

Policy Based Automation Auto-vlan

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Version Information.

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Version	Comments	Date	Author
0.1	Initial content	31 st Aug 2020	Vijay

Feature overview.

The PBA Auto-vlan feature enables cnMatrix switch to dynamically learn the vlan id's advertised by cnPilot Ap's as part of LLDP control packet. The received LLDP control packets are first authenticated by cnMatrix and then parses the received vlan ids and allows them on the directly connected interface.

This feature is intended to support zero-touch detection of cnPilot access point on cnMatrix switch and dynamically configure the port on which the LLDP packet is received. The support for PBA Auto-vlan feature starts from cnPilot firmware version 4.1 and cnMatrix firmware release 3.1.1-r3

Functional Details about the PBA Auto-vlan.

New Cambium vendor-specific LLDP TLVs is introduced to support "pushing vlan ids from Cambium cnPilot to cnMatrix switch.

The PBA TLVs are implemented as an extension to the LLDP standard, using its flexible extension mechanism.

They are implemented as vendor-specific (Cambium OUI: 58-C1-7A) TLVs using TLV type 127 as described in the 802.1ab (LLDP) standard.

Two new TLVs have been defined:

PBA Authentication TLV – used by cnMatrix switch to export current authentication-related data and settings for use by attached cnPilot devices

PBA Device Settings TLV – used by cnPilot devices leveraging PBA to export required PBA device settings like the vlan id's to cnMatrix.

By default, the cnMatrix regularly generates LLDP authentication TLV on all the ports. The below criteria decide whether the LLDP PBA Authentication TLV is included in the LLDP packet generated by cnMatrix switch or not.

- Enable/Disable Port operational status
- Enabled/Disabled PBA authentication TLV setting on the port . On port execute "no lldp pba-tlv-select authentication"
- Enabled/Disabled Auto-Attach policy globally. Execute "no auto-attach". TLV transmission is stopped on all ports when PBA is disabled globally.

Upon receipt of this LLDP authentication tlv, cnPilot AP responds by sending Device setting tlv (which basically includes the list of vlan ids allowed on the trunk interface of the AP). The expectation is the native vlan on the AP's ethernet interface to be untagged. However, when AP Ethernet is in Trunk Mode with Native VLAN Tagged, then Native VLAN ID must be present in 'Allowed vlans on the interface so that it is allowed by the switch on the port.

On cnPilot AP, PBA device setting TLV is included in LLDP packet if the ethernet port is in trunk mode. It is not generated if it is in Access mode. LLDP is enabled by default globally on the cnPilot AP. The cnMatrix switch authenticates the received LLDP

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packet from the cnPilot AP . From the device setting tlv, the switch reads the component (VLAN list, state flags) and creates a dynamic policy that is applied to the port on which the tlv was received.

The policy remains in effect until the LLDP port status changes (e.g., downstream neighbor LLDP data expires, PBA disabled on the port, link-down event), the policy data being pushed by the downstream neighbor changes (e.g., the VLAN list is updated) or a higher precedence PBA is determined to be applicable to the port.

Functional Details about PBA TLV extension.

Cambium PBA Authentication tlv

- This is Proprietary tlv generated by cnMatrix to convey authentication related data and setting. If this tlv is included in the LLDP packet, then it notifies the cnPilot devices that PBA based data path configuration is supported by the cnMatrix. If the tlv is absent, then this feature is not supported.
- The PBA Authentication TLV exports current authentication-related settings and data that is required to support secure communication between the device generating authenticated PBA TLVs and cnMatrix. It sends the following information in the tlv.
 - Source mac address: mac address of the device generating the tlv
 - Authentication state flag:
 - Flag = 1 : indicates PBA authentication is enabled. The device setting tlv received on this port in ingress direction will be authenticated before processing. If the authentication fails, the packet will be dropped, and no policy will be applied.
 - Flag= 0 : indicates the LLDP packet will not be authenticated when processing the tlv.
 - Authentication challenge:
- The cnPilot uses this information when connecting to cnMatrix to leverage PBA functionality and automatically configure datapath characteristics (e.g., VLAN settings) in a secure communication mode.

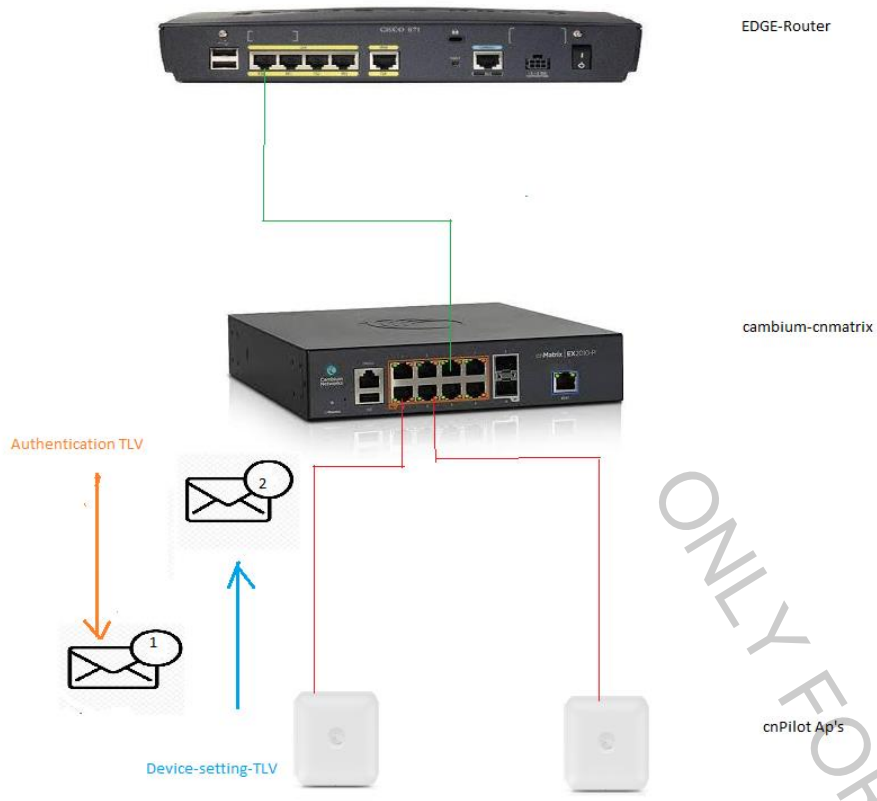
Cambium PBA Device setting tlv

- This proprietary tlv is generated by the cnPilot Ap's to update PBA enabled uplink switch about the interface configuration requirement.
- It is only generated following the receipt of a PBA Authentication TLV on the interface.
- PBA Device Settings TLV data integrity and source validation is supported using the HMAC-SHA256 message authentication algorithm. The HMAC-SHA256 generated digest size is 32 octets and the PBA Device Settings TLV includes a field to support the digest exchange between source and destination parties. Symmetric (shared) private keys are used for digest generation.
- The Digest is computed by passing the below data to the HMAC-SHA256.
 - Authentication challenge value: received from most recent incoming lldp packet from switch
 - Source mac address: MAC address of the device formulating the PBA Device Settings TLV
 - Destination mac address: derived from the Source MAC address from the most recently received PBA Authentication TLV
 - Port-id: – derived from the value of the LLDP standard (mandatory) Port ID TLV exported by the upstream cnMatrix device
- This data, along with the message authentication key, is passed through the standard HMAC-SHA256 algorithm to produce the associated message digest. The digest is then placed in the HMAC-SHA256 Digest field in the TLV prior to transmission. Upon receipt, the digest is again computed, and the resulting digest is compared against the received digest. If the received digest is the same as the newly computed digest, the TLV is considered authentic and processing can commence. If the comparison fails, the TLV is discarded and processing is terminated.
- PBA Device Settings TLV authentication can be bypassed to support Cambium devices that do not support the required authentication procedure. Disabling PBA message authentication means that PBA Device Settings TLV authentication is not performed.
- The primary use of the PBA Device Settings TLV is to pass desired VLAN settings from the source to the destination device to facilitate automatic configuration of datapath settings. This effectively pushes policy action data from the source downstream device to the destination upstream device. Settings are applied to the port through which the TLV was received (i.e., the ingress port). The following VLAN settings can be specified.

[Type here]

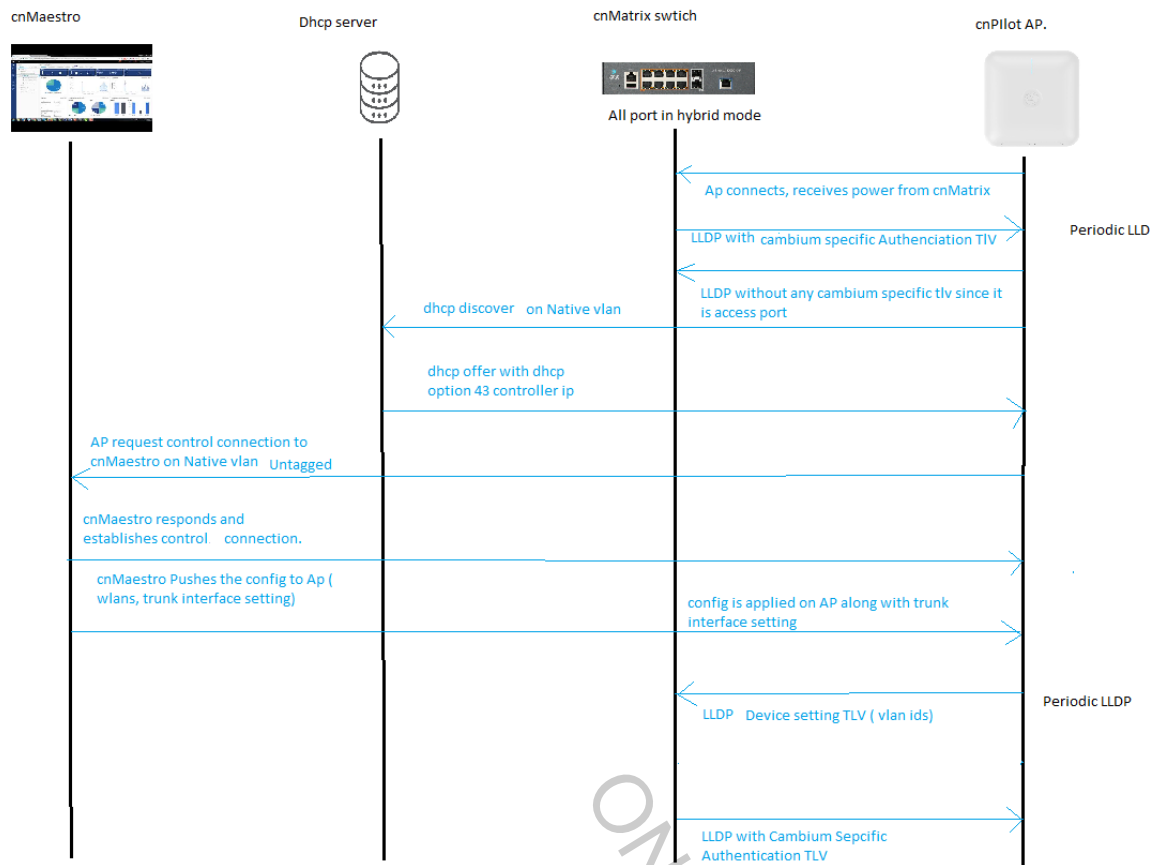
- Native VLAN – native vlan is always send as “0”. This is to avoid cnMatrix from updating the port based on received tlv from cnPilot.
- VLAN List – identifies a list of VLANs that are to be created and applied to the ingress port of the switch. The VLAN list specified is either comma separated or range (5-10). A maximum of 20 VLANs may be specified on the ethernet port.

Topology diagram



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LLDP Work Flow.



LLDP packet capture

LLDP packet originated from cnMatrix switch port (Hybrid mode)
It has authentication TLV

[Type here]

No.	Time	Source	Destination	Protocol	Length	Client MAC Info
4781	16:49:40.045981	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4782	16:49:40.045981	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4783	16:49:40.045981	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4860	16:49:56.128928	Cambium_6e:de:26	LLDP_Multicast	LLDP	165	TTL = 180 SysName = E425-6EDE26 SysDesc = cnPilot E425
4904	16:50:10.165389	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4905	16:50:10.165390	Cambium_ed:fd:63	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4906	16:50:10.165390	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
7406	16:50:28.389563	Cambium_b1:48:8c	LLDP_Multicast	LLDP	133	TTL = 180 SysName = E480-B1488C SysDesc = cnPilot E480
8183	16:50:40.342342	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
8184	16:50:40.342685	Cambium_ed:fd:63	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
8185	16:50:40.342686	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix

Frame 4904: 175 bytes on wire (1400 bits), 175 bytes captured (1400 bits) on interface 0
Ethernet II, Src: Cambium_ed:fd:68 (58:c1:7a:ed:fd:68), Dst: LLDP_Multicast (01:80:c2:00:00:0e)
Link Layer Discovery Protocol
Chassis Subtype = MAC address, Id: 58:c1:7a:ed:fd:61
Port Subtype = Interface alias, Id: 610/8
Time To Live = 120 sec
Port Description = Ethernet Interface Port 08
0000 100. = TLV Type: Port Description (4)
.... 0000 1010 = TLV Length: 26
Port Description: Ethernet Interface Port 08
System Name = cloud-cnMatrix
System Description = Cambium Networks cnMatrix EX2010-P Ethernet Switch (M:01 SM):3.1.1-r)
Capabilities
Cambium Networks Limited - Unknown (1)
1111 111. = TLV Type: Organization Specific (127)
.... 0001 0000 = TLV Length: 16
Organization Unique Code: 58:c1:7a (Cambium Networks Ltd)
Unknown Subtype: 1
Unknown Subtype Content: 0158:c17aedfd61801b76276
End of LLDPDU
0000 000. = TLV Type: End of LLDPDU (0)
.... 0000 0000 = TLV Length: 0

0000 01 80 c2 00 00 0e 58 c1 7a ed fd 68 88 cc 02 07X.2.h...
0010 04 58 c1 7a ed fd 61 04 06 01 47 69 30 2f 58 06 ..X-z-a-..G18/8-
0020 02 00 78 00 1a 45 74 68 65 72 66 65 74 20 49 6e ..x-ethernet in
0030 74 65 72 66 61 63 65 20 50 4f 72 74 20 30 30 0a ..terface Port 80-
0040 0e 63 6c 6f 75 64 2d 63 6e 4d 61 74 72 69 78 0c ..cloud-cnMatrix-
0050 44 43 61 6d 62 69 75 6d 20 4e 65 74 77 6f 72 6b ..Cambium Network
0060 71 28 61 6e 4d 61 74 72 69 78 20 45 58 32 30 31 ..cnMatrix in EX001
0070 30 2d 50 20 45 74 68 65 72 66 65 74 20 53 77 69 ..0-P lthernet swi
0080 74 61 68 20 48 57 3a 30 31 20 53 57 3a 32 20 31 ..eth Mac: 1 SM:1.1
0090 2e 31 2d 72 33 0e 04 00 14 00 14 0e 18 58 c1 7a ..1-r3...X-z
00a0 01 58 c1 7a ed fd 61 04 06 01 47 69 30 2f 58 06 ..X-z-a-..G18/8-..

LLDP packet originated from cnPilot AP. It has the device setting TLV.

No.	Time	Source	Destination	Protocol	Length	Client MAC Info
4781	16:49:40.045981	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4782	16:49:40.045981	Cambium_ed:fd:63	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4783	16:49:40.045981	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4860	16:49:56.128928	Cambium_6e:de:26	LLDP_Multicast	LLDP	165	TTL = 180 SysName = E425-6EDE26 SysDesc = cnPilot E425
4904	16:50:10.165389	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4905	16:50:10.165390	Cambium_ed:fd:63	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
4906	16:50:10.165390	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
7406	16:50:28.389563	Cambium_b1:48:8c	LLDP_Multicast	LLDP	133	TTL = 180 SysName = E480-B1488C SysDesc = cnPilot E480
8183	16:50:40.342342	Cambium_ed:fd:68	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
8184	16:50:40.342685	Cambium_ed:fd:63	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix
8185	16:50:40.342686	Cambium_ed:fd:67	LLDP_Multicast	LLDP	175	TTL = 120 SysName = cloud-cnMatrix SysDesc = Cambium Networks cnMatrix

Frame 4860: 165 bytes on wire (1320 bits), 165 bytes captured (1320 bits) on interface 0
Ethernet II, Src: Cambium_6e:de:26 (58:c1:7a:6e:de:26), Dst: LLDP_Multicast (01:80:c2:00:00:0e)
Link Layer Discovery Protocol
Chassis Subtype = MAC address, Id: 58:c1:7a:6e:de:26
Port Subtype = Interface name, Id: eth1
Time To Live = 180 sec
System Name = E425-6EDE26
System Description = cnPilot E425
Capabilities
Port Description = eth1
0000 100. = TLV Type: Port Description (4)
.... 0000 0100 = TLV Length: 4
Port Description: eth1
Cambium Networks Limited - Unknown (2)
1111 111. = TLV Type: Organization Specific (127)
.... 0101 1000 = TLV Length: 88
Organization Unique Code: 58:c1:7a (Cambium Networks Ltd)
Unknown Subtype: 2
Unknown Subtype Content: 012edfad9a8e28a24f57cbb7352cd511a5fd3002fed5...
End of LLDPDU
0000 000. = TLV Type: End of LLDPDU (0)
.... 0000 0000 = TLV Length: 0

0000 01 80 c2 00 00 0e 58 c1 7a 6e de 26 88 cc 02 07X.2n&...eth1...
0010 04 58 c1 7a 6e de 26 04 05 05 65 74 68 31 06 02 ..X-2n&...eth1...
0020 00 b4 0a 0b 45 34 32 35 2d 36 45 44 45 32 36 0cE425-6EDE26
0030 0c 63 6e 50 69 6c 6f 74 20 45 34 32 35 0e 04 00 ..cnPilot E425-
0040 1c 00 1c 00 04 65 74 68 31 fe 50 58 c1 7a 02 00eth1 325.26
0050 2e df ad 89 a8 e2 8a 82 4f 57 cb be 73 52 cd 510e-58-
0060 11 a5 fd 30 02 fe d5 9f 3f bf df 26 29 ca 1d ff0-11a5-fd3002fe-
0070 3a c1 7a 6e de 26 00 00 31 35 30 2c 31 35 31 2a ..Cambium E425-6EDE26
0080 31 35 32 2c 31 35 33 2c 31 35 34 2c 31 35 35 2e ..152,153, 154,155,
0090 31 35 36 2c 31 35 37 2c 31 35 38 2c 31 35 39 2e ..156,157, 158,159,
00a0 31 36 30 00 00 100...

Configuration on cnMatrix switch

By default, Auto-Attach policy is enabled by default on cnMatrix Switch.

[Type here]

Basic Settings Interfaces Rules Actions Policies Scripts

Auto Attach Basic Settings

Auto Attach Global Status	Enabled
String Comparison	Ignore-Case
Update Port Description	PBA Policy Name
Restricted MAC Match	Enabled
Default Auto Attach Settings	Disabled

Apply

Configuration on cnPilot Access point.

LLDP is enabled by default on cnPilot AP.

Cambium Networks™ cnPilot E425 - E425-6EDE26

Please configure the Country of operation under **Configure > System**

Configure / System

System

Name	E425-6EDE26	Hostname of the device (max 64 characters)
Location		Location where this device is placed (max 64 characters)
Contact		Contact information for the device (max 64 characters)
Country-Code		For appropriate regulatory configuration
Placement	<input checked="" type="radio"/> Indoor <input type="radio"/> Outdoor Configure the AP placement details	
LED	<input checked="" type="checkbox"/> Whether the device LEDs should be ON during operation	
LLDP	<input checked="" type="checkbox"/> Whether the AP should transmit LLDP packets	

[Type here]

Stats command on cnMatrix switch

Cambium Networks™ cnMatrix EX2010-P

Traffic Statistics Errors

TCP/UDP

IPv6

VLAN

MSTP

RSTP

PVRST

LA

LLDP

QoS

IGMP Snooping

IP

RIP

Traffic Information

Interface	Frames Transmitted	Entries Aged	Frames Received	Received Error Frames	Frames Discarded	Unrecognized TLVs	Total TLVs Discarded	PDU Length Error Drops	Description
Gi0/1	798	0	389	47	47	0	5	0	solution-lab-switch.cambiumnetwo
Gi0/2	798	0	389	47	47	0	5	0	
Gi0/3	798	0	389	47	47	0	5	0	
Gi0/4	798	0	389	47	47	0	5	0	
Gi0/5	798	0	389	47	47	0	5	0	XV2-2-484686
Gi0/6	798	0	389	47	47	0	5	0	#CambiumAuto_if6
Gi0/7	798	0	389	47	47	0	5	0	#CambiumAuto_if7
Gi0/8	798	0	389	47	47	0	5	0	#CambiumAuto_if8
Gi0/9	798	0	389	47	47	0	5	0	
Gi0/10	798	0	389	47	47	0	5	0	

Clear LLDP Counters

To check the LLDP neighbor's

```
cloud-cnMatrix# 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

Chassis ID          Local Intf    Hold-time    Capability    Port Id
-----
f8:0b:cb:98:a5:00   Gi0/1        120          B,R           Gi1/0/22
XV2-2-484686        Gi0/5        480          B,W,R,S      bc:e6:7c:48:46:86

58:c1:7a:6e:de:26   Gi0/7        180          B,W,R         eth1
00:04:56:b1:48:8c   Gi0/8        180          B,W,R         eth1
00:04:56:95:98:28   Gi0/6        180          B,W,R         eth1

Total Entries Displayed : 5
cloud-cnMatrix#
```


[Type here]

To check the vlan's learned from LLDP neighbors

```
cloud-cnMatrix#
cloud-cnMatrix# show lldp neighbors gigabitethernet 0/6 detail

Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

>>>> Local Interface : Gi0/6 <<<<

Chassis Id SubType      : Mac Address
Chassis Id              : 00:04:56:95:98:28
Port Id SubType         : Interface Name
Port Id                 : eth1
Port Description        : eth1
System Name              : E410-959828
System Desc             : cnPilot E410
Time Remaining          : 165 Seconds
System Capabilities Supported : B,W,R
System Capabilities Enabled   : B,W,R
Management Addresses     : Not Advertised

Extended 802.3 TLV Info

Extended 802.1 TLV Info
-Port ULAN Id           : 0

Cambium TLV Info
PBA Device Settings TLV Info
- Version               : 1
- Non-Zero Digest       : True
- Flags                 : 0x00
- Source MAC Address    : 00:04:56:95:98:28
- Native ULAN           : 0
- ULAN List              : 800,900,1000

-----
Total Entries Displayed : 1
```

```
cloud-cnMatrix#
cloud-cnMatrix# show lldp neighbors gigabitethernet 0/7 detail

Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

>>>> Local Interface : Gi0/7 <<<<

Chassis Id SubType      : Mac Address
Chassis Id              : 58:c1:7a:6e:de:26
Port Id SubType         : Interface Name
Port Id                 : eth1
Port Description        : eth1
System Name              : E425-6EDE26
System Desc             : cnPilot E425
Time Remaining          : 155 Seconds
System Capabilities Supported : B,W,R
System Capabilities Enabled   : B,W,R
Management Addresses     : Not Advertised

Extended 802.3 TLV Info

Extended 802.1 TLV Info
-Port ULAN Id           : 0

Cambium TLV Info
PBA Device Settings TLV Info
- Version               : 1
- Non-Zero Digest       : True
- Flags                 : 0x00
- Source MAC Address    : 58:c1:7a:6e:de:26
- Native ULAN           : 0
- ULAN List              : 150,151,152,153,154,155,156,157,158,159,160

-----
Total Entries Displayed : 1
```

[Type here]

To view the Auto-Attach policy Attached

Cambium Networks™ cnMatrix EX2010-P

Interface Statistics

Auto Attach Interface Statistics

Select	Port	Policies Applied	Policies Expired	Policy Errors	TLVs Received	TLVs Processed	TLV Authentication Failures	Previous Policy	Clear Statistics	Description
<input type="radio"/>	Gi0/1	0	0	0	0	0	0		Disabled	solution-lab-switch.cambiumnetwo
<input type="radio"/>	Gi0/2	0	0	0	0	0	0		Disabled	
<input type="radio"/>	Gi0/3	0	0	0	0	0	0		Disabled	
<input type="radio"/>	Gi0/4	0	0	0	0	0	0		Disabled	
<input type="radio"/>	Gi0/5	0	0	0	0	0	0		Disabled	XV2-2-484686
<input checked="" type="radio"/>	Gi0/6	2	1	0	73	73	0	#CambiumAuto_If6	Disabled	#CambiumAuto_If6
<input checked="" type="radio"/>	Gi0/7	4	3	0	30	30	0	#CambiumAuto_If7	Disabled	#CambiumAuto_If7
<input checked="" type="radio"/>	Gi0/8	1	0	0	79	79	0		Disabled	#CambiumAuto_If8
<input type="radio"/>	Gi0/9	0	0	0	0	0	0		Disabled	
<input type="radio"/>	Gi0/10	0	0	0	0	0	0		Disabled	

Apply Refresh Clear All

```
cloud-cnMatrix#
cloud-cnMatrix#
cloud-cnMatrix# show auto-attach policy

Policy Name:          #CambiumAuto_If6
Policy Precedence:    80
Policy Status:        enabled

*****

Policy Name:          #CambiumAuto_If7
Policy Precedence:    80
Policy Status:        enabled

*****

Policy Name:          #CambiumAuto_If8
Policy Precedence:    80
Policy Status:        enabled
```

To view the policy applied on the interface.

```
cloud-cnMatrix#
cloud-cnMatrix#
cloud-cnMatrix#
cloud-cnMatrix#
cloud-cnMatrix# show auto-attach interface

Interface    AA      Msg Auth
Status      Status
Auth TLV    Active Policy
-----
Gi0/1        enabled enabled enabled
Gi0/2        enabled enabled enabled
Gi0/3        enabled enabled enabled
Gi0/4        enabled enabled enabled
Gi0/5        enabled enabled enabled
Gi0/6        enabled enabled enabled #CambiumAuto_If6
Gi0/7        enabled enabled enabled #CambiumAuto_If7
Gi0/8        enabled enabled enabled #CambiumAuto_If8
Gi0/9        enabled enabled enabled
Gi0/10       enabled enabled enabled

cloud-cnMatrix#
```

[Type here]

To view the Auto Attach policy applied on the interface from cli.

```
cloud-cnMatrix# show auto-attach policy detail

Policy Name:          #CambiumAuto_If6
Policy Precedence:    80
Policy Status:        enabled
-----
Rule Name:            n/a
Rule Type:            SYSTEM-LLDP-PUSH
Rule Device ID Data:  <Cambium Device Auto Generated Pushed Policy>
-----
Action Name:          n/a
Action PUID:          n/a
Action Port Mode:     hybrid
Action VLAN List:     800,900,1000
*****
Policy Name:          #CambiumAuto_If7
Policy Precedence:    80
Policy Status:        enabled
-----
Rule Name:            n/a
Rule Type:            SYSTEM-LLDP-PUSH
Rule Device ID Data:  <Cambium Device Auto Generated Pushed Policy>
-----
Action Name:          n/a
Action PUID:          n/a
Action Port Mode:     hybrid
Action VLAN List:     150,151,152,153,154,155,156,157,158,159,160
*****
Policy Name:          #CambiumAuto_If8
Policy Precedence:    80
Policy Status:        enabled
-----
Rule Name:            n/a
Rule Type:            SYSTEM-LLDP-PUSH
Rule Device ID Data:  <Cambium Device Auto Generated Pushed Policy>
-----
Action Name:          n/a
Action PUID:          n/a
Action Port Mode:     hybrid
Action VLAN List:     400,600,700
```

To view the status of TLV processed or Failed.

```
cloud-cnMatrix# show auto-attach interface statistics
```

Interface	Policies Applied	Policies Expired	Policy Errors	TLVs Received	TLVs Processed	TLV Auth Failures
Gi0/1	0	0	0	0	0	0
Gi0/2	0	0	0	0	0	0
Gi0/3	0	0	0	0	0	0
Gi0/4	0	0	0	0	0	0
Gi0/5	0	0	0	0	0	0
Gi0/6	2	1	0	66	66	0
Gi0/7	4	3	0	23	23	0
Gi0/8	1	0	0	72	72	0
Gi0/9	0	0	0	0	0	0
Gi0/10	0	0	0	0	0	0

[Type here]

To view the policy statics on the port.

```
cloud-cnMatrix# show auto-attach policy statistics

Name: #CambiumAuto_If6
Applied: 1      Expired: 0      Errors: 0

Interface  Applied  Expired  Errors
-----
Gi0/1      0        0        0
Gi0/2      0        0        0
Gi0/3      0        0        0
Gi0/4      0        0        0
Gi0/5      0        0        0
Gi0/6      1        0        0
Gi0/7      0        0        0
Gi0/8      0        0        0
Gi0/9      0        0        0
Gi0/10     0        0        0

*****

Name: #CambiumAuto_If7
Applied: 1      Expired: 0      Errors: 0

Interface  Applied  Expired  Errors
-----
Gi0/1      0        0        0
Gi0/2      0        0        0
Gi0/3      0        0        0
Gi0/4      0        0        0
Gi0/5      0        0        0
Gi0/6      0        0        0
Gi0/7      1        0        0
Gi0/8      0        0        0
Gi0/9      0        0        0
Gi0/10     0        0        0

*****

Name: #CambiumAuto_If8
Applied: 1      Expired: 0      Errors: 0

Interface  Applied  Expired  Errors
-----
Gi0/1      0        0        0
Gi0/2      0        0        0
Gi0/3      0        0        0
Gi0/4      0        0        0
Gi0/5      0        0        0
Gi0/6      0        0        0
Gi0/7      0        0        0
Gi0/8      1        0        0
Gi0/9      0        0        0
Gi0/10     0        0        0

cloud-cnMatrix#
```

[Type here]

To view the LLDP counters globally.

```
cloud-cnMatrix#  
cloud-cnMatrix#  
cloud-cnMatrix#  
cloud-cnMatrix#  
cloud-cnMatrix# show lldp traffic  
Total Frames Out : 127426  
Total Tagged Frames Out : 0  
Total Entries Aged : 0  
Total Frames In : 64030  
Total Frames Received In Error : 7291  
Total Frames Discarded : 65  
Total TLVs Unrecognized : 0  
Total TLVs Discarded : 7291  
Total PDU length error Drops : 0  
Total LLDP-MED Frames Out : 28830  
Total LLDP-MED Frames In : 7226  
Total LLDP-MED Frames Discarded : 0  
Total LLDP-MED TLVs Discarded : 0  
Total Media Capability TLVs Discarded : 0  
Total Network Policy TLVs Discarded : 0  
Total Inventory TLVs Discarded : 0  
Total Location TLVs Discarded : 0  
Total Ex-PowerViaMDI TLVs Discarded : 0  
Med-Capability TLV Discard Reason : Not Applicable  
Nw-Policy TLV Discard Reason : Not Applicable  
Inventory TLV Discard Reason : Not Applicable  
Location-ID TLV Discard Reason : Not Applicable  
Ex-PowerViaMDI TLV Discard Reason : Not Applicable  
Total Device Settings TLVs Discarded : 0  
Total Device Settings TLVs Auth Fails : 22
```

To change the Authentication key on cnMatrix and cnPilot.

If the user wants to change the default shared authentication key, then can use the below cli on cnMatrix and cnPilot . Ensure it is same on both the devices, else the authentication of lldp packet will fail.

On cnPilot

```
E425-6EDE26(config)# lldp-pba-auth-key  
  
<ENTER>
```

[Type here]

```
cloud-cnMatrix(config-if)# auto-attach msg-auth-key ?  
<private-key(32)>      Authentication key  
cloud-cnMatrix(config-if)# auto-attach msg-auth-key █
```

ONLY FOR TRAINING