



# 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**

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Microsoft Corporation

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### **Abstract**

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

***Microsoft***

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

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## 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, Linux Integration Services for Hyper-V provides the following functionality:

- **Driver support for synthetic devices:** Linux Integration Services supports 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 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.



### Note

SMP support is not available for 32-bit Linux guests running on Windows Server 2008 Hyper-V or Microsoft Hyper-V Server 2008.

- **Heartbeat:** Allows the host to detect whether the guest is running and responsive.
- **Pluggable Time Source:** A pluggable clock source module is included to provide a more accurate time source to the guest..

## Supported Host Operating Systems

This version of 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
- Hyper-V in Windows Server® 2008 R2 (Standard, Enterprise, and Datacenter editions)
- Microsoft Hyper-V Server 2008 R2

## Supported Guest Operating Systems

This version of 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)



### Note

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.

- SUSE Linux Enterprise Server 11 x86 and x64 (up to 4 vCPU)
- Red Hat Enterprise Linux 5.2, 5.3, 5.4, and 5.5 x86 and x64 (Up to 4 vCPU)



### Note

Red Hat Enterprise Linux 5 x64 editions do not support using the Pluggable Time Source component.

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

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### ▶ To install 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 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 v21RC.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 Linux 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 Linux Integration Services to the virtual machine. For example:

```
# mkdir /opt/linux_ic_v21_rc  
  
# cp /mnt/cdrom/* /opt/linux_ic_v21_rc -R
```

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

```
# cd /opt/linux_ic_v21_rc/  
  
# make  
  
# make install
```

**Note**

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

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

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## To install 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 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 v21RC.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 Linux Integration Services to the virtual machine. For example:

```
# mkdir /opt/linux_ic_v21_rc  
  
# cp /mnt/cdrom/* /opt/linux_ic_v21_rc -R
```

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



```
# cd /opt/linux_ic_v21_rc/
# make
# make install
```

**NOTE:** If using the x86 version of Red Hat Enterprise Linux, follow these additional instructions before compiling and installing the drivers:

1. Attach the Red Hat Enterprise Linux ISO that was used for installation in the virtual machine, and mount it using the following commands at a shell prompt:

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

2. Install the **adjtimex** RPM for more accurate time keeping in the virtual machine:

```
# rpm -ivh /mnt/cdrom/Server/adjtimex-1.20-2.1.x86_64.rpm
```

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

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### ► To upgrade 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 Linux Integration Services Version 2.1 on SUSE Enterprise Server Linux 10 or 11](#), starting with Step 8.
4. When you are finished installing 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 Linux Integration Services from version 2 to version 2.1

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To upgrade from version 2 to version 2.1 of Linux Integration Services, follow the installation steps listed for the operating system in use. The upgrade takes place automatically.

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

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► 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 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

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Linux Integration Services now provides 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:       2.1.11
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

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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
```

If you are running SUSE Linux Enterprise Server 11, do not use YaST to configure the synthetic network card. Instead, manually configure the settings for the synthetic network card in `/etc/sysconfig/network/ifcfg-sethX`, where X represents the adapter number. By default, the configuration is set to acquire an IP address via DHCP.

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

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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

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### 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 Linux Integration Services

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To uninstall 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. From the command line, run the following command: **make uninstall**
3. Open **/boot/grub/menu.lst** or **/boot/grub/grub.conf** and remove the **noprobe** entries from the boot entries.
4. 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 Linux Integration Services Version 2.1

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### Release Notes

- This version of Linux Integration Services no longer includes the Hypercall adapter that was present in earlier versions.
- Support for this version of Linux Integration Services is provided via e-mail using the address [linuxic@microsoft.com](mailto:linuxic@microsoft.com).
- If the guest operating system is installed on a physical hard disk that is passed through directly to the virtual machine, the fastpath boot driver must be disabled. To do this, open **/boot/grub/menu.lst** and remove the **hda=noprobe** and **hdb=noprobe** entries for the correct kernel image.
- 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.
- Users of Red Hat Enterprise Linux 5.5 in a virtual machine should modify the **/boot/grub/grub.conf** file to change **hda=noprobe hdb=noprobe** to **ide0=noprobe ide1=noprobe**.

## Features Not Available

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

- Integration Services: Data Exchange, 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 usually 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 (using 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 it is possible 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.