

## Chapter 38

# Ethernet Protection Switching Ring (EPSR)

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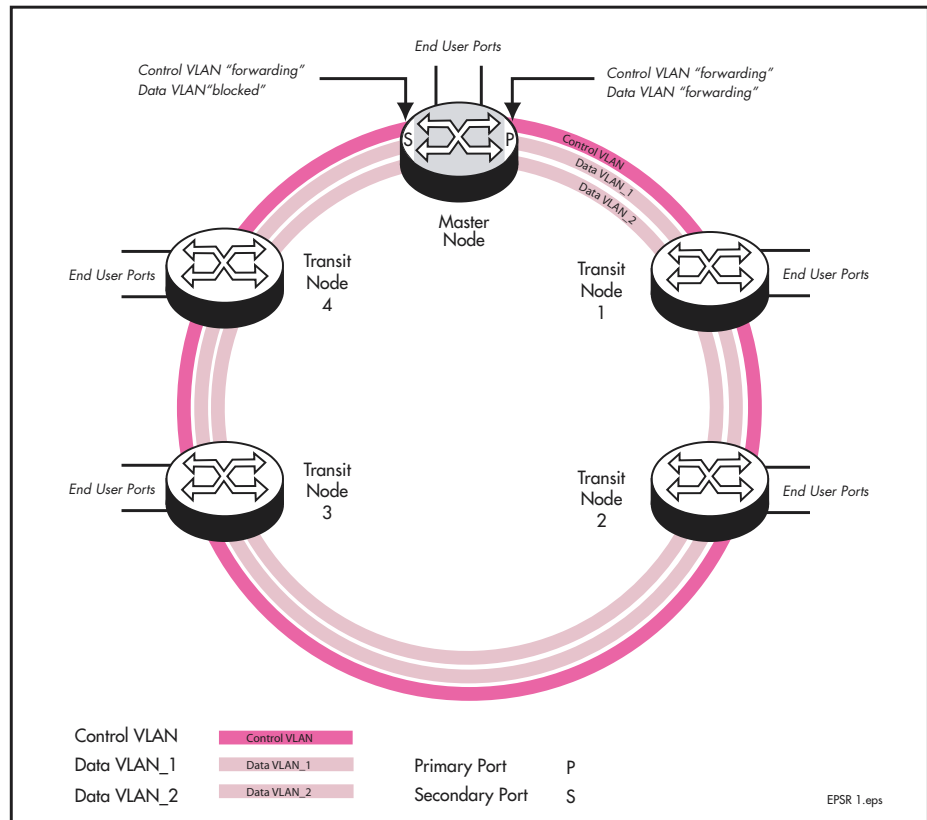
## Introduction

Ethernet Protection Switching Ring (EPSR) is a protection system employed to prevent loops in Ethernet ring based topologies. EPSR offers a rapid detection and recovery time (in the order of 50 ms, depending on configuration) if a link or node fails. This rapid recovery time makes EPSR a more effective alternative to spanning tree based options when using ring based topologies to create high speed resilient layer two networks.

## Ring Components and Operation

EPSR operates only on ring based topologies. An EPSR ring comprises a series of nodes (Ethernet bridges) connected end to end. The following figure shows a basic ring configuration. A ring comprises one master node and a number of transit nodes. Each node connects to the ring via two ports. On the master node one port is configured to be the primary port and the other, the secondary port.

Figure 38-1: Simple EPSR ring configuration



### EPSR instances and domains

Each physical EPSR ring contains one or more EPSR instances. An EPSR instance can be thought of as a component of an EPSR ring existing on a single node. A set of instances across the whole ring is called a "domain." Therefore a ring whose individual nodes each have two instances results in a two domain ring. Each instance contains a control VLAN and a number of data VLANs. EPSR instances are created using the [create epsr command on page 38-16](#).

The EPSR control VLAN, and its associated data VLANs, form a Ring Domain. Although a physical ring can have more than one domain, each domain must operate as a separate logical group of VLANs and must have its own master node. This means that several domains may share the same physical network, but must operate as logically separate VLAN groups.

- Control VLAN** The function of the control VLAN is to monitor the ring domain and maintain its operational functions. To do this it transmits and monitors operational healthcheck messages using EPSR healthcheck control frames. The control VLAN carries no user data.
- Data VLAN** The data VLAN carries the user data around the ring. Several data VLANs can share a common control VLAN.
- Master node** The master node controls the ring operation. It issues healthcheck messages at regular intervals from its primary port and monitors their arrival back at its secondary port, after they have circled the ring. Under normal operating conditions the master node's secondary port is always in the blocking state to all data VLAN traffic. This is to prevent data loops forming within the ring. This port however, operates in the forwarding state for the traffic on the control VLAN. Loops do not occur on the control VLAN because the control messages stop at the secondary port, having completed their path around the ring.
- Transit nodes** The transit nodes operate as conventional Ethernet bridges, but with the additional capability of running the EPSR protocol. This protocol requires the transit nodes to forward the healthcheck messages from the master node, and respond appropriately when a ring fault is detected. The fault condition procedure is explained in the section, [“Fault Detection and Recovery” on page 38-4](#).

## Fault Detection and Recovery

EPSR uses the following methods to detect outages in a node or a link in the ring:

- Master node polling fault detection
- Transit node unsolicited fault detection

### Master node polling

The master node issues healthcheck messages from its primary port as a means of checking the condition of the EPSR network ring. These messages are sent at regular periods, controlled by the **hellotime** parameter of the **create epsr** command on page 38-16. A failover timer is set each time a healthcheck message leaves the master node's primary port. The timeout value for this timer is set by the **failover** parameter of the **create epsr** command. If the failover timer expires before the transmitted healthcheck message is received by the master node's secondary port, the master node assumes that there is a fault in the ring, and implements its fault recovery procedures. Because this detection method relies on a timer expiry, its operation is inherently slower than the "transit node unsolicited detection method" described next.

### Transit node unsolicited

The transit node unsolicited method relies on transit nodes detecting faults at their interfaces, and immediately notifying master nodes about a break. When a transit node detects a connectivity loss, it sends a "links down" message over its good link. Because a link spans two nodes, both nodes send the "links down" message back to the master node. These nodes also change their state from "links up" to "links down," and change the state of the port connecting to the broken link, from "forwarding" to "blocking."

## Fault Recovery

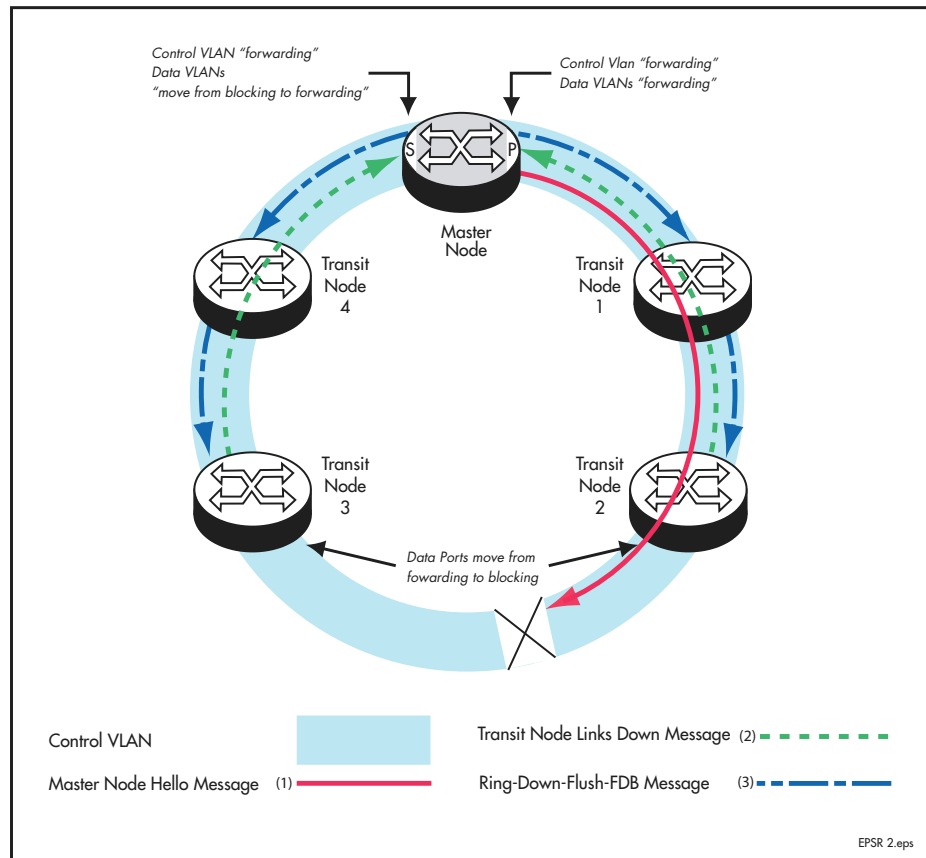
When the master node detects an outage in the ring by using its detection methods, it does the following:

1. Declares the ring to be in a "failed" state.
2. Unblocks its secondary port to enable the data VLAN traffic to pass between its primary and secondary ports.
3. Flushes its own forwarding database (FDB) for only the two ring ports.
4. Sends an EPSR Ring-Down-Flush-FDB control message to all the transit nodes, via both its primary and secondary ports.

The transit nodes respond to the Ring-Down-Flush-FDB message by flushing their forward databases for each of their ring ports. As the data starts to flow in the ring's new configuration, each of the nodes (master and transit) re-learn their Layer 2 addresses. During this period, the master node continues to send health check messages over the control VLAN. This situation continues until the faulty link or node is repaired. For a multi-domain ring, this process occurs separately for each domain within the ring.

The following figure shows the flow of control frames under fault conditions.

Figure 38-2: EPSR fault detection messages



## Restoring Normal Operation

### Transit nodes

Once a fault in the ring or node has been rectified, the transit nodes that span the previously faulty link section detects that link connectivity has returned. They then move their appropriate ring port state, from Links-Down to Pre-Forwarding, and await the Ring-Up-Flush control message from the master node.

Once these transit nodes receive the Ring-Up-Flush message, they:

- flush their forward databases for both their ring ports
- change the state of their ports from blocking to forwarding, which allows data to flow through their previously blocked ring ports

Note that the transit nodes do not enter the forward state until they have received the Ring-Up-Flush message. This is to prevent the possibility of a loop condition occurring caused by the transit nodes moving into the forwarding state before the master node secondary port can return to the blocking state. During such a period, the ring would have no ports blocked.

### Master node

With the link restored, the healthcheck messages that are sent from the primary port of the master node now complete the loop and arrive at the master node's secondary port. The master node restores normal conditions as follows:

1. Declares the ring to be in a "complete" state.
2. Blocks its secondary port for data (non-control) traffic.
3. Flushes its forwarding database for its two ring ports.
4. Sends a Ring-Up-Flush-FDB message from its primary port to all transit nodes.

## Configuration Examples

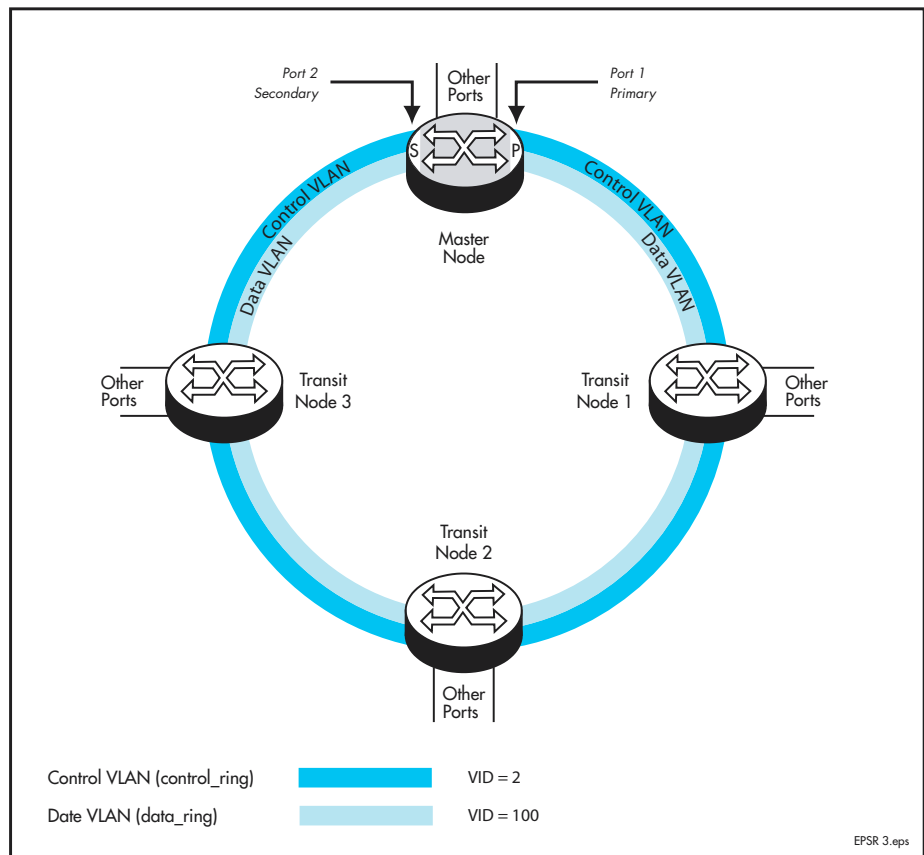
This section describes how to configure EPSR in following ways:

- **Single Domain, Single Ring Network**
- **Single Ring, Dual Domain Network**
- **EPSR and Spanning Tree Operation**

### Single Domain, Single Ring Network

This example shows a simple single ring, single domain configuration with no connecting lobes.

Figure 38-3: EPSR single domain, single ring network



The following figure shows a sample of the commands to configure this network.

Figure 38-4: Example script for a 4-node ring network

```
# EPSR configuration for a simple 4 node ring network

# For the Master Node
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=master controlvlan=control_ring primaryport=1
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one

# For Transit Nodes 1, 2, 3
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

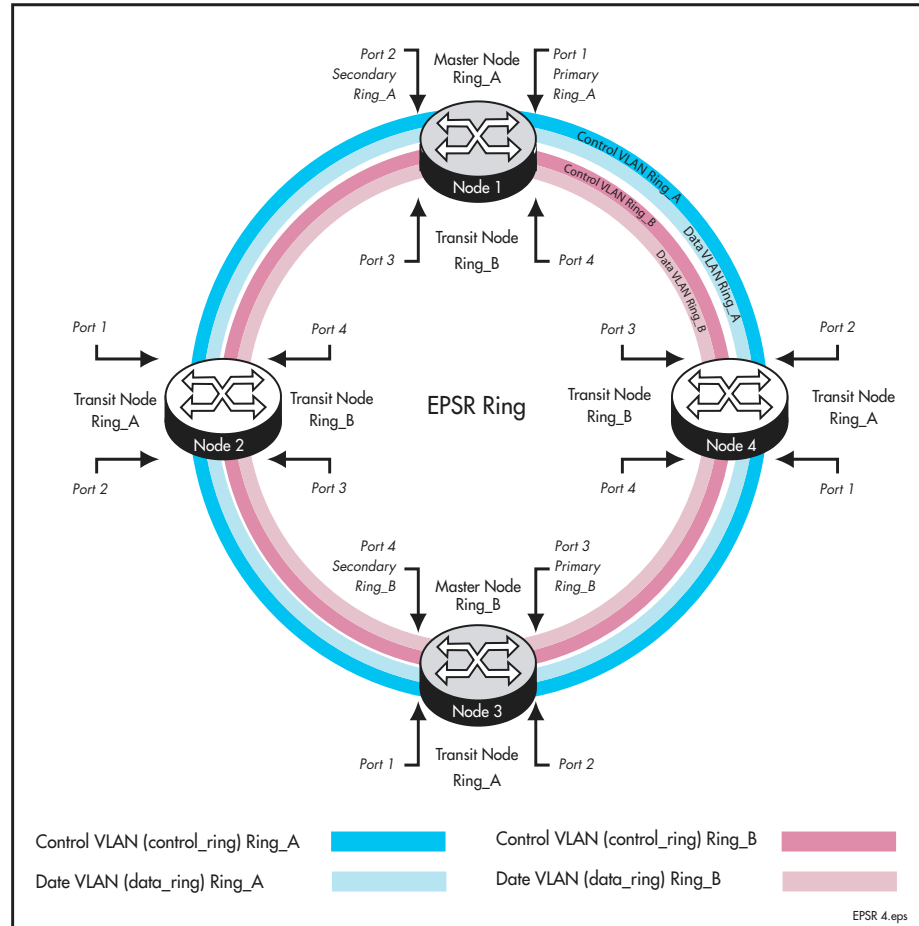
# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Configuring the other non-EPSR ports is outside the scope of this example.

## Single Ring, Dual Domain Network

This example shows an EPSR configuration where two EPSR domains share the same physical ring. This configuration lets two sets of users run totally separate layer two networks. Improved load distribution around the ring can be achieved by configuring different nodes to be the master for each ring.

Figure 38-5: EPSR single ring network, two domain network.





The following figures show a sample of the commands to configure this network.

Figure 38-6: Example script for a single ring, two domain network - Node 1

```
# Node 1 (Master node for Ring_A - Transit Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

#Create VLANs
# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# Ring_B
create vlan=control_ring_B vid=3
create vlan=data_ring_B vid=30

# VLAN Port Configuration
# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=1-2

EPSR Configuration
# create epsr domains
# domain_A
create epsr=domain_A mode=master controlvlan=control_ring_A primaryport=1
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A

# domain_B
create epsr=domain_B mode=transit controlvlan=control_ring_B
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B
```

Figure 38-7: Example script for a single ring, two domain network - Nodes 2 and 4

```
# Node 2 and Node 4 (Transit node for Ring_A - Transit Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

# Create VLANs
# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# Ring_B
create vlan=control_ring_B vid=3
create vlan=Data_ring_B vid=30

# VLAN Port Configuration
# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=3-4

EPSR Configuration
# create epsr domains
# domain_A
create epsr=domain_A mode=transit controlvlan=control_ring_A
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A

# domain_B
create epsr=domain_B mode=transit controlvlan=control_ring_B
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B
```

Figure 38-8: Example script for a single ring, two domain network - Node 3

```
# Node 3 (Transit node for Ring_A - Master Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

#Create VLANs
# Ring_B
create vlan=control_ring_B vid=3
create vlan=data_ring_B vid=30

# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# VLAN Port Configuration
# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=3-4

# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
# create epsr domains
# domain_B
create epsr=domain_B mode=master controlvlan=control_ring_B primaryport=3
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B

# domain_A
create epsr=domain_A mode=transit controlvlan=control_ring_A
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A
```

Configuring the other non-EPSR ports is outside the scope of this example.

## EPSR and Spanning Tree Operation

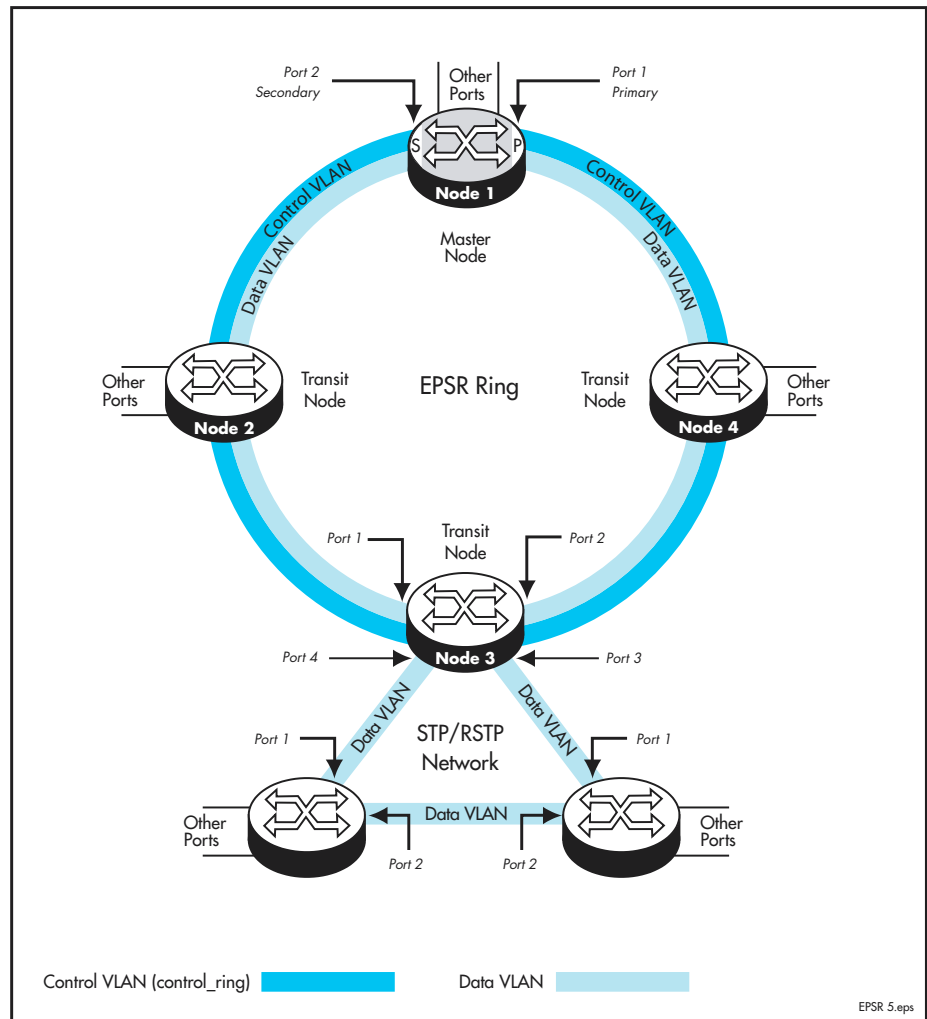
EPSR and the Spanning Tree protocol (STP) address the issue of data loop prevention, although they do it differently. For information on STP, see ["Introduction" on page 8-3 of Chapter 8, Spanning Trees](#).

EPSR is manually configured to explicitly identify which link(s) are broken in the defined ring, whereas STP/RSTP calculates where to break links based on values (metrics) users provide that are compared to determine the "best" (or lowest cost) paths for data traffic.

At the practical level these two techniques can be employed to create complementary hybrid EPSR / STP configurations. Such a configuration might have a high speed fibre loop topology backbone—controlled and managed using EPSR. Lobes could extend out from each loop node into a user mesh network. Any loops existing within this mesh network would be controlled and managed using STP/RSTP. Note that EPSR and STP cannot share the same ports.

The following figure shows a basic combined EPSR / STP network.

Figure 38-9: EPSR and spanning tree operation



The following figures show a sample of the commands to configure this network.

Figure 38-10: Example script for a combined EPSR STP network - Master Node 1

```
# EPSR configuration with spanning tree lobe
# For the Master Node (Node 1)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=200

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=master controlvlan=control_ring primaryport=1
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Figure 38-11: Example script for a combined EPSR STP network - Transit Node 3

```
# For Transit Node 3
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Enable the default STP instance
ena stp=default

# Disable the default STP instance on the ring ports 1 and 2, so that STP never
# blocks them.
dis stp=default po=1,2

# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Figure 38-12: Example script for a combined EPSR STP network - Transit Nodes 2 and 4

```
# For Transit Nodes 2 and 4
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

## Command Reference

This section describes the commands available to configure and manage the EPSR functions on the switch.

The shortest valid command is denoted by capital letters in the Syntax section. See [“Conventions” on page xlix of About this Software Reference](#) in the front of this manual for details of the conventions used to describe command syntax. See [Appendix A, Messages](#) for a complete list of messages and their meanings.

### add epsr datavlan

**Syntax** `ADD EPSR=epsr-name DATAvlan={vlan-name|1..4094}`

**Description** This command adds a data VLAN to the selected EPSR instance, in order to provide protection against network loops in that VLAN.

The following configuration rules apply when adding an EPSR data VLAN:

- The maximum number of data VLANs that can be added to an EPSR instance is 512.
- The VLAN must not already be in the EPSR instance as either a control VLAN or data VLAN.
- A VLAN cannot be added to an EPSR instance if it is already a control VLAN for another EPSR instance.
- A VLAN cannot be added to an EPSR instance if it is already a data VLAN for another instance, and that instance has a ring port that is also in this instance.
- The VLAN need not contain the ring ports in order to be added to an EPSR instance. Also, adding the VLAN to the EPSR instance before adding the ports to the data VLAN reduces the possibility of creating loops while configuring the ring.

Parameter	Description
EPSR	Name of the EPSR instance to which the VLAN is to be added. Default: no default
DATAvlan	VLAN that carries data around the EPSR ring. Default: no default
<i>vlan-name</i>	Unique name for a VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The <i>vlan-name</i> cannot be a number or <b>all</b> .
1..4094	VID of the data VLAN being added to the EPSR instance.

**Examples** To add the vlan2 VLAN to the EPSR instance called blue use the command:

```
add epsr=blue data=vlan2
```

**Related Commands** [create epsr](#)  
[create vlan](#)  
[delete epsr datavlan](#)  
[show epsr](#)

## create epsr

**Syntax** `CREate EPSR=epsr-name MODE=MASTER CONtrolvlan={vlan-name|1..4094} PRImaryport=port [HEllotime=time]  
[FAilovertime=time2] [RIngflaptime=0..65535]  
[TRap={ENABled|DISabled}]`

`CREate EPSR=epsr-name MODE=TRANSit CONtrolvlan={vlan-name|1..4078} [TRap={ENABled|DISabled}]`

**Description** This command creates an EPSR instance. Note that creating an EPSR instance also enables ingress filtering (the **infiltering** parameter of the **set switch port** command) on ports in the control VLAN. You cannot disable ingress filtering on ports while they are in the control VLAN; you must first remove them from the control VLAN or destroy the EPSR instance.

The following configuration rules apply when creating an EPSR:

- The maximum number of EPSR instances that can be created on a switch is 16.
- The control VLAN must have exactly two member ports, except where there are a group of trunked ports that count as a single port. The ports, which must be tagged for the VLAN, are used as the ring's ports of the EPSR instance.
- The control VLAN cannot be part of another EPSR instance as either a control or data VLAN.
- If trunked ports are included as a ring port, as long as one of the trunked ports is up, the ring port is considered to be, up. SNMP traps and log messages display the lowest number port as the ring port's port number for the trunk.
- Ports enabled for LACP, STP, GARP or VLAN Assignment cannot be added to an EPSR instance.

Parameter	Description
EPSR	Name of the Ethernet protected switch ring instance being created on the switch. This name is a character string, 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. You cannot name an EPSR instance "all". You cannot specify an EPSR instance using an <i>epsr-name</i> that is already configured. The <i>epsr-name</i> is not case sensitive, although its case is preserved for display purposes. Default: no default
MODE	How the device acts. Default: <b>master</b>
MASTer	Sets the switch to be the master node for the named EPSR ring.
TRANSit	Sets the switch to be a transit node for the named EPSR ring.



Parameter (cont.)	Description (cont.)
CONtrolvlan	<p>The control VLAN. Note that you must first create this VLAN with the command <a href="#">create vlan</a> in <a href="#">Chapter 7, Switching</a>.</p> <p>Default: no default</p>
<i>vlan-name</i>	<p>Unique name for the control VLAN. This name can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The <i>vlan-name</i> cannot be a number or <b>all</b>.</p>
1..4094	VID of the control VLAN
PRImaryport	<p>Port number of the primary port for the EPSR instance on this switch. Only configured for the master node.</p> <p>Default: no default</p>
HEllotime	<p>Rate that the master node transmits its TAPS protocol health control messages. The <i>time</i> can be specified from 100 milliseconds (100ms), to 32767 seconds (32767s). Only configured for the master node.</p> <p>If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.</p> <p>Default: <b>1s</b></p>
FAilvertime	<p>Time period that a master node allows for a healthcheck frame to circle the loop before declaring that the EPSR ring has broken. This time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port.</p> <p>The <i>time2</i> can be specified from 200 milliseconds (200ms) to 65535 seconds (65535s). If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.</p> <p>The <b>failvertime</b> must be at least twice the value of the <b>hellotime</b>.</p> <p>Default: <b>2s</b></p>
Ringflaptime	<p>Seconds that a master node must remain in the failed state after a link goes down, even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping (intermittently recovering from its fault).</p> <p>Default: <b>0</b></p>
TRap	<p>Whether SNMP traps are to be sent when the EPSR instance changes state.</p> <p>Default: <b>enabled</b></p>
ENabled	Traps are sent if SNMP is appropriately configured.
Disabled	Traps are not sent.

**Examples** To create an EPSR instance called blue with this switch acting as the master node, vlan2 as the control VLAN, and port 1 as the primary port, use the command:

```
cre epsr=blue mode=mast con=vlan2 pri=1
```

**Related Commands**

- [add snmp targetaddr \(SNMPv3\)](#)
- [add snmp targetparams \(SNMPv3\)](#)
- [create snmp community \(SNMPv1 & v2\)](#)
- [create vlan command on page 7-68 of Chapter 7, Switching](#)
- [destroy epsr](#)
- [set epsr](#)
- [set epsr port](#)
- [show epsr](#)

## delete epsr datavlan

**Syntax** DELEte EPSR=*epsr-name* DATAvlan={*vlan-name*|1..4094|ALL}

**Description** This command removes a data VLAN from an EPSR instance.

Deleting a VLAN that is still configured to a ring can cause loops and subsequent broadcast storms within the network. To avoid creating loops, take one or more of these steps before using this command:

- Disable the ports by using the [disable switch port command on page 7-83](#).
- Unplug the ports.
- Delete the ports from the VLAN by using the [delete vlan port command on page 7-73](#).

Parameter	Description						
EPSR	Name of the EPSR instance to delete. Default: no default						
DATAvlan	The data VLAN to be removed from the EPSR instance. <table><tr><td><i>vlan-name</i></td><td>Unique name for the VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The <i>vlan-name</i> cannot be a number or <b>all</b>.</td></tr><tr><td>1..4094</td><td>VID of the data VLAN being deleted from the EPSR instance.</td></tr><tr><td>ALL</td><td>All VLANs belonging to the EPSR instance.</td></tr></table>	<i>vlan-name</i>	Unique name for the VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The <i>vlan-name</i> cannot be a number or <b>all</b> .	1..4094	VID of the data VLAN being deleted from the EPSR instance.	ALL	All VLANs belonging to the EPSR instance.
<i>vlan-name</i>	Unique name for the VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The <i>vlan-name</i> cannot be a number or <b>all</b> .						
1..4094	VID of the data VLAN being deleted from the EPSR instance.						
ALL	All VLANs belonging to the EPSR instance.						

**Examples** To delete the vlan2 VLAN from the EPSR instance called blue, use the command:

```
del epsr=blue data=vlan2
```

**Related Commands** [add epsr datavlan](#)  
[show epsr](#)

## destroy epsr

**Syntax** DESTroy EPSR={*epsr-name*|ALL}

**Description** This command destroys a specific EPSR instance or all instances. Before using this command, disable the appropriate EPSR instances with the **disable epsr** command, and remove all their associated data VLANs. To avoid creating loops, take one or more of these steps before using this command:

- Disable the ports, using the [disable switch port command on page 7-83](#).
- Unplug the ports.
- Delete the ports from the VLAN, using the [delete vlan port command on page 7-73](#).

Note that the switch automatically enables ingress filtering (the **infiltering** parameter of the **set switch port** command) on ports in the control VLAN for each EPSR instance. When you destroy an EPSR instance, the switch also disables ingress filtering on those ports, unless they are part of another EPSR instance.

Parameter	Description
EPSR	EPSR instance to be destroyed. Default: no default
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances

**Examples** To destroy the EPSR instance called blue, use the command:

```
dest epsr=blue
```

**Related Commands** [create epsr](#)  
[disable epsr](#)  
[show epsr](#)

## disable epsr

**Syntax** `DISable EPSR={epsr-name|ALL}`

**Description** This command disables EPSR for a specific EPSR instance or all instances.

Note that disabling a VLAN that is still configured to a ring can cause loops and subsequent broadcast storms within the network. To avoid creating loops, take one or more of these steps before using this command:

- Disable the ports, using the [disable switch port command on page 7-83](#).
- Unplug the ports.
- Delete the ports from the VLAN, using the [delete vlan port command on page 7-73](#).

Parameter	Description
EPSR	EPSR instance to be disabled. Default: no default
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.

**Examples** To disable the EPSR instance called blue, use the command:

```
dis epsr=blue
```

**Related Commands** [enable epsr](#)  
[show epsr](#)

## disable epsr debug

**Syntax** `DISable EPSR={epsr-name | ALL} DEBug={ INFO | MSG | PKT | STAtE | ALL}`

**Description** This command disables debugging for a specific EPSR instance or all instances.

Parameter	Description
EPSR	EPSR instance on which debugging is to be disabled. Default: no default
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.
Debug	Debugging mode to be disabled. Default: no default
INFO	General information about EPSR.
MSG	Decoded display of received and transmitted EPSR frames.
PKT	Raw ASCII display of received and transmitted EPSR frames.
STAtE	EPSR state transitions.
ALL	All debug options.

**Examples** To disable all debugging modes on the EPSR instance called blue, use the command:

```
dis epsr=blue deb=all
```

**Related Commands** [enable epsr debug](#)  
[show epsr debug](#)

## enable epsr

**Syntax** `ENAbLe EPSR={epsr-name | ALL}`

**Description** This command enables EPSR on a specific EPSR instance or all instances.

Parameter	Description
EPSR	EPSR instance to be enabled. Default: no default
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.

**Examples** To enable the EPSR instance called blue, use the command:

```
ena epsr=blue
```

**Related Commands** [create epsr](#)  
[disable epsr](#)  
[show epsr](#)

## enable epsr debug

**Syntax** `ENable EPSR={epsr-name|ALL} DEBug={INFo|MSG|PKT|STAtE|ALL}  
[OUTput=CONsole] [TIMEOut={1..4000000000|NONE}]`

**Description** This command enables debugging for a specific EPSR instance or all instances.

Parameter	Description
EPSR	EPSR instance whose debugging is to be enabled. Default: no default
	<i>epsr-name</i> Name of the EPSR instance.
	ALL All EPSR instances.
DEbug	Debugging mode to be enabled. Default: no default.
	INFo General information about the EPSR instance selected.
	MSG Decoded display of received and transmitted EPSR frames.
	PKT Raw ASCII display of received and transmitted EPSR frames.
	STAtE EPSR state transitions.
	ALL All debug options.
OUTput	When this parameter is set to <b>console</b> , all debugging information is sent to the console. By default, the debugging data is sent to the port that received the enable epsr debug command. Use this option if the <b>enable epsr debug</b> command is used in a script because a script is not received on a port.
TIMEOut	Number of seconds during which debugging is enabled on the specified EPSR instances. Limiting the debugging period reduces the risk of overloading the switch with debugging information. This value set in this command overrides all previous EPSR debugging timeout values for the specified EPSR instances, even if they were specified for other debugging modes.  Default: the most recent timeout value set in an <b>enable epsr debug</b> command for the given EPSR instance, or <b>none</b> if none had been set.

**Examples** To enable all debugging modes on the EPSR instance called blue, use the command:

```
ena epsr=blue deb=all
```

**Related Commands** [disable epsr debug](#)  
[show epsr debug](#)

## purge epsr

**Syntax** PURge EPSR

**Description** This command destroys all EPSR instances, returning the EPSR module to its status when it was first powered on.

Note that when the data VLANs of any EPSR instances are still configured in a ring formation, purging EPSR could cause a loop in the network. To avoid creating loops, take one or more of these steps before using this command:

- Disable the ports, using the [disable switch port command on page 7-83](#).
- Unplug the ports.
- Delete the ports from the VLAN, using the [delete vlan port command on page 7-73](#).

**Examples** To purge all EPSRs, use the command:

```
pur epsr
```

**Related Commands** [create epsr](#)  
[show epsr](#)

## set epsr

**Syntax** SET EPSR={*epsr-name*|ALL} [Hello*time*=*time*]  
[Failover*time*=*time*2] [Ringflap*time*=0..65535]  
[TRAP={ENABled|DISABled}]

**Description** This command sets the parameters used by EPSR for a specific EPSR instance or all instances.

Parameter	Description
EPSR	EPSR instance to set. Default: no default
	<i>epsr-name</i> Name of the EPSR instance.
	ALL All EPSR instances.
Hello <i>time</i>	Rate that the master node transmits its TAPS protocol health control messages. The <i>time</i> can be specified from 100 milliseconds (100ms), to 32767 seconds (32767s). Only configured for the master node.  If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.  Default: <b>1s</b>

Parameter	Description (cont.)				
FAilvertime	<p>Time period that a master node allows for a healthcheck frame to circle the loop before declaring that the EPSR ring has broken. This time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port.</p> <p>The <i>time2</i> can be specified from 200 milliseconds (200ms) to 65535 seconds (65535s). If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.</p> <p>The <b>failovertime</b> must be at least twice the value of the <b>hellotime</b>.</p> <p>Default: <b>2s</b></p>				
RIngflaptime	<p>Minimum number of seconds that a master node must remain in the <i>failed</i> state after a link goes down, even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping (intermittently recovering from its fault).</p> <p>Default: <b>0</b></p>				
TRap	<p>Whether SNMP traps are sent when the EPSR instance changes state.</p> <p>Default: <b>enabled</b></p>				
	<table> <tr> <td>ENabled</td><td>Traps are sent if SNMP is appropriately configured.</td></tr> <tr> <td>DIsabled</td><td>Traps are not sent.</td></tr> </table>	ENabled	Traps are sent if SNMP is appropriately configured.	DIsabled	Traps are not sent.
ENabled	Traps are sent if SNMP is appropriately configured.				
DIsabled	Traps are not sent.				

**Examples** To set the Ringflap time for the EPSR instance called blue to 2, use the command:

```
set epsr=blue ri=2
```

**Related Commands**

- [add snmp targetaddr \(SNMPv3\)](#)
- [add snmp targetparams \(SNMPv3\)](#)
- [create snmp community \(SNMPv1 & v2\)](#)
- [create epsr](#)
- [show epsr](#)



## set epsr port

**Syntax** SET EPSR=*epsr-name* Port=*port* TYpe={PRIMary|SECOndary}

**Description** This command changes primary and secondary port designations for a specific EPSR instance. Setting one port to primary automatically causes the other port to change to secondary; similarly setting one port to secondary automatically causes the other port to change to primary.

This command is valid only when the switch is acting as the master node for the selected an EPSR instance. To set the mode for an EPSR instance, use the **create epsr** command. To view the mode for an EPSR instance, use the **show epsr** command.

You can set an EPSR port only when the EPSR is disabled. To disable an EPSR instance, use the **disable epsr** command.

If a ring port for the EPSR instance is also a member of a trunk group, you can use this command by entering any one of the ports in the trunk group.

Parameter	Description
EPSR	EPSR to be changed. Default: no default
	<i>epsr-name</i> Name of the EPSR instance.
	ALL All EPSR instances.
Port	Number of the port to be changed. The port must already be in the EPSR instance. Default: no default
Type	The port's role within the EPSR ring. Default: no default
	PRIMary The port is the primary port.
	SECOndary The port is the secondary port. When the EPSR ring is complete, the secondary port is blocked for all data VLANs within the ring domain.

**Examples** To set port 1 to be a primary port for the EPSR instance called blue, use the command:

```
set epsr=blue po=1 ty=prim
```

**Related Commands**

- [create epsr](#)
- [disable epsr](#)
- [show epsr](#)

## show epsr

**Syntax** SHOW EPSR [= { *epsr-name* | ALL } ]

**Description** This command displays information about a specific EPSR instance or all instances on the switch ([Figure 38-13](#), [Table 38-1](#)).

Parameter	Description
EPSR	EPSR instance for which you want to display information. Default: <b>all</b>
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.

Figure 38-13: Example output from the **show epsr** command

```

EPSR Information
-----
Name ..... blue
Mode ..... Master
Status ..... Enabled
State ..... Complete
Control VLAN ..... vlan2 (2)
Data VLAN(s) .....vlan100 (100)
                  .....vlan101 (101)
                  .....vlan102 (102)

Primary Port ..... 1
Primary Port Status ..... Forwarding
Secondary Port ..... 2
Secondary Port Status ..... Blocked
Hello Time ..... 1 s
Failover Time ..... 2 s
Ring Flap Time ..... 0
Trap ..... Enabled

Name ..... red
Mode ..... Transit
Status ..... Enabled
State ..... Links-Up
Control VLAN ..... vlan3 (3)
Data VLAN(s) ..... vlan103 (103)
First Po rt ..... 1
First Port Status .....Forwarding
First Port Direction ..... Upstream
Second Port ..... 2
Second Port Status ..... Forwarding
Second Port Direction ..... Downstream
Trap ..... Enabled
Master Node ..... 00-00-cd-11-b1-b4
-----

```

Table 38-1: Parameters in output of the **show epsr** command

Parameter	Meaning
Name	Name of the EPSR instance.
Mode	Whether the EPSR instance is running as a master or transit node on this device.
Status	Whether the named EPSR instance is enabled.
State	State of the EPSR instance. In a master node, a state can be: Idle, Complete or Failed. In the transit node, a state can be: Idle, Links-Up, Links-Down or Pre-Forwarding.
Control VLAN	Control VLAN for the named EPSR instance. The VLAN Identifier is shown in brackets.
Data VLAN(s)	List of data VLANs for the named EPSR instance. The VLAN Identifiers are shown in brackets.
Primary Port	Primary port for the named EPSR instance. This parameter is only shown on the master node for the instance named.
Primary Port Status	Status of the primary port; either Unknown, Forwarding, Down or Blocking. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a master node.
Secondary Port	Secondary port for the EPSR instance. This parameter is only shown on the master node for the instance named.
Secondary Port Status	Status of the secondary port; either Unknown, Forwarding, Down or Blocked. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a master node.
Hello Time	Rate that the TAPS protocol health control messages are transmitted from master node. It is specified in the <b>create epsr</b> command.  The unit symbol following the value shows whether the time is measured in seconds or milliseconds.
Failover Time	Time period that a master node waits for a healthcheck frame to circulate the loop before declaring that the EPSR ring has broken. The time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port. This parameter is only shown for a master node.  The unit symbol following the value shows whether the time is measured in seconds or milliseconds.
Ring Flap Time	Minimum number of seconds that a master node must remain in the <i>failed</i> state (before moving to the <i>complete</i> state), even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping. This parameter is only shown for a master node.
Trap	Whether SNMP traps are sent when the EPSR instance changes state. The display is either enabled or disabled. If enabled, traps are sent as long as the SNMP module is configured appropriately. If disabled, traps are not sent.
First Port	First ring port for the EPSR instance. This parameter is only shown for an instance in transit mode.

Table 38-1: Parameters in output of the **show epsr** command (cont.)

Parameter	Meaning
First Port Status	Status of the first ring port; either Unknown, Forwarding, Down or Blocking. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a transit node.
First Port Direction	Indicates connectivity of the first ring port to the master node; Upstream if this device is connected to the master through the first port, otherwise Downstream, or Unknown if the EPSR instance is disabled. This parameter is only shown for a transit node.
Second Port	The second ring port for the EPSR instance. This parameter is only shown for a transit node.
Second Port Status	The status of the second ring port; either Unknown, Forwarding, Down or Blocked. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a transit node.
Second Port Direction	Indicates connectivity of the second ring port to the master node; Upstream if this device is connected to the master through the second port, otherwise Downstream, or Unknown if the EPSR instance is disabled. This parameter is only shown for a transit node.
Master Node	The MAC Address of the EPSR domain's master node. Unknown is displayed if no messages have been received from the master yet. This parameter is only shown for a master node.

**Examples** To show the current settings of the EPSR instance called blue, use the command

```
show epsr=blue
```

**Related Commands**

- [add epsr datavlan](#)
- [create epsr](#)
- [delete epsr datavlan](#)
- [destroy epsr](#)
- [disable epsr](#)
- [enable epsr](#)
- [set epsr](#)
- [set epsr port](#)

## show epsr counter

**Syntax** SHOW EPSR[={*epsr-name*|ALL}] COUnTer

**Description** This command displays the counter information about a specific EPSR instance or all instances (Figure 38-14, Table 38-2).

Parameter	Description
EPSR	EPSR instance whose details you want to display. Default: <b>all</b>
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.
COUnTer	Counter information about a specific EPSR instance or all instances.

Figure 38-14: Example output from the **show epsr counter** command

EPSR Counters			
-----			
Name blue			
Receive:		Transmit:	
Total EPSR Packets	0	Total EPSR Packets	0
Health	0	Health	0
Ring Up	0	Ring Up	0
Ring Down	0	Ring Down	0
Link Down	0	Link Down	0
Invalid EPSR Packets	0		
Name: red			
Receive:		Transmit:	
Total EPSR Packets	0	Total EPSR Packets	0
Health	0	Health	0
Ring Up	0	Ring Up	0
Ring Down	0	Ring Down	0
Link Down	0	Link Down	0
Invalid EPSR Packets	0		
-----			

Table 38-2: Parameters in output of the **show epsr counter** command

Parameter	Meaning
Name	The name of the EPSR instance.
Receive	The number of EPSR packets received
Total EPSR Packets	The total number of valid EPSR control packets received.
Health	The number of valid healthcheck packets received.
Ring Up	The number of valid ring-up packets received.
Ring Down	he number of valid ring-down packets received.
Link Down	The number of valid link-down packets received.
Invalid EPSR Packets	The number of invalid EPSR control packets received.
Transmit	EPSR packets transmitted
Total EPSR Packets	The total number of EPSR control packets transmitted.
Health	The number of healthcheck packets transmitted.

Table 38-2: Parameters in output of the **show epsr counter** command (cont.)

Parameter	Meaning
Ring Up	The number of ring-up packets transmitted.
Ring Down	The number of ring-down packets transmitted.
Link Down	The number of link-down packets transmitted.

**Examples** To show the counters of the EPSR instance called blue, use the command:

```
show epsr=blue cou
```

**Related Commands** [show epsr](#)

## show epsr debug

**Syntax** SHOW EPSR [= {*epsr-name* | ALL}] DEBug

**Description** This command shows the debugging modes enabled on a specific EPSR instance or all instances ([Figure 38-15](#), [Table 38-3](#)).

Parameter	Description
EPSR	EPSR instance whose debugging details you want to display. Default: <b>all</b>
<i>epsr-name</i>	Name of the EPSR instance.
ALL	All EPSR instances.
DEBug	Debugging information about a specific EPSR instance or all instances.

Figure 38-15: Example output from the **show epsr debug** command

EPSR Name	Enabled Debug Modes	Output	Timeout
blue	MSG, STATE	Asyn 0 (16)	None
red	None		

Table 38-3: Parameters displayed in output of the **show epsr debug** command

Parameter	Meaning
EPSR Name	The name of the EPSR instance.
Enabled Debug Modes	List of debug modes that are enabled for the EPSR instance. Possible modes are: INFO, MSG, PKT and STATE. If a no debugging modes are enabled, the displayed output is None.
Output	Output device for the EPSR instance. This is only shown when a debug mode is enabled.
Timeout	Time in seconds that the EPSR instance stays in debug mode. This is only shown when a debug mode is enabled. If no timeout value has been set, the displayed output is None. The timeout parameter is set using the <a href="#">enable epsr debug command on page 38-22</a>

**Related Commands** [show epsr](#)