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You make possible

Troubleshooting CAT9800 & 11AX / WiFi6 Wireless-LAN

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BRKEWN-3091

Agenda

- Introduction
- C9800 WLC Architecture & KPIs
- 11AX Access Points Architecture & KPIs
- Troubleshooting Techniques
- Automating KPIs
- Key Takeaways

Introduction

You make networking **possible**

It’s Time to Think Differently about Mobility

Immersive Experiences

Basic Data Connectivity

Streaming Video 4K / 8K
AR / VR

Mobility for IoT

Industrial IoT

Autonomous Vehicles & Machines Badge Readers / Sensors
Vending Machines / MRI / X-ray

Technology Transition

Cellular | Wi-Fi

5G + Wi Fi 6

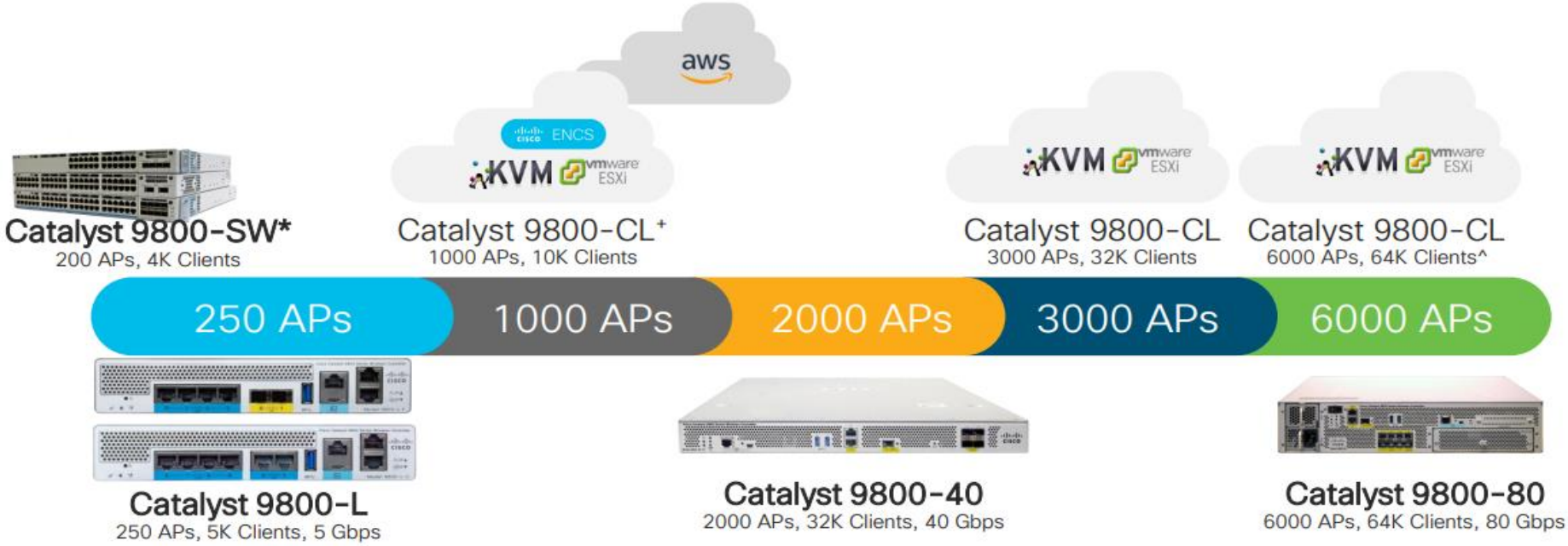
Seamless
5G + Wi-Fi 6

Superior HD connectivity and user experience

Classification and Segmentation

Beyond Wi-Fi, drive digital business forward

Deploy It the Way You Want It



*SD-Access only
^C9800-CL for Public Cloud with FlexConnect;

Cisco Catalyst 9100 Series Access Points

Ideal for small to medium-sized deployments

Mission critical

9115AX
(Wi-Fi 6 certifiable)

- 4x4 + 4x4
- MU-MIMO, OFDMA
- Spectrum Intelligence
- 1 x 2.5 mGig, TWT

9117AX
(Wi-Fi 6 Compatible)

- 8x8 + 4x4
- MU-MIMO, OFDMA (only DL)
- Spectrum intelligence
- 1 x 5 mGig
- Non Triggered TWT
- Integrated Antenna only

Powered by Cisco RF ASIC

9120AX
(Wi-Fi 6 certifiable)

- 4x4 + 4x4
- Cisco RF ASIC for Next gen
- CleanAir
- Dual 5GHz, HDX
- RF signature capture
- IoT ready (Zigbee, Thread)
- IOx infra support
- 1 x 2.5 mGig, TWT

9130AX
(Wi-Fi 6 certifiable)

- Four radios: 2.4 GHz (4x4), 5 GHz
- (8x8 and 4x4), Cisco RF ASIC, and BLE/IoT
- Cisco Flexible Radio Assignment and Cisco
- CleanAir Technology
- Internal and external antenna
- Wi-Fi 6 certified

DNA Assurance with Intelligent Capture | Bluetooth 5 | USB | Integrated or external antenna SKUs

C9800 WLC Architecture

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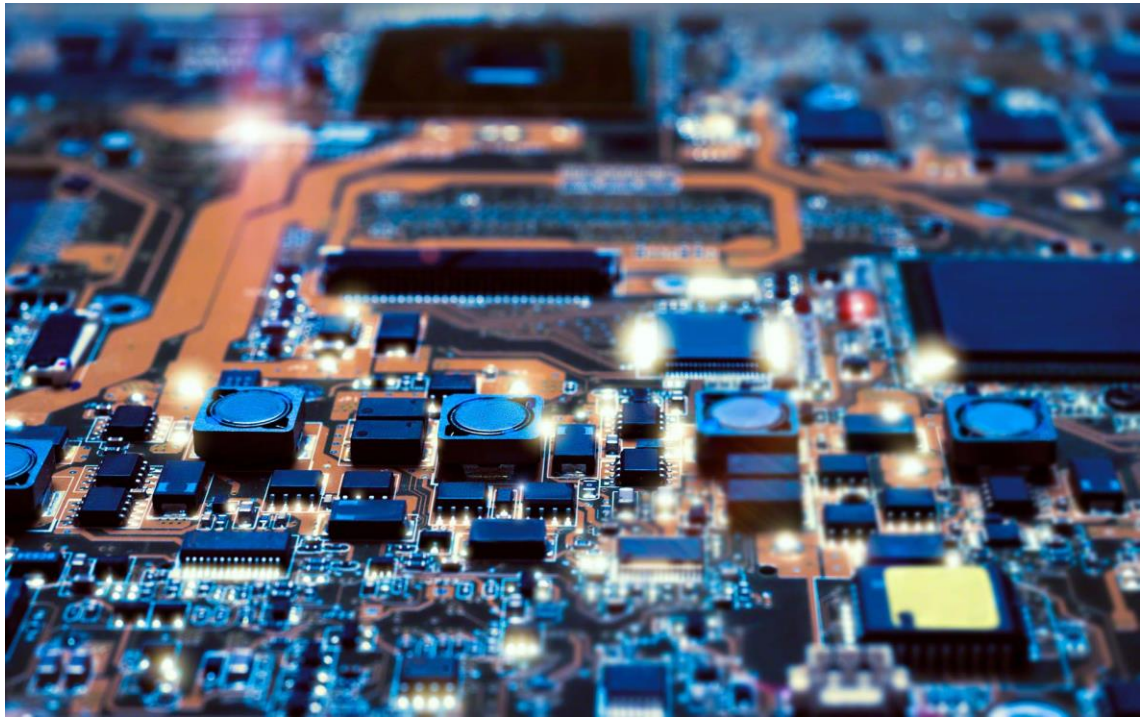
C9800 Architecture

- Hardware
- Software



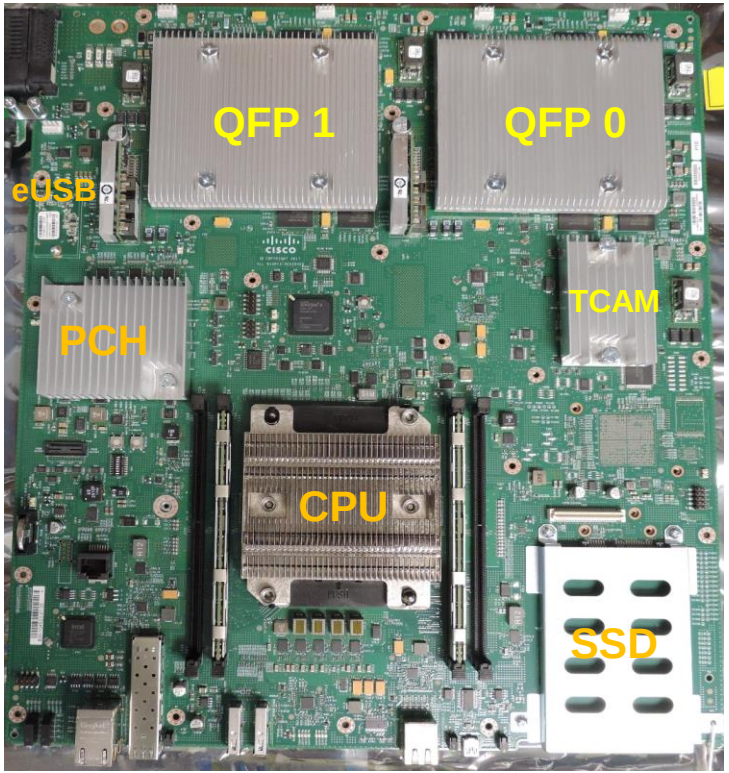
Hardware

C9800 Hardware Architecture
Different Types

- 9800-CL Cloud : Virtualizes CPP Dataplane
- 9800-40/80 – Appliance – CPP with QFP (Quantum Flow Processor)
- 9800-SW on 9300/9500 – Doppler UADP Chipset
- 9800-L – Small campus deployments copper or fiber uplinks

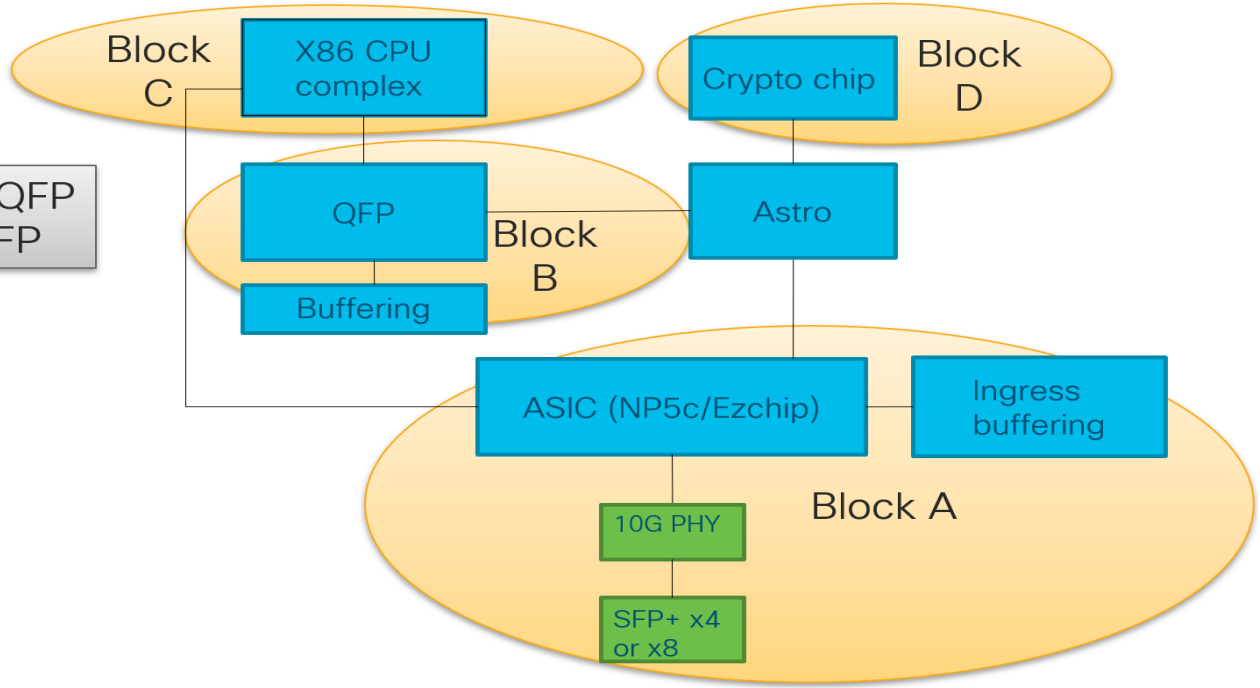
C9800 Hardware Architecture

- 9800-80 capable of 100Gbps
- 2 Load balanced QFP (1 in 9800-40)
- 1 Crypto Chip
- 12 Core CPU (8 in 9800-40)



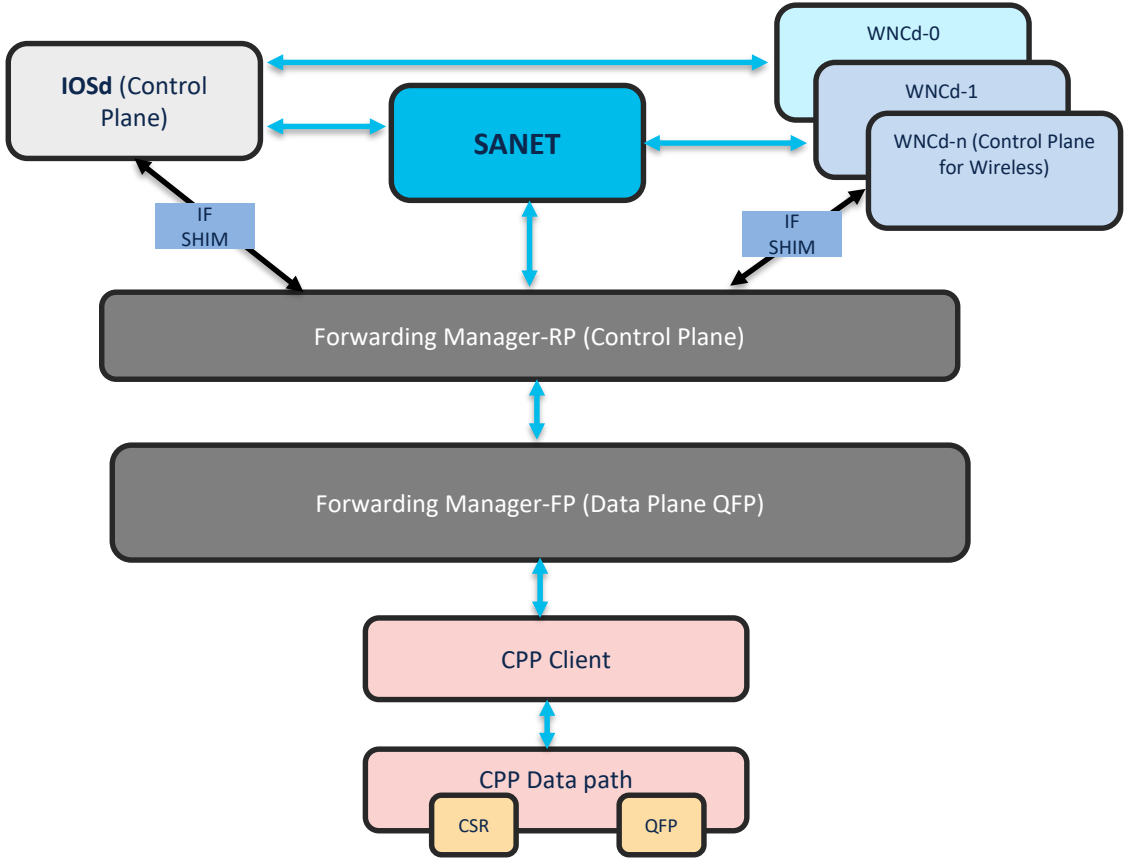
C9800 WLC Hardware
Appliance High Level Block Diagram

C9800-40: Single QFP
C9800-80: Dual QFP



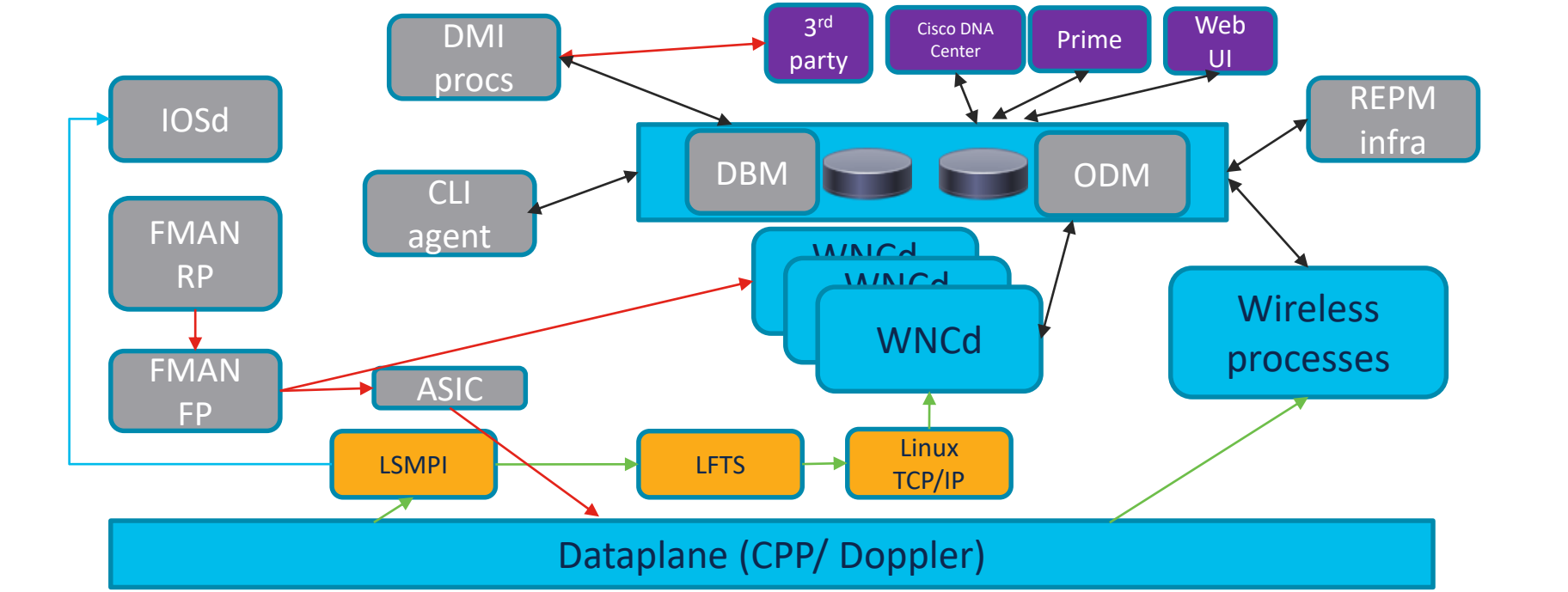
Software

C9800 Software Architecture
Simplified View



C9800 Software Architecture

Let me Complicate



11AX Access Points Architecture

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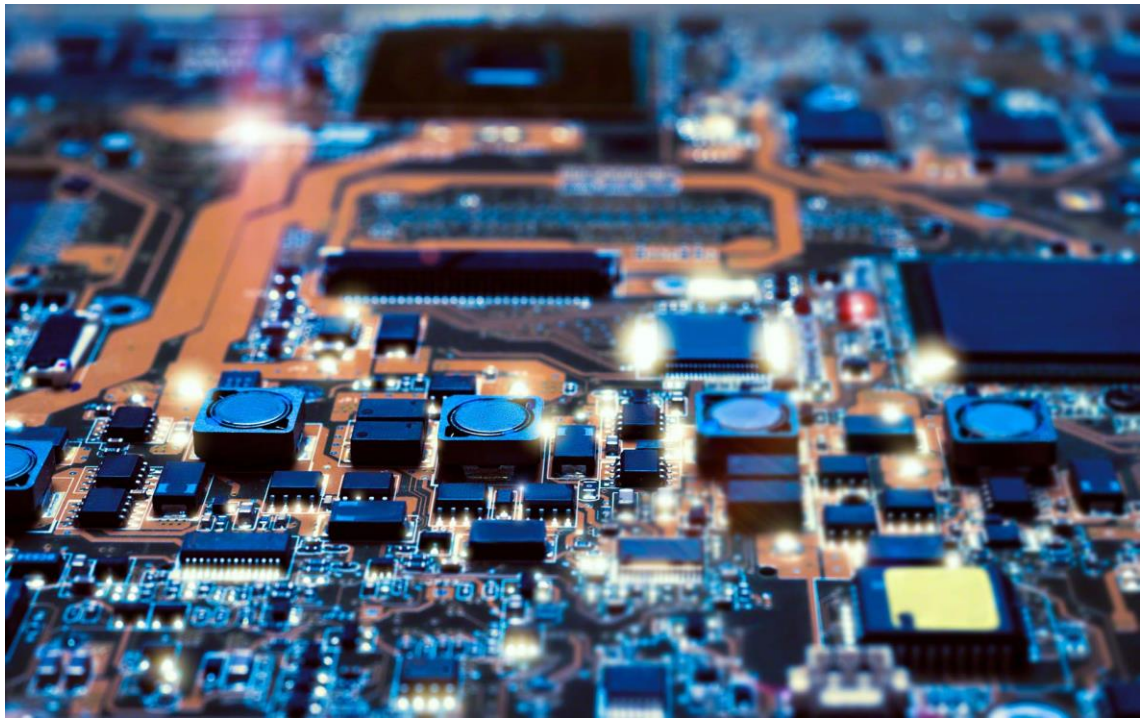
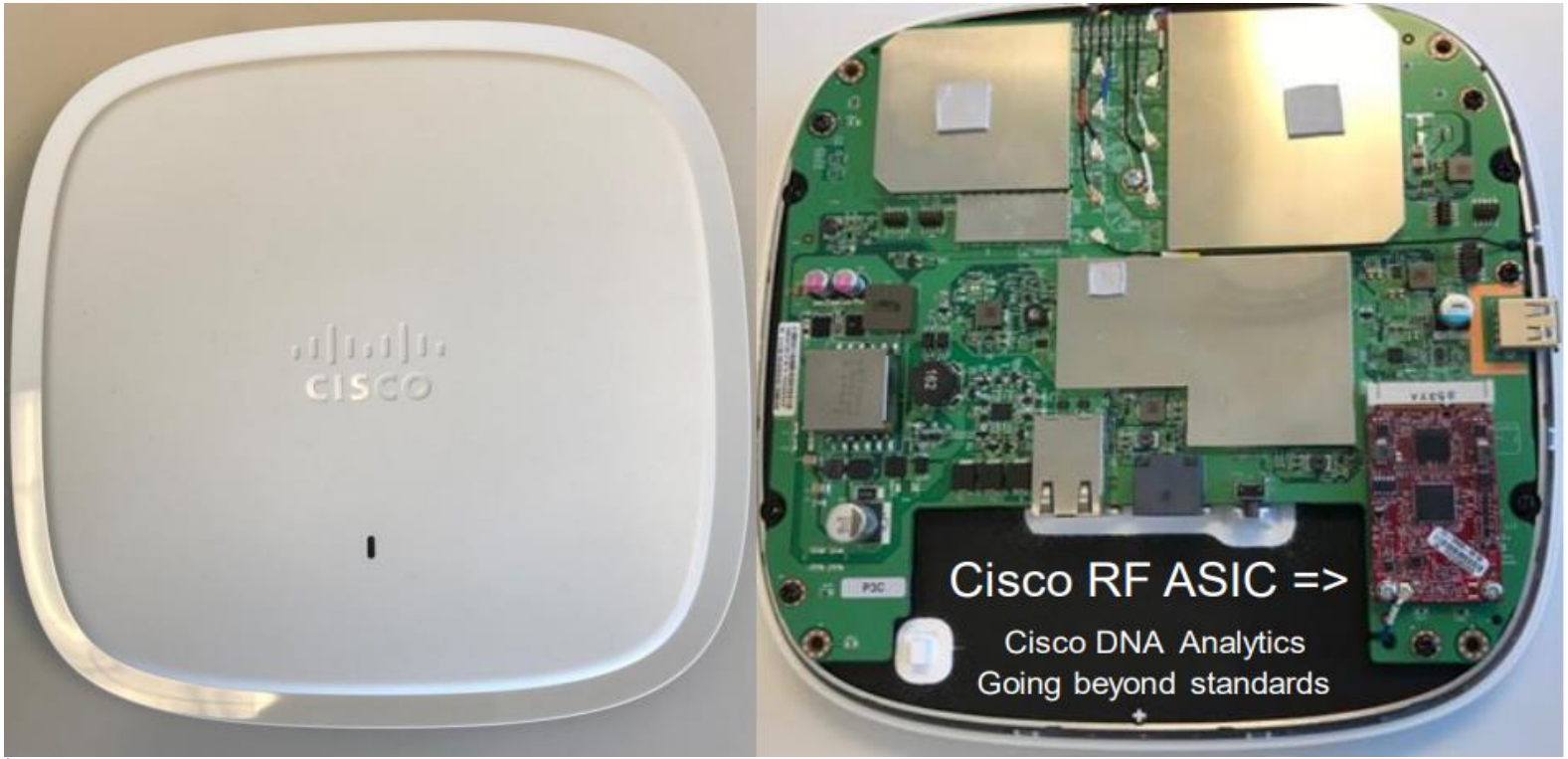
11AX Access Points Architecture

- Hardware
- Software

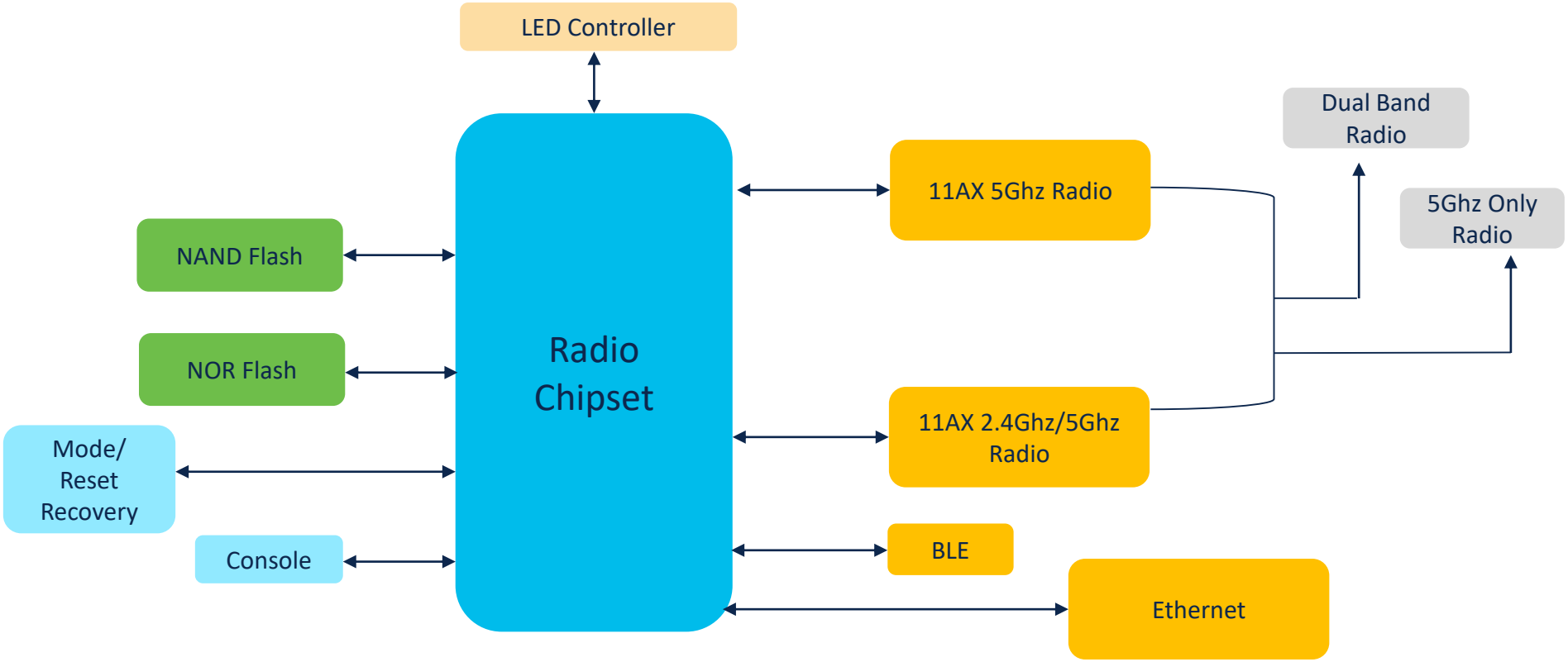


Hardware

C9100 with Cisco Custom RF ASIC



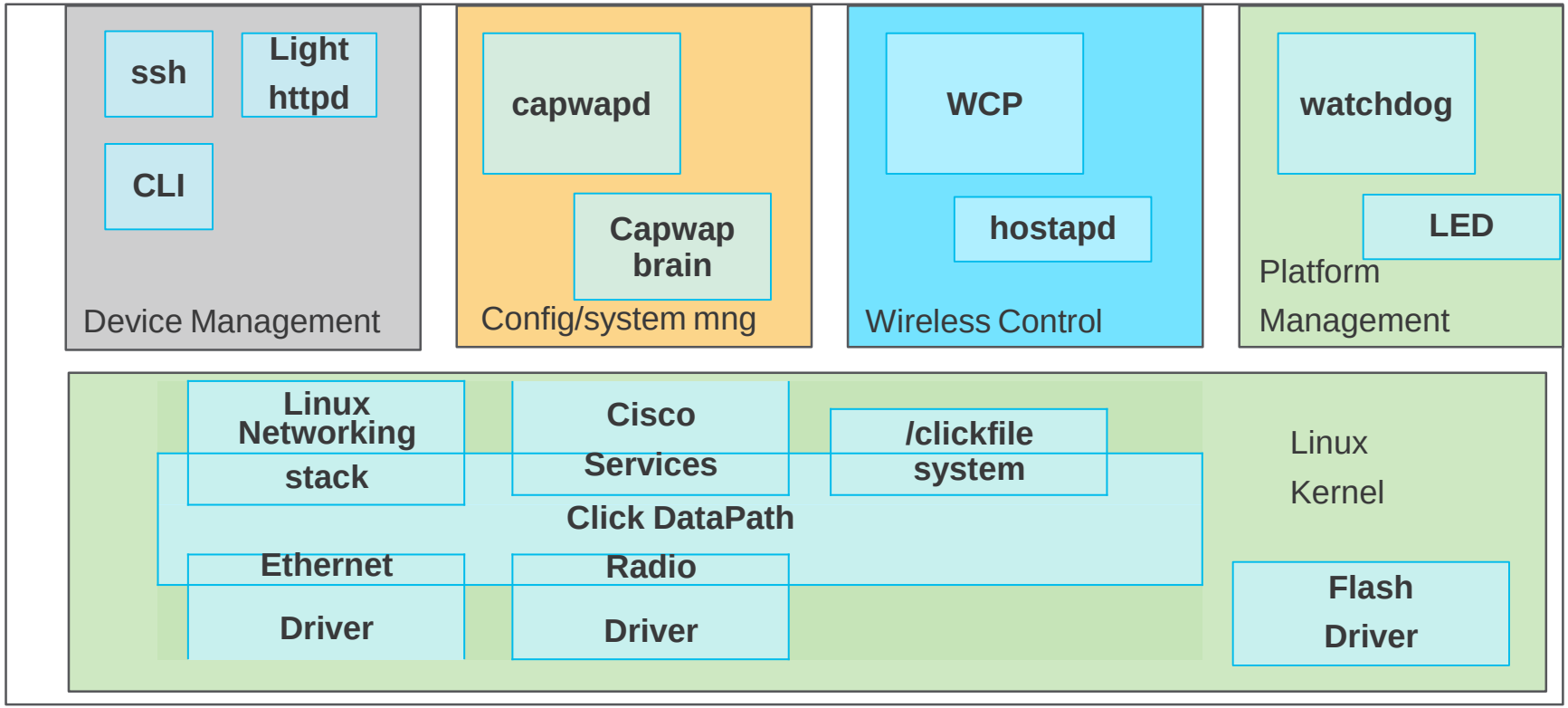
C9120AXI – Simplified Hardware Block Diagram



Software

COS AP

Different Architecture (Simplified View)



Migration

C9800 Deployment Types

Green Field

- New 9800 deployments
- Install with DNAC/Prime

Migration from AireOS

- Forklift AireOS migration to 9800
- AireOS and 9800 Coexistence (IRCM)

Platform Migration

- 16.x CA Migration to -> 9800 on 16.10
- Install with DNAC/Prime/CMX

What is New/Different

New Functionality

- Programmability
- Zero Downtime Upgrade
- New Configuration Model
- Cloud Ready
- WLC/AP patching support
- Streaming Telemetry
- Continuous Tracing, Failure Detection

Usability Differences

- Profile/Tag Configuration Model
- Client debug done through Tracing
- IOS-XE CLI
- Maintains Flat Mobility with CAPWAP transport

Supportability Changes

- Wave1/Wave2 AP support
- “Store, then Export” debugging model
- Config migration is required
- Most features has been ported, but should be verified

Deployment Lifecycle

Evaluation & Planning

- Introduction to 9800 and it's features
- Foundational knowledge in deploying 9800
- Planning network design

Design

- Scoping design requirements
- Simulating and validating design requirements
- Review Design with Enterprise Networks TME

Implementation

- Lab validation
- Production dry-runs
- Go-Live and Day 2 Support

Evaluation and Planning

Introduction

- At a glance
- Front Page
- Compatibility Matrix
- Configuration Model – Web UI

VoD Resources

- Cisco Catalyst 9800 Wireless Controller Configuration Model
- Cisco Wireless Innovations
- DNA and Catalyst 9800

Deployment Guides

- Deployment Guide
- 9800 -Aireos IRCM Deployment Guide
- C9800-CL Virtual Deployment Guide
- C9800-CL on AWS

Models

- Catalyst 9800-40
- Catalyst 9800-80
- Catalyst 9800-CL

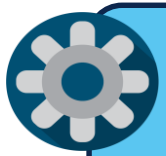
Implementation (5-Step Easy Roll-Outs!)

Install guides

- Software Configuration Guide
- Programmability Guide
- AireOS to Cat 9800 command mapping guide
- Command Reference

Configuration Examples Security

- Central Web Authentication (CWA) and ISE v2.2
- Configure 802.1x Authentication
- Configure MAC authentication SSID
- Configure a Web Authentication SSID
- FlexConnect WLAN with 802.1x AAA override



Configuration Examples General

- Building Mobility Tunnels
- High Availability (HA) Client Stateful Switch Over (SSO)
- Mobility Anchor on Catalyst 9800 Wireless Controllers
- Generate CSR for Third-Party Certificates

Troubleshooting

- Configure AP Packet Capture on Catalyst 9800 Wireless Controllers

5-Step Implementation (AireOS Migration)

Preparation

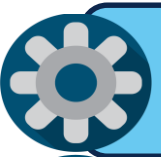
- Audit inventory (HW/SW)
- Validate feature set
- Prepare site tests
- “Migration Feasibility” check in WCAE

Data Migration

- In Box Migration
- PI/DNA
- Stand-alone migration tool

Day Zero

- Appliance Bootstrap
- Cloud Installation



Application

- Install configuration on controllers
- Move Aps
- Enable Services

Validation

- Confirm AP inventory
- Check Wireless services
- Validate RRM status

*Recommended Material

5-Step Implementation (Green Field deployment)

Preparation

- Design configuration and toplogy
- Prepare site tests

Data Migration

- NA for Green Field

Day Zero

- Appliance Bootstrap
- Cloud Installation

Application

- Install configuration on controllers
- Move Aps
- Enable Services

Validation

- Confirm AP inventory
- Check Wireless services
- Validate RRM status

*Recommended Material

11AX Installations – What do you have installed today?

- Before refreshing to Wi-Fi 6, Review your existing WLAN issues
- 1:1 replacement assumes the AP was installed in the best place to begin with?
- While new Wi-Fi 6 features might be able to help mitigate a bad or poor design NOTHING BEATS reviewing what is in place now and ***INSTALL IT RIGHT the 1st time*** ☺

Site Survey? What tool do I use for WiFi 6?

ekahau WIRELESS DESIGN

https://www.ekahau.com/

In a recent webinar Ekahau stated their tool will be ready for .11ax in the 1st half of 2019

iBwave

https://www.ibwave.com/

For more on Wi-Fi 6 Spectrum analysis, and best practices see Cisco Live session **BRKEWN-3010**

NETSCOUT AirMagnet Survey PRO

https://www.netscout.com/

KPI – Key Performance Indicators

C9800 & 11AX

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CAT9800 KPIs

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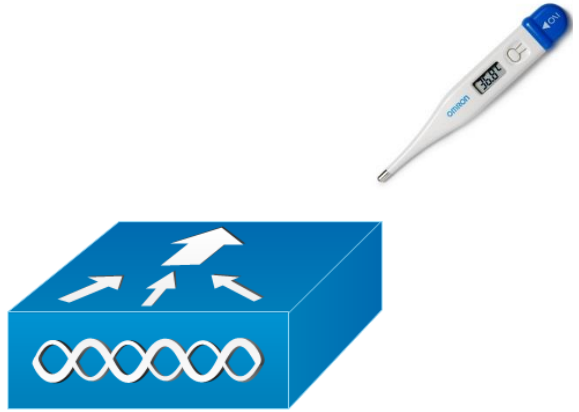
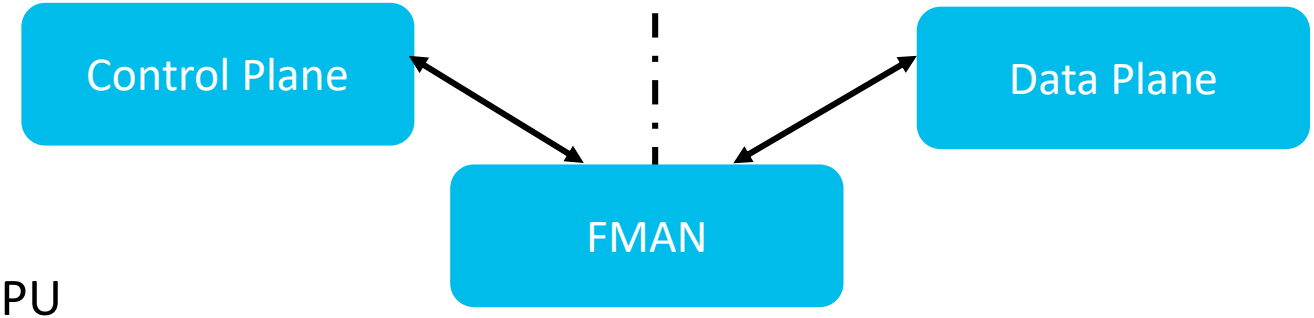
C9800 Basic Health
Does it have Fever

- Where to put the Thermometer
  - Control Plane
  - Data Plane



C9800 Basic Health
Control and Data Plane



- CPU
- Memory
- Mobility
- RRM
- NMSP Etc.

- Data Forwarding using hardware QPF (Quantum Flow Processor)
- Packet Tracer

Control Plane

C9800 KPIs
One **CPU** to bind Control and Data Plane

SURBG-9540# **show processes cpu platform sorted 1**

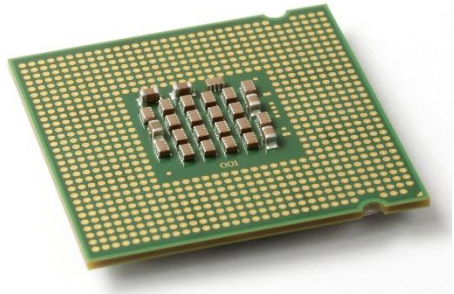
CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%

Core 0: CPU utilization for five seconds: 0%, one minute: 1%, five minutes: 0%

Core 1: CPU utilization for five seconds: 6%, one minute: 1%, five minutes: 0%

|

Core 15: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%



Pid	PPid	5Sec	1Min	5Min	Status	Size	Name
30122	21621	0%	0%	0%	S	**279544**	**wncd_0**
30016	22290	0%	0%	0%	S	**234644**	**wncd_3**
29812	22610	0%	0%	0%	S	**284636**	**wncd_4**

C9800 KPIs
Memory Monitoring

- Need Based usage
- Increases with Load
- An infinite loop will be caught by watchdog

C9800 KPIs
Memory the Easy Way

- Platform Resources – Usage/Max/Warning/Critical

Show platform resources

```
SURBG-eWLC#sh platform resources
**State Acronym: H - Healthy, W - Warning, C - Critical
Resource                 Usage                 Max              Warning          Critical         State
-------------------------------------------------------------------------------------------------------
RP0 (ok, active)                                                                                  H
 Control Processor       11.12%                100%             80%              90%              H
  DRAM                   3446MB(43%)           7922MB           88%              93%              H
```

C9800 KPIs
Memory the Easy Way

Memory One-Stop-Shop – Daily/Weekly/Monthly/Yearly Memory stats

show processes memory platform accounting

SURBG-eWLC#**sh processes memory platform accounting**
Hourly Stats

process	callsite_ID(bytes)	max_diff_bytes	callsite_ID(calls)	max_diff_calls	tracekey	timestamp(UTC)
cli_agent_rp_0	2160919555	8914627	**2160919555**	23228	**1#5abb66956d7547e01f8250be345b11fe**	2019-02-19 00:52
wncd_0_rp_0	2160919555	2598253	**146453505**	5018	**1#8844b0be9c7c328d18ad34424c5ef556**	2019-02-28 23:18

C9800 KPIs
Memory the Easy Way

- Process Platform Sorted

show process memory platform sorted

```
SURBG-eWLC#show process memory platform sorted
System memory: 8112824K total, 3529584K used, 4583240K free,
Lowest: 4540692K
Pid    Text       Data    Stack   Dynamic        RSS                Name
-------------------------------------------------------------------------
2477   318400     992164      136       300     992164   linux_iosd-imag
24730     820     379812      136     17864     379812             wncd_0
24361     136     275584      136      5896     275584            wncmgrd
27454   22964     257352      136       260     257352    ucode_pkt_PPE0
27113   14914     229744      136     30016     229744     fman_fp_image
23376     233     216856      136     39144     216856               dbm
28741      94     205504      136     37840     205504        cpp_cp_svr
23601     255     148368      136       124     148368         cli_agent
25242      61     147584      136      3876     147584             rogued
```

Data Plane

C9800 KPIs
Dataplane – Monitor Drops

Show platform hardware chassis active qpf statistics drop

```
SURBG-eWLC#sh platform hardware chassis active qfp statistics drop
Last clearing of QFP drops statistics : never

-----------------------------------------------------------------------------
Global Drop Stats                                 Packets              Octets
-----------------------------------------------------------------------------
BadIpChecksum                                          34                3036
CGACLDrop                                          238165            25629637
Disabled                                            93354            18954929
Icmp                                                   12                 684
InvL2Hdr                                                2                 232
IpFormatErr                                           299               28680
Ipv4NoAdj                                             146               19126
Ipv4NoRoute                                            13                1078
Ipv6Formaterr                                           7                 686
Ipv6NoRoute                                             2                 152
Ipv6mcNoRoute                                        3080              277200
MacMcastIpNonmcast                                   3004              138184
MinTu                                                  30                 660
PuntErr                                                 1                 309
SWPortMacConflict                                     172               18358
SWPortVpState                                         179               37443
UnconfiguredIpv4Fia                                495205           105288719
UnconfiguredIpv6Fia                               4825363           585662675
WlsCapwapError                                        358               92761
WlsCapwapReassFragConsume                              30               44540
WlsClientError                                      22174             1961877
```

C9800 KPIs
Dataplane – Access Point Details

sh tech-support wireless datapath ap mac-address <AP Radio MAC>

- Tunnel details
- Cpp-client plumbing Stats
- Datapath details
- Datapath Stats

C9800 KPIs
Dataplane – Access Point Details

Tunnel Details for CAPWAP

```
Tunnel Details for CAPWAP cpp_if_handle: 0x35
  Name                : CAPWAP-IF-0x0090000008
  pal_if_handle       : 0x90000008
  Src IP              : 9.12.64.19
  Src Port            : 5247
  Dst IP              : 9.12.64.173
  Dst Port            : 5264
  Tunnel Type         : DATA
  AP Mac              : 00a3.8e43.dac0
  Instance id         : 3
  In UIDB             : 0X176CD
  Out UIDB            : 0X176CB
  Encap Type          : 802.11
  MTU                 : 1485
  DTLS enable         : true
  AP Name             : 1815-1
  AP LAG tunnels:  8
  AP LAG enabled:  false
  Global LAG cfg:  false
  Global LAG cur:  false
```

C9800 KPIs
Dataplane – Access Point Details

CAPWAP Datapath Stats

	PKTS	Bytes
Rx redistribute Drop	0	0
Punt dot11 dot1x	20	2828
Punt dot11 iapp	233648	188631862
Punt dot11 rrm	172	20230
Punt dot11 rfid	0	0
Punt sisf dhcp	28134	9734562
Punt dot11	0	0
Punt dot11 mgmt	2444	825371
Punt dot11 probe req	1811710	469890235
Punt capwap data	0	0
Punt mobility keepalive	0	0
Punt capwap keepalive	40261	3704012

C9800 KPIs
Dataplane – Client

sh tech-support wireless datapath client mac-address <Client MAC>

- Tunnel details
- Cpp-client plumbing Stats
- Datapath details
- Datapath Stats

C9800 KPIs
Dataplane – Client

Wireless client Details

```
Wlclient Details for Client mac: b475.0e4e.40ad
------------------------------------
   Input VlanId                 :   64
   Point of Presence            :   0
   Wlclient Input flags         :   1
   Instance ID                  :   3
   ETA Feature                  :   Disabled
   EoGRE Tunnel                 :   -1
   client_mac_addr              :   b475.0e4e.40ad
   replacement_mac_addr         :   3900.0000.0000

   bssid_mac_addr               :   00a3.8e43.dacc
   Point of Attachment          :   95947
   Output vlanId                :   64
   wlan_output_uidb             :   95980
   Wlclient Output flags        :   1
   Radio ID                     :   1
   cgacl w0                     :   0xddf9d110
   cgacl w1                     :   0x22a00000
   IPv6 addr number             :   1
   IPv6 addr learning           :   0
   FQDN Filtering Enabled       :   False
   FQDN Filter ID               :   0
   FQDN Filter Name             :
   FQDN Virtual IPv4 Addr       :   0.0.0.0
   FQDN Virtual IPv6 Addr       :   0000:0000:0000:0000:0000:0000:0000:0000
```

C9800 KPIs
Dataplane – Client

Wireless client Datapath stats

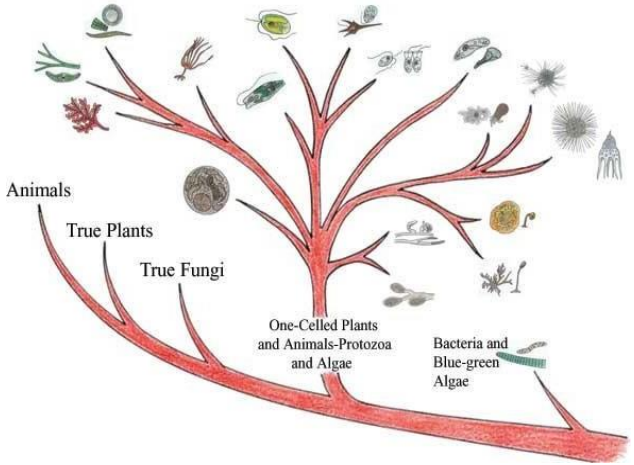
	Pkts	Bytes
Rx	0	0
Rx no uidb Drop	0	0
Rx iplearn Drop	8	784
Punt sisf dglean v6	1	94
Punt sisf broadcast arp req from wired	0	0
Punt sisf broadcast arp req from wireless	13	598
Punt sisf broadcast arp req from iosd	0	0
Punt sisf arp reply from wired	8	512
Punt sisf dhcp req from wireless	1	352
Punt sisf dhcp ack from wired	5	1730
Punt sisf dhcp ack from wireless	0	0
Punt sisf dhcp ack from iosd	0	0
Punt sisf dhcp nak from wired	0	0
Punt sisf dhcp nak from wireless	0	0
Punt sisf dhcp others from wired	0	0
Punt sisf dhcp others from wireless	1	346

11AX Access Point KPIs

You make security **possible**

COS-AP
Different Organism, Somewhat Different Health Metrics

- Some structures remain similar
- Some have changed, sh tech as easiest way
- Main things to monitor
  - CPU
  - Memory
  - Interfaces
  - Radios
  - CAPWAP



COS-AP

Memory-CPU

- Memory

****** Show memory summary ******

	total	used	free	shared	buffers
Mem:	1030616	314668	715948	0	0

- CPU

****** Show process CPU ******

Mem: 314748K used, 715868K free, 87692K shrd, 0K buff, 87788K cached

CPU: 4% usr 0% sys 0% nic 95% idle 0% io 0% irq 0% sirq

Load average: 1.00 1.01 1.05 1/109 20898

PID	PPID	USER	STAT	VSZ	% VSZ CPU	%CPU	COMMAND
6178	1	root	S	56508	5%	0	0% /usr/sbin/mrvlfwd

CPS-AP
Radio Crashes

Radio Core files

```
***** show flash cores *****

Directory of /storage/cores/

total 1524

-rw-r--r--    1 root     root       1430212 Feb 22 17:06 AP1801-3802e-up-dd_core-radio0FW-8.2.145.44.2017-02-22-17-06-27.tgz

-rw-r--r--    1 root     root        123448 Feb 20 10:58 AP1801-3802e.all.10.0.cleanair.tgz

-------------------------------------------------------------------------------

Filesystem                Size      Used Available Use% Mounted on

flash                    57.5M      1.7M     52.8M   3% /storage
```

COS-AP
Syslog – 5 Last Set of Logs

- AP syslog data

***** show flash syslogs *****

Directory of /storage/syslogs/

total 296

-rw-r--r-- 1 root root 7969 Feb 8 17:36 176

-rw-r--r-- 1 root root 20479 Feb 7 19:15 176.0

-rw-r--r-- 1 root root 4838 Feb 8 17:36 176.last_write

-rw-r--r-- 1 root root 20480 Feb 7 17:55 176.start

-rw-r--r-- 1 root root 25 Feb 8 17:37 176.watchdog_status

-rw-r--r-- 1 root root 9976 Feb 9 04:36 177

-rw-r--r-- 1 root root 20407 Feb 8 17:42 177.0

COS-AP
Client Information

- Different components

Barbados-beta-floor1#**sh dot11 clients**

AP Mode – FlexConnect

Client MAC	Slot ID	WLAN ID	AID	WLAN Name	RSSI	Maxrate	WGB
00:1E:E5:DF:A3:C4	1	3	1	psk-w2	-40	M15	No

barbados-beta-floor1# **sh controllers dot11Radio 1 client**

mac	radio	vap	aid	state	encr	Maxrate	is_wgb_wired	wgb_mac_addr
00:1E:E5:DF:A3:C4	1	2	5	FWD	AES_CCM128	M15	false	00:00:00:00:00:00

COS AP
Radio Status

- **Associated client list**:

Total Client Count:0

Radio Total_clients Legacy_clients HT/VHT20_clients HT/VHT40_clients VHT80_clients

0	0	0	0	0	0
1	0	0	0	0	0

QBSS Load: cca_load: 0x3, rx_load: 0x0, tx_load: 0x0

COS AP
Radio Status

- Statistics

Tx Watchdog stats:

```
 Tx SW Watchdog 0        /        0

 Tx HW Watchdog 0        /        0
```

Beacons missed: 0-30s 31-60s 61-90s 90s+

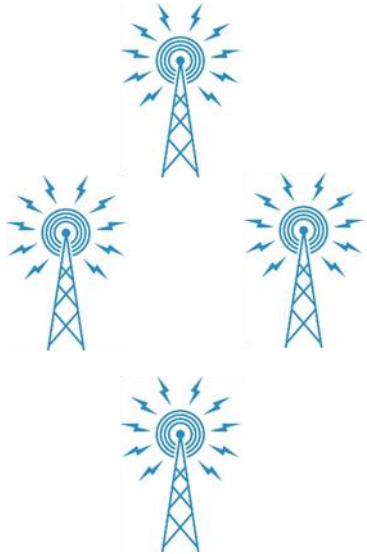
```
                  0      0      0    0
```

```
intf TxData TxUC TxMBC TxBytes TxMBBytes TxFail TxDcrd RxData RxUC RxMBC RxBytes RxErr UCTxRt
MCTxRt stats_ago

apr0v2      0    0     0       0         0      0      0      0    0     0       0     0      0
0  1.700000
```

COS AP
Radio Status

- RRM Neighbors

```
sw2_shield_gig15_C53# show rrm neighbor-list

============================================================

RRM Neighbors Slot 0

==================================

MAC Addr RSSI Srv.Chan


RRM Neighbors Slot 1

==================================

         MAC Addr RSSI Srv.Chan

58:AC:78:DF:8C:1F   -29      120

00:D7:8F:52:4F:6F   -26       52
```



COS AP
Radio Reset History

SURBG-9120I#sh history channel interface dot11Radio all

Timestamp	Slot	Client count	Channel	Trigger
Wed Jan 8 10:00:57 2020	0	0	6	RRM-DCA
Wed Jan 8 10:01:00 2020	1	0	40	Manual

COS-AP
WLAN Stats

SURBG-11ax4#*sh interfaces dot11Radio 1 wlan 1 statistics*

VAP Level Stats: apr1v1 (under radio wifi1)

Tx Data Packets = 0
Tx Data Bytes = 0
Tx Data Payload Bytes = 0
Tx Eapol Packets = 0
Rx Data Packets = 0
Rx Data Bytes = 0
Rx Data Payload Bytes = 0
Tx Data Packets per AC:
Best effort = 0
Background = 0
Video = 0
Voice = 0
Rx Data Packets per AC:
Best effort = 0

Last Tx rate for unicast Packets = 0
Last Tx rate for unicast Packets(mcs) = 0
Total number of offchan TX mgmt frames = 0
Total number of offchan TX data frames = 0
Number of failed offchan TX frames = 0
Retries = 0
Tx Mgmt Packets = 0
Rx Mgmt Packets = 0
Excessive retries per AC:
Best effort = 0
Background = 0
Video = 0
Voice = 0
Beacon success = 0
Beacon failed = 0

Troubleshooting Techniques

You make the power of data **possible**

Troubleshooting Technique
One Stop Shop

Typical Issues :

- Access Point Join/Dis-Join
- Client Connectivity
- Data Plane
- Memory, CPU and Queue

CAT9800-Troubleshooting Techniques

You make the power of data **possible**

CAT9800 – Troubleshooting

Different Debugging Architecture

- Made up of Linux Kernel with Cisco IOS
- Wireless processes implemented as Daemons

Control Plane

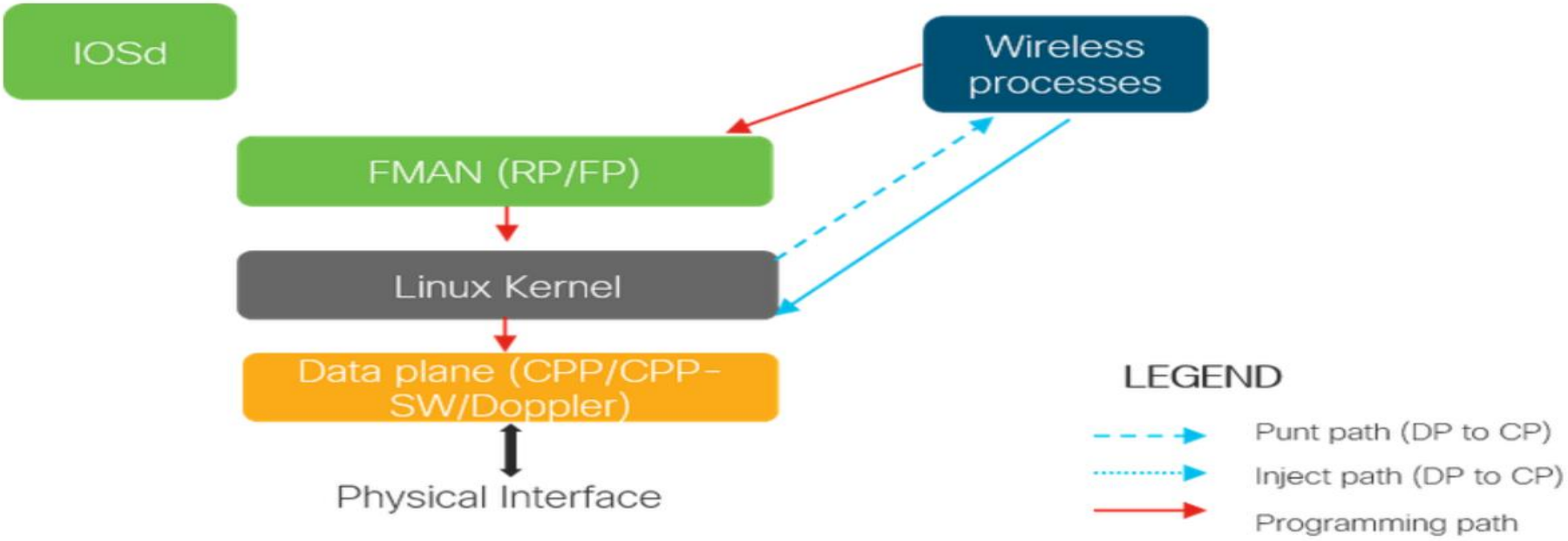
CAPWAP, Mobility, RRM, NMSP, Rogue Management ETC

Data Plane

Data Forwarding which uses Hardware QPF (Quantum Flow Processor)

CAT9800 – Troubleshooting

Packet Flow inside 9800 WLC



CAT9800 – Troubleshooting

Packet Flow Continued..

- **Punt Path** :

Control Traffic sourced from Access Point, Client Etc towards Control plane processor.

- **Inject Path** :

Return Traffic sourced from 9800 WLC towards the Client, AP injected back to the Data plane

- **Programming Path :**

Versatile tool set to trace the packet from the moment it enters 9800 WLC until the processed traffic leaves the box

CAT9800 – Troubleshooting

Types Of Debugging :

- Control Plane
- Data Plane
- Memory
- Embedded packet Capture

Control Plane

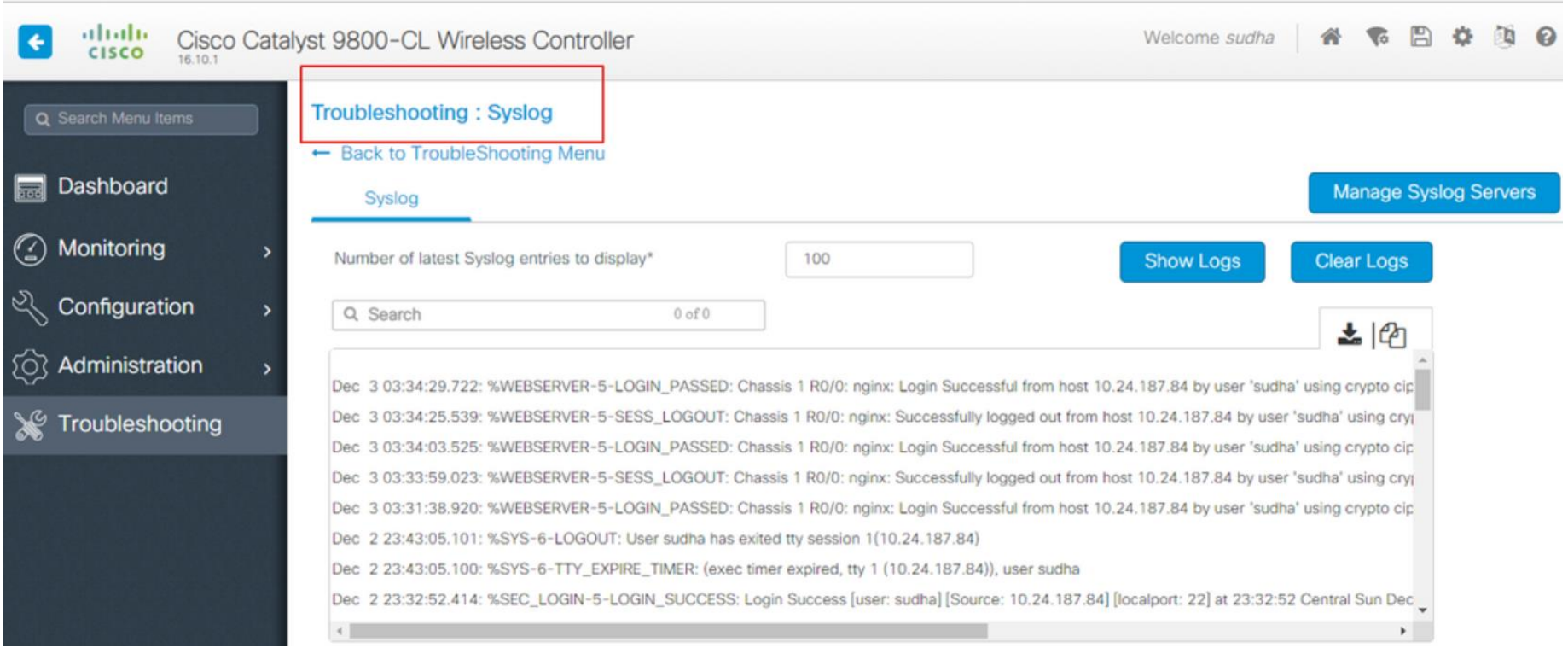
C9800 – Control Plane

Control Plane :

1. Syslog
2. Always-On Tracing
3. Conditional Debugging and RadioActive Tracing
4. Per-Process Non-Conditional Debugging

C9800 – Control Plane

Syslog : First means to verify the general health of the system



C9800 – Control Plane

Always-On Tracing – I have Everything!

- Control plane traffic is constantly logged at Notice level
- Contextual data capture on a failure scenario

Particular context (Client/AP MAC/IP) :

```
# show logging profile wireless filter mac <client-mac> to-file <AlwaysOn.txt>
```

Per-Process logs :

```
# show logging process <processd_name> to-file <AlwaysOn_Process.txt>
```

C9800 – Control Plane

Trace-On-Failure : I Know What Failed!

- Quick snapshot of known failure conditions
- Matches Pre-defined failure conditions and presents as stats

 # show logging trace-on-failure summary

 # show logging profile wireless filter uuid <UUID derived from summary> to-file bootflash:TOF-Filename.txt

- Viewed on terminal session or exported for offline analysis via bootflash ot TFTP, FTP, SCP Etc

C9800 – Control Plane

Conditional Debugging and Radio Active Tracing : Deep Dive

- Feature specific Debug level logging
- Spans across Processes, Threads for the Condition

 # debug wireless {mac | ip} {aaaa.bbbb.cccc | x.x.x.x } {monitor-time} {N sec}

 # show debugging

 # no debug wireless mac <aaaa.bbbb.cccc> -- Disable debugging

C9800 – Control Plane

Per-Process Non-Conditional Debugging : Hand Picked!

- Specific Process
- Specific Use case

 # set platform software trace <Process_Name> wireless chassis active R0

{ module_name | all-modules }

 # show platform software trace level <Process_Name> chassis active R0

 # show logging process <Process_Name> to-file <ProcessName_debug.txt>

Eg :

set platform software trace wireless chassis 1 r0 rrm all debug

Data Plane

C9800 – Data Plane
Data Plane Packet Tracking

- Detailed View of Packet Processing
- Decision Details – Punt/Drop/Forward/Consume

Provides *Three Levels* of Inspection

1. Statistics : Packet count In/Out
2. Summary : Lookup interfaces, Punt/drop/Inject details, packet processing view
3. Path Data : Packet Handling – Timestamp, Feature Specific Path, DP-to-CP Data

C9800 – Data Plane
Data Plane Packet Tracking

- **Step 1.** *Define Condition of Interest*

 # debug platform condition { interface | mac | ingress | egress | both | ipv4 | ipv6 | mpls | match }

- **Step 2.** *Enable conditional debugging*

 # debug platform condition start

- **Step 3.** *To view the currently enabled conditions*

 # show platform conditions

C9800 – Data Plane
Data Plane Packet Tracking

- **Step 4.** *Enable packet-tracer*

```
# debug platform packet-tracer packet <packet-number> {fia-trace}
```

- **Step 5.** *Verify that its running*

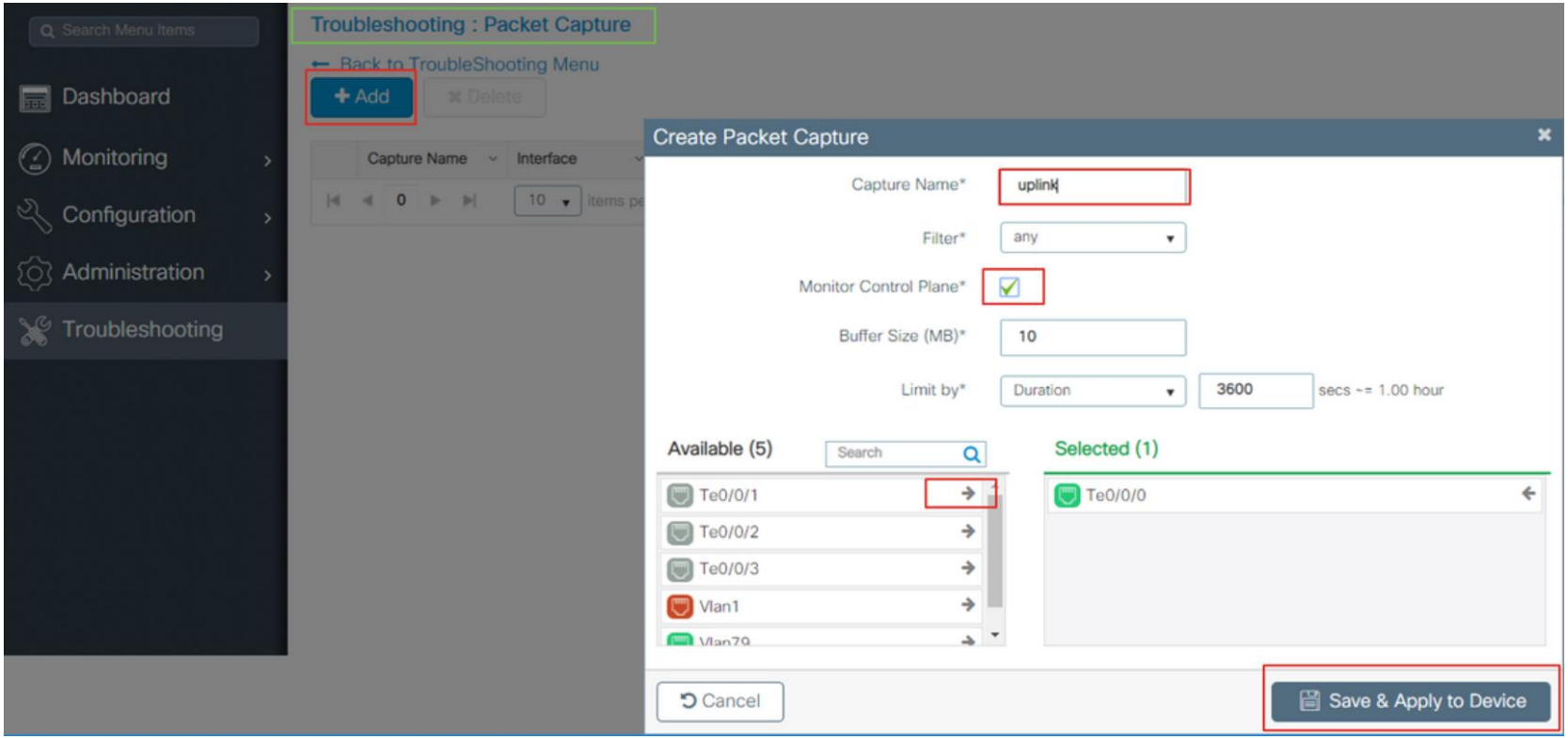
```
# show platform packet-trace statistics
```

- **Step 6.** *View and Export the Packet Dump*

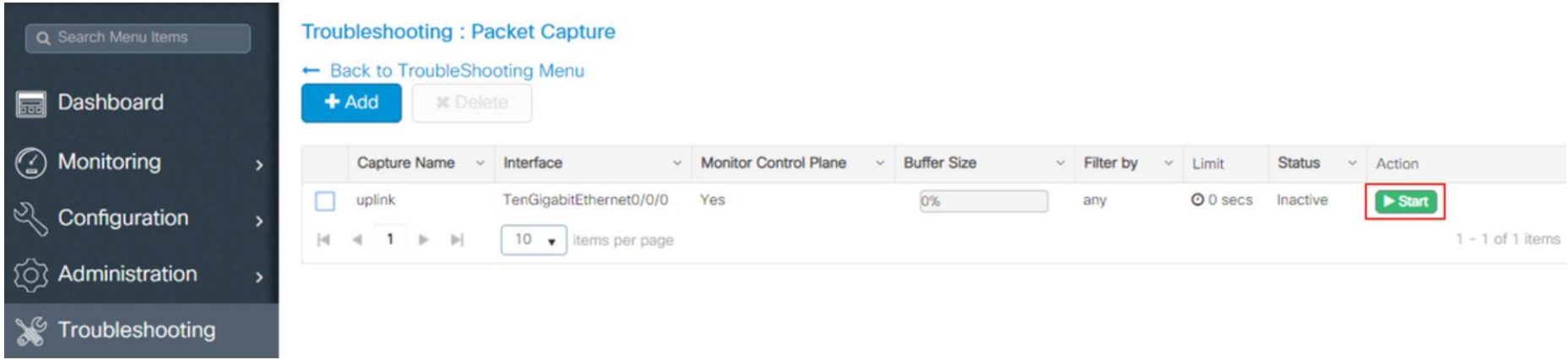
```
# show platform packet-tracer summary

# show platform packet-trace packet all | redirect { bootflash: | tftp: | ftp: } pactrac.txt
```

Embedded Packet Capture

C9800 – Embedded PCAP Tool



C9800 – Embedded PCAP Tool



1	2019-01-21 05:27:40.996942	10.104.172.169	10.65.34.206	TLSv1.2	804	Application Data
2	2019-01-21 05:27:41.035993	Vmware_9a:a8:65	Broadcast	ARP	60	Who has 10.104.172.89? Tell 10.104.172.29
3	2019-01-21 05:27:41.045987	10.65.34.206	10.104.172.169	TCP	54	64125 → 443 [ACK] Seq=1 Ack=751 Win=257 Len=0
4	2019-01-21 05:27:41.108987	Apple_33:a6:8b	Broadcast	ARP	60	Who has 10.104.172.1? Tell 10.104.172.46
5	2019-01-21 05:27:41.460974	0.0.0.0	255.255.255.255	DHCP	346	DHCP Discover - Transaction ID 0x546730d8
6	2019-01-21 05:27:41.563966	9.12.64.230	255.255.255.255	CAPWAP-Cont…	260	CAPWAP-Control - Discovery Request
7	2019-01-21 05:27:41.563966	9.12.64.230	255.255.255.255	CAPWAP-Cont…	260	CAPWAP-Control - Discovery Request
8	2019-01-21 05:27:41.563966	9.12.64.19	9.12.64.230	CAPWAP-Cont…	136	CAPWAP-Control - Discovery Response
9	2019-01-21 05:27:41.672954	0.0.0.0	255.255.255.255	DHCP	324	DHCP Discover - Transaction ID 0x6a200c34
10	2019-01-21 05:27:41.686960	0.0.0.0	255.255.255.255	DHCP	346	DHCP Discover - Transaction ID 0x48056849

11AX AP - Troubleshooting Techniques

You make the power of data **possible**

11AX AP – Troubleshooting

Types Of Debugging :

- Client Debugging / Tracing
- Packet Hex Dump Capture Tool
- AP Wired interface Capture Tool

Client Debugging / Tracing

11AX Troubleshooting
Client Tracing - 802.11 Auth & Association State

SURBG-9120I#**debug client 20:AA:4B:60:01:48**

[*01/31/2020 10:23:59.6410] CLSM[20:AA:4B:60:01:48]: US Auth(b0) seq 256 IF 19 slot 0 vap 0 len 41 state FWD

[*01/31/2020 10:23:59.6490] CLSM[20:AA:4B:60:01:48]: DS Auth len 41 slot 0 vap 0

[*01/31/2020 10:23:59.6490] CLSM[20:AA:4B:60:01:48]: client moved from DELETE_PENDING to AUTH

[*01/31/2020 10:23:59.6650] CLSM[20:AA:4B:60:01:48]: US Assoc Req(0) seq 257 IF 19 slot 0 vap 0 len 218 state AUTH

[*01/31/2020 10:23:59.6670] CLSM[20:AA:4B:60:01:48]: DS Assoc Resp(10) IF 0 slot 0 vap 0 state AUTH, generated by WLC

11AX Troubleshooting
Client Tracing – EAPOL Handshake

[*01/31/2020 10:23:59.6760] chatter: eap_to_cli: 135 | 20aa4b60 0148d4e8 8019fe20 888e0203 00750200 8a001000 00000000 000002ba 59dffdfc 867e9256 75ecd6e4 17eab7d6

[*01/31/2020 10:23:59.7070] chatter: eap_from_cli: 135 | d4e88019 fe2020aa 4b600148 888e0103 00750201 0a000000 00000000 00000277 4d20128c 8a82a9aa 8aca48d7 ad8bbc9c

[*01/31/2020 10:23:59.7080] chatter: eap_to_cli: 169 | 20aa4b60 0148d4e8 8019fe20 888e0203 00970213 ca001000 00000000 000003ba 59dffdfc 867e9256 75ecd6e4 17eab7d6

[*01/31/2020 10:23:59.7150] chatter: eap_from_cli: 113 | d4e88019 fe2020aa 4b600148 888e0103 005f0203 0a000000 00000000 00000300 00000000 00000000 00000000

11AX Troubleshooting
Client Tracing – FWD state

[*01/31/2020 10:23:59.7260] CLSM[20:AA:4B:60:01:48]: client moved from 8021X to FWD

[*01/31/2020 10:23:59.7970] chatter: ethertype_cl1: 1580466239.796724440: arp who-has 9.12.90.1 tell 9.12.90.233

[*01/31/2020 10:24:00.0930] chatter: ethertype_cl1: 1580466240.093215: arp who-has 9.12.90.1 tell 9.12.90.233

[*01/31/2020 10:24:03.0000] chatter: dhcp_reply_nonat: 1580466243.000495960: 9.12.90.1.67 > 255.255.255.255.68: udp 308

AP Wired Interface Capture Tool

AP Wired Interface Capture
Starting 8.9 and 16.12.2s

1. Debug traffic wired ip capture
2. Start the traffic
3. no debug traffic wired ip capture

SURBG-9120I#**debug traffic wired ip capture**

% Writing packets to "/tmp/pcap/SURBG-9120I_capture.pcap0"

reading from file /dev/click_wired_log, link-type EN10MB (Ethernet)

SURBG-9120I#**no debug traffic wired ip capture**

AP Wired Interface Capture
Starting 8.9 and 16.12.2s

SURBG-9120I#**copy pcap SURBG-9120I_capture.pcap0 tftp: 9.1.0.101**

100.0%

Rename the file to .pcap format and Open in in Wireshark

	Time	Time delta from	Source	Destination	Protocol	Length	Sequence	Signal streng	Retry	Channel fr	Info
1	1970-01-01 00:00:00.000000	0.0000000…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	267	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
2	2020-01-31 10:36:52.558284	158046701…	0.0.0.0	224.0.0.18	VRRP	88					Announcement (v2)
3	2020-01-31 10:36:52.558292	0.0000080…	0.0.0.0	224.0.0.18	VRRP	60					Announcement (v3)
4	1970-01-01 00:00:00.000000	-15804670…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	412	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
5	1970-01-01 00:00:00.000000	0.0000000…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	238	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
6	2020-01-31 10:36:53.248001	158046701…	9.12.89.122	255.255.255.255	CAPWA…	284					CAPWAP-Control - Discovery Request[Malformed Packet]
7	2020-01-31 10:36:53.528192	0.2801910…	9.12.89.139	255.255.255.255	DNS	83					Standard query 0x2a14 A CISCO-CAPWAP-CONTROLLER
8	1970-01-01 00:00:00.000000	-15804670…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	470	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
9	2020-01-31 10:36:54.315282	158046701…	9.12.89.224	255.255.255.255	LWAPP	132					CNTL DISCOVERY_REQUEST
10	2020-01-31 10:36:54.315290	0.0000080…	9.12.89.224	255.255.255.255	LWAPP	132					CNTL DISCOVERY_REQUEST
11	1970-01-01 00:00:00.000000	-15804670…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	296	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
12	2020-01-31 10:36:55.224404	158046701…	Cisco_19:fe:20	Cisco_19:fe:20	WLCCP	134	16		Frame is being re…		U, func=UI; SNAP, OUI 0x004096 (Cisco Systems, Inc.), PID 0x0000
13	1970-01-01 00:00:00.000000	-15804670…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	209	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........
14	2020-01-31 10:36:55.558486	158046701…	0.0.0.0	224.0.0.18	VRRP	88					Announcement (v2)
15	2020-01-31 10:36:55.558492	0.0000060…	0.0.0.0	224.0.0.18	VRRP	60					Announcement (v3)
16	1970-01-01 00:00:00.000000	-15804670…	00:00:00_00:00:00	Cisco_19:fe:20	802.11	238	16		Frame is not bein…		Probe Request, SN=16, FN=0, Flags=........

AP Hex Packet Dump

11AX Troubleshooting
Client Hex Dump – 8.10 & 16.12.2s (AP9120)

- Enables user to dump Client Management and Data frames
- Captured on the AP or Can be sent to remote capturing client

SURBG-AP9120-1#**debug client dump <Client MAC Addr>**

Show debug

Client 64:a2:f9:ce:6f:c1 debugging enabled for hexdump

Client Trace Status : Started

Client Trace ALL Clients : disable

Client Trace Address : none

11AX Troubleshooting
Client Hex Dump – 8.10 & 16.12.2s (AP9120)

Client Trace Filter : auth

Client Trace Filter : assoc

Client Trace Filter : eap

Client Trace Filter : dhcp

Client Trace Filter : dhcpv6

Client Trace Filter : icmp

Client Trace Filter : icmpv6

Client Trace Filter : ndp

Client Trace Filter : arp

Client Trace Inline Monitor pkt-attach : disable

11AX Troubleshooting
Client Hex Dump – 8.10 & 16.12.2s (AP9120)

Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] Time:475766us Dir:Rx Rate:6 Rssi:-63 Ch:44 Fc:b0 Dur:3c d4:e8:80:1a:0e:6f 64:a2:f9:ce:6f:c1 d4:e8:80:1a:0e:6f Seq:816(2070) Info:DOT11_AUTHENTICATION Retry:0 Len:54 Typesub:0b

Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0000 00 00 00 00 00 00 00 00 00 00 00 00 08 00 45 00
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0010 00 00 00 00 00 00 00 11 00 00 00 00 00 00 00 00
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0020 00 00 13 88 15 b3 ff ff 00 00 c1 1c 00 1e 00 1e
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0030 00 00 5d 47 b9 86 00 07 44 06 0c 2c a5 00 b0 00
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0040 3c 00 d4 e8 80 1a 0e 6f 64 a2 f9 ce 6f c1 d4 e8
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0050 80 1a 0e 6f 60 81 00 00 01 00 00 00 00 00 00 00
Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] 0060 aa aa 03 00 00 00

11AX Troubleshooting
Client Hex Dump – 8.10 & 16.12.2s (AP9120)

- Remove Titles and timestamps from the AP logs

Example :

For a packet which gets displayed in the below format in the debugs:

Aug 5 05:07:19 kernel: [*08/05/2019 05:07:19.4750] Time:475766us Dir:Rx Rate:6 Rssi:-63 Ch:44 Fc:b0 Dur:3c d4:e8:80:1a:0e:6f 64:a2:f9:ce:6f:c1 d4:e8:80:1a:0e:6f Seq:816(2070) Info:DOT11_AUTHENTICATION Retry:0 Len:54 Typesub:0b

- Save the Hex dump in txt file
- Import this in Wireshark file as “Import From HEX DUMP”

11AX Troubleshooting
Client Hex Dump – 8.10 & 16.12.2s (AP9120)

6	2020-01-30 13:04:35.000005	0.0000010…	Cisco-Li_60:01:48	Cisco_19:fe:2f	802.11	113	283 -44dBm	Frame is being re…	Authentication, SN=283, FN=0, Flags=....R...C, SSID=Wildcard (Broadc
7	2020-01-30 13:04:35.000006	0.0000010…	Cisco-Li_60:01:48	Cisco_19:fe:2f	802.11	236	284 -44dBm	Frame is not bein…	Association Request, SN=284, FN=0, Flags=........C, SSID=MarchSurbg[
8	2020-01-30 13:04:35.000007	0.0000010…	Cisco_19:fe:2f	Cisco-Li_60:01:48	802.11	113	0 -95dBm	Frame is not bein…	Authentication, SN=0, FN=0, Flags=........C, SSID=Wildcard (Broadcas
9	2020-01-30 13:04:35.000008	0.0000010…	Cisco_19:fe:2f	Cisco-Li_60:01:48	802.11	205	0 -95dBm	Frame is not bein…	Association Response, SN=0, FN=0, Flags=........C, SSID=Wildcard (Br
10	2020-01-30 13:04:35.000009	0.0000010…	Cisco_19:fe:2f	Cisco-Li_60:01:48	EAPOL	262	0 -95dBm	Frame is not bein…	Key (Message 1 of 4)
11	2020-01-30 13:04:35.000010	0.0000010…	Cisco-Li_60:01:48	Cisco_19:fe:2f	802.11	105	285 -40dBm	Frame is not bein…	Action, SN=285, FN=0, Flags=........C, SSID=Wildcard (Broadcast)[Mal
12	2020-01-30 13:04:35.000011	0.0000010…	Cisco_19:fe:2f	Cisco-Li_60:01:48	802.11	105	0 -95dBm	Frame is not bein…	Action, SN=0, FN=0, Flags=........C, SSID=Wildcard (Broadcast)[Malfo
13	2020-01-30 13:04:35.000012	0.0000010…	Cisco-Li_60:01:48	Cisco_19:fe:2f	EAPOL	262	486 -40dBm	Frame is not bein…	Key (Message 2 of 4)
14	2020-01-30 13:04:35.000013	0.0000010…	Cisco_19:fe:2f	Cisco-Li_60:01:48	EAPOL	296	1 -95dBm	Frame is not bein…	Key (Message 3 of 4)
15	2020-01-30 13:04:35.000014	0.0000010…	Cisco-Li_60:01:48	Cisco_19:fe:2f	EAPOL	240	487 -40dBm	Frame is not bein…	Key (Message 4 of 4)
16	2020-01-30 13:04:35.000015	0.0000010…	Cisco-Li_60:01:48	Broadcast	ARP	177	489 -39dBm	Frame is not bein…	Who has 9.12.90.229? Tell 0.0.0.0

Automating KPIs

You make multi-cloud **possible**

Automating KPIs

- KPIs can be scripted
- Simple TTL or Automate using Python

- Advantages :
  - *Memory buffer shortage*
  - *Queue drops*
  - *Data plane drops*
  - *Data Plane – Control Plane communication drops*
  - *Memory Leak*
  - *Many other unknown issues*

Automating KPIs
WLAN Data Poller – Script - AireOS and C9800!

https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!wireless-troubleshooting-tools/wireless-troubleshooting-tools

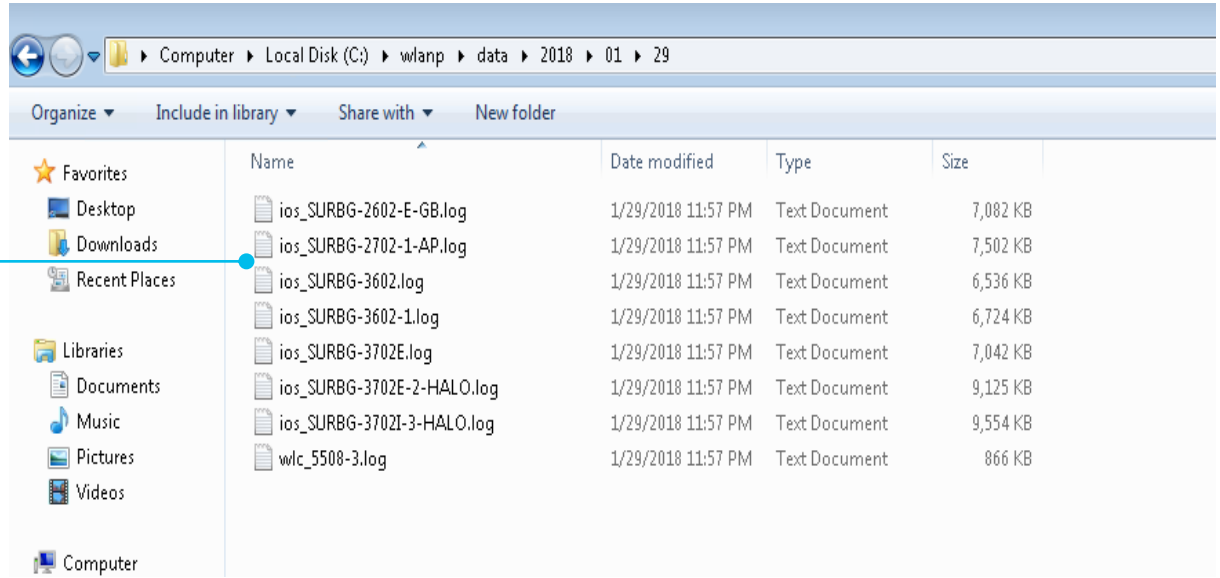
What does it do??

- *Collects KPI data (WLC, IOS and COS APs)*
- *Aggregates AP crashfiles, radio events and coredumps*
- *Enables DFS traces and debug output*
- *AP flash information in CSV format + recovery logic*

Automating KPIs

WLAN Data Poller – Script - AireOS and C9800!

Configuration / KPI Files



Automating KPIs
WLAN Data Poller – Script - AireOS and C9800!

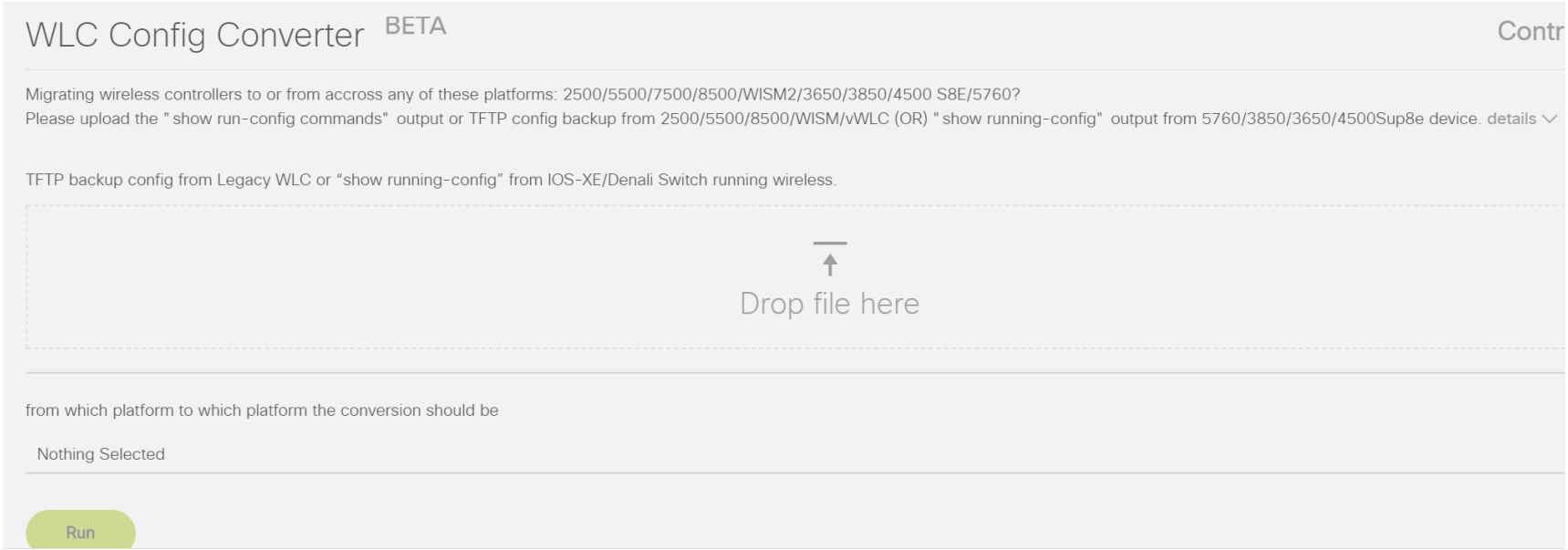
- AP Flash Corruption Data in CSV format

ap_type	ap_uptime	ap_ios_ver	fs_free_bytes	flash_issue	fs_zero_siz	fsck_fail	fsck_busy	fsck_recov	fsck_atten	md5_fail	rcv_trigger
AIR-CAP3602I-N-	244.2611111	15.3(201705	9439232	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP2702I-Z-	233.9868056	15.3(201705	17163776	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3602I-N-	244.2555556	15.3(201705	9311232	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3602I-N-	244.2611111	15.3(201705	9310208	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3602I-N-	244.25625	15.3(201705	9306112	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP2702I-Z-	244.25625	15.3(201705	17138688	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3602I-N-	244.2618056	15.3(201705	2672128	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3702I-Z-	203.6881944	15.3(201705	2452992	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3702I-Z-	220.1965278	15.3(201705	18083840	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP3702I-Z-	220.1986111	15.3(201705	15953920	FALSE	FALSE	FALSE	FALSE	FALSE	0		
AIR-CAP3702I-Z-	220.2020833	15.3(201705	15950336	FALSE	FALSE	FALSE	FALSE	FALSE	0		
AIR-CAP2702I-Z-	220.2	15.3(201705	19325440	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	
AIR-CAP2702I-Z-	220.1972222	15.3(201705	19196416	FALSE	FALSE	FALSE	TRUE	FALSE	1	FALSE	

Automating KPIs
WLC Config Migration Tool

- Tool Automates Configuration Conversion

https://cway.cisco.com/tools/WirelessConfigConverter/



Automating KPIs
WLC Config Migration Tool

AirOS-->C9800

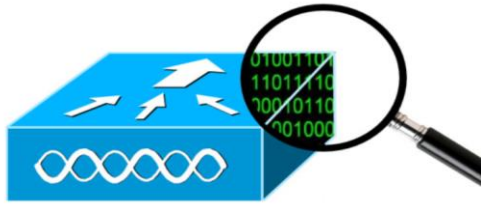
Run

Converted Config Lines

Download CSV

```
==========================================================================================================
--- START of TRANSALTED CLIS ---
==========================================================================================================
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
! Interface Configuration
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
! Interface Configuration
ip access-list extended Pre-Acl-WLC
1 permit 17 any range 0 65535 any range 53 53
2 permit 17 any range 53 53 any range 0 65535
3 permit 6 any range 0 65535 10.204.0.70 0.0.0.0 range 0 65535
4 permit 6 any range 0 65535 10.204.0.71 0.0.0.0 range 0 65535
5 permit 6 10.204.0.70 0.0.0.0 range 0 65535 any range 0 65535
```

Automating KPIs
WCAE – Wireless Analyser Express

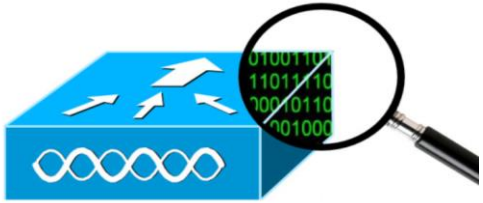


- Evolution from the WLCCA Windows version

https://cway.cisco.com/tools/WirelessAnalyzer/

https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!wireless-troubleshooting-tools/wireless-troubleshooting-tools

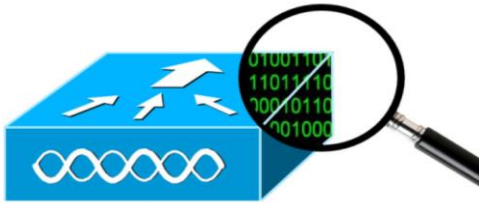
Automating KPIs
WCAE – Wireless Analyser Express



Can be used to get the answers for –

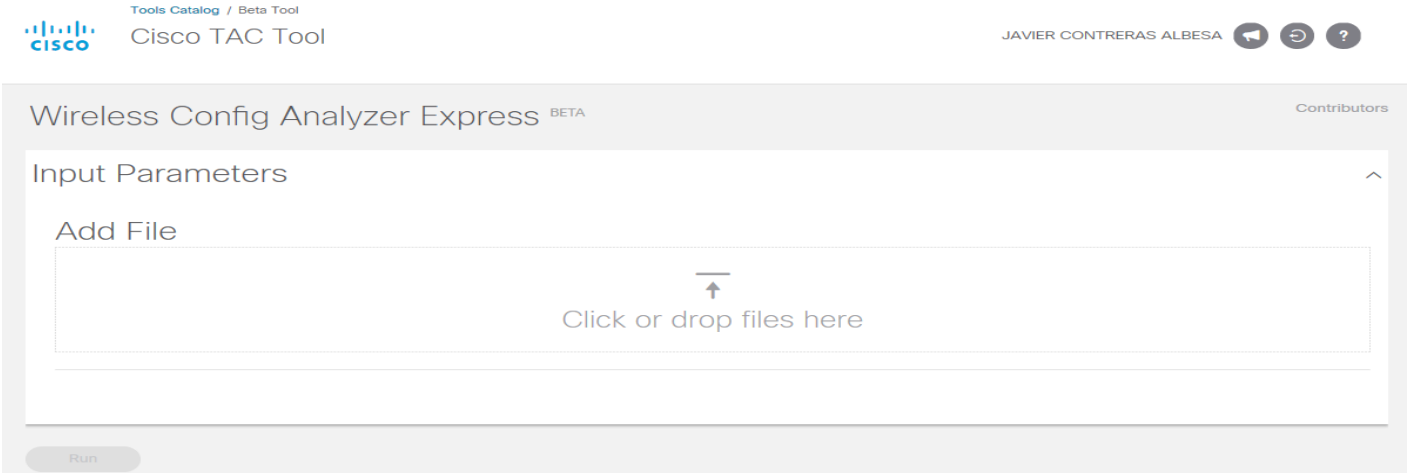
- *Got 5000 Aps… how do I find which area have problems?*
- *How do I know if there are configuration errors?*
- *Is my code version good?*
- *Is my configuration following Best Practices?*
- *Where is the RF problem?*
- *184+ automated checks*

Automating KPIs
WCAE – Wireless Analyser Express

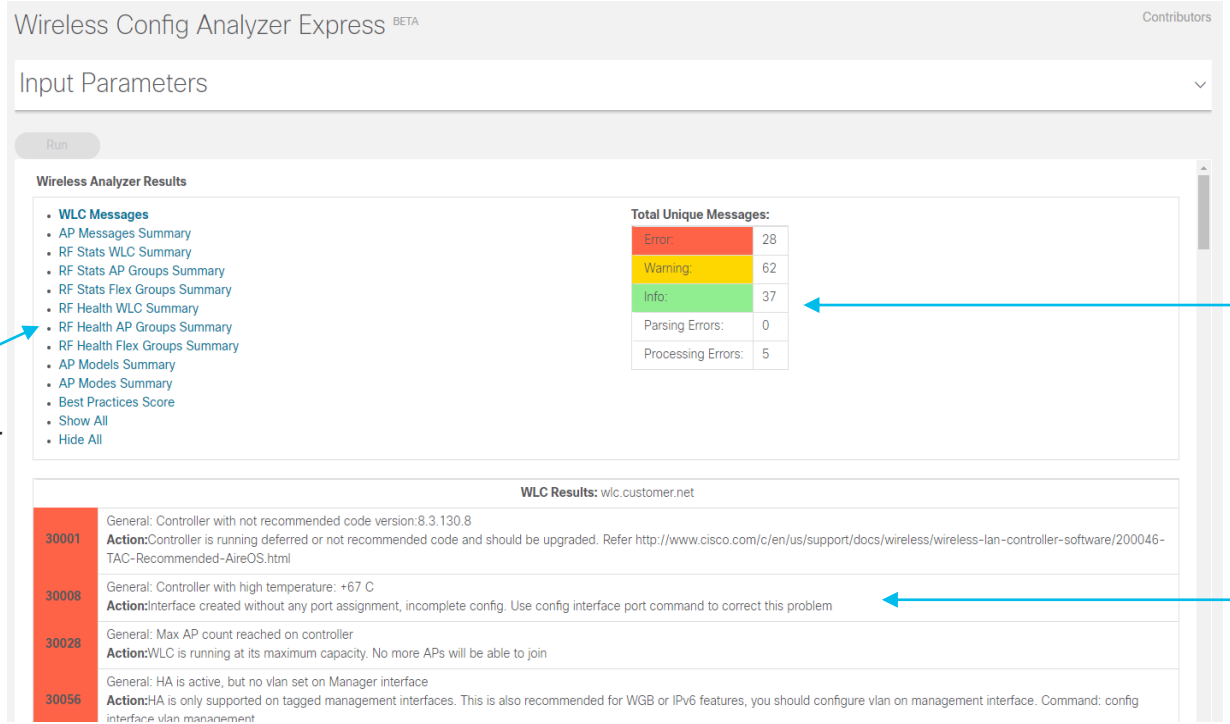


How to Use –

- Tool supports: “sh run-config”, “sh tech” and “sh msglog”
- Always prefer “sh run-config” as it provides the most complete information (RF and configuration)



Automating KPIs
WCAE – Wireless Analyser Express



Menu Area

Message counts

Current opened Summary

Key Takeaways

You make customer experience **possible**

Key Takeaways
Prevention is Better than Cure..

- C9800 WLC Architecture & KPIs
- 11AX Access Points Architecture & KPIs
- Troubleshooting Techniques
- Automating KPIs

Thank you

You make **possible**

Backup

Useful Commands

IOS-XE logging architecture

bTrace (i.e. binOS Tracing system)

- All binOS (i.e. non IOSd) processes log to files in flash/disk
- Each process has his own log file
- Files are written in memory first then on disk (bootflash:/tracelogs/)
- When a log file reaches its maximum size, it rotates and creates a new one
- Logs are written in binary and then compressed for archiving
- This means that live debugging (old IOS-like) is not available for now
- Logs are written using syslog-like severity levels
- IOSd still uses IOS logger. Migration to btrace in progress.

Useful commands and tools

Show techs

- show tech wireless
- show tech wireless ap
- show tech wireless datapath ap/client mac-address <mac>
- show tech wireless multicast
- show tech wireless qos
- show tech wireless client
- show tech wireless fabric

Useful commands and tools

Verifying AP discovery

#show wireless stats ap discovery

Discovery requests received from total number of APs : 3

AP Radio MAC	AP Ethernet MAC	IP Address	Last Success time	Last failure type	Last failure time
0062.ec06.8d10	0062.ec4a.59b8	10.48.39.177	01/15/19 03:27:43	None	NA
00be.75ba.1220	7069.5a3b.1fd0	192.168.61.74	01/15/19 06:34:22	None	NA
700f.6a41.cf60	0000.0000.0000	0.0.0.0	01/01/70 00:00:00	Non-wireless Mgmt interface	NA

Useful commands and tools

Verifying AP join

#show wireless stats ap join summary

Number of APs: 2

Base MAC	Ethernet MAC	AP Name	IP Address	Status	Last Failure Type	Last Disconnect Reason
0062.ec06.8d10	0000.0000.0000	NA	NA	Not Joined	Dtls	NA
00be.75ba.1220	0000.0000.0000	NA	NA	Not Joined	Dtls	NA
7c0e.cea0.7680	58f3.9cc4.4864	AP58f3.9cc4.4864	192.168.16.92	Not Joined	NA	Heart beat timer expiry
84b8.021d.1c70	64f6.9d58.5d3c	2702I-sniffer	192.168.16.198	Joined	Join	Wtp reset config cmd sent
a80c.0ddb.c720	a80c.0dd2.1fa8	APa80c.0dd2.1fa8	192.168.18.52	Joined	NA	DTLS alert from AP

Useful commands and tools

Verifying clients

#show wireless stats client detail

```
Total Number of Clients : 0
Protocol Statistics
---------------------------------------------------------------------------
Protcol          Client Count
802.11b                          0
802.11g                          0
802.11a                          0
802.11n-2.4 GHz                  0
802.11n-5 GHz                    0
802.11ac                         4
802.11ax-5 GHz                   0
802.11ax-2.4 GHz                 0

Monitoring interval : 10 minute(s)
Current client state statistics:
---------------------------------------------------------------------------
 Authenticating                  : 0
 Mobility                        : 0
 IP Learn                        : 0
 Webauth Pending         : 0
 Run                             : 4
```

Useful commands and tools

Verifying clients (part 2)

```
Client Summary
------------------------------
Current Clients             : 3
Excluded Clients            : 0
Disabled Clients            : 0
Foreign Clients             : 0
Anchor Clients              : 0
Local Clients               : 3

client global statistics:
------------------------------------------------------------------------------
Total association requests received                         : 30
Total association attempts                                  : 20
Total FT/LocalAuth requests                                 : 0
Total association failures                  : 2
Total association response accepts                          : 28
Total association response rejects                          : 2
Total association response errors                           : 0
Total association failures due to blacklist                 : 0
Total association drops due to multicast mac  : 0
Total association drops due to throttling                   : 0
```

Useful commands and tools

Verifying clients (part 3)

```
Total association drops due to unknown bssid      : 0
Total association drops due to parse failure      : 0
Total association drops due to other reasons      : 0
Total 11r ft authentication requests received     : 0
Total 11r ft authentication response success      : 0
Total 11r ft authentication response failure      : 0
Total 11r ft action requests received                    : 0
Total 11r ft action response success                     : 0
Total 11r ft action response failure                     : 0
Total roam attempts                               : 0
  Total CCKM roam attempts                               : 0
  Total 11r roam attempts                                : 0
  Total 11i fast roam attempts                           : 0
  Total 11i slow roam attempts                           : 0
  Total other roam type attempts                         : 0
Total roam failures in dot11                             : 0
```

(100 lines more of these)

Useful commands and tools

Verifying clients (part 5)

```
Webauth HTTP status counts
---------------------------
 HTTP 200 OK              : 0
 HTTP 201 Created                    : 0
 HTTP 202 Accepted                   : 0
 HTTP 203 Provisional Info           : 0
 HTTP 204 No Content                 : 0
 HTTP 300 Multiple Choices           : 0
 HTTP 301 Moved Permanently   : 0
 HTTP 302 Moved Temporarily   : 0
 HTTP 303 Method                     : 0
 HTTP 304 Not Modified        : 0
 HTTP 400 Bad Request                : 0
 HTTP 401 Unauthorized               : 0
 HTTP 402 Payment Required    : 0
 HTTP 403 Forbidden                  : 0
 HTTP 404 Not Found                  : 0
 HTTP 405 Method Not Allowed  : 0
 HTTP 406 None Acceptable     : 0
 HTTP 407 Proxy-Auth Required : 0
 HTTP 408 Request Timeout     : 0
 HTTP 409 Conflict                   : 0
....
```

Useful commands and tools

AP tags verification

#show ap tag summary

Number of APs: 2

AP Name	AP Mac	Site Tag Name	Policy Tag Name	RF Tag Name	Misconfigured	Tag Source
2702I-sniffer	64f6.9d58.5d3c	default-site-tag	default-policy-tag	default-rf-tag	No	Default
APa80c.0dd2.1fa8	a80c.0dd2.1fa8	default-site-tag	default-policy-tag	default-rf-tag	No	Default

Sep 19 14:17:09.787: %CONFIG_VALIDATOR_MESSAGE-5-EWLC_GEN_ERR: Chassis 2 R0/0: wncmgrd: Error in AP MAC: 4001.7ab2.c41e Applied policy-tag : noexiste definition does not exist

#sh ap tag summary

LabAP	4001.7ab2.c41e	default-site-tag	default-policy-tag	default-rf-tag	Yes	Static

Useful commands and tools

AP tags verification

#show ap name APa80c.0dd2.1fa8 tag detail

```
AP Name          : APa80c.0dd2.1fa8
AP Mac           : a80c.0dd2.1fa8

Tag Type          Tag Name
------------------------------
Policy Tag        default-policy-tag
RF Tag            default-rf-tag
Site Tag          default-site-tag

Policy tag mapping
------------------
WLAN Profile Name           Policy Name                 VLAN                    Central Switching       IPv4 ACL          IPv6 ACL
-------------------------------------------------------------------------------------------------------------------------------------
dot1x-test                  default-policy-profile      VLAN0711                ENABLED                 Not Configured    Not Configured

Site tag mapping
----------------
Flex Profile      : default-flex-profile
AP Profile        : default-ap-profile
Local-site        : Yes
```

Conclusion : troubleshooting recap

Step 1 : show log

Dec 18 13:38:18.228: %LINEPROTO-5-UPDOWN: Line protocol on Interface Capwap1, changed state to down
Dec 18 13:38:18.205: %CAPWAPAC_SMGR_TRACE_MESSAGE-3-EWLC_GEN_ERR: Chassis 1 R0/0: wncd: Error in Session-IP: 192.168.16.134[5264] Mac: 7069.5a51.46e0 Heartbeat timer expiry for AP. Close CAPWAP DTLS session
Dec 18 13:38:18.231: %CAPWAPAC_SMGR_TRACE_MESSAGE-5-AP_JOIN_DISJOIN: Chassis 1 R0/0: wncd: AP Event: AP Name: 4802paolo, MAC: 4c77.6d9e.60e4 Disjoined
Dec 21 06:19:45.425: %HTTP-4-SERVER_CONN_RATE_EXCEED: Number of connections per minute has exceeded the maximum limit(500)as specified by the platform.
..Dec 21 06:20:00.748: %HTTP-4-SERVER_CONN_RATE_EXCEED: Number of connections per minute has exceeded the maximum limit(500)as specified by the platform.
.Dec 21 06:20:00.785: %HTTP-4-SERVER_CONN_RATE_EXCEED: Number of connections per minute has exceeded the maximum limit(500)as specified by the platform.
.Dec 21 06:20:15.616: %HTTP-4-SERVER_CONN_RATE_EXCEED: Number of connections per minute has exceeded the maximum limit(500)as specified by the platform.

Conclusion : troubleshooting recap

Step 5 : TAC case

- RA-trace output (internal level, while we're at it) or **show logging profile wireless** of always-on output filtered for the problematic mac or timestamp
- Relevant show techs (at least **show tech** + **show tech wireless**)
- Your observations from "**show logging**" or "**show logging trace-on-failure summary**" (timestamps, affected macs)
- Core dump files from the web UI troubleshooting page (if the problem is a crash)

You make **possible**