Cisco HyperFlex Systems

Converting to Distributed Virtual Switches for Cisco HyperFlex VM Guest and vMotion Networks

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Executive Summary

VMware offers the vSphere Distributed Switch (vDS or dvSwitch) feature for centralized management of virtual switches in VMware ESX clusters. Since the introduction of vDS in ESX 4.0, this feature has gained widespread adoption in many virtualized landscapes. With the initial launch of Cisco HyperFlex™ Systems, the networking configuration of our hyperconverged product is installed and configured automatically using standard ESX virtual switches (vSS or vSwitch). To better align with the common practice of using vDS when customers are licensed to do so, Cisco allows the conversion of networks that do not support Cisco HyperFlex infrastructure, such as virtual machine guest networks and VMware vMotion networks, to use distributed virtual switches instead of standard virtual switches.

Solution Overview

This section defines current IT Infrastructure challenges and presents a high-level view of the solution and its benefits.

Document Purpose

This document describes how to convert guest networks and port groups in a Cisco HyperFlex cluster to use vDS instead of the standard vSwitches.

Solution Purpose

Cisco HyperFlex solutions are built on the Cisco Unified Computing System™ (Cisco UCS®) platform. They offer faster deployment, greater flexibility and efficiency at a competitive price while lowering risk for the customer. Proven components from Cisco are integrated to form a software-defined storage (SDS) platform. The approach eliminates or reduces the number of decisions that need to be made related to planning and configuration, while allowing customization to meet customer workload needs. The platform and management model adopted is an extension of the established Cisco UCS data center strategy in which familiar components are managed in a consistent manner through a policy-based framework with Cisco UCS Manager.

Business Challenge

Use of standard vSwitches in any ESX virtualized infrastructure presents several challenges:

- **Inefficiency:** Standard switches must be configured one by one, on each individual host of a vSphere cluster. Any configuration change must be repeated on each host across the cluster to remain consistent.
- **Discrepancy:** Configurations across multiple standard switches can be set differently, which can lead to configuration faults and to failure of virtual machines to migrate across hosts.
- **Lack of features:** Standard vSwitches lack features needed in large-scale and next-generation environments.

The Solution

Cisco HyperFlex Systems can be converted to use vDS instead of standard vSwitches for networks that are not part of the Cisco HyperFlex core infrastructure.

Solution Benefits

This solution provides the following benefits to customers:

- **Simplicity:** vDS is configured once in VMware vCenter. Then all the hosts in the vSphere cluster are attached to it, and they inherit the configuration.

- **Centralized management:** From vCenter, the configuration can be altered, and all hosts will change simultaneously, eliminating configuration discrepancies.
- **Features:** vDS adds support for several needed features, such as private VLANs (PVLANs), Cisco® NetFlow monitoring, and enhanced single-root I/O virtualization (SR-IOV). vDS also adds support for Link Layer Discovery Protocol (LLDP), which can be used in conjunction with the Cisco Application Policy Infrastructure Controller (APIC) to define network endpoints and policies as part of a Cisco Application Centric Infrastructure (Cisco ACI™) environment in the future.

Customers already invested in Cisco products and technologies have the opportunity to mitigate their risk further by deploying familiar and tested Cisco UCS technology.

Solution Requirements

To configure a Cisco HyperFlex cluster to use vDS requires:

- A functional and healthy running Cisco HyperFlex cluster
- VMware vCenter Server appliance or Microsoft Windows–based VMware vCenter Server
- VMware vSphere Enterprise Plus licensing for the VMware ESXi hosts in the Cisco HyperFlex cluster

Known Constraints

Network components in a Cisco HyperFlex cluster that are related to the Cisco HyperFlex infrastructure cannot be converted to vDS. The following network port groups, VMkernel ports, standard vSwitches, and uplinks must remain in the default Cisco HyperFlex configuration and cannot be modified to use distributed switches:

- Standard vSwitch named **vswitch-hx-inband-mgmt**
- Standard vSwitch named **vswitch-hx-storage-data**
- Port groups named **Storage Controller Management Network and Storage Controller Data Network**
- VMkernel ports named **Management Network** and **Storage Hypervisor Data Network**
- Network adapter uplinks **vmnic0**, **vmnic1**, **vmnic2**, and **vmnic3**

The Cisco HyperFlex storage controller virtual machines must not have their guest virtual networking connections migrated to the distributed switches. Their connections to the **Storage Controller Management Network** and **Storage Controller Data Network** port groups must remain unaltered.

Conversion Procedure

The conversion procedure consists of four basic tasks: creation of the distributed switches, configuration of the switch settings, migration to the new switches, and testing and cleanup activities.

Create the Distributed Switches

The first step in the conversion process is to create the distributed switches to which the standard vSwitches will be migrated. In this document, two vDS are created: one to replace the default standard vSwitch named **vswitch-hx-vm-network**, which carries guest virtual machine network traffic, and one to replace the default standard vSwitch named **vmotion**, which carries vMotion traffic. To create the two vDSs, complete the following steps:

1. Open and log in to the vCenter web client of the vCenter server that is managing the Cisco HyperFlex cluster.

2. Choose **vCenter Inventory Lists > Distributed Switches**.

3. Click the **Create a New Distributed Switch** icon (Figure 1).

4. In the wizard that appears, enter the desired name of the new distributed switch, click the data center object on which the Cisco HyperFlex cluster resides, and then click **Next** (Figure 2). For example, name the two vDSs **DSwitch-VMNetworks** and **DSwitch-VMotion**.

5. Select the version of the new switch to match the version of VMware ESXi running on the Cisco HyperFlex hosts. Then click **Next**.

6. Set the number of uplinks to 2. Network I/O Control can be enabled or disabled as desired. Leave the box checked to create a default port group and enter the name of the port group. Then click **Next** (Figure 3). For example, name the port group **DPortGroup-VMNetwork** or **DPortGroup-VMotion**.

7. Click **Finish**.

8. Repeat steps 3 through 7 to create the second distributed switch.
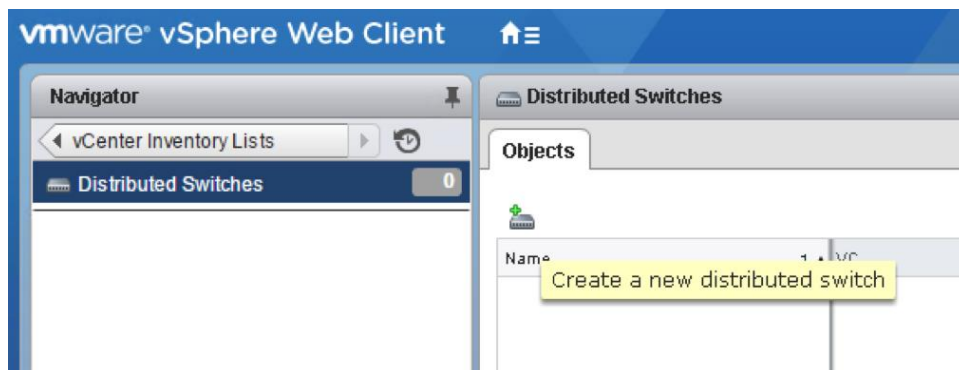
Figure 1.   Add Distributed Switch

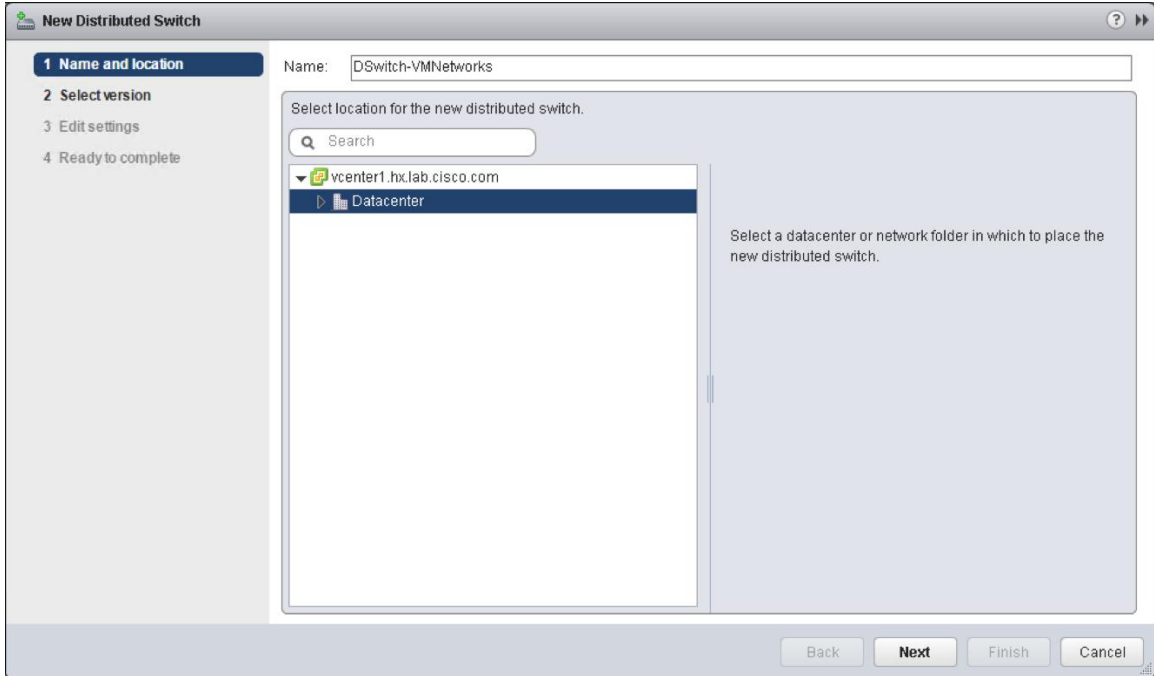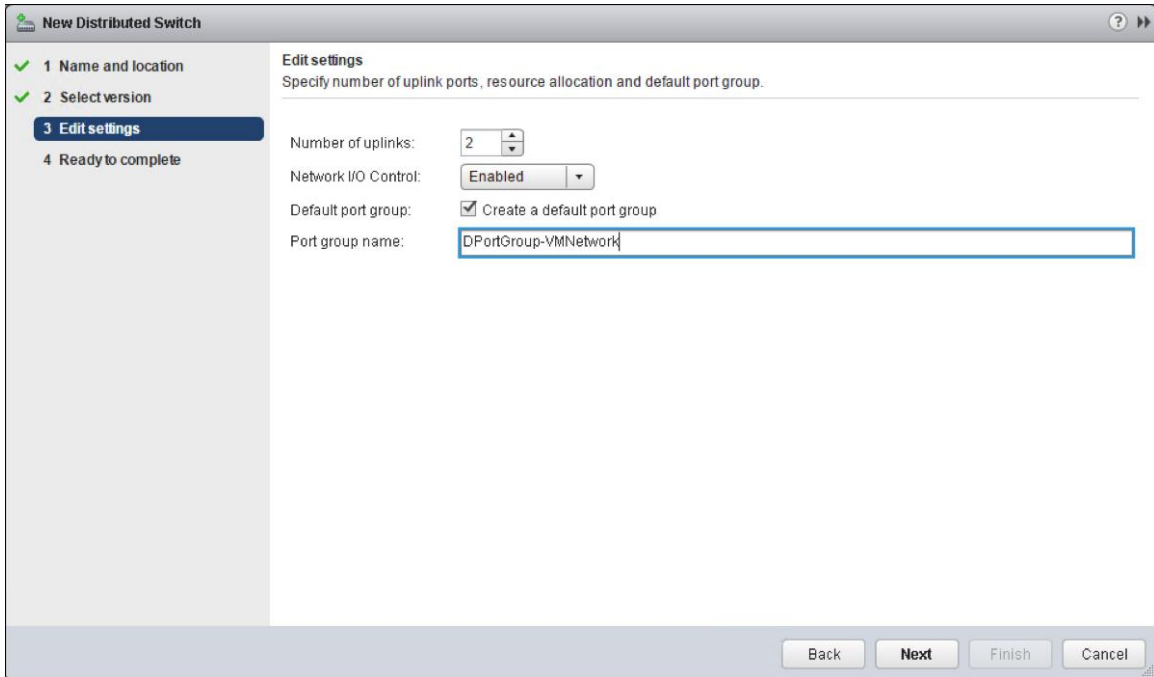**Figure 2.** Name the Distributed Switch

Figure 3. Distributed Switch Settings

Configure the Virtual Machine Guest Distributed Switch

The basic settings from the distributed switch wizard will often be insufficient to meet all the network needs of the guest virtual machines. If only a single untagged port group is used for all guest virtual machine traffic, then no additional configuration is needed, and the steps in this section can be ignored.

However, if guest virtual machine traffic is spread across multiple VLANs, then multiple port groups must be created, each configured with the VLAN ID used by the port group. Prior to the creation of the additional port groups, you must perform configuration steps in Cisco UCS Manager to create the necessary VLAN IDs and add them to the virtual network interface card (vNIC) templates. These steps are described in Appendix A and Appendix B.

To configure the distributed switch, complete the following steps:

1. In the vCenter web client, choose **vCenter Inventory Lists > Distributed Switches**.

2. Click the distributed vSwitch created for virtual machine traffic.

3. In the right pane, click the **Manage** tab, click **Settings**, and choose the **Topology** menu item.

4. To create an additional port group, click the **Create a New Distributed Port Group** icon. If additional port groups are not needed, continue to step 9 (Figure 4).

5. Enter the name of the port group and click **Next**. As a best practice, you should include the VLAN ID number in the name (Figure 5).

6. Change the VLAN type and number as required. Then click **Next** (Figure 6). For example, for a standard tagged port group on VLAN 100, change the VLAN type to **VLAN** and enter **100** as the VLAN ID.

7. Click **Finish**.

8. Repeat steps 4 through 7 for each additional port group required.

9. To modify the settings of an existing port group, click the name of the port group and then click the **Edit Distributed Port Group Settings** icon (Figure 7).

10. Edit the name and VLAN settings as needed. Then click **OK** (Figure 8). For example, for a standard tagged port group on VLAN 101, change the VLAN type to **VLAN** and enter **101** as the VLAN ID. Modify the name of the port group to include the VLAN ID number.

11. Repeat steps 9 and 10 for each distributed port group that requires modification.

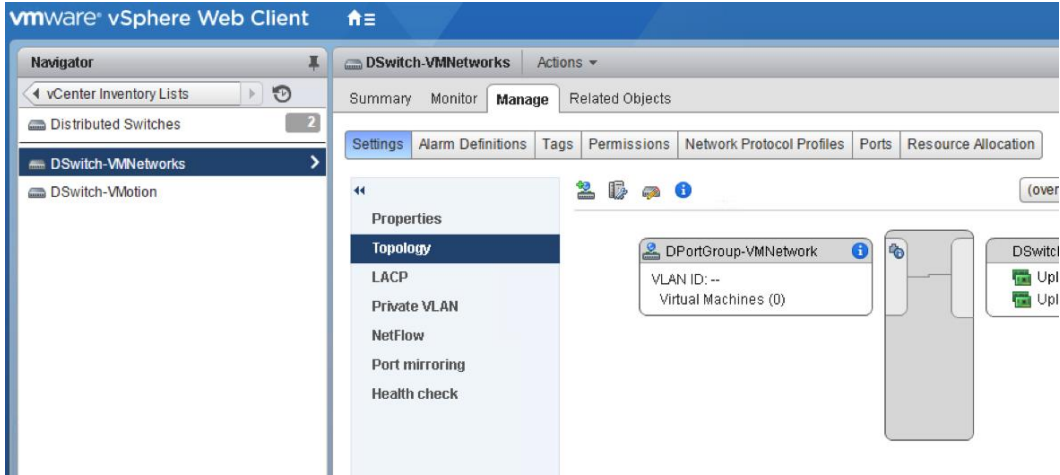**Figure 4.**   Create Additional Port Groups
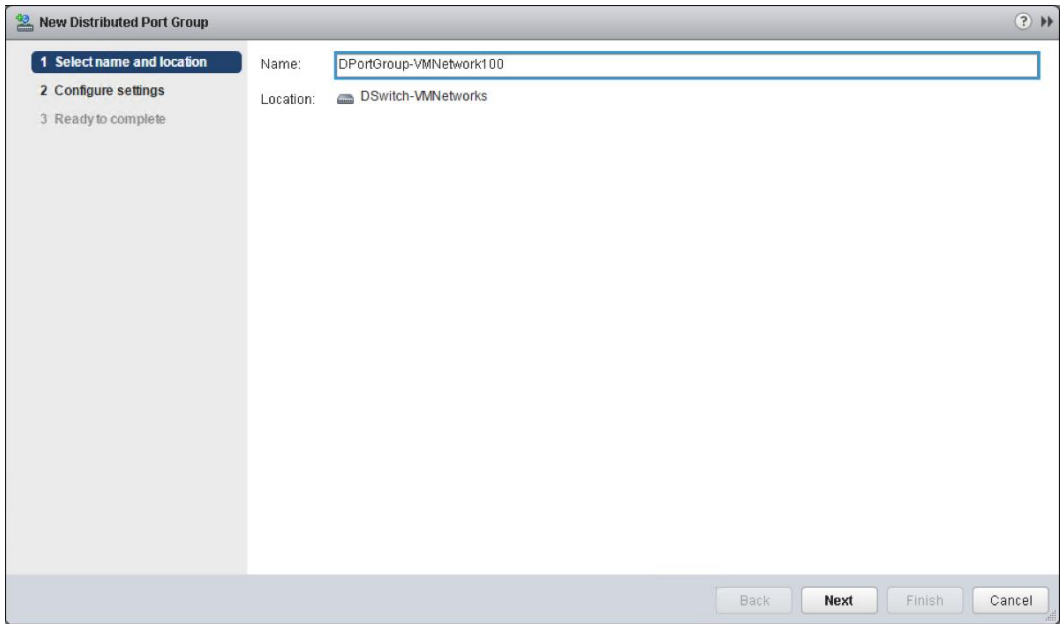

Figure 5.   Port Group Name

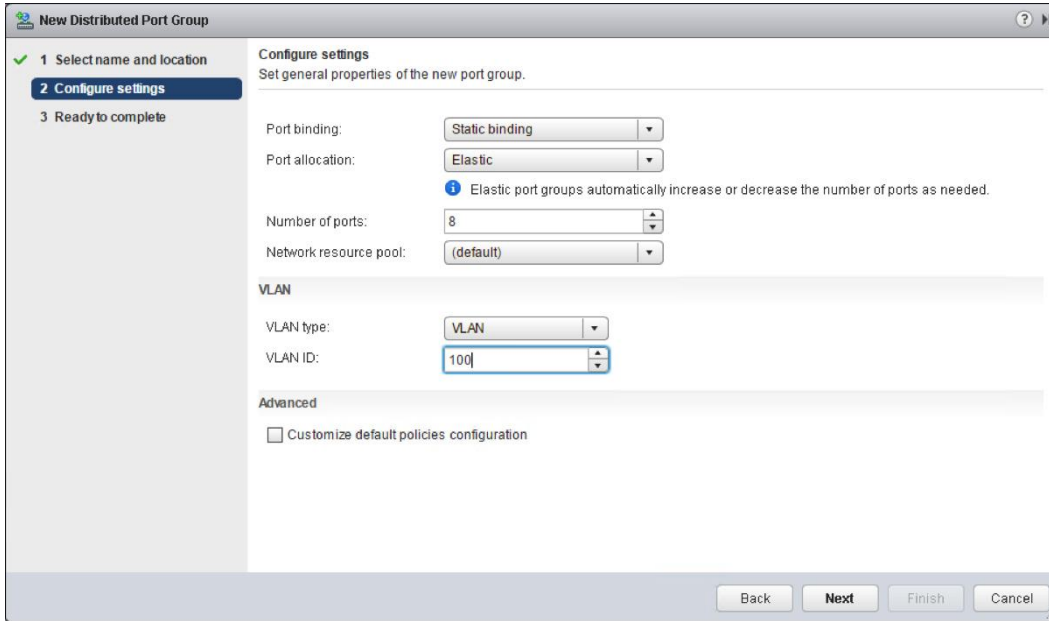**Figure 6.**   Port Group Settings

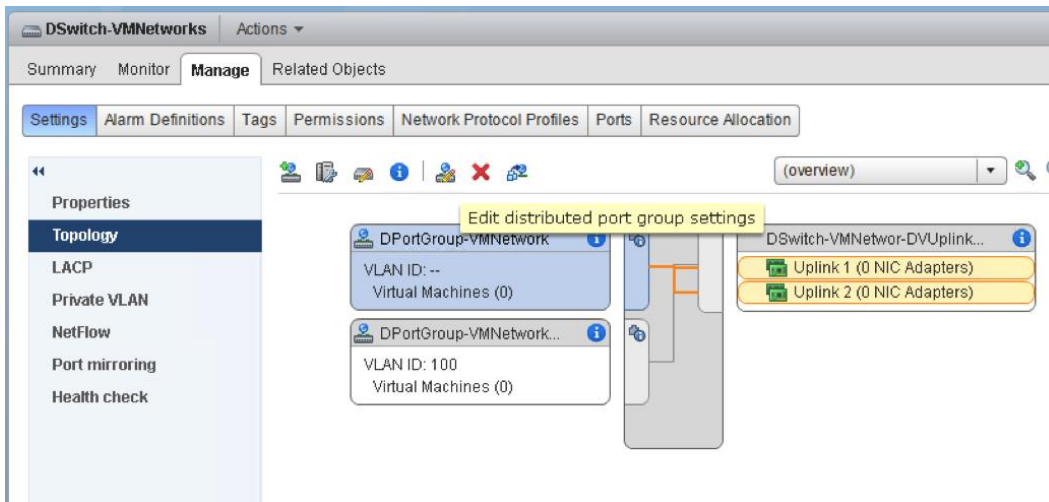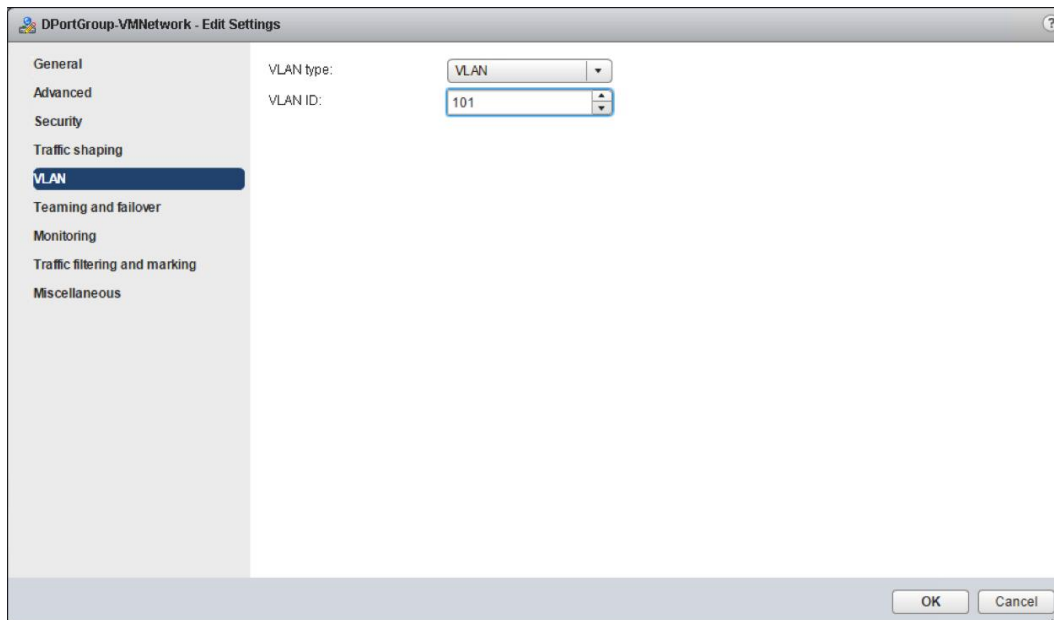**Figure 7.**   Edit Port Group

Figure 8.   Port Group VLAN Settings

Configure the VMotion Distributed Switch

The basic settings from the distributed switch wizard will be insufficient to service all the network needs of vMotion. You will need to make changes to allow jumbo frames to pass on the vMotion network and to modify the uplink failover order. To configure the distributed switch, complete the following steps:

1. In the vCenter web client, choose **vCenter Inventory Lists > Distributed Switches**.

2. Click the distributed vSwitch created for vMotion traffic.

3. In the right pane, click the **Manage** tab, click **Settings**, choose the **Properties** menu item, and click the **Edit** button.

4. Choose the **Advanced** menu item, change the maximum transmission unit (MTU) value to **9000**, and then click **OK** (Figure 9).

5. Choose the **Topology** menu item, click the name of the vMotion port group, and click the **Edit Distributed Port Group Settings** icon.

6. Choose the **Teaming and Failover** menu item, highlight uplink 2, and click the downward-pointing blue arrow to move Uplink 2 underneath Standby Uplinks. Then click **OK** (Figure 10).
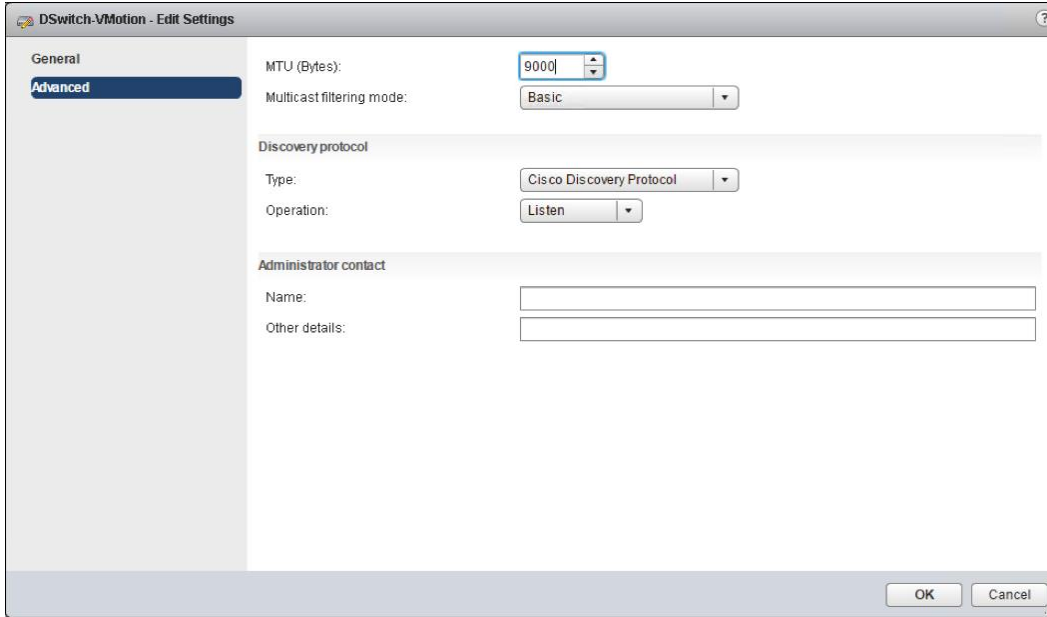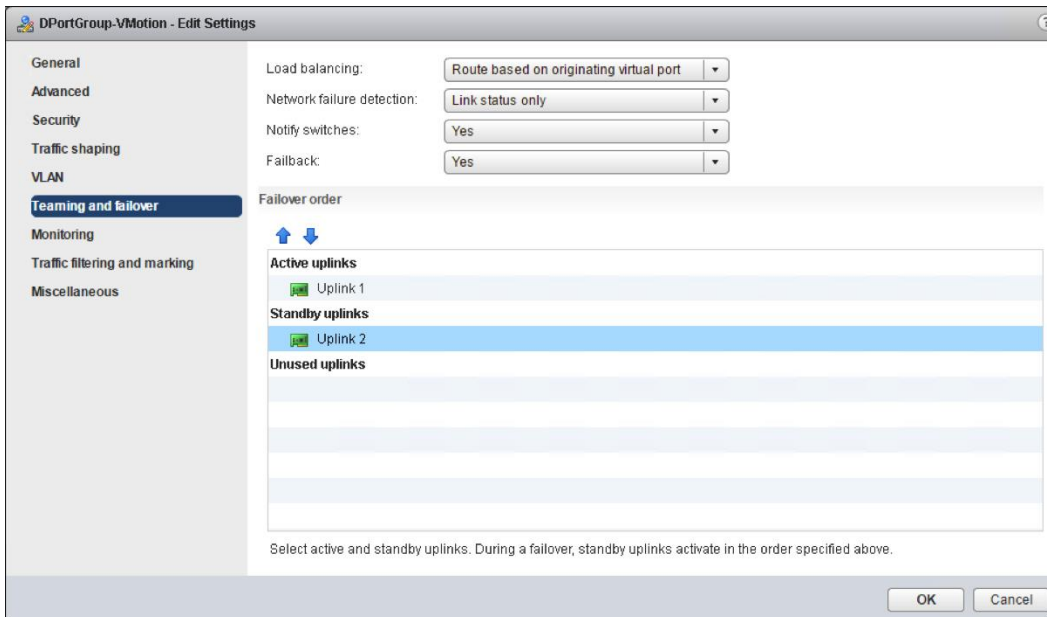
Figure 9.   Edit vMotion MTU Value

Figure 10.   Edit vMotion Failover Order

Migrate to the Virtual Machine Guest Distributed Switch

To migrate networking to the new distributed switch, complete the following steps:

1. In the vCenter web client, choose **vCenter Inventory Lists > Distributed Switches**.

2. Click the distributed vSwitch created for guest virtual machine network traffic.

3. In the right pane, click the **Manage** tab, click **Settings**, and choose the **Topology** menu item.

4. Click the **Add Hosts to This Distributed Switch and Migrate Physical or Virtual Network Adapters** icon (Figure 11).

5. Select **Add Hosts** and click **Next**.

6. Click **New Hosts**, select the hosts in the Cisco HyperFlex cluster that you want to migrate, and click **OK** (Figure 12).

7. Select the box for **Configure Identical Network Settings on Multiple Hosts** and click **Next**.

8. Select one host in the Cisco HyperFlex cluster to serve as the template for changes made to all the previously selected hosts. Then click **Next**.

9. Select the boxes for **Manage Physical Adapters** and **Migrate Virtual Machine Networking**. Then click **Next** (Figure 13).

10. In the upper pane, scroll down until you can see the uplinks vmnic4 and vmnic5 on the template host. Click **vmnic4** and click the **Assign Uplink** button.

11. Choose **Uplink 1** for vmnic4 and click **OK**.

12. Repeat steps 10 and 11 but this time choose **vmnic5** and **Uplink 2**.

13. Verify that vmnic4 and vmnic5 are properly reassigned on the template host. Click the **Apply to All** button and then click **Next** twice (Figure 14).

14. Click each virtual machine that will have its network connections migrated and click the **Assign Port Group** button. To select multiple virtual machines, you can press Ctrl and simultaneously click the mouse button and then click the **Assign Port Group** button.

Note: Do not migrate the networking of any of the Cisco HyperFlex controller virtual machines.

15. Click the name of the distributed port group to be used by virtual machines in the new switch and then click **OK** (Figure 15).

16. Repeat steps 14 and 15 until all the virtual machines have been assigned to their new port groups on the distributed switch. Then click **Next** (Figure 16).

17. Click **Finish**.
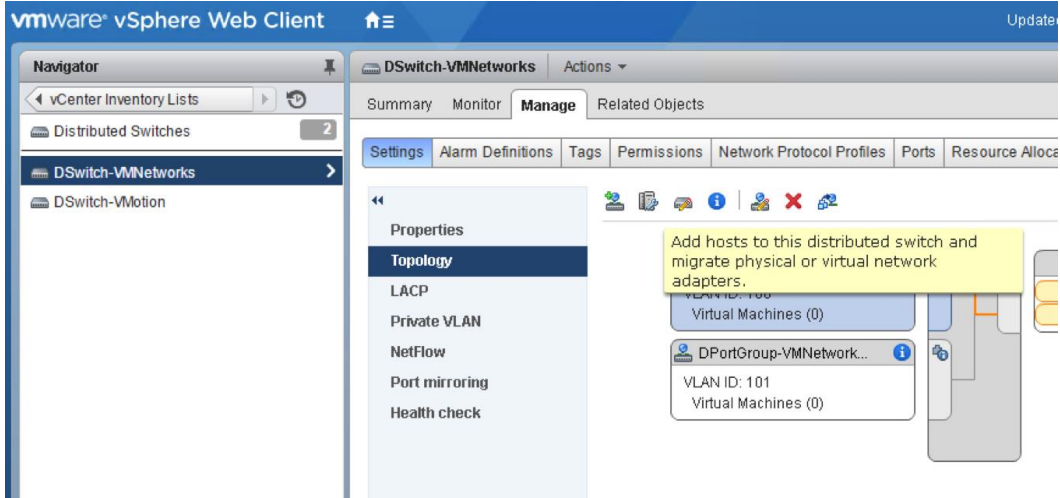
Figure 11. Add Hosts to vDS
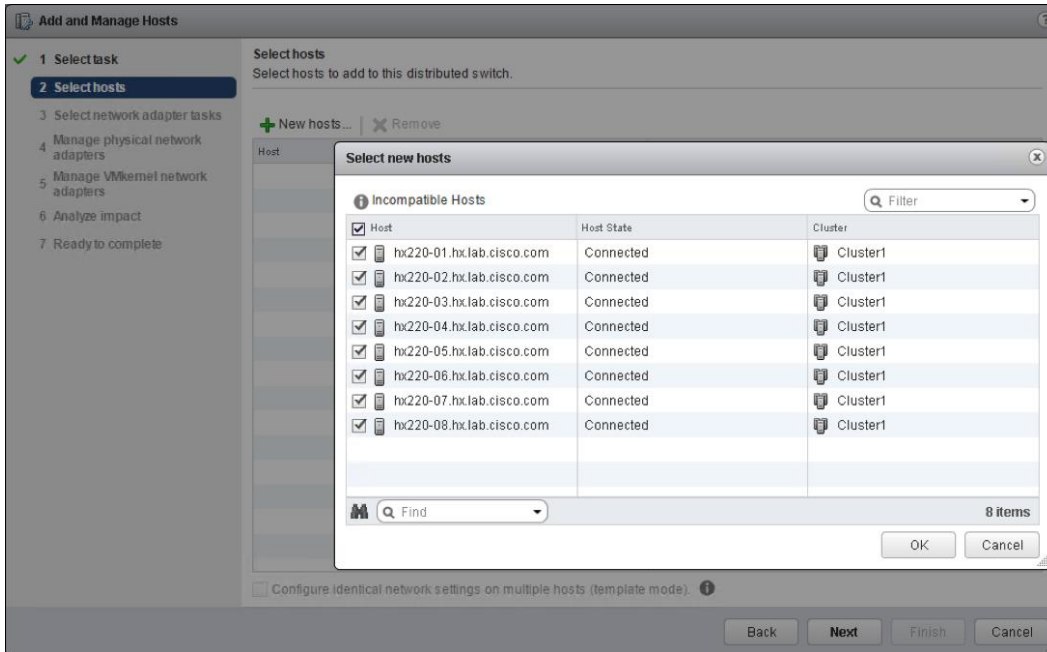

Figure 12. Select Hosts

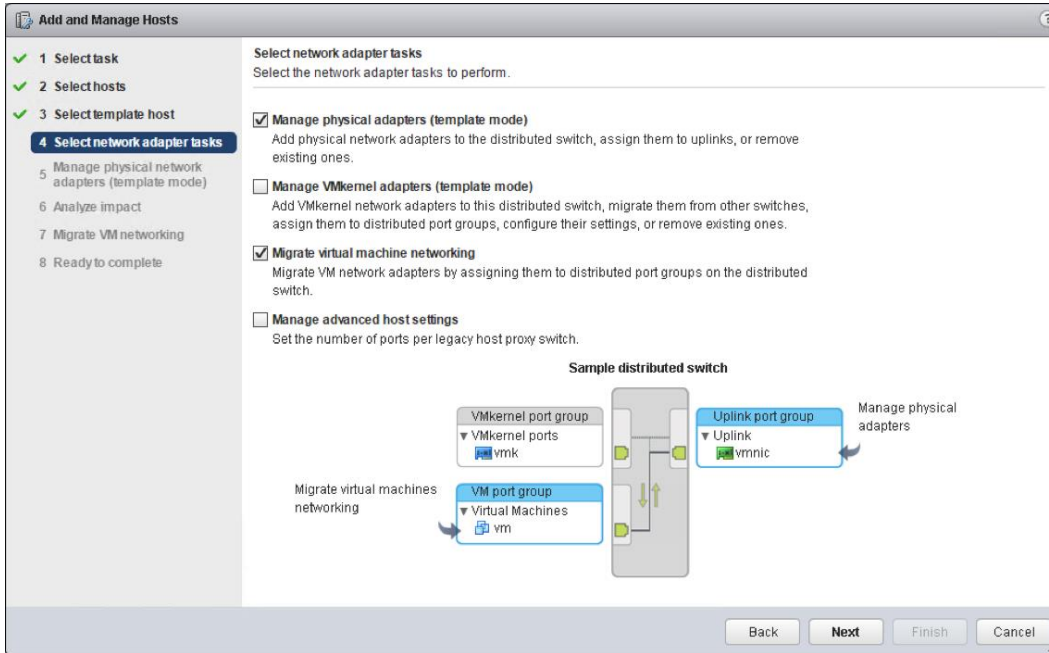**Figure 13.**   Migrate Adapters and Virtual Machine Networking

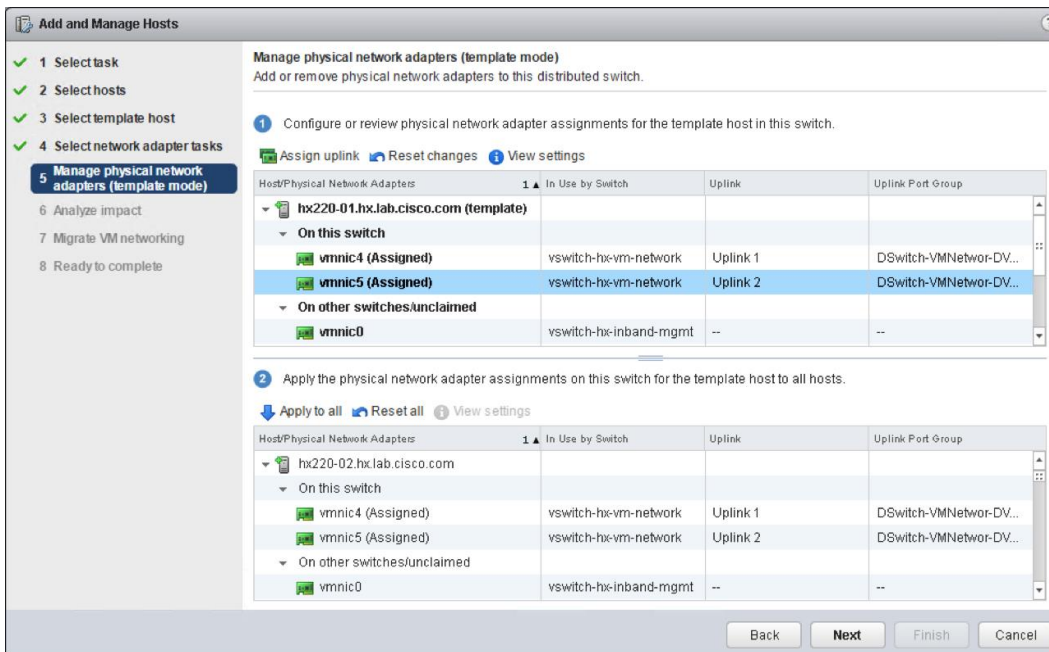**Figure 14.**   Manage Physical Adapters
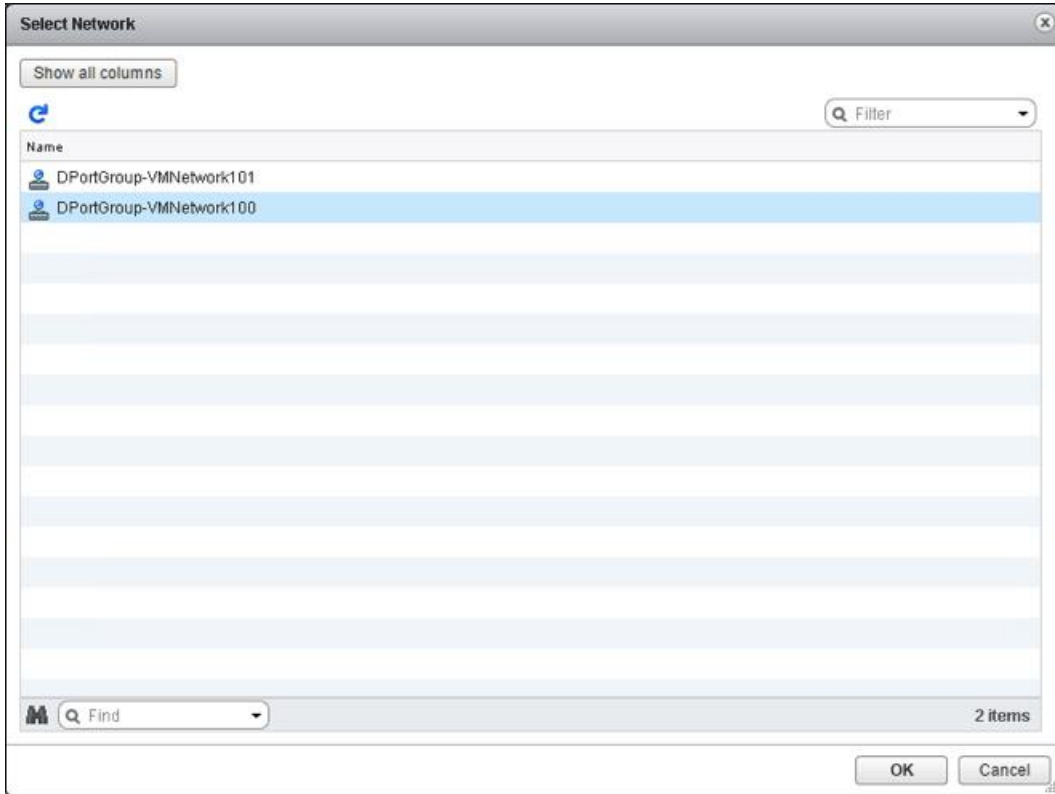
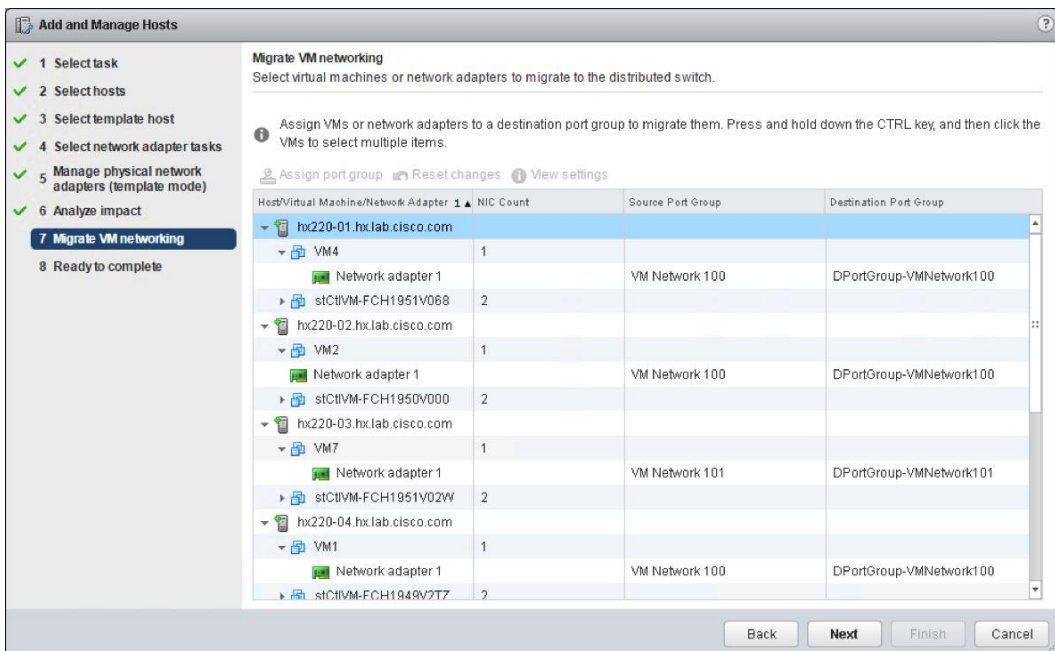**Figure 15.** Select Virtual Machine Network

Figure 16. Migrate Virtual Machine Networking

Migrate to the VMware vMotion Distributed Switch

To migrate networking to the new distributed switch, complete the following steps:

1. In the vCenter web client, choose **vCenter Inventory Lists > Distributed Switches**.

2. Click the distributed vSwitch created for vMotion traffic.

3. In the right pane, click the **Manage** tab, click **Settings**, and choose the **Topology** menu item.

4. Click the **Add Hosts to This Distributed Switch and Migrate Physical or Virtual Network Adapters** icon.

5. Select **Add Hosts** and click **Next**.

6. Click **New Hosts**, select the hosts in the Cisco HyperFlex cluster that you want to migrate, and click **OK**.

7. Select the box for **Configure Identical Network Settings on Multiple Hosts** and click **Next**.

8. Select one host in the Cisco HyperFlex cluster to serve as the template for changes made to all the previously selected hosts. Then click **Next**.

9. Select the boxes for **Manage Physical Adapters** and **Manage VMkernel Adapters**. Then click **Next** (Figure 17).

10. In the upper pane, scroll down until you see the uplinks vmnic6 and vmnic7 on the template host. Click **vmnic6** and click the **Assign Uplink** button.

11. Choose **Uplink 1** for vmnic6 and click **OK** (Figure 18).

12. Repeat steps 10 and 11, but this time choose **vmnic7** and **Uplink 2**.

13. Verify that vmnic6 and vmnic7 are properly reassigned on the template host. Click the **Apply to All** button and then click **Next** (Figure 19).

14. Click the VMkernel port assigned to vMotion traffic and click the **Assign Port Group** button.

15. Click the name of the distributed port group to be used by vMotion in the new switch and click **OK** (Figure 20).

16. Verify that the VMkernel port is properly reassigned on the template host. Then click the **Apply to All** button.

17. Enter the IP addresses that will be used by the vMotion VMkernel ports for the additional hosts, using a comma-separated list. Then click **OK**.

18. Click **Next** twice. Then click **Finish**.
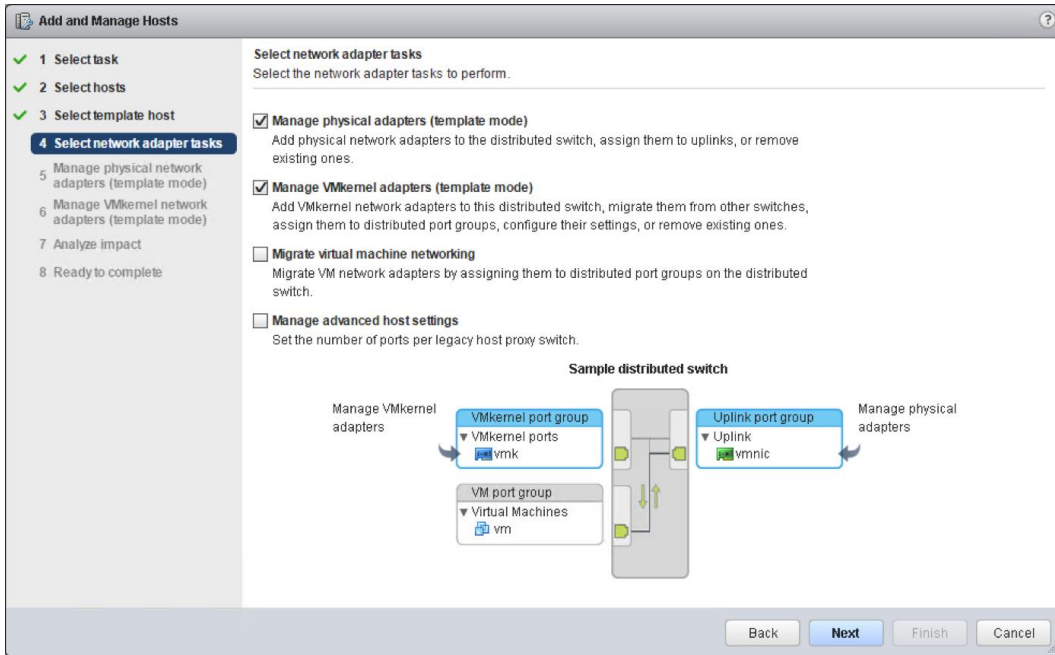
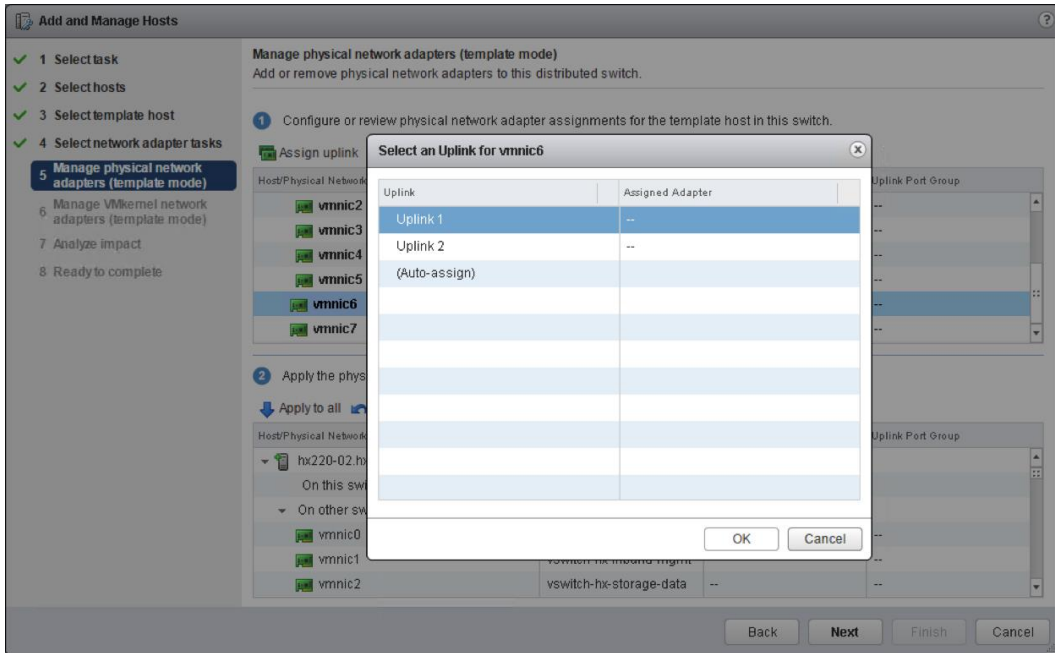**Figure 17.** Migrate Adapters and VMkernel Adapters

Figure 18. Uplink Settings
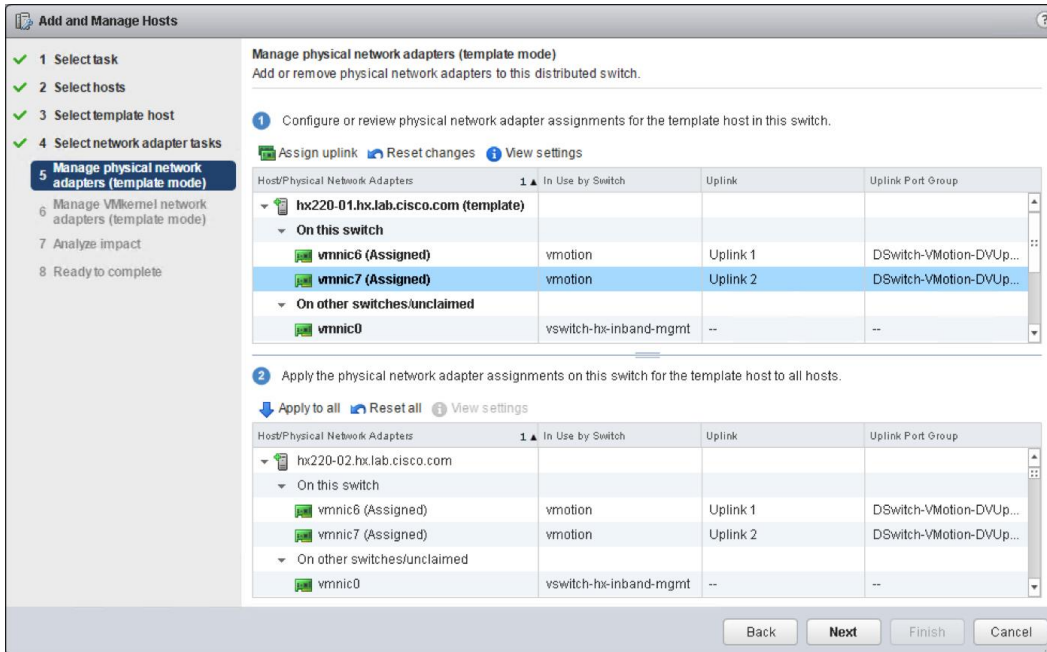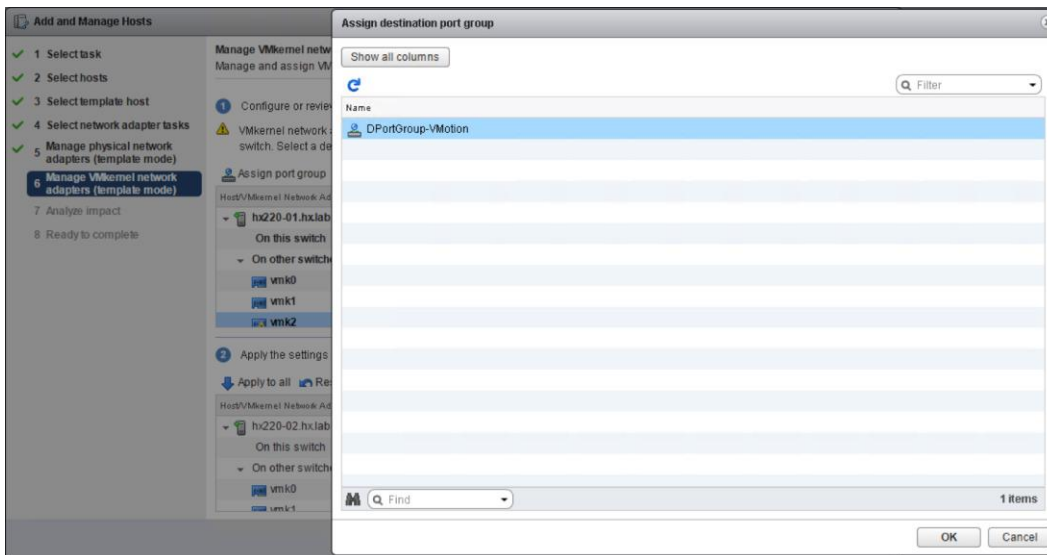
Figure 19. Assign Uplinks

Figure 20. Assign Port Group

Test and Clean Up

After the migration, test vMotion migration of virtual machines across the hosts to verify that everything works properly. Verify network connectivity to the guest virtual machines on the proper network subnets and VLANs. Typically, continuous pings to the virtual machines will show a loss of a single ping during the migration process.

After the migration is complete, you can delete the original standard vSwitches (named **vswitch-hx-vm-network** and **vmotion**) for the guest virtual machine traffic and vMotion from the Cisco HyperFlex hosts. To delete the unused standard vSwitches, complete the following steps:

1. In the vCenter web client, select **Hosts and Clusters**.
2. Click the first Cisco HyperFlex platform ESXi host in the navigation tree.
3. In the right pane, click the **Manage** tab, click **Networking**, and choose the **Virtual Switches** menu item.
4. Click the standard vSwitch named **vswitch-hx-vm-network** in the list. Then click the **Remove Selected Standard Switch** icon.
5. Click **Yes** to remove the switch.
6. Repeat steps 3 through 5 for the vSwitch named **vmotion**.
7. Repeat steps 2 through 6 for the remaining hosts in the Cisco HyperFlex cluster.

vCenter will display numerous alarms that were generated during the virtual machine guest switch migration process. You can safely clear these alarms.

Conclusion

This Cisco solution addresses the needs of many enterprise data centers by allowing the use of VMware Distributed Virtual Switches in Cisco HyperFlex clusters, staying aligned with established practices. By employing this solution, you can enable your Cisco HyperFlex system to take advantage of the features offered by vDS and remain fully supported by the Cisco Technical Assistance Center (TAC).

For More Information

The following documentation, available at Cisco Online Support, provides additional relevant information. If you do not have access to the documentation, please contact your Cisco representative.

Cisco HyperFlex technical support documentation:
http://www.cisco.com/c/en/us/support/hyperconverged-systems/hyperflex-hx-data-platform-software/tsd-products-support-series-home.html

Appendix A: Configuring Additional Virtual Machine Guest VLANs

In many cases, the Cisco HyperFlex System requires configuration of multiple VLAN IDs for the guest virtual machines to use for communication. If additional VLANs are required, you must define the VLANs in Cisco UCS Manager before you can added them to vNIC templates, and they must be configured as part of the ESXi host networking port groups. To configure additional VLANs for guest virtual machine traffic, complete the following steps:

1. In Cisco UCS Manager, click the **LAN** tab in the navigation pane.
2. Choose **LAN > LAN Cloud > VLANs**.
3. Right-click **VLANs** and choose **Create VLANs**.
4. Enter the name of the VLAN.
5. Select the multicast policy named **HyperFlex**.
6. Leave the setting for **Common/Global**.
7. Enter the VLAN ID number.

8. Leave the **Sharing Type** set to **None**.

9. Click **OK** twice.

10. Repeat steps 3 through 9 for each additional VLAN required.

Appendix B: Alternative Configuration for Tagged VLANs

The default Cisco HyperFlex installer defines only a single VLAN for virtual machine traffic in the Cisco UCS configuration. In many cases, multiple VLANs are used to carry guest virtual machine traffic, and the standards set at the customer data center require that all virtual machine traffic be tagged with the appropriate IEEE 802.1Q VLAN ID. To accommodate that requirement, changes must first be made in the Cisco UCS configuration. To modify the Cisco UCS settings for carrying multiple tagged VLANs, complete the following steps:

1. In Cisco UCS Manager, click the **LAN** tab in the navigation pane.

2. Choose **LAN > Policies > root > Sub-Organizations > hx-cluster > vNIC-Templates**.

3. Click the vNIC template named **vm-network-a**.

4. In the configuration pane, click **Modify VLANs**.

5. In the Modify VLANs window, verify that the radio buttons in the Native VLAN column are all cleared.

6. In the Modify VLANs window, click the **Select** box next to each VLAN that will be tagged and carry guest virtual machine traffic to the vDS.

7. Click **OK**.

8. Repeat steps 3 through 7 for the vNIC template named **vm-network-b**, which will also carry tagged guest virtual machine traffic.