

# SGI ProPack™ 4 for Linux® Start Here

007-4727-003

---

## CONTRIBUTORS

Written by Terry Schultz

Production by Terry Schultz

---

## COPYRIGHT

© 2005, 2006, Silicon Graphics, Inc. All rights reserved; provided portions may be copyright in third parties, as indicated elsewhere herein. No permission is granted to copy, distribute, or create derivative works from the contents of this electronic documentation in any manner, in whole or in part, without the prior written permission of Silicon Graphics, Inc.

---

## LIMITED RIGHTS LEGEND

The software described in this document is “commercial computer software” provided with restricted rights (except as to included open/free source) as specified in the FAR 52.227-19 and/or the DFAR 227.7202, or successive sections. Use beyond license provisions is a violation of worldwide intellectual property laws, treaties and conventions. This document is provided with limited rights as defined in 52.227-14.

---

## TRADEMARKS AND ATTRIBUTIONS

Silicon Graphics, SGI, the SGI logo, Altix, IRIX, OpenGL, Origin, Onyx, Onyx2, and XFS are registered trademarks and NUMAflex, NUMAlink, OpenGL Multipipe, OpenGL Performer, OpenGL Vizserver, OpenGL Volumizer, OpenMP, Performance Co-Pilot, RASC, SGI ProPack, SGIconsole, SHMEM, Silicon Graphics Prism, and Supportfolio are trademarks of Silicon Graphics, Inc., in the United States and/or other countries worldwide.

FLEXlm is a registered trademark of Macrovision Corporation. Java is a registered trademark of Sun Microsystems, Inc. in the United States and/or other countries. KAP/Pro Toolset and VTune are trademarks and Intel, Itanium, and Pentium are registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries. Linux is a registered trademark of Linus Torvalds, used with permission by Silicon Graphics, Inc. MIPS is a registered trademark of MIPS Technology, Inc. PostScript is a registered trademark of Adobe Systems, Inc. QLogic is a registered trademark of QLogic Corporation. QuickTransit is a trademark of Transitive Corporation and/or its affiliates in the United States and other countries. Red Hat and all Red Hat-based trademarks are trademarks or registered trademarks of Red Hat, Inc. in the United States and other countries. Novell is a registered trademark, and SUSE is a trademark of Novell, Inc., in the United States and other countries. Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries. All other trademarks mentioned herein are the property of their respective owners.

---

## Record of Revision

<b>Version</b>	<b>Description</b>
001	February 2005 Original publication
002	August 2005 Updated for the SGI ProPack 4 for Linux Service Pack 2 release
003	January 2006 Updated for the SGI ProPack 4 for Linux Service Pack 3 release



---

## New Features in This Guide

This update of *SGI ProPack for Linux Start Here* supports the SGI ProPack 4 for Linux Service Pack 3 release.

### Major Documentation Changes

Changes in this guide for the SGI ProPack 4 for Linux SP3 release include the following:

- Updated information about software CDs in “CD Contents” on page 2.
- Updated information about system partition layout in “Table of Disk Partitions” on page 10.
- Updated the installation instructions in “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20.
- Added information about upgrading a system from a prior SGI ProPack 4 for Linux release in “Upgrading From an Earlier SGI ProPack 4 Release to SGI ProPack 4 SP3” on page 31.
- Added information about Hyper-Threading Technology in “Cpuset Support” on page 52.
- Added information about PCI domains in “PCI Domain Support for SGI Altix 4700 Systems” on page 56.
- Added information about Reconfigurable Application-Specific Computing (RASC) in “Reconfigurable Application-Specific Computing” on page 59.
- Added information about Digital Media libraries and tools in “Digital Media” on page 69.
- Added information about the QuickTransit for Silicon Graphics translator that you can use to run software applications compiled for IRIX MIPS platforms on SGI Linux systems based on Intel Itanium processors in “QuickTransit for Silicon Graphics” on page 70.



---

# Contents

<b>Record of Revision</b>	iii
<b>Tables</b>	xi
Helpful Online Resources	xiv
Related Publications	xvi
SUSE/Novell Documentation	xvi
Intel Compiler Documentation	xvii
Other Intel Documentation	xvii
SGI Documentation	xvii
Obtaining SGI Publications	xxiii
Conventions	xxiii
Reader Comments	xxiii
<b>1. Release Features</b>	<b>1</b>
Software Introduction	1
CD Contents	2
System Controller Software 1.12 CD	5
Getting Updates	5
SGI Open Source Information	6
Installation Overview	6
Documentation Updated for This Release	6

<b>2. Software Planning and Installation . . . . .</b>	<b>9</b>
Software Planning . . . . .	10
Table of Disk Partitions . . . . .	10
Systems with Multiple Ethernet Configurations . . . . .	11
XVM Volumes Access in Rescue Mode . . . . .	11
Digital Media . . . . .	11
SLES9 SP3 Kernels. . . . .	11
Linux Kernel Crash Dump . . . . .	13
Latest PROM Firmware . . . . .	13
License Manager Updates . . . . .	14
Read Me First - Installing SLES9 with Service Pack 3 on Your SGI System . . . . .	14
Installing SUSE Linux Enterprise Server 9 SP3 . . . . .	18
How To Install SGI ProPack 4 for Linux SP3 For the First Time . . . . .	20
Instructing YaST to Look at Your Install Media . . . . .	21
Installing from CD . . . . .	21
Installing from ISO Images . . . . .	23
Other Installation Sources . . . . .	24
Installing SGI ProPack with YaST . . . . .	24
Installing SGI ProPack with YaST - Using the Text (non-graphical) Interface . . . . .	25
Installing SGI ProPack with YaST - Using the Graphical Interface . . . . .	26
Notes on Installing SGI ProPack with YaST . . . . .	28
SLES and SGI ProPack Network Installation for Experts . . . . .	28
Setting up the Network Install Server . . . . .	28
Using AutoYaST . . . . .	29
Upgrading From an Earlier SGI ProPack 4 Release to SGI ProPack 4 SP3 . . . . .	31
Instructing YaST to Look at Your Install Media for Upgrade. . . . .	31
Installing from CD . . . . .	32
Installing from ISO Images . . . . .	33
Other Installation Sources . . . . .	35

Upgrading SGI ProPack 4 for Linux and SLES9 SP3 with YaST . . . . .	35
Upgrading SGI ProPack with YaST - Using the Text (non-graphical) Interface . . . . .	36
Upgrading SGI ProPack with YaST - Using the Graphical Interface . . . . .	38
Upgrading SGI ProPack for REACT Real-Time for Linux Users . . . . .	39
Notes on Upgrading SGI ProPack with YaST . . . . .	40
Installing the SN2 Kernel . . . . .	40
Install the sn2 Kernel Variant with YaST-Using the Text (non-graphical) Interface . . . . .	41
Install the sn2 Kernel Variant with YaST-Using the Graphical Interface . . . . .	41
Install the SGI ProPack Kernel Modules for the sn2 Kernel . . . . .	42
KDB Support in the kernel-default and sn2 Kernels . . . . .	42
Installing the System Controller Software 1.12 CD . . . . .	42
Obtaining and Installing the Latest SGI Altix or Prism System Firmware . . . . .	43
Reinstalling Your Software . . . . .	45
<b>3. Product Support . . . . .</b>	<b>47</b>
SGI ProPack for Linux Products . . . . .	47
Operating System Enhancements . . . . .	52
Cpuset Support . . . . .	52
Comprehensive System Accounting (CSA) . . . . .	53
Partitioning . . . . .	53
I/O Subsystems . . . . .	54
Persistent PCI Bus Numbering . . . . .	54
Persistent IP Addressing of Ethernet Interfaces . . . . .	56
PCI Domain Support for SGI Altix 4700 Systems . . . . .	56
XFS Filesystem . . . . .	57
XVM Volume Manager . . . . .	57
HPC Application Tools and Support . . . . .	58
Message Passing Toolkit . . . . .	58
Performance Co-Pilot . . . . .	58
System Management . . . . .	59
PROM Chips . . . . .	59

Reconfigurable Application-Specific Computing . . . . .	.59
Extensible Firmware Interface (EFI) . . . . .	.60
FLEXlm . . . . .	.63
SGIconsole . . . . .	.63
System Controller Firmware . . . . .	.64
L1 and L2 System Controllers . . . . .	.64
L3 System Controller . . . . .	.65
NUMA Data Placement Tools. . . . .	.65
dlook Command . . . . .	.65
dplace Command . . . . .	.66
Graphics APIs and Software . . . . .	.66
OpenGL Multipipe . . . . .	.67
OpenGL Multipipe Software Development Kit (SDK) . . . . .	.67
OpenGL Performer . . . . .	.68
OpenGL Vizserver. . . . .	.68
OpenGL Volumizer . . . . .	.69
Digital Media . . . . .	.69
Digital Media Libraries . . . . .	.69
Digital Media Tools . . . . .	.69
QuickTransit for Silicon Graphics . . . . .	.70
<b>Index.</b> . . . . .	<b>.71</b>

---

# Tables

<b>Table 2-1</b>	Disk Partitions . . . . .	10
<b>Table 2-2</b>	SLES9 SP3 Kernels . . . . .	12
<b>Table 3-1</b>	SGI ProPack 4 for Linux Products . . . . .	48
<b>Table 3-2</b>	EFI Commands . . . . .	61



---

## About This Guide

This guide provides information about the SGI ProPack 4 for Linux Service Pack 3 release. It is divided into the following chapters:

- Chapter 1, “Release Features,” describes the major features of this release, the CD contents, SGI Open Source software, SGI system controller software, and documentation information.
- Chapter 2, “Software Planning and Installation,” describes the flowcharts of disk partitions and file configurations and layouts that you need to get started, and provides instructions for installing SGI ProPack for Linux.
- Chapter 3, “Product Support,” documents the product components that are supported on SGI Altix systems.

Online versions of this document, the SGI ProPack 4 SP3 release notes, which contain the latest information about software and documentation in this release, the list of RPMs distributed with SGI ProPack 4 SP3, and a useful migration guide, which contains helpful hints and advice for customers moving from earlier versions of SGI ProPack to SGI ProPack 4 SP3, can be found in the `/docs` directory on the SGI ProPack 4 for Linux Service Pack 3 Open/Free Source CD.

This Preface covers the following topics:

- “Helpful Online Resources” on page xiv
- “SUSE/Novell Documentation” on page xvi
- “Intel Compiler Documentation” on page xvii
- “Other Intel Documentation” on page xvii
- “SGI Documentation” on page xvii
- “Obtaining SGI Publications” on page xxiii

## Helpful Online Resources

This section describes the electronic support services available for your SGI system running SGI ProPack 4 for Linux Service Pack 3, as follows:

- Supportfolio

Supportfolio, the SGI support web site, including the SGI Knowledgebase, Unified SGI/SUSE YaST Online Server, links for software supports and updates, as described in this listing.

<https://support.sgi.com/login>

- Supportfolio SGI Knowledgebase

The SGI Knowledgebase available from Supportfolio has answers to common question, problem resolutions, how-to documents, and many other useful articles for system administrators.

<https://support.sgi.com/kb/publisher.asp>

- SGI YaST Online Update Server

The SGI YaST Update Online (YOU) server is available for your convenience. Get updates to SGI ProPack 4 for Linux and SUSE Linux Enterprise Server 9 (SLES9) using the YaST install tool right from your system. The *YaST Online Update - Patch Media Instructions* describes how to update your system using patch media. Use your Supportfolio account name and password, and point YaST to this location:

<http://you.sgi.com/>

- Supportfolio Software Updates

Check for new updates to your purchased SGI software, and download or order CDs all in one convenient place. Supportfolio Software Updates provides one-stop shopping to check for and get new updates for your SGI software.

<https://support.sgi.com/software?cmd=order>

- SGI Customer Support Center

You can open calls to the SGI Customer Support Center on-line, keep track of all your cases, and receive automatic update information when your case is updated via the Supportfolio Problem Resolution Tools at:

<https://support.sgi.com/caselist>

- SGI Software Licensing

If you need to get your license for SGI software, you can order your software licenses conveniently via e-mail or on-line.

You can send a blank email to [license@sgi.com](mailto:license@sgi.com), and you will receive a simple templet to fill out. You will quickly receive your new license back with complete instructions for installing it back via E-Mail.

Or, you can go on-line to the SGI Key-O-Matic at:

<http://www.sgi.com/support/licensing/>

## Related Publications

Documents listed in this section contain additional information that might be helpful, as follows:

- “SUSE/Novell Documentation” on page xvi
- “Intel Compiler Documentation” on page xvii
- “Other Intel Documentation” on page xvii
- “SGI Documentation” on page xvii

## SUSE/Novell Documentation

Documentation for SUSE Linux Enterprise Server 9 is located on your system in the `/usr/share/doc` directory. There are also several helpful documents provided on SLES9 CD1 in the `/docu/en` directory.

The following documentation is available:

- SUSE Linux Enterprise Server 9 Installation and Administration (manual.pdf), available online at:  
[http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)
- SUSE Linux Enterprise Server 9 Start-Up Guide (startup.pdf), available online at:  
[http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_startup\\_guide/sles\\_9\\_startup\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_startup_guide/sles_9_startup_guide.pdf)
- SUSE Linux Enterprise Server 9 Package Descriptions available online at  
<http://www.novell.com/products/linuxenterpriseserver/packages.html>
- Migrating from Red Hat to SUSE Linux Enterprise Server 9: A Novell Migration Study available online at  
[http://www.novell.com/resourcecenter/ext\\_item.jsp?itemId=13485](http://www.novell.com/resourcecenter/ext_item.jsp?itemId=13485)
- Novell YES CERTIFIED Bulletins for SGI available online at  
<http://developer.novell.com/yesearch/Search.jsp> (select "SGI" as the Company and "SUSE Linux Enterprise Server 9 for Intel Itanium Process" as the Novell Product and click Search)

Novell makes SUSE Linux Enterprise Server documentation available online at:  
<http://www.novell.com/documentation/sles9/index.html>

## Intel Compiler Documentation

Documentation for the Intel compilers is located on your system in the `/docs` directory of the directory tree where your compilers are installed. If you have installed the Intel compilers, the following documentation is available:

- *Intel C++ Compiler User's Guide* (`c_ug_lnx.pdf`).
- *Intel Fortran Compiler User's Guide* (`for_ug_lnx.pdf`).
- *Intel Fortran Programmer's Reference* (`for_prg.pdf`).
- *Intel Fortran Libraries Reference* (`for_lib.pdf`).

## Other Intel Documentation

The following references describe the Itanium (previously called "IA-64") architecture and other topics of interest:

- *Intel Itanium 2 Processor Reference Manual for Software Development and Optimization*, available online at <http://developer.intel.com/design/itanium2/manuals/251110.htm>.
- *Intel Itanium Architecture Software Developer's Manual*, available online at <http://developer.intel.com/design/itanium/manuals/iiasdmanual.htm>.
- *Introduction to Itanium Architecture*, available online at <http://shale.intel.com/softwarecollege/CourseDetails.asp?courseID=13> (secure channel required).

## SGI Documentation

The following SGI documentation is available:

- *SGI ProPack 3 to SGI ProPack 4 Migration Guide*  
This guide contains information about migrating from SGI ProPack 3 for Linux operating system to SGI ProPack 4 for Linux operating system.
- *SGI ProPack 4 for Linux Service Pack 3 Release Notes*  
Provides the latest information about software and documentation in this release. The release notes are on the SGI ProPack for Linux Documentation CD in the `root` directory, in a file named `README.TXT`.

- *YaST Online Update - Patch Media Instructions*  
Describes how to update your system using patch media.
- *SGI ProPack 4 for Linux Device Driver Porting Guide*  
Provides information on programming, integrating, and controlling drivers.
- *Porting IRIX Applications to SGI Altix Platforms: SGI ProPack for Linux*  
Provides information about porting an application to the SGI Altix platform.
- *Message Passing Toolkit (MPT) User's Guide*  
Describes industry-standard message passing protocol optimized for SGI computers.
- *Origin 2000 and Onyx2 Performance Tuning and Optimization Guide*  
Contains information specific to MIPS/IRIX systems, but the general guidelines in the document are hardware and operating system independent.
- *REACT Real-Time for Linux Programmer's Guide*  
Describes the facilities of REACT real-time for Linux that supports real-time programs.
- *Performance Co-Pilot for IA-64 Linux User's and Administrator's Guide*  
Describes the Performance Co-Pilot (PCP) software package of advanced performance tools for SGI systems running the Linux operating system.
- *Linux Configuration and Operations Guide*  
Provides information on how to perform system configuration and operations for SGI ProPack servers.
- *Linux Resource Administration Guide*  
Provides a reference for people who manage the operation of SGI ProPack servers and contains information needed in the administration of various system resource management features such as Comprehensive System Accounting (CSA), Array Services, CPU memory sets and scheduling, and the Cpuset System.
- *SGI Altix 330 System User's Guide*  
Provides an overview of the Altix 330 system components, and it describes how to set up and operate this system
- *SGI Altix 350 System User's Guide*  
Provides an overview of the Altix 350 system components, and it describes how to set up and operate this system.
- *SGI Altix 350 Quick Start Guide*  
Guides a knowledgeable user through the installation, setup, and simple configuration of most SGI Altix 350 systems.

- *SGI Altix 3000 User's Guide*  
Provides an overview of the architecture and describes the major components of the SGI Altix 3000 family of servers and superclusters. It also describes the standard procedures for powering up and powering down the system, provides basic troubleshooting information, and includes important safety and regulatory specifications.
- *SGI Altix 3700Bx2 User's Guide*  
This guide provides an overview of the architecture and descriptions of the major components that compose the SGI Altix 3700Bx2 family of servers. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting information, and important safety and regulatory specifications.
- *SGI Altix 4700 User's Guide*  
This guide provides an overview of the architecture and descriptions of the major components that compose the SGI Altix 4700 family of servers. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting information, and important safety and regulatory specifications.
- *Silicon Graphics Prism Visualization System User's Guide*  
Provides an overview of the Silicon Graphics Prism Visualization System components, and it describes how to set up and operate this system.
- *Silicon Graphics Prism Deskside Visualization System User's Guide*  
Provides an overview of the Silicon Graphics Prism Deskside system components, and it describes how to set up and operate this system.
- *Reconfigurable Application-Specific Computing User's Guide*  
Provides information about the SGI reconfigurable application-specific software computing (RASC) program that delivers scalable, configurable computing elements for the SGI Altix family of servers and superclusters and Silicon Graphics Prism Visualization Systems.
- *SIGIconsole 2.1 Start Here*  
Provides an introduction to SIGIconsole and information about setting up and configuring SIGIconsole hardware and software.
- *Console Manager for SIGIconsole Administrator's Guide*  
Provides information about the Console Manager software graphical interface allows you to control multiple SGI servers, SGI partitioned systems, and large single-system image servers.

- *SGI L1 and L2 Controller Software User's Guide*  
Describes how to use the L1 and L2 controller commands at your system console to monitor and manage SGI Altix 350 systems, the SGI Altix 3000 and SGI Altix 4700 family of servers and superclusters, and Silicon Graphics Prism Visualization Systems.
- *XFS for Linux Administration*  
Describes XFS, an open-source, fast recovery, journaling filesystem that provides direct I/O support, space preallocation, access control lists, quotas, and other commercial file system features.
- *XVM Volume Manager Administrator's Guide*  
Describes the configuration and administration of XVM logical volumes using the XVM Volume Manager.
- *Event Manager User Guide*  
Provides information about the Event Manger application that collects event information from other applications. This document describes the Event Manager application, the application programming interface that you can use to access it, the procedures that you can use to communicate with it from another application, and the commands that you can use to control it.
- *Embedded Support Partner User Guide*  
Provides information about using the Embedded Support Partner (ESP) software suite to monitor events, set up proactive notification, and generate reports. This revision of the document describes ESP version 3.0, which is the first version of ESP that supports the Linux operating system.
- *Linux Application Tuning Guide*  
Provides information about tuning application programs on SGI Altix systems. Application programs include Fortran and C programs written on SGI Linux systems with the compilers provided by Intel.
- *SCSL User's Guide*  
Provides information about the scientific libraries on SGI Altix systems and SGI IRIX systems. Topics include dicussions about BLAS, LAPACK, and FFT routines.
- *SGI OpenGL Multipipe User's Guide*  
Describes the OpenGL Multipipe product, which allows you to run single-pipe applications in a multipipe environment without modification.
- *OpenGL Performer Getting Started Guide*  
Introduces the most important concepts and classes in the OpenGL Performer library.

- *OpenGL Performer Programmer's Guide*  
Provides information about OpenGL Performer that is a programming interface (with ANSI C and C++ bindings) for creating real-time graphics applications and offers high-performance, multiprocessed rendering in an easy-to-use 3D graphics toolkit.
- *SGI OpenGL Vizserver Administrator's Guide*  
Provides information about installing, configuring, tuning, and troubleshooting OpenGL Vizserver.
- *SGI OpenGL Vizserver User's Guide*  
Describes how you use OpenGL Vizserver to interact with images and three-dimensional models utilizing the capabilities of remote SGI servers.
- *SGI OpenGL Volumizer 2 Programmer's Guide*  
Documents OpenGL Volumizer 2, a C++ volume rendering toolkit optimized for SGI scalable servers. It provides the developer with the tool set needed to solve the problems inherent in high-quality, interactive volume rendering of large datasets. This guide gives an introduction to the OpenGL Volumizer 2 application programming interface (API) and examples of its use.
- *OpenGL Volumizer 2 Reference Pages*  
Provides reference page information for OpenGL Volumizer 2.
- *OpenML Media Library Software Development Kit Programmer's Guide*  
Provides an introduction to the SGI OpenML Media Library Software Development Kit (ML). The ML provides a cross-platform library for controlling digital media hardware. It supports audio and video I/O devices and transcoders.
- *QuickTransit for Silicon Graphics Installation and User's Guide*  
Describes how to install and run IRIX applications on Silicon Graphics Prism and SGI Altix platforms. QuickTransit for Silicon Graphics is a translator that allows software applications compiled for IRIX MIPS platforms to run transparently on SGI Linux systems based on Intel Itanium processors. This guide
- *SGI OpenGL Multipipe SDK User's Guide*  
Describes how to use and configure an MPK application. SGI OpenGL Multipipe SDK (MPK) is a software development toolkit (SDK) that allows you to adapt your graphics applications to run in immersive environments and to take advantage of the scalability provided by multiple pipes and other scalable graphics hardware.

- *SGI OpenGL Multipipe SDK Programmer's Guide*  
Describes OpenGL Multipipe SDK (MPK), which is a software development toolkit (SDK) that allows you to adapt your graphics applications to run in immersive environments and to take advantage of the scalability provided by multiple pipes and other scalable graphics hardware.
- *Multipipe SDK 3.0 Reference Pages Index*  
Provides reference page information for Multipipe SDK.

## Obtaining SGI Publications

You can obtain SGI documentation in the following ways:

- See the SGI Technical Publications Library at <http://docs.sgi.com>. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.
- You can view man pages by typing `man <title>` on a command line.

## Conventions

The following conventions are used throughout this publication:

<b>Convention</b>	<b>Meaning</b>
<code>command</code>	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
<i>variable</i>	Italic typeface denotes variable entries and words or concepts being defined.
<b>user input</b>	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. (Output is shown in nonbold, fixed-space font.)
<code>manpage(x)</code>	Man page section identifiers appear in parentheses after man page names.
<b>GUI element</b>	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

## Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, contact SGI. Be sure to include the title and document number of the manual with your comments. (Online, the document number is located in the front matter of the manual. In printed manuals, the document number is located at the bottom of each page.)

You can contact SGI in any of the following ways:

- Send e-mail to the following address:  
techpubs@sgi.com
- Use the Feedback option on the Technical Publications Library Web page:  
<http://docs.sgi.com>
- Contact your customer service representative and ask that an incident be filed in the SGI incident tracking system.
- Send mail to the following address:  
Technical Publications  
SGI  
1500 Crittenden Lane, M/S 535  
Mountain View, CA 94043-1351

SGI values your comments and will respond to them promptly.

## Release Features

This chapter provides an introduction to SGI ProPack 4 for Linux Service Pack 3 and describes the CD contents, provides documentation information, and provides a brief overview of the installation process. It covers the following topics:

- “Software Introduction” on page 1
- “CD Contents” on page 2
- “System Controller Software 1.12 CD” on page 5
- “Getting Updates” on page 5
- “SGI Open Source Information” on page 6
- “Installation Overview” on page 6
- “Documentation Updated for This Release” on page 6

### Software Introduction

The SGI ProPack 4 for Linux Service Pack 3 product includes capabilities and performance improvements ideal for enabling technical and creative users to solve their big compute and data problems by using the Linux operating system and Itanium processors. This product adds to or enhances features in the base SUSE Linux Enterprise Server 9 (SLES9) Service Pack 3 (SP3) Linux distribution. SGI ProPack 4 for Linux SP3 is designed to run on any SGI Altix system or any Silicon Graphics Prism Visualization System.

SGI hardware platforms and OS configuration settings supported by SGI in this release are documented at the following URL:

<http://www.sgi.com/servers/altix/configs.html>

## CD Contents

This section describes the CDs that you receive with SGI ProPack 4 for Linux SP3 (see Figure 1-1), as follows:

- **SGI ProPack 4 for Linux Service Pack 3 Open/Free Source Software CD**  
The Open Source CD contains open source software licensed under GPL/LGPL or other open source licenses, and has files necessary for installation of the following major products:
  - Array Session Module
  - Linux Comprehensive System Accounting (CSA)
  - Linux jobs (Commands, init scripts, libraries and PAM module)
  - LSI Fusion-MPT host adapter management utility
  - NUMA tools to manage CPU placement of processes (`bcfree`, `dplace`, `dlook` utilities)
  - Performance Co-Pilot, system-level performance monitoring and performance management tool
  - Open Source SGI Profile Tools
  - SGI ProPack configuration recommendations

For a complete list of the RPMs included on the Open Source CD, see a file called `RPMS.TXT` that is available in `/docs` directory on the SGI ProPack 4 for Linux Service Pack 3 Open/Free Source Software CD.

- **SGI ProPack 4 for Linux Service Pack 3 Proprietary Software CD**

---

**Note:** This CD contains software for use on SGI systems only. Redistribution is not permitted. Please see the shrink-wrap license agreement.

---

The Proprietary CD contains proprietary software for your SGI Altix system and has files necessary for installation of the following major products:

- Flexible File I/O (FFIO) system
- Cpuset Facility workload manager tool
- Embedded Support Partner (ESP) software suite to monitor events, set up proactive notification, and generate reports
- Performance Co-Pilot visualization tools

- Intel Compiler Runtime Libraries
  - Array Services
  - Message-Passing Toolkit (MPT)
  - Scientific Computing Software Library (SCSL)
  - XVM Command line tools and graphical user interface (GUI)
  - SGI Itanium 2 PROM (System controller software)
  - SGI ProPack documentation
- **SGI ProPack 4 for Linux Service Pack 3 System Extensions CD**

This CD contains an SGI built kernel (`rtgfx` variant) and associated software that provide support for Silicon Graphics Prism systems, Digital Media tools and libraries, and REACT Real-Time for Linux features. The `rtgfx` kernel and associated kernel modules are auto-selected for installation if you select the **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and/or **SGI REACT** groups. For more information, see “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20.

The System Extensions CD has files necessary for installation of the following major products:

- Digital Media Libraries and Tools
- OpenGL Performer
- OpenGL Vizserver
- OpenGL Volumizer
- OpenGL Multipipe & SDK
- REACT Real-time for Linux Libraries and Documentation

SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD Media	
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD1
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD2
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD3
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD4
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD5
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family - CD6
SUSE LINUX Enterprise Server 9 for Itanium Processor Family - Service Pack 3 CD Media	
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family Service Pack 3 - CD1
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family Service Pack 3 - CD2
	SUSE LINUX Enterprise Server 9 for Itanium Processor Family Service Pack 3 - CD3
SGI ProPack 4 for Linux Service Pack 3 - CD Media	
	SGI ProPack 4 for Linux SP3 Open/Free Source Software CD - CD1
	SGI ProPack 4 for Linux SP3 Proprietary Software CD - CD2
	SGI ProPack 4 for Linux SP3 System Extensions CD with Silicon Graphics Prism Support

**Figure 1-1** SGI ProPack 4 for Linux Service Pack 3 Release CD Media

For a complete list of the RPMs included on and SGI ProPack 4 for Linux SP3 release, see a file called `RPMS.TXT` that is available in `/docs` directory on the SGI ProPack 4 for Linux Service Pack 3 Open/Free Source Software CD.

For the latest information about software and documentation in this release, see the release notes that are in a file named `README.TXT` that is available in `/docs` directory on the SGI ProPack 4 for Linux Service Pack 3 Open/Free Source Software CD.

The SGI ProPack 4 for Linux SP3 release notes get installed to the following location on a system running SGI ProPack 4 for Linux Service Pack 3:

`/usr/share/doc/sgi-propack-4/README.txt`

## System Controller Software 1.12 CD

---

**Note:** The System Controller Software 1.12 CD is **not** shipped by default. You can download the System Controller Software 1.12 package from <http://support.sgi.com/> or order it on CD-ROM (P/N 812-1138-007). Contact your SGI account representative if you need assistance obtaining the software package.

---

---

**Note:** The SGI System Controller software is licensed for use only on Origin and Onyx 3000 series systems (SGI systems based on MIPS processors) and on SGI Altix 330 systems, SGI Altix 350 systems, SGI Altix 3000 and SGI Altix 4000 series systems (SGI systems based on Intel Itanium processors), and Silicon Graphics Prism Visualization systems. This CD contains software provided under restricted or SGI proprietary licensing terms. The licensing terms for items on this CD allow users to install this software only on SGI systems.

---

## Getting Updates

To get updates for your SGI ProPack 4 for Linux Service Pack 3 system, you may download and install patches from the SGI YaST Online Update (YOU) server. For instructions on how to setup up the YaST Online Update client and access the SGI YOU server, read through the instructions available on Supportfolio:

[https://support.sgi.com/content\\_request/329516/you\\_server\\_instructions.html](https://support.sgi.com/content_request/329516/you_server_instructions.html)

---

**Note:** You must have a Supportfolio account to access this page and the YOU server.

---

The *YaST Online Update - Patch Media Instructions* describes how to update your system using patch media.

## SGI Open Source Information

SGI maintains the following website for open source information that describes projects related to its open source efforts:

<http://oss.sgi.com>

You can also access open source information (such as LKCD) from the following website:

<http://sourceforge.net>

## Installation Overview

SGI ProPack 4 for Linux Service Pack 3 will most likely come preinstalled on your SGI platform. Installation is described in Chapter 2, “Software Planning and Installation”.

This release also supports installing your Linux software over the network as described in “SLES and SGI ProPack Network Installation for Experts” on page 28.

## Documentation Updated for This Release

The following manuals are new or have been updated for this release:

- *Linux Resource Administration Guide*, 007-4413-010
  - Contains a new section called “Using Cpusets with Hyper-Threads” in Chapter 6, “Cpusets on SGI ProPack 4 for Linux”.
  - Corrected `crontab` entry information in Chapter 2, Comprehensive System Accounting.
- *REACT Real-Time for Linux Programmer’s Guide*, 007-4746-003
  - Contains new information about the following:
    - The `sysconf(_SC_CLK_TCK)` function to determine the tick frequency
    - `kbar` kernel barrier facility

- External interrupts
- *Linux Configuration and Operations Guide, 007-4633-009*
  - Updated information in "Cloning System Disks on SGI ProPack Systems" in Chapter 1.
  - Updated the "System Partitioning" section in chapter 1, "Configuring Your System" and added a new section in the same chapter called "Partitioning Guidelines for SGI Altix 4000 Series Systems".
  - Added information about Machine Check Architecture (MCA) error recovery in "Recovering from Machine Check Architecture Memory Errors" in Chapter 2.
  - Updated information and added a new procedure for performing diskless booting on an SGI Altix system in "Diskless Booting" in Chapter 2.
- *YaST Online Update - Patch Media Instructions*

New for this release, this document describes how to update your system using patch media. It is available off the SGI Technical Publications Library or PatchWorks on SupportFolio.



## Software Planning and Installation

This chapter describes the planning that you need to do to get started and provides instructions for installing SGI ProPack 4 for Linux Service Pack 3.

Your SGI Altix system or Silicon Graphics Prism Visualization System comes with a base Linux distribution (SUSE Linux Enterprise Server 9 (SLES9) Service Pack 3 (SP3)) and the SGI ProPack 4 for Linux Service Pack 3 software preinstalled. This chapter describes how to install the software from the CD if it should ever become necessary to reinstall it.

For security reasons, Linux requires a root password for login. The default password for your preinstalled software is `sgisgi`. After you have logged in, change this root password to a string of your own choice.

The SGI ProPack 4 for Linux SP3 software works only with the SLES9 SP3 environment. Earlier versions of this distribution, or any other distribution, are not compatible with SGI ProPack 4 for Linux SP3 software. Note that if you are running SGI ProPack 4 for Linux with SLES9 SP1, you cannot update only the SLES9 base operating system to SLES9 SP3. You must also update the SGI ProPack 4 software with SGI ProPack 4 SP3 in order to continue using the SGI ProPack features.

Before you install or configure your system, please read Chapter 1, “Release Features” so that you understand the features of SGI ProPack 4 for Linux SP3 software. You might also want to familiarize yourself with some or all of the documentation listed in “Related Publications” on page xvi.

This chapter covers the following topics:

- “Software Planning” on page 10
- “License Manager Updates” on page 14
- “Read Me First - Installing SLES9 with Service Pack 3 on Your SGI System” on page 14
- “Installing SUSE Linux Enterprise Server 9 SP3” on page 18
- “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20

- “SLES and SGI ProPack Network Installation for Experts” on page 28
- “Upgrading From an Earlier SGI ProPack 4 Release to SGI ProPack 4 SP3” on page 31
- “Installing the SN2 Kernel” on page 40
- “Installing the System Controller Software 1.12 CD” on page 42

## Software Planning

This section provides disk and file information you need to have about the software that has been shipped to you and covers the following topics:

- “Table of Disk Partitions” on page 10
- “Systems with Multiple Ethernet Configurations” on page 11
- “XVM Volumes Access in Rescue Mode” on page 11
- “Digital Media” on page 11
- “SLES9 SP3 Kernels” on page 11
- “Linux Kernel Crash Dump” on page 13
- “Latest PROM Firmware” on page 13

## Table of Disk Partitions

SGI ships systems from the factory with the partition layout shown in Table 2-1.

**Table 2-1** Disk Partitions

Partition	Type	Mount Point	Size
part1	VFAT	/boot/efi	500 MB
part2	SWAP	/swap	10 GB
part3	XFS	/	25 GB
part4	XFS	/data1	remainder of disk

## Systems with Multiple Ethernet Configurations

On SGI ProPack 4 SP3 with systems with multiple Ethernet connections, there is no guarantee that Ethernet MAC address of the base I/O IO9 or IO10 card becomes `eth0`. Putting a dual-port Gigabit Ethernet card in the PCI slot right next to the IO9 card in an Altix 350 system renders the IO9 tg3 port `eth2`. The dual-port Gigabit Ethernet card gets `eth0` and `eth1`. This can make SUSE network installs very confusing. See the SGI ProPack 4 for Linux SP3 release notes for a work around to this problem.

## XVM Volumes Access in Rescue Mode

You cannot access XVM Volumes in Rescue Mode on SGI ProPack 4 SP3 systems. It is possible to boot into rescue mode from the SLES9 SP3 CD, but that CD does not contain the `xvm` kernel module. This makes it impossible to perform maintenance on `xvm` volumes from rescue mode at this time. SGI recommends that you do not migrate any system directories to `xvm` since there is no way to access them from rescue mode.

## Digital Media

Together, the family of Digital Media Libraries and Tools encompass facilities for data format description, live audio and video I/O with built-in conversion capabilities, file operations such as reading, writing, and editing multimedia files, data conversion and compression, and playback.

Customers that wish to use any Digital Media libraries, tools, or DMediaPro products will need to install these subsystems.

## SLES9 SP3 Kernels

SLES9 SP3 contains several kernel variants, all based on the same source, but built with slightly different configuration options, that are outlined in Table 2-2. SGI ProPack 4 SP3 provides kernel modules for each of the variants for all SGI software contained in the release. SGI also provides the `rtgfx` kernel variant and associated kernel modules to support **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and **SGI React**. Note that

graphics, digital media and REACT real-time features are only supported with the `rtgfx` kernel variant.

**Table 2-2** SLES9 SP3 Kernels

<b>Kernel Variant</b>	<b>Configuration Differences</b>
kernel-default	ia64 generic kernel maximum 128 CPU support 16KB page size KDB support (must be configured on)
kernel-sn2	sn2 specific kernel maximum 512 CPU support 16KB page size KDB support (must be configured on)
kernel-64k-pagesize	ia64 generic kernel maximum 128 CPU support 64KB page size no KDB support does not work with XFS filesystems of 512 byte blocks, but does work if XFS filesystem is created with larger blocks
kernel-debug	ia64 generic kernel maximum 512 CPU support 16KB page size KDB support (enabled by default) kprobes support dprobes support slab/spinlock debugging enabled
kernel-rtgfx	Special SGI built kernel to support SGI ProPack Graphics, SGI ProPack Digital Media, or SGI REACT

During installation, if you do not explicitly select to install any other kernels, your SGI Altix or SGI Prism system will boot with the `kernel-default` variant after installation. You must explicitly select the other kernels during the SLES9 SP3 installation if you want to use any of the other kernel variants.

Both the kernel-default ("generic") and kernel-sn2 ("sn2") kernels are certified and supported on SGI Altix systems; however, SGI recommends using the sn2 kernel in most cases since this kernel is configured to support larger single system images (maximum 512 processors) . Both the kernel-default ("generic") and kernel-sn2 ("sn2") kernels include the kernel debugger (that is, KDB) to aid customer support should that become necessary.

For more information on installing the sn2 kernel, see "Installing the SN2 Kernel" on page 40.

## Linux Kernel Crash Dump

In the event of a system crash, the Linux Kernel Crash Dump (LKCD) facility will save a crash dump that will appear in the `/var/log/dump` directory after your system reboots. SGI support personnel can analyze this file to determine the cause of the system crash.

If you wish to save crash dumps to a different location, edit the `DUMPDIR` variable in `/etc/sysconfig/dump` and then run the following command: `lkcd config`.

---

**Note:** Depending on which kernel you have installed, the system may enter the KDB kernel debugger after a crash. If a `kdb>` prompt appears on the console, type `sr d` to initiate a crash dump.

---

## Latest PROM Firmware

Unless you have the most current PROM, the kernel may fail to boot during the installation procedure. The prom RPM is on the SGI ProPack 4 for Linux Service Pack 3 Proprietary CD in the `/sgi/ia64` directory.

---

**Note:** Systems running SLES9 SP3 and SGI ProPack 4 SP3 should use PROM 4.43 which ships with SGI ProPack 4 SP3. The updated PROM contains key bug fixes, along with support for new kernel features, such as memory error recovery. Note that PROM 4.43 and subsequent versions are not compatible with SLES9 SP1 or SP2. SGI Altix or Silicon

Graphics Prism software support contract customers can download PROM version 4.43 or later from the following area on Supportfolio:  
[https://support.sgi.com/browse\\_request/suse\\_patch\\_browse\\_results](https://support.sgi.com/browse_request/suse_patch_browse_results)

---

For information on obtaining the latest PROM, see “Obtaining and Installing the Latest SGI Altix or Prism System Firmware” in Chapter 2.

## License Manager Updates

Please backup your license key files prior to installing SLES9 SP3 and/or SGI ProPack 4 SP3. A license key file is **not** included in these RPMs. Your original license key files will need to be restored after you complete your installation.

In terms of FLEXlm software and licensing support, the Redhat and SUSE distributors do not ship any code. ISVs are responsible for obtaining and including FLEXlm components into their products. This includes FLEXlm license server components. SGI, as part of SGI ProPack, includes FLEXlm license server components for SGI products.

There are no differences in the FLEXlm license server components between SGI Propack 3 and SGI Propack 4.

SGI recommends FLEXlm version 9.2.3 (or greater) for the "it64\_re3" platform. This information is also available to all customers at this location:

[http://www.sgi.com/support/licensing/linux\\_faq.html](http://www.sgi.com/support/licensing/linux_faq.html)

If you encounter any license related problems, please contact your local support center at this location:

<http://www.sgi.com/support/supportcenters.html>

## Read Me First - Installing SLES9 with Service Pack 3 on Your SGI System

This section provides some information about installing SLES9 Service Pack 3 on SGI Altix and Silicon Graphics Prism systems. You need to have SLES9 Service Pack 3 installed before you can install SGI ProPack 4 for Linux Service Pack 3. For installation instructions, see “Installing SUSE Linux Enterprise Server 9 SP3” on page 18.

---

**Note:** If you are upgrading from an earlier SGI Propack for Linux release, you must upgrade SLES9 SP3 and SGI ProPack 4 SP3 at the same time. For upgrade instructions, see "Upgrading SGI ProPack 4 for Linux and SLES9 SP3 with YaST" on page 35.

---

In general, the documentation that comes with SUSE applies to installing software on an SGI Altix or SGI Prism system. This section provides some notes to get you started, as follows:

---

**Note:** Please read all the notes below before attempting installation.

---

- **Find installation documentation.**

You can find installation documentation on the first SLES9 CD in the `docu` directory. Start by reading `preparation.pdf` file. This is the "SUSE Linux Enterprise Server Architecture-Specific Information" document.

- **Find and read the SLES9 Service Pack 3 release notes.**

It is important to read the SLES9 Service Pack 3 release notes as well. You will find them in a text file named `Notes` in the root of the first SLES9 Service Pack 3 CD. Make sure you read the "**Using the bootable SP CD**" section. This is the suggested method of installing on an Altix or Prism system.

- **How to erase everything and start with a clean root drive.**

The YaST installer does not allow you to remove older partitions and create a clean root by default. To do so, you must run the YaST Partitioner in "Expert Mode" (see page 22 of the *SLES9 Installation and Administration* manual). The default filesystem type for partitions is `reiserfs`. To create partitions with the XFS filesystem type, manually "Edit" the partition and then select XFS. Boot partitions on SGI Altix systems should always use the FAT filesystem.

- **Find the best installation method for SLES9 SP3 for your site.**

There are several different methods to install SLES9 SP3. To use the graphical YaST installation, SGI recommends using the `vnc` or `ssh` methods, assuming the SGI system is connected to a network.

To use this mode, we suggest you select **EFI Shell [Built-in]** from the **Boot Maintenance** menu. A list of `fs#` devices will be presented before you get to the **Shell>** prompt. One from the list, will have the word **CDROM** in the display. If the `fs#` associated with the CDROM is 1, enter the following commands:

```
Shell> fs1:  
fs1:\> cd efi\boot
```

You are now ready to launch the installer. Issue the following command:

```
fs1:\efi\boot> bootia64
```

You now will see a list of choices including **Installation**, **Installation - Safe Settings**, and so on. Keep the default **Installation** choice highlighted. In the **boot:** prompt, your selection depends on the type of system you are booting.

If you are installing a Prism system and wish to install from the graphics monitor, you do not need to enter anything in the **Boot:** line. You may just hit enter. If you prefer to install using vnc or ssh, enter **vnc=1** or **usessh=1** in the **Boot:** line.

---

**Note:** In SLES9 SP3, it is **not** possible to use the graphical install option on the Prism display. You will automatically use text-based installation on the graphics monitor. A warning message stating that graphical installation is not complete, may appear and that is expected. Graphics functions will become available after SGI ProPack 4 SP3 is installed.

---

If you are installing software on an Altix system you need to specify information about the serial console on the boot line. If you wish to use vnc or ssh, you can supply those options as well. An example boot line specifying the serial console for installation and the use of vnc is similar to the following:

```
boot: console=ttyS0,3840n8 vnc=1
```

If you choose to install over the serial console or an L2 controller with xterm, note that the SGI Altix serial console is not 100% clean at this time and you may run into "screen corruption". Often this can be cleared up by entering `Ctrl-L` from the command line to re-draw the screen. When using xterm, remember to set the encoding to UTF-8. The following command line options have yielded fairly good results:

```
xterm -sb -en UTF-8 -geometry 130x40 -e "cu -s 38400 -l /dev/ttyS0"
```

Please note that console corruption does not apply to the Silicon Graphics Prism Visualization Systems when installing from the graphics screen. However, for initial install, only text mode is available from the graphics screen.

- **Install the SLES9 SP3 kernel appropriate for your site.**

After your system is running SLES9 SP3, you may wish to change the kernel you use to one of the several variants that SLES9 SP3 provides. After a default installation, your system will run the kernel-default variant.

**Note:** For Altix systems, SGI recommends that you install the `sn2` kernel because it supports larger CPU counts (maximum 512) and it is also configured to support use of the kernel debugger (`kdb`) commands, which are used to diagnose system panics and hangs. For more information on installing the `sn2` kernel, see “Installing the SN2 Kernel” on page 40. For Silicon Graphics Prism Visualization Systems, SGI recommends that you install the `rtgfx` kernel.

---

If you are installing SGI ProPack 4 SP3 on a Prism system, install the **Graphics** selection group from the System Extensions CD. This marks the SGI built `rtgfx` kernel for installation.

- **Find out how to perform a network installation.**

If you plan to set up a system to do network installations, you may find the “Network Install Server Setup” in this document helpful. This section describes how to integrate SGI ProPack 4 SP3 with SUSE operating system repositories.

- **Find information on AutoYaST.**

For information on AutoYaST, see “Using AutoYaST” on page 29.

- **Find out how to install or reinstall the `rtgfx` kernel for SGI ProPack 4 REACT Upgrades.**

In order to use the graphics, real-time or digital media capabilities in SGI ProPack 4 SP3, you must install the `rtgfx` kernel and the corresponding kernel modules for the `rtgfx` kernel variant.

If you are upgrading from SGI ProPack 4 to SGI ProPack 4 SP3, and you choose to install Graphics, Digital Media, or REACT components, the `rtgfx` kernel will be installed. However, your current running kernel will also be updated at the same time. Your already-running kernel will probably become the default and not the `rtgfx` kernel. For information on how to re-install the `rtgfx` kernel, see “Upgrading SGI ProPack for REACT Real-Time for Linux Users” on page 39.

---

**Caution:** Because the `rtgfx` kernel is not a standard SUSE kernel variant, it is not supported in any way by SUSE or Novell. Installation of the `rtgfx` kernel will also invalidate any existing system certifications with SLES9 SP3. Only users who require support for digital media, graphics, or real-time should install any of the software from the System Extensions CD.

---

## Installing SUSE Linux Enterprise Server 9 SP3

To install SUSE Linux Enterprise Server 9 (SLES9) SP3 from the CD media, perform the following steps:

1. Insert the SLES9 SP3 CD1 into the CD-ROM drive. You will boot the system using this CD.

---

**Note:** The system will not boot with the SLES9 CD1 media, since that media will not recognize the Silicon Graphics Prism DVD-ROM drive. You **MUST** boot with the SLES9 SP3 CD1 media. On SGI Prism Visualization Systems, if you have a bootable CD in the DVD drive when the system is reset and EFI Shell menu choice is selected, the CD is assigned the file system number `fs0`, at the top of the list. On an SGI Altix system, it is assigned `fs1` at the bottom of the list.

---

For additional information on installing with a serial connection, with SSH or via VNC, see the SUSE Linux Enterprise Server Architecture Specific Information document (`preparation.pdf`). For more detailed information about the various steps during installation, refer to the SUSE Linux Enterprise Server Administration and Installation Guide (`manual.pdf`). Both documents are located in the `docu` directory on the SLES9 SP3 CD1 media

2. Boot the system and select **CD Boot** from the boot menu when it appears.

---

**Note:** If you do not see the **CD Boot** option, you can add it to the boot menu. Select **Add a boot option**, choose to boot from **Removable media** and then select your CD-ROM drive from the list.

---

3. When presented with a list of installation options, select **Installation**. The system will continue to boot and then YaST, the text-based installation program, starts.
4. Follow the on-screen prompts as they appear. YaST will prompt you for CD1.

---

**Note:** YaST is asking for the SLES9 CD1 media, **not** the SLES9 SP3 CD1 media that was used to boot the system and start the installation.

---

5. Insert the SLES9 CD1 media and select **OK**. Ignore any warnings about the system being unable to start X, just select **OK**. The X server will not work at this point in the installation. Use the **TAB** button to navigate the YaST input fields and buttons. Select a language and accept a License and then select **Next**.

---

**Note:** You may also need to verify that the Tigon3 network card has been recognized. Select **System Information** and verify that the tg3 driver has been loaded. If the tg3 driver is not loaded, select **Kernel Modules** and then **Load network card modules** and select the tg3 driver to have the kernel load it.

---

6. Choose **Start Installation** and then **Start Install/Update** to begin the installation process. Confirm driver activation with **OK** to each then select **New Installation** when prompted.
7. If you are migrating from SGI ProPack 3 for Linux, be sure to NOT to accept the default values for partitioning. Go to **Installation Settings**, but **DO NOT ACCEPT** the default values. Choose **Partitioning**, then **Base Partition** setup, and set the partition formats by selecting **Base partition setup on this proposal** if the partition number and sizes are correct. You may also select **Create custom partition setup** if you need to tailor the size or number of partitions. The EFI boot partition format should be FAT; check that the EFI and swap partitions will be formatted, and change sda3 (or equivalent system disk partition) to the xfs format. Verify formats are correct and that all partitions boot, swap and system disk partitions will be formatted, and then select **Accept**.
8. Insert the SLES9 SP3 CD1 media when prompted and then subsequent CD media according to the on-screen prompts.

---

**Note:** YaST refers to the SLES9 CD1 media as the SUSE SLES CD and the SLES9 CD2 media as SUSE CORE CD 1. This means that you have to pay attention to the CD prompts to ensure you insert the correct CD media. The following may help: SLES9 CD1 = SLES/CD1, SLES9 CD2 = CORE/CD1, SLES9 CD3 = CORE/CD2, SLES9 CD4 = CORE/CD3, SLES9 CD5 = CORE/CD4 and SLES9 CD6 = CORE/CD5.

---

9. Once SLES 9 SP3 has been installed, you will be prompted to reboot. Do so, and then select **SUSE SLES 9** from the boot menu. In most cases, this option is the default. At the ELILO prompt, hit ENTER, and the system should boot up into another YaST session. Follow the on-screen prompts for system configuration, but when prompted with graphics card hardware detection, select **Skip Configuration**.

---

**Note:** The correct graphics driver is not available at this point in the installation. You should also skip the sound card detection.

---

If you have configured your network card and Internet connection, YaST may prompt you to test the connection. Skip this step. If you attempt to test the connection, you will be prompted to connect to the Novell YaST Online Update (YOU) server. SGI strongly recommends that you install SLES9 SP3 and SGI ProPack 4 SP3 **before** attempting to update your system with images from the SGI or Novell YOU servers.

10. Once finished, exit from YaST, login as root, and restart YaST with the following command:

```
/sbin/yast
```

You should now be ready to install SGI ProPack 4 SP3 (and SUSE Linux Software Development Kit 9 if you so choose). If you accidentally reboot and find that you are at a blank screen, it is very likely that X failed to start properly because you tried to configure the graphics card hardware. Since the graphics driver is on the SGI ProPack 4 SP3 CD media, this is expected. You should be able to access a virtual text console by holding down the CTRL, ALT and F1 (or F2, F3, and so on.) keys. You can start the new YaST session from the virtual console.

## How To Install SGI ProPack 4 for Linux SP3 For the First Time

These instructions assume that SUSE SLES9 with SLES9 Service Pack 3 has already been installed on your machine. If you do not yet have SUSE SLES9 with Service Pack 3 installed, please see “Installing SUSE Linux Enterprise Server 9 SP3” on page 18.

---

**Note:** SUSE provides extensive documentation on using YaST. See the `manual.pdf` in the `docu` directory of the first SLES9 CD.

---

These instructions are for installing SGI ProPack 4 SP3 for the first time. If you are upgrading, see “Upgrading From an Earlier SGI ProPack 4 Release to SGI ProPack 4 SP3” on page 31.

If you want to set up a network install repository that allows you to install SUSE SLES9, SLES 9 Service Pack 3, and SGI ProPack 4 SP3 all in one session, see “SLES and SGI ProPack Network Installation for Experts” on page 28.

The two primary steps to installing SGI ProPack 4 SP3 using the SUSE YaST install tool are, as follows:

- “Instructing YaST to Look at Your Install Media” on page 21
- Do the actual installation or upgrade using YaST described in “Installing SGI ProPack with YaST” on page 24.

Below, you will find detailed instructions for telling YaST about your source media for various types of media (physical CD, CD ISO images, NFS, and so on). Choose the section that matches the source media you are using. After that, you will move on to the section titled “Installing SGI ProPack with YaST” on page 24. These instructions assume you are logged in as root. If you wish to use the graphical interface of YaST, please be sure your `DISPLAY` environment variable is set properly. YaST will provide the text interface when it is unable to use graphics. If you are using the text based installer from a GNOME terminal window, you might find setting your `TERM` environment variable to `xterm` may help.

Depending on if you are using the graphical interface or the text interface to YaST, you will either click on menu choices with your mouse, or select them using your arrow keys, the `TAB` key, and the `ENTER` key.

## Instructing YaST to Look at Your Install Media

This section describes how to instruct YaST to find your install media. The instructions vary depending on your source. It covers these topics:

- “Installing from CD” on page 21
- “Installing from ISO Images” on page 23
- “Other Installation Sources” on page 24

### Installing from CD

To install SGI ProPack 4 for Linux Service Pack 3 from CD, perform the following steps:

1. Insert the SGI ProPack 4 SP3 CD1 (Open/Free Source Software CD) into the CD-ROM drive.

---

**Note:** Once SGI ProPack 4 SP3 CD1 is added as an installation source, YaST will know to prompt for SGI ProPack 4 SP3 CD2 (Proprietary Software CD); however, the SGI ProPack 4 SP3 System Extensions CD must be listed as a separate installation source, which is covered in step 9, below.

---

2. Use the `yast` command to launch the YaST installation tool, as follows:  
`/sbin/yast`
3. From the **YaST Control Center** menu, select or click on **Software**
4. Select or click on **Change Source of Installation**
5. If there are any SGI ProPack installation sources present, remove them by highlighting them one at a time and selecting **Delete**.
6. Select or click on **Add**
7. Select **CD...** from the window  
YaST will now attempt to mount the CD and add it to the list of media sources
8. Select or click on **Finish**.
9. If you wish to install from the SGI ProPack System Extensions CD or SUSE Linux SDK 9 software, insert the SGI ProPack System Extensions CD in to the CD-ROM drive and repeat steps 6 through 8.

---

**Note:** Only customers needing special graphics, digital media, or real-time features should use the SGI ProPack System Extensions CD. Most customers do not need this software. Installing from the System Extensions CD could break certifications.

---

SUSE Linux SDK 9 is a development tool kit, which contains the complete set of tools used to build the SUSE Linux Enterprise Server 9 product. The SDK also features several useful programs such as integrated development environments (IDEs), programming language support (for example, C, C++, Python, and so on), debuggers and graphics related programs. The SUSE Linux SDK 9 software is being distributed by SGI in Courtesy Support Mode.

For more information about SGI support modes on Supportfolio Online, see [http://support.sgi.com/content\\_request/46689/index.html](http://support.sgi.com/content_request/46689/index.html).

If you added SUSE Linux SDK 9 CD in step 9, also mark **SDK Documentation Tools** and any other SDK package selections that you feel will be useful before entering **OK** an **Accept**. For more information about SUSE Linux SDK 9, please see the *SUSE Linux Software Development Kit 9* document that is bundled with the SDK CDs.

10. Proceed to “Installing SGI ProPack with YaST” on page 24.

**Note:** You do not need to tell YaST about the 2nd SGI ProPack CD for this install method. YaST will prompt for it automatically when it needs it.

---

## Installing from ISO Images

These instructions show you how to install SGI ProPack 4 for Linux Service Pack 3 using ISO images. There are many ways to do this. This section just provides one example. The example assumes the images are named `propack1.iso` and `propack2.iso`. The SGI ProPack System Extensions CD contains software packages for graphics, digital media, or real-time features.

To install SGI ProPack 4 SP3 from ISO images, perform the following steps:

1. Copy the ISO images to the `/tmp` directory on your machine.
2. Make mount points for your ISO images. An example is, as follows:

```
mkdir /mnt/propack1
mkdir /mnt/propack2
```
3. Mount the ISO images, an example is, as follows:

```
mount -o ro,loop /tmp/propack1.iso /mnt/propack1
mount -o ro,loop /tmp/propack2.iso /mnt/propack2
```
4. Start `yast2`
5. From the **YaST Control Center** menu, select or click on **Software**.
6. Select or click on **Change Source of Installation**.
7. If there are any SGI ProPack installation sources present, remove them by highlighting them one at a time and selecting **Delete**.
8. Select or click on **Add**.
9. Select **Local Directory...**
10. Type in the path to your first CD. In this example, `/mnt/propack1`. Then, select or click on **OK**.
11. Select or click on **Finish**.
12. If you wish to install from the SGI ProPack System Extensions CD or SUSE Linux SDK 9 software (see step 9 of “Installing from CD” on page 21), perform the steps that follow.

---

**Note:** Only customers needing special graphics, digital media, or real-time features should use the SGI ProPack System Extensions CD. Most customers do not need this software. Installing from the System Extensions CD could break certifications.

---

13. Make mount point for the ISO image, as follows:

```
mkdir /mnt/ppext
```

14. Mount the ISO image, as follows:

```
mount -o ro,loop /tmp/propack-optional.iso /mnt/ppext
```

15. In YaST, select or click on **Add**
16. Select **Local Directory...**
17. Type in the path to your first CD. In this example, **/mnt/ppext**
18. Select or click on **Finish**.
19. Proceed to “Installing SGI ProPack with YaST” on page 24.

### Other Installation Sources

If you are an experienced YaST user, you may also find some of the other install methods useful such as NFS, HTTP, or FTP.

For NFS, you tell YaST to change the source of installation and choose **NFS...** as the source. Then you provide the NFS server name and path to the files.

If you have setup a HTTP or FTP server that provides the packages, you may use those too.

If you wish to install SUSE and SLES over the network all in one setting, see the section titled “SLES and SGI ProPack Network Installation for Experts” on page 28.

After you have your source set up, you should proceed to either the “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20.

### Installing SGI ProPack with YaST

Read this section if you are installing SGI ProPack for the first time.

After you have told YaST how to find SGI ProPack in “Instructing YaST to Look at Your Install Media” on page 21, you are ready to perform the actual installation as described in this section. These instructions are separated in to four sections, as follows:

- “Installing SGI ProPack with YaST - Using the Text (non-graphical) Interface” on page 25
- “Installing SGI ProPack with YaST - Using the Graphical Interface” on page 26
- “Installing the SN2 Kernel” on page 40
- “Notes on Installing SGI ProPack with YaST” on page 28

### Installing SGI ProPack with YaST - Using the Text (non-graphical) Interface

To install SGI ProPack 4 for Linux Service Pack 3 with YaST using the text interface, perform the following steps:

1. Make sure you are in the YaST install program at the **YaST Control Center** menu.
2. Select **Software**.
3. Select **Install and Remove Software**.
4. Select **Filter** (it is on the upper left part of the screen).
5. Select **Selections**.
6. Now you are in a **Package Categories** window. Scroll down to the bottom of the categories list and you will see package categories starting with **SGI**
7. Always select the following category: **SGI ProPack**. You can do this, for example, by highlighting the category and hitting the **ENTER** key.

If you are installing the **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and/or **SGI REACT**, an SGI built kernel will be installed and will be the default. This special kernel is named `kernel-rtgfx`.

---

**Note:** Selecting **SGI ProPack Graphics**, **SGI ProPack Digital Media**, or **SGI REACT** will install SGI supplied components that replace the SUSE version of the kernel or other components. For example, installing **SGI ProPack Graphics** will replace the SUSE versions of XFree86 RPMs with SGI modified RPMs to work with SGI graphics platforms. Customers who do not have graphics platforms and do not wish for any SUSE supplied products replaced with SGI versions should avoid these groups.

---

Choose any additional categories now.

8. Pick kernel module products that match the kernel(s) you plan to use. Choose at least one to match the current kernel. For example, if you plan to use both the default and sn2 kernel variants, select **SGI ProPack Kernel Modules - default** and **SGI ProPack Kernel Modules - sn2**.
9. Verify that the product groups you wish to install now have a "+" or "a+" in front of them.
10. Select **OK**.
11. Select **Accept** to start installing the packages.
12. Although no kernels are installed in SGI ProPack at this time, the install process will make some adjustments to which kernel modules get loaded by default when booting. In addition, certain system tuning adjustments are made. It is best to reboot after SGI ProPack installation so these changes take effect.

---

**Note:** If you have selected any one of the following selection groups, **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and/or **SGI REACT**, the `rtgfx` could be installed at this point.

---

13. See "Notes on Installing SGI ProPack with YaST" on page 28, if installation does not proceed.

### Installing SGI ProPack with YaST - Using the Graphical Interface

To install SGI ProPack 4 for Linux Service Pack 3 with YaST using the graphical interface, perform the following steps.

1. Make sure you are in the YaST install program at the **YaST Control Center** window.
2. Click on **Software** (it may already be highlighted).
3. Click on **Install and Remove Software**.
4. Click on the pull-down menu to the right of **Filter** on the upper left part of the screen.
5. Click on **Selections**.
6. Make sure you are working with the left hand window with the **Selection** title and not the individual package window on the right.

7. Notice that there is a list of product selections. Each selection has a box to the left of it. Scroll down so you can see the **SGI** selections at the end of the list.
8. Always select the following category: SGI ProPack. You can do this, for example, by checking on the small square box to the left of **SGI ProPack** and ensuring it has a check mark.

If you are installing the **graphics**, **dmedia**, or **REACT** groups, the kernel you will be using is the SGI built `rtgfx` kernel. Also, the associated modules will be auto-selected if you choose **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and/or **SGI REACT**.

---

**Note:** Selecting **SGI ProPack Graphics**, **SGI ProPack Digital Media**, or **SGI REACT** will install SGI supplied components that replace the SUSE version of the kernel or other components. For example, installing **SGI ProPack Graphics** will replace the SUSE versions of XFree86 RPMs with SGI modified RPMs to work with SGI graphics platforms. Customers who do not have graphics platforms and do not wish for any SUSE supplied products replaced with SGI versions should avoid these groups.

---

Choose any additional categories now.

9. Pick kernel module products that match the kernel(s) you plan to use. Choose at least one to match the current kernel. For example, if you plan to use both the default and sn2 kernel variants, select **SGI ProPack Kernel Modules - default** and **SGI ProPack Kernel Modules - sn2**.
10. Verify the product groups you wish to install now have a check mark in the box. Note that a small triangle may appear to the left of the check box for auto-installed groups.
11. Now click **Accept** on the lower right to start installing the packages.
12. Although no kernels are installed in SGI ProPack at this time, the install process will make some adjustments to which kernel modules get loaded by default when booting. In addition, certain system tuning adjustments are made. It is best to reboot after SGI ProPack installation so these changes take effect.

---

**Note:** If you have selected any one of the following packages, **SGI ProPack Graphics**, **SGI ProPack Digital Media**, and/or **SGI REACT**, the `rtgfx` could be installed at this point.

---

## Notes on Installing SGI ProPack with YaST

### Changed Packages window:

It is normal to be presented with a **Changed Packages** box. This box just lists some packages from the SLES9 SP3 operating system that are needed by SGI ProPack packages. Note that, in order for these packages to be installed, you will need to have your SLES9 SP3 install source available (such as the CD set).

### Conflicts:

In some cases, you could be presented with some conflicts. These are a result of unresolved dependencies from previous installation or installation attempts. If you have unresolved dependencies, you will have to resolve them before installation of SGI ProPack 4 Service Pack 3 can proceed. Sometimes, resolving these conflicts will require that some packages from SLES9 SP3 be installed. In this case, you may need to have your SLES9 SP3 install source available (such as the CD set).

## SLES and SGI ProPack Network Installation for Experts

This section describes how to set up a network install server and provides some information on using AutoYaST. It covers these topics:

- “Setting up the Network Install Server” on page 28
- “Using AutoYaST” on page 29

### Setting up the Network Install Server

This section provides you some information on installing SUSE SLES9, SLES9 Service Pack 3, and SGI ProPack 4 for Linux Service Pack 3 all in one session over the network. This is helpful for systems administrators who have several machines to install and keep up to date.

To do this, you will need to set up an NFS repository that contains the installation files.

Look at the SLES 9 SP3 release notes for how to setup an NFS repository. You can find the release notes in the text file called `Notes` in the root of the first SLES9 Service Pack 3 CD.

The section in the SLES9 SP3 release notes dealing with setting up an installation server is titled "Setting up an installation server."

Once you have an install server set up to handle SLES9 with SP3, you can then add SGI ProPack 4 Service Pack 3, as well. Simply follow the instructions in the SLES 9 SP3 release notes section titled "Integrating the Service Pack into an installation server". Instead of doing it for a Service Pack, do it for SGI ProPack 4 SP3, instead. The process is the same in both cases.

If you are doing manual network installs, you will now be able to tell YaST to configure the software to be installed and you will see the SGI ProPack entries when you filter by selections. Note that SGI ProPack 4 SP3 is **not** installed by default. You have to tell YaST you want to install it.

---

**Important:** Clients making use of your install server repository should have individual sources listed as their installation source (configured using the **Change Source of Installation** in YaST). See the following example.

---

For example, do **not** set up an install source as `/install/sles9+sp3+pp4/`. Rather, list each out such as the following:

```
/install/sles9+sp3+pp4-sp3/SUSE-CORE-Version-9/CD1
/install/sles9+sp3+pp4-sp3/SUSE-SLES-Version-9/CD1
/install/sles9+sp3+pp4-sp3/SUSE-SLES-9-Service-Pack-Version-3/CD1
/install/sles9+sp3+pp4-sp3/SGI-ProPack-4-for-Linux-Service-Pack-Version-3/CD1
```

## Using AutoYaST

AutoYaST is a method to install and configure a system based control file settings. With AutoYaST, you could install and configure a system over the network automatically. It provides similar functionality to kickstart provided by Red Hat.

You can find information on how to use AutoYaST at the following locations:  
<http://www.suse.de/~nashif/autoinstall/>

You can find information about AutoYaST in chapter 3 of *SUSE Linux Enterprise Server Installation and Administration* manual. This resides in `manual.pdf` file in the `docu` directory of the first SLES9 CD. Documentation is also available on an installed SLES9 system in `/usr/share/doc/packages/autoyast2/html`.

This information is meant to augment the instructions already available, as follows:

- If you are using AutoYaST for the first time, it is best to start by selecting **Create Reference Profile** in the **Tools** menu of YaST's **Autoinstallation** setup program.
- Always be sure your installation sources point at individual components. These are configured using the **Change Source of Installation** facility within YaST. If your install source points at the top of an NFS repository ("`/install/sles9+sp3+pp4-sp3/`" in the example below), package selections will not work properly as products that are not already installed and will not be listed. Here is an example list of valid sources, as follows:

```
/install/sles9+sp3+pp4-sp3/SUSE-CORE-Version-9/CD1  
/install/sles9+sp3+pp4-sp3/SUSE-SLES-Version-9/CD1  
/install/sles9+sp3+pp4-sp3/SUSE-SLES-9-Service-Pack-Version-3/CD1  
/install/sles9+sp3+pp4-sp3/SGI-ProPack-4-for-Linux/CD1
```

- By default, YaST will not set up the EFI Boot Manager entry during automatic installation. To change this, use YaST's **Autoinstallation** setup program and enable this feature in **Boot Loader Configuration**.
- In SLES9 SP3, it can be very confusing to get the proper `root=` entry in the target system's `elilo` configuration. The `root=` in the `elilo` configuration is not fixed up when you tell **Autoinstallation** how to partition target disks. Instead, you need to go to the **System -> Boot Loader Configuration** menu, and configure the settings. The only way to change the `root=` entry is to use the **Edit Configuration Files** option. This allows you to modify the actual target `elilo.conf` file. By default, the `root` is set to the root of the system from which you are running YaST. Sometimes, not what you want.
- If you want to configure networking, you will find the **Autoinstallation** tool offers a way to configure your network card. However, the network card SGI uses is not available in the list to select from. It may be easier to just let the hardware get detected on the first boot.
- For Altix or Prism, the instructions provided for booting over the network do not exactly match. You will need a `dhcp` and `tftp` server and you can copy the installer kernel, `initrd`, and the `elilo.conf` file from the first SLES 9 SP3 CD. After some modification, you should be able to boot this over the network with the same result as booting from the first SLES CD.
- For Prism desktide systems, at the ELILO prompt you must enter **graphics** to install using the graphics head. The default `install` input to the ELILO prompts uses the L1 serial console.

- If you are booting a system over the network for autoinstallation, you might want something similar to the following in your append line of the `elilo` configuration on your tftp server. There are of course many other ways to do this.

```
append="ramdisk_size=131072 console=ttyS0,115200n8 escdelay=250  
autoyast=nfs://128.162.243.5/install/ install=nfs://128.162.243.5/install/sles9-sp3-pp4
```

The major configuration actions are, as follows;

- `install=` points it at the SLES NFS repository to get the YaST components to launch the installer.
- `autoyast=` points to the directory that contains your autoyast profile. Note trailing `"/`. The file name it retrieves is the IP address converted to hex as described in the autoyast web documentation.
- These instructions will change significantly depending on which features of YaST. For example, you could have a rules file or a default file.
- Note that you could also choose to use SLP. SLP is documented by SUSE and is a method for clients to discover the location of the install server.

## Upgrading From an Earlier SGI ProPack 4 Release to SGI ProPack 4 SP3

This section describes how to upgrade to both SLES9 SP3 and SGI Propack 4 for Linux SP3.

---

**Note:** In order for your upgrade to work, you must upgrade to the SGI ProPack 4 SP3 and the SLES9 SP3 releases at the same time.

---

### Instructing YaST to Look at Your Install Media for Upgrade

---

**Note:** SUSE provides extensive documentation on using YaST. See the `manual.pdf` in the `docu` directory of the first SLES9 CD.

---

This section assumes that your base SUSE install sources are configured properly. See the SUSE documentation for details. The instructions given in this section guide you through

updating your install sources when upgrading SLES9 SP3 and SGI ProPack 4 SP3 at the same time.

---

**Note:** If you are upgrading from an earlier SGI Propack for Linux release, you must upgrade SLES9 SP3 and SGI ProPack 4 SP3 at the same time.

---

This section describes how to instruct YaST to find your install media. The instructions vary depending on your source. It covers these topics:

- “Installing from CD” on page 21
- “Installing from ISO Images” on page 33
- “Other Installation Sources” on page 35

### Installing from CD

To upgrade both SLES9 SP3 and SGI ProPack 4 SP3, perform the following steps:

1. Use the `yast` command to launch the YaST installation tool, as follows:  

```
/sbin/yast
```
2. From the **YaST Control Center** menu, select or click on **Software**.
3. Select or click on **Change Source of Installation**.
4. Remove any SGI ProPack installation sources present by highlighting them one at a time and selecting **Delete**.
5. Remove any old SLES9 SP2 entries by highlighting them one at a time and selecting **Delete**.
6. Insert the SGI ProPack 4 SP3 CD1 (Open/Free Source Software CD) into the CD-ROM drive.

---

**Note:** Once SGI ProPack 4 SP3 CD1 is added as an installation source, YaST will know to prompt for SGI ProPack 4 SP3 CD2 (Proprietary Software CD); however, the SGI ProPack 4 SP3 System Extensions CD must be listed as a separate installation source, which is covered in step 14 below.

---

7. Select or click on **Add**.

8. **Select CD...** from the window. YaST will now attempt to mount the CD and add it to the list of media sources.
9. Select or click on **Finish**.
10. Remove the SGI ProPack 4 SP3 CD1 from the CD-ROM drive.
11. Insert SLES9 SP3 CD1 in to the CD-ROM drive.
12. Select or click on **Add**.
13. **Select CD...** from the window. YaST will now attempt to mount the CD and add it to the list of media sources.
14. If you wish to install from the SGI ProPack System Extensions CD, insert the SGI ProPack System Extensions CD in to the CD-ROM drive and repeat steps 11 through 13.

---

**Note:** Only customers needing special graphics, digital media, or real-time features should use the SGI ProPack System Extensions CD. Most customers do **not** need this software. Installing from the System Extensions CD could break certifications.

---

15. Proceed to Installing SGI ProPack with YaST.

---

**Note:** You do not need to tell YaST about the second SGI ProPack CD or additional SLES9 SP3 CDs for this install method. YaST will prompt for them automatically when it needs them.

---

## Installing from ISO Images

These instructions show you how to install SGI ProPack 4 for Linux Service Pack 3 using ISO images. There are many ways to do this. This section just provides one example. The example assumes the images are named `propack1.iso` and `propack2.iso`. The SGI ProPack System Extensions CD contains software packages for graphics, digital media, or real-time features.

To install SGI ProPack 4 SP3 from ISO images, perform the following steps:

1. Copy the ISO images to the `/tmp` directory on your machine.
2. Make mount points for your ISO images. An example is, as follows:

```
mkdir /mnt/propack1
mkdir /mnt/propack2
```

3. Mount the ISO images, an example is, as follows:

```
mount -o ro,loop /tmp/propack1.iso /mnt/propack1
mount -o ro,loop /tmp/propack2.iso /mnt/propack2
```

4. Start `yast2`
5. From the **YaST Control Center** menu, select or click on **Software**.
6. Select or click on **Change Source of Installation**.
7. If there are any SGI ProPack installation sources present, remove them by highlighting them one at a time and selecting **Delete**.
8. Select or click on **Add**.
9. Select **Local Directory...**
10. Type in the path to your first CD. In this example, `/mnt/propack1`. Then, select or click on **OK**.
11. Select or click on **Finish**.
12. If you wish to install from the SGI ProPack System Extensions CD, perform the steps that follow.

---

**Note:** Only customers needing special graphics, digital media, or real-time features should use the SGI ProPack System Extensions CD. Most customers do not need this software. Installing from the System Extensions CD could break certifications.

---

13. Make mount point for the ISO image, as follows:

```
mkdir /mnt/ppext
```

14. Mount the ISO image, as follows:

```
mount -o ro,loop /tmp/propack-optional.iso /mnt/ppext
```

15. In YaST, select or click on **Add**
16. Select **Local Directory...**
17. Type in the path to your first CD. In this example, `/mnt/ppext`
18. Select or click on **Finish**.
19. Proceed to “Installing SGI ProPack with YaST” on page 24.

## Other Installation Sources

If you are an experienced YaST user, you may also find some of the other install methods useful such as NFS, HTTP, or FTP.

For NFS, you tell YaST to change the source of installation and choose **NFS...** as the source. Then you provide the NFS server name and path to the files.

If you have setup a HTTP or FTP server that provides the packages, you may use those too.

If you wish to install SUSE and SLES over the network all in one setting, see the section titled “SLES and SGI ProPack Network Installation for Experts” on page 28.

After you have your source set up, you should proceed to either the “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20.

## Upgrading SGI ProPack 4 for Linux and SLES9 SP3 with YaST

This section describes how to upgrade your software from a previous version of SGI Propack for Linux and SLES9 to SGI ProPack 4 SP3 and SLES9 SP3.

If you are installing for the first time, see “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20.

Make sure you have told YaST about your install sources as described in “Instructing YaST to Look at Your Install Media” on page 21.

For the upgrade to work properly, both SGI ProPack 4 SP3 and SLES9 SP3 releases need to be available as install sources. It is very likely that the old SLES9 SP2 install source is listed. This should be removed in favor of SLES9 SP3. Failure to do this will result in dependency problems and system inconsistencies.

---

**Important:** As with SUSE SLES Service Packs, SGI ProPack Service Pack upgrades is best done in live mode. In other words, do not attempt to boot in to the SLES9 or SLES9 SP3 install CD and do an "upgade" from there. If you do, the SGI packages may show up as

"protected" and "not upgradable." As described in "SLES and SGI ProPack Network Installation for Experts" on page 28, it is possible to do full fresh network installations of SLES9 + SLES9 SP3 + ProPack in one session.

---

This section covers the following topics:

- "Upgrading SGI ProPack with YaST - Using the Text (non-graphical) Interface" on page 36
- "Upgrading SGI ProPack with YaST - Using the Graphical Interface" on page 38
- "Upgrading SGI ProPack for REACT Real-Time for Linux Users" on page 39 "Notes on Upgrading SGI ProPack with YaST" on page 40

## Upgrading SGI ProPack with YaST - Using the Text (non-graphical) Interface

This section provides information on how to upgrade to a new version of SGI ProPack 4 for Linux using the text (non-graphical) YaST interface.

To upgrade your SGI ProPack software with YaST using the text interface, perform the following steps:

1. Start up `yast`.
2. Select **Software**.
3. Select **System Update**

You should now have a summary screen. Update Options should say either **Upgrade to SLES9 SP3**, **Upgrade to ProPack 4SP3**, or **Update to SGI ProPack Optional 4SP3**. All of these are OK.

Under packages, it may say that manual intervention is required. This is OK.

4. System Extensions CD Select **Change...** and then **Packages...**
5. Select **Filter** and then **Selections**.
6. Page down until you see categories starting with **SGI**.
7. If any SGI groups are already selected (have a + next to them), mark them for upgrade by entering `>`. This ensures any new SGI ProPack packages are installed. Skip the next step.

8. If SGI ProPack is not already selected, enter a plus sign (+) next to it. This may automatically deselect some old categories . This is normal.
9. If one or more **SGI ProPack Kernel Modules** categories is already marked with a plus sign (+), highlight them and enter > to upgrade them to ensure any new packages are added. In this case, you can skip the next step if you like.
10. If none of the **SGI ProPack Kernel Modules** categories are selected, select one or more **SGI ProPack Kernel Modules** categories matching the kernel or kernels you plan to run. For example, if you are using the sn2 SUSE kernel, select **SGI ProPack Kernel Modules - sn2**. To select a kernel modules category, highlight the SGI ProPack Kernel Modules package you wish to install, and enter a plus sign (+) next to it.
11. If any of **SGI ProPack Graphics**, **SGI REACT**, or **SGI ProPack Digital Media** groups are selected, for each one highlight the group and enter > to upgrade it and ensure any new packages are added.
12. If you are installing from the SGI ProPack System Extensions CD, you probably want to install one or more of the following modules: **SGI ProPack Graphics**, **SGI REACT**, or **SGI ProPack Digital Media**. The **SGI ProPack Kernel Modules - rtgfx** group would then be selected for you. Only customers wanting to run real-time, digital media, or graphics software will want install these modules. All other customers should not have the SGI ProPack System Extensions CD in the selections list and should not see these extra categories. If you do not need the System Extensions CD as an install source, it is important that it is **not** listed at all. This is because YaST may pull some packages from it, if available, even if they are not marked for install.

---

**Note:** If you are upgrading SGI REACT, highlight **SGI REACT** and enter ">" to mark it for upgrade.

---

13. You can now select **Accept**. The System Update screen will appear. Then, select **Next**. Installation should proceed.
14. See the notes at the end of this section if installation does not proceed.
15. You should now reboot your system. In addition to having a new kernel, many other pieces of system software were upgraded by both SLES9 SP3 and SGI ProPack 4 SP3.

---

**Note:** On SGI Prism Visualizaton Systems, if you have a bootable CD is in the

---

---

**Note:** DVD drive when the system is reset and EFI Shell menu choice is selected, the CD is assigned the file system number `fs0`, at the top of the list. On an SGI Altix system, it is assigned `fs1` at the bottom of the list.

---

## Upgrading SGI ProPack with YaST - Using the Graphical Interface

This section provides information on how to upgrade to a new version of SGI ProPack 4 for Linux using the YaST graphical interface.

To upgrade your SGI ProPack software with YaST using the graphical interface, perform the following steps:

1. Start up `yast2`.
2. On the left side, highlight **Software**.
3. On the right side, click on **System Update**.  
You should now have a summary screen. Update Options should say either **Upgrade to SLES9 SP3, Upgrade to ProPack 4SP3, or Update to SGI ProPack Optional 4SP3**. All of these are OK.
4. Click on **Change...** and then **Packages...**
5. If A Dependency warning window appears, click on the **Cancel** to close the window.
6. On the upper right, click on the box to the right of **Filter**. Select **Selections**.
7. Scroll down until you see categories starting with **SGI**.
8. If any SGI groups are already selected (have a blue check next to them), mark them for upgrade by highlighting the item, right-clicking the mouse button, and choosing **update**. Skip to next step.
9. If SGI ProPack is not already selected, click the box next to **SGI ProPack** so that it has a black check mark. This may automatically deselect some old categories. This is normal.
10. If one or more **SGI ProPack Kernel Modules** categories is already selected (a blue checkmark), for each category, highlight the name, click the left mouse button, and select **update**. This will ensure any new packages from the new SGI ProPack are included. You may skip the next step.

11. If no **SGI ProPack Kernel Modules** categories are selected, select one or more **SGI ProPack Kernel Modules** categories matching the kernel or kernels with which you plan to run. For example, if you are using the sn2 SUSE kernel, select **SGI ProPack Kernel Modules - sn2**. To select a kernel module category, highlight the **SGI ProPack Kernel Modules** package you wish to install. Click the box to the left of it so that it contains a check mark.
12. If any of **SGI ProPack Graphics**, **SGI REACT**, or **SGI ProPack Digital Media** groups are selected, for each one highlight the group, right-click the mouse button, and select **update** to upgrade and ensure any new packages are added.
13. If you are installing from the SGI ProPack System Extensions CD, you probably want to install one or more of the following modules: **SGI ProPack Graphics**, **SGI REACT**, or **SGI ProPack Digital Media**. The **SGI ProPack Kernel Modules - rtgfx** group would then be selected for you. Only customers wanting to run real-time, digital media, or graphics software will want install these modules. All other customers should not have the ProPack System Extensions CD in the selections list and should not see these extra categories. If you do not need the System Extensions CD as an install source, it is important that it is **not** listed at all. This is because YaST may pull some packages from it, if available, even if they are not marked for install.

---

**Note:** If you are upgrading SGI REACT, highlight **SGI React**, right-click, and select **update**.

---

14. You can now click **Accept**. You will be taken back to the **System Update** screen. Select **Next**. Installation should proceed.
15. See the notes at the end of this section if installation does not proceed.

## Upgrading SGI ProPack for REACT Real-Time for Linux Users

If you are upgrading from any previous version of ProPack 4 to Propack 4 SP3, and you are choosing to install REACT here for the first time during this upgrade, there are some special instructions. Although selecting **Graphics**, **Digital Media**, or **REACT** components automatically installs the special `rtgfx` kernel, this kernel may not be your default kernel. In other words, when you reboot, you may start up with whatever kernel you were using before (most likely `default`).

To ensure the `rtgfx` kernel becomes the default kernel, please follow the instructions below. After this, `rtgfx` will always be your default kernel.

1. Start up `yast` or `yast2`
2. Choose **Software** and then **Install and Remove Software**.
3. Choose **Search**.
4. In the **Search Phrase** box, enter `kernel-rtgfix`.
5. Select **OK**.
6. Select the `kernel-rtgfix` kernel by highlighting it.
7. Mark the package for Upgrade (> in the text interface).
8. Select **accept**.

The kernel is now re-installed. The `rtgfix` kernel will be the default kernel when you reboot your system.

---

**Warning:** If you are going to run the `reactcfg.pl` script to configure your system for restricted/isolated CPUs, the default boot kernel needs to be the `rtgfix` kernel. The `reactcfg.pl` script makes its modifications according to whatever is listed as the default boot kernel.

---

### Notes on Upgrading SGI ProPack with YaST

In some cases, you could be presented with some conflicts. These are a result of unresolved dependencies from previous installation or installation attempts. If you have unresolved dependencies, you will have to resolve them before installation of ProPack 4 will proceed. If the only thing YaST is complaining about is that packages will be added, it is usually safe to let it take the default action. Please note that if packages are added due to these dependencies, YaST will need to install them from the operating system CDs or other media - so you may have to have the media available if you run in to this situation. Most users should not experience this problem.

### Installing the SN2 Kernel

After your system is running SLES9 SP3, you may wish to change the kernel you use. SLES9 SP3 has several kernels available to choose from. By default, you get the "default" kernel. You may wish to install the `sn2` kernel instead.

SGI systems preinstalled with SLES9 SP3 are setup to run the sn2 kernel by default, so you do **not** need to install the sn2 kernel on top of a preinstalled SGI Altix or Prism system.

SGI built kernel (`rtgfx` variant) and associated software provide support for Silicon Graphics Prism systems, Digital Media tools and libraries, and REACT Real-Time for Linux features. If you want to use any of these features, you want the `rtgfx` kernel installed on your system **not** the sn2 kernel.

Installing the sn2 version of the kernel requires two primary steps, as follows:

- Installing the SLES9 SP3 sn2 kernel variant itself
- Installing the associated SGI ProPack kernel modules for the sn2 kernel (if they are not already installed)

## Install the sn2 Kernel Variant with YaST-Using the Text (non-graphical) Interface

To install the SLES9 SP3 sn2 kernel variant with the text YaST installer, perform the following:

1. Invoke the `yast2` command to start the YaST installer (see the `YAST2(8)` man page).
2. Select **Software**.
3. Select **Install and Remove Software**.
4. Select **Filter** and **Search**.  
Enter `kernel-sn2` for the search phrase and then select **accept**.
5. Select the kernel by highlighting it and click on **+**.
6. Select **accept**.

## Install the sn2 Kernel Variant with YaST-Using the Graphical Interface

To install the SLES9 SP3 sn2 kernel variant with the graphical YaST installer, perform the following:

1. Invoke the `yast2` command to start the YaST installer.
2. Select **Software**.
3. Select **Install and Remove Software**.

4. Fill in the search engine box in the upper left with **kernel-sn2** and click **Search**.
5. Select the kernel by highlighting and clicking on the empty box next to **kernel-sn2**. Make sure it is now checked.
6. Select **accept**.

## Install the SGI ProPack Kernel Modules for the sn2 Kernel

To install the ProPack kernel modules associated with the SLES9 SP3 sn2 kernel, see “How To Install SGI ProPack 4 for Linux SP3 For the First Time” on page 20. Those instructions include how to install the associated SGI ProPack kernel module group using either

## KDB Support in the kernel-default and sn2 Kernels

If you use the SLES9 SP3 kernel-default kernel or sn2 kernel, which have KDB support compiled into the kernel, you may want to add the following modules to the `MODULES_LOADED_ON_BOOT` variable in `/etc/sysconfig/kernel` file, as follows:

```
kdbm_pg  
kdbm_task  
kdbm_vm  
xfsidbg
```

These kernel modules add additional KDB commands to aid in debugging.

## Installing the System Controller Software 1.12 CD

This section provides steps for installing the System Controller Software 1.12 (for IRIX and SGI ProPack for Linux). This software is licensed for SGI Origin and Onyx 3000 series systems based on MIPS processors and for SGI Altix 330 systems, SGI Altix 350 systems, the SGI Altix 3000 family of servers and superclusters and Silicon Graphics Prism Visualization systems.

---

**Note:** The System Controller Software 1.12 CD is **not** shipped by default. You can download the System Controller Software 1.12 package from <http://support.sgi.com/> or order it on CD-ROM (P/N 812-1138-007). Contact your SGI account representative if you need assistance obtaining the software package.

---

1. Log in to the PC workstation or laptop computer where the System Controller Software 1.x" package resides, as `root`, using the root password you used in the previous installation process.
2. Insert the System Controller Software 1.12 CD into the system and enter the following command to mount the CD:  

```
mount /dev/cdrom /mnt/cdrom
```
3. Change directories to `/mnt/cdrom/RPMS/ia64` and enter the following command:  

```
./install
```
4. The installation begins. You will see which packages are being installed. After the installation is complete, you are returned to the `root` prompt.
5. After the software installation is complete, remove the System Controller Software 1.12 CD.

## Obtaining and Installing the Latest SGI Altix or Prism System Firmware

There are three levels of firmware to consider on your SGI Altix or SGI Prism system, as follows:

- L2 controller software (only configurations of SGI systems with routers have L2 controllers)
- L1 controllers on routers, IX-bricks, PX-bricks, C-bricks, and so on.
- The system PROM (each node has a system PROM and each C-brick has two nodes).

L1 and L2 System Controller firmware provides support for managing and monitoring the power, cooling, and testing functions for a brick and system compute rack.

You can always download the latest L1/L2 system controller software and PROM firmware via Supportfolio at <http://support.sgi.com/linux/>

You can also find system controller software by using the search term “system controller” at: [http://support.sgi.com/search\\_request/downloads/index](http://support.sgi.com/search_request/downloads/index).

PROM is released as patches and the latest firmware can also be found at: [http://support.sgi.com/browse\\_request/linux\\_patches\\_by\\_os](http://support.sgi.com/browse_request/linux_patches_by_os)

---

**Note:** Systems running SLES9 SP3 and SGI ProPack 4 SP3 should use PROM 4.43 which ships with SGI ProPack 4 SP3. The updated PROM contains key bug fixes, along with support for new kernel features, such as memory error recovery. Note that PROM 4.43 and subsequent versions are not compatible with SLES9 SP1 or SP2. SGI Altix or Silicon Graphics Prism software support contract customers can download PROM version 4.43 or later from the following area on Supportfolio:

[https://support.sgi.com/browse\\_request/suse\\_patch\\_browse\\_results](https://support.sgi.com/browse_request/suse_patch_browse_results)

---

To update or “flash” the system PROM, you first need to download the prom RPM from Supportfolio as described above.

---

**Note:** The PROM image on your hard drive is automatically updated when you upgrade your system to the latest SGI ProPack for Linux release. The installation of the `snprom` RPM (step 1) happens automatically as part of the SGI ProPack installation. Flashing it (steps 2-4) must be performed.

---

Once you have the latest PROM RPM, flash the PROM, as follows:

1. Install the update PROM image with the following command:

```
# rpm -Uvh RPM_NAME...
```

2. Reboot the system and enter the EFI shell. Access `/boot/efi` (typically `fs0`) from the EFI Shell> prompt:

```
Shell> fs0:
```

3. Issue the `ls` command and locate the PROM image binary:

```
fs0:\> ls
```

```
snprom.bin
```

Verify the PROM version with the following command:

```
fs0:\> flash -v snprom.bin
```

```
SGI PROM Flashing Utility
```

```
Version of prom image in file 3.32
```

Verify that the current PROM on the system is older with the following command:

```
fs0:\> flash -R
```

```
Running PROM version: 3.25
```

4. Flash **all the nodes** with the latest PROM image:

```
fs0:\> flash -a snprom.bin
```

---

**Caution:** Always allow the flash process to complete before attempting any other system activities. Flashing the PROMs may take several minutes (depending on system size). Interrupting a flash process can result in disabled processors and nodes.

---

The **all the nodes** comment in step 4 includes both partitioned and unpartitioned systems. For partitioned systems, this means that it is important to upgrade all nodes (including all nodes in all partitions) before resetting any partitions. In other words, do not reset any partitions until all nodes in all partitions have been upgraded.

Instructions for updating (flashing) the L1/L2 system controller firmware are also included in the appropriate SGI hardware user's guide and the *SGI L1 and L2 Controller Software User's Guide*. The "SGI Documentation" section in the Introduction of this manual contains a list of SGI hardware manuals for the SGI Altix and Silicon Graphics Prism Visualization systems.

## Reinstalling Your Software

To reinstall all of the software on your system, follow the entire set of installation instructions listed previously, using the latest SGI ProPack CD set.



## Product Support

This chapter documents the product components that are supported on the SGI Altix 330 systems, SGI Altix 350 systems, SGI Altix 1330 and Altix 1350 cluster systems, and SGI Altix 3000 and SGI Altix 4700 series systems and the Silicon Graphics Prism Visualization Systems. (For a list of the products, see Table 3-1 on page 48.)

Descriptions of the product components are grouped in this chapter as follows:

- “SGI ProPack for Linux Products” on page 47
- “Operating System Enhancements” on page 52
- “I/O Subsystems” on page 54
- “HPC Application Tools and Support” on page 58
- “System Management” on page 59
- “NUMA Data Placement Tools” on page 65
- “Graphics APIs and Software” on page 66

### SGI ProPack for Linux Products

Software provided by SGI for the SGI ProPack 4 for Linux SP3 release consists of kernel modules for SGI software built against the kernels in SUSE Linux Enterprise Server 9 Service Pack 3 (SLES9 SP3) and value-add software developed by SGI specifically to run on SGI Altix systems.

**Table 3-1** SGI ProPack 4 for Linux Products

Product	Description
Application performance measuring tools	VTune - This tool, developed and supported by Intel, uses the performance measurement facilities of the Itanium processor to take profiles based on elapsed time or other architected events within the processor. These profiles can be used to measure, tune, and improve application performance. For more information on VTune, go to the following web location: <a href="http://developer.intel.com/software/products/vtune/">http://developer.intel.com/software/products/vtune/</a>
Array Services	Provides a set of tools with kernel support that simplify the management of systems and parallel applications for clusters of SGI systems. For more information, see the Array Services chapter in the <i>Linux Resource Administration Guide</i> .
Cpuset System	The Cpuset System is primarily a workload manager tool permitting a system administrator to restrict the number of processors and memory resources that a process or set of processes may use. A system administrator can use cpusets to create a division of CPUs and memory resources within a larger system. For more information, see the "Cpusets on SGI ProPack 4 for Linux" chapter in the <i>Linux Resource Administration Guide</i> .
CSA	Provides jobs-based accounting of per-task resources and disk usage for specific login accounts on Linux systems. Linux CSA application interface library allows software applications to manipulate and obtain status about Linux CSA accounting methods. For more information, see the CSA chapter in the <i>Linux Resource Administration Guide</i> .
FLEXlm	Provides a floating license, run-time environment. Includes daemons suitable for serving floating licenses.

**Table 3-1** SGI ProPack 4 for Linux Products **(continued)**

<b>Product</b>	<b>Description</b>
IOC4 serial driver	<p>Driver that supports the Internal IDE CD-ROM, NVRAM, and Real-Time Clock.</p> <p>Serial ports are supported on the IOC4 base I/O chipset and the following device nodes are created:</p> <pre>/dev/ttyIOC4/0 /dev/ttyIOC4/1 /dev/ttyIOC4/2 /dev/ttyIOC4/3</pre>
Kernel partitioning support	<p>Provides the software infrastructure necessary to support a partitioned system, including cross-partition communication support. For more information on system partitioning, see the <i>Linux Configuration and Operations Guide</i>.</p>
L1 and L2 System Controller firmware	<p>Provides support for managing and monitoring the power, cooling, and testing functions for a brick and system compute rack. For more information on system controller commands, see the <i>SGI L1 and L2 Controller Software User's Guide</i></p>
MPT	<p>Provides industry-standard message passing libraries optimized for SGI computers. For more information on MPT, see the <i>Message Passing Toolkit: MPI Programmer's Manual</i>.</p>
NUMA tools	<p>Provides a collection of NUMA related tools (<code>dlook(1)</code>, <code>dplace(1)</code>, and so on). For more information on NUMA tools, see the <i>Linux Application Tuning Guide</i>.</p>
Performance Co-Pilot collector infrastructure	<p>Provides performance monitoring and performance management services targeted at large, complex systems. For more information on Performance Co-Pilot, see <i>Performance Co-Pilot for IA-64 Linux User's and Administrator's Guide</i>.</p>
PROM	<p>Allows the CPU to boot and allows you to perform system administration and software installations. For more information on the levels of PROM in your system and how to flash PROM firmware, see "Obtaining and Installing the Latest SGI Altix or Prism System Firmware" on page 43.</p>

**Table 3-1** SGI ProPack 4 for Linux Products (**continued**)

Product	Description
Reconfigurable Application-Specific Computing	Reconfigurable application-specific software computing (RASC) program delivers scalable, configurable computing elements for the SGI Altix family of servers and superclusters and Silicon Graphics Prism visualization systems. For more information, see the <i>Reconfigurable Application-Specific Computing User's Guide</i> .
REACT real-time for Linux	Support for real-time programs. For more information, see the <i>REACT Real-Time for Linux Programmer's Guide</i> .
XVM	Provides software volume manager functionality such as disk striping and mirroring. For more information on XVM, see the <i>XVM Volume Manager Administrator's Guide</i> .
OpenGL Multipipe	OpenGL Multipipe enables owners of SGI high performance visualization solutions to achieve higher levels of performance with existing single-pipe applications by bringing the power of scalable visualization to applications. For more information, see the <i>SGI OpenGL Multipipe User's Guide</i> .
OpenGL Multipipe SDK	OpenGL Multipipe SDK is an application programming interface (API) layer for OpenGL that provides a simplified approach to managing graphics applications across multiple graphics subsystems or pipes.
OpenGL Performer	OpenGL Performer is a powerful and comprehensive programming interface for developers creating real-time visual simulations and other professional performance-oriented 3D graphics applications. For more information, see the <i>OpenGL Performer Getting Started Guide</i> .
OpenGL Vizserver	OpenGL Vizserver is a technical and creative computing solution designed to deliver superior visualization, collaboration functionality, and advanced performance to any existing client desktop. For more information, see the <i>SGI OpenGL Vizserver User's Guide</i> and <i>SGI OpenGL Vizserver Administrator's Guide</i> .

**Table 3-1** SGI ProPack 4 for Linux Products **(continued)**

Product	Description
OpenGL Volumizer	OpenGL Volumizer offers a cross-platform, high-level volume rendering API designed for interactive, high quality, scalable visualization of large volumetric data sets. For more information, see the <i>SGI OpenGL Volumizer 2 Programmer's Guide</i> .
OpenML	OpenML Software Development Kit (SDK) provides a low-level application programming interface (API) for controlling digital media hardware. For more information, please see the <i>OpenML Programmer's Guide</i> .
Digital Media API and Software	The digital media libraries are a family of libraries that provide application program interfaces (APIs) for digital media.
QuickTransit for Silicon Graphics	QuickTransit is a transparent, dynamic binary translator that allows you to run IRIX applications on Silicon Graphics Prism and SGI Altix platforms.

SGI does not support the following:

- Base Linux software not released by SUSE/Novell for SLES9 SP3 or other software not released by SGI.
- Other releases, updates, or patches not released by SUSE/Novell for SLES9 SP3 or by SGI for SGI ProPack software.
- Software patches, drivers, or other changes obtained from the Linux community or vendors other than SUSE/Novell and SGI.
- Kernels recompiled or reconfigured to run with parameter settings or other modules as not specified by SUSE/Novell and SGI.
- Unsupported hardware configurations and devices.

## Operating System Enhancements

Building on the Linux operating system's rapid expansion and improvements for general commercial and enterprise environments, SGI has focused on improving Linux capabilities and performance specifically for high performance computing's (HPC's) big compute and big data environments. Thus, SGI has leveraged its experience with NUMAflex and HPC from its IRIX operating systems and MIPS processor-based systems and concentrated on the Linux kernel improvements specifically important to HPC environments.

### Cpuset Support

The cpuset facility is primarily a workload manager tool permitting a system administrator to restrict the number of processors and memory resources that a process or set of processes may use. A cpuset defines a list of CPUs and memory nodes. A process contained in a cpuset may only execute on the CPUs in that cpuset and may only allocate memory on the memory nodes in that cpuset. Essentially, cpusets provide you with a CPU and memory containers or "soft partitions" within which you can run sets of related tasks. Using cpusets on an SGI Altix system improves cache locality and memory access times and can substantially improve an applications performance and runtime repeatability. Restraining all other jobs from using any of the CPUs or memory resources assigned to a critical job minimizes interference from other jobs on the system. For example, Message Passing Interface (MPI) jobs frequently consist of a number of threads that communicate using message passing interfaces. All threads need to be executing at the same time. If a single thread loses a CPU, all threads stop making forward progress and spin at a barrier. Cpusets can eliminate the need for a gang scheduler.

Cpusets are represented in a hierarchical virtual file system. Cpusets can be nested and they have file-like permissions.

In addition to their traditional use to control the placement of jobs on the CPUs and memory nodes of a system, cpusets also provide a convenient mechanism to control the use of Hyper-Threading Technology.

For detailed information on cpusets, see Chapter 6, "Cpusets on SGI ProPack 4 for Linux" in the *Linux Resource Administration Guide*.

## Comprehensive System Accounting (CSA)

The port of Comprehensive System Accounting (CSA) software packages from IRIX to Linux is the result of an open source collaboration between SGI and Los Alamos National Laboratory (LANL) to provide jobs-based accounting of per-task resources and disk usage for specific login accounts on Linux systems.

Providing extensive system accounting capabilities is often important for very large systems, especially when the system will be shared or made available for other organizations to use. CSA uses a Job Containers feature, which provides on Linux the notion of a job. A job is an inescapable container and a collection of processes that enables CSA to track resources for any point of entry to a machine (for example, interactive login, cron job, remote login, batched workload, and so on).

The Linux CSA application interface library allows software applications to manipulate and obtain status about Linux CSA accounting methods.

CSA on Linux is an SGI open source project, also available from the following location:

<http://oss.sgi.com/projects/csa>

For further documentation and details on CSA support, see the chapter titled “Comprehensive System Accounting” in the *Linux Resource Administration Guide*.

## Partitioning

SGI provides the ability to divide a single SGI Altix system into a collection of smaller system partitions. Each partition runs its own copy of the operating system kernel and has its own system console, root filesystem, IP network address, and physical memory. All partitions in the system are connected via the SGI high-performance NUMALink interconnect, just as they are when the system is not partitioned. Thus, a partitioned system can also be viewed as a cluster of nodes connected via NUMALink.

Benefits of partitioning include fault containment and the ability to use the NUMALink interconnect and global shared memory features of the SGI Altix to provide high-performance clusters.

For further documentation and details on partitioning, see the *Linux Configuration and Operations Guide*.

## I/O Subsystems

Although some HPC workloads might be mostly CPU bound, others involve processing large amounts of data and require an I/O subsystem capable of moving data between memory and storage quickly, as well as having the ability to manage large storage farms effectively. The XFS filesystem, XVM volume manager, and data migration facilities were leveraged from IRIX and ported to provide a robust, high-performance, and stable storage I/O subsystem on Linux. This section covers the following topics:

- “Persistent PCI Bus Numbering” on page 54
- “Persistent IP Addressing of Ethernet Interfaces” on page 56
- “PCI Domain Support for SGI Altix 4700 Systems” on page 56
- “XFS Filesystem” on page 57
- “XVM Volume Manager” on page 57

### Persistent PCI Bus Numbering

Persistent PCI bus numbering ensures that bus numbers can remain the same across reboots in case of faulty hardware or reconfiguration. During platform initialization, as buses are discovered, they are assigned a logical bus number. Each logical bus number is unique, systemwide. The default number of buses supported by SGI Altix 3000 systems is 256 (numbered 0 to 255).

By default and for IX-bricks and PX-bricks only, bus numbers are allocated starting from the lowest C-brick module ID to which the I/O brick is connected. For the NUMALink connected PA-bricks it is the lowest module ID of the PA-brick. Since you can have both IX-bricks and PX-bricks on a system along with PA-bricks, it is the lowest of all these combinations.

An I/O brick can be any one of the following:

- IX-brick  
The IX-brick is PX-brick with a BaseIO card (IO9 or IO10) in bus1 slot1 of the brick.
- PX-brick  
The PX-brick is a XIO connected PCI/PCI-X I/O brick. There are 6 pci/pci-x buses, each with 2 pci/pcix slots.

- PA-brick

The PA-brick, also called the PA expansion module, is a NUMALink connected PCI/PCI-X I/O Brick. There are 4 pci/pci-x buses, two with 2 slots, and 2 with a single slot. Note that the PA-brick is supported only in NUMALink-4 Altix configurations.

Each I/O brick is allocated 0x10 buses, although the current I/O bricks support only six buses each. Therefore, bus numbers are not contiguous across the system. Bus numbers are sparse and have holes in them.

On an SGI Altix 3000 series systems, the IX-bricks and PX-brick I/O bricks have six physical buses and a PA-brick I/O brick has four physical buses. These buses are numbered 0x1 through 0x6, left to right, looking at the back of the I/O brick. If there is more than one I/O brick on the system, the buses on the next I/O brick are numbered 0x11 through 0x16. The rationale for this numbering is that the bus numbers of each I/O brick are stamped on the back of the brick and they start from 1. Therefore, the right most digit of a bus number corresponds to the actual stamped number on the I/O brick. An SGI Altix 350 system has 2 buses per module.

If you have only one I/O brick, you do not need persistent bus numbering. However, if you have more than one I/O brick, persistent bus numbering is strongly recommended, so that if an I/O brick fails to boot, your bus numbers are still the same.

To make use of persistent bus numbering, you must set the `PciBusList1`, `PciBusList2`, and `PciBusList3` PROM environment variables. Each variable is a comma separated list of the `moduleid` of I/O Bricks representing the order you want the persistent bus numbering.

There are three `PciBusList#` variables to support persistent bus numbering for 16 I/O bricks. (This is because PROM variables are limited to 48 characters. That gives us six `moduleid` per variable to support up to 16 I/O bricks). Some examples are, as follows:

```
POD> setallenv PciBusList1 "001i01,001p04,101p10"
```

or

```
POD> setallenv PciBusList1 "001i01,001p04,101p10,010i10,011p12,012p11"
```

```
POD> setallenv PciBusList2 "102i01"
```

The PROM clearance `PciBusList1` variable is used to clear the persistent bus numbering.

## Persistent IP Addressing of Ethernet Interfaces

An Ethernet interface can be given a persistent internet addresses by associating its permanent MAC address, such as 08:00:69:13:f1:aa, with an internet protocol (IP) address, for example 192.168.20.1. An interface with a persistent IP address will be given the same IP address each time the system is booted.

SGI ProPack 4 is built on top of SLES9. SLES9 has its own implementation of Ethernet persistent naming, that is, the Media Access Control (MAC) address is embedded in the name of the configuration file of the associated Ethernet interface.

For example, if you want to ensure that the Ethernet interface whose MAC address is 08:00:69:13:f1:aa always uses the IP address 192.168.20.1, edit the `/etc/sysconfig/network/ifcfg-eth-id-08:00:69:13:f1:aa` file so that it contains the following:

```
BOOTPROTO="static"
STARTMODE="onboot"
IPADDR="192.168.20.1"
NETMASK="255.255.255.0"
NETWORK="192.168.20.0"
BROADCAST="192.168.20.255"
```

For more information on Ethernet device configuration files and instructions for editing them, see `/usr/share/doc/packages/sysconfig/README`.

## PCI Domain Support for SGI Altix 4700 Systems

On an SGI Altix 4700 system, a *PCI domain* is a functional entity that includes a root bridge, subordinate buses under the root bridge, and the peripheral devices it controls. Separation, management, and protection of PCI domains is implemented and controlled by system software.

Previously, a PCI device was identified by `bus:slot:function`. With new I/O blade technology, a PCI device is identified by `domain:bus:slot:function`.

Domains (sometimes referred to as a PCI segment) are numbered from (0 to ffff). bus (0 to ff), slot (0 to 1f) and function (0 to 7).

On an SGI Altix 4700 system, a domain is a root bridge (with the bus being numbered zero), subordinate buses under that root bridge are buses 1-255.

In the past, a PA-brick was numbered bus 01, 02, 03, 04 (A bus for each root bridge (that is, each TIO ASIC)).

With PCI domain support each root bridge is numbered with a domain/bus number 0001:00, 0002:00, 0003:00, 0004:00. If a subordinate bus is plugged into the root bridge bus, it has the same domain number as the root bridge, but a different bus number (for example, 0001:01).

For PCI Express the PCIE root complex is its own domain. Each port is a subordinate bus under that domain.

Domain numbers are allocated starting from the lowest module ID (that is, rack/slot/blade location).

## XFS Filesystem

The SGI XFS filesystem provides a high-performance filesystem for Linux. XFS is an open-source, fast recovery, journaling filesystem that provides direct I/O support, space preallocation, access control lists, quotas, and other commercial file system features. Although other filesystems are available on Linux, performance tuning and improvements leveraged from IRIX make XFS particularly well suited for large data and I/O workloads commonly found in HPC environments.

For more information on the XFS filesystem, see *XFS for Linux Administration*.

## XVM Volume Manager

The SGI XVM Volume Manager provides a logical organization to disk storage that enables an administrator to combine underlying physical disk storage into a single logical unit, known as a logical volume. Logical volumes behave like standard disk partitions and can be used as arguments anywhere a partition can be specified.

A logical volume allows a filesystem or raw device to be larger than the size of a physical disk. Using logical volumes can also increase disk I/O performance because a volume can be striped across more than one disk. Logical volumes can also be used to mirror data on different disks.

This release adds a new XVM multi-host failover feature. For more information on this new feature and XVM Volume Manager in general, see *XVM Volume Manager Administrator's Guide*.

## HPC Application Tools and Support

SGI has ported HPC libraries, tools, and software packages from IRIX to Linux to provide a powerful, standards-based system using Linux and Itanium 2-based solutions for HPC environments. The following sections describe some of these tools, libraries, and software.

### Message Passing Toolkit

The SGI Message Passing Toolkit (MPT) provides industry-standard message passing libraries optimized for SGI computers. On Linux, MPT contains MPI and SHMEM APIs, which transparently utilize and exploit the low-level capabilities within SGI hardware, such as memory mapping within and between partitions for fast memory-to-memory transfers and the hardware memory controller's fetch operation (fetchop) support. Fetchops and other shared memory techniques enable ultra fast communication and synchronization between MPI processes in a parallel application.

MPI jobs can be launched, monitored, and controlled across a cluster or partitioned system using the SGI Array Services software. Array Services provides the notion of an array session, which is a set of processes that can be running on different cluster nodes or system partitions. Array Services is implemented using Process Aggregates (PAGGs), which is a kernel module that provides process containers. PAGGs has been open-sourced by SGI for Linux.

For more information on the Message Passing Toolkit, see the *Message Passing Toolkit (MPT) User's Guide*.

### Performance Co-Pilot

The SGI Performance Co-Pilot software was ported from IRIX to Linux to provide a collection of performance monitoring and performance management services targeted at large, complex systems. Integrated with the low-level performance hardware counters

and with MPT, Performance Co-Pilot provides such services as CPU, I/O, and networking statistics; visualization tools; and monitoring tools.

For more information on Performance Co-Pilot, see the *Performance Co-Pilot for IA-64 Linux User's and Administrator's Guide*.

## System Management

This section describes system management tools. These include the hardware and software environment required to boot the system, license management, system console, and system controllers.

### PROM Chips

Programmable read-only memory (PROM) chips are placed in your computer at the factory with software programmed into them that allows the CPU to boot and allows you to perform system administration and software installations. The PROM chips are not part of your disk or your operating system; they are the lowest level of access available for your system. You cannot erase them or bypass them. For more information on PROM and the L1 controller, see the *SGI L1 and L2 Controller Software User's Guide*.

## Reconfigurable Application-Specific Computing

The RASC program leverages more than 20 years of SGI experience accelerating algorithms in hardware. Rather than using relatively fixed implementations, such as graphics processing units (GPUs), RASC uses field programmable gate array (FPGA) technology to develop a full-featured reconfigurable computer. The RASC program also addresses the ease of use and performance issues present in typical reconfigurable computer environments.

To address performance issues, RASC connects FPGAs into the NUMALink fabric making them a peer to the microprocessor and providing both high bandwidth and low latency. By attaching the FPGA devices to the NUMALink interconnect, RASC places the FPGA resources inside the coherency domain of the computer system. This placement allows the FPGAs extremely high bandwidth (up to 6.4GB/s/FPGA), low latency, semaphores (Atomic Memory Operations AMOs), and hardware barriers. These features

enable both extreme performance and scalability. The RASC product also provides system infrastructure to manage and reprogram the contents of the FPGA quickly for reuse of resources.

RASC defines a set of APIs through the RASC Abstraction Layer (RASCAL). The abstraction layer can abstract the hardware to provide deep and wide scaling or direct and specific control over each hardware element in the system. In addition RASC provides a FPGA-aware version of GNU Debugger (GDB) that is based on the standard Linux version of GDB with extensions for managing multiple FPGAs. The RASC debug environment does not require learning new tool sets to quickly debug an accelerated application.

RASC supports the common hardware description languages (HDLs) for generating algorithms. RASC provides templates for Verilog- and VHDL-based algorithms. Several 3rd-party high-level language tool vendors are developing RASC interfaces and templates to use in place of traditional hardware design languages.

For detailed information on the SGI RASC program, see the *Reconfigurable Application-Specific Computing User's Guide*.

---

**Note:** This manual is currently **not** available on the SGI Technical Publications Library. It is shipped hardcover and on CD with the RASC product. It is also available from your SGI sales representative under a non-disclosure agreement.

---

## Extensible Firmware Interface (EFI)

The Extensible Firmware Interface (EFI), a supporting platform to provide input to the CPU and to handle its output, is provided by SLES9 SP3, the base Linux operating system for SGI Altix systems running SGI ProPack 4 SP3. EFI also controls the server's boot configuration, maintaining the boot menu in durable, nonvolatile memory.

SLES9 SP3 uses `elilo` package which places the bootloader (`elilo.efi`) and configuration file (`elilo.conf`) in the `/boot/efi/efi/SuSE/` directory on SGI Altix systems.

---

**Note:** When booting from SLES9 CDs, use the `bootia64` command instead of `elilo`. Once the system is running SLES9 SP3, use `elilo` to boot from EFI.

---



---

**Note:** If you have installed multiple kernel images and want to boot with one that is not currently the system default (`vmlinuz` in `/boot/efi/efi/SuSE`), simply copy the `vmlinuz` and `initrd` files for the kernel you wish to use from `/boot` to `/boot/efi/efi/SuSE`.

---

For a summary of EFI commands, see Table 3-2.

**Table 3-2** EFI Commands

EFI Command	Description
<code>alias [-bdv] [sname] [value]</code>	Sets or gets alias settings
<code>attrib [-b] [+/- rhs] [file]</code>	Views or sets file attributes
<code>bcfg</code>	Configures boot driver and load options
<code>cd [path]</code>	Updates the current directory
<code>cls [background color]</code>	Clears screen
<code>comp file1 file2</code>	Compares two files
<code>cp file [file] ... [dest]</code>	Copies files or directories
<code>date [mm/dd/yyyy]</code>	Gets or sets date
<code>dblk device [Lba] [blocks]</code>	Performs hex dump of block I/O devices
<code>dh [-b] [-p prot_id]   [handle]</code>	Dumps handle information
<code>dmpstore</code>	Dumps variable store
<code>echo [-on   -off]   [text]</code>	Echoes text to stdout or toggles script echo
<code>edit [file name]</code>	Edits a file
<code>endfor</code>	Script only: Delimits loop construct
<code>endif</code>	Script-only: Delimits IF THEN construct

---

**Table 3-2** EFI Commands (continued)

EFI Command	Description
err [ <i>level</i> ]	Sets or displays error level
exit	Exits
flash <i>filename</i>	Flashes PROM on C-brick
for var in <i>set</i>	Script-only: Indicates loop construct
getmtc	Gets next monotonic count
goto <i>label</i>	Script-only: Jumps to label location in script
guid [-b] [ <i>sname</i> ]	Dumps known guid IDs
help [-b] [ <i>internal command</i> ]	Displays this help
if [not] <i>condition</i> then	Script-only: Indicates IF THEN construct
load <i>driver_name</i>	Loads a driver
ls [-b] [ <i>dir</i> ] [ <i>dir</i> ] ...	Obtains directory listing
map [-bdvr] [ <i>sname[:]</i> ] [ <i>handle</i> ]	Maps shortname to device path
mem [ <i>address</i> ] [ <i>size</i> ] [; <i>MMIO</i> ]	Dumps memory or memory mapped I/O
memmap [-b]	Dumps memory map
mkdir <i>dir</i> [ <i>dir</i> ] ...	Makes directory
mm <i>address</i> [ <i>width</i> ] [; <i>type</i> ]	Modifies memory: Mem, MMIO, IO, PCI
mode [ <i>col row</i> ]	Sets or gets current text mode
mount <i>BlkDevice</i> [ <i>sname[:]</i> ]	Mounts a filesystem on a block device
mv <i>sfile dfile</i>	Moves files
pause	Script-only: Prompts to quit or continue
pci [ <i>bus dev</i> ] [ <i>func</i> ]	Displays PCI device(s) info
reset [cold/warm] [ <i>reset string</i> ]	Indicates cold or warm reset
rm <i>file/dir</i> [ <i>file/dir</i> ]	Removes file or directories

**Table 3-2** EFI Commands (**continued**)

EFI Command	Description
set [-bdv] [ <i>sname</i> ] [ <i>value</i> ]	Sets or gets environment variable
setsize <i>newsiz</i> <i>fname</i>	Sets the files size
stall <i>microseconds</i>	Delays for <i>x</i> microseconds
time [ <i>hh:mm:ss</i> ]	Gets or sets time
touch [ <i>filename</i> ]	Views or sets file attributes
type [-a] [-u] [-b] <i>file</i>	Types file
ver	Displays version information
vol fs [ <i>volume label</i> ]	Sets or displays volume label

## FLEXlm

FLEXlm is a flexible license management system from Macrovision that lets independent software vendors (ISVs) license their products and helps system administrators install and manage licenses with minimal overhead. It supports a wide range of licensing options, including simple node-locked licenses and floating licenses with redundant servers.

To build licensed software, ISVs must purchase a set of keys from Macrovision. System administrators can install license servers anywhere. Products purchased from SGI are typically licensed using FLEXlm.

For more information, visit

<http://www.macrovision.com/solutions/esd/flexlm/flexlm.shtml>

## SGIconsole

SGIconsole is a combination of hardware and software that provides console management and allows monitoring of multiple SGI servers running the IRIX operating system and SGI ProPack for Linux. These servers include SGI partitioned systems and

large, single-system-image servers, including SGI Altix 350 systems and the SGI Altix 3000 family of servers and superclusters.

SGIconsole consists of an 1U rackmountable SGI server based on the Intel Pentium processor, a serial multiplexer or Ethernet hub, and a software suite that includes the Console Manager package and Performance Co-Pilot, which provides access to common remote management tools for hardware and software.

Console Manager is a graphical user interface for the SGIconsole management and monitoring tool used to control multiple SGI servers. SGIconsole also has a command line interface. For more information on SGIconsole, see the *SGIconsole Start Here*.

## System Controller Firmware

This section describes the system controller firmware used in SGI Altix systems.

### L1 and L2 System Controllers

The L1 and L2 controllers are system controller firmware used in SGI systems.

The L1 controller is embedded in each brick in SGI Origin and Onyx 3000 series systems and in SGI Altix 3000 systems. An SGI Altix 4700 system can have multiple L1 host connections depending on the size of the system. The L1 controller provides power and control sequencing, along with temperature and power monitoring for each brick.

The L2 controller is a rack-level controller that monitors and controls the bricks in its rack. All L2 controllers in a system are networked together and they consolidate the control and monitoring information from each brick to provide system-level control and monitoring.

The following references describe how to install and connect to an L1 or L2 controller:

- Procedure 3-10, “Determining the Hardware Address of the L2 System Controller” in chapter 3 of the *SGIconsole 2.0 Start Here* describes how the L2 system controllers come online after a system boots and how to set the eth1 port on the SGI 1100 server to match when a DHCP server is running on a subnet.
- Procedure 3-2, “Determining the L2 Address of a New L2 Controller” in chapter 3 of the *Console Manager for SGIconsole Administrator’s Guide* describes how to find the L2 address of a new L2 controller.

- Procedure 4-1, “Connecting to a System Console” in chapter 4 of the *Console Manager for SGIconsole Administrator’s Guide* describes how to connect to a system console.
- Procedure 2-2, “Connecting to the L1 Controller” in chapter 2 of the *Linux Configuration and Operations Guide* describes how to connect to an L1 controller and from there an L2 controller with or without SGIconsole installed.
- Procedure 2-3, “Connecting to the L2 Controller” in chapter 2 of the *Linux Configuration and Operations Guide* describes how to connect to the L2 controller with or without SGIconsole installed.

For more information on the L1 and L2 system controller firmware, see the *SGI L1 and L2 Controller Software User’s Guide*.

## L3 System Controller

The L3 controller is a Linux software package that resides on a PC workstation or laptop computer. It provides remote support, system controller consoles, and system-level maintenance functions. The L3 controller software is obtained through the "System Controller Software 1.x" release.

## NUMA Data Placement Tools

This section describes the commands that are currently provided with the collection of NUMA related data placement tools that can help you with tuning applications on your system.

---

**Note:** Performance tuning information for single processor and multiprocessor programs resides in *Linux Application Tuning Guide*.

---

### dlook Command

The `dlook(1)` command displays the memory map and CPU use for a specified process. The following information is printed for each page in the virtual address space of the process:

- The object that owns the page (file, SYSV shared memory, device driver, and so on)
- Type of page (RAM, FETCHOP, IOSPACE, and so on)
- If RAM memory, the following information is supplied:
  - Memory attributes (SHARED, DIRTY, and so on)
  - Node on which that the page is located
  - Physical address of page (optional)

Optionally, the amount of elapsed CPU time that the process has executed on each physical CPU in the system is also printed.

## **dplace Command**

The `dplace(1)` command binds a related set of processes to specific CPUs or nodes to prevent process migrations. In some cases, this tool improves performance because of the occurrence of a higher percentage of memory accesses to the local node.

For more information on NUMA tools, see Chapter 5, “Data Placement Tools” in the *Linux Application Tuning Guide*.

## **Graphics APIs and Software**

This section describes graphics APIs and software supported on SGI ProPack 4 SP2 and covers the following topics:

- “OpenGL Multipipe” on page 67
- “OpenGL Multipipe Software Development Kit (SDK)” on page 67
- “OpenGL Performer” on page 68
- “OpenGL Vizserver” on page 68
- “OpenGL Volumizer” on page 69

## OpenGL Multipipe

OpenGL Multipipe enables owners of high performance visualization solutions from Silicon Graphics to create high-resolution SGI Reality Center environments and achieve higher levels of performance while continuing to use existing single pipe applications. It brings the power of scalable visualization to new applications and enables organizations to create better products, generate new ideas, and increase operational efficiency.

OpenGL Multipipe enables high levels of screen space scaling and low-to-moderate levels of performance scaling without application modification. OpenGL Multipipe uses a flexible architecture that enables a logical screen to be built up from individual physical screens that can be located anywhere within the logical screen space. This enables the creation of large walls with 2D arrays of displays, wide panoramic screens with overlapping displays for edge blending and the use of a scalable graphics compositor to drive a single screen with increased performance. For more information about OpenGL Multipipe, visit <http://www.sgi.com/products/software/multipipe/>.

## OpenGL Multipipe Software Development Kit (SDK)

OpenGL Multipipe SDK is an API layer for OpenGL that provides a simplified approach to managing graphics applications across multiple graphics subsystems or pipes and focused on delivering run-time scalability on SGI scalable graphics servers.

Applications written using the OpenGL Multipipe SDK API can run seamlessly from desktop single-processor, single-pipe systems up to large multiprocessor, multipipe scalable graphics systems. A simple configuration file defines the desired configuration of the application, such that the same application can support normal office environments, SGI Reality Center rooms, walls, immersive desk displays, and domes. In addition, the same application can take advantage of scalable graphics systems by combining the power of multiple graphics pipes into a single display output, which in turn can be scaled to drive multiple display devices. OpenGL Multipipe SDK provides a straightforward solution for graphics applications that were designed for single-processor, single-pipe applications to scale seamlessly when run on graphics systems with multiple processors and multiple graphics pipes. For more information about OpenGL Multipipe SDK, visit <http://www.sgi.com/products/software/multipipe/sdk/>.

## OpenGL Performer

OpenGL Performer is a powerful and comprehensive programming interface for developers creating real-time visual simulation and other professional performance-oriented 3D graphics applications. The toolkit simplifies development of applications used for visual simulation, manufacturing, simulation-based design, virtual reality, scientific visualization, interactive entertainment, broadcast video, architectural walk-through, and computer-aided design.

The latest release is built atop the industry-standard OpenGL graphics library, interoperates with OpenGL Volumizer, OpenGL Multipipe SDK, and OpenGL Vizserver; includes both ANSI C and C++ bindings; and is available for the IRIX, Linux, Windows XP, and Windows 2000 operating systems. For more information about OpenGL Performer, visit <http://www.sgi.com/software/performer/>.

## OpenGL Vizserver

OpenGL Vizserver is a technical and creative computing solution designed to deliver superior visualization, collaboration, and advanced performance to any client, whether on a desktop workstation or wireless tablet. OpenGL Vizserver allows users to remotely view and interact with large data sets from any other system at any location in an organization and to collaborate with multiple colleagues using these same applications and data.

OpenGL Vizserver enables a single SGI advanced visualization system to act as a multiuser graphics server which distributes remote and collaborative visualization sessions to client systems running a mix of desktop operating systems. With OpenGL Vizserver, graphics processing is handled entirely on the SGI advanced visualization system using full 3D hardware acceleration; the client machine simply decompresses and displays the image. This leverages existing internal infrastructure and allows customers to leverage the power of the world-class SGI advanced visualization systems on common desktop workstations such as Silicon Graphics visual workstations, Apple Macintosh workstations, Sun Solaris systems, or Intel architecture PCs running the Linux, Microsoft Windows NT, Windows 2000, or Windows XP operating systems. For more information about OpenGL Vizserver, visit <http://www.sgi.com/products/software/vizserver/>.

## OpenGL Volumizer

OpenGL Volumizer is a cross-platform, high-level volume rendering API for the energy, manufacturing, medical, and sciences markets. OpenGL Volumizer is a revolutionary graphics API designed for interactive, high-quality, scalable visualization of large volumetric data sets. OpenGL Volumizer provides a high-level interface to OpenGL hardware to allow application writers and researchers to visualize multiple gigabytes of volumetric data. The API uses OpenGL for volume rendering and hence allows standard graphics applications to treat volumetric and surface data in a similar fashion.

OpenGL Volumizer is a library of C++ classes that facilitates the manipulation and display of volumetric data sets common in geo-science, medical, scientific and engineering applications. It provides a layer of functionality that sits on top of OpenGL and integrates seamlessly into higher-level toolkits and applications. For more information on OpenGL Volumizer, visit <http://www.sgi.com/products/software/volumizer/>.

## Digital Media

This section describes digital media libraries and tools.

### Digital Media Libraries

The digital media libraries are a family of libraries that provide application program interfaces (APIs) for digital media I/O, file operations, playback, and conversions. For more information, see the *Digital Media Programming Guide*.

### Digital Media Tools

The digital media tools are a suite of end user tools that enable you to capture, edit, record, play, compress, and convert audio, video, or image files. For more information, see the *Digital Media Tools Guide* (007-2275-012). You can find this manual on a system with digital media packages installed or on the SGI Technical Publications Library.

## QuickTransit for Silicon Graphics

QuickTransit for Silicon Graphics is a translator that allows software applications compiled for IRIX MIPS platforms to run transparently on SGI Linux systems based on Intel Itanium processors. These systems include the Silicon Graphics Prism and SGI Altix platforms.

QuickTransit retains an application's full functionality and provides performance levels that typically exceed native speeds on existing IRIX platforms. Applications are translated without any modification to the source code or binaries. To run an IRIX application, all that is required is a copy of the existing IRIX version of the software. QuickTransit includes a set of IRIX libraries and tools sufficient to run basic IRIX utilities and to install and run more complex utilities.

On Silicon Graphics Prism systems, scalable graphics products like OpenGL Multipipe and OpenGL Vizserver can work in conjunction with QuickTransit. QuickTransit allows you to run an IRIX graphics application unchanged while a native version of OpenGL Multipipe or OpenGL Vizserver handles the final display of the application. This allows, for example, running IRIX applications in a Reality Center environment using OpenGL Multipipe or serving the graphics to remote, collaborative users using OpenGL Vizserver.

Using exactly the same method as you would on an IRIX machine, you can install, launch, and run an IRIX application. QuickTransit translates the IRIX application dynamically every time it is launched. There is no separate translation stage required before the application can run. Dynamic translation allows QuickTransit to optimize the performance for each individual run of the application.

For more information on using QuickTransit, see the *QuickTransit for Silicon Graphics Installation and User's Guide*. This manual is available on the SGI Technical Publications Library, or on a system with QuickTransit installed. The QuickTransit software is only pre-installed on Silicon Graphics Prism systems.

---

# Index

## A

Array Services, description, 48

## B

Bus numbering, 54

## C

CD contents, 2

Comprehensive System Accounting (CSA) support,  
53

Cpuset system, 52

CSA support, 53

## D

Disk partition table, 10

dlook command, 65

domains in PCI, 56

dplace command, 66

## E

EFI commands, 61

EFI support, 60

Extensible Firmware Interface (EFI) support, 60

## F

FLEXlm support, 63

## G

Graphics APIs

OpenGL Multipipe, 66

OpenGL Multipipe SDK, 67

OpenGL Performer, 68

OpenGL Vizserver, 68

OpenGL Volumizer, 69

## H

hardware platforms, 1

HPC support

libraries and tools, 58

Message Passing Toolkit, 58

Performance Co-Pilot, 58

## I

Installation

CDs, 42

installing SGI ProPack with YaST, 20

installing SLES9 SP2, 14

overview, 6

read me first, 14

setting up a network install server, 28

- system controller software, 42
- upgrading, 45

I/O subsystems

- for HPC systems, 54
- XFS filesystem support, 57
- XVM support, 57

**L**

- L1 and L2 controllers, 64
- License manager updates, 14
- Linux Kernel Crash Dump (LKCD), 13
- LKCD for file configuration, 13

**M**

- Message Passing Toolkit
  - support, 58
- Multiple Ethernet connection, 11

**N**

- NUMA tools, 65
  - dlllook command, 65
  - dplace command, 66

**O**

- Online Support Services
  - Supportfolio, xiv
- Open source website, 6
- OS configuration settings, 1
- OS enhancements
  - Comprehensive System Accounting (CSA), 53
  - cpuset support, 52
  - for HPC environments, 52

- partitioning, 53

**P**

- Password requirement, 9
- PCI domain, 56
- Performance
  - measuring, 48
- Performance Co-Pilot support, 58
- Persistent bus numbering, 54
- Persistent naming
  - bus numbers, 54
  - Ethernet devices, 56
  - XSCSI devices, 57
- Product list, 47
- Product support, 47
- PROM support, 59

**Q**

- QuickTransit for Silicon Graphics, 70

**R**

- REACT Real-Time for Linux, 39
- Reconfigurable Application-Specific Computing, 59
- Release features, 1

**S**

- SGIconsole support, 63
- Software
  - installation, 9
  - introduction, 1
  - planning, 10

- Supportfolio, xiv
- System controller firmware support, 64
- System Controller Software
  - CD, 42
- System management
  - EFI, 60
  - FLEXlm, 63
  - PROM chips, 59
  - SGIconsole, 63
  - system controller firmware, 64
  - tools, 59

## **U**

- Unsupported elements, 51
- Upgrading a system, 31
- Upgrading from previous releases, 42

## **X**

- XFS filesystem support, 57
- XVM support, 57
- XVM Volumes in Rescue Mode, 11

