



# Configuring PROFINET

## Restrictions for Configuring PROFINET

Cisco IE series switches support PROFINET I/O, RT but not IRT (isochronous real-time).

## Information About Configuring PROFINET

PROFINET is the PROFIBUS International (PI) open Industrial Ethernet Standard that uses TCP/IP and IT standards for automation control. PROFINET is particularly useful for industrial automation systems and process control networks, in which motion control and precision control of instrumentation and test equipment are important. It emphasizes data exchange and defines communication paths to meet speed requirements. PROFINET communication is scalable on three levels:

- Normal non-real-time communication uses TCP/IP and enables bus cycle times of approximately 100 ms.
- Real-time communication enables cycle times of approximately 10 ms.
- Isochronous real-time communication enables cycle times of approximately 1 ms.

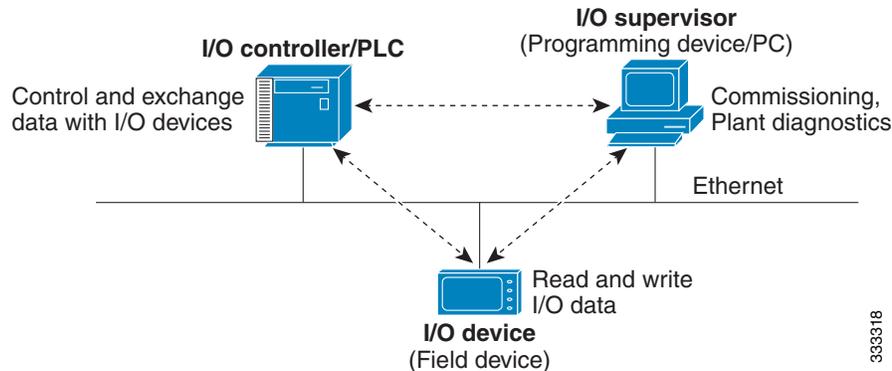
PROFINET I/O is a modular communication framework for distributed automation applications. PROFINET I/O uses cyclic data transfer to exchange data, alarms, and diagnostic information with programmable controllers, input/output (I/O) devices, and other automation controllers (for example, motion controllers).

PROFINET I/O recognizes three classes of devices:

- I/O devices
- I/O controllers
- I/O supervisors

## PROFINET Device Roles

**Figure 15** PROFINET Device Roles



An I/O controller is a programmable logic controller (PLC) that controls I/O devices and exchanges data such as configuration, alarms, and I/O data through an automation program. The I/O controller and the I/O supervisor exchange diagnostic information. The I/O controller shares configuration and input/output information with the I/O device and receives alarms from the I/O device.

PROFINET is designed to be the sole or primary management system platform. Because the I/O controller detects the switch with the Discovery and Configuration Protocol (DCP), and sets the device name and IP address, you do not need to enter Cisco IOS commands for the basic configuration. For advanced configurations (for example, QoS, DHCP, and similar features) you must use Cisco IOS commands on the switch because these features cannot be configured by using PROFINET.

An I/O supervisor is an engineering station, such as a human machine interface (HMI) or PC, used for commissioning, monitoring, and diagnostic analysis. The I/O supervisor exchanges diagnostic, status, control, and parameter information with the I/O device.

An I/O device is a distributed input/output device such as a sensor, an actuator, or a motion controller.

**Note:** If Profinet DCP cannot detect the switch/PLC/IO mac addresses, temporarily disable the firewall/virus scan from the Window PC that installed the Siemens STEP7 or TIA Portal.

In a PROFINET I/O system, all the I/O devices communicate over an Ethernet communication network to meet the automation industry requirement for bus cycle times of less than 100 ms. The network uses switches and full-duplex data exchange to avoid data collisions.

## PROFINET Device Data Exchange

After PROFINET uses DCP to discover devices, including the switch, they establish application relationships (ARs) and communication relationships (CRs). After a connection is established and information about device parameters is exchanged, input and output data is exchanged. The switch uses non-real-time CRs to exchange the data attributes listed in [Table 17 on page 129](#) and [Table 18 on page 129](#).

**Table 17 PROFINET I/O Switch Attributes**

PROFINET I/O Switch Configuration Attributes	Value or Action
Device name	Configures a name for the device.
TCP/IP	IP address, subnet mask, default gateway, SVI.
Primary temperature alarm	Enables or disables monitoring for the specified alarm.
Secondary temperature alarm	Enables or disables monitoring for the specified alarm.
RPS failed alarm	Enables or disables monitoring for the specified alarm.
Relay major alarm	Enables or disables monitoring for the specified alarm.
Reset to factory defaults	Uses the PROFINET I/O controller to reset the switch to factory defaults. This action removes the startup configuration and reloads the switch.
Relay major configuration	Specifies the type of port alarm (for example, link fault) that triggers the major relay. Any port configured with the specified alarm type can trigger the major relay.

**Table 18 PROFINET I/O Port Attributes**

PROFINET I/O Port Configuration Attributes	Value or Action
Speed	10/100/1000/auto,
Duplex	Half/full/auto,
Port mode	Access/trunk,
Link status	Shut down/no shut down,
Configure rate limiting	Broadcast, unicast, multicast threshold exceeds configured levels.
Port link fault alarm	Enables or disables monitoring for specified alarm.
Port not forwarding alarm	Enables or disables monitoring for specified alarm.
Port not operating alarm	Enables or disables monitoring for specified alarm.
Port FCS threshold alarm	Enables or disables monitoring for specified alarm.

PROFINET devices are integrated by using a general station description (GSD) file that contains the data for engineering and data exchange between the I/O controller, the I/O supervisor, and the I/O devices, including the switch. Each PROFINET I/O field device must have an associated GSD file that describes the properties of the device and contains all this information required for configuration:

- Device identification information (device ID, vendor ID and name, product family, number of ports)
- Number and types of pluggable modules
- Error text for diagnostic information
- Communication parameters for I/O devices, including the minimum cycle time, the reduction ratio, and the watch dog time
- Configuration data for the I/O device modules, including speed, duplex, VLAN, port security information, alarms, and broadcast-rate-limiting thresholds
- Parameters configured for I/O device modules for the attributes listed in [Table 18 on page 129](#)

The GSD file is on the switch, but the I/O supervisor uses this file.

**Note:** You must use the GSD file that is associated with the Cisco IOS release on the switch to manage your PROFINET network. Both the I/O supervisor and the Cisco IOS software alert you to a mismatch between the GSD file and the switch Cisco IOS software version.

## How to Configure PROFINET

### Configuring PROFINET

You can use either the PROFINET software on the I/O supervisor or the Cisco IOS software for basic switch configuration.

After you enable PROFINET, LLDP is automatically enabled on the switch because PROFINET relies on LLDP to fully function. If you disable PROFINET, you can enable or disable LLDP as needed.

### Default Configuration

PROFINET is enabled by default on all the base switch module ports. The default config is enabled on VLAN 1 but can be changed to another VLAN ID. If PROFINET has been disabled, follow the instructions in the [Enabling PROFINET, page 130](#).

### Enabling PROFINET

	Command	Purpose
1.	<b>configure terminal</b>	Enters global configuration mode.
2.	<b>profinet</b>	Enables PROFINET on the switch.
3.	<b>profinet id line</b>	(Optional) Sets the PROFINET device identifier (ID) by using the Cisco IOS software.  The maximum length is 240 characters. The only special characters allowed are the period (.) and hyphen (-), and they are allowed only in specific positions within the ID string. It can have multiple labels within the string. Each label can be from 1 to 63 characters, and labels must be separated by a period (.). The final character in the string must not be zero (0).  For more details about configuring the PROFINET ID, see the PROFINET specification, document number TC2-06-0007a, filename PN-AL-protocol_2722_V22_Oct07, available from <a href="#">PROFIBUS</a> .
4.	<b>profinet vlan vlan id</b>	(Optional) Changes the VLAN number. The default VLAN number is 1. The VLAN ID range is 1-4096. Supports one VLAN per switch.
5.	<b>interface &lt;x/y&gt;</b>	Access interface configuration mode.
6.	<b>switchport mode access</b>	Configure the port mode as access.
7.	<b>switchport access vlan &lt;&gt;</b>	Configure the access vlan required for the port.
8.	<b>switchport voice vlan dot1p</b>	Add the voice vlan dot1p command.  ■ Required only for the IE4010 switch platform.
9.	<b>end</b>	Returns to privileged EXEC mode.
10.	<b>show running-config</b>	Verifies your entries.
11.	<b>copy running-config startup-config</b>	(Optional) Saves your entries in the configuration file.

## Guidelines for the IE4010

The IE4010 does not behave same as other IE platforms when it comes to Vlan 0 tags. You need to add the **voice vlan dot1p** command to the interface to allow the vlan 0 tagged packets.

The following example shows the configuration:

```
Interface gil/2
description PLC
switchport access vlan 10
switchport mode access
switchport voice vlan dot1p
```

The highlighted command above allows the vlan 0 tagged packets to be accepted on vlan 10 along with the COS values of ingress frames.

## Monitoring and Maintaining PROFINET

**Table 19** Commands for Displaying the PROFINET Configuration

Command	Purpose
<b>show profinet sessions</b>	Displays the currently connected PROFINET sessions.
<b>show profinet status</b>	Displays the status of the PROFINET subsystem.
show lldp neighbor interface x/x detail	Displays information about the adjacent interface.

```
Example
IE5000#show profinet status
State : Enabled
Vlan : 2
Id : Ie5000
Connected : Yes
ReductRatio : 128
GSD Version: Match
```

## Troubleshooting PROFINET

The PLC has LEDs that display red for alarms, and the I/O supervisor software monitors those alarms.

To troubleshoot PROFINET use the **debug profinet** privileged EXEC command with the keywords shown in [Table 20 on page 131](#). Be aware that the output of a **debug** command might cause a serial link to fail. You should use these commands only under the guidance of a Cisco Technical Support engineer. When you use this command, use Telnet to access the Cisco IOS command-line interface (CLI) by using Ethernet rather than a serial port.

**Table 20** Commands for Troubleshooting the PROFINET Configuration

Command	Purpose
<b>debug profinet alarm</b>	Displays the alarm status (on or off) and content of PROFINET alarms.
<b>debug profinet cyclic</b>	Displays information about the time-cycle-based PROFINET Ethernet frames.
<b>debug profinet error</b>	Displays the PROFINET session errors.
<b>debug profinet packet ethernet</b>	Displays information about the PROFINET Ethernet packets.

**Table 20** Commands for Troubleshooting the PROFINET Configuration (continued)

Command	Purpose
<b>debug profinet packet udp</b>	Displays information about the PROFINET Upper Layer Data Protocol (UDP) packets.
<b>debug profinet platform</b>	Displays information about the interaction between the Cisco IOS software and PROFINET.
<b>debug profinet topology</b>	Displays the PROFINET topology packets received.
<b>debug profinet trace</b>	Displays a group of traced debug output logs.

## Additional References

The following sections provide references related to switch administration:

## Related Documents

Related Topic	Document Title
Cisco IOS basic commands	<i>Cisco IOS Configuration Fundamentals Command Reference</i>

## Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	–

## MIBs

MIBs	MIBs Link
–	To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: <a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a>

## RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	–

## Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>

