Simple Switch Mode: Port Aggregator Feature

White Paper

DELL® PowerConnect™

M6220/M6348/M8024

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Notes, Notices, and Cautions

A NOTE indicates important information that helps you make better use of your computer.

A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

A CAUTION indicates a potential for property damage, personal injury, or death.

Model M6220/M6348/M8024

Rev. A03

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Abstract

This white paper discusses Dell® PowerConnect™ blade server switch operation in Simple mode. PowerConnect blade server switches can be purchased either as standard Ethernet switches with Simple Mode operation as a configurable option or as switches that operate in simple mode exclusively (Locked Simple Mode). The topics reviewed in this document apply to Simple Mode operation in both standard and locked versions of the switches.

Introduction

The Port Aggregator feature minimizes the administration required for managing the Dell PowerConnect M6220/M6348/M8024. The Dell PowerConnect M6220/M6348/M8024 are Layer 3, Gigabit Ethernet switch blades for the Dell PowerEdge M1000e. The Dell PowerEdge M1000e can support up to 16 Server Blades and six Input Output Modules (IOMs).

The Port Aggregator feature minimizes the administration required for managing the Blade-based switches. When the switch is operating in Simple mode, the administrator can map internal ports to external ports without having to know anything about Spanning Tree Protocol (STP), Virtual Local Area Network (VLAN), Link Aggregation, or other L2/L3 protocols. For a list of Port Aggregator advantages, see page 5.

Definitions

This document assumes the reader is familiar with the Dell PowerConnect M6220/M6348/M8024 switch architecture.

Term/Acronym	Definition
CLI	Command Line Interface
CMC	Chassis Management Controller
HA	High Availability
IOM	Input Output Module
LACP	Link Aggregation Control Protocol
LACPDU	Link Aggregation Control Protocol Data Unit
LAG	Link Aggregation Group (Trunk)
LOM	LAN on motherboard
NIC	Network Interface Card
SNMP	Simple Network Management Protocol
STP	Spanning Tree Protocol
UI	User Interface
VLAN	Virtual Local Area Network

Description

The Port Aggregator feature is available when the switch is operating in Simple Mode. Simple Mode is disabled by default. The user is provided with an option to select the operational mode as Simple Mode or Normal Mode from the Dell CLI Setup wizard. In addition to this, users with privilege level 15 may change the mode via the CLI, Web, and SNMP user interfaces.

***NOTE*:** A trap identified by operationalModeChangeTrap is issued when the SNMP user changes the operational mode.

For information about changing the operational mode, refer to the Port Aggregator section of the *Dell PowerConnect M6220/M6348/M8024 Configuration Guide*.

Advantages

- Port Aggregator is simple to configure: map the internal ports to the external ports, assign a VLAN to the group (if required).
- This feature automatically configures multiple external ports into an LACP trunk group.
- By using aggregator groups, the feature provides loop-free operation without using STP.
- It works across a stack of switches (M6220 and M6348) so that you can now manage switches as one via the easy-to-use interface.
- This feature provides seamless interoperability: Uplink looks like NIC ports to the network.
- Port Aggregator is completely interoperable. Dynamic (via LACP) and static link aggregation are supported on the external ports.

Default Configurations

A default Port Aggregation (PA) group is configured on each switch. It includes all internal ports and the external ports to which they are mapped. The external ports in the PA group form a Link Aggregation Control Protocol (LACP) trunk group; therefore, like LACP groups, PA groups are limited to eight external member ports.

For M6220 and M6348 stacked switches, each unit in the stack has a default PA group. The default groups include the following ports:

- M6220 — Internal ports (1/g1–16) and all fixed front-panel 1G ports (1g17–1g20).
- M8024 — Internal ports (1/xg1–1/xg16) and all front-panel ports (1/xg17–1/xg24).
- M6348 — Internal ports (1/g1–1/g32) and the first eight front-panel 1G ports (1g/33–1g/40).

***NOTE*:** In the default configuration, any external ports that do not belong to the default PA group do not participate in any VLAN. Therefore, the external ports that are not in the default PA groups cannot switch traffic.

Figure 1 illustrates the default condition on a stand-alone M6220 (not in a stack).

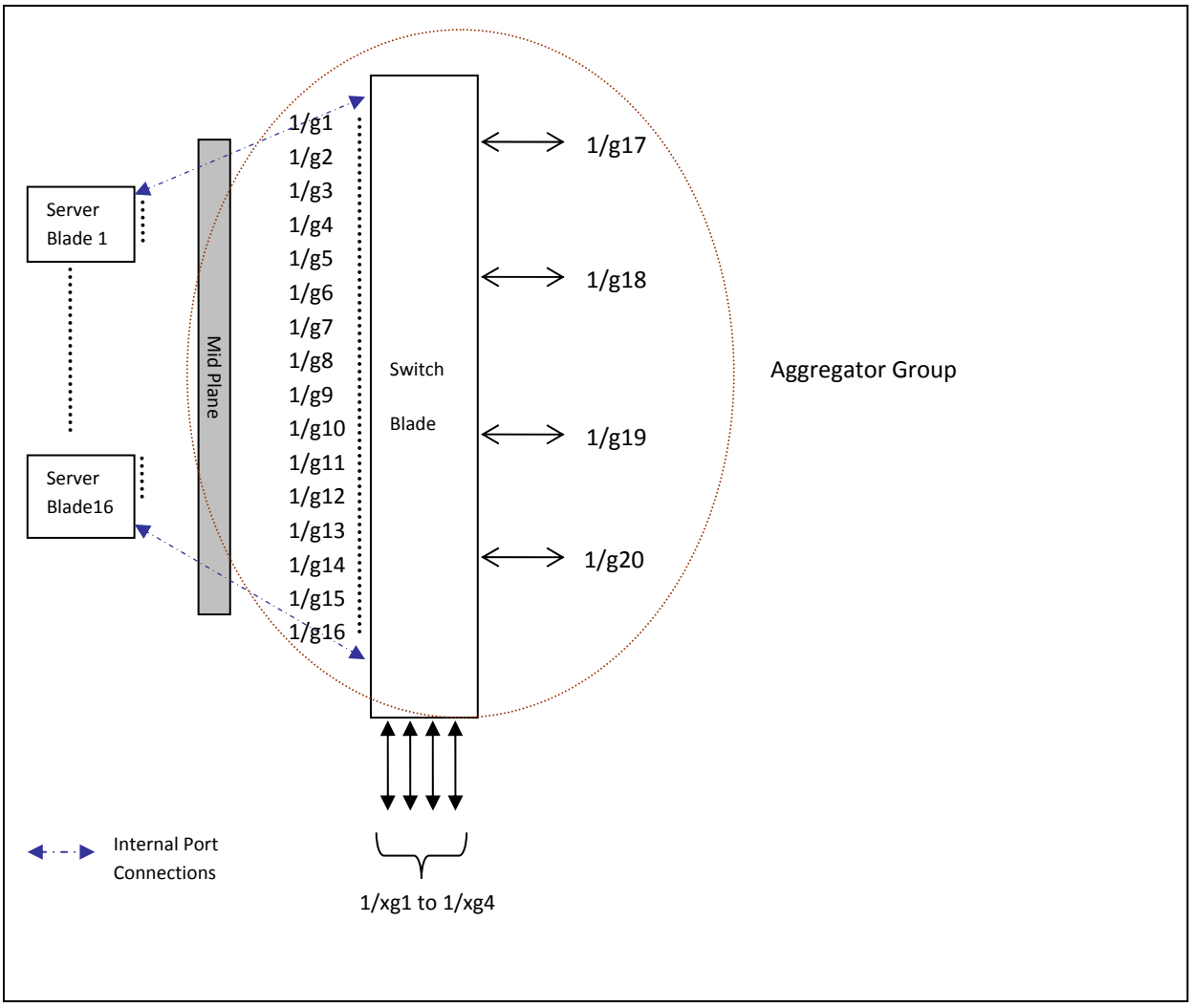


Figure 1. Default Aggregator Groups on a Modular Switch

Figure 2 illustrates the default condition on a stack of two switches. The M6220 and M6348 can be stacked with switches of the same model number (not with each other). The M8024 does not support stacking.

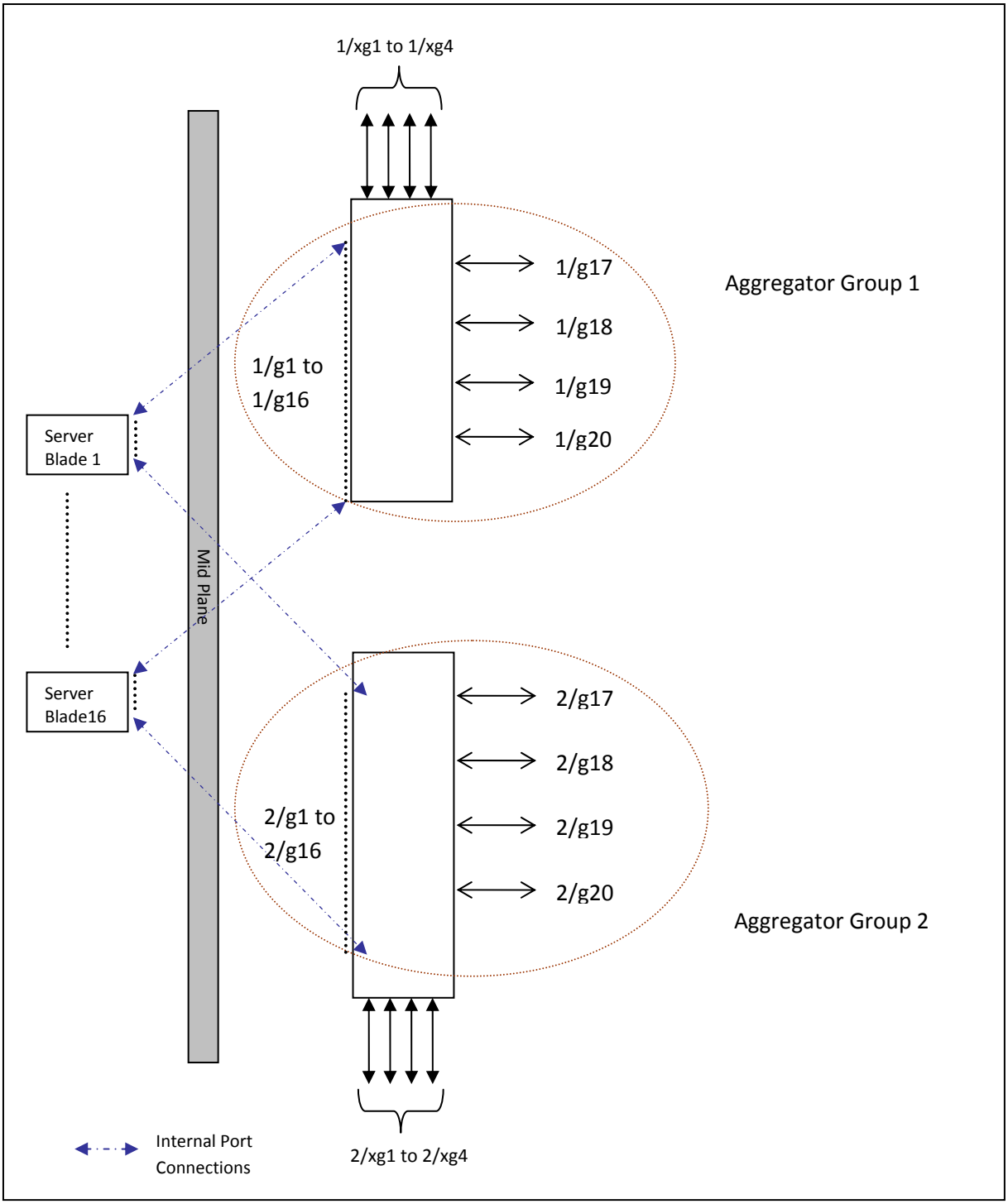


Figure 2. Default Aggregator Groups on a Stack of Two M6220 Switches

The following tables show the default Port Aggregator Group mappings for the PCM6220, PCM6348, and PCM8024 switches.

Table 1: PCM6220 Default Port Aggregator Group Mapping

Aggregator Group	Member Internal Ports	Member Uplink (External) Ports
Group 1	1/g1,1/g2,1/g3,1/g4, 1/g5, 1/g6, 1/g7, 1/g8, 1/g9, 1/g10, 1/g11, 1/g12, 1/g13, 1/g14, 1/g15, 1/g16	1/g17, 1/g18, 1/g19, 1/g20
Group 2	2/g1,2/g2,2/g3,2/g4, 2/g5, 2/g6, 2/g7, 2/g8, 2/g9, 2/g10, 2/g11, 2/g12, 2/g13, 2/g14, 2/g15, 2/g16	2/g17, 2/g18, 2/g19, 2/g20

Table 2: PCM6348 Default Port Aggregator Group Mapping

Aggregator Group	Member Internal Ports	Member Uplink (External) Ports
Group 1	1/g1,1/g2,1/g3,1/g4, 1/g5, 1/g6, 1/g7, 1/g8, 1/g9, 1/g10, 1/g11, 1/g12, 1/g13, 1/g14, 1/g15, 1/g16, 1/g17,1/g18,1/g19,1/g20, 1/g21, 1/g22, 1/g23, 1/g24, 1/g25, 1/g26, 1/g27, 1/g28, 1/g29, 1/g30, 1/g31, 1/g32	1/g33, 1/g34, 1/g35, 1/g36 1/g37, 1/g38, 1/g39, 1/g40
Group 2	2/g1,2/g2,2/g3,2/g4, 2/g5, 2/g6, 2/g7, 2/g8, 2/g9, 2/g10, 2/g11, 2/g12, 2/g13, 2/g14, 2/g15, 2/g16, 2/g17, 2/g18, 2/g19, 2/g20, 2/g21, 2/g22, 2/g23, 2/g24, 2/g25, 2/g26, 2/g27, 2/g28, 2/g29, 2/g30, 2/g31, 2/g32	2/g33, 2/g34, 2/g35, 2/g36 2/g37, 2/g38, 2/g39, 2/g40

Table 3: PCM8024 Default Port Aggregator Group Mapping

Aggregator Group	Member Internal Ports	Member Uplink (External) Ports
Group 1	1/xg1,1/xg2,1/xg3,1/xg4, 1/xg5, 1/xg6, 1/xg7, 1/xg8, 1/xg9, 1/xg10, 1/xg11, 1/xg12, 1/xg13, 1/xg14, 1/xg15, 1/xg16	1/xg17, 1/xg18, 1/xg19, 1/xg20, 1/xg21, 1/xg22, 1/xg23, 1/xg24

The maximum number of external ports that can be included in a group is limited to the maximum number of ports that can be included in both primary and secondary LAG. Eight is the maximum number of ports that can be included in a LAG.

For the PCM6220 and PCM6348 switches, the same default configuration is extended to each switch in the stack. The default configuration does not include 10G ports as part of any Aggregator Group, although they can be configured if desired.

***NOTE*:** 1G and 10G external ports cannot be used at the same time within the same Aggregator Group.

A stand-alone switch in Simple Mode supports up to eight Aggregator Groups, and a stack supports up to '6*<Number of Units in stack>' Aggregator Groups. For example, in a stack of

four units, the maximum number of Aggregator Groups is 24. On a 12-unit stack, the maximum number of groups is 72.

The number of internal ports in an Aggregator Group can include 1 up to the total number of available internal ports. The number of external ports that can be included in a group is limited to the maximum number of ports that can be included in both primary and secondary LAG. Eight is the maximum number of ports that can be added in either primary or secondary LAG. No member port, either internal or external, can participate in more than one Aggregator Group.

To prevent traffic from different groups being seen by other groups, a VLAN is reserved for each Aggregator Group by default. This VLAN reservation per group is not configurable; however, you can configure each group to participate in more than one user-created (unreserved) VLAN. VLANs 4022–4093 are reserved for each Aggregator Group, starting from 4022 for Group 1. The reserved VLANs are excluded from the user-configurable VLAN list. Member ports of the Aggregator Group are excluded from all other VLANs except the one reserved for that Group. With this reserved VLAN count, the maximum user-configurable VLANs become 952 (1024–72). This VLAN segregation ensures that the flooding occurs only within the Aggregator Group but not across groups. The MAC Address tables are shown for each Aggregator Group separately, and an 'all' option in the CLI command can be used to show all the MAC addresses in all the groups. You are not allowed to include a VLAN in more than one aggregator group.

To prevent network loops and maximize bandwidth to and from the switch, when the number of uplink ports (external ports) is more than 1, you can configure the LACP (IEEE 802.3ad) capability on the uplink ports. To distribute traffic when multiple external ports are included in a LAG, a hashing mode that is based on source MAC and destination MAC is used. You can configure the LACP mode to static/auto/off on the multiple uplink ports. When configured in "static" mode, the uplink ports will be set to Static mode (static LAG). Use static mode when connecting to a switch that does not support LACP or that has LACP disabled on its ports. When LACP mode of a group is set to "auto" and no LACP PDUs are received on any of the external links, then all ports except the lowest numbered active port would be put into passive state. A port in passive state can listen to LACP PDUs only, but cannot forward traffic. This is done to provide connectivity while preventing loops on a network that is not fully configured. This means that external ports will be reenabled when LACP PDU is detected on the passive links, without user intervention. When configured in "off" mode, links on all but one uplink port in that Aggregator group will be forced to down. In this case, lowest numbered uplink port will be active, and all other ports will be forced to down state.

Because the NICs on the server are connected to the M6220/M6348/M8024 switch, the NICs cannot tell if the switch has lost connectivity to the network. This means NIC teaming modes that rely on detecting link status will not fail over if all the uplink ports on the switch are down. To support NIC teaming failover on the server blades, all the internal ports in the Aggregator Group will be brought down if the links on all the uplink ports in that Aggregator Group are down. As soon as one or more of the uplink ports come up, all the internal ports are brought up again. This is the default behavior. You can also configure the minimum number of physical uplinks ports to be active for an Aggregator Group to be active. By default, this (minimum

number of uplinks ports to be active) is 1, which means if there is at least one external port up in the Aggregator Group, all the internal ports will be kept open. Internal ports in the Aggregator Group brought down only when all the mapped external ports are down or disconnected. For example, if you configure 1/g1, 1/g2, 1/g3, 1/g4, 1/g17, 1/g18 as members of Group 1, and configure that the minimum number of uplink ports to be active as 2, all the internal ports of the Aggregator Group will be brought down if any one of the links on 1/g17 or 1/g18 is down. As soon as the links on both 1/g17 and 1/g18 are up, the internal ports are brought up again.

A new CLI configuration mode, Aggregator Group Mode, has been created. You can enter this mode using the command **port-aggregator group <group id>** in Global Configuration mode. When Simple Mode is enabled, negotiation, speed, duplex, VLAN, and MTU configurations are allowed on the Aggregator Group but not on the individual ports. These configurations are applied to all the member ports of the Aggregator Group.

A user with privilege level 15 can change the mode of operation using the CLI, Web, and SNMP interfaces.

Entry into Normal Mode or Simple Mode is a customer-selectable option. You can configure the mode of operation from the CLI, Web, and SNMP interfaces.

- A user with privilege level 15 can change the operational mode from Simple to Normal and vice versa.
- Operational mode is set to Normal mode on resetting the configuration to Factory defaults from the software boot menu.
- When you change the operational mode, a trap is generated apart from logging a message.
- The switch maintains two separate configuration files, one for Simple Mode and another for Normal Mode. The selection of the configuration file while applying the configuration is based on the mode selection. If there is no saved configuration, then the default configuration of the selected mode is applied.
- Simple Mode allows the user to create Aggregation Groups (see Figure 1) where internal ports and external ports can be configured in a separate broadcast domain.
- Security-related configurations: dot1x, RADIUS, TACACS+ are allowed when the switch is operating in Simple Mode.
- All other feature configurations from the CLI/Web/SNMP interfaces are disabled, and the user does not see any commands/pages/MIBs related to all other regular features that are available in Normal Mode.
- The default management VLAN of the Simple Mode is the same as the reserved VLAN of the first port aggregator group.

- The switch handles traffic in the following way when in Simple Mode:
  - Tagged traffic would be dropped if the incoming port is not a member of the incoming packet's VLAN.
  - Untagged reserved VLAN traffic is switched and untagged at the egress.
  - Tagged and untagged traffic that belongs to a user-created VLAN gets switched in that VLAN and egresses as tagged.

NOTE: The reserved VLAN ID assigned to a group is also referred to as a default VLAN.

- The hashing algorithm in Simple Mode is the same as the default hashing algorithm in Normal mode. In Normal mode, the default hashing is based on source MAC and destination MAC address. You cannot change the hash algorithm in Simple Mode. Ports that are already a member of a LAG are external ports that are shown using the **show port-aggregator port summary** command. In Simple Mode, you can set the LACP mode on a group, but not on an individual port. Use the **show interface status** command to check the lag status.

LAG Failover

LAG Redundancy in Simple Mode

Since spanning tree is inactive in Simple Mode, there is no other way for a redundant link to become active when a primary link has failed. In Simple Mode, all external ports in a group belong to a LAG, so this failover will only apply to LAGs. A LAG is considered failed if the number of active member ports falls below a user-configured number.

VLAN Assignment to Internal Ports

Adding a VLAN to a port aggregator group means that all ports in the group participate in the same VLAN. It is also possible to segregate some server traffic from other traffic in the group: you can configure an internal port to participate in either a tagged or untagged VLAN. Any VLAN added to an internal port will automatically be added to all the external ports in the same port aggregator group as a tagged VLAN.

What the Port Aggregator Does Not Do

The following features are not available when the switch is operating in Simple Mode:

- No SNMPv3
- Restricted management interface
- Limited configuration
- Certain commands, such as routing-related features and QoS, are not supported.

User Interfaces

You can control the Port Aggregator feature using the CLI, Web, and SNMP interfaces.

Web Interface

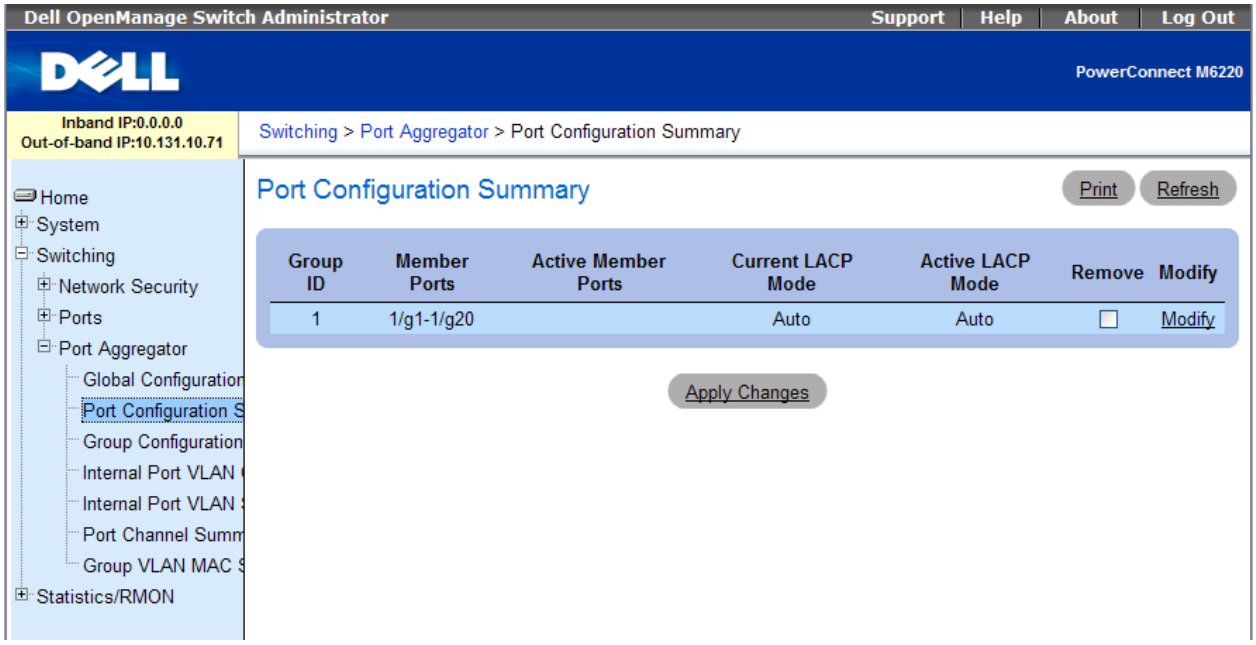
To display the **Port Aggregator** page, click **Switching** > **Port Aggregator** in the tree view. Use this page to go to the following features:

- Port Configuration Summary
- Group Configuration Summary
- Group VLAN MAC Summary
- Configuring LAG Failover

Port Configuration Summary

Use the **Port Configuration Summary** page to view information about the port members and LACP modes for the aggregator groups. From the **Port Configuration Summary** page, you can access the **Port Configuration** page.

To display the **Port Configuration Summary** page, click **Switching > Port Aggregator** > **Port Configuration Summary** in the tree view.



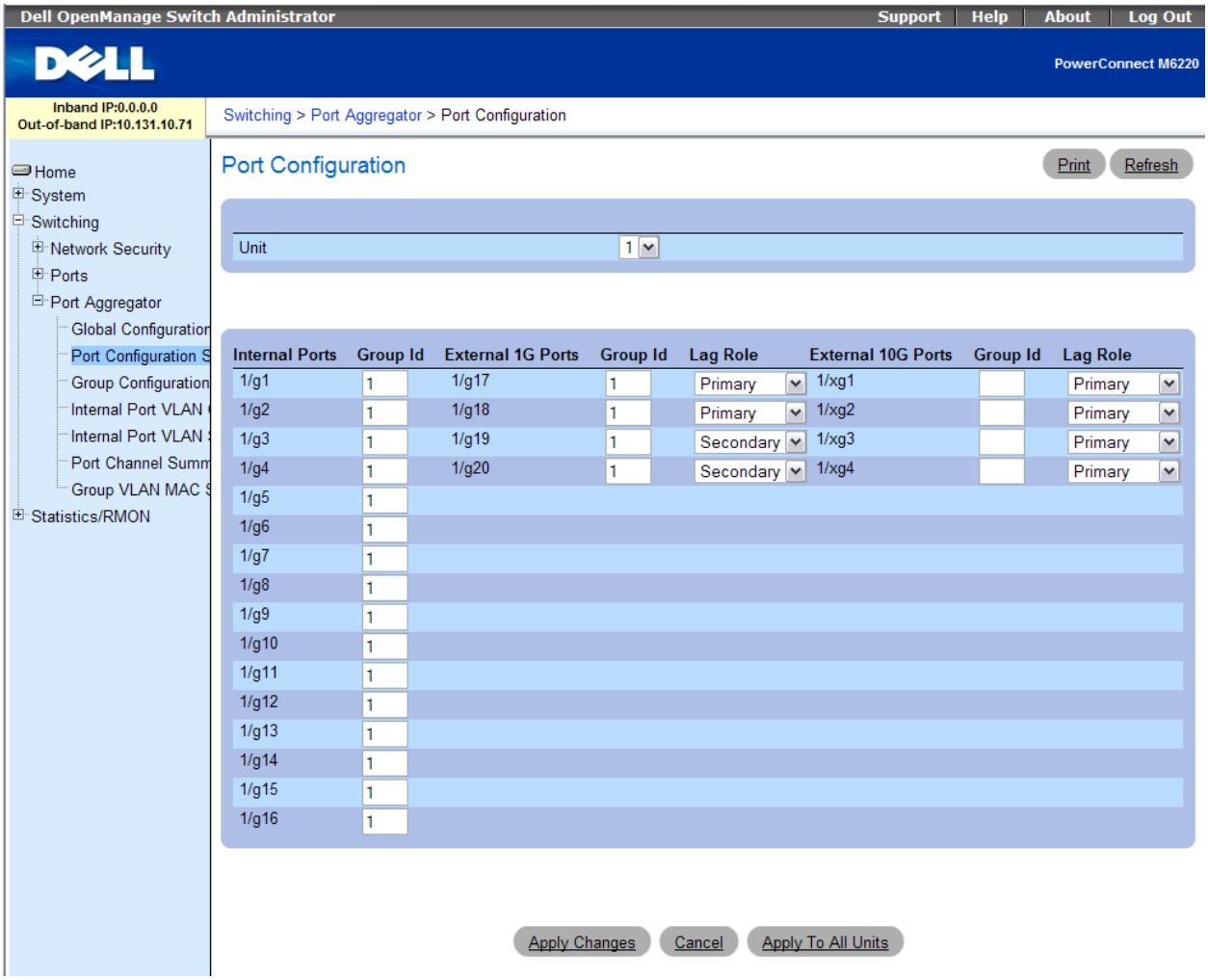
Field	Description
Group ID	The ID number of the group.
Member Ports	The list of member ports belonging to the group.
Active Member Ports	A member's port whose link status is active.
Current LACP Mode	Specifies the configured LACP mode of the group.
Active LACP Mode	Specifies the operational LACP mode. This could be different from the configured mode.

Button	Function
Print	Click the Print button to print the page.
Refresh	Click the Refresh button to refresh the page with the latest information from the switch.
Remove	Select the Remove checkbox for the groups with the ports to remove.
Modify	A link for modifying the configuration of a group. Click this link to bring up the configuration page for the group.
Apply Changes	Click the Apply Changes button to apply to the switch those changes selected in the Web page. If you select the Remove checkbox, then click the Apply Changes button, all the ports (if any ports are present) included in that group are removed. The group would still be visible with an empty member port list.

Configuring Port Aggregator Groups

You can assign each port to an aggregator group from the **Port Configuration** page, which is accessible from the **Port Configuration Summary** page. By default, all ports are in aggregator group 1.

1. Open the Port Configuration Summary page.
2. Click any **Modify** link to access the **Port Configuration** page.
3. The Port Configuration page displays.



4. Enter the aggregator group number in the group ID field for the required ports and then click **Apply Changes**.

The configuration in the previously described screen shows that internal ports 1–8 and external ports 17–18 are in aggregator group 2, and internal ports 9–16 and external ports 19–20 are in aggregator group 4.

Field	Description
Unit	The unit number. Refers to a member in the stack. Valid values are 1–12.
Internal Ports	A list of all the available internal member ports.
Group ID	Enter the Group ID to include the corresponding member ports. Group ID is an identifier of a logical port aggregator group that may have internal ports, external 1G ports, and external 10G ports as members.
LAG Role	Assigns either a primary or secondary level of importance to the LAG. The first LAG created in a group is the primary.
External 1G Ports	A list of all the available external 1G member ports.
External 10G Ports	A list of all the available external 10G member ports.

Button	Function
Print	Click the Print button to print the page.
Refresh	Click the Refresh button to refresh the page with the latest information from the switch.
Show All	Click the Show All button to display the Port Configuration Summary of all groups.
Apply Changes	Click the Apply Changes button to apply the selected configuration to the switch.
Cancel	Click the Cancel button to discard changes to the configuration on the screen and reset the data on the screen to the latest value of the switch.
Apply to All Units	Click the Apply to All Units button to apply the configuration selected in the page to all other units in the stack.

Removing Ports from an Aggregator Group

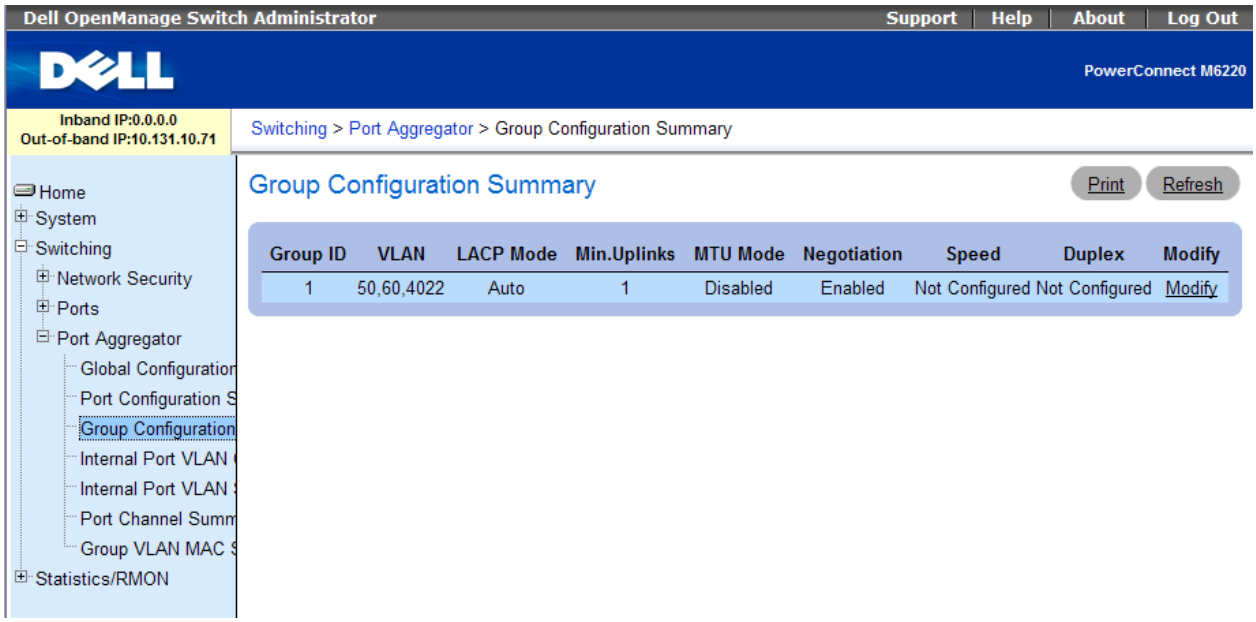
1. Open the Port Configuration Summary page.
2. Select the **Remove** option for the group with the ports to remove.
3. Click Apply Changes.
4. All ports assigned to the Port Aggregator group are removed from the group and are not assigned to any group.

NOTE: To delete a single port from a group, click **Modify** on the Port Configuration Summary page to access the Port Configuration page, delete the group ID from the port's Group ID field, and then click **Apply Changes**.

Group Configuration Summary

Use the **Group Configuration Summary** page to view information about the port aggregator group configuration for all groups. From the **Group Configuration Summary** page, you can access the **Group Configuration** page for each group and change the group settings.

To display the **Group Configuration Summary** page, click **Switching > Port Aggregator > Group Configuration Summary** in the tree view.



Entering multiple VLANs in these fields includes the aggregator group in all those VLANs.

Field	Description
Group ID	The ID number of the group.
VLAN	The list of member VLAN IDs belonging to the group.
LACP Mode	The LACP mode configured for the group members. Possible values are: o Off – All external ports except the lowest numbered port in that group would be put into shutdown state. o Static – External ports in the group are added to the static LAG. o Auto – External ports in the group are added to the dynamic LAG,
Min.Uplinks	The number of Minimum Active Uplinks configured for the group members. If less than this number of external ports has links, the internal ports in this group will have the link brought down.
MTU Mode	The MTU mode configured for the group members. When enabled, Jumbo frames (9216 bytes) are supported in this group. When disabled, the group MTU size is 1518 bytes. MTU mode is disabled by default.
Negotiation	The auto-negotiation mode configured for the group members.
Speed	The external port speed configured for the group members. This speed is only valid when auto-negotiation is disabled.
Duplex	The external port duplex mode configured for the group members. This duplex is only valid when auto-negotiation is disabled.

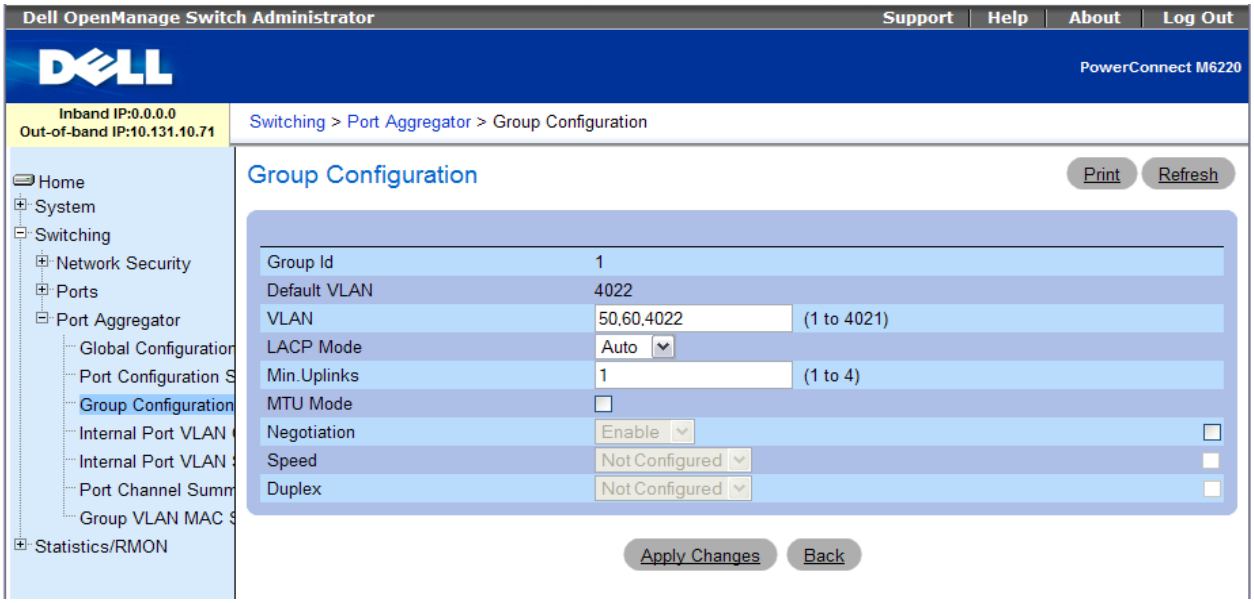
Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.
Modify	A link for modifying the configuration of a group. Click this link to display the configuration page for the group.

Configuring a Port Aggregator Group

1. Open the Group Configuration Summary page.

2. For the group to configure, click the **Modify** link at the end of the row.

3. The **Group Configuration** page for the group displays.



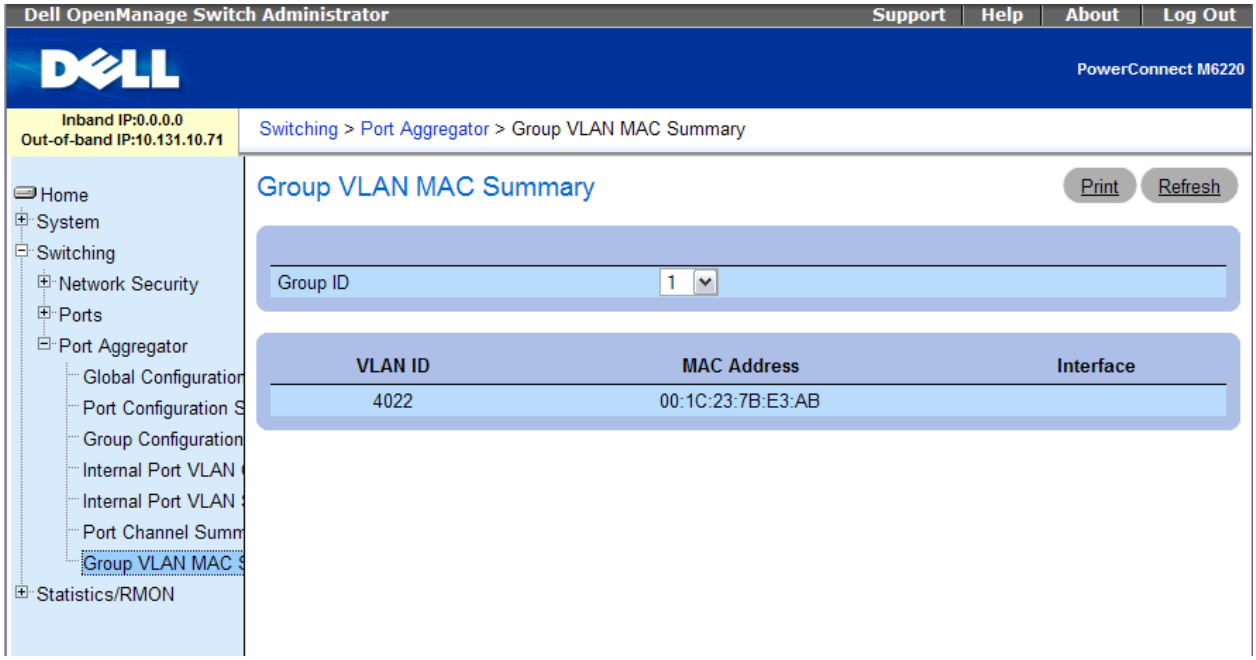
Field	Description
Group ID	The ID number of the group. Valid values are 1–72.
VLAN	The VLAN IDs to be added to the group. Valid values are 1–4021.
LACP Mode	The LACP mode to be configured for the group members. Valid values are **Off**, **Static**, or **Auto**.
Min.Uplinks	The number of minimum active uplinks to be configured for the group members. Valid values are 1–4.
MTU Mode	Select to enable MTU mode (Jumbo Frames) for the group members: deselect to disable the setting.
Negotiation	The auto-negotiation mode to be configured for the group. Valid values are **Enable** or **Disable**.
Speed	The speed to be configured for the group members. Only valid when auto-negotiation is disabled.
Duplex	The duplex setting to be configured for the group. Only valid when auto-negotiation is disabled.

Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.
Show All	Click the **Show All** button to view the Group Configuration Summary of all groups.
Apply Changes	Click the **Apply Changes** button to send the updated configuration to the switch. Configuration changes occur immediately, but some changes are not retained across a power cycle unless you save them to the system configuration file.
Cancel	Click the **Cancel** button to discard changes.

Group VLAN MAC Summary

Use the **Group VLAN MAC Summary** page to view the MAC address table entries for one Port Aggregator group or all groups.

To display the **Group VLAN MAC Summary** page, click **Switching** > **Port Aggregator > Group VLAN MAC Summary** in the tree view.



The **Group VLAN MAC Summary** page displays the entries learned on ports that are a member of the selected group.

Field	Description
Group ID	The group can be selected or the entries will be shown for all the groups. Valid values are 1–72.
VLAN ID	The list of member VLAN IDs belonging to the group. Valid values are 1–4093.
MAC Address	The MAC address learned on a listed interface.
Interface	The Interface number on which the listed MAC entry has been learned.

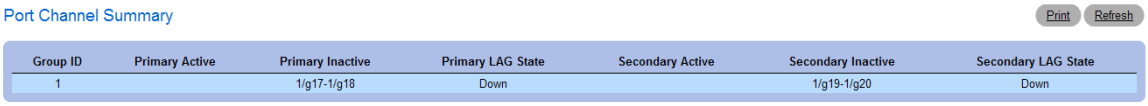
Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.

Configuring LAG Failover

See the Configuring Port Aggregator Groups on page 15 to map ports to an aggregator group.

Port Channel Summary

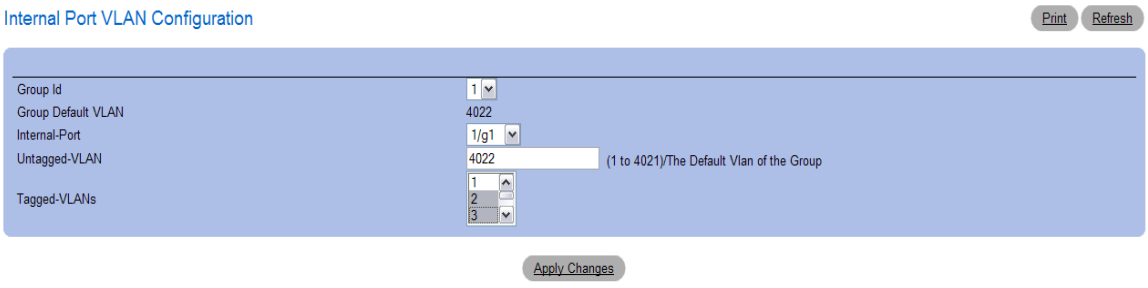
Use the **Port Channel Summary** page to view the external ports membership in primary or secondary LAG of a group. This also lists the primary or secondary LAG and its members state.



Field	Description
Group Id	Select the group identifier of the port aggregator entry (72 group entries maximum on the switch).
Primary Active	Specifies the list of all active member interfaces in the primary LAG of the group.
Primary Inactive	Specifies the list of all inactive member interfaces in the primary LAG of the group.
Primary Lag State	Specifies whether the state of primary LAG of the group is up or down.
Secondary Active	Specifies the list of all active member interfaces in the secondary LAG of the group.
Secondary Inactive	Specifies the list of all inactive member interfaces in the secondary LAG of the group.
Secondary Lag State	Specifies whether the state of secondary LAG of the group is up or down.

Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.

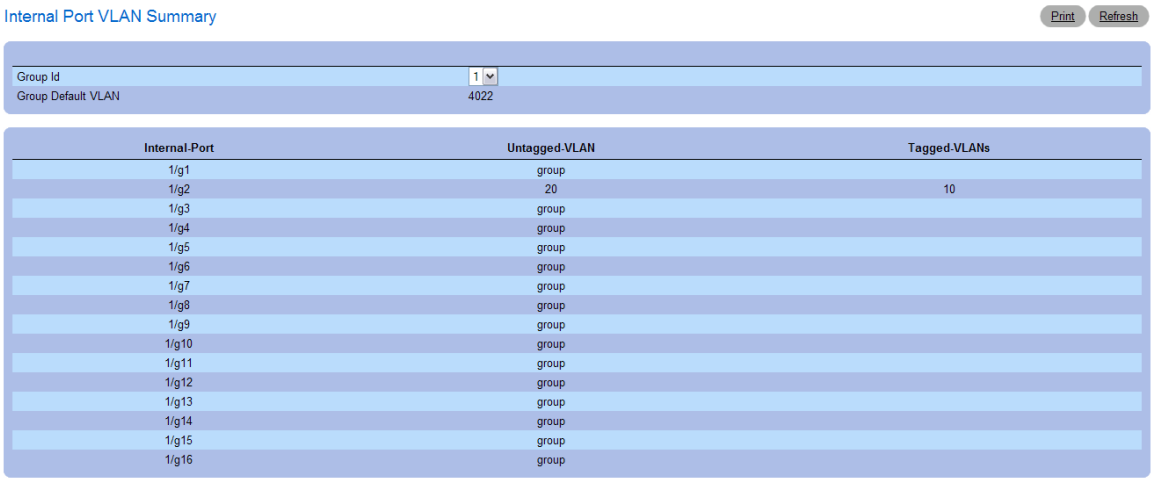
Use the **Internal Port VLAN Configuration** page to configure a VLAN on an internal port of a group.



Field	Description
Group Id	Select the group identifier of the port aggregator entry (72 group entries maximum on the switch).
Group Default VLAN	Shows the default VLAN of the group.
Internal-Port	Select a unique value, greater than zero, for each interface.
Untagged-VLAN	Select the default or tagged VLAN associated with the internal port of a group.
Tagged-VLANs	Select from a list of VLAN Ids to which a particular internal port of a group belongs.

Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.
Apply Changes	Click the **Apply Changes** button to send the updated configuration to the switch. Configuration changes occur immediately, but some changes are not retained across a power cycle unless you save them to the system configuration file.

Use the **Internal Port VLAN Summary** page to view VLAN configuration on internal ports of a group.



Field	Description
Group Id	Select the group identifier of the port aggregator entry (72 group entries maximum on the switch).
Group Default VLAN	Shows the default VLAN of the group.
Internal-Port	Shows a unique value, greater than zero, for each interface.
Untagged-VLAN	Shows the default or tagged VLAN associated with the internal port of a group.
Tagged-VLAN	Shows a list of VLAN IDs to which a particular internal port of a group belongs.

Button	Function
Print	Click the **Print** button to print the page.
Refresh	Click the **Refresh** button to refresh the page with the latest information from the switch.

Using Simple Mode with Cisco® Switches

This example describes how to configure the Simple Mode on an M6220 or M6348 interfacing to a stand-alone switch, such as a Cisco 3750.

Equipment Needed

You will need one M6220, M6348, or M8024 switch, and one Cisco switch.

Software Needed

Software version 3.1.2.x or later must be running on the PowerConnect switches.

Objective

The M6220/M6348/M8024 switch does not need to be configured if the new link is added to a port that is already a member of a group. The link is automatically added to a LAG and the traffic is load-balanced.

Procedure

Follow these steps to configure Simple Mode with Cisco switches:

1. Boot the M6220/M6348/M8024 switch with the default configuration.
2. Configure four ports (port 1 to port 4) to be a member of a dynamic LAG on the Cisco switch.
3. Connect a link from port 1 on the Cisco switch to any 1G external port on the M6220/M6348/M8024.
4. Send traffic from both sides.
5. Traffic is switched.
6. Add another link from port 2 on the Cisco switch to any 1G external port present on an M6220/M6348/M8024 switch. The newly added link would automatically be added to the LAG that is being used by the Port Aggregator group, and data would be load-balanced. The M6220/M6348 switch does not need to be configured.

Examples of a Single Switch with Four Aggregator Groups

Figure 3 illustrates an M6220 or M6348 system with a single switch having four aggregator groups with each one having four server ports and one uplink port as members. Figure 4 shows this configuration for an M8024 switch: this configuration provides complete isolation of traffic between the groups of servers (no flooding) without configuring any VLANs or spanning tree.

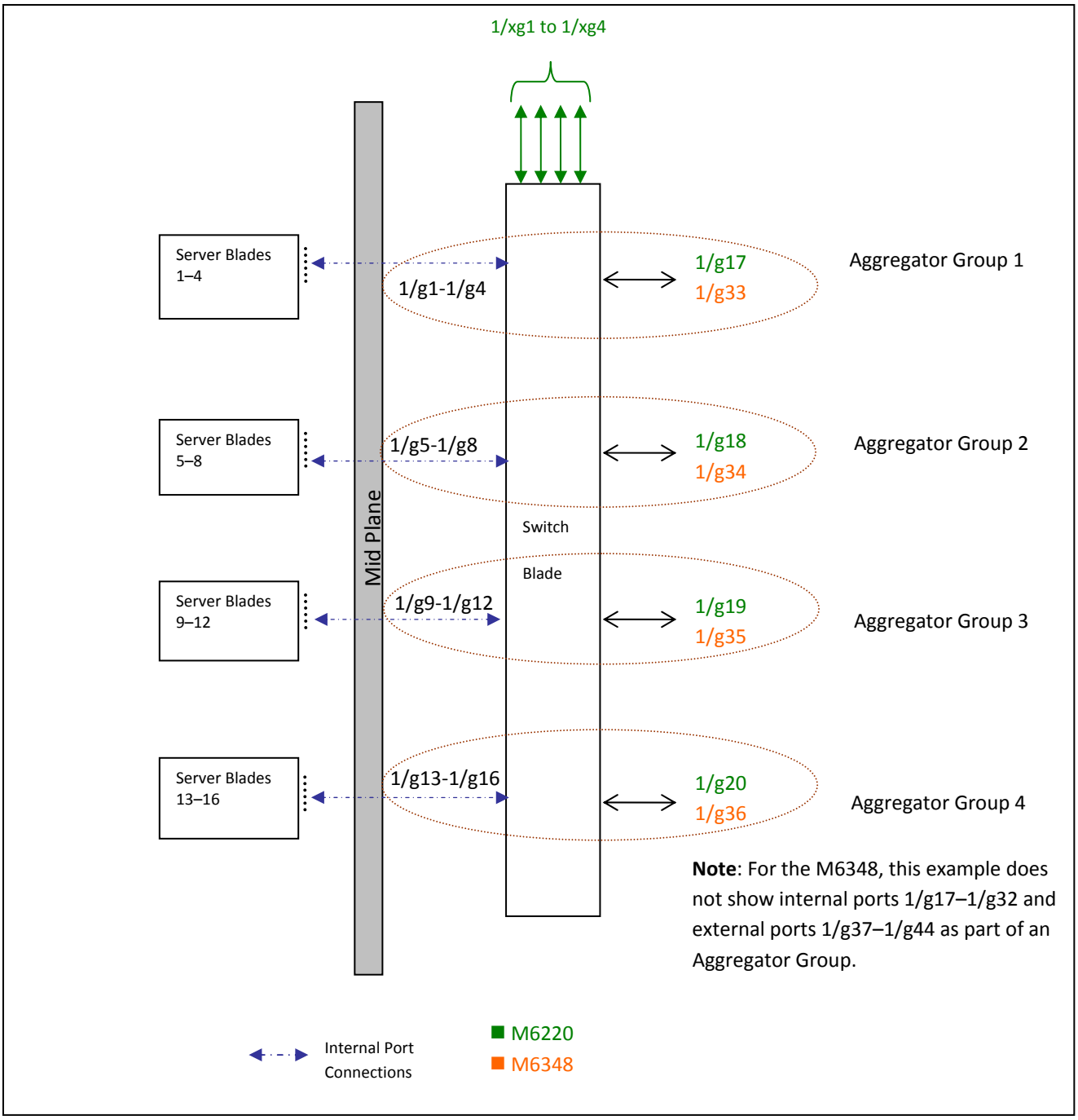


Figure 3. Single M6220/M6348 Switch with Four Aggregator Groups — Each Having Single Uplink

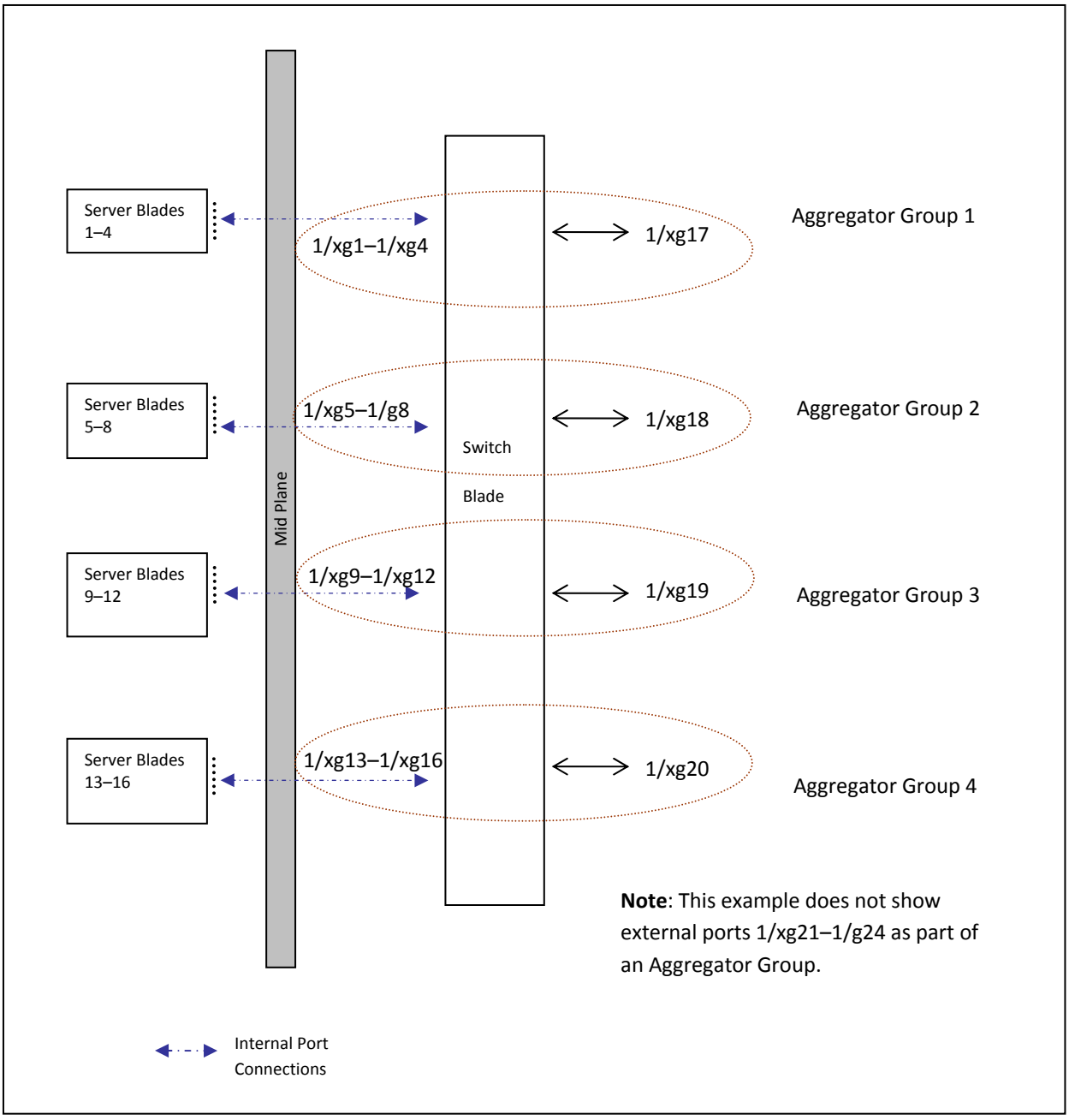


Figure 4. Single M8024 Switch with Four Aggregator Groups — Each Having Single Uplink

Examples of a Single Switch with Two Aggregator Groups

Figure 5 illustrates an M6220/M6348 system with a single switch having two aggregator groups, with each one having eight server ports and two uplink ports as members. Figure 6 illustrates this configuration for an M8024 switch.

In these examples, uplinks in each group are aggregated automatically to provide maximum bandwidth and load-balancing of the data while Ethernet traffic from servers 1–8 is completely isolated from traffic from servers 9–16.

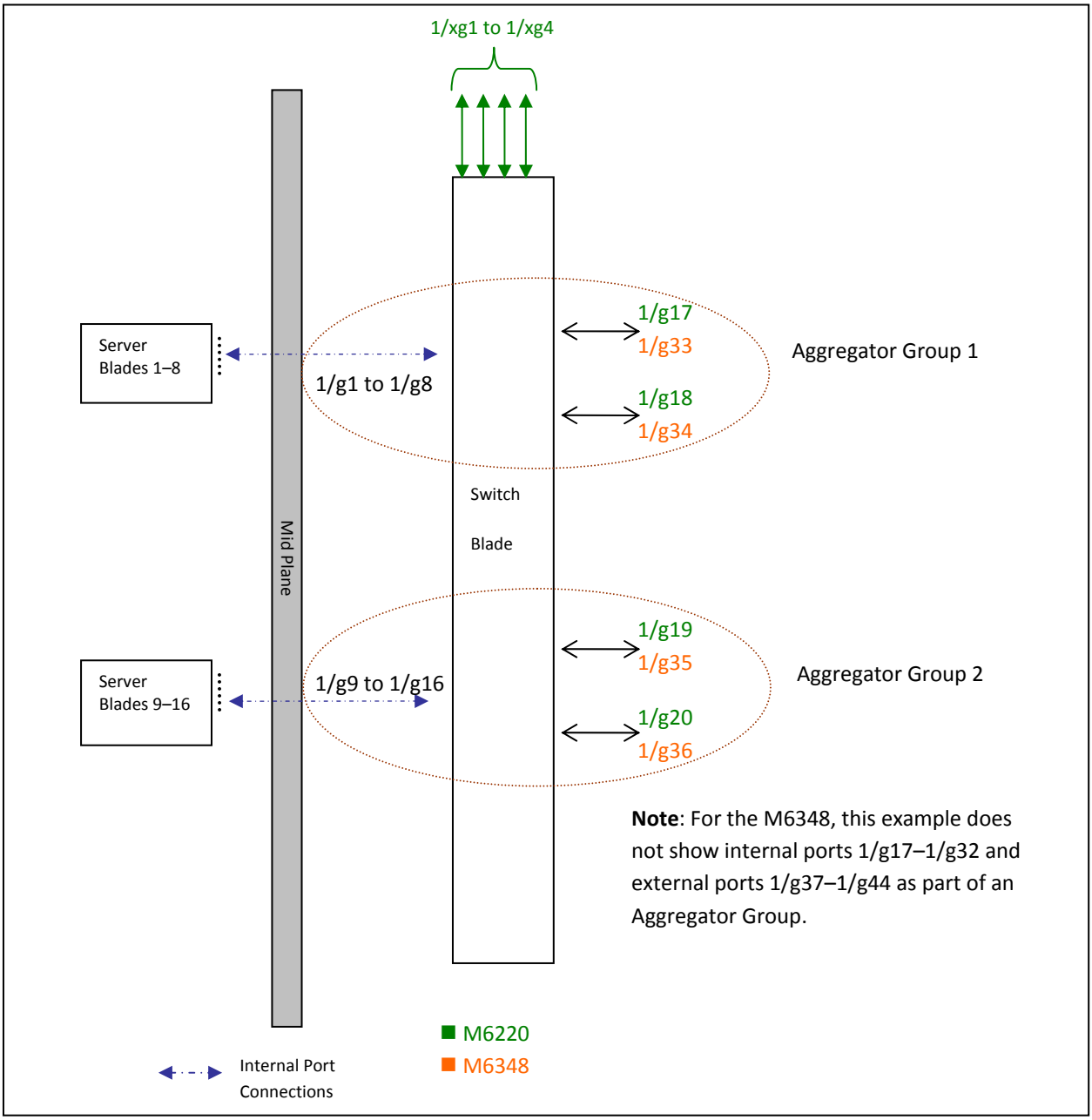


Figure 5. Single M6220/M6348 Switch Configuration with Two Aggregator Groups

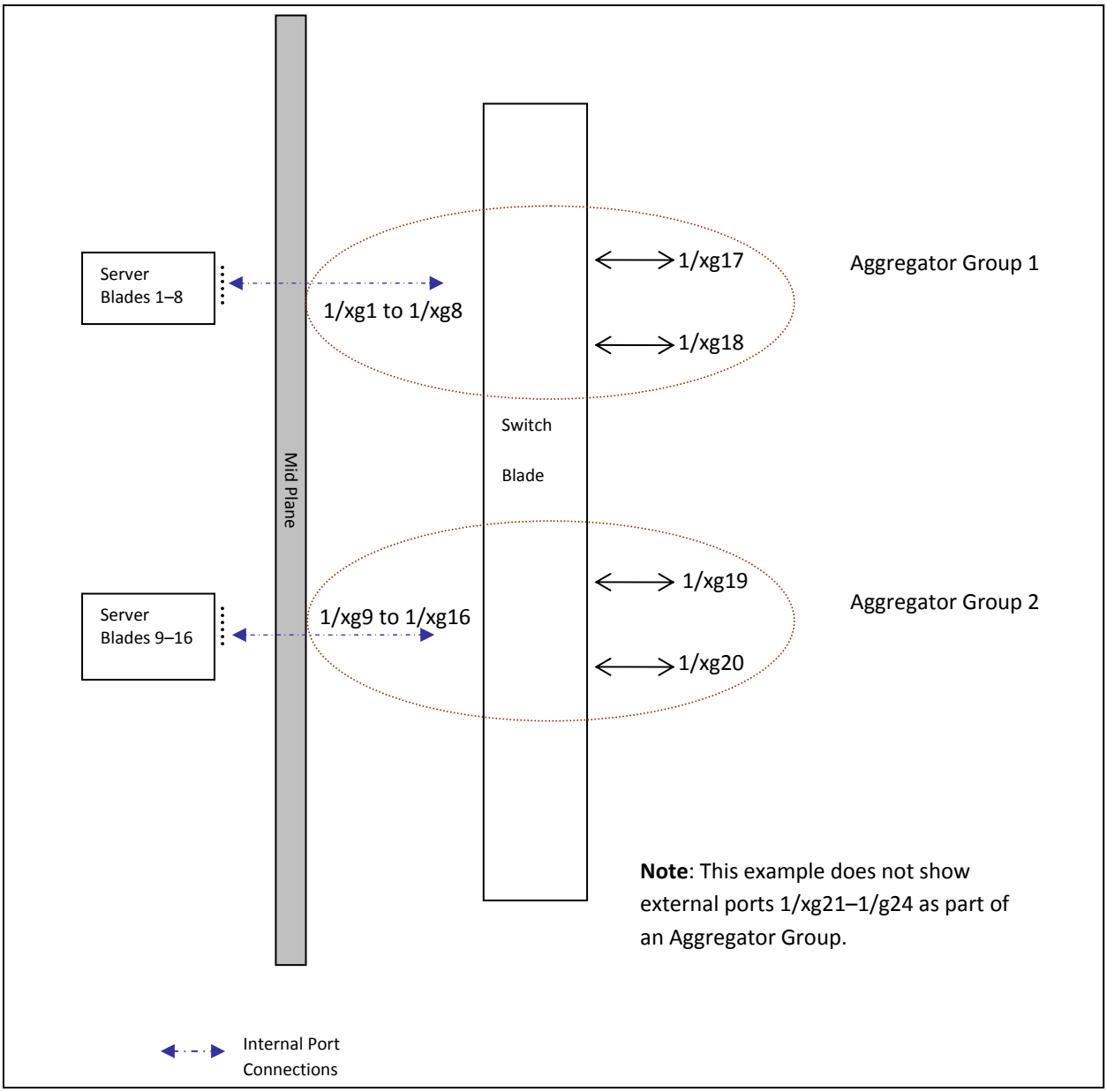


Figure 6. Single M8024 Switch Configuration with Two Aggregator Groups

Example of Two Switches with Two Aggregator Groups

Figure 7 illustrates an M6220 or M6348 system with two switches connected in a stack, having two aggregator groups with each one having eight server ports and four uplink ports as members. In this example, uplinks in each group get aggregated automatically to provide maximum bandwidth and load-balancing of the data.

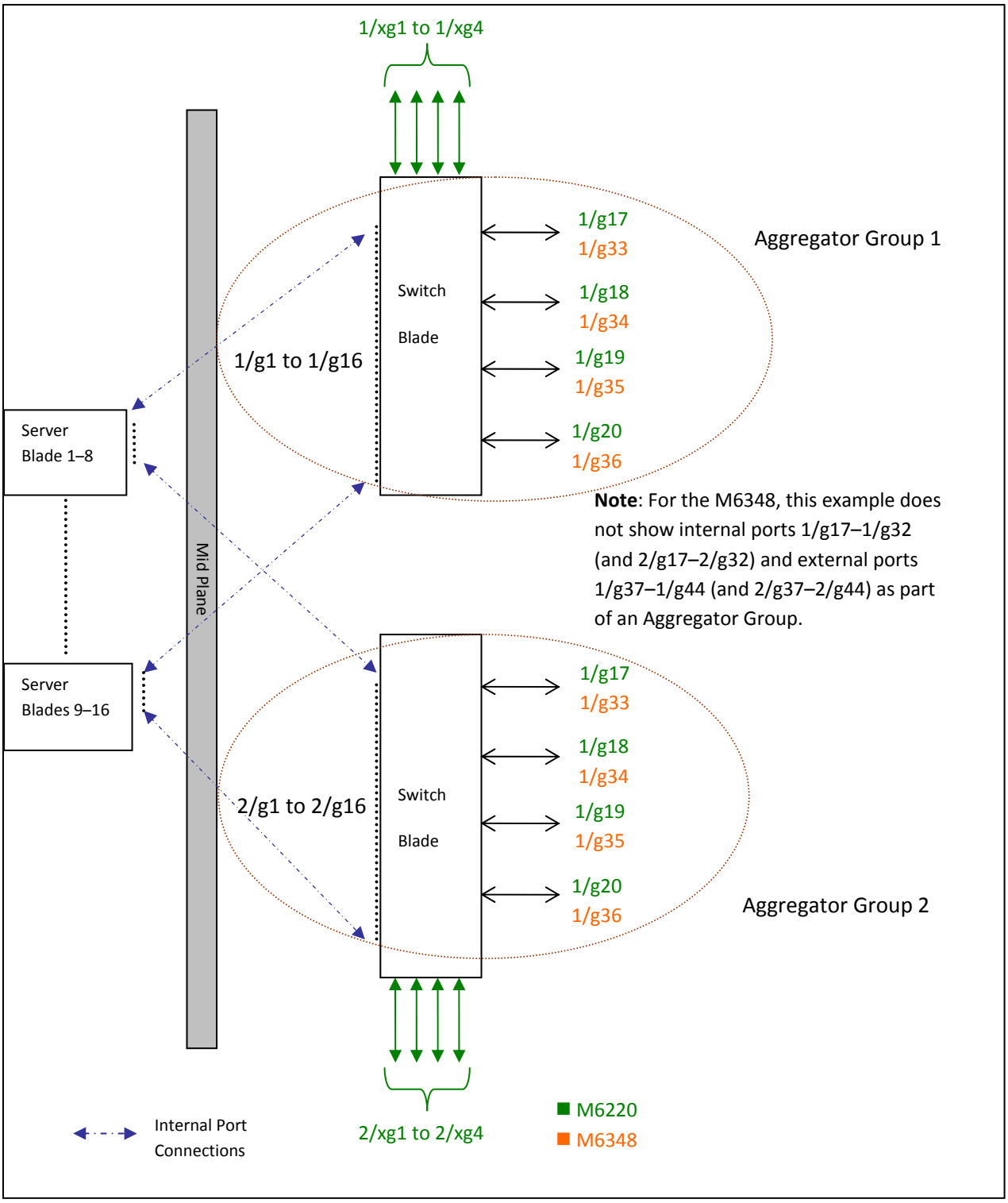


Figure 7. Stacked M6220/M6348 Switch Configuration with Two Aggregator Groups — Each Having Four Uplinks

NOTE: You cannot use link aggregation on internal ports in Simple Mode.

Example of Lag Failover with Cisco Switch

This example describes how to configure lag failover between M6220 switches and Cisco switches.

Equipment Needed

You will need one M6220 switch, and one Cisco switch.

Software Needed

Software version 3.1.2.x or later must be running on the PowerConnect switches.

Objective

The M6220 switch connectivity to the partner even if some links are failed in one LAG.

Procedure

Follow these steps to configure Simple Mode LAG failover with Cisco switches:

1. Boot the M6220 switch with the default configuration and configure ports 1/g19–1/g20 to be a part of secondary LAG.
2. Configure port-channel minimum active members to 2.
3. Configure two ports (port 1 to port 4) to be a member of a dynamic LAG on the Cisco switch and connect these to ports 1/g17–1/g18 on the M6220 switch.
4. Configure two ports (port 5 to port 8) to be a member of a dynamic LAG on the Cisco switch and connect these to ports 1/g19–1/g20 on the M6220 switch.
5. Send traffic from both switches. Traffic should be forwarded only through the primary LAG and secondary LAG should act as a backup.
6. Plugging out a link from a primary link would make the primary LAG inactive and secondary LAG active, as the number of active links would fall below the configured threshold (2).
7. Plugging in a link to a primary link would make the primary LAG active and secondary LAG inactive, since the primary LAG regains the minimum number active links.

NOTE: This example can be extended to other modular switches.

CLI Commands

The following CLI commands are used to control the Port Aggregator feature. Also, **speed, mtu**, **negotiation**, and **duplex** commands supported in Interface Configuration Mode are supported in Port-Aggregator Mode.

Execute the following commands to select the operational mode as Simple Mode when the switch is operating in Normal Mode.

1. config
2. mode simple

Wait for the configuration to be cleared and the configuration for the new mode to be applied (if any).

Port Aggregator CLI Commands:

- `port-aggregator group <GroupID>`
- `no port-aggregator group <GroupID>`
- `add ethernet <intf-list> [secondary]`
- `no add ethernet <intf-list>`
- `mtu disable`
- `no mtu disable`
- `lacp static`
- `lacp auto`
- `no lacp`
- `minimum active uplinks <number of uplinks>`
- `show bridge address-table [port-aggregator group <GroupID>]`
- `show vlan [port-aggregator group <GroupID>]`
- `show port-aggregator group summary [<GroupID>]`
- `show port-aggregator port summary [<GroupID>]`
- `show port-aggregator vlan summary [ group-id ]`

- `port-aggregator lag-failover`
- `no port-aggregator lag-failover`
- `port-channel minimum active members count`
- `no port-channel minimum active members`
- `port-aggregator traps lag-failover`
- `no port-aggregator traps lag-failover`
- `interface ethernet interface`
- `switchport general allowed vlan add vlan-list [ tagged | untagged ]`
- `switchport general allowed vlan remove vlan-list`
- `show port-aggregator port-channel summary group-id`
- `show port-aggregator vlan summary [ group-id ]`

To see examples of the commands used for Port Aggregator, refer to the Port Aggregator section in the *Dell PowerConnect M6220/M6348/M8024 Configuration Guide*.

Simple Switch Mode Supported CLI Commands

The following commands that were available in Interface Mode of Normal Switch Mode are now available in Simple Mode and are allowed to execute on a Port Aggregator group. For example, to apply any of the following commands on an aggregator group1, the following should display at the prompt: `console (config-aggregator-1)#`

These are existing commands that are documented in the *CLI Command Reference* for your Dell PowerConnect switch.

`vlan add vlan-list`

`vlan remove vlan-list`

The following commands available in Normal Switch Mode are also available in Port Aggregator Mode:

- AAA Commands:

  `aaa authentication enable`

  `aaa authentication login`

  `enable authentication`

```
enable password
ip http authentication
ip https authentication
login authentication
password (Line Configuration)
password (User EXEC)
show authentication methods
show user accounts
show users login history
username
```

- Configuration and Image File Commands:

```
boot system
clear config
copy
delete backup-config
delete backup-image
delete startup-config
filedescr
script apply
script delete
script list
script show
script validate
show backup-config
show bootvar
show running-config
show startup-config
```

```
update bootcode
```

- Ethernet Configuration Commands:

```
clear counters [ethernet interface | port-channel port-channel-
   number]

show interfaces counters [ethernet interface | port-channel port-
   channel-number]

show interfaces status [ethernet interface | port-channel port-
   channel-number ]

show statistics ethernet {<unit>/<port-type><port> | switchport }

shutdown
```

- Line Commands:

```
exec-timeout

history

history size

line

show line

speed
```

- Password Management Commands:

```
passwords aging

passwords history

passwords lockout

passwords min-length

show passwords configuration
```

- Port Channel Commands:

```
show interfaces port-channel

show statistics port-channel
```

- Radius Commands:

```
auth-port
```

```
deadtime
key
priority
radius-server deadtime
radius-server host
radius-server key
radius-server retransmit
radius-server source-ip
radius-server timeout
retransmit
show radius-servers
source-ip
timeout
usage
```

- SNMP Commands:

```
show snmp
show snmp engineID
show snmp groups
show snmp views
snmp-server community
snmp-server community-group
snmp-server contact
snmp-server enable traps
snmp-server engineID local
snmp-server group
snmp-server host
snmp-server location
```

```
snmp-server trap authentication
```

- SSH Commands:

```
crypto key generate dsa
crypto key generate rsa
crypto key pubkey-chain ssh
ip ssh port
ip ssh pubkey-auth
ip ssh server
key-string
show crypto key mypubkey
show crypto key pubkey-chain ssh
show ip ssh
user-key
```

- System Management Commands:

```
asset-tag
hostname
member
movemanagement
ping
reload
set description
show sessions
show stack-port
show stack-port counters
show stack-port diag
show supported switchtype
```

```
show switch
show system
show system id
show users
show version
stack
switch priority
switch renumber
telnet
traceroute
traceroute {ipaddress|hostname}
```

- TACACS Commands:

```
key
port
priority
show tacacs
tacacs-server host
tacacs-server key
tacacs-server timeout
timeout
```

- Web Server Commands:

```
common-name
country
crypto certificate generate
crypto certificate import
crypto certificate request
```

```
duration
ip http port
ip http server
ip https certificate
ip https port
ip https server
key-generate
location
organization-unit
show crypto certificate mycertificate
show ip http
show ip https
state
```

- Dot1x Feature Commands:

```
aaa authentication dot1x
aaa authorization network default radius
dot1x max-req
dot1x port-control
dot1x re-authenticate
dot1x re-authentication
dot1x system-auth-control
dot1x timeout quiet-period
dot1x timeout re-authperiod
dot1x timeout server-timeout
dot1x timeout supp-timeout
dot1x timeout tx-period
show dot1x
```

```
show dot1x statistics

show dot1x users
```

- Dot1x Advanced Features Commands:

```
dot1x guest-vlan <vlan-id>

dot1x unauth-vlan <vlan-id>

dot1x max-users

show dot1x clients
```

- Syslog Commands:

```
clear logging

clear logging file

logging console

logging buffered

show logging

show logging file

show syslog-servers
```

SNMP Objects

If the switch is operating in Simple Mode, then the following SNMP objects are supported. The object 'agentOperationalModeSimple' is used to select and view the operational mode and can be either in Simple Mode or Normal Mode.

agentOperationalModeGroup Index: none

MIB Objects	Supported	Access	Default	Comments
agentOperationalModeSimple	Yes	Read-write	None (1-Enable 2-Disable)	As per MIB

The object 'agentPortAggGroupMemberPortMask' is used to create and view the Port Aggregator groups. Each entry in this table is indexed by 'agentPortAggGroupID'. The object 'agentPortAggGroupActivePortMask' is used to view the active (link) ports in the member port list.

agentPortAggGroupTable Index: agentPortAggGroupID(1–72)

MIB Objects	Supported	Access	Default	Comments
agentPortAggGroupID	Yes	Not-accessible	None	As per MIB
agentPortAggGroupStatus	Yes	Read-Write	None	As per MIB
agentPortAggGroupMemberPortMask	Yes	Read-Write	None	As per MIB
agentPortAggGroupActivePortMask	Yes	Read-only	None	As per MIB
agentPortAggGroupVlan	Yes	Read-only	None	As per MIB
agentPortAggGroupLacpMode	Yes	Read-Write	None	As per MIB
agentPortAggGroupMinimumActiveUplinks	Yes	Read-Write	1 (1–4)	As per MIB
agentPortAggGroupMTU	Yes	Read-Write	2 (Disable)	As per MIB
agentPortAggGroupNegotiation	Yes	Read-Write	None (0–Disable 1–Enable)	As per MIB
agentPortAggGroupSpeed	Yes	Read-Write	None	As per MIB
agentPortAggGroupDuplex	Yes	Read-Write	None	As per MIB
agentPortAggGroupActiveLacpMode	Yes	Read-Write	None	As per MIB
agentPortAggGroupMemberPortRoleMask	Yes	Read-Write	None	As per MIB

The Port Aggregator global-configurable MIB objects are used to enable or disable Port-Channel failover mode, enable or disable Port-Channel failover trap, and configure the minimum active members in a port-channel

MIB Objects	Supported	Access	Default	Comments
agentPortAggPortChannelFailoverAdminMode	Yes	Read-Write	None	As per MIB
agentPortAggPortChannelFailoverTrapAdminMode	Yes	Read-Write	None	As per MIB
agentPortAggPortChannelMinActiveMembers	Yes	Read-Write	None	As per MIB

The IntIfVlanGroup table is used to configure and view a VLAN on an interface of a group.

agentPortAggIntIfVlanTable Index: agentPortAggIntIfVlanGroupId, agentPortAggIntIfVlanIfIndex

MIB Objects	Supported	Access	Default	Comments
agentPortAggIntIfVlanGroupId	Yes	Not accessible	None	As per MIB
agentPortAggIntIfVlanIfIndex	Yes	Not accessible	None	As per MIB
agentPortAggIntIfVlanVlanId	Yes	Not accessible	None	As per MIB
agentPortAggIntIfVlanRowStatus	Yes	Read-Create	None	As per MIB

The GroupPortChannel table is used to add an interface to a port-channel identified by a group and role. It is also used to view the members of a port-channel identified by group and role

This table member index can be used for a set of either a group index or a role index.

agentPortAggGroupPortChannelTable Index: agentPortAggGroupPortChannelGroupId, agentPortAggGroupPortChannelRole , agentPortAggGroupPortChannelMember

MIB Objects	Supported	Access	Default	Comments
agentPortAggGroupPortChannelGroupId	Yes	Not-accessible	None	As per MIB
agentPortAggGroupPortChannelRole	Yes	Not-accessible	None	As per MIB
agentPortAggGroupPortChannelMember	Yes	Not-accessible	None	As per MIB
agenetPortAggGroupPortChannelIsActive	Yes	Read-only	None	As per MIB
agentPortAggGroupPortChannelState	Yes	Read-only	None	As per MIB
agentPortAggGroupPortChannelRowStatus	Yes	Read-create	None	As per MIB

The VlanGroup table is used to create an association between a VLAN and a group. In this table, VLAN index can be set for a group index.

agentPortAggVlanGroupTable Index: agentPortAggVlanGroupID

MIB Objects	Supported	Access	Default	Comments
agentPortAggVlanGroupId	Yes	Not accessible	None	As per MIB
agentPortAggVlanVlanId	Yes	Not accessible	None	As per MIB
agentPortAggVlanGroupStatus	Yes	Read-Create	None	As per MIB

The following SNMP MIBS/objects would be available in simple mode, in addition to the port-aggregator feature specific objects.

```
  "FASTPATH-TIMEZONE-PRIVATE-MIB", "The Timezone mib for System
TimeZone and SummerTime"

  fastPathTimeZonePrivate


  "RFC 1907 - SNMPv2-MIB", "The MIB module for SNMPv2 entities"

  snmpMIB


  "RFC 2819 - RMON-MIB", "Remote Network Monitoring Management
Information Base"

  rmonMibModule

"SNMP-COMMUNITY-MIB", "This MIB module defines objects to help support
coexistence between SNMPv1,         SNMPv2, and SNMPv3."

  snmpCommunityMIB


  "SNMP-FRAMEWORK-MIB", "The SNMP Management Architecture MIB"

  snmpFrameworkMIB


  "SNMP-MPD-MIB", "The MIB for Message Processing and Dispatching"

  snmpMPDMIB


  "SNMP-TARGET-MIB", "The Target MIB Module"

  snmpTargetMIB
```

```
  "SNMP-USER-BASED-SM-MIB", "The management information definitions for
the SNMP User-based Security  Model."

  snmpUsmMIB


  "RFC 1213 - RFC1213-MIB", "Management Information Base for Network
Management of TCP/IP-based    internets: MIB-II"

  mib-2

    system             .1.3.6.1.2.1.1

    interfaces         .1.3.6.1.2.1.2

    at                 .1.3.6.1.2.1.3

    ip                 .1.3.6.1.2.1.4

    icmp               .1.3.6.1.2.1.5

    tcp                .1.3.6.1.2.1.6

    udp                .1.3.6.1.2.1.7

    egp                .1.3.6.1.2.1.8

    transmission       .1.3.6.1.2.1.10

    snmp               .1.3.6.1.2.1.11


  "RFC 2737 - ENTITY-MIB", "Entity MIB (Version 2)"

  entityMIB


  "RFC 2863 - IF-MIB", "The Interfaces Group MIB using SMIv2"

  ifMIB


  "RFC 3635 - Etherlike-MIB", "Definitions of Managed Objects for the
Ethernet-like Interface Types"

  etherMIB


  "FASTPATH-SWITCHING-MIB", "FASTPATH Switching - Layer 2"
```

```
  fastPathSwitching
    agentInfoGroup
      agentInventoryGroup
      agentTrapLogGroup
      agentSupportedMibTable
      agentSwitchCpuProcessGroup
    agentConfigGroup
      agentCLIConfigGroup
      agentNetworkConfigGroup
      agentServicePortConfigGroup
      agentSnmpConfigGroup
      agentTransferConfigGroup
      agentAuthenticationGroup
    agentSystemGroup
    fastPathSwitchingTraps


  "FASTPATH-INVENTORY-MIB", "Unit and Slot configuration."
  fastPathInventory
"FASTPATH-RADIUS-MIB" , The LVL7 Private MIB for FastPath Radius.
  fastPathRadius


  "RADIUS-ACC-CLIENT-MIB", "RADIUS Accounting Client MIB"
  radiusAccClientMIB


  "RADIUS-AUTH-CLIENT-MIB", "RADIUS Authentication Client MIB"
  radiusAuthClientMIB
  "FASTPATH-MGMT-SECURITY-MIB", "The LVL7 Private MIB for FastPath Mgmt
Security"
  fastPathMgmtSecurity
```

"Dell-Vendor-MIB", The private MIB module definition for the Dell PowerConnect Devices.

This MIB allows PowerConnect devices to be integrated into Dell ITA management

system.

powerConnectVendorMIB

"FASTPATH-LOGGING", Log management MIB.

fastPathLogging

"Dell-LAN-SYSMNG-MIB", This MIB define the common system management functions applicable to all Dell PowerConnect managed switches which support SNMP management protocol.

dellLanSystemMng

"TACACS-CLIENT-MIB" , This MIB module defines a portion of the SNMP MIB under the LVL7 Systems enterprise OID pertaining to TACACS+ client configuration.

agentTacacsClientMIB

dell_trap.my

"Dell-LAN-TRAP-MIB", "Dell alarms specific global parameters are defined in this group"

dellAlarmGroup ::dellLanCommon 1

fastpath_dhcp.my

FASTPATH-DHCPSERVER-PRIVATE-MIB, "The LVL7 Private MIB for FASTPATH DHCP Server"

fastPathDHCPServerPrivate ::fastPath 12

fastpath_dos.my

```
  FASTPATH-DENIALOFSERVICE-PRIVATE-MIB, "The LVL7 Private MIB for
FASTPATH Denial of Service."

  fastPathDenialOfService  ::fastPath 31

  fastpathsntp.my

  FASTPATH-SNTP-CLIENT-MIB, "This MIB module defines a portion of the
SNMP MIB under the LVL7 Systems                    enterprise OID
pertaining to SNTP client configuration and statistical collection."

  agentSntpClientMIB ::fastPath 17



  iftype.my

  IANAifType-MIB, "This MIB module defines the IANAifType Textual
Convention, and thus the enumerated
values of the ifType object defined in MIB-II's ifTable."

  ianaifType  ::mib-2 30



  inetaddress.my

  INET-ADDRESS-MIB, "This MIB module defines textual conventions for
representing Internet addresses.                    An Internet
address can be an IPv4 address, an IPv6 address or a DNS domain name."

  inetAddressMIB  ::mib-2 76

  mau.my

  MAU-MIB, "Management information for 802.3 MAUs."

  mauMod  ::mib-2 26



  iana-language.my

  IANA-LANGUAGE-MIB, "The MIB module registers object identifier values
for well-known programming and
      scripting languages."

  ianaLanguages ::mib-2 73
```

In addition to the Port Aggregator feature's specific objects, the following SNMP MIB/objects are available in Simple Mode:

SNMP MIBs	Description	MIB Objects
FASTPATH-TIMEZONE-PRIVATE-MIB	The Timezone MIB for System TimeZone and SummerTime	fastPathtimeZonePrivate
RFC 1907 - SNMPv2-MIB	The MIB module for SNMPv2 entities	snmpMIB
RFC 2819 - RMON-MIB	Remote Network Monitoring Management Information Base	rmonMibModule
SNMP-COMMUNITY-MIB	This MIB module defines objects to help support coexistence between SNMPv1, SNMPv2, and SNMPv3.	snmpCommunityMIB
SNMP-FRAMEWORK-MIB	The SNMP Management Architecture MIB	snmpFrameworkMIB
SNMP-MPD-MIB	The MIB for Message Processing and Dispatching	snmpMPDMIB
SNMP-TARGET-MIB	The Target MIB Module	snmpTargetMIB
RFC 1213 - RFC1213-MIB	Management Information Base for Network Management of TCP/IP-based Internets: MIB-II	mib-2 system .1.3.6.1.2.1.1 interfaces .1.3.6.1.2.1.2 at.1.3.6.1.2.1.3 ip .1.3.6.1.2.1.4 icmp .1.3.6.1.2.1.5 tcp .1.3.6.1.2.1.6 udp .1.3.6.1.2.1.7 egp .1.3.6.1.2.1.8 transmission .1.3.6.1.2.1.10 snmp .1.3.6.1.2.1.11
RFC 2737 - ENTITY-MIB	Entity MIB (Version 2)	entityMIB
RFC 2863 - IF-MIB	The Interfaces Group MIB using SMIv2	ifMIB
RFC 3635 - Etherlike-MIB	Definitions of Managed Objects for the Ethernet-like Interface Types	etherMIB
FASTPATH-SWITCHING-MIB	FASTPATH Switching - Layer 2	fastPathSwitching agentInfoGroup agentInventoryGroup agentTrapLogGroup agentSupportedMibTable agentSwitchCpuProcessGroup agentConfigGroup agentCLIConfigGroup agentNetworkConfigGroup agentServicePortConfigGroup agentSnmpConfigGroup agentTransferConfigGroup agentAuthenticationGroup agentSystemGroup fastPathSwitchingTraps
FASTPATH-INVENTORY-MIB	Unit and Slot configuration	fastPathInventory
FASTPATH-RADIUS-MIB	The Broadcom Private MIB for FASTPATH Radius	fastPathRadius
RADIUS-AUTH-CLIENT-MIB	RADIUS Authentication Client MIB	radiusAuthClientMIB
FASTPATH-MGMT-SECURITY-MIB	The Broadcom Private MIB for FASTPATH Mgmt Security	fastPathMgmtSecurity
Dell-Vendor-MIB	The private MIB module definition for the Dell PowerConnect Devices. This MIB allows PowerConnect devices to be integrated into the Dell ITA management system.	powerConnectVendorMIB
FASTPATH-LOGGING	Log management MIB	fastPathLogging

SNMP MIBs	Description	MIB Objects
Dell-LAN-SYSMNG-MIB	This MIB defines the common system management functions applicable to all Dell PowerConnect-managed switches which support SNMP management protocol.	dellLanSystemMng
TACACS-CLIENT-MIB	This MIB module defines a portion of the SNMP MIB under the Broadcom enterprise OID pertaining to TACACS+ client configuration.	agentTacacsClientMIB
dell_trap.my Dell-LAN-TRAP-MIB	Dell alarms specific global parameters are defined in this group.	dellAlarmGroup ::dellLanCommon 1
fastpath_dhcp.my FASTPATH-DHCPSERVER-PRIVATE-MIB	The Broadcom Private MIB for FASTPATH DHCP Server	fastPathDHCPServerPrivate ::fastPath 12
fastpath_dos.my FASTPATH-DENIALOFSERVICE-PRIVATE-MIB	The Broadcom private MIB for FASTPATH Denial of Service	fastPathDenialOfService ::fastPath 31
fastpathsntp.my FASTPATH-SNTP-CLIENT.MIB	This MIB module defines a portion of the SNMP MIB under the Broadcom enterprise OID pertaining to SNTP client configuration and statistical collection.	agentSntpClientMIB ::fastPath 17
iftype.my IANAifType-MIB	This MIB module defines the IANAifType Textual Convention, and thus the enumerated values of the ifType object defined in MIB-II's ifTable.	ianaifType ::mib–2 30
inetaddress.my INET-ADDRESS-MIB	This MIB module defines textual conventions for representing Internet addresses. An Internet address can be an IPv4 address, an IPv6 address or a DNS domain name.	inetAddressMIB ::mib–2 76
mau.my MAU-MIB	Management information for 802.3 MAUs	mauMod ::mib–2 26
iana-language.my IANA-LANGUAGE-MIB	The MIB module registers object identifier values for well-known programming and scripting languages.	ianaLanguages ::mib–2 73

SNMP Traps

A trap identified by operationalModeChangeTrap is issued to the SNMP user when changing the operational mode.

Limitations or Restrictions

The maximum number of Channel Groups (LAGs) is 24 and is platform independent on a switch/stack. This limits the number of LACP-capable Aggregation groups in the switch/stack.

The maximum number of external ports that can be included in a group is limited to the maximum number of ports that can be included in both a primary and secondary LAG. The maximum number of member ports that can be included in a trunk group is limited to eight because of a silicon limitation.

Simple Mode supports a default MTU size of 1518 bytes. When MTU mode is enabled, an MTU of 9216 bytes is supported.