SGI™ Linux™ Base Software 1.5 Start Here

Record of Revision

Version	Description
007	December 2000 Supports the 1.4.1 release to engineering of SGI Linux Base Software.
008	May 2001 Supports the 1.5 release to engineering of SGI Linux Base Software.

Contents

About This Document

This document provides information about the SGI Linux Base Software 1.5 release. It is divided into three chapters:

- Chapter 1, "Release Features," describes the major features of this release.

- Chapter 2, "Software Overview," describes the major features of earlier releases that are included in this release.

- Chapter 3, "Configuration and Installation,"describes the procedures for configuring and installing the SGI Linux Base Software 1.5 in various circumstances, including upgrading your system from an earlier SGI Linux Environment release.

SGI Linux Base Software 1.5 is an overlay product that adds or enhances features in Linux base distributions from Red Hat (version 7.1), SuSE (version 7.1), or TurboLinux (6.1). Guides for installing and getting started with a base Linux distribution are included with the base Linux distribution release kit.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, please tell us. 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 us 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 World Wide Web page:

  `http://techpubs.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
  1600 Amphitheatre Pkwy., M/S 535
  Mountain View, California 94043-1351

- Send a fax to the attention of "Technical Publications" at +1 650 932 0801.

We value your comments and will respond to them promptly.

Release Features

This chapter provides a short introduction to the SGI Linux Base Software 1.5 and describes the new features provided with this release. Chapter 2, "Software Overview," describes features supported in previous releases that enhance the features of your base Linux distribution.

Note: The information in this guide is also available on your SGI Linux Base Software 1.5 CD at `/cd_mount_point`/doc/sgi_lbs_15. In the `/cd_mount_point` directory you will also find the `README.SGI` file. Because this online file can be updated later in the release cycle than this document, you should check it for the latest information. After installation, all documentation (including `README.SGI`) is in `/usr/share/doc/sgi_lbs_15`.

Manuals for installing your base Linux distribution and getting started in using it are included with your base Linux distribution release kit. Use these manuals as a reference for information not included in this guide. If you need to reinstall your base distribution, you must read "Configuring SGI Monitors on the Base Distribution" on page 23.

Documentation for the SGI Linux Base Software 1.5 and for Linux in general, including man pages, HOWTO guides, and other relevant documentation from the Linux Documentation Project, is available from the following URL:

`http://techpubs.sgi.com`

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

`http://oss.sgi.com`

Feature Overview

SGI Linux Base Software 1.5 includes modules that provide manageability and scalability for Internet and high-performance clustering applications.

SGI Linux Base Software 1.5 is an overlay product that adds to or enhances features in base Linux distributions from Red Hat (version 7.1), SuSE (version 7.1), or TurboLinux (version 6.1).

The SGI Linux Base Software 1.5 will most likely come preinstalled on your SGI platform. If you should need to install it, be aware that you must install one of the supported base Linux distributions using the base distributor's installation tools and then install the SGI Linux Base Software 1.5 using its installer. This is also true if you are upgrading from an earlier version of SGI software. Installation and configuration are described in Chapter 3, "Configuration and Installation."

The SGI Linux Base Software 1.5 is designed to run on any x86 Linux system, but only SGI platforms are guaranteed. SGI hardware platforms supported by this release are documented at the following URL:

```
http://support.sgi.com/linux
```

New Features

This section describes new features for this release.

XFS support

SGI Linux Base Software 1.5 supports the XFS file system running on Linux platforms. XFS is a scalable, high-performance, journalling file system that SGI has contributed to the Open Source Linux community. The XFS journalling technology lets the file system restart almost immediately after an interrupt, regardless of the number of files it is managing.

XFS is a full 64-bit file system, capable of handling files as large as a million terabytes and of delivering near raw-I/O performance. For information about XFS, see the following URL:

```
http://oss.sgi.com/projects/xfs
```

Kernel-supported Asynchronous I/O

Kernel-supported asynchronous I/O (KAIO) differs from asynchronous I/O in that it is implemented with support from kernel modifications. These kernel modifications allow KAIO to perform *split-phase I/O* to maximize concurrency of I/O at a device. Split-phase I/O lets the initiating request (such as an `aio_read`) truly queue the I/O at the device as the first phase of the I/O request. The second phase of the I/O request, performed as part of the I/O completion, propagates results of the request. The results may include the contents of the I/O buffer on a read, the number of bytes read or written, and any error status.

For more information about KAIO, see the following URL:

```
http://oss.sgi.com/projects/kaio
```

Comprehensive System Accounting (CSA)

CSA is a set of C programs and shell scripts that provide methods for collecting per-process resource usage data, monitoring disk usage, and charging fees to specific login accounts. CSA takes this per-process accounting information and combines it by job identifier (`jid`) within system boot uptime periods.

CSA provides the following features not available with other Linux accounting packages:

- User job accounting (`ja` command), per-job accounting, and daemon accounting
- Flexible accounting periods (not just daily and monthly periods)
- Flexible system billing units (SBUs)
- Offline archiving of accounting data
- User exits for site specific customization of reports
- Configurable parameters

For detailed information about CSA, see the following URL:

`http://oss.sgi.com/projects/csa`

runon support

SGI Linux Base Software 1.5 supports the `runon` command, which runs a command on a particular CPU (this CPU affinity is called *process pinning*). The `runon` command can assign process pinning using `fork()`, or by process ID. Pinning is inherited across `fork()` and `exec()` system calls. To change the pinning, you can use the `prctl(2)` call. The `runon`(1) man page contains more information.

hinv support

SGI Linux Base Software 1.5 supports the `hinv` command, which displays the contents of the system hardware inventory table. This table is created each time a system is booted and contains entries describing various pieces of hardware in the system. The items in the table include main memory size, cache sizes, floating point unit, and disk drives. Without arguments, the `hinv` command displays a one line description of each entry in the table. The `hinv`(1) man page contains more information.

Qualified Drivers

SGI Linux Base Software 1.5 provides updated drivers, as described in this section.

Advanced Linux Sound Architecture (ALSA) drivers provide advanced multimedia The asynchronous I/O (AIO) facility implements interfaces defined by capabilities. For more information, see "Advanced Linux Sound Architecture (ALSA) Drivers" on page 17.

The QLogic 1080/1280 and 2100 drivers have been supplied by QLogic Corporation, and include updated firmware and improved error handling.

The QLogic drivers were updated to the following new versions:

- The qla2x00 driver version 4.15 beta for 2100, 2200, and 2300 cards.
- The qla1280 and qla12160 drivers version 3.23 beta.

The Alteon Gigabit Ethernet driver has been modified to recognize and drive the SGI Gigabit Ethernet card. SGI Linux Base Software 1.5 supports version 0.45.

Other drivers were updated to new versions as follows:

- DAC960 (Mylex) driver version 2.4.10

- Adaptec driver version 6.1.5, which fixes problems on SGI 1200 and SGI 1450 servers.

Note: External storage I/O hardware has been qualified against hardware and software. For information about what has been qualified, see `http://support.sgi.com/linux`.

Patches and Changes to Base Linux Distributions

This section provides an overview of changes that the SGI Linux Base Software 1.5 software makes in your base Linux distribution.

The following packages were added by SGI:

- alsa-lib-0.5.10 (ALSA driver libraries)

- alsa-utils-0.5.10 (ALSA driver utilities)

- devfsd-2.4.2 (daemon for device file systems)

- dmapi-0.1.1 (XFS data migration API

- hinv-1.4pre2 (hinv command)

- libdba.so-1.0 (APIs to enhance database performance)

- lvm-*x*-1.1 (XFS logical volume manager)

- mount-2.10f-1.i386 (NFS version 3 mount support)

- pcp-2.2.0 (Performance Co-Pilot)

- sard-0.6 (disk activity statistics/analysis)

- sgi-extra-*distribution_name*-1.8-4 (change system files for SGI value-added features)

- sgi-fonts-1.0 (SGI fonts)

- sgi-initscripts-*distribution_name*-1.6 (change init scripts for SGI value-added features)

- sgi-logos-1.0.1 (SGI logos)

- sgi-propack 1.5 (LBS documentation)

- xfsdump-1.0.4 (xfsdump utility)

- xfsprogs-1.2.0 (XFS program support)

Software Overview

This chapter describes features supported in previous SGI ProPack for Linux or SGI Linux Base Software releases that enhance the features of your base Linux distribution. For a description of new features or new enhancements for this release, please read Chapter 1, "Release Features."

The SGI Linux Base Software 1.5 provides the Linux kernel version 2.4.2. It adds functionality to base Linux distributions that is specific to SGI hardware platforms.

Some of the most significant features that Linux provides are listed below:

- An extensible UNIX-like kernel, supporting symmetric multiprocessing

- Typical commands you would expect to see on a UNIX-like system

- Typical configuration files you would expect to see on a UNIX-like system, along with an optional graphical frontend

- Development tools such as compilers, debuggers, and libraries

- Internet applications such as Web servers and browsers, news servers, network utilities, e-mail servers, and clients

- Everything needed for network file sharing with a wide variety of clients

- Desktop environments and graphical applications

The SGI Linux Base Software 1.5 provides optimization that enhances performance on heavy creative and scientific workloads. Performance enhancements include a kernel-supported asynchronous I/O (KAIO), a low-overhead interprocess synchronization mechanism, and low overhead and high-volume raw disk I/O.

Manageability and supportability improvements include kernel memory dump capability with analysis tools. SGI Linux Base Software 1.5 also includes version 1.8 of the kernel debugger `kdb`. The features of `kdb` releases are documented at the following URL:

`http://oss.sgi.com/projects/kdb`

Kernel spinlock metering (for performance bottleneck analysis) and kernel profiling (kernprof) enhancements are not include in SGI Linux Base Software 1.5 by default. You can check on the availability of lockmetering at the following URLs:

```
http://oss.sgi.com/projects/lockmeter
```

For more information about kernel profiling availability, check the following:

```
http://oss.sgi.com/projects/kernprof
```

The manageability of the release has been improved by integrating a number of publicly available kernel patches, such as the following:

- The Device File System (CONFIG_DEVFS_FS) patch from Richard Gooch. This patch provides a more consistent naming scheme for hardware and software devices. Sites that expect to connect a large number of devices may find DEVFS very useful in helping to manage them. DEVFS can also provide the traditional Linux names for devices, for backward compatibility, and is otherwise very compatible with the rest of the Linux system. LBS uses DEVFS version 176.

- The sard utility and associated kernel metrics patch for disk traffic analysis. The version .6 patch provides additional disk I/O statistics, useful for tuning database layouts and queries. The kernel also has enhanced ability to correctly update the disk read I/O and write I/O accounting for Mylex RAID. The read I/O and write I/O counters exported in /proc/partitions are correctly updated each time the kernel reads or writes to a disk. This in turns allows PCP to be used to monitor disk I/O operations on systems that have Mylex RAID controllers. The Mylex RAID driver was also updated to version 2.2.8 and the device naming convention was changed to conform to the DEVFS standard.

Process Aggregates (PAGGs)

Process Aggregates (PAGGs) are modifications to the Linux kernel that let developers create loadable kernel modules to group processes into aggregates. PAGGs provides functions that allow loadable kernel modules to register as providers of a specific type of process aggregate implementation. Additionally, this feature ensures that membership in a process aggregate, or group, is inherited across process forks.

PAGGs can be used to support a formal job container on Linux. To learn more about Process Aggregates and the job container module for Linux, consult the following URL:

```
http://oss.sgi.com/projects/pagg
```

Comprehensive System Accounting provides enhanced job accounting, which will make use of the job container kernel module. For more information, see "Comprehensive System Accounting (CSA)" on page 11, and the following URL:

```
http://oss.sgi.com/projects/csa
```

Advanced Linux Sound Architecture (ALSA) Drivers

SGI Linux Base Software 1.5 contains support for the Advanced Linux Sound Architecture (ALSA) drivers for users who want to use the digital media SDK or who use Silicon Graphics Visual Workstations for intensive audio purposes.

ALSA's mixer model provides fine control over muting and volumes of audio channels. Unlike the standard Linux audio drivers (Open Sound System or OSS), ALSA drivers offer a mute separate from volume and distinguish between input gains for recording and output feedback volumes for input sources.

The main advantages of using the ALSA drivers are as follows:

- Full support for digital media SDK

- Advanced multimedia capabilities

- Audio capabilities essential to professional audio use

- Advanced synchronization and timing features not available in the standard sound drivers

Performance Co-Pilot

Performance Co-Pilot (PCP) provides a framework and set of services to support system-level performance monitoring and performance management. The PCP open source release provides a unifying abstraction for all of the interesting performance data in a system, and allows client applications to easily retrieve and process any subset of that data using a single API.

A client-server architecture allows multiple clients to monitor the same host and a single client to monitor multiple hosts (for example, in a Beowulf cluster). This enables centralized monitoring of distributed processing.

Integrated archive logging and replay allow client applications to use the same API to process real-time data from a host or historical data from an archive.

The framework supports APIs and configuration file formats that enable the scope of performance monitoring to be extended at all levels.

The open source release of PCP provides a subset of the features of SGI's Performance Co-Pilot products for IRIX (see `http://www.sgi.com/software/co-pilot/`).

A brief list of features supported in LBS follows:

- The `pmsocks` utility allows PCP to monitor TCP applications through *socks4* firewalls. With this utility, you can monitor systems on the Internet at large from within a firewall.

- XFS and `pagebuf` metrics (these are only available if you run XFS).

- Support for NFS (version 3) PCP metrics.

- An extension of the `weblogs` PCP agent lets PCP report proxy HTTP servers and adds assorted HTTP cache statistics.

- An accounting patch to the kernel (`syscall` accounting) counts per-CPU system calls, and corresponding new metrics are included in PCP (`kernel.all.syscall` and `kernel.perCPU.syscall`). This feature is used by PCP in layered products that integrate with SGI's Embedded Support Partner (ESP) using SGI Linux Base Software 1.5 as a base.

NFS Enhancements

SGI Linux Base Software 1.5 includes support for NFS V3, with some bug fixes included to allow compatibility with IRIX systems.

Large Physical Memory Support

Large amounts of physical memory coupled with the ability to create large (multi-gigabyte) shared memory segments provide a boost in performance to database workloads. SGI includes a configuration parameter to configure the Linux community standard implementation that supports more than 2 GB of physical memory.

You need to run the i686 SMP kernel to use this feature.

Fast Synchronization Mechanism

While the UNIX System V IPC semaphore facility does provide exceptional capability, its performance leaves much to be desired. Many UNIX vendors have released a low-overhead interapplication synchronization primitive known as "post /wait."

SGI has included in this release a kernel level implementation of post/wait along with the library containing application API's. The post allows for a process to "wait" for an event. This event can either be a timeout or a "post" from another process. A group of cooperating processes can use these "post" and "wait" facilities to synchronize among themselves.

In order to use post/wait, the kernel must be compiled with the CONFIG_PW configuration variable, and you may optionally set an additional configuration variable, CONFIG_PW_VMAX. These variables are described in the configuration help. For a user program to use the post/wait facilities, it must link against libdba.so.

For more information on post/wait, please refer to the postwait(3) man page.

POSIX Asynchronous I/O

The ability to overlap I/O and processing activities has always been important to high-performance applications. To allow this type of overlap in single-threaded applications, SGI has included a kernel-level implementation of POSIX asynchronous I/O and the associated API library.

SGI Linux Base Software 1.5 works with raw devices as well as with file systems including pipes and sockets.

This facility is turned on by setting the CONFIG_AIO kernel option. User code can get access to the facility by linking with libdba.so. Further information can be found in the /lib/libdba/README file.

Kernel Spinlock Metering

SGI Linux Base Software 1.5 does not include kernel spinlock metering by default, but you can check the following URL for its availability and for additional information:

`http://oss.sgi.com/projects/lockmeter`

Spinlock metering allows developers to gather statistical information about the SMP kernel's use of spinlocks and mrlocks (multiple-reader single-writer spinlocks). This functionality is called *spinlock metering*, or *lockmetering*.

If spinlock metering is available from `http://oss.sgi.com/projects/lockmeter`, it can be built into the kernel using the `CONFIG_LOCKMETER` configuration option (in the **Kernel Hacking** section of `make xconfig`). A kernel built with lockmetering will exhibit a small (roughly 1%) performance degradation relative to a kernel that is not configured for lockmetering.

Crash Functionality

Changes have been made to the Linux crash utility, which are explained briefly below. LBS uses version 3.1.1, which supports `lcrash` on IDE drives as well as SCSI drives. General information about `lcrash` can be found in the `/cmd/lcrash/README` file. Major changes follow:

- Linux kernel crash dump enhancements. SGI Linux Base Software 1.5 provides a configuration option to allow kernel crash dumps to be available. This option is configured to be on by default, and the default dump space is the first swap partition found when booting. If you are building a new kernel, you can specify **Support kernel crash dump capabilities** in the **Kernel Hacking** section of `make xconfig`.

  The crash dump capabilities in the kernel allow the system to create a crash dump when a failure occurs due to a `panic()` call or an exception. For more details on the dump method, compression used, and so on, please read the LKCD FAQ at the following URL:

  `http://oss.sgi.com/projects/lkcd/faq.html`

  Information about LKCD is also available in the file `/cmd/lcrash/README.lkcd`.

- Boot up process changes. As the system boots up, the `/sbin/vmdump` script will be run out of `/etc/rc.d/rc.sysinit`. This script saves crash dumps and reads

sysconfig variables to open the dump device and configure the system for crash dumps.

- Crash dump configuration options. There are a number of configurable options to save system crash dumps. Please read `/etc/sysconfig/vmdump` for more details on the options available. The following list describes what the options allow you to do:

  - Determine if you want to implement crash dumps in the kernel

  - Choose whether to save crash dumps to disk or not

  - Change the location to which the crash dumps are saved

  - Specify any block dump device you want

  - Compress (or not compress) the crash dumps

  - Configure the system to reset (or not reset) after a failure

- The `lcrash` utility uses the new `librl` library for command line input.

Patches, Configuration Options, Commands, and Libraries

The following list describes patches that have been implemented as well as enhancements to configuration options, commands, and libraries:

- `librl` library. This new library supplies command line editing and command history functionality. See the `/cmd/lcrash/lib/librl/README` file for information on how to use this library. The `lcrash` command uses this library.

- SMP PTE patch. In stock Linux, the page stealing code that is used under high memory load has a bug that might cause it to steal a page from a process without writing out the contents to swap if the page has been modified by the process. This bug is only present in a multiprocessor machine. SGI Linux Base Software 1.5 provides a fix for this bug.

Configuration and Installation

Your SGI machine comes with a base Linux distribution and the SGI Linux Base Software 1.5 preinstalled. This chapter describes how to install the software from the CD if at some time you need to reinstall it. The chapter also describes how to upgrade from earlier SGI Linux releases.

Note: For security reasons, Linux requires a root password for login. This password for your preinstalled software is **sgisgi**. After you have logged in, change this root password to be a string of your own choice.

If you need to install software, be aware that you must install a base Linux distribution using the base distributor's installation tools and then install the SGI Linux Base Software 1.5 software using its installer as described in this chapter. You should configure the base Linux distribution as described in the installation manual for the base distribution.

Note: The SGI Linux Base Software 1.5 only works with Red Hat 7.1, SuSE 7.1, or TurboLinux 6.1. Earlier versions of these distributions, or any other distributions, are not compatible with SGI Linux Base Software 1.5.

Before you install or configure your system, please read Chapter 1, "Release Features," and Chapter 2, "Software Overview,"so that you understand the features of SGI Linux Base Software 1.5 and how to configure them.

Configuring SGI Monitors on the Base Distribution

Should you need to install a base Linux distribution, it is safe to allow the X Configuration mechanism to auto-probe your graphics hardware. When you are asked

to provide information for your monitor, you may refer to the following table to get information for various SGI monitors:

Table 3-1 SGI Monitor Configuration Values

Monitor	Horizontal Sync	Vertical Sync
SGI 17-inch 340C	30-95	48-180
SGI 17-inch GDM-17E11	30.0-85	48.0-150.0
SGI 17-inch GDM-2011P	30.0-85.0	48.0-150.0
SGI 17-inch M-7S54SG	30.0-92.0	48.0-160.0
SGI 19-inch CNMB024B	30-100	48-200
SGI 21-inch GDM-5011P	30-107	48-160
SGI 21-inch 420c	30-107	48-160
SGI 21-inch GDM-5411	30-121	48-160
SGI 20-inch GDM-20E21	30.0-96.1	48.0-160.0
SGI 20-inch GDM-4011P	30.0-96.1	48.0-160.0
SGI 21-inch GDM-5011P	30.0-107.1	48.0-160.0
SGI 21-inch GDM-5021PT	30.0-107.1	48.0-160.0
SGI 24-inch GDM-90W11	30.0-96.1	48.0-160.0

Installing SGI Linux Base Software 1.5 from a CD

Should you need to install SGI Linux Base Software 1.5 from a CD, first ensure that Red Hat 7.1, SuSE 7.1, or TurboLinux 6.1 is installed, and then use the procedure in this section.

The installation procedure has buttons that will allow you to go back to the previous screen or to quit the installation. To use these buttons, press the `Tab` key to highlight the one you want to use and press `Enter`.

1. Log in as root.

2. Mount the SGI Linux Base Software 1.5 CD by executing the mount command as you have configured it. A common example is `mount /dev/cdrom /mnt/cdrom`.

3. Change directories to the root directory for the mounted CD. A common root directory is `/mnt/cdrom`.

4. Execute `./INSTALL`

    Note: SGI Linux Base Software 1.5 provides support for the 2.2.17 Linux kernel. Install this software by executing `./INSTALL -k 2.2.17` rather than `./INSTALL`.

5. Select the language you want to use for the installation procedure. The default is English. Use the up and down arrow keys to select your language of choice. Press the `Tab` key to highlight **OK** and press `Enter`.

6. The **Welcome** screen appears. Highlight **OK** and press `Enter`.

7. The **Language Support** screen appears. Select the language you want for the documentation that will be installed on your system. All languages are provided on the CD, so you can retrieve languages other than the one you select at this time. The default is to install the English documentation. Use the up and down arrow keys to highlight your selection, then press the `Tab` key to highlight **OK** and press `Enter`.

8. The **Package Group Selection** screen appears. This screen allows you to select the type of package you want to install. You select a package by using the up and down arrow keys and pressing the Space bar to select the one you want. When you select a package, RPMs for that package will be installed after you press the `Tab` key to highlight **OK** and press `Enter`.

    You may also choose **Select individual packages**, which lets you choose the specific RPMs that you want to install.

9. You may see the **Package Dependencies** screen, which tells you if there are additional packages required beyond those you selected. Review the packages. If you want to install them (you should install them unless there is some important reason not to do so), press the `Tab` key to highlight **OK** and press `Enter`.

10. The **Installation to Begin** screen appears. It tells you that a log of the installation will be placed in /tmp/sgi-install.log. Press the Tab key to highlight **OK** and press Enter.

11. The installation begins. You will see the **Package Installation** screen, which tells you which packages are being installed and logs the time it takes to install them.

12. After the installation is complete, the **Complete** screen appears. Press Enter. You are returned to the root prompt.

13. After the SGI Linux Base Software 1.5 installation is complete, reboot your system to begin using the newly installed SGI Linux Base Software 1.5 kernel. You can reboot by typing reboot and pressing RETURN.

Recreating or Upgrading Your Preinstalled Software

Should you need to recreate your system (returning it to its original state), install your base distribution (Red Hat 7.1, SuSE 7.1 or TurboLinux 6.1) as described in the distributor's installation instructions and then install the SGI Linux Base Software 1.5 from the CD as described in "Installing SGI Linux Base Software 1.5 from a CD" on page 24.

To upgrade your software from earlier SGI Linux releases, you should follow the instructions for upgrading to Red Hat 7.1, SuSE 7.1, or TurboLinux 6.1.

After you have upgraded your base distribution, install the SGI Linux Base Software 1.5 as described in "Installing SGI Linux Base Software 1.5 from a CD" on page 24.

Note: It is not possible to change base distributions after upgrading your SGI Linux Base Software 1.5 release. You must install or upgrade to the appropriate base distribution and then install SGI Linux Base Software 1.5.