



# **Configuration — Ethernet Modules**

## **Avaya Virtual Services Platform 9000**

3.2  
NN46250-508,03.01  
February 2012

## Notice

While reasonable efforts have been made to ensure that the information in this document is complete and accurate at the time of printing, Avaya assumes no liability for any errors. Avaya reserves the right to make changes and corrections to the information in this document without the obligation to notify any person or organization of such changes.

## Documentation disclaimer

“Documentation” means information published by Avaya in varying mediums which may include product information, operating instructions and performance specifications that Avaya generally makes available to users of its products. Documentation does not include marketing materials. Avaya shall not be responsible for any modifications, additions, or deletions to the original published version of documentation unless such modifications, additions, or deletions were performed by Avaya. End User agrees to indemnify and hold harmless Avaya, Avaya's agents, servants and employees against all claims, lawsuits, demands and judgments arising out of, or in connection with, subsequent modifications, additions or deletions to this documentation, to the extent made by End User.

## Link disclaimer

Avaya is not responsible for the contents or reliability of any linked Web sites referenced within this site or documentation provided by Avaya. Avaya is not responsible for the accuracy of any information, statement or content provided on these sites and does not necessarily endorse the products, services, or information described or offered within them. Avaya does not guarantee that these links will work all the time and has no control over the availability of the linked pages.

## Warranty

Avaya provides a limited warranty on its Hardware and Software (“Product(s)”). Refer to your sales agreement to establish the terms of the limited warranty. In addition, Avaya’s standard warranty language, as well as information regarding support for this Product while under warranty is available to Avaya customers and other parties through the Avaya Support Web site: <http://support.avaya.com>. Please note that if you acquired the Product(s) from an authorized Avaya reseller outside of the United States and Canada, the warranty is provided to you by said Avaya reseller and not by Avaya.

## Licenses

THE SOFTWARE LICENSE TERMS AVAILABLE ON THE AVAYA WEBSITE, [HTTP://SUPPORT.AVAYA.COM/LICENSEINFO/](http://support.avaya.com/licenseinfo/) ARE APPLICABLE TO ANYONE WHO DOWNLOADS, USES AND/OR INSTALLS AVAYA SOFTWARE, PURCHASED FROM AVAYA INC., ANY AVAYA AFFILIATE, OR AN AUTHORIZED AVAYA RESELLER (AS APPLICABLE) UNDER A COMMERCIAL AGREEMENT WITH AVAYA OR AN AUTHORIZED AVAYA RESELLER. UNLESS OTHERWISE AGREED TO BY AVAYA IN WRITING, AVAYA DOES NOT EXTEND THIS LICENSE IF THE SOFTWARE WAS OBTAINED FROM ANYONE OTHER THAN AVAYA, AN AVAYA AFFILIATE OR AN AVAYA AUTHORIZED RESELLER; AVAYA RESERVES THE RIGHT TO TAKE LEGAL ACTION AGAINST YOU AND ANYONE ELSE USING OR SELLING THE SOFTWARE WITHOUT A LICENSE. BY INSTALLING, DOWNLOADING OR USING THE SOFTWARE, OR AUTHORIZING OTHERS TO DO SO, YOU, ON BEHALF OF YOURSELF AND THE ENTITY FOR WHOM YOU ARE INSTALLING, DOWNLOADING OR USING THE SOFTWARE (HEREINAFTER REFERRED TO INTERCHANGEABLY AS “YOU” AND “END USER”), AGREE TO THESE TERMS AND CONDITIONS AND CREATE A BINDING CONTRACT BETWEEN YOU AND AVAYA INC. OR THE APPLICABLE AVAYA AFFILIATE (“AVAYA”).

## Copyright

Except where expressly stated otherwise, no use should be made of materials on this site, the Documentation, Software, or Hardware provided by Avaya. All content on this site, the documentation and the Product provided by Avaya including the selection, arrangement and design of the content is owned either by Avaya or its licensors and is protected by copyright and other intellectual property laws including the sui generis rights relating to the protection of databases. You may not modify, copy, reproduce, republish, upload, post, transmit or distribute in any way any content, in whole or in part, including any code and software unless expressly authorized by Avaya. Unauthorized reproduction, transmission, dissemination, storage, and or use without the express written consent of Avaya can be a criminal, as well as a civil offense under the applicable law.

## Third-party components

Certain software programs or portions thereof included in the Product may contain software distributed under third party agreements (“Third Party Components”), which may contain terms that expand or limit rights to use certain portions of the Product (“Third Party Terms”). Information regarding distributed Linux OS source code (for those Products that have distributed the Linux OS source code), and identifying the copyright holders of the Third Party Components and the Third Party Terms that apply to them is available on the Avaya Support Web site: <http://support.avaya.com/Copyright>.

## Trademarks

The trademarks, logos and service marks (“Marks”) displayed in this site, the Documentation and Product(s) provided by Avaya are the registered or unregistered Marks of Avaya, its affiliates, or other third parties. Users are not permitted to use such Marks without prior written consent from Avaya or such third party which may own the Mark. Nothing contained in this site, the Documentation and Product(s) should be construed as granting, by implication, estoppel, or otherwise, any license or right in and to the Marks without the express written permission of Avaya or the applicable third party.

Avaya is a registered trademark of Avaya Inc.

All non-Avaya trademarks are the property of their respective owners, and “Linux” is a registered trademark of Linus Torvalds.

## Downloading Documentation

For the most current versions of Documentation, see the Avaya Support Web site: <http://support.avaya.com>.

## Contact Avaya Support

Avaya provides a telephone number for you to use to report problems or to ask questions about your Product. The support telephone number is 1-800-242-2121 in the United States. For additional support telephone numbers, see the Avaya Web site: <http://support.avaya.com>.

## Contents

<b>Chapter 1: Purpose of this document</b> .....	<b>5</b>
<b>Chapter 2: New in this release</b> .....	<b>7</b>
Features.....	7
Other changes.....	7
<b>Chapter 3: Ethernet module fundamentals</b> .....	<b>9</b>
Ethernet module concepts.....	9
Ethernet module features.....	13
<b>Chapter 4: Ethernet module configuration using ACLI</b> .....	<b>19</b>
Enabling a module.....	19
Disabling a module.....	20
Configuring 10/100/1000 Mbit/s 9048GT Ethernet ports with Autonegotiation.....	21
Configuring 9048GT Ethernet ports without Autonegotiation.....	23
Configuring 100/1000 Mbit/s 9048GB Ethernet ports.....	24
Configuring 10 Gb/s 9024XL Ethernet ports.....	27
Associating a port to a VRF instance.....	28
<b>Chapter 5: Ethernet module configuration using EDM</b> .....	<b>31</b>
Enabling a module.....	31
Disabling a module.....	32
Configuring an Ethernet port.....	33
Associating a port to a VRF instance.....	35
<b>Chapter 6: Lossless Ethernet</b> .....	<b>37</b>
Lossless Ethernet fundamentals.....	37
Lossless Ethernet configuration using ACLI.....	40
Configuring Lossless Ethernet using ACLI.....	40
Displaying Lossless Ethernet information using ACLI.....	43
Lossless Ethernet configuration using EDM.....	44
Configuring Lossless Ethernet using EDM.....	44
Specifying the lossless-802.1p value using EDM.....	46
<b>Chapter 7: Port reference</b> .....	<b>49</b>
<b>Chapter 8: Customer service</b> .....	<b>53</b>
Getting technical documentation.....	53
Getting product training.....	53
Getting help from a distributor or reseller.....	53
Getting technical support from the Avaya Web site.....	53
<b>Glossary</b> .....	<b>55</b>



# Chapter 1: Purpose of this document

You can use Configuration, Ethernet Modules to configure and monitor the Ethernet modules for the Virtual Services Platform 9000.

Purpose of this document

# Chapter 2: New in this release

The following sections detail what is new in *Avaya Virtual Services Platform 9000 Configuration — Ethernet Modules*, NN46250–508.

---

## Features

See the following sections for information about feature changes.

### Lossless Ethernet

Release 3.2 adds Lossless Ethernet for 10 GbE ports to guarantee the switch does not drop certain traffic types.

You can configure all unicast traffic on the port to be Lossless, or you can configure only tagged unicast traffic with a specific 802.1p value to be Lossless.

If you change the Lossless-802.1p value, the change affects all priority-based flow control (PFC) configured ports. You cannot change this value for individual Lossless ports.

Multicast traffic is not treated as Lossless traffic, so, when the port is in Lossless mode multicast traffic can be dropped.

For more information, see:

- [Lossless Ethernet fundamentals](#) on page 37
- [Configuring Lossless Ethernet using ACLI](#) on page 40
- [Displaying Lossless Ethernet information using ACLI](#) on page 43
- [Configuring Lossless Ethernet using EDM](#) on page 44
- [Specifying the lossless-802.1p value using EDM](#) on page 46

For conceptual information on Lossless Ethernet, see *Avaya Virtual Services Platform 9000 Planning and Engineering — Network Design*, NN46250–200.

---

## Other changes

See the following sections for information about changes that are not feature-related.

### **ACLI Commands**

Examples for ACLI commands exist for most commands in the document.

### **Introduction chapter and navigation**

Introduction chapters and navigation are removed.

### **Purpose of this document**

To improve documentation usability, a brief description of the purpose of this document is now the first chapter.

### **Terminology**

Terminology no longer exists in a separate document. Terminology is in a glossary at the end of this document.

### **Common procedures**

Common procedures are incorporated in the document.



# Chapter 3: Ethernet module fundamentals

Use the information in this section to understand Ethernet configuration concepts.

---

## Ethernet module concepts

Extending Ethernet over local, metropolitan, and wide area networks provides cost-effective solutions for data transmission and ensures end-to-end Ethernet connectivity. To optimize Ethernet communications, you can configure a number of parameters. The following sections provide information you can use to configure Ethernet modules for optimal performance.

- [Port speed and duplex mode](#) on page 9
- [Autonegotiation](#) on page 9
- [Remote Fault Indication](#) on page 11
- [Custom Autonegotiation Advertisement](#) on page 11
- [802.3x flow control for Gigabit Ethernet](#) on page 11
- [Maximum transmission unit and jumbo frames](#) on page 12
- [MLT and Link Aggregation Control Protocol groups port speed](#) on page 12
- [Virtual Router Forwarding for Ethernet modules](#) on page 12

### Port speed and duplex mode

Avaya Virtual Services Platform 9000 Ethernet modules support various data rates; these include 10 Mbit/s, 100 Mbit/s, 1000 Mbit/s, and 10 Gbit/s. Some modules support several data rates and use Autonegotiation to determine the appropriate data rate.

The duplex mode determines the direction of traffic flow during data communication. Half-duplex indicates that communication occurs between two Ethernet devices in both directions, but only in one direction at a time. Full-duplex indicates that communication occurs in both directions simultaneously. If you do not use Autonegotiation, ensure that you set both interconnected Ethernet devices to the same mode.

Some modules must use full-duplex; on those modules, you cannot change this parameter.

### Autonegotiation

Use Autonegotiation to allow the device to automatically negotiate the best common data rate and duplex mode to use between two Autonegotiation-capable Ethernet devices.

Autonegotiation automatically configures devices that share a link segment to take maximum advantage of their abilities. You can use Autonegotiation to advertise abilities of devices at both ends of a link segment, acknowledge receipt and understanding of their common modes of operation, and to reject the use of operational modes that both devices do not share. Where

more than one common mode exists between the two devices, a mechanism selects a single mode of operation using a predetermined priority resolution function.

Autonegotiation uses autosensing to allow devices compatible with 10BASE-T, 100BASE-TX, or 100BASE-T4 to be recognized even if they do not support Autonegotiation. In this case, only the speed can be sensed, not the duplex mode.

Autonegotiation uses a modified 10BASE-T link integrity test pulse sequence to perform Autonegotiation; no packet or upper layer protocol overhead is added to the network devices.

Disabling Autonegotiation on 1000BASE-T ports can result in inconsistent behavior. Avaya recommends that you enable Autonegotiation on all 1000BASE-T ports.

Autonegotiation is not supported on 10 Gbit/s small form factor pluggable plus (SFP+) ports or on 100Mbit/s small form factor pluggable (SFP) ports. While 1000 Mbit/s SFP ports do support Autonegotiation, they do not support a change in data rate unless you change the SFP which supports a different speed; a 1 Gbit/s SFP can only operate at 1 Gbit/s. On optical links, Autonegotiation does not negotiate the data rate; Autonegotiation is only used for Remote Fault Indication (RFI).

### Autonegotiation recommendations

Avaya recommends that you set the following Autonegotiation parameters between two 1000BASE-T ports on devices A and B.

**Table 1: Recommended Autonegotiation configuration on 1000BASE-T ports**

Port on device A	Port on device B	Remarks	Recommendation
Autonegotiation enabled	Autonegotiation enabled	Ports negotiate on highest supported mode on both sides.	This configuration is the recommended configuration if both ports support Autonegotiation mode.
Autonegotiation disabled; set to full-duplex	Autonegotiation disabled; set to full-duplex	Both sides require the same mode.	This configuration is the recommended configuration if you use full-duplex, but Autonegotiation is not supported.
Autonegotiation disabled; set to half-duplex	Autonegotiation enabled	This is an invalid configuration.	Use fixed speed/duplex modes on both sides.

 **Note:**

Although all Virtual Services Platform 9000 1000BASE-T ports support Autonegotiation, there can be situations where Autonegotiation does not function properly and a link remains down. If this situation occurs, Avaya recommends that you disable Autonegotiation and configure matching speed and duplex on both sides of the link (usually 10 Mbit/s and full-

duplex). This operation does not comply with the latest IEEE 802.3ab standard, which recommends use of Autonegotiation on 1000BASE-T ports for 1000Mbit/s links.

### Remote Fault Indication

The stations on both ends of a fiber pair use Remote Fault Indication (RFI) to inform one another after a problem occurs on one of the fibers.

The 802.3z Gigabit Ethernet (GbE) standard defines RFI as part of the Autonegotiation function.

Because RFI is part of the Autonegotiation function, if you disable Autonegotiation, you automatically disable RFI.

#### **Tip:**

Avaya recommends that you enable Autonegotiation on GbE links in all cases where the devices on both ends of a fiber link support Autonegotiation.

Without RFI support, if one of two unidirectional fibers that form the connection between the two platforms fails, the transmitting side cannot determine that the link is broken in one direction and the link remains active.

### Custom Autonegotiation Advertisement

The 10/100/1000 Mbit/s ports support Custom Autonegotiation Advertisement (CANA). Use CANA to control the speed and duplex settings that these modules advertise during Autonegotiation sessions between Ethernet devices. You can only establish links using these advertised settings, rather than at the highest common supported operating mode and data rate.

Use CANA to provide smooth migration from 10/100 Mbit/s to 1000 Mbit/s on host and server connections. Using Autonegotiation only, the switch always uses the fastest possible data rates. In scenarios where uplink bandwidth is limited, CANA provides control over negotiated access speeds, and thus improves control over traffic load patterns.

Virtual Services Platform 9000 supports CANA on 10/100/1000 Mbit/s RJ-45 ports only. To use CANA, you must enable Autonegotiation.

### 802.3x flow control for Gigabit Ethernet

Use flow control to protect against packet loss. Flow control prevents Ethernet ports from receiving more data than they can process.

The 802.3x flow control mechanism is effective only at the Data Link Layer (Layer 2). When Virtual Services Platform 9000 routes packets, flow control packets are ignored.

The Ethernet modules support IEEE 802.3x flow control in the following way:

- temporarily halt packet transmission when an 802.3x Pause frame is received from the remote end

#### **Note:**

802.3x flow control pause frames are not transmitted by default. Transmit flow control can be enabled if required.

Flow control can be enabled on ports of any speed.

### **Maximum transmission unit and jumbo frames**

Jumbo frames are larger than the maximum Ethernet frame size, or maximum transmission unit (MTU) specified in the IEEE 802.3 standard. For untagged frames, the maximum standard size is 1518 bytes. For tagged frames, the maximum standard size increases by 4 bytes to 1522 bytes.

The default maximum Ethernet frame size supported by Virtual Services Platform 9000 is 1950 bytes. The 10 Gbit/s module (9024XL) also supports this frame size. To support a jumbo frame system, configure the CP MTU to 9600 bytes. Interface ports cannot pass jumbo frames by default.

If a jumbo frame enters on an interface and is destined to egress a chassis interface that does not support jumbo frames, the system gracefully drops it.

If a port on a Gigabit Ethernet module receives a packet bigger than the configured system MTU size, the MAC chip increments the byte counter with the MTU size instead of the actual packet size, which reflects in the statistics of that port.

### **MLT and Link Aggregation Control Protocol groups port speed**

Avaya recommends that all ports that belong to the same MLT group or Link Aggregation Control Protocol (LACP) group use the same port speed, for example, 1 Gbit/s, even if you use Autonegotiation. In the case of MLTs, the software does not enforce this requirement.

### **Virtual Router Forwarding for Ethernet modules**

You can use Virtual Router Forwarding (VRF) to have Virtual Services Platform 9000 act as multiple virtual routers.

You can configure each VRF instance as a separate router; this means that you can configure different routing protocols and associated parameters for each instance. You can associate non—zero VRF instances with module ports.

The Ethernet parameters (such as: Autonegotiate; AdminDuplex; AdminSpeed) that a user can edit for a VRF instance depend on whether the port belongs to only one, or more than one, VRF instance.

The following examples show what is possible:

- If a port belongs to only one VRF, you can edit the Ethernet parameters of the VRF.
- If a port belongs to more than one VRF instance, you cannot edit the Ethernet parameters of the VRF instance; you can only edit the GlobalRouter port parameters.
- If a port belongs to a single non—zero VRF, this VRF can change the port Ethernet parameters.
- If a port belongs to multiple VRF instances, then only the Global Router can change this port configuration.

## Ethernet module features

This section details the features of Virtual Services Platform 9000 Ethernet modules.

**+ Tip:**

To determine whether SFPs are present on your switch you can use the ACLI command `show pluggable-optical-modules <basic|detail>` to display SFP and SFP+ information.

The following table shows supported Ethernet modules you can use to provide Ethernet services using Virtual Services Platform 9000.

**Table 2: Ethernet modules**

Module	Module description
9024XL	24 port 10 Gb/s small form-factor pluggable plus (SFP+) Ethernet interface module. The 9024XL module also supports 1 Gb/s SFP connections. Refer to <i>Avaya Virtual Services Platform 9000 Installation — SFP Hardware Components</i> , NN46250–305, for a list of supported SFPs.
9048GT	48 port 10/100/1000 megabit per second (Mb/s) Ethernet Copper interface module with RJ45 connectors.
9048GB	48 port 1 gigabit per second (Gb/s) small form-factor pluggable (SFP) Ethernet interface module that supports multimode fiber (MMF), single-mode fiber (SMF), and copper connections. The 9048GB module also supports 100MB FX connections. Refer to <i>Avaya Virtual Services Platform 9000 Installation — SFP Hardware Components</i> , NN46250–305, for a list of supported SFPs.

### 9024XL Ethernet interface module

The 9024XL interface module is a 24 port 10 gigabit per second (Gb/s) small form-factor pluggable plus (SFP+) interface module. The module has approximately a 3.5:1 oversubscribed line rate over 24 ports of 10 Gb/s Ethernet traffic using standard SFP+ fiber connectors. Each continuous physical group of 4 ports supports a combined bandwidth of 11.3GE. Use only a single port per grouping to ensure no oversubscription. As a helpful guide the last port in each group has a black mark on the faceplate. The module supports Short Range (SR) and Long Range (LR) SFP+ format. The module measures 24 inches in length.

The following table details the multimode fiber (MMF) and single-mode fiber (SMF) SFP+ fiber connectors supported by Avaya Virtual Services Platform 9000.

**Table 3: 9024XL compatible connectors**

Model number	Product number	Description
10GBASE-SR/SW	AA1403015-E6	850 nanometers (nm). The range is up to <ul style="list-style-type: none"> <li>• 22 m using 62.5 micrometer (<math>\mu\text{m}</math>), 160 megaHertz times km (MHz-km) MMF</li> <li>• 33 m using 62.5 <math>\mu\text{m}</math>, 200 MHz-km MMF</li> <li>• 66 m using 62.5 <math>\mu\text{m}</math>, 500 MHz-km MMF</li> <li>• 82 m using 50 <math>\mu\text{m}</math>, 500 MHz-km MMF</li> <li>• 300 m using 50 <math>\mu\text{m}</math>, 2000 MHz-km MMF</li> </ul>
10GBASE-LRM	AA1403017-E6	1310 nm. Up to 220 m reach over Fiber Distributed Data Interface (FDDI)-grade 62.5 $\mu\text{m}$ multimode fiber. Suited for campus LANs.
10GBASE-LR/LW	AA1403011-E6	1310 nm SMF. The range is up to 10 km.
10GBASE-ER/EW	AA1403013-E6	1550 nm SMF. The range is up to 40 km.
10GBASE-CX	AA1403018-E6 to AA1403021-E6	4-pair twinaxial copper cable to connect 10 Gb ports. The maximum range is 15 m.
1000BASE-SX	AA1419048-E6	Well-suited for campus local area networks (LAN) and intrabuilding links. Up to 275 or 550 m reach (fiber-dependent) over a fiber pair.
1000BASE-LX	AA1419049-E6	Up to 10 km reach over a single mode fiber (SMF) pair. Up to 550 m reach over a multimode fiber (MMF) pair.
1000BASE-XD	AA1419050-E6	1310 nm, up to 40 km over SMF pair.
	AA1419051-E6	1550 nm (non-CWDM), up to 40 km over SMF pair.

Model number	Product number	Description
1000BASE-ZX	AA1419052-E6	1550 nm (non-CWDM), up to 70 km over SMF pair.
1000BASE CWDM	AA1419053-E6 to AA1419060-E6	1470 nm to 1610 nm (CWDM) up to 40km over SMF pair.

The 9024XL has the following characteristics:

- compliant with IEEE 802.3ae standards
- 802.3 Ethernet frame format, MAC layer functionality
- 64B/66B line encoding
- asynchronous Ethernet interface

### 9048GT Ethernet interface module

The 9048GT interface module is a 48 port 10/100/1000 Mb/s Ethernet Copper interface module with RJ45 connectors.

The 9048GT has the following characteristics:

- compliant with IEEE 802.3ab standards
- 802.3 Ethernet frame format, MAC layer functionality
- asynchronous Ethernet interface

### 9048GB Ethernet interface module

The 9048GB interface module is a 48 port 1 Gb/s small form-factor pluggable (SFP) interface module that supports multimode fiber (MMF), single-mode fiber (SMF), and copper connections.

The following table details the SFP connectors supported by Avaya Virtual Services Platform 9000:

**Table 4: 9048GB compatible connectors**

Model	ROHS product number	Description
1000BASE-T	AA1419043-E6	CAT5 UTP, up to 100 m. The 1000BASE-T device is all electrical, and as a result it does not need DDI support.
1000BASE-SX	AA1419048-E6	850 nm, up to 275 or 550 m
1000BASE-LX	AA1419049-E6	1310 nm, up to 10 km
1000BASE-XD	AA1419050-E6	1310 nm, up to 40 km
	AA1419051-E6	1550 nm, up to 40km (non-CWDM)
1000BASE-ZX	AA1419052-E6	1550 nm, up to 70 km (non-CWDM)

Model	ROHS product number	Description
1000BASE-BX-U	AA1419069-E6	1310 nm up to 10km
	AA1419076-E6	1310 nm up to 40km
1000BASE-BX-D	AA1419070-E6	1490 nm up to 10km
	AA1419077-E6	1490 nm up to 40km
1000BASE-EX	AA1419071-E6	1550 nm, up to 120 km (non-CWDM)
1000BASE CWDM	AA1419053-E6	1470 nm, up to 40 km
	AA1419054-E6	1490 nm, up to 40 km
	AA1419055-E6	1510 nm, up to 40 km
	AA1419056-E6	1530 nm, up to 40 km
	AA1419057-E6	1550 nm, up to 40 km
	AA1419058-E6	1570 nm, up to 40 km
	AA1419059-E6	1590 nm, up to 40 km
	AA1419060-E6	1610 nm, up to 40 km
	AA1419061-E6	1470 nm, up to 70 km
	AA1419062-E6	1490 nm, up to 70 km
	AA1419063-E6	1510 nm, up to 70 km
	AA1419064-E6	1530 nm, up to 70 km
	AA1419065-E6	1550 nm, up to 70 km
	AA1419066-E6	1570 nm, up to 70 km
	AA1419067-E6	1590 nm, up to 70 km
	AA1419068-E6	1610 nm, up to 70 km
100BASE-FX	AA1419074-E6	1310 nm, up to 2km

The 9048GB is 100/1000 Mb/s capable and measures 24 inches in length.

The 9048GB has the following characteristics:

- compliant with IEEE 802.3z standards
- 802.3 Ethernet frame format, MAC layer functionality
- asynchronous Ethernet interface

### Ethernet SFPs and Autonegotiation

Two interface modules accept SFPs: the 9024XL (10 Gb/s) and the 9048GB (1 Gb/s). Both accept a limited number of lower-speed SFPs, which affects Autonegotiation support.



The following restrictions apply to the 9024XL:

- You can use 1 Gb/s SFPs but not 100 Mb/s SFPs.
- Autonegotiation is undefined for 10 Gb/s interfaces. You cannot use the CLI to modify Autonegotiation on a port with a 10 Gb/s SFP inserted.
- You can use CLI to change the Autonegotiation configuration for an empty port before you insert a 1 Gb/s SFP.
- After you insert a 1 Gb/s SFP into a port, you can enable Autonegotiation on that port only for the detection of remote faults. You cannot select the speed or duplex mode, or configure CANA.
- The default configuration for Autonegotiation is disabled, even if you insert a 1 Gb/s SFP.

The following restrictions apply to the 9048GB:

- Autonegotiation is enabled by default for all ports.
- Autonegotiation is disabled if you insert a 100 Mb/s SFP. This module does not support Autonegotiation on reduced speed SFPs.
- You can change the Autonegotiation configuration for a port, as long as you do not insert a 100 Mb/s SFP.

Because you can change SFPs, inconsistencies can arise in the configuration file if you swap SFPs of different speeds. The port operates correctly after you change the SFP, but the configuration file can contain inappropriate Autonegotiation settings because of prior CLI actions. The system ignores these inconsistencies and does not generate an error. You can save the running configuration to update the file with correct Autonegotiation settings for the port.



# Chapter 4: Ethernet module configuration using ACLI

Configure an Ethernet port to ensure proper operation and optimum performance of the port.

---

## Enabling a module

### Before you begin

- You must log on to the Global Configuration mode in ACLI.

### About this task

Enable an Ethernet module to allow traffic to flow through it.

### Procedure

Enable a module:

```
no slot shutdown {slot[-slot][,...]}
```

---

### Example

```
VSP-9012:>enable
```

```
VSP-9012:1#configure terminal
```

```
VSP-9012:1(config)#no slot shutdown 3/1-3/48, 4/1-4/24
```

---

## Variable definitions

Use the data in the following table to use the `no slot shutdown` command.

**Table 5: Variable definitions**

Variable	Value
{slot[-slot][,...]}	Specifies one or more slot numbers. Valid slots are 3 to 12.

---

## Disabling a module

### Before you begin

- You must log on to the Global Configuration mode in ACLI.

### About this task

Disable an Ethernet module before you remove it from the chassis to minimize traffic loss. Traffic does not flow on a disabled module.

### Procedure

Disable a module:

```
slot shutdown {slot[-slot][,...]}
```

---

### Example

```
VSP-9012:>enable
```

```
VSP-9012:1#configure terminal
```

```
VSP-9012:1(config)#slot shutdown 3/1
```

---

## Variable definitions

Use the data in the following table to use the `slot shutdown` command.

**Table 6: Variable definitions**

Variable	Value
{slot[-slot][,...]}	Specifies one or more slot numbers. Valid slot numbers are 3 to 12.

---

## Configuring 10/100/1000 Mbit/s 9048GT Ethernet ports with Autonegotiation

Configure 10/100/1000 Mbit/s Ethernet ports with Autonegotiation so that they operate optimally for your network conditions. To use Custom Autonegotiation Advertisement (CANA), you must enable Autonegotiation.

### Before you begin

- You must log on to the Interface Configuration mode in ACLI.

#### Important:

If a port belongs to a MultiLink Trunking (MLT) group and you configure CANA on the port (that is, you configure an advertisement other than the default), you must apply the same configuration to all other ports of the MLT group (if they support CANA).

If a 10/100/1000 Mbit/s port that supports CANA is in a MLT group with 10/100BASE-TX ports, or another port type that does not support CANA, use CANA only if it does not conflict with MLT abilities.

#### Important:

If you disable CANA on a port using the `auto-negotiation-advertisements none`, or `no auto-negotiation-advertisements` commands, the port closes down until a valid CANA setting is applied to the port. Resetting the device is not required for the setting to take effect.

### About this task

#### Important:

Avaya recommends that all ports that belong to the same MLT or Link Aggregation Control Protocol (LACP) group use the same port speed. In the case of MLTs, the software does not enforce this.

### Procedure

1. Enable Autonegotiation:  
`auto-negotiate [port {slot/port[-slot/port][,...]}] enable`
2. Configure CANA:

```

auto-negotiation-advertisements [port {slot/port[-slot/port]
[,...]}] <10-full|10-half|100-full|100-half|1000-full|1000-
half|none>

```

---

### Example

```

VSP-9012:>enable
VSP-9012:1#configure terminal
VSP-9012:1(config)#interface gigabitethernet 4/2
VSP-9012:1(config-if)#auto-negotiate enable
VSP-9012:1(config-if)#auto-negotiation-advertisements 100-full

```

---

## Variable definitions

Use the data in following table to use the `auto-negotiate` command.

**Table 7: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies the port or ports that you want to configure.
enable]	Enables Autonegotiation for the port or other ports of the module. The default form of this command is <code>default auto-negotiate [port {slot/port[-slot/port][,...]}] [enable]</code> . The no form of this command is <code>no auto-negotiate [port {slot/port[-slot/port][,...]}] [enable]</code> .

Use the data in following table to use the `auto-negotiation-advertisements` command.

**Table 8: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies which port to configure the CANA advertisement settings of. You must enable Autonegotiation to use CANA. The default form of this command is <code>default auto-negotiation-</code>

Variable	Value
	advertisements [port {slot/port[-slot/port][,...]}] . The no form of this command is no auto-negotiation-advertisements [port {slot/port[-slot/port][,...]}].
<10-full 10-half 100-full 100-half 1000-full 1000-half none>	Configures the CANA speed and duplex mode.

---

## Configuring 9048GT Ethernet ports without Autonegotiation

Configure Ethernet ports without Autonegotiation so that they operate optimally for your network conditions.

### Before you begin

- You must log on to the Interface Configuration mode in ACLI.

### About this task



#### Important:

Ensure that all ports that belong to the same MLT or Link Aggregation Control Protocol (LACP) group use the same port speed.

### Procedure

- Configure the duplex mode:  

```
duplex [port {slot/port[-slot/port][,...]}] <half|full>
```
- Configure the port speed:  

```
speed [port {slot/port[-slot/port][,...]}] <10|100>
```

---

### Example

```
VSP-9012:1>enable
VSP-9012:1#configure terminal
VSP-9012:1(config)#interface gigabitethernet 4/47
VSP-9012:1(config-if)#duplex full
VSP-9012:1(config-if)#speed 100
```

---

## Variable definitions

Use the data in following table to use the `duplex` command.

**Table 9: Variable definitions**

Variable	Value
<code>port {slot/port[-slot/port][,...]}</code>	Specifies which port to configure the duplex settings of.
<code>&lt;half full&gt;</code>	Specifies half-duplex or full-duplex mode for 10/100/1000 Mbit/s ports; 1 and 10 Gbit/s optical ports must use full-duplex mode.

Use the data in following table to use the `speed` command.

**Table 10: Variable definitions**

Variable	Value
<code>port {slot/port[-slot/port][,...]}</code>	Specifies the port speed. This option does not apply to 1 Gigabit or 10 Gigabit Ethernet modules. Use <code>port {slot/port[-slot/port][,...]}</code> to change other ports to the same settings. The default form of this command is <code>default speed [port {slot/port[-slot/port][,...]}]</code> .
<code>&lt;10 100&gt;</code>	Specifies the speed of the port in Mbit/s.

---

## Configuring 100/1000 Mbit/s 9048GB Ethernet ports

Configure 100/1000 Mbit/s Ethernet ports so they operate optimally for your network conditions. These ports use the small form-factor pluggable (SFP) connectors.

### Before you begin

- You must log on to the Interface Configuration mode in ACLI.

### About this task



#### Important:

Ensure that all ports that belong to the same MLT or LACP group use the same port speed.



## Procedure

1. Enable Autonegotiation:  

```
auto-negotiate [port {slot/port[-slot/port][,...]}] enable
```
2. Enable flow control as required:  

```
tx-flow-control [port {slot/port[-slot/port][,...]}] enable
```
3. Optionally, create a name for the port or group of ports:  

```
name [port {slot/port[-slot/port][,...]}] WORD<0-42>
```
4. Optionally, disable the interface:  

```
shutdown [port {slot/port[-slot/port][,...]}]
```

## Example

```
VSP-9012:1>enable
VSP-9012:1#configure terminal
VSP-9012:1(config)#interface gigabitethernet 3/48
VSP-9012:1(config-if)#auto-negotiate enable
VSP-9012:1(config-if)#tx-flow-control enable
```

## Variable definitions

Use the data in the following table to use the `auto-negotiate` command.

**Table 11: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies the port or ports to configure.
enable	Enables Auto-Negotiation for the selected ports. The default form of this command is <code>default auto-negotiate [port {slot/port[-slot/port][,...]}] [enable]</code> . To disable Auto-Negotiation, use the no form of this command: <code>no auto-negotiate [port {slot/port[-slot/port][,...]}] [enable]</code> .

Use the data in the following table to use the `name` command.

**Table 12: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies the port or ports to configure.
<WORD 0-42>	Configures a name for the port or ports.

Use the data in the following table to use the `shutdown` command.

**Table 13: Variable definitions**

Variable	Value
port {slot[-slot][,...]}	Specifies the port or ports to configure. The no form of this command is <code>no shutdown [port {slot[-slot] [, ...]}]</code> .

Use the data in the following table to use the `tx-flow-control` command.

**Table 14: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies the port or ports to configure.
enable	Enables flow control. After you enable <code>tx-flow-control</code> , the TX port transmits MAC control PAUSE frames to indicate congestion on the receive side of the port interface. The link partner ceases transmission based on the MAC control frame pause-timer value. The default is disabled. You can enable flow control only on 1 Gbit/s and 10 Gbit/s ports. You cannot enable flow control for ports that run at less than 1 Gbit/s. The default form of this command is <code>default tx-flow-control [port {slot/port[-slot/port] [, ...]}] [enable]</code> . The no form of this command is <code>no tx-flow-control [port {slot/port[-slot/port][,...]}] [enable]</code> .

---

## Configuring 10 Gb/s 9024XL Ethernet ports

Configure 10 Gbit/s Ethernet ports so they operate optimally for your network conditions.

### Before you begin

- You must log on to the Interface Configuration mode in ACLI.

**Important:**

You cannot configure Auto-Negotiation for 10 Gbit/s ports.

**Important:**

Ensure that all ports that belong to the same MLT or LACP group use the same port speed.

### About this task

These ports use the small form-factor pluggable (SFP) and small form-factor pluggable plus (SFP+) connectors. Refer to [Configuring 100/1000 Mbit/s 9048GB Ethernet ports](#) on page 24 for configuring SFP connectors.

SFP connectors are also supported on the 9024XL.

### Procedure

Enable flow control:

```
tx-flow-control [port {slot/port[-slot/port][,...]}] enable
```

---

### Example

```
VSP-9012:1>enable
```

```
VSP-9012:1#configure terminal
```

```
VSP-9012:1(config)#interface gigabitethernet 4/24
```

```
VSP-9012:1(config-if)#tx-flow-control enable
```

---

## Variable definitions

Use the data in the following table to use the `tx-flow-control` command.

**Table 15: Variable definitions**

Variable	Value
port {slot/port[-slot/port][,...]}	Specifies the port or ports to configure.
enable	<p>Enables flow control. After you enable tx-flow-control, the TX port transmits MAC control PAUSE frames to indicate congestion on the receive side of the port interface. The link partner ceases transmission based on the MAC control frame pause-timer value. The default is disabled.</p> <p>You can enable flow control only on 1 Gbit/s and 10 Gbit/s ports. You cannot enable flow control for ports that run at less than 1 Gbit/s.</p> <p>The default form of this command is <code>default tx-flow-control [port {slot/port[-slot/port] [,...]}] [enable]</code>.</p> <p>The no form of this command is <code>no tx-flow-control [port {slot/port[-slot/port] [,...]}] [enable]</code>.</p>

---

## Associating a port to a VRF instance

Associate a port to a Virtual Router Forwarding (VRF) instance so that the port becomes a member of the VRF instance.

### Before you begin

- The VRF instance must exist. For more information about the creation of VRFs, see *Avaya Virtual Services Platform 9000 Configuration — IP Routing*, NN46250-505.
- You must log on to the Interface Configuration mode in ACLI.

### About this task

You can assign a VRF instance to a port after you configure the VRF. The system assigns ports to the Global Router, VRF 0, by default.

### Procedure

Associate a VRF instance with a port:

```
vrf <WORD 0-16>
```

---

**Example**

```
VSP-9012:1>enable
```

```
VSP-9012:1#configure terminal
```

```
VSP-9012:1(config)#interface gigabitethernet 3/21
```

```
VSP-9012:1(config-if)#vrf red
```

---

**Variable definitions**

Use the data in the following table to use the `vrf` command.

**Table 16: Variable definitions**

Variable	Value
<WORD 0-16>	Configures the VRF name.



# Chapter 5: Ethernet module configuration using EDM

Configure an Ethernet port to ensure proper operation and optimum performance of the port.

---

## Enabling a module

### About this task

Enable an Ethernet module to allow traffic to flow through it.

### Procedure

1. In the **Device Physical View** tab, select a module.
  2. In the navigation tree, open the following folders: **Configuration > Edit**.
  3. Click **Card**.
  4. Select **up** in the **AdminStatus** field.
  5. Select the power priority in the **PowerManagementPriority** field.
  6. Click **Apply**.
- 

---

## Card field descriptions

Use the data in the following table to use the **Card** tab.

Name	Description
<b>CardType</b>	The card type.
<b>CardDescription</b>	A description of the card.
<b>CardSerialNo</b>	The card serial number.
<b>CardPartNo</b>	The card part number.
<b>CardAssemblyDate</b>	The assembly date of the card.
<b>CardHWConfig</b>	The card hardware configuration.

Name	Description
<b>AdminStatus</b>	The administrative status of the card. Use this field to enable, disable, or reset the card.
<b>OperStatus</b>	The current operational status of the card.
<b>ModuleType</b>	The module type.
<b>ModuleDescription</b>	The module description.
<b>ModuleSerialNo</b>	The module serial number.
<b>ModulePartNo</b>	The module part number.
<b>ModuleDateCode</b>	The module date code.
<b>ModuleHWConfig</b>	The module hardware configuration.
<b>PowerManagementPriority</b>	The power management priority setting.
<b>Slot Power</b>	The status of slot power.

---

## Disabling a module

### About this task

Disable an Ethernet module before you remove it from the chassis to minimize traffic loss. Traffic does not flow on a disabled module.

### Procedure

1. In the **Device Physical View** tab, select a module.
  2. In the navigation tree, open the following folders: **Configuration > Edit**.
  3. Click **Card**.
  4. Select **down**.
  5. Click **Apply**.
-



---

## Configuring an Ethernet port

### Before you begin



#### Important:

You cannot configure Auto-Negotiation for 10 Gbit/s ports.



#### Important:

Ensure that all ports that belong to the same MLT or LACP group use the same port speed.

### About this task

Configure an Ethernet port so it operates optimally for your network.

### Procedure

1. In the **Device Physical View** tab, select a port.
  2. In the navigation tree, open the following folders: **Configuration > Edit > Port**.
  3. Click **General**.
  4. Click the **Interface** tab.
  5. Complete the fields as required.
  6. Click **Apply**.
- 

---

## Interface field descriptions

Use the data in the following table to use the **Interface** tab.

Name	Description
<b>Index</b>	Displays the index of the port, written in the slot/port format.
<b>Name</b>	Configures the name of the port.
<b>Descr</b>	Displays the description of the port.
<b>Type</b>	Displays the type of connector plugged in the port.
<b>Mtu</b>	Displays the Maximum Transmission Unit (MTU) for the port.

Name	Description
<b>PhysAddress</b>	Displays the physical address of the port.
<b>VendorDescr</b>	Displays the vendor of the connector plugged in the port.
<b>AdminStatus</b>	Configures the port as enabled (up) or disabled (down) or testing.
<b>OperStatus</b>	Displays the current status of the port.
<b>LastChange</b>	Displays the timestamp of the last change.
<b>LinkTrap</b>	Enable or disable link trapping.
<b>AutoNegotiate</b>	Enables or disables Autonegotiation for this port.
<b>AdminDuplex</b>	If AutoNegotiate is false, configures if the port connects using full duplex or half duplex.
<b>OperDuplex</b>	Displays the currently saved AdminDuplex value.
<b>AdminSpeed</b>	If AutoNegotiate is false, configures the speed of the port.
<b>OperSpeed</b>	Displays the currently saved AdminSpeed value.
<b>AutoNegAd</b>	Configures the Custom Autonegotiation Advertisement (CANA) settings of the port.
<b>QoSLevel</b>	Selects the Quality of Service (QOS) level for this port.
<b>DiffServ</b>	Enables the Differentiated Service feature for this port.
<b>Layer3Trust</b>	Configures if the system trusts Layer 3 packets coming from access links or core links only.
<b>Layer2Override8021p</b>	Enables or disables Layer 2 override of 802.1p.
<b>MltID</b>	Shows the MLT ID associated with this port.
<b>Locked</b>	Shows if the port is locked.
<b>UnknownMacDiscard</b>	Discards packets that have an unknown source MAC address, and prevents other ports from sending packets with that same MAC address as the destination MAC address.
<b>AdminRouting</b>	Configures the port as routable or not.

Name	Description
<b>OperRouting</b>	Displays the currently saved AdminRouting value.
<b>HighSecureEnable</b>	Enables or disables the high secure feature for this port.
<b>IngressRatePeak</b>	Configures the peak rate in Kb/s.
<b>IngressRateSvc</b>	Configures the service rate in Kb/s
<b>EgressRateLimitState</b>	Enables or disables egress port-based shaping to bind the maximum rate at which traffic leaves the port.
<b>EgressRateLimit</b>	Configures the egress rate limit in Kb/s.
<b>Action</b>	<p>Performs one of the following actions on the port</p> <ul style="list-style-type: none"> <li>• flushMacFdb - flush the MAC forwarding table</li> <li>• flushArp - flush the ARP table</li> <li>• flushIp - flush the IP route table</li> <li>• flushAll - flush all tables</li> <li>• triggerRipUpdate - manually trigger a RIP update</li> <li>• clearLoopDetectAlarm - manually enable the port on all the disabled vlans.</li> </ul>
<b>Result</b>	Displays result of the selected action.

---

## Associating a port to a VRF instance

### About this task

Associate a port to a Virtual Router Forwarding (VRF) instance so that the port becomes a member of the VRF instance.

You can assign a VRF instance to a port after you configure the VRF. The system assigns ports to the GlobalRouter, VRF 0, by default.

### Procedure

1. In the **Device Physical** View tab, select a port.
2. In the navigation tree, open the following folders: **Configuration > Edit > Port**.
3. Click **General**.

4. Click the **VRF** tab.
  5. To the right of the **BrouterVrflid** box, click the ellipsis (...) button.
  6. In the BrouterVrflid dialog box, select the required VRF.
  7. Click **OK**.
  8. Click **Apply**.
- 

---

## VRF field descriptions

Use the data in the following table to use the **VRF** tab.

Name	Description
<b>Vrflids</b>	Specifies the ID of the current VRF of this port.
<b>VrfNames</b>	Specifies the name of the current VRF of this port.
<b>VrfCount</b>	Specifies how many VRFs this port is associated to.
<b>BrouterVrflid</b>	Specifies the ID of the new VRF to apply to this port.
<b>BrouterVrfName</b>	Specifies the name of the new VRF to apply to this port.

# Chapter 6: Lossless Ethernet

The information in this chapter can help you understand Lossless Ethernet configuration concepts and tasks in relation to Ethernet Modules.

---

## Lossless Ethernet fundamentals

On Virtual Services Platform 9000, you can configure 10 GbE ports to be lossless.

The Lossless Ethernet feature applies to traffic in both directions on a lossless port.

### Unicast traffic and lossless:

You can configure all unicast traffic on the port to be lossless.

Or you can specify that only tagged unicast traffic, with a specific 802.1p value, is lossless.

### Pause types:

If the port becomes congested, the switch performs flow control based on the pause type configuration.

To configure the Lossless Ethernet feature, you enable it on a port and configure the pause type.

The pause type can be one of two values:

- pause (FC) — On the port, all unicast traffic is lossless. FC is the default pause type.
- priority-based flow control (PFC) — On the port, all tagged unicast traffic that has an 802.1p value that matches the lossless-802.1p value is lossless. The switch treats traffic that does not meet this requirement as lossy traffic, and it can drop the lossy traffic.

### Lossless 802.1p value:

Following are some limitations that apply to the lossless 802.1p value:

- If traffic enters the device on a lossless PFC-enabled port and exits the device on an lossless FC-enabled port (or vice-versa), only packets with matching lossless-802.1p values are lossless.
- The default lossless 802.1p value is 3 but you can configure it to other values.

### Note:

If you change the lossless-802.1p value, the change affects all PFC configured ports. You cannot change this value for individual lossless ports.

- The lossless-802.1p value must be mapped to internal QoS level 3. Avaya recommends that you do not use filters to remark the internal QoS.
- When you enable lossless-PFC on a port, the port does not become Lossless-PFC if the lossless 802.1p value maps to an internal QoS level other than 3, or if the internal QoS level 3 maps to any other 802.1p value.
- You cannot change the lossless 802.1p value to match the configured port QoS value on any of the Lossless-PFC-enabled ports in the system.
- You cannot enable Lossless-PFC on a port if its port QoS value is equal to the lossless 802.1p value.
- On a Lossless-PFC-enabled port, you cannot set the port QoS value to the lossless 802.1p value.
- In a Lossless-PFC (802.1Qbb) domain, the lossless behavior is guaranteed as long as the lossless 802.1p, ingress 1p to QoS map and the egress QoS to 1p maps are consistent.

When you change the lossless 802.1p and ingress 1p to QoS map you must configure the egress QoS to 1p map correctly.

#### **Lossless bandwidth:**

For Lossless-PFC, you can configure the guaranteed lossless bandwidth in steps of 1 Gb.

The default lossless bandwidth is 50% of the port bandwidth.

#### **Interface module configuration limitations**

The following list identifies configuration limitations for interface module support:

- You can configure Lossless Ethernet only on 10 GbE ports.
- You cannot configure Lossless Ethernet on the 9048GB or 9048GT modules.
- You cannot configure Lossless Ethernet on a 10GbE port if you install a 1 GbE SFP.
- Only a 9024XL module with a MAC version of BCM56820-B0 supports Lossless-PFC mode.

Use the command `show sys-info ASIC` to view the MAC version of the module.

The ports on the 9024XL module divide into three 8–port clusters:

- ports 1–8
- ports 9–16
- ports 17–24

#### **Clusters and Lossless Ethernet:**

A cluster is considered lossless if at least one port in the cluster is lossless-enabled.

On a module you can enable Lossless Ethernet on a maximum of two ports per cluster. The pause type of two lossless ports in the same cluster must be the same.

 **Note:**

If you configure the second port in a cluster with a different pause type, the system prompts you to apply that change to the first lossless port in the cluster.

Within a cluster, one port must be in the top row of the cluster, and one port must be in the bottom row of the cluster.

You cannot enable Lossless Ethernet on two ports in the same row of a cluster.

If you do not enable Lossless Ethernet on any ports in a lossless cluster half, only the lowest numerical port, which is administratively enabled, is operational. The remaining three ports in the cluster half are operationally down.

A maximum of two ports can be operational in a lossless cluster; either two lossless ports, or one lossless port and one lossy port.

If a port in a cluster half is lossless-enabled, the other three ports in that half will be held operationally down.

After you disable Lossless Ethernet on one half of a cluster, the system will allow one of the four ports in that half to be operationally up in lossy mode.

After you disable Lossless Ethernet on the last port in a cluster, all eight ports return to the operational state that they were in prior to Lossless Ethernet configuration.

The system displays a warning if at least one cluster is in Lossless-PFC mode and you

- attempt to map a non-lossless 802.1p value to internal QoS level 3
- map the lossless 802.1p value to an internal QoS level other than 3

### General configuration limitations

The following list identifies configuration limitations for Lossless Ethernet:

- If you configure a port as lossless-PFC, it neither generates nor reacts to FC frames.
- On a Lossless-PFC port, lossless is not guaranteed on IP packets with a DSCP value that is set to one of the Avaya-on-Avaya values (47,41,35, and 27).

 **Tip:**

Avaya-on-Avaya was formerly known as NT-on-NT.

- If you configure a port as lossless-FC, it neither generates nor reacts to PFC frames.
- You cannot configure an interface policer and Lossless Ethernet on the same port.
- If you configure port mirroring on a lossless port, the system does not guarantee lossless behavior.
- If you configure packet capture (PCAP) on a lossless port, the system does not guarantee lossless behavior.
- The chassis must use at least five Switch Fabric modules to support the Lossless Ethernet feature.

The following limitations apply to all lossless ports, irrespective of pause-type:

- You cannot configure Layer 2 untrusted on a lossless port.

Layer 2 is always trusted for a lossless port. If you enable lossless on a Layer 2 untrusted port, the port is forced to be Layer 2 trusted. If you then disable lossless on that port, Layer 2 remains trusted on that port.

- You cannot configure Layer 3 trusted on a lossless port.

Layer 3 is always untrusted for a lossless port. If you enable lossless on a Layer 3 trusted port, the port is forced to be Layer 3 untrusted. If you disable lossless on that port, Layer 3 becomes trusted.

Configuration limitations exist for a MultiLink Trunking (MLT) with lossless port members. For more information on MLT and PFC configuration limitations, conceptual information on Lossless Ethernet and recommended deployment of Lossless Ethernet, see *Avaya Virtual Services Platform 9000 Planning and Engineering – Network Design*, NN46250-200.

### Lossless Ethernet and tx-flow-control

By default, tx-flow-control is disabled on a port.

That is, the port does not transmit flow control (FC), or pause, frames.

#### **Note:**

Avaya recommends that you do not enable tx-flow-control on a lossless port.

If you enable tx-flow-control on a lossless port, Avaya cannot guarantee appropriate lossless behavior.

---

## Lossless Ethernet configuration using ACLI

---

### Configuring Lossless Ethernet using ACLI

To configure the Lossless Ethernet feature, you enable it on a port and configure the pause type.

#### Before you begin

- You must log on to Global Configuration mode.
- The chassis must use at least five Switch Fabric modules to support Lossless Ethernet feature.



 **Note:**

- You cannot configure an interface policer and Lossless Ethernet on the same port.
- If you configure port mirroring or packet capture (PCAP) on a lossless port, the system does not guarantee lossless behavior.
- Avaya recommends that you do not enable tx-flow control on a lossless port. If you enable tx-flow control on a lossless port, Avaya cannot guarantee appropriate lossless behavior.

## Procedure

1. Configure the Lossless 802.1p value to the default value:  

```
default qos lossless-802.1p
```
2. Configure the Lossless 802.1p value to a different value:  

```
qos lossless-802.1p <0-6>
```
3. Log on to Interface GigabitEthernet configuration mode:  

```
interface GigabitEthernet <slot/port [-slot/port] [,...]>
```
4. Configure the pause-type for lossless mode:  

```
lossless-port pause-type {fc|pfc}
```
5. If the pause-type is PFC, configure the lossless PFC guaranteed bandwidth:  

```
lossless-port pfc-bandwidth <2-8>
```
6. Configure PFC pause-type and PFC-bandwidth in a single step:  

```
lossless-port pause-type pfc pfc-bandwidth <2-8>
```
7. Enable the lossless mode for the port:  

```
lossless-port enable
```

---

## Example


```
VSP-9012:1> enable
VSP-9012:1# configure terminal
VSP-9012:1(config)# default qos lossless-802.1p
VSP-9012:1(config)# interface GigabitEthernet 4/16
VSP-9012:1(config-if)# lossless-port pause-type pfc
VSP-9012:1(config-if)# lossless-port pfc-bandwidth 5
VSP-9012:1(config-if)# lossless-port pause-type pfc pfc-bandwidth 4
VSP-9012:1(config-if)# lossless-port enable
```

## Variable definitions

Use the data in the following table to use the `lossless-port` command.

Variable	Value
enable	Enables Lossless Ethernet mode for the port. To disable Lossless Ethernet mode for the port use the <code>no</code> parameter. <b>Example:</b> <code>no lossless-port</code> <b>DEFAULT:</b> disabled
pause-type	Specifies the pause frame type. <ul style="list-style-type: none"> <li>• <code>pause (FC)</code> — All unicast traffic on the port is lossless.</li> <li>• <code>priority-based flow control (PFC)</code> — All tagged unicast traffic on the port with an 802.1p value that matches the <code>lossless-802.1p</code> value is lossless. The switch treats traffic that does not meet this requirement as lossy traffic. The switch can drop the lossy traffic.</li> </ul> <b>DEFAULT:</b> FC
pfc-bandwidth <2–8>	Specifies the bandwidth, in Gbps, in a range from 2 to 8, when the <code>pause-type</code> is set to PFC. <b>DEFAULT:</b> 5

Use the data in the following table to use the `qos lossless-802.1p` command.

Variable	Value
qos lossless-802.1p <0–6>	Specifies the <code>lossless-802.1p</code> value in a range from 0 to 6. While you can configure the <code>Lossless-802.1p</code> value, a change affects all of the <code>Lossless-PFC</code> ports in the system. <b>DEFAULT:</b> 3   <b>Note:</b> You must map the <code>Lossless-802.1p</code> value to internal QoS level 3 because, when you configure the <code>Lossless-802.1p</code> value, the system does not apply the <code>Lossless-802.1p</code> change if the <code>lossless-802.1p</code> value is mapped to an Internal QoS level other than 3 or if the internal

Variable	Value
	QoS level 3 is mapped to any other 802.1p value. Avaya recommends that you do not use filters to remark the internal QoS.

## Displaying Lossless Ethernet information using ACLI

Display information on which ports are configured for Lossless Ethernet, the pause-type and priority-based flow control (PFC) bandwidth.

Display the configured Lossless 802.1p value in the system.

Display FC and PFC pause transmit and receive counters.

### Procedure

1. Display information on a port configured for Lossless Ethernet:  

```
show interfaces gigabitethernet lossless-config {slot/port[-slot/port] [,...]}
```
2. Display the 802.1p value used for Lossless Ethernet:  

```
show qos lossless-802.1p
```
3. Display PFC pause TX-RX counter:  

```
show interface GigabitEthernet error verbose [slot/port[-slot/port] [,...]]
```
4. Display FC and PFC transmit and receive counters.  

```
show interface gigabitethernet statistics {slot/port[slot/port] [,...]}
```

### Example

```
VSP-9012:> show interfaces gigabitethernet lossless-config 5/1, 5/5, 6/3
```

```
=====
Port Lossless Config
=====
PORT      LOSSLESS      PAUSE-TYPE      PFC-BW(Gbps)
-----
5/1       TRUE          PFC             5G
5/5       TRUE          PFC             5G
6/3       TRUE          FC              --
```

```
VSP-9012:> show qos lossless-802.1p
```

```
=====
QOS Lossless-802.1p
```

```
=====
Lossless-802.1p Level: 3
```

```
VSP-9012:> show interface gigabitethernet error verbose 4/1
```

```
=====
Port Ethernet Error Extended
=====
```

PORT NUM	MAC_RX ERRORS	MAC_TX ERRORS	DEFER TX	PACKET ERRORS	LINK INACTIV	UNKNOWN PROTOS
4/1	0	0	0	0	0	0

PORT NUM	IN FLWCTRL	OUT FLWCTRL	IN PFC	OUT PFC
4/1	0	0	0	0

```
VSP-9012:>show interface gigabitethernet statistics {slot/port[slot/port] [,...]}
```

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

PORT NUM	IN OCTETS	OUT OCTETS	IN PACKET	OUT PACKET
4/4	0	0	0	0

PORT NUM	IN FLOWCTRL	OUT FLOWCTRL	IN PFC	OUT PFC	OUTLOSS PACKETS
4/4	0	0	0	0	0

---

## Lossless Ethernet configuration using EDM

---

### Configuring Lossless Ethernet using EDM

To configure the Lossless Ethernet feature, you enable it on a port and configure the pause type.

 **Note:**

Avaya recommends that you do not enable tx-flow control on a lossless port. If you enable tx-flow control on a lossless port, Avaya cannot guarantee appropriate lossless behavior.

You can change the lossless-802.1p value. For more information on this procedure and configuration limitations, see [Specifying the lossless-802.1p value using EDM](#) on page 46

### Before you begin

The chassis must use at least five Switch Fabric modules to support the Lossless Ethernet feature.

### Procedure

1. In the navigation tree, expand the following folders: **Configuration > Edit > Port**
2. Click **General**.
3. Click the **LosslessEthernet** tab.
4. Select the **Configured** check box.
5. In the **PauseType** box, select **fc** or **pfc**.
6. If the **PauseType** is **pfc**, in the **PfcBandwidth** box, select the appropriate value.
7. Click **Apply**.

## Lossless Ethernet field descriptions

Use the data in the following table to use the **Lossless Ethernet** tab.

Name	Description
<b>Configured</b>	Enables lossless Ethernet mode for the port. <b>DEFAULT:</b> disabled
<b>PauseType</b>	<b>PauseType</b> selects the pause frame type. <ul style="list-style-type: none"> <li>• <b>fc</b> — All unicast traffic on the port is lossless.</li> <li>• <b>pfc</b> — With priority-based flow control, all tagged unicast traffic on the port that has an 802.1p value that matches the lossless-802.1p value is lossless. The switch treats traffic that does not meet this requirement as lossy traffic. The switch can drop the lossy traffic.</li> </ul> <b>DEFAULT:</b> fc
<b>PfcBandwidth</b>	Specifies the bandwidth, in Gbps, in a range from 2 to 8, when the <b>PauseType</b> is set to <b>pfc</b> . <b>DEFAULT:</b> 5

## Specifying the lossless-802.1p value using EDM

When you configure a port on your switch to use Lossless-PFC, the system compares the 802.1p value of the traffic on the port to the lossless 802.1p value — if both values match, the switch treats the traffic as lossless.

You can configure a specific lossless 802.1p value.

### Before you begin

- Enable Lossless Ethernet on the port.
- Specify the pause -type for the traffic on the port.

### About this task

If you change the lossless–802.1p value, the change affects all priority-based flow control (PFC) configured ports. You cannot change this value for individual lossless ports.


### Procedure

1. In the navigation tree, expand the following folders: **Configuration > Edit**.
2. Click **Chassis**.
3. Click the **System Flags** tab.
4. In the **Lossless8021p** box, type a number.
5. Click **Apply**.

## System Flags field descriptions

Use the data in the following table to use the **System Flags** tab.

Name	Description
<b>EnableAccessPolicy</b>	Activates access policies.
<b>MrouteStreamLimit</b>	Activates or disables Mroute Stream Limit.
<b>ForceTrapSender</b>	Configures circuitless IP as a trap originator.
<b>ForceIpHdrSender</b>	If you enable Force IP Header Sender, the system matches the IP header source address with SNMP header sender networks.
<b>ForceTopologyIpFlagEnable</b>	Activates or disables the flag that configures the CLIP ID as the topology IP. Values are true or false. <b>DEFAULT:</b> false (disabled)
<b>CircuitlessIpId</b>	Uses the CLIP ID as the topology IP.

Name	Description
	Enter a value from 1–256.
<b>ProfileType</b>	<p>Configures the system to give preference to one type of traffic over the other in times of over subscription. The values are:</p> <ul style="list-style-type: none"> <li>• balanced</li> <li>• unicastOptimized</li> <li>• multicastOptimized</li> </ul> <p><b>DEFAULT:</b>balanced</p>
<b>Lossless8021p</b>	<p>Specifies the lossless-802.1p value, in a range from 0 to 6.</p> <p><b>DEFAULT:</b> 3</p> <p> <b>Note:</b></p> <p>The internal QoS level that corresponds to the lossless 802.1p value must be 3. Avaya recommends that you do not use filters to remark the internal QoS level.</p> <p>When you enable lossless-PFC on a port, the port cannot become lossless-PFC if the lossless-802.1p value maps to an internal QoS level other than 3, or if the internal QoS level 3 maps to another 802.1p value.</p> <p>In a Lossless-PFC (802.1Qbb) domain, the lossless behavior is guaranteed as long as the Lossless 802.1p, ingress 1p to QoS map and the egress QoS to 1p map are consistent.</p> <p>When you change the Lossless 802.1p and ingress 1p to QoS map, you must configure the egress QoS to 1p map correctly.</p> <p>For more information on Lossless Ethernet, see <i>Avaya Virtual Services Platform 9000 Planning and Engineering-Network Design</i>, NN46250–200, and <i>Avaya Virtual Services Platform 9000 Administration</i>, NN46250–600.</p>
<b>HaCpu</b>	<p>Activates or disables the CPU High Availability feature.</p> <p>If you enable or disable High Availability mode, the secondary CPU resets automatically to load settings from the saved configuration file.</p> <p><b>DEFAULT:</b> enabled</p>
<b>HaCpuState</b>	<p>Indicates the CPU High Availability state.</p> <ul style="list-style-type: none"> <li>• initialization—indicates the CPU is in this state</li> <li>• oneWayActive—modules that need to synchronize register with the framework (either locally or a message received from a remote CPU)</li> </ul>

Name	Description
	<ul style="list-style-type: none"> <li>• twoWayActive—modules that need to synchronize register with the framework (either locally or a message received from a remote CPU)</li> <li>• synchronized—table-based synchronization is complete on the current CPU</li> <li>• remoteIncompatible—CPU framework version is incompatible with the remote CPU</li> <li>• error—if an invalid event is generated in a specific state the CPU enters Error state</li> <li>• disabled—High Availability is not activated</li> <li>• peerNotConnected—no established peer connection</li> <li>• peerConnected—established peer connection is established</li> <li>• lostPeerConnection—lost connection to peer or standby CPU</li> <li>• notSynchronized—table-based synchronization is not complete</li> </ul>
<b>HaEvent</b>	<p>Indicates the High Availability event status.</p> <ul style="list-style-type: none"> <li>• restart—causes the state machine to restart.</li> <li>• systemRegistrationDone—causes the CPU to transfer to One Way or Two Way Active state.</li> <li>• tableSynchronizationDone—causes the CPU to transfer to synchronized state.</li> <li>• versionIncompatible—causes the CPU to go to remote incompatible state</li> <li>• noEvent—means no event occurred to date.</li> </ul>
<b>StandbyCpu</b>	<p>Indicates the state of the standby CPU.</p>



# Chapter 7: Port reference

This chapter contains reference information that you can use to perform other procedures on Ethernet modules.

## Port operation reference

While this document focuses on the configuration of Ethernet modules features, a port can take part in many different types of operations. Other documents include details for different port operations.

## Reference to other documents

For more information about other port-related parameters, see the documents referenced in the following table.

**Table 17: Documentation references**

For more information about	See
<code>access-diffserv</code>	<i>Avaya Virtual Services Platform 9000 Configuration — QoS and ACL-Based Filtering</i> , NN46250-502
<code>action</code>	<i>Avaya Virtual Services Platform 9000 Configuration — IP Routing</i> , NN46250-505, and <i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree</i> , NN46250-500
<code>auto-recover-port</code>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree</i> , NN46250-500
<code>brouter port</code>	<i>Avaya Virtual Services Platform 9000 Configuration — IP Routing</i> , NN46250-505
<code>clear mac-address-table dynamic</code>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree</i> , NN46250-500
<code>cp-limit</code>	<i>Avaya Virtual Services Platform 9000 Administration</i> , NN46250-600
<code>default-vlan-id</code>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree</i> , NN46250-500
<code>eapol</code>	<i>Avaya Virtual Services Platform 9000 Security</i> , NN46250-601
<code>enable-diffserv</code>	<i>Avaya Virtual Services Platform 9000 Configuration — QoS and ACL-Based Filtering</i> , NN46250-502
<code>encapsulation dot1q</code>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree</i> , NN46250-500

<b>For more information about</b>	<b>See</b>
<b>fabric</b>	<i>Avaya Virtual Services Platform 9000 Administration, NN46250-600</i>
<b>high-secure</b>	<i>Avaya Virtual Services Platform 9000 Security, NN46250-601</i>
<b>ip</b>	<i>Avaya Virtual Services Platform 9000 Configuration — IP Routing, NN46250-505</i>
<b>ipv6</b>	<i>Avaya Virtual Services Platform 9000 Configuration — IPv6 Routing, NN46250-509</i>
<b>lACP</b>	<i>Avaya Virtual Services Platform 9000 Configuration — Link Aggregation, MLT, and SMLT, NN46250-503</i>
<b>lock</b>	<i>Avaya Virtual Services Platform 9000 Security, NN46250-601</i>
<b>loop-detect</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>mac-security</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>pcap</b>	<i>Avaya Virtual Services Platform 9000 Troubleshooting, NN46250-700</i>
<b>policy-vlan-precedence</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>protocol-vlan</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>qos</b>	<i>Avaya Virtual Services Platform 9000 Configuration — QoS and ACL-Based Filtering, NN46250-502</i>
<b>rate-limit</b>	<i>Avaya Virtual Services Platform 9000 Configuration — QoS and ACL-Based Filtering, NN46250-502</i>
<b>remote-mirroring</b>	<i>Avaya Virtual Services Platform 9000 Troubleshooting, NN46250-700</i>
<b>routing</b>	<i>Avaya Virtual Services Platform 9000 Configuration — IP Routing, NN46250-505, and Avaya Virtual Services Platform 9000 Configuration — IPv6 Routing, NN46250-509</i>
<b>slpp</b>	<i>Avaya Virtual Services Platform 9000 Configuration — Link Aggregation, MLT, and SMLT, NN46250-503</i>
<b>snmp</b>	<i>Avaya Virtual Services Platform 9000 Security, NN46250-601</i>
<b>spanning-tree</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>

For more information about	See
<b>spoof-detect</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>tagged-frames-discard</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>untagged-frames-discard</b>	<i>Avaya Virtual Services Platform 9000 Configuration — VLANs and Spanning Tree, NN46250-500</i>
<b>vlacp</b>	<i>Avaya Virtual Services Platform 9000 Configuration — Link Aggregation, MLT, and SMLT, NN46250-503</i>
<b>vrf</b>	<i>Avaya Virtual Services Platform 9000 Configuration — IP Routing, NN46250-505</i>

Port reference

# Chapter 8: Customer service

Visit the Avaya Web site to access the complete range of services and support that Avaya provides. Go to [www.avaya.com](http://www.avaya.com) or go to one of the pages listed in the following sections.

---

## Getting technical documentation

To download and print selected technical publications and release notes directly from the Internet, go to [www.avaya.com/support](http://www.avaya.com/support).

---

## Getting product training

Ongoing product training is available. For more information or to register, you can access the Web site at [www.avaya.com/support](http://www.avaya.com/support). From this Web site, you can locate the Training contacts link on the left-hand navigation pane.

---

## Getting help from a distributor or reseller

If you purchased a service contract for your Avaya product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

---

## Getting technical support from the Avaya Web site

The easiest and most effective way to get technical support for Avaya products is from the Avaya Technical Support Web site at [www.avaya.com/support](http://www.avaya.com/support).



## Glossary

<b>Avaya command line interface (ACLI)</b>	A textual user interface. When you use ACLI, you respond to a prompt by typing a command. After you enter the command, you receive a system response.
<b>Custom AutoNegotiation Advertisement (CANA)</b>	An enhancement of the IEEE 802.3 autonegotiation process on the 10/100/1000 copper ports. Custom AutoNegotiation Advertisement offers improved control over the autonegotiation process. The system advertises all port capabilities that include, for tri-speed ports, 10 Mb/s, 100 Mb/s, 1000 Mb/s speeds, and duplex and half-duplex modes of operation. This advertisement results in autonegotiation between the local and remote end that settles on the highest common denominator. Custom AutoNegotiation Advertisement can advertise a user-defined subset of the capabilities that settle on a lower or particular capability.
<b>Data Communications Equipment (DCE)</b>	A network device (such as a modem) that establishes, maintains, and terminates a session.
<b>far end fault indication (FEFI)</b>	Determines that one of two unidirectional fibers, that form the connection between two switches, fails.
<b>gigabit Ethernet (GbE)</b>	Ethernet technology with speeds up to 1 Gbit/s.
<b>Institute of Electrical and Electronics Engineers (IEEE)</b>	An international professional society that issues standards and is a member of the American National Standards Institute, the International Standards Institute, and the International Standards Organization.
<b>Interface module</b>	An interface module is a module that provides network connectivity for various media (sometimes called Layer 0) and protocol types. Interface modules are also called Ethernet modules.
<b>interswitch trunking (IST)</b>	A feature that uses one or more parallel point-to-point links to connect two aggregation switches. The two aggregation switches use this channel to share information and operate as a single logical switch. Only one interswitch trunk can exist on each Split Multilink Trunking (SMLT) aggregation switch.
<b>Layer 3</b>	The Network Layer of the OSI model. Example of a Layer 3 protocol is Internet Protocol (IP).

<b>Link Aggregation Control Protocol (LACP)</b>	A protocol that exists between two endpoints to bundle links into an aggregated link group for bandwidth increase and link redundancy.
<b>maximum transmission unit (MTU)</b>	The largest number of bytes in a packet—the maximum transmission unit of the port.
<b>Media Access Control (MAC)</b>	Arbitrates access to and from a shared medium.
<b>MultiLink Trunking (MLT)</b>	A method of link aggregation that uses multiple Ethernet trunks aggregated to provide a single logical trunk. A multilink trunk provides the combined bandwidth of multiple links and the physical layer protection against the failure of a single link.
<b>multimode fiber (MMF)</b>	A fiber with a core diameter larger than the wavelength of light transmitted that you can use to propagate many modes of light. Commonly used with LED sources for low speed and short distance lengths. Typical core sizes (measured in microns) are 50/125, 62.5/125 and 100/140.
<b>nanometer (nm)</b>	One billionth of a meter ( $10^{-9}$ meter). A unit of measure commonly used to express the wavelengths of light.
<b>packet loss</b>	Expressed as a percentage of packets dropped over a specified interval. Keep packet loss to a minimum to deliver effective IP telephony and IP video services.
<b>port</b>	A physical interface that transmits and receives data.
<b>quality of service (QoS)</b>	Use QoS features to reserve resources in a congested network. For example, you can configure a higher priority to IP deskphones, which need a fixed bit rate, and, split the remaining bandwidth between data connections if calls in the network are important than the file transfers.
<b>Routing Information Protocol (RIP)</b>	A distance vector protocol in the IP suite, used by IP network-layer protocol, that enables routers in the same AS to exchange routing information by means of periodic updates. The RIP is most often used as a very simple IGP within small networks.
<b>Simple Loop Prevention Protocol (SLPP)</b>	Simple Hello Protocol that prevents loops in a Layer 2 network (VLAN).
<b>Simple Network Management Protocol (SNMP)</b>	Administratively monitors network performance through agents and management stations.



<b>single mode fiber (SMF)</b>	One of the various light waves transmitted in an optical fiber. Each optical signal generates many modes, but in single-mode fiber only one mode is transmitted. Transmission occurs through a small diameter core (approximately ten micrometers), with a cladding that is 10 times the core diameter. These fibers have a potential bandwidth of 50 to 100 GHz per kilometer.
<b>small form factor pluggable (SFP)</b>	A hot-swappable input and output enhancement component used with Avaya products to allow gigabit Ethernet ports to link with other gigabit Ethernet ports over various media types.
<b>small form factor pluggable plus (SFP+)</b>	SFP+ transceivers are similar to SFPs in physical appearance but SFP+ transceivers provide Ethernet at 10 gigabit per second (Gb/s).
<b>spanning tree</b>	A simple, fully-connected active topology formed from the arbitrary physical topology of connected bridged Local Area Network components by relaying frames through selected bridge ports. The protocol parameters and states that are used and exchanged to facilitate the calculation of the active topology and to control the bridge relay function.
<b>unshielded twisted pair (UTP)</b>	A cable with one or more pairs of twisted insulated copper conductors bound in a single plastic sheath.
<b>Virtual Link Aggregation Control Protocol (VLACP)</b>	Virtual Link Aggregation Control Protocol (VLACP) is a Layer 2 handshaking protocol that can detect end-to-end failure between two physical Ethernet interfaces.
<b>virtual router (VR)</b>	An abstract object managed by the Virtual Router Redundancy Protocol (VRRP) that acts as a default router for hosts on a shared LAN.
<b>virtual router forwarding (VRF)</b>	Provides traffic isolation between customers operating over the same node. Each virtual router emulates the behavior of a dedicated hardware router by providing separate routing functionality, and the network treats each VRF as a separate physical router.

virtual router forwarding (VRF)