



Installing VMware Tools on Clearswift v4 Gateways

Technical Guide

Version 2.0

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1 Introduction

Since the introduction of Version 4 of the Clearswift SECURE Gateways, the products run on a Red Hat Enterprise Linux 64 bit Platform. Having a standard underlying Linux distribution opens a wide range of options and flexibility to fulfil specific clients' requirements.

This guide explains how VMware tools can be installed on v4 Clearswift Gateways.

It can, for example, be used to connect to an external LDAPS server, whilst for the gateway it will be treated as a standard LDAP connection.

The configuration described in this guide has been validated on the below versions:

- SECURE Email Gateway – Version 4.2.0 / 4.3.0
- vSphere 5.1 and 5.5

2 Scope

This guide describes the steps to take to install the VMware Tools for Red Hat 6 from vSphere v5.1 and 5.5, as well as the actions to take on the Gateways.

3 Installation and Setup

3.1 Overview

VMWare vSphere provides a virtualization hypervisor to run compatible operating systems on virtual machines. Depending on the level of interaction with the guest operating system and the capabilities of the underlying hardware, it can provide different virtualization methods, where para-virtualization is the one that achieves best performance.

Para-virtualization allows direct but supervised access to the hardware resources to the guest operating system. However, this cannot be done unless the guest operating system has the appropriate drivers and tools to get to interact with the para-virtualized hardware as it is exposed by the hypervisor.

The VMware Tools provide several tools for better interaction between the host vSphere and the guest operating system, including the appropriate para-virtualization drivers.

It is important to note that the installation of the VMware Tools can cause disruption on the system at several stages, so it should not be done on a system processing traffic.

3.2 Installation

The process to do the installation of the VMware tools consists of:

- Validate the correct Operating System is configured in vSphere for the Gateway VM
- Share the VMware tools ISO with the Gateway VM
- Mount the CD image from the Gateway's Operating System
- Run the installation

Linux is a monolithic kernel, what means that it is not modular and adding new drivers or functionality requires its recompilation. To avoid this step, there is a hook in the kernel that allows running drivers at user level. However, these drivers are dependant on the specific kernel version.

As the VMware Tools use this hook and select the drivers to install based on the Linux version configured for the guest, it is important to first check that Red Hat Enterprise Linux 6 64 bits has been configured when installing the system. Otherwise, it could even try to compile the tools based on the detected kernel version, which has many dependencies like having the C compiling tools and the Linux kernel headers.

Thus, the first step is to check the configuration of the guest VM:

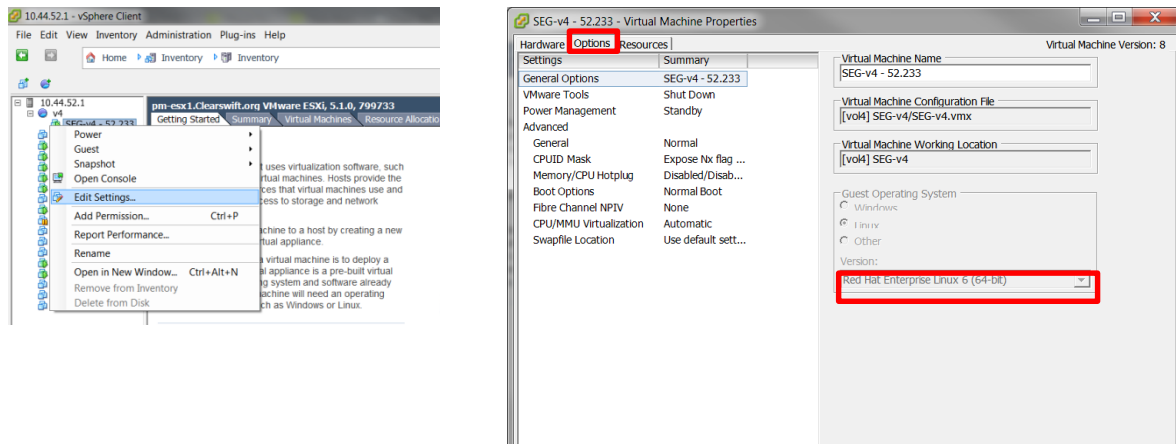


Figure 1: Verifying the configured guest OS

In case the system was not configured as Red Hat Enterprise Linux 6 (64 bits), it should be turned off and this setting changed to the correct one.

Once verified that the correct version has been specified, the VMware Tools ISO can be shared with the Gateway. Please note that this step might cause disruption, as explained in 5.1.

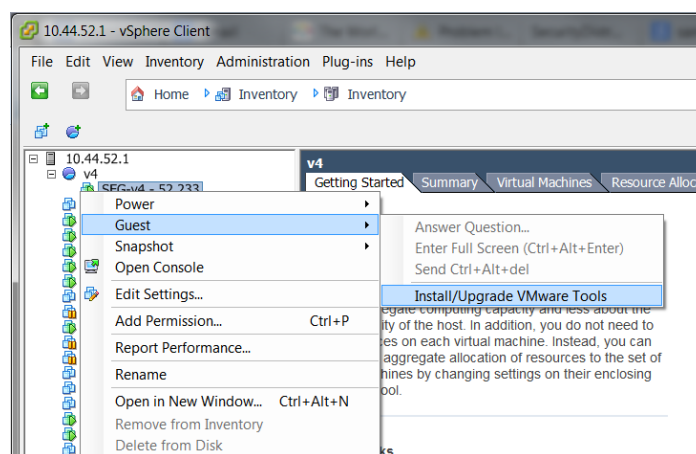


Figure 2: Sharing the VMware Tools ISO

The next step requires logging into the Gateway to mount the drive and run the installation:

```
[cs-admin@seg421 ~]$ sudo su -
[sudo] password for cs-admin:
[root@seg421 ~]# mkdir /tmp/dvd
[root@seg421 ~]# mount /dev/cdrom /tmp/dvd
mount: block device /dev/sr0 is write-protected, mounting read-only
[root@seg421 ~]# ls /tmp/dvd
manifest.txt  VMwareTools-9.0.0-782409.tar.gz
```

The tools come as a compressed archive, so they need to be extracted to be run:

```
[root@seg421 ~]# cd /tmp
[root@seg421 tmp]# mkdir VMwareTools
[root@seg421 tmp]# cd VMwareTools/
[root@seg421 VMwareTools]# tar xzvf /tmp/dvd/VMwareTools-9.0.0-782409.tar.gz
vmware-tools-distrib/
vmware-tools-distrib/bin/
vmware-tools-distrib/bin/vm-support
vmware-tools-distrib/bin/vmware-config-tools.pl
vmware-tools-distrib/bin/vmware-uninstall-tools.pl
vmware-tools-distrib/installer/
vmware-tools-distrib/installer/services.sh
vmware-tools-distrib/installer/upstart-job.conf
vmware-tools-distrib/vmware-install.pl

(...)

vmware-tools-distrib/etc/xsession-gdm.sh
vmware-tools-distrib/etc/not configured
vmware-tools-distrib/etc/poweroff-vm-default
[root@seg421 VMwareTools]#
```

Once extracted, the installer can be run:

```
[root@seg421 VMwareTools]# ls
vmware-tools-distrib
[root@seg421 VMwareTools]# cd vmware-tools-distrib/
[root@seg421 vmware-tools-distrib]# ls
bin doc etc FILES INSTALL installer lib vmware-install.pl
[root@seg421 vmware-tools-distrib]# ./vmware-install.pl

Creating a new VMware Tools installer database using the tar4 format.

Installing VMware Tools.

In which directory do you want to install the binary files?
[/usr/bin]

What is the directory that contains the init directories (rc0.d/ to rc6.d/)?
[/etc/rc.d]

What is the directory that contains the init scripts?
[/etc/rc.d/init.d]

In which directory do you want to install the daemon files?
[/usr/sbin]

In which directory do you want to install the library files?
[/usr/lib/vmware-tools]

The path "/usr/lib/vmware-tools" does not exist currently. This program is
going to create it, including needed parent directories. Is this what you want?
[yes]

In which directory do you want to install the documentation files?
[/usr/share/doc/vmware-tools]

The path "/usr/share/doc/vmware-tools" does not exist currently. This program
is going to create it, including needed parent directories. Is this what you
want? [yes]

The installation of VMware Tools 9.0.0 build-782409 for Linux completed
successfully. You can decide to remove this software from your system at any
time by invoking the following command: "/usr/bin/vmware-uninstall-tools.pl".
```

At the end of the installation process you are asked to run the configuration script:

```
Before running VMware Tools for the first time, you need to configure it by
invoking the following command: "/usr/bin/vmware-config-tools.pl". Do you want
this program to invoke the command for you now? [yes]

Initializing...

Making sure services for VMware Tools are stopped.

The VMware FileSystem Sync Driver (vmsync) allows external third-party backup
software that is integrated with vSphere to create backups of the virtual
machine. Do you wish to enable this feature? [no]

Found a compatible pre-built module for vmci. Installing it...

Found a compatible pre-built module for vsock. Installing it...

The module vmxnet3 has already been installed on this system by another
installer or package and will not be modified by this installer. Use the flag
--clobber-kernel-modules=vmxnet3 to override.

The module pvscsi has already been installed on this system by another
installer or package and will not be modified by this installer. Use the flag
--clobber-kernel-modules=pvscsi to override.

The module vmmemctl has already been installed on this system by another
installer or package and will not be modified by this installer. Use the flag
--clobber-kernel-modules=vmmemctl to override.

The VMware Host-Guest Filesystem allows for shared folders between the host OS
and the guest OS in a Fusion or Workstation virtual environment. Do you wish
to enable this feature? [no]

Found a compatible pre-built module for vmxnet. Installing it...

The vmblock enables dragging or copying files between host and guest in a
Fusion or Workstation virtual environment. Do you wish to enable this feature?
[no]

!!! [EXPERIMENTAL] !!!
VMware automatic kernel modules enables automatic building and installation of
VMware kernel modules at boot that are not already present. By selecting yes,
you will be enabling this experimental feature. You can always disable this
feature by re-running vmware-config-tools.pl.

Would you like to enable VMware automatic kernel modules?
[no]

No X install found.

Creating a new initrd boot image for the kernel.
vmware-tools start/running
The configuration of VMware Tools 9.0.0 build-782409 for Linux for this running
kernel completed successfully.

You must restart your X session before any mouse or graphics changes take
effect.

You can now run VMware Tools by invoking "/usr/bin/vmware-toolbox-cmd" from the
command line.

To enable advanced X features (e.g., guest resolution fit, drag and drop, and
file and text copy/paste), you will need to do one (or more) of the following:
1. Manually start /usr/bin/vmware-user
2. Log out and log back into your desktop session; and,
3. Restart your X session.
```

```
Enjoy,  
--the VMware team  
Found VMware Tools CDROM mounted at /media/dvd. Ejecting device /dev/sr0 ...
```

To confirm that the installation has been successful, using vSphere client check if VMware tools is running in the summary panel for that guest.

General	
Guest OS:	Red Hat Enterprise Linux 6 (64-bit)
VM Version:	8
CPU:	2 vCPU
Memory:	4096 MB
Memory Overhead:	51.03 MB
VMware Tools:	✔ Running (Current)
IP Addresses:	10.44.52.26
DNS Name:	seg421.clearswift-test.com
State:	Powered On
Host:	pm-esx1.Clearswift.org
Active Tasks:	
vSphere HA Protection:	🔍 N/A 🗨

4 Performance Impact

4.1 Overview

As explained in the previous section, by installing the VMware Tools on the guest VM para-virtualization can be used, what has a big impact on the system's performance.

In order to compare the same system before and after the installation of the VMware Tools, a performance test tool has been run on the system to compare CPU, memory and disk i/o. These numbers must be taken with caution and are only meant to prove that there is a noticeable performance improvement in some areas of the system when installing the VMware Tools.

It must be noted though that the network performance has not been tested thoroughly and other network analysis like the one provide by VMware should be taken into consideration:

http://www.vmware.com/files/pdf/perf_comparison_virtual_network_devices_wp.pdf

4.2 Phoronix Test Suite

The tool that has been used to run the performance tests is Phoronix Test Suite (<http://www.phoronix-test-suite.com/>). It provides a wide range of tests and has very few dependencies, so the installation is fairly simple.

The suite requires PHP to be installed and the libXpm library. The list of packages follows:

- libXpm
- php-cli
- php-common
- php-fpdf
- php-gd
- php-pdo
- php-xml

These packages can be easily installed using yum:

```
# yum install libXpm php-cli php-common php-fpdf php-gd php-pdo php-xml
```

4.3 Performance Tests

Phoronix Test Suite offers a wide range of test sets to be run focused on a specific resource. In order to do the comparison the focus has been to validate the performance impact on CPU, memory and storage access.

The installation of the VMware Tools is only expected to have a noticeable impact on the storage access speed.

The following tests have been selected for each of the resources:

- **CPU:** pts/compress-pbzip2 – Consists of a multithreaded compression test
- **Memory:** pts/ramspeed – Runs several sets of operations in memory for integer and float numbers
- **Storage:** pts/aio-stress – Makes asynchronous accesses to storage

The results have been normalized so that the best result gets 100%:

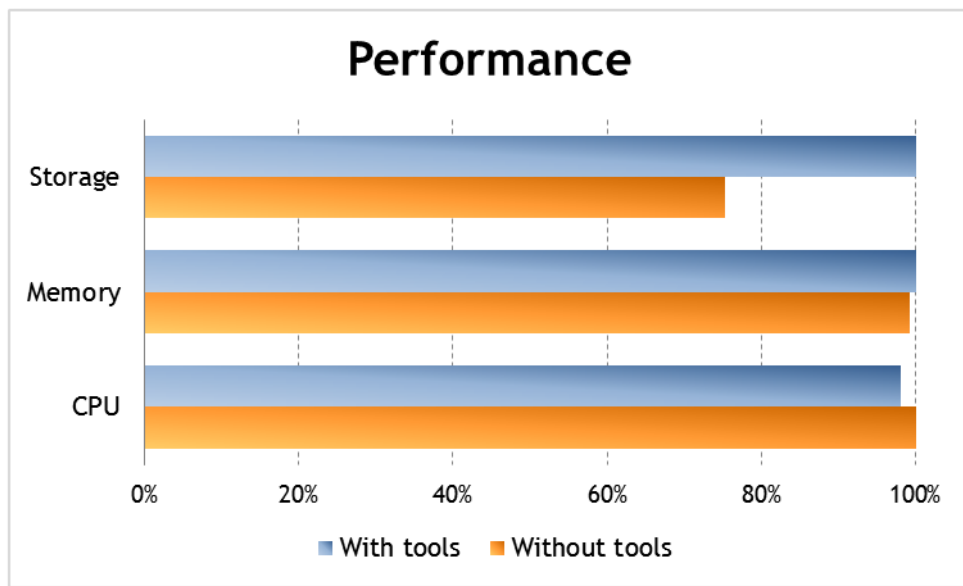


Figure 3: Performance comparison

As expected, the biggest difference is shown in disk performance, being faster using the VMware Tools than without. Memory and CPU performance is very similar in both cases, and the very small variations can be caused by many external factors.

5 Troubleshooting

5.1 VM seems to hang when sharing the VMware Tools with the guest

If the gateway is using the virtual DVD drive or there is an image already configured and mounted in the Gateway, exposing the VMware Tools ISO will cause the VM to pause until a question is answered:

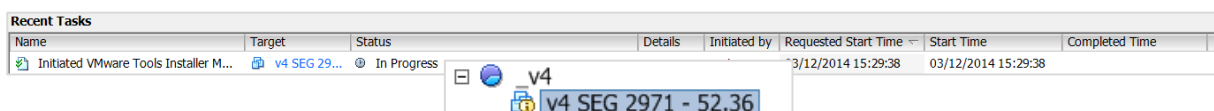


Figure 4: VM is paused waiting for an answer

There is no pop-up window showing the question and it is not until the guest entry in vSphere is right clicked and the option selected that the question is showed.

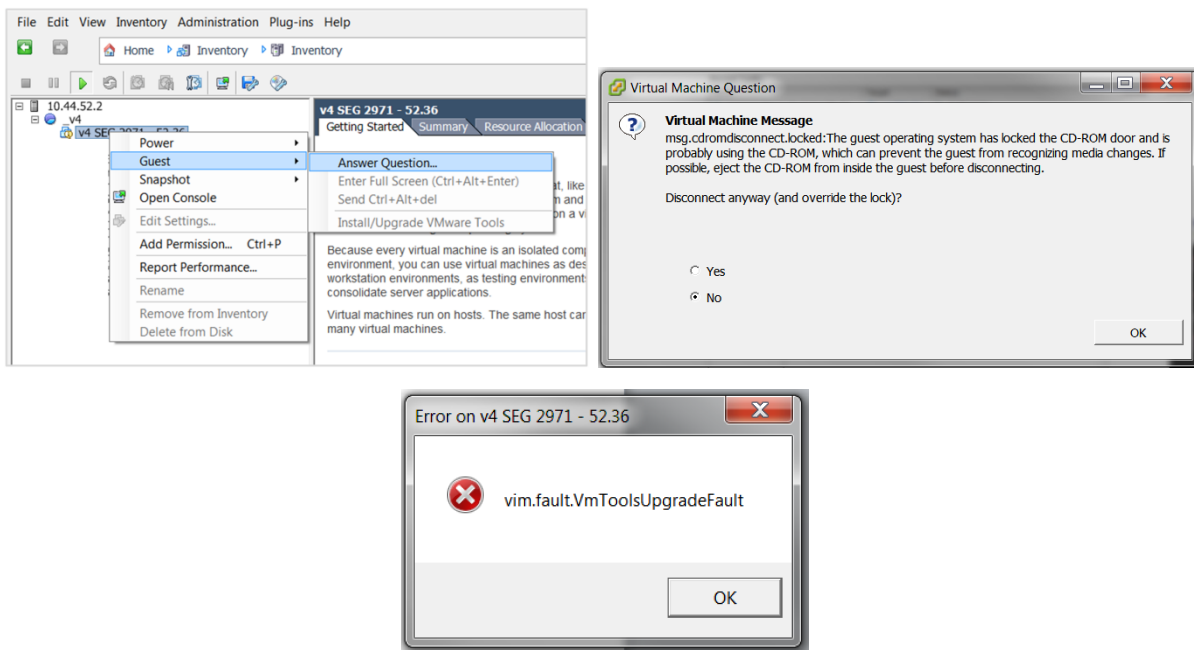


Figure 5: Failure to mount the VMware Tools ISO

The media must first be unmounted from the Gateway running the below command:

```
# umount /media/*
```

After that the VMware Tools can be shared successfully with the Gateway and will be ready to be mounted:

Recent Tasks							
Name	Target	Status	Details	Initiated by	Requested Start Time	Start Time	Completed Time
Initiated VMware Tools Installer Mount	SEG-v4 - 52...	Completed		root	08/12/2014 12:14:24	08/12/2014 12:14:24	08/12/2014 12:14:24

Figure 6: VMware Tools ISO successfully shared

5.2 VMware tools did not complete the configuration process

There are cases in which the initial run of the configuration tools done automatically at the end of the installation wouldn't complete successfully. Running the tools manually seems to solve the problem.

The configuration of the VMware tools can be done using the following command:

```
/usr/bin/vmware-config-tools.pl
```

6 FAQ – Frequently Asked Questions

Q: Is it recommended to install the VMware Tools in the Clearswift Gateways?

A: Yes. The Clearswift Gateways require a high performance system in order to provide content inspection efficiently. The VMware tools improve the performance mostly in disk access, which is one of the key resources.

Q: Apart from para-virtualized storage drivers, what else is provided by the VMware Tools?

A: The VMware Tools provide:

- VMware Tools service – Provides communication between host and guest used for example to cleanly poweroff the guest or time synchronization.
- VMware device drivers – To improve the communication and provide para-virtualization in some cases.
- VMware user process – Allows tasks like cutting and paste between host and guest. This functionality is not relevant for the Clearswift Gateways.
- VMware Tools control panel – Not relevant in a Clearswift Gateway.

VMware provides detailed information about the VMware tools on their website, which is recommended to be reviewed:

http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=splayKC&externalId=340