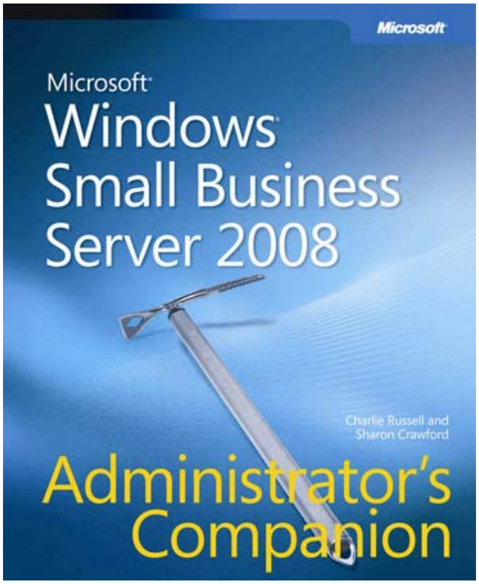

Windows® Small Business Server 2008 Administrator's Companion

Charlie Russel and
Sharon Crawford

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CHAPTER 6

Configuring SBS in Hyper-V

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Hyper-V is Microsoft's new hypervisor-based, native Windows Server 2008 virtualization solution. While not for everyone, we think that using virtualization (and specifically Hyper-V) to build your SBS network is a very cost-effective solution that can provide an excellent end-user experience while also enabling improved disaster recovery and ease of management.

When we wrote the *Microsoft Windows Small Business Server 2003 Administrator's Companion*, virtualization was a tiny fraction of the market and almost exclusively the province of very large organizations. Microsoft had no virtualization products and provided little or no support for companies and individuals using virtualization. By the time we wrote *Microsoft Windows Small Business Server 2003 R2 Administrator's Companion*, there was already a huge shift in place. Microsoft had bought out a virtualization company and had two products on the market: Virtual PC and Virtual Server. More and more companies were looking to virtualization as a way to consolidate servers, reduce server room footprints, and provide flexible test environments. Virtualization had gone from the "Hey, that's kinda neat" phase to the "Hmmm, you know, that might just make sense" phase. Companies large and small were actively investigating virtualization, planning how to use it, or already deploying it.

Now, fast forward a couple of years, and virtualization is a way of life for many of us. We couldn't begin to do what we need to do without being able to virtualize, and we're actively deploying virtual solutions in production. Microsoft has gone from having a couple of virtualization products to having a suite of solutions around virtualization, including building it right into the operating system with the inclusion of Hyper-V in Windows Server 2008.

REAL WORLD **What's Different?**

Why has virtualization suddenly become such a compelling scenario? What has changed? We think that two very important changes are driving the move to virtualize: official support from Microsoft and the wide availability of x64 hardware.

Official support means that if you have an issue with Windows or just about any of the Microsoft server applications, and you're running in a virtualized environment, you're still supported, and Microsoft support won't say, "Sorry, we don't support you on Virtual Server." This is an important concern for anyone using virtualization in a production environment.

The wide availability of x64 hardware is also driving the move to virtualization. The biggest limiting factor for running virtualization on 32-bit Windows is the RAM limitation. By moving to x64 Windows Server, especially Windows Server 2008 with native Hyper-V, running many server workloads on a single physical server is easy. For example, while writing this book, we've been using an HP ML350G5 server with 16 gigabytes (GB) of RAM and two dual-core processors. That lets us easily run two copies of Windows Small Business Server 2008 in virtual machines and several Windows Vista and Windows XP virtual machines as well.

In this chapter, we'll cover the specifics of installing and configuring SBS in a Hyper-V environment while we also provide a general overview of Hyper-V and cover basic installation and configuration.

Hyper-V Overview

Windows Server 2008 (and thus Windows Small Business Server 2008) includes built-in virtualization with the Hyper-V Server Role. Hyper-V is hypervisor-based, native virtualization that uses the hardware virtualization capabilities of the latest Intel and AMD processors to provide a robust, fast, and resource-conserving virtual environment.

Emulation versus Hypervisor

There are two basic methods of virtualizing operating systems: emulation and hypervisor. *Emulation* builds an execution environment on top of the underlying operating system of the host computer and uses software to simulate the hardware that is made available to the guest operating systems.

A *hypervisor* is software that runs directly on the hardware of the physical server and provides a narrow hardware abstraction layer between the hardware and the base operating system. The hypervisor can use the native hardware support in current Intel and AMD processors to improve the overall performance and security of the hypervisor.

Because Hyper-V is a hypervisor and is built in to Windows Server 2008, it runs more efficiently and natively. A server running Hyper-V has multiple partitions, each running natively on the underlying hardware. The first partition is known as the parent partition and acts as the hardware and operating system control partition for all the other partitions where virtualized operating systems run. The other partitions are child partitions, each with their own operating systems, running directly on the hypervisor layer, as shown in Figure 6-1.

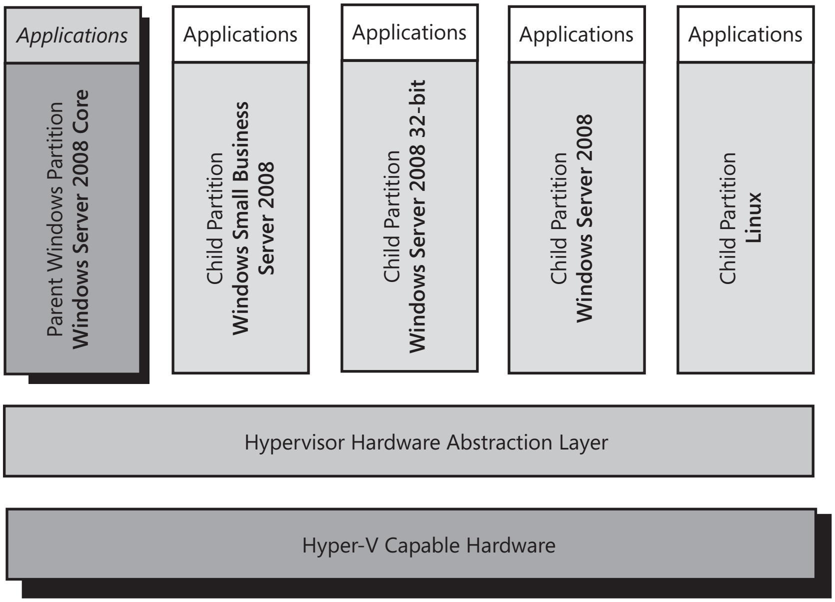


FIGURE 6-1 Windows Server 2008 Hyper-V architecture

Windows Server 2003 supported using Microsoft Virtual Server 2005 R2 as a virtualization solution. Virtual Server is not a hypervisor-based virtualization: It is designed to run on top of an existing operating system—the host operating system—and provide an emulated hardware environment for guest operating systems, as shown in Figure 6-2.

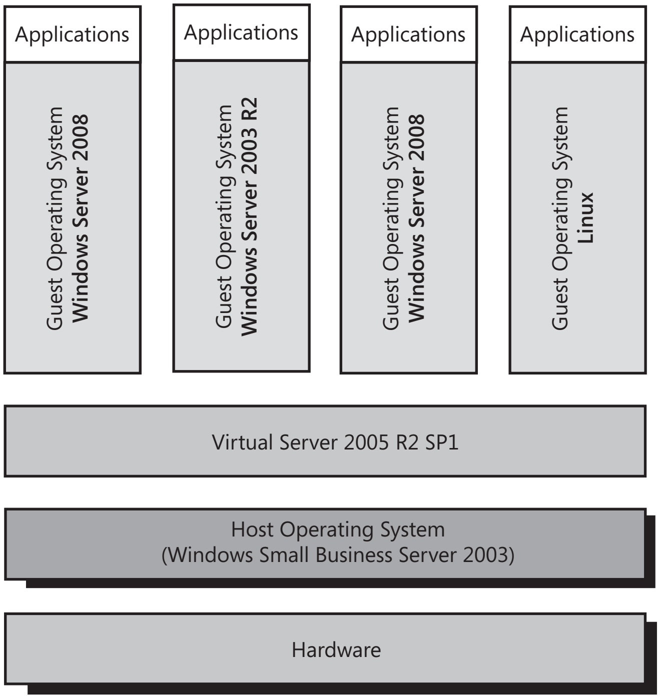


FIGURE 6-2 Microsoft Virtual Server architecture

Hyper-V runs on x64 versions of full Windows Server 2008 and Server Core, as well as the new Hyper-V Server. In most cases, Server Core, or the standalone Hyper-V Server, which is based on Server Core, should be the preferred parent partition for a server that will be used for virtualization. This limits the resource footprint of the parent partition and also makes it easier to protect, because the number of services and attack vectors is fewer on Server Core.

Requirements

The requirements for enabling the Hyper-V Role on Windows Server 2008 are as follows:

- x64 version of Windows Server 2008
- Hardware virtualization support (Intel-VT or AMD-V–enabled CPUs)
- Hardware Data Execution Protection (DEP)–enabled (Intel XD bit or AMD NX bit)

In addition to the requirements for the parent partition of Windows Server 2008, each child partition requires approximately 75 megabytes (MB) of RAM and the hard disk space used by the operating system in the child partition.

Finally, it is important that your server have a minimum of two NICs installed, exclusive of any special management NICs such as an HP iLO. One of these NICs will be reserved for remote management of the parent server and ensures that you can always connect to the parent partition to manage the child partitions.

REAL WORLD **I/O Subsystem**

Any virtualization solution puts a lot of stress on the hardware of the I/O subsystem, especially the disk subsystem. Each virtual hard disk is a file, and with multiple operating systems each writing to files independently and concurrently, a lot of I/O traffic is writing to the parent partition's file system. As a result, a weak or slow I/O subsystem will quickly become the bottleneck limiting the overall performance of the virtual machines.

Also, unlike many applications, virtualization tends to be write-intensive, making it essential that you plan your RAID subsystem accordingly. RAID 5 is a much less appealing alternative as a base RAID choice for the parent operating system. You also do not want to run software RAID on the parent Windows Server 2008.

Any RAID subsystem works better the more disks it has. A RAID 0+1 array that has four 400-GB disks has 800 GB of disk space available, but it is not as fast as a RAID 0+1 array of eight 200-GB disks, which provides the same 800 GB of disk space. By adding extra disks, the writing and reading from the array is distributed across more disks, putting less load on each individual disk.

The same stresses apply to the networking portion of the I/O subsystem that apply to the disk portion. Because many virtual machines can connect through a single physical NIC, you'll want to specify fast and resource-sparing network cards for your Hyper-V server. Here's a clue: a $20 GigE network card is not going to provide the same satisfactory experience as a quality, server-class network card connected to either the PCI-X or PCIe busses.

If you're building or specifying a server for Hyper-V (or any virtualization product), don't skimp on the I/O subsystem. A fast RAID controller with a large cache and a wide array with as many disks as you can manage is an important performance choice. And be especially aware of redundancy. If your Hyper-V server fails because you've had two disks in a RAID 5 array fail, not only is the one physical server down, but your SBS server and every other virtual machine running on that server are also down.

Installation

Installing Hyper-V on Windows Server 2008 uses the native Windows Server 2008 tools—either the graphical Server Manager, or the command-line version, ServerManagerCmd.exe. When installing on Windows Server 2008 Core, use the OCSetup.exe utility.

Installing On Windows Server Core

To install the Hyper-V Role on Server Core, first complete the normal installation of Windows Server 2008 by selecting the appropriate version (Enterprise or Standard) of Server Core as the operating system being installed. Then perform basic initial configuration of the operating system, including setting the IP addresses, setting the server name, and configuring the Windows Firewall, as detailed in the following section. You will not be joining the Server Core to the domain, because the domain will be a child of the Core parent partition. Scripts to simplify the installation and initial configuration are provided on the companion media that accompanies this book. You will need to enable remote administration as part of the base Server Core installation because there is no way to directly manage or create virtual machines on Server Core—the Hyper-V Management Console won't run on Server Core.

COMPANION MEDIA **The previously mentioned scripts—initsetup1.cmd and initsetup2.cmd—are in the Scripts folder on this book's companion media.**

When you've completed the base operating system configuration, use the following commands to add the Hyper-V Role:

```
bcdedit /set hypervisorlaunchtype auto
start /w ocsetup Microsoft-Hyper-V
```

You'll need to reboot the server after these commands have been run.

NOTE **The preceding bcdedit command is not strictly required, but if you don't run it, you need to do two reboots before Hyper-V is fully operational.**

Initial Configuration

The initial steps you'll need to perform on a Server Core installation can vary depending on what Roles you're installing, but in a basic Hyper-V-only installation, these are the essential basic steps:

- Set a fixed IP address.
- Change the server name to something reasonable.
- Enable remote management through Windows Firewall.
- Enable remote desktop.
- Activate the server.

Table 6-1 contains the settings we'll be using during this install scenario.

TABLE 6-1 Settings for Initial Server Core Configuration (Example)

SETTING	VALUE
IP Address (Management NIC)	192.168.51.4
Gateway	192.168.51.1
DNS Server	192.168.51.2
IP Address (Child Partition NIC)	192.168.16.2
Gateway	192.168.16.1
DNS Server	192.168.16.2
Server Name	hp350-core-04
Default Desktop Resolution	1024x768
Remote Management	Enable for All Profiles
Windows Activation	Activate

IMPORTANT **Normally, servers used for SBS 2008 are equipped with only a single network card because SBS 2008 only supports a single NIC configuration. However, if you are using Hyper-V virtualization, you'll want a second NIC to ensure that you maintain management access to the physical computer even if there are problems with the virtualized SBS. That second NIC can be connected to the same subnet (range of IP addresses) as the primary NIC, or it can be on a completely separate network, as in our test network here.**

To configure the initial settings of a Server Core installation, follow these steps:

1. Log on to the newly installed Windows Server 2008 computer. You'll be prompted to change your initial password.
2. At the initial command window, start a second command window by typing the following command:

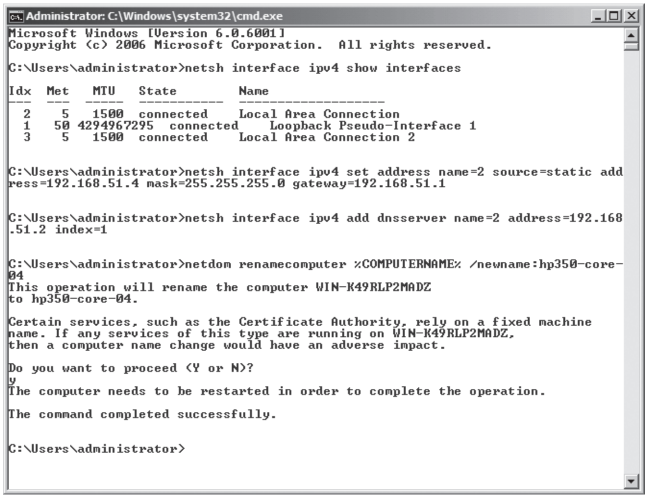
   ```
   Start cmd
   ```

   Although not an absolute requirement, it's often handy to have a second window open when you've only got the command line to work from.
3. If you're running on two different subnets, determine which network adapter is connected to which subnet. If both have DHCP servers, a simple **`ipconfig`** will give you the information you need.
4. Set up your management network first by running the following commands, modified to match your environment. Our settings are taken from Table 6-1.

   ```
   netsh interface ipv4 show interfaces
   netsh interface ipv4 set address name="2" source=static
   ```

```
  address=192.168.51.4     mask=255.255.255.0
  gateway=192.168.51.1
netsh interface ipv4 add dnsserver name="2" address=192.168.51.2 index=1
netdom renamecomputer %COMPUTERNAME% /newname: hp350-core-04
```

5. If there were no problems encountered, run `shutdown /t 0 /r` to reboot your server. Figure 6-3 shows a typical session.



```
Microsoft Windows [Version 6.0.6001]
Copyright (c) 2006 Microsoft Corporation.  All rights reserved.

C:\Users\administrator>netsh interface ipv4 show interfaces

Idx  Met   MTU   State        Name
---  ---  -----  -----------  -------------------
  2    5   1500  connected    Local Area Connection
  1   50 4294967295  connected    Loopback Pseudo-Interface 1
  3    5   1500  connected    Local Area Connection 2


C:\Users\administrator>netsh interface ipv4 set address name=2 source=static add
ress=192.168.51.4 mask=255.255.255.0 gateway=192.168.51.1


C:\Users\administrator>netsh interface ipv4 add dnsserver name=2 address=192.168
.51.2 index=1


C:\Users\administrator>netdom renamecomputer %COMPUTERNAME% /newname:hp350-core-
04
This operation will rename the computer WIN-K49RLP2MADZ
to hp350-core-04.

Certain services, such as the Certificate Authority, rely on a fixed machine
name. If any services of this type are running on WIN-K49RLP2MADZ,
then a computer name change would have an adverse impact.

Do you want to proceed (Y or N)?
y
The computer needs to be restarted in order to complete the operation.

The command completed successfully.


C:\Users\administrator>
```

FIGURE 6-3 Initial configuration of the management interface for Server Core

6. When the server restarts, log back on. If you use two CMD windows, you'll need to start the second one. Server Core isn't smart enough to do it automatically.
7. Run the following commands, as shown in Figure 6-4.

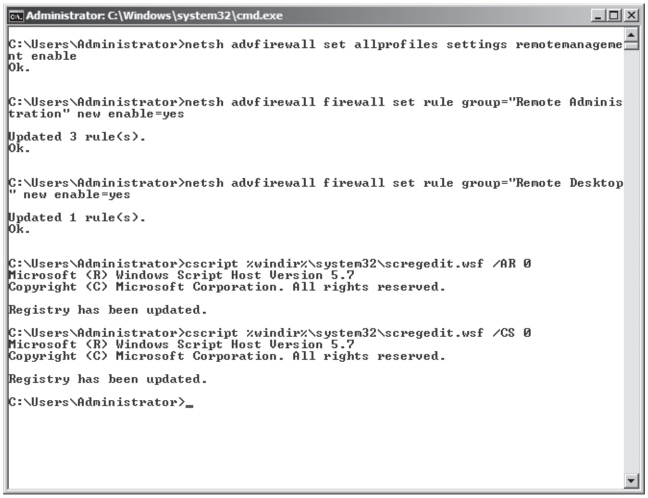
```
Netsh advfirewall set allprofiles settings remotemanagement enable
Netsh advfirewall firewall set rule group="Remote Administration" new enable=yes
Netsh advfirewall firewall set rule group="Remote Desktop" new enable=yes
Cscript %windir%\system32\scregedit.wsf /AR 0
Cscript %windir%\system32\scregedit.wsf /CS 0
```

8. Restart the server and log back on. Run the following command (and answer "Y" when prompted) to set up Windows Remote Management (WinRM):

```
Winrm quickconfig
```

9. If your copy of Windows Server 2008 does not have the RTM version of Hyper-V, please download and copy the RTM version to the server, and run the install. The file can be downloaded from the link in Microsoft Knowledge Base article 950050 at *http://support.microsoft.com/kb/950050/*.
10. Run the following command and then restart the server as requested:

```
<path>\Windows6.0-KB950050-x64.msu
```



```
C:\Users\Administrator>netsh advfirewall set allprofiles settings remotemanageme
nt enable
Ok.


C:\Users\Administrator>netsh advfirewall firewall set rule group="Remote Adminis
tration" new enable=yes

Updated 3 rule(s).
Ok.


C:\Users\Administrator>netsh advfirewall firewall set rule group="Remote Desktop
" new enable=yes

Updated 1 rule(s).
Ok.


C:\Users\Administrator>cscript %windir%\system32\scregedit.wsf /AR 0
Microsoft (R) Windows Script Host Version 5.7
Copyright (C) Microsoft Corporation. All rights reserved.

Registry has been updated.

C:\Users\Administrator>cscript %windir%\system32\scregedit.wsf /CS 0
Microsoft (R) Windows Script Host Version 5.7
Copyright (C) Microsoft Corporation. All rights reserved.

Registry has been updated.

C:\Users\Administrator>_
```

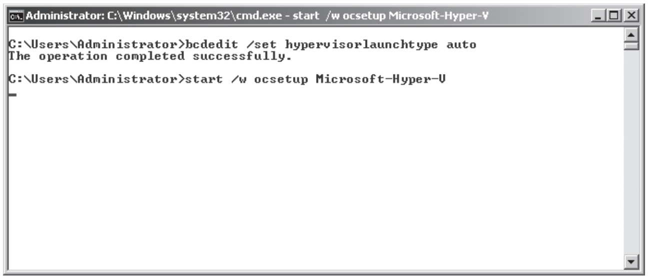
FIGURE 6-4 Configuring Server Core firewall and registry settings

Installing the Hyper-V Role

When you’ve completed the initial configuration of the Windows Server 2008 Server Core, you can then add the Hyper-V Role to your server. To enable the Hyper-V Role to the server, use the following commands, as shown in Figure 6-5.

```
Bcdedit /set hypervisorlaunchtype auto
Start /w ocsetup Microsoft-Hyper-V
```

> ***IMPORTANT*** **Syntax for `ocsetup` commands are very fussy and case sensitive.**


Administrator: C:\Windows\system32\cmd.exe - start /w ocsetup Microsoft-Hyper-V

```
C:\Users\Administrator>bcdedit /set hypervisorlaunchtype auto
The operation completed successfully.

C:\Users\Administrator>start /w ocsetup Microsoft-Hyper-V
_
```

FIGURE 6-5 Enabling the Hyper-V Role on Windows Server 2008 Server Core

You’ll need to restart your server at least once following these commands, and then Hyper-V will be installed and ready to configure.

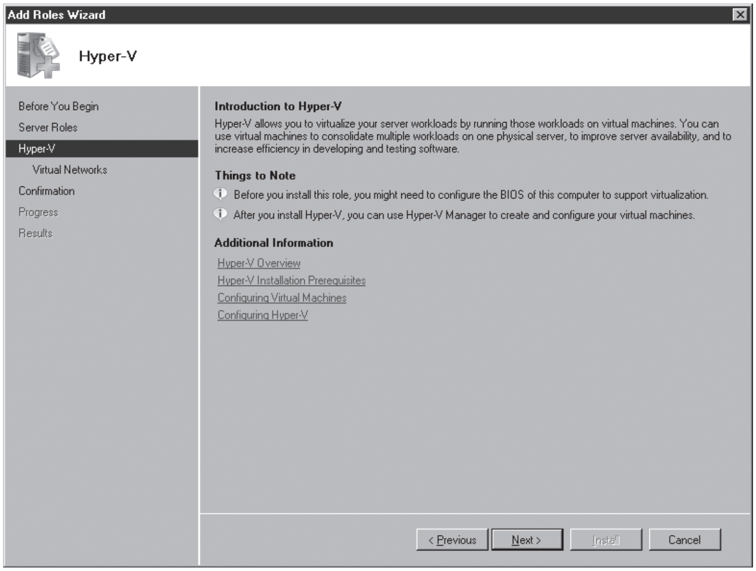
Installing on Full Windows Server 2008

To install the Hyper-V Role on full Windows Server 2008, first complete the normal installation and configuration of Windows Server 2008, as described in Chapter 23, "Installing the Second Server." When initial configuration has completed, you can install the Hyper-V Role using the following steps:

1. Open the Server Manager console if it isn't open already.
2. Select Add Roles from the Action menu to open the Before You Begin page of the Add Roles Wizard.
3. Read the advice on the Before You Begin page. It's actually good advice and a useful reminder. If you've read the page, understand all its implications, and don't ever want to see the page again, select the Skip This Page By Default check box. We leave it unchecked, personally.

> ***NOTE*** **If you've already run the Add Roles Wizard and have selected Skip This Page By Default, you won't see the Before You Begin page of the Add Roles Wizard.**

4. Click Next to open the Select Server Roles page of the Add Roles Wizard.
5. Select Hyper-V from the list of Roles.
6. Click Next to open the Hyper-V page, as shown in Figure 6-6. This page describes the Hyper-V Role and includes a Things To Note section that has cautions and advisories specific to the Hyper-V Role. The page also has a link to several Additional Information pages with up-to-date information on Hyper-V.



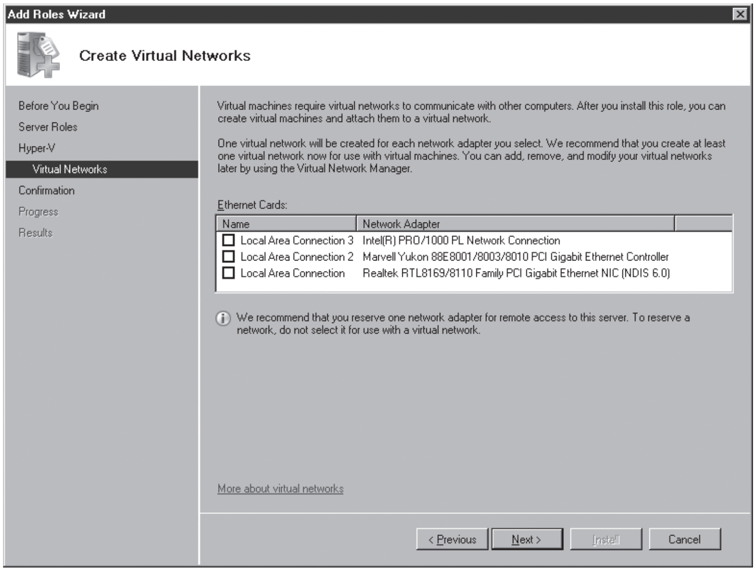
Hyper-V allows you to virtualize your server workloads by running those workloads on virtual machines. You can use virtual machines to consolidate multiple workloads on one physical server, to improve server availability, and to increase efficiency in developing and testing software.

Before you install this role, you might need to configure the BIOS of this computer to support virtualization.

After you install Hyper-V, you can use Hyper-V Manager to create and configure your virtual machines.

FIGURE 6-6 The Hyper-V page of the Add Roles Wizard

7. When you've read the Things To Note, click Next to open the Create Virtual Networks page shown in Figure 6-7.



Virtual machines require virtual networks to communicate with other computers. After you install this role, you can create virtual machines and attach them to a virtual network.

One virtual network will be created for each network adapter you select. We recommend that you create at least one virtual network now for use with virtual machines. You can add, remove, and modify your virtual networks later by using the Virtual Network Manager.

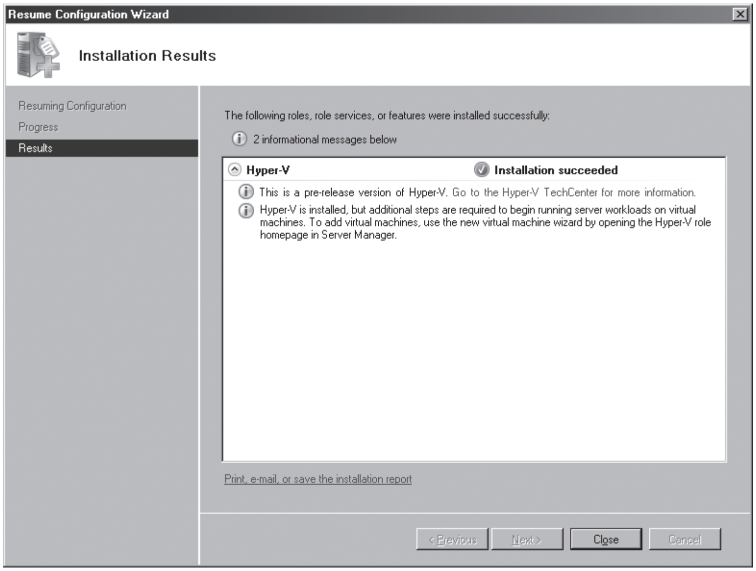
Ethernet Cards:

Name	Network Adapter
☐ Local Area Connection 3	Intel(R) PRO/1000 PL Network Connection
☐ Local Area Connection 2	Marvell Yukon 88E8001/8003/8010 PCI Gigabit Ethernet Controller
☐ Local Area Connection	Realtek RTL8169/8110 Family PCI Gigabit Ethernet NIC (NDIS 6.0)

We recommend that you reserve one network adapter for remote access to this server. To reserve a network, do not select it for use with a virtual network.

FIGURE 6-7 The Create Virtual Networks page of the Add Roles Wizard

8. Select the Ethernet Cards you want to create Virtual Networks for. The general rule is to leave at least one network card not used for virtual networks to ensure that you maintain full remote connectivity to the server.
9. When the Add Roles Wizard has all the information necessary to proceed, it will open the Confirm Installation Selections page. If everything looks correct, click Install to begin the installation.
10. When the installation completes, you'll see the Installation Results page. The Hyper-V installation will require a reboot. Click Close to complete the wizard. Click Yes to reboot now.
11. After the server reboots, log back on with the same account that you used to add the Hyper-V Role. The Resume Configuration Wizard will open, and when the configuration is complete, you'll see the final Installation Results page, as shown in Figure 6-8.



The following roles, role services, or features were installed successfully:

2 informational messages below

Hyper-V — Installation succeeded

This is a pre-release version of Hyper-V. Go to the Hyper-V TechCenter for more information.

Hyper-V is installed, but additional steps are required to begin running server workloads on virtual machines. To add virtual machines, use the new virtual machine wizard by opening the Hyper-V role homepage in Server Manager.

FIGURE 6-8 The Installation Results page of the Resume Configuration Wizard

12. Click Close to exit the wizard.

Initial Configuration

After you've installed the Hyper-V Role, you need to actually configure Hyper-V and then start adding virtual machines. The management tool for Hyper-V is the Hyper-V Manager console. Like other management consoles in Windows Server 2008, it integrates into the Server Manager console. You can use it there or run it standalone. We prefer standalone, frankly. Open Administrative Tools and select Hyper-V Manager from the list to run the Hyper-V Manager console standalone.

NOTE **You could run the Hyper-V Manager console by starting it from the command line, but unlike other Windows Server 2008 management consoles, it's not put in %windir%\system32. It is actually in %ProgramFiles%\Hyper-V, which isn't on your path. The command line for this is:**

```
"%ProgramFiles%\Hyper-V\virtmgmt.msc" (quotes required)
```

NOTE **If you're running Hyper-V on Server Core, you'll need to install the Hyper-V management tools onto a Windows Vista or Windows Server 2008 computer and run them remotely. See Microsoft Knowledge Base article 952627 at *http://support.microsoft.com/kb/952627/*. You'll use the same steps as if you were running the console locally, but you'll have to connect to the server first.**

Configuring Networks

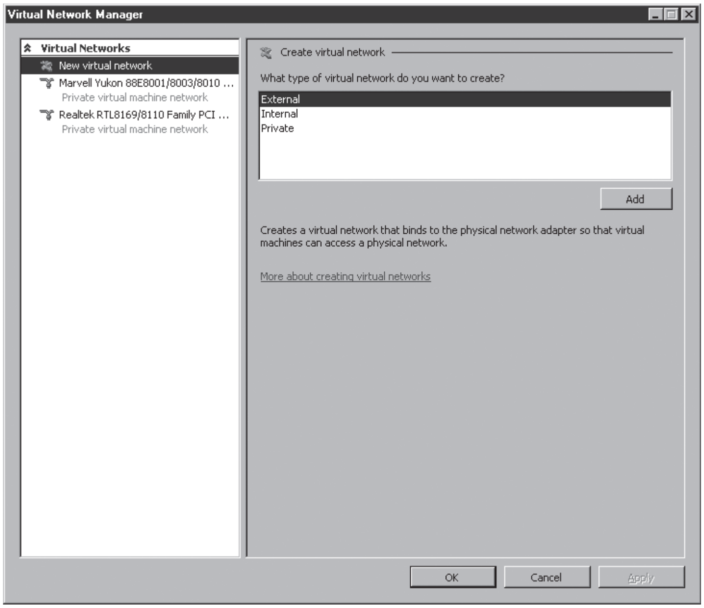
The first step after installing Hyper-V is to configure your networks. This step in the Add Roles Wizard creates the network and attaches it to the network cards you selected, but it makes the new networks available only as a private network connection, which isn't terribly useful if you need to connect your virtual machines to the outside world or another network. And, of course, if you installed on Server Core, no network configuration has been done at all.

Hyper-V supports three kinds of virtual networks:

- **External** An external network is a virtual network switch that binds to the physical network adapter, providing access to resources outside the virtual network. An external network can be assigned to a VLAN.
- **Internal** An internal network is a virtual network switch that allows virtual machines on the server to connect to each other and to the parent partition. An internal network can be assigned to a VLAN.
- **Private** A private network is a virtual network switch that allows virtual machines to connect to each other but provides no connection between the virtual machines and the physical computer.

To set your networks to be external networks, allowing them to connect through the physical network adapter to outside the physical computer, use the following steps:

1. Open the Hyper-V Manager console if it isn't already open.
2. Select the Hyper-V computer in the left pane and then click Virtual Network Manager in the Actions pane to open the Virtual Network Manager as shown in Figure 6-9.

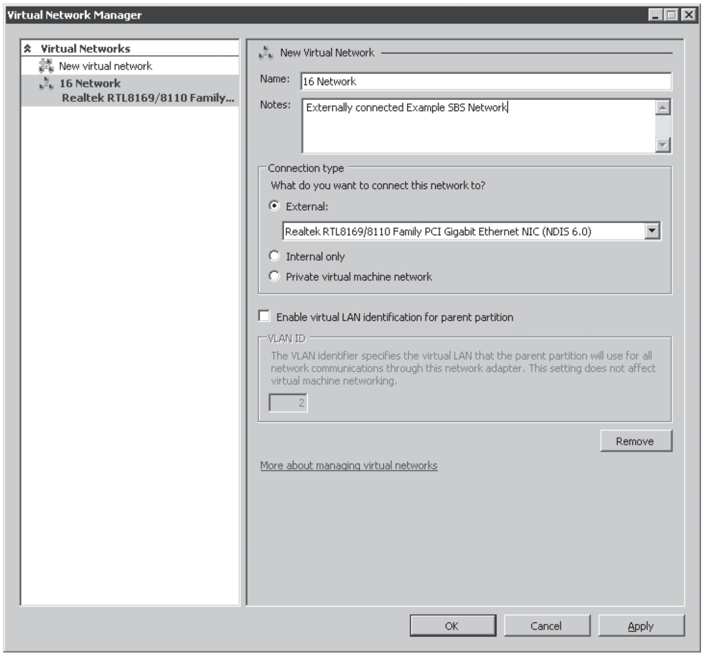

Virtual Network Manager
Virtual Networks
New virtual network
Marvell Yukon 88E8001/8003/8010 ...
Private virtual machine network
Realtek RTL8169/8110 Family PCI ...
Private virtual machine network
Create virtual network
External
Internal
Private
Add
More about creating virtual networks
OK
Cancel
Apply

What type of virtual network do you want to create?

Creates a virtual network that binds to the physical network adapter so that virtual machines can access a physical network.

FIGURE 6-9 The Virtual Network Manager

3. Select the Virtual Network you want to make an external network. Edit the name to provide a more meaningful description and add any notes you want to add.
4. Select External and then select the physical network adapter you want to connect this virtual network to from the drop-down list, as shown in Figure 6-10.



Name: 16 Network

Notes: Externally connected Example SBS Network

Connection type

What do you want to connect this network to?

● External:

Realtek RTL8169/8110 Family PCI Gigabit Ethernet NIC (NDIS 6.0)

○ Internal only

○ Private virtual machine network

☐ Enable virtual LAN identification for parent partition

VLAN ID

The VLAN identifier specifies the virtual LAN that the parent partition will use for all network communications through this network adapter. This setting does not affect virtual machine networking.

2

FIGURE 6-10 Attaching a virtual network to a physical adapter to create an external network

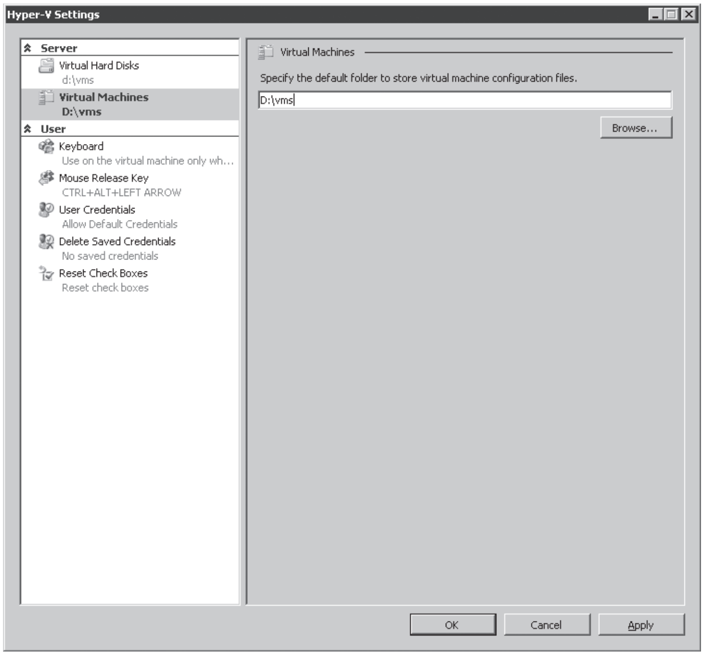
5. Click OK to close the Virtual Network Manager and apply your changes.

Server Settings

The next step in configuring your Hyper-V server is to set the overall server settings and the user-specific settings. General server settings include the default location for hard disks and the default location for virtual machines. User-specific settings include keyboard settings and saved credentials.

To set the server settings for a Hyper-V server, use the following steps:

1. Open the Hyper-V Manager console if it isn't already open.
2. Select the Hyper-V computer in the left pane and then click Hyper-V Settings in the Actions pane to open the Hyper-V Settings dialog box, shown in Figure 6-11.



Virtual Hard Disks
d:\vms
Virtual Machines
D:\vms
Keyboard
Use on the virtual machine only wh...
Mouse Release Key
CTRL+ALT+LEFT ARROW
User Credentials
Allow Default Credentials
Delete Saved Credentials
No saved credentials
Reset Check Boxes
Reset check boxes

Specify the default folder to store virtual machine configuration files.
D:\vms

FIGURE 6-11 The Hyper-V Settings dialog box

3. Select Virtual Hard Disks in the left pane and enter the top of the path to use as a default for storing the VHD files used by virtual machines. You can change the actual path of any specific VHD later. This just sets the default location.
4. Select Virtual Machines in the left pane and set the default path for storing virtual machine snapshot files.
5. Select Keyboard in the left pane and specify how special Windows key combinations (such as Alt+Tab and Ctrl+Esc) are used.
6. Select Mouse Release Key and set the default key combination to release a captured mouse when connecting to a virtual machine that doesn't have Integration Components installed.
7. Select Delete Saved Credentials or Reset Check Boxes to remove any saved credentials on the server or to reset all the Don't Ask Me Again check boxes on the server.
8. Click OK to change the settings and return to the main Hyper-V Manager.

REAL WORLD **Default Locations**

The default locations that Microsoft has chosen for VHD files and snapshot files frankly just don't make any sense at all. The default location is on the system drive of the parent partition. That's just a really bad idea. Your VHD files could take up hundreds of gigabytes of space, possibly terabytes of space. Do they really think that your system drive is the right place for all that? Well, we certainly don't. Frankly, we think they should either ask the question during the install, or actually go out and inspect your system and choose an appropriate default based on your system configuration. But they didn't make that choice, so you need to take steps to fix it.

The default location for snapshots is also on the system drive of the parent partition, and again these are files that are going to take up a lot of space. Plus, putting these files on the system drive is a bad decision for performance.

We suggest creating one or more disk volumes specifically for storing VHDs and snapshots. This makes backups easier, allows you to store your VHDs on your fastest array, and just makes good sense. Even if you had to completely rebuild the server, by having your VHDs and snapshot files on separate volumes, you greatly simplify the recovery process.

Creating a Virtual Machine

Okay—enough of that getting-ready stuff and basic configuration. The real reason we're running Hyper-V is to actually create and use virtual machines (VMs), so let's get down to it. There are several different ways you can make a VM, but they all start with the Hyper-V Manager console.

NOTE System Center Virtual Machine Manager (SCVMM) 2008 will support Hyper-V, including for creation of VMs. We can't wait! If you use more than one or two VMs and support more than one host server, SCVMM is a great product. And we're pretty cautious about saying things like that.

The basic steps for creating a VM are as follows:

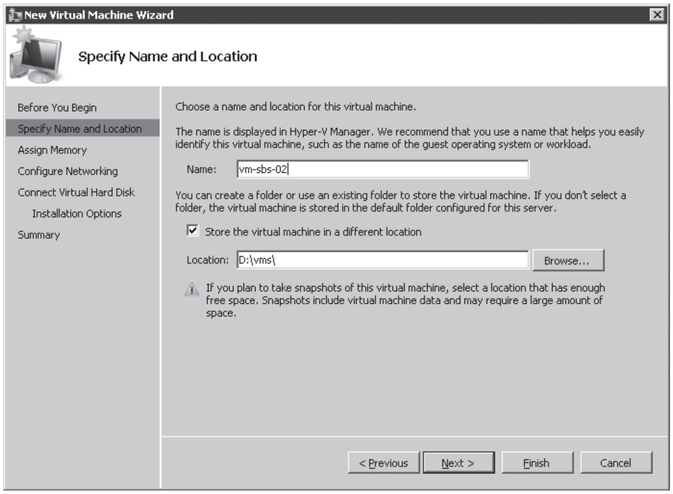
- Create a new VM, giving it a name and location.
- Assign RAM to the VM.
- Connect to a network.
- Assign or create a Virtual Disk.
- Specify where the operating system will be loaded from.

The New Virtual Machine Wizard handles all these basic steps but is pretty limited, and insufficient for creating a VM for SBS. You'll want to actually configure the VM further before installing SBS or the SBS second server on your VM. We'll start by walking through the steps for creating a VM and then show you how to change that basic VM to be a bit more useful and flexible.

Creating a Basic VM

To create a new VM, follow these steps:

1. Open the Hyper-V Manager console if it isn't already open.
2. Select the Hyper-V computer in the left-hand pane, click New, and then click Virtual Machine on the Actions menu to start the New Virtual Machine Wizard.
3. If you haven't disabled the Before You Begin page, you can read the description of what's going to happen or click the More About Creating Virtual Machines link to open the Help pages for creating a VM. Select the Do Not Show This Page Again check box so that you don't have to see this page again.
4. Click Next to open the Specify Name And Location page, shown in Figure 6-12.



Choose a name and location for this virtual machine.

The name is displayed in Hyper-V Manager. We recommend that you use a name that helps you easily identify this virtual machine, such as the name of the guest operating system or workload.

Name: vm-sbs-02

You can create a folder or use an existing folder to store the virtual machine. If you don't select a folder, the virtual machine is stored in the default folder configured for this server.

☑ Store the virtual machine in a different location

Location: D:\vms\

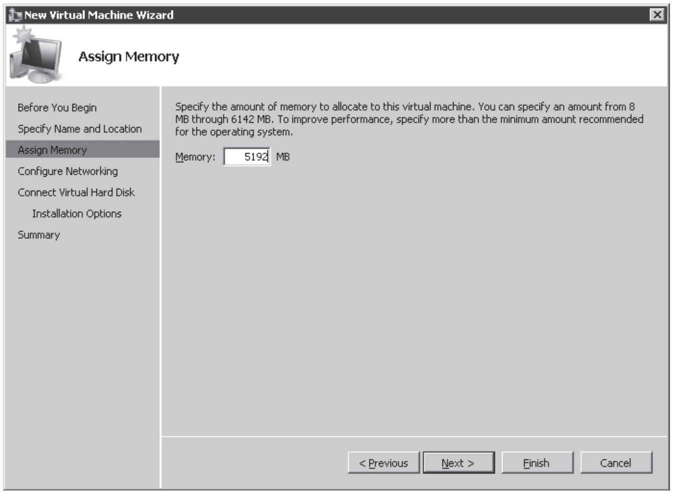
If you plan to take snapshots of this virtual machine, select a location that has enough free space. Snapshots include virtual machine data and may require a large amount of space.

FIGURE 6-12 The Specify Name And Location page of the New Virtual Machine Wizard

5. Enter a name for the VM and select the Store The Virtual Machine In A Different Location check box. When you select this check box, all the files for this VM will be stored in a directory with the same name as the VM, shown below in the Location field.

> ***NOTE*** **For this first VM, with a name of vm-sbs-02 and a default location of D:\vms\, the result will be a new directory of D:\vms\vm-sbs-02, with the files and subdirectories of the VM stored in it.**

6. Click Next to open the Assign Memory page, shown in Figure 6-13. Specify the amount of memory that will be assigned to the new VM. You should specify the same amount of memory that you would specify for the RAM of a physical SBS computer, but *do not exceed the memory of the host physical computer*.

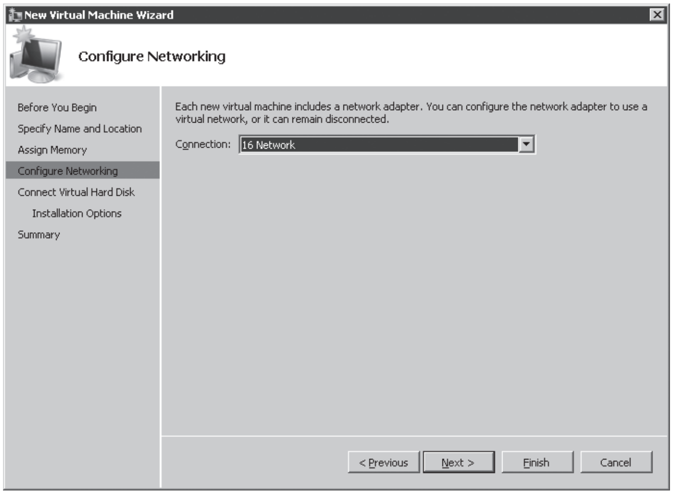


Specify the amount of memory to allocate to this virtual machine. You can specify an amount from 8 MB through 6142 MB. To improve performance, specify more than the minimum amount recommended for the operating system.

Memory: 5192 MB

FIGURE 6-13 The Assign Memory page of the New Virtual Machine Wizard

7. Click Next to open the Configure Networking page. Select the network that the VM will be connected to, as shown in Figure 6-14.

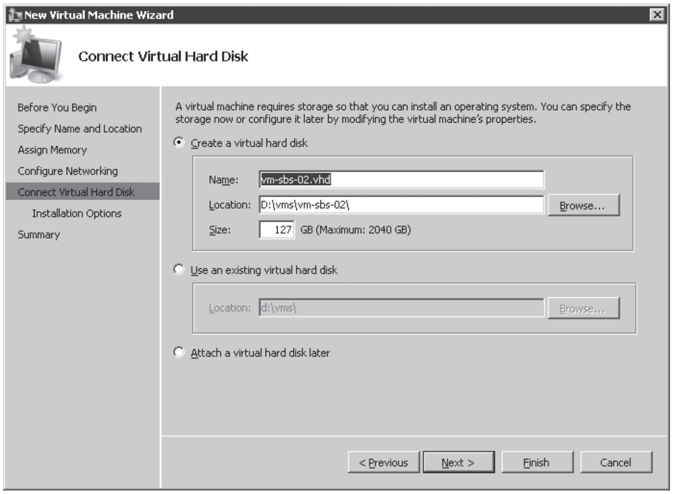


Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual network, or it can remain disconnected.

Connection: 16 Network

FIGURE 6-14 The Configure Networking page of the New Virtual Machine Wizard

8. Click Next to open the Connect Virtual Hard Disk page, shown in Figure 6-15.



A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties.

● Create a virtual hard disk

Name: vm-sbs-02.vhd

Location: D:\vms\vm-sbs-02\

Size: 127 GB (Maximum: 2040 GB)

○ Use an existing virtual hard disk

Location: d:\vms\

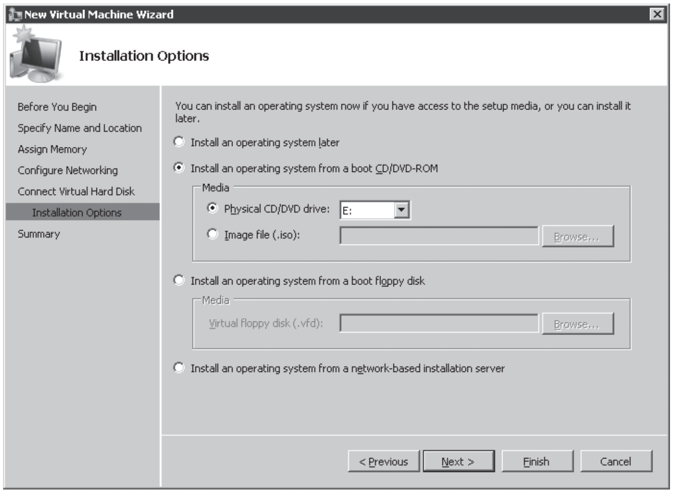
○ Attach a virtual hard disk later

FIGURE 6-15 The Connect Virtual Hard Disk page of the New Virtual Machine Wizard

9. Select Create A Virtual Disk to create a new, automatically expanding, virtual disk with a nominal size of 127 GB. Accept the default location and name or modify as appropriate for your environment. If you think you'll need a system disk larger than 127 GB, change the Size field.

IMPORTANT **The maximum size of an IDE VHD in Hyper-V is 2 terabytes (2040 GB, actually). But a dynamically expanding virtual hard disk doesn't actually take up any more room on your physical hard disk or array than it needs to. As you expand your use of the VM, the size of the disk will continue to grow, up to the size you set when you create the disk.**

10. Click Next to open the Installation Options page, as shown in Figure 6-16.



You can install an operating system now if you have access to the setup media, or you can install it later.

○ Install an operating system later

● Install an operating system from a boot CD/DVD-ROM

Media

● Physical CD/DVD drive: E:

○ Image file (.iso): Browse...

○ Install an operating system from a boot floppy disk

Media

Virtual floppy disk (.vfd): Browse...

○ Install an operating system from a network-based installation server

FIGURE 6-16 The Installation Options page of the New Virtual Machine Wizard

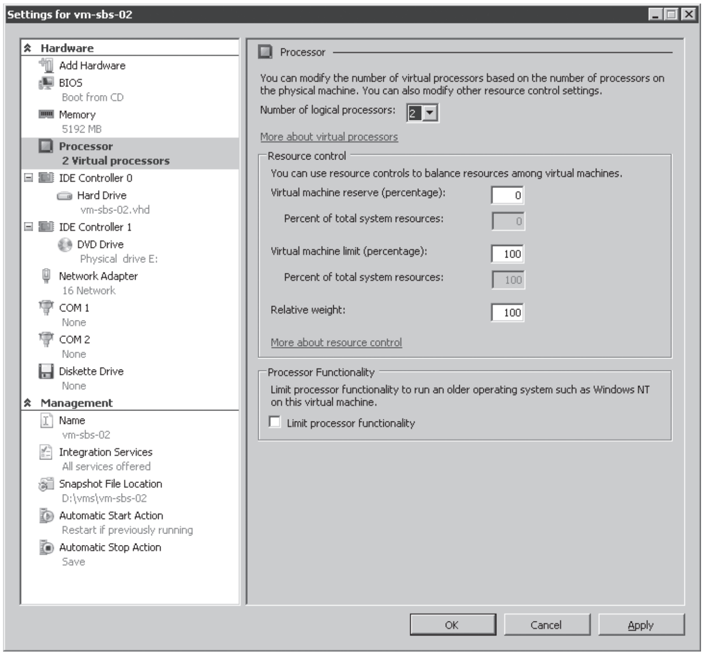
The choices are as follow:

- **Install An Operating System Later** This option requires you to configure how your operating system will be installed manually before starting the VM.
- **Install An Operating System From A Boot CD/DVD-ROM** This option allows you to connect to the physical computer's CD or DVD drive, or to mount an ISO file stored on the physical computer's hard disk as if it were a physical CD/DVD drive.
- **Install An Operating System From A Boot Floppy Disk** This option allows you to connect to a virtual floppy disk (.vfd) file as if it were a physical floppy drive.
- **Install An Operating System From A Network-Based Installation Server** This option changes the BIOS setting for the VM to enable a network boot from a PXE server and also changes the network card for the VM to be an emulated Legacy Network Adapter instead of the default synthetic network adapter. If you're deploying using a WDS server, choose this option.

11. Click Next to open the Completing The New Virtual Machine Wizard summary page or click Finish to skip the last step. On the last page you can choose to automatically start the new VM as soon as you close the wizard, but we think that's a bad option. Just skip it—you should probably adjust the settings for the new VM before you start it anyway.

Machine Settings

After you've created the VM for your SBS server, you should make some changes to the machine settings that the New Virtual Machine Wizard has configured. To adjust the settings of a VM, select the VM in the center Virtual Machines pane of Hyper-V Manager and click Settings on the Action menu to open the Settings dialog box for the VM, as shown in Figure 6-17.


Settings for vm-sbs-02

Hardware
Add Hardware
BIOS
Boot from CD
Memory
5192 MB
Processor
2 Virtual processors
IDE Controller 0
Hard Drive
vm-sbs-02.vhd
IDE Controller 1
DVD Drive
Physical drive E:
Network Adapter
16 Network
COM 1
None
COM 2
None
Diskette Drive
None
Management
Name
vm-sbs-02
Integration Services
All services offered
Snapshot File Location
D:\vms\vm-sbs-02
Automatic Start Action
Restart if previously running
Automatic Stop Action
Save

Processor

You can modify the number of virtual processors based on the number of processors on the physical machine. You can also modify other resource control settings.

Number of logical processors: 2

More about virtual processors

Resource control

You can use resource controls to balance resources among virtual machines.

Virtual machine reserve (percentage): 0
Percent of total system resources: 0
Virtual machine limit (percentage): 100
Percent of total system resources: 100
Relative weight: 100

More about resource control

Processor Functionality

Limit processor functionality to run an older operating system such as Windows NT on this virtual machine.

☐ Limit processor functionality

FIGURE 6-17 The Settings dialog box for the vm-sbs-02 virtual machine

The settings page of a VM allows you to control the virtual hardware available to that VM. The settings that can be changed on a VM include the following:

- **Add Hardware** Add a SCSI Controller, Network Adapter, or Legacy Network Adapter.
- **BIOS** Change the boot order and Numlock state.
- **Memory** Set the amount of memory assigned to the VM. Each VM is limited to 64 GB of memory.
- **Processor** Set the number of logical processors assigned to the VM. This is limited to the number of logical processors available on the host computer, or four logical processors, whichever is fewer. Hyper-V is limited to a maximum of 16 logical processors per host computer in the initial release. For SBS 2008, assign at least two logical processors.
- **IDE Controllers 0, 1** Set the drives connected to each IDE controller. Both Hard Disk and DVD Drive types are supported on IDE controllers.
- **SCSI Controller(s)** Set the drives connected to the synthetic SCSI controller. Each SCSI controller is assigned to SCSI ID7 and can support up to six virtual SCSI drives. SCSI drives cannot be used as boot drives and are not available until integration components are installed. Even if your physical drives are SCSI or SAS, do not choose SCSI here for your boot disk. That must always be IDE.
- **Network Adapters** Set the network, Mac type, and VLAN connections of the synthetic network adapters. Each VM is limited to a maximum of eight network adapters. SBS 2008 only supports a single network.

- **Legacy Network Adapters** Set the network, Mac type, and VLAN connections of the legacy network adapters. Each VM is limited to a maximum of four legacy network adapters.
- **COM 1, COM 2** Set the named pipe used to communicate with the physical host computer.
- **Diskette Drive** Set the virtual floppy drive (.vfd) that is connected to the virtual floppy drive. No pass-through to the physical floppy drive on the host (parent) computer is supported. Use VFDs for SBS Answer Files to automate deployment.

Memory and CPU

Hyper-V supports a maximum of four processors and 64 GB of RAM per VM. On host computers with fewer than four processors, you'll be limited to the number of logical processors on the host itself. And you need to be careful not to over-specify the RAM for VMs on a physical computer. You need to leave at least 500 MB of RAM for the host partition, plus a bit (less than 100 MB) per running VM.

Disks and Controllers

Hyper-V uses a pair of synthetic IDE controllers for hard disks and DVD drives by default. You must use an IDE for the boot hard disk—the synthetic SCSI controller won't have drivers available in the operating system until after the Integration Services are installed.

If you're familiar with the IDE controller in Virtual Server 2005, you'll know that it was slow and only supported hard disks up to 127 GB. We quickly learned to use Virtual Server's SCSI controller and floppy disk to load the drivers during installation, greatly speeding up the process. But that workaround is no longer necessary. The new IDE controller in Hyper-V has full LBA-48 support, and it's much faster than the old Virtual Server one.

Before you can add additional disks and connect them to a SCSI controller, you need to add the SCSI controller. By default, a new VM doesn't include a SCSI controller. When you add the controller, you can also add one or more disks to the controller.

REAL WORLD Choosing Disk Types

Hyper-V supports three virtual disk types—dynamically expanding disks, fixed-sized disks, and differencing disks.

Dynamically expanding disks are created with a maximum size, and this is the size that the operating system of the VM sees. But the actual .vhd file of the disk takes up only as much space on your physical hard disk or array as absolutely required for the current contents of the VM drive. As the VM requires more storage space, Hyper-V automatically grows the .vhd file. This is very efficient of hard disk space, allowing you to add space only as absolutely required. But it does mean a slight performance hit every time the disk needs to grow, and more important, the .vhd

file tends to become somewhat fragmented over time, also impacting performance. Nonetheless, we almost always use this type of disk for our VMs except where absolute performance is an issue.

A fixed-size disk is also a .vhd file, but instead of growing only as big as it needs to, when it needs to, it is created at the full size on disk that it needs to be. It takes a significant time to create the .vhd file, but it will be created as a contiguous file (or as contiguous as the underlying fragmentation of your physical disk or array allows).

A differencing disk is an interesting disk type. It is like a dynamic disk in that it gets only as large as it needs to. But a differencing disk is a great way to combine the disk space requirements of multiple VMs. You create the original "base" VM and then mark the disks as read-only. You can actually delete the VM that created the base disks. Now you create one or more VMs that have the same operating system and you create them with differencing disk(s). The differencing disk points to the original base .vhd file, and the only thing that gets saved to the differencing disk is any change from the base VM. This allows multiple VMs to share the same base, simplifying deployment of different versions of the same base system—very useful for quickly building test networks.

The biggest disadvantage of differencing disks is speed. As more VMs point back to the original VHD files, the access to that VHD can be slowed. And if anything causes a change to the original VHD, all the VMs that point to it can be lost. Over time, the size advantage of differencing disks is also reduced as updates and service packs are applied to the differenced VMs. But for a test environment? Differencing disks can be a great speed and resource saver.

The final option is to point directly to the physical partition. This is the fastest option but provides the least flexibility. You might choose this option if you are running Microsoft SQL Server on a VM and you have a performance-sensitive application. But even there, we tend to avoid it if at all possible, choosing a fixed-size disk instead. The difference in speed is negligible, but the flexibility difference is significant.

Network Adapters

When you create a new VM, it will automatically include a single network adapter. Unless you choose to install the operating system from the network, it will add one of the synthetic network adapters that are new to Hyper-V. These work great and are definitely the preferred choice—unless you are running an operating system that doesn't have Integration Services available for it. If that's the case, you'll need to change this adapter to a legacy network adapter. You can't directly change the adapter type—you'll need to delete the existing one and add a legacy adapter.

Because SBS 2008 includes the necessary Integration Components built into the base operating system, you should always choose a synthetic network adapter unless you are using PXE to boot from the network.

COM and Floppy

Hyper-V automatically configures a pair of virtual COM ports (COM1 and COM2) and a virtual floppy disk drive for each VM. But it doesn't actually connect them to anything. To connect a COM port to the host computer, you need to use named pipes. For floppy disks, you need to create a virtual floppy disk file (.vfd). A VFD file is an image of a floppy disk. There is no way in Hyper-V to connect directly to any existing floppy drive on the server.

Working with a Virtual Machine

Working with a Hyper-V VM is almost identical to working with a physical computer. You should do virtually everything you need to do from the client operating system, just as you would on a physical computer. You can connect to the client operating system using Remote Desktop when that is a supported option, and you can always connect using the Virtual Machine Connection. You can open the Virtual Machine Connection to a particular VM by either double-clicking the VM in the Hyper-V Manager console or by selecting it and then clicking Connect on the Action menu. You can connect either locally from the parent partition or remotely if you're running the Hyper-V Remote Management Tools. This connection is to the VM the same as the physical keyboard, mouse, and monitor of a physical computer. However, there are some actions that need to be performed from the parent partition, either from the Hyper-V console or from the menu bar of the Virtual Machine Connection.

Starting, Stopping, Saving, Snapshotting

To start a VM, you need to either set the VM to automatically start or use the Hyper-V Manager console to start the VM. Right-click the VM in the console and select Start from the menu. If you have the Virtual Machine Connection for that VM open, you can select Start from the Action menu.

To stop a VM, you should shut down the operating system in the VM. You can initiate this from the Hyper-V Manager console or on the Virtual Machine Connection Action menu, if Integration Services are installed in the VM. You can also stop a VM by right-clicking the VM in the console and selecting Turn Off , but this can cause corruption issues for the VM's operating system and is not recommended when other alternatives are available.

You can save a VM from the Hyper-V Manager console or the Virtual Machine Connection for that VM by selecting Save from the Action menu. This will save the current state of the VM to disk and is similar to hibernating a physical computer. It does release memory and resources back to the parent partition.

Pausing a VM is similar to putting a physical computer into sleep mode. It's not actively doing anything, but it also doesn't release any of the VM's resources back to the parent partition, except that it isn't using a CPU or doing any disk I/O. But the RAM it has allocated to the VM stays unavailable to other VMs.

Snapshots are one of the ways that VMs are more useful and flexible than any physical computer. Snapshots allow you to take a "picture" of a running virtual machine at an exact moment in time and save it. You can revert back to that snapshot later, starting up the VM at that exact configuration. This is *extremely* useful for building test computers, because it lets you try a new configuration or software application without the risk of having to rebuild the computer if something really bad happens or just wasting the time trying to get back to where you were before the change if it didn't work.

Snapshots can be a powerful tool, giving you the ability to try something with the calm assurance that you can recover completely if it doesn't work. And snapshots happen in seconds. Just select the VM in the Hyper-V Manager console, right-click, and select Snapshot. The VM can be running or not—it doesn't matter.

After you create a snapshot, the VM returns to its previous state. You can rename the snapshot, check the settings that applied at the time of the snapshot, delete it, or even delete an entire snapshot subtree. All these actions are available from the Actions pane of the Hyper-V Manager console or from the Action menu of the Virtual Machine Connection. You can also revert a VM to its previous snapshot or select another snapshot in the tree and apply it.

As you can see, powerful stuff, and the possibilities are something you'll just have to work with a bit to begin to understand.

Clipboard

The Hyper-V Virtual Machine Connection supports a limited ability to pass the contents of your clipboard between the parent partition and the running VM. Only text can be passed, but this allows you to replay the text as keystrokes into the VM. To use this capability, you need to copy text to your clipboard on the parent partition using Ctrl+C or any other method. Then, in the child partition, prepare the location you want to type the text into and select Type Clipboard Text on the Clipboard menu of the Virtual Machine Connection. The text is typed into the child partition at the cursor, one character at a time.

The other feature of the Hyper-V Virtual Machine Connection Clipboard menu is a screen capture utility. A pretty limited one, frankly, but it works if what you need to do is capture the entire screen of the child computer. To capture the screen, just select Capture Screen from the Virtual Machine Connection Clipboard menu. This puts the screen into your clipboard, and from there you can paste it into Microsoft Paint or any other graphics program.

REAL WORLD **Screen Capture Utilities**

The ability to capture screens is an essential for any documentation task, and often important for troubleshooting as well. Having an exact picture of the situation at a specific point in time just makes everything clearer, in our experience. The screen capture utility in Hyper-V only does the full screen—you can't get screen shots of individual windows or buttons—because the keystrokes are usually captured from the parent partition, not the child. Our solution is to use a small utility that is much smarter at screen shots than anything we could do with the built-in facilities of Windows—HyperSnap (*http://www.hyperionics.com*). There are other good screen capture utilities out there, but we've been using HyperSnap for more than 13 years now, and it does an excellent job. We can capture exactly what we want and save it in any format we can imagine. Plus, if we do need to manipulate an image for some reason, HyperSnap has the ability to do that, too. We load a copy of HyperSnap into every test computer we run, using Group Policy to deploy it. And when we needed screen shots for Server Core? Hyperionics did a custom version for us that worked where nothing else had.

SBS in Hyper-V

Microsoft has announced that running SBS Standard and Premium in a Hyper-V child partition is supported, and that using the Second Server as a parent partition, with only the Hyper-V Role enabled, is fully supported and still allows installation of the Second Server as a child partition. Further, if no additional Roles are installed in the parent partition, and the parent partition is used as part of an SBS network, the partition does not need to be domain joined, simplifying deployment. See the "Microsoft server software and supported virtualization environments" Knowledge Base article (*http://support.microsoft.com/?kbid=957006*) for up-to-date virtualization support statements. So, that sounds like we think everything is good with running Hyper-V, right? Well, no.

We think that one scenario is a really, really bad idea, even if it is technically possible. You should *not* run the Hyper-V Role inside your primary SBS server. Way too many other things are going on with any SBS server to also add in the Hyper-V Role, and it is not a supported scenario.

Hyper-V should always run in a partition where little or nothing else is going on. The parent partition should be just that—strictly a parent. This keeps the attack surface of the entire set of virtual machines smaller, reduces the number of reboots required, and keeps the resources for the VM, which should be the ones doing the heavy lifting.

We can imagine scenarios in which the parent partition is also running a couple of key infrastructure Roles as well—DNS and DHCP come to mind. We generally prefer not to do this, but it can make life a bit easier in some scenarios. However, when you start running any other Roles beyond Hyper-V on your parent partition, you've changed the licensing equation.

Licensing

With Windows Server 2008 Standard, including SBS Second Server, you are entitled to what are called 1+1 licensing rights. This means that you can use the same physical license to install Windows Server 2008 on the parent partition and the first child partition, *as long as the only Role you install into the parent is Hyper-V*. That's an important limitation. As soon as you start adding in other Roles, you lose the right to run a child partition without buying a full license for it.

Windows Server 2008 Enterprise gives you the right to install a parent partition and four child partitions, as long as that parent partition is used only for the Hyper-V Role. As soon as you add in any other Roles to the parent, you lose one of your secondary rights.

Windows Server 2008 Datacenter gives you the right to install a parent partition and as many child partitions as you want. Of course, the actual cost of a Datacenter license is just a bit out of the reach of most small businesses.

Configuration

When you configure a child partition for SBS Standard, you should allocate the same level of hardware resources to the child as you would to a physical server running SBS Standard. This means a *minimum* of 4 GB of RAM, but we think 6 GB is a more appropriate minimum for any production environment. And at least two processor cores. Use the synthetic network adapters, which are much faster than the legacy emulation ones. And create the same number of virtual hard disks for your server as you would have arrays with a physical computer. We like to have a minimum of three disks—one for the system, one for user space, and one for Microsoft Exchange data. Even if your circumstances require you to have them sitting on the same RAID array, having three separate virtual disks puts you in a position to add additional arrays if you need to, and you can easily move the VHDs over to the new array to balance the load.

The one configuration that we see happening increasingly as consultants and others begin to understand the power and capabilities of 64-bit servers is the "SBS Premium in a Box" deployment. This starts with a small Hyper-V parent partition, possibly running Server Core, and then two child partitions—the first running the main SBS server and the second running the SBS second server with SQL Server on it. Or, in many deployments, a Windows Server 2008 Standard server running Terminal Services.

This all-in-one solution could easily be supported on a single, well-thought-out, mid-range server, with two quad-core CPUs and 12-16 GB of RAM—and a good SAS disk array.

Summary

Virtualization is a hot topic these days, and with good reason. The new capabilities of 64-bit servers and Microsoft's new Hyper-V technology make it a compelling option in many scenarios. In this chapter we've covered the basics of using Hyper-V to virtualize Windows Small Business Server 2008. In the next chapter, we cover migrating from an existing Windows Small Business Server 2003 network to SBS 2008.