# SGI™ SynaptIQ™ Administrator's Guide

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# Contents

**Figures** . . . . . vii
Related Publications . . . . . ix
Conventions . . . . . x
Reader Comments . . . . . x

**1. SGI SynaptIQ Overview** . . . . . 1
SGI Graphics Cluster System Architecture . . . . . 1
System Software . . . . . 3
What SGI SynaptIQ Provides . . . . . 5

**2. SGI SynaptIQ Features** . . . . . 7
Patches and Changes to Base Linux Distributions . . . . . 8
XFS Support . . . . . 9
Kernel-Supported Asynchronous I/O . . . . . 9
Comprehensive System Accounting (CSA) . . . . . 9
`runon` Support . . . . . 10
`hinv` Support . . . . . 10
Qualified Drivers . . . . . 11
Process Aggregates (PAGG) . . . . . 11
Advanced Linux Sound Architecture (ALSA) Drivers . . . . . 12
Performance Co-Pilot . . . . . 12
NFS Enhancements . . . . . 13
Large Physical Memory Support . . . . . 14
Fast Synchronization Mechanism . . . . . 14
POSIX Asynchronous I/O . . . . . 14
Kernel Spinlock Metering . . . . . 15

Crash Functionality . . . . . 15
Patches, Configuration Options, Commands, and Libraries . . . . . 16

**3. Configuration and Installation** . . . . . 17
Configuring the X Window System . . . . . 18
SGI SynaptIQ Configuration Notes . . . . . 18
Silicon Graphics VPro Accelerated OpenGL Implementation . . . . . 18
Application Notes . . . . . 19
Installing SGI SynaptIQ from a CD . . . . . 19
Recreating or Upgrading Your Preinstalled Software . . . . . 21

**4. Linux System Recovery** . . . . . 23
Setup and Red Hat Linux Installation . . . . . 24
X Window System Installation . . . . . 25
Changing the Password . . . . . 26
Changing the Desktop to KDE . . . . . 26
Configuring the Network . . . . . 26
Adding User `gcadmin` . . . . . 29
Accounting for All Hard Drives . . . . . 30
Enabling Autologin for Channel Nodes . . . . . 30
Site-Specific Actions . . . . . 30

**A. SGI SynaptIQ Components** . . . . . 31

# Figures

**Figure 1-1** Sample Configuration of an SGI Graphics Cluster Series 12 . . . 2
**Figure 1-2** System Software Architecture. . . . . 4

# About This Guide

This guide documents SGI SynaptIQ, which is an overlay product that adds to or enhances features in Linux base distribution from Red Hat 7.1. Guides for installing and getting started with a base Linux distribution are included with the base Linux distribution release kit.

SGI SynaptIQ is a software component of the SGI Graphics Cluster Series 12. SGI SynaptIQ provides critical cluster and graphics administration elements that make management across the system easy.

## Related Publications

The following SGI documents contain additional information that may be helpful:

- *SGI ImageSync User's Guide*
- *SGI DataSync Programmer's Guide*
- *SGI Graphics Cluster Hardware User's Guide*
- *SGI Graphics Cluster Quick Start Guide*

To obtain SGI documentation as well as documentation for Linux in general— including man pages, HOWTO guides, and other relevant documentation from the Linux Documentation Project, see the SGI Technical Publications Library at `http://techpubs.sgi.com.`

The errata that describes issues and bugfixes or workarounds not included in this document is available at the following URL:

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

## Conventions

The following conventions are used throughout this document:

| Convention | Meaning |
|---|---|
| `command` | This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, programming language structures, and URLs. |
| *variable* | Italic typeface denotes variable entries and words or concepts being defined. |
| **`user input`** | This fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font. |
| **interface** | This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, and menus. Functions are also denoted in bold with following parentheses. |
| `manpage`(*x*) | Man page section identifiers appear in parentheses after man page names. |

## 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.)

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# SGI SynaptIQ Overview

This overview of SGI SynaptIQ consists of the following sections:

- "SGI Graphics Cluster System Architecture"
- "System Software"
- "What SGI SynaptIQ Provides"

## SGI Graphics Cluster System Architecture

The SGI Graphics Cluster uses either the Linux or Windows NT operating system and incorporates proprietary hardware and software from SGI. The hardware consists of the following:

- A single master node
- Multiple visual channel nodes (each with a commercial graphics card)
- An Ethernet backbone, including a network switch
- An optional SGI ImageSync network

Figure 1-1 illustrates the hardware architecture.

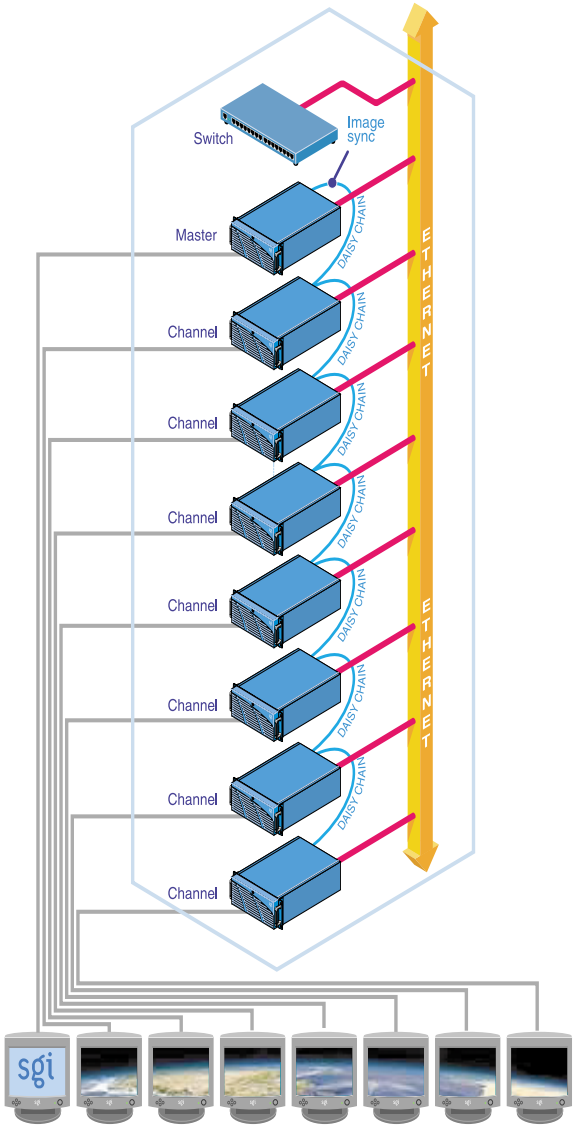


**Figure 1-1** Sample Configuration of an SGI Graphics Cluster Series 12

## System Software

The software for the SGI Graphics Cluster Series 12 consists of the following:

- Operating system (Windows NT 4.0 or SGI Linux kernel with XFS support (2.4.2-5SGI-137 or greater)
- SGI ImageSync device drivers
- SGI SynaptIQ (Linux systems only)
- SGI DataSync (Linux systems only)

Figure 1-2 illustrates the software architecture.

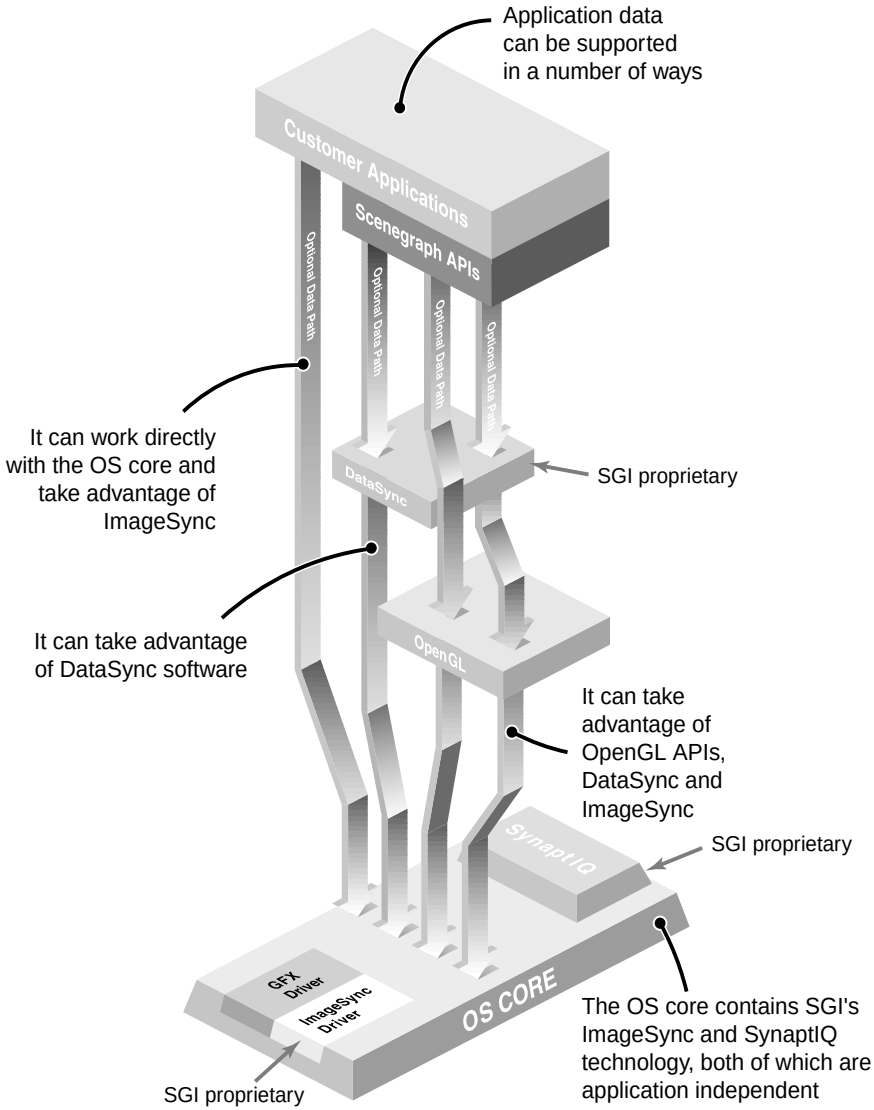


**Figure 1-2** System Software Architecture

## What SGI SynaptIQ Provides

SGI SynaptIQ provides critical cluster and graphics administration elements that make management across the system easy. SGI SynaptIQ is composed of basic cluster administration tools, termed Linux Plug-n-Go, a necessity for IA-32 systems running Linux. SGI SynaptIQ also includes all necessary drivers and the SGI Linux kernel compiled with OpenGL and other graphics tools that SGI has developed.

# SGI SynaptIQ Features

SGI SynaptIQ is an overlay product that adds to or enhances features in base Linux distributions from Red Hat 7.1. The SGI SynaptIQ software provides the Linux kernel version 2.4.2. The following are some of the most significant features that Linux provides:

- 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 front end
- 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 graphics applications

The SGI SynaptIQ software adds functionality to base Linux distributions that is specific to the SGI Graphics Cluster. This chapter describes the following features:

- "Patches and Changes to Base Linux Distributions"
- "XFS Support"
- "Kernel-Supported Asynchronous I/O"
- "Comprehensive System Accounting (CSA)"
- "runon Support"
- "hinv Support"
- "Qualified Drivers"
- "Process Aggregates (PAGG)"
- "Advanced Linux Sound Architecture (ALSA) Drivers"
- "Performance Co-Pilot"

- "NFS Enhancements"
- "Large Physical Memory Support"
- "Fast Synchronization Mechanism"
- "POSIX Asynchronous I/O"
- "Kernel Spinlock Metering"
- "Crash Functionality"
- "Patches, Configuration Options, Commands, and Libraries"

## Patches and Changes to Base Linux Distributions

This section provides an overview of changes that the SGI SynaptIQ 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-RedHat-1.8-6` (changed system files for SGI value-added features)
- `sgi-fonts-1.0` (SGI fonts)
- `sgi-initscripts-RedHat-1.7-2` (changed `init` scripts for SGI value-added features)
- `sgi-logos-1.0.1` (SGI logos)

- `sgi-SynaptIQdocs 1.5` (SGI SynaptIQ documentation)
- `xfsdump-1.0.4` (`xfsdump` utility)
- `xfsprogs-1.2.0` (XFS program support)

## XFS Support

SGI SynaptIQ 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:

`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 allows the initiating request (such as an `aio_read`) to 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 SynaptIQ 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 SynaptIQ 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 SynaptIQ 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 12.

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 SynaptIQ 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

---

**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`.

---

Performer for Linux is fully API-compatible with existing Performer applications running on IRIX and is a full distribution, including the core run-time libraries and file loaders, development header files, sample source code, and man pages.

## Process Aggregates (PAGG)

Process Aggregates (PAGG) are modifications to the Linux kernel that let developers create loadable kernel modules to group processes into aggregates. PAGG 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.

PAGG 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 9, and the following URL:

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

## Advanced Linux Sound Architecture (ALSA) Drivers

SGI SynaptIQ contains support for the Advanced Linux Sound Architecture (ALSA) drivers for users who want to use OpenML or who use SGI Graphics Clusters 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 OpenML
- 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 graphics 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/`).

The following is a brief list of PCP features supported in SGI SynaptIQ:

- 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 available only 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 SynaptIQ as a base.

## NFS Enhancements

SGI SynaptIQ includes support for NFS version 3, with some bugfixes 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 various types of workloads. SGI includes a configuration parameter to configure the Linux community standard implementation—that is, i686 UP and SMP kernels have 4GB memory support (SGI Graphics Cluster Series 12 are limited to 1.5 GB of memory support).

## 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 APIs. 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 SynaptIQ 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 SynaptIQ 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. SGI SynaptIQ 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 SynaptIQ 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 SynaptIQ provides a fix for this bug.

# Configuration and Installation

This chapter describes how to install the SGI SynaptIQ software from a CD. You will need to do this only if you have purchased a SGI Graphics Cluster configuration that did not have Linux preloaded onto the hard disk drive at the factory, or if you should need to reinstall the base Linux distribution for some reason.

---

**Note:** SGI Graphics Cluster configurations with preloaded Linux software are shipped from the factory with a `root` password of `sgisgi`. In some cases, a reseller may have configured the system without a root password before it reached you. In any case, you should ensure that your system has a non-null root password before connecting it to a network.

---

If you need to install software, you should do it in the following order:

1. Read the file `README.SYNAPTIQ` before you install software, including the base Linux distribution. This file is located in the top-level directory of the CD.
2. Install a base Linux distribution using the base distributor's installation tools.
3. Install the SGI SynaptIQ software using its installer, as described in this chapter.
4. Configure the base Linux distribution as described in the installation manual for the base distribution.

---

**Note:** The SGI SynaptIQ software works only with Red Hat 7.1. Earlier versions of Red Hat, or any other distributions, are not compatible with SGI SynaptIQ.

---

## Configuring the X Window System

SGI SynaptIQ includes a default XFree86 4.0 configuration file that is specific to the Silicon Graphics VPro accelerated Linux OpenGL implementation. The file is installed in two places:

- `/etc/X11/XF86Config-4`
- `/etc/X11/XF86Config_sgi`

Please see this file for information about X Window System configuration, including pointers to information about changes to this file that are necessary in order to use a non-English keyboard.

There are many interactive configuration utility programs available to generate `XF86Config` files. SGI strongly recommends that you **not** attempt to use any of these programs, because they will not generate an `XF86Config` file that is appropriate for an SGI Graphics Cluster.

If your `/etc/X11/XF86Config-4` file becomes corrupted (for example, as a result of attempting to run a configuration utility program), simply execute the following command as root:

```
# cp /etc/X11/XF86Config_sgi /etc/X11/XF86Config-4
```

## SGI SynaptIQ Configuration Notes

The following information will help you get SGI SynaptIQ up and running properly.

### Silicon Graphics VPro Accelerated OpenGL Implementation

The Silicon Graphics VPro accelerated OpenGL implementation is the product of a partnership among SGI, NVidia Corporation, and VA Linux. The VPro graphics accelerators are based on accelerator chips from NVidia.

The “workstation” convention is for **`glXSwapBuffers()`** to be synchronized to vertical retrace. The “PC” convention is for **`glXSwapBuffers()` not** to be synchronized to vertical retrace. The VPro OpenGL implementation follows the “PC” convention by default.

To synchronize **glXSwapBuffers()** to vertical retrace, set the environment variable GL_SYNC_TO_VBLANK as follows before starting the application program.

For csh-based shells, use the following command:

```
setenv __GL_SYNC_TO_VBLANK 1
```

For sh-based shells, use the following command:

```
export __GL_SYNC_TO_VBLANK=1
```

### Application Notes

If you encounter a problem with a packaged Linux application program on your SGI Graphics Cluster, contact the packager to find out if a patch or update is available to fix the problem.

## Installing SGI SynaptIQ from a CD

If you need to install SGI SynaptIQ 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 SynaptIQ CD by executing the mount command as you have configured it. A common example is the following:

   ```
   mount /dev/cdrom -t iso9600 /mnt/cdrom.
   ```

3. Change directories to the root directory for the mounted CD. A common root directory is /mnt/cdrom.
4. Execute the following command:

   ```
   ./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 SynaptIQ installation is complete, reboot your system to begin using the newly installed SGI SynaptIQ 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 as described in Chapter 4, “Linux System Recovery” and then install the SGI SynaptIQ from the CD as described in “Installing SGI SynaptIQ from a CD” on page 19.

# Linux System Recovery

This chapter describes how to recover a cluster node. There are several methods available to recover a node:

- A simple, kick-start procedure

  Documented in this chapter.

- SystemImager

  Located on the Linux Graphics Cluster Resource CD in `/unsupported/systemimager/*`.

- Mindi and Mondo

  Accessible at `http://www.microwerks.net/~hugo/`.

This chapter describes the simple, kick-start recovery procedure in the following sections:

- "Setup and Red Hat Linux Installation"
- "X Window System Installation"
- "Changing the Password"
- "Changing the Desktop to KDE"
- "Configuring the Network"
- "Adding User gcadmin"
- "Accounting for All Hard Drives"
- "Enabling Autologin for Channel Nodes"
- "Site-Specific Actions"

## Setup and Red Hat Linux Installation

To set up your system for the installation and to install Red Hat Linux, perform the following steps.

1. Mount the Linux Graphics Cluster Resource CD and create a kick-start floppy disk by using the following command:

   ```
   # dd of=/dev/fd0 if=/mnt/cdrom/unsupported/ks_gc_1.0.img
   ```

   You may wish to edit or replace the `/dev/fd0/ks.cfg` file. SGI has pre-installed several applications that may not be useful to your activities. The installation from the Red Hat 7.1 distribution consumes 1.765 GB of disk space and installs 701 packages by using the the included `ks.cfg` file.

   The following CDs will be used with the kick-start floppy disk:

   - SGI XFS 1.0 for Red Hat 7.1
   - Red Hat Linux 7.1 Operating System, Binary CD 1
   - Red Hat Linux 7.1 Operating System, Binary CD 2

2. Before starting the installation, back up any files from the node you wish to keep (assuming the node is somewhat functional).

   **Note:** During a kick-start installation, the Red Hat installer will remove any partitions and reformat the hard drive. If multiple hard drives are found, it will span Linux partitions across all of the hard drives it finds.

3. Power down the node and disconnect or remove power from all hard drives, except the system drive.
4. Ensure you have a monitor, mouse, and keyboard attached to the node being recovered.
5. Power up the node, insert the kick-start floppy disk into the floppy disk drive, and insert the SGI XFS 1.0 for Red Hat 7.1 CD into the CD-ROM drive.

   The installer creates the following partitions:

   | | |
   |---|---|
   | /boot | 32 MB, XFS format |
   | / | 8 GB, XFS format |

| | |
|---|---|
| swap | 2047 MB |
| /home | Remaining free disk space, XFS format |

The installer copies the installation image onto the system drive and then prompts for the Red Hat Linux 7.1 CD 1.

6. Load the Red Hat Linux 7.1 CD 1.

   It installs several files up to the point of installing the kernel. It ejects the Red Hat Linux 7.1 CD 1 and asks for the SGI XFS 1.0 for Red Hat 7.1 CD.

7. Load the SGI XFS 1.0 for Red Hat 7.1 CD and await the next prompt to re-insert the Red Hat Linux 7.1 CD 1.

8. When prompted, load the Red Hat Linux 7.1 CD 1.

   Subsequently, the installer requests the Red Hat Linux 7.1 CD 2.

9. Load the Red Hat Linux 7.1 CD 2 and continue the installation.

   Using the kick-start floppy disk, the installation of the base Red Hat Linux distribution will consume approximately 30 minutes.

10. When prompted, press the `Enter` key to end the installation.

11. As the node reboots, remove the kick-start floppy disk and Red Hat Linux CD 2 from the CD-ROM drive .

## X Window System Installation

The node comes up without X windows. The following steps describe how to install the X Window System.

1. Log in as `root`.

2. Place the SGI Linux Graphics Cluster Resource CD into the CD-ROM drive and mount it, as shown in the following:

   ```
   [root@master-channel /root]# mount /dev/cdrom -t iso9660 /mnt/cdrom
   ```

3. Change the current directory to that of the CD and start the installation script, as shown in the following:

   ```
   [root@master-channel /root]# cd /mnt/cdrom
   [root@master-channel /root]# ./INSTALL
   ```

4. When prompted, select the appropriate optional software and follow the instructions as documented in the installation section of the `README.GCE` file located on the Graphics Cluster Resource CD.
5. When the installation has completed, switch to the home directory, umount the CD, remove it from the CD-ROM drive, and reboot the system, as shown in the following:

```
[root@master-channel /root]# cd $HOME
[root@master-channel /root]# umount /mnt/cdrom
[root@master-channel /root]# eject
[root@master-channel /root]# sync
[root@master-channel /root]# reboot
```

## Changing the Password

When the system has booted to multi-user level, log in as `root`, using the password `sgisgi`. Change the password to one suitable for your installation.

## Changing the Desktop to KDE

Switch the desktop to K Desktop Environment (KDE) using the GUI menu as follows:

**`Gnome -> Programs -> System -> Desktop Switching Tool`**

Select the KDE desktop.

## Configuring the Network

You now need to appropriately configure the network. The following steps describe how to do this.

1. Log out and log in as `root`.
2. Bring up the network configuration GUI as follows:

   **`KDE -> System -> Network Configuration`**

3. Set up the host name and domain definitions.

   Select **Hosts** and add in the host names and IP address for the network interfaces.

   **Note:** Master nodes have up to three host name/IP pairs. Channel nodes have up to two host name/IP pairs.

4. Select **Interfaces** and associate the main IP address of the node with `eth0`.
5. Associate any additional IP addresses with appropriate additional interfaces.

   Ensure that the button **Activate on Boot** is depressed. Click **OK** for each interface definition and save the definition.

6. Select **Routing.**
7. Ensure that the default gateway is the master-channel's IP address for channel nodes.
8. Enter the appropriate Ethernet IP address for the master channel.
9. Enter the gateway device's IP address.

   Use `eth0` for the default gateway device.

10. Save the configuration and quit from the network configuration GUI.
11. Reboot the system.

    You may do so from a terminal at the command line. If you log out, you will experience a gray screen with the X mouse cursor. This is due to the network definitions having changed and the window manager KDE, in this case, is trying to use the host name.

    To effect a reboot at this stage, you need to do the following two things:

    a. Restart X Windows.

    b. While the screen is blank, reboot the system

    These two steps are accomplished by the following two sets of keyboard actions:

    ```
    Ctrl-Alt-Backspace
    Ctrl-Alt-Delete
    ```

    Note that `Backspace` is sometimes the `<-` key.

12. When the system has rebooted, log in as `root` and check the `/etc/modules.conf` file to ensure that the network interfaces have been properly assigned to the proper driver, as shown in the following example:

```
[root@master-channel /root]# cat /etc/modules.conf

alias eth0 eepro100
alias eth1 eepro100
alias scsi_hostadapter aic7xxx
alias eth2 acenic
alias parport_lowlevel parport_pc
post-install sound-slot-0 /bin/aumix-minimal -f /etc/.aumixrc -L
>/dev/null 2>&1 || :
pre-remove sound-slot-0 /bin/aumix-minimal -f /etc/.aumixrc -S
>/dev/null 2>&1 || :
alias usb-controller usb-uhci
alias char-major-195 NVdriver
options NVdriver NVreg_EnableVia4x=1
alias char-major-253 imagesync
alias char-major-254 windrvr

include /etc/modules.alsa
```

    Note that the Gigabit Ethernet driver `acenic` has been aliased to `eth2`. Linux will sometimes assign the wrong driver to the wrong adapter and while the network will appear to function, no packets will be sent or received.

13. If necessary, manually edit the file `/etc/modules.conf` to correct driver misassignments and enter the following:

```
[root@master-channel /root]# depmod
```

14. To further verify that the network is functioning, enter the following:

```
[root@master-channel /root]# netstat -ina

Kernel Interface table

Iface   MTU Met    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP
TX-OVR Flg
eth0   1500   0    91918      0      0      0   122900      0      0
0 BRU
eth1   1500   0        1      0      0      0       55      0      0
0 BRU
eth2   1500   0   110353      0      0      0        2      0      0
0 BRU
lo    16436   0       21      0      0      0       21      0      0
0 LRU
```

Note that in the preceding example, all interfaces have activity.

Further, detailed verification of network setup can be determined from the following files:

- /etc/sysconfig/network
- /etc/sysconfig/network-scripts/ifcfg-eth{0,1,2}
- /etc/resolv.conf
- /etc/hosts

15. If the system is a master channel, ensure pconsole functions properly by using it to attach to one or more channels, as shown in the following example:

```
[root@master-channel /root]# pconsole.sh channel0 channel1
```

## Adding User gcadmin

Bring up the User Manager GUI or use the adduser command line interface. Add the gcadmin account with the following parameters:

| | |
|---|---|
| **login** | gcadmin |
| **Name** | Graphics Cluster Admin. |
| **User id** | 501 |
| **Use Private Group** | uncheck |
| **Password** | sgisgi (Do change.) |
| **Primary Group** | adm |
| **Groups Belong to** | sys |

If you are using the User Manager GUI, save the new user information and exit out of the GUI.

## Accounting for All Hard Drives

Add the appropriate entries into the file `/etc/fstab` for any additional hard drives you may have. At a minimum, you must add the following line to `/etc/fstab`:

```
/dev/cdrom      /mnt/cdrom      auto    noauto,owner    0 0
```

Now shut down the node and re-attach and re-power any additional hard drives. Power the system back up and ensure they all mount properly during the boot up procedure.

## Enabling Autologin for Channel Nodes

If the node being recovered is a channel node, use your editor of choice to create the file `/etc/sysconfig/autologin` with the following contents:

```
AUTOLOGIN=yes
EXEC=/usr/X11R6/bin/startx
USER=gcadmin
```

Save the file, reboot the node, and select KDE as the window manager (see "Changing the Desktop to KDE").

## Site-Specific Actions

You may now shut down the node and remove the mouse and keyboard. If appropriate, re-attach the proper monitor to the node. Re-attach and re-power any additional hard drives and power up the node. Verify that any additional hard drives mount properly during bootup.

If you want to reinstate utilities such as `rsync`, cron jobs, or other customizations, now is an appropriate time to add them back to the channel node. When doing any desktop customizations, shut off screen savers and the like.

# SGI SynaptIQ Components

Table A-1 lists the SGI SynaptIQ components that are installeld on your system.

**Table A-1** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| Amusements | Games | `fortune-mod` |
| | Graphics | `kdetoys`<br>`xloadimage`<br>`xmorph`<br>`xscreensaver`<br>`xsri` |
| Applications | Archiving | `cdrecord`<br>`dump`<br>`pax`<br>`rmt`<br>`sharutils`<br>`taper`<br>`unarcj`<br>`unzip`<br>`xfsdump`<br>`zip` |
| | Communications | `minicom` |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | Databases | db3-utils<br>freecdb<br>mysql<br>mysql-devel<br>mysql-server<br>mysqlclient9<br>postgresql<br>postgresql-jdbc<br>postgresql-odbc<br>postgresql-perl<br>postgresql-python<br>postgresql-server<br>postgresql-tcl<br>postgresql-tk |
| | Editors | emacs<br>emacs-x11<br>emacs-leim<br>emacs-nox<br>gedit<br>psgml<br>vim-X11 |
| | Engineering | bc<br>gnuplot<br>units |
| | File | ncompress<br>stat |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | Internet | balsa<br>elm<br>exmh<br>fetchmail<br>fetchmailconf<br>finger<br>ftp<br>gftp<br>gq<br>htdig<br>htmlview<br>im<br>kdenetwork<br>links<br>lynx<br>metamail<br>mozilla<br>mozilla-mail<br>mozilla-pim<br>mtr<br>mtr-gtk<br>mutt<br>ncftp<br>netscape-common<br>netscape-communicator<br>nmh<br>openldap-clients<br>openssh<br>openssh-askpass<br>openssh-askpass-gnome<br>openssh-clients<br>openssh-perl<br>openssh-python<br>pan<br>pine<br>plugger<br>rsh<br>rsync<br>slrn<br>stunnel<br>talk |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | tcpdump<br>telnet<br>traceroute<br>urlview<br>w3c-libwww-apps<br>wget<br>whois<br>xchat |
| | Multimedia | ImageMagick<br>Mesa-demos<br>aumix<br>aumix-X11<br>awesfx<br>cdda2wav<br>cdp<br>cdparanoia<br>desktop-backgrounds<br>dia<br>ee<br>extrace<br>gd-progs<br>gimp<br>gimp-data-extras<br>gimp-devel<br>gimp-perl<br>gnome-audio<br>gnome-media<br>kdegraphics<br>kdemultimedia<br>mikmod<br>mpg123<br>multimedia<br>netpbm-progs<br>playmidi<br>playmidi-X11<br>sndconfig<br>sox |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | timidity++<br>transfig<br>xfig<br>xmms<br>xmms-gnome<br>xsane<br>xsane-gimp |
| | Productivity | gnumeric<br>ical |
| | Publishing | a2ps<br>enscript<br>ghostscript<br>ghostscript-fonts<br>gphoto<br>groff-perl<br>gv<br>jadetex<br>lout<br>lout-doc<br>mpage<br>pnm2ppa<br>psutils<br>sgml-tools<br>tetex<br>tetex-afm<br>tetex-doc<br>tetex-dvips<br>tetex-fonts<br>tetex-latex<br>tetex-xdvi<br>texinfo<br>xpdf |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | System | apacheconf<br>arpwatch<br>auth_ldap<br>autorun<br>bind-utils<br>bindconf<br>bug-buddy<br>control-panel<br>dialog<br>fbset<br>firewall-config<br>gnome-linuxconf<br>gnome-utils<br>gnomerpm<br>gnupg<br>gtop<br>iproute<br>kdeutils<br>linuxconf<br>lm_sensors<br>locale_config<br>magicdev<br>mkisofs<br>mkxauth<br>mt-st<br>mtools<br>mtx<br>netcfg<br>nut<br>nut-cgi<br>nut-client<br>open<br>parted<br>procinfo<br>psacct<br>pvm-gui<br>rdate<br>rdist<br>rpm2html<br>rpmfind |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | samba-client<br>samba-common<br>samba-swat<br>sane<br>screen<br>statserial<br>sudo<br>symlinks<br>sysctlconfig<br>sysstat<br>timetool<br>tksysv<br>ucd-snmp-utils<br>usbview<br>usermode<br>xcpustate<br>xosview<br>xsysinfo |
| | Text | aspell<br>docbook-dtd30-sgml<br>docbook-dtd31-sgml<br>docbook-dtd40-sgml<br>docbook-dtd41-sgml<br>docbook-dtd41-xml<br>docbook-style-dsssl<br>docbook-utils<br>docbook-utils-pdf<br>dos2unix<br>indent<br>lv<br>m4<br>mawk<br>openjade<br>perl-SGMLSpm<br>pspell<br>rgrep<br>sgml-common |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | tamago<br>unix2dos |
| Development | Debuggers | gdb<br>kdbg<br>lslk<br>lsof<br>ltrace<br>memprof<br>strace<br>sysreport |
| | Languages | compat-egcs<br>cpp<br>dev86<br>expect<br>gcc<br>gcc-c++<br>gcc-chill<br>gcc-g77<br>gcc-objc<br>gnome-objc<br>guile<br>itcl<br>kaffe<br>librep<br>nasm<br>nasm-doc<br>perl-DBD-MySQL<br>perl-DBD-Pg<br>perl-DBI<br>php<br>php-imap<br>php-ldap |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | php-mysql<br>php-pgsql<br>pygnome<br>pygnome-applet<br>pygnome-capplet<br>pygnome-libglade<br>pygtk<br>pygtk-libglade<br>python<br>rep-gtk<br>rep-gtk-libglade<br>tcl<br>tclx<br>tix<br>tk<br>tkinter<br>umb-scheme |
| | Libraries | 4Suite<br>Distutils<br>ImageMagick-c++-devel<br>ImageMagick-devel<br>Mesa-devel<br>ORBit-devel<br>SDL-devel<br>SDL_image-devel<br>SDL_mixer-devel<br>XFree86-devel<br>Xaw3d-devel<br>acl-devel<br>apache-devel<br>attr-devel<br>audiofile-devel<br>blas<br>bzip2-devel<br>compat-glibc<br>control-center-devel<br>cyrus-sasl-devel<br>db1-devel |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | db2-devel |
| | | dmapi-devel |
| | | e2fsprogs-devel |
| | | esound-devel |
| | | expat-devel |
| | | fnlib-devel |
| | | freetype-devel |
| | | gd-devel |
| | | gdbm-devel |
| | | gdk-pixbuf-devel |
| | | glib-devel |
| | | glibc-devel |
| | | glibc-profile |
| | | gmp-devel |
| | | gnome-core-devel |
| | | gnome-libs-devel |
| | | gnome-objc-devel |
| | | gpm-devel |
| | | gsm-devel |
| | | gtk+-devel |
| | | imlib-devel |
| | | kdebindings-devel |
| | | kdelibs-devel |
| | | kdelibs-sound-devel |
| | | kdesdk-devel |
| | | kdesupport-devel |
| | | krb5-devel |
| | | kudzu-devel |
| | | lam |
| | | lapack |
| | | libghttp-devel |
| | | libglade-devel |
| | | libgtop-devel |
| | | libjpeg-devel |
| | | libmng-devel |
| | | libodbc++ |
| | | libodbc++-devel |
| | | libogg-devel |
| | | libpcap |
| | | libpng-devel |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | libstdc++-devel<br>libtermcap-devel<br>libtiff-devel<br>libungif-devel<br>libunicode-devel<br>libxml-devel<br>mozilla-devel<br>ncurses-devel<br>netpbm-devel<br>newt-devel<br>openldap-devel<br>openssl-devel<br>pam-devel<br>pciutls-devel<br>postgresql-devel<br>pump-devel<br>pvm<br>python-devel<br>python-xmlrpc<br>qt-devel<br>readline-devel<br>rpm-devel<br>rpm-python<br>slang-devel<br>smpeg-devel<br>tcllib<br>unixODBC-devel<br>vorbis-devel<br>xdelta-devel<br>xfsprogs-devel<br>zlib-devel |
| | System | kernel-headers<br>kernel-source |
| | Tools | ElectricFence<br>asp2php<br>asp2php-gtk |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | autoconf<br>automake<br>binutils<br>bison<br>byacc<br>cdecl<br>cproto<br>ctags<br>cvs<br>diffstat<br>dmalloc<br>doxygen<br>flex<br>glade<br>gperf<br>gtk-doc<br>kdevelop<br>lclint<br>make<br>nasm-rdoff<br>njamd<br>patch<br>pkgconfig<br>pmake<br>qt-designer<br>rcs<br>rpm-build<br>xdelta |
| | Documentation | XFree86-doc<br>apache-manual<br>bash-doc<br>blas-man<br>gnome-users-guide<br>indexhtml<br>kdoc<br>kernel-doc<br>lapack-man<br>man-pages |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | php-manual<br>python-docs<br>sendmail-doc |
| System Environment | Base | acl<br>adjtimex<br>alchemist<br>attr<br>chkfontpath<br>dmapi<br>gnome-print<br>iptables<br>isapnptools<br>joystick<br>ksconfig<br>libgnomeprint11<br>mkkickstart<br>nss_ldap<br>pam_krb5<br>pinfo<br>rhn_register<br>rhn_register-gnome<br>shapecfg<br>up2date<br>up2date-gnome<br>yp-tools |
| | Daemons | LPRng<br>ORBit<br>XFree86-xfs<br>am-utils<br>apache |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | autofs<br>bind<br>cipe<br>dhcp<br>esound<br>finger-server<br>gated<br>imap<br>inews<br>iputils<br>mod_dav<br>mod_perl<br>mod_ssl<br>nfs-utils<br>nscd<br>ntp<br>openssh-server<br>pidentd<br>portmap<br>printconf<br>printconf-gui<br>routed<br>rsh-server<br>rusers<br>rusers-server<br>rwall<br>rwall-server<br>rwho<br>samba<br>sendmail-cf<br>talk-server<br>tcp_wrappers<br>telnet-server<br>tux<br>ucd-snmp<br>wu-ftpd<br>xinetd<br>ypbind<br>ypserv |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | Kernel | kernel-smp |
| | Libraries | ImageMagick-c++<br>Mesa<br>SDL<br>SDL_image<br>SDL_mixer<br>VFlib2<br>XFree86-libs<br>Xaw3d<br>arts<br>audiofile<br>compat-libstdc++<br>db3-devel<br>expat<br>fnlib<br>freetype<br>gal<br>gd<br>gdk-pixbuf<br>gmp<br>gnome-audio-extra<br>gnome-core<br>gnome-libs<br>gsl<br>gtk+<br>gtk-engines<br>imlib<br>imlib-cfgeditor<br>kdelibs<br>kdelibs-sound<br>kdesupport<br>krbafs<br>libelf<br>libgal3<br>libgcj<br>libghttp<br>libglade |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| | | libgtop<br>libjpeg<br>libmng<br>libodbc++-qt<br>libogg<br>libole2<br>libpng<br>libtiff<br>libtool-libs<br>libungif<br>libunicode<br>libxml<br>lockdev<br>netpbm<br>nss_db<br>openssl095a<br>pythonlib<br>qt<br>smpeg<br>smpeg-xmms<br>unixODBC<br>unixODBC-kde<br>w3c-libwww |
| | Shells | mc<br>pdksh<br>sash |

**Table A-1 (continued)** Installation List for SGI SynaptIQ

| Category | SubCategory | Components |
|---|---|---|
| User Interface | Desktops | control-center<br>gmc<br>gnome-applets<br>kdeadmin<br>kdebase<br>kdebindings<br>kdebindings-kmozilla<br>kdesdk<br>koffice<br>sawfish<br>sawfish-themer<br>switchdesk<br>switchdesk-gnome<br>switchdesk-kde |
| | X | XFree86<br>XFree86-100dpi-fonts<br>XFree86-75dpi-fonts<br>XFree86-tools<br>XFree86-twm<br>XFree86-xdm<br>gdm<br>glms<br>gqview<br>rxvt<br>ttfonts<br>urw-fonts<br>xinitrc<br>xtt-fonts |
| | X Hardware Support | Xconfigurator |