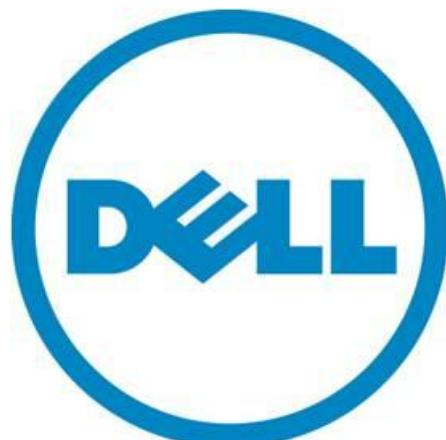


# Deployment of Dell M8024-k Blade Switch with Cisco Nexus 5000 Series Switch

---

A Dell Interoperability Whitepaper

Victor Teeter



THIS TECHNICAL INTEROPERABILITY WHITE PAPER IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.

© 2011 Dell Inc. All rights reserved. Reproduction or translation of any part of this work beyond that permitted by U.S. copyright laws without the written permission of Dell Inc. is unlawful and strictly forbidden. For more information, contact Dell.

*Dell*, the **DELL** logo, the **DELL** badge, **PowerConnect** and **PowerEdge** are trademarks of Dell Inc.. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell Inc. disclaims any proprietary interest in trademarks and trade names other than its own.

October 2011

# Contents

|   |    |
|---|----|
| Contents .....  | 1  |
| Summary .....   | 3  |
| Simple Switch Mode .....  | 3  |
| Testing Scenarios .....   | 4  |
| Scenario 1: Enabling Spanning Tree (RSTP) and Creating a LAG (Link Aggregation) on the Dell PowerConnect M8024-k Switch ..... | 5  |
| Configuring the Dell M8024-k Switch .....   | 5  |
| Configuring the Cisco 5020 Switch .....   | 7  |
| Validation .....  | 7  |
| Scenario 2: Configuring an Untagged VLAN on a Single LAG .....  | 8  |
| Configuring the Dell M8024-k Switch .....   | 8  |
| Configuring the Cisco 5020 Switch .....   | 12 |
| Validation .....  | 13 |
| Scenario 3: Configuring Multiple VLANs on a Single LAG .....  | 15 |
| Configuring the Dell M8024-k Switch .....   | 16 |
| Configuring the Cisco 5020 Switch .....   | 25 |
| Validation .....  | 26 |
| Scenario 4: Configuring Multiple LAGs and Dedicating Specific Uplinks Using VLANs .....                                       | 27 |
| Configuring the Dell M8024-k Switch .....   | 27 |
| Configuring the Cisco 5020 Switch .....   | 37 |
| Validation .....  | 38 |
| Scenario 5: Configuring Multiple VLANs on Multiple LAGs .....   | 39 |
| Configuring the Dell M8024-k Switch .....   | 39 |
| Configuring the Cisco Nexus 5020 Switch .....   | 53 |
| Validation .....  | 55 |
| Scenario 6: Configuring a Backup LAG for Failover .....   | 56 |
| Configuring the Dell M8024-k Switch .....   | 56 |
| Configuring the Cisco Nexus 5020 Switch .....   | 63 |
| Validation .....  | 63 |
| Appendix - Network Switch Versions .....  | 64 |
| About Dell .....  | 64 |

## Figures

|           |  |    |
|-----------|--|----|
| Figure 1. | The Dell PowerConnect M8024-k Switch ..... | 3  |
| Figure 2. | Graphic Representation of Scenario 1 ..... | 5  |
| Figure 3. | Graphic Representation of Scenario 2.....  | 8  |
| Figure 4. | Graphic Representation of Scenario 3.....  | 15 |
| Figure 5. | Graphic Representation of Scenario 4.....  | 27 |
| Figure 6. | Graphic Representation of Scenario 5.....  | 39 |
| Figure 7. | Graphic representation of Scenario 6. .... | 56 |

## Tables

|          |                                |    |
|----------|--------------------------------|----|
| Table 1. | Switch Firmware Versions ..... | 64 |
|----------|--------------------------------|----|

## 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".

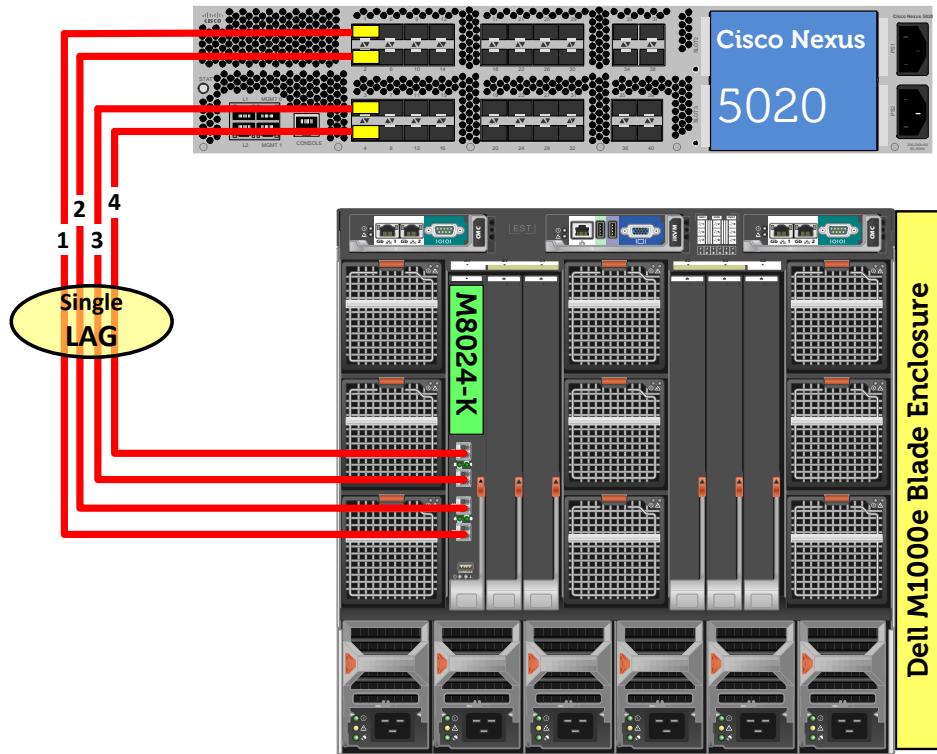
## Testing Scenarios

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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The top navigation bar includes the DELL logo, the title "OPENMANAGE™ SWITCH ADMINISTRATOR", and links for "Support | About | Log Out". The left sidebar menu under "System" shows various switch configuration categories like Home, System, Switching, and Spanning Tree. The "Spanning Tree" category is expanded, and its "Global Settings" sub-item is selected and highlighted in blue. The main content area is titled "Global Settings: Detail". It contains a table with the following settings:

| Global Settings       |                                     |
|-----------------------|-------------------------------------|
| Spanning Tree Status  | Enable ▾                            |
| STP Operation Mode    | Rapid STP ▾                         |
| BPDU Flooding         | Disable ▾                           |
| Port Fast             | <input checked="" type="checkbox"/> |
| Port Fast BPDU Filter | Disable ▾                           |
| Loop Guard            | Disable ▾                           |
| BPDU Protection       | Disable ▾                           |

- 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

The screenshot shows the Dell OpenManage Switch Administrator interface. The top bar includes the Dell logo, the title "OPENMANAGE™ SWITCH ADMINISTRATOR", and links for "Support | About | Log Out". The left sidebar, titled "System" and showing "PowerConnect M8024-k admin, r/w", has a tree view with "Switching" expanded, including "Network Security", "Slots", "Ports", "Address Tables", "GARP", "Spanning Tree", "VLAN", "Link Aggregation", and "LAG Membership" (which is selected and highlighted in blue). The main content area is titled "LAG Membership: Detail". It features a table with columns for "Ports" (Te1 through Te20) and rows for "LACP" and "LAG". The "LAG" row shows membership for ports Te1 through Te12 and Te13 through Te20, with each port assigned to LAG 1. An "Apply" button is located at the bottom right of the table.

- 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.

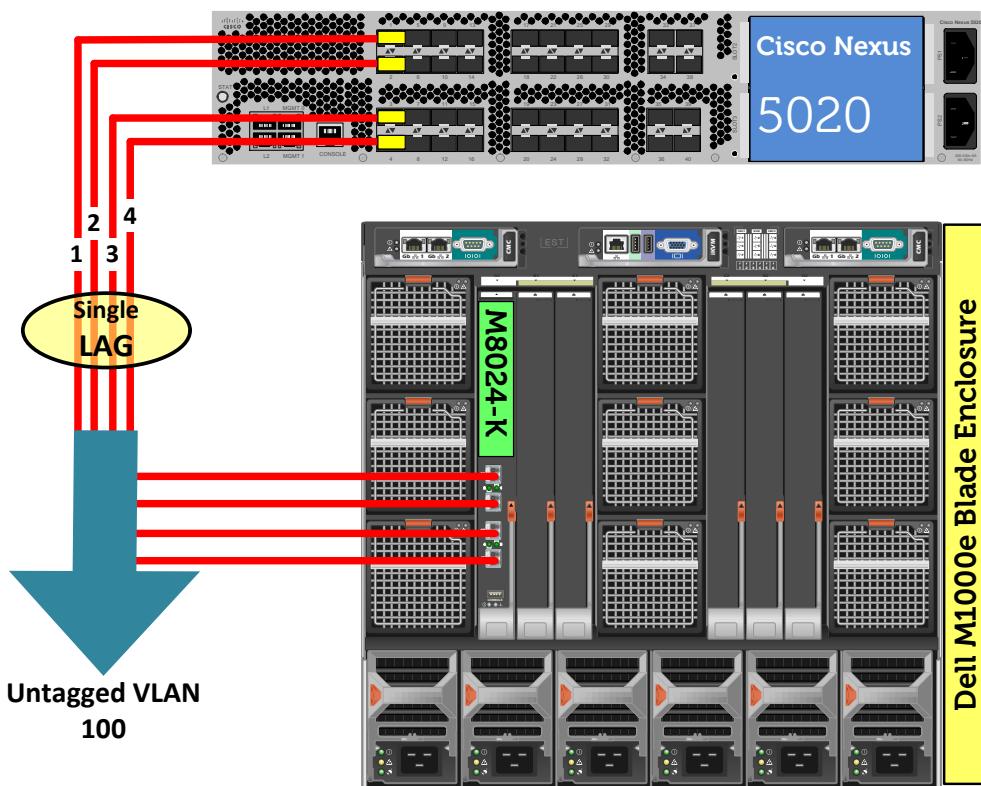


Figure 3. Graphic Representation of Scenario 2.

### 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.

| Ports | Te1 | Te2 | Te3 | Te4 | Te5 | Te6 | Te7 | Te8 | Te9 | Te10 | Te11 | Te12 | Te13 | Te14 | Te15 | Te16 | Te17 | Te18 | Te19 | Te20 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| LACP  |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      | L    | L    | L    | L    |
| LAG   |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      | 1    | 1    | 1    | 1    |

- 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.

**VLAN Membership: Add**

|           |  |
|-----------|--|
| VLAN ID   | <input type="text" value="100"/> (2 to 4093) |
| VLAN Name | <input type="text"/>                         |

**Apply**

- 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.

**Port Settings: Detail**

|                   |   |
|-------------------|---|
| Ports             | Unit <input type="button" value="1"/> Port <input type="button" value="Te1/0/1"/> |
| Port VLAN Mode    | <input type="button" value="Access"/>   |
| PVID              | <input type="text" value="100"/> (1 to 4093)                                      |
| Frame Type        | <input type="button" value="AdmitUntaggedOnly"/>                                  |
| Ingress Filtering | <input type="button" value="Enable"/>   |
| Port Priority     | <input type="text" value="0"/> (0 to 7)   |

**Apply**

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar navigation tree includes Home, System, Switching (Network Security, Slots, Ports, Address Tables, GARP, Spanning Tree), VLAN (VLAN Membership, Port Settings, LAG Settings), Bind MAC to VLAN, Bind IP Subnet to VLAN, GVRP Parameters, Protocol Group, and Double VLAN. The LAG Settings node is selected. The main content area is titled "LAG Settings: Detail". It displays configuration for LAG Po1. The fields are as follows:

|                   |                 |
|-------------------|-----------------|
| LAG               | Po1             |
| Port VLAN Mode    | General         |
| PVID              | 100 (1 to 4093) |
| Frame Type        | Admit All       |
| Ingress Filtering | Enable          |

At the bottom right of the form is a blue "Apply" button. Above the form, there are tabs for "Detail" and "Show All", and icons for Help, Print, Copy, and Question.

- 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.

**VLAN Membership: Detail**

Show VLAN

|                          |                               |
|--------------------------|-------------------------------|
| Show VLAN                | 100-VLAN0100                  |
| VLAN Name                | VLAN0100 (0 to 32 characters) |
| Status                   | Static                        |
| VLAN ID-Individual/Range | Range[2-4093]                 |
| VLAN Participation All   | <input type="checkbox"/>      |
| Participation All        | Include                       |
| Tagging All              | Untagged                      |

Remove

|             |                          |
|-------------|--------------------------|
| Remove VLAN | <input type="checkbox"/> |
|-------------|--------------------------|

Unit 1  
Port 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

|         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Static  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Current |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Lags 1 2 3 4 5 6 7 8 9 10 11 12

|         |   |   |   |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|---|---|---|
| Static  | U |   |   |   |   |   |   |   |   |   |   |
| Current | U | F | F | F | F | F | F | F | F | F | F |

[▲ Back to top](#)

[▲ Back to top](#)

Apply

- 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).

**System**  
PowerConnect M8024-k  
admin, r/w

**IP Interface Configuration**

**IP Interface Configuration: Detail**

**Instructions:** Selecting **Loopbacks** from the Interface list redirects you to the **Loopbacks Configuration** page.

|                                 |  |
|---------------------------------|--|
| Interface                       | Vlan100  |
| Routing Mode                    | Enable   |
| IP Address Configuration Method | Manual   |
| IP Address                      | 1.1.1.10   |
| Subnet Mask                     | 255.255.255.0  |
| Forward Net Directed Broadcasts | Disable  |
| Active State                    | Active   |
| MAC Address                     | 5C26.0AAD.0D2E   |
| Encapsulation Type              | Ethernet   |
| Proxy Arp                       | Enable   |
| Local Proxy Arp                 | Disable  |
| IP MTU                          | 1500 (68 to 9198) Use Link MTU <input checked="" type="checkbox"/> |
| Bandwidth                       | 10000 (1 to 10000000)  |
| Destination Unreachables        | Enable   |
| ICMP Redirects                  | Enable   |

**Buttons:** Delete Primary, Secondary IP Address, Apply

- 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.

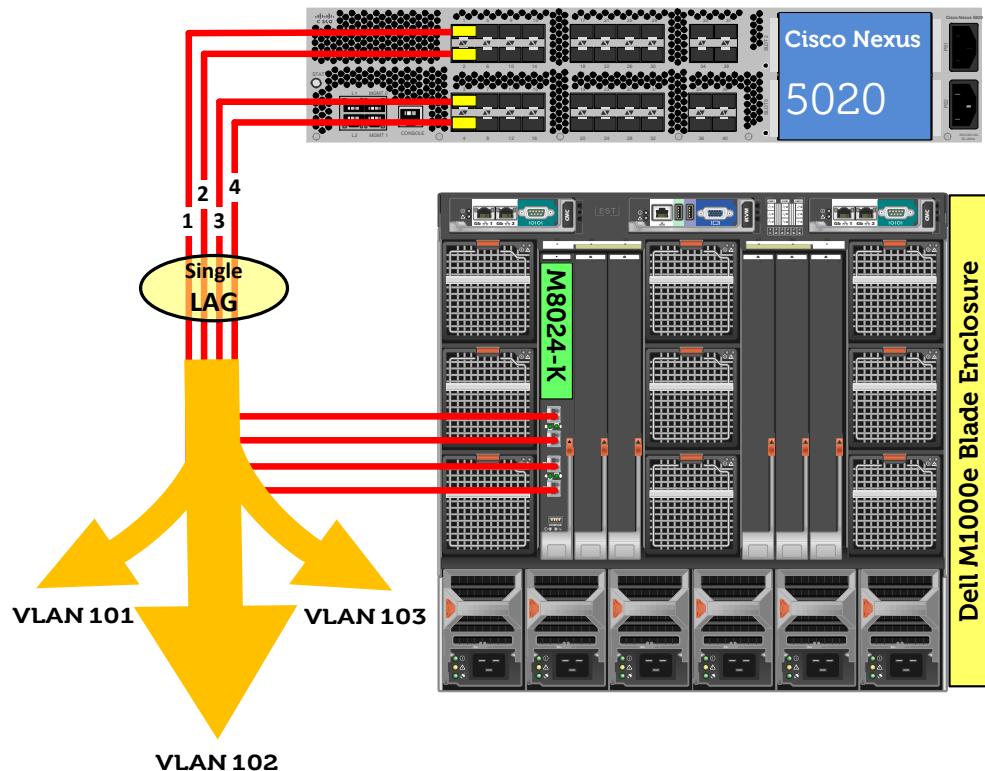
For example, assign an IP address (i.e. 1.1.1.20) to VLAN interface on Cisco Nexus use the following commands:

```
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.

| Ports | Te1 | Te2 | Te3 | Te4 | Te5 | Te6 | Te7 | Te8 | Te9 | Te10 | Te11 | Te12 | Te13 | Te14 | Te15 | Te16 | Te17 | Te18 | Te19 | Te20 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| LACP  |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      | L    | L    | L    | L    |      |
| LAG   |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      | 1    | 1    | 1    | 1    |      |

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar menu under the 'Switching' section has 'LAG Settings' selected. The main content area is titled 'LAG Settings: Detail'. It contains the following configuration fields:

|                   |               |
|-------------------|---------------|
| LAG               | Po1           |
| Port VLAN Mode    | General       |
| PVID              | 1 (1 to 4093) |
| Frame Type        | Admit All     |
| Ingress Filtering | Enable        |

An 'Apply' button is located at the bottom right of the form.

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar menu under the 'Switching' section has 'Port Settings' selected. The main content area is titled 'Port Settings: Detail'. It contains the following configuration fields:

|                   |                     |
|-------------------|---------------------|
| Ports             | Unit 1 Port Te1/0/1 |
| Port VLAN Mode    | General             |
| PVID              | 1 (1 to 4093)       |
| Frame Type        | Admit All           |
| Ingress Filtering | Enable              |
| Port Priority     | 0 (0 to 7)          |

An 'Apply' button is located at the bottom right of the form.

- 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.

**VLAN Membership: Add**

|           |  |
|-----------|--|
| VLAN ID   | <input type="text" value="101"/> (2 to 4093) |
| VLAN Name | <input type="text"/> (0 to 32 characters)    |

**Apply**

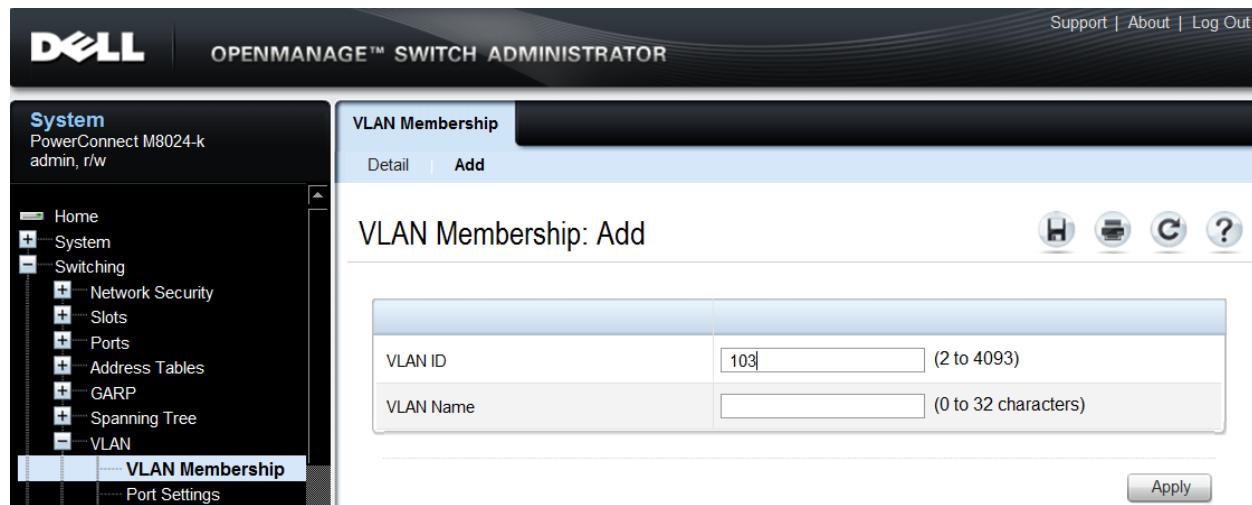
- Click **Apply**.
- Enter the VLAN ID (i.e. 102) in the **VLAN ID** field.
- Optionally, enter a VLAN Name in the **VLAN Name** field.

**VLAN Membership: Add**

|           |  |
|-----------|--|
| VLAN ID   | <input type="text" value="102"/> (2 to 4093) |
| VLAN Name | <input type="text"/> (0 to 32 characters)    |

**Apply**

- 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.

**VLAN Membership: Detail**

Show VLAN: 101-VLAN0101

VLAN Name: VLAN0101

Status: Static

VLAN Participation All:

VLAN ID-Individual/Range:  Range[2-4093]

Participation All: Autodetect

Tagging All: Tagged

Remove VLAN:

| Unit    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |
| Current | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |

| Lags    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |
| Current | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |    |    |    |

Apply

- 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.

**VLAN Membership: Detail**

Show VLAN: 102-VLAN0102

VLAN Name: VLAN0102

Status: Static

VLAN Participation All:

VLAN ID-Individual/Range:  Range[2-4093]

Participation All: Autodetect

Tagging All: Tagged

Remove VLAN:

| Unit    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |
| Current | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |

| Lags    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

Apply

- 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.

The screenshot shows the 'VLAN Membership: Detail' page in the Dell OpenManage Switch Administrator. The 'Show VLAN' dropdown is set to '103-VLAN103'. The 'VLAN Name' field contains 'VLAN103'. The 'Status' is 'Static'. Under 'VLAN Participation All', 'VLAN ID-IndividualRange' is set to 'Range[2-4093]'. Under 'Participation All', it is set to 'Autodetect'. Under 'Tagging All', it is set to 'Tagged'. The 'Remove' section has a 'Remove VLAN' checkbox. Below this are two tables: 'Unit' and 'Lags'. The 'Unit' table shows port 1 as tagged (T) and others as untagged (F). The 'Lags' table shows Port-channel 1 as tagged (T) and others as untagged (F). The 'Apply' button is located at the bottom right of the page.

- 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.

The screenshot shows the Dell PowerConnect M8024-k web interface. The left sidebar navigation tree is collapsed, showing sections like Home, System, Switching, Routing, ARP, IP, IPv6, OSPF, BOOTP/DHCP Relay Agent, IP Helper, RIP, Router Discovery, Router, VLAN Routing, VRRP, Tunnels, Loopbacks, Statistics/RMON, Quality of Service, IPv4 Multicast, and IPv6 Multicast. The 'IP Interface Configuration' section is selected under the IP category.

The main content area is titled 'IP Interface Configuration: Detail'. It displays configuration settings for 'Vlan101'. The configuration includes:

- Interface:** Vlan101
- Routing Mode:** Enable
- IP Address Configuration Method:** Manual
- IP Address:** 1.1.1.10
- Subnet Mask:** 255.255.255.0
- Forward Net Directed Broadcasts:** Disable
- Active State:** Active
- MAC Address:** 5C26.0AAD.0D2E
- Encapsulation Type:** Ethernet
- Proxy Arp:** Enable
- Local Proxy Arp:** Disable
- IP MTU:** 1500 (68 to 9198) Use Link MTU checked
- Bandwidth:** 10000 (1 to 10000000)
- Destination Unreachables:** Enable
- ICMP Redirects:** Enable

At the bottom right of the configuration table are three buttons: 'Delete Primary', 'Secondary IP Address', and 'Apply'.

- 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.

The screenshot shows the Dell PowerConnect M8024-k web interface. The left sidebar navigation tree is collapsed, showing sections like Home, System, Switching, Routing, ARP, IP, IPv6, OSPF, BOOTP/DHCP Relay Agent, IP Helper, RIP, Router Discovery, Router, VLAN Routing, VRRP, Tunnels, and Loopbacks. Under the IP section, 'IP Interface Configuration' is selected. The main content area is titled 'IP Interface Configuration: Detail' and shows configuration for 'Vlan102'. The configuration fields include:

| Setting                         | Value                          |
|---------------------------------|--------------------------------|
| Interface                       | Vlan102                        |
| Routing Mode                    | Enable                         |
| IP Address Configuration Method | Manual                         |
| IP Address                      | 1.1.2.10                       |
| Subnet Mask                     | 255.255.255.0                  |
| Forward Net Directed Broadcasts | Disable                        |
| Active State                    | Active                         |
| MAC Address                     | 5C26.0AAD.0D2E                 |
| Encapsulation Type              | Ethernet                       |
| Proxy Arp                       | Enable                         |
| Local Proxy Arp                 | Disable                        |
| IP MTU                          | 1500 (68 to 9198) Use Link MTU |
| Bandwidth                       | 10000 (1 to 10000000)          |
| Destination Unreachables        | Enable                         |
| ICMP Redirects                  | Enable                         |

At the bottom right of the configuration form are three buttons: 'Delete Primary', 'Secondary IP Address', and 'Apply'.

- 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.

The screenshot shows the Dell PowerConnect M8024-k web interface. The left sidebar navigation tree is collapsed, showing sections like Home, System, Switching, Routing, IP, and Statistics. The 'IP Interface Configuration' section is selected under the IP category. The main content area is titled 'IP Interface Configuration: Detail' for 'Vlan103'. The configuration form includes fields for Interface (Vlan103), Routing Mode (Enable), IP Address Configuration Method (Manual), IP Address (1.1.3.10), Subnet Mask (255.255.255.0), Forward Net Directed Broadcasts (Disable), Active State (Active), MAC Address (5C26.0AAD 0D2E), Encapsulation Type (Ethernet), Proxy Arp (Enable), Local Proxy Arp (Disable), IP MTU (1500), Bandwidth (10000), Destination Unreachables (Enable), and ICMP Redirects (Enable). At the bottom right are buttons for Delete Primary, Secondary IP Address, and Apply.

- 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
```

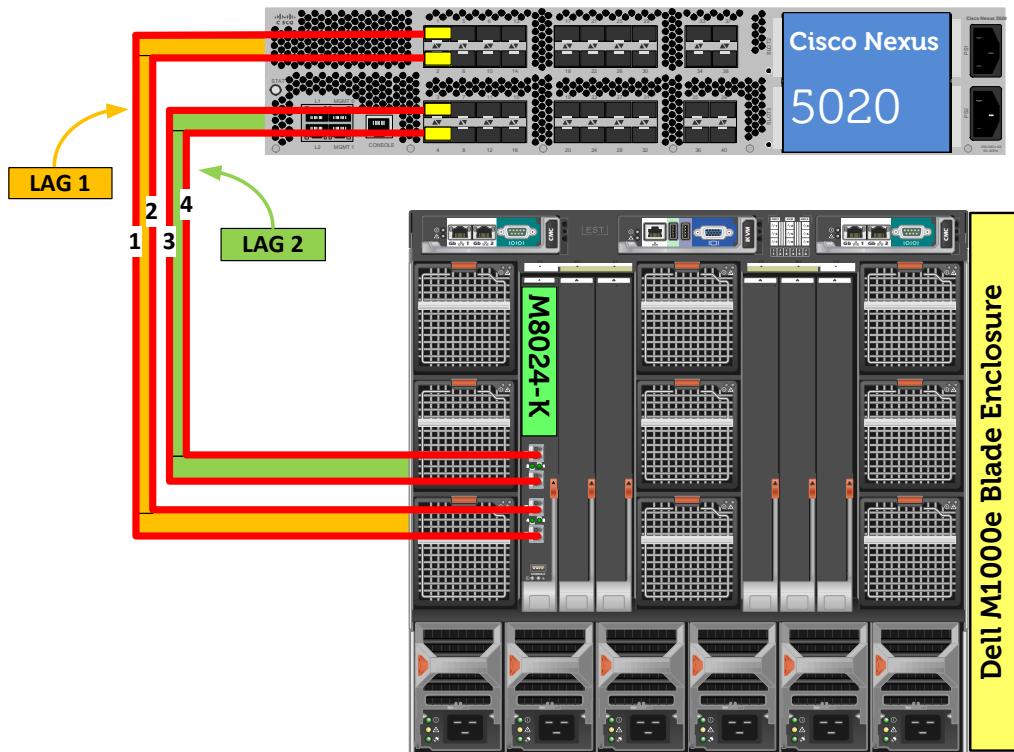
### ***Validation***

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.

|      | Te1 | Te2 | Te3 | Te4 | Te5 | Te6 | Te7 | Te8 | Te9 | Te10 | Te11 | Te12 | Te13 | Te14 | Te15 | Te16 | Te17 | Te18 | Te19 | Te20 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| LACP |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      | L    | L    | L    | L    |
| LAG  |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      | 1    | 1    | 2    | 2    |

- 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.

|           |  |
|-----------|--|
| VLAN ID   | <input type="text" value="101"/> (2 to 4093) |
| VLAN Name | <input type="text"/> (0 to 32 characters)    |

- 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.

**VLAN Membership: Add**

|           |                      |             |
|-----------|----------------------|-------------|
| VLAN ID   | 102                  | (2 to 4093) |
| VLAN Name | (0 to 32 characters) |             |

**Apply**

- 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**.

**LAG Settings: Detail**

|                   |           |
|-------------------|-----------|
| LAG               | Po1       |
| Port VLAN Mode    | General   |
| PVID              | 1         |
| Frame Type        | Admit All |
| Ingress Filtering | Enable    |

**Apply**

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar shows a navigation tree under the 'Switching' section, with 'VLAN' expanded and 'LAG Settings' selected. The main content area is titled 'LAG Settings: Detail'. It displays configuration fields for a selected LAG (Po2). The fields are:

|                   |               |
|-------------------|---------------|
| LAG               | Po2           |
| Port VLAN Mode    | General       |
| PVID              | 1 (1 to 4093) |
| Frame Type        | Admit All     |
| Ingress Filtering | Enable        |

At the bottom right of the form is a 'Apply' button.

- 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).

The screenshot shows the Dell OpenManage Switch Administrator web interface. The left sidebar has a tree view under the 'Switching > VLAN' section, with 'Port Settings' selected. The main panel title is 'Port Settings: Detail' for port 'Te1/0/1'. The configuration fields are:

|                   |                         |
|-------------------|-------------------------|
| Ports             | Unit 1 ▾ Port Te1/0/1 ▾ |
| Port VLAN Mode    | Access ▾                |
| PVID              | 101 (1 to 4093)         |
| Frame Type        | AdmitUntaggedOnly ▾     |
| Ingress Filtering | Enable ▾                |
| Port Priority     | 0 (0 to 7)              |

An 'Apply' button is at the bottom right.

- 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).

The screenshot shows the Dell OpenManage Switch Administrator web interface. The left sidebar has a tree view under the **System** tab, with **Port Settings** selected. The main content area is titled "Port Settings: Detail" and shows configuration for port **Te1/0/2**. The configuration fields are:

|                   |                                   |
|-------------------|-----------------------------------|
| Ports             | Unit <b>1</b> Port <b>Te1/0/2</b> |
| Port VLAN Mode    | <b>Access</b>                     |
| PVID              | <b>102</b> (1 to 4093)            |
| Frame Type        | <b>AdmitUntaggedOnly</b>          |
| Ingress Filtering | <b>Enable</b>                     |
| Port Priority     | <b>0</b> (0 to 7)                 |

At the bottom right is a **Apply** button.

- 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

**VLAN Membership: Detail**

Show VLAN

|                          |                                    |
|--------------------------|------------------------------------|
| Show VLAN                | 102-VLAN102                        |
| VLAN Name                | VLAN102 (0 to 32 characters)       |
| Status                   | Static                             |
| VLAN Participation All   | <input type="checkbox"/>           |
| VLAN ID-Individual/Range | <input type="text"/> Range[2-4093] |
| Participation All        | Autodetect                         |
| Tagging All              | Tagged                             |

Remove

|             |                          |
|-------------|--------------------------|
| Remove VLAN | <input type="checkbox"/> |
|-------------|--------------------------|

Unit

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | U | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |
| Current | F | U | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

Lags

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |
| Current | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |

- 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.

**System**  
PowerConnect M8024-k  
admin, r/w

**IP Interface Configuration**

**Detail** Show All

**IP Interface Configuration: Detail**

**Instructions:** Selecting **Loopbacks** from the Interface list redirects you to the **Loopbacks Configuration** page.

|                                 |                                |
|---------------------------------|--------------------------------|
| Interface                       | Vlan101                        |
| Routing Mode                    | Enable                         |
| IP Address Configuration Method | Manual                         |
| IP Address                      | 1.1.1.10                       |
| Subnet Mask                     | 255.255.255.0                  |
| Forward Net Directed Broadcasts | Disable                        |
| Active State                    | Active                         |
| MAC Address                     | 5C26.0AAD.0D2E                 |
| Encapsulation Type              | Ethernet                       |
| Proxy Arp                       | Enable                         |
| Local Proxy Arp                 | Disable                        |
| IP MTU                          | 1500 (68 to 9198) Use Link MTU |
| Bandwidth                       | 10000 (1 to 10000000)          |
| Destination Unreachables        | Enable                         |
| ICMP Redirects                  | Enable                         |

Delete Primary Secondary IP Address Apply

- 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.

**IP Interface Configuration: Detail**

| Instructions: Selecting Loopbacks from the Interface list redirects you to the <a href="#">Loopbacks Configuration</a> page. |                                |
|--|--------------------------------|
| Interface  | Vlan102                        |
| Routing Mode   | Enable                         |
| IP Address Configuration Method  | Manual                         |
| IP Address   | 1.1.2.10                       |
| Subnet Mask  | 255.255.255.0                  |
| Forward Net Directed Broadcasts  | Disable                        |
| Active State   | Active                         |
| MAC Address  | 5C26.0AAD.0D2E                 |
| Encapsulation Type   | Ethernet                       |
| Proxy Arp  | Enable                         |
| Local Proxy Arp  | Disable                        |
| IP MTU   | 1500 (68 to 9198) Use Link MTU |
| Bandwidth  | 10000 (1 to 10000000)          |
| Destination Unreachables   | Enable                         |
| ICMP Redirects   | Enable                         |

[Delete Primary](#) [Secondary IP Address](#) [Apply](#)

- 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.

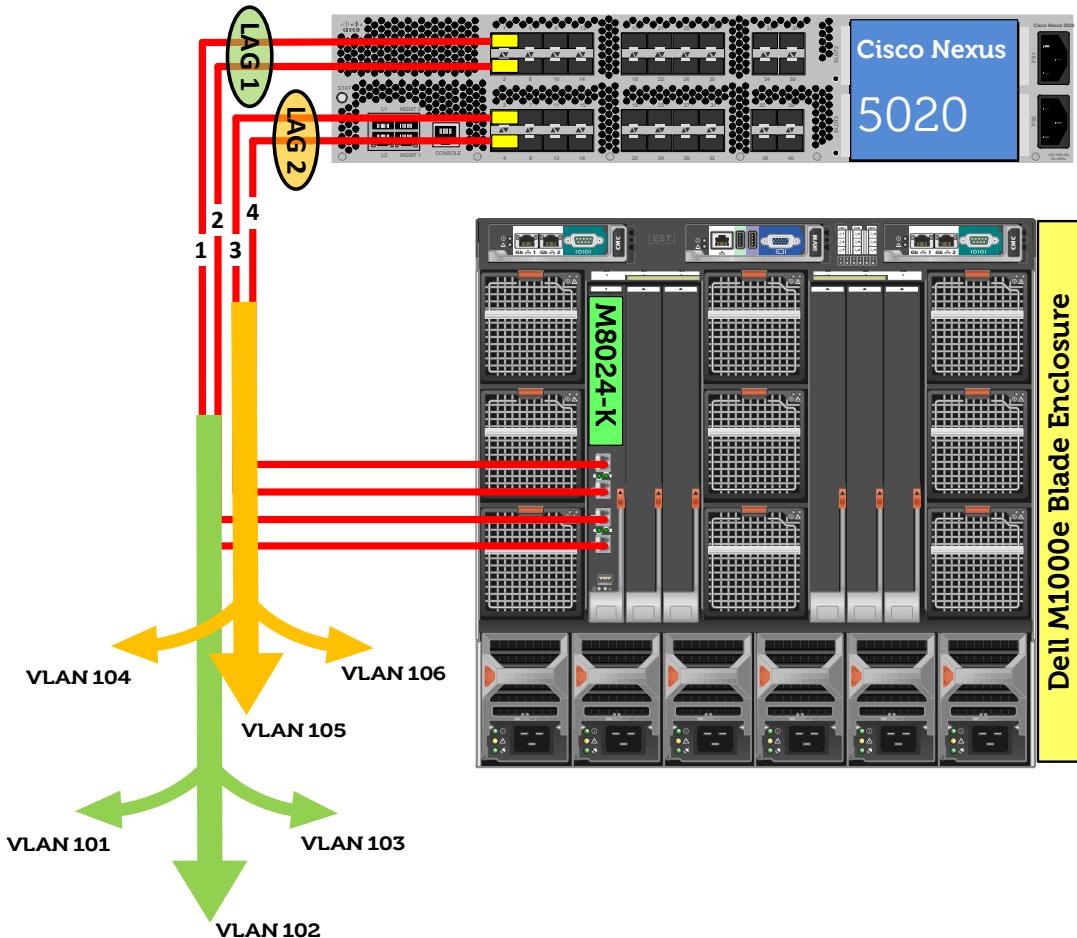
It is also possible to validate the entire path from the Cisco Nexus to the blade server, going through the PowerConnect M8024-k switch. In the example above the following lines were added to the M8024-k that put blade server traffic on slot 1 onto VLAN 101.

```
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.

| Ports | Te1 | Te2 | Te3 | Te4 | Te5 | Te6 | Te7 | Te8 | Te9 | Te10 | Te11 | Te12 | Te13 | Te14 | Te15 | Te16 | Te17 | Te18 | Te19 | Te20 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| LACP  |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| LAG   |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      | 1    | 1    | 2    | 2    |

- 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.

The screenshot shows the Dell OpenManage Switch Administrator web interface. The top header includes the DELL logo, the title "OPENMANAGE™ SWITCH ADMINISTRATOR", and links for "Support | About | Log Out". The left sidebar, titled "System", shows the switch model "PowerConnect M8024-k" and user "admin, r/w". It has a tree view with "Home", "System", "Switching" (expanded to show "Network Security", "Slots", "Ports", "Address Tables", "GARP", "Spanning Tree", "VLAN"), "VLAN Membership" (selected and highlighted in blue), and "Port Settings". The main content area is titled "VLAN Membership" and "Add". It contains two input fields: "VLAN ID" with the value "101" and a note "(2 to 4093)", and "VLAN Name" with an empty input field and a note "(0 to 32 characters)". Below the fields is a "Apply" button. The top right of the main panel has icons for Home, Print, Copy, and Help.

- 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.

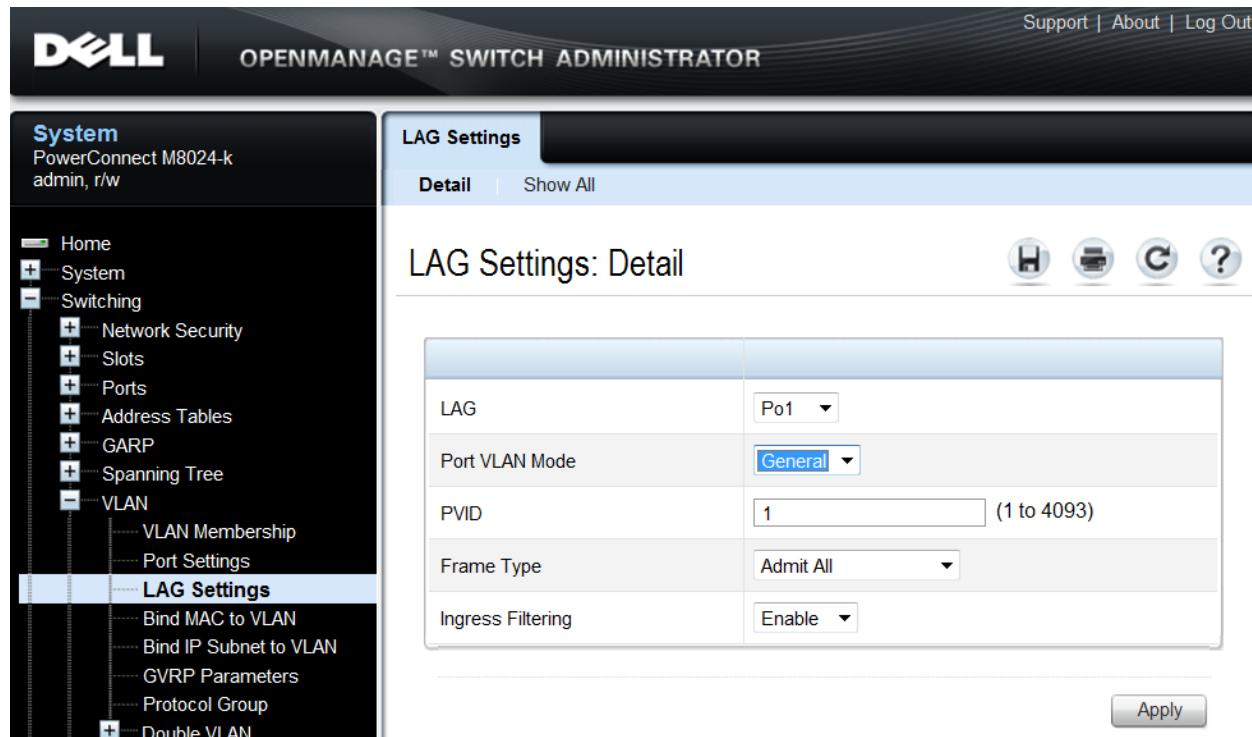
This screenshot shows the same interface as the previous one, but the "VLAN ID" field now contains "102". The "VLAN Name" field remains empty. The rest of the interface, including the sidebar, main title, and "Apply" button, is identical to the first screenshot.

- 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**.



The screenshot shows the Dell OpenManage Switch Administrator interface. The top navigation bar includes the DELL logo, OPENMANAGE™ SWITCH ADMINISTRATOR, Support, About, and Log Out links. The left sidebar menu is under the System section, with the Switching category expanded, showing options like Home, System, Ports, Address Tables, GARP, Spanning Tree, VLAN, and LAG Settings. The LAG Settings option is currently selected. The main content area is titled "LAG Settings: Detail" for LAG Po1. It displays configuration fields: LAG (Po1), Port VLAN Mode (General), PVID (1), Frame Type (Admit All), and Ingress Filtering (Enable). There are also icons for Help, Print, Copy, and Question. At the bottom right is an "Apply" button.

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The top navigation bar includes the DELL logo, the title "OPENMANAGE™ SWITCH ADMINISTRATOR", and links for "Support | About | Log Out". The left sidebar menu under "System" shows "PowerConnect M8024-k" and "admin, r/w". The main content area is titled "LAG Settings" and "Detail". It displays a configuration table with the following settings:

|                   |               |
|-------------------|---------------|
| LAG               | Po2           |
| Port VLAN Mode    | General       |
| PVID              | 1 (1 to 4093) |
| Frame Type        | Admit All     |
| Ingress Filtering | Enable        |

At the bottom right of the form is a blue "Apply" button.

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar shows a navigation tree with 'Port Settings' selected under 'Switching > VLAN'. The main panel displays 'Port Settings: Detail' for port Te1/0/1. The configuration includes:

|                   |                     |
|-------------------|---------------------|
| Ports             | Unit 1 Port Te1/0/1 |
| Port VLAN Mode    | General             |
| PVID              | 101 (1 to 4093)     |
| Frame Type        | Admit All           |
| Ingress Filtering | Enable              |
| Port Priority     | 0 (0 to 7)          |

An 'Apply' button is located at the bottom right of the form.

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator interface. The left sidebar shows a navigation tree with 'Port Settings' selected under 'Switching > VLAN'. The main panel displays 'Port Settings: Detail' for port Te1/0/2. The configuration includes:

|                   |                     |
|-------------------|---------------------|
| Ports             | Unit 1 Port Te1/0/2 |
| Port VLAN Mode    | General             |
| PVID              | 102 (1 to 4093)     |
| Frame Type        | Admit All           |
| Ingress Filtering | Enable              |
| Port Priority     | 0 (0 to 7)          |

An 'Apply' button is located at the bottom right of the form.

- 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.

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |
| Current | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |

- 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.

| Unit    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | U | F | F | F | F | F | F | F | F  | F  | F  |    |    |    |    |    |    |    |    |

| Lags    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

- 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.

**VLAN Membership: Detail**

Show VLAN

|                          |                               |
|--------------------------|-------------------------------|
| Show VLAN                | 103-VLAN0103                  |
| VLAN Name                | VLAN0103 (0 to 32 characters) |
| Status                   | Static                        |
| VLAN Participation All   | <input type="checkbox"/>      |
| VLAN ID-Individual/Range | Range[2-4093]                 |
| Participation All        | Autodetect                    |
| Tagging All              | Tagged                        |

Remove

|             |                          |
|-------------|--------------------------|
| Remove VLAN | <input type="checkbox"/> |
|-------------|--------------------------|

Unit

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

Lags

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |

- 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.

| Unit    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

| Lags    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |

- 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.

**VLAN Membership: Detail**

Show VLAN

|                          |                                    |
|--------------------------|------------------------------------|
| Show VLAN                | 105-VLAN0105 ▾                     |
| VLAN Name                | VLAN0105 (0 to 32 characters)      |
| Status                   | Static                             |
| VLAN Participation All   | <input type="checkbox"/>           |
| VLAN ID-Individual/Range | <input type="text"/> Range[2-4093] |
| Participation All        | Autodetect ▾                       |
| Tagging All              | Tagged ▾                           |

Remove

|             |                          |
|-------------|--------------------------|
| Remove VLAN | <input type="checkbox"/> |
|-------------|--------------------------|

Unit 1

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

Lags

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |

- 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.

**VLAN Membership: Detail**

Show VLAN

|           |                               |
|-----------|-------------------------------|
| Show VLAN | 106-VLAN0106                  |
| VLAN Name | VLAN0106 (0 to 32 characters) |
| Status    | Static                        |

VLAN Participation All

VLAN ID-Individual/Range Range[2-4093]

Participation All Autodetect

Tagging All Tagged

Remove

|             |  |
|-------------|--|
| Remove VLAN |  |
|-------------|--|

Unit 1

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

Lags

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | F | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |

- 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.

The screenshot shows the Dell PowerConnect M8024-k web interface. The left sidebar navigation tree is collapsed, showing sections like Home, System, Routing, IP, and others. The main content area is titled "IP Interface Configuration: Detail". It displays configuration parameters for a selected interface. The "Interface" dropdown is set to "Vlan101". Other fields include:

- Routing Mode:** Enable
- IP Address Configuration Method:** Manual
- IP Address:** 1.1.1.10
- Subnet Mask:** 255.255.255.0
- Forward Net Directed Broadcasts:** Disable
- Active State:** Active
- MAC Address:** 5C26.0AAD.0D2E
- Encapsulation Type:** Ethernet
- Proxy Arp:** Enable
- Local Proxy Arp:** Disable
- IP MTU:** 1500 (68 to 9198) Use Link MTU checked
- Bandwidth:** 10000 (1 to 10000000)
- Destination Unreachables:** Enable
- ICMP Redirects:** Enable

At the bottom right of the configuration form are three buttons: "Delete Primary", "Secondary IP Address", and "Apply".

- 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.

The screenshot shows the Dell PowerConnect M8024-k web interface. The left sidebar navigation tree is collapsed, showing sections like Home, System, Switching, Routing, ARP, IP, Statistics, and various protocols (DHCP Server, IPv6, OSPF, etc.). The 'IP Interface Configuration' section is selected under the IP category. The main content area is titled 'IP Interface Configuration: Detail' for 'Vlan102'. It contains a table with the following configuration details:

| Instructions: Selecting Loopbacks from the Interface list redirects you to the <a href="#">Loopbacks Configuration</a> page. |                                |
|--|--------------------------------|
| Interface  | Vlan102                        |
| Routing Mode   | Enable                         |
| IP Address Configuration Method  | Manual                         |
| IP Address   | 1.1.2.10                       |
| Subnet Mask  | 255.255.255.0                  |
| Forward Net Directed Broadcasts  | Disable                        |
| Active State   | Active                         |
| MAC Address  | 5C26.0AAD.0D2E                 |
| Encapsulation Type   | Ethernet                       |
| Proxy Arp  | Enable                         |
| Local Proxy Arp  | Disable                        |
| IP MTU   | 1500 (68 to 9198) Use Link MTU |
| Bandwidth  | 10000 (1 to 10000000)          |
| Destination Unreachables   | Enable                         |
| ICMP Redirects   | Enable                         |

At the bottom right of the configuration table are three buttons: 'Delete Primary', 'Secondary IP Address', and 'Apply'.

- 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***

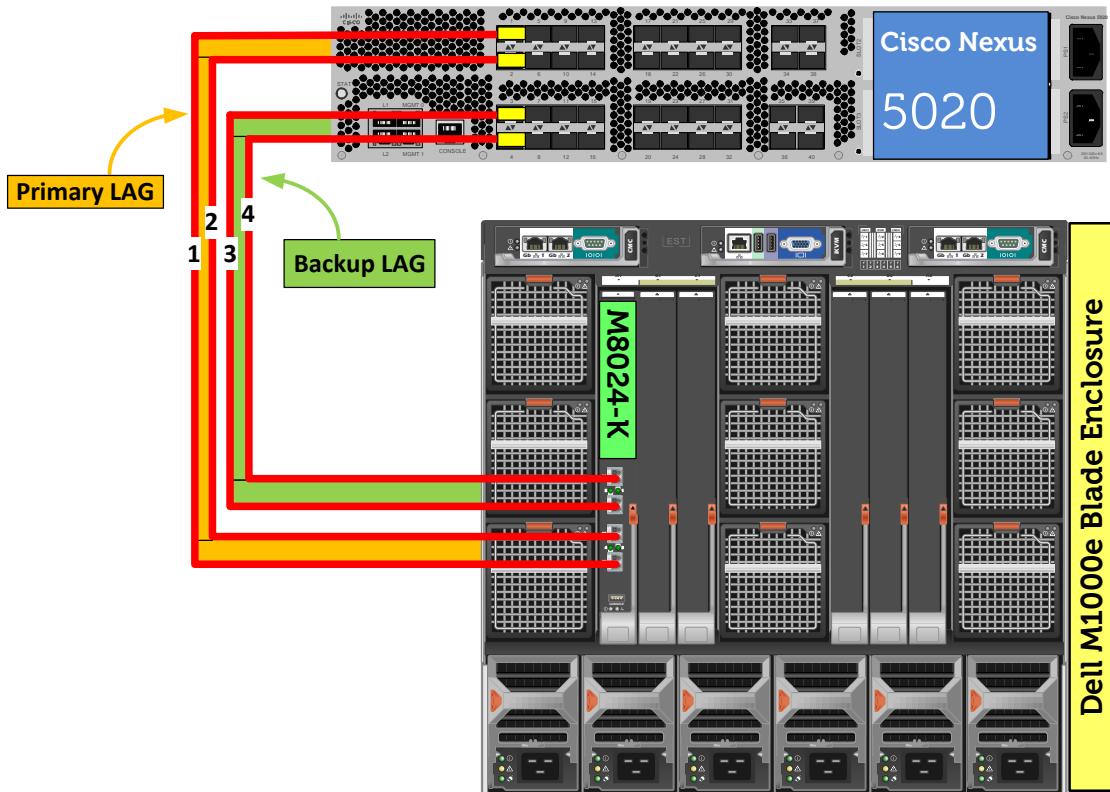
An IP address was assigned to each VLAN interface on the PowerConnect switch as well as the Cisco switch. To validate each VLAN setup, ping each IP subnet between the two switches.

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.

|      | Ports | Te1 | Te2 | Te3 | Te4 | Te5 | Te6 | Te7 | Te8 | Te9 | Te10 | Te11 | Te12 | Te13 | Te14 | Te15 | Te16 | Te17 | Te18 | Te19 | Te20 |
|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| LACP |       |     |     |     |     |     |     |     |     |     |      |      |      | L    | L    | L    | L    |      |      |      |      |
| LAG  |       |     |     |     |     |     |     |     |     |     |      |      |      | 1    | 1    | 2    | 2    |      |      |      |      |

- 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.

|                          |  |
|--------------------------|--|
| VLAN ID-Individual/Range | <input type="text" value="100"/> (2 to 4093) |
| VLAN Name                | <input type="text"/>                         |

- 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**.

The screenshot shows the Dell OpenManage Switch Administrator web interface. The top navigation bar includes the Dell logo, 'OPENMANAGE™ SWITCH ADMINISTRATOR', and links for 'Support | About | Log Out'. The left sidebar menu under 'System' shows 'PowerConnect M8024-k' and 'admin, r/w'. The main content area has a title 'LAG Settings' with tabs 'Detail' and 'Show All'. Below this is a sub-section titled 'LAG Settings: Detail'. On the right side of this section are icons for Help, Print, Copy, and Refresh. The configuration form contains the following fields:

|                   |                 |
|-------------------|-----------------|
| LAG               | Po1             |
| Port VLAN Mode    | General         |
| PVID              | 100 (1 to 4093) |
| Frame Type        | Admit All       |
| Ingress Filtering | Enable          |

An 'Apply' button is located at the bottom right of the configuration area.

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

The screenshot shows the Dell OpenManage Switch Administrator interface. The top navigation bar includes the Dell logo, the title "OPENMANAGE™ SWITCH ADMINISTRATOR", and links for "Support | About | Log Out". The left sidebar menu under "System" shows "PowerConnect M8024-k" and "admin, r/w". The main content area has a breadcrumb path "LAG Settings > Detail". Below this, there is a table with the following fields:

|                   |                 |
|-------------------|-----------------|
| LAG               | Po2             |
| Port VLAN Mode    | General         |
| PVID              | 100 (1 to 4093) |
| Frame Type        | Admit All       |
| Ingress Filtering | Enable          |

At the bottom right of the table is a "Apply" button.

- 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.

**VLAN Membership: Detail**

Show VLAN

|                          |                                    |
|--------------------------|------------------------------------|
| Show VLAN                | 100-VLAN0100                       |
| VLAN Name                | VLAN0100 (0 to 32 characters)      |
| Status                   | Static                             |
| VLAN Participation All   | <input type="checkbox"/>           |
| VLAN ID-Individual/Range | <input type="text"/> Range[2-4093] |
| Participation All        | Autodetect                         |
| Tagging All              | Tagged                             |

Remove

|             |                          |
|-------------|--------------------------|
| Remove VLAN | <input type="checkbox"/> |
|-------------|--------------------------|

Unit 1

| Port    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Static  | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |
| Current | F | F | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |

Lags

| Lag     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Static  | T | T |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Current | T | T | F | F | F | F | F | F | F | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  | F  |    |    |    |    |    |    |

- 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.

The screenshot shows the 'IP Interface Configuration: Detail' page. The left sidebar navigation tree includes Home, System, Switching, Routing, ARP, IP, IP Interface Configuration, DHCP Client Lease Parameters, DHCP Server, IPv6, OSPF, BOOTP/DHCP Relay Agent, IP Helper, RIP, Router Discovery, Router, VRRP, Tunnels, and Loopback Interfaces. The 'IP Interface Configuration' node is selected. The main panel displays configuration for 'Interface' Vlan100, with 'Routing Mode' set to 'Enable'. Other fields include 'IP Address' (1.1.1.10), 'Subnet Mask' (255.255.255.0), 'Forward Net Directed Broadcasts' (Disable), 'Active State' (Active), 'MAC Address' (5C26.0AAD.0D2E), 'Encapsulation Type' (Ethernet), 'Proxy Arp' (Enable), 'Local Proxy Arp' (Enable), 'IP MTU' (1500), 'Bandwidth' (10000), 'Destination Unreachables' (Enable), and 'ICMP Redirects' (Enable). A note at the top states: 'Instructions: Selecting Loopback Interfaces from the Interface list redirects you to the Loopback Interfaces Configuration page.'

- 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.

The screenshot shows the 'Configuration: Detail' page under 'Link Dependency'. The left sidebar navigation tree includes Home, System, Switching, Network Security, Slots, Ports, Address Tables, GARP, Spanning Tree, VLAN, Link Aggregation, Multicast Support, MVR Configuration, LLDP, Dynamic ARP Inspection, DHCP Snooping, DHCP Relay, IP Source Guard, PFC, and Link Dependency. The 'Link Dependency' node is selected. The main panel displays 'Group ID' (1), 'Link Action' (Up), and three lists: 'Member Ports' (Po2), 'Available Ports' (Te1/0/19, Te1/0/20, Po3, Po4, Po5, Po6, Po7, Po8, Po9, Po10), and 'Ports Depended On' (Po1). An 'Apply' button is at the bottom right.

- 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.