CHAPTER 9

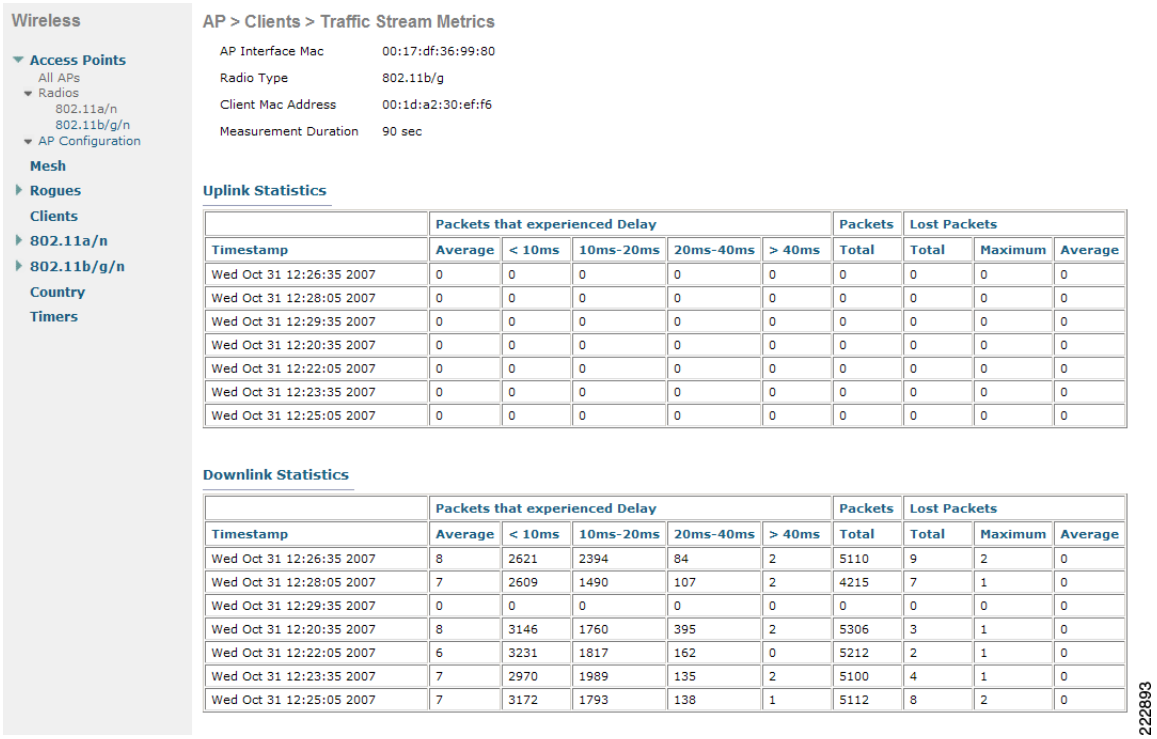
Voice over WLAN Troubleshooting and Management Tools

One of the challenges in mobility is the fact that users are mobile, and while they have an investment in ensuring that their end device is working correctly, they have less of an investment in a piece of geography. That is, while a user will address what they perceive as an equipment issue promptly, they are less likely to spend time addressing what they perceive as coverage issues as they will simply move on to another location. This means that you are more likely to get help desk calls if users cannot connect, but coverage and performance issues are more likely to be anecdotal. Unless time and effort are invested to ensure coverage issues are address proactively, user satisfaction can be low before the issues make into a operations and maintenance case. For this reason the primary focus in this chapter will be the use of tools to translate user anecdotes into system parameters, and tools to proactively identify potential coverage and performance issues.

WLC Tools

The WLC provides many different debug and show commands to assist in general trouble shooting. In the case of VoWLAN two help screens in analyzing VoWLAN quality issues are shown in Figure 9-1 and Figure 9-2. Figure 9-1 shows the client traffic Stream metrics, which provides information upon the packet delay and packet loss experience by a client on an AP. As packet delay and loss are key parameters in VoIP call quality the traffic stream measures provide network insight in to the call quality experienced by a client.

Figure 9-1 WLC Client Traffic Stream Metrics



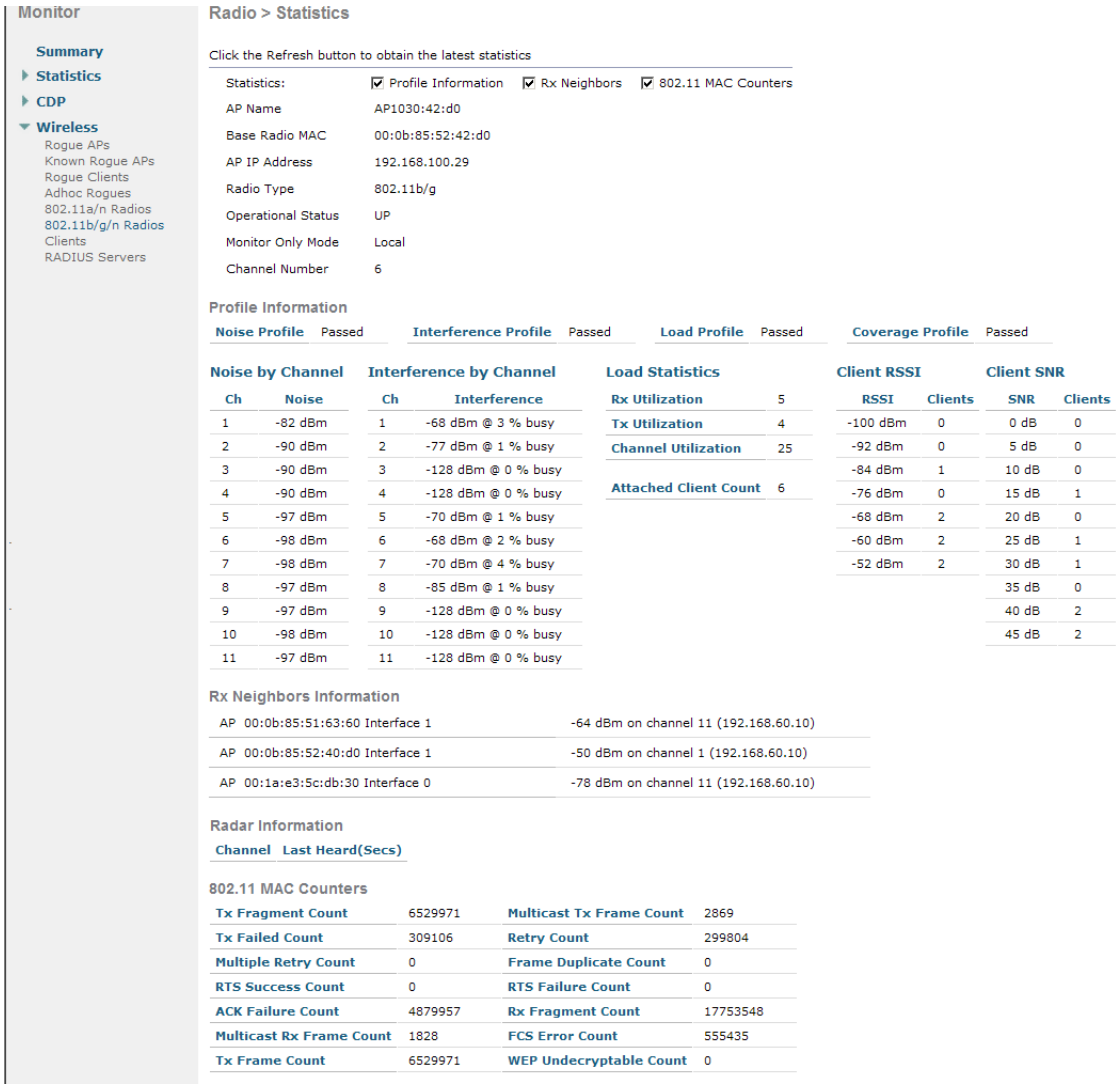
	Packets that experienced Delay					Packets	Lost Packets		
Timestamp	Average	< 10ms	10ms-20ms	20ms-40ms	> 40ms	Total	Total	Maximum	Average
Wed Oct 31 12:26:35 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:28:05 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:29:35 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:20:35 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:22:05 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:23:35 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:25:05 2007	0	0	0	0	0	0	0	0	0

	Packets that experienced Delay					Packets	Lost Packets		
Timestamp	Average	< 10ms	10ms-20ms	20ms-40ms	> 40ms	Total	Total	Maximum	Average
Wed Oct 31 12:26:35 2007	8	2621	2394	84	2	5110	9	2	0
Wed Oct 31 12:28:05 2007	7	2609	1490	107	2	4215	7	1	0
Wed Oct 31 12:29:35 2007	0	0	0	0	0	0	0	0	0
Wed Oct 31 12:20:35 2007	8	3146	1760	395	2	5306	3	1	0
Wed Oct 31 12:22:05 2007	6	3231	1817	162	0	5212	2	1	0
Wed Oct 31 12:23:35 2007	7	2970	1989	135	2	5100	4	1	0
Wed Oct 31 12:25:05 2007	7	3172	1793	138	1	5112	8	2	0

Note In Figure 9-1, uplink statistics have not been reported by the VoWLAN client, and therefore the data is all zeros.

Figure 9-2 shows AP radio statistics, including channel load, channel noise, client RSSI and SNR and AP Neighbor information from RRM. This can provide more general information about the RF environment that VoWLAN clients are operating in which parameters may be impacting VoWLAN call quality.

Figure 9-2 AP Radio Statistics



WCS Tools

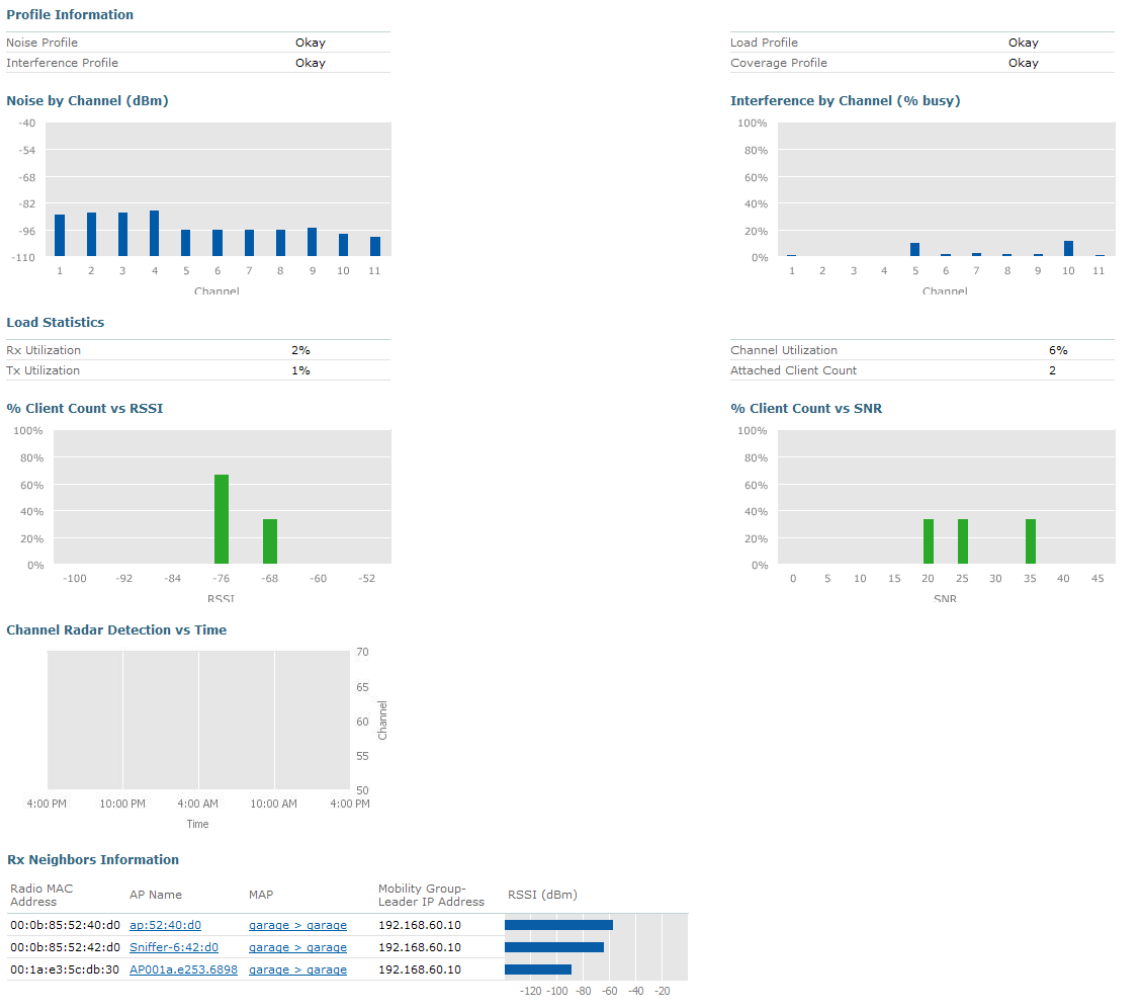
While the WLC can provide AP statistics and client traffic stream statistics, the WCS is the best place to start VoWLAN trouble shooting. This is because the WCS provides the topological visibility through its building and floor plan maps providing a way to translate the user complaint "I seem to have trouble with calls in building *x* on floor *y*" into there seems to be an issue involving APs X1, X2, and X3. In

addition to providing this translation between the physical world to the network world, the WCS provides a centralized location for viewing and aggregation of the same statistics shown by the WLC, as well as providing reports of how key parameters have changed over time

Monitoring

Figure 9-3 shows similar AP statistics to those shown in by the WLC in Figure 9-2; the WLC allows these to be shown in text format or graphical format.

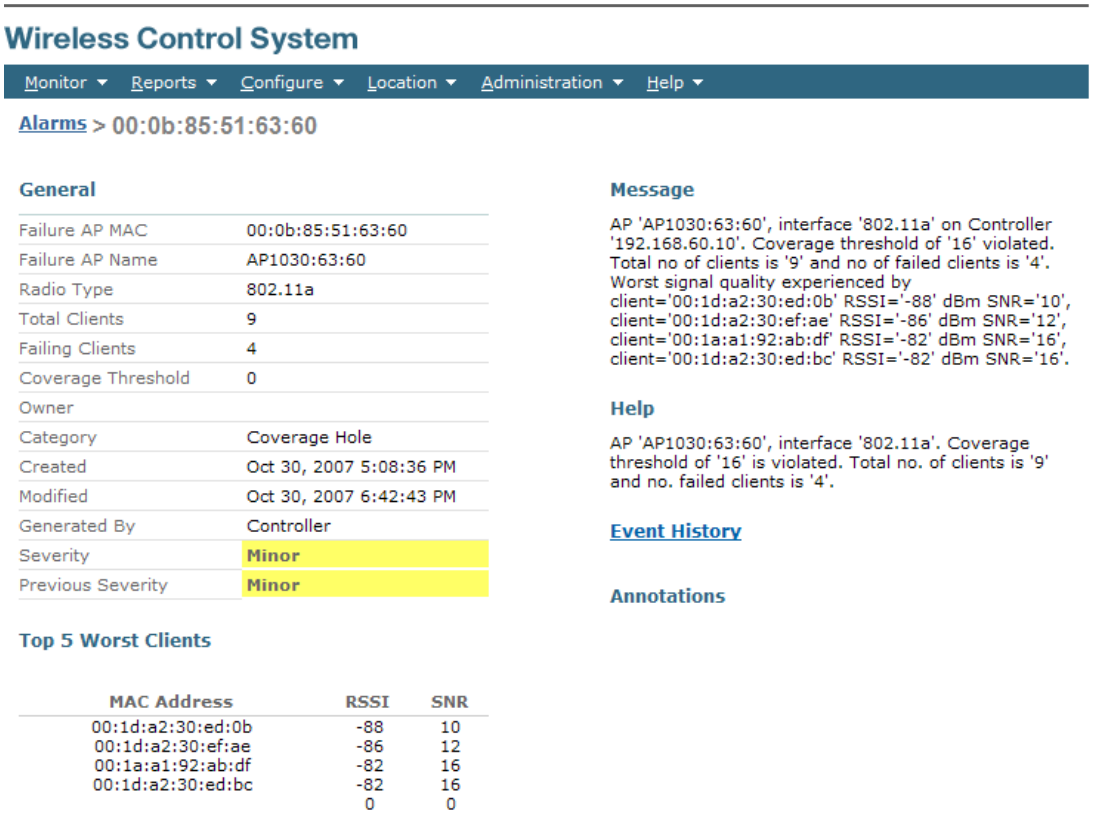
Figure 9-3 AP Statistics



Alarms

The WCS provides an aggregation point for alarms. Figure 9-4 shows an example of an alarm that may provide input to a VoWLAN issue, that is, a Coverage Hole alarm. Excessive hole coverage alarms that are unrelated to an actual AP issue may indicate a RF coverage issue users are in an area inadequately covered due either to planning, implementation or operational issue. The Coverage Hole alarms may also be indicative of a sticky client issue where a WLAN client is not roaming into a better coverage area.

Figure 9-4 Hole Coverage Alarm



Reports

The WCS reports provide insight into key VoWLAN parameters over time, helping to correlate network parameters with the timing of particular incidents, and allowing trending of key parameters overtime. Figure 9-5 shows an example of the a graph from the AP TxPower and Channel report, excessive changes in this area may indicate a systematic RF interference issue to be investigated or an indication that the Auto-RF configuration of the network may need to be tuned to better fit the environment and deployment.

Figure 9-5 Power and Channel Reports

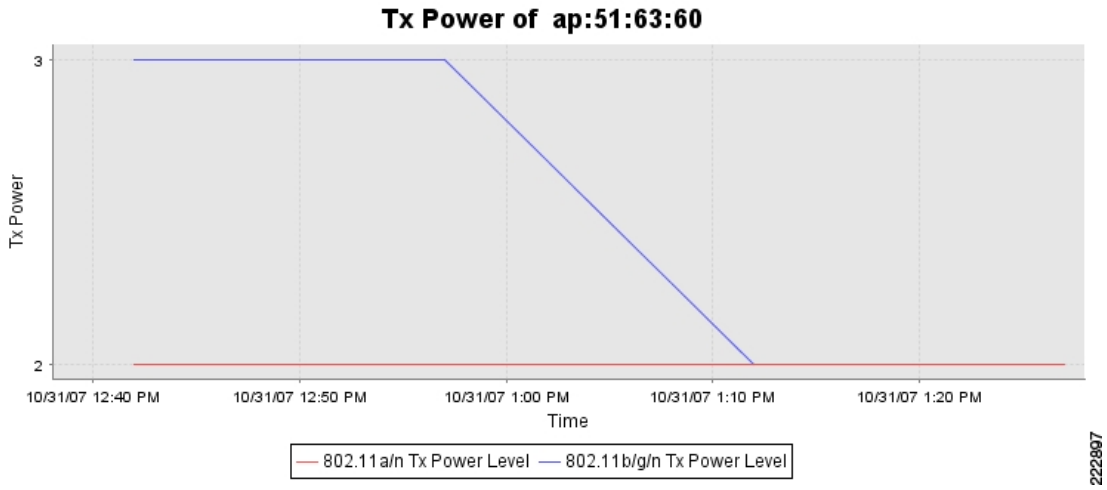


Figure 9-6 shows an example of the voice bandwidth statistics report, these reports can used to track possible call capacity and admission control issues.

Figure 9-6 Voice Statistics

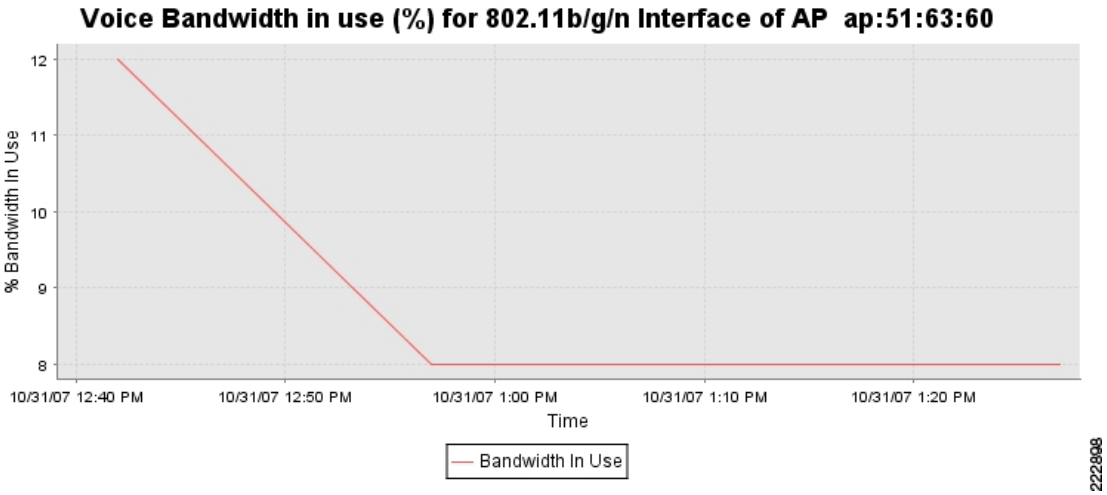


Figure 9-7 shows an example of the client traffic stream metrics, similar to that shown in the WLC in Figure 9-1, but it has the advantage of providing information upon roaming delay, and providing client traffic stream information across APs, and WLCs.

Figure 9-7 Traffic Stream Statistics

Time	Client MAC	AP Name	Radio Type	QOS	%PLR (Downlink)	%PLR (Uplink)	Avg Queuing Delay (ms) (Downlink)	Avg Queuing Delay (ms) (Uplink)	%Packets > 40ms Queuing Delay (Uplink)	%Packets 20ms-40ms Queuing Delay (Uplink)	Roaming Delay
10/31/07 12:38 PM	00:1d:a2:30:ef:b4	AP0018.193f.663e	802.11b/g	Normal	0.00	0.00	8	0	0.00	0.00	0
10/31/07 12:39 PM	00:1d:a2:30:ef:b4	AP0018.193f.663e	802.11b/g	Normal	0.00	0.00	8	0	0.00	0.00	0
10/31/07 12:41 PM	00:1d:a2:30:ef:b4	AP0018.193f.663e	802.11b/g	Normal	0.00	0.00	7	0	0.00	0.00	0
10/31/07 12:42 PM	00:1d:a2:30:ef:b4	AP0018.193f.663e	802.11b/g	Normal	0.30	0.00	7	0	0.00	0.00	0
10/31/07 12:44 PM	00:1d:a2:30:ef:b4	AP0018.193f.663e	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0
10/31/07 12:37 PM	00:1d:a2:30:ef:f6	Sniffer-6:42:d0	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0
10/31/07 12:56 PM	00:1d:a2:30:ef:f6	Sniffer-6:42:d0	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0
10/31/07 1:02 PM	00:1d:a2:30:ef:f6	Sniffer-6:42:d0	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0
10/31/07 12:49 PM	00:1d:a2:30:ef:f6	ap:51:63:60	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0
10/31/07 12:58 PM	00:1d:a2:30:ef:f6	ap:51:63:60	802.11b/g	Normal	0.00	0.00	0	0	0.00	0.00	0

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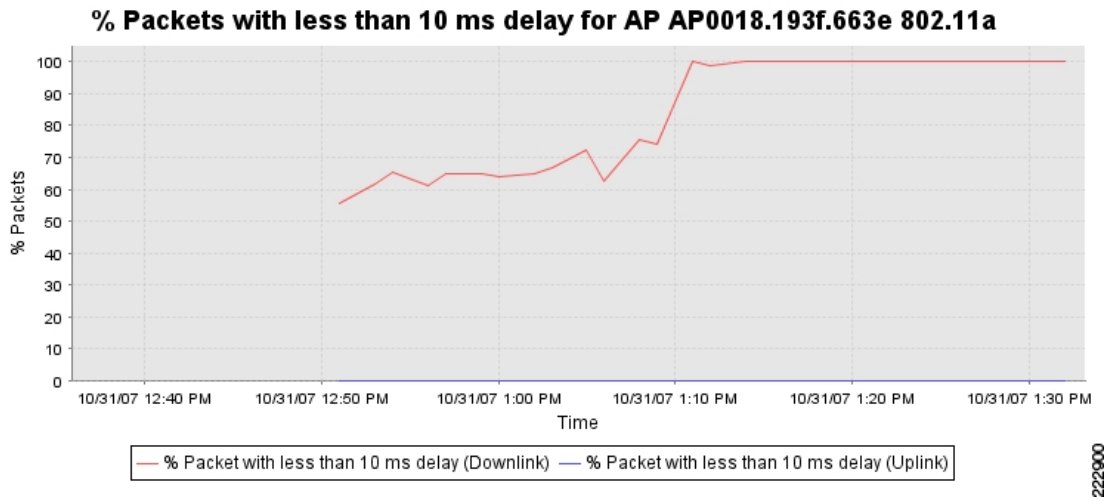
Figure 9-8 shows an example of a traffic stream metrics graph which provides tracking of key stream parameters over time. This allows the correlation of traffic stream parameters with specific events and the trending of these parameters over time.

Figure 9-8 Traffic Stream Metrics Graph



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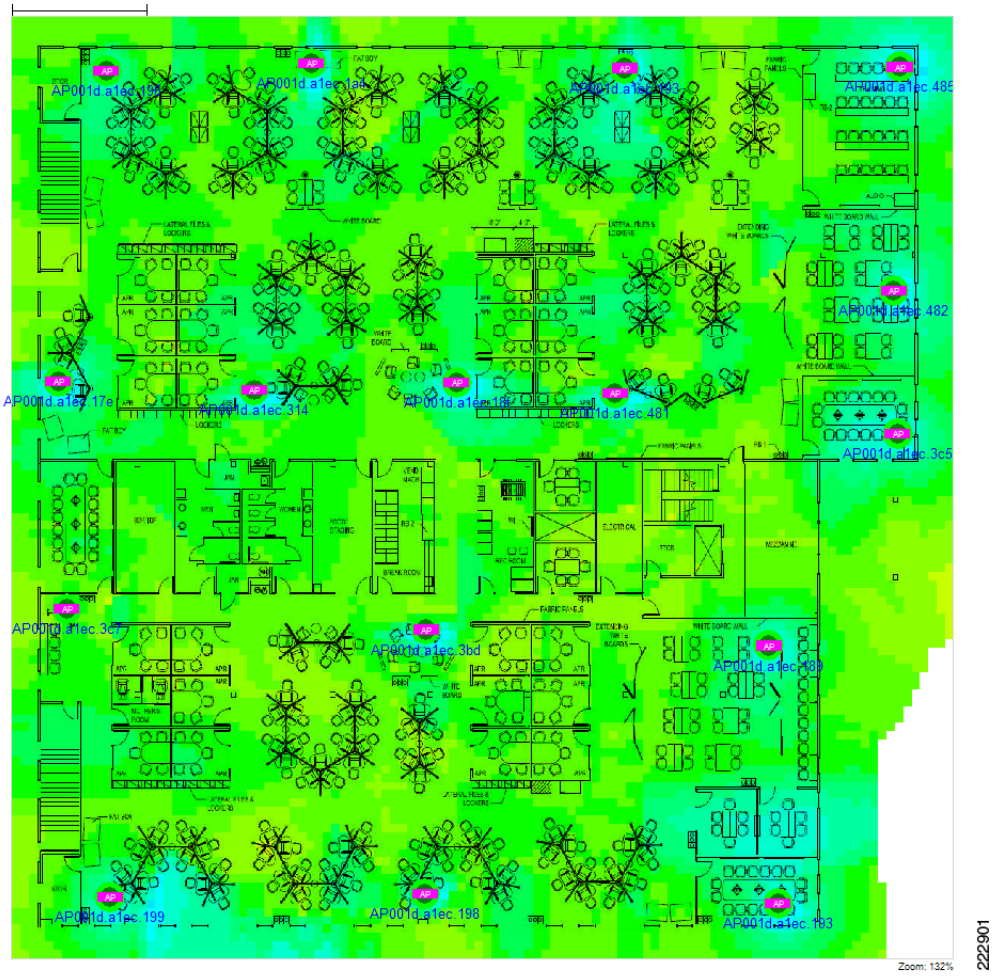
Third Party Tools

AirMagnet Surveyor Pro

We have already discussed the importance of site surveys in RF design session. While the WCS planning tools and WCS RF visualization tools provide a picture of the RF environment, but these are predictions of the RF environment, and if there is one invariable law of computing it is “Garbage in Garbage Out”.

Despite the effort and care applied at the front end of the system the only true measure of their quality and the prediction system is to measure the output. The means of output measurement is a site survey. A site survey can be as simple as measuring signal strength and performance on sample client devices, but, site survey tools such as Airmagnet provide a much richer interface view of the data collected and value added tools to analyze the RF data. The site survey data associated with the floor plan, as shown in Figure 9-9, allows the RF coverage maps of the WCS be validated against data in the WLAN client domain. Given that the WCS maps are a key remote trouble shooting tool, it is also key that these maps be validated by performing a site survey. http://www.airmagnet.com/products/survey/.

Figure 9-9 Example of an Airmagnet Survey



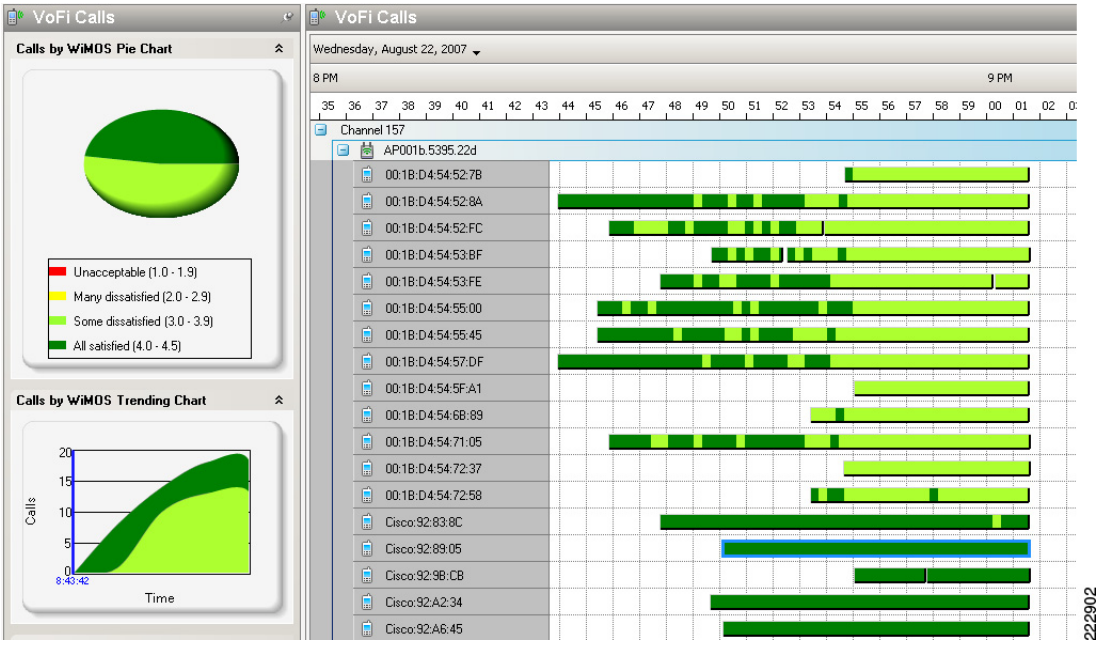
In addition the Airmagnet Site Survey through its AirWise feature provides and assessment of the the VoWLAN readiness of the environment analyzing key parameters such as coverage and AP overlap, and providing planning prediction of network changes based upon the collected survey data.

VoWLAN Analysis

One of the challenges in VoWLAN analysis is determining call quality. Most VoIP systems provide a Mean Opinion Score (MoS) score, but these MoS scores are not always readily accessible and their values are not consistent across devices. The VoFi analyzer from Airmagnet provides a readily accessible

means of measuring VoWLAN voice quality overtime for multiple handsets. Figure 9-10 shows an example of a VoFi Analyzer capture for a group of 11a handsets. Section 1 shows a pie chart of the distribution of MoS scores across handsets, section 2 shows the a histogram of calls and MoS scores over time, and section three shows the MoS values of individual handsets over time.

Figure 9-10 VoFi 11a Analysis



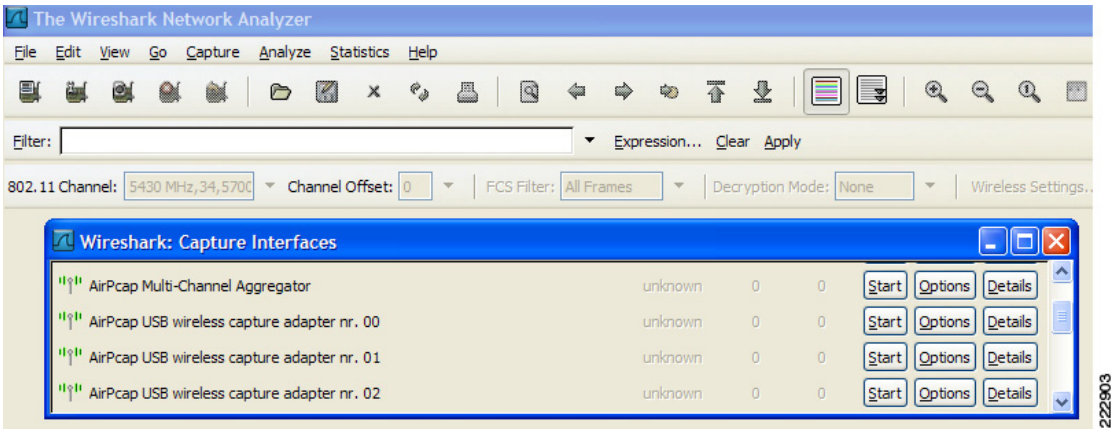
For more information about VoFi11a, refer to the following URL:

http://www.airmagnet.com/products/vofi_analyzer/

CACE Technologies and Wireshark

One of the challenges in troubleshooting WLAN issues is capturing traffic on multiple channels while maintaining accurate timing information. CACE Technologies provides USB WLAN NICs, and a USB hub with drivers to allow the multiple WLAN NICs configured for different channels and connected to the hub, can deliver capture data to Wireshark. Figure 9-11 shows an example of the AirPcap interfaces for Wireshark. The interfaces are available individually and an aggregated capture from all AirPcap adaptors is also available.

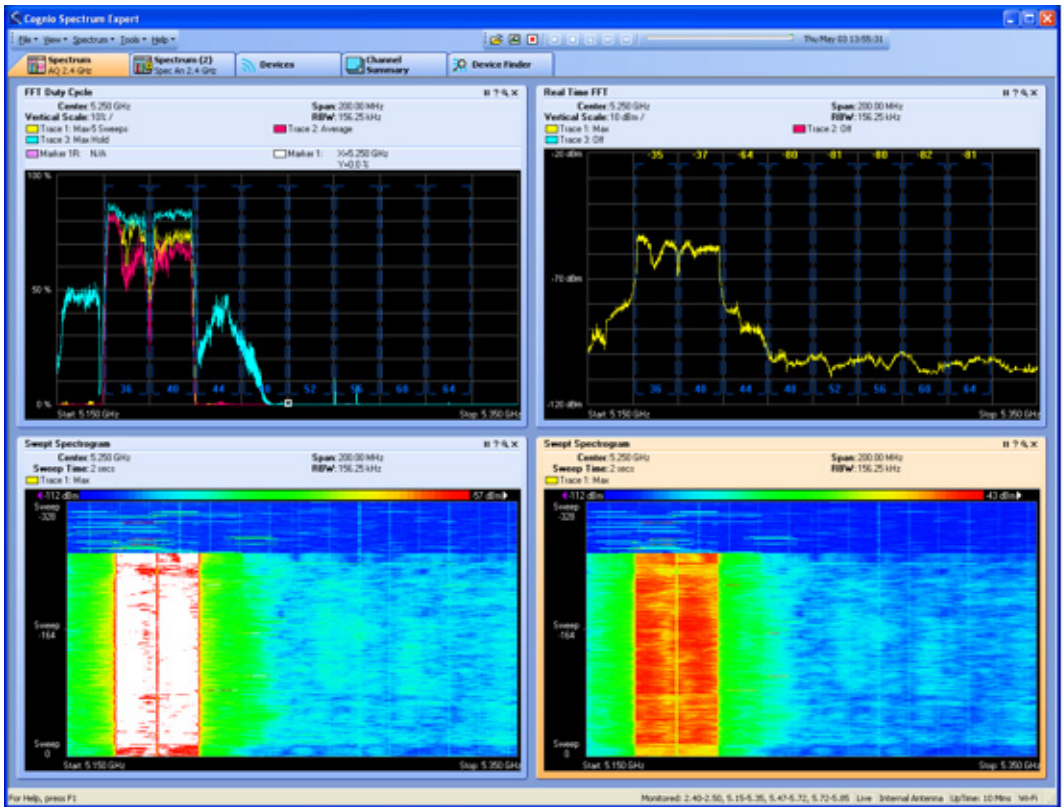
Figure 9-11 Wireshark Capture Interfaces



Cisco Spectrum Expert

WLAN networks can suffer performance degradation caused by changes in the environment. Interference—caused by WLAN transmissions as well as signals radiating from WLAN electronic equipment—accounts for the majority of spectrum problems. Interfering devices may include Bluetooth devices, fluorescent lights, microwave ovens, wireless video and audio monitors, cordless computer mice, and millions of other device types. A standard WLAN site survey tool is designed to measure WLAN coverage. It uses a WLAN chipset to measure the signal strength of APs as you move around the building. Unfortunately, WLAN chips are designed to decode WLAN signals only, and can't tell you much about interference from other WLAN devices. (This is the same limitation experienced when using a WLAN packet analysis tool.) A WLAN site survey tool might indicate a general area where a WLAN signal was observed. But the tool can't directly help you determine the nature of the interference, the type of device causing it, or where the device is located. The Cisco Spectrum Expert analyzer has intelligent spectrum management tools that provide a straightforward view into exactly what devices are on the network at any given time and where they are located. With such visibility, enterprises can address critical problems dynamically and can also set policies that eliminate or control interfering devices that might be clogging the WLAN spectrum. At the time of writing, Cisco Spectrum Expert is a recent Cisco acquisition, please check www.cisco.com for the most up to date information on Cisco Spectrum Expert's availability and capabilities

Figure 9-12 Example Cisco Spectrum Expert Screen Capture



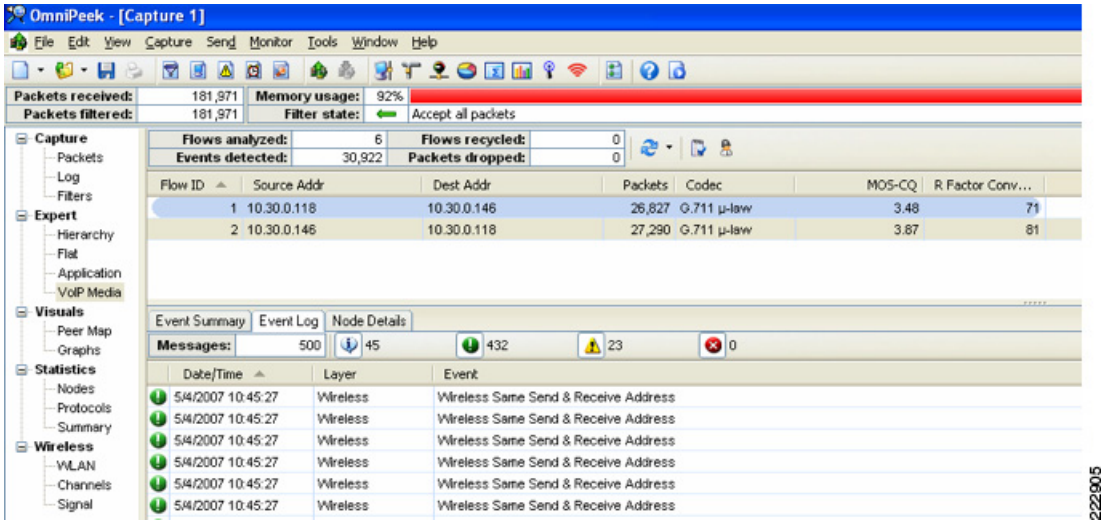
For more information about Cisco Spectrum Expert, refer to the following URL:

http://www.cisco.com/en/US/products/ps9393/index.html

WildPackets OmniPeek

The Omni Peak network analyzer provides comprehensive WLAN protocols decodes and an filtering as well as VoIP analysis. Unfortunately the VoIP analysis like that of the Wireshark relies upon analyzing the RTP stream, which on a typical WLAN would encrypted and unavailable from a WLAN capture. For VoIP analysis the capture and analysis must be performed after the WLC.

Figure 9-13 Example OmniPeek VoIP Analysis



For more information about OmniPeek, refer to the following URL:

http://www.wildpackets.com/products/omnipeek/overview