LynxOS-178 v2.2.4 BETA Installation Guide

LynxOS-178 v2.2.4 BETA

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Preface

Typographical Conventions

The typefaces used in this manual, summarized below, emphasize important concepts. All references to filenames and commands are case-sensitive and should be typed accurately.

Kind of Text	Examples
Body text; *italicized* for emphasis, new terms, and book titles	Refer to the *LynxOS-178 v2.2.4 BETA Installation Guide*
Environment variables, filenames, functions, methods, options, parameter names, path names, commands, and computer data	`ls -l myprog.c /dev/null`
Commands that need to be highlighted within body text, or commands that must be typed as is by the user are **bolded**.	`login: myname` `# cd /usr/home`
Text that represents a variable, such as a filename or a value that must be entered by the user, is *italicized*.	`cat <filename>` `mv <file1> <file2>`

Blocks of text that appear on the display screen after entering instructions or commands	`Loading file /tftpboot/shell.kdi into 0x4000`
	`.....`
	`File loaded. Size is 1314816`
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Keyboard options, button names, and menu sequences	**Enter**, **Ctrl-C**

LynxOS-178 v2.2.4 BETA Documentation Set

The LynxOS-178 v2.2.4 BETA Documentation Set includes the following:

- *LynxOS-178 v2.2.4 BETA Release Notes*
- *LynxOS-178 v2.2.4 BETA Installation Guide*
- *LynxOS-178 v2.2.4 BETA Advanced Porting Kit Guide*
- *LynxOS-178 v2.2.4 BETA T2080RDB Board Support Guide*
- *LynxOS-178 v2.2.4 BETA P3041RDB Board Support Guide*
- *Lynx Certifiable Stack v2.0.1 User's Guide*
- *Lynx Certifiable Stack v2.0.1 Release Notes*
- *LOCI v5.1.1 BETA Release Notes*
- *SpyKer v5.1.1 BETA Release Notes*
- *Luminosity v5.1.1 BETA Release Notes*

Additional documents from the LynxOS-178 v2.2.3 commercial release have been included in this release when applicable.

Technical Support

Lynx Software Technologies handles support requests from current support subscribers. For questions regarding Lynx Software Technologies products, evaluation CDs, or to become a support subscriber; our knowledgeable sales staff will be pleased to help you. Please visit us at:

http://www.lynx.com/corporate/contact/support.php3

How to Submit a Support Request

When you are ready to submit a support request, please include *all* of the following information:

- First name
- Last name
- Your job title
- Phone number
- Fax number
- E-mail address
- Company name
- Address
- City, State, ZIP
- Country
- LynxOS version number [LynxOS-178 v2.2.4 BETA]
- Target Platform (for example, PowerPC)
- Board Support Package (BSP)
- Current Service Pack Revision
- Development Host OS version
- Detailed description of the problem that you are experiencing:
  - Is there a requirement for a US Citizen to work on this issue?
  - Priority of the problem — Critical, High, Medium, or Low?
  - Test Cases or Log Files that substantiate or elaborate the problem?

Where to Submit a Support Request

By E-mail:

Support, Europe	tech_europe@lynx.com
Support, worldwide except Europe	support@lynx.com
Training and Courses	USA: training-usa@lynx.com Europe: training-europe@lynx.com

By Phone:

Training and courses	USA: +1 408-979-4353 Europe: +33 1 30 85 06 00
Support, Europe (from our Paris, France office)	+33 1 30 85 93 96
Support, worldwide except Europe and Japan (from our San José, CA, USA headquarters)	+1 800-327-5969 or +1 408-979-3940
Support, Japan	+81 33 449 3131

By Fax:

Support, Europe (from our Paris, France office)	+33 1 30 85 06 06
Support, worldwide except Europe and Japan (from our San José, CA, USA headquarters)	+1 408-979-3945
Support, Japan	+81 22 449 3803

Special Notes

The following notations highlight any key points and cautionary notes that may appear in this manual.

NOTE: These callouts note important or useful points in the text.

CAUTION! Used for situations that present minor hazards that may interfere with or threaten equipment/performance.

CHAPTER 1 *Introduction*

What is LynxOS-178 v2.2.4 BETA?

LynxOS-178 v2.2.4 BETA will hereon simply be referred to as *LynxOS-178*.

LynxOS-178 includes kernel enhancements, new tool chains, debuggers, and Cross-Development Host support.

Lynx Software Technologies, Inc. has been the premier developer of POSIX-conformant real-time operating systems. Our flagship product, called LynxOS, is in use in hundreds of thousands of installations where high reliability and hard real-time determinism are essential. LynxOS-178 is based on LynxOS and has the features necessary for safety-critical applications such as aviation, defense, medicine, along with other business-critical fields. Along with the operating system and the Development tools, Lynx Software Technologies can optionally provide the necessary artifacts to permit LynxOS-178 to be used in systems that are certifiable up to level A of the RTCA DO-178B standard. In addition, LynxOS-178 provides the ability to run multiple levels of DO-178B criticality on the same platform.

LynxOS-178 Development Environment

LynxOS-178 uses the following for the Development Environment:

- Host Platform: PC running Red Hat Enterprise Linux 6.2 64bit or Windows 7 64bit.
- Target System: Usually purpose-built computers running a custom-configured Board Support Package (BSP) for that board. When the actual target systems are not yet available, development can be done using "reference platforms" (that is, commercially available computers for which a BSP already exists). Contact a Lynx Software Technologies representative for information about target platforms that are currently available.

Features of LynxOS-178

LynxOS-178 provides the following features:

- UNIX-LIKE ENVIRONMENT — The LynxOS-178 Operating System is similar to UNIX. Applications use processes and threads, make system calls, and use device drivers. The product can run a shell on a serial port for a developer to interact directly with the target machine. It also has device drivers to permit mounting an external disk drive to facilitate testing and data capture
- POSIX-CONFORMANT INTERFACES — LynxOS-178 offers POSIX.1 conformance and also supplies all the services specified by POSIX 1.b (real-time extensions) and POSIX 1.c (threads extensions). The POSIX real-time and thread extensions are later additions to the original POSIX.1 standard, and they have extensive applicability for real-time and embedded systems.

  The real-time extensions include priority scheduling, real-time signals, clocks and timers, semaphores, message passing, shared memory, asynch and synch I/O, and memory locking. The threads extensions include specifications for thread creation, control, and cleanup; thread scheduling; thread synchronization; and signal handling.
- DO-178B LEVEL A CERTIFIED ARTIFACTS — LynxOS-178 contains a combination of certified and certifiable software and artifacts that allow developers to quickly produce and deploy safety-critical systems. LynxOS-178 artifact packages for the kernel and system services, including full DO-178B traceability through requirements, design, code, test, and test results are available as optional products. Please contact your Lynx Software Technologies sales representative to discuss the availability of DO-178B artifact packages for specific components.
- MATURE, STABLE, AND FULLY CERTIFIABLE — LynxOS, on which LynxOS-178 is based, is an embedded real-time Operating System that has been rigorously exercised through millions of deployments and is the foundation of multiple safety-critical systems that have been certified to DO-178B.
- HARD PARTITIONING OF TIME, MEMORY, AND RESOURCES — LynxOS-178 implements a time-slice scheduling algorithm that gives each partition fixed execution time so that the system can be deterministically safe. Additionally, the system allows multiple applications of differing criticality levels within partitions to execute,

completely isolated, on the same hardware resource. With LynxOS-178, each task runs protected in its own space for uncompromising reliability within a hard partitioned Virtual Machine, enabling easier application certification.

- UPGRADABLE WITHOUT INVALIDATING CERTIFICATION — Mountable file systems and dynamically installed device drivers ease the certification of upgrades and enhancements. Applications and drivers are not required to be linked to the Operating System and can, therefore, be isolated, limiting recertification efforts for the full Operating System when only an application or driver needs modification.
- ARINC 653-1 SUPPORT — LynxOS-178 conforms to the ARINC 653-1 APEX Interface defined by the ARINC 653-1 standard, ensuring application portability, software reuse, and interoperability between embedded systems. LynxOS-178 provides the following system service groups in accordance with the ARINC 653-1 standard: Partition Management, Process Management, Time Management, Interpartition Communication (Sampling Port Services and Queuing Port Services), Intrapartition Communication (Buffer Services, Blackboard Services, Semaphore Services, and Event Services), and Health Monitoring.
- FACE SUPPORT — This release contains enhancements to both ARINC and POSIX support in order to fully support the API requirements of the FACE 2.0/2.1 Safety Extended profile in Production Version. All of these APIs are also available in Development Version.
- NETWORKING SUPPORT IN THE DEVELOPMENT VERSION — The Development Version of LynxOS-178 includes the TCP/IP stack to enable development and debugging. TCP/IP and NFS include support for the following utilities and services: `ping`, `rcp`, `rlogin`, `route`, `NFS client`, `ftpd`, `irshd`, `rlogind`, `rshd`, and `telnetd`.

NOTE: The TCP/IP stack is intended for use during software development. It is not to be used in a certified systems and is not partition-aware.

- USER-SUPPLIED NETWORK STACK SUPPORT IN THE PRODUCTION VERSION — The user may supply their own driver that will implement the network stack as well as a UNIX domain datagram-based socket functionality. The Production Version kernel has hooks for user-supplied functions, and also a dummy driver (`nullnux`) is provided in the Production Version.
- Production Version LCS TCP/IP Stack.
- INTRAPARTITION COMMUNICATION USING UNIX DOMAIN SOCKETS — In the Development Version, both stream- and datagram-based sockets are supported. In the Production Version, stream-based sockets are supported by default and support for the rest depends on the user-supplied network stack.
- FATAL SIGNALCATCHING BY HEALTH MONITOR IS CONFIGURABLE IN THE DEVELOPMENT VERSION— By default, the fatal signals are not processed by the Health Monitor and the reaction of the system to such signals conforms with POSIX. By setting the `HM_CATCH_FAULTS` macro to 1 in the BSP specific `uparam.h` file, the system may be configured to catch the fatal signals using the Health Monitor. In the Production vERSION, fatal signals are always processed by the Health Monitor
- THREAD SAFE BSD LIBRARY — The `libbsd` library that provides network-related functions such as `gethostbyname` is thread-safe now and can be used in multithreaded applications without an additional synchronization.
- CONFIGURABLE TICK TIMER FREQUENCY — The tick rate can be configured by adjusting the `TICKSPERSEC` macro in the `usr/include/conf.h` file. By default, the rate is set to 1000 ticks per second. After changing the value, the kernel must be rebuilt.

Supported Host and Target Systems

The LynxOS-178 v2.2.4 BETA Cross-Development software should be installed on a supported Cross-Development Host. The following table provides a summary of the supported host and target configurations.

Table 1-1: Supported Host and Target Configurations

Supported Host Systems	Supported Target Systems
Windows 7 Professional, SP1 (64-bit)	Freescale P3041 DS Freescale T2080 QDS Freescale T2080 RDB
Red Hat Enterprise Linux 6.2 (64-bit)	Freescale P3041 DS Freescale T2080 QDS Freescale T2080 RDB

About LynxOS-178 v2.2.4 BETA

LynxOS-178 v2.2.4 BETA supports two versions:

- Development Version
- Production Version

The Production Version of LynxOS-178 has a feature set that has complete DO-178 artifacts and traceability for Level A certification of the LynxOS-178 kernel and libraries.

The Development Version (a superset of the Production Version) has additional features that assist in application development and debugging on LynxOS-178:

- MORE KERNEL FEATURES — `TTY`, `ptrace`, `skdb`, and `CodeTEST hooks`, etc.
- SHELLS AND UTILITIES — `bash`, TFTP application, `ps`, `gzip`, high water mark utilities, and additional file system utilities such as `ls`, `cat`, `mkdir`, `copy`, and `rm`, etc.
- DEBUGGERS — Standard `gdbserver` for working with GDB.
- ADDITIONAL DEVICE DRIVERS — network interface drivers.

These additional features do not have supporting DO-178B artifacts and are intended for use during development only.

Refer to the *LynxOS-178 v2.2.4 BETA User's Guide* for the sets of system calls that are supported in the Development Version and Production Version.

LynxOS-178 Product Package

The LynxOS-178 product package includes the following:

- License Manager CD-ROM
- LynxOS-178 Open Development Environment for Linux (ODEL) Development Version CD-ROM
- LynxOS-178 Open Development Environment for Linux (ODEL) Production Version CD-ROM
- LynxOS-178 Open Development Environment for Windows (ODEW) Development Version CD-ROM
- LynxOS-178 Open Development Environment for Windows (ODEW) Production Version CD-ROM
- LynxOS-178 Documentation CD-ROM
- (Optional) LynxOS-178 Advanced Porting Kit CD-ROM
- (Optional) LynxOS-178 Sources CD-ROM
- (Optional) LynxOS-178 GNU Toolchain Source CD-ROM
- (Optional) LynxOS-178 Test Suite Source
- (Optional) LynxOS-178 OpenGroup Test Sources

CD-ROM Contents for Binary Packages

Table 1-2 lists the contents of the `/lynx/flexlm-v11.7/binaries/` directory on the License Manager CD-ROM.

Table 1-2: License Manager CD-ROM Contents

Directory	Contents
`/lynx/flexlm-v11.7/binaries/`	
<media_num>`.license_linux32.tgz`	FlexLM v11.7 License Manager for 32 bits Linux system
<media_num>`.license_linux64.tgz`	FlexLM v11.7 License Manager for 64 bits Linux system
<media_num>`.license_win32.tgz`	FlexLM v11.7 License Manager for Windows system
<media_num>`.license_sol.tgz`	FlexLM v11.7 License Manager for Solaris system

Table 1-3 lists the contents of the `/tar_images/` directory on the LynxOS-178 ODEL Development Version CD-ROM, where *<bsp_name>* is the name of the Board Support Package (BSP).

Table 1-3: LynxOS-178 ODEL Development Version CD-ROM Contents

Directory	Contents
`Linux/Disk1/InstData/VM/install.bin`	Linux Installer
`/tar_images/`	
<media_num>`.cdk`*<host>*`.tar.gz`	GNU toolchain and all other Development Tools
<media_num>`.los178_dev.tar.gz`	System files (minus the RSC files) for the PowerPC architecture with debugging support
<media_num>`.bsp_`*<bsp_name>*`_dev.tar.gz`	BSP files for a target board in the Development Version
<media_num>`.los178_rsc_dev.tar.gz`	System files included within the RSC components for the Development Version

Table 1-3: LynxOS-178 ODEL Development Version CD-ROM Contents

Directory	Contents
<media_num>.libcrypt.tar.gz	Libcrypt files
<media_num>.demo_src.tar.gz	Sources for the demo Kernel Downloadable Images (KDIs) within LynxOS-178

Table 1-4 lists the contents of the /tar_images/ directory on the LynxOS-178 ODEL Production Version CD-ROM, where *<bsp_name>* is the name of the Board Support Package (BSP).

Table 1-4: LynxOS-178 ODEL Production Version CD-ROM Contents

Directory	Contents
/tar_images/	
<media_num>.cdk*<host>*.tar.gz	GNU toolchain and all other Development Tools
<media_num>.los178_pdn.tar.gz	System files (minus the RSC files) for the PowerPC architecture with debugging support
<media_num>.los178_rsc_pdn.tar.gz	System files included within the RSC components for the Production Version
<media_num>.bsp_*<bsp_name>*_pdn.tar.gz	BSP files for a target board in the Production Version
<media_num>.libcrypt.tar.gz	Libcrypt files
<media_num>.demo_src.tar.gz	Sources for the demo Kernel Downloadable Images (KDIs) within LynxOS-178

Table 1-5 lists the contents of the /tar_images/ directory on the LynxOS-178 ODEW Development Version CD-ROM, where <bsp_name> is the name of the Board Support Package (BSP).

Table 1-5: LynxOS-178 ODEW Development Version CD-ROM Contents

Directory	Contents
/tar_images/	
<media_num>.los178_dev.tar.gz	System files (minus the RSC files) for the PowerPC architecture with debugging support
<media_num>.los178_rsc_dev.tar.gz	System files included within the RSC components for the Development Version
<media_num>.cdkwin32.tar.gz	GNU toolchain and all other Development Tools
<media_num>.bsp_<bsp_name>_dev.tar.gz	BSP files for a target board in the Development Version
<media_num>.libcrypt.tar.gz	Libcrypt files
<media_num>.demo_src.tar.gz	Sources for the demo Kernel Downloadable Images (KDIs) within LynxOS-178

Table 1-6 lists the contents of the /tar_images/ directory on the LynxOS-178 ODEW Production Version CD-ROM, where <bsp_name> is the name of the Board Support Package (BSP).

Table 1-6: LynxOS-178 ODEW Production Version CD-ROM Contents

Directory	Contents
Windows/Disk1/InstData/VM/install.exe	Windows Installer
/tar_images/	
<media_num>.los178_pdn.tar.gz	System files (minus the RSC files) for the PowerPC architecture with debugging support
<media_num>.los178_rsc_pdn.tar.gz	System files included within the RSC components for the Production Version

Table 1-6: LynxOS-178 ODEW Production Version CD-ROM Contents

Directory	Contents
<media_num>.cdkwin32.tar.gz	GNU toolchain and all other Development Tools
<media_num>.bsp_*<bsp_name>*_pdn.tar.gz	BSP files for a target board in the Production Version
<media_num>.libcrypt.tar.gz	Libcrypt files
<media_num>.demo_src.tar.gz	Sources for the demo Kernel Downloadable Images (KDIs) within LynxOS-178

Table 1-7 lists the contents of the /tar_images/ directory on the LynxOS-178 Test Suite Source.

Table 1-7: LynxOS-178 LynxOS-178 Test Suite Source CD-ROM Contents

Directory	Contents
<media_num>.api_sockets_test.tar.gz	API Sockets Test
<media_num>.arinc653_test.tar.gz	Arinc653 Test
<media_num>.testdrivers_src.tar.gz	Test Driver Source
<media_num>.libgcc_test.tar.gz	Libgcc Test
<media_num>.memdisk_test.tar.gz	Memdisk Test
<media_num>.tp_test.tar.gz	Time Partitioning Test
<media_num>.rp_test.tar.gz	Resource Partitioning Test

Table 1-8 lists the contents of the /tar_images/ directory on the LynxOS-178 OpenGroup Test Source.

Table 1-8: LynxOS-178 OpenGroup Test Source CD-ROM Contents

Directory	Contents
<media_num>.opengroup_test.tar.gz	Board Test Configuration
<media_num>.common_src_tst_configuration.tar.gz	OpenGroup Test Source

Table 1-9 lists the contents of the `/tar_images/` directory on the LynxOS-178 GNU Toolchain Source.

Table 1-9: LynxOS-178 GNU Toolchain Source CD-ROM Contents

Directory	Contents
`<media_num>.toolchain_src.tar.gz`	Toolchain Source Files
`README.txt`	Instructions for building the GNU toolchain

Installation Procedures Summary

The installation procedure is summarized below. Use these steps to prepare for installation and to begin the process.

1. Install FLEXlm software and obtaining a license key.

   LynxOS-178 v2.2.4 BETA installation requires that you install FLEXlm software and obtain a license key by submitting the FLEXlm license key request form. Complete details on installing the Flexlm software and the procedure to obtain the license key are provided in the *License Management Software User's Guide*.

2. Perform one of the following options:

   a. Install the LynxOS-178 Binary Package using GUI Installer and install the LynxOS-178 v2.2.4 BETA Binary Service Pack.

      For LynxOS-178 in the Development Version, refer to "Installing the LynxOS-178 Development Version" on page 19.

      For LynxOS-178 in the Production Version, refer to "Installing the LynxOS-178 Production Version" on page 28.

   b. Build LynxOS-178 from Source Code by using the LynxOS-178 v2.2.4 BETA Source Packages and the LynxOS-178 v2.2.4 BETA Service Pack Source.

      For LynxOS-178 in the Development Version, refer to "Building the LynxOS-178 Development Version" on page 38.

      For LynxOS-178 in the Production Version, refer to the "Building the LynxOS-178 Production Version" on page 39.

CHAPTER 2 *Installing LynxOS-178*

This section describes the installation procedure for the LynxOS-178 software components onto a Linux Host or onto a Windows Host.

Installing the LynxOS-178 Development Version

Overview

Installation of these core components is required for the LynxOS-178 software. The core LynxOS-178 software components are:

- The LynxOS-178 CDK — Includes the GNU toolchain, License Management software, and all other Development tools.
- The LynxOS-178 Development Version — Includes the LynxOS-178 system files, RSC files, `Libcrypt` and BSP for a target board.

The basic steps of the installation are as follows:

1. Install the LynxOS-178 CDK, ODE, and BSP from the respective CD-ROMs by using the InstallAnywhere GUI Installer (for Linux Hosts and Windows Hosts).

   An overview of the installation steps is provided in the following sections. The information in those sections might also help some users to plan what their responses will be to certain installation prompts.

NOTE: The figures shown in the following sections are based on the LynxOS-178 Development Version installation.

2. Run a setup script to enable LynxOS-178.
3. Open a License Management session.

Linux Host Installation

To install the LynxOS-178 onto the Linux Host, perform the steps described below.

NOTE: The LynxOS-178 CDK package *must* be installed *before* the LynxOS-178 Development Version package. Failure to install these components in the correct order can result in problems with LynxOS-178.

---

1. Install the LynxOS-178 Development Version core components by using the InstallAnywhere GUI Installer.

   Insert the LynxOS-178 CDK CD-ROM (Linux Host) into the CD-ROM drive. Enter the following command to start LynxOS-178 CDK installation:

   ```
   # sh <cdrom_mount_point>/Linux/Disk1/InstData/ \
   VM/install.bin
   ```

   This will open the **Introduction** window (see Figure 2-1).

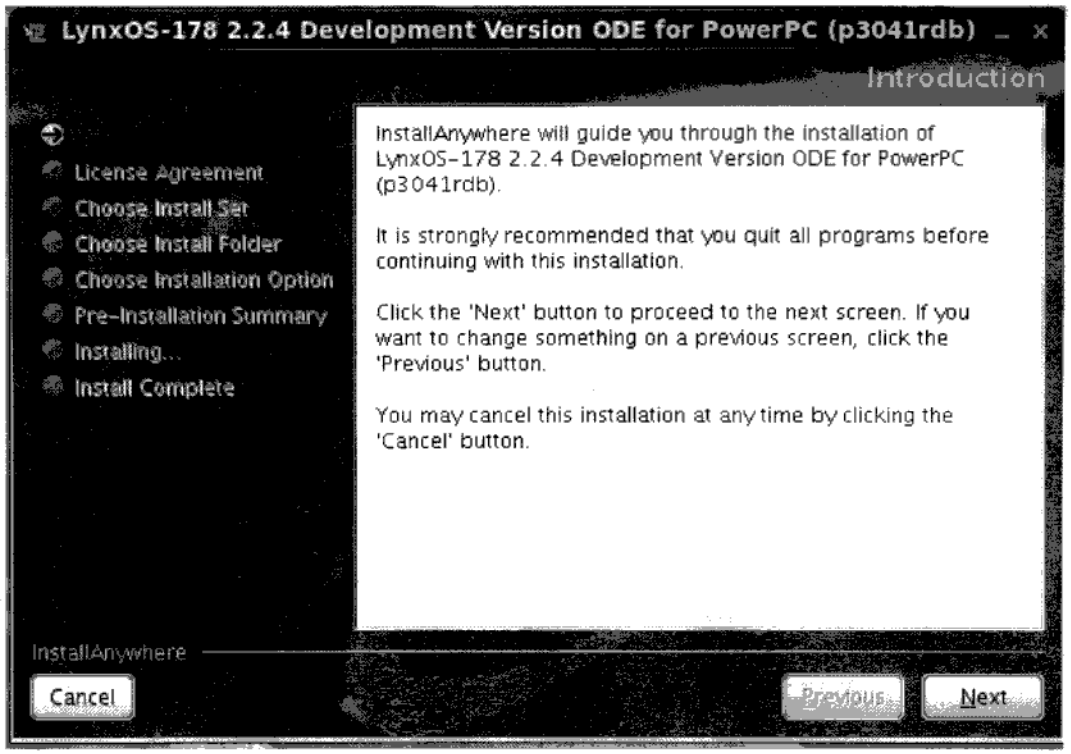

Figure 2-1: LynxOS-178 v2.2.4 BETA for PowerPC — Introduction

Click **Next** to go to the **License Agreement** window.

The **License Agreement** window appears (see Figure 2-2).

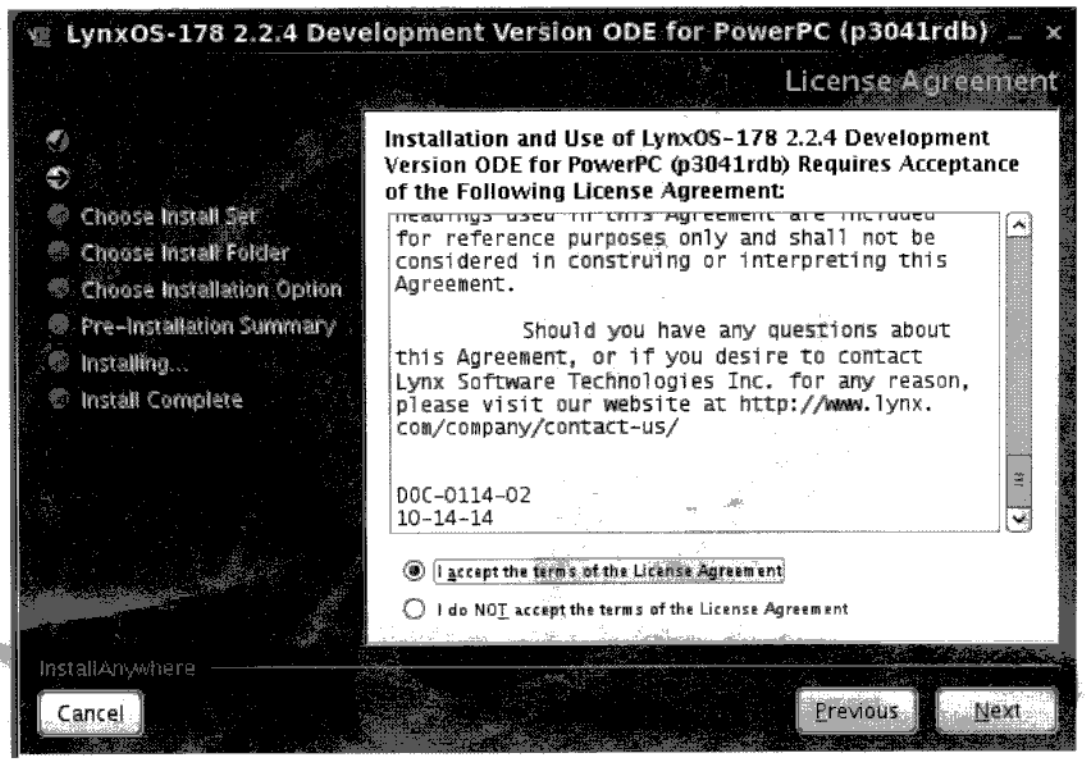

Figure 2-2: LynxOS-178 v2.2.4 BETA for PowerPC — License Agreement

Read the displayed License Agreement completely by scrolling down and select the **I accept the terms of the License Agreement** radio button.

Click **Next** to go to the **Choose Install Set** window.

The **Choose Install Set** window is displayed. Figure 2-3 shows the dialog where the user can specify a custom install set of options that are available and will be installed with LynxOS-178.

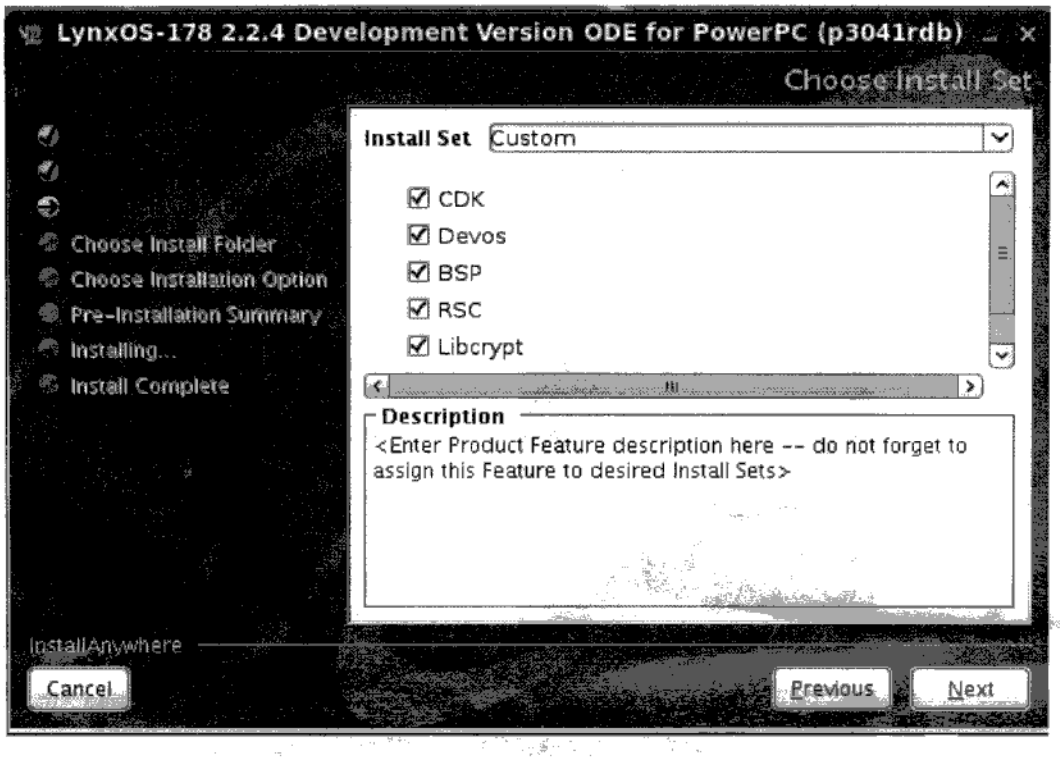

Figure 2-3: LynxOS-178 v2.2.4 BETA for PowerPC — Choose Install Set

Click **Next** to go to the **Choose Install Folder** window.

The **Choose Install Folder** window is displayed. The user can specify the name of the folder where LynxOS-178 will be installed. Figure 2-4 shows the window with the default installation folder as `/usr/los178/2.2.4`.

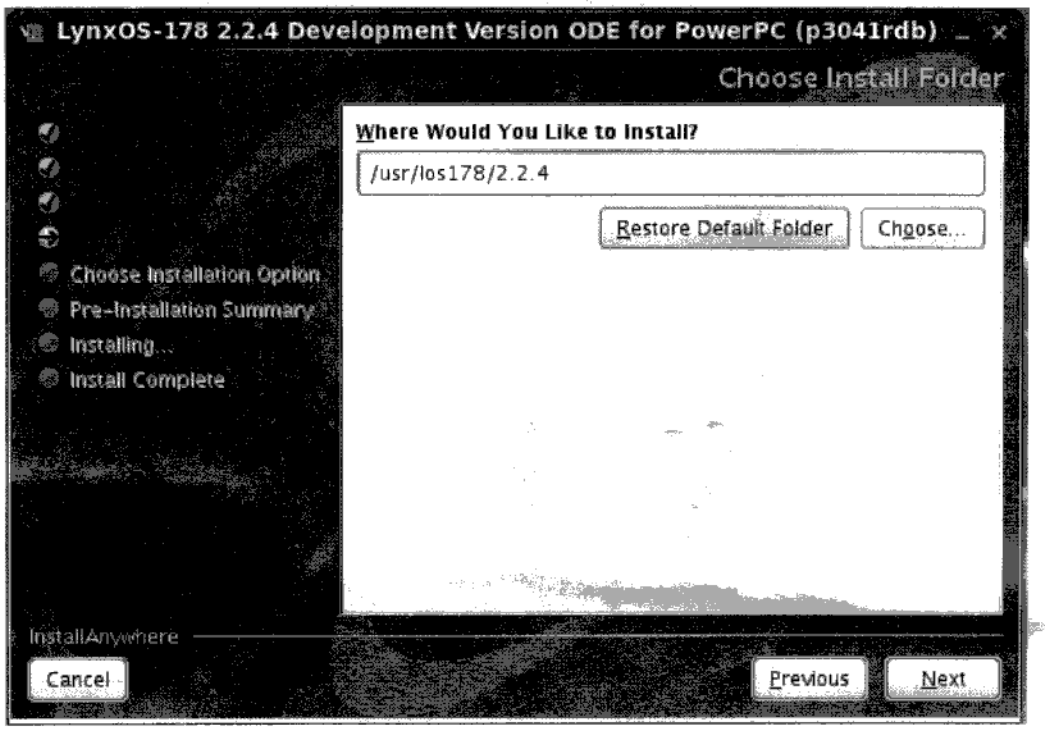

Figure 2-4: LynxOS-178 v2.2.4 BETA for PowerPC — Choose Install Folder

NOTE: The absolute path name is required here. Any relative path name can result in installation problems.

Click **Next** to go to the **Choose Install Option** window.

The **Choose Install Option** window is displayed. Figure 2-5 shows the window that appears after the default installation folder `/usr/los178/2.2.4/` has been selected.

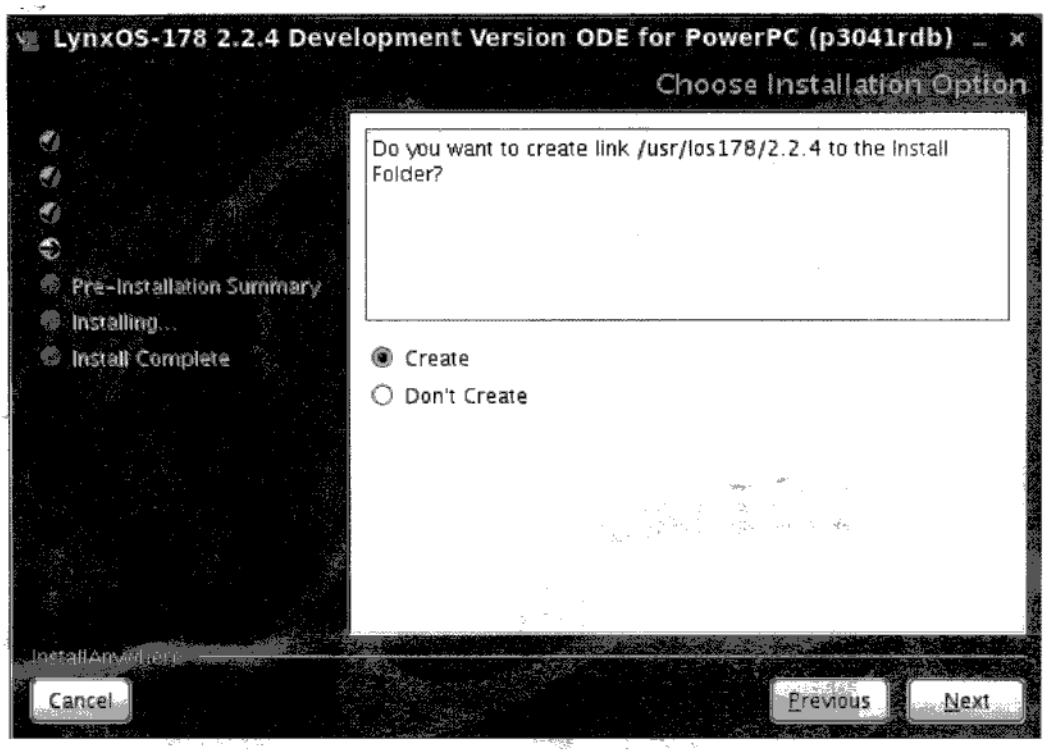

Figure 2-5: LynxOS-178 v2.2.4 BETA for PowerPC — Choose Installation Option

The user can elect to either **Create** or **Don't Create** a link to the *Install Folder* that was specified in the previous window.

Click **Next** to go to the **Pre-Installation Summary** window.

The **Pre-Installation Summary** window is displayed. Figure 2-6 displays the installation choices that have been made by the user.

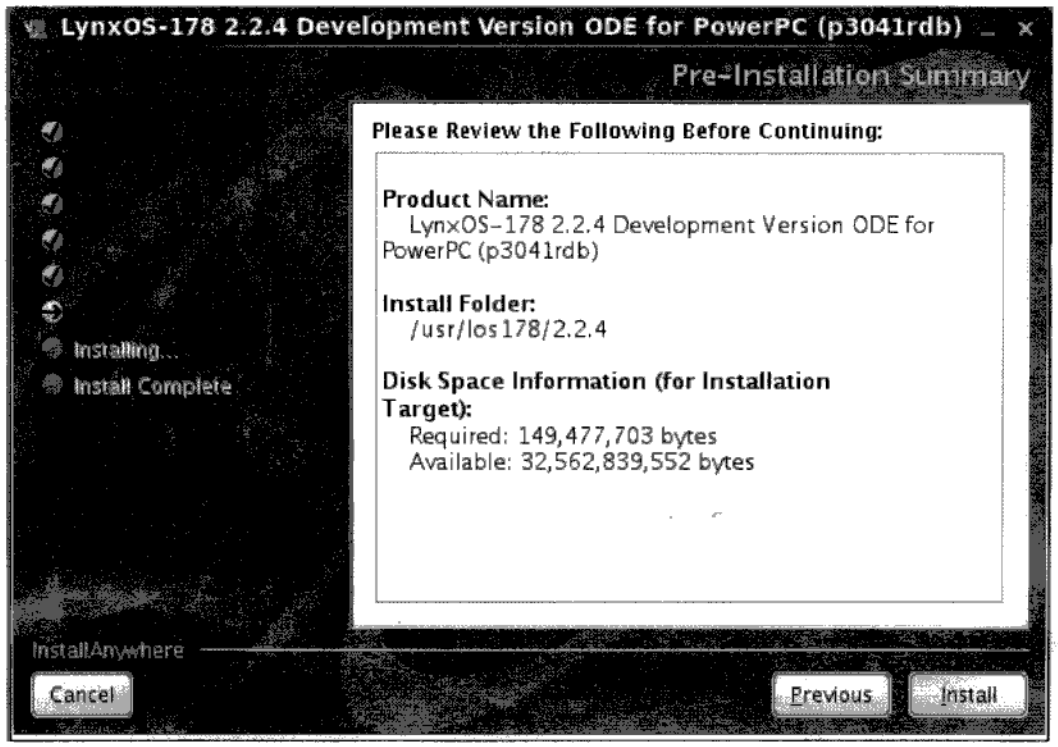

Figure 2-6: LynxOS-178 v2.2.4 BETA for PowerPC — Pre-Installation Summary

This window allows the user to review information such as *Product Name*, *Install Folder*, and *Disk Space Information* before continuing the installation process.

Click **Install** to proceed with installation.

Windows Cross-Development Installation

The LynxOS-178 ODEW CD-ROM contains the CDK, RSC, and ODE software components. These components are installed at the same time during the GUI Installer installation.

NOTE: If Cygwin is installed and mounted on the Windows Host, the Cygwin mounted directories should be un-mounted before installing LynxOS-178 v2.2.4 BETA.

NOTE: Installation of an ODEW onto a disk drive other than **C** is not supported for the Windows Host. It is important to install the ODEW onto the **C** disk drive.

---

1. Install the LynxOS-178 Development Version core components by using the InstallAnywhere GUI Installer.

   Insert the LynxOS-178 Development Version ODEW CD-ROM into the CD-ROM drive. If Autorun is enabled on the system, the **Introduction** window will come up automatically. If Autorun is disabled, start the installation by double-clicking the **Install InstallAnywhere self Extractor Macrovision** icon under the `<cdrom_drive>:Windows\Disk1\InstData\VM` directory.

   For the LynxOS-178 ODEW CD-ROM, specify whether the software is being installed for a single user or for multiple users.

   The user can go through the installation steps as instructed by the InstallAnywhere GUI Installer prompt.

2. Before using LynxOS-178 v2.2.4 BETA to develop applications, you must perform the following:

   - Double click the LynxOS-178 v2.2.4 BETA icon on the desktop to launch the bash shell.
   - Change to the directory where the LynxOS-178 CDK is installed and set LynxOS-178. For example:

     ```
     $ cd /usr/los178/2.2.4/ppc_dev
     $ . SETUP.bash
     ```

Refer to the *LynxOS-178 v2.2.4 BETA User's Guide* for more information on the `SETUP` script.

NOTE: If you did not already install and configure the FlexLM software, you must complete the License Management Installation Process before you proceed. Refer to the *License Management Installation Guide* for complete details.

---

3. Open a License Management session. Define the license data file. For example:

```
$ export LM_LICENSE_FILE=c:/flexlm/ \
v11.7/WIN32/license.dat
```

To start the Session Manager, enter the following:

```
$ cd $ENV_PREFIX
$ lwsmgr &
```

NOTE: The above set of commands opens the License Management session info window. The License Management session will run while this window is open. Closing the License Management info window stops the License Management session.

Installing the LynxOS-178 Production Version

Overview

Installation of these core components is required for the LynxOS-178 Production Version. These core LynxOS-178 software components are:

- The LynxOS-178 CDK — Includes the GNU toolchain, License Management software, and all other Development tools.
- The LynxOS-178 RSC Production Version — Includes system files in the RSC components.
- The LynxOS-178 Production Version ODE (ODEL for Linux Hosts and ODEW for Windows Hosts) — Includes the LynxOS-178 system files, Libcrypt, and BSP for the target board.

The basic steps of the installation are as follows:

1. Install LynxOS-178 CDK, RSC, ODE, and BSP from their respective CD-ROMs by using the InstallAnywhere GUI Installer (for Linux and Windows Hosts) or Unix-like command line interface.
2. Run a setup script to enable LynxOS-178.
3. Open a License Management session.

Linux Production Version Installation

To install the LynxOS-178 Production Version onto the appropriate host, perform the steps described below.

NOTE: The LynxOS-178 CDK package *must* be installed *before* the LynxOS-178 Development Version RSC and ODEL packages. Failure to install these components in the correct order can result in problems with LynxOS-178.

---

1. Install the LynxOS-178 Development Version core components by using the InstallAnywhere GUI Installer.

   Insert the LynxOS-178 CDK CD-ROM (Linux Host) into the CD-ROM drive. Enter the following command to start LynxOS-178 Production Version CDK installation.

```
# sh <cdrom_mount_point>/Linux/Disk1/InstData/ \
VM/install.bin
```

After LynxOS-178 CDK installation completes, insert the LynxOS-178 Production Version ODEL CD-ROM into the CD-ROM drive. Enter the following command:

```
# sh <cdrom_mount_point>/Linux/Disk1/InstData/ \
VM/install.bin
```

Insert the LynxOS-178 Production Version ODEL CD-ROM into the CD-ROM drive. Enter the following command:

```
# sh <cdrom_mount_point>/Disk1/InstData/Linux/ \
VM/install.bin
```

The user can now examine the LynxOS-178 Production Version installation steps as instructed by the InstallAnywhere GUI Installer.

2. Before using LynxOS-178 v2.2.4 BETA to develop applications, set LynxOS-178 with one of the two `SETUP` scripts:

   - For the `bash` shell:

     ```
     $ . SETUP.bash
     ```

   - For C shell:

     ```
     % source SETUP.csh
     ```

   Refer to the *LynxOS-178 v2.2.4 BETA User's Guide* for more information on these setup scripts.

NOTE: If you did not install and configure the FLEXlm software already, you must complete it before you proceed to the next step. Refer to *License Management Installation Guide* for complete details.

---

3. Open a License Management session. Define the license data file. For example:

   ```
   $ export LM_LICENSE_FILE=/usr/local/flexlm/ \
   v11.7/linux64/license.dat
   ```

   To start the Session Manager, enter the following:

   ```
   $ cd $ENV_PREFIX
   $ lwsmgr
   ```

Once the Session Manager is started, the user can start using the protected software tools.

Windows Cross-Development Installation

NOTE: If Cygwin is installed and mounted on the Windows Host, the Cygwin mounted directories should be un-mounted before installing LynxOS-178 v2.2.4 BETA.

NOTE: Installation of an ODEW onto a disk drive other than **C** is not supported for the Windows Host. It is important to install the ODEW onto the **C** disk drive.

The LynxOS-178 ODEW Production Version CD-ROM contains the CDK, RSC, Libcrypt, and (ODEL for Linux Hosts and ODEW for Windows Hosts) software components. These components are installed at the same time during the GUI Installer installation.

1. Install the LynxOS-178 Production Version core components by using the InstallAnywhere GUI Installer.

   Insert the LynxOS-178 Production Version ODEW CD-ROM into the CD-ROM drive. If Autorun is enabled on the system, the **Introduction** window will come up automatically. If Autorun is disabled, start the installation by double-clicking the **Install InstallAnywhere self Extractor Macrovision** icon under the `<cdrom_drive>:Windows\Disk1\InstData\VM` directory.

   User can go through the installation steps as instructed by the InstallAnywhere GUI Installer.

2. Before using LynxOS-178 v2.2.4 BETA to develop applications, you must perform the following:

   - Double click the LynxOS-178 v2.2.4 BETA icon on the desktop to launch the bash shell:

   Change to the directory where the LynxOS-178 CDK is installed and set LynxOS-178. For example:

   ```
   $ cd /usr/los178/2.2.4/ppc_dev
   $ . SETUP.bash
   ```

   - Refer to the *LynxOS-178 v2.2.4 BETA User's Guide* for more information on these setup scripts.

NOTE: Installing the Development Version and the Production Version into the same location, and then uninstalling one of them will remove Cygwin.

NOTE: If you did not install and configure the FLEXlm software already, you must complete it before you proceed to the next step. Refer to the *License Management Installation Guide* for complete details.

3. Open a License Management session. Define the license data file. For example:

```
$ export LM_LICENSE_FILE=c:/flexlm/ \
v11.7/win32/license.dat
```

To start the Session Manager, enter the following:

```
$ cd $ENV_PREFIX
$ lwsmgr &
```

NOTE: The above set of commands opens the License Management session info window. The License Management session is run while this window is open. Closing the License Management info window stops the License Management session.

Uninstalling LynxOS-178

From a Linux Host

To uninstall LynxOS-178 from a Linux host, enter the following:

```
# sh
<install_folder>/.IA_LynxOS_224_<comp>_<arch>_<mode>/ \
UninstallData/Uninstall
```

where *<install_folder>* is the install folder, *<comp>* is the short name of LynxOS-178 installation CD-ROM (for example, `ODE`), *<arch>* is the target architecture (`ppc`), and *<mode>* is the LynxOS-178 version (`dev`, `pdn` or `all`).

NOTE: The `.CommonComponents` directory in the installation directory may not be deleted after uninstalling any single installed project. Please remove it manually, after the uninstallation completes.

From a Windows Host

To uninstall LynxOS-178 from a Windows host, perform the following steps:

1. From the Windows **Control Panel**, select **Add/Remove Programs**.
2. Select the LynxOS-178 software.
3. Select **Change/Remove**.

NOTE: Some files are not removed during uninstalling. Remove these files manually.

NOTE: After uninstalling `Libcrypt_binary` or `LCS_binary`, these components remain in the list of **Add or Remove Programs**. Please remove these components from **Add or Remove Programs** using the **Change/Remove** button.

CHAPTER 3 *Building LynxOS-178 from Source Code*

This chapter describes the contents of the LynxOS-178 Source package, the process of installing LynxOS-178 sources, and how to build the Development Version and Production Version of LynxOS-178 from source.

LynxOS-178 Source Package Contents

The LynxOS-178 source package includes the following:

- LynxOS-178 OSS CD-ROM
- LynxOS-178 Advanced Porting Kit CD-ROM

CD-ROM Layout

Table 3-1 lists the contents of the `/tar_images/` directory on the LynxOS-178 OSS CD-ROM.

Table 3-1: LynxOS-178 OSS CD-ROM Contents

Directory	Contents
`/tar_images/`	
`<media_num>.los178_src.tar.gz`	Sources for system files (minus RSC files) for the PowerPC architecture
`<media_num>.los178_rsc_src.tar.gz`	Sources for system files included in the RSC components for the PowerPC architecture
`<media_num>.tcpip_src.tar.gz`	Sources for TCP/IP stack
`<media_num>.nfs_src.tar.gz`	Sources for NFS
`<media_num>.libcrypt_src.tar.gz`	Sources for Libcrypt

Table 3-2 lists the contents of the `/tar_images/` directory on the LynxOS-178 Advanced Porting Kit CD-ROM, where *<bsp_name>* is the name of the Board Support Package and *<csp_name>* is the name of the CPU Support Package (CSP).

Table 3-2: LynxOS-178 Advanced Porting Kit CD-ROM Contents

Directory	Contents
LynxOS-178 v2.2.4 BETA Board Support Guide	Documentation that describes the Board Support Guide
LynxOS-178 v2.2.4 BETA Advanced Porting Kit Guide	Documentation that describes the Advanced Porting Kit Guide
/tar_images/	
<media_num>.*<bsp_name>*_src.tar.gz	Sources for BSP files placed on a target board
<media_num>.drm_src.tar.gz	DRM sources
<media_num>.csp_src_*<csp_name>*.tar.gz	PowerPC CSP and family of source files for a specified CSP
<media_num>.cinit_common_src.tar.gz	Common source files for CINIT
<media_num>.cinit_*<bsp_name>*_src.tar.gz	CINIT source files for the BSP
<media_num>.hm_src.tar.gz	Health Monitor sources

Installing LynxOS-178 Sources

This section describes the installation procedure for the LynxOS-178 source files Linux Host.

An outline for the basic steps of the installation are as follows:

1. Create the installation directory.
2. Extract the installation files for the OSS and PKT from their respective CD-ROMs.
3. Run a setup script to enable LynxOS-178.
4. Open a License Management Session.

NOTE: Installing the LynxOS-178 sources requires root privileges.

It is critical to create separate installation directories for the Development Version and the Production Version builds.

The instructions below assume that the `/home/los178/dev-build` directory is used for building the Development Version and that the `/home/los178/pdn-build` directory is used for building the Production Version.

The LynxOS-178 sources **MUST** be installed in the order defined. Failure to install these components in the correct order can result in problems with building LynxOS-178.

Perform the following steps in the exact order defined below:

1. Create a directory for the LynxOS-178 source installation by issuing the following command:

   ```
   # mkdir -p /home/los178/dev-build/
   ```

2. Install the LynxOS-178 OSS:

   - Insert the LynxOS-178 OSS CD-ROM into the CD-ROM drive and mount it.
   - Change to the LynxOS-178 installation directory:

     ```
     # cd /home/los178/dev-build/
     ```

   - Enter the following commands to extract the LynxOS-178 OSS tar files using the `tar` command:

     ```
     # tar -xvzpf /mnt/cdrom/tar_images/ \
     ```

```
<media_num>.los178_src.tar.gz

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.los178_rsc_src.tar.gz

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.tcpip_src.tar.gz

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.nfs_src.tar.gz

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.libcrypt_src.tar.gz

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.cdk<host>.tar.gz
```

where *<media_num>* is an assigned unique number.

- Unmount the LynxOS-178 OSS CD-ROM and remove it from the CD-ROM drive.

3. Install the LynxOS-178 Advanced Porting Kit:
   - Insert the LynxOS-178 Advanced Porting Kit CD-ROM into the CD-ROM drive and mount it.
   - Change to the LynxOS-178 installation directory:

     ```
     # cd /home/los178/dev-build/
     ```

   - Extract the BSP sources by entering the following commands:

     ```
     # tar -xvzpf /mnt/cdrom/tar_images/ \
     <media_num>.csp_src_<csp_name>.tar.gz

     # tar -xvzpf /mnt/cdrom/tar_images/ \
     <media_num>.drm_src.tar.gz

     # tar -xvzpf /mnt/cdrom/tar_images/ \
     <media_num>.bsp_src_<bsp_name>.tar.gz

     # tar -xvzpf /mnt/cdrom/tar_images/ \
     <media_num>.cinit_<bsp_name>_src.tar.gz

     # tar -xvzpf /mnt/cdrom/tar_images/ \
     <media_num>.hm_src.tar.gz
     ```

where <media_num> is an assigned unique number, <bsp_name> is the name of the Board Support Package and <csp_name> is the name of the CPU Support Package.
LynxOS-178 sources are now installed.

- Unmount the LynxOS-178 Advanced Porting Kit CD-ROM and remove it from the CD-ROM drive.

4. Install the LynxOS-178 CDK:
   - Insert the LynxOS-178 <host> CDK CD-ROM into the CD-ROM drive and mount it.
   - Change to the LynxOS-178 installation directory and extract the CDK using the following commands:

```
# cd /home/los178/dev-build/

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.cdk<host>.tar.gz
```

   - Unmount the LynxOS-178 <host> CDK CD-ROM and remove it from the CD-ROM drive.
5. Insert the LynxOS-178 Linux (ODEL) Development Version CD-ROM into the CD-ROM drive and mount it.
   - Change to the LynxOS-178 installation directory and extract the useful library files using the following commands:

```
# cd /home/los178/dev-build/

# tar -xvzpf /mnt/cdrom/tar_images/ \
<media_num>.los178_dev.tar.gz./sys/miscgcc
```

6. Before using LynxOS-178 sources to build binaries, users must setup LynxOS-178 with one of two SETUP scripts:
   - For the bash shell:

```
$ . SETUP.bash
```

   - For C shell:

```
% source SETUP.csh
```

Refer to the *LynxOS-178 v2.2.4 BETA User's Guide* for more information on these setup scripts. Ensure that the License Management Session has been installed.

Building the LynxOS-178 Development Version

After the sources have been installed, perform the following steps to build the LynxOS-178 Development Version:

1. Change to the LynxOS-178 Development Installation Directory:

   ```
   $ cd  /home/los178/dev-build
   ```

2. Modify the following entry in the `ENVIRONMENT` file to read as shown below.

   ```
   DEVELOPMENT=yes
   ```

3. Enable LynxOS-178 by using the `SETUP` script:

   ```
   $ . SETUP.bash
   ```

4. Open a License Management session.

   - On the Linux Hosts:

     ```
     $ lwsmgr
     ```

   - On the Windows Host:

     ```
     $ lwsmgr &
     ```

5. Execute the `make install` command:

   ```
   $ make install
   ```

Building the LynxOS-178 Production Version

Assuming the LynxOS-178 sources have been installed in the `/home/los178/pdn-build` directory (separate from the Development Version build), perform the following steps to build the LynxOS-178 Production Version:

1. Change to the LynxOS-178 Production Version build directory:

   ```
   $ cd /home/los178/pdn-build
   ```

2. Modify the following entry in the `ENVIRONMENT` file to read as shown below.

   ```
   DEVELOPMENT=no
   ```

3. Enable LynxOS-178 by using the `SETUP` script:

   ```
   $ . SETUP.bash
   ```

4. Open a License Management session:

   - On the Linux Host:

     ```
     $ lwsmgr
     ```

   - On the Windows Host:

     ```
     $ lwsmgr &
     ```

5. Execute the `make install` command:

   ```
   $ make install
   ```