

Troubleshooting Voice with WCS

Problem Definition

Users deploying VoWLAN in their network need to make their way through various issues. The top two challenges are to make sure that there is enough coverage and that the controllers are configured right.

Use Cases

The tool will be able to troubleshoot the following use cases.

- Poor call quality
 - Red/Yellow QoS – TSM Report
 - High Channel Utilization
 - High Roaming delay – TSM Report
 - Frequent Tx power changes
 - Low AP density - VRT
 - Channel change report/RRM changes
 - Roaming history - location - integration /I2 roam history
 - RSSI report per client - distinguish
- Call drops
 - Packet loss on TSM
 - Frequent channel changes
 - Low AP density - VRT
 - Coverage Hole Alarms/Precoverage Events
- Not able to place a call
 - Basic 802.11 issues – Client Troubleshooting
 - Low AP density - VRT
- One-way audio
 - High Packet loss and High latency – TSM Report
 - No TSM records indicate incorrect UP marking
- Echo

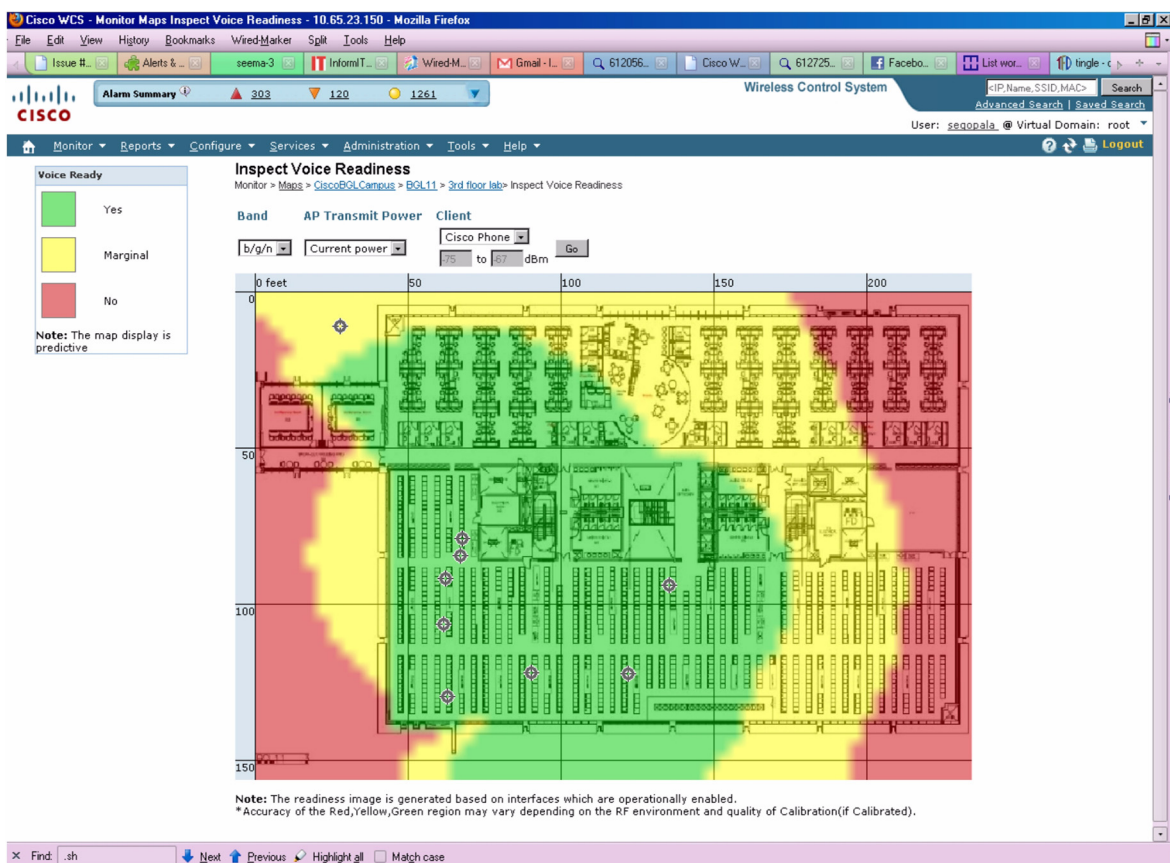
Problem Definition

- High Packet Latency – TSM Report

Reference Attachment – Network-wide issue

- Run Voice Audit and attach report
- Voice Readiness Tool snapshot for the affected floor(s)
- RRM Dashboard snapshot
- Alarm/Event Counts
 - Coverage Hole Alarm
 - Precoverage Hole Event
- Reports per Controller/Floor Map
 - Historical TSM
 - Tx Power / Channel
 - Channel Utilization
- RF Issues
- Customers using WLAN for data, turned on voice, AP density not sufficient

Figure 7-1 VoWLAN Readiness Tool



RRM Dashboard

Figure 7-2 Real Time - TSM Report

The screenshot shows the Cisco WCS Monitor APs interface. The main content area displays a table of access points. The table has columns for AP Name, Ethernet MAC, IP Address, Radio, Map Location, Controller, Client Count, Admin Status, and AP Name. Two access points are listed, both with IP Address 10.34.142.40 and Controller 10.34.142.150. The first access point has a Client Count of 0 and Admin Status Enabled. The second access point has a Client Count of 0 and Admin Status Enabled. A dropdown menu is open, showing a list of reports to generate for the selected APs. The reports include: Select a report --, Select a report --, Load, Dynamic Power Control, Noise, Interference, Coverage (RSSI), Coverage (SNR), Up/Down Statistics, Voice Statistics, Voice TSM Table, Voice TSM Reports, 802.11 Counters, AP Profile Status, Air Quality vs Time, Traffic Stream Metrics, Tx Power and Channel, VoIP Calls Graph, VoIP Calls Table, and Voice Statistics.

AP Name	Ethernet MAC	IP Address	Radio	Map Location	Controller	Client Count	Admin Status	AP Name
☐ SJC17-22A-P162	00:1d:a2:7f:82:54	10.34.142.40	802.11b/g	Unassigned	10.34.142.150	0	Enabled	Local
☒ SJC17-22A-P162	00:1d:a2:7f:82:54	10.34.142.40	802.11a	Unassigned	10.34.142.150	0	Enabled	Local

Figure 7-3 Client TSM Report

Cisco WCS - Reports - sghosal-Inx - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

https://sghosal-Inx/webacs/reportsAction.do#runresult

Cisco WCS - Reports - 10.32.16.246 Cisco WCS - Reports - sghosal-Inx

Monitor Reports Configure Services Administration Tools Help Logout

Client Traffic Stream Metrics : New

Reports > Report Launch Pad > Client > Client Traffic Stream Metrics > Client Traffic Stream Metrics Report Details

Settings

Report Title:

Report By:

Report Criteria:

Reporting Period: ☒ Last 1 Hour ☐ From : : To : :

Schedule

Scheduling: ☐ Enable

Export Format:

Destination: ☒ File ☐ Email

Start Date/Time: 03/21/2009 14:55

Current Server Time: 03/21/2009 14:59:14 PDT

Recurrence: ☒ No Recurrence ☐ Hourly ☐ Daily ☐ Weekly

Customize Report

Click here to customize report content based on your preference.

Report Run Result

Client Traffic Stream Metrics

Generated: Sat Mar 21 14:59:13 PDT 2009

Report By: Client Mac Address

Client Mac Address: 00:1c:58:cc:ec:7c

Reporting Period: 3/19/09 2:59 PM to 3/21/09 2:59 PM

Client Traffic Stream Metrics

Time	Client MAC	QOS	AP Name	Radio Type	%PLR (Downlink)	%PLR (Uplink)
3/20/09 11:36 AM	00:1c:58:cc:ec:7c	Degraded	SJC17-12A-P083	802.11a	6.67	0.00
3/20/09 11:37 AM	00:1c:58:cc:ec:7c	Normal	SJC17-12A-P083	802.11a	0.00	0.00
3/20/09 12:27 PM	00:1c:58:cc:ec:7c	Degraded	SJC17-12A-P083	802.11a	1.69	0.00
3/20/09 12:29 PM	00:1c:58:cc:ec:7c	Normal	SJC17-12A-P083	802.11a	0.00	0.00

Done sghosal-Inx

Figure 7-4 AP TSM Report

The screenshot displays the Cisco WCS Reports interface in a Mozilla Firefox browser window. The page title is "Traffic Stream Metrics : New". The breadcrumb navigation is "Reports > Report Launch Pad > Performance > Traffic Stream Metrics > Traffic Stream Metrics Report Details".

Settings:

- Report Title: (empty text box)
- Report By: AP By Controller
- Report Criteria: All Controllers > All Access Points
- Protocol: ☒ 802.11a/n ☐ 802.11b/g/n
- Reporting Period: Last 1 Hour

Schedule:

- Scheduling: ☐ Enable
- Export Format: CSV
- Destination: File (/scratch/wcs/H/dist/wcs/linux/webnms/Rp-server/root/reports/TrafficStreamMetrics)
- Start Date/Time: 03/21/2009 15:05:05 PDT
- Current Server Time: 03/21/2009 15:05:50 PDT
- Recurrence: ☒ No Recurrence ☐ Hourly ☐ Daily ☐ Weekly

Customize Report:

Click here to customize report content based on your preference. [Customize](#)

Report Run Result:

Traffic Stream Metrics

Generated: Sat Mar 21 15:05:49 PDT 2009

Report By: AP By Controller

Protocol: 802.11a/n

Reporting Period: 3/19/09 3:05 PM to 3/21/09 3:05 PM

Traffic Stream Metrics Table:

Time	Client MAC	AP Name	Radio Type	Avg Queueing Delay (Downlink)	Avg Queueing Delay (Uplink)	QoS	% Packet with more than 20 ms delay (Downlink)	% Packet with more than 20 ms delay (Uplink)	% Packet with more than 40 ms delay (Downlink)	% Packet with more than 40 ms delay (Uplink)	Packet Loss Ratio (Downlink)	Packet Loss Ratio (Uplink)	Roaming Count	Roaming Delay
3/20/09 11:35 AM	00:1c:58:0cc:ec7c	SJC17-12A-P083	802.11a	5.00	1.00	Degraded	0.46	0.85	0.00	0.00	6.67	0.00	0	0
3/20/09 11:36 AM	00:1c:58:0cc:ec7c	SJC17-12A-P083	802.11a	5.00	1.00	Degraded	0.46	0.85	0.00	0.00	6.67	0.00	0	0
3/20/09 11:37 AM	00:1c:58:0cc:ec7c	SJC17-12A-P083	802.11a	0.00	0.00	Normal	0.00	0.00	0.00	0.00	0.00	0.00	0	0
3/20/09 12:27 PM	00:1c:58:0cc:ec7c	SJC17-12A-P083	802.11a	5.00	1.00	Degraded	9.42	0.00	0.00	0.00	1.69	0.00	1	730
3/20/09 12:29 PM	00:1c:58:0cc:ec7c	SJC17-12A-P083	802.11a	0.00	0.00	Normal	0.00	0.00	0.00	0.00	0.00	0.00	0	0
3/19/09 5:18 PM	00:1c:58:0cd:3d:2c	SJC17-12A-P084	802.11a	0.00	0.00	Fair	0.00	0.13	0.00	0.00	2.19	0.00	0	0

Page 1 of 4

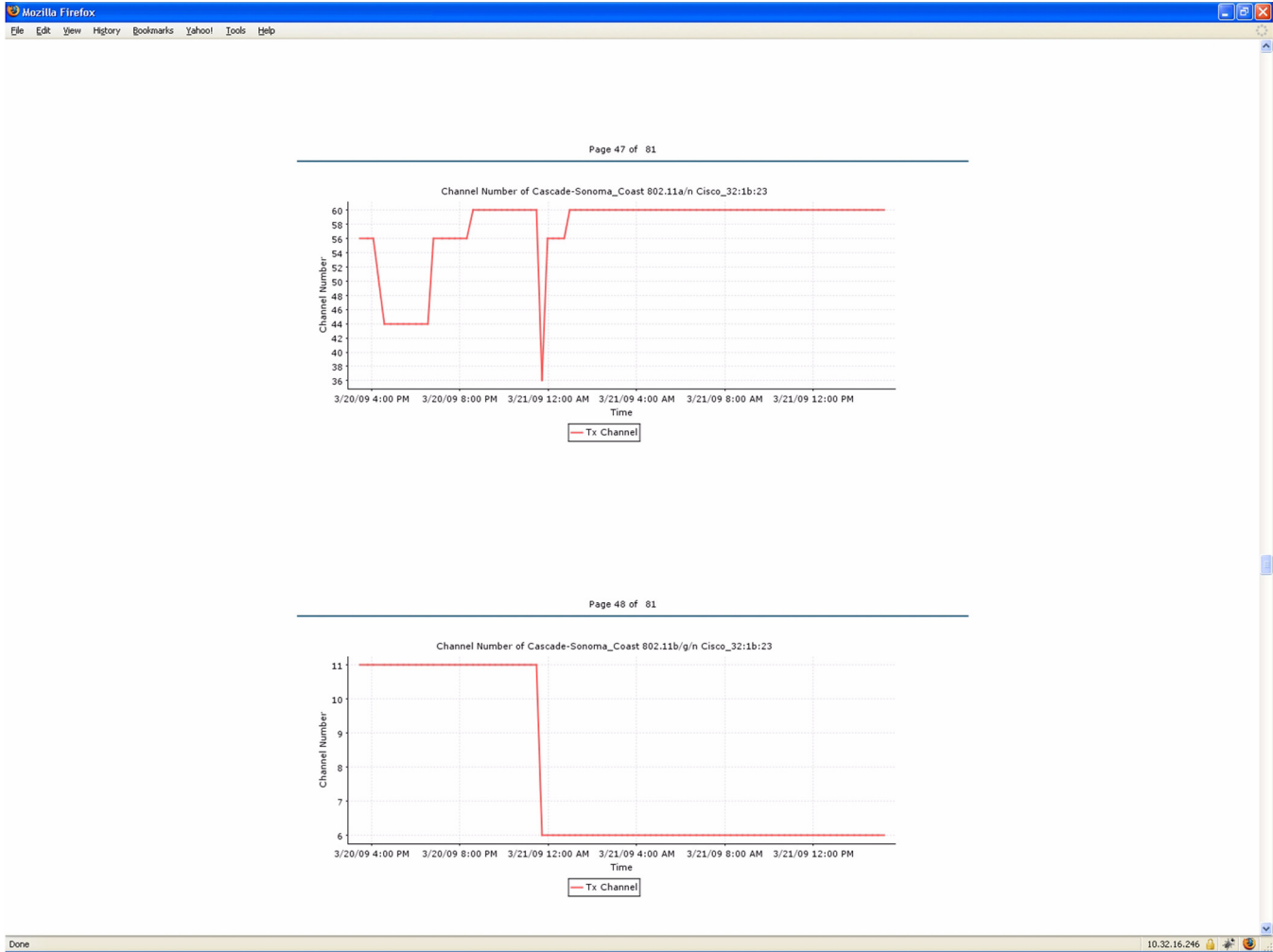
Figure 7-5 Tx Power / Channel Report

Figure 7-6 Channel Utilization Report

Figure 7-7 Coverage Hole Alarm / PreCoverage Event

Cisco WCS - Event Details - Coverage Hole Warning - 10.32.16.246 - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

https://10.32.16.246/webacs/eventDetailAction.do?event

Cisco WCS - Event Details - Cover... Cisco WCS - Alarms - sghosal-Inx

CISCO Alarm Summary 972 8264 311 Wireless Control System Primary <IP,Name,SSID,MAC> Search Advanced Search | Saved Search User: sghosal_@ Virtual Domain: root Logout

Monitor Reports Configure Services Administration Tools Help

Coverage Hole Warning Details for Client:00:16:6f:8e:9b:32

Monitor > Alarm > Events > Coverage Hole Warning Details for Client

General

Client MAC Address 00:16:6f:8e:9b:32

AP MAC Address 00:1f:26:28:27:c0

AP Name wnbu-bgl11-41a-iap-ap8

Radio Type 802.11 b/g/n

Power Level 1

Client Type 2

Wlan Coverage Hole Status Enabled

WLAN alpha

Category Coverage Hole

Created March 19, 2009 8:20:40 PM PDT

Generated By Controller

Device IP Address

Severity Info

Message

Pre-Coverage Hole reported by '00:16:6f:8e:9b:32' was found on Controller '10.65.23.36' near 'wnbu-bgl11-41a-iap-ap8' with MacAddress '00:1f:26:28:27:c0'.

Neighbor AP's

MAC Address	RSSI	Radio Type
00:1f:26:28:27:50	-67	802.11 b/g/n
00:1f:26:28:27:c0	-69	802.11 b/g/n
00:1e:f7:74:f4:b0	-77	802.11 b/g/n
00:1f:26:28:27:10	-78	802.11 b/g/n

Done 10.32.16.246

Figure 7-8 Air Quality vs Time

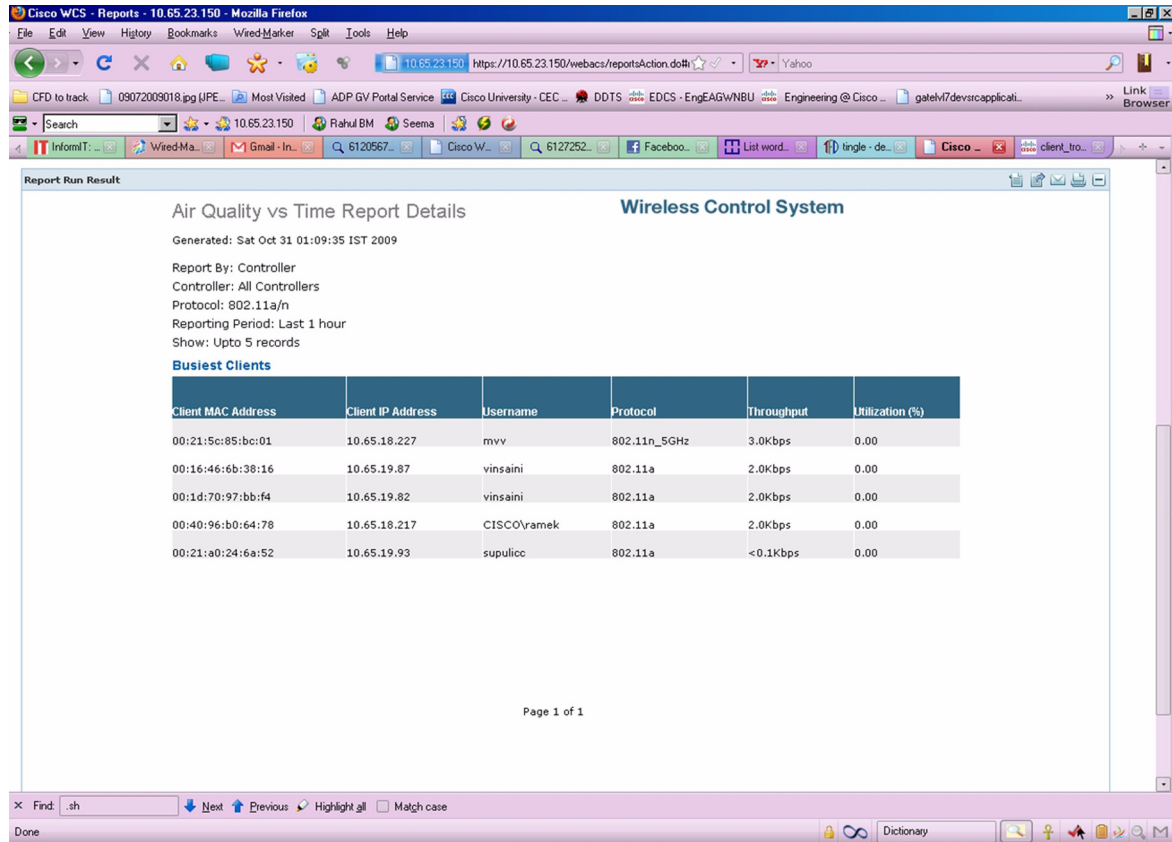


Figure 7-9 VoIP Calls Graph

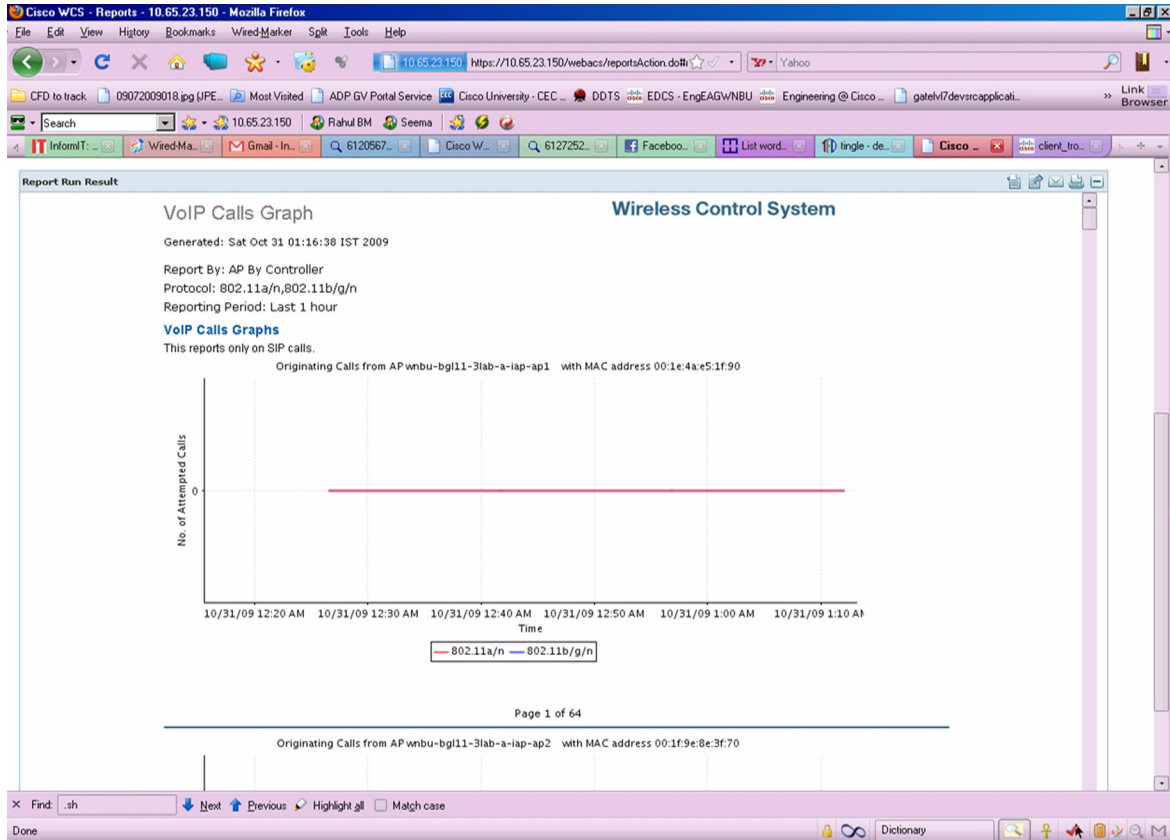


Figure 7-10 VoIP Calls Table

Report Run Result

VoIP Calls Table

Generated: Sat Oct 31 01:26:19 GMT+05:30 2009

Report By: AP By Controller

Protocol: 802.11a/n,802.11b/g/n

Reporting Period: Last 1 hour

This reports only on SIP calls.

AP Name	802.11a/n Count	802.11a/n Duration (sec)	802.11b/g/n Count	802.11b/g/n Duration (sec)
3-1130-9A:80	0	0	0	0
AP0024.9752.7316	0	0	0	0
AP0015.63e4.f86d	0	0	0	0
wmbu	0	0	0	0
2	0	0	0	0
1510-RAP	0	0	0	0
AP0024.5036.0b00	0	0	0	0
AP0024.5036.4c00	0	0	0	0
AP0024.5036.3f00	0	0	0	0
ap:71:60:b0	0	0	0	0

Page 1 of 3

AP Name	802.11a/n Count	802.11a/n Duration (sec)	802.11b/g/n Count	802.11b/g/n Duration (sec)
AP0024.5036.7200	0	0	0	0

Find: .sh Next Previous Highlight all Match case

Done

Figure 7-11 Voice Statistics

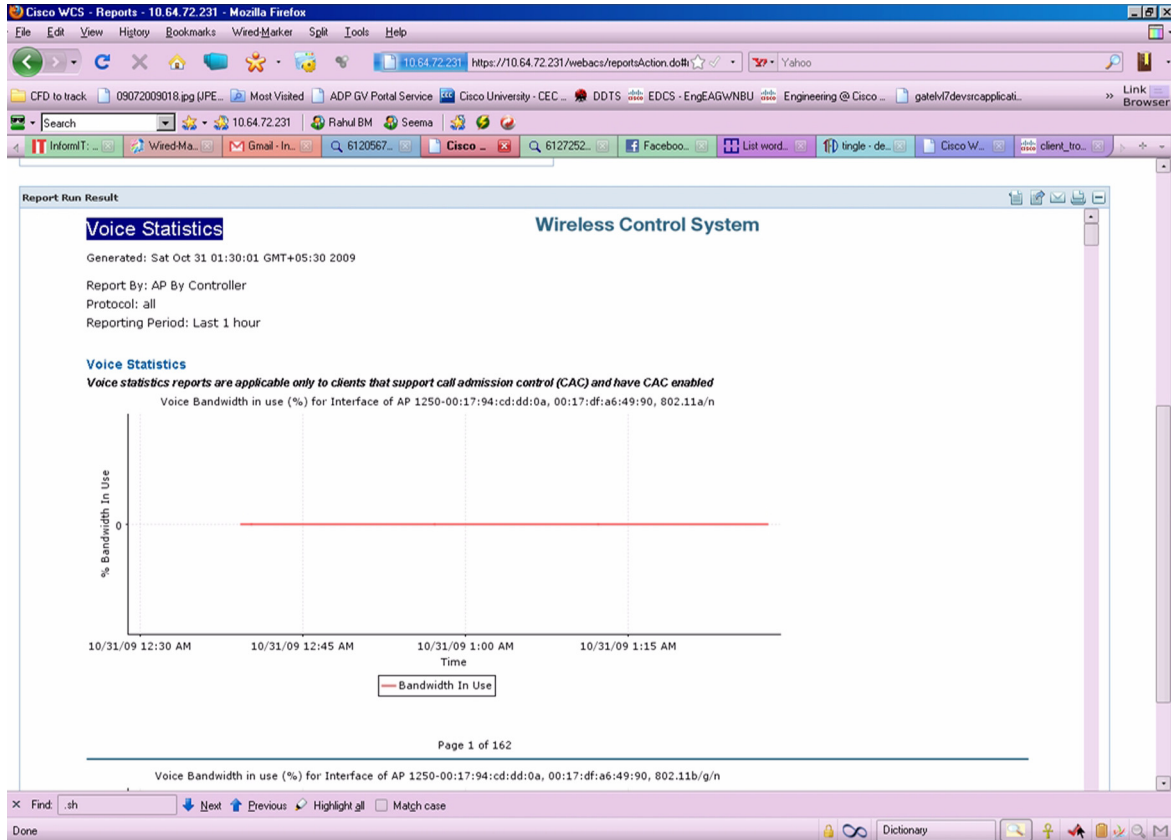


Figure 7-12 Voice Traffic Stream Metrics Table

Cisco WCS - Traffic Stream Metrics for an AP - 10.65.23.150 - Mozilla Firefox

File Edit View History Bookmarks WiredMarker Split Tools Help

seema-3 InformT... Wired-M... Gmail-L... 612056... Cisco W... 612725... Facebook... List wor... tingle - d... Cisco client_tr

Alarm Summary 303 123 1261 Wireless Control System KIP Name,SSID,MAC> Search Advanced Search Saved Search User: segopala_@ Virtual Domain: root Logout

Monitor Reports Configure Services Administration Tools Help

Voice Traffic Stream Metrics Table
Monitor > Access Points > wnbu-bq11-3lab-a-lap-802 > 802.11a/h > Voice Traffic Stream Metrics Table

Time	Client MAC	QoS	%PLR (DownLink)	%PLR (Uplink)	Avg Queuing Delay (ms) (Downlink)	Avg Queuing Delay (ms) (Uplink)	%Packets > 40ms Queuing Delay (Downlink)	%Packets 20ms-40ms C
Tue Oct 27 17:21:47 IST 2009	00:21:6a:6c:da:e8	Degraded	100	0	0	0	0	0
Wed Oct 28 14:29:08 IST 2009	00:21:6a:6c:da:e8	Degraded	100	0	0	0	0	0
Wed Oct 28 17:23:07 IST 2009	00:1d:e0:34:b0:af	Degraded	100	0	0	0	0	0
Thu Oct 29 14:40:55 IST 2009	00:21:6a:6c:da:e8	Degraded	100	0	0	0	0	0
Thu Oct 29 15:09:25 IST 2009	00:21:6a:6c:da:e8	Degraded	100	0	0	0	0	0
Thu Oct 29 18:36:24 IST 2009	00:18:de:b8:92:75	Degraded	100	0	0	0	0	0
Fri Oct 30 13:37:46 IST 2009	00:21:6a:1d:1f:a2	Degraded	100	0	0	0	0	0

X Find .sh Next Previous Highlight all Match case

Figure 7-13 Voice TSM Reports (1 of 3)

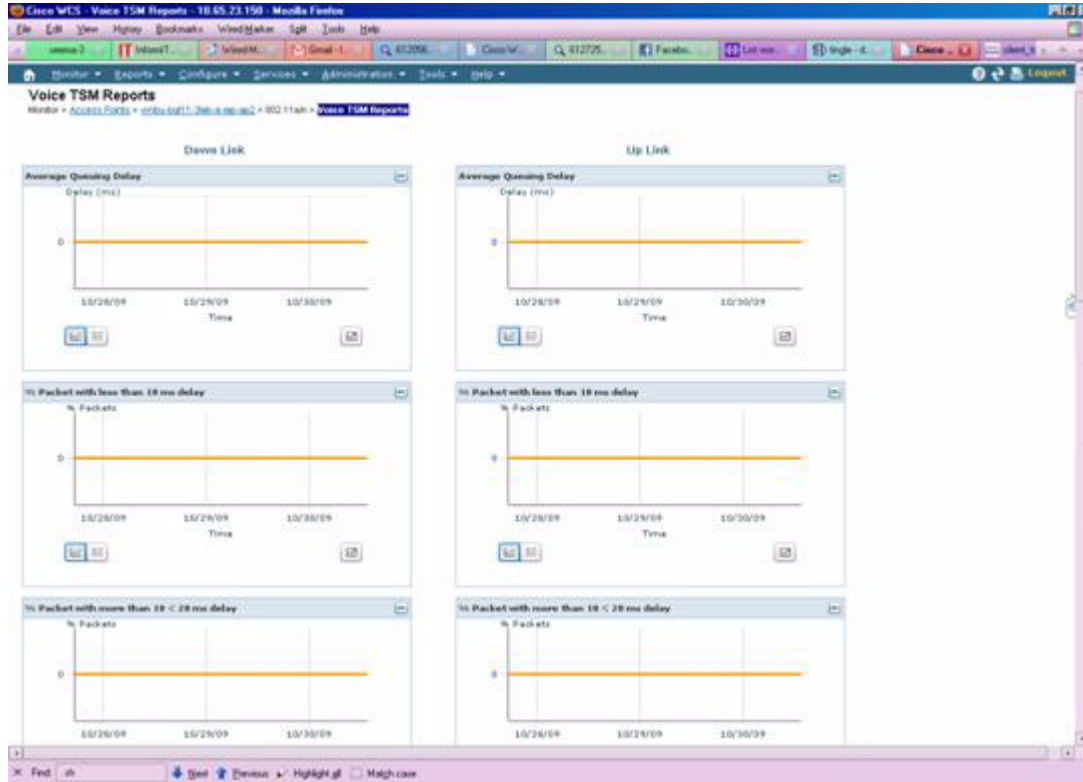


Figure 7-14 Voice TSM Reports (2 of 3)

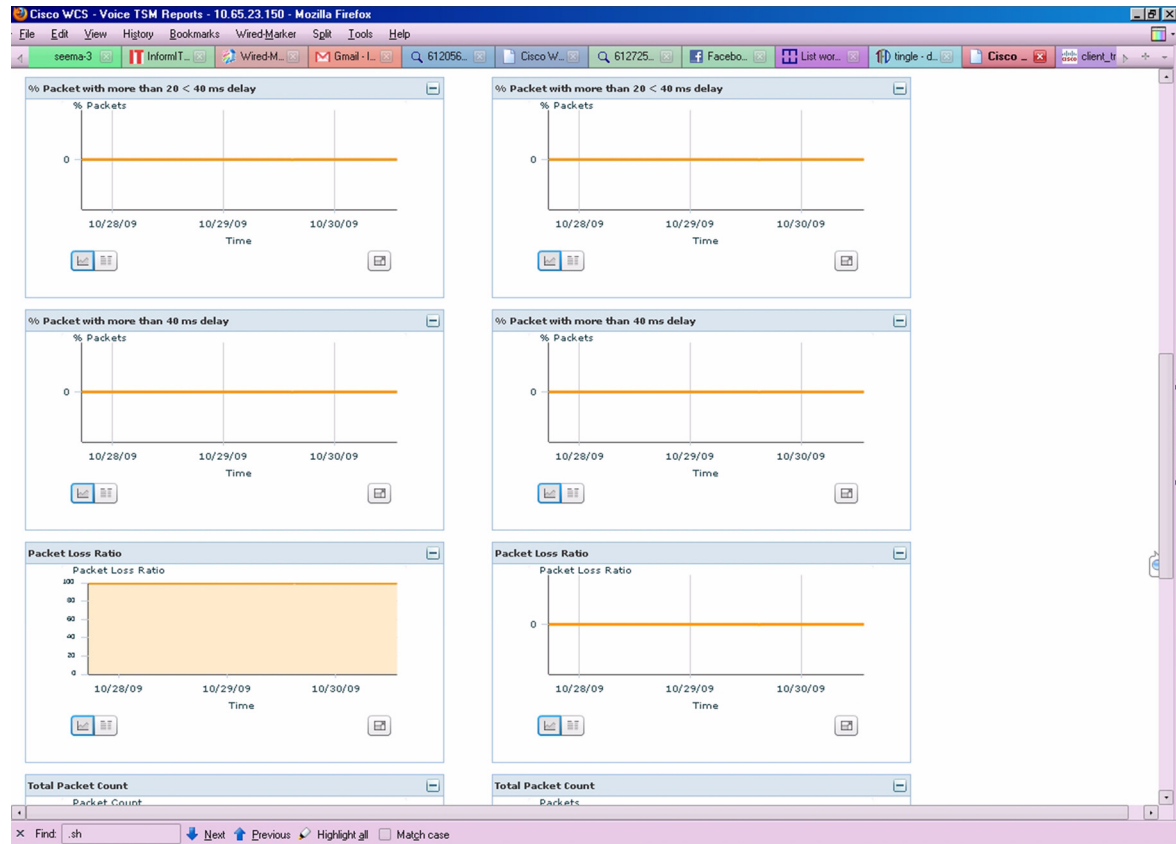
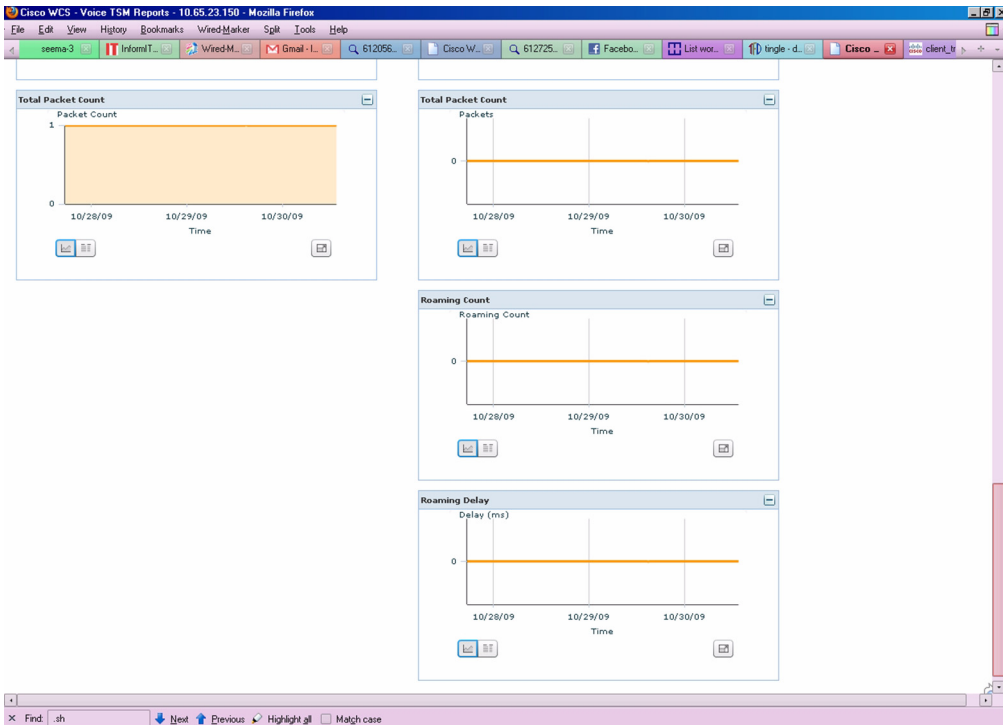


Figure 7-15 Voice TSM Reports (3 of 3)

Configuration Issues

- Customers need to spend enormous time to configure controllers as per the 792xG Series wireless IP phone deployment guide
- Thick Deployment guide for 792xG Series wireless IP phone
- Difficult to check which configurations are altered, over a period of time

Run Voice Audit and Attach Report

- The WCS does Online Auditing, in which device attributes are fetched from the network with Audit is run.
- WCS will ship with canned rules called VoWLAN Audit Rules (VRs), each of which will represent an individual configuration check. VR can be individually turned on and off by the user. Also some of the VRs may require user data as an input. Example of a VR: “Enable QBSS.”

VoWLAN Audit

- Validates the controller configuration against deployment guide recommendations or preconfigured criteria.
- Default configuration check is based on the *792xG Deployment Guide*.
- Allows customization of the configuration validation for other client types.

- Some configuration validations are version dependent.
- Can be initiated on demand.

Figure 7-16 VoWLAN Audit Tool

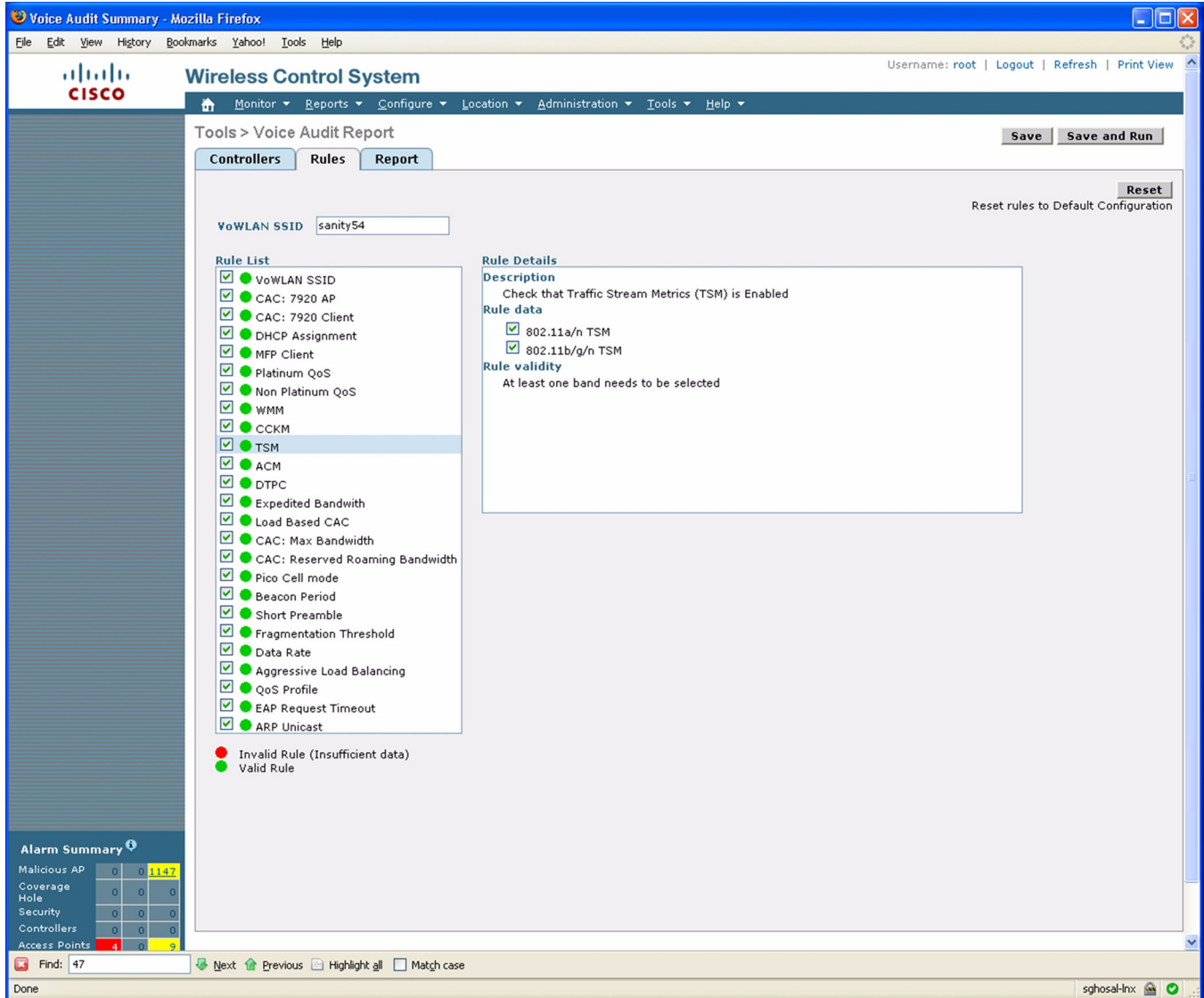


Figure 7-17 VoWLAN Audit Reporting

Audit Status	Start Time	End Time	#Total Devices	#Completed Devices	#Rules
Complete	10/27/09 2:45 PM	10/27/09 2:45 PM	3	3	22

IP Address	Rule	Result	Details	Time
10.65.23.36	ACM	Violation	ACM not Enabled for 11a/n interface for Video, ACM not Enabled for 11b/g/n interface for Video	10/27/09 2:45 PM
10.65.23.36	Data Rate	Violation	Data rate configuration of the device did not match with the Rule definition. The violated parameters are: 6Mbps 11b/g, 9Mbps 11b/g, 11Mbps 11b/g, 12Mbps 11b/g, 24Mbps 11b/g	10/27/09 2:45 PM
10.65.23.36	Aggressive Load Balancing	Violation	Global Aggressive Load Balancing not Disabled	10/27/09 2:45 PM
10.65.23.36	EAP Request Timeout	Violation	EAP Request Timeout configured in device = 31 did not match with the Rule data = 30	10/27/09 2:45 PM
10.65.23.39	ACM	Violation	ACM not Enabled for 11a/n interface for Video, ACM not Enabled for 11b/g/n interface for Video	10/27/09 2:45 PM
10.65.23.39	Data Rate	Violation	Data rate configuration of the device did not match with the Rule definition. The violated parameters are: 1Mbps 11b/g, 2Mbps 11b/g, 5.5Mbps 11b/g, 6Mbps 11b/g, 9Mbps 11b/g	10/27/09 2:45 PM
10.65.23.39	Aggressive Load Balancing	Violation	Global Aggressive Load Balancing not Disabled	10/27/09 2:45 PM
10.65.23.41	ACM	Violation	ACM not Enabled for 11a/n interface for Video, ACM not Enabled for 11b/g/n interface for Video	10/27/09 2:45 PM
10.65.23.41	Data Rate	Violation	Data rate configuration of the device did not match with the Rule definition. The violated parameters are: 1Mbps 11b/g, 2Mbps 11b/g, 5.5Mbps 11b/g, 6Mbps 11b/g, 9Mbps 11b/g, 11Mbps 11b/g, 12Mbps 11b/g, 24Mbps 11b/g	10/27/09 2:45 PM
10.65.23.41	Aggressive Load Balancing	Violation	Global Aggressive Load Balancing not Disabled	10/27/09 2:45 PM

VoWLAN Audit Rules (VRs)

Check VoWLAN SSID

User needs to define a set of VoWLAN SSIDs. Each controller will be checked for the existence of a subset of the user defined SSIDs.

Enable ARP Caching

This is a check box for user to enable/disable this option. This is a controller configuration.

Enable CAC

- User needs to provide VoWLAN SSIDs.
- CAC needs to be enabled.
- User might provide Maximum Allowed Bandwidth and Reserve Roaming Bandwidth. The device config should have at least the user defined Bandwidth.

- Expedited Bandwidth needs to be enabled.
- All the above will be checked for all the user defined SSIDs.

Enable TSM metric

- User needs to provide VoWLAN SSIDs.
- TSM metrics need to be enabled for user defined SSIDs.

Enable DTPC

- This is an interface-based configuration. User will be able to enable/disable per interface.
- AP configuration might have overridden this controller configuration via custom power assignment and this will result in AP level violation.

Enable DHCP server override

User needs to provide VoWLAN SSIDs. DHCP override option will be checked for all SSIDs that matched with the user defined SSID. Note that only one violation will be raised for multiple mismatches across SSIDs.

Check that Platinum QoS is used for VoWLAN

User needs to provide the VoWLAN SSIDs. If a user-defined SSID is not present in the controller, then the rule will not be applied. The rule will be applied only when a matching SSID is found.

Check that Platinum QoS is not used for non-voice WLAN

User needs to provide VoWLAN SSIDs. For all SSIDs excluding the user-defined ones, the QoS policy should be set to non-Platinum.

Check that QoS policies are left at default

One violation will be generated even if there are multiple mismatches across different QoS Profiles.

Check RF configuration

- Beacon period: 100
- DTIM period: 1
- Fragmentation threshold: 2346
- Short preamble: Enable
- Pico cell mode: Disable

- Each will generate an instance of violation for each RF configuration mismatch

Check that Data rate configuration is as below

- Disabled: 1, 2, 5.5, 6, 9, 11
- Mandatory: 11
- Supported: 12,18,24,36,48,54

**Note**

User will be able to change the values for each category. Note that only one violation will be raised for all mismatches.

Disable aggressive load balancing

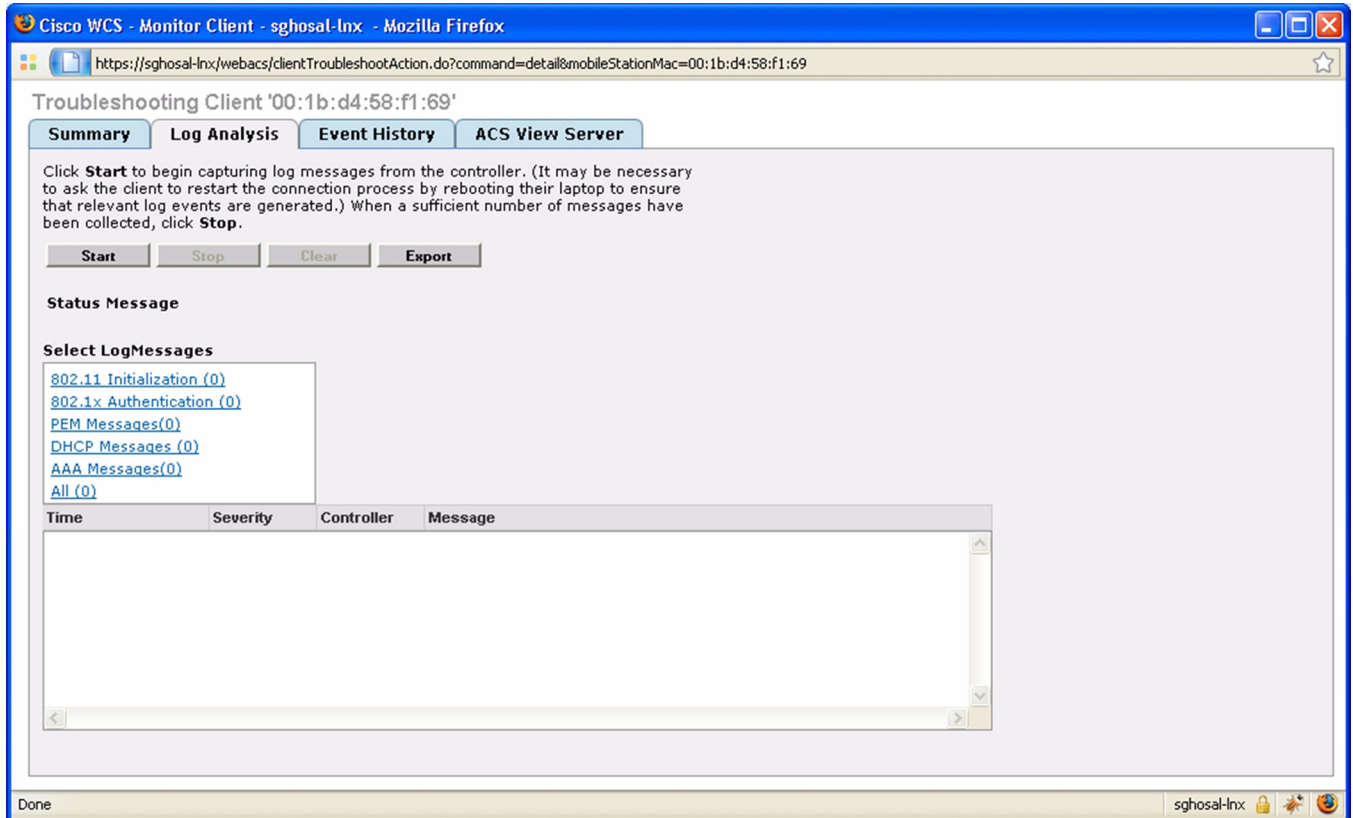
The user must provide VoWLAN SSIDs. For the user-defined SSIDs, check if load balancing has been turned off.

Additional rules

- WMM being set to “Allowed”/”Required”
- CCKM being enabled
- Pico Cell mode being disabled
- EAP Request timeout being set to 20 sec
- ACM being Enabled

VoWLAN Client Troubleshooting

Figure 7-18 Troubleshooting Client



Troubleshooting of client is divided into following categories (msgType)

- dot11(0) - dot11-related messages.
- dot1x(1) - dot1x, authentication-related messages.
- pem(2) - Policy Enforcement Module – client state machine related messages.
- dhcp(3) - DHCP-related messages.
- aaa(4) - AAA-related messages.
- voice(5) - Voice-related message. This is new msg type that will be added.
- misc(6) - Miscellaneous messages, such as Roaming, etc.

TSPEC Codes

Table 7-1 *Actions Required for Each Status and Reason Code*

Code	Meaning
0x03	APF_STATUS_CCX_QOS_ADDTS_NO_BANDWIDTH
0xc8	APF_STATUS_CCX_QOS_UNSPECIFIED_FAILURE
0xc9	APF_STATUS_CCX_QOS_POLICY
0xca	APF_STATUS_CCX_INSUFFICIENT_BANDWIDTH
0xcb	APF_STATUS_CCX_INVALID_QOS_PARAMETER