



# Windows Server® 2008

## **Linux Integration Services Version 2.1 for Hyper-V (Windows Server 2008, Windows Server 2008 R2, Microsoft Hyper-V Server 2008, and Microsoft Hyper-V Server 2008 R2) Readme**

---

Microsoft Corporation

Published: March 2010

### **Abstract**

This guide discusses the installation and functionality of the Linux Integration Services for Hyper-V™ technology when the components are installed on a virtual machine.

***Microsoft***

# Copyright information

---

This document is provided for informational purposes only and Microsoft makes no warranties, either express or implied, in this document. Information in this document, including URL and other Internet Web site references, is subject to change without notice. The entire risk of the use or the results from the use of this document remains with the user. Unless otherwise noted, the companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted in examples herein are fictitious. No association with any real company, organization, product, domain name, e-mail address, logo, person, place, or event is intended or should be inferred. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation. Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property. © 2009 Microsoft Corporation. All rights reserved. Microsoft, Hyper-V, Windows, Windows Vista, and Windows Server are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other trademarks are property of their respective owners.

# Contents

---

Linux Integration Services Version 2.1 for Hyper-V Readme.....	5
Linux Integration Services Version 2.1 for Microsoft Hyper-V Features .....	5
Supported Host Operating Systems .....	5
Supported Guest Operating Systems .....	5
Synthetic Mouse Support.....	6
Installing the Linux Integration Services Version 2.1 on SUSE Enterprise Server Linux 10 or 11 .	6
Installing the Linux Integration Services Version 2.1 on Red Hat Enterprise Linux 5 .....	7
Upgrading the Linux Integration Services from Version 1 to Version 2.1.....	8
Upgrading the Linux Integration Services from version 2 to version 2.1 .....	9
Installing the Integration Services on SUSE Linux Enterprise Server 11 Virtual Machines .....	9
Verifying Linux Integration Services Version 2.1 Functionality .....	10
Configuring the Synthetic Network Card in SUSE Linux .....	11
Configuring the Synthetic Network Card in Red Hat Enterprise Linux .....	11
Configuring the Synthetic Storage Controller in SUSE Linux.....	12
Configuring the Synthetic Storage Controller in Red Hat Enterprise Linux.....	12
Uninstalling the Linux Integration Services .....	13
Additional Information about the Linux Integration Services Version 2.1 .....	13
Release Notes.....	13
Features not available .....	14
Enabling blkVSC (Fastpath boot).....	14
Important Considerations for Making Linux Virtual Machines Highly Available in Failover	
Clustering and Hyper-V .....	15



# Linux Integration Services Version 2.1 for Microsoft Hyper-V Readme

---

## Linux Integration Services Version 2.1 for Microsoft Hyper-V Features

When installed on a virtual machine that is running a supported Linux operating system, the Linux Integration Services for Hyper-V provide the following functionality:

- **Driver support for synthetic devices:** The Linux Integration Services support the synthetic network controller and the synthetic storage controller that were developed specifically for Hyper-V.
- **Fastpath Boot Support for Hyper-V:** Boot devices now take advantage of the block Virtualization Service Client (VSC) to provide enhanced performance.
- **Timesync:** The clock inside the virtual machine will remain synchronized with the clock on the host.
- **Integrated Shutdown:** Virtual machines running Linux can be shut down from either the Hyper-V Manager or the VMConnect application using the “Shut Down” command.
- **Symmetric Multi-Processing (SMP) Support:** Supported Linux distributions can properly use up to 4 virtual processors (VP) per virtual machine.

## Supported Host Operating Systems

This version of the Linux Integration Services supports the following versions of Hyper-V:

- Windows Server® 2008 Standard, Windows Server® 2008 Enterprise, and Windows Server® 2008 Datacenter (64-bit versions only)
- Microsoft® Hyper-V Server 2008
- Windows® Server 2008 R2 Hyper-V Standard, Enterprise, and Datacenter
- Microsoft® Hyper-V Server 2008 R2

## Supported Guest Operating Systems

This version of the Linux Integration Services supports the following guest operating systems and virtual CPU (vCPU) configurations:

- 
- SUSE Linux Enterprise Server 10 SP3 x86 and x64 (up to 4 vCPU) (1)
- SUSE Linux Enterprise Server 11 x86 and x64 (up to 4 vCPU)

- Red Hat Enterprise Linux 5.2, 5.3, and 5.4 x86 and x64 (Up to 4 vCPU)

1: SUSE Linux Enterprise Server 10 SP2 will no longer be supported by Novell as of April 12, 2010. Novell recommends that users migrate to SUSE Linux Enterprise Server 10 SP3.

## Synthetic Mouse Support

Synthetic mouse support is not included in this download. However, synthetic mouse drivers for use with Linux running on Hyper-V are available. For more information, see the [Citrix Project Satori Web site](http://go.microsoft.com/fwlink/?LinkId=157779) at <http://go.microsoft.com/fwlink/?LinkId=157779>.



### Note

Synthetic Mouse support is not available on SUSE Linux Enterprise Server 11 at this time.

# Installing the Linux Integration Services Version 2.1 on SUSE Enterprise Server Linux 10 or 11

---

## ► To install the Linux Integration Services Version 2.1:

1. Open Hyper-V Manager: Click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. Create a new virtual machine where you will install Linux: In the **Actions** menu, click **New**, and then click **Virtual Machine**.
3. Specify the Linux installation media: Right-click the virtual machine that you created, and then click **Settings**. In **IDE Controller**, specify one of the following:
  - An image file in ISO format that contains the files required for installation
  - A physical CD/DVD drive that contains the installation media
4. Turn on the virtual machine: Right-click the virtual machine that you created, and then click **Connect**.
5. Begin installing Linux.
6. Ensure that the optional package **C/C++ Compiler and Tools** is selected during installation. It is required to build and install the Linux Integration Services.
7. When prompted, restart the virtual machine and complete any first-boot configuration tasks.



### Note

Unless a legacy network adapter was added during the virtual machine's

initial configuration, the virtual machine will not have any network support.

8. Log on to the virtual machine.
9. In Hyper-V Manager, configure **LinuxIC v21.ISO** (located in the directory where you extracted the downloaded files) as a physical CD/DVD drive on the virtual machine.



#### Note

If the virtual machine is running SUSE Linux Enterprise Server 11, complete Step 1 in the section titled [Installing the Integration Services on SUSE Linux Enterprise Server 11 Virtual Machines](#) before you continue.

10. As the root user, mount the CD in the virtual machine by issuing the following commands at a shell prompt:

```
# mkdir /mnt/cdrom  
  
# mount /dev/cdrom /mnt/cdrom
```

11. Copy the Linux Integration Services to the virtual machine. For example:

```
# mkdir /opt/linux_ic_v21  
  
# cp /mnt/cdrom/* /opt/linux_ic_v21 -R
```

12. As the root user, run the following command to install the synthetic drivers. A reboot is not required.

```
# /opt/linux_ic_v21/setup.pl drivers
```



#### Note

If the virtual machine is running SUSE Linux Enterprise Server 11, complete Steps 2-4 in the section titled [Installing the Integration Services on SUSE Linux Enterprise Server 11 Virtual Machines](#).

## Installing the Linux Integration Services Version 2.1 on Red Hat Enterprise Linux 5

---

### ► To install the Linux Integration Services Version 2.1:

1. Open Hyper-V Manager: Click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. Create a new virtual machine where you will install Linux: In the **Actions** menu, click **New**, and then click **Virtual Machine**.
3. Specify the Linux installation media: Right-click the virtual machine that you created, and then click **Settings**. In **IDE Controller**, specify one of the following:

- An image file in ISO format that contains the files required for installation
  - A physical CD/DVD drive that contains the installation media
4. Turn on the virtual machine: Right-click the virtual machine that you created, and then click **Connect**.
  5. Begin installing Linux.
  6. Ensure that the optional package **Software Development** is selected during installation. It is required to build and install the Linux Integration Services.
  7. When prompted, restart the virtual machine and complete any first-boot configuration tasks.



#### Note

Unless a legacy network adapter was added during the virtual machine's initial configuration, the virtual machine will not have any network support.

8. Log on to the virtual machine.
9. In Hyper-V Manager, configure **LinuxIC v21.ISO** (located in the directory where you extracted the downloaded files) as a physical CD/DVD drive on the virtual machine.
10. As the root user, mount the CD in the virtual machine by issuing the following commands at a shell prompt:

```
# mkdir /mnt/cdrom

# mount /dev/cdrom /mnt/cdrom
```

11. Copy the Linux Integration Services to the virtual machine. For example:

```
# mkdir /opt/linux_ic_v21

# cp /mnt/cdrom/* /opt/linux_ic_v21 -R
```

12. As the root user, run the following command to install the synthetic drivers. A reboot is not required.

```
# /opt/linux_ic_v21/setup.pl drivers
```

## Upgrading the Linux Integration Services from Version 1 to Version 2.1

---

### ► To upgrade the Linux Integration Services:

1. Shut down all Linux virtual machines on the host.
2. Turn on the Linux virtual machine, and boot into the “stock” (not Xen) kernel.
3. Follow the instructions in the section titled [Installing the Linux Integration Services](#)



[Version 2.1 on SUSE Enterprise Server Linux 10 or 11](#), starting with Step 8.

4. When you are finished installing the Linux Integration Services, remove the entry for the Xen-enabled kernel with Hypercall adapter from **menu.lst** using the following procedure:
  - a. As the root user, edit **/boot/grub/menu.lst**.
  - b. Find the entry that uses the Xen-enabled Linux kernel and delete it. For example, the following entry uses the Xen-enabled kernel:

```
title Xen - SUSE Linux Enterprise Server 10 SP2 - 2.6.16.60-0.21
root (hd0,1)

kernel /boot/x2v-32.gz

module /boot/vmlinuz-2.6.16.60-0.21-xen root=/dev/hda2 resume=/dev/hda1
splash=silent showopts

module /boot/initrd-2.6.16-60-0.21-xen
```

- c. Set the “default” value to match the entry that uses the native Linux kernel. In most cases, this will remain 0.

## Upgrading the Integration Services from version 2 to version 2.1

---

To update from version 2 to version 2.1 of the Integration Services, follow the same steps as listed under the operating system in use. The upgrade takes place automatically.

## Installing the Integration Services on SUSE Linux Enterprise Server 11 Virtual Machines

---

► To install the Integration Services:

1. Modify **/etc/modprobe.d/unsupported-modules** so that the option `allow_unsupported_modules` reads as follows:

```
allow_unsupported_modules 1
```

Save the changes to the file, and then restart the virtual machine and continue from Step 10 in the section titled [Installing the Linux Integration Services Version 2.1 on SUSE Enterprise Server Linux 10 or 11](#).

2. As the root user, edit **/etc/fstab** and make the following changes:

- a. Sections that begin with **/dev/disk/\*** should be replaced by their **/dev/hd\*** equivalents, so that **/etc/fstab** looks similar to the following example:

```
/dev/hda1 swap                swap                defaults            0 0
/dev/hda2 /                    ext3                acl,user_xattr      1 1
```

- b. Save the changes to **/etc/fstab**.
3. As the root user, edit **/boot/grub/menu.lst** and modify the kernel options as follows:

```
root=/dev/hda2 resume=/dev/hda1
```

4. Modify **/etc/modprobe.d/unsupported-modules** so that the option **allow\_unsupported\_modules** reads as follows:

```
allow_unsupported_modules 0
```

## Verifying Linux Integration Services Version 2.1 Functionality

---

The Linux Integration Services now provide support for the **modinfo** command. To get module information for each installed kernel module, run the following command:

```
# /sbin/modinfo vmbus
filename:      /lib/modules/2.6.16.60-0.54.5-smp/kernel/drivers/vmbus/vmbus.ko
version:      2.1.0
license:      GPL
depends:
vermagic:     2.6.16.60-0.54.5-smp SMP gcc-4.1
parm:         vmbus_irq:int
parm:         vmbus_loglevel:int
```

This command can be repeated for all kernel modules (vmbus, netvsc, storvsc, blkvsc).

To verify that all subcomponents are running,, as the root user, issue the following command at a shell prompt:

```
# /sbin/lsmmod | grep vsc
```

The output should include lines similar to the following example:

```
netvsc 57832 0
```

```
storvsc 50288 0
blkvsc 54032 3
vmbus 70120 3 netvsc,storvsc,blkvsc
```



#### Note

Your file system type or other local factors might result in different file sizes in your deployment.

- “netvsc” provides support for the synthetic network card.
- “storvsc” provides support for the synthetic SCSI controller and disks.
- “blkvsc” provides support for synthetic IDE disks and fastpath boot.
- “vmbus” is the fast communication channel between the Hyper-V host and the virtual machine.

## Configuring the Synthetic Network Card in SUSE Linux

---

From YaST, use the Network Card applet to configure the newly installed synthetic network adapter. Configure the Virtual Ethernet Card, which is a synthetic network card with enhanced performance. After successful configuration, **seth0** should appear in the output of the `ifconfig` command, similar to the following example:

```
$/sbin/ifconfig
seth0          Link encap:Ethernet HWaddr 00:15:5D:01:08:77
```

## Configuring the Synthetic Network Card in Red Hat Enterprise Linux

---

Use the Network configuration tool (in System/Administration/Network) to configure the newly installed synthetic network adapter. Configure the Virtual Ethernet Card, which is a synthetic network card with enhanced performance. After successful configuration, **seth0** should appear in the output of the `ifconfig` command, similar to the following example:

```
$/sbin/ifconfig
seth0          Link encap:Ethernet HWaddr 00:15:5D:01:08:77
```

# Configuring the Synthetic Storage Controller in SUSE Linux

---

## ► To configure the Synthetic Storage Controller:

1. If you have a SCSI disk attached, as the root user, execute the following command at a shell prompt:

```
# cat /proc/scsi/scsi
```

This displays the information for the synthetic SCSI controller.

```
Attached devices:
```

```
Host: scsi0 Channel: 00 Id: 00 Lun: 00 Vendor: Msft Model: Virtual Disk Rev:
1.0 Type: Direct-Access ANSI SCSI Revision: 04
```

This indicates that the synthetic SCSI controller has been enumerated correctly.

2. Next, as the root user, execute the following command at a shell prompt to verify that there are disk(s) attached to the SCSI controller:

```
# ls /dev/sd*
```

```
brw-r----- 1 root disk 8,0 Nov 27 17:25 /dev/sda
```

3. After you confirm the presence of the disk(s), use the **Partitioner** tool in YaST to create a partition on the disk.

# Configuring the Synthetic Storage Controller in Red Hat Enterprise Linux

---

## ► To configure the Synthetic Storage Controller:

1. If you have a SCSI disk attached, as the root user, execute the following command at a shell prompt:

```
# cat /proc/scsi/scsi
```

This displays the information for the synthetic SCSI controller.

```
Attached devices:
```

```
Host: scsi0 Channel: 00 Id: 00 Lun: 00 Vendor: Msft Model: Virtual Disk Rev:
1.0 Type: Direct-Access ANSI SCSI Revision: 04
```

This indicates that the synthetic SCSI controller has been enumerated correctly.

2. Next, as the root user, execute the following command at a shell prompt to verify that there are disk(s) attached to the SCSI controller:

```
# ls /dev/sd*
```

```
brw-r----- 1 root disk 8,0 Nov 27 17:25 /dev/sda
```

3. After you confirm the presence of the disk(s), use the **fdisk** tool (as the root user) to create a partition on the disk.

## Uninstalling the Linux Integration Services

---

To uninstall the Linux Integration Services, follow these steps.

1. From the Linux virtual machine, browse to the location where the installation files were copied (for example, **/opt/linux**).
2. Browse to the **drivers/dist** directory.
3. From the command line, run the following command: **make uninstall**
4. Open **/boot/grub/menu.lst** or **/boot/grub/grub.conf** and remove the **noprobe** entries from the boot entries.
5. Restore the **initrd** image to the original file. For example:  
**cp /boot/initrd-2.6.16.60-0.54.5-smp.backup0 /boot/initrd-2.6.16.60-0.54.5-smp**

## Additional Information about the Linux Integration Services Version 2.1

---

### Release Notes

- This version of the integration services no longer includes the Hypercall adapter that was present in earlier versions.
- Support for this version of the Linux Integration Services is provided via e-mail using the address [linuxic@microsoft.com](mailto:linuxic@microsoft.com).
- Event log entries: You may notice event log entries similar to the following. These messages can be safely ignored.

- Networking driver on 'Virtual Machine' loaded but has a different version from the server. Server version 3.2 Client version 0.2 (Virtual machine ID DC1CCF5C-0C1A-4825-B32C-9A4F8F85AA9D). The device will work, but this is an unsupported configuration. This means that technical support will not be provided until this problem is resolved. To fix this problem, upgrade the integration services. To upgrade, connect to the virtual machine and select Insert Integration Services Setup Disk from the Action menu.
- A storage device in 'Virtual Machine' loaded but has a different version from the server. Server version 4.2 Client version 2.0 (Virtual machine ID DC1CCF5C-0C1A-4825-B32C-9A4F8F85AA9D). The device will work, but this is an unsupported configuration. This means that technical support will not be provided until this problem is resolved. To fix this problem, upgrade the integration services. To upgrade, connect to the virtual machine and select Insert Integration Services Setup Disk from the Action menu.
- Shutting down a Linux virtual machine running the Linux Integration Services from System Center Virtual Machine Manager 2008 is not supported in the User Interface. The virtual machine can be shut down via PowerShell using the following cmdlet:
 

```
Get-VMMServer -computername localhost
$VM = Get-VM | where { $_.Name -eq "VMNAME" }
Shutdown-VM -VM $VM
```

## Features Not Available

The following features are not available in this version of the Linux Integration Services:

- Integration Services: Data Exchange, Heartbeat, Volume Snapshot Backup
- Networking: Jumbo Frames and TCP Offload
- Storage: Hot Add/Remove (VHD's and Passthrough Disks)

## Enabling blkVSC (Fastpath boot)

To enable enlightened mode on the IDE hard disk and support fastpath boot and enhanced disk speed, **noprobe** options are applied to IDE hard disks. Due to a known issue, this option might impact CDROM usage inside the virtual machine. To enable enlightened IDE hard disks and use CDROM at the same time, the kernel options (**hda=noprobe hdb=noprobe**) are applied automatically during installation. This setting works for the default virtual machine configuration: the hard disk is on virtual IDE Controller 0, and CDROM is on virtual IDE Controller 1 of the virtual machine. This setting assumes the hard disk is **/dev/hda**, and the CDROM drive is **/dev/hdc**. If the hard disk or CDROM are in different locations, the kernel parameters should be updated accordingly in **/boot/grub/menu.lst** (for SUSE Linux Enterprise distributions) or **/boot/grub/grub.conf** (for Red Hat Enterprise Linux distributions). This change requires a reboot of the virtual machine to take effect.

## Enabling Promiscuous Mode

The synthetic network adapter can be used in either normal mode or promiscuous mode. When in promiscuous mode, the synthetic network adapter will pass all packets through instead of only the packets destined for the host. This is normally needed only for advanced networking configurations.

To enable promiscuous mode, execute the following steps as the root user:

```
# rmmod netvsc.ko  
# modprobe netvsc.ko promisc_mode=1
```

To disable promiscuous mode, execute the following steps as the root user:

```
# rmmod netvsc.ko  
# modprobe netvsc.ko
```

## Important Considerations for Making Linux Virtual Machines Highly Available in Failover Clustering and Hyper-V

Linux virtual machines that will be deployed in a highly-available scenario (utilizing failover clustering) should be configured with static MAC addresses for each virtual network adapter. Because of the way Linux configures the network adapter, in certain versions of Linux, there is a possibility that the networking configuration will be lost after failover because a new MAC address is assigned to the virtual network adapter. To work around this issue, ensure that each virtual network adapter has a static MAC address. This can be configured by editing the settings of the virtual machine in Hyper-V Manager.