

VERDE™ Cluster Quick-Start

The logo for Virtual Bridges features a green arc above the word "Virtual" in green and "Bridges" in dark blue. A trademark symbol (TM) is positioned to the upper right of "Bridges".

Virtual Bridges™

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Table Of Contents

Overview.....	3
Scope.....	3
References and Requirements.....	3
Known Issues.....	4
Hardware Configuration.....	5
Software Configuration.....	6
VERDE Cluster Master Software Installation.....	6
VERDE Satellite Server Software Installation.....	6
VERDE Management Workstation Installation.....	7
Virtual Desktop Management.....	8
Creating and Deploying Virtual Desktops.....	8
Applying Changes to Published Virtual Desktops.....	8
Cluster and Session Management.....	10
Legal.....	11

Overview

Scope

This document presents a task-oriented “quick-start” guide to deploying a simple VERDE Cluster implementation.

References and Requirements

- This document assumes the reader is familiar with the Virtual Bridges *VERDE Cluster Overview* document, currently available at: <http://vbridges.com/docs/VERDEClusterOverview.pdf>
- The Virtual Bridges VERDE (Virtual Enterprise Remote Desktop Environment) product builds on the Win4VDI and Win4Lin/Win4Solaris platforms to deliver Linux or Windows virtual desktops as cloud computing applications. Some topics will refer to the *Win4Lin Pro* or *Win4Solaris Pro Users Guide* for additional information or specific reference points. It is strongly recommended that the reader be familiar with the structure of the above mentioned Users Guide in order to facilitate learning the VERDE administration process. While this document focuses on cluster administration only, some topics cross over into virtual desktop management and may reference the above said documents.
- This document assumes either a Linux or Sun Solaris server platform, and unless necessary, will not distinguish between the two. Basic Linux and/or Sun Solaris system administration skills are assumed for anyone using this document.
- Many administration tasks will require the use of the `root` user account on the server. This document assumes that the reader either has `root` (or `sudo`) access, or can easily acquire it in order to perform such tasks. Please note that the document will not distinguish between `sudo`, `su`, or `login` for `root` access – it will simply be referred to as `root` access. The reader should adjust commands accordingly for what is appropriate on his or her system.
- This document assumes the reader either has access to the servers' consoles, or can reach shells on the servers remotely using protocols such as `telnet` or `ssh`. Some tasks may require the use of an *X11* server on the display terminal, and it is up to the reader to properly configure local/remote *X11* access via the console, `ssh`, `telnet`, or other methods. Note that some of these methods may require the explicit setting and export of the `DISPLAY` environment variable. Also, unless otherwise noted, commands in this manual assume a Bourne or POSIX shell (e.g. `sh`, or `bash`).

Known Issues

- AMD Satellite Servers cannot properly virtualize Linux guests using SVM technology via the Linux KVM driver for this architecture. If virtual Linux guest desktops are needed, Intel hardware should be used instead. Please refer to the following bug report in order to track the progress of this KVM defect, or subscribe to the KVM developers mailing list:
http://sourceforge.net/tracker/?func=detail&atid=893831&aid=2351676&group_id=180599
- Satellite Servers do not currently prevent local logins if the Cluster Master cannot be reached
- Login reservations currently do not time out; this is not critical except that it may artificially alter load balancing if many users connect but do not complete a login
- Satellite Servers currently update their load statistics arbitrarily every 3 seconds with the Cluster Master; this may need to be tuned and/or made configurable depending on network load requirements or desired sensitivity of the cluster
- On Ubuntu Linux 8.04 LTS hosts, the KVM driver that ships with the kernel currently has a bug which may result in a kernel “oops” and frozen `kvm` processes in userspace. The current workaround is to download and install the latest version of the KVM drivers from their *Sourceforge* repository:
http://sourceforge.net/project/showfiles.php?group_id=180599
A closely related bug report for this can be found here (although it is known to be fixed with the latest version of KVM):
http://sourceforge.net/tracker/?func=detail&atid=893831&aid=2025527&group_id=180599

**** THIS ISSUE HAS BEEN REPORTED TO CANONICAL AND IS BEING ADDRESSED ****

Hardware Configuration

For setting up a basic VERDE Cluster, 2 or more servers should be networked via a LAN. For best performance and scalability, each server should feature 2 additional private LAN/interconnects to clustering services (Cluster Master and Directory/Authentication Server), and storage (NFS, CIFS, etc.) The Satellite Servers should be exposed to the LAN so that clients can connect to them, but the Cluster Master (if not hosted on a Satellite Server) should not be exposed. Switched bandwidth is strongly recommended on every segment possible. The highest bandwidth available should also be used on each network segment, public or private.

Storage requirements will vary based on deployed users and size of master virtual machine(s), but for the purposes of illustration, 100GB free space on the share storage is assumed.

Additionally, a management workstation should be connected to both the storage and the directory/authentication server.

There are no additional hardware requirements for the purpose of this document. For information on capacity planning, including metrics, please refer to the *VERDE Cluster Overview* document.

Software Configuration

This document assumes the following software configuration on each server and management workstation:

- Linux 2.6-based distribution, x86_64 architecture, KVM-capable kernel with KVM drivers loaded
- Consistent user ID's across servers and management workstation, either created locally on each server or served from an authentication database (e.g. LDAP)
- NFS-mounted home directories for users with virtual desktops; consistent mount points across all Satellite Servers and management workstations in the cluster; NFS "lock" option must be enabled in order to support POSIX/Mandatory file locking on the network storage (this is the default on most Linux implementations)

VERDE Cluster Master Software Installation

The VERDE Cluster Master software can either be installed on one of the Satellite Servers, or on its own dedicated server. To install the software:

1. Install the appropriate VERDE/Win4VDI (Win4LinPro) RPM or .deb package
2. if the Cluster Master will be dedicated, there is no need to license it; otherwise a VERDE/Win4VDI license must be applied (see below)
3. Edit the `/var/lib/win4linpro/settings.global` file, and modify the `WIN4_VERDE_CLUSTER_MASTER` setting, or add it to the end if it's not there already:

```
WIN4_VERDE_CLUSTER_MASTER="yes"
```

4. Restart the Win4* services so that the Cluster Master daemon starts (note that you do not need to do this again since it will start automatically when the server boots the next time):
`/usr/lib/win4linpro/etc/rc.win4 restart`

Note that the VERDE Cluster Master daemon (`verdecmd`) will start 40 subprocesses and manage them automatically. To shut down the Cluster Master software, simply kill the parent `verdecmd` process (can be discovered using the `ps` command or by checking the system's log.) To permanently stop it from loading, remove the `WIN4_VERDE_CLUSTER_MASTER="yes"` line from the file `/var/lib/win4linpro/settings.global`

VERDE Satellite Server Software Installation

To install and enable the VERDE Satellite Server Software:

1. Install the appropriate VERDE/Win4VDI (Win4LinPro) RPM or .deb package
2. License the software by creating the file `/var/lib/win4linpro/license.lic`, as root, with the following contents:

```
# beginning of file
LICENSE_CODE=LLLLLLLLL-LLLLLL-LLLL-LLLL-LLLL-LL
CUSTOMER_NAME="XXXXXX"
BUMPS_1=BBB-BBB-BBBBBBBB-BBBBBB-BBBB-BBBB-BB
# end of file
```

Replace the L's with the actual base license code. Replace the X's with your name or the name of your organization. If you have a bump license, replace the B's with the bump license code. Otherwise omit the line that begins with `BUMPS_1=`

The file should be owned by `root` and have permissions `0600`.

3. Edit the `/var/lib/win4linpro/settings.global` file, and modify the following settings, or add the following lines to the end if they are not there already:

```
WIN4_VERDE_CMADDR=CCCC
WIN4_VERDE_PUBADDR=PPPP
WIN4_SNAP_DIR=/tmp
```

Replace the C's with the IP address or resolvable FQDN of the VERDE Cluster server. Replace the P's with the public IP address or publicly (via the LAN) resolvable FQDN of this server (omitting this setting uses the server's configured `hostname`, but keep in mind this must be reachable and resolvable from the LAN.) `WIN4_SNAP_DIR` should be used to determine where transient VM storage should live. This should be a local disk for best performance. If `/tmp` does not have enough space, choose a different directory. Please refer to the VERDE Cluster Overview document for transient storage capacity planning metrics. Note that if you omit `WIN4_SNAP_DIR`, transient files will live on the network-attached storage and may result in performance degradation.

At this point the VERDE Satellite Server should momentarily connect (and maintain a connection) to the VERDE Cluster Master. If the VERDE Cluster Master goes offline, the Satellite Server will retry the connection until it comes online again.

VERDE Management Workstation Installation

To install the VERDE Workstation/Win4Lin Pro software on the management workstation:

1. Install the appropriate VERDE/Win4VDI (Win4LinPro) RPM or .deb package
2. Run the *Win4Lin Pro Console* (`win4console`) as a non-`root` user in order to license the software

The management workstation will be used to install and provision virtual machines. You should not do this on Satellite Servers. The management workstation should not actually "join" the cluster, but it should have consistent access to authentication and storage services much like a Satellite Server would. For best results, the management workstation should live in the data center or behind the data center firewall.

Virtual Desktop Management

Creating and Deploying Virtual Desktops

From the management workstation, you can install and deploy virtual desktops for users on the cluster. The model assumed for this document is the *Dynamic Renewable Desktop* provisioning method. Please refer to the *Win4Lin Pro Users Guide* for information on how to create and deploy dynamic user sessions.

If creating a Windows virtual machine as a master installation, this can be done with the *Win4Lin Pro Console* (`win4console`) GUI.

If creating a Linux virtual machine as a master installation, please use the `win4-install-linux` command instead.

Be sure to name the configuration `win4`, as this is the only configuration that VERDE Cluster will manage.

Once created, you should publish and deploy the session from the management workstation. All this assumes the home directories live on the shared storage, and user ID's are consistent. Also, be sure to deploy the configuration as `win4` for the dynamic users, as this is the only configuration that the VERDe Cluster will manage.

Applying Changes to Published Virtual Desktops

After sessions are deployed, you should never start the `win4` configuration for the published user again. You should instead perform an “offline” update from the management workstation. “offline” updates are used to configure or install software on a deployed published virtual machine without disrupting or having to log-off users who are running dynamic instances of it on the cluster. To do this, you must use the “replica” model, which involves the following:

1. Making a complete copy of the virtual machine (copying the `win4` folder)
2. Starting this replica copy using either the *Win4Lin Pro Console* or the `win4` command, explicitly specifying the name of the copy as a command-line argument so as to not start the default `win4`
3. Performing any software installation or configuration inside the replica virtual machine as needed
4. Shutting down the replica virtual machine cleanly
5. Using a combination “rename” and “delete” mechanism to replace the original `win4` virtual machine with the replica, so that users who log in (or restart their sessions) moving forward will inherit the new changes automatically.

The following example assumes that the user has a Terminal window open on the management workstation, and is logged in as the `non-root` user hosting the published virtual desktop environment. All steps will be illustrated as command-line shell format:

```
# make sure current directory is home directory
cd

# create a replica of the win4 virtual machine, deleting any previous
# replicas
rm -rf win4.replica
cp -Rp win4 win4.replica
```

```
# start the replica virtual machine
# after performing the necessary updates inside, the guest OS
# should be shut down cleanly
win4 win4.replica

# move the existing win4 virtual machine out of the way,
# then rename the replica to win4; first, delete any
# left-over copies of the old win4 virtual machine to avoid
# move problems and save storage
rm -rf win4.old
mv win4 win4.old; mv win4.replica win4
```

It is recommended that the `win4` configuration be backed up first before attempting this, in case the procedure fails or you need to revert the changes. Note that after the last command is executed above, users logging into the cluster who start dynamic instances of this virtual desktop will automatically inherit the latest changes.

Cluster and Session Management

Managing the cluster is done from the Cluster Master computer itself. You can either do an interactive session with verbose information, or write an application that connects to the `verdecmd` management UNIX socket (`/var/run/win4linpro/verdecmd-socket`). Such applications can be written in just about any language that supports access to UNIX domain sockets, including C, C++, PHP, Perl, and others, and may be deployed as an interactive Linux application or from a web server on the same computer.

To start an interactive session on the Cluster Master, log in as `root` on that system, and run the following command:

```
/usr/lib/win4linpro/bin/verdecmon
```

Once in the monitor session, use the `help` command to list available commands, or `help <command>` to get usage information for any specific command. The basic commands are:

- `help` – show list of available commands, or usage for a specific command
- `hello` – show the interactive greeting message, including overview information such as number of servers and users
- `verbose` – show verbose setting, or set it (default is on for interactive mode, off for socket mode)
- `server` – list information about a specific Satellite Server, by Server ID
- `user` – list information about a specific user, by Linux user ID
- `servers` – list information about all known connected Satellite Servers
- `users` – list information about all known running user sessions on the cluster
- `offlineserver` – take a server offline, which prevents users from logging into it; any running sessions on the server continue to run without problem
- `onlineserver` – take a server back online, allowing logins again
- `abortuser` – shut down a user session immediately, without waiting for it to exit gracefully
- `shutdownuser` – shut down a user session gracefully (using the guest OS's shutdown mechanism)
- `logoffuser` – attempt a graceful shutdown, but resort to `abortuser` if shut down exceeds a certain length of time
- `quit` – exit this `verdecmon` session

The VERDE Cluster Master management interface can be provided to non-`root` users as well if desired, although this is usually not recommended. Typically you will do this if you use a pseudo-administrator on the Cluster Master server, or if you run a web server (e.g. *apache*) hosting an application that connects to the management UNIX socket but runs as a non-`root` user inside the web server. To do this, use the following 2 settings in `/var/lib/win4linpro/settings.global`:

- `VERDECMD_CONN_UID` – set to the user name or numeric UID who should own the socket file
- `VERDECMD_CONN_GID` – set to the group name or numeric GID who should own the socket file

The default for both settings is 0, indicating the file is owned by `root:root`. Regardless of these settings, the file `/var/run/win4linpro/verdecmd-socket` will always have mode `01770`, which indicates sticky bit, and read/write permissions for both user and group.

Legal

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