Thank You, WiTuners®! Now We See What's Happening

A case study illustrates how WiTuners helped a major airport discovering the underlying causes of a mysterious performance issue with WiTuners unique capabilities of discovering in-depth details of Wi-Fi networks and performing what-if analysis

Introduction

For long, a mysterious issue has been bothering the IT team of a large airport–the intermittent failure of the Wi-Fi network in one of its lounges to serve its customers. The problem occurred usually, but not always, during busy hours. The network provider was barraged with complaints; a solution was needed and it was needed quickly and it had to be a good solution, not a quick workaround. The network had to remain operational and therefore no "experiments" were possible. All analysis had to be done off-line but traffic sampling was allowed, provided no traveler information would become public.

After the conventional off-the-shelf solutions were exhausted, WiTuners was brought in to give it a try. Can WiTuners help with its capabilities of examining the in-depth performance details and performing what-if analysis?

Charting the problem

The airport lounge concerned is typical of many such lounges throughout the world: a single entry point connects to two wings that are a little offset from each other. The space is generally open; seating arrangements and refreshment desks and booths complete the general description. The lounge can accommodate hundreds of travelers and it tends to be very busy before the departure of the main flights. People throng into the lounge in droves.

Many of the travelers using the lounge carry smartphones in addition to the usual notebooks and, more recently, tablets. Being used to "always on" connectivity, many smartphone users have their phones set to acquire any Wi-Fi network. Given the number of access points covering the lounge there was no reason to assume that the access points were the cause of the observed congestion.

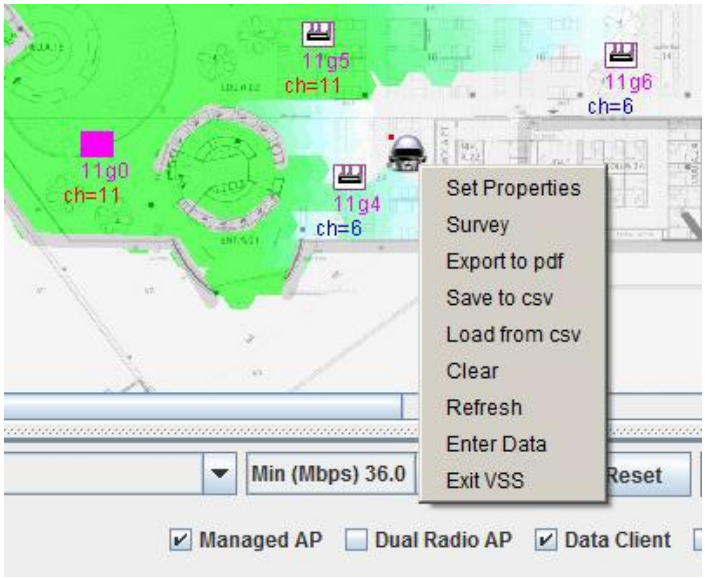
Snooping the air traffic turned out not work. All APs were known and operated normally up to the point of congestion. There were Blue tooth devices present but their activity was not correlated to the congestion events. All the while, unexplained broadband interference that waxed and waned with the network load but it never disappeared completely. Further, the spectrum survey showed that channel occupancy also peaked during congestion but the number of actual connections did not.

Clearly the conventional "clean air" approaches to analyze this problem failed and a different approach proved necessary.

Addressing the issue with WiTuners

Since there were no external sources of interference, "self-interference" scenario appeared to be a likely explanation for the congestion observed. The collisions should cause congestion only if the network is very busy –e.g. above 70% channel occupation. To test this hypothesis, more detailed views of the self-interference was necessary. If confirmed, an optimization of the RF plan –mostly the access point parameter settings – might be sufficient remove the hidden node effects.

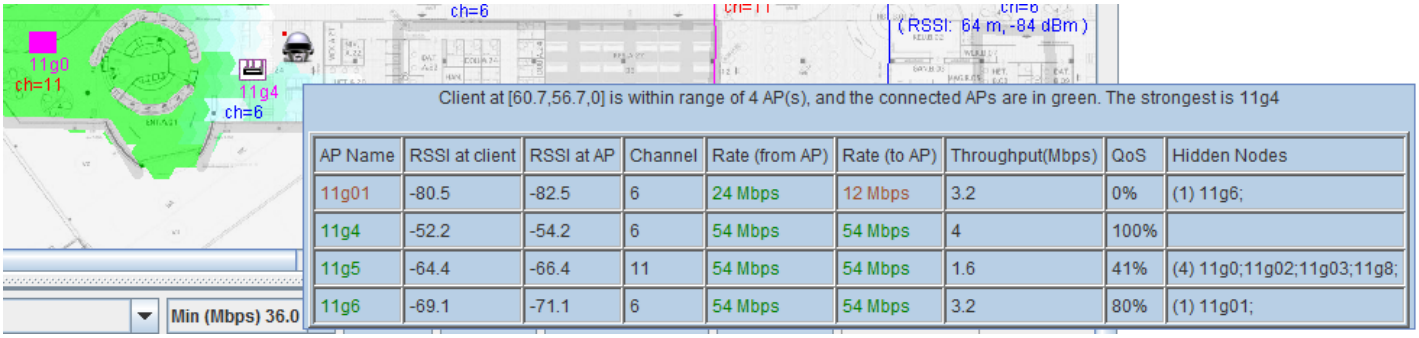
So we turned on WiTuners, which can be launched from anywhere anytime with a web browser. The floor plan and object data of the lounge were loaded into WiTuners, together with the placement and properties of the access points.



The resulting heat-maps showed the expected full coverage of the access points. Also notebook computers proved to have good coverage so that hidden node issues were highly unlikely. When the smartphone properties were entered, the coverage proved to be full of holes: in many locations, the desired minimal transmission rate could not be achieved and the potential for hidden node effects was confirmed to be extensive.

The whole lounge was analyzed by means of the Virtual Site Survey (VSS) capability of WiTuners. It allows a virtual walkthrough a deployment space with device of certain properties – such as a smartphone – and to discover the actual conditions as they are likely to obtain in the real world. This is the user interface for the VSS: a robot symbol that can be defined and be moved anywhere. As the control window shows a survey can be saved and recalled as well as printed for later reference.

At each location, the VSS shows the local signal conditions as shown in the picture below

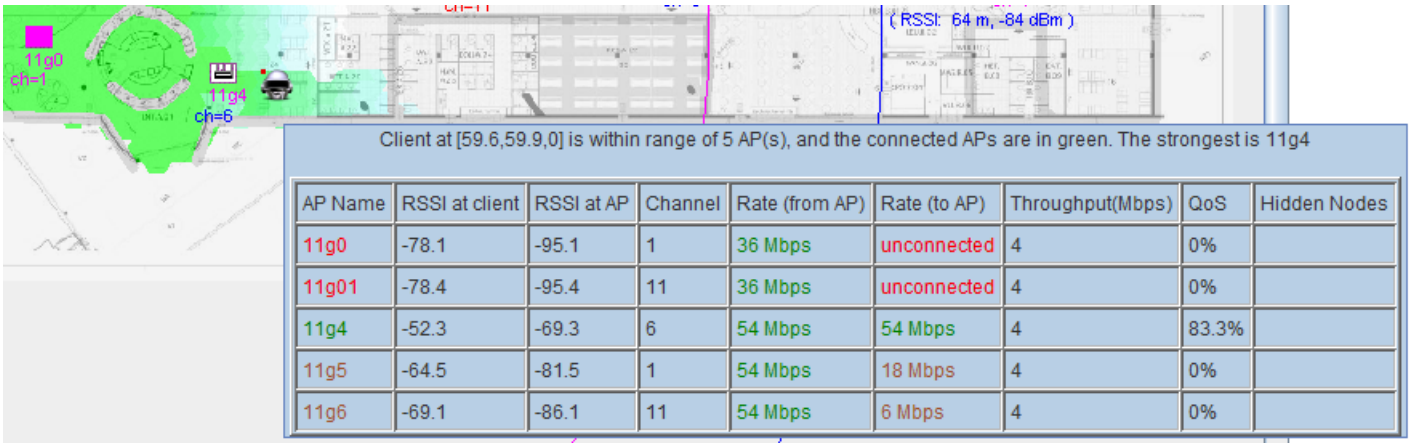


Client at [60.7,56.7,0] is within range of 4 AP(s), and the connected APs are in green. The strongest is 11g4

AP Name	RSSI at client	RSSI at AP	Channel	Rate (from AP)	Rate (to AP)	Throughput(Mbps)	QoS	Hidden Nodes
11g01	-80.5	-82.5	6	24 Mbps	12 Mbps	3.2	0%	(1) 11g6;
11g4	-52.2	-54.2	6	54 Mbps	54 Mbps	4	100%	
11g5	-64.4	-66.4	11	54 Mbps	54 Mbps	1.6	41%	(4) 11g0;11g02;11g03;11g8;
11g6	-69.1	-71.1	6	54 Mbps	54 Mbps	3.2	80%	(1) 11g01;

The above screenshot shows for a certain location within the lounge, that a smartphone can connect with three access points but that three of these connections are subject to hidden node interference from other access points, and by extension, from notebooks operating in the same global area. There proved to be a number of such locations and all of them were listed by the program.

Now, it becomes clear that the significant hidden node interference within the network itself is the underlying cause for what has been troubling the IT team of the airport. The remaining task is straightforward: tune with WiTuners the settings of access points to reduce the self-interference with the help of a number of wizards built in WiTuners, play what-if analysis to ensure satisfaction, and apply the optimization to the Wi-Fi networks in the airport lounge.



Client at [59.6,59.9,0] is within range of 5 AP(s), and the connected APs are in green. The strongest is 11g4

AP Name	RSSI at client	RSSI at AP	Channel	Rate (from AP)	Rate (to AP)	Throughput(Mbps)	QoS	Hidden Nodes
11g0	-78.1	-95.1	1	36 Mbps	unconnected	4	0%	
11g01	-78.4	-95.4	11	36 Mbps	unconnected	4	0%	
11g4	-52.3	-69.3	6	54 Mbps	54 Mbps	4	83.3%	
11g5	-64.5	-81.5	1	54 Mbps	18 Mbps	4	0%	
11g6	-69.1	-86.1	11	54 Mbps	6 Mbps	4	0%	

Learning from this case study

This case study provides a valuable lesson: high density mixed, device networks pose challenges to network planners and network managers that far exceed the usual “wireless problems” like an access point failure or wrong Wi-Fi settings on a notebook.

Addressing such challenges demands sophisticated tools that are able to deal with the complexities of RF propagation and wireless network protocols.

WiTuners clearly proved up to the task – thanks to its comprehensive approach to Wi-Fi analysis. WiTuners looks at all aspects of Wi-Fi operation and take in account signal propagation conditions as well as protocol interactions. This capability, together with real-time network performance audit and optimization makes WiTuners a unique and highly valuable tool for network owners as well as network installers.

In this case, another great benefit of WiTuners is also well demonstrated from a unique angle: it allowed testing and confirmation of the hypothesis about the underlying causes of the observed network deterioration without having to physically change anything in the lounge. By avoiding a “trial and error” process to optimize the network, impacting the customers in the lounge could be avoided as well. Also, using WiTuners saved valuable time because the optimization could be done off-line on a notebook PC.

For more information about how WiTuners helps to resolve the issue after discovering its underlying causes, please contact WiTuners at http://www.wituners.com

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