Packet Capture

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Using the Debug Packet Logging Facility

The debug packet logging facility enables you to display all packets going to and from the controller CPU. You can enable it for received packets, transmitted packets, or both. By default, all packets received by the debug facility are displayed. However, you can define access control lists (ACLs) to filter packets before they are displayed. Packets not passing the ACLs are discarded without being displayed.

Each ACL includes an action (permit, deny, or disable) and one or more fields that can be used to match the packet. The debug facility provides ACLs that operate at the following levels and on the following values:

- Driver ACL
  - NPU encapsulation type
  - Port
- Ethernet header ACL
  - Destination address
  - Source address
  - Ethernet type
  - VLAN ID
- IP header ACL
  - Source address
  - Destination address
  - Protocol
  - Source port (if applicable)
  - Destination port (if applicable)

- EoIP payload Ethernet header ACL
  - Destination address
  - Source address
  - Ethernet type
  - VLAN ID
- EoIP payload IP header ACL
  - Source address
  - Destination address
  - Protocol
  - Source port (if applicable)
  - Destination port (if applicable)
- CAPWAP payload 802.11 header ACL
  - Destination address
  - Source address
  - BSSID
  - SNAP header type
- CAPWAP payload IP header ACL
  - Source address
  - Destination address
  - Protocol
  - Source port (if applicable)
  - Destination port (if applicable)

At each level, you can define multiple ACLs. The first ACL that matches the packet is the one that is selected.

This section contains the following subsection:

Configuring the Debug Facility (CLI)

Procedure

Step 1 To enable the debug facility, enter this command:

- **debug packet logging enable** {**rx** | **tx** | **all**} *packet_count display_size*

where

- **rx** displays all received packets, **tx** displays all transmitted packets, and **all** displays both transmitted and received packets.
- *packet_count* is the maximum number of packets to log. You can enter a value between 1 and 65535 packets, and the default value is 25 packets.
- *display_size* is the number of bytes to display when printing a packet. By default, the entire packet is displayed.

  Note
  To disable the debug facility, enter this command: **debug packet logging disable**.

- **debug packet logging acl driver** *rule_index action npu_encap port*

  where

  - *rule_index* is a value between 1 and 6 (inclusive).
  - *action* is permit, deny, or disable.
  - *npu_encap* specifies the NPU encapsulation type, which determines how packets are filtered. The possible values include dhcp, dot11-mgmt, dot11-probe, dot1x, eoip-ping, iapp, ip, lwapp, multicast, orphan-from-sta, orphan-to-sta, rbcp, wired-guest, or any.
  - *port* is the physical port for packet transmission or reception.

- Use these commands to configure packet-logging ACLs:

  debug packet logging acl eth *rule_index action dst src type vlan*

  where

  - *rule_index* is a value between 1 and 6 (inclusive).
  - *action* is permit, deny, or disable.
  - *dst* is the destination MAC address.
  - *src* is the source MAC address.
  - *type* is the two-byte type code (such as 0x800 for IP, 0x806 for ARP). This parameter also accepts a few common string values such as “ip” (for 0x800) or “arp” (for 0x806).
  - *vlan* is the two-byte VLAN ID.

- **debug packet logging acl ip** *rule_index action src dst proto src_port dst_port*

  where

  - *proto* is a numeric or any string recognized by getprotobyname(). The controller supports the following strings: ip, icmp, igmp, ggp, ipencap, st, tcp, egp, pup, udp, hmp, xns-idp, rdp, iso-tp4, xtp, ddp, idpr-cmtp, rspf, vmtp, ospf, ipip, and encap.
  - *src_port* is the UDP/TCP two-byte source port (for example, telnet, 23) or “any.” The controller accepts a numeric or any string recognized by getservbyname(). The controller supports the following strings: tcpmux, echo, discard, systat, daytime, netstat, qotd, msp, chargen, ftp-data, ftp, fsp, ssh, telnet, smtp, time, rlp, nameserver, whois, re-mail-ck, domain, mtp, bootps, bootpc, tftp, gopher,

rje, finger, www, link, kerberos, supdup, hostnames, iso-tsap, csnet-ns, 3com-tsmux, rtelnet, pop-2, pop-3, sunrpc, auth, sftp, uucp-path, nntp, ntp, netbios-ns, netbios-dgm, netbios-ssn, imap2, snmp, snmp-trap, cmip-man, cmip-agent, xdmcp, nextstep, bgp, prospero, irc, smux, at-rtmp, at-nbp, at-echo, at-zis, qmtp, z3950, ipx, imap3, ulistserv, https, snpp, saft, npmp-local, npmp-gui, and hmmp-ind.

- *dst_port* is the UDP/TCP two-byte destination port (for example, telnet, 23) or "any." The controller accepts a numeric or any string recognized by getservbyname(). The controller supports the same strings as those for the *src_port*.

- **debug packet logging acl eoip-eth** *rule_index action dst src type vlan*
- **debug packet logging acl eoip-ip** *rule_index action src dst proto src_port dst_port*
- **debug packet logging acl lwapp-dot11** *rule_index action dst src bssid snap_type*

  where

  - *bssid* is the Basic Service Set Identifier.
  - *snap_type* is the Ethernet type.

- **debug packet logging acl lwapp-ip** *rule_index action src dst proto src_port dst_port*

Note
To remove all configured ACLs, enter this command: **debug packet logging acl clear-all**.

Step 2 To configure the format of the debug output, enter this command:

debug packet logging format {**hex2pcap** | **text2pcap**}

The debug facility supports two output formats: hex2pcap and text2pcap. The standard format used by IOS supports the use of hex2pcap and can be decoded using an HTML front end. The text2pcap option is provided as an alternative so that a sequence of packets can be decoded from the same console log file.

Figure 1: Sample Hex2pcap Output

This figure shows an example of hex2pcap output.

```
tx len=118, encap=n/a, port=1
[0000]: 000C316E 7F80000B 854008c0 08004500 ..1n.....@.@..E.
[0010]: 00680000 40004001 5FBE0164 6C0E0164 .h..@.@._>.dl..d
[0020]: 6C010800 08D9E500 00000000 00000000 l....Ye........
[0030]: 00000000 00000000 00000000 00001C1D ................
[0040]: 1E1F2021 22232425 26272829 2A2B2C2D ...!"#$%&'()*+,-
[0050]: 2E2F3031 32333435 36373839 3A3B3C3D ./0123456789:;<=
[0060]: 3E3F4041 42434445 46474849 4A4B4C4D >?@ABCDEFGHIJKLM
[0070]: 4E4F5051 5253                       NOPQRS
rx len=118, encap=ip, port=1
[0000]: 000B8540 08C0000C 316E7F80 08004500 ...@.@..1n....E.
[0010]: 00680000 4000FF01 A0BD0164 6C010164 .h..@....=.dl..d
[0020]: 6C0E0000 10D9E500 00000000 00000000 l....Ye........
[0030]: 00000000 00000000 00000000 00001C1D ................
[0040]: 1E1F2021 22232425 26272829 2A2B2C2D ...!"#$%&'()*+,-
[0050]: 2E2F3031 32333435 36373839 3A3B3C3D ./0123456789:;<=
[0060]: 3E3F4041 42434445 46474849 4A4B4C4D >?@ABCDEFGHIJKLM
[0070]: 4E4F5051 5253                       NOPQRS
```

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Figure 2: Sample Text2pcap Output

This figure shows an example of text2pcap output.

```
tx len=118, encap=n/a, port=1
0000 00 0C 31 6E 7F 80 00 0B 85 40 08 c0 08 00 45 00 ..1n.....@.@..E.
0010 00 68 00 00 40 00 40 01 5F BE 01 64 6C 0E 01 64 .h..@.@._>.dl..d
0020 6C 01 08 00 08 D9 E5 00 00 00 00 00 00 00 00 00 l....Ye.........
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 1C 1D ................
0040 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D ...!"#$%&'()*+,-
0050 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D ./0123456789:;<=
0060 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D >?@ABCDEFGHIJKLM
0070 4E 4F 50 51 52 53                              NOPQRS
rx len=118, encap=ip, port=1
0000 00 0B 85 40 08 C0 00 0C 31 6E 7F 80 08 00 45 00 ...@.@..1n....E.
0010 00 68 00 00 40 00 FF 01 A0 BD 01 64 6C 01 01 64 .h..@....=.dl..d
0020 6C 0E 00 00 10 D9 E5 00 00 00 00 00 00 00 00 00 l....Ye.........
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 1C 1D ................
0040 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D ...!"#$%&'()*+,-
0050 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D ./0123456789:;<=
0060 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D >?@ABCDEFGHIJKLM
0070 4E 4F 50 51 52 53                              NOPQRS
```

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Step 3 To determine why packets might not be displayed, enter this command:

debug packet error {**enable** | **disable**}

Step 4 To display the status of packet debugging, enter this command:

show debug packet

Information similar to the following appears:

```
Status.......................................... disabled
Number of packets to display.................... 25
Bytes/packet to display......................... 0
Packet display format........................... text2pcap

Driver ACL:
      [1]: disabled
      [2]: disabled
      [3]: disabled
      [4]: disabled
      [5]: disabled
      [6]: disabled
   Ethernet ACL:
      [1]: disabled
      [2]: disabled
      [3]: disabled
      [4]: disabled
      [5]: disabled
      [6]: disabled
   IP ACL:
      [1]: disabled
      [2]: disabled
      [3]: disabled
      [4]: disabled
      [5]: disabled
      [6]: disabled
   EoIP-Ethernet ACL:
      [1]: disabled
```

```
   [2]: disabled
   [3]: disabled
   [4]: disabled
   [5]: disabled
   [6]: disabled
EoIP-IP ACL:
   [1]: disabled
   [2]: disabled
   [3]: disabled
   [4]: disabled
   [5]: disabled
   [6]: disabled
LWAPP-Dot11 ACL:
   [1]: disabled
   [2]: disabled
   [3]: disabled
   [4]: disabled
   [5]: disabled
   [6]: disabled
LWAPP-IP ACL:
   [1]: disabled
   [2]: disabled
   [3]: disabled
   [4]: disabled
   [5]: disabled
   [6]: disabled?
```

Wireless Sniffing

The controller enables you to configure an AP as a network *sniffer*, which captures and forwards all the packets on a particular channel to a remote machine that runs packet analyzer software. These packets contain information on time stamps, signal strength, packet sizes, and so on. Sniffers allow you to monitor and record network activity and to detect problems.

For more information about wireless sniffing using Cisco APs in Sniffer mode, see https://www.cisco.com/c/en/us/support/docs/wireless-mobility/80211/200527-Fundamentals-of-802-11-Wireless-Sniffing.html#anc11.

This section contains the following subsections:

Prerequisites for Wireless Sniffing

To perform wireless sniffing, you need the following hardware and software:

- A dedicated access point—An access point configured as a sniffer cannot simultaneously provide wireless access service on the network. To avoid disrupting coverage, use an access point that is not part of your existing wireless network.
- A remote monitoring device—A computer capable of running the analyzer software.
- Software and supporting files, plug-ins, or adapters—Your analyzer software may require specialized files before you can successfully enable

Restrictions on Wireless Sniffing

- Supported third-party network analyzer software applications are as follows:
  - Wildpackets Omnipeek or Airopeek
  - AirMagnet Enterprise Analyzer
  - Wireshark
- The latest version of Wireshark can decode the packets by going to the Analyze mode. Select **decode as**, and switch UDP5555 to decode as PEEKREMOTE.
- You must disable IP-MAC address binding in order to use an access point in sniffer mode if the access point is joined to a controller. To disable IP-MAC address binding, enter the **config network ip-mac-binding disable** command in the controller CLI.
- You must enable WLAN 1 in order to use an access point in sniffer mode if the access point is joined to a controller. If WLAN 1 is disabled, the access point cannot send packets.
- **Issue**: AP disconnections, traffic destined to controller received using AP sniffer radio MAC address.

  Conditions: These issues are observed if APs are configured to operate in sniffer mode and controller sends sniffed traffic to configured destination. These issues impact scenarios where the controller is connected to Cisco Application Centric Infrastructure (ACI) Fabric and data gleaning is used for IP-MAC address binding.

  Workaround: Avoid using APs in sniffer mode or do not use data gleaning for IP-MAC address binding.

Configuring Sniffing on an Access Point (GUI)

Procedure

Step 1 Choose **Wireless** > **Access Points** > **All APs** to open the **All APs** page.

Step 2 Click the name of the access point that you want to configure as the sniffer. The **All APs** > **Details** for page appears.

Step 3 From the **AP Mode** drop-down list, choose **Sniffer**.

Step 4 Click **Apply**.

Step 5 Click **OK** when prompted that the access point will be rebooted.

Step 6 Choose **Wireless** > **Access Points** > **Radios** > **802.11a/n (or 802.11b/g/n**) to open the **802.11a/n/ac (or 802.11b/g/n) Radios** page.

Step 7 Hover your cursor over the blue drop-down arrow for the desired access point and choose **Configure**. The **802.11a/n/ac (or 802.11b/g/n) Cisco APs** > **Configure** page appears.

Step 8 Select the **Sniff** check box to enable sniffing on this access point, or leave it unselected to disable sniffing. The default value is unchecked.

Step 9 If you enabled sniffing in Step 8, follow these steps:

a) From the Channel drop-down list, choose the channel on which the access point sniffs for packets.

b) In the **Server IP Address** text box, enter the IP address of the remote machine running Omnipeek, Airopeek, AirMagnet, or Wireshark.

Step 10 Click **Apply**.

Step 11 Click **Save Configuration**.

Configuring Sniffing on an Access Point (CLI)

Procedure

Step 1 Configure the access point as a sniffer by entering this command:

config ap mode sniffer *Cisco_AP*

where *Cisco_AP* is the access point configured as the sniffer.

Step 2 When warned that the access point will be rebooted and asked if you want to continue, enter **Y**. The access point reboots in sniffer mode.

Step 3 Enable sniffing on the access point by entering this command:

config ap sniff {802.11a | 802.11b} enable *channel server_IP_address Cisco_AP*

where

- *channel* is the radio channel on which the access point sniffs for packets. The default values are 36 (802.11a/n/ac) and 1 (802.11b/g/n).
- *server_IP_address* is the IP address of the remote machine running Omnipeek, Airopeek, AirMagnet, or Wireshark.
- *Cisco_AP* is the access point configured as the sniffer.

Note
To disable sniffing on the access point, enter the **config ap sniff** {**802.11a | 802.11b**} **disable** *Cisco_AP* command.

Step 4 Save your changes by entering this command:

save config

Step 5 See the sniffer configuration settings for an access point by entering this command:

show ap config {**802.11a | 802.11b**} *Cisco_AP*