VMware Tools Installation Guide For Operating System Specific Packages

ESXi 5.1
ESXi 5.0
VMware Tools

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About This Book

The VMware Tools Installation Guide For Operating System Specific Packages provides information about how to use the operating system specific packages (OSP) to install VMware Tools in virtual machines. OSPs are separate downloadable VMware Tools packages. These packages are specific to each operating system. OSPs enable individual, and operating system (OS) specific, download and installation of VMware Tools.

NOTE Use either the VMware Tools automatic installation and update through the VMware vSphere Client or use the OSPs for individual manual installation and update. You cannot mix the two methods.

The OSPs support a specific list of Linux guest operating systems. For a current list of the guests supported by VMware Tools OSPs, see the online VMware Compatibility Guide.

http://www.vmware.com/resources/compatibility/search.php?action=base&deviceCategory=software

From the VMware Web site select **Support and Downloads > Compatibility Guides**, and click the **View the Guest/Host OS tab on the VMware Compatibility Guide Web site** link.

Intended Audience

This book is intended for administrators who want to install or use operating system specific packages for VMware Tools. This book is for experienced Linux system administrators who are familiar with virtual machine technology. The administrator should also be familiar with datacenter operations and proficient with packaging and updating systems of their specific guest OS Linux distribution.

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Introduction to Operating System Specific Packages for VMware Tools 1

OSPs for VMware Tools is a packaging and distribution mechanism for VMware Tools. These OSPs use the native package formats and standards of the supported guest operating systems.

OSPs are an alternative to the existing mechanism used to install VMware Tools through the VMware vSphere™ Client. With OSPs you can use the native update mechanisms of your operating system to download, install, and manage VMware Tools. With OSPs you can manage VMware Tools from the virtual machine as you would other standard software.

This chapter includes the following topics:

Benefits of Installing VMware Tools OSPs

VMware Tools OSPs occupy a smaller amount of disk space than the tar installer used with vSphere Client, which makes package installation or uninstallation fast.

The following features describe the benefits of using VMware Tools OSPs:

Separate Updates

VMware Tools OSP updates are provided separately from the VMware platform. The decoupling allows you to update to the latest version of VMware Tools without having to upgrade to the latest version of the VMware product. Keeping OSPs as separate downloadable packages allows for more flexibility in managing your VMware products' updates and installations. With OSPs you can configure the update managers on your Linux distributions to check for updates to VMware Tools as needed.

In ESXi 5.0 and later releases, VMware Tools OSPs are certified to run on a range of ESXi releases, from two versions earlier than the current release through two versions later than the current release. For example, VMware Tools OSPs for ESXi 5.0 are certified to run on ESXi 4.0, 4.1, 5.0, 5.1, and the next ESXi release after version 5.1.

Standards-compliant

VMware Tools OSPs are packaged in the native package format and follow the best practices and standards of the supported operating systems. For example, Red Hat Enterprise Linux uses the RPM package manager and Debian-based distributions use the Debian Packaging Standard. OSPs use the standard

mechanisms for dependencies among packages, and the tools are separated into components for kernel and user space. These standard mechanisms allow you to audit the packages on virtual machines with or without graphics components.

Version Manageability With OSPs, you can use the standard guest operating system packaging tools to examine and easily understand how the OSPs behave while installing or uninstalling VMware Tools. This understanding allows you to determine which components you want to install and the validity of the packaging.

NOTE Directly upgrading VMware Tools OSPs is not supported. To upgrade OSPs, you must uninstall the current OSP version and reinstall the upgraded OSP version.

Supported Guest Operating Systems for VMware Tools OSPs

VMware Tools OSPs are available for 32-bit and 64-bit versions of the supported guest operating system. OSPs are also available for the most popular kernel variants, such as bigsmp, hugemem, pae, and so on. The kernel module source packages provide limited support for customized or otherwise nonstandard kernels.

For a current list of the guests supported by VMware Tools OSPs, see the online *VMware Compatibility Guide*.

http://www.vmware.com/resources/compatibility/search.php?action=base&deviceCategory=software

From the VMware Web site select **Support and Downloads > Compatibility Guides**, and click the **View the Guest/Host OS tab on the VMware Compatibility Guide Web site** link.

Weak Versioning for VMware Tools OSPs

VMware provides weak versioning for sharing Linux kernel modules across kernels with compatible application binary interfaces (ABIs). You can use kernel modules between multiple ABI compatible kernels without installing modules for each kernel. Weak versioning uses modules from another kernel if the modules are ABI compatible with the currently running kernel.

Weak versioning is applied to Linux systems when a known level of ABI compatibility is guaranteed by the guest operating system vendor. The compatible guest operating systems for ESXi 5.1.*x* include RHEL 3 through RHEL 6 and SLES 9 through SLES 11 SP2. If you run a guest operating system that is not compatible, weak versioning might create links to modules that might not work for a given kernel.

VMware provides the following types of weak versioning:

- The Partner Driver Linux Process (PLDP) for SuSE and the Driver Update Program (DUP) for RHEL.

  This distribution method applies to RHEL 5, RHEL 6, SLES 10, SLES 11, SLES 11 SP1, and SLES 11 SP2.

- Weak versioning provided by VMware.

  This distribution method applies to RHEL 3, RHEL 4, and SLES 9.

PLDP/DUP Weak Versioning

The PLDP/DUP weak versioning method ensures that VMware Tools OSPs are ABI compatible with the kernel before the OSP modules are loaded. PLDP/DUP weak versioning takes place when you install OSPs on a RHEL 5, RHEL 6, SLES 10, SLES 11, SLES 11 SP1, or SLES 11 SP2 operating system.

VMware provides binary kernel modules for a specific kernel, typically the base kernel for a release. For example, VMware provides kernel modules for the first released kernel of RHEL 5, 2.6.18-8.el5.

Now you might upgrade the kernel or operating system to a later version. For example, you might upgrade the RHEL 5 kernel to 2.6.18-9.el5 or the operating system to RHEL 5.1. PLDP/DUP ensures that the VMware Tools modules load and function on all kernel versions that are ABI compatible. If a module is not compatible, it is not installed.

PLDP/DUP uses RPM to resolve dependencies and symbols when it matches a package against the kernel. An RPM can have a list of symbols as dependencies that must be resolved before a module can be installed. The symbols in the kernel and in modules are checksummed. To streamline the potentially large number of symbols that must be checked, the OS joins function signatures in the kernel into related groups and checksums the entire group. For example, one checksum might be performed for the net group, another for the core group, and so on.

When a kernel module is built, PLDP/DUP invokes special macros that find all function calls to the kernel. If their signatures match those in the kernel, the signatures are grouped and the checksum is added to the module's `Requires:` section.

When you run the installation, the currently installed kernel (which might be a later version) must provide a matching checksum. If it does not, the module cannot be installed.

PLDP/DUP uses the same strategy to resolve symbols that modules require from other modules. When a kernel module is built, the symbols that the module exports are checksummed and added to its `Provides:` sections. Symbols required from other modules that were not provided by the kernel are checksummed and added to the module's `Requires:` section.

Enforcing ABI Compatibility When Kernels Are Updated

When you install VMware Tools modules, PLDP/DUP continues to ensure ABI compatibility after a kernel is updated within a major release. The PLDP/DUP verification process ensures that modules are linked to all compatible kernels.

For example, you might install the VMCI module in the 2.6.18-8.el5 kernel, in the following directory:

```
/lib/modules/2.6.18-8.el5/extra/vmware/vmci.ko
```

If you update the kernel to 2.6.18-9.el5, the PLDP/DUP process starts the requirement checks to confirm that the installation can continue. PLDP/DUP performs the following tasks:

1. RPM verifies all package dependencies.
2. PLDP/DUP runs the weak-updates program, which verifies that the VMCI module in the old kernel can work with the new kernel.
3. If the verification passes, the weak-updates program creates a symlink in the new kernel's module directory that points to the actual module in the old kernel's module directory:

   ```
   /lib/modules/2.6.18-9.el5/weak-updates/vmware-tools-vmci/vmci.ko ->
   /lib/modules/2.6.18-8.el5/extra/vmware/vmci.ko
   ```

This verification takes place whenever a new kernel version or a module supported by PLDP/DUP is installed.

Weak Versioning and Distribution Supplied Kernel Module Packages

By default, certain VMware Tools kernel module packages are installed on the native RHEL 6, SLES 11 SP1, SLED 11 SP1, SLES 11 SP2, and SLED 11 SP2 operating systems. For these modules, weak versioning behaves differently on RHEL and SUSE systems.

The distribution supplied modules are `vmxnet3`, `vmw_pvscsi`, and `vmware_balloon`. For details, see "Distribution Supplied Kernel Module Packages," on page 20.

On RHEL systems, modules linked in through weak versioning (DUP) do not take precedence over distribution supplied modules that are built into the kernel. If you install VMware Tools kernel module packages for one of these modules, and you update the kernel, the new kernel uses its modules and not the ones provided by VMware Tools.

On SUSE systems, modules linked in through weak versioning (PLDP) take precedence over distribution supplied modules that are built into the kernel. If you install VMware Tools kernel module packages for one of these modules, the system continues to use them, even on later kernels.

Changing the Behavior of Distribution Supplied Kernel Module Packages

You can change the default behavior of distribution supplied kernel module packages when the kernel is updated on RHEL and SUSE systems.

On RHEL systems, you can override the default use of the distribution supplied module when the kernel is updated by directing the system to use the weak-updates directory.

On SUSE systems, you can override the default use of the VMware Tools provided module when the kernel is updated by directing the system to use the directory in the kernel.

Procedure

1 Add a file in the `/etc/depmod.d` directory.

For example, for the `vmw_pvscsi` module, create the `/etc/depmod.d/vmw_pvscsi.conf` file.

2 Add a line to the file you created to override the default behavior for a module.

Option	Description
RHEL systems	For example, add the following line to the `/etc/depmod.d/vmw_pvscsi.conf` file to point to the weak-updates directory: `override vmw_pvscsi * extra/vmware-tools-pvscsi`
SUSE systems	For example, add the following line to the `/etc/depmod.d/vmw_pvscsi.conf` file to point to the directory in the kernel: `override vmw_pvscsi * kernel/drivers/scsi`

Weak Versioning for RHEL 4, RHEL 3, and SLES 9

Starting with ESXi 5.0.*x*, VMware provides weak versioning for VMware Tools module packages for RHEL 4, RHEL 3, and SLES 9 by means of an init script. The VMware provided weak versioning method allows a module to load as long as kernel ABI compatibility exists between the module and the currently running kernel.

This weak versioning method occurs when the module package is installed or the virtual machine is started. It does not provide weak versioning when a new version of the kernel is installed, as is done by PLDP/DUP.

When you install a VMware Tools module package, the module is installed in the `/lib/modules/`*`kernel_version`*`/extra/` directory in the kernel version for which the module was built. When the init script for a module is started, the script checks if the module exists in the running kernel's directory. If the module is present, the script uses `modprobe` to load the module and its dependencies.

If the module is not present, VMware provided weak versioning determines where the module is installed and adds a symlink from the `/lib/modules/`*`running_kernel`*`/extra/` directory to the module's location. Weak versioning runs `depmod -a` again to allow the module to be picked up in the dependency list. If needed, it runs `mkinitrd` to build the module into the initial ramdisk. After the module is installed and linked, it is loaded by the `modprobe` utility.

As long as kernel ABI compatibility exists between the module and the running kernel, the module loads, behaving as if it were part of the kernel.

Preparing for VMware Tools OSP Installation 2

You must complete certain tasks before you install the VMware Tools OSPs.

The OSPs are on the VMware Web site at http://packages.vmware.com/tools. Locate the directory that corresponds to your ESXi installation and the operating system where you want to install OSPs.

See the OSP Web site for general information and for links to downloads and support information: http://www.vmware.com/download/packages.html.

This chapter includes the following topics:

Uninstall Existing VMware Tools

To use VMware Tools OSPs, use the VMware vSphere Client to uninstall the existing VMware Tools to prevent package conflicts and incorrect operation of VMware Tools.

The messages in the sample commands indicate the following requirements:

- # root permission is required
- $ root permission is not required

Procedure

1 From the virtual machine command prompt, log in as root.

2 Run the uninstall command.

Option	Action
Remove VMware Tools that were installed with the tar installer	Enter `# vmware-uninstall-tools.pl`.
Remove VMware Tools that were installed with the rpm installer	Enter `# rpm -e VMwareTools`.

VMware Tools are uninstalled.

Uninstall Existing OSPs

If you have earlier versions of OSPs installed, you must uninstall them with the system package manager before you install the latest version. For example, for a Red Hat guest, use the RPM application to remove previously installed OSP packages. Upgrading VMware OSPs is not supported.

Ubuntu 8.10 OSP Installation Exception

Starting with Ubuntu 8.10, open-vm-tools is packaged with the multiverse repository. VMware does not support the use of these packages in VMware virtual machines.

The version of tools available in the Ubuntu 8.10 multiverse repository is based on a development snapshot of the open-vm-tools project hosted on `http://sourceforge.net`. These packages are not official VMware Tools releases. VMware Global Support Services might require customers using the Ubuntu packages to remove these packages and install the official VMware Tools release as part of a support request related to Ubuntu 8.10.

If you install unsupported kernel modules in a virtual machine that already contains an official VMware Tools release, the unsupported modules overwrite the VMware modules.

Uninstall Existing Ubuntu open-vm-tools Packages

You must remove Ubuntu `open-vm-tools` packages if they are installed and verify that you uninstalled them.

Procedure

1 Run the following command to determine whether you have the Ubuntu `open-vm-tools` package installed.

```
$ sudo dpkg-query -s open-vm-tools
```

If the result states that the `open-vm-tools` package is not installed, you can safely install the OSPs.

2 If the Ubuntu `open-vm-tools` package is installed, remove the package.

```
$ sudo apt-get remove open-vm-tools
```

3 Verify that you do not have the `open-vm-tools` package installed on the system.

```
$ sudo dpkg-query -s open-vm-tools
```

A confirmation indicates that the `open-vm-tools` package is not installed and no information is available.

Determining the Configuration Method for Installing VMware Tools OSPs

You can use a package manager to install OSPs in many guest operating system releases. In certain earlier operating systems, you must install OSPs manually.

The guest operating system determines which of the following methods you must use to configure your guest operating system to install OSPs.

Package manager A tool provided with the operating system that provides dependency resolution among packages. You can install multiple packages in a single command.

Manual configuration Requires that you run each command individually.

You can use the supported package managers to install OSPs in the following guest operating systems.

Table 2-1. Supported Package Managers

Package Manager	Guest Operating Systems
yum	Red Hat Enterprise Linux 6, Red Hat Enterprise Linux 5, CentOS 6, CentOS 5
apt	Ubuntu 8.04, 8.04.*x*, 8.10, 9.04, 9.10, 10.04, 10.04.*x*, 10.10, 11.04, 11.10, and 12.04
rug	SUSE Linux Enterprise Server 10 and SUSE Linux Enterprise Desktop 10
zypper	SUSE Linux Enterprise Server 11, 11 SP1, and 11 SP2 SUSE Linux Enterprise Desktop 11, 11 SP1, and 11 SP2

NOTE For Ubuntu 12.04 and later releases, OSPs will support Long Term Support (LTS) releases only.

The following guest operating systems require manual configuration:

- Red Hat Enterprise Linux 4 and Red Hat Enterprise Linux 3
- SUSE Linux Enterprise Server 9
- CentOS 4

Installing the VMware Tools OSPs with a Package Manager

You install VMware Tools by running an operating system-specific installation command in the virtual machine.

NOTE If you install the VMware Tools packages manually, different commands are required and you must download each package before you install the packages. For a list of VMware Tools packages, see "VMware Tools Operating System Specific Installation Packages," on page 14.

If the operating system has a package manager such as yum, apt, rug, or zypper, the command you use installs all of the required packages in a single command. You select the configuration appropriate for the environment and install the VMware Tools packages. The `vmware-tools-esx-kmods-`*`kernel_type`* and `vmware-tools-esx` or `vmware-tools-esx-nox` packages install all the available components for the operating system.

Table 2-2. VMware Tools Packages

Description	Packages
VMware Tools with graphics components	`vmware-tools-esx-kmods-`*`kernel_type`* `vmware-tools-esx`
VMware Tools without graphics components	`vmware-tools-esx-kmods-`*`kernel_type`* `vmware-tools-esx-nox`

VMware Tools Operating System Specific Installation Packages

VMware provides installation packages for each supported guest operating system environment. The sequence of package installation remains the same regardless of the environment on which the virtual machine is running.

VMware Tools Kernel Module Packages

The VMware Tools kernel module packages are installed in the `/lib/modules` directory on the virtual machine after dependencies have been resolved.

NOTE RHEL 5 and RHEL 6 kernel module packages use a different naming convention than the names shown in the following table. For example, instead of `vmware-tools-`*`module`*`-kmp-`*`kernel_type`*, RHEL 5 and 6 use `kmod-vmware-tools-`*`module`*`-`*`kernel_type`*, where *module* is the module name and *kernel_type* is the type of kernel installed on the virtual machine.

Ubuntu kernel module packages also use a different naming convention than the names shown in the following table. For example, instead of `vmware-tools-`*`module`*`-kmp-`*`kernel_type`*, Ubuntu uses `vmware-tools-`*`module`*`-modules-`*`kernel_type`*.

Table 2-3. VMware Tools Kernel Module Packages

Package	Description
`vmware-tools-esx-kmods-`*`kernel_type`*	Installs all the required VMware Tools kernel module packages for a particular kernel. This meta-package depends on the default set of kernel module packages for the kernel type specified with *kernel_type*. This package does not install the user space components needed for VMware Tools functionality. You must separately install the user space packages that match your needs. To view the full list of packages that this package installs, use your package manager to show the dependencies of this package. Typically, this meta-package is run with the `vmware-tools-esx` or `vmware-tools-esx-nox` package to create a complete VMware Tools OSP installation on the system.
`vmware-tools-vmblock` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmblock` for the running kernel.
`vmware-tools-vmblock-common`	Contains the common files used by all `vmblock` Kernel Module Packages. These files include the common configuration and setup scripts responsible for loading a `vmblock` kernel module.
`vmware-tools-vmblock-kmp-`*`kernel_type`*	The `vmblock` kernel module built for the particular kernel type.
`vmware-tools-vmci` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmci`.
`vmware-tools-vmci-common`	Contains the device driver for the Virtual Machine Communication Interface (VMCI) device. This PCI device provides high-speed communication between the virtual machine and its hypervisor or host applications, as well as between virtual machines that reside on the same host. VMCI does not rely on guest networking.
`vmware-tools-vmci-kmp-`*`kernel_type`*	The `vmci` kernel module built for the particular kernel type.
`vmware-tools-vmhgfs` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmhgfs`.
`vmware-tools-vmhgfs-common`	The `vmhgfs` driver is the Host-Guest File System client that provides a file system interface, using a specific namespace, that allows guest user applications to perform file operations, access files, or create new files that reside on the host. The `vmhgfs` driver communicates with the Host-Guest File System server that runs on the host.

Table 2-3. VMware Tools Kernel Module Packages (Continued)

Package	Description
`vmware-tools-vmhgfs-kmp-`*`kernel_type`*	The `vmhgfs` kernel module built for the particular kernel type.
`vmware-tools-vmmemctl` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmmemctl`.
`vmware-tools-vmmemctl-common`	Contains the common configuration and setup scripts responsible for loading the `vmmemctl` kernel module. These files are used by all `vmmemctl-kmp` packages.
`vmware-tools-vmmemctl-kmp-`*`kernel_type`*	The `vmmemctl` kernel module built for the particular kernel type.
`vmware-tools-vmxnet` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmhgfs`.
`vmware-tools-vmxnet-common`	Contains the VMware `vmxnet` Virtual Ethernet driver.
`vmware-tools-vmxnet-kmp-`*`kernel_type`*	The `vmxnet` kernel module built for the particular kernel type.
`vmware-tools-vmxnet3` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmxnet3`.
`vmware-tools-vmxnet3-common`	Contains the VMware `vmxnet3` virtual NIC driver.
`vmware-tools-vmxnet3-kmp-`*`kernel_type`*	The `vmxnet3` kernel module built for the particular kernel type.
`vmware-tools-pvscsi` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `pvscsi`.
`vmware-tools-pvscsi-common`	Contains the `pvscsi` kernel module. Paravirtual SCSI (PVSCSI) adapters are high-performance storage adapters that can generate greater throughput and lower CPU utilization. PVSCSI adapters are best suited for high-performance storage environments. For more information on PVSCSI adapters, see the *vSphere Basic System Administration Guide*.
`vmware-tools-pvscsi-kmp-`*`kernel_type`*	The `pvscsi` kernel module built for the particular kernel type.
`vmware-tools-vmsync` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmsync`.
`vmware-tools-vmsync-common`	The `vmsync` kernel module provides functions used by VMware Tools to freeze I/O to mounted file systems and flush any in-memory data to disk. These functions are used when virtual machines are quiesced.
`vmware-tools-vmsync-kmp-`*`kernel_type`*	The `vmsync` kernel module built for the particular kernel type.
`vmware-tools-vsock` (SRPM)	Lets you build binary Kernel Module Packages (kmps) for `vmsock`.
`vmware-tools-vsock-common`	Contains the VMCI sockets kernel module, which provides an interface similar to the Berkeley UNIX sockets interface for using the VMCI device. VMCI sockets allows for socket-based communication between processes in the virtual machine and on the host, as well as between processes running on different virtual machines.
`vmware-tools-vsock-kmp-`*`kernel_type`*	The `vsock` kernel module built for the particular kernel type.

Table 2-4. VMware Tools Guest SDK Package

Package	Description
`vmware-tools-guestsdk`	Provides the header files and documentation needed to develop applications that interact with VMware Tools libraries.

VMware Tools Plug-in Packages

VMware Tools plug-in packages provide plug-ins that are used with the VMware Tools daemon, `vmtoolsd`. The plug-ins provide functions such as drag-and-drop operations, time synchronization, and clean shutdown and power operations.

Table 2-5. VMware Tools Services Plug-ins

Package	Description
`vmware-tools-plugins-autoUpgrade`	Provides the `autoUpgrade` plug-in, which allows VMware Tools to be upgraded automatically, based on host settings. This plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-plugins-deployPkg`	Ccontains a plug-in that is used with the VMware Tools daemon, `vmtoolsd`. This plug-in enables image customization, which allows the host to customize virtual machine images.
`vmware-tools-plugins-guestInfo`	Provides a plug-in that collects guest configuration and state information, such as storage capacity and networking state, and makes the information available via the vSphere SDK. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-plugins-hgfsServer`	Contains a plug-in that provides the Host-Guest File System file server for the virtual host's Host-Guest File System client file copy library. This library allows the virtual host to perform file copy operations to and from the guest. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-plugins-powerOps`	Contains a plug-in that provides the soft power operations feature. This feature allows clean power off and provides hooks to execute scripts when the virtual machine powers on, powers off, suspends, and resumes. The plug-in is used with the VMware Tools daemon, `vmtoolsd`
`vmware-tools-plugins-timeSync`	Provides the `timeSync` plug-in, which maintains the correct time in the guest operating system in the absence of an NTP server. It also synchronizes guest time with the host at startup and after resume. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-plugins-vix`	Contains a plug-in that provides the guest management operations feature for the vSphere Web Services SDK and the VMware VIX API. This feature includes file copy operations to and from the guest, process management, and similar guest operations. For more information about guest operations, see the reference guides for the VMware VIX API and the `GuestOperationsManager` object of the vSphere Web Services SDK. This plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-plugins-vmbackup`	Provides the `vmbackup` plug-in, which delivers functionality for quiescing applications and file systems in the guest operating system so that the virtual machine is in a consistent state when you create snapshots or backups. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
`vmware-tools-services`	Provides the fundamental applications that VMware Tools needs to function. This package includes the pivotal VMware Tools daemon, `vmtoolsd`, which allows the majority of services to function in guest operating systems. It also includes the command line version of the VMware toolbox to adjust settings within tools, and it includes a few other libraries needed for functionality.

Table 2-6. VMware Tools User Plug-ins

Package	Description
vmware-tools-plugins-desktopEvents	Provides a plug-in that handles desktop events. The plug-in maps SIGUSR2 to a reload executable handler and defines an X I/O error handler that provides a clean shutdown. It also includes session-locking code to ensure that only one instance of the container is connected to the current X display. This plug-in is used with the VMware Tools daemon, `vmtoolsd`.
vmware-tools-plugins-dndcp	Provides the guest user-level agent plug-in, which provides drag-and-drop and copy-and-paste operations. Various formats are supported, including file, text, rtf, and image. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
vmware-tools-plugins-resolutionSet	This plugin adjusts the guest's virtual monitor to match the window in which the virtual monitor is displayed. The plug-in is used with the VMware Tools daemon, `vmtoolsd`
vmware-tools-plugins-unity	Enables integration between hosts and guests, eliminating the need for a separate window for the virtual machine. The plug-in is used with the VMware Tools daemon, `vmtoolsd`.
vmware-tools-user	Enhances the host-guest UI experience by providing additional host-guest features. A VMware user can match the screen resolution between host and guest. This package also enables drag-and-drop copy operations between the guest and host on systems where host-guest drag-and-drop is supported.

VMware Tools Packages Without Graphics Components

The VMware Tools packages without graphics (X Window) support are designed for Linux servers that do not need to provide windows output or accept user input from desktop devices.

Table 2-7. VMware Tools Packages Without Graphics Components

Package	Description
vmware-tools-core	Contains all essential applications and libraries needed by VMware Tools to function. This package includes all components that are a part of the VMware Tools critical path.
vmware-tools-foundation	Provides a sanity check for the VMware Tools installation, ensuring that no other installations of VMware Tools are present. This package also adds critical data to the VMware Tools database file.
vmware-tools-guestlib	Provides a library for the guest operating system.
vmware-tools-help	Contains the help-related documentation for VMware Tools.
vmware-tools-hgfs	Provides the applications and libraries that enable and use the Host-Guest Filesystem. NOTE The Host-Guest Filesystem is a feature that is limited to Workstation and Fusion virtual environments. It does not function in ESXi virtual environments.
vmware-tools-libraries-nox	Contains the libraries not related to XOrg that are used by the applications included with VMware Tools if the system libraries are insufficient. The libraries provided by this package are used if the native libraries included in the guest operating system are not recent enough to run the VMware Tools applications.
vmware-tools-esx-nox	Installs a lightweight version of the VMware Tools OSPs on a system without support for X Windows. This meta-package creates the dependencies to properly install VMware Tools, but it provides only the command-line based applications included with VMware Tools. It does not include graphical applications or their associated libraries.
vmware-tools-thinprint	Contains the guest services that enable virtual printing with Thinprint. The Thinprint guest services communicate with the Thinprint component on the host through a virtual serial port or an RDP/PCoIP channel to automatically discover printers configured on the host, as well as to pass down print jobs to the host Thinprint component.

VMware Tools Packages With Graphics Components

The VMware Tools packages with graphics (X Window) support are designed for Linux virtual machines that must provide windows output and accept user input from desktop devices.

Table 2-8. VMware Tools Packages With Graphics Components

Package	Description
`vmware-tools-esx`	Installs a full user space installation of the VMware Tools OSPs. This meta-package establishes dependencies on the other user space packages needed to create a user space installation. This meta-package does not install the VMware Tools kernel module packages needed by the user space components. You must install the appropriate kernel module packages separately. To view the full list of packages that this meta-package installs, use your package manager to show the dependencies of this package.
`vmware-tools-libraries-x`	Contains the libraries related to XOrg that are used by the applications included with VMware Tools if the system libraries are insufficient. The libraries provided by this package are used if the native libraries included in the guest operating system are not recent enough to run the VMware Tools applications.

Table 2-9. VMware Tools Xorg Packages

Package	Description
`vmware-tools-xorg-drv-display`	Contains the XOrg display driver that is used in VMware virtual machines. When this driver is used with VMware Tools, it optimizes 2D graphics performance and enables a number of features such as unity, guest autofit, and multi-monitor full screen.
`vmware-tools-xorg-drv-mouse`	Contains the XOrg mouse driver that is used in VMware virtual machines. This driver ensures that the mouse pointer movement in the guest is consistent with the host pointer movement, with minimal latency.

Installing VMware Tools OSPs 3

The guest operating system you are using determines the VMware Tools installation processes that you perform.

This chapter includes the following topics:

Distribution Supplied Display and Mouse Packages

VMware Tools OSPs contain meta packages that manage the installation of the driver packages and that provide the mouse and display drivers for ESXi.

Distribution-supplied packages that provide mouse and display drivers for ESXi take precedence over the same drivers supplied by the VMware Tools OSP packages. The precedence assumes that the distribution-supplied packages function as expected and that the drivers were configured properly to manage the display and mouse.

Distribution Supplied Kernel Module Packages

By default, certain VMware Tools kernel modules are provided within the native RHEL 6, SLES 11 SP1, SLED 11 SP1, SLES 11 SP2, SLED 11 SP2, and Ubuntu kernel packages.

Operating System Package	Corresponding VMware Tools Package
`vmxnet3`	`vmware-tools-vmxnet3`
`vmw_pvscsi`	`vmware-tools-pvscsi`
`vmware_balloon`	`vmware-tools-vmmemctl`

NOTE The `vmware_balloon` kernel module is included in the kernel packages distributed with RHEL 6 and later and all kernels 2.6.34 and later.

When you install the VMware Tools packages, the VMware provided packages are not installed by default. The distribution provided packages work with the other VMware Tools packages for any given kernel distribution. To replace these packages with the corresponding VMware Tools provided packages, use the `zypper` command for SUSE distributions or the `apt` command for Ubuntu distributions. For instructions on overriding the distribution supplied VMware modules on RHEL 6, see "Install VMware Tools for RHEL 6, RHEL 5, CentOS 6, and CentOS 5 Guest Operating Systems," on page 22.

Installing VMware Tools Using OSPs on a RHEL 6, RHEL 5, CentOS 6, and CentOS 5 Virtual Machine

When you use a package manager to install VMware Tools, you import the VMware Packaging Public Keys, edit the proxy, and configure the software. Editing the proxy is optional.

Register RHEL 6 and RHEL 5 with the Red Hat Network

To access additional RHEL 6 or RHEL 5 packages, register your RHEL 6 or RHEL 5 virtual machine with the Red Hat Network.

Procedure

- Follow the instructions in your Red Hat operating system documentation to register the RHEL 6 or RHEL 5 virtual machine with your Red Had Network.

Prepare to Install OSPs for RHEL 6, RHEL 5, CentOS 6, and CentOS 5 Guest Operating Systems

Before you install OSPs with a package manager, you must import VMware packaging key files, create and edit a repository file, and take other steps to prepare for the installation.

The OSPs are located on the VMware Tools packages Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For the complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

   a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

   b Use a Web browser to download all the VMware Public Packaging Public Keys from the http://packages.vmware.com/tools/keys directory.

   c Save the key files to the directory you created.

   d For each key that you download, run the following command to import the key.

   ```
   # rpm --import /key_path/key_name
   ```

   key_path is the directory in which you saved the keys.

   key_name is the filename of a key.

2 (Optional) Set up the proxy server information in `/etc/yum.conf`.

   For example:

   ```
   proxy=http://squid.example.com:3128
   proxy_username=proxyuser
   proxy_password=proxypass
   ```

3 Create and edit the VMware repository directory and file.

   If it does not exist, create the directory and repository file on the virtual machine. You can select any name for this file, but it must use the `.repo` file extension.

   For example:

   ```
   /etc/yum.repos.d/vmware-tools.repo
   ```

4 Add the following contents to the repository file and save.

   ```
   [vmware-tools]
   name=VMware Tools
   baseurl=http://packages.vmware.com/tools/esx/esxi-version/dist/arch
   enabled=1
   gpgcheck=1
   ```

   esxi-version is the ESXi version. For example: `5.1` or `5.0u1`.

   dist is `rhel5` or `rhel6`.

   arch the architecture option for 32-bit is i386 and for 64-bit is x86_64.

   CentOS 5 uses the rhel5 baseurl.

As an alternative to steps Step 3 and Step 4, you can download the repository configuration package for your distribution from the `http://packages.vmware.com/tools/esx/esxi-version/repos` directory, where *esxi-version* is your ESXi version. For example: `5.1` or `5.0u1`.

Select the proper architecture for your distribution. For example, in the ESXi 5.0 release, for a RHEL 5 distribution on a 64-bit system, you might select `vmware-tools-repo-RHEL5-8.6.0-0.x86_64`. For a RHEL 5 distribution on a 32-bit system, you might select `vmware-tools-repo-RHEL5-8.6.0-0.i686`.

Install VMware Tools for RHEL 6, RHEL 5, CentOS 6, and CentOS 5 Guest Operating Systems

RHEL 6, RHEL 5, CentOS 6, and CentOS 5 use the yum package management tool. When you specify the VMware Tools package, the yum package management tool installs any required additional packages.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Prerequisites

- Verify that you completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you completed the tasks described in "Prepare to Install OSPs for RHEL 6, RHEL 5, CentOS 6, and CentOS 5 Guest Operating Systems," on page 20.

Procedure

1 Open a command window in the guest operating system.

2 Run the `` `uname -r` `` command to identify the type of kernel that is installed on the virtual machine.

For example, the `` `uname -r` `` command might display `2.6.18-53.el5-PAE`, where `2.6.18-53.el5` is the kernel and `PAE` is the kernel type.

Kernel types can be `PAE` or `pae`. In RHEL kernels, if the default type is installed, no type is displayed.

3 Run the `yum` command.

```
# yum install vmware-tools-esx-kmods-kernel_type vmware-tools-esx
```

For example, if a PAE kernel is installed, use `vmware-tools-esx-kmods-PAE`. If a default kernel is installed and no type is displayed, use `vmware-tools-esx-kmods`.

You must list `vmware-tools-esx-kmods-`*`kernel_type`* first to resolve the kernel modules packages first. After the kernel dependencies are satisfied, dependencies among the remaining packages are resolved, and all the other packages are installed in the correct order.

4 Restart the virtual machine.

On RHEL 6, the following packages are not installed by default, as they are provided by the kernel:

- `vmware-tools-vmxnet3`
- `vmware-tools-pvscsi`
- `vmware-tools-vmmemctl`

You can install the VMware Tools provided packages to replace the corresponding kernel-provided packages.

On RHEL 5, RHEL 6, and later, modules supplied by the kernel take precedence over modules that are weakly versioned. For information, see "Weak Versioning for VMware Tools OSPs," on page 8.

To replace these packages, you must recompile the modules from source and install the resulting packages. See "Build the Binary Kernel Module Packages for RHEL 6, RHEL 5, CentOS 6, and CentOS 5," on page 35.

IMPORTANT The distribution-provided packages function with VMware Tools. Take this step only if you have a specific reason to do so.

What to do next

To verify the installation, follow the instructions in "Verify VMware Tools Installation," on page 33.

Installing VMware Tools Using OSPs on a RHEL 4, CentOS 4, and RHEL 3 Virtual Machine

Package management tools such as yum are not currently supported for RHEL 4, CentOS 4, and RHEL 3. You must install the VMware Tools packages manually.

Download OSPs for the RHEL 4, CentOS 4, and RHEL 3 Guest Operating Systems

You must download all of the packages for a given distribution and architecture to the virtual machine on which you plan to install VMware Tools.

The OSPs are located on the VMware Tools packages Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For the complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

   a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

   b Use a Web browser to download the VMware Public Packaging DSA Public Key file, `VMWARE-PACKAGING-GPG-DSA-KEY.pub`, from the http://packages.vmware.com/tools/keys directory.

   c Save the files to the directory you created.

   d For each key that you download, run the following command to import the key.

   ```
   # rpm --import /key_path/key_name
   ```

   key_path is the directory in which you saved the keys.

   key_name is the filename of a key.

2 Browse to the ESXi repository on the VMware Tools packages Web site: `http://packages.vmware.com/tools/esx/esxi-version`.

   Replace *esxi-version* with your ESXi version. For example: `5.1` or `5.0u1`.

3 Select the subdirectory for your operating system.

   CentOS 4 uses the `rhel4` VMware Tools packages.

4 Select the subdirectory that contains the packages for your virtual machine's architecture.

Option	Description
x86_64/	64-bit packages
i386/	32-bit packages

5 Create a directory for the packages on the virtual machine where you plan to install VMware Tools.

   /vmware-tools-path/

6 Download the packages to the directory you created.

Install VMware Tools for RHEL 4, CentOS 4, and RHEL 3 Guest Operating Systems

You must manually run rpm commands to install VMware Tools on RHEL 4, CentOS 4, and RHEL 3 virtual machines.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

NOTE When you install VMware Tools OSPs on a 64-bit RHEL 3 u9 AS distribution, you cannot change the screen resolution to a higher value than 800 x 600.

Prerequisites

- Verify that you completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you completed the tasks described in "Download OSPs for the RHEL 4, CentOS 4, and RHEL 3 Guest Operating Systems," on page 23.

Procedure

1 From the virtual machine command line, back up the SVGA driver.

Option	Description
32-bit	`# cp /usr/X11R6/lib/modules/drivers/vmware_drv.o /usr/X11R6/lib/modules/drivers/vmware_drv.o.backup`
64-bit	`# cp /usr/X11R6/lib64/modules/drivers/vmware_drv.o /usr/X11R6/lib64/modules/drivers/vmware_drv.o.backup`

2 Install the VMware Tools packages.

```
# rpm -ivh --force vmware-tools-*.rpm
```

When this command runs, all of the other packages are installed in the correct order. This command installs kernel module packages for all the available kernels, which ensures that the packages required for the running kernel are installed.

What to do next

To verify the installation, follow the instructions in "Verify VMware Tools Installation," on page 33.

Installing VMware Tools Using OSPs on a SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, and SLED 11 Virtual Machine

When you use a package manager to install VMware Tools, you import the VMware Packaging Public Keys, edit the proxy, and configure the software. Editing the proxy is optional.

Prepare to Install OSPs for SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, and SLED 11 Guest Operating System

Before you install OSPs with a package manager, you must import VMware packaging key files, create and edit a repository file, and take other steps to prepare for the installation.

The OSPs are located on the VMware Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For the complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

   a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

   b Use a Web browser to download all the VMware Public Packaging Public Key files from the http://packages.vmware.com/tools/keys directory.

   c Save the files into the directory you created.

   d For each key that you download, run the following command to import the key.

   ```
   # rpm --import /key_path/key_name
   ```

   key_path is the directory in which you saved the keys.

   key_name is the filename of a key.

2 (Optional) Configure the proxy.

   ```
   # export http_proxy=http://squid.example.com:3128
   ```

3 Create and edit the VMware zypper repository.

   a Add the yum style repository as a zypper service.

   You must type the entire command.

   ```
   # zypper addservice
    --type=YUM http://packages.vmware.com/tools/esx/esxi-version/dist/arch
    vmware-tools-collection
   ```

   esxi-version is the ESXi version. For example: `5.1` or `5.0u1`.

   dist is `sles11.2`, `sles11.1`, or `sles11.0`.

   arch. The architecture option for 32-bit is `i586` and for 64-bit is `x86_64`.

   b Verify the repository configuration.

   ```
   # zypper packages vmware-tools-collection
   ```

As an alternative to creating and editing the VMware zypper repository, you can download the repository configuration package for your distribution from the `http://packages.vmware.com/tools/esx/esxi-version/repos` directory.

Replace *esxi-version* with your ESXi version. For example: `5.1` or `5.0u1`.

Select the proper architecture for your distribution. For example, in the ESXi 5.0 release, for a SLES 11 SP1 distribution on a 64-bit system, you might select `vmware-tools-repo-SLES11.1-8.6.0-0.x86_64`. For a SLES 11 SP1 distribution on a 32-bit system, you might select `vmware-tools-repo-SLES11.1-8.6.0-0.i586`.

Install VMware Tools for SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, and SLED 11 Guest Operating Systems

Use the zypper package management tool to install VMware Tools on a SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, or SLED 11 virtual machine. When you specify the VMware Tools package, zypper installs any additional required packages.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Prerequisites

- Verify that you completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you completed the tasks described in "Prepare to Install OSPs for SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, and SLED 11 Guest Operating System," on page 24.

Procedure

1. Open a command window in the guest operating system.
2. Run the `` `uname -r` `` command to identify the type of kernel that is installed on the virtual machine.

   This command displays the kernel and kernel type. Kernel types can be `default`, `pae`, or `vmi`.
3. Run the following command to install the VMware Tools package.

   ```
   # zypper install vmware-tools-collection vmware-tools-esx-kmods-kernel_type vmware-tools-esx
   ```

   For example, if the *kernel_type* is `default`, use `vmware-tools-esx-kmods-default` in the command.

   When you run this command, all of the other packages are automatically installed in the correct order.
4. (Optional) On SLES 11 SP2, SLES 11 SP1, SLED 11 SP2, or SLED 11 SP1, install certain VMware Tools provided packages to replace the corresponding system-provided packages.

   IMPORTANT The distribution-provided packages function with VMware Tools. Install these packages only if you have a specific reason to do so.

   - `vmware-tools-vmxnet3`
   - `vmware-tools-pvscsi`

When you install the VMware Tools packages for SLES 11 SP1, SLES 11, and SLED 11, the following message appears:

```
The following packages are not supported by their vendor: package names
```

The message varies depending on which version of VMware Tools you have installed. You can safely ignore this message.

What to do next

To verify the installation, follow the instructions in "Verify VMware Tools Installation," on page 33.

Installing VMware Tools Using OSPs on a SLES 10 and SLED 10 Virtual Machine

When you use a package manager to install VMware Tools, you import the VMware Packaging Public Keys, edit the proxy, and configure the software. Editing the proxy is optional.

Prepare to Install OSPs for the SLES 10 and SLED 10 Guest Operating System

Before you install OSPs with a package manager, you must import VMware packaging key files, create and edit a repository file, and take other steps to prepare for the installation.

The OSPs are located on the VMware Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For a complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

   a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

   b Use a Web browser to download all the VMware Public Packaging Public Key files from the http://packages.vmware.com/tools/keys directory.

   c Save the files into the directory you created.

   d For each key that you download, run the following command to import the key.

   ```
   # rpm --import /key_path/key_name
   ```

   key_path is the directory in which you saved the keys.

   key_name is the filename of a key.

2 (Optional) Configure the proxy using the rug command.

```
# rug set-prefs proxy-url http://squid.example.com:3128
```

3 Create and edit the VMware rug repository.

   a Add the yum style repository as a rug service.

   ```
   # rug service-add
    --type=YUM http://packages.vmware.com/tools/esx/esxi-version/sles10/arch
   vmware-tools-collection
   ```

   esxi-version is the ESXi version. For example: `5.1` or `5.0u1`.

   arch. The architecture option for 32-bit is i586 and for 64-bit is x86_64.

   b Verify the repository configuration.

   ```
   # rug packages vmware-tools-collection
   ```

4 Subscribe to the rug catalog.

```
# rug subscribe -a
```

Install VMware Tools for the SLES 10 and SLED 10 Guest Operating System

Use the rug package management tool to install VMware Tools on a SLES 10 and SLED 10 virtual machine. When you specify the VMware Tools package, rug installs any additional required packages.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Prerequisites

- Verify that you completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you completed the tasks described in "Prepare to Install OSPs for the SLES 10 and SLED 10 Guest Operating System," on page 27.

Procedure

1. Open a command window in the guest operating system.
2. Run the `` `uname -r` `` command to identify the type of kernel that is installed on the virtual machine.

   This command displays the kernel and kernel type.

   Kernel types can be `default`, `smp`, `bigsmp`, `vmi`, or `vmipae`.
3. Run the following command to install the VMware Tools packages.

   ```
   # rug install -c vmware-tools-collection vmware-tools-esx-kmods-kernel_type vmware-tools-esx
   ```

   For example, if the *kernel_type* is `default`, use `vmware-tools-esx-kmods-default` in the command.

All of the other packages are installed in the correct order.

What to do next

To verify the installation, follow the instructions in "Verify VMware Tools Installation," on page 33.

Installing VMware Tools Using OSPs on a SLES 9 Virtual Machine

Package management tools such as rug are not currently supported for SLES 9. You must install the VMware Tools packages manually.

Download OSPs for the SLES 9 Guest Operating System

You must download all of the packages for a given distribution and architecture to the virtual machine on which you plan to install VMware Tools.

The OSPs are located on the VMware Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For a complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

b Use a Web browser to download the VMware Public Packaging DSA Public Key file, `VMWARE-PACKAGING-GPG-DSA-KEY.pub`, from the http://packages.vmware.com/tools/keys directory.

c Save the files into the directory you created.

d For each key that you download, run the following command to import the key.

```
# rpm --import /key_path/key_name
```

key_path is the directory in which you saved the keys.

key_name is the filename of a key.

2 Browse to the ESXi repository at `http://packages.vmware.com/tools/esx/esxi-version/sles9.x`.

esxi-version is the ESXi version. For example: `5.1` or `5.0u1`.

x is the minor SLES 9 release number such as SLES 9.1.

For example: `http://packages.vmware.com/tools/esx/5.1/sles9.1`

3 Select the subdirectory that contains the packages for your virtual machine's architecture.

Option	Description
x86_64/	64-bit packages
i586/	32-bit packages

4 Create a directory for the packages on the virtual machine on which you plan to install VMware Tools.

/vmware-tools-path/

5 Download the packages to the directory you created.

Install VMware Tools for the SLES 9 Guest Operating System

You must manually run rpm commands to install VMware Tools on a SLES 9 virtual machine.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Prerequisites

- Verify that you have completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you have completed the tasks described in "Download OSPs for the SLES 9 Guest Operating System," on page 28.

Procedure

1 (Optional) From the virtual machine command line, back up the SVGA driver from SUSE.

Option	Description
32-bit	`# cp /usr/X11R6/lib/modules/drivers/vmware_drv.o /usr/X11R6/lib/modules/drivers/vmware_drv.o.backup`
64-bit	No SVGA driver is provided by SUSE.

2 Run the following command to install the VMware Tools packages.

```
# rpm -ivh --force vmware-tools-*.rpm
```

When you run this command, all of the other packages are installed in the correct order.

When you install the VMware Tools packages for SLES 9, the following message appears.

```
Warning "vmware-tools-8.3.0-206098.el4.i686.rpm: V3 RSA/MD5 signature: NOKEY, key ID 66fd4949."
```

You can safely ignore this message.

What to do next

To verify the installation, follow the instructions in "Verify VMware Tools Installation," on page 33.

Installing VMware Tools Using OSPs on an Ubuntu Virtual Machine

When you use a package manager to install VMware Tools, you import the VMware Packaging Public Keys, edit the proxy, and configure the software. Editing the proxy is optional.

Prepare to Install OSPs for the Ubuntu Guest Operating System

Before you install OSPs with a package manager, you must import VMware packaging key files, create and edit a repository file, and take other steps to prepare for the installation.

The OSPs are located on the VMware Web site at http://packages.vmware.com/tools.

NOTE Do not use the OSPs in the `/latest/` directory on the VMware Tools packages Web site. The OSPs in the `/latest/` directory are for informational purposes only and do not work with the operating system package manager.

Prerequisites

Locate the directory that corresponds to your ESXi release and the operating system on which you want to install the OSPs. For a complete list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Procedure

1 Obtain and import the VMware Packaging Public Keys.

   a Create a directory on the virtual machine to store the VMware Packaging Public Keys.

   b Use a Web browser to download all the VMware Public Packaging Public Key files from the http://packages.vmware.com/tools/keys directory.

   c Save the files to the directory you created.

   d For each key that you download, run the following command to import the key.

   ```
   $ sudo apt-key add /key_path/key_name
   ```

   key_path is the directory in which you saved the keys.

   key_name is the filename of a key.

2 (Optional) Configure the proxy from the guest operating system on the virtual machine where you plan to install VMware Tools.

   a (Optional) Create a configuration file.

   b Add the following contents to the `/etc/apt/apt-get conf` file.

   ```
   ACQUIRE {http::proxy "http://[[user][:pass]@]host[:port]/"
   }
   ```

   For example:

   ```
   ACQUIRE {http::proxy "http://proxyuser:proxypass@proxy.proxyprovider.com:3128"
   }
   ```

3 Create and edit the VMware repository directory and file.

   a (Optional) If it does not exist, create the directory and repository file on the virtual machine

   You can select any name for this file, but it must use the `.list` file extension.

   For example: `/etc/apt/sources.list.d/vmware-tools.list`.

   b Add the following contents to the repository file and save the file.

   `deb http://packages.vmware.com/tools/esx/`*`esxi-version`*`/ubuntu `*`dist`*` main`

   esxi-version is the ESXi version. For example: `5.1` or `5.0u1`.

   The configuration syntax is specific to each operating system version. Replace *dist* with `precise` for Ubuntu 12.04, `oneiric` for Ubuntu 11.10, `natty` for Ubuntu 11.04, `maverick` for Ubuntu 10.10, `lucid` for Ubuntu 10.04, `karmic` for Ubuntu 9.10, `jaunty` for Ubuntu 9.04, `intrepid` for Ubuntu 8.10, and `hardy` for Ubuntu 8.04.

   NOTE For Ubuntu 12.04 and later releases, OSPs will support Long Term Support (LTS) releases only.

   c Update the local repository cache.

   ```
   $ sudo apt-get update
   ```

   This command lists the packages available for downloading and updates that are listed on the VMware Web site.

As an alternative to creating and editing the VMware repository directory and file, you can download the repository configuration package for your distribution from the `http://packages.vmware.com/tools/esx/`*`esxi-version`*`/repos` directory.

Replace *esxi-version* with your ESXi version. For example: `5.1` or `5.0u1`.

Make sure to select the proper architecture for your distribution. For example, in the ESXi 5.0 release, for an Ubuntu 10.10 distribution on a 64-bit system, you might select `vmware-tools-repo-ubuntu10.10_8.6.0_amd64.deb`. For an Ubuntu 10.10 distribution on a 32-bit system, you might select `vmware-tools-repo-ubuntu10.10_8.6.0_i386.deb`.

Install VMware Tools for Ubuntu Guests

Use the apt-get package management tool to install VMware Tools on an Ubuntu virtual machine. When you specify the VMware Tools package, apt-get installs any additional required packages.

For a list of packages to install, see "VMware Tools Operating System Specific Installation Packages," on page 14.

Starting with Ubuntu 8.10, `open-vm-tools` is packaged with the multiverse repository. VMware does not support the use of these packages in VMware virtual machines. You must remove Ubuntu `open-vm-tools` packages if they are installed and verify that you uninstalled them. For details, see "Ubuntu 8.10 OSP Installation Exception," on page 12.

NOTE If the kernel version on the virtual machine does not match the version provided with the VMware Tools OSPs, you must install customized kernel module packages. See "Build Customized Kernel Module Packages for Ubuntu," on page 39.

Prerequisites

- Verify that you completed the tasks described in Chapter 2, "Preparing for VMware Tools OSP Installation," on page 11.
- Verify that you completed the tasks described in "Prepare to Install OSPs for the Ubuntu Guest Operating System," on page 30.
- For Ubuntu 8.10, you must configure your system to allow the `apt-get` package manager to use the correct Ubuntu repository. See "Configure Ubuntu 8.10 Systems to Use the Correct Repository," on page 39.

Procedure

1 Identify the kernel module for the Ubuntu operating system from the command line.

```
$ `uname -r`
```

This command returns the kernel and one of the following kernel types:

- `generic`
- `server`
- `virtual`
- `generic-pae`

2 Install the kernel modules for the kernel version and type.

For example:

```
$ sudo apt-get install vmware-tools-esx-kmods-kernel_release
```

kernel_release is the kernel release and type returned by the `` `uname -r` `` command.

3 Install the remaining components.

```
$ sudo apt-get install vmware-tools-esx
```

To install the remaining components without graphics support, use the following command:

```
$ sudo apt-get install vmware-tools-esx-nox
```

4 (Optional) Install certain VMware Tools provided packages to replace the corresponding system-provided packages.

Package	Distribution
vmware-tools-vmxnet3	10.04, 10.10, 11.04, 11.10, 12.04
vmware-tools-pvscsi	10.04, 10.10, 11.04, 11.10, 12.04
vmware-tools-vmmemctl	10.10, 11.04, 11.10, 12.04

For example: `$ sudo apt-get install vmware-tools-pvscsi-modules-` `` `uname -r` ``

IMPORTANT The system-provided packages function with VMware Tools. Take this step only if you have a specific reason to do so.

All of the required packages are installed in the correct order.

Verify VMware Tools Installation

After you install OSPs and reboot the virtual machine, verify that VMware Tools are installed and functioning properly.

Procedure

1 Verify that the VMware Tools daemon, `vmtoolsd`, is running.

```
$ pgrep –fl vmtoolsd
```

2 Verify that the required kernel modules load properly.

```
$ /sbin/lsmod
```

The `vmmemctl` kernel module is always loaded. The `vmxnet`, `vmxnet3`, and `pvscsi` modules are loaded only when the virtual machine is configured with the corresponding device.

NOTE If the distribution has a `vmxnet3`, `pvscsi`, or `vmmemctl` kernel driver, the drivers are not updated when you install operating system-specific packages.

Status of VMware Tools in vSphere Client

After VMware Tools OSPs are installed on a guest, the VMware vSphere Client reports the status of VMware Tools for that guest as **3rd-party/Independent**. This status indicates that OSPs are installed. In this situation, do not attempt to install the standard VMware Tools through the VMware vSphere Client.

Installing Customized Kernel Module Packages

4

VMware Tools OSPs work with unmodified kernels from your operating system distributor, but also allow you to use customized kernels. When customized kernels are similar enough to the distributor kernel, OSPs function by using kernel module source packages. Kernel module source packages are packages in standard distributor format, source RPM files, and kernel source Deb files.

Prerequisites

Verify that the required packages, such as `gcc`, `kernel-source/headers/devel`, `rpm-build`, and `redhad-rpm-config` packages, are installed. SUSE distributions do not require packages.

Procedure

1 Unpack and recompile the `rpm` or `deb` source packages with your own kernel into usable binary packages.

2 (Optional) If you do not want to install these dependencies on the guest, use a staging host for compilation.

3 Distribute the resulting binary packages to the target guest.

This chapter includes the following topics:

Building Customized Kernel Module Packages for Red Hat Enterprise Linux and SUSE Linux Enterprise Distributions

The rpm-based distributions include RHEL 3 through 6, SLES 9 through 11 SP2, SLED 10 through 11 SP2, and CentOS 4 through 6. You can build customized binary kernel module packages for these distributions.

Build the Binary Kernel Module Packages for RHEL 6, RHEL 5, CentOS 6, and CentOS 5

For VMware Tools to function properly, you can use the VMware provided source packages to create binary packages for specific kernels .

NOTE The `vmsync` and `vmhgfs` kernel module packages are optional components.

Procedure

1 Download the following ESXi kmod source packages from the repository.

`vmware-tools-`*`module-version`*`.src.rpm`

module is the kernel module package.

version is the version for the tools and the package.

Find the packages at `http://packages.vmware.com/tools/esx/esxi-version/dist/SRPMS`

Replace *esxi-version* with the ESXi version. For example: `5.1` or `5.0u1`.

Replace *dist* with `rhel6` or `rhel5`.

2 Install `yum-utils`.

```
# yum install yum-utils
```

`yum-utils` provides `yum-builddep`.

3 Run the `yum-builddep` command to meet build dependencies.

```
# yum-builddep vmware-tools-module-version.src.rpm
```

4 Run the following command to compile the source packages into binary packages.

NOTE When you run the `rpmbuild` command, if you rebuild the `vsock` or `vmhgfs` packages, you must first rebuild and install the `vmci` source package.

```
# rpmbuild --rebuild vmware-tools-module-version.src.rpm
```

This command builds a binary kmod package suitable for use with the running kernel.

What to do next

Install the binary kernel module packages. See "Install Custom Built Binary Module Packages," on page 38.

Build the Binary Kernel Module Packages for RHEL 4, RHEL 3, and CentOS 4

For VMware Tools to function properly, you can use the VMware provided source packages to create binary packages for specific kernels.

Procedure

1 Download the following ESXi kmod source packages from the repository.

`vmware-tools-module-version.src.rpm`

module is the kernel module package.

version is the version for the tools and the package.

Find the packages at `http://packages.vmware.com/tools/esx/esxi-version/dist/SRPMS`

Replace *esxi-version* with the ESXi version. For example: `5.1` or `5.0u1`.

Replace *dist* with `rhel4` or `rhel3`.

2 Install the kernel headers for the kernel for which you are building the kernel module packages.

3 Install the `gcc` and `rpm-build` packages.

4 Run the following command to compile the source packages into binary packages.

```
# rpmbuild --rebuild vmware-tools-module-version.src.rpm
```

This command builds a binary kmod package suitable for use with the running kernel.

What to do next

Install the binary kernel module packages. See "Install Custom Built Binary Module Packages," on page 38.

Build the Binary Kernel Module Packages for SLES 10, SLES 11, SLES 11 SP1, SLES 11 SP2, SLED 10, SLED 11, SLED 11 SP1, and SLED 11 SP2

For VMware Tools to function properly, you can use the VMware provided source packages to create binary packages for specific kernels.

Procedure

1 Download the following ESXi kmod source packages from the repository.

`vmware-tools-`*`module`*`-`*`version`*`.src.rpm`

module is the kernel module package.

version is the version for the tools and the package.

Find the packages at: `http://packages.vmware.com/tools/esx/`*`esxi-version`*`/`*`dist`*`/SRPMS`

Replace *esxi-version* with the ESXi version. For example: `5.1` or `5.0u1`.

Replace *dist* with sles10, sles11.0, sles11.1, or sles11.2.

2 Install the kernel headers for the kernel module packages you plan to build.

3 Install the `gcc`, `kernel-source`, and `kernel-syms` packages.

4 Run the following command to compile the source packages into binary packages.

NOTE When you run the `rpmbuild` command, if you rebuild the `vsock` or `vmhgfs` packages, you must first rebuild and install the `vmci` source package.

```
# rpmbuild --rebuild vmware-tools-module-version.src.rpm
```

This command builds a binary kmod package suitable for use with the running kernel.

What to do next

Install the binary kernel module packages. See "Install Custom Built Binary Module Packages," on page 38.

Build the Binary Kernel Module Packages for SLES 9

For VMware Tools to function properly, you can use the VMware provided source packages to create binary packages for specific kernels.

Procedure

1 Download the following ESXi kmod source packages from the repository.

`vmware-tools-`*`module`*`-`*`version`*`.src.rpm`

module is the kernel module package.

version is the version for the tools and the package.

Find the packages at `http://packages.vmware.com/tools/esx/`*`esxi-version`*`/sles9.0/SRPMS`

Replace *esxi-version* with the ESXi version. For example: `5.1` or `5.0u1`

2 Install the kernel headers for the kernel for which you are building the kernel module packages.

3 Install the `gcc`, `kernel-source`, and `kernel-syms` packages.

4 Run the following command to compile the source packages into binary packages.

```
# rpmbuild --rebuild /vmware-tools-module-version.src.rpm
```

This command builds a binary kmod package suitable for use with the running kernel.

What to do next

Install the binary kernel module packages. See "Install Custom Built Binary Module Packages," on page 38.

Install Custom Built Binary Module Packages

After creating a binary kernel module package, you can install the custom built packages.

Prerequisites

- Install the `vmware-tools-module-common` and `vmware-tools-foundation` packages on the system.

  module is the name of the kernel module package you are installing.

- For the `vmblock` package, install the `vmware-tools-module-common`, `vmware-tools-foundation`, `vmware-tools-core`, `vmware-tools-libraries-nox`, and `vmware-tools-guestlib` packages on the system.

Procedure

- Run the following command to install your custom binary package.

  - For RHEL 6 and RHEL 5:

    ```
    # rpm -ivh /path/kmod-vmware-tools-module-version.arch.rpm
    ```

    For RHEL 6, when you install the `vsock` or `vmhgfs` package, run the following command:

    ```
    # rpm -ivh --nodeps /path/kmod-vmware-tools-module-version.arch.rpm
    ```

  - For RHEL 4, RHEL 3, SLES, and SLED releases:

    ```
    # rpm -ivh /path/vmware-tools-module-version.arch.rpm
    ```

  Replace *path* with the path for your distribution.

Option	Description
RHEL 6	`$HOME/rpmbuild/RPMS/arch`
RHEL 3 through 5, and CentOS 4 and 5	`/usr/src/redhat/RPMS/arch`
SLES and SLED	`/usr/src/packages/RPMS/arch`

Replace *arch* with your architecture.

Option	Description
x86_64	64-bit
i386	32-bit Red Hat kernels
i586	32-bit SUSE kernels

Build Customized Kernel Module Packages for Ubuntu

You can build a customized Ubuntu binary kernel and install VMware Tools OSPs. For more information about the functions of `module-assistant`, see the `module-assistant` manpage .

Prerequisites

For Ubuntu 8.10, you must configure your system to allow the `apt-get` package manager to use the correct Ubuntu repository. See "Configure Ubuntu 8.10 Systems to Use the Correct Repository," on page 39.

Procedure

1 Update your repository information.

```
$ sudo apt-get update
```

2 Install the VMware Tools foundation package to prepare the system for installation.

```
$ sudo apt-get install vmware-tools-foundation
```

For the `vmblock` package, also install the following packages:

```
$ sudo apt-get install vmware-tools-core vmware-tools-libraries-nox
vmware-tools-guestlib
```

3 Install `Deb-Helper`.

```
$ sudo apt-get install debhelper
```

4 Install the source package and a requirement that the compiled package will need.

```
$ sudo apt-get install vmware-tools-module-modules-source vmware-tools-module-common
```

module is the name of the module package that you are building.

5 Prepare your system for building the module.

```
$ sudo module-assistant prepare
```

6 Build the kernel module package.

```
$ sudo module-assistant build vmware-tools-module-modules-source
```

7 Install the kernel module package.

```
$ sudo module-assistant install vmware-tools-module-modules-source
```

Configure Ubuntu 8.10 Systems to Use the Correct Repository

Ubuntu 8.10 has reached its end of life. As a result, Ubuntu moved the package repository to the location where Ubuntu stores old releases. To allow the `apt-get` package manager to download Ubuntu 8.10 packages, you must edit the `/etc/apt/sources.list` file to point to the correct repository.

Procedure

- In the `/etc/apt/sources.list` file, find every instance of `us.archive.ubuntu.com` and replace it with `old-releases.ubuntu.com`

Maintaining VMware Tools OSPs Across Linux OS Upgrades

5

Linux operating system upgrades generally can be classified into three categories: maintenance upgrades, minor upgrades, or major upgrades. Depending on the significance of the operating system upgrade, you might need to uninstall the current VMware Tools OSPs and reinstall a different version of the OSPs. However, the different Linux vendors treat maintenance, minor, and major upgrades differently. Your approach to maintaining VMware Tools OSPs across Linux operating system upgrades depends on the operating system vendor.

NOTE Upgrading VMware Tools OSPs is not supported. To upgrade OSPs, you must uninstall the current OSP version and reinstall the upgraded OSP version.

Typically, a maintenance upgrade incorporates errata, security bug fixes, and so on. The OS kernel is not significantly changed, and the current VMware Tools OSPs remain compatible with the kernel. You do not have to reinstall upgraded OSPs for maintenance upgrades.

Typically, a minor upgrade might include new kernel packages, but the packages maintain ABI compatibility with the initial major release which the minor release is upgrading. When ABI compatibility is maintained, you do not have to reinstall different OSPs. However, this is not the case with every vendor. Upgrading between minor versions of guest operating systems varies depending on the vendor.

Typically, a major upgrade includes a wholly new kernel version and new packages. To maintain compatibility with an upgrade to a major operating system release, you must take these steps:

1 Uninstall the current VMware Tools OSPs.

2 Upgrade the guest operating system to the new release.

3 Install the VMware Tools OSPs that are compatible with the upgraded operating system.

For RHEL, CentOS, and Oracle Linux operating systems, ABI compatibility is maintained across maintenance and minor upgrades, and you do not have to uninstall and reinstall OSPs. For example, if you upgrade from RHEL 6.0 to 6.1, you do not have to reinstall OSPs. For a major upgrade such as from RHEL 5 to RHEL 6, you must uninstall the RHEL 5-compatible OSPs, upgrade the operating system, and install the RHEL 6-compatible OSPs.

For Ubuntu maintenance and minor upgrades, you do not have to install upgraded kernel packages, but you might have to rebuild custom OSPs from source to stay compatible with the upgraded kernel.

For SLES and SLED maintenance upgrades, you do not have to reinstall OSPs. However, for minor upgrades, you might have to reinstall OSPs. For example, to upgrade from SLES 11 SP1 to SLES 11 SP2, you must uninstall the SLES 11 SP1-compatible OSPs, upgrade the operating system, and install the SLES 11 SP2-compatible OSPs.

Uninstalling VMware Tools OSPs 6

For some operating system releases, you can uninstall VMware Tools OSPs by using a package manager. For other OS releases, you must manually uninstall VMware Tools OSPs.

This chapter includes the following topics:

Uninstall VMware Tools OSPs With a Package Manager

To uninstall the VMware Tools OSPs, you can use your package manager to remove the packages.

During VMware Tools OSP installation, the VMWare provided display and mouse driver packages are installed over the operating system-provided driver packages if the VMware packages are newer. When you uninstall the OSPs, the VMware provided display and mouse driver packages are removed, leaving the operating system without VMware provided display and mouse drivers. In this situation, you must reinstall the native operating system provided drivers or leave the VMware provided drivers on the system.

NOTE The yum package manager does not uninstall properly because rpm does not uninstall the packages in the correct sequence. You must manually uninstall OSPs on the RHEL, and CentOS distributions that use yum and the older distributions that do not use yum. See "Manually Uninstall VMware Tools," on page 44.

Procedure

- Uninstall VMware Tools OSPs by running the package manager `remove` command from the command line of the guest operating system.

Option	Action
SLES 11 SP2, SLES 11 SP1, SLES 11, SLED 11 SP2, SLED 11 SP1, or SLED 11	Enter `# zypper remove 'vmware-tools-*'`
SLES 10	Enter `# rug remove 'vmware-tools-*'`
Ubuntu	Enter `$ sudo apt-get remove --purge 'vmware-tools-*'`

The preceding command removes the VMware provided display and mouse driver packages. If you want to keep these packages, you must remove all VMware Tools OSPs except `vmware-tools-xorg-drv-display`, `vmware-tools-xorg-drv-mouse`, and `vmware-tools-foundation`.

On Ubuntu systems, if you uninstall the VMware provided display and mouse driver packages, you must reinstall the distribution provided driver packages to return the system to its original state. For example, run the following commands:

```
$ sudo apt-get install xserver-xorg-video-all
$ sudo apt-get install xserver-xorg-input-all
```

IMPORTANT If you uninstall the VMware provided display and mouse drivers on an Ubuntu system, do not log out or restart the system before you reinstall the distribution provided display and mouse drivers. The system cannot restart properly without these drivers.

Manually Uninstall VMware Tools

You must manually uninstall VMware Tools packages on certain operating system releases.

RHEL 5, RHEL 6, CentOS 6, and CentOS 5 use the yum package manager. However, the yum package manager does not uninstall properly because rpm does not uninstall the packages in the correct sequence.

RHEL 3, RHEL 4, CentOS 4, and SLES 9 use rpm distributions.

On distributions that use yum or rpm, you must remove the OSP packages in a specific order because of package dependencies.

Procedure

1 Remove the OSP meta-packages.

```
# rpm –e vmware-tools-esx
# rpm –e vmware-tools-esx-nox
# for file in `rpm –qa|grep vmware-tools-esx-kmods`; do
    rpm –e $file
done
```

2 Remove the Thinprint and Host-Guest Filesystem packages.

```
# rpm –e vmware-tools-thinprint
# rpm –e vmware-tools-hgfs
```

3 Remove the VMware Tools plug-in packages.

```
# for file in `rpm –qa |grep vmware-tools-plugins`; do
   rpm –e $file
done
# rpm –e vmware-tools-user
# rpm –e vmware-tools-services
```

4 Remove the kernel module packages.

a Remove the kernel modules.

On RHEL 5 and RHEL 6 distributions:

```
# for file in `rpm –qa |grep vmware–tools|grep kmod|grep –v vmci`; do
   rpm –e $file
done

# for file in `rpm –qa |grep vmware–tools|grep kmod|grep vmci`; do
   rpm –e $file
done
```

On RHEL 3, RHEL 4, and SLES 9 distributions:

```
# for file in `rpm –qa |grep vmware–tools|grep kmp|grep –v vmci`; do
   rpm –e $file
done

# for file in `rpm –qa |grep vmware–tools|grep kmp|grep vmci`; do
   rpm –e $file
done
```

b Remove the kernel module common packages.

```
# for file in `rpm –qa |grep vmware–tools|grep common`; do
   rpm –e $file
done
```

5 Remove the base packages.

```
# rpm –e vmware–tools–help
# rpm –e vmware–tools–guestsdk

# rpm –e vmware–tools–core
# rpm –e vmware–tools–libraries–x
# rpm –e vmware–tools–libraries–nox
# rpm –e vmware–tools–guestlib
```

6 (Optional) Remove the VMware provided display and mouse drivers.

```
# rpm –e ––nodeps vmware–tools–xorg–drv–mouse
# rpm –e ––nodeps vmware–tools–xorg–drv–display

# rpm –e vmware–tools–foundation
```

Skip this step if you do not want to remove the VMware provided display and mouse driver packages. If you skip this step, the `vmware–tools–xorg–drv–display`, `vmware–tools–xorg–drv–mouse`, and `vmware–tools–foundation` packages remain on the system.

On RHEL 5 and RHEL 6 systems, if you uninstall the VMware provided display and mouse driver packages, you must reinstall the distribution provided driver packages to return the system to its original state. For example, run the following command:

```
yum install xorg–x11–drv–vmware xorg–x11–drv–vmmouse
```

IMPORTANT If you uninstall the VMware provided display and mouse drivers on a RHEL 5 or RHEL 6 system, do not log out or restart the system before you reinstall the distribution provided display and mouse drivers. The system cannot restart properly without these drivers.

If a package is not installed, the command skips the action and returns the prompt.

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