

Must-have tools for setting up a Wi-Fi net

AirMagnet, Ekahau and TamoGraph simplify Wi-Fi planning and surveying.

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In order to ensure proper Wi-Fi coverage and performance, RF site surveys should be performed before and after WLAN installations and modifications. Though you can walk around and do simple signal checks and throughput tests using free software on your laptop, using Wi-Fi surveying software provides much better testing and reporting.

You load your floor plans (or maps for outdoors) into Wi-Fi surveying software and after walking around taking measurements you'll have visualizations on many Wi-Fi aspects—basically weather maps of your Wi-Fi environment. Signal, noise, signal-to-noise ratio (SNR), and data rates are some of the most basic measurements you'll see. The tools offer additional visualizations, like channel overlaps, capacity, VoWLAN or RLTS (real-time location system) details, and other Wi-Fi health attributes.

Wi-Fi surveying software also allows you to create completely simulated Wi-Fi environments within the software. You place virtual access points on your floor plan or map, defining antenna and power specs, and then specify wall types and other RF attenuators so the signal propagation can be better predicted.

For this review we tested three professional survey tools: [AirMagnet Survey](#) from Fluke Networks, [Ekahau Site Survey \(ESS\)](#), and [TamoGraph Site Survey](#) from TamoSoft.

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To evaluate these tools, we performed Wi-Fi site surveying and planning for Faircreek Church in Fairborn, Ohio, to assist in upgrading their Wi-Fi network. They had a total of four Cisco access points in two buildings totaling 36,000 square feet. Coverage and capacity issues in the main building emerged after 16 Wi-Fi smart thermostats were installed throughout the two buildings. These thermostats required good Wi-Fi signal in areas that did not have it.

Since Faircreek had recently changed to a SonicWALL router that could also serve as the wireless controller they wanted to go with compatible access points: SonicPoints. We used these survey tools to generate a simulated Wi-Fi network using the SonicPoint specs in order to better see how many access points were needed and their optimum locations.

In addition to coverage, it was important for Faircreek to have adequate capacity to support dozens of Wi-Fi users in the main building during Sunday morning services. In the end, we determined that they would need at least three access points in the main building, using one previous access point location and then running cabling for two new locations. For the other building, the two previous access point locations were adequate.

We also used these tools to perform RF site surveys and get measurements before the upgrade to see existing coverage and after to verify coverage and performance. We performed passive and active surveys with each tool, all involving pretty much the same process. However, as you see from the pros/cons and in the full reviews, there are notable differences between the tools in the exact features and functionality.

NET RESULTS

	AirMagnet Survey	Ekahau Site Survey (ESS)	TamoGraph Site Survey
Price (Standard/Pro)	\$2,112 / \$4,235	\$2,714 / \$5,304 <small>(W/ REQUIRED SUPPORT)</small>	\$749 / \$999
Pros	Iperf-based active surveys, spectrum analyzer integration, VoWLAN surveys	Solid GUI, RTLS surveys, channel planner feature	Spectrum analyzer integration, throughput testing for active surveys, photo saving
Cons	Stricter system and adapter requirements, GUI not as user-friendly	Active surveys only ping-based, lacking spectrum analyzer integration	No specific VoWLAN or RTLS support, lacking auto AP location/channel feature

AirMagnet Survey

Fluke Networks provides a few different licensing options for their surveying and planning solutions. AirMagnet Survey Express (\$2,112) provides basic survey and mapping functionality. AirMagnet Survey PRO (\$4,235), which is what we reviewed, offers additional survey features and integrates [AirMagnet Planner](#) (\$2,120 standalone) for simulation functionality. Fluke Networks provides optional Gold Support for these products, starting at \$768 per year for AirMagnet Survey PRO.

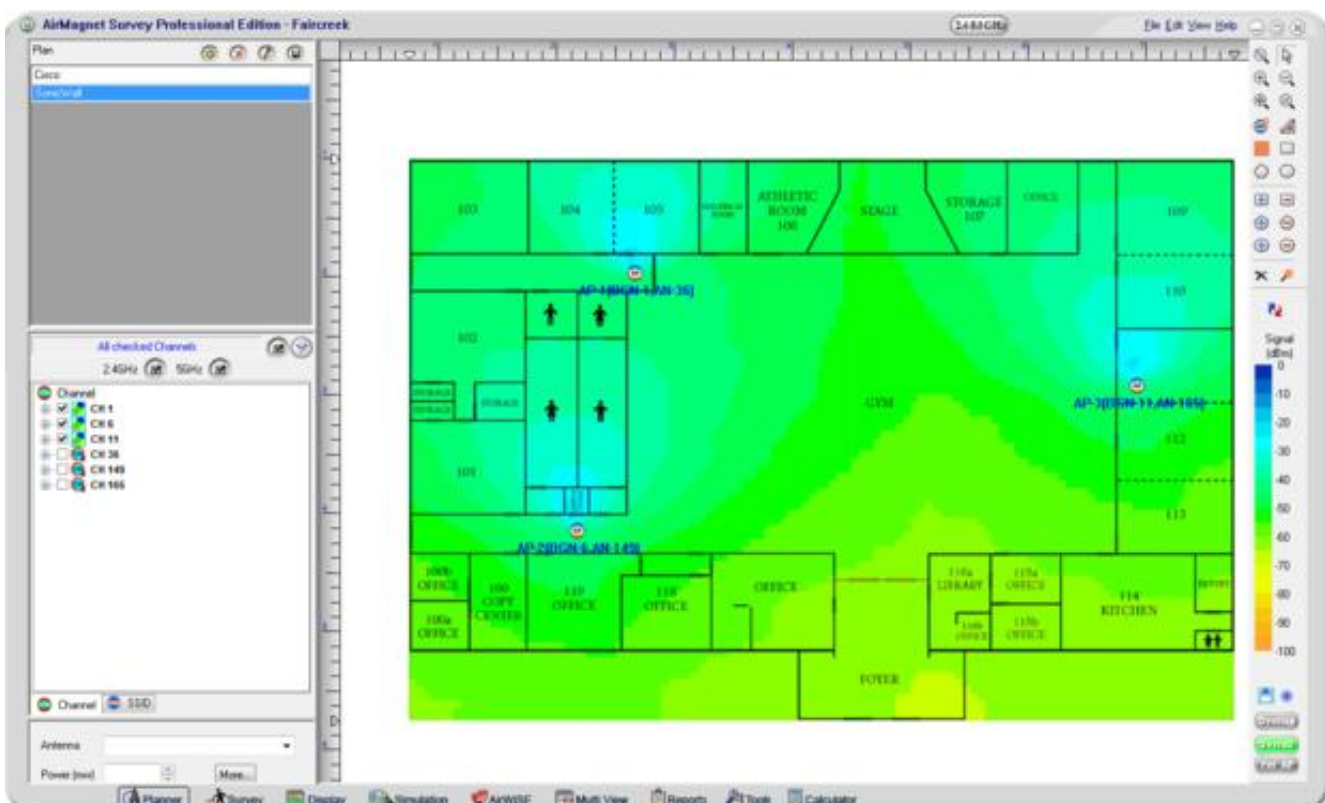
Fluke Networks provides a [free demo version](#) of AirMagnet Survey PRO, limited to 30 minutes of continuous use and doesn't allow printing, merging, or saving of projects or generation of reports.

Fluke Networks survey and planner products support only the Professional, Business, Ultimate, or Enterprise editions of Windows, either 32-bit or 64-bit. However, the exact Windows version you'll require is based upon which wireless adapter you plan to use. Although Windows 8.1 isn't officially supported yet, it will be in the next release coming the summer of 2014.

Unlike the two other solutions, AirMagnet requires you to use an adapter that's on their supported list for both the active and passive surveying. However they support a wide variety of adapters, including a couple that support 802.11ac and one that supports three spatial streams for 802.11n.

AirMagnet Survey didn't have the most attractive and user-friendly GUI, but it was still functional. It has seven main pages, some of which could be streamlined into fewer pages. There are buttons on the bottom of the screen to switch between the pages.

The Planner page shows the integrated AirMagnet Planner application that allows you to create a simulated Wi-Fi environment from scratch. In addition to specifying and drawing wall types and other RF attenuators on the floor plan map, you can specify where you do and don't want coverage. This is useful when using their Advisor feature that can automatically select optimum access point locations based upon the environment, access point antennas, and your signal requirement.



Signal visualization of 2.4GHz for simulated APs in main test building.

We did see a few things with the Planner feature that could be improved. It didn't have our required access point vendor (SonicWall) in their long list of preconfigured antenna selections, so I just choose antennas with similar gain and patterns. We also didn't find one of our required wall types (cinder block) for the test building, it was very easy to add.

In Planner you must hit the refresh button after every change before they're accounted for on the signal map or the additional visualizations on the Display page, which takes a noticeable amount of time. Additionally, there's no feature to automatically assign channels to manually place access points on the map like there is with Ekahau Site Survey. Plus, noise can't be defined and accounted for in these Planner environments, unlike the two other products.

The Survey page is where you go to perform actual surveying. In addition to the usual passive and active modes, it supports active surveys using Iperf. This gives you more realistic throughput results than just using pings. When a supported spectrum analyzer is configured you'll also see live spectrum graphs during surveying. The raw spectrum readings are also saved for later viewing on the Display page in addition to providing two visualizations.

The Display page is where you go to view the signal and other map types of both simulated environments generated by Planner and results from real surveys.

The following visualizations are shown for passive surveys:

- 802.11ac MCS RX
- 802.11ac MCS TX
- 802.11n MCS RX
- 802.11n MCS TX
- Channel Interference
- Channel Overlap
- Channel Width
- Noise
- Operating Mode
- Predictive PHY Data Rate Down
- Signal Strength
- Signal to Noise Ratio
- Spectrum Channel Power (requires supported analyzer)
- Spectrum Interferer Power (requires supported analyzer)

For active (ping-based) surveys you also get the following visualizations:

- Real world data rates
- Uplink
- Packet losses
- Packet retries

For active (Iperf-based) surveys you'll also see the following:

- Real world data rates
- Downlink
- Real world WLAN throughput
- Uplink
- Downlink

For simulated environments via Planner you'll see the following visualizations:

- Signal Strength
- Channel Interference
- Predictive PHY Data Rate Down
- Throughput

AirMagnet is the only survey tool we reviewed that offers support for doing full VoWLAN surveys. Once you configure a test phone and perform a live test you'll see the following visualizations:

- Voice over Wi-Fi
- VoFi signal strength
- Roaming zones
- Channel utilization
- Number of active calls
- Call quality (MOS score)

We found some improvements that could be made to the Display page. First, when you change the visualization type it automatically re-selects all the SSIDs, thus if you only want to see results from a particular access point you must de-select the others every time you change visualization types. You can use the filtering feature to create a separate survey data file containing just the access points you'd like to work with, but it would be nice if this weren't required.

Another possible improvement on Display page is how the limit or threshold ranges are set for the results shown on the visualizations. When you manually set the threshold ranges they're applied to the other data and

visualization types. For instance, we set the minimum limit of SNR to 15 dB and when we viewed the signal or noise maps the minimum limit of both were -85 dBm instead of -100 dBm. It would be nice if you could set limits or threshold ranges individually for each result or map type.

The Simulation page allows you to perform virtual modifications on an existing actual survey to see the simulated affects on signal and throughput values, which is a unique feature of AirMagnet. You can change access point settings and add or move them as well. This is similar to Planner but designed for use after a survey has been made. It would be nice if these similar features could be combined into one page and interface.

The AirWISE page is where you input requirements for the Wi-Fi network and can see the pass/fail results of each. It has preconfigured requirements for several VoWLAN phones (Cisco and Vocera) and Cisco Location Service.

The Multi View page is similar to the Display page but shows up to four different floor plan maps at once, especially useful for multi-floor projects. The Reports page is where you can view and export pre-configured reports on a variety of aspects, which can be highly customized.

Despite some GUI annoyances, overall AirMagnet is one of the most advanced surveying tools. I'd certainly recommend it for general survey needs and especially if VoWLAN is being deployed. In addition to the Iperf-based active surveys, spectrum analyzer integration, and VoWLAN support, I liked the Simulation feature where I could easily modify an existing survey and the Multi View page where I could see multiple floor plans at once.

Ekahau Site Survey

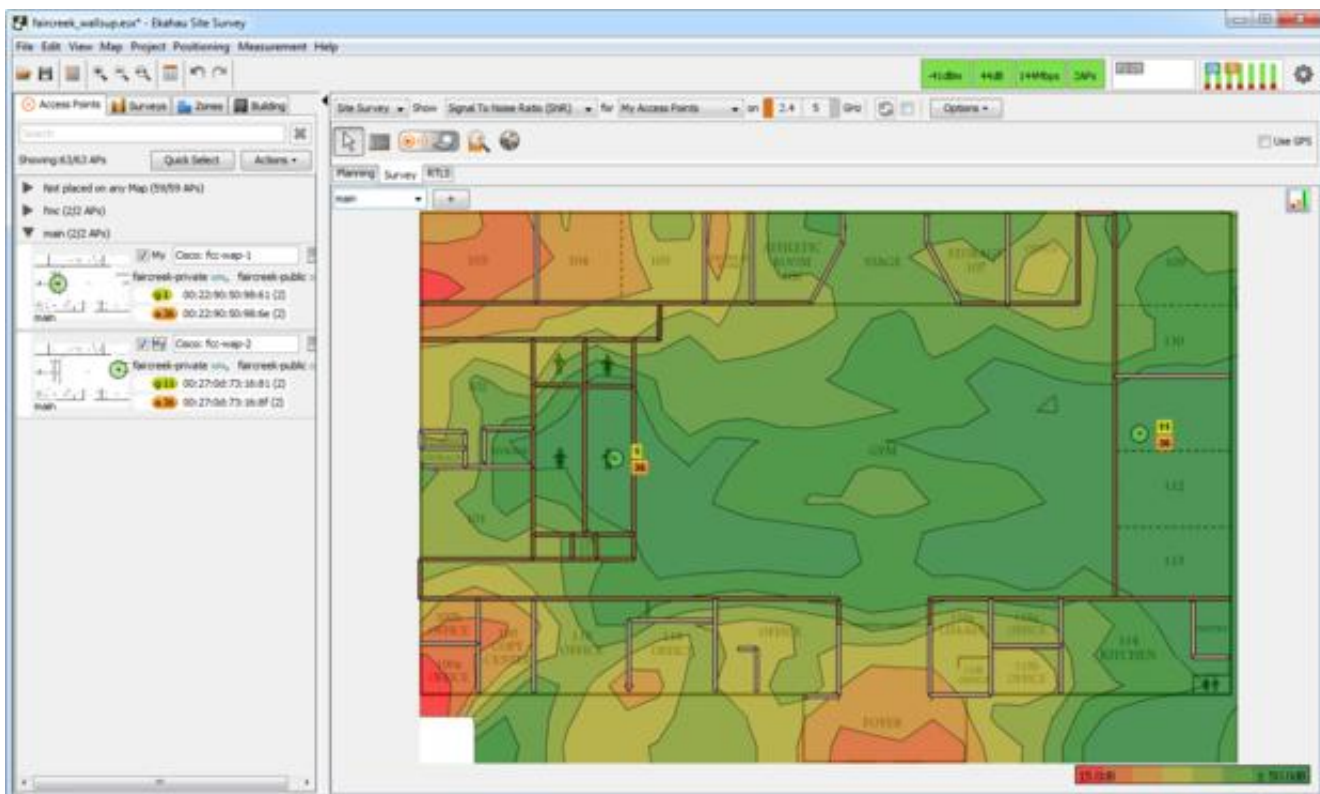
Ekahau Site Survey (ESS) is offered in two editions. ESS Standard (\$2,295) includes the basic surveying and mapping functions. We reviewed ESS Pro (\$4,495), which adds simulation, GPS support, and enhanced troubleshooting and reporting. For both editions, you receive their recommended USB-based Wi-Fi adapter: Ekahau NIC 300. Both editions require you to sign-up for their annual support package at the time of purchase, \$419 per year for ESS Standard and \$809 per year for ESS Pro, but renewal after the first year is optional.

ESS is offered as a free 14-day evaluation with a 30-minute limit on planning and surveying and doesn't allow saving or reporting the data.

ESS supports any edition of Windows 8, 7, Vista, or XP for both 32-bit and 64-bit. Like TamoGraph Site Survey, ESS supports any wireless adapter for active surveying. For passive surveying you must use their supplied adapter or another adapter on their relatively short supported list.

Though Ekahau doesn't have an 802.11ac adapter on their official list yet, its supplied 802.11a/b/g/n adapter does support passive 802.11ac surveys. For surveying Wi-Fi networks that support three spatial streams (802.11n or 802.11ac), you can perform active surveys with any three stream adapter but currently they don't support any three stream adapter for passive surveys on 802.11n or 802.11ac.

We found the GUI of ESS to be intuitive and user-friendly. Almost all the functions are available on the single main screen. The main window of the screen displays the floor plan maps and you can switch between the planning and surveying modes (and RTLS survey mode when enabled) by clicking on their tabs. On the left of the window is a pane where you can tab between the access point survey, and building lists.



SNR visualization of 2.4GHz for the previous APs in main test building.

On the top of the main ESS screen are convenient live connection details of the wireless adapters. It shows text readout of the signal, SNR, and access point count, also indicating whether these are pass or fail based upon your defined requirements. Plus it shows a small graph for each wireless adapter giving you a quick visual of the signal and noise levels. However, even when using Ekahau Spectrum Analyzer, live spectrum graphs aren't shown in the survey tool; there's only a shortcut button that takes you to the separate Chanalyzer Pro application. It would be great if it was more integrated like with the two other survey tools we reviewed.

When setting your Wi-Fi requirements you'll find preconfigured basic requirements (email/web, high speed, etc.) in addition to some for voice (Cisco, Polycom, Vocera) and RTLS deployments.

During our surveying we didn't run into any issues but found some improvements that could be made. It would be great if the active surveying supported more realistic throughput testing, like Iperf-based surveys with AirMagnet, in addition to the simple pinging. Ekahau says they are working on this and should be out in a release later in 2014.

Also, it would be great if it were easier to manually choose what survey mode each adapter is configured for, in case we'd want to change for instance which one performs the active surveying.

The following visualizations are shown for passive and simulated surveys:

- Associated Access Point
- Capacity Clients per AP
- Capacity Health
- Channel Bandwidth
- Channel Coverage
- Channel Overlap
- Data Rate
- Difference in Interference
- Difference in Number of APs
- Difference in Signal Strength
- Interference / Noise
- Network Health
- Network Issues
- Number of Access Points
- Per-Channel View
- Signal Strength
- Signal-to-Noise Ratio
- Strongest Access Point
- Throughput (Max)

The following visualizations are shown for active surveys:

- Network Health
- Network Issues
- Ping / Round Trip Time
- Ping Packet Loss
- Throughput (Max)

ESS is the only survey tool to provide functionality designed specifically for surveying environments utilizing real-time location system (RTLS). When enabled, it gives you another tab on the main interface where you can define rails, open spaces, zones, and location beacons, and it offers the following visualizations:

- Calibration Quality
- Location Accuracy
- Locations Coverage
- Location Quality
- Number of APs
- Signal Strength
- Zone Accuracy
- Zone Similarity

Like the other tools, the planning features of ESS allow you to create fully simulated Wi-Fi environments from scratch. But we found it isn't easy to add additional wall types, like the cinder block that was in our test building, during the planning phase.

Like AirMagnet, you can specify desired coverage areas so the Auto-Planner feature can automatically place access points on the map based upon the environment, access point antennas, and your requirements. But unique to ESS is a convenient feature called Channel Planner. It can automatically assign optimum channels to simulated access points you manually create.

Overall Ekahau Site Survey (ESS) is a great tool with a solid GUI. Though I'd like to see improvements to the active surveying and spectrum integration, I'd still recommend it for general surveying and especially if RTLS is being deployed. I liked that it offered many different visualizations, various preconfigured network requirements, and supported a wide variety of client simulations. One relatively small but very useful feature I enjoyed is Channel Planner.

TamoGraph Site Survey

TamoGraph Site Survey is offered in a Standard edition (\$749), providing basic survey functionality and then a Pro edition (\$999), adding simulation features, GPS support, and report customization. For our review we evaluated the Pro edition. They offer a free 30-day trial with stringent limitations: surveys limited to 10 minutes, predictive planning five minutes, watermarks on the visualizations, and no saving of projects or reports.

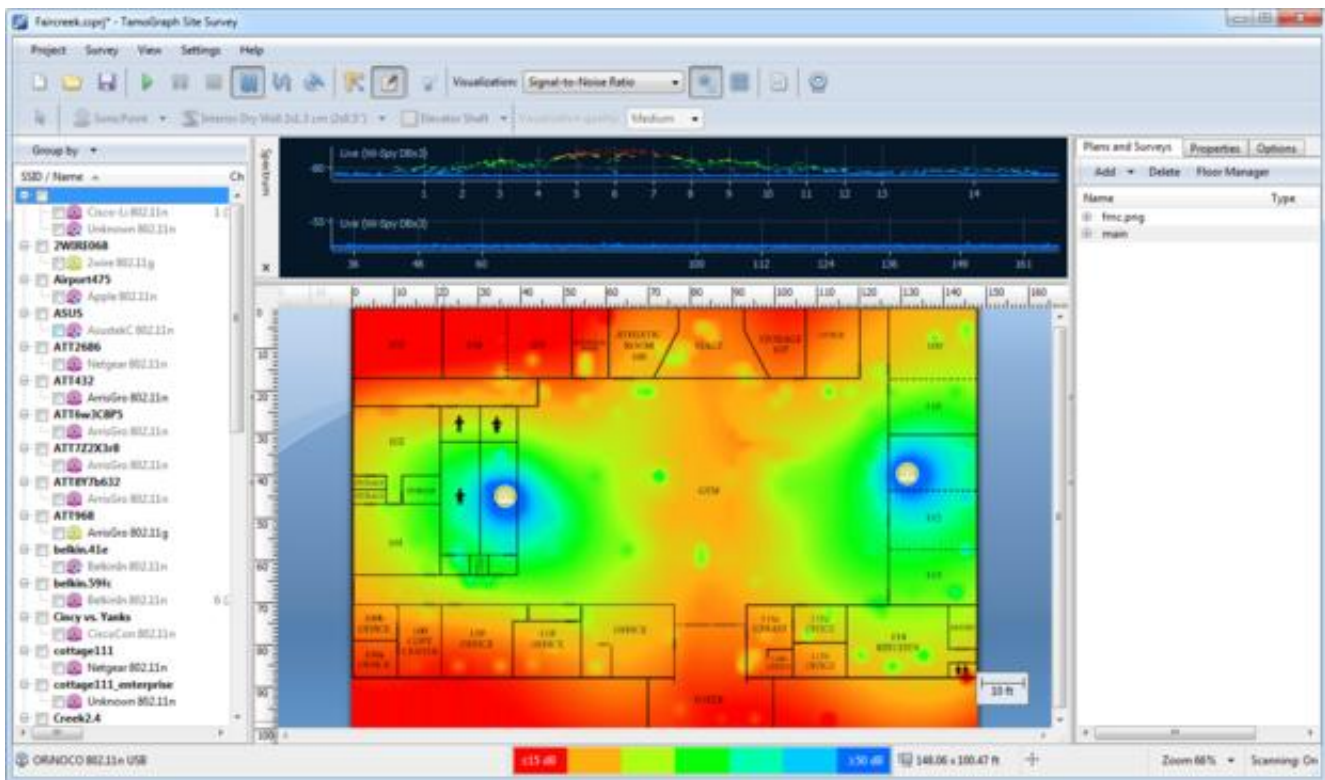
TamoGraph Site Survey runs on any Windows edition from XP to 8.1. Like with ESS, any Wi-Fi adapter can be used for active surveying. For passive surveying it supports plenty of wireless adapters, including many for 802.11ac and two 802.11n adapters that support three spatial streams.

We found the GUI of TamoGraph Site Survey to be attractive and user-friendly. You'll find one floor map display area where you can see real survey results and also perform simulation. On the left of the map window is a pane with the SSID list, showing real SSIDs from surveys and any SSIDs of virtual access points you place on the map.

On the right of the map window is a pane that has three tabs for accessing various settings. The Plans and Surveys tab is where you add floor plan images or street maps and manage survey data files. The Properties tab allows you to set environment settings, client capabilities, requirements, and scanning settings. The Options tab is where you can customize the visualization coloring, result ranges, and other miscellaneous settings.

When surveying you can do passive surveying and/or active surveying using pings or their throughput test utility (similar to AirMagnet). Surveying for us went smoothly. The only improvement we see that could be made here is the ability to simulate different clients other than the actual client used for the survey, like supported in the other tools.

Though we didn't get to try out the photo and voice command features released in its latest update, both seem useful. The photo feature allows you to take snapshots from the laptop webcam or tablet camera and place it on the floor plan map, for instance to photograph access point or cabling locations. The voice command feature allows you to control basic functions via voice recognition, such as starting/stopping the survey and zooming in and out.



SNR visualization of 2.4GHz for the previous APs in main test building.

The following visualizations are shown for passive and simulated surveys:

- AP Coverage Areas
- Channel Bandwidth
- Expected PHY Rate
- Frame Format
- Number of APs
- Requirements
- Signal Level
- Signal-to-Interference Ratio
- Signal-to-Noise Ratio

The following visualizations are shown for active surveys:

- Actual PHY Rate
- Associated AP
- Requirements
- Round-trip Time

When using their throughput test utility for active surveys you'll also see the following:

- TCP Downstream Rate
- TCP Upstream Rate

- UDP Downstream Loss
- UDP Downstream Rate
- UDP Upstream Loss
- UDP Upstream Rate

Like the other tools, TamoGraph Site Survey allows you to create fully simulated Wi-Fi environments from scratch. Although it didn't have one of our required wall types (cinder block) for our test building pre-configured, it was very easy to add. But the simulation tool lacks automatic access point location and/or channel assignment functionality like the other tools provide.

Overall I was impressed with TamoGraph Site Survey, especially since it's priced 65% to 80% less than the two other tools. Though it lacks specific functionality for VoWLAN and RTLS surveying, I'd recommend it for general surveying. It was great to see it supported thorough active surveying, spectrum analyzer integration, and photo saving.

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