

# [AN046]



**ADVANCED**  
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## LLDP-MED Configuration with Cisco Switch

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### Static Electric Warning

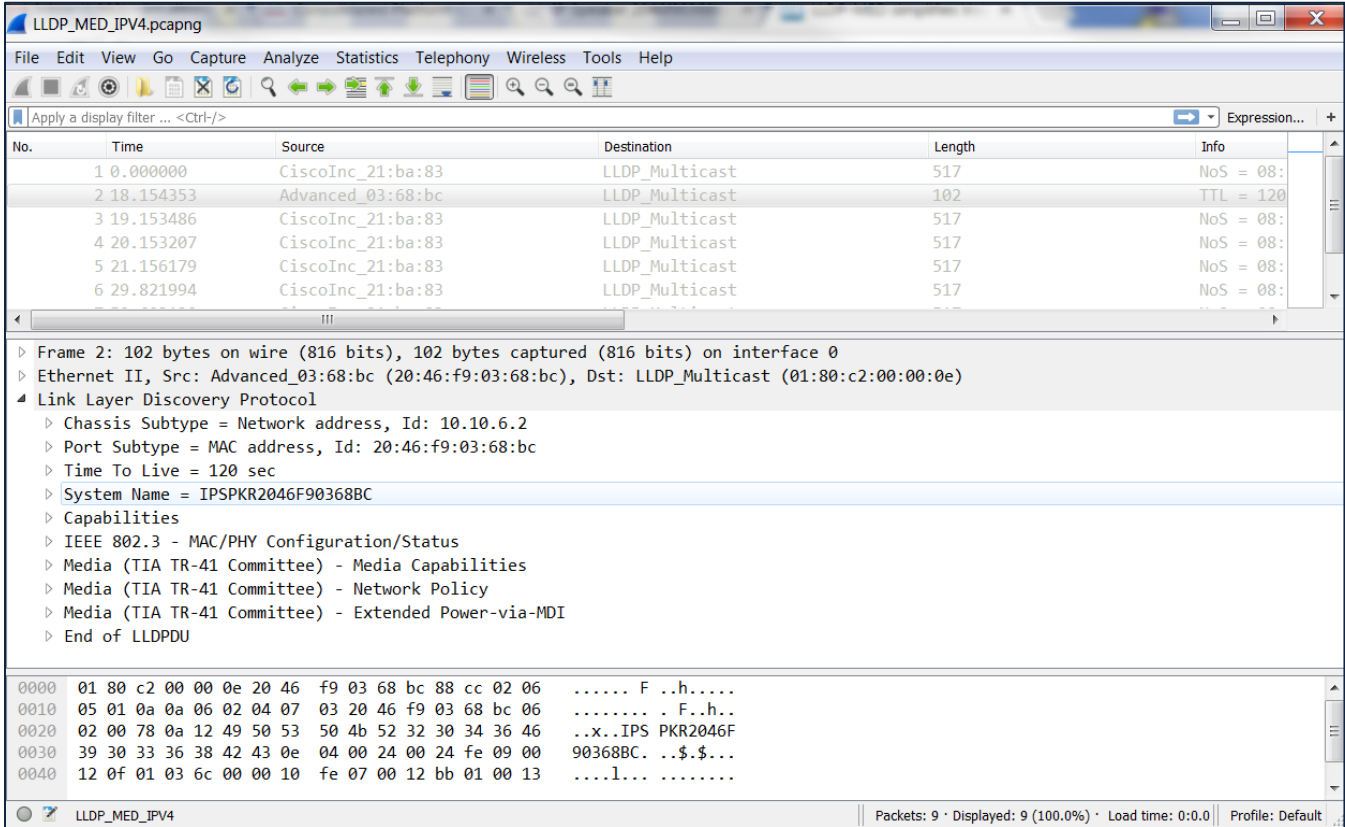


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## LLDP-MED – WHAT AND WHY?

Link Layer Discovery Protocol – Media Endpoint Discovery (LLDP-MED) allows endpoints and infrastructure (such as Ethernet switches) to share configuration and operation information. This feature, in turn, simplifies the deployment and troubleshooting of VoIP endpoint devices. LLDP-MED is based on the IEEE802.1AB LLDP standard. This document describes how to configure the LLDP-MED operation on both an AND device and Cisco switch to support Voice VLAN operation.



No.	Time	Source	Destination	Length	Info
1	0.000000	CiscoInc_21:ba:83	LLDP_Multicast	517	NoS = 08:
2	18.154353	Advanced_03:68:bc	LLDP_Multicast	102	TTL = 120
3	19.153486	CiscoInc_21:ba:83	LLDP_Multicast	517	NoS = 08:
4	20.153207	CiscoInc_21:ba:83	LLDP_Multicast	517	NoS = 08:
5	21.156179	CiscoInc_21:ba:83	LLDP_Multicast	517	NoS = 08:
6	29.821994	CiscoInc_21:ba:83	LLDP_Multicast	517	NoS = 08:

```

Frame 2: 102 bytes on wire (816 bits), 102 bytes captured (816 bits) on interface 0
Ethernet II, Src: Advanced_03:68:bc (20:46:f9:03:68:bc), Dst: LLDP_Multicast (01:80:c2:00:00:0e)
  Link Layer Discovery Protocol
    Chassis Subtype = Network address, Id: 10.10.6.2
    Port Subtype = MAC address, Id: 20:46:f9:03:68:bc
    Time To Live = 120 sec
    System Name = IPSPKR2046F90368BC
    Capabilities
      IEEE 802.3 - MAC/PHY Configuration/Status
      Media (TIA TR-41 Committee) - Media Capabilities
      Media (TIA TR-41 Committee) - Network Policy
      Media (TIA TR-41 Committee) - Extended Power-via-MDI
    End of LLDPDU
  
```

```

0000  01 80 c2 00 00 0e 20 46 f9 03 68 bc 88 cc 02 06  ....F..h....
0010  05 01 0a 0a 06 02 04 07 03 20 46 f9 03 68 bc 06  ....F..h..
0020  02 00 78 0a 12 49 50 53 50 4b 52 32 30 34 36 46  ..x..IPS PKR2046F
0030  39 30 33 36 38 42 43 0e 04 00 24 00 24 fe 09 00  90368BC. .$.$.
0040  12 0f 01 03 6c 00 00 10 fe 07 00 12 bb 01 00 13  ....l...
  
```

Example LLDP-MED Packet and Exchange

## DEVICE CONFIGURATION

This section will cover the configuration of both an AND device and an example Cisco switch for correct Voice VLAN detection and operation. Upon boot-up, the AND device sends an LLDP-MED packet to the switch to request the current Voice VLAN setting on the port. If an LLDP-MED packet from the switch is not received after approximately 45 seconds, the AND device will revert to LLDP operation and send untagged packets. If an LLDP-MED packet *is* received from the switch, the AND device will use the settings received in that packet for Voice VLAN operation.

### AND Device

By default, AND devices with firmware 1.6 and newer will work with LLDP-MED out of the box.

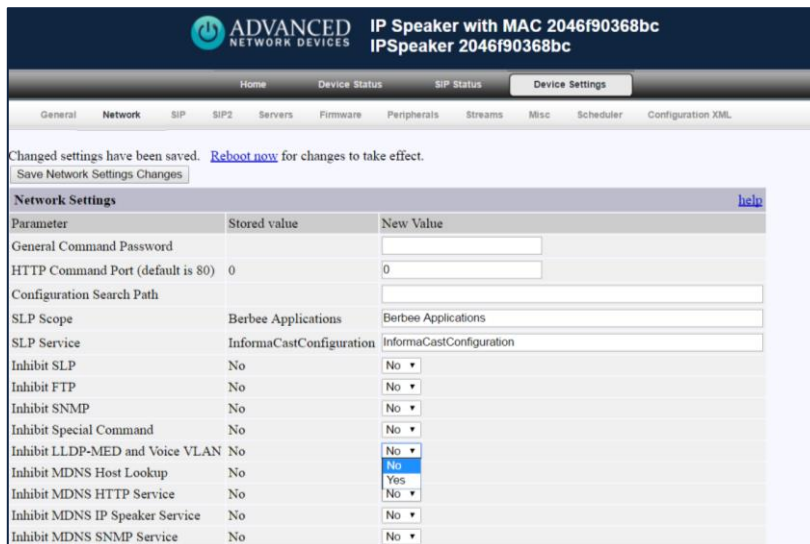
If LLDP-MED was previously disabled, it can be re-enabled via two methods, depending on the use of configuration files:

If configuration files are in use, add the following tag to the configuration file:

```
<lldp_med_and_voice_vlan_inhibit val="1" />
```

Then save changes to the file and reboot the device.

If configuration files are not in use, go directly to the device’s web interface and select Device Settings, then the Network sub-menu. Under the Network Settings table, select “No” for the Inhibit LLDP-MED and Voice VLAN setting (shown below). Next, click the “Save Network Settings Changes” button and then click the “Reboot Now” link to power cycle the device.



The screenshot shows the web interface for an AND device. The top navigation bar includes 'Home', 'Device Status', 'SIP Status', and 'Device Settings'. Below this is a sub-menu with 'General', 'Network', 'SIP', 'SIP2', 'Servers', 'Firmware', 'Peripherals', 'Streams', 'Misc', 'Scheduler', and 'Configuration XML'. The main content area displays a message: 'Changed settings have been saved. [Reboot now](#) for changes to take effect.' Below this is a 'Save Network Settings Changes' button. The 'Network Settings' table is shown with the following parameters:

Parameter	Stored value	New Value
General Command Password		<input type="text"/>
HTTP Command Port (default is 80)	0	<input type="text"/>
Configuration Search Path		<input type="text"/>
SLP Scope	Berbee Applications	<input type="text"/>
SLP Service	InformaCastConfiguration	<input type="text"/>
Inhibit SLP	No	No ▾
Inhibit FTP	No	No ▾
Inhibit SNMP	No	No ▾
Inhibit Special Command	No	No ▾
Inhibit LLDP-MED and Voice VLAN	No	No ▾
Inhibit MDNS Host Lookup	No	No ▾
Inhibit MDNS HTTP Service	No	Yes ▾
Inhibit MDNS IP Speaker Service	No	No ▾
Inhibit MDNS SNMP Service	No	No ▾

LLDP-MED Configuration on an AND device

## CISCO SWITCH

The three configuration sections of concern for a Cisco switch are Power over Ethernet (PoE), LLDP-MED and Voice VLAN. The switch used in the following example is a Cisco Catalyst 2960.

### PoE

The Ethernet port must be configured to provide power to an IEEE Class 4 device. The simplest approach to this is to configure the port to auto mode. In auto mode, the switch automatically detects if the connected device requires power. If the switch discovers a powered device connected to the port and if the switch has enough power, it turns on power to the port on a first-come basis and updates the switch port status LEDs. In the configuration example shown below, Gigabit Ethernet Port 1 is configured for auto detection and allocation of PoE.

```
DDC_LAB_01#
DDC_LAB_01#
DDC_LAB_01#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DDC_LAB_01(config)#interface gigabitethernet 1/0/1
DDC_LAB_01(config-if)#power inline auto
DDC_LAB_01(config-if)#end
DDC_LAB_01#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
DDC_LAB_01#
```

## LLDP-MED

LLDP and LLDP-MED are disabled in the default configuration of the Cisco switch. Default LLDP/LLDP-MED configuration is shown below.

### Default LLDP Configuration

Table 1 Default LLDP Configuration

Feature	Default Setting
LLDP global state	Disabled
LLDP holdtime (before discarding)	120 seconds
LLDP timer (packet update frequency)	30 seconds
LLDP reinitialization delay	2 seconds
LLDP tlv-select	Disabled to send and receive all TLVs
LLDP interface state	Disabled
LLDP receive	Disabled
LLDP transmit	Disabled
LLDP med-tlv-select	Disabled to send all LLDP-MED TLVs. When LLDP is globally enabled, LLDP-MED-TLV is also enabled.

To enable LLDP and LLDP-MED on Gigabit Ethernet Port 1, follow the configuration example below.

```
DDC_LAB_01>enable
Password:
DDC_LAB_01#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DDC_LAB_01(config)#lldp run
DDC_LAB_01(config)#interface gigabitethernet 1/0/1
DDC_LAB_01(config-if)#lldp transmit
DDC_LAB_01(config-if)#lldp receive
DDC_LAB_01(config-if)#end
```

Note that the default LLDP holdtime, LLDP timer, and LLDP reinitialization delay are correct for standard operation. In the event of corrupt settings, see this configuration example with the correct settings.

```
DDC_LAB_01>enable
Password:
DDC_LAB_01#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DDC_LAB_01(config)#lldp holdtime 120
DDC_LAB_01(config)#lldp timer 30
DDC_LAB_01(config)#lldp reinit 2
DDC_LAB_01(config)#end
DDC_LAB_01#show lldp

Global LLDP Information:
  Status: ACTIVE
  LLDP advertisements are sent every 30 seconds
  LLDP hold time advertised is 120 seconds
  LLDP interface reinitialisation delay is 2 seconds
DDC_LAB_01#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
DDC_LAB_01#
```



## Voice VLAN

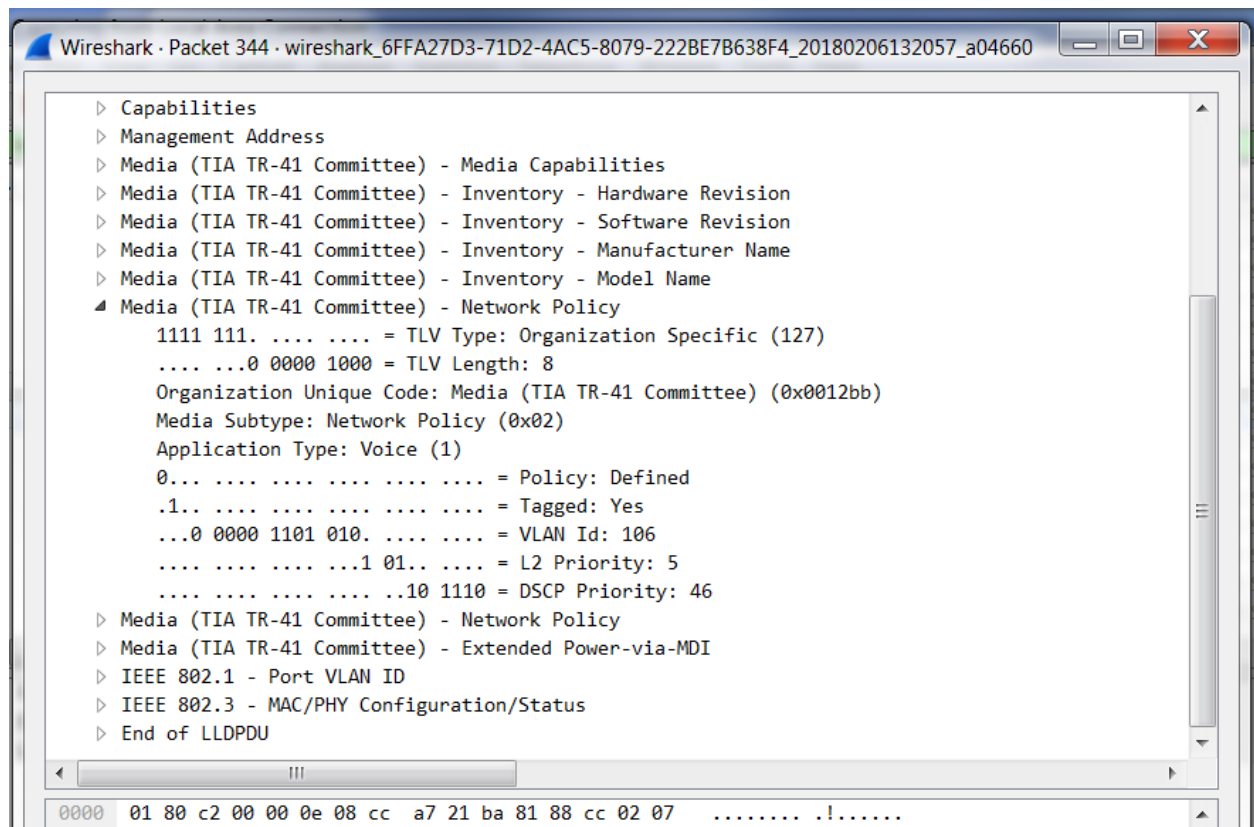
The next step requires defining the Voice VLAN network policy, and assigning it to the Voice VLAN port(s). The example below defines network policy profile 18 as VLAN tagging of 106, COS (Class of Service) of 5 and a DSCP (Differentiated Services Code Point) value of 46. Network policy profile 18 is then assigned to Gigabit Ethernet Port 1. Note that the example shows how to configure the values associated with the Voice VLAN. This example does not show suggested or default Voice VLAN setting values. Check with a network administrator for the correct configuration values.

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#network-policy profile 18
Switch(config-network-policy)#voice vlan 106 cos 5
Switch(config-network-policy)#voice vlan 106 dscp 46
Switch(config-network-policy)#exit
Switch(config)#interface gigabitethernet 1/0/1
Switch(config-if)#network-policy 18
% Voice VLAN does not exist. Creating vlan 106
Switch(config-if)#lldp med-tlv-select network-policy
Switch(config-if)#end
Switch#
```

To confirm the network policy configuration and assignment, use the *show network-policy profile* command.

```
Switch>enable
Switch#show network-policy profile 18
Network Policy Profile 18
  voice vlan 106
  Interface:
    GigabitEthernet1/0/1
Switch#
```

The network policy can also be confirmed by inspecting the LLDP-MED packet on the switch.



After confirming correct settings, store the running-config to the startup-config. Switch configuration is complete.

```
DDC_LAB_01#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
DDC_LAB_01#
```





## APPENDIX

### COS Priority Values

PCP	Priority	Acronym	Traffic types
1	0 (lowest)	BK	Background
0	1(Default)	BE	Best Effort
2	2	EE	Excellent Effort
3	3	CA	Critical Applications
4	4	VI	Video, < 100 ms latency and jitter
5	5	VO	Voice, < 10 ms latency and jitter
6	6	IC	Internet Control
7	7 (highest)	NC	Network Control

### Common DSCP Values

	DSCP Value	DSCP Description	Example Traffic Types
	46	VoIP	<i>VoIP</i>
	34	Interactive video	<i>Video conferencing</i>
	26	Mission critical data	<i>Database queries Database synchronizations Streaming media</i>
	0	Best effort	
	10	Bulk data	<i>E-mail Web browsing</i>
	8	Scavenger	<i>Network backups Windows Update</i>