

Silicon Graphics Visual Workstation Environment (VWE) Start Here

007-4203-003

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About This Document

This document provides information about the Visual Workstation Environment (VWE) 3.1 release. It is divided into three chapters:

- Chapter 1, “Release Features,” describes the major features of this release.
- Chapter 2, “Software Features,” describes the major features of earlier releases that are included in this release.
- Chapter 3, “Configuration and Installation,” discusses installing and configuring the VWE software.

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

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We value your comments and will respond to them promptly.

Release Features

This chapter provides a short introduction to the Visual Workstation Environment (VWE) and describes the features provided with this release. Chapter 2, “Software Features,” describes features supported in previous releases that enhance the features of your base Linux distribution.

Caution: Before installing or reinstalling software, including your base Linux distribution, you must read the file `README.VWE`, located in the top-level directory of the software CD. This file contains information which arose too late in the release cycle to be documented in this manual. After software installation, this file is located at `/usr/share/doc/VWE-3.1/README.VWE`.

Caution: VWE has been tested only on Silicon Graphics Visual Workstations, and it does not support other systems. Please do not attempt to install this software on any system other than a Silicon Graphics Visual Workstation.

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>

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 the X Window System” on page 16.

Documentation for the VWE software 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/>

Note: Packaged with the VWE software is a separate sheet that contains the Software License Agreement. This software is provided to you solely under the terms and conditions of the Software License Agreement. Please take a few moments to review the Agreement.

Feature Overview

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

The VWE software will most likely come preinstalled on your SGI workstation. 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 VWE software using the VWE installer. Installation and configuration are described in Chapter 3, "Configuration and Installation."

New Features

This section describes new features for this release.

XFS support

VWE 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

VWE 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

VWE 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

VWE 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 8.

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. VWE 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>.

Patches and Changes to Base Linux Distributions

This section provides an overview of changes that the VWE 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-vwedocs 1.5 (VWE documentation)
- xfsdump-1.0.4 (xfsdump utility)
- xfsprogs-1.2.0 (XFS program support)

Software Features

This chapter describes features supported in previous releases that enhance the features of your base Linux distribution. For a description of new features, please read Chapter 1, “Release Features.”

The Visual Workstation Environment (VWE) software provides the Linux kernel version 2.4.2. The VWE software adds functionality to base Linux distributions that is specific to SGI visual workstations.

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

Open Inventor

VWE supports Open Inventor, an object-oriented 3D toolkit that offers a comprehensive solution to traditional 3D programming problems. Its programming model, based on a 3D scene database, includes a rich set of objects such as cubes, polygons, materials, cameras, lights, trackballs, engines, 3D viewers, and editors that speed up programming time and extend 3D programming capabilities.

OpenGL Performer

VWE supports the OpenGL Performer, a high-performance 3D rendering toolkit for developers of real-time, interactive graphics applications. Performer simplifies development of complex applications such as those for visual simulation, simulation-based design, virtual reality, interactive entertainment, broadcast video, CAD, and architectural walk-through, while providing a high-performance portability path across the entire SGI product line.

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 (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 3, and the following URL:

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

Advanced Linux Sound Architecture (ALSA) Drivers

VWE 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 VWE as a base.

NFS Enhancements

VWE 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 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, the i686 enterprise kernel has 64GB max memory support, and all others have 960MB 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 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.

VWE 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

VWE 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. VWE 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. VWE 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 `libr1` 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:

- `libr1` library. This new library supplies command line editing and command history functionality. See the `/cmd/lcrash/lib/libr1/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. VWE provides a fix for this bug.

Configuration and Installation

This chapter describes how to install the Visual Workstation Environment (VWE) software from CD. You will need to do this only if you have purchased a Silicon Graphics Visual Workstation 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: Silicon Graphics Visual Workstation configurations with preloaded Linux software are shipped from the factory with a null root password. In some cases, a reseller may have configured the system with 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.VWE` 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 VWE 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 VWE software 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 VWE.

Configuring the X Window System

VWE 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`
- `/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 a XF86Config file that is appropriate for a Silicon Graphics Visual Workstation.

If your `/etc/X11/XF86Config` 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
```

VWE Configuration Notes

The following information will help you get VWE 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 VALinux. 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 Silicon Graphics Visual Workstation, contact the packager to find out if a patch or update is available to fix the problem.

Performer

The URL for Performer information is <http://www.sgi.com/software/performer>.

Performer for Linux is included in VWE. To run the Performer Town demonstration program, use the following command:

```
% perfly town.perfly
```

You should see a full-screen animated 3D simulation of a vehicle driving through a town.

Blender

The URL for Blender information is <http://www.blender.nl>.

After installing Blender, execute the following command:

```
% blender -f -H
```

Heretic II

The URL for Heretic II is <http://www.lokigames.com/products/heretic2>.

After installing Heretic II, change directories to the Heretic II application directory and remove the following symbolic link:

```
libGL.so -> libMesaGL.so
```

After starting the application, use the video menu to set the render mode to **OpenGL**.

Updates and patches are available at the following URL:

```
http://www.lokigames.com/products/heretic2/updates.php3
```

Quake II

After installing Quake II, change directories to the Quake II application directory and remove the following symbolic link:

```
libGL.so -> libMesaGL.so
```

To run Quake II in OpenGL mode, type the following command:

```
# quake2 +set vid_ref glx +set gl_driver libGL.so
```

Installing VWE from a CD

Should you need to install VWE 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 VWE 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: VWE 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 VWE installation is complete, reboot your system to begin using the newly installed VWE 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 the distributor's installation instructions and then install the VWE from the CD as described in "Installing VWE from a CD" on page 18.

To upgrade your software from earlier SGI Linux releases, you should follow the instructions for upgrading the base distribution. VWE will only run on Red Hat 7.1, SuSE 7.1, or TurboLinux 6.1.

After you have upgraded your base distribution, install the VWE as described in as described in "Installing VWE from a CD" on page 18.

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