SSE-X3548S/SSE-X3548SR

MLAG

User's Guide

Revision 1.14

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Date	Revision	Description
5/14/2020	1.14	Initial document.

Contents

1 Overview

Typically data centers provide redundancy by means of oversubscription by connecting switches and servers to dual aggregation switches. In such cases, Spanning Tree Protocol (STP) prevents network loops by blocking half of the links to the aggregation switches. However this reduces the available bandwidth by 50%.

The Multi-Chassis Link Aggregation (MLAG) feature allows users to logically aggregate ports across two switches. This provides increased bandwidth and redundancy.

There can be multiple MLAG interfaces between two switches. The maximum number of MLAG interfaces is limited by the maximum number of LAGs supported in the switch models. Similar to the LAG, MLAG also supports up to eight member ports.

The two switches that logically aggregate are called *MLAG peer switches* and communicate through an interface called an *Inter peer link* (IPL). The IPL is primarily used to exchange MLAG control information between peer switches, however it also carries data traffic for devices that are attached to only one of the MLAG peers.

1.1 Terminologies

1.1.1 IPL – Inter Peer Link

The link connecting two MLAG peer switches is referred as an Inter Peer Link (IPL).
This link **should be configured as a LACP port channel**. It can have many member ports as supported by the switch model.

1.1.2 Peer Switch

The two switches that form a single logical port channel interface is referred to as peer switches. The peer switches are connected through the IPL interface. For example, in the topology diagrams shown in the “Topologies” section, the switches “Switch A” and “Switch B” are peer switches.

1.1.3 MLAG Port Channel

The link connecting MLAG peers to MLAG partner switches is called an MLAG port channel. MLAG port channel interfaces should be created on peer switches with the **same port channel number**.

1.1.4 Partner Device

The device connected to both the peer switches using a LACP aggregation link is referred as partner device. For example, in the topology diagrams shown in “Topologies” section, the switch “Switch C” and “Servers” are partner devices for MLAG switches.

1.1.5 Single Homed Device

A single homed device is a device connected to only one peer switch. This connection could be a regular single physical link connection or a connection through a port channel interface.

2 Topologies

2.1 Topology 1 - Server to Switch MLAG Topology

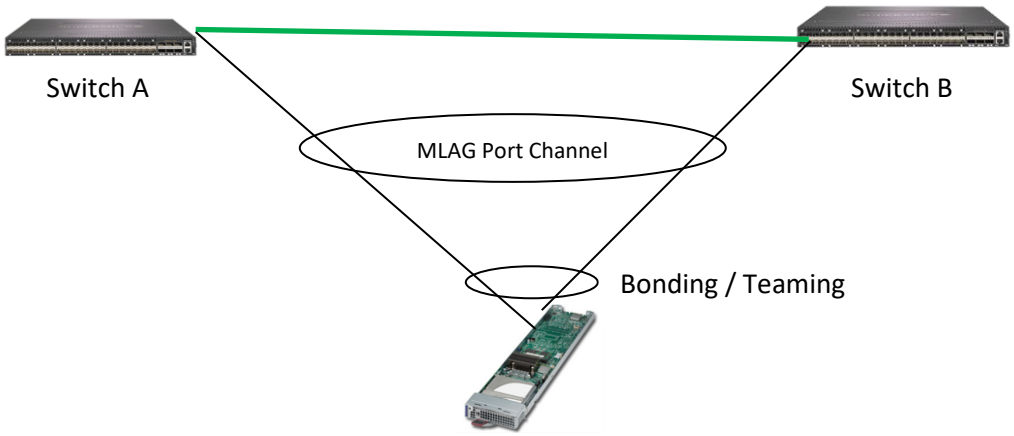

Figure MLAG1

In Figure MLAG-1, Switch A and Switch B are peer switches in the MLAG. Switches A and B are connected through an IPL port channel interface.

The server is connected to both MLAG peer switches either through regular bonding or by a teaming LACP interface on the server side.

On the switch side, the ports connected to the server are configured with the same MLAG enabled port channel number.

2.2 Topology 2 - Switch to Switch MLAG Topology

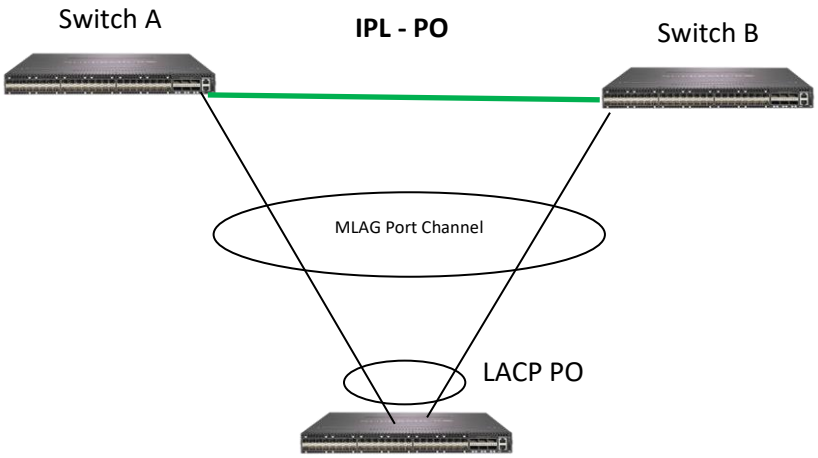

Figure MLAG-2

In Figure MLAG-2, Switch A and Switch B are peer switches in the MLAG. Switches A and B are connected through an IPL port channel interface.

Switch C is connected to both MLAG peer switches through a regular LACP port channel interface.

On the Switch A and Switch B sides, the ports connected to Switch C are configured with the same MLAG enabled port channel number.

2.3 Topology 3 - Single Uplink Switch Topology

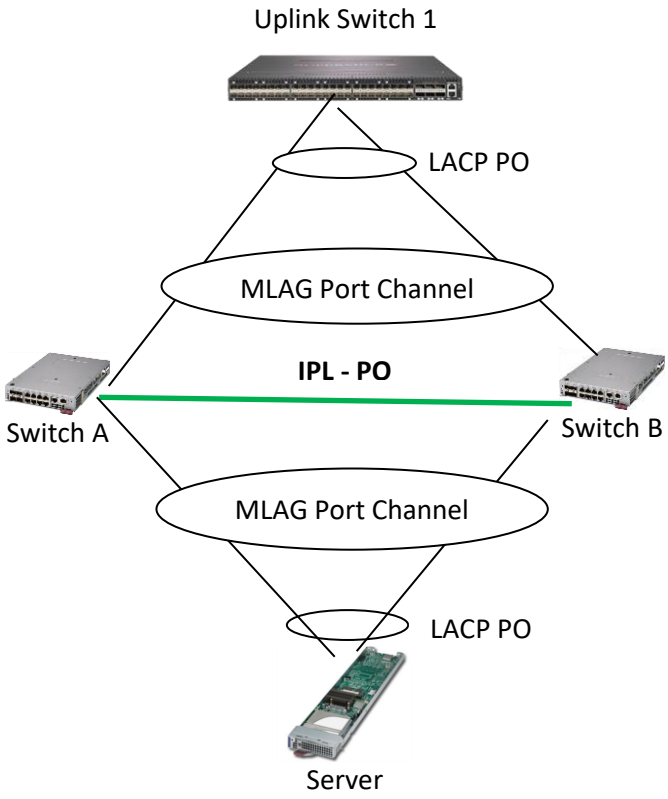

Figure MLAG-3

In Figure MLAG-3, Switch A and Switch B are peer switches in the MLAG. Switches A and B are connected through an IPL port channel interface.

The server is connected to both MLAG peer switches through a regular LACP port channel interface.

Uplink Switch 1 is connected to MLAG peer switches Switch A and Switch B through a regular LACP port channel interface.

On the Switch A and Switch B sides, the ports connected to the server are configured with the same MLAG enabled port channel number. Similarly, the ports connected to Uplink Switch 1 are configured with the same MLAG port channel number.

The reason for LAG in the uplink switch is to make sure the uplink switch does not send the same packet (broadcast or multicast) to both MLAG peer switches.

Topology 4 – Redundant Uplink Switch Topology

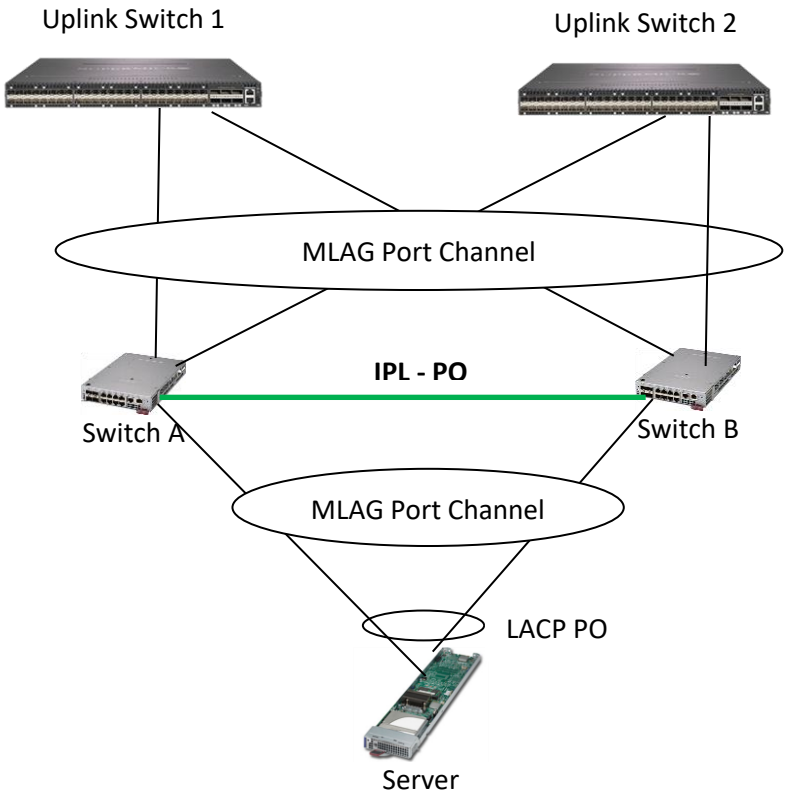

Figure MLAG-4

In Figure MLAG-4, Switch A and Switch B are peer switches in the MLAG. Switches A and B are connected through an IPL port channel interface.

The server is connected to both the MLAG peer switches through regular LACP port channel interface.

Uplink Switch 1 and Uplink Switch 2 are connected to MLAG peer switches Switch A and Switch B through the MLAG port channel interface.

On the Switch A and Switch B sides, the ports connected to the server are configured with the same MLAG enabled port channel number. Similarly, the ports connected to Uplink Switch 1 and Uplink Switch 2 are configured with the same MLAG port channel number.

The reason for MLAG in the uplink switches is to make sure the uplink switch does not send the same packet (broadcast or multicast) to both the MLAG peer switches.

2.4 Topology 5 - Server to switch Layer 3 MLAG topology

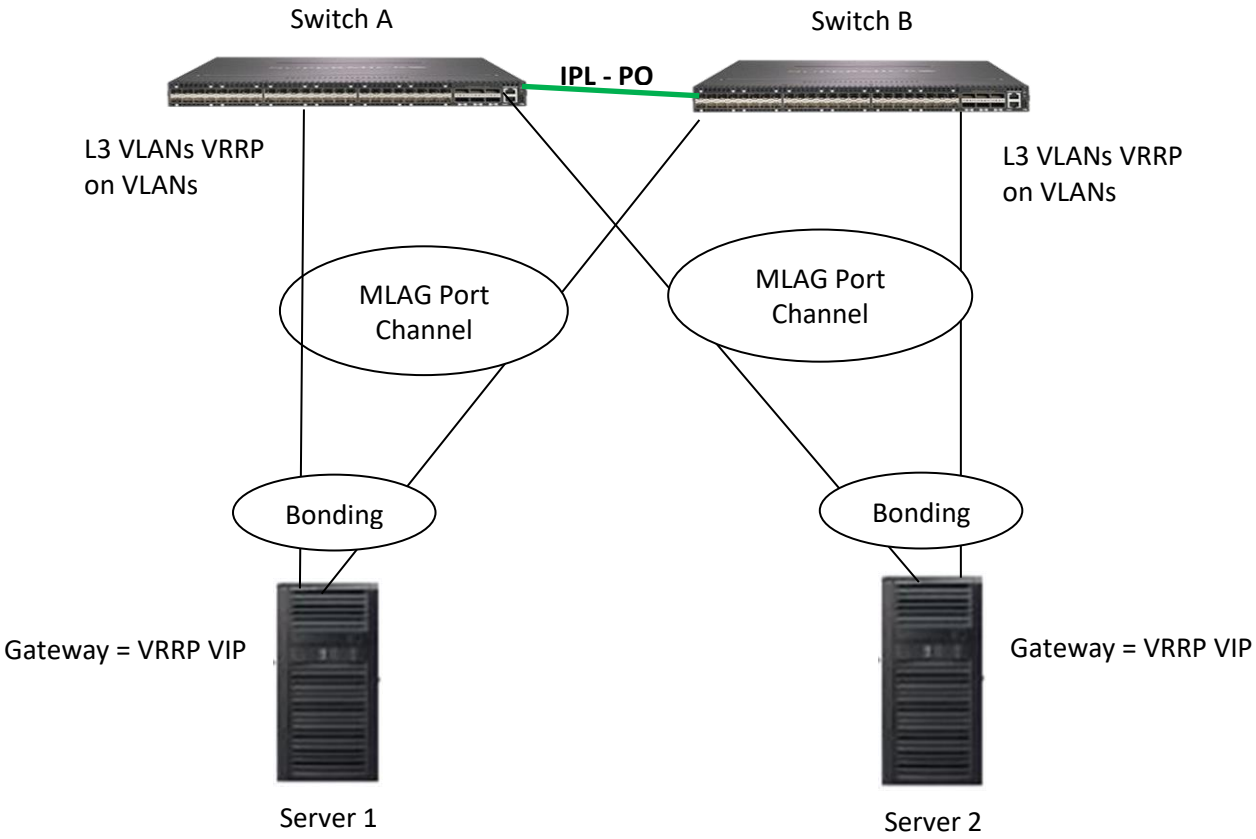

Figure MLAG-5

In Figure MLAG-5 Switches A and B are peer switches in the MLAG. Switches A and B are connected through an IPL port channel interface.

The servers are connected to both of the MLAG peer switches through a regular bonding or teaming LACP interface on the server side. The servers are configured with IP addresses in the L3 VLANs network (configured in MLAG peer switches). The VRRP virtual IP addresses configured in the MLAG peer switches are used as gateway IP addresses in the servers.

On the switch side the ports connected to server are configured with the same MLAG enabled port channel number. Layer 3 VLANs with required IP subnets are configured in the MLAG peer switches. VRRP is configured between the MLAG peer switches.

3 Default Configuration

Parameter	Default Value
System ID	None
System priority	32768
Keep alive time	3 seconds
IPL interface	None
MLAG status	Disabled

4 MLAG Configurations

The mandatory configurations for an MLAG are:

1) System ID
2) Priority
3) IPL port channel interface
4) Enabling MLAG on port channel interfaces

The keep alive time configuration is optional.

4.1 MLAG System ID

The MLAG system ID is a text string configured as a unique MAC address. MLAG switches use this MLAG system ID to identify their peers.

The MLAG system ID must be configured the same in both peer switches. If this condition is not met, the peer connection will not be established. All the MLAG links (connected to different partner devices) in the switch will use this globally configured MLAG system ID.

The LACP globally unique system identifier is formed by combining the MLAG system ID and the MLAG system priority.

Follow the steps below to configure the MLAG System ID.

Step	Command	Description
Step 1	**configure terminal**	Enters the configuration mode
Step 2	**mlag system-identifier <aa:aa:aa:aa:aa:aa>**	Configure the system ID

		<aa:aa:aa:aa:aa:aa> - Specify any unicast MAC address to be used as the MLAG system ID
Step 3	**end**	Exits the configuration mode.
Step 4	show mlag detail	Displays the MLAG configuration details

The **"no mlag system-identifier"** command deletes the MLAG system ID.

When the MLAG system ID is deleted, both IPL and MLAG port channel connected to partner devices will go DOWN.

```
swA#configure terminal
swA(config)# mlag system-identifier 00:01:02:03:04:05
swA#end

swA#  show mlag detail
System Identifier: 00:01:02:03:04:05
System Priority: 32768
Keep Alive Time: 90
IPL Interface: po1
Peer System Identifier: 00:01:02:03:04:05
IPL Link Status: Up
Peer Connection State: ESTABLISHED
MLAG Role: PRIMARY
```

4.2 MLAG System Priority

MLAG switches use this MLAG system priority for LACP exchanges with partner devices.

MLAG system priority must be configured the same in both peer switches. If this condition is not met, the peer connection will not be established. All the MLAG links (connected to different partner devices) in the switch will use this globally configured MLAG system priority.

The LACP globally unique system identifier is formed by combining the MLAG system ID and the MLAG system priority.

Follow the steps below to configure the MLAG system priority.

Step	Command	Description
Step 1	**configure terminal**	Enters the configuration mode
Step 2	**mlag system-priority <0-65535>**	Configure the MLAG system priority
Step 3	**End**	Exits the configuration mode.

Step 4	show mlag detail	Displays the MLAG configuration details

The **"no mlag system-priority"** command deletes the MLAG system priority.

When the MLAG system priority is deleted, both the IPL and the MLAG port channel connected to partner devices will go DOWN.

```
swA#configure terminal
swA(config)# mlag system-priority 1024
swA#end

swA#  show mlag detail
System Identifier: 00:01:02:03:04:05
System Priority: 1024
Keep Alive Time: 90
IPL Interface: po1
Peer System Identifier: 00:01:02:03:04:05
IPL Link Status: Up
Peer Connection State: ESTABLISHED
MLAG Role: PRIMARY
```

4.3 Keep Alive Time

MLAG peer switches periodically transmit keep alive packets to maintain the relationship between peer switches. The value of the keep alive transmit timer is user configurable.
The keep alive mechanism identifies one of the peer switches as the primary and another as the secondary switch based on the switch system MAC address. The switch with the lower MAC address will be the primary switch.
Follow the steps below to configure MLAG Keep alive time.

Step	Command	Description
Step 1	**configure terminal**	Enters the configuration mode
Step 2	**mlag keepalive-time <3-90>**	Configure the MLAG keepalive time.
Step 3	**End**	Exits the configuration mode.
Step 4	show mlag detail	Displays the MLAG configuration details

The "**no mlag keepalive-time"** command resets the keep alive time to its default value.

Keep alive time can be different on both peers.

```
swA#configure terminal
swA(config)# mlag keepalive-time 30
```

swA#end

swA# show mlag detail
System Identifier: 00:01:02:03:04:05
System Priority: 32768
Keep Alive Time: 30
IPL Interface: po1
Peer System Identifier: 00:01:02:03:04:05
IPL Link Status: Up
Peer Connection State: ESTABLISHED
MLAG Role: PRIMARY

4.4 IPL Interface

The link connecting between two MLAG peer switches is referred as the Inter Peer Link (IPL). This link should be configured as an LACP port channel. It can have as many member ports as supported by the switch model.

Only the primary switch among the peers participates in spanning tree protocol.
Follow the steps below to configure the IPL interface.

Step	Command	Description
Step 1	**configure terminal**	Enters the configuration mode
Step 2	**mlag interface port-channel <port-channel-id (1-65535)>**	Configure the IPL interface used to establish the connection between the peers. Note: The given port channel should exist as a LACP port channel prior to this IPL interface configuration.
Step 3	**End**	Exits the configuration mode.
Step 4	show mlag detail	Displays the MLAG configuration details
Step 5	show mlag stp	Displays the MLAG Spanning Tree details

The "**no mlag interface"** command deletes the IPL interface.

The IPL interface cannot be deleted when IPL is in the established state.

swA#configure terminal
swA(config)# mlag interface port-channel 2
swA#end

```
swA#  show mlag detail
System Identifier: 00:01:02:03:04:05
System Priority: 32768
Keep Alive Time: 90
IPL Interface: po2
Peer System Identifier: 00:01:02:03:04:05
IPL Link Status: Up
Peer Connection State: ESTABLISHED
MLAG Role: PRIMARY
```

4.5 MLAG Port Channels

As the link connecting MLAG peers to MLAG partner switches, the MLAG port channel interfaces should be created on both peer switches with the same port channel number.

Step	Command	Description
Step 1	**configure terminal**	Enters the configuration mode
Step 2	**interface port-channel <channel-group-number>**	Creates a port channel using "interface port-channel" command. *channel-group-number* – may be any number from 1 to 65535.
Step 3	**mlag enable**	Configure MLAG link from switch to the partner devices.
Step 4	**end**	Exits the configuration mode.
Step 5	show mlag interface	Displays the details of MLAG interface between peers and partner devices.

The "**mlag disable**" command disables the MLAG link between the switch and the partner device.

```
swA#configure terminal
swA(config)# interface port-channel 1
swA(config-if)# mlag enable
swA#end
```

```
swA# show mlag interface

MLAGId   Local Status   Peer Status
------   ------------   -----------
Po 1       UP           UP
```

The “show interface port channel” command also shows the basic port channel details for MLAG port channels.

4.6 Other Configurations

MLAG peer switches exchange only the dynamic learned specific information. The configurations across peer switches are not exchanged. Hence, users need to make sure MLAG peer switches are configured correctly. The following configurations have to be similar across MLAG peer switches for correct functionality.

Requirements	Comments
VLAN configurations for MLAG interfaces	
Spanning tree configurations for MLAG interfaces	
ACL configurations related to MLAG interfaces	
QoS configurations related to MLAG interfaces	
MAC aging time	
Static MAC entries	
MTU on MLAG and IPL interfaces	

Contacting Supermicro

Headquarters

Address:	Super Micro Computer, Inc. 980 Rock Ave. San Jose, CA 95131 U.S.A.
Tel:	+1 (408) 503-8000
Fax:	+1 (408) 503-8008
Email:	marketing@supermicro.com (General Information) support@supermicro.com (Technical Support)
Web Site:	www.supermicro.com

Europe

Address:	Super Micro Computer B.V. Het Sterrenbeeld 28, 5215 ML 's-Hertogenbosch, The Netherlands
Tel:	+31 (0) 73-6400390
Fax:	+31 (0) 73-6416525
Email:	sales@supermicro.nl (General Information) support@supermicro.nl (Technical Support) rma@supermicro.nl (Customer Support)
Web Site:	www.supermicro.com.nl

Asia-Pacific

Address:	Super Micro Computer, Inc. 3F, No. 150, Jian 1st Rd. Zhonghe Dist., New Taipei City 235 Taiwan (R.O.C)
Tel:	+886-(2) 8226-3990
Fax:	+886-(2) 8226-3992
Email:	support@supermicro.com.tw
Web Site:	www.supermicro.com.tw