

AIX® Version 7.1



# Technical Reference: Communications, Volume 1



AIX® Version 7.1



# Technical Reference: Communications, Volume 1

**Note**

Before using this information and the product it supports, read the information in "Notices," on page 481.

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This edition applies to AIX Version 7.1 and to all subsequent releases and modifications until otherwise indicated in new editions.

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## About This Book

This book provides experienced C programmers with complete detailed information about data link controls, the Data Link Provider Interface, eXternal Data Representation, the AIX® 3270 Host Connection Program, the Network Computing System, Network Information Services and Network Information Services+, the New Database Manager, and remote procedure calls for the AIX® operating system. To use the book effectively, you should be familiar with commands, system calls, subroutines, file formats, and special files. This publication is also available on the documentation CD that is shipped with the operating system.

This book is part of the six-volume technical reference set, *AIX Version 6.1 Technical Reference*, that provides information on system calls, kernel extension calls, and subroutines in the following volumes:

- *AIX Version 6.1 Technical Reference: Base Operating System and Extensions Volume 1* and *AIX Version 6.1 Technical Reference: Base Operating System and Extensions Volume 2* provide information on system calls, subroutines, functions, macros, and statements associated with base operating system runtime services.
- *AIX Version 6.1 Technical Reference: Communications Volume 1* and *AIX Version 6.1 Technical Reference: Communications Volume 2* provide information on entry points, functions, system calls, subroutines, and operations related to communications services.
- *AIX Version 6.1 Technical Reference: Kernel and Subsystems Volume 1* and *AIX Version 6.1 Technical Reference: Kernel and Subsystems Volume 2* provide information about kernel services, device driver operations, file system operations, subroutines, the configuration subsystem, the communications subsystem, the low function terminal (LFT) subsystem, the logical volume subsystem, the M-audio capture and playback adapter subsystem, the printer subsystem, the SCSI subsystem, and the serial DASD subsystem.

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## Highlighting

The following highlighting conventions are used in this book:

<b>Bold</b>	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Also identifies graphical objects such as buttons, labels, and icons that the user selects.
<i>Italics</i>	Identifies parameters whose actual names or values are to be supplied by the user.
Monospace	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

---

## Case-Sensitivity in AIX®

Everything in the AIX® operating system is case-sensitive, which means that it distinguishes between uppercase and lowercase letters. For example, you can use the **ls** command to list files. If you type **LS**, the system responds that the command is "not found." Likewise, **FILEA**, **FiLea**, and **filea** are three distinct file names, even if they reside in the same directory. To avoid causing undesirable actions to be performed, always ensure that you use the correct case.

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## ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

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## 32-Bit and 64-Bit Support for the Single UNIX<sup>®</sup> Specification

Beginning with Version 5.2, the operating system is designed to support The Open Group's Single UNIX Specification Version 3 (UNIX 03) for portability of UNIX-based operating systems. Many new interfaces, and some current ones, have been added or enhanced to meet this specification, making Version 5.2 even more open and portable for applications, while remaining compatible with previous releases of AIX<sup>®</sup>. To determine the proper way to develop a UNIX<sup>®</sup> 03-portable application, you may need to refer to The Open Group's UNIX<sup>®</sup> 03 specification, which can be accessed online or downloaded from <http://www.unix.org/>.

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## Related Publications

The following books contain information about or related to application programming interfaces:

- *Operating system and device management*
- *Networks and communication management*
- *AIX Version 6.1 General Programming Concepts: Writing and Debugging Programs*
- *AIX Version 6.1 Communications Programming Concepts*
- *AIX Version 6.1 Kernel Extensions and Device Support Programming Concepts*
- *AIX<sup>®</sup> Version 6.1 Files Reference*

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# Chapter 1. Data Link Controls

---

## dlcclose Entry Point of the GDLC Device Manager

### Purpose

Closes a generic data link control (GDLC) channel.

### Syntax

```
#include <sys/device.h>
```

```
int dlcclose ( devno, chan)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being closed.

### Description

Each GDLC supports the **dlcclose** entry point as its switch table entry for the **close** subroutine. The file system calls this entry point from the process environment only. The **dlcclose** entry point is called when a user's application program invokes the **close** subroutine or when a kernel user calls the **fp\_close** kernel service. This routine disables a GDLC channel for the user. If this is the last channel to close on the port, the GDLC device manager issues a close to the network device handler and deletes the kernel process that serviced device handler events on behalf of the user.

### Parameters

<i>devno</i>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. There is one <b>dev_t</b> device number for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<i>chan</i>	Specifies the channel ID assigned by GDLC in the <b>dlcmpx</b> routine at open time.

### Return Values

0	Indicates a successful operation.
EBADF	Indicates a bad file number. This value is defined in the <b>/usr/include/sys/errno.h</b> file.

### Related Information

The **close** subroutine.

The **ddclose** device entry point.

The **dlcmpx** entry point of the GDLC device manager, **dlcopen** entry point of the GDLC device manager.

The **fp\_close** kernel service.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlcconfig Entry Point of the GDLC Device Manager

### Purpose

Configures the generic data link control (GDLC) device manager.

### Syntax

```
#include <sys/uio.h>
#include <sys/device.h>
```

```
int dlcconfig ( devno, op, uiop)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being configured.

### Description

The **dlcconfig** entry point is called during the kernel startup procedures to initialize the GDLC device manager with its device information. The operating system also calls this routine when the GDLC is being terminated or queried for vital product data.

Each GDLC supports the **dlcconfig** entry point as its switch table entry for the **sysconfig** subroutine. The file system calls this entry point from the process environment only.

### Parameters

*devno* Indicates major and minor device numbers. This is a **dev\_t** device number that specifies both the major and minor device numbers of the GDLC device manager. One **dev\_t** device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.

*op* Specifies the operation code that indicates the function to be performed:

- CFG\_INIT**  
Initializes the GDLC device manager.
- CFG\_TERM**  
Terminates the GDLC device manager.
- CFG\_QVPD**  
Queries GDLC vital product data. This operation code is optional.

*uiop* Points to the **uio** structure specifying the location and length of the caller's data area for the **CFG\_INIT** and **CFG\_QVPD** operation codes. No data areas are specifically defined for GDLC, but DLCs can define the data areas for a particular network.

### Return Values

The following return values are defined in the **/usr/include/sys/errno.h** file:

**0** Indicates a successful operation.

**EINVAL** Indicates an invalid value.

**ENODEV** Indicates that no such device handler is present.

**EFAULT** Indicates that a kernel service, such as the **uiomove** or **devswadd** kernel service, has failed.

### Related Information

The **ddconfig** device entry point.

The **uiomove** kernel service.



## dlcioctl Entry Point of the GDLC Device Manager

### Purpose

Issues specific commands to generic data link control (GDLC).

### Syntax

```
#include <sys/device.h>
#include <sys/gdlex tcb.h>
int dlcioctl (devno, op, arg, devflag, chan, ext)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being controlled.

### Description

The **dlcioctl** entry point is called when an application program invokes the **ioctl** subroutine or when a kernel user calls the **fp\_ioctl** kernel service. The **dlcioctl** routine decodes commands for special functions in the GDLC.

Each GDLC supports the **dlcioctl** entry point as its switch table entry for the **ioctl** subroutine. The file system calls this entry point from the process environment only.

### Parameters

<i>devno</i>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. One <b>dev_t</b> device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<i>op</i>	Specifies the parameter from the subroutine that specifies the operation to be performed. See "ioctl Operations (op) for DLC" for a list of all possible operators.
<i>arg</i>	Indicates the parameter from the subroutine that specifies the address of a parameter block. See "Parameter Blocks by ioctl Operation for DLC" for a list of all possible arguments.
<i>devflag</i>	Specifies the flag word with the following flags defined: <b>DKERNEL</b> Entry point called by kernel routine using the <b>fp_open</b> kernel service. This indicates that the <i>arg</i> parameter points to kernel space. <b>DREAD</b> Open for reading. This flag is ignored. <b>DWRITE</b> Open for writing. This flag is ignored. <b>DAPPEND</b> Open for appending. This flag is ignored. <b>DNDELAY</b> Device open in nonblocking mode. This flag is ignored.
<i>chan</i>	Specifies the channel ID assigned by GDLC in the <b>dlcmpx</b> routine at open time.
<i>ext</i>	Specifies the extended subroutine parameter. This parameter is ignored by GDLC.

## Return Values

The following return values are defined in the `/usr/include/sys/errno.h` file.

Value	Description
0	Indicates a successful operation.
EBADF	Indicates a bad file number.
EINVAL	Indicates an invalid value.
ENOMEM	Indicates insufficient resources to satisfy the <code>ioctl</code> subroutine.

## Related Information

The `ioctl` subroutine.

The `ddioctl` device driver entry point.

The `dlcmpx` entry point of the GDLC device manager.

`ioctl` Operations (op) for DLC.

The `fp_ioctl` kernel service, `fp_open` kernel service.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlcmpx Entry Point of the GDLC Device Manager

### Purpose

Decodes the device handler's special file name appended to the open call.

### Syntax

```
#include <sys/device.h>
```

```
int dlcmpx ( devno, chanp, channame)
```

**Note:** The `dlc` prefix is replaced with the three-digit prefix for the specific GDLC device manager being opened.

### Description

The operating system calls the `dlcmpx` entry point when a generic data link control (GDLC) channel is allocated. This routine decodes the name of the device handler appended to the end of the GDLC special file name at open time. GDLC allocates the channel and returns the value in the `chanp` parameter.

This routine is also called following a `close` subroutine to deallocate the channel. In this case the `chanp` parameter is passed to GDLC to identify the channel being deallocated. Since GDLC allocates a new channel for each `open` subroutine, a `dlcmpx` routine follows each call to the `dlclose` routine.

Each GDLC supports the `dlcmpx` entry point as its switch table entry for the `open` and `close` subroutines. The file system calls this entry point from the process environment only.

## Parameters

<i>devno</i>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. There is one <b>dev_t</b> device number for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<i>chanp</i>	Specifies the channel ID returned if a valid path name exists for the device handler, and the <b>openflag</b> is set. If no channel ID is allocated, this parameter is set to a value of -1 by GDLC.
<i>channname</i>	Points to the appended path name (path name extension) of the device handler that is used by GDLC to attach to the network. If this is null, the channel is deallocated.

## Return Values

The following return values are defined in the `/usr/include/sys/errno.h` file:

Value	Description
0	Indicates a successful operation.
EBADF	Indicates a bad file number.
EINVAL	Indicates an invalid value.

## Related Information

The **close** subroutine, **open** subroutine.

The **ddmpx** device entry point.

The **dlclose** entry point for the GDLC device manager, **dlcopen** entry point for the GDLC device manager.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlcopen Entry Point of the GDLC Device Manager

### Purpose

Opens a generic data link control (GDLC) channel.

### Syntax

```
#include <sys/device.h>
#include <sys/gdlextc.h>
```

```
int dlcopen ( devno, devflag, chan, ext)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being opened.

### Description

The **dlcopen** entry point is called when a user's application program invokes the **open** or **openx** subroutine, or when a kernel user calls the **fp\_open** kernel service. The GDLC device manager opens the specified communications device handler and creates a kernel process to catch posted events from that port. Additional opens to the same port share both the device handler open and the GDLC kernel process created on the original open.

Each GDLC supports the **dlcopen** entry point as its switch table entry for the **open** and **openx** subroutines. The file system calls this entry point from the process environment only.

**Note:** It may be more advantageous to handle the actual device handler open and kernel process creation in the **dlcmpx** routine. This is left as a specific DLC's option.

## Parameters

<i>devno</i>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. One <b>dev_t</b> device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<i>devflag</i>	Specifies the flag word with the following flags defined: <b>DKERNEL</b> Entry point called by kernel routine using the <b>fp_open</b> kernel service. All command extensions and <b>ioctl</b> arguments are in kernel space. <b>DREAD</b> Open for reading. This flag is ignored. <b>DWRITE</b> Open for writing. This flag is ignored. <b>DAPPEND</b> Open for appending. This flag is ignored. <b>DNDELAY</b> Device open in nonblocking mode. This flag is ignored.
<i>chan</i>	Specifies the channel ID assigned by GDLC in the <b>dlcmpx</b> routine.
<i>ext</i>	Specifies the extended subroutine parameter. This is a pointer to the <b>dlc_open_ext</b> extended I/O structure for the <b>open</b> subroutine.

## Return Values

The following return values are defined in the **/usr/include/sys/errno.h** file.

Value	Description
<b>0</b>	Indicates a successful operation.
<b>ECHILD</b>	Indicates that the device manager cannot create a kernel process.
<b>EINVAL</b>	Indicates an invalid value.
<b>ENODEV</b>	Indicates that no such device handler is present.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the <b>open</b> subroutine.
<b>EFAULT</b>	Indicates that a kernel service, such as the <b>copyin</b> or <b>initp</b> kernel service was unsuccessful.

## Related Information

The **open** or **openx** subroutine.

The **ddopen** device entry point.

The **dlclose** entry point of the GDLC device manager, **dlcmpx** entry point of the GDLC device manager.

The **fp\_open** kernel service, **copyin** kernel service, **initp** kernel service.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlicread Entry Point of the GDLC Device Manager

### Purpose

Reads receive data from generic data link control (GDLC).

### Syntax

```
#include <sys/device.h>
#include <sys/gdlextc.h>
int dlicread (devno, uiop, chan, ext)
```

**Note:** The **dlic** prefix is replaced with the three-digit prefix for the specific GDLC device manager being read.

### Description

The **dlicread** entry point is called when a user application program invokes the **readx** subroutine. Kernel users do *not* call an **fp\_read** kernel service. All receive data is returned to the user in the same order as received. The type of data that was read is indicated, as well as the service access point (SAP) and link station (LS) identifiers.

The following fields in the **uio** and **iovec** structures are used to control the read-data transfer operation:

Field	Description
<code>uio_iov</code>	Points to an <b>iovec</b> structure.
<code>uio_iovcnt</code>	Indicates the number of elements in the <b>iovec</b> structure. This must be set to a value of 1. Vectored read operations are not supported.
<code>uio_offset</code>	Indicates the file offset established by a previous <b>fp_lseek</b> kernel service. This field is ignored by GDLC.
<code>uio_segflag</code>	Indicates whether the data area is in application or kernel space. This is set to the <b>UIO_USERSPACE</b> value by the file I/O subsystem to indicate application space.
<code>uio_fmode</code>	Contains the value of the file mode set with the <b>open</b> applications subroutine to GDLC.
<code>uio_resid</code>	Specifies initially the total byte count of the receive data area. GDLC decrements this count for each packet byte received using the <b>uimove</b> kernel service.
<code>iovec structure</code>	Contains the starting address and length of the received data.
<code>iov_base</code>	Specifies where GDLC writes the address of the received data. This field is a variable in the <b>iovec</b> structure.
<code>iov_len</code>	Contains the byte length of the data. This field is a variable in the <b>iovec</b> structure.

Each GDLC supports the **dlicread** entry point as its switch table entry for the **readx** subroutine. The file system calls this entry point from the process environment only.

### Parameters

<code>devno</code>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. One <b>dev_t</b> device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<code>uiop</code>	Points to the <b>uio</b> structure containing the read parameters.
<code>chan</code>	Specifies the channel ID assigned by GDLC in the <b>dlicmpx</b> routine at open time.
<code>ext</code>	Specifies the extended subroutine parameter. This is a pointer to the extended I/O structure. The argument to this parameter must always be in the application space. See the "read Subroutine Extended Parameters for DLC" for more information on this parameter.

## Return Values

Successful read operations and those truncated due to limited user data space each return a value of 0 (zero). If more data is received from the media than will fit into the application data area, the **DLC\_OFLO** value indicator is set in the command extension area (**dlc\_io\_ext**) to indicate that the read is truncated. All excess data is lost.

The following return values are defined in the **/usr/include/sys/errno.h** file:

Value	Description
<b>EBADF</b>	Indicates a bad file number.
<b>EINTR</b>	Indicates that a signal interrupted the routine before it received data.
<b>EINVAL</b>	Indicates an invalid value.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the read operation.

## Related Information

The **open** subroutine, **readx** subroutine.

The **ddread** device entry point.

The **dlcmpx** entry point of the GDLC device manager, **dlcwrite** entry point of the GDLC device manager.

The **fp\_lseek** kernel service, **fp\_read** kernel service, **uiomove** kernel service.

read Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlcselect Entry Point of the GDLC Device Manager

### Purpose

Selects for asynchronous criteria from generic data link control (GDLC), such as receive data completion and exception conditions.

### Syntax

```
#include <sys/device.h>
#include <sys/poll.h>
#include <sys/gd1extcb.h>

int dlcselect (devno, events, reventp, chan)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being selected.

### Description

The **dlcselect** entry point is called when a user application program invokes a **select** or **poll** subroutine. This allows the user to select receive data or exception conditions. The **POLLOUT** write-availability criteria is not supported. If no results are available at the time of a **select** subroutine, the user process is put to sleep until an event occurs.

If one or more events specified in the *events* parameter are true, the **dlcselect** routine updates the *reventp* (returned events) parameter (passed by reference) by setting the corresponding event bits that indicate which events are currently true.

If none of the requested events are true, the **dlcselect** routine sets the returned events parameter to a value of 0 (passed by reference using the *reventp* parameter) and checks the **POLLSYNC** flag in the *events* parameter. If this flag is true, the routine returns because the event request was a synchronous request. If the **POLLSYNC** flag is false, an internal flag is set for each event requested in the *events* parameter.

When one or more of the requested events become true, GDLC issues the **selnotify** kernel service to notify the kernel that a requested event or events have become true. The internal flag indicating that the event was requested is then reset to prevent renotification of the event.

If the port in use is in a closed state, implying that the requested event or events can never be satisfied, GDLC sets the returned events flags to a value of 1 for each event that can never be satisfied. This is done so that the **select** or **poll** subroutine does not wait indefinitely.

Kernel users do not call an **fp\_select** kernel service since their receive data and exception notification functions are called directly by GDLC. "open Subroutine Extended Parameters for DLC" details how these function handlers are specified.

Each GDLC supports the **dlcselect** entry point as its switch table entry for the **select** or **poll** subroutines. The file system calls this entry point from the process environment only.

## Parameters

<i>devno</i>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. One <b>dev_t</b> device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<i>events</i>	Identifies the events to check. The following events are: <ul style="list-style-type: none"> <li><b>POLLIN</b> Read selection.</li> <li><b>POLLOUT</b> Write selection. This is not supported by GDLC.</li> <li><b>POLLPRI</b> Exception selection.</li> <li><b>POLLSYNC</b> This request is a synchronous request only. The routine should not perform a <b>selnotify</b> kernel service routine due to this request if the events occur later.</li> </ul>
<i>reventp</i>	Identifies a returned events pointer. This is a parameter passed by reference to indicate which of the selected events are true at the time of the call. See the preceding <i>events</i> parameter for possible values.
<i>chan</i>	Specifies the channel ID assigned by GDLC in the <b>dlcmpx</b> routine at open time.

## Return Values

The following return values are defined in the **/usr/include/sys/errno.h** file:

Value	Description
<b>0</b>	Indicates a successful operation.
<b>EBADF</b>	Indicates a bad file number.
<b>EINTR</b>	Indicates that a signal interrupted the subroutine before it found any of the selected events.
<b>EINVAL</b>	Indicates that the specified <b>POLLOUT</b> write selection is not supported.

## Related Information

The **select** subroutine, **poll** subroutine.

The **ddselect** device entry point, **dlcmpx** entry point.

The **fp\_select** kernel service.

open Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dlcwrite Entry Point of the GDLC Device Manager

### Purpose

Writes transmit data to generic data link control (GDLC).

### Syntax

```
#include <sys/uio.h>
#include <sys/device.h>
#include <sys/gdlextc.h>
int dlcwrite (devno, uiop, chan, ext)
```

**Note:** The **dlc** prefix is replaced with the three-digit prefix for the specific GDLC device manager being written.

### Description

The **dlcwrite** entry point is called when a user application program invokes a **writex** subroutine or when a kernel user calls the **fp\_write** kernel service. An extended write is used in order to specify the type of data being sent, as well as the service access point (SAP) and link station (LS) identifiers.

The following fields in the **uio** and **iovec** structures are used to control the write data transfer operation:

Field	Description
<code>uio_iov</code>	Points to an <b>iovec</b> structure.
<code>uio_iovcnt</code>	Indicates the number of elements in the <b>iovec</b> structure. This must be set to a value of 1 for the kernel user, indicating that there is a single communications memory buffer ( <b>mbuf</b> ) chain associated with the <b>write</b> subroutine.
<code>uio_offset</code>	Specifies the file offset established by a previous <b>fp_lseek</b> kernel service. This field is ignored by GDLC.
<code>uio_segflag</code>	Indicates whether the data area is in application or kernel space. This field is set to the <b>UIO_USERSPACE</b> value by the file I/O subsystem if the data area is in application space. The field must be set to the <b>UIO_SYSSPACE</b> value by the kernel user to indicate kernel space.
<code>uio_fmode</code>	Contains the value of the file mode set during an application <b>open</b> subroutine to GDLC or can be set directly during a <b>fp_open</b> kernel service to GDLC.
<code>uio_resid</code>	Contains the total byte count of the transmit data area for application users. For kernel users, GDLC ignores this field since the communications memory buffer ( <b>mbuf</b> ) also carries this information.
<code>iovec structure</code>	Contains the starting address and length of the transmit. (See the <code>iov_base</code> and <code>iov_len</code> fields.)
<code>iov_base</code>	Specifies a variable in the <b>iovec</b> structure where GDLC gets the address of the application user's transmit data area or the address of the kernel user's transmit <b>mbuf</b> .



Field	Description
<code>iov_len</code>	Specifies a variable in the <b>iovec</b> structure that contains the byte length of the application user's transmit data area. This variable is ignored by GDLC for kernel users, since the transmit <b>mbuf</b> contains a length field.

Each GDLC supports the **dlcwrite** entry point as its switch table entry for the **writex** subroutine. The file system calls this entry point from the process environment only.

## Parameters

<code>devno</code>	Indicates major and minor device numbers. This is a <b>dev_t</b> device number that specifies both the major and minor device numbers of the GDLC device manager. One <b>dev_t</b> device number exists for each type of GDLC, such as Ethernet, Token-Ring, or SDLC.
<code>uiop</code>	Points to the <b>uio</b> structure containing the write parameters.
<code>chan</code>	Specifies the channel ID assigned by GDLC in the <b>dlcmpx</b> routine at open time.
<code>ext</code>	Specifies the extended subroutine parameter. This is a pointer to the extended I/O structure. This data must be in the application space if the <code>uio_fmode</code> field indicates an application subroutine or in the kernel space if the <code>uio_fmode</code> field indicates a kernel subroutine. See the "write Subroutine Extended Parameters for DLC" for more information on this parameter.

## Return Values

The following return values are defined in the `/usr/include/sys/errno.h` file:

Value	Description
<code>0</code>	Indicates a successful operation.
<b>EAGAIN</b>	Indicates that transmit is temporarily blocked and a sleep cannot be issued.
<b>EBADF</b>	Indicates a bad file number (application).
<b>EINTR</b>	Indicates that a signal interrupted the routine before it could complete successfully.
<b>EINVAL</b>	Indicates an invalid value, such as too much data for a single packet.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the <b>write</b> subroutine, such as a lack of communications memory buffers ( <b>mbufs</b> ).
<b>ENXIO</b>	Indicates an invalid file pointer (kernel).

## Related Information

The **open** subroutine, **writex** subroutine.

The **dlcmpx** entry point of the GDLC device manager, **dlcread** entry point of the GDLC device manager, **ddwrite** device entry point.

The **fp\_lseek** kernel service, **fp\_open** kernel service, **fp\_write** kernel service.

write Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## close Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Closes the generic data link control (GDLC) device manager using a file descriptor.

## Syntax

```
int close ( fildev )
```

## Description

The **close** subroutine disables a GDLC channel. If this is the last channel to close on a port, the GDLC device manager is reset to an idle state on that port and the communications device handler is closed.

Each GDLC supports the **close** subroutine interface by way of its **dlclose** and **dlcmpx** entry points. This subroutine can be called from the process environment only.

## Parameters

*fildev* Specifies the file descriptor of the GDLC being closed.

## Return Values

**0** Indicates a successful operation.  
**EBADF** Indicates a bad file number. This value is defined in the `/usr/include/sys/errno.h` file.

If an error occurs, a value of -1 is also returned.

## Related Information

The **close** subroutine.

open Subroutine Interface for DLC Devices .

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## ioctl Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Transfers special commands to generic data link control (GDLC) using a file descriptor.

### Syntax

```
#include <sys/ioctl.h>  
#include <sys/devinfo.h>  
#include <sys/gdlextc.h>
```

```
int ioctl ( fildev, op, arg );
```

### Description

The **ioctl** subroutine initiates various GDLC functions, such as changing configuration parameters, contacting a remote link, and testing a link. Most of these operations can be completed before returning to the user (synchronously). Since some operations take longer, asynchronous results are returned later using the exception condition notification. Application users can obtain these exceptions using the **DLC\_GET\_EXCEP** ioctl operation. For more information on the functions that can be initiated using the **ioctl** subroutine, see "ioctl Operations (op) for DLC" and "Parameter Blocks by ioctl Operation for DLC".

Each GDLC supports the **ioctl** subroutine interface via its **dlcioctl** entry point. This subroutine may be called from the process environment only.

## Parameters

<i>fildev</i>	Specifies the file descriptor of the target GDLC.
<i>op</i>	Specifies the operation to be performed by GDLC. See "ioctl Operations (op) for DLC" for a listing of all possible operators.
<i>arg</i>	Specifies the address of the parameter block. See "Parameter Blocks by ioctl Operations for DLC" for a listing of possible values.

## Return Values

0 Indicates a successful operation.

If an error occurs, a value of -1 is returned with one of the following error values available using the **errno** global variable, as defined in the **/usr/include/sys/errno.h** file:

Value	Description
<b>EBADF</b>	Indicates a bad file number.
<b>EINVAL</b>	Indicates an invalid argument.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the <b>ioctl</b> subroutine.

## Related Information

The **ioctl** subroutine.

ioctl Operations (op) for DLC.

Parameter Blocks by ioctl Operation for DLC.

Generic Data Link Control (GDLC) Environment Introduction in *AIX Version 6.1 Communications Programming Concepts*.

---

## open Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Opens the generic data link control (GDLC) device manager by special file name.

### Syntax

```
#include <fcntl.h>
#include <sys/gdlextc.h>
```

```
int open ( path, oflag, mode)
```

or

```
int openx (path, oflag, mode, ext)
```

### Description

The **open** subroutine allows the application user to open a GDLC device manager by specifying the DLC special file name and the target device handler special file name. Since the GDLC device manager is multiplexed, more than one process can open it (or the same process many times) and still have unique channel identifications.

Each open carries the communications device handler's special file name so that the DLC knows on which port to transfer data. This name must directly follow the DLC's special file name. For example, in the `/dev/dlccether/ent0` character string, `ent0` is the special file name of the Ethernet device handler. GDLC obtains this name using its **dlcmpx** routine.

Each GDLC supports the **open** subroutine interface by way of its **dlcopen** and **dlcmpx** entry points. This subroutine may be called from the process environment only.

## Parameters

<i>path</i>	Consists of a character string containing the <b>/dev</b> special file name of the GDLC device manager, with the name of the communications device handler appended as follows:  <code>/dev/dlccether/ent0</code>
<i>oflag</i>	Specifies a value for the file status flag. The GDLC device manager ignores all but the following flags:  <b>O_RDWR</b> Open for reading and writing. This must be set for GDLC or the open will fail.  <b>O_NDELAY, O_NONBLOCK</b> Subsequent reads with no data present and writes that cannot get enough resources will return immediately. The calling process is not put to sleep.
<i>mode</i>	Specifies the <b>O_CREAT</b> mode parameter. This is ignored by GDLC.
<i>ext</i>	Specifies the extended subroutine parameter. This is a pointer to the <b>dlc_open_ext</b> extended I/O structure for the open subroutines. See "open Subroutine Extended Parameters for DLC" for more information on this parameter.

## Return Values

Upon successful completion, the **open** subroutine returns a valid file descriptor that identifies the opened GDLC channel.

If an error occurs, a value of -1 is returned with one of the following error values available using the **errno** global variable, as defined in the `/usr/include/sys/errno.h` file:

Value	Description
<b>ECHILD</b>	Indicates that the device manager cannot create a kernel process.
<b>EINVAL</b>	Indicates an invalid value.
<b>ENODEV</b>	Indicates that no such device handler is present.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the <b>open</b> subroutine.
<b>EFAULT</b>	Indicates that a kernel service, such as the <b>copyin</b> or <b>initp</b> kernel service, has failed.

## Related Information

The **dlcmpx** entry point.

The **copyin** kernel service, **initp** kernel service.

close Subroutine Interface for Data Link Control (DLC) Devices, open Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## readx Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Allows receive application data to be read using a file descriptor.

### Syntax

```
#include <sys/gdlextc.h>
#include <sys/uio.h>
int readx (fildes, buf, len, ext)
```

### Description

The receive queue for this application user is interrogated for any pending data. The oldest data packet is copied to user space, with the type of data, the link station correlator, and the service access point (SAP) correlator written to the extension area. When attempting to read an empty receive data queue, the default action is to delay until data is available. If the **O\_NDELAY** or **O\_NONBLOCK** flags are specified in the **open** subroutine, the **readx** subroutine returns immediately to the caller.

Data is transferred using the **uiomove** kernel service between the user space and kernel communications memory buffers (**mbufs**). A complete receive packet must fit into the user's read data area. Generic data link control (GDLC) does not break up received packets into multiple user data areas.

Each GDLC supports the **readx** subroutine interface via its **dlcread** entry point. This subroutine can be called from the process environment only.

### Parameters

<i>fildes</i>	Specifies the file descriptor returned from the <b>open</b> subroutine.
<i>buf</i>	Points to the user data area.
<i>len</i>	Contains the byte count of the user data area.
<i>ext</i>	Specifies the extended subroutine parameter. This is a pointer to the <b>dlc_io_ext</b> extended I/O structure for the <b>readx</b> subroutine. "read Subroutine Extended Parameters for DLC" provides more information on this parameter. <b>Note:</b> It is the user's responsibility to set the <i>ext</i> parameter area to 0 (zero) before issuing the <b>readx</b> subroutine to insure valid entries when no data is available.

### Return Values

Upon successful completion, the **readx** subroutine returns the number of bytes read and placed into the application data area. If more data is received from the media than will fit into the application data area, the **DLC\_OFLO** flag is set in the **dlc\_io\_ext** command extension area to indicate that the read is truncated. All excess data is lost.

If no data is available and the application user has specified the **O\_NDELAY** or **O\_NONBLOCK** flags at open time, a 0 (zero) is returned.

If an error occurs, a value of -1 is returned with one of the following error numbers available using the **errno** global variable, as defined in the **/usr/include/sys/errno.h** file:

Value	Description
<b>EBADF</b>	Indicates a bad file number.

Value	Description
<b>EINTR</b>	Indicates that a signal interrupted the subroutine before it received data.
<b>EINVAL</b>	Indicates an invalid value.
<b>ENOMEM</b>	Indicates insufficient resources to satisfy the read operation.

## Related Information

The **open** subroutine, **readx** subroutine.

The **uiomove** kernel service.

read Subroutine Extended Parameters for DLC, writex Subroutine Interface for DLC Devices.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## select Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Allows data to be sent using a file descriptor.

### Syntax

```
#include <sys/select.h>
int select (nfdsmgs, readlist, writelist, exceptlist, timeout)
```

### Description

The **select** subroutine checks the specified file descriptor and message queues to see if they are ready for reading (receiving) or writing (sending), or if they have an exception condition pending.

**Note:** Generic data link control (GDLC) does not support transmit for nonblocked notification in the full sense. If the *writelist* parameter is specified in the **select** call, GDLC always returns as if transmit is available. There is no checking to see if internal buffering is available or if internal control-block locks are free. These resources are much too dynamic, and tests for their availability can be done reasonably only at the time of use.

The *readlist* and *exceptlist* parameters are fully supported. Whenever the selection criteria specified by the *SelType* parameter is true, the file system returns a value that indicates the total number of file descriptors and message queues that satisfy the selection criteria. The **fdsmask** bit masks are modified so that bits set to a value of 1 indicate file descriptors that meet the criteria. The **msgids** arrays are altered so that message queue identifiers that do not meet the criteria are replaced with a value of -1. If the selection is not satisfied, the calling process is put to sleep waiting on a **selwakeup** subroutine at a later time.

Each GDLC supports the **select** subroutine interface via its **dlcselect** entry point. This subroutine can be called from the process environment only.

### Parameters

<i>nfdsmgs</i>	Specifies the number of file descriptors and message queues to check.
----------------	---

**sellist**

The *readlist*, *writelist*, and *exceptlist* parameters specify what to check for during reading, writing, and exceptions, respectively. Each **sellist** is a structure that contains a file descriptor bit mask (**fdsmask**) and message queue identifiers (**msgids**).

*timeout*

The *writelist* criterion is always set to True by GDLC. Points to a structure that specifies the maximum length of time to wait for at least one of the selection criteria to be met (if the *timeout* parameter is not a null pointer).

## Return Values

Upon successful completion, the **select** subroutine returns a value that indicates the total number of file descriptors and message queues that satisfy the selection criteria. The return value is similar to the *nfdsmgs* parameter in that the low-order 16 bits give the number of file descriptors. Also, the high-order 16 bits give the number of message queue identifiers. These values indicate the sum total that meet each of the read and exception criteria.

If the time limit specified by the *timeout* parameter expires, then the **select** subroutine returns a value of 0 (zero).

If an error occurs, a value of -1 is returned with one of the following error values available using the **errno** global variable, as defined in the */usr/include/sys/errno.h* file:

**EBADF**

Indicates a bad file number.

**EINTR**

Indicates that a signal interrupted the subroutine before it found any of the selected events.

**EINVAL**

Indicates that one of the parameters contained an invalid value.

## Related Information

The **select** subroutine.

Select/Poll Logic for ddwrite and ddread Routines in *AIX Version 6.1 Technical Reference: Kernel and Subsystems Volume 1*.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## writex Subroutine Interface for Data Link Control (DLC) Devices

### Purpose

Allows application data to be sent using a file descriptor.

### Syntax

```
#include <sys/gdlextcb.h>
#include <sys/uio.h>
int writex (fildes, buf, len, ext)
```

### Description

Four types of data can be sent to generic data link control (GDLC). Network data can be sent to a service access point (SAP), while normal, Exchange Identification (XID) or datagram data can be sent to a link

station (LS). Data is transferred using the **uiomove** kernel service between the application user space and kernel communications I/O buffers (**mbufs**). All data must fit into a single packet for each **write** subroutine. The generic data link control does not separate the user's write data area into multiple transmit packets. A maximum write data size is passed back to the user at **DLC\_ENABLE\_SAP** completion and at **DLC\_START\_LS** completion for this purpose. See **DLC\_SAPE\_RES** and **DLC\_STAS\_RES** for further information.

Normally, GDLC can immediately satisfy a **write** subroutine by completing the data link headers and sending the transmit packet down to the device handler. In some cases, however, transmit packets can be blocked by the particular protocol's flow control or by a resource outage. GDLC reacts to this differently, based on the system blocked or nonblocked file status flags. These are set for each channel using the **O\_NDELAY** and **O\_NONBLOCK** values passed on **open** or **fcntl** subroutines with the **F\_SETFD** parameter.

GDLC only looks at the **uio\_fmode** field on each **write** subroutine to determine whether the operation is blocked or nonblocked. Nonblocked writes that cannot get enough resources to queue the data return an error indication. Blocked **write** subroutines put the calling process to sleep until the resources free up or an error occurs.

Each GDLC supports the **writex** subroutine interface via its **dlcwrite** entry point. This subroutine may be called from the process environment only.

**Note:** GDLC does not support nonblocked transmit users based on resource availability using the **selwakeup** subroutine. Internal resources such as communications I/O buffers and control block locks are very dynamic. Any **write** subroutines that fail with errors (such as **EAGAIN** or **ENOMEM**) should be retried at the user's discretion.

## Parameters

<i>fildev</i>	Specifies the file descriptor returned from the <b>open</b> subroutine.
<i>buf</i>	Points to the user data area.
<i>len</i>	Contains the byte count of the user data area.
<i>ext</i>	Specifies the extended subroutine parameter. This is a pointer to the <b>dlc_io_ext</b> extended I/O structure for the <b>writex</b> subroutine. "write Subroutine Extended Parameters for DLC" provides more information on this parameter.

## Return Values

Upon successful completion, this service returns the number of bytes that were written into a communications packet from the user data area.

If an error occurs, a value of -1 is returned with one of the following error values available using the **errno** global variable, as defined in the **/usr/include/sys/errno.h** file.

Value	Description
<b>EAGAIN</b>	Indicates insufficient resources to satisfy the write. For example, the routine was unable to obtain a necessary lock. The user can try again later.
<b>EBADF</b>	Indicates a bad file number.
<b>EINTR</b>	Indicates that a signal interrupted the subroutine before it completed successfully.
<b>EINVAL</b>	Indicates an invalid value, such as too much data for a single packet.



Value	Description
EIO	Indicates that an I/O error has occurred, such as loss of the port.
ENOMEM	Indicates insufficient resources to satisfy the write operation. For example, a lack of communications memory buffers ( <b>mbufs</b> ). The user can try again later.

## Related Information

The **fcntl** subroutine, **open** subroutine, **writex** subroutine.

The **uiomove** kernel service.

Parameter Blocks by ioctl Operation for DLC.

readx Subroutine Interface for DLC Devices, write Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## open Subroutine Extended Parameters for DLC

### Purpose

Alters certain defaulted parameters for an extended **open** (**openx**) subroutine.

### Syntax

```
struct dlc_open_ext
{
    __ulong32_t maxsaps;
    int (*rcvi_fa)();
    int (*rcvx_fa)();
    int (*rcvd_fa)();
    int (*rcvn_fa)();
    int (*excp_fa)();
};
```

### Description

An extended **open** or **openx** subroutine can be issued to alter certain defaulted parameters, such as maximum service access points (SAPs) and ring queue depths. Kernel users may change these normally defaulted parameters, but are required to provide additional parameters to notify the **dlcopen** routine that these callers are to be treated as kernel processes and not as application processes. Additional parameters passed include functional addresses that generic data link control (GDLC) calls to notify about asynchronous events, such as receive data available.

The *maxsaps* parameter is optional for both the application and the kernel user. The other five parameters are mandatory for kernel users but are ignored by GDLC for application users. There are no default values. Each field must be filled in by the kernel user. All functional entry addresses must be valid. That is, entry points that the kernel user does not wish to support must at least point to a routine which frees the communication's memory buffer (**mbuf**) passed on the call.

These DLC extended parameters for the **open** subroutine are part of the data link control in BOS Extensions 2 for the device manager you are using.

See the `/usr/include/sys/gdlextc.h` file for more details on GDLC structures.

## Parameters

<code>maxsaps</code>	Specifies the maximum number of SAPs the user channel uses to start and run concurrently. Any value from 1 to 127 can be specified. If the default value of 1 is desired, the user must set the field to 0 (zero) before issuing the <b>open</b> subroutine.
<code>rcvi_fa</code>	Points to the address of a user I-Frame Data Received routine that handles the sequenced receive data completions. This field is valid for kernel users only and must be set to 0 (zero) by application users.
<code>rcvx_fa</code>	Points to the address of a user XID Data Received routine that handles the exchange ID receive data completions.
<code>rcvd_fa</code>	Points to the address of a user Datagram Data Received routine that handles the datagram receive data completions.
<code>rcvn_fa</code>	Points to the address of a user Network Data Received routine that handles the network receive data completions.
<code>excp_fa</code>	Points to the address of a user Exception Condition routine that handles the exception conditions, such as <b>DLC_SAPE_RES</b> (SAP-enabled) or <b>DLC_CONT_RES</b> (LS-contacted).

## Related Information

The **open** or **openx** subroutine.

The **dlcopen** entry point.

List of Kernel Routines for DLC.

Parameter Blocks by ioctl Operation for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## read Subroutine Extended Parameters for DLC

### Purpose

Provide generic data link control (GDLC) with a structure to return data types and service access point (SAP) and link station (LS) correlators.

### Syntax

```
#define DLC_INFO    0x80000000
#define DLC_XIDD    0x40000000
#define DLC_DGRM    0x20000000
#define DLC_NETD    0x10000000
#define DLC_OFLO    0x00000002
#define DLC_RSPP    0x00000001
```

```
struct dlc_io_ext
{
    __ulong32_t  sap_corr;
```

```

    __ulong32_t  ls_corr;
    __ulong32_t  flags;
    __ulong32_t  dlh_len;
};

```

## Description

An extended **read** or **readx** subroutine must be issued by an application user to provide GDLC with a structure to return the type of data and the SAP and LS correlators.

## Parameters

*sap\_corr* Specifies the user's SAP identifier of the received data.  
*ls\_corr* Specifies the user's LS identifier of the received data.  
*flags* Specifies flags for the **readx** subroutine. The following flags are supported:

### DLC\_INFO

Indicates that normal sequenced data has been received for a link station using an I-Frame Data Received routine. If buffer overflow (OFLO) is indicated, the received data has been truncated because the received data length exceeds either the maximum I-field size derived at completion of **DLC\_START\_LS** ioctl operation or the application user's buffer size.

### DLC\_XIDD

Indicates that exchange identification (XID) data has been received for a link station using an XID Data Received routine. If buffer overflow (OFLO) is indicated, the received XID has been truncated because the received data length exceeds either the maximum I-field size derived at **DLC\_START\_LS** completion or the application user's buffer size. If response pending (RSPP) is indicated, an XID response is required and must be provided to GDLC using a write XID as soon as possible to avoid repolling and possible termination of the remote LS.

### DLC\_DGRM

Indicates that a datagram has been received for an LS using a Datagram Data Received routine. If buffer overflow (OFLO) is indicated, the received data has been truncated because the received data length exceeds either the maximum I-field size derived at **DLC\_START\_LS** completion or the application user's buffer size.

### DLC\_NETD

Indicates that data has been received from the network for a service access point using a Network Data Received routine. This may be link-establishment data such as X.21 call-progress signals or Smartmodem command responses. It can also be data destined for the user's SAP when no link station has been started that fits the addressing of the packet received. If buffer overflow (OFLO) is indicated, the received data has been truncated because the received data length exceeds either the maximum packet size derived at **DLC\_ENABLE\_SAP** completion or the application user's buffer size.

Network data contains the entire MAC layer packet, excluding any fields stripped by the adapter such as Preamble or CRC.

### DLC\_OFLO

Indicates that overflow of the user data area has occurred and the data was truncated. This error does not set a **u.u\_error** indication.

### DLC\_RSPP

Indicates that the XID received requires an XID response to be sent back to the remote link station.

*dlh\_len* Specifies data link header length. This field has a different meaning depending on whether the extension is for a **readx** subroutine call *to* GDLC or a response *from* GDLC.

On the application **readx** subroutine, this field indicates whether the user wishes to have datalink header information prefixed to the data. If this field is set to 0 (zero), the data link header is *not* to be copied (only the I-field is copied). If this field is set to any nonzero value, the data link header information is included in the read operation.

On the response to an application **readx** subroutine, this field contains the number of data link header bytes received and copied into the data link header information field.

On asynchronous receive function handlers to the kernel user, this field contains the length of the data link header within the communications memory buffer (**mbuf**).

These DLC extended parameters for the **read** subroutine are part of the data link control in BOS Extensions 2 for the device manager you are using.

## Related Information

The **read**, **readx**, **readv**, or **readvx** subroutine.

List of Kernel Routines for DLC.

Parameter Blocks by ioctl Operation for DLC.

write Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## write Subroutine Extended Parameters for DLC

### Purpose

Provide generic data link control (GDLC) with data types, service access points (SAPs), and link station (LS) correlators.

### Syntax

```
#define   DLC_INFO       0x80000000
#define   DLC_XIDD       0x40000000
#define   DLC_DGRM       0x20000000
#define   DLC_NETD       0x10000000
```

```
__ulong32_t  sap_corr;
__ulong32_t  ls_corr;
__ulong32_t  flags;
__ulong32_t  dlh_len;
};
```

### Description

An extended **write** or **writex** subroutine must be issued by an application or kernel user to provide GDLC with data types, SAPs, and LS correlators.

These DLC extended parameters for the **write** subroutine are part of the data link control in BOS Extensions 2 for the device manager you are using.

## Parameters

*sap\_corr*

Specifies the GDLC SAP correlator of the write data. This field must contain the same correlator value passed back from GDLC in the `gd1c_sap_corr` field when the SAP was enabled.

*dlh\_len*

Not used for writes.

*ls\_corr*

Specifies the GDLC LS correlator of the write data. This field must contain the same correlator value passed back from GDLC in the `gd1c_ls_corr` field when the LS was started.

*flags*

Specifies flags for the **writex** subroutine. The following flags are supported:

### **DLC\_INFO**

Requests a sequenced data class of information to be sent (generally called I-frames).

This request is valid any time the target link station has been started and contacted.

### **DLC\_XIDD**

Requests an exchange identification (XID) non-sequenced command or response packet to be sent.

This request is valid any time the target link station has been started with the following rules:

GDLC sends the XID as a command as long as no **DLC\_TEST**, **DLC\_CONTACT**, **DLC\_HALT\_LS**, or **DLC\_XIDD** write subroutine is already in progress, and no received XID is waiting for a response. If a received XID is waiting for a response, GDLC automatically sends the write XID as that response. If no response is pending and a command is already in progress, the write is rejected by GDLC.

### **DLC\_DGRM**

Requests a datagram packet to be sent. A datagram is an unnumbered information (UI) response.

This request is valid any time the target link station has been started.

### **DLC\_NETD**

Requests that network data be sent.

Examples of network data include special modem control data or user-generated medium access control (MAC) and logical link control (LLC) headers.

Network data must contain the entire MAC layer packet headers so that the packet can be sent without the data link control (DLC)'s intervention. GDLC only provides a pass-through function for this type of write.

This request is valid any time the SAP is open.

## Related Information

The **write** or **writex** subroutine.

List of Kernel Routines for DLC.

read Subroutine Extended Parameters for DLC.

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## Datagram Data Received Routine for DLC

### Purpose

Receives a datagram packet each time it is coded by the kernel user and called by generic data link control (GDLC).

### Syntax

```
#include <sys/gdlextc.h>
```

```
int (*dlc_open_ext.rcvd_fa)( m, ext)
struct mbuf *m;
struct dlc_io_ext *ext;
```

### Description

The DLC Datagram Data Received routine receives a datagram packet each time it is coded by the kernel user and called by GDLC.

Each GDLC supports a subset of the data-received routines. It is critical to performance that the Datagram Data Received routine be coded to minimize the amount of time spent prior to returning to the GDLC that called it.

### Parameters

*m* Points to a communications memory buffer (**mbuf**).

*ext* Specifies the receive extension parameter. This is a pointer to the **dlc\_io\_ext** extended I/O structure for read operations.

### Return Values

<b>DLC_FUNC_OK</b>	Indicates that the received datagram <b>mbuf</b> data has been accepted.
<b>DLC_FUNC_RETRY</b>	Indicates that the received datagram <b>mbuf</b> data cannot be accepted at this time. GDLC should retry this function later. The actual retry wait period depends on the DLC in use. Excessive retries may close the link station.

## Related Information

read Subroutine Extended Parameters for DLC .

Generic Data Link Control (GDLC) Environment Overview in *AIX® Version 6.1 Communications Programming Concepts*.

---

## Exception Condition Routine for DLC

### Purpose

Notifies the kernel user each time an asynchronous event occurs in generic data link control (GDLC).

### Syntax

```
#include <sys/gdlextc.h>

int (*dlc_open_ext.excp_fa)( ext)
struct dlc_getx_arg *ext;
```

### Description

The DLC Exception Condition routine notifies the kernel user each time an asynchronous event occurs, such as **DLC\_SAPD\_RES** (SAP-disabled) or **DLC\_CONT\_RES** (contacted), in GDLC.

Each GDLC supports a subset of the data-received routines. It is critical to performance that the Exception Condition routine for DLC be coded to minimize the amount of time spent prior to returning to the GDLC that called it.

### Parameters

*ext* Specifies the same structure for a **dlc\_getx\_arg** (get exception) ioctl subroutine.

### Return Values

**DLC\_FUNC\_OK** Indicates that the exception has been accepted.

**Note:** The function call above has a hidden parameter extension for internal use only, defined as **int \*chanp**, the channel pointer.

### Related Information

The **ioctl** subroutine.

Parameter Blocks by ioctl Operation for DLC .

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## I-Frame Data Received Routine for DLC

### Purpose

Receives a normal sequenced data packet each time it is coded by the kernel user and called by generic data link control (GDLC).

### Syntax

```
#include <sys/gdlextc.h>

int (*dlc_open_ext.rcvi_fa)( m, ext)
struct mbuf *m;
struct dlc_io_ext *ext;
```

## Description

The DLC I-Frame Data Received routine receives a normal sequenced data packet each time it is coded by the kernel user and called by GDLC.

Each GDLC supports a subset of the data-received routines. It is critical to performance that the I-Frame Data Received routine be coded to minimize the amount of time spent prior to returning to the GDLC that called it.

## Parameters

*m* Points to a communications memory buffer (**mbuf**).

*ext* Specifies the receive extension parameter. This is a pointer to the **dlc\_io\_ext** extended I/O structure for reads. The argument to this parameter must be in the kernel space.

## Return Values

**DLC\_FUNC\_OK** Indicates that the received **I-frame** function call is accepted.

**DLC\_FUNC\_BUSY** Indicates that the received **I-frame** function call cannot be accepted at this time. The **ioctl** command operation **DLC\_EXIT\_LBUSY** must be issued later using the **ioctl** subroutine.

**DLC\_FUNC\_RETRY** Indicates that the received **I-frame** function call cannot be accepted at this time. GDLC should retry this function call later. The actual retry wait period depends on the DLC in use. Excessive retries can be subject to a halt of the link station.

## Related Information

The **ioctl** subroutine.

Parameter Blocks by **ioctl** Operation for DLC .

read Subroutine Extended Parameters for DLC .

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## Network Data Received Routine for DLC

### Purpose

Receives network-specific data each time it is coded by the kernel user and called by generic data link control (GDLC).

### Syntax

```
#include <sys/gdlextc.h>
```

```
int (*dlc_open_ext.rcvn_fa)( m, ext)
struct mbuf *m;
struct dlc_io_ext *ext;
```

### Description

The DLC Network Data Received routine receives network-specific data each time the routine is coded by the kernel user and called by GDLC.



Each GDLC supports a subset of the data-received routines. It is critical to performance that the Network Data Received routine be coded to minimize the amount of time spent prior to returning to the GDLC that called it.

## Parameters

*m* Points to a communications memory buffer (**mbuf**).

*ext* Specifies the receive extension parameter. This is a pointer to the **dlc\_io\_ext** extended I/O structure for read operations.

## Return Values

**DLC\_FUNC\_OK** Indicates that the received network **mbuf** data has been accepted.

**DLC\_FUNC\_RETRY** Indicates that the received network **mbuf** data cannot be accepted at this time. GDLC should retry this function call later. The actual retry wait period depends on the DLC in use. Excessive retries can cause a disabling of the service access point.

## Related Information

read Subroutine Extended Parameters for DLC .

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## XID Data Received Routine for DLC

### Purpose

Receives an exchange identification (XID) packet each time it is coded by the kernel user and called by generic data link control (GDLC).

### Syntax

```
#include <sys/gdlextc.h>

int (*dlc_open_ext.rcvx_fa)( m, ext)
struct mbuf *m;
struct dlc_io_ext *ext;
```

### Description

The DLC XID Data Received routine receives an XID packet each time the routine is coded by the kernel user and called by GDLC.

Each GDLC supports a subset of the data-received routines. It is performance critical that the XID Data Received routine be coded to minimize the amount of time spent prior to returning to the GDLC that called it.

## Parameters

*m* Points to a communication memory buffer (**mbuf**).

*ext* Specifies the receive extension parameter. This is a pointer to the **dlc\_io\_ext** extended I/O structure for reads. The argument to this parameter must be in the kernel space.

## Return Values

<b>DLC_FUNC_OK</b>	Indicates that the received XID <b>mbuf</b> data has been accepted.
<b>DLC_FUNC_RETRY</b>	Indicates that the received XID <b>mbuf</b> data cannot be accepted at this time. GDLC should retry this function call later. The actual retry wait period depends on the DLC in use. Excessive retries may close the link station.

## Related Information

read Subroutine Extended Parameters for DLC .

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## ioctl Operations (op) for DLC

### Syntax

```
#define DLC_ENABLE_SAP      1
#define DLC_DISABLE_SAP    2
#define DLC_START_LS       3
#define DLC_HALT_LS        4
#define DLC_TRACE           5
#define DLC_CONTACT        6
#define DLC_TEST            7
#define DLC_ALTER           8
#define DLC_QUERY_SAP      9
#define DLC_QUERY_LS      10
#define DLC_ENTER_LBUSY    11
#define DLC_EXIT_LBUSY     12
#define DLC_ENTER_SHOLD    13
#define DLC_EXIT_SHOLD     14
#define DLC_GET_EXCEP      15
#define DLC_ADD_GRP        16
#define DLC_ADD_FUNC_ADDR  17
#define DLC_DEL_FUNC_ADDR  18
#define DLC_DEL_GRP        19
#define IOCINFO            /* see /usr/include/sys/ioctl.h */
```

### Description

**Note:** If the operation's notification is returned asynchronously to the user by way of exception, application users should refer to "DLC\_GET\_EXCEP ioctl Operation for DLC" and kernel users should refer to "Exception Condition Routine for DLC" for more information.

Each GDLC supports a subset of ioctl subroutine operations. These ioctl operations are selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. They may be called from the process environment only.

The following ioctl command operations are supported for generic data link control (GDLC):

Operation	Description
<b>DLC_ADD_FUNC_ADDR</b>	Adds a group or multicast receive functional address to a port. This command allows additional functional address bits to be added to the current receive functional address mask, as supported by the individual device handlers. See device handler specifications to determine which address values are supported. <b>Note:</b> Currently, token ring is the only local area network (LAN) protocol supporting functional addresses.
<b>DLC_ADD_GRP</b>	Adds a group or multicast receive address to a port. This command allows additional address values to be filtered in receive as supported by the individual communication device handlers. See device handler specifications to determine which address values are supported.
<b>DLC_ALTER</b>	Alters link station (LS) configuration.
<b>DLC_CONTACT</b>	Contacts the remote LS. This ioctl operation does not complete processing before returning to the user. The <b>DLC_CONTACT</b> notification is returned asynchronously to the user by way of exception.
<b>DLC_DEL_GRP</b>	Removes a group or multicast address that was previously added to a port with a <b>DLC_ENABLE_SAP</b> or <b>DLC_ADD_GRP</b> ioctl operation.
<b>DLC_DEL_FUNC_ADDR</b>	Removes a group or multicast receive functional address from a port. This command removes functional address bits from the current receive functional address mask, as supported by the individual device handlers. See device handler specifications to determine which address values are supported. <b>Note:</b> Currently, token ring is the only local area network protocol supporting functional addresses.
<b>DLC_DISABLE_SAP</b>	Disables a service access point (SAP). This ioctl operation does not fully complete the disable SAP processing before returning to the user. The <b>DLC_DISABLE_SAP</b> notification is returned asynchronously to the user later by way of exception.
<b>DLC_ENABLE_SAP</b>	Enables an SAP. This ioctl operation does not fully complete the enable SAP processing before returning to the user. The <b>DLC_ENABLE_SAP</b> notification is returned asynchronously to the user later by way of exception.
<b>DLC_ENTER_LBUSY</b>	Enters local busy mode on an LS.
<b>DLC_ENTER_SHOLD</b>	Enters short hold mode on an LS.
<b>DLC_EXIT_LBUSY</b>	Exits local busy mode on an LS.
<b>DLC_EXIT_SHOLD</b>	Exits short hold mode on an LS.
<b>DLC_GET_EXCEP</b>	Returns asynchronous exception notifications to the application user. <b>Note:</b> This ioctl command operation is not used by the kernel user since all exception conditions are passed to the kernel user by their exception handler routine.
<b>DLC_HALT_LS</b>	Halts an LS. This ioctl operation does not complete processing before returning to the user. Notification of the ioctl operation, <b>DLC_HALT_LS</b> , is returned asynchronously to the user by way of exception.
<b>DLC_QUERY_LS</b>	Queries an LS.
<b>DLC_QUERY_SAP</b>	Queries an SAP.
<b>DLC_START_LS</b>	Starts an LS. This ioctl operation does not complete processing before returning to the user. Notification of the ioctl operation, <b>DLC_START_LS</b> , is returned asynchronously to the user by way of exception.
<b>DLC_TEST</b>	Tests LS connectivity. This ioctl operation does not complete processing before returning to the user. Notification of the ioctl operation, <b>DLC_TEST</b> completion, is returned asynchronously to the user by way of exception.
<b>DLC_TRACE</b>	Traces LS activity.
<b>IOCINFO</b>	Returns a structure that describes the device. Refer to the description of the <code>/usr/include/sys/devinfo.h</code> file. The first byte is set to an ioctype of <b>DD_DLC</b> . The subtype and data are defined by the individual DLC devices.

## Related Information

Parameter Blocks by ioctl Operation for DLC .

## Parameter Blocks by ioctl Operation for DLC

### Description

Each command operation has a specific parameter block associated with the command pointed to by the *arg* pointer. Some parameters are sent to the generic data link control (GDLC) and others are returned.

The ioctl command operations for DLC are:

- **DLC\_ADD\_FUNC\_ADDR** ioctl Operation for DLC
- **DLC\_ADD\_GRP** ioctl Operation for DLC
- **DLC\_ALTER** ioctl Operation for DLC
- **DLC\_CONTACT** ioctl Operation for DLC
- **DLC\_DEL\_FUNC\_ADDR** ioctl Operation for DLC
- **DLC\_DEL\_GRP** ioctl Operation for DLC
- **DLC\_DISABLE\_SAP** ioctl Operation for DLC
- **DLC\_ENABLE\_SAP** ioctl Operation for DLC
- **DLC\_ENTER\_LBUSY** ioctl Operation for DLC
- **DLC\_ENTER\_SHOLD** ioctl Operation for DLC
- **DLC\_EXIT\_LBUSY** ioctl Operation for DLC
- **DLC\_EXIT\_SHOLD** ioctl Operation for DLC
- **DLC\_GET\_EXCEP** ioctl Operation for DLC
- **DLC\_HALT\_LS** ioctl Operation for DLC
- **DLC\_QUERY\_LS** ioctl Operation for DLC
- **DLC\_QUERY\_SAP** ioctl Operation for DLC
- **DLC\_START\_LS** ioctl Operation for DLC
- **DLC\_TEST** ioctl Operation for DLC
- **DLC\_TRACE** ioctl Operation for DLC
- **IOCINFO** ioctl Operation for DLC

---

### DLC\_ADD\_FUNC\_ADDR ioctl Operation for DLC

The **DLC\_ADD\_FUNC\_ADDR** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block adds a functional address mask any time a service access point (SAP) has been enabled via **DLC\_ENA\_SAP** ioctl. Multiple functional address bits may be specified.

```
struct dlc_func_addr
{
    __u_long32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __u_long32_t  len_func_addr_mask; /* length of functional */
    /* address mask */
    uchar_t  func_addr_mask[DLC_MAX_ADDR]; /* functional address */
    /* mask */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the generic data link control (GDLC) service access point (SAP) correlator being requested to delete a functional address from a port.
len_func_addr_mask	Contains the byte length of the functional address mask to be added.
func_addr_mask	Contains the functional address mask value to be ORed with the functional address on the adapter. See the individual DLC interface documentation to determine the length and format of this field.

---

## DLC\_ADD\_GRP ioctl Operation for DLC

The **DLC\_ADD\_GRP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block adds a group or multicast receive address:

```
struct dlc_add_grp
{
    __ulong32_t gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t grp_addr_len; /* group address length */
    uchar_t grp_addr[DLC_MAX_ADDR]; /* grp addr to be added */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the generic data link control (GDLC) service access point (SAP) Correlator being requested to add a group or multicast address to a port.
grp_addr_len	Contains the byte length of the group or multicast address to be added.
grp_addr	Contains the group or multicast address value to be added.

---

## DLC\_ALTER ioctl Operation for DLC

The **DLC\_ALTER** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block alters a link station's (LS) configuration parameters:

```
#define DLC_MAX_ROUT 20 /* Maximum Size of Routing Info */

struct dlc_alter_arg
{
    __ulong32_t gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t gdlc_ls_corr; /* GDLC link station correlator */
    __ulong32_t flags; /* Alter Flags */
    __ulong32_t repoll_time; /* New Repoll Timeout */
    __ulong32_t ack_time; /* New Acknowledge Timeout */
    __ulong32_t inact_time; /* New Inactivity Timeout */
    __ulong32_t force_time; /* New Force Timeout */
    __ulong32_t maxif; /* New Maximum I-Frame Size */
    __ulong32_t xmit_wind; /* New Transmit Value */
};
```

```

__ulong32_t max_repoll; /* New Max Repoll Value */
__ulong32_t routing_len; /* Routing Length */
u_char_t routing[DLC_MAX_ROUT]; /* New Routing Data */
__ulong32_t result_flags; /* Returned flags */
};

```

The fields of this ioctl operation are:

<b>Field</b>	<b>Description</b>
gdlc_sap_corr	Indicates the generic data link control (GDLC) service access point (SAP) correlator of the target LS.
gdlc_ls_corr	Indicates the GDLC LS correlator to be altered.
flags	Specifies alter flags. The following flags are supported: <p><b>DLC_ALT_RTO</b> Alter repoll timeout:</p> <p>0 = Do not alter repoll timeout.</p> <p>1 = Alter configuration with value specified.</p> <p>Alters the length of time the LS waits for a response before repolling the remote station. When specified, the repoll timeout value specified in the LS configuration is overridden by the value supplied in the repoll timeout field of the <b>Alter</b> command. This new value remains in effect until another value is specified or the LS is halted.</p> <p><b>DLC_ALT_AKT</b> Alter acknowledgment timeout:</p> <p>0 = Do not alter the acknowledgment timeout.</p> <p>1 = Alter configuration with value specified.</p> <p>Alters the length of time the LS delays the transmission of an acknowledgment for a received I-frame. When specified, the acknowledgment timeout value specified in the LS configuration is overridden by the value supplied in the acknowledgment timeout field of the <b>Alter</b> command. This new value remains in effect until another value is specified or the LS is halted.</p> <p><b>DLC_ALT_ITO</b> Alter inactivity timeout:</p> <p>0 = Do not alter inactivity timeout.</p> <p>1 = Alter configuration with value specified.</p> <p>Alters the maximum length of time allowed without receive link activity from the remote station. When specified, the inactivity timeout value specified in the LS configuration is overridden by the value supplied in the inactivity timeout field of the <b>Alter</b> command. This new value remains in effect until another value is specified or the LS is halted.</p> <p><b>DLC_ALT_FHT</b> Alter force halt timeout:</p> <p>0 = Do not alter force halt timeout.</p> <p>1 = Alter configuration with value specified.</p> <p>Alters the period to wait for a normal disconnection before forcing the halt LS to occur. When specified, the force halt timeout value specified in the LS configuration is overridden by the value supplied in the force halt timeout field of the <b>Alter</b> command. This new value remains in effect until another value is specified or the LS is halted.</p>

**Field****Description****DLC\_ALT\_MIF**

Maximum I-field length:

0 = Do not alter maximum I-field length.

1 = Alter configuration with value specified.

Sets the value for the maximum length of transmit or receive data in one I-field. If received data exceeds this length, a buffer overflow indication set by GDLC in the receive extension. When specified, the maximum I-field length value specified in the LS configuration is overridden by the value supplied in the maximum I-field length specified in the **Alter** command. This new value remains in effect until another value is specified or the LS is halted.

**DLC\_ALT\_XWIN**

Alter transmit window:

0 = Do not alter transmit window.

1 = Alter configuration with value specified.

Alters the maximum number of information frames that can be sent in one transmit burst. When specified, the transmit window count value specified in the LS configuration is overridden by the value supplied in the transmit window field of the **Alter** command. This new value remains in effect until another value is specified or the LS is halted.

**DLC\_ALT\_MXR**

Alter maximum repoll:

0 = Do not alter maximum repoll.

1 = Alter configuration with value specified.

Alters the maximum number of retries for an acknowledged command frame, or in the case of an I-frame timeout, the number of times the nonresponding remote LS will be polled with a supervisory command frame. When specified, the maximum repoll count value specified in the LS configuration is overridden by the value supplied in the maximum repoll count field of the **Alter** command. This new value remains in effect until another value is specified or the LS is halted.

**DLC\_ALT\_RTE**

Alter routing:

0 = Do not alter routing.

1 = Alter configuration with value specified.

Alters the route that subsequent transmit packets take when transferring data across a local area network bridge. When specified, the routing length and routing data values specified in the LS configuration are overridden by the values supplied in the routing fields of the **Alter** command. These new values remain in effect until another route is specified or the LS is halted.

Field	Description
	<p><b>DLC_ALT_SM1</b> Set primary SDLC Control mode:</p> <p>0 = Do not alter SDLC Control mode.</p> <p>1 = Set SDLC Control mode to primary.</p> <p>Sets the local station to a primary station in NDM, waiting for a command from PU services to write an XID or TEST, or a command to contact the secondary for NRM data phase. This control can only be issued if not already in NRM, and no XID, TEST, or SNRM is in progress. This flag cannot be set if the <b>DLC_ALT_SM2</b> flag is set.</p>
	<p><b>DLC_ALT_SM2</b> Set secondary SDLC Control mode:</p> <p>0 = Do not alter SDLC Control mode.</p> <p>1 = Set SDLC Control mode to secondary.</p> <p>Sets the local station to a secondary station in NDM, waiting for XID, TEST, or SNRM from the primary station. This control can only be issued if not already in NRM, and no XID, TEST, or SNRM is in progress. This flag cannot be set if the <b>DLC_ALT_SM1</b> flag is set.</p>
	<p><b>DLC_ALT_IT1</b> Set notification for Inactivity Time-Out mode:</p> <p>0 = Do not alter Inactivity Time-Out mode.</p> <p>1 = Set Inactivity Time-Out mode to notification only.</p> <p>Inactivity does not cause the LS to be halted, but notifies the user of inactivity without termination.</p>
	<p><b>DLC_ALT_IT2</b> Set automatic halt for Inactivity Time-Out mode:</p> <p>0 = Do not alter Inactivity Time-Out mode.</p> <p>1 = Set Inactivity Time-Out mode to automatic halt.</p>
repoll_time	Provides a new value to replace the LS repoll time-out value whenever the <b>DLC_ALT_RTO</b> flag is set.
ack_time	Provides a new value to replace the LS acknowledgment time-out value whenever the <b>DLC_ALT_AKT</b> flag is set.
inact_time	Provides a new value to replace the LS inactivity time-out value whenever the alter <b>DLC_ALT_ITO</b> flag is set.
force_time	Provides a new value to replace the LS force halt time-out value whenever the <b>DLC_ALT_FHT</b> flag is set.
maxif	Provides a new value to replace the LS-started result value for the maximum I-field size whenever the <b>DLC_ALT_MIF</b> flag is set. GDLC does not allow this value to exceed the capacity of the receive buffer and only increases the internal value to the allowed maximum.
xmit_wind	Provides a new value to replace the LS transmit window count value whenever the <b>DLC_ALT_XWIN</b> flag is set.
max_repoll	Provides the new value that is to replace the LS maximum repoll count value whenever the <b>DLC_ALT_MXR</b> flag is set.
routing_len	Provides a new value to replace the LS routing field length whenever the <b>DLC_ALT_RTE</b> flag is set.
routing	Provides a new value to replace the LS routing data whenever the <b>DLC_ALT_RTE</b> flag is set.



<b>Field</b>	<b>Description</b>
result_flags	<p>Returns the following result indicators at the completion of the alter operation, depending on the command:</p> <p><b>DLC_MSS_RES</b> Indicates mode set secondary. Set to 1, this bit indicates that the station mode has been set to secondary as a result of the user issuing an <b>Alter</b> (set mode secondary) command.</p> <p><b>DLC_MSSF_RES</b> Indicates mode set secondary was unsuccessful. Set to 1, this bit indicates that the station mode has been not set to secondary as a result of the user issuing an <b>Alter</b> (set mode secondary) command. This occurs whenever an SDLC LS is already in data phase or an SDLC primary command sequence has not yet completed.</p> <p><b>DLC_MSP_RES</b> Indicates mode set primary. Set to 1, this bit indicates that the station mode has been set to primary as a result of the user issuing an <b>Alter</b> (set mode primary) command.</p> <p><b>DLC_MSPF_RES</b> Indicates mode set primary was unsuccessful. Set to 1, this bit indicates that the station mode has not been set to primary as a result of the user issuing an <b>Alter</b> (set mode primary) command. This occurs whenever an SDLC LS is already in data phase.</p>

The protocol-dependent area allows additional fields to be provided by a specific protocol type. Corresponding flags may be necessary to support additional fields. This optional data area must directly follow (or append to) the end of the **dlc\_alter\_arg** structure.

---

## DLC\_CONTACT ioctl Operation for DLC

The **DLC\_CONTACT** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block contacts a remote station for a particular local link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

<b>Field</b>	<b>Description</b>
gdlc_sap_corr	Contains the GDLC SAP correlator of the target LS.
gdlc_ls_corr	Contains the GDLC LS correlator to be contacted.

---

## DLC\_DEL\_FUNC\_ADDR ioctl Operation for DLC

The **DLC\_DEL\_FUNC\_ADDR** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block deletes a previously defined functional address mask any time a service access point (SAP) has been enabled with a **DLC\_ENA\_SAP** ioctl. Multiple functional address bits can be specified.

```

struct dlc_func_addr
{
    __u_long32_t gdlc_sap_corr; /* GDLC SAP correlator */
    __u_long32_t len_func_addr_mask; /* length of functional */
    /* address mask */
    uchar_t func_addr_mask[DLC_MAX_ADDR]; /*functional add. mask */
};

```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Indicates the generic data link control (GDLC) service access point (SAP) identifier being requested to delete a functional address from a port.
len_func_addr_mask	Contains the byte length of the functional address mask to be deleted.
func_addr_mask	Contains the functional address mask value to be deleted from with the functional address on the adapter. See the individual DLC interface documentation to determine the length and format of this field.

---

## DLC\_DEL\_GRP ioctl Operation for DLC

The **DLC\_DEL\_GRP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter removes a previously defined group or multicast address:

```

struct dlc_add_grp
{
    __u_long32_t gdlc_sap_corr; /*GDLC SAP correlator */
    __u_long32_t grpaddr_len; /*group address length */
    uchar_t grp_addr[DLC_MAX_ADDR]; /*group address to be
    removed */
};

```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Indicates the generic data link control (GDLC) service access point (SAP) identifier being requested to remove a group or multicast address from a port. This field is known as the GDLC SAP Correlator field.
grp_addr_len	Contains the byte length of the group or multicast address to be removed.
grp_addr	Contains the group or multicast address to be removed.

---

## DLC\_DISABLE\_SAP ioctl Operation for DLC

The **DLC\_DISABLE\_SAP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block disables a service access point (SAP):

```

struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* <not used for disabling a SAP> */
};

```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains GDLC SAP correlator. The field indicates the GDLC SAP identifier to be disabled.
gdlc_ls_corr	Contains GDLC LS correlator. The GDLC LS identifier is returned to the user as soon as resources are determined to be available. This correlator must accompany all commands associated with this LS.

---

## DLC\_ENABLE\_SAP ioctl Operation for DLC

The **DLC\_ENABLE\_SAP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block enables a service access point (SAP):

```

#define DLC_MAX_NAME    20
#define DLC_MAX_GSAPS   7
#define DLC_MAX_ADDR    8

#define  DLC_ESAP_NTWK  0x40000000
#define  DLC_ESAP_LINK  0x20000000
#define  DLC_ESAP_PHYC  0x10000000
#define  DLC_ESAP_ANSW  0x08000000
#define  DLC_ESAP_ADDR  0x04000000

struct dlc_esap_arg
{
    __ulong32_t  gdlc_sap_corr;
    __ulong32_t  user_sap_corr;
    __ulong32_t  len_func_addr_mask;
    uchar_t     func_addr_mask [DLC_MAX_ADDR];

    __ulong32_t  len_grp_addr;
    uchar_t     grp_addr [DLC_MAX_ADDR];
    __ulong32_t  max_ls;
    __ulong32_t  flags;
    __ulong32_t  len_laddr_name;

    u_char_t    laddr_name [DLC_MAX_NAME];
    u_char_t    num_grp_saps;
    u_char_t    grp_sap [DLC_MAX_GSAPS];
    u_char_t    res1[3];
    u_char_t    local_sap;
};

```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Specifies the generic data link control's (GDLC) SAP identifier that is returned to the user. This correlator must accompany all subsequent commands associated with this SAP.
user_sap_corr	Specifies an identifier or correlator the user wishes to have returned on all SAP results from GDLC. It allows the user of multiple SAPs to choose a correlator to route the SAP-specific results.
len_func_addr_mask	Specifies the byte length of the following functional address mask. This field must be set to 0 if no functional address is required. Length values of 0 through 8 are supported.
func_addr_mask	Specifies the functional address mask to be ORed with the functional address on the adapter. This address mask allows packets that are destined for specified functions to be received by the local adapter. See individual DLC interface documentation to determine the format and length of this field. <b>Note:</b> GDLC does not distinguish whether a received packet was accepted by the adapter due to a pre-set network, group, or functional address. If the SAP address matches and the packet is otherwise valid (no protocol errors, for instance), the received packet is passed to the user.
len_grp_addr	Specifies the byte length of the following group address. This field must be set to 0 (zero) if no group address is required. Length values of 0 through 8 are supported.
grp_addr	Specifies the group address value to be written to the adapter. It allows packets that are destined for a specific group to be received by the local adapter. <b>Note:</b> Most adapters allow only one group address to be active at a time. If this field is nonzero and the adapter rejects the group address because it is already in use, the enable SAP call fails with an appropriate error code.
max_ls	Specifies the maximum number of link stations (LSs) allowed to operate concurrently on a particular SAP. The protocol used determines the values for this field.

<b>Field</b>	<b>Description</b>
flags	<p>Supports the following flags of the <b>DLC_ENABLE_SAP</b> ioctl operation:</p> <p><b>DLC_ESAP_NTWK</b> Teleprocessing network type:</p> <ul style="list-style-type: none"> <li>0 = Switched (default)</li> <li>1 = Leased</li> </ul> <p><b>DLC_ESAP_LINK</b> Teleprocessing link type:</p> <ul style="list-style-type: none"> <li>0 = Point to point (default)</li> <li>1 = Multipoint</li> </ul> <p><b>DLC_ESAP_PHYC</b> Physical network call (teleprocessing):</p> <ul style="list-style-type: none"> <li>0 = Listen for incoming call</li> <li>1 = Initiate call</li> </ul> <p><b>DLC_ESAP_ADDR</b> Local address or name indicator. Specifies whether the local address or name field contains an address or a name:</p> <ul style="list-style-type: none"> <li>0 = Local name specified (default)</li> <li>1 = Local address specified</li> </ul> <p><b>DLC_ESAP_ANSW</b> Teleprocessing autocal or autoanswer:</p> <ul style="list-style-type: none"> <li>0 = Manual call and answer (default)</li> <li>1 = Automatic call and answer</li> </ul>
len_laddr_name	Specifies the byte length of the following local address or name. Length values of 1 through 20 are supported.
laddr_name	Contains the unique network name or address of the user local SAP as indicated by the <b>DLC_ESAP_ADDR</b> flag. Some protocols allow the local SAP to be identified by name (for example, Name-Discovery Services) and others by address (for example, Address Resolve Procedures). Other protocols such as Synchronous Data Link Control (SDLC) do not identify the local SAP. Check the individual DLC's usage of this field for the protocol you are operating.
num_grp_saps	Specifies the number of group SAPs to which the user's local SAP responds. If no group SAPs are needed, this field must contain a 0. Up to seven group SAPs can be specified.
grp_sap	Contains the specific group SAP values to which the user local SAP responds (seven maximum).
local_sap	Specifies the local SAP address opened. Receive packets with this LSAP value indicated in the destination SAP field are routed to the LSs opened under this particular SAP.

The protocol-specific data area allows parameters to be defined by the specific GDLC device manager, such as X.21 call-progress signals or Smartmodem call-establishment data. This optional data area must directly follow (or append to) the end of the **dlc\_esap\_arg** structure.

---

## DLC\_ENTER\_LBUSY ioctl Operation for DLC

The **DLC\_ENTER\_LBUSY** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block enters local busy mode on a particular link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

Field	Description
<code>gdlc_sap_corr</code>	Contains the GDLC SAP correlator of the target LS.
<code>gdlc_ls_corr</code>	Contains the GDLC LS correlator to enter local busy mode.

---

## DLC\_ENTER\_SHOULD ioctl Operation for DLC

The **DLC\_ENTER\_SHOULD** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block enters short hold mode on a particular link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

Field	Description
<code>gdlc_sap_corr</code>	Contains the generic data link control (GDLC) service access point (SAP) correlator of the target LS.
<code>gdlc_ls_corr</code>	Contains the GDLC LS correlator to enter short hold mode.

---

## DLC\_EXIT\_LBUSY ioctl Operation for DLC

The **DLC\_EXIT\_LBUSY** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block exits local busy mode on a particular link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the GDLC SAP correlator of the target LS.
gdlc_ls_corr	Contains the GDLC LS correlator to exit local busy mode.

---

## DLC\_EXIT\_SHOULD ioctl Operation for DLC

The **DLC\_EXIT\_SHOULD** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block exits short hold mode on a particular link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the generic data link control (GDLC) service access point (SAP) correlator of the target LS.
gdlc_ls_corr	Contains the GDLC LS correlator to exit short hold mode.

---

## DLC\_GET\_EXCEP ioctl Operation for DLC

The **DLC\_GET\_EXCEP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block returns asynchronous exception notifications to the application user:

```
struct dlc_getx_arg
{
    __ulong32_t  user_sap_corr; /* user SAP corr - RETURNED */
    __ulong32_t  user_ls_corr; /* user ls corr - RETURNED */
    __ulong32_t  result_ind; /* the flags identifying the type */
    /* of excep*/
    int  result_code; /* the manner of excep */
    u_char_t  result_ext[DLC_MAX_EXT]; /* excep specific ext */
};
```

The fields of this ioctl operation are:

Field	Description
user_sap_corr	Indicates the user service access point (SAP) correlator for this exception.
user_ls_corr	Indicates the user link station (LS) correlator for this exception.

**Field**  
result\_ind

**Description**

Result indicators:

**DLC\_TEST\_RES**

Test complete: a nonextended result. Set to 1, this bit indicates that the link test has completed as indicated in the result code.

**DLC\_SAPE\_RES**

SAP enables: an extended result. Set to 1, this bit indicates that the SAP is active and ready for LSs to be started. See **DLC\_SAPE\_RES** operation for the format of the extension area.

**DLC\_SAPD\_RES**

SAP disabled: a nonextended result. Set to 1, this bit indicates that the SAP has been terminated as indicated in the result code.

**DLC\_STAS\_RES**

Link station started: an extended result. Set to 1, this bit indicates that the link station is connected to the remote station in asynchronous or normal disconnected mode. GDLC is waiting for link receive data from the device driver or additional commands from the user such as the **DLC\_CONTACT** ioctl operation. See the **DLC\_STAS\_RES** operation for the format of the extension area.

**DLC\_STAH\_RES**

Link station halted: a nonextended result. Set to 1, this bit indicates that the LS has terminated due to a **DLC\_HALT\_LS** ioctl operation from the user, a remote discontact, or an error condition indicated in the result code.

**DLC\_DIAL\_RES**

Dial the phone: a nonextended result. Set to 1, this bit indicates that the user can now manually dial an outgoing call to the remote station.

**DLC\_IWOT\_RES**

Inactivity without termination: a nonextended result. Set to 1, this bit indicates that the LS protocol activity from the remote station has terminated for the length of time specified in the configuration (receive inactivity timeout). The local station remains active and notifies the user if the remote station begins to respond. Additional notifications of inactivity without termination are suppressed until the inactivity condition clears up.

**DLC\_IEND\_RES**

Inactivity ended: a nonextended result. Set to 1, this bit indicates that the LS protocol activity from the remote station has restarted after a condition of inactivity without termination.

**DLC\_CONT\_RES**

Contacted: a nonextended result. Set to 1, this bit indicates that GDLC has either received a Set Mode, or has received a positive response to a Set Mode initiated by the local LS. GDLC is now able to send and receive normal sequenced data on this LS.

**DLC\_RADD\_RES**

Remote address/name change: an extended result. Set to 1, this bit indicates that the remote LS address (or name) has been changed from the previous value. This can occur on synchronous data link control (SDLC) links when negotiating a point-to-point connection, for example. See the **DLC\_RADD\_RES** operation for the format of the extension area.



<b>Field</b>	<b>Description</b>
result_code	Indicates the result code. The following values specify the result codes for GDLC. Negative return codes that are even indicate that the error condition can be remedied by restarting the LS returning the error. Return codes that are <i>odd</i> indicate that the error is catastrophic, and, at the minimum, the SAP must be restarted. Additional error data may be obtained from the GDLC error log and link trace entries.
<b>DLC_SUCCESS</b>	The result indicated was successful.
<b>DLC_PROT_ERR</b>	Protocol error.
<b>DLC_BAD_DATA</b>	A bad data compare on a TEST.
<b>DLC_NO_RBUF</b>	No remote buffering on test.
<b>DLC_RDISC</b>	Remote initiated discontact.
<b>DLC_DISC_TO</b>	Discontact abort timeout.
<b>DLC_INACT_TO</b>	Inactivity timeout.
<b>DLC_MSESS_RE</b>	Mid session reset.
<b>DLC_NO_FIND</b>	Cannot find the remote name.
<b>DLC_INV_RNAME</b>	Invalid remote name.
<b>DLC_SESS_LIM</b>	Session limit exceeded.
<b>DLC_LST_IN_PRGS</b>	Listen already in progress.
<b>DLC_LS_NT_COND</b>	LS unusual network condition.
<b>DLC_LS_ROUT</b>	Link station resource outage.
<b>DLC_REMOTE_BUSY</b>	Remote station found, but busy.
<b>DLC_REMOTE_CONN</b>	Specified remote is already connected.
<b>DLC_NAME_IN_USE</b>	Local name already in use.
<b>DLC_INV_LNAME</b>	Invalid local name.

Field	Description
	<b>DLC_SAP_NT_COND</b> SAP network unusual network condition.
	<b>DLC_SAP_ROUT</b> SAP resource outage.
	<b>DLC_USR_INTRF</b> User interface error.
	<b>DLC_ERR_CODE</b> Error in the code has been detected.
	<b>DLC_SYS_ERR</b> System error.
result_ext	Indicates result extension. Several results carry extension areas to provide additional information about them. The user must provide a full-sized area for each result requested since there is no way to tell if the next result is extended or nonextended. The extended result areas are described by type below.

## DLC\_SAPE\_RES SAP Enabled Result Extension

The following parameter block enables a service access point (SAP) result extension:

```
struct dlc_sape_res
{
    __ulong32_t max_net_send; /* maximum write network data length */
    __ulong32_t lport_addr_len; /* local port network address length */
    u_char_t lport_addr[DLC_MAX_ADDR]; /* the local port address */
};
```

The fields of this extension are:

Field	Description
max_net_send	Indicates the maximum number of bytes that the user can write for each packet when writing network data. This is generally based on a communications <b>mbuf/mbufs</b> page cluster size, but is not necessarily limited to a single <b>mbuf</b> structure since <b>mbuf</b> clusters can be linked.
lport_addr_len	Indicates the byte length of the local port network address.
lport_addr	Indicates the hexadecimal value of the local port network address.

## DLC\_STAS\_RES Link Station Started Result Extension

The following parameter block starts a link station (LS) result extension:

```
struct dlc_stas_res
{
    ulong32_t maxif; /* max size of the data sent */
    /* on a write */
    ulong32_t rport_addr_len; /* remote port network address */
    /* length */
    u_char_t rport_addr[DLC_MAX_ADDR]; /* remote port address */
    ulong32_t rname_len; /* remote network name length */
    u_char_t rname[DLC_MAX_NAME]; /* remote network name */
    uchar_t res[3]; /* reserved */
};
```

```

uchar_t  rsap; /* remote SAP */
ulong32_t max_data_off; /* the maximum data offsets for sends*/
};

```

The fields of this extension are:

Field	Description
maxif	Contains the maximum byte size allowable for user data. This value is derived from the value supplied by the user at the start link station ( <b>DLC_START_LS</b> ) and the actual number of bytes that can be handled by the GDLC and device handler on a single transmit or receive. Generally this value is less than the size of a communications <b>mbuf</b> page cluster. However, some communications devices may be able to link page clusters together, so the maximum I-field receivable may exceed the length of a single <b>mbuf</b> cluster. The returned value never exceeds the value supplied by the user, but may be smaller if buffering is not large enough to hold the specified value.
rport_addr_len	Contains the byte length of the remote port network address.
rport_addr	Contains the hexadecimal value of the remote port network address.
rname_len	Contains the byte length of the remote port network name. This is returned only when name discovery procedures are used to locate the remote station. Otherwise this field is set to 0 (zero). Network names can be 1 to 20 characters in length.
rname	Contains the name used by the remote SAP. This field is valid only if name-discovery procedures were used to locate the remote station.
rsap	Contains the hexadecimal value of the remote SAP address.
max_data_off	Contains the write data offset in bytes of a communications <b>mbuf</b> cluster where transmit data must minimally begin. This allows ample room for the DLC and MAC headers to be inserted if needed. Some DLCs may be able to prepend additional <b>mbuf</b> clusters for their headers, and in this case will set this field to 0 (zero).  This field is only valid for kernel users that pass in a communications <b>mbuf</b> structure on write operations. <b>Note:</b> To align the data moves to a particular byte boundary, the kernel user may wish to choose a value larger than the minimum value returned.

## DLC\_STAH\_RES Link Station Halted Result Extension

The following parameter block halts the link station (LS) result extension:

```

struct dlc_stah_res
{
    __ulong32_t  conf_ls_corr; /* conflicting link station corr */
};

```

The field of this extension is:

**Field**

conf\_ls\_corr

**Description**

Indicates conflicting link station correlator. Contains the user's link station identifier that already has the specified remote station attached.

This extension is valid only if the result code value indicates -936 (specified remote is already connected).

## DLC\_RADD\_RES Remote Address/Name Change Result Extension

The following parameter block changes the remote address or name of the result extension:

```
struct dlc_radd_res
{
    __ulong32_t  rname_len; /* remote network name/addr length */
    u_char  rname[DLC_MAX_NAME]; /* remote network name/addr */
};
```

The fields of this extension are:

**Field**

rname\_len

**Description**

Indicates the remote network address or name length. Contains the byte length of the updated remote SAP's network address or name.

rname

Contains the updated address or name being used by the remote SAP.

## DLC\_HALT\_LS ioctl Operation for DLC

The **DLC\_HALT\_LS** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block halts a link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

**Field**

gdlc\_sap\_corr

**Description**

Contains the GDLC SAP correlator: The GDLC SAP identifier of the target LS.

gdlc\_ls\_corr

Contains the GDLC LS correlator: The GDLC LS identifier to be halted.

## DLC\_QUERY\_LS ioctl Operation for DLC

The **DLC\_QUERY\_LS** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block queries statistics of a particular link station (LS):

```

struct dlc_qls_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC ls correlator */
    __ulong32_t  user_sap_corr; /* user's SAP correlator - RETURNED */
    __ulong32_t  user_ls_corr; /* user's link station corr-RETURNED */
    u_char_t    ls_diag[DLC_MAX_DIAG]; /* the char name of the ls */
    __ulong32_t  ls_state; /* current ls state */
    __ulong32_t  ls_sub_state; /* further clarification of state */
    struct dlc_ls_counters counters;
    __ulong32_t  protodd_len; /*protocol dependent data byte length*/
};

```

The fields of this ioctl operation are:

<b>Field</b>	<b>Description</b>
gdlc_sap_corr	Specifies the generic data link control (GDLC) service access point (SAP) correlator of the target LS.
gdlc_ls_corr	Specifies the GDLC LS correlator to be queried.
user_sap_corr	Specifies the user SAP correlator returned for routing purposes.
user_ls_corr	Specifies the user LS correlator, that is the user LS identifier returned for routing purposes.
ls_diag	Contains the link station (LS) diagnostic tag. Indicates the ASCII character string tag passed to GDLC at the <b>DLC_START_LS</b> ioctl operation to identify the station being queried. For example, SNA services puts the attachment profile name in this field.
ls_state	Contains the current state of this LS: <ul style="list-style-type: none"> <li><b>DLC_OPENING</b> Indicates the SAP or link station is in the process of opening.</li> <li><b>DLC_OPENED</b> Indicates the SAP or link station has been opened.</li> <li><b>DLC_CLOSING</b> Indicates the SAP or link station is the process of closing.</li> <li><b>DLC_INACTIVE</b> Indicates the link station is currently inactive.</li> </ul>
ls_sub_state	Contains the current substate of this LS. Several indicators may be active concurrently. <ul style="list-style-type: none"> <li><b>DLC_CALLING</b> Indicates the link station is calling.</li> <li><b>DLC_LISTENING</b> Indicates the link station is listening.</li> <li><b>DLC_CONTACTED</b> Indicates the link station is contacted into sequenced data mode.</li> <li><b>DLC_LOCAL_BUSY</b> Indicates the local link station is currently busy.</li> <li><b>DLC_REMOTE_BUSY</b> Indicates the remote link station is currently busy.</li> </ul>

**Field**  
counters

**Description**

Contains link station reliability/availability/serviceability counters. These 14 reliability/availability/serviceability counters are shown as an example only. Each GDLC device manager provides as many of these counters as necessary to diagnose specific network problems for its protocol type.

**test\_cmds\_sent**

Specifies the number of test commands sent.

**test\_cmds\_fail**

Specifies the number of test commands failed.

**test\_cmds\_rec**

Specifies the number of test commands received.

**data\_pkt\_sent**

Specifies the number of sequenced data packets sent.

**data\_pkt\_resent**

Specifies the number of sequenced data packets resent.

**max\_cont\_resent**

Specifies the maximum number of contiguous resendings.

**data\_pkt\_rec**

Indicates data packets received.

**inv\_pkt\_rec**

Specifies the number of invalid packets received.

**adp\_rec\_err**

Specifies the number of data-detected receive errors.

**adp\_send\_err**

Specifies the number of data-detected transmit errors.

**rec\_inact\_to**

Specifies the number of received inactivity timeouts.

**cmd\_polls\_sent**

Specifies the number of command polls sent.

**cmd\_repolls\_sent**

Specifies the number of command repolls sent.

**cmd\_cont\_repolls**

Specifies the maximum number of continuous repolls sent.

protodd\_len

Indicates length of protocol-dependent data. This field contains the byte length of the following area.

The protocol-dependent data contains any additional statistics that a particular GDLC device manager might provide. See the individual GDLC specifications for information on the specific fields returned. This optional data area must directly follow (or append to) the end of the **dlc\_qls\_arg** structure.

---

## DLC\_QUERY\_SAP ioctl Operation for DLC

The **DLC\_QUERY\_SAP** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block queries statistics of a particular service access point (SAP):

```
#define DLC_MAX_DIAG 16 /* the max string of chars in the */
    /* diag name */

struct dlc_qsap_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  user_sap_corr; /* user SAP correlator (returned) */
    __ulong32_t  sap_state;    /* state of the SAP, returned by kernel */
    uchar_t     dev[DLC_MAX_DIAG]; /* the returned device handler's */
    /* device name */
    __ulong32_t  devdd_len;    /* device driver dependent data */
    /* byte length */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the generic data link control (GDLC) SAP correlator to be queried.
user_sap_corr	Contains the user SAP correlator returned for routing purposes.
sap_state	Contains the current SAP state: <b>DLC_OPENING</b> Indicates the SAP or link station is in the process of opening. <b>DLC_OPENED</b> Indicates the SAP or link station has been opened. <b>DLC_CLOSING</b> Indicates the SAP or link station is the process of closing.
dev	Contains the <b>/dev</b> directory name of the communications I/O device handler being used by this SAP.
devdd_len	Contains the byte length of the expected device driver statistics that will be appended to the <b>dlc_qsap_arg</b> structure.

The device driver- dependent data contains the device statistics of the attached network device handler. This is generally the query device statistics (reliability/availability/serviceability log area) returned from an ioctl operation issued to the device handler by the Data Link Control (DLC). See the individual GDLC device manager specifications, discussed in the Generic Data Link Control (GDLC) Environment Overview, for information on the particular fields returned.

The optional data area must directly follow or append to the end of the **dlc\_qsap\_arg** structure.

---

## DLC\_START\_LS ioctl Operation for DLC

The **DLC\_START\_LS** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block starts a link station (LS) on a particular SAP as a caller or listener:

```
#define DLC_MAX_DIAG 16 /* the maximum string of chars */
/* in the diag name */

struct dlc_sls_arg
{
    __ulong32_t  gdlc_ls_corr; /* GDLC User link station correlator */
    u_char_t     ls_diag[DLC_MAX_DIAG]; /* the char name of the ls */
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  user_ls_corr; /* User's SAP correlator */
    __ulong32_t  flags; /* Start Link Station flags */
    __ulong32_t  trace_chan; /* Trace Channel (rc of trcstart)*/
    __ulong32_t  len_raddr_name; /* Length of the remote name/addr*/
    u_char_t     raddr_name[DLC_MAX_NAME]; /* The Remote addr/name */

    __ulong32_t  maxif; /* Maximum number of bytes in an */
    /* I-field */
    __ulong32_t  rcv_wind; /* Maximum size of receive window */
    __ulong32_t  xmit_wind; /* Maximum size of transmit window */
    u_char_t     rsap; /* Remote SAP value */
    u_char_t     rsap_low; /* Remote SAP low range value */
    u_char_t     rsap_high; /* Remote SAP high range value */
    u_char_t     res1; /* Reserved */

    __ulong32_t  max_repoll; /* Maximum Repoll count */
    __ulong32_t  repoll_time; /* Repoll timeout value */
    __ulong32_t  ack_time; /* Time to delay trans of an ack */
    __ulong32_t  inact_time; /* Time before inactivity times out */
    __ulong32_t  force_time; /* Time before a forced disconnect */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_ls_corr	Contains GDLC LS correlator. The GDLC LS identifier returned to the user as soon as resources are determined to be available. This correlator must accompany all commands associated with this LS.
ls_diag	Contains LS diagnostic tag. Any ASCII 1 to 16-character name written to GDLC trace, error log, and status entries for LS identification. (The end-of-name delimiter is the AIX® null character.)
gdlc_sap_corr	Contains GDLC LS correlator. Specifies the SAP with which to associate this link station. This field must contain the same correlator value passed to the user in the gdlc_sap_corr field by GDLC when the SAP was enabled.
user_ls_corr	Contains user LS correlator. Specifies an identifier or correlator that the user wishes to have returned on all LS results and data from GDLC. It allows the user of multiple link stations to route the station-specific results based on a correlator.



<b>Field</b>	<b>Description</b>
flags	<p>Contains common LS flags. The following flags are supported:</p> <p><b>DLC_TRCO</b> Trace control on: 0 = Disable link trace. 1 = Enable link trace.</p> <p><b>DLC_TRCL</b> Trace control long: 0 = Link trace entries are short (80 bytes). 1 = Link trace entries are long (full packet).</p> <p><b>DLC_SLS_STAT</b> Station type for SDLC: 0 = Secondary (default) 1 = Primary</p> <p><b>DLC_SLS_NEGO</b> Negotiate station type for SDLC: 0 = No (default) 1 = Yes</p> <p><b>DLC_SLS_HOLD</b> Hold link on inactivity: 0 = No (default). Terminate the LS. 1 = Yes, hold it active.</p> <p><b>DLC_SLS_L SVC</b> LS virtual call: 0 = Listen for incoming call. 1 = Initiate call.</p> <p><b>DLC_SLS_ADDR</b> Address indicator: 0 = Remote is identified by name (discovery). 1 = Remote is identified by address (resolve, SDLC).</p>
trace_chan	Specifies the channel number obtained from the <b>trcstart</b> subroutine. This field is valid only if the <b>DLC_TRCO</b> indicator is set active.
len_raddr_name	Specifies the byte length of the remote address or name. This field must be set to 0 if no remote address or name is required to start the LS. Length values of 0 through 20 are supported.
raddr_name	Contains the unique network address of the remote node if the <b>DLC_SLS_ADDR</b> indicator is set active. Contains the unique network name of the remote node if the <b>DLC_SLS_ADDR</b> indicator is reset. Addresses are entered in hexadecimal notation, and names are entered in character notation. This field is only valid if the previous length field is nonzero.
maxif	Specifies the maximum number of I-field bytes that can be in one packet. This value is reduced by GDLC if the device handler buffer sizes are too small to hold the maximum I-field specified here. The resultant size is returned from GDLC when the link station has been started.
rcv_wind	The receive window specifies the maximum number of sequentially numbered receive I-frames the local station can accept before sending an acknowledgment.

Field	Description
xmit_wind	Specifies the transmit window and the maximum number of sequentially numbered transmitted I-frames that can be outstanding at any time.
rsap	Specifies the remote SAP address being called. This field is valid only if the <b>DLC_SLS_LSVC</b> indicator or the <b>DLC_SLS_ADDR</b> indicator is set active.
rsap_low	Specifies the lowest value in the range of remote SAP address values that the local SAP responds to when listening for a remote-initiated attachment. This value cannot be the null SAP (0x00) or the discovery SAP (0xFC), and must have the low-order bit set to 0 (B`nnnnnn0') to indicate an individual address.
rsap_high	Specifies the highest value in the range of remote SAP address values that the local SAP responds to, when listening for a remote-initiated attachment. This value cannot be the null SAP (0x00) or the discovery SAP (0xFC), and must have the low-order bit set to 0 (B`nnnnnn0') to indicate an individual address.
max_repoll	Specifies the maximum number of retries for an unacknowledged command frame, or in the case of an I-frame timeout, the number of times the nonresponding remote link station is polled with a supervisory command frame.
repoll_time	Contains the timeout value (in increments defined by the specific GDLC) used to specify the amount of time allowed prior to retransmitting an unacknowledged command frame.
ack_time	Contains the timeout value (in increments defined by the specific GDLC) used to specify the amount of time to delay the transmission of an acknowledgment for a received I-frame.
inact_time	Contains the timeout value (in increments of 1 second) used to specify the maximum amount of time allowed before receive inactivity returns an error.
force_time	Contains the timeout value (in increments of 1 second) specifying the period to wait for a normal disconnection. Once the timeout occurs, the disconnection is forced and the link station is halted.

The protocol-specific data area allows parameters to be defined by a specific GDLC device manager, such as Token-Ring dynamic window increment or SDLC primary slow poll. This optional data area must directly follow (or append to) the end of the **dlc\_sls\_arg** structure.

---

## DLC\_TEST ioctl Operation for DLC

The **DLC\_TEST** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block tests the link to a remote for a particular local link station (LS):

```
struct dlc_corr_arg
{
    __ulong32_t  gdlc_sap_corr;    /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr;    /* GDLC link station correlator */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Indicates the GDLC SAP correlator of the target LS.
gdlc_ls_corr	Indicates the GDLC LS correlator to be tested.

---

## DLC\_TRACE ioctl Operation for DLC

The **DLC\_TRACE** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

The following parameter block traces link station (LS) activity for short or long activities:

```
struct dlc_trace_arg
{
    __ulong32_t  gdlc_sap_corr; /* GDLC SAP correlator */
    __ulong32_t  gdlc_ls_corr; /* GDLC link station correlator */
    __ulong32_t  trace_chan; /* Trace Channel (rc of trcstart) */
    __ulong32_t  flags; /* Trace Flags */
};
```

The fields of this ioctl operation are:

Field	Description
gdlc_sap_corr	Contains the GDLC SAP correlator. The correlator returned by GDLC when the SAP was enabled by the user. This correlator identifies the user SAP to the GDLC protocol process.
gdlc_ls_corr	Contains the GDLC LS correlator. The correlator returned by GDLC when the LS was started by the user. This correlator identifies the user LS to the GDLC protocol process.
trace_chan	Specifies the trace channel number obtained from the <b>trcstart</b> subroutine. This field is only valid if the <b>DLC_TRCO</b> indicator is set active.
flags	Specifies trace flags. The following flags are supported: <b>DLC_TRCO</b> Trace control on: 0 = Disable link trace. 1 = Enable link trace. <b>DLC_TRCL</b> Trace control long: 0 = Link trace entries are short (80 bytes). 1 = Link trace entries are long (full packet).

---

## IOCINFO ioctl Operation for DLC

This operation returns a structure that describes the device. The first byte is set to an iotype of **DD\_DLC**. The subtype and data are defined by the individual DLC devices. See the **/usr/include/sys/devinfo.h** file for details.

The **IOCINFO** ioctl operation is selectable through the **fp\_ioctl** kernel service or the **ioctl** subroutine. It can be called from the process environment only.

### Related Information

Generic Data Link Control (GDLC) Environment Overview in *AIX Version 6.1 Communications Programming Concepts*.



---

## Chapter 2. Data Link Provider Interface (DLPI)

---

### DL\_ATTACH\_REQ Primitive

#### Purpose

Requests that the data link service (DLS) provider associate a physical point of attachment (PPA) with a stream.

#### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong    dl_primitive;
    ulong    dl_ppa;
} dl_attach_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

#### Description

The **DL\_ATTACH\_REQ** primitive requests that the DLS provider associate a PPA with a stream. The **DL\_ATTACH\_REQ** primitive is needed for *style 2* DLS providers to identify the physical medium over which communication is to transpire.

#### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_ATTACH_REQ</b> message.
<i>dl_ppa</i>	Specifies the identifier of the PPA to be associated with the stream. The dlpi driver is implemented a <i>style 2</i> provider
	The value of the <i>dl_ppa</i> parameter must include identification of the communication medium. For media that multiplex multiple channels over a single physical medium, this identifier should also specify a specific communication channel (where each channel on a physical medium is associated with a separate PPA).
	<b>Note:</b> Because of the provider-specific nature of this value, DLS user software that is to be protocol independent should avoid hard-coding the PPA identifier. The DLS user should retrieve the necessary PPA identifier from some other entity (such as a management entity) and insert it without inspection into the <b>DL_ATTACH_REQ</b> primitive.

#### States

Valid	The primitive is valid in the <b>DL_UNATTACHED</b> state.
New	The resulting state is <b>DL_ATTACH_PENDING</b> .

#### Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user resulting in the <b>DL_UNBOUND</b> state.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned and the resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have proper permission to use the requested PPA.
<b>DL_BADPPA</b>	Indicates the specified PPA is invalid.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.

## Related Information

The **DL\_BIND\_REQ** primitive, **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_BIND\_ACK Primitive

### Purpose

Reports the successful bind of a data link service access point (DLSAP) to a stream.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_sap;
    ulong dl_addr_length;
    ulong dl_addr_offset;
    ulong dl_max_conind;
    ulong dl_xidtest_flg;
} dl_bind_ack_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_BIND\_ACK** primitive reports the successful bind of a DLSAP to a stream and returns the bound DLSAP address to the data link service (DLS) user. This primitive is generated in response to a **DL\_BIND\_REQ** primitive.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_BIND_ACK</b> primitive.
<i>dl_sap</i>	Specifies the DLSAP address information associated with the bound DLSAP. It corresponds to the <i>dl_sap</i> parameter of the associated <b>DL_BIND_REQ</b> primitive, which contains part or all of the DLSAP address. For the portion of the DLSAP address conveyed in the <b>DL_BIND_REQ</b> primitive, this parameter contains the corresponding portion of the address for the DLSAP that was actually bound.
<i>dl_addr_length</i>	Specifies the length of the complete DLSAP address that was bound to the Data Link Provider Interface (DLPI) stream. The bound DLSAP is chosen according to the guidelines presented under the description of the <b>DL_BIND_REQ</b> primitive.
<i>dl_addr_offset</i>	Specifies where the DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PCPROTO</b> block.

<i>dl_max_conind</i>	Specifies whether a <b>DL_CODLS</b> stream will allow incoming connection indications ( <b>DL_CONNECT_IND</b> ). If the value is zero, the stream cannot accept any <b>DL_CONNECT_IND</b> messages; the stream will only accept <b>DL_CONNECT_REQ</b> . If the value is greater than zero, then this stream is a listening stream, and indicates how many <b>DL_CONNECT_IND</b> 's can be pending at one time.
<i>dl_xidtest_flg</i>	Specifies the XID and test responses supported by the provider. Valid values are: <ul style="list-style-type: none"> <li><b>0</b>           The DLS user will be handling all XID and TEST traffic.</li> <li><b>DL_AUTO_XID</b> Automatically handles XID responses.</li> <li><b>DL_AUTO_TEST</b> Automatically handles test responses.</li> <li><b>DL_AUTO_XID DL_AUTO_TEST</b> Automatically handles both XID and TEST responses.</li> </ul>

## States

Valid	The primitive is valid in the <b>DL_BIND_PENDING</b> state.
New	The resulting state is <b>DL_IDLE</b> .

## Related Information

The **DL\_BIND\_REQ** primitive.

---

## DL\_BIND\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider bind a data link service access point (DLSAP) to a stream.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_sap;
    ulong dl_max_conind;
    ushort dl_service_mode;
    ushort dl_conn_mgmt;
    ulong dl_xidtest_flg;
} dl_bind_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

A stream is active when the DLS provider can transmit and receive protocol data units destined to or originating from the stream. The physical point of attachment (PPA) associated with each stream must be initialized when the **DL\_BIND\_REQ** primitive has been processed. The PPA is initialized when the **DL\_BIND\_ACK** primitive is received. If the PPA cannot be initialized, the **DL\_BIND\_REQ** primitive fails.

## Parameters

*dl\_primitive*  
*dl\_sap*

Specifies the **DL\_BIND\_REQ** primitive.

Identifies the DLSAP to be bound to the Data Link Provider Interface (DLPI) stream. This parameter can contain either the full DLSAP address or a portion of the address sufficient to uniquely identify the DLSAP. The **DL\_BIND\_ACK** primitive returns the full address of the bound DLSAP. The *dl\_sap* parameter is a ulong containing an ether type for DL\_ETHER, or a single byte SAP for 802.2 networks.

The DLS provider adheres to the following rules when it binds a DLSAP address:

- The DLS provider must define and manage its DLSAP address space.
- The DLS provider allows the same DLSAP to be bound to multiple streams.

The DLS provider may not be able to bind the specified DLSAP address for the following reasons:

- The DLS provider statically associated a specific DLSAP with each stream. The value of the *dl\_sap* parameter is ignored by the DLS provider and the **DL\_BIND\_ACK** primitive returns the DLSAP address that is already associated with the stream.

**Note:** Because of the provider-specific nature of the DLSAP address, protocol-independent DLS user software should not have this value hard-coded. The DLS user should retrieve the necessary DLSAP address from the appropriate header file for that protocol and insert it without inspection into the **DL\_BIND\_REQ** primitive. Specifies the maximum number of outstanding **DL\_CONNECT\_IND** primitives allowed on the DLPI stream. This field controls whether a connection-oriented stream will accept incoming connection indications. This parameter can have one of the following values:

*dl\_max\_conind*

- 0** The stream cannot accept any **DL\_CONNECT\_IND** primitives.
- >0** The DLS user accepts the specified number of **DL\_CONNECT\_IND** primitives before having to respond with a **DL\_CONNECT\_RES** or **DL\_DISCONNECT\_REQ** primitive.

The DLS provider may not be able to support the value supplied in the *dl\_max\_conind* parameter for the following reasons:

- If the provider cannot support the specified number of outstanding connect indications, it should set the value down to a number it can support.
- Only one stream that is bound to the indicated DLSAP can have an allowed number of maximum outstanding connect indications greater than 0. If a **DL\_BIND\_REQ** primitive specifies a value greater than 0, but another stream has already bound itself to the DLSAP with a value greater than 0, the request fails. The DLS provider then sets the *dl\_errno* parameter of the **DL\_ERROR\_ACK** primitive to a value of **DL\_BOUNDED**.
- A connection cannot be accepted on a stream bound with a *dl\_max\_conind* greater than zero. No other streams in which the value of the *dl\_max\_conind* parameter is greater than 0 can be bound to the same DLSAP. This restriction prevents more than one stream bound to the same DLSAP from receiving connect indications and accepting connections.
  - A DLS user should always be able to request a *dl\_max\_conind* parameter value of 0, since this indicates to the DLS provider that the stream will only be used to originate connect requests.
  - A stream in which the *dl\_max\_conind* parameter has a negotiated value greater than 0 cannot originate connect requests.

**Note:** This field is ignored in connectionless-mode service.



*dl\_service\_mode*

Specifies the following modes of service for this stream:

**DL\_CODLS**

Selects the connection-oriented only mode. The connection primitives will be accepted. In addition, an arbitrary number of streams may bind to the same *dl\_sap* on the same interface, as long as *dl\_max\_conind* is zero. No incoming datagram traffic will be sent up this stream. Such frames will either be routed to a **DL\_CLDLS** stream, or silently discarded.

**DL\_CLDLS**

Selects the connectionless only mode. The connection primitives will not be accepted. This mode selects exclusive control of connectionless traffic. All datagrams (**DL\_UNITDATA\_IND**) from any remote station addressed to this *dl\_sap* will be received on this stream, even if another stream is currently connected on the same *dl\_sap*. Only one stream per interface may bind **DL\_CLDS**.

**DL\_CLDLSIDL\_CODLS**

Selects the connection-oriented service augmented with connectionless traffic. An arbitrary number of streams may bind to the same *dl\_sap* on the same interface. This mode is mutually exclusive with **DL\_CLDLS**.

If the DLS provider does not support the requested service mode, a **DL\_ERROR\_ACK** primitive is generated. This primitive conveys a value of **DL\_UNSUPPORTED**.

This field is ignored.

*dl\_conn\_mgmt*  
*dl\_xidtest\_flg*

Indicates to the DLS provider that XID or test responses for this stream are to be automatically generated by the DLS provider. The *xidtest\_flg* parameter contains a bit mask that can specify either, both, or neither of the following values:

**DL\_AUTO\_XID**

Indicates to the DLS provider that automatic responses to XID commands are to be generated.

**DL\_AUTO\_TEST**

Indicates to the DLS provider that automatic responses to test commands are to be generated.

**DL\_AUTO\_XIDIDL\_AUTO\_TEST**

Indicates to the DLS provider that automatic responses to both XID commands and test commands are to be generated.

The DLS provider supports automatic handling of XID and test responses. If an automatic XID or test response has been requested, the DLS provider does not generate **DL\_XID\_IND** or **DL\_TEST\_IND** primitives. Therefore, if the provider receives an XID request (**DL\_XID\_REQ**) or test request (**DL\_TEST\_REQ**) from the DLS user, the DLS provider returns a **DL\_ERROR\_ACK** primitive, specifying a **DL\_XIDAUTO** or **DL\_TESTAUTO** error code, respectively.

If no value is specified in the *dl\_xidtest\_flg* parameter, the DLS provider does not automatically generate XID and test responses.

The value informs the DLS provider that the DLS user will be handling all XID and TEST traffic. A nonzero value indicates the DLS provider is responsible for either XID or TEST traffic or both. If the driver handles XID or TEST, the DLS user will not receive any incoming XID or TEST frames, nor be allowed to send them.

## States

Valid      The primitive is valid in the **DL\_UNBOUND** state.  
New        The resulting state is **DL\_BIND\_PENDING**.

## Acknowledgments

Successful                   The **DL\_BIND\_ACK** primitive is sent to the DLS user. The resulting state is **DL\_IDLE**.  
Unsuccessful                The **DL\_ERROR\_ACK** primitive is returned. The resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have proper permission to use the requested DLSAP address.
<b>DL_BADADDR</b>	Indicates the DLSAP address information is invalid or is in an incorrect format.
<b>DL_BOUND</b>	Indicates the DLS user attempted to bind a second stream to a DLSAP with a <i>dl_max_conind</i> parameter value greater than 0, or the DLS user attempted to bind a second connection management stream to the PPA.
<b>DL_INITFAILED</b>	Indicates the automatic initialization of the PPA failed.
<b>DL_NOADDR</b>	Indicates the DLS provider cannot allocate a DLSAP address for this stream.
<b>DL_NOAUTO</b>	Indicates automatic handling of XID and test responses is not supported.
<b>DL_NOTINIT</b>	Indicates the PPA was not initialized prior to this request.
<b>DL_NOTESTAUTO</b>	Indicates automatic handling of test responses is not supported.
<b>DL_NOXIDAUTO</b>	Indicates automatic handling of XID responses is not supported.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_UNSUPPORTED</b>	Indicates the DLS provider does not support the requested service mode on this stream.

## Related Information

The **DL\_BIND\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_CONNECT\_CON Primitive

### Purpose

Informs the local data link service (DLS) user that the requested data link connection has been established.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_resp_addr_length;
    ulong dl_resp_addr_offset;
    ulong dl_qos_length;
    ulong dl_qos_offset;
    ulong dl_growth;
} dl_connect_con_t;
```

### Description

The **DL\_CONNECT\_CON** primitive informs the local DLS user that the requested data link connection has been established. The primitive contains the data link service access point (DLSAP) address of the responding DLS user.

**Note:** This primitive applies to connection mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_CONNECT_CON</b> primitive.
<i>dl_resp_addr_length</i>	Specifies the length of the address of the responding DLSAP associated with the newly established data link connection.
<i>dl_resp_addr_offset</i>	Specifies where responding DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_qos_length</i>	The DLS provider does not support QOS parameters. This value is set to 0.
<i>dl_qos_offset</i>	The DLS provider does not support QOS parameters. This value is set to 0.
<i>dl_growth</i>	Defines a growth field for future enhancements to this primitive. Its value must be set to zero.

## States

Valid	The primitive is valid in the <b>DL_OUTCON_PENDING</b> state.
New	The resulting state is <b>DL_DATAXFER</b> .

## Related Information

**DL\_CONNECT\_REQ** primitive.

---

## DL\_CONNECT\_IND Primitive

### Purpose

Informs the local data link service (DLS) user that a remote (calling) DLS user is attempting to establish a data link connection.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure.

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_correlation;
    ulong dl_called_addr_length;
    ulong dl_called_addr_offset;
    ulong dl_calling_addr_length;
    ulong dl_calling_addr_offset;
    ulong dl_qos_length;
    ulong dl_qos_offset;
    ulong dl_growth;
} dl_connect_req_t;
```

### Description

The **DL\_CONNECT\_IND** primitive informs the local DLS user that a remote (calling) DLS user is attempting to establish a data link connection. The primitive contains the data link service access point (DLSAP) addresses of the calling and called DLS user.

The **DL\_CONNECT\_IND** primitive also contains a number that allows the DLS user to correlate the primitive with a subsequent **DL\_CONNECT\_RES**, **DL\_DISCONNECT\_REQ**, or **DL\_DISCONNECT\_IND** primitive.

The number of outstanding **DL\_CONNECT\_IND** primitives issued by the DLS provider must not exceed the value of *the dl\_max\_conind* parameter specified by the **DL\_BIND\_ACK** primitive. If this limit is reached and an additional connect request arrives, the DLS provider does not pass the corresponding connect indication to the DLS user until a response is received for an outstanding request.

**Note:** This primitive applies to connection mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_CONNECT_IND</b> primitive.
<i>dl_correlation</i>	Specifies the correlation number to be used by the DLS user to associate this message with the <b>DL_CONNECT_RES</b> , <b>DL_DISCONNECT_REQ</b> , or <b>DL_DISCONNECT_IND</b> primitive that is to follow. This value enables the DLS user to multithread connect indications and responses. All outstanding connect indications must have a distinct, nonzero correlation value set by the DLS provider.
<i>dl_called_addr_length</i>	Specifies the length of the address of the DLSAP for which this <b>DL_CONNECT_IND</b> primitive is intended. This address is the full DLSAP address specified by the calling DLS user and is typically the value returned on the <b>DL_BIND_ACK</b> associated with the given stream.
<i>dl_called_addr_offset</i>	Specifies where the called DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_calling_addr_length</i>	Specifies the length of the address of the DLSAP from which the <b>DL_CONNECT_REQ</b> primitive was sent.
<i>dl_calling_addr_offset</i>	Specifies where the calling DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_qos_length</i>	The DLS provider does not support QOS parameters. This length field is set to 0.
<i>dl_qos_offset</i>	The DLS provider does not support QOS parameters. This length field is set to 0.
<i>dl_growth</i>	Defines a growth field for future enhancements to this primitive. Its value must be set to 0.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> state. It is also valid in the <b>DL_INCON_PENDING</b> state when the maximum number of outstanding <b>DL_CONNECT_IND</b> primitives has not been reached on this stream.
New	The resulting state is <b>DL_INCON_PENDING</b> , regardless of the current state.

## Acknowledgments

The DLS user must send either the **DL\_CONNECT\_RES** primitive to accept the connect request or the **DL\_DISCONNECT\_REQ** primitive to reject the connect request. In either case, the responding message must convey the correlation number received from the **DL\_CONNECT\_IND** primitive. The DLS provider uses the correlation number to identify the connect request to which the DLS user is responding.

## Related Information

The **DL\_BIND\_ACK** primitive, **DL\_CONNECT\_RES** primitive, **DL\_DISCONNECT\_IND** primitive, **DL\_DISCONNECT\_REQ** primitive.

---

## DL\_CONNECT\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider establish a data link connection with a remote DLS user.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_qos_length;
    ulong dl_qos_offset;
    ulong dl_growth;
} dl_connect_req_t;
```

### Description

The **DL\_CONNECT\_REQ** primitive requests that the DLS provider establish a data link connection with a remote DLS user. The request contains the data link service access point (DLSAP) address of the remote DLS user.

**Note:** This primitive applies to connection mode.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_CONNECT_REQ</b> primitive.
<i>dl_dest_addr_length</i>	Specifies the length of the DLSAP address that identifies the DLS user with whom a connection is to be established. If the called user is implemented using DLPI, this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Specifies where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_qos_length</i>	The DLS provider does not support any QOS parameter values. This value is set to 0.
<i>dl_qos_offset</i>	The DLS provider does not support any QOS parameter values. This value is set to 0.
<i>dl_growth</i>	Defines a growth field for future enhancements to this primitive. Its value must be set to 0.

### States

Valid	The primitive is valid in the <b>DL_IDLE</b> state.
New	The resulting state is <b>DL_OUTCON_PENDING</b> .

### Acknowledgments

There is no immediate response to the connect request. However, if the connect request is accepted by the called DLS user, the **DL\_CONNECT\_CON** primitive is sent to the calling DLS user, resulting in the **DL\_DATAXFER** state.

If the connect request is rejected by the called DLS user, the called DLS user cannot be reached, or the DLS provider or called DLS user do not agree on the specified quality of service, a **DL\_DISCONNECT\_IND** primitive is sent to the calling DLS user, resulting in the **DL\_IDLE** state.

If the request is erroneous, the **DL\_ERROR\_ACK** primitive is returned and the resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have proper permission to use the requested DLSAP address.
<b>DL_BADADDR</b>	Indicates the DLSAP address information is invalid or is in an incorrect format.
<b>DL_BADQOSPARAM</b>	Indicates the QOS parameters contain invalid values.
<b>DL_BADQOSTYPE</b>	Indicates the QOS structure type is not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_UNSUPPORTED</b>	Indicates the DLS user has indicated QOS parameters, which are unsupported.

## Related Information

The **DL\_CONNECT\_CON** primitive, **DL\_DISCONNECT\_IND** primitive, **DL\_ERROR\_ACK** primitive, **DL\_BIND\_ACK** primitive.

---

## DL\_CONNECT\_RES Primitive

### Purpose

Directs the data link service (DLS) provider to accept a connect request from a remote DLS user.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_correlation;
    ulong dl_resp_token;
    ulong dl_qos_length;
    ulong dl_qos_offset;
    ulong dl_growth;
} dl_connect_res_t;
```

### Description

The **DL\_CONNECT\_RES** primitive directs the DLS provider to accept a connect request from a remote (calling) DLS user on a designated stream. The DLS user can accept the connection on the same stream where the connect indication arrived, or on a different, previously bound stream. The response contains the correlation number from the corresponding **DL\_CONNECT\_IND** primitive, selected quality of service (QOS) parameters, and an indication of the stream on which to accept the connection.

After issuing this primitive, the DLS user can immediately begin transferring data using the **DL\_DATA\_REQ** primitive. However, if the DLS provider receives one or more **DL\_DATA\_REQ** primitives from the local DLS user before it has established a connection, the provider must queue the data transfer requests internally until the connection is successfully established.

**Note:** This primitive applies to connection mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_CONNECT_RES</b> primitive.
<i>dl_correlation</i>	Specifies the correlation number that was received with the corresponding <b>DL_CONNECT_IND</b> primitive. The DLS provider uses the correlation number to identify the connect indication to which the DLS user is responding.
<i>dl_resp_token</i>	Specifies one of the following values: <ul style="list-style-type: none"><li><b>&gt;0</b> Specifies the token associated with the responding stream on which the DLS provider is to establish the connection. This stream must be in the <b>DL_IDLE</b> state. The token value for a stream can be obtained by issuing a <b>DL_TOKEN_REQ</b> primitive on that stream.</li><li><b>0</b> Indicates the DLS user is accepting the connection on the stream where the connect indication arrived.</li></ul>
<i>dl_qos_length</i>	The DLS provider does not support QOS parameters. This value is set to 0.
<i>dl_qos_offset</i>	The DLS provider does not support QOS parameters. This value is set to 0.
<i>dl_growth</i>	Defines a growth field for future enhancements to this primitive. Its value must be set to 0.

## States

Valid	The primitive is valid in the <b>DL_INCON_PENDING</b> state.
New	The resulting state is <b>DL_CONN_RES_PENDING</b> .

## Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user. If no outstanding connect indications remain, the resulting state for the current stream is <b>DL_IDLE</b> . Otherwise, it remains <b>DL_INCON_PENDING</b> . For the responding stream (designated by the <i>dl_resp_token</i> parameter), the resulting state is <b>DL_DATAXFER</b> . If the current stream and responding stream are the same, the resulting state of that stream is <b>DL_DATAXFER</b> . These streams can only be the same when the response corresponds to the only outstanding connect indication.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned on the stream where the <b>DL_CONNECT_RES</b> primitive was received, and the resulting state of that stream and the responding stream is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have proper permission to use the requested data link service access point (DLSAP) address.
<b>DL_BADCORR</b>	Indicates the correlation number specified in this primitive does not correspond to a pending connect indication.
<b>DL_BADQOSPARAM</b>	Indicates the QOS parameters contain invalid values.
<b>DL_BADQOSTYPE</b>	Indicates the QOS structure type is not supported by the DLS provider.
<b>DL_BADTOKEN</b>	Indicates the token for the responding stream is not associated with a currently open stream.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state, or the responding stream was not in a valid state for establishing a connection.
<b>DL_PENDING</b>	Indicates the current and responding streams are the same, and there is more than one outstanding connect indication.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.

## Related Information

The **DL\_CONNECT\_IND** primitive, **DL\_CONNECT\_RES** primitive, **DL\_DATA\_REQ** primitive, **DL\_ERROR\_ACK** primitive, **DL\_OK\_ACK** primitive.

---

## DL\_DATA\_IND Primitive

### Purpose

Conveys a data link service data unit (DLSDU) from the data link service (DLS) provider to the DLS user.

### Structure

The primitive consists of one or more **M\_DATA** message blocks containing at least one byte of data. (That is, there is no DLPI data structure associated with this primitive.)

### Description

The **DL\_DATA\_IND** primitive conveys a DLSDU from the DLS provider to the DLS user. The DLS provider guarantees to deliver each DLSDU to the local DLS user in the same order as received from the remote DLS user. If the DLS provider detects unrecoverable data loss during data transfer, this may be indicated to the DLS user by a **DL\_RESET\_IND** primitive, or, if the connection is lost, by a **DL\_DISCONNECT\_IND** primitive.

**Note:** This primitive applies to connection mode.

### States

Valid	The primitive is valid in the <b>DL_DATA_XFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_DISCONNECT\_IND** primitive, **DL\_RESET\_IND** primitive.

---

## DL\_DATA\_REQ Primitive

### Purpose

Conveys a complete data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider for transmission over the data link connection.

### Structure

This primitive consists of one or more **M\_DATA** message blocks containing at least one byte of data. (That is, there is no DLPI data structure associated with this primitive.)

### Description

The **DL\_DATA\_REQ** primitive conveys a complete DLSDU from the DLS user to the DLS provider for transmission over the data link connection. The DLS provider guarantees to deliver each DLSDU to the remote DLS user in the same order as received from the local DLS user. If the DLS provider detects unrecoverable data loss during data transfer, the DLS user can be notified by a **DL\_RESET\_IND** primitive. If the connection is lost, the user can be notified by a **DL\_DISCONNECT\_IND** primitive.



To simplify support of a **read/write** interface to the data link layer, the DLS provider must recognize and process messages that consist of one or more **M\_DATA** message blocks without a preceding **M\_PROTO** message block. This message type may originate from the **write** subroutine.

#### Notes:

1. This does not imply that the Data Link Provider Interface (DLPI) directly supports a pure **read/write** interface. If such an interface is desired, a streams module could be implemented to be pushed above the DLS provider.
2. (Support of Direct User-Level Access) A streams module would implement more field processing itself to support direct user-level access. This module could collect messages and send them in one larger message to the DLS provider, or break large DLSDUs passed to the DLS user into smaller messages. The module would only be pushed if the DLS user was a user-level process.
3. The **DL\_DATA\_REQ** primitive applies to connection mode.

## States

Valid	The primitive is valid in the <b>DL_DATAXFER</b> state. If it is received in the <b>DL_IDLE</b> or <b>DL_PROV_RESET_PENDING</b> state, the primitive is discarded without generating an error.
New	The resulting state is unchanged.

## Acknowledgments

Successful	No response is generated.
Unsuccessful	A streams <b>M_ERROR</b> message is issued to the DLS user specifying an <b>errno</b> global value of <b>EPROTO</b> . This action should be interpreted as a fatal, unrecoverable, protocol error. A request will fail under the following conditions: <ul style="list-style-type: none"><li>• The primitive was issued from an invalid state. If the request is issued in the <b>DL_IDLE</b> or <b>DL_PROV_RESET_PENDING</b> state. However, the request is discarded without generating an error.</li><li>• The amount of data in the current DLSDU is not within the DLS provider's acceptable bounds as specified by the <i>dl_min_sdu</i> and <i>dl_max_sdu</i> parameters of the <b>DL_INFO_ACK</b> primitive.</li></ul>

## Related Information

The **DL\_DISCONNECT\_IND** primitive, **DL\_INFO\_ACK** primitive, **DL\_RESET\_IND** primitive.

---

## DL\_DETACH\_REQ Primitive

### Purpose

Requests that the data link service (DLS) *style 2* provider detach a physical point of attachment (PPA) from a stream.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_detach_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

## Description

For *style 2* DLS providers, the **DL\_DETACH\_REQ** primitive requests the DLS provider detach a PPA from a stream.

## Parameters

*dl\_primitive* Specifies the **DL\_DETACH\_REQ** primitive.

## States

Valid The primitive is valid in the **DL\_UNBOUND** state.  
New The resulting state is **DL\_DETACH\_PENDING**.

## Acknowledgments

Successful The **DL\_OK\_ACK** primitive is sent to the DLS user. The resulting state is **DL\_UNATTACHED**.  
Unsuccessful The **DL\_ERROR\_ACK** primitive is returned, and the resulting state is unchanged.

## Error Codes

**DL\_OUTSTATE** Indicates the primitive was issued from an invalid state.  
**DL\_SYSERR** Indicates a system error occurred. The system error is indicated in the **DL\_ERROR\_ACK** primitive.

## Related Information

The **DL\_ERROR\_ACK** primitive, **DL\_OK\_ACK** primitive.

---

## DL\_DISABMULTI\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider disable specific multicast addresses on a per stream basis.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_addr_length;
    ulong dl_addr_offset;
} dl_disabmulti_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_DISABMULTI\_REQ** primitive requests that the DLS provider disable specific multicast addresses on a per stream basis.

The DLS provider must not run in the interrupt environment. If the DLS provider runs in the interrupt environment, the system returns a **DL\_ERROR\_ACK** primitive with an error code of **DL\_SYSERR** and an operating system error code of 0.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_DISABMULTI_REQ</b> primitive.
<i>dl_addr_length</i>	Specifies the length of the physical address.
<i>dl_addr_offset</i>	Indicates where the multicast address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in any state in which a local acknowledgement is not pending, with the exception of the <b>DL_UNATTACH</b> state.
New	The resulting state is unchanged.

## Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_BADADDR</b>	Indicates the data link service access point (DLSAP) address information is invalid or is in an incorrect format.
<b>DL_NOTENAB</b>	Indicates the address specified is not enabled.
<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The <b>DL_ERROR_ACK</b> primitive indicates the system error.

## Related Information

The **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive, **DL\_ENABMULTI\_REQ** primitive.

---

## DL\_DISCONNECT\_IND Primitive

### Purpose

Informs the data link service (DLS) user that the data link connection on the current stream has been disconnected, or that a pending connection has been cancelled.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_originator;
```

```

    ulong dl_reason;
    ulong dl_correlation;
} dl_disconnect_ind_t;

```

## Description

The **DL\_DISCONNECT\_IND** primitive informs the DLS user of one of the following conditions:

- The data link connection on the current stream has been disconnected.
- A pending connection from either the **DL\_CONNECT\_REQ** or **DL\_CONNECT\_IND** primitive has been cancelled.

The primitive indicates the origin and the cause of the disconnect.

**Note:** This primitive applies to connection mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_DISCONNECT_IND</b> primitive.
<i>dl_originator</i>	Indicates whether the disconnect originated from a DLS user or provider. Valid values are <b>DL_USER</b> and <b>DL_PROVIDER</b> .
<i>dl_reason</i>	Specifies the reason for the disconnect. Reasons for disconnect are: <ul style="list-style-type: none"> <li><b>DL_DISC_PERMANENT_CONDITION</b> Indicates the connection was released because of a permanent condition.</li> <li><b>DL_DISC_TRANSIENT_CONDITION</b> Indicates the connection was released because of a temporary condition.</li> <li><b>DL_CONREJ_DEST_UNKNOWN</b> Indicates the connect request has an unknown destination.</li> <li><b>DL_CONREJ_DEST_UNREACH_PERMANENT</b> Indicates the connection was released because the destination for connect request could not be reached. This is a permanent condition.</li> <li><b>DL_CONREJ_DEST_UNREACH_TRANSIENT</b> Indicates the connection was released because the destination for connect request could not be reached. This is a temporary condition.</li> <li><b>DL_CONREJ_QOS_UNAVAIL_PERMANENT</b> Indicates the requested quality of service (QOS) parameters became permanently unavailable while establishing a connection.</li> <li><b>DL_CONREJ_QOS_UNAVAIL_TRANSIENT</b> Indicates the requested QOS parameters became temporarily unavailable while establishing a connection.</li> <li><b>DL_DISC_UNSPECIFIED</b> Indicates the connection was closed because of an unspecified reason.</li> </ul>
<i>dl_correlation</i>	If the value is nonzero, specifies the correlation number contained in the <b>DL_CONNECT_IND</b> primitive being cancelled. This value permits the DLS user to associate the message with the proper <b>DL_CONNECT_IND</b> primitive. If the disconnect request indicates the release of a connection that is already established, or is indicating the rejection of a previously sent <b>DL_CONNECT_REQ</b> primitive, the value of the <i>dl_correlation</i> parameter is zero.

## States

Valid The primitive is valid in any of the following states:

- **DL\_DATAXFER**
- **DL\_INCON\_PENDING**
- **DL\_OUTCON\_PENDING**
- **DL\_PROV\_RESET\_PENDING**
- **DL\_USER\_RESET\_PENDING**

New The resulting state is **DL\_IDLE**.

## Related Information

The **DL\_CONNECT\_IND** primitive, **DL\_CONNECT\_REQ** primitive.

---

## DL\_DISCONNECT\_REQ Primitive

### Purpose

Requests that an active data link be disconnected.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_reason;
    ulong dl_correlation;
} dl_disconnect_req_t;
```

### Description

The **DL\_DISCONNECT\_REQ** primitive requests the data link service (DLS) provider to disconnect an active data link connection or one that was in the process of activation. The **DL\_DISCONNECT\_REQ** primitive can be sent in response to a previously issued **DL\_CONNECT\_IND** or **DL\_CONNECT\_REQ** primitive. If an incoming **DL\_CONNECT\_IND** primitive is being refused, the correlation number associated with that connect indication must be supplied. The message indicates the reason for the disconnect.

**Note:** This primitive applies to connection mode.

### Parameters

*dl\_primitive* Specifies the **DL\_DISCONNECT\_REQ** primitive.

<i>dl_reason</i>	Indicates one of the following reasons for the disconnect: <b>DL_DISC_NORMAL_CONDITION</b> Indicates normal release of a data link connection. <b>DL_DISC_ABNORMAL_CONDITION</b> Indicates abnormal release of a data link connection. <b>DL_CONREJ_PERMANENT_COND</b> Indicates a permanent condition caused the rejection of a connect request. <b>DL_CONREJ_TRANSIENT_COND</b> Indicates a transient condition caused the rejection of a connect request. <b>DL_DISC_UNSPECIFIED</b> Indicates the connection was closed for an unspecified reason.
<i>dl_correlation</i>	Specifies one of the following values: <b>0</b> Indicates either the disconnect request is releasing an established connection or is cancelling a previously sent <b>DL_CONNECT_REQ</b> primitive. <b>&gt;0</b> Specifies the correlation number that was contained in the <b>DL_CONNECT_IND</b> primitive being rejected. This value permits the DLS provider to associate the primitive with the proper <b>DL_CONNECT_IND</b> primitive when rejecting an incoming connection.

## States

Valid The primitive is valid in any of the following states:

- **DL\_DATAXFER**
- **DL\_INCON\_PENDING**
- **DL\_OUTCON\_PENDING**
- **DL\_PROV\_RESET\_PENDING**
- **DL\_USER\_RESET\_PENDING**

New

- **DL\_DISCON11\_PENDING**

## Acknowledgments

Successful The **DL\_OK\_ACK** primitive is sent to the DLS user resulting in the **DL\_IDLE** state.  
Unsuccessful The **DL\_ERROR\_ACK** primitive is returned, and the resulting state is unchanged.

## Error Codes

**DL\_BADCORR** Indicates the correlation number specified in this primitive does not correspond to a pending connect indication.  
**DL\_OUTSTATE** Indicates the primitive was issued from an invalid state.  
**DL\_SYSERR** Indicates a system error occurred. The system error is indicated in the **DL\_ERROR\_ACK** primitive.

## Related Information

The **DL\_CONNECT\_IND** primitive, **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive, **DL\_CONNECT\_REQ** primitive.

---

## DL\_ENABMULTI\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider enable specific multicast addresses on a per stream basis.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_addr_length;
    ulong dl_addr_offset;
} dl_enabmulti_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_ENABMULTI** primitive requests that the DLS provider enable specific multicast addresses on a per stream basis. It is invalid for a DLS provider to pass upstream messages that are destined for any address other than those explicitly enabled on that stream by the DLS user.

If a duplicate address is requested, the system returns a **DL\_OK\_ACK** primitive, with no operation performed. If the stream is closed, all multicast addresses associated with the stream will be unregistered.

The DLS provider must not run in the interrupt environment. If the DLS provider runs in the interrupt environment, the system returns a **DL\_ERROR\_ACK** primitive with a **DL\_SYSERR** error code and an operating system error code of 0.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_ENABMULTI</b> primitive.
<i>dl_addr_length</i>	Specifies the length of the multicast address.
<i>dl_addr_offset</i>	Indicates where the multicast address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

### States

Valid	The primitive is valid in any state in which a local acknowledgement is not pending, with the exception of the <b>DL_UNATTACH</b> state.
New	The resulting state is unchanged.

### Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_BADADDR</b>	Indicates the data link service access point (DLSAP) address information is invalid or is in an incorrect format.
<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state, or the responding stream was not in a valid state for establishing a connection.
<b>DL_TOOMANY</b>	Indicates the limit has been exceeded for the maximum number of DLSAPs per stream.
<b>DL_SYSERR</b>	Indicates a system error. The <b>DL_ERROR_ACK</b> primitive indicates the error.

## Related Information

The **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive, **DL\_DISABMULTI\_REQ** primitive.

---

## DL\_ERROR\_ACK Primitive

### Purpose

Informs the data link service (DLS) user that a request or response was invalid.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_error_primitive;
    ulong dl_errno;
    ulong dl_unix_errno;
} dl_ok_ack_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_ERROR\_ACK** primitive informs the DLS user that the previously issued request or response was invalid. This primitive identifies the primitive in error, specifies a Data Link Provider Interface (DLPI) error code, and if appropriate, indicates an operating system error code.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_ERROR_ACK</b> primitive.
<i>dl_error_primitive</i>	Identifies the primitive that caused the error.
<i>dl_errno</i>	Specifies the DLPI error code associated with the failure. See the individual request or response for the error codes that are applicable. In addition to those errors: <b>DL_BADPRIM</b> Indicates an unrecognized primitive was issued by the DLS user. <b>DL_NOTSUPPORTED</b> Indicates an unsupported primitive was issued by the DLS user.
<i>dl_unix_errno</i>	Specifies the operating system error code associated with the failure. This value should be nonzero only when the <i>dl_errno</i> parameter is set to <b>DL_SYSERR</b> . It is used to report operating system failures that prevent the processing of a given request or response.



## States

Valid	The primitive is valid in all states that have a pending acknowledgment or confirmation.
New	The resulting state is the same as the one from which the acknowledged request or response was generated.

## Related Information

The `DL_OK_ACK` primitive.

---

## DL\_GET\_STATISTICS\_ACK Primitive

### Purpose

Returns statistics in response to the `DL_GET_STATISTICS_REQ` primitive.

### Structure

The message consists of one `M_PCPROTO` message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_stat_length;
    ulong dl_stat_offset;
} dl_get_statistics_ack_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The `DL_GET_STATISTICS_ACK` primitive returns statistics in response to the `DL_GET_STATISTICS_REQ` primitive.

The `/usr/include/sys/dlpistats.h` file defines the statistics that the `DL_GET_STATISTICS_ACK` and `DL_GET_STATISTICS_REQ` primitives support. The primitives support the statistics both globally (totals for all streams) and per stream. Per stream, or *local*, statistics can be requested only for the stream over which the `DL_GET_STATISTICS_REQ` primitive is requested.

The global and local statistics structures are returned concatenated. The offset in the `M_PCPROTO` message, returned by the `DL_GET_STATISTICS_ACK` primitive, indicates where the two concatenated structures begin. The first statistics structure contains information about the local stream over which the `DL_GET_STATISTICS_REQ` primitive was issued. The second statistics structure contains the global statistics collected and summed for all streams.

The structures for the local statistics are initialized to zero when the stream is opened. The structure for the global statistics is initialized to zero when the `dlpi` kernel extension is loaded. The statistics structures can be reset to zero using the `DL_ZERO_STATS_IOCTL` command. See "IOCTL Specifics" in Data Link Provider Interface Information.

The statistics collected by the DLPI provider are considered vague. There are no locks protecting the counters to prevent write collisions.

### Parameters

`dl_primitive` Specifies the `DL_GET_STATISTICS_ACK` primitive.

*dl\_stat\_length* Specifies the length of the statistics structure.  
*dl\_stat\_offset* Indicates where the statistics information begins. The value of this parameter is the offset from the beginning of the **M\_PCPROTO** block.

## States

Valid The primitive is valid in any attached state in which a local acknowledgement is not pending.  
New The resulting state is unchanged.

## Related Information

The **DL\_GET\_STATISTICS\_REQ** primitive.

"IOCTL Specifics" in Data Link Provider Interface Information.

---

## DL\_GET\_STATISTICS\_REQ

### Purpose

Directs the data link service (DLS) provider to return statistics to the DLS user.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_get_statistics_req_t;
```

The **dl\_get\_statistics\_req\_t** structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_GET\_STATISTICS\_REQ** primitive directs the DLS provider to return statistics.

### Parameters

*dl\_primitive* Specifies the **DL\_GET\_STATISTICS\_REQ** primitive.

## States

Valid The primitive is valid in any attached state in which a local acknowledgment is not pending.  
New The resulting state is unchanged.

## Acknowledgments

Successful The **DL\_GET\_STATISTICS\_ACK** primitive is sent to the DLS user.  
Unsuccessful The **DL\_ERROR\_ACK** primitive is returned to the DLS user.

## Error Codes

<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_SYSERR</b>	Indicates a system error. The <b>DL_ERROR_ACK</b> primitive indicates the error.

## Related Information

The **DL\_GET\_STATISTICS\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_INFO\_ACK Primitive

### Purpose

Returns information about the Data Link Provider Interface (DLPI) stream in response to the **DL\_INFO\_REQ** primitive.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_max_sdu;
    ulong dl_min_sdu;
    ulong dl_addr_length;
    ulong dl_mac_type;
    ulong dl_reserved;
    ulong dl_current_state;
    long dl_sap_length;
    ulong dl_service_mode;
    ulong dl_qos_length;
    ulong dl_qos_offset;
    ulong dl_qos_range_length;
    ulong dl_qos_range_offset;
    ulong dl_provider_style;
    ulong dl_addr_offset;
    ulong dl_version;
    ulong dl_brdcst_addr_length;
    ulong dl_brdcst_addr_offset;
    ulong dl_growth;
} dl_info_ack_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_INFO\_ACK** primitive returns information about the DLPI stream to the data link service (DLS). The **DL\_INFO\_ACK** primitive is a response to the **DL\_INFO\_REQ** primitive.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_INFO_ACK</b> primitive.
<i>dl_max_sdu</i>	Specifies the maximum number of bytes that can be transmitted in a data link service data unit (DLSDU). This value must be a positive integer greater than or equal to the value of the <i>dl_min_sdu</i> parameter.

<i>dl_min_sdu</i>	Specifies the minimum number of bytes that can be transmitted in a DLSDU. The minimum value is 1.
<i>dl_addr_length</i>	Specifies the length, in bytes, of the provider's data link service access point (DLSAP) address. For hierarchical subsequent binds, the length returned is the total length. The total length is the sum of the values for the physical address, service access point (SAP), and subsequent address length.
<i>dl_mac_type</i>	Specifies the type of medium supported by this DLPI stream. Possible values include: <p><b>DL_CSMACD</b> Indicates the medium is carrier sense multiple access with collision detection (ISO 8802/3).</p> <p><b>DL_TPR</b> Indicates the medium is token-passing ring (ISO 8802/5).</p> <p><b>DL_ETHER</b> Indicates the medium is Ethernet bus.</p> <p><b>DL_FDDI</b> Indicates the medium is a Fiber Distributed Data Interface.</p> <p><b>DL_OTHER</b> Indicates any other medium.</p>
<i>dl_reserved</i>	Indicates a reserved field, the value of which must be set to 0.
<i>dl_current_state</i>	Specifies the state of the DLPI interface for the stream the DLS provider issues this acknowledgement.
<i>dl_sap_length</i>	Indicates the current length of the SAP component of the DLSAP address. The specified value must be an integer. The absolute value of the <i>dl_sap_length</i> parameter provides the length of the SAP component within the DLSAP address. The value can be one of the following: <p><b>&gt;0</b>      Indicates the SAP component precedes the physical component within the DLSAP address.</p> <p><b>&lt;0</b>      Indicates the physical component precedes the SAP component within the DLSAP address.</p> <p><b>0</b>        Indicates that no SAP has been bound.</p>
<i>dl_service_mode</i>	Specifies which service modes that the DLS provider supports if the <b>DL_INFO_ACK</b> primitive is returned before the <b>DL_BIND_REQ</b> primitive is processed. This parameter contains a bit-mask specifying the following value: <p><b>DL_CODLS</b> Indicates connection-oriented DLS.</p> <p><b>DL_CLDLS</b> Indicates connectionless DLS.</p> <p>Once a specific service mode has been bound to the stream, this field returns that specific service mode.</p>
<i>dl_qos_length</i>	The DLS provider does not support <i>*_qos_*</i> parameters. This value is set to 0.
<i>dl_qos_offset</i>	The DLS provider does not support <i>*_qos_*</i> parameters. This value is set to 0.
<i>dl_qos_range_length</i>	The DLS provider does not support <i>*_qos_*</i> parameters. This value is set to 0.
<i>dl_qos_range_offset</i>	The DLS provider does not support <i>*_qos_*</i> parameters. This value is set to 0.

<i>dl_provider_style</i>	Specifies the style of the DLS provider associated with the DLPI stream. The following provider class is defined: <b>DL_STYLE2</b> Indicates the DLS user must explicitly attach a PPA to the DLPI stream using the <b>DL_ATTACH_REQ</b> primitive.
<i>dl_addr_offset</i>	Specifies the offset of the address that is bound to the associated stream. If the DLS user issues a <b>DL_INFO_REQ</b> primitive before binding a DLSAP, the value of the <i>dl_addr_length</i> parameter is set to 0.
<i>dl_version</i>	Indicates the version of the supported DLPI.
<i>dl_brdcst_addr_length</i>	Indicates the length of the physical broadcast address.
<i>dl_brdcst_addr_offset</i>	Indicates where the physical broadcast address begins. The value of this parameter is the offset from the beginning of the <b>PCPROTO</b> block.
<i>dl_growth</i>	Specifies a growth field for future use. The value of this parameter is 0.

## States

Valid	The primitive is valid in any state in response to a <b>DL_INFO_REQ</b> primitive.
New	The resulting state is unchanged.

## Related Information

The **DL\_INFO\_REQ** primitive, **DL\_BIND\_REQ** primitive, **DL\_ATTACH\_REQ** primitive.

---

## DL\_INFO\_REQ Primitive

### Purpose

Requests information about the Data Link Provider Interface (DLPI) stream.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_info_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_INFO\_REQ** primitive requests information from the data link service (DLS) provider about the DLPI stream. This information includes a set of provider-specific parameters, as well as the current state of the interface.

### Parameters

<i>dl_primitive</i>	Conveys the <b>DL_INFO_REQ</b> primitive.
---------------------	---

## States

Valid	The primitive is valid in any state in which a local acknowledgment is not pending.
New	The resulting state is unchanged.

## Acknowledgments

The DLS provider responds to the information request with a **DL\_INFO\_ACK** primitive.

## Related Information

The **DL\_INFO\_ACK** primitive.

---

## DL\_OK\_ACK Primitive

### Purpose

Acknowledges that a previously issued primitive was received successfully.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_correct_primitive;
} dl_ok_ack_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_OK\_ACK** primitive acknowledges to the data link service (DLS) user that a previously issued primitive was received successfully. It is only initiated for the primitives listed in the "States" section.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_OK_ACK</b> primitive.
<i>dl_correct_primitive</i>	Identifies the received primitive that is being acknowledged.

### States

Valid The primitive is valid in response to the following primitives:

- **DL\_ATTACH\_REQ**
- **DL\_DETACH\_REQ**
- **DL\_UNBIND\_REQ**
- **DL\_SUBS\_UNBIND\_REQ**
- **DL\_PROMISCON\_REQ**
- **DL\_ENABMULTI\_REQ**
- **DL\_DISABMULTI\_REQ**
- **DL\_PROMISCOFF\_REQ**

New The resulting state depends on the current state and is fully defined in "Allowable Sequence of DLPI Primitives" in your copy of the AT&T DLPI Specifications.

### Related Information

The **DL\_ATTACH\_REQ** primitive, **DL\_DETACH\_REQ** primitive, **DL\_UNBIND\_REQ** primitive, **DL\_SUBS\_UNBIND\_REQ** primitive, **DL\_PROMISCON\_REQ** primitive, **DL\_ENABMULTI\_REQ** primitive, **DL\_DISABMULTI\_REQ** primitive, **DL\_PROMISCOFF\_REQ** primitive.

---

## DL\_PHYS\_ADDR\_ACK Primitive

### Purpose

Returns the value for the physical address to the data link service (DLS) user in response to a **DL\_PHYS\_ADDR\_REQ** primitive.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_addr_length;
    ulong dl_addr_offset;
} dl_phys_addr_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_PHYS\_ADDR\_ACK** primitive returns the value for the physical address to the DLS user in response to a **DL\_PHYS\_ADDR\_REQ** primitive.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_PHYS_ADDR_ACK</b> primitive.
<i>dl_addr_length</i>	Specifies the length of the physical address.
<i>dl_addr_offset</i>	Indicates where the physical address begins. The value of this parameter is the offset from the beginning of the <b>M_PCPROTO</b> block.

### States

Valid	The primitive is valid in any state in response to a <b>DL_PHYS_ADDR_REQ</b> primitive.
New	The resulting state is unchanged.

### Related Information

The **DL\_PHYS\_ADDR\_REQ** primitive.

---

## DL\_PHYS\_ADDR\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider return the current value of the physical address associated with the stream.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
```

```

    ulong dl_primitive;
    ulong dl_addr_type;
} dl_phys_addr_req_t;

```

This structure is defined in `/usr/include/sys/dlpi.h`.

## Description

The **DL\_PHYS\_ADDR\_REQ** primitive requests that the DLS provider return the current value of the physical address associated with the stream.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_PHYS_ADDR_REQ</b> primitive.
<i>dl_addr_type</i>	Specifies the requested address. The value is:
	<b>DL_CURR_PHYS_ADDR</b>
	Current physical address.

## States

Valid	The primitive is valid in any attached state in which a local acknowledgment is not pending. For a <i>style 2</i> DLS provider, this is after a PPA is attached using the <b>DL_ATTACH_REQ</b> provider.
New	The resulting state is unchanged.

## Acknowledgments

Successful	The <b>DL_PHYS_ADDR_ACK</b> primitive is sent to the DLS user.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned to the DLS user.

## Error Codes

<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_UNSUPPORTED</b>	Indicates the requested address type is not supplied by the DLS provider.
<b>DL_SYSERR</b>	Indicates a system error occurred and the provider did not have access to the physical address.

## Related Information

The **DL\_PHYS\_ADDR\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_PROMISCOFF\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider disable promiscuous mode on a per-stream basis, at either the physical level or the service access point (SAP) level.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:



```
typedef struct
{
    ulong dl_primitive;
    ulong dl_level;
} dl_promiscoff_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

## Description

A device in promiscuous mode lets a user view *all* packets, not just those destined for the user.

The **DL\_PROMISCOFF\_REQ** primitive requests that the DLS provider disable promiscuous mode on a per-stream basis, at either the physical level or the SAP level.

If the DLS user disables the promiscuous mode at the physical level, the DLS user no longer receives a copy of every packet on the wire for all SAPs.

If the DLS user disables the promiscuous mode at the SAP level, the DLS user no longer receives a copy of every packet on the wire directed to that user for all SAPs.

If the DLS user disables the promiscuous mode for all multicast addresses, the DLS user no longer receives all packets on the wire that have either a multicast or group destination address. This includes broadcast.

An application issuing the **DL\_PROMISCOFF\_REQ** primitive must have root authority. Otherwise, the DLS provider returns the **DL\_ERROR\_ACK** primitive with an error code of **DL\_ACCESS**.

The DLS provider must not run in the interrupt environment. If it does, the system returns a **DL\_ERROR\_ACK** primitive with an error code of **DL\_SYSERR** and an operating system error code of 0.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_PROMISCOFF_REQ</b> primitive.
<i>dl_level</i>	Indicates promiscuous mode at the physical or SAP level. Possible values include:
	<b>DL_PROMISC_PHYS</b> Indicates promiscuous mode at the physical level.
	<b>DL_PROMISC_SAP</b> Indicates promiscuous mode at the SAP level.
	<b>DL_PROMISC_MULTI</b> Indicates promiscuous mode for all multicast addresses.

## States

Valid	The primitive is valid in any state in which an acknowledgement is not pending, with the exception of <b>DL_UNATTACH</b> .
New	The resulting state is unchanged.

## Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have permission to issue the primitive.
<b>DL_NOTENAB</b>	Indicates the mode is not enabled.
<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_UNSUPPORTED</b>	Indicates the DLS provider does not supply the requested level.

## Related Information

The **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_PROMISCON\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider enable promiscuous mode on a per stream basis, at either the physical level or the service access point (SAP) level.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_level;
} dl_promiscon_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

A device in promiscuous mode lets a user view *all* packets, not just those destined for the user.

The **DL\_PROMISCON\_REQ** primitive requests that the DLS provider enable promiscuous mode on a per-stream basis, either at the physical level or at the SAP level.

The DLS provider routes all received messages on the media to the DLS user until either a **DL\_DETACH\_REQ** or a **DL\_PROMISCOFF\_REQ** primitive is received or the stream is closed.

If the DLS user enables the promiscuous mode at the physical level, the DLS user receives a copy of every packet on the wire for all SAPs.

If the DLS user enables the promiscuous mode at the SAP level, the DLS user receives a copy of every packet on the wire directed to that user for all SAPs.

If the DLS user enables the promiscuous mode for all multicast addresses, the DLS user receives all packets on the wire that have either a multicast or group destination address. This includes broadcast.

If the DLS user issues duplicate requests, the system returns a **DL\_OK\_ACK** primitive and does not perform the operation.

An application issuing the **DL\_PROMISCON\_REQ** primitive must have root authority. Otherwise, the DLS provider returns the **DL\_ERROR\_ACK** primitive with an error code of **DL\_ACCESS**.

The DLS provider must not run in the interrupt environment. If it does, the system returns a **DL\_ERROR\_ACK** primitive with an error code of **DL\_SYSERR** and an operating system error code of 0.

The above code fragment .

The following sample code fragment discards the **DL\_UNITDATA\_IND** header, and will work with **dlpi**:

```
if (raw_mode) {
if (mp->b_datap->db_type == M_PROTO) {
union DL_primitives *p;
p = (union DL_primitives *)mp->b_rptr;
if (p->d1_primitive == DL_UNITDATA_IND) {
mb1k_t *mp1 = mp->b_cont;
freeb(mp);
mp = mp1;
}
}
}
```

For compatibility with future releases, it is recommended that you parse the frame yourself. The MAC and LLC headers are presented in the M\_DATA message for promiscuous mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_PROMISCON_REQ</b> primitive.
<i>dl_level</i>	Indicates promiscuous mode at the physical or SAP level. Possible values include: <b>DL_PROMISC_PHYS</b> Indicates promiscuous mode at the physical level. <b>DL_PROMISC_SAP</b> Indicates promiscuous mode at the SAP level. <b>DL_PROMISC_MULTI</b> Indicates promiscuous mode for all multicast addresses.

## States

Valid	The primitive is valid in any state in which an acknowledgement is not pending, with the exception of <b>DL_UNATTACH</b> .
New	The resulting state is unchanged.

## Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user.
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have permission to issue the primitive.
<b>DL_NOTSUPPORTED</b>	Indicates the primitive is known but not supported by the DLS provider.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.

<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_UNSUPPORTED</b>	Indicates the DLS provider does not support the requested service on this stream.

## Related Information

The **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive, **DL\_DETACH\_REQ** primitive, **DL\_PROMISCOFF\_REQ** primitive.

---

## DL\_RESET\_CON Primitive

### Purpose

Informs the data link service (DLS) user that the reset has been completed.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_reset_con_t;
```

### Description

The **DL\_RESET\_CON** primitive informs the DLS user initiating the reset that the reset has been completed.

**Note:** This primitive applies to connection mode.

### Parameters

*dl\_primitive* Specifies the **DL\_RESET\_CON** primitive.

### States

Valid The primitive is valid in the **DL\_USER\_RESET\_PENDING** state.  
 New The resulting state is **DL\_DATAXFER**.

## Related Information

**DL\_RESET\_IND** Primitive

---

## DL\_RESET\_IND Primitive

### Purpose

Indicates a data link service (DLS) connection has been reset.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_originator;
    ulong dl_reason;
} dl_disconnect_ind_t;
```

## Description

The **DL\_RESET\_IND** primitive informs the DLS user that either the remote DLS user is resynchronizing the data link connection, or the DLS provider is reporting loss of data from which it can not recover. The primitive indicates the reason for the reset.

**Note:** This primitive applies to connection mode.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_RESET_IND</b> primitive.
<i>dl_originator</i>	Specifies whether the reset was originated by the DLS user or DLS provider. The values are <b>DL_USER</b> or <b>DL_PROVIDER</b> , respectively.
<i>dl_reason</i>	Indicates one of the following reasons for the reset: <ul style="list-style-type: none"> <li><b>DL_RESET_FLOW_CONTROL</b> Indicates flow control congestion.</li> <li><b>DL_RESET_LINK_ERROR</b> Indicates the occurrence of a data link error.</li> <li><b>DL_RESET_RESYNCH</b> Indicates a request for resynchronization of a data link connection.</li> </ul>

## States

Valid	The primitive is valid in the <b>DL_DATAXFER</b> state.
New	The resulting state is <b>DL_PROV_RESET_PENDING</b> .

## Acknowledgments

The DLS user should issue a **DL\_RESET\_RES** primitive to continue the resynchronization procedure.

## Related Information

The **DL\_RESET\_RES** primitive.

## DL\_RESET\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider begin resynchronizing a data link connection.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_reset_req_t;
```

## Description

The **DL\_RESET\_REQ** primitive requests that the DLS provider begin resynchronizing a data link connection.

### Notes:

1. No guarantee exists that data in transit when the **DL\_RESET\_REQ** primitive is initiated will be delivered.
2. This primitive applies to connection mode.

## Parameters

*dl\_primitive* Specifies the **DL\_RESET\_REQ** primitive.

## States

Valid The primitive is valid in state **DL\_DATAXFER**.  
New The resulting state is **DL\_USER\_RESET\_PENDING**.

## Acknowledgments

Successful There is no immediate response to the reset request. However, as resynchronization completes, the **DL\_RESET\_CON** primitive is sent to the initiating DLS user, resulting in the **DL\_DATAXFER** state.  
Unsuccessful The **DL\_ERROR\_ACK** primitive is returned and the resulting state is unchanged.

## Error Codes

**DL\_OUTSTATE** Indicates the primitive was issued from an invalid state.  
**DL\_SYSERR** Indicates a system error occurred. The system error is indicated in the **DL\_ERROR\_ACK** primitive.

## Related Information

The **DL\_RESET\_CON** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_RESET\_RES Primitive

### Purpose

Directs the data link service (DLS) provider to complete resynchronizing the data link connection.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_reset_res_t;
```

## Description

The **DL\_RESET\_RES** primitive directs the DLS provider to complete resynchronizing the data link connection.

**Note:** This primitive applies to connection mode.

## Parameters

*dl\_primitive* Specifies the **DL\_RESET\_RES** primitive.

## States

Valid The primitive is valid in the **DL\_PROV\_RESET\_PENDING** state.  
New The resulting state is **DL\_RESET\_RES\_PENDING**.

## Acknowledgments

Successful The **DL\_OK\_ACK** primitive is sent to the DLS user, and the resulting state is **DL\_DATAXFER**.  
Unsuccessful The **DL\_ERROR\_ACK** primitive is returned, and the resulting state is unchanged.

## Error Codes

**DL\_OUTSTATE** Indicates the primitive was issued from an invalid state.  
**DL\_SYSERR** Indicates a system error occurred. The system error is indicated in the **DL\_ERROR\_ACK** primitive.

## Related Information

**DL\_RESET\_IND** Primitive

---

## DL\_SUBS\_BIND\_ACK Primitive

### Purpose

Reports the successful bind of a subsequent data link service access point (DLSAP) to a stream and returns the bound DLSAP address to the data link service (DLS) user.

### Structure

The message consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_subs_sap_length;
    ulong dl_subs_sap_offset;
} dl_subs_bind_ack_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

## Description

The **DL\_SUBS\_BIND\_ACK** primitive reports the successful bind of a subsequent DLSAP to a stream and returns the bound DLSAP address to the DLS user. This primitive is generated in response to a **DL\_BIND\_REQ** primitive.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_SUBS_BIND_ACK</b> primitive.
<i>dl_subs_sap_length</i>	Specifies the length of the specified DLSAP.
<i>dl_subs_sap_offset</i>	Indicates where the DLSAP begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_SUBS_BIND_PND</b> state.
New	The resulting state is <b>DL_IDLE</b> .

## Related Information

The **DL\_SUBS\_BIND\_REQ** primitive.

---

## DL\_SUBS\_BIND\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider bind a subsequent data link service access point (DLSAP) to the stream.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_subs_sap_offset;
    ulong dl_subs_sap_length;
    ulong dl_subs_bind_class;
} dl_subs_bind_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

## Description

The **DL\_SUBS\_BIND\_REQ** primitive requests that the DLS provider bind a subsequent DLSAP to the stream. The DLS user must identify the address of the subsequent DLSAP to be bound to the stream.

The 802.2 networks accept either **DL\_HIERARCHICAL\_BIND** or **DL\_PEER\_BIND**. The *dl\_subs\_sap\_length* parameter must be 5 (sizeof snap) for hierarchical binds, and *dl\_subs\_sap\_offset* must point to a complete SNAP. For peer binds, *dl\_subs\_sap\_length* may be either 1 or 5, and *dl\_subs\_sap\_offset* must point to either a single byte SAP or a complete SNAP (as in hierarchical binds).

In the case of SNAP binds, **DL\_PEER\_BIND** and **DL\_HIERARCHICAL\_BIND** are synonymous, and fully interchangeable.



Several distinct SAPs/SNAPs may be bound on any single stream. Since a DSAP address field is limited to 8 bits, a maximum of 256 SAPs/SNAPS can be bound to a single stream. Closing the stream or issuing **DL\_UNBIND\_REQ** causes all SAPs and SNAPs to be unbound automatically, or each subs sap can be individually unbound.

DL\_ETHER supports only **DL\_PEER\_BIND**, and *dl\_subs\_sap\_offset* must point to an ethertype (*dl\_subs\_sap\_length* == sizeof(ushort)).

## Examples:

Preferred Request	Sap
<b>DL_BIND_REQ</b>	0xaa
<b>DL_SUBS_BIND_REQ/DL_HIERARCHICAL_BIND</b>	08.00.07.80.9b
<b>DL_SUBS_BIND_REQ/DL_HIERARCHICAL_BIND</b>	08.00.07.80.f3

or

Equivalent Effect	Sap
<b>DL_BIND_REQ</b>	0xaa
<b>DL_SUBS_BIND_REQ/DL_PEER_BIND</b>	08.00.07.80.9b
<b>DL_SUBS_BIND_REQ/DL_PEER_BIND</b>	08.00.07.80.f3

or

Equivalent Effect	Sap
<b>DL_BIND_REQ</b>	0xaa
<b>DL_SUBS_BIND_REQ/DL_HIERARCHICAL_BIND</b>	08.00.07.80.9b
<b>DL_SUBS_BIND_REQ/DL_PEER_BIND</b>	08.00.07.80.f3

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_SUBS_BIND_REQ</b> primitive.
<i>dl_subs_sap_length</i>	Specifies the length of the specified DLSAP.
<i>dl_subs_sap_offset</i>	Indicates where the DLSAP begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_subs_bind_class</i>	Specifies either peer or hierarchical addressing. Possible values include: <ul style="list-style-type: none"> <li><b>DL_PEER_BIND</b> Specifies peer addressing. The DLSAP specified is used instead of the DLSAP bound in the bind request.</li> <li><b>DL_HIERARCHICAL_BIND</b> Specifies hierarchical addressing. The DLSAP specified is used in addition to the DLSAP specified using the bind request.</li> </ul>

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> state.
New	The resulting state is <b>DL_SUBS_BIND_PND</b> .

## Acknowledgments

Successful	The <b>DL_SUBS_BIND_ACK</b> primitive is sent to the DLS user, and the resulting state is <b>DL_IDLE</b> .
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_ACCESS</b>	Indicates the DLS user does not have proper permission to use the requested DLSAP address.
<b>DL_BADADDR</b>	Indicates the DLSAP address information is invalid or is in an incorrect format.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_TOOMANY</b>	Indicates the limit has been exceeded for the maximum number of DLSAPs per stream.
<b>DL_UNSUPPORTED</b>	Indicates the DLS provider does not support the requested addressing class.

## Related Information

The **DL\_ERROR\_ACK** primitive, **DL\_SUBS\_BIND\_ACK** primitive.

---

## DL\_SUBS\_UNBIND\_REQ Primitive

### Purpose

Requests that the data link service (DLS) provider unbind the data link service access point (DLSAP) that was bound by a previous **DL\_SUBS\_BIND\_REQ** primitive from this stream.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_subs_sap_length;
    ulong dl_subs_sap_offset;
} dl_subs_unbind_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_SUBS\_UNBIND\_REQ** primitive requests that the DLS provider unbind the DLSAP that was bound by a previous **DL\_SUBS\_BIND\_REQ** primitive from this stream.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_SUBS_UNBIND_REQ</b> primitive.
<i>dl_subs_sap_length</i>	Specifies the length of the specified DLSAP.
<i>dl_subs_sap_offset</i>	Indicates where the DLSAP begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> state.
New	The resulting state is <b>DL_SUBS_UNBIND_PND</b> .

## Acknowledgments

Successful	The <b>DL_OK_ACK</b> primitive is sent to the DLS user. The resulting state is <b>DL_IDLE</b> .
Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned, and the resulting state is unchanged.

## Error Codes

<b>DL_BADADDR</b>	Indicates the DLSAP address information is invalid or is in an incorrect format.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_SYSERR</b>	Indicates a system error occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.

## Related Information

The **DL\_OK\_ACK** primitive, **DL\_ERROR\_ACK** primitive, **DL\_SUBS\_BIND\_REQ** primitive.

---

## DL\_TEST\_CON Primitive

### Purpose

Conveys the test-response data link service data unit (DLSDU) from the data link service (DLS) provider to the DLS user in response to a **DL\_TEST\_REQ** primitive.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_src_addr_length;
    ulong dl_src_addr_offset;
} dl_test_con_t;
```

### Description

The **DL\_TEST\_CON** primitive conveys the test-response DLSDU from the DLS provider to the DLS user in response to a **DL\_TEST\_REQ** primitive.

**Note:** This primitive applies to XID and test operations.

### Parameters

*dl\_primitive* Specifies the **DL\_TEST\_CON** primitive.

<i>dl_flag</i>	Indicates flag values for the request as follows: <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_src_addr_length</i>	Specifies the length of the DLSAP address of the source DLS user.
<i>dl_src_addr_offset</i>	Indicates where the source DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive.

---

## DL\_TEST\_IND Primitive

### Purpose

Conveys the test-response indication data link service data unit (DLSDU) from the data link service (DLS) provider to the DLS user.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_src_addr_length;
    ulong dl_src_addr_offset;
} dl_test_ind_t;
```

### Description

The **DL\_TEST\_IND** primitive conveys the test-response indication DLSDU from the DLS provider to the DLS user.

**Note:** This primitive applies to XID and test operations.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_TEST_IND</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows: <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.

<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_src_addr_length</i>	Specifies the length of the DLSAP address of the source DLS user.
<i>dl_src_addr_offset</i>	Indicates where the source DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive.

---

## DL\_TEST\_REQ Primitive

### Purpose

Conveys one test-command data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider for transmission to a peer DLS provider.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
} dl_test_req_t;
```

### Description

The **DL\_TEST\_REQ** primitive conveys one test-command DLSDU from the DLS user to the DLS provider for transmission to a peer DLS provider.

A **DL\_ERROR\_ACK** primitive is always returned.

**Note:** This primitive applies to XID and test operations.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_TEST_REQ</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows: <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.

<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Acknowledgments

Unsuccessful	The <b>DL_ERROR_ACK</b> primitive is returned for an invalid test-command request.
--------------	--

**Note:** It is recommended that the DLS user use a timeout procedure to recover from a situation when the peer DLS user does not respond.

## Error Code

<b>DL_OUTSTATE</b>	The primitive was issued from an invalid state.
<b>DL_BADADDR</b>	The DLSAP address information was invalid or was in an incorrect format.
<b>DL_BADDATA</b>	The amount of data in the current DLSDU exceeded the DLS provider's DLSDU limit.
<b>DL_SYSERR</b>	A system error has occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.
<b>DL_TESTAUTO</b>	Indicates the previous bind request specified automatic handling of test responses.

## Related Information

The **DL\_BIND\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_TEST\_RES Primitive

### Purpose

Conveys the test-response data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider in response to a **DL\_TEST\_IND** primitive.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
} dl_test_res_t;
```

## Description

The **DL\_TEST\_RES** primitive conveys the test-response DLSDU from the DLS user to the DLS provider in response to a **DL\_TEST\_IND** primitive.

**Note:** This primitive applies to XID and test operations.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_TEST_RES</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows: <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive.

---

## DL\_TOKEN\_ACK Primitive

### Purpose

Specifies the connection-response token assigned to a stream.

### Structure

The primitive consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_token;
} dl_token_req_t;
```

### Description

The **DL\_TOKEN\_ACK** primitive is sent in response to the **DL\_TOKEN\_REQ** primitive. The **DL\_TOKEN\_ACK** primitive specifies the connection-response token assigned to the stream.

**Note:** This primitive applies to connection mode.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_TOKEN_ACK</b> primitive.
---------------------	--

*dl\_token* Specifies the connection-response token associated with a stream. This value must be a nonzero value. After an initial **DL\_TOKEN\_REQ** primitive is issued on a stream, the data link service (DLS) provider generates the same token value for each subsequent **DL\_TOKEN\_REQ** primitive issued on the stream.

The DLS provider generates a token value for each stream upon receipt of the first **DL\_TOKEN\_REQ** primitive issued on that stream. The same token value is returned in response to all subsequent **DL\_TOKEN\_REQ** primitives issued on a stream.

## States

Valid The primitive is valid in any state in response to a **DL\_TOKEN\_REQ** primitive.  
New The resulting state is unchanged.

## Related Information

The **DL\_TOKEN\_REQ** primitive.

---

## DL\_TOKEN\_REQ Primitive

### Purpose

Requests that a connection-response token be assigned to the stream and returned to the data link service (DLS) user.

### Structure

The primitive consists of one **M\_PCPROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_token_req_t;
```

### Description

The **DL\_TOKEN\_REQ** primitive requests that a connection-response token be assigned to the stream and returned to the DLS user. This token can be supplied in the **DL\_CONNECT\_RES** primitive to indicate the stream on which a connection is to be established.

**Note:** This primitive applies to connection mode.

### Parameters

*dl\_primitive* Specifies the **DL\_TOKEN\_REQ** primitive.

## States

Valid The primitive is valid in any state in which a local acknowledgement is not pending.  
New The resulting state is unchanged.

## Acknowledgments

The DLS provider responds to the information request with a **DL\_TOKEN\_ACK** primitive.



## Related Information

The `DL_CONNECT_RES` primitive, `DL_TOKEN_ACK` primitive.

---

## DL\_UDERROR\_IND Primitive

### Purpose

Informs the data link service (DLS) user that a previously sent `DL_UNITDATA_REQ` primitive produced an error or could not be delivered.

### Structure

The message consists of either one `M_PROTO` message block or one `M_PCPROTO` message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_unix_errno;
    ulong dl_errno;
} dl_uderror_ind_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The `DL_UDERROR_IND` primitive informs the DLS user that a previously sent `DL_UNITDATA_REQ` primitive produced an error or could not be delivered. The primitive indicates the destination DLSAP address associated with the failed request, and returns an error value that specifies the reason for failure.

There is, however, no guarantee that such an error report will be generated for all undeliverable data units, because connectionless-mode data transfer is not a confirmed service.

### Parameters

<i>dl_primitive</i>	Specifies the <code>DL_UDERROR_IND</code> primitive.
<i>dl_dest_addr_length</i>	Specifies the length of the DLSAP address of the destination DLS user.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <code>M_PROTO</code> message block.
<i>dl_unix_errno</i>	Specifies the operating system code associated with the failure. This value should be nonzero only when the <i>dl_errno</i> parameter is set to <code>DL_SYSERR</code> . It is used to report operating system failures that prevent the processing of a given request or response.

*dl\_erno*

Indicates the Data Link Provider Interface (DLPI) error code associated with the failure. Possible values include:

**DL\_BADADDR**

Indicates the DLSAP address information is invalid or is in an incorrect format.

**DL\_OUTSTATE**

Indicates the primitive was issued from an invalid state.

**DL\_UNSUPPORTED**

Indicates the DLS provider does not support the requested priority.

**DL\_UNDELIVERABLE**

Indicates the request was valid but for some reason the DLS provider could not deliver the data unit (for example, due to lack of sufficient local buffering to store the data unit).

## States

Valid      The primitive is valid in the **DL\_IDLE** state.  
New        The resulting state is unchanged.

## Related Information

The **DL\_UNITDATA\_REQ** primitive.

---

## DL\_UNBIND\_REQ Primitive

### Purpose

Requests the data link service (DLS) provider to unbind a data link service access point (DLSAP).

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure:

```
typedef struct
{
    ulong dl_primitive;
} dl_unbind_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_UNBIND\_REQ** primitive requests that the DLS provider unbind the DLSAP that had been bound by a previous **DL\_BIND\_REQ** primitive. If one or more DLSAPs were bound to the stream with a **DL\_SUBS\_BIND\_REQ** primitive and have not been unbound with a **DL\_SUBS\_UNBIND\_REQ** primitive, the **DL\_UNBIND\_REQ** primitive unbinds all the subsequent DLSAPs for that stream along with the DLSAP bound with the previous **DL\_BIND\_REQ** primitive.

At the successful completion of the request, the DLS user can issue a new **DL\_BIND\_REQ** primitive for a potentially new DLSAP.

### Parameters

*dl\_primitive*                      Specifies the **DL\_UNBIND\_REQ** primitive.

## States

Valid      The primitive is valid in the **DL\_IDLE** state.  
New        The resulting state is **DL\_UNBIND\_PENDING**.

## Acknowledgments

Successful            The **DL\_OK\_ACK** primitive is sent to the DLS user, and the resulting state is **DL\_UNBOUND**.  
Unsuccessful          The **DL\_ERROR\_ACK** primitive is returned, and the resulting state is unchanged.

## Error Codes

**DL\_OUTSTATE**        Indicates the primitive was issued from an invalid state.  
**DL\_SYSERR**          Indicates a system error occurred. The system error is indicated in the **DL\_ERROR\_ACK** primitive.

## Related Information

The **DL\_BIND\_REQ** primitive, **DL\_ERROR\_ACK** primitive, **DL\_OK\_ACK** primitive, **DL\_SUBS\_BIND\_REQ** primitive, **DL\_SUBS\_UNBIND\_REQ** primitive.

---

## DL\_UNITDATA\_IND Primitive

### Purpose

Conveys one data link service data unit (DLSDU) from the data link service (DLS) provider to the DLS user.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure, followed by one or more **M\_DATA** blocks containing at least one byte of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_src_addr_length;
    ulong dl_src_addr_offset;
    ulong dl_group_address;
} dl_unitdata_ind_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

### Description

The **DL\_UNITDATA\_IND** primitive conveys one DLSDU from the DLS provider to the DLS user.

**Note:** The amount of user data that may be transferred in a single DLSDU is limited. This limit is conveyed by the *dl\_max\_sdu* parameter of the **DL\_INFO\_ACK** primitive.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_UNITDATA_IND</b> primitive.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), the full DLSAP address is returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_src_addr_length</i>	Specifies the length of the DLSAP address of the source DLS user.
<i>dl_src_addr_offset</i>	Indicates where the source DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_group_address</i>	Indicates the address set by the DLS provider upon receiving and passing upstream a data message when the destination address of the data message is a multicast or broadcast address.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_INFO\_ACK** primitive, **DL\_BIND\_ACK** primitive, **DL\_UDERROR\_IND** primitive.

---

## DL\_UNITDATA\_REQ Primitive

### Purpose

Conveys one data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider for transmission to a peer DLS user.

### Structure

The message consists of one **M\_PROTO** message block, which contains the following structure, followed by one or more **M\_DATA** blocks containing at least one byte of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    dl_priority_t dl_priority;
} dl_unitdata_req_t;
```

This structure is defined in `/usr/include/sys/dlpi.h`.

### Description

The **DL\_UNITDATA\_REQ** primitive conveys one DLSDU from the DLS user to the DLS provider for transmission to a peer DLS user.

The amount of user data that may be transferred in a single DLSDU is limited. This limit is conveyed by the *dl\_max\_sdu* parameter of the **DL\_INFO\_ACK** primitive.

Because connectionless-mode data transfer is an unacknowledged service, the DLS provider makes no guarantees of delivery of connectionless DLSDUs. It is the responsibility of the DLS user to do any necessary sequencing or retransmissions of DLSDUs in the event of a presumed loss.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_UNITDATA_REQ</b> primitive.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), the full DLSAP address is returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_priority</i>	Indicates the priority value within the supported range for this particular DLSDU.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> state.
New	The resulting state is unchanged.

## Acknowledgments

If the DLS provider accepts the data for transmission, there is no response. This does not, however, guarantee that the data will be delivered to the destination DLS user, because the connectionless-mode data transfer is not a confirmed service.

If the request is erroneous, the **DL\_UDERROR\_IND** primitive is returned, and the resulting state is unchanged.

If for some reason the request cannot be processed, the DLS provider may generate a **DL\_UDERROR\_IND** primitive to report the problem. There is, however, no guarantee that such an error report will be generated for all undeliverable data units, because connectionless-mode data transfer is not a confirmed service.

## Error Codes

<b>DL_BADADDR</b>	Indicates the DLSAP address information is invalid or is in an incorrect format.
<b>DL_BADDATA</b>	Indicates the amount of data in the current DLSDU exceeds the DLS provider's DLSDU limit.
<b>DL_OUTSTATE</b>	Indicates the primitive was issued from an invalid state.
<b>DL_UNSUPPORTED</b>	Indicates the DLS provider does not support the requested priority.

## Related Information

The **DL\_INFO\_ACK** primitive, **DL\_BIND\_ACK** primitive, **DL\_UDERROR\_IND** primitive.

---

## DL\_XID\_CON Primitive

### Purpose

Conveys an XID data link service data unit (DLSDU) from the data link service (DLS) provider to the DLS user in response to a **DL\_XID\_REQ** primitive.

## Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_src_addr_length;
    ulong dl_src_addr_offset;
} dl_xid_con_t;
```

## Description

The **DL\_XID\_CON** conveys an XID DLSDU from the DLS provider to the DLS user in response to a **DL\_XID\_REQ** primitive.

**Note:** This primitive applies to XID and test operations.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_XID_CON</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows:  <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_src_addr_length</i>	Specifies the length of the DLSAP address of the source DLS user.
<i>dl_src_addr_offset</i>	Indicates where the source DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive, **DL\_XID\_REQ** primitive.

---

## DL\_XID\_IND Primitive

### Purpose

Conveys an XID data link service data unit (DLSDU) from the DLS provider to the data link service (DLS) user.

## Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
    ulong dl_src_addr_length;
    ulong dl_src_addr_offset;
} dl_xid_ind_t;
```

## Description

The **DL\_XID\_IND** primitive conveys an XID DLSDU from the DLS provider to the DLS user.

**Note:** This primitive applies to XID and test operations.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_XID_IND</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows:  <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.
<i>dl_src_addr_length</i>	Specifies the length of the DLSAP address of the source DLS user.
<i>dl_src_addr_offset</i>	Indicates where the source DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive.

---

## DL\_XID\_REQ Primitive

### Purpose

Conveys one XID data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider for transmission to a peer DLS user.

## Structure

The message consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
} dl_xid_req_t;
```

This structure is defined in **/usr/include/sys/dlpi.h**.

## Description

Conveys one XID DLSDU from the DLS user to the DLS provider for transmission to a peer DLS user.

A **DL\_ERROR\_ACK** primitive is always returned.

**Note:** This primitive applies to XID and test operations.

## Parameters

<i>dl_primitive</i>	Specifies the <b>DL_XID_REQ</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows:  <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

## States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Acknowledgments

Unsuccessful           The **DL\_ERROR\_ACK** primitive is returned for an invalid XID request.

**Note:** It is recommended that the DLS user use a timeout procedure to recover from a situation when there is no response from the peer DLS User.

## Error Codes

<b>DL_OUTSTATE</b>	The primitive was issued from an invalid state.
<b>DL_BADADDR</b>	The DLSAP address information was invalid or was in an incorrect format.
<b>DL_BADDATA</b>	The amount of data in the current DLSDU exceeded the DLS provider's DLSDU limit.
<b>DL_SYSERR</b>	A system error has occurred. The system error is indicated in the <b>DL_ERROR_ACK</b> primitive.



**DL\_XIDAUTO** Indicates the previous bind request specified that the provider would handle XID.

## Related Information

The **DL\_BIND\_ACK** primitive, **DL\_ERROR\_ACK** primitive.

---

## DL\_XID\_RES Primitive

### Purpose

Conveys an XID data link service data unit (DLSDU) from the data link service (DLS) user to the DLS provider in response to a **DL\_XID\_IND** primitive.

### Structure

The primitive consists of one **M\_PROTO** message block, which contains the following structure, followed by zero or more **M\_DATA** blocks containing zero or more bytes of data:

```
typedef struct
{
    ulong dl_primitive;
    ulong dl_flag;
    ulong dl_dest_addr_length;
    ulong dl_dest_addr_offset;
} dl_xid_res_t;
```

### Description

The **DL\_XID\_RES** primitive conveys an XID DLSDU from the DLS user to the DLS provider in response to a **DL\_XID\_IND** primitive.

**Note:** This primitive applies to XID and test operations.

### Parameters

<i>dl_primitive</i>	Specifies the <b>DL_XID_RES</b> primitive.
<i>dl_flag</i>	Indicates flag values for the request as follows: <b>DL_POLL_FINAL</b> Indicates whether the poll/final bit is set.
<i>dl_dest_addr_length</i>	Specifies the length of the data link service access point (DLSAP) address of the destination DLS user. If the destination user is implemented using the Data Link Provider Interface (DLPI), this address is the full DLSAP address returned on the <b>DL_BIND_ACK</b> primitive.
<i>dl_dest_addr_offset</i>	Indicates where the destination DLSAP address begins. The value of this parameter is the offset from the beginning of the <b>M_PROTO</b> message block.

### States

Valid	The primitive is valid in the <b>DL_IDLE</b> or <b>DL_DATAXFER</b> state.
New	The resulting state is unchanged.

## Related Information

The **DL\_BIND\_ACK** primitive.



---

## Chapter 3. eXternal Data Representation

---

### xdr\_accepted\_reply Subroutine

#### Purpose

Encodes RPC reply messages.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
int xdr_accepted_reply ( xdrs, ar)
XDR *xdrs;
struct accepted_reply *ar;
```

#### Description

The **xdr\_accepted\_reply** subroutine encodes Remote Procedure Call (RPC) reply messages. The routine generates message replies similar to RPC message replies without using the RPC program.

#### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*ar* Specifies the address of the structure that contains the RPC reply.

#### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

#### Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

### xdr\_array Subroutine

#### Purpose

Translates between variable-length arrays and their corresponding external representations.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_array (xdrs, arrp, sizep, maxsize, elsize, elproc)
XDR * xdrs;
char ** arrp;
u_int * sizep;
```

```
u_int maxsize;
u_int elsize;
xdrproc_t elproc;
```

## Description

The **xdr\_array** subroutine is a filter primitive that translates between variable-length arrays and their corresponding external representations. This subroutine is called to encode or decode each element of the array.

## Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>arrp</i>	Specifies the address of the pointer to the array. If the <i>arrp</i> parameter is null when the array is being deserialized, the XDR program allocates an array of the appropriate size and sets the parameter to that array.
<i>sizep</i>	Specifies the address of the element count of the array. The element count cannot exceed the value for the <i>maxsize</i> parameter.
<i>maxsize</i>	Specifies the maximum number of array elements.
<i>elsize</i>	Specifies the byte size of each of the array elements.
<i>elproc</i>	Translates between the C form of the array elements and their external representations. This parameter is an XDR filter.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_bool Subroutine

### Purpose

Translates between Booleans and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_bool ( xdrs, bp)
XDR *xdrs;
bool_t *bp;
```

### Description

The **xdr\_bool** subroutine is a filter primitive that translates between Booleans (C integers) and their external representations. When encoding data, this filter produces values of either 1 or 0.

### Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
-------------	---

*bp* Specifies the address of the Boolean data.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_bytes Subroutine

### Purpose

Translates between internal counted byte arrays and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_bytes ( xdrs, sp, sizep, maxsize)  
XDR *xdrs;  
char **sp;  
u_int *sizep;  
u_int maxsize;
```

### Description

The **xdr\_bytes** subroutine is a filter primitive that translates between counted byte arrays and their external representations. This subroutine treats a subset of generic arrays, in which the size of array elements is known to be 1 and the external description of each element is built-in. The length of the byte array is explicitly located in an unsigned integer. The byte sequence is not terminated by a null character. The external representation of the bytes is the same as their internal representation.

### Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>sp</i>	Specifies the address of the pointer to the byte array.
<i>sizep</i>	Points to the length of the byte area. The value of this parameter cannot exceed the value of the <i>maxsize</i> parameter.
<i>maxsize</i>	Specifies the maximum number of bytes allowed when XDR encodes or decodes messages.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

### Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_callhdr Subroutine

### Purpose

Describes RPC call header messages.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_callhdr ( xdrs,  chdr)  
XDR *xdrs;  
struct rpc_msg *chdr;
```

### Description

The **xdr\_callhdr** subroutine describes Remote Procedure Call (RPC) call header messages. This subroutine generates call headers that are similar to RPC call headers without using the RPC program.

### Parameters

*xdrs*     Points to the eXternal Data Representation (XDR) stream handle.  
*chdr*     Points to the structure that contains the header for the call message.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

### Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_callmsg Subroutine

### Purpose

Describes RPC call messages.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_callmsg ( xdrs,  cmsg)  
XDR *xdrs;  
struct rpc_msg *cmsg;
```

### Description

The **xdr\_callmsg** subroutine describes Remote Procedure Call (RPC) call messages. This subroutine generates messages similar to RPC messages without using the RPC program.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*cmmsg* Points to the structure that contains the text of the call message.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_char Subroutine

### Purpose

Translates between C language characters and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_char ( xdrs, cp)  
XDR *xdrs;  
char *cp;
```

### Description

The **xdr\_char** subroutine is a filter primitive that translates between C language characters and their external representations.

**Note:** Encoded characters are not packed and occupy 4 bytes each. For arrays of characters, the programmer should consider using the **xdr\_bytes**, **xdr\_opaque**, or **xdr\_string** routine.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*cp* Points to the character.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_destroy Macro

### Purpose

Destroys the XDR stream pointed to by the *xdrs* parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
void xdr_destroy ( xdrs)  
XDR *xdrs;
```

### Description

The **xdr\_destroy** macro invokes the destroy routine associated with the eXternal Data Representation (XDR) stream pointed to by the *xdrs* parameter and frees the private data structures allocated to the stream. The use of the XDR stream handle is undefined after it is destroyed.

### Parameters

*xdrs*      Points to the XDR stream handle.

### Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_enum Subroutine

### Purpose

Translates between a C language enumeration (enum) and its external representation.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_enum ( xdrs, ep)  
XDR *xdrs;  
enum_t *ep;
```

### Description

The **xdr\_enum** subroutine is a filter primitive that translates between a C language enumeration (enum) and its external representation.

### Parameters

*xdrs*      Points to the eXternal Data Representation (XDR) stream handle.



*ep* Specifies the address of the enumeration data.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_float Subroutine

### Purpose

Translates between C language floats and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_float ( xdrs, fp)  
XDR *xdrs;  
float *fp;
```

### Description

The **xdr\_float** subroutine is a filter primitive that translates between C language floats (normalized single-precision floating-point numbers) and their external representations.

### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*fp* Specifies the address of the float.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_free Subroutine

### Purpose

Deallocates, or frees, memory.

### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/xdr.h>
```

```
void xdr_free ( proc, objp)  
xdrproc_t proc;  
char *objp;
```

## Description

The **xdr\_free** subroutine is a generic freeing routine that deallocates memory. The *proc* parameter specifies the eXternal Data Representation (XDR) routine for the object being freed. The *objp* parameter is a pointer to the object itself.

**Note:** The pointer passed to this routine is *not* freed, but the object it points to *is* freed (recursively).

## Parameters

*proc*      Points to the XDR stream handle.  
*objp*      Points to the object being freed.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_getpos Macro

### Purpose

Returns an unsigned integer that describes the current position in the data stream.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
u_int xdr_getpos ( xdrs)  
XDR *xdrs;
```

### Description

The **xdr\_getpos** macro invokes the get-position routine associated with the eXternal Data Representation (XDR) stream pointed to by the *xdrs* parameter. This routine returns an unsigned integer that describes the current position in the data stream.

### Parameters

*xdrs*      Points to the XDR stream handle.

### Return Values

This macro returns an unsigned integer describing the current position in the stream. In some XDR streams, it returns a value of -1, even though the value has no meaning.

## Related Information

The `xdr_setpos` macro.

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_inline Macro

### Purpose

Returns a pointer to the buffer of a stream pointed to by the `xdrs` parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
long *x_inline ( xdrs, len)
XDR *xdrs;
int len;
```

### Description

The `xdr_inline` macro invokes the inline subroutine associated with the eXternal Data Representation (XDR) stream pointed to by the `xdrs` parameter. The subroutine returns a pointer to a contiguous piece of the stream's buffer, whose size is specified by the `len` parameter. The buffer can be used for any purpose, but it is not data-portable. The `xdr_inline` macro may return a value of null if it cannot return a buffer segment of the requested size.

### Parameters

`xdrs` Points to the XDR stream handle.  
`len` Specifies the size, in bytes, of the internal buffer.

### Return Values

This macro returns a pointer to a piece of the stream's buffer.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_int Subroutine

### Purpose

Translates between C language integers and their external representations.

### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/xdr.h>
```

```
xdr_int ( xdrs, ip)
XDR *xdrs;
int *ip;
```

## Description

The **xdr\_int** subroutine is a filter primitive that translates between C language integers and their external representations.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*ip* Specifies the address of the integer.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_long Subroutine

### Purpose

Translates between C language long integers and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_long
( xdrs, lp)
XDR *xdrs;
long *lp;
```

### Description

The **xdr\_long** filter primitive translates between C language long integers and their external representations. This primitive is characteristic of most eXternal Data Representation (XDR) library primitives and all client XDR routines.

### Parameters

*xdrs* Points to the XDR stream handle. This parameter can be treated as an opaque handler and passed to the primitive routines.  
*lp* Specifies the address of the number.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

When in 64 BIT mode, if the value of the long integer can not be expressed in 32 BIT, **xdr\_long** will return a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_opaque Subroutine

### Purpose

Translates between fixed-size opaque data and its external representation.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_opaque ( xdrs, cp, cnt)
XDR *xdrs;
char *cp;
u_int cnt;
```

### Description

The **xdr\_opaque** subroutine is a filter primitive that translates between fixed-size opaque data and its external representation.

### Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>cp</i>	Specifies the address of the opaque object.
<i>cnt</i>	Specifies the size, in bytes, of the object. By definition, the actual data contained in the opaque object is not machine-portable.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_opaque\_auth Subroutine

### Purpose

Describes RPC authentication messages.

## Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/rpc.h>
```

```
xdr_opaque_auth ( xdrs, ap)  
XDR *xdrs;  
struct opaque_auth *ap;
```

## Description

The **xdr\_opaque\_auth** subroutine describes Remote Procedure Call (RPC) authentication information messages. It generates RPC authentication message data without using the RPC program.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*ap* Points to the structure that contains the authentication information.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_pmap Subroutine

### Purpose

Describes parameters for **portmap** procedures.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_pmap ( xdrs, regs)  
XDR *xdrs;  
struct pmap *regs;
```

### Description

The **xdr\_pmap** subroutine describes parameters for **portmap** procedures. This subroutine generates **portmap** parameters without using the **portmap** interface.

### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*regs* Points to the buffer or register where the **portmap** daemon stores information.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **portmap** daemon.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_pmaplist Subroutine

### Purpose

Describes a list of port mappings externally.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_pmaplist ( xdrs, rp)  
XDR *xdrs;  
struct pmaplist **rp;
```

### Description

The **xdr\_pmaplist** subroutine describes a list of port mappings externally. This subroutine generates the port mappings to Remote Procedure Call (RPC) ports without using the **portmap** interface.

### Parameters

*xdrs*     Points to the eXternal Data Representation (XDR) stream handle.  
*rp*        Points to the structure that contains the **portmap** listings.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **portmap** daemon.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_pointer Subroutine

### Purpose

Provides pointer chasing within structures and serializes null pointers.

### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/xdr.h>
```

```
xdr_pointer (xdrs, objpp, objsize, xdrobj)  
XDR * xdrs;  
char ** objpp;  
u_int objsize;  
xdrproc_t xdrobj;
```

## Description

The **xdr\_pointer** subroutine provides pointer chasing within structures and serializes null pointers. This subroutine can represent recursive data structures, such as binary trees or linked lists.

## Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>objpp</i>	Points to the character pointer of the data structure.
<i>objsize</i>	Specifies the size of the structure.
<i>xdrobj</i>	Specifies the XDR filter for the object.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_reference Subroutine

### Purpose

Provides pointer chasing within structures.

### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/xdr.h>
```

```
xdr_reference ( xdrs, pp, size, proc)  
XDR *xdrs;  
char **pp;  
u_int size;  
xdrproc_t proc;
```

## Description

The **xdr\_reference** subroutine is a filter primitive that provides pointer chasing within structures. This primitive allows the serializing, deserializing, and freeing of any pointers within one structure that are referenced by another structure.



The **xdr\_reference** subroutine does not attach special meaning to a null pointer during serialization. Attempting to pass the address of a null pointer can cause a memory error. The programmer must describe data with a two-armed discriminated union. One arm is used when the pointer is valid; the other arm, when the pointer is null.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*pp* Specifies the address of the pointer to the structure. When decoding data, XDR allocates storage if the pointer is null.  
*size* Specifies the byte size of the structure pointed to by the *pp* parameter.  
*proc* Translates the structure between its C form and its external representation. This parameter is the XDR procedure that describes the structure.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_rejected\_reply Subroutine

### Purpose

Describes RPC message rejection replies.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_rejected_reply ( xdrs, rr)  
XDR *xdrs;  
struct rejected_reply *rr;
```

### Description

The **xdr\_rejected\_reply** subroutine describes Remote Procedure Call (RPC) message rejection replies. This subroutine can be used to generate rejection replies similar to RPC rejection replies without using the RPC program.

### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*rr* Points to the structure that contains the rejected reply.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_replymsg Subroutine

### Purpose

Describes RPC message replies.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_replymsg ( xdrs,  rmsg)  
XDR *xdrs;  
struct rpc_msg *rmsg;
```

### Description

The **xdr\_replymsg** subroutine describes Remote Procedure Call (RPC) message replies. Use this subroutine to generate message replies similar to RPC message replies without using the RPC program.

### Parameters

*xdrs*     Points to the eXternal Data Representation (XDR) stream handle.  
*rmsg*     Points to the structure containing the parameters of the reply message.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_setpos Macro

### Purpose

Changes the current position in the XDR stream.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_setpos ( xdrs,  pos)  
XDR *xdrs;  
u_int pos;
```

## Description

The **xdr\_setpos** macro invokes the set-position routine associated with the eXternal Data Representation (XDR) stream pointed to by the *xdrs* parameter. The new position setting is obtained from the **xdr\_getpos** macro. The **xdr\_setpos** macro returns a value of false if the set position is not valid or if the requested position is out of bounds.

A position cannot be set in some XDR streams. Trying to set a position in such streams causes the macro to fail. This macro also fails if the programmer requests a position that is not in the stream's boundaries.

## Parameters

*xdrs*     Points to the XDR stream handle.  
*pos*     Specifies a position value obtained from the **xdr\_getpos** macro.

## Return Values

Upon successful completion (if the stream is positioned successfully), this macro returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **xdr\_getpos** macro.

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Non-Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_short Subroutine

### Purpose

Translates between C language short integers and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
xdr_short ( xdrs, sp)
XDR *xdrs;
short *sp;
```

### Description

The **xdr\_short** subroutine is a filter primitive that translates between C language short integers and their external representations.

### Parameters

*xdrs*     Points to the eXternal Data Representation (XDR) stream handle.  
*sp*     Specifies the address of the short integer.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_string Subroutine

### Purpose

Translates between C language strings and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_string ( xdrs, sp, maxsize)  
XDR *xdrs;  
char **sp;  
u_int maxsize;
```

### Description

The **xdr\_string** subroutine is a filter primitive that translates between C language strings and their corresponding external representations. Externally, strings are represented as sequences of ASCII characters, while internally, they are represented with character pointers.

### Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>sp</i>	Specifies the address of the pointer to the string.
<i>maxsize</i>	Specifies the maximum length of the string allowed during encoding or decoding. This value is set in a protocol. For example, if a protocol specifies that a file name cannot be longer than 255 characters, then a string cannot exceed 255 characters.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_u\_char Subroutine

### Purpose

Translates between unsigned C language characters and their external representations.

### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/xdr.h>
```

```
xdr_u_char ( xdrs, ucp)  
XDR *xdrs;  
char *ucp;
```

## Description

The `xdr_u_char` subroutine is a filter primitive that translates between unsigned C language characters and their external representations.

## Parameters

`xdrs` Points to the eXternal Data Representation (XDR) stream handle.  
`ucp` Points to an unsigned integer.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_u\_int Subroutine

### Purpose

Translates between C language unsigned integers and their external representations.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_u_int ( xdrs, up)  
XDR *xdrs;  
u_int *up;
```

### Description

The `xdr_u_int` subroutine is a filter primitive that translates between C language unsigned integers and their external representations.

### Parameters

`xdrs` Points to the eXternal Data Representation (XDR) stream handle.  
`up` Specifies the address of the unsigned long integer.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_u\_long Subroutine

### Purpose

Translates between C language unsigned long integers and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_u_long ( xdrs, ulp)  
XDR *xdrs;  
u_long *ulp;
```

### Description

The **xdr\_u\_long** subroutine is a filter primitive that translates between C language unsigned long integers and their external representations.

### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*ulp* Specifies the address of the unsigned long integer.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_u\_short Subroutine

### Purpose

Translates between C language unsigned short integers and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_u_short ( xdrs, usp)  
XDR *xdrs;  
u_short *usp;
```

## Description

The **xdr\_u\_short** subroutine is a filter primitive that translates between C language unsigned short integers and their external representations.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*usp* Specifies the address of the unsigned short integer.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_union Subroutine

### Purpose

Translates between discriminated unions and their external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_union (xdrs, dscmp, unp, armchoices, defaultarm)  
XDR * xdrs;  
enum_t * dscmp;  
char * unp;  
struct xdr_discrim * armchoices;  
xdrproc_t (* defaultarm);
```

### Description

The **xdr\_union** subroutine is a filter primitive that translates between discriminated C unions and their corresponding external representations. It first translates the discriminant of the union located at the address pointed to by the *dscmp* parameter. This discriminant is always an **enum\_t** value. Next, this subroutine translates the union located at the address pointed to by the *unp* parameter.

The *armchoices* parameter is a pointer to an array of **xdr\_discrim** structures. Each structure contains an ordered pair of parameters [*value*, *proc*]. If the union's discriminant is equal to the associated value, then the specified process is called to translate the union. The end of the **xdr\_discrim** structure array is denoted by a routine having a null value. If the discriminant is not found in the choices array, then the *defaultarm* structure is called (if it is not null).

### Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*dscmp* Specifies the address of the union's discriminant. The discriminant is an enumeration (**enum\_t**) value.

<i>unp</i>	Specifies the address of the union.
<i>armchoices</i>	Points to an array of <b>xdr_discrim</b> structures.
<i>defaultarm</i>	A structure provided in case no discriminants are found. This parameter can have a null value.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_vector Subroutine

### Purpose

Translates between fixed-length arrays and their corresponding external representations.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdr_vector (xdrs, arrp, size, elsize, elproc)
XDR * xdrs;
char * arrp;
u_int size, elsize;
xdrproc_t elproc;
```

### Description

The **xdr\_vector** subroutine is a filter primitive that translates between fixed-length arrays and their corresponding external representations.

### Parameters

<i>xdrs</i>	Points to the eXternal Data Representation (XDR) stream handle.
<i>arrp</i>	Specifies the pointer to the array.
<i>size</i>	Specifies the element count of the array.
<i>elsize</i>	Specifies the size of each of the array elements.
<i>elproc</i>	Translates between the C form of the array elements and their external representation. This is an XDR filter.

### Return Values

Upon successful completion, this routine returns a value of 1. If unsuccessful, it returns a value of 0.

### Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.



---

## xdr\_void Subroutine

### Purpose

Supplies an XDR subroutine to the RPC system without transmitting data.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
xdr_void ()
```

### Description

The **xdr\_void** subroutine has no function parameters. It is passed to other Remote Procedure Call (RPC) subroutines that require a function parameter, but does not transmit data.

### Return Values

This subroutine always returns a value of 1.

### Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdr\_wrapstring Subroutine

### Purpose

Calls the **xdr\_string** subroutine.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>

xdr_wrapstring ( xdrs, sp)
XDR *xdrs;
char **sp;
```

### Description

The **xdr\_wrapstring** subroutine is a primitive that calls the **xdr\_string** subroutine (*xdrs*, *sp*, *MAXUN.UNSIGNED*), where the *MAXUN.UNSIGNED* value is the maximum value of an unsigned integer. The **xdr\_wrapstring** subroutine is useful because the Remote Procedure Call (RPC) package passes a maximum of two eXternal Data Representation (XDR) subroutines as parameters, and the **xdr\_string** subroutine requires three.

### Parameters

*xdrs*     Points to the XDR stream handle.  
*sp*       Specifies the address of the pointer to the string.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The `xdr_string` subroutine.

eXternal Data Representation (XDR) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

Understanding XDR Library Filter Primitives in *AIX® Version 6.1 Communications Programming Concepts*.

---

## `xdr_authunix_parms` Subroutine

### Purpose

Describes UNIX-style credentials.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpc/rpc.h>
```

```
xdr_authunix_parms ( xdrs, app)
```

```
XDR *xdrs;
```

```
struct authunix_parms *app;
```

### Description

The `xdr_authunix_parms` subroutine describes UNIX-style credentials. This subroutine generates credentials without using the Remote Procedure Call (RPC) authentication program.

### Parameters

`xdrs` Points to the eXternal Data Representation (XDR) stream handle.

`app` Points to the structure that contains the UNIX-style authentication credentials.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## `xdr_double` Subroutine

### Purpose

Translates between C language double-precision numbers and their external representations.

### Library

C Library (`libc.a`)

## Syntax

```
#include <rpc/xdr.h>
```

```
xdr_double ( xdrs, dp)
XDR *xdrs;
double *dp;
```

## Description

The **xdr\_double** subroutine is a filter primitive that translates between C language double-precision numbers and their external representations.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.  
*dp* Specifies the address of the double-precision number.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Understanding XDR Library Filter Primitives in *AIX Version 6.1 Communications Programming Concepts*.

---

## xdrmem\_create Subroutine

### Purpose

Initializes in local memory the XDR stream pointed to by the *xdrs* parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
void
xdrmem_create ( xdrs, addr, size, op)
XDR *xdrs;
char *addr;
u_int size;
enum xdr_op op;
```

### Description

The **xdrmem\_create** subroutine initializes in local memory the eXternal Data Representation (XDR) stream pointed to by the *xdrs* parameter. The XDR stream data is written to or read from a chunk of memory at the location specified by the *addr* parameter.

### Parameters

*xdrs* Points to the XDR stream handle.  
*addr* Points to the memory where the XDR stream data is written to or read from.  
*size* Specifies the length of the memory in bytes.

*op* Specifies the XDR direction. The possible choices are **XDR\_ENCODE**, **XDR\_DECODE**, or **XDR\_FREE**.

## Related Information

eXternal Data Representation (XDR) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

Understanding XDR Non-Filter Primitives in *AIX® Version 6.1 Communications Programming Concepts*.

---

## xdrrec\_create Subroutine

### Purpose

Provides an XDR stream that can contain long sequences of records.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
void
```

```
xdrrec_create (xdrs, sendsize, recvsize, handle, readit, writeit)
```

```
XDR * xdrs;
```

```
u_int sendsize;
```

```
u_int recvsize;
```

```
char * handle;
```

```
int (* readit) (), (* writeit) ();
```

### Description

The **xdrrec\_create** subroutine provides an eXternal Data Representation (XDR) stream that can contain long sequences of records and handle them in both the encoding and decoding directions. The record contents contain data in XDR form. The routine initializes the XDR stream object pointed to by the *xdrs* parameter.

**Note:** This XDR stream implements an intermediate record stream. As a result, additional bytes are in the stream to provide record boundary information.

### Parameters

*xdrs* Points to the XDR stream handle.

*sendsize* Sets the size of the input buffer to which data is written. If 0 is specified, the buffers are set to the system defaults.

*recvsize* Sets the size of the output buffer from which data is read. If 0 is specified, the buffers are set to the system defaults.

*handle* Points to the input/output buffer's handle, which is opaque.

*readit* Points to the subroutine to call when a buffer needs to be filled. Similar to the **read** system call.

*writeit* Points to the subroutine to call when a buffer needs to be flushed. Similar to the **write** system call.

## Related Information

eXternal Data Representation (XDR) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

## xdrrec\_endofrecord Subroutine

### Purpose

Causes the current outgoing data to be marked as a record.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdrrec_endofrecord ( xdrs, sendnow)  
XDR *xdrs;  
bool_t sendnow;
```

### Description

The **xdrrec\_endofrecord** subroutine causes the current outgoing data to be marked as a record and can only be invoked on streams created by the **xdrrec\_create** subroutine. If the value of the *sendnow* parameter is nonzero, the data in the output buffer is marked as a completed record and the output buffer is optionally written out.

### Parameters

*xdrs*                Points to the eXternal Data Representation (XDR) stream handle.  
*sendnow*           Specifies whether the record should be flushed to the output **tcp** stream.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

### Related Information

The **xdrrec\_create** subroutine.

eXternal Data Representation (XDR) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

Understanding XDR Non-Filter Primitives in *AIX® Version 6.1 Communications Programming Concepts*.

---

## xdrrec\_eof Subroutine

### Purpose

Checks the buffer for an input stream that indicates the end of file (EOF).

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdrrec_eof ( xdrs)
XDR *xdrs;
```

## Description

The **xdrrec\_eof** subroutine checks the buffer for an input stream to see if the stream reached the end of the file. This subroutine can only be invoked on streams created by the **xdrrec\_create** subroutine.

## Parameters

*xdrs* Points to the eXternal Data Representation (XDR) stream handle.

## Return Values

After consuming the rest of the current record in the stream, this subroutine returns a value of 1 if the stream has no more input, and a value of 0 otherwise.

## Related Information

The **xdrrec\_create** subroutine.

eXternal Data Representation (XDR) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

Understanding XDR Non-Filter Primitives in *AIX® Version 6.1 Communications Programming Concepts*.

---

## xdrrec\_skiprecord Subroutine

### Purpose

Causes the position of an input stream to move to the beginning of the next record.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/xdr.h>
```

```
xdrrec_skiprecord ( xdrs)
XDR *xdrs;
```

## Description

The **xdrrec\_skiprecord** subroutine causes the position of an input stream to move past the current record boundary and onto the beginning of the next record of the stream. This subroutine can only be invoked on streams created by the **xdrrec\_create** subroutine. The **xdrrec\_skiprecord** subroutine tells the eXternal Data Representation (XDR) implementation that the rest of the current record in the stream's input buffer should be discarded.

## Parameters

*xdrs* Points to the XDR stream handle.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The `xdrrec_create` subroutine.

eXternal Data Representation (XDR) Overview for Programming in AIX® *Version 6.1 Communications Programming Concepts*.

Understanding XDR Non-Filter Primitives in AIX® *Version 6.1 Communications Programming Concepts*.

---

## xdrstdio\_create Subroutine

### Purpose

Initializes the XDR data stream pointed to by the `xdrs` parameter.

### Library

C Library (`libc.a`)

### Syntax

```
#include <stdio.h>
#include <rpc/xdr.h>
void xdrstdio_create ( xdrs, file, op)
XDR *xdrs;
FILE *file;
enum xdr_op op;
```

### Description

The `xdrstdio_create` subroutine initializes the eXternal Data Representation (XDR) data stream pointed to by the `xdrs` parameter. The XDR stream data is written to or read from the standard input/output stream pointed to by the `file` parameter.

**Note:** The destroy routine associated with such an XDR stream calls the `fflush` function on the `file` stream, but never calls the `fclose` function.

### Parameters

`xdrs` Points to the XDR stream handle to initialize.  
`file` Points to the standard I/O device that data is written to or read from.  
`op` Specifies an XDR direction. The possible choices are `XDR_ENCODE`, `XDR_DECODE`, or `XDR_FREE`.

## Related Information

eXternal Data Representation (XDR) Overview for Programming in AIX® *Version 6.1 Communications Programming Concepts*.

Understanding XDR Non-Filter Primitives in AIX® *Version 6.1 Communications Programming Concepts*.





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## Chapter 4. AIX® 3270 Host Connection Program (HCON)

---

### cfxfer Function

#### Purpose

Checks the status of the programmatic File Transfer.

#### Library

File Transfer Library (**libfxfer.a**)

#### C Syntax

```
#include <fxfer.h>
```

```
cfxfer ( sxfer )  
struct fxs *sxfer;
```

#### Pascal Syntax

```
%include fxfer.inc  
%include fxhfile.inc
```

```
function pcfxfer (var Sxfer : fxs) : integer; external;
```

#### FORTRAN Syntax

```
INTEGER FCFXFER  
EXTERNAL FCFXFER
```

```
CHARACTER*XX SRC, DST, TIME
```

```
INTEGER BYTCNT, STAT
```

```
INTEGER ERRNO
```

```
RC = FCFXFER (SRC, DST, BYTCNT,  
+ STAT, ERRNO, TIME, RC)
```

#### Description

The **cfxfer** function returns the status of the file transfer request made by the **fxfer** function. This function must be called once for each file transfer request. The **cfxfer** function places the status in the structure specified by the *sxfer* parameter for C and Pascal. For FORTRAN, status is placed in each corresponding parameter.

Each individual file transfer and file transfer status completes the requests in the order the requests are made. If multiple asynchronous requests are made:

- To a single host session, the **cfxfer** function returns the status of each request in the same order the requests are made.
- To more than one host session, the **cfxfer** function returns the status of each request in the order it is completed.

If the file transfer is run asynchronously and the **cfxfer** function is immediately called, the function returns a status not available -2 code. An application performing a file transfer should not call the **cfxfer** function

until an error -1 or ready status 0 is returned. The application program can implement the status check in a **FOR LOOP** or a **WHILE LOOP** and wait for a -1 or 0 to occur.

The **cxfer** function is part of the Host Connection Program (HCON).

## C Parameters

*sxfer* Specifies an **fxs** structure as defined in the **fxfer.h** file. The **fxs** C structure is:

```
struct fxs {
    int    fxs_bytcnt;
    char   *fxs_src;
    char   *fxs_dst;
    char   *fxs_ctime;
    int    fxs_stat;
    int    fxs_errno;
}
```

## Pascal Parameters

*Sfxfer* Specifies a record of type **fxs** as defined within the **fxfer.inc** file. The Pascal **fxs** record format is:

```
fxs = record
    fxs_bytcnt : integer;
    fxs_src : stringptr;
    fxs_dst : stringptr;
    fxs_ctime : stringptr;
    fxs_stat : integer;
    fxs_errno : integer;
end;
```

## C and Pascal fxs Field Descriptions

<i>fxc_bytcnt</i>	Indicates the number of bytes transferred.
<i>fxc_src</i>	Points to a static buffer containing the source file name. The static buffer is overwritten by each call.
<i>fxc_dst</i>	Points to a static buffer containing the destination file name. The static buffer is overwritten by each call.
<i>fxc_ctime</i>	Specifies the time the destination file is created relative to Greenwich Mean Time (GMT) midnight on January 1, 1970.
<i>fxs_stat</i>	Specifies the status of the file transfer request.
<i>fxs_errno</i>	Specifies the error number that results from an error in a system call.

## FORTTRAN Parameters

<i>SRC</i>	Specifies a character array of <i>XX</i> length containing the source file name.
<i>DST</i>	Specifies a character array of <i>XX</i> length containing the destination file name.
<i>BYTCNT</i>	Indicates the number of bytes transferred.
<i>STAT</i>	Specifies the status of the file transfer request.
<i>ERRNO</i>	Specifies the error number that results from an error in a system call.
<i>TIME</i>	Specifies the time the destination file is created.

## Return Values

The **cxfer** function returns the following:

Value	Description
-------	-------------

- |    |  |
|----|--|
| 0  | Ready status-success. The structure member <i>fxs.fxs_stat</i> contains status of <b>fxfer</b> function. |
| -1 | Error status. Failure of <b>cxfer</b> function. The <b>fxs</b> structure has NOT been set.               |
| 1  | Status is not yet available.   |

The **fx\_statxxxxxx** status file contains the status of each file transfer request made by the application program. The **fxfer** function fills in the *xxxxxx* portion of the **fx\_stat** file based on random letter generation and places the file in the **\$HOME** directory.

## Files

<b>\$HOME/fx_statxxxxxx</b>	Temporary file used for status
-----------------------------	--------------------------------

## Related Information

The **fxfer** command.

The **fxfer** function, **g32\_fxfer** function.

---

## fxfer Function

### Purpose

Initiates a file transfer from within a program.

### Library

File Transfer Library (**libfxfer.a**)

### C Syntax

```
#include <fxfer.h>
```

```
fxfer ( xfer, sessionname)  
struct fxc *xfer;  
char *sessionname;
```

### Pascal Syntax

```
%include /usr/include/fxfer.inc  
%include /usr/include/fxhfile.inc  
%include /usr/include/fxconst.inc
```

```
function pfxfer  
(var xfer : fxc; sessionname : stringptr) :  
integer; external;
```

### FORTRAN Syntax

```
INTEGER FFXFER
```

```
EXTERNAL FFXFER
```

**CHARACTER\*XX SRCF, DSTF, LOGID, INPUTFLD, CODESET, SESSIONNAME**

**INT FLAGS, RECL, BLKSIZE, SPACE, INCR, UNIT, RC**

**RC = FFXFER ( SRCF, DSTF, LOGID, FLAGS, RECL, BLKSIZE,  
+ SPACE, INCR, UNIT, INPUTFLD, CODESET, SESSIONNAME)**

## Description

The **fxfer** function transfers a file from a specified source to a specified destination. The file transfer is accomplished as follows:

- In the C or Pascal language, the **fxfer** or **pxfer** function transfers a file specified by the *fxc\_src* variable to the file specified by the *fxc\_dst* variable. Both variables are defined in the **fxc** structure.
- In the FORTRAN language, the **FFXFER** function transfers a file specified by the *SRCF* variable to the file specified by the *DSTF* variable.

The **fxfer** function is part of the Host Connection Program (HCON).

The **fxfer** function requires one or more adapters used to connect to a host.

This function requires one of the following operating system environments be installed on the mainframe host: VM/SP CMS, VM/XA CMS, MVS/SP TSO/E, MVS/XA, TSO/E, CICS/VS, VSE/ESA, or VSE/SP.

This function requires that the System/370 Host-Supported File Transfer Program (**IND\$FILE** or its equivalent) be installed on the mainframe host.

The file names are character strings. The local-system file names must be in operating system format. The host file names must conform to the host naming convention, which must be one of the following formats:

<b>Format</b>	<b>Description</b>
<b>VM/CMS</b>	<i>FileName FileType FileMode</i>
<b>MVS/TSO</b>	<i>DataSetName [(MemberName)]/[Password]</i>
<b>CICS/VS</b>	<i>FileName</i> (up to 8 characters)
<b>VSE/ESA</b>	<i>FileName</i> (up to 8 characters)

**Note:** The VSE host is not supported in a double-byte character set (DBCS) environment.

## C Parameters

<i>xfer</i>	Specifies a pointer to the <b>fxc</b> structure defined in the <b>fxfer.h</b> file.
<i>sessionname</i>	Points to the name of a session. The session profile for that session specifies the host connectivity to be used by the file transfer programming interface. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Session variables are defined in a HCON session profile. If the value of the <i>sessionname</i> parameter is set to a null value, the <b>fxfer</b> function assumes you are running in an <b>e789</b> subshell.

## Pascal Parameters

<i>xfer</i>	Specifies a record of <b>fxc</b> type within the <b>fxfer.inc</b> file.
-------------	---

*sessionname* Points to the name of a session. The session profile indicated by the *sessionname* parameter defines the host connectivity to be used by the file transfer programming interface. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Session variables are defined in an HCON session profile. If the *sessionname* parameter is set to char(0), the **pxfer** function assumes you are running in an **e789** subshell.

## FORTRAN Parameters

*SRCF* Specifies a character array of *XX* length containing the source file name.

*DSTF* Specifies a character array of *XX* length containing the destination file name.

*LOGID* Specifies a character array of *XX* length containing the host logon ID.

*SESSIONNAME* Points to the name of a session. The *SESSIONNAME* parameter names a session profile that defines the host connectivity to be used by the file transfer programming interface. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Session variables are defined in a HCON session profile. If the *SESSIONNAME* parameter is set to char(0), the **FFXFER** function assumes you are running in an **e789** subshell.

*FLAGS* Contains the option flags value, which is the sum of the desired option values:

<b>1</b>	Upload
<b>2</b>	Download
<b>4</b>	Translate on
<b>8</b>	Translate carriage return line feed
<b>16</b>	Replace
<b>32</b>	Append
<b>64</b>	Queue
<b>128</b>	Fixed-length records
<b>256</b>	Variable-length records
<b>512</b>	Undefined length (TSO only)
<b>1024</b>	Host system TSO
<b>2048</b>	Host system CMS
<b>4096</b>	Host system CICS/VS
<b>8192</b>	Host system VSE/ESA

*RECL* Specifies the logical record length.

*BLKSIZE* Specifies the block size.

*SPACE* Specifies the allocation space.

*INCR* Specifies the allocation space increment.

*UNIT* Specifies the unit of allocation:

<b>-1</b>	Specifies the number of TRACKS.
<b>-2</b>	Specifies the number of CYLINDERS.

A positive number indicates the number of bytes to allocate.

*INPUTFLD* Specifies the host input table field.

## CODESET

Specifies an alternate code set to use for ASCII to EBCDIC and EBCDIC to ASCII translations:

### CHAR(0)

Uses current operating-system ASCII code page.

### IBM®-932

Uses IBM® code page 932 for translation in a DBCS environment.

### ISO8859-1

Uses ISO 8859-1 Latin alphabet number 1 code page.

### ISO8859-7

Uses ISO 8859-7 Greek alphabet.

### ISO8859-9

Uses ISO 8859-9 Turkish alphabet.

### IBM®-eucJP

Uses IBM® Extended UNIX® code for translation in the Japanese Language environment.

### IBM®-eucKR

Translates Korean language.

### IBM®-eucTW

Translates traditional Chinese language.

## Notes:

1. All FORTRAN character array strings must be terminated by a null character, as in the following example:  

```
SRCF = 'rtfile'//CHAR(0)
```
2. The VSE host system is not supported in a DBCS environment.
3. The unique DBCS file-transfer flags are not supported by this function.

## Return Values

If the **fxfer** function is called synchronously, it returns a value of 0 when the transfer is completed. The application program can then issue a **cfxfer** function call to obtain the status of the file transfer.

If the **fxfer** function is called asynchronously, it returns 0. The application program can issue a **cfxfer** function call to determine when the file transfer is completed and to obtain the status of the file transfer. If the status cannot be reported by the **cfxfer** function due to an I/O error on the **fx\_statxxxxxx** status file, the **cfxfer** function returns a -1. If the status is not ready, the **cfxfer** function returns a -2.

The **fx\_statxxxxxx** status file contains the status of each file transfer request made by the application program. The **fxfer** function fills in the **xxxxxx** portion of the **fx\_stat** file based on random letter generation and places the file in the **\$HOME** directory.

## Related Information

The file-transfer check status function is the **cfxfer** function.

---

## g32\_alloc Function

### Purpose

Initiates interaction with a host application.

## Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

## C Syntax

```
#include <g32_api.h>
```

```
g32_alloc ( as, applname, mode)
```

```
struct g32_api *as;
```

```
char *applname;
```

```
int mode;
```

## Pascal Syntax

```
function g32allc (var as : g32_api;  
    applname : stringptr;  
    mode : integer): integer; external;
```

## FORTRAN Syntax

```
EXTERNAL G32ALLOC
```

```
INTEGER RC, MODE, AS(9), G32ALLOC
```

```
CHARACTER* XX NAME
```

```
RC = G32ALLOC (AS, NAME, MODE)
```

## Description

The **g32\_alloc** function initiates interaction with a host application and sets the API mode. The host application program is invoked by entering its name, using the 3270 operatorless interface.

If invocation of the host program is successful and the mode is API/API, control of the session is passed to the application. If the mode is API/3270, the emulator retains control of the session. The application communicates with the session by way of the 3270 operatorless interface.

The **g32\_alloc** function may be used only after a successful open using the **g32\_open** or **g32\_openx** function. The **g32\_alloc** function must be issued before using any of the message or 3270 operatorless interface functions.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Applications programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_alloc** function is part of the Host Connection Program (HCON).

The **g32\_alloc** function requires one or more adapters used to connect to a host.

CICS® and VSE do not support **API/API** or **API/API\_T** modes.

## C Parameters

**as** Specifies a pointer to a **g32\_api** structure. Status information is returned in this structure.

*applname* Specifies a pointer to the name of the host application to be executed. This string should be the entire string necessary to start the application, including any necessary parameters or options. When specifying an *applname* parameter, place the host application name in double quotes ("Testload") or specify a pointer to a character string.

*mode* Specifies the API mode. The types of modes that can be used are contained in the **g32\_api.h** file and are defined as follows:

#### **MODE\_3270**

The API/3270 mode lets local system applications act like a 3270 operatorless interface. Applications in this mode use the 3270 operatorless interface to communicate with the host application. In API/3270 mode, if the value of the *applname* parameter is a null pointer, no host application is started.

#### **MODE\_API**

The API/API mode is a private protocol for communicating with host applications that assume they are communicating with a program. Applications in this mode use the message interface to communicate with host applications using the host API. The API program must use HCON's API and must have a corresponding host API program that uses HCON's host API for the programs to communicate.

**Note:** When a session is in this mode, all activity to the screen is stopped until this mode is exited. API/3270 mode functions cannot be used while in the API/API mode. The keyboard is locked.

#### **MODE\_API\_T**

The API\_T mode is the same as the **MODE\_API** type except this mode translates messages received from the host from EBCDIC to ASCII, and translates messages sent to the host from ASCII to EBCDIC. The translation tables used are determined by the language characteristic in the HCON session profile.

**Note:** A host application started in API/API or API/API\_T mode must issue a **G32ALLOC** function as the API waits for an acknowledgment from the host application, when starting an API/API mode session.

## Pascal Parameters

*as* Specifies the **g32\_api** structure.

*applname* Specifies a **stringptr** containing the name of the host application to be executed. This string should be the entire string necessary to start the host application, including any necessary parameters and options. A null application name is valid in 3270 mode.

*mode* Specifies the mode desired for the session.

## FORTTRAN Parameters

*AS* Specifies the **g32\_api** equivalent structure as an array of integers.

*NAME* Specifies the name of the application that is to execute on the host.

*MODE* Specifies the desired mode for the API.

## Return Values

**0** Indicates successful completion.

**-1** Indicates an error has occurred.

- The *errcode* field in the **g32\_api** structure is set to an error code identifying the error.
- The *xerrinfo* field can be set to give more information about the error.

## Examples

The following example illustrates the use of the **g32\_alloc** function in C language:



```

#include <g32_api.h>          /* API include file      */
main ()
{
struct g32_api *as, asx;     /* API status          */
int session_mode = MODE_API /* api session mode. Other
                             modes are MODE_API_T
                             and MODE_3270 */

char appl_name [20]         /* name of the application to
                             run on the host */

int return;                 /* return code         */
.
.
.
strcpy (appl_name, "APITESTN"); /* name of host application */
return = g32_alloc(as, appl_name, session_mode);
.
.
return = g32_dealloc(as);
.
.
.

```

---

## g32\_close Function

### Purpose

Detaches from a session.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_close ( as )
struct g32_api *as;
```

### Pascal Syntax

```
function g32close (var as : g32_api) : integer; external;
```

### FORTRAN Syntax

```
EXTERNAL G32CLOSE
```

```
INTEGER AS(9), G32CLOSE
```

```
RC = G32CLOSE(AS)
```

### Description

The **g32\_close** function disconnects from a 3270 session. If the **g32\_open** or **g32\_openx** function created a session, the **g32\_close** function logs off from the host and terminates the session. A session must be terminated (using the **g32\_dealloc** function) before issuing the **g32\_close** function.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_close** function is part of the Host Connection Program (HCON).

The **g32\_close** function requires one or more adapters used to connect to a host.

## C Parameters

**as** Specifies a pointer to a **g32\_api** structure. Status is returned in this structure.

## Pascal Parameters

**as** Specifies a **g32\_api** structure.

## FORTRAN Parameters

**AS** Specifies the **g32\_api** equivalent structure as an array of integers.

## Return Values

**0** Indicates successful completion.

**-1** Indicates an error has occurred.

- The **errcode** field in the **g32\_api** structure is set to an error code identifying the error.
- The **xerrinfo** field can be set to give more information about the error.

## Examples

The following example fragment illustrates the use of the **g32\_close** function in C language:

```
#include <g32_api.h>      /* API include file */
main()
{
  struct g32_api *as;    /* g32 structure */
  int return;
  .
  .
  .
  return = g32_close(as);
  .
  .
  .
```

---

## g32\_dealloc Function

### Purpose

Ends interaction with a host application.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (libg3270f.a)

## C Syntax

```
#include <g32_api.h>
```

```
g32_dealloc( as)  
struct g32_api *as;
```

## Pascal Syntax

```
function g32deal (var as : g32_api) : integer; external;
```

## FORTRAN Syntax

```
EXTERNAL G32DEALLOC
```

```
INTEGER AS(9), G32DEALLOC  
RC = G32DEALLOC(AS)
```

## Description

The **g32\_dealloc** function ends interaction with the operating system application and the host application. The function releases control of the session.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_dealloc** function is part of the Host Connection Program (HCON).

The **g32\_dealloc** function requires one or more adapters used to connect to a host.

## C Parameters

*as* Specifies a pointer to a **g32\_api** structure. Status is returned in this structure.

## Pascal Parameters

*as* Specifies the **g32\_api** structure.

## FORTRAN Parameters

*AS* Specifies the **g32\_api** equivalent structure as an array of integers.

## Return Values

**0** Indicates successful completion.

**-1** Indicates an error has occurred.

- The *errcode* field in the **g32\_api** structure is set to an error code identifying the error.
- The *xerrinfo* field can be set to give more information about the error.

## Examples

The following example illustrates the use of the **g32\_dealloc** function in C language:

```
#include <g32_api.h>      /* API include file */
main ()
{
  struct g32_api *as, asx; /* asx is statically defined */
  int session_mode = MODE_API; /* api session mode. Other
                               modes are MODE_API_T */
  char appl_name [20];    /* name of the application to
                           run on the host */
  int return;            /* return code */
  .
  .
  .
  strcpy (appl_name, "APITESTN"); /* name of host application */
  return = g32_alloc(as, appl_name, session_mode);
  .
  .
  .
  return = g32_dealloc(as);
  .
  .
  .
}
```

---

## g32\_fxfer Function

### Purpose

Invokes a file transfer.

### Libraries

HCON Library

File Transfer Library (**libfxfer.a**)

C (**libg3270.a**)

Pascal (**libg3270p.a**)

Fortran (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
#include <fxfer.h>
```

```
g32_fxfer ( as, xfer )
struct g32_api *as;
struct fxc *xfer;
```

### Pascal Syntax

```
const
%include /usr/include/g32const.inc
%include /usr/include/g32fxconst.inc
type
%include /usr/include/g32types.inc
%include /usr/include/fxhfile.inc
function g32fxfer(var as : g32_api; var xfer : fxc) : integer; external;
```

## FORTRAN Syntax

```
INTEGER G32FXFER, RC, AS(9)
EXTERNAL G32FXFER
CHARACTER*XX SRCF, DSTF, INPUTFLD, CODESET
INTEGER FLAGS,RECL,BLKSIZE,SPACE,INCR,UNIT
RC = G32FXFER(AS,SCRFF, DSTF, FLAGS, RECL, BLKSIZE, SPACE,
+ INCR, UNIT, INPUTFLD, CODESET)
```

## Description

The **g32\_fxfer** function allows a file transfer to take place within an API program without the API program having to invoke a **g32\_close** and relinquish the link. The file transfer is run in a programmatic fashion, meaning the user must set up the flag options, the source file name, and the destination file name using either the programmatic **fxfer fxc** structure for C and Pascal or the numerous variables for FORTRAN. The **g32\_fxfer** function will detach from the session without terminating it, run the specified file transfer, and then reattach to the session.

If a **g32\_alloc** function has been issued before invoking the **g32\_fxfer** command, be sure that the corresponding **g32\_dealloc** function is incorporated into the program before the **g32\_fxfer** function is called.

The status of the file transfer can be checked by using the **cfxfer** file-transfer status check function after the **g32\_fxfer** function has been invoked.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_fxfer** function is part of the Host Connection Program (HCON).

The **g32\_fxfer** function requires one or more adapters used to connect to a host.

This function requires that the Host-Supported File Transfer Program (**IND\$FILE** or its equivalent) be installed on the host.

## C Parameters

*as* Specifies a pointer to the **g32\_api** structure. Status is returned in this structure.  
*xfer* Specifies a pointer to the **fxc** structure defined in the **fxfer.h** file.

## Pascal Parameters

*as* Specifies a record of type **g32\_api**.  
*xfer* Specifies a record of type **fxc** within the **fxfer.inc** file.

## FORTRAN Parameters

*AS* Specifies the **g32\_api** equivalent structure as an array of integers.  
*SRCF* Specifies a character array of *XX* length containing the source file name.  
*DSTF* Specifies a character array of *XX* length containing the destination file name.

*FLAGS* Contains the option flags value, which is the sum of the desired option values listed below:

<b>1</b>	Upload
<b>2</b>	Download
<b>4</b>	Translate On
<b>8</b>	Translate Carriage Return Line Feed
<b>16</b>	Replace
<b>32</b>	Append
<b>64</b>	Queue. This option may be specified by the user, but it is blocked by the <b>G32FXFER</b> command.
<b>128</b>	Fixed Length Records
<b>256</b>	Variable Length Records
<b>512</b>	Undefined Length (TSO only)
<b>1024</b>	Host System TSO
<b>2048</b>	Host System CMS
<b>4096</b>	Host System CICS/VS
<b>8192</b>	Host System VSE/ESA

*RECL* Specifies the logical record length.

*BLKSIZE* Specifies the block size (TSO only).

*SPACE* Specifies the allocation space (TSO only).

*INCR* Specifies the allocation space increment (TSO only).

*UNIT* Specifies the unit of allocation (TSO only), which is:

<b>-1</b>	Number of TRACKS
<b>-2</b>	Number of CYLINDERS.

**A positive number indicates the number of blocks to be allocated.**

*INPUTFLD* Specifies the host input table field.

**CODESET** Specifies an alternate code set to use for ASCII to EBCDIC and EBCDIC to ASCII translations. The following code sets are supported:

**CHAR( 0)**

Uses current operating system ASCII code page.

**IBM850**

Uses IBM® code page 850 for translation in a single byte code set (SBCS) environment.

**IBM932**

Uses IBM® code page 932 for translation in a double byte code set (DBCS) environment.

**ISO8859-1**

Uses ISO 8859-1 Latin alphabet number 1 code page.

**ISO8859-7**

Uses ISO 8859-7 Greek alphabet.

**ISO8859-9**

Uses ISO 8859-9 Turkish alphabet.

**IBMeucJP**

Uses IBM® Extended UNIX® Code for translation in the Japanese Language environment.

**IBMeucKR**

Korean language.

**IBMeucTW**

Traditional Chinese language.

**Notes:**

1. All FORTRAN character array strings must be null-terminated. For
2. example:  
SRCF = 'rtfile'//CHAR(0)
3. The Host System VSE is not supported in the DBCS environment.
4. The unique DBCS file transfer flags are not supported by this function.

## Return Values

- 0** Indicates successful completion. The user may call the **cfxfer** function to get the status of the file transfer.
- 1** Indicates the file transfer did not complete successfully. The user may call the **cfxfer** function to get the status of the file transfer.
- 1** Indicates the **g32\_fxfer** command failed while accessing the link. The **errcode** field in the **g32\_api** structure is set to an error code identifying the error. The **xerrinfo** field can be set to give more information about the error.

## Examples

The following example fragment illustrates the use of the **g32\_fxfer** function in an **api\_3270** mode program in C language:

```
#include <g32_api.h> /* API include file */
#include <fxfer.h> /* file transfer include file */
main()
{
    struct g32_api *as,asx;
    struct fxc *xfer; struct fxs sxfer;
    int session_mode=MODE_3270;
    char *aixfile="/etc/motd";
    char *hostfile="test file a";
    char sessionname[30],uid[30],pw[30];
    int mlog=0,ret=0;
    as = &asx;
```

```

sessionname = '\0'; /* We are assuming SNAME is set */
.
.
ret=g32_open(as,mlog,uid,pw,sessionname);
printf("The g32_open return code = %d\n",ret);
.
.
/* Malloc space for the file transfer structure */
xfer = (struct fxc *) malloc(2048);
/* Set the file transfer flags to upload,
replace, translate and Host CMS */
xfer->fxc_opts.f_flags = FXC_UP | FXC_REPL | FXC_TNL |
FXC_CMS;
xfer->fxc_opts.f_lrecl = 80; /* Set the Logical Record length
to 80 */
xfer->fxc_opts.f_inputfld = (char *)0; /* Set Input Field
to NULL */
xfer->fxc_opts.f_aix_codepg = (char *)0; /* Set Alternate
Codepg to NULL */
xfer->fxc_src = aixfile; /* Set the Source file name to
aixfile */
xfer->fxc_dst = hostfile; /* Set the Destination file name
to hostfile */

ret=g32_fxfer(as,xfer);
printf("The g32_fxfer return code = %d\n",ret);
/* If the file transfer completed then get the status code of
the file transfer */
if ((ret == 0) || (ret == 1)) {
ret = cfxfer(&sxfer);
if (ret == 0) {
printf("Source file: %s\n",sxfer.fxs_src);
printf("Destination file: %s\n", \
sxfer.fxs_dst);
printf("Byte Count: %d\n",sxfer.fxs_bytcnt);
printf("File transfer time: %d\n",sxfer.fxs_ctime);
printf("Status Message Number: %d\n",sxfer.fxs_stat);
printf("System Call error number:%d\n",sxfer.fxs_errno);
}
}
.
.
.
ret=g32_close(as);
printf("The g32_close return code = %d\n",ret);
return(0);
}

```

The following example fragment illustrates the use of the **g32\_fxfer** function in an **api\_3270** mode program in Pascal language.

```

program test1(input,output);
const%include /usr/include/g32const.inc
%include /usr/include/fxconst.inc
type
%include /usr/include/g32hfile.inc
%include /usr/include/g32types.inc
%include /usr/include/fxhfile.inc
var
as:g32_api;
xfer:fxc;
sxfer:fxs;
ret,sess_mode,flag:integer;
session,timeout,uid,pw:stringptr;
source,destination:stringptr;
begin
sess_mode = MODE_3270;
flag := 0;

```



```

{ Initialize API stringptrs and create space }
new(uid,8);
uid@ := chr(0);
new(pw,8);
pw@ := chr(0);
new(session,2);
session@ := 'a'; { Open session a }
new(timeout,8);
timeout := '60';
{ Call g32openx and open session a }
ret := g32openx(as,flag,uid,pw,session,timeout);
writeln('The g32openx return code = ',ret:4);
.
.
.
{ Set up the file transfer options and file names }
new(source,1024);
source := 'testfile'; { Source file, assumes testfile exists
                      in the current directory }
new(destination,1024);
destination := 'testfile'; { Destination file, TSO file
                             testfile }
{ Set flags to Upload, Replace, Translate and Host TSO }
xfer.fxc_opts.f_flags := FXC_UP + FXC_TSO + FXC_REPL + \      FXC_TNL;
xfer.fxc_src := source;
xfer.fxc_dst := destination;
{Call the g32_fxfer using the specified flags and file names}
ret := g32fxfer(as,xfer);
writeln('The g32fxfer return code = ',ret:4);
{ If g32_fxfer returned with 1 or 0 call the file transfer \      status check function }
if (ret >= 0) then begin
  ret := pcfxfer(sxfer);
  if (ret = 0) then begin
    writeln('Source file:      ',sxfer.fxs_src@);
    writeln('Destination file:  ',sxfer.fxs_dst@);
    writeln('File Transfer Time: ',sxfer.fxs_ctime@);
    writeln('Byte Count:       ',sxfer.fxs_bytcnt);
    writeln('Status Message Number: ',sxfer.fxs_stat);
    writeln('System Call Error Number: ',sxfer.fxs_errno);
  end;
end;
.
.
.
{ Close the session using the g32close function }
ret := g32close(as);
writeln('The g32close return code = ',ret:4);
end.

```

The following example fragment illustrates the use of the **g32\_fxfer** function in an **api\_3270** mode program in FORTRAN language:

```

INTEGER G32OPENX,G32FXFER,G32CLOSE,FCFXFER
INTEGER RET,'AS(9)FLAG
EXTERNAL G32OPENX
EXTERNAL G32FXFER
EXTERNAL G32CLOSE
EXTERNAL FCFXFER
CHARACTER*8 UID
CHARACTER*8 PW
CHARACTER*2 SESSION
CHARACTER*8 TIMEOUT
CHARACTER*256 SRCF
CHARACTER*256 DSTF
CHARACTER*256 SRC
CHARACTER*256 DST
CHARACTER*64 INPUTFLD

```

```

CHARACTER*8    CODESET
CHARACTER*40   TIME
INTEGER BYTCNT,STAT,ERRNO,TIME
INTEGER FLAGS,RECL,BLKSIZE,SPACE,INCR,UNIT
C Set up all FORMAT statement
1  FORMAT("THE G32OPENX RETURN CODE = ",I4)
2  FORMAT("THE G32FXFER RETURN CODE = ",I4)
3  FORMAT("THE G32CLOSE RETURN CODE = ",I4)
4  FORMAT("THE FCFXFER RETURN CODE = ",I4)
5  FORMAT("-----")
10  FORMAT("SOURCE FILE: ",A)
11  FORMAT("DESTINATION FILE: ",A)
12  FORMAT("BYTE COUNT: ",I10)
13  FORMAT("TIME: ",A)
14  FORMAT("STATUS MESSAGE NUMBER: ",I10)
15  FORMAT("SYSTEM CALL ERROR NUMBER: ",I10)
C Set up all character values for the G32OPENX command
UID = CHAR(0)
PW = CHAR(0)
SESSION = 'z'//CHAR(0)
TIMEOUT = '60'//CHAR(0)
FLAG = 0
SRCF = 'testcase1'//CHAR(0)
DSTF = '/home/test.case1'//CHAR(0)
C Source and Destination files for the fcfxfer status
C check command
SRC = CHAR(0)
DST = CHAR(0)
C Set Input Field to NULL
INPUTFLD = CHAR(0)
C Set Alternate AIX® codeset to NULL
CODESET = CHAR(0)
C Set the G32FXFER file transfer flags and options
C Take the defaults for Logical Record Length, Block Size,
C and Space
RECL = 0
BLKSIZE = 0
SPACE = 0
C Set FLAGS to download (2), translate(4), and Host
TSO(1024)
FLAGS = 1030
C Call G32OPENX
RET = G32OPENX(AS,FLAG,UID,PW,sessionname,TIMEOUT)
WRITE(*,1) RET
.
.
.
C Call G32FXFER
RET = G32FXFER(AS,SRCF,DSTF,FLAGS,RECL,BLKSIZE,SPACE
+          INCR,UNIT,INPUTFLD,CODESET)
WRITE(*,2) RET
.
.
.
C Call G32CLOSE
RET = G32CLOSE(AS)
WRITE(*,3) RET
C Call FCFXFER for file transfer status output
RET = FCFXFER(SRC,DST,BYTCNT,STAT,ERRNO,TIME)
WRITE(*,4) RET
WRITE(*,5)
WRITE(*,10) SRC
WRITE(*,11) DST
WRITE(*,12) BYTCNT
WRITE(*,13) TIME
WRITE(*,14) STAT

```

```
WRITE(*,15) ERRNO
WRITE(*,5)
STOP
END
```

---

## g32\_get\_cursor Function

### Purpose

Sets the row and column components of the **g32\_api** structure to the current cursor position in a presentation space.

### Libraries

HCON Library  
C (**libg3270.a**)  
Pascal (**libg3270p.a**)  
FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_get_cursor ( as )
struct g32_api as
```

### Pascal Syntax

```
function g32curs (var as : g32_api) : integer; external;
```

### FORTRAN Syntax

```
EXTERNAL G32GETCURSOR
```

```
INTEGER AS(9), G32GETCURSOR
RC = G32GETCURSOR(AS)
```

### Description

The **g32\_get\_cursor** function obtains the row and column address of the cursor and places these values in the *as* structure. An application can only use the **g32\_get\_cursor** function in API/3270 mode.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Applications programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_get\_cursor** function is part of the Host Connection Program (HCON).

The **g32\_get\_cursor** function requires one or more adapters used to connect to a host.

### C Parameters

*as* Specifies a pointer to the **g32\_api** structure. This structure contains the row (**row**) and column (**column**) address of the cursor. Status information is also set in this structure.

## Pascal Parameters

`as` Specifies the `g32_api` structure.

## FORTTRAN Parameters

`AS` Specifies the `g32_api` equivalent structure as an array of integers.

## Return Values

- 0** Indicates successful completion.
  - The corresponding **row** element of the `as` structure is the row position of the cursor.
  - The corresponding **column** element of the `as` structure is the column position of the cursor.
- 1** Indicates an error has occurred.
  - The `errcode` field in the `g32_api` structure is set to the error code identifying the error.
  - The `xerrinfo` field can be set to give more information about the error.

## Examples

**Note:** The following example is missing the required `g32_open` and `g32_alloc` functions which are necessary for every HCON Workstation API program.

The following example fragment illustrates, in C language, the use of the `g32_get_cursor` function in an `api_3270` mode program:

```
#include <g32_api.h>      /* API include file */
#include <g32_keys.h>
main()
{
  struct g32_api *as;      /* g32 structure */
  char *buffer;           /* pointer to char string */
  int return;             /* return code */
  char *malloc();         /* C memory allocation function*/
  .
  .
  .
  return = g32_notify(as,1); /* Turn notification on */
  buffer = malloc(10);
  return = g32_get_cursor(as); /* get location of cursor */
  printf ("The cursor position is row: %d col: %d/n",
         as -> row, as -> column);
  /* Get data from host starting at the current row and column */
  as -> length = 10;       /* length of a pattern on host */
  return = g32_get_data(as,buffer); /* get data from host */
  printf("The data returned is <%s>\n",buffer);
  /* Try to search for a particular pattern on host */
  as ->row =1;            /* row to start search */
  as ->column =1;         /* column to start search */
  return = g32_search(as,"PATTERN");
  /*Send a clear key to the host */
  return = g32_send_keys(as,CLEAR);
  /* Turn notification off */
  return = g32_notify(as,0);
  .
  .
  .
}
```

---

## g32\_get\_data Function

### Purpose

Obtains current specified display data from the presentation space.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_get_data ( as, buffer)
```

```
struct g32_api *as;
```

```
char *buffer;
```

### Pascal Syntax

```
function g32data (var as : g32_api;  
    buffer : integer) : integer; external;
```

### FORTRAN Syntax

```
EXTERNAL G32GETDATA
```

```
INTEGER AS(9), G32GETDATA
```

```
CHARACTER *XX Buffer
```

```
RC = G32GETDATA(AS, Buffer)
```

### Description

The **g32\_get\_data** function obtains current display data from the presentation space. The transfer continues until either the transfer length is exhausted or the starting point is reached. If the transfer length is greater than the presentation space, then the **g32\_get\_data** function only reads data that equals one presentation space and leaves the rest of the buffer unchanged.

The **g32\_get\_data** function can only be used in API/3270 session mode.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Applications programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_get\_data** function is part of the Host Connection Program (HCON).

The **g32\_get\_data** function requires one or more adapters used to connect to a host.

In a double-byte character set (DBCS) environment, the **g32\_get\_data** function only obtains SBCS data from the presentation space even if Kanji or Katakana characters are displayed on the screen. The DBCS data are not available.

## C Parameters

- as* Specifies a pointer to the **g32\_api** structure containing the row (**row**) and column (**column**) address where the data begins, and the length (**length**) of data to return. Status information is also returned in this structure.
- buffer* Specifies a pointer to a buffer where the data is placed.

## Pascal Parameters

- as* Specifies the **g32\_api** structure.
- buffer* Specifies an address of a character-packed array. The array must be the same length or greater than the length field in the **g32\_api** structure.
- Note:** The address of a packed array can be obtained by using the **addr()** system call:  
buffer := addr (<message array name> [1]).

## FORTRAN Parameters

- AS* Specifies the **g32\_api** equivalent structure as an array of integers.
- buffer* Specifies the character array that receives the retrieved data. The array must be the same length or greater than the length field in the **g32\_api** structure.
- Note:** If the size of the buffer is smaller than *AS(LENGTH)*, a memory fault may occur.

## Return Values

- 0** Indicates successful completion.
- 1** Indicates an error has occurred.
- The **errcode** field in the **g32\_api** structure is set to the error code identifying the error.
  - The **xerrinfo** field can be set to give more information about the error.

## Examples

The following example fragment illustrates the use of the **g32\_get\_data** function in an **api\_3270** mode program in C language.

**Note:** The following example is missing the required **g32\_open** and **g32\_alloc** functions which are necessary for every HCON Workstation API program.

```
#include <g32_api.h>      /* API include file */
#include <g32_keys.h>
main()
{
  struct g32_api *as;      /* g32 structure */
  char *buffer;           /* pointer to char string */
  int return;             /* return code */
  char *malloc();         /* C memory allocation function */
  .
  .
  .
  return = g32_notify(as,1); /* Turn notification on */
  buffer = malloc(10);
  return = g32_get_cursor(as); /* get location of cursor */
  printf (" The cursor position is row: %d col: %d/n",
    as -> row, as -> column);
  /* Get data from host starting at the current row and column */
  as -> length = 10;      /* length of a pattern on host */
  return = g32_get_data(as,buffer); /* get data from host */
  printf("The data returned is <%s>\n",buffer);
```

```

/* Try to search for a particular pattern on host */
as ->row =1;      /* row to start search */
as ->column =1;   /* column to start search */
return = g32_search(as,"PATTERN");
/*Send a clear key to the host */
return = g32_send_keys(as,CLEAR);
/* Turn notification off */
return = g32_notify(as,0);
.
.
.

```

---

## g32\_get\_status Function

### Purpose

Returns status information of the logical path.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_get_status ( as)
```

```
struct g32_api *as;
```

### Pascal Syntax

```
function g32stat (var as: g32_api) : integer; external;
```

### FORTRAN Syntax

```
EXTERNAL G32GETSTATUS
```

```
INTEGER AS(9),G32GETSTATUS
```

```
RC = G32GETSTATUS( AS)
```

### Description

The **g32\_get\_status** function obtains status information about the communication path. The function is called after an API application determines that an error has occurred while reading from or writing to the communication path or after a time out. The HCON session profile specifies the communication path.

The **g32\_get\_status** function can only be used in API/API, API/API\_T, and API/3270 modes.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_get\_status** function is part of the Host Connection Program (HCON).

The **g32\_get\_status** function requires one or more adapters used to connect to a host.

## C Parameters

**as** Specifies a pointer to a **g32\_api** structure; status is returned in this structure.

## Pascal Parameters

**as** Specifies the **g32\_api** structure.

## FORTRAN Parameters

**AS** Specifies a **g32\_api** equivalent structure as an array of integers.

**Note:** This function is used to determine the condition or status of the link. It should not be used to determine whether the previous I/O operation was successful or unsuccessful (the return code will provide this information).

## Return Values

**0** Indicates successful completion.

## Error Codes

The values of `errcode` are as follows:

Error Code	Description
<b>G32_NO_ERROR</b>	0, indicates no error has occurred.
<b>G32_COMM_CHK</b>	-1, indicates a communications check has occurred.
<b>G32_PROG_CHK</b>	-2, indicates a program check has occurred within the emulator.
<b>G32_MACH_CHK</b>	-3, indicates a machine check has occurred.
<b>G32_FATAL_ERROR</b>	-4, indicates a fatal error has occurred within the emulator.
<b>G32_COMM_REM</b>	-5, indicates a communications check reminder has occurred.

If `errcode` is anything other than `G32_NO_ERROR`, then `xerrinfo` contains an emulator program error code.

### Value Description

- 1** Indicates an error has occurred.
- The `errcode` field in the **g32\_api** structure is set to the error code identifying the error.
  - The `xerrinfo` field can be set to give more information about the error.

## Examples

The following example fragment illustrates the use of the **g32\_get\_status** function in C language:

```
#include <g32_api.h>      /* API include file */
main()
{
  struct g32_api *as;     /* g32 structure */
  int return;
  return = g32_write(as, mssg, length);
  /* see if unsuccessful */
  if (return < 0) {
    return = g32_get_status(as);
    printf("Return from g32_get_status = %d \n",return);
  }
}
```



```

printf("errcode = %d xerrinfor = %d \n",
      as -> errcode , as -> xerrinfo);
.
.
.

```

## Implementation Specifics

---

### g32\_notify Function

#### Purpose

Turns data notification on or off.

#### Libraries

HCON Library  
 C (**libg3270.a**)  
 Pascal (**libg3270p.a**)  
 FORTRAN (**libg3270f.a**)

#### C Syntax

```
#include <g32_api.h>
```

```
g32_notify ( as, note)
struct g32_api *as;
int note;
```

#### Pascal Syntax

```
subroutine g32note (var as : g32_api;
  note : integer) : integer; external;
```

#### FORTRAN Syntax

```
EXTERNAL G32NOTIFY
```

```
INTEGER AS(9), Note, G32NOTIFY
RC = G32NOTIFY(AS, Note)
```

#### Description

The **g32\_notify** subroutine is used to turn notification of data arrival on or off. The **g32\_notify** subroutine may be used only by applications in an API/3270 session mode.

If an application wants to know when the emulator receives data from the host, it turns notification on. This causes the emulator to send a message to the application whenever it receives data from the host. The message is sent to the IPC message queue whose file pointer is stored in the `eventf` field of the `as` data structure. The application may then use the **poll** system call to wait for data from the host. Once notified the application should clear notification messages from the IPC queue, using the **msgrcv** subroutine. When the application no longer wants to be notified, it should turn notification off with another **g32\_notify** call.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_notify** function is part of the Host Connection Program (HCON).

The **g32\_notify** function requires one or more adapters used to connect to a host.

## C Parameters

*as* Specifies a pointer to the **g32\_api** structure. Status is returned in this structure.  
*note* Specifies to turn notification off (if the *note* parameter is zero) or on (if the *note* parameter is nonzero).

## Pascal Parameters

*as* Specifies a **g32\_api** structure.  
*note* Specifies an integer that signals whether to turn notification off (if the *note* parameter is zero) or on (if the *note* parameter is nonzero).

## FORTRAN Parameters

*AS* Specifies a **g32\_api** equivalent structure as an array of integers.  
*Note* Specifies to turn notification off (if the *Note* parameter is zero) or on (if the *Note* parameter is nonzero).

## Return Values

**0** Indicates successful completion.  
**-1** Indicates an error has occurred.

- The *errcode* field in the **g32\_api** structure is set to the error code identifying the error.
- The *xerrinfo* field can be set to give more information about the error.

## Examples

**Note:** The following example is missing the required **g32\_open** and **g32\_alloc** functions, which are necessary for every HCON Workstation API program.

The example fragment illustrates, in C language, the use of the **g32\_notify** function in an **api\_3270** mode program:

```
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/poll.h>
#include <sys/msg.h>
#include "g32_api.h"
```

```
*****
Note that the following function is an example of g32_notify function use.
It is meant to be called from an API application program that has already
performed a g32_open() or g32_openx() and a g32_alloc() function call. The
function will accept the as structure, a search pattern, and a timeout
(in seconds) as arguments. The purpose for calling this function is to
search for a certain pattern on the "screen" within a given amount of
time. As soon as the host updates the screen (presentation space), the
notification is sent (the poll returns with a success). This data may
not be your desired pattern, so this routine will retry until the timeout
is reached. The function will poll on the message queue and search the
presentation space each time the API is notified. If the pattern is found,
a success is returned. If the pattern is not found in the specified timeout
period, a failure (-1) is returned. The application should pass the timeout
value in seconds.
```

```
*****/
```

```

search_pres_space (as,pattern,timeout)
    struct g32_api *as;          /* Pointer to api structure */
    char *pattern;              /* Pattern to search for in
                                presentation space */
    int timeout;                /* The maximum time to wait before
                                returning a failure */
{
    char done=0;                /* Flag used to test if loop is
                                finished */
    int rc;                     /* return code */
    long msg;                   /* message buffer */
    unsigned long nfdmsgs;      /* Specified number of file
                                descriptors and number of
                                message queues to check. Low
                                order 16 bits is the number of
                                elements in array of pollfd.
                                High order 16 bits is number of
                                elements in array of pollmsg.*/

    struct pollmsg msglstptr;    /* structure defined in poll.h
                                contains message queue id,
                                requested events, and returned
                                events */

    timeout *= 1000             /* convert to milliseconds for
                                poll call */

    g32_notify (as, 1);         /* turn on the notify */
    rc = g32_search(as,pattern); /* search the presentation space
                                for the pattern */

    if (rc == 0) {
        done = 1;
    }
    /*Loop while the pattern not found and the timeout has not been
    reached */
    /* Note that this is done in 500 ms. increments */
    while ( !(done) && (timeout > 0) ) {
        /* wait a max of 500 ms for a response from the host */
        /* This is done via the poll system call */
        nfdmsgs = (1<<16);      /* One element in the msglstptr
                                array. Since the low order
                                bits are zero, they will be
                                ignored by the poll */

        msglstptr.msgid = as->eventf; /* The message queue id */
        msglstptr.reqevents = POLLIN; /*Set flag to check if input is
                                present on message queue */

        /* poll on the message queue. A return code of 1 signifies
        data from the host. An rc of 0 signifies a timeout. An
        rc < 0 signifies an error */
        rc = poll (&msglstptr,nfdmsgs,(long)500);
        rc = rc >> 16;          /* shift return code into low
                                order bits */

        /* If the poll found something, do another search */
        if (rc = 1) {
            /* call msgrcv system call, retrying until success */
            /* This is done to flush the IPC queue */
            do {
                rc = msgrcv(as->eventf,(struct msgbuf *)&msg,

                            (size_t)0,(long)1,IPC_NOWAIT|IPC_NOERROR);

            }
            while ( rc == G32ERROR);

            rc = g32_search (as,pattern); /* Search for pattern */
            /* if pattern is found, set done flag to exit loop */
            if (rc == 0) {
                done = 1;
            }
        }
    }
    timeout -= 500; /* decrement the timeout by 500ms */
}

```

```

    } /* end while */
    g32_notify (as,0); /* turn the notify off again */
    if (done) {
        return (0);      /* search was successful */
    }
    else {
        return (-1);    /* failure */
    }
}

```

---

## g32\_open Function

### Purpose

Attaches to a session. If the session does not exist, the session is started.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_open (as, flag, uid, pw, sessionname)
```

```
struct g32_api * as;
```

```
int flag;
```

```
char * uid;
```

```
char * pw;
```

```
char * sessionname;
```

### Pascal Syntax

```
function g32open(var as : g32_api; flag : integer;
```

```
    uid : stringptr;
```

```
    pw : stringptr;
```

```
    sessionname : stringptr) : integer; external;
```

### FORTRAN Syntax

```
INTEGER G32OPEN, RC, AS(9), FLAG
```

```
EXTERNAL G32OPEN
```

```
CHARACTER*XX UID, PW, SESSIONNAME
```

```
RC = G32OPEN(AS, FLAG, UID, PW, SESSIONNAME)
```

## Description

The **g32\_open** function attaches to a session with the host. If the session does not exist, the session is started automatically. The user is logged on to the host if requested. This function is a subset of the capability provided by the **g32\_openx** function. An application program must call the **g32\_open** or **g32\_openx** function before calling any other API function. If an API application is running implicitly, an automatic login is performed.

The **g32\_open** function can be nested for multiple opens as long as a distinct *as* structure is created and passed to each open. Corresponding API functions will map to each open session according to the *as* structure passed to each.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_open** function is part of the Host Connection Program (HCON).

The **g32\_open** function requires one or more adapters used to connect to a host.

CICS/VS and VSE/ESA do not support **API/API** or **API/API\_T** modes.

## C Parameters

<i>as</i>	Specifies a pointer to the <b>g32_api</b> structure. Status is returned in this structure.
<i>flag</i>	Signals whether the login procedure should be performed. Flag values are as follows: <ul style="list-style-type: none"><li>• If the emulator is running and the user is logged in to the host, the value of the <i>flag</i> parameter must be 0.</li><li>• If the emulator is running, the user is not logged in to the host, and the API logs in to the host, the value of the <i>flag</i> parameter must be set to 1.</li><li>• If the emulator is not running and the API application executes an automatic login/logoff procedure, the value of the <i>flag</i> parameter is ignored.</li></ul>
<i>uid</i>	Specifies a pointer to the login ID string if the <b>g32_open</b> function logs in to the host. If the login ID is a null string, the login procedure prompts the user for both the login ID and the password unless the host login ID is specified in the session profile in which case the user is prompted only for a password. The login ID is a string consisting of the host user ID and, optionally, a list of comma-separated AUTOLOG variables, which is passed to the implicit procedure. The following is a sample list of AUTOLOG variables: userid, node_id, trace, time=n,...
<i>pw</i>	Specifies a pointer to the password string associated with the login ID string. The following usage considerations apply to the <i>pw</i> parameter: <ul style="list-style-type: none"><li>• If no password is to be specified, the user can specify a null string.</li><li>• If no value is provided and the program is running implicitly, the login procedure prompts the user for the password.</li><li>• If the <i>uid</i> parameter is a null string, the <i>pw</i> parameter is ignored.</li></ul>
<i>sessionname</i>	Specifies a pointer to the name of a session. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters.

## Pascal Parameters

<i>as</i>	Specifies the <b>g32_api</b> structure.
-----------	---

<i>flag</i>	Signals whether the login procedure should be performed. <ul style="list-style-type: none"> <li>• If the emulator is running, the user is logged in to the host, and the API application executes as a subshell of the emulator, the value of the <i>flag</i> parameter must be 0.</li> <li>• If the emulator is running, the user is not logged in to the host, and the API application executes as a subshell of the emulator and the application is to perform an automatic login/logoff procedure, the value of the <i>flag</i> parameter must be set to 1.</li> <li>• If the emulator is not running and the API application executes an automatic login/logoff procedure, the value of the <i>flag</i> parameter is ignored.</li> </ul>
<i>uid</i>	Specifies a pointer to the login ID string. If the user ID is a null string, the login procedure prompts the user for both the user ID and the password unless the host login ID is specified in the session profile. In the latter case, the user is prompted only for a password.
<i>pw</i>	Specifies a pointer to the password string associated with the login ID string. If it points to a null string, the login procedure prompts the user for the password. This parameter is ignored if the <i>uid</i> parameter is a null string.
<i>sessionname</i>	Specifies a pointer to the name of a session, which indicates the host connectivity to be used by the API application. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters.

## FORTRAN Parameters

When creating strings in FORTRAN that are to be passed as parameters, the strings must be terminated by with a null character, CHAR(0).

Parameter	Description
AS	Specifies the <b>g32_api</b> equivalent structure as an array of integers.
FLAG	Signals whether the login procedure should be performed.
UID	Specifies a pointer to the login ID string. If the user ID is a null string, the login procedure prompts the user for both the user ID and the password unless the host login ID is specified in the session profile. In the latter case, the user is prompted only for a password.
PW	Specifies a pointer to the password string associated with the login ID string. If the parameter specifies a null string, the login procedure prompts the user for the password. This parameter is ignored if the <i>uid</i> parameter is a null string.
SESSIONNAME	Specifies the name of a session, which indicates the host connectivity to be used by the API application. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters.

## Return Values

Upon successful completion:

- A value of 0 is returned.
- The `lpid` field in the **g32\_api** structure is set to the session ID.

Upon unsuccessful completion:

- A value of -1 is returned.
- The `errcode` field in the **g32\_api** structure is set to an error code identifying the error.
- The `xerrinfo` field can be set to give more information about the error.

## Examples

The following example fragment illustrates the use of the **g32\_open** function in an **api\_3270** mode program in C language:

```
#include <g32_api.h>
main()
{
    struct g32_api *as, asx; /* asx is statically
                           declared*/
}
```

```

int flag=0;
int ret;
as = &asx;      /* as points to an
                  allocated structure */
ret=g32_open(as,flag,"mike","mypassword","a");
.
.
.
}

```

The following example fragment illustrates the use of the **g32\_open** function in an **api\_3270** mode program in Pascal language:

```

program apitest (input, output);
const
%include /usr/include/g32const.inc
type
%include /usr/include/g32types.inc
var
  as : g32_api;
  rc : integer;
  flag : integer;
  sn : stringptr;
  ret : integer;
  uid, pw : stringptr;
%include /usr/include/g32hfile.inc
begin
  flag := 0;
  new(uid,20);
  uid@ := chr(0);
  new (pw,20);
  pw@ := chr(0);
  new (sn,1);
  sn@ := 'a';
  ret := g32open(as,flag,uid,pw,sn);
  .
  .
  .
end.

```

The following example fragment illustrates the use of the **g32\_open** function in an **api\_3270** mode program in FORTRAN language:

```

INTEGER G32OPEN
INTEGER RC, AS(9), FLAG
CHARACTER*20 UID
CHARACTER*10 PW
CHARACTER*2 SN
EXTERNAL G32OPEN
UID = CHAR(0)
PW = CHAR(0)
SN = 'a'//CHAR(0)
FLAG = 0
RC = G32OPEN(AS, FLAG, UID, PW, SN)
.
.
.

```

---

## g32\_openx Function

### Purpose

Attaches to a session and provides extended open capabilities. If the session does not exist, the session is started.

## Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

## C Syntax

```
#include <g32_api.h>
g32_openx (as, flag, uid, pw, sessionname, timeout)

struct g32_api * as;

int flag;

char * uid;

char * pw;

char * sessionname;

char * timeout;
```

## Pascal Syntax

```
function g32openx(var as : g32_api; flag: integer;

    uid : stringptr;

    pw : stringptr;

    sessionname : stringptr;

    timeout : stringptr) : integer; external;
```

## FORTRAN Syntax

INTEGER G32OPENX, RC, AS(9), FLAG

EXTERNAL G32OPENX

CHARACTER\* XX UID, PW, SESSIONNAME

RC = G32OPENX (AS, FLAG, UID, PW, SESSIONNAME, TIMEOUT)

## Description

The **g32\_openx** function attaches to a session. If the session does not exist, the session is started. This is an automatic login. The user is logged in to the host if requested. The **g32\_openx** function provides additional capability beyond that of the **g32\_open** function. An application program must call **g32\_openx** or **g32\_open** before any other API function.

If an API application is run automatically, the function performs an automatic login.

The **g32\_openx** function can be nested for multiple opens as long as a distinct *as* structure is created and passed to each open. Corresponding API functions will map to each open session according to the *as* structure passed to each.



HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Applications programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_openx** function is part of the Host Connection Program (HCON).

The **g32\_openx** function requires one or more adapters used to connect to a host.

CICS® and VSE do not support **API/API** or **API/API\_T** modes.

## C Parameters

The **g32\_openx** function allows for a varying number of parameters after the *flag* parameter. The *as* and *flag* parameters are required; the *uid*, *pw*, *session*, and *timeout* parameters are optional.

With the **g32\_open** function, the *timeout* parameter does not exist and the parameters for *uid*, *pw*, and *session* are not optional. The reason for making the last four parameters optional is that the system either prompts for the needed information (*uid* and *pw*) or defaults with valid information (*session* or *timeout*).

Unless all of the parameters are defined for this function, the parameter list in the calling statement must be terminated with the integer 0 (like the **exec** function). Providing an integer of 1 forces a default on a parameter. Use the default to provide a placeholder for optional parameters that you do not need to supply.

Parameter	Description
<i>as</i>	Specifies a pointer to the <b>g32_api</b> structure.
<i>flag</i>	Requires one of the following: <ul style="list-style-type: none"> <li>• Set the <i>flag</i> parameter to 0, if the emulator is running and the user is logged on to host.</li> <li>• Set the <i>flag</i> parameter to 1 if the emulator is running, the user is not logged on to host, and the API application is to perform the login/logoff procedure.</li> </ul> <p>The <b>g32_openx</b> function ignores the <i>flag</i> parameter, if the emulator is not running and the API application executes an automatic login/logoff procedure.</p>
<i>uid</i>	Specifies a pointer to the login ID string. If the login ID is a null string, the login procedure prompts the user for both the login ID and the password, unless the host login ID is specified in the session profile. In the latter case the user is prompted only for a password. The login ID is a string consisting of the host user ID and an optional list of additional variables separated by commas, as shown in the example: <pre>userid,var1,var2,...</pre> <p>In this example, <i>var1</i> is the login script name (when using AUTOLOG) and <i>var2</i> is the optional trace and time values. The list is passed to the automatic procedure.</p>
<i>pw</i>	Specifies a pointer to the password string associated with the login ID string. The following usage considerations apply to the <i>pw</i> parameter: <ul style="list-style-type: none"> <li>• If no password is to be specified, the user can specify a null string.</li> <li>• If no value is provided and the program is running automatically, the login procedure prompts the user for the password.</li> <li>• If the <i>uid</i> parameter is a null string, the <i>pw</i> parameter is ignored.</li> </ul>
<i>sessionname</i>	Points to the name of a session. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Parameters for each session are specified in a per session profile.
<i>timeout</i>	Specifies a pointer to a numerical string that specifies the amount of nonactive time in seconds allowed to occur between the workstation and the host operations (that is, <b>g32_read</b> and <b>G32WRITE</b> ). This parameter is optional. If no value is provided in the calling statement, the default value is 15. The minimum value allowed is 1. There is no maximum value limitation.

## Pascal Parameters

When using C as a programming language, you can make use of the feature of variable numbered parameters. In Pascal, however, this feature is not allowed. Therefore, calls to the **g32\_openx** function must contain all six parameters.

To use defaults for the four optional parameters of C, provide a variable whose value is a null string.

**Note:** The use of the integer 1 is not allowed in the Pascal version of the **g32\_openx** function. Space must be allocated for any string pointers prior to calling the **g32\_openx** function.

Parameter	Description
<i>as</i>	Specifies the <b>g32_api</b> structure.
<i>flag</i>	Signals whether the login procedure should be performed: <ul style="list-style-type: none"><li>• Set the <i>flag</i> parameter to 0. If the emulator is running, the user is logged on to host.</li><li>• Set the <i>flag</i> parameter to 1. If the emulator is running, the user is not logged on to host, and the API application performs the login/logoff procedure.</li><li>• If the emulator is not running and the API application executes an automatic login/logoff procedure, the value of <i>flag</i> is ignored.</li></ul>
<i>uid</i>	Specifies a pointer to the login ID string. If the login ID is a null string, the login procedure prompts the user for both the login ID and the password, unless the host login ID is specified in the session profile. In the latter case the user is prompted only for a password.
<i>pw</i>	Specifies a pointer to the password string associated with the login ID string. The following usage considerations apply to the <i>pw</i> parameter: <ul style="list-style-type: none"><li>• If no password is to be specified, the user can specify a null string.</li><li>• If no value is provided and the program is running automatically, the login procedure prompts the user for the password.</li><li>• If the <i>uid</i> parameter is a null string, the <i>pw</i> parameter is ignored.</li></ul>
<i>sessionname</i>	Points to the name of a session. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Parameters for each session are specified in a per session profile.
<i>timeout</i>	Specifies a pointer to a numerical string that specifies the amount of nonactive time in seconds allowed to occur between the workstation and the host operations (that is, <b>g32_read</b> and <b>g32WRITE</b> ). This parameter is optional. If no value is provided in the calling statement, the default value is 15. The minimum value allowed is 1. There is no maximum value limitation.

## FORTRAN Parameters

FORTRAN calls to **G32\_OPENX** *must* contain all six parameters. To use defaults for the four optional parameters of C language, provide a variable whose value is a null string. Note that the use of the integer 1 is not allowed in the FORTRAN version of this function. When creating strings in FORTRAN that are to pass as parameters, the strings must be linked with a null character, CHAR(0).

Parameter	Description
<i>AS</i>	Specifies the <b>g32_api</b> equivalent structure as an array of integers.
<i>FLAG</i>	Signals that the login procedure should be performed: <ul style="list-style-type: none"><li>• Set the <i>FLAG</i> parameter to 0, if the emulator is running, the user is logged on to host.</li><li>• Set the <i>FLAG</i> parameter to 1, if the emulator is running, the user is not logged on to host.</li><li>• If the emulator is not running and the API application executes an automatic login/logoff procedure, the value of the <i>FLAG</i> parameter is ignored.</li></ul>
<i>UID</i>	Specifies a pointer to the login ID string. If the login ID is a null string, the login procedure prompts the user for both the login ID and the password, unless the host login ID is specified in the session profile. In the latter case the user is prompted only for a password.

Parameter	Description
<i>PW</i>	Specifies a pointer to the password string associated with the login ID string. The following usage considerations apply to the <i>pw</i> parameter: <ul style="list-style-type: none"> <li>• If no password is to be specified, the user can specify a null string.</li> <li>• If no value is provided and the program is running automatically, the login procedure prompts the user for the password.</li> <li>• If the <i>uid</i> parameter is a null string, the <i>pw</i> parameter is ignored.</li> </ul>
<i>SESSIONNAME</i>	Specifies the name of a session. The session name is a single character in the range of a through z. Capital letters are interpreted as lowercase letters. Parameters for each session are specified in a per session profile.
<i>TIMEOUT</i>	Specifies a numerical string that specifies the amount of nonactive time in seconds allowed to occur between the workstation and the host operations (that is, <b>g32_read/g32WRITE</b> ). There is no maximum to this, but the minimum is 1.

## Return Values

- 0** Indicates successful completion. The *lpid* field in the **g32\_api** structure is set to the session ID.
- 1** Indicates an error has occurred.
- The *errcode* field in the **g32\_api** structure is set to an error code identifying the error.
  - The *xerrinfo* field can be set to give more information about the error.

## Examples

1. To use the **g32\_openx** function with fewer than four optional string constant parameters specified and with **AUTOLOG**, enter:

```
g32_openx (AS, 0, "john, tso, trace", "j12hn");
```

2. To use the **g32\_openx** function with fewer than four optional string constant parameters specified and with the automatic login facility, enter:

```
g32_openx (AS, 1, "john", "j12hn", "Z", 0);
```

3. To use the **g32\_openx** function with all optional parameters not specified, enter:

```
g32_openx (AS, 1, 0);
```

OR

```
g32_openx (AS, 0, 0);
```

4. To use the **g32\_openx** function with four variable optional parameters, enter:

```
g32_openx (AS, 0, UID, Pw, Sessionname, TimeOut);
```

5. To use the **g32\_openx** function with fewer than four variable optional parameters, enter:

```
g32_openx (AS, 1, UID, Pw, 0);
```

6. To use the **g32\_openx** function with two default optional parameters, enter:

```
g32_openx (AS, 0, 1, 1, 1, "60");
```

7. To use the **g32\_openx** function with a mixture:

```
g32_openx (AS, 0, 1, 1, Session, 0);
```

8. To use the **g32\_openx** function within a program segment in the C language:

```
#include <g32_api.h>
main()
{
    struct g32_api *as, asx;          /* asx is a temporary struct */
                                    /* g32.api so that storage */
                                    /* is allocated */

    int flag=0;
    int ret;
```

```

sn = &nm;
as = &asx;          /* as points to an allocated structure */
ret=g32_openx(as,flag,"mike","mypassword","a","60");
.
.
.
}

```

**Note:** Only the first two parameters are mandatory. The remaining parameters can be terminated with a 0. For example:

```
ret = g32_openx(as.flag,0);
```

Null characters may be substituted for any of the string values if profile or command values are desired.

9. To use the **g32\_openx** function within a program segment in the Pascal language:

```

program apitest (input, output);
const
%include /usr/include/g32const.inc
type
%include /usr/include/g32types.inc
var
  as : g32_api;
  rc : integer;
  flag : integer;
  sn : stringptr;
  timeout : stringptr;
  ret : integer;
  uid, pw : stringptr;
%include /usr/include/g32hfile.inc
begin
  flag := 0;
  new(uid,20);
  uid@ := chr(0);
  new (pw,20);
  pw@ := chr(0);
  new (sn,1);
  sn@ := 'a';
  new (timeout,32);
  timeout@ := '60';
  ret := g32openx(as,flag,uid,pw,sn,timeout);
  .
  .
  .
end.

```

10. To use the **g32\_openx** function within a program segment in the FORTRAN language:

```

INTEGER G32OPENX
INTEGER RC, AS(9), FLAG
CHARACTER*20 UID
CHARACTER*10 PW
CHARACTER*10 TIMEOUT
CHARACTER*1 SN
EXTERNAL G32OPENX
UID = CHAR(0)
TIMEOUT = CHAR(0)
MODEL = CHAR(0)
PW = CHAR(0)
SN = 'a'//CHAR(0)
TIMEOUT = '60'//CHAR(0)
FLAG = 0
RC = G32OPENX(AS, FLAG, UID, PW, SN, TIMEOUT)
.
.
.

```

---

## g32\_read Function

### Purpose

Receives a message from a host application.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_read ( as, msgbuf, msglen)
```

```
struct g32_api *as;
```

```
char **msgbuf;
```

```
int *msglen;
```

### Pascal Syntax

```
function g32read (var as : g32_api;  
  var buffer : stringptr;  
  var msglen : integer) : integer; external;
```

### FORTTRAN Syntax

```
EXTERNAL G32READ
```

```
INTEGER AS(9), BUFLen, G32READ
```

```
CHARACTER *XX MSGBUF
```

```
RC= G32READ ( AS, MSGBUF, BUFLen)
```

### Description

The **g32\_read** function receives a message from a host application. The **g32\_read** function may only be used by those applications having API/API or API/API\_T mode specified with the **g32\_alloc** function.

- In C or Pascal, a buffer is obtained, a pointer to the buffer is saved, and the message from the host is read into the buffer. The length of the message and the address of the buffer are returned to the user application.
- In FORTRAN, the calling procedure must pass a buffer large enough for the incoming message. The **BUFLen** parameter must be the actual size of the buffer. The **G32READ** function uses the **BUFLen** parameter as the upper array bound. Therefore, any messages larger than **BUFLen** are truncated to fit the buffer.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_read** function is part of the Host Connection Program (HCON).

The **g32\_read** function requires one or more adapters used to connect to a host.

In a DBCS environment, the **g32\_read** function only reads SBCS data from a host in the **MODE\_API\_T** mode.

## C Parameters

<i>as</i>	Specifies a pointer to a <b>g32_api</b> structure.
<i>msgbuf</i>	Specifies a pointer to a buffer where a message from the host is placed. The API obtains space for this buffer by using the <b>malloc</b> library subroutine, and the user is responsible for releasing it by issuing a <b>free</b> call after the <b>g32_read</b> function.
<i>msglen</i>	Specifies a pointer to an integer where the length, in bytes, of the <i>msgbuf</i> parameter is placed. The message length must be greater than 0 but less than or equal to the maximum I/O buffer size parameter specified in the HCON session profile.

## Pascal Parameters

<i>as</i>	Specifies the <b>g32_api</b> structure.
<i>buffer</i>	Specifies a <b>stringptr</b> structure. The API obtains space for this buffer by using the <b>malloc</b> C library subroutine, and the user is responsible for releasing it by issuing a <b>dispose</b> subroutine after the <b>g32_read</b> function.
<i>msglen</i>	Specifies an integer where the number of bytes read is placed. The message length must be greater than 0 (zero) but less than or equal to the maximum I/O buffer size parameter specified in the HCON session profile.

## FORTRAN Parameters

<i>AS</i>	Specifies the <b>g32_api</b> equivalent structure.
<i>BUFLen</i>	Specifies the size, in bytes, of the value contained in the <i>MSGBUF</i> parameter. The message length must be greater than 0 and less than or equal to the maximum I/O buffer size parameter specified in the HCON session profile.
<i>MSGBUF</i>	Specifies the storage area for the character data read from the host.

## Return Values

> 0 (greater than or equal to zero)  
-1

Indicates successful completion.  
Indicates an error has occurred.

- The *errcode* field in the **g32\_api** structure is set to the error code identifying the error.
- The *xerrinfo* field can be set to give more information about the error.

## Examples

The following example illustrates the use of the **g32\_read** function in C language.

```
#include <g32_api>      /* API include file */
main()
{
  struct g32_api *as, asx /* g32_api structure */
  char **msg_buf;        /* pointer to host msg buffer */
  char *messg;          /* pointer to character string */
  int msg_len;          /* pointer to host msg length */
  char * malloc();      /* C memory allocation function */
  int return;           /* return code is no. of bytes read */
  .
  .
  .
```

```

as = &asx;
msg_buff = &messg;      /* point to a string */
return = g32_read(as, msg_buff, &msg_len);
.
.
.
free (*msg_buff);
.
.
.

```

---

## g32\_search Function

### Purpose

Searches for a character pattern in a presentation space.

### Libraries

HCON Library  
C (**libg3270.a**)  
Pascal (**libg3270p.a**)  
FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```

g32_search ( as, pattern)
struct g32_api *as;
char *pattern;

```

### Pascal Syntax

```

function g32srch(var as : g32_api;
  pattern : stringptr) : integer; external;

```

### FORTRAN Syntax

```
EXTERNAL G32SEARCH
```

```
INTEGER AS(9), G32SEARCH
```

```

CHARACTER *XX PATTERN
RC = G32SEARCH(AS, PATTERN)

```

### Description

The **g32\_search** function searches for the specified byte pattern in the presentation space associated with the application.

**Note:** The **g32\_search** function can only be used in API/3270 mode.

The search is performed from the row and column given in the **g32\_api** structure to the end of the presentation space. Note that the row and column positions start at 1 (one) and not 0. If you start at 0 for row and column, an invalid position error will result.

The **g32\_search** function is part of the Host Connection Program (HCON).

The **g32\_search** function requires one or more adapters used to connect to a host.

In a DBCS environment, the **g32\_search** function only searches the presentation space for an SBCS character pattern. This function does not support Katakana or DBCS characters.

## Pattern Matching

In any given search pattern, the following characters have special meaning:

Character	Description
?	The question mark is the arbitrary character, matching any one character.
*	The asterisk is the wildcard character, matching any sequence of zero or more characters.
\	The backslash is the escape character meaning the next character is to be interpreted literally.

**Note:** The pattern cannot contain two consecutive wildcard characters.

## Pattern Matching Example

The string AB?DE matches any of ABCDE, AB9DE, ABxDE, but does not match ABCD, ABCCDE, or ABDE.

The string AB\*DE matches any of ABCDE, AB9DE, ABCCDE, ABDE, but does not match ABCD, ABCDF, or ABC.

## Pattern Matching in C and Pascal

If the pattern needs to contain either a question mark or an asterisk as a literal character, these symbols must be preceded by two escape characters (\\? or \\\*). For example, to search for the string, How are you today?, the pattern might be:

```
How are you today \\?
```

The backslash can be used as a literal character by specifying four backslash characters (\\\\) in the pattern. For example, to search for the string, We found the \., the pattern might be:

```
We found the \\\\. 
```

## Pattern Matching in FORTRAN

If the pattern needs to contain either a question mark or an asterisk as a literal character, these symbols must be preceded by one escape character (\? or \\*). For example, to search for the string, How are you today?, the pattern might be:

```
How are you today\?
```

The backslash can be used as a literal character by specifying two backslash characters (\\) in the pattern. For example, to search for the string, We found the \., the pattern might be:

```
We found the \\. 
```

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Application programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

## C Parameters

<i>as</i>	Specifies a pointer to a <b>g32_api</b> structure. It also contains the row and column where the search should begin. Status information is returned in this structure.
<i>pattern</i>	Specifies a pointer to a byte pattern, which is searched for in the presentation space.



## Pascal Parameters

- as* Specifies the **g32\_api** structure.
- pattern* Specifies a pointer to a string containing the pattern to search for in the presentation space. The string must be at least as long as the length indicated in the **g32\_api** structure.

## FORTRAN Parameters

- AS* Specifies a **g32\_api** equivalent structure as an array of integers.
- PATTERN* Specifies a string that is searched for in the presentation space.

## Return Values

- 0** Indicates successful completion.
- The corresponding *row* field of the *as* structure is the row position of the beginning of the matched string.
  - The corresponding *column* field of the *as* structure is the column position of the beginning of the matched string.
  - The corresponding *length* field of the *as* structure is the length of the matched string.
- 1** Indicates an error has occurred.
- The *errcode* field in the **g32\_api** structure is set to the error code identifying the error.
  - The *xerrinfo* field can be set to give more information about the error.

## Examples

**Note:** The following example is missing the required **g32\_open** and **g32\_alloc** functions which are necessary for every HCON Workstation API program.

The following example fragment illustrates the use of the **g32\_search** function in an **api\_3270** mode program in C language:

```
#include <g32_api.h>           /* API include file */
#include <g32_keys.h>
main()
{
  struct g32_api *as;         /* g32 structure */
  char *buffer;              /* pointer to char string */
  int return;                 /* return code */
  char *malloc();            /* C memory allocation
                             function */
  .
  .
  .
  return = g32_notify(as,1);  /* Turn notification on */
  buffer = malloc(10);
  return = g32_get_cursor(as); /* get location of cursor */
  printf (" The cursor position is row: %d col: %d/n",
         as -> row, as -> column);

  /* Get data from host starting at the current row and column */
  as -> length = 10;          /* length of a pattern on host */
  return = g32_get_data(as,buffer); /* get data from host */
  printf("The data returned is <%s>\n",buffer);

  /* Try to search for a particular pattern on host */
  as ->row =1;                /* row to start search */
  as ->column =1;             /* column to start search */
  return = g32_search(as,"PATTERN");
  /*Send a clear key to the host */
```

```
return = g32_send_keys(as,CLEAR);
/* Turn notification off */
return = g32_notify(as,0);
.
.
.
```

---

## g32\_send\_keys Function

### Purpose

Sends key strokes to the terminal emulator.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
#include <g32_keys.h>
```

```
g32_send_keys ( as, buffer)
```

```
struct g32_api *as;
```

```
char *buffer;
```

### Pascal Syntax

```
const
```

```
%include /usr/include/g32keys.inc
```

```
function g32sdky (var as : g32_api;
  buffer : stringptr) : integer; external;
```

### FORTTRAN Syntax

```
EXTERNAL G32SENDKEYS
```

```
INTEGER AS(9), G32SENDKEYS
```

```
CHARACTER *XX BUFFER
```

```
RC = G32SENDKEYS( AS, BUFFER)
```

### Description

The **g32\_send\_keys** function sends one or more key strokes to a terminal emulator as though they came from the keyboard. ASCII characters are sent by coding their ASCII value. Other keys (such as Enter and the cursor-movement keys) are sent by coding their values from the **g32\_keys.h** file (for C programs) or **g32keys.inc** file (for Pascal programs). FORTRAN users send other keys by passing the name of the key through the **G32SENDKEYS** buffer.

**Note:** The **g32\_send\_keys** function can only send 128 characters per call. The **g32\_send\_keys** function can be chained when more than 128 characters must be sent.

The **g32\_send\_keys** function can only be used in API/3270 mode.

The **g32\_send\_keys** function is part of the Host Connection Program (HCON).

The **g32\_send\_keys** function requires one or more adapters used to connect to a host.

In a DBCS environment, the **g32\_send\_keys** function only sends SBCS keystrokes, including ASCII characters, to a terminal emulator. DBCS characters are ignored.

## C Parameters

*as* Specifies a pointer to the **g32\_api** structure. Status is returned in this structure.  
*buffer* Specifies a pointer to a buffer of key stroke data.

## Pascal Parameters

*as* Specifies the **g32\_api** structure. Status is returned in this structure.  
*buffer* Specifies a pointer to a string containing the keys to be sent to the host. The string must be at least as long as indicated in the **g32\_api** structure.

## FORTRAN Parameters

*AS* Specifies the **g32\_api** equivalent structure as an array of integers.  
*BUFFER* The character array containing the key sequence to send to the host. A special emulator key can be sent by the **g32\_send\_keys** function as follows:  
BUFFER = 'ENTER'//CHAR(0)  
RC = G32SENDKEYS (AS,BUFFER)

The special emulator strings recognized by the **g32\_send\_keys** function are as follows:

CLEAR	DELETE	DUP	ENTER
EOF	ERASE	FMARK	HOME
INSERT	NEWLINE	RESET	SYSREQ
LEFT	RIGHT	UP	DOWN
LLEFT	RRIGHT	UUP	DDOWN
TAB	BTAB	ATTN	
PA1	PA2	PA3	
PF1	PF2	PF3	PF4
PF5	PF6	PF7	PF8
PF9	PF10	PF11	PF12
PF13	PF14	PF15	PF16
PF17	PF18	PF19	PF20
PF21	PF22	PF23	PF24
			CURSEL

## Return Values

**0** Indicates successful completion.  
**-1** Indicates an error has occurred.

- The *errcode* field in the **g32\_api** structure is set to the error code identifying the error.
- The *xerrinfo* field can be set to give more information about the error.

## Examples

**Note:** The following example is missing the required **g32\_open** and **g32\_alloc** functions which are necessary for every HCON workstation API program.

The following example fragment illustrates, in C language, the use of the **g32\_send\_keys** function in an **api\_3270** mode program:

```
#include <g32_api.h>          /* API include file */
#include <g32_keys.h>
main()
{
  struct g32_api *as;        /* g32 structure */
  char *buffer;             /* pointer to char string */
  int return;               /* return code */
  char *malloc();           /* C memory allocation
                             function */
  .
  .
  .
  return = g32_notify(as,1); /* Turn notification on */
  buffer = malloc(10);
  return = g32_get_cursor(as); /* get location of cursor */
  printf (" The cursor position is row: %d col: %d/n",
         as -> row, as -> column);
  /* Get data from host starting at the current row and column */
  as -> length = 10;        /* length of a pattern on host */
  return = g32_get_data(as,buffer); /* get data from host */
  printf("The data returned is <%s>\n",buffer);
  /* Try to search for a particular pattern on host */
  as ->row =1;              /* row to start search */
  as ->column =1;           /* column to start search */
  return = g32_search(as,"PATTERN");
  /*Send a clear key to the host */
  return = g32_send_keys(as,CLEAR);
  /* Turn notification off */
  return = g32_notify(as,0);
  .
  .
  .
}
```

---

## g32\_write Function

### Purpose

Sends a message to a host application.

### Libraries

HCON Library

C (**libg3270.a**)

Pascal (**libg3270p.a**)

FORTRAN (**libg3270f.a**)

### C Syntax

```
#include <g32_api.h>
```

```
g32_write ( as, msgbuf, msglen)
```

```
struct g32_api *as;
```

```
char *msgbuf;
```

```
int msglen;
```

### Pascal Syntax

```
function g32wrte (var as : g32_api;  
  buffer : integer;  
  msglen : integer) : integer; external;
```

# FORTRAN Syntax

EXTERNAL G32WRITE

INTEGER AS(9), MSGLEN, G32WRITE

CHARACTER\* XX MSGBUF

RC = G32WRITE(AS, MSGBUF, MSGLEN)

## Description

The **g32\_write** function sends the message pointed to by the *msgbuf* parameter to the host. This function may only be used by those applications having API/API or API/API\_T mode specified by the **g32\_alloc** command.

HCON application programs using the Pascal language interface must include and link both the C and Pascal libraries. Applications programs using the FORTRAN language for the HCON API must include and link both the C and FORTRAN libraries.

The **g32\_write** function is part of the Host Connection Program (HCON).

The **g32\_write** function requires one or more adapters used to connect to a host.

In a DBCS environment, the **g32\_write** function only sends SBCS data to a host in the MODE\_API\_T mode.

## C Parameters

*as* Specifies the pointer to a **g32\_api** structure.  
*msgbuf* Specifies a pointer to a message, which is a byte string.  
*msglen* Specifies the length, in bytes, of the message pointed to by the *msgbuf* parameter. The value of the *msglen* parameter must be greater than 0 and less than or equal to the maximum I/O buffer size specified in the HCON session profile.

## Pascal Parameters

*as* Specifies the **g32\_api** structure.  
*buffer* Specifies an address of a character-packed array.  
**Note:** The address of a packed array can be obtained by the **addr()** function call: *buffer* := **addr** (<msg array name> [1]).  
*msglen* Specifies an integer indicating the length of the message to send to the host. The *msglen* parameter must be greater than 0 and less than or equal to the maximum I/O buffer size specified in the HCON session profile.

## FORTRAN Parameters

*AS* Specifies the **g32\_api** equivalent structure as an array of integers.  
*MSGBUF* Specifies a character array containing the data to be sent to the host.  
*MSGLEN* Specifies the number of bytes to be sent to the host. The *MSGLEN* parameter must be greater than 0 and less than or equal to the maximum I/O buffer size specified in the HCON session profile.

## Return Values

> 0 (greater than or equal to zero) Indicates successful completion.

-1

Indicates an error has occurred.

- The `errcode` field in the `g32_api` structure is set to the error code identifying the error.
- The `xerrinfo` field can be set to give more information about the error.

## Examples

The following example illustrates, in C language, the use of the `g32_write` function:

```
#include <g32_api>      /* API include */
main()
{
  struct g32_api *as;    /* the g32 structure */
  char *messg;          /* pointer to a character string to
                        send to the host */
  int length;          /* Number of bytes sent */
  char *malloc();       /* C memory allocation function */
  int return;          /* return code is no. of bytes sent */
  .
  .
  .
  messg = malloc(30);    /* allocate 30 bytes for the string */
                        /* initialize message string with information */
  strcpy(messg,"string to be sent to host/0");
  length = strlen(messg); /* length of the message */
  return = g32_write(as,messg,length);
  .
  .
  .
}
```

---

## G32ALLOC Function

### Purpose

Starts interaction with an API application running simultaneously on the local system.

### Syntax

`G32ALLOC`

### Description

The `G32ALLOC` function starts a session with an application program interface (API) application by sending a message to the `g32_alloc` system call indicating that the allocation is complete. The `G32ALLOC` function is a HCON API function that can be called by a 370 Assembler application program.

The `G32ALLOC` function is part of the Host Connection Program (HCON).

The `G32ALLOC` function requires one or more adapters used to connect to a mainframe host.

### Return Values

This call sets register 0 to the following values:

Value	Description
> 0	Indicates a normal return or a successful call. The value returned indicates the maximum number of bytes that may be transferred to an operating system application by way of <code>G32WRITE</code> or received from an operating systems application by way of <code>G32READ</code> .
< 0	Indicates less than 0. Host API error condition.

## Examples

The following 370 Assembler code example illustrates the use of the host **G32ALLOC** function:

```
L R11,=v(G32DATA)
USING G32DATAD,R11
G32ALLOC          /* Allocate a session */
LTR R0,R0
BNM OK           /* Normal completion */
C R0,G32ESESS    /* Session error */
BE SESSERR
C R0,G32ESYS     /* System error */
BE SYSERR
.
.
.
```

## Related Information

Session control subroutines are the **g32\_alloc** subroutine, **g32\_close** subroutine, **g32\_dealloc** subroutine, **g32\_open** subroutine, and **g32\_openx** subroutine.

Message interface subroutines are the **g32\_get\_status** subroutine, **g32\_read** subroutine, and **g32\_write** subroutine.

Additional host interface functions are the **G32DLLOC** function, **G32READ** function, and **G32WRITE** function.

---

## G32DLLOC Function

### Purpose

Terminates interaction with an API application running simultaneously on the local system.

### Syntax

**G32DLLOC**

### Description

The **G32DLLOC** function ends interaction with an API application. The **G32DLLOC** function is a HCON API function that can be called by a 370 Assembler applications program.

The **G32DLLOC** function requires one or more adapters used to connect to a mainframe host.

### Return Values

This call sets register 0 (zero) to the following values:

Value	Description
0	Indicates a normal return or a successful call.
< 0	Indicates less than zero. An error condition exists.

## Examples

The following 370 Assembler code example illustrates the use of the host **G32DLLOC** function:

```
L R11,=v(G32DATA)
USING G32DATAD,R11
G32DLLOC          /* Deallocate a session. */
C R0, G32ESESS    /* Check for G32 error. */
BE SESSERR        /* Branch if error. */
C R0, G32ESYS     /* Check for system error. */
```

```
BE    SYSERR          /* Branch if error.      */
.
.
.
```

## Related Information

Session control subroutines are the **g32\_alloc** subroutine, **g32\_close** subroutine, **g32\_dealloc** subroutine, **g32\_open** subroutine, and **g32\_openx** subroutine.

Message interface subroutines are the **g32\_read** subroutine, **g32\_get\_status** subroutine, and **g32\_write** subroutine.

Additional host interface functions are the **G32ALLOC** function, **G32READ** function, and **G32WRITE** function.

---

## G32READ Function

### Purpose

Receives a message from the API application running simultaneously on the local system.

### Syntax

```
G32READ
```

### Description

The **G32READ** function receives a message from an application programming interface (API) application. The **G32READ** function returns when a message is received. The status of the transmission is returned in register zero (R0).

The **G32READ** function returns the following information:

#### Return Description

<b>R0</b>	Indicates the number of bytes read.
<b>R1</b>	Indicates the address of the message buffer.

In VM/CMS, storage for the **read** command is obtained using the **DMSFREE** macro. R0 contains the number of bytes read. R1 contains the address of the buffer. It is the responsibility of the host application to release the buffer with a **DMSFRET** call. Assuming the byte count and address are in R0 and R1, respectively, the following code fragment should be used to free the buffer:

The **G32READ** function is part of the Host Connection Program (HCON).

The **G32READ** function requires one or more adapters used to connect to a mainframe host.

```
SRL  R0,3
A    R0,=F'1'
DMSFRET DWORDS=(0),LOC=(1)
```

In MVS/TSO, storage for the **READ** command is obtained using the **GETMAIN** macro. R0 contains the number of bytes read. R1 contains the address of the buffer. The host application must release the buffer with a **FREEMAIN** call.

**Attention:** In MVS/TSO, when programming an API assembly language application, you must be careful with the **TPUT** macro. If it is used in a sequence of **G32READ** and **G32WRITE** subroutines, it



will interrupt the API/API mode and switch the host to the API/3270 mode to exit. You will not be able to get the API/API mode back until you send the Enter key.

## Return Values

The **G32READ** function sets register zero (R0) to the following values:

Value	Description
> 0	Normal return. Indicates the length of the message as the number of bytes read.
< 0	Less than zero. Indicates a host API error condition.

## Examples

The following 370 Assembler code example illustrates the use of the host **G32READ** function:

```
      .  
      .  
      .  
MEMORY L 12,=v(G32DATA)      /* SET POINTER TO API DATA AREA */  
      .  
      .  
      L 2,=F`2'  
G32READ      /* RECEIVE MESSAGE FROM AIX® */  
ST 1,ADDR      /* STORE ADDRESS OF MESSAGE */  
ST 0,LEN      /* STORE LENGTH OF MESSAGE */  
BAL 14,CHECK  
      .  
      .  
      .
```

## Related Information

For documentation on the **DMSFREE** and **DMSFRET** macros, consult the *VM/SP Entry System Programmer's Guide*.

For documentation on the **GETMAIN** and **FREEMAIN** macros, consult the *MVS/XA System Macros and Facilities, Volume 2* or *MVS/XA Supervisor Services and Macros*.

---

## G32WRITE Function

### Purpose

Sends a message to an API application running simultaneously on the local system.

### Syntax

```
G32WRITE MSG, LEN
```

### Description

The **G32WRITE** function sends a message to an API application. The maximum number of bytes that may be transferred is specified by the value returned in register zero (R0) after a successful completion of the **G32ALLOC** function.

The **G32 WRITE** function is a HCON API function that can be called by a 370 Assembler applications program.

The **G32WRITE** function requires one or more adapters used to connect to a mainframe host.

## Parameters

*MSG* Gives the address of the message to be sent. It may be:

*Label* A label on a DC or DS statement declaring the message.

*0(reg)* A register containing the address of the message.

*LEN* Specifies the length, in bytes, of the message. It is a full word, whose contents cannot exceed the value returned by the **G32ALLOC** function in R0. It must be:

*Label* The address of a full word containing the length of the message.

## Return Values

The **G32WRITE** function sets register 0 to the following values:

Value	Description
0	Indicates a normal return; call successful.
< 0	Less than 0. Indicates a host API error condition.

## Examples

The following 370 Assembler code example illustrates the use of the host **G32WRITE** function:

```
L R11,=v(G32DATA)
USING G32DATAD,R11
G32WRITE MSG1, LEN1      /* write "Hello" to AIX® */
LTR R0,R0                /* check return code */
BE WRITEOK               /* if good, go to write */
( error code )
.
.
.
MSG1 DC C 'HELLO'
LEN1 DC AL4(*-MSG1)
```

---

## Chapter 5. Network Computing System (NCS)

---

### lb\_lookup\_interface Library Routine (NCS)

#### Purpose

Looks up information about an interface in the Global Location Broker (GLB) database.

#### Syntax

```
void lb_lookup_interface ( object_interface, lookup_handle)
void lb_lookup_interface ( max_results, num_results, results, status)
uuid_t *object_interface;
lb_lookup_handle_t *lookup_handle;
unsigned long max_results;
unsigned long *num_results;
lb_entry_t results [ ];
status_t *status;
```

#### Description

The **lb\_lookup\_interface** routine returns GLB database entries whose fields in the *object\_interface* parameters match the specified interface. It returns information about all replicas of all objects that can be accessed through that interface.

The **lb\_lookup\_interface** routine cannot return more than the number of matching entries specified by the *max\_results* parameter at one time. The *lookup\_handle* parameter directs this routine to do sequential lookup calls to find all matching entries.

#### Notes:

1. The Location Broker does not prevent modification of the database between lookup calls, which can cause the locations of entries relative to a *lookup\_handle* value to change. If multiple calls are made to find all matching results in the database, the returned information may skip or duplicate entries from the database.
2. It is also possible for the results of a single lookup call to skip or duplicate entries. This can occur if the size of the results exceeds the size of a remote procedure call (RPC) packet (64KB).

#### Parameters

##### Input

<i>object_interface</i>	Points to the Universal Unique Identifier (UUID) of the interface being looked up.
<i>max_results</i>	Specifies the maximum number of matching entries that can be returned by a single call. This should be the number of elements in the <i>results</i> parameter array.

##### Input/Output

<i>lookup_handle</i>	Specifies a location in the database. On input, the <i>lookup_handle</i> value indicates the location in the database where the search begins. An input value of <b>lb_default_lookup_handle</b> specifies that the search starts at the beginning of the database. On return, the <i>lookup_handle</i> parameter indicates the next unsearched part of the database (that is, the point at which the next search should begin). A return value of <b>lb_default_lookup_handle</b> indicates that the search reached the end of the database. Any other value indicates that the search found the number of matching entries specified by the <i>max_results</i> parameter before it reached the end of the database.
----------------------	--

## Output

<i>num_results</i>	Points to the number of entries that are returned in the <i>results</i> parameter array.
<i>results</i>	Specifies the array that contains the matching GLB database entries, up to the number specified in the <i>max_results</i> parameter. If the array contains any entries for servers on the local network, those entries appear first.
<i>status</i>	Points to the completion status.

## Examples

To look up information in the GLB database about a matrix multiplication interface, enter:

```
lb_lookup_interface (&matrix_if_id, &lookup_handle,  
    results_array_size, &num_results,  
    &matrix_if_results_array, &status);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## lb\_lookup\_object Library Routine (NCS)

### Purpose

Looks up information about an object in the Global Location Broker (GLB) database.

### Syntax

```
void lb_lookup_object ( object, lookup_handle)  
void lb_lookup_object ( max_results, num_results, results, status)  
uuid_t *object;  
lb_lookup_handle_t *lookup_handle;  
unsigned long max_results;  
unsigned long *num_results;  
lb_entry_t results [ ];  
status_t *status;
```

### Description

The **lb\_lookup\_object** routine returns GLB database entries whose fields in the *object* parameter match the specified object. It returns information about all replicas of an object and all interfaces to the object.

The **lb\_lookup\_object** routine cannot return more than the number of matching entries specified by *max\_results* parameter at one time. The *lookup\_handle* parameter directs this routine to do sequential lookup calls to find all matching entries.

#### Notes:

1. The Location Broker does not prevent modification of the database between lookup calls, which can cause the locations of entries relative to a value of the *lookup\_handle* parameter to change. If multiple calls are made to find all matching results in the database, the returned information may skip or duplicate entries from the database.
2. It is also possible for the results of a single lookup call to skip or duplicate entries. This can occur if the size of the results exceeds the size of a remote procedure call (RPC) packet (64KB).

## Parameters

### Input

<i>object</i>	Points to the Universal Unique Identifier (UUID) of the object being looked up.
<i>max_results</i>	Specifies the maximum number of matching entries that can be returned by a single call. This should be the number of elements in the <i>results</i> parameter array.

### Input/Output

<i>lookup_handle</i>	Specifies a location in the database. On input, the value of the <i>lookup_handle</i> parameter indicates the location in the database where the search begins. An input value of <b>lb_\$default_lookup_handle</b> specifies that the search starts at the beginning of the database. On return, the <i>lookup_handle</i> parameter indicates the next unsearched part of the database (that is, the point at which the next search should begin). A return value of <b>lb_\$default_lookup_handle</b> indicates that the search reached the end of the database. Any other value indicates that the search found at most the number of matching entries specified by the <i>max_results</i> parameter before it reached the end of the database.
----------------------	---

### Output

<i>num_results</i>	Points to the number of entries that were returned in the <i>results</i> parameter array.
<i>results</i>	Specifies the array that contains the matching GLB database entries, up to the number specified in the <i>max_results</i> parameter. If the array contains any entries for servers on the local network, those entries appear first.
<i>status</i>	Points to the completion status.

## Examples

To look up GLB database entries for the bank **bank\_id**, enter:

```
lb_$lookup_object(&bank_id, &lookup_handle, MAX_LOCS, &n_locs,  
    bank_loc, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## lb\_\$lookup\_object\_local Library Routine

### Purpose

Looks up information about an object in a Local Location Broker (LLB) database.

### Syntax

```
void lb_$lookup_object_local ( object, sockaddr, slength, lookup_handle)  
void lb_$lookup_object_local ( max_results, num_results, results, status)  
uuid_t *object;  
socket_addr_t *sockaddr;  
unsigned long slength;  
lb_$lookup_handle_t *lookup_handle;  
unsigned long max_results;  
unsigned long *num_results;  
lb_$entry_t results [ ];  
status_t *status;
```

## Description

The `lb_$lookup_object_local` routine searches the specified LLB database and returns all entries whose fields in the `object` parameter match the specified object. It returns information about all replicas of an object and all interfaces to the object that are located on the specified host.

The `lb_$lookup_interface` routine cannot return more than the number of matching entries specified by the `max_results` parameter at one time. The `lookup_handle` parameter directs this routine to do sequential lookup calls to find all matching entries.

### Notes:

1. The Location Broker does not prevent modification of the database between lookup calls. This can cause the locations of entries relative to a value of the `lookup_handle` parameter to change. If multiple calls are made to find all matching results in the database, the returned information may skip or duplicate entries from the database.
2. It is also possible for the results of a single lookup call to skip or duplicate entries. This can occur if the size of the results exceeds the size of a remote procedure call (RPC) packet (64KB).

## Parameters

### Input

<code>object</code>	Points to the Universal Unique Identifier (UUID) of the object being looked up.
<code>sockaddr</code>	Specifies the location of the LLB database to be searched. The socket address must specify the network address of a host. However, the port number in the socket address is ignored. The lookup request is always sent to the host's LLB port.
<code>length</code>	Specifies the length, in bytes, of the socket address specified by the <code>sockaddr</code> parameter.
<code>max_results</code>	Specifies the maximum number of matching entries that can be returned by a single call. This should be the number of elements in the <code>results</code> parameter array.

### Input/Output

<code>lookup_handle</code>	<p>Specifies a location in the database. On input, the value of the <code>lookup_handle</code> parameter indicates the location in the database where the search begins. An input value of <b>lb_\$default_lookup_handle</b> specifies that the search starts at the beginning of the database.</p> <p>On return, the <code>lookup_handle</code> indicates the next unsearched part of the database (that is, the point at which the next search should begin). A return value of <b>lb_\$default_lookup_handle</b> indicates that the search reached the end of the database. Any other value indicates that the search found at most the number of matching entries specified by the <code>max_results</code> parameter before it reached the end of the database.</p>
----------------------------	--

### Output

<code>num_results</code>	Points to the number of entries that were returned in the <code>results</code> parameter array.
<code>results</code>	Specifies the array that contains the matching GLB database entries, up to the number specified in the <code>max_results</code> parameter. If the array contains any entries for servers on the local network, those entries appear first.
<code>status</code>	Points to the completion status.

## Examples

In the following example, the **repob** object is replicated, with only one replica located on any host. To look up information about the **repob** object, enter:

```
lb_$lookup_object_local (&repob_id, &location, location_length,  
    &lookup_handle, 1, &num_results, myob_entry, &st);
```

Since there is only one replica located on any host, the routine returns at most one result.

## Related Information

---

### lb\_lookup\_range Library Routine

#### Purpose

Looks up information in a Global Location Broker (GLB) or Local Location Broker (LLB) database.

#### Syntax

```
void lb_lookup_range ( object, object_type, object_interface, location, lookup_handle)
void lb_lookup_range ( location_length, max_results, num_results, results, status)
uuid_t *object;
uuid_t *object_type;
uuid_t *object_interface;
socket_addr_t *location;
unsigned long location_length;
lb_lookup_handle_t *lookup_handle;
unsigned long max_results;
unsigned long *num_results;
lb_entry_t results [ ];
status_t *status;
```

#### Description

The **lb\_lookup\_range** routine returns database entries that contain matching **object**, **obj\_type**, and **obj\_interface** identifiers. A value of **uuid\_\$nil** in any of these input parameters acts as a wildcard and matches all values in the corresponding entry field. You can include wild cards in any combination of these parameters.

The **lb\_lookup\_interface** routine cannot return more than the number of matching entries specified by the *max\_results* parameter at one time. The *lookup\_handle* parameter directs this routine to do sequential lookup calls to find all matching entries.

#### Notes:

1. The Location Broker does not prevent modification of the database between lookup calls, which can cause the locations of entries relative to a value of the *lookup\_handle* parameter value to change. If multiple calls are made to find all matching results in the database, the returned information may skip or duplicate entries from the database.
2. The results of a single lookup call can possibly skip or duplicate entries. This can occur if the size of the results exceeds the size of a remote procedure call (RPC) packet (64KB).

#### Parameters

##### Input

<i>object</i>	Points to the Universal Unique Identifier (UUID) of the object being looked up.
<i>object_type</i>	Points to the UUID of the type being looked up.
<i>object_interface</i>	Points to the UUID of the interface being looked up.
<i>location</i>	Points to the location of the database to be searched. If the value of the <i>location_length</i> parameter is 0, the GLB database is searched. Otherwise, the LLB database at the host specified by the socket address is searched. If the LLB database is searched, the port number in the socket address is ignored, and the lookup request is sent to the LLB port.

<i>location_length</i>	Specifies the length, in bytes, of the socket address indicated by the <i>location</i> parameter. A value of 0 indicates that the GLB database is to be searched.
<i>max_results</i>	Specifies the maximum number of matching entries that can be returned by a single call. This should be the number of elements in the <i>results</i> array.

## Input/Output

<i>lookup_handle</i>	Specifies a location in the database. On input, the value of the <i>lookup_handle</i> parameter indicates the location in the database where the search begins. An input value of <b>lb_\$default_lookup_handle</b> specifies that the search starts at the beginning of the database. On return, the <i>lookup_handle</i> parameter indicates the next unsearched part of the database (that is, the point at which the next search should begin). A return value of <b>lb_\$default_lookup_handle</b> indicates that the search reached the end of the database. Any other value indicates that the search found the number of matching entries specified by the <i>max_results</i> parameter before it reached the end of the database.
----------------------	---

## Output

<i>num_results</i>	Points to the number of entries that were returned in the <i>results</i> parameter array.
<i>results</i>	Specifies the array that contains the matching GLB database entries, up to the number specified in the <i>max_results</i> parameter. If the array contains any entries for servers on the local network, those entries appear first.
<i>status</i>	Points to the completion status.

## Examples

To look up information in the GLB database about the **change\_if** interface to the **proc\_db2** object (which is of the **proc\_db** type), enter:

```
lb_$lookup_range (&proc_db2_id, &proc_db_id, &change_if_id,
  glb, 0, &lookup_handle, 10, &num_results, results, &st);
```

The name *glb* is defined elsewhere as a null pointer. The *results* parameter is a 10-element array of the **lb\_\$entry\_t** type.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## lb\_\$lookup\_type Library Routine

### Purpose

Looks up information about a type in the Global Location Broker (GLB) database.

### Syntax

```
void lb_$lookup_type ( object_type, lookup_handle, max_results)
void lb_$lookup_type ( num_results, results, status)
uuid_$t *object_type;
lb_$lookup_handle_t *lookup_handle;
unsigned long max_results;
unsigned long *num_results;
lb_$entry_t results [ ];
status_$t *status;
```



## Description

The **lb\_\$lookup\_type** routine returns GLB database entries whose fields in the *object\_type* parameter match the specified type. It returns information about all replicas of all objects of that type and about all interfaces to each object.

The **lb\_\$lookup\_type** routine cannot return more than the number of matching entries specified by the *max\_results* parameter at one time. The *lookup\_handle* parameter directs this routine to do sequential lookup calls to find all matching entries.

### Notes:

1. The Location Broker does not prevent modification of the database between lookup calls, which can cause the locations of entries relative to a value of the *lookup\_handle* parameter to change. If multiple calls are made to find all matching results in the database, the returned information may skip or duplicate entries from the database.
2. It is also possible for the results of a single lookup call to skip or duplicate entries. This can occur if the size of the results exceeds the size of a remote procedure call (RPC) packet (64KB).

## Parameters

### Input

*object\_type* Points to the Universal Unique Identifier (UUID) of the type being looked up.  
*max\_results* Specifies the maximum number of matching entries that can be returned by a single call. This should be the number of elements in the *results* parameter array.

### Input/Output

*lookup\_handle* Specifies a location in the database. On input, the value of the *lookup\_handle* parameter indicates the location in the database where the search begins. An input value of **lb\_\$default\_lookup\_handle** specifies that the search starts at the beginning of the database.  
  
On return, the *lookup\_handle* parameter indicates the next unsearched part of the database (that is, the point at which the next search should begin). A return value of **lb\_\$default\_lookup\_handle** indicates that the search reached the end of the database. Any other value indicates that the search found at most the number of matching entries specified by the *max\_results* parameter before it reached the end of the database.

### Output

*num\_results* Points to the number of entries that were returned in the *results* parameter array.  
*results* Specifies the array that contains the matching GLB database entries, up to the number specified in the *max\_results* parameter. If the array contains any entries for servers on the local network, those entries appear first.  
*status* Points to the completion status.

## Examples

To look up information in the GLB database about the **array\_proc** type, enter:

```
lb_$lookup_type (&array_proc_id, &lookup_handle, 10,  
                &num_results, &results, &st)
```

The *results* parameter is a 10-element array of the **lb\_\$entry\_t** type.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## lb\_register Library Routine (NCS)

### Purpose

Registers an object and an interface with the Location Broker.

### Syntax

```
void lb_register ( object, object_type, object_interface, flags, annotation)
void lb_register ( sockaddr, slength, entry, status)
uuid_t *object;
uuid_t *object_type;
uuid_t *object_interface;
b_server_flag_t *flags;
char annotation [ ];
socket_addr_t *sockaddr;
unsigned long slength;
lb_entry_t *entry;
status_t *status;
```

### Description

The **lb\_register** routine registers with the Location Broker a specific interface to an object and the location of a server that exports that interface. This routine replaces an existing entry in the Location Broker database that matches the *object*, *object\_type*, and *object\_interface* parameters as well as both the address family and host in the socket address specified by the *sockaddr* parameter. If no such entry exists, the routine adds a new entry to the database.

If the *flags* parameter has a value of **lb\_server\_flag\_local**, the entry is registered only in the Local Location Broker (LLB) database at the host where the call is issued. Otherwise, the entry is registered in both the LLB and the Global Location Broker (GLB) databases.

### Parameters

#### Input

<i>object</i>	Points to the Universal Unique Identifier (UUID) of the object being looked up.
<i>object_type</i>	Points to the UUID of the type being looked up.
<i>object_interface</i>	Points to the UUID of the interface being looked up.
<i>flags</i>	Points to the server that implements the interface. The value must be 0 or <b>lb_server_flag_local</b> .
<i>annotation</i>	Specifies information, such as textual descriptions of the object and the interface. It is set in a 64-character array.
<i>sockaddr</i>	Points to the socket address of the server that exports the interface to the object.
<i>slength</i>	Specifies the length, in bytes, of the socket address ( <i>sockaddr</i> ) parameter.

#### Output

<i>entry</i>	Points to the copy of the entry that was entered in the Location Broker database.
<i>status</i>	Points to the completion status.

## Examples

To register the **bank** interface to the **bank\_id** object, enter:

```
lb_$register (&bank_id, &bank_$uuid, &bank_$if_spec.id, 0,  
            BankName, &saddr, slen, &entry, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## lb\_\$unregister Library Routine

### Purpose

Removes an entry from the Location Broker database.

### Syntax

```
void lb_$unregister ( entry, status)  
lb_$entry_t *entry;  
status_$t *status;
```

### Description

The **lb\_\$unregister** routine removes from the Location Broker database the entry that matches the value supplied in the *entry* parameter. The value of the *entry* parameter should be identical to that returned by the **lb\_\$register** routine when the database entry was created. However, the **lb\_\$unregister** routine does not compare all of the fields in the *entry* parameter. It ignores the `flags` field, the `annotation` field, and the port number in the `saddr` field.

This routine removes the entry from the Local Location Broker (LLB) database on the local host (the host that issues the call). If the **flags** field of the *entry* parameter is not the value **lb\_\$server\_flag\_local**, this routine also removes the entry from all replicas of the Global Location Broker (GLB) database.

### Parameters

#### Input

*entry* Points to the entry being removed from the Location Broker database.

#### Output

*status* Points to the completion status.

## Examples

To unregister the entry specified by the **BankEntry** results structure, which was obtained from a previous call to the **lb\_\$register** routine, enter:

```
lb_$unregister (&BankEntry, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$cleanup Library Routine

### Purpose

Establishes a cleanup handler.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
```

```
status_t
pfm_$cleanup( cleanup_record)
pfm_$cleanup_rec *cleanup_record;
```

### Description

The **pfm\_\$cleanup** routine establishes a cleanup handler that is executed when a fault occurs. A cleanup handler is a piece of code executed before a program exits when a signal is received by the process. The cleanup handler begins with a call to the **pfm\_\$cleanup** routine. This routine registers an entry point with the system where program execution resumes when a fault occurs. When a fault occurs, execution resumes after the most recent call to the **pfm\_\$cleanup** routine.

There can be more than one cleanup handler in a program. Multiple cleanup handlers are executed consecutively on a last-in-first-out basis (LIFO), starting with the most recently established handler and ending with the first cleanup handler. The system provides a default cleanup handler established at program invocation. The default cleanup handler is always called last, just before a program exits, and releases any system resources still held before returning control to the process that invoked the program.

When called to establish a cleanup handler, the **pfm\_\$cleanup** routine returns the **pfm\_\$cleanup\_set** status to indicate that the cleanup handler was successfully established. When the cleanup handler is entered in response to a fault signal, the **pfm\_\$cleanup** routine effectively returns the value of the fault that triggered the handler.

**Note:** Cleanup handler code runs with asynchronous faults inhibited. When the **pfm\_\$cleanup** routine returns something other than **pfm\_\$cleanup\_set** status, which indicates that a fault has occurred, there are four possible ways to leave the cleanup code:

- The program can call the **pfm\_\$signal** routine to start the next cleanup handler with a different fault signal.
- The program can call the **pfm\_\$exit** routine to start the next cleanup handler with the same fault signal.
- The program can continue with the code following the cleanup handler. It should generally call the **pfm\_\$enable** routine to re-enable asynchronous faults. Execution continues from the end of the cleanup handler code; it does not resume where the fault signal was received.
- The program can re-establish the handler by calling the **pfm\_\$reset\_cleanup** routine before proceeding.

### Parameters

#### Input

*cleanup\_record*                      A record of the context in which the **pfm\_\$cleanup** routine is called. A program should treat this as an opaque data structure and not try to alter or copy its contents. It is needed by the **pfm\_\$cleanup** and **pfm\_\$reset\_cleanup** routines to restore the context of the calling process at the cleanup handler entry point.

## Examples

To establish a cleanup handler for a routine, use the following:

```
fst = pfm_cleanup(crec)
```

where `fst` is of type `status_$t` and `crec` is of type `pfm_$cleanup_crec`.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$enable Library Routine

### Purpose

Enables asynchronous faults.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
void
pfm_$enable (void)
```

### Description

The `pfm_$enable` routine enables asynchronous faults after they have been inhibited by a call to the `pfm_$inhibit` routine. The `pfm_$enable` routine causes the operating system to pass asynchronous faults on to the calling process.

While faults are inhibited, the operating system holds at most one asynchronous fault. Consequently, when the `pfm_$enable` subroutine returns, there can be at most one fault waiting on the process. If more than one fault was received between calls to the `pfm_$inhibit` and `pfm_$enable` routines, the process receives the first asynchronous fault received while faults were inhibited.

## Examples

To enable asynchronous interrupts to occur after a call to the `pfm_$inhibit` routine, use the following:

```
pfm_$enable( );
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$enable\_faults Library Routine

### Purpose

Enables asynchronous faults.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
void
pfm_$enable_faults (void)
```

## Description

The **pfm\_enable\_faults** routine enables asynchronous faults after they have been inhibited by a call to the **pfm\_inhibit\_faults** routine. The **pfm\_enable\_faults** routine causes the operating system to pass asynchronous faults on to the calling process.

While faults are inhibited, the operating system holds at most one asynchronous fault. Consequently, when **pfm\_enable\_faults** returns, there can be at most one fault waiting on the process. If more than one fault was received between calls to the **pfm\_inhibit\_faults** and **pfm\_enable\_faults** routines, the process receives the first asynchronous fault received while faults were inhibited.

## Examples

To enable faults to occur after a call to **pfm\_inhibit\_faults**, use the following:

```
pfm_enable_faults( );
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_inhibit Library Routine

### Purpose

Inhibits asynchronous faults.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
void
pfm_inhibit (void)
```

### Description

The **pfm\_inhibit** routine prevents asynchronous faults from being passed to the calling process. While faults are inhibited, the operating system holds at most one asynchronous fault. Consequently, a call to the **pfm\_inhibit** routine can result in the loss of some signals. For that and other reasons, it is good practice to inhibit faults only when absolutely necessary.

**Note:** This routine has no effect on the processing of synchronous faults, such as access violations or floating-point and overflow exceptions.

### Examples

To prevent asynchronous interrupts from occurring in a critical portion of a routine, use the following:

```
pfm_inhibit( );
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_inhibit\_faults Library Routine

### Purpose

Inhibits asynchronous faults, but allows task switching.

## Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>

void
pfm_$inhibit_faults (void)
```

## Description

The **pfm\_\$inhibit** routine prevents asynchronous faults, except for time-sliced task switching, from being passed to the calling process. While faults are inhibited, the operating system holds at most one asynchronous fault. Consequently, a call to the **pfm\_\$inhibit\_faults** routine can result in the loss of some signals. For that and other reasons, it is good practice to inhibit faults only when absolutely necessary.

**Note:** This routine has no effect on the processing of synchronous faults, such as access violations or floating-point and overflow exceptions.

## Examples

To prevent faults from occurring in a critical portion of a routine, use the following:

```
pfm_$inhibit_faults( );
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$init Library Routine

### Purpose

Initializes the program fault management (PFM) package.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>

void
pfm_$init ( flags)
unsigned long flags;
```

### Description

The **pfm\_\$init** routine initializes the PFM package. Applications that use the PFM package should invoke the **pfm\_\$init** routine before invoking any other Network Computing System (NCS) routines.

### Parameters

#### Input

*flags* Indicates which initialization activities to perform. Currently only one value is valid: **pfm\_\$init\_signal\_handlers**. This causes C signals to be intercepted and converted to PFM signals. The signals intercepted are **SIGINT**, **SIGILL**, **SIGFPE**, **SIGTERM**, **SIGHUP**, **SIGQUIT**, **SIGTRAP**, **SIGBUS**, **SIGSEGV**, and **SIGSYS**.

## Examples

To initialize the PFM subsystem, enter:

```
pfm_$init(pfm_$init_signal_handlers);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$reset\_cleanup Library Routine

### Purpose

Resets a cleanup handler.

### Syntax

```
#include <idl/c/base.h>  
#include <idl/c/pfm.h>
```

```
void  
pfm_$reset_cleanup ( cleanup_record, status )  
pfm_$cleanup_rec *cleanup_record;  
status_t *status;
```

### Description

The **pfm\_\$reset\_cleanup** routine re-establishes the cleanup handler last entered so that any subsequent errors enter it first. This procedure should only be used within cleanup handler code.

### Parameters

#### Input

*cleanup\_record* Indicates a record of the context at the cleanup handler entry point. It is supplied by the **pfm\_\$cleanup** routine when the cleanup handler is first established.

#### Output

*status* Points to the completion status.

## Examples

To re-establish a cleanup handler, enter:

```
pfm_$reset_cleanup(crec, st);
```

where the *crec* cleanup record is a valid cleanup handler.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.



---

## pfm\_\$rls\_cleanup Library Routine

### Purpose

Releases cleanup handlers.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
```

```
void
pfm_$rls_cleanup( cleanup_record, status)
pfm_$cleanup_rec *cleanup_record;
status_t *status;
```

### Description

The **pfm\_\$rls\_cleanup** routine releases the cleanup handler associated with the *cleanup\_record* parameter and all cleanup handlers established after it.

### Parameters

#### Input

*cleanup\_record*                      Indicates the cleanup record for the first cleanup handler to release.

#### Output

*status*                      Points to the completion status. If the *status* parameter has a value of **pfm\_\$bad\_rls\_order**, it means that the caller attempted to release a cleanup handler before releasing all handlers established after it. This status is only a warning. The intended cleanup handler is released, along with all cleanup handlers established after it.

### Examples

To release an established cleanup handler, enter:

```
pfm_$rls_cleanup(crec, st);
```

where *crec* is a valid cleanup record established by the **pfm\_\$cleanup** routine.

### Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## pfm\_\$signal Library Routine (NCS)

### Purpose

Signals the calling process.

### Syntax

```
#include <idl/c/base.h>
#include <idl/c/pfm.h>
```

```
void
pfm_$signal ( fault_signal)
status_$t *fault_signal;
```

## Description

The **pfm\_\$signal** routine signals the fault specified by the *fault\_signal* parameter to the calling process. It is usually called to leave cleanup handlers.

**Note:** This routine does not return when successful.

## Parameters

### Input

*fault\_signal*                      Indicates a fault code.

## Examples

To send the calling process a fault signal, enter:

```
pfm_$signal(fst);
```

where *fst* is a valid PFM fault.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$alloc\_handle Library Routine

### Purpose

Creates a Remote Procedure Call (RPC) handle.

### Syntax

```
handle_t rpc_$alloc_handle
( object_id, family, status)
uuid_$t *object_id;
unsigned long family;
status_$t *status;
```

### Description

The **rpc\_\$alloc\_handle** routine creates an unbound RPC handle that identifies a particular object but not a particular server or host. A remote procedure call made using an unbound handle is broadcast to all Local Location Brokers (LLBs) on the local network. If the call's interface and the object identified by the handle are both registered with any LLB, that LLB forwards the request to the registering server. The client RPC runtime library returns the first response that it receives and binds the handle to the server.

**Note:** This routine is used by clients only.

## Parameters

### Input

<i>object_id</i>	Points to the Universal Unique Identifier (UUID) of the object to be accessed. If there is no specific object, specify <b>uuid_\$nil</b> as the value.
<i>family</i>	Specifies the address family to use in communications to access the object.

### Output

<i>status</i>	Points to the completion status.
---------------	----------------------------------

## Return Values

Upon successful completion, the **rpc\_\$alloc\_handle** routine returns an RPC handle identifying the remote object in the form **handle\_t**. This handle is used as the first input parameter to remote procedure calls with explicit handles.

## Examples

The following statement allocates a handle that identifies the Acme company's payroll database object:

```
handle = rpc_$alloc_handle (&acme_pay_id, socket_$dds, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$bind Library Routine

### Purpose

Allocates an Remote Procedure Call (RPC) handle and sets its binding to a server.

### Syntax

```
handle_t rpc_$bind ( object_id, sockaddr, slength, status)
uuid_$t *object_id;
socket_$addr_t *sockaddr;
unsigned long slength;
us_$t *status;
```

### Description

The **rpc\_\$bind** function creates a fully bound RPC handle that identifies a particular object and server. This routine is equivalent to an **rpc\_\$alloc\_handle** routine followed by an **rpc\_\$set\_binding** routine.

**Note:** This routine is used by clients only.

## Parameters

### Input

<i>object_id</i>	Points to the Universal Unique Identifier (UUID) of the object to be accessed. If there is no specific object, specify <b>uuid_\$nil</b> as the value.
<i>sockaddr</i>	Points to the socket address of the server.
<i>slength</i>	Specifies the length, in bytes, of the socket address ( <i>sockaddr</i> ) parameter.

## Output

*status* Points to the completion status.

## Return Values

Upon successful completion, this routine returns an RPC handle (**handle\_t**) that identifies the remote object. This handle is used as the first input parameter to remote procedure calls with explicit handles.

## Examples

The following example binds a banking client program to the specified object and socket address:

```
h =rpc_$bind(&bank_id, &bank_loc[0].saddr, bank_loc[0].saddr_len,
            &st);
```

The **bank\_loc** structure is the *results* parameter of a previous Location Broker lookup call.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$clear\_binding Library Routine

### Purpose

Unsets the binding between a Remote Procedure Call (RPC) handle and a host and server.

### Syntax

```
void rpc_$clear_binding ( handle, status)
handle_t handle;
status_t *status;
```

### Description

The **rpc\_\$clear\_binding** routine removes any association between an RPC handle and a particular server and host, but does not remove the association between the handle and an object. This routine saves the RPC handle so that it can be reused to access the same object, either by broadcasting or after resetting the binding to another server.

A remote procedure call made using an unbound handle is broadcast to all Local Location Brokers (LLBs) on the local network. If the call's interface and the object identified by the handle are both registered with any LLB, that LLB forwards the request to the registering server. The client RPC runtime library returns the first response that it receives and binds the handle to the server.

The **rpc\_\$clear\_binding** routine reverses an **rpc\_\$set\_binding** routine.

## Parameters

### Input

*handle* Specifies the RPC handle from which the binding is being cleared.

### Output

*status* Points to the completion status.

**Note:** This routine is used by clients only.

## Examples

To clear the binding represented in a handle, enter:

```
rpc_$clear_binding(handle, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$clear\_server\_binding Library Routine

### Purpose

Unsets the binding between a Remote Procedure Call (RPC) handle and a server.

### Syntax

```
void rpc_$clear_server_binding ( handle, status)
handle_t handle;
status_t *status;
```

### Description

The **rpc\_\$clear\_server\_binding** routine removes the association between an RPC handle and a particular server (which is a particular port number), but does not remove the associations with an object and a host. For example, the routine unmaps the handle to the port number, but it leaves the object and host associated through a network address.

This routine replaces a fully bound handle with a bound-to-host handle. A bound-to-host handle identifies an object located on a particular host, but does not identify a server exporting an interface to the object.

If a client uses a bound-to-host handle to make a remote procedure call, the call is sent to the Local Location Broker (LLB) forwarding port at the host identified by the handle. If the call's interface and the object identified by the handle are both registered with the host's LLB, the LLB forwards the request to the registering server. When the client RPC runtime library receives a response, it binds the handle to the server. Subsequent remote procedure calls that use this handle are then sent directly to the bound server's port.

The **rpc\_\$clear\_server\_binding** routine is used for client error recovery when a server terminates. The port that a server uses when it restarts is not necessarily the same port that it used previously. Therefore, the binding that the client was using may not be correct. This routine enables the client to unbind from the nonfunctioning server while retaining the binding to the host. When the client sends a request, the binding is automatically set to the server's new port.

**Note:** This routine is used by clients only.

### Parameters

#### Input

*handle* Specifies the RPC handle from which the server binding is being cleared.

## Output

*status* Points to the completion status.

## Examples

To clear the server binding represented in a handle, enter:

```
rpc_$clear_server_binding(handle, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$dup\_handle Library Routine

### Purpose

Makes a copy of a Remote Procedure Call (RPC) handle.

### Syntax

```
handle_t rpc_$dup_handle ( handle, status)
handle_t handle;
status_t *status;
```

### Description

The **rpc\_\$dup\_handle** routine returns a copy of an existing RPC handle. Both handles can then be used in the client program for concurrent multiple accesses to a binding. Because all duplicates of a handle reference the same data, a call to the **rpc\_\$set\_binding**, **rpc\_\$clear\_binding**, or **rpc\_\$clear\_server\_binding** routine made on any one duplicate affects all duplicates. However, an RPC handle is not freed until the **rpc\_\$free\_handle** routine is called on all copies of the handle.

**Note:** This routine is used by clients only.

### Parameters

#### Input

*handle* Specifies the RPC handle to be copied.

#### Output

*status* Points to the completion status.

### Return Values

Upon successful completion, this routine returns the duplicate handle (**handle\_t**).

### Examples

To create a copy of a handle, enter:

```
thread_2_handle = rpc_$dup_handle(handle, &st);
```

The copy is called `thread_2_handle`.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$free\_handle Library Routine

### Purpose

Frees a Remote Procedure Call (RPC) handle.

### Syntax

```
void rpc_$free_handle ( handle, status)
handle_t handle;
status_t *status;
```

### Description

The **rpc\_\$free\_handle** routine frees an RPC handle by clearing the association between the handle and a server or an object, and then releasing the resources identified by the RPC handle. The client program cannot use a handle after it is freed.

To make multiple RPC calls using the same interface but different socket addresses, replace the binding in an existing handle with the **rpc\_\$set\_binding** routine instead of creating a new handle with the **rpc\_\$free\_handle** and **rpc\_\$bind** routines.

To free copies of RPC handles created by the **rpc\_\$dup\_handle** routine, use the **rpc\_\$free\_handle** routine once for each copy of the handle. However, the RPC runtime library does not differentiate between calling the **rpc\_\$free\_handle** routine several times on one copy of a handle and calling it one time for each of several copies of a handle. Therefore, if you use duplicate handles, you must ensure that no thread inadvertently makes multiple **rpc\_\$free\_handle** calls on a single handle.

**Note:** This routine is used by clients only.

### Parameters

#### Input

*handle* Specifies the RPC handle to be freed.

#### Output

*status* Points to the completion status.

### Examples

To free two copies of a handle, enter:

```
rpc_$free_handle(handle, &st);
rpc_$free_handle(thread_2_handle, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$inq\_binding Library Routine (NCS)

### Purpose

Returns the socket address represented by a Remote Procedure Call (RPC) handle.

### Syntax

```
void rpc_$inq_binding ( handle, sockaddr, slength, status)
handle_t handle;
socket_$addr_t *sockaddr;
unsigned long *slength;
status_$t *status;
```

### Description

The **rpc\_\$inq\_binding** routine enables a client to determine the socket address, and therefore the server, identified by an RPC handle. It can be used to determine which server is responding to a remote procedure call when a client uses an unbound handle in the call.

**Note:** This routine is used by clients only.

### Parameters

#### Input

*handle* Specifies an RPC handle.

#### Output

*sockaddr* Points to the socket address represented by the *handle* parameter.  
*slength* Points to the length, in bytes, of the socket address (*sockaddr*).  
*status* Points to the completion status.

### Return Values

The **rpc\_\$inq\_binding** routine fails if the following is true:

Value	Description
<b>rpc_\$unbound_handle</b>	The handle is not bound and does not represent a specific host address.

### Examples

The Location Broker administrative tool, **lb\_admin**, uses the following statement to determine the particular GLB that responded to a lookup request:

```
rpc_$inq_binding(glb_$handle, &global_broker_addr,
    &global_broker_addr_len, &status);
```

### Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.



---

## rpc\_\$inq\_object Library Routine (NCS)

### Purpose

Returns the object Universal Unique Identifier (UUID) represented by a Remote Procedure Call (RPC) handle.

### Syntax

```
void rpc_$inq_object ( handle, object_id, status)
handle_t handle;
uuid_t *object_id;
status_t *status;
```

### Description

The **rpc\_\$inq\_object** routine enables a server to determine the particular object that a client is accessing. A server must use the **rpc\_\$inq\_object** routine if it exports an interface through which multiple objects may be accessed.

A server can make this call only if the interface uses explicit handles (that is, if each operation in the interface has a handle argument). If the interface uses an implicit handle, the handle identifier is not passed to the server.

**Note:** This routine is used by servers only.

### Parameters

#### Input

*handle* Specifies an RPC handle.

#### Output

*object\_id* Points to the UUID of the object identified by the *handle* parameter.  
*status* Points to the completion status.

### Examples

A database server that manages multiple databases must determine the particular database to be accessed whenever it receives a remote procedure call. Each manager routine therefore makes the following call:

```
rpc_$inq_object(handle, &db_uuid, &st);
```

The routine then uses the returned UUID to identify the database to be accessed.

### Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$listen Library Routine

### Purpose

Listens for and handles remote procedure call packets.

## Syntax

```
void rpc_$listen ( max_calls, status)
unsigned long max_calls;
status_$t *status;
```

## Description

The **rpc\_\$listen** routine dispatches incoming remote procedure call requests to manager procedures and returns the responses to the client. You must issue an **rpc\_\$use\_family** or **rpc\_\$use\_family\_wk** routine before you use the **rpc\_\$listen** routine.

**Note:** This routine is used by servers only.

## Parameters

### Input

*max\_calls* Specifies the maximum number of calls (in the range 1 through 10) that a server is allowed to process concurrently. Although concurrent processes are not supported in this operating system's implementation of Network Computing System (NCS), this parameter is provided for compatibility with other NCS implementations.

### Output

*status* Points to the completion status.

## Return Values

This routine normally does not return.

## Examples

To have a server listen for incoming remote procedure call requests, enter:

```
rpc_$listen(5, &status);
```

**Note:** The *max\_calls* parameter, which is set at 5 in the example, is insignificant because this implementation of NCS does not support concurrent processes. The parameter is provided for compatibility with other implementations.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$name\_to\_sockaddr Library Routine

### Purpose

Converts a host name and port number to a socket address.

### Syntax

```
void rpc_$name_to_sockaddr ( name, nlength, port, family, sockaddr, slength, status)
char *name;
unsigned long nlength;
unsigned long port;
unsigned long family;
```

```
socket_addr_t *sockaddr;  
unsigned long *slength;  
status_t *status;
```

## Description

The `rpc_name_to_sockaddr` routine provides the socket address for a socket, given the host name, the port number, and the address family.

You can specify the socket address information either as one text string in the `name` parameter, or by passing each of the three elements as a separate parameter. When three separate elements are passed, the `name` parameter should contain only the host name.

## Parameters

### Input

<i>name</i>	Points to a host name, and optionally, a port and an address family, in the form: <i>family:host[<i>port</i>]</i> . The <i>family:</i> and [ <i>port</i> ] parameters are optional. If you specify a <i>family</i> variable as part of the <i>name</i> parameter, you must specify <code>socket_sunspec</code> in the <i>family</i> parameter. The only supported value for the <i>family</i> variable is <code>ip</code> . The <i>host</i> parameter specifies the host name, and <i>port</i> specifies a port number in integer form.
<i>nlength</i>	Specifies the number of characters in the <i>name</i> parameter.
<i>port</i>	Specifies the socket port number. If you are not specifying a well-known port, this parameter should have the value <code>socket_sunspec_port</code> . The returned socket address will specify the Local Location Broker (LLB) forwarding port at the host. If you specify the port number in the <i>name</i> parameter, this parameter is ignored.
<i>family</i>	Specifies the address family to use for the socket address. This value corresponds to the communications protocol used to access the socket and determines how the socket address ( <i>sockaddr</i> ) parameter is expressed. If you specify the address family in the <i>name</i> parameter, this parameter must have the value <code>socket_sunspec</code> .

### Output

<i>sockaddr</i>	Points to the socket address corresponding to the <i>name</i> , <i>port</i> , and <i>family</i> parameters.
<i>slength</i>	Points to the length, in bytes, of the socket address (specified by the <i>sockaddr</i> parameter).
<i>status</i>	Points to the completion status.

## Examples

To place in the `sockaddr` structure a socket address that specifies the LLB forwarding port at the host identified by `host_name`, enter:

```
rpc_name_to_sockaddr(host_name, strlen(host_name),  
    socket_sunspec_port, socket_sunspec, &sockaddr, &slen, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_register Library Routine

### Purpose

Registers an interface at a server.

## Syntax

```
void rpc_$register ( if_spec, epv, status)
rpc_$if_spec_t *if_spec;
rpc_$epv_t epv;
status_$t *status;
```

## Description

The **rpc\_\$register** routine registers an interface with the Remote Procedure Call (RPC) runtime library. After an interface is registered, the RPC runtime library passes requests for that interface to the server.

You can call **rpc\_\$register** multiple times with the same interface (for example, from various subroutines of the same server), but each call must specify the same entry point vector (EPV). Each registration increments a reference count for the registered interface. An equal number of calls to the **rpc\_\$unregister** routine are then required to unregister the interface.

## Parameters

### Input

*if\_spec*            Points to the interface being registered.  
*epv*                Specifies the EPV for the operations in the interface.

### Output

*status*            Points to the completion status.

**Note:** This routine is used by servers only.

## Return Values

The **rpc\_\$register** routine fails if one or more of the following is true:

Value	Description
<b>rpc_\$too_many_ifs</b>	The maximum number of interfaces is already registered with the server.
<b>rpc_\$illegal_register</b>	You are trying to register an interface that is already registered, and you are using an EPV different from the one used when the interface was first registered.

## Examples

To register a **bank** interface with the bank server host's RPC runtime library, enter:

```
rpc_$register(&bank_$if_spec, bank_$server_epv, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$set\_binding Library Routine

### Purpose

Associates a Remote Procedure Call (RPC) handle with a server.

## Syntax

```
rpc_$set_binding ( handle, sockaddr, slength, status)
struct handle_t *handle;
struct socket_addr_t *sockaddr;
int slength;
struct status_t *status;
```

## Description

The `rpc_$set_binding` routine sets the binding of an RPC handle to the specified server. The handle then identifies a specific object at a specific server. Any subsequent remote procedure calls that a client makes using the handle are sent to this destination. This routine can also replace an existing binding in a fully bound handle, or set the binding in an unbound handle.

**Note:** This routine is used by clients only.

## Parameters

### Input

<i>handle</i>	Specifies an RPC handle.
<i>sockaddr</i>	Specifies the socket address of the server with which the handle is being associated.
<i>slength</i>	Specifies the length, in bytes, of the socket address ( <i>sockaddr</i> ) parameter.

### Output

<i>status</i>	Specifies the completion status.
---------------	----------------------------------

## Examples

To set the binding on the `m_handle` handle to the first server in the `results` array, which was returned by a previous Location Broker lookup call, enter:

```
rpc_$set_binding(m_handle, &lb_results[0].saddr,
    lb_results[0].saddr_len, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$sockaddr\_to\_name Library Routine

### Purpose

Converts a socket address to a host name and port number.

### Syntax

```
void rpc_$sockaddr_to_name ( sockaddr, slength, name, nlength, port, status)
socket_addr_t *sockaddr;
unsigned long slength;
unsigned long *nlength;
char *name;
unsigned long *port;
status_t *status;
```

## Description

The `rpc_$sockaddr_to_name` routine provides the address family, the host name, and the port number identified by the specified socket address.

## Parameters

### Input

*sockaddr* Points to a socket address.  
*slength* Specifies the length, in bytes, of socket address (*sockaddr*) parameter.

### Input/Output

*nlength* On input, points to the length of the *name* parameter in the buffer. On output, points to the number of characters returned in the *name* parameter.

### Output

*name* Points to a character string that contains the host name and the address family in the format: *family:host*. The value of the *family* parameter must be **ip**.  
*port* Points to the socket port number.  
*status* Points to the completion status.

## Examples

To take the bank server's socket address, return the server's host name and port, and then print the information, enter:

```
rpc_$sockaddr_to_name(&saddr, slen, name, &namelen, &port, &st);  
printf("(bankd) name=\"%s\", port=%d\n", name, namelen, port);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$unregister Library Routine

### Purpose

Unregisters an interface.

### Syntax

```
void rpc_$unregister ( if_spec, status)  
rpc_if_spec_t *if_spec;  
status_t *status;
```

### Description

The `rpc_$unregister` routine unregisters an interface that the server previously registered with the Remote Procedure Call (RPC) runtime library. After an interface is unregistered, the RPC runtime library does not pass requests for that interface to the server.

If a server uses multiple calls to the `rpc_$register` routine to register an interface more than once, then the server must call the `rpc_$unregister` routine an equal number of times to unregister the interface.

## Parameters

### Input

*if\_spec* Points to the interface being unregistered.

### Output

*status* Points to the completion status.

**Note:** This routine is used by servers only.

## Examples

To unregister a matrix arithmetic interface, use the following:

```
rpc_unregister (&matrix_if_spec, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_suse\_family Library Routine

### Purpose

Creates a socket of a specified address family for a Remote Procedure Call (RPC) server.

### Syntax

```
void rpc_suse_family ( family, sockaddr, slength, status)
unsigned long family;
socket_addr_t *sockaddr;
unsigned long *slength;
status_t *status;
```

### Description

The **rpc\_suse\_family** routine creates a socket for a server without specifying its port number. (The RPC runtime software assigns the port number.) Use this routine to create the server socket unless the server must listen on a particular well-known port. If the socket must listen on a specific well-known port, use the **rpc\_suse\_family\_wk** routine to create the socket.

A server can listen on more than one socket. However, a server normally does not listen on more than one socket for each address family, regardless of the number of interfaces that it exports. Therefore, most servers should make this call once for each supported address family.

**Note:** This routine is used by servers only.

## Parameters

### Input

*family* Specifies the address family of the socket to be created. This value corresponds to the communications protocol used to access the socket and determines how the socket address (*sockaddr*) parameter is expressed.

## Output

<i>sockaddr</i>	Points to the socket address of the socket on which the server listens.
<i>slength</i>	Points to the length, in bytes, of the socket address ( <i>sockaddr</i> ) parameter.
<i>status</i>	Points to the completion status.

## Return Values

The `rpc_$use_family` routine can fail if one or more of the following is true:

Value	Description
<code>rpc_\$cant_create_sock</code>	The RPC runtime library is unable to create a socket.
<code>rpc_\$cant_bind_sock</code>	The RPC runtime library created a socket but is unable to bind it to a socket address.
<code>rpc_\$too_many_sockets</code>	The server is trying to use more than the maximum number of sockets allowed. The server has called the <code>rpc_\$use_family</code> or <code>rpc_\$use_family_wk</code> routines too many times.

## Examples

To create the bank server's socket, enter:

```
rpc_$use_family(atoi(argv[1]), &saddr, &slen, &st);
```

The numeric value of the address family to be used is supplied as an argument to the program.

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_\$use\_family\_wk Library Routine

### Purpose

Creates a socket with a well-known port for a Remote Procedure Call (RPC) server.

### Syntax

```
void rpc_$use_family_wk ( family, if_spec, sockaddr, slength, status)
unsigned long family;
rpc_$if_spec_t *if_spec;
socket_$addr_t *sockaddr;
unsigned long *slength;
status_$t *status;
```

### Description

The `rpc_$use_family_wk` routine creates a socket that uses the port specified with the *if\_spec* parameter. Use this routine to create a socket if a server must listen on a particular well-known port. Otherwise, create the socket with the `rpc_$use_family` routine.

A server can listen on more than one socket. However, a server normally does not listen on more than one socket for each address family, regardless of the number of interfaces that it exports. Therefore, most servers that use well-known ports should make this call once for each supported address family.

**Note:** This routine is used by servers only.



## Parameters

### Input

<i>family</i>	Specifies the address family of the socket to be created. This value corresponds to the communications protocol used to access the socket and determines how the socket address ( <i>sockaddr</i> ) parameter is expressed.
<i>if_spec</i>	Points to the interface that will be registered by the server. The well-known port is specified as an interface attribute.

### Output

<i>sockaddr</i>	Points to the socket address of the socket on which the server listens.
<i>length</i>	Points to the length, in bytes, of the socket address ( <i>sockaddr</i> ) parameter.
<i>status</i>	Points to the completion status.

## Return Values

The `rpc_$use_family_wk` routine fails if one of the following is true:

Value	Description
<code>rpc_\$cant_create_sock</code>	The RPC runtime library is unable to create a socket.
<code>rpc_\$cant_bind_sock</code>	The RPC runtime library created a socket but is unable to bind it to a socket address.
<code>rpc_\$too_many_sockets</code>	The server is trying to use more than the maximum number of sockets allowed. The server has called the <code>rpc_\$use_family</code> or <code>rpc_\$use_family_wk</code> routines too many times.
<code>rpc_\$addr_in_use</code>	The specified address and port are already in use. This is caused by multiple calls to the <code>rpc_\$use_family_wk</code> routine with the same well-known port.

## Examples

To create a well-known socket for an array processor server, enter:

```
rpc_$use_family_wk (socket_$internet, &matrix_$if_spec,  
&sockaddr, slen, &st);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## uuid\_\$decode Library Routine (NCS)

### Purpose

Converts a character-string representation of a Universal Unique Identifier (UUID) into a UUID.

### Syntax

```
void uuid_$decode ( uuid_string, uuid, status)  
char *uuid_string;  
uuid_$t *uuid;  
status_$t *status;
```

## Description

The `uuid_decode` routine returns the UUID corresponding to a valid character-string representation of a UUID.

## Parameters

### Input

`uuid_string` Points to the character-string representation of a UUID in the form `uuid_string_t`.

### Output

`uuid` Points to the UUID that corresponds to the character string represented in the `uuid_string` parameter.

`status` Points to the completion status.

## Examples

The following call returns as `my_uuid` the UUID corresponding to the character-string representation in `my_uuid_rep`:

```
uuid_decode (my_uuid_rep, &my_uuid, &status);
```

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## uuid\_encode Library Routine (NCS)

### Purpose

Converts a Universal Unique Identifier (UUID) into its character-string representation.

### Syntax

```
void uuid_encode ( uuid, uuid_string)
uuid_t *uuid;
char *uuid_string;
```

### Description

The `uuid_encode` call returns the character-string representation of a UUID.

### Parameters

#### Input

`uuid` Points to the UUID.

#### Output

`uuid_string` Points to the character-string representation of a UUID, in the form `uuid_string_t`.

## Examples

The following call returns as `my_uuid_rep` the character-string representation for the UUID `my_uuid`:  
`uuid_encode (&my_uuid, my_uuid_rep);`

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.

---

## uuid\_gen Library Routine (NCS)

### Purpose

Generates a new Universal Unique Identifier (UUID).

### Syntax

```
void uuid_gen ( uuid)
uuid_t *uuid;
```

### Description

The `uuid_gen` routine returns a new UUID.

### Parameters

#### Output

`uuid` Points to the new UUID in the form of `uuid_t`.

## Examples

The following call returns as `my_uuid` a new UUID:  
`uuid_gen (&my_uuid);`

## Related Information

Remote Procedure Call (RPC) Runtime Library (NCS) in *AIX Version 6.1 Communications Programming Concepts*.



---

## Chapter 6. Network Information Services (NIS) and Network Information Services+ (NIS+)

---

### nis\_add\_entry (NIS+ API)

#### Purpose

Used to add the NIS+ object to the NIS+ `table_name`.

#### Syntax

```
cc [ flag . . . ] file . . . -lnsl [ library . . . ]  
#include <rpcsvc/nis.h>
```

```
nis_result * nis_add_entry(nis_name table_name, nis_object object, u_long* flags);
```

#### Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables, `nis_add_entry( )` is used to add the NIS+ object to the NIS+ `table_name`.

Entries within a table are named by NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value, . . . ], tablename
```

`nis_add_entry( )` will add the NIS+ object to the NIS+ `table_name`. The `flags` parameter is used to specify the failure semantics for the add operation:

**0** The default (`flags = 0`) is to fail if the entry being added already exists in the table.

#### ADD\_OVERWRITE

Specifies that the existing object is to be overwritten if it exists (a modify operation), or added if it does not exist. With the **ADD\_OVERWRITE** flag, this function will fail with the error **NIS\_PERMISSION** if the existing object does not allow modify privileges to the client.

#### RETURN\_RESULT

Specifies that the server will return a copy of the resulting object if the operation was successful. To succeed, `nis_add_entry( )` must inherit the **PAF\_TRUSTED\_PATH** attribute.

#### Return Values

These functions return a pointer to a structure of type `nis_result`:

```
struct nis_result {  
    nis_error status;  
    struct {  
        u_int      objects_len;  
        nis_object * objects_val;  
    } objects;  
    netobj  cookie;  
    u_long  zticks;  
    u_long  dticks;  
    u_long  aticks;  
    u_long  cticks;  
};
```

The `status` member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function `nis_sperrno( )`.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### **NIS\_BADATTRIBUTE**

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

### **NIS\_BADNAME**

The name passed to the function is not a legal NIS+ name.

### **NIS\_BADREQUEST**

A problem was detected in the request structure passed to the client library.

### **NIS\_CACHEEXPIRED**

The entry returned came from an object cache that has **expired**. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### **NIS\_CBERROR**

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.

### **NIS\_CBRESULTS**

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

### **NIS\_FOREIGNNS**

The name could not be completely resolved. When the name passed to the function would resolve

in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

#### **NIS\_INVALIDOBJ**

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

#### **NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

#### **NIS\_MODFAIL**

The attempted modification failed.

#### **NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

#### **NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

#### **NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.

#### **NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

#### **NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

#### **NIS\_NOSUCHTABLE**

The named table does not exist.

#### **NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

#### **NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove()**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

#### **NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).

#### **NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

#### **NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

### **NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND**, except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

### **NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

### **NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

### **NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

### **NIS\_SUCCESS**

The request was successful.

### **NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

### **NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.

### **NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

### **NIS\_TYPEMISMATCH**

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## **Summary of Trusted**

To succeed, **nis\_add\_entry( )** must inherit the **PAF\_TRUSTED\_PATH** attribute.

## **Related Information**

**nis\_first\_entry**, **nis\_list**, **nis\_local\_directory**, **nis\_lookup**, **nis\_modify\_entry**, **nis\_next\_entry**, **nis\_perror**, **nis\_remove\_entry**, and **nis\_sperror**.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## **nis\_first\_entry (NIS+ API)**

### **Purpose**

Used to fetch entries from a table one at a time.



## Syntax

```
cc [ flag . . . ] file . . . -lnsl [ library . . . ]  
#include <rpcsvc/nis.h>
```

```
nis_result * nis_first_entry(nis_name table_name)
```

## Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables, **nis\_first\_entry( )** is used to fetch entries from a table one at a time.

Entries within a table are named by .NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value, . . . ], tablename
```

**nis\_first\_entry( )** fetches entries from a table one at a time. This mode of operation is extremely inefficient and callbacks should be used instead whenever possible. The table containing the entries of interest is identified by *name*. If a search criteria is present in *name* it is ignored. The value of *cookie* within the **nis\_result** structure must be copied by the caller into local storage and passed as an argument to **nis\_next\_entry( )**.

## Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {  
    nis_error status;  
    struct {  
        u_int      objects_len;  
        nis_object * objects_val;  
    } objects;  
    netobj  cookie;  
    u_long  zticks;  
    u_long  dticks;  
    u_long  aticks;  
    u_long  cticks;  
};
```

The *status* member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function **nis\_sperrno( )**.

The **objects** structure contains two members: *objects\_val* is an array of *nis\_object* structures; *objects\_len* is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts, until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### NIS\_BADATTRIBUTE

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

### NIS\_BADNAME

The name passed to the function is not a legal NIS+ name.

### NIS\_BADREQUEST

A problem was detected in the request structure passed to the client library.

### NIS\_CACHEEXPIRED

The entry returned came from an object cache that has *expired*. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### NIS\_CBERROR

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.

### NIS\_CBRESULTS

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

### NIS\_FOREIGNNS

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with an NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

### NIS\_INVALIDOBJ

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

### NIS\_LINKNAMEERROR

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

### NIS\_MODFAIL

The attempted modification failed.

**NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

**NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

**NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.

**NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

**NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

**NIS\_NOSUCHTABLE**

The named table does not exist.

**NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

**NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove()**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

**NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).

**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

**NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND**, except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

**NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

### **NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

### **NIS\_SUCCESS**

The request was successful.

### **NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

### **NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.

### **NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

### **NIS\_TYPERISMATCH**

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## **Related Information**

`nis_add_entry`, `nis_list`, `nis_local_directory`, `nis_lookup`, `nis_modify_entry`, `nis_next_entry`, `nis_perror`, `nis_remove_entry`, and `nis_serror`.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## **nis\_list (NIS+ API)**

### **Purpose**

Used to search a table in the NIS+ namespace.

### **Syntax**

```
cc [ flag . . . ] file . . . -lnsl [ library . . . ]  
#include <rpcsvc/nis.h>  
  
nis_result * nis_list(name, flags, callback userdata);  
nis_name name;  
u_long flags;  
int (*callback)( );  
void userdata;
```

## Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables, `nis_list()` is used to search a table in the NIS+ *namespace*.

Entries within a table are named by NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value,... ],tablename
```

The list function, `nis_list()`, takes an indexed name as the value for the *name* parameter. Here, the tablename should be a fully qualified NIS+ name unless the **EXPAND\_NAME** flag is set. The second parameter, *flags*, defines how the function will respond to various conditions. The value for this parameter is created by logically **OR** ing together one or more flags from the following list:

### FOLLOW\_LINKS

If the table specified in *name* resolves to be a **LINK** type object, this flag specifies that the client library follow that link and do the search at that object. If this flag is not set and the name resolves to a link, the error **NIS\_NOTSEARCHABLE** will be returned.

### FOLLOW\_PATH

This flag specifies that if the entry is not found within this table, the list operation should follow the path specified in the table object. When used in conjunction with the **ALL\_RESULTS** flag, it specifies that the path should be followed regardless of the result of the search. When used in conjunction with the **FOLLOW\_LINKS** flag, named tables in the path that resolve to links will be followed until the table they point to is located. If a table in the path is not reachable because no server that serves it is available, the result of the operation will be either a "soft" success or a "soft" failure to indicate that not all tables in the path could be searched. If a name in the path names is either an invalid or non-existent object, then it is silently ignored.

### HARD\_LOOKUP

This flag specifies that the operation should continue trying to contact a server of the named table until a definitive result is returned (such as **NIS\_NOTFOUND**).

**Warning:** Use the flag **HARD\_LOOKUP** carefully since it can cause the application to block indefinitely during a network partition.

### ALL\_RESULTS

This flag can only be used in conjunction with **FOLLOW\_PATH** and a callback function. When specified, it forces all of the tables in the path to be searched. If *name* does not specify a search criteria (imply that all entries are to be returned), then this flag will cause all of the entries in all of the tables in the path to be returned.

### NO\_CACHE

This flag specifies that the client library should bypass any client object caches and get its information directly from either the master server or a replica server for the named table.

### MASTER\_ONLY

This flag is even stronger than **NO\_CACHE** as it specifies that the client library should *only* get its information from the master server for a particular table. This guarantees that the information will be up-to-date. However, there may be severe performance penalties associated with contacting the master server directly on large networks. When used in conjunction with the **HARD\_LOOKUP** flag, this will block the list operation until the master server is up and available.

### EXPAND\_NAME

When specified, the client library will attempt to expand a partially qualified name by calling `nis_getnames()`, which uses the environment variable **NIS\_PATH**.

## RETURN\_RESULT

This flag is used to specify that a copy of the returning object be returned in the **nis\_result** structure if the operation was successful.

The third parameter to **nis\_list( )**, **callback**, is an optional pointer to a function that will process the **ENTRY** type objects that are returned from the search. If this pointer is **NULL**, then all entries that match the search criteria are returned in the **nis\_result** structure; otherwise, this function will be called once for each entry returned. When called, this function should return **0** when additional objects are desired, and **1** when it no longer wishes to see any more objects.

The fourth parameter, **userdata**, is simply passed to callback function along with the returned entry object. The client can use this pointer to pass state information or other relevant data that the callback function might need to process the entries.

## Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {
    nis_error status;
    struct {
        u_int      objects_len;
        nis_object * objects_val;
    } objects;
    netobj      cookie;
    u_long      zticks;
    u_long      dticks;
    u_long      aticks;
    u_long      cticks;
};
```

The **status** member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function **nis\_sperno( )**.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts, until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating anNIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### **NIS\_BADATTRIBUTE**

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

### **NIS\_BADNAME**

The name passed to the function is not a legal NIS+ name.

### **NIS\_BADREQUEST**

A problem was detected in the request structure passed to the client library.

### **NIS\_CACHEEXPIRED**

The entry returned came from an object cache that has *expired*. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### **NIS\_CBERROR**

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.

### **NIS\_CBRESULTS**

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

### **NIS\_FOREIGNNS**

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

### **NIS\_INVALIDOBJ**

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

### **NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

### **NIS\_MODFAIL**

The attempted modification failed.

### **NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

### **NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

### **NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.



**NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

**NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

**NIS\_NOSUCHTABLE**

The named table does not exist.

**NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

**NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove( )**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

**NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).

**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

**NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND** except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

**NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

**NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

**NIS\_SUCCESS**

The request was successful.

**NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

**NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.



## NIS\_TRYAGAIN

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

## NIS\_TYEMISMATCH

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## Environment

### NIS\_PATH

When set, this variable is the search path used by **nis\_list( )** if the flag **EXPAND\_NAME** is set.

## Notes:

- The path used when the flag **FOLLOW\_PATH** is specified is the one present in the *first* table searched. The path values in tables that are subsequently searched are ignored.
- It is legal to call functions that would access the nameservice from within a list callback. However, calling a function that would itself use a callback, or calling **nis\_list( )** with a callback from within a list callback function, is not currently supported.

## Related Information

**nis\_add\_entry**, **nis\_first\_entry**, **nis\_local\_directory**, **nis\_lookup**, **nis\_modify\_entry**, **nis\_next\_entry**, **nis\_perror**, **nis\_remove\_entry**, and **nis\_sperror**.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## nis\_local\_directory (NIS+ API)

### Purpose

Returns the name of the NIS+ domain for this machine.

### Syntax

```
cc [ flag . . . ] file . . -lnsl [ library . . . ]  
#include <rpcsvc/nis.h>
```

```
nis_name nis_local_directory(void)
```

### Description

One of a group of NIS+ APIs that return several default NIS+ names associated with the current process, **nis\_local\_directory( )** returns the name of the NIS+ domain for this machine. This is currently the same as the Secure RPC domain returned by the **sysinfo(2)** system call.

**Note:** The result returned by this routine is a pointer to a data structure with the NIS+ library, and should be considered a "read-only" result and should not be modified.

## Environment

### nis\_group

This variable contains the name of the local NIS+ group. If the name is not fully qualified, the value returned by `nis_local_directory( )` will be concatenated to it.

## Related Information

`nis_add_entry`, `nis_first_entry`, `nis_list`, `nis_lookup`, `nis_modify_entry`, `nis_next_entry`, `nis_perror`, `nis_remove_entry`, and `nis_serror`.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## nis\_lookup (NIS+ API)

### Purpose

Used to resolve an NIS+ name and return a copy of that object from an NIS+ server.

### Syntax

```
cc [ flag . . . ] file . . . -lnsl [ library . . . ]
#include <rpcsvc/nis.h>
nis_result * nis_lookup(nis_name name, u_long flags);
void nis_freeresult(nis_result * result);
```

### Description

One of a group of NIS+ APIs that is used to locate and manipulate all NIS+ objects except the NIS+ entry objects, `nis_lookup( )` resolves an NIS+ name and returns a copy of that object from an NIS+ server.

This function should be used only with names that refer to an NIS+Directory, NIS+Table, NIS+Group, or NIS+Private object. If a name refers to an NIS+ entry object, the functions listed in `nis_subr(3N)` should be used.

`nis_lookup` returns a pointer to a `nis_result` structure that *must* be freed by calling `nis_freeresult( )` when you have finished using it. If one or more of the objects returned in the structure need to be retained, they can be copied with `nis_clone_object(3N)`.

`nis_lookup( )` takes two parameters, the name of the object to be resolved in *name*, and a flags parameter, *flags*. The object name is expected to correspond to the syntax of a non-indexed NIS+ name. The `nis_lookup( )` function is the *only* function from this group that can use a non-fully qualified name. If the parameter *name* is not a fully qualified name, then the flag `EXPAND_NAME` *must* be specified in the call. If this flag is not specified, the function will fail with the error `NIS+BADNAME`.

The *flags* parameter is constructed by logically **OR** ing zero or more flags from the following list:

#### EXPAND\_NAME

When specified, the client library will attempt to expand a partially qualified name by calling the function `nis_getnames( )`, which uses the environment variable `nis_path`.

## FOLLOW\_LINKS

When specified, the client library will "follow" links by issuing another NIS+ lookup call for the object named by the link. If the linked object is itself a link, then this process will iterate until either an object is found that is not a **link** type object, or the library has followed 16 links.

## HARD\_LOOKUP

When specified, the client library will retry the lookup until it is answered by a server. Using this flag will cause the library to block until at least one NIS+ server is available. If the network connectivity is impaired, this can be a relatively long time.

## MASTER\_ONLY

When specified, the client library will bypass any object caches and any domain replicas and fetch the object from the NIS+ master server for the object's domain. This insures that the object returned is up-to-date at the cost of a possible performance degradation and failure if the master server is unavailable or physically distant.

## NO\_CACHE

When specified, the client library will bypass any object caches and will get the object from either the master NIS+ server or one of its replicas.

The status value may be translated to ascii text using the function **nis\_sperno( )**.

On return, the **objects** array in the result will contain one and possibly several objects that were resolved by the request. If the **FOLLOW\_LINKS** flag was present, on success the function could return several entry objects if the link in question pointed within a table. If an error occurred when following a link, the objects array will contain a copy of the link object itself.

## Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {
    nis_error status;
    struct {
        u_int objects_len;
        nis_object * objects_val;
    } objects;
    netobj cookie;
    u_long zticks;
    u_long dticks;
    u_long aticks;
    u_long cticks;
};
```

The **status** member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function **nis\_sperno( )**.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts, until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### **NIS\_BADNAME**

The name passed to the function is not a legal NIS+ name.

### **NIS\_CACHEEXPIRED**

The object returned came from an object cache that has *expired*. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### **NIS\_FOREIGNNS**

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

### **NIS\_INVALIDOBJ**

The object pointed to by *obj* is not a valid NIS+ object.

### **NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

### **NIS\_MODFAIL**

The attempted modification failed.

### **NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

### **NIS\_NAMEUNREACHABLE**

A server for the directory of the named object could not be reached. This can occur when there is a network partition or all the servers have crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

### **NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

### **NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

### **NIS\_NOSUCHTABLE**

The named table does not exist.

**NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally this will not occur; however, if you are not using the built-in location mechanism for servers, you may see this if your mechanism is broken.

**NIS\_NOTFOUND**

The named object does not exist in the namespace.

**NIS\_NOTMASTER**

An attempt was made to update the database on a replica server.

**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

**NIS\_S\_SUCCESS**

The request was successful; however, the object returned came from an object cache and not directly from the server. If you want to see objects from object caches, you must specify the flag **NO\_CACHE** when you call the lookup function.

**NIS\_SUCCESS**

The request was successful.

**NIS\_SYSTEMERROR**

A generic system error occurred while attempting the request. Most commonly the server has crashed or the database has become corrupted. Check the **syslog** record for error messages from the server.

**NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. For the **add**, **remove**, and **modify** operations this is returned when either the master server for a directory is unavailable or it is in the process of checkpointing its database. It can also be returned when the server is updating its internal state or, in the case of **nis\_list( )**, if the client specifies a callback and the server does not have the resources to handle callbacks.

**NIS\_UNKNOWNOBJ**

The object returned is of an unknown type.

## Environment

**NIS\_PATH**

If the flag **EXPAND\_NAME** is set, this variable is the search path used by **nis\_lookup( )**.

## Related Information

**nis\_add\_entry**, **nis\_first\_entry**, **nis\_list**, **nis\_local\_directory**, **nis\_modify\_entry**, **nis\_next\_entry**, **nis\_perror**, **nis\_remove\_entry**, and **nis\_serror**.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## nis\_modify\_entry (NIS+ API)

### Purpose

Used to modify an NIS+ object identified by *name*.

### Syntax

```
cc [ flag . . . ] file . . -lnsl [ library . . . ]  
#include <rpsvc/nis.h>
```

```
nis_remove_entry * nis_remove_entry(nis_name name, nis_object * object, u_long flags);
```

### Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables; **nis\_modify\_entry( )** is used to remove the identified entry from the table or a set of entries identified by *table\_name*.

Entries within a table are named by NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value, . . . ], tablename
```

**nis\_modify\_entry( )** modifies an object identified by *name*. The parameter *object* should point to an entry with the **EN\_MODIFIED** flag set in each column that contains new information.

The owner, group, and access rights of an entry are modified by placing the modified information into the respective fields of the parameter, *object*: **zo\_owner**, **zo\_group**, and **zo\_access**.

These columns will replace their counterparts in the entry that is stored in the table. The entry passed must have the same number of columns, same type, and valid data in the modified columns for this operation to succeed.

If the flags parameter contains the flag **MOD\_SAMEOBJ**, the object pointed to by *object* is assumed to be a cached copy of the original object. If the OID of the object passed is different than the OID of the object the server fetches, then the operation fails with the **NIS\_NOTSAMEOBJ** error. This can be used to implement a simple read-modify-write protocol that will fail if the object is modified before the client can write the object back.

If the flag **RETURN\_RESULT** has been specified, the server will return a copy of the resulting object if the operation was successful.

To succeed, **nis\_modify\_entry( )** must inherit the **PAF\_TRUSTED\_PATH** attribute.

### Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {  
    nis_error status;  
    struct {  
        u_int    objects_len;  
        nis_object * objects_val;  
    } objects;  
    netobj    cookie;  
    u_long    zticks;
```

```

        u_long    dticks;
        u_long    aticks;
        u_long    cticks;
};

```

The **status** member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function **nis\_sperrno( )**.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts, until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### NIS\_BADATTRIBUTE

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

### NIS\_BADNAME

The name passed to the function is not a legal NIS+ name.

### NIS\_BADREQUEST

A problem was detected in the request structure passed to the client library.

### NIS\_CACHEEXPIRED

The entry returned came from an object cache that has **expired**. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### NIS\_CBERROR

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.



## **NIS\_CBRESULTS**

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

## **NIS\_FOREIGNNS**

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

## **NIS\_INVALIDOBJ**

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

## **NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

## **NIS\_MODFAIL**

The attempted modification failed.

## **NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

## **NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

## **NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.

## **NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

## **NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

## **NIS\_NOSUCHTABLE**

The named table does not exist.

## **NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally, this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

## **NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove( )**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

## **NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).



**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

**NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND** except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

**NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

**NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

**NIS\_SUCCESS**

The request was successful.

**NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

**NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.

**NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

**NIS\_TYPEMISMATCH**

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## Summary of Trusted

To succeed, **nis\_modify\_entry( )** must inherit the **PAF\_TRUSTED\_PATH** attribute.

## Related Information

**nis\_add\_entry**, **nis\_first\_entry**, **nis\_list**, **nis\_local\_directory**, **nis\_lookup**, **nis\_next\_entry**, **nis\_perror**, **nis\_remove\_entry**, and **nis\_sperror**.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## nis\_next\_entry (NIS+ API)

### Purpose

Used to fetch entries from a table one at a time.

### Syntax

```
cc [ flag . . . ] file . . -lnsl [ library . . . ]  
#include <rpcsvc/nis.h>
```

```
nis_result * nis_next_entry(nis_name table_name, netobj cookie)
```

### Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables, **nis\_next\_entry( )** is used to retrieve the "next" entry from a table specified by **table\_name**.

Entries within a table are named by NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value, . . . ], tablename
```

**nis\_next\_entry( )** retrieves the "next" entry from a table specified by **table\_name**. The order in which entries are returned is not guaranteed. Further, should an update occur in the table between client calls to **nis\_next\_entry( )**, there is no guarantee that an entry that is added or modified will be seen by the client. Should an entry be removed from the table that would have been the "next" entry returned, the error **NIS\_CHAINBROKEN** is returned instead.

### Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {  
    nis_error status;  
    struct {  
        u_int      objects_len;  
        nis_object * objects_val;  
    } objects;  
    netobj      cookie;  
    u_long      zticks;  
    u_long      dticks;  
    u_long      aticks;  
    u_long      cticks;  
};
```

The **status** member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function **nis\_sperno( )**.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to **nis\_freeresult( )**. If you need to keep a copy of one or more objects, they can be copied with the function **nis\_clone\_object( )** and freed with the function **nis\_destroy\_object( )**.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

- zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.
- dticks** The time spent in the database backend, this time is measured from the time a database call starts, until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.
- aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.
- cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the more pertinent ones:

### NIS\_BADATTRIBUTE

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

### NIS\_BADNAME

The name passed to the function is not a legal NIS+ name.

### NIS\_BADREQUEST

A problem was detected in the request structure passed to the client library.

### NIS\_CACHEEXPIRED

The entry returned came from an object cache that has *expired*. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

### NIS\_CBERROR

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.

### NIS\_CBRESULTS

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

### NIS\_FOREIGNNS

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

### NIS\_INVALIDOBJ

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

**NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

**NIS\_MODFAIL**

The attempted modification failed.

**NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

**NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

**NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.

**NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

**NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.

**NIS\_NOSUCHTABLE**

The named table does not exist.

**NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally, this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

**NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove( )**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

**NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).

**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

**NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND**, except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

### **NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

### **NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

### **NIS\_SUCCESS**

The request was successful.

### **NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

### **NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.

### **NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

### **NIS\_TYPEMISMATCH**

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## **Related Information**

`nis_add_entry`, `nis_first_entry`, `nis_list`, `nis_local_directory`, `nis_lookup`, `nis_modify_entry`, `nis_perror`, `nis_remove_entry`, and `nis_sperror`.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## **nis\_perror (NIS+ API)**

### **Purpose**

Prints the error message corresponding to **status** as "*label*: error message" on standard error.

### **Syntax**

```
cc  
[  
  flag  
  ... ]  
file  
...  
-lnsl
```

```
[
library
... ]
#include <rpcsvc/nis.h>

char * nis_sperrno(nis_error status);
void nis_perror(nis_error status, char * label);
void nis_lerror(nis_error status, char * label);
char * nis_sperror_r(nis_error status, char * label, char * buf, int length);
char * nis_sperror(nis_error status, char * label);
```

## Description

One of a group of NIS+ APIs that convert NIS+ status values into strings, **nis\_perror** prints the error messages corresponding to *status* as "*label*: error messages" on standard error.

## Related Information

nis\_add\_entry, nis\_first\_entry, nis\_list, nis\_local\_directory, nis\_lookup, nis\_modify\_entry, nis\_next\_entry, nis\_remove\_entry, and nis\_sperror.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## nis\_remove\_entry (NIS+ API)

### Purpose

Used to remove an NIS+ object from the NIS+ *table\_name*.

### Syntax

```
cc [ flag . . . ] file . . . -lnsl [ library . . . ]
#include <rpcsvc/nis.h>
```

```
nis_result * nis_remove_entry(nis_name name, nis_object, * object, u_long flags);
```

### Description

One of a group of NIS+ APIs that is used to search and modify NIS+ tables, **nis\_remove\_entry( )** is used to remove the identified entry from the table or a set of entries identified by ***table\_name***.

Entries within a table are named by NIS+ indexed names. An indexed name is a compound name that is composed of a search criteria and a simple NIS+ name that identifies a table object. A search criteria is a series of column names and their associated values enclosed in bracket [ ] characters. Indexed names have the following form:

```
[ colname=value, . . . ], tablename
```

**nis\_remove\_entry( )** removes the identified entry from the table or a set of entries identified by ***table\_name***. If the parameter ***object*** is non-null, it is presumed to point to a cached copy of the entry. When the removal is attempted, and the object that would be removed is not the same as the cached object pointed to by ***object***, then the operation will fail with an **NIS\_NOTSAMEOBJ** error. If an object is passed with this function, the search criteria in *name* is optional as it can be constructed from the values within the entry. However, if no object is present, the search criteria must be included in the ***name*** parameter. If the flags variable is null, and the search criteria does not uniquely identify an entry, the

**NIS\_NOTUNIQUE** error is returned and the operation is aborted. If the flag parameter **REM\_MULTIPLE** is passed, and if remove permission is allowed for each of these objects, then all objects that match the search criteria will be removed. Note that a null search criteria and the **REM\_MULTIPLE** flag will remove all entries in a table.

To succeed, `nis_remove_entry( )` must inherit the **PAF\_TRUSTED\_PATH** attribute.

## Return Values

These functions return a pointer to a structure of type **nis\_result**:

```
struct nis_result {
    nis_error status;
    struct {
        u_int      objects_len;
        nis_object * objects_val;
    } objects;
    netobj      cookie;
    u_long      zticks;
    u_long      dticks;
    u_long      aticks;
    u_long      cticks;
};
```

The **status** member contains the error status of the the operation. A text message that describes the error can be obtained by calling the function `nis_sperno( )`.

The **objects** structure contains two members: **objects\_val** is an array of **nis\_object** structures; **objects\_len** is the number of cells in the array. These objects will be freed by a call to `nis_freeresult( )`. If you need to keep a copy of one or more objects, they can be copied with the function `nis_clone_object( )` and freed with the function `nis_destroy_object( )`.

The various ticks contain details of where the time (in microseconds) was taken during a request. They can be used to tune one's data organization for faster access and to compare different database implementations.

**zticks** The time spent in the NIS+ service itself, this count starts when the server receives the request and stops when it sends the reply.

**dticks** The time spent in the database backend, this time is measured from the time a database call starts until a result is returned. If the request results in multiple calls to the database, this is the sum of all the time spent in those calls.

**aticks** The time spent in any *accelerators* or caches. This includes the time required to locate the server needed to resolve the request.

**cticks** The total time spent in the request, this clock starts when you enter the client library and stops when a result is returned. By subtracting the sum of the other ticks values from this value you can obtain the local overhead of generating an NIS+ request.

Subtracting the value in **dticks** from the value in **zticks** will yield the time spent in the service code itself. Subtracting the sum of the values in **zticks** and **aticks** from the value in **cticks** will yield the time spent in the client library itself.

**Note:** All of the tick times are measured in microseconds.

## Errors

The client library can return a variety of error returns and diagnostics. Following are some of the mor pertinent ones:

**NIS\_BADATTRIBUTE**

The name of an attribute did not match up with a named column in the table, or the attribute did not have an associated value.

**NIS\_BADNAME**

The name passed to the function is not a legal NIS+ name.

**NIS\_BADREQUEST**

A problem was detected in the request structure passed to the client library.

**NIS\_CACHEEXPIRED**

The entry returned came from an object cache that has *expired*. This means that the time to live value has gone to zero and the entry may have changed. If the flag **NO\_CACHE** was passed to the lookup function, the lookup function will retry the operation to get an unexpired copy of the object.

**NIS\_CBERROR**

An RPC error occurred on the server while it was calling back to the client. The transaction was aborted at that time and any unsent data was discarded.

**NIS\_CBRESULTS**

Even though the request was successful, all of the entries have been sent to your callback function and are thus not included in this result.

**NIS\_FOREIGNNS**

The name could not be completely resolved. When the name passed to the function would resolve in a namespace that is outside the NIS+ name tree, this error is returned with a NIS+ object of type **DIRECTORY**. The returned object contains the type of namespace and contact information for a server within that namespace.

**NIS\_INVALIDOBJ**

The object pointed to by *object* is not a valid NIS+ entry object for the given table. This could occur if it had a mismatched number of columns, or a different data type (for example, binary or text) than the associated column in the table.

**NIS\_LINKNAMEERROR**

The name passed resolved to a **LINK** type object and the contents of the object pointed to an invalid name.

**NIS\_MODFAIL**

The attempted modification failed.

**NIS\_NAMEEXISTS**

An attempt was made to add a name that already exists. To add the name, first remove the existing name and then add the new name or modify the existing named object.

**NIS\_NAMEUNREACHABLE**

This soft error indicates that a server for the desired directory of the named table object could not be reached. This can occur when there is a network partition or the server has crashed. Attempting the operation again may succeed. See the **HARD\_LOOKUP** flag.

**NIS\_NOCALLBACK**

The server was unable to contact the callback service on your machine. This results in no data being returned.

**NIS\_NOMEMORY**

Generally a fatal result. It means that the service ran out of heap space.

**NIS\_NOSUCHNAME**

This hard error indicates that the named directory of the table object does not exist. This occurs when the server that should be the parent of the server that serves the table does not know about the directory in which the table resides.



**NIS\_NOSUCHTABLE**

The named table does not exist.

**NIS\_NOT\_ME**

A request was made to a server that does not serve the given name. Normally, this will not occur; however, if you are not using the built in location mechanism for servers, you may see this if your mechanism is broken.

**NIS\_NOTFOUND**

No entries in the table matched the search criteria. If the search criteria was null (return all entries), then this result means that the table is empty and may safely be removed by calling the **nis\_remove( )**. If the **FOLLOW\_PATH** flag was set, this error indicates that none of the tables in the path contain entries that match the search criteria.

**NIS\_NOTMASTER**

A change request was made to a server that serves the name, but it is not the master server. This can occur when a directory object changes and it specifies a new master server. Clients that have cached copies of the directory object in the **/var/nis/NIS\_SHARED\_DIRCACHE** file will need to have their cache managers restarted (use **nis\_cachemgr -i** to flush this cache).

**NIS\_NOTSAMEOBJ**

An attempt to remove an object from the namespace was aborted because the object that would have been removed was not the same object that was passed in the request.

**NIS\_NOTSEARCHABLE**

The table name resolved to a NIS+ object that was not searchable.

**NIS\_PARTIAL**

This result is similar to **NIS\_NOTFOUND** except that it means the request succeeded but resolved to zero entries. When this occurs, the server returns a copy of the table object instead of an entry so that the client may then process the path or implement some other local policy.

**NIS\_RPCERROR**

This fatal error indicates the RPC subsystem failed in some way. Generally there will be a **syslog(3)** message indicating why the RPC request failed.

**NIS\_S\_NOTFOUND**

The named entry does not exist in the table; however, not all tables in the path could be searched, so the entry may exist in one of those tables.

**NIS\_S\_SUCCESS**

Even though the request was successful, a table in the search path was not able to be searched, so the result may not be the same as the one you would have received if that table had been accessible.

**NIS\_SUCCESS**

The request was successful.

**NIS\_SYSTEMERROR**

Some form of generic system error occurred while attempting the request. Check the **syslog(3)** record for error messages from the server.

**NIS\_TOOMANYATTRS**

The search criteria passed to the server had more attributes than the table had searchable columns.

**NIS\_TRYAGAIN**

The server connected to was too busy to handle your request. **add\_entry( )**, **remove\_entry( )**, and **modify\_entry( )** return this error when the master server is currently updating its internal state. It can be returned to **nis\_list( )** when the function specifies a callback and the server does not have the resources to handle callbacks.

## NIS\_TYEMISMATCH

An attempt was made to add or modify an entry in a table, and the entry passed was of a different type than the table.

## Summary of Trusted

To succeed, `nis_remove_entry( )` must inherit the `PAF_TRUSTED_PATH` attribute.

## Related Information

`nis_add_entry`, `nis_first_entry`, `nis_list`, `nis_local_directory`, `nis_lookup`, `nis_modify_entry`, `nis_next_entry`, `nis_perror`, and `nis_sperror`.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## nis\_sperror (NIS+ API)

### Purpose

Returns a pointer to a string that can be used or copied using the `strdup` function.

### Syntax

```
cc
[
flag
... ]
file
...
-lns1
[
library
... ]
#include <rpcsvc/nis.h>
char * nis_sperror(nis_error status, char * label);
```

### Description

One of a group of NIS+ APIs that convert NIS+ status values into strings, `nis_sperror` returns a pointer to a string that can be used or copied using the `strdup` function. The caller must supply a string buffer, `buf`, large enough to hold the error string (a buffer size of 128 bytes is guaranteed to be sufficiently large). `status` and `label` are the same as for `nis_perror`. The pointer returned by the function is a pointer to `buf`. `length` specifies the number of characters to copy from the error string to `buf`. The string is returned as a pointer to a buffer that is reused on each call.

**Note:** When compiling multithreaded applications, see *Writing Reentrant and Thread-Safe Code* for information about the use of the `_REENTRANT` flag.

### Related Information

`nis_add_entry`, `nis_first_entry`, `nis_list`, `nis_local_directory`, `nis_lookup`, `nis_modify_entry`, `nis_next_entry`, `nis_perror`, and `nis_remove_entry`.

Network Information Services+ and NIS+ Namespace and Structure in *AIX Version 6.1 Network Information Services (NIS and NIS+) Guide*.

TCP/IP protocols in *Networks and communication management*.

List of NIS and NIS+ Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_all Subroutine

### Purpose

Transfers all of the key-value pairs from the Network Information Services (NIS) server to the client as the entire map.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_all ( indomain, inmap, incallback)
char *indomain;
char *inmap;
struct ypall_Callback *incallback {
int (* foreach) ();
char * data;
};
```

```
foreach (instatus, inkey, inkeylen, inval, invallen, indata)
int instatus;
char * inkey;
int inkeylen;
char * inval;
int invallen;
char * indata;
```

### Description

The **yp\_all** subroutine provides a way to transfer an entire map from the server to the client in a single request. The routine uses Transmission Control Protocol (TCP) rather than User Datagram Protocol (UDP) used by other NIS subroutines. This entire transaction takes place as a single Remote Procedure Call (RPC) request and response. The **yp\_all** subroutine is used like any other NIS procedure, identifying a subroutine and map in the normal manner, and supplying a subroutine to process each key-value pair within the map.

The memory pointed to by the *inkey* and *inval* parameters is private to the **yp\_all** subroutine. This memory is overwritten with each new key-value pair processed. The **foreach** function uses the contents of the memory but does not own the memory itself. Key and value objects presented to the **foreach** function look exactly as they do in the server's map. Objects not terminated by a new-line or null character in the server's map are not terminated by a new-line or null character in the client's map.

**Note:** The remote procedure call is returned to the **yp\_all** subroutine only after the transaction is completed (successfully or unsuccessfully) or after the **foreach** function rejects any more key-value pairs.

## Parameters

<i>data</i>	Specifies state information between the <b>foreach</b> function and the mainline code (see also the <i>indata</i> parameter).
<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>incallback</i>	Specifies the structure containing the user-defined <b>foreach</b> function, which is called for each key-value pair transferred.
<i>instatus</i>	Specifies either a return status value of the form <b>NIS_TRUE</b> or an error code. The error codes are defined in the <b>rpcsvc/yp_prot.h</b> file.
<i>inkey</i>	Points to the current key of the key-value pair as returned from the server's database.
<i>inkeylen</i>	Returns the length, in bytes, of the <i>inkey</i> parameter.
<i>inval</i>	Points to the current value of the key-value pair as returned from the server's database.
<i>invallen</i>	Specifies the size of the value in bytes.
<i>indata</i>	Specifies the contents of the <b>incallback-&gt;data</b> element passed to the <b>yp_all</b> subroutine. The <b>data</b> element shares state information between the <b>foreach</b> function and the mainline code. The <i>indata</i> parameter is optional because no part of the NIS client package inspects its contents.

## Return Values

The **foreach** subroutine returns a value of 0 when it is ready to be called again for additional received key-value pairs. It returns a nonzero value to stop the flow of key-value pairs. If the **foreach** function returns a nonzero value, it is not called again, and the **yp\_all** subroutine returns a value of 0.

## Related Information

Network Information Service (NIS) Overview for System Management and TCP/IP protocols in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_bind Subroutine

### Purpose

Used in programs to call the **ypbind** daemon directly for processes that use backup strategies when Network Information Services (NIS) is not available.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypc1nt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_bind ( indomain)
char *indomain;
```

## Description

In order to use NIS, the client process must be bound to an NIS server that serves the appropriate domain. That is, the client must be associated with a specific NIS server that services the client's requests for NIS information. The NIS lookup processes automatically use the **ypbind** daemon to bind the client, but the **yp\_bind** subroutine can be used in programs to call the daemon directly for processes that use backup strategies (for example, a local file) when NIS is not available.

Each NIS binding allocates, or uses up, one client process socket descriptor, and each bound domain uses one socket descriptor. Multiple requests to the same domain use the same descriptor.

**Note:** If a Remote Procedure Call (RPC) failure status returns from the use of the **yp\_bind** subroutine, the domain is unbound automatically. When this occurs, the NIS client tries to complete the operation if the **ypbind** daemon is running and either of the following is true:

- The client process cannot bind a server for the proper domain.
- RPCs to the server fail.

## Parameters

*indomain*        Points to the name of the domain for which to attempt the bind.

## Return Values

The NIS client returns control to the user with either an error or a success code if any of the following occurs:

- The error is not related to RPC.
- The **ypbind** daemon is not running.
- The **ypserv** daemon returns the answer.

## Related Information

The **ypbind** daemon, **ypserv** daemon.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_first Subroutine

### Purpose

Returns the first key-value pair from the named Network Information Services (NIS) map in the named domain.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```

yp_first (indomain, inmap, outkey, outkeylen, outval, outvallen)
char * indomain;
char * inmap;
char ** outkey;
int * outkeylen;
char ** outval;
int * outvallen;

```

## Description

The `yp_first` routine returns the first key-value pair from the named NIS map in the named domain.

## Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>outkey</i>	Specifies the address of the uninitialized string pointer where the first key is returned. Memory is allocated by the NIS client using the <b>malloc</b> subroutine, and may be freed by the application.
<i>outkeylen</i>	Returns the length, in bytes, of the <i>outkey</i> parameter.
<i>outval</i>	Specifies the address of the uninitialized string pointer where the value associated with the key is returned. Memory is allocated by the NIS client using the <b>malloc</b> subroutine, and may be freed by the application.
<i>outvallen</i>	Returns the length, in bytes, of the <i>outval</i> parameter.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns an error as described in the `rpcsvc/yp_prot.h` file.

## Related Information

The **malloc** subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming and List of NIS Programming References in *AIX Version 6.1 Communications Programming Concepts*.

## yp\_get\_default\_domain Subroutine

### Purpose

Gets the default domain of the node.

### Library

C Library (**libc.a**)

### Syntax

```

#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>

```

```

yp_get_default_domain ( outdomain)
char **outdomain;

```

## Description

Network Information Services (NIS) lookup calls require both a map name and a domain name. Client processes can get the default domain of the node by calling the **yp\_get\_default\_domain** routine and using the value returned in the *outdomain* parameter as the input domain (*indomain*) parameter for NIS remote procedure calls.

## Parameters

*outdomain* Specifies the address of the uninitialized string pointer where the default domain is returned. Memory is allocated by the NIS client using the **malloc** subroutine and should not be freed by the application.

## Return Values

Upon successful completion, this routine returns a value of 0. If unsuccessful, it returns an error as described in the **rpcsvc/ypclnt.h** file.

## Related Information

The **malloc** subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_master Subroutine

### Purpose

Returns the machine name of the Network Information Services (NIS) master server for a map.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_master ( indomain, inmap, outname)
char *indomain;
char *inmap;
char **outname;
```

### Description

The **yp\_master** subroutine returns the machine name of the NIS master server for a map.

### Parameters

*indomain* Points to the name of the domain used as input to the subroutine.  
*inmap* Points to the name of the map used as input to the subroutine.

*outname* Specifies the address of the uninitialized string pointer where the name of the domain's **yp\_master** server is returned. Memory is allocated by the NIS client using the **malloc** subroutine, and may be freed by the application.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns one of the error codes described in the **rpcsvc/yp\_prot.h** file.

## Related Information

The **malloc** subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_match Subroutine

### Purpose

Searches for the value associated with a key.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_match (indomain, inmap, inkey, inkeylen, outval, outvallen)
char * indomain;
char * inmap;
char * inkey;
int inkeylen;
char ** outval;
int * outvallen;
```

### Description

The **yp\_match** subroutine searches for the value associated with a key. The input character string entered as the key must match a key in the Network Information Services (NIS) map exactly because pattern matching is not available in NIS.

### Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>inkey</i>	Points to the name of the key used as input to the subroutine.
<i>inkeylen</i>	Specifies the length, in bytes, of the key.
<i>outval</i>	Specifies the address of the uninitialized string pointer where the values associated with the key are returned. Memory is allocated by the NIS client using the <b>malloc</b> subroutine, and may be freed by the application.



*outvallen* Returns the length, in bytes, of the *outval* parameter.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns one of the error codes described in the `rpcsvc/yp_prot.h` file.

## Related Information

The `malloc` subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_next Subroutine

### Purpose

Returns each subsequent value it finds in the named Network Information Services (NIS) map until it reaches the end of the list.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_next (indomain, inmap, inkey, inkeylen, outkey, outkeylen, outval, outvallen)
```

```
char * indomain;
```

```
char * inmap;
```

```
char * inkey;
```

```
int inkeylen;
```

```
char ** outkey;
```

```
int * outkeylen;
```

```
char ** outval;
```

```
int * outvallen;
```

### Description

The `yp_next` subroutine returns each subsequent value it finds in the named NIS map until it reaches the end of the list.

The `yp_next` subroutine must be preceded by an initial `yp_first` subroutine. Use the *outkey* parameter value returned from the initial `yp_first` subroutine as the value of the *inkey* parameter for the `yp_next` subroutine. This will return the second key-value pair associated with the map. To show every entry in the NIS map, the `yp_first` subroutine is called with the `yp_next` subroutine called repeatedly. Each time the `yp_next` subroutine returns a key-value, use it as the *inkey* parameter for the next call.

The concepts of *first* and *next* depend on the structure of the NIS map being processed. The routines do not retrieve the information in a specific order, such as the lexical order from the original, non-NIS database information files or the numerical sorting order of the keys, values, or key-value pairs. If the

**yp\_first** subroutine is called on a specific map with the **yp\_next** subroutine called repeatedly until the process returns a **YPERR\_NOMORE** message, every entry in the NIS map is seen once. If the same sequence of operations is performed on the same map at the same server, the entries are seen in the same order.

**Note:** If a server operates under a heavy load or fails, the domain can become unbound and then bound again while a client is running. If it binds itself to a different server, entries may be seen twice or not at all. The domain rebinds itself to protect the enumeration process from being interrupted before it completes. Avoid this situation by returning all of the keys and values with the **yp\_all** subroutine.

## Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>inkey</i>	Points to the key that is used as input to the subroutine.
<i>inkeylen</i>	Returns the length, in bytes, of the <i>inkey</i> parameter.
<i>outkey</i>	Specifies the address of the uninitialized string pointer where the first key is returned. Memory is allocated by the NIS client using the <b>malloc</b> subroutine, and may be freed by the application.
<i>outkeylen</i>	Returns the length, in bytes, of the <i>outkey</i> parameter.
<i>outval</i>	Specifies the address of the uninitialized string pointer where the values associated with the key are returned. Memory is allocated by the NIS client using the <b>malloc</b> subroutine, and may be freed by the application.
<i>outvallen</i>	Returns the length, in bytes, of the <i>outval</i> parameter.

## Return Values

Upon successful completion, this routine returns a value of 0. If unsuccessful, it returns one of the error codes described in the **rpcsvc/yp\_prot.h** file.

## Related Information

The **malloc** subroutine, **yp\_all** subroutine, **yp\_first** subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_order Subroutine

### Purpose

Returns the order number for an Network Information Services (NIS) map that identifies when the map was built.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_order (indomain, inmap, outorder)
char * indomain;
char * inmap;
int * outorder;
```

## Description

The **yp\_order** subroutine returns the order number for a NIS map that identifies when the map was built. The number determines whether the local NIS map is more current than the master NIS database.

## Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>outorder</i>	Points to the returned order number, which is a 10-digit ASCII integer that represents the operating system time, in seconds, when the map was built.

## Return Values

Upon successful completion, this routine returns a value of 0. If unsuccessful, it returns one of the error codes described in the **rpcsvc/yp\_prot.h** file.

## Related Information

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_unbind Subroutine

### Purpose

Manages socket descriptors for processes that access multiple domains.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
void yp_unbind ( indomain)
char *indomain;
```

### Description

The **yp\_unbind** subroutine is available to manage socket descriptors for processes that access multiple domains. When the **yp\_unbind** subroutine is used to free a domain, all per-process and per-node resources that were used to bind the domain are also freed.

### Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
-----------------	---

## Return Values

Upon successful completion, this routine returns a value of 0. If unsuccessful, it returns one of the error codes described in the `rpcsvc/yp_prot.h` file.

## Related Information

The `yp_bind` subroutine.

The `ypbind` daemon.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References, Remote Procedure Call (RPC) Overview for Programming, and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## yp\_update Subroutine

### Purpose

Makes changes to an Network Information Services (NIS) map.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
yp_update (indomain, inmap, ypop, inkey, inkeylen, indata, indatalen)
char * indomain;
char * inmap;
unsigned ypop;
char * inkey;
int inkeylen;
char * indata;
int indatalen;
```

### Description

**Note:** This routine depends upon the secure Remote Procedure Call (RPC) protocol, and will not work unless the network is running it.

The `yp_update` subroutine is used to make changes to a NIS map. The syntax is the same as that of the `yp_match` subroutine except for the additional `ypop` parameter, which may take on one of the following four values:

Value	Description
<code>ypop_INSERT</code>	Inserts the key-value pair into the map. If the key already exists in the map, the <code>yp_update</code> subroutine returns a value of <code>YPERR_KEY</code> .
<code>ypop_CHANGE</code>	Changes the data associated with the key to the new value. If the key is not found in the map, the <code>yp_update</code> subroutine returns a value of <code>YPERR_KEY</code> .
<code>ypop_STORE</code>	Stores an item in the map regardless of whether the item already exists. No error is returned in either case.
<code>ypop_DELETE</code>	Deletes an entry from the map.

## Parameters

<i>indomain</i>	Points to the name of the domain used as input to the subroutine.
<i>inmap</i>	Points to the name of the map used as input to the subroutine.
<i>ypop</i>	Specifies the update operation to be used as input to the subroutine.
<i>inkey</i>	Points to the input key to be used as input to the subroutine.
<i>inkeylen</i>	Specifies the length, in bytes, of the <i>inkey</i> parameter.
<i>indata</i>	Points to the data used as input to the subroutine.
<i>indatalen</i>	Specifies the length, in bytes, of the data used as input to the subroutine.

## Return Values

Upon successful completion, this routine returns a value of 0. If unsuccessful, it returns one of the error codes described in the `rpcsvc/yp_prot.h` file.

## Files

`/var/yp/updaters`                      A makefile for updating NIS maps.

## Related Information

The `yp_match` subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## yperr\_string Subroutine

### Purpose

Returns a pointer to an error message string.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
char *yperr_string ( incode)
int incode;
```

### Description

The `yperr_string` routine returns a pointer to an error message string. The error message string is null-terminated but contains no period or new-line escape characters.

## Parameters

*incode* Contains Network Information Services (NIS) error codes as described in the `rpcsvc/yp_prot.h` file.

## Return Values

This subroutine returns a pointer to an error message string corresponding to the *incode* parameter.

## Related Information

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References in *AIX Version 6.1 Communications Programming Concepts*.

---

## ypprot\_err Subroutine

### Purpose

Takes an Network Information Services NIS protocol error code as input and returns an error code to be used as input to a `yperr_string` subroutine.

### Library

C Library (`libc.a`)

### Syntax

```
#include <rpcsvc/ypclnt.h>
#include <rpcsvc/yp_prot.h>
```

```
ypprot_err ( incode)
u_int incode;
```

### Description

The `ypprot_err` subroutine takes a NIS protocol error code as input and returns an error code to be used as input to a `yperr_string` subroutine.

## Parameters

*incode* Specifies the NIS protocol error code used as input to the subroutine.

## Return Values

This subroutine returns a corresponding error code to be passed to the `yperr_string` subroutine.

## Related Information

The `yperr_string` subroutine.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

List of NIS Programming References and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## Chapter 7. New Database Manager (NDBM)

---

### dbm\_close Subroutine

#### Purpose

Closes a database.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <ndbm.h>
```

```
void dbm_close ( db)  
DBM *db;
```

#### Description

The **dbm\_close** subroutine closes a database.

#### Parameters

*db* Specifies the database to close.

#### Related Information

The **dbmclose** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

### dbm\_delete Subroutine

#### Purpose

Deletes a key and its associated contents.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <ndbm.h>
```

```
int dbm_delete ( db, key)  
DBM *db;  
datum key;
```

#### Description

The **dbm\_delete** subroutine deletes a key and its associated contents.

## Parameters

*db* Specifies a database.  
*key* Specifies the key to delete.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, the subroutine returns a negative value.

## Related Information

The **delete** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dbm\_fetch Subroutine

### Purpose

Accesses data stored under a key.

### Library

C Library (**libc.a**)

### Syntax

```
#include <ndbm.h>
```

```
datum dbm_fetch ( db, key)
```

```
DBM *db;
```

```
datum key;
```

### Description

The **dbm\_fetch** subroutine accesses data stored under a key.

## Parameters

*db* Specifies the database to access.  
*key* Specifies the input key.

## Return Values

Upon successful completion, this subroutine returns a **datum** structure containing the value returned for the specified key. If the subroutine is unsuccessful, a null value is indicated in the *dptr* field of the **datum** structure.

## Related Information

The **fetch** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.



---

## dbm\_firstkey Subroutine

### Purpose

Returns the first key in a database.

### Library

C Library (**libc.a**)

### Syntax

```
#include <ndbm.h>
datum dbm_firstkey ( db)
DBM *db;
```

### Description

The **dbm\_firstkey** subroutine returns the first key in a database.

### Parameters

*db* Specifies the database to access.

### Return Values

Upon successful completion, this subroutine returns a **datum** structure containing the value returned for the specified key. If the subroutine is unsuccessful, a null value is indicated in the *dptr* field of the **datum** structure.

### Related Information

The **firstkey** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dbm\_nextkey Subroutine

### Purpose

Returns the next key in a database.

### Library

C Library (**libc.a**)

### Syntax

```
#include <ndbm.h>

datum dbm_nextkey ( db)
DBM *db;
```

### Description

The **dbm\_nextkey** subroutine returns the next key in a database.

## Parameters

*db* Specifies the database to access.

## Return Values

Upon successful completion, this subroutine returns a **datum** structure containing the value returned for the specified key. If the subroutine is unsuccessful, a null value is indicated in the *dptr* field of the **datum** structure.

## Related Information

The **nextkey** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dbm\_open Subroutine

### Purpose

Opens a database for access.

### Library

C Library (**libc.a**)

### Syntax

```
#include <ndbm.h>
```

```
DBM *dbm_open ( file, flags, mode)  
char *file;  
int flags, mode;
```

### Description

The **dbm\_open** subroutine opens a database for access. The subroutine opens or creates the *file.dir* and *file.pag* files, depending on the *flags* parameter. The returned DBM structure is used as input to other NDBM routines.

### Parameters

*file* Specifies the path to open a database.  
*flags* Specifies the flags required to open a subroutine.  
*mode* Specifies the mode required to open a subroutine.

For more information about the *flags* and *mode* parameters, see the **open**, **openx**, or **creat** subroutine.

### Return Values

Upon successful completion, this subroutine returns a pointer to the DBM structure. If unsuccessful, it returns a null value.

### Related Information

The **dbmopen** subroutine, **open**, **openx**, or **creat** subroutine.

## dbm\_store Subroutine

### Purpose

Places data under a key.

### Library

C Library (**libc.a**)

### Syntax

```
#include <ndbm.h>
```

```
int dbm_store (db, key, content, flags)
DBM * db;
datum key, content;
int flags;
```

### Description

The **dbm\_store** subroutine places data under a key.

### Parameters

<i>db</i>	Specifies the database to store.
<i>key</i>	Specifies the input key.
<i>content</i>	Specifies the value associated with the key to store.
<i>flags</i>	Contains either the <b>DBM_INSERT</b> or <b>DBM_REPLACE</b> flag.

### Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, the subroutine returns a negative value. When the **dbm\_store** subroutine is called with the *flags* parameter set to the **DBM\_INSERT** flag and an existing entry is found, it returns a value of 1. If the *flags* parameter is set to the **DBM\_REPLACE** flag, the entry will be replaced, even if it already exists.

### Related Information

The **store** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dbmclose Subroutine

### Purpose

Closes a database.

### Library

DBM Library (**libdbm.a**)

## Syntax

```
#include <dbm.h>
```

```
void dbmclose ( db)  
DBM *db;
```

## Description

The **dbmclose** subroutine closes a database.

## Parameters

*db* Specifies the database to close.

## Related Information

The **dbm\_close** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## dbminit Subroutine

### Purpose

Opens a database for access.

### Library

DBM Library (**libdbm.a**)

### Syntax

```
#include <dbm.h>
```

```
dbminit ( file)  
char *file;
```

### Description

The **dbminit** subroutine opens a database for access. At the time of the call, the *file.dir* and *file.pag* files must exist.

**Note:** To build an empty database, create zero-length **.dir** and **.pag** files.

### Parameters

*file* Specifies the path name of the database to open.

### Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, the subroutine returns a negative value.

### Related Information

The **dbm\_open** subroutine.

## delete Subroutine

### Purpose

Deletes a key and its associated contents.

### Library

DBM Library (**libdbm.a**)

### Syntax

```
#include <dbm.h>
```

```
delete ( key)  
datum key;
```

### Description

The **delete** subroutine deletes a key and its associated contents.

### Parameters

*key* Specifies the key to delete.

### Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, the subroutine returns a negative value.

### Related Information

The **dbm\_delete** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## fetch Subroutine

### Purpose

Accesses data stored under a key.

### Library

DBM Library (**libdbm.a**)

### Syntax

```
#include <dbm.h>
```

```
datum fetch ( key)  
datum key;
```

## Description

The **fetch** subroutine accesses data stored under a key.

## Parameters

*key* Specifies the input key.

## Return Values

Upon successful completion, this subroutine returns data corresponding to the specified key. If the subroutine is unsuccessful, a null value is indicated in the *dp<sub>tr</sub>* field of the returned **datum** structure.

## Related Information

The **dbm\_fetch** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## firstkey Subroutine

### Purpose

Returns the first key in the database.

### Library

DBM Library (**libdbm.a**)

### Syntax

```
#include <dbm.h>
datum firstkey ()
```

### Description

The **firstkey** subroutine returns the first key in the database.

### Return Values

Returns a **datum** structure containing the first key value pair.

### Related Information

The **dbm\_firstkey** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## nextkey Subroutine

### Purpose

Returns the next key in a database.

### Library

DBM Library (**libdbm.a**)

## Syntax

```
#include <dbm.h>
```

```
datum nextkey ( key)  
datum key;
```

## Description

The **nextkey** subroutine returns the next key in a database.

## Parameters

*key* Specifies the input key. This value has no effect on the return value, but must be present.

## Return Values

Returns a **datum** structure containing the next key-value pair.

## Related Information

The **dbm\_nextkey** subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## store Subroutine

### Purpose

Places data under a key.

### Library

DBM Library (**libdbm.a**)

### Syntax

```
#include <dbm.h>
```

```
int store ( key, content)  
datum key, content;
```

### Description

The **store** subroutine places data under a key.

### Parameters

*key* Specifies the input key.  
*content* Specifies the value associated with the key to store.

### Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, the subroutine returns a negative value.

## Related Information

The `dbm_store` subroutine.

List of NDBM and DBM Programming References and NDBM Overview in *AIX Version 6.1 Communications Programming Concepts*.



---

## Chapter 8. Remote Procedure Calls (RPC)

---

### auth\_destroy Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

### auth\_destroy Macro Exported from the libc Library

#### Purpose

Destroys authentication information.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void auth_destroy ( auth)
auth *auth;
```

#### Description

The **auth\_destroy** macro destroys the authentication information structure pointed to by the *auth* parameter. Destroying the structure deallocates private data structures. The use of the *auth* parameter is undefined after calling this macro.

#### Parameters

*auth*     Points to the authentication information structure to be destroyed.

#### Related Information

List of RPC Programming References.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### auth\_destroy Macro Exported from the libnsl Library

#### Purpose

Destroys authentication information.

#### Library

Network Services Library (**libnsl.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void auth_destroy ( auth)
AUTH *auth;
```

#### Description

The **auth\_destroy** macro destroys the client authentication information associated with the *auth* parameter. The *auth* parameter, which points to an authentication structure that is present in the client handle (the **cl\_auth** field), is passed to the server when a remote procedure call (RPC) is made. The private data structures are deallocated when the authentication information structure is destroyed. The usage of the *auth* parameter is undefined after a call to this macro.

## Parameters

*auth* Points to the authentication information structure to be destroyed.

## Examples

```
#include <rpc/rpc.h>
#include <stdio.h>

int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L ;
    char *nettype = "visible";
    char hostname[255] ;      /* The name of remote host */
    AUTH *auth

    /* Create client handle */
    if ((cl=clnt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
    {
        fprintf(stdout, "clnt_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /* Create default authentication structure */
    auth = authsys_create_default();
    cl->cl_auth = auth;

    /*
     * Make a CLNT_CALL
     */

    /* Destroy the authentication information */
    auth_destroy(cl->cl_auth);

    /* Destroy the client handle */
    clnt_destroy(cl);

    return 0;
}
```

## Related Information

The “clnt\_destroy Macro” on page 303.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authdes\_create Subroutine

### Purpose

Enables the use of Data Encryption Standard (DES) from the client side.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>

AUTH *authdes_create (name, window, syncaddr, ckey)
char * name;
```

```
u_int window;
struct sockaddr * syncaddr;
des_block * ckey;
```

## Description

The **authdes\_create** subroutine interfaces to the secure authentication system, known as DES. This subroutine, used from the client side, returns the authentication handle that allows use of the secure authentication system.

**Note:** The **keyserv** daemon must be running for the DES authentication system to work.

## Parameters

<i>name</i>	Specifies the network name (or netname) of the server process owner. The <i>name</i> parameter can be either the host name derived from the <b>host2netname</b> subroutine or the user name derived from the <b>user2netname</b> subroutine.
<i>window</i>	Specifies the confirmation of the client credentials, given in seconds. A small value for the <i>window</i> parameter is more secure than a large one. However, choosing too small a value for the <i>window</i> parameter increases the frequency of resynchronizations due to clock drift.
<i>syncaddr</i>	Identifies clock synchronization. If the <i>syncaddr</i> parameter has a null value, then the authentication system assumes that the local clock is always in sync with the server's clock. The authentication system will not attempt resynchronizations. However, if an address is supplied, the system uses the address for consulting the remote time service whenever resynchronization is required. This parameter usually contains the address of the RPC server itself.
<i>ckey</i>	Specifies the DES key. If the value of the <i>ckey</i> parameter is null, the authentication system generates a random DES key to be used for the encryption of credentials. However, if a DES key is supplied, the supplied key is used.

## Return Values

This subroutine returns a pointer to a DES authentication object.

## Related Information

List of RPC Programming References.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authdes\_getucred Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

## authdes\_getucred Subroutine Exported from the libc Library

### Purpose

Maps a Data Encryption Standard (DES) credential into a UNIX<sup>®</sup> credential.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
authdes_getucred (adc, uid, gid, grouplen, groups)
struct authdes_cred * adc;
```

```
short * uid;
short * gid;
short * grouplen;
int * groups;
```

## Description

The **authdes\_getucred** subroutine interfaces to the secure authentication system known as DES. The server uses this subroutine to convert a DES credential, which is the independent operating system, into a UNIX<sup>®</sup> credential. The **authdes\_getucred** subroutine retrieves necessary information from a cache instead of using the network information service (NIS).

**Note:** The **keyserv** daemon must be running for the DES authentication system to work.

## Parameters

<i>adc</i>	Points to the DES credential structure.
<i>uid</i>	Specifies the caller's effective user ID (UID).
<i>gid</i>	Specifies the caller's effective group ID (GID).
<i>grouplen</i>	Specifies the group's length.
<i>groups</i>	Points to the group's array.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **keyserv** daemon.

List of RPC Programming References.

Network Information Service (NIS) Overview for System Management in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## authdes\_getucred Subroutine Exported from the libnsl Library

### Purpose

Maps a Data Encryption Standard (DES) credential into a UNIX<sup>®</sup> credential.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>

int authdes_getucred (authdes_credential, user_idp, group_idp, grouplen, groups)
const struct authdes_cred *authdes_credential ;
uid_t *user_idp ;
gid_t *group_idp ;
short *grouplen ;
gid_t *groups ;
```

### Description

The **authdes\_getucred** subroutine, which belongs to the secure RPC category, is used on server side to convert an operating-system-independent **AUTH\_DES** credential into an **AUTH\_SYS** UNIX<sup>®</sup> credential.

**Note:** The **keyser** daemon must be running for the **AUTH\_DES** authentication mechanism to work. You must run the **keylogin** command before calling the subroutine.

## Parameters

<i>authdes_credential</i>	Points to the DES credential structure.
<i>user_idp</i>	Specifies the effective user ID (UID) of the caller.
<i>group_idp</i>	Specifies the effective group ID (GID) of the caller.
<i>grouplen</i>	Specifies the group's length.
<i>groups</i>	Points to the group's array.

## Return Values

1	successful
0	unsuccessful

## Examples

```
#include <rpc/rpc.h>
static void dispatch(struct svc_req *, SVCXPRT *);

main()
{
    rpcprog_t  RPROGNUM = 0x3fffffffL;
    rpcvers_t  RPROGVER = 0x1L;

    /* Create service handle for RPROGNUM, RPROGVER and tcp transport */
    if(!svc_create( dispatch, RPROGNUM, RPROGVER, "tcp")) {
        fprintf(stderr, "\nsvc_create() failed\n");
        exit(EXIT_FAILURE);
    }

    svc_run();
}

/* The server dispatch function */
static void dispatch(struct svc_req *rqstp, SVCXPRT *transp)
{
    struct authdes_cred *des_cred;
    uid_t uid;
    gid_t gid;
    int gidlen;
    gid_t gidlist[10];

    switch (rqstp->rq_cred.oa_flavor) {

    case AUTH_DES :
        /* AUTH_DES Authentication flavor */
        des_cred = (struct authdes_cred *) rqstp->rq_clntcred;
        if (!authdes_getucred(des_cred, &uid, &gid, &gidlen, gidlist)) {
            svcerr_systemerr(transp);
            return;
        }
        break;

    default :
        /* Other Authentication flavor */
        break;
    }

    /* The Dispatch Routine code continues .. */
}
```

## Related Information

The “authdes\_seccreate Subroutine,” “netname2user Subroutine” on page 357, and “user2netname Subroutine” on page 472.

The **keylogin** command.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authdes\_seccreate Subroutine

### Purpose

Maps a UNIX® credential into a data encryption standard (DES) credential .

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
AUTH *authdes_seccreate(netname, time_window, time_host, deskey)
const char *netname;
const uint_t time_window;
const char *time_host;
const des_block *deskey;
```

### Description

The **authdes\_seccreate** subroutine, which belongs to the secure remote procedure call (RPC) category, implements the **AUTH\_DES** authentication flavor. This subroutine is used on the client side to convert a UNIX® credential to an operating-system-independent **AUTH\_DES** credential. When the time difference between the client clock and the server clock exceeds the valid time period, the server rejects client credentials. In such case, you can consult with the host specified by the *time\_host* parameter to resynchronize the client and server clocks. The *time\_host* and *deskey* parameters are optional. When you set the *time\_host* parameter to a null value, the local clock is always in sync with the clock on the specified host. When you set the *deskey* parameter to a null value, a random DES key is generated for encrypting client credentials.

**Note:** The **AUTH\_DES** authentication mechanism works only when the **keyserv** daemon is running. Also, you must have run the **keylogin** command.

### Parameters

<i>netname</i>	Specifies the network name of the owner of the server process.
<i>time_window</i>	Specifies the time period during which a client credential is valid.
<i>time_host</i>	Specifies the host that is consulted in the case of clock drift.
<i>deskey</i>	Specifies the DES key for encrypting client credentials.

### Return Values

a valid authentication handle	successful
a null value	unsuccessful

## Examples

In the following example, the **authdes\_seccreate** subroutine creates and returns an authentication handle, so that the communication between the client and the server takes place using the AUTH\_DES authentication.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    char netname[255]; /* contains netname of owner of server process */
    char rhost[255]; /* Remote host netname on which server resides */
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    CLIENT *clnt;

    /* Obtain network netname of remote host */
    if (!host2netname(netname, rhost, NULL))
    {
        fprintf(stderr, "\nhost2netname() failed\n");
        exit(EXIT_FAILURE);
    }

    /* Create a client handle for remote host rhost for PROGNUM & PROGVER on tcp transport */
    clnt = clnt_create(rhost, PROGNUM, PROGVER, "tcp");
    if (clnt == (CLIENT *) NULL) {
        fprintf(stderr, "client_create() error\n");
        exit(1);
    }

    clnt->cl_auth = authdes_seccreate(netname, 80, rhost, (des_block *)NULL);

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the authentication handle */
    auth_destroy(clnt->cl_auth);

    /* Destroy the client handle in the end */
    clnt_destroy(clnt);

    return 0;
}
```

## Related Information

The “authdes\_getucred Subroutine” on page 277, “host2netname Subroutine” on page 344, “netname2host Subroutine” on page 355, “user2netname Subroutine” on page 472, “netname2user Subroutine” on page 357.

The **keyerv** daemon and the **keylogin** command.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authnone\_create Subroutine

### Purpose

Creates null authentication.

## Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/rpc.h>
AUTH *authnone_create ( )
```

## Description

The **authnone\_create** subroutine creates and returns a default Remote Procedure Call (RPC) authentication handle that passes null authentication information with each remote procedure call.

## Return Values

This subroutine returns a pointer to an RPC authentication handle.

## Related Information

The **authunix\_create** subroutine, **authunix\_create\_default** subroutine, **svcerr\_auth** subroutine.

The **auth\_destroy** macro.

List of RPC Programming References.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authsys\_create or authsys\_create\_default Subroutine

### Purpose

Creates and returns the authentication handle of a remote procedure call (RPC).

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
AUTH * authsys_create( hostname, user_id, group_id, length, aup_gids)
const char *hostname;
const uid_t user_id;
const gid_t group_id;
const int length;
const gid_t *aup_gids;
AUTH *authsys_create_default( void )
```

### Description

The **authsys\_create** and **authsys\_create\_default** subroutines belong to the secure-RPC category. The **authsys\_create** or **authsys\_create\_default** subroutine creates and returns an RPC-authentication handle. The authentication information that is passed to the server on each RPC is the AUTH\_SYS authentication information.

The **authsys\_create\_default** subroutine, which is basically a wrapper around the **authsys\_create** subroutine, calls the **authsys\_create** subroutine with appropriate parameters.



**Note:** Application programs assign the RPC authentication handle to the **cl\_auth** field of the client handle.

## Parameters

<i>hostname</i>	Specifies the host name of the server where the authentication information is created.
<i>user_id</i>	Specifies the user ID.
<i>group_id</i>	Specifies the current group ID of the user.
<i>length</i>	Specifies the number of groups to which the user belongs, that is, the length of the <i>aup_gids</i> parameter.
<i>aup_gids</i>	Specifies an array of groups to which the user belongs.

## Return Values

The **authsys\_create** or **authsys\_create\_default** subroutine returns a pointer to an RPC-authentication handle.

## Examples

1. In the following example, the **authsys\_create** subroutine is called after a client handle is created. An authentication handle is returned and assigned to the **cl\_auth** field of the client handle. Then, after a successful client call, the **auth\_destroy** macro destroys the authentication information associated with the **cl\_auth** field.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    char *nettype = "visible";
    char hostname[255]; /* The name of remote hostname */
    AUTH *auth;
    gid_t gids[100];
    int length ;

    /* Set the number of groups to which the user belongs.
    *This value is passed to authsys_create()
    */
    if ((length = getgroups(NGROUPS_MAX, gids)) < 0) {
        printf("failed in getgroups()\n");
        exit(2);
    } else
        length = (length > 16) ? 16 : length;

    if ((cl=cInt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
    {
        fprintf(stdout, "cInt_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /* Set the AUTH structure using AUTH_SYS authentication flavor */
    auth = authsys_create(hostname, getuid(), getgid(), length, gids);
    cl->cl_auth = auth;

    /*
    * Make a CLNT_CALL
    */

    /* Destroy the authentication information */
    auth_destroy(cl->cl_auth);

    /* Destroy the client handle */
    cInt_destroy(cl);
}
```

```

    return 0;
}

```

2. In the following example, the **authsys\_create\_default** subroutine is called after a client handle is created. An authentication handle is returned and assigned to the **cl\_auth** field of the client handle. Then, after a successful client call, the **auth\_destroy** macro destroys the authentication information associated with the **cl\_auth** field.

```

#include <stdlib.h>
#include <rpc/rpc.h>
int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    char *nettype = "visible";
    char hostname[255]; /* The name of remote host */
    AUTH *auth

    if ((cl=cInt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
    {
        fprintf(stdout, "cInt_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /* Set the AUTH structure using AUTH_SYS authentication flavor */
    auth = authsys_create_default();
    cl->cl_auth = auth;

    /*
     * Make a CLNT_CALL
     */

    /* Destroy the authentication information */
    auth_destroy(cl->cl_auth);

    /* Destroy the client handle */
    cInt_destroy(cl);

    return 0;
}

```

## Related Information

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authunix\_create Subroutine

### Purpose

Creates an authentication handle with operating system permissions.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
AUTH *authunix_create (host, uid, gid, len, aupgids)
char * host;
int uid, gid;
int len, * aupgids;
```

## Description

The **authunix\_create** subroutine creates and returns a Remote Procedure Call (RPC) authentication handle with operating system permissions.

## Parameters

<i>host</i>	Points to the name of the machine on which the permissions were created.
<i>uid</i>	Specifies the caller's effective user ID (UID).
<i>gid</i>	Specifies the caller's effective group ID (GID).
<i>len</i>	Specifies the length of the groups array.
<i>aupgids</i>	Points to the counted array of groups to which the user belongs.

## Return Values

This subroutine returns an RPC authentication handle.

## Related Information

The **authnone\_create** subroutine, **authunix\_create\_default** subroutine, **svcerr\_auth** subroutine.

The **auth\_destroy** macro.

List of RPC Programming References.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## authunix\_create\_default Subroutine

### Purpose

Sets the authentication to default.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
AUTH *authunix_create_default()
```

### Description

The **authunix\_create\_default** subroutine calls the **authunix\_create** subroutine to create and return the default operating system authentication handle.

### Return Values

Upon successful completion, this subroutine returns an authentication handle.

## Related Information

The **authnone\_create** subroutine, **authunix\_create** subroutine, **svcerr\_auth** subroutine.

The **auth\_destroy** macro.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## callrpc Subroutine

### Purpose

Calls the remote procedure on the machine specified by the *host* parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
callrpc (host, prognum, versnum, procnum, inproc, in, outproc, out)
char * host;
u_long prognum, versnum, procnum;
xdrproc_t inproc;
char * in;
xdrproc_t outproc;
char * out;
```

### Description

The **callrpc** subroutine calls a remote procedure identified by the *prognum* parameter, the *versnum* parameter, and the *procnum* parameter on the machine pointed to by the *host* parameter.

This subroutine uses User Datagram Protocol/Internet Protocol (UDP/IP) as a transport to call a remote procedure. No connection will be made if the server is supported by Transmission Control Protocol/Internet Protocol (TCP/IP). This subroutine does not control time outs or authentication.

### Parameters

<i>host</i>	Points to the program name of the remote machine.
<i>prognum</i>	Specifies the number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Specifies the number of the procedure associated with the remote program being called.
<i>inproc</i>	Specifies the name of the XDR procedure that encodes the procedure parameters.
<i>in</i>	Specifies the address of the procedure arguments.
<i>outproc</i>	Specifies the name of the XDR procedure that decodes the procedure results.
<i>out</i>	Specifies the address where results are placed.

### Return Values

This subroutine returns a value of **enum clnt\_stat**. Use the **clnt\_perrno** subroutine to translate this failure status into a displayed message.

## Related information

The `clnt_broadcast` subroutine, `clnttcp_create` subroutine, `clntudp_create` subroutine, `clnt_perrno` subroutine, `registerrpc` subroutine, `svc_run` subroutine.

The `clnt_call` macro.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## cbc\_crypt, des\_setparity, or ecb\_crypt Subroutine

### Purpose

Implements Data Encryption Standard (DES) encryption routines.

### Library

DES library (`libdes.a`)

### Syntax

```
# include <des_crypt.h>
```

```
int ecb_crypt ( key, data, datalen, mode)
```

```
char *key;  
char *data;  
unsigned datalen;  
unsigned mode;
```

```
int cbc_crypt(key, data, datalen, mode, ivec)
```

```
char *key;  
char *data;  
unsigned datalen;  
unsigned mode;  
char ivec;  
void des_setparity(key)  
char *key;
```

### Description

The `ecb_crypt` and `cbc_crypt` subroutines implement DES encryption routines, set by the National Bureau of Standards.

- The `ecb_crypt` subroutine encrypts in ECB (Electronic Code Book) mode, which encrypts blocks of data independently.
- The `cbc_crypt` subroutine encrypts in CBC (Cipher Block Chaining) mode, which chains together successive blocks. CBC mode protects against insertions, deletions, and substitutions of blocks. Also, regularities in the clear text will not appear in the cipher text.

These subroutines are not available for export outside the United States.

**Note:** The DES library must be installed to use these subroutines.

### Parameters

`data` Specifies that the data is to be either encrypted or decrypted.

<i>datalen</i>	Specifies the length in bytes of data. The length must be a multiple of 8.
<i>key</i>	Specifies the 8-byte encryption key with parity. To set the parity for the key, which for DES is in the low bit of each byte, use the <b>des_setparity</b> subroutine.
<i>ivec</i>	Initializes the vector for the chaining in 8-byte. This is updated to the next initialization vector upon return.
<i>mode</i>	Specifies whether data is to be encrypted or decrypted. This parameter is formed by logically ORing the <b>DES_ENCRYPT</b> or <b>DES_DECRYPT</b> symbols. For software versus hardware encryption, logically OR the <b>DES_HW</b> or <b>DES_SW</b> symbols. These four symbols are defined in the <b>/usr/include/des_crypt.h</b> file.

## Return Values

<b>DESERR_BADPARAM</b>	Specifies that a bad parameter was passed to routine.
<b>DESERR_HWERR</b>	Specifies that an error occurred in the hardware or driver.
<b>DESERR_NOHWDEVICE</b>	Specifies that encryption succeeded, but was done in software instead of the requested hardware.
<b>DESERR_NONE</b>	Specifies no error.

**Note:** Given the **stat** variable, for example, which contains the return value for either the **ecb\_crypt** or **cbc\_crypt** subroutine, the **DES\_FAILED(stat)** macro is false only for the **DESERR\_NONE** and **DESERR\_NOHWDEVICE** return values.

## Files

**/usr/include/des\_crypt.h** Defines macros and needed symbols for the *mode* parameter.

## Related Information

Secure NFS in *Security*.

Example Using DES Authentication in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_broadcast Subroutine

### Purpose

Broadcasts a remote procedure call to all locally connected networks.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
enum clnt_stat clnt_broadcast (prognum, versnum, procnum, inproc)
enum clnt_stat clnt_broadcast (in, outproc, out, eachresult)
u_long prognum, versnum, procnum;
xdrproc_t inproc;
char * in;
xdrproc_t outproc;
char * out;
resultproc_t eachresult;
```

## Description

The **clnt\_broadcast** subroutine broadcasts a remote procedure call to all locally connected networks. The remote procedure is identified by the *prognum*, *versnum*, and *procnum* parameters on the workstation identified by the *host* parameter.

Broadcast sockets are limited in size to the maximum transfer unit of the data link. For Ethernet, this value is 1500 bytes.

When a client broadcasts a remote procedure call over the network, a number of server processes respond. Each time the client receives a response, the **clnt\_broadcast** subroutine calls the **eachresult** routine. The **eachresult** routine takes the following form:

```
eachresult (out, *addr)
char *out;
struct sockaddr_in *addr;
```

## Parameters

<i>prognum</i>	Specifies the number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Identifies the procedure to be called.
<i>inproc</i>	Specifies the procedure that encodes the procedure's parameters.
<i>in</i>	Specifies the address of the procedure's arguments.
<i>outproc</i>	Specifies the procedure that decodes the procedure results.
<i>out</i>	Specifies the address where results are placed.
<i>eachresult</i>	Specifies the procedure to call when clients respond.
<i>addr</i>	Specifies the address of the workstation that sent the results.

## Return Values

If the **eachresult** subroutine returns a value of 0, the **clnt\_broadcast** subroutine waits for more replies. Otherwise, the **clnt\_broadcast** subroutine returns with the appropriate results.

## Related Information

The **callrpc** subroutine.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_call Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

## clnt\_call Macro Exported from the libc Library

### Purpose

Calls the remote procedure associated with the *clnt* parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
enum clnt_stat clnt_call (clnt, procnum, inproc, in, outproc, out, tout)
CLIENT * clnt;
u_long procnum;
xdrproc_t inproc;
char * in;
xdrproc_t outproc;
char * out;
struct timeval tout;
```

## Description

The **clnt\_call** macro calls the remote procedure associated with the client handle pointed to by the *clnt* parameter.

## Parameters

<i>clnt</i>	Points to the structure of the client handle that results from a Remote Procedure Call (RPC) client creation subroutine, such as the <b>clntudp_create</b> subroutine that opens a User Datagram Protocol/Internet Protocol (UDP/IP) socket.
<i>procnum</i>	Identifies the remote procedure on the host machine.
<i>inproc</i>	Specifies the procedure that encodes the procedure's parameters.
<i>in</i>	Specifies the address of the procedure's arguments.
<i>outproc</i>	Specifies the procedure that decodes the procedure's results.
<i>out</i>	Specifies the address where results are placed.
<i>tout</i>	Sets the time allowed for results to return.

## Related Information

The **callrpc** subroutine, **clnt\_perror** subroutine, **clnttcp\_create** subroutine, **clntudp\_create** subroutine.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_call Macro Exported from the libnsl Library

### Purpose

Calls the remote procedure associated with the client handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
clnt_call(clnt, procnum, inproc, in, outproc, out, tout)
CLIENT * clnt;
rpcproc_t procnum;
xdrproc_t inproc;
caddr_t in;
xdrproc_t outproc;
caddr_t out;
struct timeval tout;
```

### Description

The **clnt\_call** macro calls the remote procedure associated with the client file handle. The handle is obtained by calling any of the client creation subroutines. You can specify the eXternal Data Representation (XDR) procedure that encodes the procedure parameters along with the address of the parameters. Similarly, you can specify the XDR procedure that decodes the procedure results and address where those results are to be placed.



## Parameters

<i>clnt</i>	Specifies a generic client handle created by a successful call to the <b>clnt_create</b> subroutine.
<i>procnum</i>	Specifies the remote procedure number.
<i>inproc</i>	Specifies the XDR procedure that encodes the procedure parameters.
<i>in</i>	Specifies the address of the procedure arguments.
<i>outproc</i>	Specifies the XDR procedure that decodes the procedure results.
<i>out</i>	Specifies the address where results are placed.
<i>tout</i>	Sets the time given to the server to respond.

## Return Values

RPC_SUCCESS	successful
nonzero	unsuccessful

## Error Codes

The **clnt\_call** macro returns failure when one or more of the following codes are true.

<b>RPC_PROCUNAVAIL</b>	The remote procedure is not available.
<b>RPC_TIMEDOUT</b>	The timeout value has expired.
<b>RPC_AUTHERROR</b>	Authentication failure occurred.
<b>RPC_FAILED</b>	An unspecified error occurred.
<b>RPC_UNKNOWNPROTO</b>	The protocol is unknown.
<b>RPC_UNKNOWNADDR</b>	The remote address is unknown.
<b>RPC_CANTENCODEARGS</b>	The specified XDR procedures cannot encode arguments or cannot decode results.
<b>RPC_PROGUNAVAIL</b>	The program is not available.
<b>RPC_INTR</b>	The call is interrupted.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *client ;
    char hostname[255] ;
    /* The Remote host on which server is implemented */
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    rpcproc_t procedure_number = 0x1L;
    struct timeval total_timeout = { 25 , 0 } ;
    enum clnt_stat cs ;

    /* Create client handle by calling clnt_create subroutine */
    client = clnt_create(hostname, program_number, version_number, "tcp");
    if (client == (CLIENT *)NULL)
    {
        fprintf(stderr,"Couldn't create client\n");
        exit(1);
    }

    /* Calls the remote procedure */
    cs = clnt_call(client, procedure_number, (xdrproc_t)xdr_void,
                  NULL, (xdrproc_t)xdr_void, NULL, total_timeout);
    if (cs != RPC_SUCCESS)
    {
        fprintf(stderr,"\n Client Call failed\n");
        exit(1);
    }
}
```

```

    /* Destroy the client handle at the end */
    clnt_destroy(client);

    return 0;
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_control Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

## clnt\_control Macro Exported from the libc Library

### Purpose

Changes or retrieves various information about a client object.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```

bool_t clnt_control (cl, req, info)
CLIENT * cl;
int req;
char * info;

```

### Description

The **clnt\_control** macro is used to change or retrieve various information about a client object.

User Datagram Protocol (UDP) and Transmission Control Protocol (TCP) have the following supported values for the *req* parameter's argument types and functions:

Values for the req Parameter	Argument Type	Function
CLSET_TIMEOUT	struct timeval	Sets total time out.
CLGET_TIMEOUT	struct timeval	Gets total time out.
CLGET_SERVER_ADDR	struct sockaddr	Gets server's address.

The following operations are valid for UDP only:

Values for the req Parameter	Argument Type	Function
CLSET_RETRY_TIMEOUT	struct timeval	Sets the retry time out.
CLGET_RETRY_TIMEOUT	struct timeval	Gets the retry time out.

### Notes:

1. If the time out is set using the **clnt\_control** subroutine, the time-out parameter passed to the **clnt\_call** subroutine will be ignored in all future calls.

- The retry time out is the time that User Datagram Protocol/Remote Procedure Call (UDP/RPC) waits for the server to reply before retransmitting the request.

## Parameters

*cl* Points to the structure of the client handle.  
*req* Indicates the type of operation.  
*info* Points to the information for request type.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **clnttcp\_create** subroutine, **clntudp\_create** subroutine.

The **clnt\_call** macro.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_control Macro Exported from the libnsl Library

### Purpose

Changes or retrieves information of the client handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
bool_t clnt_control(cl, req, info)
CLIENT * cl;
int req;
char * info;
```

### Description

The **clnt\_control** macro subroutine is a simplified-level subroutine for transport-independent remote procedure calls (TI\_PRC). You can use the subroutine to change or retrieve information about the client handle. The generic client handle that is obtained from various client create subroutines is supplied as the input parameter. You need to specify the type of operation along with the pointer to the information. For both connectionless and connection-oriented transports, we can either set or get various information about client objects. The data type of the *info* parameter changes according to the type of operation. For example, you can specify the *req* parameter with the following values:

#### CLGET\_VERS

Gets the version number of the RPC program associated with the client.

#### CLSET\_VERS

Sets the version number of the RPC program associated with the client.

For the *req* parameter in the example, the value of the *info* parameter is of the **rpcvers\_t** type.

Values for the <i>req</i> Parameter	Argument Type	Function
CLSET_TIMEOUT	struct timeval *	Sets the total timeout.

Values for the <i>req</i> Parameter	Argument Type	Function
CLGET_TIMEOUT	struct timeval *	Gets the total timeout.
CLGET_SVC_ADDR	struct netbuf *	Gets the address of the server.
CLGET_FD	int *	Gets associated file descriptor.
CLSET_RETRY_TIMEOUT	struct timeval *	Sets the retry timeout.
CLGET_RETRY_TIMEOUT	struct timeval *	Gets the retry timeout.
CLGET_VERS	rpcvers_t	Gets the version number of the RPC program.
CLSET_VERS	rpcvers_t	Sets the version number of the RPC program.
CLGET_XID	uint32_t	Gets XID of the previous RPC.
CLSET_XID	uint32_t	Sets XID of the previous RPC.
CLGET_PROG	rpcprog_t	Gets the program number.
CLSET_PROG	rpcprog_t	Sets the program number.

## Parameters

*cl* Points to the structure of the generic RPC-client handle .

*req* Indicates the type of the operation.

*info* Points to the information for request type. The *info* parameter is expected to be a pointer to an appropriate structure. The nature of the structure depends on the type of the operation.

## Return Values

1 successful

0 unsuccessful

## Examples

In the following example, the **clnt\_control** macro subroutine returns the version number of the program that is specified by the *versnum* parameter.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    struct timeval t;
    CLIENT *cl ;
    rpcprog_t PROG = 0x3fffffffL;
    rpcvers_t versnum,PROGVER = 0x1L;
    char hostname[255] /* The Remote Host */
    char *nettype = "visible" ;

    /* Create generic client handle */
    cl = clnt_create( hostname, PROG, PROGVER, nettype);
    if(cl==NULL)
    {
        fprintf(stderr,"Couldnot create client handle");
        exit(1);
    }

    if(!clnt_control(cl, CLGET_VERS, versnum))
    {
        fprintf(stderr,"Failed in clnt_control routine");
        exit(1);
    }
}
```

```

    fprintf(stdout, "\n VERSION NUMBER = %1u \n", versnum);

    /* Destroy the client handle at the end */
    clnt_destroy(cl);
    return 0;
}

```

## Related Information

The **svc\_control** subroutine

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_create Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### clnt\_create Subroutine Exported from the libc Library

#### Purpose

Creates and returns a generic client handle.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
CLIENT *clnt_create (host, prognum, versnum, protocol)
char * host;
unsigned prognum, versnum;
char * protocol;
```

#### Description

Creates and returns a generic client handle.

Remote Procedure Calls (RPC) messages transported by User Datagram Protocol/Internet Protocol (UDP/IP) can hold up to 8KB of encoded data. Use this transport for procedures that take arguments or return results of less than 8KB.

**Note:** When the **clnt\_create** subroutine is used to create a RPC client handle, the timeout value provided on subsequent calls to **clnttcp\_call** are ignored. Using the **clnt\_create** subroutine has the same effect as using **clnttcp\_create** followed by a call to **clnt\_control** to set the timeout value for the RPC client handle. If the timeout parameter is used on the **clnttcp\_call** interface, use the **clnttcp\_create** interface to create the client handle.

#### Parameters

<i>host</i>	Identifies the name of the remote host where the server is located.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>protocol</i>	Identifies which data transport protocol the program is using, either UDP or Transmission Control Protocol (TCP).

## Return Values

Upon successful completion, this subroutine returns a client handle.

## Related Information

The **clnttcp\_create** subroutine, **clntudp\_create** subroutine.

The **clnt\_control** macro, **clnt\_destroy** macro.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_create Subroutine Exported from the libnsl Library

### Purpose

Creates and returns a generic client handle for a remote program.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
CLIENT *clnt_create(host, prognum, versnum, nettype)
const char *host;
const rpcprog prognum;
const rpcvers_t versnum;
char *nettype;
```

### Description

The **clnt\_create** subroutine is a top-level API for transport independent remote procedure calls (TI\_PRC). The subroutine creates and returns a generic client handle for the specified program and version. This generic client handle is returned from the remote host on which the server is running. This operation is done with the available transport service of the class that is specified by the *nettype* parameter. The **clnt\_create** subroutine chooses the first successful transport from the NETPATH environment variable and then from the **netconfig** database in a top-to-bottom order. A default timeout value specifies the time for the **clnt\_create** subroutine to return. If the timeout value expires, the subroutine returns NULL. You can modify the timeout value using the **clnt\_control** macro subroutine.

### Notes:

1. The **clnt\_pcreateerror** subroutine can be used to obtain the reason for failure of the creation of an RPC-client handle.
2. The **clnt\_create** subroutine returns a valid client handle even if the specified version number is not supported by the server. The **clnt\_call** subroutine will recognize the condition and return failure.

### Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.

## Return Values

a generic client handle that is successful  
valid

NULL

unsuccessful

## Error Codes

The `clnt_create` subroutine returns failure when one or more of the following codes are true.

### RPC\_UNKNOWNPROTO

- The value specified by the `nettype` parameter is not valid.
- The value specified by the `nettype` parameter is set to **netpath**, and the `NETPATH` environment variable is set to a transport service that is not valid.

### RPC\_UNKNOWNHOST

The host name is not valid.

### RPC\_PROGNOTREGISTERED

The program number is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    char *nettype = "visible";
    char hostname[255]; /* The name of remote host */

    /*
     * make the clnt_create call with this nettype and
     * observe the result
     */

    if ((cl=clnt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
    {
        fprintf(stdout, "clnt_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle at the end */
    clnt_destroy(cl);

    return 0;
}
```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_create\_timed Subroutine

### Purpose

Creates and returns a generic client handle for a remote program within the specified time.

### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
clnt_create_timed(host, prognum, versnum, nettype, timeout)
const char *host;
const rpcprog_t prognum;
const rpcvers_t versnum;
const char *nettype;
const struct timeval *timeout;
```

## Description

The **clnt\_create\_timed** subroutine is a top-level API for transport-independent remote procedure calls (TI\_PRC). The subroutine creates and returns a generic client handle for the specified program and version specified. This generic client handle is returned from the remote host on which server is running. The operation is done using the available transport service of the class that is specified by the *nettype* parameter. The **clnt\_create\_timed** subroutine chooses the first successful transport from the NETPATH environment variable and then from the **netconfig** database in a top-to-bottom order. The value of the *timeout* parameter specifies the time for the **clnt\_create\_timed** subroutine to return. If the timeout value expires, the subroutine returns a null value.

**Note:** The subroutine returns a valid client handle even if the version number specified by the *versnum* parameter is not supported by the server. The **clnt\_call** subroutine can recognize the error and return failure.

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.
<i>timeout</i>	Specifies the maximum time spent for each transport class in the <i>nettype</i> class.

## Return Values

a generic client handle that is valid	successful
a null value	unsuccessful

## Error Codes

The **clnt\_create\_timed** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"><li>The value specified by the <i>nettype</i> parameter is not valid.</li><li>The value specified by the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li></ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_TIMEDOUT</b>	The timeout value has expired.
<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
```



```

{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L ;
    char *nettype = "visible";
    char hostname[255] ; /* The name of remote host */
    struct timeval tv;

    tv.tv_sec = 5 ;
    tv.tv_usec = 0 ;

    /*
    * make the clnt_create_timed call with this nettype and
    * observe the result
    */

    if ((cl=clnt_create_timed( hostname, PROGNUM, PROGVER, nettype, &tv)) == NULL)
    {
        fprintf(stdout, "clnt_create_timed : failed.\n");
        exit(EXIT_FAILURE);
    }

    /*
    * Make a call to clnt_call() subroutine
    */

    /* Destroy the client handle at the end */
    clnt_destroy(cl);

    return 0;
}

```

## Related Information

The “clnt\_tp\_create\_timed Subroutine” on page 329 and “clnt\_create\_vers\_timed Subroutine” on page 301.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_create\_vers Subroutine

### Purpose

Creates and returns a generic client handle for a remote program and the registered version number that is the highest within the specified range.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>

clnt_create_vers(host, prognum, progver_out, progver_low, progver_high, nettype)
const char *host;
const rpcprog_t prognum;
rpcvers_t *progver_out;
const rpcvers_t progver_low;
const rpcvers_t progver_high;
const char *nettype;

```

## Description

The **clnt\_create\_vers** subroutine creates and returns a generic client handle for the specified program and the highest registered version that falls within the range bounded by the values specified by the *progver\_low* and *progver\_high* parameters. You must specify the *progver\_low* and *progver\_high* parameters. When the function returns successfully, the value of the *progver\_out* parameter is set to the highest registered version within the specified range (*progver\_low* <= *progver\_out* <= *progver\_high*). The subroutine returns a generic client handle from the remote host where server is located. The operation is done with the available transport service of the class that is specified by the *nettype* parameter. The **clnt\_create\_vers** subroutine uses first successful transport from the NETPATH environment variable and then from the **netconfig** database if required. You can modify the default timeout value using the **clnt\_control** subroutine.

**Note:** The subroutine returns a null value if no version is registered within the specified range.

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>progver_out</i>	The highest version number that is registered at the server. The version number is returned within the specified range.
<i>progver_low</i>	The lower limit of the version number specified by the application.
<i>progver_high</i>	The upper limit of the version number specified by the application.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.

## Return Values

a generic client handle that is valid	successful
a null value	unsuccessful

**Note:** You can use the **clnt\_pcreateerror** subroutine to obtain the reason for failure.

## Error Codes

The **clnt\_create\_vers** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"><li>The value specified by the <i>nettype</i> parameter is not valid.</li><li>The value specified by the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li></ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_PROGVERSMISMATCH</b>	No version is registered at the server within the range bounded by the values specified by the <i>progver_low</i> and <i>progver_high</i> parameters.
<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
}
```

```

rpcvers_t PROGVER_OUT ;
char *nettype = "visible";
rpcvers_t PROGVER_LOW = 1;
rpcvers_t PROGVER_HIGH = 10;
char hostname[255]; /* The Remote host on which the server resides */

/*
 * make the clnt_create_vers call with this nettype and
 * observe the result
 */
if ((c1=clnt_create_vers( hostname, PROGNUM, &PROGVER_OUT,
                        PROGVER_LOW, PROGVER_HIGH, nettype)) == NULL)
{
    fprintf(stdout, "clnt_create_vers : failed.\n");
    exit(EXIT_FAILURE);
}
/*
 * Make a call to clnt_call() subroutine
 */
/* Destroy the client handle at the end */
clnt_destroy(c1);

return 0;
}

```

## Related Information

The “clnt\_create Subroutine” on page 295, “clnt\_tp\_create Subroutine” on page 327, and “clnt\_tli\_create Subroutine” on page 325.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_create\_vers\_timed Subroutine

### Purpose

Creates and returns a generic client handle for a remote program and the registered version number that is the highest in the specified range with the specified timeout.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>

clnt_create_vers_timed(host, prognum, progver_out, progver_low, progver_high, nettype, timeout)
const char *host;
const rpcprog_t prognum;
rpcvers_t *progver_out;
const rpcvers_t progver_low;
const rpcvers_t progver_high;
const char *nettype;
const struct timeval *timeout;

```

### Description

The **clnt\_create\_vers\_timed** subroutine creates and returns a generic client handle for the specified program and the highest registered version that falls within the range bounded by the values specified by the *progver\_low* and *progver\_high* parameters. You must specify the *progver\_low* and *progver\_high* parameters. When the function returns successfully, the value of the *progver\_out* parameter is set to the

highest registered version within the specified range (*progver\_low* <= *progver\_out* <= *progver\_high*). The subroutine returns a generic client handle from the remote host where server is located. The operation is done with the available transport service of the class specified by the *nettype* parameter. The **clnt\_create\_vers\_timed** subroutine uses first successful transport from the NETPATH environment variable and then from the **netconfig** database if required. The value of the *timeout* parameter indicates the maximum amount of time that is spent for each transport class.

**Note:** The subroutine returns a null value if no version is registered within the specified range or when the timeout value expires.

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>progver_out</i>	The highest version number that is registered at the server. The version number is returned within the specified range.
<i>progver_low</i>	The lower limit of the version number specified by the application.
<i>progver_high</i>	The upper limit of the version number specified by the application.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.
<i>timeout</i>	Specifies the maximum time that is spent for each transport class in the <i>nettype</i> class.

## Return Values

a generic client handle that is valid	successful
a null value	unsuccessful

**Note:** You can use the **clnt\_pcreateerror** subroutine to obtain the reason for failure.

## Error Codes

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"> <li>The value specified by the <i>nettype</i> parameter is not valid.</li> <li>The value specified by the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li> </ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_PROGVERSMISMATCH</b>	No version is registered at the server within the range bounded by the values specified by the <i>progver_low</i> and <i>progver_high</i> parameters.
<b>RPC_TIMEDOUT</b>	The timeout value has expired.
<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER_OUT ;
    char *nettype = "visible";
    rpcvers_t PROGVER_LOW = 1;
    rpcvers_t PROGVER_HIGH = 10;
    struct timeval tv;
```

```

char hostname[255] ; /* The Remote host on which the server resides */

tv.tv_sec = 25;
tv.tv_usec = 0;
/*
 * make the clnt_create_vers_timed call with this nettype and
 * observe the result
 */
if ((cl=clnt_create_vers_timed( hostname, PROGNUM, &PROGVER_OUT,
    PROGVER_LOW, PROGVER_HIGH, nettype, &tv)) == NULL)
{
    fprintf(stdout, "clnt_create_vers_timed : failed.\n");
    exit(EXIT_FAILURE);
}
/*
 * Make a call to clnt_call() subroutine
 */
/* Destroy the client handle at the end */
clnt_destroy(cl);

return 0;
}

```

## Related Information

The “clnt\_create Subroutine” on page 295, “clnt\_tp\_create Subroutine” on page 327, and “clnt\_tli\_create Subroutine” on page 325.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_destroy Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

### clnt\_destroy Macro Exported from the libc Library

#### Purpose

Destroys the client's Remote Procedure Call (RPC) handle.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void clnt_destroy ( clnt)
CLIENT *clnt;
```

#### Description

The **clnt\_destroy** macro destroys the client's RPC handle. Destroying the client's RPC handle deallocates private data structures, including the *clnt* parameter itself. The use of the *clnt* parameter becomes undefined upon calling the **clnt\_destroy** macro.

#### Parameters

*clnt*      Points to the structure of the client handle.

## Related Information

The `clntudp_create` subroutine, `clnt_create` subroutine.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_destroy Macro Subroutine Exported from the libnsl Library

### Purpose

Destroys the handle of a remote procedure call (RPC) client.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>
void clnt_destroy(clnt)
CLIENT *clnt;
```

### Description

The `clnt_destroy` macro subroutine is a top-level API for transport-independent remote procedure calls (TI\_PRC). The macro subroutine destroys the handle of the RPC client that is obtained after a successful call to any of the client-creation subroutines. The `clnt` parameter is deallocated along with other private data structures. After a call to this macro subroutine, the use of the `clnt` parameter is undefined. Any associated file descriptor will be closed if the RPC library has opened the associated file descriptor or was set using the `clnt_control` subroutine.

### Parameters

`clnt` Points to the structure of the client handle.

### Return Values

The `clnt_destroy` macro subroutine fails if the specified client handle has a null value.

### Examples

In the following example, the `clnt_destroy` macro subroutine successfully destroys the client handle that is returned by the `clnt_create` subroutine.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = x3fffffffL ;
    rpcvers_t PROGVER = x1L ;
    char *nettype = "visible";
    char hostname[255]; /* The name of remote host */

    /*
    * make the clnt_create call with this nettype and
    * observe the result
    */
    if ((cl=clnt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
    {
        fprintf(stdout, "clnt_create : failed.\n");
        exit(EXIT_FAILURE);
    }
    /*
    * Make a call to clnt_call() subroutine
```

```

    */
    /* Destroy the client handle when no more needed */
    clnt_destroy( cl );

    return 0;
}

```

## Related Information

The “svc\_destroy Macro” on page 415.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_dg\_create Subroutine

### Purpose

Creates and returns a generic client handle for a remote program using a connectionless transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
CLIENT * clnt_dg_create(fd, svcaddr, prognum, versnum, sendsize, recvsize)
int fd;
const struct netbuf *svcaddr;
const rpcprog_t prognum;
const rpcvers_t versnum;
const uint_t sendsize;
const uint_t recvsize

```

### Description

The **clnt\_dg\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). With the subroutine, applications can control all the options. The **clnt\_dg\_create** subroutine creates and returns a generic client handle for the specified program and version. The subroutine uses a connectionless transport. The generic client handle is returned from the remote host where the server is located. The subroutine uses an open and bound file descriptor through the connectionless transport and the specified address of the remote program to call the remote program. If you set the sizes of the send and receive buffers that can be specified by the *sendsize* and *recvsize* parameter to 0, the default sizes of the buffers are used. This subroutine resends the call message after an interval of 15 seconds until the subroutine receives a response, or the call times out. The **clnt\_call** subroutine specifies the timeout value. You can use the **clnt\_control** subroutine to modify the retry time and timeout values.

**Note:** If you set the value of the *fd* parameter to `RPC_ANYFD` or set the value of the *svcaddr* parameter to a null value, the subroutine fails and returns a null value.

### Parameters

<i>fd</i>	Specifies the open and bound file descriptor on a connectionless transport.
<i>svcaddr</i>	Specifies the address of the remote program.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>sendsize</i>	Specifies the size of the send buffer.
<i>recvsize</i>	Specifies the size of the receive buffer.

## Return Values

a generic client handle that is valid      successful  
a null value                              unsuccessful

You can use the `clnt_pcreateerror` subroutine to obtain the reason for failure.

## Error Codes

The `clnt_dg_create` subroutine returns failure if one or more of the following codes are true.

<b>RPC_TLIERROR</b>	The file descriptor is not valid.
<b>RPC_UNKNOWNADDR</b>	The value of the <code>svcaddr</code> parameter that holds the address of the remote program is NULL.
<b>RPC_CANTENCODEARGS</b>	The size of the send or receive buffer is less than that of the sent packet.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl ;
    int fd;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    struct netconfig *nconf ;
    struct netbuf svcaddr;
    char hostname[255];    /* The name of remote host */

    if ((nconf = getnetconfig("udp")) == (struct netconfig *)NULL)
    {
        fprintf(stderr, "Cannot get netconfig entry for UDP\n");
        exit(1);
    }

    if (!rpcb_getaddr(PROGNUM, PROGVER, nconf, &svcaddr, hostname))
    {
        fprintf(stderr, "rpcb_getaddr failed!!\n");
        exit(1);
    }
    /* Get the file descriptor for connection oriented transport */
    fd = . . .

    if ((cl = clnt_dg_create(fd, &svcaddr,
                           PROGNUM, PROGVER, 0, 0))==NULL);
    {
        fprintf(stdout, "clnt_dg_create : failed.\n");
        exit(1);
    }

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle at the end */
}
```



```

    clnt_destroy(c1);
    return 0;
}

```

## Related Information

The “clnt\_tp\_create Subroutine” on page 327, “clnt\_tli\_create Subroutine” on page 325, and “clnt\_vc\_create Subroutine” on page 331.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_door\_create Subroutine

### Purpose

Creates and returns a generic client handle for a program over the doors-transport mechanism.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
CLIENT * clnt_door_create(prognum, versnum, sendsize)
const rpcprog_t prognum;
const rpcvers_t versnum;
const uint_t sendsize;

```

### Description

The **clnt\_door\_create** subroutine creates and returns a generic client handle for the specified program and version. The subroutine creates the client handle over the doors-transport mechanism that can accelerate the data transfer between different processes on the same machine. If you set the size of the send buffer that is specified by the *sendsize* parameter to 0, the default size of 16KB is used.

### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>sendsize</i>	Specifies the size of the send buffer.

### Return Values

a generic client handle that is valid	successful
NULL	unsuccessful

### Error Codes

The **clnt\_door\_create** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_PROGVERSISMATCH</b>	The version number is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L ;

    /*
     * make the clnt_door_create call with this nettype and
     * observe the result
     */

    if ((cl=clnt_door_create( PROGNUM, PROGVER, 0)) == NULL)
    {
        fprintf(stdout, "clnt_door_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle in the end */
    clnt_destroy(cl);

    return 0;
}
```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

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## clnt\_freeres Macro

**Important:** The macro is exported from both the **libc** and the **libns1** libraries.

## clnt\_freeres Macro Exported from the libc Library

### Purpose

Frees data that was allocated by the Remote Procedure Call/eXternal Data Representation (RPC/XDR) system.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
clnt_freeres ( clnt, outproc, out)
CLIENT *clnt;
xdrpoc_t outproc;
char *out;
```

## Description

The **clnt\_freeres** macro frees data allocated by the RPC/XDR system. This data was allocated when the RPC/XDR system decoded the results of an RPC call.

## Parameters

*clnt* Points to the structure of the client handle.  
*outproc* Specifies the XDR subroutine that describes the results in simple decoding primitives.  
*out* Specifies the address where the results are placed.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_freeres Macro Exported from the libnsl Library

### Purpose

Frees data that was allocated by the Remote Procedure Call/eXternal Data Representation (RPC/XDR) system.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
bool_t clnt_freeres (clnt, outproc, out)
CLIENT *clnt;
xdrproc_t outproc;
caddr_t out;
```

### Description

The **clnt\_freeres** macro frees data allocated by the RPC/XDR system. This data is allocated when the RPC/XDR system decoded the results of an RPC call. You must specify the address of the results along with the procedure to decode it.

### Parameters

*clnt* Points to the structure of the client handle.  
*outproc* Specifies the XDR subroutine that describes the results in simple decoding primitives.  
*out* Specifies the address where the results are placed.

### Return Values

1 successful  
0 unsuccessful

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <sys/types.h>
#include <sys/select.h>
int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    rpcproc_t procnum 0x1L;
```

```

CLIENT *clnt;
enum clnt_stat stat;
struct timeval timeout = {25,0};
char *nettype = "tcp";
char hostname[255] ; /* The Remote Host */

struct arguments{
    unsigned int size;
    char *data;
};
struct arguments input_arguments ;
struct arguments output_results ;

if ((clnt=clnt_create(hostname, PROGNUM, PROGVER, nettype))==NULL)
{
    fprintf(stderr,"clnt_create() subroutine failed");
    exit(1);
}

stat = clnt_call(clnt, procnum, (xdrproc_t)xdr_array,
                (char *)&input_arguments, (xdrproc_t)xdr_array,
                (char *)&output_results, timeout);

if(!clnt_freeres(clnt, (xdrproc_t)xdr_array,(caddr_t )&output_results))
{
    fprintf(stderr,"clnt_freeres failed");
}

/* Destroy client handle in the end */
clnt_destroy(clnt);

return 0;
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_geterr Macro

**Important:** The macro is exported from both the **libc** and the **libns1** libraries.

## clnt\_geterr Macro Exported from the libc Library

### Purpose

Copies error information from a client handle.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
void clnt_geterr ( clnt,  errp)
CLIENT *clnt;
struct rpc_err *errp;
```

### Description

The **clnt\_geterr** macro copies error information from a client handle to an error structure.

## Parameters

*clnt* Points to the structure of the client handle.  
*errp* Specifies the address of the error structure.

## clnt\_geterr Macro Exported from the libnsl Library

### Purpose

Copies error information from a client handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void clnt_geterr ( clnt, errp)
CLIENT *clnt;
struct rpc_err *errp;
```

### Description

The **clnt\_geterr** macro copies error information from a client handle to an error structure.

### Parameters

*clnt* Points to the structure of the client handle.  
*errp* Specifies the address of the error structure.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <sys/time.h>

int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    rpcproc_t procnum = 0x1L;
    CLIENT *clnt;
    enum clnt_stat cs;
    struct rpc_err client_error;
    char hostname[255] ; /* The Remote Host */
    char *nettype = "tcp";
    struct timeval total_timeout = {25,0};

    int input_arguments , output_results ;

    if ((clnt=clnt_create(hostname, PROGNUM, PROGVER, nettype))==NULL)
    {
        fprintf(stderr,"clnt_create() subroutine failed");
        exit(1);
    }

    cs = clnt_call(clnt, procnum, (xdrproc_t)xdr_int,
                  (char *)&input_arguments, (xdrproc_t)xdr_int,
                  (char *)&output_results, total_timeout);

    if (cs != RPC_SUCCESS)
        clnt_geterr(clnt,&client_error);

    /* Destroy client handle in the end */
```

```
    clnt_destroy(clnt);
    return 0;
}
```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_pcreateerror Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### clnt\_pcreateerror Subroutine Exported from the libc Library

#### Purpose

Indicates why a client Remote Procedure Call (RPC) handle was not created.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void clnt_pcreateerror ( s )
char *s;
```

#### Description

The **clnt\_pcreateerror** subroutine writes a message to standard error output, indicating why a client RPC handle could not be created. The message is preceded by the string pointed to by the *s* parameter and a colon.

Use this subroutine if one of the following calls fails: the **clntraw\_create** subroutine, **clnttcp\_create** subroutine, or **clntudp\_create** subroutine.

#### Parameters

*s* Points to a character string that represents the error text.

## Related Information

The **clnt\_create** subroutine, **clnt\_screateerror** subroutine, **clntraw\_create** subroutine, **clnttcp\_create** subroutine, **clntudp\_create** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### clnt\_pcreateerror Subroutine Exported from the libnsl Library

#### Purpose

Prints an error message that is related to the creation of an RPC client handle to the standard error.

#### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/clnt.h>
void clnt_pcreateerror(error_msg)
const char * error_msg;
```

## Description

The **clnt\_pcreateerror** subroutine is used for error handling. The subroutine displays the actual cause of failure of the creation of an RPC client handle on the standard error. The actual error message, which is appended with a newline, is preceded by the string specified by *error\_msg* parameter and a colon.

**Note:** If the *error\_msg* parameter has a null value, the output is a colon followed by the actual error message.

## Parameters

*error\_msg*                      Specified an error-message string that is provided by an application.

## Examples

In the following example, the **clnt\_create** subroutine tries to register a program number that is not valid and hence will return a null value. The **clnt\_pcreateerror** subroutine returns the actual error message, which is preceded by the specified string ("Invalid Program Number" ) and a colon.

```
#include <rpc/clnt.h>
#include <stdio.h>

int main()
{
    CLIENT *cl;
    char hostname[255] ; /* The name of remote host */
    char *nettype = "visible" ;
    rpcprog_t PROGNUM ; /* Invalid Value */
    rpcvers_t PROGVER ;

    cl = clnt_create(hostname, PROGNUM, PROGVER, nettype);

    if(cl==NULL)
    {
        clnt_pcreateerror("Invalid Program Number ");
        exit(1);
    }

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle at the end */
    clnt_destroy(cl);

    return 0;
}
```

## Related Information

The “clnt\_screateerror Subroutine” on page 319.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_perrno Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### clnt\_perrno Subroutine Exported from the libc Library

#### Purpose

Specifies the condition of the *stat* parameter.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void clnt_perrno ( stat)  
enum clnt_stat stat;
```

#### Description

The **clnt\_perrno** subroutine writes a message to standard error output, corresponding to the condition specified by the *stat* parameter.

This subroutine is used after a **clnt\_call** subroutine fails. The **clnt\_perrno** subroutine translates the failure status (the **enum clnt\_stat** subroutine) into a message.

If the program does not have a standard error output, or the programmer does not want the message to be output with the **printf** subroutine, or the message format used is different from that supported by the **clnt\_perrno** subroutine, then the **clnt\_sperrno** subroutine is used instead of the **clnt\_perrno** subroutine.

#### Parameters

*stat* Specifies the client error status of the remote procedure call.

#### Return Values

The **clnt\_perrno** subroutine translates and displays the following **enum clnt\_stat** error status codes:

<b>RPC_SUCCESS</b> = 0	Call succeeded.
<b>RPC_CANTENCODEARGS</b> = 1	Cannot encode arguments.
<b>RPC_CANTDECODERES</b> = 2	Cannot decode results.
<b>RPC_CANTSSEND</b> = 3	Failure in sending call.
<b>RPC_CANTRECV</b> = 4	Failure in receiving result.
<b>RPC_TIMEDOUT</b> = 5	Call timed out.

#### Related Information

The **callrpc** subroutine, **clnt\_sperrno** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### clnt\_perrno Subroutine Exported from the libnsi Library

#### Purpose

Specifies the reason for failure of the procedure call.



## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
void clnt_perrno ( stat)
const enum clnt_stat stat;
```

## Description

The **clnt\_perrno** subroutine writes a message to standard error output, corresponding to the condition specified by the *stat* parameter.

This subroutine is used after a **clnt\_call** subroutine fails. The **clnt\_perrno** subroutine translates the failure status (the **enum clnt\_stat** subroutine) into a message.

If the program does not have a standard error output, or the programmer does not want the message to be output with the **printf** subroutine, or the message format used is different from that supported by the **clnt\_perrno** subroutine, the **clnt\_sperno** subroutine is used instead of the **clnt\_perrno** subroutine.

## Parameters

*stat*                Specifies the client error status of the remote procedure call.

## Error Codes

The following table list some error status codes that the **clnt\_perrno** subroutine can translate and display. You can find a complete list of error codes in the **clnt\_stat.h** file.

<b>RPC_SUCCESS</b> = 0	The call succeeded.
<b>RPC_CANTENCODEARGS</b> = 1	Arguments cannot be encoded.
<b>RPC_CANTDECODERES</b> = 2	Results cannot be decoded .
<b>RPC_CANTSEND</b> = 3	A failure occurred in sending call.
<b>RPC_CANTRECV</b> = 4	A failure occurred in receiving result.
<b>RPC_TIMEDOUT</b> = 5	The call timed out.

## Examples

In the following example, the **clnt\_perrno** subroutine displays the condition of the *cs* parameter.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <sys/time.h>

int main()
{
    char hostname[255] ; /* The Remote host on which server is implemented */
    rpcprog_t program_number ;
    rpcvers_t version_number ;
    rpcproc_t procedure_number ;
    enum clnt_stat cs ;
    char *nettype = "visible";

    cs = rpc_call(hostname, program_number, version_number, procedure_number,
                  (xdrproc_t)xdr_void, NULL, (xdrproc_t)xdr_void, NULL, nettype);
    if (cs != RPC_SUCCESS)
    {
        fprintf(stderr, "\n RPC Call failed\n");
        clnt_perrno(cs) ;
        exit(1);
    }
}
```

```
}  
return 0 ;  
}
```

## Related Information

The “`clnt_sperrno` Subroutine” on page 321.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_perror Subroutine

**Important:** The subroutine is exported from both the `libc` and the `libnsi` libraries.

### clnt\_perror Subroutine Exported from the libc Library

#### Purpose

Indicates why a remote procedure call failed.

#### Library

C Library (`libc.a`)

#### Syntax

```
#include <rpc/rpc.h>
```

```
clnt_perror ( clnt, s )  
CLIENT *clnt;  
char *s;
```

#### Description

The `clnt_perror` subroutine writes a message to standard error output indicating why a remote procedure call failed. The message is preceded by the string pointed to by the `s` parameter and a colon.

This subroutine is used after the `clnt_call` macro.

#### Parameters

`clnt` Points to the structure of the client handle.  
`s` Points to a character string that represents the error text.

#### Return Values

This subroutine returns an error string to standard error output.

#### Related Information

The `clnt_sperror` subroutine.

The `clnt_call` macro.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_perror Subroutine Exported from the libnsl Library

### Purpose

Indicates why a remote procedure call failed.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void clnt_perror ( clnt, s)
const CLIENT *clnt;
const char *s;
```

### Description

The **clnt\_perror** subroutine writes a message to standard error output indicating why a remote procedure call failed. The message is preceded by the string pointed to by the *s* parameter and a colon. The message is appended by a newline. This subroutine is used after the **clnt\_call** macro.

### Parameters

<i>clnt</i>	Points to the structure of the client handle.
<i>s</i>	Points to a character string that represents the error text.

### Examples

In the following example, the **clnt\_perror** subroutine displays the reason for failure of a remote procedure call.

```
#include <stdio.h>
#include <rpc/rpc.h>
int main()
{
    CLIENT *client ;
    char hostname[255] ; /* The Remote host on which server is implemented */
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    rpcproc_t procedure_number = 0x1L;
    struct timeval total_timeout = { 25 , 0 } ;
    enum clnt_stat cs ;

    /* Create client handle */
    client = clnt_create(hostname, program_number, version_number, "tcp");
    if (client == (CLIENT *)NULL)
    {
        fprintf(stderr,"Couldn't create client\n");
        exit(1);
    }

    /* Make a call to remote procedure associated with client handle */
    cs = clnt_call(client, procedure_number, (xdrproc_t)xdr_void, NULL,
                  (xdrproc_t)xdr_void, NULL, total_timeout);
    if (cs != RPC_SUCCESS)
    {
        clnt_perror(client,"Client Call failed");
        exit(1);
    }

    /* Destroy client handle in the end */
    clnt_destroy(client);

    return 0;
}
```

## Related Information

The “clnt\_sperror Subroutine” on page 323.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_raw\_create Subroutine

### Purpose

Creates and returns a generic client handle for the specified program and version.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
CLIENT * clnt_raw_create( prognum, versnum )
const rpcprog_t prognum;
const rpcvers_t versnum;
```

### Description

The **clnt\_raw\_create** subroutine creates and returns a generic client handle for the specified program and version. For this subroutine, the server must be in the same address space as the client because the transport that is used for the client-server communication is the buffer in the process-address space of the client. This facilitates measurement of remote procedure call (RPC) overheads, such as round trip times, without any kernel or networking interference.

### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.

### Return Values

a generic client handle that is valid	successful
NULL	unsuccessful

### Error Codes

The **clnt\_raw\_create** subroutine returns failure when one or more of the following error codes are true.

<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.
<b>RPC_PROGVERSISMATCH</b>	The version number is not valid.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
```

```

CLIENT *cl;
rpcprog_t PROGNUM = 0x3fffffffL;
rpcvers_t PROGVER = 0x1L ;

/*
 * make the clnt_door_create call with this nettype and
 * observe the result
 */

if ((cl=clnt_raw_create( PROGNUM, PROGVER ) == NULL)
{
    fprintf(stdout, "clnt_raw_create : failed.\n");
    exit(EXIT_FAILURE);
}

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy client handle in the end */
clnt_destroy(cl);

return 0;
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_spcreateerror Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### clnt\_spcreateerror Subroutine Exported from the libc Library

#### Purpose

Indicates why a client Remote Procedure Call (RPC) handle was not created.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
char *clnt_spcreateerror ( s)
char *s;
```

#### Description

The **clnt\_spcreateerror** subroutine returns a string indicating why a client RPC handle was not created.

**Note:** This subroutine returns the pointer to static data that is overwritten on each call.

#### Parameters

**s** Points to a character string that represents the error text.

## Related Information

The `clnt_pcreateerror` subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_spcreateerror Subroutine Exported from the libnsl Library

### Purpose

Returns an error message that is related to the remote procedure call (RPC) client-handle creation.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>
char * clnt_spcreateerror( error_msg );
const char *error_msg ;
```

### Description

The `clnt_spcreateerror` subroutine is used for error handling. The subroutine displays the actual cause of failure of the creation of an RPC client handle. The actual error message is preceded by the string specified by `error_msg` parameter and a colon. However, the actual error message is not appended with a newline.

**Note:** If the `error_msg` parameter has a null value, the output is a colon followed by the actual error message.

### Parameters

`error_msg`                      Specified an error-message string that is provided by an application.

### Example

In the following example, the `clnt_create` subroutine tries to register a program number that is not valid and hence returns a null value. The `clnt_spcreateerror` subroutine returns the actual error message, which is preceded by the specified string ("Invalid Program Number" ) and a colon.

```
#include <rpc/clnt.h>
#include <stdio.h>

int main()
{
    CLIENT *cl;
    char hostname[255] ; /* The name of remote host */
    char *nettype = "visible" ;
    rpcprog_t PROGNUM ; /* Invalid Value */
    rpcvers_t PROGVER ;
    char *err_str;

    cl = clnt_create(hostname, PROGNUM, PROGVER, nettype);

    if(cl==NULL)
    {
        err_str = clnt_spcreateerror("Invalid Program Number ");
        printf("\n%s",err_str);
        exit(1);
    }

    /*
    * Make a call to clnt_call() subroutine
```

```

*/
/* Destroy the client handle at the end */
clnt_destroy(cl);

return 0;
}

```

## Related Information

The “clnt\_pcreateerror Subroutine” on page 312.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_sperrno Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### clnt\_sperrno Subroutine Exported from the libc Library

#### Purpose

Specifies the condition of the *stat* parameter by returning a pointer to a string containing a status message.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
char *clnt_sperrno ( stat)
enum clnt_stat stat;
```

#### Description

The **clnt\_sperrno** subroutine specifies the condition of the *stat* parameter by returning a pointer to a string containing a status message. The string ends with a new-line character.

Whenever one of the following conditions exists, the **clnt\_sperrno** subroutine is used instead of the **clnt\_perrno** subroutine when a **clnt\_call** routine fails:

- The program does not have a standard error output. This is common for programs running as servers.
- The programmer does not want the message to be output with the **printf** subroutine.
- A message format differing from that supported by the **clnt\_perrno** subroutine is being used.

**Note:** The **clnt\_sperrno** subroutine does not return the pointer to static data, so the result is not overwritten on each call.

#### Parameters

*stat*      Specifies the client error status of the remote procedure call.

## Return Values

The `clnt_sperrno` subroutine translates and displays the following `enum clnt_stat` error status messages:

Message	Description
<code>RPC_SUCCESS = 0</code>	Call succeeded.
<code>RPC_CANTENCODEARGS = 1</code>	Cannot encode arguments.
<code>RPC_CANTDECODERES = 2</code>	Cannot decode results.
<code>RPC_CANTSEND = 3</code>	Failure in sending call.
<code>RPC_CANTRECV = 4</code>	Failure in receiving result.
<code>RPC_TIMEDOUT = 5</code>	Call timed out.

## Related Information

The `clnt_perrno` subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## `clnt_sperrno` Subroutine Exported from the `libnsl` Library

### Purpose

Specifies the reason for failure of the procedure call.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>
char *clnt_sperrno(stat)
const enum clnt_stat stat;
```

### Description

The `clnt_sperrno` subroutine specifies the condition of the `stat` parameter by returning a pointer to a string containing a status message. The string ends with a new-line character.

Whenever one of the following conditions exists, the `clnt_sperrno` subroutine is used instead of the `clnt_perrno` subroutine when a `clnt_call` routine fails:

- The program does not have a standard error output. This is common for programs running as servers.
- The programmer does not want the message to be output with the `printf` subroutine.
- A message format differing from that supported by the `clnt_perrno` subroutine is being used.

**Note:** The `clnt_sperrno` subroutine does not return the pointer to static data, so the result is not overwritten on each call.

### Parameters

`stat` Specifies the client error status of the remote procedure call.

### Error Codes

The following table list some error status codes that the `clnt_sperrno` subroutine can translate and display. You can find a complete list of error codes in the `clnt_stat.h` file.

<code>RPC_SUCCESS = 0</code>	The call succeeded.
<code>RPC_CANTENCODEARGS = 1</code>	Arguments cannot be encoded.
<code>RPC_CANTDECODERES = 2</code>	Results cannot be decoded .



**RPC\_CANTSEND** = 3  
**RPC\_CANTRECV** = 4  
**RPC\_TIMEDOUT** = 5

A failure occurred in sending call.  
A failure occurred in receiving result.  
The call timed out.

## Examples

In the following example, the **clnt\_sperrno** subroutine returns the status message in the string pointed to by the *err\_str* parameter.

```
#include <rpc/clnt.h>
#include <stdio.h>
#include <sys/time.h>

int main()
{
    char hostname[255] ; /* The Remote host on which server is implemented */
    rpcprog_t program_number ;
    rpcvers_t version_number ;
    rpcproc_t procedure_number ;
    enum clnt_stat cs ;
    char *nettype = "visible";
    char *err_str;

    cs = rpc_call(hostname, program_number, version_number, procedure_number, (xdrproc_t)xdr_void, NULL,
                  (xdrproc_t)xdr_void, NULL, nettype);
    if (cs != RPC_SUCCESS)
    {
        err_str = clnt_sperrno(cs) ;
        fprintf(stdout, "\n%s", err_str) ;
    }

    return 0 ;
}
```

## Related Information

The “clnt\_perrno Subroutine” on page 314.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_sperror Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### clnt\_sperror Subroutine Exported from the libc Library

#### Purpose

Indicates why a remote procedure call failed.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
char *clnt_sperror ( cl, s)
CLIENT *cl;
char *s;
```

## Description

The **clnt\_sperror** subroutine returns a string to standard error output indicating why a Remote Procedure Call (RPC) call failed. This subroutine also returns the pointer to static data overwritten on each call.

## Parameters

*cl* Points to the structure of the client handle.  
*s* Points to a character string that represents the error text.

## Return Values

This subroutine returns an error string to standard error output.

## Related Information

The **clnt\_perror** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## clnt\_sperror Subroutine Exported from the libnsl Library

### Purpose

Returns the error message indicating why a remote procedure call failed.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
char *clnt_sperror ( cl, s)
const CLIENT *cl;
const char *s;
```

### Description

The **clnt\_sperror** subroutine returns an error message indicating why a remote procedure call failed. The message is preceded by the string that is pointed to by the *s* parameter and a colon. The message is not appended by a newline. This subroutine is used after the **clnt\_call** macro. The difference between the **clnt\_sperror** and **clnt\_perror** subroutines is that **clnt\_perror** displays the error message on standard error whereas **clnt\_sperror** just returns a pointer to the buffer that holds this error message.

**Note:** In a single thread, the subroutine uses the same buffer that is overwritten by the error message on successive calls. However, in multithreaded applications, the buffers used are thread-specific.

### Parameters

*cl* Points to the structure of the client handle.  
*s* Points to a character string that represents the error text.

### Return Values

This subroutine returns an error string.

### Examples

In the following example, the **clnt\_sperror** subroutine returns the reason for failure of a remote procedure call that is pointed to by the *err\_str* parameter.

```
#include <rpc/clnt.h>
#include <stdio.h>
#include <sys/time.h>
```

```

int main()
{
    CLIENT *client ;
    char hostname[255] ; /* The Remote host on which server is implemented */
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    rpcproc_t procedure_number = 0x1L;
    struct timeval total_timeout = { 25 , 0 } ;
    enum clnt_stat cs ;
    char *err_str ;

    /* Create client handle */
    client = clnt_create(hostname, program_number, version_number, "tcp");
    if (client == (CLIENT *)NULL)
    {
        fprintf(stderr,"Couldn't create client\n");
        exit(1);
    }

    /* Call remote procedure associated with client handle */
    cs = clnt_call(client, procedure_number, (xdrproc_t)xdr_void, NULL,
                  (xdrproc_t)xdr_void, NULL, total_timeout);
    if (cs != RPC_SUCCESS)
    {
        err_str = clnt_sperror(client,"Client Call failed");
        fprintf(stderr,"%s",err_str);
        exit(1);
    }

    /* Destroy client handle in the end */
    clnt_destroy(client);

    return 0;
}

```

## Related Information

The “clnt\_perror Subroutine” on page 316.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_tli\_create Subroutine

### Purpose

Creates and returns a generic client handle for a remote program using the specified transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/clnt.h>
CLIENT * clnt_tli_create(fd, nconf, svcaddr, prognum, versnum, sendsize, recvsize)
const int fd;
const struct netconfig *nconf;
const struct netbuf *svcaddr ;
const rpcprog_t prognum;
const rpcvers_t versnum;
const uint_t sendsize;
const uint_t recvsize;

```

## Description

The **clnt\_tli\_create** subroutine is an expert-level API for transport-independent remote procedure calls (TI\_PRC). The subroutine specifies transport-related parameters. The **clnt\_tli\_create** subroutine creates and returns a generic client handle for the specified program and version. This generic client handle is returned from the remote host. The subroutine uses an open and bound file descriptor through the specified transport and the address of the remote program to call the remote program. If you set the sizes of the send and receive buffers that are specified by the *sendsize* and *recvsize* parameters to 0, the default sizes of the buffers are used.

**Note:** If you set the value of the *nconf* parameter to a connection-oriented transport and set the value of the *svcaddr* parameter to NULL, the file descriptor is assumed to be connected. If you set the value of the *nconf* parameter to a connectionless transport and set the value of the *svcaddr* parameter to NULL, an error is returned. If you set the value of the *fd* parameter to RPC\_ANYFD, a suitable file descriptor is opened and bound on the specified transport. If you set the value of the *fd* parameter to RPC\_ANYFD and set the value of the *nconf* parameter to NULL, an error is returned.

## Parameters

<i>fd</i>	Specifies the file descriptor that is open, bound, and connected on the specified transport.
<i>nconf</i>	Specifies the transport to use.
<i>svcaddr</i>	Specifies the address of the remote program
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>sendsize</i>	Specifies the size of the send buffer.
<i>recvsize</i>	Specifies the size of the receive buffer.

## Return Values

a generic client handle that is valid	successful
NULL	unsuccessful

You can use the **clnt\_pcreateerror** subroutine to obtain the reason for failure.

## Error Codes

The **clnt\_tli\_create** subroutine returns failure if one or more of the following are true.

<b>RPC_TLIERROR</b>	The file descriptor is not valid.
<b>RPC_UNKNOWNADDR</b>	The value of the <i>svcaddr</i> parameter that holds the address of the remote program is NULL.

## Examples

In the following example, the **clnt\_tli\_create** subroutine returns a generic client handle for the remote program using the specified transport on successful completion.

```
int main()
{
    char hostname[255]; /* The Remote Host */
    rpcprog_t PROGNUM = 0x3fffffffL ;
    rpcvers_t PROGVER = 0x1L ;
    struct netconfig *nconf
    struct netbuf svcaddr ;
    CLIENT *cl ;
    char *transport ;          /* Can be set to TCP or UDP */
}
```

```

if ((nconf = getnetconfigent(transport)) == (struct netconfig *)NULL)
{
    fprintf(stderr, "Cannot get netconfig entry for UDP\n");
    exit(2);
}

if (!rpcb_getaddr(PROGNUM, PROGVER, nconf, &svccaddr, hostname))
{
    fprintf(stderr, "rpcb_getaddr failed!!\n");
    exit(2);
}

/*
 * make the clnt_tli_create call with nconf and
 * observe the result
 */
cl = clnt_tli_create(RPC_ANYFD, nconf, &svccaddr, PROGNUM, PROGVER, 0, 0);
if( cl==NULL )
{
    fprintf(stdout, "clnt_tli_create : failed.\n");
    exit(EXIT_FAILURE);
}

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy the client handle at the end */
clnt_destroy(cl);

return 0;
}

```

## Related Information

The “clnt\_create Subroutine” on page 295, “clnt\_tp\_create Subroutine” and “clnt\_vc\_create Subroutine” on page 331.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_tp\_create Subroutine

### Purpose

Creates a client handle for a remote program using the specified class of transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
CLIENT * clnt_tp_create(host, prognum, versnum, nconf)
const char *host;
const rpcprog_t prognum;
const rpcvers_t versnum;
const struct netconfig *nconf;

```

## Description

The **clnt\_tp\_create** subroutine is an intermediate-level API. The subroutine enables the application to have a better control over the transport service to be used. The subroutine creates a client handle for the specified program and version. This client handle is created and returned from a remote host where the server is located. The operation is done with a transport service that is specified by *nconf* parameter. The service can be a connection-oriented or a connectionless service.

**Note:** If you set the value of the *nconf* parameter to NULL, the subroutine fails.

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>nconf</i>	Defines a specific transport service to use.

## Return Values

a generic client handle that is valid	successful
NULL	unsuccessful

You can use the **clnt\_pcreateerror** subroutine to obtain the reason for failure.

## Error Codes

The **clnt\_tp\_create** subroutine returns failure if one or more of the following are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"><li>The transport service that is specified by the <i>nconf</i> parameter is NULL.</li><li>The value of the <i>nconf</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li></ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_TLIERROR</b>	The value of the <i>nconf</i> parameter is set to <b>udp</b> and a call to the <b>clnt_tp_create</b> subroutine is made from the client program with the <i>nconf</i> member ( <i>nc_semantics</i> = NC_TPI_COTS_ORD).
<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.

## Examples

In the following example, the **clnt\_tp\_create** subroutine returns a generic client handle using the **tcp** transport service on successful completion.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *client;
    struct netconfig *nconf;
    char hostname[255] ; /* The Remote host where server is located */
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;

    /* getnetconfig() returns a pointer to the struct netconfig
     * structure corresponding to tcp transport
```

```

    */
    if ((nconf = getnetconfig("tcp")) == (struct netconfig *)NULL)
    {
        fprintf(stderr, "Cannot get netconfig entry for UDP\n");
        exit(2);
    }

    /* Create client handle using clnt_tp_create() */
    client = clnt_tp_create(hostname, PROGNUM, PROGVER, nconf);
    if (client == (CLIENT *)NULL)
    {
        fprintf(stderr, "Couldn't create client at inter lvl\n");
        clnt_pcreateerror("Inter lvl : ");
        exit(EXIT_FAILURE);
    }

    /*
    * Make a call to clnt_call() subroutine
    */

    /* Destroy client handle in the end */
    clnt_destroy(client);

    return 0 ;
}

```

## Related Information

The “clnt\_create Subroutine” on page 295 and “clnt\_tli\_create Subroutine” on page 325.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_tp\_create\_timed Subroutine

### Purpose

Creates a client handle for a remote program using the specified class of transport within the specified timeout.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
CLIENT * clnt_tp_create_timed(host, prognum, versnum, nconf, timeout)
const char *host;
const rpcprog_t prognum;
const rpcvers_t versnum;
const struct netconfig *nconf;
const struct timeval *timeout;

```

### Description

The **clnt\_tp\_create\_timed** subroutine is an intermediate level API. The subroutine enables the application to have a better control over the transport service to be used. The subroutine creates a client handle for the specified program and version. This client handle is created and returned from the remote host where server is located. The operation is done with a transport service specified by *nconf* parameter. The service can be a connection-oriented or connectionless service. The *timeout* parameter specifies the time duration within which the subroutine returns. If the timeout value expires, the subroutine fails and returns NULL.

**Note:** If you set the value of the *nconf* parameter to NULL, the subroutine fails.

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>nconf</i>	Defines a specific transport service to use.
<i>timeout</i>	Specifies the timeout value.

## Return Values

a generic client handle that is valid	successful
NULL	unsuccessful

You can use the **clnt\_pcreateerror** subroutine to obtain the reason for failure.

## Error Codes

The **clnt\_tp\_create\_timed** subroutine returns failure if one or more of the following are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"><li>The transport service specified by the <i>nconf</i> parameter is NULL.</li><li>The value of the <i>nconf</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li></ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_TLIERROR</b>	The value of the <i>nconf</i> parameter is set to <b>udp</b> and a call to the <b>clnt_tp_create</b> subroutine is made from the client program with <i>nconf</i> member (nc_semantics = NC_TPI_COTS_ORD).
<b>RPC_PROGNOTREGISTERED</b>	The program number is not valid.
<b>RPC_TIMEDOUT</b>	The timeout value has expired.

## Examples

In the following example, the **clnt\_tp\_create\_timed** subroutine returns a generic client handle using the **tcp** transport service on successful completion. If the timeout value expires, the subroutine returns NULL.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *client;
    struct netconfig *nconf;
    char hostname[255]; /* The Remote host where server is located */
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    const struct timeval timeout = { 25 , 0 } ;

    /* getnetconfignt() returns a pointer to the struct netconfig
     * structure corresponding to tcp transport
     */
    if ((nconf = getnetconfignt("tcp")) == (struct netconfig *)NULL)
    {
        fprintf(stderr, "Cannot get netconfig entry for UDP\n");
        exit(2);
    }
}
```



```

client = clnt_tp_create_timed(hostname, PROGNUM, PROGVER, nconf, &timeout);
if (client == (CLIENT *)NULL)
{
    fprintf(stderr, "Couldn't create client at inter lvl\n");
    clnt_pcreateerror("Inter lvl : ");
    exit(EXIT_FAILURE);
}

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy client handle in the end */
clnt_destroy(client);

return 0 ;
}

```

## Related Information

The “clnt\_create\_timed Subroutine” on page 297 and “clnt\_create\_vers\_timed Subroutine” on page 301.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnt\_vc\_create Subroutine

### Purpose

Creates and returns a generic client handle for a remote program using a connection-oriented transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
CLIENT * clnt_vc_create(fd, svcaddr, prognum, versnum, sendsize, recvsize)
int fd;
const struct netbuf * svcaddr;
const rpcprog_t prognum;
const rpcvers_t versnum;
const uint_t sendsize;
const uint_t recvsize

```

### Description

The **clnt\_vc\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). With the subroutine, applications can control all the options. The **clnt\_vc\_create** subroutine creates and returns a generic client handle for the specified program and version. The subroutine uses a connection-oriented transport. The generic client handle is returned from the remote host where the server is located. The subroutine uses an open and bound file descriptor through the connection-oriented transport and the specified address of the remote program to call the remote program. The can be specified by the *sendsize* and *recvsize* parameters. If you set the sizes of the send and receive buffers that are specified by the *sendsize* and *recvsize* parameters to 0, the default sizes of the buffers are used.

**Note:** If you set the value of the *fd* parameter to `RPC_ANYFD` or set the *svcaddr* subroutine to a null value, the subroutine fails and returns a null value.

## Parameters

<i>fd</i>	Specifies the open and bound file descriptor on a connection-oriented transport.
<i>svcaddr</i>	Specifies the address of the remote program.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>sendsize</i>	Specifies the size of the send buffer.
<i>recvsize</i>	Specifies the size of the receive buffer.

## Return Values

a generic client handle that is valid	successful
a null value	unsuccessful

You can use the `clnt_pcreateerror` subroutine to obtain the reason for failure.

## Error Codes

The `clnt_vc_create` subroutine returns failure if one or more of the following codes are true.

<b>RPC_TLIERROR</b>	The file descriptor is not valid.
<b>RPC_UNKNOWNADDR</b>	The value of the <i>svcaddr</i> parameter that holds the address of the remote program is a null value.
<b>RPC_CANTENCODEARGS</b>	The size of the send or receive buffer is less than that of the sent packet.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl ;
    int fd;
    rpcprog_t PROGNUM    =    0x3fffffffL;
    rpcvers_t PROGVER    =    0x1L ;
    struct netconfig *nconf ;
    struct netbuf svcaddr ;
    char hostname[255] ;    /* The name of remote host */

    /* getnetconfig() returns a pointer to the struct netconfig
     * structure corresponding to tcp transport
     */
    if ((nconf = getnetconfig("tcp")) == (struct netconfig *)NULL)
    {
        fprintf(stderr, "Cannot get netconfig entry for UDP\n");
        exit(2);
    }

    /* Get address of service on remote host */
    if (!rpcb_getaddr(PROGNUM, PROGVER, nconf,
                     &svcaddr, hostname))
    {
        fprintf(stderr, "rpcb_getaddr failed!!\n");
        exit(2);
    }
    /* Get the open and bound file descriptor for connection oriented transport */
    fd = . . .
    if ((cl = clnt_vc_create(fd, &svcaddr,
                           PROGNUM, PROGVER, 0, 0))==NULL);
}
```

```

    {
        fprintf(stdout, "clnt_vc_create : failed.\n");
        exit(EXIT_FAILURE);
    }

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy client handle in the end */
    clnt_destroy(c1);

    return 0;
}

```

## Related Information

The “clnt\_tp\_create Subroutine” on page 327, “clnt\_tli\_create Subroutine” on page 325, and “clnt\_dg\_create Subroutine” on page 305.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clntraw\_create Subroutine

### Purpose

Creates a toy Remote Procedure Call (RPC) client for simulation.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
CLIENT *clntraw_create ( prognum, versnum)
u_long prognum, versnum;
```

### Description

The **clntraw\_create** subroutine creates a toy RPC client for simulation of a remote program. This toy client uses a buffer located within the address space of the process for the transport to pass messages to the service. If the corresponding RPC server lives in the same address space, simulation of RPC and acquisition of RPC overheads, such as round-trip times, are done without kernel interference.

### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.

### Return Values

Upon successful completion, this subroutine returns a pointer to a valid RPC client. If unsuccessful, it returns a value of NULL.

## Related Information

The `clnt_pcreateerror` subroutine, `svcrow_create` subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clnttcp\_create Subroutine

**Important:** The subroutine is exported from both the `libc` and the `libnsi` libraries.

## clnttcp\_create Subroutine Exported from the libc Library

### Purpose

Creates a Transmission Control Protocol/Internet Protocol (TCP/IP) client transport handle.

### Library

C Library (`libc.a`)

### Syntax

```
CLIENT *clnttcp_create (addr, prognum, versnum, sockp, sendsz, recvsz)
struct sockaddr_in * addr;
u_long prognum, versnum;
int * sockp;
u_int sendsz, recvsz;
```

### Description

The `clnttcp_create` subroutine creates a Remote Procedure Call (RPC) client transport handle for a remote program. This client uses TCP/IP as the transport to pass messages to the service.

The TCP/IP remote procedure calls use buffered input/output (I/O). Users can set the size of the send and receive buffers with the `sendsz` and `recvsz` parameters. If the size of either buffer is set to a value of 0, the `clnttcp_create` subroutine picks suitable default values.

### Parameters

<i>addr</i>	Points to the Internet address of the remote program. If the port number for this Internet address ( <code>addr-&gt;sin_port</code> ) is a value of 0, then the <i>addr</i> parameter is set to the actual port on which the remote program is listening. The client making the remote procedure call consults the remote <code>portmap</code> daemon to obtain the port information.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>sockp</i>	Specifies a pointer to a socket. If the value of the <i>sockp</i> parameter is <code>RPC_ANYSOCK</code> , the <code>clnttcp_create</code> subroutine opens a new socket and sets the <i>sockp</i> pointer to the new socket.
<i>sendsz</i>	Sets the size of the send buffer.
<i>recvsz</i>	Sets the size of the receive buffer.

### Return Values

Upon successful completion, this routine returns a valid TCP/IP client handle. If unsuccessful, it returns a value of null.

### Related Information

The `callrpc` subroutine, `clnt_pcreateerror` subroutine, `clntudp_create` subroutine, `svctcp_create` subroutine.

The `portmap` daemon.

The `clnt_call` macro.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

## clnttcp\_create Subroutine Exported from the libnsl Library

### Purpose

Creates a Transmission Control Protocol/Internet Protocol (TCP/IP) client transport handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
CLIENT *clnttcp_create (addr, prognum, versnum, fdp, sendsz, recvsz)
struct sockaddr_in *addr;
rpcprog_t prognum;
rpcvers_t versnum;
int *fdp;
uint_t sendsz, recvsz;
```

### Description

The `clnttcp_create` subroutine creates a Remote Procedure Call (RPC) client transport handle for a remote program. This client uses TCP/IP as the transport to pass messages to the service.

The TCP/IP remote procedure calls use buffered input/output (I/O). Users can set the size of the send and receive buffers with the `sendsz` and `recvsz` parameters. If the size of either buffer is set to a value of 0, the `clnttcp_create` subroutine picks suitable default values.

### Parameters

<code>addr</code>	Points to the Internet address of the remote program. If the port number for this Internet address ( <code>addr-&gt;sin_port</code> ) is a value of 0, then the <code>addr</code> parameter is set to the actual port on which the remote program is listening. The client making the remote procedure call consults the remote <b>portmap</b> daemon to obtain the port information.
<code>prognum</code>	Specifies the program number of the remote program.
<code>versnum</code>	Specifies the version number of the remote program.
<code>fdp</code>	Specifies a pointer to a socket. If the value of the <code>fdp</code> parameter is <b>RPC_ANYSOCK</b> , the <code>clnttcp_create</code> subroutine opens a new socket and sets the <code>fdp</code> pointer to the new socket.
<code>sendsz</code>	Sets the size of the send buffer.
<code>recvsz</code>	Sets the size of the receive buffer.

### Return Values

a valid TCP/IP client handle	successful
a null value	unsuccessful

### Error Codes

<b>RPC_PROGNOTREGISTERED</b>	The program is not registered.
<b>RPC_SYSTEMERROR</b>	The file descriptor is not valid.

## Examples

In the following example, the `clnttcp_create` subroutine creates and returns a TCP/IP client transport handle.

```
#include <rpc/rpc.h>
#include <stdio.h>

#define ADDRBUFSIZE 255

int main()
{
    CLIENT *clnt;
    rpcprog_t  PROGNUM = 0x3fffffffL;
    rpcvers_t  PROGVER = 0x1L;
    int      fd;
    uint_t    sendsz=0, recvsz=0;
    struct sockaddr_in addr;
    char      addrbuf[ADDRBUFSIZE];
    struct netbuf  svcaddr;
    struct netconfig *nconf;
    char host[255] ; /* The remote host name */

    svcaddr.len = 0;
    svcaddr.maxlen = ADDRBUFSIZE;
    svcaddr.buf = addrbuf;

    /* Get pointer to struct netconfig for tcp transport */
    nconf = getnetconfig("tcp");
    if (nconf == (struct netconfig *) NULL) {
        printf("getnetconfig() failed\n");
        exit(1);
    }

    /* Get the address of remote service */
    if (!rpcb_getaddr(PROGNUM, PROGVER, nconf, &svcaddr, host)) {
        printf("rpcb_getaddr() failed\n");
        exit(1);
    }
    memcpy(&addr, svcaddr.buf, sizeof(struct sockaddr_in));

    fd = ... /* Code to obtain open and bound file descriptor on tcp transport */

    clnt = (CLIENT *) clnttcp_create(&addr, PROGNUM, PROGVER, &fd, sendsz, recvsz);

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle in the end */
    clnt_destroy(clnt);

    return 0;
}
```

## Related Information

The “callrpc Subroutine” on page 286, “clnt\_pcreateerror Subroutine” on page 312, “clntudp\_create Subroutine” on page 339, “svctcp\_create Subroutine” on page 467, “clnt\_vc\_create Subroutine” on page 331, and “clnt\_tp\_create Subroutine” on page 327.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## clntudp\_bufcreate Subroutine

### Purpose

Creates a User Datagram Protocol/Internet Protocol (UDP/IP) client transport handle with specified maximum packet size for UDP-based remote procedure call (RPC) messages.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
CLIENT *clntudp_bufcreate( addr, prognum, versnum, wait, fdp, sendsz, recvsz)
struct sockaddr_in * addr;
rpcprog_t prognum;
rpcvers_t versnum;
struct timeval wait;
int * fdp;
uint_t sendsz;
uint_t recvsz;
```

### Description

The **clntudp\_bufcreate** subroutine creates an RPC client transport handle for a remote program. The client uses UDP as the transport to pass messages to the service. The remote program is located at the internet address specified by the *addr* parameter. The *fdp* parameter represents the open and bound file descriptor. If it is set to `RPC_ANYSOCK`, the subroutine opens a new file descriptor and binds it to the UDP transport. The *sendsz* and *recvsz* parameters specify the size of send and receive buffers used for sending and receiving UDP-based RPC messages.

### Parameters

<i>addr</i>	Points to the Internet address of the remote program. If the port number for this Internet address ( <b>addr-&gt;sin_port</b> ) is 0, the value of the <i>addr</i> parameter is set to the port that the remote program is listening on. The <b>clntudp_bufcreate</b> subroutine consults the remote <b>portmap</b> daemon for this information.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>wait</i>	Sets the amount of time that the UDP/IP transport waits to receive a response before the transport sends another remote procedure call or the remote procedure call times out. You can use the <b>clnt_call</b> macro to set the total time for the call to time out.
<i>fdp</i>	Specifies the open and bound file descriptor. If the value of the <i>fdp</i> parameter is <code>RPC_ANYSOCK</code> , the <b>clntudp_bufcreate</b> subroutine opens a new file descriptor and sets the <i>fdp</i> pointer to the new file descriptor.
<i>sendsz</i>	Specifies the size of the send buffer.
<i>recvsz</i>	Specifies the size of the receive buffer.

### Return Values

a valid UDP client handle	successful
a null value	unsuccessful

### Error Codes

<b>RPC_PROGNOTREGISTERED</b>	The program is not registered.
------------------------------	--------------------------------

## Examples

In the following example, the `clntudp_bufcreate` subroutine creates and returns a UDP/IP client transport handle.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#define ADDRBUFSIZE 255

int main()
{
    CLIENT *clnt;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    int fd;
    struct timeval waittime = {25,0};
    struct sockaddr_in addr;
    char addrbuf[ADDRBUFSIZE];
    struct netbuf svcaddr;
    struct netconfig *nconf;
    uint_t sendsz, recvsz;
    char host[255] ; /* The remote host name */

    svcaddr.len = 0;
    svcaddr.maxlen = ADDRBUFSIZE;
    svcaddr.buf = addrbuf;

    /* Get pointer to struct netconfig for tcp transport */
    nconf = getnetconfig("udp");
    if (nconf == (struct netconfig *) NULL) {
        printf("getnetconfig() failed\n");
        exit(1);
    }

    /* Get the address of remote service */
    if (!rpcb_getaddr(PROGNUM, PROGVER, nconf, &svcaddr, host)) {
        printf("rpcb_getaddr() failed\n");
        exit(1);
    }
    memcpy(&addr, svcaddr.buf, sizeof(struct sockaddr_in));

    fd = ... /* Code to obtain open and bound file descriptor on udp transport */

    clnt = (CLIENT *) clntudp_bufcreate(&addr, PROGNUM, PROGVER, waittime, &fd, sendsz, recvsz);

    /*
     * Make a call to clnt_call() subroutine
     */

    /* Destroy the client handle in the end */
    clnt_destroy(clnt);

    return 0;
}
```

## Related Information

The “`clnt_dg_create` Subroutine” on page 305 and “`clnt_call` Macro” on page 289.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.



---

## clntudp\_create Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

## clntudp\_create Subroutine Exported from the libc Library

### Purpose

Creates a User Datagram Protocol/Internet Protocol (UDP/IP) client transport handle.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
CLIENT *clntudp_create (addr, prognum, versnum, wait, sockp)
struct sockaddr_in * addr;
u_long prognum, versnum;
struct timeval wait;
int * sockp;
```

### Description

The **clntudp\_create** subroutine creates a Remote Procedure Call (RPC) client transport handle for a remote program. The client uses UDP as the transport to pass messages to the service.

RPC messages transported by UDP/IP can hold up to 8KB of encoded data. Use this subroutine for procedures that take arguments or return results of less than 8KB.

### Parameters

<i>addr</i>	Points to the Internet address of the remote program. If the port number for this Internet address ( <b>addr-&gt;sin_port</b> ) is 0, then the value of the <i>addr</i> parameter is set to the port that the remote program is listening on. The <b>clntudp_create</b> subroutine consults the remote <b>portmap</b> daemon for this information.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>wait</i>	Sets the amount of time that the UDP/IP transport waits to receive a response before the transport sends another remote procedure call or the remote procedure call times out. The total time for the call to time out is set by the <b>clnt_call</b> macro.
<i>sockp</i>	Specifies a pointer to a socket. If the value of the <i>sockp</i> parameter is <b>RPC_ANYSOCK</b> , the <b>clntudp_create</b> subroutine opens a new socket and sets the <i>sockp</i> pointer to that new socket.

### Return Values

Upon successful completion, this subroutine returns a valid UDP client handle. If unsuccessful, it returns a value of null.

### Related Information

The **callrpc** subroutine, **clnt\_pcreateerror** subroutine, **clnttcp\_create** subroutine, **svcudp\_create** subroutine.

The **portmap** daemon.

The **clnt\_call** macro.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

# clntudp\_create Subroutine Exported from the libnsl Library

## Purpose

Creates a User Datagram Protocol/Internet Protocol (UDP/IP) client transport handle.

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
CLIENT *clntudp_bufcreate (addr, prognum, versnum, wait, fdp)
struct sockaddr_in *addr;
rpcprog_t prognum;
rpcvers_t versnum;
struct timeval wait;
int *fdp;
```

## Description

The **clntudp\_create** subroutine creates a Remote Procedure Call (RPC) client transport handle for a remote program. The client uses UDP as the transport to pass messages to the service.

RPC messages transported by UDP/IP can hold up to 8KB of encoded data. Use this subroutine for procedures that take arguments or return results of less than 8KB.

## Parameters

<i>addr</i>	Points to the Internet address of the remote program. If the port number for this Internet address ( <b>addr-&gt;sin_port</b> ) is 0, then the value of the <i>addr</i> parameter is set to the port that the remote program is listening on. The <b>clntudp_create</b> subroutine consults the remote <b>portmap</b> daemon for this information.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>wait</i>	Sets the amount of time that the UDP/IP transport waits to receive a response before the transport sends another remote procedure call or the remote procedure call times out. The total time for the call to time out is set by the <b>clnt_call</b> macro.
<i>fdp</i>	Specifies a pointer to a socket. If the value of the <i>fdp</i> parameter is <b>RPC_ANYSOCK</b> , the <b>clnttcp_create</b> subroutine opens a new socket and sets the <i>fdp</i> pointer to the new socket.

## Return Values

a valid UDP client handle	successful
a null value	unsuccessful

## Error Codes

<b>RPC_PROGNOTREGISTERED</b>	The program is not registered.
<b>RPC_SYSTEMERROR</b>	The file descriptor is not valid.

## Examples

In the following example, the **clntudp\_create** subroutine creates and returns a UDP/IP client transport handle.

```
#include <rpc/rpc.h>
#include <stdio.h>

#define ADDRBUFSIZE 255
#define ADDRBUFSIZE 255
```

```

int main()
{
    CLIENT *clnt;
    rpcprog_tPROGNUM = 0x3fffffffL;
    rpcvers_tPROGVER = 0x1L;
    intfd;
    struct timeval waittime = {25,0};
    struct sockaddr_in addr;
    char    addrbuf[ADDRBUFSIZE];
    struct netbuf  svcaddr;
    struct netconfig *nconf;
    char host[255] ; /* The remote host name */

    svcaddr.len = 0;
    svcaddr.maxlen = ADDRBUFSIZE;
    svcaddr.buf = addrbuf;
    /* Get pointer to struct netconfig for tcp transport */
    nconf = getnetconfig("udp");
    if (nconf == (struct netconfig *) NULL) {
        printf("getnetconfig() failed\n");
        exit(1);
    }
    /* Get the address of remote service */
    if (!rpcb_getaddr(PROGNUM, PROGVER, nconf, &svcaddr, host)) {
        printf("rpcb_getaddr() failed\n");
        exit(1);
    }
    memcpy(&addr, svcaddr.buf, sizeof(struct sockaddr_in));
    fd = ... /*Code to obtain open and bound file descriptor on udp transport */

    clnt = (CLIENT *) clntudp_create(&addr, PROGNUM, PROGVER, waittime, &fd);
    /*
     * Make a call to clnt_call() subroutine
     */
    /* Destroy the client handle in the end */
    clnt_destroy(clnt);

    return 0;
}

```

## Related Information

The “callrpc Subroutine” on page 286, “clnt\_pcreateerror Subroutine” on page 312, “clntudp\_create Subroutine” on page 339, “svctcp\_create Subroutine” on page 467, and “clnt\_dg\_create Subroutine” on page 305.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

The “clnt\_call Macro” on page 289.

---

## get\_myaddress Subroutine

### Purpose

Gets the user's Internet Protocol (IP) address.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
void
get_myaddress ( addr)
struct sockaddr_in *addr;
```

## Description

The **get\_myaddress** subroutine gets the machine's IP address without consulting the library routines that access the */etc/hosts* file.

## Parameters

*addr* Specifies the address where the machine's IP address is placed. The port number is set to a value of **htons** (PMAPPORT).

## Related Information

The */etc/hosts* file.

Internet Protocol in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## getnetname Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libns1** libraries.

## getnetname Subroutine Exported from the libc Library

### Purpose

Installs the network name of the caller in the array specified by the *name* parameter.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
getnetname ( name)
char name [MAXNETNAMELEN];
```

### Description

The **getnetname** subroutine installs the caller's unique, operating-system-independent network name in the fixed-length array specified by the *name* parameter.

### Parameters

*name* Specifies the network name (or netname) of the server process owner. The *name* parameter can be either the host name derived from the **host2netname** subroutine or the user name derived from the **user2netname** subroutine.

### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **host2netname** subroutine, **user2netname** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## getnetname Subroutine Exported from the libnsl Library

### Purpose

Generates the operating-system-independent network name of the caller.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
getnetname ( name)
char *name;
```

### Description

The **getnetname** subroutine, which belongs to the secure RPC category, is used in applications that use the **AUTH\_DES** authentication flavor. This subroutine generates the network name (or netname) of the caller. If the caller has root authority, the net name of the host machine is generated.

### Parameters

*name*                Represents the network name of the caller.

### Return Values

1	successful
0	unsuccessful

### Examples

```
#include <rpc/rpc.h>
int main()
{
    char name[255]; /* contains netname of owner of server process */
    char rhost[255]; /* Remote host name on which server resides */
    rpcprog_t  PROGNUM = 0x3fffffffL;
    rpcvers_t  PROGVER = 0x1L;

    if(!getnetname(name))
    {
        fprintf(stderr,"getnetname() error\n");
        exit(1);
    }

    /* Create a client handle for remote host rhost for PROGNUM & PROGVER on tcp transport */
    clnt = clnt_create(rhost, PROGNUM, PROGVER, "tcp");
    if (clnt == (CLIENT *) NULL) {
        fprintf(stderr,"client_create() error\n");
        exit(1);
    }

    clnt->cl_auth = authdes_seccreate(name, 80, rhost, (des_block *)NULL);

    /*
     * Make a call to clnt_call() subroutine
    */
}
```

```

*/

/* Destroy the authentication handle */
auth_destroy(clnt->cl_auth);

/* Destroy the client handle in the end */
clnt_destroy(clnt);

return 0;
}

```

## Related Information

The “host2netname Subroutine” and “user2netname Subroutine” on page 472.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## host2netname Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libns1** libraries.

### host2netname Subroutine Exported from the libc Library

#### Purpose

Converts a domain-specific host name to an operating-system-independent network name.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
host2netname ( name, host, domain)
```

```
char *name;
```

```
char *host;
```

```
char *domain;
```

#### Description

The **host2netname** subroutine converts a domain-specific host name to an operating-system-independent network name.

This subroutine is the inverse of the **netname2host** subroutine.

#### Parameters

*name* Points to the network name (or netname) of the server process owner. The *name* parameter can be either the host name derived from the **host2netname** subroutine or the user name derived from the **user2netname** subroutine.

*host* Points to the name of the machine on which the permissions were created.

*domain* Points to the domain name.

#### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

#### Related Information

The **netname2host** subroutine, **user2netname** subroutine.

## host2netname Subroutine Exported from the libnsl Library

### Purpose

Converts a domain-specific host name to an operating-system-independent network name.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int host2netname( name, host, domain)
char *name;
const char *host;
const char *domain;
```

### Description

The **host2netname** subroutine, which belongs to the secure remote procedure call (RPC) category, is used in applications that use the **AUTH\_DES** authentication flavor. This subroutine is generally used on the client side to generate network name (or netname) of the host on which the server program resides and to which the client needs to contact using **AUTH\_DES** authentication flavor.

**Note:** When the *domain* parameter is set to a null value, the **host2netname** subroutine uses the default domain name of the machine. When the *host* parameter is set to a null value, the subroutine is the inverse of the **netname2host** subroutine.

### Parameters

<i>name</i>	Represents the network name of the host after successful completion.
<i>host</i>	Specifies the domain-specific host name.
<i>domain</i>	Specifies the domain name of the host.

### Return Values

1	successful
0	unsuccessful

### Examples

```
#include <rpc/rpc.h>
int main()
{
    char name[255]; /* contains netname of owner of server process */
    char host[255]; /* Remote host name on which server resides */
    char domain[255];
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;

    /* obtain the domainname of the host */
    if (getdomainname(domain, 255)) {
        fprintf(stderr, "\ngetdomainname() failed\n");
        exit(2);
    }

    /* Obtain network name of remote host */
    if (!host2netname(name, host, domain))
    {
        fprintf(stderr, "\nhost2netname() failed\n");
    }
}
```

```

    exit(EXIT_FAILURE);
}

/* Create a client handle for remote host rhost for PROGNUM & PROGVER on tcp transport */
clnt = clnt_create(host, PROGNUM, PROGVER, "tcp");
if (clnt == (CLIENT *) NULL) {
    fprintf(stderr, "client_create() error\n");
    exit(1);
}

clnt->cl_auth = authdes_seccreate(name, 80, host, (des_block *)NULL);

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy the authentication handle */
auth_destroy(clnt->cl_auth);

/* Destroy the client handle in the end */
clnt_destroy(clnt);

return 0;
}

```

## Related Information

The “authdes\_getucred Subroutine” on page 277, “authdes\_seccreate Subroutine” on page 280, “netname2host Subroutine” on page 355, and “user2netname Subroutine” on page 472.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## key\_decryptsession Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### key\_decryptsession Subroutine Exported from the libc Library

#### Purpose

Decrypts a server network name and a Data Encryption Standard (DES) key.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
key_decryptsession ( remotename, deskey)
char *remotename;
des_block *deskey;
```

#### Description

The **key\_decryptsession** subroutine interfaces to the **keyserv** daemon, which is associated with the secure authentication system known as DES. The subroutine takes a server network name and a DES key and decrypts the DES key by using the public key of the server and the secret key associated with the effective user number (UID) of the calling process. User programs rarely need to call this subroutine. System commands such as **keylogin** and the Remote Procedure Call (RPC) library are the main clients.

This subroutine is the inverse of the **key\_encryptsession** subroutine.



## Parameters

*remotename* Points to the remote host name.  
*deskey* Points to the **des\_block** structure.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns a value of -1.

## Related Information

The **key\_encryptsession** subroutine.

The **keylogin** command.

The **keyserv** daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## key\_decryptsession Subroutine Exported from the libnsl Library

### Purpose

Decrypts the Data Encryption Standard (DES) key.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int key_decryptsession ( remotename, deskey)
const char *remotename;
des_block *deskey;
```

### Description

The **key\_decryptsession** subroutine, which belongs to the secure remote procedure call (RPC) category, is an interface subroutine to the **keyserver** daemon. The subroutine takes a server network name and a DES key and decrypts the DES key by using the public key of the server and the secret key associated with the effective user number (UID) of the calling process. User programs rarely need to call this subroutine.

**Note:** This subroutine is the inverse of the **key\_encryptsession** subroutine. You must run the **keyserv** daemon to enable this subroutine.

## Parameters

*remotename* Specifies the remote host name.  
*deskey* Specifies the DES key.

## Return Values

0 successful  
-1 unsuccessful

## Examples

```
#include <rpc/rpc.h>
int main()
{
```

```

des_block dblock;
char name[MAXNETNAMELEN + 1]; /* contains netname of owner of server process */
char rhost[255]; /* The Remote host */

/* Obtain network name of remote host */
if (!host2netname(name, rhost, NULL))
{
    fprintf(stderr, "\nhost2netname() failed\n");
    exit(1);
}

if (key_decryptsession(name, &dblock)!=0) {
    fprintf(stderr, "\nkey_decryptsession() failed\n");
    exit(1);
}
return 0;
}

```

## Related Information

The “key\_gendes Subroutine” on page 350, “key\_encryptsession Subroutine,” “key\_secretkey\_is\_set Subroutine” on page 352, and “key\_setsecret Subroutine” on page 353.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## key\_encryptsession Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsI** libraries.

### key\_encryptsession Subroutine Exported from the libc Library

#### Purpose

Encrypts a server network name and a Data Encryption Standard (DES) key.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
key_encryptsession ( remotename, deskey)
char *remotename;
des_block *deskey;
```

#### Description

The **key\_encryptsession** subroutine interfaces to the **keyserv** daemon, which is associated with the secure authentication system known as DES. This subroutine encrypts a server network name and a DES key. To do so, the routine uses the public key of the server and the secret key associated with the effective user number (UID) of the calling process. System commands such as **keylogin** and the Remote Procedure Call (RPC) library are the main clients. User programs rarely need to call this subroutine.

This subroutine is the inverse of the **key\_decryptsession** subroutine.

#### Parameters

<i>remotename</i>	Points to the remote host name.
<i>deskey</i>	Points to the <b>des_block</b> structure.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns a value of -1.

## Related Information

The **key\_decryptsession** subroutine.

The **keylogin** command.

The **keyserv** daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## key\_encryptsession Subroutine Exported from the libnsl Library

### Purpose

Encrypts the Data Encryption Standard (DES) key.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int key_encryptsession ( remotename, deskey)
char *remotename;
des_block *deskey;
```

### Description

The **key\_encryptsession** subroutine, which belongs to the secure remote procedure call (RPC) category, is an interface subroutine to the **keyserver** daemon. The subroutine takes a server network name and a DES key and encrypts the key by using the public key of the server and the secret key associated with the effective UID of the calling process. However, user programs rarely need to call this subroutine.

**Note:** This subroutine is the inverse of the **key\_decryptsession** subroutine. You must run the **keyserv** daemon to enable this subroutine.

### Parameters

<i>remotename</i>	Specifies the remote host name.
<i>deskey</i>	Specifies the DES key.

### Return Values

0	successful
-1	unsuccessful

### Examples

```
#include <rpc/rpc.h>

int main()
{
    des_block dblock;
    char name[255]; /* contains netname of owner of server process */
    char rhost[255]; /* The Remote host */

    /* Obtain network name of remote host */
    if (!host2netname(name, rhost, NULL))
```

```

{
    fprintf(stderr, "\nhost2netname() failed\n");
    exit(1);
}

strcpy(dblock.c, "deskey");
if (key_encryptsession(name, &dblock) != 0) {
    fprintf(stderr, "\nkey_encryptsession() failed\n");
    exit(1);
}

return 0;
}

```

## Related Information

The “key\_gendes Subroutine,” “key\_decryptsession Subroutine” on page 346, “key\_secretkey\_is\_set Subroutine” on page 352, and “key\_setsecret Subroutine” on page 353.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## key\_gendes Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libns1** libraries.

## key\_gendes Subroutine Exported from the libc Library

### Purpose

Asks the **keyserv** daemon for a secure conversation key.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
key_gendes ( deskey)
des_block *deskey;
```

### Description

The **key\_gendes** subroutine interfaces to the **keyserv** daemon, which is associated with the secure authentication system known as Data Encryption Standard (DES). This subroutine asks the **keyserv** daemon for a secure conversation key. Choosing a key at random is not recommended because the common ways of choosing random numbers, such as the current time, are easy to guess. User programs rarely need to call this subroutine. System commands such as **keylogin** and the Remote Procedure Call (RPC) library are the main clients.

### Parameters

*deskey*      Points to the **des\_block** structure.

### Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns a value of -1.

## Related Information

The **keylogin** command.

The **keyserv** daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## key\_gendes Subroutine Exported from the libnsl Library

### Purpose

Gets a secure conversation key from the **keyserver** daemon.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int key_gendes ( deskey)
des_block *deskey;
```

### Description

The **key\_gendes** subroutine, which belongs to the secure remote procedure call (RPC) category, is an interface subroutine to the **keyserver** daemon. The conversation key that is used to encrypt the timestamp is usually chosen at random. However, choosing a key at random is not suggested because the common ways of choosing random key, such as the current time, are not secure. Therefore, the **key\_gendes** subroutine asks the **keyserver** daemon for a secure conversation key.

**Note:** The **keyserv** daemon must be running for this subroutine to work.

### Parameters

*deskey*        Specifies the secure conversation key after successful completion.

### Return Values

0	successful
-1	unsuccessful

### Examples

```
#include <rpc/rpc.h>
int main()
{
    char    name[255]; /* contains netname of owner of server process */
    char    rhost[255]; /* Remote host name on which server resides */
    rpcprog_t  PROGNUM = 0x3fffffffL;
    rpcvers_t  PROGVER = 0x1L;
    CLIENT *clnt;
    des_block  dblock;

    /* Obtain network name of remote host */
    if (!host2netname(name, rhost, NULL))
    {
        fprintf(stderr, "\nhost2netname() failed\n");
        exit(EXIT_FAILURE);
    }

    if (key_gendes(&dblock) == -1) {
```

```

    fprintf(stderr, "\nkey_gendes() failed\n");
    exit(EXIT_FAILURE);
}

/* Create a client handle for remote host rhost
 *for PROGNUM & PROGVER on tcp transport
 */
clnt = clnt_create(rhost, PROGNUM, PROGVER, "tcp");
if (clnt == (CLIENT *) NULL) {
    fprintf(stderr, "client_create() error\n");
    exit(1);
}

clnt->cl_auth = authdes_seccreate(name, 80, rhost, &dblock);

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy the authentication handle */
auth_destroy(clnt->cl_auth);

/* Destroy the client handle in the end */
clnt_destroy(clnt);

return 0;
}

```

## Related Information

The “key\_encryptsession Subroutine” on page 348, “key\_decryptsession Subroutine” on page 346, “key\_secretkey\_is\_set Subroutine,” and “key\_setsecret Subroutine” on page 353.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## key\_secretkey\_is\_set Subroutine

### Purpose

Determines whether a key is set for the effective UID of the calling process.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
int key_secretkey_is_set (void)

```

### Description

The **key\_secretkey\_is\_set** subroutine belongs to the secure remote procedure call (RPC) category. The subroutine is an interface subroutine to the **keyserver** daemon. The **keylogin** command fetches the key for the effective UID of the calling process and stores the key in the **keyserv** daemon. This subroutine is thus used to determine whether the **keyserv** daemon contains the key for the effective UID of the calling process.

### Return Values

1 The key is stored in the **keyserver** daemon.

## Examples

```
#include <rpc/rpc.h>
int main()
{
    if (key_secretkey_is_set() != 1) {
        fprintf(stderr, "key_secretkey_is_set() failed");
        exit(1);
    }

    return 0;
}
```

## Related Information

The **keylogin** command.

The **keyserv** daemon.

The “key\_encryptsession Subroutine” on page 348, “key\_decryptsession Subroutine” on page 346, and “key\_setsecret Subroutine.”

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## key\_setsecret Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### key\_setsecret Subroutine Exported from the libc Library

#### Purpose

Sets the key for the effective user number (UID) of the calling process.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
key_setsecret ( key)
char *key;
```

#### Description

The **key\_setsecret** subroutine interfaces to the **keyserv** daemon, which is associated with the secure authentication system known as Data Encryption Standard (DES). This subroutine is used to set the key for the effective UID of the calling process. User programs rarely need to call this subroutine. System commands such as **keylogin** and the Remote Procedure Call (RPC) library are the main clients.

#### Parameters

*key* Points to the key name.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns a value of -1.

## Related Information

The **keylogin** command.

The **keyserv** daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## key\_setsecret Subroutine Exported from the libnsl Library

### Purpose

Sets the key for the effective user number (UID) of the calling process.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int key_setsecret ( key)
const char *key;
```

### Description

The **key\_setsecret** subroutine, which belongs to the secure RPC category, is an interface routine to the **keyserver** daemon. User programs rarely need to call this subroutine.

**Note:** You must run the **keyserv** daemon to enable the subroutine.

### Parameters

*key*                Specifies the key to be set for an effective user ID of the calling process.

### Return Values

0	successful
-1	unsuccessful

### Examples

```
#include <rpc/rpc.h>
int main()
{
    char key[255] = "deskey"; /* contains the key to be set */

    if (key_setsecret(key) != 0) {
        fprintf(stderr, "\nkey_setsecret() failed\n");
        exit(1);
    }
    return 0;
}
```

### Related Information

The “**key\_encryptsession Subroutine**” on page 348, “**key\_decryptsession Subroutine**” on page 346, “**key\_secretkey\_is\_set Subroutine**” on page 352.



## netname2host Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### netname2host Subroutine Exported from the libc Library

#### Purpose

Converts an operating-system-independent network name to a domain-specific host name.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
netname2host ( name, host, hostlen)
char *name;
char *host;
int hostlen;
```

#### Description

The **netname2host** subroutine converts an operating-system-independent network name to a domain-specific host name.

This subroutine is the inverse of the **host2netname** subroutine.

#### Parameters

<i>name</i>	Specifies the network name (or netname) of the server process owner. The <i>name</i> parameter can be either the host name derived from the <b>host2netname</b> subroutine or the user name derived from the <b>user2netname</b> subroutine.
<i>host</i>	Points to the name of the machine on which the permissions were created.
<i>hostlen</i>	Specifies the size of the host name.

#### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

#### Related Information

The **host2netname** subroutine, **user2netname** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### netname2host Subroutine Exported from the libnsl Library

#### Purpose

Converts an operating-system-independent network name to a domain-specific host name.

#### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
int netname2host( name, host, hostlen)
const char *name;
const char *host;
const int hostlen;
```

## Description

The **netname2host** subroutine, which belongs to the secure remote procedure call (RPC) category, is used in applications that use the **AUTH\_DES** authentication flavor. This subroutine is usually used on server side to convert the network name of a host to the domain-specific host name.

This subroutine is the inverse of the **host2netname** subroutine.

## Parameters

<i>name</i>	Specifies the network name of the host.
<i>host</i>	Represents the domain-specific host name after successful completion.
<i>hostlen</i>	Specifies the maximum length of the host name.

## Return Values

1	successful
0	unsuccessful

## Examples

```
#include <rpc/rpc.h>
static void dispatch(struct svc_req *, SVCXPRT *);

main()
{
    rpcprog_t RPROGNUM = 0x3fffffffL;
    rpcvers_t RPROGVER = 0x1L;

    /* Create service handle for RPROGNUM, RPROGVER and tcp transport */
    if(!svc_create( dispatch, RPROGNUM, RPROGVER, "tcp")) {
        fprintf(stderr, "\nsvc_create() failed\n");
        exit(EXIT_FAILURE);
    }

    svc_run();
}

/* The server dispatch function */
static void dispatch(struct svc_req *rqstp, SVCXPRT *transp)
{
    char        hostp[300];
    struct authdes_cred *des_cred;

    switch (rqstp->rq_cred.oa_flavor) {

    case AUTH_DES :
        /* AUTH_DES Authentication flavor */
        des_cred = (struct authdes_cred *) rqstp->rq_clntcred;
        if (!netname2host(des_cred->adc_fullname.name, hostp, 300)) {
            svcerr_systemerr(transp);
            return;
        }
        fprintf(stdout, "The domain-specific host name is %s", hostp);
        break;

    default :
```

```

/* Other Authentication flavor */
break;
}

/* The Dispatch Routine code continues .. */
}

```

## Related Information

The “authdes\_getucrd Subroutine” on page 277, “authdes\_seccreate Subroutine” on page 280, “host2netname Subroutine” on page 344, and “user2netname Subroutine” on page 472.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## netname2user Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### netname2user Subroutine Exported from the libc Library

#### Purpose

Converts from an operating-system-independent network name to a domain-specific user number (UID).

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
netname2user (name, uidp, gidp, gidlenp, gidlist)
```

```
char * name;
int * uidp;
int * gidp;
int * gidlenp;
int * gidlist;
```

#### Description

The **netname2user** subroutine converts from an operating-system-independent network name to a domain-specific UID. This subroutine is the inverse of the **user2netname** subroutine.

#### Parameters

<i>name</i>	Points to the network name (or netname) of the server process owner. The <i>name</i> parameter can be either the host name derived from the <b>host2netname</b> subroutine or the user name derived from the <b>user2netname</b> subroutine.
<i>uidp</i>	Points to the user ID.
<i>gidp</i>	Points to the group ID.
<i>gidlenp</i>	Points to the size of the group ID.
<i>gidlist</i>	Points to the group list.

#### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

#### Related Information

The **host2netname** subroutine, **user2netname** subroutine.

## netname2user Subroutine Exported from the libnsl Library

### Purpose

Converts from an operating-system-independent network name to a domain-specific user number (UID).

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>

int netname2user(name, uidp, gidp, gidlenp, gidlist)
const char *name;
uid_t *uidp;
gid_t *gidp;
int gidlenp;
gid_t gidlist[NGRPS];
```

### Description

The **netname2user** subroutine, which belongs to the secure remote procedure call (RPC) category, is used in applications that use **AUTH\_DES** authentication flavor. This subroutine is usually used on the server side to convert the network name of a user to the domain-specific user-ID.

**Note:** This subroutine is the inverse of the **user2netname** subroutine.

### Parameters

<i>name</i>	Specifies the network name of the host.
<i>uidp</i>	Specifies the effective user ID (UID) of the caller.
<i>gidp</i>	Specifies the effective group ID (GID) of the caller.
<i>gidlenp</i>	Specifies the length of array of groups to which the user belongs.
<i>gidlist</i>	Points to the group array.

### Return Values

1	successful
0	unsuccessful

### Examples

```
#include <rpc/rpc.h>
static void dispatch(struct svc_req *, SVCXPRT *);

main()
{
    rpcprog_t RPROGNUM = 0x3fffffffL;
    rpcvers_t RPROGVER = 0x1L;

    /* Create service handle for RPROGNUM, RPROGVER and tcp transport */
    if(!svc_create( dispatch, RPROGNUM, RPROGVER, "tcp")) {
        fprintf(stderr, "\nsvc_create() failed\n");
        exit(EXIT_FAILURE);
    }
    svc_run();
}

/* The server dispatch function */
static void dispatch(struct svc_req *rqstp, SVCXPRT *transp)
```

```

{
  struct authdes_cred *des_cred;
  uid_t uid;
  gid_t gid;
  int gidlen;
  gid_t gidlist[10];

  switch (rqstp->rq_cred.oa_flavor) {

    case AUTH_DES :
      /* AUTH_DES Authentication flavor */
      des_cred = (struct authdes_cred *) rqstp->rq_clntcred;
      if (!netname2user(des_cred->adc_fullname.name, &uid, &gid, &gidlist, gidlist))
      {
        svcerr_systemerr(transp);
        return;
      }
      break;
    default :
      /* Other Authentication flavor */
      break;
  }
  /* The Dispatch Routine code continues .. */
}

```

## Related Information

The “authdes\_getucred Subroutine” on page 277, “authdes\_seccreate Subroutine” on page 280, “host2netname Subroutine” on page 344, and “user2netname Subroutine” on page 472.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## pmap\_getmaps Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### pmap\_getmaps Subroutine Exported from the libc Library

#### Purpose

Returns a list of the current Remote Procedure Call (RPC) program-to-port mappings on the host.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
struct pmaplist *pmap_getmaps ( addr)
struct sockaddr_in *addr;
```

#### Description

The **pmap\_getmaps** subroutine acts as a user interface to the **portmap** daemon. The subroutine returns a list of the current RPC program-to-port mappings on the host located at the Internet Protocol (IP) address pointed to by the *addr* parameter.

**Note:** The **rpcinfo -p** command calls this subroutine.

## Parameters

*addr* Specifies the address where the machine's IP address is placed.

## Return Values

If there is no list of current RPC programs, this procedure returns a value of null.

## Related Information

The **pmap\_set** subroutine, **pmap\_unset** subroutine, **svc\_register** subroutine.

The **rpcinfo** command.

The **portmap** daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## pmap\_getmaps Subroutine Exported from the libnsl Library

### Purpose

Returns a list of the current Remote Procedure Call (RPC) program-to-port mappings on the host.

### Library

C Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
struct pmaplist *pmap_getmaps(addr)
struct sockaddr_in *addr;
```

### Description

The **pmap\_getmaps** subroutine acts as a user interface to the **portmap** daemon. The subroutine returns a list of the current RPC program-to-port mappings on the host located at the Internet Protocol (IP) address pointed to by the *addr* parameter.

**Note:** The **rpcinfo -p** command calls this subroutine.

## Parameters

*addr* Specifies the address where the machine's IP address is placed.

## Return Values

a pointer to the first element of the list	successful
a null value	unsuccessful

## Examples

In the following example, the **pmap\_getmaps** subroutine obtains a list of the current RPC program-to-port mappings on the host.

```
#include <rpc/rpc.h>
#include <stdio.h>

int main()
{
    rpcprog_t PROGNUM = 0x3fffffffL ;
```

```

rpcvers_t PROGVER = 0x1L ;
struct hostent *hp;
struct sockaddr_in addr;
struct pmaplist *plist = NULL;

/* Obtain the host information */
hp = (struct hostent *) gethostbyname(hostname);
if (hp == NULL) {
    printf("host information not found\n");
    exit(2);
}

addr.sin_family = hp->h_addrtype;
memcpy(&addr.sin_addr.s_addr, hp->h_addr_list[0], hp->h_length);

plist = (struct pmaplist *) pmap_getmaps(&addr);
if(plist==NULL)
{
    fprintf(stderr,"pmap_getmaps() failed");
    exit(1);
}

return 0;
}

```

## Related Information

The “pmap\_set Subroutine” on page 366, “pmap\_unset Subroutine” on page 368, “rpcb\_getmaps Subroutine” on page 403, and “pmap\_getport Subroutine.”

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## pmap\_getport Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libns1** libraries.

### pmap\_getport Subroutine Exported from the libc Library

#### Purpose

Requests the port number on which a service waits.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
u_short pmap_getport (addr, prognum, versnum, protocol)
struct sockaddr_in * addr;
u_long prognum, versnum, protocol;
```

#### Description

The **pmap\_getport** subroutine acts as a user interface to the **portmap** daemon in order to return the port number on which a service waits.

#### Parameters

<i>addr</i>	Points to the Internet Protocol (IP) address of the host where the remote program supporting the waiting service resides.
<i>prognum</i>	Specifies the program number of the remote program.

*versnum* Specifies the version number of the remote program.  
*protocol* Specifies the transport protocol the service recognizes.

## Return Values

Upon successful completion, the **pmap\_getport** subroutine returns the port number of the requested program; otherwise, if the mapping does not exist or the Remote Procedure Call (RPC) system could not contact the remote **portmap** daemon, this subroutine returns a value of 0. If the remote **portmap** daemon could not be contacted, the **rpc\_createerr** subroutine contains the RPC status.

## Related Information

The **portmap** daemon.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## pmap\_getport Subroutine Exported from the libnsl Library

### Purpose

Requests the port number on which a service waits.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
u_short pmap_getport (addr, prognum, versnum, protocol)
struct sockaddr_in * addr;
rpcprog_t prognum;
rpcvers_t versnum;
rpcprot_t protocol;
```

### Description

The **pmap\_getport** subroutine acts as a user interface to the **portmap** daemon in order to return the port number on which a service waits.

### Parameters

*addr* Points to the Internet Protocol (IP) address of the host where the remote program supporting the waiting service resides.  
*prognum* Specifies the program number of the remote program.  
*versnum* Specifies the version number of the remote program.  
*protocol* Specifies the transport protocol the service recognizes, which can be IPPROTO\_TCP or IPPROTO\_UDP.

## Return Values

Upon successful completion, the **pmap\_getport** subroutine returns the port number of the requested program; otherwise, if the mapping does not exist or the Remote Procedure Call (RPC) system could not contact the remote **portmap** daemon, this subroutine returns a value of 0. If the remote **portmap** daemon could not be contacted, the **rpc\_createerr** subroutine contains the RPC status.

## Examples

```
#include <rpc/rpc.h>
int main()
{
```



```

struct sockaddr_in addr;
u_short port = 0;
rpcprog_t PROGNUM = 0x3fffffff0L;
rpcvers_t PROGVER = 0x1L;
struct hostent *hp;
char hostname[255]; /* Remote host name */

/* Get the information of host */
hp = (struct hostent *) gethostbyname(hostname);
if (hp == NULL) {
    printf("host information for %s not found\n", hostname);
    exit(1);
}
/* Retrieve the address of host */
addr.sin_family = hp->h_addrtype;
memcpy(&addr.sin_addr.s_addr, hp->h_addr_list[0], hp->h_length);

port = pmap_getport(&addr, PROGNUM, PROGVER, IPPROTO_TCP);
if(port==0)
{
    printf("pmap_getport() failed");
    exit(1);
}

return 0;
}

```

## Related Information

The “pmap\_getmaps Subroutine” on page 359, “pmap\_set Subroutine” on page 366, “pmap\_unset Subroutine” on page 368, and “pmap\_rmtcall Subroutine.”

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## pmap\_rmtcall Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### pmap\_rmtcall Subroutine Exported from the libc Library

#### Purpose

Instructs the **portmap** daemon to make a remote procedure call.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```

enum clnt_stat pmap_rmtcall (addr, prognum, versnum, procnum)\
enum clnt_stat pmap_rmtcall (inproc, in, outproc, out, tout, portp)
struct sockaddr_in * addr;
u_long prognum, versnum, procnum;
xdrproc_t inproc;
char * in;
xdrproc_t outproc;
char * out;
struct timeval tout;
u_long * portp;

```

## Description

The **pmap\_rmtcall** subroutine is a user interface to the **portmap** daemon. The routine instructs the host **portmap** daemon to make a remote procedure call (RPC). Clients consult the **portmap** daemon when sending out RPC calls for given program numbers. The **portmap** daemon tells the client the ports to which to send the calls.

## Parameters

<i>addr</i>	Points to the Internet Protocol (IP) address of the host where the remote program that supports the waiting service resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Identifies the procedure to be called.
<i>inproc</i>	Specifies the eXternal Data Representation (XDR) routine that encodes the remote procedure parameters.
<i>in</i>	Points to the address of the procedure arguments.
<i>outproc</i>	Specifies the XDR routine that decodes the remote procedure results.
<i>out</i>	Points to the address where the results are placed.
<i>tout</i>	Sets the time the routine waits for the results to return before sending the call again.
<i>portp</i>	Points to the program port number if the procedure succeeds.

## Related Information

The **clnt\_broadcast** subroutine.

The **portmap** daemon.

Internet Protocol in *Networks and communication management*.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## pmap\_rmtcall Subroutine Exported from the libnsl Library

### Purpose

Instructs the **portmap** daemon to make a remote procedure call.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
enum clnt_stat pmap_rmtcall(addr, prognum, versnum, procnum, in, inproc, out, outproc, tout, portp)
struct sockaddr_in *addr;
rpcprog_t prognum;
rpcvers_t versnum;
rpcproc_t procnum;
caddr_t in;
xdrproc_t inproc;
caddr_t out;
xdrproc_t outproc;
struct timeval tout;
rpcport_t *portp;
```

## Description

The **pmap\_rmtcall** subroutine is a user interface to the **portmap** daemon. The subroutine instructs the host **portmap** daemon to make a remote procedure call (RPC) to a procedure on that host on behalf of

the caller. Clients consult the **portmap** daemon when sending out RPC calls for the specified program and version numbers. The **portmap** daemon tells the client the port number to which to send the calls.

Use the **rpcb\_rmtcall** subroutine instead of the **pmap\_rmtcall** subroutine. The **pmap\_rmtcall** subroutine is compatible only with earlier versions of AIX®.

## Parameters

<i>addr</i>	Points to the Internet Protocol (IP) address of the host where the remote program that supports the waiting service resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Identifies the procedure to be called.
<i>inproc</i>	Specifies the eXternal Data Representation (XDR) routine that encodes the remote procedure parameters.
<i>in</i>	Points to the address of the procedure arguments.
<i>outproc</i>	Specifies the XDR routine that decodes the remote procedure results.
<i>out</i>	Points to the address where the results are placed.
<i>tout</i>	Sets the time the routine waits for the results to return before sending the call again.
<i>portp</i>	Specifies the program port number. You can set the parameter value to 0.

## Error Codes

The subroutine fails when the following error code is true.

### RPC\_TIMEDOUT

- The timeout value is too small.
- The specified program number is not registered at the server side.
- The specified version number is not registered at the server side.
- The specified procedure number is not registered at the server side.
- The server supports only the TCP transport.

## Examples

```
#include <rpc/rpc.h>

int main()
{
    rpcprog_t      PROGNUM=0x3fffffffL;
    rpcvers_t      PROGVER=0x1L;
    rpcproc_t      PROCNUM=0x1L;
    struct sockaddr_in addr;
    int in, out;
    struct timeval  timeout = {25, 0};
    rpcport_t      portp=0;
    enum clnt_stat  cs;

    /*
     * Get the IP address of remote host, on which the procedure to be, called is located.
     * Store the value in addr.
     */

    /* Make a call to pmap_rmtcall() subroutine */
    cs = pmap_rmtcall( &addr, PROGNUM, PROGVER, PROCNUM, &in,
        xdr_int, &out, xdr_int, timeout, portp);

    if(cs!=RPC_SUCCESS)
    {
        fprintf(stderr,"pmap_rmtcall failed");
        exit(1);
    }
}
```

```

}
return 0;
}

```

## Related Information

The “`rpcb_rmtcall` Subroutine” on page 406, “`pmap_getmaps` Subroutine” on page 359, “`pmap_getport` Subroutine” on page 361, “`pmap_set` Subroutine,” and “`pmap_unset` Subroutine” on page 368.

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---

## pmap\_set Subroutine

**Important:** The subroutine is exported from both the `libc` and the `libnsi` libraries.

### pmap\_set Subroutine Exported from the libc Library

#### Purpose

Maps a remote procedure call to a port.

#### Library

C Library (`libc.a`)

#### Syntax

```
#include <rpc/rpc.h>
```

```

pmap_set (prognum, versnum, protocol, port)
u_long prognum, versnum, protocol;
u_short port;

```

#### Description

The `pmap_set` subroutine acts as a user interface to the `portmap` daemon to map the program number, version number, and protocol of a remote procedure call to a port on the machine `portmap` daemon.

**Note:** The `pmap_set` subroutine is called by the `svc_register` subroutine.

#### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>protocol</i>	Specifies the transport protocol that the service recognizes. The values for this parameter can be <code>IPPROTO_UDP</code> or <code>IPPROTO_TCP</code> .
<i>port</i>	Specifies the port on the machine's <code>portmap</code> daemon.

#### Return Values

Upon successful completion, this routine returns a value of 1. If unsuccessful, it returns a value of 0.

#### Related Information

The `portmap` daemon.

The `pmap_getmaps` subroutine, `pmap_unset` subroutine, `svc_register` subroutine.

TCP/IP protocols in *Networks and communication management*.

## **pmap\_set** Subroutine Exported from the **libnsl** Library

### **Purpose**

Creates a mapping of the triplet (the program, version, and protocol) to a port.

### **Library**

Network Services Library (**libnsl.a**)

### **Syntax**

```
#include <rpc/rpc.h>
bool_t pmap_set (prognum, versnum, protocol, port)
rpcprog_t prognum;
rpcvers_t versnum;
rpcprot_t protocol;
u_short port;
```

### **Description**

The **pmap\_set** subroutine acts as a user interface to the **portmap** daemon to map the program number, version number, and protocol of a remote procedure call to a port on the machine **portmap** daemon. The **pmap\_set** subroutine is called by the **svc\_register** subroutine.

**Note:** The subroutine only fails if the port is bound.

### **Parameters**

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>protocol</i>	Specifies the transport protocol that the service recognizes. The values for this parameter can be <b>IPPROTO_UDP</b> or <b>IPPROTO_TCP</b> .
<i>port</i>	Specifies the port on the <b>portmap</b> daemon of the machine.

### **Return Values**

1	successful
0	unsuccessful

### **Examples**

```
#include <rpc/rpc.h>
u_short get_free_port(void)
{
    /* Code to obtain a free port */
}

int main()
{
    u_short port = 0;
    rpcprog_t PROGNUM = 0x3fffffff0L;
    rpcvers_t PROGVER = 0x1L;

    /* Obtain a free port */
    port = get_free_port();

    /* Set the mapping between triplet [PROGNUM,PROGVER,PROTOCOL] and port */
    if (pmap_set(PROGNUM, PROGVER, IPPROTO_TCP, port) == 0)
    {
        printf("pmap_set() failed");
    }
}
```

```
    exit(1);
}

return 0;
}
```

## Related Information

The “`rpcb_set` Subroutine” on page 407, “`pmap_getmaps` Subroutine” on page 359, “`pmap_getport` Subroutine” on page 361, “`pmap_unset` Subroutine,” “`svc_register` Subroutine” on page 440, and “`pmap_rmtcall` Subroutine” on page 363.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## `pmap_unset` Subroutine

**Important:** The subroutine is exported from both the `libc` and the `libnsl` libraries.

### `pmap_unset` Subroutine Exported from the `libc` Library

#### Purpose

Destroys the mappings between a remote procedure call and the port.

#### Library

C Library (`libc.a`)

#### Syntax

```
#include <rpc/rpc.h>
```

```
pmap_unset ( prognum, versnum)
u_long prognum, versnum;
```

#### Description

The `pmap_unset` subroutine destroys mappings between the program number and version number of a remote procedure call and the ports on the host `portmap` daemon.

#### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.

## Related Information

The `pmap_getmaps` subroutine, `pmap_set` subroutine, `svc_unregister` subroutine.

The `portmap` daemon.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### `pmap_unset` Subroutine Exported from the `libnsl` Library

#### Purpose

Destroys the mappings between the triplet (the program, version, and protocol) and the port.

#### Library

Network Services Library (`libnsl.a`)

## Syntax

```
#include <rpc/rpc.h>
bool_t pmap_unset ( prognum, versnum)
rpcprog_t prognum;
rpcvers_t versnum;
```

## Description

The **pmap\_unset** subroutine destroys mappings between the triplet (the program number, version number, and protocol) and the port of a remote procedure call and the ports on the host **portmap** daemon. The mapping can be established by the **pmap\_set** subroutine.

## Parameters

*prognum*                    Specifies the program number of the remote program.  
*versnum*                    Specifies the version number of the remote program.

## Examples

```
#include <rpc/rpc.h>
u_short get_free_port(void)
{
    /* Code to obtain a free port */
}

int main()
{
    u_short port = 0;
    rpcprog_t PROGNUM = 0x3fffffff0L;
    rpcvers_t PROGVER = 0x1L;

    /* Obtain a free port */
    port = get_free_port();

    /* Set the mapping between triplet [PROGNUM,PROGVER,PROTOCOL] and port */
    if (pmap_set(PROGNUM, PROGVER, IPPROTO_TCP, port) == 0)
    {
        printf("pmap_set() failed");
        exit(1);
    }

    if(pmap_unset(PROGNUM, PROGVER)==0)
    {
        printf("pmap_unset() failed");
        exit(1);
    }

    return 0;
}
```

## Related Information

The “**rpcb\_unset Subroutine**” on page 409, “**pmap\_getmaps Subroutine**” on page 359, “**pmap\_getport Subroutine**” on page 361, “**pmap\_set Subroutine**” on page 366, “**svc\_register Subroutine**” on page 440, and “**pmap\_rmtcall Subroutine**” on page 363.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## registerrpc Subroutine

### Purpose

Registers a procedure with the Remote Procedure Call (RPC) service package.

## Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/rpc.h>
```

```
registerrpc (prognum, versnum, procnum, procname, inproc, outproc)  
u_long prognum, versnum, procnum;  
char * (* procname) ();  
xdrproc_t inproc, outproc;
```

## Description

The **registerrpc** subroutine registers a procedure with the RPC service package.

If a request arrives that matches the values of the *prognum* parameter, the *versnum* parameter, and the *procnum* parameter, then the *procname* parameter is called with a pointer to its parameters, after which it returns a pointer to its static results.

**Note:** Remote procedures registered in this form are accessed using the User Datagram Protocol/Internet Protocol (UDP/IP) transport protocol only.

## Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Identifies the procedure number to be called.
<i>procname</i>	Identifies the procedure name.
<i>inproc</i>	Specifies the eXternal Data Representation (XDR) subroutine that decodes the procedure parameters.
<i>outproc</i>	Specifies the XDR subroutine that encodes the procedure results.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of -1.

## Related Information

The **callrpc** subroutine, **svcudp\_create** subroutine.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rttime Subroutine

### Purpose

Gets remote time.

### Library

C Library (**libc.a**)



## Syntax

```
#include <rpc/rpc.h>
#include <sys/types.h>
#include <sys/time.h>
#include <netinet/in.h>
```

```
int rtime ( addrp, timep, timeout)
struct sockaddr_in *addrp;
struct timeval *timep;
struct timeval *timeout;
```

## Description

The **rtime** subroutine consults the Internet Time Server (TIME) at the address pointed to by the *addrp* parameter and returns the remote time in the **timeval** structure pointed to by the *timep* parameter. Normally, the User Datagram Protocol (UDP) protocol is used when consulting the time server. If the *timeout* parameter is specified as null, however, the routine instead uses Transmission Control Protocol (TCP) and blocks until a reply is received from the time server.

## Parameters

<i>addrp</i>	Points to the Internet Time Server.
<i>timep</i>	Points to the <b>timeval</b> structure.
<i>timeout</i>	Specifies how long the routine waits for a reply before terminating.

## Return Values

Upon successful completion, this subroutine returns a value of 0. If unsuccessful, it returns a value of -1, and the **errno** global variable is set to reflect the cause of the error.

## Related Information

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_broadcast Subroutine

### Purpose

Invokes the remote procedure associated with the specified program and version by broadcasting the call message through all connectionless transports of the specified class.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
enum cInt_stat rpc_broadcast(prognum, versnum, procnum, in_proc, input, out_proc,
output, result, nettype)
const rpcprog_t prognum;
const rpcvers_t versnum;
const rpcproc_t procnum;
const xdrproc_t in_proc;
caddr_t input;
```

```

const xdrproc_t out_proc;
caddr_t output;
const resultproc_t result;
const char *nettype ;

```

## Description

The **rpc\_broadcast** subroutine calls the remote procedure associated with the specified program and version. When calling the procedure, the subroutine broadcasts the call message through all connectionless transports of the specified class. You can specify an eXternal Data Representation (XDR) procedure that encodes the procedure parameters along with the address of the parameters. Similarly, you can specify an XDR procedure that decodes the procedure results along with the address where those results are to be placed. Every time the **rpc\_broadcast** subroutine receives a response, the subroutine calls the following subroutine:

```
bool_t result(caddr_t output, const struct netbuf *addr, const struct netconfig *nconf);
```

The *output* parameter of the subroutine is the same as that of the **rpc\_broadcast** subroutine. The *addr* parameter holds the address of the machine that sent the results. The *nconf* parameter specifies the transport that is used by the machine to respond. If the **result** subroutine returns a value of 0, the **rpc\_broadcast** subroutine waits for more replies. Otherwise, the subroutine returns with an appropriate status.

## Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	The remote procedure number.
<i>in_proc</i>	An XDR procedure for encoding the procedure parameters.
<i>input</i>	The address of the procedure arguments.
<i>out_proc</i>	An XDR procedure for decoding the procedure results.
<i>output</i>	The address where the results will be placed.
<i>result</i>	The subroutine that is invoked when the <b>rpc_broadcast</b> receives a response.
<i>nettype</i>	Defines a class of transports which can be used for a particular application.

## Return Values

0	successful
an appropriate status	unsuccessful

You can obtain the status using the **clnt\_perrno** subroutine.

## Error Codes

The **rpc\_broadcast** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"> <li>The value of the <i>nettype</i> parameter is not valid.</li> <li>The value of the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li> </ul>
<b>RPC_TIMEDOUT</b>	<ul style="list-style-type: none"> <li>The timeout value has expired.</li> <li>The specified version is not registered at the server.</li> <li>The remote procedure is not available.</li> </ul>
<b>RPC_PROGVERSMISMATCH</b>	The specified version is not registered at the server.
<b>RPC_FAILED</b>	An unspecified error occurred. The procedure specified by the <i>in_proc</i> or <i>out_proc</i> parameter might not be valid.
<b>RPC_CANTDECODEARGS</b>	The arguments or results are not valid.

## Examples

```
#include <rpc/rpc.h>

bool_t result(caddr_t out, const struct netbuf *addr, const struct netconfig *nconf)
{
    /* result() subroutine code */
}

int main()
{
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    rpcproc_t procedure_number = 0x1L;
    enum clnt_stat cs ;
    char *nettype = "visible";
    cs = rpc_broadcast(program_number, version_number, procedure_number,
                      (xdrproc_t)xdr_void, NULL, (xdrproc_t)xdr_void,
                      NULL, eachresult, nettype);
    if (cs != RPC_SUCCESS)
    {
        fprintf(stderr, "\n RPC Call failed\n");
        exit(1);
    }
    return 0;
}
```

## Related Information

The “rpc\_broadcast\_exp Subroutine.”

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_broadcast\_exp Subroutine

### Purpose

Invokes the remote procedure associated with specified program and version by broadcasting the call message through all connectionless transports of the specified class with initial wait time and the maximum wait-time constraints.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>

enum clnt_stat rpc_broadcast_exp(prognum, versnum, procnum, in_proc, input, out_proc, output, result,
i_time, w_time, nettype)
const rpcprog_t prognum;
const rpcvers_t versnum;
const rpcproc_t procnum;
const xdrproc_t in_proc;
caddr_t input;
const xdrproc_t out_proc;
caddr_t output;
```

```

const resultproc_t result;
const int itime;
const int wtime;
const char *nettype;

```

## Description

The **rpc\_broadcast\_exp** subroutine calls the remote procedure associated with the specified program and version. When calling the procedure, the subroutine broadcasts the call message through all connectionless transports of the specified class. You can specify an eXternal Data Representation (XDR) procedure that encodes the procedure parameters along with the address of the parameters. Similarly, you can specify an XDR procedure that decodes the procedure results along with the address where those results are to be placed. Every time the **rpc\_broadcast\_exp** subroutine receives a response, the subroutine calls the following subroutine:

```
bool_t result(caddr_t output, const struct netbuf *addr, const struct netconfig *nconf);
```

The *output* parameter of the subroutine is the same as that of the **rpc\_broadcast\_exp** subroutine. The *addr* parameter holds the address of the machine that sent the results. The *nconf* parameter specifies the transport used by the machine to respond. You can specify the initial time before the request is resent in milliseconds. Similarly, after the request is resent for the first time, the retransmission interval increases exponentially until it exceeds the maximum value that you can also specify in milliseconds. If the **result** subroutine returns a value of 0, the **rpc\_broadcast\_exp** subroutine waits for more replies. Otherwise, the subroutine returns with an appropriate status.

## Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	Specifies the remote procedure number.
<i>in_proc</i>	Specifies the XDR procedure for encoding the procedure parameters.
<i>input</i>	Specifies the address of the procedure arguments.
<i>out_proc</i>	Specifies the XDR procedure for decoding the procedure results.
<i>output</i>	Specifies the address where the results will be placed.
<i>result</i>	Specifies the subroutine that is invoked when the <b>rpc_broadcast_exp</b> receives a response.
<i>itime</i>	Specifies the initial timeout before the request is resent.
<i>wtime</i>	Specifies the maximum timeout.
<i>nettype</i>	Defines a class of transports which can be used for a particular application.

## Return Values

The **rpc\_broadcast\_exp** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"> <li>The value of the <i>nettype</i> parameter is not valid.</li> <li>The value of the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li> </ul>
<b>RPC_TIMEDOUT</b>	<ul style="list-style-type: none"> <li>The timeout value has expired.</li> <li>The specified version is not registered at the server.</li> <li>The remote procedure is not available.</li> </ul>
<b>RPC_PROGVERSMISMATCH</b>	The specified version is not registered at the server.
<b>RPC_FAILED</b>	An unspecified error occurred. The procedure specified by the <i>in_proc</i> or <i>out_proc</i> parameter might not be valid.
<b>RPC_CANTDECODEARGS</b>	The arguments or results are not valid.
<b>RPC_SYSTEMERROR</b>	All of the process memory is exhausted (heap).

## Examples

```
#include <rpc/rpc.h>

bool_t result(caddr_t output, const struct netbuf *addr, const struct netconfig *nconf)
{
    /* result() subroutine code */
}

int main()
{
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    rpcproc_t procedure_number = 0x1L;
    enum clnt_stat cs ;
    char *nettype = "visible";
    const int itime = 5 ;
    const int wtime = 25 ;
    cs = rpc_broadcast_exp( program_number, version_number, procedure_number,
                          (xdrproc_t)xdr_void, NULL, (xdrproc_t)xdr_void, NULL,
                          result, itime, wtime, nettype);
    if (cs != RPC_SUCCESS)
    {
        fprintf(stderr, "\n RPC Call failed\n");
        exit(1);
    }
    return 0;
}
```

## Related Information

The “rpc\_broadcast Subroutine” on page 371.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_call Subroutine

### Purpose

Calls the remote procedure associated with the specified program and version on a remote host.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>

enum clnt_stat rpc_call(host, prognum, versnum, procnum, in_proc, input, out_proc, output, nettype)
const char *host;
const rpcprog_t prognum;
const rpcvers_t versnum;
const rpcproc_t procnum;
const xdrproc_t in_proc;
const char *input;
const xdrproc_t out_proc;
char *output;
const char *nettype;
```

## Description

The **rpc\_call** subroutine calls the remote procedure associated with the specified program and version. The remote procedure that is specified by the *procnum* procedure resides on a remote host. You can specify an eXternal Data Representation (XDR) procedure that encodes the procedure parameters along with the addresses of the parameters. Similarly, you can specify an XDR procedure that decodes the procedure results and address where those results are to be placed. You can specify the transport class using the *nettype* parameter. The **rpc\_call** subroutine uses the first available transport. You cannot control timeout, and you cannot control authentication because the client handle is not created (as in client-creation subroutines).

## Parameters

<i>host</i>	Specifies the host name where the server resides.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>procnum</i>	The remote procedure number.
<i>in_proc</i>	The XDR procedure for encoding the procedure parameters.
<i>input</i>	The address of the procedure arguments.
<i>out_proc</i>	The XDR procedure for decoding the procedure results.
<i>output</i>	The address where the results are placed.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.

## Return Values

RPC_SUCCESS	successful
an appropriate status	unsuccessful

You can use the **clnt\_perrno** subroutine to get the status.

## Error Codes

The **rpc\_call** subroutine returns failure when one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	<ul style="list-style-type: none"><li>The value specified by the <i>nettype</i> parameter is not valid.</li><li>The value specified by the <i>nettype</i> parameter is set to <b>netpath</b>, and the NETPATH environment variable is set to a transport service that is not valid.</li></ul>
<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_PROCUNAVAIL</b>	The remote procedure is not available
<b>RPC_TIMEDOUT</b>	The timeout value has expired.
<b>RPC_PROGVERSMISMATCH</b>	The specified version is not registered at the server.
<b>RPC_FAILED</b>	An unspecified error occurred. The procedure specified by the <i>in_proc</i> or <i>out_proc</i> parameter might not be valid.
<b>RPC_CANTDECODEARGS</b>	The arguments or results are not valid.
<b>RPC_SYSTEMERROR</b>	All of the process memory is exhausted (heap).

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
int main()
{
    char hostname[255] ;
    /* The Remote host on which server is implemented */
    rpcprog_t program_number ;
```

```

rpcvers_t version_number ;
rpcproc_t procedure_number ;
enum clnt_stat cs ;
char *nettype = "visible";

cs = rpc_call(hostname, program_number, version_number, procedure_number,
              (xdrproc_t)xdr_void, NULL, (xdrproc_t)xdr_void, NULL, nettype);
if (cs != RPC_SUCCESS)
{
    fprintf(stderr, "\n RPC Call failed\n");
    exit(1);
}

return 0;
}

```

## Related Information

The “clnt\_call Macro” on page 289.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_control Subroutine

### Purpose

Changes or retrieves information of global remote procedure call (RPC) attributes for client and server applications.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
bool_t rpc_control(op, info);
int op;
void * info;

```

### Description

The subroutine sets and retrieves values of global RPC attributes that apply to clients and servers. The *op* parameter indicates the operation type and the *info* parameter is a pointer to the operation-specific information. The data type specified by the *info* parameter changes according to the operation type. For example, you can set the *op* parameter with the following values:

#### RPC\_SVC\_MTMODE\_SET

Sets the multithread mode.

#### RPC\_SVC\_MTMODE\_GET

Get the multithread mode.

For the *op* parameter in this example, the value of the *info* parameter is of the **int \*** type.

Values for the <i>op</i> Parameter	Argument Type	Function
RPC_SVC_MTMODE_SET	int *	Sets the multithread mode.
RPC_SVC_MTMODE_GET	int *	Gets the multithread mode.

Values for the <i>op</i> Parameter	Argument Type	Function
RPC_SVC_THRMAX_SET	int *	Sets the maximum number of threads.
RPC_SVC_THRMAX_GET	int *	Gets the maximum number of threads.
RPC_SVC_THRTOTAL_GET	int *	Gets the number of active threads.
RPC_SVC_THRCREATES_GET	int *	Gets the number of threads created.
RPC_SVC_THRERRORS_GET	int *	Gets the number of threads that create errors.
RPC_SVC_USE_POLLFD	int *	Sets the number of file descriptors to unlimited.

Three multithread (MT) modes are listed in the following table.

RPC_SVC_MT_NONE	the single-threaded mode (default)
RPC_SVC_MT_AUTO	the automatic MT mode
RPC_SVC_MT_USER	the user MT mode

The default (single-threaded) mode stays unless the application sets the other two modes. When a mode is set, it cannot be changed. A server can create a maximum of 16 threads anytime. You can restrict the number of thread resources consumed by a server. If a server needs more than 16 threads, set the maximum number of threads to a desired number. Similarly, RPC servers are limited to a maximum of 1024 file descriptors or connections. Applications that use preferred interfaces of the **svc\_pollfd** global variable and the **svc\_getreq\_poll** subroutines can use unlimited number of file descriptors. To achieve the goal, you can point the *info* parameter to nonzero and set the *op* parameter value to **RPC\_SVC\_USE\_POLLFD**.

## Parameters

<i>op</i>	Represents the operation type.
<i>info</i>	Points to the information for the request type. The <i>info</i> parameter is expected to be a pointer to an appropriate structure. The nature of the structure depends on the operation type.

## Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

In the following example, the **rpc\_control** subroutine is used to set server program in the automatic MT mode.

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    SVCXPRT *transpnum;
    rpcprog_t prognum = 0x3fffffffL;
    rpcvers_t progver = 0x1L;

    /* Register the service for prognum & progver on tcp transport */
    transpnum = svc_create(dispatch_AUTOMT, prognum, progver, "tcp");
    if (transpnum == 0)
```



```

{
    fprintf(stderr, "Cannot create a service.\n");
    svc_unreg(prognum,progver);
    exit(1);
}

/* Configure the server in AUTO_MT mode */
mode = RPC_SVC_MT_AUTO;
if(rpc_control(RPC_SVC_MTMODE_SET,&mode) == FALSE)
{
    fprintf(stderr,"\nError in rpc_control!\n");
    exit(1);
}

svc_run();

return 0;
}

```

## Related Information

The “svc\_control Subroutine” on page 412, and “clnt\_control Macro” on page 292.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_createerr Global Variable

### Purpose

Holds the status of a client-handle-creation subroutine for a remote procedure call (RPC).

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
struct rpc_createerr rpc_createerr

```

### Description

Whenever a client-creation subroutine fails, the subroutine sets the value of the **rpc\_createerr** global variable to an appropriate error code. The **clnt\_pcreateerror** and **clnt\_screateerror** subroutines use this global variable to display the failure reason.

**Note:** For multithreaded applications, each thread has its own **rpc\_createerr** variable.

### Examples

In the following example, the **rpc\_createerr** global variable is used to display the error code.

```

#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    CLIENT *cl;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    char *nettype = "visible";

```

```

char hostname[255] ;      /* The name of remote host */

/*
 * make the cInt_create call with this nettype and
 * observe the result
 */
if ((c1=cInt_create( hostname, PROGNUM, PROGVER, nettype)) == NULL)
{
    fprintf(stdout, "The error status : %d\n" , rpc_createerr.cf_stat);
    exit(EXIT_FAILURE);
}

/* destroy the client handle */
cInt_destroy(c1);

return 0;
}

```

## Related Information

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_get\_error Subroutine

### Purpose

Gets an error number on failure.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_get_error(rpc_gss_error_t *err);

```

### Description

You can use the **rpc\_gss\_get\_error** subroutine to retrieve the error code when RPCSEC\_GSS subroutines fail.

### Parameters

*err*                      Points to an **rpc\_gss\_error\_t** structure. This is an output parameter.

### Return Values

TRUE	successful
FALSE	unsuccessful

If an RPCSEC\_GSS subroutine fails, only the **rpc\_gss\_get\_error** subroutine sets the error to a meaningful value.

## Error Codes

<code>RPC_GSS_ER_SUCCESS</code>	0	No error occurred.
<code>RPC_GSS_ER_SYSTEMERROR</code>	1	A system error occurred.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>
#define PROGNUM 0x3fffffffL
#define VERSNUM 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);
main()
{
    char *principal, *mechanism;
    u_int reqtime;
    rpc_gss_error_t gss_error;

    /* Create RPC service handle and register with RPCBIND service */

    /* Initialize the required parameters */

    /* Set the principal name */
    if(rpc_gss_set_svc_name(principal, mechanism, req_time, PROGNUM, VERSNUM) == FALSE)
    {
        fprintf(stderr, "\nError in rpc_gss_set_svc_name:\n");
        /* Retrieve error */
        rpc_gss_get_error(&gss_error);
        fprintf(stderr, "rpc_gss_error: %d \nSystem_error: %d \n",
            gss_error.rpc_gss_error, gss_error.system_error);
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 1;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}
```

## Related Information

The “`rpc_gss_set_defaults` Subroutine” on page 397, “`rpc_gss_max_data_length` Subroutine” on page 388, “`rpc_gss_set_svc_name` Subroutine” on page 392, “`rpc_gss_getcred` Subroutine” on page 386, “`rpc_gss_set_callback` Subroutine” on page 395, “`rpc_gss_get_principal_name` Subroutine” on page 383, “`rpc_gss_svc_max_data_length` Subroutine” on page 398.

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---

## `rpc_gss_get_mech_info` Subroutine

### Purpose

Gets a list of quality of protections for the specified mechanism and security type.

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpcsec_gss.h>
char ** rpc_gss_get_mech_info(mechanism, service)
char *mechanism;
rpc_gss_service_t *service;
```

## Description

The subroutine provides a list of quality of protections for the specified mechanism and security type.

## Parameters

<i>mechanism</i>	Represents the supported security mechanism that is used for context creation (for example, <i>kerberosv5</i> ).
<i>service</i>	Represents the type of service for the session that basically offers a level of protection (for example, integrity and privacy).

## Return Values

a list of character strings terminated by a null value	successful
a null value	unsuccessful

The value of null specifies that you can use the default quality of protection.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

int main(int argc, char *argv[])
{
    char **s;
    char *mechanism;
    int i;
    rpc_gss_service_t service;

    mechanism = "kerberosv5";
    service = 2; /* 1: none, 2: integrity. 3: privacy */

    if((s = rpc_gss_get_mech_info(mechanism, &service)) == NULL)
    {
        fprintf(stderr, "\nrpc_gss_get_mech_info() Returned NULL, default QOP value can be used!\n");
        exit(1);
    }
    return 0;
}
```

## Related Information

The “[rpc\\_gss\\_get\\_mechanisms Subroutine](#)” on page 383, “[rpc\\_gss\\_is\\_installed Subroutine](#)” on page 387, and “[rpc\\_gss\\_get\\_versions Subroutine](#)” on page 385.

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---

## rpc\_gss\_get\_mechanisms Subroutine

### Purpose

Gets a list of supported security mechanisms.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpcsec_gss.h>
char ** rpc_gss_get_mechanisms();
```

### Description

The **rpc\_gss\_get\_mechanisms** subroutine returns a list of supported security mechanisms.

### Return Values

a NULL-terminated list of character strings	successful
NULL	unsuccessful

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

int main(void)
{
    char **s;
    /* Get mechanisms */
    if((s = rpc_gss_get_mechanisms()) == NULL)
    {
        fprintf(stderr, "\nrpc_gss_get_mechanisms() failed!\n");
        exit(1);
    }
    return 0;
}
```

### Related Information

The “[rpc\\_gss\\_get\\_mech\\_info Subroutine](#)” on page 381, “[rpc\\_gss\\_is\\_installed Subroutine](#)” on page 387, and “[rpc\\_gss\\_get\\_versions Subroutine](#)” on page 385.

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---

## rpc\_gss\_get\_principal\_name Subroutine

### Purpose

Gets the principal name of a known entity at the server end.

### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_get_principal_name(s_principal, mech, name_u, node, secdomain)
rpc_gss_principal_t *s_principal;
char *mech;
char *name_u;
char *node;
char *secdomain;
```

## Description

Sometimes, a server wants to compare principal name that it has received with that of a known entity. The **rpc\_gss\_get\_principal\_name** subroutine provides the principal name of a known entity. This subroutine has various parameters that uniquely identify the known entity on the network and creates principal name of the **rpc\_gss\_principal\_t** type.

## Parameters

<i>s_principal</i>	Represents the principal name of a client. This is an output parameter.
<i>mech</i>	Represents the supported security mechanism that is used (for example, kerberosv5).
<i>name_u</i>	Specifies the UNIX <sup>®</sup> login name.
<i>node</i>	Represents the machine name.
<i>secdomain</i>	Represents the security domain.

Parameter values are dependent on security mechanism. For those parameters that are not applicable for a particular security mechanism, you can specify NULL.

## Return Values

TRUE	successful
FALSE	unsuccessful

You can use the **rpc\_gss\_get\_error** subroutine to retrieve the error number.

## Examples

In the following example, the principal name is constructed for users with the myuser UNIX<sup>®</sup>-login name, the mynode node, the mydomain domain, and the kerberosv5 security mechanism.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>
#define PROGNUM 0x3fffffffL
#define VERSNUM 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);
main()
{
    /* Create RPC service handle and register with RPCBIND service */

    /* Set the principal name */

    svc_run();
    return 1;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpirt)
{
```

```

char *myuser,*mynode,*mydomain;
rpc_gss_principal_t princ;

myuser = "test01";
mynode = "localhost";
mydomain = "ibm.com";
if (!rpc_gss_get_principal_name(&princ,"kerberosv5",myuser,mynode,mydomain))
{
    fprintf(stderr,"Error in getting principal name\n");
    exit(1);
}
/* Compare retrieved principal name in 'princ' with received principal name */
/* Send reply back to caller */
}

```

## Related Information

The “rpc\_gss\_get\_mechanisms Subroutine” on page 383 and “rpc\_gss\_set\_svc\_name Subroutine” on page 392.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_get\_versions Subroutine

### Purpose

Gets the highest and lowest version of RPCSEC\_GSS.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_get_versions(vers_hi,vers_lo)
u_int *vers_hi;
u_int *vers_lo;

```

### Description

You can use this subroutine to determine the highest and the lowest version of RPCSEC\_GSS that is supported.

### Parameters

<i>vers_hi</i>	Points to the highest version when a subroutine returns successfully.
<i>vers_lo</i>	Points to the lowest version when a subroutine returns successfully.

### Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

int main()
{
    int high_vers, low_vers;
    if (rpc_gss_get_versions(&high_vers,&low_vers))
    {
        fprintf(stderr, "\nError in rpc_gss_get_versions:\n");
        exit(EXIT_FAILURE);
    }
    return 0;
}
```

## Related Information

The “[rpc\\_gss\\_get\\_mech\\_info Subroutine](#)” on page 381, “[rpc\\_gss\\_is\\_installed Subroutine](#)” on page 387, and “[rpc\\_gss\\_get\\_mechanisms Subroutine](#)” on page 383.

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---

## rpc\_gss\_getcred Subroutine

### Purpose

Gets credentials of a caller.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpcsec_gss.h>

bool_t rpc_gss_getcred(req, r_cred, u_cred, cookie)
struct svc_req *req;
rpc_gss_rawcred_t **r_cred;
rpc_gss_ucred_t **u_cred;
void **cookie;
```

### Description

The **rpc\_gss\_getcred** subroutine is used to get credentials of a caller. You can retrieve network credentials and UNIX<sup>®</sup> credentials.

### Parameters

<i>req</i>	Points to a received service-request structure.
<i>r_cred</i>	Points to an <b>rpc_gss_rawcred_t</b> structure that is returned with raw credentials. Raw credentials include the remote procedure call (RPC) version, security mechanism, quality of protection, client principal, server principal, service type, and so on. This is an output parameter. You can specify the parameter with NULL.
<i>u_cred</i>	Points to an <b>rpc_gss_ucred_t</b> structure that is returned with UNIX <sup>®</sup> credentials. UNIX <sup>®</sup> credentials include user ID, group ID, and so on. This is an output parameter. You can specify the parameter with NULL.
<i>cookie</i>	Represents a 4-byte entity that an application can use in any manner. This is an output parameter.



## Return Values

TRUE	successful
FALSE	unsuccessful

You can use the `rpc_gss_get_error` subroutine to retrieve the error number.

## Examples

In the following example, credentials of the caller are retrieved in the dispatch routine of the server.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

#define PROGNUM 0x3fffffffL
#define VERSNUM 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);
main()
{
    /* Create RPC service handle and register with RPCBIND service */

    /* Set the principal name */

    svc_run();
    return 1;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    rpc_gss_rawcred_t *r_cred;
    rpc_gss_ucred_t *u_cred;

    /* Get caller's credentials */
    if(rpc_gss_getcred(request, &r_cred, &u_cred, NULL) == FALSE)
    {
        fprintf(stderr, "\nError in rpc_gss_getcred:\n");
        rpc_gss_get_error(&gss_error);
        fprintf(stderr, "rpc_gss_error: %d \nSystem_error: %d \n",
            gss_error.rpc_gss_error, gss_error.system_error);
        svcerr_systemerr(xpvt);
        return;
    }

    /* Send reply back to caller */
}
```

## Related Information

The “`rpc_gss_set_callback` Subroutine” on page 395 and “`rpc_gss_set_svc_name` Subroutine” on page 392.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_is\_installed Subroutine

### Purpose

Checks whether a security mechanism is installed.

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_is_installed(mechanism)
char *mechanism;
```

## Description

You can use the subroutine to determine whether the specified security mechanism is installed.

## Parameters

*mechanism*                      Specifies a security mechanism (for example, *kerberosv5*).

## Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

int main()
{
    char *mechanism;

    mechanism = "kerberosv5";
    /* Check if mechanism is installed */
    if(rpc_gss_is_installed(mechanism) == FALSE)
    {
        fprintf(stderr, "\n%s Mechanism not installed!\n", mechanism);
        exit(1);
    }
    return 0;
}
```

## Related Information

The “[rpc\\_gss\\_get\\_mech\\_info Subroutine](#)” on page 381, “[rpc\\_gss\\_get\\_versions Subroutine](#)” on page 385, and “[rpc\\_gss\\_get\\_mechanisms Subroutine](#)” on page 383.

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---

## rpc\_gss\_max\_data\_length Subroutine

### Purpose

Gets the maximum length of untransformed data that is allowed by the transport (a client-side version).

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpcsec_gss.h>
int rpc_gss_max_data_length(a_handle, max_tp_length)
AUTH *a_handle;
int max_tp_length;
```

## Description

Some transport types have restrictions on the maximum size of data that can be sent out in one data unit. After the security transformations on actual data, data length increases that depends on the selected security mechanism. Some applications need to know the actual length of untransformed data that is allowed before performing security transformations. You can get this maximum length of untransformed data using the **rpc\_gss\_max\_data\_length** subroutine.

## Parameters

<i>a_handle</i>	Represents an RPC handle that is returned when security context is created.
<i>max_tp_length</i>	Represents the maximum length of data unit allowed by transport. This is an input parameter.

## Return Values

On successful completion, the **rpc\_gss\_max\_data\_length** subroutine returns the maximum size of untransformed data that is allowed.

## Examples

```
#include <stdlib.h>
#include <tiuser.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

main()
{
    CLIENT *client;
    int fd, untransformed_data, max_tp_len;
    struct t_info info;

    /* Create client handle */
    /* Create security context */

    /* Get associated file descriptor */
    if(cInt_control(client,CLGET_FD,(caddr_t)&fd) == FALSE)
    {
        fprintf(stderr,"\nError in cInt_control.\n");
        exit(1);
    }
    /* Get info related to transport */
    if(t_getinfo(fd,&info) !=0)
    {
        fprintf(stderr,"\nError in t_getinfo.\n");
        exit(1);
    }
    /* Get max data length allowed by transport */
    max_tp_len = info.tsdu;
```

```

    /* get max untransformed data length */
    untransformed_data = rpc_gss_max_data_length(client->cl_auth, max_tp_len);
}

```

## Related Information

The “rpc\_gss\_svc\_max\_data\_length Subroutine” on page 398.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_mech\_to\_oid Subroutine

### Purpose

Gets values of object-identifier structure corresponding to the specified mechanism.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_mech_to_oid(mech,oid)
char *mech;
rpc_gss_OIDc *oid;

```

### Description

Kernel remote procedure call (RPC) routines use non-string values to represent mechanisms and quality of parameters. The non-string values, which an application sometimes needs, can be in the form of structures or just numbers. This subroutine provides values of an object-identifier structure that are related to the specified mechanism.

### Parameters

<i>mech</i>	Represents the supported security mechanism that is used for context creation (for example, <i>kerberosv5</i> ).
<i>oid</i>	Points to an <b>rpc_gss_OIDc</b> structure that is filled up by this subroutine.

### Return Values

TRUE	successful
FALSE	unsuccessful

### Examples

```

#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

int main(int argc,char *argv[])
{
    rpc_gss_OID *oid;
    char *mechanism;

    mechanism = "kerberosv5";
}

```

```

/* Get non-string value for mechanism */
if(rpc_gss_mech_to_oid(mechanism,oid) == FALSE)
{
    fprintf(stderr,"\nrpc_gss_mech_to_oid() failed!\n");
    exit(1);
}
return 0;
}

```

## Related Information

The “rpc\_gss\_qop\_to\_num Subroutine.”

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_qop\_to\_num Subroutine

### Purpose

Gets the number that is related to specified mechanism and quality of protection.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_qop_to_num(qop,mech,num)
char *qop;
char *mech;
u_int *num;

```

### Description

Kernel remote procedure call (RPC) routines use non-string values to represent mechanisms and quality of parameters. The non-string values, which an application sometimes needs, can be in the form of structures or just numbers. This subroutine provides the number that is related to the specified mechanism and quality of protection.

### Parameters

<i>qop</i>	Represents the quality of protection (qop).
<i>mech</i>	Represents the supported security mechanism that is used for context creation (for example, <i>kerberosv5</i> ).
<i>num</i>	Represents a non-string value for the specified mechanism-qop combination. The value is filled up by the subroutine.

### Return Values

TRUE	successful
FALSE	unsuccessful

### Examples

```

#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

```

```

int main(int argc, char *argv[])
{
    u_int num;
    char *qop, *mechanism;

    mechanism = "kerberosv5";
    qop = "GSS_C_QOP_DEFAULT";
    /* Get non-string value for qop */
    if(rpc_gss_qop_to_num(qop, mechanism, &num) == FALSE)
    {
        fprintf(stderr, "\nrpc_gss_qop_to_num() failed!\n");
        exit(1);
    }
    return 0;
}

```

## Related Information

The “`rpc_gss_mech_to_oid` Subroutine” on page 390.

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---

## rpc\_gss\_set\_svc\_name Subroutine

### Purpose

Sets the principal name that a server or a service represents.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_set_svc_name(s_principal, mech, r_time, prog, vers)
char *s_principal;
char *mech;
u_int r_time;
u_int prog;
u_int vers;

```

### Description

When a client wants to use any service provided by a server with `RPCSEC_GSS` APIs, the client basically addresses server principals rather than actual services. A principal is a user or a service that uses authentication services and is identified in authentication database. The **`rpc_gss_set_svc_name`** subroutine sets the principal name that the server or service represents. You can use this subroutine to set more than one principal name to the same server or service.

### Parameters

<i>s_principal</i>	Specifies a server principal of the form <i>service@host</i> . The <i>service</i> variable represents the service offered by a server and the <i>host</i> variable indicates the name of a machine on which the server resides (for example, <code>nfs@aix1.ibm.com</code> ).
<i>mech</i>	Represents the supported security mechanism that is used for client-server communication (for example, <code>kerberosv5</code> ).
<i>r_time</i>	Represents the time, in seconds, for which credentials must be valid. (The time is mechanism-dependent.)

*prog* Represents the remote procedure call (RPC) program number of a service.  
*vers* Represents the RPC version number of a service.

## Return Values

TRUE successful  
FALSE unsuccessful

You can use the `rpc_gss_get_error` subroutine to retrieve the error number.

## Examples

In the following example, the principal name is set for the RPC service with the program and version number that are provided by the server.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);
main()
{
    char *s_principal, *mech;
    u_int r_time;
    rpc_gss_error_t gss_error;

    /* Create RPC service handle and register with RPCBIND service */

    /* Initialize the required parameters */
    s_principal = "myservice@aix1.ibm.com"; /* service@host */
    mech = "kerberosv5";
    r_time = 1000;

    /* Set the principal name */
    if(rpc_gss_set_svc_name(s_principal, mech, r_time, PROG, VERS) == FALSE)
    {
        fprintf(stderr, "\nError in rpc_gss_set_svc_name:\n");
        rpc_gss_get_error(&gss_error);
        fprintf(stderr, "rpc_gss_error: %d \nSystem_error: %d \n",
                gss_error.rpc_gss_error, gss_error.system_error);
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 1;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpirt)
{
    /* dispatch routine code */
}
```

## Related Information

The “`rpc_gss_get_mechanisms` Subroutine” on page 383 and “`rpc_gss_get_principal_name` Subroutine” on page 383.

## rpc\_gss\_seccreate Subroutine

### Purpose

Creates a security context.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpcsec_gss.h>
AUTH *rpc_gss_seccreate(cl, s_principal, mech, s_type, qop, o_req, o_ret)
CLIENT *cl;
char *s_principal;
char *mech;
rpc_gss_service_t s_type;
char *qop;
rpc_gss_options_req_t *o_req;
rpc_gss_options_ret_t *o_ret;
```

### Description

When making a remote procedure call using RPCSEC\_GSS APIs, a security context must be created between the client and the server. The **rpc\_gss\_seccreate** subroutine uses the RPCSEC\_GSS protocol to create a context. With the subroutine, you can specify the security mechanism that is used for context creation and thus for further client-server communication, security types and the quality of protection.

### Parameters

<i>cl</i>	Represents a client handle that can be created using any of the client handle creation subroutines.
<i>s_principal</i>	Specifies a server principal of the form <i>service@host</i> . The <i>service</i> variable represents the service offered by a server and the <i>host</i> variable indicates the name of a machine on which the server resides (for example, <i>nfs@aix1.ibm.com</i> ).
<i>mech</i>	Represents the supported security mechanism that is used for context creation and client-server communication (for example, <i>kerberosv5</i> ).
<i>s_type</i>	Represents the type of service for the session that basically offers a level of protection. (for example, <i>integrity</i> and <i>privacy</i> ).
<i>qop</i>	Represents the quality of protection. You can specify the parameter to select cryptographic algorithm.
<i>o_req</i>	Specifies the options that are passed to the GSS_API layer under the RPCSEC_GSS layer. If you specify the parameter with NULL, default parameters are used.
<i>o_ret</i>	Specifies the options that are returned by the GSS_API layer. If you do not want to see options, you can specify the parameter with NULL. The <i>o_ret</i> parameter is an output parameter.

### Return Values

a security context handle of the <b>AUTH</b> type	successful
NULL	unsuccessful

You can use the **rpc\_gss\_get\_error** subroutine to retrieve the error number.



## Examples

In the following example, security context is created to have a secure communication between the client and the server.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

main()
{
    CLIENT *client;
    char *s_principal;
    char *mech;
    rpc_gss_service_t s_type;
    char *qop;
    rpc_gss_options_ret_t o_ret;
    rpc_gss_error_t gss_error;

    /* Create client handle using any of the client handle creation routines*/

    /* Initialize the required parameters */
    s_principal = "myservice@aix1.ibm.com"; /* service@host */
    mech = "kerberosv5";
    s_type = 2; /* 1: none, 2: integrity. 3: privacy */
    qop = "GSS_C_QOP_DEFAULT";
    o_ret.major_status = 0;
    o_ret.minor_status = 0;

    /* Create security context */
    client->cl_auth = rpc_gss_seccreate(client, s_principal,
                                     mech, s_type, qop, NULL, &o_ret);
    if(client->cl_auth == NULL)
    {
        fprintf(stderr, "\nError in rpc_gss_seccreate:\n");
        rpc_gss_get_error(&gss_error);
        fprintf(stderr, "rpc_gss_error: %d \nSystem_error: %d \n"
                    ,gss_error.rpc_gss_error,gss_error.system_error);
        exit(EXIT_FAILURE);
    }
    /* Make a call to server */
}
```

## Related Information

The “rpc\_gss\_get\_error Subroutine” on page 380 and “rpc\_gss\_get\_mechanisms Subroutine” on page 383.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_set\_callback Subroutine

### Purpose

Specifies callback routine for the context use.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpcsec_gss.h>
```

```
bool_t rpc_gss_set_callback(cb)
struct rpc_gss_callback_t *cb;
```

## Description

With the **rpc\_gss\_set\_callback** subroutine, you can set a user-defined callback routine that is invoked when the context is used for the first time.

## Parameters

*cb* Points to a **rpc\_gss\_callback\_t** structure.

The following is the definition of the **rpc\_gss\_callback\_t** structure.

```
typedef struct {
u_int program;
u_int version;
bool_t (*callback )();
} rpc_gss_callback_t;
```

<i>program</i>	Represents the program number for which the context is established.
<i>version</i>	Represents version number for which context is established.
<i>callback</i>	Represents a user-defined callback routine that is in the following form: <pre>bool_t callback ( req, deleg, gss_context, lock, cookie ) struct svc_req *req; gss_cred_id_t deleg; gss_ctx_id_t gss_context; rpc_gss_lock_t *lock; void **cookie;</pre>

The following table list the parameters of the callback routine.

<i>req</i>	Points to a received service-request structure.
<i>deleg</i>	Represents delegated credentials.
<i>gss_context</i>	Represents the Generic Security Services (GSS) context.
<i>lock</i>	Points to a <b>rpc_gss_lock_t</b> structure. You can use the parameter to enforce particular protection quality for that session.
<i>cookie</i>	Represents a 4-byte entity that an application can use in any manner.

## Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>
#define PROGNUM 0x3fffffffL
#define VERSNUM 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);

bool_t callback(struct svc_req *req, gss_cred_id_t deleg, gss_ctx_id_t gss_context,
               rpc_gss_lock_t *lock, void **cookie)
{
    fprintf(stdout, "\nIn callback routine!\n");
    return TRUE;
}
```

```

}

main()
{
    rpc_gss_callback_t cb;
    cb.program = PROG;
    cb.version = VERS;
    cb.callback = callback;

    /* Create RPC service handle and register with RPCBIND service */

    /* Set the principal name */

    if (!rpc_gss_set_callback(&cb)) {
        fprintf(stderr, "Error while setting callback\n");
        exit(1);
    }
    svc_run();
    return 1;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    /* Dispatch routine code */
}

```

## Related Information

The “rpc\_gss\_getcred Subroutine” on page 386.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_set\_defaults Subroutine

### Purpose

Changes the service type and quality of protection for client-server communication.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpcsec_gss.h>
bool_t rpc_gss_set_defaults(auth_t, s_type, qop)
AUTH *auth_t;
rpc_gss_service_t s_type;
char *qop;

```

### Description

While creating security context, you can specify the *s\_type* and *qop* parameters for the transfer sessions. You can change the two parameters for next transfer sessions using the **rpc\_gss\_set\_defaults** subroutine.

### Parameters

*auth\_t* Represents an authentication handle returned by the **rpc\_gss\_seccreate** subroutine.

<i>s_type</i>	Represents the type of service for the session that basically offers a level of protection. (for example, integrity and privacy).
<i>qop</i>	Represents the quality of protection. You can specify the parameter to select cryptographic algorithm.

## Return Values

TRUE	successful
FALSE	unsuccessful

You can use the **rpc\_gss\_get\_error** subroutine to retrieve the error number.

## Examples

The following example uses the **rpc\_gss\_set\_defaults** subroutine to set service type and quality of protection after security context creation.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <rpc/rpcsec_gss.h>

main()
{
    CLIENT *client;
    rpc_gss_service_t service_type;
    char *qop;
    rpc_gss_error_t gss_error;

    /* Create client handle using any of the client handle creation routines*/

    /* Create security context using rpc_gss_seccreate */

    /* Set service_type and quality of protection */
    if(rpc_gss_set_defaults(client->cl_auth,service_type,qop) == FALSE)
    {
        fprintf(stderr,"\nError in rpc_gss_set_defaults:\n");
        rpc_gss_get_error(&gss_error);
        fprintf(stderr,"rpc_gss_error: %d \nSystem_error: %d \n",
                gss_error.rpc_gss_error,gss_error.system_error);
        exit(EXIT_FAILURE);
    }
    /* Make a call to server */
}
```

## Related Information

The “**rpc\_gss\_get\_mech\_info** Subroutine” on page 381.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_gss\_svc\_max\_data\_length Subroutine

### Purpose

Gets the maximum length of untransformed data allowed by the transport (a server-side version).

### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpcsec_gss.h>
int rpc_gss_svc_max_data_length(req,max_tp_length)
struct svc_req *req;
int max_tp_length;
```

## Description

Some transport types have restrictions on the maximum size of data that can be sent out in one data unit. After the security transformations on actual data, data length increases that depends on the selected security mechanism. Some applications need to know the actual length of untransformed data that is allowed before performing security transformations. You can get this maximum length of untransformed data using the **rpc\_gss\_svc\_max\_data\_length** subroutine.

## Parameters

<i>req</i>	Points to a received service-request structure.
<i>max_tp_length</i>	Represents the maximum length of data unit allowed by transport. This is an input parameter.

## Return Values

On successful completion, the subroutine returns the maximum size of the allowed untransformed data.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <tiuser.h>
#include <rpc/rpcsec_gss.h>

#define PROGNUM 0x3fffffffL
#define VERSNUM 0x1L

static void sample_dispatch(struct svc_req *, SVCXPRT *);
main()
{
    /* Create RPC service handle and register with RPCBIND service */
    /* Set the principal name */
    svc_run();
    return 1;
}
/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpirt)
{
    int untransformed_data, max_tp_len;
    struct t_info info;

    /* Get info related to transport */
    if(t_getinfo(xpirt->xp_fd,&info) !=0)
    {
        fprintf(stderr,"\nError in t_getinfo.\n");
        exit(1);
    }
    /* Get max data length allowed by transport */
    max_tp_len = info.tsdu;

    /* Get max data length allowed by transport */
    untransformed_data = rpc_gss_svc_max_data_length(request, max_tp_len);
```

```
    /* Send reply back to caller */  
}
```

## Related Information

The “`rpc_gss_max_data_length` Subroutine” on page 388.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpc\_reg Subroutine

### Purpose

Registers program number, version number, and procedure with the remote procedure call (RPC) service package.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>  
  
bool_t rpc_reg( prog, vers, proc, proc_name, iproc, oproc, nettype);  
const rpcprog_t prog;  
const rpcvers_t vers;  
const rpcproc_t proc;  
char *(*proc_name)(char *);  
const xdrproc_t iproc;  
const xdrproc_t oproc;  
const char *nettype;
```

### Description

The `rpc_reg` subroutine is a simplified-level API for transport-independent RPC that specify the transport type. Applications using this level do not need to explicitly create handles. The `rpc_reg` subroutine registers a program, a procedure, and a version with the RPC service package on all available transports that are specified by the `nettype` parameter. If you set the `nettype` parameter to a null value, the `rpc_reg` subroutine searches transports in `NETPATH` environment variable from left to right. If the value of the `NETPATH` environment variable is also null or unset, the `rpc_reg` subroutine searches in `netconfig` database from top to bottom. Whenever a service request from a client arrives, the program number, version number, and procedure number are mapped with registered services and respective procedure is called with appropriate parameters. The `rpc_reg` subroutine uses eXternal Data Representation (XDR) functions to encode and decode the parameters. The `rpc_reg` subroutine can register an individual procedure that can be a part of a large RPC service. A single procedure cannot be unregistered, but you can unregister the whole RPC service using the `svc_unreg` subroutine.

### Parameters

<code>prog</code>	Specifies the program number.
<code>vers</code>	Specifies the version number.
<code>proc</code>	Specifies the procedure number.
<code>proc_name</code>	Points to a registered procedure, which returns a pointer to a static result. The parameter to the procedure is a pointer to the decoded procedure argument.
<code>iproc</code>	Specifies the XDR function to decode the parameters of the procedure.
<code>oproc</code>	Specifies the XDR function to encode the result of the procedure.

*nettype*

Defines a class of transports that can be used for a particular application.

## Return Values

0	successful
-1	unsuccessful

## Examples

In the following example, after the successful run of the **rpc\_reg** subroutine, a service with PROG and VERS is registered with RPC service package on the tcp transport.

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L
#define PROC 0x1L

char * sample_proc(char *);

main()
{
    char *nettype;

    /* Specify transport type */
    nettype = "tcp";

    /* unregister the previous RPC service */
    svc_unreg(PROG,VERS);

    /* Register a single procedure at a time using rpc_reg() */
    if(rpc_reg(PROG,VERS,PROC,sample_proc,xdr_char,xdr_char,nettype) == -1)
    {
        fprintf(stderr,"\nError in rpc_reg!\n");
        svc_unreg(PROG,VERS);
        exit(EXIT_FAILURE);
    }

    /* Server waits for client's request to arrive */
    svc_run();

    return 0;
}

char * sample_proc(char *ptr)
{
    /* code for sample_proc procedure */
}
```

## Related Information

The “rpc\_call Subroutine” on page 375, “rpc\_broadcast Subroutine” on page 371, “svc\_reg Subroutine” on page 438, “svc\_unreg Subroutine” on page 449, and “svc\_auth\_reg Subroutine” on page 410.

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---

## rpcb\_getaddr Subroutine

### Purpose

Finds the address of a remote service.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
bool_t rpcb_getaddr (prognum, progver, nconf, svcaddr, host)
const rpcprog_t prognum;
const rpcvers_t progver;
const struct netconfig *nconf;
struct netbuf *svcaddr;
const char *host;
```

### Description

The **rpcb\_getaddr** subroutine is used to get the address of the remote service that is located on the host. This remote service is registered on the host with the specified program and version. The service is associated with the specified transport. On successful completion, the value of the *svcaddr* parameter is the address of the remote service.

**Note:** You must preallocate the *svcaddr* parameter before calling the **rpcb\_getaddr** subroutine.

### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>progver</i>	Specifies the version number of the remote program.
<i>nconf</i>	Specifies the protocol associated with the service.
<i>svcaddr</i>	Specifies the address of the remote service.
<i>host</i>	Specifies the host name on which the server resides.

### Return Values

TRUE	successful
FALSE	unsuccessful

The subroutine returns FALSE in the following two conditions:

- The mapping does not exist on the host.
- The remote **rpcbind** service cannot be contacted.

The status of failure is set in the **rpc\_createerr** global variable .

### Error Codes

<b>RPC_UNKNOWNHOST</b>	The host name is not valid.
<b>RPC_PROGNOTREGISTERED</b>	The service is not registered with the remote <b>rpcbind</b> service.
<b>RPC_FAILED</b>	An unspecified error occurred.



## Examples

In the following example, the `rpcb_getaddr` subroutine gets the address of remote service associated with the specified program, version, and `udp` transport.

```
#include <stdlib.h>
#include <rpcb_getaddr/rpc.h>

#define ADDRBUFSIZE 255

int main()
{
    char hostname[255] ; /* The Remote host on which server is implemented */
    rpcprog_t program_number = 0x3fffffffL;
    rpcvers_t version_number = 0x1L;
    struct netbuf nbuf;
    struct netconfig *nconf;
    char addrbuf[ADDRBUFSIZE];

    /* Get pointer to struct netconfig for udp transport */
    nconf = getnetconfig("udp");
    if (nconf == (struct netconfig *) NULL) {
        fprintf(stdout, "\nerror in getnconfig!\n");
        exit(1);
    }

    nbuf.len = 0;
    nbuf.maxlen = ADDRBUFSIZE;
    nbuf.buf = addrbuf;

    if (!rpcb_getaddr(program_number, version_number, nconf, &nbuf, hostname)) {
        fprintf(stdout, "\nerror in getnconfig!\n");
        exit(1);
    }

    return 0;
}
```

## Related Information

The “`pmap_getport` Subroutine” on page 361, “`rpcb_getmaps` Subroutine,” “`rpcb_set` Subroutine” on page 407, and “`rpcb_unset` Subroutine” on page 409.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpcb\_getmaps Subroutine

### Purpose

Returns program-to-address mappings.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>
struct rpclist *rpcb_getmaps(nconf, host)
const struct netconfig *nconf;
const char *host;
```

## Description

The **rpcb\_getmaps** subroutine returns a list of remote procedure call (RPC) program-to-address mappings for on a remote host. The *host* parameter represents the host from which the list of mappings is returned. The remote **rpcbind** service on the host is contacted by the transport specified by the *nconf* parameter. The subroutine returns a null value if the remote **rpcbind** service cannot be contacted.

## Parameters

*nconf* Specifies the protocol associated with the service.  
*host* Specifies the host name on which the server resides.

## Return Values

a pointer to the **rpcblist** structure                      successful  
FALSE    unsuccessful

## Error Codes

**RPC\_UNKNOWNHOST**    The host name is not valid.  
**RPC\_N2AXLATEFAILURE**    The value of the *nconf* argument is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    /* The Remote host on which server is implemented */
    char hostname[255] ;
    struct netconfig *nconf;
    struct rpcblist *rpclist = NULL;

    /* Get pointer to struct netconfig for udp transport */
    nconf = getnetconfig("udp");
    if (nconf == (struct netconfig *) NULL) {
        fprintf(stdout, "\nerror in getnetconfig!\n");
        exit(1);
    }
    rpclist = (struct rpcblist *)rpcb_getmaps(nconf, hostname);
    if (rpclist == NULL) {
        fprintf(stderr,"could not get the rpcblist on remote host\n");
        clnt_pcreateerror("rpcb_getmap:");
        exit(1);
    }
    return 0;
}
```

## Related Information

The “pmap\_getport Subroutine” on page 361, “rpcb\_getaddr Subroutine” on page 402, “rpcb\_set Subroutine” on page 407, and “rpcb\_unset Subroutine” on page 409.

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---

## rpcb\_gettime Subroutine

### Purpose

Returns the time on a remote host.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
bool_t rpcb_gettime(host, time_p)
const char *host;
time_t *time_p;
```

### Description

You can obtain the time on a remote host using the **rpcb\_gettime** subroutine. The time is returned by the *time\_p* parameter. You must preallocate the *time\_p* parameter before calling this subroutine. If the host is specified with a null value, this subroutine returns the time on the local machine from which the subroutine is called. Generally, the **rpcb\_gettime** subroutine is used to synchronize the time between clients and servers. This subroutine is particularly needed for secure remote procedure call (RPC) applications in which clients and servers must be synchronized.

### Parameters

<i>host</i>	Specifies the host name on which the server resides.
<i>time_p</i>	Specifies the time on the host.

### Return Values

TRUE	successful
FALSE	unsuccessful

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    char hostname[255] ; /* The Remote host */
    time_t      time_p = 0;

    if( rpcb_gettime(hostname, &time_p)== FALSE ) {
        fprintf(stderr,"rpcb_gettime failed");
        exit(1);
    }
    return 0;
}
```

### Related Information

The “**rpcb\_getmaps Subroutine**” on page 403, “**rpcb\_getaddr Subroutine**” on page 402, “**rpcb\_set Subroutine**” on page 407, and “**rpcb\_unset Subroutine**” on page 409.

## rpcb\_rmtcall Subroutine

### Purpose

Instructs the **rpcbind** service on a remote host to make a remote procedure call (RPC) on behalf of the caller to a procedure on that host.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
enum cInt_stat rpcb_rmtcall(nconf, host, prognum, progver, procnum, in_proc, input, out_proc,
output, t_out, svcaddr)
const struct netconfig *nconf
const char *host
const rpcprog_t prognum;
const rpcvers_t versnum;
const rpcproc_t procnum;
const xdrproc_t in_proc;
const caddr_t input;
const xdrproc_t out_proc;
const caddr_t output;
const struct timeval t_out;
struct netbuf *svcaddr
```

### Description

The **rpcb\_rmtcall** subroutine is an interface to the **rpcbind** service. The subroutine instructs the **rpcbind** service on the remote host to make an RPC call on behalf of the caller to a procedure on that host. The **netconfig** structure must correspond to a connectionless transport. You can use this subroutine for a **ping** program because the subroutine performs the lookup and call in one step.

### Parameters

<i>host</i>	Specifies the host name on which the server resides.
<i>prognum</i>	Specifies the program number of the remote host.
<i>progver</i>	Specifies the version number of the remote host.
<i>procnum</i>	Specifies the procedure number on the remote host.
<i>in_proc</i>	Specifies the eXternal Data Representation (XDR) procedure to encode the input parameters.
<i>out_proc</i>	Specifies the XDR procedure to decode the output results.
<i>output</i>	Specifies the address of output parameters.
<i>t_out</i>	Specifies the timeout value.
<i>input</i>	Specifies the address of input parameters.
<i>nconf</i>	Specifies the protocol associated with the service.
<i>svcaddr</i>	Specifies the address of the remote service when the procedure succeeds.

### Return Values

RPC_SUCCESS	successful
nonzero	unsuccessful

## Error Codes

### RPC\_TIMEDOUT

- The **netconfig** structure corresponds to a connection-oriented transport.
- The version number is not valid.
- The program number is not valid.
- The procedure number is not valid.

## Examples

```
#include <rpc/rpc.h>

int main()
{
    struct netconfig *nconf;
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
    rpcproc_t PROCNUM = 0x1L;
    struct timeval timeout = {25,0};
    int req , resp;
    enum clnt_stat cs;
    char host[255]; /* Remote host name */

    req = 5 ; /* initialise input parameter to a valid value */

    /* Set the netconfig structure for tcp transport */
    if ((nconf = getnetconfig("tcp")) == (struct netconfig *) NULL) {
        printf("getnetconfig() failed");
        exit(1);
    }

    /* Call the remote procedure using rpcb_rmtcall() */
    cs = rpcb_rmtcall(nconf,host,PROGNUM,PROGVER,PROCNUM,(xdrproc_t)xdr_int,
        (caddr_t)&req, (xdrproc_t)xdr_int, (caddr_t)&resp, timeout, nbuf);

    /* Check for the return status */
    if(cs != RPC_SUCCESS)
    {
        printf("rpcb_rmtcall() failed");
        exit(1);
    }

    return 0;
}
```

## Related Information

The “pmap\_rmtcall Subroutine” on page 363, “rpcb\_getmaps Subroutine” on page 403, “rpcb\_getaddr Subroutine” on page 402, “rpcb\_set Subroutine,” and “rpcb\_unset Subroutine” on page 409.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## rpcb\_set Subroutine

### Purpose

Establishes a mapping between the program, version, **netconfig** structure and the service address.

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
bool_t rpcb_set(prognum, progver, nconf, svcaddr)
const rpcprog_t prognum;
const rpcvers_t progver;
const struct netconfig *nconf;
struct netbuf *svcaddr
```

## Description

The **rpcb\_set** subroutine is used to establish a mapping of triplet (the program number, version number and the **nc\_netid** field of the *nconf* argument) to the service on a remote host. The mapping is established on the **rpcbind** service of the machine. The *svcaddr* parameter specifies the address of the remote service. The **nc\_netid** field of the **netconfig** structure identifies the network identifier defined by the **netconfig** database.

**Note:** This subroutine fails if it tries to create a mapping that exists on the machine.

## Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>progver</i>	Specifies the version number of the remote program.
<i>nconf</i>	Specifies the protocol associated with the service.
<i>svcaddr</i>	Specifies the address of the remote service.

## Return Values

TRUE	successful
FALSE	unsuccessful

## Error Codes

The **rpcb\_set** subroutine returns failure if one or more of the following codes are true.

<b>RPC_UNKNOWNPROTO</b>	The value of the <i>netconfig</i> argument is not valid.
<b>RPC_UNKNOWNADDR</b>	The remote service address is not valid.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

int main()
{
    rpcprog_t PROGNUM ;
    rpcvers_t PROGVER ;
    struct netconfig *nconf ;
    struct netbuf *nbuf;
    struct t_bind *bind_addr = NULL;

    /* Get netconfig structure corresponding to tcp transport */
    if ((nconf = getnetconfig("tcp")) == (struct netconfig *) NULL)
    {
        fprintf(stderr, "getnetconfig failed");
    }
}
```

```

        exit(1);
    }
    /*
    * Code to open and bind file descriptor to bind_addr address
    */
    nbuf = &bind_addr->addr;
    if( rpcb_set(PROGNUM, PROGVER, nconf, nbuf) == FALSE ) {
        fprintf(stderr,"rpcb_set() failed");
        exit(1);
    }
    svc_run();
    return 0;
}

```

## Related Information

The “pmap\_set Subroutine” on page 366, “rpcb\_getaddr Subroutine” on page 402, “rpcb\_getmaps Subroutine” on page 403, “rpcb\_gettime Subroutine” on page 405, and “rpcb\_unset Subroutine.”

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---

## rpcb\_unset Subroutine

### Purpose

Destroys the mapping between the program, version, **netconfig** structure and the service address.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
bool_t rpcb_unset(prognum, progver, nconf)
const rpcprog_t prognum;
const rpcvers_t progver;
const struct netconfig *nconf;

```

### Description

The **rpcb\_unset** subroutine destroys a mapping of triplet (program number, version number, and the **nc\_netid** field of the *nconf* argument) to the address of a remote service. The mapping is destroyed from the **rpcbind** service of the machine. The **nc\_netid** field of the **netconfig** structure identifies the network identifier defined by the **netconfig** database.

### Parameters

<i>prognum</i>	Specifies the program number of the remote program.
<i>progver</i>	Specifies the version number of the remote program.
<i>nconf</i>	Specifies the protocol associated with the service.

### Return Values

TRUE	successful
FALSE	unsuccessful

## Error Codes

The `rpcb_unset` subroutine returns failure if one or more of the following codes are true.

**RPC\_UNKNOWNPROTO**

The value of the `netconfig` argument is not valid.

**RPC\_UNKNOWNADDR**

The remote service address is not valid.

## Examples

```
#include <rpc/rpc.h>
#include <stdio.h>

int main()
{
    rpcprog_t PROGNUM ;
    rpcvers_t PROGVER ;
    struct netconfig *nconf ;
    struct netbuf *nbuf;
    struct t_bind *bind_addr = NULL;

    /* Get netconfig structure corresponding to tcp transport */
    if ((nconf = getnetconfig("tcp")) == (struct netconfig *) NULL) {
        fprintf(stderr, "getnetconfig failed");
        exit(1);
    }
    /*
     * Code to open and bind file descriptor to bind_addr address
     */
    nbuf = &bind_addr->addr;
    if( rpcb_set(PROGNUM, PROGVER, nconf, nbuf) == FALSE ) {
        fprintf(stderr, "rpcb_set() failed");
        exit(1);
    }
    rpcb_unset(PROGNUM, PROGVER, nconf);
    svc_run();
    return 0;
}
```

## Related Information

The “`pmap_set` Subroutine” on page 366, “`rpcb_getaddr` Subroutine” on page 402, “`rpcb_getmaps` Subroutine” on page 403, “`rpcb_gettime` Subroutine” on page 405, and “`rpcb_set` Subroutine” on page 407.

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---

## svc\_auth\_reg Subroutine

### Purpose

Registers an authentication routine with the dispatch mechanism.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
```



```
int svc_auth_reg(cr_flavor, auth_handler);
const int cr_flavor;
enum auth_stat(*auth_handler)(struct svc_req *, struct rpc_msg *);
```

## Description

The **svc\_auth\_reg** subroutine registers an authentication routine with the dispatch mechanism so that service requests from clients can be authenticated with the specified authentication type. With the subroutine, you can add new authentication types to applications without changing the existing library. Call the **svc\_auth\_reg** subroutine after the service registration and before calling the **svc\_run** subroutine. When remote procedure call (RPC) credentials are checked, the corresponding authentication handler is invoked. When registered, the authentication handler cannot be changed or deleted.

## Parameters

<i>cr_flavor</i>	Specifies the authentication type.
<i>auth_handler</i>	Specifies the authentication handler that has two parameters and returns a valid value of the <b>auth_stat</b> type.

## Return Values

0	The subroutine completed successfully.
1	An authentication handler has already registered for the specified authentication type.
-1	An error occurred.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
enum auth_stat auth_handler(struct svc_req *rqst, struct rpc_msg *msg);

main()
{
    char *nettype;
    int no_of_handles, cr_flavor;

    /* Specify transport type */
    nettype = "tcp";

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS, nettype)) == 0)
    {
        fprintf(stdout, "Error in svc_create!");
        exit(EXIT_FAILURE);
    }

    /* select desired cr_flavor */
    cr_flavor = AUTH_NONE;

    /* Register an authentication routine with the dispatch mechanism */
    if(svc_auth_reg(cr_flavor, auth_handler) == -1)
    {
        fprintf(stdout, "Error in svc_auth_reg!");
        exit(EXIT_FAILURE);
    }
}
```

```

    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    /* dispatch routine code */
}

/*following is the sample authentication handler */
enum auth_stat auth_handler(struct svc_req *rqst, struct rpc_msg *msg)
{
    fprintf(stdout, "Entering authentication handler\n");
    return AUTH_OK; /* auth_stat value */
}

```

## Related Information

The “authsys\_create or authsys\_create\_default Subroutine” on page 282, “authnone\_create Subroutine” on page 281, and “auth\_destroy Macro” on page 275.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_control Subroutine

### Purpose

Retrieves information about a client call (a server-side routine).

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
bool_t svc_control(svc, rq, in);
SVCXPRT *svc;
u_int rq;
void *in;

```

### Description

The **svc\_control** subroutine is a top-level subroutine for transport-independent remote procedure calls (TI\_PRC), giving you greater control over communication parameters. The subroutine retrieves the transaction ID of a client call. With the RPC service handle and the operation type specified by the *svc* and *rq* parameters, the subroutine retrieves information with a pointer specified by the *in* parameter.

### Parameters

*svc* Specifies the RPC service handle of a registered service.

*rq* Represents an operation type. You can specify the **SVCGET\_XID** operation type:

#### **SVCGET\_XID**

This operation returns transaction ID of a client call. The transaction ID uniquely identifies a client request with the version, program number, procedure number and client. The transaction ID is retrieved from the RPC service handle. Only the RPC service handle of a connection-oriented or connectionless transport has transaction ID. For other handles, the function returns false.

*in* Points to information that can be retrieved.

## Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    int in;
    struct netconfig *nconf;
    SVCXPRT *svc_handle;

    svc_unreg(PROG, VERS);

    /* Get transport type*/

    nconf = getnetconfigent("tcp");
    if (nconf == (struct netconfig *) NULL)
    {
        fprintf(stderr, "getnetconfigent failed!\n");
        exit(EXIT_FAILURE);
    }

    /* Create RPC service handle and register with RPCBIND service */

    if((svc_handle = svc_tp_create(sample_dispatch, PROG, VERS, nconf)) == (SVCXPRT *)NULL)
    {
        fprintf(stderr, "Error in svc_tp_create!");
        exit(EXIT_FAILURE);
    }

    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    int in=0;
    /* dispatch routine code */
    /* Retrieve the information about the registered service */
    if(svc_control(xpvt, SVCGET_XID, (void *)&in) == FALSE)
    {
        fprintf(stderr, "Error in svc_control!");
    }
}
```

```

        exit(EXIT_FAILURE);
    }
}

```

## Related Information

The “svc\_create Subroutine,” “rpc\_control Subroutine” on page 377, “clnt\_control Macro” on page 292.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_create Subroutine

### Purpose

Creates remote procedure call (RPC) service handles for all specified transports.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
int svc_create(dispatch, prog, vers, nettype);
void (*dispatch) (const struct svc_req*, const SVCXPRT*);
const rpcprog_t prog;
const rpcvers_t vers;
const char *nettype;

```

### Description

This subroutine is a top-level API for transport-independent remote procedure calls (TI\_PRC), giving you greater control over communication parameters. This subroutine creates RPC service handles and registers with RPC service package with the specified program and version for all transports of the class specified by the *nettype* parameter. If the value of the *nettype* parameter is NULL, the subroutine searches transports in the NETPATH environment variable from left to right. If the value of the NETPATH variable is also NULL or unset, the subroutine searches in the **netconfig** database from top to bottom. After creating the handle, call the **svc\_run** subroutine that waits for a service request to arrive. When a service request from the client for the specified program and version arrives, a dispatch subroutine is called.

### Parameters

<i>dispatch</i>	Specifies a subroutine that is called when a service request arrives.
<i>prog</i>	Represents the program number.
<i>vers</i>	Represents the version number.
<i>nettype</i>	Defines a class of transports that can be used for a particular application.

### Return Values

the number of RPC service handles that are created	successful
0	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    char *nettype;
    int no_of_handles;

    /* initialize transport type */
    nettype = "tcp";

    /* Create RPC service handle and register with RPCBIND service */

    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }

    svc_run();

    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    /* dispatch routine code */
}
```

## Related Information

The “svc\_tp\_create Subroutine” on page 447, “svc\_tli\_create Subroutine” on page 446, “svc\_reg Subroutine” on page 438, “svc\_control Subroutine” on page 412, “rpc\_reg Subroutine” on page 400 and “svc\_destroy Macro.”

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_destroy Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

### svc\_destroy Macro Exported from the libc Library

#### Purpose

Destroys a Remote Procedure Call (RPC) service transport handle.

#### Library

C Library (**libc.a**)

## Syntax

```
#include <rpc/rpc.h>
```

```
void svc_destroy ( xprt)  
SVCXPRT *xprt;
```

## Description

The **svc\_destroy** macro destroys an RPC service transport handle. Destroying the service transport handle deallocates the private data structures, including the handle itself. After the **svc\_destroy** macro is used, the handle pointed to by the *xprt* parameter is no longer defined.

## Parameters

*xprt*      Points to the RPC service transport handle.

## Related Information

The **clnt\_destroy** macro, **svc\_freeargs** macro.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_destroy Macro Exported from the libnsl Library

### Purpose

Destroys a remote procedure call (RPC) service handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>  
void svc_destroy(xprt)  
SVCXPRT *xprt;
```

### Description

This subroutine is a top-level API for transport-independent remote procedure calls (TI\_PRC), giving you greater control over communication parameters. This subroutine destroys the RPC service handle that is created when registering the service. This subroutine deallocates all of the private data structures that are allocated when the handle is created and the handle itself.

### Parameters

*xprt*                      Points to the RPC service handle.

### Examples

```
#include <stdlib.h>  
#include <rpc/rpc.h>  
#include <netconfig.h>  
  
#define PROG 0x3fffffffL  
#define VERS 0x1L  
  
static void sample_dispatch();  
  
main()  
{
```

```

SVCXPRT *svc_handle;
int fd;
struct netconfig *nconf;

/* Get required file descriptor, and transport type */

/* Create RPC service handle */
if((svc_handle = svc_tli_create(fd, nconf, 0, 0, 0)) == (SVCXPRT *)NULL)
{
    fprintf(stdout,"Error in svc_tli_create!");
    exit(EXIT_FAILURE);
}

/* Register RPC service using RPC service handle with RPCBIND package*/
if(svc_reg(svc_handle, PROG, VERS, sample_dispatch, nconf) == 0)
{
    fprintf(stdout,"Error in svc_reg!");

    /*Destroy the RPC service handle as service is not registered*/
    svc_destroy(svc_handle);
    exit(EXIT_FAILURE);
}

svc_run();
return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}

```

## Related Information

The “svc\_create Subroutine” on page 414, “svc\_control Subroutine” on page 412.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_dg\_create Subroutine

### Purpose

Creates a remote procedure call (RPC) service handle for a connectionless transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
SVCXPRT *svc_dg_create(fd, sendsize, recvsize)
int fd;
const uint_t sendsize;
const uint_t recvsize;

```

### Description

The **svc\_dg\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). Bottom-level APIs provide a full control over the transport options. The subroutine creates an RPC service handle for a connectionless transport. You can use this handle for procedures that accept a

small number of arguments or return small values, because connectionless messages can hold limited amount of data. This subroutine does not register a server with RPC services because the program number and version number are not specified.

## Parameters

<i>fd</i>	Indicates an open file descriptor that is bound.
<i>sendsize</i>	Specify the send buffer size. If the value is set to 0, the default size for that transport is used.
<i>recvsize</i>	Specify the receive buffer size. If the value is set to 0, the default size for that transport is used.

## Return Values

an RPC service handle	successful
NULL	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

main()
{
    SVCXPRT *svc_handle;    /* server handle */
    int fd;

    /* Get proper file descriptor */

    /* sendsize and recvsize are 0, thus default size will be chosen */

    if((svc_handle = svc_dg_create(fd, 0, 0))!=(SVCXPRT *)NULL)
    {
        fprintf(stdout,"Error in svc_dg_create!");
        exit(EXIT_FAILURE);
    }

    /* Register RPC service */

    svc_run();
    return 0;
}
```

## Related Information

The “svc\_vc\_create Subroutine” on page 452, and “svc\_fd\_create Subroutine” on page 423.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_dg\_enablecache Subroutine

### Purpose

Allocates the duplicate request cache for the service endpoint.



## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
int svc_dg_enablecache(xprt, cachesz )
SVCXPRT *xprt;
const uint_t cachesz;
```

## Description

This subroutine allocates the duplicate request cache for the RPC service handle specified by the *xprt* parameter that can hold cache entries whose number are specified by the *cachesz* parameter. Request caching is useful for operations that cannot be performed twice with the same result. When the cache mechanism is enabled, the mechanism cannot be disabled.

## Parameters

<i>xprt</i>	Indicates the RPC service handle.
<i>cachesz</i>	Indicates the number of cache entries.

## Return Values

1	successful
0	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    SVCXPRT *svc_handle;
    struct netconfig *nconf;

    svc_unreg(PROG,VERS);

    /* Get desired transport type */
    nconf = getnetconfig("tcp");
    if(nconf == NULL)
    {
        fprintf(stderr, "\nError in getnetconfig!\n");
        exit(EXIT_FAILURE);
    }

    /* Create svc_handle */
    svc_handle = svc_tli_create(RPC_ANYFD, nconf, NULL, 0, 0);
    if(svc_handle == (SVCXPRT *)NULL)
    {
        fprintf(stdout, "Error in svc_tli_create!");
        exit(EXIT_FAILURE);
    }
}
```

```

/* Register dispatch routine for prog and vers with RPCBIND service */
if(svc_reg(svc_handle, PROG, VERS, sample_dispatch,nconf) == 0)
{
    fprintf(stdout,"Error in svc_reg!");
    exit(EXIT_FAILURE);
}

/* This subroutine allocates duplicate cache */
if( svc_dg_enablecache(svc_handle,5) == 0)
{
    fprintf(stdout,"Error in svc_dg_enablecache!");
    exit(EXIT_FAILURE);
}

svc_run();

fprintf(stderr,"\nError in svc_run!\n");
exit(EXIT_FAILURE);
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_done Subroutine

### Purpose

Frees the resources allocated to service a client request.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
int svc_done(xprt )
SVCXPRT *xpvt;

```

### Description

The **svc\_done** subroutine frees the resources allocated to service a client request. The subroutine is used when the server is in the user-multithreaded mode. If used in the single-threaded mode or in the AUTO-MT mode, the subroutine has no effect. This subroutine is normally called in a service procedure before the return, when the remote procedure call (RPC) request has been serviced or when any abnormal condition occurs.

**Note:** You can set the server in multithreaded mode using the **rpc\_control** subroutine.

## Parameters

*xprt* Identifies the service handle.

## Return Values

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <pthread.h>

rpcprog_t prognum;
rpcvers_t progver;

/* create threads to serv multiple client requests */
void * thread_func(void * xprt)
{
    int result = 3;

    if(svc_sendreply((SVCXPRT *) xprt, (xdrproc_t) xdr_int,
                    (char *) &result) == FALSE)
        svcerr_systemerr(xprt);

    /* call to svc_done which frees resources allocated */
    svc_done((SVCXPRT *)xprt);

    pthread_exit(0);
}

/* dispatch routine */
static void dispatch(struct svc_req * request, SVCXPRT * xprt)
{
    int ret;
    pthread_t tid;

    if((ret = pthread_create(&tid, NULL, thread_func,
                            (void *)xprt)) != 0)
    {
        fprintf(stderr, "\nError in pthread_create.\n");
        exit(2);
    }
}

int main()
{
    int num, mode;

    prognum = 0x3fffffffL;
    progver = 0x1L;

    svc_unreg(prognum, progver);

    /* register RPC service */
    num = svc_create(dispatch, prognum, progver, "tcp");
    if (num == 0)
    {
        fprintf(stderr, "Error in svc_create.\n");
        exit(EXIT_FAILURE);
    }

    /* server in USER-MT mode */

    mode = RPC_SVC_MT_USER;
```

```

    if(rpc_control(RPC_SVC_MTMODE_SET,&mode) == FALSE)
    {
        fprintf(stderr,"\nError in rpc_control!\n");
        exit(EXIT_FAILURE);
    }

    svc_run();
    exit(1);
}

```

## Related Information

The “svc\_exit Subroutine” and “rpc\_control Subroutine” on page 377.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_exit Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svc\_exit Subroutine Exported from the libc Library

#### Purpose

Causes the **svc\_run** service loop to terminate and return.

#### Library

Network Services Library (**libnsl.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svc_exit (void);
```

#### Description

The **svc\_exit** subroutine causes the **svc\_run** loop to terminate and return to the caller. This subroutine can be called by a service procedure. The call causes all service threads to exit and destroys all server services. Callers must reestablish all services if they wish to resume server activity.

#### Related Information

The “svc\_run Subroutine” on page 442.

### svc\_exit Subroutine Exported from the libnsl Library

#### Purpose

Destroys all remote procedure call services registered by the server.

#### Library

Network Services Library (**libnsl.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svc_exit (void);
```

## Description

The **svc\_exit** subroutine destroys all RPC services registered by server program and forces the **svc\_run** subroutine to return. This subroutine has a global scope and thus all server activities are stopped. To restart the RPC server activities, you must reregister RPC services.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <pthread.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    SVCXPRT *svc_handle;
    struct netconfig *nconf;

    /* Create svc_handle using server handle creation routines and get transport type */

    /* Register dispatch routine for program number and version number with RPCBIND service */

    svc_run();
    fprintf(stdout, "\nAfter svc_run()!\n");

    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    /* code for dispatch routine */
    svc_exit();
}

```

## Related Information

The “svc\_run Subroutine” on page 442.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_fd\_create Subroutine

### Purpose

Creates a remote procedure call (RPC) service handle on an open and bound file descriptor.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
SVCXPRT *svc_fd_create(fd, sendsize, recvsize)
int fd;
const uint_t sendsize;
const uint_t recvsize;
```

## Description

The **svc\_fd\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). Bottom-level APIs provide a full control over the transport options. This subroutine creates a service handle over a given file descriptor. The file descriptor must be open and bound that is connected to a connection-oriented transport. This subroutine does not register a server with RPC services because the program number and version number are not specified. The size of the send and receive buffers can be specified by the *sendsize* and *recvsize* parameters. If the values of the *sendsize* and *recvsize* parameters are set to 0, the default size is used for buffers.

## Parameters

<i>fd</i>	Indicates an open file descriptor that is bound.
<i>sendsize</i>	Specify the send buffer size. If the value is set to 0, the default size for that transport is used.
<i>recvsize</i>	Specify the receive buffer size. If the value is set to 0, the default size for that transport is used.

## Return Values

an PRC service handle	successful
NULL	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

main()
{
    SVCXPRT *svc_handle;    /* server handle */
    int fd;                /* file descriptor */
    /* Get proper file descriptor */

    /* sendsize and recvsize are 0, thus default size will be chosen */

    if((svc_handle = svc_fd_create(fd, 0, 0))==(SVCXPRT *)NULL)
    {
        fprintf(stdout,"Error in svc_fd_create!");
        exit(EXIT_FAILURE);
    }

    /* Register RPC service */

    svc_run();
    return 0;
}
```

## Related Information

The “svc\_dg\_create Subroutine” on page 417, and “svc\_vc\_create Subroutine” on page 452.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_fdset Global Variable

### Purpose

Indicates the read-file descriptor bit mask of the remote procedure call (RPC) server.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
fd_set svc_fdset
```

### Description

The **svc\_fdset** global variable is a read-only global variable, indicating the read-file descriptor bit mask of the remote procedure call (RPC) server. The variable is normally used when the server handles RPC requests asynchronously (the **svc\_run** subroutine is not used). The value of the **svc\_fdset** global variable might change after calls to the **svc\_getreqset**, **svc\_getreq\_poll** or other RPC service handle creation subroutines. The value of the **svc\_fdset** global variable is limited to 1024. Servers running in MT mode cannot read this variable. Instead they can create auxiliary threads to handle asynchronous requests.

**Note:** Do not pass the address of this variable to any of the select subroutines. Instead pass a copy of the address.

### Related Information

The “svc\_pollfd Global Variable” on page 436 and “svc\_max\_pollfd Global Variable” on page 436.

The “svc\_getreqset Subroutine” on page 433 and “svc\_getreq\_poll Subroutine” on page 432.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_freeargs Macro

**Important:** The macro is exported from both the **libc** and the **libnsl** libraries.

### svc\_freeargs Macro Exported from the libc Library

#### Purpose

Frees data allocated by the Remote Procedure Call/eXternal Data Representation (RPC/XDR) system.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>

svc_freeargs ( xprt, inproc, in)
SVCXPRT *xprt;
xdrproc_t inproc;
char *in;
```

## Description

The **svc\_freeargs** macro frees data allocated by the RPC/XDR system. This data is allocated when the RPC/XDR system decodes the arguments to a service procedure with the **svc\_getargs** macro.

## Parameters

*xprt* Points to the RPC service transport handle.  
*inproc* Specifies the XDR routine that decodes the arguments.  
*in* Specifies the address where the procedure arguments are placed.

## Related Information

The **svc\_getargs** macro, **svc\_destroy** macro.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_freeargs Macro Exported from the libnsl Library

### Purpose

Frees data allocated by the Remote Procedure Call/eXternal Data Representation (RPC/XDR) system.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
svc_freeargs ( xprt, inproc, in)
SVCXPRT *xprt;
xdrproc_t inproc;
caddr_t in;
```

## Description

The **svc\_freeargs** macro frees data allocated by the RPC/XDR system. This data is allocated when the RPC/XDR system decodes the arguments to a service procedure with the **svc\_getargs** macro.

## Parameters

*xprt* Points to the RPC service transport handle.  
*inproc* Specifies the XDR routine that decodes the arguments.  
*in* Specifies the address where the procedure arguments are placed.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
```



```

    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }

    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    int args,result;

    /* decode argument from client using xdr_int() */
    if (svc_getargs(xpvt, (xdrproc_t)xdr_int,(caddr_t)&args) == FALSE)
    {
        svcerr_decode(xpvt);
        fprintf(stdout,"Error in svc_getargs!");
        return;
    }

    /* call service procedure */

    /* free allocated data */
    if (svc_freeargs(xpvt, (xdrproc_t)xdr_int,(caddr_t)&args) == FALSE)
    {
        fprintf(stdout,"Error in svc_freeargs!");
        return;
    }
    /* send reply to client */
    if(!svc_sendreply(xpvt,(xdrproc_t)xdr_int,(caddr_t)&result))
    {
        fprintf(stdout,"Error in svc_sendreply!");
        svcerr_systemerr(xpvt);
    }
}

```

## Related Information

The “svc\_getargs Macro.”

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_getargs Macro

**Important:** The macro is exported from both the **libc** and the **libnsi** libraries.

### svc\_getargs Macro Exported from the libc Library

#### Purpose

Decodes the arguments of a Remote Procedure Call (RPC) request.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
svc_getargs ( xprt, inproc, in)
SVCXPRT *xprt;
xdrproc_t inproc;
char *in;
```

## Description

The **svc\_getargs** macro decodes the arguments of an RPC request associated with the RPC service transport handle.

## Parameters

*xprt* Points to the RPC service transport handle.  
*inproc* Specifies the eXternal Data Representation (XDR) routine that decodes the arguments.  
*in* Specifies the address where the arguments are placed.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **svc\_freeargs** macro.

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_getargs Macro Exported from the libnsl Library

### Purpose

Decodes the arguments of a Remote Procedure Call (RPC) request.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
svc_getargs (xprt, inproc, in)
SVCXPRT *xprt;
xdrproc_t inproc;
caddr_t in;
```

## Description

The **svc\_getargs** macro decodes the encoded arguments of an RPC request associated with the RPC service transport handle. The arguments can then be passed to the service procedure for further processing.

## Parameters

*xprt* Points to the RPC service transport handle.  
*inproc* Specifies the eXternal Data Representation (XDR) routine that decodes the arguments.  
*in* Specifies the address where the arguments are placed.

## Return Values

TRUE	successful
FALSE	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */

    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }

    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int args,result;

    /* decode argument from client using xdr_int() */
    if (svc_getargs(xprt, (xdrproc_t)xdr_int,(caddr_t)&args) == FALSE)
    {
        svcerr_decode(xprt);
        fprintf(stdout,"Error in svc_getargs!");
        return;
    }
    /* call service procedure */

    /* free allocated data */
    if (svc_freeargs(xprt, (xdrproc_t)xdr_int,(caddr_t)&args) == FALSE)
    {
        fprintf(stdout,"Error in svc_freeargs!");
        return;
    }

    /* send reply to client */
    if(!svc_sendreply(xprt,(xdrproc_t)xdr_int,(caddr_t)&result))
    {
        fprintf(stdout,"Error in svc_sendreply!");
        svcerr_systemerr(xprt);
    }
}
```

## Related Information

The “svc\_freeargs Macro” on page 425.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_getcaller Macro

### Purpose

Gets the network address of the caller of a procedure.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
struct sockaddr_in *  
svc_getcaller ( xprt )  
SVCXPRT *xprt;
```

### Description

The **svc\_getcaller** macro retrieves the network address of the caller of a procedure associated with the Remote Procedure Call (RPC) service transport handle.

### Parameters

*xprt*      Points to the RPC service transport handle.

### Related Information

The **svc\_register** subroutine, **svc\_run** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_getreq\_common Subroutine

### Purpose

Handles remote procedure call (RPC) service requests on a given file descriptor.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>  
void svc_getreq_common( fd )  
int fd;
```

### Description

The **svc\_getreq\_common** subroutine is used to handle the RPC service request on a specified file descriptor. You can use the subroutine after calling the **poll** or **select** subroutine. The **svc\_getreq\_common** subroutine is generally used when a server wants to handle RPC service requests asynchronously (the **svc\_run** subroutine is not used).

## Parameters

*fd* Specifies a file descriptor on which the RPC service request arrives.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <poll.h>

void my_svc_getreq_poll(struct pollfd * poll_fd, int retval)
{
    int i;
    int ds;

    for (i = fds = 0; fds < retval; i++) {

        /* for all file descriptors check if input is pending
        and handle the request on that file descriptor */

        svc_getreq_common(poll_fd[i]);
    }
}
main()
{

    int no_of_fds;
    int i;
    struct pollfd pollfd_set[1024];

    /* Register RPC Service */

    /* serve client's requests asynchronously */
    while(1)
    {
        /* initialize the pollfd_set array and
        get no of file descriptors in "no_of_fds"*/

        /* Keep polling on file descriptors */
        switch (i = poll(pollfd_set, no_of_fds, -1))
        {
            case -1:
            case 0:
                continue;
            default:
                /* Handle RPC request on each file descriptor */
                my_svc_getreq_poll(pollfd_set, i);
        }
    }
}
```

## Related Information

The “svc\_getreq\_poll Subroutine” on page 432 and “svc\_getreqset Subroutine” on page 433.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_getreq\_poll Subroutine

### Purpose

Handles remote procedure call (RPC) requests on an RPC file descriptor asynchronously.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svc_getreq_poll(poll_fd, retval)
struct pollfd *poll_fd;
int retval;
```

### Description

This subroutine handles RPC requests on an RPC file descriptor asynchronously (when the **svc\_run** subroutine is not used). Call the subroutine after calling the **poll** subroutine, which determines that RPC service requests have arrived in RPC file descriptors.

### Parameters

<i>poll_fd</i>	Represents the array of the <b>pollfd</b> structures on which the polling operation is done.
<i>retval</i>	Represents the value returned by the <b>poll</b> subroutine.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <poll.h>

main()
{
    int no_of_fds;
    int i;
    struct pollfd pollfd_set[1024];

    /* Register RPC Service */

    /* serve client's requests asynchronously */
    while(1)
    {
        /* initialize the pollfd_set array and
         get no of file descriptors in "no_of_fds"*/

        /* Keep polling on file descriptors */
        switch (i = poll(pollfd_set, no_of_fds, -1))
        {
            case -1:
            case 0:
                continue;
            default:
                /* Handle RPC request on each file descriptor */
                svc_getreq_poll(pollfd_set, i);
        }
    }
}
```

## Related Information

The “`svc_getreq_common` Subroutine” on page 430 and “`svc_getreqset` Subroutine.”

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_getreqset Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

## svc\_getreqset Subroutine Exported from the libc Library

### Purpose

Services a Remote Procedure Call (RPC) request.

### Library

C Library (**libc.a**)

### Syntax

```
#include <sys/types.h>
#include <sys/select.h>
#include <rpc/rpc.h>
```

```
void svc_getreqset ( rdfs)
fd_set *rdfs;
```

### Description

The **svc\_getreqset** subroutine is only used if a service implementor does not call the **svc\_run** subroutine, but instead implements custom asynchronous event processing. The subroutine is called when the **select** subroutine has determined that an RPC request has arrived on any RPC sockets. The **svc\_getreqset** subroutine returns when all sockets associated with the value specified by the *rdfs* parameter have been serviced.

### Parameters

*rdfs* Specifies the resultant read-file descriptor bit mask.

### Restrictions

In AIX® 5.2, the maximum number of open file descriptors that an RPC server can use has been set to 32767 so that compatibility can be maintained with RPC-server applications built on earlier releases of AIX®.

The **fd\_set** type passed into the **svc\_getreqset** subroutine must be compiled with **FD\_SETSIZE** set to 32767 or larger. Passing in a smaller **fd\_set** argument can cause the **svc\_getreqset** subroutine to overrun the passed-in buffer.

### Related Information

The **select** subroutine, **svc\_run** subroutine.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX Version 6.1 Communications Programming Concepts*.

# svc\_getreqset Subroutine Exported from the libnsl Library

## Purpose

Serves a Remote Procedure Call (RPC) request.

## Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
void svc_getreqset ( rfdsets)
fd_set *rfdsets;
```

## Description

The **svc\_getreqset** subroutine is used only when RPC service requests are handled asynchronously (the **svc\_run** subroutine is not used). The subroutine is called after a call to the **select** subroutine that determines that an RPC request has arrived on RPC file descriptors. The **svc\_getreqset** subroutine returns when all file descriptors specified by the *rfdsets* parameter have been serviced.

## Parameters

*rfdsets* Specifies the resultant read-file descriptor bit mask.

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <sys/types.h>
#include <sys/select.h>

main()
{
    fd_set rfdsets;

    /* Register RPC Service */

    /* serve client's requests asynchronously */
    while(1)
    {
        rfdsets = svc_fdset;

        /* get max value that newly created file descriptor can have in "tb_size" */

        switch (select(tb_size, &rfdsets, NULL,NULL,NULL))
        {
            case -1:
            case 0 :
                break;
            default:
                /* Handle RPC request on each file descriptor */
                svc_getreqset(&rfdsets);
        }
    }
}
```

In the example, the **svc\_run** subroutine is replaced by a while loop that handles RPC requests asynchronously.

## Related Information

The “**svc\_getreq\_poll** Subroutine” on page 432, “**svc\_getreq\_common** Subroutine” on page 430, and “**svc\_run** Subroutine” on page 442.



## svc\_getrpccaller Subroutine

### Purpose

Gives the network address of a caller of a procedure (a server-side subroutine).

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
struct netbuf *svc_getrpccaller( xprt );
SVCXPRT *xprt;
```

### Description

The **svc\_getrpccaller** subroutine gives network address of a caller of a procedure associated with the remote procedure call (RPC) service handle.

### Parameters

*xprt*                                Represents the RPC service handle.

### Return Values

On successful completion, the **svc\_getrpccaller** subroutine returns network address of a caller.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype;
    int no_of_handles;

    nettype = "tcp";

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
```

```

int result;
struct netbuf *clntaddr;

/* Get client's name and address */
clntaddr = svc_getrpccaller(xprt);

/* send reply back to client */
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_max\_pollfd Global Variable

### Purpose

Indicates the maximum length of the **svc\_pollfd** array.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
pollfd_t *svc_pollfd;

```

### Description

The **svc\_max\_pollfd** global variable is a read-only global variable indicating the maximum length of the **svc\_pollfd** array. This variable is generally used when the **svc\_run** subroutine is not used and a server wants to handle remote procedure call (RPC) service requests asynchronously. Its value might change when the **svc\_getreq\_poll** subroutine is called or when other RPC service handle-creation subroutines are called.

## Related Information

The “svc\_fdset Global Variable” on page 425 and “svc\_pollfd Global Variable.”

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_pollfd Global Variable

### Purpose

Points to an array of the **pollfd\_t** structures representing the read-file descriptor of a remote procedure call (RPC) server.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
pollfd_t *svc_pollfd

```

## Description

The **svc\_pollfd** global variable is a read-only global variable pointing to an array of the **pollfd\_t** structures representing the read-file descriptor of an RPC server. Use this variable only when the **svc\_run** subroutine is not used and the server wants to handle RPC service requests asynchronously. The value of the variable might change when the **svc\_getreq\_poll** subroutine is called or when other RPC service handle-creation subroutines are called. By default, the **svc\_pollfd** global variable contains 1024 entries. You can change the value using the **rpc\_control** subroutine.

**Note:** Do not pass the address of this variable to any of the select subroutines. Pass a copy of the address instead.

## Related Information

The “svc\_fdset Global Variable” on page 425 and “svc\_max\_pollfd Global Variable” on page 436.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_raw\_create Subroutine

### Purpose

Creates a remote procedure call (RPC) handle for raw interfaces.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
SVCXPRT *svc_raw_create (void)
```

### Description

The **svc\_raw\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). Bottom-level APIs provide a full control over the transport options. This subroutine creates an RPC service handle for raw interfaces. The transport type is a buffer in the address space of the process. Thus the client must be in the same address space. This subroutine provides simulation of the RPC service with all RPC overheads without actually using any network interface. This subroutine does not register a server with an RPC service package because the program number and version number are not specified.

**Note:** Do not use the **svc\_run** subroutine over raw interfaces.

### Return Values

an PRC service handle	successful
NULL	unsuccessful

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

main()
{
```

```

SVCXPRT *svc_handle;      /* server handle */

/* create server handle using svc_raw_create */
if((svc_handle=svc_raw_create())==(SVCXPRT *)NULL)
{
    fprintf(stdout,"Error in svc_raw_create!");
    exit(EXIT_FAILURE);
}

/* Note that transport type passed to svc_reg() is NULL */
if(svc_reg(svc_handle, PROG, VERS, sample_dispatch, NULL) == 0)
{
    fprintf(stdout,"Error in svc_reg!");
    exit(EXIT_FAILURE);
}

/* note that here svc_run() is not called */
/* To call registered procedure, client should be in same address space */

return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_reg Subroutine

### Purpose

Associates the program number and version number with a service-dispatch subroutine.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>

int svc_reg( xpvt, prog, vers, dispatch, nconf)
const SVCXPRT *xpvt;
const rpcprog_t prog;
const rpcvers_t vers;
void (*dispatch)(struct svc_req *, SVCXPRT *);
const struct netconfig *nconf;

```

### Description

The **svc\_reg** subroutine is an expert-level API for transport-independent remote procedure calls (TI\_PRC). This subroutine registers the program number and version with the RPC service package on the transport that is specified by the *nconf* parameter. This subroutine associates the program number and version number with a service-dispatch subroutine. If you set the *nconf* parameter to a null value, the service is not registered with the **rpcbind** service. Otherwise, the service is registered with the **rpcbind** service.

## Parameters

<i>xprt</i>	Specifies an RPC service handle.
<i>prog</i>	Specifies the program number.
<i>vers</i>	Specifies the version number.
<i>dispatch</i>	Specifies the subroutine that is called when a service request arrives.
<i>nconf</i>	Defines a <b>netconfig</b> structure that specifies the type of transport.

## Return Values

1	successful
0	unsuccessful

## Examples

In the following example, before the **svc\_reg** subroutine is called, an RPC service handle must be created with the **svc\_dg\_create**, **svc\_vc\_create**, **svc\_fd\_create** subroutines and so on.

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    SVCXPRT *svc_handle;
    struct netconfig *nconf;

    /* Get transport type */
    nconf = getnetconfig("tcp");
    if(nconf == NULL)
    {
        fprintf(stderr, "\nError in getnetconfig!\n");
        exit(EXIT_FAILURE);
    }

    /* Create RPC service handle */
    svc_handle = svc_tli_create(RPC_ANYFD, nconf, NULL, 0, 0);
    if(svc_handle == (SVCXPRT *)NULL)
    {
        fprintf(stdout, "Error in svc_tli_create!");
        exit(EXIT_FAILURE);
    }

    /* Register dispatch routine for prog and vers with RPCBIND service */

    if(svc_reg(svc_handle, PROG, VERS, sample_dispatch, nconf) == 0)
    {
        fprintf(stdout, "Error in svc_reg!");
        exit(EXIT_FAILURE);
    }

    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
```

```
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}
```

## Related Information

The “svc\_fd\_create Subroutine” on page 423, “svc\_dg\_create Subroutine” on page 417, “svc\_vc\_create Subroutine” on page 452 “svc\_create Subroutine” on page 414, “svc\_unreg Subroutine” on page 449.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_register Subroutine

### Important:

- The subroutine is exported from both the **libc** and the **libnsl** libraries.

## svc\_register Subroutine Exported from the libc Library

### Purpose

Maps a remote procedure.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
svc_register (xpvt, prognum, versnum, dispatch, protocol)
SVCXPRT * xpvt;
u_long prognum, versnum;
void (* dispatch) ();
int protocol;
```

### Description

The **svc\_register** subroutine maps a remote procedure with a service dispatch procedure pointed to by the *dispatch* parameter. If the *protocol* parameter has a value of 0, the service is not registered with the **portmap** daemon. If the *protocol* parameter does not have a value of 0 (or if it is **IPPROTO\_UDP** or **IPPROTO\_TCP**), the remote procedure triple (*prognum*, *versnum*, and *protocol* parameters) is mapped to the **xpvt->xp\_port** port.

The dispatch procedure takes the following form:

```
dispatch (request, xpvt)
struct svc_req *request;
SVCXPRT *xpvt;
```

### Parameters

<i>xpvt</i>	Points to a Remote Procedure Call (RPC) service transport handle.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>dispatch</i>	Points to the service dispatch procedure.
<i>protocol</i>	Specifies the data transport used by the service.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **pmap\_set** subroutine, **pmap\_getmaps** subroutine, **svc\_unregister** subroutine.

The **portmap** daemon.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_register Subroutine Exported from the libnsl Library

### Purpose

Associates the program and version number with the dispatch subroutine.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>

bool_t svc_register (xprt, prognum, versnum, dispatch, protocol)
SVCXPRT *xprt;
rpcprog_t prognum;
rpcvers_t versnum;
void (* dispatch)();
int protocol;
```

### Description

The **svc\_register** subroutine maps a program and version to a service dispatch procedure pointed to by the *dispatch* parameter. If the value of the *protocol* parameter is 0, the service is not registered with the **portmap** daemon. If the value of the *protocol* parameter is not 0 (or it is **IPPROTO\_UDP** or **IPPROTO\_TCP**), the remote procedure triplet (the program, the version, and the protocol) is mapped to the *xprt->xp\_port* port.

The **svc\_register** subroutine is obsolete. Use the **svc\_reg** subroutine instead.

The dispatch procedure has the following form:

```
dispatch (request, xprt)
struct svc_req *request;
SVCXPRT *xprt;
```

### Parameters

<i>xprt</i>	Points to a Remote Procedure Call (RPC) service transport handle.
<i>prognum</i>	Specifies the program number of the remote program.
<i>versnum</i>	Specifies the version number of the remote program.
<i>dispatch</i>	Points to the service dispatch procedure.
<i>protocol</i>	Specifies the data transport used by the service.

## Return Values

1	successful
---	------------

## Examples

```
#include <rpc/rpc.h>

static void dispatch(rqstp, transp) /* remote procedure */
struct svc_req *rqstp;
SVCXPRT *transp;
{
    /* Dispatch Routine Code */
}

int main()
{
    SVCXPRT *svc = NULL;
    uint_t sendsz, recvsz;
    int protocol = IPPROTO_TCP;

    /* Set send and receive buffer sizes to 0 so that they are set to default values
     * when svctcp_create() is called
     */
    sendsz = 0;
    recvsz = 0;

    /* Create service handle for tcp transport */
    svc = (SVCXPRT *) svctcp_create(RPC_ANYSOCK, sendsz, recvsz);
    if (svc == NULL) {
        fprintf(stderr, "\nsvctcp_create failed\n");
        exit(1);
    }

    if(svc_register(svc, prognum, versnum, dispatch, protocol)==0);
    {
        fprintf(stderr,"svc_register() failed");
        exit(1);
    }

    /* Accept the client requests */
    svc_run();

    return 0;
}
```

## Related Information

The “svc\_reg Subroutine” on page 438.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_run Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### svc\_run Subroutine Exported from the libc Library

#### Purpose

Waits for a Remote Procedure Call service request to arrive.

#### Library

C Library (**libc.a**)



## Syntax

```
#include <rpc/rpc.h>
void svc_run (void);
```

## Description

The **svc\_run** subroutine waits for a Remote Procedure Call (RPC) service request to arrive. When a request arrives, the **svc\_run** subroutine calls the appropriate service procedure with the **svc\_getreqset** subroutine. This procedure is usually waiting for a **select** subroutine to return.

## Restrictions

In AIX<sup>®</sup> 5.2, the maximum number of open file descriptors that an RPC server can use has been set to 32767 so that compatibility can be maintained with RPC-server applications built on earlier releases of AIX<sup>®</sup>.

## Related Information

The **callrpc** subroutine, **registerrpc** subroutine, **select** subroutine, **svc\_getreqset** subroutine, and “svc\_exit Subroutine” on page 422.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_run Subroutine Exported from the libnsl Library

### Purpose

Waits for a Remote Procedure Call service request to arrive.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svc_run (void);
```

### Description

The **svc\_run** subroutine waits for a remote procedure call (RPC) service request to arrive and never returns. When a server is configured in single-threaded mode and if a request arrives, the **svc\_run** subroutine calls the appropriate dispatch subroutine. In the Automatic-MT or User-MT mode, this subroutine must be called exactly once. In the Automatic-MT mode, a new thread is created for each new RPC request. In the User-MT mode, the **svc\_run** subroutine does not create threads, and you must create threads to serve RPC requests.

### Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    char *nettype;
    int no_of_handles;
    nettype = "tcp";
    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS, nettype)) == 0)
    {
```

```

    fprintf(stdout,"Error in svc_create!");
    exit(EXIT_FAILURE);
}
svc_run();
return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* dispatch routine code */
}

```

## Related Information

The “svc\_getreq\_poll Subroutine” on page 432 and “svc\_getreqset Subroutine” on page 433.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_sendreply Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### svc\_sendreply Subroutine Exported from the libc Library

#### Purpose

Sends back the results of a remote procedure call.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```

svc_sendreply ( xpvt, outproc, out)
SVCXPRT *xpvt;
xdrproc_t outproc;
char *out;

```

#### Description

The **svc\_sendreply** subroutine sends back the results of a remote procedure call. This subroutine is called by a Remote Procedure Call (RPC) service dispatch subroutine.

#### Parameters

<i>xpvt</i>	Points to the RPC service transport handle of the caller.
<i>outproc</i>	Specifies the eXternal Data Representation (XDR) routine that encodes the results.
<i>out</i>	Points to the address where results are placed.

#### Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

eXternal Data Representation (XDR) Overview for Programming and Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_sendreply Subroutine Exported from the libnsl Library

### Purpose

Sends back the results of a remote procedure call.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
bool_t svc_sendreply(xprt, oproc, output)
const SVCXPRT *xprt;
const xdrproc_t oproc;
caddr_t output;
```

### Description

The **svc\_sendreply** subroutine sends back the results of a remote procedure call (RPC). This subroutine is called by an RPC service dispatch subroutine. This subroutine encodes the result from a service procedure into the eXternal Data Representation (XDR) format with a specified XDR procedure, and then sends the procedure back to a client.

### Parameters

<i>xprt</i>	Points to the RPC service transport handle of the caller.
<i>oproc</i>	Specifies the eXternal Data Representation (XDR) routine that encodes the results.
<i>output</i>	Points to the address where results are placed.

### Return Values

TRUE	successful
FALSE	unsuccessful

### Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype;
    int no_of_handles;

    nettype = "tcp";
    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout, " Error in svc_create ");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int result;
```

```

/* Some code to call appropriate service procedure.
 * Procedure will return its result.
 */
/* Send the result back to client */
if(!svc_sendreply(xprt,(xdrproc_t)xdr_int,(caddr_t)&result))
{
    fprintf(stdout, " Error in svc_create ");
    svcerr_systemerr(transp);
}
}

```

## Related Information

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_tli\_create Subroutine

### Purpose

Creates a remote procedure call (RPC) service handle for the specified transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
SVCXPRT *svc_tli_create(fd, nconf, bind_addr, sendsize, recvsz)
int fd;
const struct netconfig *nconf;
const struct t_bind *bind_addr;
const uint_t sendsize;
const uint_t recvsz ;

```

### Description

The subroutine is an expert-level API for transport-independent remote procedure calls (TI\_PRC). This subroutine creates an RPC service handle on a given file descriptor and returns a pointer to it. The server is not registered with an RPC service package because the program and version numbers are not specified. If you specify the *fd* parameter with the **RPC\_ANYFD** value, the file descriptor on the specified transport is opened. If the file descriptor is open but unbound, and you specify the *bind\_addr* parameter with a valid address, the file descriptor is bound by the given address. If the file descriptor is open and unbound, and the value of the *bind\_addr* parameter is NULL, the default address for the transport is used and the number of connections for the connection-oriented transport is set to 8.

### Parameters

<i>fd</i>	Indicates an open file descriptor that is bound or unbound.
<i>nconf</i>	Indicates type of transport.
<i>bind_addr</i>	Indicates address to which the file descriptor is to be bound. The value can be a valid address or NULL.
<i>sendsize</i>	Specify the send buffer size. If the value is set to 0, the default size for is used.
<i>recvsz</i>	Specify the receive buffer size. If the value is set to 0, the default size is used.

## Return Values

a service handle	successful
NULL	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

main()
{
    SVCXPRT *svc_handle;      /* server handle */
    struct netconfig *nconf;

    /* get proper file descriptor */

    /* get transport type */
    nconf = getnetconfigent("tcp");
    if (nconf == (struct netconfig *) NULL)
    {
        fprintf(stderr, "getnetconfigent failed\n");
        exit(EXIT_FAILURE);
    }

    /* sendsize and recvsiz are 0, thus default size will be chosen */
    if((svc_handle=svc_tli_create(fd, nconf, 0, 0, 0))==(SVCXPRT *)NULL)
    {
        fprintf(stdout,"Error in svc_tli_create!");
        exit(EXIT_FAILURE);
    }

    /* Register RPC service using RPC service handle with RPCBIND package */
    svc_run();
    return 0;
}
```

## Related Information

The “svc\_tp\_create Subroutine,” “svc\_vc\_create Subroutine” on page 452, “svc\_dg\_create Subroutine” on page 417, and “svc\_fd\_create Subroutine” on page 423.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_tp\_create Subroutine

### Purpose

Creates a server handle for the specified transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
SVCXPRT *svc_tp_create(dispatch, prog, vers, nconf);
void (*dispatch)(struct svc_req*, SVCXPRT*);
const rpcprog_t prog;
const rpcvers_t vers;
const struct netconfig *nconf;
```

## Description

The subroutine is an intermediate-level API for transport-independent remote procedure calls (TI\_PRC). This subroutine creates and returns a service handle for the transport specified by *nconf* parameter. The subroutine also registers a server with the RPCBIND service. When a request arrives for the specified program and version, a subroutine specified by the *dispatch* parameter is called. Call the **svc\_run** subroutine so that the server can listen to the requests from clients.

## Parameters

<i>dispatch</i>	Specifies the subroutine that is called when a service request arrives.
<i>prog</i>	Specifies the program number.
<i>vers</i>	Specifies the version number.
<i>nconf</i>	Indicates a type of transport.

## Return Values

a service handle	successful
NULL	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();

main()
{
    SVCXPRT *svc_handle; /* server handle */
    struct netconfig *nconf; /* transport type */

    /* get transport type */
    nconf = getnetconfig("tcp");
    if (nconf == (struct netconfig *) NULL)
    {
        fprintf(stderr, "getnetconfig failed.\n");
        exit(EXIT_FAILURE);
    }

    /* create service handle and register with RPCBIND service */

    if((svc_handle=svc_tp_create(sample_dispatch, PROG, VERS, nconf))==(SVCXPRT *)NULL)
    {
        fprintf(stdout, "Error in svc_tp_create!");
        exit(EXIT_FAILURE);
    }

    svc_run();
    return 0;
}
```

```

}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    /* code for dispatch routine */
}

```

## Related Information

The “svc\_create Subroutine” on page 414, “svc\_tli\_create Subroutine” on page 446, and “svc\_reg Subroutine” on page 438.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_unreg Subroutine

### Purpose

Unregisters the program number and version number with the remote procedure call (RPC) service package.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
void svc_unreg(prog ,vers)
const rpcprog_t prog;
const rpcvers_t vers;

```

### Description

This subroutine is an expert-level API for transport-independent remote procedure calls (TI\_PRC). This subroutine removes the mapping to network address from the RPC service package. The subroutine also unregisters the program number and version number from the dispatch subroutine with the RPC service package. When the subroutine is called, the whole service that is identified by the program and version gets unregistered.

### Parameters

<i>prog</i>	Specifies the program number.
<i>vers</i>	Specifies the version number.

### Examples

```

#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

main()

```

```

{
    SVCXPRT *svc_handle;    /* service handle */
    struct netconfig *nconf;

    /* Get transport type and create RPC service handle. */

    /* Register dispatch routine for prog and vers with RPCBIND service */

    If(svc_reg(svc_handle, PROG, VERS, sample_dispatch,nconf) == 0)
    {
        sprintf(stdout,"Error in svc_reg!");
        exit(EXIT_FAILURE);
    }

    /* Unregister the service with given prog and vers */
    svc_unreg(PROG, VERS);

    return 0;
}

```

## Related Information

The “svc\_reg Subroutine” on page 438.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_unregister Subroutine

### Important:

- The subroutine is exported from both the **libc** and the **libnsl** libraries.

## svc\_unregister Subroutine Exported from the libc Library

### Purpose

Removes mappings between procedures and objects.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
void svc_unregister ( prognum, versnum)
u_long prognum, versnum;
```

### Description

The **svc\_unregister** subroutine removes mappings between dispatch subroutines and the service procedure identified by the *prognum* parameter and the *versnum* parameter. It also removes the mapping between the port number and the service procedure which is identified by the *prognum* parameter and the *versnum* parameter.

### Parameters

*prognum*      Specifies the program number of the remote program.  
*versnum*      Specifies the version number of the remote program.



## Related Information

The `pmap_unset` subroutine, `svc_register` subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svc\_unregister Subroutine Exported from the libnsl Library

### Purpose

Removes mappings between a service procedure and dispatch subroutines.

### Library

Network Services Library (`libnsl.a`)

### Syntax

```
#include <rpc/rpc.h>
void svc_unregister (prognum, versnum)
rpcprog_t prognum;
rpcvers_t versnum;
```

### Description

The `svc_unregister` subroutine removes mappings between dispatch subroutines and the service procedure identified by the `prognum` parameter and the `versnum` parameter. It also removes the mapping between the port number and the triple (the program, the version, the protocol) from the `portmap` daemon.

The `svc_unregister` subroutine is obsolete. Use the `svc_unreg` subroutine instead.

### Parameters

`prognum` Specifies the program number of the remote program.  
`versnum` Specifies the version number of the remote program.

### Examples

```
#include <rpc/rpc.h>

rpcprog_t prognum = 0x3fffffffL;
rpcvers_t versnum = 0x1L;

static void dispatch(rqstp, transp) /* remote procedure */
struct svc_req *rqstp;
SVCXPRT *transp;
{
    /* Dispatch Routine Code */
}

void main_exit_handler()
{
    svc_unregister(prognum,versnum);
}

int main()
{
    SVCXPRT *svc = NULL;
    uint_t sendsz, recvsz;
    int protocol = IPPROTO_TCP;

    /* register exit handler which on exit of server program calls svc_unregister */
    atexit(main_exit_handler)

    /* Set send and receive buffer sizes to 0 so that they are set to default values
```

```

    * when svctcp_create() is called
    */
    sendsz = 0;
    recvsz = 0;

    /* Create service handle for tcp transport */
    svc = (SVCXPRT *) svctcp_create(RPC_ANYSOCK, sendsz, recvsz);
    if (svc == NULL) {
        fprintf(stderr, "\nsvcupdp_create failed\n");
        exit(1);
    }

    if(svc_register(svc, prognum, versnum, dispatch, protocol)==0);
    {
        fprintf(stderr,"svc_register() failed");
        exit(1);
    }

    /* Accept client requests */
    svc_run();

    return 0;
}

```

## Related Information

The “svc\_unreg Subroutine” on page 449.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svc\_vc\_create Subroutine

### Purpose

Creates a remote procedure call (RPC) service handle for connection-oriented transport.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```

#include <rpc/rpc.h>
SVCXPRT *svc_vc_create(fd, sendsize, recvsz)
int fd;
const uint_t sendsize;
const uint_t recvsz;

```

### Description

The **svc\_vc\_create** subroutine is a bottom-level API for transport-independent remote procedure calls (TI\_PRC). Bottom-level APIs provide a full control over the transport options. This subroutine creates an RPC service handle for connection-oriented transport. This subroutine does not register a server with an RPC service package because the program number and version number are not specified.

### Parameters

<i>fd</i>	Indicates an open file descriptor that is bound.
<i>sendsize</i>	Specify the send buffer size. If the value is set to 0, the default size for that transport is used.

*recvsize* Specify the receive buffer size. If the value is set to 0, the default size for that transport is used.

## Return Values

an PRC service handle	successful
NULL	unsuccessful

## Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>

main()
{
    SVCXPRT *svc_handle;    /* server handle */
    int fd;                 /* file descriptor */

    /* Get proper file descriptor */

    /* sendsize and recvsize are 0, thus default size will be chosen */

    if((svc_handle = svc_vc_create(fd, 0, 0))==(SVCXPRT *)NULL)
    {
        fprintf(stdout,"Error in svc_vc_create!");
        exit(EXIT_FAILURE);
    }

    /* Register RPC service */

    svc_run();
    return 0;
}
```

## Related Information

The “*svc\_dg\_create Subroutine*” on page 417, and “*svc\_fd\_create Subroutine*” on page 423.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## svcerr\_auth Subroutine

**Important:** The subroutine is exported from both the **libcrpc** and the **libnsl** libraries.

### svcerr\_auth Subroutine Exported from the libcrpc Library

#### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call due to an authentication error.

#### Library

RPC Library (**libcrpc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_auth ( xprt, why)
SVCXPRT *xprt;
enum auth_stat why;
```

## Description

The **svcerr\_auth** subroutine is called by a service dispatch subroutine that refuses to perform a remote procedure call (RPC) because of an authentication error. This subroutine sets the status of the RPC reply message to **AUTH\_ERROR**.

## Parameters

*xprt* Points to the RPC service transport handle.  
*why* Specifies the authentication error.

## svcerr\_auth Subroutine Exported from the libnsl Library

### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call due to an authentication error.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svcerr_auth ( xprt, why)
const SVCXPRT *xprt;
const enum auth_stat why;
```

## Description

The **svcerr\_auth** subroutine is called by a service dispatch subroutine when an authentication error occurs. This subroutine sets the status of the remote procedure call (RPC) reply message to **RPC\_AUTHERROR**.

## Parameters

*xprt* Points to the RPC service transport handle.  
*why* Specifies the authentication error.

## Examples

In the following example, a dispatch subroutine sends reply back to the client with the reason indicating why an authentication error occurred.

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype;
    int no_of_handles;

    nettype = "tcp";
    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout, " Error in svc_create ");
    }
}
```

```

    exit(EXIT_FAILURE);
}
svc_run();
return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int result;
    enum auth_stat why;

    /* Check for appropriate authentication */
    /* set reason for authentication error */
    why = AUTH_BADCRED;

    /* Send reply to client */
    svcerr_auth(xprt,why);
}

```

## Related Information

The “`svcerr_weakauth` Subroutine” on page 464.

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---

## svcerr\_decode Subroutine

**Important:** The subroutine is exported from both the `libc` and the `libns1` libraries.

### svcerr\_decode Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot decode the parameters of a request.

#### Library

C Library (`libc.a`)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_decode ( xprt)
SVCXPRT *xprt;
```

#### Description

The `svcerr_decode` subroutine is called by a service dispatch subroutine that cannot decode the parameters specified in a request. This subroutine sets the status of the Remote Procedure Call (RPC) reply message to the `GARBAGE_ARGS` condition.

#### Parameters

`xprt` Points to the RPC service transport handle.

## Related Information

The `svc_getargs` macro.

## svcerr\_decode Subroutine Exported from the libnsl Library

### Purpose

Indicates that the service dispatch routine cannot decode the parameters of a request.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svcerr_decode ( xprt)
const SVCXPRT *xprt;
```

### Description

The **svcerr\_decode** subroutine is called by a service dispatch subroutine that cannot decode the parameters specified in a request. This subroutine sets the status of the remote procedure call (RPC) reply message to the **RPC\_CANTDECODEARGS** condition.

### Parameters

*xprt*                Points to the RPC service transport handle.

### Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout, " Error in svc_create ");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int args;

    /* decode argument from client using xdr_int() */
    if (svc_getargs(xprt, (xdrproc_t)xdr_int,(caddr_t)&args) == FALSE)
    {
        svcerr_decode(xprt);
        fprintf(stdout, " Error in svc_create ");
        return;
    }
}
```

## Related Information

The “`svcerr_noproc` Subroutine,” “`svcerr_noprogram` Subroutine” on page 459, “`svcerr_progvers` Subroutine” on page 460, and “`svcerr_systemerr` Subroutine” on page 462.

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---

## svcerr\_noproc Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svcerr\_noproc Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call because the program cannot support the requested procedure.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_noproc ( xprt)  
SVCXPRT *xprt;
```

#### Description

The **svcerr\_noproc** subroutine is called by a service dispatch routine that does not implement the procedure number the caller has requested. This subroutine sets the status of the Remote Procedure Call (RPC) reply message to the **PROC\_UNAVAIL** condition, which indicates that the program cannot support the requested procedure.

**Note:** Service implementors do not usually need this subroutine.

#### Parameters

*xprt*      Points to the RPC service transport handle.

### svcerr\_noproc Subroutine Exported from the libnsl Library

#### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call because the program cannot support the requested procedure.

#### Library

Network Services Library (**libnsl.a**)

#### Syntax

```
#include <rpc/rpc.h>  
void svcerr_noproc ( xprt)  
const SVCXPRT *xprt;
```

## Description

The **svcerr\_noproc** subroutine is called by a service dispatch subroutine when the procedure number that is requested by a caller is not implemented. This subroutine sets the status of the remote procedure call (RPC) reply message to the **RPC\_PROCUNAVAIL** condition, which indicates that the program cannot support the requested procedure.

## Parameters

*xprt* Points to the RPC service transport handle.

## Examples

In the following example, the **svcerr\_noproc** subroutine is called from a dispatch subroutine when a requested procedure is not supported.

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout, " Error in svc_create ");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}
/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int args;

    switch(request->rq_proc)
    {
        case 0:
            svc_sendreply(xprt, (xdrproc_t) xdr_void, (caddr_t) NULL);
            return;
        case 1:
        case 2:
            . . .
        case n:
            /* Call appropriate procedure */
        default:
            svcerr_noproc(xprt);
            return;
    }
}
```

## Related Information

The “[svcerr\\_decode Subroutine](#)” on page 455, “[svcerr\\_noprogram Subroutine](#)” on page 459, “[svcerr\\_progrvers Subroutine](#)” on page 460, and “[svcerr\\_systemerr Subroutine](#)” on page 462.

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---

## svcerr\_noprogram Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svcerr\_noprogram Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call because the requested program is not registered.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_noprogram ( xprt)  
SVCXPRT *xprt;
```

#### Description

The **svcerr\_noprogram** subroutine is called by a service dispatch routine when the requested program is not registered with the Remote Procedure Call (RPC) package. This subroutine sets the status of the RPC reply message to the **PROG\_UNAVAIL** condition, which indicates that the remote server has not exported the program.

**Note:** Service implementors do not usually need this subroutine.

#### Parameters

*xprt*      Points to the RPC service transport handle.

### svcerr\_noprogram Subroutine Exported from the libnsl Library

#### Purpose

Indicates that the service dispatch routine cannot complete a remote procedure call because the requested program is not registered.

#### Library

Network Services Library (**libnsl.a**)

#### Syntax

```
#include <rpc/rpc.h>  
void svcerr_noprogram ( xprt)  
const SVCXPRT *xprt;
```

#### Description

The **svcerr\_noprogram** subroutine is called by a service dispatch routine when the requested program is not registered with the remote procedure call (RPC) package. This subroutine sets the status of the RPC reply message to the **RPC\_PROGUNAVAIL** condition, which indicates that the remote server has not exported the program.

#### Parameters

*xprt*              Points to the RPC service transport handle.

## Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout, " Error in svc_create ");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    int args;
    /* Dispatch routine code */
    /* If requested program is not registered. */
    svcerr_noprogram(xpvt);
}
```

## Related Information

The “svcerr\_decode Subroutine” on page 455, “svcerr\_noprogram Subroutine” on page 457, “svcerr\_progvers Subroutine,” and “svcerr\_systemerr Subroutine” on page 462.

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---

## svcerr\_progvers Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### svcerr\_progvers Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call because the requested program version is not registered.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_progvers ( xpvt)
SVCXPRT *xpvt; u_long
```

## Description

The **svcerr\_progvers** subroutine is called by a service dispatch routine when the requested version of a program is not registered with the Remote Procedure Call (RPC) package. This subroutine sets the status of the RPC reply message to the **PROG\_MISMATCH** condition, which indicates that the remote server cannot support the client's version number.

**Note:** Service implementors do not usually need this subroutine.

## Parameters

*xprt* Points to the RPC service transport handle.

## svcerr\_progvers Subroutine Exported from the libnsl Library

### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call because the requested program version is not registered.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svcerr_progvers( xprt, low, high)
const SVCXPRT *xprt;
const rpcvers_t low;
const rpcvers_t high;
```

### Description

The **svcerr\_progvers** subroutine is called by a service dispatch routine when the requested version of a program is not registered with the Remote Procedure Call (RPC) package. This subroutine sets the status of the RPC reply message to the **RPC\_PROGVERS\_MISMATCH** condition, which indicates that the remote server cannot support the client's version number.

**Note:** Service implementors do not usually need this subroutine.

### Parameters

*xprt* Points to the RPC service transport handle.  
*low* Indicates the lowest version number.  
*high* Indicates the highest version number.

### Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype = "tcp";
    int no_of_handles;

    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS, nettype)) == 0)
    {
```

```

    fprintf(stdout,"Error in svc_create!");
    exit(EXIT_FAILURE);
}
svc_run();
return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xpvt)
{
    int args,high,low;

    /* Dispatch routine code */
    /* If requested version of a program is not registered. */
    svcerr_progrvers(xpvt,low,high);
}

```

## Related Information

The “svcerr\_decode Subroutine” on page 455, “svcerr\_noproc Subroutine” on page 457, “svcerr\_noprogram Subroutine” on page 459, and “svcerr\_systemerr Subroutine.”

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---

## svcerr\_systemerr Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### svcerr\_systemerr Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call due to an error that is not covered by a protocol.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_systemerr ( xpvt)
SVCXPRT *xpvt;
```

#### Description

The **svcerr\_systemerr** subroutine is called by a service dispatch subroutine that detects a system error not covered by a protocol. For example, a service dispatch subroutine calls the **svcerr\_systemerr** subroutine if the first subroutine can no longer allocate storage. The routine sets the status of the Remote Procedure Call (RPC) reply message to the **SYSTEM\_ERR** condition.

#### Parameters

*xpvt*      Points to the RPC service transport handle.

## svcerr\_systemerr Subroutine Exported from the libnsl Library

### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call due to an error that is not covered by a protocol.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void svcerr_systemerr ( xprt)
const SVCXPRT *xprt;
```

### Description

The **svcerr\_systemerr** subroutine is called by a service dispatch subroutine when a system error occurs that can not be covered by any particular protocol. The subroutine sets the status of the remote procedure call (RPC) reply message to the **RPC\_SYSTEMERROR** condition.

### Parameters

*xprt*      Points to the RPC service transport handle.

### Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype;
    int no_of_handles;

    nettype = "tcp";
    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int result;

    /* Some code to call appropriate service procedure.
       Procedure will return its result.
    */
    if(!svc_sendreply(xprt,(xdrproc_t)xdr_int,(caddr_t)&result))
    {
        fprintf(stdout,"Error in svc_sendreply!");
        svcerr_systemerr(xprt);
    }
}
```

## Related Information

The “`svcerr_decode` Subroutine” on page 455, “`svcerr_noproc` Subroutine” on page 457, “`svcerr_progrvers` Subroutine” on page 460, and “`svcerr_noprogram` Subroutine” on page 459.

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---

## svcerr\_weakauth Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svcerr\_weakauth Subroutine Exported from the libc Library

#### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call due to insufficient authentication security parameters.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
void svcerr_weakauth ( xprt)  
SVCXPRT *xprt;
```

#### Description

The **svcerr\_weakauth** subroutine is called by a service dispatch routine that cannot make the remote procedure call (RPC) because the supplied authentication parameters are insufficient for security reasons.

The **svcerr\_weakauth** subroutine calls the **svcerr\_auth** subroutine with the correct RPC service transport handle (the `xprt` parameter). The subroutine also sets the status of the RPC reply message to the **AUTH\_TOOWEAK** condition as the authentication error (**AUTH\_ERR**).

#### Parameters

`xprt` Points to the RPC service transport handle.

## Related Information

The **svcerr\_auth** subroutine, **svcerr\_decode** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

### svcerr\_weakauth Subroutine Exported from the libnsl Library

#### Purpose

Indicates that the service dispatch routine cannot complete the remote procedure call due to insufficient authentication security parameters.

#### Library

Network Services Library (**libnsl.a**)

## Syntax

```
#include <rpc/rpc.h>
void svcerr_weakauth ( xprt)
const SVCXPRT *xprt;
```

## Description

The **svcerr\_weakauth** subroutine is called by a service dispatch routine that cannot make the remote procedure call (RPC) because the supplied authentication parameters are insufficient for security reasons.

The **svcerr\_weakauth** subroutine calls the **svcerr\_auth** subroutine with the correct RPC service transport handle (the *xprt* parameter). The subroutine also sets the status of the RPC reply message to the **AUTH\_TOOWEAK** condition as the authentication error (**RPC\_AUTHERROR**).

## Parameters

*xprt*      Points to the RPC service transport handle.

## Examples

```
#include <rpc/rpc.h>
#include <stdlib.h>
#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
main()
{
    char *nettype;
    int no_of_handles;

    nettype = "tcp";
    /* Create RPC service handle and register with RPCBIND service */
    if((no_of_handles = svc_create(sample_dispatch, PROG, VERS,nettype)) == 0)
    {
        fprintf(stdout,"Error in svc_create!");
        exit(EXIT_FAILURE);
    }
    svc_run();
    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    int result;
    enum auth_stat why;

    /* Check for appropriate authentication */
    /* If insufficient authentication security parameters then send reply to client */
    svcerr_weakauth(xprt);
}
```

## Related Information

The “svcerr\_auth Subroutine” on page 453.

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---

## svcfld\_create Subroutine

### Purpose

Creates a service on any open file descriptor.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
```

```
SVCXPRT *svcfld_create ( fd, sendsize, recvsize)
int fd;
u_int sendsize;
u_int recvsize;
```

### Description

The **svcfld\_create** subroutine creates a service on any open file descriptor. Typically, this descriptor is a connected socket for a stream protocol such as Transmission Control Protocol (TCP).

By default, the RPC server uses nonblocking I/O with TCP. This behavior can be changed by setting the environment variable **RPC\_TCP\_MODE** to **USEBLOCKING**, which causes the TCP RPC server to use blocking I/O.

**Note:** Using blocking I/O leaves the server vulnerable to disruption by malicious or misconfigured clients.

### Parameters

<i>fd</i>	Identifies the descriptor.
<i>sendsize</i>	Specifies the size of the send buffer.
<i>recvsize</i>	Specifies the size of the receive buffer.

### Restrictions

In AIX® 5.2, the maximum number of open file descriptors that an RPC server can use has been set to 32767 so that compatibility can be maintained with RPC-server applications built on earlier releases of AIX®.

### Return Values

Upon successful completion, this subroutine returns a TCP-based transport handle. If unsuccessful, it returns a value of null.

### Related Information

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming and Sockets Overview in *AIX® Version 6.1 Communications Programming Concepts*.



---

## svccraw\_create Subroutine

### Purpose

Creates a toy Remote Procedure Call (RPC) service transport handle for simulation.

### Library

C Library (**libc.a**)

### Syntax

```
#include <rpc/rpc.h>
SVCXPRT *svccraw_create ( )
```

### Description

The **svccraw\_create** subroutine creates a toy RPC service transport handle. The service transport handle is located within the address space of the process. If the corresponding RPC server resides in the same address space, then simulation of RPC and acquisition of RPC overheads, such as round-trip times, are done without kernel interference.

### Return Values

Upon successful completion, this subroutine returns a pointer to a valid RPC transport handle. If unsuccessful, it returns a value of null.

### Related Information

The **clntraw\_create** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

---

## svctcp\_create Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svctcp\_create Subroutine Exported from the libc Library

#### Purpose

Creates a Transmission Control Protocol/Internet Protocol (TCP/IP) service transport handle.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>

SVCXPRT *svctcp_create ( sock, sendsz, rcvsz)
int sock;
u_int sendsz, rcvsz;
```

#### Description

The **svctcp\_create** subroutine creates a Remote Procedure Call (RPC) service transport handle based on TCP/IP and returns a pointer to it.

Since TCP/IP remote procedure calls use buffered I/O, users can set the size of the send and receive buffers with the *sendsz* and *recvsz* parameters, respectively. If the size of either buffer is set to a value of 0, the **svctcp\_create** subroutine picks suitable default values.

By default, the RPC server uses nonblocking I/O with TCP. This behavior can be changed by setting the environment variable **RPC\_TCP\_MODE** to **USEBLOCKING**, which causes the TCP RPC server to use blocking I/O.

**Note:** Using blocking I/O leaves the server vulnerable to disruption by malicious or misconfigured clients.

## Parameters

<i>sock</i>	Specifies the socket associated with the transport. If the value of the <i>sock</i> parameter is <b>RPC_ANYSOCK</b> , the <b>svctcp_create</b> subroutine creates a new socket. The service transport handle socket number is set to <b>xprt-&gt;xp_sock</b> . If the socket is not bound to a local TCP/IP port, then this routine binds the socket to an arbitrary port. Its port number is set to <b>xprt-&gt;xp_port</b> .
<i>sendsz</i>	Specifies the size of the send buffer.
<i>recvsz</i>	Specifies the size of the receive buffer.

## Restrictions

In AIX® 5.2, the maximum number of open file descriptors that an RPC server can use has been set to 32767 so that compatibility can be maintained with RPC-server applications built on earlier releases of AIX®.

## Return Values

Upon successful completion, this subroutine returns a valid RPC service transport handle. If unsuccessful, it returns a value of null.

## Related Information

The **registerrpc** subroutine, **svcdup\_create** subroutine.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in AIX® Version 6.1 *Communications Programming Concepts*.

Sockets Overview in AIX® Version 6.1 *Communications Programming Concepts*.

## svctcp\_create Subroutine Exported from the libnsl Library

### Purpose

Creates a Transmission Control Protocol/Internet Protocol (TCP/IP) service transport handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
SVCXPRT *svctcp_create (fd, sendsz, recvsz)
int fd;
uint_t sendsz;
uint_t recvsz;
```

### Description

The **svctcp\_create** subroutine creates a Remote Procedure Call (RPC) service transport handle based on TCP/IP and returns a pointer to it.

Because TCP/IP remote procedure calls use buffered I/O, you can set the size of the send and receive buffers with the *sendsz* and *recvsz* parameters. If the size of either buffer is set to a value of 0, the **svctcp\_create** subroutine picks suitable default values. The *fd* parameter specifies a file descriptor on a TCP transport. You can set the value of the *fd* parameter to **RPC\_ANYSOCK**, so that the **svctcp\_create** subroutine creates a new file descriptor on the TCP transport and binds the file descriptor to a port.

Use the **svc\_create** subroutine instead of the **svctcp\_create** subroutine. The **svctcp\_create** subroutine is compatible only with earlier versions of AIX®.

## Parameters

<i>fd</i>	Specifies the file descriptor that is associated with the TCP transport.
<i>sendsz</i>	Specifies the size of the send buffer.
<i>recvsz</i>	Specifies the size of the receive buffer.

## Return Values

a valid RPC service transport handle	successful
a null value	unsuccessful

## Examples

```
#include <rpc/rpc.h>

static void dispatch(struct svc_req *, SVCXPRT *);

int main()
{
    SVCXPRT    *svc=NULL;
    int        fd;
    uint_t     sendsz, recvsz;
    int        protocol = IPPROTO_TCP;

    /* Set send and receive buffer sizes to 0 so that they are set to
     * default values when svctcp_create() is called
     */
    sendsz = 0;
    recvsz = 0;

    /* Set the file descriptor to RPC_ANYFD */
    fd = RPC_ANYSOCK;

    svc = (SVCXPRT *) svctcp_create(fd, sendsz, recvsz);
    if(svc==NULL)
    {
        fprintf(stderr,"svctcp_create() failed");
        exit(1);
    }

    /* create association between program & version number and dispatch routine */
    if(svc_register(svc, prognum, versnum, dispatch, protocol) == 0)
    {
        fprintf(stderr,"svc_register() failed");
        exit(1);
    }

    /* Accept client requests */
    svc_run();

    return 1;
}

static void dispatch(rqstp, transp)    /* remote procedure */
```

```

struct svc_req *rqstp;
SVCXPRT      *transp;
{
/* Dispatch Routine Code */
}

```

## Related Information

The “svc\_create Subroutine” on page 414, “svc\_tli\_create Subroutine” on page 446, and “svc\_vc\_create Subroutine” on page 452.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

## svcdp\_create Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### svcdp\_create Subroutine Exported from the libc Library

#### Purpose

Creates a User Datagram Protocol/Internet Protocol (UDP/IP) service transport handle.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
SVCXPRT *svcdp_create ( sock)
int sock;
```

#### Description

The **svcdp\_create** subroutine creates a Remote Procedure Call (RPC) service transport handle based on UDP/IP and returns a pointer to it.

The UDP/IP service transport handle is used only for procedures that take up to 8KB of encoded arguments or results.

#### Parameters

**sock** Specifies the socket associated with the service transport handle. If the value specified by the **sock** parameter is **RPC\_ANYSOCK**, the **svcdp\_create** subroutine creates a new socket and sets the service transport handle socket number to **xprt->xp\_sock**. If the socket is not bound to a local UDP/IP port, then the **svcdp\_create** subroutine binds the socket to an arbitrary port. The port number is set to **xprt->xp\_port**.

#### Restrictions

In AIX® 5.2, the maximum number of open file descriptors that an RPC server can use has been set to 32767 so that compatibility can be maintained with RPC-server applications built on earlier releases of AIX®.

#### Return Values

Upon successful completion, this subroutine returns a valid RPC service transport. If unsuccessful, it returns a value of null.

## Related Information

The **registerrpc** subroutine, **svctcp\_create** subroutine.

TCP/IP protocols in *Networks and communication management*.

Remote Procedure Call (RPC) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

## svculdp\_create Subroutine Exported from the libnsl Library

### Purpose

Creates a User Datagram Protocol/Internet Protocol (UDP/IP) service transport handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
SVCXPRT *svculdp_create (fd)
int fd;
```

### Description

The **svculdp\_create** subroutine creates a remote procedure call (RPC) service transport handle. The *fd* parameter specifies a file descriptor on the UDP transport. You can set the value of the *fd* parameter to **RPC\_ANYSOCK**, so that the **svculdp\_create** subroutine creates a new file descriptor on UDP transport and binds the file descriptor to a port.

The UDP/IP service transport handle is used only for procedures that take up to 8KB of encoded arguments or results.

Use the **svc\_create** subroutine instead of the **svculdp\_create** subroutine. The **svculdp\_create** subroutine is compatible only with earlier versions of AIX®.

### Parameters

*fd* Specifies the file descriptor associated with the udp transport.

### Return Values

a valid RPC service transport handle	successful
a null value	unsuccessful

### Examples

```
#include <rpc/rpc.h>

static void dispatch(struct svc_req *, SVCXPRT *);

int main()
{
    SVCXPRT *svc=NULL;
    int fd;
    int protocol = IPPROTO_UDP;

    /* Set the file descriptor to RPC_ANYFD */
    fd = RPC_ANYSOCK;

    svc = (SVCXPRT *) svculdp_create(fd);
    if(svc==NULL)
```

```

{
    fprintf(stderr,"svcudp_create() failed");
    exit(1);
}

/* create association between program & version number and dispatch routine */
if(svc_register(svc, prognum, versnum, dispatch, protocol) == 0)
{
    fprintf(stderr,"svc_register() failed");
    exit(1);
}

/* Accept client requests */
svc_run();

return 1;
}

static void dispatch(rqstp, transp)    /* remote procedure */
    struct svc_req *rqstp;
    SVCXPRT      *transp;
{
    /* Dispatch Routine Code */
}

```

## Related Information

The “svc\_create Subroutine” on page 414, “svc\_tli\_create Subroutine” on page 446, and “svc\_dg\_create Subroutine” on page 417.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## user2netname Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsl** libraries.

### user2netname Subroutine Exported from the libc Library

#### Purpose

Converts from a domain-specific user ID to a network name that is independent from the operating system.

#### Library

C Library (**libc.a**)

#### Syntax

```
#include <rpc/rpc.h>
```

```
int user2netname ( name, uid, domain)
char *name;
int uid;
char *domain;
```

#### Description

The **user2netname** subroutine converts from a domain-specific user ID to a network name that is independent from the operating system.

This subroutine is the inverse of the **netname2user** subroutine.

## Parameters

*name* Points to the network name (or netname) of the server process owner.  
*uid* Points to the caller's effective user ID (UID).  
*domain* Points to the domain name.

## Return Values

Upon successful completion, this subroutine returns a value of 1. If unsuccessful, it returns a value of 0.

## Related Information

The **host2netname** subroutine, **netname2user** subroutine.

Remote Procedure Call (RPC) Overview for Programming in *AIX® Version 6.1 Communications Programming Concepts*.

## user2netname Subroutine Exported from the libnsl Library

### Purpose

Converts a domain-specific user name to an operating-system-independent network name.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
int user2netname( name, uid, domain)
char *name;
const uid_t uid;
const char *domain;
```

### Description

The **user2netname** subroutine, which belongs to the secure remote procedure call (RPC) category, is used in applications which use the **AUTH\_DES** authentication flavor. This subroutine is used on client side to generate a network name (or a netname) of the user.

This subroutine is the inverse of the **netname2user** subroutine.

## Parameters

*name* Represents the network name of the user after successful completion.  
*uid* Specifies a domain-specific user name.  
*domain* Specifies the domain.

## Return Values

1 successful  
0 unsuccessful

## Examples

```
#include <rpc/rpc.h>
int main()
{
    char name[255]; /* contains netname of owner of server process */
    char rhost[255]; /* Remote host name on which server resides */
    char domain[255];
    rpcprog_t PROGNUM = 0x3fffffffL;
    rpcvers_t PROGVER = 0x1L;
```

```

/* obtain the domainname of the host */
if (getdomainname(domain, 255)) {
    fprintf(stderr, "\ngetdomainname() failed\n");
    exit(2);
}

/* Obtain network name of remote host */
if (!user2netname(name, getuid() , domain))
{
    fprintf(stderr, "\nhost2netname() failed\n");
    exit(EXIT_FAILURE);
}

/* Create a client handle for remote host rhost for PROGNUM & PROGVER on tcp transport */
clnt = clnt_create(rhost, PROGNUM, PROGVER, "tcp");
if (clnt == (CLIENT *) NULL) {
    fprintf(stderr, "client_create() error\n");
    exit(1);
}

clnt->cl_auth = authdes_seccreate(name, 80, rhost, (des_block *)NULL);

/*
 * Make a call to clnt_call() subroutine
 */

/* Destroy the authentication handle */
auth_destroy(clnt->cl_auth);

/* Destroy the client handle in the end */
clnt_destroy(clnt);

return 0;
}

```

## Related Information

The “authdes\_getucred Subroutine” on page 277, “authdes\_seccreate Subroutine” on page 280, “host2netname Subroutine” on page 344, and “netname2user Subroutine” on page 357.

Transport Independent Remote Procedure Call and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xprt\_register Subroutine

**Important:** The subroutine is exported from both the **libc** and **libnsl** libraries.

### xprt\_register Subroutine Exported from the libc Library

#### Purpose

Registers a Remote Procedure Call (RPC) service transport handle.

#### Library

C Library (**libc.a**)

#### Syntax

```

#include <rpc/svc.h>
void xprt_register ( xprt)
SVCXPRT *xprt;

```



## Description

The **xprt\_register** subroutine registers an RPC service transport handle with the RPC program after the transport has been created. This subroutine modifies the **svc\_fdset** global variable. The **svc\_fdset** global variable indicates read file descriptor bit mask of the RPC server, which is generally required if you call the **svc\_exit** subroutine. After calling the **svc\_exit** subroutine, you can use the **xprt\_register** subroutine to reregister RPC services.

**Note:** Service implementors do not usually need this subroutine.

## Parameters

*xprt* Points to the newly created RPC service transport handle.

## Related Information

eXternal Data Representation (XDR) Overview for Programming in AIX® Version 6.1 Communications Programming Concepts.

Remote Procedure Call (RPC) Overview for Programming in AIX® Version 6.1 Communications Programming Concepts.

## xprt\_register Subroutine Exported from the libnsl Library

### Purpose

Registers a Remote Procedure Call (RPC) service transport handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void xprt_register ( xprt )
const SVCXPRT *xprt;
```

### Description

The **xprt\_register** subroutine registers an RPC service transport handle with the RPC program after the transport has been created. This subroutine modifies the **svc\_fdset** global variable. The **svc\_fdset** global variable indicates read file descriptor bit mask of the RPC server, which is generally required if you call the **svc\_exit** subroutine. After calling the **svc\_exit** subroutine, you can use the **xprt\_register** subroutine to reregister RPC services.

**Note:** Service implementors do not usually need this subroutine.

### Parameters

*xprt* Points to the newly created RPC service transport handle.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

static void sample_dispatch();
```

```

main()
{
    SVCXPRT *svc_handle;
    struct netconfig *nconf;

    /* Get transport type and create RPC service handle */

    /* Register dispatch routine for program number and version number with RPCBIND service */

    If(svc_reg(svc_handle, PROG, VERS, sample_dispatch,nconf) == 0)
    {
        fprintf(stdout,"Error in svc_reg!");
        exit(EXIT_FAILURE);
    }

    svc_run();

    /* execution control will come here after svc_exit() is called.
    Thus when client request comes, control goes in dispatch routine where svc_exit() is called. */

    /* code to get new svc_handle */

    /* register with xprt_register */
    xprt_register(svc_handle);

    /* verify if svc_fdset is modified */

    return 0;
}

/* following is the sample dispatch routine*/
static void sample_dispatch(struct svc_req *request, SVCXPRT *xprt)
{
    /* some code */
    svc_exit();
}

```

## Related Information

The “xprt\_unregister Subroutine.”

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## xprt\_unregister Subroutine

**Important:** The subroutine is exported from both the **libc** and the **libnsi** libraries.

### xprt\_unregister Subroutine Exported from the libc Library

#### Purpose

Removes a Remote Procedure Call (RPC) service transport handle.

#### Library

C Library (**libc.a**)

#### Syntax

```

void xprt_unregister ( xprt)
SVCXPRT *xprt;

```

## Description

The **xprt\_unregister** subroutine removes an RPC service transport handle from the RPC service program before the transport handle can be destroyed. This subroutine modifies the **svc\_fds** global variable.

**Note:** Service implementors do not usually need this subroutine.

## Parameters

*xprt* Points to the RPC service transport handle to be destroyed.

## Related Information

eXternal Data Representation (XDR) Overview for Programming in AIX® *Version 6.1 Communications Programming Concepts*.

Remote Procedure Call (RPC) Overview for Programming in AIX® *Version 6.1 Communications Programming Concepts*.

## xprt\_unregister Subroutine Exported from the libnsl Library

### Purpose

Removes a Remote Procedure Call (RPC) service transport handle.

### Library

Network Services Library (**libnsl.a**)

### Syntax

```
#include <rpc/rpc.h>
void xprt_unregister ( xprt)
const SVCXPRT *xprt;
```

### Description

The **xprt\_unregister** subroutine removes an RPC service transport handle from the RPC service program before the transport handle can be destroyed. This subroutine modifies the **svc\_fds** global variable. The **svc\_fdset** global variable indicates read file descriptor bit mask of the RPC server, which is generally required if you do not call the **svc\_run** subroutine.

**Note:** Service implementors do not usually need this subroutine.

### Parameters

*xprt* Points to the RPC service transport handle to be destroyed.

### Examples

```
#include <stdlib.h>
#include <rpc/rpc.h>
#include <netconfig.h>

#define PROG 0x3fffffffL
#define VERS 0x1L

main()
{
    SVCXPRT *svc_handle; /* server handle */
    struct netconfig *nconf;
    int fd;

    /* Get proper file descriptor */
```

```

/* Get transport type */

/* Get RPC service handle */

/* sendsize and recvsize are 0, thus default size will be chosen */
if((svc_handle=svc_tli_create(fd, nconf, 0, 0, 0))==(SVCXPRT *)NULL)
{
    fprintf(stdout,"Error in svc_tli_create!");
    exit(EXIT_FAILURE);
}

/* register it */
xprt_register(svc_handle);

/* unregister it */
xprt_unregister(svc_handle);

/* destroy the RPC service handle */
svc_destroy(svc_handle);

/* check if svc_fdset is modified */

    return 0;
}

```

## Related Information

The “xprt\_register Subroutine” on page 474.

Transport Independent Remote Procedure Call, IPv6 concerns for Transport Independent Remote Procedure Call, and eXternal Data Representation Overview for Programming in *AIX Version 6.1 Communications Programming Concepts*.

---

## Data Link Provider Interface (DLPI)

- DL\_ATTACH\_REQ Primitive
- DL\_BIND\_ACK Primitive
- DL\_BIND\_REQ Primitive
- DL\_CONNECT\_CON Primitive
- DL\_CONNECT\_IND Primitive
- DL\_CONNECT\_REQ Primitive
- DL\_CONNECT\_RES Primitive
- DL\_DATA\_IND Primitive
- DL\_DATA\_REQ Primitive
- DL\_DETACH\_REQ Primitive
- DL\_DISABMULTI\_REQ Primitive
- DL\_DISCONNECT\_IND Primitive
- DL\_DISCONNECT\_REQ Primitive
- DL\_ENABMULTI\_REQ Primitive
- DL\_ERROR\_ACK Primitive
- DL\_GET\_STATISTICS\_REQ Primitive
- DL\_GET\_STATISTICS\_ACK Primitive
- DL\_INFO\_ACK Primitive
- DL\_INFO\_REQ Primitive
- DL\_OK\_ACK Primitive

- DL\_PHYS\_ADDR\_REQ Primitive
- DL\_PHYS\_ADDR\_ACK Primitive
- DL\_PROMISCOFF\_REQ Primitive
- DL\_PROMISCON\_REQ Primitive
- DL\_RESET\_CON Primitive
- DL\_RESET\_IND Primitive
- DL\_RESET\_REQ Primitive
- DL\_RESET\_RES Primitive
- DL\_SUBS\_BIND\_ACK Primitive
- DL\_SUBS\_BIND\_REQ Primitive
- DL\_SUBS\_UNBIND\_REQ Primitive
- DL\_TEST\_CON Primitive
- DL\_TEST\_IND Primitive
- DL\_TEST\_REQ Primitive
- DL\_TEST\_RES Primitive
- DL\_TOKEN\_ACK Primitive
- DL\_TOKEN\_REQ Primitive
- DL\_UDERROR\_IND Primitive
- DL\_UNBIND\_REQ Primitive
- DL\_UNITDATA\_IND Primitive
- DL\_UNITDATA\_REQ Primitive
- DL\_XID\_CON Primitive
- DL\_XID\_IND Primitive
- DL\_XID\_REQ Primitive
- DL\_XID\_RES Primitive



---

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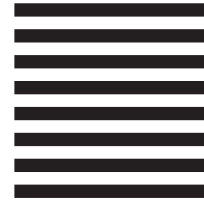
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