Virtual Services Platform
4000

Engineering

> VMware Private VLAN Trunking Technical Configuration Guide

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Abstract

This Technical Configuration Guide provides an overview and examples on configuring Private VLAN on VMware servers connected to a VSP 4000 with multiples links. Private VLAN and ETREE require software version 3.0.1 on VSP 4000.

Revision Control

No	Date	Version	Revised by	Remarks
1	1/21//2012	1.0	EMEA CSE	Initial document for customer
2	8/21/2012	2.0	EMEA CSE	Remove reference to customer and provide more information for Private Vlan and ETREE.
3	8/22/2012	2.1	EMEA CSE	Final review

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Conventions

This section describes the text, image, and command conventions used in this document.

Symbols

Tip – Highlights a configuration or technical tip.

Note – Highlights important information to the reader.

Warning – Highlights important information about an action that may result in equipment damage, configuration or data loss.

Text

Bold text indicates emphasis.

Italic text in a Courier New font indicates text the user must enter or select in a menu item, button or command:

```
ERS5520-48T# show running-config
```

Output examples from Avaya devices are displayed in a Lucida Console font:

```
ERS5520-48T# show sys-info


Operation Mode:          Switch
MAC Address:             00-12-83-93-B0-00
PoE Module FW:           6370.4
Reset Count:             83
Last Reset Type:         Management Factory Reset
Power Status:            Primary Power
Autotopology:            Enabled
Pluggable Port 45:       None
Pluggable Port 46:       None
Pluggable Port 47:       None
Pluggable Port 48:       None
Base Unit Selection:     Non-base unit using rear-panel switch
sysDescr:                Ethernet Routing Switch 5520-48T-PWR
                         HW:02       FW:6.0.0.10  SW:v6.2.0.009
                         Mfg Date:12042004    HW Dev:H/W rev.02
```

1. Private VLAN (PVLAN) Overview

VSP 4000 software release 3.0.1.0 introduces private VLANs. Private VLANs provide isolation between ports within a Layer 2 service.

Private VLAN uses two VLANs, a primary VLAN and a secondary VLAN. Standard VLAN configuration takes place on the primary VLAN. The secondary VLAN is virtual and inherits configuration from the primary VLAN.

Ports in the private VLAN are configured as isolated, promiscuous, or trunk.

- Promiscuous ports communicate with all other ports within the private VLAN and uses the primary VLAN
- Isolated ports communicate with the promiscuous ports, but not with any other isolated port and uses the secondary VLAN.
- Trunk ports carry traffic between other port members within the private VLANs and accept either primary or secondary VLAN traffic.

In terms of network topology, the isolated port is considered a spoke. The isolated port, or spoke, does not communicate with any other isolated port in the network. The isolated port only communicates with the promiscuous ports, or hubs.

Private VLAN concept can be extended to Shortest Path Bridging and is referred as E-Tree (Ethernet Private Tree). The VSP 4000 can associate a PVLAN to an L2VSN I-SID. Flooded traffic from both Promiscuous and Isolated devices are transported over the same I-SID multicast tree and squelching for spoke-to-spoke traffic is done on the egress SPB Backbone Edge Bridge (BEB). This means the Private VLAN IDs are globally significant and must be the same on all BEBs.

The following figure shows a basic E-Tree network topology consisting of groups of private VLANs connected by the SPBM core network.

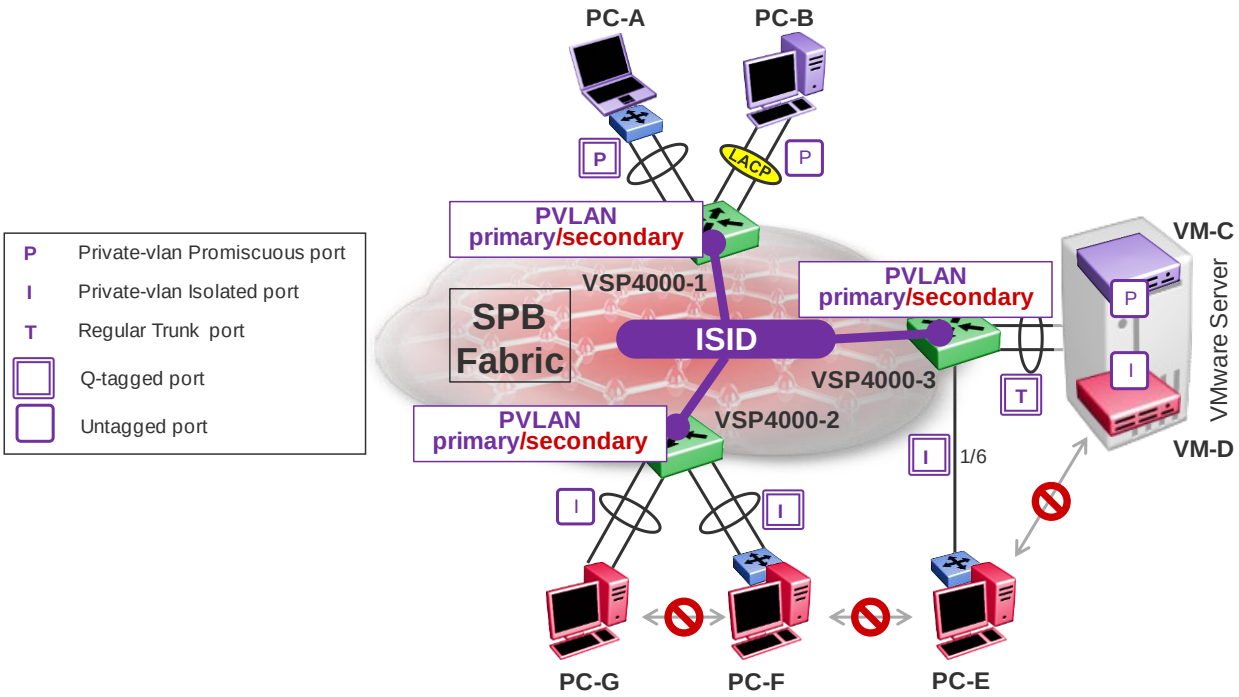


Figure 1 – E-Tree (Ethernet Private Tree) topology

In terms of connectivity, stations in purple from figure 1 can reach all other stations that are purple and red. However stations in red can only reach stations in purple. Stations in red are not allowed to communicate between themselves. The following table summarizes network connectivity:

FROM / TO	PC -A	PC-B	VM-C	VM-D	PC-E	PC-F	PC-G
PC-A		Yes	Yes	Yes	Yes	Yes	Yes
PC-B	Yes		Yes	Yes	Yes	Yes	Yes
VM-C	Yes	Yes		Yes	Yes	Yes	Yes
VM-D	Yes	Yes	Yes		No	No	No
PC-E	Yes	Yes	Yes	No		No	No
PC-F	Yes	Yes	Yes	No	No		No
PC-G	Yes	Yes	Yes	No	No	No	

Table 1 – Station connectivity matrix

Also, the PVLAN implementation on the VSP 4000 fully interoperates with the Cisco PVLAN implementation. It is the same implementation used by VMware ESX and other vendors.

2. Configuration Example - Summary

In our configuration example, a physical server with two virtual machines (Srv-1_MSFT and Srv-2_MSFT) is connected to a VSP 4000 (VSP400-3) by a trunk port. Srv-1_MSFT is assigned to the primary VLAN ID (promiscuous/hub) and Srv-2_MSFT is assigned to the secondary VLAN ID (isolated/spoke).

The two servers as shown below (figure 2) will be able to communicate, but in the case you have a more complex network with more stations, Srv-1_MSFT will be able to communicate with all stations while Srv-2_MSFT will be able to communicate only to the primary VLAN attached stations (hubs) and not to stations attached to the secondary VLAN (spokes). Refer to figure 1 for E-Tree (Ethernet Private Tree) topology and to table 1 for station connectivity matrix.

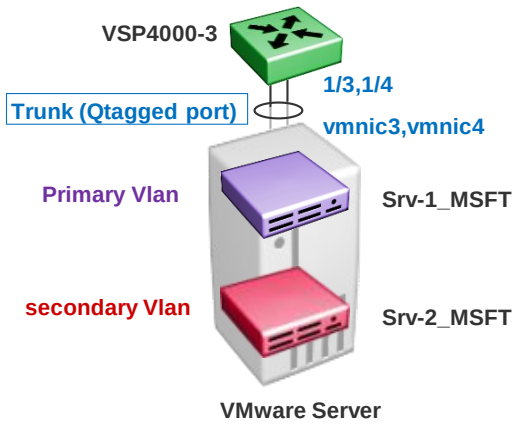
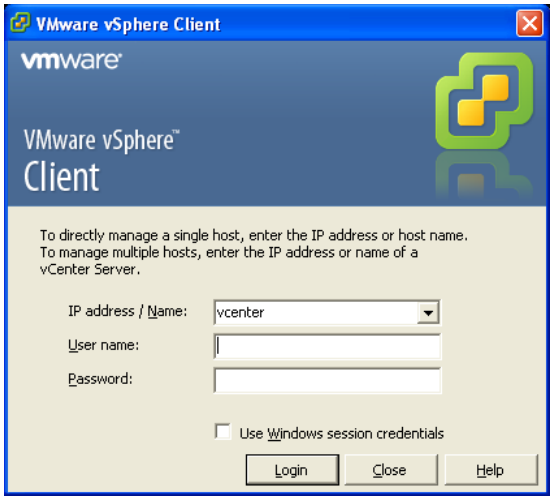


Figure 2 - VMware server connected to VSP 4000

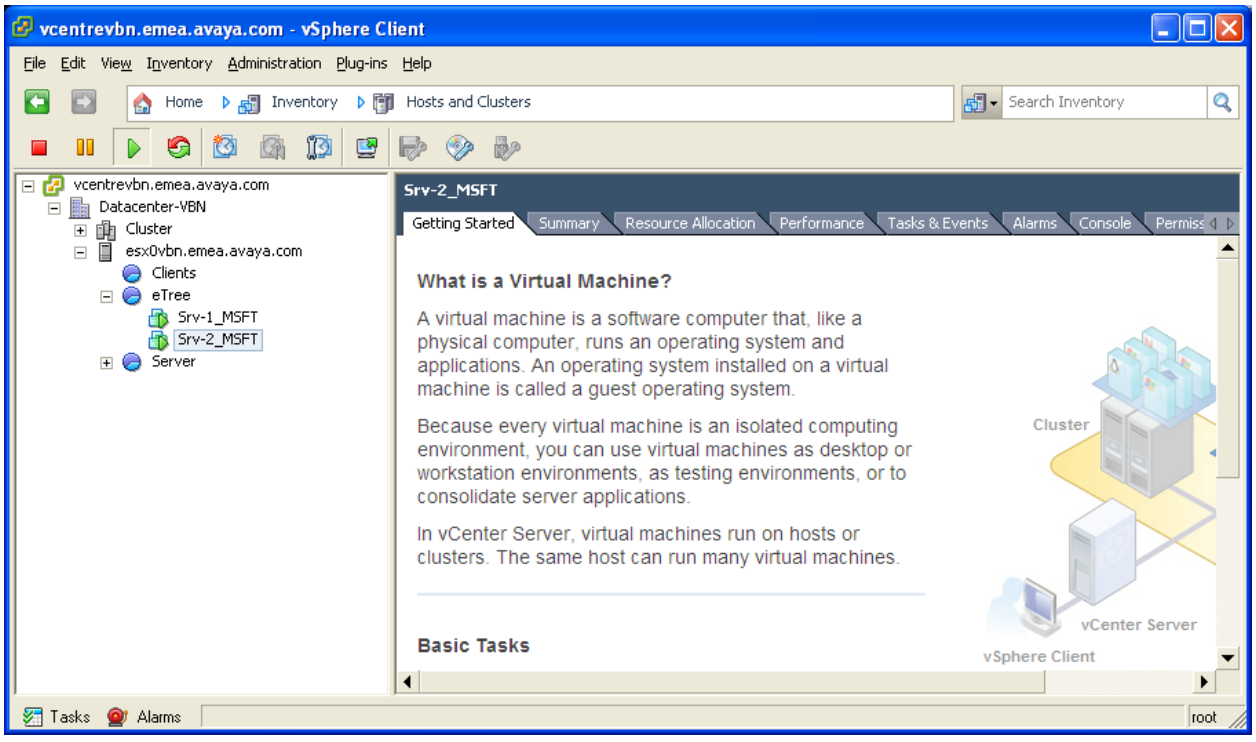
The two next chapters cover VMware server and VSP 4000 configuration.

3. VMware Configuration

Launch vSphere client



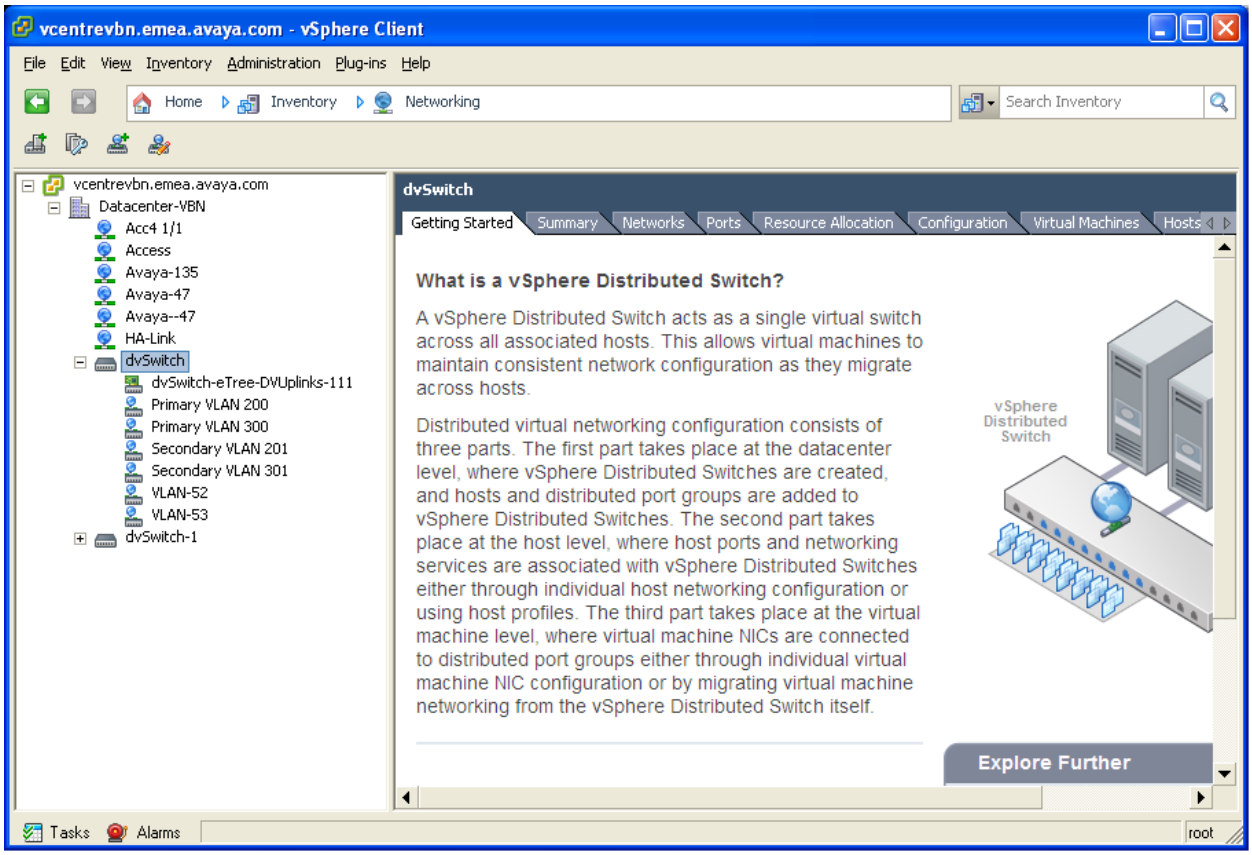
Enter credentials and once logged you will get the following window:



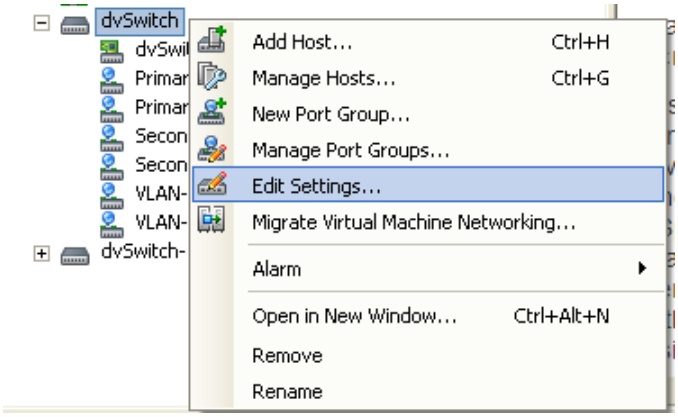
Note – it is assumed the virtual machines are already created and the physical interfaces already assigned and connected to the VSP 4000 as shown in figure 1.

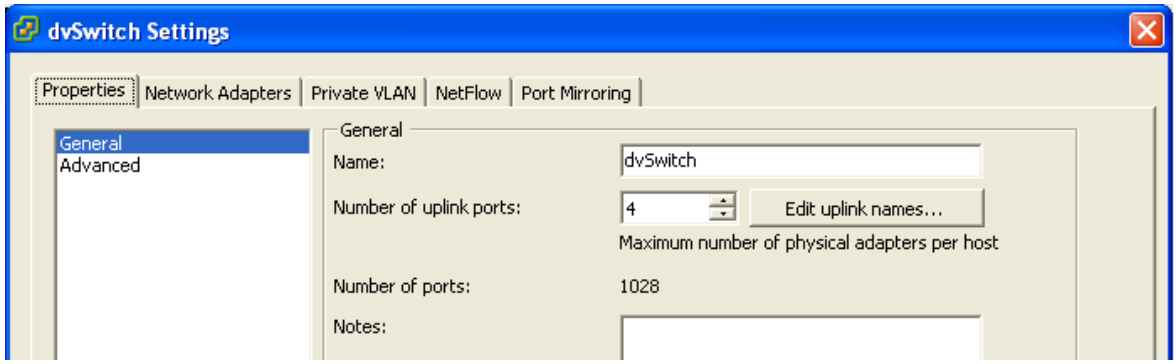
3.1 vSphere Distributed Switch Configuration

In our example, dVSwitch is already created and the associated physical interfaces (vmnic) assigned to it. The first step is to create Private VLANs (primary and secondary) on the distributed switch. Change view to *Inventory -> Networking*

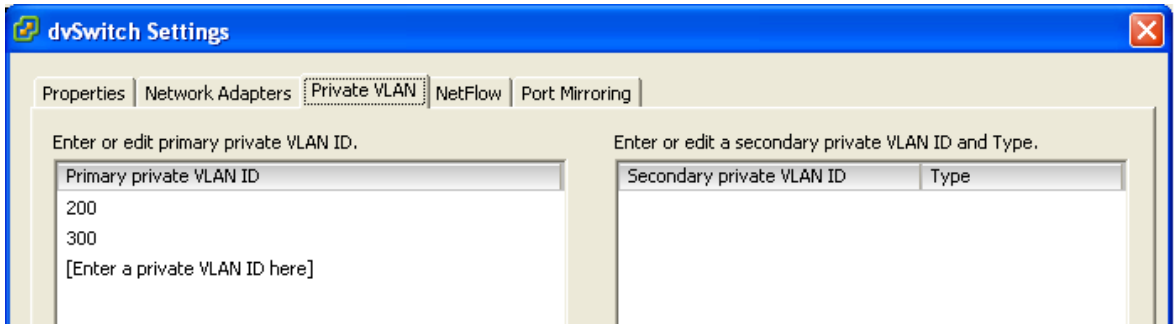


Select dVSwitch, right click, and select *Edit Setting*

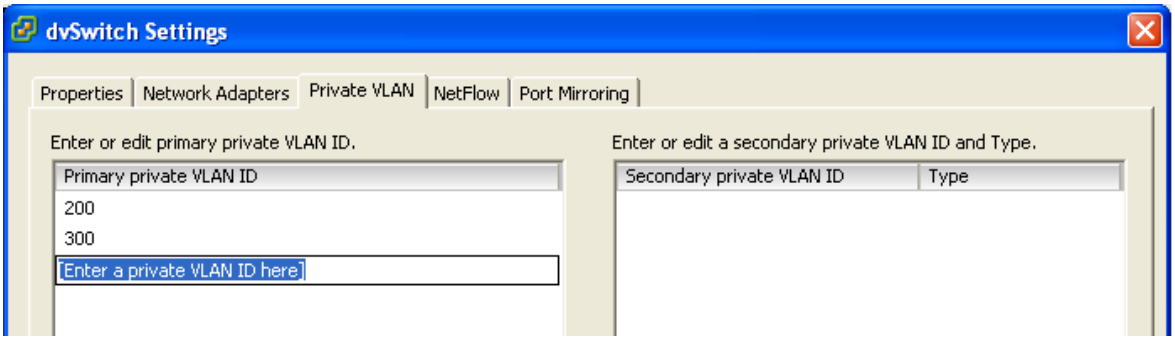




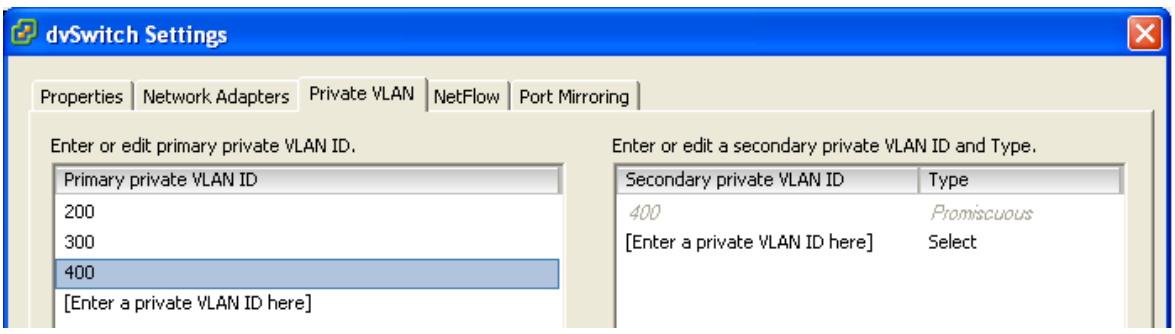
Select *Private Vlan* tab.



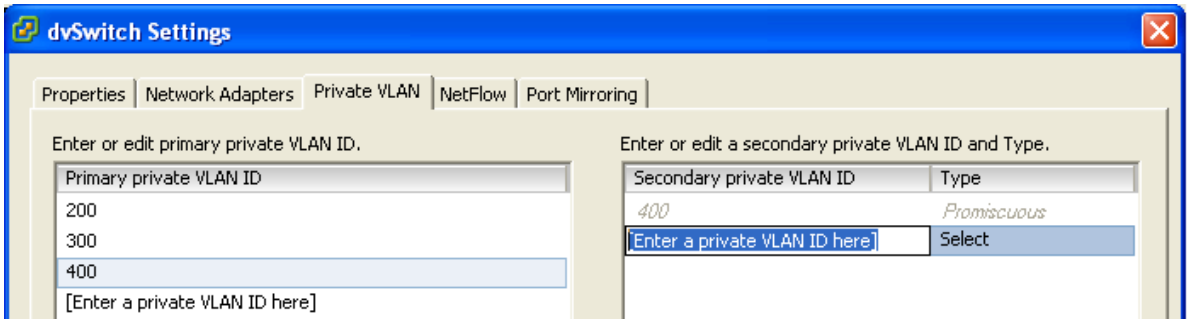
On the left window, enter a primary VLAN ID, and then double-click on the *[Enter a private VLAN ID here]* window



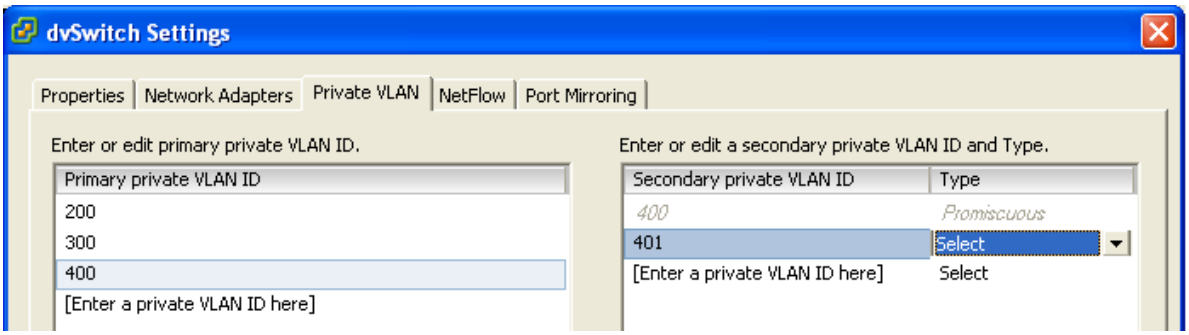
Enter a valid primary VLAN ID, (i.e. 400) and then press the return key. As shown here, you can see 200/300 was already created.



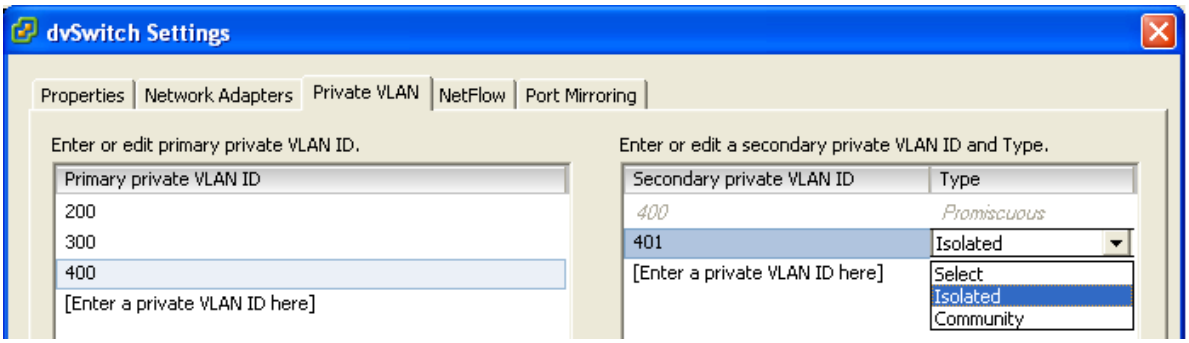
On the right window, enter a secondary VLAN ID, and then double click on the *[Enter a private VLAN ID here]* window



Enter a valid secondary VLAN ID, (i.e. 401) and press the return key



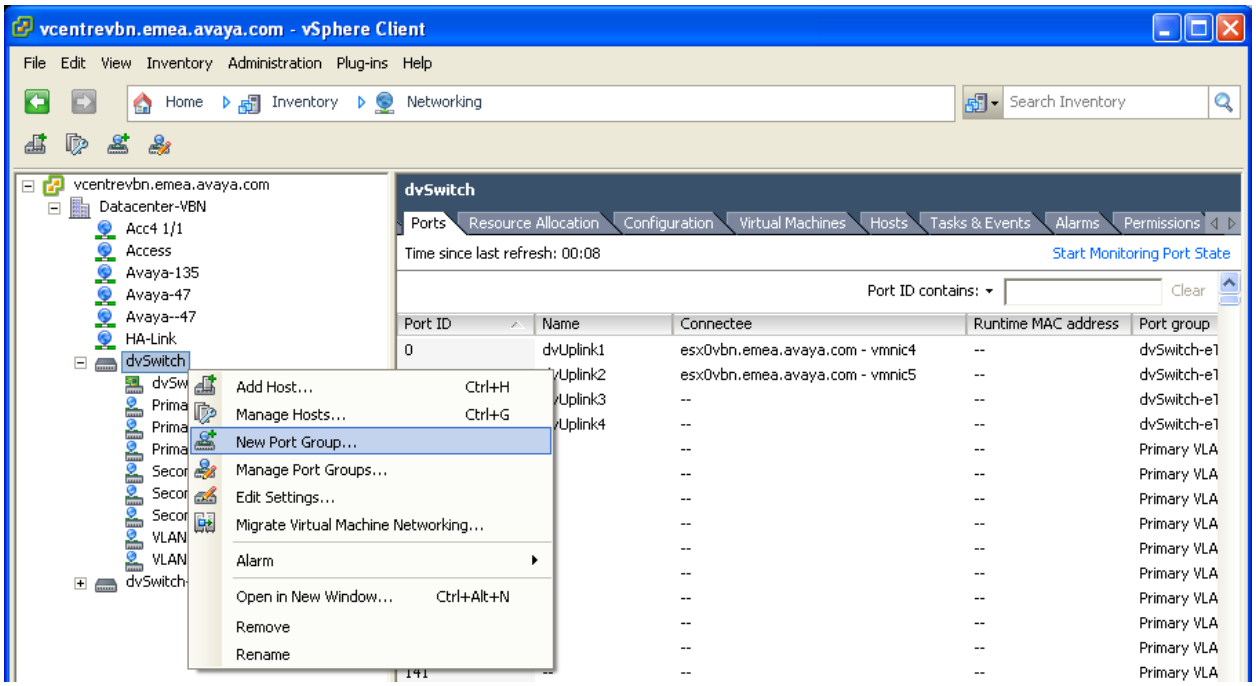
Finally select *Isolated* for Type



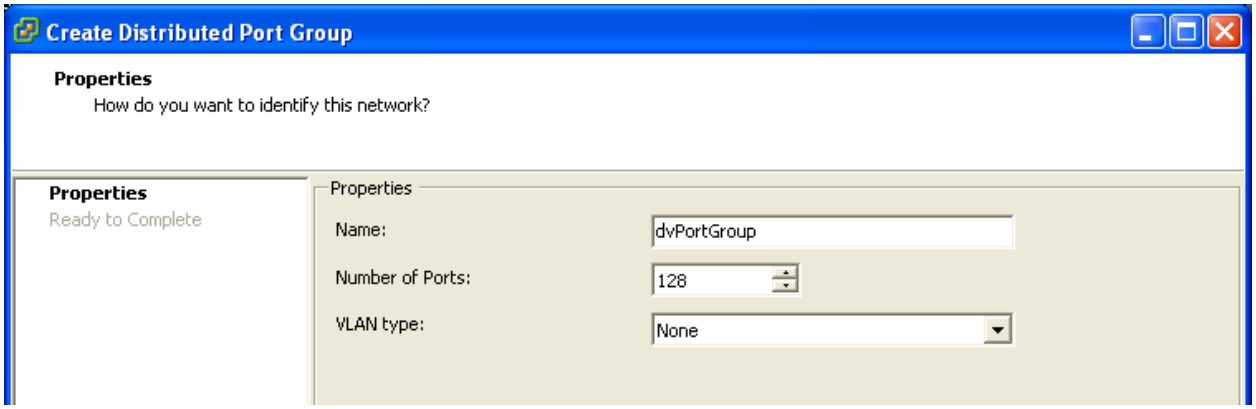
Click *OK* button.

3.2 Port Group Configuration

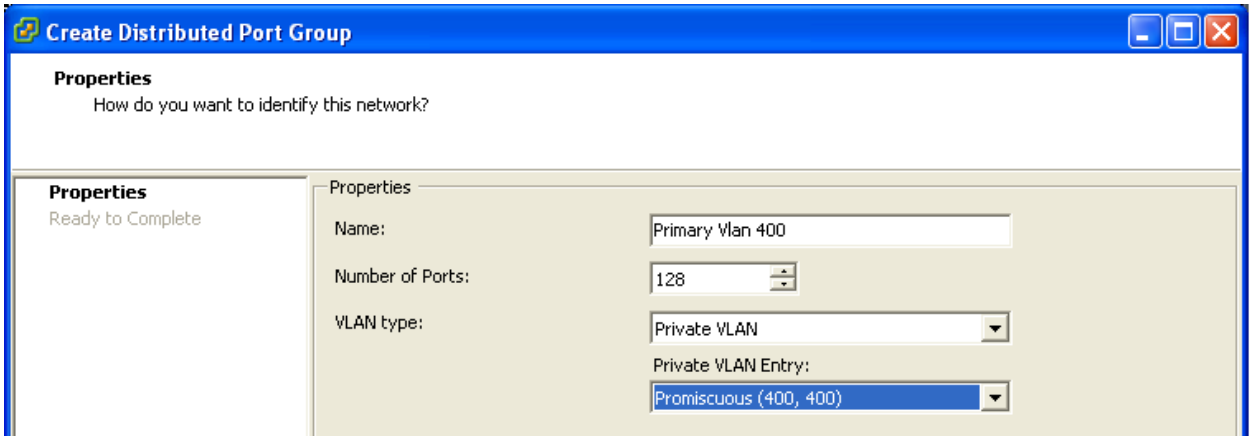
Next step is to assign primary and secondary private VLAN ID to port groups.



Right-click dvSwitch and select *New Port Group*.

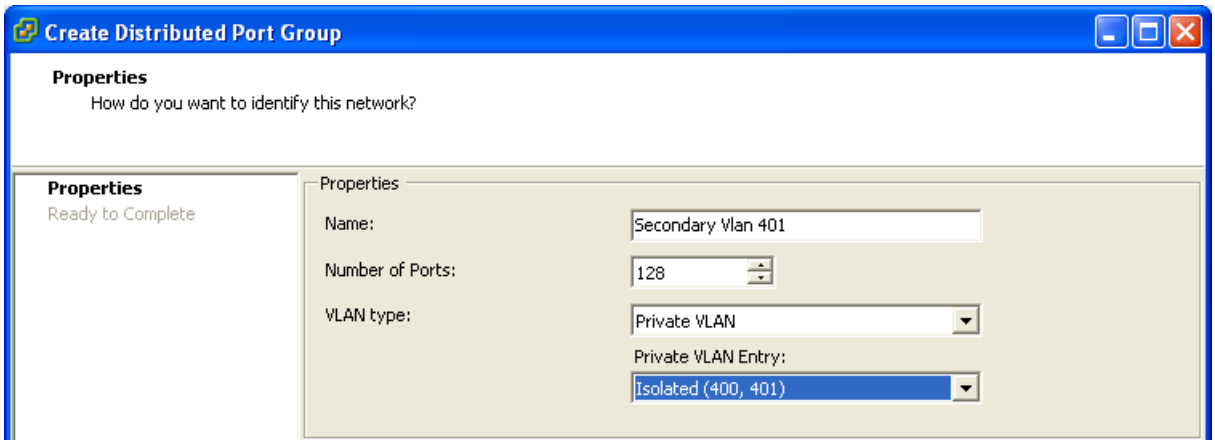


Enter a name, i.e. *Primary Vlan 400*, select *Private VLAN* for Vlan type, and then select the correct VLAN ID, i.e. 400 (Promiscuous 400,400) as used in our example.



Select *Next*, then *Finish*.

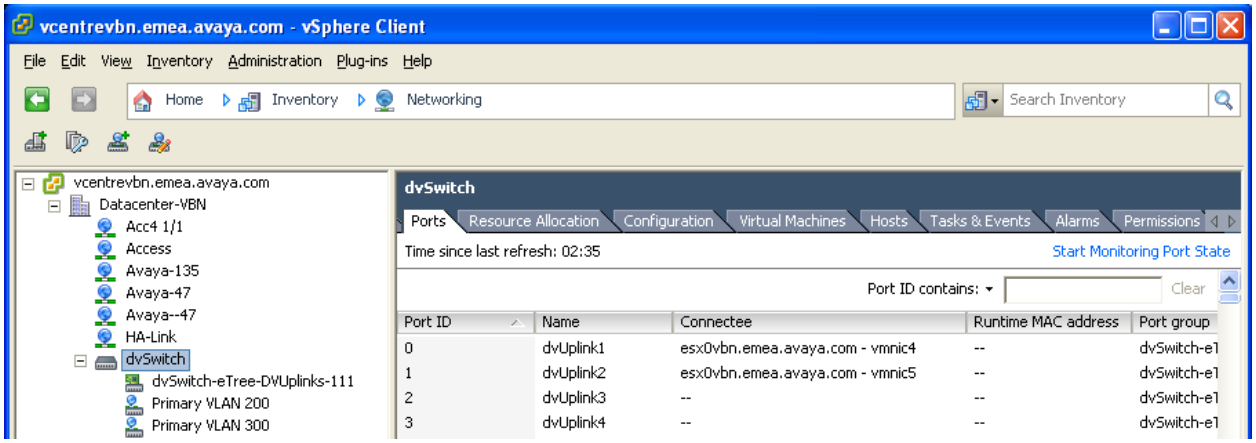
Create another port group for the secondary VLAN ID, enter a name, i.e. *Secondary Vlan 401*, and then select the correct VLAN ID, i.e. 401 (Isolated 400,401) as used in our example.



Select *Next*, then *Finish*.

3.3 Load Balancing Configuration

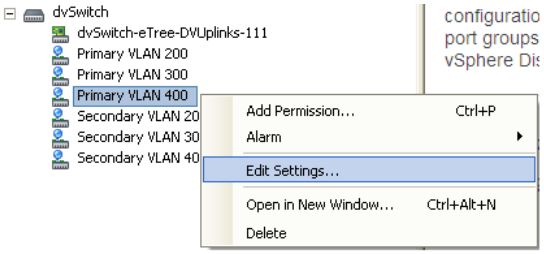
Next step is to change default load balancing behavior for the two network interfaces we have configured on the dvSwitch (vmnic4 & vmnic5).



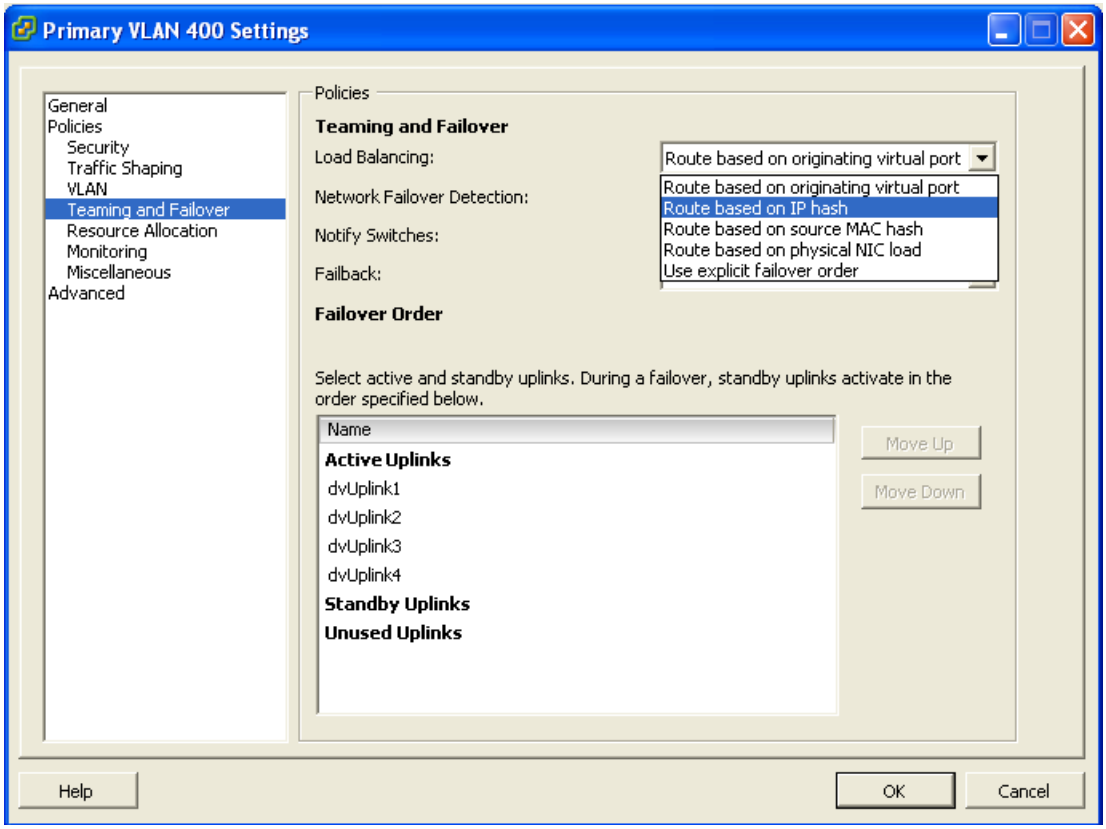
By default, the ESX server is setup with *Route based on originating virtual port* where it simply assigns a VM (virtual machine) to a physical network interface (vmnicX). In our case, we have to use *Route based on IP hash* as we want to load share traffic on two interfaces (vmnic4 and vmnic5).

Change trunking on both port groups from the default *Route based on originating virtual port* setting to *Route based on IP hash* for the Primary and Secondary port groups. The VSP 4000 is configured with MultiLink Trunking.

Select *Primary VLAN 400* and then *Edit Settings*

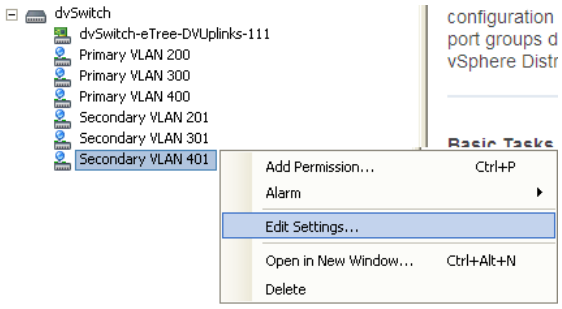


Select *Teaming and Failover*, change load balancing from *Route based on originating virtual port* to *Route based on IP hash*.

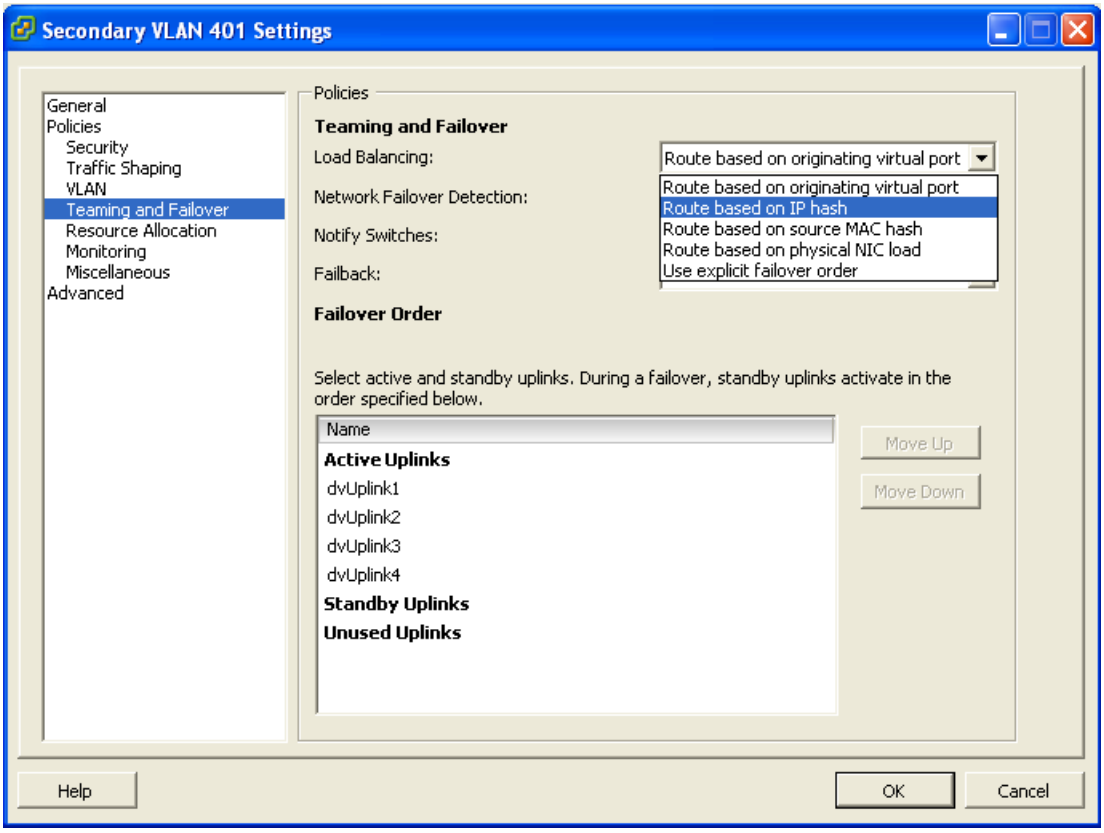


Then click *OK* button when finished.

Repeat same action for the secondary VLAN ID. Select *Secondary VLAN 401* and then *Edit Settings*



Select *Teaming and failover*, change load balancing from *Route based on originating virtual port* to *Route based on IP hash*.

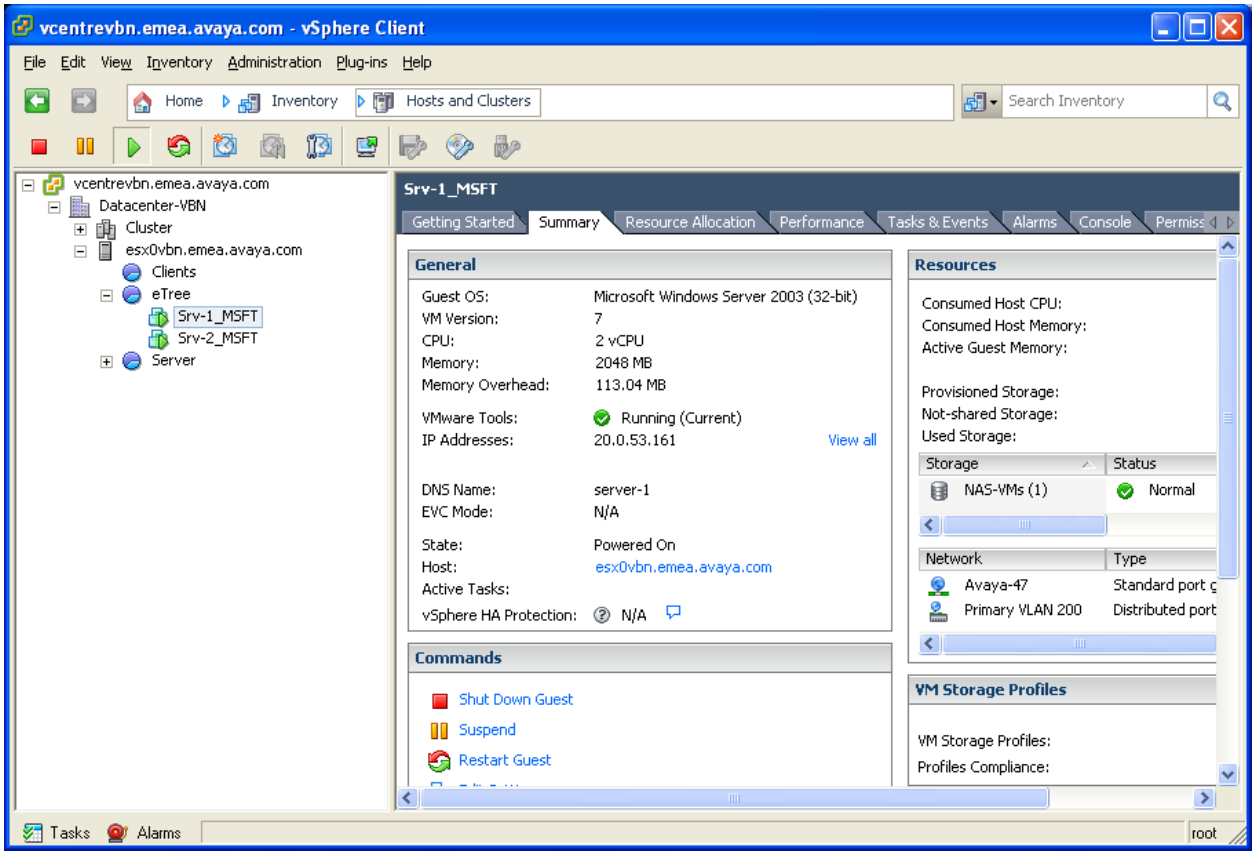


Then click *OK* button when finished.

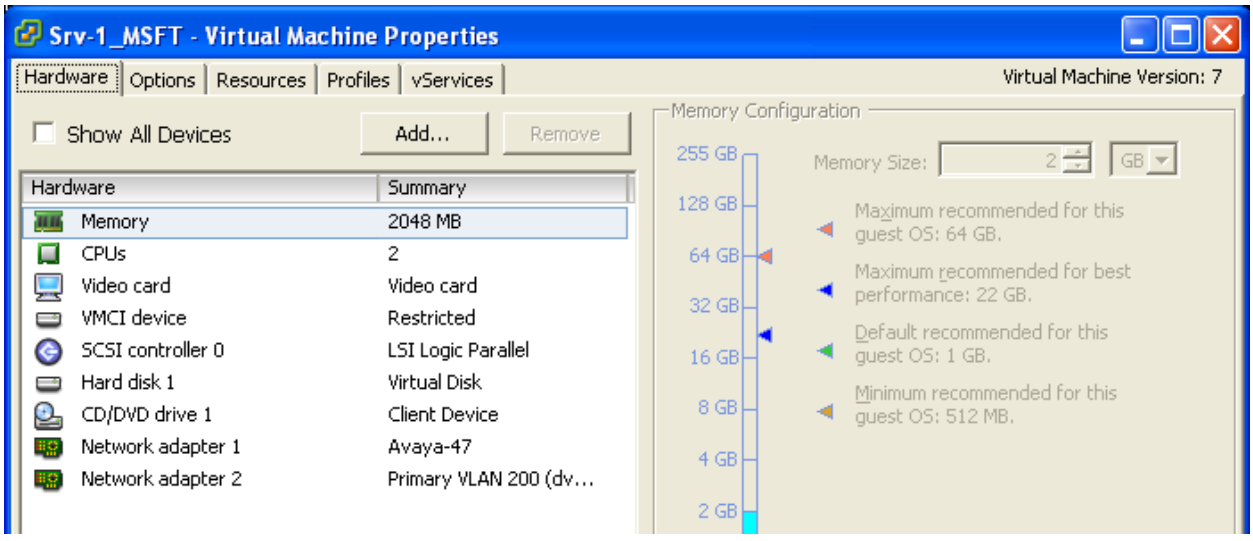
3.4 Virtual Machine Configuration

Final step is to assign these port groups to each Virtual Machine (Srv-1_MSFT and Srv-2_MSFT).

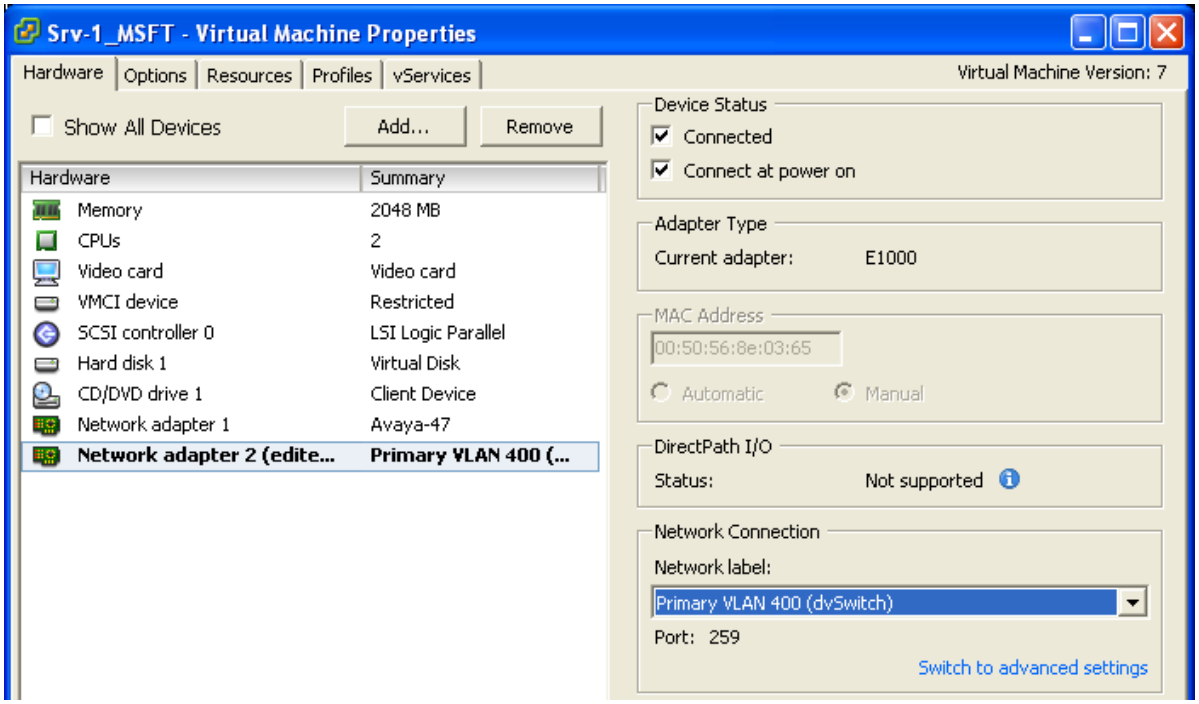
Change view to *Home -> Inventory -> Hosts and Clusters*



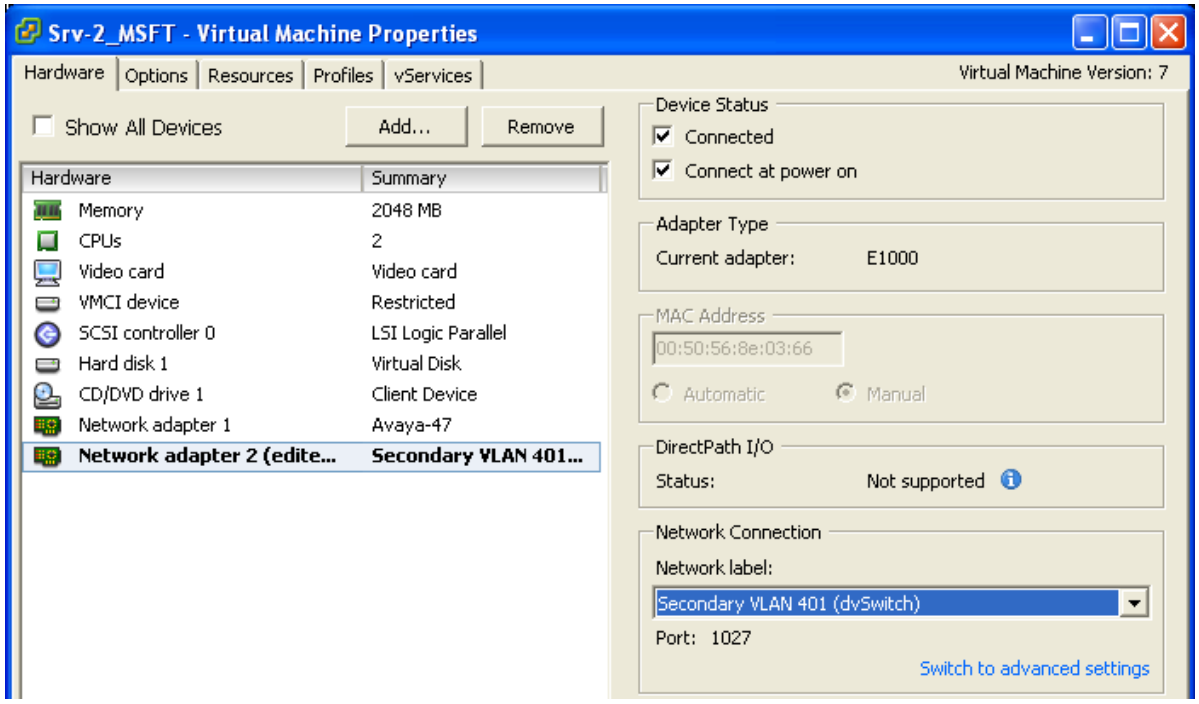
Select a Virtual Machine (VM), in our case *Srv-1_MSFT,* right-click and select *Edit Settings*



Notice that two adapters are already assigned. The first one is used for out of band access while the second one is in band access. Assign Primary VLAN 400 to network adapter 2.



Repeat same action for the second virtual machine, *Srv-2_MSFT*, right-click and select *Edit Settings*



4. VSP 4000

In our specific case, a physical server with two virtual machines (Srv-1_MSFT and Srv-2_MSFT) is connected to a VSP 4000 by a trunk port (ports 1/4 and 1/5 are Qtagged via MLT 1). In fact Srv-1_MSFT is assigned to the primary VLAN (Private VLAN configured on VMware server) and acts as a promiscuous node/hub. However, Srv-2_MSFT is assigned to the secondary VLAN (Private VLAN configured on VMware server) and acts as an isolated node/spoke.

The two servers as shown below (figure 3) will be able to communicate, but in the case you have a more complex network with more stations, Srv-1_MSFT will be able to communicate with all stations while Srv-2_MSFT will be able to communicate only to the primary VLAN attached stations (hubs) and not to stations attached to the secondary VLAN (spokes). Refer to figure 1 for E-Tree (Ethernet Private Tree) topology and to table 1 for station connectivity matrix.

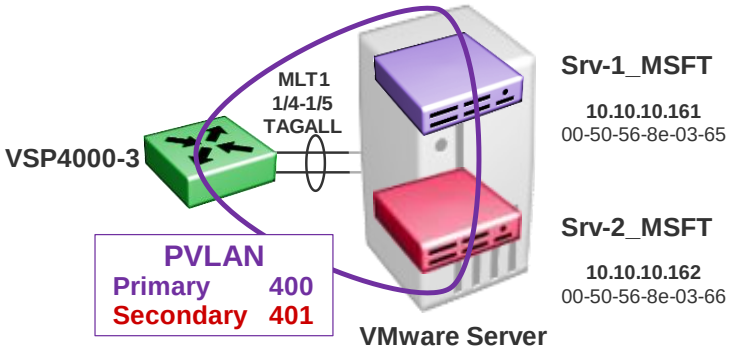


Figure 3 - VMware server and VSP 4000 Logical setup

4.1 Configuration commands

The following commands configure trunking, private VLAN and E-tree:

```
VSP4000-3:1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
VSP4000-3:1(config)#mlt 1 enable name "ESX-Trunk"
VSP4000-3:1(config)#mlt 1 member 1/4-1/5
VSP4000-3:1(config)#mlt 1 encapsulation dot1q
VSP4000-3:1(config)#mlt 1 private-vlan trunk
VSP4000-3:1(config)#vlan create 400 type pvlan-mstprstp 0 secondary 401
VSP4000-3:1(config)#vlan mlt 400 1
VSP4000-3:1(config)#vlan i-sid 400 4000
```

Note – VSP4000-3 is connected to a SPB network and E-Tree configuration is limited to VLAN ID to ISID mapping. Please refer to Shortest Path Bridging (802.1aq) Technical Configuration Guide for more information about SPB configuration.

4.2 Show commands

You can display Private VLAN information globally by issuing the following commands:

```
VSP4000-3:1#show vlan private-vlan
================================================================================
                                PRIVATE VLAN
================================================================================
Primary             Primary             Secondary           Secondary
VLAN                ISID                VLAN                ISID
--------------------------------------------------------------------------------
400                 4000                401                 4000
```

Or per interface

```
VSP4000-3:1#show interfaces gigabitEthernet private-vlan 1/4,1/5
================================================================================
                             Port Private Vlans
================================================================================
PORT                                    VID
NUM    TAGGING   PVLAN    PVLAN TYPE    TYPE       VID
--------------------------------------------------------------------------------
1/4    enable    enable   trunk         both       400/401
1/5    enable    enable   trunk         both       400/401
```

Reference Documentation

Document Title	Publication Number	Description
Shortest Path Bridging (802.1aq)	NN48500-617	Technical Configuration Guide
Basic SPB Configuration	NN48500-632	Technical Configuration Guide
Configuration — VLANs and Spanning Tree Avaya Virtual Services Platform 4000	NN46251-500	VSP 4000 Manual
Configuration - Shortest Path Bridging MAC (SPBM) - Avaya Virtual Services Platform 4000	NN46251-510	VSP 4000 Manual

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