Deployment of Dell M8024-k Blade Switch with Cisco Nexus 5000 Series Switch

A Dell Interoperability Whitepaper

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Summary

Adding a Dell™ PowerConnect™ blade (M-Series) switch, with a Dell PowerEdge™ M1000e modular blade enclosure to an external Cisco Nexus Switch is a straightforward process. This document is targeted at today's FC SAN and Ethernet LAN environments and meant to serve as a supplementary guide on how to interconnect equipment that makes up datacenter.

This document provides an easy to use step-by-step guide on how to configure and deploy DELL M-Series 10Gbit/s Blade Switch (M8024-k) (see Figure 1) with a Cisco Nexus 5000 Series Switch. For the examples in this guide, the Nexus 5020 was used.

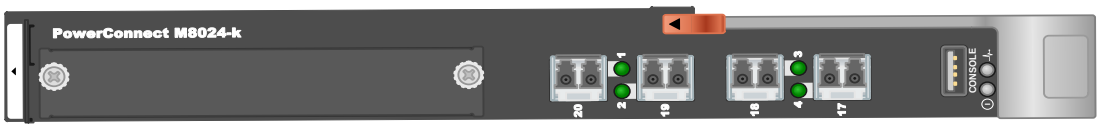


Figure 1. The Dell PowerConnect M8024-k Switch

Simple Switch Mode

Simple Switch Mode, or SSM, allows server administrators, or anyone with very limited expertise in configuring Ethernet Switches, the ability to deploy a loop-free switching solution without having to configure the Spanning Tree Protocol (STP) or design its integration into the existing environment. The primary advantages of deploying SSM are as follows:

- Port Aggregation is easy to configure. Simply group internal ports and associate with external ports, assign VLANs (if required), and it's ready to go.
- SSM automatically configures multiple external ports into a Link Aggregation Control Protocol (LACP) trunk group.
- By using Aggregator Groups, the Simple Switch Mode provides loop-free operation without using STP.
- Port Aggregation is completely interoperable. Dynamic (via LACP) and static link aggregation is supported on the external ports.

This document does not use SSM, but instead guides the user through the steps using the Normal mode of operation. To learn more about SSM or find the associated SSM configurations as shown in the guide, download the white paper titled "Deployment of Dell M8024-k- Blade Switch in Simple Mode with Cisco Nexus 5000-series Switch".

Testing Scenarios

The following sections will present an overview of a variety of different network deployment scenarios and will provide step-by-step set up guidance using configuration tools, with screen shots as a visual guide.

- Each of the following scenarios in this document assumes that the PowerConnect device is in Normal Mode configuration. If Simple Mode is enabled it will need to be disabled.

- All scenarios assume that the M8024-k is using external ports 17-20 and that no module is installed providing additional external ports.

- Be sure to enable the Spanning Tree protocol on both network devices for proper functioning before setting up any of the configurations mentioned in this documentation. Scenario 1 provides steps on how to do this.

Scenario 1: Enabling Spanning Tree (RSTP) and Creating a LAG (Link Aggregation) on the Dell PowerConnect M8024-k Switch

This scenario shows how to enable Spanning Tree then setup a LAG (Link Aggregation) between the PowerConnect M8024-k switch and the Cisco Nexus 5020 using LACP. Figure 2 shows this connectivity.

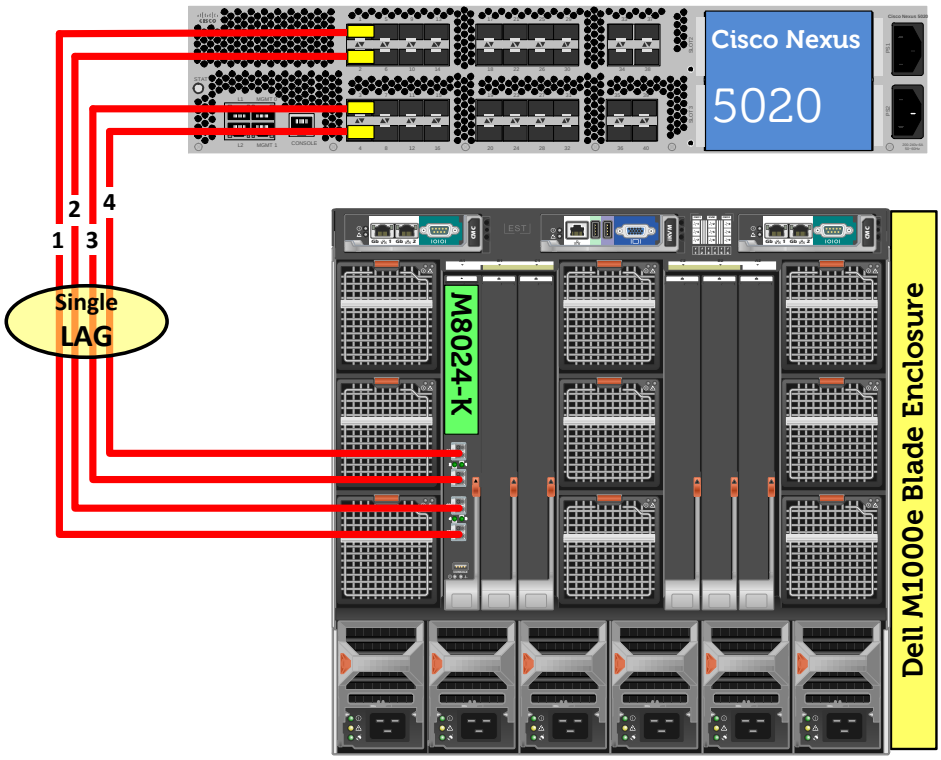


Figure 2. Graphic Representation of Scenario 1

Configuring the Dell M8024-k Switch

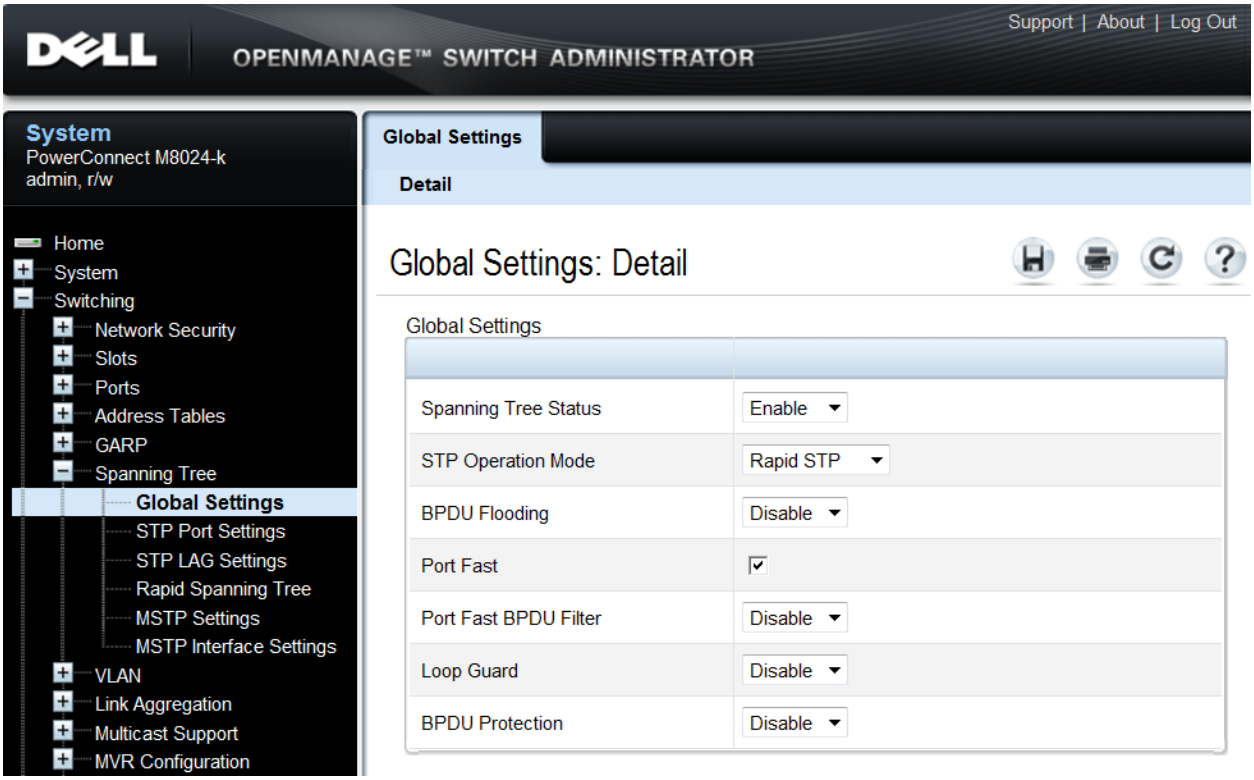
Configure Link Aggregation Control Protocol (LACP) on Dell PowerConnect 8024-k switch ports. This switch supports industry-standard LAGs that adhere to the IEEE 802.3ad specification. Each LAG can consist of up to eight 10G ports, which would provide a maximum bandwidth of 80Gbps, plus add failover redundancy. In this example we will create a LAG consisting of 4 physical 10Gbps ports.

Command-Line Interface Method

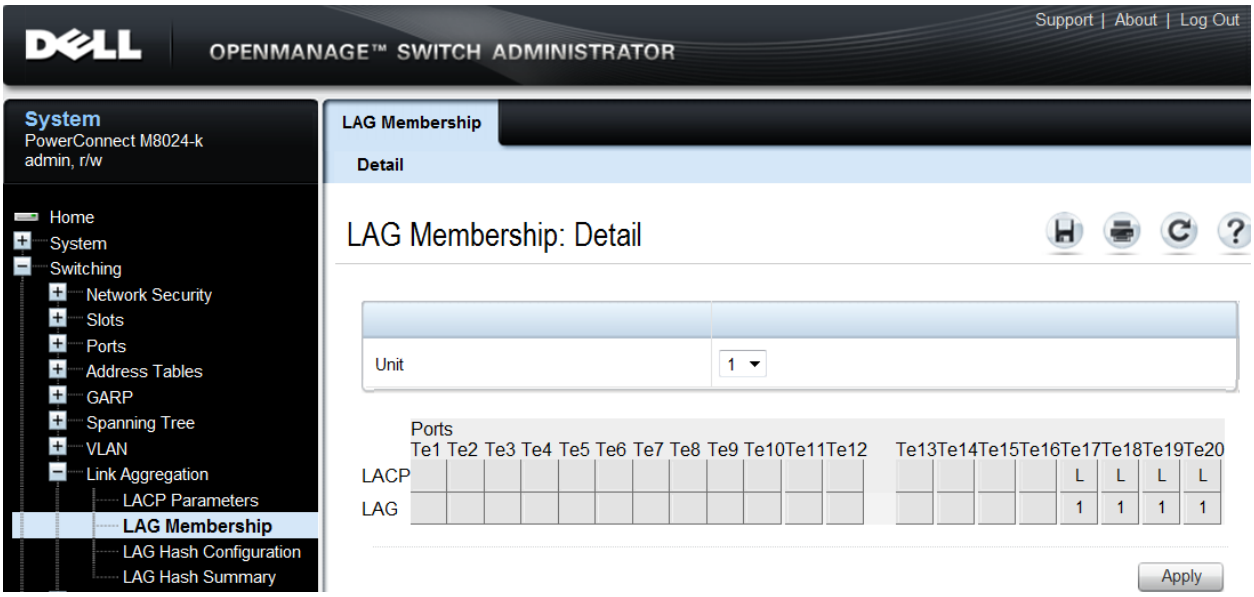
```
console(config)#spanning-tree

console(config)#spanning-tree mode rstp

console(config)#interface range Te1/0/17-20

console(config-if)#channel-group 1 mode active

console(config-if)#exit

console(config)#exit
```

Web Interface Method:

- Select **Switching > Spanning Tree > Global Settings**.
- For Spanning Tree Status, select **Enable**.
- For STP Operation Mode, select **Rapid STP**.



- Click **Apply.**
- Select **Switching > Link Aggregation > LAG Membership**.
- Click each box in the LAG row once for Te17 thru Te20. This will automatically set LACP to create a dynamic LAG on these ports



- Click **Apply**.

Configuring the Cisco 5020 Switch

Configure Link Aggregation Control Protocol (LACP) on Cisco switch ports. In this example, the first 4 ports of Cisco Nexus which are connected to M8024-k switch need to be configured as one single aggregation group. To do so, login to the Cisco Nexus 5020 switch and make the following changes using the CLI:

```
Nexus5020(config)#feature lacp
Nexus5020(config)#interface ethernet 1/1-4
Nexus5020(config-if-range)#channel-group 1 mode active
Nexus5020(config-if-range)#exit
Nexus5020(config)#exit
```

Validation

To test the LAG's resilience, unplug any one, two , or three of the cables used in this scenario and the remaining cable(s) will continue to pass traffic between the devices. Display the LAG port members by typing the following command from the CLI:

```
console# show interface port-channel
```

Scenario 2: Configuring an Untagged VLAN on a Single LAG

This scenario shows an overview of configuring VLANs on the Dell PowerConnect M8024-k switch. Figure 4 shows this connectivity.
VLANs allow for greater granularity and quality of service (QoS) control over simple sub-netting. In this example a VLAN is configured across internal port 1 and external ports 17-20 on the M8024-k, and then extended onto the external network by configuring the Cisco Nexus switch.

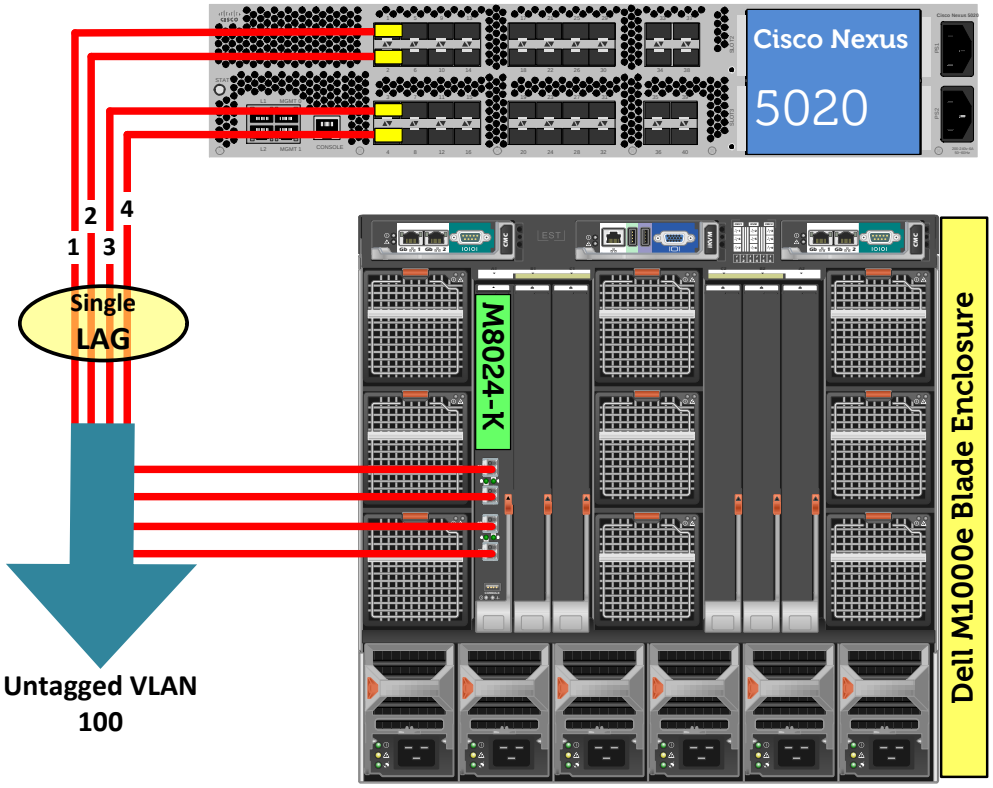


Figure 3. Graphic Representation of Scenario 2.

Configuring the Dell M8024-k Switch

Command-Line Interface Method:

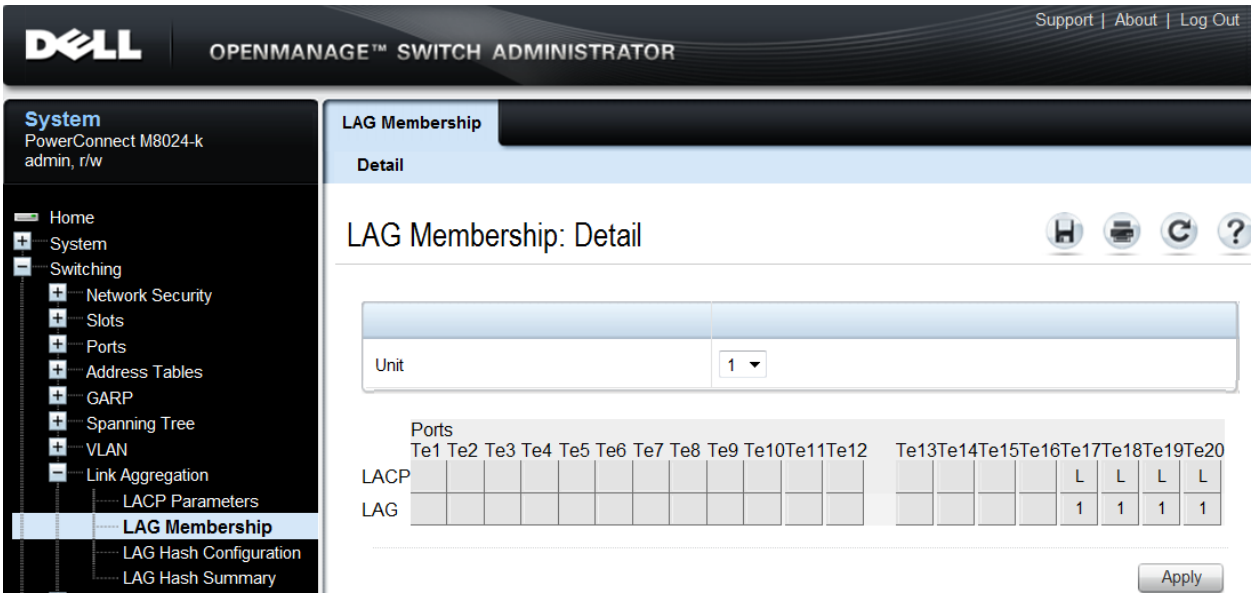
```
console(config)#interface range Te1/0/17-20
console(config-if)#channel-group 1 mode active
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 100
console(config-vlan)#exit
```

```
console(config)#interface port-channel 1
console(config-if-Po1)#switchport mode general
console(config-if-Po1)#switchport general allowed vlan add 100 untagged
console(config-if-Po1)#switchport general pvid 100
console(config-if-Po1)#exit
console(config)#interface vlan 100
console(config-if-vlan100)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan100)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport access VLAN 100
console(config-if-Te1/0/1)#exit
console(config)#exit
```

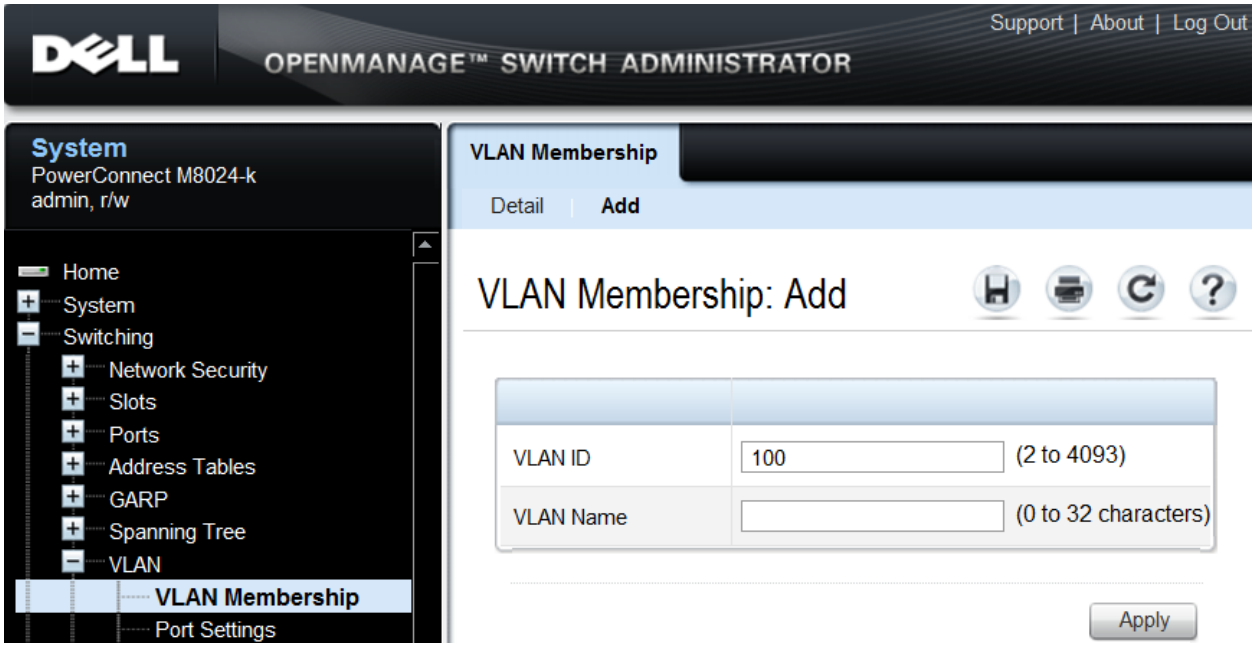
Web Interface Method:

- Select **Switching > Link Aggregation > LAG Membership**.
- Click each box in the LAG row once for Te17 thru Te20. This will automatically set LACP to create a dynamic LAG on these ports.

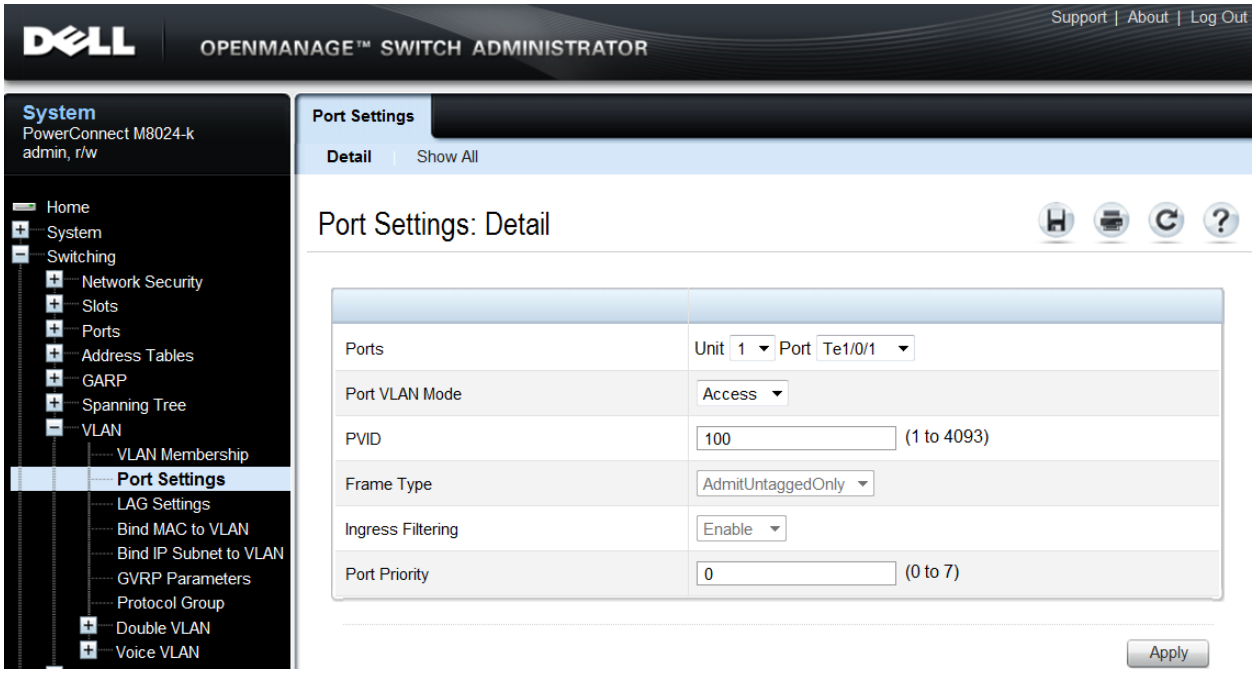
.



- Click **Apply**.
- Select **Switching > VLAN > VLAN Membership > Add**.
- Enter the VLAN ID (i.e. 100) in the VLAN ID field.
- Optionally, enter a VLAN Name in the VLAN Name field.

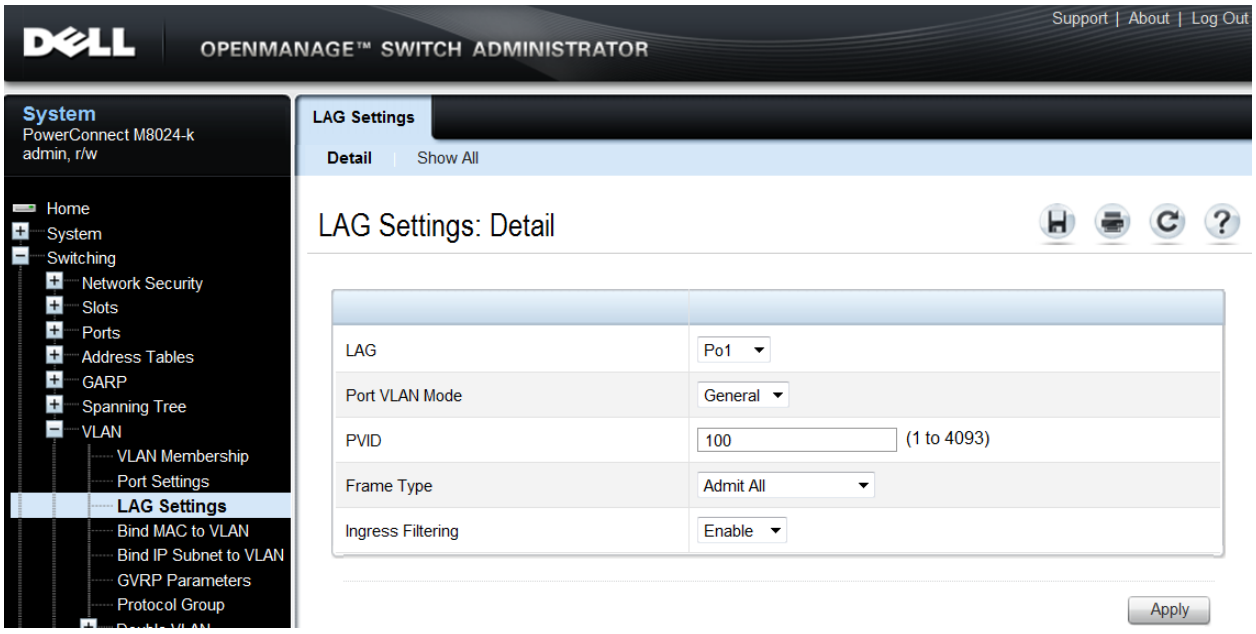


- Click **Apply**.
- Select **Switching > VLAN > Port Settings**.
- Select the internal port (i.e. Te1/0/1) in the Ports menu.
- Set the Port VLAN Mode to Access.
- Enter the PVID (i.e. 100) into the **PVID** field.



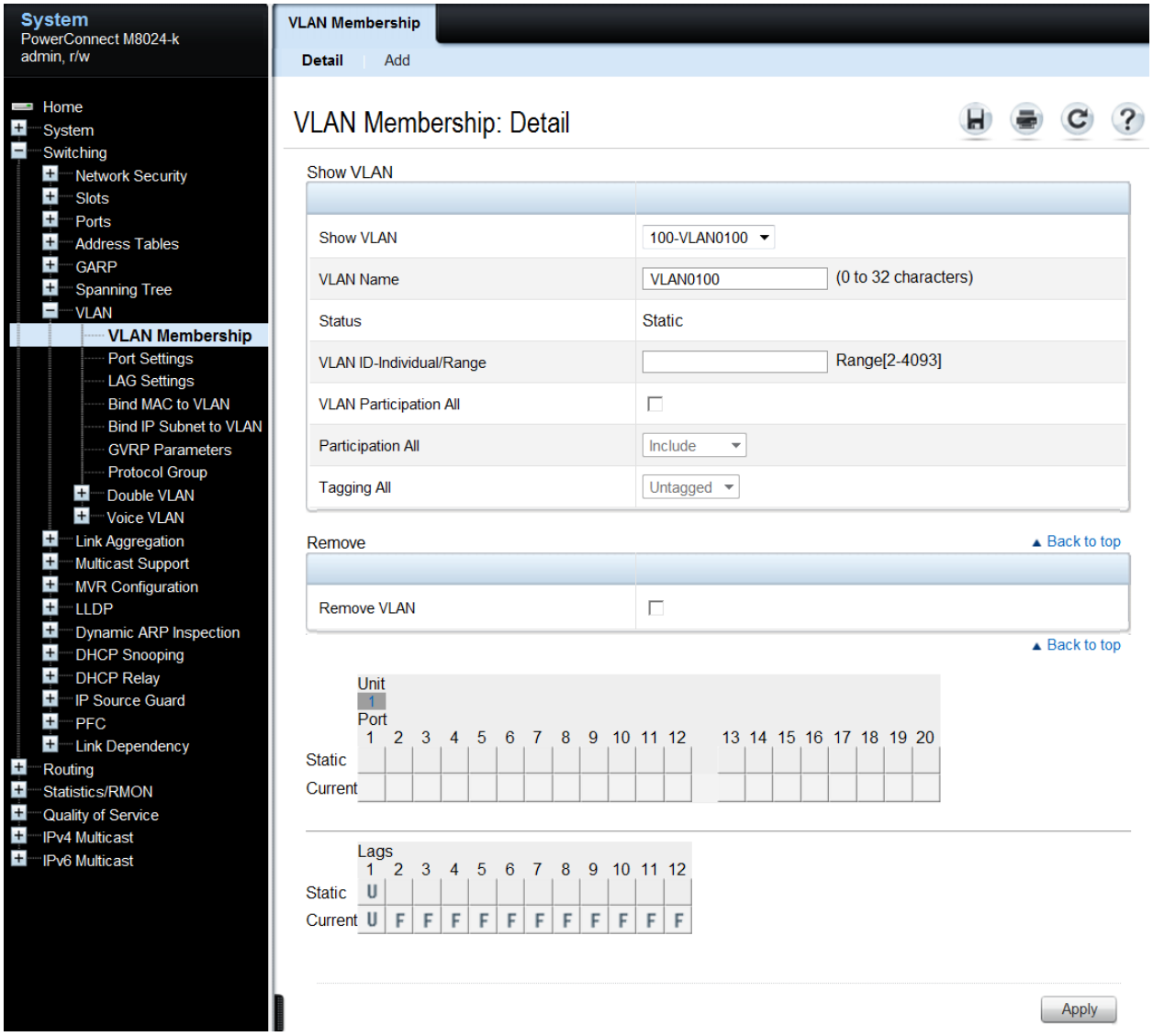
- Click **Apply**
- Select **Switching > VLAN > LAG Setting**.
- Select the LAG (i.e. Po1) from the **LAG** menu.

- Set the **Port VLAN Mode** to **General**.
- Enter the PVID (i.e. 100) in the **PVID** field.
- Select **Frame Type** (i.e. Admit All) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.
- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the VLAN created above (i.e. 100).
- At the bottom of the page under LAGs, click the blank box below the number 1 until a "U" is present. This assigns Port-channel 1 to the VLAN as untagged.

The row labeled "Current" will continue to show **F** (forbidden) until **Apply** is pressed.



- Click **Apply**.

Configuring the Cisco 5020 Switch

Login to the Nexus 5020 and make the following changes using the CLI:

```
Nexus5020(config)# feature lacp
Nexus5020(config)# vlan 100
Nexus5020(config-vlan)# exit
Nexus5020(config)# interface ethernet 1/1-4
Nexus5020(config-if-range)# channel-group 1 mode active
```

```
Nexus5020(config-if-range)# exit
Nexus5020(config)#  interface port-channel 1
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# switchport trunk native vlan 100
Nexus5020(config-if)# end
```

Validation

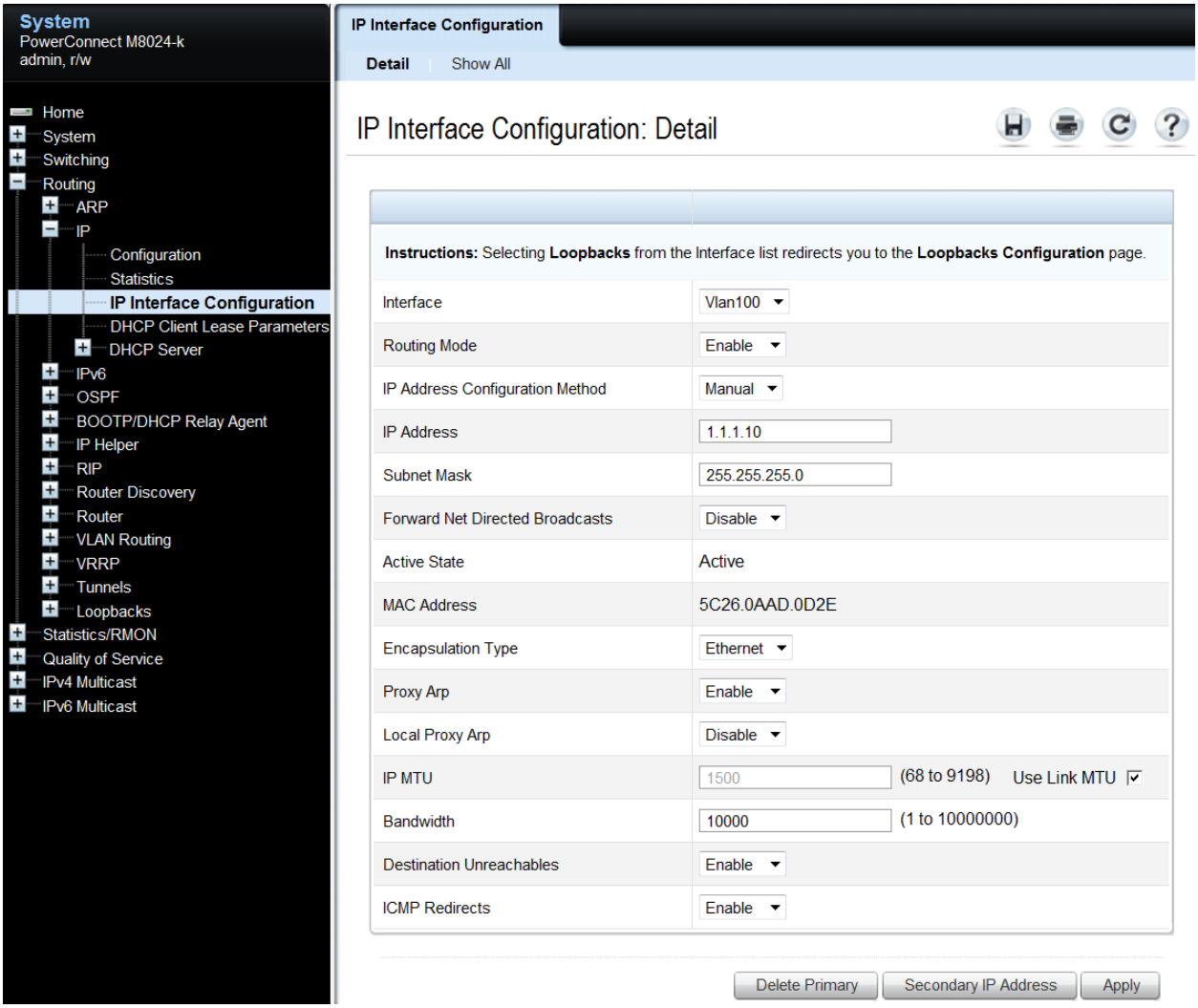
The next steps are optional, but can be used to validate or troubleshoot the VLAN and LAG setup.

Command-Line Interface Method:

```
console(config)#interface vlan 100
console(config-if-vlan100)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan100)#exit
console(config)#exit
```

Web Interface Method:

- Select **Routing > IP > IP Interface Configuration**.
- Select the VLAN (i.e. Vlan100) from the **Interface** menu.
- Enable **Routing Mode**.
- Change the **IP Address Configuration Method** to **Manual**.
- Provide an **IP Address** and **Subnet Mask** in the appropriate fields. (i.e. 1.1.1.10 and 255.255.255.0).



- Click **Apply**.

Validation: Cisco 5000 Command Line Interface

Assign an arbitrary IP address to VLAN interface on the Cisco switch and try to ping that IP address from the server.

For example, assign an IP address (i.e. 1.1.1.20) to VLAN interface on Cisco Nexus use the following commands:

```
Nexus5020(config)# feature interface-vlan
Nexus5020(config)# interface vlan 100
Nexus5020(config-vlan)# ip address 1.1.1.20/24
Nexus5020(config-vlan)# no shutdown
Nexus5020(config-vlan)# exit
```

Next, add an IP address (i.e. 1.1.1.5) to the Server blade in the M1000e blade enclosure. A ping should be successful between the Cisco Nexus and the M1000e server, between the Cisco Nexus and the M8024-k, and between the M8024-k and the Server blade.

Scenario 3: Configuring Multiple VLANs on a Single LAG

This section provides an overview of configuring multiple VLANs per internal port to connect to a server NIC with Tagging enabled, which is useful for management of VMs. Figure 4 shows the connectivity for this scenario.

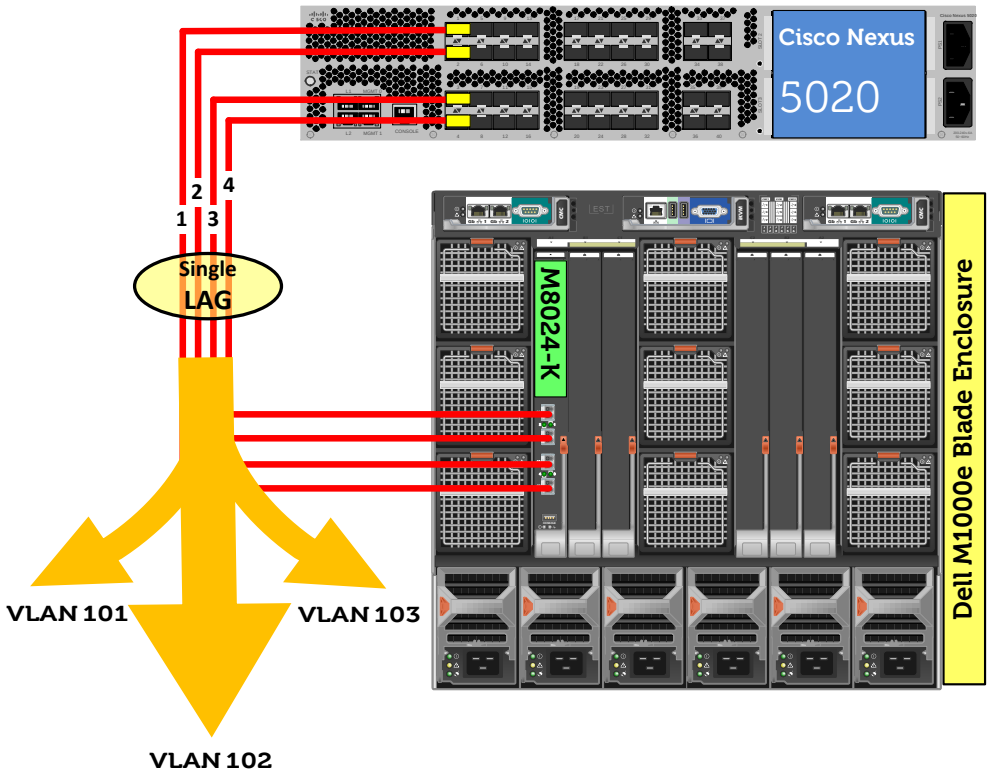


Figure 4. Graphic Representation of Scenario 3.

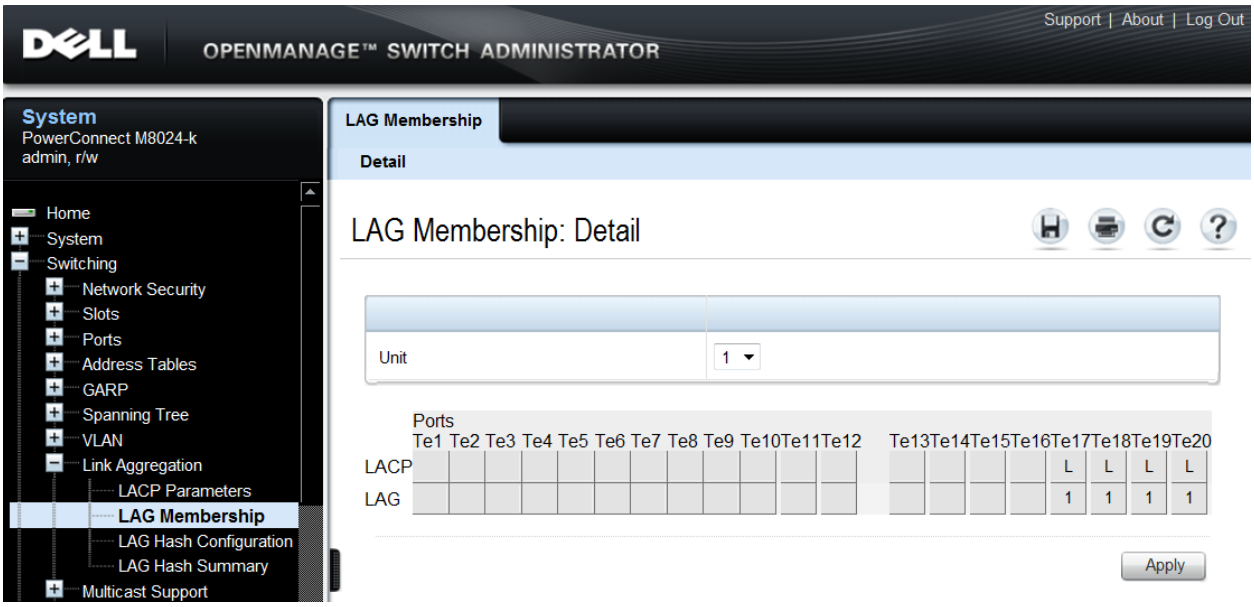
Configuring the Dell M8024-k Switch

Command-Line Interface Method:

```
console(config)#interface range Te1/0/17-20
console(config-if)#channel-group 1 mode active
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 101-103
console(config-vlan)#exit
console(config)#interface port-channel 1
console(config-if-Po1)#switchport mode general
console(config-if-Po1)#switchport general allowed vlan add 101-103 tagged
console(config-if-Po1)#exit
console(config)#interface vlan 101
console(config-if-vlan101)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan101)#exit
console(config)#interface vlan 102
console(config-if-vlan102)#ip address 1.1.2.10 255.255.255.0
console(config-if-vlan102)#exit
console(config)#interface vlan 103
console(config-if-vlan103)#ip address 1.1.3.10 255.255.255.0
console(config-if-vlan103)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport general allowed vlan add 101-103 tagged
console(config-if-Te1/0/1)#exit
console(config)#exit
```

Web Interface Method:

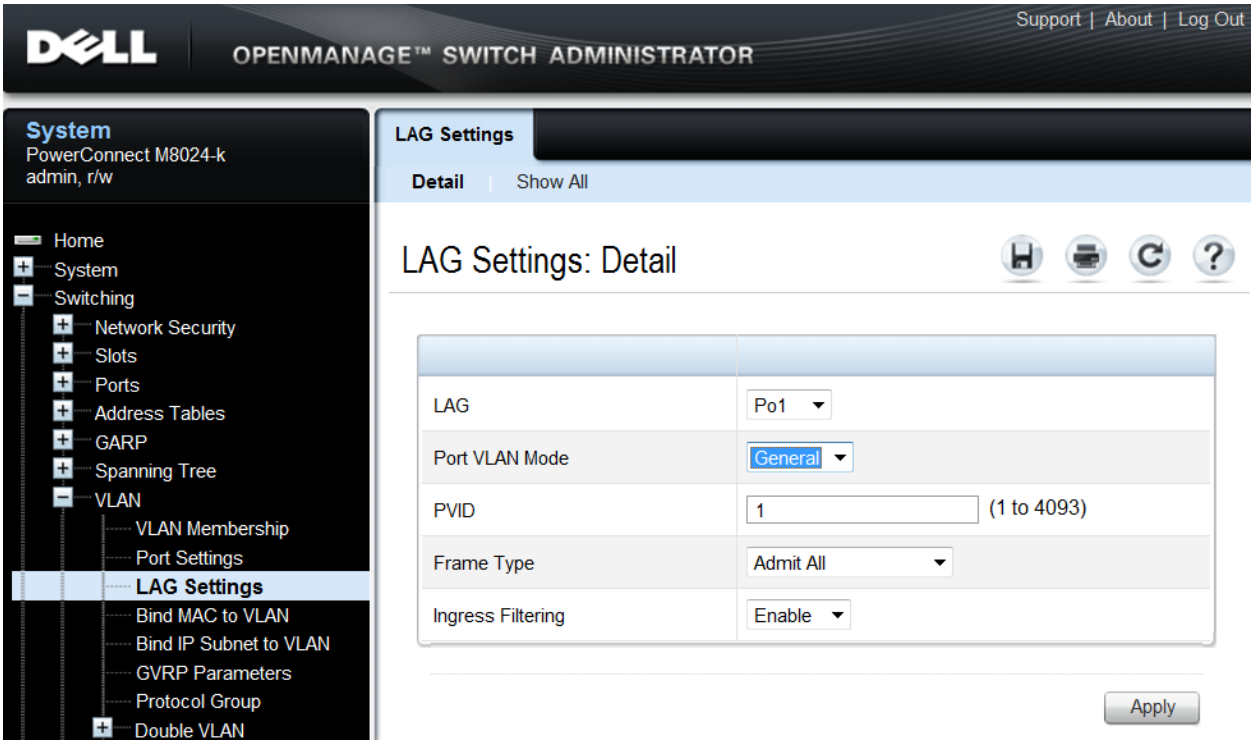
- Select **Switching > Link Aggregation > LAG Membership**
- Enter a LAG number (i.e. 1) in the LAG row for Te17 thru Te20. Click the box above each number that you just entered until it shows the letter L. This sets LACP to create a dynamic LAG on these ports.



- Click **Apply**.

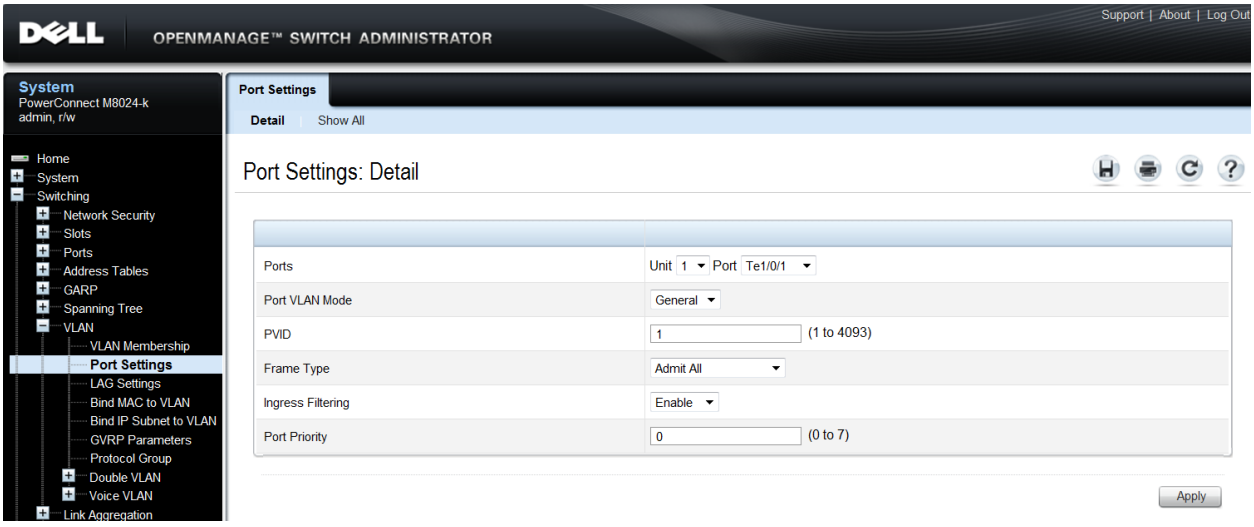
The next two screens show how to set the LAG and an internal port (i.e. port 1) to **General** mode.

- Select **Switching > VLAN > LAG Settings**.
- Select the LAG (i.e. Po1) from the **LAG** menu.
- Set the **Port VLAN Mode** to **General**.
- Select **Frame Type** (i.e. Admit All) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.

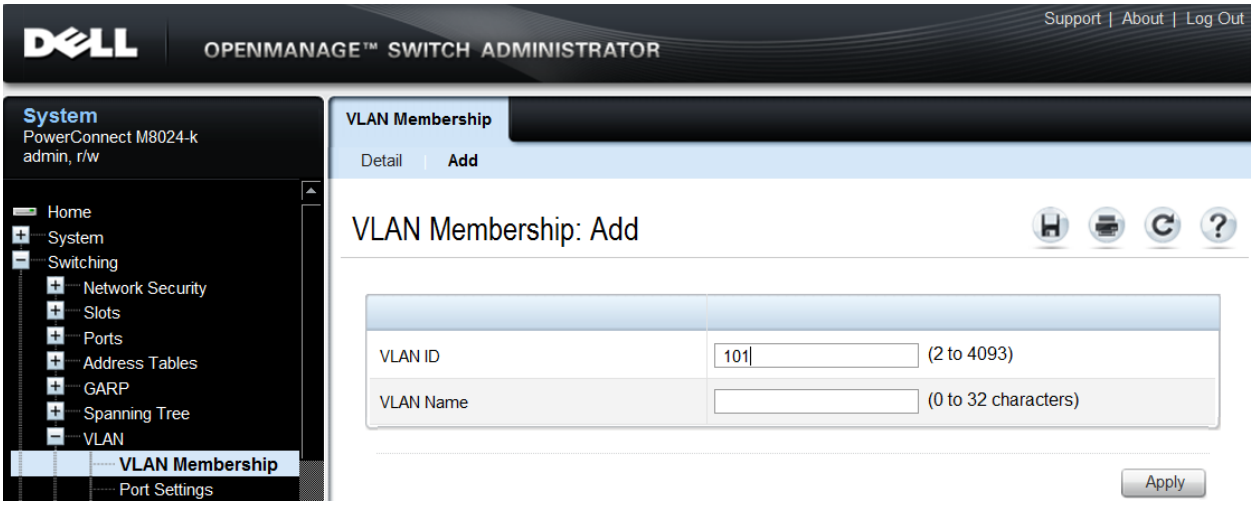
- Select **Switching > VLAN > Port Settings**.
- Select the internal port (i.e. Te1/0/1) in the **Ports** menu.
- Set the **Port VLAN Mode** to **General**.
- Set **Frame Type** to **Admit All**.



- Click **Apply**.

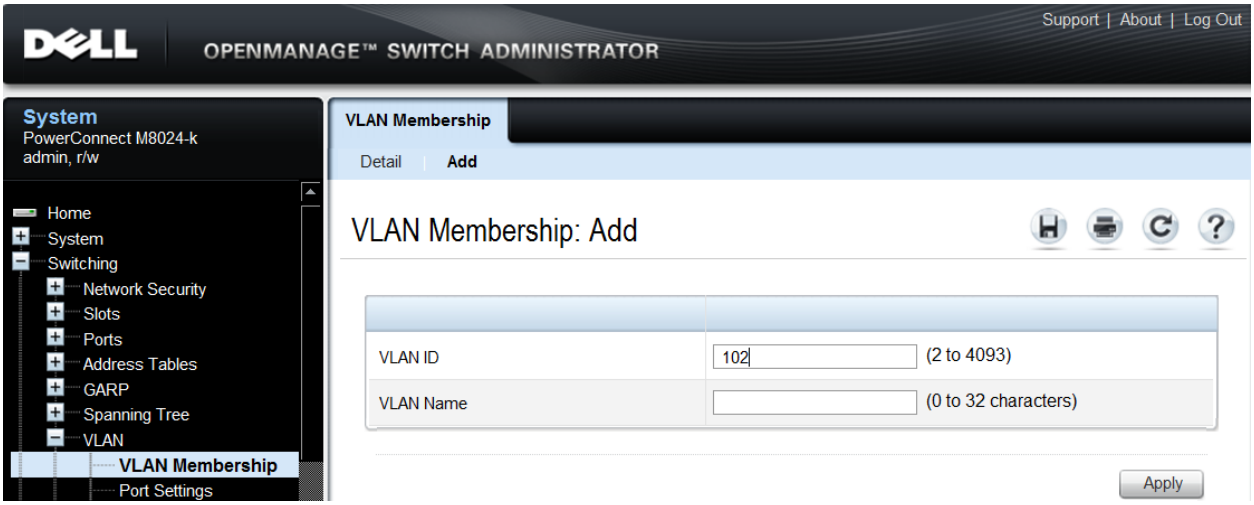
The next three screens show how to create three VLANs (i.e. VLAN 101, 102, and 103).

- Select **Switching > VLAN > VLAN Membership > Add**.
- Enter the VLAN ID (i.e. 101) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.



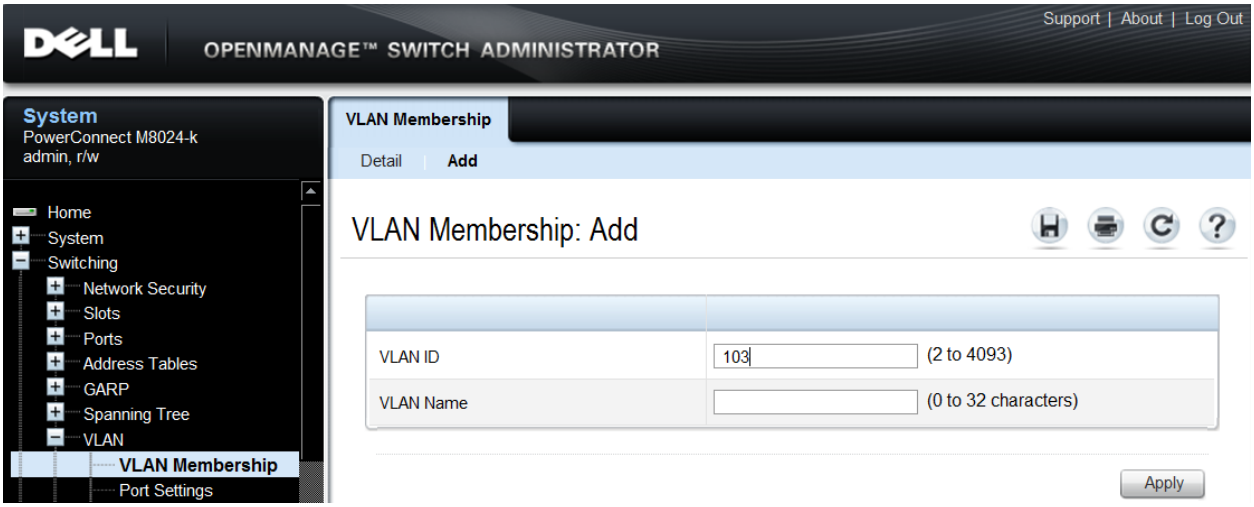
- Click **Apply**.

- Enter the VLAN ID (i.e. 102) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.



- Click **Apply**.

- Enter the VLAN ID (i.e. 103) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.

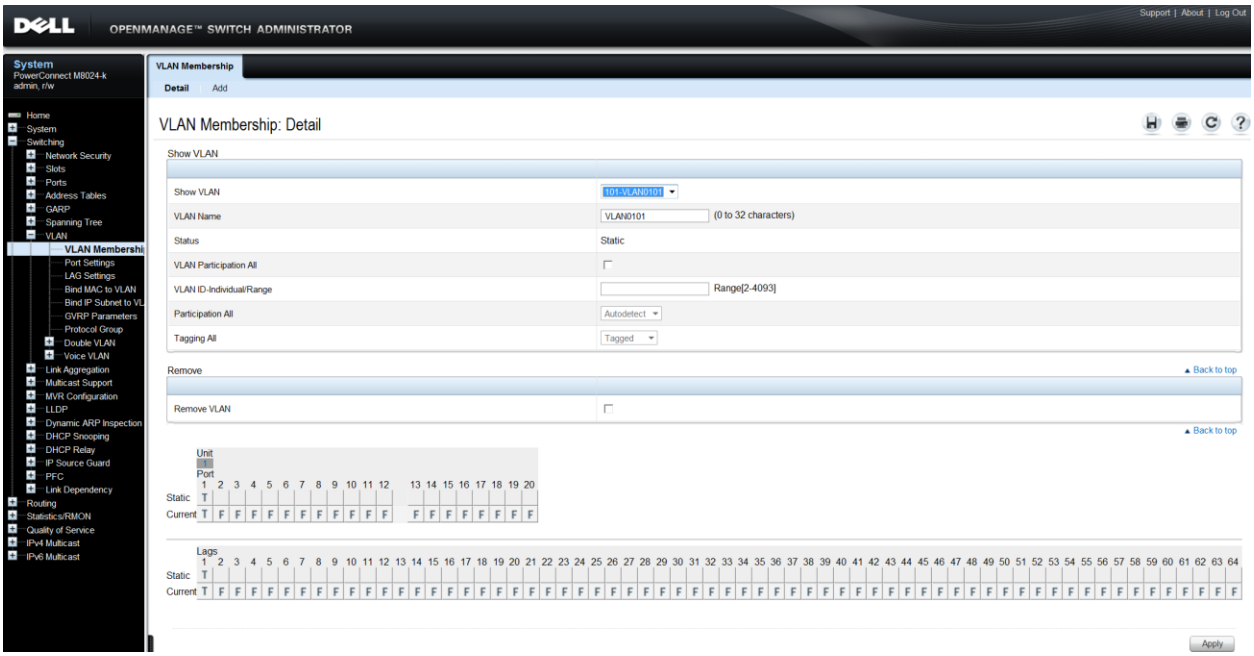


- Click **Apply**.

The next three screens add a LAG (i.e. LAG 1) and a port (i.e. Port 1) to multiple VLANs (VLAN 101, 102, and 103).

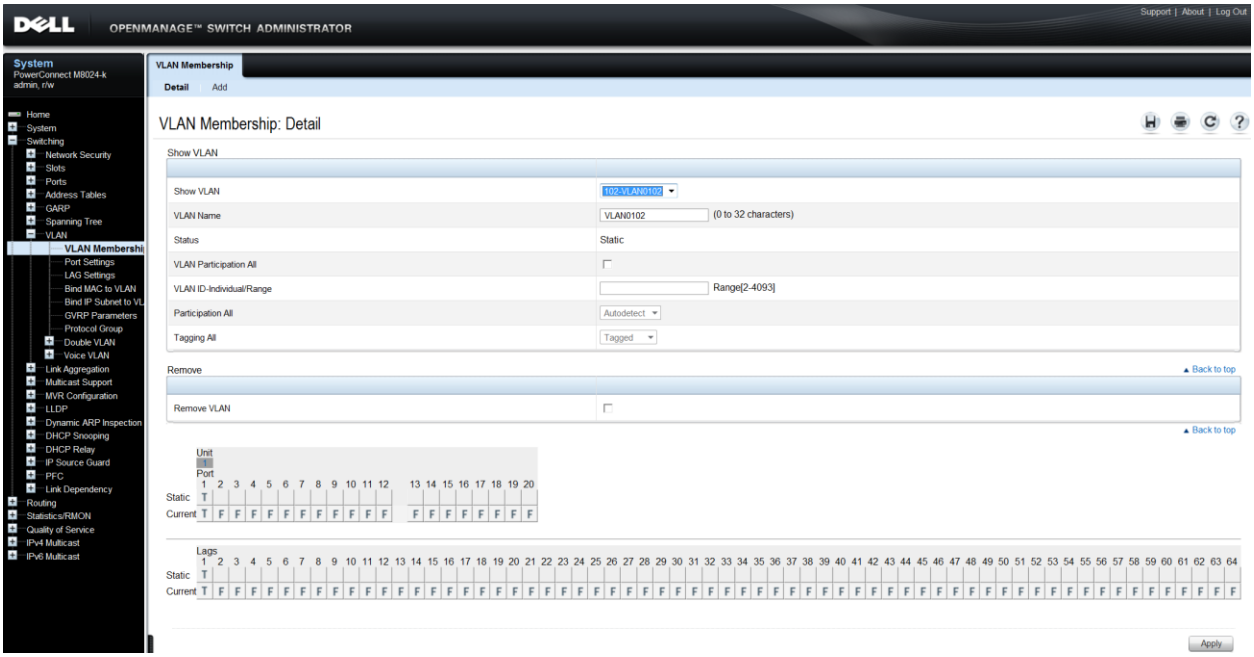
- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the first VLAN created above (i.e. VLAN101).
- At the bottom of the page under LAGs, click the blank box below the number 1 until a "T" is present. This will assign Port-channel 1 to the VLAN as tagged.
- Click the blank box below the number 1 under Port until a "T" is present. This will assign port #1 to the VLAN as tagged.

The rows labeled "Current" will continue to show F (forbidden) on the chosen ports until **Apply** is pressed.



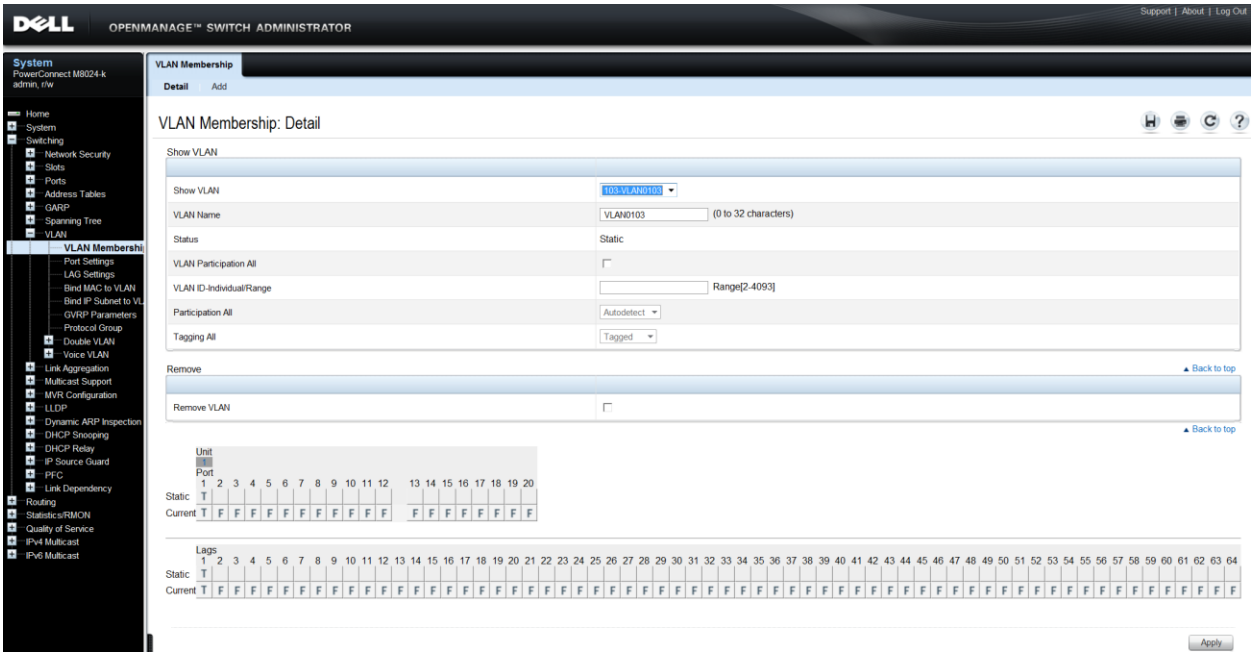
- Click **Apply**.

- In the **Show VLAN** pull-down menu, select the second VLAN previously created (i.e. VLAN102).
- At the bottom of the page under **LAGs**, click the blank box below the number 1 until a "T" is present. This will assign Port-channel 1 to the VLAN as tagged.
- Click the blank box below the number 1 under **Port** until a "T" is present. This will assign port #1 to the VLAN as tagged.



- Click **Apply**.

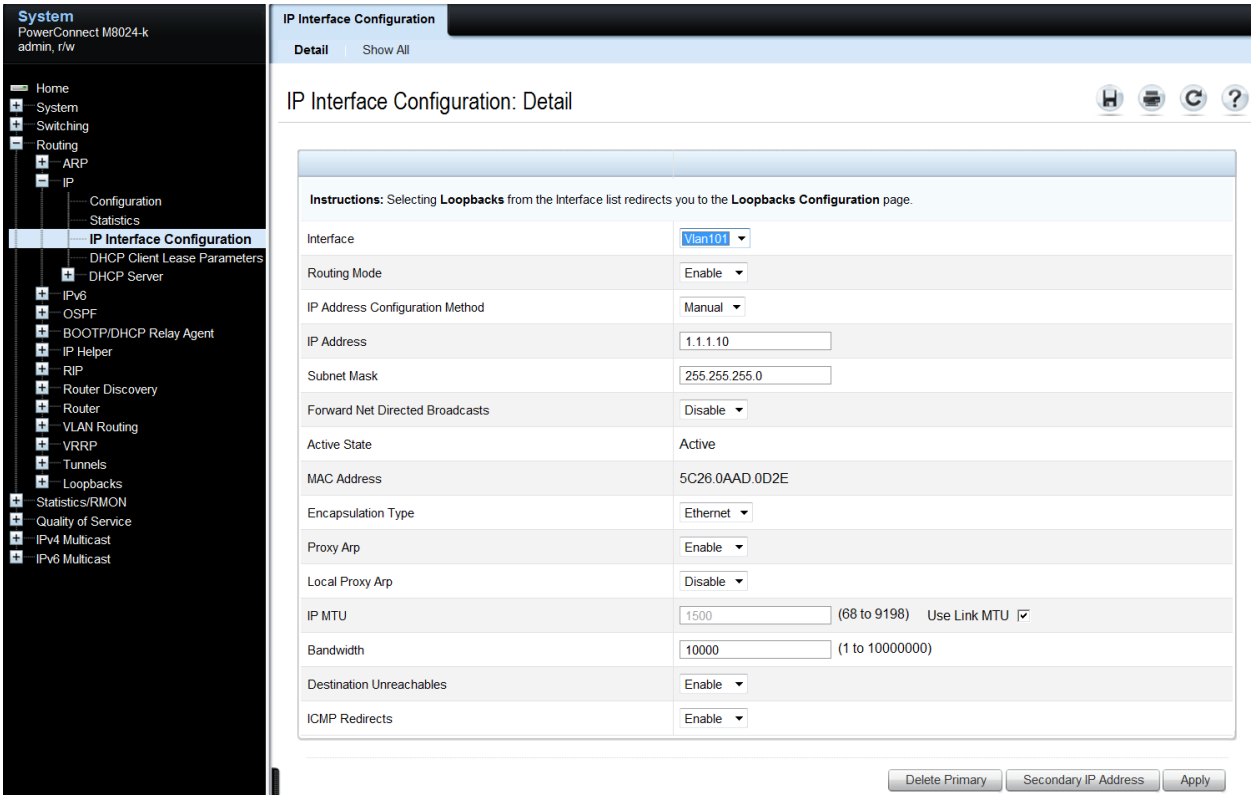
- In the **Show VLAN** pull-down menu, select the third VLAN previously created (i.e. VLAN103).
- At the bottom of the page under **LAGs**, click the blank box below the number 1 until a "T" is present. This will assign Port-channel 1 to the VLAN as tagged.
- Click the blank box below the number 1 under **Port** until a "T" is present. This will assign port #1 to the VLAN as tagged.



- Click **Apply**.

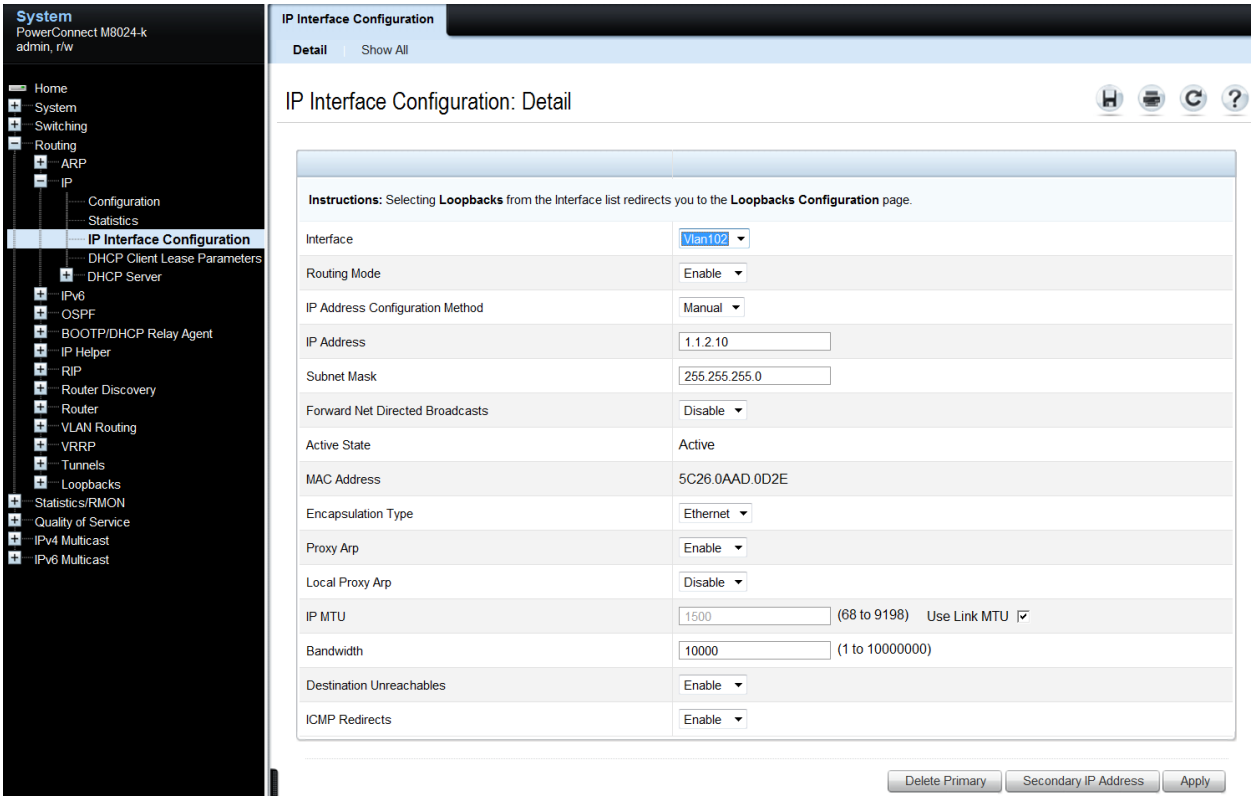
The next three screens add an IP address to each of the three VLANs (i.e. VLAN 101, 102, and 103), each in a different subnet.

- Select **Routing>IP>IP Interface Configuration**.
- Select the first VLAN (i.e. VLAN 101) using the Interface pull-down menu.
- Set **Routing Mode** to **Enable**.
- Set **IP address Configuration Method** to **Manual**.
- Provide the **IP Address** (i.e. 1.1.1.10) in the appropriate field.
- Set the appropriate **Subnet Mask** (i.e. 255.255.255.0)
- Set the **IP MTU** and **Bandwidth** parameters to appropriate sizes.



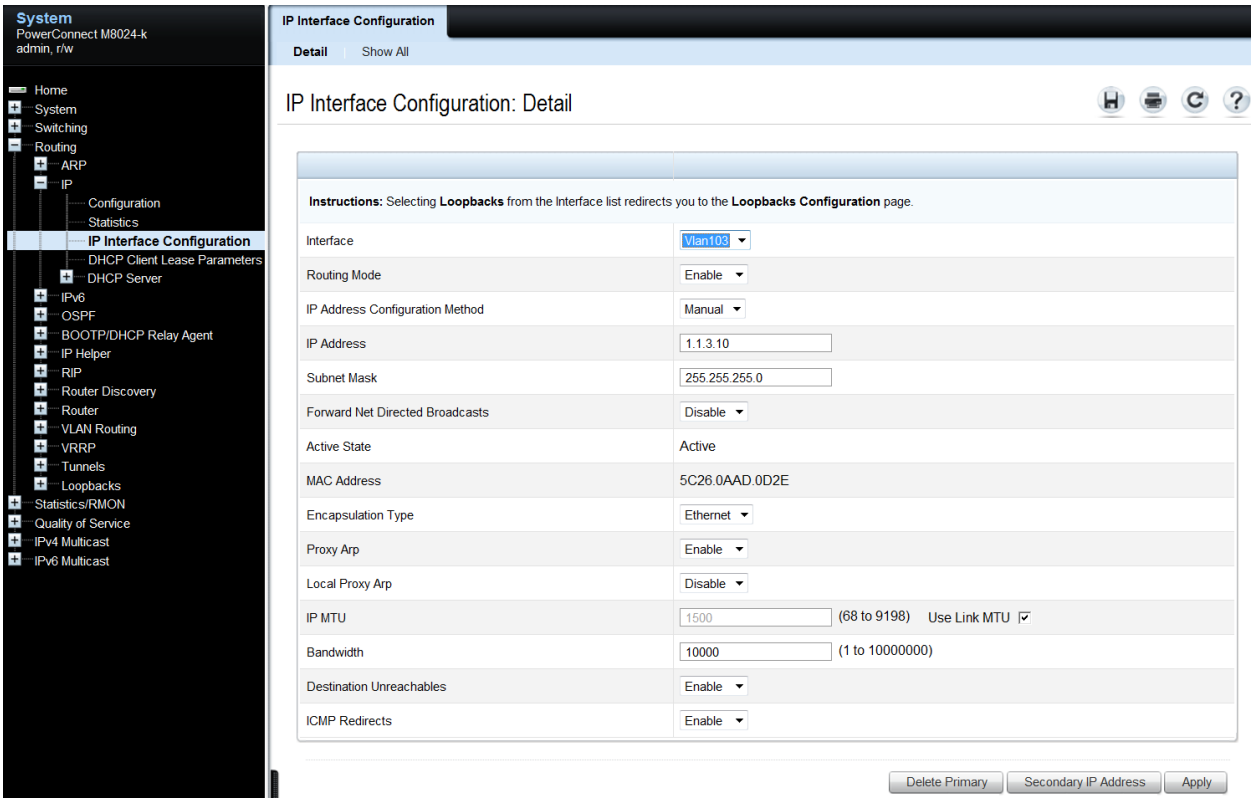
- Click **Apply**.

- Select the second VLAN (i.e. VLAN 102) using the Interface pull-down menu.
- Repeat the steps used above for VLAN 101 to set the parameters for VLAN 102. The screen below should reflect the settings. All parameters should be the same as before except for the Interface and IP Address fields.



- Click **Apply**.

- Select the third VLAN (i.e. VLAN 103) using the Interface pull-down menu.
- Repeat the steps used above for VLAN 102 to set the parameters for VLAN 103. The screen below should reflect the settings. All parameters should be the same as before except for the Interface and IP Address fields.



- Click **Apply**.

Configuring the Cisco 5020 Switch

Login to the Cisco Nexus 5020 and make the following changes using the CLI:

```
Nexus5020# configure
Enter configuration commands, one per line.  End with CNTL/Z.
Nexus5020(config)# feature lacp
Nexus5020(config)# vlan 101-103
Nexus5020(config-vlan)# exit
Nexus5020(config)# interface ethernet 1/1-4
Nexus5020(config-if-range)# channel-group 1 mode active
Nexus5020(config-if-range)# exit
Nexus5020(config)# interface port-channel 1
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# switchport trunk allowed vlan 101-103
Nexus5020(config-if)# exit
Nexus5020(config)# int vlan 101
```

```
Nexus5020(config-if)# ip add 1.1.1.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# int vlan 102
Nexus5020(config-if)# ip add 1.1.2.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# int vlan 103
Nexus5020(config-if)# ip add 1.1.3.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
```

Validation

An IP address was assigned to each VLAN interface on the PowerConnect switch as well as the Cisco switch. To validate each VLAN setup, attempt to ping each IP subnet between the two switches.

For example, pinging the IP address (i.e. 1.1.2.20 belonging to the Nexus) from the M8024-k should be successful and will validate your VLAN 102 setup.

Scenario 4: Configuring Multiple LAGs and Dedicating Specific Uplinks Using VLANs

This section will provide an overview of configuring multiple Link Aggregation Groups (LAGs) to group specific attached blade servers and dedicating specific Uplinks to carry that traffic to the Cisco Nexus switch network. For this scenario, the blade server in M1000e port 1 is configured to use LAG 1, while the blade server in port 2 is configured to use LAG 2.

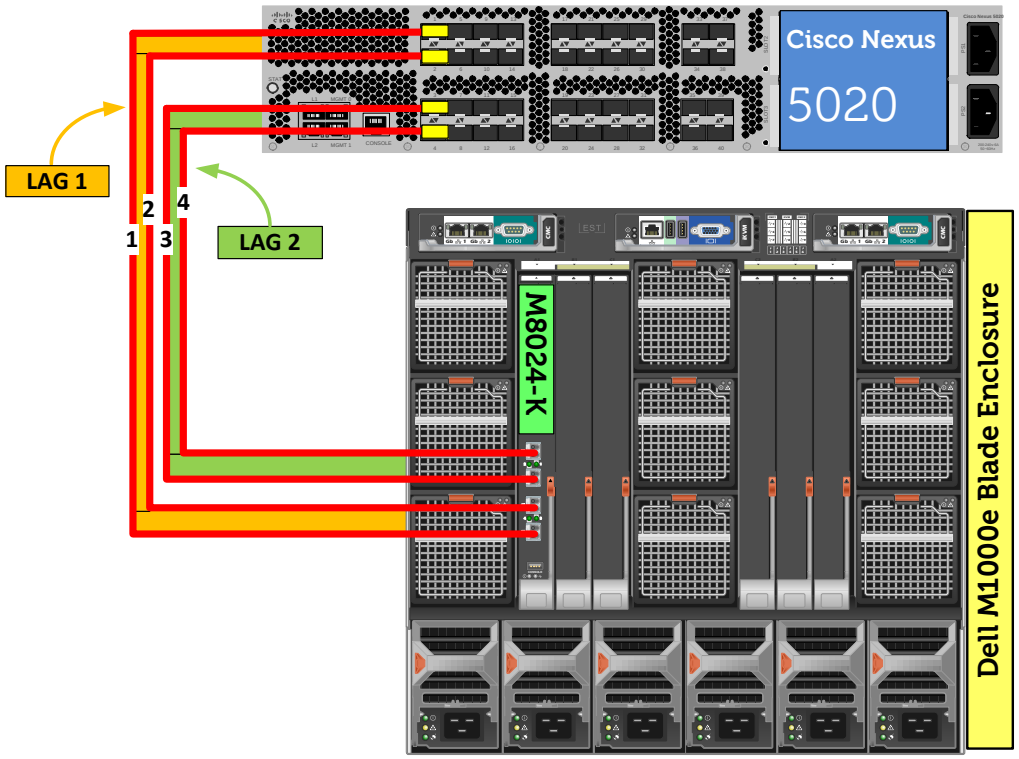


Figure 5. Graphic Representation of Scenario 4.

Configuring the Dell M8024-k Switch

Command-Line Interface Method:

```
console(config)#interface range Te1/0/17-18
console(config-if)#channel-group 1 mode active
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 101
console(config-vlan)#exit
```

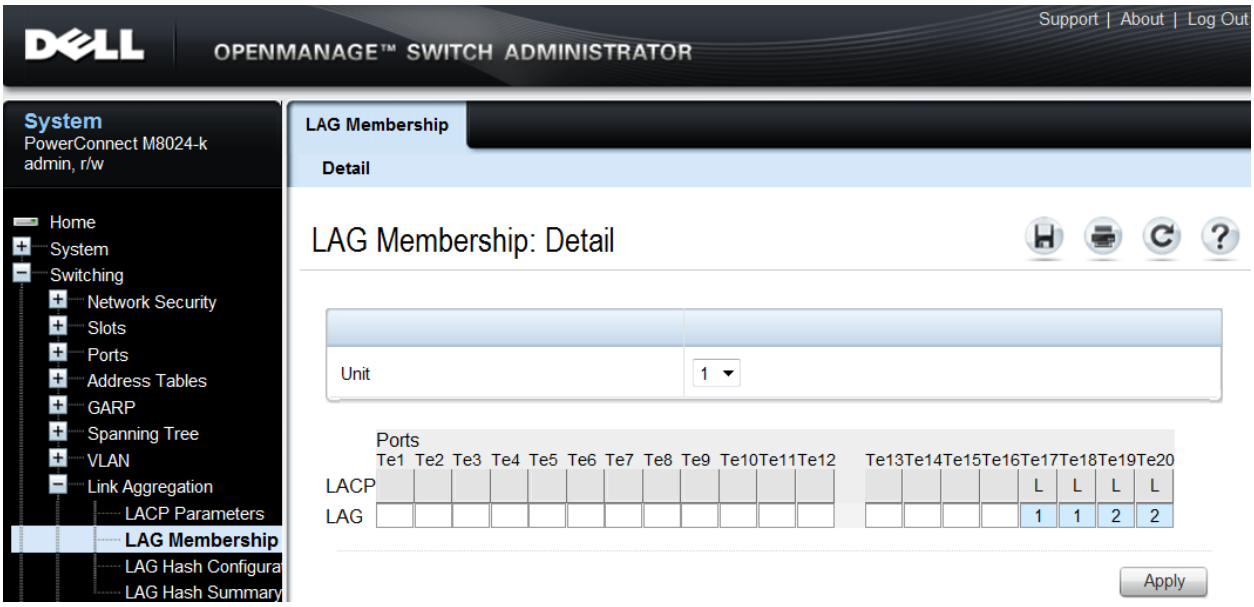
```
console(config)#interface port-channel 1
console(config-if-Po1)#switchport mode general
console(config-if-Po1)#switchport general allowed vlan add 101 tagged
console(config-if-Po1)#exit
console(config)#interface vlan 101
console(config-if-vlan101)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan101)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport access vlan 101
console(config-if-Te1/0/1)#exit
console(config)#interface range Te1/0/19-20
console(config-if)#channel-group 2 mode active
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 102
console(config-vlan)#exit
console(config)#interface port-channel 2
console(config-if-Po2)#switchport mode general
console(config-if-Po2)#switchport general allowed vlan add 102 tagged
console(config-if-Po2)#exit
console(config)#interface vlan 102
console(config-if-vlan102)#ip address 1.1.2.10 255.255.255.0
console(config-if-vlan102)#exit
console(config)#interface Te1/0/2
console(config-if-Te1/0/2)#switchport access vlan 102
console(config-if-Te1/0/2)#exit
console(config)#exit
```

Web Interface Method:

The following steps will create two LAG (link aggregation groups).

- Select **Switching > Link Aggregation > LAG Membership**
- Enter a LAG number (i.e. 1) in the LAG row for Te17 and Te18.
- Enter a second LAG number (i.e. 2) in the LAG row for Te19 and Te20.

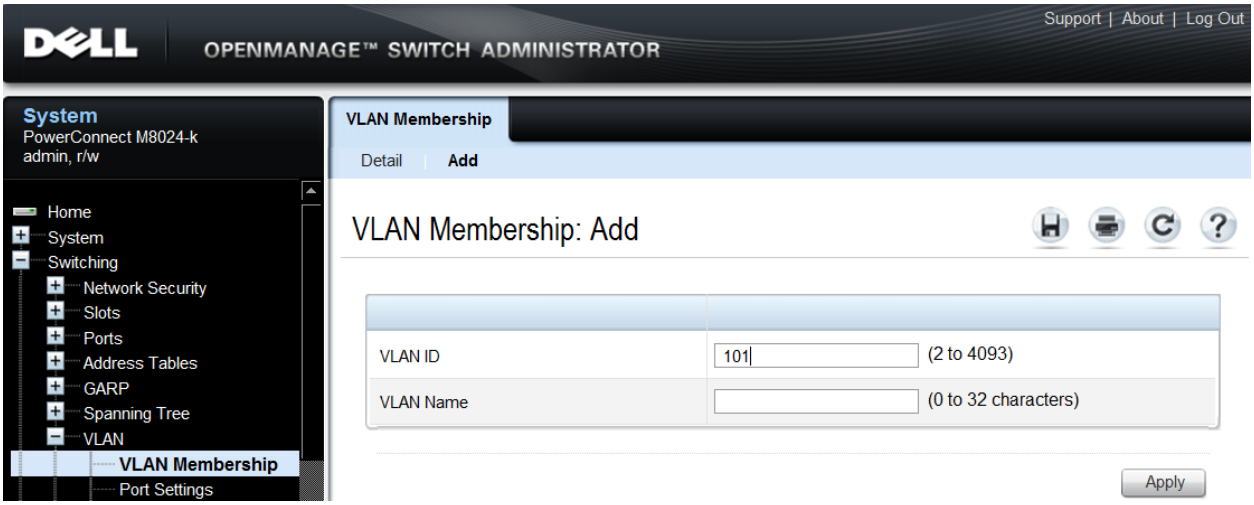
- Click one of the boxes above each LAG number that you just entered until it shows the letter L over all numbers. This will set LACP and create dynamic LAGs on these ports.



- Click Apply.

The next two screens show how to create two VLANs (i.e. VLAN 101 and 102).

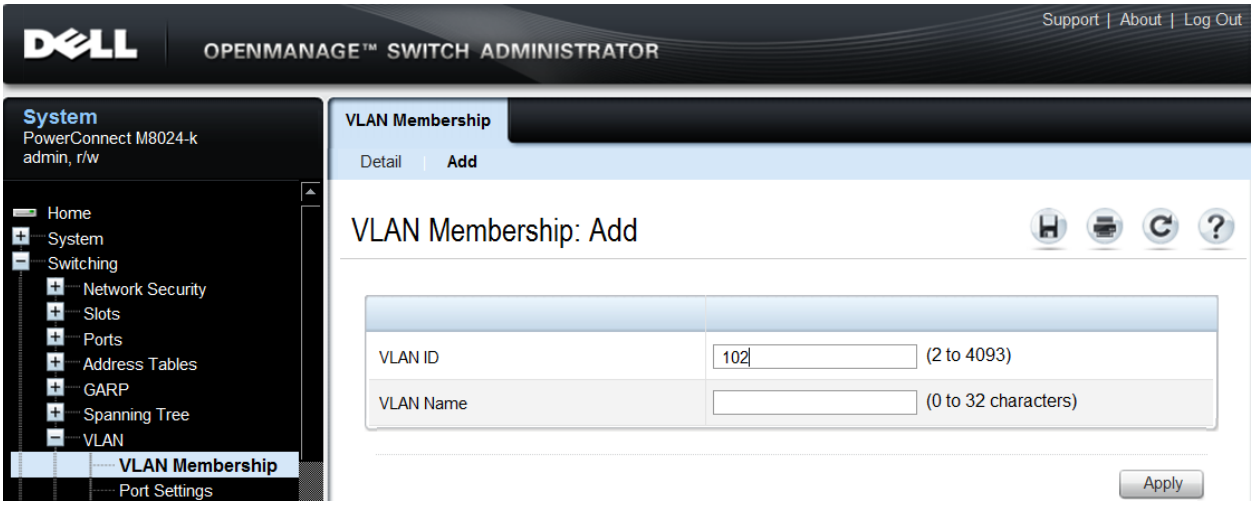
- Select **Switching > VLAN > VLAN Membership > Add**.
- Enter the VLAN ID (i.e. 101) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.



- Click **Apply**.

- Enter the next VLAN ID (i.e. 102) in the **VLAN ID** field.

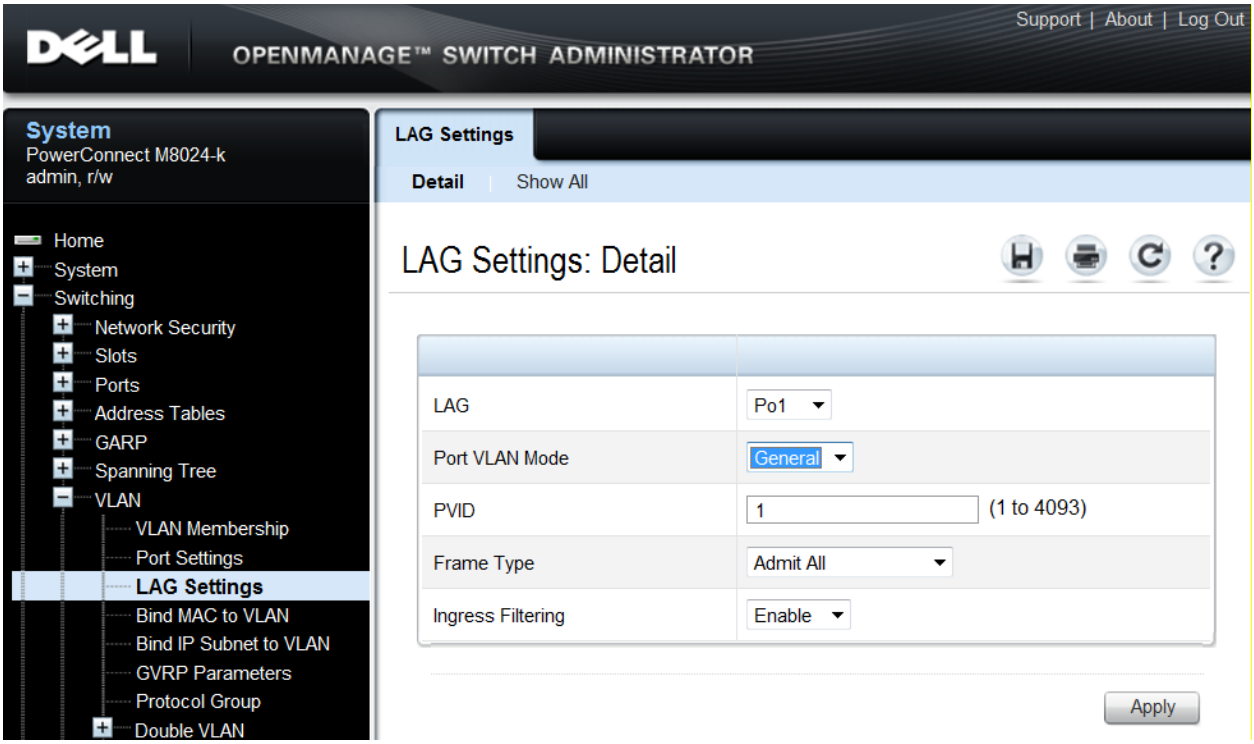
- Optionally, enter a VLAN Name in the **VLAN Name** field.



- Click **Apply**.

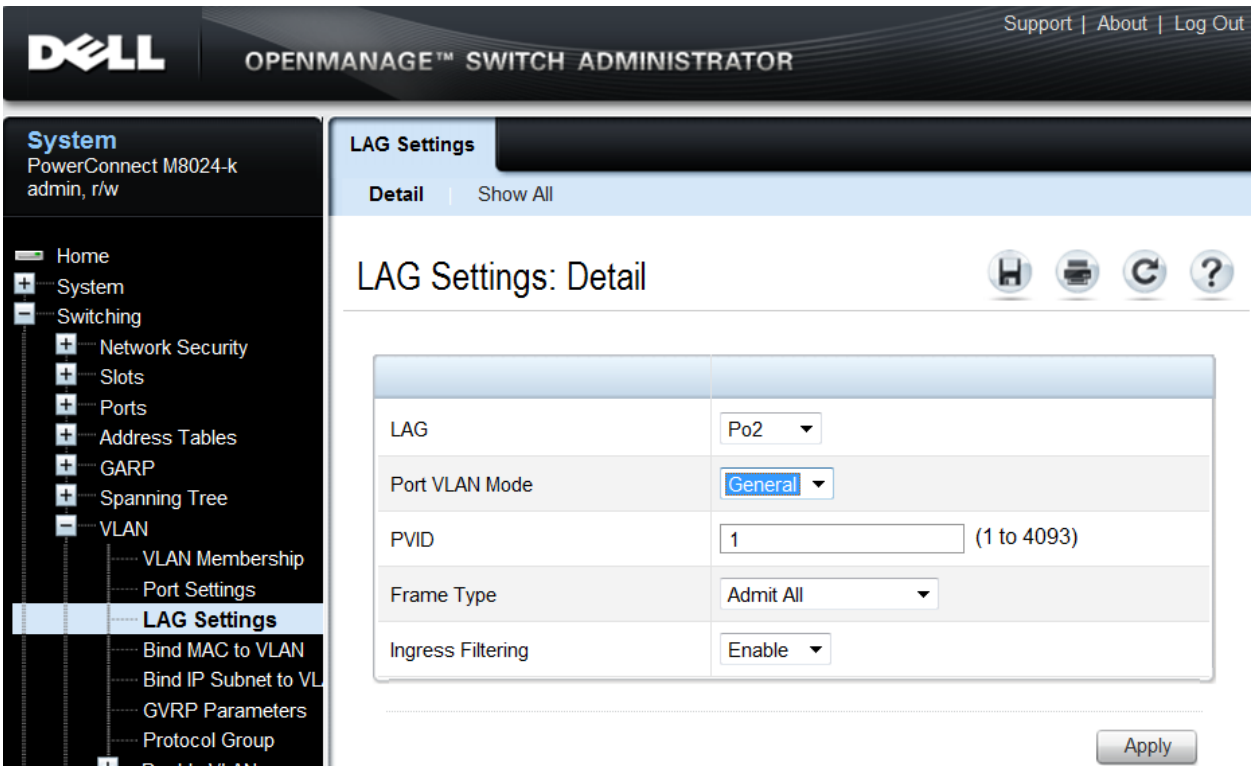
The next two screens show how to set the LAGs (i.e. 1 and 2) to General mode.

- Select **Switching > VLAN > LAG Settings**.
- Select the first LAG (i.e. Po1) from the **LAG** menu.
- Set the **Port VLAN Mode** to **General**.
- Select **Frame Type** (i.e. Admit All) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.

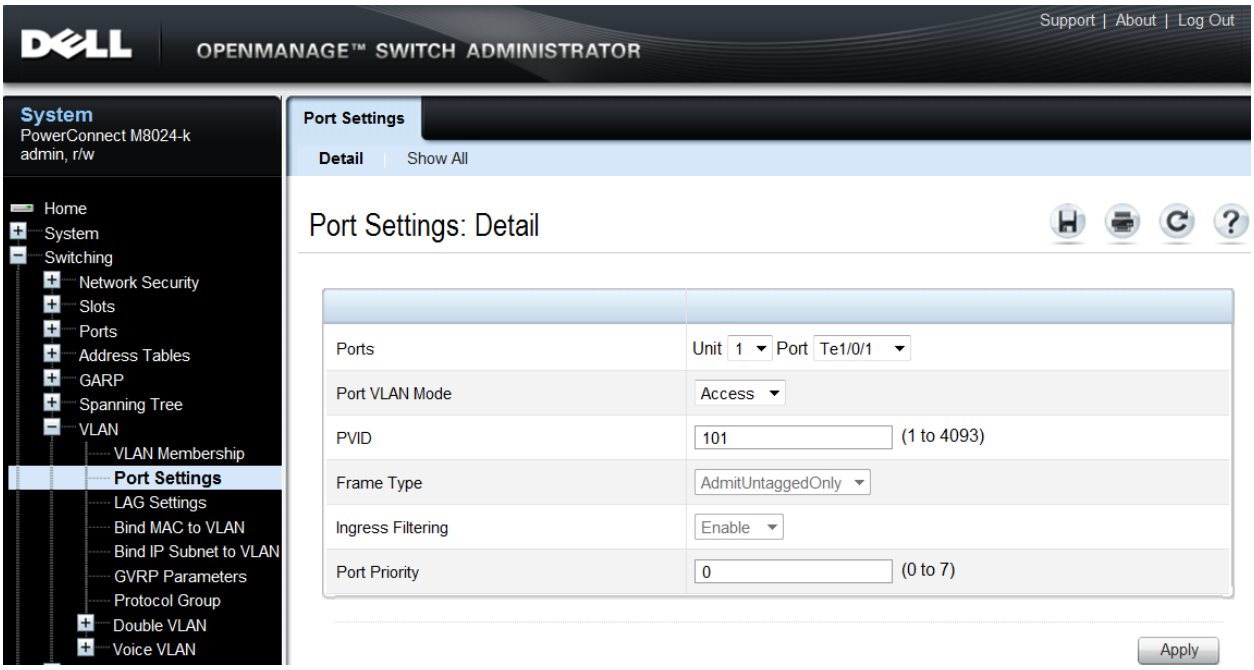
- Select the next LAG (i.e. Po2) from the **LAG** menu.
- Set the **Port VLAN Mode** to **General**.
- Select **Frame Type** (i.e. Admit All) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.

The next steps show how to set the PVID of the first internal port (i.e. Te1/0/1) going to the blade server in slot 1, which will allow all untagged packets on this Access port to use the VLAN (i.e. VLAN 101).

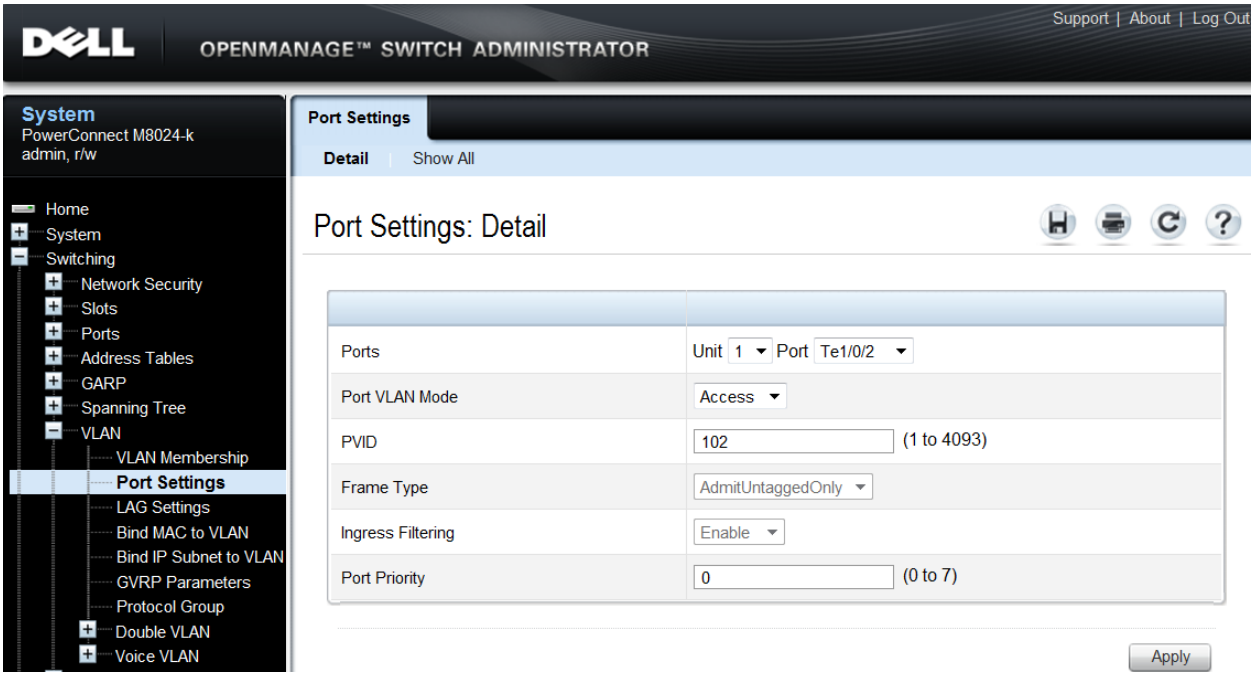
- Select **Switching > VLAN > Port Settings**.
- Select the port (i.e. Te1/0/1) from the **Ports** menu.
- Set the **Port VLAN Mode** to **Access**.
- Set the **PVID** to the desired VLAN (i.e. 101).



- Click **Apply**.

The next steps show how to set the PVID of the second internal port (i.e. Te1/0/2) going to the blade server in slot 2, which will allow all untagged packets on this Access port to use the VLAN (i.e. VLAN 102).

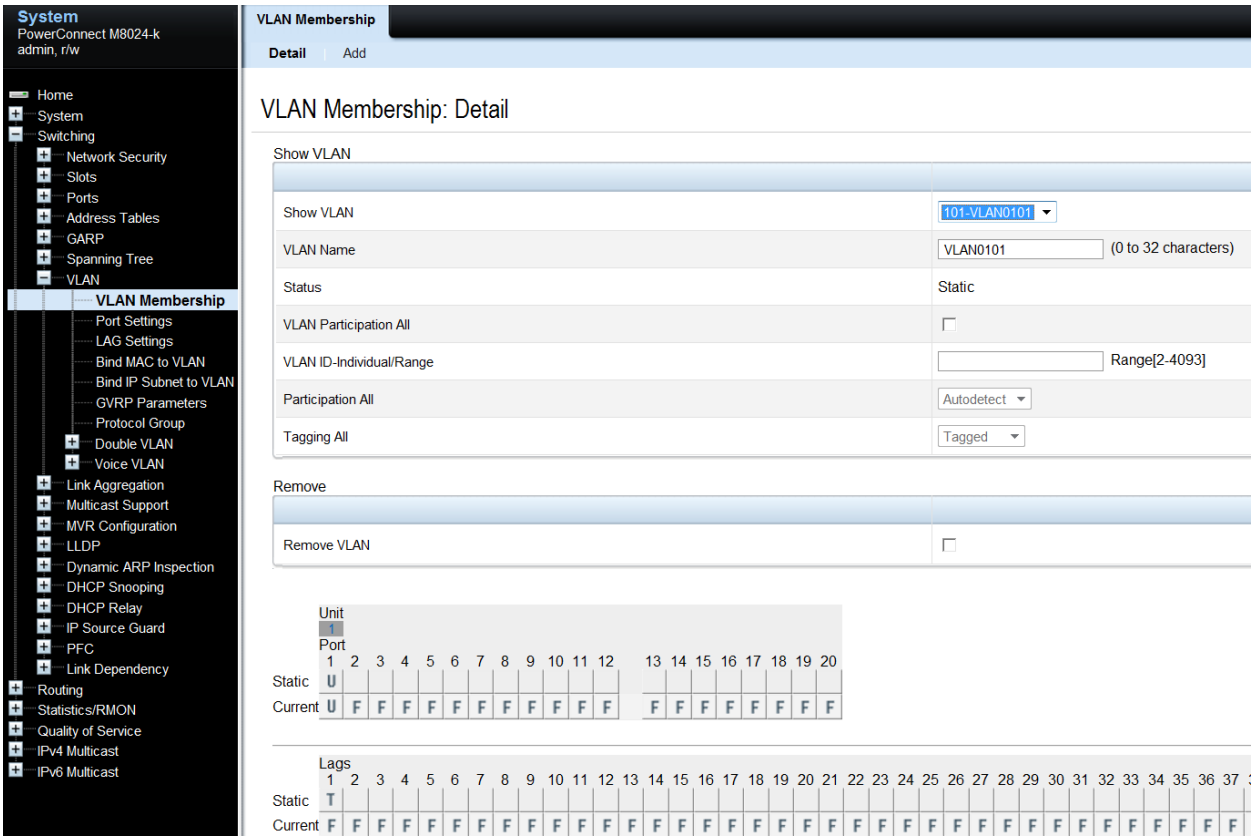
- Select **Switching > VLAN > Port Settings**.
- Select the port (i.e. Te1/0/2) from the **Ports** menu.
- Set the **Port VLAN Mode** to **Access**.
- Set the **PVID** to the desired VLAN (i.e. 102).



- Click **Apply**.

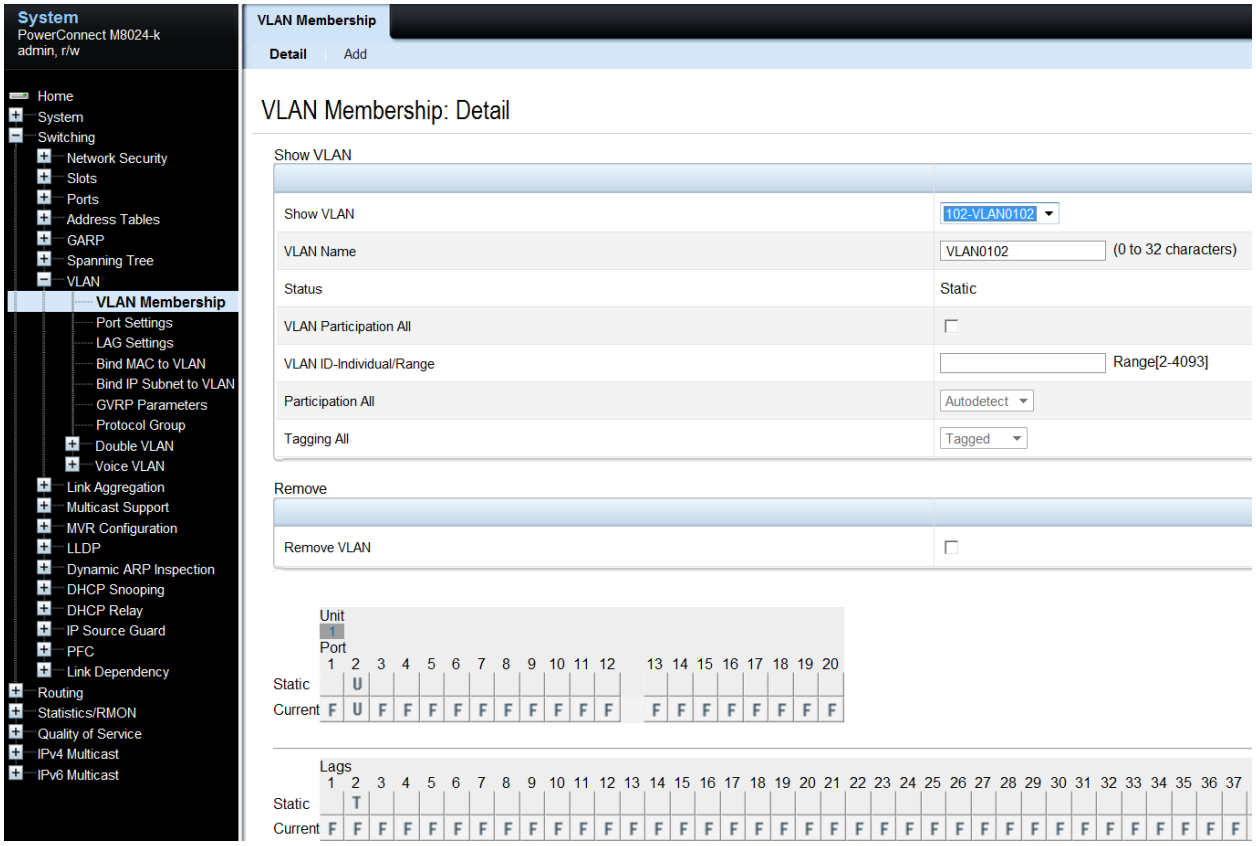
The next two screens add LAGs and ports to each of the VLANs (i.e. VLAN 101 and 102). The first steps describe assigning LAG 1 and port Te1/0/1 to VLAN 101.

- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the first VLAN created above (i.e. VLAN 101).
- At the bottom of the page under LAGs, click the blank box below the number 1 until a "T" is present. This will assign Port-channel 1 to the VLAN as tagged.
- Under **Port**, click the box below the number 1 until a "U" is present. This will assign port Te1/0/1 to the VLAN as untagged.



- Click **Apply**.

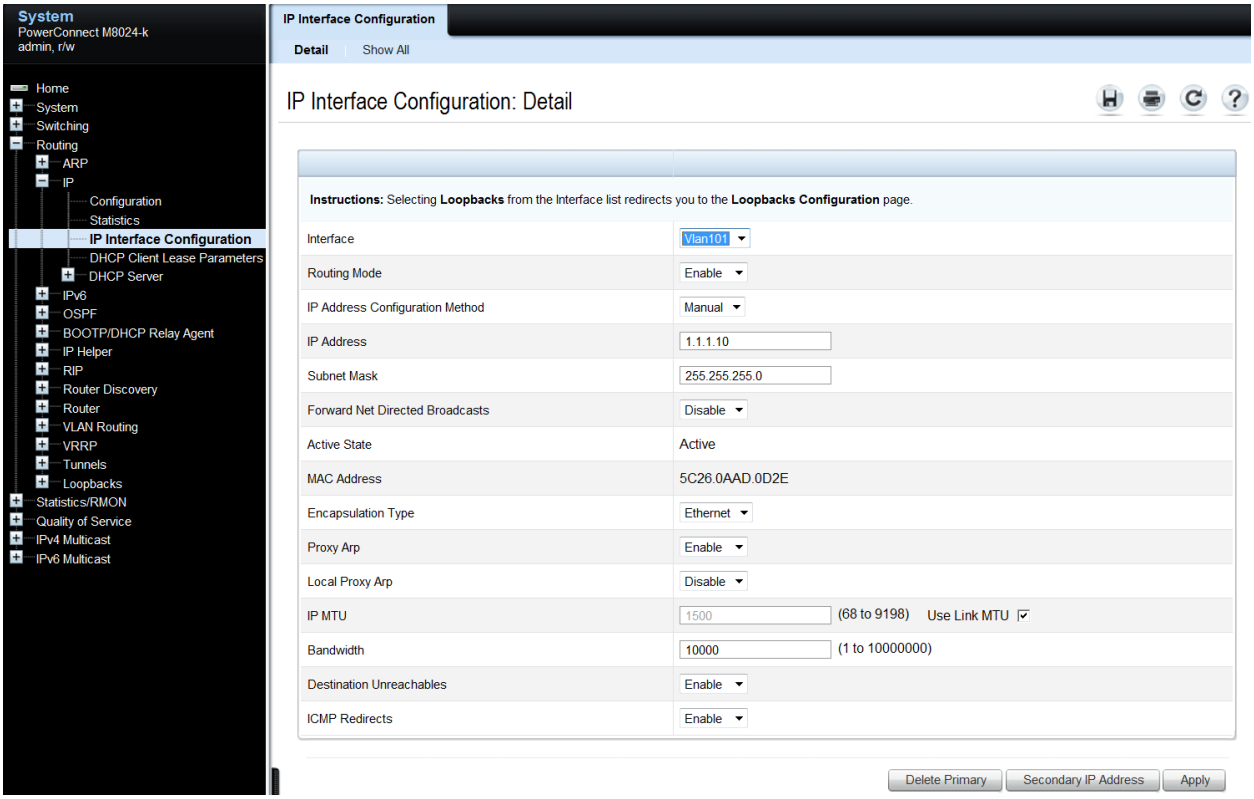
- In the **Show VLAN** pull-down menu, select the second VLAN previously created (i.e. VLAN 102).
- At the bottom of the page under LAGs, click the blank box below the number 2 until a "T" is present. This will assign Port-channel 2 to the VLAN as tagged.
- Under **Port**, click the box below the number 2 until a "U" is present. This will assign port Te1/0/2 to the VLAN as untagged



- Click **Apply**.

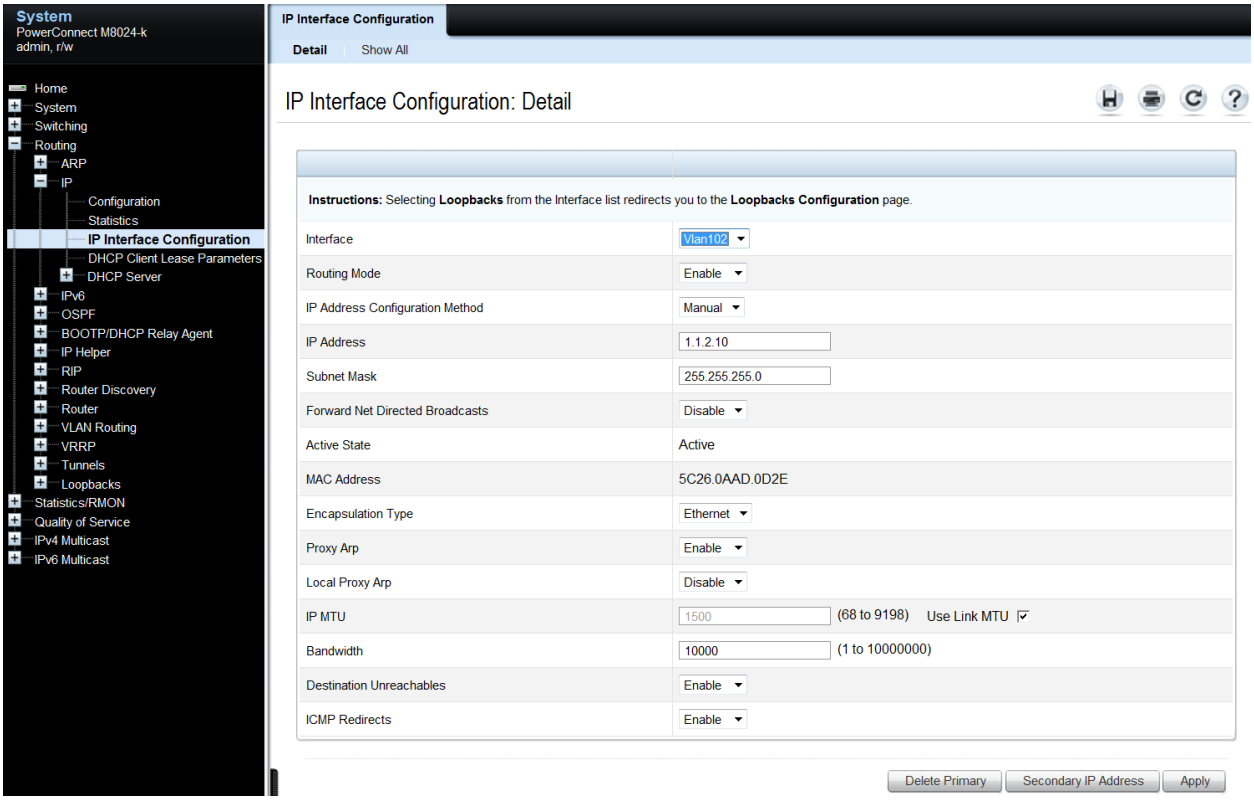
The next two screens add an IP address to each VLANs (i.e. VLAN 101 and 102), each in a different subnet.

- Select **Routing > IP > IP Interface Configuration**.
- Select the first VLAN (i.e. VLAN 101) using the **Interface** pull-down menu.
- Set **Routing Mode** to **Enable**.
- Set **IP Address Configuration Method** to **Manual**.
- Provide the IP Address (i.e. 1.1.1.10) in the appropriate field.
- Set the appropriate **Subnet Mask** (i.e. 255.255.255.0)
- Set the **IP MTU** and **Bandwidth** parameters to appropriate sizes. The most common values for these fields are 1500 and 10000, respectively.



- Click **Apply**.

- Select the second VLAN (i.e. VLAN 102) using the **Interface** pull-down menu.
- Repeat the steps used above for VLAN 101 to set the parameters for VLAN 102. The screen below should reflect the settings. All parameters should be the same as before except for the **Interface** and **IP Address** fields.



- Click **Apply**.

Configuring the Cisco 5020 Switch

Login to the Nexus 5020 and enter the following commands. In this example we are adding ports 1-2 to port-channel 1 and ports 3-4 to port-channel 2.

```
Nexus5020# configure
Enter configuration commands, one per line.  End with CNTL/Z.
Nexus5020(config)# feature lacp
Nexus5020(config)# interface ethernet 1/1-2
Nexus5020(config-if-range)# channel-group 1 mode active
Nexus5020(config-if-range)# interface ethernet 1/3-4
Nexus5020(config-if-range)# channel-group 2 mode active
Nexus5020(config-if-range)# exit
Nexus5020(config)# vlan 101-102
Nexus5020(config-vlan)# exit
Nexus5020(config)# int vlan 101
Nexus5020(config-if)# ip add 1.1.1.20/24
Nexus5020(config-if)# no shut
```

```
Nexus5020(config-if)# exit
Nexus5020(config)# int vlan 102
Nexus5020(config-if)# ip add 1.1.2.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface port-channel1
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# switchport trunk allowed vlan 101
Nexus5020(config-if)# exit
Nexus5020(config)# interface port-channel2
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# switchport trunk allowed vlan 102
Nexus5020(config-if)# end
```

Validation

An IP address was assigned to each VLAN interface on the PowerConnect switch as well as the Cisco switch. To validate each VLAN setup, attempt to ping each IP subnet between the two switches.

For example, pinging the IP address (i.e. 1.1.2.20 belonging to the Nexus) from the M8024-k should be successful and will validate the VLAN 102 setup.

It is also possible to validate the entire path from the Cisco Nexus to the blade server, going through the PowerConnect M8024-k switch. In the example above the following lines were added to the M8024-k that put blade server traffic on slot 1 onto VLAN 101.

```
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport access vlan 101
```

By now adding an IP address to the server NIC (i.e. 1.1.1.5), it is possible to ping the server from the M8024-k as well as from the Cisco Nexus.

Scenario 5: Configuring Multiple VLANs on Multiple LAGs

This scenario will demonstrate an overview of adding VLANs in a multi-LAG configuration, which combine the advantages of virtual network administration with physical network separation.

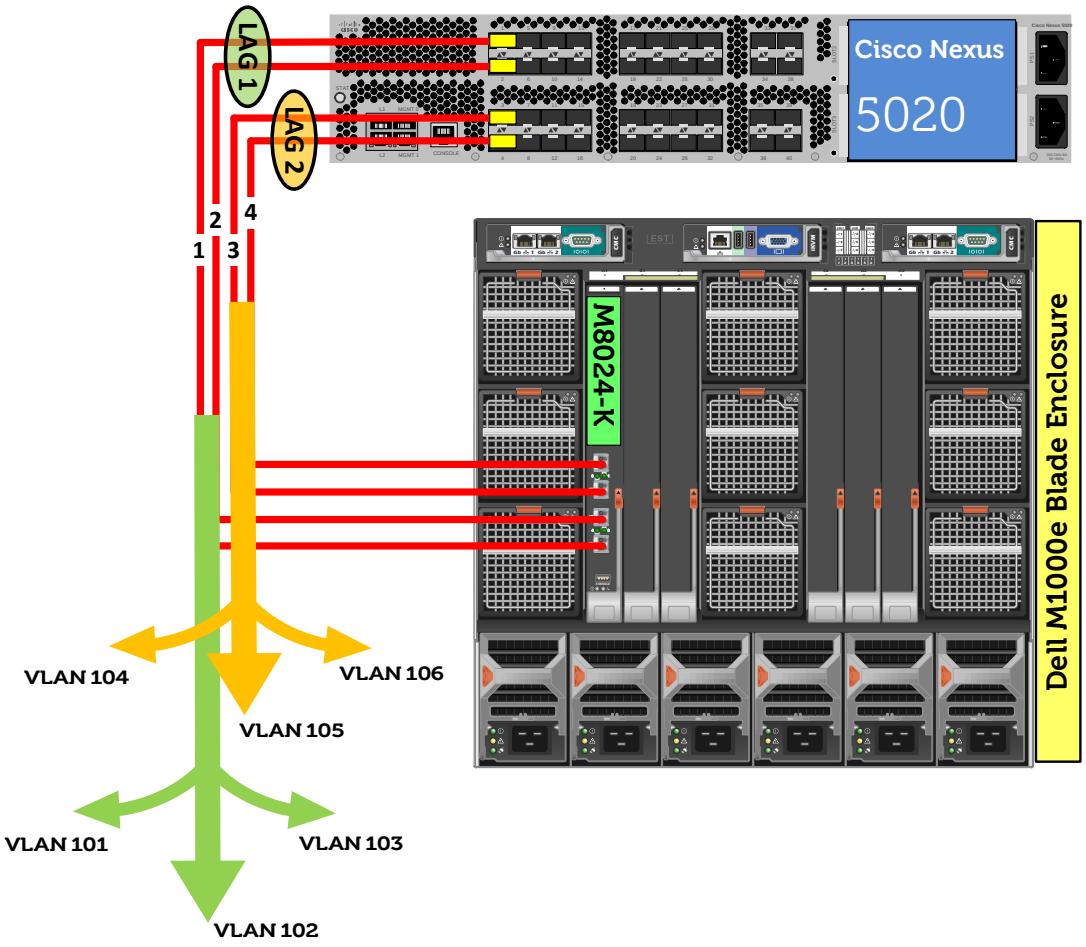


Figure 6. Graphic Representation of Scenario 5.

Configuring the Dell M8024-k Switch

Command-Line Interface Method:

This first set of commands will create the first LAG (i.e. 1) and assign three VLANs (i.e. 101-103) to the LAG and the first port (i.e. Te1/0/1, which is attached to the blade server in slot 1).

```
console(config)#interface range Te1/0/17-18
console(config-if)#channel-group 1 mode active
console(config-if)#exit
console(config)#vlan database
```

```
console(config-vlan)#vlan 101-103
console(config-vlan)#exit
console(config)#interface port-channel 1
console(config-if-Po1)#switchport mode general
console(config-if-Po1)#switchport general allowed vlan add 101-103 tagged
console(config-if-Po1)#exit
console(config)#interface vlan 101
console(config-if-vlan101)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan101)#exit
console(config)#interface vlan 102
console(config-if-vlan102)#ip address 1.1.2.10 255.255.255.0
console(config-if-vlan102)#exit
console(config)#interface vlan 103
console(config-if-vlan103)#ip address 1.1.3.10 255.255.255.0
console(config-if-vlan103)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport general allowed vlan add 101-103 tagged
console(config-if-Te1/0/1)#exit
```

This second set of commands will create the second LAG (i.e. 2) and assign three VLANs (i.e. 104-106) to the LAG and the second port (i.e. Te1/0/2, which is attached to the blade server in slot 2).

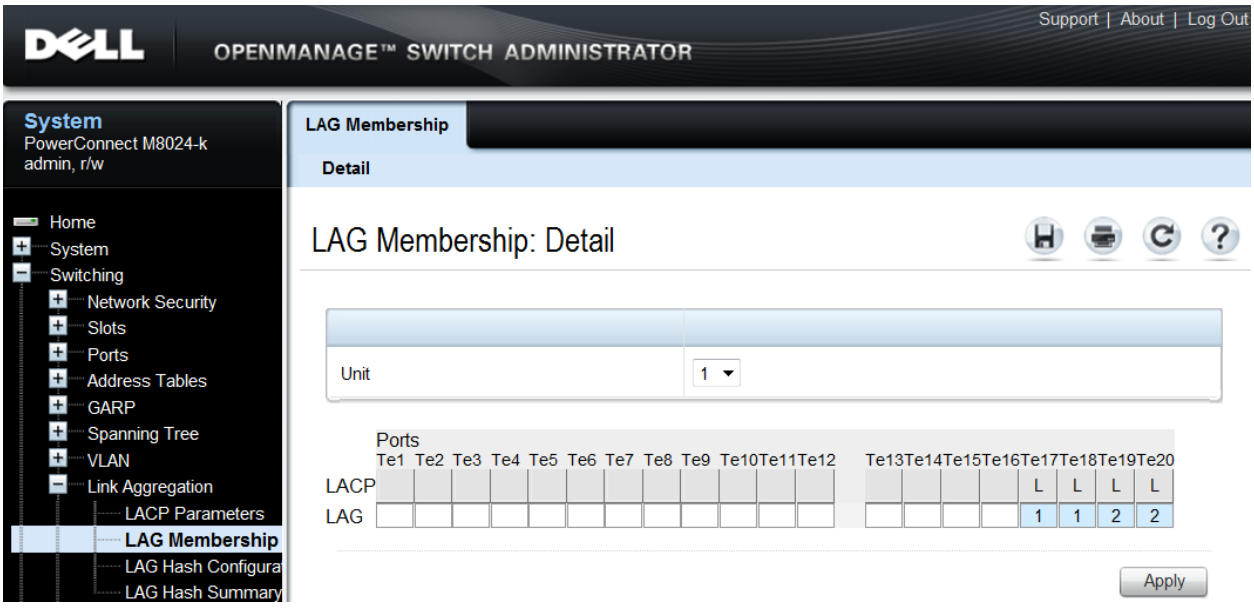
```
console(config)#interface range Te1/0/19-20
console(config-if)#channel-group 2 mode active
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 104-106
console(config-vlan)#exit
console(config)#interface port-channel 2
console(config-if-Po2)#switchport mode general
console(config-if-Po2)#switchport general allowed vlan add 104-106 tagged
console(config-if-Po2)#exit
console(config)#interface vlan 104
console(config-if-vlan104)#ip address 1.1.4.10 255.255.255.0
console(config-if-vlan104)#exit
```

```
console(config)#interface vlan 105
console(config-if-vlan105)#ip address 1.1.5.10 255.255.255.0
console(config-if-vlan105)#exit
console(config)#interface vlan 106
console(config-if-vlan106)#ip address 1.1.6.10 255.255.255.0
console(config-if-vlan106)#exit
console(config)#interface Te1/0/2
console(config-if-Te1/0/2)#switchport general allowed vlan add 104-106 tagged
console(config-if-Te1/0/2)#exit
console(config)#exit
```

Web Interface Method:

First, create two LAGs (link aggregation groups) using these steps.

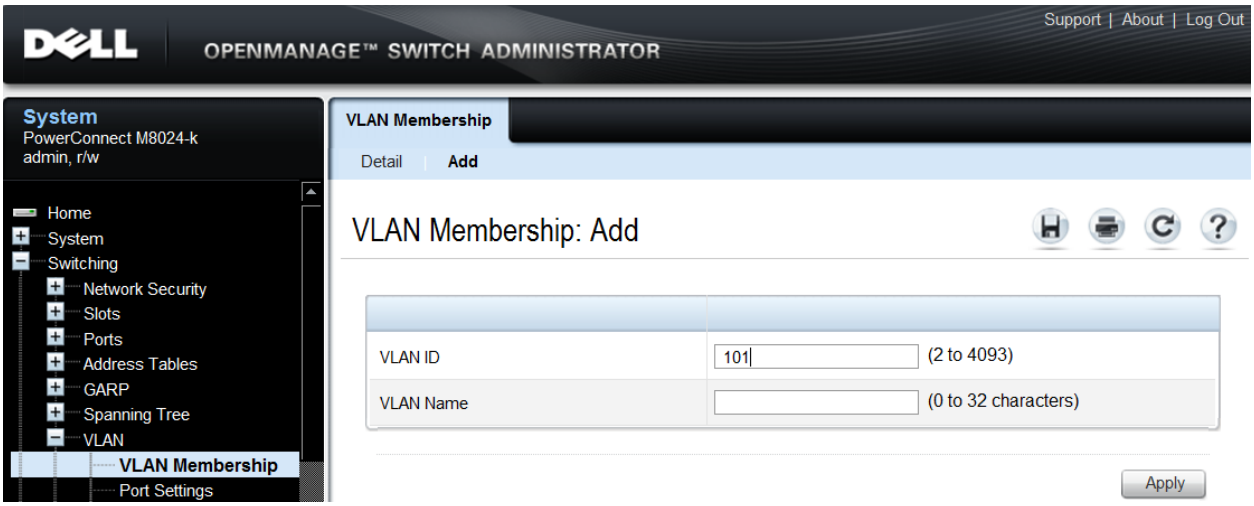
- Select **Switching > Link Aggregation > LAG Membership**
- Enter a LAG number (i.e. 1) in the LAG row for Te17 and Te18.
- Enter a second LAG number (i.e. 2) in the LAG row for Te19 and Te20.
- Click one of the boxes above each LAG number that you just entered until it shows the letter L over all numbers. This will set LACP and create dynamic LAGs on these ports.



- Click **Apply**.

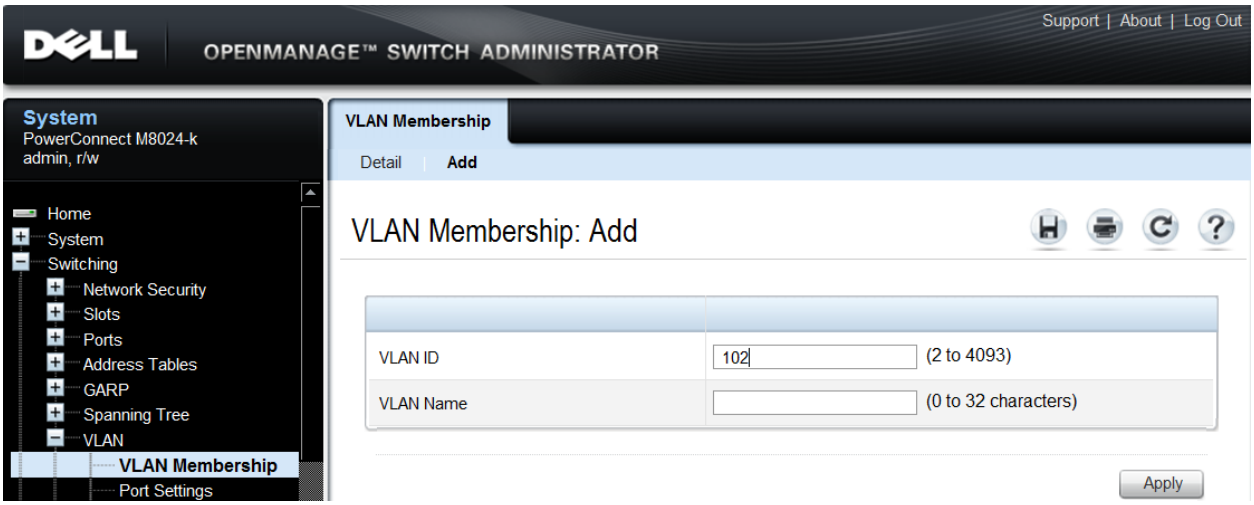
The following steps show how to create six VLANs (i.e. VLANs 101 - 106), the first three to be assigned to LAG 1 and the second three to be assigned to LAG 2.

- Select **Switching > VLAN > VLAN Membership > Add**.
- Enter the first VLAN ID (i.e. 101) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.



- Click **Apply**.

- Enter the next VLAN ID (i.e. 102) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.



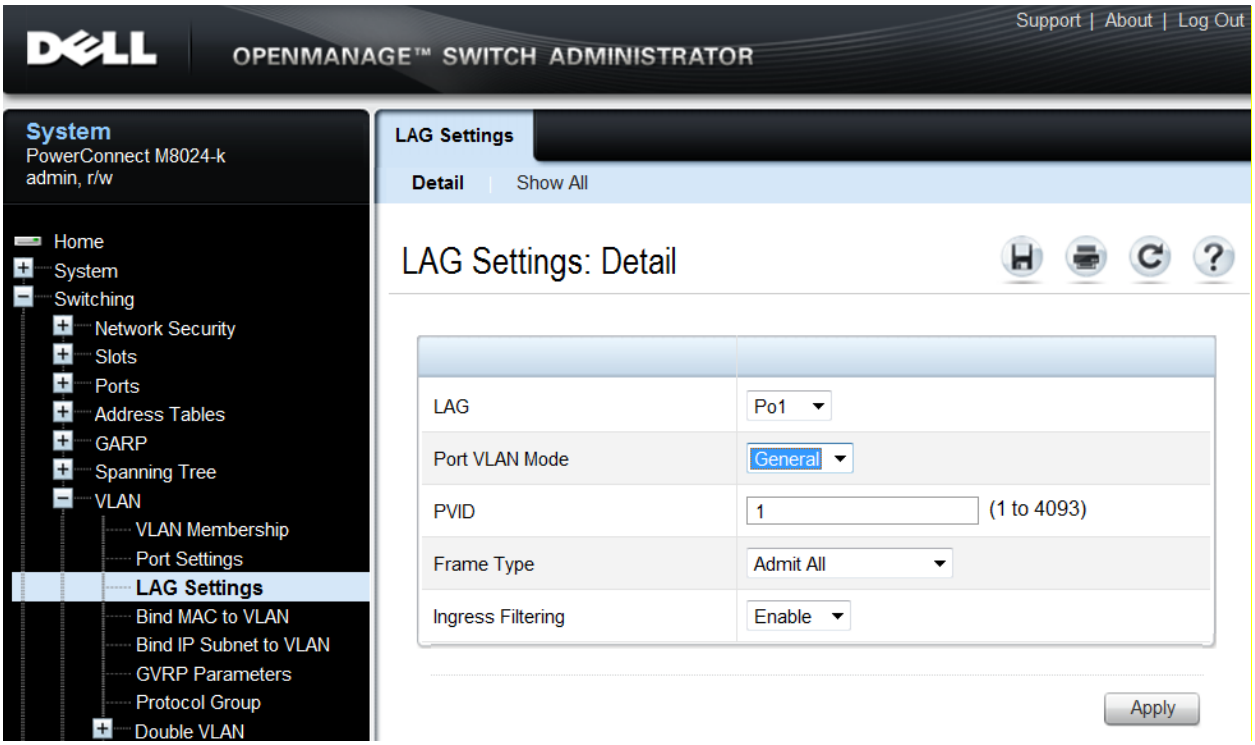
- Click **Apply**.

- Continue entering each subsequent VLAN ID (i.e. 103 through 106) in the **VLAN ID** field, clicking **Apply** after each entry.

NOTE: Version 4.2 firmware provides the ability to create multiple VLANs with one command when the VLANs are in a range (i.e. 101-106). To specify a range, simply separate the first and last VLANs with a hyphen (-).

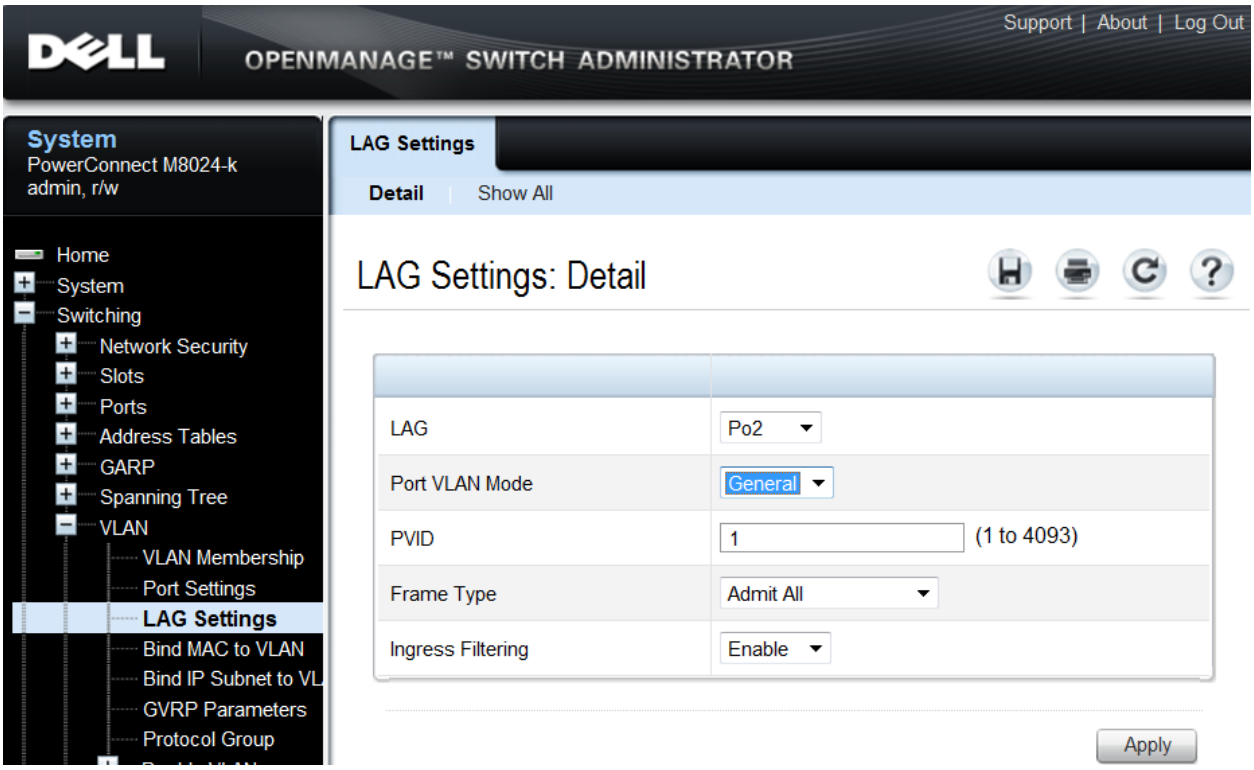
The next two screens show how to set the LAGs (i.e. 1 and 2) to General mode.

- Select **Switching > VLAN > LAG Settings**.
- Select the first LAG (i.e. Po1) from the LAG menu.
- Set the **Port VLAN Mode** to **General**.
- Select **Frame Type** (i.e. **Admit All**) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.

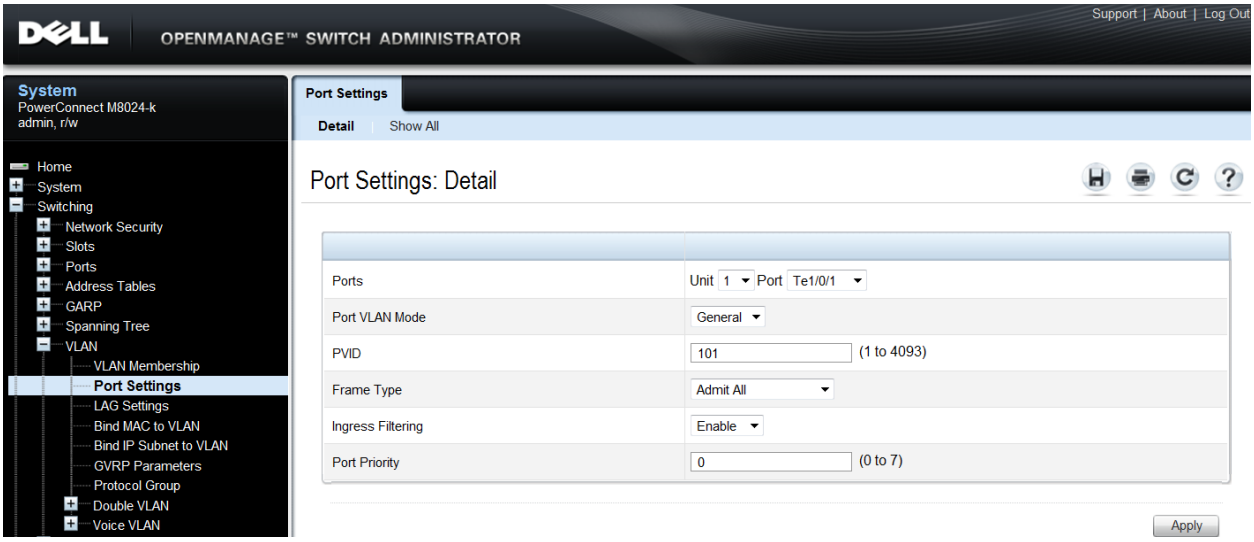
- Select the next LAG (i.e. Po2) from the LAG menu.
- Set the **Port VLAN Mode** to **General**.
- Select **Frame Type** (i.e. **Admit All**) from the menu.
- Enable **Ingress Filtering**.



- Click **Apply**.

The next steps show how to set the VLAN Mode and PVID of the first internal port (i.e. Te1/0/1) going to the blade server in slot 1, which will allow all untagged packets on this General port to use the desired VLAN (i.e. VLAN 101).

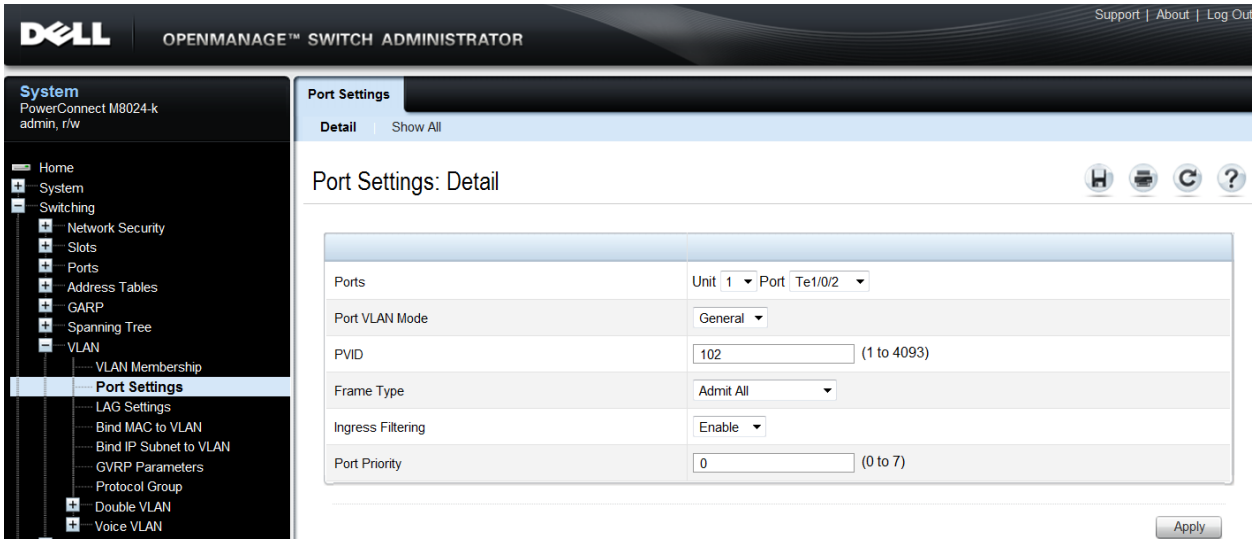
- Select **Switching > VLAN > Port Settings**.
- Select the port (i.e. Te1/0/1) from the **Ports** menu.
- Set the **Port VLAN Mode** to **General**.
- Set the PVID to the desired VLAN (i.e. 101).
- Set the **Frame Type** to **Admit All**.



- Click **Apply**.

The next steps show how to set the VLAN Mode and PVID of the second internal port (i.e. Te1/0/2) going to the blade server in slot 2, which will allow all untagged packets on this General port to use the desired VLAN (i.e. VLAN 102).

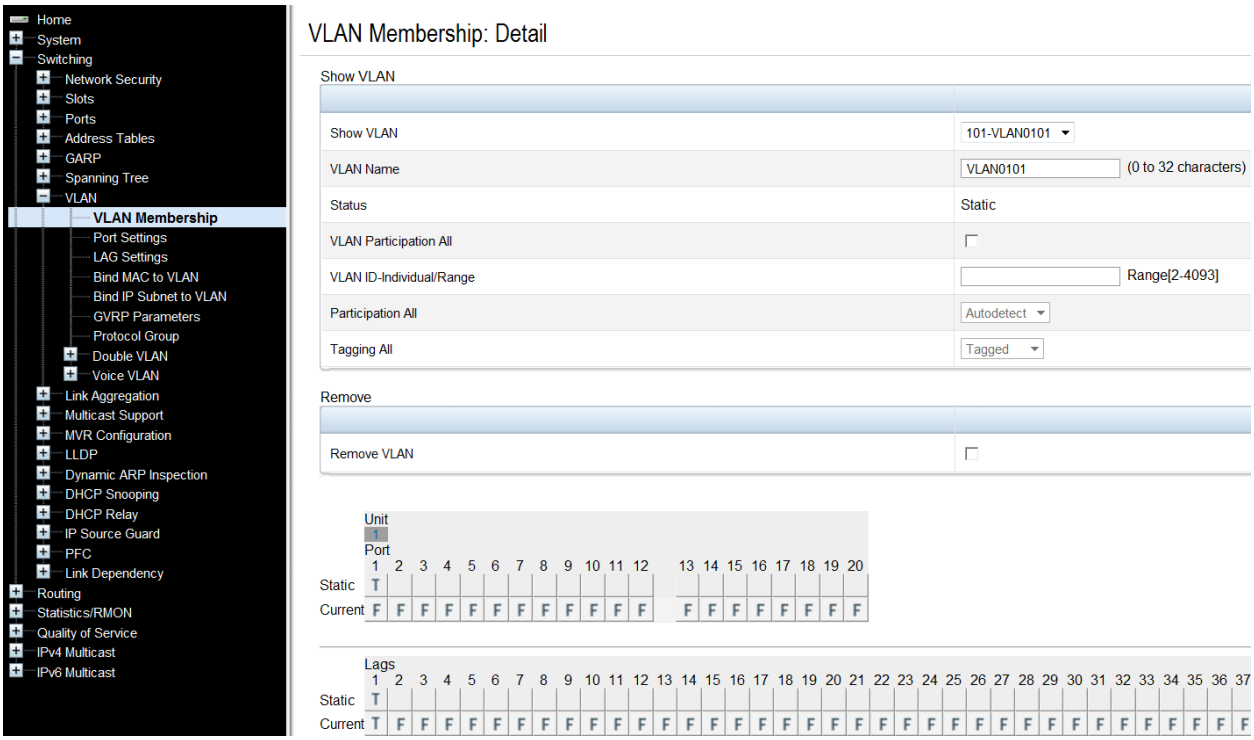
- Select **Switching > VLAN > Port Settings**.
- Select the port (i.e. Te1/0/2) from the **Ports** menu.
- Set the **Port VLAN Mode** to **General**.
- Set the **PVID** to the desired VLAN (i.e. 102).
- Set the **Frame Type** to **Admit All**.



- Click **Apply**.

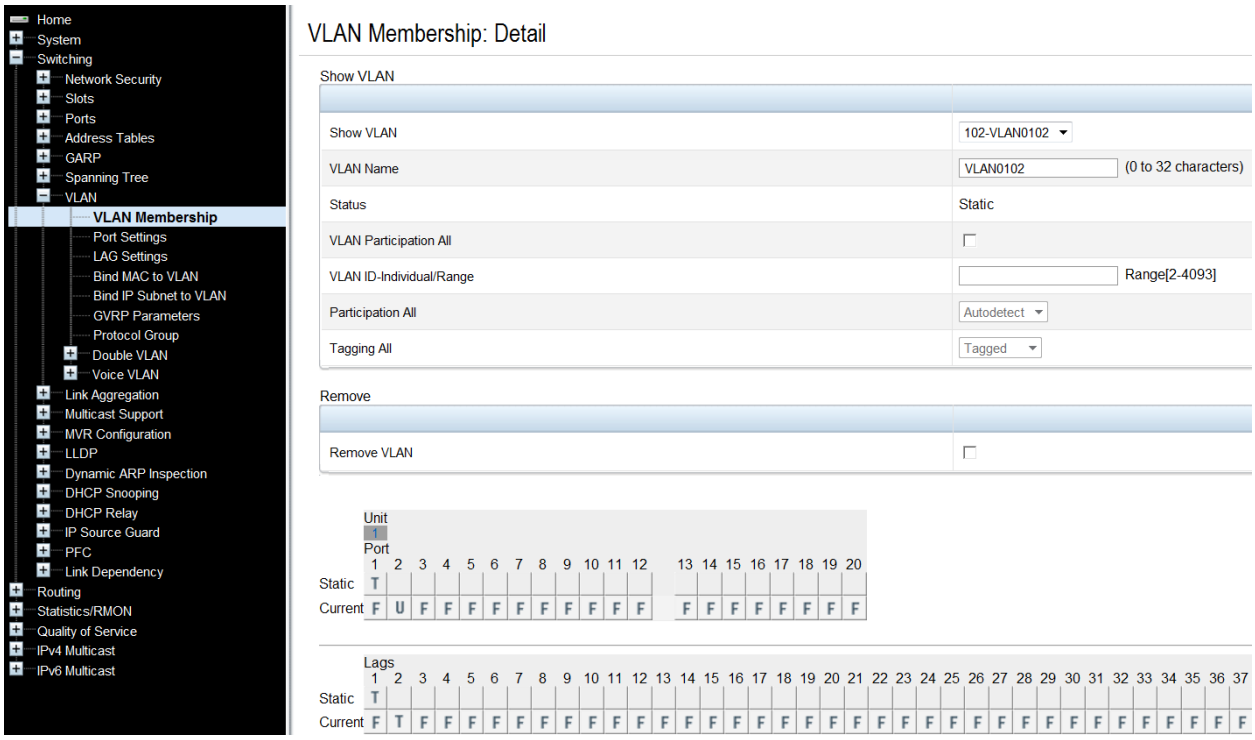
The next six screens add LAGs and ports to each of the VLANs (i.e. VLAN 101 – VLAN 106). The first three screens describe assigning LAG 1 and port Te1/0/1 to VLANs 101-103. The next three screens describe assigning LAG 2 and port Te1/0/2 to VLANs 104-106.

- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the first VLAN created above (i.e. VLAN 101).
- At the bottom of the page under LAGs, click the blank box below the number 1 until a "T" is present. This will assign Port-channel 1 to the VLAN as tagged.
- Under **Port**, click the box below the number 1 until a "T" is present. This will assign port Te1/0/1 to the VLAN as tagged.



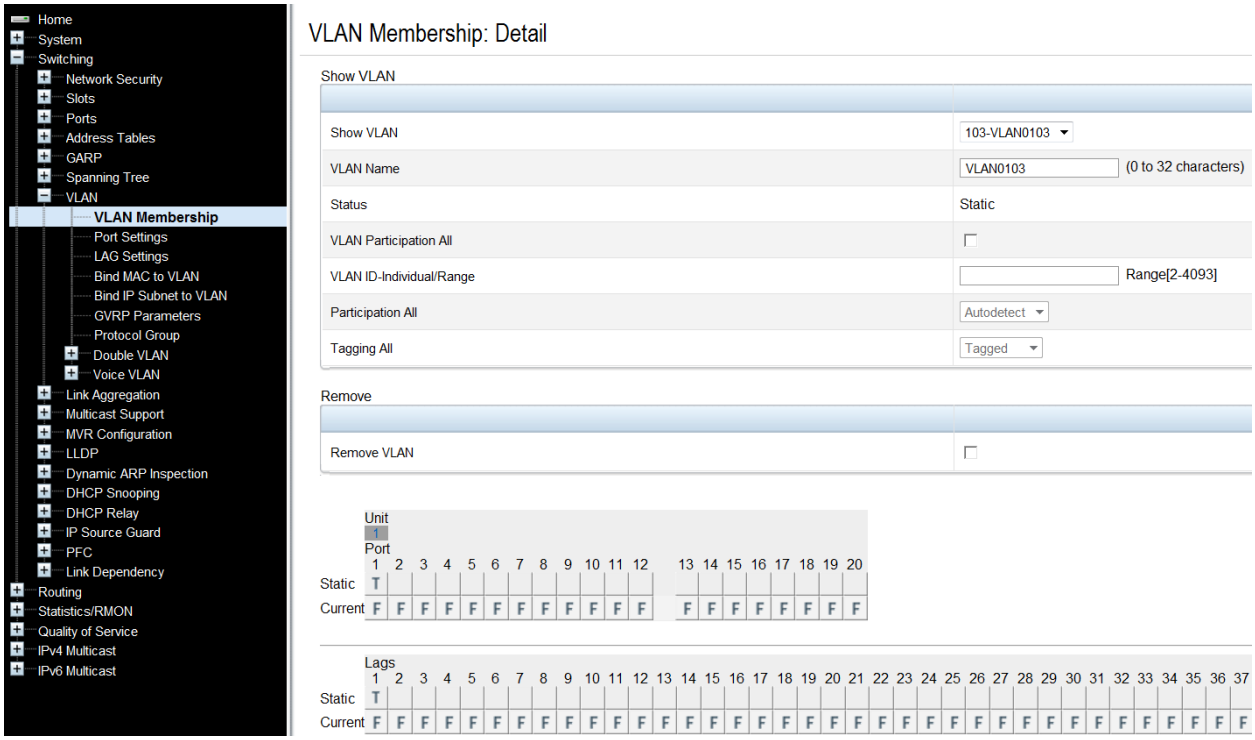
- Click **Apply**.

- In the **Show VLAN** pull-down menu, select the next VLAN (i.e. VLAN 102).
- At the bottom of the page under LAGs, again click the blank box below the number 1 until a "T" is present.
- Under **Port**, again click the box below the number 1 until a "T" is present.



- Click **Apply**.

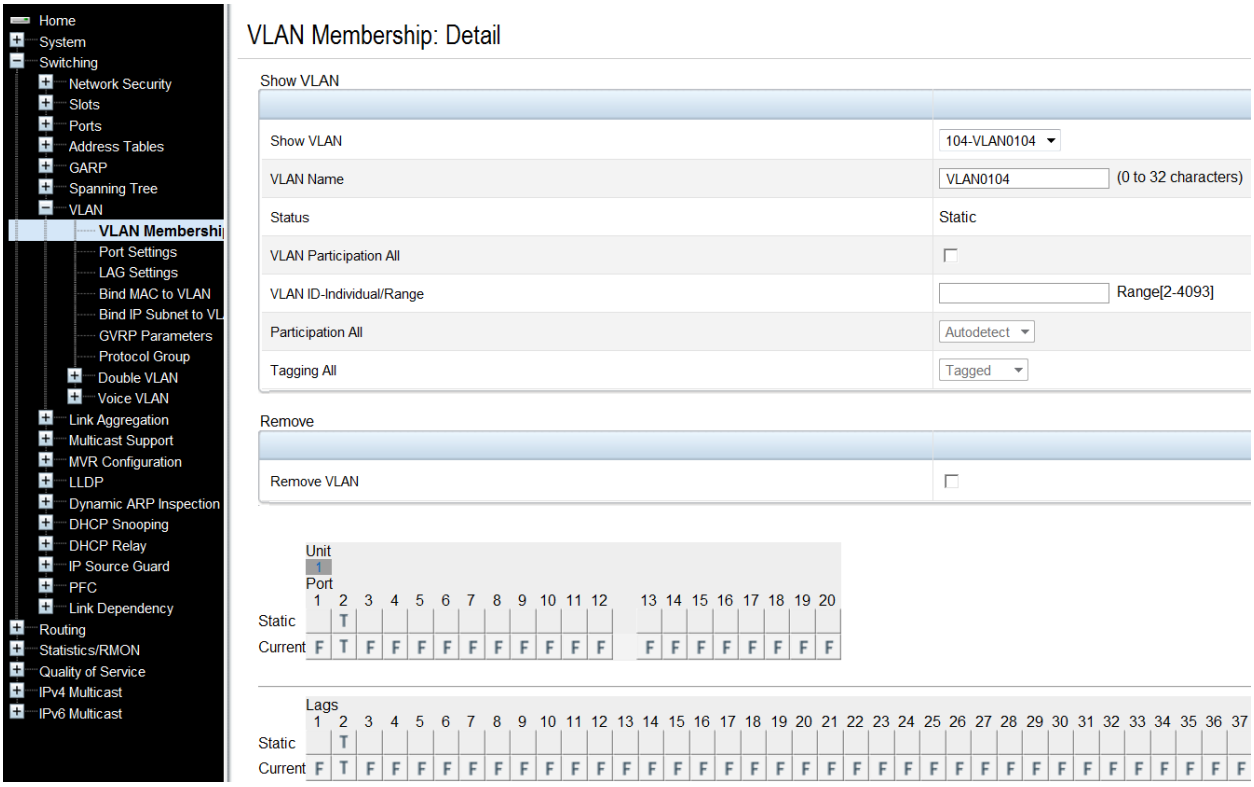
- In the **Show VLAN** pull-down menu, select the next VLAN (i.e. VLAN 103).
- At the bottom of the page under LAGs, again click the blank box below the number 1 until a "T" is present.
- Under **Port**, again click the box below the number 1 until a "T" is present.



- Click **Apply**.

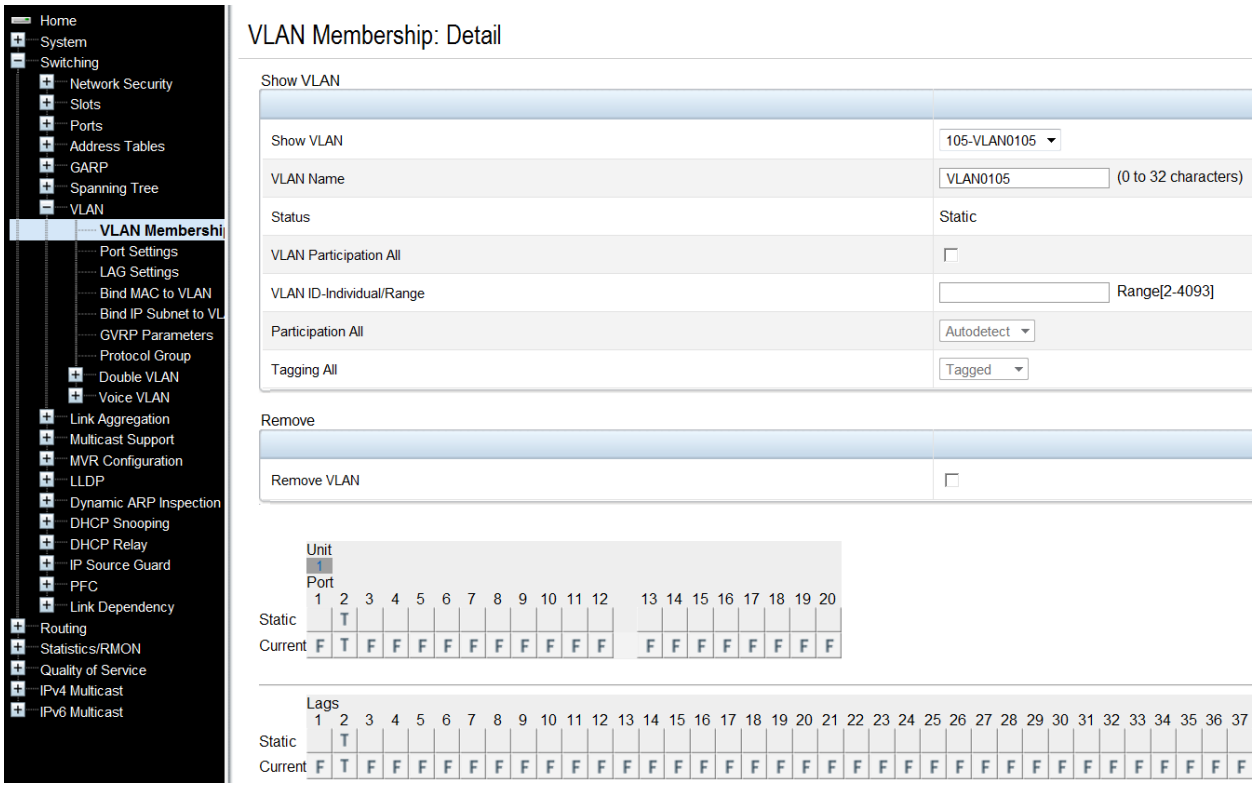
The following steps and three screens describe assigning LAG 2 and port Te1/0/2 to VLANs 104-106.

- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the fourth VLAN previously created (i.e. VLAN 104).
- At the bottom of the page under LAGs, click the blank box below the number 2 until a "T" is present. This will assign Port-channel 2 to the VLAN as tagged.
- Under **Port**, click the box below the number 2 until a "T" is present. This will assign port Te1/0/2 to the VLAN as tagged.



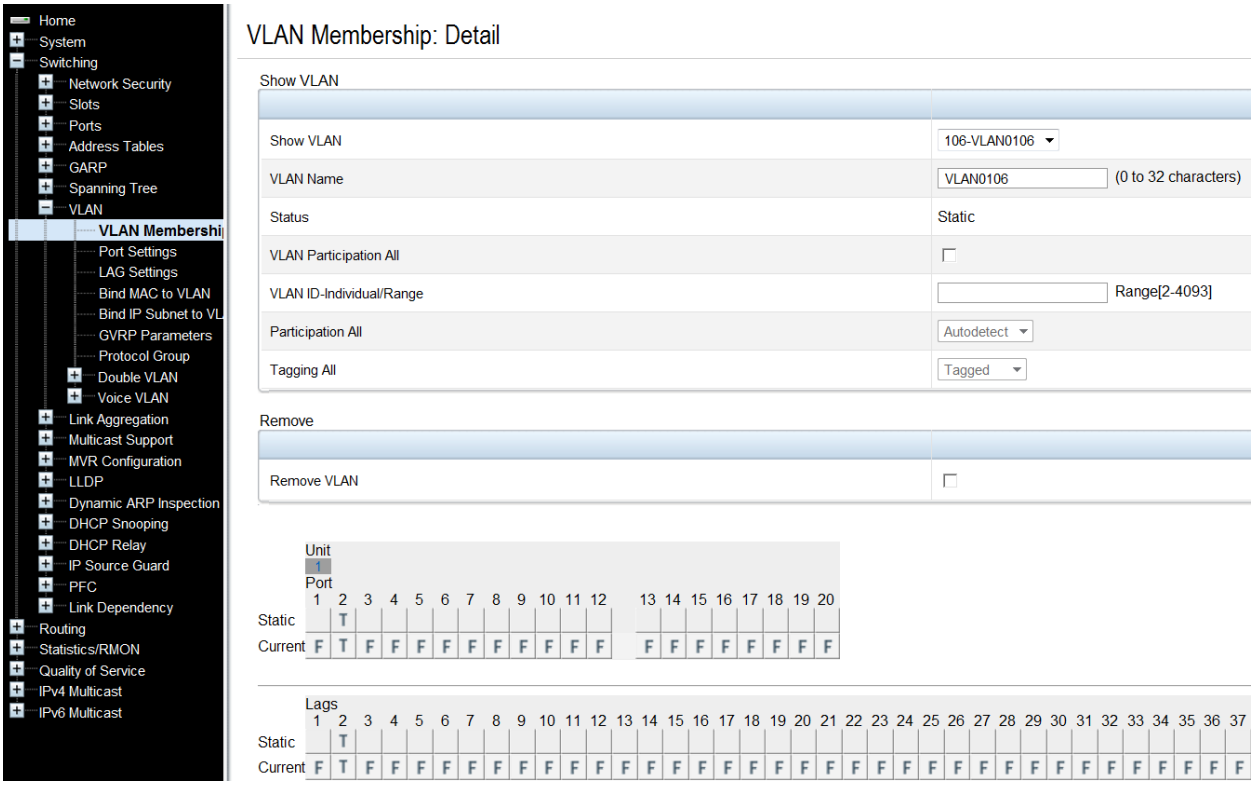
- Click **Apply**.

- In the **Show VLAN** pull-down menu, select the next VLAN (i.e. VLAN 105).
- At the bottom of the page under LAGs, again click the blank box below the number 2 until a "T" is present.
- Under **Port**, again click the box below the number 2 until a "T" is present.



- Click **Apply**.

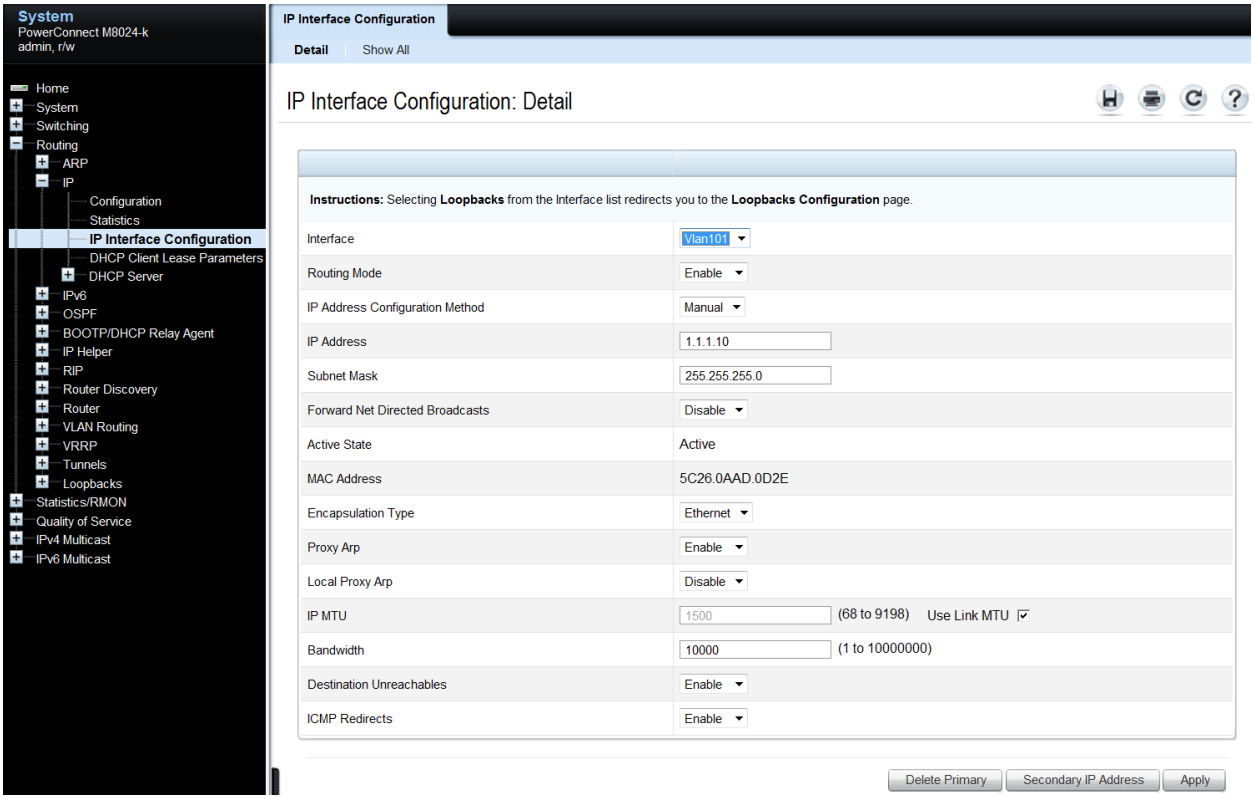
- In the **Show VLAN** pull-down menu, select the next VLAN (i.e. VLAN 106).
- At the bottom of the page under LAGs, again click the blank box below the number 2 until a "T" is present.
- Under **Port**, again click the box below the number 2 until a "T" is present.



- Click **Apply**.

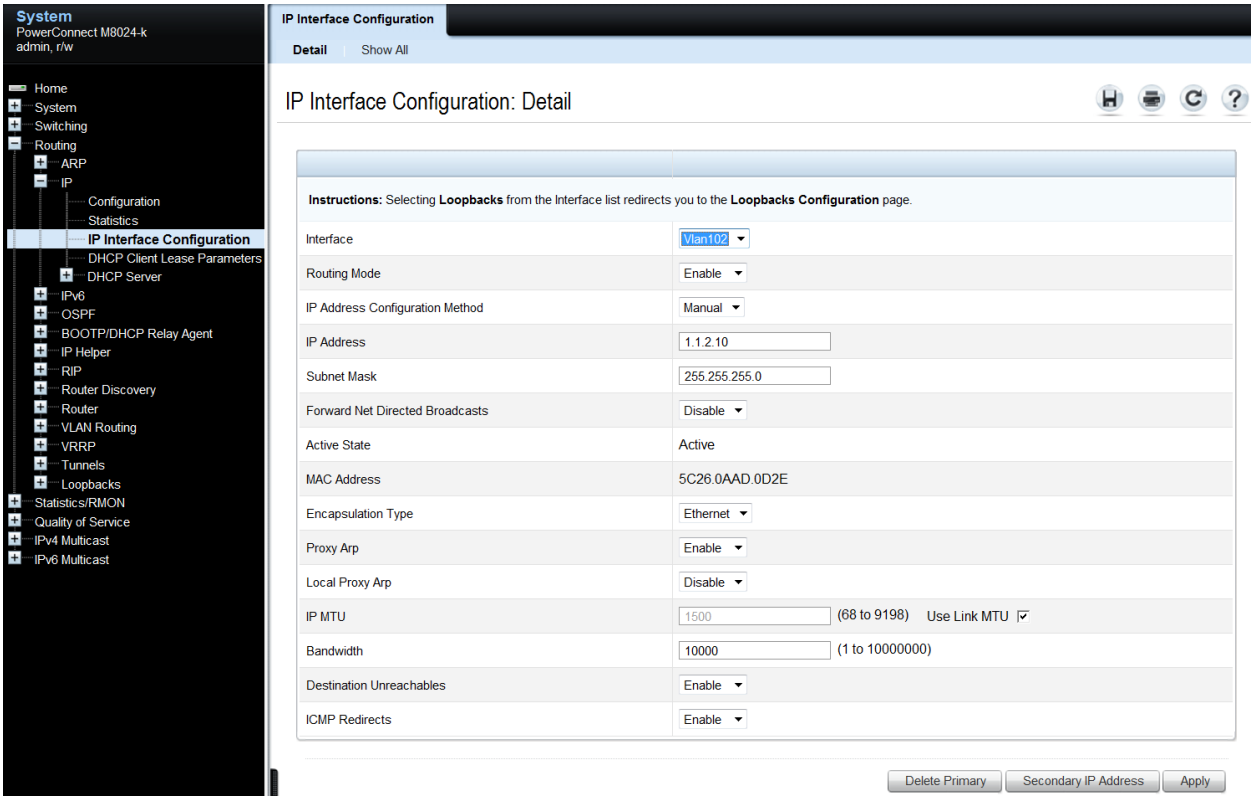
The next two screens show how to add an IP address to each VLAN (i.e. VLAN 101 through 106), each in a different subnet.

- Select **Routing > IP > IP Interface Configuration**.
- Select the first VLAN (i.e. VLAN 101) using the **Interface** pull-down menu.
- Set **Routing Mode to Enable**.
- Set **IP Address Configuration Method** to **Manual**.
- Provide the IP Address (i.e. 1.1.1.10) in the appropriate field.
- Set the appropriate **Subnet Mask** (i.e. 255.255.255.0)
- Set the **IP MTU** and **Bandwidth** parameters to appropriate sizes. The most common values for these fields are 1500 and 10000, respectively.



- Click **Apply**.

- Select the second VLAN (i.e. VLAN 102) using the **Interface** pull-down menu.
- Repeat the steps used above to set the parameters for each remaining VLAN (i.e. VLAN 102 through VLAN 106). For example, the screen below should reflect the settings for VLAN 102, with an IP address of 1.1.2.10. All parameters should be the same as before except for the **Interface** and **IP Address** fields.



- Click **Apply**.

Configuring the Cisco Nexus 5020 Switch

Login to the Nexus and enter the following commands to configure trunking and multiple VLANs on each port-channel.

```
Nexus5020# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Nexus5020(config)# feature lacp
Nexus5020(config)# vlan 101-103
Nexus5020(config-vlan)# exit
Nexus5020(config)# interface vlan 101
Nexus5020(config-if)# ip address 1.1.1.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface vlan 102
Nexus5020(config-if)# ip address 1.1.2.20/24
```

```
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface vlan 103
Nexus5020(config-if)# ip add 1.1.3.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface ethernet 1/1-2
Nexus5020(config-if-range)# switchport
Nexus5020(config-if-range)# channel-group 1 mode active
Nexus5020(config-if-range)# no shutdown
Nexus5020(config-if-range)# exit
Nexus5020(config)# interface port-channel 1
Nexus5020(config-if)# switchport
Nexus5020(config-if)# switchport trunk allowed vlan 101-103
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# end
```

For this next set of commands a **second** Cisco Nexus could be used. However for this example, we'll continue using the same Nexus 5000 switch and simply use ports 3 and 4 for the next LAG group.

```
Nexus5020# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Nexus5020(config)# feature lacp
Nexus5020(config)# vlan 104-106
Nexus5020(config-vlan)# exit
Nexus5020(config)# interface vlan 104
Nexus5020(config-if)# ip address 1.1.4.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface vlan 105
Nexus5020(config-if)# ip address 1.1.5.20/24
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface vlan 106
Nexus5020(config-if)# ip add 1.1.6.20/24
```

```
Nexus5020(config-if)# no shut
Nexus5020(config-if)# exit
Nexus5020(config)# interface ethernet 1/3-4
Nexus5020(config-if-range)# switchport
Nexus5020(config-if-range)# channel-group 2 mode active
Nexus5020(config-if-range)# no shutdown
Nexus5020(config-if-range)# exit
Nexus5020(config)# interface port-channel 2
Nexus5020(config-if)# switchport
Nexus5020(config-if)# switchport trunk allowed vlan 104-106
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# end
```

Validation

An IP address was assigned to each VLAN interface on the PowerConnect switch as well as the Cisco switch. To validate each VLAN setup, ping each IP subnet between the two switches.

For example, pinging the IP address (i.e. 1.1.2.20 belonging to the Nexus) from the M8024-k should be successful and will validate your VLAN 102 setup.

Scenario 6: Configuring a Backup LAG for Failover

This section provides an overview of setting up a straight-through topology with LAG failover. This allows Dell switches to automatically change from the primary to the backup LAG in the event of a port failure, reducing potential downtime.

Also included are steps to create a VLAN with an IP address then assigning the LAGs to this VLAN to help validate a proper setup.

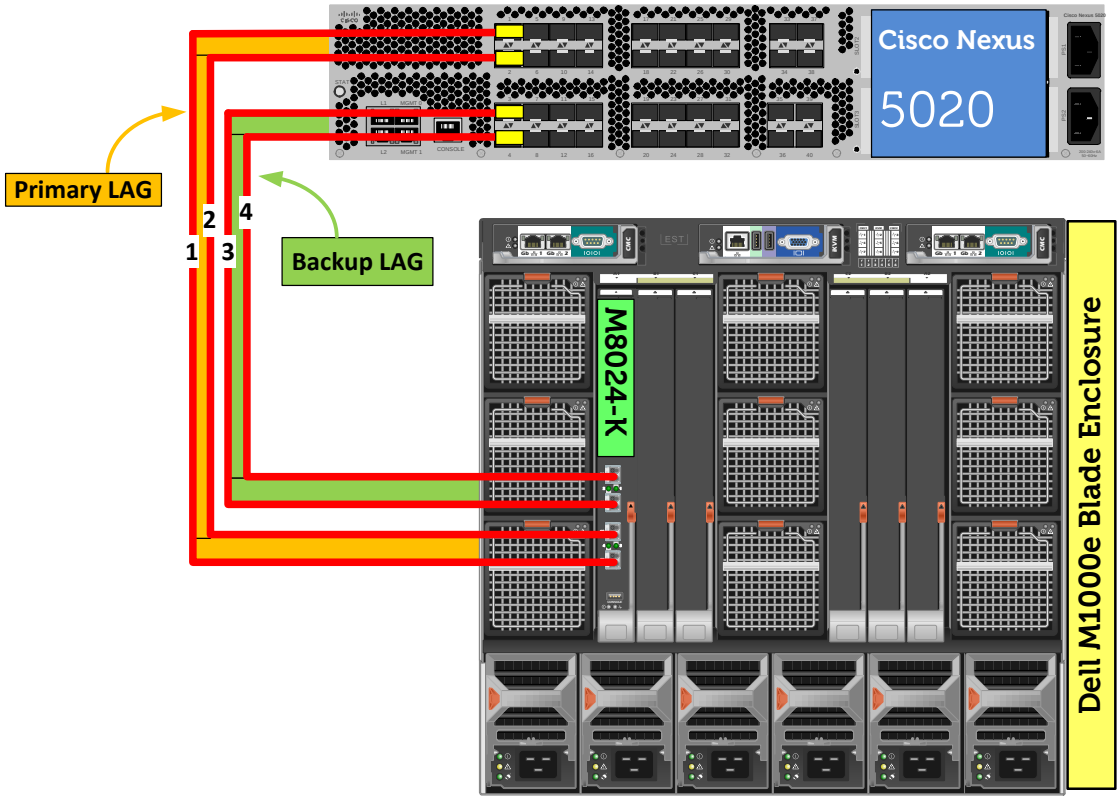


Figure 7. Graphic representation of Scenario 6.

Configuring the Dell M8024-k Switch

Command-Line Interface Method:

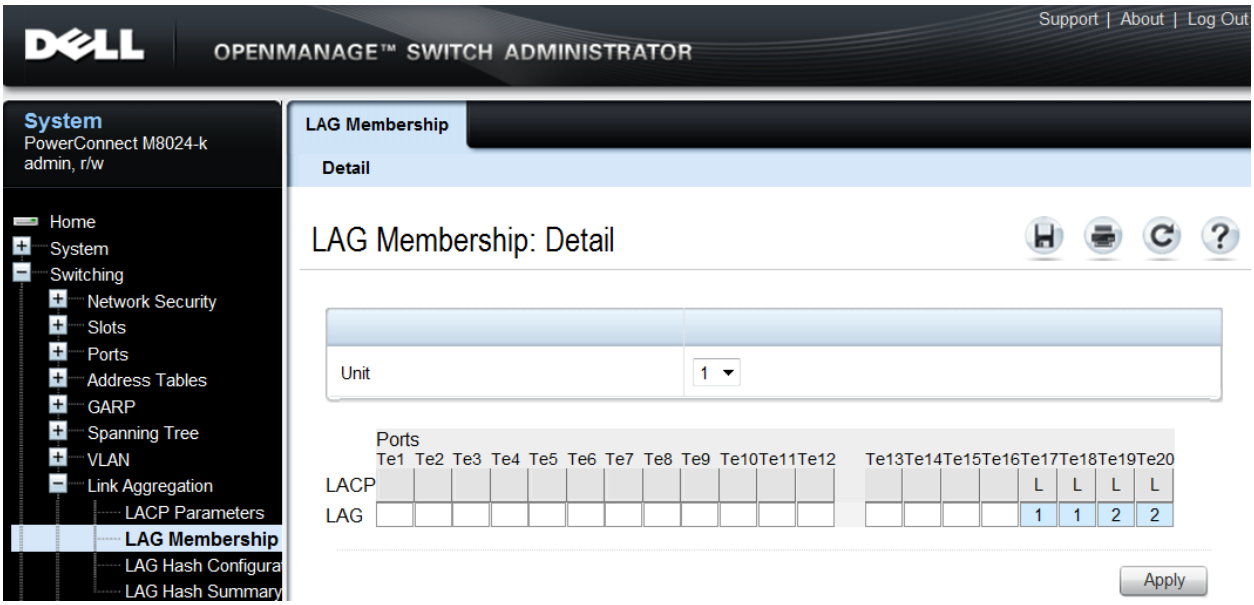
```
console(config)#interface range Te1/0/17-18
console(config-if)#channel-group 1 mode active
console(config-if)#exit
console(config)#interface range Te1/0/19-20
console(config-if)#channel-group 2 mode active
```

```
console(config-if)#exit
console(config)#vlan database
console(config-vlan)#vlan 100
console(config-vlan)#exit
console(config)#interface port-channel 1
console(config-if-Po1)#switchport mode general
console(config-if-Po1)#switchport general allowed vlan add 100 tagged
console(config-if-Po1)#exit
console(config)#interface port-channel 2
console(config-if-Po2)#switchport mode general
console(config-if-Po2)#switchport general allowed vlan add 100 tagged
console(config-if-Po2)#exit
console(config)#interface vlan 100
console(config-if-vlan100)#ip address 1.1.1.10 255.255.255.0
console(config-if-vlan100)#exit
console(config)#link-dependency  group 1
console(config-linkDep-group-1)#add port-channel 2
console(config-linkDep-group-1)#depends-on port-channel 1
console(config-linkDep-group-1)#action up
console(config-linkDep-group-1)#end
```

Web Interface Method:

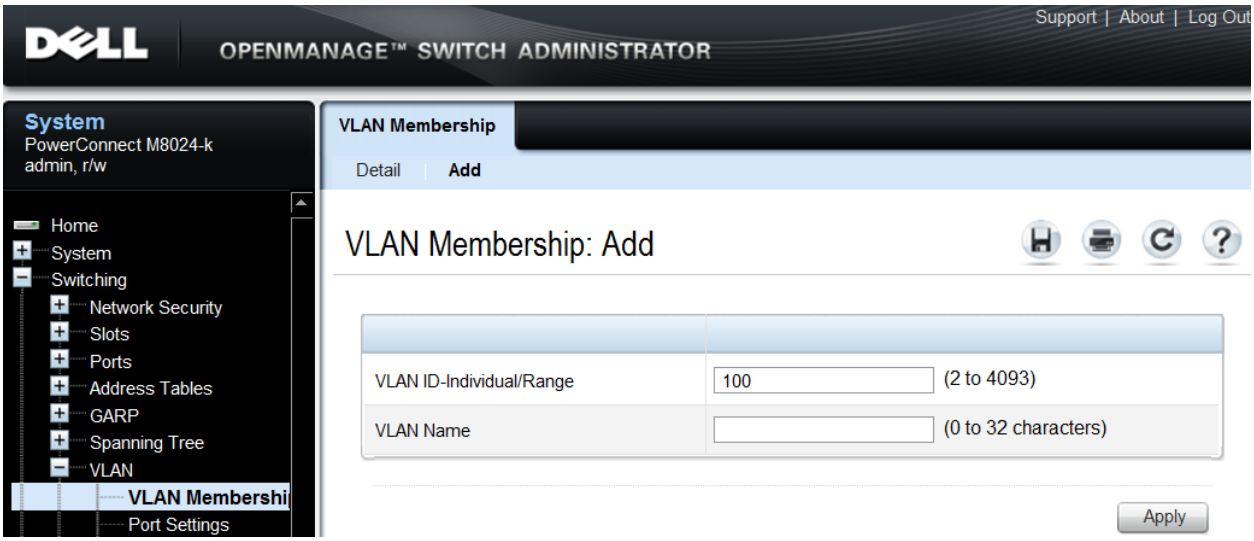
First, create two LAG (link aggregation groups) using these steps.

- Select **Switching > Link Aggregation > LAG Membership**
- Enter a LAG number (i.e. 1) in the **LAG** row for Te17 and Te18.
- Enter a second LAG number (i.e. 2) in the **LAG** row for Te19 and Te20.
- Click one of the boxes above each LAG number that you just entered until it shows the letter L over all numbers. This will set LACP and create dynamic LAGs on these ports.



- Click **Apply**.

- Select **Switching > VLAN > VLAN Membership > Add**.
- Enter the VLAN ID (i.e. 100) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.

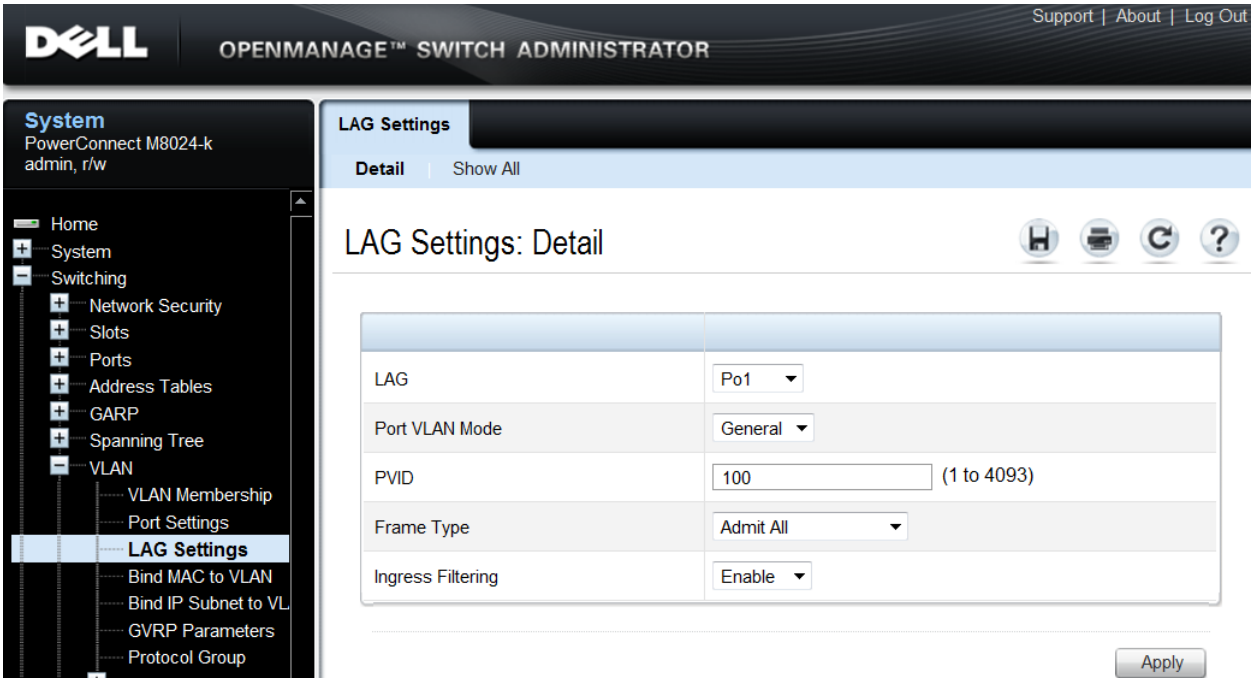


- Click **Apply**.

The next two screens show how to set the LAGs (i.e. 1 and 2) to General mode.

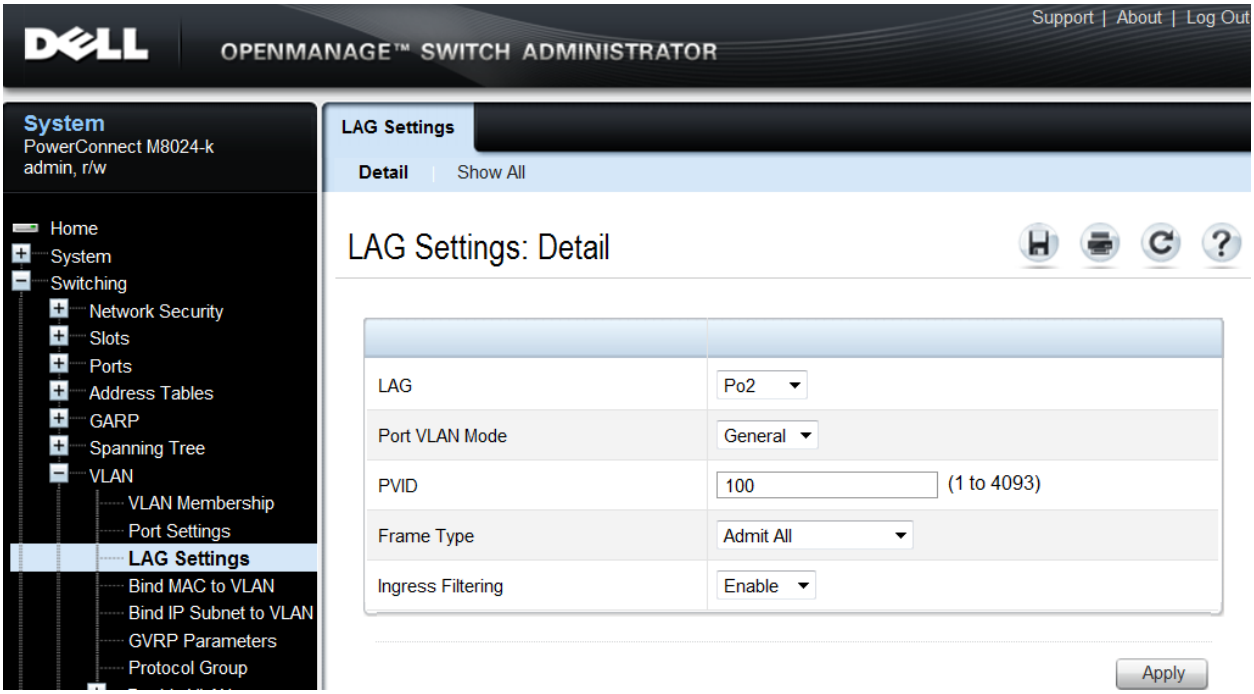
- Select **Switching > VLAN > LAG Settings**.
- Select the first LAG (i.e. Po1) from the **LAG** menu.
- Set the **Port VLAN Mode** to **General**.

- Optionally set the **PVID**, though not required for this scenario.
- Select **Frame Type** (i.e. **Admit All**) from the menu.
- Enable **Ingress Filtering**.



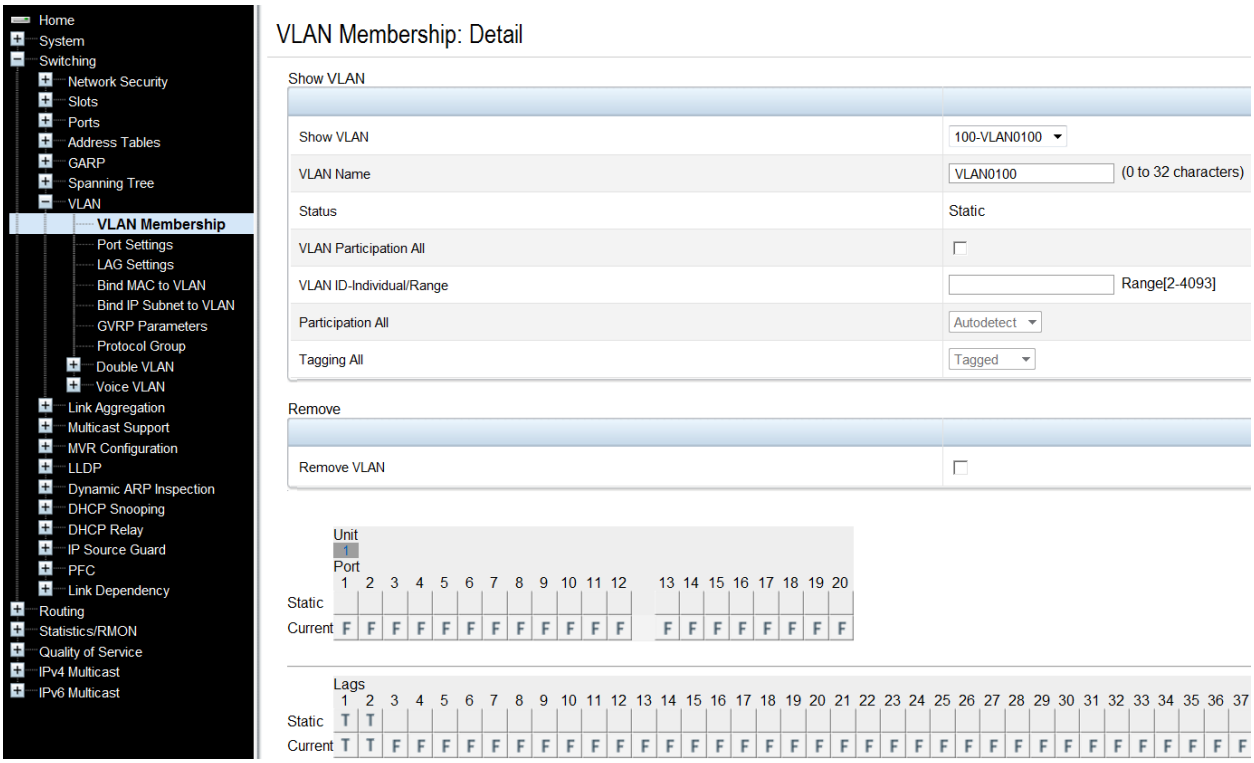
- Click **Apply.**

- Select the second LAG (i.e. Po2) from the **LAG** menu.
- Repeat the steps above to configure this LAG.



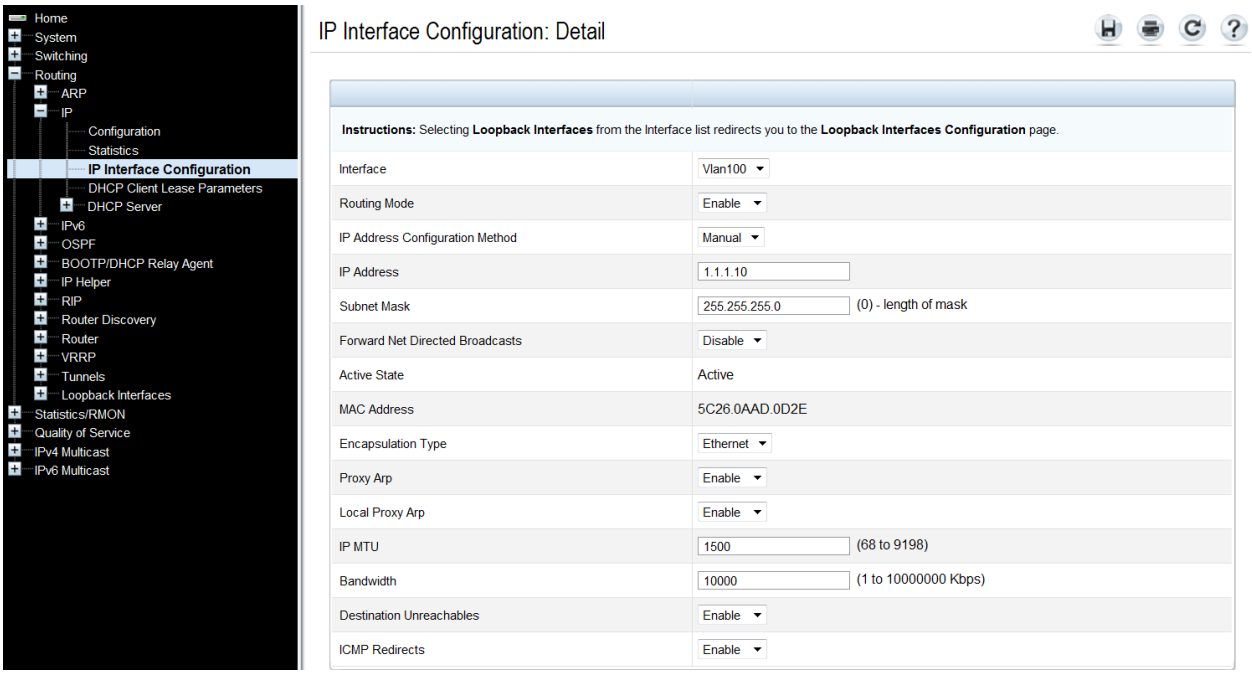
- Click **Apply**.

- Select **Switching > VLAN > VLAN Membership > Detail**.
- In the **Show VLAN** pull-down menu, select the VLAN (i.e. VLAN 100).
- At the bottom of the page under LAGs, click the blank box below numbers 1 and 2 until a "T" is present. This assigns Port-channels 1 and 2 to the VLAN as tagged.
- Under **Port**, click the box below the number 1 until a "T" is present. This will assign port Te1/0/1 to the VLAN as tagged.



- Click **Apply**.

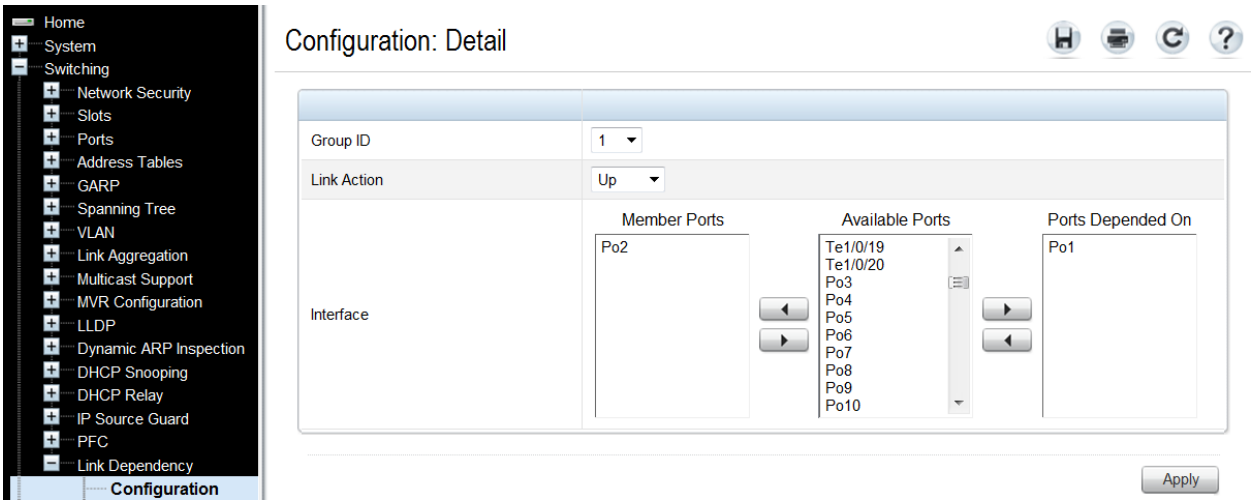
- Select **Routing > IP > IP Interface Configuration**.
- Select the VLAN (i.e. VLAN 100) using the Interface pull-down menu.
- Set **Routing Mode** to **Enable**.
- Set **IP Address Configuration Method** to **Manual**.
- Provide the IP **Address** (i.e. 1.1.1.10) in the appropriate field.
- Set the appropriate **Subnet Mask** (i.e. 255.255.255.0)
- Set the **IP MTU** and **Bandwidth** parameters to appropriate sizes. The most common values for these fields are 1500 and 10000, respectively.



- Click **Apply**.

Perform the following to set the LAG failover, so if LAG 1 (Po1) fails, LAG 2 (Po2) will take over. Until LAG 1 goes down, LAG 2 (Po2) remains down by default.

- Select **Switching > Link Dependency > Configuration**.
- Select the **Group ID** (i.e. 1) using the pull-down menu.
- Select **Up** for the **Link Action**.
- Set **Member Ports** to Po2 by selecting Po2 from **Available Ports** and using the arrow to move it to the **Member Ports** list.
- Set **Port Depended On** to Po1 by selecting Po1 from **Available Ports** and using the arrow to move it to the **Ports Depended On** list.



- Click **Apply**.

Configuring the Cisco Nexus 5020 Switch

Login to the Nexus 5020 and make the following changes:

```
Nexus5020# configure
Enter configuration commands, one per line.  End with CNTL/Z.
Nexus5020(config)# feature lacp
Nexus5020(config)# interface ethernet 1/1-4
Nexus5020(config if-range)#switchport
Nexus5020(config-if-range)# channel-group 1 mode active
Nexus5020(config-if-range)# no shutdown
Nexus5020(config-if-range)# exit
Nexus5020(config)# feature interface-vlan
Nexus5020(config)# interface vlan 100
Nexus5020(config-if)# ip address 1.1.1.20/24
Nexus5020(config-if)# no shutdown
Nexus5020(config-if)# exit
Nexus5020(config)# vlan 100
Nexus5020(config-vlan)# state active
Nexus5020(config-vlan)# exit
Nexus5020(config)#  interface port-channel 1
Nexus5020(config-if)# switchport mode trunk
Nexus5020(config-if)# switchport trunk allowed vlan 100
Nexus5020(config-if)# end
```

Validation

When link-dependency is enabled in this example, the first LAG is up and the second LAG is inactive (notice the LEDs on the front of each switch). To test LAG failover, unplug LAG 1. This will enable LAG 2 which will begin passing traffic that was going through LAG 1 and can be tested with a simple ping between devices. Notice again the LEDs on front of each switch. The LEDs for LAG 2 now show active, whereas LAG 1 is down. This can also be seen from the CLI by typing the following command:

```
console# show interface port-channel
Po1       Inactive: Te1/0/17, Te1/0/18
Po2       Active:    Te1/0/19, Te1/0/2020
```

The same information is also displayed from the Web Interface under **Switching > Ports > LAG Configuration > Show All**.

Appendix - Network Switch Versions

Version information for the network switches we used are as follows:

Network switch	Dell PowerConnect M8024k	Cisco Nexus 5020
Software version	4.1 and 4.2	5.0(3)N1(1b)

Table 1. Switch Firmware Versions

About Dell

Dell (NASDAQ: DELL) is a leading technology provider to commercial and public enterprises around the world.