



Multi-Chassis Link Aggregation (MLAG)

Configuration Guide

Revision 1.1

The information in this USER'S MANUAL has been carefully reviewed and is believed to be accurate. The vendor assumes no responsibility for any inaccuracies that may be contained in this document, makes no commitment to update or to keep current the information in this manual, or to notify any person organization of the updates. Please Note: For the most up-to-date version of this manual, please see our web site at www.supermicro.com.

Super Micro Computer, Inc. ("Supermicro") reserves the right to make changes to the product described in this manual at any time and without notice. This product, including software, if any, and documentation may not, in whole or in part, be copied, photocopied, reproduced, translated or reduced to any medium or machine without prior written consent.

IN NO EVENT WILL SUPERMICRO BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, SPECULATIVE OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OR INABILITY TO USE THIS PRODUCT OR DOCUMENTATION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN PARTICULAR, SUPERMICRO SHALL NOT HAVE LIABILITY FOR ANY HARDWARE, SOFTWARE, OR DATA STORED OR USED WITH THE PRODUCT, INCLUDING THE COSTS OF REPAIRING, REPLACING, INTEGRATING, INSTALLING OR RECOVERING SUCH HARDWARE, SOFTWARE, OR DATA.

Any disputes arising between manufacturer and customer shall be governed by the laws of Santa Clara County in the State of California, USA. The State of California, County of Santa Clara shall be the exclusive venue for the resolution of any such disputes. Super Micro's total liability for all claims will not exceed the price paid for the hardware product.

FCC Statement: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

California Best Management Practices Regulations for Perchlorate Materials: This Perchlorate warning applies only to products containing CR (Manganese Dioxide) Lithium coin cells. Perchlorate Material-special handling may apply. See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate/> for further details.

Manual Revision 1.1

Release Date: October 5, 2016

Unless you request and receive written permission from Super Micro Computer, Inc., you may not copy any part of this document.

Information in this document is subject to change without notice. Other products and companies referred to herein are trademarks or registered trademarks of their respective companies or mark holders.

Copyright © 2016 by Super Micro Computer, Inc.

All rights reserved.

Printed in the United States of America

Contents

1	MLAG Configuration Guide	4
1.1	Overview	4
1.1.1	Terminologies.....	4
1.2	Topologies.....	6
1.2.1	Topology 1 - Server to switch MLAG topology.....	6
1.2.2	Topology 2 - Switch to switch MLAG topology	7
1.2.3	Topology 3 - Single uplink switch topology.....	8
1.2.4	Topology 4 – Redundant uplink switch topology.....	9
1.2.5	Topology 5 - Server to switch Layer 3 MLAG topology	10
1.3	Default Configuration.....	10
1.4	MLAG Configurations	11
1.4.1	MLAG System ID.....	11
1.4.2	MLAG System Priority	12
1.4.3	Keep Alive Time.....	13
1.4.4	IPL Interface	13
1.4.5	MLAG Port Channels	14
1.4.6	Web configurations.....	15
1.4.7	Other configurations.....	20
1.5	Sample MLAG Configurations	21
1.5.1	Switch Configurations	21
1.6	Troubleshooting.....	37

1 MLAG Configuration Guide

This document describes the Multi-Chassis Link Aggregation (MLAG) feature supported in Supermicro Layer 2 / Layer 3 switch products.

The availability of the MLAG feature depends on the switch model. The currently supported Top-of-Rack switch models are SSE-X24S/R, SSE-X3348S/R, and SSE-X3348T/R. It is also supported on the SBM-XEM-X10SM Supermicro Blade switch.

1.1 Overview

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

The Multi-Chassis Link Aggregation (MLAG) feature allow 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. As with LAG, MLAG also supports up to 8 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.

1.1.1 Terminologies

1.1.1.1 IPL – Inter Peer Link

The link connecting two MLAG peer switches is called 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.

1.1.1.2 Peer Switch

The two switches that form a single logical port channel interface are called “peer switches”. The peer switches are connected through the IPL interface. For example, in the topology diagrams shown in [Section 1.2 - Topologies](#), switches “A” and “B” are peer switches.

1.1.1.3 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 both of the peer switches with the **same port channel number**.

1.1.1.4 Partner Device

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

1.1.1.5 Single Homed Device

The device connected to only one of the peer switch is called a “Single Homed Device”. This connection could be a regular single physical link connection or it could be made through a port channel interface.

1.2 Topologies

1.2.1 Topology 1 - Server to switch MLAG topology

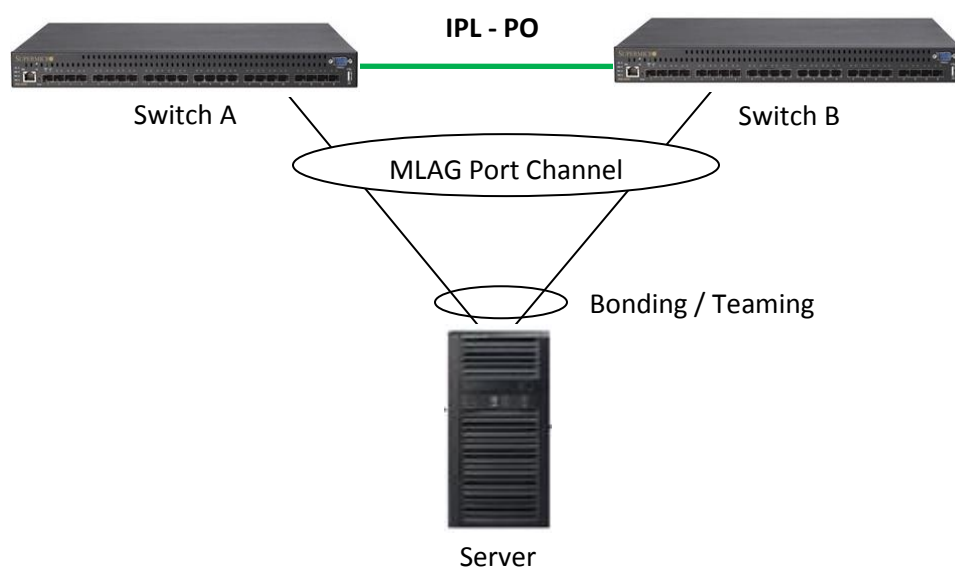


Figure 1

In Figure 1 Switches A and 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 of the MLAG peer switches through a regular bonding or 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.

1.2.2 Topology 2 - Switch to switch MLAG topology

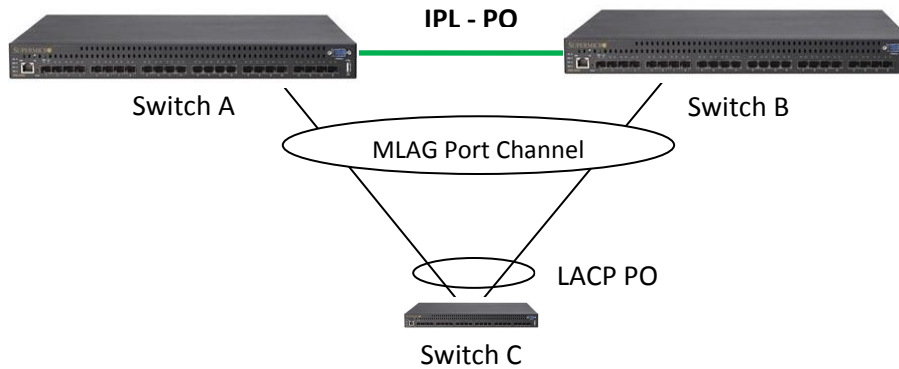


Figure 2

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

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

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

1.2.3 Topology 3 - Single uplink switch topology

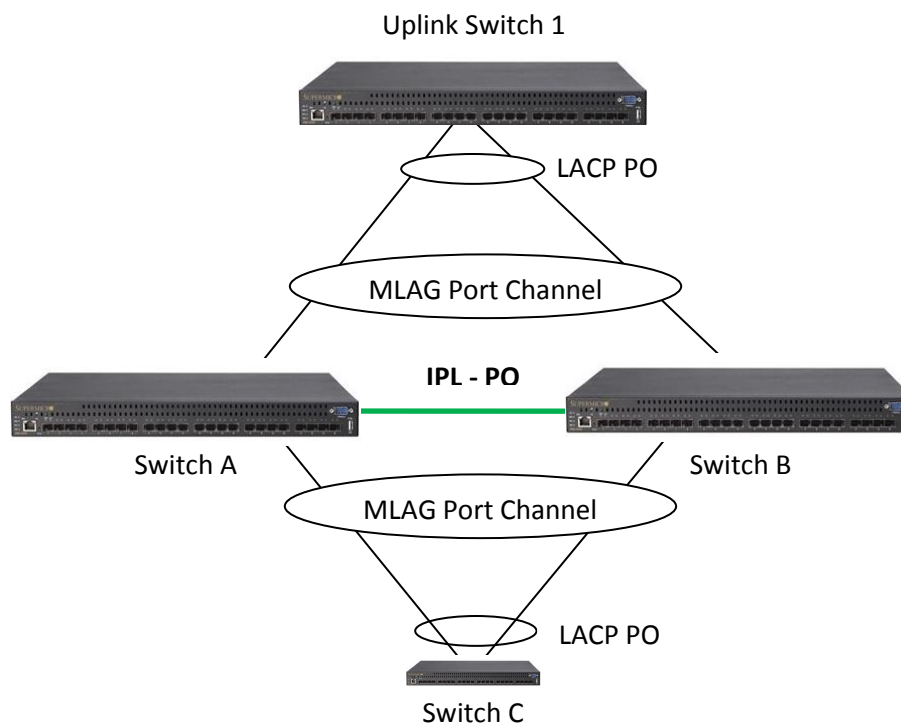


Figure 3

In Figure 3 Switches A and 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 of the MLAG peer switches through a regular LACP port channel interface.

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

On Switches A and B the ports connected to Switch C 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 same packet (broadcast or multicast) to both the MLAG peer switches.

1.2.4 Topology 4 – Redundant uplink switch topology

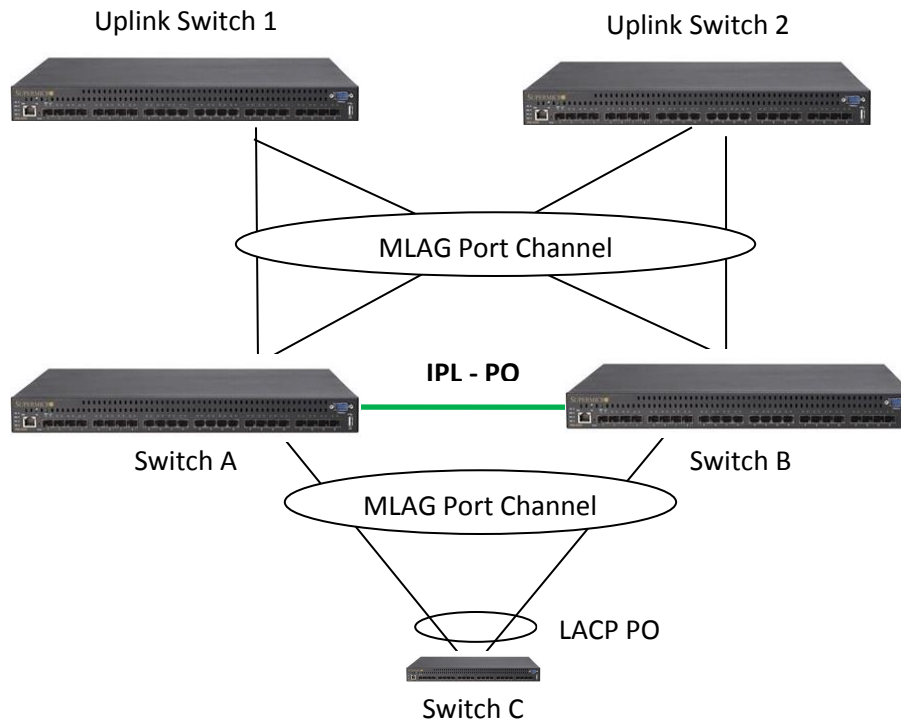


Figure 4

In Figure 4 Switches A and 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 of the MLAG peer switches through a regular LACP port channel interface.

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

On Switches A and B the ports connected to Switch C are configured with the same MLAG enabled port channel number. Similarly the ports connected to Uplink Switches 1 and 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 same packet (broadcast or multicast) to both the MLAG peer switches.

1.2.5 Topology 5 - Server to switch Layer 3 MLAG topology

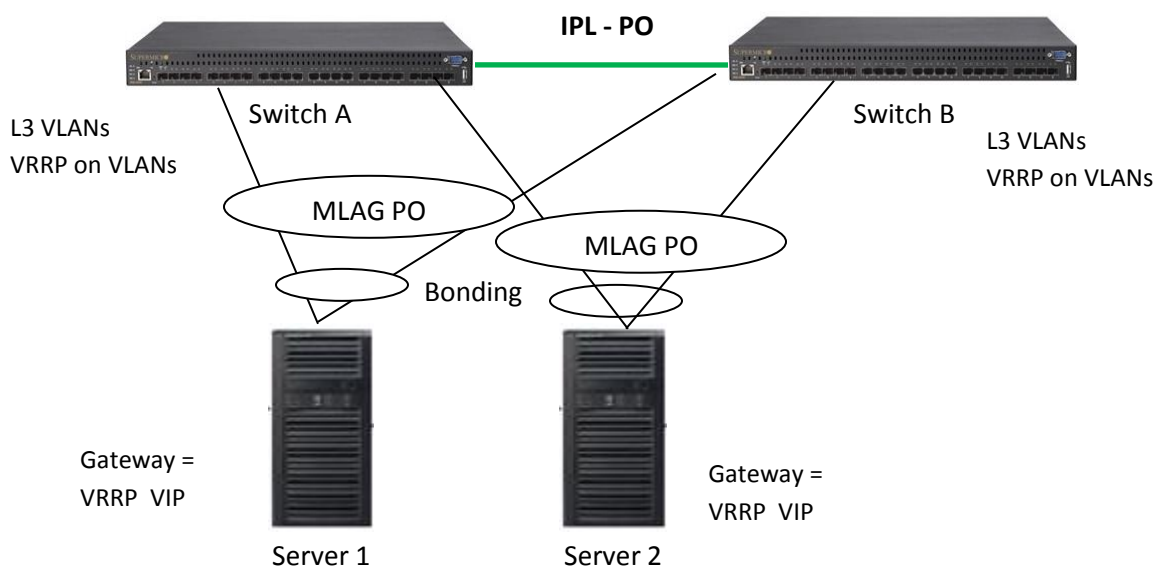


Figure 5

In Figure 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.

1.3 Default Configuration

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

1.4 MLAG Configurations

The mandatory configurations for an MLAG are:

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

The “keep alive time” configuration is optional.

1.4.1 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 of the peer switches. If this condition is not met, the peer connection will not be established. All of 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 MLAG system ID and the MLAG system priority.

Follow the steps below to configure an 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 the IPL and the 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

```

1.4.2 MLAG System Priority

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

An MLAG system priority must be configured the same in both of the peer switches. If this condition is not met, the peer connection will not be established. All of 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 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
```

1.4.3 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 a primary and other as a 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 the MLAG “keep alive” time.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	m lag keepalive-time <3-90>	Configure the MLAG keep alive 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. keepalive-time can be different on both the 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
```

1.4.4 IPL Interface

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

Note: 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	m1ag 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 m1ag detail	Displays the MLAG configuration details
Step 5	show m1ag stp	Displays the MLAG Spanning Tree details



The “no m1ag interface” command deletes the IPL interface.

The IPL interface cannot be deleted when IPL is in the “Established” state.

```
swA#configure terminal
swA(config)# m1ag interface port-channel 2
swA#end
```

```
swA# show m1ag 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
```

1.4.5 MLAG Port Channels

The link connecting MLAG peers to MLAG partner switches is called an “MLAG Port Channel”.. MLAG port channel interfaces should be created on both of the 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. <i>channel-group-number</i> – 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.

1.4.6 Web configurations

The following configurations can be done in the Web interface in the MLAG configuration page.

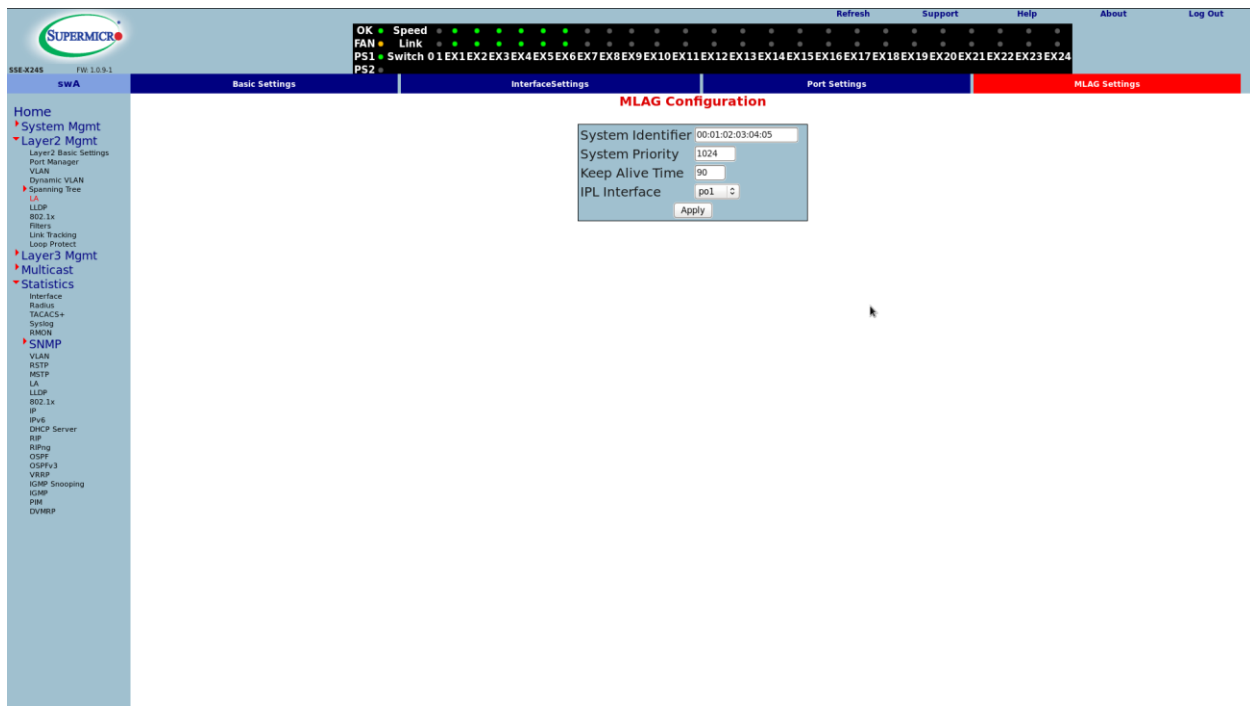
MLAG system ID

MLAG System Priority

MLAG Keep Alive Time

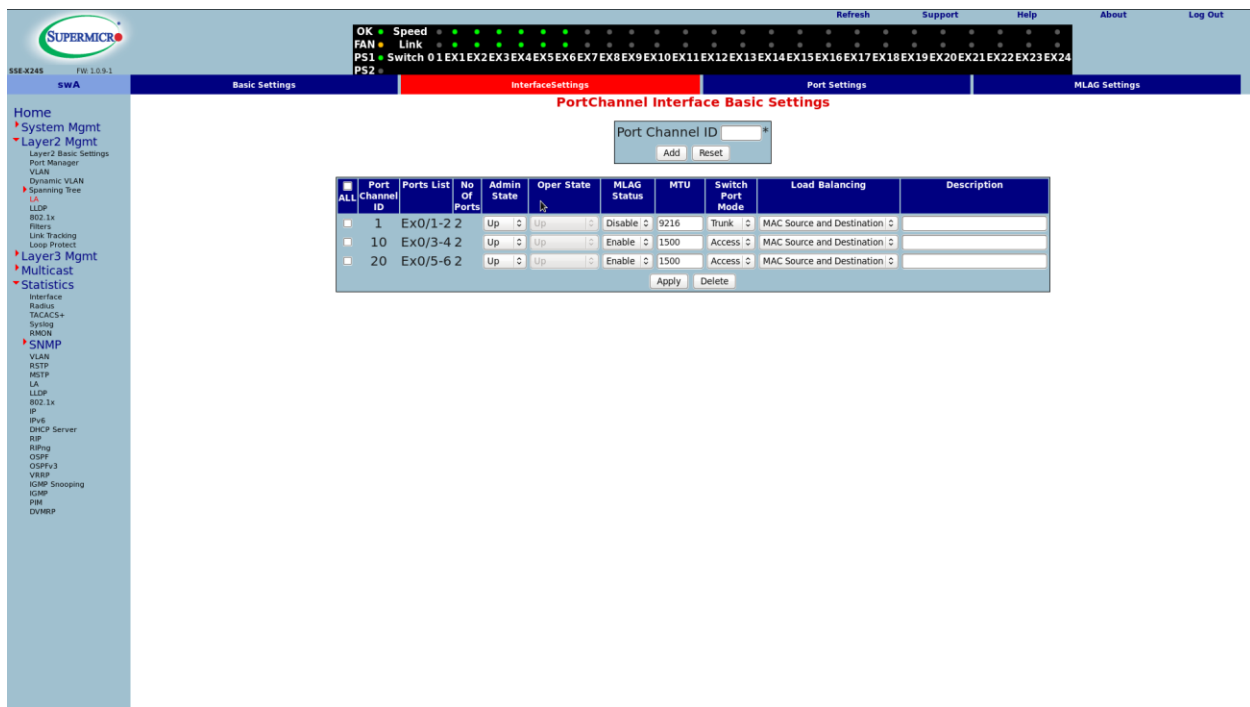
MLAG Interface

This page is available in the LA configurations page list in Layer 2 Mgmt section.



The LA interface page allows the user to enable or disable MLAG in the LACP port channel interfaces.

This page is also available in the LA configurations page list in the Layer 2 Mgmt section.



The following pages show how to check MLAG status:

MLAG status page

The screenshot displays the Supermicro switch management interface. At the top, there is a status bar with indicators for Speed, Link, and Switch status. Below this, a navigation menu includes options like Port/LACP Stats, Neighbour Stats, MLAG Status (highlighted in red), MLAG Interface Status, and MLAG Counters. On the left, a sidebar menu lists various configuration categories such as System Mgmt, Layer2 Mgmt, Layer3 Mgmt, and Statistics. The main content area shows the MLAG Status page with the following details:

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	Secondary

MLAG interface status page

OK Speed Link PS1 PS2 Switch 0 1 EX1 EX2 EX3 EX4 EX5 EX6 EX7 EX8 EX9 EX10 EX11 EX12 EX13 EX14 EX15 EX16 EX17 EX18 EX19 EX20 EX21 EX22 EX23 EX24

Refresh Support Help About Log Out

SWA PortLACP Stats Neighbour Stats MLAG Status MLAG Interface Status MLAG Counters

Home System Mgmt Layer2 Mgmt Layer3 Mgmt Multicast Statistics Interface Radius TACACS+ Syslog RMON SNMP VLAN RSTP MSTP LA LLDP 802.1x IP IPv6 DHCP Server RIP RIPv2 OSPF OSPFv3 VRRP IGMP Snooping IGMP PM DVRRP

MLAG Interface Status

MLAG Id	Local Status	Peer Status
Po10	Up	Unknown
Po20	Up	Unknown
Po100	Down	Unknown

MLAG counters page

OK Speed Link PS1 PS2 Switch 0 1 EX1 EX2 EX3 EX4 EX5 EX6 EX7 EX8 EX9 EX10 EX11 EX12 EX13 EX14 EX15 EX16 EX17 EX18 EX19 EX20 EX21 EX22 EX23 EX24

Refresh Support Help About Log Out

SWA PortLACP Stats Neighbour Stats MLAG Status MLAG Interface Status MLAG Counters

Home System Mgmt Layer2 Mgmt Layer3 Mgmt Multicast Statistics Interface Radius TACACS+ Syslog RMON SNMP VLAN RSTP MSTP LA LLDP 802.1x IP IPv6 DHCP Server RIP RIPv2 OSPF OSPFv3 VRRP IGMP Snooping IGMP PM DVRRP

MLAG Counters Statistics

Reset Statistics

Rx KeepAlive Packets	Rx MLAG Status Packets	Rx STP Packets	Rx STP PortState Packets	Rx MAC Packets	Rx ARP Packets	Rx IGS Packets	Tx KeepAlive Packets	Tx MLAG Status Packets	Tx STP Packets	Tx STP PortState Packets	Tx MAC Packets	Tx ARP Packets	Tx IGS Packets
16	2	0	4	8	0	10	12	4	9	7	12	3	5

These pages are available in the LA page group in the Statistics section.

MAC, IGS and ARP related MLAG information can be seen in the following pages:

MLAG MAC Table – This page is available in the VLAN page groups in the Statistics section.

The screenshot shows the Supermicro switch management interface. The top navigation bar includes 'Refresh', 'Support', 'Help', 'About', and 'Log Out'. The main content area is titled 'MLAG MAC Table' and displays a table with the following data:

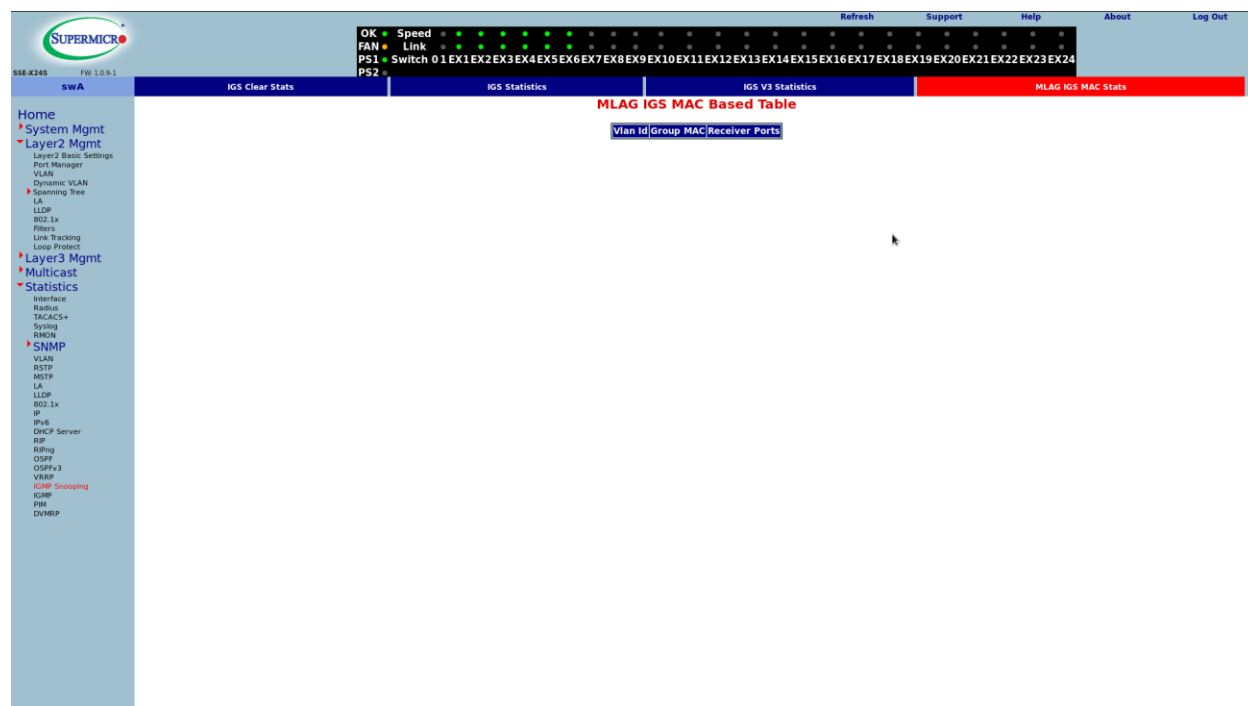
Vlan	Mac Address	Ports
1	00:25:90:40:19:de	po1
10	00:25:90:40:05:f2	po10
10	00:25:90:40:05:f4	po10
10	00:25:90:40:05:f5	po10
10	00:25:90:40:19:de	po1
20	00:25:90:40:19:de	po1
20	00:25:90:40:46:9c	po20
20	00:25:90:40:46:9d	po20

MLAG ARP – This page is available in the IP page groups in the Statistics section.

The screenshot shows the Supermicro switch management interface. The top navigation bar includes 'Refresh', 'Support', 'Help', 'About', and 'Log Out'. The main content area is titled 'MLAG ARP Table' and displays a table with the following data:

IP Address	MAC Address	Type	Interface	Mapping
------------	-------------	------	-----------	---------

MLAG IGS – This page is available in the IGMP Snooping page group in the Statistics section.

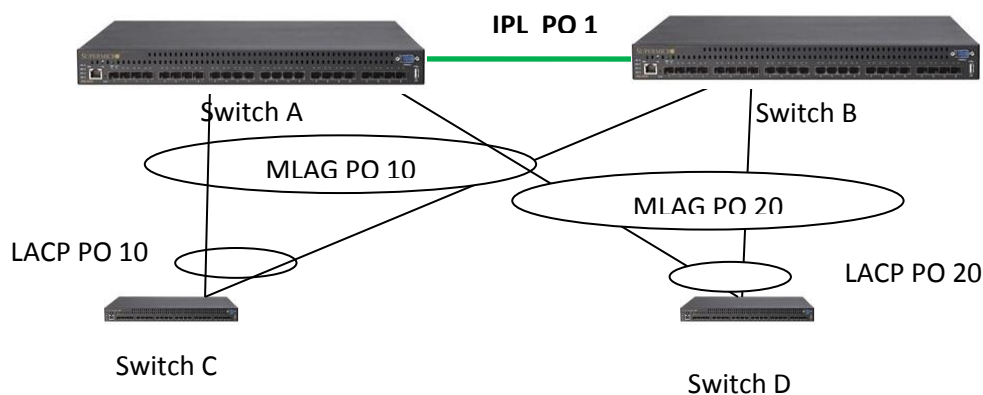


1.4.7 Other Configurations

MLAG peer switches exchange only dynamically learned specific information. Information about the configurations shared across peer switches is not exchanged. Hence, the user needs to make sure that all individual MLAG peer switches are configured correctly. The following configurations must be the same across MLAG peer switches for correct functionality.

Requirements	Comments
VLAN configurations for MLAG interfaces	
Spanning tree configurations for MLAG interfaces	
Layer 3 subnets for MLAG interfaces related layer 3 interfaces	Only for Layer 3 switches.
ACL configurations related to MLAG interfaces	
QoS configurations related to MLAG interfaces	
MAC aging time	
ARP aging time	Only for Layer 3 switches.
Static MAC entries	
Static ARP entries	Only for Layer 3 switches.
Static IP routes	Only for Layer 3 switches.
MTU on MLAG and IPL interfaces	

1.5 Sample MLAG Configurations



1.5.1 Switch Configurations

1.5.1.1 Switch A configuration

```
swA# show running-config
```

```
Building configuration...
```

Switch ID	Hardware Version	Firmware Version	OS Version
0	SSE-X24S Rev. C (P3-01)	1.0.9-1	111

```
ip address 172.31.31.26
device name swA
interface port-channel 1
exit
interface port-channel 10
exit
interface port-channel 20
exit
mlag system-identifier 00:01:02:03:04:05
mlag keepalive-time 90
mlag interface port-channel 1
```

```
vlan 1
  ports ex 0/10 tagged
  ports gi 0/1 untagged
  ports ex 0/7-9 untagged
  ports ex 0/11-24 untagged
  ports po 1 untagged
exit
```

```
vlan 10
  ports po 10 untagged
exit
vlan 20
  ports po 20 untagged
exit

interface Ex 0/1
  mtu 9216
  channel-group 1 mode active

interface Ex 0/2
  mtu 9216
  channel-group 1 mode active

interface Ex 0/3
  channel-group 10 mode active

interface Ex 0/4
  channel-group 10 mode active

interface Ex 0/5
  channel-group 20 mode active

interface Ex 0/6
  channel-group 20 mode active

interface po 1
  mtu 9216
  switchport mode trunk
  spanning-tree disable

interface po 10
  switchport access vlan 10
  switchport mode access
  mlag enable

interface po 20
  switchport access vlan 20
  switchport mode access
  mlag enable

interface vlan 1
  ip address 172.31.31.26 255.255.0.0

interface vlan 10
  ip address 10.1.1.1 255.255.255.0

interface vlan 20
  ip address 20.1.1.1 255.255.255.0
```

```

exit
ip igmp snooping
vlan 1
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit
vlan 10
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit
vlan 20
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit

router vrrp
 interface vlan 10
   vrrp 10 ipv4 10.1.1.3 ping-able
exit
 interface vlan 20
   vrrp 20 ipv4 20.1.1.3 ping-able
exit
exit

interface vlan 1
 ipv6 address fe80::230:48ff:fee3:7542 link-local
exit

```

swA#

swA# **show mlag details**

```

System Identifier      : 00:01:02:03:04:05
System Priority        : 32768
KeepAlive Time        : 90
IPL Interface         : po1
Peer System Identifier : 00:01:02:03:04:05
IPL Link Status       : Up
Peer Connection State  : ESTABLISHED
MLAG Role             : SECONDARY

```

swA# show mlag interface

MLAG Id	Local Status	Peer Status
Po 10	UP	UP
Po 20	UP	UP

swA# **show mlag stp**

Local Interface	STP State
-----------------	-----------

```
-----  
Po 10          SECONDARY  
Po 20          SECONDARY
```

```
swA# show spanning-tree
```

```
We are the root of the Spanning Tree  
Root Id      Priority  32768  
              Address  00:30:48:e3:75:42  
              Cost    0  
              Port    0  
              Max age 20 Sec, forward delay 15 Sec
```

```
MST00
```

```
Spanning tree Protocol has been enabled
```

```
MST00 is executing the mstp compatible Multiple Spanning Tree Protocol  
Bridge Id    Priority  32768  
              Address  00:30:48:e3:75:42  
              Max age 20 sec, forward delay is 15 sec  
              Dynamic Path Cost is Disabled
```

Name	Role	State	Cost	Prio	Type
po1	Disabled	Forwarding	1000	128	P2P
po10	Disabled	Forwarding	1000	128	P2P
po20	Disabled	Forwarding	1000	128	P2P

```
swA# show int po 10
```

```
po10 up, line protocol is up (connected)  
Bridge Port Type: Customer Bridge Port
```

```
Hardware Address is 00:30:48:e3:75:45  
MTU 1500 bytes,
```

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/3	Bundle	128	10	10	0x4	0x3d
Ex0/4	Bundle	128	10	10	0x5	0x3d

```
Reception Counters  
  Octets          : 8020  
  Unicast Packets : 0  
  Broadcast Packets : 2  
  Multicast Packets : 66  
  Pause Frames    : 0  
  Undersize Frames : 0
```

```
Oversize Frames      : 0
CRC Error Frames     : 0
Discarded Packets    : 0
Error Packets        : 0
Unknown Protocol     : 0
```

```
Transmission Counters
Octets               : 8217
Unicast Packets     : 0
Non-Unicast Packets : 67
Pause Frames        : 0
Discarded Packets   : 0
Error Packets       : 0
```

swA#

swA# show int po 20

```
po20 up, line protocol is up (connected)
Bridge Port Type: Customer Bridge Port
```

```
Hardware Address is 00:30:48:e3:75:47
MTU 1500 bytes,
```

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/5	Bundle	128	20	20	0x6	0x3d
Ex0/6	Bundle	128	20	20	0x7	0x3d

```
Reception Counters
Octets               : 7872
Unicast Packets     : 2
Broadcast Packets   : 2
Multicast Packets   : 64
Pause Frames        : 0
Undersize Frames    : 0
Oversize Frames     : 0
CRC Error Frames    : 0
Discarded Packets   : 2
Error Packets       : 0
Unknown Protocol    : 0
```

```
Transmission Counters
Octets               : 4003216
Unicast Packets     : 5810
Non-Unicast Packets : 72
Pause Frames        : 0
Discarded Packets   : 0
Error Packets       : 0
```

swA#

```
swA# show mlag counters
KeepAlive sent           : 8
MLAG Staus change sent  : 1
STP packet sent         : 0
STP PortState packet sent : 0
MAC Sync packet sent    : 6
ARP Sync packet sent    : 5
IGS packet sent        : 1
KeepAlive received     : 10
MLAG Staus change received : 0
STP packet received    : 0
STP PortState packet received : 0
MAC Sync packet received : 5
ARP Sync packet received : 1
IGS packet received    : 2
swA#
```

swA# show mlag mac

Vlan	Mac Address	Ports
----	-----	-----
1	00:25:90:40:19:de	po1
10	00:25:90:40:05:f2	po10
10	00:25:90:40:05:f4	po10
10	00:25:90:40:05:f5	po10
10	00:25:90:40:19:de	po1
20	00:25:90:40:19:de	po1
20	00:25:90:40:46:9c	po20
20	00:25:90:40:46:9d	po20

Total Mac Addresses displayed: 8

1.5.1.2 Switch B Configurations

swB# show running-config

```
Building configuration...
Switch ID  Hardware Version          Firmware Version  OS Version
0          SSE-X24S Rev. A      (P3-01)         1.0.9-1         1.1.5

ip address 172.31.31.25
ip gateway 172.31.0.1
device name swB
interface port-channel 1
exit
```

```
interface port-channel 10
exit
interface port-channel 20
exit
interface port-channel 100
exit
mlag system-identifier 00:01:02:03:04:05
mlag keepalive-time 90
mlag interface port-channel 1

vlan 1
  ports po 100 tagged
  ports ex 0/7-9 untagged
  ports ex 0/11-24 untagged
  ports po 1 untagged
exit
vlan 10
  ports po 10 untagged
exit
vlan 20
  ports po 20 untagged
exit

interface Ex 0/1
  mtu 9216
  channel-group 1 mode active

interface Ex 0/2
  mtu 9216
  channel-group 1 mode active

interface Ex 0/3
  channel-group 20 mode active

interface Ex 0/4
  channel-group 20 mode active

interface Ex 0/5
  channel-group 10 mode active

interface Ex 0/6
  channel-group 10 mode active

interface Ex 0/10
  channel-group 100 mode active

interface po 1
  mtu 9216
  switchport mode trunk
  spanning-tree disable
```

```
interface po 10
  switchport access vlan 10
  switchport mode access
  mlag enable

interface po 20
  switchport access vlan 20
  switchport mode access
  mlag enable

interface po 100
  mlag enable

interface vlan 10
  ip address 10.1.1.2 255.255.255.0

interface vlan 20
  ip address 20.1.1.2 255.255.255.0

exit
ip igmp snooping
vlan 1
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit
vlan 10
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit
vlan 20
ip igmp snooping
ip igmp snooping mrouter port-channel 1
exit

logging trap debugging

router vrrp
  interface vlan 10
    vrrp 10 ipv4 10.1.1.3 ping-able
  exit
  interface vlan 20
    vrrp 20 ipv4 20.1.1.3 ping-able
  exit
exit

swB#
```

```
swB# show mlag details
```

```

System Identifier      : 00:01:02:03:04:05
System Priority       : 32768
KeepAlive 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
swB# show mlag interface

```

MLAG Id	Local Status	Peer Status
Po 10	UP	UP
Po 20	UP	UP
Po 100	Down	Unknown

```
swB# show mlag stp
```

Local Interface	STP State
Po 10	PRIMARY
Po 20	PRIMARY

```
swB# show spanning-tree
```

```

Root Id      Priority 32768
             Address 00:25:90:40:05:ee
             Cost   1000
             Port   po10
             Max age 20 Sec, forward delay 15 Sec

```

```
MST00
```

```
Spanning tree Protocol has been enabled
```

```
MST00 is executing the mstp compatible Multiple Spanning Tree Protocol
```

```

Bridge Id      Priority 32768
             Address 00:25:90:40:19:de
             Max age is 20 sec, forward delay is 15 sec
             Dynamic Path Cost is Disabled

```

Name	Role	State	Cost	Prio	Type
po1	Disabled	Forwarding	1000	128	P2P
po10	Root	Forwarding	1000	128	P2P
po20	Designated	Forwarding	1000	128	P2P

```
swB#
```

```
swB# show int po 10
```

```
po10 up, line protocol is up (connected)
```

Bridge Port Type: Customer Bridge Port

Hardware Address is 00:25:90:40:19:e2

MTU 1500 bytes,

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/5	Bundle	128	10	10	0x5	0x3d
Ex0/6	Bundle	128	10	10	0x6	0x3d

Reception Counters

Octets : 58871
Unicast Packets : 0
Broadcast Packets : 0
Multicast Packets : 479
Pause Frames : 0
Undersize Frames : 0
Oversize Frames : 0
CRC Error Frames : 0
Discarded Packets : 0
Error Packets : 0
Unknown Protocol : 0

Transmission Counters

Octets : 61788
Unicast Packets : 0
Non-Unicast Packets : 888
Pause Frames : 0
Discarded Packets : 0
Error Packets : 0

swB# show int po 20

po20 up, line protocol is up (connected)

Bridge Port Type: Customer Bridge Port

Hardware Address is 00:25:90:40:19:e0

MTU 1500 bytes,

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/3	Bundle	128	20	20	0x3	0x3d
Ex0/4	Bundle	128	20	20	0x4	0x3d

Reception Counters

Octets : 924706
Unicast Packets : 7433
Broadcast Packets : 1

```
Multicast Packets      : 78
Pause Frames           : 0
Undersize Frames       : 0
Oversize Frames        : 0
CRC Error Frames       : 0
Discarded Packets      : 0
Error Packets          : 0
Unknown Protocol       : 0
```

```
Transmission Counters
Octets                 : 1090675
Unicast Packets        : 1178
Non-Unicast Packets    : 1314
Pause Frames           : 0
Discarded Packets      : 0
Error Packets          : 0
```

swB# show mlag counters

```
KeepAlive sent         : 13
MLAG Staus change sent : 0
STP packet sent        : 0
STP PortState packet sent : 0
MAC Sync packet sent   : 5
ARP Sync packet sent   : 1
IGS packet sent        : 2
KeepAlive received     : 11
MLAG Staus change received : 1
STP packet received    : 0
STP PortState packet received : 0
MAC Sync packet received : 6
ARP Sync packet received : 5
IGS packet received    : 1
swB# show mlag mac
```

Vlan	Mac Address	Ports
----	-----	-----
1	00:30:48:e3:75:42	po1
10	00:25:90:40:05:f3	po10
10	00:30:48:e3:75:42	po1
20	00:25:90:40:46:9e	po20
20	00:25:90:40:46:9f	po20
20	00:30:48:e3:75:42	po1

```
Total Mac Addresses displayed: 6
```

1.5.1.3 Switch C Configuration

```
swC(config)# show running-config
```

Building configuration...

Switch ID	Hardware Version	Firmware Version
OS Version		
0	SSE-X3348SR Rev.B (P4-01)	1.0.5.7
2		

device name swC

```
interface port-channel 10
exit
```

```
vlan 1
```

```
  ports gi 0/1-2 untagged
  ports ex 0/1-2 untagged
  ports ex 0/7-48 untagged
  ports qx 0/1-4 untagged
  ports po 10 untagged
```

```
exit
```

```
vlan 10
```

```
exit
```

```
interface Ex 0/3
```

```
  channel-group 10 mode active
```

```
interface Ex 0/4
```

```
  channel-group 10 mode active
```

```
interface Ex 0/5
```

```
  channel-group 10 mode active
```

```
interface Ex 0/6
```

```
  channel-group 10 mode active
```

```
interface vlan 1
```

```
exit
```

```
ip igmp snooping
```

```
vlan 10
```

```
ip igmp snooping
```

```
exit
```

```
logging console
```

```
logging trap debugging
```

```
interface vlan 1
```

```
  ipv6 address fe80::225:90ff:fe40:5ee link-local
```

```
exit
```

```
swC(config)#
```

```
swC(config)# show int po 10
```

```
po10 up, line protocol is up (connected)
Bridge Port Type: Customer Bridge Port
```

```
Hardware Address is 00:25:90:40:05:f2
MTU 1500 bytes,
```

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/3	Bundle	128	10	10	0x5	0x3d
Ex0/4	Bundle	128	10	10	0x6	0x3d
Ex0/5	Bundle	128	10	10	0x7	0x3d
Ex0/6	Bundle	128	10	10	0x8	0x3d

```
Reception Counters
```

```
Octets : 99277
Unicast Packets : 0
Unicast Packets Rate : 0/Sec
Broadcast Packets : 3
Broadcast Packets Rate : 0/Sec
Multicast Packets : 1345
Multicast Packets Rate : 1/Sec
Overall Packets Rate : 1/Sec
Pause Frames : 0
Undersize Frames : 0
Oversize Frames : 0
CRC Error Frames : 0
Discarded Packets : 1320
Error Packets : 0
Unknown Protocol : 0
```

```
Transmission Counters
```

```
Octets : 95442
Unicast Packets : 0
Unicast Packets Rate : 0/Sec
Broadcast Packets : 2
Broadcast Packets Rate : 0/Sec
Multicast Packets : 776
Multicast Packets Rate : 0/Sec
Overall Packets Rate : 0/Sec
Pause Frames : 0
Discarded Packets : 0
Error Packets : 0
```

```
swC(config)#
```

```
swC# show spanning-tree
```

```
We are the root of the Spanning Tree
Root Id          Priority  32768
                  Address  00:25:90:40:05:ee
                  Cost    0
                  Port    0
                  Max age 20 Sec, forward delay 15 Sec
```

```
MST00
```

```
Spanning tree Protocol has been enabled
```

```
MST00 is executing the mstp compatible Multiple Spanning Tree Protocol
```

```
Bridge Id        Priority  32768
                  Address  00:25:90:40:05:ee
                  Max age  is 20 sec, forward delay is 15 sec
                  Dynamic Path Cost is Disabled
```

Name	Role	State	Cost	Prio	Type
-----	-----	-----	-----	-----	-----
po10	Designated	Forwarding	500	128	P2P

```
swC#
```

1.5.1.4 Switch D Configuration

```
swD(config)# show running-config
```

```
Building configuration...
Switch ID          Hardware Version          Firmware Version
OS Version
0                  SSE-X3348S Rev.1 (P4-01)    1.0.5.12
2.6.23.0.11

ip address 20.1.1.105
device name swD
interface port-channel 20
exit
port-channel load-balance src-mac 20

vlan 1
  ports gi 0/1-2 untagged
  ports ex 0/1-2 untagged
  ports ex 0/7-48 untagged
  ports qx 0/1-4 untagged
  ports po 20 untagged
exit
vlan 20
exit

interface Ex 0/3
  channel-group 20 mode active
```

```

interface Ex 0/4
  channel-group 20 mode active

interface Ex 0/5
  channel-group 20 mode active

interface Ex 0/6
  channel-group 20 mode active

interface vlan 1
  ip address 20.1.1.105 255.255.255.0

exit
vlan 1
ip igmp snooping mrouter gigabitethernet 0/1
exit

logging trap debugging

interface vlan 1
  ipv6 address fe80::225:90ff:fe40:4698 link-local
exit

swD(config)#

```

swD(config)# show int po 20

```

po20 up, line protocol is up (connected)
Bridge Port Type: Customer Bridge Port

```

```

Hardware Address is 00:25:90:40:46:9c
MTU 1500 bytes,

```

Port	State	LACP Port Priority	Admin Key	Oper Key	Port Number	Port State
Ex0/3	Bundle	128	20	20	0x5	0x3d
Ex0/4	Bundle	128	20	20	0x6	0x3d
Ex0/5	Bundle	128	20	20	0x7	0x3d
Ex0/6	Bundle	128	20	20	0x8	0x3d

Reception Counters

```

Octets : 7045429
Unicast Packets : 11072
Unicast Packets Rate : 5/Sec
Broadcast Packets : 6
Broadcast Packets Rate : 0/Sec
Multicast Packets : 2129
Multicast Packets Rate : 1/Sec
Overall Packets Rate : 6/Sec

```

```

Pause Frames           : 0
Undersize Frames       : 0
Oversize Frames        : 0
CRC Error Frames       : 0
Discarded Packets      : 203
Error Packets          : 0
Unknown Protocol       : 0

```

Transmission Counters

```

Octets                 : 1323069
Unicast Packets        : 10353
Unicast Packets Rate   : 5/Sec
Broadcast Packets      : 3
Broadcast Packets Rate : 0/Sec
Multicast Packets      : 228
Multicast Packets Rate : 0/Sec
Overall Packets Rate   : 5/Sec
Pause Frames           : 0
Discarded Packets      : 0
Error Packets          : 0

```

swD(config)#

swD# show spanning-tree

```

Root Id      Priority 32768
             Address 00:25:90:40:05:ee
             Cost    1500
             Port    po20
             Max age 20 Sec, forward delay 15 Sec

```

MST00

Spanning tree Protocol has been enabled

MST00 is executing the mstp compatible Multiple Spanning Tree Protocol

```

Bridge Id      Priority 32768
             Address 00:25:90:40:46:98
             Max age is 20 sec, forward delay is 15 sec
             Dynamic Path Cost is Disabled

```

Name	Role	State	Cost	Prio	Type
Gi0/1	Designated	Forwarding	20000	128	P2P
po20	Root	Forwarding	500	128	P2P

swD#

1.6 Troubleshooting

#	Issue	Cause(s)	Solution
1	Peer not established	<ol style="list-style-type: none">1) System ID does not match on both peers.2) Priority does not match in both peers.	<p>Configure same value of System ID on both switches.</p> <p>Configure same value of priority on both switches.</p>
2	MLAG is not UP	Port channel ID's used in both peers are different.	Configure same port channel ID's on both switches for MLAG link.