



# Using Link Layer Discovery Protocol in Multivendor Networks

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Link Layer Discovery Protocol (LLDP), standardized by the IEEE as part of 802.1ab, enables standardized discovery of nodes, which in turn facilitates future applications of standard management tools such as Simple Network Management Protocol (SNMP) in multivendor networks. Using standard management tools makes physical topology information available and helps network administrators detect and correct network malfunctions and inconsistencies in configuration.

The Cisco implementation of LLDP is based on the IEEE 802.1ab standard.

- [Finding Feature Information, on page 1](#)
- [Prerequisites for Using Link Layer Discovery Protocol in Multivendor Networks, on page 1](#)
- [Restrictions for Using Link Layer Discovery Protocol in Multivendor Networks, on page 2](#)
- [Information About Using Link Layer Discovery Protocol in Multivendor Networks, on page 2](#)
- [How to Configure Link Layer Discovery Protocol in Multivendor Networks, on page 4](#)
- [Configuration Examples for Link Layer Discovery Protocol in Multivendor Networks, on page 12](#)
- [Additional References for Using Link Layer Discovery Protocol in Multivendor Networks, on page 14](#)
- [Feature Information for Link Layer Discovery Protocol in Multivendor Networks, on page 15](#)

## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

## Prerequisites for Using Link Layer Discovery Protocol in Multivendor Networks

The Type-Length-Value (TLV) types must be 0 through 127.

# Restrictions for Using Link Layer Discovery Protocol in Multivendor Networks

Use of LLDP is limited to 802.1 media types such as Ethernet, Token Ring, and FDDI networks.

## Information About Using Link Layer Discovery Protocol in Multivendor Networks

### IEEE 802.1ab LLDP

IEEE 802.1ab Link Layer Discovery Protocol (LLDP) is an optional link layer protocol for network topology discovery in multivendor networks. Discovery information includes device identifiers, port identifiers, versions, and other details. As a protocol that aids network management, LLDP provides accurate network mapping, inventory data, and network troubleshooting information.

LLDP is unidirectional, operating only in an advertising mode. LLDP does not solicit information or monitor state changes between LLDP nodes. LLDP periodically sends advertisements to a constrained multicast address. Devices supporting LLDP can send information about themselves while they receive and record information about their neighbors. Additionally, devices can choose to turn off the send or receive functions independently. Advertisements are sent out and received on every active and enabled interface, allowing any device in a network to learn about all devices to which it is connected. Applications that use this information include network topology discovery, inventory management, emergency services, VLAN assignment, and inline power supply.



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**Note** LLDP and Cisco Discovery Protocol can operate on the same interface.

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The figure below shows a high-level view of LLDP operating in a network node.






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**Note** A system power budget is the default power allocated to a device based on its device class. However, the total power sourced from a switch is finite, and power budgeting is done by the power module based on the number of ports already being served, total power that can be served, and number of new ports that are requesting.

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- Inventory management TLV—Allows an endpoint to send detailed inventory information about itself to the switch, including information hardware revision, firmware version, software version, serial number, manufacturer name, model name, and asset ID TLV.
- Location TLV—Provides location information from the switch to the endpoint device. The location TLV can send the following information:
  - Civic location information—Provides the civic address information and postal information. Examples of civic location information are street address, road name, and postal community name information.
  - ELIN location information—Provides the location information of a caller. The location is determined by the Emergency location identifier number (ELIN), a phone number that routes an emergency call to the local public safety answering point (PSAP). The PSAP can call back the emergency caller using the same number.

## Benefits of LLDP

- Follows IEEE 802.1ab standard.
- Enables interoperability among multivendor devices.
- Facilitates troubleshooting of enterprise networks and uses standard network management tools.
- Provides extension for applications such as VoIP.

# How to Configure Link Layer Discovery Protocol in Multivendor Networks

## Enabling and Disabling LLDP Globally

LLDP is disabled globally by default. This section describes the tasks for enabling and disabling LLDP globally.

### Enabling LLDP Globally

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **lldp**{hold time *seconds* | **reinit** *delay* | **run** | **timer** *rate* | **tlv-select** *tlv*}

## 4. end

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
Step 3	<b>lldp{hold time seconds   reinit delay   run   timer rate   tlv-select tlv}</b> <b>Example:</b> Device(config)# lldp run	Enables LLDP globally.
Step 4	<b>end</b> <b>Example:</b> Device(config)# end	Returns to privileged EXEC mode.

## Disabling LLDP Globally

## SUMMARY STEPS

1. enable
2. configure terminal
3. no lldp{hold time seconds | reinit delay | run | timer rate | tlv-select tlv}
4. end

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
<b>Step 3</b>	<b>no lldp</b> {hold time <i>seconds</i>   <b>reinit</b> <i>delay</i>   <b>run</b>   <b>timer</b> <i>rate</i>   <b>tlv-select</b> <i>tlv</i> }  <b>Example:</b>  Device(config)# no lldp run	Disables LLDP globally.
<b>Step 4</b>	<b>end</b>  <b>Example:</b>  Device(config)# end	Returns to privileged EXEC mode.

## Disabling and Enabling LLDP on a Supported Interface

LLDP is enabled by default on all supported interfaces. This section describes the tasks for disabling and enabling LLDP on a supported interface.

### Disabling LLDP on a Supported Interface

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no lldp** {**tlv-select** *tlv* | **receive** | **transmit**}
5. **end**

#### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type number</i>  <b>Example:</b>  Device(config)# interface ethernet 0/1	Specifies the interface type and number and enters interface configuration mode.

	Command or Action	Purpose
Step 4	<b>no lldp</b> {tlv-select <i>tlv</i>   receive   transmit} <b>Example:</b> Device(config-if)# no lldp receive	Disables an LLDP TLV or LLDP packet reception on a supported interface.
Step 5	<b>end</b> <b>Example:</b> Device(config-if)# end	Returns to privileged EXEC mode.

## Enabling LLDP on a Supported Interface

LLDP information can be transmitted and received only on an interface where LLDP is configured and enabled. Perform this task to enable LLDP.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **lldp** {tlv-select *tlv* | receive | transmit}
5. **end**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
Step 3	<b>interface</b> <i>type number</i> <b>Example:</b> Device(config)# interface ethernet 0/1	Specifies the interface type and number and enters interface configuration mode.
Step 4	<b>lldp</b> {tlv-select <i>tlv</i>   receive   transmit} <b>Example:</b> Device(config-if)# lldp transmit	Enables an LLDP TLV or LLDP packet transmission on a supported interface.

	Command or Action	Purpose
<b>Step 5</b>	<b>end</b> <b>Example:</b> <pre>Device(config-if)# end</pre>	Returns to privileged EXEC mode.

## Setting LLDP Packet Hold Time

Hold time is the duration that a receiving device should maintain LLDP neighbor information before aging it. Perform this task to define a hold time for an LLDP-enabled device.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **lldp holdtime *seconds***
4. **end**

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>lldp holdtime <i>seconds</i></b> <b>Example:</b> <pre>Device(config)# lldp holdtime 100</pre>	Specifies the hold time.
<b>Step 4</b>	<b>end</b> <b>Example:</b> <pre>Device(config)# end</pre>	Returns to privileged EXEC mode.

## Setting LLDP Packet Frequency

Perform this task to specify an interval at which the Cisco software sends LLDP updates to neighboring devices.



**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `lldp timer rate`
4. `end`

**DETAILED STEPS**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>lldp timer rate</b> <b>Example:</b> Device(config)# lldp timer 75	Specifies the rate at which LLDP packets are sent every second.
<b>Step 4</b>	<b>end</b> <b>Example:</b> Device(config)# end	Returns to privileged EXEC mode.

**Monitoring and Maintaining LLDP in Multivendor Networks**

Perform this task to monitor and maintain LLDP in multivendor networks. This task is optional, and Steps 2 and 3 can be performed in any sequence.

**SUMMARY STEPS**

1. `enable`
2. `show lldp [entry {* | word} | errors | interface [ethernet number] | neighbors [ethernet number | detail] | traffic]`
3. `clear lldp {counters | table}`
4. `end`

**DETAILED STEPS**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<code>enable</code>	Enables privileged EXEC mode.

	Command or Action	Purpose
	<b>Example:</b>  Device> enable	<ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show lldp</b> [ <b>entry</b> { <b>*</b>   <i>word</i> }   <b>errors</b>   <b>interface</b> [ <b>ethernet number</b> ]   <b>neighbors</b> [ <b>ethernet number</b>   <b>detail</b> ]   <b>traffic</b> ]  <b>Example:</b>  Device# show lldp entry *	Displays summarized and detailed LLDP information.  <b>Note</b> When the <b>show lldp neighbors</b> command is issued, if the device ID has more than 20 characters, the ID is truncated to 20 characters in command output because of display constraints.
<b>Step 3</b>	<b>clear lldp</b> { <b>counters</b>   <b>table</b> }  <b>Example:</b>  Device# clear lldp counters	Resets LLDP traffic counters and tables to zero.
<b>Step 4</b>	<b>end</b>  <b>Example:</b>  Device# end	Returns to user EXEC mode.

## Enabling and Disabling LLDP TLVs

LLDP TLV support is enabled by default if LLDP is enabled globally and locally on a supported interface. Specific TLVs, however, can be enabled and suppressed.

### Enabling LLDP TLVs

#### SUMMARY STEPS

- enable
- configure terminal
- interface *type number*
- lldp {tlv-select *tlv* | receive | transmit}
- lldp tlv-select *tlv*
- end

#### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
Step 2	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
Step 3	<b>interface type number</b> <b>Example:</b>  Device(config)# interface ethernet 0/1	Specifies the interface type and number on which to enable LLDP and enters interface configuration mode.
Step 4	<b>lldp {tlv-select tlv   receive   transmit}</b> <b>Example:</b>  Device(config-if)# lldp transmit	Enables an LLDP TLV or LLDP packet transmission on a supported interface.
Step 5	<b>lldp tlv-select tlv</b> <b>Example:</b>  Device(config-if)# lldp tlv-select system-description	Enables a specific LLDP TLV on a supported interface.
Step 6	<b>end</b> <b>Example:</b>  Device(config-if)# end	Returns to privileged EXEC mode.

## Disabling LLDP TLVs

### SUMMARY STEPS

1. enable
2. configure terminal
3. interface type number
4. no lldp {tlv-select tlv | receive | transmit}
5. no lldp tlv-select tlv
6. end

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# <code>configure terminal</code>	Enters global configuration mode.
<b>Step 3</b>	<b>interface type number</b> <b>Example:</b>  Device(config)# <code>interface ethernet 0/1</code>	Specifies the interface type and number on which to disable LLDP and enters interface configuration mode.
<b>Step 4</b>	<b>no lldp {tlv-select tlv   receive   transmit}</b> <b>Example:</b>  Device(config-if)# <code>no lldp receive</code>	Disables an LLDP TLV or LLDP packet reception on a supported interface.
<b>Step 5</b>	<b>no lldp tlv-select tlv</b> <b>Example:</b>  Device(config-if)# <code>no lldp tlv-select system-description</code>	Disables a specific LLDP TLV on a supported interface.
<b>Step 6</b>	<b>end</b> <b>Example:</b>  Device(config-if)# <code>end</code>	Returns to privileged EXEC mode.

## Configuration Examples for Link Layer Discovery Protocol in Multivendor Networks

### Example: Configuring Voice VLAN

The following example shows how to configure voice VLAN and verify

```
Device1> enable
Device1# configure terminal
Device1(config)# interface GigabitEthernet0/1/7
Device1(config-if)# switchport voice vlan 10
Device1(config-if)# no ip address
Device1(config-if)# end
```

The following example displays the updated running configuration on Device 2. LLDP is enabled with hold time, timer, and TLV options configured.

```
Device1# show lldp neighbors detail

Local Intf: Gi0/1/7
Chassis id: 10.10.0.1
Port id: C8F9F9D61BC2:P1
```

```

Port Description: SW PORT
System Name: SEPC8F9F9D61BC2

System Description:
Cisco IP Phone 7962G,V12, SCCP42.9-3-1ES27S

Time remaining: 127 seconds
System Capabilities: B,T
Enabled Capabilities: B,T
Management Addresses:
    IP: 10.10.0.1
Auto Negotiation - supported, enabled
Physical media capabilities:
    1000baseT(HD)
    1000baseX(FD)
    Symm, Asym Pause(FD)
    Symm Pause(FD)
Media Attachment Unit type: 16
Vlan ID: - not advertised

MED Information:

MED Codes:
    (NP) Network Policy, (LI) Location Identification
    (PS) Power Source Entity, (PD) Power Device
    (IN) Inventory

H/W revision: 12
F/W revision: tnp62.8-3-1-21a.bin
S/W revision: SCCP42.9-3-1ES27S
Serial number: FCH1610A5S5
Manufacturer: Cisco Systems, Inc.
Model: CP-7962G
Capabilities: NP, PD, IN
Device type: Endpoint Class III
Network Policy(Voice): VLAN 10, tagged, Layer-2 priority: 5, DSCP: 46
Network Policy(Voice Signal): VLAN 10, tagged, Layer-2 priority: 4, DSCP: 32
PD device, Power source: Unknown, Power Priority: Unknown, Wattage: 6.3
Location - not advertised

```

The following example shows how to configure LLDP timer, hold time, and TLVs options on Device 2.

```

Device> enable
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# lldp run
Device(config)# lldp holdtime 150
Device(config)# lldp timer 15
Device(config)# lldp tlv-select port-vlan
Device(config)# lldp tlv-select mac-phy-cfg
Device2(config)# interface ethernet 0/0
Device2(config-if)# lldp transmit
Device2(config-if)# end
00:08:32: %SYS-5-CONFIG_I: Configured from console by console

```

The following example shows that voice vlan has been configured on the IP phone.

```

Device1# show lldp traffic
LLDP traffic statistics:
    Total frames out: 20
    Total entries aged: 0
    Total frames in: 15
    Total frames received in error: 0
    Total frames discarded: 0

```

```

Total TLVs unrecognized: 0
Device1# show lldp neighbors
Capability codes:
  (R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
  (W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID      Local Intf    Hold-time    Capability    Port ID
Device2        Et0/0        150          R             Et0/0
Total entries displayed: 1
Device2# show lldp traffic
LLDP traffic statistics:
  Total frames out: 15
  Total entries aged: 0
  Total frames in: 17
  Total frames received in error: 0
  Total frames discarded: 2
  Total TLVs unrecognized: 0
Device2# show lldp neighbors
Capability codes:
  (R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
  (W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID      Local Intf    Hold-time    Capability    Port ID
Device1        Et0/0        150          R             Et0/0
Total entries displayed: 1

```

## Additional References for Using Link Layer Discovery Protocol in Multivendor Networks

### Related Documents

Related Topic	Document Title
Cisco IOS commands: master list of commands with complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<a href="#">Cisco IOS Master Command List, All Releases</a>
Carrier Ethernet commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<a href="#">Cisco IOS Carrier Ethernet Command Reference</a>
LLDP	<a href="#">Link Layer Discovery Protocol</a>
Per port location configurations	<a href="#">Per Port Location Configuration</a>

### Standards and RFCs

Standards/RFCs	Title
IEEE 802.1ab	<a href="#">Station and Media Access Control Connectivity Discovery</a>
RFC 2922	<a href="#">Physical Topology MIB</a>

**MIBs**

<b>MIB</b>	<b>MIBs Link</b>
PTOPO MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**Technical Assistance**

<b>Description</b>	<b>Link</b>
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for Link Layer Discovery Protocol in Multivendor Networks

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1: Feature Information for Using Link Layer Discovery Protocol in Multivendor Networks**

<b>Feature Name</b>	<b>Releases</b>	<b>Feature Information</b>
IEEE 802.1ab LLDP (Link Layer Discovery Protocol)	Cisco IOS XE Release 3.8S  Cisco IOS XE Release 3.9S	LLDP, standardized by the IEEE as part of 802.1ab, enables standardized discovery of nodes, which in turn facilitates future applications of standard management tools such as SNMP in multivendor networks.  In Cisco IOS XE Release 3.9S, support was added for the Cisco 903 Series Aggregation Services Routers.  The following commands were introduced or modified: <b>clear lldp</b> , <b>lldp</b> , and <b>show lldp</b> .

