Windows Server 2012 R2

Microsoft

Configuring Networking with System Center 2012 R2 Virtual Machine Manager

Windows Server 2012 R2

Hands-on lab

In this lab, you will learn how to configure network virtualization for a multi-tenant environment with System Center 2012 R2 Virtual Machine Manager. Configuring network virtualization is a process which requires extensive planning and preparation. The result of this planning is a series of network objects which represent network items such as switches, physical segments, virtual (tenant) network segments, and the objects which define the relationship between them. This lab assumes you have completed the planning exercise and are implementing a set of objects for Contoso, Inc, to provide network isolation for two tenants across multiple Hyper-V servers.

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Introduction

Estimated time to complete this lab

30 minutes

Objectives

After completing this lab, you will be able to:

- Define networking objects for tenant networks.
- Define networking objects for provider networks
- Implement logical switches

Prerequisites

Before working on this lab, you must have:

- An understanding of networking concepts such as subnets, TCP/IP, and switches.
- An understanding of network isolation concepts.

Overview of the lab

In this lab, you will learn how to configure network virtualization for a multi-tenant environment with System Center 2012 R2 Virtual Machine Manager. Configuring network virtualization is a process which requires extensive planning and preparation. The result of this planning is a series of network objects which represent network items such as switches, physical segments, virtual (tenant) network segments, and the objects which define the relationship between them. This lab assumes you have completed the planning exercise and are implementing a set of objects for Contoso, Inc, to provide network isolation for two tenants across multiple Hyper-V servers.

Virtual machine technology

This lab is completed using virtual machines that run on Windows Server 2012 Hyper-V technology. To log on to the virtual machines, press CTRL+ALT+END and enter your logon credentials.

Computers in this lab

This lab uses computers as described in the following table. Before you begin the lab, you must ensure that the virtual machines are started and then log on to the computers.

Computer	Role	Configuration
DC	Domain controller, iSCSI SAN	Contains a virtual iSCSI SAN to provide storage for cluster nodes on a storage network.
Server1	Hyper-V server	Virtualized Hyper-V server
Server2	Hyper-V server	Virtualized Hyper-V server
VMM	VMM 2012 R2	System Center 2012 R2 Virtual Machine Manager server
Admin	Client workstation with RSAT	Windows 8.1 with RSAT.

◊ All user accounts in this lab use the password **Passw0rd!**

Note regarding pre-release software

Portions of this lab may include software that is not yet released, and as such may still contain active or known issues. While every effort has been made to ensure this lab functions as written, unknown or unanticipated results may be encountered as a result of using pre-release software.

Note regarding user account control

Some steps in this lab may be subject to user account control. User account control is a technology which provides additional security to computers by requesting that users confirm actions that require administrative rights. Tasks that generate a user account control confirmation are denoted using a shield icon. If you encounter a shield icon, confirm your action by selecting the appropriate button in the dialog box that is presented.

Note on activation

The virtual machines for these labs may have been built by using software that has not been activated. This is by design in the lab to prevent the redistribution of activated software. The unactivated state of software has been taken into account in the design of the lab. Consequently, the lab is in no way affected by this state. For operating systems other than Windows 8.1, click Cancel or Close if prompted by an activation dialog box. If you are prompted by an Activate screen for Windows 8.1, press the Windows key to display the Start screen.

Exercise 1: Creating Logical Tenant and Provider Network Objects

In this exercise, you will create the network objects used by Contoso, Inc to host cloud services for customers. In this scenario, Contoso, Inc. has a single, flat network which contains all its Hyper-V host servers as a single logical group. You will create the Contoso network objects for the Contoso data center, as well as create VM networks for each of Contoso's tenants.

Register Hyper-V hosts

In this task, you will manage the Hyper-V servers Server1 and Server2 with System Center 2012 R2 Virtual Machine Manager. For this lab, you will use two standalone servers. An enterprise data center would use clustered servers; however the fundamental processes in this lab remain the same.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. From the taskbar, open the **Microsoft Virtual Machine Manager Console**

   ★ It will take a few moments for the console to appear.

2. In Fabric, click **Servers**.

3. Click **Add Resources**, and then click **Hyper-V Hosts and Clusters**.

4. In Resource Location, click **Next**.

5. In Credentials, click **Browse**.

6. Click Contoso Administraor, and then click **OK**.

7. Click **Next**.

8. **In Discovery Scope**, in Computer Names, type **Server1** and **Server2** each on a separate line, and then click **Next**.

9. In Target resources, click **Select all**, and then click **Next**.

10. In Host Settings, click **Next**, and then click **Finish**.

11. Wait for the two Add virtual machine host jobs to complete, and then close the **Jobs** window.

    ★ It will take a few moments for the job to complete. Once completed disregard the Warning that Multipath I/O is not enabled.

Modify the Default Contoso Logical Network

When you add hosts, the current network information of the host computers is used to create default logical networks. The name of the network will be based on the hostnames of the added Hyper-V servers.

In this example, the default name of Contoso was used to create an empty logical network, which we will now modify. You can control this behavior using the general settings in Virtual Machine Manager.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, expand **Networking**, and then click **Logical Networks**.

2. Click **Contoso**, and then click **Properties**.

3. In Name, type **Contoso Network**, and then check **Allow new VM networks created on this logical network to use network virtualization**.

4. Click **Network Site**, and then click **Add**.

   ✐ Sites denote either physical or logical locations that are managed as a unit and contain one or more IP subnets.

5. In Network Site name, change Contoso Network_0 to **Contoso Datacenter**.

6. Check **All Hosts**.

7. Next to Associated VLANs and IP subnets, click **Insert 0row**.

8. In VLAN, type **0**.

   ✐ VLAN 0 indicates no VLAN tagging.

9. In IP subnet, type **192.168.10.0/24**.

10. Click **OK**.

Create an IP pool for the Contoso logical network

In this task, you will create a new IP pool for the Contoso logical network.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, navigate to **Networking/Logical Networks**, and then click **Contoso Network**.

2. On the ribbon, click **Create**, and then click **IP Pool**.

3. In Name, type **Contoso Network Provider IP Pool**, and then click **Next**.

4. In Network Site, accept the default network site, and then click **Next**.

5. In IP address range, edit Starting IP address to **192.168.10.200**, and then click **Next**.

6. Click **Next** on each of the remaining pages, and then click **Finish**.

   ✐ You would normally configure IP pool properties such as DNS server and gateway. Since you will not be using them in this lab, you will skip these steps for simplicity.

7. Close the **Jobs** window.

Create tenant networks for Woodgrove Bank and Tailspin Toys

In this task, you will create two new VM networks, one for each of the two customers of Contoso, Inc. These tenant networks, known as VM networks, are the basis for network virtualization in a multi-tenant environment. Note that both Tailspin Toys and Woodgrove Bank use the address space of 10.0.0.0/8 for their VMs.

A logical network represents a physical location or group of physical entities and also contains VM networks.

A VM network represents an isolated virtual network, which can span multiple physical networks.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In the Virtual Machine Manager console, click **Contoso Network**.

2. On the ribbon, click **Create VM Network**.

3. In Name, type **Tailspin Toys**, and then click **Next**.

4. In Isolation, click **Next**.

   ★ The default form of isolation is using network virtualization.

5. In VM Subnets, click **Add**.

6. In VM subnet, in Name, type **TSP Subnet**.

7. In Subnet, type **10.0.0.0/8**, and then click **Next**.

   ★ The subnet is used to route traffic internally in the VM network.

8. On Connectivity, click **Next**, and then click **Finish**.

9. Close the **Jobs** window.

10. In the Virtual Machine Manager Console, click **Contoso Network**.

11. On the ribbon, click **Create VM Network**.

12. In Name, type **Woodgrove Bank**, and then click **Next**.

13. On the Isolation page, click **Next**.

14. In VM Subnets, click **Add**.

15. In VM Subnet, in Name, type **WGB Subnet**.

16. In Subnet, type **10.0.0.0/8**, and then click **Next**.

    ★ This tenant uses the same subnet as the previous tenant. Network virtualization makes this possible.

17. On Connectivity, click **Next**, and then click **Finish**.

18. Close the **Jobs** window.

Create IP Pools for Tennant Networks

In this task you will create IP pools containing IP addressed to be allocated to Virtual Machines assigned to Virtual Networks.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. Click **VM's and Services**.
2. Click **VM Networks**, then click **Woodgrove Bank**.
3. Click **Create IP Pool**.
4. In Name, type **WGB IP Pool**, and then click **Next**.
5. In Network Site, accept the default network site, and then click **Next**.
6. In IP address range, click **Next**.
7. Click **Next** on each of the remaining pages, and then click **Finish**.

   ✦ You would normally configure IP pool properties such as DNS server and gateway. Since you will not be using them in this lab, you will skip these steps for simplicity.

8. Close the **Jobs** window.
9. Repeat this process and create a new IP Pool for Tailspin Toys, called TSP IP Pool.

Create a storage network for iSCSI storage devices

In this task, you will create a new logical network for ISCSI-based storage devices to communicate. This logical network represents a physical segment in the data center dedicated to storage traffic.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, under Networking, click **Logical Networks**.
2. Click **Create Logical Network**.
3. In Name, type **iSCSI Storage LAN**, and then click **Next**.
4. Click **Network Site**, and then click **Add**.
5. In Network Site name, change iSCSI Storage LAN_0 to **iSCSI Storage LAN**.
6. Check **All Hosts**.
7. Next to Associated VLANs and IP subnets, click **Insert 0row**.
8. In VLAN, type **0**.
9. In IP subnet, type **10.0.0.0/8**.
10. Click **Next**, and then click **Finish**.
11. Close the **Jobs** window.

Create custom port classifications

Port classifications provide global names for identifying different types of virtual network adapter port profiles. A port classification can be used across multiple logical switches while the settings for the port classification remain specific to each logical switch. For example, you might create one port classification named FAST to identify ports that are configured to have more bandwidth, and another port classification named SLOW to identify ports that are configured to have less bandwidth. In this task, you will create a port classification for ports that have Internet connectivity and one for ports that are on 10 GB fabric.

✏ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, under Networking, click **Port Classifications**.

2. In the ribbon click **Create**, and then click **Port Classification**.

3. In Name, type **10GB Fabric**, and then click **OK**.

   ✦ This port classification will be used to identify physical network adapters in Hyper-V host servers that have a 10 GB network infrastructure attached to them.

4. In the ribbon click **Create**, and then click **Port Classification**.

5. In Name, type **Internet Connected**, and then click **OK**.

Create port profiles

Port profiles serve two distinct functions. They govern what network adapter capabilities are exposed to a VM, and they control which physical network adapters can be used to provide connectivity to the network when virtual switches are created.

Virtual network adapter port profiles are named collections of Hyper-V network adapter settings which can be assigned to a specific virtual machine, or switch port. These are the same settings typically found under the Advanced settings of a Hyper-V network adapter on a virtual machine. Settings such as SR-IOV, DHCPGuard, and other similar settings are found here. Once defined, many port profiles can be assigned to a host. When future VMs are created, the port profiles available determine what capabilities (such as SR-IOV) the VM may leverage.

Uplink port profiles are used to connect virtual switches to physical networks.

In this task, you will create a Hyper-V virtual network adapter port profile which guarantees 100 MB of bandwidth. You will also create an uplink port profile.

✏ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, under Networking, click **Port Profiles**.

2. In the ribbon click **Create**, and then click **Hyper-V Port Profile**.

3. In Name, type **100MB Reserved**, and then click **Next**.

4. Check **Enable virtual machine queue**, check **Enable IPSec task offloading**, and then click **Next**.

5. On the Security Settings page, click **Next**.

6. On the Bandwidth Settings page, in Minimum bandwidth (Mbps), type **100**, and then click **Next**.

7. Click **Finish**.

8. Close the **Jobs** window.

9. In the ribbon click **Create**, and then click **Hyper-V Port Profile**.

10. In Type of Hyper-V Port Profile click **Uplink port profile**.

11. In Name, type **Server Defaults Uplink**.

12. In Type of Hyper-V Port Profile click Uplink port profile , and then click **Next**.

13. In Network sites, check both **Contoso Datacenter** and **iSCSI Storage LAN**, and then click **Next**.

14. Click **Finish**.

15. Close the **Jobs** window.

Create logical switches for Contoso and for iSCSI network access

In this task, you will use the objects created in the previous tasks to create a new logical switch for Contoso network and tenant access, as well as second for iSCSI access.

Logical switches are a new type of switch which is different than the default Hyper-V switch created and managed through the Hyper-V console. Logical switches are implemented through switch extensions which are deployed when the logical switch is deployed to the Hyper-V host. Only Virtual Machine Manager has the ability to define and deploy logical switches, as this is not native Hyper-V functionality.

Logical switches serve as a collection of functionality and policies which are centrally configured and enforced.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In Fabric, under Networking, click **Logical Switches**.

2. In the ribbon click **Create Logical Switch**.

3. Click **Next**.

4. In Name, type **Contoso Datacenter Core (Teamed)**, and then click **Next**.

   ✦ Notice the warning regarding SR-IOV.

5. On the Extensions page, click **Next**.

   ✦ You can only have one uplink port for each selected extension.

6. On Uplink, in Uplink mode, select **Team**, and then click **Add**.

   ✦ Since you only created one uplink port profile, only one is available.

7. Click **OK**, and then click **Next**.

8. In Virtual Port, click **Add**.

9. In Port Classification, click **Browse**.

10. Click **10Gb Fabric, click OK**

11. On the Add Virtual Port page check **Include a virtual network adapter port profile in this virtual port**.

12. In the Native virtual network adapter port profile select **High Bandwidth Adapter**, and then click **OK**.

13. Repeat step 8-12 to add the following port classifications and virtual network adapter port profiles.

Port Classification	Virtual Network Adapter Port Profile
Guest Dynamic IP	**Guest Dynamic IP**
Host Management	**Host Management**
Low Bandwidth	**Low Bandwidth Adapter**
Medium Bandwidth	**Medium Bandwidth Adapter**

14. Click **Medium bandwidth**, click **Set Default**, and then click **Next**.

15. Click **Finish**.

16. Close the **Jobs** window.

17. Repeat steps 1 through 15 to create a second logical switch. Make the following modifications only.

Item	Value
Switch Name:	**Contoso Datacenter Core (Non-teamed)**
Uplink Mode:	**No Uplink Team**

18. In Fabric, under Networking click **Logical Switches**.

19. On the ribbon, click **Create Logical Switch**.

20. In Name, type **ISCSI LAN Switch**.

21. Click **Next**.

22. On the Extensions page, click **Next**.

23. On Uplink, in Uplink mode, select **Team**, and then click **Add**.

24. Click **OK**, and then click **Next**.

25. In Virtual Port, click **Add**.

26. In Port Classification, click **Browse**.

27. Click **iSCSI workload**, click OK and then check **Include a virtual network adapter port profile in this virtual port**.

28. Select **iSCSI**, and then click **OK**.

29. Click **Next**, and then click **Finish**.

30. Close the **Jobs** window.

Exercise 2: Configuring your Hosting Fabric

In this exercise, you will "connect the dots" and use the objects created in Exercise 1 to configure Hyper-V hosts and virtual machines to communicate on both customer (tenant) and provider (physical) networks.

Configure Hyper-V host networking

In this task, you will configure the physical network adapters on Server1 and Server2 to ensure they are associated with the correct logical networks and IP subnets. While Virtual Machine Manager will generally detect networking correctly, it is not uncommon to have to make minor configuration changes to ensure host servers correctly reflect the underlying physical topology. This lab environment requires a few of these minor modifications.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In the Virtual Machine Manager Console, in Fabric, expand **Servers**, and then click **All Hosts**.

2. Click **Server1**, and then click **Properties**.

3. In Server1 Properties, click **Hardware**.

4. Under Network adapters, under the network adapter labeled Storage, click **Logical network connectivity**.

5. Check **iSCSI Storage LAN**.

6. Under Network adapters, under the network adapter labeled CorpNet, click **Logical network connectivity**.

7. Uncheck all items.

8. Under Network adapters, under the network adapter labeled CorpNet2, click **Logical network connectivity**.

9. Uncheck all items.

10. Click **OK**.

11. Repeat these steps on Server2 to configure networking.

Deploy logical switches to Server1 and Server2

In this task, you will deploy the Contoso Datacenter Core (non-teamed) logical switch on Server1 and Server2. It is important to note that if Server1 and Server2 were a Hyper-V cluster, you would only need to create the logical switch once on the cluster object. Once created, it would be automatically created on all cluster nodes.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In All Hosts, click **Server1**, and then click **Properties**.

2. Click **Virtual Switches**, click **New Virtual Switch**, and then click **New Logical Switch**.

   ✦ You also have the option of creating a traditional Hyper-V switch by selecting New Standard Switch.

3. In Logical Switch, select **Contoso Datacenter Core (Teamed)**.

   ✦ You have the ability to add two or more adapters to the team. This is because the uplink port was defined as a teamed port when the switch was created. Hyper-V will take care of creating the Windows team using the adapters you specify.

4. In Logical Switch, select **Contoso Datacenter Core (Non-Teamed)**.

   ✦ You will be using a non-teamed switch in this lab environment.

5. In Adapter, select **EtherNet**.

6. Click **New Virtual Network Adapter**.

   ✦ A logical switch alone does not suffice to connect hosts or virtual machines to the physical network. Virtual network adapters must be added and associated with logical networks.

7. In Name, type **Management**.

8. In Classification, type **Host Management**.

9. Click **Contoso Datacenter**, and then click **New Virtual Network Adapter**.

10. In Name, type **VM Access**.

11. Check **This virtual network adapter inherits settings from the physical management adapter**.

12. In Classification, select **10Gb Fabric**.

13. Click **OK**.

14. In the VMM warning dialog box, click **OK**.

15. Repeat these steps to deploy the logical switch on **Server2**.

Exercise 2: Creating Tenant Virtual Machines that use Network Virtualization

In this exercise, you will create a cloud infrastructure that implements network virtualization. You will create two clouds, once for each tenant. You will then create multiple VMs in each cloud.

Create clouds for each tenant

In this task, you will create a cloud for Tailspin Toys and a cloud for Woodgrove Bank.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In the Virtual Machine Manager Console, click **VMs and Services**.
2. Click **Clouds**, and then click **Create Cloud**.
3. In Name, type **Woodgrove Bank**, and then click **Next**.
4. In Host Groups, check **All Hosts**, and then click **Next**.
5. In Logical Networks, check **Contoso Network**, and then click **Next**.

   ★ This cloud is not controlling which virtual networks a tenant uses; that is controlled using the tenant account and access permissions, which will be set next.

   ★ This allows the cloud to contain any networks to which the user has access, in the Contoso logical network.

6. Click **Next** until you reach the Port Classifications page.
7. Check **10GB Fabric**, and then click **Next**.
8. Check **Local Storage**, and then click **Next**.

   ★ Storage options are discussed in a separate lab, and can be configured to use local storage, SMB storage, or any SMI-S-based storage provider using iSCSI or Fibre Channel.

9. Click **Next** on each of the remaining pages, and then click **Finish**.
10. Close the **Jobs** window.
11. Repeat this process to create a cloud for Tailspin Toys, and then name the cloud **Tailspin Toys**.

Create tenant accounts

In this task, you will create two tenant accounts, once for Woodgrove Bank and one for Tailspin Toys.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In VMs and Services, click **Tenants**.
2. Right-click **Tenants**, and then click **Create User Role**.
3. In Name, type **Woodgrove Bank Admin1**, and then click **Next**.

4. In Profile, click **Tenant Administrator**, and then click **Next**.

5. On Members, click **Next**.

   ✦ You can assign user accounts to this role now, or at a later time. We will not be assigning user accounts at this time.

6. In Scope, check **Woodgrove Bank**, and then click **Next**.

7. In Quotas, click **Next**.

8. In Networking, click **Add**, select **Woodgrove Bank**, and then click **OK**.

9. Click **Next**.

10. In Permissions, click **Select all**, and then click **Next**.

11. One each of the remaining pages, click **Next**, and then click **Finish**.

12. Optionally, repeat these steps to create a tenant account for Tailspin Toys.

Deploy a cloud VM which uses network virtualization

In this final task, you will deploy a new cloud VM for the Woodgrove Bank tenant, and then configure that VM to communicate using network virtualization. The key step in this process is to associate the new VM with the Woodgrove Bank VM network.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In VMs and Services, click **Create Virtual Machine**.

2. In Select Source, click **Create the new virtual machine with a blank virtual hard disk**, and then click **Next**.

   ✦ Since this VM is running in a virtualized Hyper-V server, it cannot be booted, and thus an empty VHD is fine.

3. In Virtual machine name, type **WGB-VM1**, and then click **Next**.

4. In Configure Hardware, click **Memory**, and then in Virtual machine memory, type **32**.

5. Under Network Adapters, click **Network Adapter 1**.

6. In the configuration pane, click **Connected to a VM network**, and then click **Browse**.

7. Click **Woodgrove Bank**, and then click **OK**.

8. In VM Subnet, select **WGB Subnet**.

9. Under Port profile, in Classification, select **10Gb Fabric**, and then click **Next**.

10. On the Select Destination page, click **Next**.

11. On the Select Cloud page, click **Woodgrove Bank**, and then click **Next**.

12. Click **Next** on each of the remaining pages, and then click **Create**.

✦ You will see a Create virtual machine in cloud job with a status of Failed. This is expected in this environment and is due to the fact that we are using virtualized Hyper-V servers.

13. Close the **Jobs** window.

Review the virtual machine configuration

In this task, you will review the newly created virtual machine to understand the networking configuration.

✎ Begin this task logged on to **Admin** as **Contoso\Administrator** using the password **Passw0rd!**

1. In the Virtual Machine Manager Console, under **Clouds**, click **Woodgrove Bank**.

2. Click **WGB-VM1**, and then click **Properties**.

3. Click **Hardware Configuration**, and then click **Network Adapter 1**.

✦ Note that the VM is connected to the Woodgrove Bank VM network, which is a virtual network in the larger Contoso Datacenter logical network.

4. Close all open windows.