Sun Ethernet Fabric Operating System LLA Administration Guide

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Using This Documentation

- **Overview** – Provides information about configuring LLA, which is a L2 feature that provides the aggregation of links from a server connected to two physical switches resulting in increased redundancy and capacity
- **Audience** – Users implementing LLA with other protocols in the router stack
- **Required Knowledge** – Basic knowledge of LLA

Product Documentation Library

Documentation and resources for this product and related products are available at:

- http://www.oracle.com/goto/es2-72_es2-64/docs
- http://www.oracle.com/goto/ES1-24/docs

Acronyms and Abbreviations

Acronym or Abbreviation	Explanation
LLA	Logical link aggregation
ISL	Inter-switch link
SEFOS	Sun Ethernet Fabric Operating System

CLI Command Modes

The following table lists the configuration modes used in this document with their access and exit methods.

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Access SEFOS from Oracle ILOM with read-only rights (privilege level 1).	`SEFOS>`	Use the `logout` or `exit` command to return to the Oracle ILOM prompt.

Command Mode	Access Method	Prompt	Exit Method
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	`SEFOS#`	Use the `logout` or `exit` command to return to the Oracle ILOM prompt.
Global Configuration	From User EXEC mode, use the `enable` command.	`SEFOS(config)#`	Use the `end` command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the `interface interface-type interface-id` command.	`SEFOS(config-if)#`	Use the `exit` command to return to Global Configuration mode, or use the `end` command to return to Privileged EXEC mode.
LLA Configuration	From Global Configuration mode, use the `lla` command.	`SEFOS(config-lla)#`	Use the `exit` command to return to Global Configuration mode, or use the `end` command to return to Privileged EXEC mode.

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LLA Overview

This section describes the LA protocol.

Protocol Description

Standard link aggregation enables you to directly connect two systems through multiple ports. These ports are viewed as one logical link, and may be simultaneously in active mode. This situation provides higher capacity between the two systems and supports automatic fail over if any of the physical ports becomes unavailable. Typically, you can use link aggregation between tiers for higher capacity. To provide redundancy, multiple up-links are deployed between tiers. However, because of the spanning tree algorithm, only one of these links is active.

LLA on the other hand, enables link aggregation links from servers to terminate at two separate switches. This situation provides an increase in capacity and redundancy, supporting an active-active deployment model. Fail-over can occur rapidly, as there are no L2 or L3 protocol delays. On the server, the links are configured as Linux bonds or Oracle Solaris link aggregations.

In LLA, two switches are connected together directly through an ISL, a special trunk group between them. The LLA ports are connected to the server and are members of the LLA port-channels. The ISL port-channel is required to be in forwarding state on both the switches at all times. This is done by setting the spanning tree cost on the ISL port-channel lower than any other port in the system, and by choosing the uplink costs such that the sum of the ISL cost and the preferred uplink cost is less than that of other uplinks. Both switches maintain their identity as separate L2/L3 switching entities. The rest of the network sees them as two separate L2 switches with different addresses.

When designing a deployment with LLA, carefully examine the expected traffic patterns. The ISL port-channel should be provisioned with an adequate bandwidth. Traffic from the uplinks may always be distributed between the local link and the path crossing the ISL. Likewise, depending on the server side configuration, traffic may always be using both paths in the reverse direction.

With LLA enabled, the switches must share state and maintain a common mapping of ports. This common mapping is initialized when SEFOS starts up. For this reason, after LLA is configured, the configuration must be saved and SEFOS must be restarted.

LLA Port-Types

There are three types of LLA ports:

- **LLA ports.** Ports connected to the hosts and part of the LLA port-channel.
- **ISL ports.** Ports used to connect the two switches and part of the ISL port-channel. The ISL ports have to be consecutive, otherwise an error is flagged and LLA is disabled on subsequent start-up.
- **Standard ports.** Any other ports. Standard ports may be part of regular port-channels.

LLA Port-Channels

The port-channels could be any of the following three types:

- **LLA port-channel.** Configured on both systems with the same port-channel key and port number. The LLA port-channel key range is from 101 to 124. Only one LLA port per LLA port-channel is allowed. The range of LLA port-channels from 125 to 130 is reserved for internal usage. New LLA port-channels are allowed at run-time. However, changes to existing LLA ports and LLA port-channel is not supported.
- **ISL port-channel.** Configured on both systems and member ports connecting the two switches. The ISL port-channel key is fixed as 100. When multiple VLANs are configured, ISL port-channel should be in trunk mode. The ISL port-channel must be a member of every VLAN that the LLA port-channels are in. Changes to the ISL port-channel will require SEFOS to be restarted after saving the configuration.
- **Regular port-channel.** Any standard ports not configured as either LLA or ISL ports can be member of regular port-channels. Up to 12 regular port-channels can be created, with the port-channel keys ranging from 131 to 142.

Supported CLI Commands

You can use the following CLI commands to configure LLA:

- `set lla enable`
- `set lla disable`
- `lla`

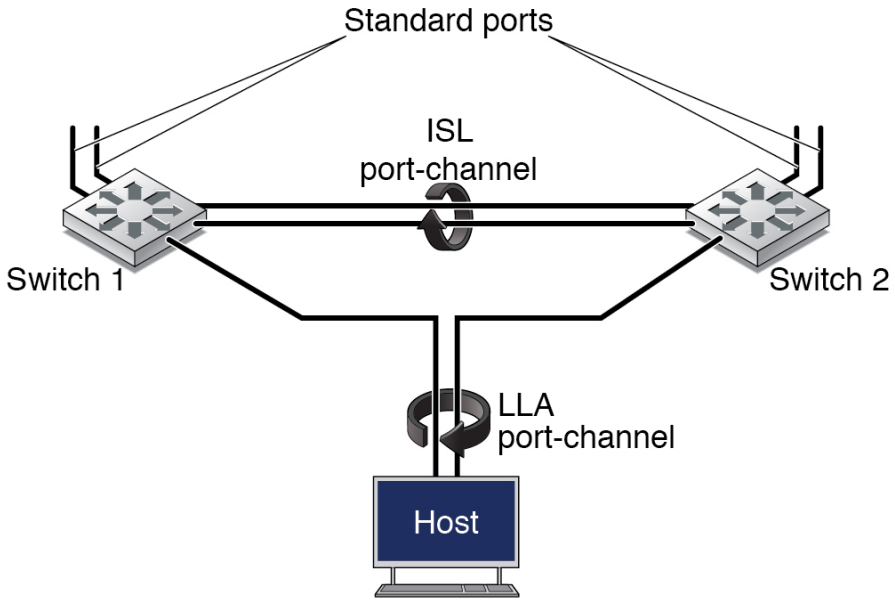
- `isl port-channel key`
- `lla port-channel key`
- `no isl port-channel key`
- `no lla port-channel key`
- `role primary`
- `secondary primary`
- `no role`
- `show lla role`
- `show lla ports`
- `show lla status`

Refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual* for the complete set of commands for configuring LLA.

Configuring LLA

These sections describe how to configure LLA on a switch.

LLA Example Topology



▼ Configure LLA

To configure LLA on a switch, you must first configure the LLA and ISL port-channels.

Connect the host to one port on each of the switches. The connections must be to the same port number on both switches. Form an aggregate on the host with the interfaces connected to these ports. Both active-active and active-standby configurations for aggregate ports are allowed.

On each switch, create the LLA port-channel, ISL port-channel and add the member ports. The LLA port on each switch is the port connected to the host. The ISL ports are the ports connecting the two switches. The LLA port-channel and corresponding member ports must be the same on both switches. Then configure the LLA role as primary or secondary for both switches. Ensure that one switch is the primary and the other the secondary. Then enable LLA. If the `enable LLA` command is not executed, LLA will not be enabled after restart, even though the LLA role and ports are configured. Then restart the SEFOS on the switches. After the restart, LLA will be operable and the switches will assume their respective roles.

1. **Create an LLA port-channel.**

```
Switch-<n>(config)# interface port-channel 101

The LLA port-channels are reserved from 101 to 124. The mode changes to port-channel
 configuration.

Switch-<n>(config-if)# no shut
Switch-<n>(config-if)# exit
```

2. **Create the ISL port-channel.**

```
Switch-<n>(config)# interface port-channel 100

The port-channel 100 is reserved for ISL. The mode changes to port-channel configuration.

Switch-<n>(config-if)# spanning-tree cost 10

The ISL port-channel must be in forwarding state on both the fabrics.

Switch-<n>(config-if)# no shutdown
Switch-<n>(config-if)# exit
```

3. **Add ports to the LLA port-channel.**

```
Switch-<n>(config)# interface extreme-ethernet 0/15
Switch-<n>(config-if)# channel-group 101 mode on
Switch-<n>(config-if)# no shutdown
Switch-<n>(config-if)# exit
```

4. **Add ports to the ISL port-channel.**

```
Switch-<n>(config)# interface extreme-ethernet 0/11
Switch-<n>(config-if)# channel-group 100 mode on
```

```
Switch-<n>(config-if)# no shutdown
Switch-<n>(config-if)# exit

Switch-<n>(config)# interface extreme-ethernet 0/12
Switch-<n>(config-if)# channel-group 100 mode on
Switch-<n>(config-if)# no shutdown
Switch-<n>(config-if)# exit
```

The ISL ports must be contiguous. The `interface range` command may also be used to add ports to the ISL port-channel.

5. Set the LLA role and add the ISL and LLA port-channels.

The role is configured as primary on one switch and as secondary on the other switch.

```
Switch-1(config)# lla
Switch-1(config-lla)# role primary

Switch-1(config)# lla
Switch-2(config-lla)# role secondary

Switch-<n>(config-lla)# isl port-channel 100
Switch-<n>(config-lla)# lla port-channel 101
Switch-<n>(config-lla)# exit
Switch-<n>(config)#
```

6. Enable LLA.

```
Switch-<n># configure terminal
Switch-<n>(config)# set lla enable

Switch-<n>(config)# set port-channel enable
```

The port-channel feature has to be enabled for LLA.

7. Verify the configuration.

```
Switch-1# show lla role

LLA Role: primary
Switch-1# show lla status

LLA Disabled with role not set at bootup

SEFOS. LLA configurations take affect only after saving the configuration and restarting

SEFOS# show lla ports

Isl Trunk Port-channel: port-channel 100
Ports:
```

```
interface  extreme-ethernet 0/11
interface  extreme-ethernet 0/12

Lla Port-channel: port-channel 101
Ports:
interface  extreme-ethernet 0/15
```

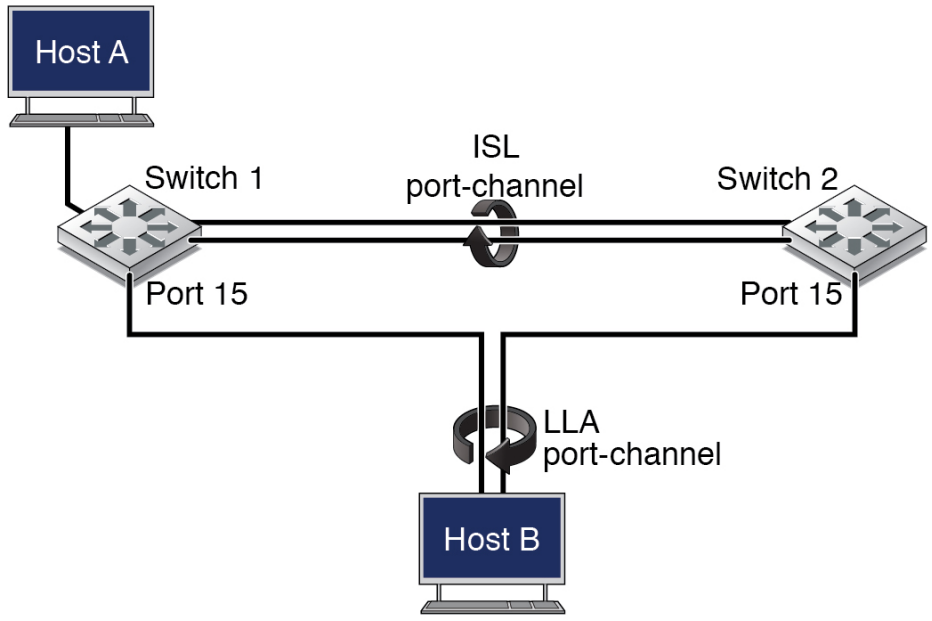
8. **Save the LLA configuration.**

```
Switch-<n># write startup-config

  LLA configuration takes affect after restarting the SEFOS.
```

9. **Verify the configuration by checking connectivity between a host connected to an uplink on one of the switches to another host connected to the LLA ports on both switches.**

```
Switch-1# show lla status

LLA Enabled with role primary at bootup
```

- Ping from `Host A` on uplink port 10 on switch 1 to `Host B` on LLA ports 15. On `Host B`, the interfaces connected to the switches are bonded.



```
[Host-A ~]# ping host-b

PING host-b (192.168.1.10) 56(84) bytes of data.
64 bytes from host-b (192.168.1.10): icmp_seq=0 ttl=255 time=1.61 ms
64 bytes from host-b (192.168.1.10): icmp_seq=1 ttl=255 time=0.288 ms

--- host-b ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 0.288/0.952/1.616/0.664 ms
```

- Shut down LLA port 15 on switch 1. Traffic resumes in very short time through port 15 on switch 2.

10. Show the running configuration for LLA.

```
Switch-1# show running-config LLA

Building configuration...
lla enabled
!
role primary
!
interface port-channel 100
isl trunk port-channel
!
interface  extreme-ethernet 0/11
isl port
!
interface  extreme-ethernet 0/12
isl port
!
!

!
interface port-channel 101
lla port-channel
!
interface  extreme-ethernet 0/15
lla port
!
end
```