

Sun Ethernet Fabric Operating System SLB Administration Guide

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Using This Documentation

- **Overview** – Provides information about the Oracle SEFOS SLB feature and how to configure SLB
- **Audience** – Users implementing SLB with other protocols in the router stack
- **Required Knowledge** – Basic knowledge of the SLB feature

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>
- <http://www.oracle.com/goto/sn-10gbE-72p/docs>
- <http://www.oracle.com/goto/sb6k-24p-10gbe/docs>

Acronyms and Abbreviations

The following table contains the acronyms and abbreviations are used in this book.

Acronym or Abbreviation	Explanation
ACL	Access control list
CLI	Command-line interface
DSR	Direct server return
ECMP	Equal cost multiple path
GARP	Generic Attribute Registration Protocol
GMRP	GARP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
ICMP	Internal Control Message Protocol
L2	OSI layer 2
L3	OSI layer 3

Acronym or Abbreviation	Explanation
LAG	Link aggregation group
LBG	Load balancing group
NAT	Network address translation
PVID	Permanent VLAN identifier
SEFOS	Sun Ethernet Fabric Operating System
RIP	Real IP address
SLB	Server load balancing
SLB-L2	Server load balancing in L2 form
VIP	Virtual IP address
VM	Virtual machine

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 <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	SEFOS#	Use the <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Global Configuration	From Privileged EXEC mode, use the <code>configure terminal</code> command.	SEFOS(config)#	Use the <code>end</code> command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the interface <code>interface-type interface-id</code> command.	SEFOS(config-if)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.

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SLB Overview

SLB technology enables a switch to distribute input traffic to switch connected servers. SLB operates in two different forms, SLB (traffic distribution to target servers through L3 routing) and SLB-L2 (traffic distribution to switch port-connected servers through L2 switching).

These sections describe these two forms of SLB and show examples of some common configurations.

- [“Configuring the SLB Topology Example ” on page 11](#)
- [“Configuring the SLB-L2 Topology Example” on page 13](#)
- [“Conditions for a Member Participating in Load Distribution” on page 15](#)

Configuring the SLB Topology Example

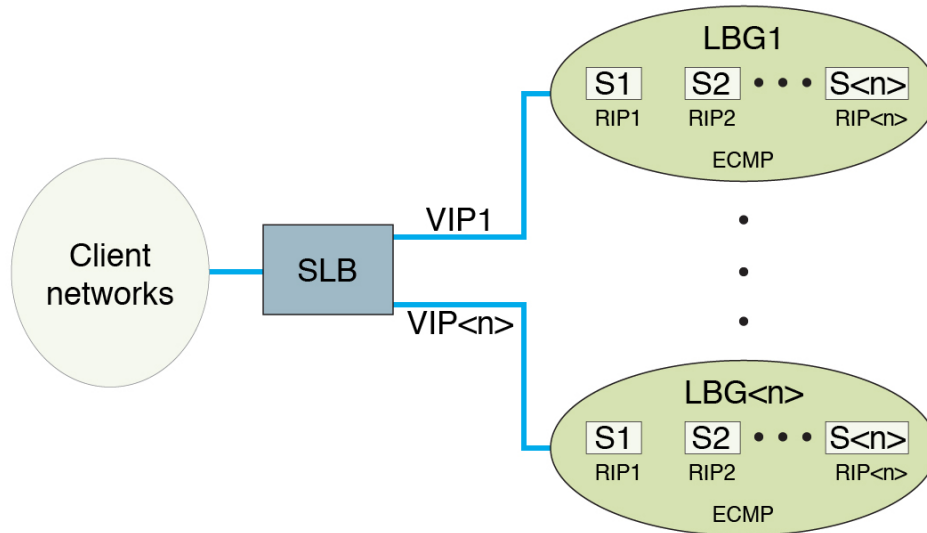
These sections describes how to configure the example.

- [“SLB Description” on page 11](#)
- [“SLB Topology Example” on page 12](#)
- [“SLB Configuration Guidelines and Prerequisites ” on page 12](#)
- [“Default Settings” on page 13](#)

SLB Description

In SLB, LBGs include server members identified by level-3 protocol (IP) addresses. Server members can be physical servers (server blades or rackmounted servers) or VMs with IP addresses assigned. Technically, server members in an LBG are multiple next hops of an ECMP route. Each LBG is identified by a VIP address that is used to represent the IP address of the virtual server. From the client network, the virtual server is highly available with dynamically reconfigurable resources. Load distribution is performed using the routing hash function of the switch. Load distribution policies are based on the contents of the L3/4 packet header. Failover is supported at the server member's level. A failed member within an LBG is replaced by another server member residing within the same LBG. A health check is performed by the switch using an ICMP ping.

SLB Topology Example



When traffic that arrives from the client to the server needs to be distributed to the virtual server (traffic with destination IP address as VIP), ECMP routing occurs. The destination MAC address of each packet is changed to the MAC address of the real server by the switch hardware in wire speed. In return traffic (from the server to the client), DSR is used to directly forward to the client all traffic returning to the clients. No ECMP routing occurs in backward traffic. The real server returns the packet with the source IP address set to the VIP instead of its own IP address, which is made possible by setting the loopback interface (for example, `100`) in each server participating in the LBG. The loopback interface provides address aliasing for the VIP, but will not respond to ARP requests of the VIP. No NAT is involved in either the forward and reverse direction.

SLB Configuration Guidelines and Prerequisites

These guidelines and prerequisites apply to SLB configurations:

- Set up as many as 16 servers per SLB group.
- Establish up to 16 SLB groups.
- Set up as many as 32 servers on the switch for load balancing.
- Ensure that server members within an SLB group do not span multiple VLANs.
- Choose any IP address for a VIP, ensuring that the IP address is *not* in the same subnet as the physical server's subnet.

- Although it is not a strict requirement, you should disable switch ports that are involved in the SLB before setting up SLB.
- If port-channel is configured along with SLB, ensure that the load balancing policy of both SLB and port-channel is the same. Some of the SLB policies are not available for port-channel. Ensure that such a policy is not chosen.

Valid Configuration Example

In this example, 1 is a previously configured port-channel interface.

```
SEFOS(config)# slb policy src-ip
SEFOS(config)# port-channel load-balance src-ip 1
```

Invalid Configuration Examples

In this example, 1 is a previously configured port-channel interface. This configuration is not valid because the `slb policy` and the `port-channel` policies are different.

```
SEFOS(config)# slb policy src-ip
SEFOS(config)# port-channel load-balance dest-ip 1
```

In this example, `port-channel` policy is left as default. This configuration is not valid because the default `port-channel` policy is not `src-ip`.

```
SEFOS(config)# slb policy src-ip
```

Default Settings

No SLB group is set up on the switch by default.

Configuring the SLB-L2 Topology Example

These sections describes how to configure the example.

- [“SLB-L2 Description” on page 14](#)
- [“SLB-L2 Topology Example” on page 14](#)
- [“SLB-L2 Configuration Guidelines and Prerequisites” on page 15](#)

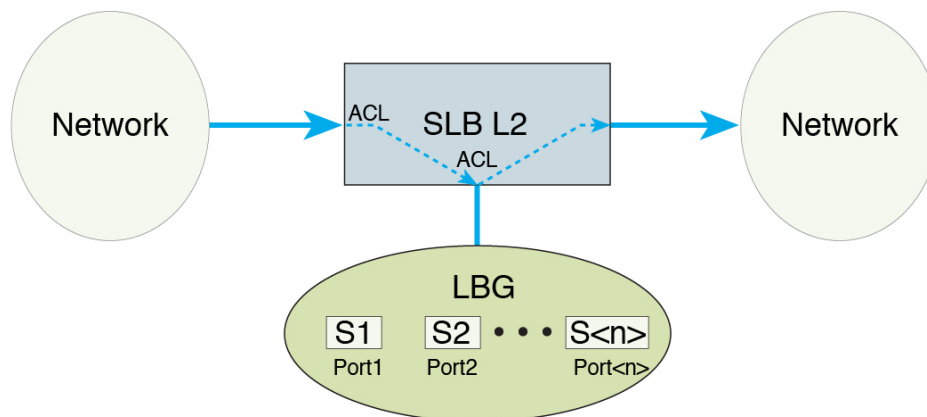
- [“Default Settings” on page 15](#)

SLB-L2 Description

In SLB-L2, an LBG consists of switch port members. Load distribution is performed through the LAG hash function of the switch. Load distribution policies are based on the contents of the L2/3/4 packet header. Failover is supported at the level of the switch port members. Depending on the fail-over method chosen, a failed member within an LBG is replaced by another switch port or by a group of switch ports within the LBG. Link-level connectivity between the switch port and the server is monitored by a health check mechanism.

SLB-L2 Topology Example

This figure shows the SLB-L2 topology used in this document.



In SLB-L2, all traffic operates within the same subnet, which means that no routing takes place in the load distribution data path. Traffic that needs to be load balanced is first filtered out by ACL at the ingress port. If data is permitted by the port, ACL redirects the traffic to an LBG. Traffic leaving the switch ports within an LBG can be tagged with a unique VLAN ID before reaching the servers connected to the ports. After the servers process the data, all traffic that enters the switch with the tagged VLAN ID is redirected to an egress port of the switch.

You can configure ingress and egress ports as the same or as different ports, referred to as a bump-in-the-wire configuration, where the servers are the "bumps" in the wire for packet processing. SLB-L2 divides ingress traffic into multiple flows and hashes them into multiple server members. This mechanism enables simultaneous processing of multiple data flows, increasing the overall throughput of the wire.

SLB-L2 Configuration Guidelines and Prerequisites

These guidelines and prerequisites apply to SLB-L2 configurations:

- Set up as many as 16 servers per SLB group.
- Establish up to two SLB groups.
- For bump-in-the-wire configurations, you must directly connect servers to switch ports within an SLB-L2 group.
- Ensure that SLB and SLB-L2 switch ports do not overlap.
- Set up only one traffic distribution hash policy on a switch. If the application requires running SLB and SLB-L2 at the same time, the policy must be chosen carefully to work with both SLB and SLB-L2. In such configurations, you *must* use the `slb l2 policy` command to set up a policy that works with both SLB and SLB-L2. When L2 fields are in the hash policy (for example, `src-mac`, `dest-mac`, `type`, `vlan-id`, `vlan-pri`, or `l2-sym`), they will only be recognized by SLB-L2. SLB ignores these L2 fields settings.

Default Settings

No SLB-L2 group is set up on the switch by default.

Conditions for a Member Participating in Load Distribution

When a server member is in an active state, the switch can access the server. An active status does not necessarily mean that the server member participates as a target in the load distribution. Whether the server member actually participates in the load distribution depends on various factors, including whether the following conditions are met:

- The client network to the switch is set up properly.
- The network interfaces in the clients are up.
- Each client has a proper route entry for the VIP.
- Each server has a proper loopback interface (for example, `lo0:1`) entry for the VIP.

If all of these conditions are satisfied, client traffic will be distributed to the active servers. Which active servers receive the traffic depends on the traffic distribution hash policy used.

If a server member is shown to be in an idle state, the server member is not reachable from the switch. In this case, ensure that the server network to the switch is properly set up and that the network interface in the server is up.

Configuring SLB Entries

These sections describe how to configure SLB entries using the configurations presented in [“SLB Topology Example” on page 12](#). These examples were produced on a system running the Oracle Solaris OS.

Before configuring SLB, ensure that the [“SLB Configuration Guidelines and Prerequisites” on page 12](#) are satisfied.

- [“Create SLB Server Members” on page 17](#)
- [“Remove SLB Server Members” on page 18](#)
- [“Set the Traffic Distribution Policy” on page 18](#)
- [“Restore the Default Traffic Distribution Policy” on page 19](#)
- [“Create Multiple LBGs” on page 19](#)
- [“Set the ICMP Parameters” on page 19](#)
- [“Set the Health-Monitor Parameters” on page 20](#)
- [“Server Health-Check Function” on page 20](#)

▼ Create SLB Server Members

When you add a server member as the first member of the group, an LBG is created. This example shows adding two server entries, as well as a single standby server, to an LBG.

1. **Add the first and second server members.**

```
SEFOS# configure terminal
SEFOS(config)# slb 10.10.10.0 255.255.255.0 192.0.0.1,192.0.0.2
```

2. **Create a standby SLB server member.**

```
SEFOS# configure terminal
SEFOS(config)# slb standby 10.10.10.0 255.255.255.0 192.0.0.3
SEFOS(config)# end
```

3. **Show current LBGs and members.**

The following example shows LBG with one active SLB server member and one standby SLB server member. For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution” on page 15](#).

```
SEFOS# show slb

SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1       1     00:14:4f:3e:e0:10  3  ACTIVE
192.0.0.2       1     00:14:4f:3e:e0:15  8  IDLE
192.0.0.3       1     00:14:4f:3e:e0:19  12 STANDBY  (up)
```

▼ Remove SLB Server Members

This example shows removing one server member from an LBG. You use the same process to remove an active or standby server member.

1. Remove the server entry.

```
SEFOS# configure terminal
SEFOS(config)# no slb standby 10.10.10.0 255.255.255.0 192.0.0.2
SEFOS(config)# end
```

2. Show current LBGs and members.

The following example shows the removal of one of the active SLB server members.

```
SEFOS# show slb

SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1       1     00:14:4f:3e:e0:10  3  ACTIVE
192.0.0.3       1     00:14:4f:3e:e0:19  12 STANDBY  (up)
```

▼ Set the Traffic Distribution Policy

This example shows setting the hash traffic distribution policy to use the source IP address for hashing.

1. Set the distribution policy.

```
SEFOS# configure terminal
SEFOS(config)# slb policy src-ip
SEFOS(config)# end
```

2. Show the current traffic distribution policy.

```
SEFOS# show slb policy

L3/4 Hash Fields:
  src-ip
Rotation: 0
DiffservMask: 0x0
UserMask: 0x0
FlowLabelMask: 0x0
```

▼ Restore the Default Traffic Distribution Policy

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb policy default
SEFOS(config)# end
```

▼ Create Multiple LBGs

To create more than one LBG, you can execute the `slb` command as shown in previous sections, with a different VIP or VIP address mask. This example forms two LBGs, each with two server members.

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb 10.10.10.0 255.255.255.0 192.0.0.1,192.0.0.2
SEFOS(config)# slb 10.10.11.0 255.255.255.0 192.0.0.3,192.0.0.4
SEFOS(config)# end
```

▼ Set the ICMP Parameters

- Type.

```
SEFOS(config)# slb ping-config default
```

▼ Set the Health-Monitor Parameters

- **Type.**

```
SEFOS(config)# slb monitor-config default
```

Server Health-Check Function

The health-check function is disabled on the switch by default. The function is automatically enabled when the first server member is added to the first SLB group on the switch, and it is disabled automatically when the last member is removed from the last SLB group on the switch.

Each SLB server member in an LBG is monitored by an ICMP ping originated from the switch. When ping fails, a failover event takes place. SLB supports an active-standby configuration. A standby server must be created in order for failover to take place. When a failure occurs in any of the active servers in the LBG, SLB looks for the first available standby server within the same SLB group to replace it. When a replacement server is found, all traffic hashed to the failed server will be redirected to the standby server. Traffic hashed to all other servers is not affected.

Configuring SLB-L2 Entries

These sections describe how to configure SLB-L2 entries using the sample configurations presented in [“SLB Overview”](#). Before configuring SLB-L2 entries, ensure that you have satisfied the [“SLB-L2 Configuration Guidelines and Prerequisites”](#) on page 15.

The server and client setup examples are produced on a system running the Oracle Solaris OS.

- [“Create SLB-L2 Server Members”](#) on page 21
- [“Remove SLB-L2 Port Members”](#) on page 22
- [“View the Traffic Distribution Policy”](#) on page 22
- [“Restore the Default Traffic Distribution Policy”](#) on page 23
- [“Set the Failover Method”](#) on page 23
- [“Restore the Default Failover Method”](#) on page 23
- [“Create Multiple SLB-L2 Groups”](#) on page 23

▼ Create SLB-L2 Server Members

When you add a member as the first member of a group, an SLB-L2 group is created. The following example shows adding active port members to an SLB-L2 group.

1. **Add the first active port member to the group.**

```
SEFOS# configure terminal
SEFOS(config)# slb l2 1 extreme-ethernet 0/3-5
SEFOS(config)# end
```

2. **Show current SLB-L2 groups and members.**

The following example shows one SLB-L2 group with three active SLB-L2 port members and one standby SLB-L2 port member.

```
SEFOS# show slb l2

L2 SLB Group #1:
    Failover Method: Failover to All Ports
    Port Members:
```

Port	State	Comments
====	====	=====
3	ACTIVE	
4	ACTIVE	
5	ACTIVE	
6	STANDBY	

▼ Remove SLB-L2 Port Members

This example shows removing one port member from a SLB-L2 group. You use the same process to remove an active or standby port member.

1. Remove the member entry.

```
SEFOS# configure terminal
SEFOS(config)# no slb l2 1 extreme-ethernet 0/5
SEFOS(config)# end
```

2. Show current LBGs and members.

The following example shows the removal of one of the active SLB server members.

```
SEFOS# show slb

L2 SLB Group #1:
    Failover Method: Failover to All Ports
Port Members:
Port   State   Comments
====   ====   =====
3      ACTIVE
4      ACTIVE
6      STANDBY
```

▼ View the Traffic Distribution Policy

● Type.

```
SEFOS# show slb l2 policy

L2 Hash Fields:
L3/4 Hash Fields:
    src-ip
Rotation: 0
DiffservMask: 0x0
UserMask: 0x0
FlowLabelMask: 0x0
```

▼ Restore the Default Traffic Distribution Policy

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb l2 policy default
SEFOS(config)# end
```

▼ Set the Failover Method

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb l2 failover-method 1 standby
SEFOS(config)# end
```

▼ Restore the Default Failover Method

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb l2 failover-method default
SEFOS(config)# end
```

▼ Create Multiple SLB-L2 Groups

To create multiple SLB-L2 groups, specify a different group ID for each group.

- Type.

```
SEFOS# configure terminal
SEFOS(config)# slb l2 1 extreme-ethernet 0/3-5
SEFOS(config)# slb l2 2 extreme-ethernet 0/7-9
```


Creating Example SLB Configurations

There are many ways you can configure SLB. The following examples show some common usage cases. All host command lines are shown in the Oracle Solaris OS.

The following sections provide examples for a basic SLB configuration, a configuration with separate VLANs, and a configuration with multiple SLB groups.

- [“Creating a Basic SLB Configuration” on page 25](#)
- [“Creating a Separate VLAN SLB Configuration” on page 30](#)
- [“Creating a Multiple SLB Group Configuration” on page 36](#)
- [“Creating a Failover Example” on page 46](#)

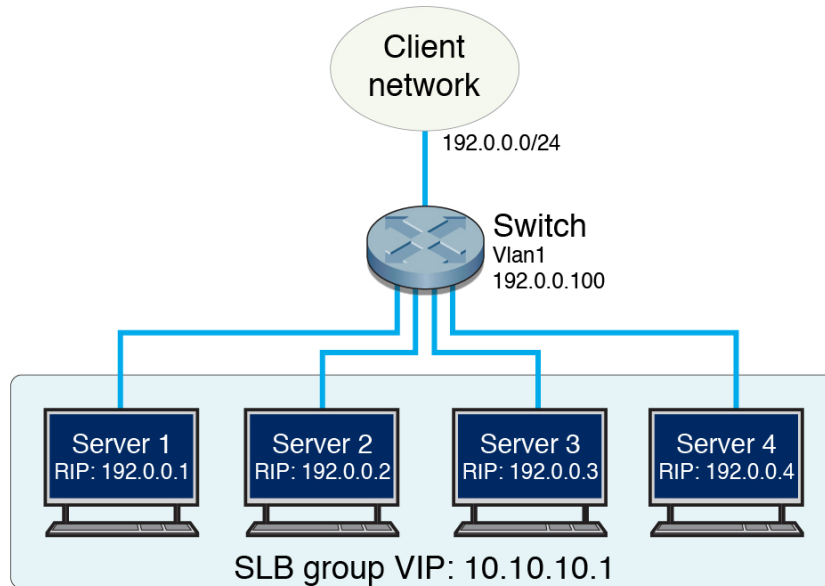
Creating a Basic SLB Configuration

These sections describe how to create a basic SLB configuration.

- [“Basic SLB Configuration” on page 25](#)
- [“Basic SLB Configuration Steps” on page 26](#)
- [“Set Up the Switch \(Basic SLB\)” on page 27](#)
- [“Set Up the Client \(Basic SLB\)” on page 28](#)
- [“Set Up the Server \(Basic SLB\)” on page 28](#)
- [“Enable the Switch Ports \(Basic SLB\)” on page 29](#)
- [“Save the Current Configuration \(Basic SLB\)” on page 30](#)

Basic SLB Configuration

This figure illustrates the basic SLB configuration. This configuration consists of a switch connected to a client network and multiple servers. Clients and servers are within one single subnet (assume that the configuration uses the switch's default VLAN, VLAN 1). Servers are directly connected to the switch.



Feature	Default Settings
VIP	10.10.10.1
Active servers' RIP	192.0.0.1, 192.0.0.2, 192.0.0.3
Standby server's RIP	192.0.0.4
Client and server subnets, VLAN 1	192.0.0.0/24
Subnet interface address	192.0.0.100
Switch ports used by servers	extreme-ethernet 0/15-18
Switch ports used by client network	extreme-ethernet 0/3-6
Network interface for both servers	ixgbe0

Basic SLB Configuration Steps

Use these steps to create a basic SLB configuration:

Step	Description	Links
1.	Set up the switch.	“Set Up the Switch (Basic SLB)” on page 27
2.	Set up the client. (Repeat this step for each client in the client network.)	“Set Up the Client (Basic SLB)” on page 28
3.	Set up the server. (Repeat this step for each server in the SLB group.)	“Set Up the Server (Basic SLB)” on page 28

Step	Description	Links
4.	Enable the switch ports.	“Enable the Switch Ports (Basic SLB)” on page 29
5.	Save the current configuration if necessary.	

▼ Set Up the Switch (Basic SLB)

Shut down SLB-related switch ports on the switch.

1. **Enter Global Configuration mode so you can shut down SLB-related switch ports on the switch.**

```
SEFOS# configure terminal
```

2. **Shut down switch ports connected to the client network.**

```
SEFOS(config)# interface range extreme-ethernet 0/3-6
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

3. **Shut down switch ports connected to the servers.**

```
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

4. **Set up the interface address of the switch.**

```
SEFOS(config)# interface vlan 1
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.0.0.100 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

5. **Set up SLB entries.**

```
SEFOS(config)# slb 10.10.10.0 255.255.255.0 192.0.0.1,192.0.0.2,192.0.0.3
SEFOS(config)# slb standby 10.10.10.0 255.255.255.0 192.0.0.4
```

6. **Set the traffic distribution hash policy (if needed).**

```
SEFOS(config)# slb policy src-ip
```

```
SEFOS(config)# end
```

7. View the updated configuration.

```
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
```

```
Server Members:
```

IP Address	Vlan	MacAddress	Port	State	Comments
192.0.0.1	----	-----	----	IDLE	
192.0.0.2	----	-----	----	IDLE	
192.0.0.3	----	-----	----	IDLE	
192.0.0.4	----	-----	----	STANDBY	(down)

The preceding output shows that all active servers are in idle state (not reachable from the switch) and that the standby server is also unreachable from the switch (marked as down in the Comments column).

▼ Set Up the Client (Basic SLB)

1. Set up the clients' network interfaces if they are not already set up.
2. Establish a route entry to the VIP.

```
client1% route add 10.10.10.1/24 192.0.0.100
```

In this example, all client initiated traffic with a destination IP address of 10.10.10.1 will be forwarded to the gateway interface 192.0.0.100.

▼ Set Up the Server (Basic SLB)

Each server must have a minimum of two interfaces set up, one interface for the actual device and another interface for a loopback used as an IP address alias.

1. Set up the physical interface.

```
server1% ifconfig ixgbe0 plumb
server1% ifconfig ixgbe0 192.0.0.1 netmask 255.255.255.0 up
```

2. Set up the loopback interface.

```

server1% ifconfig lo0:1 plumb
server1% ifconfig lo0:1 10.10.10.1 netmask 255.255.255.0 up

server1% ifconfig -a

lo0:1: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
    inet 10.10.10.1 netmask ffffffff
ixgbe0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 192.0.0.1 netmask ffffffff broadcast 192.0.0.255
    ether 0:1b:21:53:6e:e0

```

▼ Enable the Switch Ports (Basic SLB)

Before you enable the switch ports on the network, ensure that you have set up the switch, the server, and the client for each server in the SLB group, as described in the previous sections.

1. Enable the switch ports on the server network.

```

SEFOS# configure terminal
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# exit

```

2. Enable the switch ports on the client network.

```

SEFOS(config)# interface range extreme-ethernet 0/3-6
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# end

```

3. Test the SLB configuration.

```

SEFOS# show slb

SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:

```

IP Address	Vlan	MacAddress	Port	State	Comments
192.0.0.1	1	00:14:4f:53:6e:e0	15	ACTIVE	
192.0.0.2	1	00:14:4f:6c:bf:00	16	ACTIVE	
192.0.0.3	1	00:14:4f:20:12:01	17	ACTIVE	
192.0.0.4	1	00:14:4f:18:05:30	18	STANDBY	(up)

It might take up to 30 seconds for the server status to show. If executing the `slb show` command does not show the server status, repeat the command every few seconds until it shows the status. If no status appears after 30 seconds, ensure that you have correctly completed the preceding steps.

For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution”](#) on page 15.

The client should now be able to reach the virtual server using the VIP, as follows:

```
client1% ping 10.10.10.1  
  
10.10.10.1 is alive
```

▼ Save the Current Configuration (Basic SLB)

- If you want to save the current configuration, type.

```
SEFOS# write startup-config
```

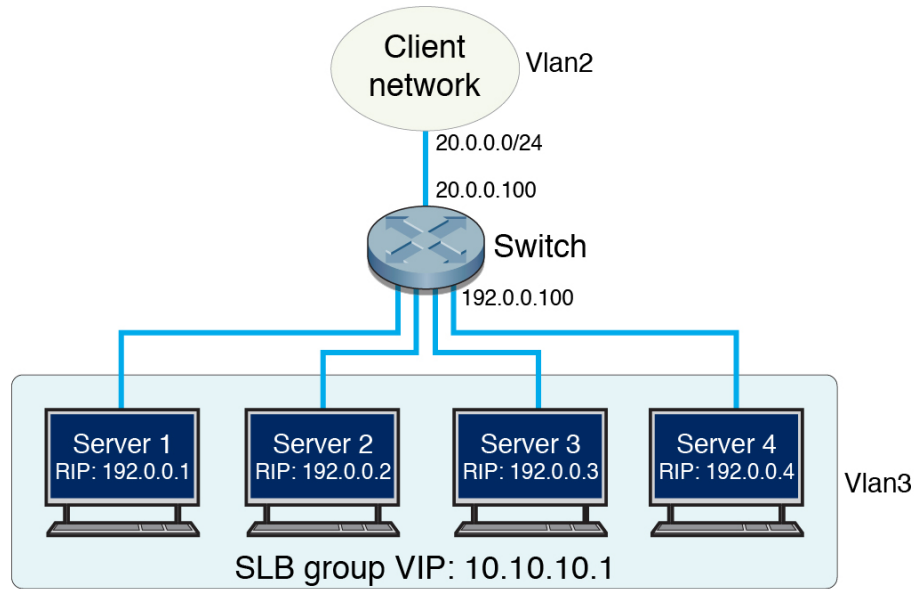
Creating a Separate VLAN SLB Configuration

These sections describe how to create a separate VLAN SLB configuration.

- [“Separate VLAN SLB Configuration”](#) on page 30
- [“Configuration With Separate VLANs Steps”](#) on page 31
- [“Set Up the Switch \(Separate VLAN SLB\)”](#) on page 32
- [“Set Up the Client \(Separate VLAN SLB\)”](#) on page 34
- [“Set Up the Server \(Separate VLAN SLB\)”](#) on page 34
- [“Enable the Switch Ports \(Separate VLAN SLB\)”](#) on page 35
- [“Save the Current Configuration \(Separate VLAN SLB\)”](#) on page 36

Separate VLAN SLB Configuration

The following figure illustrates an SLB configuration with servers and clients on separate VLANs. Servers are directly connected to the switch.



Feature	Default Settings
VIP	10.10.10.1
Active servers' RIP	192.0.0.1, 192.0.0.2, 192.0.0.3
Standby server's RIP	192.0.0.4
Client subnet, VLAN 2	20.0.0.0/24
Client subnet interface address	20.0.0.100
Server subnet, VLAN 3	192.0.0.0/24
Server subnet interface address	192.0.0.100
Switch ports used by servers	extreme-ethernet 0/15-18
Switch ports used by client network	extreme-ethernet 0/3-6
Network interface for both servers	ixgbe0

Configuration With Separate VLANs Steps

This example shows the SLB configuration with servers and clients on separate VLANs. Servers are directly connected to the switch.

Use these steps to create this type of SLB configuration:

Step	Description	Links
1.	Set up the switch.	"Set Up the Switch (Separate VLAN SLB)" on page 32

Step	Description	Links
2.	Set up the client. (Repeat this step for each client in the client network.)	“Set Up the Client (Separate VLAN SLB)” on page 34
3.	Set up the server. (Repeat this step for each server in the SLB group.)	“Set Up the Server (Separate VLAN SLB)” on page 34
4.	Enable the switch ports.	“Enable the Switch Ports (Separate VLAN SLB)” on page 35
5.	Save the current configuration if necessary.	

▼ Set Up the Switch (Separate VLAN SLB)

Shut down SLB-related switch ports on the switch.

1. Disable GVRP and GMRP.

```
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
```

2. Enter Global Configuration mode so you can shut down SLB-related switch ports on the switch.

```
SEFOS# configure terminal
```

3. Shut down switch ports connected to the client network.

```
SEFOS(config)# interface range extreme-ethernet 0/3-6
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

4. Shut down switch ports connected to servers.

```
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

5. Set up the client VLAN.

Set up switch port access of the client network.

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# exit
SEFOS(config)# interface range extreme-ethernet 0/3-6
SEFOS(config-if-range)# switchport access vlan 2
```



```
SEFOS(config-if-range)# exit
```

Set up interface address of the client VLAN.

```
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 20.0.0.100 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

6. Set up the server VLAN.

Set up VLAN switch port access for the server network.

```
SEFOS(config)# vlan 3
SEFOS(config-vlan)# exit
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# switchport access vlan 3
SEFOS(config-if-range)# exit
```

Set up interface address of the server VLAN.

```
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.0.0.100 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

7. Set up SLB entries.

```
SEFOS(config)# slb 10.10.10.0 255.255.255.0 192.0.0.1,192.0.0.2,192.0.0.3
SEFOS(config)# slb standby 10.10.10.0 255.255.255.0 192.0.0.4
```

8. Set the traffic distribution hash policy (if needed).

```
SEFOS(config)# slb policy src-ip
SEFOS(config)# end
```

9. View the updated configuration.

```
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
```

```
Server Members:
```

IP Address	Vlan	MacAddress	Port	State	Comments
192.0.0.1	----	---:---:---:---:---:---	----	IDLE	

```
192.0.0.2      ----  -:---:---:---:---:---  ----  IDLE
192.0.0.3      ----  -:---:---:---:---:---  ----  IDLE
192.0.0.4      ----  -:---:---:---:---:---  ----  STANDBY   (down)
```

The preceding output shows that all active servers are in idle state (not reachable from the switch) and that the standby server is also unreachable from the switch (marked as down in the Comments column).

▼ Set Up the Client (Separate VLAN SLB)

1. **Set up the clients' network interfaces if they are not already set up.**
2. **Establish a route entry to the VIP.**

```
client1% route add 10.10.10.1/24 20.0.0.100
```

In this example, all client initiated traffic with a destination IP address of 10.10.10.1 will be forwarded to the gateway interface 20.0.0.100.

3. **If the clients need to reach the physical server's subnet using the servers' RIPs, add the following route.**

```
client1% route add 192.0.0.0/24 20.0.0.100
```

▼ Set Up the Server (Separate VLAN SLB)

Each server must have a minimum of two interfaces set up, one interface for the actual device and another interface for a loopback used as an IP address alias.

1. **Set up the physical interface.**

```
server1% ifconfig ixgbe0 plumb
server1% ifconfig ixgbe0 192.0.0.1 netmask 255.255.255.0 up
```

2. **Set up the loopback interface.**

```
server1% ifconfig lo0:1 plumb
server1% ifconfig lo0:1 10.10.10.1 netmask 255.255.255.0 up

server1% ifconfig -a
```

```
lo0:1: flags=2001000849<UP, LOOPBACK, RUNNING, MULTICAST, IPv4, VIRTUAL> mtu 8232 index 1
    inet 10.10.10.1 netmask fffffff0
ixgbe0: flags=1000843<UP, BROADCAST, RUNNING, MULTICAST, IPv4> mtu 1500 index 3
    inet 192.0.0.1 netmask fffffff0 broadcast 192.0.0.255
    ether 0:1b:21:53:6e:e0
```

3. Add a route to reach the client network.

```
server1% route add 20.0.0.0/24 192.0.0.100
```

▼ Enable the Switch Ports (Separate VLAN SLB)

Before you enable the switch ports on the network, ensure that you have set up the switch, the server, and the client for each server in the SLB group, as described in the previous sections.

1. Enable the switch ports on the server network.

```
SEFOS# configure terminal
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# exit
```

2. Enable the switch ports on the client network.

```
SEFOS(config)# interface range extreme-ethernet 0/3-6
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# end
```

3. Test the SLB configuration.

```
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State  Comments
=====
192.0.0.1       3     00:1b:21:53:6e:e0  15 ACTIVE
192.0.0.2       3     00:1b:21:53:6f:00  16 ACTIVE
192.0.0.3       3     00:3e:16:20:12:01  17 ACTIVE
192.0.0.4       3     00:3e:15:18:05:30  18 STANDBY (up)
```

It might take up to 30 seconds for the server status to show. If executing the `slb show` command does not show the server status, repeat the command every few seconds until it shows the status. If no status appears after 30 seconds, ensure that you have correctly completed the preceding steps.

For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution”](#) on page 15.

The client should now be able to reach the virtual server using the VIP, as follows:

```
client1% ping 10.10.10.1  
  
10.10.10.1 is alive
```

▼ Save the Current Configuration (Separate VLAN SLB)

- If you want to save the current configuration, type.

```
SEFOS# write startup-config
```

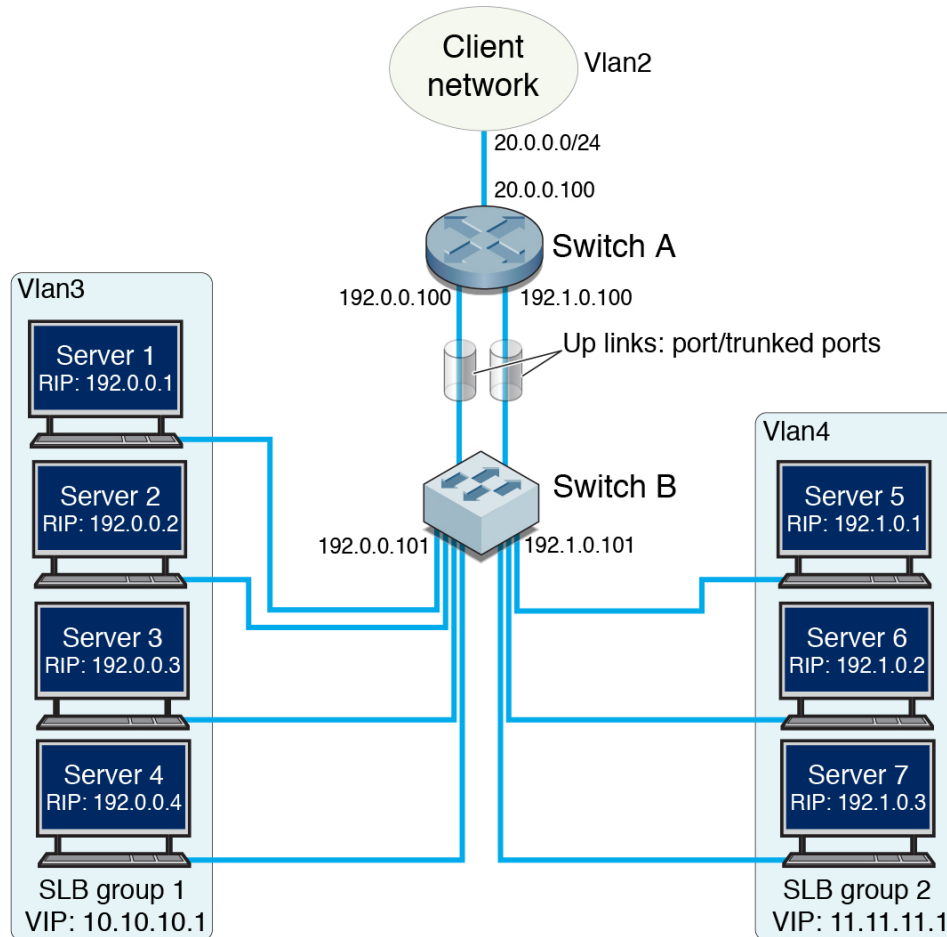
Creating a Multiple SLB Group Configuration

These sections describe how to create a multiple SLB group configuration.

- [“Multiple-SLB-Group Configuration”](#) on page 36
- [“Configuration With Multiple SLB Groups Steps”](#) on page 38
- [“Set Up Switch A”](#) on page 39
- [“Set Up Switch B”](#) on page 41
- [“Set Up the Client \(Multiple SLB Group\)”](#) on page 42
- [“Set Up the Servers in SLB Group 1”](#) on page 43
- [“Set Up the Servers in SLB Group 2”](#) on page 43
- [“Enable the Switch Ports \(Multiple SLB Group\)”](#) on page 44
- [“Save the Current Configuration \(Multiple SLB Group\)”](#) on page 46

Multiple-SLB-Group Configuration

This example shows the SLB configuration with servers configured as multiple SLB groups. Servers and clients are at multiple VLANs, and the servers are indirectly attached to the switch.



Feature	Default Settings
VIP of SLB group 1	10.10.10.1
Active servers' RIP	192.0.0.1, 192.0.0.2, 192.0.0.3
Standby server's RIP	192.0.0.4
VIP of SLB group 2	11.11.11.1
Active servers' RIP	192.1.0.1, 192.1.0.2, 192.1.0.3
Client subnet	20.0.0.0/24
Client VLAN	VLAN 2
Server SLB group 1 Subnet	192.0.0.0/24
Server SLB group 1 Subnet interface address	192.0.0.100
Server SLB group 1 VLAN	VLAN 3

Feature	Default Settings
Server SLB group 2 subnet	192.1.0.0/24
Server SLB group 2 subnet interface address	192.1.0.100
Server SLB group 2 VLAN	VLAN 4
Network interface for both servers	ixgbe0

In this sample configuration, the switches perform as follows:

Switch A:

- Runs SLB.
- Attached to the client network using switch ports extreme-ethernet 0/1-4.
- Connected to switch B through two uplink ports extreme-ethernet 0/9-10. Port extreme-ethernet 0/9 carries VLAN 3 traffic, port extreme-ethernet 0/10 carries VLAN 4 traffic.

Switch B:

- Directly connects to the servers.
- Connects to switch A through two uplink ports extreme-ethernet 0/11-12. Port extreme-ethernet 0/11 carries VLAN 3 traffic, port extreme-ethernet 0/12 carries VLAN 4 traffic.
- Servers in SLB group1 are connected to switch ports extreme-ethernet 0/15-18.
- Servers in SLB group 2 are connected to switch ports extreme-ethernet 0/19-21.

Configuration With Multiple SLB Groups Steps

This example shows the SLB configuration with multiple SLB groups. Servers are directly connected to the switch.

Use these steps to create this type of SLB configuration:

Step	Description	Links
1.	Set up the switch A. Set up switch B.	“Set Up Switch A” on page 39 “Set Up Switch B” on page 41
2.	Set up the client. (Repeat this step for each client in the client network.)	“Set Up the Client (Multiple SLB Group)” on page 42
3.	Set up the server. (Repeat this step for each server in the SLB group.)	“Set Up the Servers in SLB Group 1” on page 43 “Set Up the Servers in SLB Group 2” on page 43
4.	Enable the switch ports.	“Enable the Switch Ports (Multiple SLB Group)” on page 44
5.	Save the current configuration if necessary.	

▼ Set Up Switch A

Shut down SLB-related switch ports on the switch.

1. Shut down switch ports connected to the clients.

```
SEFOS# configure terminal
SEFOS(config)# interface range extreme-ethernet 0/1-4
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

2. Shut down uplink ports to switch B.

```
SEFOS(config)# interface range extreme-ethernet 0/9-10
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

3. Disable GVRP and GMRP.

```
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
```

4. Set up spanning tree so that it works with two separate VLANs.

```
SEFOS(config)# spanning-tree mst configuration
SEFOS(config-mst)# name example3
SEFOS(config-mst)# revision 1
SEFOS(config-mst)# instance 1 vlan 3
SEFOS(config-mst)# instance 2 vlan 4
SEFOS(config-mst)# exit
```

5. Set up the client VLAN.

Set up VLAN switch port access to the client network.

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# exit
SEFOS(config)# interface range extreme-ethernet 0/1-4
SEFOS(config-if-range)# switchport access vlan 2
SEFOS(config-if-range)# exit
```

Set up the interface address of the client VLAN.

```
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 20.0.0.100 255.255.255.0
```

```
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

6. Set up the server VLAN.

Set up the server VLANs on uplinks.

```
SEFOS(config)# vlan 3
SEFOS(config-vlan)# port extreme-ethernet 0/9
SEFOS(config-vlan)# exit
SEFOS(config)# vlan 4
SEFOS(config-vlan)# port extreme-ethernet 0/10
SEFOS(config-vlan)# exit
```

Set up the VLAN gateway interface addresses of server subnets.

```
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.0.0.100 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 4
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.1.0.100 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

7. Set up SLB entries.

Set up the first SLB group.

```
SEFOS(config)# slb 10.10.10.0 255.255.255.0 192.0.0.1,192.0.0.2,192.0.0.3
SEFOS(config)# slb standby 10.10.10.0 255.255.255.0 192.0.0.4
```

Set up the second SLB group.

```
SEFOS(config)# slb 11.11.11.0 255.255.255.0 192.1.0.1,192.1.0.2,192.1.0.3
```

8. Set the traffic distribution hash policy (if needed).

```
SEFOS(config)# slb policy src-ip
SEFOS(config)# end
```

9. View the updated configuration.

```
SEFOS# show slb

SLB Group ID: 1 Virtual IP: 10.10.10.0/24
```



```

Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1      ----  -:-:-:-:-:-:-  ----  IDLE
192.0.0.2      ----  -:-:-:-:-:-:-  ----  IDLE
192.0.0.3      ----  -:-:-:-:-:-:-  ----  IDLE
192.0.0.4      ----  -:-:-:-:-:-:-  ----  STANDBY  (down)

SLB Group ID: 2 Virtual IP: 11.11.11.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.1.0.1      ----  -:-:-:-:-:-:-  ----  IDLE
192.1.0.2      ----  -:-:-:-:-:-:-  ----  IDLE
192.1.0.3      ----  -:-:-:-:-:-:-  ----  IDLE

```

The preceding output shows that all active servers are in idle state (not reachable from the switch) and that the standby server is also unreachable from the switch (marked as down in the Comments column).

▼ Set Up Switch B

Shut down SLB-related switch ports on the switch.

1. Shut down the uplinks connected to switch A.

```

SEFOS# configure terminal
SEFOS(config)# interface range extreme-ethernet 0/11-12
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit

```

2. Shut down the switch ports connected to the servers.

```

SEFOS(config)# interface range extreme-ethernet 0/15-21
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit

```

3. Disable GVRP and GMRP.

```

SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable

```

4. Set up spanning tree so that it works with two separate VLANs.

```

SEFOS(config)# spanning-tree mst configuration

```

```
SEFOS(config-mst)# name example3
SEFOS(config-mst)# revision 1
SEFOS(config-mst)# instance 1 vlan 3
SEFOS(config-mst)# instance 2 vlan 4
SEFOS(config-mst)# exit
```

5. Set up the server VLAN.

Set up the server VLANs on up-links.

```
SEFOS(config)# vlan 3
SEFOS(config-vlan)# port extreme-ethernet 0/11
SEFOS(config-vlan)# exit
SEFOS(config)# vlan 4
SEFOS(config-vlan)# port extreme-ethernet 0/12
SEFOS(config-vlan)# exit
```

Set up the VLAN switch port access to server networks.

```
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# switchport access vlan 3
SEFOS(config-if-range)# exit
SEFOS(config)# interface range extreme-ethernet 0/19-21
SEFOS(config-if-range)# switchport access vlan 4
SEFOS(config-if-range)# exit
```

Set up the VLAN interface addresses of server VLANs.

```
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.0.0.101 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 4
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 192.1.0.101 255.255.255.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

▼ Set Up the Client (Multiple SLB Group)

1. Set up the clients' network interfaces if they are not already set up.
2. Establish a route entry to the VIPs.

```
client1% route add 10.10.10.1/24 20.0.0.100
```

```
client1% route add 11.11.11.1/24 20.0.0.100
```

In this example, all client initiated traffic with a destination IP addresses of 10.10.10.1 or 11.11.11.1 will be forwarded to the gateway interface 20.0.0.100.

3. **If the clients need to reach the physical server's subnet using the servers' RIPs, add the following routes.**

```
client1% route add 192.0.0.0/24 20.0.0.100
client1% route add 192.1.0.0/24 20.0.0.100
```

▼ Set Up the Servers in SLB Group 1

Each server must have a minimum of two interfaces set up, one interface for the actual device and another interface for a loopback used as an IP address alias. Complete the following task for each server in SLB group 1.

1. **Set up the physical interface.**

```
server1% ifconfig ixgbe0 plumb
server1% ifconfig ixgbe0 192.0.0.1 netmask 255.255.255.0 up
```

2. **Set up the loopback interface.**

```
server1% ifconfig lo0:1 plumb
server1% ifconfig lo0:1 10.10.10.1 netmask 255.255.255.0 up
```

```
server1% ifconfig -a
```

```
lo0:1: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
    inet 10.10.10.1 netmask ffffffff
ixgbe0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 192.0.0.1 netmask ffffffff broadcast 192.0.0.255
    ether 0:1b:21:53:6e:e0
```

3. **Add a route to reach the client network.**

```
server1% route add 20.0.0.0/24 192.0.0.100
```

▼ Set Up the Servers in SLB Group 2

Complete the following task for each server in SLB group 2.

1. Set up the physical interface.

```
server1% ifconfig ixgbe0 plumb
server1% ifconfig ixgbe0 192.1.0.1 netmask 255.255.255.0 up
```

2. Set up the loopback interface.

```
server1% ifconfig lo0:1 plumb
server1% ifconfig lo0:1 11.11.11.1 netmask 255.255.255.0 up

server1% ifconfig -a

lo0:1: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
    inet 11.11.11.1 netmask ffffffff
ixgbe0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 192.1.0.1 netmask ffffffff broadcast 192.1.0.255
    ether 0:1b:21:9f:e9:e0
```

3. Add a route to reach the client network.

```
server1% route add 20.0.0.0/24 192.1.0.100
```

▼ **Enable the Switch Ports (Multiple SLB Group)**

Before you enable the switch ports on the network, ensure that you have set up the switch, the server, and the client for each server in the SLB group, as described in the previous sections.

1. Enter configuration mode on switch B.

```
SEFOS# configure terminal
```

2. Enable the switch ports on the server.

```
SEFOS(config)# interface range extreme-ethernet 0/15-21
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# exit
```

3. Enable the uplinks to switch A.

```
SEFOS(config)# interface range extreme-ethernet 0/11-12
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# end
```

4. Enter configuration mode on switch A.

```
SEFOS# configure terminal
```

5. Enable the uplinks to switch B.

```
SEFOS(config)# interface range extreme-ethernet 0/9-10
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# end
```

6. Enable the client network.

```
SEFOS(config)# interface range extreme-ethernet 0/1-4
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# end
```

7. View the SLB configuration.

```
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1      3     00:1b:21:53:6e:e0  9 ACTIVE
192.0.0.2      3     00:1b:21:53:6f:00  9 ACTIVE
192.0.0.3      3     00:3e:16:20:12:01  9 ACTIVE
192.0.0.4      3     00:3e:15:18:05:30  9 STANDBY (up)

SLB Group ID: 2 Virtual IP: 11.11.11.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1      4     00:4b:21:32:ed:34  10 ACTIVE
192.0.0.2      4     00:4b:21:49:a4:90  10 ACTIVE
192.0.0.3      4     00:3e:16:16:57:22  10 ACTIVE
```

It might take up to 30 seconds for the server status to show. If executing the `slb show` command does not show the server status, repeat the command every few seconds until it shows the status. If no status appears after 30 seconds, ensure that you have correctly completed the preceding steps.

For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution” on page 15](#).

The client should now be able to reach the virtual server using the VIP, as follows:

```
client1% ping 10.10.10.1
```

```
10.10.10.1 is alive

client1% ping 11.11.11.1

11.11.11.1 is alive
```

▼ Save the Current Configuration (Multiple SLB Group)

- If you want to save the current configuration, type.

```
SEFOS# write startup-config
```

Creating a Failover Example

These sections describe how to create a failover example.

- [“Failover Example” on page 46](#)
- [“Trigger a Failover” on page 47](#)
- [“Restart the Server Following Failure” on page 47](#)

Failover Example

This section provides an example of an SLB failover. In this example, the SLB group used has three active nodes and one standby node as follows:

```
SLB Group #0 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1       3     00:1b:21:53:6e:e0  9 ACTIVE
192.0.0.2       3     00:1b:21:53:6f:00  9 ACTIVE
192.0.0.3       3     00:3e:16:20:12:01  9 ACTIVE
192.0.0.4       3     00:3e:15:18:05:30  9 STANDBY (up)
```

In the SLB active/standby configuration, each failed node requires a standby node for failover (a one-to-one relationship). When all standby nodes are taken due to multiple active node failures, the next failed node will remain in the failed state, and traffic to that node will not be redirected.

For a standby node to replace a failed node (changing the state from standby to failover), the node must be reachable from the switch (marked by the up statement in the Comments column).

▼ Trigger a Failover

A failover can be triggered by bringing down the network interface on one of the servers. This example brings down the server with RIP of 192.0.0.1.

- **Type.**

```
server1% ifconfig ixgbe0 down
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1       3     00:1b:21:53:6e:e0  9 FAILED      Failover to 192.0.0.4
192.0.0.2       3     00:1b:21:53:6f:00  9 ACTIVE
192.0.0.3       3     00:3e:16:20:12:01  9 ACTIVE
192.0.0.4       3     00:3e:15:18:05:30  9 FAILOVER    Replacing 192.0.0.1
```

SLB output shows that 192.0.0.1 has changed from the active to the failed state. At the same time, 192.0.0.4 changed from standby to the failover state. Traffic hashed to 192.0.0.1 is now redirected to 192.0.0.4. Traffic hashed to all other nodes is not affected by this failover event.

▼ Restart the Server Following Failure

When the failed server is repaired and restored (starts responding to ICMP ping from the switch again), it resumes in the active state, and the failover server resumes in standby state. This situation is demonstrated in this example by bringing the ixgbe0 network interface on server 1 backup.

- **Type.**

```
server1% ifconfig ixgbe0 up
SEFOS# show slb
```

```
SLB Group ID: 1 Virtual IP: 10.10.10.0/24
Server Members:
IP Address      Vlan  MacAddress      Port State      Comments
=====
192.0.0.1       3     00:1b:21:53:6e:e0  9 ACTIVE
192.0.0.2       3     00:1b:21:53:6f:00  9 ACTIVE
192.0.0.3       3     00:3e:16:20:12:01  9 ACTIVE
192.0.0.4       3     00:3e:15:18:05:30  9 STANDBY    (up)
```


Creating SLB-L2 Configuration Examples

These sections provide examples for a basic SLB configuration, a configuration with separate VLANs, and a configuration with multiple SLB groups. All host command lines are shown in the Oracle Solaris OS.

- [“Bump-In-The-Wire Configuration” on page 49](#)
- [“Creating a Single-Switch Configuration” on page 49](#)
- [“Creating a Dual-Switch Configuration” on page 55](#)
- [“Creating an SLB-L2 Failover Example” on page 62](#)

Bump-In-The-Wire Configuration

A common use case of SLB-L2 is the bump-in-the-wire configuration. The "bumps" are servers processing nodes that can run applications such as a firewall, packet filtering, and data interception.

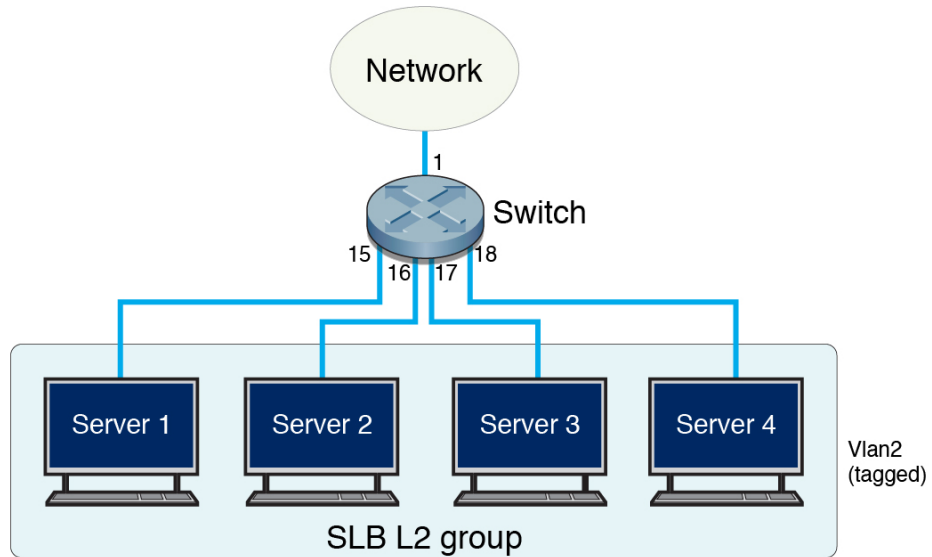
Creating a Single-Switch Configuration

These sections describes how to create a single-switch configuration.

- [“Basic Single-Switch Configuration” on page 49](#)
- [“Create a Single-Switch Configuration” on page 50](#)

Basic Single-Switch Configuration

The following figure illustrates a basic SLB-L2 configuration. In this example, four switch ports are formed as an L2 LBG.



Feature	Example Setting
Group ID	1
Switch port for server 1	extreme-ethernet 0/15 on switch 2
Switch port for server 2	extreme-ethernet 0/16 on switch 2
Switch port for server 3	extreme-ethernet 0/17 on switch 2
Switch port for server 4	extreme-ethernet 0/18 on switch 2

▼ Create a Single-Switch Configuration

This example shows how to create an SLB-L2 single-switch configuration.

1. Shut down the ingress port and all server ports.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

2. Disable GVRP and GMRP.

```
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
```

3. Form an LBG.

```
SEFOS(config)# slb l2 1 extreme-ethernet 0/15-18
SEFOS(config-if-range)# exit
```

4. View the configuration.

```
SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to Standby Port(s) first, then All Ports
Port Members:
Port   State   Comments
====   =====
15     IDLE
16     IDLE
17     IDLE
18     IDLE
```

All ports are in the idle state because the interface ports 15 through 18 are still disabled.

5. Set the LBG failover method (if different from the default).

```
SEFOS(config)# slb l2 failover-method 1 prefer-standby
```

6. Set the load distribution hash policy (if different from the default).

```
SEFOS(config)# slb l2 policy src-ip
```

7. Set up the bump-in-the-wire configuration.

To set up the bump-in-the-wire configuration, you must use a VLAN tag to identify ingress and egress traffic ports. This example associates the LBG and the ingress/egress port with VLAN 2. The following steps set up VLAN membership for the ports that participate in the LBG and also set up the switch to insert the VLAN tag to outgoing packets from port 15-18.

a. Set up VLAN.

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# port extreme-ethernet 0/15-18
SEFOS(config-if-range)# exit
```

b. Set up VLAN membership and PVID for the ingress port.

```
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# switchport access vlan 2
SEFOS(config-if)# exit
```

c. View the configuration.

```
SEFOS# show vlan

Vlan database
-----
Vlan ID          : 1
Member Ports     : Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6, Ex0/7
                  Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12, Ex0/13
                  Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18, Ex0/19
                  Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports   : Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6, Ex0/7
                  Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12, Ex0/13
                  Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18, Ex0/19
                  Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports  : None
Name             :
Status           : Permanent
-----
Vlan ID          : 2
Member Ports     : Ex0/1, Ex0/15, Ex0/16, Ex0/17, Ex0/18
Untagged Ports   : Ex0/1
Forbidden Ports  : None
Name             :
Status           : Permanent
-----
```

8. Set up ACL.

a. Set up ACL rules in the ingress port such that the permitted traffic is forwarded to the LBG.

In this example, all packets with a source IP address of 1.2.3.4 are redirected to LBG group 1, which was set up in the preceding steps.

```
SEFOS(config)# ip access-list extended 20
SEFOS(config-ext-nacl)# permit ip host 1.2.3.4 any loadbalance 1
SEFOS(config-ext-nacl)# exit
SEFOS(config)# ip access-list extended 90
SEFOS(config-ext-nacl)# deny ip any any
SEFOS(config-ext-nacl)# exit
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# ip access-list 20 in
SEFOS(config-if)# ip access-list 90 in
SEFOS(config-if)# exit
```

b. Steer the packets to the egress port.

All packets arriving at the switch ports from the servers within the LBG must be steered to the egress port. In this example, the processed packets are steered from the servers back to the same switch port used as the ingress port.

```
SEFOS(config)# mac access-list extended 21
SEFOS(config-ext-macl)# permit any any vlan 2 redirectport extreme-ethernet 0/1
SEFOS(config-ext-macl)# exit
SEFOS(config)# mac access-list extended 91
SEFOS(config-ext-macl)# deny any any
SEFOS(config-ext-macl)# exit
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# mac access-list 21 in
SEFOS(config-if-range)# mac access-list 91 in
SEFOS(config-if-range)# end
```

c. View the ACL.

```
SEFOS# show access-list

Extended IP Access List 20
-----
Filter Priority           : 1
Filter Protocol Type     : ANY
IP address Type          : IPV4
Source IP address        : 1.2.3.4
Source IP address mask   : 255.255.255.255
Source IP Prefix Length  : 32
Destination IP address   : 0.0.0.0
Destination IP address mask : 0.0.0.0
Destination IP Prefix Length : 0
Flow Identifier          : 0
In Port List             : Ex0/1
Out Port List            : NIL
Filter TOS               : NIL
Filter DSCP              : NIL
Filter Action            : Load balance to Group 1
Status                   : Active

Extended IP Access List 90
-----
Filter Priority           : 1
Filter Protocol Type     : ANY
IP address Type          : IPV4
Source IP address        : 0.0.0.0
Source IP address mask   : 0.0.0.0
Source IP Prefix Length  : 0
Destination IP address   : 0.0.0.0
Destination IP address mask : 0.0.0.0
```

```

Destination IP Prefix Length : 0
Flow Identifier              : 0
In Port List                 : Ex0/1
Out Port List                : NIL
Filter TOS                   : NIL
Filter DSCP                  : NIL
Filter Action                : Deny
Status                       : Active

```

MAC ACCESS LISTS

Extended MAC Access List 21

```

Filter Priority              : 1
Ether Type                  : 0
Protocol Type               : 0
Vlan Id                     : 2
User-Priority               : 0
Destination MAC Address     : 00:00:00:00:00:00
Source MAC Address         : 00:00:00:00:00:00
In Port List                : Ex0/15 , Ex0/16 , Ex0/17 , Ex0/18
Filter Action               : Redirect to Port 1
Status                      : Active

```

Extended MAC Access List 91

```

Filter Priority              : 1
Ether Type                  : 0
Protocol Type               : 0
Vlan Id                     : 0
User-Priority               : 0
Destination MAC Address     : 00:00:00:00:00:00
Source MAC Address         : 00:00:00:00:00:00
In Port List                : Ex0/15 , Ex0/16 , Ex0/17 , Ex0/18
Filter Action               : Deny
Status                      : Active

```

9. Enable the switch ports.

```

SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# exit
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end

```

10. View the SLB-L2 configuration.

```

SEFOS# show slb l2

L2 SLB Group #1

```

```

Failover Method: Failover to Standby Port(s) first, then All Ports
Port Members:
Port   State   Comments
====   =====
15    ACTIVE
16    ACTIVE
17    ACTIVE
18    ACTIVE

```

It might take up to 30 seconds for the port status to show. If executing the `slb show` command does not show the port status, try again in intervals of a few seconds until the status displays. If no status appears after 30 seconds, ensure that you have correctly completed the preceding steps.

For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution” on page 15](#).

11. Save the current configuration (if needed).

```
SEFOS# write startup-config
```

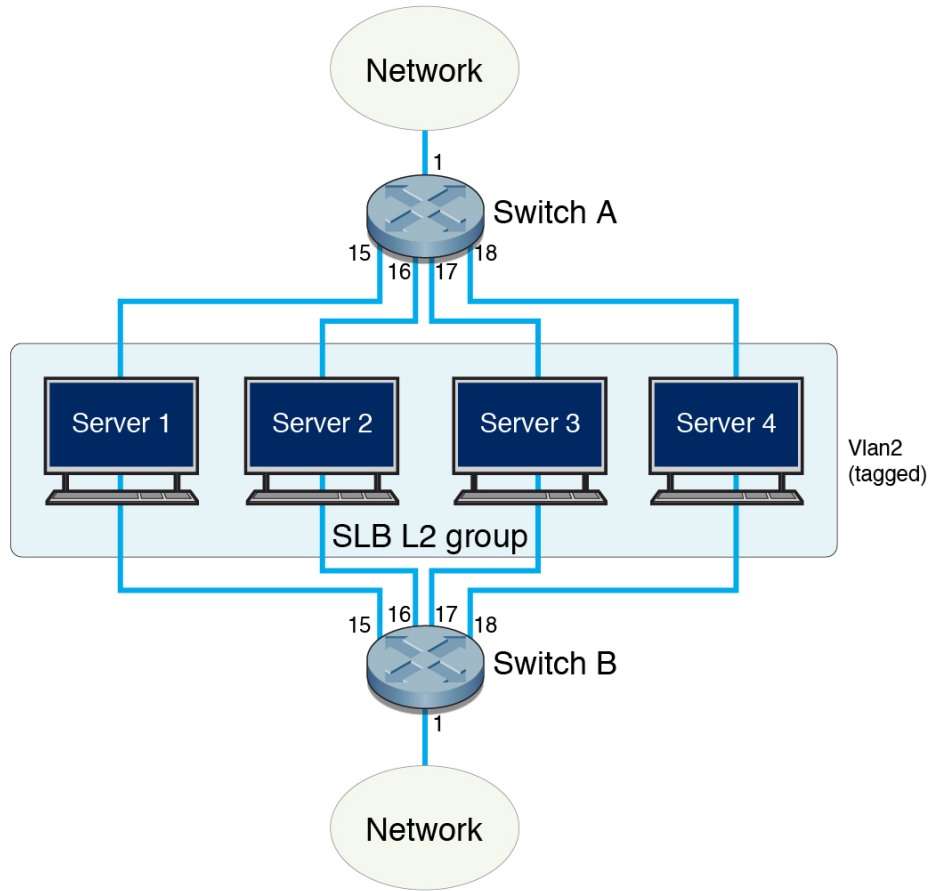
Creating a Dual-Switch Configuration

These sections describe how to create a dual-switch configuration.

- [“Dual-Switch Configuration” on page 55](#)
- [“Create a Dual-Switch Configuration” on page 56](#)

Dual-Switch Configuration

This example shows a dual-switch configuration, with the servers configured in between the two switches as the "bump". Each server is dual-homed. LBGs are formed in a symmetric way (LBG on each switch has the same port members set up in the exact same order).



Feature	Example Setting
Group ID	1
Switch port for server 1	extreme-ethernet 0/15 on switch 2
Switch port for server 2	extreme-ethernet 0/16 on switch 2
Switch port for server 3	extreme-ethernet 0/17 on switch 2
Switch port for server 4	extreme-ethernet 0/18 on switch 2

▼ Create a Dual-Switch Configuration

This example shows how to create an SLB-L2 dual-switch configuration. Repeat steps 1 through 3 on each switch.

1. Shut down the ingress port and all server ports.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# shutdown
SEFOS(config-if-range)# exit
```

2. Disable GVRP and GMRP.

```
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
```

3. Form an LBG.

```
SEFOS(config)# slb l2 1 extreme-ethernet 0/15-18
SEFOS(config-if-range)# exit
```

4. View the configuration.

```
SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to Standby Port(s) first, then All Ports
Port Members:
Port   State   Comments
====   =====
15     IDLE
16     IDLE
17     IDLE
18     IDLE
```

The same output will appear from group 2 after you run these commands on switch 2.

All ports are in idle state because the interface ports 15 through 18 are still disabled.

5. Set the LBG failover method (if different from the default).

```
SEFOS(config)# slb l2 failover-method 1 prefer-standby
```

6. Set the load distribution hash policy.

To get forward and reverse traffic to be hashed to the same node (referred to as hash symmetry), you must choose a policy that includes the `sym` option. Use either of the following methods to maintain hash symmetry.

This example includes both source and destination IP addresses for hashing in a symmetrical manner. The same hash results even if the source and destination IP addresses are swapped.

```
SEFOS(config)# slb l2 policy src-ip dest-ip sym
```

Alternatively, you could maintain hash symmetry while using only the `src-ip` field on switch A and the `dest-ip` field on switch B.

On switch A, type.

```
SEFOS(config)# slb l2 policy src-ip sym
```

On switch B, type.

```
SEFOS(config)# slb l2 policy dest-ip sym
```

7. Set up the bump-in-the-wire configuration.

To set up the bump-in-the-wire configuration, you must use a VLAN tag to identify ingress and egress traffic ports. This example associates the LBG and the ingress/egress port with VLAN 2. The following steps set up VLAN membership for the ports that participate in the LBG and also set up the switch to insert the VLAN tag to outgoing packets from port 15-18.

a. Set up VLAN.

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# port extreme-ethernet 0/15-18
SEFOS(config-if-range)# exit
```

b. Set up VLAN membership and PVID for the ingress port.

```
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# switchport access vlan 2
SEFOS(config-if)# exit
```

c. View the configuration.

```
SEFOS# show vlan

Vlan database
-----
Vlan ID          : 1
Member Ports     : Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6, Ex0/7
                  Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12, Ex0/13
                  Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18, Ex0/19
                  Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
```

```

Untagged Ports      : Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6, Ex0/7
                    : Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12, Ex0/13
                    : Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18, Ex0/19
                    : Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
-----
Vlan ID             : 2
Member Ports        : Ex0/1, Ex0/15, Ex0/16, Ex0/17, Ex0/18
Untagged Ports      : Ex0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
-----

```

8. Set up ACL.

a. Set up ACL rules in the ingress port such that the permitted traffic is forwarded to the LBG.

In this example, all packets with a source IP address of 1.2.3.4 are redirected to LBG group 1, which was set up in the preceding steps. All other packets will be denied access by the ingress port.

```

SEFOS(config)# ip access-list extended 20
SEFOS(config-ext-nacl)# permit ip any any loadbalance 1
SEFOS(config-ext-nacl)# exit
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# ip access-list 20 in
SEFOS(config-if)# exit

```

b. Steer the packets to the egress port.

All packets arriving the switch ports from the servers within the LBG need to be steered to the egress port. In this example, the processed packets are steered from the servers back to same switch port used as the ingress port.

```

SEFOS(config)# mac access-list extended 21
SEFOS(config-ext-macl)# permit any any vlan 2 redirectport extreme-ethernet 0/1
SEFOS(config-ext-macl)# exit
SEFOS(config)# mac access-list extended 91
SEFOS(config-ext-macl)# deny any any
SEFOS(config-ext-macl)# exit
SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# mac access-list 21 in
SEFOS(config-if-range)# mac access-list 91 in
SEFOS(config-if-range)# end

```

c. View the ACL.

SEFOS# show access-list

Extended IP Access List 20

```
-----  
Filter Priority           : 1  
Filter Protocol Type     : ANY  
IP address Type         : IPV4  
Source IP address       : 0.0.0.0  
Source IP address mask  : 0.0.0.0  
Source IP Prefix Length : 0  
Destination IP address  : 0.0.0.0  
Destination IP address mask : 0.0.0.0  
Destination IP Prefix Length : 0  
Flow Identifier         : 0  
In Port List           : Ex0/1  
Out Port List          : NIL  
Filter TOS             : NIL  
Filter DSCP            : NIL  
Filter Action          : Load balance to Group 1  
Status                 : Active
```

Extended IP Access List 90

```
-----  
Filter Priority           : 1  
Filter Protocol Type     : ANY  
IP address Type         : IPV4  
Source IP address       : 0.0.0.0  
Source IP address mask  : 0.0.0.0  
Source IP Prefix Length : 0  
Destination IP address  : 0.0.0.0  
Destination IP address mask : 0.0.0.0  
Destination IP Prefix Length : 0  
Flow Identifier         : 0  
In Port List           : Ex0/1  
Out Port List          : NIL  
Filter TOS             : NIL  
Filter DSCP            : NIL  
Filter Action          : Deny  
Status                 : Active
```

MAC ACCESS LISTS

Extended MAC Access List 21

```
-----  
Filter Priority           : 1  
Ether Type              : 0  
Protocol Type           : 0  
Vlan Id                 : 2  
User-Priority           : 0  
Destination MAC Address : 00:00:00:00:00:00  
Source MAC Address      : 00:00:00:00:00:00
```

```

In Port List           : Ex0/15 , Ex0/16 , Ex0/17 , Ex0/18
Filter Action          : Redirect to Port 1
Status                 : Active

Extended MAC Access List 91
-----
Filter Priority        : 1
Ether Type             : 0
Protocol Type         : 0
Vlan Id               : 0
User-Priority         : 0
Destination MAC Address : 00:00:00:00:00:00
Source MAC Address    : 00:00:00:00:00:00
In Port List         : Ex0/15 , Ex0/16 , Ex0/17 , Ex0/18
Filter Action         : Deny
Status                : Active

```

9. Enable the switch ports.

```

SEFOS(config)# interface range extreme-ethernet 0/15-18
SEFOS(config-if-range)# no shutdown
SEFOS(config-if-range)# exit
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end

```

10. View the SLB-L2 configuration.

```

SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to Standby Port(s) first, then All Ports
Port Members:
Port   State   Comments
====  =====
15     ACTIVE
16     ACTIVE
17     ACTIVE
18     ACTIVE

```

It might take up to 30 seconds for the port status to show. If executing the `slb show` command does not show the port status, try again in intervals of a few seconds until the status displays. If no status appears after 30 seconds, ensure that you have correctly completed the preceding steps.

For information about the status of a server member, see [“Conditions for a Member Participating in Load Distribution”](#) on page 15.

11. Save the current configuration (if needed).

```
SEFOS# write startup-config
```

Creating an SLB-L2 Failover Example

These sections describe how to create an SLB-L2 failover example.

- [“SLB-L2 Failover Example” on page 62](#)
- [“Trigger a Failover” on page 62](#)
- [“Restart the Interface Following Failure” on page 63](#)

SLB-L2 Failover Example

SLB-L2 monitors the link interface between the server and the switch. When the link fails, a failover event takes place. SLB-L2 provides several failover options. Refer to the `slb l2 failover-method` command in the *Sun Ethernet Fabric Operating System CLI Base Reference Manual* for more information.

The following example illustrates a failover event. The LBG in this example has four active nodes.

```
SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to All ports

Port Members:
Port   State   Comments
====   =====
15     ACTIVE
16     ACTIVE
17     ACTIVE
18     ACTIVE
```

▼ Trigger a Failover

You can simulate a link failure by shutting down one of the switch ports. This example shuts down port 16.

1. **Shut down a switch port.**

```
SEFOS# configure terminal
```

```
SEFOS(config)# interface extreme-ethernet 0/16
SEFOS(config-if)# shutdown
SEFOS(config-if)# end
```

2. After a few seconds, examine the SLB-L2 output.

```
SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to All ports

Members:
Port   State   Comments
====   =====
15     ACTIVE
16     FAILED   Failover to All ports
17     ACTIVE
18     ACTIVE
```

This output shows that port 16 has failed. The port's state changed from active to failed. The traffic hashed to the server for port 16 will be rehashed to all remaining active ports.

▼ Restart the Interface Following Failure

When the port 16 is repaired and recovered, use the following commands to ensure that the port status has returned to active.

1. Restart the interface.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/16
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

2. After a few seconds, examine the SLB-L2 output.

```
SEFOS# show slb l2

L2 SLB Group #1
Failover Method: Failover to All ports

Members:
Port   State   Comments
====   =====
15     ACTIVE
16     ACTIVE
17     ACTIVE
```

18 ACTIVE

Port 16 is now returned to active state.