Ethernet Routing Switch

8800

Virtual Services Platform

7000 9000

Engineering

> Basic SPB Configuration

Avaya Data Solutions

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Abstract

This document provides summary configuration items required to enable SPB.

Revision Control

No	Date	Version	Revised By	Remarks
1	7/12/2011	1.0	John Vant Erve	Initial Release
2	4/20/2012	1.1	John Vant Erve	Added multicast provisioning for IP Shortcuts, L2VSN, and L3VSN
2	2/11/2013	2.0	John Vant Erve	Added VSP 7000 and VSP 9000

Table of Contents

1. Summary of SPB Services 7
2. SPB Configuration 8
2.1 SPB NNI Summary 8
2.1.1 SPB Example 10
2.2 Configuration NNI 11
2.2.1 Configuration Mode 11
2.2.2 SPB Enable 11
2.2.3 SPB Sys-Name 11
2.2.4 SPB B-VLANs 12
2.2.5 ISIS Configuration 12
2.2.6 ISIS SPB Configuration 13
2.2.7 ISIS SPB SMLT Configuration 13
2.2.8 Enable ISIS 14
2.2.9 Configure ISIS NNI Interfaces 14
2.3 Show Commands 15
2.3.1 VSP 7000 – Rear Port Mode 16
2.3.2 VSP 7000 – Rear Port Mode LACP Provisioning 16
3. CFM 17
3.1 Configuration 17
3.1.1 CFM 17
3.2 Show Command 19
4. Enabling IP Shortcuts 20
4.1 Configuration 20
4.1.1 Add circuitless/loopback address 20
4.1.2 Enable SPB IP 20
4.1.3 VLAN 21
4.1.4 Redistribute IP Networks via ISIS – Direct Interfaces 22
4.2 Show Command 25
5. Enabling Multicast over IP Shortcuts 26
5.1 Configuration 26
5.1.1 Enable SPB Multicast – Global 26
5.1.2 Enable L3 SPB Multicast 26
5.2 Show Commands 28
6. L2VSN 29
6.1 Configuration 29
6.1.1 Create VLAN 29

6.1.2 Add I-SID to VLAN 29
6.2 Show Commands 30
7. Multicast over L2VSN 31
7.1 Configuration 31
7.1.1 Enable SPB Multicast – Global 31
7.1.2 Enable IGMP at VLAN level 31
7.2 Show Commands 33
8. L3VSN 34
8.1.1 VRF 34
8.1.2 VLAN 34
8.1.3 L3 IPVPN 35
8.1.4 Redistribute IP Networks via ISIS – Direct Interfaces 35
8.2 Show Commands 36
9. Multicast over L3VSN 37
9.1 Configuration 37
9.1.1 Enable SPB Multicast – Global 37
9.1.2 Enable Multicast VPN 37
9.1.3 Enable L3 SPB Multicast 38
9.1.4 IGMP 38
9.2 Show Commands 39
10. Inter VSN Routing 40
10.1 Configuration 40
10.1.1 L2VSNs 40
10.1.2 VRF 41
11. QoS 42
11.1 Configuration 42
11.1.1 Enable DiffServ 42
11.1.2 Enable p-bit override 42
11.1.3 Enable DiffServ Access 43
11.1.4 Enable QoS Port Level 43
11.1.5 Police Profile 44
12. CFM SPB & CMAC - Configuration Details 46
13. DiffServ Details – ERS 8800 & VSP 9000 47

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:

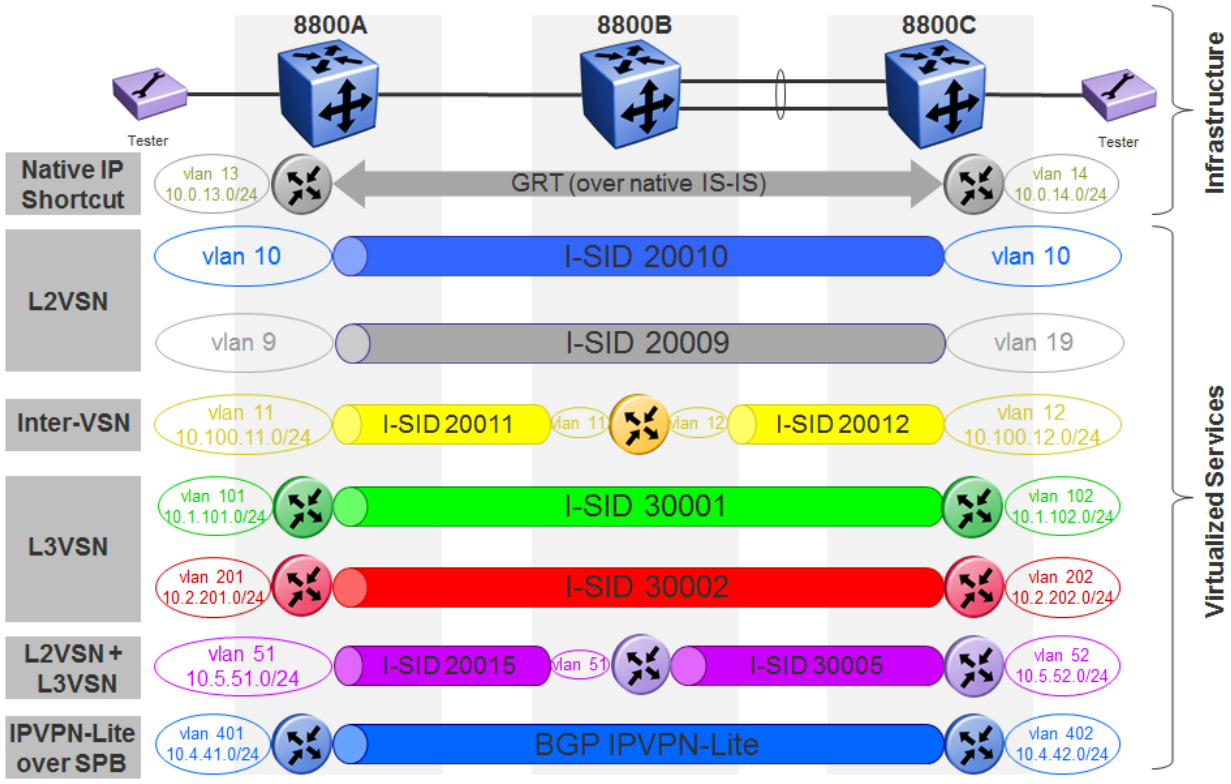
```
ERS5520-48T# show running-config
```

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

```
ERS5520-48T# show sys-info

Operation Mode:          Switch
MAC Address:             00-12-83-93-B0-00
PoE Module FW:           6370.4
Reset Count:             83
Last Reset Type:         Management Factory Reset
Power Status:            Primary Power
Autotopology:            Enabled
Pluggable Port 45:       None
Pluggable Port 46:       None
Pluggable Port 47:       None
Pluggable Port 48:       None
Base Unit Selection:     Non-base unit using rear-panel switch
sysDescr:                Ethernet Routing Switch 5520-48T-PWR
                         HW:02       FW:6.0.0.10  SW:v6.2.0.009
                         Mfg Date:12042004    HW Dev:H/W rev.02
```

1. Summary of SPB Services



Capability Feature Matrix	ERS 8800	VSP 9000	VSP 7000
L2 VSN	Y	Y	Y
L2 VSN with Multicast (IGMP)	Y	3.4 (2H'13)	10.4 (CY14)
L3 VSN	Y	Y	N
L3 VSN with Multicast (IGMP)	Y	3.4 (2H'13)	N
IP Shortcut Routing	Y	Y	N
IP Shortcut Routing with Multicast	Y	3.4 (2H'13)	N
Inter-VSN Routing	Y	Y	N
IPVPN-Lite over SPB	Y	N	N
Enterprise Fabric & Switch Cluster Interoperability	Y	Y	10.3 (2H'13)
Enterprise Fabric & Stackable Chassis Interoperability	N/A	N/A	10.3 (2H'13)
Enterprise Fabric Connectivity Management (802.1ag)	Y	Y	Y
CFM, L2 Ping, Traceroute, and Tracetree	Y	Y	Y
L2 Ping for Access VLAN (CVLAN)	Y	3.4 (2H'13)	10.4 (CY14)

2. SPB Configuration

2.1 SPB NNI Summary

The following chart displays the minimum items required to enable SPB minus the interface configuration. Note this is a one-time configuration and once provisioned, only the services has to be provisioned on the required SPB Backbone Edge Bridges.

Paramter	Value	Description
VLAN		
VLAN ID	1-4094	Two VLANs required, a primary B-VLAN and a secondary B-VLAN
VLAN Names	string	Optional, i.e. BVLAN-1 for the primary and BVLAN-2 for the secondary
IS-IS		
IS-IS Area	xx.xxxx.xxxx...xxxx - 1...13 bytes	IS-IS area , all SPB bridge must be provisioned with the same area
System ID	xxxx.xxxx.xxxx - 6 bytes	Optional. By default the base MAC address will be used. The System ID also known as B-MAC (Backbone MAC) must be unique per SPB bridge. It is recommended to change the System ID to an easy to recognize value to help in troubleshooting.
System Name	string	Name used by the SPB bridge and must be unique per SPB bridge.
State	enable	To enable the ISIS protocol
SPB		
Instance	1-100	Only one instance is supported.
Nick Name	x.xx.xx - 2.5 bytes	Nick name used by the SPB bridge and must be unique per SPB bridge.
Add B-VLANs	vid	Add the primary backbone VLAN and secondary backbone VLAN IDs. The same primary and secondary B-VLAN configuration must be provisioned the same on all SPB bridges so that each bridge will make a similar decision for computing routes and load-balancing traffic.
SPB – SMLT		
SMLT Peer System ID	xx:xx:xx:xx:xx:xx	Each SMLT cluster switch must be peered with the System ID (B-MAC) of its peer

SMLT Virtual B-MAC	xx:xx:xx:xx:xx:xx	Must be the same on both cluster switches and must be unique within SPB network. By default, the lowest B-MAC plus 1 will be automatically provisioned.
CFM		
Maintenance Domain Name	string	Name given to the Maintenance Domain. One for SPB and another for C-VLAN where each domain is further subdivided into logical groupings called Maintenance Associations. For the ERS 8800 starting in release 7.1.1 and the VSP 7000, a SPBM Domain Name of *spbm* and a C-VLAN Domain Name of *cmac* will be automatically created.
MD Level	0-7	Level associated by the MD with a default value of 5.
Maintenance Association	string	Name given to the Maintenance Association (MA). One is required per B-VLAN for a total of two MA's for SPB and one or more for each C-VLAN if you wish to test to a C-VLAN level. Each MA is defined by a set of Maintenance Points (MP). For the ERS 8800 starting in release 7.1.1 and the VSP 7000, a SPBM Domain Name of *spbm* will be automatically created with two MA's, one for each B-VLAN ID using the B-VLAN IDs. Also a SPBM Domain Name of *cmac* will be automatically created with a MA using the VLAN ID for each C-VLAN created.
Maintenance Point	1-8191	The MP is the demarcation point and should be unique per SPB bridge. There are two types of MP, Maintenance End Point (MEP) and Maintenance Intermediate Point (MIP).

2.1.1 SPB Example

Assuming we have two of each VSP 9000, VSP 7000, and ERS 8800 bridges, the following chart provides an example of suggested values.

Item	ERS 8800		VSP 7000		VSP 9000	
System Name	8001	8002	7001	7002	9001	9002
System ID	0049.0008.0100	0049.0008.0200	0049.0007.0100	0049.0007.0200	0049.0009.0100	0049.0009.0100
Nick Name	0.08.01	0.08.02	0.07.01	0.07.02	0.09.01	0.09.02
B-VLAN 1	4051					
B-VLAN 2	4052					
Primary B-VLAN	4051					
ISIS Area	49.0001					

2.2 Configuration NNI

2.2.1 Configuration Mode

CLI

```
config
```

ACLI

```
config terminal
```

The ERS 8800 which supports either CLI or ACLI. The VSP 7000 and VSP 9000 only support ACLI. On an ERS 8800 switch, to change from CLI to ACLI, enter the CLI command *config boot flags acli true* and *save boot*. Prior to making the change, you should convert the configuration file to ACLI by entering the command *save config file /flash/config_acli.cfg backup /flash/config.cfg mode acli*. To change from ACLI to CLI, enter the ACLI command *no boot config flags acli* and *save boot*. Prior to making the change, you should convert the configuration file to CLI by entering the command *save config file /flash/config_cli.cfg backup /flash/config.cfg mode cli*.

2.2.2 SPB Enable

CLI

```
spbm enable
```

ACLI

```
spbm
```

2.2.3 SPB Sys-Name

CLI

```
cli prompt <word 0-255>
```

ACLI

```
prompt <word 0-255>
```

VSP 7000

```
snmp-server name <word 0-31>
```

By default, the prompt, snmp-server, or sys-name will automatically become the ISIS SysName. You may also use the following commands to provision the ISIS SysName.

CLI

```
isis sys-name <word 0-255>
```

ACLI

```
router isis
  sys-name <word 0-255>
exit
```

2.2.4 SPB B-VLANs

CLI

```
vlan 4051 create spbm-bvlan name "BVLAN-1"
vlan 4052 create spbm-bvlan name "BVLAN-2"
```

ACLI

```
vlan create 4051 name "BVLAN-1" type spbm-bvlan
vlan create 4052 name "BVLAN-2" type spbm-bvlan
```

SPB does switching on B-VLANs where two is always recommended.

The same B-VLANs, primary and secondary, must be provisioned on all SPB bridges.

It is recommended to start the B-VLAN number using the highest addressable range starting at 4050 or higher up to 4065.

2.2.5 ISIS Configuration

CLI

```
isis system-id 0049.0001.0100
isis manual-area add 49.0001
```

ACLI

```
router isis
  system-id 0049.0001.0100
  manual-area 49.0001
exit
```

The ISIS manual-area is required and must be provisioned the same on all SPB nodes.

The ISIS system-id has to be unique on each SPB node. Note that one does not have to provision an ISIS system-id, however, it is recommended for troubleshooting purposes. In this example, system IDs start with 0049.0001.0100 for the first bridge, 0049.0001.0200 for the second bridge and so on. For these System IDs, 49 indicates a private address, the "0001" indicates area "0001", and 0100, 0200, etc., indicate the node number (1 through n). These System IDs correspond to SPB Nicknames of 1.01.10, 1.01,20, 1.01.30 for nodes 1, 2 and 3 respectively, and so on.

The upper 4 bytes of the system-id has to be non-zeros, i.e. 0000.0001.0500 is not allowed. Also, the system-id cannot be a multicast MAC address (0x00.0000.0000 where x is an odd value).

2.2.6 ISIS SPB Configuration

CLI

```
isis spbm 1 create
isis spbm 1 nick-name 0.01.05
isis spbm 1 add-b-vid 4051-4052 primary 4051
```

ACLI

```
router isis
  spbm 1
  spbm 1 nick-name 0.01.05
  spbm 1 b-vid 4051-4052 primary 4051
exit
```

The ISIS nick-name must be provisioned on all SPB bridges and must be unique on each SPB bridge.

2.2.7 ISIS SPB SMLT Configuration

At this time, the configuration shown below only applies to the ERS 8800 and VSP 9000.

CLI

```
isis spbm 1 smlt virtual-bmac 00:49:00:01:05:01
isis spbm 1 smlt peer-system-id 0049.0001.0600
```

ACLI

```
router isis
  spbm 1 smlt-virtual-bmac 00:49:00:01:05:01
  spbm 1 smlt-peer-system-id 0049.0001.0600
exit
```

This step is only required on SPB nodes supporting SMLT. The virtual B-MAC must be the same on both SMLT cluster switches. The peer-system-id is the SMLT cluster's peer system-id. Note, by default, if you do not configure the SMLT virtual-bmac, it will be automatically created using the lowest B-MAC of the SMLT cluster plus 1.

2.2.8 Enable ISIS

CLI

```
isis enable
```

ACLI

```
router isis enable
```

2.2.9 Configure ISIS NNI Interfaces

2.2.9.1 Port Level

CLI

```
ethernet 2/5 isis create
ethernet 2/5 isis spbm 1 state enable
ethernet 2/5 isis enable
```

ACLI

```
interface GigabitEthernet 3/3
  isis
  isis spbm 1
  isis enable
exit
VSP 7000:
interface fastEthernet 3/3
  isis
  isis spbm 1
  isis enable
exit
```

2.2.9.2 MLT Level

The following only applies to the ERS 8800 and VSP 9000. For the VSP 7000, you need to enable ISIS on the aggregate Ethernet ports that are part of an MLT.

CLI

```
mlt 1 isis create
mlt 1 isis spbm 1 state enable
mlt 1 isis enable
```

ACLI

```
interface mlt 1
  isis
  isis spbm 1
  isis enable
exit
```

2.3 Show Commands

CLI	ACLI
ISIS	
show isis info	show isis
show isis interface	show isis interface
show isis adjacencies	show isis adjacencies
show isis system-id	show isis system-id
show isis manual-area	show isis manual-area
show isis lsdb	show isis lsdb
SPB	
show isis spbm info	show isis spbm
show isis spbm nick-name	show isis spbm nick-name
show isis spbm unicast-fib	show isis spbm unicast-fib
show isis spbm unicast-fib vlan 4051	show isis spbm unicast-fib vlan 4051
show isis spbm unicast-fib vlan 4052	show isis spbm unicast-fib vlan 4052
show isis spbm unicast-tree 4051	show isis spbm unicast-tree 4051
show isis spbm unicast-tree 4052	show isis spbm unicast-tree 4052

2.3.1 VSP 7000 – Rear Port Mode

In the 10.2 release, the VSP 7000 can be configured in Fabric Interconnect Mesh (FI) mode by setting the rear-port mode to SPB. This allows the VSP 7000 to run SPB via the rear ports using stacking cables to connect to other VSP 7000s. In the 10.2.1 release, SMLT will be supported allowing for either SPB or SMLT to operate via the rear port. In the 10.3 release, both SPB and SMLT will be supported via the rear ports.

Please refer to the *Resilient Data Center Solutions Technical Configuration Guide* publication number NN48500-645 for more details.

ACLI

```
rear-port mode enable spb
Enabling rear port mode will disable Fabric Interconnect Stack operation.
Switch configuration will be reset to partial-defaults. Continue(yes/no)?yes
--------------------------------------------------------------------------------
show rear-port mode
```

2.3.2 VSP 7000 – Rear Port Mode LACP Provisioning

By default when rear port mode is enabled, LACP is automatically enabled across all rear ports using a default LACP key of 4095. If you wish, you can change this value on one or more of the four rear ports. In SPB rear port mode, the port numbers for each rear port is as follows:

- FI Up (right) Top: Ports 34, 35, 36
- FI Down (left) Top: Ports 38, 39 (SPB) or ports 38, 39, 40 (Standard)
- FI Up (right) Bottom: Port 33
- FI Down (left) Bottom: Port 37

For example, to change the LACP on the *FI Up (right) Top* ports:

```
interface fastEthernet 34-36
lacp key 4094
exit
show lacp aggr
show lacp port aggr <aggr id>
show lacp debug member 34-36
```

3. CFM

3.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

3.1.1 CFM

3.1.1.1 Pre 7.1.1.0 for the ERS 8800 and release 3.3 for the VSP 9000

CLI - MD =spbm, B-VLANs 4051 & 4052, MA = 4051 & 4052, MEP = 2, Level = 5 (default = 4)

```
cfm md spbm create
cfm md spbm ma 4051 create
cfm md spbm ma 4052 create
cfm md spbm ma 4051 mep 2 create state enable
cfm md spbm ma 4052 mep 2 create state enable
vlan 4051 add-nodal-mep spbm.4051.2
vlan 4052 add-nodal-mep spbm.4052.2
vlan 4051 add-nodal-mip-level 5
vlan 4052 add-nodal-mip-level 5
```

ACLI - MD = spbm, B-VLANs 4051 & 4052, MA = 4051 & 4052, MEP = 2, Level =5 (default = 4)

```
cfm maintenance-domain spbm
cfm maintenance-association spbm 4051
cfm maintenance-association spbm 4052
cfm maintenance-endpoint spbm 4051 2 state enable
cfm maintenance-endpoint spbm 4052 2 state enable
vlan nodal-mep 4051 spbm 4051 2
vlan nodal-mip-level 4051 5
vlan nodal-mep 4052 spbm 4052 2
vlan nodal-mip-level 4052 5
```

3.1.1.2 Release 7.1.1.0 or higher for the ERS 8800 and release 10.2 for the VSP 7000

CLI

```
cfm cmac mepid <1-8191>
cfm cmac level <0-7>
cfm cmac state enable
cfm spbm mepid <1-8191>
cfm spbm level <0-7>
cfm spbm state enable
```

ACLI

```
cfm cmac mepid <1-8191>
cfm cmac level <0-7>
cfm cmac enable
cfm spbm mepid <1-8191>
cfm spbm level <0-7>
cfm spbm enable
```

CMAC provisioning is only required on BEB where C-VLANs are terminated and is not supported at this time for the VSP 7000.

3.2 Show Command

CLI	ACLI
CFM Config	
show cfm cmac info show cfm spbm info show cfm md info show cfm ma info md spbm show cfm ma info md cmac	***ERS 8800 & VSP 9000:*** show cfm cmac show cfm spbm show cfm maintenance-domain show cfm maintenance-association show cfm maintenance-endpoint ***VSP 7000:*** show cfm spbm
CFM SPB Test Commands	
l2ping 4051.8007 l2ping 4052.8007 l2traceroute 4051.8007 l2traceroute 4052.8007	***ERS 8800 & VSP 9000:*** l2 ping vlan 4051 routernodename 8007 l2 ping vlan 4052 routernodename 8007 l2 traceroute vlan 4051 routernodename 8007 l2 traceroute vlan 4052 routernodename 8007 ***VSP 7000:*** l2ping vlan 4051 routernodename 8007 l2ping vlan 4052 routernodename 8007 l2traceroute vlan 4051 routernodename 8007 l2traceroute vlan 4052 routernodename 8007
CFM CMAC Test Commands – ERS 8800 only using CFM MAC and C-VLAN ID	
show cfm cmac info l2ping 10.00:e0:7b:bc:23:de l2traceroute 10.00:e0:7b:bc:23:de	show cfm cmac l2 ping vlan **10 mac 00:e0:7b:bc:23:de** l2 traceroute vlan 10 mac 00:e0:7b:bc:23:de

4. Enabling IP Shortcuts

This section does not apply to the VSP 7000.

4.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

4.1.1 Add circuitless/loopback address

CLI

```
ip circuitless-ip-int  1 create 10.1.1.6/255.255.255.255
```

ACLI

```
interface loopback 1
  ip address 10.1.1.6/255.255.255.255
exit
```

4.1.2 Enable SPB IP

CLI

```
isis ip source-address 10.1.1.6
isis spbm 1 ip enable
ip ecmp enable
```

ACLI

```
router isis
  ip-source-address 10.1.1.1
  spbm 1 ip enable
exit
ip ecmp
```

Once IP is enabled on each SPB node, the ISIS source IP should be learn via all SPB nodes where IP is enabled. The ISIS source IP is the address used for IP packets originating from an SPB node.

4.1.3 VLAN

4.1.3.1 Non SMLT

CLI

```
vlan 1012 create byport-mstprstp 0
vlan 1012 ports add 4/35
vlan 1012 ip create 10.7.112.1/24
```

ACLI

```
vlan create 1012 type port-mstprstp 0
vlan member add 1012 4/35
interface vlan 1012
   ip address 10.7.112.1 255.255.255.0
   exit
```

4.1.3.2 SMLT

CLI – Assuming RSMLT is used, IST MLT ID is 1, and SMLT ID is 5

```
vlan 1012 create byport-mstprstp 0
vlan 1012 add-mlt 1
vlan 1012 add-mlt 5
vlan 1012 ip create 10.7.112.1/24
vlan 1012 ip spb-multicast enable
vlan 1012 ip rsmlt enable
vlan 1012 ip rsmlt holdup-timer 9999
```

ACLI - – Assuming RSMLT is used, IST MLT ID is 1, and SMLT ID is 5

```
vlan create 1012 type port-mstprstp 0
vlan mlt 1012 1
vlan mlt 1012 5
interface vlan 1012
   ip address 10.7.112.1 255.255.255.0
   ip rsmlt
   ip rsmlt holdup-timer 9999
   exit
ip rsmlt edge-support
```

4.1.4 Redistribute IP Networks via ISIS – Direct Interfaces

4.1.4.1 Non SMLT Cluster

CLI

```
ip isis redistribute direct create
ip isis redistribute direct enable
ip isis redistribute direct apply
```

ACLI

```
router isis
  redistribute direct
  redistribute direct enable
exit
isis apply redistribute direct
```

4.1.4.2 SMLT Cluster - Suppress IST Network

CLI

```
ip prefix-list "IST" add-prefix 10.2.1.0/30  maskLenFrom 30 maskLenTo 30
ip route-policy "suppressIST" seq 1 create
ip route-policy "suppressIST" seq 1 enable
ip route-policy "suppressIST" seq 1 action deny
ip route-policy "suppressIST" seq 1 match-network "IST"
ip route-policy "suppressIST" seq 2 create
ip route-policy "suppressIST" seq 2 enable
ip isis redistribute direct create
ip isis redistribute direct route-policy "suppressIST"
ip isis redistribute direct enable
ip isis redistribute direct apply
```

ACLI

ERS 8800:

```
ip prefix-list "IST" 10.2.1.0/30  ge 30 le 30
route-map "suppressIST" 1
  no permit
  enable
  match network "IST"
exit
route-map "suppressIST" 2
  enable
  match protocol local
exit
router isis
  redistribute direct
  redistribute direct route-map "suppressIST"
  redistribute direct enable
exit
isis apply redistribute direct
```

VSP 9000:

```
ip prefix-list "IST" 10.2.1.0/30  ge 30 le 30
route-map "suppressIST" 1
  enable
```

```
  match network "IST"
exit
route-map "suppressIST" 1 deny
route-map "suppressIST" 2
  enable
  match protocol local
exit
router isis
  redistribute direct
  redistribute direct route-map "suppressIST"
  redistribute direct enable
exit
isis apply redistribute direct
```

Other protocols such as static, BGP, RIP, or OSPF can also be redistributed via ISIS

4.2 Show Command

CLI	ACLI
ISIS Source IP Address	
`show isis info`	`show isis`
SPB IP Enable	
`show isis spbm info`	`show isis spbm`
IP Route	

`show ip route info`
`show ip route info -s 10.1.1.0/24`
`show ip route info ip 10.1.1.0`
	`show ip route`
	`show ip route -s 10.1.1.0/24`
	`show ip route 10.1.1.0`

SPB IP	
`show isis spbm ip-unicast-fib`	`show isis spbm ip-unicast-fib`
SPB ISIS LSP (link state protocol) of local node to verify direct route are sent out	
`show isis lsdb lspid 0049.0001.0100.00-00 detail tlv 135`	`show isis lsdb lspid 0049.0001.0100.00-00 tlv 135 detail`

5. Enabling Multicast over IP Shortcuts

This section only applies to the ERS 8800 at this time.

5.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

5.1.1 Enable SPB Multicast – Global

CLI

```
isis spbm 1 multicast enable
```

ACLI

```
router isis
  spbm 1 multicast enable
exit
```

5.1.2 Enable L3 SPB Multicast

5.1.2.1 IGMPv2

CLI

```
vlan 1012 ip spb-multicast enable
```

ACLI

```
interface vlan 1012
   ip spb-multicast enable
   exit
```

5.1.2.2 IGMPv3

CLI

```
vlan 1012 ip spb-multicast enable
vlan 1012 ip igmp version 3
```

ACLI

```
interface vlan 1012
   ip spb-multicast enable
   ip igmp version 3
   exit
```

On an ERS 8800, IGMPv3 only works if the receiver uses SSM (S.G IGMPv3 join). It is unable to process a *.G IGMPv3 join.

5.2 Show Commands

CLI	ACLI
IGMP Interface	
`show ip igmp interface`	`show ip igmp interface`
IGMP cache/groups – receiver end	
`show ip igmp cache` `show ip igmp group`	`show ip igmp cache` `show ip igmp group`
IGMP sender – source end	
`show ip igmp sender`	`show ip igmp sender`
SPB Multicast	

`show isis spbm-mcast-summary`
`show isis spbm ip-multicast-route info`
`show isis spbm ip-multicast-route all`
`show isis spbm ip-multicast-route info`
`group <group address>`
`show isis spbm ip-multicast-route info group <group address> source <source ip>`
	`show isis spbm-mcast-summary`
	`show isis spbm ip-multicast-route`
	`show isis spbm ip-multicast-route all`
	`show isis spbm ip-multicast-route`
	`group <group address>`
	`show isis spbm ip-multicast-route info group <group address> source <source ip>`

CFM – source end, use CFM command on BEB bridge where the multicast source is located	
`l2tracemroute source <source ip> group <group address>`	`l2 tracemroute source <source ip> group <group address>`
TLV	

`show isis lsdb tlv 186 detail`
`show isis lsdb tlv 144 detail`
`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
`show isis lsdb lspid <lsp id> tlv 144 detail`
	`show isis lsdb tlv 186 detail`
	`show isis lsdb tlv 144 detail`
	`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
	`show isis lsdb lspid <lsp id> tlv 144 detail`

TLV 186 on the BEB bridge where the source is located should display the multicast source and group addresses and have the Tx bit set. Each multicast group should have its own unique data ISID with a value of 1600000x. TLV 144 on the BEB bridge where the sender is located should have the Tx bit set while on all BEB bridges where there is a receiver should have the Rx bit set.

6. L2VSN

6.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

6.1.1 Create VLAN

CLI

```
ethernet 2/4 perform-tagging enable
vlan 100 create byport-mstprstp 0
vlan 100 ports add 2/4
vlan 1 ports remove 2/4
```

ACLI

```
interface GigabitEthernet 2/4
  encapsulation dot1q
exit
vlan create 100 type port-mstprstp 0
vlan members 100 2/4
vlan members remove 1 2/4
```

6.1.2 Add I-SID to VLAN

CLI

```
vlan 100 i-sid 100100
```

ACLI

```
vlan i-sid 100 100100
```

6.2 Show Commands

CLI	ACLI
I-SID	
show vlan info i-sid show vlan info i-sid 100100	show vlan i-sid show vlan i-sid 100100
VLAN fdb entries	
show vlan info fdb-entry 100	show vlan mac-address-entry 100 ***VSP 7000:*** show mac-address-table vid 100
VLAN remote fdb entries	
show vlan info remote-mac-table 100	show vlan remote-mac-table 100 ***VSP 7000:*** show mac-address-table spbm i-sid 100100
ISIS SPB multicast tree	
show isis spbm multicast-fib show isis spbm multicast-fib vlan 4051 i-sid 100100 show isis spbm multicast-fib vlan 4052 i-sid 100100	show isis spbm multicast-fib show isis spbm multicast-fib vlan 4051 i-sid 100100 show isis spbm multicast-fib vlan 4052 i-sid 100100
SPB i-sid details	
show isis lsdb lspid 0049.0001.0200.00-00 tlv 144 sub-tlv 3 detail	show isis lsdb lspid 0049.0001.0200.00-00 tlv 144 sub-tlv 3 detail

7. Multicast over L2VSN

This section only applies to the ERS 8800 at this time.

7.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

7.1.1 Enable SPB Multicast – Global

CLI

```
isis spbm 1 multicast enable
```

ACLI

```
router isis
  spbm 1 multicast enable
exit
```

7.1.2 Enable IGMP at VLAN level

7.1.2.1 IGMPv2

CLI

```
vlan 100 ip igmp snoop enable
vlan 100 ip igmp snoop-querier-addr 192.168.99.1
```

ACLI

```
interface vlan 100
  ip igmp snooping
  ip igmp snoop-querier-addr 192.168.99.1
exit
```

Please note, if the SPB bridge is connected to an edge switch, it may be necessary to add an IGMP query address. If you omit adding a query address, the SPB bridge will send IGMP queries with a source address of 0.0.0.0. Depending on the edge switch model, it may not accept a query with a source address of 0.0.0.0. This is the case if using an Avaya stackable

edge switch that supports IGMPv3.

7.1.2.2 IGMPv3

CLI

```
vlan 100 ip igmp proxy-snoop enable
vlan 100 ip igmp snoop enable
vlan 100 ip igmp snoop-querier-addr 192.168.99.1
vlan 2256 ip igmp ssm-snoop enable
vlan 2256 ip igmp version 3
```

ACLI

```
interface vlan 100
ip igmp proxy
ip igmp snooping
ip igmp snoop-querier-addr 192.168.99.1
ip igmp ssm-snoop
ip igmp version 3
```

On an ERS 8800, IGMPv3 only works if the receiver uses SSM (S.G IGMPv3 join). It is unable to process a *.G IGMPv3 join.

7.2 Show Commands

CLI	ACLI
IGMP Interface	
`show ip igmp interface`	`show ip igmp interface` `show ip igmp interface vlan 100`
IGMP cache/groups – receiver end	
`show ip igmp cache` `show ip igmp group`	`show ip igmp cache` `show ip igmp group`
IGMP sender – source end	
`show ip igmp sender`	`show ip igmp sender`
SPB Multicast	

`show isis spb-mcast-summary`
`show isis spbm ip-multicast-route all`
`show isis spbm ip-multicast-route vlan 100`
`show isis spbm ip-multicast-route vsn-isid 110100`
	`show isis spb-mcast-summary`
	`show isis spbm ip-multicast-route all`
	`show isis spbm ip-multicast-route vlan 100`
	`show isis spbm ip-multicast-route vsn-isid 110100`

Using CFM to verify multicast route – performed only on BCB switch where sender is located	
`l2tracemroute source <source address> group <group address> vlan <C-VLAN id>`	`l2 tracemroute source <source address> group <group address> vlan <C-VLAN id>`
TLV	

`show isis lsdb tlv 185 detail`
`show isis lsdb tlv 144 detail`
`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
`show isis lsdb lspid <lsp id> tlv 144 detail`
	`show isis lsdb tlv 185 detail`
	`show isis lsdb tlv 144 detail`
	`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
	`show isis lsdb lspid <lsp id> tlv 144 detail`

TLV 185 on the BEB bridge where the source is located should display the multicast source and group addresses and have the Tx bit set. Each multicast group should have its own unique data ISID with a value of 1600000x. TLV 144 on the BEB bridge where the sender is located should have the Tx bit set while on all BEB bridges where there is a receiver should have the Rx bit set.

8. L3VSN

This section does not apply to the VSP 7000.

Configuration

CLI

```
config
```

ACLI

```
config terminal
```

Ensure that SPB IP is enabled – see section 4.

8.1.1 VRF

CLI

```
ip vrf blue create
```

ACLI

```
ip vrf blue
```

8.1.2 VLAN

CLI

```
ethernet 2/4 perform-tagging enable
vlan 1000 create byport-mstprstp 0
vlan 1000 ports add 2/4
vlan 1000 vrf blue
vlan 1000 ip create 10.5.100.1/24
vlan 1 ports remove 2/4
```

ACLI

```
interface GigabitEthernet 2/4
  encapsulation dot1q
exit
vlan create 1000 type port-mstprstp 0
vlan members 1000 2/4
vlan members remove 1 2/4
```

```
interface Vlan 1000
  vrf blue
  ip address 10.5.100.1 255.255.255.0
exit
```

8.1.3 L3 IPVPN

CLI

```
ip vrf blue ipvpn create
ip vrf blue ipvpn i-sid 2101000
ip vrf blue ipvpn enable
```

ACLI

```
router vrf blue
  ipvpn
  i-sid 2101000
  ipvpn enable
exit
```

8.1.4 Redistribute IP Networks via ISIS – Direct Interfaces

CLI

```
ip vrf blue isis redistribute direct create
ip vrf blue isis redistribute direct enable
ip vrf blue isis redistribute direct apply
```

ACLI

```
router vrf blue
  isis redistribute direct
  isis redistribute direct enable
exit
isis apply redistribute direct vrf blue
```

8.2 Show Commands

CLI	ACLI
I-SID	
show ip vrf ipvpn info show ip vrf ipvpn info vrf blue	show ip ipvpn show ip ipvpn vrf blue
IP Interfaces	
show ip interface vrf blue	show ip interface vrf blue
IP Routes	
show ip route info vrf blue	show ip route vrf blue
IP Testing	
ping 10.1.115.1 vrf blue source 10.7.115.1 traceroute 10.7.115.1 vrf blue source 10.1.115.1	ping 10.1.115.1 vrf blue source 10.7.115.1 traceroute 10.7.115.1 vrf blue source 10.1.115.1
SPB i-sid & IP fib, local and remote	
show isis lsdb lspid 0049.0001.0100.00-00 tlv 184 detail show isis lsdb lspid 0049.0001.0700.00-00 tlv 184 detail	show isis lsdb lspid 0049.0001.0100.00-00 tlv 184 detail show isis lsdb lspid 0049.0001.0700.00-00 tlv 184 detail

9. Multicast over L3VSN

This section applies to the ERS 8800 only at this time.

If you only wish to perform multicast, it is not necessary to enable the L3VSN or redistribute unicast routes into or out of ISIS. Multicast routing does not depend on unicast routing (both for VRF and GRT). This allows for easier migrations where multicast from PIM to SPB can be migrated and then migrate unicast separately or not at all

9.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

9.1.1 Enable SPB Multicast – Global

CLI

```
isis spbm 1 multicast enable
```

ACLI

```
router isis
  spbm 1 multicast enable
exit
```

9.1.2 Enable Multicast VPN

CLI

```
ip vrf blue mvpn enable
```

ACLI

```
router vrf blue
  mvpn enable
exit
```

9.1.3 Enable L3 SPB Multicast

CLI

```
vlan 2255 ip spb-multicast enable
```

ACLI

```
interface vlan 2255
   ip spb-multicast enable
   exit
```

9.1.4 IGMP

9.1.4.1 IGMPv2

No configuration required, default setting.

9.1.4.2 IGMPv3

CLI

```
vlan 2255 ip igmp version 3
```

ACLI

```
interface vlan 2255
   ip igmp version 3
   exit
```

On an ERS 8800, IGMPv3 only works if the receiver uses SSM (S.G IGMPv3 join). It is unable to process a *.G IGMPv3 join.

9.2 Show Commands

CLI	ACLI
IGMP Interface	
`show ip igmp interface vrf blue`	`show ip igmp interface vrf blue`
IGMP cache/groups – receiver end	
`show ip igmp cache vrf blue` `show ip igmp group vrf blue`	`show ip igmp cache vrf blue` `show ip igmp group vrf blue`
IGMP sender – source end	
`show ip igmp sender vrf blue`	`show ip igmp sender vrf blue`
SPB Multicast	

`show isis spbm multicast`
`show isis spb-mcast-summary`
`show isis spbm ip-multicast-route vrf blue`
`show isis spbm ip-multicast-route vrf blue group <group address>`
`show isis spbm ip-multicast-route vsn-isid <vsn isid>`
	`show isis spbm multicast`
	`show isis spb-mcast-summary`
	`show isis spbm ip-multicast-route vrf blue`
	`show isis spbm ip-multicast-route vrf blue group <group address>`

TLV	

`show isis lsdb tlv 185 detail`
`show isis lsdb tlv 144 detail`
`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
`show isis lsdb lspid <lsp id> tlv 144 detail`
	`show isis lsdb tlv 185 detail`
	`show isis lsdb tlv 144 detail`
	`show isis lsdb lspid tlv 144 sub-tlv 3 detail`
	`show isis lsdb lspid <lsp id> tlv 144 detail`

TLV 185 on the BEB bridge where the source is located should display the multicast source and group addresses and have the Tx bit set. Each multicast group should have its own unique data ISID with a value of 1600000x. TLV 144 on the BEB bridge where the sender is located should have the Tx bit set while on all BEB bridges where there is a receiver should have the Rx bit set.

10. Inter VSN Routing

This section does not apply to the VSP 7000.

10.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

Inter VSN can be configured via any SPB single node or two SPB nodes and running VRRP between them. The following is a simple Inter VSN configuration provisioning done via one node.

10.1.1 L2VSNs

CLI

```
vlan 100 create byport-mstprstp 0
vlan 100 ports add 2/4
vlan 100 i-sid 100100
vlan 150 create byport-mstprstp 0
vlan 150 ports add 2/8
vlan 150 i-sid 100150
```

ACLI

```
vlan create 100 type port-mstprstp 0
vlan members 100 2/4
vlan i-sid 100 100100
vlan create 150 type port-mstprstp 0
vlan members 150 2/8
vlan i-sid 150 100150
```

10.1.2 VRF

CLI

```
ip vrf inter-isid create
vlan 100 vrf inter-isid
vlan 150 vrf inter-isid
vlan 100 ip create 10.5.100.1/24
vlan 150 ip create 10.5.150.1/24
```

ACLI

```
ip vrf inter-isid
interface vlan 100
  vrf inter-isid
  ip address 10.5.100.1 255.255.255.0
exit
interface vlan 150
  vrf inter-isid
  ip address 10.5.150.1 255.255.255.0
exit
```

11. QoS

11.1 Configuration

CLI

```
config
```

ACLI

```
config terminal
```

11.1.1 Enable DiffServ

CLI

```
ethernet <slot/port> enable-diffserv <false|true>
```

ACLI

```
interface gigabitEthernet <slot/port>
  enable-diffserv enable
exit
```

VSP 7000:

```
qos if-group name trust class trusted
qos if-assign port <ports> name trust
```

Please note that only the ERS 8800 required DiffServ to be enabled as the default value is disabled on all ports. In regards to the VSP 7000 and VSP 9000, DiffServ is enabled by default on all ISIS enabled ports. Hence, the above steps are not required and only shown for information purposes.

11.1.2 Enable p-bit override

Please note, this section does not apply to VSP 7000.

CLI

```
ethernet <slot/port> 802.1p-override <enable|disable>
```

ACLI

```
interface gigabitEthernet <slot/port>
  qos 802.1p-override enable
exit
```

11.1.3 Enable DiffServ Access

This section applies to the VSP 9000 and ERS 8800. By default, all non NNI ports on the VSP 7000 are untrusted.

CLI

```
ethernet <slot/port> access-diffserv <enable|disable>
```

ACLI

```
interface gigabitEthernet <slot/port>
  access-diffserv enable
exit
```

11.1.4 Enable QoS Port Level

This section does not apply to the VSP 7000.

CLI

```
ethernet <slot/port> qos-level <0-6>
```

ACLI

```
interface gigabitEthernet <slot/port>
  qos level <0-6>
exit
```

11.1.5 Police Profile

CLI – Police traffic on VLAN 1000 via port 3/24 at CIR = 5M and PIR = 7M

```
qos policy 1 create peak-rate 7000 svc-rate 5000 lanes 3/3 name 5meg
filter act 1 create
filter act 1 ethernet etherType,vlan
filter act 1 apply
filter acl 1 create inPort act 1 name Police5M
filter acl 1 port add 3/24
filter acl 1 ace 1 action permit police 1
filter acl 1 ace 1 ethernet vlan-id eq 1000
filter acl 1 ace 1 ethernet ether-type eq ip
filter acl 1 ace 1 debug count enable
filter acl 1 ace 1 enable
```

ACLI – Police traffic on VLAN 1000 via port 3/24 (port 20 on VSP 7000) at CIR = 5M and PIR = 7M

ERS 8800:

```
qos policy 1 peak-rate 7000 svc-rate 5000 name 5meg
qos policy 1 lanes 3/3
filter act 1
filter act 1 ethernet etherType,vlan
filter apply act 1
filter acl 1 type inPort act 1 name Police5M
filter acl port 1 3/24
filter acl ace 1 1 name Police5M
filter acl ace action 1 1 permit
filter acl ace action 1 1 permit police 1
filter acl ace ethernet 1 1 ether-type eq ip
filter acl ace ethernet 1 1 vlan-id eq 1000
filter acl ace 1 1 enable
```

VSP 9000:

```
qos policy 1 peak-rate 7000 svc-rate 5000 name 5meg
show qos policy-config 1
filter acl 1 type inPort name Police5M
filter acl port 1 3/24
filter acl ace 1 1001 name Police5M
filter acl ace action 1 1001 permit
filter acl ace action 1 1001 permit police 1
```

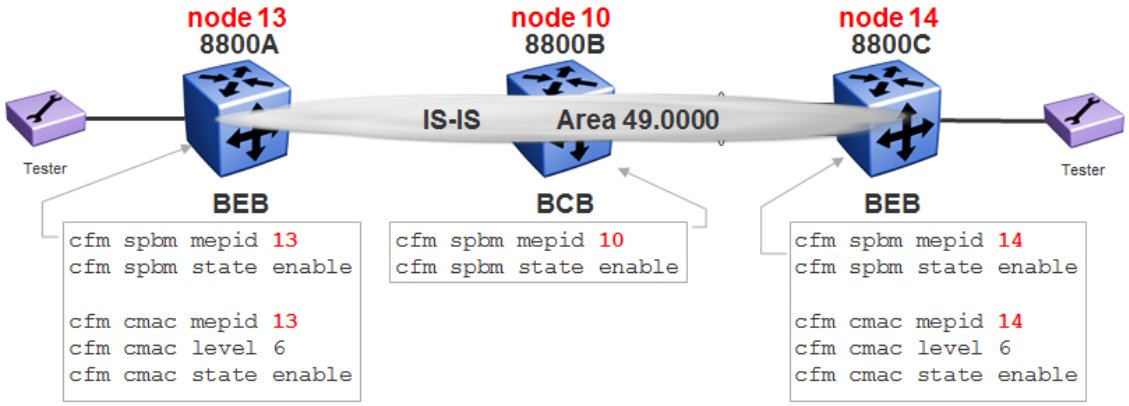
```
filter acl ace ethernet 1 1001 ether-type eq ip
filter acl ace ethernet 1 1001 vlan-id eq 1000
filter acl ace 1 1001 enable
show filter acl ace 1 1
```

The ACE ID must be in the range of 1001-2000 if using an ACE action of police.

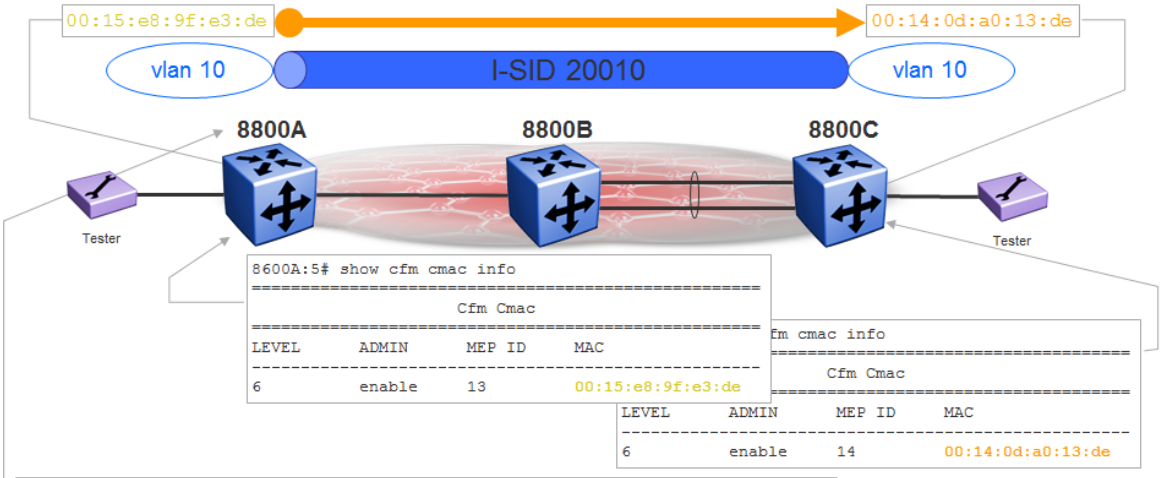
VSP 7000:

```
qos traffic-profile classifier name Police5M vlan-min 1000 vlan-max 1000 eval-order 5
committed-rate 5056 max-burst-rate 7040 drop-out-action enable
qos traffic-profile set port 20 name Police5M
show qos traffic-profile classifier name Police5M
show qos traffic-profile set port 20 name Police5M
```

12. CFM SPB & CMAC - Configuration Details



- This ensures that we get full OAM functionalities across:
  - SPB -> Backbone VLAN-ids (BVIDs) i.e. Infrastructure
  - CMAC -> Customer VLANs (CVLANs) i.e. Services
- If a node is acting as a BCB (i.e. it has no CVLANs) no point enabling CFM CMAC on it
- Use a higher level (6) on CMAC CFM
- Leave default level (4) on SPBM CFM




```
8600A:5# l2ping 10.00:14:0d:a0:13:de
----00:14:0d:a0:13:de    L2 PING Statistics----  0(64) bytes of data
1 packets transmitted, 1 packets received,   0.00% packet loss
  round-trip (us)        min/max/ave/stdv =  5446/5446/5446.00/ 0.00

8600A:5# l2traceroute 10.00:14:0d:a0:13:de
l2traceroute to   (00:14:0d:a0:13:de),  vlan 10
0    00:15:e8:9f:e3:de    (00:15:e8:9f:e3:de)
1    00:14:0d:a0:13:de    (00:14:0d:a0:13:de)
```

- On a VLAN with no IP address, the chassis MAC (with 'de' as last byte) is used

13. DiffServ Details – ERS 8800 & VSP 9000

Case		enable-diffserv	Access-diffserv	802.1p-override	Result	DSCP Modified	p-bit modified
1	Bridged	false	false	disable	L2 trusted L3 trusted	no	no
2	Bridged	false	true	disable	L2 trusted L3 untrusted	no	no
3	Bridged	true	true	disable	L2 trusted L3 untrusted	no	no
4	Bridged	true	false	disable	L2 trusted L3 trusted	no	no
5	Bridged	false	true	enable	L2 untrusted L3 untrusted	no	yes
6	Bridged	true	true	enable	L2 untrusted L3 untrusted	yes	yes
7	Bridged	false	false	enable	L2 untrusted L3 trusted	no	yes
8	Routed	false	false	disable	L2 trusted L3 trusted	no	no
9	Routed	false	true	disable	L2 trusted L3 untrusted	no	no
10	Routed	true	true	disable	L2 trusted L3 untrusted	yes	no
11	Routed	true	false	disable	L2 trusted L3 trusted	no	no
12	Routed	false	true	enable	L2 untrusted L3 untrusted	no	yes
13	Routed	true	true	enable	L2 untrusted	yes	yes

Case		enable-diffserv	Access-diffserv	802.1p-override	Result	DSCP Modified	p-bit modified
					L3 untrusted		
14	Routed	false	false	enable	L2 untrusted L3 trusted	no	yes
15	Routed	true	true	enable	L2 untrusted L3 trusted	yes	yes
	Default	false	false	disable	L2 trusted L3 trusted		