Cisco APIC Support for CDP and LLDP

Revised: September 22, 2023

New and Changed Information

The following table provides an overview of the significant changes up to this current release. The table does not provide an exhaustive list of all changes or of the new features up to this release.

Table 1: New Features and Changed Behavior

Cisco APIC Release Version	Feature	Description
Release 6.0(3)	Ability to select new Type, Length, and Values for Azure Stack HCI.	Configuring CDP and LLDP in Leaf Switches Using the GUI, on page 6
Release 4.2(1i)	Ability to configure CDP and LLDP in APIC management interface is introduced.	--

Cisco Discovery Protocol

CDP is a media-independent and protocol-independent protocol that runs on all Cisco-manufactured equipment including routers, bridges, access and communication servers, and switches. CDP is a device discovery protocol that allows network management applications to automatically discover and learn about other Cisco devices that are connected to the network and/or atached to your device.

CDP gathers protocol addresses of neighboring devices and discovers the platform of those devices. CDP runs over the data link layer only. Two systems that support different Layer 3 protocols can learn about each other.

Each device that you configure for CDP sends periodic advertisements to a multicast address. Each device advertises at least one address at which it can receive SNMP messages. The advertisements also contain hold-time information, which indicates the length of time that a receiving device should hold CDP information before removing it. You can configure the advertisement or refresh timer and the hold timer.

Link Layer Discovery Protocol

To permit the discovery of non-Cisco devices, Cisco APIC supports the Link Layer Discovery Protocol (LLDP), a vendor-neutral device discovery protocol that is defined in the IEEE 802.1ab standard. LLDP allows network devices to advertise information about themselves to other devices on the network. This protocol runs over the data-link layer, which allows two systems running different network layer protocols to learn about each other.

LLDP is a one-way protocol that transmits information about the capabilities and current status of a device and its interfaces. LLDP devices use the protocol to solicit information only from other LLDP devices.

LLDP supports a set of attributes that it uses to discover other devices. These attributes contain type, length, and value (TLV) descriptions. LLDP devices can use TLVs to send and receive information to other devices on the network. Details such as configuration information, device capabilities, and device identity can be advertised using this protocol.

CDP and LLDP For Cisco APIC

Starting with Cisco APIC Release 4.2(1), you can configure Cisco Discovery Protocol (CDP) and Link Layer Discovery Protocol (LLDP) in leaf and spine switch management interfaces. The use case is that with CDP and LLDP enabled in the leaf and spine switch management interface, you can troubleshoot cabling issues without physically examining and tracking the cables. This is especially useful for sites that are unstaffed.

Users require a global, fabric-wide CDP and LLDP enabled for all the management interfaces on all the switches instead of as a switch-by-switch policy. With the availability of this feature, CDP and LLDP can be enabled or disabled for all the management interfaces at the same time.

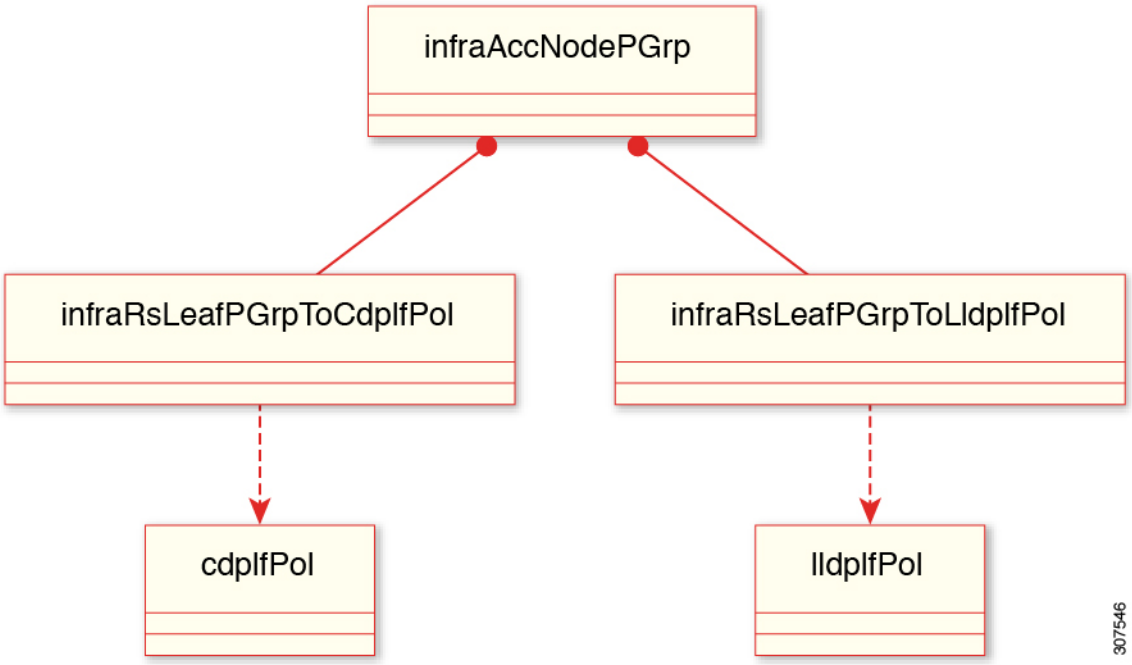
When CDP and LLDP are enabled, the user can view the management interfaces of Cisco ACI fabric nodes as neighbors in the out-of-band (OOB) management switches used to connect to the Cisco ACI nodes. In addition, the user can detect the connected devices directly from spine switches and leaf switches.

Software Architecture

In Cisco APIC, starting with Release 4.2(1), the following LLDP and CDP policy implementations are supported for management interfaces:

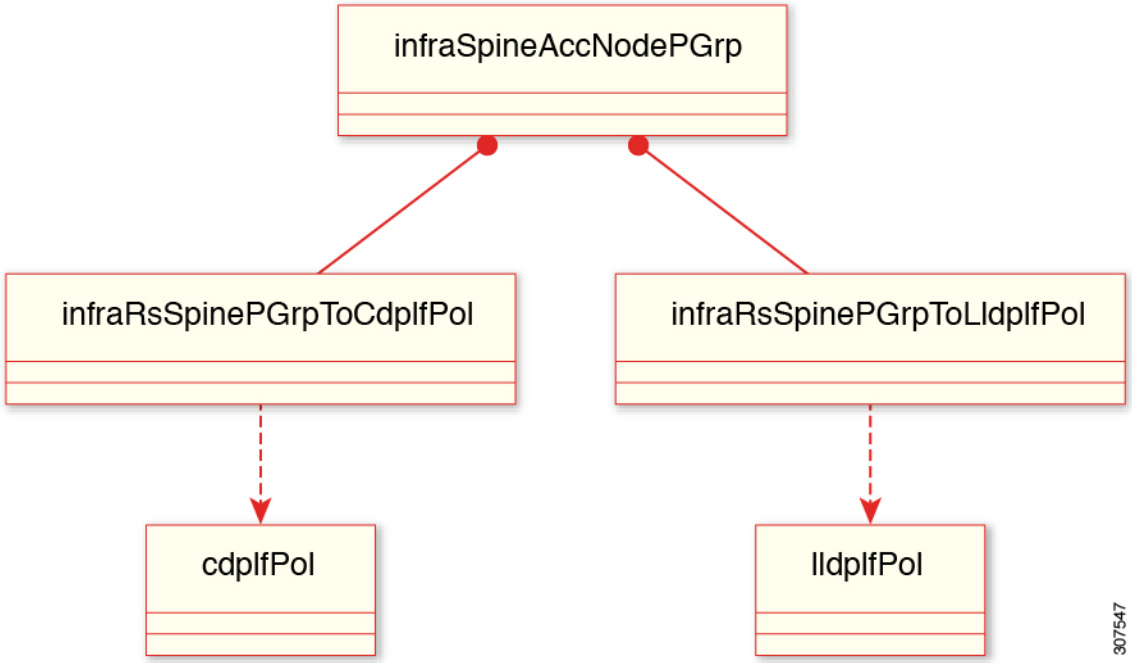
- lldp:InstPol and cdp:InstPol for switch level polices
- lldp:IfPol and cdp:IfPol for interface level policies.

Figure 1: User Configurable infraAccNodePGrp and Relationship with CDP and LLDP Interface Policies



For leaf switches, two new relations are created under infraAccNodePGrp, and they are associated with the leaf switch policy group to cdpIfPol and lldpIfPol repectively. See the preceding figure for details.

Figure 2: User Configurable infraSpineAccNodePGrp and Relationship with CDP and LLDP Interface Policies



Similarly, for spine switches, two new relationships are created under infraSpineAccNodePGrp, and they are associated with the spine switch policy group to cdpIfPol and lldpIfPol repectively. See the preceding figure for details.

CDP and LLDP Guidelines and Limitations

- CDP and LLDP must be enabled on the device before you can enable or disable it on any interfaces.
- By default, if you do not associate any LLDP or CDP policies to a switch policy group, the protocols are disabled on the management interfaces.
- CDP can discover up to 256 neighbors per port if the port is connected to a hub with 256 connections.
- You can configure CDP on physical interfaces and port channels only.
- LLDP must be enabled on the fabric before you can enable or disable it on any interfaces.
- LLDP can discover up to one device per port.
- Additional LLDP and IEEE DCBX TLVs are not supported on FEX interfaces.
- The TLV name will only have the first 32 characters as specified by standards, even if the user configures more than 32 characters when creating VLANs.
- Even if there are more than 25 active VLANs on an interface, only 25 VLANs are advertised in the VLAN name TLV.
- The VLANs associated with a routed sub-interface are not advertised.
- Infra-VLAN is not advertised even if infra VLAN is enabled on the interface.

Configuring CDP and LLDP in Spine Switches Using the GUI

In the following task, you create a separate CDP and LLDP policy dedicated for management interfaces, and then you add the policy to the spine switch policy group as a node level policy.

Before you begin

All associated leaf and spine switches in the Cisco ACI fabric must support Cisco APIC release 4.2(1) at a minimum.

Procedure

Step 1 On the menu bar, choose **Fabric** > **Access Policies** > **Policies** > **Interface** > **CDP Interface**.

Step 2 Right-click and choose **Create CDP Interface Policy**.

Step 3 In the **Create CDP Interface Policy** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the CDP Interface Policy.

b) In the **Admin State** field, choose the **Disabled** or **Enabled** tab. Click **Submit**.

The default value is **Enabled**.

You have enabled a CDP interface policy for the spine switch.

Step 4 In the **Navigation** pane, choose **Fabric** > **Access Policies** > **Policies** > **Interface** > **LLDP Interface**.

Step 5 Right-click and choose **Create LLDP Interface Policy**.

Step 6 In the **Create LLDP Interface Policy** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the LLDP Interface Policy.

b) In the **Receive State** field, choose the **Disabled** or **Enabled** tab.

The default value is **Enabled**.

c) In the **Transmit State** field, choose the **Disabled** or **Enabled** tab.

The default value is **Enabled**.

d) Click **Submit**.
You have enabled an LLDP interface policy for the spine switch.

Step 7 To apply the CDP and LLDP policies to the appropriate spine switch, create a Policy Group by navigating on the menu bar to **Fabric** > **Access Policies** > **Switches** > **Spine Switches** > **Policy Groups**, and right-click **Create Spine Switch Policy Group**.

Step 8 In the **Create Spine Switch Policy Group** dialog box, perform the following actions:

Note If you do not specify a CDP or LLDP policy, the default CDP and LLDP policies will automatically be used.

a) In the **Name** field, enter a name for the Spine Switch Policy Group.

b) In the **CDP Policy** field, from the drop-down list, choose the appropraiate CDP policy.

c) In the **LLDP Policy** field, from the drop-down list, choose the appropriate LLDP policy. Click **Submit**.

This creates the Spine Switch Policy Group.

Step 9 To create a spine switch profile, navigate to **Fabric** > **Access Policies** > **Switches** > **Spine Switches** > **Profiles**, and right-click **Profiles** to choose **Create Spine Profile**.

Step 10 In the **Create Spine Profile** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the Spine Profile.
b) In the **Spine Selectors** area, in the **Name** field, enter a name for the selector.
c) In the **Blocks** field, from the drop-down list, check the checkbox for the desired spine switch.
d) In the **Policy Group** field, choose the appropriate policy group that you created earleir. Click **Update** and click **Next**.
e) In the **Associations** tab, take any further actions if appropriate and click **Finish**.

Your spine switch profile is created and the spine switch policy group is associated with it.

Configuring CDP and LLDP in Leaf Switches Using the GUI

In the following task, you create a separate CDP and LLDP policy dedicated for management interfaces, and then you add the policy to the leaf switch policy group as a node level policy.

Before you begin

All associated leaf and spine switches in the Cisco Application Centric Infrastructure (ACI) fabric must support Cisco Application Policy Infrastructure Controller (APIC) release 4.2(1) at a minimum.

Procedure

Step 1 On the menu bar, choose **Fabric** > **Access Policies** > **Policies** > **Interface** > **CDP Interface**.

Step 2 Right-click and choose **Create CDP Interface Policy**.

Step 3 In the **Create CDP Interface Policy** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the CDP Interface Policy.
b) In the **Admin State** field, choose the **Disabled** or **Enabled** tab. Click **Submit**

The default value is **Enabled**.

You have enabled a CDP interface policy for the leaf switch.

Step 4 In the **Navigation** pane, choose **Fabric** > **Access Policies** > **Policies** > **Interface** > **LLDP Interface**.

Step 5 Right-click and choose **Create LLDP Interface Policy**.

Step 6 In the **Create LLDP Interface Policy** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the LLDP Interface Policy.
b) In the **Receive State** field, choose the **Disabled** or **Enabled** tab.

The default value is **Enabled**.

c) In the **Transmit State** field, choose the **Disabled** or **Enabled** tab.

The default value is **Enabled**.

d) In the **DCBXP Version** field, choose either the **CEE** or **IEEE 802.1** tab.

The default value is **CEE**.

When you select the **CEE** tab, LLDP will advertise the following TLVs:

- DCBX Control

- Priority Groups
- Priority-Based Flow Control
- Application Protocol

When you select the **IEEE 802.1** tab, LLDP will advertise the following TLVs:

- ETS Recommendation
- ETS Configuration
- PFC Configuration (you must set the Interface Priority Flow Control policy to **Auto**)

Note Azure Stack HCI requires **IEEE 802.1** and enables LLDP for the Interface Policy Group used for the interfaces that are connected to the Azure Stack HCI servers, and enables the optional TLV parameters (see step 8).

e) Click **Submit**.
You have enabled an LLDP interface policy for the leaf switch.

Step 7 To apply the CDP and LLDP policies to the appropriate leaf switch, create a Policy Group by navigating in the menu bar to **Fabric** > **Access Policies** > **Switches** > **Leaf Switches** > **Policy Groups**, and right-click **Create Access Switch Policy Group**.

Step 8 To configure optional LLDP parameters, navigate in the menu bar to **Fabric** > **Fabric Policies** > **Policies** > **Global** > **LLDP Policy Default**. In the **LLDP Interface Policy - Default** dialog box, perform the following actions:

a) In the **Hold Time (sec)** field, specify the hold time.
b) In the **Initial Delay Time (sec)** field, specify the initial delay time.
c) In the **Transmit Frequency (sec)** field, specify the transmit frequency time.
d) In the **Optional TLV Selector**, choose the TLVs that you want to associate with your LLDP.

Note The TLVs that you select are enabled globally.

For Azure Stack HCI, you must select the following TLVs on the **LLDP Interface Policy - Default**:

- Port Link Aggregation
- Port Maximum Frame Size
- Port VLAN Name
- IEEE 802.1 DCBX (for Azure Stack HCI Storage network and other no-drop traffic)

Step 9 In the **Create Access Switch Policy Group** dialog box, perform the following actions:

Note If you do not specify a CDP or LLDP policy, the default CDP and LLDP policies will automatically be used.

a) In the **Name** field, enter a name for the Access Switch Policy Group.
b) In the **CDP Policy** field, from the drop-down list, choose the appropriate CDP policy.
c) In the **LLDP Policy** field, from the drop-down list, choose the appropriate LLDP policy. Click **Submit**.

This creates the Access Switch Policy Group (Leaf Switch Policy Group).

Step 10 To create a leaf switch profile, in the menu bar, navigate to **Fabric** > **Access Policies** > **Switches** > **Leaf Switches** > **Profiles**, and right-click **Profiles** to choose **Create Leaf Profile**.

Step 11 In the **Create Leaf Profile** dialog box, perform the following actions:

a) In the **Name** field, enter a name for the Leaf Profile.
b) In the **Leaf Selectors** area, in the **Name** field, enter a name for the selector.
c) In the **Blocks** field, from the drop-down list, check the checkbox for the desired leaf switch.
d) In the **Policy Group** field, choose the appropriate policy group that you created earlier. Click **Update** and click **Next**.
e) In the **Associations** tab, take any further actions if appropriate and click **Finish**.

Your leaf switch profile is created and the leaf switch policy group is associated. The leaf switch profile is associated at the node level and not at the interface level.

Configuring CDP and LLDP in Leaf and Spine Switches Using the REST API

In the following task, you create a separate CDP and LLDP policy dedicated for management interfaces, and then you add the policy to the leaf switch policy group as a node level policy.

Before you begin

All associated leaf and spine switches in the Cisco ACI fabric must support Cisco APIC release 4.2(1) at a minimum.

Procedure

Step 1 Specify the leaf switch selector name and node block range and associate it with the appropriate leaf switch policy group.

Example:

```
<polUni>
<infraInfra>
   <infraNodeP name="test" status="">
        <infraLeafS name="test" type="range">
            <infraNodeBlk name="test" from_="101" to_="101"/>
            <infraRsAccNodePGrp tDn="uni/infra/funcprof/accnodepgrp-test" status="" />
        </infraLeafS>
    </infraNodeP>
```

Step 2 Specify the spine switch selector name and node block range and associate it with the appropriate spine switch policy group.

Example:

```
  <infraSpineP name="test" status="">
      <infraSpineS name="test" type="range" >
          <infraNodeBlk name="test" from_="103" to_="103" />
          <infraRsSpineAccNodePGrp tDn="uni/infra/funcprof/spaccnodepgrp-test" />
      </infraSpineS>
```

Step 3 Configure the leaf switch policy group with the CDP and LLDP policies.

Example:

```
<infraFuncP>
                 <infraAccNodePGrp name="test">
         <infraRsLeafPGrpToCdpIfPol tnCdpIfPolName="mgmt" status=""/>
         <infraRsLeafPGrpToLldpIfPol tnLldpIfPolName="mgmt" status=""/>
        </infraAccNodePGrp>
```

Step 4 Configure the spine switch policy group with the CDP and LLDP policies.

Example:

```
        <infraSpineAccNodePGrp name="test">
             <infraRsSpinePGrpToCdpIfPol tnCdpIfPolName="mgmt" status=""/>
             <infraRsSpinePGrpToLldpIfPol tnLldpIfPolName="mgmt" status=""/>
        </infraSpineAccNodePGrp>
        </infraFuncP>
```

Step 5 Specify the attributes for the CDP and LLDP policies that are configured.

Example:

```
       <lldpIfPol name="mgmt" adminRxSt="disabled" adminTxSt="enabled" />
       <cdpIfPol name="mgmt" adminSt="enabled" />
    </infraInfra>
</polUni>
```

Configuring CDP in Leaf Switches Using NX-OS CLI

Procedure

	Command or Action	Purpose
Step 1	configure **Example:** `apic1# configure`	Enters global configuration mode.
Step 2	**mgmt-cdp** *name* **Example:** `apic1(config)# mgmt-cdp cdp1`	Defines the CDP policy.
Step 3	admin-state {enabled | disabled } **Example:** `apic1(config-mgmt-cdp)# admin-state enabled`	Sets the admin state. Default is enabled.
Step 4	exit **Example:**	Returns to global configuration mode.

	Command or Action	Purpose
	`apic1(config-mgmt-cdp)# exit`	
Step 5	template leaf-policygroup *leaf_group_name* **Example:** `template leaf-policy-group samplePolicyGrp`	Defines the leaf switch policy group.
Step 6	mgmt-cdp *name* **Example:** `apic1(config-leaf-policy-group)# mgmt-cdp cdp1`	Configures the relation to the CDP policy for the leaf switch policy group.
Step 7	exit **Example:** `apic1(config-leaf-policy-group)# exit`	Returns to global configuration mode.
Step 8	leaf-profile *leaf_profile_name* **Example:** `apic1(config)#leaf-profile sampleLeafProf`	Configures a leaf switch profile.
Step 9	leaf-group *leaf_group_name* **Example:** `apic1(config-leaf-profile)# leaf-group sampleLeafGrp`	Specifies a group of leaf switches.
Step 10	leaf **leaf_group_number** **Example:** `apic1(config-leaf-profile)# leaf 101-102`	Adds leaf switches to the leaf profile.
Step 11	leaf-policy-group *leaf_policy_group_name* **Example:** `apic1(config-leaf-group)# leaf-policy-group samplePolicyGrp`	Specifies the leaf policy group to be associated to the leaf switches.
Step 12	exit **Example:** `apic1(config-leaf-policy-group)# exit`	Exits command mode.

Configuring CDP in Spine Switches in Management Interface Using NX-OS CLI

Procedure

	Command or Action	Purpose
Step 1	configure **Example:** `apic1# configure`	Enters global configuration mode.
Step 2	**mgmt-cdp** *name* **Example:** `apic1(config)# mgmt-cdp cdp1`	Defines the CDP policy.
Step 3	admin-state {enabled | disabled } **Example:** `apic1(config-mgmt-cdp)# admin-state enabled`	Sets the admin state. Default is enabled.
Step 4	exit **Example:** `apic1(config-mgmt-cdp)# exit`	Returns to global configuration mode.
Step 5	template spine-policygroup *spine-policy-group_group_name* **Example:** `template spine-policy-group samplePolicyGrp`	Defines the spine switch policy group.
Step 6	mgmt-cdp *name* **Example:** `apic1(config-spine-policy-group)# mgmt-cdp cdp1`	Configures the relation to the CDP policy for the spine switch policy group.
Step 7	exit **Example:** `apic1(config-spine-policy-group)# exit`	Returns to global configuration mode.
Step 8	spine-profile *spine_profile_name* **Example:** `apic1(config)#spine-profile sampleSpineProf`	Configures a spine switch profile.
Step 9	spine-group *spine_group_name* **Example:** `apic1(config-spine-profile)# spine-group sampleLeafGrp`	Specifies a group of spine switches.

	Command or Action	Purpose
Step 10	spine **spine_group_number** **Example:** `apic1(config-spine-profile)# spine 201-202`	Adds spine switches to the spine profile.
Step 11	spine-policy-group *spine_policy_group_name* **Example:** `apic1(config-spine-group)# spine-policy-group samplePolicyGrp`	Specifies the spine policy group to be associated to the spine switches.
Step 12	exit **Example:** `apic1(config-spine-policy-group)# exit`	Exits command mode.

Configuring LLDP in Leaf Switches Using NX-OS CLI

Procedure

	Command or Action	Purpose
Step 1	configure **Example:** `apic1# configure`	Enters global configuration mode.
Step 2	**mgmt-lldp** *name* **Example:** `apic1(config)# mgmt-lldp lldp1`	Defines the LLDP policy.
Step 3	admin-rx-state {enabled | disabled } **Example:** `apic1(config-mgmt-lldp)# admin-rx-state enabled`	Sets the admin RX state. Default is enabled.
Step 4	admin-tx-state {enabled | disabled } **Example:** `apic1(config-mgmt-lldp)# admin-tx-state enabled`	Sets the admin TX state. Default is enabled.
Step 5	exit **Example:** `apic1(config-mgmt-lldp)# exit`	Returns to global configuration mode.
Step 6	template leaf-policy-group *leaf_group_name* **Example:** `template leaf-policy-group samplePolicyGrp`	Defines the leaf switch policy group.

	Command or Action	Purpose
Step 7	mgmt-lldp *name* **Example:** `apic1(config-leaf-policy-group)# mgmt-lldp lldp1`	Configures the relation to the LLDP policy for the leaf switch policy group.
Step 8	(Optional)lldp tlv-select *show lldp tlv-select* **Example:** `leaf1# show lldp tlv-select` **`management-address port-descriptionport-vlan system-capabilities system-description system-namedcbxp`**	Specifies the TLVs to send and receive in LLDP packets. The available TLVs are non-configurable default TLVs and the configurable optional TLVs are disabled by default. The available TLVs are **`dcbxp`**, **`management-address`**, **`port-description`**, **`port-vlan`**, **`system-capabilities`**, **`system-description`**, **`system-name`**, **`dcbxp max-framesize`**, **`vlan-name`**, and **`link-aggregation`**.
Step 9	exit **Example:** `apic1(config-leaf-policy-group)# exit`	Returns to global configuration mode.
Step 10	leaf-profile *leaf_profile_name* **Example:** `apic1(config)#leaf-profile sampleLeafProf`	Configures a leaf switch profile.
Step 11	leaf-group *leaf_group_name* **Example:** `apic1(config-leaf-profile)# leaf-group sampleLeafGrp`	Specifies a group of leaf switches.
Step 12	leaf **leaf_group_number** **Example:** `apic1(config-leaf-profile)# leaf 101-102`	Adds leaf switches to the leaf profile.
Step 13	leaf-policy-group *leaf_policy_group_name* **Example:** `apic1(config-leaf-group)# leaf-policy-group samplePolicyGrp`	Specifies the leaf policy group to be associated to the leaf switches.
Step 14	exit **Example:** `apic1(config-leaf-policy-group)# exit`	Exits command mode.

Configuring LLDP in Spine Switches Using NX-OS CLI

Procedure

	Command or Action	Purpose
Step 1	configure **Example:** `apic1# configure`	Enters global configuration mode.
Step 2	**mgmt-lldp** *name* **Example:** `apic1(config)# mgmt-lldp lldp1`	Defines the LLDP policy.
Step 3	admin-rx-state {enabled | disabled } **Example:** `apic1(config-mgmt-lldp)# admin-rx-state enabled`	Sets the admin RX state. Default is enabled.
Step 4	admin-tx-state {enabled | disabled } **Example:** `apic1(config-mgmt-lldp)# admin-tx-state enabled`	Sets the admin TX state. Default is enabled.
Step 5	exit **Example:** `apic1(config-mgmt-lldp)# exit`	Returns to global configuration mode.
Step 6	template spine-policy-group *spine_group_name* **Example:** `template spine-policy-group samplePolicyGrp`	Defines the spine switch policy group.
Step 7	mgmt-lldp *name* **Example:** `apic1(config-spine-policy-group)# mgmt-lldp lldp1`	Configures the relation to the LLDP policy for the spine switch policy group.
Step 8	exit **Example:** `apic1(config-spine-policy-group)# exit`	Returns to global configuration mode.
Step 9	spine-profile *spine_profile_name* **Example:** `apic1(config)#spine-profile sampleSpineProf`	Configures a spine switch profile.
Step 10	spine-group *spine_group_name* **Example:**	Specifies a group of spine switches.

	Command or Action	Purpose
	`apic1(config-spine-profile)# spine-group sampleSpineGrp`	
Step 11	spine **spine_group_number** **Example:** `apic1(config-spine-profile)# spine 201-202`	Adds spine switches to the spine profile.
Step 12	spine-policy-group *spine_policy_group_name* **Example:** `apic1(config-spine-group)# spine-policy-group samplePolicyGrp`	Specifies the spine policy group to be associated to the spine switches.
Step 13	exit **Example:** `apic1(config-spine-policy-group)# exit`	Exits command mode.

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