
cisco Live!
ALL IN

The bridge to possible

Wireless Config Analyzer Express

Take Cisco Brain in Your Hands

Javier Contreras – Principal Engineer

BRKEWN-3006

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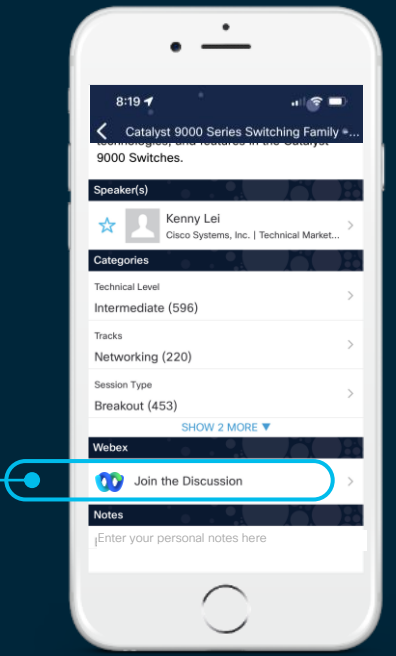

https://ciscolive.ciscoevents.com/ciscolivebot/#BRKEWN-3006

Agenda

- What is WCAE?
- How to use it?
- Examples
- Where do I start?
- Other Tools
- Conclusion

What is the Wireless Config Analyzer Express?

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Wireless Config Analyzer Express

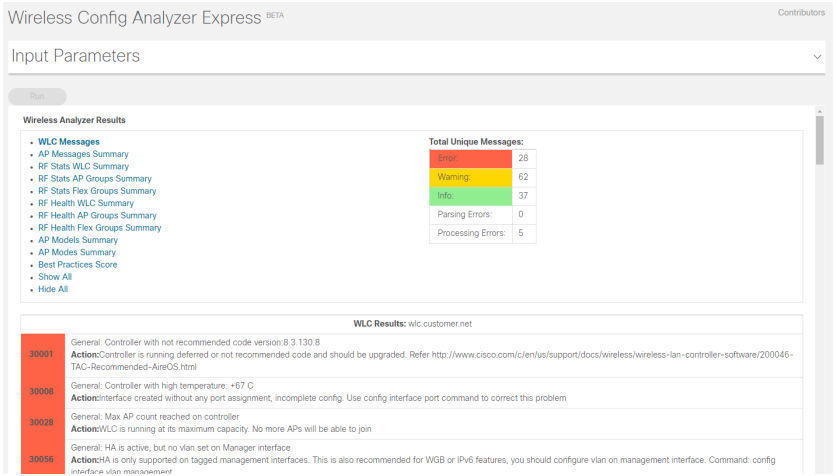
- Evolution from WLCCA
- Bring human years of learning and experience to you
- Case prevention
- Reduce case lifetime
- Single controller analysis
- Support for AireOS or 9800/EWC
  - Any model, any version

A bit of history…

- Born from: “No way I will check 200 interfaces across 45 controllers”
- Push for sharing: “2 weeks of Aps droping on and off, one line setting: STP”
- 700 Supermarkets. Which one is having RF issues?

Wireless Config Analyzer Express

- I got 5000 Aps… How do I find which ones have problems?
- Do I have any config errors?
- Is my current code correct?
- How is my implementation of best practices?



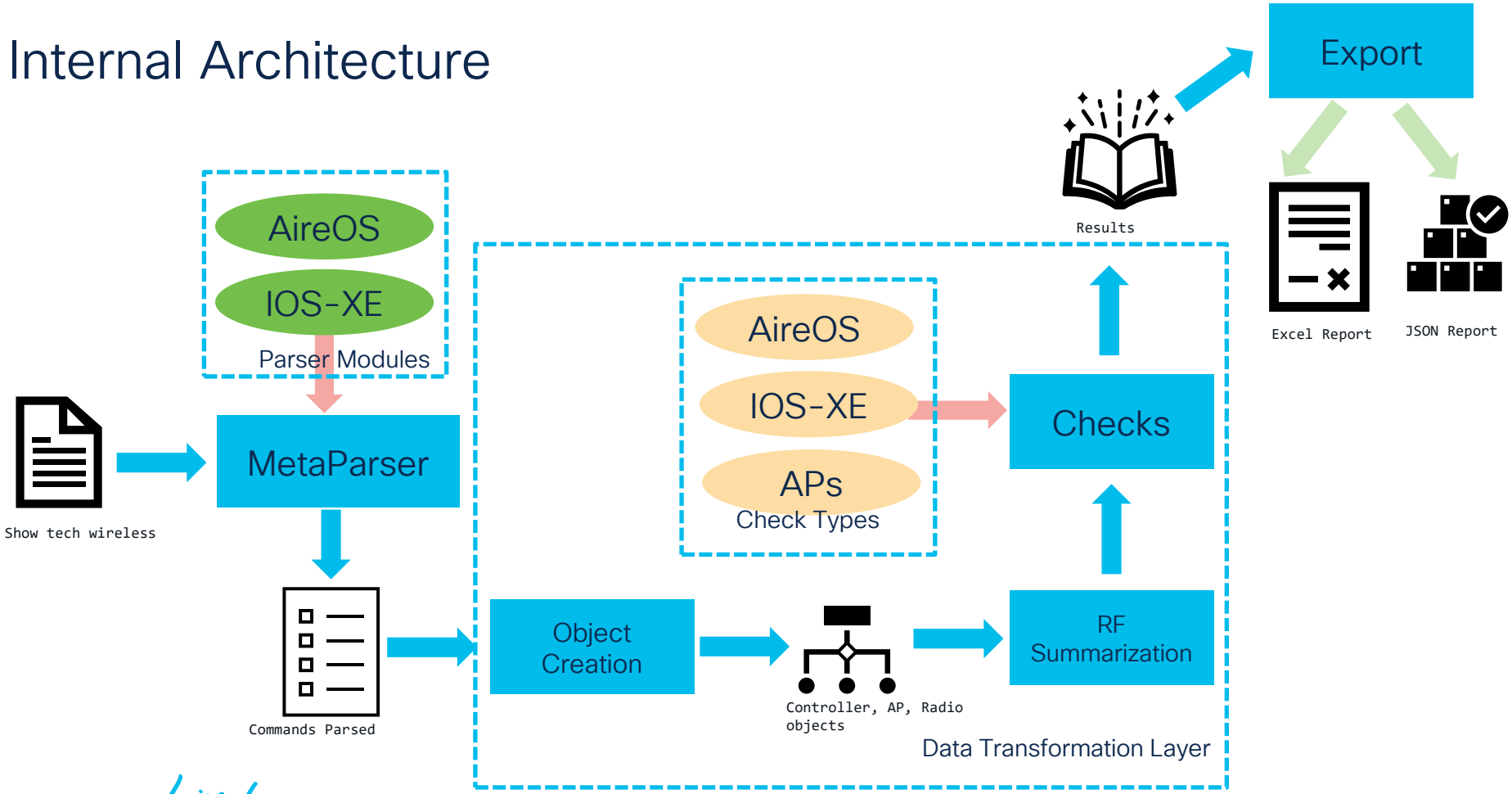
Wireless Config Analyzer Express

- What it does:
  - Configuration Checks
  - RF Health Analysis
  - RF Stats Summarization
  - Upgrade Advisor
  - Channel Stats
  - Tag/Policy usage
  - RRM analysis
  - Log Message Summarization
  - Ap inventory
  - RF Graph Analysis
- New Client audits:
  - 8821, iPhone, Drager, Vocera, Spectralink
- Client type list
- NDP AP summarization
- Controller config highlights
- AP Config view
- AP RF view

Where?

- Cloud Version:
  https://cway.cisco.com/tools/WirelessAnalyzer/
- Desktop Version:
  https://github.com/CiscoDevNet/wcae
- More info:
  https://developer.cisco.com/docs/wireless-troubleshooting-tools/
- Alias:
  wcae@cisco.com
- Webex Room:
  https://eurl.io/#R6RK2M73v

Internal Architecture



Basic Concepts

Input Files

You can upload a Zip!

- Tool supports:
  - “sh run-config” ← AireOS
  - “sh tech wireless” ← 9800/EWC
- Best way to capture it, AireOS:
  - SSH with config paging disabled
  - Use: *transfer upload datatype run-config (max 32MB)*

  https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!how-to-colletct-sh-run-config
- Best way to capture it, IOS-XE:
  - SSH and collect all output
  - Debug bundle, add the command “show tech wireless”

  https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!best-way-on-how-to-collect-show-tech-wireless-for-catalyst-9800

WLC/AP Checks

- ID is unique number assigned to the check
- Level indicates severity
- Category: Config Errors, Best Practices, Operational, Information
- Feature: to facilitate identifying where it applies

ID	Level	Category	Feature	Message	Action
230011	Error	Operational	RRM	RRM: RRM leaders do not match between 2.4 and 5GHz bands, this could lead to errors on FRA calculations	FRA needs that both 2.4 and 5GHz leaders run on same physical controller. In situations for static leaders, if the platform license AP count is exceeded, the grouping may be splitl leading to this situation. In that case, FRA can't be used. A configuration change or reassignment of APs is recommended
230022	Error	Config Error	Load Balancing	Load Balancing: Load Balancing window is zero, it is strongly suggested to use higher value	Using a window set to zero can cause serious association errors, try to use 5 or higher. Command: config load-balancing window
230010	Warning	Config Error	11n/11ac/ 11ax	11n/11ac/11ax: DCA with channel bonding in use and 11n/11ac/11ax are disabled. Invalid configuration.	Either disable channel bonding in 5GHz configuration, or enable back high speed protocols (11n/11ac/11ax)
230017	Warning	Best Practices	CAPWAP	CAPWAP: Invalid AP join counter, it is higher than controller capacity, contact TAC as it is possible software defect	If the AP joined counter is higher than platform allowed count, this could indicate a potential software defect, contact TAC for more information
230009	Info	Best Practices	RRM	RRM: Channels 100-140 are not in use for DCA. If country regulations allows it, it is advisable to enable to improve channel distribution on 5GHz band	When possible, enable all supported channels, to reduce any co-channel interference on high AP density scenarios
230020	Info	Best Practices	Webauth	Webauth: Virtual Gateway IP is not on 192.0.2.0/24 , 198.51.100.0/24 , 203.0.113.0/24 networks, change to recommended to avoid overlapping with Internet Allocated addresses. RFC5737	Virtual GW address must not match any Internet Routable address, as it could lead to controller blackholing traffic for it. Use one of the recommended addresses

WLC/AP Checks

- How to interpret:
  - Error: you should really check it up
  - Warning: may or not be important, depending on scenario, design, etc
  - Info: just as reference, can be valid/normal data

- Always evaluate the information
- Check Action field on how to fix or for more information

- Best Practices try to be “good” for most cases, exceptions do apply
- Config Errors: most of the time they are real

WLC/AP Checks

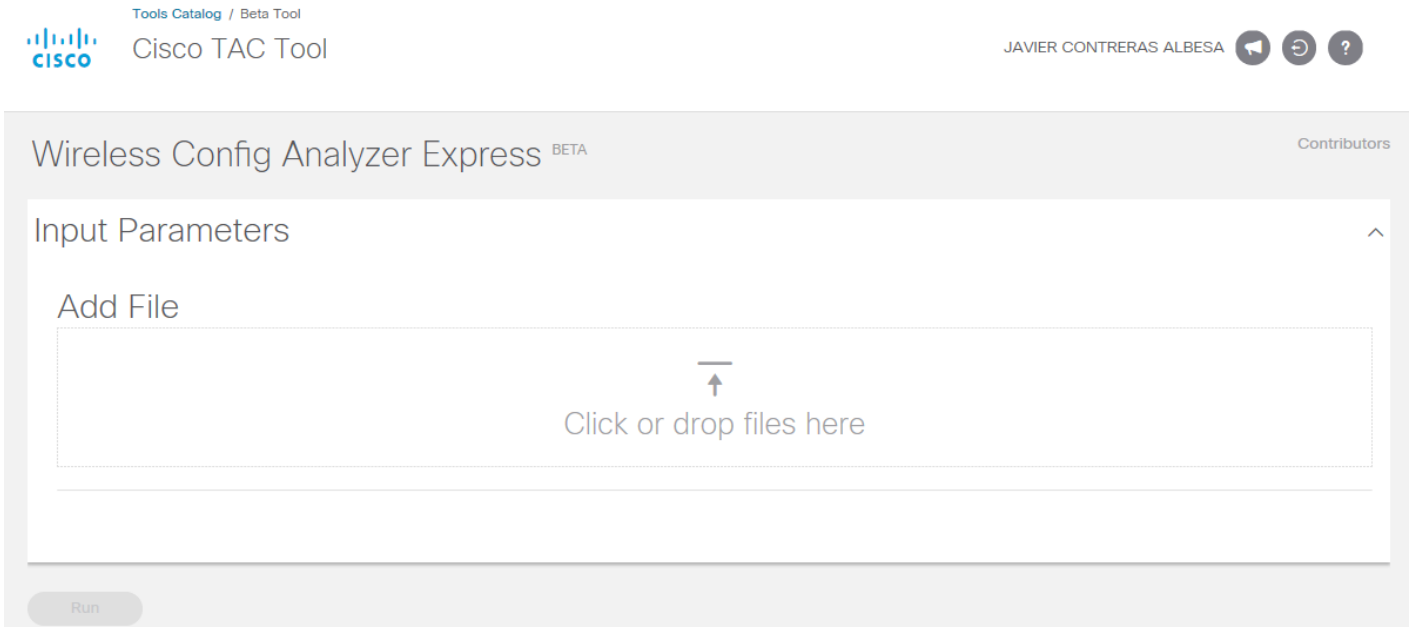
Area	9800	AireOS
General	99	144
WLAN	25	NA
Policy	24	NA
Others (RF prof, Mesh, Flex, etc)	11	12
RF	32	32
Security	NA	22
AP	34	34

Data Summarization

- Three levels of aggregation
  - Controller
  - Per Site Tag/AP group
  - Per Flex Profile / Flex group
- All RF info is per band taken from individual AP radios
- Band is detected per slot

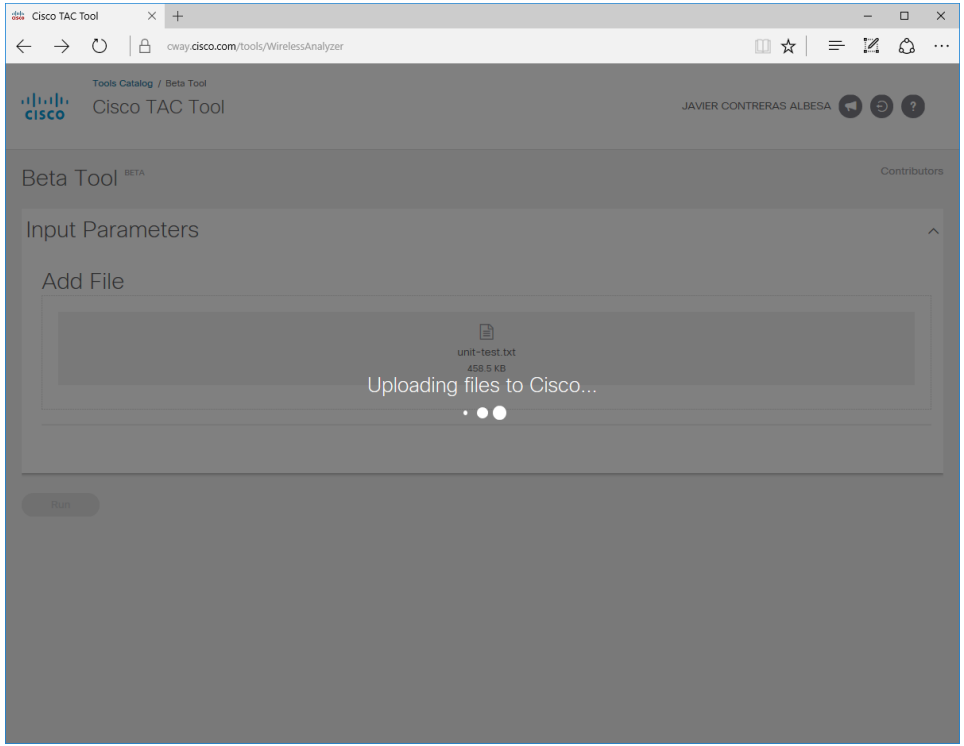
How to use

- Go to : https://cway.cisco.com/tools/WirelessAnalyzer/

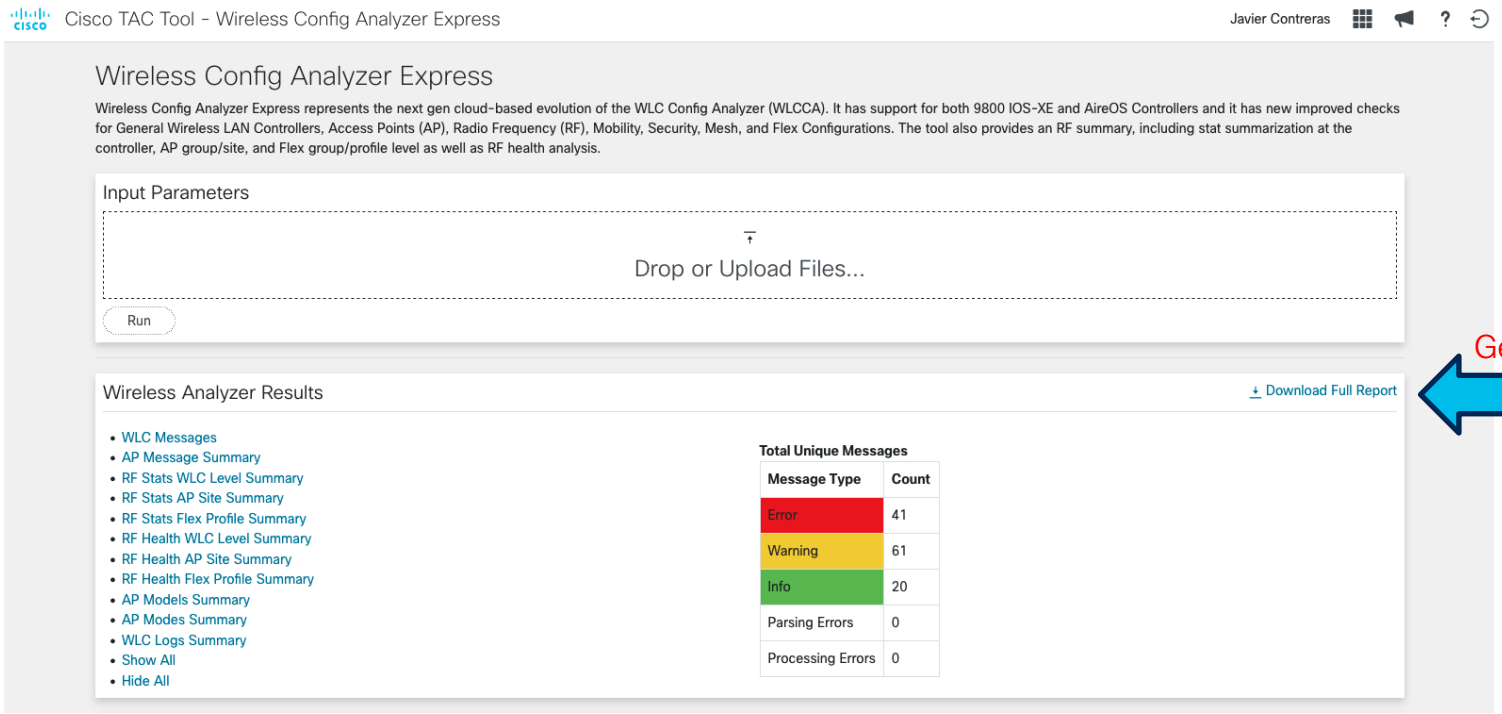


How to use

- Upload file, analysis will start

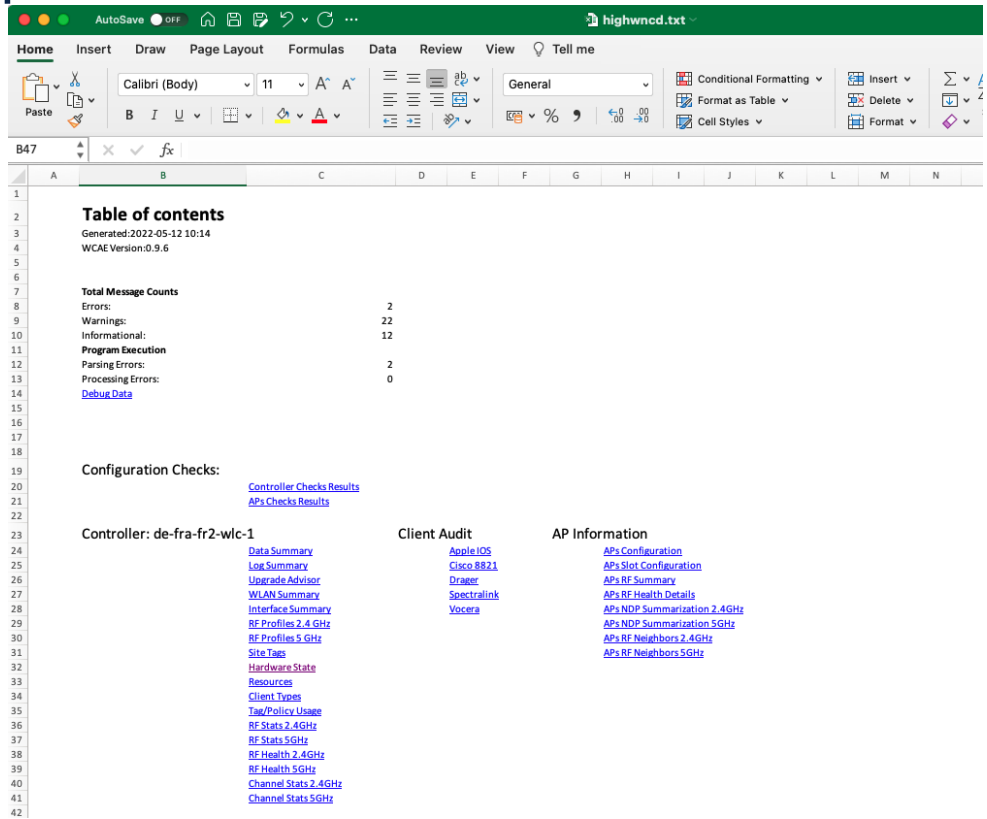


Done!



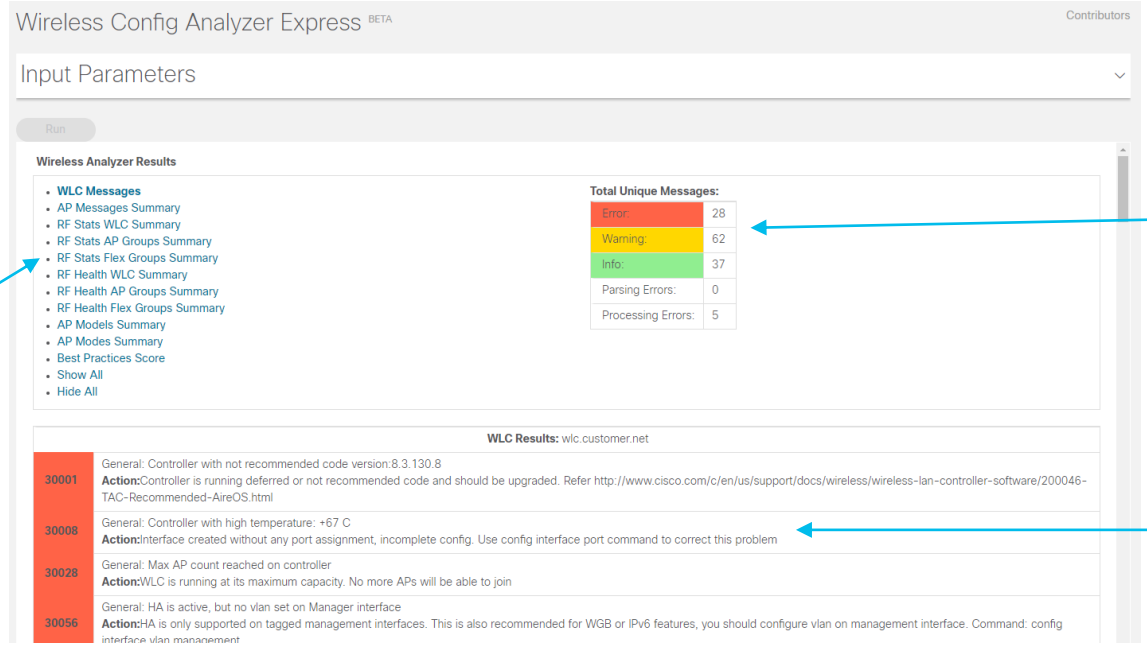
Get full analysis!

XLS Report



Cloud – Reviewing Results

Interface



Menu Area

Message Counts

Open summary

RF Stats WLC

RF State	Radios High CoChannel	39	28
	Radios High Utilization	0	0
	Isolated Radios	0	0
	Poor Coverage Radios	0	1
	High	0	0
	Radios Interference Profile Failed	1	0
	Radios Noise Profile Failed	0	0
	Radios Load Profile Failed	0	0
DFS	Radios DFS Channel	0	26
	Radios Non DFS Channel	42	16
Client Stats	Radios with Low SNR Clients	5	12
	Total High SNR Clients	33	142
	Total Low SNR Clients	5	16
	Total High RSSI Clients	36	148
	Total Low RSSI Clients	2	10
	Total Associated Clients	40	168
Clean Air	Total Clean Air Detected Devices	155	0

Radios with more than 10 channel changes per day

Help

Quick RF issues

DFS use

Client levels

Interf.

RF Stats WLC

- Summary per AP Group/Tag or Flex Group/Profile
- Reports if any AP is missing radios

RF Stats AP Groups Level Summary

DML

		2.4GHz Band	5GHz Band
Radio states	**Total Radios:**	65	65
	Total Enabled:	65	65
	Total Disabled:	0	0
	Total Missing Config:	0	0
	Total Client Servicing:	65	65
Radio Types	**Legacy:**	0	0
	11n:	65	58
	11ac:	0	7
	Unknown:	0	0
Radio RRM State	**TPC Auto Power:**	64	65
	Manual Power:	1	0
	DCA Auto Channel:	0	0
	Manual Channel:	65	65
	Radios High CoChannel:	60	14
	Radios High Utilization:	3	0
	Isolated Radios:	0	0
	Poor Coverage Radios:	65	64

RF Health WLC/AP Groups/Flex Groups

General Evaluation

Total Radios per Level

RF Health WLC Level Summary

	2.4GHz Band	5GHz Band
Total Radios:	542	580
Health Assesment:	Low	High
Lowest Metric Average:	53	80

Stats

AP Radio Count per RF Health Metrics

	2.4GHz Band			5GHz Band		
	Low	Medium	High	Low	Medium	High
Co-Channel Neighbor Utilization:	25	80	437	0	0	580
Co-Channel Overlapping:	53	80	409	0	3	577
Side Channel Overlapping:	0	0	542	0	0	580
Noise Same Channel:	0	1	541	0	0	580
Noise Side Channel:	1	4	537	0	0	580
Interference Same Channel:	0	2	540	0	0	580
Interference Side Channel:	0	0	542	0	0	580
Low SNR Clients:	4	10	528	23	63	494
Radio Utilization:	131	114	297	25	11	544
Cleanair Interferers:	0	0	542	0	0	580

Individual Metrics

RF Health WLC/AP Groups/Flex Groups

- Co-Channel Neighbor Utilization
  - Summary of Nearby Aps on channel, activity vs distance
- Co-Channel Overlapping
  - Summary of Nearby Aps on channel, tx power vs distance
- Side Channel Overlapping
  - Summary AP on sides of current channel (channel distance for 2.4 GHz, 5GHz bonding options)
- Noise Same Channel
  - Noise level of current channel. -80 dBm is 0, 50 is 100%
- Noise Side Channel:
  - Noise levels of sides of adjacent channels

RF Health WLC/AP Groups/Flex Groups

- Interference Same Channel
  - Interference (wifi) on same channel. -90 dBm is 0, -50 is 100%
- Interference Side Channel
  - Interference (wifi) on adjacent channels, including 5GHz bonding options
- Low SNR Clients
  - For Aps with >5 clients. Percentage of clients < 25 SNR
- Radio Utilization
  - 60% utilization is 0% health
- Cleanair Interferers:
  - Relation of interferers for their RSSI vs Duty cycle

Mini-Desktop Version

WCAE Mini Desktop

- Same engine as the cloud version, same checks
- Only provides full report, with detailed RF information
- Additional summarization levels
- RF internal reports
- Supports Mac OS or Windows
- XLS report saved on same location as file

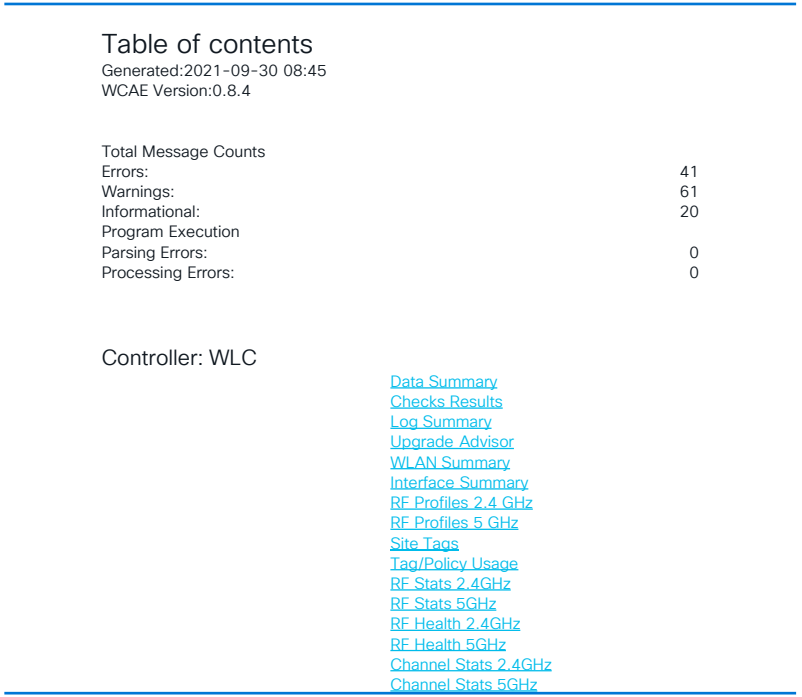


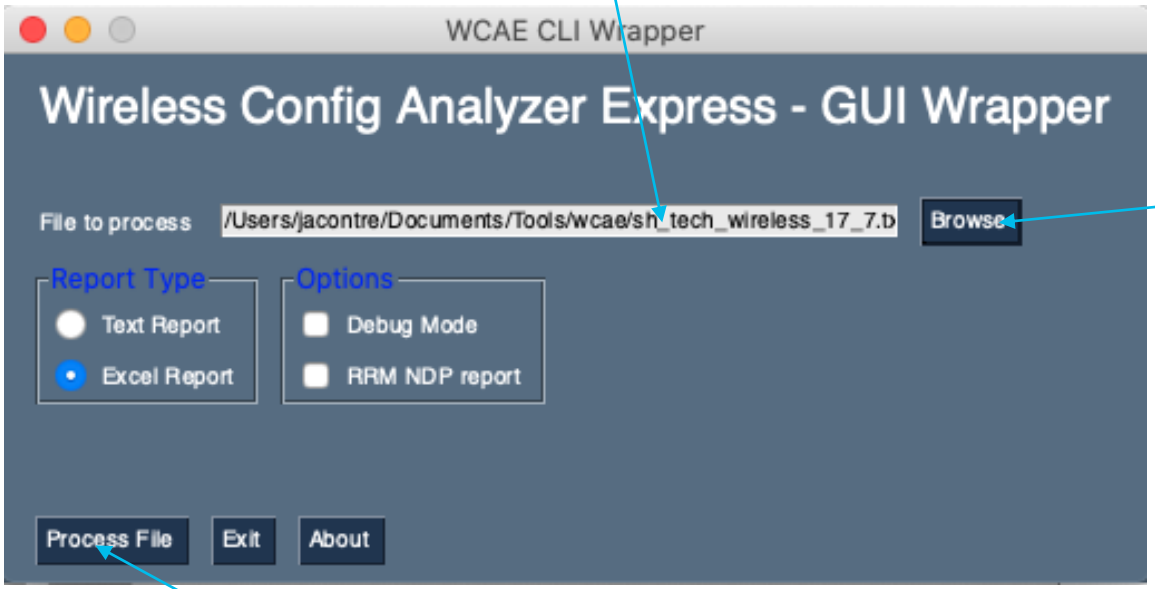
Table of contents

Generated:2021-09-30 08:45
WCAE Version:0.8.4

Total Message Counts	
Errors:	41
Warnings:	61
Informational:	20
Program Execution	
Parsing Errors:	0
Processing Errors:	0

Controller: WLC

Interface



Too much info, where do I start?

How to do initial assessment

- I am 4000 KM away… how do I get “a feeling” of your network?
  - Power level distribution
  - Channel list in use
  - Tags in use
  - Co-channel metrics
  - On channel highest neighbor
  - RF Health

Getting a feeling… Channel Stats

Summarization Level	Name	Channel	APs	Clients	Average Power
Site Tag	default-site-tag	60	2	0	3
Site Tag	default-site-tag	161	2	0	6.5
Site Tag	default-site-tag	48	3	1	6
Site Tag	default-site-tag	104	1	0	8
Site Tag	default-site-tag	157	3	2	6
Site Tag	default-site-tag	64	4	0	6.75
Site Tag	default-site-tag	100	3	0	4.67
Site Tag	default-site-tag	124	3	0	8
Site Tag	default-site-tag	132	3	1	4
Site Tag	default-site-tag	144	1	0	3
Site Tag	default-site-tag	40	2	1	6.5
Site Tag	default-site-tag	112	2	0	5.5
Site Tag	default-site-tag	52	3	0	8
Site Tag	default-site-tag	149	2	0	6.5
Site Tag	default-site-tag	128	2	0	5.5
Site Tag	default-site-tag	44	2	0	5
Site Tag	default-site-tag	116	2	0	5.5
Site Tag	default-site-tag	153	1	0	8
Site Tag	default-site-tag	140	1	0	3
Site Tag	default-site-tag	36	2	0	4
Site Tag	default-site-tag	120	1	0	8
Site Tag	default-site-tag	165	1	0	8

Summarization Level	Name	Channel	APs	Clients	Average Power
Site Tag	sitetag	60	16	22	1.19
Site Tag	sitetag	56	14	14	1.14
Site Tag	sitetag	44	20	18	1.1
Site Tag	sitetag	64	21	11	1.1
Site Tag	sitetag	36	73	74	1.05
Site Tag	sitetag	52	11	9	1.09
Site Tag	sitetag	48	16	35	1.31
Site Tag	sitetag	40	13	24	1.31

Channel plan issues

- Reduced Channel list leads to high cochannel
- Common in 2.4
- For 5GHz:
  - DCA configuration
  - Country restrictions
  - High density + Omni antennas
- For 6GHz
  - Wide channels
- Symptoms:
  - High on channel Neighbor
  - Maxed out RX Neighbor count

RF Health	RX Neighbors	Highest RX Neighbor	On Channel Neighbor Count	Highest RX Neighbor on Channel	Lowest RX Neighbor
13.51	34	-58	5	-72	-84
86.11	34	-52	5	-68	-95
42.86	34	-50	4	-68	-86
95	34	-53	4	-75	-91
100	22	-47	4	-75	-83
96.67	34	-46	4	-80	-89
28.57	34	-46	4	-74	-91
83.33	34	-50	4	-68	-85
53.33	34	-63	4	-70	-92
41.67	30	-38	4	-49	-87
58.33	34	-46	4	-59	-93
43.33	29	-29	4	-62	-88
100	28	-53	4	-78	-93
55.56	32	-44	4	-55	-92
93.33	33	-44	4	-78	-89

Power distribution

- High Power levels
  - Low coverage
  - Bad TPC config
- Low power levels
  - High Ceiling scenario

Summarization Level	[redacted]	Channel	APs	Clients	Average Power
Controller		157	17	6	2.82
Controller		149	27	3	4.33
Controller		40	6	0	2.83
Controller		44	28	0	2.79
Controller		161	17	0	3.59
Controller		36	25	10	2.92
Controller		48	12	15	3.33
Controller		153	2	0	3.5
Site Tag		157	17	6	2.82
Site Tag		149	27	3	4.33
Site Tag		40	6	0	2.83
Site Tag		44	28	0	2.79
Site Tag		161	17	0	3.59
Site Tag		36	25	10	2.92
Site Tag		48	12	15	3.33
Site Tag		153	2	0	3.5

Summarization Level	Name	Channel	APs	Clients	Average Power
Site Tag	sitetag	60	16	22	1.19
Site Tag	sitetag	56	14	14	1.14
Site Tag	sitetag	44	20	18	1.1
Site Tag	sitetag	64	21	11	1.1
Site Tag	sitetag	36	73	74	1.05
Site Tag	sitetag	52	11	9	1.09
Site Tag	sitetag	48	16	35	1.31
Site Tag	sitetag	40	13	24	1.31

Client view

- AP Health : Low SNR clients
- AP Stats (per AP)
  - On Channel Neighbor count
  - Highest Neighbor
  - Lowest Neighbor
- RF stats (per area)
  - Channel change count
  - Low vs High SNR
  - Poor coverage
  - Isolated
- RF Health as Area highlight

Summarization Level	[redacted]	Assesment	Total APs	AP Low RF Health	AP Medium RF Health	AP High RF Health
Controller		High	1918	132	132	1654
AP Group		High	7	0	0	7
AP Group		High	55	1	1	53
AP Group		High	59	5	2	52
AP Group		High	43	5	4	34
AP Group		High	44	4	3	37
AP Group		High	44	2	5	37
AP Group		High	13	0	0	13
AP Group		High	24	1	1	22
AP Group		High	86	4	9	73
AP Group		High	82	6	8	68
AP Group		High	27	3	1	23
AP Group		High	61	1	2	58
AP Group		High	25	0	2	23
AP Group		High	10	1	2	7
AP Group		High	47	0	0	47
AP Group		High	56	0	3	53
AP Group		High	43	1	1	41
AP Group		High	84	5	4	75
AP Group		High	146	8	10	128
AP Group		High	107	17	5	85
AP Group		High	66	2	5	59
AP Group		High	23	1	3	19
AP Group		High	31	1	0	30
AP Group		High	109	14	8	87
AP Group		High	221	34	20	167
AP Group		High	48	0	2	46
AP Group		High	36	0	1	35

6GHz Migration

- Power levels per site
  - 3-4: we are good
  - 1-2: be careful
- YMMV!

Summarization Level	Name	Channel	APs	Clients	Average Power	Average Power dBm
Controller	9800-b	36	82	20	5.63	2.79
Controller	9800-b	52	26	3	5.62	2.62
Controller	9800-b	64	53	11	5.42	3.13
Controller	9800-b	132	68	12	7.15	3.53
Controller	9800-b	100	49	11	7.04	3.82
Controller	9800-b	112	45	17	7.16	3.53
Controller	9800-b	48	20	2	5.95	2.05
Controller	9800-b	44	21	6	6.24	0.24
Controller	9800-b	104	4	1	6	7.75
Controller	9800-b	108	1	0	4	14
Controller	9800-b	56	13	4	5.54	2.69
Controller	9800-b	40	2	0	3	12
Controller	9800-b	136	3	0	6.33	7
Controller	9800-b	60	2	1	4.5	8

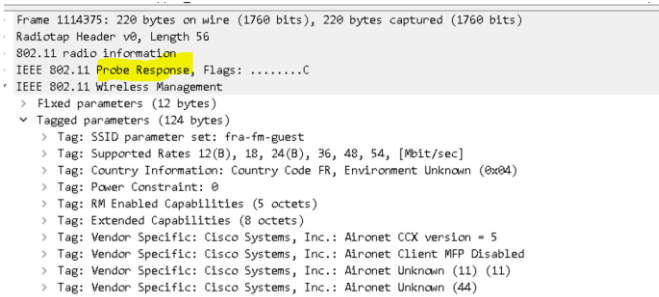
Summarization Level	Name	Channel	APs	Clients	Average Power	Average Power dB
Controller	9800-a	48	42	17	1.81	14.57
Controller	9800-a	64	257	20	1.58	16.25
Controller	9800-a	132	173	12	2.1	19.6
Controller	9800-a	36	311	16	1.36	15.92
Controller	9800-a	100	213	30	2.2	19.34
Controller	9800-a	112	90	9	2.8	17.57
Controller	9800-a	56	11	2	1.36	16.91
Controller	9800-a	108	16	0	2.12	19.62
Controller	9800-a	52	115	11	1.89	15.34
Controller	9800-a	40	9	0	1.44	15.67
Controller	9800-a	44	49	4	2.12	13.63
Controller	9800-a	104	8	0	1.88	20
Controller	9800-a	60	16	4	1.19	17.44
Controller	9800-a	136	34	3	2.94	17.18
Controller	9800-a	116	1	0	8	2

Real Life Examples...

AP not broadcasting 11n/11ax

- Customer reports 9115 not broadcasting HT/VHT/HE
- TAC case opened, TAC reaches alias for possible new defect

- WCAE:



240009	Warning	Config Error	11n/11ax/11a x	802.11n/11ac radios are present, but WMM is disabled on the WLAN(s): FRA_AP_WLAN_PRO,FRA_AP_WLAN_GUEST

```
WLAN Profile Name     : XXXXX
================================================
Identifier                                      : 7
Description                                     :
Network Name (SSID)                             : XXXXX
Status                                          : Enabled
Broadcast SSID                                  : Enabled
Advertise-Apname                                : Disabled
..
CHD per WLAN                                    : Enabled
WMM                                             : Disabled. <<< THIS
WiFi Direct Policy                              : Disabled
```

Guest WLAN not working

- 118 Policy Tags
- Clients report problems

230070	Error	Config Error	Tag	Tag policy is using a Policy name not found. This will cause significant impact. Tag XXX Policy	This is normally a misconfiguration on the Tag entry, with possible invalid Policy name set. Please edit the tag and check the policy name used

- Webauth Not working
- GUI warns in 17.6+

240003	Error	Config Error	Webauth	WLAN profile(s) with webauth parameter map pointing to non-existing value. Profile: guest1	Check the configuration item, and change/replace it with a existing value

Full Gory Details...

Log Summary

- Troubleshooting help
- Shows how many times, first found and last found per message

Type	Times	Severity	First	Last
SWPORT-4-MAC_CONFLICT	469	Warning	Oct 15 19:02:05.873: %IOSXE-4-PLATFORM: Chassis 1 R0/0: cpp_cp: QFP:0.0 Thread:000 TS:00001316162762868333	Oct 20 13:44:51.481: %IOSXE-4-PLATFORM: Chassis 1 R0/0: cpp_cp: QFP:0.0 Thread:000 TS:00001729120363188363
SEC_LOGIN-5-LOGIN_SUCCESS	10	Notice	Oct 16 05:21:35.642:	Oct 20 14:01:20.911:
WEBSERVER-5-LOGIN_PASSED	6	Notice	Oct 16 05:21:35.643:	Oct 20 11:33:04.933:
WEBSERVER-5-SESS_LOGOUT	3	Notice	Oct 16 05:38:04.777:	Oct 19 14:46:37.097:
WEBSERVER-5-SESS_TIMEOUT	3	Notice	Oct 20 05:56:09.139:	Oct 20 12:18:28.509:
SYS-5-CONFIG_P	1	Notice	Oct 20 11:55:46.369:	Oct 20 11:55:46.369:
SYS-6-TTY_EXPIRE_TIMER	2	Info	Oct 20 11:48:25.463:	Oct 20 12:16:58.814:
SYS-6-LOGOUT	3	Info	Oct 20 11:48:25.468:	Oct 20 14:01:01.708:

Upgrade Advisor

- Maximum version that can be installed
- Checks controller and AP models
- AireOS: Can you migrate to IOS-XE?

Upgrade Advisor

Current Controller version:	17.3.3
Maximmum possible or Recommended Network version:	17.3.x
Maximum Supported Controller Version:	No Current Limit
Maximum Common Supported APs Version:	17.3.x
Maximum Supported version per AP detected model:	
AP3802	No Current Limit
AP1562	No Current Limit
1562	No Current Limit
C9120	No Current Limit
CAP2702	17.3.x
Recommended upgrade path to maximum version:	Upgrade directly to 17.3.x
Documentation for more details	9800 Recommended Code Upgrade Tips and Tricks Wireless Compatibility Matrix

WLAN Summary

- Combination of WLAN and Policy profiles
- Uses Tags and all unused WLANs
- Highlights config errors

WLAN Name	SSID	WLAN Status	Policy Name	Policy Status	Vlan	WLAN Active Clients	Radio Policy	Security Policies
OEAP	ne0-w1f1	Enabled	policy_profile	Enabled	VLAN0010	0	All	WPA2 AES Auth: 802.1x OKC
Test-AX	Test-AX	Enabled	Test-AX_WLANID_2	Enabled	VLAN0010	1	All	WPA2 AES Auth: PSK OKC CCKM
RHA-Voice-5G	RHA-Voice-5G	Enabled	Test-AX_WLANID_1	Enabled	VLAN0050	1	All	WPA2 AES WPA3 Auth: PSK OKC
wlan-ipad	nextstage	Enabled	wProfPol__iPad	Disabled	90	245	802.11a only	WPA2 AES Auth: PSK OKC
wlan-ginga	wProfPol_2F		Profile name not found					
wlan-guest	GuestNet	Enabled	wProfPol_Osaka_Guest	Enabled	VLAN1400	29	All	WPA2 AES Auth: PSK OKC Webauth

Interface Summary

- Quick view of most important parameters
- Highlights vlan name errors
- Where it is being used

Interface Name	IP Address	Mask	MTU	Shutdown	Protocol	DHCP Proxy	DHCP Relay source	Vlan Name	Profile Use
GigabitEthernet1	172.31.247.75	255.255.255.192	1500	No	Down				None
GigabitEthernet2				No	Up				None
GigabitEthernet3				No	Down				None
GigabitEthernet0				No	Down				None
Vlan1			1500	No	Down			default	test,DISABLED
Vlan10			1500	Yes	Up			VLAN0010	RHA-Test-AX_WLANID_2,Nikkei_policy_profile
Vlan20	172.31.247.56	255.255.255.192	1500	No	Up		Vlan20	VLAN0020	None
Vlan26	10.10.26.253	255.255.255.0		No	Down	10.10.2.166,10.10.2.165		Not Found	None
Vlan50			1500	No	Up			VLAN0050	RHA-Test-AX_WLANID_1,RHA-SPB-Arena_WLANID_1
Vlan90	172.31.239.129	255.255.255.128	1500	No	Down			VLAN0090	wProfPol_Osaka_iPad

RF Profiles

- Summary of settings
- How many Aps are using it

RF Profile Name	APs Using	Status	TX Min	TX Max	TPC Threshold	Rates	RX SOP	Channel Width
24GHz_Best_Practice	1	TRUE	5	14	-70	Mandatory:24, Supported:18, 36, 48, 54, Unsupported:11, 1, 2, 5.5, 9,	auto	20
Low_Client_Density_rf_24gh	Not in use on any Tag	TRUE	-10	30	-65	Mandatory:11, 1, 2, 5.5, Supported:18, 36, 48, 54, 9, Unsupported:	low	20
High_Client_Density_rf_24gh	Not in use on any Tag	TRUE	7	30	-70	Mandatory:12, Supported:18, 36, 48, 54, 9, Unsupported:11, 1, 2, 5.5, 6,	medium	20
Typical_Client_Density_rf_24gh	4	TRUE	-10	30	-70	Mandatory:12, Supported:18, 36, 48, 54, 9, Unsupported:11, 1, 2, 5.5, 6,	auto	20

Tag/Policy Usage

- Tag combinations in use
- Aps where they are applied

Tags/Policy usage for WLC:WLC								
Combination	**Policy Tag**	**Site Tag**	**Join Profile**	**RF Tag**	**RF Profile 2.4G**	**RF Profile 5G**	**Flex Profile**	
1	RHA-SPB-Arena	wrong-vlan	RHA-SPB-Arena	RHA-SPB-Arena	Typical_Client_Density_rf_24gh	Typical_Client_Density_rf_5gh	wrong-vlan-flex	
1	**Wlan**	**Policy**						
1	RHA-Voice-5G	RHA-SPB-Arena_WLANID_1						
1	**AP List**							
1	APA4B4-3929-1							
Combination	**Policy Tag**	**Site Tag**	**Join Profile**	**RF Tag**	**RF Profile 2.4G**	**RF Profile 5G**	**Flex Profile**	
2	RHA-SPB-Arena	default-site-tag	default-ap-profile	RHA-SPB-Arena	Typical_Client_Density_rf_24gh	Typical_Client_Density_rf_5gh	RHA-SPB-Arena	
2	**Wlan**	**Policy**						
2	RHA-Voice-5G	RHA-SPB-Arena_WLANID_1						
2	**AP List**							
2	APA4B4-3929-2 APA4B4-3929.							

RF Stats

- Summary at Controller, Site tag/AP group, Flex Profile levels
- Radio analysis
  - Isolated: no valid neighbors
  - Poor roaming: no peers higher than -75
- 26 metrics provided

Summarization Level	Name	Radios	Client Servicing Radios	Enabled Radios	Disabled Radios	Auto Chanel
Controller	WLC	6	3	3	0	3
Site Tag	RHA-Test-AX	1	0	0	0	0
Site Tag	RHA-SPB-Arena	1	0	0	0	0
Site Tag	wrong-vlan	1	0	0	0	0
Site Tag	default-site-tag	2	2	2	0	2
Site Tag	Home_Office	1	1	1	0	1
Flex Profile	OEAP-FLEX	0	0	0	0	0
Flex Profile	RHA-SPB-Arena	1	1	1	0	1
Flex Profile	default-flex-profile	0	0	0	0	0
Flex Profile	wrong-vlan-flex	1	0	0	0	0

RF Health – Summary

- Summary at Controller, Site tag/AP group, Flex Profile levels
- Same as Cloud output
- Go here to find pain areas

							Co-Channel Neighbor Utilization		
Summarization Level	Name	Assesment	Total APs	AP Low RF Health	AP Medium RF Health	AP High RF Health	Low	Medium	High
Controller	name1	Low	1634	1022	258	354	173	270	1191
AP Group	name2	Medium	7	2	3	2	0	0	7
AP Group	name3	Low	49	17	5	27	2	4	43
AP Group	name4	Low	56	26	13	17	2	10	44
AP Group	name5	Low	33	24	8	1	13	6	14
AP Group	name6	Low	37	27	8	2	4	10	23
AP Group	name7	Low	38	27	6	5	12	11	15
AP Group	name8	High	13	2	1	10	0	0	13
AP Group	name9	High	24	0	7	17	0	0	24
AP Group	name10	Low	65	49	13	3	14	17	34
AP Group	name11	Low	57	34	13	10	12	12	33
AP Group	name12	Low	25	22	2	1	12	4	9
AP Group	name13	Medium	58	17	13	28	0	0	58
AP Group	name14	High	5	0	1	4	0	0	5
AP Group	BH-NB01F(NB02-N01)	High	8	2	1	5	0	2	6

RF Health – AP

- Detailed view per AP
- Drives attention to worst offender metric > Root cause

Name	Slot	Band	Channel	Health	Co-Channel Neighbor Utilization	Co-Channel Overlapping	Side Channel Overlapping	Noise Same Channel	Noise Side Channel
AP1	0	2	11	73.33	92.59	88.89	100	100	73.33
AP2	1	5	157	96.67	99.35	100	100	100	100
AP3	2	2	1	100	100	100	100	100	100
AP4	0	2	1	100	100	100	100	100	100
AP5	1	5	48	96.67	100	100	100	100	100
AP6	2	2	1	100	100	100	100	100	100
AP7	0	2	11	0	41.67	0	100	40	58.67
AP8	1	5	64	0	50	52.78	100	100	100
AP9	2	2	1	100	100	100	100	100	100
AP10	0	2	11	100	100	100	100	100	100
AP11	1	5	161	26.67	45	50	100	100	100
AP12	2	2	1	100	100	100	100	100	100
AP13	0	2	1	100	100	100	100	100	100
AP14	1	5	36	78.33	98.8	100	100	100	100
AP15	2	2	1	100	100	100	100	100	100
AP16	0	2	6	75	86.39	75	100	100	94

Channel Stats

- Summary at Controller, Site tag/AP group, Flex Profile levels
- Channel distribution, power
- Clients and Neighbor counts
- Immediately know RF design issues, density

Summarization Level	Name	Channel	APs	Clients	Average Power	Average Power dBm	Average Utilization	Average Client Count/Radio	Average Neighbor Count
Controller	WLC	6	2	0	4	8.5	42	0	0
Controller	WLC	11	1	0	4	12	82	0	0
Site Tag	default-site-tag	6	1	0	3	15	57	0	0
Site Tag	default-site-tag	11	1	0	4	12	82	0	0
Site Tag	Home_Office	6	1	0	5	2	27	0	0
Flex Profile	RHA-SPB-Arena	6	1	0	3	15	57	0	0

AP /Slot Config

- Quick view of critical AP configuration
- Review per radio configuration
- Easy to spot errors

Name	Model	Admin Status	Eth Mac	Serial	Mode	AP group/Site	Flex group/Site	Location
ap1	AIR-CAP2702E-A-K9	Enabled	A4-B4-39-29-1B-C4	FGL1413L3BH	FlexConnect	wrong-vlan	wrong-vlan-flex	default location
ap2	AIR-AP1852E-B-K9	Enabled	A4-B4-39-29-1D-28	FGL2413L3BJ	FlexConnect	default-site-tag	RHA-SPB-Arena	default location
ap3	C9120AXI-R	Enabled	A4-B4-39-29-27-5C	FGL2413L3BK	Local	default-site-tag	RHA-SPB-Arena	default location
ap4	C9120AXI-R	Enabled	F4-BD-9E-9A-67-40	FGL2429L06G	Local	RHA-SPB-Arena	RHA-SPB-Arena	default location
ap5	C9120AXI-R	Enabled	F4-BD-9E-9A-67-DC	FGL2429L06F	Local	RHA-Test-AX	default-flex-profile	default location

Name	Model	Slot	Radio Mac	Type	Mode	Admin State	Slot Op State	Current Band	Channel
ap1	AIR-CAP2702E-A-K9	0	5C-E1-76-2C-77-E0	802.11ax - 2.4 GHz	Local	Enabled	Down	2.4GHz	1
ap1	AIR-CAP2702E-A-K9	1	5C-E1-76-2C-77-E0	802.11ax - 5 GHz	Local	Enabled	Up	5 GHz	132
ap2	AIR-AP1852E-B-K9	0	5C-E1-76-2C-83-00	802.11ax - 2.4 GHz	Local	Enabled	Up	2.4GHz	6
ap2	AIR-AP1852E-B-K9	1	5C-E1-76-2C-83-00	802.11ax - 5 GHz	Local	Enabled	Up	5 GHz	144
ap3	C9120AXI-R	0	5C-E1-76-2C-D4-A0	802.11ax - 2.4 GHz	Local	Enabled	Up	2.4GHz	11
ap3	C9120AXI-R	1	5C-E1-76-2C-D4-A0	802.11ax - 5 GHz	Local	Enabled	Up	5 GHz	44

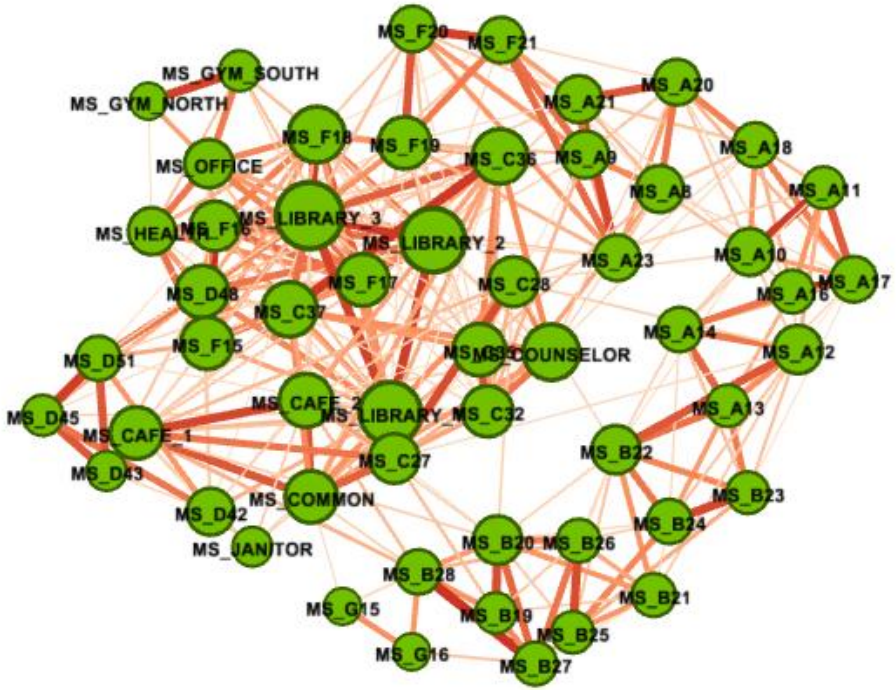
AP RF Summary

- Critical for troubleshooting
- RF issues
  - Highest Neighbor on channel
  - On channel neighbor count
  - RF health
  - Channel change count

Name	Radio Mac	Model	Mode	Slot	Band	Channel	TX Power	TX Power dBm	Total Clients	CH Util%	CH TX Util%	CH RX Util%
ap1	5C-E1-76-2C-77-E0	AIR-CAP2702E-A-K9	Local	0	2	1	3	15	0	43	1	0
ap1	5C-E1-76-2C-77-E0	AIR-CAP2702E-A-K9	Local	1	5	132	1	18	0	1	1	0
ap2	5C-E1-76-2C-83-00	AIR-AP1852E-B-K9	Local	0	2	6	3	15	0	57	1	0
ap2	5C-E1-76-2C-83-00	AIR-AP1852E-B-K9	Local	1	5	144	1	18	0	5	1	0
ap3	5C-E1-76-2C-D4-A0	C9120AXI-R	Local	0	2	11	4	12	0	82	1	0
ap3	5C-E1-76-2C-D4-A0	C9120AXI-R	Local	1	5	44	1	18	1	4	1	0

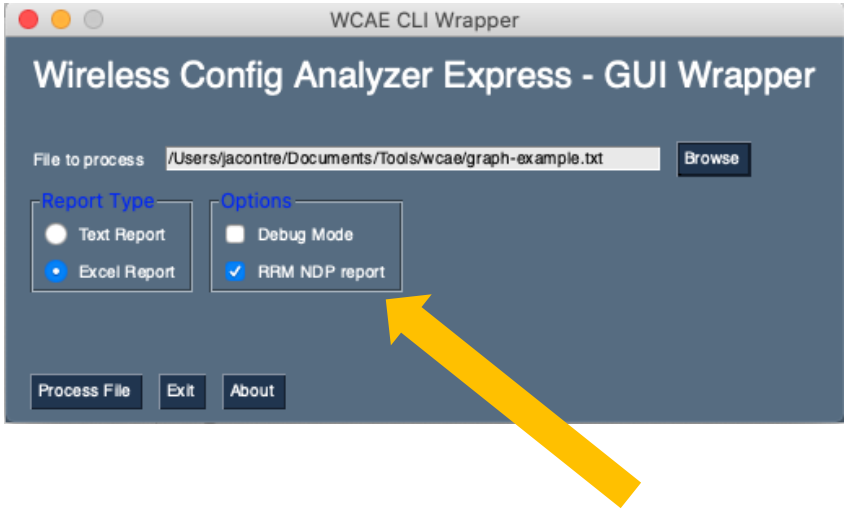
RF Graph Analysis

- Get a “physical free” view of your RF space
- Analysis of AP relationships, RF distance and impact in network
- Visual analysis to understand problems, roaming paths, etc

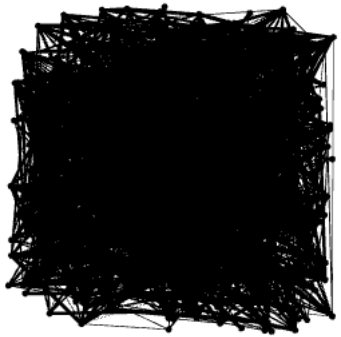


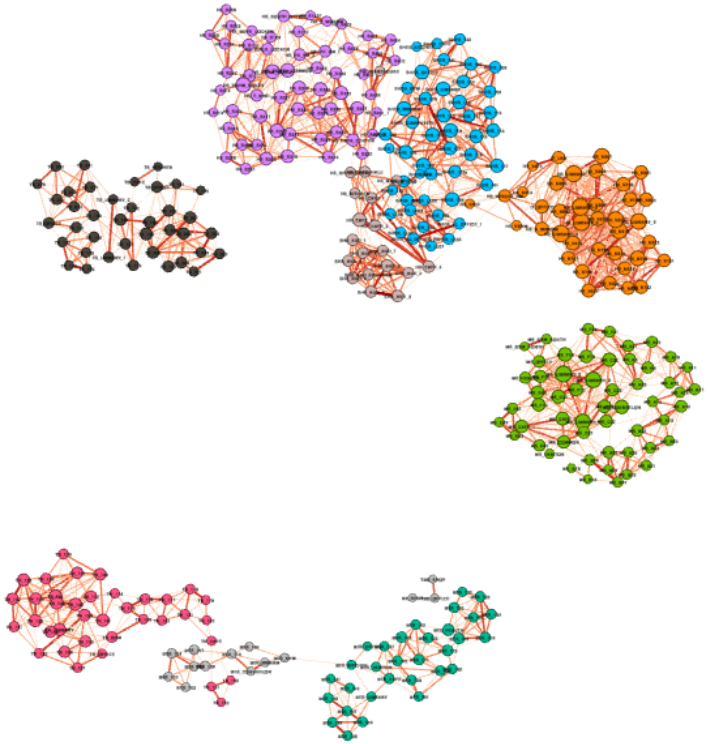
RF Graph Analysis

- You need Desktop version
- Uses external tool for visualization and “preparation” (Gephi)
- Few steps required
- https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!rf-graph-analysis-using-wcae-desktop-and-gephi/initial-requirements



RF Graph Analysis





Other Tools

Wireless Captures Simplified

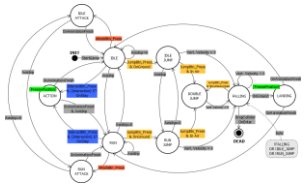
WiFi Hawk

Bird's Eye view on Features

- Expert system to identify problems over from a wireless capture
  - Hard to see issues found in huge files
  - Low level protocol analysis
  - Interoperability problems
- Generate a summary of events per client and AP WLANs
- Create Expert reports
- Speed up event identification in a wireless capture

"Loose State Machine"

- Client has state machine to detect error transitions
  - No authentication
  - PSK failures
  - EAPoL negotiation errors
- This must work even when capture is incomplete, or we have missing frames



Quick Index view

- List of BSSIDs (APs) and clients active during the capture
- Quick glance on who is having problems
- Last known state for each client (probing, auth, full traffic, etc)
- Click on each item for full details

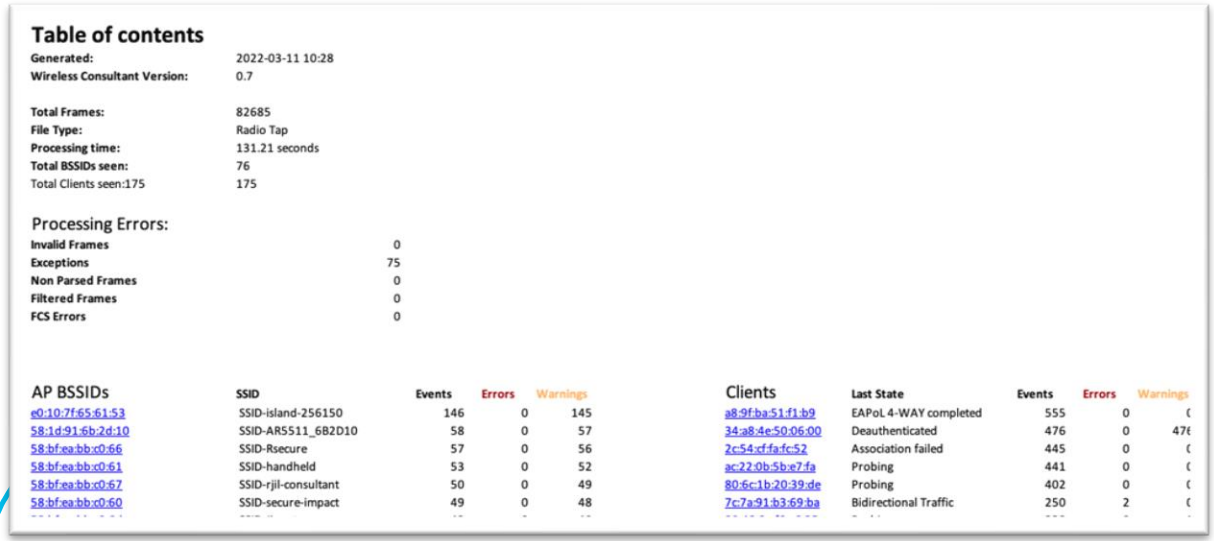


Table of contents

Generated:	2022-03-11 10:28
Wireless Consultant Version:	0.7
Total Frames:	82685
File Type:	Radio Tap
Processing time:	131.21 seconds
Total BSSIDs seen:	76
Total Clients seen:175	175

Processing Errors:

Invalid Frames	0
Exceptions	75
Non Parsed Frames	0
Filtered Frames	0
FCS Errors	0

AP BSSIDs	SSID	Events	Errors	Warnings
e0:10:7f:65:61:53	SSID-island-256150	146	0	145
58:1d:91:6b:2d:10	SSID-AR5511_6B2D10	58	0	57
58:bf:ea:bb:c0:66	SSID-Rsecure	57	0	56
58:bf:ea:bb:c0:61	SSID-handheld	53	0	52
58:bf:ea:bb:c0:67	SSID-rjil-consultant	50	0	49
58:bf:ea:bb:c0:60	SSID-secure-impact	49	0	48

Clients	Last State	Events	Errors	Warnings
a8:9f:ba:51:f1:b9	EAPoL 4-WAY completed	555	0	0
34:a8:4e:50:06:00	Deauthenticated	476	0	476
2c:54:cf:fa:fc:52	Association failed	445	0	0
ac:22:0b:5b:e7:fa	Probing	441	0	0
80:6c:1b:20:39:de	Probing	402	0	0
7c:7a:91:b3:69:ba	Bidirectional Traffic	250	2	0

Event Flow

Color coded events registered per device

Summary of repeated items for a more concise view

Quick location in capture of important issues (frame/time)

Added information for better understanding

Translation of reason codes, failures, EAP types, etc

Event Flow:

Direction	Type	Severity	BSSID	Frame	Time	Info
>>>>>>	Probe requests	Info	NA	28669	NA	Consecutive requests:48
<<<<<<	Probe responses	Info	NA	28617	NA	Consecutive responses:223
>>>>>>	Auth request	Info	64:f6:9d:55:5c:f4	28688	Thu, 12 May 2016 11:22:33 CEST	Auth Open System
<<<<<<	Auth resp success	Info	64:f6:9d:55:5c:f4	28690	Thu, 12 May 2016 11:22:33 CEST	Auth Open System
>>>>>>	Assoc request	Info	64:f6:9d:55:5c:f4	28693	Thu, 12 May 2016 11:22:33 CEST	Type: 802.1x . To SSID:Jio_AKA-Ahmedabad
<<<<<<	EAP ID request	Info	64:f6:9d:55:5c:f4	28701	Thu, 12 May 2016 11:22:33 CEST	Identy request
>>>>>>	EAP ID response	Info	64:f6:9d:55:5c:f4	28715	Thu, 12 May 2016 11:22:33 CEST	Identy response
<<<<<<	EAP request	Info	64:f6:9d:55:5c:f4	28802	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA
>>>>>>	EAP response	Info	64:f6:9d:55:5c:f4	28880	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA
>>>>>>	EAP response	Info	64:f6:9d:55:5c:f4	28883	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA
<<<<<<	EAP Success	Info	64:f6:9d:55:5c:f4	29201	Thu, 12 May 2016 11:22:34 CEST	Dot1x Auth success
<<<<<<	EAP KEY RX	Info	64:f6:9d:55:5c:f4	29203	Thu, 12 May 2016 11:22:34 CEST	EAPoL M1
<<<<<<	EAP Start	Info	64:f6:9d:55:5c:f4	29214	Thu, 12 May 2016 11:22:34 CEST	EAP START
<<<<<<	EAP Start	Info	64:f6:9d:55:5c:f4	29219	Thu, 12 May 2016 11:22:34 CEST	EAP START
<<<<<<	EAP ID request	Info	64:f6:9d:55:5c:f4	29221	Thu, 12 May 2016 11:22:34 CEST	Identy request
<<<<<<	EAP ID request	Info	64:f6:9d:55:5c:f4	29223	Thu, 12 May 2016 11:22:34 CEST	Identy request
>>>>>>	Client going to sleep	Info	64:f6:9d:55:5c:f4	39809	Thu, 12 May 2016 11:22:53 CEST	Signaling AP that is going to sleep
>>>>>>	Sleep Time	Warning	NA	48017	NA	Client slept for more than 0:00:12 seconds
>>>>>>	Sleep Time	Warning	NA	49805	NA	Client slept for more than 0:00:03 seconds
>>>>>>	Sleep Cycles	Info	NA		NA	Consecutive sleep-awake cycles:2
>>>>>>	Client awake	Info	64:f6:9d:55:5c:f4	49805	Thu, 12 May 2016 11:23:08 CEST	Signaling AP that is going to sleep

Histograms – Client

- Get quick glance on signal levels, rates and QoS marking received and transmitted by client
- Supported on Radiotap and Peekremote (AP sniffer) file formats

Detecting easy to miss problems

- Simplify finding issues across large captures
  - Unencrypted traffic leak (client/AP)
  - Beacon loss
  - High co-channel
  - Incorrect data rates

Event Flow

Direction	Type	Severity	Frame	Time	Info
------	High Channel Utilization	Warning	1	Fri, 15 Mar 2019 21:05:05 CET	Current Channel utilization: 94
>>>>>>	First Beacon	Info	1	Fri, 15 Mar 2019 21:05:05 CET	
>>>>>>	Beacon loss	Warning	2	Fri, 15 Mar 2019 21:05:06 CET	Beacon loss detected, Time delta:0.824816
------	High Channel Utilization	Warning	2	Fri, 15 Mar 2019 21:05:06 CET	Current Channel utilization: 95
>>>>>>	Beacon loss	Warning	3	Fri, 15 Mar 2019 21:05:08 CET	Beacon loss detected, Time delta:1.427207
------	High Channel Utilization	Warning	3	Fri, 15 Mar 2019 21:05:08 CET	Current Channel utilization: 95
>>>>>>	Beacon loss	Warning	9	Fri, 15 Mar 2019 21:05:11 CET	Beacon loss detected, Time delta:3.523894
------	High Channel Utilization	Warning	9	Fri, 15 Mar 2019 21:05:11 CET	Current Channel utilization: 94
>>>>>>	Beacon loss	Warning	13	Fri, 15 Mar 2019 21:05:16 CET	Beacon loss detected, Time delta:4.612270
<<<<<<	EAP KEY RX	Info	6c:8b:d3:3b:8a:a0	1269 Thu, 21 Jan 2021 00:51:56 CET	EAPoL M1
<<<<<<	EAP KEY RX	Info	6c:8b:d3:3b:8a:a0	1271 Thu, 21 Jan 2021 00:51:56 CET	EAPoL M1
<<<<<<	EAP KEY RX	Info	6c:8b:d3:3b:8a:a0	1273 Thu, 21 Jan 2021 00:51:56 CET	EAPoL M1
>>>>>>	EAP KEY TX	Info	6c:8b:d3:3b:8a:a0	1330 Thu, 21 Jan 2021 00:51:56 CET	EAPoL M2
<<<<<<	Unencrypted AP TX Traffic	Error	6c:8b:d3:3b:8a:a0	1333 Thu, 21 Jan 2021 00:51:56 CET	AP defect, traffic sent without encryption
<<<<<<	EAP KEY RX	Info	6c:8b:d3:3b:8a:a0	1334 Thu, 21 Jan 2021 00:51:56 CET	EAPoL M3

Where?

- Desktop Version:
  https://developer.cisco.com/docs/wireless-troubleshooting-tools/#!wifi-hawk

- Webex Room:
  https://eurl.io/#wVvmfGR_w

- Alias:
  wifi-hawk@cisco.com

Cisco Networking Bot

https://cnb.cisco.com/

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EoS/EoL

Product Migration/Adoption

Config / Tshoot Guides

Security Advisories

Release Recommendations

HW-SW Compatibility

Transforming Customer Experience with Cisco AI Chatbots

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- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

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