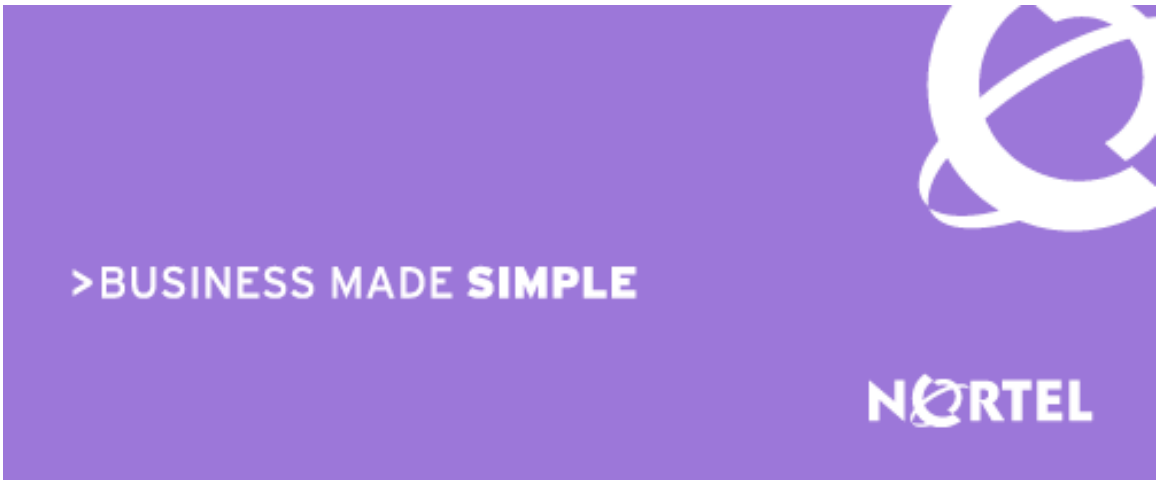

Ethernet Routing Switch
8600 8300 5x00 1600
Engineering

> Switch Clustering using Split Multi-Link Trunking (SMLT) with ERS 8600, 8300, 5x00 and 1600 Series Technical Configuration Guide

Enterprise Solution Engineering
Document Date: June 4, 2009
Document Number: NN48500-518
Document Version: 3.8

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Abstract

This document provides configuration procedures for Nortel's Split Multi-Link Trunking feature for the Ethernet Routing Switch 8600, 8300, 5x00, and 1600 series.

Document Updates

June 4, 2009 – Corrections to Table 2 regarding 802.3ad support on the ERS 8300 and 5x00

May 26, 2009 – Document title update and change made to remove VLACP MAC reference for ERS55xx at interface level.

August 14, 2008 – Made changes in reference to VRRP Hold-down timer and critical IP interface for the ERS5x00. Sections 1.3.2.6 and 2.6 have been updated.

February 25, 2008 – Changes to VLACP recommended values and support on ERS 8300. SLPP added on ERS 8300. Changes made to recommended FDB timers for SMLT VLANs. Add MLT port index command.

May 7, 2007 – Changes using two VLANs in RSMLT square or full mesh topology

Conventions

This section describes the text, image, and command conventions used in this document.

Symbols

Tip – Highlights a configuration or technical tip.

Note – Highlights important information to the reader.

Warning – Highlights important information about an action that may result in equipment damage, configuration or data loss.

Text

Bold text indicates emphasis.

Italic text in a Courier New font indicates text the user must enter or select in a menu item, button or command:

ERS5520-48T# ***show running-config***

Output examples from Nortel devices are displayed in a Lucida Console font:

ERS5520-48T# ***show running-config***

```
! Embedded ASCII Configuration Generator Script
! Model = Ethernet Routing Switch 5520-24T-PWR
! Software version = v5.0.0.011
enable
configure terminal
```

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1. Document Overview

The purpose of this Technical Configuration Guide is to provide configuration examples on various Nortel Ethernet Routing Switches (ERS) that support Split Multilink Trunking (SMLT). For a detailed overview on SMLT, please refer to the Converged Campus Technical Solution Guide (NN48500-516).

1.1 Software Levels

The configuration examples in this guide are based on the following minimum software levels.

Table 1: Minimum Software Levels for this TCG

Product	Minimum Software Level
ERS8600	5.0
ERS8300	4.2
ERS1600	2.1
ERS5x00	6.0

1.2 SMLT Features

The following displays the various SMLT options available for each Nortel switch that supports SMLT.

Table 2: SMLT Options

Feature	ERS8600	ERS8300	ERS1600	ERS5x00
Topologies				
Triangle	√	√	√	√
Square	√	√	-	√[1]
Full Mesh	√	√	-	√[1]
Aggregation				
MLT	√	√	√	√
802.3ad	√	√	-	-
ConfigurationOptions				
SMLT	√	√	√	√
SLT	√	√	√	√
Routing				
VRRP with Backup Master	√	√	√	√
RSMLT Edge	√			
RSMLT	√			
SMLT Protection Mechanisms				
CP-Limit	√	√	√	-
Ext CP-Limit	√	-	-	-
Loop Detect	√	-	-	-
SLPP	√	√	-	√
VLACP	√	√	-	√
Filter untagged Frames	√	√	√	√
Other				
Ping Snoop	√	√	-	-

1 Only supported between ERS5x00 SMLT clusters or a ERS5x00 SMLT cluster to a ERS8600 cluster

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1.3 SMLT Recommendations

1.3.1 SMLT Cluster

All configuration examples are based on the latest recommendations based on the software levels shown in table 1 above. Hence, this TCG will use the following settings for each configuration example.

Table 3: SMLT Recommendations

Feature	ERS8600	ERS8300	ERS1600	ERS5x00
Aggregation				
MLT	√	√	√	√
VLAN Tagging	√	√	√	√
STP disabled	√	√	√	√
SMLT Protection Mechanisms				
CP-Limit	√	√	√	-
Ext CP-Limit with Soft-down Option	√	-	-	-
SLPP	√	√	-	√
VLACP	√	√	-	√
Filter untagged Frames	√	√	√	√

It is recommended to use MLT inplace of 802.3ad as it provides faster recovery. The fastest possible recovery with 802.3ad would be around 1.5 second's compared to less than one second with MLT. If you wish or need to enable 802.3ad, please refer to the document number NN48500-502 (Technical Configuration Guide for Link Aggregation Control Protocol (LACP) 802.3ad and VLACP) for more details.

It is recommended to use the reserved multicast MAC address of 01:80:c2:00:00:0f for the VLACP MAC address for all Ethernet applications. This does not apply if you use an Ethernet over a LAN Extension service where it is recommended to use the default VLACP MAC.

It is recommended to use a SLPP receive threshold of 5 on the primary switch and a value of 50 on the secondary switch in an SMLT cluster. However, depending on the number of VLANs tagged across a trunk, the SLPP receive threshold on the primary switch may have to be increased from the recommended value of 5. A value of 5, for example, works fine on the primary switch for a couple of VLANs.

It is recommended to enable Ext CP-Limit with the soft-down option when using software release 4.1 or higher. The hard-down option should only be used as a loop prevention mechanism in software release 3.7.x.

ERS 5510's do not support both Filter Untagged Frames and VLACP simultaneously

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1.3.2 Recommended Values

The following information provides the suggested recommended value for each feature.

Configuration values are always left to the discretion of the user. The values called out in this doc are Nortel recommendations, which the user may wish to alter for their particular network and network needs. The values Nortel recommends have been tested and known to work. If the values are altered and issues are experienced, depending upon the situation, it is suggested to use the recommended values shown in this section.

1.3.2.1 Feature Summary

Table 4 : Feature Summary

Hardware/Software Platform	CP Limit	Ext CP Limit	Loop Detect	ARP Detect	Port Level Rate Limiting	VLACP	SLPP
ERS 8600 4.0.x	Yes [2]	N/A	Yes [1]	Yes [1, 2]	Yes [2]	Yes [1]	N/A
ERS 8600 4.1.x	Yes [2]	Yes [2] (Softdown)	No	No	Yes [2]	Yes [1]	Yes [1]
ERS 8300 3.0.x	Yes [1, 2]	N/A	N/A	N/A	No	N/A	N/A
ERS 8300 4.1.x	Yes [1, 2]	N/A	N/A	N/A	No	Yes [1]	N/A
ERS 8300 4.2.x	Yes [1, 2]	N/A	N/A	N/A	No	Yes [1]	Yes [1]
ERS 5x00 6.0.x	N/A	N/A	N/A	N/A	No	Yes [1]	Yes [1]
ERS 1600 2.1.x	Yes	N/A	N/A	N/A	No	N/A	N/A
[1] Loop Protection [2] CPU Protection							

Broadcast and multicast rate liming may occasionally drop packets when enabled no the ERS8600. Please see ERS8600 release notes for software level 5.0.1, document number NN46205-405 in reference to CR number Q01871916.

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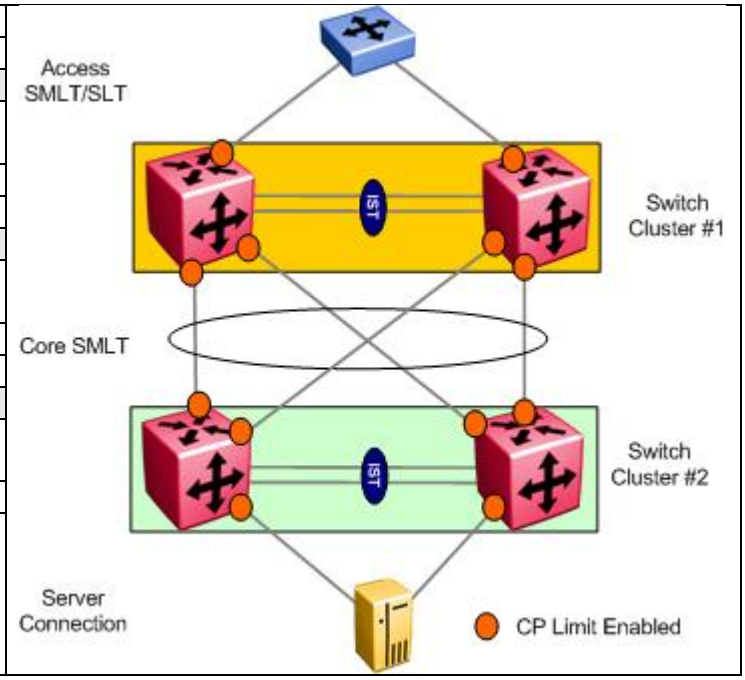
1.3.2.2 CP Limit

Table 5 : CP Limit Recommended Values

	CP Limit Values	
	Broadcast	**Multicast**
Aggressive		
Access SMLT/SLT	1000	1000
Server	2500	2500
Core SMLT	7500	7500
Moderate		
Access SMLT/SLT	2500	2500
Server	5000	5000
Core SMLT	9000	9000
Relaxed		
Access SMLT/SLT	4000	4000
Server	7000	7000
Core SMLT	10000	10000



CP Limit protects against control broadcast and multicast traffic destined to the CPU. If the defined rate is exceeded, the corresponding port is shut down and you need to disable and then re-enable the port to recover. CP Limit does not protect against user data traffic nor again traffic types such as SNMP, telnet, ICMP, IP with TLL 1, Unknown SA, etc. It is only supported on the ERS 8300 and ERS 8600.

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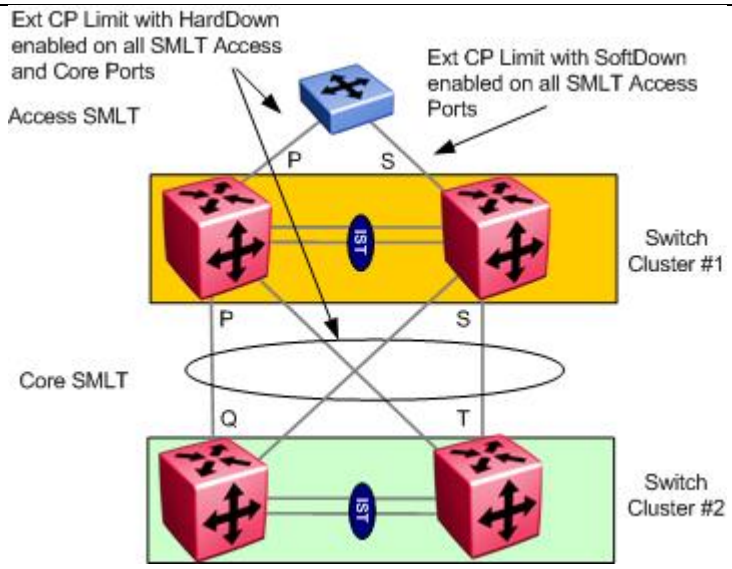
1.3.2.3 Ext CP Limit

Table 6 : Ext CP Limit Recommended Values

SoftDown – use with 4.1 or higher	
Setting	**Value**
Maximum Ports	5
Minimum Congestion Time	3 seconds (default)
Port Congestion Time	5 seconds (default)
CP Limit Utilization Rate	Dependent on network traffic
HardDown – use wth 3.7	
Maximum Ports	5
Minimum Congestion Time	P = 4,000ms S = 70,000ms T = 140,000ms Q = 210,000ms
Port Congestion Time	P = 4 Sec. S = 70 Sec. T = 140 Sec. Q = 210 Sec.



Primary (P) – primary target for convergence, Secondary (S) – secondary target for convergence
Tertiary (T) – third target for convergence, Quarternary (Q) – fourth target for convergence
Note : Ext CP Limit HardDown option is not recommended for software release 4.1 or later. This option should only be used when SLPP is not available.

Can be used in conjunction with CP Limit and expands the ability of CP Limit by monitoring buffer congestion on the CPU and port level congestion on the I/O modules. Like CP Limit, it does not look at user data packets. This feature is only available on the ERS 8600 and if the recommended SoftDown option is enabled, the maximum number of I/O ports that can be monitored is 5.

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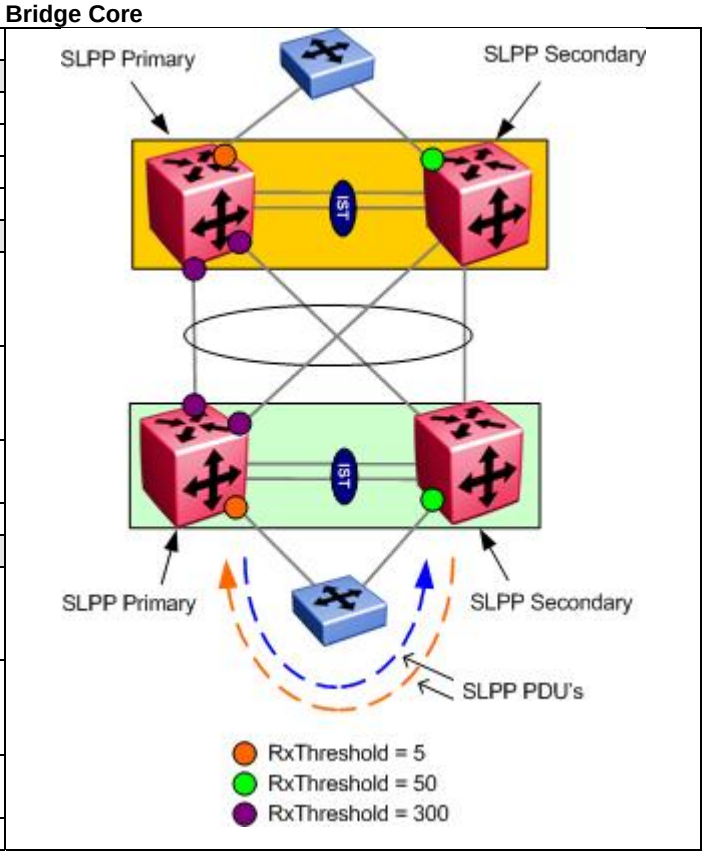
1.3.2.4 SLPP – Bridge Core

Table 7: SLPP Recommended Values for Bridge Core

	Settings
Enable SLPP	
Access SMLT	Yes
Access SLT	Yes
Core SMLT	Yes
IST	No
Primary Switch	
Packet Rx Threshold Edge Ports	5*
Packet Rx Threshold Core Ports	300
Transmission Interval	Default (500ms)
Ethertype	Default
Secondary Switch	
Packet Rx Threshold Edge Ports	50
Packet Rx Threshold Core Ports	Disable
Transmission Interval	Default (500ms)
Ethertype	Default



* This number may have to be increased depending on the number of VLANs tagged across a trunk interface. For example, the recommended value of 5 works fine for a couple of tagged VLANs.

SLPP is used to detect loops and shut down the appropriate port(s) where the loop is detected. SLPP operates by sending SLPP-PDU's where a loop is detected if the SLPP-PDU is received either on the same switch that orginated the the PDU's or on the peer switch. SLPP is configured on a per VLAN and port basis

As the number of VLANs running SLPP scale off of a specific uplink port, the Rx-threshold value may need to be increased to prevent complete isolation of the offending edge. Critical to note is that the primary goal of SLPP is to protect the core at all costs. In certain loop conditions, what may occur is the secondary switch also detecting the loop and its SLPP Rx-threshold is reached before the primary can stop the loop by taking its port down. Therefore, both switches eventually take their ports down and the edge becomes isolated. The larger the number of VLANs associated with the port, the more likely this could occur, especially for loop conditions that affect all VLANs. The recommended step here is to increase the Rx-threshold on the secondary only.

As a guideline, when the number of edge VLANs off of a specific uplink exceed 10, increase the secondary Rx-threshold to 100.

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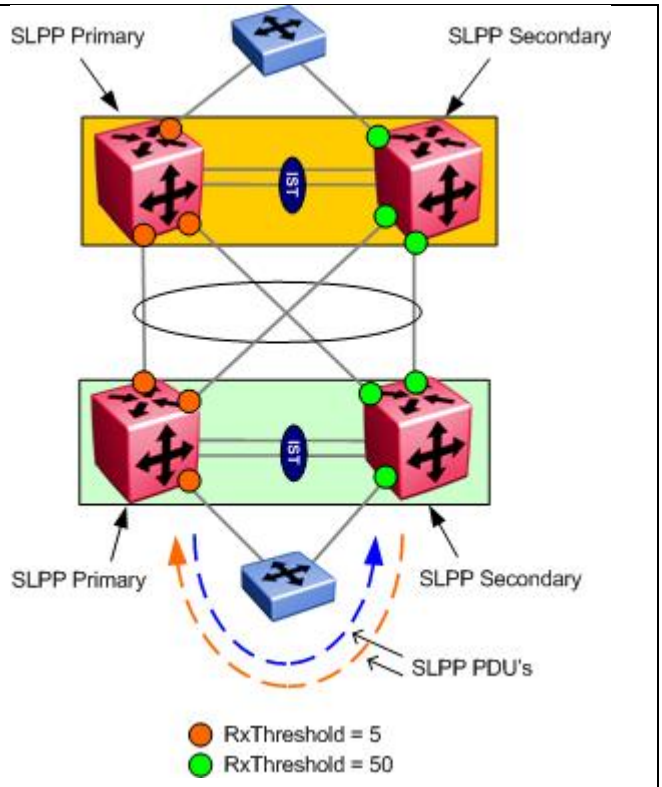
1.3.2.5 SLPP – Routed Core

Table 7: SLPP Recommended Values for Routed Core

	Settings
Enable SLPP	
Access SMLT	Yes
Access SLT	Yes
Core SMLT	Yes
IST	No
Primary Switch	
Packet Rx Threshold Edge Ports	5*
Packet Rx Threshold Core Ports	5
Transmission Interval	Default (500ms)
Ethertype	Default
Secondary Switch	
Packet Rx Threshold Edge Ports	50
Packet Rx Threshold Core Ports	50
Transmission Interval	Default (500ms)
Ethertype	Default



* This number may have to be increased depending on the number of VLANs tagged across a trunk interface. For example, the recommended value of 5 works fine for a couple of tagged VLANs.

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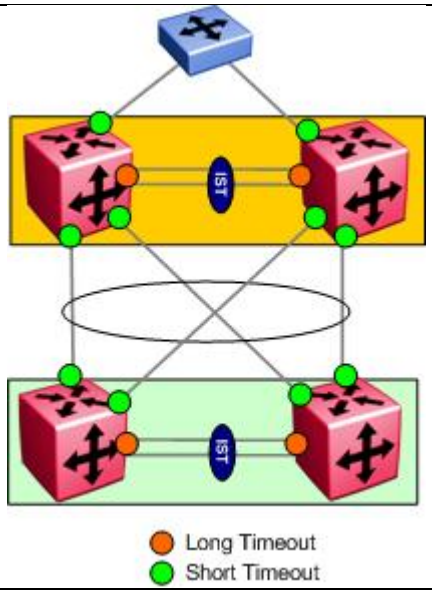
1.3.2.6 VLACP

Table 8: VLACP Recommended Values

Parameter	Setting
SMLT Access	
Timeout	Short
Timer	500ms
Timeout Scale	5
VLACP MAC	01:80:C2:00:00:0F
SMLT Core	
Timeout	Short
Timer	500ms
Timeout Scale	5
VLACP MAC	01:80:C2:00:00:0F
IST	
Timeout	Long
Timer	10000
Timeout Scale	3
VLACP MAC	01:80:C2:00:00:0F



To use Fast Periodic Timers of less than 200ms between ERS8600's only, a SuperMezz module must be present.

VLACP is used to detect end-to-end link failures on direct point-to-point interfaces. This is accomblished by each switch transmitting VLACP PDU's at a set timer interval in order for a llink to maintain a 'link-up' state. For all direct connected point-to-point links, use the reserved multicast MAC address of 01:80:c2:00:00:0f. For end-to-end connnections traversing intermediate networks, use the default VLACP MAC address 01:80:c2:00:11:00.

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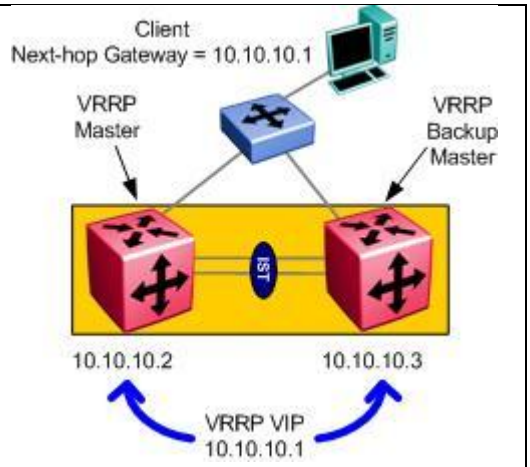
1.3.2.7 VRRP Backup Master

Table 9: VRRP Backup Master Recommended Values

Item	Configuration
VRRP VIP Guidelines	Do not use the physical IP address of VLAN as VRRP address. Always use three IP addresses, two VLAN physical and one virtual
Backup Master	Enable
VRRP Master	Define the SMLT Primary switch as the master by increasing the VRRP priority with a value higher than the default setting of 100.
DHCP	If you enable DHCP Relay, use the VLAN physical address and not the VRRP virtual IP address
Advertise Interval	10 Seconds
Hold-down Timer	60 seconds Note 1



Note 1: This value should be set to 0 seconds for the ERS5x00 only; please see note below

If there are multiple VLANs being utilized with VRRP enabled, it is recommended to stagger the VRRP Master such that both SMLT cluster switches are VRRP Master for half the VLANs.

The VRRP hold-down timer and critical IP interface should not be used in reference to the ERS5x00 only. Please see CR Q01737679 in the 5.1 release notes for the ERS5x00 (NN47200-400). In reference to the ERS5x00 only, if VRRP is used, Nortel recommends that:

1. VRRP Backup Master should be enabled on both SMLT cluster switches
2. Critical IP functionality should be disabled
3. VRRP Holddown-Timer should be set to 0
4. Customers should upgrade to a code level of 5.0.7 or 5.1.0 or higher as a separate bug (Q1733378) present in 5.0.3 and 5.0.6 coe may inappropirately send traffic across the IST causing it to drop

Critical IP should NOT be used with VRRP Backup Master. There are known issues when using this feature with VRRP Backup Master.

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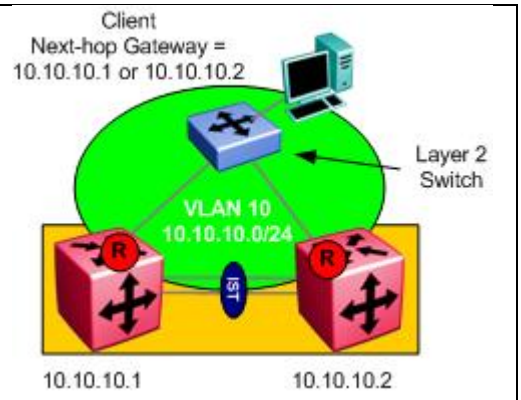
1.3.2.8 RSMLT Edge

Table 10: RSMLT Edge Recommended Values

Parameter/Item	Setting/Configuration
Hold-up Timer	Infinity (9999)
IP Address	Any IP address can be used on the Primary or Secondary switch as long as they are different. It is suggested to use a.b.c.1 for the primary and a.b.c.2 for secondary switch
IGP Interface Type	It is recommended to not send IGP updates/hello on the RSMLT edge ports; i.e. use OSPF passive interface.
RSMLT-edge	RSMLT-edge should be enabled which in turn stores the peer's MAC/IP address pair in its local configuration file and restores the configuration if the peer does not restore as a simulaneous reboot of both RSMLT peer switches



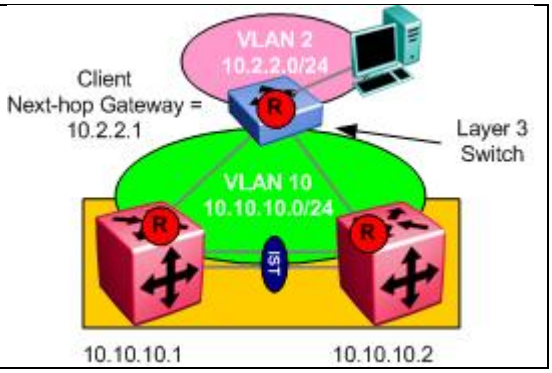
As an alternative to VRRP with Backup Master, RSMLT Edge can be used for Layer 2 connectivity to an Edge. This feature allows both SMLT cluster switches to forward traffic on behalf of the other. Also, it scales beyond the VRRP limit of only 255 instances. Please note that VRRP and RSMLT Edge should not be enabled on the same VLAN and when RSMLT Edge is configured, the configuration file must be saved in order to store the peer's MAC address.

Please remember to save the configuration when RSMLT Edge is configured. This step is required in order the save the peer MAC address.

1.3.2.9 RSMLT

Table 11: RSMLT Recommended Values

Parameter/Item	Setting/Configuration
Hold-up Timer	At least 1.5 times greater than the routing protocol convergence time. Leave default setting of 180 seconds
Hold-down Timer	At least 1.5 times greater than the routing protocol convergence time. Leave default setting of 60 seconds.



If the Edge switch supports Layer 3, RSMLT can be enabled. RSMLT provides sub-second failover without having to modify any layer 3 routing protocol timers. There is no requirement to use VRRP or ECMP on the Edge VLAN to load-balance traffic to both SMLT peer switches.

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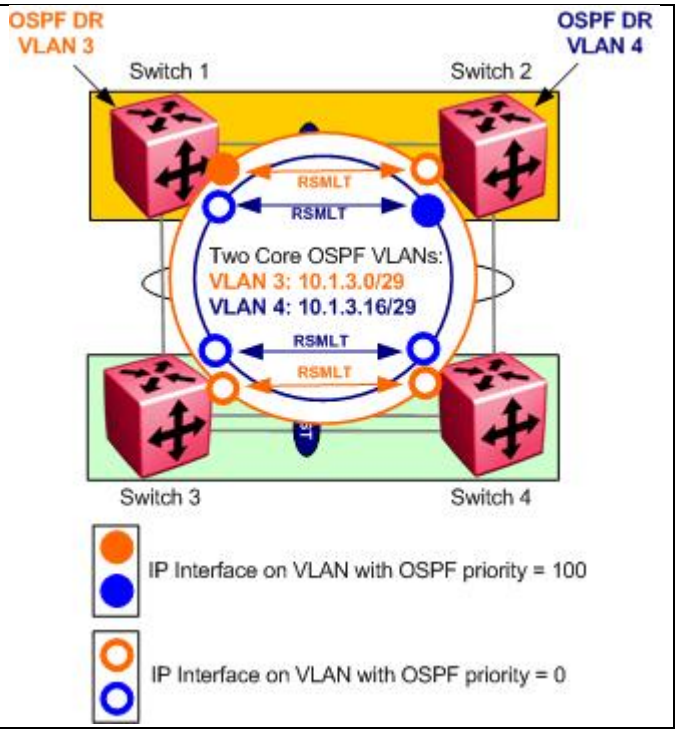
1.3.2.10 RSMLT Dual Core with OSPF

Table 11: RSMLT Recommended Values

Parameter/Item	Setting/Configuration
Hold-up Timer	At least 1.5 times greater than the routing protocol convergence time. Leave default setting of 180 seconds
Hold-down Timer	At least 1.5 times greater than the routing protocol convergence time. Leave default setting of 60 seconds.
OSPF DR Priority – Core VLAN A	
Switch 1	100
Switch 2	0
Switch 3	0
Switch 4	0
OSPF DR Priority – Core VLAN B	
Switch 1	100
Switch 2	0
Switch 3	0
Switch 4	0



RSMLT can be used with multiple VLANs in the core to provide sub-second failover for routed VLAN traffic using any type of IGP protocol such as OSPF or RIP. There is no requirement to use VRRP or ECMP in the core VLANs. Square of Full Mesh topologoies are supported in the core. If OSPF is used in the core, it is recommended to run two SPF instances via two separate VLANs. The reason for this recommendation is in the event of losing an OSPF designated router (DR). Normally, if a DR is lost, a traffic interruption of up to 10 seconds could occur. By creating a second OSPF core VLAN and configuring the DR as outlined above, sub-second recover will occur similar to Layer 2 SMLT operation.

It is recommended to use low slot numbers for the MLT ports used in the core between the two SMLT clusters when running OSPF with RSMLT. The reason for this is becuase CP generated traffic is always sent out on the lowered numbered ports when active.

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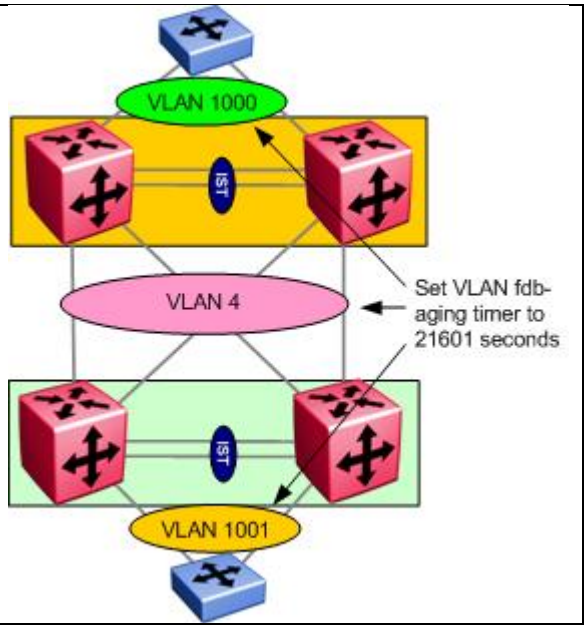
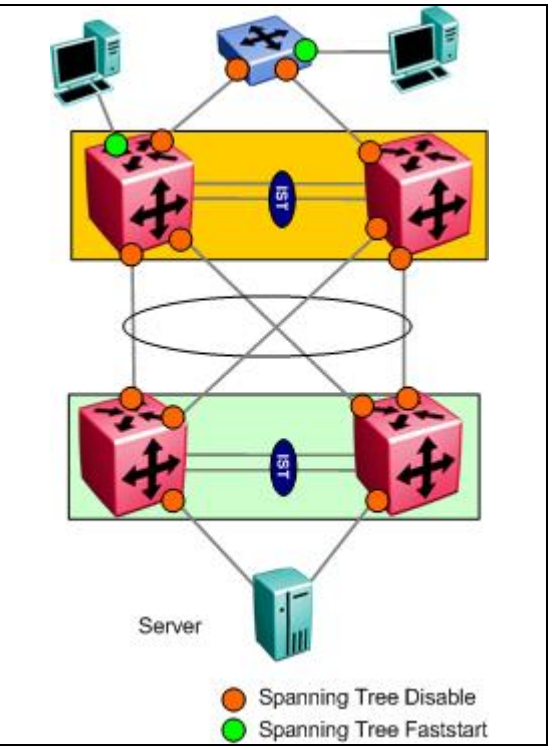
1.3.2.11 VLAN FDB Aging Timer for SMLT VLANs

Parameter/Item	Setting/Configuration	
Fdb-entry aging-timer	One second higher than sytem ARP agingin timer or 21601 seconds	

Please note that only for the ERS 5x00, the FBD aging timer should be left at the default setting of 300 seconds. The recommended value of 21601 seconds only applies to the ERS 8600, 8300, or 1600. .

1.3.2.12 Spanning Tree

Parameter/Item	Setting/Configuration	
Spanning Tree Learning on SMLT Cluster switches	Disabled on all SMLT, SLT, and IST port members on SMTL cluster switches. Fast start learning enabled on all other ports.	
Spanning Tree learning on Edge switches	Disabled on all uplink aggregation ports on Edge switches to SMLT cluster switches. Fast start learning enabled on all other ports.	

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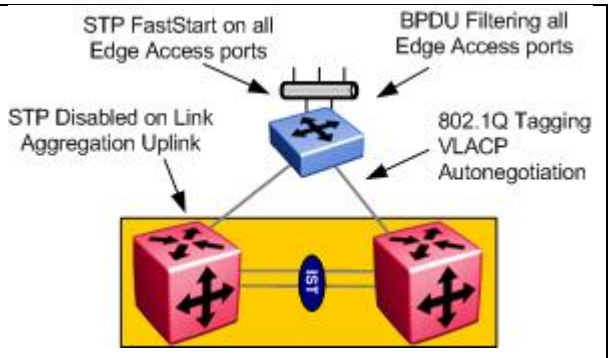
Spanning Tree is automatically disabled on all IST, SMLT, and SLT ports when using a ERS 8600, 8300, or 1600 switch. Spanning must be manually disabled when using a ERS 5xxx switch.

When using a ERS 5xxx switch, if you remove a port member from the default VLAN (VLAN 1) prior to adding this port to a new VLAN, Spanning Tree is automatically disabled on this port member.

1.3.3 Edge Access Switch

In regards to the access switch that connects to a SMLT Cluster, the following items should be enabled or used.

Feature	Uplink Ports to SMLT Cluster	Access ports for Users
STP	Disable on all MLT uplink ports	Enable STP FastStart
VLACP	Enable with Short Timers if available	No
BPDU Filtering	No	Enable with timer set to infinity (set to 0) when available
VLAN Tagging	Always enable	When needed
Autoneg	Enable	Enable
DHCP Snooping	No	Yes (when DHCP is used)
ARP Inspection[1]	No	Yes (when DHCP is used)
IP Source Guard / Reverse Path Check[1]	No[2]	Yes



[1] Dymanic ARP Inspection and IP Source Guard use the binding table create by DHCP Snooping, hence, in order to use these features, DHCP Snooping must be enabled. IP Source Guard should not be enabled on uplink ports from the Edge to the Core and should only be enabled on the Edge access ports (untrusted ports) where DHCP Snooping and Dynamic ARP Inspection are enabled.

[2] In an ERS 8600 RSMLT Cluster, if you wish to enable Reverse Path Check, please select “exist-only” and only enable Reverse Path Checking with Edge switches with known IP routes. For unknown routes, i.e. routes learned from the Internet, it is recommened to disable Reverse Path Check on the ERS 8600 cluster switches.

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2. Configuring SMLT – Triangle Topology Examples

2.1 Configuration – ERS8600 Layer 2 SMLT Triangle Switch Cluster Configuration

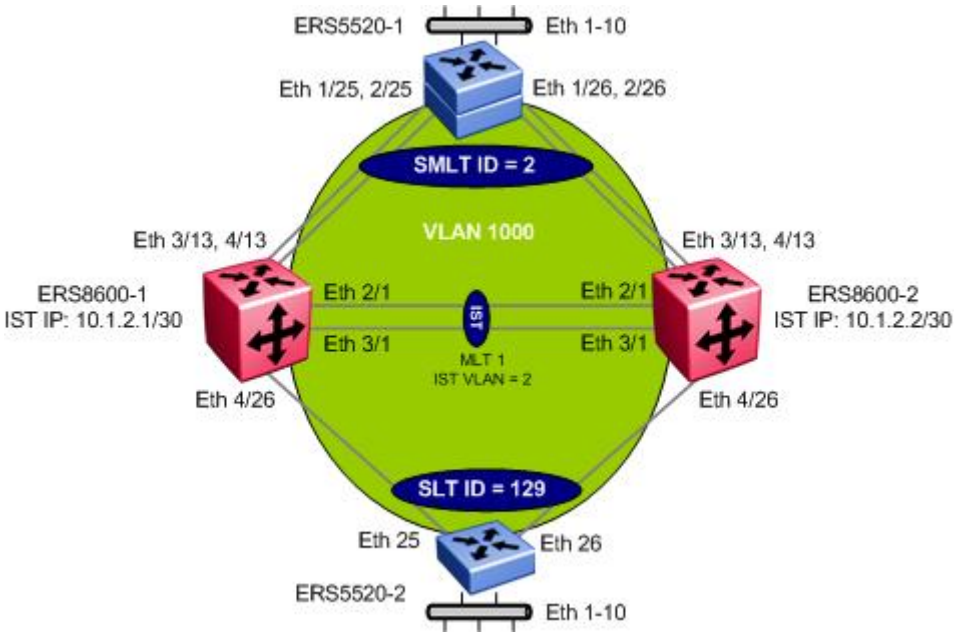

Figure 1: ERS8600 Layer 2 Triangle SMLT Configuration with SLPP and Ext-CP-Limit

For this example, we will configure the SMLT switch cluster with the following:

- IST
  - IST VLAN 2 using MLT ID = 1 assuming the SMLT cluster is configured for mixed mode (R-modules and non R-modules)
  - Tagged port members 2/1 and 3/1
  - All IST ports are Gigabit Ethernet ports using default setting of Autonegotiation enable
  - VLACP using the recommend reserved multicast MAC (01:80:C2:00:00:0F), long timers, and slow-periodic-time of 10,000 ms
- SMLT and SLT
  - SMLT VLAN 1000
  - ERS8600-1 is assumed to the SMLT Primary switch while ERS8600-2 is the SMLT Secondary switch
  - MLT and SMLT ID of 2 for ERS5520-1 with tagged port member 3/13 and 4/13
  - SLT ID of 129 for ERS5520-2 with tagged port member 4/26
  - All SMLT and SLTports are Gigabit Ethernet ports using default setting of Autonegotiation enable

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- Enable SLPP
- Enable VLACP with recommended reserved multicast MAC address and with short timers of 500ms and set timeout scale to 5
- Enable “Discard Untagged Frames” on all Access SMLT/SLT port members, this includes ports 3/13, 4/13, and 4/26
- Disable STP on all SMLT ports (default setting when SMLT is enabled)
- Set the recommended moderate CP Limit settings for broadcast and multicast traffic
- Enable Extended CP-Limit with SoftDown option
  - Maximum ports to check to 5
  - SoftDown utilization threshold set to 10%

- Access Switches

  On both ERS5520-1 and ERS5520-2, the following will be configured:

  - Broadcast and multicast rate limiting with a threshold to 10%
  - Enable Spanning Tree Fast Start and BPDU filtering on all edge ports
  - Disable Spanning Tree on MLT core ports to SMLT Cluster switches
  - BPDU filtering on all edge ports
  - VLAN Tagging on MLT access trunk ports

For this example, the IST was created using GE ports on 8630GBR I/O modules. It’s important to note that SMLT does not have any restrictions on the port types (copper, fiber, GE, 10GE) or I/O modules (E, M or R) that can be used for IST and SMLT connections. The only restriction is that the IST and SMLT ports must be of the same link speed (i.e. you cannot use 10GE and 1GE ports to form an IST or an SMLT) and same physical port type.

It is recommended to use the lowest MLT number for the IST. For the VLAN ID, it makes no difference if you use a low or high number.

It is recommended to start the SLT numbering at 129 up to 512 even though you can use any number from 1 to 512. As of software release 4.1 for the ERS8600, with R-mode enabled, up to 128 link aggregation groups (MLT or 802.3ad/LACP) are supported using ID’s starting at 1 up to 128. This is to avoid taking away a valid MLT ID that can be use for either a MLT or SMLT instance.

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<ExternalDistribution>

2.1.1 Configuration – ERS8600 Layer 2 Switch Cluster

For this configuration example, ERS8600-1 is configured using the NNCLI command interface while ERS8600-2 is configured using the Passport command interface.

2.1.1.1 Create VLANs

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 1000 to be used at a Layer 2 level to ERS5520-1 and ERS5520-2 for connecting users.

ERS8600-1: Step 1 – VLANs 2 and 1000
ERS8600-1:5(config)#***vlan create 2 name IST type port 1***
ERS8600-1:5(config)#***vlan create 1000 name Services type port 1***
ERS8600-2: Step 1 – Create VLAN 1 and 1000
ERS8600-2:5# ***config vlan 2 create byport 1 name IST***
ERS8600-2:5# ***config vlan 1000 create byport 1 name Services***

The IST and SMLT port numbers will be added when the corresponding MLT is created.

2.1.1.2 Change fdb aging timer for VLAN 1000

ERS8600-1: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS8600-1:5(config)#***vlan mac-address-entry 1000 aging-time 21601***
ERS8600-2: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS8600-2:5# ***config vlan 1000 fdb-entry aging-time 21601***

2.1.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 2/1 and 3/1. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members by default. VLACP will be enabled on the IST trunk.

It is recommended to use the reserved multicast MAC address of 01:80:c2:00:00:0f for the VLACP MAC address.

By default, unless you specify the VLACP timeout, the default setting of *long* will be used. Hence, we do not have to configure the VLACP timeout for the IST.

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ERS8600-1: Step 1 – Create MLT 1 for IST

```
ERS8600-1:5(config)#mlt 1
ERS8600-1:5(config)#mlt 1 name IST
ERS8600-1:5(config)#mlt 1 member 5/1,6/1
ERS8600-1:5(config)#mlt 1 encapsulation dot1q
ERS8600-1:5(config)#vlan mlt 2 1
```

ERS8600-2: Step 1 – Create MLT 1 for IST

```
ERS8600-2:5# config mlt 1 create
ERS8600-2:5# config mlt 1 name IST
ERS8600-2:5# config mlt 1 add port 2/1,3/1
ERS8600-2:5# config vlan 2 add-mlt 1
```

ERS8600-1: Step 2 – Create IST

```
ERS8600-1:5(config)#interface vlan 2
ERS8600-1:5(config-if)#ip address 10.83.1.1 255.255.255.252
ERS8600-1:5(config-if)#exit
ERS8600-1:5(config)#interface mlt 1
ERS8600-1:5(config-mlt)#ist peer-ip 10.83.1.2 vlan 2
ERS8600-1:5(config-mlt)#ist enable
ERS8600-1:5(config-mlt)#end
```

ERS8600-2: Step 2 – Create IST

```
ERS8600-2:5# config vlan 2 ip create 1.1.1.2/30
ERS8600-2:5# config mlt 1 ist create ip 1.1.1.1 vlan-id 2
ERS8600-2:5# config mlt 1 ist enable
```

ERS8600-1: Step 3 – Enable VLACP

```
ERS8600-1:5(config)# interface gigabitEthernet 2/1,3/1
ERS8600-1:5(config-if)#vlacp slow-periodic-time 10000
ERS8600-1:5(config-if)#vlacp enable
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 3 – Enable VLACP

```
ERS8600-2:5# config ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-1:5# config ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-2:5# config ethernet 2/1,3/1 vlacp enable
ERS8600-2:5# config vlacp enable
```

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2.1.1.4 SMLT-2 to ERS5520-1

ERS8600-1: Step 1 – Create SMLT-2

```
ERS8600-1:5(config)#mlt 2
ERS8600-1:5(config)# mlt 2 member 3/13,4/13 vlan 1000
ERS8600-1:5(config)# mlt 2 encapsulation dot1q
ERS8600-1:5(config)#interface mlt 2
ERS8600-1:5(config-mlt)#smlt 2
ERS8600-1:5(config-mlt)#end
```

ERS8600-2: Step 1 – Create SMLT-2

```
ERS8600-2:5# config mlt 2 create
ERS8600-2:5# config mlt 2 name ERS5520-1
ERS8600-2:5# config mlt 2 perform-tagging enable
ERS8600-2:5# config mlt 2 add port 3/13,4/13
ERS8600-2:5# config vlan 1000 add-mlt 2
ERS8600-2:5# config mlt 2 smlt create smlt-id 2
```

2.1.1.5 SLT-129 to ERS5520-2

ERS8600-1: Step 1 – Create SLT-129

```
ERS8600-1:5(config)#vlan ports 4/26 tagging tagAll
ERS8600-1:5(config)#vlan members remove 1 4/26
ERS8600-1:5(config)#vlan members add 1000 4/26
ERS8600-1:5(config)#interface gigabitEthernet 4/26
ERS8600-1:5(config-if)#smlt 129
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 1 – Create SLT-129

```
ERS8600-2:5# config ethernet 4/26 perform-tagging enable
ERS8600-2:5# config vlan 1 ports remove 4/26
ERS8600-2:5# config vlan 1000 ports add 4/26
ERS8600-2:5# config ethernet 4/26 smlt 129 create
```

2.1.1.6 Add VLAN 1000 to IST

ERS8600-1: Step 1 –Add VLAN 1000 to IST

```
ERS8600-1:5(config)#vlan mlt 1000 1
```

ERS8600-2: Step 1 – Add VLAN 1000 to IST

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```
ERS8600-2:5# config vlan 1000 add-mlt 1
```

2.1.1.7 CP Limit – SMLT port members

CP Limit will be enabled on all the SMLT Access port members. For this example, we will select the moderate recommendations for CP-Limit.

ERS8600-1: Step 1 – CP Limit

```
ERS8600-1:5(config)#interface gigabitEthernet 3/13,4/13,4/26
ERS8600-1:5(config-if)#cp-limit multicast 2500 broadcast 2500
```

ERS8600-2: Step 1 – CP Limit

```
ERS8600-2:5# config ethernet 3/13,4/13,4/26 cp-limit enable multicast-limit
2500 broadcast-limit 2500
```

2.1.1.8 SLPP

SLPP will be enabled globally and only on the SMLT access ports 3/13 and 4/13 and SLT access port 4/26 for VLAN 1000. On the SMLT primary switch we will set the SLPP packet-rx-threshold to 5, while on the SMLT secondary switch we will set the SLPP packet-rx-threshold to 50. For this example, we will pick ERS8600-1 as the primary switch.

The recommended SLPP receive threshold value for the primary switch is 5 and 50 for the secondary switch in an SMLT cluster.

SLPP should only be enabled on the SMLT access ports and not on the IST port members.

ERS8600-1: Step 1 – Enable SLPP

```
ERS8600-1:5(config)#slpp vid 1000
ERS8600-1:5(config)#slpp enable
ERS8600-1:5(config)# interface gigabitEthernet 3/13,4/13,4/26
ERS8600:5(config-if)#slpp packet-rx-threshold 5
ERS8600:5(config-if)# slpp packet-rx
ERS8600:5(config-if)#exit
```

ERS8600-2: Step 1 – Enable SLPP

```
ERS8600-2:5# config slpp add 1000
ERS8600-2:5# config slpp operation enable
ERS8600-2:5# config ethernet 3/13,4/13,4/26 slpp packet-rx enable
ERS8600-2:5# config ethernet 3/13,4/13,4/26 slpp packet-rx-threshold 50
```

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2.1.1.9 VLACP

As the access switches, ERS5520-1 and ERS5520-2, supports VLACP, we will enable this feature and use the short timeout option with the recommended fast-peiodic-time of 500ms and time-out scale of 5. In addition, we will use the recommended VLACP reserved MAC address.

ERS8600-1: Step 1 – Enable VLACP

```
ERS8600-1:5(config)#interface gigabitEthernet 3/13,4/13,4/26
ERS8600-1:5(config-if)#vlacp timeout short
ERS8600-1:5(config-if)#vlacp timeout-scale 5
ERS8600-1:5(config-if)#vlacp fast-periodic-time 500
ERS8600-1:5(config-if)#vlacp funcmac-addr 01:80:c2:00:00:0f
ERS8600-1:5(config-if)#vlacp enable
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 1 – Enable VLACP

```
ERS8600-2:5# config ethernet 3/13,4/13,4/26 vlacp fast-periodic-time 500
ERS8600-2:5# config ethernet 3/13,4/13,4/26 vlacp timeout short
ERS8600-2:5# config ethernet 3/13,4/13,4/26 vlacp timeout-scale 5
ERS8600-2:5# config ethernet 3/13,4/13,4/26 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-2:5# config ethernet 3/13,4/13,4/26 vlacp enable
```

Do not enable VLACP on a port level until the VLACP MAC address has been changed.

2.1.1.10 Ext-CP Limit

Ext-CP Limit will be enabled globally and on the SMLT access ports in the SMLT switch cluster. The SoftDown option will be used with the bandwidth utilization threshold set to 10%.

ERS8600-1: Step 1 – Enable EXT-CP-Limit

```
ERS8600-1:5(config)#sys ext-cp-limit
ERS8600-1:5(config)#sys ext-cp-limit max-ports-to-check 5
ERS8600-1:5(config)#sys ext-cp-limit trap-level Normal
ERS8600-1:5(config)#interface gigabitEthernet 3/13,4/13,4/26
ERS8600-1:5(config-if)# ext-cp-limit softDown threshold-util-rate 10
```

ERS8600-2: Step 1 – Enable EXT-CP-Limit

```
ERS8600-2:5# config sys ext-cp-limit extcplimit enable
ERS8600-2:5# config sys ext-cp-limit max-ports-to-check 5
ERS8600-2:5# config sys ext-cp-limit trap-level Normal
ERS8600-2:5# config ethernet 3/13,4/13,4/26 ext-cp-limit SoftDown
```

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```
threshold-util-rate 10
```

2.1.1.11 Discard Untagged Frames

It is recommended to enable discard untagged frames on all IST and SMLT ports.

ERS8600-1: Step 1 – Enable Discard Untagged Frames

```
ERS8600-1:5(config)#interface gigabitEthernet 2/1,3/1,3/13,4/13,4/26
ERS8600-1:5(config-if)#untagged-frames-discard
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 1 – Enable Discard Untagged Frames

```
ERS8600-2:5# config ethernet 2/1,3/1,3/13,4/13,4/26  untagged-frames-discard enable
```

2.1.2 Configuration - Edge Switch

2.1.2.1 Create VLAN

ERS5520-1: Step 1 – VLANs 1000

```
5520-1(config)#vlan create 1000 name Services type port
5520-1(config)#vlan members remove 1 1/1-10,1/25-26,2/1-10,2/25-26
5510-1(config)#vlan ports 1/25-26,2/25-26 tagging tagall
5520-1(config)#vlan members 1000 1/1-10,1/25-26,2/1-10,2/25-26
```

ERS5520-2: Step 1 – Create VLAN 1000

```
5520-2(config)#vlan create 1000 name Services type port
5520-2(config)#vlan members remove 1 1-10,25-26
5520-2(config)#vlan ports 25-26 tagging tagall
5520-2(config)#vlan members 1000 1-10,25-26
```

2.1.2.2 Create MLT

ERS5520-1: Step 1 – Create MLT 1

```
5520-1(config)# mlt 1 member 1/25-26,2/25-26 learning disable
5520-1(config)# mlt 1 enable
```

ERS5520-2: Step 1 – Create MLT 1

```
5520-2(config)# mlt 1 member 25,26 learning disable
5520-2(config)#mlt 1 enable
```

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2.1.2.3 VLACP

Please note that on an ERS5x00 switch, the VLACP MAC is entered as a hexadecimal value in the format of 'H.H.H'. Hence, the recommended VLACP MAC value of 01:80:c2:00:00:0f is entered as *180.c200.f*.

ERS5520-1: Step 1 – Enable VLACP

```
5520-1(config)#vlacp macaddress 180.c200.f
5520-1(config)#vlacp enable
5520-1(config)#interface fastEthernet 1/25-26,2/25-26
5520-1(config-if)#vlacp timeout short
5520-1(config-if)#vlacp timeout-scale 5
5520-1(config-if)#vlacp enable
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Enable VLACP

```
5520-2(config)#vlacp macaddress 180.c200.f
5520-2(config)#vlacp enable
5520-2(config)# interface fastEthernet 25,26
5520-2(config-if)# vlacp timeout short
5520-2(config-if)# vlacp timeout-scale 5
5520-2(config-if)#vlacp enable
5520-2(config-if)#exit
```

2.1.2.4 Enable Spanning Tree Fast Start and BPDU filtering on all Access Ports

ERS5520-1: Step 1 – Enable STP Fast Start and BPDU Filtering

```
5520-1(config)#interface fastEthernet 1/1-10,2/1-10
5520-1(config-if)#spanning-tree learning fast
5520-1(config-if)#spanning-tree bpdu-filtering timeout 0
5520-1(config-if)#spanning-tree bpdu-filtering enable
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Enable STP Fast Start and BPDU Filtering

```
5520-2(config)#interface fastEthernet 1-10
5520-2(config-if)#spanning-tree learning fast
5520-2(config-if)# spanning-tree bpdu-filtering timeout 0
5520-2(config-if)# spanning-tree bpdu-filtering enable
5520-2(config-if)#exit
```

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2.1.2.5 Enable Rate Limiting

ERS5520-1: Step 1 –Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic
5520-1(config)#***interface fastEthernet all***
5520-1(config-if)#***rate-limit port 1/1-10,2/1-10 both 10***
5520-1(config-if)#***exit***
ERS5520-2: Step 1 – Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic
5520-2(config)#***interface fastEthernet all***
5520-2(config-if)#***rate-limit port 1-10 both 10***
5520-2(config-if)#***exit***

Please note that the rate limit parameter on the ERS5x00 is expressed as percentage of total traffic. The values used in this example are just a suggestion and may vary depending on your needs.

When measuring the Broadcast Rate Limit, note that the rate limiting feature displays a calculation based on packets rather than octets. To obtain the actual value, use the following equation (the average packet size is 500 bytes):

(Line speed (bit/sec)/ Average packet size x 8) X (Rate Limit/100) = Packets per second

2.1.2.6 Discard Untagged Frames

ERS5520-1: Step 1 – Enable Discard Untagged Frames
5520-1(config)# ***vlan ports 1/25-26,2/25-26 filter-untagged-frame enable***
ERS5520-2: Step 1 – Enable Discard Untagged Frames
5520-2(config)#***vlan ports 25-26 filter-untagged-frame enable***

Please note that with the ERS5510 only, you cannot enable filter untagged frames when using VLACP. This does not apply to the ERS5520 or ERS5530.

2.1.3 Verify Operations

2.1.3.1 Verify MLT Configuration

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:
NNCLI: ***show mlt***
PPCLI: ***show mlt info***
Result:

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```
================================================================================
                                    Mlt Info
================================================================================
                          PORT    SVLAN  MLT   MLT        PORT         VLAN
MLTID IFINDEX NAME        TYPE    TYPE   ADMIN CURRENT    MEMBERS      IDS
--------------------------------------------------------------------------------
1   4098  IST           trunk   normal ist   ist          2/1,3/1      2 1000
2   4100  5520-1        trunk   normal smlt  smlt       3/13,4/13      1000


                MULTICAST              DESIGNATED   LACP      LACP
MLTID IFINDEX   DISTRIBUTION  NT-STG   PORTS        ADMIN     OPER
--------------------------------------------------------------------------------
1       4098     disable      enable   2/1          disable   down
2       4100     disable      enable   3/13         disable   down
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT MLT are correct: • IST MLT 1: Member of VLANs ***1000*** & ***2*** with port members ***2/1 and 3/1*** • MLT 2: Member of VLAN ***1000*** with port member ***3/13*** and ***4/13***
MLT ADMIN	Displays as ***smlt*** or ***ist*** if configured correctly. The value ***normal*** indicates that the IST or SMLT is not configured.
MLT CURRENT	Displays as ***smlt*** or ***ist*** if the SMLT or IST is operational.
PORT TYPE	Displays as ***trunk*** for all IST and SMLT ports and will pass tagged frames. The value ***access*** indicates that the port will pass untagged frames.

2.1.3.2 Virtual LANs (VLANs):

Step 1 – Verify the VLAN port assignments and 802.1Q tagging settings by issuing the following command:

NNCLI: ***show interfaces gigabitEthernet vlan***

PPCLI: ***show ports info vlans port 2/1,3/1,3/13,4/13,4/26***

Result:

```
================================================================================
                            Port Vlans
================================================================================
PORT           DISCARD DISCARD   DEFAULT VLAN    PORT     UNTAG
NUM   TAGGING  TAGFRAM UNTAGFRAM VLANID  IDS     TYPE     DEFVLAN
--------------------------------------------------------------------------------
2/1   enable   false   true      2       2 1000  normal   disable
3/1   enable   false   true      2       2 1000  normal   disable
3/13  enable   false   true      1000    1000    normal   disable
4/13  enable   false   true      1000    1000    normal   disable
4/26  enable   false   true      1000    1000    normal   disable
```

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On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT ports are correct: • IST Ports: Member of VLANs ***1000*** & ***2***. • SMLT 2 Ports: Member of VLAN ***1000***. • SLT 129 Ports: Member of VLAN ***1000***.
TAGGING	Displays as ***enable*** for all IST and SMLT ports. The value ***disable*** indicates that the port is in an untagged mode.
DISCARD UNTAGFRAM	Displays as ***true*** for all IST and SMLT ports. The value ***false*** indicates that the port will pass untagged frames.

2.1.3.3 Inter Switch Trunk (IST):

Step 1 – Verify that the IST is configured correctly and is functioning by issuing the following command:

```
NNCLI: show ist mlt
PPCLI: show mlt ist info
```

Result:

```
=======================================================
                          Mlt IST Info
=======================================================
MLT   IP                  VLAN     ENABLE   IST
ID    ADDRESS             ID       IST      STATUS
-------------------------------------------------------
1     10.1.2.2            2        true     up
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
MLT ID	Verify the MLT ID assigned to the IST is correct.
IP ADDRESS	Verify that the IST peer IP address is correct: • ERS8600-1: Will display the peer IP ***10.1.2.2*** • ERS8600-2: Will display the peer IP ***10.1.2.1***
VLAN ID	Displays the IST VLAN which for this example is VLAN 2.
ENABLE IST	Displays as ***true***. The value ***false*** indicates that the IST is not enabled.
IST STATUS	Displays as ***up***. The value ***down*** indicates that the IST is not operational.

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2.1.3.4 Split MultiLink Trunking (SMLT):

Step 1 – Verify that SMLT is functioning correctly by issuing the following command:

```
NNCLI: ERS8600-1:5#show smlt mlt
ERS8600-1:5#show smlt gigabitethernet
PPCLI: show smlt info
```

Result:

```
================================================
                        Mlt SMLT Info
================================================
MLT   SMLT     ADMIN    CURRENT
ID    ID       TYPE     TYPE
------------------------------------------------
2     2        smlt     smlt

================================================================================
                        Port SMLT Info
================================================================================
PORT  SMLT     ADMIN    CURRENT
NUM   ID       TYPE     TYPE
--------------------------------------------------------------------------------
4/26  129      smlt     smlt
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
SMLT ID	Verify that the SMLT IDs match the MLT IDs. For the SLT, port 4/26 should display SLT ID 129.
ADMIN TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the MLT is not configured as an SMLT trunk.
CURRENT TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the SMLT ports are disconnected or the SMLT IDs are mis-configured.

2.1.3.5 Virtual Link Aggregation Control Protocol (VLACP):

Step 1 – Verify that VLACP is globally enabled by using the following command:

```
NNCLI: show vlacp
PPCLI: show vlacp info
```

Result:

```
================================================================================
                        Vlacp Global Information
================================================================================
               SystemId: 00:01:81:28:84:00
                   Vlacp: enable
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify

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Vlacp	Displays as ***enable***. The value ***disable*** indicates that VLACP is globally disabled on the switch.
SystemId	Displays as ***00:01:81:28:84:00***. Please note that the VLACP reserved MAC shows up at the interface level.

Step 2 – Verify the IST and SMLT per port VLACP settings by issuing the following command:

```
NNCLI: show vlacp interface gigabitethernet 2/1,3/1,3/13,4/13
PPCLI: show ports info vlacp port 2/1,3/1,3/13,4/13
```

Result:

```
================================================================================
                          VLACP Information
================================================================================
INDEX ADMIN    OPER     PORT    FAST     SLOW     TIMEOUT TIMEOUT ETHER       MAC
      ENABLED  ENABLED  STATE   TIME     TIME     TIME    SCALE   TYPE        ADDR
--------------------------------------------------------------------------------
2/1   true     true     UP      200      10000    long    3       0x8103      01:80:c2:00:00:0f
3/1   true     true     UP      200      10000    long    3       0x8103      01:80:c2:00:00:0f
3/13  true     true     UP      500      30000    short   5       0x8103      01:80:c2:00:00:0f
4/13  true     true     UP      500      30000    short   5       0x8103      01:80:c2:00:00:0f
4/26  true     true     UP      500      30000    short   5       0x8103      01:80:c2:00:00:0f
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
ADMIN ENABLED	Displays as ***true*** for the IST, SMLT-2, and SLT-129 ports. The value ***false*** indicates that VLACP is disabled for the port.
OPER ENABLED	Displays as ***true*** for the IST SMLT-2, and SLT-129 ports. The value ***false*** indicates that VLACP is not operational on the port.
FAST TIME	Displays as ***500*** for the SMLT-2 and SLT-129 ports. The value must match for each switch port in the link pair.
SLOW TIME	Displays as ***10000*** for the IST port members. If not, please change the VLACP slow-periodic-time setting to this value.
TIMEOUT TIME	Displays as ***long*** for the IST ports and ***short*** for SMLT-2 and SLT-129 ports. This value must match for each switch port in the link pair.
TIMEOUT SCALE	Displays as ***5*** for the SMLT-2 and SLT-129 ports. The default timeout scale of ***3*** will be displayed for the IST port members 2/1 and 3/1.
MAC ADDR	The VLACP MAC address is assigned to each IST, SMLT-2 and SLT-129 port members: • IST port 2/1 and 3/1: ***01:80:c2:00:00:0f***. • SMLT-2 & SLT-129 ports: ***01:80:c2:00:00:0f***. The VLACP MAC address must match for each switch port in the link

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	pair.

2.1.3.6 Simple Loop Prevention Protocol (SLPP):

Step 1 – Verify that SLPP is globally enabled on the switch by issuing the following command:

```
NNCLI & PPCLI: show slpp
```

Result:

```
================================================================================
                          SLPP Info
================================================================================
            etherType (hex) : 0x8104
                  operation : enabled
                tx-interval : 500
                       vlan : 1000
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
operation	Displays as ***enable***. The value ***disable*** indicates that SLPP is globally disabled on the switch.
vlan	Displays as ***1000*** indicating SLPP is enabled for VLAN 1000.

Step 2 – Verify the SLPP settings by issuing the following command:

```
NNCLI: show interfaces gigabitEthernet slpp 3/13,4/13,4/26
PPCLI: show ports info slpp port 3/13,4/13,4/26
```

Result:

```
        ============================================================
                                Port Interface
        ============================================================

        PORT        PKT-RX      PKT-RX     INCOMING   SLPP PDU
        NUM                     THRESHOLD  VLAN ID    ORIGINATOR
        ------------------------------------------------------------
        3/13        enabled     5
        4/13        enabled     5
        4/26        enabled     5
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
PORT NUM	Displays the port numbers for SMLT ports.
PKT-RX	Displays as ***enabled*** for all SMLT ports. The value ***false*** indicates that

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	SLPP is disabled for the port.
PKT-RX THRESHOLD	Displays as ***5*** for each SMLT/SLT port on ERS8600-1 and ***50*** for each SMLT/SLT port on ERS6800-2.

If port 4/13 is disabled on either ERS8600-1 or ERS8600-2 due to either switch receiving its own SLPP-PDU, a message is logged and a trap will be issued. The following is an example of log message received on ERS8600-1 upon detecting its own SLPP-PDU caused by a loop in the network.

- NNCLI: ERS8600-1:5#***show logging file tail***
- PPCLI: ERS8600-1:5# ***show log file tail***

```
CPU6 [03/02/06 15:41:15] SNMP INFO Slpp port down(SlppRxPort = 269, SlppRxVlan =
1000, SlppIncomingVlanId = 1000, SlppSrcMacAddress = 00:01:81:28:84:00)
CPU6 [03/02/06 15:41:15] SNMP INFO Smlt Link Down Trap(SmltId=10)
CPU6 [03/02/06 15:41:15] SNMP INFO Smlt Link Up Trap(SmltId=10)
CPU6 [03/02/06 15:41:15] SNMP INFO Smlt Link Down Trap(SmltId=10)
CPU6 [03/02/06 15:41:15] SNMP INFO Port 4/13 is a trunk port
CPU6 [03/02/06 15:41:15] SNMP INFO Link Down(4/13) due to slpp
CPU6 [03/02/06 15:41:15] SW WARNING slppRx: SLPP packet received Rx-Vlan 1000,
Rx-
Port 4/13, PDU-Vlan 1000, SRC-Mac 00:01:81:28:84:00
```

Also, you view the port state by using the following command

- NNCLI: ERS8600-1:5#***show interfaces gigabitEthernet state 4/13***
- PPCLI: ERS8600-1:5# ***show port info state port 4/13***

```
================================================================
                          Port State
================================================================
PORT NUM    ADMINSTATUS   PORTSTATE    REASON      DATE
----------------------------------------------------------------
4/13          up            down          SLPP        03/02/06 15:41:15
```

NOTE: To bring port 4/13 back up, you must disable and then re-enable the port using the following commands:

- NNCLI
  - ERS8600-1:5(config)#***interface gigabitEthernet 4/13***
  - ERS8600-1:5(config-if)#***shutdown***
  - ERS8600-1:5(config-if)#***no shutdown***
  - ERS8600-1:5(config-if)#***exit***
- PPCLI:
  - ERS8600-1:5# ***config ethernet 4/13 state disable***
  - ERS8600-1:5# ***config ethernet 4/13 state enable***

If you wish, you can also bring the port(s) back up automatically by using the following command:

- NNCLI:
  - ERS8600-1:5(config)#***interface gigabitEthernet 4/13***
  - ERS8600-1:5(config-if)# ***auto-recover-port enable***
  - ERS8600-1:5(config-if)#***exit***
- PPCLI:
  - ERS8600-1:5# ***config ethernet <slot/port> auto-recover-port enable***

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NOTE: Although you can configure a port to bring it back up automatically, it is not recommended to enable this feature and use the default setting of disable.

2.1.3.7 Ext-CP-Limit:

Step 1 – Verify that EXT-CP-Limit is globally enabled on each switch by issuing the following command:

```
NNCLI & PPCLI: show sys ext-cp-limit
```

Result:

```
        extcplimit           : enable
        max-ports-to-check   : 5
        min-congestion-time  : 3000
        port-congestion-time : 5
        trap-level           : Normal
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
extcplimit	Displays as ***enable***. The value ***disable*** indicates that EXT-CP-Limit is globally disabled on the switch.
max-ports-to-check	Displays as ***5***. The value **5** indicated the maximum number of ports to check for Ext-CP Limit.

Step 2 – Verify the SMLT ports EXT-CP-Limit settings by issuing the following command:

```
NNCLI: show interfaces gigabitEthernet ext-cp-limit
2/1,3/1,3/13,4/13,4/26
PPCLI: show ports info ext-cp-limit port 2/1,3/1,3/13,4/13,4/26
```

Result:

```
================================================================================
                        Port Ext-CP-Limit Info
================================================================================
PORT  EXT-CP-LIMIT    UTIL-RATE     SHUTDOWN
--------------------------------------------------------------------------------
2/1   None            50            false
3/1   None            50            false
3/13  SoftDown        10            false
4/13  SoftDown        10            false
4/26  SoftDown        10            false
```

On each ERS8600 in the switch cluster verify the following information:

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Option	Verify
EXT-CP-LIMIT	Displays as ***None*** for IST ports and ***SoftDown*** for all SMLT/SLT ports.
UTIL-RATE	Displays as ***10*** for all SMLT/SLT ports. A different value indicates a different percentage threshold has been defined for the port(s).
SHUTDOWN	Displays as ***false*** for all SMLT/SLT ports. The value ***true*** indicates that EXT-CP-Limit has disabled a port due to excessive traffic exceeding the specified threshold from the port was impacting the CPU.

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<ExternalDistribution>

2.2 Configuration – ERS8600 Triangle Switch Cluster using VRRP with Backup Master

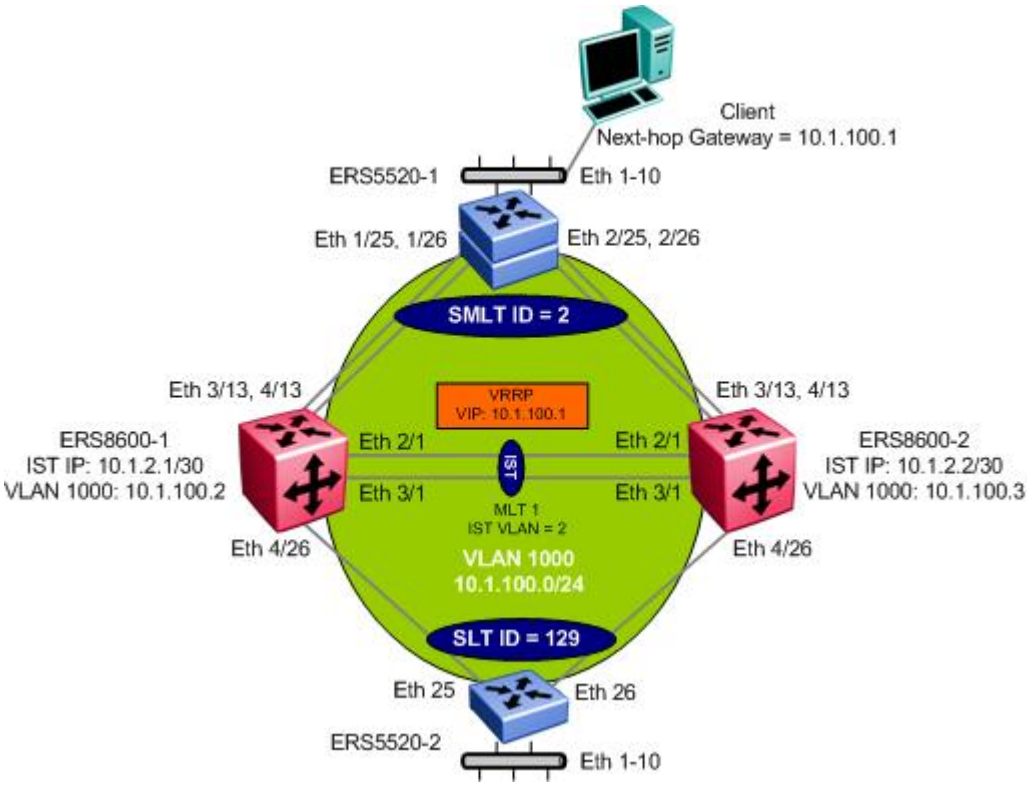

Figure 2: ERS8600 Triangle SMLT Configuration with VRRP Backup Master

Assuming we take the same base setup as used in Section 2.1.1 but we now add a Layer 3 routing protocol with VRRP Backup Master. The configuration remains the same with the addition of enabling a routing protocol on VLAN 10 and enabling VRRP Backup-Master.

Overall, we will use the same configuration steps as used in Section 2.1.1 and will add the following:

- Enable OSPF on VLAN 1000
  - VLAN 1000 on ERS8600-1 will be configured with IP address 10.1.100.2/24
  - VLAN 1000 on ERS8600-2 will be configured with IP address 10.1.100.3/24
  - Both ERS8600-1 and ERS8600-2 will be configured with OSPF passive interface as both switches are connected to Layer 2 access switches. This prevent OSPF messages being send to the access switches
  - Use default OSPF timers
- Enable VRRP on VLAN 1000 with the following settings
  - Enable backup master
  - Set the hold down timer to 60 seconds on ERS8600-1 and ERS8600-2
  - Set the VRRP VIP to 10.1.100.1 on both switches in the SMLT cluster
  - Set VRRP virtual router id (vrid) to 10

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- Set the VRRP priority to 200 on ERS8600-1 so that it becomes the VRRP master and use the default value of 100 on ERS-8600-2 so that it becomes the VRRP backup

The VRRP hold down timer should be set long enough such that the IGP routing protocol has time to converge and update the routing table. In some cases, setting the VRRP hold down timer a minimum of 1.5 times the IGP convergence time should be sufficient. For OSPF, it is suggested to use a value of 60 seconds if using the default OSPF timers.

Please note that the ERS8600 supports up to 255 VRRP instances. If you have a requirement for more than 255 routing instances to a Layer 2 access in a SMLT cluster, you can use RSMLT Edge instead of VRRP backup master or a mix of both.

2.2.1 Configuration – ERS8600 Layer 3 Switch Cluster using VRRP Backup Master

For this configuration example, ERS8600-1 is configured using the NNCLI command interface while ERS8600-2 is configured using the Passport command interface.

2.2.1.1 Add IP address to VLAN 1000

ERS8600-1: Step 1 – Add IP address to VLAN 1000
ERS8600-1:5(config)#***interface vlan 1000***
ERS8600-1:5(config-if)#***ip address 10.1.100.2 255.255.255.0***
ERS8600-2: Step 1 – Add IP address to VLAN 1000
ERS8600-2:5# ***config vlan 1000 ip create 10.1.100.3/24***

2.2.1.2 Enable OSPF

VLAN 1000 will be configured with OSPF passive interface on the SMLT Switch cluster.

ERS8600-1: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS8600-1:5(config-if)#***ip ospf network passive***
ERS8600-1:5(config-if)#***ip ospf enable***
ERS8600-1:5(config-if)#***exit***
ERS8600-2: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS8600-2:5# ***config vlan 1000 ip ospf interface-type passive***
ERS8600-2:5# ***config vlan 1000 ip ospf enable***
ERS8600-1: Step 2 – Enable OSPF globally
ERS8600-1:5(config)#***router ospf enable***
ERS8600-2: Step 2 – Enable OSPF globally

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```
ERS8600-2:5# config ip ospf enable
```

2.2.1.3 Enable VRRP

ERS8600-1: Step 1 – Add VRRP VIP

```
ERS8600-1:5(config)#interface vlan 1000
ERS8600-1:5(config-if)#ip vrrp address 10 10.1.100.1
```

ERS8600-2: Step 1 – Add VRRP VIP

```
ERS8600-2:5# config vlan 1000 ip vrrp 10 address 10.1.100.1
```

ERS8600-1: Step 2 – Enable backup master

```
ERS8800-1:5(config-if)#ip vrrp 10 backup-master enable
```

ERS8600-2: Step 2 – Enable backup master

```
ERS8600-2:5# config vlan 1000 ip vrrp 10 backup-master enable
```

ERS8600-1: Step 3 – Set the hold down timer to 60 seconds

```
ERS8600-1:5(config-if)#ip vrrp 10 holddown-timer 60
```

ERS8600-2: Step 3 – Set the hold down timer to 60 seconds

```
ERS8600-2:5# config vlan 1000 ip vrrp 10 holddown-timer 60
```

ERS8600-1: Step 4 – Set VRRP priority

```
ERS8800-1:5(config-if)#ip vrrp 10 priority 200
```

ERS8600-1: Step 5 – Enable VRRP

```
ERS8600-1:5(config-if)#ip vrrp 10 enable
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 5 – Enable VRRP

```
ERS8600-2:5# config vlan 1000 ip vrrp 10 enable
```

2.2.1.4 DHCP Relay Option

If you wish to enable DHCP Relay on VLAN 1000, please enter the following commands assuming the DHCP relay agent is 172.30.30.20.

ERS8600-1: Step 1 – Enable DHCP Relay on VLAN 1000

```
ERS8600-1:5(config)#interface vlan 1000
ERS8600-1:5(config-if)#ip dhcp-relay
```

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```
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 1 – Enable DHCP Relay on VLAN 1000

```
ERS8600-2:5# config vlan 1000 ip dhcp-relay enable
```

ERS8600-1: Step 2 – Enable DHCP agent

```
ERS8600-1:5(config)#ip dhcp-relay fwd-path 10.1.100.2 172.30.30.20 mode dhcp
```

ERS8600-2: Step 2 – Enable DHCP agent

```
ERS8600-2:5# config ip dhcp-relay create-fwd-path agent 10.1.100.3 server
172.30.30.20 mode dhcp state enable
```

2.2.2 Verify Operations

2.2.2.1 VRRP Operations

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
NNCLI: show ip vrrp interface vrid 10
PPCLI: show ip vrrp info vrid 10
```

Result:

```
================================================================================
                          Vrrp Info
================================================================================

VRID  P/V   IP              MAC                STATE    CONTROL  PRIO  ADV
--------------------------------------------------------------------------------
10    260   10.1.100.1      00:00:5e:00:01:0a  Master   Enabled  200   1

VRID  P/V   MASTER          UP TIME               HLD DWN  CRITICAL IP (ENABLED)
--------------------------------------------------------------------------------
10    260   10.1.100.1      0 day(s), 00:01:53    0        0.0.0.0         (No)

VRID  P/V   BACKUP MASTER   BACKUP MASTER STATE   FAST ADV (ENABLED)
--------------------------------------------------------------------------------
10    260   enable          down                  200       (NO)
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VRID	Verify that the VRRP VID is ***10*** on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
IP	Verify that the VRRP IP address is ***10.1.100.1*** on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
MAC	The VRRP MAC on both switches in the SMLT cluster should be the same.
STATE	Verify the VRRP state:

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	• ERS8600-1: ***Master*** • ERS8600-2: ***Back Up***
PRIO	Verify that the VRRP priority is set to ***200*** on ERS8600-1 and ***100*** on ERS8600-2. If not, configure the appropriate VRRP priority.
MASTER	Verify that VRRP master's IP address belongs to ERS8600-1 on both switches: • ERS8600-1: ***10.1.100.2*** • ERS8600-2: ***10.1.100.2***
BACKUP MASTER	Verify that backup master is set to ***enable*** on both switches. If not, enable VRRP backup master.
BACKUP MASTER STATE	Verify that VRRP backup master state on both switches: • ERS8600-1: ***down*** • ERS8600-2: ***up***
(ENABLED)	Verify that the VRRP fast advertise is set to ***NO*** on ERS8600-1 and ERS8600-2. It is not nessesary to enable VRRP fast advertise.

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2.3 Configuration – ERS8600 Layer 2 Edge Routed SMLT (RSMLT Edge) Triangle Switch Cluster Configuration

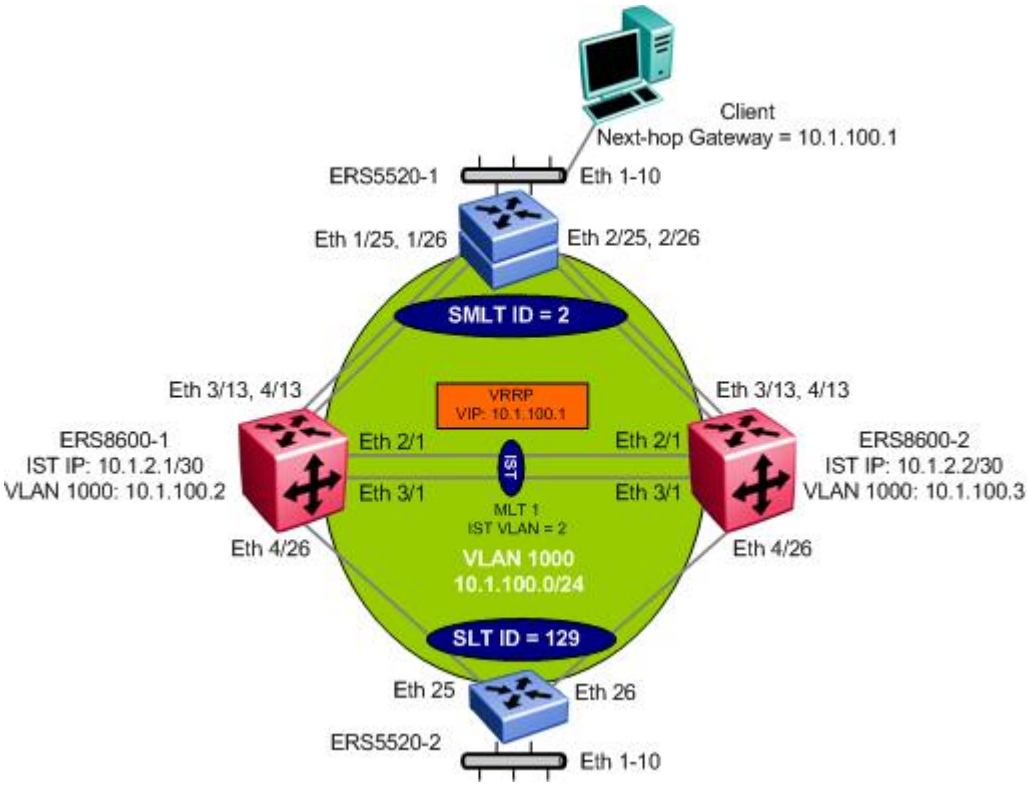

Figure 3: ERS8600 RSMLT Edge

If a redundant layer 3 triangle edge is required via a layer 2 access switch, this can be accomplished using either VRRP with backup-master enabled or RSMLT Edge. Either option will work. However, there is only a maximum of 255 VRRP instances available on the ERS8600. If there is concern about running out of VRRP instances, RSMLT Edge can be deployed.

For this configuration example, we will enable RSMLT Edge on VLAN 1000 on the ERS8600 Switch Cluster. The users connected to either ERS5520-1 or ERS5520-2 can use the IP address of either ERS8600 peer switch as the default gateway. For this example, ERS8600-1 will be used as the default gateway while ERS8600-2 will forward traffic on behalf of its peer.

In reference to the diagram above, we will configure the following:

- Overall, this configuration example will cover the configuration steps required for ERS8600-1 and ERS8600-2 assuming we take the same base setup as used in Section 2.1.1
- OSPF will be used as the IGP on VLAN 1000
- We will set the RSMLT holdup timer to infinity (value of 9999) as required for RSMLT Edge

The hold-down timer should be configured to be at least 1.5 times greater than the routing protocol convergence time, thus allowing RIP, OSPF or BGP enough time to build up the routing table of the recovering router before L3 forwarding for its peer router's MAC address is activated again. For example, if the default routing timers are used, the hold-down timer could be set for 60 seconds for OSPF while for RIP, 180 second could be used. The default hold-down timer is set for 60 seconds and since we

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are using OSPF in this example, we do not have to change this setting.

The default RSMLT hold-up timer is 180 seconds, which is designed for interconnecting to Layer 3 switches. For RSMLT Edge, the hold-up timer should be set to infinity (9999), which allows the core nodes in the Switch Cluster to forward traffic indefinitely on behalf of their peers similar to the VRRP backup-master function.

2.3.1 Configuration – ERS8600 Switch Cluster using RSMLT Edge

For this configuration example, ERS8600-1 is configured using the NNCLI command interface while ERS8600-2 is configured using the Passport command interface.

2.3.1.1 Add IP address to VLAN 1000

ERS8600-1: Step 1 – Add IP address to VLAN 1000
ERS8600-1:5(config)#***interface vlan 1000***
ERS8600-1:5(config-if)#***ip address 10.1.100.1 255.255.255.0***
ERS8600-2: Step 1 – Add IP address to VLAN 1000
ERS8600-2:5# ***config vlan 1000 ip create 10.1.100.2/24***

2.3.1.2 Enable OSPF

VLAN 1000 will be configured with OSPF passive interface on the SMLT Switch cluster.

ERS8600-1: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS8600-1:5(config-if)#***ip ospf network passive***
ERS8600-1:5(config-if)#***ip ospf enable***
ERS8600-1:5(config-if)#***exit***
ERS8600-2: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS8600-2:5# ***config vlan 1000 ip ospf interface-type passive***
ERS8600-2:5# ***config vlan 1000 ip ospf enable***
ERS8600-1: Step 2 – Enable OSPF globally
ERS8600-1:5(config)#***router ospf enable***
ERS8600-2: Step 2 – Enable OSPF globally
ERS8600-2:5# ***config ip ospf enable***

2.3.1.3 Enable RSMLT Edge

VLAN 1000 will be configured with OSPF passive interface on the SMLT Switch cluster.

ERS8600-1: Step 1 – Enable RSMLT

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```
ERS8600-1:5(config)#interface vlan 1000
ERS8600-1:5(config-if)#ip rsmlt
```

ERS8600-2: Step 1 – Enable RSMLT

```
ERS8600-2:5# config vlan 1000 ip rsmlt enable
```

ERS8600-1: Step 2 – Set the RSMLT hold-up timer to infinity

```
ERS8600-1:5(config-if)#ip rsmlt holdup-timer 9999
ERS8600-1:5(config-if)#exit
```

ERS8600-2: Step 2 – Set the RSMLT hold-up timer to infinity

```
ERS8600-2:5# config vlan 1000 ip rsmlt holdup-timer 9999
```

ERS8600-1: Step 3 – Enable RSMLT-edge support

```
ERS8600-1:5(config)#ip rsmlt edge-support
```

ERS8600-2: Step 3 – Enable RSMLT-edge support

```
ERS8600-2:5# config ip rsmlt rsmlt-edge-support enable
```

2.3.1.4 DHCP Option

Please see section 2.2.1.4.

2.3.2 Verify RSMLT Edge Operation

2.3.2.1 RSMLT Edge Operations

Step 1 – Verify that the RSMLT instance is configured correctly and is functioning by issuing the following command:

```
NNCLI: show ip rsmlt
PPCLI: show ip rsmlt info
```

Result:

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```
================================================================================
                          Ip Rsmlt Local Info
================================================================================

VID   IP              MAC                ADMIN   OPER  HDTMR  HUTMR
--------------------------------------------------------------------------------
1000  10.1.100.1      00:01:81:28:86:1c  Enable  Up    60     infinity

VID   SMLT ID                  SLT ID
--------------------------------------------------------------------------------
1000                           129


================================================================================
                          Ip Rsmlt Peer Info
================================================================================

VID   IP              MAC                ADMIN   OPER  HDTMR  HUTMR

--------------------------------------------------------------------------------
1000  10.1.100.2      00:e0:7b:bc:22:02  Enable  Up    60     infinity

VID   HDT REMAIN  HUT REMAIN  SMLT ID                  SLT ID

--------------------------------------------------------------------------------
1000  60          infinity                              129
```

Step 2 – Verify that the RSMLT-edge is enabled.

NNCLI: ***show ip rsmlt edge-support***

PPCLI: ***config ip rsmlt info***

Result:

```
RSMLT Peer Info:
        rsmlt-peer-forwarding : enable
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
ADMIN	Verify that the RSMLT Admin is ***Enabled*** on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
OPER	Verify that the RSMLT operations is ***up*** on both ERS8600-1 and ERS8600-2.
HUTMR	Verify that the RSMLT holdup timer is set to ***infinity*** on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
SMLT ID	Verify the SLT ID is showing ***129***.
Ip Rsmlt Peer Info	Verify the RSMLT Peer is showing: • ERS8600-1: VLAN ***1000***, SLT ***129*** , IP ***10.1.100.2*** and the corresponding MAC of RSMLT cluster peer • ERS8600-2: VLAN ***1000*** and SLT ***129***, IP ***10.1.100.1*** and the corresponding MAC of RSMLT cluster peer
rsmlt-peer-forwarding	Verify that RSMLT-edge support is enabled; if not, enable RSMLT-edge.

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2.4 Configuration – ERS8600 Layer 3 Routed SMLT Triangle Switch Cluster Configuration

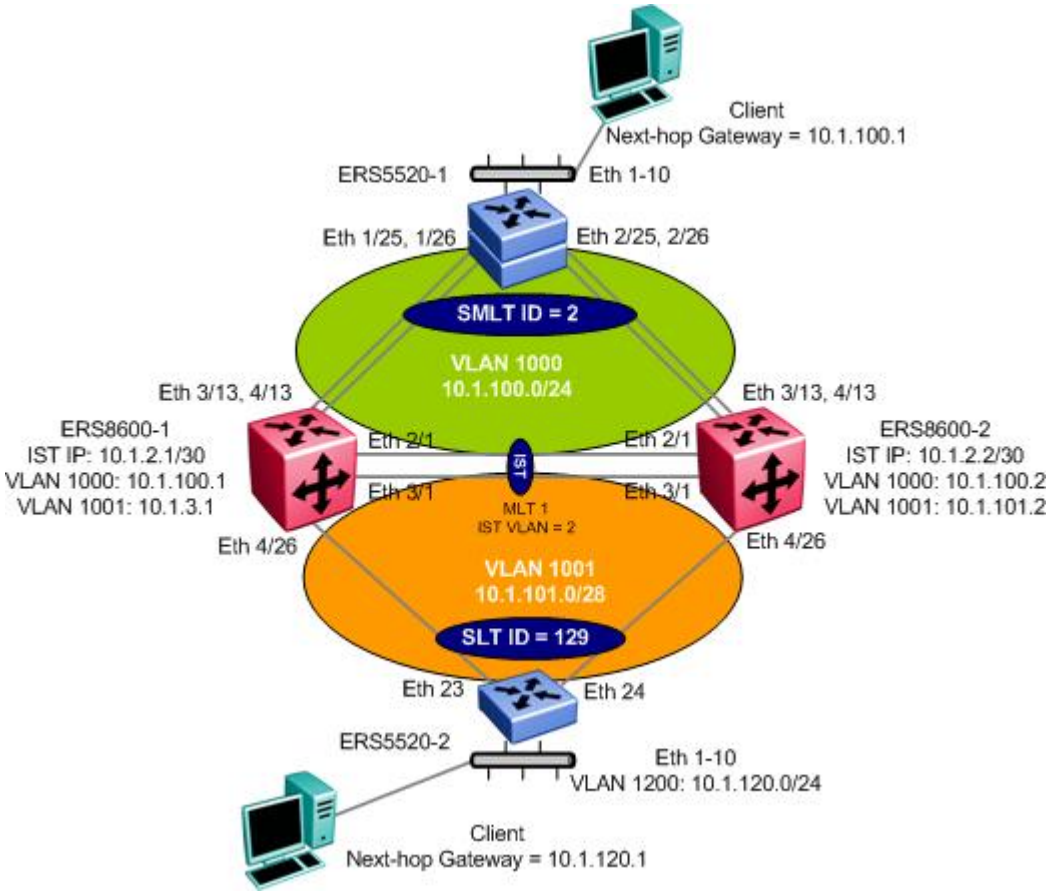

Figure 4: ERS8600 RSMLT

If the access switch supports L3, RSMLT can be enabled. For this example, we will configure the SMLT switch cluster with the following assuming ERS5520-2 is enabled for Layer 3:

- SMLT Cluster
  - Base SLT configuration is based on configuration from section 2.1.1 in regards to SLT configuration, CP Limit, Ext-CP Limit, SLPP, and VLACP
  - Add VLAN 1001 with IP subnet 10.1.101.0/24 and tagged port member 4/26; add IP address 10.1.101.1 to ERS8600-1 and 10.1.101.2 to ERS8600-2
  - Enable RSMLT on port 4/26
- Access Switch – ERS5520-2
  - Add VLAN 1001 with IP address 10.1.101.3/24 and MLT tagged trunk members 23 and 24
  - Add access VLAN 1200 with IP address 10.1.120.1/24 and user port members 1 to 10
  - Enable OSPF on both VLAN 1001 and 1200

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2.4.1 Configuration – ERS8600 Switch Cluster using RSMLT

For this configuration example, ERS8600-1 is configured using the NNCLI command interface while ERS8600-2 is configured using the Passport command interface.

2.4.1.1 Create VLAN 1001

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 1001 to be used at a Layer 3 level to ERS5520-2

ERS8600-1: Step 1 – Create VLAN 1001
ERS8600-1:5(config)#***vlan create 1001 name 5520-2 type port 1***
ERS8600-2: Step 1 – Create VLAN 1001
ERS8600-2:5# ***config vlan 1001 create byport 1 name 5520-2***
ERS8600-1: Step 2– Remove port 4/26 from VLAN 1000 and add it to VLAN 1001
ERS8600-1:5(config)#***vlan members remove 1000 4/26*** ERS8600-1:5(config)#***vlan members add 1001 4/26***
ERS8600-2: Step 2 – Remove port 4/26 from VLAN 1000 and add it to VLAN 1001
ERS8600-2:5# ***config vlan 1000 port remove 4/26*** ERS8600-2:6# ***config vlan 1001 port add 4/26***

2.4.1.2 Change fdb aging timer for VLAN 1001

ERS8600-1: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS8600-1:5(config)#***vlan mac-address-entry 1001 aging-time 21601***
ERS8600-2: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS8600-2:5# ***config vlan 1001 fdb-entry aging-time 21601***

2.4.1.3 Add IP address to VLAN 1001

ERS8600-1: Step 1 – Add IP address to VLAN 1001
ERS8600-1:5(config)#***interface vlan 1001*** ERS8600-1:5(config-if)#***ip address 10.1.101.1 255.255.255.240***
ERS8600-2: Step 1 – Add IP address to VLAN 1001
ERS8600-2:5# ***config vlan 1001 ip create 10.1.101.2/28***

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2.4.1.4 Enable OSPF

VLAN 1001 will be configured with OSPF on the SMLT Switch cluster.

ERS8600-1: Step 1 – Enable OSPF to VLAN 1001
ERS8600-1:5(config)#***interface vlan 1001***
ERS8600-1:5(config-if)#***ip ospf enable***
ERS8600-1:5(config-if)#***exit***
ERS8600-2: Step 1 – Enable OSPF to VLAN 1001
ERS8600-2:5# ***config vlan 1001 ip ospf enable***
ERS8600-1: Step 2 – Enable OSPF globally
ERS8600-1:5(config)#***router ospf enable***
ERS8600-2: Step 2 – Enable OSPF globally
ERS8600-2:5# ***config ip ospf enable***

2.4.1.5 Enable RSMLT

VLAN 1001 with RSMLT using default RSMLT timers.

ERS8600-1: Step 1 – Enable RSMLT
ERS8600-1:5(config)#***interface vlan 1001***
ERS8600-1:5(config-if)#***ip rsmlt***
ERS8600-1:5(config-if)#***exit***
ERS8600-2: Step 1 – Enable RSMLT
ERS8600-2:5# ***config vlan 1001 ip rsmlt enable***

2.4.2 Configuration - Edge Switch

2.4.2.1 Create VLANs 1001 and 1200 and Delete VLAN 1000

Assuming we are using the configuration from section 2.1.2, perform the following steps:

ERS5520-2: Step 1 – Create VLAN 1001 and 1200
5520-2(config)#***vlan create 1001 name rsmlt_cluster type port***
5520-2(config)#***vlan create 1200 name access type port***
5520-2(config)#***vlan delete 1000***
5520-2(config)# ***vlan members add 1001 23,24***
5520-2(config)# ***vlan members add 1200 2-10***

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2.4.2.2 Add IP addresses

ERS5520-2: Step 1 – Add IP address to VLAN 1001

```
5520-2 (config)# interface vlan 1001
5520-2 (config-if)# ip address 10.1.101.3 255.255.255.240
5520-2 (config-if)# exit
```

ERS5520-2 Step 2 – Add IP address to VLAN 1200

```
5520-2(config)#interface vlan 1200
5520-2(config-if)#ip address 10.1.120.1 255.255.255.0
5520-2(config-if)#exit
```

2.4.2.3 Enable OSPF

Enable OSPF on VLANs 3 and 1001. VLAN 1001 will be configured with OSPF passive interface.

ERS5520-2: Step 1 – Enable IP Routing

```
5520-2(config)#ip routing
```

ERS5520-1: Step 2 – Enable OSPF to VLAN 1200 with passive interface

```
5520-2(config)# interface vlan 1200
5520-2(config-if)#ip ospf network passive
5520-2(config-if)#ip ospf enable
5520-2 (config-if)# exit
```

ERS5520-2: Step 3 – Enable OSPF to VLAN 1001

```
5520-2(config)# interface vlan 1001
5520-2(config-if)#ip ospf enable
5520-2(config-if)# exit
```

ERS5520-2: Step 4 – Enable OSPF globally

```
5520-2(config)#router ospf enable
```

ERS5520-2: Step 5 – Enable OSPF for network address belonging to VLAN 3 and 1001

```
5520-2(config)#router ospf
5520-2(config-router)#network 10.1.101.3
5520-2(config-router)#network 10.1.120.1
5520-2(config-router)#exit
```

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2.4.2.4 DHCP Option

If you wish to enable DHCP relay for VLAN 1200, please enter the following command assuming the DHCP server IP address is 172.30.30.20. By default, DHCP is enabled on all VLANs when you add an IP address.

ERS5520-2: Step 1 – Enable reply agent
5520-2(config)# ***ip dhcp-relay fwd-path 10.1.120.1 172.30.30.20 mode dhcp***

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2.4.3 Verify RSMLT Operation

2.4.3.1 RSMLT Operations

Please note that only the output pertaining to VID 1001 is shown below.

Step 1 – Verify that the RSMLT instance is configured correctly and is functioning by issuing the following command:

```
ERS8600-1:5# show ip rsmlt info
```

Result:

```
================================================================================
                          Ip Rsmlt Local Info
================================================================================

VID   IP              MAC               ADMIN   OPER  HDTMR  HUTMR
--------------------------------------------------------------------------------
1001  10.1.101.1     00:01:81:28:86:1d  Enable  Up    60     180

VID   SMLT ID                  SLT ID
--------------------------------------------------------------------------------
1001                             129

================================================================================
                          Ip Rsmlt Peer Info
================================================================================

VID   IP              MAC               ADMIN   OPER  HDTMR  HUTMR
--------------------------------------------------------------------------------
1001  10.1.101.2     00:e0:7b:bc:22:03  Enable  Up    60     180

VID   HDT REMAIN  HUT REMAIN  SMLT ID                  SLT ID
--------------------------------------------------------------------------------
1001  60          180                                   129
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
ADMIN	Verify that the RSMLT Admin is ***Enabled*** on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
OPER	Verify that the RSMLT operations is ***Up*** on both ERS8600-1 and ERS8600-2.
HDTMR HUTMR	Verify that the RSMLT holdup and holddown timer is set to ***60*** and ***180*** respectively on both ERS8600-1 and ERS8600-2. If not, there is a configuration error.
SMLT ID	Verify the SLT ID is showing ***129***.
Ip Rsmlt Peer Info	Verify the RSMLT Peer is showing: • ERS8600-1: VLAN ***1001***, SLT ***129*** , IP ***10.1.101.2*** and the corresponding MAC of RSMLT cluster peer • ERS8600-2: VLAN ***1001*** and SLT ***129***, IP ***10.1.101.1*** and the corresponding MAC of RSMLT cluster peer

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2.5 Configuration - ERS5x00 Layer 2 SMLT Triangle Switch Cluster Configuration

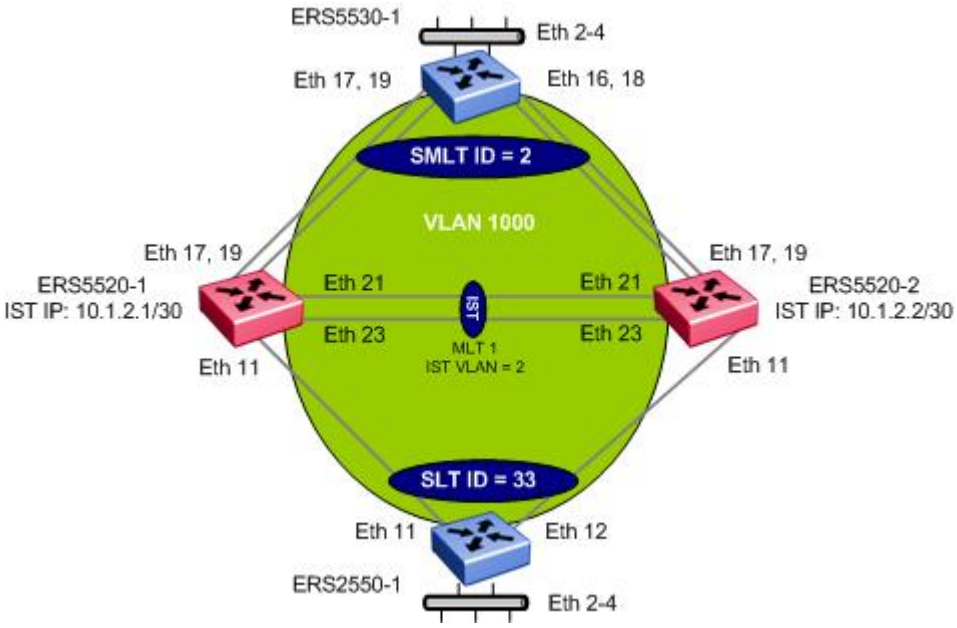

Figure 5: ERS5x00 Layer 2 Triangle SMLT Configuration

For this example, we will configure the SMLT switch cluster with the following:

- IST
  - IST VLAN 2 using MLT ID = 1
  - Tagged port members 21 and 23
  - All IST ports are Gigabit Ethernet ports using default setting of Autonegotiation enable
  - VLACP using the recommend reserved multicast MAC (01:80:C2:00:00:0F) and long timers
- SMLT and SLT
  - SMLT VLAN 1000
  - MLT and SMLT ID of 2 for ERS5530-1 with tagged port member 17 and 19
  - SLT ID of 33 for ERS2520-1 with tagged port member 11
  - Enable SLPP
  - All SMLT and SLTports are 10/100 Mbps Ethernet ports using default setting of Autonegotiation enable
  - Enable VLACP with recommended reserved multicast MAC address, set VLACP timeout scale to 5, and use default short timers of 500ms; this is for the ERS5530-1 switch only as the ERS2550 does not support VLACP in its current release.
  - Enable “Discard Untagged Frames” on all SMLT/SLT port members
  - Disable STP on all SMLT ports
- On both ERS5530-1 and ERS2550-1, the following will be configured:

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- Broadcast and multicast rate limiting with a threshold to 10%.
- Spanning Tree Fast Start on all edge ports
- BPDU filtering on all edge ports
- VLAN Tagging on SMLT access trunk ports

Presently, SMLT is supported in a standalone or stacked configuration. Square or full mesh topology is supported beween ERS 5x00 to ERS 5x00 SMLT clusters or ERS 5x00 to ERS 8600 SMLT clusters. Please refer to document number NN48500-555 for more details.

You must have an Advanced Routing License to enable SMLT on the ERS5x00. Please ensure that you have obtained and installed the license prior to configuring SMLT on the ERS5x00 switch.

It is recommended to use the lowest MLT number for the IST which will be 1. In regards to the VLAN ID, it makes no difference what VLAN ID to use.

It is recommended to start the SLT numbering at 33 up to 512 even though you can use any number from 1 to 512. This is to avoid taking away a valid MLT ID that can be used for either a MLT or SMLT instance.

In a stacked configuration, when configuring a DMLT as an IST or SMLT, it is recommended that at least one port member is on the base. This help traffic recover faster in case of a base unit failure.

2.5.1 Configuration – ERS5x00 Layer 2 Switch Cluster

2.5.1.1 Create VLANs and enable discard untagged frames

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 1000 to be used at a Layer 2 level to ERS5530-1 and ERS2550-1 for connecting users.

ERS5520-1: Step 1 – VLANs 2 and 1000

```
5520-1(config)#vlan create 2 name ist type port
5520-1(config)#vlan create 1000 name Services type port
5520-1(config)#vlan ports 11,17,19,21,23 tagging tagAll filter-untagged-frame enable
5520-1(config)#vlan members remove 1 11,17,19,21,23
5520-1(config)#vlan members 2 21,23
5520-1(config)#vlan members 1000 11,17,19,21,23
```

ERS5520-2: Step 1 – Create VLAN 2 and 1000

```
5520-2(config)#vlan create 2 name ist type port
5520-2(config)#vlan create 1000 name Services type port
5520-2(config)#vlan ports 11,17,19,21,23 tagging tagAll filter-untagged-
```

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```
frame enable
5520-2(config)#vlan members remove 1 11,17,19,21,23
5520-2(config)#vlan members 2 21,23
5520-1(config)#vlan members 1000 11,17,19,21,23
```

The above steps assume that the ERS5x00 switch is using the default VLAN configuration mode of *strict*. In this mode, you must first remove port members from the default VLAN 1 prior to adding these port members to a new VLAN. The VLAN configuration mode is set by using the command *vlan configcontrol <automatic|autopvid|flexible|strict>*

2.5.1.2 Enable VLACP globally and use the Reserved MAC

It is recommended to use the reserved multicast MAC address of 01:80:c2:00:00:0f for the VLACP MAC address. Via the ERS5x00, enter the hex value *180.c200.f.*

ERS5520-1: Step 1 – Configure the VLACP MAC and enable VLACP

```
5520-1(config)#vlacp macaddress 180.c200.f
5520-1(config)#vlacp enable
```

ERS5520-2: Step 1 – Configure the VLACP MAC and enable VLACP

```
5520-2(config)#vlacp macaddress 180.c200.f
5520-2(config)#vlacp enable
```

2.5.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 21 and 23. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members via the MLT configuration. VLACP will be enabled on the IST trunk.

ERS5520-1: Step 1 – Create MLT 1 for IST

```
5520-1(config)# mlt 1 name ist enable member 21,23 learning disable
```

ERS5520-2: Step 1 – Create MLT 1 for IST

```
5520-2(config)# mlt 1 name ist enable member 21,23 learning disable
```

ERS5520-1: Step 2 – Enable IP Routing Globally and add IP address to IST

```
5520-1(config)#ip routing
5520-1(config)#interface vlan 2
5520-1(config-if)#ip address 10.1.2.1 255.255.255.252
5520-1(config-if)#exit
```

ERS5520-2: Step 2 – Enable IP Routing Globally and add IP address to IST

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```
5520-2(config)#ip routing
5520-2(config)#interface vlan 2
5520-2(config-if)#ip address 10.1.2.2 255.255.255.252
5520-2(config-if)#exit
```

ERS5520-1: Step 3 – Create IST

```
5520-1(config)#interface mlt 1
5520-1(config-if)#ist enable peer-ip 10.1.2.2 vlan 2
5520-1(config-if)#exit
```

ERS5520-2: Step 3 – Create IST

```
5520-2(config)#interface mlt 1
5520-2(config-if)#ist enable peer-ip 10.1.2.1 vlan 2
5520-2(config-if)#exit
```

ERS5520-1: Step 4 – Enable VLACP

```
5520-1(config)#interface FastEthernet ALL
5520-1(config-if)#vlacp slow-periodic-time 10000
5520-1(config-if)#vlacp port 21,23 enable
5520-1(config-if)#exit
```

ERS5520-2: Step 4 – Enable VLACP

```
5520-2(config)#interface FastEthernet ALL
5520-2(config-if)#vlacp slow-periodic-time 10000
5520-2(config-if)#vlacp port 21,23 enable
5520-2(config-if)#exit
```

2.5.1.4 SMLT-2 to ERS5530-1

ERS5520-1: Step 1 – Create MLT 2 for SMLT 2

```
5520-1(config)#mlt 2 name 5530-1 enable member 17,19 learning disable
```

ERS5520-2: Step 1 – Create MLT 2 for SMLT 2

```
5520-2(config)#mlt 2 name 5530-1 enable member 17,19 learning disable
```

ERS5520-1: Step 2 – Create SMLT 2

```
5520-1(config)#interface mlt 2
5520-1(config-if)#smlt 2
5520-1(config-if)#exit
```

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ERS5520-2: Step 2 – Create SMLT 2

```
5520-2(config)#interface mlt 2
5520-2(config-if)#smlt 2
5520-2(config-if)#exit
```

2.5.1.5 SLT-33 to ERS2550-2

ERS5520-1: Step 1 – Create SLT-33

```
5520-1(config)#interface FastEthernet ALL
5520-1(config-if)#smlt port 11 33
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Create SLT-33

```
5520-2(config)#interface FastEthernet ALL
5520-2(config-if)#smlt port 11 33
5520-2(config-if)#exit
```

2.5.1.6 SLPP

SLPP will be enabled globally and only on the SMLT access ports 17 and 19 and SLT access port 11 for VLAN 1000. On the SMLT primary switch we will set the SLPP packet-rx-threshold to 5, while on the SMLT secondary switch we will set the SLPP packet-rx-threshold to 50. For this example, we will pick ERS5520-1 as the primary switch.

The recommended SLPP receive threshold value for the primary switch is 5 and 50 for the secondary switch in an SMLT cluster.

SLPP should only be enabled on the SMLT access ports and not on the IST port members.

ERS5520-1: Step 1 – Enable SLPP

```
5520-1(config)#slpp vid 1000
5520-1(config)#slpp enable
5520-1(config)#interface fastEthernet 11,17,19
5520-1(config-if)#slpp packet-rx-threshold 5
5520-1(config-if)# slpp enable
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Enable SLPP

```
5520-2(config)#slpp vid 1000
5520-2(config)#slpp enable
5520-2(config)#interface fastEthernet 11,17,19
```

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```
5520-2(config-if)#slpp packet-rx-threshold 50
5520-2(config-if)# slpp enable
5520-2(config-if)#exit
```

2.5.1.7 VLACP

As the access switches supports VLACP, we will enable this feature and use the short timeout option. By default the ERS5x00 uses a default short timeout of 500ms. In addition, we will use the recommended VLACP reserved MAC address and set the VLACP timeout scale to 5

Please note, software release 4.2 or higher is required on the ERS 2500 to support VLACP

ERS5520-1: Step 1 – Enable VLACP

```
5520-1(config)#interface FastEthernet 11,17,19
5520-1(config-if)#vlacp timeout short
5520-1(config-if)#vlacp timeout-scale 5
5520-1(config-if)#vlacp enable
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Enable VLACP

```
5520-2(config)#interface FastEthernet 11,17,19
5520-2(config-if)#vlacp timeout short
5520-2(config-if)#vlacp timeout-scale 5
5520-2(config-if)#vlacp enable
5520-2(config-if)#exit
```

Do not enable VLACP on a port level until the VLACP MAC address has been changed.

2.5.2 Configuration - Edge Switch

2.5.2.1 Create VLAN

ERS5530-1: Step 1 – VLAN 2

```
5530-1(config)#vlan create 2 name core_1 type port
5530-1(config)#vlan members remove 1 2-4,16-19
5530-1(config)#vlan ports 1/25,2/25 tagging tagall
5530-1(config)#vlan members 2 2-4,16-18
```

ERS2550-1: Step 1 – Create VLAN 2

```
2550-1(config)#vlan create 2 name core_1 type port
```

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```
2550-1(config)#vlan members remove 1 2-4,11-12
2550-1(config)#vlan ports 11-12 tagging tagall
2550-1(config)#vlan members 2 2-4,11-12
```

2.5.2.2 Create MLT

ERS5530-1: Step 1 – Create MLT 1

```
5530-1(config)# mlt 1 name core_1 member 16-19 learning disable
5530-1(config)# mlt 1 enable
```

ERS2550-1: Step 1 – Create MLT 1

```
2550-1(config)#mlt 1 name core_1 member 11-12 learning disable
2550-1(config)#vlan mlt 1 enable
```

2.5.2.3 VLACP

ERS5530-1: Step 1 – Enable VLACP

```
5530-1(config)#vlacp macaddress 180.c200.f
5530-1(config)#vlacp enable
5530-1(config)#interface fastEthernet 16-19
5530-1(config-if)#vlacp timeout short
5530-1(config-if)#vlacp timeout-scale 5
5530-1(config-if)#vlacp enable
5530-1(config-if)#exit
```

ERS2550-1: Step 1 – Enable VLACP

```
2550-1(config)#vlacp macaddress 180.c200.f
2550-1(config)#vlacp enable
2550-1(config)#interface fastEthernet 11,12
2550-1(config-if)#vlacp timeout short
2550-1(config-if)#vlacp timeout-scale 5
2550-1(config-if)#vlacp enable
```

Please note that the ERS2500 requires software level 4.2 or higher to support VLACP.

2.5.2.4 Enable Spanning Tree Fast Start and BPDU filtering on all access ports

ERS5530-1: Step 1 – Enable STP Fast Start and BPDU filtering

```
5530-1(config)#interface fastEthernet 2-4
5530-1(config-if)#spanning-tree learning fast
```

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```
5530-1(config-if)#spanning-tree bpdu-filtering timeout 0
5530-1(config-if)#spanning-tree bpdu-filtering enable
5530-1(config-if)#exit
```

ERS2550-1: Step 1 – Enable STP Fast Start and BPDU filtering

```
2550-1(config)#interface fastEthernet 2-4
2550-1(config-if)#spanning-tree learning fast
2550-1(config-if)#spanning-tree bpdu-filtering timeout 0
2550-1(config-if)#spanning-tree bpdu-filtering enable
2550-1(config-if)#exit
```

Please note that the ERS2500 requires software level 4.2 or higher to support BPDU filtering.

2.5.2.5 Enable Rate Limiting

ERS5530-1: Step 1 – Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic

```
5530-1(config)#interface fastEthernet all
5530-1(config-if)#rate-limit port 2-4 both 10
5530-1(config-if)#exit
```

ERS2550-1: Step 1 – Enable Rate Limiting to maximum value of 262143 pps for both broadcast and multicast traffic

```
2550-1(config)#interface fastEthernet 2-4
2550-1(config-if)#rate-limit both 262143
2550-1(config-if)#exit
```

Please note that the rate limit parameter on the ERS5x00 is expressed as percentage of total traffic whereas for the ERS2500 it is express in Packets Per Second (pps). The values used in this example are just a suggestion and may vary depending on your needs.

2.5.2.6 Discard Untagged Frames

ERS5530-1: Step 1 – Enable Discard Untagged Frames

```
5530-1(config)#vlan ports 16-18 filter-untagged-frame enable
```

ERS5520-2: Step 1 – Enable Discard Untagged Frames

```
2550-1(config)#vlan ports 11-12 filter-untagged-frame enable
```

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2.5.3 Verify Operations

2.5.3.1 Verify MLT Configuration

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
5520-1#show mlt
```

Result:

```
        Id Name            Members                Bpdu   Mode          Status  Type
        -- --------------- ---------------------- ------ ------------- ------- -----
        1  ist             21,23                  All    Basic         Enabled Trunk
        2  5530-1          17,19                  All    Basic         Enabled Trunk
```

For each switch in the SMLT switch cluster, verify the following information:

Option	Verify
Members	Verify that the VLAN port members assigned to the IST and SMLT MLT are correct: • MLT 1: Port members ***21*** and ***23*** • MLT 2: Port members ***17*** and ***19***
Statues	Displays as ***Enabled***
Type	Displays as ***Trunk*** for MLT 1 and MLT 2

2.5.3.2 Virtual LANs (VLANs):

Step 1 – Verify the VLAN port assignments:

```
5520-1#show vlan
```

Result:

```
Id  Name                 Type     Protocol         User PID Active IVL/SVL Mgmt
--- -------------------- -------- ---------------- -------- ------ ------- ----
1   VLAN #1              Port     None             0x0000   Yes    IVL     No
        Port Members: 2-10,12-16,18,20,22,24
2    ist                  Port     None             0x0000   Yes    IVL     No
        Port Members: 21,23
1000 vlan2                Port     None             0x0000   Yes    IVL     Yes
        Port Members: 11,17,19,21,23
```

Step 2 – Verify the VLAN port assignments and 802.1Q tagging settings by issuing the following commands:

```
5520-1#show vlan interface info 11,17,19,21,23
```

Result:

```
      Filter     Filter
     Untagged Unregistered
Port  Frames     Frames    PVID PRI    Tagging     Name
```

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```
---- -------- ------------ ---- --- ------------ ----------------
11   Yes      Yes          1    0   TagAll       Port 11
17   Yes      Yes          1    0   TagAll       Port 17
19   Yes      Yes          1    0   TagAll       Port 19
21   Yes      Yes          1    0   TagAll       Port 21
23   Yes      Yes          1    0   TagAll       Port 23
```

Step 3 – Verify the VLAN port assignments and 802.1Q tagging settings by issuing the following commands:

```
5520-1#show vlan interface vids 11,17,19,21,23
```

Result:

```
Port VLAN VLAN Name          VLAN VLAN Name          VLAN VLAN Name
---- ---- ----------------  ---- ----------------  ---- ----------------
11   1000 vlan2
---- ---- ----------------  ---- ----------------  ---- ----------------
17   1000 vlan2
---- ---- ----------------  ---- ----------------  ---- ----------------
19   1000 vlan2
---- ---- ----------------  ---- ----------------  ---- ----------------
21   1000 vlan2             2    IST
---- ---- ----------------  ---- ----------------  ---- ----------------
23   1000 vlan2             2    IST
---- ---- ----------------  ---- ----------------  ---- ----------------
```

On each ERS5520 in the switch cluster verify the following information:

Option	Verify
VLAN Port Members	VLAN Port Members: • VLAN 2: Port members ***21*** and ***23.*** • VLAN 1000: Port members ***11, 17, 19, 21,*** and ***23***
TAGGING	Displays as ***enable*** for all IST and SMLT ports. The value ***UntagAll*** indicates that the port is in an untagged mode. Filter Untagged Frames displays as ***Yes***.
VIDS	Displays as ***1000*** for all SMLT ports and as ***2*** for all IST ports.

2.5.3.3 Inter Switch Trunk (IST):

Step 1 – Verify that the IST is configured correctly and is functioning by issuing the following command:

```
5520-1#show ist
```

Result:

```
        ================================================================
        MLT ID Enabled Running Master Peer IP Address Vlan ID
        ------ ------- ------- ------ --------------- -------
        1      YES     YES     NO     10.1.2.2        2
```

On each ERS5520 in the switch cluster verify the following information:

Option	Verify

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MLT	Displays as ***1.*** The value ***1*** indicates that the IST is using MLT 1.
Running	Displays as ***YES***. The value ***YES*** indicates that the IST is operational.
Master	Verify that the one of the peer is Master: • 5520-1: ***NO*** • 5520- 2: ***YES***
Peer IP	Verify that the IST peer IP address is correct: • ERS5520-1: Will display the peer IP ***10.1.2.2*** • ERS5520-2: Will display the peer IP ***10.1.2.1***
Vlan ID	Displays the correct IST VLAN ID of ***2***.

2.5.3.4 Split MultiLink Trunking (SMLT):

Step 1 – Verify that SMLT is functioning correctly by issuing the following command:

```
5520-1#show smlt mlt 2
```

Result:

```
================================================================
                                        MLT SMLT Info
================================================================
MLT    SMLT      ADMIN     CURRENT
ID     ID        TYPE      TYPE
----------------------------------------------------------------
2        2         smlt      smlt
```

On each ERS5520 in the switch cluster verify the following information:

Option	Verify
MLT ID	Verify the SMLT ID ***2*** is assigned to MLT 2 is correct.
ADMIN TYPE	Displays as ***smlt***. The value ***norm*** indicates that the SMLT is not configured correctly.
CURRENT TYPE	Displays as ***smlt***. The value ***norm*** indicates that the SMLT instance is not operational. The value ***SMLT*** indicates that this SMLT instance is up and operational.

2.5.3.5 SMLT Single Link Trunking (SLT):

Step 1 – Verify that SMLT is functioning correctly by issuing the following command:

```
5520-1#show smlt fastethernet 33
```

Result:

```
========================================================
                                        SLT Info
========================================================
```

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```
PORT   SMLT      ADMIN     CURRENT
NUM    ID        TYPE      TYPE
-------------------------------------------------------
11       33       slt      slt
```

On each ERS5520 in the switch cluster verify the following information:

Option	Verify
Port Number	Verify the port number for SLT 33 is port ***11***.
ADMIN TYPE	Displays as ***slt***. The value ***norm*** indicates that the SLT is not configured correctly.
CURRENT TYPE	Displays as ***slt***. The value ***norm*** indicates that the SLT instance is not operational. The value ***SLT*** indicates that this SLT instance is up and operational.

The command *show smlt* will display all the current IST, SMLT, and SLT settings and state.

5520-1#***show smlt***

```
================================================================================
                                          MLT SMLT Info
================================================================================
MLT    SMLT      ADMIN     CURRENT
ID     ID        TYPE      TYPE
--------------------------------------------------------------------------------
1                 ist       ist
2        2        smlt      smlt
================================================================================
                                          SLT Info
================================================================================
PORT   SMLT      ADMIN     CURRENT
NUM    ID        TYPE      TYPE
--------------------------------------------------------------------------------
11       33       slt       slt
```

2.5.3.6 Simple Loop Prevention Protocol (SLPP):

Step 1 – Verify that SLPP is globally enabled on the switch by issuing the following command:

```
5520-1#show slpp
```

Result:

```
================================================================================
                        SLPP Info
============================================================
SLPP Enabled:  True
SLPP Transmission Interval:  500
SLPP Ether Type:  0x8104
SLPP Auto Port Re-Enable Timeout:  Disabled
```

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```
SLPP Vlans:  1000
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
SLPP Enabled	Displays as ***True***. The value ***False*** indicates that SLPP is globally disabled on the switch.
vlan	Displays as ***1000*** indicating SLPP is enabled for VLAN 1000.

Step 2 – Verify the SLPP settings by issuing the following command:

```
5520-1#show interfaces fastEthernet slpp 11,17,19
```

Result:

```
        Port SLPP Enabled Pkt Rx Threshold Incoming Vlan Id Src Node Type
        ---- ------------ ---------------- ---------------- -------------
        11   True         5                0                None
        17   True         5                0                None
        19   True         5                0                None
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
PORT	Displays the port numbers as per selected.
SLPP Enabled	Displays as ***true*** for ports where SLPP is enabled. The value ***False*** indicates that SLPP is disabled for the port.
Pkt Rx Threshold	Displays as ***5*** for each SMLT/SLT port on ERS5520-1 and ***50*** for each SMLT/SLT port on ERS5520-2.
Incoming Vlan	Displays as ***0*** as long as there is no loop. If there is a loop detected by SLPP, the corresponding VLAN will be shown under this column.
Src Node Type	Displays as ***None*** as long as there is no loop. Will be displayed as Peer if there is a loop detected.

If port 11 is disabled on either ERS5520-1 or ERS5520-2 due to either switch receiving its own SLPP-PDU, a message is logged and a trap will be issued. The following is an example of log message received on ERS5520-1 upon detecting its own SLPP-PDU caused by a loop in the network.

- 5520-1#***show logging sort-reverse***

```
I    00:02:49:45                  45       Trap:  Smlt Link Down, smlt:33
I    00:02:49:45                  44       Trap:  Smlt Link Down, smlt:33
I    00:02:49:45                  43       Link Down Trap for Port: 11
I    00:02:49:45                  42       Trap:  SLPP Port Down Event, Port:
11
I    00:02:45:23                  41       #0 Session opened from serial conne
```

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Also, you view the SLPP port state by using the following command

- ERS5520-1:5#***show slpp interface 11***

```
Port SLPP Enabled Pkt Rx Threshold Incoming Vlan Id Src Node
Type
---- ------------ ---------------- ---------------- ------------
11   True         5                1000             Peer
```

2.5.3.7 Virtual Link Aggregation Control Protocol (VLACP):

Step 1 – Verify that VLACP is globally enabled by using the following command:

```
5520-1#show vlacp
```

Result:

```
================================================================
                        Vlacp Global Information
================================================================
                Multicast address :  01:80:c2:00:00:0f
                Vlacp             :  enabled
```

On each ERS5520 in the switch cluster verify the following information:

Option	Verify
Vlacp	Displays as ***enable***. The value ***disable*** indicates that VLACP is globally disabled on the switch.
Multicast address	Displays as ***01:80:c2:00:00:0f***. This indicates at the correct reserved address was entered correctly.

Step 2 – Verify the IST and SMLT per port VLACP settings by issuing the following command:

```
5520-1#show vlacp interface 11,17,19,21,23
```

Result:

```
================================================================================
                           VLACP Information
================================================================================
PORT ADMIN    OPER    HAVE    FAST  SLOW  TIMEOUT TIMEOUT ETH  MAC
     ENABLED ENABLED PARTNER TIME  TIME  TYPE    SCALE   TYPE ADDRESS
--------------------------------------------------------------------------------
0/11  true    true    yes    500   30000 short   5       8103 01:80:c2:00:00:0f
0/17  true    true    yes    500   30000 short   5       8103 01:80:c2:00:00:0f
0/19  true    true    yes    500   30000 short   5       8103 01:80:c2:00:00:0f
0/21  true    true    yes    500   10000 long    3       8103 01:80:c2:00:00:0f
0/23  true    true    yes    500   10000 long    3       8103 01:80:c2:00:00:0f
```

On each ERS5x00 in the switch cluster verify the following information:

Option	Verify
ADMIN ENABLED	Displays as ***true*** for the IST, SMLT-2 and SLT-33 ports. The value ***false*** indicates that VLACP is disabled for the port.

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OPER ENABLED	Displays as ***true*** for the IST, SMLT-2 and SLT-33 ports. The value ***false*** indicates that VLACP is not operational on the port.
TIME	Displays as ***10000*** for the IST port members. If not, please change the VLACP time value for the IST port members.
TIMEOUT TIME	Displays as ***long*** for the IST ports and ***short*** for SMLT-2 and SLT-33 ports. This value must match for each switch port in the link pair.
TIMEOUT SCALE	Display as ***5*** only for the SMLT-2 and SLT-33 port members..
MAC ADDR	The VLACP MAC address is assigned to each IST and SMLT-2: • IST ports 21 and 23: ***01:80:c2:00:00:0f*** • SMLT-2 ports 17 and 19: ***01:80:c2:00:00:0f*** • SLT-33 port 1: ***01:80:c2:00:00:0f*** The VLACP MAC address must match for each switch port in the link pair.

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2.6 Configuration – ERS5x00 Triangle Switch Cluster using VRRP with Backup Master

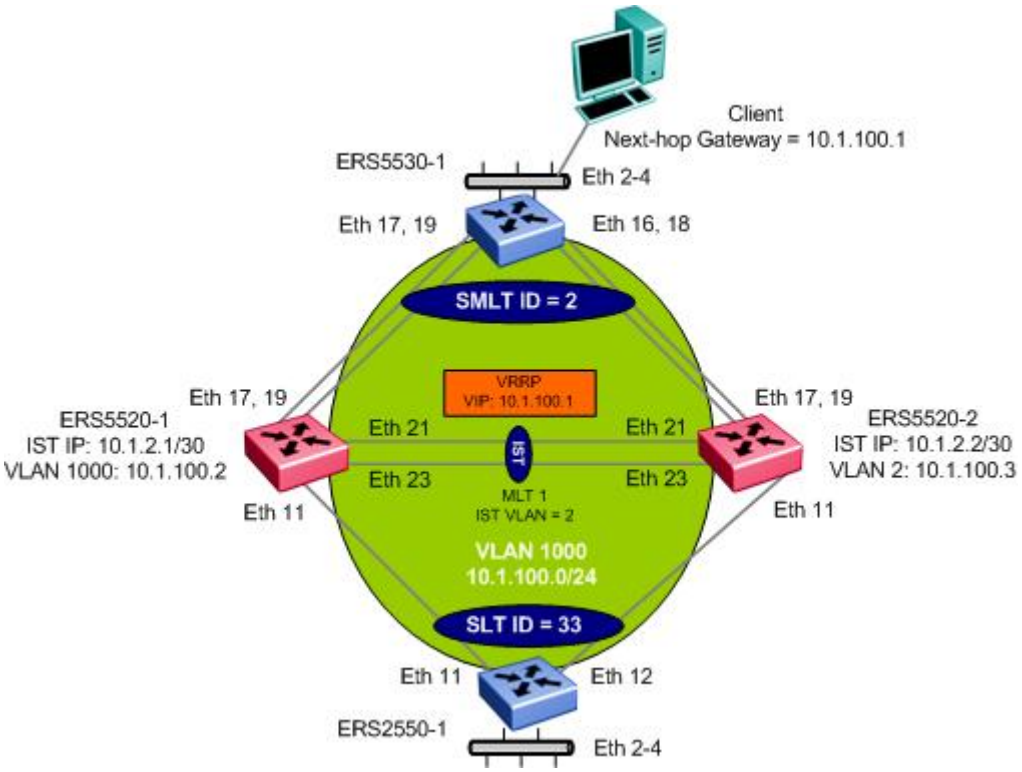

Figure 6: ERS5x000 Triangle SMLT Configuration with VRRP Backup Master

Assuming we take the same base setup as used in Section 2.5.1 but we now add a Layer 3 routing protocol with VRRP Backup Master. The configuration remains the same with the addition of enabling a routing protocol on VLAN 1000 and enabling VRRP Backup-Master.

Overall, we will use the same configuration steps as used in Section 2.5.1 and will add the following:

- Enable OSPF on VLAN 1000
  - VLAN 1000 on ERS5520-1 will be configured with IP address 10.1.100.2/24
  - VLAN 1000 on ERS5520-2 will be configured with IP address 10.1.100.3/24
  - Both ERS5520-1 and ERS5520-2 will be configured with OSPF passive interface as both switches are connected to Layer 2 access switches. This prevent OSPF messages being send to the access switches
  - Use default OSPF timers
- Enable VRRP on VLAN 2 with the following settings
  - Enable backup master
  - Set the hold down timer to 0 seconds on ERS5520-1 and ERS5520-2 – please see section 1.3.2.7
  - Set the VRRP VIP to 10.1.100.1 on both switches in the SMLT cluster
  - Set the VRRP virtual router id to 2

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- Set the VRRP priority to 200 on ERS5520-1 so that it becomes the VRRP master and use the default value of 100 on ERS-5520-2 so that it becomes the VRRP backup

Normally, the VRRP hold down timer should be set long enough such that the IGP routing protocol has time to converge and update the routing table. However, for the ERS5x00 only, due to hardware limitations, the VRRP hold-down timer should be set to zero and the critical IP interface should not be used.

In Release 5.0.x, pinging the virtual IP address from the master VRRP routing switch is not supported. Please see document NN47200-400 (Release Notes — Software Release 5.0) for more detail and other VRRP/SMLT related issues. This problem has been corrected in software release 6.0, however, pinging the VRRP IP address from local console or telnet is not supported – please see Release Notes for release 6.0.

2.6.1 Configuration – ERS5x00 Layer 3 Switch Cluster using VRRP Backup Master

2.6.1.1 Add IP address to VLAN 1000

ERS5520-1: Step 1 – Add IP address to VLAN 1000

```
5520-1(config)#interface vlan 1000
5520-1(config-if)#ip address 10.1.100.2 255.255.255.0
5520-1(config-if)#exit
```

ERS5520-2: Step 1 – Add IP address to VLAN 1000

```
5520-2(config)#interface vlan 1000
5520-2(config-if)#ip address 10.1.100.3 255.255.255.0
5520-2(config-if)#exit
```

2.6.1.2 Enable OSPF

VLAN 1000 will be configured with OSPF passive interface on the SMLT Switch cluster. As we have already enable IP routing globally when we configured the IST, we do not have to perform this step again.

ERS5520-1: Step 1 – Enable OSPF to VLAN 1000 with passive interface

```
5520-1(config)# interface vlan 1000
5520-1(config-if)#ip ospf network passive
5520-1(config-if)#ip ospf enable
5520-1(config-if)# exit
```

ERS5520-2: Step 1 – Enable OSPF to VLAN 1000 with passive interface

```
5520-2(config)# interface vlan 1000
5520-2(config-if)#ip ospf network passive
5520-2(config-if)#ip ospf enable
5520-2(config-if)# exit
```

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ERS5520-1: Step 2 – Enable OSPF globally

```
5520-1(config)#router ospf enable
```

ERS5520-2: Step 2 – Enable OSPF globally

```
5520-2(config)#router ospf enable
```

2.6.1.3 Enable VRRP

ERS5520-1: Step 1 – Enable VRRP Globally

```
5520-1(config)#router vrrp enable
```

ERS5520-2: Step 1 – Enable VRRP Globally

```
5520-2(config)#router vrrp enable
```

ERS5520-1: Step 2 – Add VIP, enable backup master, set the hold-down timer to 0, and enable VRRP to VLAN 1000. In addition, set the VRRP priority to 200.

```
5520-1(config)#interface vlan 1000
5520-1(config-if)#ip vrrp address 2 10.1.100.1
5520-1(config-if)#ip vrrp 2 backup-master enable
5520-1(config-if)#ip vrrp 2 holddown-timer 0
5520-1(config-if)#ip vrrp 2 priority 200
5520-1(config-if)#ip vrrp 2 enable
5520-1(config-if)#exit
```

ERS5520-2: Step 2 – Add VIP, enable backup master, set the hold-down timer to 0, and enable VRRP to VLAN 1000

```
5520-2(config)#interface vlan 1000
5520-2(config-if)#ip vrrp address 2 10.1.100.1
5520-2(config-if)#ip vrrp 2 backup-master enable
5520-2(config-if)#ip vrrp 2 holddown-timer 0
5520-2(config-if)#ip vrrp 2 enable
5520-2(config-if)#exit
```

2.6.1.4 DHCP Option

If you wish to enable DHCP relay for VLAN 1000, please enter the following command assuming the DHCP server IP address is 172.30.30.20. By default, DHCP is enabled on all VLANs when you add an IP address.

ERS5520-1: Step 1 – Enable reply agent

```
5520-1(config)# ip dhcp-relay fwd-path 10.1.100.2 172.30.30.20 mode dhcp
```

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ERS5520-2: Step 1 – Enable reply agent

```
5520-2(config)# ip dhcp-relay fwd-path 10.1.100.3 172.30.30.20 mode dhcp
```

2.6.2 Verify Operations

2.6.2.1 VRRP Operations

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command "show ip vrrp interface <1-4094; VLAN id> verbose vrid <1-255>:

```
5520-1#show ip vrrp interface 1000 verbose vrid 2
```

Result:

```
VLAN VR   Virtual                       Admin  Primary          Master
ID   ID   IP Address       State       State  IP Address       IP Address
---- ---  ---------------  ----------  -----  ---------------  ---------------
1000 2    10.1.100.1       Master      Up     10.1.100.2       10.1.100.2

VLAN VR        Adv       FastAdv  FastAdv   Critical    Critical
ID   ID   Pri  Interval  Enabled  Interval  IP Enabled  IP Address
---- ---  ---  --------  -------  --------  ----------  ---------------
1000 2    200  1         False    200       False       0.0.0.0

VLAN VR   BkMaster  BkMaster  Hold            Virtual            Virtual Router
ID   ID   Enabled   State     Timer  Action   MAC Address        Uptime
---- ---  --------  --------  -----  -------  -----------------  --------------
1000 2    True      Down      0      None     00:00:5e:00:01:02  0d 00:31:42

Total VRRP instances: 1
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VRID	Verify that the VRRP VID is ***2*** on both ERS5520-1 and ERS5520-2. If not, there is a configuration error.
Virtual IP Address	Verify that the VRRP IP address is ***10.1.100.1*** on both ERS5520-1 and ERS5520-2. If not, there is a configuration error.
Virtual MAC Address	The VRRP MAC on both switches in the SMLT cluster should be the same.
Admin State	Verify that the VRRP administrative state is ***Up***.
State	Verify the VRRP state: • ERS5520-1: ***Master*** • ERS5520-2: ***Back Up***
Pri	Verify that the VRRP priority is set to ***200*** on ERS5520-1 and ***100*** on ERS5520-2. If not, configure the appropriate VRRP priority.
FastAdv Enabled	Verify that the VRRP Fast Advertise option is disabled.

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Primary IP Address	Verify that VRRP master's IP address belongs to ERS5x00-1 on both switches: • ERS5520-1: ***10.1.100.2*** • ERS5520-2: ***10.1.100.2***
BkMaster Enable	Verify that backup master is set to ***True*** on both switches. If not, enable VRRP backup master.
BkMaster STATE	Verify that VRRP backup master state on both switches: • ERS5520-1: ***down*** • ERS5520-2: ***up***
Hold Timer	Verify that the hold-down timer is set to ***0***.

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2.7 Configuration – ERS1600 Layer 2 SMLT Triangle Switch Cluster Configuration

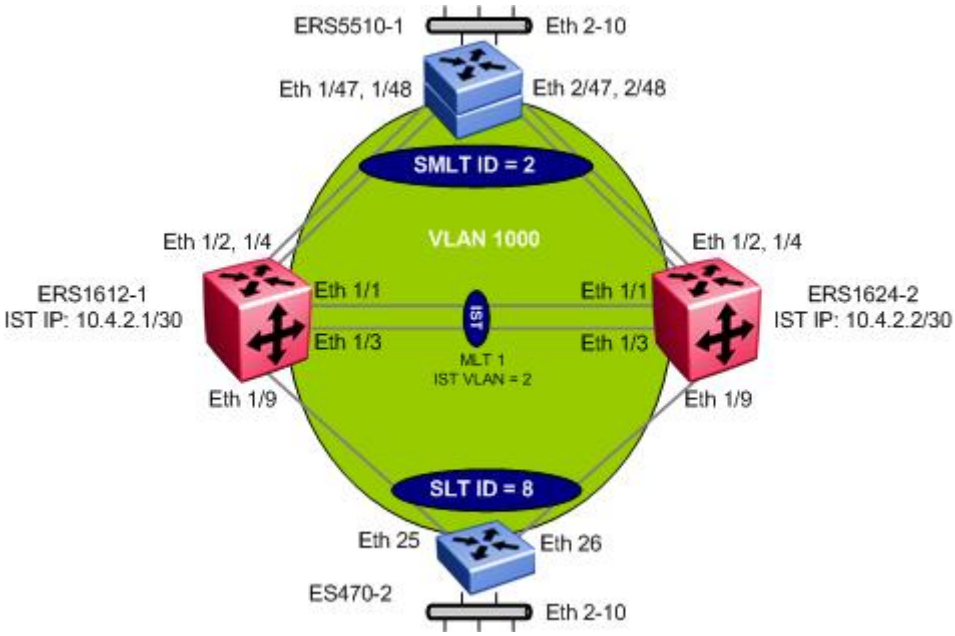

Figure 7: ERS1600 Layer 2 Triangle SMLT Configuration

For this example, we will configure the SMLT switch cluster with the following:

- IST
  - IST VLAN 2 using MLT ID = 1
  - Tagged port members 1/1 and 1/3
  - All IST ports are Gigabit Ethernet ports using default setting of Autonegotiation enable
- SMLT and SLT
  - SMLT VLAN 1000
  - ERS1612-1 is assumed to the SMLT Primary switch while ERS1624-2 is the SMLT Secondary switch
  - MLT and SMLT ID of 2 for ERS5510-1 with tagged port member 1/2 and 1/4
  - SLT ID of 8 for ERS470-2 with tagged port member 1/9
  - All SMLT and SLTports are Gigabit Ethernet ports using default setting of Autonegotiation enable
  - Enable “Discard Untagged Frames” on all SMLT/SLT port members, this includes ports 1/1, 1/2, 1/3, 1/4 and 1/9.
  - Disable STP on all SMLT ports (default setting when SMLT is enabled)
    - SoftDown utilization threshold set to 10%
- On both ERS5510-1 and ES470-2, the following will be configured:
  - Broadcast and multicast rate limiting with a threshold to 10%.

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- Spanning Tree Fast Start on all edge ports
- BPDU filtering on all edge ports
- VLAN Tagging on SMLT access trunk ports

It is recommended to use the lowest possible MLT number for the IST which will be one. For the SMLT, start with lowest MLT number available and work up.

It is recommended to start the SLT numbering at 8 up to 512 even though you can use any number from 1 to 7. This is to avoid taking away a valid MLT ID that can be use for either a MLT or SMLT instance. The ERS1600 support up to 7 MLT instances.

Please note that VLACP is not supported on the ERS1600.

Please not that the GBIC's on the ES470 (non-PoE switches) does not support auto-negotiate. Hence, we must disable auto-negotiation on the SMLT cluster for all ports going to the ES470. However, the ES-470-PWR (PoE switches) does support auto-negotiate.

2.7.1 Configuration – ERS1600 Layer 2 Switch Cluster

2.7.1.1 Create VLANs

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 1000 to be used at a Layer 2 level to ERS5510-1 and ES470-2 for connecting users.

ERS1612-1: Step 1 – VLANs 2 and 1000
ERS1612:1:1# ***config vlan 2 create byport 1 name IST***
ERS1612:1:1# ***config vlan 1000 create byport 1 name Services***
ERS1624-2: Step 1 – Create VLAN 2 and 1000
ERS1624-2:1# ***config vlan 2 create byport 1 name IST***
ERS1624-2:1# ***config vlan 1000 create byport 1 name Services***

2.7.1.2 Change fdb aging timer for VLAN 1000

ERS1612-1: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS1612:1:1# ***config vlan 1000 fdb-entry aging-time 21601***
ERS1624-2: Step 1 – Change fdb aging timer on VLAN 1000 to recommended value of 21601 seconds
ERS1624-2:1# ***config vlan 1000 fdb-entry aging-time 21601***

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2.7.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 1 and 3. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members by default.

ERS1612-1: Step 1 – Create MLT 1 for IST

```
ERS1612:1# config mlt 1 create
ERS1612:1# config mlt 1 name IST
ERS1612:1# config mlt 1 add port 1/1,1/3
ERS1612:1# config vlan 2 add-mlt 1
```

ERS1624-2: Step 1 – Create MLT 1 for IST

```
ERS1624-2:1# config mlt 1 create
ERS1624-2:1# config mlt 1 name IST
ERS1624-2:1# config mlt 1 add port 1/1,1/3
ERS1624-2:1# config vlan 2 add-mlt 1
```

ERS1612-1: Step 2 – Create IST

```
ERS1612:1# config vlan 2 ip create 10.4.2.1/30
ERS1612:1# config mlt 1 ist create ip 10.4.2.2 vlan-id 2
ERS1612:1# config mlt 1 ist enable
```

ERS1624-2: Step 2 – Create IST

```
ERS1624-2:1# config vlan 2 ip create 10.4.2.2/30
ERS1624-2:1# config mlt 1 ist create ip 10.4.2.1 vlan-id 2
ERS1624-2:1# config mlt 1 ist enable
```

2.7.1.4 SMLT-2 to ERS5510-1

ERS1612-1: Step 1 – Create SMLT-2

```
ERS1612:1# config mlt 2 create
ERS1612:1# config mlt 2 name ERS5510-1
ERS1612:1# config mlt 2 perform-tagging enable
ERS1612:1# config mlt 2 add ports 1/2,1/4
ERS1612:1# config vlan 1000 add-mlt 1
ERS1612:1# config mlt 2 smlt create smlt-id 2
```

ERS1624-2: Step 1 – Create SMLT-2

```
ERS1624-2:1# config mlt 2 create
ERS1624-2:1# config mlt 2 name ERS5510-1
```

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```
ERS1624-2:1# config mlt 2 perform-tagging enable
ERS1624-2:1# config mlt 2 add ports 1/2,1/4
ERS1624-2:1# config vlan 1000 add-mlt 2
ERS1624-2:1# config mlt 2 smlt create smlt-id 2
```

2.7.1.5 Add VLAN 1000 to IST

ERS8600-1: Step 1 – Add VLAN 1000 to IST

```
ERS1612-1:5# config vlan 1000 add-mlt 1
```

ERS8600-2: Step 1 – Add VLAN 1000 to IST

```
ERS1624-2:5# config vlan 1000 add-mlt 1
```

2.7.1.6 SLT-129 to ERS470-2

ERS1612-1: Step 1 – Create SLT-8

```
ERS1612:1# config ethernet 1/9 perform-tagging enable
ERS1612:1# config vlan 1 ports remove 1/9
ERS1612:1# config vlan 1000 ports add 1/9
ERS1612:1# config ethernet 1/9 smlt 8 create
```

ERS1624-2: Step 1 – Create SLT-8

```
ERS1624-2:1# config ethernet 1/9 perform-tagging enable
ERS1624-2:1# config vlan 1 ports remove 1/9
ERS1624-2:1# config vlan 1000 port add 1/9
ERS1624-2:1# config ethernet 1/9 smlt 8 create
```

2.7.1.7 Disable auto-negotiation on ports 1/9

ERS1612-1: Step 1 – Create SLT-129

```
ERS1612:1# config ethernet 1/9 auto-negotiate disable
```

ERS1624-2: Step 1 – Create SLT-129

```
ERS1624-2:1# config ethernet 1/9 auto-negotiate disable
```

Please not that the GBIC's on the ES470 (non-PoE switches) does not support auto-negotiate. Hence, we must disable auto-negotiation on the SMLT cluster for all ports going to the ES470. However, the ES-470-PWR (PoE switches) does support auto-negotiate.

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2.7.1.8 CP Limit – SMLT port members

CP Limit will be enabled on all the SMLT Access port members. For this example, we will select the moderate recommendations for CP-Limit.

ERS1612-1: Step 1 – CP Limit

```
ERS1612:1# config ethernet 1/2,1/4,1/9 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

ERS1624-2: Step 1 – CP Limit

```
ERS1624-2:1# config ethernet 1/2,1/4,1/9 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

2.7.1.9 Discard Untagged Frames

It is recommended to enable discard untagged frames on all IST and SMLT ports.

ERS1612-1: Step 1 – Enable Discard Untagged Frames

```
ERS1612:1# config ethernet 1/1-1/4,1/9 untagged-frames-discard enable
```

ERS1624-2: Step 1 – Enable Discard Untagged Frames

```
ERS1624-2:1# config ethernet 1/1-1/4,1/9 untagged-frames-discard enable
```

2.7.2 Configuration - Edge Switch

2.7.2.1 Create VLAN

ERS5510-1: Step 1 – VLANs 1000

```
5510-1(config)# vlan create 1000 name smlt_2 type port
5510-1(config)# vlan members remove 1 1/2-10,1/47-48,2/2-10,2/47-48
5510-1(config)# vlan ports 1/47-48,2/47-48 tagging tagall
5520-1(config)#vlan members 1000 1/2-10,1/47-48,2/2-10,2/47-48
```

ERS470-2: Step 1 – Create VLAN 1000

```
470-2(config)#vlan create 1000 name smlt_2 type port
470-2(config)# vlan members remove 1 2-10,25-26
470-2(config)# vlan ports 25-26 tagging tagall
470-2(config)# vlan members 1000 2-10,25-26
```

2.7.2.2 Create MLT

ERS5510-1: Step 1 – Create MLT 1

```
5510-1(config)#mlt 1 enable member 1/47-48,2/47-48 learning disable
```

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ERS470-2: Step 1 – Create MLT 1

```
470-2(config)# mlt 1 enable member 25,26 learning disable
```

2.7.2.3 Enable Spanning Tree Fast Start and BPDU filtering on all access ports

ERS5510-1: Step 1 – Enable STP Fast Start and BPDU Filtering

```
5510-1(config)#interface fastEthernet 1/2-10,2/2-10
5510-1(config-if)#spanning-tree learning fast
5510-1(config-if)#spanning-tree bpdu-filtering timeout 0
5510-1(config-if)#spanning-tree bpdu-filtering enable
5510-1(config-if)#exit
```

ERS470-2: Step 1 – Enable STP Fast Start and BPDU Filtering

```
470-2(config)# interface fastEthernet 2-10
470-2(config-if)#spanning-tree learning fast
470-2(config-if)# spanning-tree bpdu-filtering timeout 0
470-2(config-if)# spanning-tree bpdu-filtering enable
470-2(config-if)#exit
```

2.7.2.4 Enable Rate Limiting

ERS5510-1: Step 1 –Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic

```
5510-1(config)#interface fastEthernet all
5510-1(config-if)# rate-limit port 1/2-10,2/2-10 both 10
5510-1(config-if)#exit
```

ERS470-2: Step 1 – Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic

```
470-2(config)#interface fastEthernet all
470-2(config-if)# rate-limit port 2-10 both 10
470-2(config-if)#exit
```

2.7.3 Verify Operations

2.7.3.1 Verify MLT Configuration

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
ERS-1612:1# show mlt info
```

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Result:

```
================================================================================
                                    Mlt Info
================================================================================
                                  PORT    MLT   MLT        PORT            VLAN
MLTID IFINDEX NAME                TYPE    ADMIN CURRENT    MEMBERS         IDS
--------------------------------------------------------------------------------
1     6144    IST                 trunk   ist   ist        1/1,1/3          2
1000
2     6150    ERS5510-1           trunk   smlt  smlt       1/2,1/4          1000

                         DESIGNATED
MLTID IFINDEX  NT-STG    PORTS
--------------------------------------------------------------------------------
1      6144     enable   1/3
2      6150     enable   1/2
```

On each ERS1600 in the switch cluster verify the following information:

Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT MLT are correct: • IST MLT 1: Member of VLANs ***2*** & ***1000*** with port members ***1/1 and 1/3*** • MLT 2: Member of VLAN ***1000*** with port member ***1/2*** and ***1/4***
MLT ADMIN MLT CURRENT	Displays as ***smlt*** or ***ist***. The value ***normal*** indicates that the IST or SMLT is not operational.
PORT TYPE	Displays as ***trunk*** for all IST and SMLT ports and will pass tagged frames. The value ***access*** indicates that the port will pass untagged frames.

2.7.3.2 Virtual LANs (VLANs):

Step 1 – Verify the VLAN port assignments and 802.1Q tagging settings by issuing the following command:

```
ERS-1612:1# show ports info vlans 1/1-1/4,1/9
```

Result:

```
================================================================
                                Port Vlans
================================================================
PORT          DISCARD   DEFAULT UNTAG   VLAN
NUM   TAGGING UNTAGFRAM VLANID  DEFVLAN IDS
----------------------------------------------------------------
1/1   enable  enable    2       disable 2 1000
1/2   enable  enable    1000    disable 1000
1/3   enable  enable    2       disable 2 1000
1/4   enable  enable    1000    disable 1000
1/9   enable  enable    1000    disable 1000
```

On each ERS8600 in the switch cluster verify the following information:

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Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT ports are correct: • IST Ports: Member of VLANs ***2*** & ***1000*** • SMLT 1 Ports: Member of VLAN ***1000***. • SLT 8 Ports: Member of VLAN ***1000***.
TAGGING	Displays as ***enable*** for all IST and SMLT ports. The value ***disable*** indicates that the port is in an untagged mode.
DISCARD UNTAGFRAM	Displays as ***enable*** for all IST and SMLT ports. The value ***disable*** indicates that the port will pass untagged frames.

2.7.3.3 Inter Switch Trunk (IST):

Step 1 – Verify that the IST is configured correctly and is functioning by issuing the following command:

```
ERS-1612:1# show mlt ist info
```

Result:

```
================================================================
                                        Mlt IST Info
================================================================
MLT    IP                  VLAN     ENABLE    IST
ID     ADDRESS             ID       IST       STATUS
----------------------------------------------------------------
1      10.4.2.2            2        true      up
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
MLT ID	Verify the MLT ID assigned to the IST is correct.
IP ADDRESS	Verify that the IST peer IP address is correct: • ERS1612-1: Will display the peer IP ***10.4.2.2*** • ERS1624-2: Will display the peer IP ***10.4.2.1***
ENABLE IST	Displays as ***true***. The value ***false*** indicates that the IST is not enabled.
IST STATUS	Displays as ***up***. The value ***down*** indicates that the IST is not operational.

2.7.3.4 Split MultiLink Trunking (SMLT):

Step 1 – Verify that SMLT is functioning correctly by issuing the following command:

```
ERS-1612:1# show smlt
```

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Result:

```
==================================================================
                                        Mlt SMLT Info
==================================================================
MLT    SMLT      ADMIN     CURRENT
ID     ID        TYPE      TYPE
------------------------------------------------------------------
2      2         smlt      smlt



==================================================================
                                        Port SMLT Info
==================================================================
PORT   SMLT      ADMIN     CURRENT
NUM    ID        TYPE      TYPE
------------------------------------------------------------------
1/9    8         smlt      smlt
```

On each ERS1600 in the switch cluster verify the following information:

Option	Verify
SMLT ID	Verify that the SMLT IDs match the MLT IDs. For port 1/9, the SLT ID should be displayed as 8.
ADMIN TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the MLT is not configured as an SMLT trunk.
CURRENT TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the SMLT ports are disconnected or the SMLT IDs are mis-configured.

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2.8 Configuration – ERS1600 Triangle Switch Cluster using VRRP with Backup Master

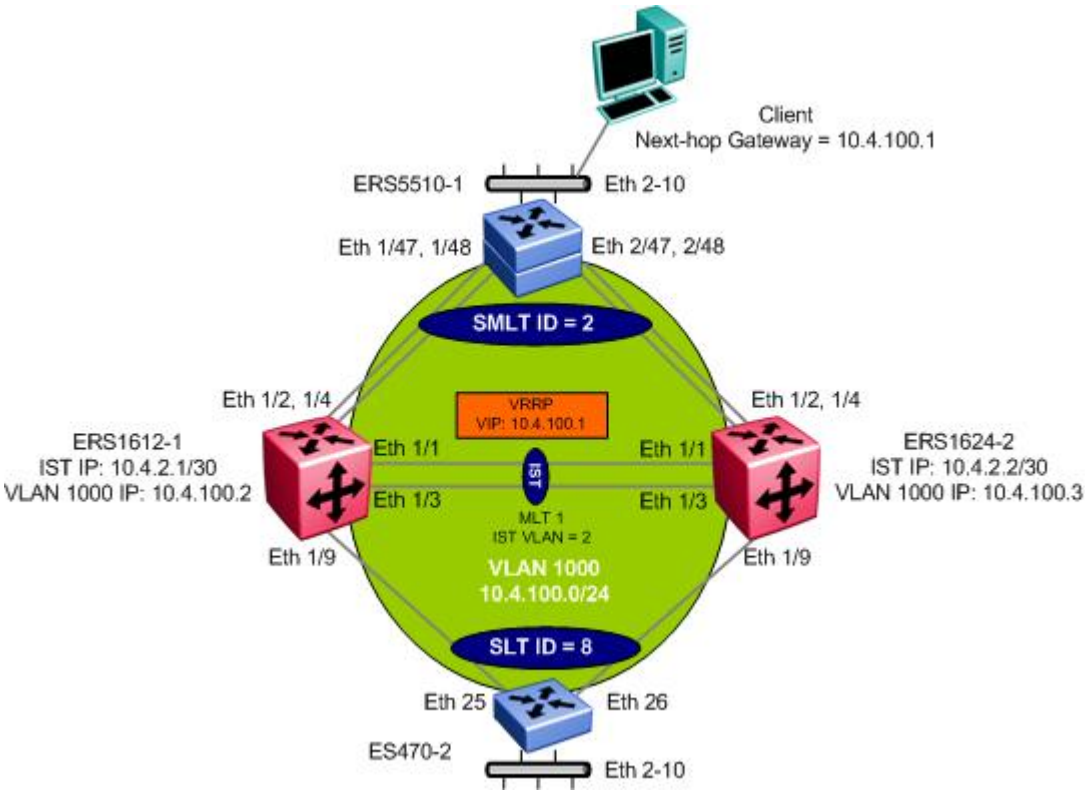

Figure 8: ERS1600 Triangle SMLT Configuration with VRRP Backup Master

Assuming we take the same base setup as used in Section 2.7.1 but we now add a Layer 3 routing protocol with VRRP Backup Master. The configuration remains the same with the addition of enabling a routing protocol on VLAN 1000 and enabling VRRP Backup-Master.

Overall, we will use the same configuration steps as used in Section 2.1.1 and will add the following:

- Enable OSPF on VLAN 1000
  - VLAN 1000 on ERS1612-1 will be configured with IP address 10.4.100.2/24
  - VLAN 1000 on ERS1612-2 will be configured with IP address 10.4.100.3/24
  - Both ERS1612-1 and ERS1624-2 will be configured with OSPF passive interface as both switches are connected to Layer 2 access switches. This prevent OSPF messages being send to the access switches
  - Use default OSPF timers
- Enable VRRP on VLAN 1000 with the following settings
  - Enable backup master
  - Set the hold down timer to 60 seconds on ERS1612-1 and ERS1624-2
  - Set the VRRP VIP to 10.4.100.1 on both switches in the SMLT cluster
  - Set the VRRP virtual router id to 10

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- Set the VRRP priority to 200 on ERS1612-1 so that it becoming the VRRP master and use the default value of 100 on ERS-1624-2 so that it becoming the VRRP backup

The VRRP hold down timer should be set long enough such that the IGP routing protocol has time to converge and update the routing table. In some cases, setting the VRRP hold down timer a minimum of 1.5 times the IGP convergence time should be sufficient. For OSPF, it is suggested to use a value of 60 seconds if using the default OSPF timers.

2.8.1 Configuration – ERS1600 Layer 3 Switch Cluster using VRRP Backup Master

2.8.1.1 Add IP address to VLAN 1000

ERS1612-1: Step 1 – Add IP address to VLAN 1000
ERS-1612:1# ***config vlan 1000 ip create 10.4.100.2/24***
ERS1624-2: Step 1 – Add IP address to VLAN 1000
ERS-1624-2:1# ***config vlan 1000 ip create 10.4.100.3/24***

2.8.1.2 Enable OSPF

VLAN 1000 will be configured with OSPF passive interface on the SMLT Switch cluster.

ERS1612-1: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS-1612:1# ***config vlan 1000 ip ospf interface-type passive*** ERS-1612:1# ***config vlan 1000 ip ospf enable***
ERS1624-2: Step 1 – Enable OSPF to VLAN 1000 with passive interface
ERS-1624-2:1# ***config vlan 1000 ip ospf interface-type passive*** ERS-1624-2:1# ***config vlan 1000 ip ospf enable***
ERS1612-1: Step 2 – Enable OSPF globally
ERS-1612:1# ***config ip ospf enable***
ERS1624-2: Step 2 – Enable OSPF globally
ERS-1624-2:1# ***config ip ospf enable***

2.8.1.3 Enable VRRP

ERS1612-1: Step 1 – Add VRRP VIP
ERS-1612:1# ***config vlan 1000 ip vrrp 10 address 10.4.100.1***
ERS1624-2: Step 1 – Add VRRP VIP

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ERS-1624-2:1# ***config vlan 1000 ip vrrp 10 address 10.4.100.1***
ERS1612-1: Step 2 – Enable backup master
ERS-1612:1# ***config vlan 1000 ip vrrp 10 backup-master enable***
ERS1624-2: Step 2 – Enable backup master
ERS-1624-2:1# ***config vlan 1000 ip vrrp 10 backup-master enable***
ERS1612-1: Step 3 – Set the hold down timer to 60 seconds
ERS-1612:1# ***config vlan 1000 ip vrrp 10 holddown-timer 60***
ERS1624-2: Step 3 – Set the hold down timer to 60 seconds
ERS-1624-2:1# ***config vlan 1000 ip vrrp 10 holddown-timer 60***
ERS1612-1: Step 4 – Set VRRP priority
ERS-1612:1# ***config vlan 1000 ip vrrp 10 priority 200***
ERS1612-1: Step 5 – Enable VRRP
ERS-1612:1# ***config vlan 1000 ip vrrp 10 enable***
ERS1624-2: Step 5 – Enable VRRP
ERS-1624-2:1# ***config vlan 1000 ip vrrp 10 enable***

2.8.1.4 DHCP Option

If you wish to enable DHCP Relay on VLAN 1000, please enter the following commands assuming the DHCP relay agent is 172.30.30.20.

ERS1612-1: Step 1 – Enable DHCP Relay on VLAN 1000
ERS1612-1:5# ***config vlan 1000 ip dhcp-relay enable***
ERS1624-2: Step 1 – Enable DHCP Relay on VLAN 1000
ERS1624-2:5# ***config vlan 1000 ip dhcp-relay enable***
ERS1612-1: Step 2 – Enable DHCP agent
ERS1612-1:5# ***config ip dhcp-relay create-fwd-path agent 10.4.100.2 server 172.30.30.20 mode dhcp state enable***
ERS1624-2: Step 2 – Enable DHCP agent
ERS1624-2:5# ***config ip dhcp-relay create-fwd-path agent 10.4.100.3 server 172.30.30.20 mode dhcp state enable***

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2.8.2 Verify Operations

2.8.2.1 VRRP Operations

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
ERS-1612:1# show ip vrrp info vrid 10
```

Result:

```
================================================================================
                                    Vrrp Info
================================================================================

VRID  P/V   IP              MAC                STATE    CONTROL  PRIO  ADV
--------------------------------------------------------------------------------
10    10    10.4.100.1      00:00:5e:00:01:0a  Master   Enabled  200   1

VRID  P/V   MASTER          UP TIME               HLD DWN  CRITICAL IP (ENABLED)
--------------------------------------------------------------------------------
10    10    10.4.100.2      0 day(s), 00:03:57    0        0.0.0.0         (No)

VRID  P/V   BACKUP MASTER   BACKUP MASTER STATE   FAST ADV (ENABLED)
--------------------------------------------------------------------------------
10    10    enable          down                  200       (NO)
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VRID	Verify that the VRRP VID is ***10*** on both ERS1612-1 and ERS1624-2. If not, there is a configuration error.
IP	Verify that the VRRP IP address is ***10.4.100.1*** on both ERS1612-1 and ERS1624-2. If not, there is a configuration error.
MAC	The VRRP MAC on both switches in the SMLT cluster should be the same.
STATE	Verify the VRRP state: • ERS1612-1: ***Master*** • ERS1624-2: ***Back Up***
PRIO	Verify that the VRRP priority is set to ***200*** on ERS1612-1 and ***100*** on ERS1624-2. If not, configure the appropriate VRRP priority.
MASTER	Verify that VRRP master's IP address belongs to ERS1612-1 on both switches: • ERS1612-1: ***10.4.100.2*** • ERS1624-2: ***10.4.100.2***
BACKUP MASTER	Verify that backup master is set to ***NO*** on both switches. If not, enable VRRP backup master.

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BACKUP MASTER STATE	Verify that VRRP backup master state on both switches: • ERS1612-1: ***down*** • ERS1624-2: ***up***
ENABLED	Verify that the VRRP fast advertise is set to ***disable*** on ERS1612-1 and ERS1624-2.

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2.9 Configuration - ERS8300 Layer 2 SMLT Triangle Switch Cluster Configuration

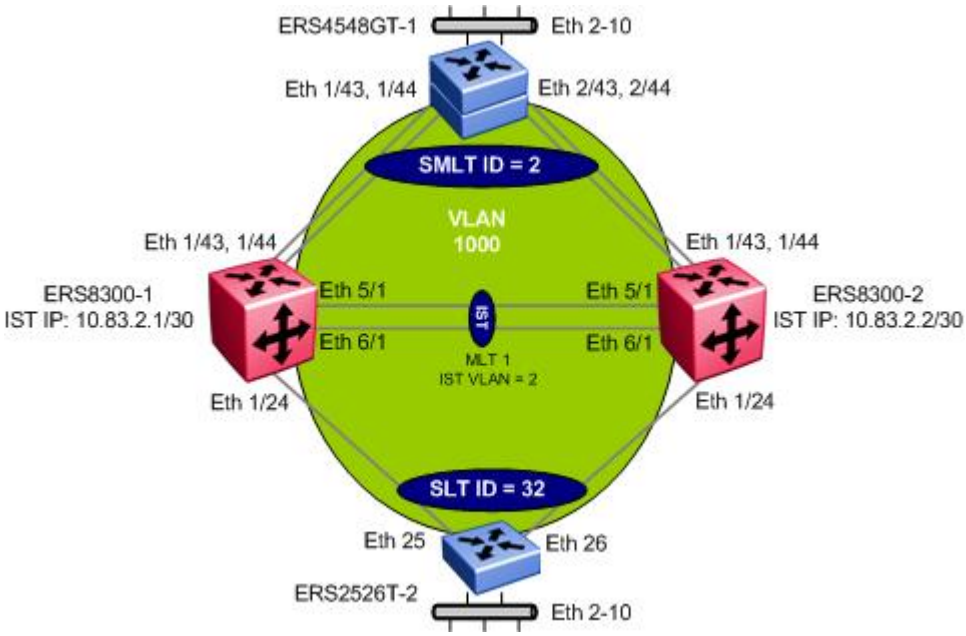

Figure 9: ERS 8300 Layer 2 Triangle SMLT Configuration

For this example, we will configure the SMLT switch cluster with the following:

- IST
  - IST VLAN 2 using MLT ID = 1
  - Tagged port members 5/1 and 6/1
  - All IST ports are Gigabit Ethernet ports using default setting of Autonegotiation enable
  - VLACP using the recommend reserved multicast MAC (01:80:C2:00:00:0F), long timers and slow-periodic-time of 10,000ms
- SMLT and SLT
  - SMLT VLAN 1000
  - MLT and SMLT ID of 2 for ERS4548GT-1 with tagged port member 1/43 and 1/44
  - SLT ID of 32 for ERS2526T-1 with tagged port member 1/24
  - All SMLT and SLTports are Ethernet ports using default setting of Autonegotiation enable
  - Enable “Discard Untagged Frames” on all SMLT/SLT port members
  - Enable SLPP
  - Disable STP on all SMLT ports
  - Enable VLACP with recommended reserved multicast MAC address and with short timers of 500ms and set timeout scale to 5

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- Change default MAC fdb timeout

- On both ERS4548GT-1 and ERS2526T-2, the following will be configured:
  - Broadcast and multicast rate limiting with a threshold to 10%.
  - Spanning Tree Fast Start on all edge ports
  - VLAN Tagging on SMLT access trunk ports

You must have an Advanced Routing License to enable SMLT on the ERS8300. Please ensure that you have obtained and installed the license prior to configuring SMLT on the ERS8300 switch.

It is recommended to use the lowest possible MLT number for the IST which will be 1. For the SMLT, start with lowest MLT number available and work up.

It is recommended to start the SLT numbering at 32 up to 512 even though you can use any number from 1 to 512. This is to avoid taking away a valid MLT ID that can be use for either a MLT or SMLT instance. The ERS8300 supports up to 31 MLT instances.

Please note that you cannot use IST MLT ID value of greater than 7 even though the ERS8300 support up to 31 MLT Ids. Please see software release notes for release 3.0.2 for more details.

If you do, you will be prompted with the following error message when attempted to add the IST MLT ID to an SMLT VLAN :

Error: SMLT(with FE ports) and IST(MLT-ID>7) cannot coexist

2.9.1 Configuration – ERS8300 Layer 2 Switch Cluster

For this configuration example, ERS8300-1 is configured using the NNCLI command interface while ERS8300-2 is configured using the Passport command interface.

2.9.1.1 Create VLANs

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 1000 to be used at a Layer 2 level to ERS4548GT-1 and ERS2526T-2 for connecting users.

ERS8300-1: Step 1 – Create VLANs 2 and 1000
ERS8300-1:5(config)#***vlan create 2 name IST type port 1***
ERS8300-1:5(config)#***vlan create 1000 name Services type port 1***
ERS8300-2: Step 1 – Create VLANs 2 and 1000
ERS8300-2:5# ***config vlan 2 create byport 1 name IST***
ERS8300-2:5# ***config vlan 1000 create byport 1 name Services***

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2.9.1.2 Change fdb aging timer for VLAN 1000

ERS8300-1: Step 1 – Create fdb aging timer on VLAN 1000 to recommended value of 21601 seconds

```
ERS8300-1:5(config)#vlan fdb-entry 1000 aging-time 21601
```

ERS8300-2: Step 1 – Create fdb aging timer on VLAN 1000 to recommended value of 21601 seconds

```
ERS8300-2:5# config vlan 1000 fdb-entry aging-time 21601
```

2.9.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 2/1 and 3/1. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members by default.

ERS8300-1: Step 1 – Create MLT 1 for IST

```
ERS8300-1:5(config)#mlt 1
ERS8300-1:5(config)#mlt 1 member 5/1,6/1
ERS8300-1:5(config)#mlt 1 encapsulation dot1q
ERS8300-1:5(config)#vlan add-mlt 2 1
```

ERS8300-2: Step 1 – Create MLT 1 for IST

```
ERS8300-2:5# config mlt 1 create
ERS8300-2:5# config mlt 1 name IST
ERS8300-2:5# config mlt 1 add port 5/1,6/1
ERS8300-2:5# config vlan 2 add-mlt 1
```

ERS8300-1: Step 2 – Create IST

```
ERS8300-1:5(config)#interface vlan 2
ERS8300-1:5(config-if)#ip address 10.83.1.1 255.255.255.252
ERS8300-1:5(config-if)#exit
ERS8300-1:5(config)#interface mlt 1
ERS8300-1:5(config-mlt)#ist ip 10.83.1.2 vlan 2
ERS8300-1:5(config-mlt)#ist enable
ERS8300-1:5(config-mlt)#end
```

ERS8300-2: Step 2 – Create IST

```
ERS8300-2:5# config vlan 2 ip create 10.83.1.2/30
ERS8300-2:5# config mlt 1 ist create ip 10.83.1.1 vlan-id 2
ERS8300-2:5# config mlt 1 ist enable
```

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ERS8300-1: Step 3 – Enable VLACP

```
ERS8300-1:5(config)#vlacp macaddress 01:80:c2:00:00:0f
ERS8300-1:5(config)#vlacp enable
ERS8300-1:5(config)# interface gigabitEthernet 5/1,6/1
ERS8300-1:5(config-if)#vlacp slow-periodic-time 10000
ERS8300-1:5(config-if)#vlacp enable
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 3 – Enable VLACP

```
ERS8300-2:5# config vlacp macaddress 01:80:c2:00:00:0f
ERS8300-2:5# config vlacp enable
ERS8300-2:5# config ethernet 5/1 vlacp slow-periodic-time 10000
ERS8300-2:5# config ethernet 5/1 vlacp enable
```

2.9.1.4 SMLT-2 to ERS4548GT-1

ERS8300-1: Step 1 – Create SMLT-2

```
ERS8300-1:5(config)#mlt 2
ERS8300-1:5(config)# mlt 2 member 2/1-2/2 vlan 1000
ERS8300-1:5(config)# mlt 2 encapsulation dot1q
ERS8300-1:5(config)#interface mlt 2
ERS8300-1:5(config-mlt)#smlt 2
ERS8300-1:5(config-mlt)#end
```

ERS8300-2: Step 1 – Create SMLT-2

```
ERS8300-2:5# config mlt 2 create
ERS8300-2:5# config mlt 2 perform-tagging enable
ERS8300-2:5# config mlt 2 add ports 1/43,1/44
ERS8300-2:5# config vlan 1000 add-mlt 2
ERS8300-2:5# config mlt 2 smlt create smlt-id 2
```

2.9.1.5 Add VLAN 1000 to IST

ERS8600-1: Step 1 – Add VLAN 1000 to IST

```
ERS8300-1:5(config)#vlan add-mlt 1000 1
```

ERS8600-2: Step 1 – Add VLAN 1000 to IST

```
ERS8300-2:5# config vlan 1000 add-mlt 1
```

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2.9.1.6 SLT-32 to ERS2526-2

ERS8300-1: Step 1 – Create SLT-32

```
ERS8300-1:5(config)#vlan ports 1/24 tagging tagAll
ERS8300-1:5(config)#vlan members remove 1 1/24
ERS8300-1:5(config)#vlan members add 1000 1/24
ERS8300-1:5(config)#interface fastEthernet 1/24
ERS8300-1:5(config-if)#smlt 32
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Create SLT-32

```
ERS8300-2:5# config ethernet 1/24 perform-tagging enable
ERS8300-2:5# config vlan 1 ports remove 1/24
ERS8300-2:5# config vlan 1000 ports add 1/24
ERS8300-2:5# config ethernet 1/24 smlt 32 create
```

2.9.1.7 CP Limit – SMLT Port Members

CP Limit will be enabled on all the SMLT Access port members. For this example, we will select the moderate recommendations for CP-Limit.

ERS8300-1: Step 1 – CP Limit

```
ERS8300-1:5(config)#interface fastEthernet 1/24,1/43,1/44
ERS8300-1:5(config-if)# cp-limit both 2500
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – CP Limit

```
ERS8300-2:5# config ethernet 1/24,1/43,1/44 cp-limit enable multicast-limit
2500 broadcast-limit 2500
```

2.9.1.8 SLPP

SLPP will be enabled globally and only on the SMLT access ports 1/43and 1/44 and SLT access port 1/24 for VLAN 1000. On the SMLT primary switch we will set the SLPP packet-rx-threshold to 5, while on the SMLT secondary switch we will set the SLPP packet-rx-threshold to 50. For this example, we will pick ERS8300-1 as the primary switch.

The recommended SLPP receive threshold value for the primary switch is 5 and 50 for the secondary switch in an SMLT cluster.

SLPP should only be enabled on the SMLT access ports and not on the IST port members.

ERS8300-1: Step 1 – Enable SLPP

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```
ERS8300-1:5(config)#slpp vid 1000
ERS8300-1:5(config)#slpp operation
ERS8300-1:5(config)# interface fastEthernet 1/24,1/43,1/44
ERS8300:5(config-if)#slpp packet-rx-threshold 5
ERS8300:5(config-if)# slpp packet-rx
ERS8300:5(config-if)#end
```

ERS8300-2: Step 1 – Enable SLPP

```
ERS8300-2:5# config slpp add 1000
ERS8300-2:5# config slpp operation enable
ERS8300-2:5# config ethernet 3/13,4/13,4/26 slpp packet-rx-threshold 50
ERS8300-2:5# config ethernet 1/24,1/43,1/44 slpp packet-rx enable
```

2.9.1.9 VLACP

As the access switches, ERS4548GT-1 and ERS2526GT-2, supports VLACP, we will enable this feature and use the short timeout option. By default the ERS4500 amd ERS 2500 uses a default short timeout of 500ms. Hence, we will configure this value on the ERS8600 switch cluster on the SMLT access ports. In addition, we will use the recommended VLACP reserved MAC address.

ERS8300-1: Step 1 – Enable VLACP

```
ERS8300-1:5(config)#interface fastEthernet 1/24,1/43,1/44
ERS8300-1:5(config-if)#vlacp timeout short
ERS8300-1:5(config-if)#vlacp timeout-scale 5
ERS8300-1:5(config-if)#vlacp fast-periodic-time 500
ERS8300-1:5(config-if)#vlacp enable
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Enable VLACP

```
ERS8300-2:5# config ethernet 1/24,1/43,1/44 vlacp fast-periodic-time 500
ERS8300-2:5# config ethernet 1/24,1/43,1/44 vlacp timeout short
ERS8300-2:5# config ethernet 1/24,1/43,1/44 vlacp timeout-scale 5
ERS8300-2:5# config ethernet 1/24,1/43,1/44 vlacp enable
```

Do not enable VLACP on a port level until the VLACP MAC address has been changed which is a global parameter on the ERS 8300.

2.9.1.10 Discard Untagged Frames

It is recommended to enable discard untagged frames on all IST and SMLT ports.

ERS8300-1: Step 1 – Enable Discard Untagged Frames

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```
ERS8300-1:5(config)#interface fastEthernet 1/24,1/43,1/44
ERS8300-1:5(config-if)#untagged-frames-discard
ERS8300-1:5(config-if)#exit
ERS8300-1:5(config)#interface gigabitEthernet 5/1,6/1
ERS8300-1:5(config-if)#untagged-frames-discard
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Enable Discard Untagged Frames

```
ERS8300-2:5# config ethernet 1/24,1/43,1/44,5/1,6/1 untagged-frames-discard enable
```

2.9.2 Configuration - Edge Switch

2.9.2.1 Create VLAN

ERS4548GT-1: Step 1 – VLAN 1000

```
4548GT-1(config)#vlan create 1000 name smlt_1 type port
4548GT-1(config)# vlan members remove 1 1/2-10,1/43-44,2/2-10,2/43-44
4548GT-1(config)# vlan ports 1/43-44,2/43-44 tagging tagall
4548GT-1(config)#vlan members 1000 1/2-10,1/43-44,2/2-10,2/43-44
```

ERS2526T-2: Step 1 – Create VLAN 1000

```
2526-2(config)#vlan create 1000 name core type port
2526-2(config)#vlan members remove 1 2-10,23,24
2526-2(config)#vlan ports 23,24 tagging tagall
2526-2(config)#vlan members 1000 2-10,23,24
```

2.9.2.2 Create MLT

ERS4548GT-1: Step 1 – Create MLT 1

```
4548GT-1(config)# mlt 1 name core enable member 1/43-44,2/43-44 learning disable
```

ERS2526T-2: Step 1 – Create MLT 1

```
2526-2(config)#mlt 1 name core enable member 23,24 learning disable
```

2.9.2.3 VLACP

ERS4548GT-1: Step 1 – Enable VLACP

```
4548GT-1(config)#vlacp macaddress 01:80:c2:00:00:0f
4548GT-1(config)#vlacp enable
4548GT-1(config)#interface fastEthernet 1/43-44,2/43-44
```

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```
4548GT-1(config-if)#vlacp timeout-scale 5
4548GT-1(config-if)#vlacp timeout short
4548GT-1(config-if)#vlacp enable
```

ERS2526T-2: Step 1 – Enable STP VLACP

```
2526-2(config)# vlacp macaddress 01:80:c2:00:00:0f
2526-2(config)#vlacp enable
2526-2(config)#interface fastEthernet 23,24
2526-2(config-if)# vlacp timeout-scale 5
2526-2(config-if)# vlacp timeout short
2526-2(config-if)#vlacp enable
```

Software release 4.2 or greater is required for the ERS 2500 to support VLACP

2.9.2.4 Enable Spanning Tree Fast Start on all Access Ports

ERS4548GT-1: Step 1 – Enable STP Fast Start and BPDU Filtering

```
4548GT-1(config)# interface fastEthernet 1/2-10,2/2-10
4548GT-1(config-if)#spanning-tree learning fast
4548GT-1(config-if)#spanning-tree bpdu-filtering timeout 0
4548GT-1(config-if)#spanning-tree bpdu-filtering enable
4548GT-1(config-if)#exit
```

ERS2526T-2: Step 1 – Enable STP Fast Start and BPDU Filtering

```
2526-2(config)#interface fastEthernet 2-10
2526-2(config-if)#spanning-tree learning fast
2526-2(config-if)#spanning-tree bpdu-filtering timeout 0
2526-2(config-if)#spanning-tree bpdu-filtering enable
2526-2(config-if)#exit
```

Please note that the ERS2500 requires software level 4.2 or higher to support BPDU filtering. The ERS 4500 required software release 5.1 or higher

2.9.2.5 Enable Rate Limiting

ERS4548GT-1: Step 1 –Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic

```
4548GT-1(config)# interface fastEthernet 1/2-10,2/2-10
4548GT-1(config-if)#rate-limit both 10
4548GT-1(config-if)#exit
```

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ERS2526T-2: Step 1 – Enable Rate Limiting to 10% of total traffic for both broadcast and multicast traffic

```
2526-2(config)# interface fastEthernet 2-10
2526-2(config-if)#rate-limit both 262143
2526-2(config-if)#exit
```

2.9.3 Verify Operations

2.9.3.1 Verify MLT configuration

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
ERS8300-1:5#show mlt
```

Result:

```
================================================================================
                                   Mlt Info
================================================================================
MLT                              PORT    MLT     MLT          PORT
 DESIGNATED     LACP       LACP    VLAN
ID  IFINDEX  NAME             TYPE   ADMIN   CURRENT     MEMBERS          NT-STG
  PORT          ADMIN     OPER    IDS
--------------------------------------------------------------------------------
1   6144    IST              trunk  ist     ist       5/1,6/1            disable
 5/1            disable   down 2 1000
2   6145    MLT-2            trunk  smlt    smlt      1/43-1/44          enable
 2/1            disable   down 1000
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT MLT are correct: • IST MLT 1: Member of VLANs ***2*** & ***1000*** with port members ***5/1 and 6/1*** • MLT 2: Member of VLAN ***1000*** with port member ***1/43*** and ***1/44***
MLT Admin	Displays as ***smlt*** or ***ist***. The value ***normal*** indicates that the IST or SMLT is not operational.
PORT TYPE	Displays as ***trunk*** for all IST and SMLT ports and will pass tagged frames. The value ***access*** indicates that the port will pass untagged frames.

2.9.3.2 Virtual LANs (VLANs):

Step 1 – Verify the VLAN port assignments and 802.1Q tagging settings by issuing the following command:

```
ERS8300-1:5#show interfaces fastEthernet vlan 1/24,1/43,1/44
```

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```
ERS8300-1:5#show interfaces gigabitEthernet vlan 5/1,6/1
```

Result:

```
================================================================================
                                        Port Vlans
================================================================================
PORT          DISCARD   DEFAULT UNTAG   VLAN
NUM   TAGGING UNTAGFRAM VLANID  DEFVLAN IDS
--------------------------------------------------------------------------------
1/24  enable  enable    1000    disable 1000
1/43  enable  enable    1000    disable 1000
1/44  enable  enable    1000    disable 1000

================================================================================
                                        Port Vlans
================================================================================
PORT          DISCARD   DEFAULT UNTAG   VLAN
NUM   TAGGING UNTAGFRAM VLANID  DEFVLAN IDS
--------------------------------------------------------------------------------
5/1   enable  enable    2       disable 2 1000
6/1   enable  enable    2       disable 2 1000
```

On each ERS8300 in the switch cluster verify the following information:

Option	Verify
VLAN IDS	Verify that the VLAN ids assigned to the IST and SMLT ports are correct: • IST Ports: Member of VLANs ***2*** & ***1000*** • SMLT 2 Ports: Member of VLAN ***1000*** • SLT 32 Ports: Member of VLAN ***1000***
TAGGING	Displays as ***enable*** for all IST and SMLT ports. The value ***disable*** indicates that the port is in an untagged mode.
DISCARD UNTAGFRAM	Displays as ***enable*** for all IST and SMLT ports. The value ***disable*** indicates that the port will pass untagged frames.

2.9.3.3 Inter Switch Trunk (IST):

Step 1 – Verify that the IST is configured correctly and is functioning by issuing the following command:

```
ERS8300-1:5#show ist
```

Result:

```
        ================================================================
                                            Mlt IST Info
        ================================================================
        MLT    IP                   VLAN     ENABLE    IST
        ID     ADDRESS              ID       IST       STATUS
        ----------------------------------------------------------------
        1      10.83.2.2            2        true      up
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify

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MLT ID	Verify the MLT ID assigned to the IST is correct.
IP ADDRESS	Verify that the IST peer IP address is correct: • ERS8300-1: Will display the peer IP ***10.83.2.2*** • ERS8300-2: Will display the peer IP ***10.83.2.1***
ENABLE IST	Displays as ***true***. The value ***false*** indicates that the IST is not enabled.
IST STATUS	Displays as ***up***. The value ***down*** indicates that the IST is not operational.

2.9.3.4 Split MultiLink Trunking (SMLT):

Step 1 – Verify that SMLT is functioning correctly by issuing the following command:

```
ERS8300-1:5#show smlt
```

Result:

```
=========================================================
                                        Mlt SMLT Info
=========================================================
MLT    SMLT     ADMIN    CURRENT
ID     ID       TYPE     TYPE
---------------------------------------------------------
2      2        smlt     smlt



=========================================================
                                        SMLT Info
=========================================================
PORT   SMLT     ADMIN    CURRENT
NUM    ID       TYPE     TYPE
---------------------------------------------------------
1/24   32       smlt     smlt
```

On each ERS8300 in the switch cluster verify the following information:

Option	Verify
SMLT ID	Verify that the SMLT IDs match the MLT IDs. For port 1/24, the SLT ID should be displayed as 32.
ADMIN TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the MLT is not configured as an SMLT trunk.
CURRENT TYPE	Displays as ***smlt*** for each SMLT/SLT ID. A ***normal*** value indicates that the SMLT ports are disconnected or the SMLT IDs are mis-configured.

2.9.3.5 Virtual Link Aggregation Control Protocol (VLACP):

Step 1 – Verify that VLACP is globally enabled by using the following command:

```
ERS8300-1:5#show vlacp info
```

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Result:

```
==========================================================================
                            Vlacp Global Information
==========================================================================
                 SystemId: 00:0e:62:ce:00:00
                    Vlacp: enable
          Admin-Mac-Address: 01:80:c2:00:00:0f
       Runnning-Mac-Address: 01:80:c2:00:00:0f
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
Vlacp	Displays as ***enable***. The value ***disable*** indicates that VLACP is globally disabled on the switch.
Admin-Mac-Address Running-Mac-Address	Displays as ***01:80:c2:00:00:0f***.

Step 2 – Verify the IST and SMLT per port VLACP settings by issuing the following command:

```
ERS8300-1:5# show vlacp interface fastethernet 1/24,1/43,1/44
ERS8300-1:5# show vlacp interface gigabitethernet 5/1,6/1
```

Result:

```
================================================================================
                              VLACP Information
================================================================================
INDEX ADMIN    OPER     PORT    FAST     SLOW     TIMEOUT TIMEOUT ETHER       MAC

      ENABLED ENABLED STATE   TIME     TIME     TIME     SCALE   TYPE        ADDR

--------------------------------------------------------------------------------
1/24  true     true     UP     500      30000    short     5       0x8103     01:80:c2:
00:00:0f
1/43  true     true     UP     500      30000    short     5       0x8103     01:80:c2:
00:00:0f
1/44  true     true     UP     500      30000    short     5       0x8103     01:80:c2:
00:00:0f
5/1   true     true     UP     200      10000     long     3       0x8103     01:80:c2:
00:00:0f
6/1   true     true     UP     200      10000     long     3       0x8103     01:80:c2:
00:00:0f
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
ADMIN ENABLED	Displays as ***true*** for the IST (ports 5/1 and 6/1), SMLT-2 (ports 1/43 and 1/44), and SLT-32 port (port 1/24). The value ***false*** indicates that VLACP is disabled for the port.
OPER ENABLED	Displays as ***true*** for the IST, SMLT-2, and SLT-32 ports. The value ***false*** indicates that VLACP is not operational on the port.

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FAST TIME	Displays as ***500*** for the ports 1/24, 1/43, and 1/44. The value must match for each switch port in the link pair.
SLOW TIME	Displays as ***10000*** for the ports 5/1 and 6/1, the IST port members. The value must match for each switch port in the link pair.
TIMEOUT TIME	Displays as ***long*** for the IST ports and ***short*** for SMLT-2 and SLT-32 ports. This value must match for each switch port in the link pair.
MAC ADDR	The VLACP MAC address is assigned to each IST, SMLT-2 and SLT-32 port members: • IST port 2/1 and 3/1: ***01:80:c2:00:00:0f***. • SMLT-2 & SLT-129 ports: ***01:80:c2:00:00:0f***. The VLACP MAC address must match for each switch port in the link pair.

2.9.3.6 SLPP

Step 1 – Verify that SLPP is globally enabled:

```
ERS8300-1:5# show slpp
```

Result:

```
================================================================
                                SLPP Info
================================================================
            etherType (hex) :  0x8104
                  operation :  enabled
                tx-interval :  500
                       vlan : 1000
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
operation	Displays as ***enable***. The value ***disable*** indicates that SLPP is globally disabled on the switch.
vlan	Displays as ***1000.***

Step 2 – Verify the SLPP Packet Receive and Packet Threshold settings by issuing the following command:

```
ERS8300-1:5# show interfaces fastEthernet 1/24,1/43,1/44
```

Result:

```
================================================================================
                               Port Interface
================================================================================

PORT                        LINK  PORT           PHYSICAL          STATUS
```

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```
NUM   INDEX DESCRIPTION    TRAP  LOCK     MTU   ADDRESS           ADMIN  OPERATE
-------------------------------------------------------------------------------
1/24  128   100BaseTX      true  false    1522  00:0e:62:ce:00:80 up     up
1/43  129   100BaseTX      true  false    1522  00:0e:62:ce:00:81 up     up
1/44  151   100BaseTX      true  false    1522  00:0e:62:ce:00:97 up     up

|
|
|

================================================================
                                  Port SLPP
================================================================

PORT        PKT-RX      PKT-RX     INCOMING   SLPP PDU
NUM                     THRESHOLD  VLAN ID    ORIGINATOR
----------------------------------------------------------------

1/24        enabled     5
1/43        enabled     5
1/44        enabled     5
```

On each ERS8300 in the switch cluster verify the following information:

Option	Verify
PKT-RX	Displays as ***enable*** for ports 1/24, 1/43, and 1/44. The value ***disable*** indicates that SLPP is disabled for the port.
PKT-RX THRESHOLD	Displays as ***5*** for primary switch ERS8300-1 and ***50*** for the secondary switch ERS8300-2.
STATUS ADMIN	Displays as ***up***. If down, check to make to the state has not be configured as disable on a port lebel
OPERATE	Displays as ***up***. If displayed as ***down***, check the log or syslog to see if SLPP caused the port to go down or if the admin-state has been disabled on a port.

If there is a loop in the network, SLPP will shut down the appropriate port and logged as shown below:

```
ERS-8310:5#show logging file tail
CPU5 [2009-02-06 14:54:14] HW INFO portLinkDownEvent starting 2009-02-06 14:54:1
4 on ports 2/24
CPU5 [2009-02-06 14:54:14] SNMP INFO VLACP Link DOWN(1/24)
CPU5 [2009-02-06 14:54:14] SNMP INFO Smlt Link Down Trap(SmltId=32)
CPU5 [2009-02-06 14:54:14] SNMP INFO Slpp port down(SlppRxPort = 151, SlppRxVlan
 =1000, SlppIncomingVlanId = 1000, SlppSrcMacAddress = 00:0e:62:cb:c3:e8)
CPU5 [2009-02-06 14:54:14] LACP INFO the vlacp link is DOWN. port=1/24
CPU5 [2009-02-06 14:54:14] MLT INFO SMLT 32 UP
CPU5 [2009-02-06 14:54:14] MLT INFO SMLT 32 DOWN
```

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2.10 Configuration – ERS8300 Triangle Switch Cluster using VRRP with Backup Master

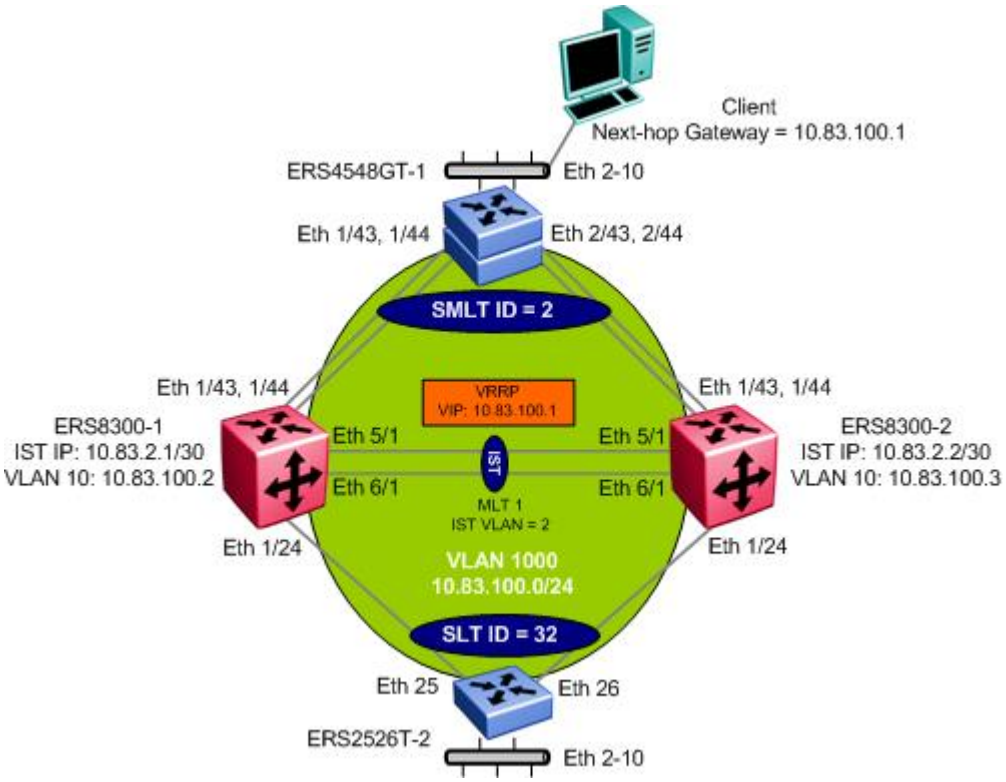

Figure 10: ERS8300 Triangle SMLT Configuration with VRRP Backup Master

Assuming we take the same base setup as used in Section 2.9.1 but we now add a Layer 3 routing protocol with VRRP Backup Master. The configuration remains the same with the addition of enabling a routing protocol on VLAN 1000 and enabling VRRP Backup-Master.

Overall, we will use the same configuration steps as used in Section 2.9.1 and will add the following:

- Enable OSPF on VLAN 1000
  - VLAN 1000 on ERS8300-1 will be configured with IP address 10.83.100.2/24
  - VLAN 1000 on ERS8300-2 will be configured with IP address 10.83.100.3/24
  - Both ERS8300-1 and ERS8300-2 will be configured with OSPF passive interface as both switches are connected to Layer 2 access switches. This prevent OSPF messages being send to the access switches
  - Use default OSPF timers
- Enable VRRP on VLAN 1000 with the following settings
  - Enable backup master
  - Set the hold down timer to 60 seconds on ERS8300-1 ERS8300-2
  - Set the VRRP VIP to 10.83.100.1 on both switches in the SMLT cluster
  - Set the VRRP virtual router id to 10

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- Set the VRRP priority to 200 on ERS8300-1 so that it becomes the VRRP master and use the default value of 100 on ERS-8300-2 so that it becomes the VRRP backup

The VRRP hold down timer should be set long enough such that the IGP routing protocol has time to converge and update the routing table. In some cases, setting the VRRP hold down timer a minimum of 1.5 times the IGP convergence time should be sufficient. For OSPF, it is suggested to use a value of 60 seconds if using the default OSPF timers.

2.10.1 Configuration – ERS8300 Layer 3 Switch Cluster using VRRP Backup Master

2.10.1.1 Add IP address to VLAN 1000

ERS8300-1: Step 1 – Add IP address to VLAN 1000

```
ERS8300-1:5(config)#interface vlan 1000
ERS8300-1:5(config-if)#ip address 10.83.100.2 255.255.255.0
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Add IP address to VLAN 1000

```
ERS8300-2:5# config vlan 1000 ip create 10.83.100.3/24
```

2.10.1.2 Enable OSPF

VLAN 10 will be configured with OSPF passive interface on the SMLT Switch cluster.

ERS8300-1: Step 1 – Enable OSPF to VLAN 1000 with passive interface

```
ERS8300-1:5(config)#interface vlan 1000
ERS8300-1:5(config-if)#ip ospf interface-type passive
ERS8300-1:5(config-if)#ip ospf enable
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Enable OSPF to VLAN 1000 with passive interface

```
ERS8300-2:5# config vlan 1000 ip ospf interface-type passive
ERS8300-2:5# config vlan 1000 ip ospf enable
```

ERS8300-1: Step 2 – Enable OSPF globally

```
ERS8300-1:5(config)#router ospf enable
```

ERS8300-2: Step 2 – Enable OSPF globally

```
ERS8300-2:5# config ip ospf enable
```

2.10.1.3 Enable VRRP

ERS8300-1: Step 1 – Add VRRP VIP

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```
ERS8300-1:5(config)#interface vlan 1000
ERS8300-1:5(config-if)#ip vrrp address 10 10.83.100.1
```

ERS8300-2: Step 1 – Add VRRP VIP

```
ERS8300-2:5# config vlan 1000 ip vrrp 10 address 10.83.100.1
```

ERS8600-1: Step 2 – Enable backup master

```
ERS8300-1:5(config-if)#ip vrrp 10 backup-master enable
```

ERS8300-2: Step 2 – Enable backup master

```
ERS8300-2:5# config vlan 1000 ip vrrp 10 backup-master enable
```

ERS8300-1: Step 3 – Set the hold down timer to 60 seconds

```
ERS8300-1:5(config-if)#ip vrrp 10 holddown-timer 60
```

ERS8300-2: Step 3 – Set the hold down timer to 60 seconds

```
ERS8300-2:5# config vlan 1000 ip vrrp 10 holddown-timer 60
```

ERS8300-1: Step 4 – Set VRRP priority

```
ERS8300-1:5(config-if)#ip vrrp 10 priority 200
```

ERS8300-1: Step 6 – Enable VRRP

```
ERS8300-1:5(config-if)#ip vrrp 10 enable
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 6 – Enable VRRP

```
ERS8300-2:5# config vlan 10 ip vrrp 10 enable
```

Please note that VRRP fast-advertise is not supported at this time on the ERS8300.

2.10.1.4 DHCP Relay – Optional

If you wish to enable DHCP Relay on VLAN 1000, please enter the following commands assuming the DHCP relay agent is 172.30.30.20.

ERS8300-1: Step 1 – Enable DHCP Relay on VLAN 1000

```
ERS8300-1:5(config)#interface vlan 1000
ERS8300-1:5(config-if)#ip dhcp-relay
ERS8300-1:5(config-if)#exit
```

ERS8300-2: Step 1 – Enable DHCP Relay on VLAN 10

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```
ERS8300-2:5# config vlan 1000 ip dhcp-relay enable
```

ERS8300-1: Step 2 – Enable DHCP agent

```
ERS8300-1:5(config)#ip dhcp-relay fwd-path 10.83.100.2 172.30.30.20
ERS8300-1:5(config)#ip dhcp-relay fwd-path 10.83.100.2 172.30.30.20 mode dhcp
ERS8300-1:5(config)#ip dhcp-relay fwd-path 10.83.100.2 172.30.30.20 enable
```

ERS8300-2: Step 2 – Enable DHCP agent

```
ERS8300-2:5# config ip dhcp-relay create-fwd-path agent 10.83.100.3 server
172.30.30.20 mode dhcp state enable
```

2.10.2 Verify Operations

2.10.2.1 VRRP Operations

Step 1 – Verify that the MLT instances is configured correctly and is functioning by issuing the following command:

```
ERS8300-1:5# show ip vrrp address vrid 10
```

Result:

```
================================================================================
                                    Vrrp Info
================================================================================

VRID  P/V   IP              MAC                STATE    CONTROL  PRIO  ADV
--------------------------------------------------------------------------------
10    10    10.83.100.1     00:00:5e:00:01:0a  Master   Enabled  200   1

VRID  P/V   MASTER          UP TIME               HLD DWN  CRITICAL IP (ENABLED)
--------------------------------------------------------------------------------
10    10    10.83.100.2     0 day(s), 00:03:48    0        0.0.0.0         (No)

VRID  P/V   BACKUP MASTER   BACKUP MASTER STATE
--------------------------------------------------------------------------------
10    10    enable          down
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VRID	Verify that the VRRP VID is ***10*** on both ERS8300-1 and ERS8300-2. If not, there is a configuration error.
IP	Verify that the VRRP IP address is ***10.83.100.1*** on both ERS8300-1 and ERS8300-2. If not, there is a configuration error.
MAC	The VRRP MAC on both switches in the SMLT cluster should be the same.
STATE	Verify the VRRP state: • ERS8300-1: ***Master***

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	• ERS8300-2: ***Back Up***
PRIO	Verify that the VRRP priority is set to ***200*** on ERS8600-1 and ***100*** on ERS8600-2. If not, configure the appropriate VRRP priority.
MASTER	Verify that VRRP master's IP address belongs to ERS8600-1 on both switches: • ERS8300-1: ***10.83.100.2*** • ERS8300-2: ***10.83.100.2***
BACKUP MASTER	Verify that backup master is set to ***enable*** on both switches. If not, enable VRRP backup master.
BACKUP MASTER STATE	Verify that VRRP backup master state on both switches: • ERS8300-1: ***down*** • ERS8300-2: ***up***

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3. Configuring SMLT – Square and Full Mesh Topology Examples

3.1 Configuration – ERS8600 Layer 2 Square SMLT with Cisco at Edge Using EtherChannel

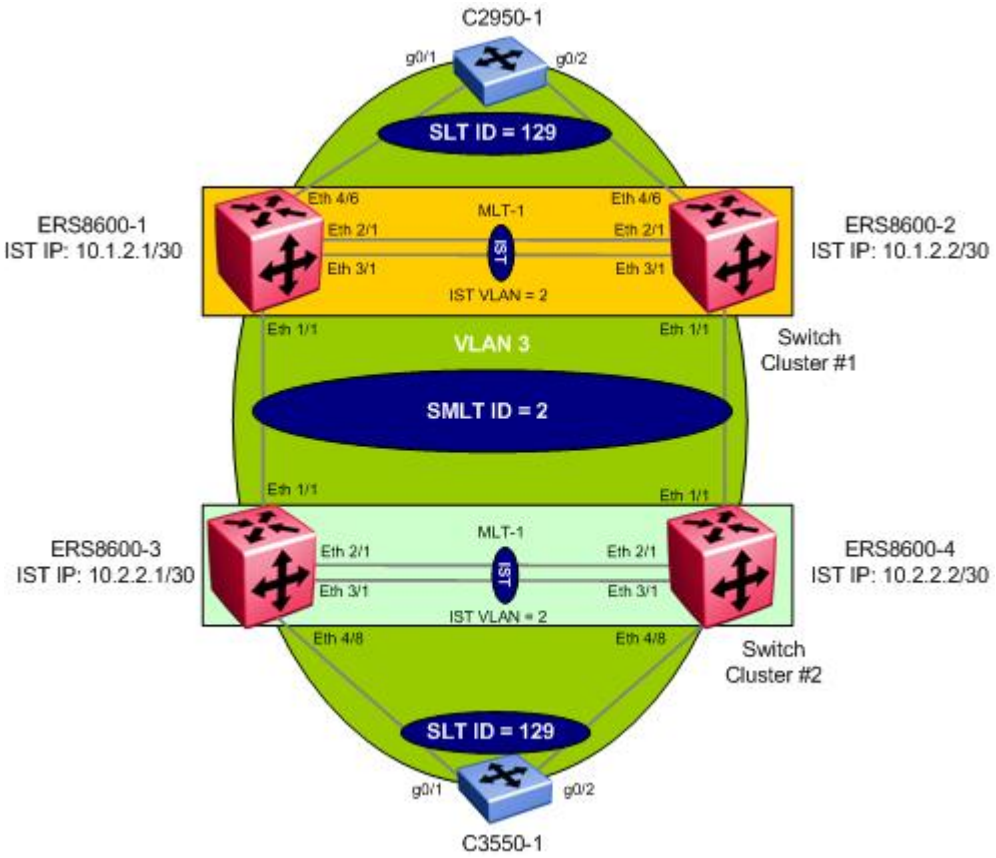

Figure 11: Square SMLT Configuration

The Square SMLT configuration procedure is repeating the triangle configuration steps twice. The Full Mesh SMLT configuration is the same as the square configuration with the addition of adding connections between the Switch Clusters – e.g. ERS8600-1 to ERS8600-4 and ERS8600-2 and ERS8600-3.

The main rule for a square configuration is that the IST pairs, Switch Cluster #1 and Switch Cluster #2, each must have matching SMLT IDs. The SMLT IDs can be different between the two SMLT Clusters as they only have local significance within the cluster. For example, we could use SMLT ID = 2 with port member 1/1 in Switch Cluster #1 and use SMLT ID = 15 with port member 1/1 in Switch Cluster #2. However, this is not recommened as it is best to use the same SMLT ID for ease of configuration and trouble-shooting problems.

In regards to SLPP, as this is a bridged network end-to-end, it is recommended to use a SLPP Packet Receive Threshold of 300 on the primary switches core ports connecting the two SMLT clusters. In our example, this is in reference to port 1/1 on switches ERS8600-1 and ERS8600-2.

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For this configuration example, Cisco switches are used at the SMLT access layer using Etherchannel to connect to the SMLT Cluster. Please note that any local proprietary load-balance mechanism or 802.3ad can be used to connect to an SMLT Cluster.

It is recommended to use the same SMLT ID's between the two SMLT clusters for ease in configuration and trouble-shooting.

It is recommended to use a unique IP subnet between the SMLT Cluster.

As illustrated in the diagram above, the SMLT or SLT ID is local to an SMLT Cluster. Hence the reason we are using SLT-129 in both Switch Cluster #1 and Switch Cluster #2. Please not that this is not a requirement; it just illustrates the flexibility of the solution.

3.1.1 Switch Cluster

3.1.1.1 Create VLANs

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 3 to be used at a Layer 2 level to C2950-1 and C3550-2 for connecting users.

Switch Cluster #1
ERS8600-1: Step 1 – Create VLANs 2 and 3
ERS8600-1:5# ***config vlan 2 create byport 1 name IST*** ERS8600-1:5# ***config vlan 3 create byport 1 name Services***
ERS8600-2: Step 1 – Create VLAN 2 and 3
ERS8600-2:5# ***config vlan 2 create byport 1 name IST*** ERS8600-2:5# ***config vlan 3 create byport 1 name Services***
Switch Cluster #2
ERS8600-3: Step 1 – Create VLANs 2 and 3
ERS8600-3:5# ***config vlan 2 create byport 1 name IST*** ERS8600-3:5# ***config vlan 3 create byport 1 name Services***
ERS8600-4: Step 1 – Create VLAN 2 and 3
ERS8600-4:5# ***config vlan 2 create byport 1 name IST*** ERS8600-4:5# ***config vlan 3 create byport 1 name Services***

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3.1.1.2 Change fdb aging timer for VLAN 3

Switch Cluster #1
ERS8600-1: Step 1 – Change fdb aging timer for VLAN 3
ERS8600-1:5# ***config vlan 3 fdb-entry aging-time 21601***
ERS8600-2: Step 1 – Change fdb aging timer for VLAN 3
ERS8600-2:5# ***config vlan 3 fdb-entry aging-time 21601***
Switch Cluster #2
ERS8600-3: Step 1 – Change fdb aging timer for VLAN 3
ERS8600-3:5# ***config vlan 3 fdb-entry aging-time 21601***
ERS8600-4: Step 1 – Change fdb aging timer for VLAN 3
ERS8600-4:5# ***config vlan 3 fdb-entry aging-time 21601***

3.1.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 2/1 and 3/1. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members by default. VLACP will be enabled on the IST trunk.

It is recommended to use the reserved multicast MAC address of 01:80:c2:00:00:0f for the VLACP MAC address.

Switch Cluster #1
ERS8600-1: Step 1 – Create MLT 1 for IST
ERS8600-1:5# ***config mlt 1 create*** ERS8600-1:5# ***config mlt 1 name IST*** ERS8600-1:5# ***config mlt 1 add port 2/1,3/1*** ERS8600-1:5# ***config vlan 2 add-mlt 1***
ERS8600-2: Step 1 – Create MLT 1 for IST
ERS8600-2:5# ***config mlt 1 create*** ERS8600-2:5# ***config mlt 1 name IST*** ERS8600-2:5# ***config mlt 1 add port 2/1,3/1*** ERS8600-2:5# ***config vlan 2 add-mlt 1***
ERS8600-1: Step 2 – Create IST
ERS8600-1:5# ***config vlan 2 ip create 10.1.2.1/30***

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```
ERS8600-1:5# config mlt 1 ist create ip 10.1.2.2 vlan-id 2
ERS8600-1:5# config mlt 1 ist enable
```

ERS8600-2: Step 2 – Create IST

```
ERS8600-2:5# config vlan 2 ip create 10.1.2.2/30
ERS8600-2:5# config mlt 1 ist create ip 10.1.2.1 vlan-id 2
ERS8600-2:5# config mlt 1 ist enable
```

ERS8600-1: Step 3 – Enable VLACP

```
ERS8600-1:5# ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-1:5# ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-1:5# ethernet 2/1,3/1 vlacp enable
ERS8600-1:5# config vlacp enable
```

ERS8600-2: Step 3 – Enable VLACP

```
ERS8600-2:5# ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-2:5# ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-2:5# ethernet 2/1,3/1 vlacp enable
ERS8600-2:5# config vlacp enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Create MLT 1 for IST

```
ERS8600-3:5# config mlt 1 create
ERS8600-3:5# config mlt 1 name IST
ERS8600-3:5# config mlt 1 add port 2/1,3/1
ERS8600-3:5# config vlan 2 add-mlt 1
```

ERS8600-4: Step 1 – Create MLT 1 for IST

```
ERS8600-4:5# config mlt 1 create
ERS8600-4:5# config mlt 1 name IST
ERS8600-4:5# config mlt 1 add port 2/1,3/1
ERS8600-4:5# config vlan 2 add-mlt 1
```

ERS8600-3: Step 2 – Create IST

```
ERS8600-3:5# config vlan 2 ip create 10.2.2.1/30
ERS8600-3:5# config mlt 1 ist create ip 10.2.2.2 vlan-id 2
ERS8600-3:5# config mlt 1 ist enable
```

ERS8600-4: Step 2 – Create IST

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```
ERS8600-4:5# config vlan 2 ip create 10.2.2.2/30
ERS8600-4:5# config mlt 1 ist create ip 10.2.2.1 vlan-id 2
ERS8600-4:5# config mlt 1 ist enable
```

ERS8600-3: Step 3 – Enable VLACP

```
ERS8600-3:5# ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-3:5# ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-3:5# ethernet 2/1,3/1 vlacp enable
ERS8600-3:5# config vlacp enable
```

ERS8600-4: Step 3 – Enable VLACP

```
ERS8600-4:5# ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-4:5# ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-4:5# ethernet 2/1,3/1 vlacp enable
ERS8600-4:5# config vlacp enable
```

3.1.1.4 SMLT-2

Switch Cluster #1

ERS8600-1: Step 1 – Create SMLT-2

```
ERS8600-1:5# config mlt 2 create
ERS8600-1:5# config mlt 2 name CORE
ERS8600-1:5# config mlt 2 perform-tagging enable
ERS8600-1:5# config mlt 2 add port 1/1
ERS8600-1:5# config vlan 2 add-mlt 2
ERS8600-1:5# config mlt 2 smlt create smlt-id 2
```

ERS8600-2: Step 1 – Create SMLT-2

```
ERS8600-2:5# config mlt 2 create
ERS8600-2:5# config mlt 2 name CORE
ERS8600-2:5# config mlt 2 perform-tagging enable
ERS8600-2:5# config mlt 2 add port 1/1
ERS8600-2:5# config vlan 3 add-mlt 2
ERS8600-2:5# config mlt 2 smlt create smlt-id 2
```

Switch Cluster #2

ERS8600-3: Step 1 – Create SMLT-2

```
ERS8600-3:5# config mlt 2 create
```

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```
ERS8600-3:5# config mlt 2 name CORE
ERS8600-3:5# config mlt 2 perform-tagging enable
ERS8600-3:5# config mlt 2 add port 1/1
ERS8600-3:5# config vlan 3 add-mlt 2
ERS8600-3:5# config mlt 2 smlt create smlt-id 2
```

ERS8600-4: Step 1 – Create SMLT-2

```
ERS8600-4:5# config mlt 2 create
ERS8600-4:5# config mlt 2 name CORE
ERS8600-4:5# config mlt 2 perform-tagging enable
ERS8600-4:5# config mlt 2 add port 1/1
ERS8600-4:5# config vlan 3 add-mlt 2
ERS8600-4:5# config mlt 2 smlt create smlt-id 2
```

Please note that although we used the same SMLT ID in the core for SMLT cluster 1 and 2, it is not a requirement. The SMLT and IST ID's are local to each SMLT cluster. In the core, it is best practice to use the same SMLT ID's for ease of configuration and trouble-shooting purposes.

3.1.1.5 Add VLAN 3 to IST

Switch Cluster #1

ERS8600-1: Step 1 – Add VLAN 3 to IST MLT

```
ERS8600-1:5# config vlan 3 add-mlt 1
```

ERS8600-2: Step 1 – Add VLAN 3 to IST MLT

```
ERS8600-2:5# config vlan 3 add-mlt 1
```

Switch Cluster #2

ERS8600-3: Step 1 – Add VLAN 3 to IST MLT

```
ERS8600-3:5# config vlan 3 add-mlt 1
```

ERS8600-4: Step 1 – Add VLAN 3 to IST MLT

```
ERS8600-4:5# config vlan 3 add-mlt 1
```

3.1.1.6 SLT-129 to C2950-1

Switch Cluster #1

ERS8600-1: Step 1 – Create SLT-129

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```
ERS8600-1:5# config ethernet 4/6 perform-tagging enable
ERS8600-1:5# config vlan 1 ports remove 4/6
ERS8600-1:5# config vlan 3 ports add 4/6
ERS8600-1:5# config ethernet 4/6 smlt 129 create
```

ERS8600-2: Step 1 – Create SLT-129

```
ERS8600-2:5# config ethernet 4/6 perform-tagging enable
ERS8600-2:5# config vlan 1 ports remove 4/6
ERS8600-2:5# config vlan 3 ports add 4/6
ERS8600-2:5# config ethernet 4/6 smlt 129 create
```

3.1.1.7 SLT-129 to C3550-1

Switch Cluster #2

ERS8600-3: Step 1 – Create SLT-129

```
ERS8600-3:5# config ethernet 4/8 perform-tagging enable
ERS8600-3:5# config vlan 1 ports remove 4/8
ERS8600-3:5# config vlan 3 ports add 4/8
ERS8600-3:5# config ethernet 4/8 smlt 129 create
```

ERS8600-4: Step 1 – Create SLT-129

```
ERS8600-4:5# config ethernet 4/8 perform-tagging enable
ERS8600-4:5# config vlan 1 ports remove 4/8
ERS8600-4:5# config vlan 3 ports add 4/8
ERS8600-4:5# config ethernet 4/8 smlt 129 create
```

3.1.1.8 CP Limit – SMLT port members

CP Limit will be enabled on all the SMLT Access port members. For this example, we will select the moderate recommendations for CP-Limit.

Switch Cluster #1

ERS8600-1: Step 1 – CP Limit for SMLT Access ports

```
ERS8600-1:5# config ethernet 4/6 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

ERS8600-2: Step 1 – CP Limit for SMLT Access ports

```
ERS8600-2:5# config ethernet 4/6 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

ERS8600-1: Step 2 – CP Limit for SMLT Core ports

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```
ERS8600-1:5# config ethernet 1/1 cp-limit enable multicast-limit 5000
broadcast-limit 5000
```

ERS8600-2: Step 2 – CP Limit for SMLT Core ports

```
ERS8600-2:5# config ethernet 1/1 cp-limit enable multicast-limit 5000
broadcast-limit 5000
```

Switch Cluster #2

ERS8600-3: Step 1 – CP Limit for SMLT Access ports

```
ERS8600-3:5# config ethernet 4/8 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

ERS8600-4: Step 1 – CP Limit for SMLT Access ports

```
ERS8600-4:5# config ethernet 4/8 cp-limit enable multicast-limit 2500
broadcast-limit 2500
```

ERS8600-3: Step 2 – CP Limit for SMLT Core ports

```
ERS8600-3:5# config ethernet 1/1 cp-limit enable multicast-limit 5000
broadcast-limit 5000
```

ERS8600-4: Step 2 – CP Limit for SMLT Core ports

```
ERS8600-4:5# config ethernet 1/1 cp-limit enable multicast-limit 5000
broadcast-limit 5000
```

3.1.1.9 SLPP

For this example, we will pick ERS8600-1 as the primary switch for switch cluster 1 and ERS8600-3 as primary for switch cluster 2. SLPP will be enabled globally and on the SMLT access ports 4/6 on switch cluster 1 and 4/8 on switch cluster 2 and on core port member 1/1 on both cluster 1 and cluster 2. On the SMLT primary switch, we will set the SLPP packet-rx-threshold to 5 while on the SMLT secondary switch, we will set the SLPP packet-rx-threshold to 50 for the access ports. As this is a bridged network end-to-end, on the SMLT primary switch only, we will set the SLPP packet-rx-threshold to 300 for the core ports

SLPP should only be enabled on the SMLT access or core ports and not on the IST port members.

Switch Cluster #1

ERS8600-1: Step 1 – Enable SLPP and in regards to the core port on the primary switch only, set the SLPP Rx-Threshold with a value of 300

```
ERS8600-1:5# config slpp add 3
ERS8600-1:5# config slpp operation enable
ERS8600-1:5# config ethernet 1/1,4/6 slpp packet-rx enable
ERS8600-1:5# config ethernet 4/6 slpp packet-rx-threshold 5
```

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```
ERS8600-1:5# config ethernet 1/1 slpp packet-rx-threshold 300
```

ERS8600-2: Step 1 – Enable SLPP

```
ERS8600-2:5# config slpp add 3
ERS8600-2:5# config slpp operation enable
ERS8600-2:5# ethernet 4/6 slpp packet-rx enable
ERS8600-2:5# ethernet 4/6 slpp packet-rx-threshold 50
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable SLPP and in regards to the core port on the primary switch only, set the SLPP Rx-Threshold with a value of 300

```
ERS8600-3:5# config slpp add 3
ERS8600-3:5# config slpp operation enable
ERS8600-3:5# config ethernet 1/1,4/8 slpp packet-rx enable
ERS8600-3:5# config ethernet 4/8 slpp packet-rx-threshold 5
ERS8600-3:5# config ethernet 1/1 slpp packet-rx-threshold 300
```

ERS8600-4: Step 1 – Enable SLPP

```
ERS8600-4:5# config slpp add 3
ERS8600-4:5# config slpp operation enable
ERS8600-4:5# ethernet 4/8 slpp packet-rx enable
ERS8600-4:5# ethernet 4/8 slpp packet-rx-threshold 50
```

3.1.1.10 VLACP – SMLT Core

We will enable VLACP and use the short timeout option with a timeout setting of 500ms on the SMLT core port 1/1.

Switch Cluster #1

ERS8600-1: Step 1 – Enable VLACP

```
ERS8600-1:5# config ethernet 1/1 vlacp fast-periodic-time 500
ERS8600-1:5# config ethernet 1/1 vlacp timeout short
ERS8600-1:5# config ethernet 1/1 vlacp timeout-scale 5
ERS8600-1:5# config ethernet 1/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-1:5# config ethernet 1/1 vlacp enable
```

ERS8600-2: Step 1 – Enable VLACP

```
ERS8600-2:5# config ethernet 1/1 vlacp fast-periodic-time 500
ERS8600-2:5# config ethernet 1/1 vlacp timeout short
ERS8600-2:5# config ethernet 1/1 vlacp timeout-scale 5
```

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```
ERS8600-2:5# config ethernet 1/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-2:5# config ethernet 1/1 vlacp enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable VLACP

```
ERS8600-3:5# config ethernet 1/1 vlacp fast-periodic-time 500
ERS8600-3:5# config ethernet 1/1 vlacp timeout short
ERS8600-3:5# config ethernet 1/1 vlacp timeout-scale 5
ERS8600-3:5# config ethernet 1/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-3:5# config ethernet 1/1 vlacp enable
```

ERS8600-4: Step 1 – Enable VLACP

```
ERS8600-4:5# config ethernet 1/1 vlacp fast-periodic-time 500
ERS8600-4:5# config ethernet 1/1 vlacp timeout short
ERS8600-3:5# config ethernet 1/1 vlacp timeout-scale 5
ERS8600-4:5# config ethernet 1/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-4:5# config ethernet 1/1 vlacp enable
```

Do not enable VLACP on a port level until the VLACP MAC address has been changed.

3.1.1.11 Ext-CP Limit

Ext-CP Limit will be enable globally and on the SMLT access ports in the SMLT switch cluster. The SoftDown option will be used with the bandwidth utilization threshold set to 10%.

Switch Cluster #1

ERS8600-1: Step 1 – Enable EXT-CP-Limit

```
ERS8600-1:5# config sys ext-cp-limit extcplimit enable
ERS8600-1:5# config sys ext-cp-limit max-ports-to-check 5
ERS8600-1:5# config sys ext-cp-limit trap-level Normal
ERS8600-1:5# config ethernet 4/6 ext-cp-limit SoftDown threshold-util-
rate 10
```

ERS8600-1: Step 2 – Enable EXT-CP-Limit

```
ERS8600-1:5# config sys ext-cp-limit extcplimit enable
ERS8600-1:5# config sys ext-cp-limit max-ports-to-check 5
ERS8600-1:5# config sys ext-cp-limit trap-level Normal
ERS8600-1:5# config ethernet 4/6 ext-cp-limit SoftDown threshold-util-
rate 10
```

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Switch Cluster #2
ERS8600-3: Step 1 – Enable EXT-CP-Limit
ERS8600-3:5# ***config sys ext-cp-limit extcplimit enable***
ERS8600-3:5# ***config sys ext-cp-limit max-ports-to-check 5***
ERS8600-3:5# ***config sys ext-cp-limit trap-level Normal***
ERS8600-3:5# ***config ethernet 4/8 ext-cp-limit SoftDown threshold-util-rate 10***
ERS8600-4: Step 2 – Enable EXT-CP-Limit
ERS8600-4:5# ***config sys ext-cp-limit extcplimit enable***
ERS8600-4:5# ***config sys ext-cp-limit max-ports-to-check 5***
ERS8600-4:5# ***config sys ext-cp-limit trap-level Normal***
ERS8600-4:5# ***config ethernet 4/8 ext-cp-limit SoftDown threshold-util-rate 10***

3.1.1.12 Discard Untagged Frames

It is recommended to enable discard untagged frames on all IST and SMLT ports.

Switch Cluster #1
ERS8600-1: Step 1 – Enable Discard Untagged Frames
ERS8600-1:5# ***config ethernet 2/1,3/1,4/6 untagged-frames-discard enable***
ERS8600-2: Step 1 – Enable Discard Untagged Frames
ERS8600-2:5# ***config ethernet 2/1,3/1,3/13,4/6 untagged-frames-discard enable***
Switch Cluster #2
ERS8600-3: Step 1 – Enable Discard Untagged Frames
ERS8600-3:5# ***config ethernet 2/1,3/1,3/13,4/8 untagged-frames-discard enable***
ERS8600-4: Step 1 – Enable Discard Untagged Frames
ERS8600-4:5# ***config ethernet 2/1,3/1,3/13,4/8 untagged-frames-discard enable***

3.1.2 Configuration - Edge Switch

3.1.2.1 C3550

Note: Spanning Tree, PVST+, is enabled by default on a Cisco switch. Spanning Tree should be left enabled on all user ports and set for portfast, but disabled on the trunk EtherChannel ports. This can

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be accomplished on the Port-channel ports using the command ‘spanning-tree bpdufilter enable’ command.

```
!
spanning-tree mode pvst
spanning-tree extend system-id
no spanning-tree vlan 3
!
vlan dot1q tag native
!
interface Port-channel1
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 3
 switchport mode trunk
 spanning-tree bpdufilter enable
!
interface FastEthernet0/3
 switchport access vlan 3
 switchport mode access
 spanning-tree portfast
!
interface FastEthernet0/4
 switchport access vlan 3
 switchport mode access
 spanning-tree portfast
!
interface GigabitEthernet0/1
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 3
 switchport mode trunk
 channel-group 1 mode on
!
interface GigabitEthernet0/2
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 3
 switchport mode trunk
 channel-group 1 mode on
!
```

3.1.2.2 C2950

```
!
spanning-tree mode pvst
no spanning-tree optimize bpdu transmission
spanning-tree extend system-id
!
interface Port-channel1
 switchport trunk allowed vlan 3
 switchport mode trunk
!
interface FastEthernet0/3
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/4
 switchport access vlan 3
```

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```
 switchport mode access
!
interface GigabitEthernet0/1
 switchport trunk allowed vlan 3
 switchport mode trunk
 channel-group 1 mode on
!
interface GigabitEthernet0/2
 switchport trunk allowed vlan 3
 switchport mode trunk
 channel-group 1 mode on
!
```

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3.2 Configuration – ERS8600 Layer 3 Routed SMLT in SMLT Full Mesh Core

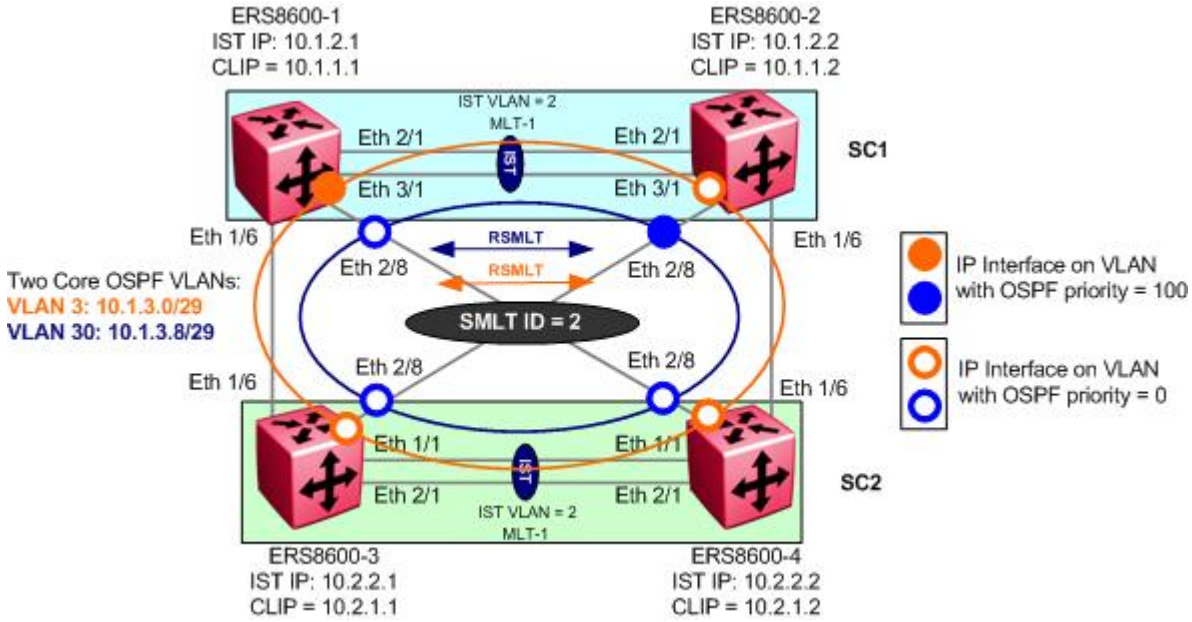

Figure 12: RSMLT Full Mesh Core Configuration

The following example is based on a full mesh SMLT core using Routed SMLT (RSMLT) in the core. Please see configuration example 2.4 for configuring RSMLT at the SMLT access layer. For this example, we will use OSPF as the routing protocol. For simplicity, we will use OSPF area 0.

In reference to the diagram above, we will configure the following:

- Overall, this configuration example will cover the configuration steps required for ERS8600-1, ERS8600-1, ERS8600-3, and ERS8600-4.
- Via Switch Cluster #1, we will configure
  - VLAN 2 for the IST VLAN using MLT ID = 1
  - VLAN 3 and 30 for the core VLANs using MLT and SMLT ID = 2
  - OSPF as the IGP using area 0
  - ERS8600-1 OSPF priority to 100 for VLAN 3 and 0 for VLAN 30
  - ERS8600-2 OSPF priority to 0 for VLAN 3 and 100 for VLAN 30
  - IST IP subnet 10.1.2.0/30
  - Enable VLACP using recommended reserved MAC
  - Using the CLIP address as the OSPF router ID
  - Enable SLPP on the core VLANs with a SLPP Packet Receive thresholdof 5 on ERS8600-1 assuming ERS8600-1 is the primary switch and a threshold of 50 on ERS8600-2 assuming it is the secondary switch
- Via Switch Cluster #2, we will configure
  - VLAN 2 for the IST VLAN using MLT ID = 1
  - VLAN 3 and 30 for the core VLANs using MLT and SMLT ID = 2
  - OSPF as the IGP using area 0
  - ERS8600-3 and ERS8600-4 OSPF priority to 0 for VLAN 3 and VLAN 30
  - IST IP subnet 10.2.2.0/30
  - Enable VLACP using recommended reserved MAC

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- Using the CLIP address as the OSPF router ID
- Enable SLPP on the core VLANs with a SLPP Packet Receive thresholdof 5 on ERS8600-3 assuming ERS8600-1 is the primary switch and a threshold of 50 on ERS8600-4 assuming it is the secondary switch

3.2.1 RSMLT Configuration

3.2.1.1 Create VLANs

The following port based VLANs will be configured on the SMLT Switch cluster

- VLAN 2 to be used by the Inter Switch Trunk (IST)
- VLAN 3 and VLAN 30 to be used in the RSMLT core level to ERS8600-1, ERS8600-2, ERS8600-3, and ERS8600-4.

Switch Cluster #1
ERS8600-1: Step 1 – VLANs 2, 3, and 30
ERS8600-1:5# ***config vlan 2 create byport 1 name IST***
ERS8600-1:5# ***config vlan 3 create byport 1 name RSMLT_Core_1***
ERS8600-1:5# ***config vlan 30 create byport 1 name RSMLT_Core_2***
ERS8600-2: Step 1 – VLANs 2, 3, and 30
ERS8600-2:5# ***config vlan 2 create byport 1 name IST***
ERS8600-2:5# ***config vlan 3 create byport 1 name RSMLT_Core***
ERS8600-2:5# ***config vlan 30 create byport 1 name RSMLT_Core_2***
Switch Cluster #2
ERS8600-3: Step 1 – VLANs 2, 3, and 30
ERS8600-3:5# ***config vlan 2 create byport 1 name IST***
ERS8600-3:5# ***config vlan 3 create byport 1 name RSMLT_Core***
ERS8600-3:5# ***config vlan 30 create byport 1 name RSMLT_Core_2***
ERS8600-4: Step 1 – VLANs 2, 3, and 30
ERS8600-4:5# ***config vlan 2 create byport 1 name IST***
ERS8600-4:5# ***config vlan 3 create byport 1 name RSMLT_Core***
ERS8600-4:5# ***config vlan 30 create byport 1 name RSMLT_Core_2***

3.2.1.2 Change fdb aging timer for VLAN 3 and 30

Switch Cluster #1
ERS8600-1: Step 1 – Change fdb aging timer for VLAN 3 and 30
ERS8600-1:5# ***config vlan 3 fdb-entry aging-time 21601***

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```
ERS8600-1:5# config vlan 30 fdb-entry aging-time 21601
```

ERS8600-2: Step 1 – Change fdb aging timer for VLAN 3 and 30

```
ERS8600-2:5# config vlan 3 fdb-entry aging-time 21601
ERS8600-2:5# config vlan 30 fdb-entry aging-time 21601
```

Switch Cluster #2

ERS8600-3: Step 1 – Change fdb aging timer for VLAN 3 and 30

```
ERS8600-3:5# config vlan 3 fdb-entry aging-time 21601
ERS8600-3:5# config vlan 30 fdb-entry aging-time 21601
```

ERS8600-4: Step 1 – Change fdb aging timer for VLAN 3 and 30

```
ERS8600-4:5# config vlan 3 fdb-entry aging-time 21601
ERS8600-4:5# config vlan 30 fdb-entry aging-time 21601
```

3.2.1.3 Create IST

Multilink Trunking 1 (MLT 1) will be used for the IST with port members 2/1 and 3/1 for SMLT cluster 1. We will also use MLT 1 for the IST for SMLT cluster 2 with port members 1/1 and 2/1. 802.1Q tagging will be enabled on all IST port members and Spanning Tree will be disabled on all IST port members by default. VLACP will be enabled on the IST trunk.

It is recommended to use the reserved multicast MAC address of 01:80:c2:00:00:0f for the VLACP MAC address.

Switch Cluster #1

ERS8600-1: Step 1 – Create MLT 1 for IST

```
ERS8600-1:5# config mlt 1 create
ERS8600-1:5# config mlt 1 name IST
ERS8600-1:5# config mlt 1 add port 2/1,3/1
ERS8600-1:5# config vlan 2 add-mlt 1
```

ERS8600-2: Step 1 – Create MLT 1 for IST

```
ERS8600-2:5# config mlt 1 create
ERS8600-2:5# config mlt 1 name IST
ERS8600-2:5# config mlt 1 add port 2/1,3/1
ERS8600-2:5# config vlan 2 add-mlt 1
```

ERS8600-1: Step 2 – Create IST

```
ERS8600-1:5# config vlan 2 ip create 10.1.2.1/30
ERS8600-1:5# config mlt 1 ist create ip 10.1.2.2 vlan-id 2
```

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```
ERS8600-1:5# config mlt 1 ist enable
```

ERS8600-2: Step 2 – Create IST

```
ERS8600-2:5# config vlan 2 ip create 10.1.2.2/30
ERS8600-2:5# config mlt 1 ist create ip 10.1.2.1 vlan-id 2
ERS8600-2:5# config mlt 1 ist enable
```

ERS8600-1: Step 3 – Enable VLACP

```
ERS8600-1:5# config ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-1:5# config ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-1:5# ethernet 2/1,3/1 vlacp enable
ERS8600-1:5# config vlacp enable
```

ERS8600-2: Step 3 – Enable VLACP

```
ERS8600-2:5# ethernet 2/1,3/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-2:5# ethernet 2/1,3/1 vlacp slow-periodic-time 10000
ERS8600-2:5# ethernet 2/1,3/1 vlacp enable
ERS8600-2:5# config vlacp enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Create MLT 1 for IST

```
ERS8600-3:5# config mlt 1 create
ERS8600-3:5# config mlt 1 name IST
ERS8600-3:5# config mlt 1 add port 1/1,2/1
ERS8600-3:5# config vlan 2 add-mlt 1
```

ERS8600-4: Step 1 – Create MLT 1 for IST

```
ERS8600-4:5# config mlt 1 create
ERS8600-4:5# config mlt 1 name IST
ERS8600-4:5# config mlt 1 add port 1/1,2/1
ERS8600-4:5# config vlan 2 add-mlt 1
```

ERS8600-3: Step 2 – Create IST

```
ERS8600-3:5# config vlan 2 ip create 10.2.2.1/30
ERS8600-3:5# config mlt 1 ist create ip 10.2.2.2 vlan-id 2
ERS8600-3:5# config mlt 1 ist enable
```

ERS8600-4: Step 2 – Create IST

```
ERS8600-4:5# config vlan 2 ip create 10.2.2.2/30
```

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```
ERS8600-4:5# config mlt 1 ist create ip 10.2.2.1 vlan-id 2
ERS8600-4:5# config mlt 1 ist enable
```

ERS8600-3: Step 3 – Enable VLACP

```
ERS8600-3:5# ethernet 1/1,2/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-3:5# ethernet 1/1,2/1 vlacp slow-periodic-time 10000
ERS8600-3:5# ethernet 1/1,2/1 vlacp enable
ERS8600-3:5# config vlacp enable
```

ERS8600-4: Step 3 – Enable VLACP

```
ERS8600-4:5# ethernet 1/1,2/1 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-4:5# ethernet 1/1,2/1 vlacp slow-periodic-time 10000
ERS8600-4:5# ethernet 1/1,2/1 vlacp enable
ERS8600-4:5# config vlacp enable
```

3.2.1.4 SMLT-2 for RSMLT Core

Switch Cluster #1

ERS8600-1: Step 1 – Create SMLT-2

```
ERS8600-1:5# config mlt 2 create
ERS8600-1:5# config mlt 2 name RSMLT_Core
ERS8600-1:5# config mlt 2 perform-tagging enable
ERS8600-1:5# config mlt 2 add port 1/6,2/8
ERS8600-1:5# config vlan 3 add-mlt 2
ERS8600-1:5# config vlan 30 add-mlt 2
ERS8600-1:5# config mlt 2 smlt create smlt-id 2
```

ERS8600-2: Step 1 – Create SMLT-2

```
ERS8600-2:5# config mlt 2 create
ERS8600-2:5# config mlt 2 name RSMLT_Core
ERS8600-2:5# config mlt 2 perform-tagging enable
ERS8600-2:5# config mlt 2 add port 1/6,2/8
ERS8600-2:5# config vlan 3 add-mlt 2
ERS8600-2:5# config vlan 30 add-mlt 2
ERS8600-2:5# config mlt 2 smlt create smlt-id 2
```

Switch Cluster #2

ERS8600-3: Step 1 – Create SMLT-2

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```
ERS8600-3:5# config mlt 2 create
ERS8600-3:5# config mlt 2 name RSMLT_Core
ERS8600-3:5# config mlt 2 perform-tagging enable
ERS8600-3:5# config mlt 2 add port 1/6,2/8
ERS8600-3:5# config vlan 3 add-mlt 2
ERS8600-3:5# config vlan 30 add-mlt 2
ERS8600-3:5# config mlt 2 smlt create smlt-id 2
```

ERS8600-4: Step 1 – Create SMLT-2

```
ERS8600-4:5# config mlt 2 create
ERS8600-4:5# config mlt 2 name RSMLT_Core
ERS8600-4:5# config mlt 2 perform-tagging enable
ERS8600-4:5# config mlt 2 add port 1/6,2/8
ERS8600-4:5# config vlan 3 add-mlt 2
ERS8600-4:5# config vlan 30 add-mlt 2
ERS8600-4:5# config mlt 2 smlt create smlt-id 2
```

3.2.1.5 Add VLAN 3 and 30 to IST

Switch Cluster #1

ERS8600-1: Step 1 – Add VLAN 3 and 30 to IST

```
ERS8600-1:5# config vlan 3 add-mlt 1
ERS8600-1:5# config vlan 30 add-mlt 1
```

ERS8600-2: Step 1 – Add VLAN 3 and 30 to IST

```
ERS8600-2:5# config vlan 3 add-mlt 1
ERS8600-2:5# config vlan 30 add-mlt 1
```

Switch Cluster #2

ERS8600-3: Step 1 – Add VLAN 3 and 30 to IST

```
ERS8600-3:5# config vlan 3 add-mlt 1
ERS8600-3:5# config vlan 30 add-mlt 1
```

ERS8600-4: Step 1 – Add VLAN 3 and 30 to IST

```
ERS8600-4:5# config vlan 3 add-mlt 1
ERS8600-4:5# config vlan 30 add-mlt 1
```

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3.2.1.6 Add IP address to VLAN 3 and VLAN 30

Switch Cluster #1
ERS8600-1: Step 1 – Add IP address to VLAN 3 and 30
ERS8600-1:5# ***config vlan 3 ip create 10.1.3.1/29*** ERS8600-1:5# ***config vlan 30 ip create 10.1.3.9/29***
ERS8600-2: Step 1 – Add IP address to VLAN 3 and 30
ERS8600-2:5# ***config vlan 3 ip create 10.1.3.2/29*** ERS8600-1:5# ***config vlan 30 ip create 10.1.3.10/29***
Switch Cluster #2
ERS8600-3: Step 1 – Add IP address to VLAN 3 and 30
ERS8600-3:5# ***config vlan 3 ip create 10.1.3.3/29*** ERS8600-3:5# ***config vlan 30 ip create 10.1.3.11/29***
ERS8600-4: Step 1 – Add IP address to VLAN 3 and 30
ERS8600-4:5# ***config vlan 3 ip create 10.1.3.4/29*** ERS8600-4:5# ***config vlan 30 ip create 10.1.3.12/29***

3.2.1.7 Circuitless IP (CLIP)

By default, the ERS8600 automatically adds an OSPF router-id. For trouble-shooting proposes or if you are using BGP-4, you may wish to set the OSPF router-id; please note that by default, the BGP router-id is derived from the OSPF router-id.

For this configuration example, assuming no exiting circuitless-ip address have already been configured, we will configure the following

- use CLIP ID 1 with the following IP addresses
  - 8600-1 : 10.1.1.1/32
  - 8600-2 : 10.1.1.2/32
  - 8600-3 : 10.2.1.1/32
  - 8300-4 : 10.2.1.2/32
- Enable OSPF on CLIP 1

Although you can use any mask with a Circuitless-IP address, it is recommended to use a 32-bit IP subnet mask.

Please note that by default, the CLIP address uses OSPF area 0. If the CLIP is used in a different OSPF area, please use the command '*config ip circuitless-ip-int <1..32> area <ipaddr>*' to change the OSPF area.

Switch Cluster #1

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ERS8600-1: Step 1 – Create CLIP 1 and enable OSPF

```
ERS8600-1:5# config ip circuitless-ip-int 1 create 10.1.1.1/32
ERS8600-1:5# config ip circuitless-ip-int 1 ospf enable
```

ERS8600-2: Step 1 – Create CLIP 1 and enable OSPF

```
ERS8600-2:5# config ip circuitless-ip-int 1 create 10.1.1.2/32
ERS8600-2:5# config ip circuitless-ip-int 1 ospf enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Create CLIP 1 and enable OSPF

```
ERS8600-3:5# config ip circuitless-ip-int 1 create 10.2.1.1/32
ERS8600-3:5# config ip circuitless-ip-int 1 ospf enable
```

ERS8600-4: Step 1 – Create CLIP 1 and enable OSPF

```
ERS8600-4:5# config ip circuitless-ip-int 1 create 10.2.1.2/32
ERS8600-4:5# config ip circuitless-ip-int 1 ospf enable
```

3.2.1.8 Change the OSPF Router-ID

Switch Cluster #1

ERS8600-1: Step 1 – Change the OSPF router-id with the CLIP address

```
ERS8600-1:5# config ip ospf router-id 10.1.1.1
```

ERS8600-2: Step 1 – Change the OSPF router-id with the CLIP address

```
ERS8600-2:5# config ip ospf router-id 10.1.1.2
```

Switch Cluster #2

ERS8600-3: Step 1 – Change the OSPF router-id with the CLIP address

```
ERS8600-3:5# config ip ospf router-id 10.2.1.1
```

ERS8600-4: Step 1 – Change the OSPF router-id with the CLIP address

```
ERS8600-4:5# config ip ospf router-id 10.2.1.2
```

3.2.1.9 Enable OSPF

VLAN 3 and 30 will be configured with OSPF on the SMLT Switch cluster. For this example, we will make ERS8600-1 the OSPF DR for VLAN 3 and make ERS8600-2 the DR for VLAN 30.

Switch Cluster #1

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ERS8600-1: Step 1 – Enable OSPF for VLAN 3 and 30 and make VLAN 3 the DR using a priority setting of 100. For VLAN 30, we will set the OSPF priority to 0.

```
ERS8600-1:5# config vlan 3 ip ospf priority 100
ERS8600-1:5# config vlan 3 ip ospf enable
ERS8600-1:5# config vlan 30 ip ospf priority 0
ERS8600-1:5# config vlan 30 ip ospf enable
```

ERS8600-2: Step 1 – Enable OSPF for VLAN 3 and 30 and make VLAN 30 the DR using a priority setting of 100. For VLAN 3, we will set the OSPF priority to 0.

```
ERS8600-2:5# config vlan 3 ip ospf priority 0
ERS8600-2:5# config vlan 3 ip ospf enable
ERS8600-2:5# config vlan 30 ip ospf priority 100
ERS8600-2:5# config vlan 30 ip ospf enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable OSPF for VLAN 3 and 30 and set the DR priority to 0.

```
ERS8600-3:5# config vlan 3 ip ospf priority 0
ERS8600-3:5# config vlan 3 ip ospf enable
ERS8600-3:5# config vlan 30 ip ospf priority 0
ERS8600-3:5# config vlan 30 ip ospf enable
```

ERS8600-4: Step 1 – Enable OSPF to VLAN 3

```
ERS8600-4:5# config vlan 3 ip ospf priority 0
ERS8600-4:5# config vlan 3 ip ospf enable
ERS8600-4:5# config vlan 30 ip ospf priority 0
ERS8600-4:5# config vlan 30 ip ospf enable
```

ERS8600-1: Step 2 – Enable OSPF globally

```
ERS8600-1:5# config ip ospf enable
```

ERS8600-2: Step 2 – Enable OSPF globally

```
ERS8600-2:5# config ip ospf enable
```

ERS8600-3: Step 2 – Enable OSPF globally

```
ERS8600-3:5# config ip ospf enable
```

ERS8600-4: Step 2 – Enable OSPF globally

```
ERS8600-4:5# config ip ospf enable
```

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3.2.1.10 Enable RSMLT

VLAN 3 with RSMLT using default timers

Switch Cluster #1
ERS8600-1: Step 1 – Enable RSMLT
ERS8600-1:5# ***config vlan 3 ip rsmlt enable*** ERS8600-1:5# ***config vlan 30 ip rsmlt enable***
ERS8600-2: Step 1 – Enable RSMLT
ERS8600-2:5# ***config vlan 3 ip rsmlt enable*** ERS8600-2:5# ***config vlan 30 ip rsmlt enable***
Switch Cluster #2
ERS8600-3: Step 1 – Enable RSMLT
ERS8600-3:5# ***config vlan 3 ip rsmlt enable*** ERS8600-3:5# ***config vlan 30 ip rsmlt enable***
ERS8600-4: Step 1 – Enable RSMLT
ERS8600-4:5# ***config vlan 3 ip rsmlt enable*** ERS8600-4:5# ***config vlan 30 ip rsmlt enable***

3.2.1.11 CP Limit – SMLT port members

CP Limit will be enabled on all the SMLT core port members. For this example, we will select the moderate recommendations for CP-Limit.

Switch Cluster #1
ERS8600-1: Step 1 – CP Limit
ERS8600-1:5# ***config ethernet 1/6,2/8 cp-limit enable multicast-limit 9000 broadcast-limit 9000***
ERS8600-2: Step 1 – CP Limit
ERS8600-2:5# ***config ethernet 1/6,2/8 cp-limit enable multicast-limit 9000 broadcast-limit 9000***
Switch Cluster #2
ERS8600-3: Step 1 – CP Limit
ERS8600-3:5# ***config ethernet 1/6,2/8 cp-limit enable multicast-limit 9000 broadcast-limit 9000***

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ERS8600-4: Step 1 – CP Limit

```
ERS8600-4:5# config ethernet 1/6,2/8 cp-limit enable multicast-limit 9000
broadcast-limit 9000
```

3.2.1.12 SLPP

SLPP will be enabled globally and on the SMLT access ports and core port members. In this example, we only show the configuration for the core ports. On the SMLT primary switch, we will set the SLPP packet-rx-threshold to 5 while on the SMLT secondary switch, we will set the SLPP packet-rx-threshold to 50 for the core ports.

SLPP should only be enabled on the SMLT access or core ports and not on the IST port members.

Switch Cluster #1

ERS8600-1: Step 1 – Enable SLPP

```
ERS8600-1:5# config slpp add 3,30
ERS8600-1:5# config slpp operation enable
ERS8600-1:5# config ethernet 1/6 slpp packet-rx enable
ERS8600-1:5# config ethernet 1/6 slpp packet-rx-threshold 5
```

ERS8600-2: Step 1 – Enable SLPP

```
ERS8600-2:5# config slpp add 3,30
ERS8600-2:5# config slpp operation enable
ERS8600-2:5# ethernet 1/6 slpp packet-rx enable
ERS8600-2:5# ethernet 1/6 slpp packet-rx-threshold 50
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable SLPP

```
ERS8600-3:5# config slpp add 3,30
ERS8600-3:5# config slpp operation enable
ERS8600-3:5# config ethernet 1/6 slpp packet-rx enable
ERS8600-3:5# config ethernet 1/6 slpp packet-rx-threshold 5
```

ERS8600-4: Step 1 – Enable SLPP

```
ERS8600-4:5# config slpp add 3,30
ERS8600-4:5# config slpp operation enable
ERS8600-4:5# ethernet 1/6 slpp packet-rx enable
ERS8600-4:5# ethernet 1/6 slpp packet-rx-threshold 50
```

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3.2.1.13 VLACP

We will enable VLACP in the core using VLACP short timers and with the recommended reserved MAC.

Switch Cluster #1

ERS8600-1: Step 1 – Enable VLACP

```
ERS8600-1:5# config ethernet 1/6,2/8 vlacp fast-periodic-time 500
ERS8600-1:5# config ethernet 1/6,2/8 vlacp timeout short
ERS8600-1:5# config ethernet 1/6,2/8 vlacp timeout-scale 5
ERS8600-1:5# config ethernet 1/6,2/8 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-1:5# config ethernet 1/6,2/8 vlacp enable
```

ERS8600-2: Step 1 – Enable VLACP

```
ERS8600-2:5# config ethernet 1/6,2/8 vlacp fast-periodic-time 500
ERS8600-2:5# config ethernet 1/6,2/8 vlacp timeout short
ERS8600-2:5# config ethernet 1/6,2/8 vlacp timeout-scale 5
ERS8600-2:5# config ethernet 1/6,2/8 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-2:5# config ethernet 1/6,2/8 vlacp enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable VLACP

```
ERS8600-3:5# config ethernet 1/6,2/8 vlacp fast-periodic-time 500
ERS8600-3:5# config ethernet 1/6,2/8 vlacp timeout short
ERS8600-3:5# config ethernet 1/6,2/8 vlacp timeout-scale 5
ERS8600-3:5# config ethernet 1/6,2/8 vlacp enable
ERS8600-3:5# config ethernet 1/6,2/8 vlacp macaddress 01:80:c2:00:00:0f
```

ERS8600-4: Step 1 – Enable VLACP

```
ERS8600-4:5# config ethernet 1/6,2/8 vlacp fast-periodic-time 500
ERS8600-4:5# config ethernet 1/6,2/8 vlacp timeout short
ERS8600-4:5# config ethernet 1/6,2/8 vlacp timeout-scale 5
ERS8600-4:5# config ethernet 1/6,2/8 vlacp macaddress 01:80:c2:00:00:0f
ERS8600-4:5# config ethernet 1/6,2/8 vlacp enable
```

Do not enable VLACP on a port level until the VLACP MAC address has been changed.

3.2.1.14 Discard Untagged Frames

It is recommended to enable discard untagged frames on all IST and SMLT ports.

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Switch Cluster #1

ERS8600-1: Step 1 – Enable Discard Untagged Frames

```
ERS8600-1:5# config ethernet 2/1,3/1,1/6,2/8 untagged-frames-discard
enable
```

ERS8600-2: Step 1 – Enable Discard Untagged Frames

```
ERS8600-2:5# config ethernet 2/1,3/1,1/6,2/8 untagged-frames-discard
enable
```

Switch Cluster #2

ERS8600-3: Step 1 – Enable Discard Untagged Frames

```
ERS8600-1:5# config ethernet 1/1,2/1,1/6,2/8 untagged-frames-discard
enable
```

ERS8600-3: Step 1 – Enable Discard Untagged Frames

```
ERS8600-2:5# config ethernet 1/1,2/1,1/6,2/8 untagged-frames-discard
enable
```

3.2.2 Verify Layer 3 RSMLT Operations

3.2.2.1 OSPF Operations

Step 1 – Verify that all the switches in the RSMLT core are peered:

```
ERS8600-1:5# show ip ospf neighbors
```

Result:

```
================================================================================
                          Ospf Neighbors
================================================================================
INTERFACE       NBRROUTERID     NBRIPADDR       PRIO_STATE    RTXQLEN PERMANENCE
--------------------------------------------------------------------------------
10.1.3.9        10.2.1.2        10.1.3.12       0    TwoWay   0       Dynamic
10.1.3.9        10.2.1.1        10.1.3.11       0    TwoWay   0       Dynamic
10.1.3.9        10.1.1.2        10.1.3.10       100  Full     0       Dynamic
10.1.3.1        10.2.1.1        10.1.3.3        0    Full     0       Dynamic
10.1.3.1        10.2.1.2        10.1.3.4        0    Full     0       Dynamic
10.1.3.1        10.1.1.2        10.1.3.2        0    Full     0       Dynamic
```

```
ERS8600-2:5# show ip ospf neighbors
```

Result:

```
================================================================================
                          Ospf Neighbors
================================================================================
INTERFACE       NBRROUTERID     NBRIPADDR       PRIO_STATE    RTXQLEN PERMANENCE
--------------------------------------------------------------------------------
10.1.3.10       10.2.1.2        10.1.3.12       0    Full     0       Dynamic
10.1.3.10       10.2.1.1        10.1.3.11       0    Full     0       Dynamic
10.1.3.10       10.1.1.1        10.1.3.9        0    Full     0       Dynamic
10.1.3.2        10.2.1.1        10.1.3.3        0    TwoWay   0       Dynamic
```

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```
10.1.3.2        10.2.1.2        10.1.3.4        0    TwoWay   0       Dynamic
10.1.3.2        10.1.1.1        10.1.3.1        100  Full     0       Dynamic
```

```
ERS8600-3:5# show ip ospf neighbors
```

Result:

```
================================================================================
                            Ospf Neighbors
================================================================================
INTERFACE       NBRROUTERID     NBRIPADDR       PRIO_STATE    RTXQLEN PERMANENCE
--------------------------------------------------------------------------------
10.1.3.11       10.2.1.2        10.1.3.12       0    TwoWay   0       Dynamic
10.1.3.11       10.1.1.2        10.1.3.10       100  Full     0       Dynamic
10.1.3.11       10.1.1.1        10.1.3.9        0    TwoWay   0       Dynamic
10.1.3.3        10.1.1.1        10.1.3.1        100  Full     0       Dynamic
10.1.3.3        10.2.1.2        10.1.3.4        0    TwoWay   0       Dynamic
10.1.3.3        10.1.1.2        10.1.3.2        0    TwoWay   0       Dynamic
```

```
ERS8600-4:5# show ip ospf neighbors
```

Result:

```
================================================================================
                            Ospf Neighbors
================================================================================
INTERFACE       NBRROUTERID     NBRIPADDR       PRIO_STATE    RTXQLEN PERMANENCE
--------------------------------------------------------------------------------
10.1.3.12       10.1.1.2        10.1.3.10       100  Full     0       Dynamic
10.1.3.12       10.2.1.1        10.1.3.11       0    TwoWay   0       Dynamic
10.1.3.12       10.1.1.1        10.1.3.9        0    TwoWay   0       Dynamic
10.1.3.4        10.2.1.1        10.1.3.3        0    TwoWay   0       Dynamic
10.1.3.4        10.1.1.1        10.1.3.1        100  Full     0       Dynamic
10.1.3.4        10.1.1.2        10.1.3.2        0    TwoWay   0       Dynamic
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
INTERFACE	The local IP address should be displayed as follows: • ERS8600-1: ***10.1.3.1*** & ***10.1.3.9*** • ERS8600-2: ***10.1.3.2*** & ***10.1.3.10*** • ERS8600-3: ***10.1.3.3*** & ***10.1.3.11*** • ERS8600-4: ***10.1.3.4*** & ***10.1.3.12***
NBRIPADDR PRIO_STATE	Verify that switches ERS8600-2, ERS8600-3, ERS8600-4 peering state is displayed as ***Full*** pointing to ERS8600-1 VLAN 3's NBRIPADDR of 10.1.3.1 as it is the OSPF DR for VLAN 3. Verify that switches ERS8600-1, ERS8600-3, ERS8600-4 peering state is displayed as ***Full*** pointing to ERS8600-2 VLAN 30's NBRIPADDR of 10.1.3.10 as it is the OSPF DR for VLAN 30.

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3.2.2.2 RSMLT Operations

Step 1 – Verify that the RSMLT instance is configured correctly and is functioning by issuing the following command:

```
ERS8600-1:5# show ip rsmlt info
```

Result:

```
================================================================================
                          Ip Rsmlt Local Info
================================================================================

VID   IP              MAC               ADMIN   OPER  HDTMR  HUTMR
--------------------------------------------------------------------------------
3     10.1.3.1        00:01:81:28:86:13 Enable  Up    60     180
30    10.1.3.9        00:01:81:28:86:14 Enable  Up    60     180

VID   SMLT ID                  SLT ID
--------------------------------------------------------------------------------
3       2
30      2
================================================================================
                          Ip Rsmlt Peer Info
================================================================================

VID   IP              MAC               ADMIN   OPER  HDTMR  HUTMR
--------------------------------------------------------------------------------
3     10.1.3.2        00:e0:7b:bc:22:01 Enable  Up    60     180
30    10.1.3.10       00:e0:7b:bc:22:14 Enable  Up    60     180

VID   HDT REMAIN  HUT REMAIN  SMLT ID                  SLT ID
--------------------------------------------------------------------------------
3     60          180         2
30    60          180         2
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
VID	The VID should be displayed as ***3*** and ***30*** for SMLT 2.
IP	Verify the correct IP address for each switch: • ERS8600-1: ***10.1.3.1*** & ***10.1.3.9*** • ERS8600-2: ***10.1.3.2*** & ***10.1.3.10*** • ERS8600-3: ***10.1.3.3*** & ***10.1.3.11*** • ERS8600-4: ***10.1.3.4*** & ***10.1.3.12***
ADMIN	Verify that the RSMLT Admin is ***Enabled*** on both clusters. If not, there is a configuration error.
OPER	Verify that the RSMLT operation is ***Up*** on both clusters.
HUTMR HDRMR	Verify that the RSMLT holdup and holddown timer is set to ***60*** and ***180*** repectively on both clusters. If not, there is a configuration error.

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SMLT ID	Verify the SMLT ID is showing ***2***.
Ip Rsmlt Peer Info	Verify the RSMLT Peer is showing: • ERS8600-1: o VLAN 3: SMLT ***2***, IP ***10.1.3.2*** o VLAN 30: SMLT ***2***, IP ***10.1.3.10*** • ERS8600-2: o VLAN 30, SMLT ***2***, IP ***10.1.3.1*** o VLAN 30, SMLT ***2***, IP ***10.1.3.9*** • ERS8600-3: o VLAN 3, SMLT ***2***, IP ***10.1.3.4*** o VLAN 30: SMLT ***2***, IP ***10.1.3.12*** • ERS8600-4: o VLAN 3, SMLT ***2***, IP ***10.1.3.3*** o VLAN 30: SMLT ***2***, IP ***10.1.3.11***

3.2.2.3 CLIP Address

Step 1 – Verify that all the switches in the RSMLT core are peered:

```
ERS8600-1:5# show ip circuitless-ip-int info
```

Result:

```
================================================================================
                          Circuitless Ip Interface
================================================================================
INTERFACE    IP_ADDRESS      NET_MASK        OSPF_STATUS  PIM_STATUS   AREA_ID
ID
--------------------------------------------------------------------------------
1            10.1.1.1        255.255.255.255 enable       enable       0.0.0.0
```

On each ERS8600 in the switch cluster verify the following information:

Option	Verify
INTERFACE	The CLIP IP address should be displayed as follows: • ERS8600-1: ***10.1.1.1*** • ERS8600-2: ***10.1.1.2*** • ERS8600-3: ***10.2.1.1*** • ERS8600-4: ***10.2.1.2***

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4. Configuring Ping Snoop to Verify Traffic Flow

Ping snoop is a feature that can be used to verify correct traffic flow behavior in an SMLT network. This is especially useful when determining traffic patterns during a link failure exercise.

This feature displays the path that IP traffic takes over an MLT or SMLT path. Ping snoop works by enabling a filter that copies ICMP messages to the CPU. The CPU then monitors the ICMP stream. The console displays the port that is used for each IP traffic flow, from source to destination station. There is no mechanism to prevent line rate ICMP traffic from going to the CPU as a result of enabling ping snoop.

You create a ping snoop filter by specifying a source and destination IP address. Then, you specify the ports on which you want to enable ping snoop. Only one ping snoop filter is supported on a port. If an ICMP request is received on any of the added ports, the source and destination IP address and the port on which the packet was received will be displayed on the management console.

Please note the Ping snoop is only supported on the ERS8600 and ERS8300. There is also a Technical Tip on this topic that can be downloaded, reference number TT-0606501a, by going to www.nortel.com. This section only includes an example for the ERS8600.

Note that the new hashing for IP traffic between a given source and destination IP address will be different for TCP/UDP packets and ICMP packets. Therefore the use of ping, in conjunction with the 8600 ping-snoop feature, is no longer always reliable to determine the hashed path taken by IP TCP/UDP traffic, if that hashing is performed by an R-module ingress port. If the hashing is performed by a legacy module, then ping-snoop functions just as before with other code releases.

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4.1 Configuration Example - ERS8600 MLT Hashing

4.1.1 Ping Snoop and Legacy Modules

For legacy modules, ping snoop uses one of the available 8 global filters (0-7) for the classic modules, thus one global filter must be available before ping snoop can be used. Ping snoop can only be configured using CLI. If you use telnet to access the CLI, then you must enable log message to the screen if you wish to view the ping snoop message real time.

4.1.1.1 Configuration Example - Legacy Module Ping Snoop

The following example demonstrates how to enable ping snoop filter to capture ICMP packets from source or destination IP network 30.30.30.0/24 via ports 1/47 and 2/1. For legacy modules, legacy filters must be used.

ERS8600: Step 1 – Create Ping Snoop Filter
ERS8600-1:5# ***config diag ping-snoop create src-ip 30.30.30.0/24 dst-ip 30.30.30.0/24***
ERS8600: Step 2 – Add port members to filter
ERS8600-1:5# ***config diag ping-snoop add-ports 1/47,2/1***
ERS8600: Step 3 – Enable Ping Snoop
ERS8600-1:5# ***config diag ping-snoop enable true***

4.1.1.2 Verify Operations – Ping Snoop Legacy Modules

You need to look at the log messages to see the results from Ping Snoop

Step 1 – Verify that all the switches in the RSMLT core are peered:
ERS8600-1:5# ***config log screen on*** or ERS8600-1:5# ***show log file tail***
Result:
ERS8600-1:5# ***CPP Task=tMainTask CPU6 [01/24/06 12:49:12] CPU INFO ICMP Reply received on port 1/47 withSrc=30.30.30.10 Dst=30.30.30.3*** ERS8600-1:5# ***CPP Task=tMainTask CPU6 [01/24/06 12:49:12] CPU INFO ICMP Reply received on port 1/47 withSrc=30.30.30.10 Dst=30.30.30.3*** ERS8600-1:5# CPP ***Task=tMainTask CPU6 [01/24/06 12:49:13] CPU INFO ICMP Reply received on port 1/47 withSrc=30.30.30.10 Dst=30.30.30.3***

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By adding all the MLT/SMLT ports to this filter on a per switch basis, the user can determine the exact path traffic is taking.

4.1.1.3 Configuration Example – R-module Ping Snoop

The following example demonstrates to monitor both ICMP message type echo-reply and echo-request on port 4/9 with a source IP address range of 10.1.25.0/24 to a destination IP range of 10.0.0.0/8.

ERS8600: Step 1 – ACL 4096 and add port 4/9

```
ERS8600-1:5# config filter acl 4096 port add 4/9
ERS8600-1:5# config filter acl 4096 enable
```

ERS8600: Step 2 – Add ACE's to ACL 4096

```
ERS8610-1:5# config filter acl 4096 ace 1 create name echo_reply
ERS8610-1:5# config filter acl 4096 ace 1 ip src-ip eq 10.1.25.0/24
ERS8610-1:5# config filter acl 4096 ace 1 ip dst-ip eq 10.0.0.0/8
ERS8610-1:5# config filter acl 4096 ace 1 protocol icmp-msg-type eq echoreply
ERS8610-1:5# config filter acl 4096 ace 1 enable
ERS8610-1:5# config filter acl 4096 ace 2 create name echo_request
ERS8610-1:5# config filter acl 4096 ace 2 ip src-ip eq 10.1.25.0/24
ERS8610-1:5# config filter acl 4096 ace 2 ip dst-ip eq 10.0.0.0/8
ERS8610-1:5# config filter acl 4096 ace 2 protocol icmp-msg-type eq echo-
request
ERS8610-1:5# config filter acl 4096 ace 2 enable
```

4.1.1.4 Enable log screen

- ERS8610-B:5# ***config log screen on***

4.1.1.5 Verify Operations – Ping Snoop R-modules

You need to look at the log messages to see the results from Ping Snoop.

Step 1 – Verify that all the switches in the RSMLT core are peered:

```
ERS8600-1:5# config log screen on
```

or

```
ERS8600-1:5# show log file tail
```

Result:

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```
ERS8610-B:5# CPP Task=tMainTask CPU5 [07/17/06 16:09:40] CPU INFO ICMP
Request received on port 4/9 with Src=10.1.25.100 Dst=10.1.3.3

ERS8610-B:5# CPP Task=tMainTask CPU5 [07/17/06 16:09:41] CPU INFO ICMP
Request received on port 4/9 with Src=10.1.25.100 Dst=10.1.3.3

ERS8610-B:5# CPP Task=tMainTask CPU5 [07/17/06 16:09:42] CPU INFO ICMP
Request received on port 4/9 with Src=10.1.25.100 Dst=10.1.3.3

ERS8610-B:5# ping 10.1.25.100

CPP Task=tMainTask CPU5 [07/17/06 16:10:11] CPU INFO ICMP Reply
received on port 4/9 with Src=10.1.25.100 Dst=10.1.25.3

ERS8610-B:5# 10.1.25.100 is alive
```

4.1.2 MLT Port Index calculation

The port index command can be used to calculate the port used for a specific MLT number. This can be configured by using the following command where the src-port and dst-port are optional:

- ERS8600:6# ***config sys set hash-calc getmltindex traffic-type <non-ip|ipv4|ipv6> dest-val <destination address> src-val <source address> mltID <1-256> src-port <0 – 65535> dst-port <0 – 65535>***

4.1.2.1 Configuration Example

The following example demonstrates to find the index from a source IP address of 10.1.25.1 to a destination IP address of 10.2.3.5 for MLT 2.

ERS8600: Step 1 – ACL 4096 and add port 4/9

```
ERS8600-2:6# config sys set hash-calc getmltindex traffic-type ipv4 dest-val
10.2.3.5 src-val 10.1.25.1 mltID 2
```

Results

```
If the ingress port is on R-module card[2,4,7], the traffic will egress out of
port: 4/8 for mltid: 2

If the ingress port is on non-Rmodule card[3], the traffic will egress out of
port: 4/8 for mltid: 2
```

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5. Reference Documentation:

The following documents can be found by going to http://support.nortel.com.

Document Title	Publication Number	Description
Switch Clustering (SMLT/SLT/RSMLT/MSLT) Supported Topologies and Interoperability with ERS 8600 / 5000 / 8300 / 1600	NN48500-555	
Converged Campus Technical Solution Guide	NN48500-516	
Link Aggregation Control Protocol (LACP) 802.3ad and VLACP Technical Configuration Guide	NN48500-502	
Configuration — VLANs and Spanning Tree	NN46205-517	ERS8600 Series Software Release 5.0
Configuration — Link Aggregation, MLT, and SMLT	NN46205-518	
Configuring Ping Snoop on Ethernet Routing Switch R-Modules	TT-0606501a	ERS8600
Configuring VLANs, Spanning Tree, and Static Link Aggregation using the CLI	NN46208-500	ERS1600
Configuration — VLANs, Spanning Tree, and MultiLink Trunking	NN47200-502	ERS5500
Configuration — Link Aggregation, MLT, and SMLT	NN46200-517	ERS8300

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