AirMagnet® Survey User Guide

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AirMagnet Survey User Guide

Introduction

Product Overview

AirMagnet Survey is a powerful, easy-to-use survey tool for planning, collecting and analyzing WLAN site RF (radio frequency) data crucial for successful WLAN deployment.

Wireless network installation is a complex and daunting task that involves many invisible and unpredictable variables such as RF signal strength, noise level, data rate, channel allocation, user density, and so on. Since all these factors ultimately affect WLAN network performance, it is necessary to perform RF site surveys to fully understand the behavior of radio waves within a facility before installing wireless network access points. Operating at the RF level, AirMagnet Survey enables WLAN professionals to quickly and easily determine the optimal number and placement of WLAN infrastructure devices to provide the best coverage and throughput required by the users in a cost-effective way.

AirMagnet Planner is a wireless network planning tool that accounts for building materials, obstructions, access point configurations, antenna patterns and a host of other variables to provide a reliable predictive map of Wi-Fi signal and performance. The solution offers superior predictive modeling to determine ideal quantity, placement and configuration of APs for optimal security, performance and compliance.

AirMagnet Planner includes built-in automated tools to help users with their migration strategy from existing legacy 802.11a/b/g/n networks to 802.11ac/ax technology.

AirMagnet Planner can be purchased as a separate product or as a fully integrated feature of AirMagnet Survey. When integrated with AirMagnet Survey, users have a powerful solution that combines state-of-the-art predictive modeling with real-world performance data.

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Compiled in the United States of America.

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AirMagnet Survey PRO vs. Survey Express

AirMagnet Survey comes in two versions: PRO and Express. The table below highlights the similarities and differences between the two.

	Product Features	Survey PRO	Survey Express
Site Survey scenarios	Indoor site survey	Yes	Yes
	Outdoor site survey	Yes	No

Coverage maps	RF signal coverage	Yes	Yes
	Data rate	Yes	Yes
	Channel interference	Yes	Yes
	802.11n/ac/ax (AP operating mode, Channel width, Max MCS)	Yes	No
	Packet loss/retry	Yes	Yes
Floor-based deployments	Single-floor data display and analysis	Yes	Yes
	Multi-floor data display and analysis	Yes	No
	802.11 deployments	802.11a/b/g/n/ac/ax	802.11a/b/g/n/ac/ax
Surveying capabilities	Passive surveys	Yes	Yes
	Active surveys	Yes	Yes
	Active Iperf surveys	Yes	No
	Data simulation	Yes	Yes
	Active tools	Yes	Yes
	200+ channel deployment	Yes	No
Reporting capabilities	Survey Reports	Multiple reports	One Report*
Network design verification	Network design verification	Yes	No
	VoWLAN deployment verification	Yes	No
RF spectrum analysis	Spectrum XT integration	Yes	No
	RF spectrum heatmaps	Yes	No
Cisco Prime NCS/WCS	Survey Integration	Yes	No
	Planner Integration	Yes	With purchase of AirMagnet Planner Module.
Network Planning	AirMagnet Planner	Yes	With purchase of AirMagnet Planner Module.

* AirMagnet Survey Express has one default report: 'Overall Coverage Report by Channel'.

Additional Notes regarding AirMagnet Survey PRO and AirMagnet Survey Express:

- If you are installing AirMagnet Survey PRO, you should see the words "Survey PRO" across the top of the sticker bearing the serial number and serial key; if you are installing AirMagnet Survey Express, you'll see the word "Survey Express".

- AirMagnet Survey PRO offers more features than AirMagnet Survey Express. If you are using AirMagnet Survey Express and wish to upgrade to AirMagnet Survey PRO, contact your AirMagnet product reseller or AirMagnet Technical Support.

- An AirMagnet Spectrum XT Adapter is required in order to view spectrum data on AirMagnet Survey PRO. Those who want to take advantage of this feature must purchase AirMagnet Spectrum XT separately at their own expense.

Key Features and Benefits

AirMagnet Survey offers the following key features and benefits (Note that some of the features are available in Survey PRO only):

- **AirMapper™** eliminates the need for laptops, dongles, or tethered devices to conduct site surveys. You can perform a survey with the AirMapper application on your NetAlly AirCheck G2 or EtherScope nXG and analyze the data with AirMagnet Survey PRO.

  There are two options to transfer survey data from a NetAlly AirCheck G2 or EtherScope nXG:

  Link-Live Download

  1. When saving an AirMapper survey, select Link-Live as the destination.
  2. Login to your Link-Live account.
  3. You can download AirMapper projects to your PC with AirMagnet Survey PRO v10.0 (or later) using the Export for Survey PRO option on Link-Live.

  USB Transfer

  1. When saving the survey on the AirCheck G2 or EtherScope nXG, select Local as the destination.
  2. Plug a USB thumb drive into one of the USB-A ports on your handheld tester.
  3. Transfer the AirMapper (.amp) file that was saved to the USB thumb drive.
  4. Remove the USB thumb drive from the handheld tester and plug it into a PC with AirMagnet Survey PRO v10.0 (or later).
  5. Open the AirMagnet Survey PRO application.
  6. Go to File and select the Open Project option.
  7. Browse to the location of the .amp file.
  8. Select the .amp file and click the Open button.
  9. When asked where to save the new project, browse to preferred destination and click on the OK button.

  After the import has been completed a new Survey Project (.svp) file will be created using the data collected by the AirMapper application. You will be able to use all AirMagnet Survey functionality to analyze your AirMapper survey data, including:

  o Heatmaps
    - Signal Strength
    - Noise
    - SNR
    - Interference

- ▪ Predictive PHY Data Rates

- ▪ Max MCS

- ▪ AP Operating Mode

- ▪ Channel Width

- o Simulation Mode

- o MultiView

- o DiffView

- o AirWISE

- o Reports

Please be aware of the following while using this new functionality:

- o You will not be able to import an AirMapper (.amp) file into an existing Survey Project (.svp) project, a new project will always be created. Still, after the new project has been created you will be able to import the .svdx file in that project into other projects.

- o A converted AirMapper project will have the same name as the .amp file.

- o The Adapter Name under Survey Properties will say AirMapper.

- o Open Space Office will be used as the Environment by default, but it can be changed through the Project Properties screen. Signal Propagation Assessment will match the value used on the AirMapper application.

- o The AP Default Power will be set as 100.0 mWatts, but it can be changed if needed through the Project Properties screen. Note: This setting is only used by the Simulation tool.

- o An AirMapper (.amp) project cannot be directly imported into MultiView, but you can import it after converting it into a Survey Project (.svp).

- **GPS support** allows you to use any AirMagnet-supported GPS device for large-scale, outdoor WLAN site surveys. The program can automatically calibrate GPS location information (longitude and latitude) of any given point on the site and place APs in their optimal locations. It can also automatically collect site data as you are moving (walking/driving) along the survey path. *Available in AirMagnet Survey PRO only.*

- **Integration with AirMagnet Spectrum XT,** which comes with AirMagnet's advanced spectrum sensing hardware and analysis software, brings the AirMagnet Survey to a higher level by offering wireless network professionals a powerful tool for spectrum monitoring as the basis for network planning and deployment, in-depth and localized trouble-shooting, and network optimization. *Available in AirMagnet Survey PRO only. Requires AirMagnet Spectrum XT application installed on same machine including a valid license and AirMagnet Spectrum XT Adapter.*

- **AirWISE Integration** incorporates AirMagnet's AirWISE technology into the Survey product to help wireless LAN planners and administrators make well-informed decisions regarding the requirements for their WLAN deployment and maintenance using real data collected from a site survey. It is geared towards helping identify critical issues in WLAN performance and providing straightforward actionable solutions to the issues that are identified. For example, one of the policies can help you determine WLAN readiness for "Cisco Location-based Services." *Available in AirMagnet Survey PRO only.*

- **Comprehensive survey data reports** let you turn your survey data and simulation results into various data reports. The reports contain comprehensive information on channel allocation and usage, WLAN SSID coverage and throughput, AP coverage, RF interference and noise, etc. The reports can be exported in popular file formats (Acrobat PDF, HTML, Microsoft Word (RTF), Microsoft Excel 97-2000 (XLS) and XML). The reports can be saved on your hard drive. A translation feature enables report templates to be localized for multiple languages. *Available in AirMagnet Survey PRO only.*

- **Multi-floor site survey** and data analysis feature allows you to conduct RF surveys on a per-floor basis. Each survey on an individual floor is treated as a separate project. You can then view them individually or collectively to see how they perform in terms of signal coverage across the floors. *Available in AirMagnet Survey PRO only.*

- **A powerful, comprehensive, and easy-to-use WLAN deployment utility** integrates functionalities such as site survey, data analysis, channel and power simulation, data merging and filtering, calculation, and network connectivity troubleshooting all in one package.

- **Three survey options—active, passive, and active Iperf—**allow you to gather complete site RF data, including signal strength, channel allocation, noise level, signal-to-noise ratio, coverage, media type, transmission speed, packet loss/retry rate, etc. In an active survey, AirMagnet Survey can associate with a specific AP or SSID; in a passive survey, it can "pick up" any RF data that exist in a WLAN environment, including data from neighboring WLANs. Active Iperf Surveys allow the system to gather information for PHY data rates for both uplink and downlink connections.

- **Two display options** enable you to view and analyze site RF data by channel or by SSID. You can easily identify WLAN deficiencies in terms of AP coverage, roaming boundary, channel allocation/interference, noise impact, etc.

- **Support for Intel® Centrino® Mobile Technologies** allows customers to take advantage of the advanced performance and security features offered by the latest Intel® Centrino™ mobile technology products.

- **Easy-to-use Simulation tool** allows you to conduct simulations on AP channel allocation, output power, and SSID assignment right from your desktop and get the results in a matter of seconds. You can conduct various "tests" to find the best AP channel allocation with maximum signal strength and minimum co-channel or adjacent channel interference; analyze the impact of AP repositioning to select the optimal AP deployment location and provide the most efficient signal coverage; analyze the impact of adding or reducing the number of APs at a site to determine the optimal number of APs for desired signal coverage; and visually compare the results before and after the simulations, etc.

- **Data filtering capability** allows you to zero in on specific APs for detailed analyses and to experiment with different AP deployment scenarios.

- **Data merging** gives you a holistic view of all factors affecting your wireless LAN deployment. You can experiment and simulate with different AP deployment options for maximum signal coverage and minimum interference.

- **Diagnostic tools** let the you analyze signal distribution patterns and conduct end-to-end connectivity tests with DHCP and Ping tools at any time.

- **Built-in wireless calculator** allows you to calculate various parameters important to WLAN performance. They include System Operating Margin, Free Space Loss,

Fresnel Zone, Downtilt Angle and Distance, and Downtilt Coverage. So you can make informed decisions for your WLAN deployment and/or upgrade.

- **Graphical data display with color spectrum and gradient** makes it easy to understand and differentiate RF data from various sources (that is, APs or SSIDs and channels). This allows you to base your WLAN decisions on "facts" rather than "hypotheses".

- **Support for all wireless LAN PHY standards**, that is, 802.11a/b/g/n/ac/ax.

- **Survey comparison view** helps users visualize the differences between two surveys taken of the same area. This can be most useful for users who wish to see how a wireless environment changed over time by comparing two surveys taken months apart.

- **Passive survey speed data calculation** generates speed data for passive or simulated data, allowing users to view the predicted transmission rates for APs without having to conduct an active survey for each device.

- **Profile management** makes storing configuration settings for any given site easy. Users can implement profiles for each site surveyed and quickly switch back and forth between profiles, eliminating the need to manually adjust configuration settings at each location.

- **Cisco Prime NCS/WCS** are network management tools. Integrated with AirMagnet Survey, it allows you to import AirMagnet Survey and AirMagnet Planner files into Cisco Prime NCS/WCS. It also lets you export a Cisco Prime NCS/WCS project into AirMagnet Survey.

- **Survey Mobile app** is a mobile and easy to carry platform for conducting site surveys using an Android phone or tablet. Because it integrates seamlessly with AirMagnet Survey PRO, you can conduct the survey using Survey Mobile, and then share the projects with other users of AirMagnet Survey PRO. Simply email the project from your handheld device and open the project (.svd file) in AirMagnet Survey PRO for deeper survey analysis and reporting.
  The Survey Mobile app .apk file can be found in your installation directory. To load the app onto your device, connect your Android device to your PC and enable USB mass-storage mode. You can then drag and drop the file onto your Android device. Then, using a file manager, such as Astro or ES File Explorer, locate the file on your Android device and install it.

- **Multi Floor Planner** enables you to view how signal propagation occurs between floors in a multi-floor building. With Multi Floor Planner, you can create a new project for one or more floors and you can also import individual AirMagnet Planner projects for one or more floors as well. By creating a single building project in this way, you can see predictive heatmap visualizations, for example, of how APs on one floor may propagate signal strength coverage to other floors. It includes support for 802.11a/b/g/n/ac/ax APs.

System Requirements

Note:

Laptop/Notebook PC/Tablet PC

Operating Systems: Microsoft Windows 8.1 Pro/Enterprise 64-bit or Microsoft Windows 10 Pro/Enterprise 64-bit

> **Note:** *64-bit Operating System supported on Windows 8 and 8.1 for certain wireless adapters. Refer to "Supported Adapter" section at* *https://airmagnet.netally.com/my_airmagnet/public/documents/#3rdpartydriver*

- Intel® Core™ 2 Duo 2.00 GHz (Intel® Core™ i5 or higher recommended)
- 4 GB memory or higher.
- 800 MB free hard disk space
- AirMagnet-supported wireless network adapter(s)
- Cardbus, ExpressCard slot, USB port or mini PCI slot for external adapter use.
- When using multiple adapters. AirMagnet recommends the use of its multi-adapter kit. Otherwise, multiple slots/ports in the PC are required.
- Optional AirMagnet Spectrum XT adapter and license for integrated spectrum survey on Survey PRO. Required for viewing spectrum data and heatmap.
- A site map in a supported format. Refer to Supported Image File Formats.
- Google Earth must be installed in order to export the GPS data for outdoor surveys to Google Earth (Survey PRO only).

Apple® MacBook® Pro:

- Operating Systems: MAC OS X v10.5 (Leopard™) running a supported Windows OS (as noted under Laptop/Notebook PC/Tablet PC section) using Boot Camp®.
- Intel®-based CPU 1.6 GHz or higher.
- 4 GB memory or higher.
- 800 MB free hard disk space.
- Cardbus, ExpressCard slot, USB port or mini PCI slot (whichever applicable for your adapter).
- Built-in Atheros-based Airport Extreme 802.11n wireless adapter or any AirMagnet-supported wireless network adapter (whichever applicable).
- Optional AirMagnet Spectrum XT adapter and license for integrated spectrum survey on Survey PRO. Required for viewing spectrum data and heatmap.
- A site map in a format supported by AirMagnet Survey. Refer to Supported Image File Formats.
- Google Earth must be installed in order to export the GPS data for outdoor surveys to Google Earth (Survey PRO only).
- When using multiple adapters, AirMagnet recommends the use of its multi-adapter kit. Otherwise, multiple slots/ports in the Macbook® Pro are required.

Guideline for Use of Wi-Fi Adapters

AirMagnet Survey/Planner requires that a Wi-Fi adapter be installed on the same computer running the application to capture Wi-Fi data.

AirMagnet mobile products categorize Wi-Fi adapters into the following types:

Preferred Adapters: These adapters have been tested by AirMagnet and are recommended for use with AirMagnet products. Drivers have been customized for extended feature support. For a complete, up-to-date listing of AirMagnet Preferred wireless adapters, visit

Other Adapters: These adapters can be used with AirMagnet Survey PRO but have not been tested by AirMagnet. Drivers have not been customized, will provide limited features, and could provide inaccurate data. Note: When installing Intel® and USB adapters, it is important that you uncheck the option to install the adapter's client utility in addition to the driver software.

Limitations of Other Network Adapters

Any 802.11 adapter supported by Windows other than the Preferred Adapters falls into the Other network adapters category. They can be used with AirMagnet Survey PRO to perform a survey but have not been tested by AirMagnet. These adapters' drivers have not been customized, provide limited feature support, and could provide inaccurate information. It is important to note that NetAlly is not responsible for the quality of the test results collected using these adapters. The following are noted limitations of generic adapters in AirMagnet Survey.

- No ability to scan specific channels: all channels are scanned. There is no Scan or 802.11 tab under the File>Configure menu.
- No noise or signal-to-noise ratio (SNR) measurements.
- Measured PHY data rates in the uplink and downlink directions are not separated. Only a single PHY data rate for the connection is reported.
- No packet retries and loss measurements on active and iPerf surveys.
- iPerf throughput performance may vary, depending on the model of the generic adapter in use.
- Limitations in the wireless channels that they scan: They may only be able to scan channels that are approved for wireless use in a specific country, and unable to scan channels assigned as Dynamic Frequency Selection (DFS) channels.
- Only one non-preferred adapter can be used when utilizing multiple adapters. Refer to "Utilizing Multiple Adapters" in the AirMagnet Survey User Guide.
- There is no roaming control for active and iPerf surveys.
- Due to the inability to disable roaming on the adapter, only the "by SSID" (not by AP) method is available for active and iPerf surveys.

A complete, up-to-date listing of AirMagnet-supported wireless adapters is located here:

https://www.netally.com/products/airmagnet-survey-pro/#SupportedAdapters

Wi-Fi Adapter Driver Packages

The supported driver packages for preferred adapters is located in your My AirMagnet account under the Documents/Drivers section.

Supported GPS Devices

When conducting a GPS outdoor survey, the GPS device must be compatible with AirMagnet Survey PRO by satisfying the following requirements:

- Must be NMEA compliant
- Capable of generating serial data which can be verified via Hyperterminal.
- Recognized by the laptop as a COM port

If your GPS device is not an NMEA compliant, you may use a 3rd party software solution that will allow the GPS USB to be detected as a COM port. You will then need to verify that the data is converted to NMEA format. Software solutions such as this have worked on many GPS models; however, AirMagnet cannot ensure that it works with all GPS devices.

Supported Image File Formats

A digital site map of the facility or location needs to be in one of the supported file formats. Having a site map allows you to accurately mark AP locations and coverage areas. However, if no digital site map is available, you may create one using a drawing software application. You can also sketch a map by hand and then have it scanned and saved in one of the supported image file formats.

File Format	Description
.BMP	The standard Bit-Mapped Graphics format used in the Windows environment.
.DIB	Device-Independent Bitmap, a variant of a bitmap (bmp) file.
.DWF	DWF is an Autodesk Design Web Format file. This file format is highly compressed for efficient distribution. *Note: Project exports are not supported with this file type.*
.DWG	DWG is file format for AutoCAD drawing files in MS-DOS and Windows. DWG is now being supported by certain non-AutoCAD systems in the same manner that DXF is supported by non-AutoCAD systems. See .DXF below. Versions up to CAD 2014 are supported.
.DXF	Data Exchange Format is a format for storing vector data in ASCII or binary files used by AutoCAD and other CAD software for data interchange.
.EMF	(Enhanced MetaFile) and WMF (Windows MetaFile) are the major display formats of the Windows operating environment and the native graphics formats for MS Office applications.
.GIF	Graphics Interchange Format is a variation of the bitmap image format for pictures with up to 256 distinct colors.
.JPG	Short for .JPEG (Joint Photographics Experts Group); a file format widely used for web images.
.PNG	Portable Network Graphics is a bitmapped image format that uses lossless data compression.
.VSD	Microsoft Visio 2010 image file.
.WMF	Windows MetaFile. See .EMF above.
.VDX	Visio drawing.

Note: One image file format is not favored over another. You are encouraged to consult a reference book on digital imaging for the pros and cons of each of these image formats.

Also, make sure that the map is legible and is as accurate as possible. A good site map should be clear enough when viewed at a normal scale (1:1) on the view without zooming.

By default, a floor map is displayed in an 8.5"x 11" or 21.6 cm x 28 cm dimension.

Furthermore, try to keep your map image file within a reasonable size. A large-sized image may take longer to upload, and, in some cases, may even cause the program to crash. Consider slicing a map image into sections if it is too large.

Survey Viewer License

The Survey Viewer license is available to customers who have AllyCare Support.

The Survey Viewer license replaces the "Display-Only Mode" implemented in previous releases of the software. Users can download one Viewer license from their MyAirMagnet page after registering the Survey product. You can obtain two additional Viewer licenses by contacting Technical Support. The Viewer license can then be installed and bound to another machine or wireless card, just as with a normal Survey installation.

Note: The Viewer license is bound in the same manner as any license, and as such can only be associated with one machine or wireless card.

The main restriction of the Viewer license is that installations in Viewer mode cannot conduct surveys or use "Tools". Additionally, the Viewer license is based on the master Survey license you purchased, and has the same limitations as the master license. For example, if you own a Survey Express license, the associated Viewer license allows access to the Display, Simulation, and Calculator screens.

Product Registration

By registering your purchased software, you are entitled to a free My AirMagnet account with the following benefits:

- Download software updates to the software when available.
- Access product documentation, like Release Notes and User Guides.
- Download wireless adapter drivers.
- Access training videos.

To register your product, open the following URL:

https://airmagnet.netally.com/support/register_product/

Technical Support

AllyCare Product Support

NetAlly's AllyCare is our comprehensive support and maintenance program that offers expanded coverage for the products.

For more information, visit https://www.netally.com/support/.

Contact Us

Call toll-free in North America: 1-844-TRU-ALLY (1-844-878-2559)

Visit https://www.netally.com/contact-us/ for additional phone numbers. Scroll down and select your region to complete a web form and have a NetAlly representative contact you.

Accessing Help

Context-sensitive help documentation can be displayed by pressing the F1 key. If context sensitive help is available for the user interface view in focus, the topic will be displayed.

Alternatively, you can access help options from the **Help** menu.
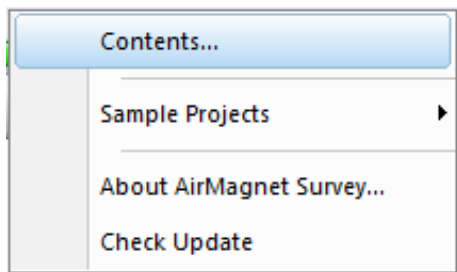
Sharing Projects

You can share your Survey and AirMagnet Planner projects among other users who have the associated products or viewer software installed on their computers.

Here's what to do to share a project:

1. Locate the project folder. The folder was created when you created your new project. The folder name is the "project name" you gave your project.
2. Zip the folder and send it to the recipient.
3. The recipient needs to unzip the folder, launch the application and select **File>Open**. Browse to the folder. The correct project file will be the only file available to open.

Installation

Checking Product Package Contents

Before you start, make sure that the following items are included in the product package:

- Compliance Guide
- A software certificate with the serial number and serial key
- If a support contract was purchased, a support contract with a support serial number and serial key.

In case any items are missing or damaged, contact your authorized reseller or AirMagnet Technical Support immediately.

Preparing for Software Installation

AirMagnet strongly recommended that you review this information before starting product installation.

Verify System Requirements

Be sure to install the software on a computer that complies with the system requirements.

Before You Begin

Consider the following before installing, launching and using the software:

- Be sure to have active Internet connection when launching the software for the first time.
- You must have administrative rights on the computer running the product software.
- Be aware certain firewall settings or antivirus software may interfere with the product software.
- Network software that uses a wireless adapter may cause a conflict with the product software.

Product Upgrades

If the computer running the software application has an active Internet connection and a product upgrade is available, a notification dialog will be displayed during product launch indicating that a newer version of the software is available. Click **Yes** to proceed to your MyAirMagnet account where you can access the software upgrade download. The product upgrade will be listed in **Registered Products > Downloads** section under Software Download.

An active support contract is required in order to upgrade from an older version to a newer version of the product. All existing customers wishing to install a newer release of the product should verify the status of their product support contract before starting the installation.

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You can view the status of your support contract under the Registered Products section of your MyAirMagnet account.

You can also manually check for product updates by selecting **Check Update** from the Help menu.

Software License

You are required to install a unique software license in order to successfully run the software application. You will be prompted to install the license when the product is launched for the first time.

Obtaining a Software License

Your Software License Certificate includes a Serial Number (S/N) and a Keycode (Serial Key). When the application is launched for the first time, you will be required to supply this information to proceed. This Serial Number / Serial Key combination enables you to obtain a software license compatible with the software version of your product and in accordance with your support contract.

Once you enter the Serial Number and Serial Key, you will be prompted to obtain the license:

License Download: If the machine is connected to the Internet, you may choose to obtain the license by download. In this case the system will automatically download the license and install it.

Browse to License: If the license is accessible on your network (previously downloaded), you may choose to browse to it. The name of the license file is "serial number.lic"

For example: A4018-04280450.lic.

The license will be copied to your AirMagnet product directory.

For example: c:\Program Files\AirMagnet Inc\AirMagnet Surveyor.

Binding the License to a MAC address

One software license per MAC address is permitted. The license can be bound to a specific computer (laptop) or to a removable wireless adapter. This provides flexibility in how the product may be used and shared.

During product installation, you will be prompted to choose which option to use. Depending on your choice, the application automatically captures the MAC address of the machine or adapter.

Note: If you choose to bind the software license to a removable adapter, the adapter must be active on the computer at the time you launch the application.

MAC Address Reset

Should you desire to reset the MAC address to a different computer or adapter, you can request a MAC address reset by choosing "MAC Address Reset" from your MyAirMagnet account.

Backing-up the License File

AirMagnet strongly recommends that you register your product, download the license file and save it in a safe location. Having a backup license file makes it easy to reinstall the application anytime, if needed because you can just browse to the file to install it.

Support Contract Activation

If you purchased an AllyCare support contract for your product, the license file contains information that indicates whether support has been pre-activated.

If no pre-activation occurred, you will be presented with a dialog to supply a support contract Serial Number and Serial Key.

Installing Product Software

If you have a current support contract, the download will be the most current version of the product, otherwise it will be the version you are entitled to download.

1. From the Registered Products page of your My AirMagnet account, click the software download, and run or save the file.
   If the file was saved, double-click the .exe file to begin running the installer.
2. Agree to the Software License Agreement to proceed with installation. Refer to Software License Agreement.
3. Set the installation destination folder. Accept the Program Files default, or browse to a different location.
4. Click **Finish** to complete the installation. At this point, you can select another option from the installer, or click **Exit** to close the installer.

Uninstalling Product Software

1. From the **Windows Settings** (accessible from the left side of the Start menu), select **Apps**.
2. Click **Apps**. The list of installed applications is displayed.
3. Select the desired application.
4. Select **Uninstall**.
5. You will be prompted to choose whether to keep your license file and created/modified files after uninstalling the product:

- **Yes**: The license file and created/modified files will not be deleted.
- **No**: The license file and created/modified files will be deleted.

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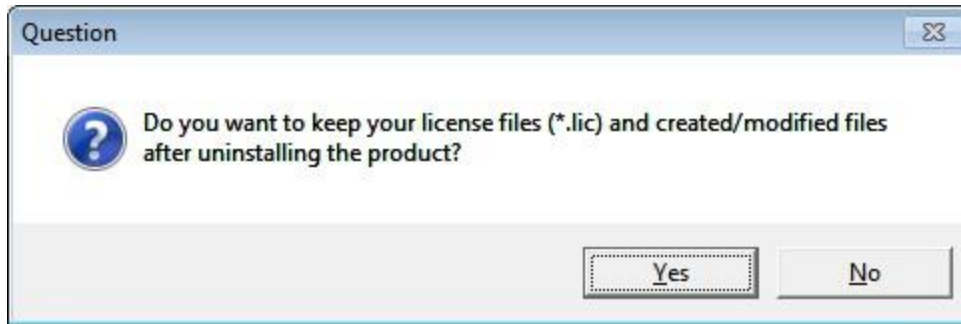
The following is a list of files affected by the selection chosen:

- Antenna patterns - User-created antenna files
- Wall/Area configuration - Areas and Walls - AreaList.txt and WallList.txt
- Floor Material - FloorMaterials.xml
- OUI to vendor mappings - LanCardVendors.txt
- Custom Report Templates - No change to current behavior. Currently pre-defined template will be replaced and customer created one is kept
- AP Groupings - Predefined Rules.csv
- APAlias.map - APAlias.map
- Profiles from File\Configure - User-created profiles
- AirWISE Policies and Areas - For policies, user-created policies. For Areas, saved to project folder, so no action on those files
- Phonebook - Phonebook.xml and profiles.xml
- Speed table - SpeedMap.txt

If you choose to re-install the product software and if you preserved the files, the installer will merge-in the new files (for example, new antenna patterns) but will not replace any files from the above groups if they already exist on the target system. This will apply to all files in all groups.

Launching the Application for the First Time

Note: Do not attempt to launch the application during a Microsoft Windows update. If this occurs, the following error message may be displayed, "The application has failed to start because its side-by-side configuration is incorrect."

When you launch the application for the first time, you will need to validate your license and install it.

License Method

Choose which method to use for installing the software license:
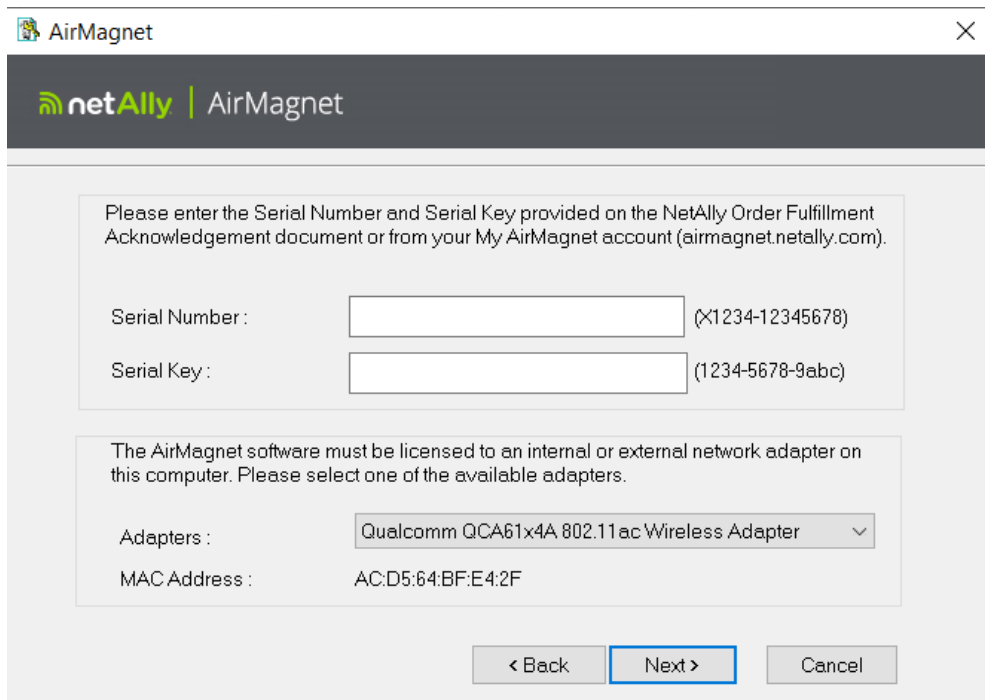
- **Download the license:** You must be connected to the Internet and have an active Internet connection. The license will be downloaded from the NetAlly website.

- **Browse to a license:** You will be prompted to browse to the file. The license must have been previously downloaded from the NetAlly website.

Serial Number, Serial Key and MAC Address Binding

When launching the software for the first time, you be required to supply a valid serial number and serial key. You also need to bind the license to the MAC address of an internal or external network adapter.

License Activation Notes:

If the license file does not support the installed version of the product, an error message will be displayed such as "Invalid License File" or "This serial number is currently out of support" or "Invalid Product Code."

If you receive an error when attempting to install the software license. Here are a couple reasons the license selection may produce an error message along with what you can do:

- **Your license does not support a newer version of the product:** In this case, you can purchase a support contract that entitles you to run the newer software.
- **Invalid Product Code:** The license file you chose is for a different product. Verify that the license file name has the same serial number as the serial number for your product.

If you believe the error message to be incorrect about the status of your product or license, contact your sales representative or Technical Support. You will be asked to provide the serial number and serial key for the product in question.

When Using USB Adapters

- **It is best to always use the same USB port for the adapter.** When using any of the USB wireless adapters, wireless profiles may need to be re-created when the adapter is plugged into a different USB port—as profiles are stored based on the port, not the adapter itself.

- When installing the new Intel® and USB adapters, it is important that users uncheck the option to install the adapter's client utility in addition to the driver software.

- In order to run AirMagnet Survey using a USB preferred adapter, you must install the adapter using the installer found at https://airmagnet.netally.com/my_airmagnet/public/documents/#3rdpartydriver.

Quick Start

AirMagnet Survey Main View

To open AirMagnet Survey: Open the Windows Start menu, and select **AirMagnet Survey>Survey**. The application will open in Survey mode showing a default blank Map view.
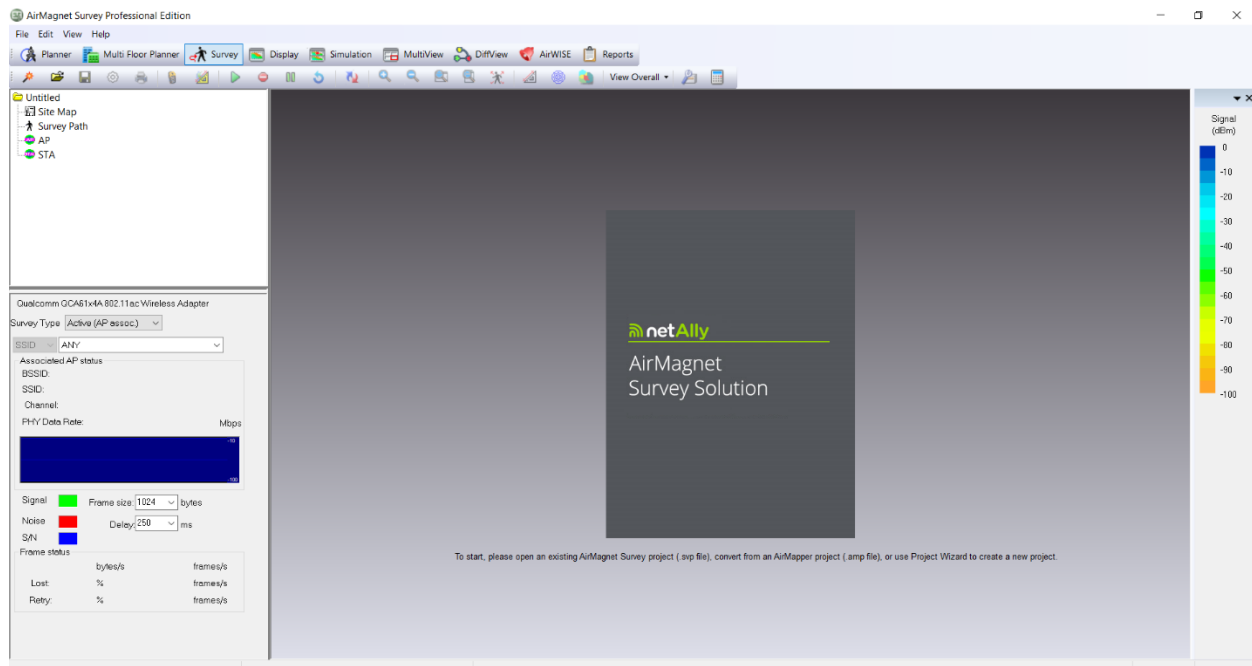
To open an existing project: Click **Open** [icon] or select Open Project from the File menu and navigate to the project file. If you select an AirMapper™ project file (.amp) you will be asked to specify a new location for the converted Survey project.

> *Note: When opening an existing project, be sure the Windows "Regional and Language Options" settings match between the existing project and the computer on which you open the project.*

To start a new Survey or Planner project: Click **Project Wizard** [icon].

Additionally, some sample floor plans and sample projects are available from the **Help** menu.

> *Note: Should you choose to open or start a new Planner project, be sure to change the view to **Planner** from the Navigation bar.*

Navigation Bar

The Navigation bar enables you to open the various functional views within the user interface.

Button	Description
Planner	Simulate AP signal propagation for a site before deployment in order to determine optimal AP placement and configuration.
Multi Floor Planner	View how signal propagation occurs between floors in a multi-floor building.
Survey	Perform site surveys by collecting RF data on a WLAN site. **Note:** *This view will not be available if the software is installed or operated in Viewer mode.*
Display	View and analyze RF data collected during site surveys.
Simulation	Conduct data simulation on signal coverage.
AirWISE	Access advice about AP deployment based on the RF data collected during site surveys.
Multi View	Display and analyze RF data collected from sites with multiple floors so that you can visualize the interrelationship among the APs across the floors.
DiffView	Open the project in multiple frames enabling you to compare the results of two data files.
Reports	Generate reports based on Planner and Survey project data. **Note:** *This function will not work until data are loaded.*

Comparison of functions available in AirMagnet Survey PRO vs. AirMagnet Survey Express.

View/Tools	AirMagnet Survey PRO		AirMagnet Survey Express	
	Typical	Viewer	Typical	Viewer
Survey	yes	no	yes	no
Display	yes	yes	yes	yes
Simulation	yes	yes	yes	yes
AirWISE	yes	yes	no	no
Multi View	yes	yes	no	no
Reports	yes	yes	no*	no
Tools	yes	no	yes	no
Calculator	yes	yes	yes	yes

*AirMagnet Survey Express has one report: 'Overall Coverage Report by Channel'.

Utilizing Multiple Adapters

Note: *The use of multiple adapters is supported in AirMagnet Survey Pro only. AirMagnet Survey Express can use only one single adapter at any given time.*

AirMagnet Survey supports up to two simultaneous adapters. If the machine running AirMagnet Survey has multiple AirMagnet-supported wireless adapters connected at the time the application is launched, you will be prompted to select the adapters that should be utilized by the survey process.
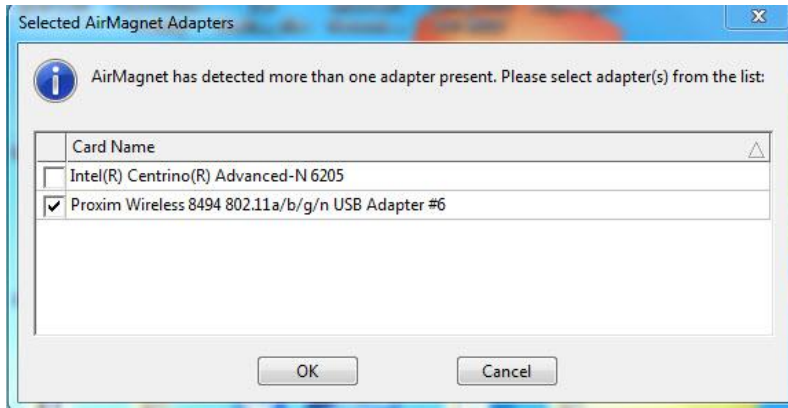
Note: *In some cases, you must have multiple different adapters inserted in order to utilize the multi-adapter functionality. Refer to the AirMagnet's website for details on which adapters are supported in multi-adapter mode. Refer to Supported WiFi Adapters.*

When operating in multi-adapter mode, Survey's user interface will adjust slightly on many screens to reflect the simultaneous use of multiple wireless adapters.
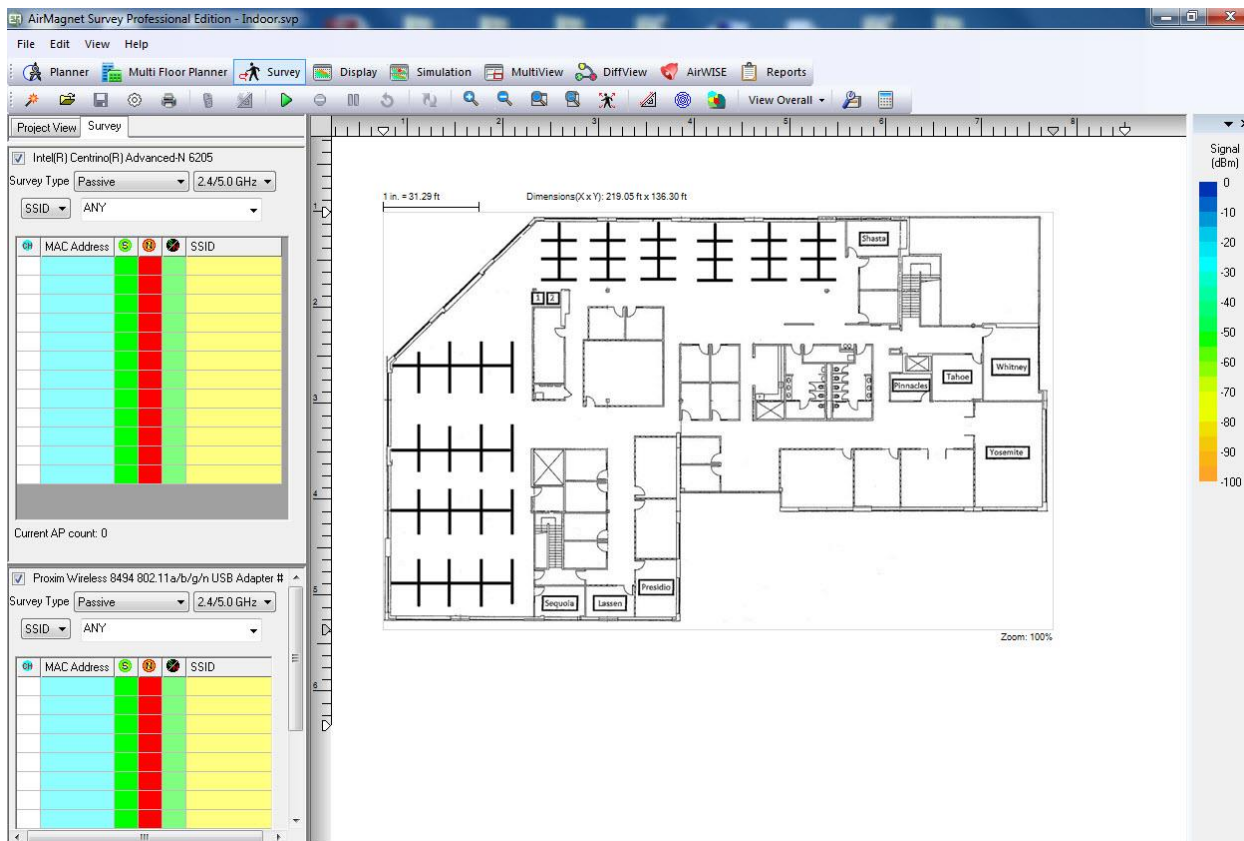
Each adapter is granted its own survey pane, allowing you to easily track the devices and signal levels detected by each independent device. You are granted further control over these adapters in Survey's Scan configuration (**File>Configure>Scan**), where each device can be adjusted manually to specify the channels to be scanned.

Note: When a selection is made in either of the drop-down menus for the survey type, the second menu will only display the types supported with the first selection.

The table below indicates the possibilities for conducting simultaneous surveys using two adapters. If conducting the type of survey indicated in the far left column, the check marks indicate the type of simultaneous survey that may be conducted. For example, if conducting a VoFi survey, the only possible simultaneous option is a Passive survey.

	Passive	Active	Vo-Fi	Iperf
Passive	X	X	X	X
Active	X	X		
VoFi	X			
Iperf	X			

Note: Only one adapter can be a non-preferred adapter when using multiple adapters. In this case, the following options are available:
- A preferred adapter performing a Passive Survey and a non-preferred adapter performing an Active Survey.
- A preferred adapter performing a Passive Survey and a non-preferred adapter performing an Iperf Survey.

The illustration below shows the Survey Type drop-down menu for a Broadcom 802.11ac Network Adapter.
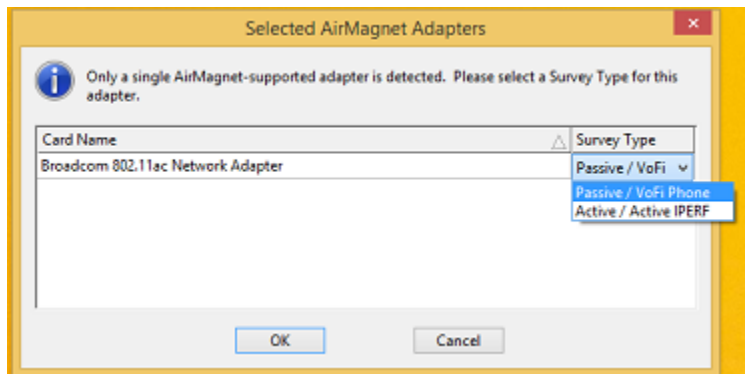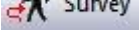
Using AirMagnet Survey

Survey User Interface

About Survey View
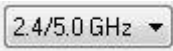
The Survey view is used for conducting WLAN site surveys whose purposes are to collect RF data in the airwave over the site. Once a Survey project is created, it will be automatically opened on the Display view. The same thing happens when you open a Survey project that you have created earlier. You can open the Survey view simply by clicking ![Survey] on the Navigation Bar. The figure below shows the application's Survey view.
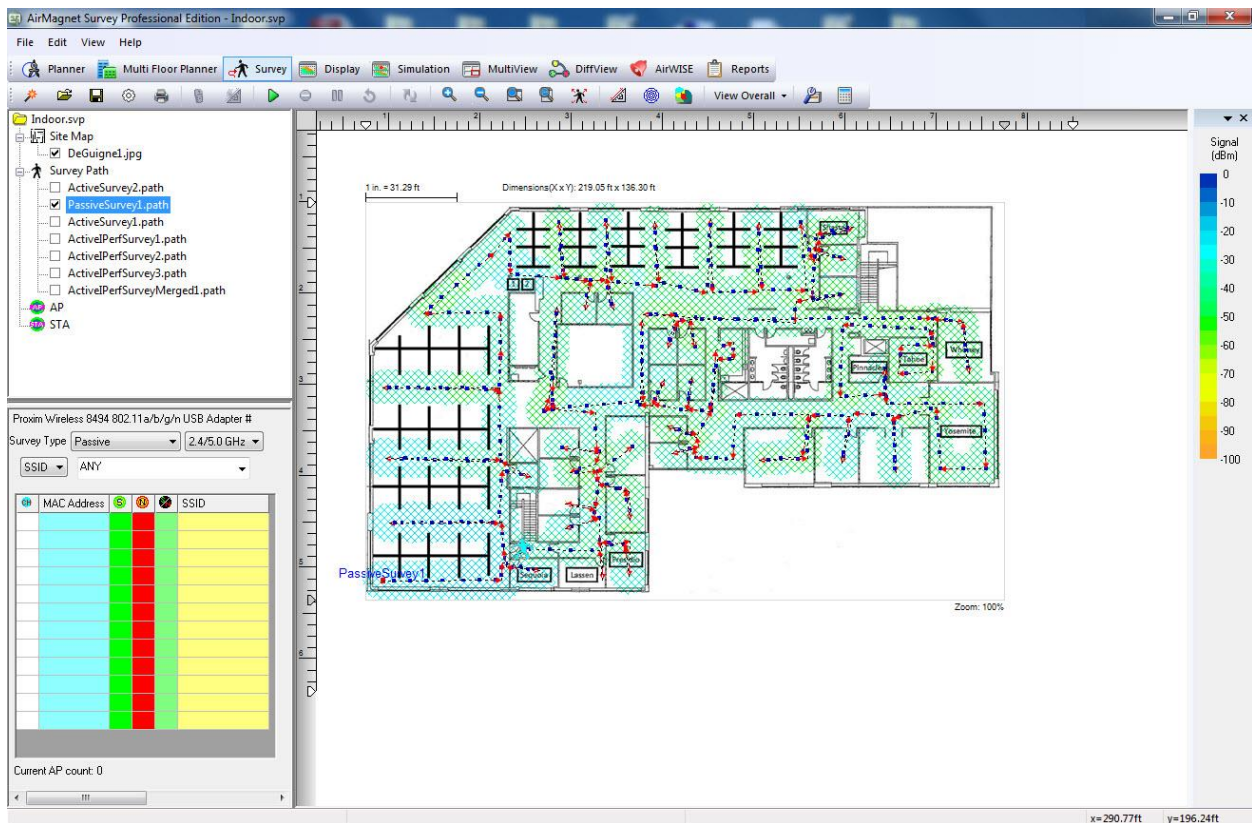
Note: *The Survey view is NOT available for AirMagnet Survey that is installed or operated for display only.*

Media Type Button

The ![2.4/5.0 GHz] (**Media Type**) drop-down is located in the Data window of the Survey view. Click this button to display a drop-down menu of 802.11 media types that determine the type of data to be collected and displayed: It offers the following options:

Note: *Because certain non-preferred adapters automatically scan both bands, the Media Type button does not display when such an adapter is being used.*

- 2.4 GHz: Selecting 2.4 GHz allows the wireless network card to scan data from APs utilizing the 2.4 GHz band only (generally, 802.11b/g/n/ax media types).

- 5.0 GHz: Selecting 5.0 GHz allows the wireless network card to scan data from APs utilizing the 5.0 GHz band only (generally, 802.11a/n/ac/ax media types).

- 2.4/5.0 GHz: Selecting 2.4/5.0 GHz allows the wireless network card to scan data from APs utilizing either or both bands.

Note: *AirMagnet highly recommends that you select a media type before you start on a site survey. This will enable you to focus on APs using a specific type of media during the survey.*

Survey File Menu Options

The figure below shows the options of the File menu on the Survey view.

For keyboard shorcuts: Alt+F activates the menu. The activation letter (if any) is underlined. Any Ctrl+ option is noted as well.
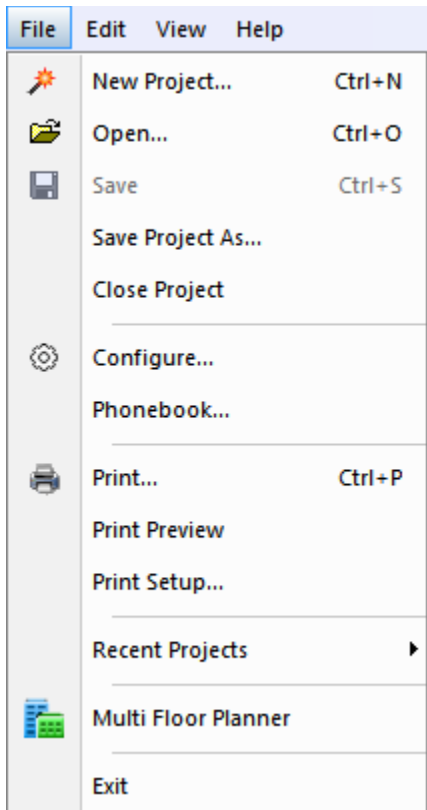
Option	Description
New Project...	Opens the New Project Wizard window where you can create a new Survey project. It works in the same way as (**Project Wizard Ctrl+N**) on the Toolbar.

Open…	Opens an existing Survey project. It works in the same way as (**Open Project Ctrl+O**) on the Toolbar.
Save	Saves changes made to the current project. It works in the same way as (**Save Ctrl+S**) on the Toolbar.
Save Project As…	Saves the current project under a different name.
Close Project	Close the current Survey project file.
Configure…	Opens the Survey Configuration dialog box where you can configure various parameters in AirMagnet Survey. It works in the same way as (**Configuration**) on the toolbar.
Phonebook	Used for managing VoFi profiles. Refer to Configuring a VoFi Phone Book.
Print…	Opens the Print dialog box where you can print the current image (Ctrl+P).
Print Preview	Allows you to preview what is going to be printed.
Print Setup…	Opens the Print Setup dialog box where you can select paper options.
Recent Projects	Lists the most recently opened Survey project files.
Multi Floor Planner	Launches Multi Floor Planner. Refer to Multi Floor Planner Introduction.
Exit	Exits AirMagnet Survey.

Survey View Menu Options

The figure below shows the View menu options on the Survey view.

For keyboard shorcuts: Alt+F activates the menu. The activation letter (if any) is underlined. Any Ctrl+ option is noted as well.

Option	Description
Zoom In	Enlarges the view of the current floor map in the map window. It works in the same way as (**Zoom In, Ctrl+Page up**) on the toolbar.
Zoom Out	Reduces the view of current floor map in the map window. It works in the same way as (**Zoom Out, Ctrl+Page Down**) on the toolbar.
Zoom to Fit	Fits the current floor map to the map window. It works in the way as (**Zoom Fit**) on the toolbar.
Zoom to Actual Size	Fits the current floor map to its actual print scale. It works in the same way as (**Survey Zoom**) on the toolbar.
Set Zoom...	Opens the Set Zoom dialog box where you can specify the specific ratio at which the view of the map can be increased.
Toolbars and Docking Windows	Choose to show or hide the Legend and Status Bar (show is checked). Reset Toolbar: Dragging the Toolbar handles enables the Toolbar to be undocked or moved above or below the Navigation Bar. Clicking this option will reset the Toolbar to its default setting.
Show Rulers	Enables you to show or hide the rulers along the edge of the map window.
Show Grids	Enables you to show or hide grids in the map window.
Invert Legend Colors	Flips the legend color scheme vertically. Same as using F10.
Project Properties...	Opens the Project Properties window where you can adjust the physical properties of the floor map of the survey site.

	AP/Path Name Font...	Opens the Font window where you can modify the font properties of APs and survey paths on the floor map.

Toolbar

The figure below shows the Toolbar on the Survey view. It contains frequently used tools, some of which are also found in the File and View menus.

Icon	Name	Description
	Project Wizard	Opens the New Project Wizard where you can create a new Survey project. Refer to File menu.
	Open Project	Opens an existing Survey (.svp) file. Refer to File menu.
	Save	Saves changes made to the current project. (Ctrl+S)
	Configuration	Opens Survey Configuration window. Refer to File menu.
	GPS or Manual Mode	Allows you to switch between GPS-aided survey or regular survey. *Note: This option is available only in Survey PRO with GPS-aided Survey projects.*
	Print	Opens the Print dialog box where you can print the current floor plan image (Ctrl+P).
	Measure Mode	Re-calibrates site dimensions of a floor plan.
	Toggle Outline	Enables you to view an outline of where a heatmap transitions from one legend value to the next value.
	Start Survey	Starts the survey.
	Stop Survey	Ends the current survey.
	Pause	Stops the survey momentarily until you click to resume data collection.
	Retract	Functions as an "Undo" command, reversing the most recent data point at each click of the button. Clicking this button repeatedly keeps erasing the survey path backwards. To resume the survey, click a new data point on the site map. *Note: If the survey retract button is grayed out (unavailable), it probably means "Auto Position APs with signal greater than __ dBm" is enabled. Refer to How to Locate an AP.*
	Zoom In	Enlarges the view of the site map.
	Zoom Out	Reduces the view of the site map.
	Zoom Fit	Fits the site map to the Map Window.

	Zoom Actual Size	Fits the current floor map to its actual print scale.
	Survey Zoom	Covers the view with the Map Window. To restore the default view, click the button again.

Survey Project Window

The Project Window displays all the components of the current Survey project opened on the Survey view, as shown in the figure below.

A Data File items are as follows from the top:
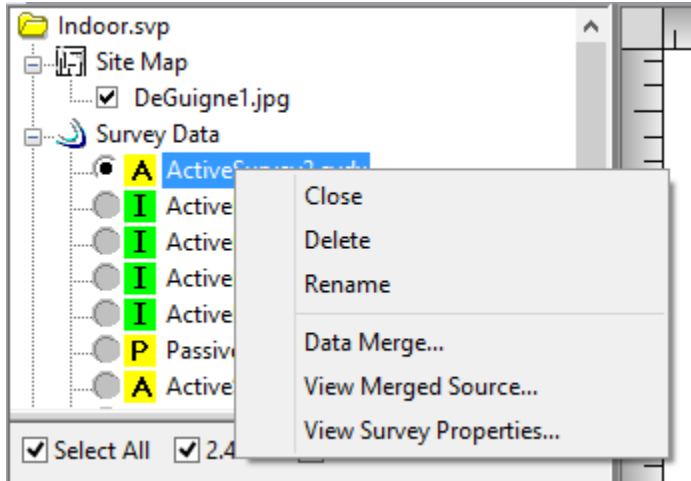
- Project file name.
- Floor plan image file name used in the project.
- Survey paths (surveys conducted) listed from first to last for this project.
- Any APs and/or STA (stations) placed on the floor plan.

Right-click Pop-up Menu

The Project Window on the Survey view and Display view also includes a right-click menu. Some options are available in Survey view and others in Display view. Unavailable options are grayed-out.

Right-click a survey data file to view the right-click menu options.

Menu Option	Description
Close	Close this data file
Delete	Deletes the selected (right-clicked) item.
Rename	Rename this data file
Data Merge...	Allows you to merge two or more data files. **Note:** *This option is available on Display view only.*
View Merged Source ...	Shows the sources from which a merged data file was created.
View Survey Properties ...	Opens a window that displays information about the file.

View Survey Properties

From the Project Window, right-click a survey data file (.svdx), and select **View Survey Properties** from the pop-up menu. The Survey Properties dialog opens, as illustrated below.

Note: *This option replaces "View Raw Data" in Survey version 8.8 and higher.*

The Survey Properties dialog provides information about the selected survey data file.

View Survey Database

The Survey Properties includes an option to view in-depth, database details included in the selected survey data file.

To view the database, you will need a database viewer application such as "DB Browser for SQLite". This application may be downloaded at http://sqlitebrowser.org/

Click **View Survey Database**. You may be prompted by Windows to associate the database with the desired database viewer application.

Right-Click to Show CAD Layers...

From the Project Window, right-click a CAD image file, and select **Show CAD Layers...**

The Drawing Layers... dialog opens, as shown below.

Data Window

The Data Window displays real-time RF data as they are captured while a survey is in progress. Data start to appear in this window once you click ▶ (**Start Survey**) on the

Toolbar. The contents displayed in the Data Window vary, depending on the survey mode (active vs. passive) you select.

For information on active and passive surveys, Refer to Active Survey Data Window and Passive Survey Data Window.

Active Survey Data Window

The figure below shows the Data Window when AirMagnet Survey is set in active survey mode. (Availability of some configuration fields depends on adapter support.)

Option	Description
Adapter	The adapter used for the survey is noted at the top of the window.
Survey Type	Options are Active, Passive and Active IPERF.
Media Type	Options are 2.4, 5.0 and 2.4/5.0 GHz
SSID/AP	Enables you to associate to either a specific AP or SSID during the active survey. The associated drop-down enables you to choose a specific device to survey.
Roaming	Allows you to set the roaming criteria for the survey. Refer to Roaming Control.
BSSID	The name and MAC address of the AP being associated with.
SSID	The name of the network to which the associated AP belongs.
Speed	The rate (in terms of Mbps) at which packets are transmitted.
Channel	The radio channel the AP uses to send and receive RF signals, including the primary and secondary channels, channel bandwidth and the channel span.

Signal	The signal strength for the received packets. The higher the value, the stronger the signal.
Noise	The level of background radio frequency energy in the 2.4-GHz or 5-GHz band. The lower the value, the less the noise.
S/N	The Signal/Noise ratio. Compares the Signal data to the amount of ambient Noise.
Frame Size	The size of the frame transmitted in terms of bytes.
Delay	The time (in microseconds) between successive transmissions.
Bytes/s	The number of bytes (of data) transmitted per second.
Frames/s	The number of packets (of data) transmitted per second.
Lost	The percentage and number of packets that were not transmitted successfully from the AP.
Retry	The percentage and number of packets that were not transmitted successfully from the AP.

Setting Roaming Properties

The (**Roaming Option**) button in the upper-right corner of the active survey window enables you to control the roaming capability of the wireless network adapter being used with AirMagnet Survey. It can help define precisely when the adapter roams, based on the properties that you have configured in the Set Roaming Criteria dialog box. See the figure below.

A list of adapters that support this feature may be found under the "Supported Adapters" section of the AirMagnet website at https://www.netally.com/products/airmagnet-survey-pro/#SupportedAdapters. Locate the desired adapter, and click "FEATURE DETAILS." Refer to the column labeled "Roaming Control for Active Surveys."

You should configure the Roaming Control (Signal) feature when using a USB wireless network adapter to perform a site survey by SSID.

> **Note:** In order to test roaming during an active survey, you should set the Windows Wireless Profile to Automatically Connect and the other profiles to Manually Connect. Otherwise, Windows may activate the other profiles when the Roaming feature is enabled.

To set the roaming properties of a wireless network adapter:

1. From the Survey view, click . The **Set Roaming Criteria** dialog box appears.
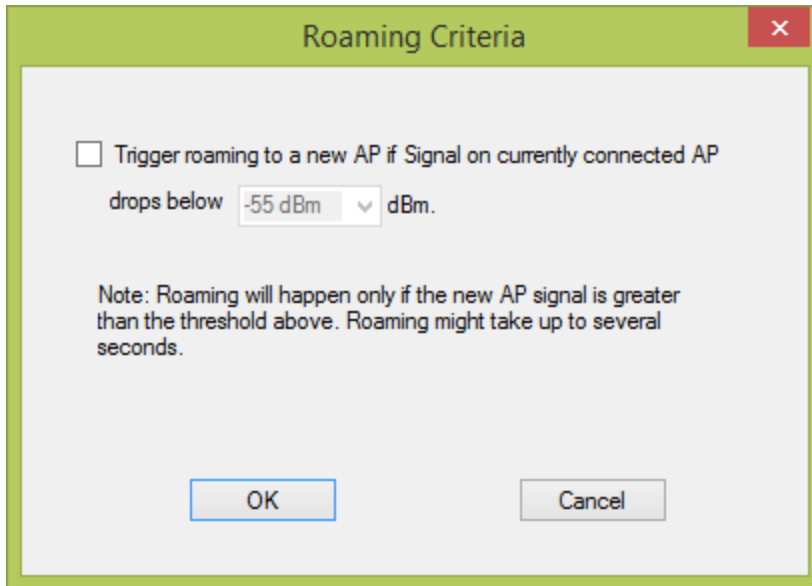
2. Select Trigger roaming to a new AP if signal on currently connect AP drops below.

3. Click the down arrows to select value of interest.

4. Click **OK**.

The wireless network adapter starts roaming when any one of these values is met. Configuring roaming based on signal strength will cause your computer to roam once it reaches a specific minimum signal strength.

Passive Survey Data Window

The figure below shows the Data Window during a survey when set in Passive Survey mode. (Availability of some configuration fields depends on adapter support.)

Note: During a passive survey, if an AP is detected with a Hidden SSID, the AP name shown in the MAC Address column on the Survey page will be displayed in red, instead of the usual black. This is to differentiate it from the other, broadcasting SSID APs.

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Option	Description
Adapter	The adapter used for the survey is noted at the top of the window.
Survey Type	Options are Active, Passive and Active IPERF.
Media Type	Options are 2.4, 5.0 and 2.4/5.0 GHz
SSID/AP	Enables you to detect devices by AP or SSID during the survey. The associated drop-down enables you to either choose a specific device to survey or choose "ANY" to capture data for all detected devices (SSID or AP).
Channel	The RF channel each AP is using as captured by the wireless network card. The Channel column displays the primary and secondary channels, channel bandwidth and the channel span.
MAC Address	The MAC addresses of each AP. It can display either "Best Name" or MAC address. Right-click the window to change the display type.
Signal Strength	The signal strength of all received packets from the AP.
Noise Level	The level of background RF energy in the 2.4-GHz or 5-GHz band. The Lower the value, the less noise detected.
Signal/Noise Ratio	The signal strength compared to the noise level. A higher S/N ratio usually means better network performance, as there is less noise impacting the signal.
SSID	The name of the network to which an AP belongs.
Current AP Count	The total number of APs currently detected.

Before beginning a passive survey, you may drag-and-drop APs from the Data Window onto the Map Window floor plan. Once the survey begins, this option is not available; however,

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after concluding the survey, this option becomes available in the Display View. Refer to Channel/SSID List.

Map Window

The figure below shows the Map Window on the Survey view, with a site map displayed in it. A site map appears in the Map Window only when it is selected (checked) in the Project Window. Otherwise, this part of the view will be blank.
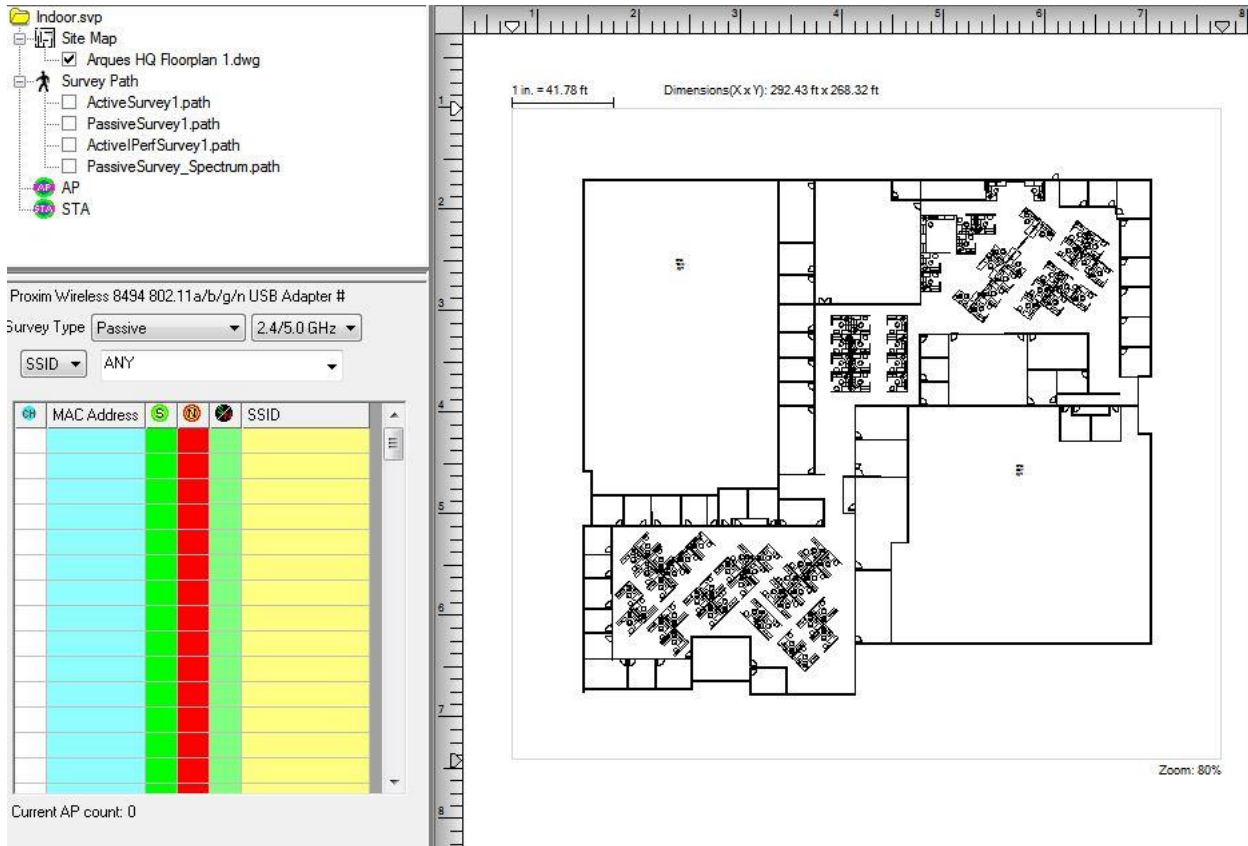
By default, a site map automatically opens in the Map Window when you open a Survey project. As soon as a survey is started, information such as AP locations, survey paths, data collection points, and so on. start to appear on the map. Before starting a site survey, it is important to make sure that the project and site map match the location to be surveyed.

Modifying Project Properties

If desired, you can adjust the properties specified during project creation from the Survey view. This can be necessary if the dimensions of the site have changed, new infrastructure has been installed, or the image appears to be stretched after upgrading to a newer version of the AirMagnet Survey software.
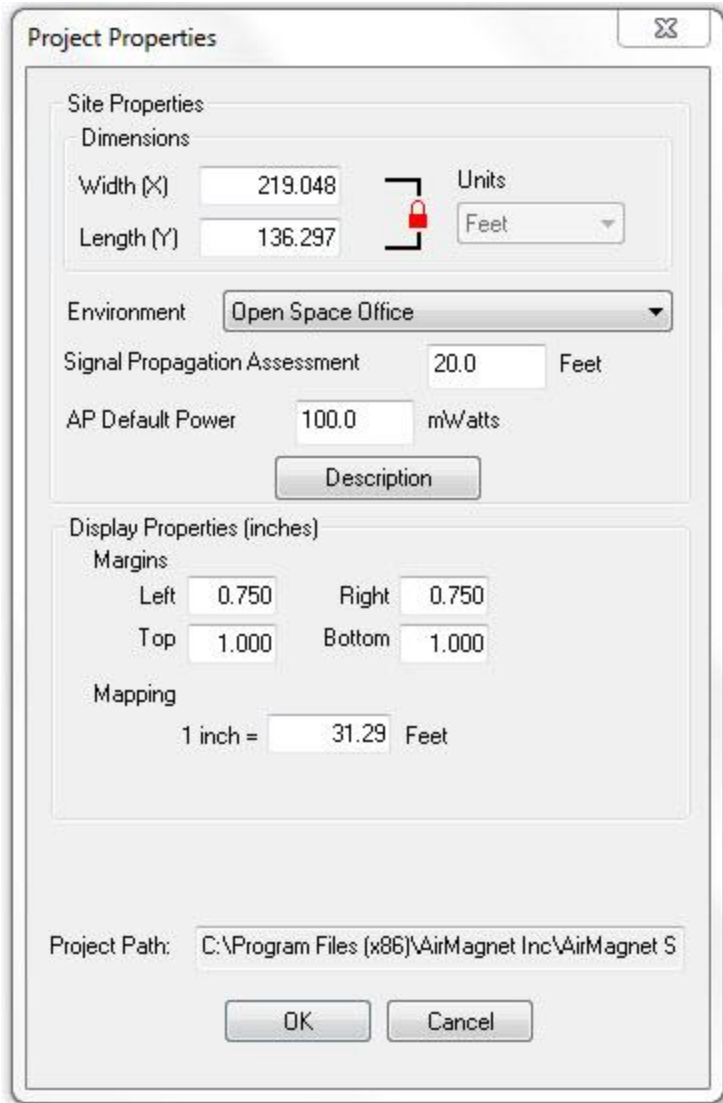
To adjust project properties:

1. Right-click the map window and select **Project Properties**…. (Alternatively, click **View>Project Properties…** from the menu bar.) The Project Properties window appears.
2. Make any adjustments required, as described in the following Project Properties table.
3. Click **OK** to save the changes.

Field	Description
Dimensions	Alter the width and length of the map as desired. Note that since the units of measurement are locked in during project creation, the Units field is grayed out.
Environment	This field allows the user to change the environment type, that is, from Open Space Office to Commercial.

Signal Propagation Assessment	Adjusts the signal propagation assessment. The default value depends on the Environment selected when creating the project.
AP Default Power	Adjusts the default power setting for APs placed on the project.
Description	Click this button to enter a description for the project.
Margins	Allows the user to adjust the spacing padded around the site map.
Mapping	Adjusts the scale of the image; this setting can also be modified by using the Measure Mode tool. Refer to The Toolbar for more details.
Project Path	Directory location for the open project.

Using Iperf Integration

AirMagnet Survey's integration with the open-source Iperf software provides you with a means of recording both upload and download transmit rates during an active survey. Although this requires some additional configuration when compared to active surveys, the ability to view both upload and download speed information can be invaluable when analyzing the wireless network environment.

During an Iperf survey, the laptop which is being used to conduct the survey transmits custom Iperf data packets to a user-configured Iperf server. The server's responses allow Survey to record the station's download speed from the current location.

In order to conduct an active Iperf survey, you must download and unzip the Iperf server software on a separate device. AirMagnet's legacy iPerf integration is designed to operate with Iperf Server version 1.7.0, 2.0.5, and 2.0.9. You can locate Iperf software by means of internet search on the term "iperf2". (See the **For iPerf3** section below for information about using Survey's new iPerf3 integration in v9.3.)

> **Note:** *AirMagnet recommends that you create an Iperf folder in the root directory to contain the files (that is, C:\Iperf).*

Starting the Iperf Server:

After the Iperf server software has been downloaded and extracted, you must launch the application before starting an Iperf survey.

1. Type 'cmd' in the Windows search field in the bottom Taskbar.
2. Open the Windows command-line interface.
3. Navigate to the Iperf folder (e.g., C:\Iperf) using the CHDIR command as needed.
4. Type '**Iperf –s**' and press **Enter**. A message appears describing the TCP port in use by the server.

> **Note:** *In the command to start the Iperf server, the '-s' parameter stands for 'server' and the '-p 5001 part tells the server to listen on port 5001. By default, AirMagnet Survey uses 5001 as the port for its transmissions during an active Iperf survey. If the Iperf server port is changed, you must change the port used by the Survey application as well.*

To access IPerf configuration options, select Active IPerf as the Survey type, and select the **Advanced** button to open the **IPerf Config** dialog box. (See [Choosing a Survey Mode](#) and [Active Survey Data Window](#).)

> *Note: Ensure that the **Client port** set in the **IPerf Config** dialog is not blocked by an AP/controller/firewall, etc. The default client port for the down link is 9999.*

Once the Iperf server status message appears, the system is actively listening for Iperf transmission messages. The system is now ready for conducting an active Iperf survey.

For iPerf 3

Beginning with Survey version 9.3, iPerf 3 is supported for performing an iPerf survey, either via iPerf 3 server software installed on a PC or other machine, or using NetAlly's Test Accessory.

- To download and install iPerf 3 software, visit https://iperf.fr/.
- Learn more about the Test Accessory from NetAlly.com/products/TestAccessory. See the Test Accessory User Guide for instructions on adjusting the Test Accessory's settings.

Note the following differences in functionality between iPerf 2 and iPerf 3:

- While using iPerf 2, you will be able to run both upload and download throughput measurements at the same time. While using iPerf 3, you will only be able to run an upload or a download test. iPerf 3 does not support the option to run both tests at the same time.

- You will have the option to perform an iPerf 3 throughput survey against your own iPerf 3 server, or you could use NetAlly's Test Accessory (pocket sized iPerf server). You will not be able to perform an iPerf 2 survey against the NetAlly Test Accessory.

- iPerf 3 surveys are only supported while using 802.11ac/ax adapters. You still will be able to use older Wi-Fi adapters while running an iPerf 2 survey.

- For iPerf3 servers, the default port number is 5201. iPerf3 clients use an ephemeral port.

Using an iPerf 3 Server

See the "iPerf user docs" page at https://iperf.fr/.

In the **Active IPERF Survey** Data Window, select **IPerf 3** in the appropriate drop-down menu field.

Site Surveys

Creating an Indoor Survey Project
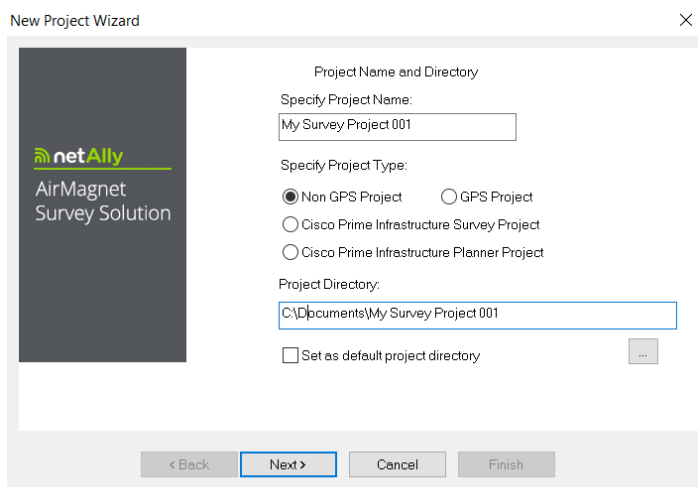
Prior to starting a site survey, it is required that you create a Survey project which involves naming the project, importing a site map, specifying some physical properties of the site, and so on. This section explains the procedures for creating a Survey project for an indoor site survey.

To create a new Survey project:

1. Do one of the following:
    - From the Main Menu, select **File>New Project**…, or
    - From the Toolbar, click ![wizard icon] (**Project Wizard**).

The New Project Wizard view appears.

2. Enter a unique name for the new project.

> **Note:** *This section explains the procedures for creating a Survey project that is NOT intended for an outdoor GPS-aided site survey. Therefore, leave the GPS Project option unselected. For instructions on how to create a GPS-aided Survey project and how to conduct GPS-aided site surveys, Refer to Creating GPS-Aided Site Surveys. Keep in mind that the GPS feature is available only in AirMagnet Survey PRO. Users of AirMagnet Survey Express who wish to upgrade to AirMagnet Survey PRO should contact AirMagnet Sales for more information.*

3. Save the project using one of the following options:
    - To save the project to the default location, click **Next**.
    - To save the project to a location other than the default, click ![button icon] to specify a location of your choice, and click **Next**.

> **Note:** *By default, AirMagnet Survey automatically saves the project to the C drive on your computer, using the name you specify. Check "Set as default project directory" to ensure that subsequent Survey projects are saved to the same location, if desired.*

4. Click (**Import Site Image**) to locate and import the site map of the location where surveys will be conducted.

5. For **Unit of Measurement**, select Feet or Meters.

6. For **Floor Plan Dimensions**, enter the Width and Length of the floor plan.

Note: *"Floor Plan Dimensions" refers to the scale (in feet or meters)of the entire image area of the floor plan (including any white space margin included in the image). If you are not sure of the dimensions, you may or may not enter the approximate values here and then recalibrate the values more accurately later. Refer to Measuring and Calibrating the Floor Plan Scale. The floor plan must have calibration values whether entered here or by using Measure Mode before starting a survey.*

7. Click **Next**.

8. For **Survey Environment**, select an option that resembles the site environment where the survey is to be conducted.

9. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the site environment you select.

> **Note:** *AirMagnet Survey assigns the Signal Propagation Assessment value based on the estimate of the distance RF signals could travel in each of these typical site environments. Normally, it is recommended that you accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you enter will affect the way the program interpolates site data.*

10. For **AP Default Power**, do nothing (normally).

> **Note:** *If you know the default value of the AP power, enter it now. The value will be used when conducting data simulation.*

11. Click **Next**. The New Project Wizard view refreshes.
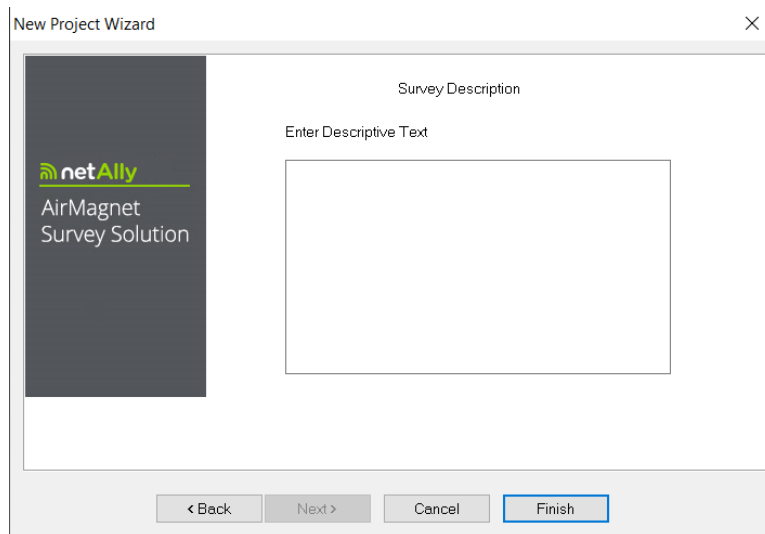
12. Enter a brief description of the project. (Optional.)

13. Click **Finish**. The newly created Survey project will automatically appear in the Project Window, and the site map will be displayed in the Map Window.

Note: You can create as many projects as needed by following the same procedures outlined above. By default, a new project will automatically open on the Survey view as soon as it is created.

Choosing a Survey Mode

AirMagnet Survey can be operated in three survey modes:

- **Active Survey:** In an active survey mode, the wireless network card actively associates itself with the selected AP or SSID, sending and receiving RF packets to and from the AP or SSID. Selecting a specific AP will let the wireless network card associate only with that AP, whereas selecting an SSID will let it associate with the AP that has the strongest RF signal within the SSID group as you're roaming over the site. Refer to Enabling Active Survey Mode.

- **Active IPERF Survey:** The Active Iperf Survey option refers to AirMagnet Survey's integration with the open-source Iperf software, and is effectively a standard active survey with a bit more initial configuration that provides additional transmission data to the user. This setup allows you to gather transmission data for both uplink and downlink rates (as opposed to just the former). Refer to Using Iperf Integration for information on configuring and activating Iperf integration.

- **Passive Survey:** In a passive survey mode, the wireless network card does not associate itself with any particular AP or SSID. Instead, it simply listens to the RF data moving through the site, detecting and recording all RF signals and noises in the environment. By default, AirMagnet Survey opens in the active survey mode when it is operated in Survey view. Refer also to Enabling Passive Survey Mode.

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Enabling Passive Survey Mode

To set AirMagnet Survey in passive survey mode:

1. From the Data Window, click the **Survey Type** drop-down list and select **Passive Survey**.
2. Do one of the following
   - Leave the **SSID** field set to **Any**, or
   - Select a specific **SSID** or **AP** from the drop-down.

Refer to [Passive Survey Data Window](#).

Enabling Active Survey Mode

To set AirMagnet Survey in active survey mode:

1. From the Data Window, click the **Survey Type** drop-down list and select **Active Survey**.
2. Do one of the following:
   - Select **AP** from the drop-down list on the left and then choose a specific AP from the drop-down list on the right (if you want to perform an active survey on an individual AP).
   - Select **SSID** from the drop-down list on the left and then choose an SSID from the drop-down list on the right (if you want to perform a survey on an entire network.

Refer to [Active Survey Data Window](#).

Conducting Indoor Site Surveys

AirMagnet Survey can be used for both pre- and post-installation WLAN surveys to collect RF data on the site. The surveys can be performed without having APs permanently installed in their locations. Also, there is no need to adjust channels from the APs prior to a survey since AirMagnet Survey allows you to do channel separation when analyzing the data in the Display view, where you can change channel allocation once a suitable channel combination is identified through channel simulation. This undoubtedly saves both time and resources that would otherwise be required for a conventional site survey.

When opening a Survey project, make sure that the Survey project (.svp) file is located on the laptop PC you are using to conduct the site survey. Opening projects remotely (that is, over a network connection) can create problems when trying to save the data after conducting the survey if the network connection is no longer available.

When performing a survey that may take a long time (for example, longer than 10-15 minutes), Airmagnet recommends that you break the survey up into several smaller instances. This ensures that you will not lose all the survey data should a problem arise with the computer. After the multiple surveys have been completed, you can then merge the resulting data files together to create the same result as surveying the entire area at once.

This section explains indoor site surveys that are usually small-scale surveys conducted inside a building, for example, an office complex, warehouse, and so on.

Pre-Installation Site Surveys

A properly conducted pre-deployment survey can help ensure that the ultimate network installation operates at peak efficiency, with a minimum of extraneous or conflicting components. The process outlined below is designed to help users conduct a basic survey of the network environment prior to actually installing any network components.

Note: The following steps are intended to outline the basic required steps for a proper survey; additional enhancements for improved results can be found later in this documentation.

Pre-installation survey procedures can be summarized as follows:

1. Conduct a passive survey of the entire site (broken up into several shorter surveys, if necessary) in order to collect data regarding ambient traffic, noise levels, and frequency usage.
2. Use AirMagnet Planner to create a model of the new site, including anticipated layout, obstacles, and so on.

Note: Users who do not have an AirMagnet Planner license will not be able to model the network using AirMagnet Planner. For steps on manually planning out the environment, Refer to "Manually Planning the Deployment". It is important to note that a manually-created plan can provide several advantages over a Planner-assisted one, since it is based on real-world data. After creating the manual plan, continue with these steps to complete the pre-installation survey process.

3. Use the Planner Advisor function to allow Planner to automatically suggest optimal AP locations for the new site. Refer to "Using Planner Advisor" for more details.
4. Use Survey's Display view to analyze the Planner results (or the results from the manual plan) in order to verify that the projections meet the needs of the expected deployment.
5. Set up the network as projected from the steps above.

Manually Planning the Deployment

Manually testing the new wireless site prior to deployment can take environmental variables into account and therefore provides more detailed information. The following survey is generally referred to as an AP-on-a-stick survey because you use a single AP to determine the potential placement of several APs.

To manually plan the wireless deployment:

1. Go to the likely location where you may want to deploy an access point (AP).
2. Use a test AP to conduct as many active surveys as needed to ensure that the AP's intended coverage area is fully covered by the surveys.

Note: Since you should save the survey data at the end of each survey, you may end up having several active survey data files for the AP at one location.

3. Move the AP to the other potential AP locations and conduct several active surveys at each location in the same manner as described in Step 2. Remember to save the survey data at the end of each survey.

4. Conduct one passive survey using the same AP, and save the survey data.

5. Switch AirMagnet Survey to the Display view and merge all the active and passive survey data files. For instructions on how to merge data files, refer to Merging Survey Data.

6. Display the merged data by channel or by SSID. Refer to Project Window and Channel/SSID List.

> *Note: For better results, AimMagnet recommend that (1) you merge the active survey data files collected at each location first, (2) merge the merged active survey data files from all locations, and (3) merge the passive survey data file with the merged active survey data file that included active survey data from all locations. This will provide you with the most comprehensive RF data about the AP and the site environment.*

Post-Installation Site Surveys

Regular post-deployment surveys can help you ensure that you keep abreast of changes in the wireless environment. Even when perfectly designed, a pre-installation site plan cannot account for changes in the network's demands, unexpected interferers, along with a multitude of other dynamic factors in a wireless coverage area. You must conduct "refresher" surveys at regular intervals in order to verify that the deployment continues to meet enterprise requirements.

> *Note: The following steps are intended to outline the basic required steps for a proper survey; additional enhancements for improved results can be found later in this documentation.*

Post-installation survey procedures can be summarized as follows:

1. Conduct a passive survey of the entire deployed environment (broken up into several shorter surveys, if necessary) and compare the results to those generated during the planning stage of the pre-deployment process described above.

2. Make any required adjustments that were not accounted for in the pre-installation portion in order to make the network meet the user and throughput requirements.

> *Note: Step 2 is necessary due to the fact that some factors cannot be accounted for during the planning process. For example, having people moving through the wireless environment can cause interference that would not be there prior to installation.*

3. Conduct an active survey in order to verify that there are no gaps in the coverage area that were not discovered during the passive survey. This process also allows you to verify that the real-world network traffic (for example, PHY data rate, packet loss/retry, uplink/downlink data) meets user requirements.

> *Note: It is important to note that although it is more complex, an active survey provides a variety of additional benefits over simply conducting a passive survey. Refer to "Choosing a Survey Mode" for more information.*

4. Repeat steps 1 through 3 at least every three months in order to keep up-to-date information about the wireless network on hand.

Tips for Improved Survey Accuracy

The following tips are intended as guidelines that can help enhance the general survey procedures.

- Focus on one band (2.4- or 5-GHz) at a time; attempting to do both may take less time, but can cause "gaps" in the data.
- Plan the survey path ahead of time in order to conduct the most complete survey in minimal time. Planning and walking the path ahead of time can help the user identify obstacles, potential trouble spots, etc.
- Be sure to survey from all areas of the network; don't assume that coverage on one side of the APs will be identical on the opposite.
- Moving faster can result in insufficient data collected; however, moving too slowly results in longer processing times due to an excess of information.
- Active surveys give a much more comprehensive perspective of "real-world" performance, and as such are required for a complete survey process.

Conducting a Passive Survey

As described earlier in this documentation, the passive survey is a quick and easy survey method that gathers all available 802.11 information in the wireless environment. This allows you to view any traffic present, be it from a neighboring network or simply from ambient noise levels. The steps below detail the basic process of conducting a passive survey.

When you start and conduct a survey, the application begins collecting data about the environment. The idea is to walk a path about which you desire to gain signal coverage information.

Use the following suggestions for improving the accuracy of your survey:

- Click your position on the image map each time you change direction.
- Click at identifiable landmarks (such as doorways) that indicate your position on the image map.
- Maintain a steady walking pace slower than a normal walk in order to gather plenty of data.

Note: The steps below assume that the you have already created a survey project for the desired site. AirMagnet recommends that you have the Survey projects created ahead of time in order to make sure that the site map is accurate and of good resolution.

To conduct a passive survey:

1. From within AirMagnet Survey, click 📁 (**Open Project**) from the Toolbar.
2. Locate and open the Survey project (.svp) file of interest. The selected project file appears in the Project Window and the site map displays in the Map Window.

3. If the project has more than one site map, select the map you want to display in the Map Window (if it is not already opened).

4. Click [2.4/5.0 GHz ▼] (**Media Type**) and select a media type from the drop-down list.

5. From the Data Window, click the **Survey Type** drop-down list and select **Passive**.

Note: *For best results, AirMagnet recommends leaving the SSID field to "Any" while performing a passive survey. This will enable you to collect comprehensive RF signal data from the site environment.*

6. Click (**Start Survey**) and walk through the planned survey path, clicking as necessary to indicate each step in the survey. Note that by default, AirMagnet Survey automatically spaces data points over time, so it is only necessary to click a point when starting the survey and changing direction.

While conducting a survey, you must click from time-to-time to save the data as you travel along your survey path. The inactivity timer has been enhanced to automatically pause the survey if there is no click within the system specified time.

If the system does not detect a click action within the allotted time, a warning message prompt appears that counts down the time available to click before the survey is automatically paused.

Note: *AirMagnet recommends that you maintain a steady pace slower than a normal walk in order to gather as much data as possible.*

7. Click (S**top Survey**) once enough data have been collected.
8. Save the survey data when prompted.

For instructions on how to view and analyze survey data, refer to Performing Data Analyses.

Conducting an Active Survey

As explained previously, active surveys are more difficult to set up and perform than passive surveys, but have the advantage of providing real-world data for PHY Data Rate,

packet loss/retry, and uplink/downlink rates. Although active surveys require some configuration and initial setup prior to collecting data, these steps are required for users who wish to obtain the most accurate reflection of the network's performance as it relates to the end-user.

To conduct an active survey:

1. From within AirMagnet Survey, click [icon] (**Open Project**) from the Toolbar.

2. Locate and open the Survey project (.svp) file of interest. The selected project file appears in the Project Window and the site map displays in the Map Window.

3. If the project has more than one site map, select the map you want to display in the Map Window (if it is not already opened).

4. Click [2.4/5.0 GHz] (M**edia Type**) and select a media type from the drop-down list.

5. From the **Data** Window, click the **Survey Type** drop-down list and select **Active**.

6. Use the first drop-down to select **SSID** (to associate to a specific SSID) or **AP** (to associate to a specific AP).

7. Use the second drop-down to select the **SSID** or **AP** to which the application should associate.

8. If the selected SSID or AP requires a specific authentication mechanism, configure this information via the 802.11 tab from the **File>Configure**… menu. Refer to "Configuring 802.11 Parameters" for more information. If no authentication is necessary, continue to Step 9.

9. Click (Start Survey) and walk through the planned survey path, clicking as necessary to indicate each step in the survey. Note that by default, AirMagnet Survey automatically spaces data points over time, so it is only necessary to click a point when starting the survey and changing direction.

> While conducting a survey, you must click from time-to-time to save the data as you travel along your survey path. The inactivity timer has been enhanced to automatically pause the survey if there is no click within the system specified time.
>
> If the system does not detect a click action within the allotted time, a warning message prompt appears that counts down the time available to click before the survey is automatically paused.

Note: AirMagnet recommends that you maintain a steady pace slower than a normal walk in order to gather as much data as possible.

10. Click (**Stop Survey**) once enough data have been collected.

11. Save the survey data when prompted.

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For instructions on how to view and analyze survey data, Refer to Performing Data Analyses.

Placing APs in the Survey

Active Survey for a specific AP: When you Start an Active Survey for a specific AP (Click **Start Survey** ▶), you are prompted about whether you want to place the AP at its location on the floor plan. If you choose **Yes**, an AP appears on the floor plan and you may drag it to its actual location.

Passive Survey: When you Start a Passive Survey (Click **Start Survey** ▶), detected AP(s) are listed in the Active Survey Data window. Before the first click, you can drag a desired AP listing on to the floor plan in order to indicate its actual location. You can do this one-at-a-time for as many APs as desired.

When you stop and save the survey, any APs on the floor plan will be contained in the associated Survey Data Files (.svdx) that have been saved in the project. This means that when you switch to Display view and open a Data File, any APs saved in the data file will be automatically placed on the floor plan.

At this point, once a survey is stopped and saved, you can drag one or more APs on to the floor plan, however; these new APs will be in the next survey (since the last survey was saved and closed) or, if you do not conduct another survey, these APs will be in the survey project but not contained in a data file.

Deleting APs from the Survey Project

You can delete any APs from the survey project. From the Survey view, right click the desired AP listing in the Project Window and select **Delete**. However; any data file created (saved surveys) will still contain the placed APs.
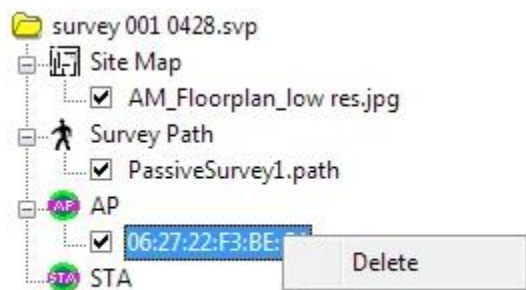
Deleting APs from a Data File

If one or more APs were placed in the survey project and the survey was saved, the APs will appear in the data file in Display view (refer to Map Window). You can delete a placed AP from the data file.

1. Select the desired data file (.svdx) in Display view to show its floor plan and heatmap in the Map window.

2. In the Map window, right-click the desired AP and select **Delete location information for this AP**. You are prompted to choose one of two options:

   - **Delete from both the survey and project files**: The AP location is deleted from both this survey data file and also from this opened survey project.

   - **Delete from survey file only**: The AP location is deleted from this survey data file only, but kept in the survey project.

Merging Survey Data

As mentioned earlier, when performing a site survey on a large site, you may want to break up the project into several small survey projects. Each small project covers only a part of the site. You save the survey data collected from each small area as a separate Survey (.svp) file. When the whole survey project is completed, you end up having several survey files, each covering a specific part of the site or network. You then have to merge the individual Survey files together to get a Survey file containing data that cover the whole site. You will then use this consolidated (.svp) file to plan and enhance your wireless network.

AirMagnet recommends the following steps when merging Survey data files:

1. Merge all the active survey files collected at the same AP location.
2. Merge the merged active files from all AP locations.
3. Merge the merged active file from Step 2 with the passive survey file(s).

Documenting Your Surveys and Analyses

You can document the results of your site surveys and data analyses using AirMagnet AirMagnet Survey's **Copy** and **Print** functions.

Copying Your Data into Other Applications

You can copy your survey data and the results of your analyses (displayed in the Map Window) into any software application that supports the copy-and-paste function. The copied data will contain whatever information displayed in the Map Window, including the site map, AP locations, survey paths, and the graph (if in Display screen). This is a great way to share your survey data.

To copy data to another application:

1. Display the data you want to show on the site map.
2. Click **Edit>Copy Heatmap Image**.
3. Open a file in a software application that supports copy-and-paste and paste it into the document. The following figure shows survey data copied and pasted into a Microsoft Outlook document.
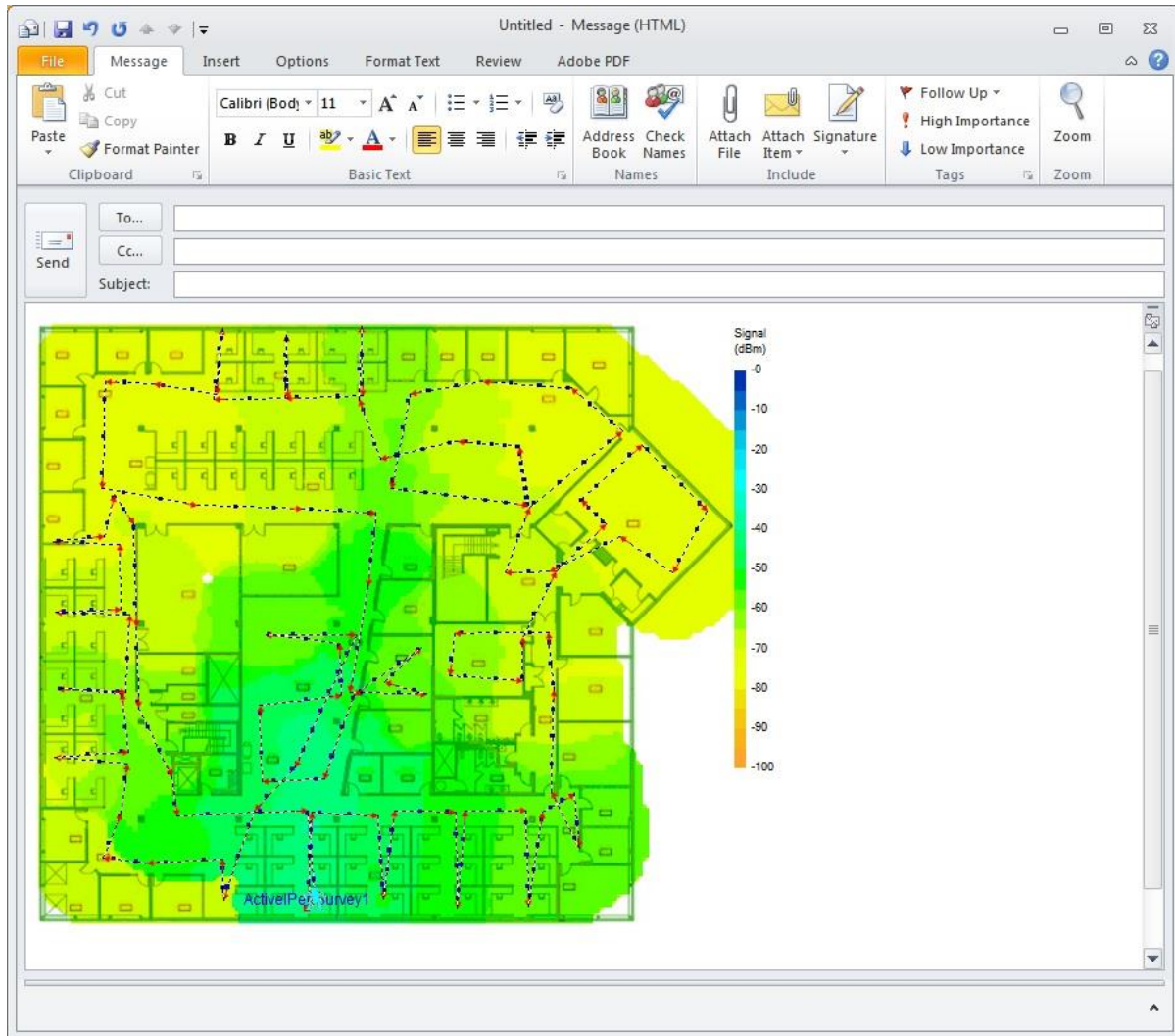
Printing Your AirMagnet Survey Data

You can print your survey data using AirMagnet Survey's printing capability. The data you print can be raw data collected from site surveys or the results of your data analyses, simulation, or filtering. It's a great way to document your site surveys and WLAN infrastructure, as well as a way to share your work.

To print your survey data:

1) Display the file in the *Map Window.*

2) Click **File>Print Preview.** The *Print Preview* window appears.
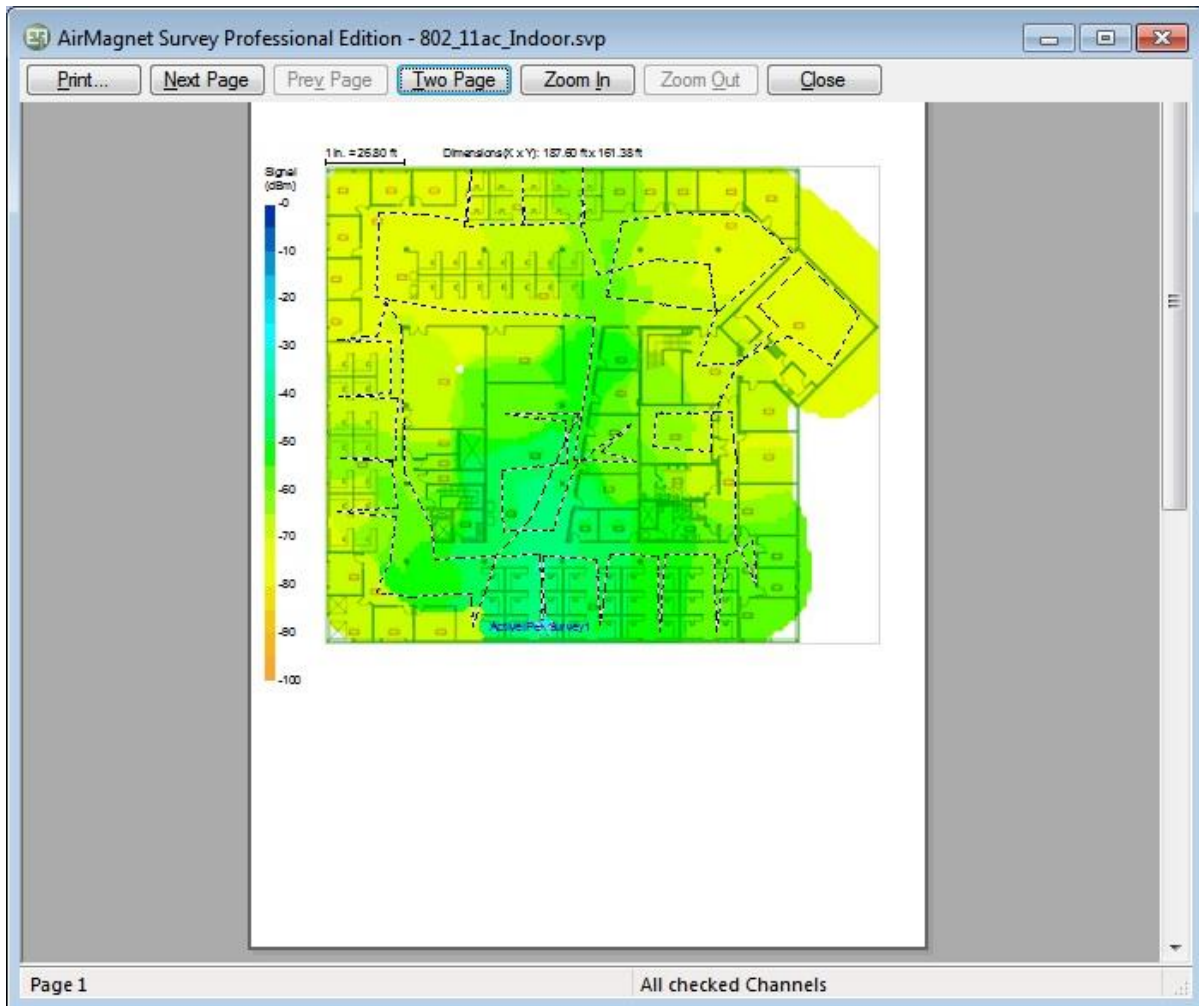
3) If you are satisfied with what you see in the **Preview** window, click **Print**. The Print dialog box appears.

4) Make the desired selections, and click **OK**.

Sharing a Survey Project

An AirMagnet Survey project may be shared with other users who have AirMagnet Survey or AirMagnet Viewer installed on their computer along with a valid license. For viewer restrictions, refer to Survey Viewer License.

To share your project with another user:

1. Locate the survey project folder. The folder was created when you set up your new project. The folder name is the "project name" you gave your project. The default location is "My Documents."
2. Compress the folder using a compression application (for example, ZIP) and send it to the recipient.

The recipient of the compressed file can do the following to open the shared AirMagnet Survey project:

1. Decompress the folder.
2. Launch AirMagnet Survey.
3. Select **File>Open** and browse to the .svp file contained in the decompressed folder.

GPS Surveys

Creating a GPS-Aided Survey Project Using an Existing Site Map

This section explains the procedures for creating GPS-aided Survey projects. GPS-aided site surveys usually cover large outdoor areas. Like creating an indoor Survey project, creating an outdoor GPS-aided Survey project also involves importing a site map which is done in the same way as you do when creating an indoor Survey project.

To create a new site map using Bing Maps or Google Maps:

1. Open Bing Maps or Google Maps in a web browser, and enter a location for your outdoor Survey, zooming in appropriately.
2. Use a screenshot application (like Windows Snipping Tool) to create a .png or .jpg of the area.
3. Open AirMagnet Survey, and create a new GPS Survey project (see details below).
4. To view GPS coordinates (for later entry into the **New Project Wizard** dialog box **GPS Coordination**), in Bing Maps, right click at the desired map location. In Google Maps, left click at the desire map location. A pop-up will display the GPS coordinates of the spot where you clicked.

To create an outdoor Survey project using an existing site map:

1. Start AirMagnet Survey and click **File> New Project....** The New Project Wizard view appears.
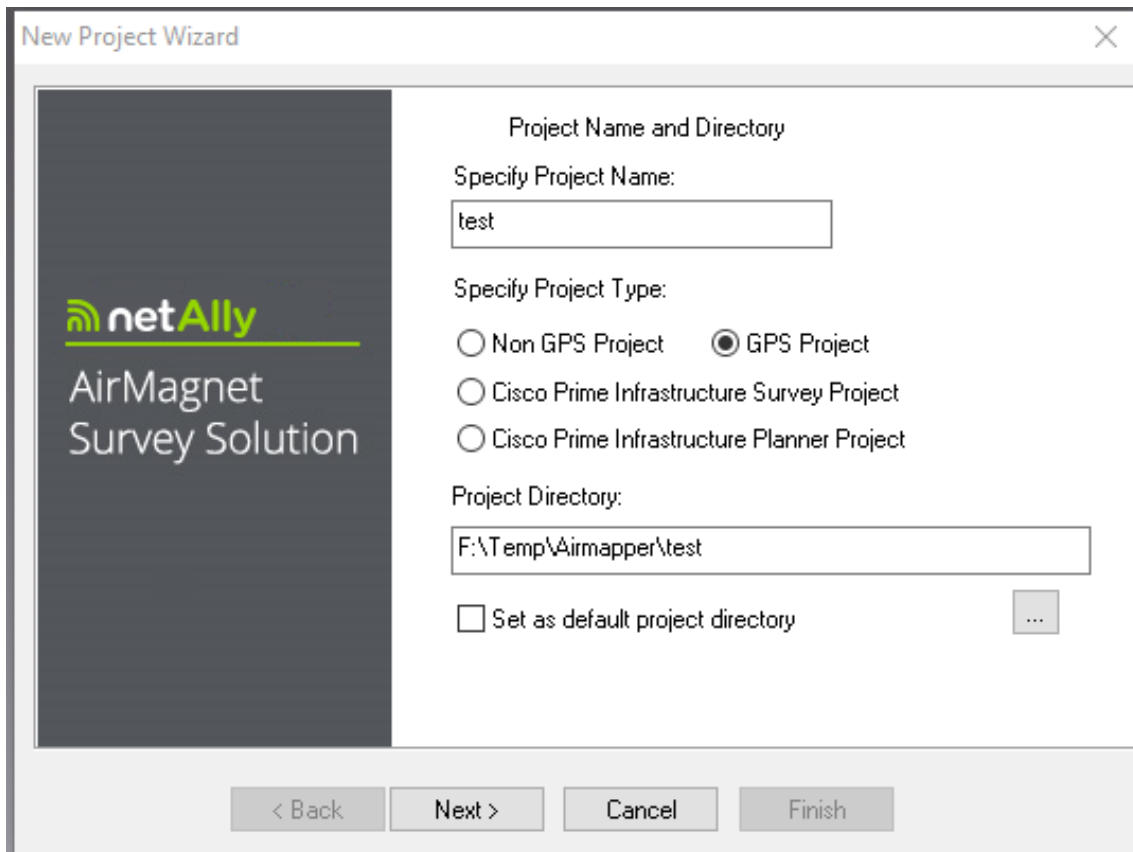
2. Specify the name of the new project, and click **GPS Project**.

3. Type the directory path or browse to the location where the project file is to be stored, and click **Next**.

> *Note:* *The following steps assume you want to import a site map (image file) from your local computer.*

4. Click the **Import Outdoor Street/Campus Map (GPS) Image** radio button. The "Select Type" drop-down appears that allows the user to browse for a map.

5. To import a site map from the local computer, select "Browse" and open the desired image.

5. If you know the values of GPS coordinates, you can enter them now. Otherwise, you can use the calibration tool ![icon] to calibrate the data later. For more information about GPS calibration, refer to [Performing a GPS-Aided Site Survey](#).

6. Click **Next**. The New Project Wizard view refreshes.
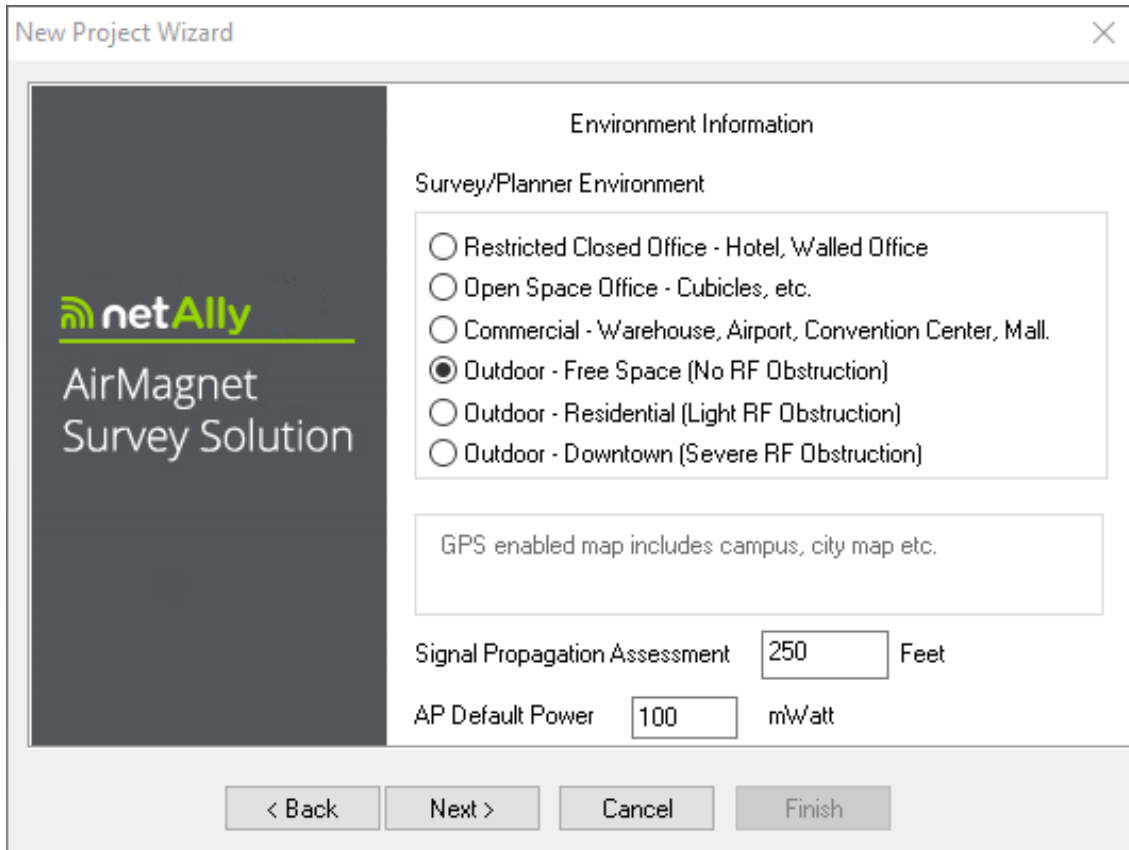
7. For **Survey Environment**, check the outdoor option that best matches the environment to be surveyed.

8. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the survey environment you've selected.

Note: AirMagnet Survey assigns the Signal Propagation Assessment value based on the estimate of the distance RF signals could travel in each of those typical survey environments as shown in the figure above. Normally, AirMagnet recommends that you accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you specify will affect the way the program interpolates survey data.

9. For **AP Default Power**, do nothing (normally).

Note: If you know the value of AP power, you can enter it now. It will be used when conducting data simulation.

10. Click **Next**. The New Project Wizard view refreshes.

11. Enter a description of the project. Enter a brief description of the project in the space, and click **Finish**. The newly created Survey project will automatically open on the Display view, with the site map in the Map Window.

Configuring GPS COM Port

Once a GPS-aided Survey project is created, the next step is to configure Survey's GPS COM port so that it can communicate with the GPS device to which it is connected.

To configure Survey's GPS COM port:

1. From your desktop, open the **Device Manager**. You can search for it using the Windows search field in the bottom Taskbar.

> **Note:** *Accessing the Windows Device Manger procedure may differ somewhat depending on the Windows operating system. Refer to* ***Windows Help>Device Manager****.*
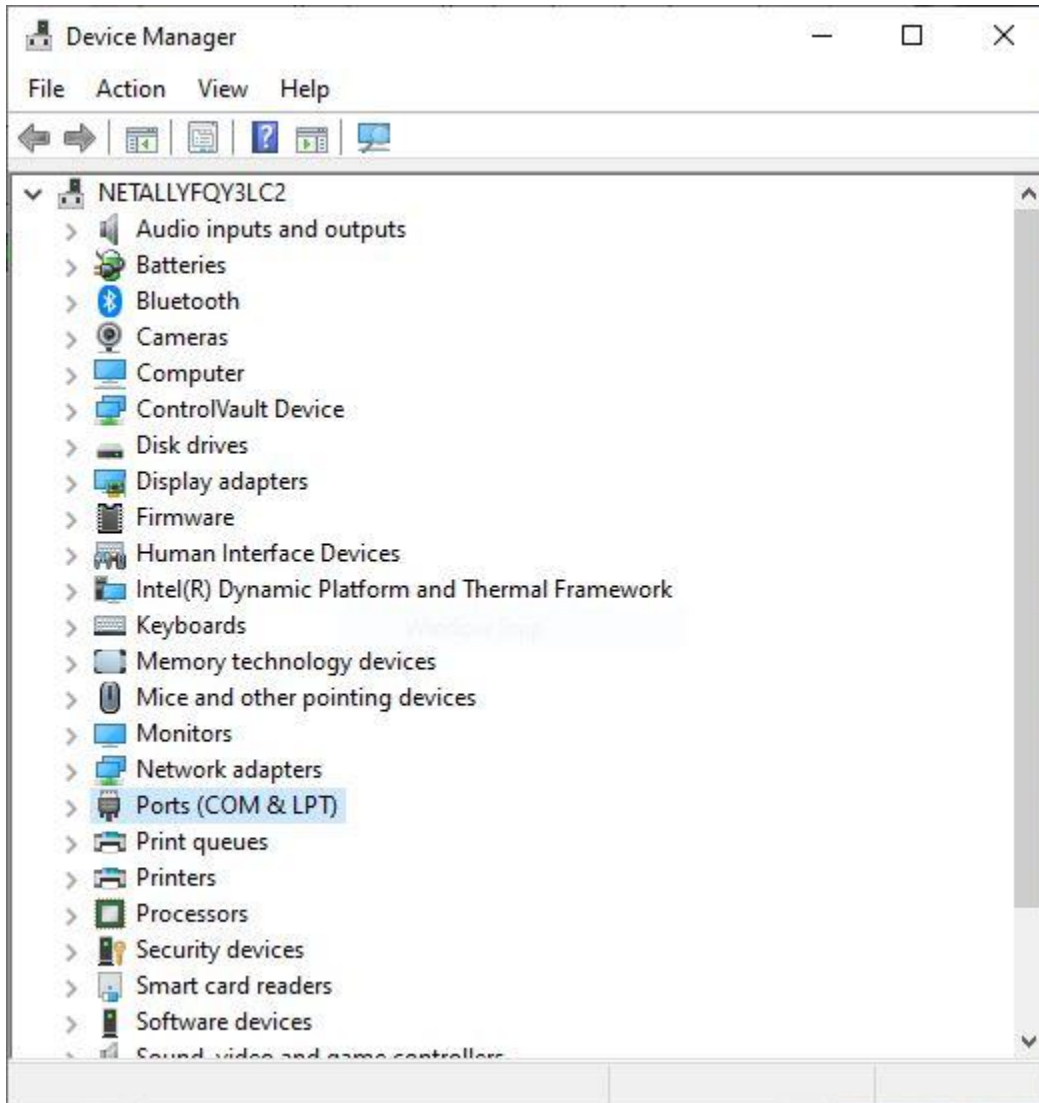
2. Click **Ports (COM & LPT)**, and write down the COM port number listed after the device's name.
3. Close the **Device Manager**.
4. From Survey's Survey or Display view, click **File>Configure**…. The Survey Configuration dialog box appears. The **Settings** tab is default.
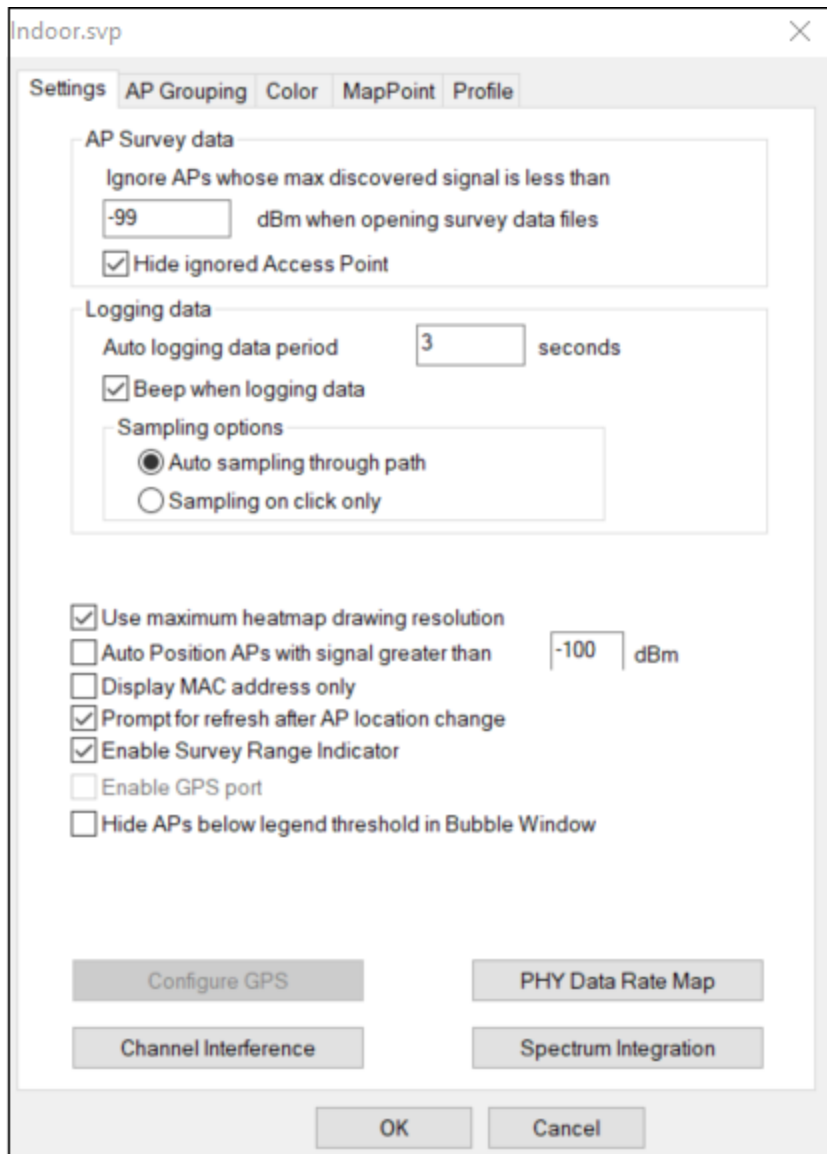
5. Check **Enable GPS Port** and click **Configure GPS**.... The GPS COM Configuration dialog box appears.
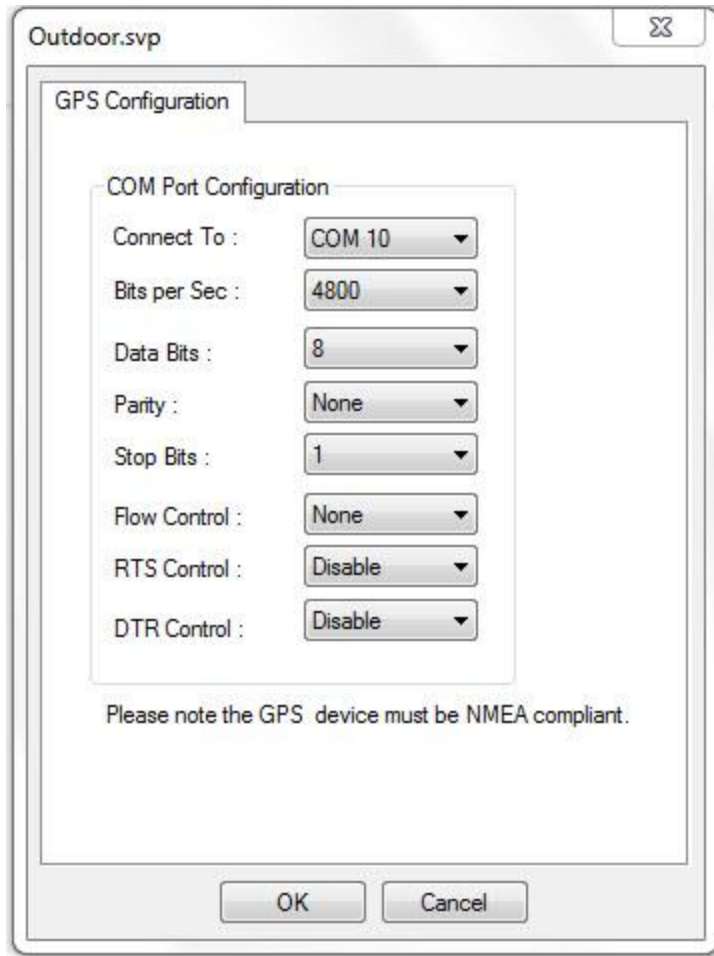
6. Under **Connect to**, select the COM port identical to the one you found in Step 2.

7. Under **Flow Control**, select **None**, and click **OK**.

8. Click **OK** to close the **Survey Configuration** dialog box.

Note: A USB to Com port software may be needed when connecting a GPS device via a USB port rather than a Com port. This software is often provided by the GPS device manufacturer.

Verifying GPS Device Connection

To verify the connection to a GPS device:

1. From the Navigation Bar, click **Tools>GPS Information**. Survey's **Tools** dialog box appears.
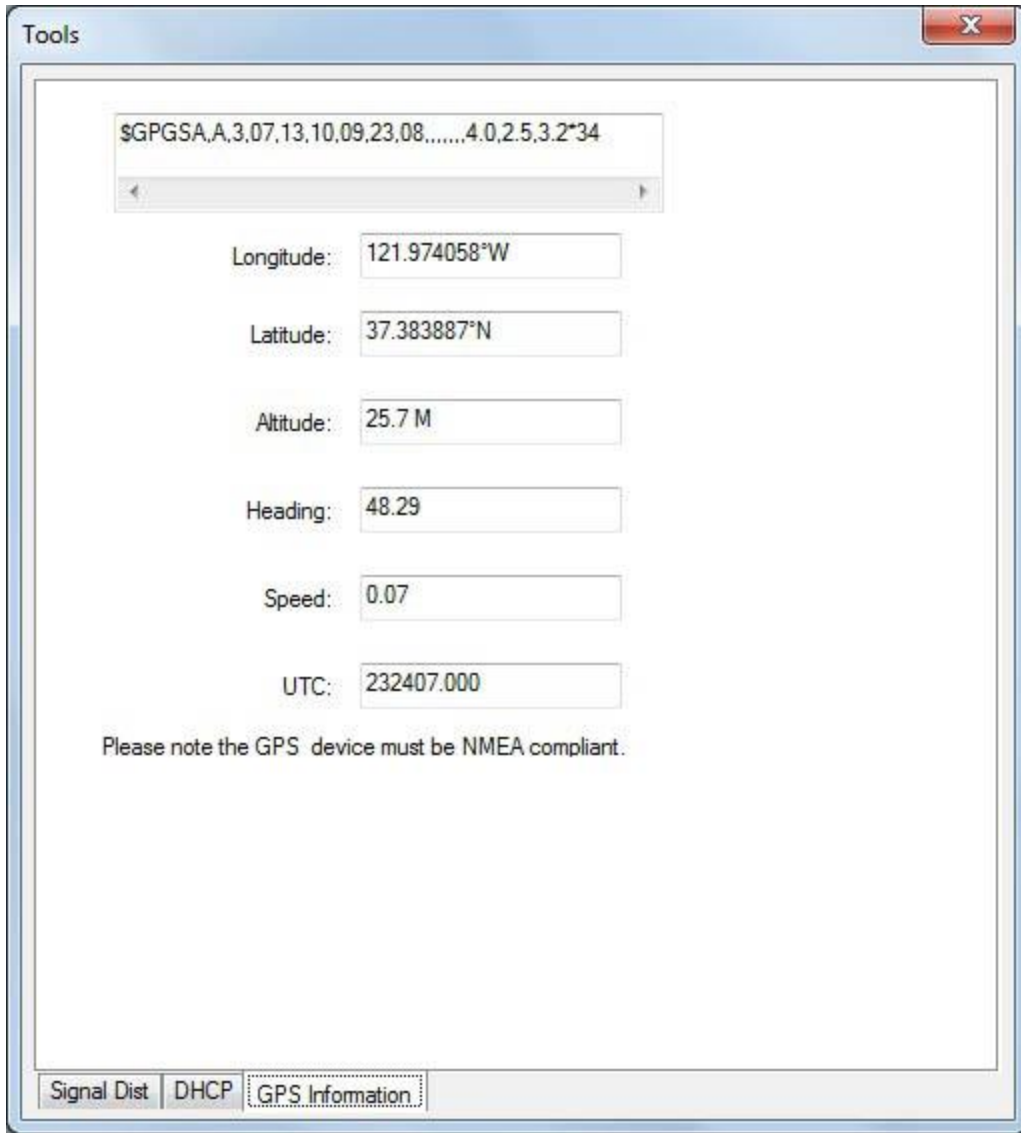
Note: *The view should be populated with valid GPS information if Survey is successfully connected to the GPS device. Otherwise, you may have to do some troubleshooting to make sure that the connection between Survey and the GPS device is established. No data will be collected if communication between AirMagnet Survey and the GPS device fails.*

2. Close the **Survey Configuration** dialog box.

Performing a GPS-Aided Site Survey

Once the communication between AirMagnet Survey and the GPS device is established, you can start performing a GPS-aided site survey.

Note: *To find coordinates without using GPS, you can open Bing or Google Maps in a web browser. In Bing Maps, right click at the desired map location. In Google Maps, left click at the desire map location. A pop-up window will display the GPS coordinates of the spot where you clicked.*
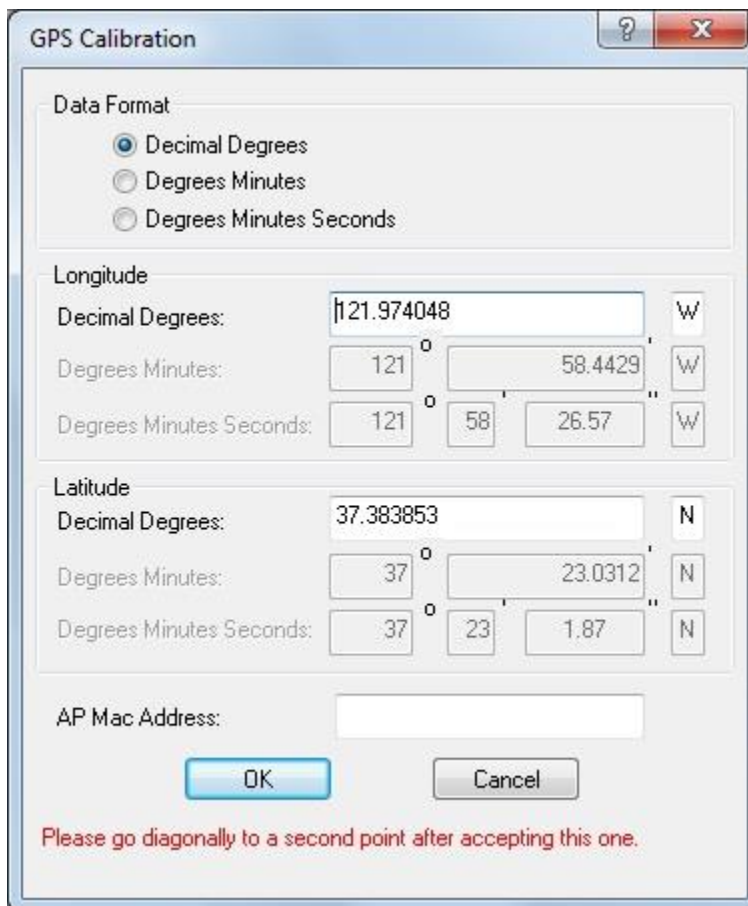
To calibrate the GPS Coordinates:

If you created the GPS survey project using a site map, you must first calibrate the GPS as described in the following steps. Otherwise skip to "Starting GPS Survey."

1. Open a GPS-aided survey project that you have created.
2. From the GPS map, determine the two locations where GPS coordinates are to be taken.

    Note: *To ensure the accuracy of your GPS survey, it is highly recommended that you select two points with different GPS coordinates on the map. They should be in the north and west directions and be set far apart from each other.*

3. From the Toolbar, select ![icon] (**Calibrate GPS**) and click the first spot on the GPS map. AirMagnet Survey starts to recalibrate the GPS information.

4. Click **OK** to close the view.
5. Then move to the second location, click the corresponding point in the map. Survey will recalibrate the GPS coordinates for this location.
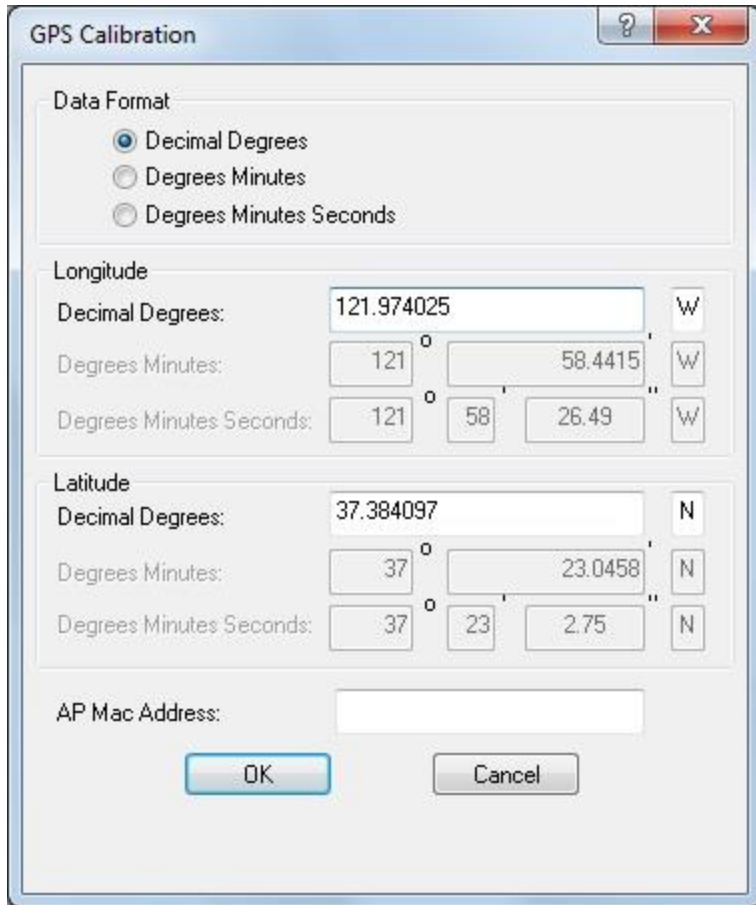
6. Click **OK** to close the view. A dialog box will appear asking if you wish to start the survey.

7. Click **Yes**, or go to "Starting the GPS Survey" to do so manually.

To Start the GPS Survey:

1. From the Toolbar, click (**Start Survey**) and start to move along the survey path.

2. Click (**Stop Survey**) when enough data have been collected.

3. Save the project.

Note: You can repeat the same procedures to conduct as many GPS surveys as needed. The figure below shows a sample GPS survey view.
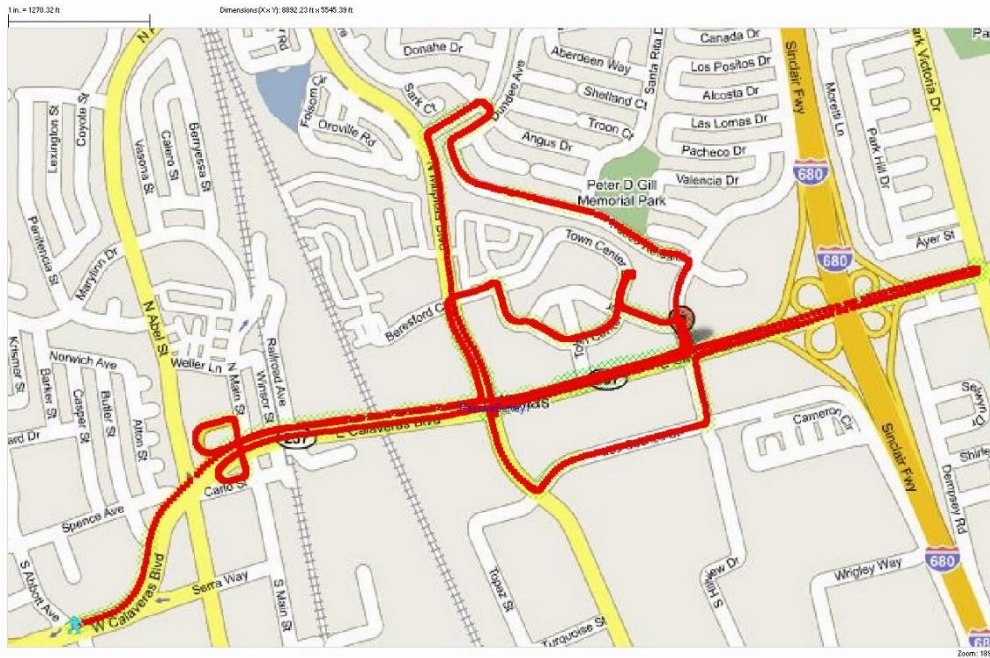
Exporting GPS-Aided Site Survey Data to Google Earth

You can export your survey data collected during a GPS-aided site survey to Google Earth so that you can view the data on a larger scale.

Note: You must be working from the Display view in order to export data to Google Earth.

To export into Google Earth:

1. Download and install Google Earth software (if not already done) from http://earth.google.com/download-earth.html.

2. Open the GPS project in the **Display** view, click **File>Export to Google Earth**.

3. The Google Earth view opens, displaying your survey data superimposed over the map.
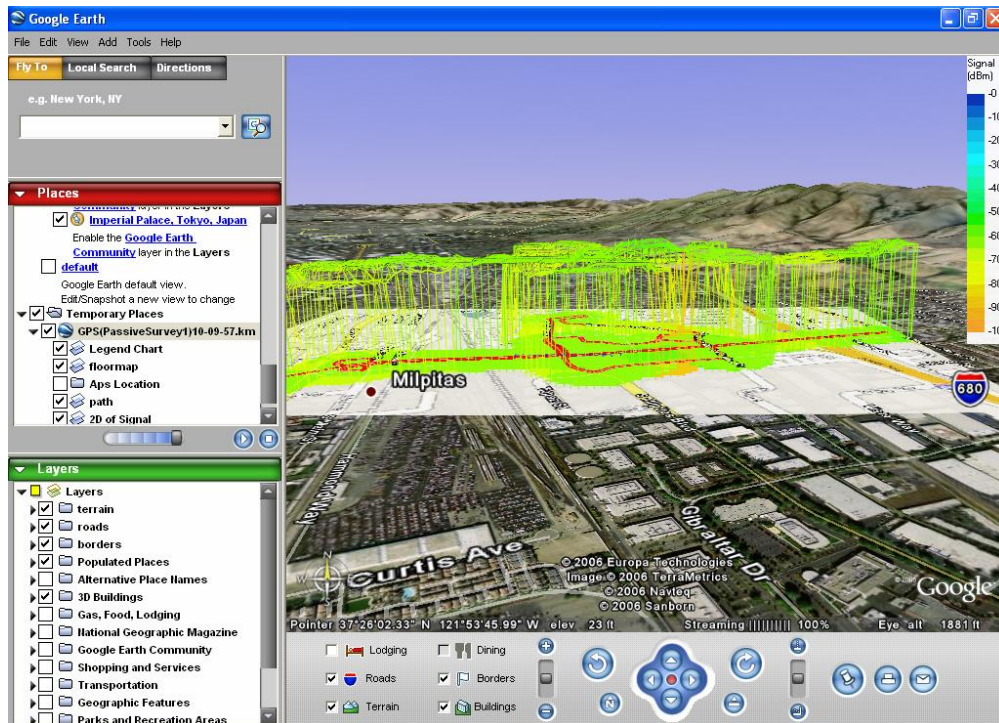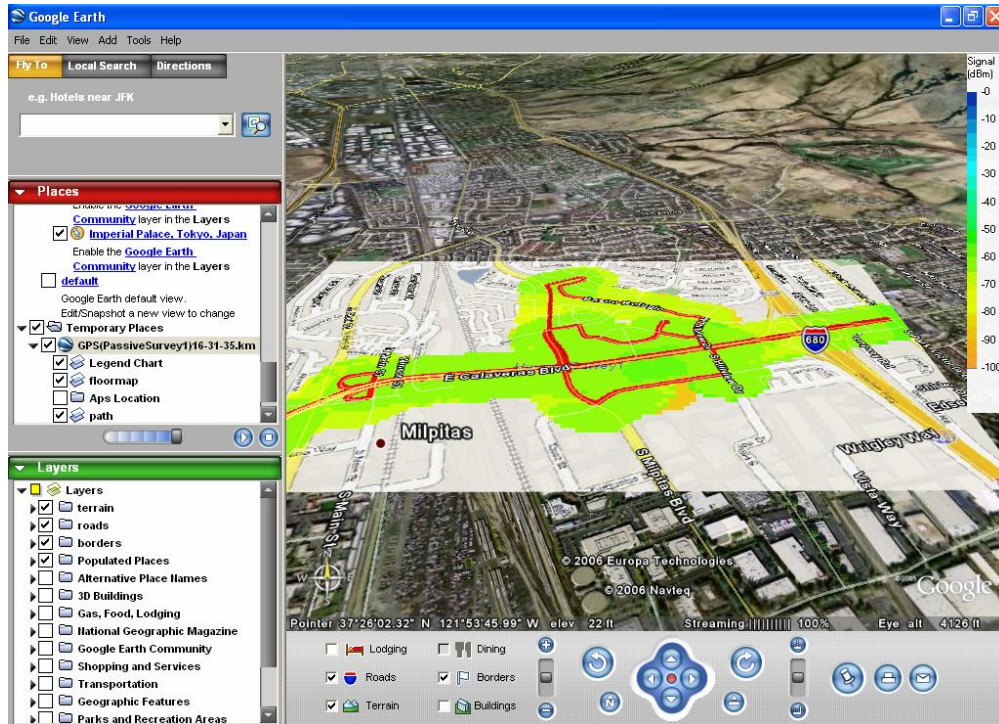
VoFi Surveys

Conducting VoFi Surveys

A VoFi survey is a critical part of planning any voice over WLAN deployment. By conducting a VoFi survey, you can gain a comprehensive view of the wireless environment from the

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perspective of a VoFi phone. Just as with a data network, any problems or wireless hazards that are present in an anticipated VoFi deployment will be significantly easier to remedy if they are identified before the network is fully operational. As such, taking the time to properly survey and troubleshoot the pre-deployment environment can greatly improve the resulting installation.

Note: You can verify that an existing wireless deployment is VoFi-ready by following the instructions provided with the AirWISE view.

VoFi surveys gather data from an active connection between a wireless AP and a VoFi phone. In order to establish this connection, you must establish a call between two phones (one of which must be a VoFi phone; the other may be VoFi or wired, but must remain stationary during the survey) before attempting to start the survey. Once Survey detects the call, you can start collecting the survey data. VoFi surveys can be helpful in troubleshooting problem areas in a VoFi deployment; they can provide details about the active call such as WiMOS, roaming frequency, and signal strength.

Note: VoFi surveys require that you carry an actively connected VoFi phone along with the laptop during the survey process. For best results, attach the phone to the laptop in an upright position (to best mimic the position of the phone during an actual call). Before starting a VoFi survey, you should note down the MAC address of the phone being used, as the phone must be selected from a list of active calls once the survey has started.

To conduct a VoFi survey:

1. Create a new survey project (click here for instructions).
2. Configure Survey's VoFi phone book .
3. From Survey's configuration window, click the **Scan** tab and specify the channels on which the VoFi APs operate. This step helps the application quickly re-detect the phone during instances of roaming.
4. From the Survey view, click the **Survey Type** drop-down list and select **VoFi Phone Survey**.
5. Start a call with the VoFi phone and click (**Start Survey**). The **VoFi Call List** dialog box appears.
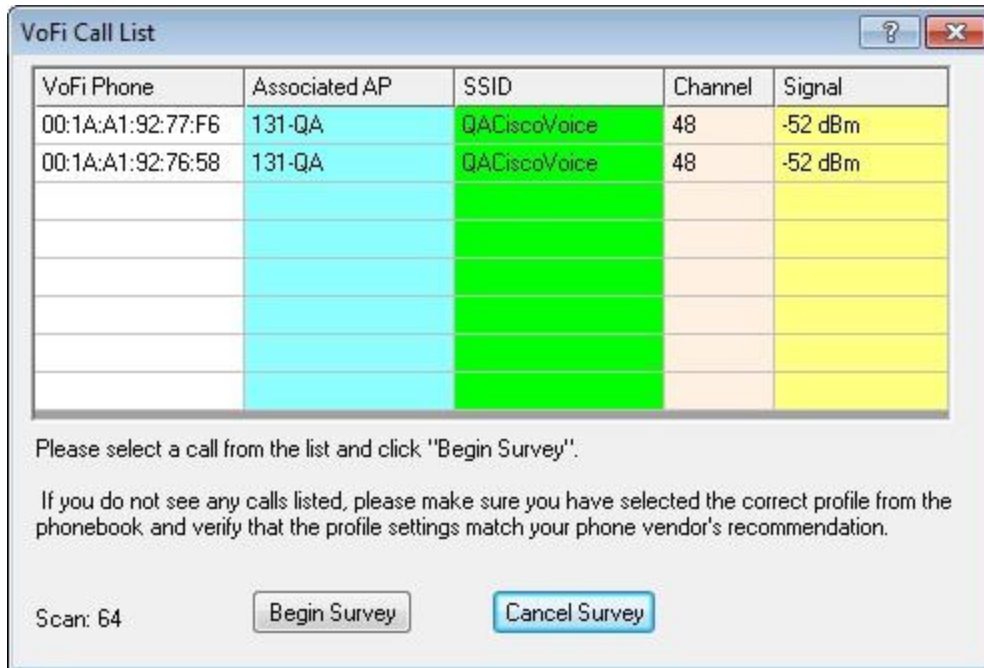
6. Select the phone's MAC address from the call list and click **Begin Survey**.

7. Click regularly along the survey path to collect data, just as during a standard data survey. A pop-up window will appear whenever the phone roams to indicate its roaming status.

8. Once the survey is completed, click ![icon] (**Stop Survey**) and save the data.

Note: *After completing a VoFi survey, you can view the resulting picture of the wireless environment. Refer to Analyzing VoFi Survey Data for additional details.*

Configuring a VoFi Phone Book

Note: *The VoFi phone book must be configured before attempting to conduct a VoFi survey.*

Due to the differences between individual VoFi phones, you must provide some configuration information in order to ensure that Survey can properly interpret the data received from VoFi surveys. This process consists of you creating VoFi phone profiles within Survey's phonebook that correspond to the types of phones in use (or expected to be in use) on the VoFi deployment. The following sections provide you with a guide through this process.

To access the VoFi Phonebook:

1. Navigate to the Survey or Display view.
2. Click **File>Phonebook**…. The Phonebook window appears.
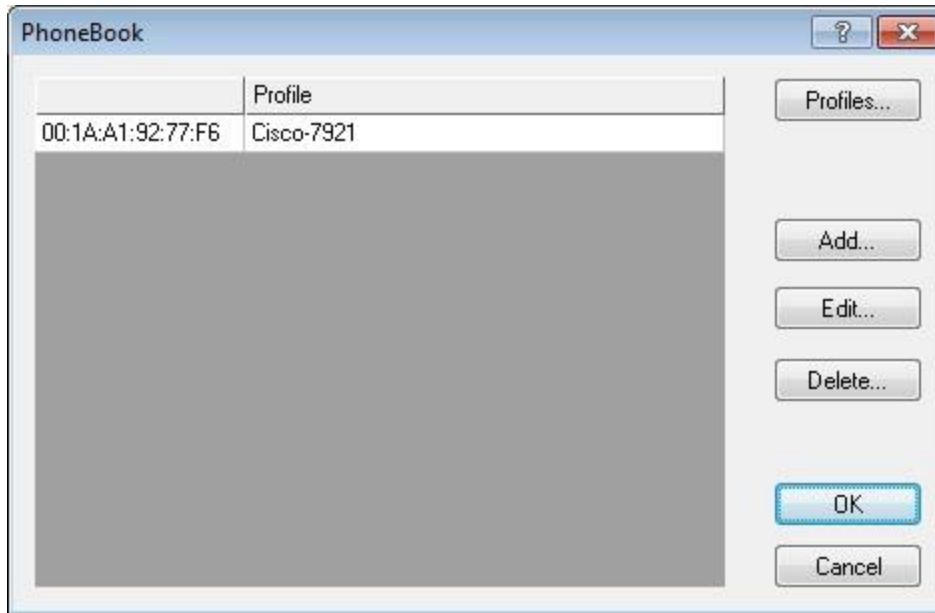
Creating VoFi Phone Profiles

Phone profiles contain the required configuration information specific to individual types of phones. Phones provided by different vendors (or even different phone models from a single vendor) can have drastically different configurations, and without creating profiles within Survey that correspond to the phone types in use, the user may not obtain optimal results from VoFi surveys.

To create a VoFi profile:

1. From the Phonebook window, click **Profiles**…. The **VoFi Profiles** window appears.
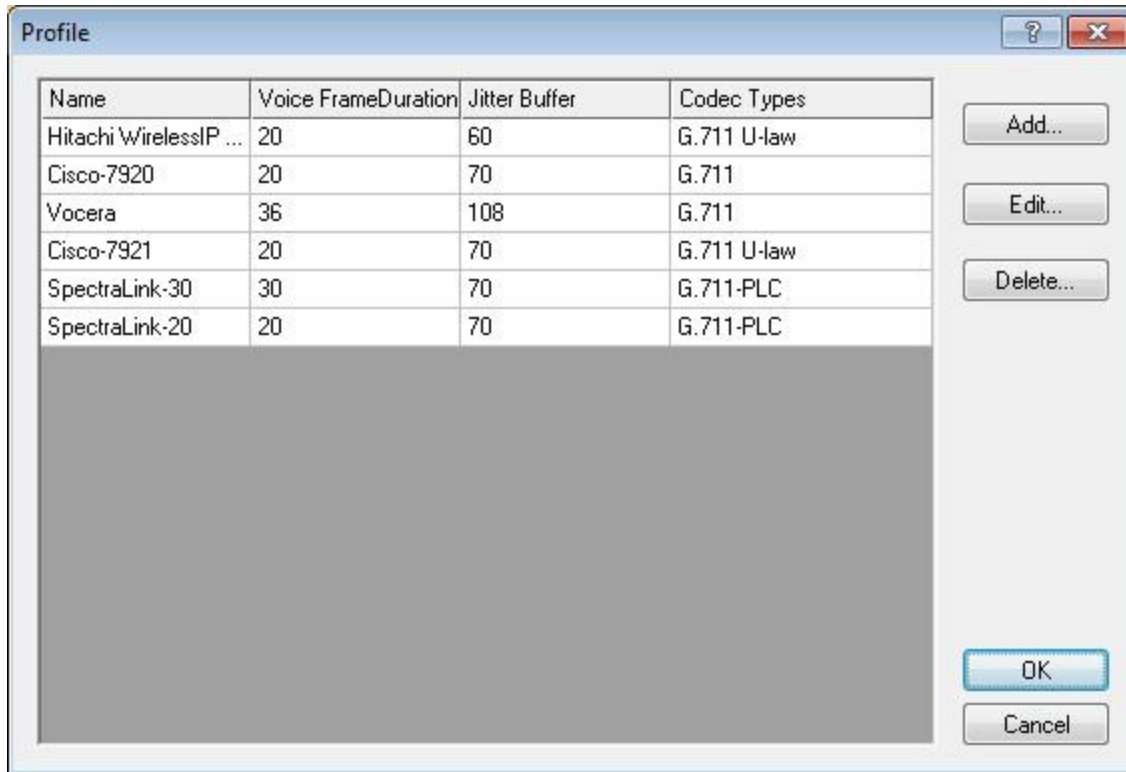
2. Click **Add...** to open the **Create Profile** dialog box.

3. Enter a name for the profile (AirMagnet recommends that this name match the vendor and model number of the phone).

4. Fill in the remaining fields as required by the phone. See the table below for additional details.

Field	Description
Codec Type	A codec refers to an algorithm or specialized computer program that encodes or reduces the number of bytes consumed by large files and programs. Files encoded with a specific codec require the same codec for decoding. Refer to the VoFi phone's user manual to determine the codec it uses.
Voice Frame Duration	In contrast to most wireless transactions, VoFi data is normally transmitted in steady fixed-size packets. The voice frame duration refers to the time (in milliseconds) that should be allocated for each frame. This value should be available from the VoFi phone vendor's website or documentation.
Jitter Buffer	The jitter buffer refers to the amount of memory allocated to buffering voice data to account for "jitter", or packet delays, in the VoFi exchange. Since seemingly small amounts of delay in a conversation can result in drastically reduced call quality, the phones include a built-in buffer to help smooth out portions of the call that experience unusually high jitter levels. The phone's specified jitter buffer value should be provided in its documentation or website.

5. Click **OK** to save the new profile.

6. Repeat Steps 1 through 5 for each type of phone in use on the VoFi deployment. When finished, click **OK** to close the VoFi Profiles window.

Note: Entering the incorrect values for a VoFi phone profile can result in Survey being unable to detect calls made from phones associated with the profile.

Once all necessary profiles have been implemented, users can add the phones to their corresponding profiles, as described here.

Adding Phones to VoFi Profiles

After creating a VoFi phone profile, you must enter the VoFi phones in use in the deployment into Survey's VoFi phone book and match each device with the appropriate phone profile. This step ensures that VoFi Survey is able to detect the call.

To add phones to the phone book:

1. From the Phonebook window, click **Add...**. The New Phonebook Entry dialog box appears.

2. Enter the phone's MAC address in standard MAC notation (for example, aa:bb:cc:dd:ee:ff, including colons).

Note: If you have already conducted a passive survey of the wireless environment, the MAC Address drop-down list may already contain the phone's MAC address information. In this case, use the drop-down to select the desired phone.

3. Use the Profile Name drop-down list to select the desired profile and click **OK** to save the changes.
4. Repeat steps 1 through 3 for all phones necessary.

Using AirMagnet Planner

Planner User Interface

Navigation Bar

Serves as a launching pad of various screens and utilities. Options on the navigation bar vary, depending on the software license.
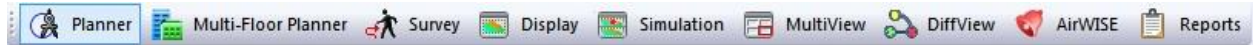
Some options on the navigation bar refer to features unavailable when using AirMagnet Planner.

Click **Planner** to open the Planner view.

File Menu Options

The File menu provides the following options in Planner view.
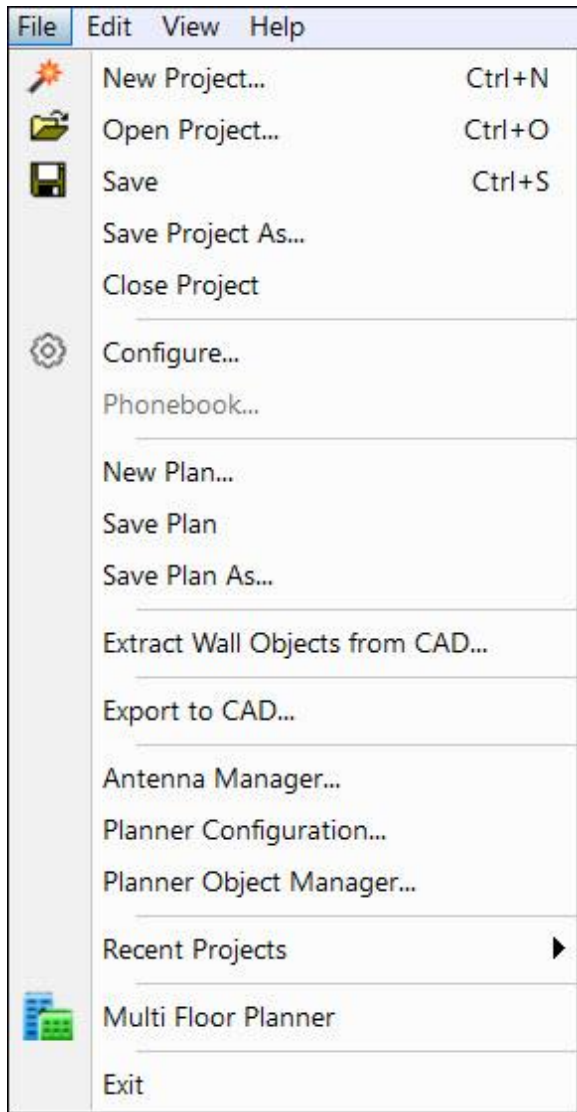
Menu Option	Description
New Project...	Opens the New Project Wizard window where you can create a new Planner project.
Open Project...	Opens an existing Planner project.
Save	Saves changes made to the current project.
Save Project As...	Saves the current project under a different name.
Close Project	Closes the current Planner project file.
Configure...	Opens the Configuration dialog box where you can configure various parameters in AirMagnet Planner.
New Plan...	Creates a new plan in the current Planner project.
Save Plan	Saves the current plan within the Planner project.
Save Plan As...	Saves the current plan under a different name within the current Planner project.

Extract Wall Objects from CAD...	If you imported a CAD image (.dwg) for your project, this option opens the Create Planner Wall Objects from CAD Drawing dialog where you can select layers and configure walls.
Export to CAD...	If you imported a CAD image (.dwg) for your project, this option enables you to export the image along with any APs and walls data.
Antenna Manager...	Opens the Antenna Manager dialog, allowing you to customize and modify antenna pattern templates.
Planner Configuration...	Opens the Planner Configuration dialog, allowing the user to customize various aspects of Planner's display.
Planner Object Manager...	Opens the Planner Object Manager, allowing the user to view a list of wall and area types in the plan.
Recent Projects	Provides a list of previously open projects. Selecting a listing will open the project.
Multi Floor Planner	Opens Multi Floor Planner.
Exit	Exits AirMagnet Planner.

View Menu Options

The View menu provides the following options.

Menu Option	Description
Zoom In	Enlarges the view of the current floor map in the map window. It works in the same way as ![icon] (**Zoom In**) on the toolbar.
Zoom Out	Reduces the view of current floor map in the map window. It works in the same way as ![icon] (**Zoom Out**) on the toolbar.
Zoom to Fit	Fits the current floor map to the map window. It works in the way as ![icon] (**Zoom Fit**) on the toolbar.
Zoom to Actual Size	![icon] Fits the current floor map to its actual print scale.
Set Zoom...	Opens the Set Zoom dialog box where you can specify the specific ratio at which the view of the map can be increased.
Show CAD Layers...	Allows you to select which layers of a CAD image to display and, if the image has multiple layouts, which layout to display. This feature is also available when you right-click on the image in Display View.

Toolbars and Docking Windows	Show or hide the Legend, Status Bar and reset the Toolbar to its default setting.
Show Rulers	Show or hide the rulers along the edge of the map window.
Show Grids	Show or hide grids in the map window.
Invert Legend Colors	Flips the color scheme of the legend vertically.
Filter APs	Once APs are placed on a floorplan, this option opens the Filter AP dialog where you may create a data file that includes or excludes APs from the heatmap generation.
Overlap	Same as the Overlap button. Indicates signal overlap or channel interference overlap. Based on the Data Type selected, overlap will filter out all information that does not overlap, and will display only the data that does overlap.
Overall	Same as the Overall button. The default heatmap indicates overall signal strength coverage.
View Per Channel	Active when the Channel/SSID View is set to Channel. Same as Per Channel option on the Toolbar. Displays data by channel. Displays each channel in a different color. When this option is enabled, the channel list assigns different colors to the channels.
Per SSID	Active when the Channel/SSID View is set to SSID. Same as Per SSID option on the Toolbar. Display data by SSID. Displays each SSID in a different color. When this option is enabled, the channel list assigns different colors to the SSIDs.
Show AP List	Displays a list of all APs contained within the current plan. This allows you to easily manage basic settings for each AP in the list.
Re-Sequence AP Numbering	Re-sequences the numbering of all APs placed on the map that fit the default numbering scheme ("AP-#") to remove numbering gaps that may have occurred during the design process.
Refresh	Generates or refreshes the heatmap. Requires that one or more APs be placed on floor plan.

Toolbar

The Toolbar contains frequently used tools, some of which are identical to those found in the File and View menus.

The following screen shot of the toolbar shows an undocked view. To undock the toolbar, drag the handle at the far left on the toolbar.

Icon	Tool Name	Description
	Project Wizard	Create a new project.

	Open Project	Browse to open a project.
	Save	Save the open project.
	Configure	Opens the project configuration window.
	Select	Selects the cursor tool, allowing you to select and modify specific items.
	Zoom In	Enlarges the view of the site map.
	Zoom Out	Reduces the view of the site map.
	Zoom Fit	Fits the site map to the Map Window.
	Actual Size	Sets the zoom value to the actual size of the site map file.
	Create AP	Allows you to create and place a new AP in the map.
	Measure Mode	Allows you to recalibrate site dimensions to suit your location.
	Create Wall	Allows you to select a wall type and draw the walls of your site.
	Create Rectangular Attenuation Area	Allows you to select an area type (cubicle, office, etc.) and draw out a rectangular section of area.
	Create Arbitrary Attenuation Area	Same as rectangular area, but is not restricted to drawing rectangles (draws like the Create Wall tool).
	Create Elliptical Attenuation Area	Allows you to select an area type (cubicle, office, etc.) and draw out an elliptical area.
	Create Rectangular Coverage Area	Allows you to draw a rectangular coverage area. This area is used by Planner Advisor only.
	Create Rectangular Excluded Area	Allows you to draw a rectangular excluded area. This area is used by Planner Advisor only.
	Create Arbitrary Coverage Area	Allows you to draw an arbitrary coverage area. This area is used by Planner Advisor only.
	Create Arbitrary Excluded Area	Allows you to draw an arbitrary excluded area. This area is used by Planner Advisor only.
	Create Elliptical Coverage Area	Allows you to draw an elliptical coverage area. This area is used by Planner Advisor only.
	Create Elliptical Excluded Area	Allows you to draw an elliptical excluded area. This area is used by Planner Advisor only.
	Clear All Objects	Opens a dialog allowing you to remove all placed objects, or all objects of a certain type (APs, attenuation areas, walls, etc.).
	Advisor	Opens the Planner Advisor tool.
	Refresh	Generate and refresh the heatmap
	Overlap	Show or hide coverage overlap in the Map Window. Available in Display view.
	Filtering	Filter AP data out of the Planner project.
	Tools	Opens the Signal and DHCP tools.
	Calculator	Opens the calculator tool.

Project Window

The Project Window displays all the plans contained in the current project(s).
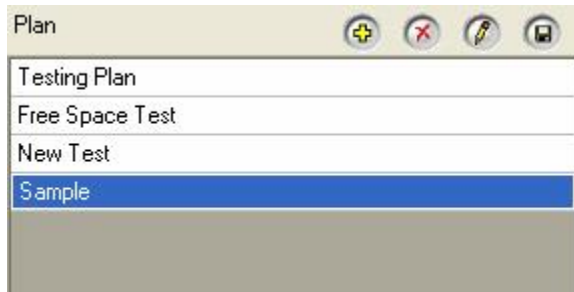
The Project Window for the Planner view contains the following components:

- **Tools**: contains buttons to add, delete, modify, and save the active plans contained in the current project file.
- **Plans**: displays the active plans contained in the current project file. The selected plan is the one displayed on the view at any given time.
- **Right-Click Pop-Up Menu**: See Right-Click Pop-Up Menu below.

Right-Click Pop-Up Menu

The Project Window on the Planner view also comes with a pop-up menu, which can be activated when you right-click a main entry.
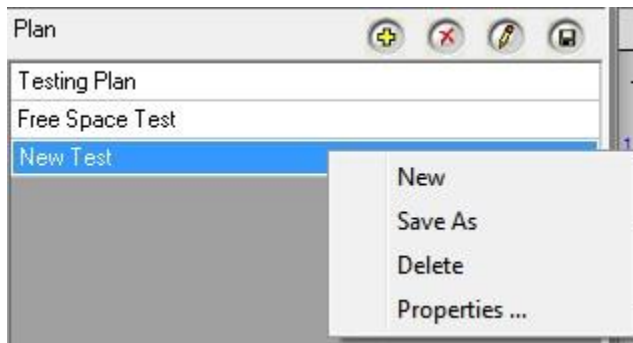
Menu Option	Description
New	Opens the plan dialog box to create a new plan.
Save As	Allows you to save the current plan and rename it, if desired.
Delete	Deletes the selected (right-clicked) item.
Properties...	Allows you to modify the properties of the selected plan.

Channel Tab

The image below shows the Data Window when the Channel tab is selected. By checking or unchecking specific APs or channels, you can change the display on the map to narrow the focus of your analysis.
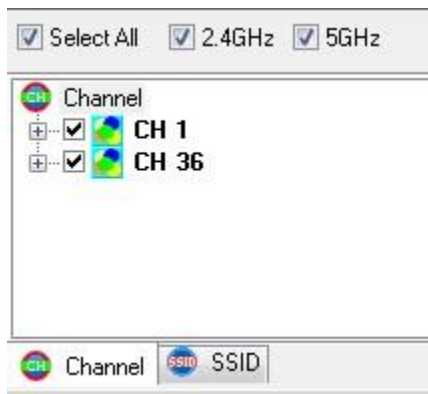
SSID Tab

The image below shows the Data Window when the SSID tab is selected. By checking and unchecking specific SSIDs or APs, you may refine your analysis just as you can from the Channel tab.

AP Data Properties

AP properties (such as channel and media type) may be viewed using a few different methods, however, the properties can only be edited in the Planner view.

- In the **Planner** view, right-click an AP located on the site map and select **Properties**. This option enables the properties to be edited.
- Expand either the **SSID** or **Channel** tree in the **Data** window. Right-click an AP and select **Properties**. (Edit is available in Display view as well)
- In the **Display** view, right click an AP located on the site map and select **AP Properties**.

For a description about each property item, Refer to Adding APs to the Plan.

Map Window

The image below shows the Map Window on the Planner view with a site map in it. A plan will be displayed if it is selected in the Project Window; thus, if you wish to change the plan you have displayed, just select it from the list at the top left. By default, a site map will automatically open in the Map Window when you open a Planner project. Before starting a

plan, it is important to make sure that the project and/or site map matches the location you wish to project.
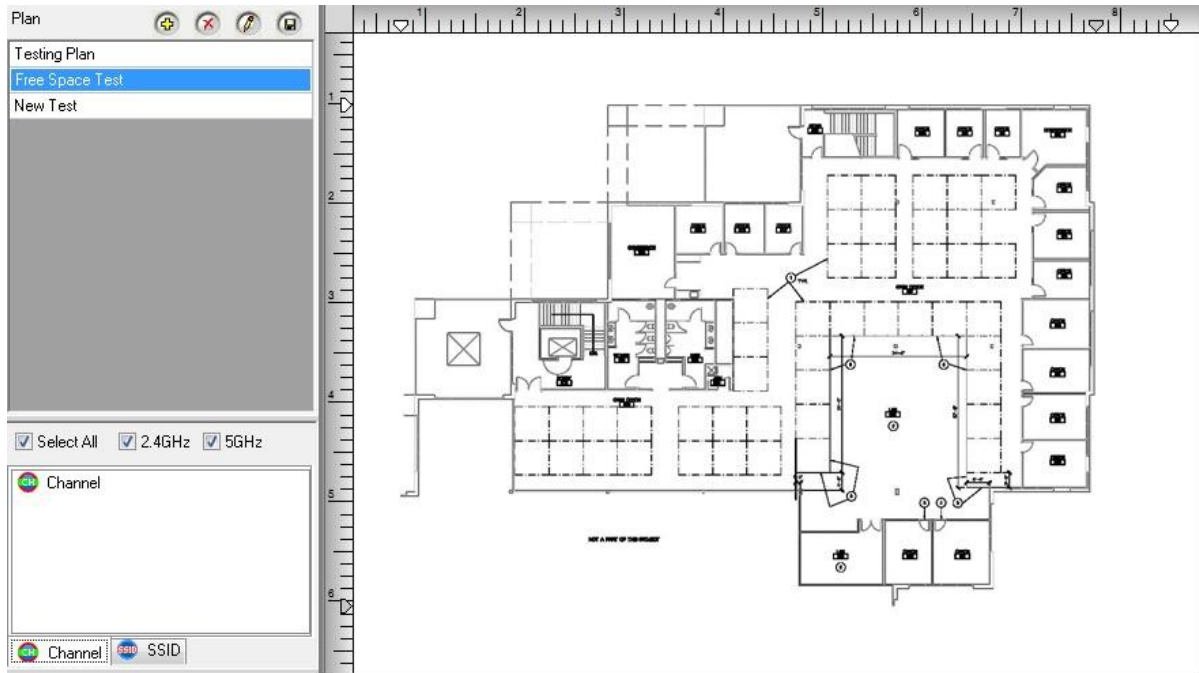
Planner Configuration

The File drop-down in the menu bar contains a **Planner Configuration** selection that enables you to customize several aspects of AirMagnet Planner. The sections below describe each tab in the **Planner Configuration** menu.

- Usability
- Sampling Density

Usability

The Usability tab allows you to modify several settings that alter Planner's behavior when generating and processing a site plan.
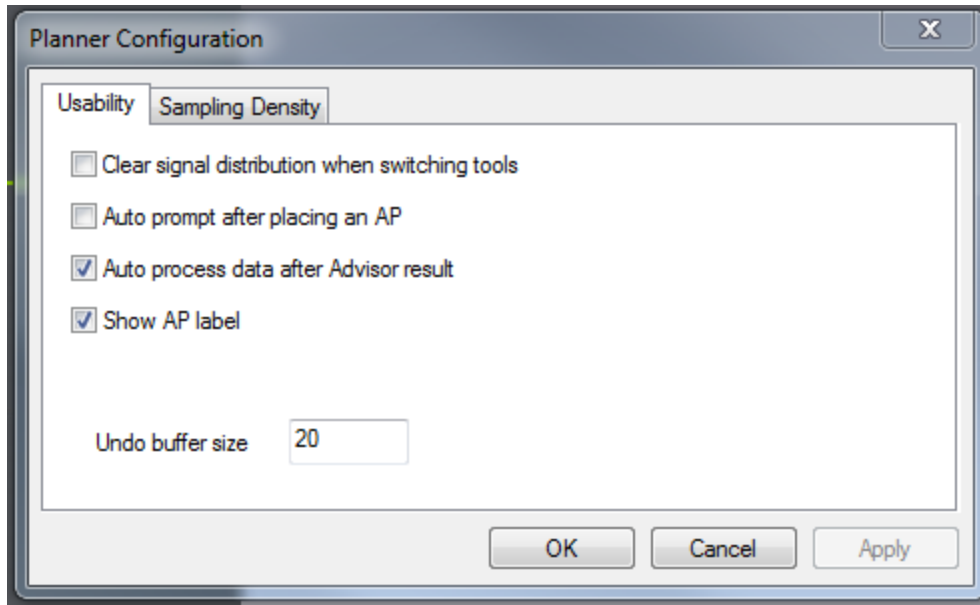
Option	Description
Clear signal distribution when switching tools	Enabling this function causes Planner's heatmap to reset whenever the user selects a new tool from the toolbar.
Auto prompt after placing an AP	Enabling this option causes Planner to open the AP Properties dialog whenever a new AP is placed on the map.
Auto processing data after Advisor result	Enabling this causes Planner to automatically generate a signal coverage heatmap once Planner Advisor has finished processing.
Show AP label	Enabling this displays labels beneath placed APs. These labels contain the AP's name, media type, and channel.
Undo buffer size	This field allows the user to specify the number of operations that will be saved in Planner's undo buffer. By default, users can undo up to 20 operations by repeatedly pressing **Ctrl+z**; to adjust this value, simply enter the desired number. Redo is available using **Ctrl+y**.

Sampling Density

The Sampling Density tab allows you to control the precision Planner when processing signal data. As the slider approaches the "Low Density" end of the bar, processing signal data will take less time but will also be less comprehensive. Conversely, moving the slider towards "High Density" causes more detailed results that take more time to process.

You can also check the "Use recommended sampling distance" option to have Planner automatically calculate a suggested value to use. This value is generated based on the size and complexity of the site plan in use. Larger maps will have a larger recommended value in order to reduce processing time.
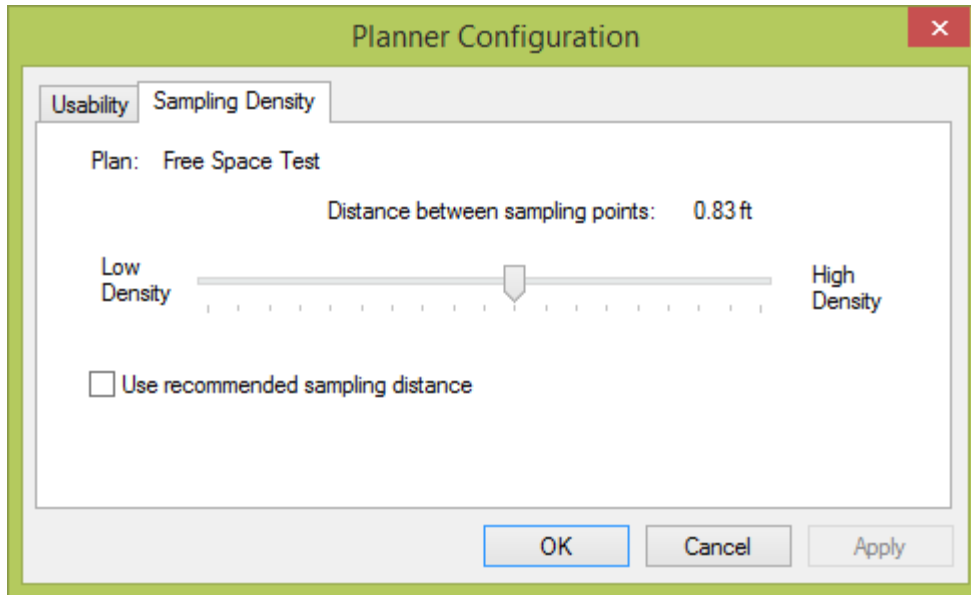
Wall / Area Object Manager

Multi Floor Planner: Wall/Area Configuration

Modify the wall and area types available in an AirMagnet Planner project.

Click **File>Planner Object Manager** (In Multi Floor Planner: **Tools>Configure Walls/Areas**)
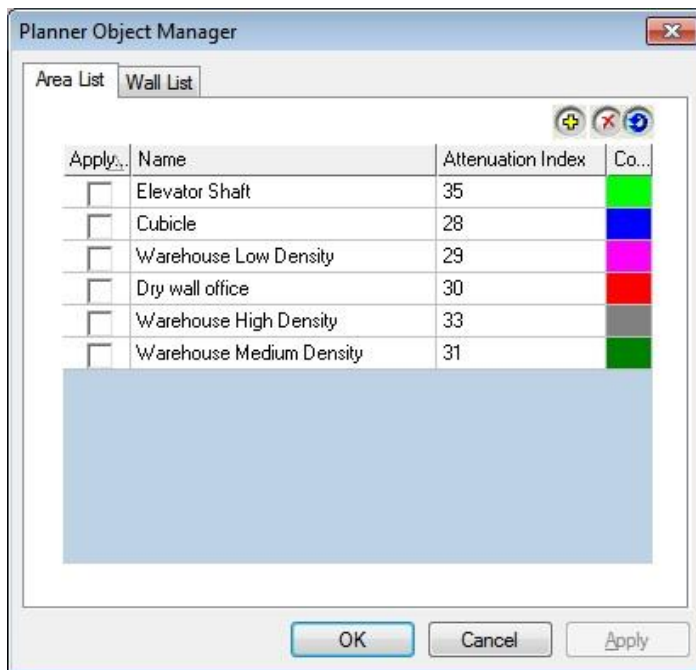
Clicking in any field allows the user to modify the values for each wall. The buttons at the top right allow you to create and remove walls and areas from the list (depending on active tab selection Wall or Area).

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Icon	Tool Name	Description
	Add	Add a new area or wall type to the list.
	Delete	Remove an existing area or wall type.
	Default	Restore Planner's default list. This will reset all values and remove any custom area or wall types created.

For a brief explanation of the dB drop, refer to dB Drop.

For information about the attenuation index, refer to Attenuation Index.

Attenuation Index

An area's attenuation index refers to the rate of signal degradation experienced by RF traffic as it moves across the area. A larger value corresponds to a greater drop in signal strength; thus, an elevator shaft has a significantly higher index than a cubicle. It is important to note that while a higher attenuation index indicates a greater drop, this value is not identical to a dB drop value, nor is it a percentage.

dB Drop Value

While the dB drop value of a wall works similarly to the attenuation index used for areas, the values are quite different. A wall's dB drop refers to the drop in strength a signal experiences when passing through the object. This value is measured in dB; users can enter their own wall types and easily find the dB drop for the wall. To do so, just measure signal strength on each side of the wall (using AirMagnet Survey, for example) and calculate the difference between the two sides. The resulting difference is the wall's dB drop value.

Working with the Antenna Manager

AirMagnet Planner's built-in antenna manager allows you to select the type of antenna your wireless device uses. It also contains an antenna pattern modification tool, so if your antenna doesn't appear in the list, you can hand-draw the signal field that your antenna generates.

- Viewing Included Antenna Properties
- Creating a Custom Antenna Pattern

Viewing Included Antenna Properties

Generally, you will be able to find your antenna in the list of presets included with AirMagnet Planner. In order to view the properties of your antenna, follow the steps below.

To view included antenna properties:

1. Click **File>Antenna Manager....**
2. The Antenna Manager opens.
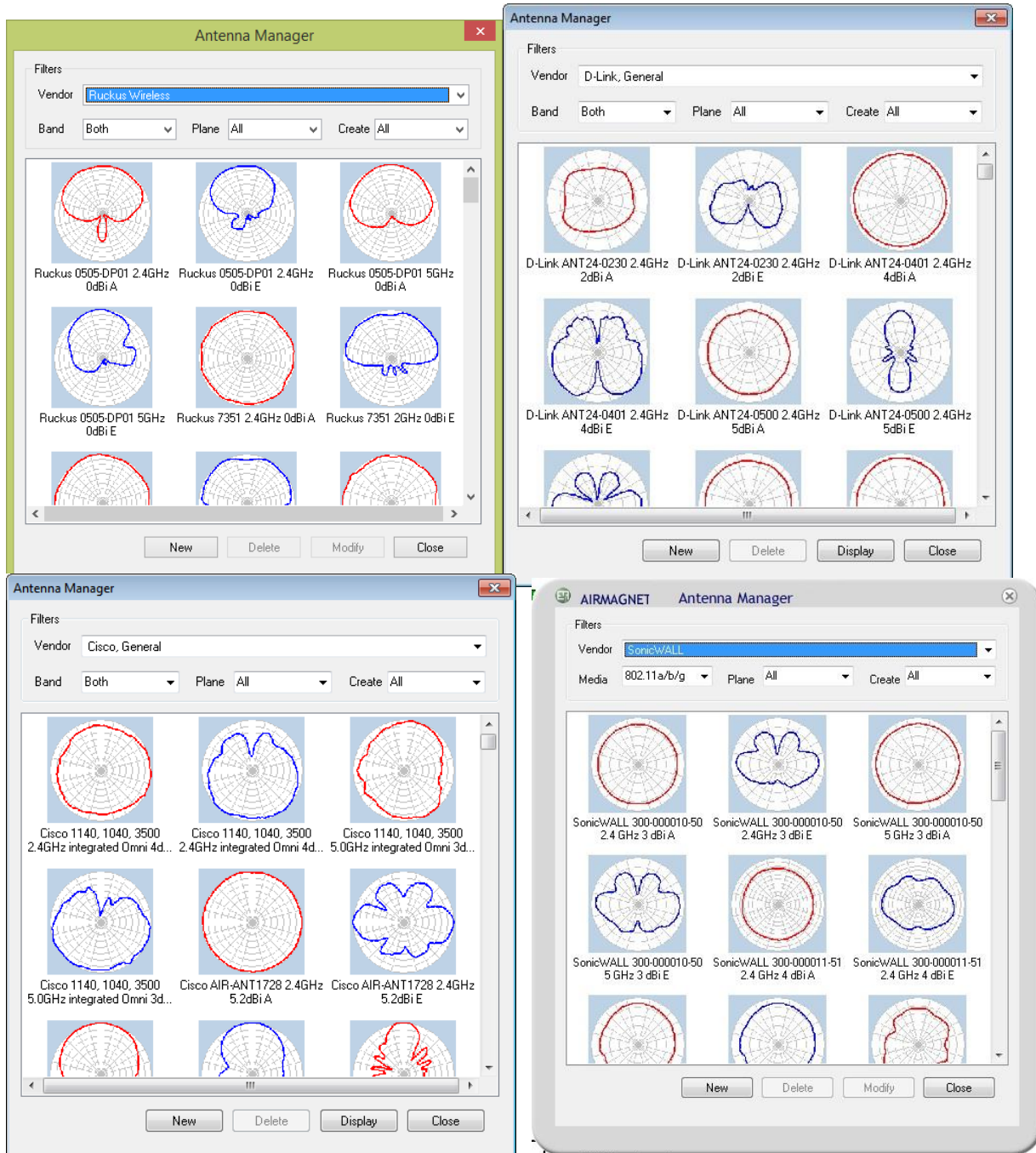
3. As shown above, there are several filter options listed at the top of the window to narrow your antenna search.

Field	Description
Vendor	Clicking this field allows you to check the different antenna vendors you wish to display. If your network only employs antennae from a specific company, you can narrow your search accordingly. N/A.
Band	This list allows you to select which media type you wish to narrow your search by.

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Plane	You may choose to view only antennas using the azimuth (top view) or elevation (side view) planes, or simply leave the setting at "All" to show everything.
Create	This field lets you specify whether the pattern you're looking for is one you customized yourself or one that came pre-defined in AirMagnet Planner.

4. To view a built-in antenna pattern, click the antenna you wish to view and click **Display**. The Antenna Pattern dialog appears.

5. You may only alter the options you use to view this pattern in the "Tracker" box at the bottom right. The box contains three options:

- **Show Tracker:** Enables you to turn off the visible points on the field and displays only the field line. The other two options will not be available unless this box is checked.

- **Show Handle:** displays straight lines connecting the yellow points on the field, as well as the red curved fit line. These yellow points appear only on the lines radiating outward from the center of the circle, and allow you to make large changes to the field.

- **Show Assist:** displays only the blue points, which are connected by the red curved line. These blue points allow you to fine-tune the field in-between the Handle points. You may also enable Show Handle to view the final field view.

Note: You cannot modify the built-in antenna patterns. In order to modify the pattern, you must create your own antenna following the steps below.

Creating a Custom Antenna Pattern

If your antenna is not listed in the presets, you can create a customized antenna pattern. This will enable AirMagnet Planner to accurately project the desired pattern.

Note: When planning to create a new antenna pattern, it might be easier to start by using an existing pattern that is similar to the one you are creating. To do so, select a similar pattern shape from the list of antenna patterns in the Antenna Manager and click **New***. The new antenna pattern will be based on the pattern you selected.*
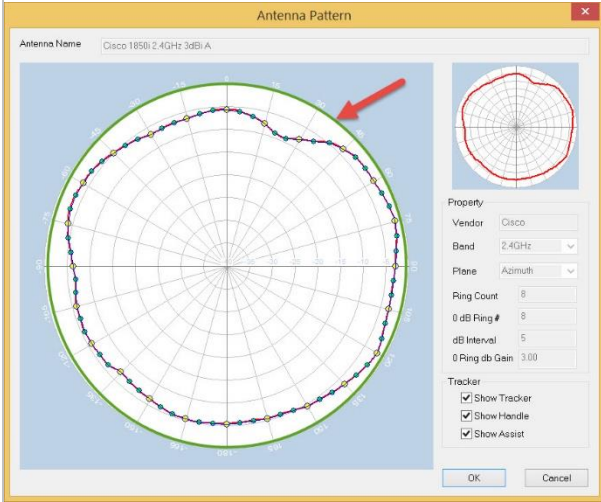
To create a new antenna pattern:

1. Click **File>Antenna Manager….**
2. From the Antenna Manager, click the **New** button (or locate a similar pattern and click **New**). The Antenna Pattern view appears.

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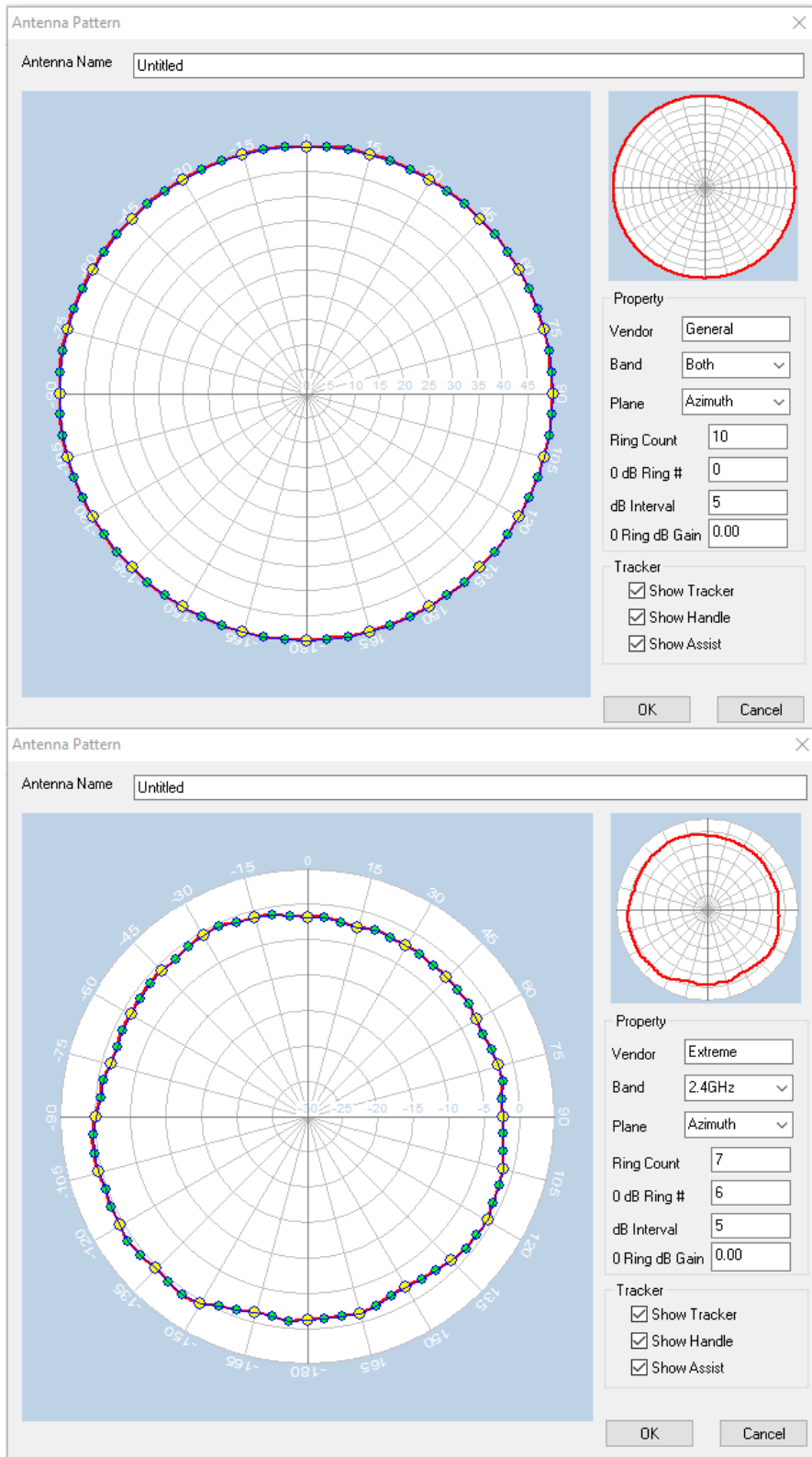
3. For the **Antenna Name**, enter a unique name for the new antenna pattern.

4. Configure the antenna properties as described in the following table:

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Field	Description
Vendor	Enter the name of your antenna's vendor.
Band	Select 2.4 GHz or 5 GHz.
Plane	You may select either the Azimuth plane (horizontal) or the Elevation plane (vertical) depending on the type of pattern you are creating.
Ring Count	This value alters the number of concentric circles displayed in the field diagram. Count the number of rings in the product antenna pattern diagram and enter the number here (include the outer-most ring)
0 dB Ring #	Using the product antenna pattern diagram, count the number of rings from the center to the 0 dB ring and enter the value here.
dB Interval	Using the product antenna diagram, determine the dB interval between each ring and enter the value here. For example, if there is a 5 dB interval between each ring, the value to enter here is 5.
0 Ring dB Gain	Using the product antenna diagram, if the graph reaches the peak gain at any point, enter 0. If the graph does not reach the peak gain, enter the peak gain value provided in the antenna vendor's user documentation/data sheet. This is shown in the following examples where the 0 dB ring is highlighted in bold and shown by an arrow. In the first example it is not exceeded; in the second it is.
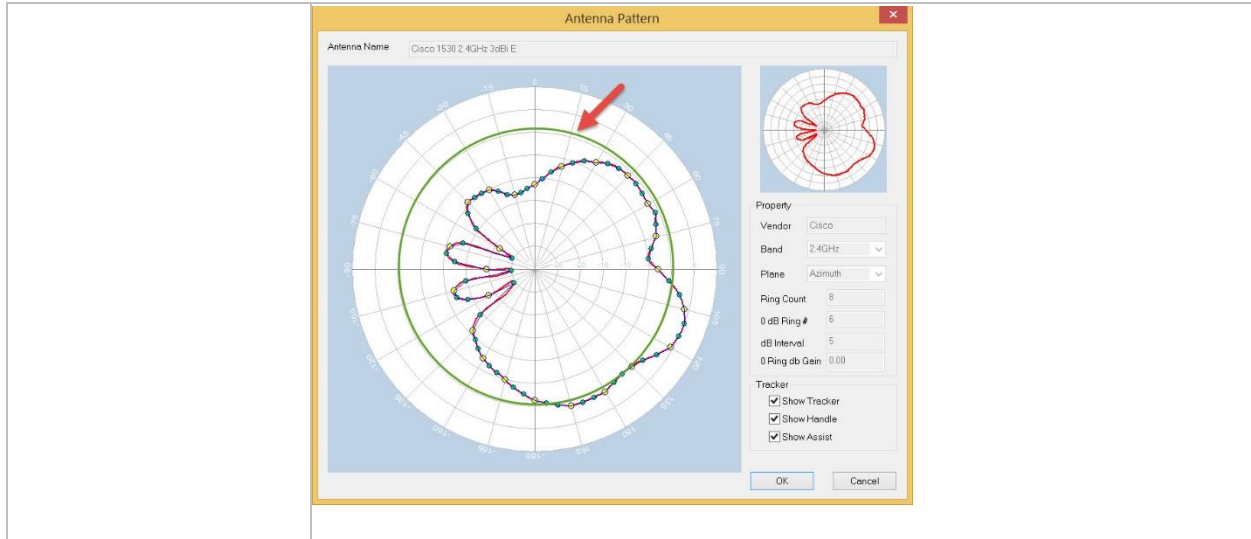
5. Adjust the antenna pattern drawing by dragging the Handle and Assist points as needed. Handle points (yellow points)allow for larger changes while the Assist points (blue points) enable fine-tuning the drawing.

Note: A suggestion for drawing the antenna pattern: Obtain and open an electronic image of the product antenna pattern diagram. Size the image to the same size as the diagram (antenna drawing) in the Antenna Manager. Trace the outline of the product antenna pattern on a transparency. Overlay the transparency on the Antenna Manager. Drag the handles to conform to the trace image.
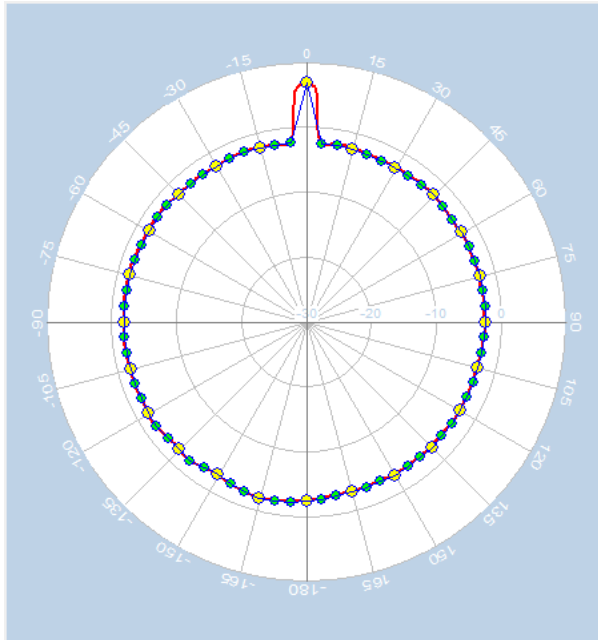
Note: You may find it easiest to uncheck the Show Assist box to make large changes to the field. Re-check Show Assist to fine-tune the drawing.

6. Click **OK** to save the new antenna pattern. The new antenna pattern appears as a selection in the Antenna Manager.

Note: *To use the new antenna pattern, you must first place an AP on the floor plan. Double-click the AP to open its properties. Click* **Pattern** *in the* AP Properties dialog*.*

If you wish to delete the new pattern, select it and click **Delete**. Note that you cannot delete any of the pre-set patterns.

Export to CAD

If you imported a CAD image (.dwg) for your project, this option enables you to export the image along with any APs and walls data that was added to the image.

Note: *To use this feature, you must use a CAD image (DWG file format) for your AirMagnet Planner project.*

Note: *If you chose to show or hide individual layers of the CAD image, these changes are reflected in your exported CAD file. Refer to the* View Menu *or* Right-click Pop-up Menu*.*
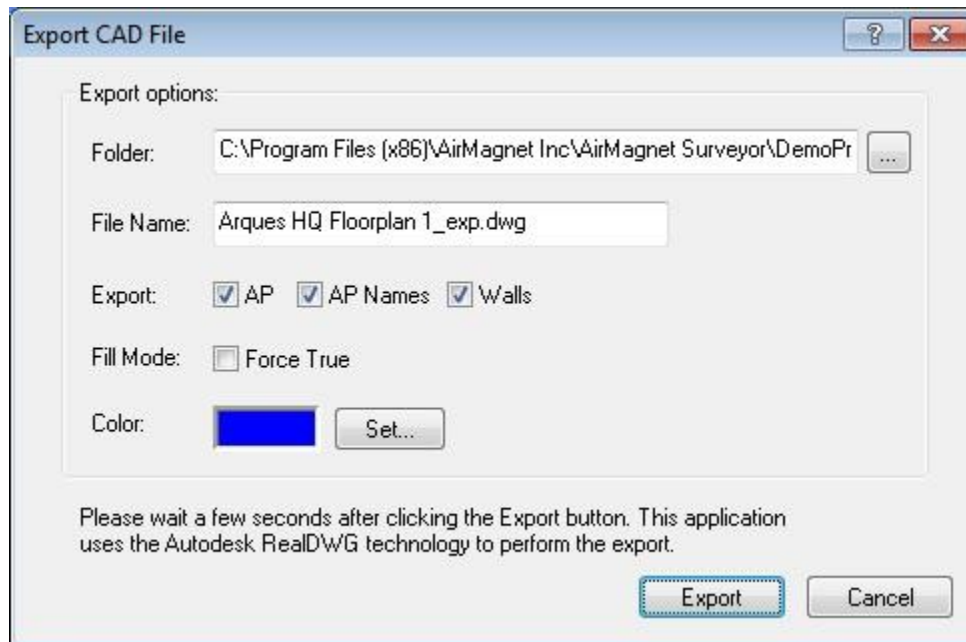
To export to CAD:

1. From the **File** menu, select **Export to CAD**. This opens the **Export to CAD** dialog.
2. Using the **Folder** text box, type the path to save your exported file. You may also use the **Browse** button to the right of the text box to set the path.
3. In the **File Name** text box, use the auto-fill file name or revise the file name. The file extension must be .dwg.
4. Use the **Export** option check boxes to set the AirMagnet Planner data to include in the file. The options are AP, AP Names and Walls.
5. **Fill Mode** specifies whether you want the wall thickness filled or unfilled. Check **Force True** to cause the walls to be filled.
6. The **Color** option enables you to set the color of AirMagnet Planner data. Click **Set** to change the default color.

7. Click **Export** to save the file.

Planner Projects

Product Features

AirMagnet Survey provides the following main features:

- **Import site map** feature enables you to import a pre-existing map image of your building to allow you to properly plan out specifications tailor-made to your site.
- **Drawing tools** make tailoring your site map to match the office environment easy. You may select from a wide range of pre-set materials (cubicle, drywall, brick, etc.) with built-in Attenuation Indices or, for advanced users, you may also custom-build your own materials.
- **Antenna manager** comes packaged with pre-set antenna field patterns. You may also custom-generate your own pattern and adjust AP height and the direction of the field. Not available in Multi Floor Planner.
- **Report generator** will generate custom reports based on your planner findings. It will create a document detailing your project that you can export and print or email to others.
- **Adjustable Sampling density** gives you the ability to customize the degree of precision your projection will employ for better and more accurate results.
- **Two display options** enable you to view and analyze site RF data by channel or by SSID. You can easily identify WLAN deficiencies in terms of AP coverage, roaming boundary, channel allocation/interference, noise impact, etc.
- **Zoom options** allow you to zoom in to a specific portion of your site to determine problem spots and how to fix them.
- **Graphical data display** with color spectrum and gradient makes it easy to understand and differentiate RF data from various sources (that is, APs or SSIDs and channels). This allows you to base your WLAN decisions on "facts" rather than "hypotheses".
- **Planner Advisor** helps you determine the ideal arrangement of APs with a few simple layout modifications. Easy-to-use Advisor tools help generate a site plan that contains as much information as possible to assist Advisor in making an accurate assessment.
- **Planner Export** lets you take an existing Cisco Prime NCS/WCS AirMagnet Planner project and import it into Cisco Prime NCS/WCS. Not available in Multi Floor Planner.

Creating a Planner Project

Prior to starting a site plan, it is required that you create a Planner project, which involves naming the project, importing a site map, specifying some physical properties of the site, and so on. This section contains the procedures on how to create a Planner project.

To create a new Planner project:

1. From the Main Menu, select **File>New Project**.... The New Project Wizard appears.

2. In **Specify Project Name**, enter a unique name for the new project. Save the project using one of the following options:

- To save the project to the default location, simply click **Next**. The New Project Wizard view refreshes.

- To save the project to a location other than the default, click **Browse** to specify a location of your choice, and then click **Next**. The New Project Wizard view refreshes.

Note: *By default, AirMagnet Planner automatically saves the project to the C drive on your computer, using the name you specify.*

3. Click [...] (Import Site Image) to locate and import the site map of the location.

4. For the **Unit of Measurement**, select Feet or Meters. For Floor Plan Dimension, enter the Width and Length of the site map. Click **Next**.

> **Note:** *"Floor Plan Dimensions" refers to the scale (in feet or meters)of the entire image area of the floor plan (including any white space margin included in the image). If you are not sure of the dimensions, you may or may not enter the approximate values here and then recalibrate the values more accurately later. Refer to [Measuring and Calibrating the Floor Plan Scale](#).*

5. For **Environment**, select an option that resembles the site environment you are planning for.

6. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Planner can automatically assign the value according to the site environment you select.

> **Note:** *AirMagnet Planner assigns the Signal Propagation Assessment value based on the estimate of the distance RF signals could travel in each of these typical site environments. Normally, AirMagnet recommends that you accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you enter will affect the way the program interpolates site data.*

7. For **AP Default Power**, do nothing (normally). Click **Next**. The New Project Wizard view refreshes.

8. In **Enter Descriptive Text**, type a brief description of the project. (Optional.)

9. Click **Finish**. The newly created Planner project will automatically appear in the Project Window, and the site map will be displayed in the Map Window.

Creating a Site Plan

Now that you have [imported your site map](#), you must draw up your planned office arrangement so you can analyze your AP setup. In this section, you will use AirMagnet

Planner's drawing tools to design your ideal office and then determine how many APs you will need to realize that goal. Click on the links below to view descriptions of each section.

- Using the Wall Tool
- Drawing Rectangular and Arbitrary Areas
- Adding APs to the Plan
- Using the Right-Click Menu

Using the Wall Tool

Your should first establish your office's walls and doors. The steps below will walk you through the process of outlining your building.

1. Select the **Create Wall** tool from the toolbar.
2. You will see a drop-down list appear in the top-right corner of the Map Window. This list contains a number of pre-set wall types that come with inherent dB drop levels (the affect these walls will have upon your wireless network). Select the wall type that you wish to place.

Note: In a Cisco Prime NCS/WCS Planner project, only Cisco NCS/WCS type walls will appear in the drop-down menu.

3. Click the spot where you would like to start drawing the wall. Move your cursor to a corner or a point where the wall changes its angle, and click again. You can click several times along a wall, following its bends and curves. When you wish to conclude this portion of the wall, right-click, and the wall will be filled in.

*Note: If you click the wrong spot while drawing your wall, press Ctrl+Z on the keyboard. This function will reverse the last click, and will continue to back up as you press it repeatedly. To cancel drawing the wall, press **Esc,** and the wall will be erased. Your tool will then default to the cursor.*

4. Repeat step 3 until all of your walls are filled in. You may select different wall types (windows, doors, and so on.) from the drop-down list mentioned previously.

Note: In general, you will want to draw straight walls at 45 or 90 degree angles to each other. To ensure that your drawing is straight, hold down the Shift key while lining up your wall tool. This locks the path to 45 and 90 degree angles, making drawing straight paths much easier.

Using Automatic Wall Extraction

Automatic Wall Extraction (AWE) is a new Planner feature for importing walls from CAD files. This feature allows you to select what layer(s) contain walls, and automatically draw walls in Planner at those locations. This feature dramatically shortens design time when a CAD file is present. Using this method you can spend time on value-added activities (design) rather than just drawing lines.

When to Use AWE

Prior to starting a site plan, you should create a Planner project, which involves naming the project, importing a site map, specifying some physical properties of the site, and so on. This procedure is the same as for any Planner project, except that you must import a CAD drawing (extension of .dxf, .dwf) when you import your site map.

Overview of Using AWE

1. Create a project using a CAD drawing.

2. Select the layers to use from the CAD drawing.

3. Create/modify your walls.

4. Place APs.

5. Do a Refresh to create a Heatmap.

6. Manipulate Walls and APs as desired.

How to Use AWE

Use this feature as follows:

1. From the Main Menu of Planner or Display, select **File>New Project....** The New Project Wizard appears. For more details, refer to <u>To create a new Planner project</u>.

2. If you are not already in Planner (that is, you created your new project in Display) click the **Planner** tab.

3. Select **View>Show CAD Layers**. A window similar to the following appears. This window allows you to decide which CAD layers you want to display on your map.
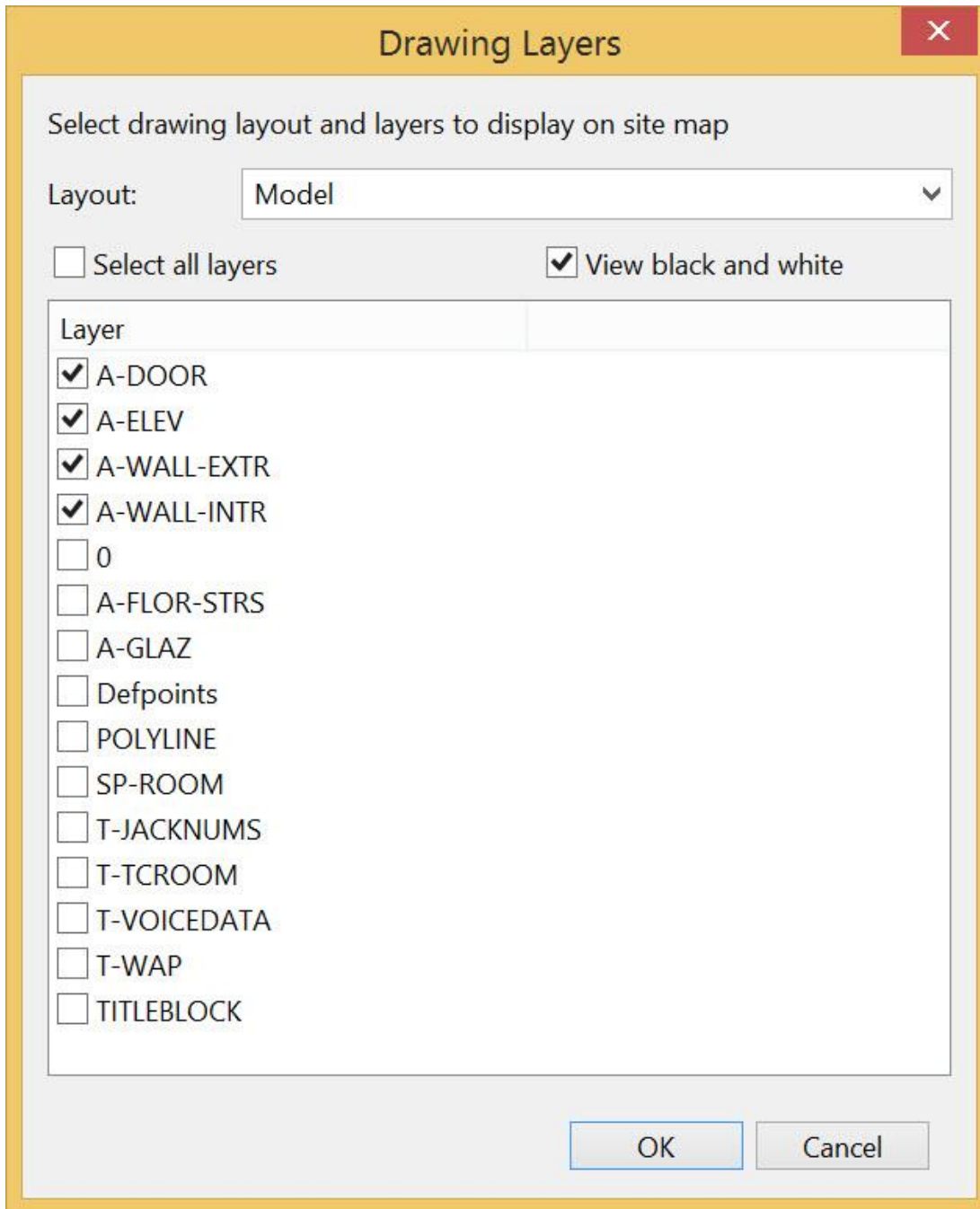
4. Click the **Select all layers** check box and then click it again. This clears all of the check boxes. Now click the layers that you wish to appear on your map.

    Use the drop-down menu/check boxes as follows:

    - **Layout:** Some CAD files may have multiple layouts within them. Use the Layout dropdown box to select from available layouts in the CAD file.

    - **Select all Layers**: Selects/deselects all layers.

- **View black and white**: Some CAD files make use of color on various layers that may interfere with easy visibility of heatmaps. To default all layers to display in black and white, select this option

Note: *There can be many layers on a CAD drawing. Try to limit your choices to those that contain elements that represent your actual walls, or those that will be valuable in working with your floorplan*

5.   When you have finished selecting your layers, click **OK**.

6.   Select **File>Extract Wall Objects from CAD...** A window similar to the following appears, displaying the layers that you have selected for viewing.
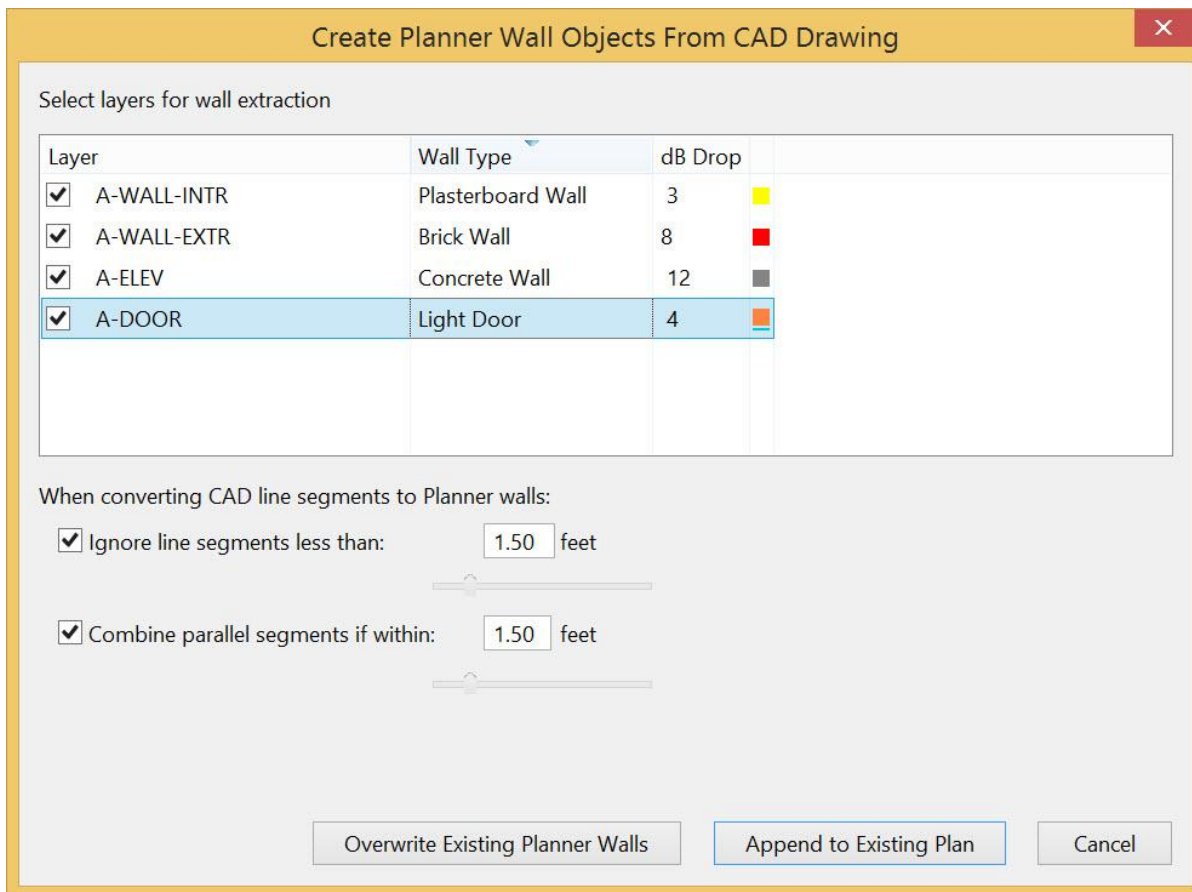
7.   Select your layers by clicking the check boxes in the Layer column.

8.   Click on the Wall Type in any row to open a drop-down menu that will allow you to select a wall type to use for that layer (the default is Brick Wall).

The available selections are Dry Wall, Concrete Wall, Thick Wall, Metal Door, Heavy Door, Brick Wall, Light Door, Cinder Wall, Plasterboard Wall, Thin Window, Glass Wall with Metal Frame, Window Office.

Click **db Drop** in any row to modify the db Drop value.

9.   Select or deselect the following check boxes:

- **Ignore line segments less than:** Many CAD drawings contain short line elements that don't contribute to RF propagation, but constitute a large amount of "visual noise". This option provides you with a way of reducing this visual noise.

- **Combine parallel segments if within**: Many CAD drawings represent walls with two parallel lines close to each other. If this option is disabled, you might end up with twice as many walls, doubling the attenuation.

  By using these, options, you can avoid importing artifacts from CAD files that aren't true wall segments.

10.   Click **Overwrite Existing Planner Walls**. A map appears, based on your selections, similar to the following. These options are for vertical and horizontal lines (not diagonal).
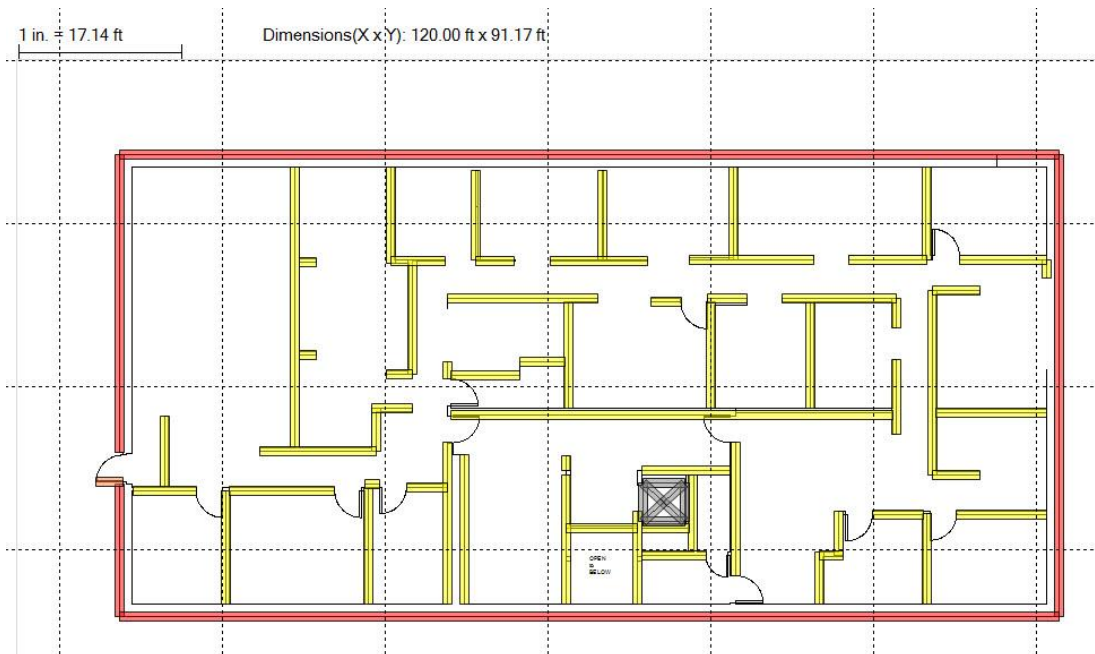
Note: You can return later and add additional layers. If you do this, you would click Append to Existing Plan. Be careful not to append the same layer multiple times.

11.   Select any wall or area type and right-click. A pop-up menu appears allowing you to **Delete** the wall segment or change the **Properties** of each segment. For more information refer to Using the Right-Click Menu.

12.   Refer to the following sections in the *Survey Pro User Guide* for additional information on adding APs to create a heatmap or manipulating individual or group walls:

- Using the Wall Tool (designing your ideal office and determining how many APs you will need to realize that goal)
- Drawing Attenuation Areas (changing the decibel values of walls and other objects)
- Adding APs to the Plan
- 802.11 AP Options

- Using the Right-Click Menu (modifying or removing any placed objects)

13.   You can also manipulate wall selection as follows:

a.   Press and hold the **Ctrl key** while selecting a wall to add it to a list of selected walls.

b.   Press and hold the **Ctrl key** and click the selected wall a second time to remove it from the selected wall list.

c.   Clicking somewhere without a wall selected will deselect all.

d.   Clicking some other type of Planner object (AP, attenuation area, and so on) deselects all walls

e.   Clicking without the **Ctrl key** on a wall that is selected or unselected makes that wall the only selected object in the list.

f.   With a group of walls selected, you can Delete, Move (as a group) and Change Properties. Resizing does not work when more than one wall is selected.

g.   If all the walls in a group do not have the same attenuation or type, the Wall Properties dialog entries for type and attenuation are blank.

h.   The Wall Properties dialog sets all to the selected attenuation value. A warning notice in the Wall Properties dialog is displayed if all walls are not the same type or attenuation. In this case, the type, "dB Drop" fields is empty.

i.   Hold the **Shift key** with the Select icon selected to create a rubber-band effect on a mouse move from the initial selection point to a point where the mouse is released. Any wall segment **COMPLETELY** inside the rubber band area are added to the selected wall list. This technique applies **only** to walls. Any other Planner items (APs, attenuation areas, and so on) within the rubber-band area will not be selected.

j.   If any walls selected before the rubber-band selection, will **NOT** be selected again unless they are within the rubber-band area. If some other object was previously selected, it will be deselected.

14. Click the ![Refresh icon] (**Refresh)** icon on the tool bar to generate a heatmap.

Note: Extracted walls can be moved, modified and deleted just like user-drawn walls.

Drawing Attenuation Areas

After you have completed the wall layout, you can draw out the rectangular internal layout components of your office (cubicles, offices, and so on). The steps below will guide you through the process.

Note: Both Wall and Area should not be used for the same attenuation space. For example, if you create a wall enclosing a small office, do not create an attenuation area inside the office.

To draw rectangular areas:

1. Select the **Create Rectangular Attenuation Area** tool from the toolbar.

2. As with the Wall Tool, you will see a drop-down list appear in the top right corner of the map view. This list contains different rectangular areas with pre-set attenuation indices. Select the area type you wish to place.
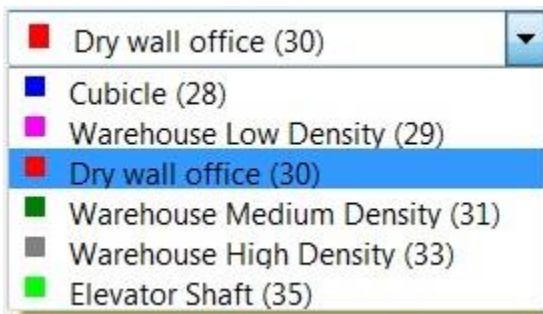
Note: The numbers displayed above represent the built-in attenuation indices for each type of space. While this is similar to the dB value of walls, the attenuation index refers to the effect of an area on wireless coverage, whereas dB drop refers to an immediate decrease over a single spot. For more information about the attenuation index, refer to Attenuation Index.

3. Click the corner of an area you wish to designate. Move the mouse cursor to the opposite corner and click again to draw an area.

4. Repeat step 3 for any further areas you wish to draw.

Drawing Arbitrary Areas

The arbitrary area tool works very much like the wall tool; however, instead of drawing a wall, you are defining a region similar to that defined by the rectangular area tool. If you have a cubicle or office area that is not a perfect rectangle, this tool will allow you to define it with precision.

To draw an arbitrary region:

1. Select the arbitrary region tool, and then pick your material from the drop-down list (same as for the rectangular area tool).

2. Click once at the point you wish to start drawing from. Outline the area you wish to define in the same way you used the wall tool before. Right-click to stop drawing and define the area.

Note: Just as with the wall tool, hold down Shift to ensure that your lines are straight 45 and 90 degree angles from each other.

3. Repeat step 2 for any additional irregular areas.

Adding APs to the Plan

After you have finished designing your office map, you can place APs where you expect to have them. Alternatively, you can just place one arbitrarily and then see what its coverage region is like so you can determine where the next one should go. This allows you to determine what number and placement of APs will give you the optimal coverage for your site.

To place APs:

1. Click **Create AP** on the toolbar.

2. Click the location you wish to place the AP. Place as many APs as are needed in this same manner.

3. To change back to the normal cursor, click the **Select** tool or press the **Esc** key.

4. Right-click one of the APs and select **Properties...**. The **AP Properties** dialog box appears.
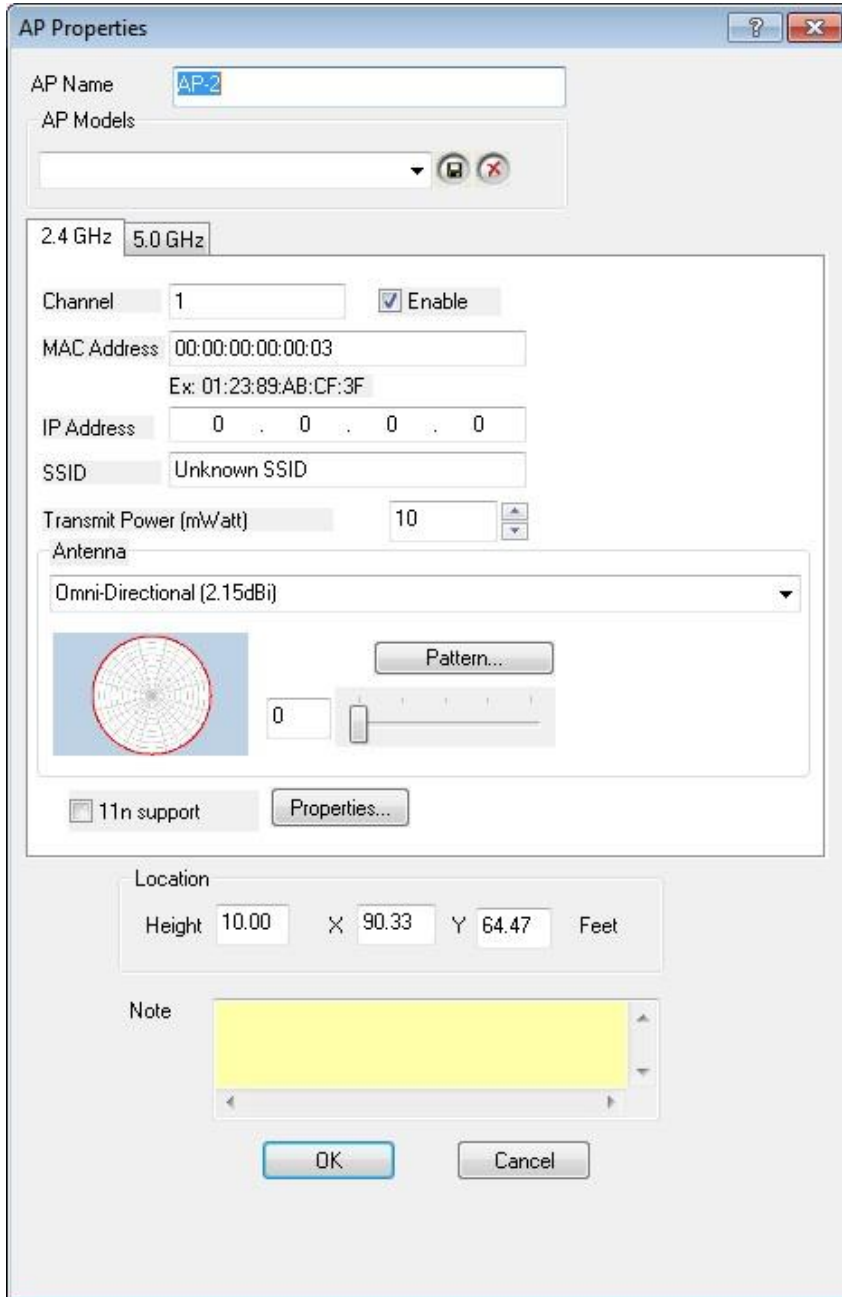
5. Enter an **AP Name** for the new AP.

6. You can save this particular set of configuration properties by giving this configuration an **AP Model** name and by saving the model [icon]. This is handy in order to give several APs the same basic configuration later on. You can also delete an existing model by selecting the model and clicking delete [icon].

7. The next section of the dialog box has two tabs: 2.4 GHz and 5 GHz. The two tabs control the settings for the associated media types.

Note: The following table describes the items and related descriptions also found in the AP Properties dialog in Multi Floor Planner.

Item	Description
Channel	Enter the channel the device operates on.
Enable	Check this box to enable the current tab media type. If your device operates solely on one media type, disable the tab that is not applicable.
MAC Address	This field will have a default value entered. You may modify this as desired to identify virtual APs.
Full Mac Address	Multi Floor Planner only. Auto populates the field in the event APs on different floors have the same MAC address.
IP Address	Enter an IP, if desired, to identify a virtual AP. Not in Multi Floor Planner.
SSID	Enter the SSID, if desired, to identify a virtual AP.
Transmit Power (mW)	Enter the number that will closely match the true transmit power setting of the AP.
Antenna	This section enables you to customize the type of antenna your device uses. If your device appears in the drop-down list, select it, and your device's coverage field will be shown in the diagram on the left. If it doesn't appear, you may customize your antenna pattern (refer to the Antenna Manager for more information). After selecting your antenna, you can use the slider to change its orientation with respect to its surroundings. For Multi Floor Planner Antenna Properties, refer to Viewing Multi-floor Data.
11n support	AirMagnet Planner: Check this option to specify that the AP is 802.11n-capable. Refer to 802.11n AP Options for additional details.
Media Type	Multi Floor Planner only. Based on 2.4 or 5 GHz tab, choose the desired option.
Location	Enter the height (in feet) that the AP will be at. The X and Y fields refer to your device's location on the map. Specify these if your layout is in a grid format.
Note	Enter a description for the AP (optional).

6. Click OK. Your AP will now be placed. Modify any others you placed earlier following this same procedure.

7. Click [icon] (**Refresh**) to see a heatmap view of the predictive Wi-Fi signal strength coverage.

8. You may move the APs by selecting the cursor tool and dragging them where you wish. After making any changes, click **Refresh** to update the view.

> **Note:** *The AP icons placed on the site map vary in color based on their media type. 802.11a/n APs appear blue, 802.11b/g/n appear orange, and APs that utilize both mediums appear half blue and half orange.*

AirMagnet Planner maintains a list of all APs currently in use on the site plan. To access this list, click **View>Show AP List**.

If the existing AP numbering has gaps that resulted from deleting APs during your design efforts, Survey can re-sequence the numbering of all APs placed on the map that fit the default numbering scheme ("AP-#"). Select the "Re-Sequence AP Numbering" option in the View menu to re-sequence your auto-numbered APs.

More heatmap data types are available in the Display view. For more information about Display view data types, refer to About Display view.

802.11 AP Options

With 802.11n support, you can place, simulate, and assess coverage utilizing the latest wireless standard.

1. In Planner view, right-click an AP and select **Properties**.
2. Click the desired band tab (2.4 GHz or 5 GHz).
3. Check **11n support** and click **Properties**.

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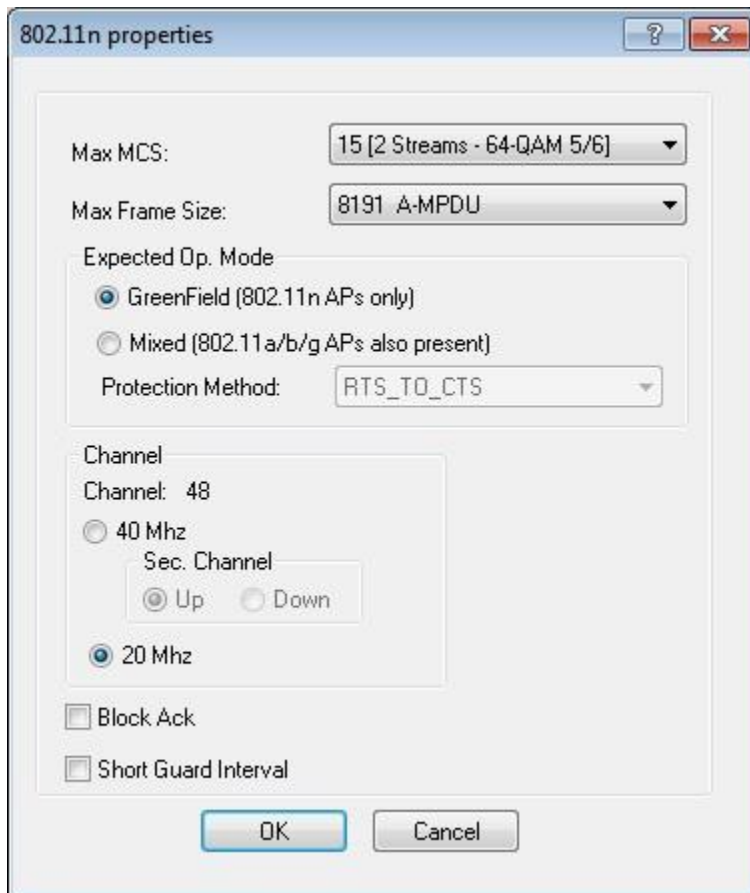
Refer to the table below for the selections that can be made in the 802.11n Properties dialog box.

Option	Description
Max MCS	The MCS (Modulation and Coding Scheme) is an integer value that can range from 0 to 76, although current 802.11n devices only support MCS values up to 31. The MCS selection corresponds to the maximum data transfer rate supported by the AP.
Max Frame Size	802.11n devices support frame sizes up to 64 KB, as opposed to the 4 KB maximum size supported by legacy devices. This process minimizes wireless overhead in the network by reducing the number of frames required per transmission.
Expected Op. Mode	802.11n devices have the capability of operating in what is known as Greenfield mode, which means that the deployment consists purely of 802.11n-capable devices. This is a setting that is configured on the individual AP; an 802.11n AP that is set to Greenfield mode will be unable to service legacy (802.11a/b/g) clients. **Note:** *After placing 802.11n APs on a Planner project, your selections for each AP's Expected Operating Mode are checked when the data is processed (that is, when you check). If the system detects that you have placed a legacy device within range of an AP that is set to Greenfield mode, the AP List dialog box will appear in order to notify you that the Expected Operating Mode and actual operating mode do not match. In order to ensure optimal operation of 802.11n devices, you should not mix pure Greenfield devices with legacy APs.*
Protection Method	If the Mixed Mode option is selected, you can specify the type of protection mechanism in use on the AP.
Channel	802.11n devices are capable of operating on 40 MHz channel widths, as opposed to the 20 MHz channels utilized by most standard legacy devices. In order to accommodate the 40 MHz width, you can set the AP to transmit over two 20 MHz channels. In this case, you can select the desired channel and then specify whether the secondary channel used is above or below the channel selected.
Block ACK	The 802.11n specification provides a new frame type called a Block ACK frame, which allows an AP to acknowledge blocks of multiple frames with a single ACK frame. In contrast, legacy devices are required to send an ACK frame for every frame received, resulting in significantly increased network overhead. With Block ACK capability, 802.11n devices reduce this traffic load and can consequently improve overall network performance.
Short Guard Interval	The Guard Interval refers to the period of time that passes between data transmissions; a shorter interval generally helps to prevent potential wireless hazards such as propagation delays, echoes, or reflections. The 802.11n specification currently provides two guard interval options: 400 ns and 800 ns. This setting can be specified using the AP's management interface. By default, most 802.11n devices are set to 800 ns.

AP List

You can quickly view a list of all APs currently placed on the site plan by clicking **View>Show AP List**. This option opens the **AP List** window.

Note: In Multi Floor Planner, the AP List table looks somewhat different although column descriptions are similar. Any differences between the two tables are noted in table descriptions.
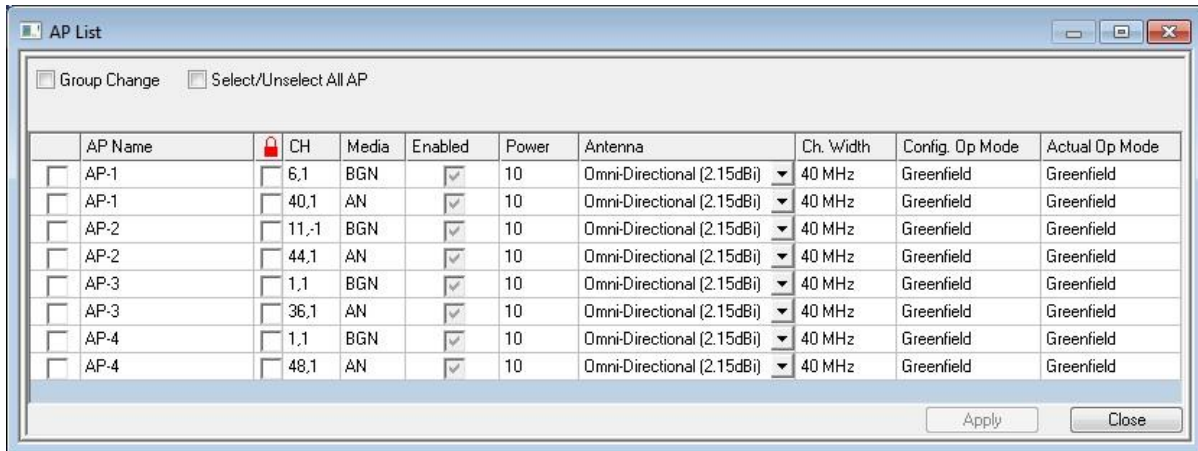
Note: The AP List shows two entries for each AP: one for 802.11a and one for b/g. This allows you to easily modify which media type is enabled on any given AP. The window contains several columns that provide details about the AP's properties.

Column	Description
Group Change	Useful for batch changing Power and Antenna settings. Select the APs to batch change. Check Group Change. Make a change to an item in the table. All selected APs of the same type are changed.
Select/Unselect All AP	Use this option to select all or unselect all APs.
🔒	A check in this field indicates that the AP is locked, and therefore it cannot be modified by Planner Advisor.
AP Name	The name of the AP.
Channel	The Channel that the AP is set to.
Media	The media type of the AP.
Enabled	A check in this field indicates that the AP is enabled on the plan.
Power	The power setting for the AP (in MiliWatts).
Antenna	The antenna currently used by the AP.
Ch. Width	The channel width in use by the AP.
Config Op. Mode	The Operating Mode specified in the AP's properties: **Greenfield:** for 802.11n devices only; **Mixed:** for deployments utilizing 802.11n and legacy devices together; **Legacy**, for a pure legacy (e.g., no 802.11n devices) implementation. Multi Floor Planner also includes **Mixed VHT** that includes 802.11ac.
Actual Op. Mode	When the deployment is configured optimally, the Actual Op. Mode field will mirror the values in the Config Op. Mode column. As shown in the figure above, when a device's configured value conflicts with the actual setting (for example, when an AP is set to pure Greenfield mode when legacy devices are present in the environment), the Actual Op.

	Mode will be highlighted in red text, indicating a conflict. Not in Multi Floor Planner.

To modify an AP's properties, just double-click it in the AP List to bring up the AP Properties window.

Note: The AP List will automatically pop up when 🔃 *(Refresh) is clicked if you have 802.11n APs set to Greenfield mode in a deployment in which legacy APs are still present. This is to notify you of potential conflicts due to the Greenfield restriction; Greenfield deployments cannot have legacy devices present, since the older devices can cause reduced data rates for the wireless network.*

Using the Right-Click Menu

You may modify or remove a placed object at any time by just right-clicking on it and selecting the option you desire.

Note: The Locked AP and Default AP options only appear if the user has right-clicked on an AP.

Option	Description
Properties…	Opens either the AP Properties or Wall/Area Properties dialog box, depending on the object selected.
Delete	Deletes the selected object.
Locked AP	Locks the selected AP. This ensures that Planner Advisor cannot modify any of the AP's properties.
Default AP	Specifies the properties of the selected AP as Planner's default AP settings. Any APs placed after selecting this reflect the current AP's settings.
Select 2.4 GHz AP or Select 5 GHz AP	Depending on whether one or two channels are enabled for the AP, this option enables you to select one. It operates the same as selecting a single channel in the **Data** window.

Using Planner Advisor

AirMagnet Planner implements an advisor feature to help you optimize the layout of APs on site plans. After drawing walls and areas on the site plan, you can specify two types of areas to narrow advisor's focus: coverage areas and AP exclusion areas. These areas can be drawn using their tools in the Toolbar.

Each tool has both a coverage (represented by a blue '+') and AP exclusion (represented by a red '–') area type. Coverage areas represent portions of the site plan that absolutely must have signal coverage and can contain APs; AP exclusion areas are those in which APs **cannot** be placed.

Icon	Name	Description
	Create Rectangular Coverage/AP Exclusion Area	Draws a rectangular coverage or AP exclusion area on the map.
	Create Arbitrary Coverage/AP Exclusion Area	Draws an arbitrary coverage or AP exclusion area on the map. This tool works well for irregularly-shaped regions (that is. areas other than cubicles, offices, and so on.).
	Create Elliptical Coverage/AP Exclusion Area	Draws an elliptical coverage or AP exclusion area on the map. This tool is useful for areas that cannot be drawn easily using straight lines.

In order to use Planner's Advisor, you must lay out the site plan as normal (draw out walls, cubicles, and so on.). After the general areas are drawn, coverage and AP exclusion areas can be added in order to define the required signal coverage area. Once all this is completed, you can generate Advisor's recommended AP layout.

- Drawing Coverage/AP Exclusion Areas
- Generating Advisor's Layout

AP Coverage and Exclusion Areas

This section describes how to set a site plan up in order to help Planner Advisor reach the most accurate results possible. It is important that you lay out their coverage and AP exclusion areas properly so that Advisor can generate the optimal layout.

> **Note:** Advisor's results depend heavily on user input; therefore, the more detailed the plan layout, the more accurate the results. The only way to perfectly determine the optimal layout for a site is to test a setup and run a site survey using the AirMagnet Survey software.

To draw coverage and AP exclusion areas:

1. Select the coverage tool that will best fit the region to be drawn (rectangle, arbitrary, or ellipse). Use the tool to define the intended region in the same manner as areas are defined.
2. Repeat the process until all necessary areas are defined.
3. Repeat steps 1-2 for any AP exclusion areas as well.
4. The plan is now ready for Planner Advisor analysis.

Generating an Advisor Layout

Now that the site plan has been properly defined, Planner Advisor can generate its optimal AP layout.

To generate an Advisor Layout:

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1. Click the (**Advisor**) button in the toolbar. The **Advisor Criteria** dialog appears.

2. Make any desired changes to the dialog information.

Field	Description
Minimum Signal Strength Coverage	This field defines the minimum strength required at any point in a coverage area. The signal strength cannot drop below this value in areas that require coverage.
Transmit Power	This field defines the transmit power for the APs placed by Advisor.
Band	This field defines the band to be used by Advisor's placed APs.
Omni Antenna Gain	This field defines each AP's antenna gain. Note that Advisor's APs will utilize omnidirectional antennas.
AP Height	The AP's height directly affects its signal coverage; APs placed at higher elevations will not cover as wide an area as those at standard ceiling height.
Max MCS	802.11n Only: The Modulation Coding Scheme (MCS) is an integer value that can range from 0 to 76, although Planner only supports values up to 15. The MCS selection corresponds to the maximum data transfer rate supported by the AP.
Frame Size	802.11n Only: 802.11n devices support frame sizes up to 64 KB, as opposed to the 4 KB maximum size supported by legacy devices. This process minimizes wireless overhead in the network by reducing the number of frames required per transmission.
Channels...	This button opens the **Channel Allocation** dialog box, which enables you to specify precisely which channels the Planner Advisor function

	can use. For more information, see more information below. Note that a minimum of three channels must be selected for each band in use.
Enable 802.11n Support	Check this option to allow Advisor to place 802.11n devices. Note that 802.11n support must be enabled in order to modify the Max MCS and Frame Size fields described above.
Legacy to 802.11n: One-for-one Replacement	Enabling this option ensures that Planner Advisor will replace the APs already present in a legacy site plan with 802.11n-enabled APs.

Planner Advisor Channel Allocation

The Channel Allocation dialog box allows users to easily specify the channels available to Planner Advisor. Using this function, Planner can be customized to eliminate specific channels for regions with restricted allocations to the 2.4 and 5 GHz bands.

> **Note:** To enable both 2.4 and 5 GHz bands, the **2.4/5 GHz** option must have been selected in the **Band** drop-down in the **Advisor Criteria** dialog.
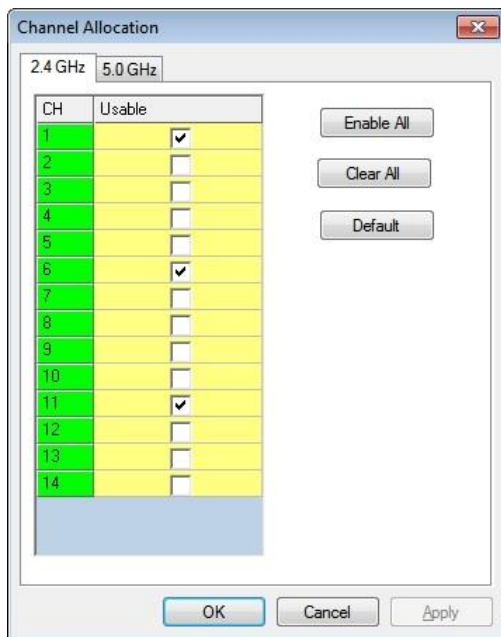
The tabs at the top of the dialog box allow you to easily switch between the two major wireless bands. To specify the channels to be used, just check the "Usable" box for each desired channel. Use the Enable All and Clear All buttons to quickly check and uncheck all channels. The Default button will automatically restore Planner's default settings; as shown in the image above, channels 1, 6, and 11 are checked by default for the 2.4 GHz band. For the 5 GHz band, channels 36, 44, and 52 are automatically selected.

3. Click **OK** to close the **Channel Allocation** dialog.

4. Click **OK** to start the Advisor. Advisor will begin processing the site data and testing AP locations.

5. After the process completes, APs are placed on the plan. Click [icon] (**Refresh**) to view the site's projected heatmap.

Zoom: 178%
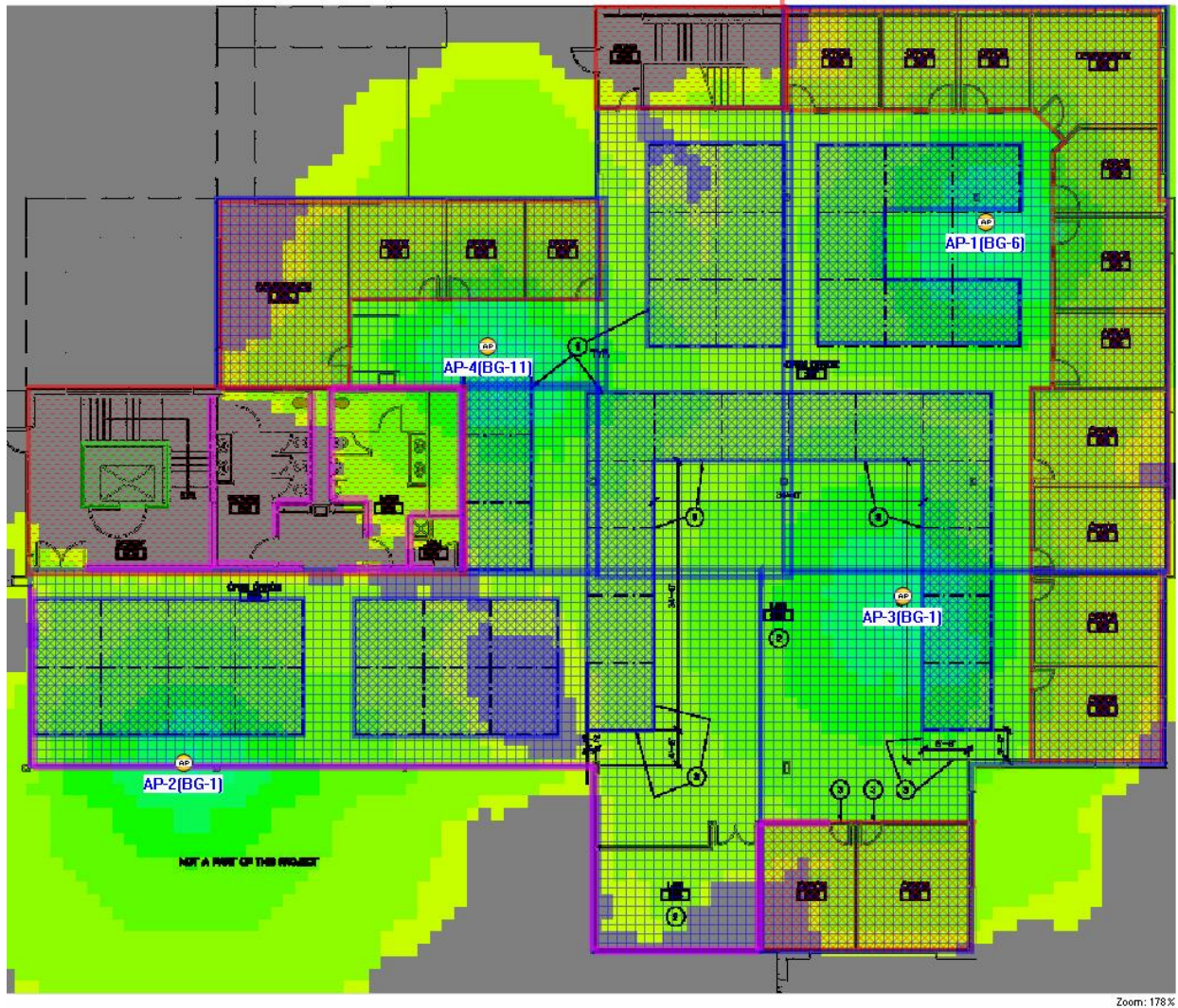
Viewing Planner Reports

AirMagnet Planner's built-in reporting feature will automatically generate report data pertaining to your current site plan. This report will include screens displaying your planned signal coverage, AP locations, and a list of placed APs. The AP list also contains detailed information about each individual placed AP, including Name/MAC address, antenna type, and channel allocation.

To generate Planner reports:

1. After setting up your site plan, click **Reports**.
2. From the **Reports** view, select **Planner Report** in the top left.
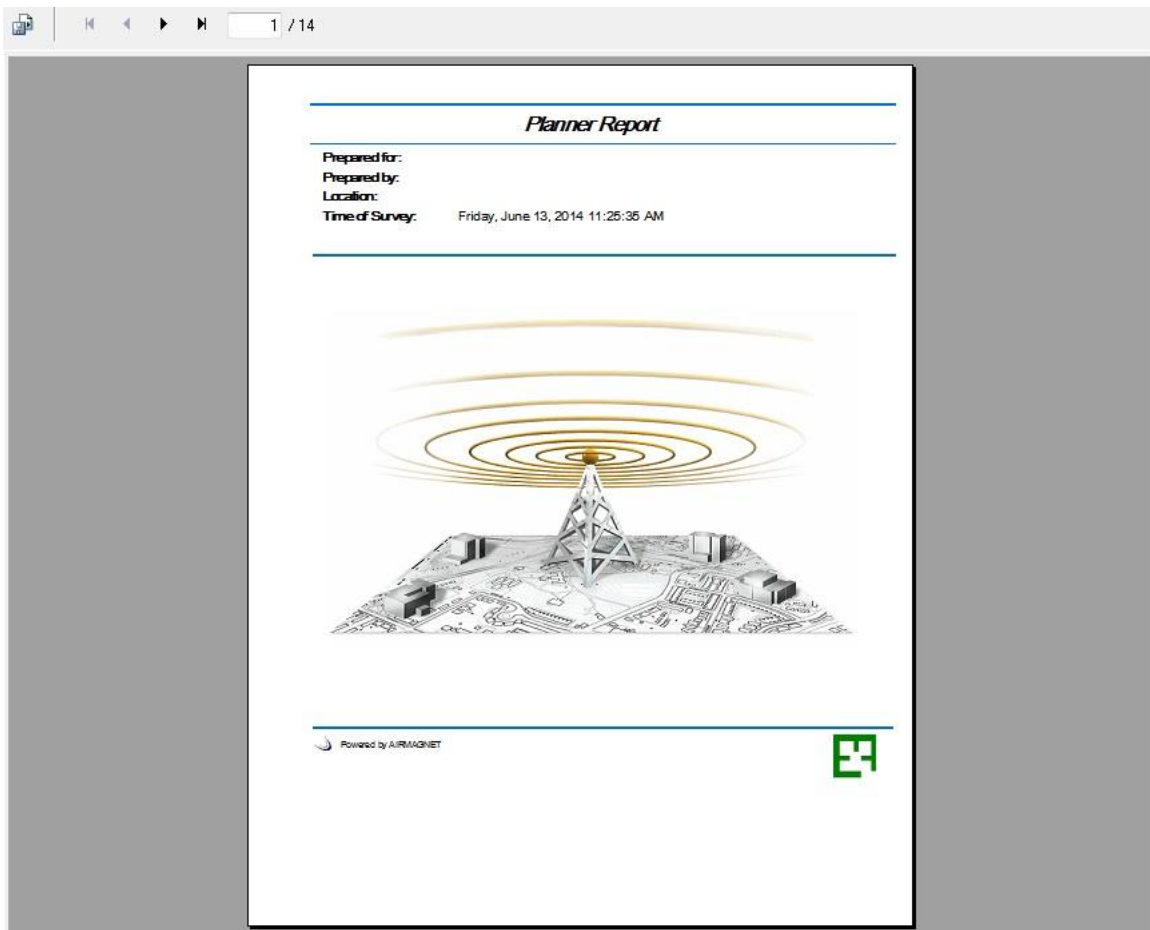
3. Navigate through the report pages by using the arrow buttons at the top.

For more information, refer to Reports

Multi Floor Planner

Introduction

Multi Floor Planner enables you to view how signal propagation occurs between floors in a multi-floor building. With Multi Floor Planner, you can create a new Building Project that consists of multiple floors.

You can create a floor plan project for each floor within a Multi Floor Planner Building Project and you can also import individual AirMagnet Planner site plans for one or more floors as well.

By creating a building project in this way, you can see predictive heatmap visualizations of how APs on one floor may, for example, propagate signal strength coverage to other floors or may produce channel interference.

Multi Floor Planner includes support for 802.11a/b/g/n/ac/ax APs for predictive visualizations of signal strength, data rates, operating mode, MCS transmit rate and channel width.

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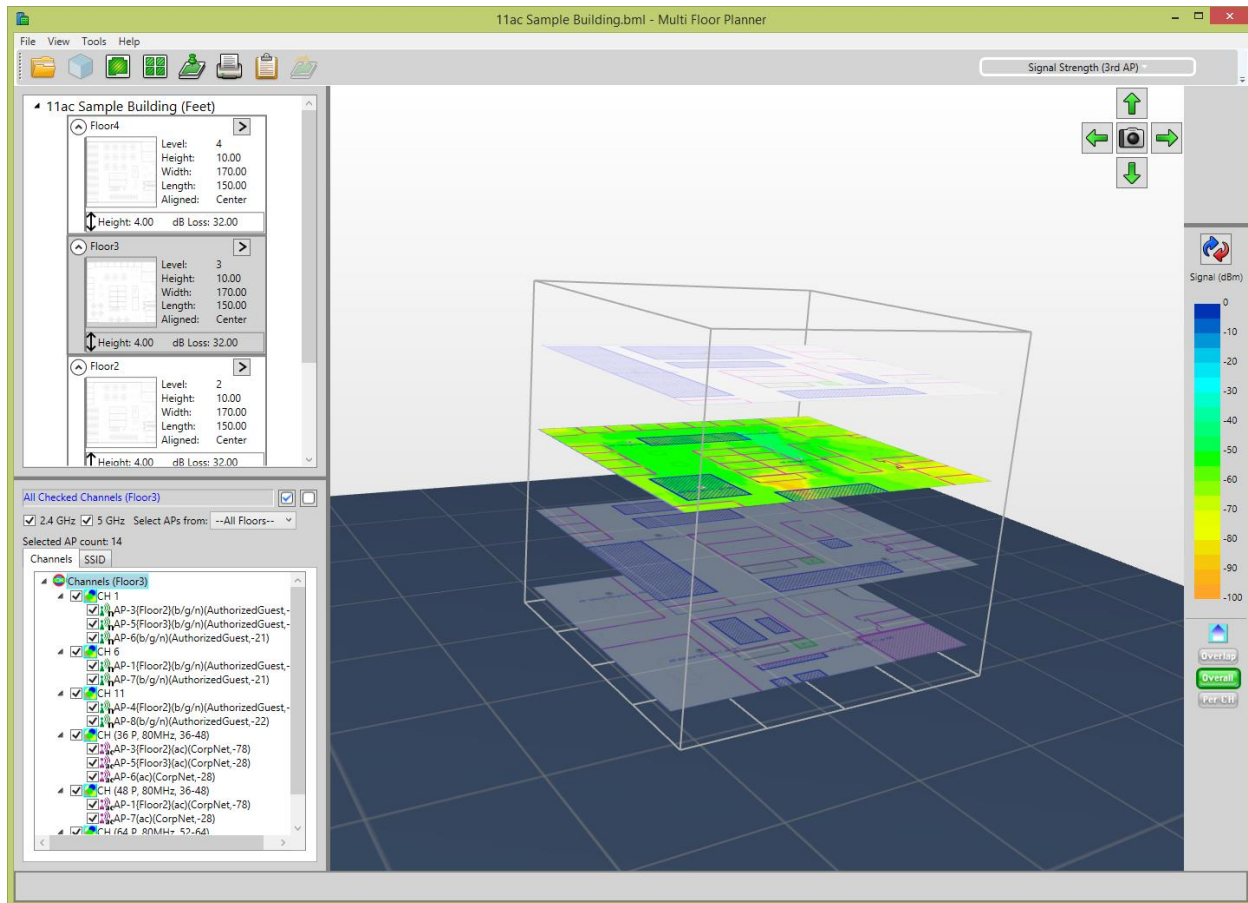
Before You Begin

With Multi Floor Planner, you can load and modify existing AirMagnet Planner site plans and you can also create and modify new AirMagnet Planner site plans for the individual floors that make up a multi-floor building project.

When existing AirMagnet Planner site plans are imported into a Multi Floor Planner building project, they are added by reference (absolute directory path), therefore, it may be best to have all the source project folders containing site plans in a common directory. Any changes made and saved within Multi Floor Planner will update the source files. To avoid modifying existing planner projects, make a copy of original project folder to use for Multi Floor Planner.

Note: Multi Floor Planner projects that include 802.11ac/ax are not backwards compatible with previous software versions of Multi Floor Planner that do not include 802.11ac/ax.

Also, AirMagnet Planner project site plans are named 1.spi, 2.spi, and so on. You may want to determine the site plan name before beginning your multi-floor building project. To do this, open the .spi file in Notepad. The site plan name is the Name value (for example, Name=myproject). The site plan is located in the folder created for the Planner project.

Note: AirMagnet recommends that site plans with similar dimensions in a single building use a similar Sampling Density value. If you have modified your site plans to use a Sampling Density value other than the default, AirMagnet recommends you re-configure
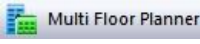
the values so they are similar. Refer to [Sampling Density](#) and [Modifying a Floor Plan Project](#).
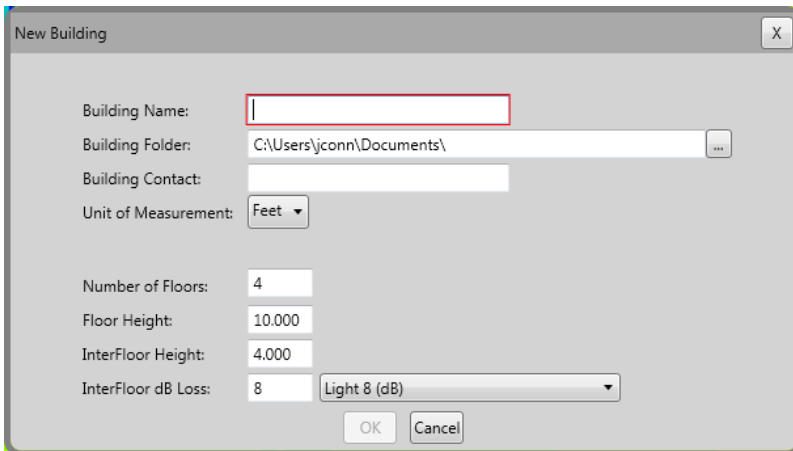
Multi Floor Planner Building Project

This topic describes how to create and edit a Multi Floor Planner Building Project.

To create, export, import or edit a building project:

Click [Multi Floor Planner] **Multi Floor Planner** on the navigation Bar or from the **File** menu. The Multi Floor Planner window opens.

- **Create a new building project:** Select **New** from the File menu to create a multi-floor building. Configure the **New Building** options and click **OK**.

- **Export a building project:** Select **Export** from the File menu. Browse to the desired directory location. A .zip file containing the building project files will be created.

- **Import a building project:** Select **Import** from the File menu. Browse to the building project zip file. **Note:** The building project must have been previously exported (File>Export) to create the zip file.

- **Edit building properties:** Click **View**> **View Building Properties**.

Item	Description
Building Name	Provide a name for the building project.
Building Folder	Set the directory location for the building project. Default is C:\program files\AirMagnet Inc\AirMagnet Surveyor\Building1
Building Contact	Contact information if desired. Any descriptive text may be added here.
Unit of Measurement	Option to use Feet or Meters for the project unit of measure. The unit type must match the type used for any imported site plans.
Number of floors	The total number of floors in the building project. Individual floors may be added or deleted later.

Floor Height	A default floor to ceiling height. The height may be customized later on a floor-by-floor basis
Interfloor height	Based on the unit of measure, the distance between the floor and the ceiling of next lower floor.
Interfloor dB Loss	The amount of dBm attenuation resulting from interfloor obstruction to the RF signal. You may set this value or choose a preset from the drop-down menu. The resulting dBm loss value is the product of this value multiplied by the Interfloor height.

To add and manage floors in a building project:

Each floor (level) in the building includes a menu of options. To access the menu, click the chevron in the top right corner of the level.
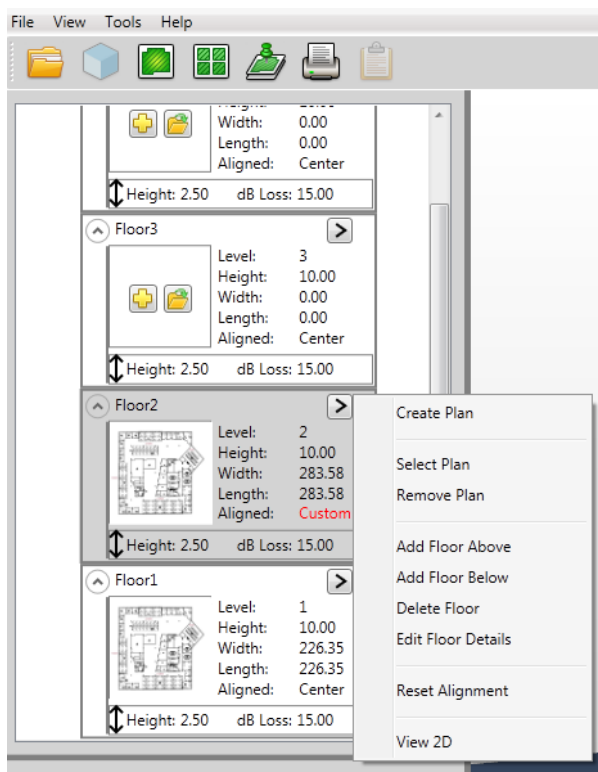
Item	Description
Create Plan	Creates a new floor plan project for this floor.
Select Plan	Imports an AirMagnet Planner site plan to this floor.
Remove Plan	Removes the floor site plan from this floor.
Add Floor Above	Inserst a new floor above this floor.
Add Floor Below	Inserts a new floor below this floor.
Delete Floor	Deletes this floor from the building. Doing this will consecutively re-number the floors.
Edit Floor Details	Opens a dialog containing floor details.
Reset Alignment	Resets the alignment of this floor to the default alignment.

View 2D	Switches to 2D view.

To configure each level in the building project:

In the Building Tree, each level is listed beginning with Level 1 at the bottom.

Adding an existing planner site plan to a level in the building project: On the desired level in the building tree, click the chevron drop-down menu and select **Select Plan** and navigate to the desired AirMagnet Planner site plan. A valid site plan has a .spi file extension.

Creating a new project for a level in the building: On the desired level in the building tree, click the chevron drop-down menu and select **Create Plan**.

Configure the new project options and click **OK**.

Item	Description
Project Name	Give a name to this new floor plan project
Project Folder	The default path where the project will be created is within the parent building project.
Floor Plan	You must add a floor plan image. Browse to a floor plan image. The image must be in one of the supported file formats. Refer to Supported Image File Formats. *Note: The Visio format is not supported in Multi Floor Planner.*
Dimensions	This refers to the scale (in feet or meters) of the entire image area of the floor plan (including any white space margin included in the image). If you are not sure of the dimensions, you may or may not enter the approximate values here and then recalibrate the values more accurately later in 2D view. Refer to Measuring and Calibrating the Floor Plan Scale.
Propagation	Like a regular AirMagnet Planner project, the Propagation value default is based on the estimate of the distance RF signals could travel in a typical site environments. Normally, AirMagnet recommends that you

	accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you enter will affect the way the program interpolates site data.
Environment	Select an option that resembles the real world site environment
Description	Project description text can be added here.

Each level in the building tree includes a summary of the information for that level as described in the following table:

Item	**Description**
Floor Name	Specify a name for this floor.
Floor Height	The distance from floor to the ceiling. This may be changed by editing the Floor Details.
Interfloor height	Based on the unit of measure, the distance between the floor and the ceiling of next lower floor.
Interfloor dB Loss	The amount of dBm attenuation resulting from interfloor obstruction to the RF signal. You may set this value or choose a preset from the drop-down menu.
Floor Contact	Contact information if desired. Any descriptive text may be added here.
Plan	The plan file for this floor along with its directory location.
Floor plan	The name of the floor plan image used for this floor along with its directory location. The browse option enables you to change the image if desired.
Dimensions	The width and length of the floor plan. This is based on the calibration scale. See "Project Configuration" table.
Propagation	Refer to "Project Configuration" table.
Environment	Select an option that resembles the real world site environment

Floor Alignment

By default, all levels in the building project are aligned vertically to their center point. Each level may be re-aligned based on common walls, elevators, stairwells, and so on. in order to create a more accurate representation of the building.

1. Click Align Floors or select **Align Floors** from the Tools menu.

2. From the **Select Floor to align** drop-down above the top image, select the desired floor plan.

3. From the **Select Ref Floor** drop-down above the bottom image, select the floor plan to which the plan above will be aligned.

4. On the floor plan at the top, click the first point of alignment. A push pin icon will appear. Click the second point of alignment. A second push pin will appear. Between the push pins indicates the alignment edge.

5. On the bottom floor plan, click the first point of alignment. An alignment line appears between two push pins that indicates the alignment edge to which the top plan will be aligned. The push pin highlighted in pink may be adjusted around the radius of

the other push pin. If desired, click-and-drag the highlighted push pin to move its position.

6. Click **Align**. You may see the multi-floor view on the right readjust to account for any change in alignment.

   You may continue to align floors as desired with the following two exceptions: 1) Once a floor is used a reference floor, if it in turn is then aligned to a reference floor, any floors previously aligned to it will remain their current position. 2) Once a floor (e.g., floor 1) is used a reference floor (for example, floor 2 aligned to floor 1), it cannot be then aligned to a floor that was previously aligned to it (for example, floor 1 aligned to floor 2).

*Note: You can choose to reset alignment to the default and start over by selecting **Reset Alignment** from the **Tools** menu.*

7. To save any alignment changes, click **OK**. To return to the Building Tree view without saving changes, click **Cancel**.
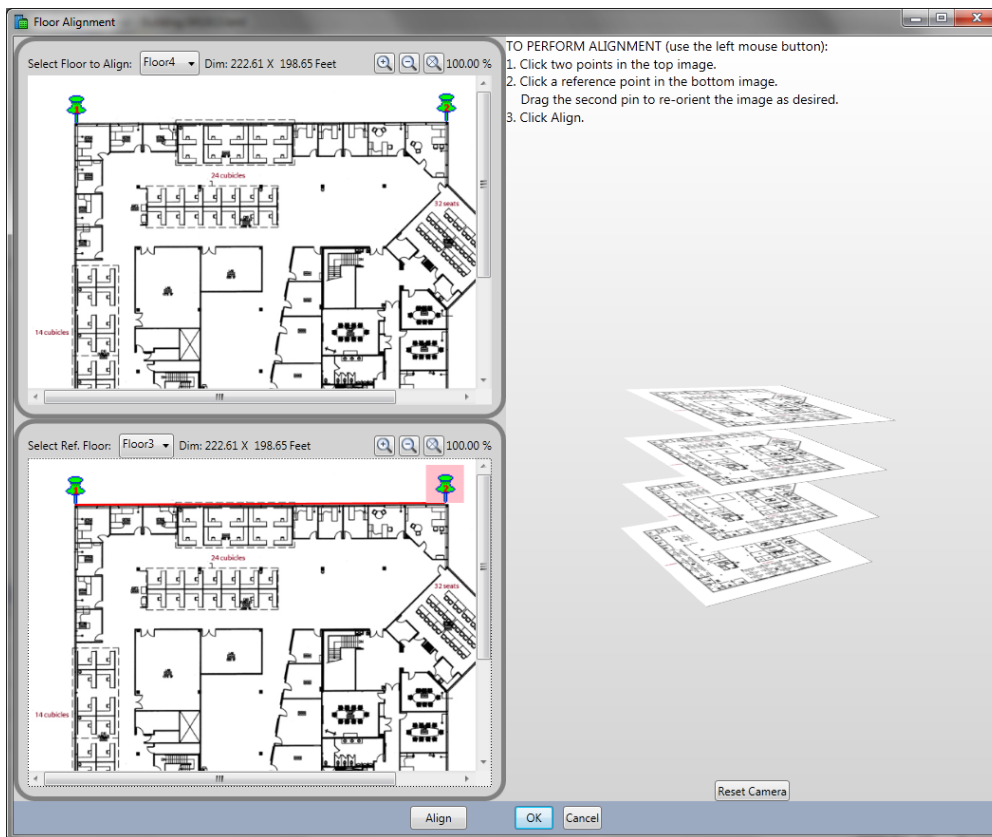
Modifying a Floor Plan Project

The default view in Multi Floor Planner is 3D view . To perform tasks such as recalibration, adding RF obstructions and APs to your project, switch to 2D view. To do this,

select a floor in the building tree and click **View 2D** ![icon]. Refer to the "Planner Projects" section for details about using the various AirMagnet Planner tools available in this view.

> *Note: Not all Planner tools are currently available in Multi Floor Planner.*

Viewing Multi-floor Data

Once APs are included in to your building project (either as part of an imported AirMagnet Planner site plan or by adding them in Multi Floor Planner 2D view), the data may be processed to show a predictive, color-coded visualization of the Wi-Fi environment.

To get started, click **Refresh** ![icon]. The Map view will process the project to show a color-coded heatmap display. The color-codes correspond to the legend at the far right.
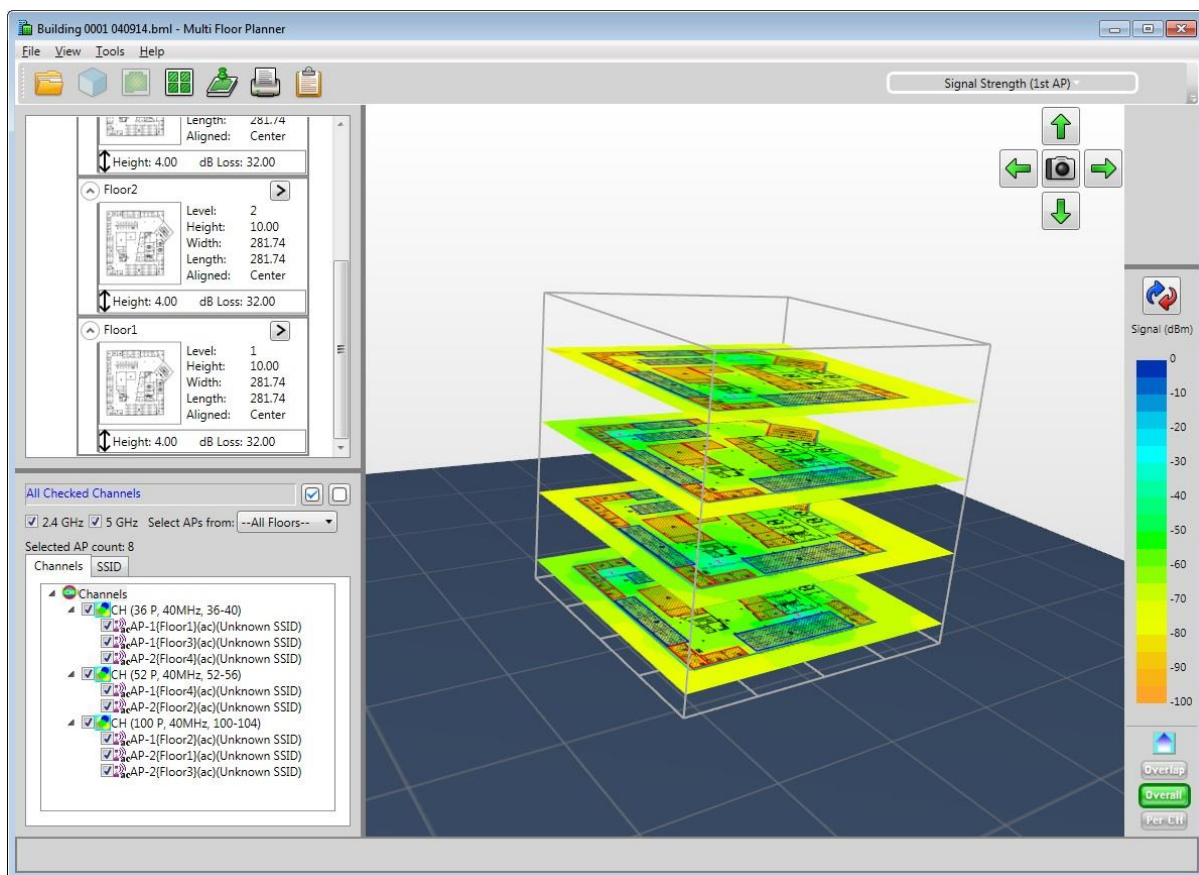
You can adjust various controls in the user interface to examine various predictive scenarios (refer to Data Filtering Examples).

Editing AirMagnet Planner Site Plans

If you imported a Planner site plan into a building project using the "Select Plan" option, the site plan was imported into Multi Floor Planner by reference. This means that if you modify the plan in Multi Floor Planner and save the building project, the original plan will be

modified to reflect the changes. It also means that if you open the original planner project in AirMagnet Planner and save any changes, when you re-open the Multi Floor Planner building project, it will reflect the changes.

Building Tree Controls

To select a single floor, click the floor in the building tree. To select all floors, click the parent Building Name at the top of the tree.

Data Type Controls

The Data Type drop-down in the top right of the Map view enables different ways data may be shown: Signal Strength, Channel Interference, Predictive PHY Data Rate Downlink and Throughput. For more information about data analysis using these controls, see the "Performing Data Analysis" section.

Data Tree Controls

Use "Select APs From..." drop-down menu to control what AP information to display. This works in conjunction with checked options in the Channel and SSID tree.

- **All Floors:** Using this option includes the data from all APs on all floors.
- **Floor ___:** This option includes only data from APs on the selected floor.
- **Bleedover:** This option includes only data from all floors except the selected floor.

The Data Tree on the bottom left will list the APs discovered on the site plans for each floor. APs will be listed by Channel in the Channel tab view and by SSID in the SSID tab view.

A Channel listing indicates the Channel Number (for example, 36), Channel Width (for example, 40MHz) and Channel Span (for example, 36-40).

Clicking an AP in the list displays a visualization of its location and floor height.
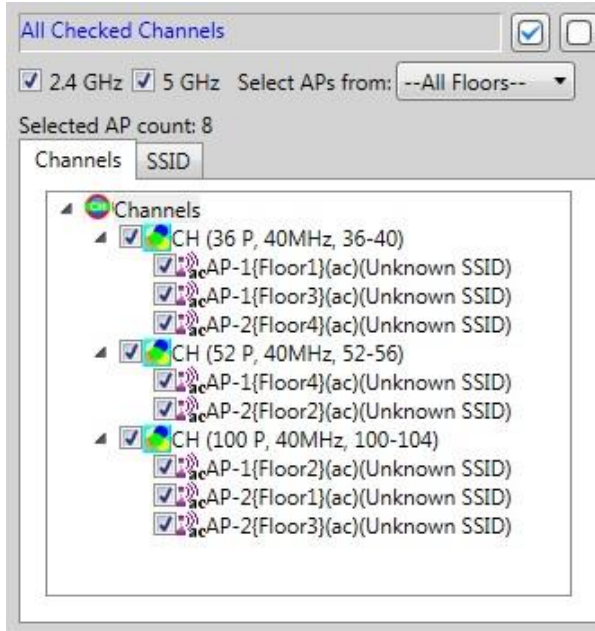
If a Data Tree option is unchecked, the data is filtered out of the color-coded Map view. Re-checking an option will re-incorporate that data.

Data Tree Controls

Item	Description
Check All / Uncheck All	Use these controls to "fast check all" or "uncheck all" associated channels and/or SSIDs listed in the Data Tree.
Media Type	Use the checkboxes to choose whether to view 2.4 GHz APs, 5.0 GHz APs or both
Channels	Click this tab to list APs by their corresponding channel setting.
SSID	Click this tab to list APs by their SSID
AP list	Use the checkboxes to include or exclude an AP in making heatmap calculations. The parent checkbox will enable or remove all children.
Selected AP Count	Total APs selected.

Legend Controls

The label at the top of the legend indicates the measurement type. The colors in the legend correspond to the associated numbered increments along the vertical axis.

The top of the legend may be dragged down to filter out the top ranges of data. The bottom of the legend may be dragged up to filter out the lower ranges of data.

The arrow button below the legend may be used to reverse the measurement direction of the legend.

For more information about configuring the legend, refer to Configuring Legend Color Schemes.
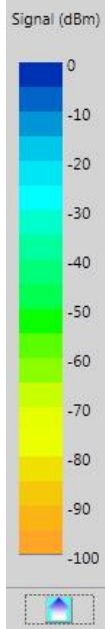
Overlap, Overall, Per Channel Controls

Overlap: Selecting this option displays signal overlap or channel interference in the Map Window.

Overall: Displays overall site RF signal coverage. This viewing option is active by default.

Per Channel: Displays data by channel, SSID, or AP.

For detailed information about using Overlap, Overall and Per Channel, see the "Performing Data Analysis" section.

3D View

3D View is the default view and displays a three dimensional view of a building project including all levels. With the cursor over this view, drag the mouse to rotate the building on the associated axis (refer to Menu Reference). Selecting a level from the Building Project tree will focus on the selected level in the 3D view and dim the other levels.

Thumbnail View

Click Thumbnail view to display thumbnail images of all the floors in your project. Double-click a single floor to open it in 2D view.

2D View

Select a floor in the tree view and click 2D View to display a two dimensional view of that floor.
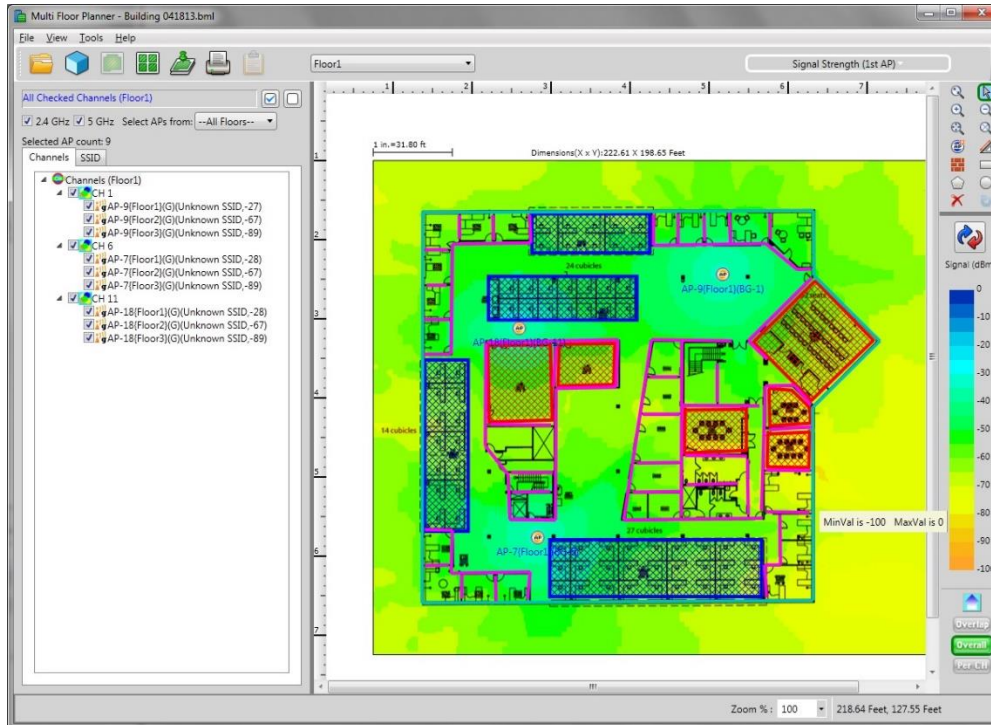
In 2D view, the options in the user interface correspond to similar options in Planner. Refer to the "Planner Projects" section for details about using these tools.

*N**ote:** Right-click an individual AP to display a menu of AP options. To view AP details, select **Properties** from the menu. You can also delete the AP from the floor plan by selecting **Delete** from the menu. If you select **Default AP** from the menu, this AP's properties will become the default for the AP tool. If checked, un-checking Default AP will restore the default setting.*

Special 802.11ac Options

802.11ac Data Types

Multi Floor Planner includes some heatmap generation Data Type options for 802.11ac not available in Planner: Predictive PHY Data Rate Downlink; 802.11ac: Max MCS (AP Tx); and Channel Overlap. For explanations of these heatmap options, refer to Performing Data Analysis.

802.11ac AP Configuration

Multi Floor Planner includes some AP configuration options for 802.11ac not available in Planner. For 802.11ac AP, Select the **5 GHz** tab and choose **802.11ac** from the **Media Type** drop-down.
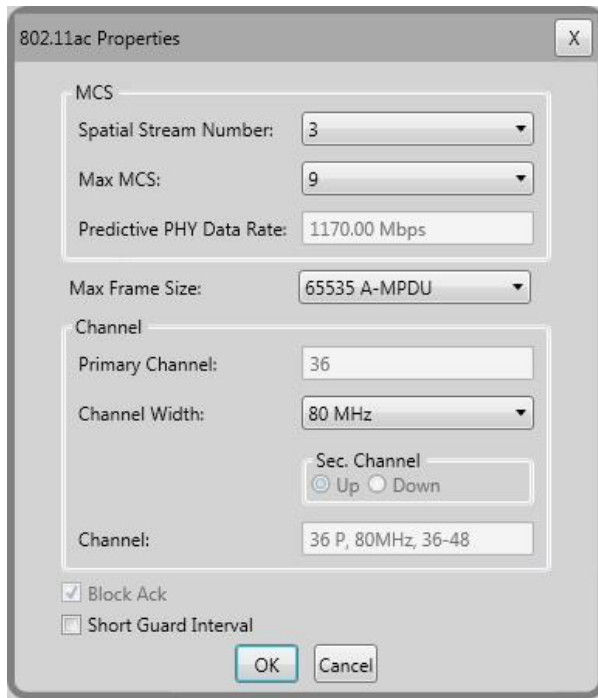
Item	Description
Spatial Stream Number	Predictive MIMO support for up to 3 spatial streams
Max MCS	Predictive MCS support for index values 0-9.
Predictive PHY Data Rate	Calculation value based on spatial stream and MCS selections.
Max Frame Size	Frame size options are available for Aggregate MAC protocol data unit (A-MPDU)
Primary Channel	Indicates the Primary Channel selected for this AP.
Channel Width	Provides options for the selection of 20, 40, 80 and 160 channel width
Sec. Channel	Options to choose whether the secondary channel should be A higher frequency (up) or lower frequency (down).
Channel	Summarizes the selections made for the channel.
Block Ack	Block Ack is checked by default to indicate it is enabled. It cannot be modified.
Short Guard Interval	Checked is enabled. Default is 400 ns.

Special 802.11ax Options

802.11ax Data Types

Multi Floor Planner includes some heatmap generation Data Type options for 802.11ax not available in Planner: Predictive PHY Data Rate Downlink; 802.11ax: Max MCS (AP Tx); and

Channel Overlap. For explanations of these heatmap options, refer to Performing Data Analysis.

802.11ax AP Configuration

Multi Floor Planner includes some AP configuration options for 802.11ax not available in Planner. For 802.11ax AP, Select the **5 GHz** tab and choose **802.11ax** from the **Media Type** drop-down.

Item	Description
Spatial Stream Number	Predictive MIMO support for up to 8 spatial streams
Max MCS	Predictive MCS support for index values 0-11.
Predictive PHY Data Rate	Calculation value based on spatial stream and MCS selections.
Max Frame Size	Frame size options are available for Aggregate MAC protocol data unit (A-MPDU)
Primary Channel	Indicates the Primary Channel selected for this AP.
Channel Width	Provides options for the selection of 20, 40, 80 and 160 channel width.
Sec. Channel	Options to choose whether the secondary channel should be A higher frequency (up) or lower frequency (down).
Channel	Summarizes the selections made for the channel.
Block Ack	Block Ack is checked by default to indicate it is enabled. It cannot be modified.

Menu Reference

File Menu

Item	Description
New	Create a multi-floor building project. The file extension is .bml
Open	Open a multi-floor building project. The file extension is .bml
Close	Close the multi-floor building project. Includes an option to Save any unsaved changes.
Save	Save the currently opened multi-floor building project.
Export	Export the building project as a .zip file. Use this option to import the project on another machine running Multi Floor Planner.
Import	Import a building project from a .zip file. Choose the .zip from File for Import. Create the imported project in Import Location.
Print Preview (Current View)	Open a print preview of the current view.
Recent Files	List any previously opened files.
Exit	Quit Multi Floor Planner.

View Menu

Item	Description
View 3D	Refer to Map View options.
View 2D	Refer to Map View options
View Thumbnail	Refer to Map View options
View Building Properties	Refer to Building Project
View Legend	If the Legend tool is closed (unavailable), this option restores the Legend.
View AP List	View a list of all APs currently placed on the site plan. Refer to Viewing a List of APs.

Tools Menu
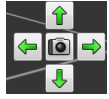
Item	Description
Align Floors	Refer to Floor Alignment
Reset Alignment	Reset the building levels to default center alignment.
Copy View	Copy the current site map view to the clipboard.
Copy Current View	For example, a zoomed-in view, this will capture the zoom area only.
Configure	Refer to Configuration.
Configure Walls/Areas	Refer to Wall / Area Object Manager.

Help Menu

Item	Description
View Help	Open Help documentation
Sample Project	Open a sample Multi Floor Planner building project

About Multi Floor Planner	Provide information about Multi Floor Planner such as the Multi Floor Planner version and build number.

Map View options

Item	Description
Camera	3D view panning controls. Click the camera icon to reset the default view. Arrows control the associated panning direction.
Zoom and Rotate	While in 3D view, Right-click and drag in the desired direction to rotate the building in 3D space; left-click and drag up to zoom in or drag down to zoom out.
Open	Open a multi-floor building project
View 3D	Displays the floor plans in a 3D view that simulates width, length and floor height in three dimensional space. Clicking a floor in the building tree will highlight that particular floor. Clicking the parent Building Name will highlight all floors.
View 2D	Displays a flat length by width view of a floor plan selected in the Building Tree. Click a floor in the Building Tree and then click **View 2D**. Mouse over the floor to view a pop-up of data details.
View Thumbnails	Displays a 2D view of all the floors.
Align Floors	Opens the Alignment feature.
Print	Print the current view.
Report	Generate the Multi Floor Planner report. Refer to <u>Multi Floor Planner Reports</u>.

Planner Configuration

From the **Tools** menu, select **Configure**.

Tab	Item	Description
General		
	Default Building Folder	Directory path for the project.
	AP Display	Use either a user definable name or MAC address.
	Bubble Help	Choose to activate or deactivate bubble help text. Available in 2D view only. Check "Hide APs below

		Threshold" to exclude APs in this range from Bubble Help.
	Walls/Areas	Choose to show or hide walls and areas added to the floor plan.
	Grid	Choose to display or not display the grid overlay.
Floor Material		Choose to add a new floor type to the list of options. Floor material determines the db loss for the associated floor. It is calculated on a per foot or per meter basis.

Sampling Density

From the **Tools** menu, select **Configure Plan**. This dialog enables you to set the distance between predictive sampling points. A lower number (smaller distance) will produce a higher density of sampling points. Keep in mind that a higher density requires more computing power and may produce longer heatmap display processing time.
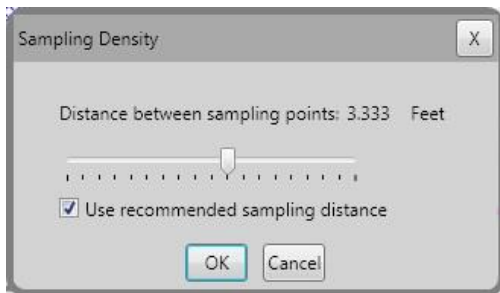
Multi Floor Planner Reports

To generate a report of the building project, click . The report will automatically be generated in the main view.

Note: *Data must be processed (***Refresh***) in order for the Report option to be available. Report is not available from 2D view.*

The topics, floors and heatmaps contained in the report are related to the following factors:
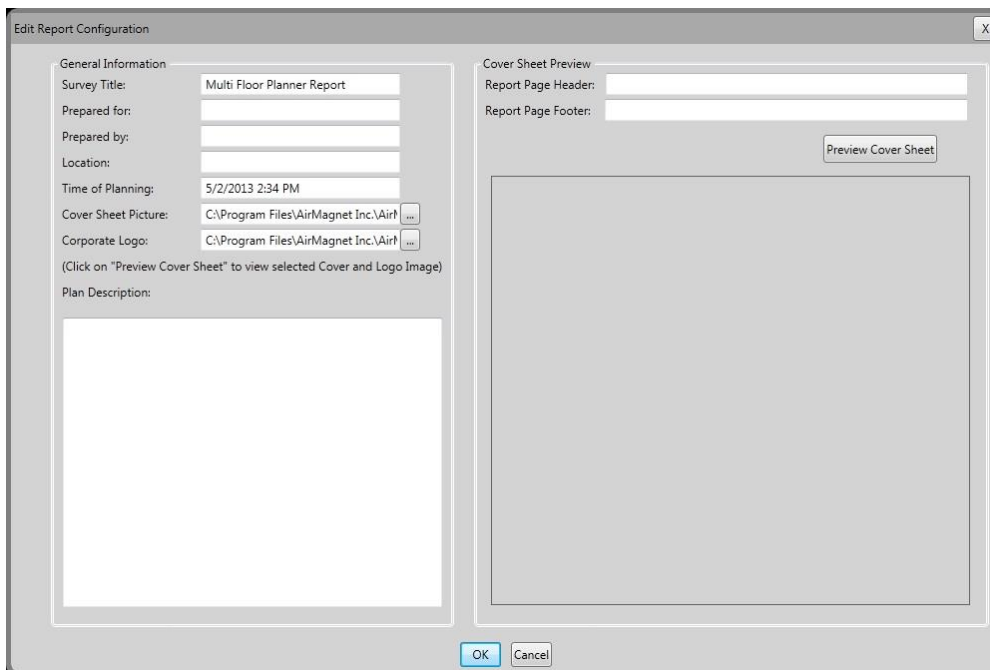
- If the "building" is selected in the tree view, information about all floors in the building are generated. If a specific level is selected, only information regarding that level is generated.
- Information is generated according to the way the filters are set in the Data Tree (refer to Viewing Multi-floor Data). For example, if "bleedover" is selected, only information regarding bleed over will be generated.
- Legend settings.

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> **Note:** *If any of the above settings are changed, the report must be re-generated to reflect the changes. To re-generate the report, click* ▶ *.*

Information about the associated controls at the top of the Report window may be found in Report Window.

General Information

To view report information that may be modified, click 🛈. After modifying the properties desired, a preview of the report's cover sheet by clicking "Preview Cover Sheet." To close the view and save any changes, click **OK**. To close the view without saving changes, click **Cancel**.

Field	Description
Survey Title	The title of the survey.
Prepared for	Recipient of the report.
Prepared by	Report preparer.
Location	Survey location.
Time of Planning	Date stamp that may be modified.
Cover Sheet Picture	Directory path to the picture that will be displayed on the cover sheet of the finished report. Recommended size is 650w x 400h pixels. If the width is larger then the image will be cut off. If the height is longer it may be displayed in new page.
Corporate Logo	If desired, users can specify a logo to be displayed in the lower-right corner of the cover page. Recommended size is 164w x 164h pixels. A larger width will cause the image to be cut off. A longer height may cause the image to be displayed in new page.
Plan Description	An option to include paragraph text.

Report Page Header & Footer	Running header and footer text may be added here. The text will be aligned to the left side of the page. In addition, a default page number is included at the bottom right corner of each page.

Report Localization

The report is generated based on the Windows language setting. In addition, the report may be generated in the following languages: English, Arabic, French, German and Russian.

1. Click to generate the report.

2. From the language drop-down at the top of the report view, select the language of choice.

3. Click re-generate.

4. You may also edit the General Information as described above.

Data Filtering Examples

The following data filtering scenarios provide some guidance for using the various data filtering controls in Multi Floor Planner.

Signal Bleed-over throughout the Entire Building

View how the signal strength of particular AP or set of APs may propagate to other floors: Select **Signal Strength** from the Data Type drop-down. Activate data filtering on all floors by selecting the parent Building Name in the Building Tree and selecting "All Floors" from the Data Tree drop-down. Make sure all APs are checked in Data Tree.

Signal Bleed-over on a Single Floor

View how the signal strength from other floors affects a selected floor: Select **Signal Strength** from the Data Type drop-down. Activate data filtering on a single floor by selecting the floor in the Building Tree. From the **Select APs from** drop-down, select **Bleedover**. This option filters out the data from the APs on the selected floor while including any bleed-over data from other floors. This may be easier to view in 2D view.

Signal Propagation from the Selected Floor

In 3D or Thumbnail view, see how the signal strength from one floor affects the entire buiding: Select **Signal Strength** from the Data Type drop-down. Activate data filtering on all floors by selecting the parent Building Name in the Building Tree. From the **Select APs from** drop-down, select a floor (for example, Floor 1). This option filters out the data from the APs on all floors except the selected floor.

Signal Propagation by Channel or SSID

In 3D or Thumbnail view, see how the signal strength is propagated by channel or SSID: Select **Signal Strength** from the Data Type drop-down. Activate data filtering on all floors

by selecting the parent Building Name in the Building Tree and selecting "All Floors" from the Data Tree drop-down. Click **Per CH** (below legend). To view by channel, click the Channel tab in the Data Tree. To view by SSID click the SSID tab in the Data Tree. Keep in mind that you can drill down to show data from all channels, individual channels or individual APs by selecting the desired parent or child listing in the Data Tree.

Using Multi Floor Planner Advisor

AirMagnet Planner implements an advisor feature to help you optimize the layout of APs on site plans. After drawing walls and areas on the site plan, you can specify two types of areas to narrow advisor's focus: coverage areas and AP exclusion areas. These areas can be drawn using their tools in the Toolbar.

Each tool has both a coverage (represented by a blue '+') and AP exclusion (represented by a red '–') area type. Coverage areas represent portions of the site plan that absolutely must have signal coverage and can contain APs; AP exclusion areas are those in which APs **cannot** be placed.

Icon	Name	Description
	Create Rectangular Coverage/AP Exclusion Area	Draws a rectangular coverage or AP exclusion area on the map.
	Create Arbitrary Coverage/AP Exclusion Area	Draws an arbitrary coverage or AP exclusion area on the map. This tool works well for irregularly-shaped regions (that is. areas other than cubicles, offices, and so on.).
	Create Elliptical Coverage/AP Exclusion Area	Draws an elliptical coverage or AP exclusion area on the map. This tool is useful for areas that cannot be drawn easily using straight lines.

In order to use Multi Floor Planner's Advisor, you must lay out the site plan as normal (draw out walls, cubicles, and so on.). After the general areas are drawn, coverage and AP exclusion areas can be added in order to define the required signal coverage area. Once all this is completed, you can generate Advisor's recommended AP layout.

- [Drawing Coverage/AP Exclusion Areas](#)
- [Generating Advisor's Layout](#)

AP Coverage and Exclusion Areas

This section describes how to set a site plan up in order to help Multi Floor Planner Advisor reach the most accurate results possible. It is important that you lay out their coverage and AP exclusion areas properly so that Advisor can generate the optimal layout.

> **Note:** *Advisor's results depend heavily on user input; therefore, the more detailed the plan layout, the more accurate the results. The only way to perfectly determine the optimal layout for a site is to test a setup and run a site survey using the AirMagnet Survey software.*

To draw coverage and AP exclusion areas:

1. Select the coverage tool that will best fit the region to be drawn (rectangle, arbitrary, or ellipse). Use the tool to define the intended region in the same manner as areas are defined.

2. Repeat the process until all necessary areas are defined.

3. Repeat steps 1-2 for any AP exclusion areas as well.

4. The plan is now ready for Multi Floor Planner Advisor analysis.

Generating a Multi Floor Planner Advisor Layout

Now that the site plan has been properly defined, Multi Floor Planner Advisor can generate its optimal AP layout.

To generate an Advisor Layout:

1. Click the (**Advisor**) button in the toolbar. The **Advisor Criteria** dialog appears.
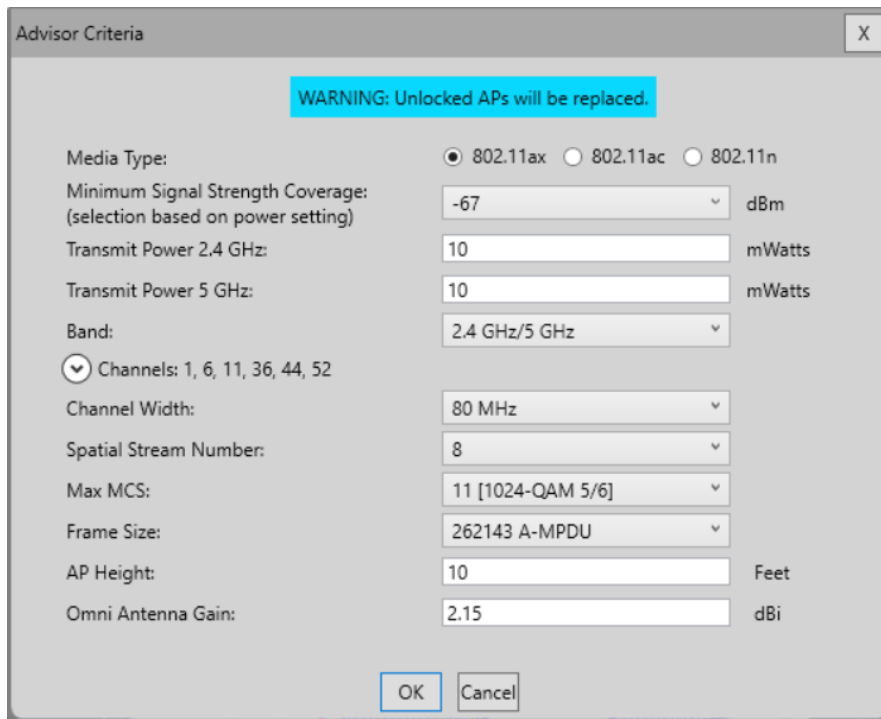
2. Make any desired changes to the dialog information.

Field	Description
Media Type	This selection specifies the Wi-Fi standard supported by the Advisor-placed APs. Note that the Media Type selection changes the available range of some of the settings below.
Minimum Signal Strength Coverage	This field defines the minimum strength required at any point in a coverage area. The signal strength cannot drop below this value in areas that require coverage.
Transmit Power 2.4 GHz	This field defines the transmit power for the 2.4 GHz APs placed by Advisor.

135

Transmit Power 5 GHz	This field defines the transmit power for the 5 GHz APs placed by Advisor.
Band	This field defines the band to be used by Advisor's placed APs.
Channels	This button opens the **Channel Allocation** drop-down menu, which enables you to specify precisely which channels that Advisor can use when placing APs. Note that a minimum of three channels must be selected for each band in use.
Channel Width	The Channel Width setting specifies the channel width to be used by Advisor-placed APs. The 802.11n media type supports 20 MHz and 40 MHz channel widths. 802.11ac and 802.11ax media types also include 80 MHz and 160 MHz channel widths.
Spatial Stream Number	The Spatial Stream Number setting specifies the number of spatial streams to be used by Advisor-placed APs. The setting is used by 802.11ac and 802.11ax media types and ranges from 1 to 8.
Max MCS	The Modulation Coding Scheme (MCS) setting specifies the MCS index used by Advisor-placed APs. The MCS setting corresponds to the maximum data transfer rate supported by the AP. The 802.11n media type settings range from 0 to 76. The 802.11ac media type settings range from 0 to 9. The 802.11ax media type settings range from 0 to 11.
Frame Size	The Frame Size setting specifies the maximum frame size used by the Advisor-placed APs. This setting can range from 3839 to 4194303 depending on the media type. Larger frame sizes minimize wireless overhead in the network by reducing the number of frames required per transmission.
AP Height	The AP's height directly affects its signal coverage; APs placed at higher elevations will not cover as wide an area as those at standard ceiling height.
Omni Antenna Gain	This field defines each AP's antenna gain. Note that Advisor's APs will utilize omnidirectional antennas.

3. Click **OK** to start the Advisor. Advisor will begin processing the site data and testing AP locations.

4. After the process completes, APs are placed on the plan. Click (**Refresh**) to view the site's projected heatmap.
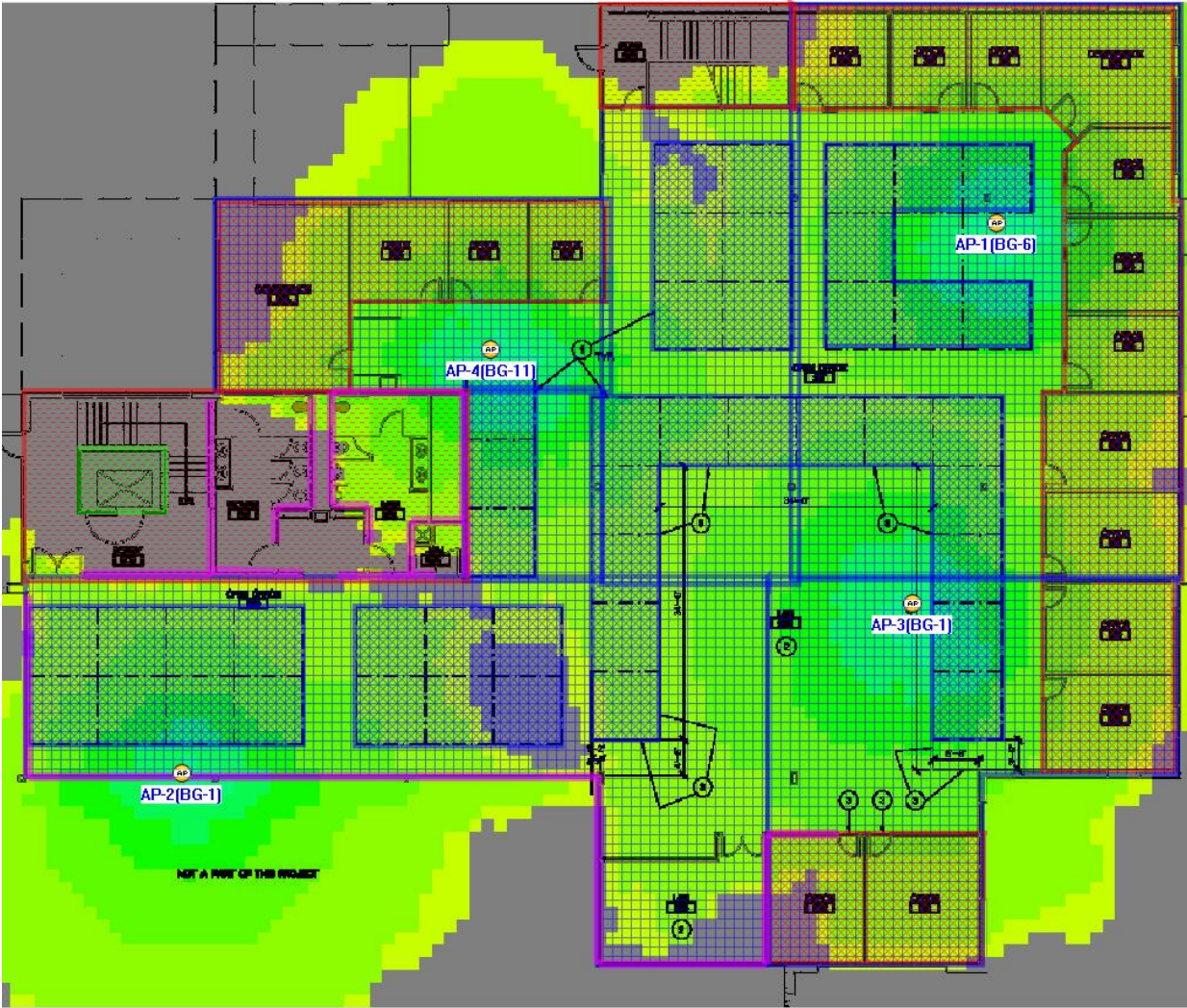
Configuration Options

Configuration Dialog

The Configuration dialog includes several tabs, each dedicated to a specific aspect of the program's settings.

To access the Configuration dialog, do either of the following:

- From the Main Menu, select **File>Configure**....

- From the Toolbar, click (**Configuration**).

By default, the Settings tab is selected when the dialog box opens.

Indoor.svp   ✕

Settings   AP Grouping   Color   MapPoint   Profile

AP Survey data

    Ignore APs whose max discovered signal is less than

    | -99 | dBm when opening survey data files

    ☑ Hide ignored Access Point

Logging data

    Auto logging data period | 3 | seconds

    ☑ Beep when logging data

    Sampling options

      ◉ Auto sampling through path

      ○ Sampling on click only

☑ Use maximum heatmap drawing resolution
☐ Auto Position APs with signal greater than | -100 | dBm
☐ Display MAC address only
☑ Prompt for refresh after AP location change
☑ Enable Survey Range Indicator
☐ Enable GPS port
☐ Hide APs below legend threshold in Bubble Window

| Configure GPS | | PHY Data Rate Map |

| Channel Interference | | Spectrum Integration |

| OK | | Cancel |

Configuring Program Settings

This option defines the way AirMagnet Survey collects and processes data. It also enables you to optimize certain attributes on the wireless network adapter in use to maximize its performance with the application.

To configure settings:

1. From the Main Menu, select **File>Configure**....
2. Make sure the **Settings** tab is selected.

Parameter	Description
Ignore APs whose max discovered signal strength is less than	Specify a threshold value for AP signal strength. **Note:** *APs whose signal strengths fall below that value will be ignored. The value of signal strength ranges from 0 (strongest) to -100 (weakest).*
Hide ignored Access Point	If selected, APs whose maximum signal strengths fall below the threshold will not be shown in the Channel/SSID Tree in the Display view.
Auto logging data period	Enter a value in seconds. This option determines how frequently the application automatically logs data points during a site survey. **Note:** *This allows you to set AirMagnet Survey's automatic data sampling interval. The default value is once every three seconds.*
Beep when logging data	If selected, AirMagnet Survey will beep each time it logs data. **Note:** *It serves as an indicator that Survey is working properly. The frequency of the beeping depends on the data sampling interval specified above.*
Auto sampling through path	If selected, AirMagnet Survey will automatically mark data sampling points on the site map, which are represented by the blue dots along the survey path. **Note:** *The data sampling interval will be determined by the value you specified in Auto logging data period. See above.*

Sampling on click only	If selected, AirMagnet Survey will sample data only when you click on the site map. *Note: When conducting a Click to Sample survey, it's important to ensure that the application has had adequate time to complete a full scan cycle before clicking to record a sample and moving on. Moving and clicking significantly faster than the scan pattern can result in decreased heatmap accuracy. To aid in recording accurate data, a progress bar at the bottom of the survey screen continuously shows the progression through the configured scan pattern. Use it to verify that a full scan cycle has been completed before you click to record data. Once the meter reaches 100%, a new scan is started and the meter resets to 0. However, this* progress bar is only applicable when you use adapters that support user-defined scan patterns.
Use maximum heatmap drawing resolution	If selected, AirMagnet Survey will display smoother looking heatmaps for floor plans with less than 400 feet (122 meters) dimension.
Auto position APs with signal strength greater than	If selected, you may also need to set a signal strength value in the space below. AirMagnet Survey automatically places the APs that meet your specification in their optimal locations on the site map.
Display MAC address only	If selected, AirMagnet Survey will display all APs by MAC address alone, rather than attempting to display a vendor ID or custom name.
Prompt for refresh after AP location change	If selected, AirMagnet Survey will prompt you to refresh the view each time you reposition an AP.
Enable Survey Range Indicator	If selected, AirMagnet Survey will automatically mark the survey data sampling range (radius) as you click on the site map.
Enable GPS port	If selected, the Configure... button next to it will be enabled so that you can configure GPS settings. Refer to Conducting GPS-Aided Site Surveys.
Hide APs below legend threshold in Bubble Window	If selected, APs placed on the floor plan (whether placed APs in a survey or placed APs in Planner) will not be included in the Bubble window listing.
Configure GPS	Opens the dialog to configure GPS integration for conducting a GPS survey. Refer to Configuring GPS COM Port.
Channel Interference	Opens the Interference dialog where you can configure the minimum values of AP signals that the program will take into account when calculating signal interference.
Spectrum Integration	Clicking this button will open the Spectrum Integration dialog box where you can choose to show or hide the Spectrum Integration window, which, if enabled, will appear below the Map Window on the Survey and Display screens. For information

	about AirMagnet Spectrum Analyzer, refer to AirMagnet Spectrum Analyzer introduction.
PHY Data Rate Map	This is used when generating speed data for passive surveys. Refer to Calibrating Wireless Network Adapter Speed.

3. Click **OK**.

Specifying Interference Settings

Definitions of signal interference and noise are rather subjective. They may vary from person to person, depending on an individual's perception and level of tolerance. For instance, -67 dBm or -87 dBm may be considered as interference by some people, but may also be considered acceptable by others.

The Ch Interference Setting… button allows you to specify the minimum value that the program should consider as interference when calculating these parameters. Once specified, any signal from an adjacent AP that falls below the value will not be considered as interference by the program.

To specify interference settings:

1. From the Main Menu, select **File>Configure**….
2. From the **Settings** tab, click **Ch Interference Setting**…. The **Interference** dialog box appears.
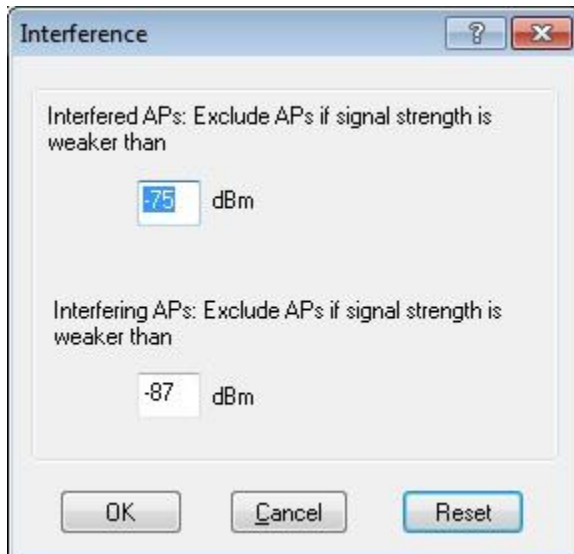
2. Specify the desired values for interference and noise, and click **OK**.

Note: The first field specifies a setting for "Interfered APs", or those that are experiencing interference from other sources. The second refers to "Interfering APs', or those that are causing interference to others.

Calibrating Wireless Network Adapter Speed

The **PHY Data Rate Map** button in the Settings dialog brings up the **PHY Data Rate Map** table, which enables you to specify speed transmission information for the wireless network adapter in use. This is important for speed data calculated for passive or virtual surveys.

The values displayed in the speed mapping table relate to the minimum signal strength required in order to transmit data at a given speed. For example, the default value for transmitting at 6 Mbps for 802.11g traffic is -86dBm.

Note: The default values provided in the table are based on Receive/Radio sensitivity values for most wireless network adapters. You should only modify any values that do not match those of the wireless network adapter in use. Refer to the adapter's technical specifications from the vendor's website.

To adjust speed settings on a wireless network adapter:

1. Click **File>Configure**…
2. From the **Settings** tab, click **PHY Data Rate Map**. The **PHY Data Rate Map** table appears.
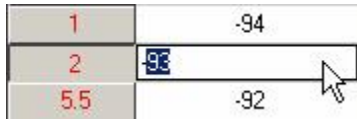
2. Click the tab that matches the media type in use.
3. To modify a value, highlight the value and enter the new value.

1	-94
2	93
5.5	-92

4. Click **OK** to save the changes.

To restore the default values:

Click **Restore to Default**.

Configuring AP Grouping

AP Grouping allows you to set up specific names for single devices that utilize multiple SSIDs under different BSSIDs. The grouping helps identify instances where separate BSSIDs show up and appear to be several different devices when they actually belong to a single device.

A few pre-defined rules are available. You may also create custom (New) rules.

You can enable and use AP grouping as follows:

- Choose to use "Any" (any vendor) either 2.4 or 5 GHz. This will group all MAC addresses where the last octet is 0-16, for example, xx.xx.xx.xx.xx.x0
- Choose to use Ubiquity 2.4 or 5 GHz: Octet: First (1), consecutive mac address 16, starting bytes: 0
- Choose to use Ruckus 2.4 or 5 GHz. This will group all MAC addresses where the last octet is 0-16, for example, xx.xx.xx.xx.xx.x0
- Create "New" AP Grouping Rules as described below.

AP Grouping Limitations

AP Grouping is subject to the following limitations:

- Automatic rules are not editable and do not show up in the "Group Rule Name" list and cannot be deleted or edited.

- No special name will be displayed if "Display Best Name" is selected in the filter view, for example, Name will be the same as if its MAC address is selected unless there is a known AP name.
- The existing OUI to create grouping rules will not be modified.
- AP grouping will not attempt to group dual radio APs into a single device.

To configure AP grouping using pre-defined settings:

1. From the **Survey Configuration** dialog box, select the **AP Grouping** tab.
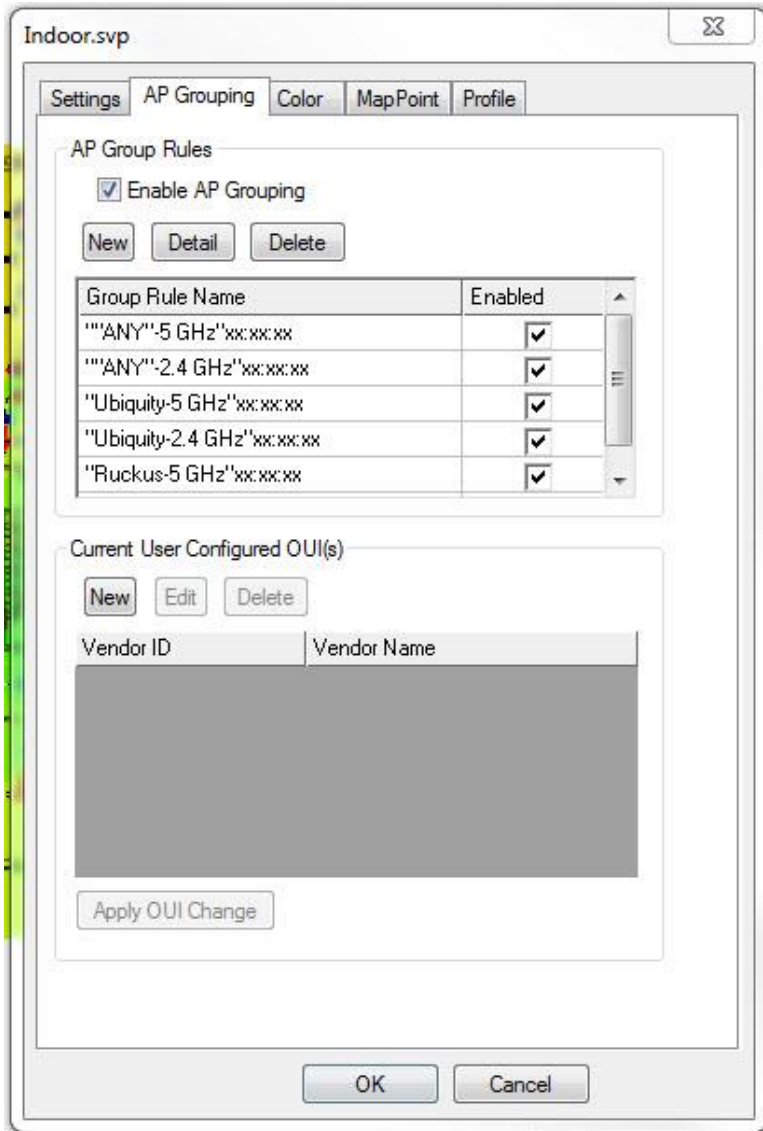
2. Check **Enable auto grouping**.
3. Check the desired listings in the **Group Rule Name** table.
4. Click **OK**.

You can disable AP Grouping by unchecking **Enable AP Grouping**.

Viewing AP Grouping Rules

You can view the details of the default settings.

1. Select an AP Group rule.
2. Click **Detail**. A dialog box appears showing all the attributes of that auto grouping rule.

The table below briefly describes each of these fields.

Parameter	Description
Vendor ID	Specifies the name of the device vendor that the rule applies to.
Band	Specifies what media type is used on the device.
MAC address order	Indicates whether address is in ascending or descending order
MAC address hexdigit starting from	Indicates the hex digit used to start the grouping.
Number of contiguous MAC address	Indicates the number of consecutive addresses you wish to classify in the group.

Creating New AP Grouping Rules

The AP Grouping tab's pre-configured auto group rules automatically incorporate a range of vendor IDs for devices from various manufacturers. These numbers are assigned to vendors by the IEEE, and as newer cards are released, new IDs are granted.

The IEEE OUI file is located in c:\AirMagnet\Surveyor\OUI and the user can download the latest IEEE file from here: http://standards.ieee.org/develop/regauth/oui/oui.txt. Open the web page and from the browser **File** menu, select **Save As**. Save as a .txt format.

Additionally, vendor names can be modified to abbreviate them or otherwise make them more meaningful as desired. For example, you may rename "Hewlett-Packard" to "HP". To make a change, open "oui_alias.txt" located here: C:\Program Files (x86)\AirMagnet Inc\AirMagnet Surveyor\OUI.

Note: *the vendor names drop-down in "AP Grouping" will either be the first word in the name or the first 16 characters (if the first name is longer than 16 characters).*

1. From the **Survey Configuration** dialog box, select the **AP Grouping** tab.
2. Under **AP Group Rules**, click **New**.
3. From the **Vendor ID** drop-down, select the desired vendor.
4. Configure the grouping options as desired.
5. Click **OK**.
6. The newly added vendor ID can now be enabled as a AP Group Rule.

You can delete an AP Grouping rule you created. To do this, check the desired rule and click **Delete**. You cannot delete a pre-defined rule.

Current User Configured OUI(s)

1. From the **Survey Configuration** dialog box, select the **AP Grouping** tab.
2. Under **Current User Configured**, click **New**.
3. Type the **Vendor ID**.
4. Type the **Vendor Name**.
5. Click **OK**.
6. Select **apply OUI change**.

The newly added vendor ID can now be used to create an AP Group Rule.

> **Note:** If you use the same vendor name for each new vendor ID, a grouping rule using that vendor name will apply to all the IDs associated with that vendor name.

Alternatively, the ID may be created manually:

1. Navigate to AirMagnet Survey's installation directory (typically C:\Program Files (x86)\AirMagnet Inc\AirMagnet Surveyor).
2. Open **LanCardVendors.txt**.
3. Follow the instructions for creating a new entry.
4. Save and close the text file.

The new entry will be implemented when AirMagnet Survey is launched.

Configuring Legend Color Settings

This feature allows you to set and change the color settings on the Legend, which also affects the color scheme displayed in the Map Window on the view.

To configure Legend color schemes:

1. From the Main Menu, select **File>Configure**....
2. Click the **Color** tab.
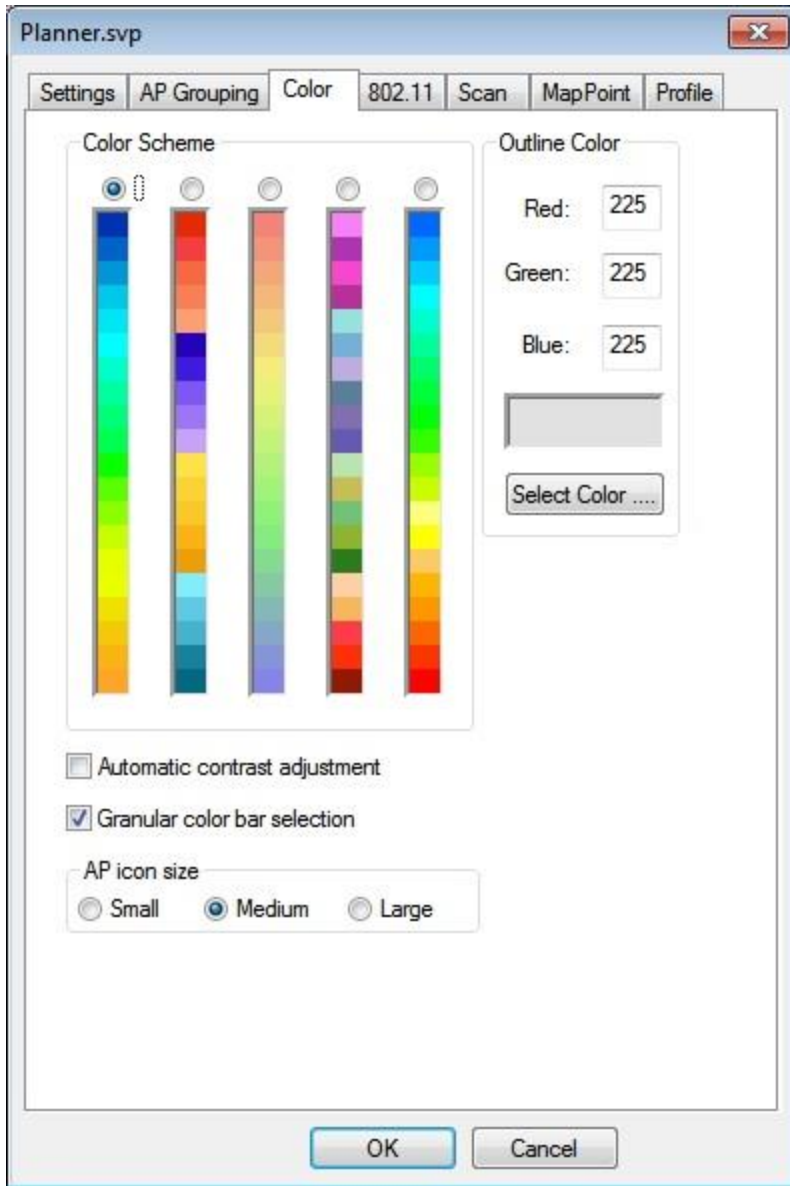
2. Make the selections as described in the table below.

Parameter	Description
Color Scheme	Use the radio buttons to select a color scheme. **Note:** *Each radio button represents a color scheme, which affects the overall color scheme of the Legend. Your selection will be automatically reflected on the Legend once you click OK.*
Outline Color	Either change any of the color values (Red, Green, Blue) by highlighting it and then overriding it with a new one or click **Select Color...** to choose a color from the Color box.

	Note: This option affects the color of the borderline around areas (that is, cells) covered by different APs.
Automatic contrast adjustment	If selected, the program will automatically adjust the color contrast as you drag the color box up or down the Legend.
Granular color bar selection	If selected, the program will change the color shade one grade at a time as you drag the color box up or down the Legend.
AP icon size	Select an AP icon size as desired.

3. Click **OK** when finished.

Configuring 802.11 Parameters

In order to perform Active and Active Iperf surveys, the adapter needs to associate with the desired AP or SSID. This likely requires establishing the authentication method and security password for the AP or SSID. This can be accomplished using Windows Wireless settings outside AirMagnet Survey or it can be set up in AirMagnet Survey using 802.11 configuration.

To configure 802.11 parameters:

1. From the Main Menu, select **File>Configure**....
2. Click the **802.11** tab.
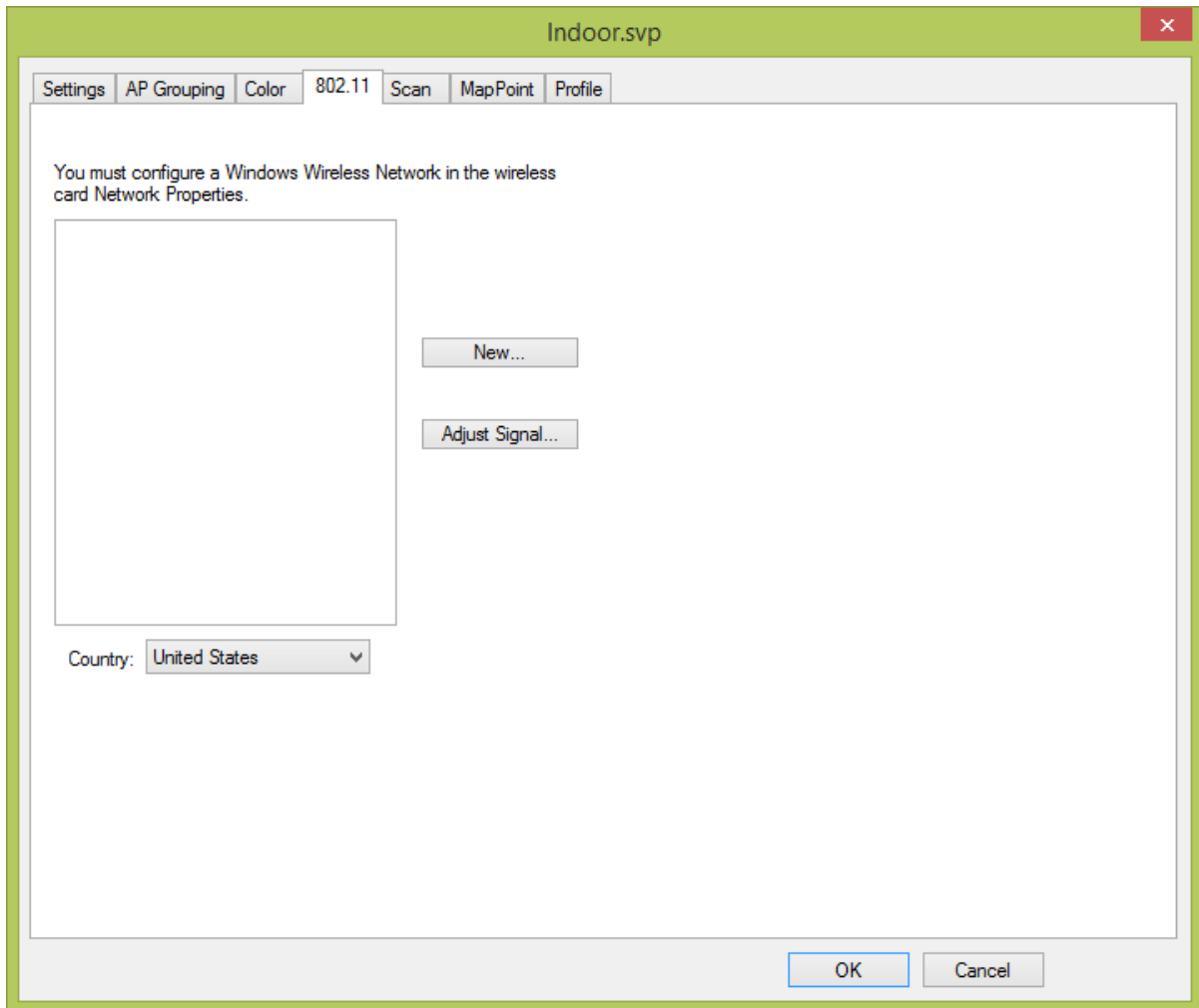
2. Click **New** to create a new profile. Provide a **Name** for the AP or SSID and click **OK**.

3. With the SSID or AP name selected in the **Wireless Networks** drop-down, click **Edit**.

4. Make the desired entries and/or selections in the **Connections** tab and **Security** tab as you normally would for a new Windows Wireless connection.

5. Click **OK**.

Note: The options available depend on the adapter and OS being used with AirMagnet Survey. Refer to the "Supported Adapters" section of the AirMagnet Survey web site at - *https://www.netally.com/products/airmagnet-survey-pro/#SupportedAdapters*

Configuring Channel Scan

Configuring channel scan settings allows you to specify the channels you want the wireless network adapter to scan and to set the frequency at which the scanning occurs.

Note: In order for AirMagnet Survey to record data from the channels of interest, make sure that you have the scan feature enabled for those channels using this view. A

common reason that no data are recorded for a specific channel is that the scan feature on that channel is not enabled at all.

To configure Scan parameters:

1. From the Main Menu, select **File>Configure**....
2. Click the **Scan** tab.
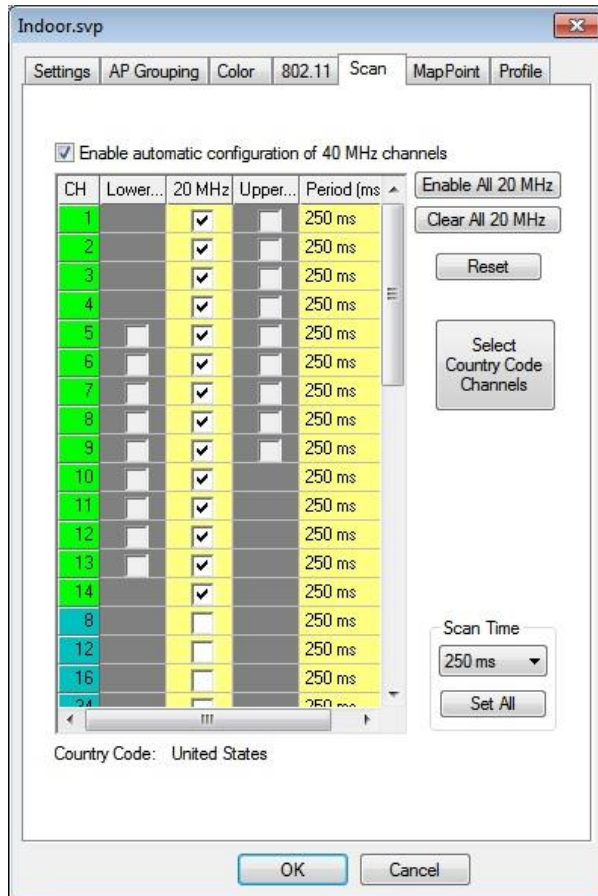
Note: When running in multi-adapter mode, a drop-down menu will appear at the top of the window allowing the user to select the desired device.

2. Use the controls to enable the channel or channels to be scanned (checked channels are scanned).

- Use the check boxes to enable (or disable) individual channels to be scanned.
- Click **Enable All** to enable all channels so that all channels will be scanned.
- Click **Clear All** to disable all the channels so that no channel will be scanned.

3. Set the scan intervals:

- Click the **Period (ms)** field, and select a scan frequency for the individual channels from the drop-down list.
- Click Scan Time down arrow to select a time period, and then click Set All to apply the time period to all channels.

- Click Reset to restore the scan settings to the default, which is 250 ms.

4. Click **OK**.

Note: When an 802.11n card is in use, the Scan tab allows you to specify scanning on lower and upper portions of selected channels. This is due to the use of 40 MHz channel settings; by default, AirMagnet Survey automatically configures these channels. However, you can specify these channels manually by unchecking Enable automatic configuration of 40 MHz channels and checking the individual upper and lower channels desired.

Configuring a Survey Profile

The Profile tab allows you to store settings made in Survey's configuration and reapply them for future surveys. These settings can be saved into an AirMagnet Profile (.apf) file and then uploaded onto another computer using AirMagnet Survey. This feature is particularly useful for users who survey different sites repeatedly. Profiles can be created for individual sites, making it easy to re-configure the scan settings as the site requires.

To configure a Survey profile:

1. From the Main Menu, select **File>Configure.**
2. Click the **Profile** tab.
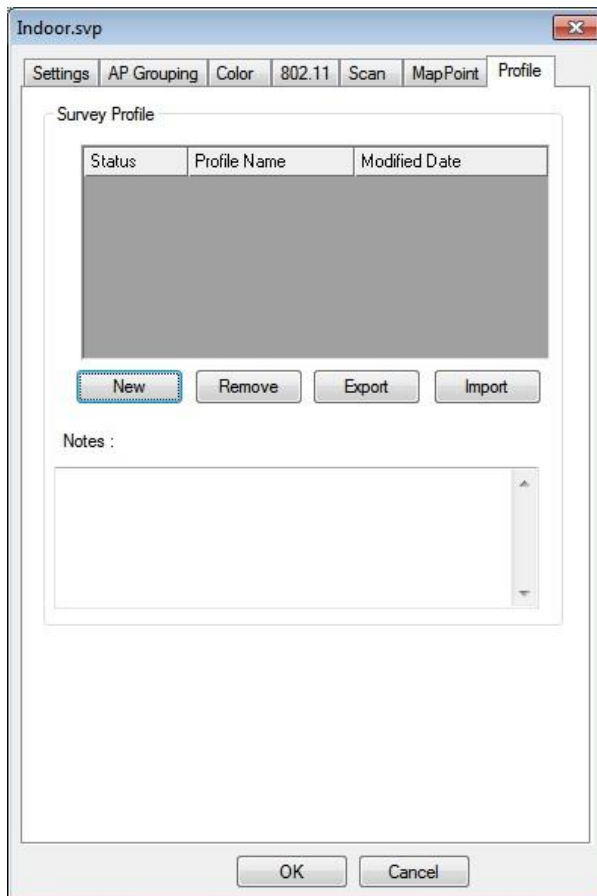
2. Click **New**. The New Profile dialog appears.

3. Enter a unique name for the profile. (This will also be the profile's filename, for example, "Profilename.apf").

4. Leave the **Create New Profile** radio button selected.

Note: The "Copy From" button allows the user to duplicate the settings configured in an existing profile and apply them to the new profile.

5. Click **OK**. The new profile appears in the profile list window.

6. Enter any comments about the new profile in the Comments field below the Profile List (optional).

7. Click **OK**.

Note: The new profile is automatically selected as the active profile. Any changes made in Survey's configuration are stored in the active profile.

RF Signal Adjustment

About Signal Adjustment

Consumers have a wide variety of 802.11 wireless network adapters to choose from for use with different applications. Since these adapters are designed and manufactured by different vendors, there is a possibility of manufacturing differences between the vendors leading to the possibility of different signal readings.

View our "preferred" list of Wi-Fi adapters on the AirMagnet Website:
https://www.netally.com/products/airmagnet-survey-pro/#SupportedAdapters

How to Use Signal Adjustment Options

AirMagnet Survey comes with a Signal Adjustment dialog box to make wireless network adapter adjustment fast and easy. You can bring up the dialog box by clicking **File>Configure…>802.11>Adjust Signal….**

Once you have brought up the Signal Adjustment dialog box, you should click the down arrow in the upper-left corner and select one of the following options:

- **No Adjustment**
- **Pre-Defined Adjustment** (This is the entry below **No Adjustment,** for example., AirMagnet 802.11 a/b/g/n Wireless PC card.)
- **Custom Adjustment**

No Adjustment

No Adjustment means no adjustment offsets are applied by AirMagnet to the wireless network adapter. This option should be used when the user prefers to utilize the adapter manufacturer's raw RF signal strength readings.

To use a wireless network adapter's default settings without adjustment, perform the following steps:

1. From the upper-left corner of the Signal Adjustment dialog box, click the down arrow and select **No Adjustment** from the list menu. Refer to the figure below.
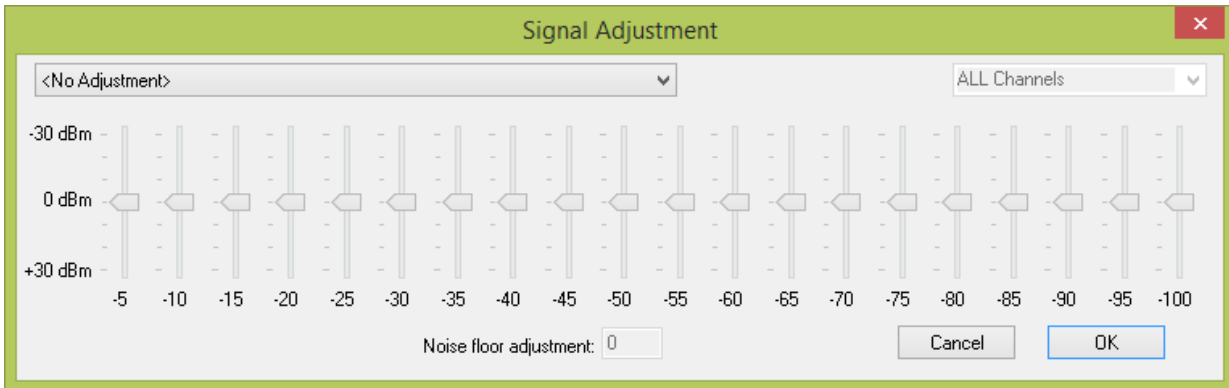
Note: *When you have selected the "No Adjustment" option, all other controls in the Signal Adjustment dialog box will be grayed out (unavailable).*

2. Click the **OK** button to implement the selection.

Pre-Defined Adjustment

If the wireless network adapter you are using happens to be on the pre-adjusted list, then the AirMagnet application automatically recognizes the adapter and displays the pre-defined adjustment option. In other words, if your wireless network adapter is displayed as a Pre-Defined Adjustment entry in the list menu, it means that you have the option to select and utilize the AirMagnet-adjusted values. In this case, you do not have to do anything other than select this entry. You still have the option to make changes to the settings of a pre-adjusted wireless network adapter. In this case, you are customizing a pre-adjusted wireless network adapter, which will also be discussed below.

All tests for defining the adjusted values for the wireless adapter were performed using adjusted spectrum analyzers in a professionally shielded isolation chamber to ensure the best possible accuracy. The adjustment first uses the spectrum analyzer to measure the down-link (from AP to station) radio signal strength from the Access Point at various attenuation points, with an attenuator placed in between the two. The attenuation is achieved by tuning down the radio signal power the attenuator receives from the AP. For example, if the attenuator receives the signal strength of -20 dBm from the AP, it will tune it down to -30 dBm. As a result, the AP signal strength will be -30 dBm when received by the spectrum analyzers. The measurements are carried out at on all channels applicable to the 802.11 protocol used on the wireless network adapter being adjusted. Once the benchmark values are established using the spectrum analyzer, we then perform the same measurement procedures with an 802.11 wireless network adapter (for example, AirMagnet 802.11 a/b/g/n Wireless PC Card) and adjust the values in reference to the benchmark values.

Consider the following example: If at Attenuation Point A, the spectrum analyzer displays a radio signal power value of -20 dBm and the adapter being adjusted displays -30 dBm, AirMagnet adds 10 dBm to bring it to line up with the benchmark values. The pre-defined offsets are relative to the spectrum analyzer. In other words, the pre-defined adjustment patterns will make the target Wi-Fi adapter to report signal strength readings similar to those reported by professional grade spectrum analyzers. For the same wireless network adapter, this same procedure is repeated on every applicable channel/frequency. This is how the pre-defined adjustment values are derived. All adjustment data involving those pre-adjusted wireless network adapters are included in the application.

To use pre-defined adjustment, do the following:

1. Click the down arrow and verify if your wireless network adapter appears as a pre-defined adjustment entry. Refer to the figure below.
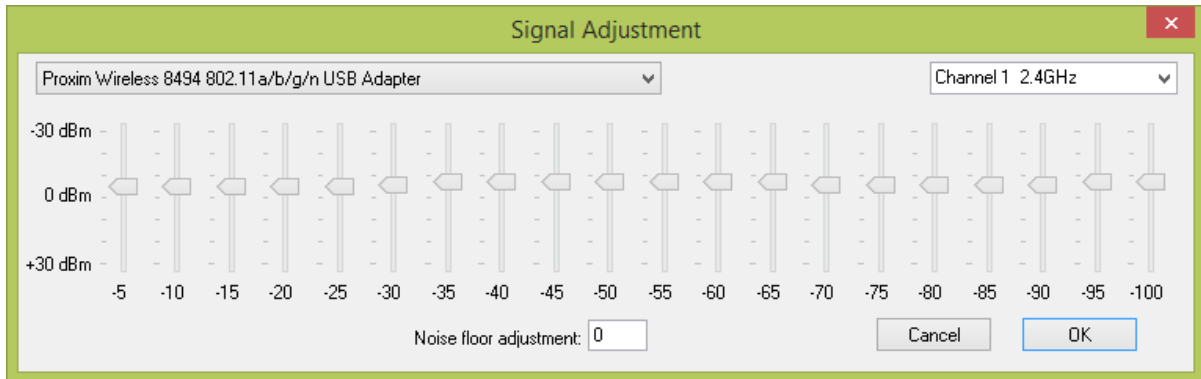
2. Select it (for example, AirMagnet 802.11 a/b/g/n/ USB Adapter Card as shown in the figure above) if the name of your wireless network adapter appears.
3. Click **OK.**

Note: These three steps are all you need to do if the wireless network adapter has been identified as pre-defined adjustment (by AirMagnet). No other action is needed. However, this does not mean that you cannot make any change to a pre-adjusted wireless network adapter. On the contrary, AirMagnet does allow you to make changes to a pre-adjusted wireless network adapter. In this case, you are actually making custom adjustment on the basis of a predefined adjustment. Any custom adjustment made in this way will not change any of the signal values that are dependent on the pre-adjustment settings. Instead, it updates the custom adjustment option with the new settings. The following paragraph explains how to make changes to settings of a pre-adjusted wireless network adapter.

To make changes to a pre-defined adjustment, do the following:

1. Repeat Steps 1 through 2 in the previous paragraph.
2. From the upper-right corner, click the down arrow and select a channel of interest.
3. Use the sliders to turn up or down the RF signal strength as desired.
4. When the **"Create a custom signal adjustment based on current settings?"** message appears, click **Yes.**
5. Continue to adjust the signal strengths with the sliders.
6. Adjust the noise floor by entering a desire value in the noise floor adjustment box.
7. Click **OK** to implement the change.

Note: Custom signal adjustment on a pre-adjusted wireless network adapter must be done channel by channel, one at a time. This is because changes made to a particular channel apply to that channel only. If you want to make changes to any other channels, you have to make the changes channel by following the same steps.

Custom Adjustment

Custom adjustment can be used when you want to create your own adjustment table for your wireless network adapter from the Signal Adjustment dialog box.

Custom adjustment patterns can be created to equalize the signal strength readings between any combination of Wi-Fi adapters. Begin by measuring (similar to the process defined in the pre-adjustment section) two different radios with zero offsets at varying distances, comparing the received signal strengths at each distance, then calculating the differences between Wi-Fi adapters and using the differences to set the offset of one radio in an effort to match the signal strength reading of the other Wi-Fi adapter.

This feature allows you to adjust the RF signal strength and noise floor of the wireless network card in 5-dBm increments. This way you can normalize different Wi-Fi adapters to exhibit similar signal level readings. Without using this feature, the signal level readings may vary significantly between Wi-Fi adapters from different vendors, or even between different models from the same vendor.

The horizontal numbers (-5 to -100) represent the signal strength levels received by a Wi-Fi adapter. At each signal strength level, an offset can be set (from -30dB to +30dB) by adjusting the sliders up or down.

To custom-adjust a wireless network adapter's RF signal power, do the following:

1. From the drop-down list menu, select **Custom Adjustment** (The name of your wireless network adapter should be appended here, if it has not been pre-adjusted). Refer to the figure below.
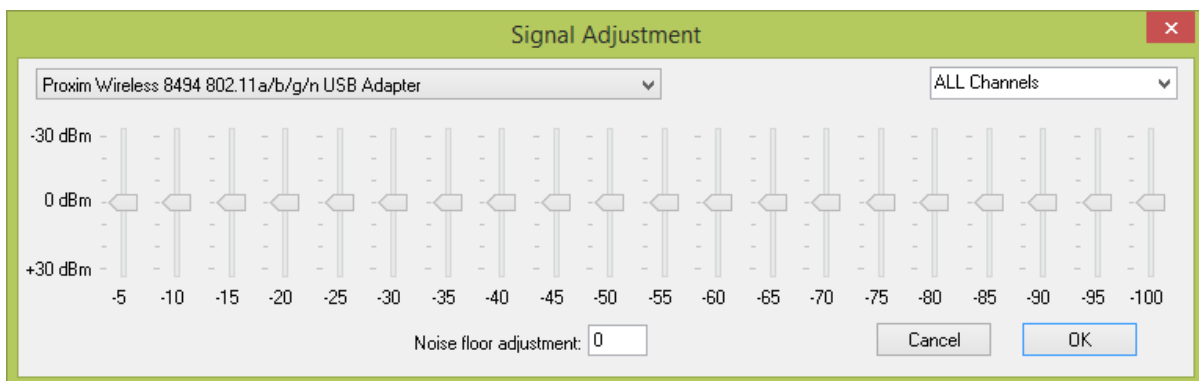
2. From the upper-right corner, click the down arrow and select a channel of interest.

*Note: Normally, signal adjustment is performed on a per-channel basis unless you want to apply the same adjustment to all channels. In this case, you should select **All Channels** from the channel list menu.*

3. Use the sliders to adjust the RF signal strengths.

4. If you wish, highlight the number for the Noise floor adjustment box and type a new value over it.

5. Click **OK** when completed.

Display View

About Display view

The Display view is designed for viewing, analyzing, and manipulating data. Normally, you use this view only after you have completed <u>and saved</u> a survey and/or site plan. To open the Display view, click ![Display] on the Navigation Bar.
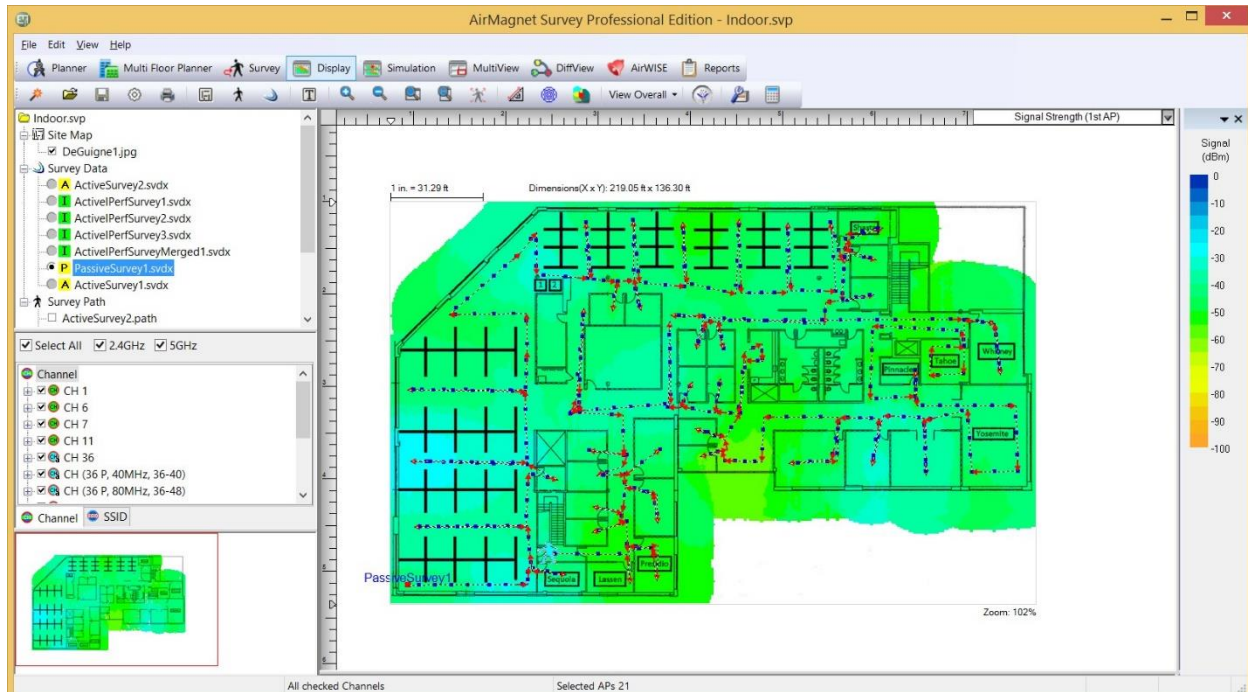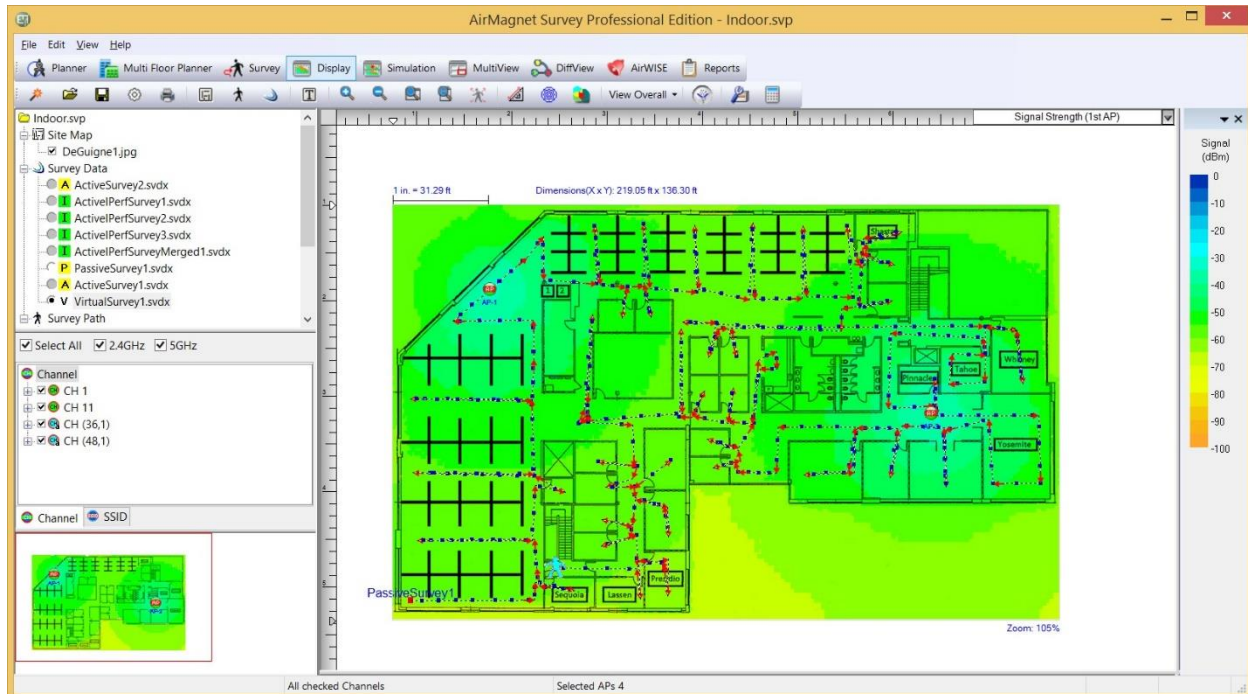
By default, the Display view is selected when a project file (.svp) is opened. The view may show the site map only, without any data. To show data over the site map, you must open one of the data files listed under Survey Data in the Project Window by clicking the corresponding radio button.

Some changes occur in the Display view when survey data are loaded. The Spectrum XT Window may appear if you are running AirMagnet Survey PRO, provided that this feature is enabled. Refer to Enabling Spectrum Analyzer.

Display View Menu Options

The Menu bar on the Display view also has three menu groups, each containing various menu options for viewing, analyzing, and manipulating survey data. Except for the Help menu whose content stays the same for all the screens, the File and View menus contain options that are specific to the Display view only.

File Menu

The figure below shows the File menu on the Display view.
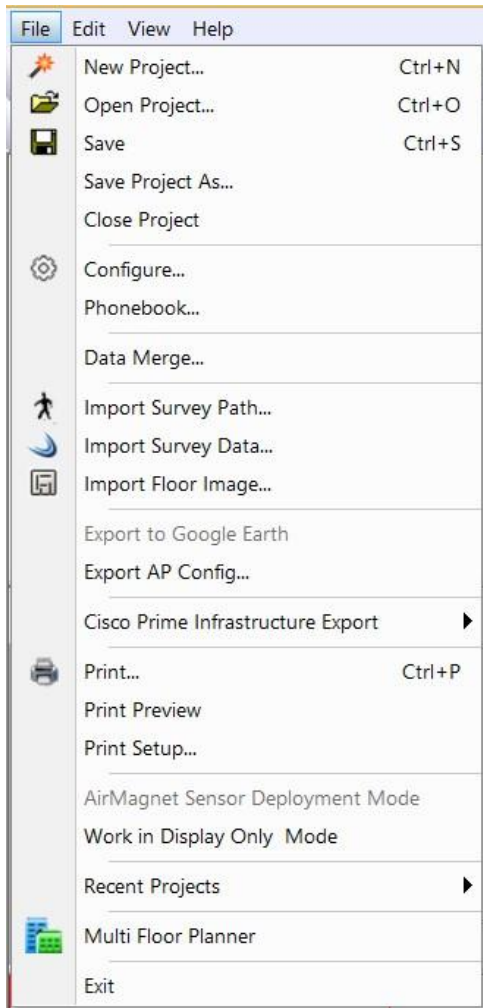
Menu Option	Description
New Project...	Opens the New Project Wizard where you can create a new project.
Open Project...	Opens an existing project (.svp) file.
Save	Saves changes made to the current project. Note: This option is available only when changes are made to an opened project file.
Save Project As...	Allows you to save an existing project under a new file name.
Close Project	Closes the current project.
Configure...	Opens the Configuration dialog box which allows you to set up project parameters.
Phonebook	Configure a VoFi Phonebook. Refer to Configuring a VoFi Phone Book.
Data Merge	Opens a window containing all data files so that you can select the files you want to merge.
Import Survey Path...	Opens the Import Site Survey Path File dialog box where you can import the survey data file. Also see Import Path on the toolbar.
Import Survey Data...	Opens the Import Site Survey Data File dialog box so that you can import the data of an existing survey project.

Import Floor Image…	Opens the Open Site Image dialog box so that you can import a site map.
Export to Google Earth	Enables you to export a GPS survey for viewing in Google Earth.
Export AP Config…	Opens the Export AP Config dialog box so that you can export AP configuration data in the Excel format.
Cisco Prime NCS/WCS Export	If a Cisco Prime NCS/WCS Planner or Survey project was imported and modified, it may be exported using these options.
Print	Prints the content of the Map Window.
Print Preview	Opens the Preview Window so that you can preview what is to be printed.
Print Setup	Opens the Print Setup window where you can set your printing preferences.
Work in Display Only Mode	Allows you to switch to Viewer mode. You will have fewer view options and no survey options.
Recent Projects	Allows you to quickly open projects that have been viewed recently.
Multi Floor Planner	Opens Multi Floor Planner
Exit	Exit the software application

View Menu

The figure below shows the View menu on the Display view.

Option	Description
Zoom In	Enlarges the view of the current floor map in the map window. It works in the same way as ![zoom in icon] (**Zoom In**) on the toolbar.
Zoom Out	Reduces the view of current floor map in the map window. It works in the same way as ![zoom out icon] (**Zoom Out**) on the toolbar.
Zoom to Fit	Fits the current floor map to the map window. It works in the way as ![zoom fit icon] (**Zoom Fit**) on the toolbar.
Zoom to Actual Size	Fits the current floor map to its actual print scale. It works in the same way as Actual Size ![actual size icon] on the toolbar.
Set Zoom...	Opens the Set Zoom dialog box where you can specify the specific ratio at which the view of the map can be increased.

Show CAD Layers...	Allows you to select which layers of a CAD image to display and, if the image has multiple layouts, which layout to display. This feature is also available when you right-click on the image in Display View.
Toolbars and Docking Windows	Enables you to show (checked) or hide legend and/or status bar. If the default toolbar settings are modified, click **Reset Toolbar** to reset the toolbar to default setting.
Show Rulers	Allows you to show or hide the rulers along the edge of the map window.
Show Grids	Allows you to show or hide grids in the map window.
Invert Legend Colors	Flips the legend color scheme vertically.
Filter APs	Brings up the Data Filtering by AP dialog box which allows you to create a filtered survey data file which contains data only related to the selected APs. Refer to Creating Filtered Data Files.
Overlap	Allows you to show or hide signal overlap or channel interference in the Map Window. Make sure the Data Type selected is 1st AP.
Overall	Displays overall site RF coverage. This option is active by default.
Per Channel	Displays data by channel.
Per SSID	Displays data by SSID.
Lock AP Location	Allows you to lock APs to their respective locations on the site map. Note: This feature can help make your survey results more accurate.
Project Properties...	Opens the Project Properties window where you can adjust the physical properties of the floor map of the survey site.
AP/Path Name Font...	Opens the Font window where you can modify the font properties of APs and survey paths on the floor map.
Measure Mode	Sets Measure Mode so you can measure the distance between any two points on the site map.
Throughput Simulator	Opens the Throughput Simulator. Refer to About Simulation view.
Refresh	Refresh the heatmap display to reflect any changes. Same as Refresh on the Toolbar.

Project Window

The figure below shows the Project Window on the Display view.
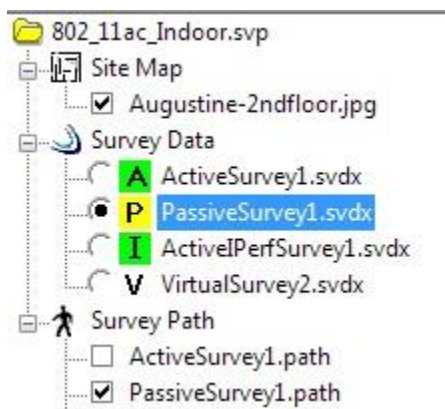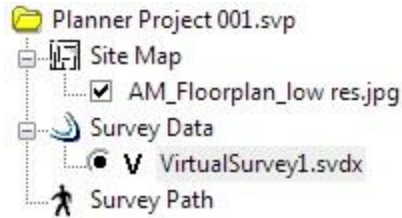
As shown in the figure above, the Project Window displays files in a Survey project in three folders:

- **Site Map:** Shows all the site maps (floor plans) for the Survey project. To select a site map, put a check mark in the check box in front of the map file. The selected map will be displayed in the Map Window. By default, a site map is automatically selected and displayed when a new project is created, or when an existing project is opened.

- **Survey Data:** Lists the data files available in this project, each file representing an individual survey. They contain data such as SSIDs, APs, signal strength, noise level, signal/noise ratio, etc. captured during the survey. File types are as follows: **A** (active survey), **P** (passive survey), **I** (Iperf survey), **Ma** (merge surveys), **Ms** (merged surveys), **S** (simulation survey), **An** (AirMapper™/AirCheck™ Survey) and (VoFi survey), **V** (virtual survey).

- **Survey Path** (this option applies to Survey projects and not to Planner projects): Shows all the survey paths recorded during a site survey. You can have as many survey paths in the folder as you recorded, and display as many of them as necessary. To display a survey path, put a check mark in the check box in front of the survey path file.

You can show or hide any file (that is, site map, survey data, survey path) simply by checking or un-checking the corresponding radio button. Unlike the Project Window on the Survey view, the Project Window on the Display view has a Survey Data folder instead of the AP folder.

By default, the most recently opened site map is automatically selected and displayed when you switch to the Display view. If a project contains more than one site map, you may need to select the one you want to display if it is not already opened. Also, no survey data are displayed in the Map Window when you switch to the Display view. You need to select a survey data file to display it.

Data File Conversion

Beginning with Survey PRO/Planner version 8.8, the project data file extension was changed from .svd to .svdx. A project containing data files having the .svd extension may be opened in version 8.8 and higher; however, if the data file is selected in Display view (for example), you will be prompted to convert the file from .svd to .svdx.

MultiFloor Planner projects are not affected by this change.

During conversion, the old file is preserved and a new .svdx file is created.

Survey PRO, Survey Express or Survey Planner version 8.7 or earlier cannot open projects that have the .svdx extension.

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To Convert your Survey Data Files to .svdx:

1. In the **Display View**, right click on the project, and select **Convert Surveys to Current Version**.
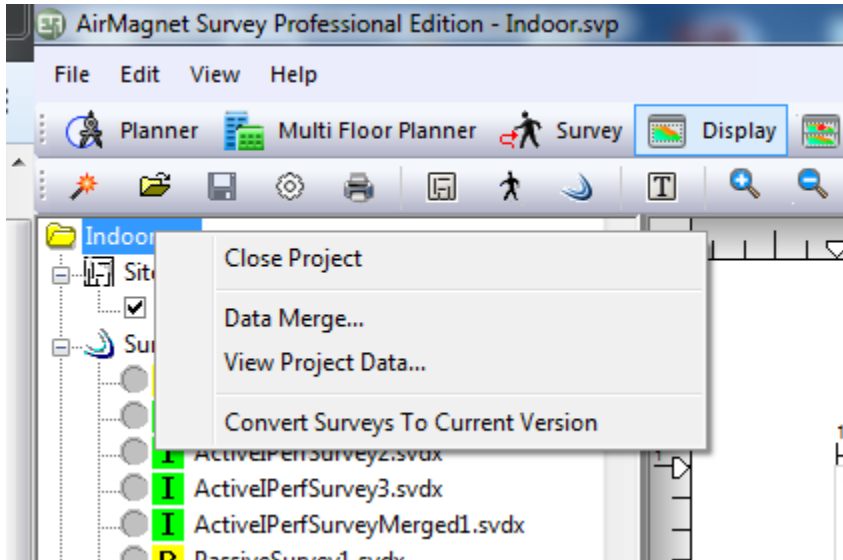
2. Click **Yes** to confirm and start the conversion process.

A progress window will show the files being converted. If you click **Cancel** during file conversion, the process will cancel after the current file completes and before the next file begins.

Right-click Pop-up Menu

The Project Window on the Survey view and Display view also includes a right-click menu. Some options are available in Survey view and others in Display view. Unavailable options are grayed-out.

Right-click a survey data file to view the right-click menu options.

Menu Option	Description
Close	Close this data file
Delete	Deletes the selected (right-clicked) item.
Rename	Rename this data file
Data Merge...	Allows you to merge two or more data files. *Note: This option is available on Display view only.*
View Merged Source ...	Shows the sources from which a merged data file was created.
View Survey Properties ...	Opens a window that displays information about the file.

View Survey Properties

From the Project Window, right-click a survey data file (.svdx), and select **View Survey Properties** from the pop-up menu. The Survey Properties dialog opens, as illustrated below.

Note: This option replaces "View Raw Data" in Survey version 8.8 and higher.

The Survey Properties dialog provides information about the selected survey data file.

View Survey Database

The Survey Properties includes an option to view in-depth, database details included in the selected survey data file.

To view the database, you will need a database viewer application such as "DB Browser for SQLite". This application may be downloaded at http://sqlitebrowser.org/

Click **View Survey Database**. You may be prompted by Windows to associate the database with the desired database viewer application.

Right-Click to Show CAD Layers...

From the Project Window, right-click a CAD image file, and select **Show CAD Layers...**

The Drawing Layers… dialog opens, as shown below.

Displaying a Site Map

By default, the most recently opened site map is automatically selected and displayed when you switch to the Display screen. If a project contains more than one site map, you may need to select the one you want to display if it is not already opened.

To select a site map:

Select the check box in front of the site map. The selected site map appears in the Map Window.

To deselect a site map:

Do one of the following:

- Uncheck the check box in front of the site map, or
- Select another site map.

Displaying Survey Data

Each survey data file contains the RF data. By default, no survey data will be displayed in the Map Window when you switch to the Display screen. You need to select a survey data file to display it.

To display a survey data file:

Click the radio button in front of the data file. The data in the selected survey data file populates the Map Window once the file is loaded. The time it takes to open a data file depends on the size of the file. Some survey data files may take significantly longer to load mainly because of the enormous amount of data contained in those files.

Displaying a Survey Path

In order to have a better understanding of the survey data, Airmagnet recommends that the survey path be shown on the site map when analyzing survey data. This provides a physical context for the data.

To display a survey path: Select the check box associated with the survey path. The selected survey path appears in the Map Window.

To hide the survey path: Uncheck the check box in front of the survey path.

Channel/SSID List

The Channel/SSID List allows you to view the list of channels or wireless networks contained in a selected survey data file. You can make the selection by clicking either the **Channel** or **SSID** tab at the bottom of the list.

When a data file is selected in the Project list, the Channel/SSID List can be expanded to show individual APs. The APs are organized by Channel or SSID depending on the tab

selection. The APs will display its associated 802.11a/b/g/n/ac/ax icon (for example,).
802.11ac/ax APs include the primary channel, channel width, and channel span.
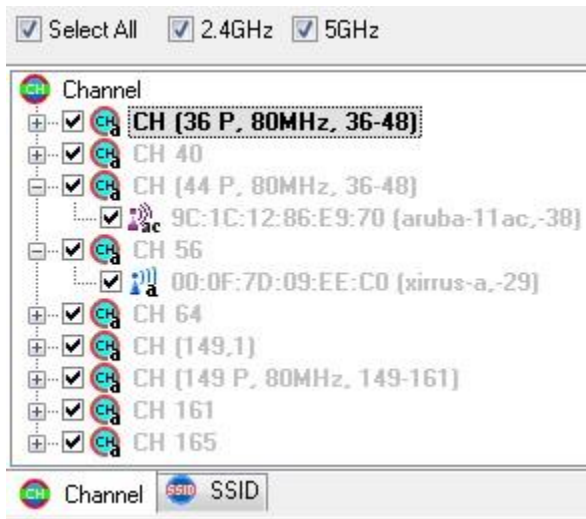
This part of the Display view contains the following control options for manipulating data display:

Select All: This option enables you to select or de-select all the entries (that is, channels, SSIDs, APs, etc.) in the Channel/SSID tree with a click of the button. By default, all entries in the Channel/SSID tree are selected when a survey data file is loaded, meaning that all the data contained in the file will be shown in the Map Window.

If you want to focus on data related to one or more specific channels, SSIDs, or APs, you can uncheck this option to clear all the selections. At this point you can manually select only those entries that concern you the most. These filter selections will be preserved when changing heatmap Data Type options.

2.4 GHz: This option enables you to display or hide signal information for the 2.4-GHz (11b/g/n/ax) spectrum. This makes it easy to distinguish between 802.11b/g/n/ax data and 802.11a/n/ac/ax on a map that contains both types.

5 GHz: This option enables you to display or hide signal information for the 5-GHz (11a/n/ac/ax) spectrum. Enabling this option along with the 2.4GHz option described above displays all media types detected in an environment that utilizes both 802.11a/b/g/n/ac/ax devices.

Note: You may also create a filtered survey data file which contains data only related to selected APs. Refer to Creating Filtered Data Files.

Placing APs on the Floor Plan

While in Display view, you may expand the Channel/SSID list to view APs contained in the survey data file. If desired, you can drag APs from this list to their location on the floor plan. There are a few benefits to doing this:

- Showing the physical location of APs in reports
- Modifying the AP power setting

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- Using features such as Cisco Location-based services

Note: Physical APs with more than one radio may be listed in the Channel/SSID list multiple times relative to the number of radios. If this is the case, you can place APs on top of each other on the floor plan.

After placing the AP on the floor plan, you may modify a few of the properties of an AP. To do this, right-click the AP and select **AP Properties**. This opens the **AP Properties** dialog. A few options are editable.

Alias Name: You may type an alias name to map a full MAC address to a user-friendly name. Alias Name is included in the AP information line in the Channel/SSID list. Select the drop-down menu next to Alias to apply the Alias name to the whole Project or only the currently opened survey.

The format for items in 'MyAccessPoints.txt' is as follows:

MAC Address, alias

For example:

01:23:45:67:89:0A, My Favorite AP

Original and Simulated Power Setting: You may also modify the power setting in milliwatts. Select **Apply power setting**, and check the **Center on AP** checkbox to apply the power setting around the AP.

Click **OK** to save the changes.

> **Note:** For information about adding APs to the survey project (Survey view) and about deleting placed APs from the project and from individual data files, refer to _Placing APs in the Survey_.

Overview Window

In the lower left-hand corner of the Display view is the Overview Window, which provides a bird's-eye view of the entire site map regardless of the viewing option used in the Map Window. It enables you to try different viewing options in the Map Window without "losing the big picture."

By default, the Overview Window is enclosed by a red box when a survey data file is opened, indicating that you are now focusing on the entire site (map). If you want to focus on a specific area of the site, you can click outside the red box to make it disappear and then click and drag a smaller box on the map. You can then drag this box to zoom in on any specific area on the map to get a close-up look at that section in the Map Window.

Map Window

The Map Window on the Display view allows you to view and analyze data contained in the selected data file.

Data at any location on the site (XY coordinates) may be viewed in two ways: Mouse hover and Measurement Details. In each case, the data displayed depends on the Data Type selection in the drop-down at the top of the Display view.

Mouse hover: If you hover the mouse over a point on the heatmap, a summary of the current Data Type selected is displayed in a balloon tip.

Measurement Details: You can view the Measurement Details of any location on the heatmap by clicking the desired XY coordinates on the heatmap. A dockable window will open to display the details data. A red push pin indicates the coordinates location selected. Click a column heading to sort data by column in ascending or descending order.

From the dockable window, click **Copy** to copy the data details to the clipboard.

You can also visualize and analyze the data using different color schemes and analytical tools. Refer to Performing Data Analyses for more information.
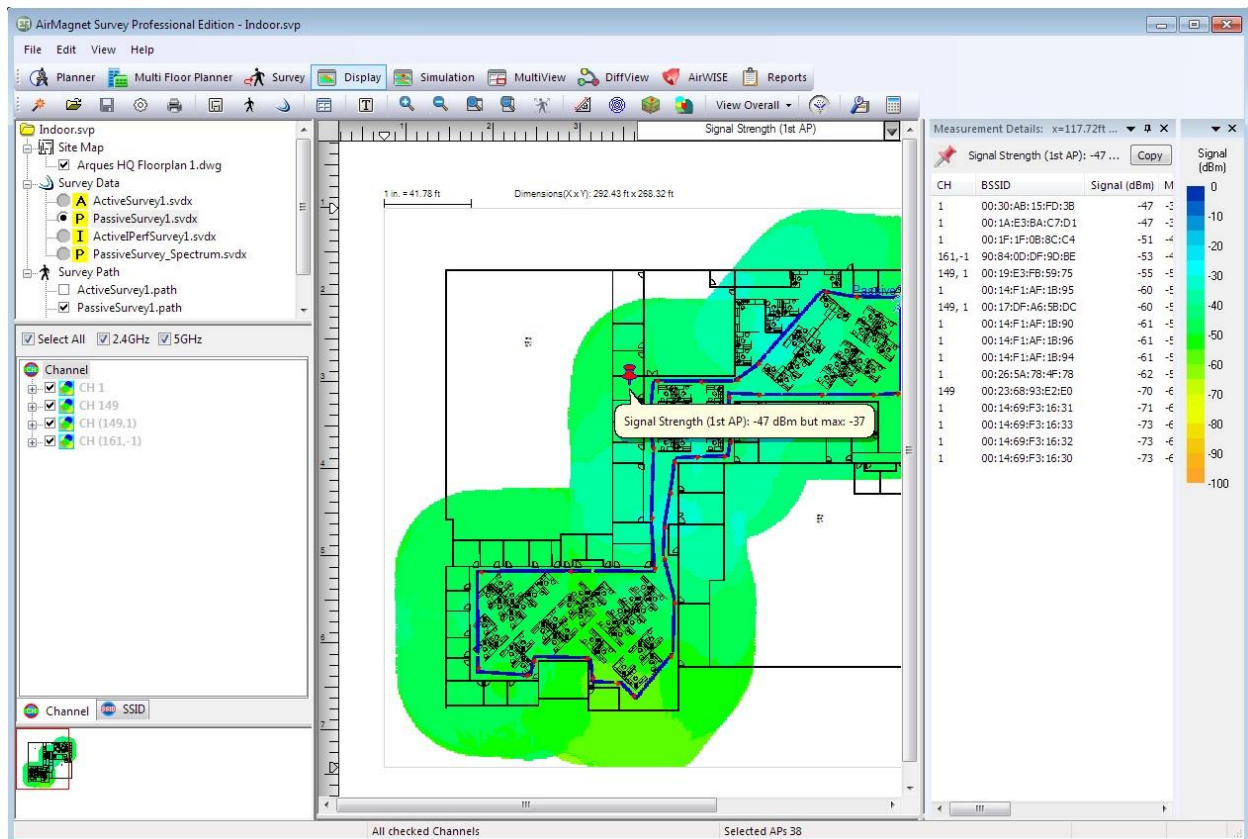
Display View Toolbar

The Toolbar on the Display view contains frequently used tools for presenting survey data. Some of these tools are identical to those on the File and View menus of the Display view.

The following screen shot shows the toolbar undocked. The toolbar may be undocked by dragging its handle located on the far left.

Icon	Name	Description
	Project Wizard	Opens the New Project Wizard where you can create a new Survey project. Refer to File menu.
	Open Project	Opens an existing Survey (.svp) file. Refer to File menu.
	Save	Saves changes you've made in the current project.
	Configuration	Opens Survey Configuration window. Refer to File menu.
	Print	Prints what is shown in the Map Window.
	Site Image	Opens the Import Site Image window so you can import a site map.
	Import Path	Opens the Import Site Survey Path File dialog box where you can import the survey path of a survey data file.
	Import Survey Data	Opens the Import Site Survey Data window so you can import site survey data (.svd or .svdx) files.
	Zoom In	Enlarges the view of the site map.
	Zoom Out	Reduces the view of the site map.
	Zoom Fit	Fits the site map to the Map Window.
	Actual Size	Displays the site image in a size as it is printed.
	Measure Mode	Starts the Measure Mode so that you can measure the distance between any two points in the site map. Refer to Measuring Distance Between Locations.
	Toggle Outline	Enables you to view an outline of where a heatmap transitions from one legend value to the next value.
	Create Comment	Allows you to place a comment field anywhere on the displayed map. To do so, click the button and then click where the comment should be inserted.
	Refresh	Generate and refresh the heatmap
	Overlap	Show or hide coverage overlap in the Map Window. Available in Display view. Be sure 1st AP Data Type is selected.
	Filtering	Filter AP data out of the Planner project.
	Tools	Opens the Signal and DHCP tools.
	Calculator	Opens the calculator tool.

The Display view Toolbar also includes a drop-down menu with the following options:

View Overall: Displays overall RF coverage in the Map Window. This option is active by default.

View Per Channel: Displays data by channel. The Channel tab in the Channel/SSID list must be selected.

View Per SSID: Displays data by SSID. The SSID tab in the Channel/SSID list must be selected.

Legend

The right-hand side of the Display view shows the Legend which provides a variety of ways for displaying and analyzing survey data using different color schemes and patterns.

Note: The colors gray and white may appear in a heatmap and not be indicated on the legend. White may indicate no coverage. Gray may indicate that a coverage requirement is not met.
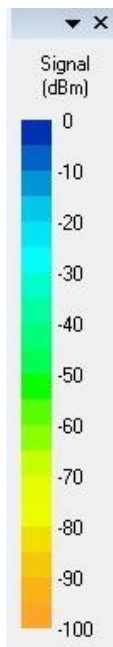
At the top of the Legend is the **Data Type** (including its unit of measure). It indicates the type of data being displayed in the Map Window and reflected in the Legend. It is identical to what is selected from the Data Type list menu on top the Map Window.

You may set the upper and/or lower limit of RF data (signal, noise, interference, and so on.) to be shown in the Map Window by dragging up from the bottom of the Legend and/or down from the top of the Legend.

The color scheme may also be adjusted. Refer to Configuring Legend Color Schemes.

Measuring and Calibrating the Floor Plan Scale

An easy-to-use measurement tool enables you to measure distances on the floor plan relative to the floor plan scale. It also enables you to recalibrate the scale of the floor plan (in feet or meters).

When you create a new project and load a floor plan image, there is an option to enter the dimensions of the floor plan image in feet or meters (X and Y dimensions). Keep in mind that entering dimensions using this method includes any white space outside the perimeter of the building that may be included in the image. In most cases, it is probably more accurate to recalibrate the scale. In fact, if you leave the dimensions blank when creating a new project, you will be prompted at the conclusion of the project wizard to recalibrate the default scale.

To recalibrate the scale of the floor plan:

1. From the Toolbar, click the **Measurement** tool . A prompt is displayed to choose whether to measure or recalibrate. To recalibrate, click **Yes**.

2. The idea is to click two points on the floor plan where you know the actual distance between the points. A rule of thumb is that a longer distance tends to be more precise than a shorter distance.

3. This opens the Recalibration dialog.
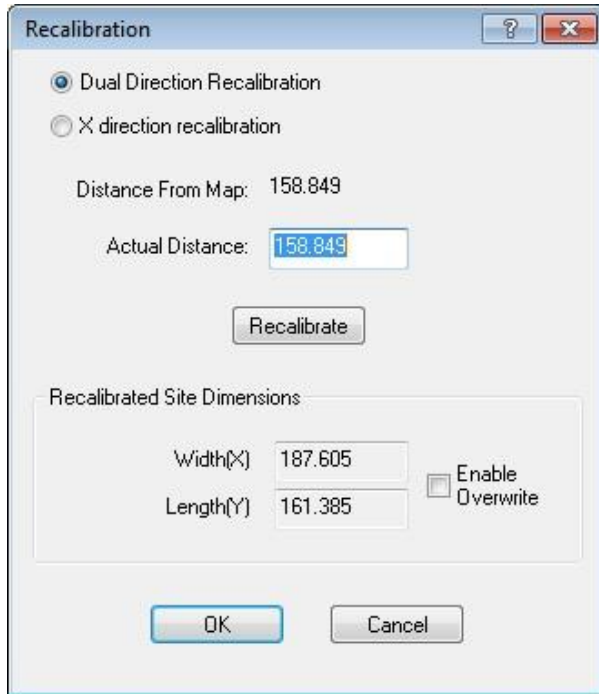
4. Enter the correct value for the "Actual distance" you measured, click **Recalibrate**, and then click **OK**.

To measure a distance on the floor plan:

1. From the Toolbar, click the measurement tool ⬜. A prompt is displayed to choose whether to measure or recalibrate. To measure, click **No**.

2. Click the measurement beginning point. As you move the mouse, the distance is indicated in feet or meters depending on the unit of measure selected for the project. Click an end point to complete the measurement.

Data Type List Menu

This option is available on the Display view only after data are loaded, that is, after a data file is opened from the Project Window. It allows you to select the type of data you want to display in the Map Window. You can access the options by clicking the down arrow.

The data types presented here are related to the selection you make from the Channel/SSID Tree. It affects the content displayed in the Map Window and may also affect the options on the Color Legend and Analytical Tools.
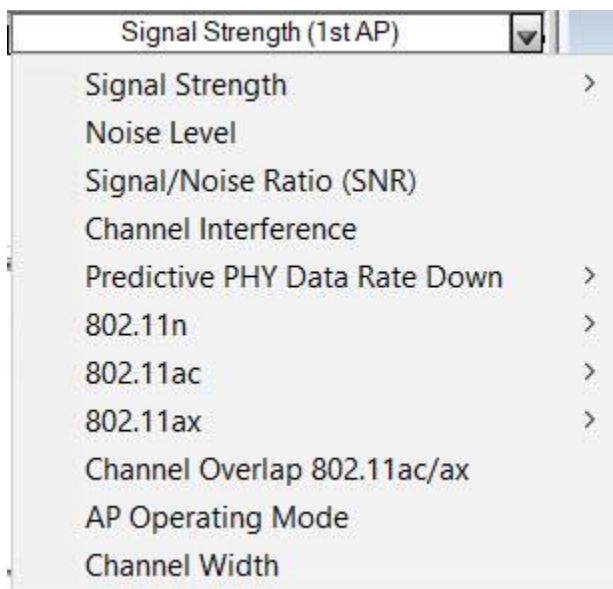
Using Context-Sensitive Pop-up Menu

A context-sensitive pop-up menu can be accessed by right-clicking the Map Window. It is available on all major screens of the application. As the name suggests, the content of the pop-up menu depends on the view context.

To access the context-sensitive pop-up menu:

1. Right-click any part of the map view. The context-sensitive pop-up menu appears.
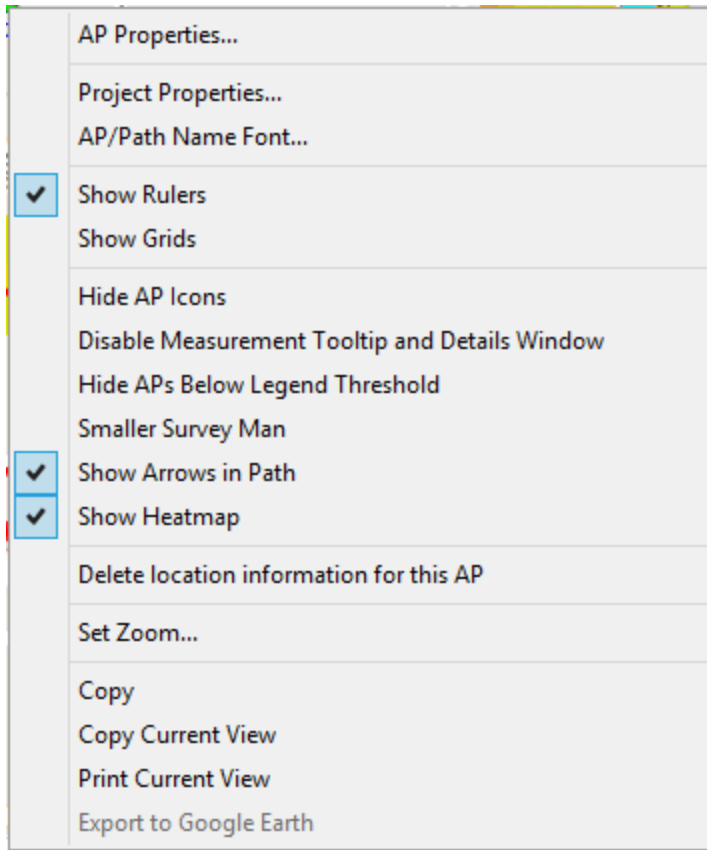
Option	Description
AP Properties	Allows you to view the properties of the AP that you right-clicked. This option is available only when you right click an AP in the Map Window.
Project Properties	Same as View Menu.
AP/Path Name Font	Same as View Menu.
Show Rulers	Same as View Menu.
Show Grids	Same as View Menu.
Hide AP Icons	Allows you to hide the AP icons from view so that they will not be displayed in reports.
Disable Measurement Tooltip and Details Window	Allows you to prevent tip screens from popping up when you mouse over the Map Window.
Hide APs Below Legend Threshold	Enabling this option will hide APs outside the threshold range set for the Legend. Keep in mind the ends of the Legend may be dragged toward the center to adjust the range.
Smaller Survey Man	Shrinks the icon of a person on the map. This applies only to a site survey.
Show Arrows in Path	Enabling this option adds directional arrows to survey paths. This is helpful for indicating the beginning to end course of the path taken during the survey. Not applicable to Planner.
Show Heatmap	Disabling this option will remove heatmap from the view.

Delete location information for this AP	Removes the location information of the selected AP.
Set Zoom…	Allows you to set the zoom level. Same as Zoom tools on Toolbar and View menu.
Copy	Same as View Menu.
Copy Current View	Allows you to copy and paste the content in the current Map Window to another application. It is especially useful for copying a zeroed-in area for detailed analysis.
Print Current View	Allows you to print the content in the current Map Window to another application. It is especially useful for printing a zeroed-in area for detailed analysis.
Export to Google Earth	Allows to export the data to Google Earth.

Merging Survey Data

Merging survey data means combining different survey data files into one file that includes all the data collected from the individual files.

> **Note:** If two data files contain placed APs having the same MAC address and any were moved, you are prompted that the location of APs was changed between surveys.

To merge survey data files:

1. Click **File>Data Merge**…. The Data File Merge window appears.
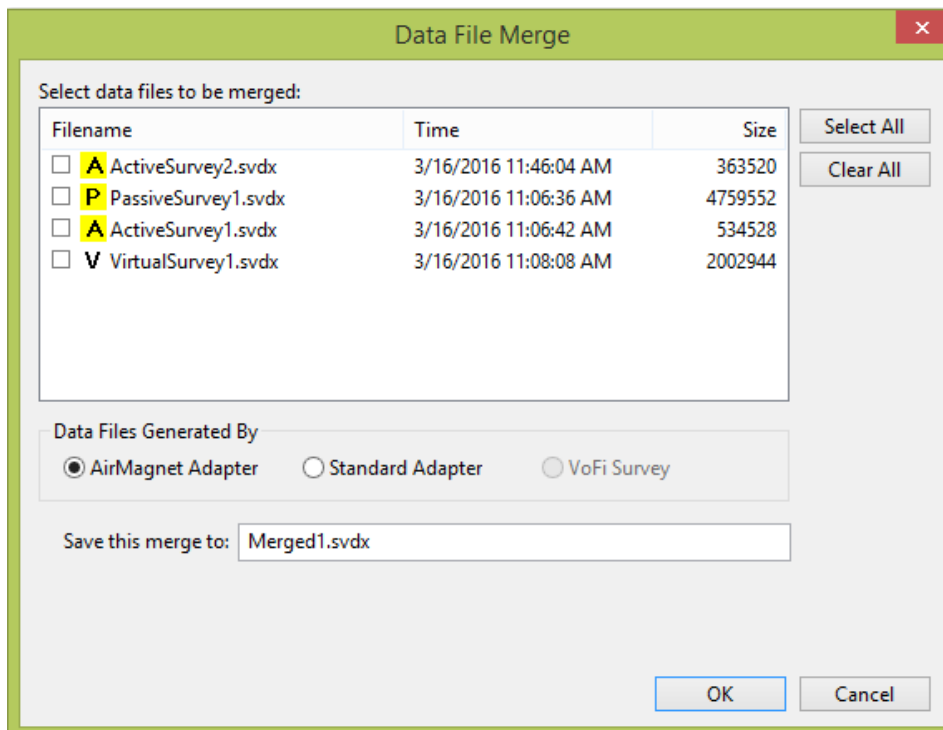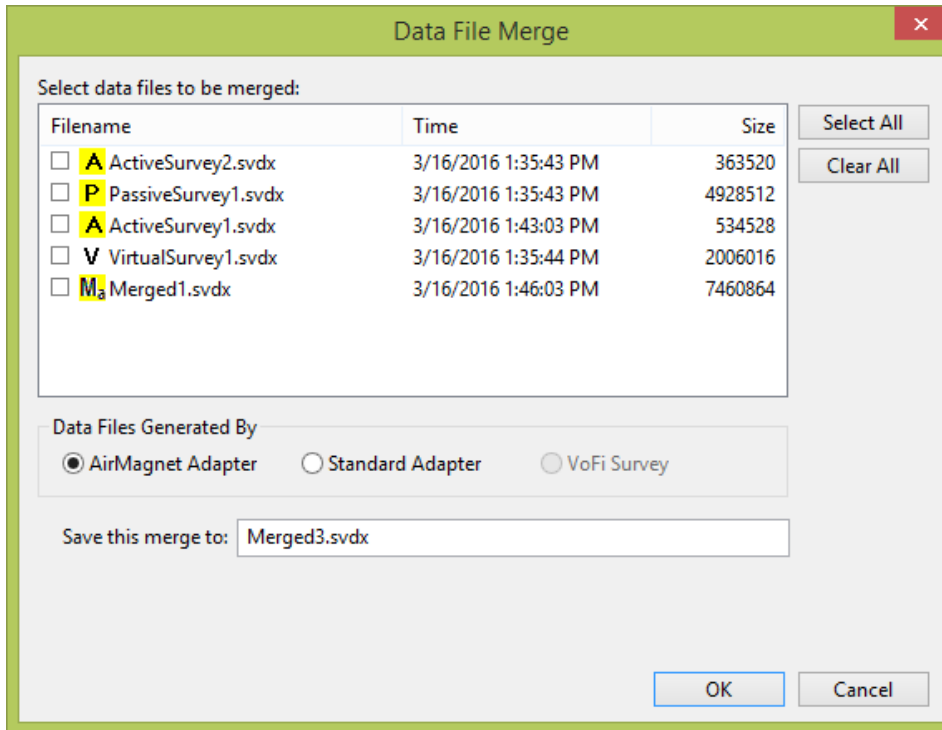
2. If the project contains data files generated by both an AirMagnet adapter and non-preferred adapter, you can only merge files of the same type. In this case, under **Data Files Generated By,** select the desired adapter. Only data files created by that adapter type will be listed.

3. Check the files you want to merge.

4. In **Save this merge to**, type a name for the merged file.

5. Click **OK**. The file-merge progress bar appears at the bottom of the Map Window, showing the progress of the merge operation. The newly merged file appears in the Project Window under Survey Data once the merge is completed.

6. To display the merged file, click the radio button in front of it.

Note: After a merged file is created, you can view the list of source files that were used to create the merged file, by right-clicking the file and selecting "View Merged Source" from the pop-up menu.
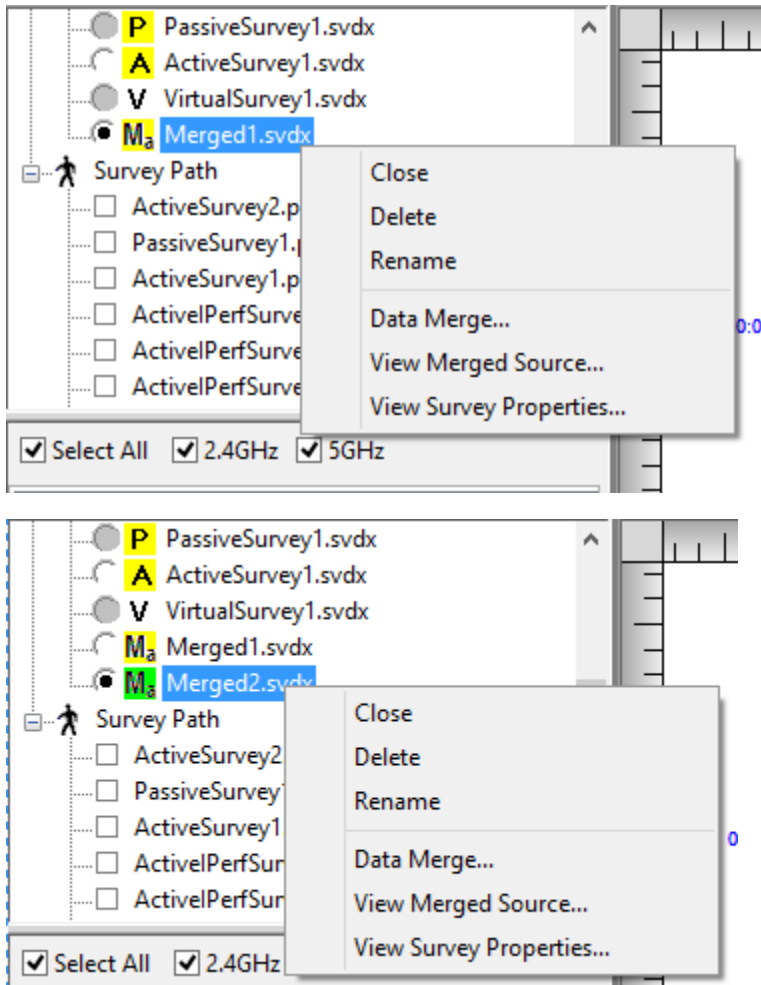
Creating Filtered Data Files

You may create one or more data sub-set(s) of a Survey Data file (a filtered data file). The new filtered data file is added to list of survey data files.

To create a filtered data file:

1. Select the desired Survey Data File.

2. From the Toolbar, click **Filtering** . The **Data Filtering** window appears.
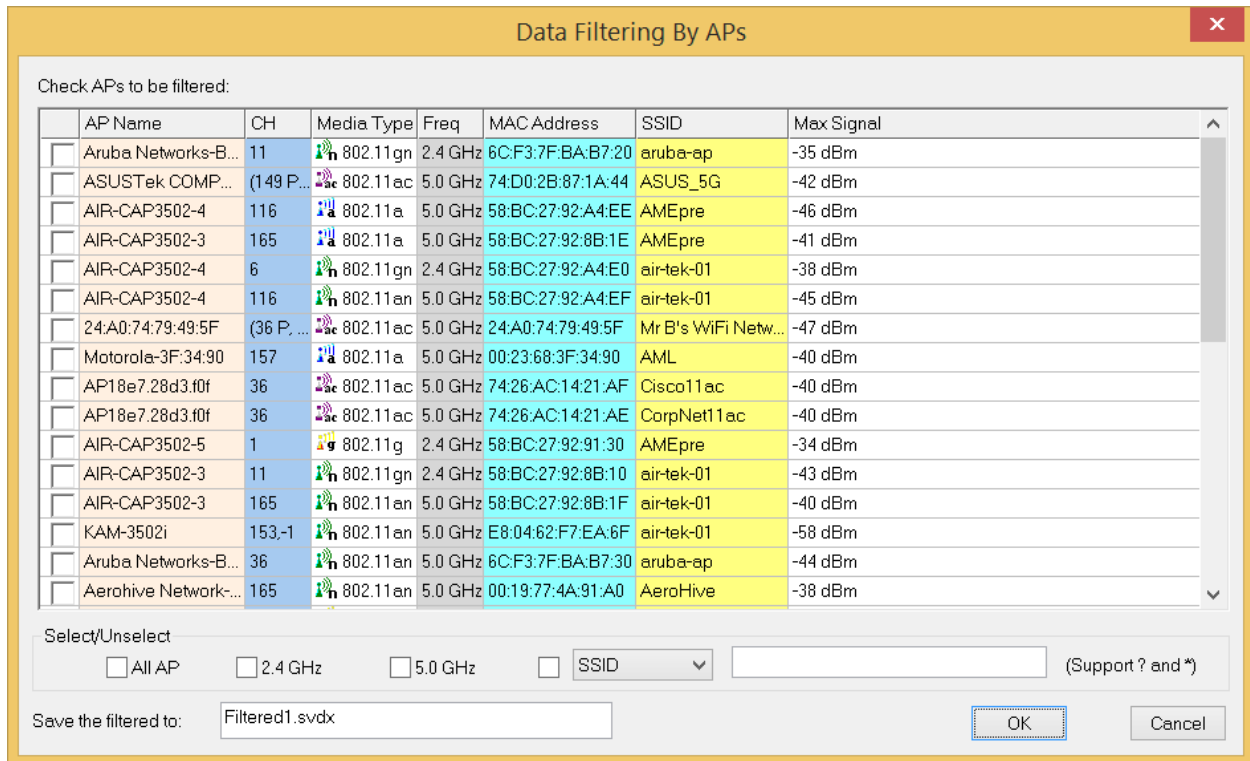
3. You can use various controls to sort the AP listings:

- Column headings sort by the column type.

- All AP check box selects all listings.

- 2.4 GHz check box selects only APs set to 2.4 GHz.

- 5 GHz check box selects only APs set to 5 GHz.

- SSID, AP Name, MAC drop-down: Select an option from the drop-down, type the desired name and check the box. Two wild cards are supported: Use * for incomplete name (e.g. 00*); Use ? to replace an unknown character (for example, Cisco-123?). Matches are case sensitive.

4. Check the box to select the AP(s) of interest.

5. In **Save the filtered to:** type a name for the filtered data file.

6. Click **OK**. The newly created filtered file appears in the **Project** window under **Survey Data**.

Performing Data Analysis

How to Evaluate Overall Site Signal Coverage

To evaluate the overall RF signal coverage at the site:

1. If your project includes more than one survey, you may choose to merge the survey data files before performing data analysis.
2. From the Project Window, select the desired data file.
3. Click the **SSID** tab and select the SSID from the SSID List.
4. From the Data Type drop-down menu, select **Signal Strength**.
5. From the Toolbar drop-down, select **View Overall**.
6. Use the colors on the Legend to determine the signal strength at different locations.
7. Set the upper and/or lower limit of signal strength on the Legend.
8. Move the cursor to different locations to view details of signal strengths from the pop-up view.
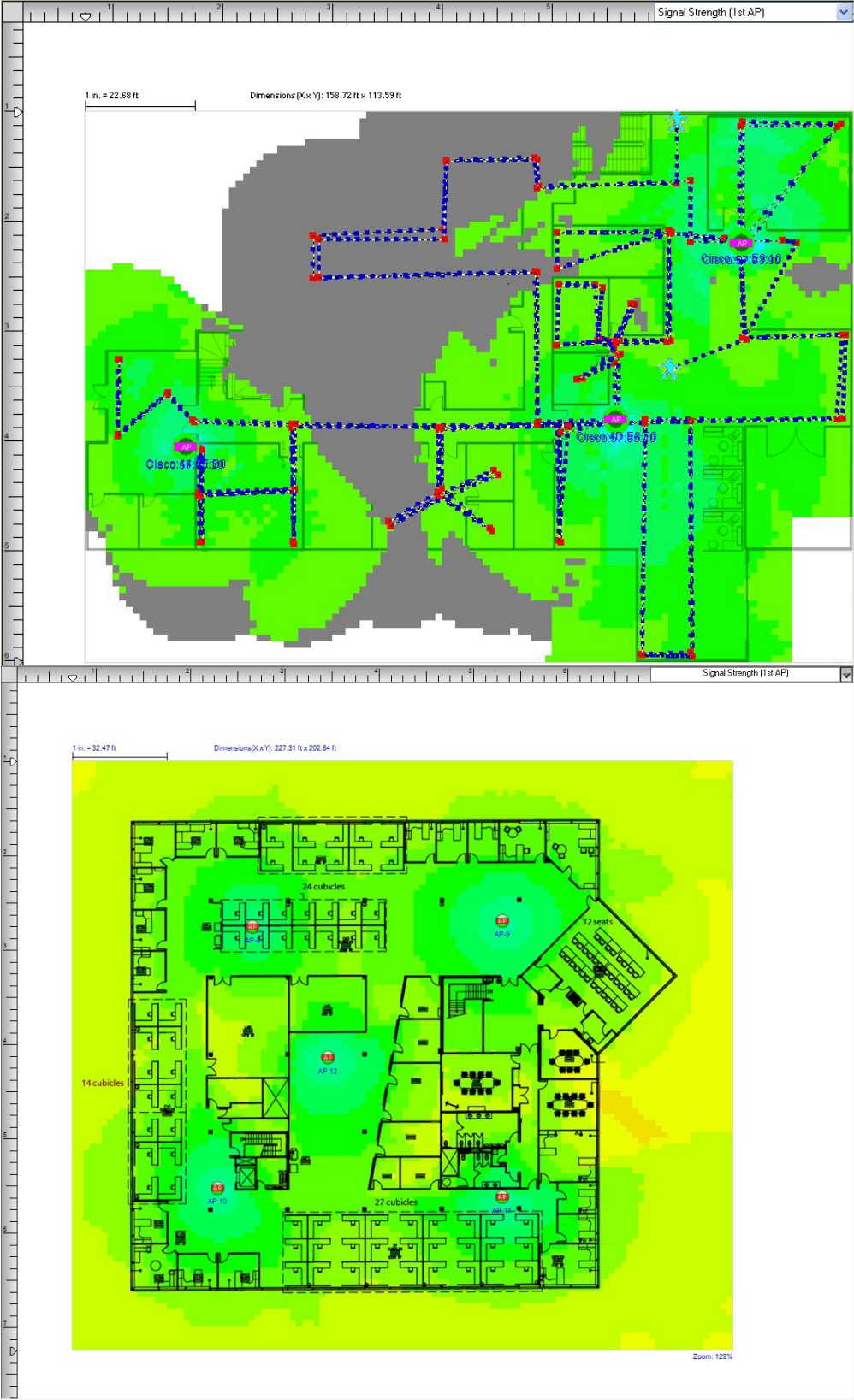
> *Note:* Areas of different signal strengths are indicated by different shades of colors. Areas that fall out of the signal strength range are grey (as shown above).

How to Identify Coverage Cells by Individual APs

To identify the coverage cells by individual APs:

1. If your project includes more than one survey, you may choose to merge the survey data files before performing data analysis.
2. From the Project Window, select the desired data file.
3. Once the data are loaded, click the **SSID** tab and highlight an SSID from the **SSID** List.
4. From the **Data Type** drop-down menu, select **Signal Strength.**
5. From the drop-down on the Toolbar, select **View per AP**. Areas covered by different APs are shown in different colors.
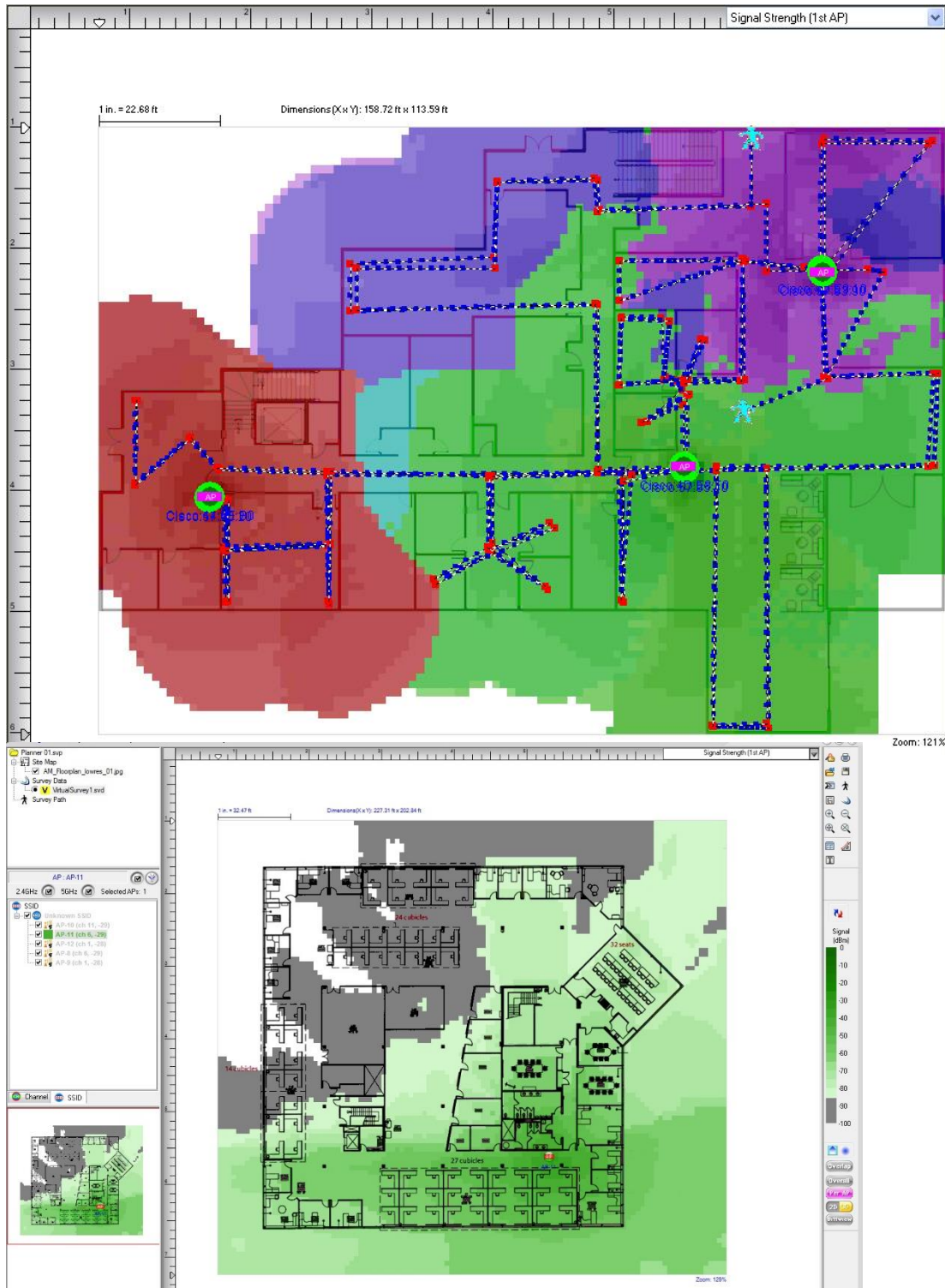
How to Determine the Number and Placement of APs

To determine the optimal number and placement of APs:

1. If your project includes more than one survey, you may choose to merge the survey data files before performing data analysis.

2. From the Project Window, select the desired data file.

3. Once the file is loaded, click the **SSID** tab and select an SSID.

4. Uncheck the APs that are of no interest to you.

5. From the **Data Type** drop-down menu, select **Signal Strength**.

6. From the drop-down on the Toolbar, select **View per AP**. This displays the APs in the color as they appear in the SSID List.
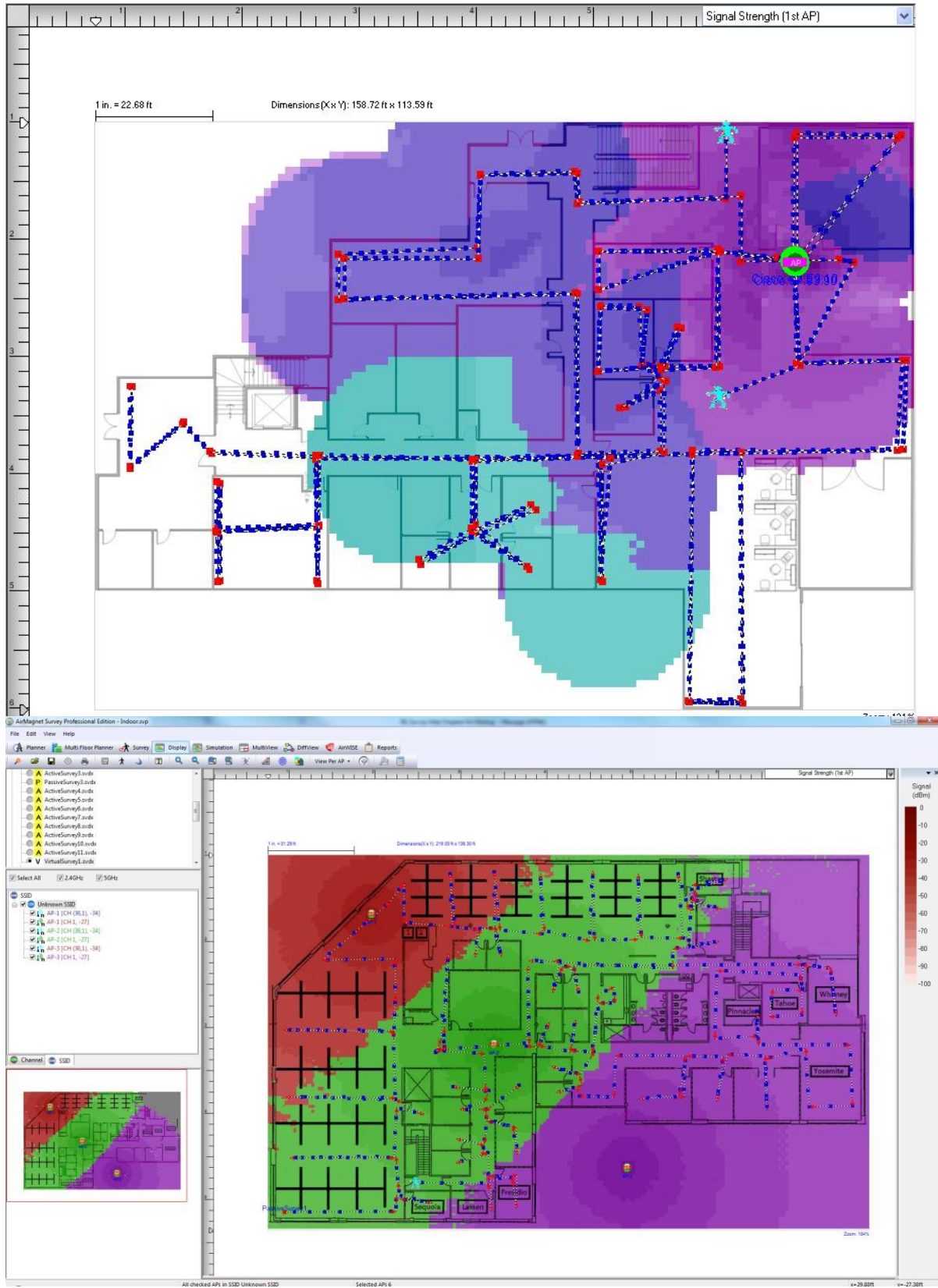
Note: The figure above shows two APs selected; the heatmap reveals that these four APs provide coverage for virtually the entire map.

How to Determine Cell Overlap

To determine a cell overlap:

1. If your project includes more than one survey, you can choose to merge the survey data files before performing data analysis.
2. From the Project Window, select the desired data file.
3. From the Channel/SSID Tree, click the **SSID** tab and highlight an SSID of interest.
4. Make sure all APs under the SSID are checked.
5. From the **Data Type** drop-down menu, select **Signal.**
6. From Toolbar, click (**Overlap**).

1 in. = 22.68 ft   Dimensions (X x Y): 158.72 ft x 113.59 ft

Signal Strength (1st AP)

Cisco:44:__:B0

Cisco:57:95:__

Zoom: 121%
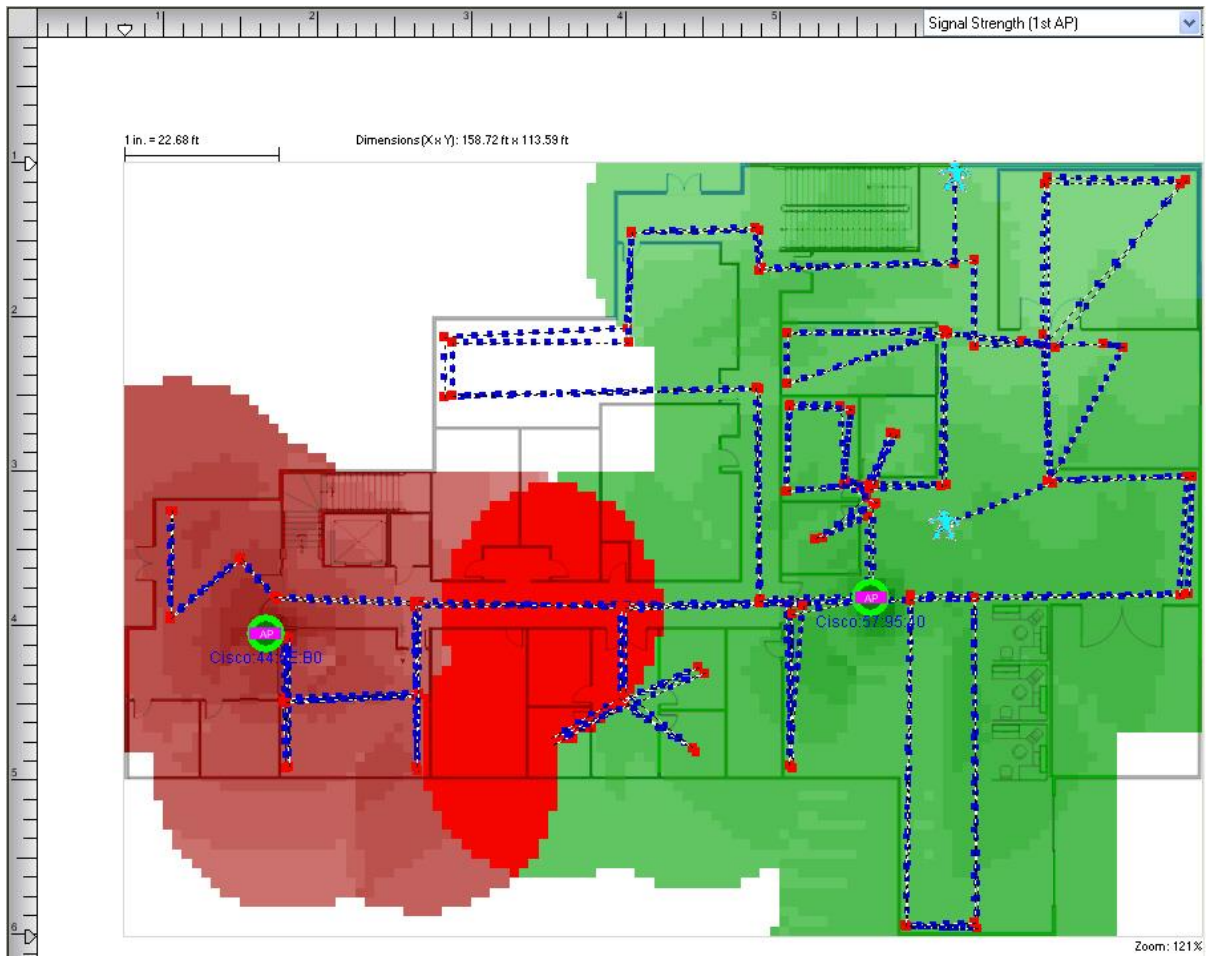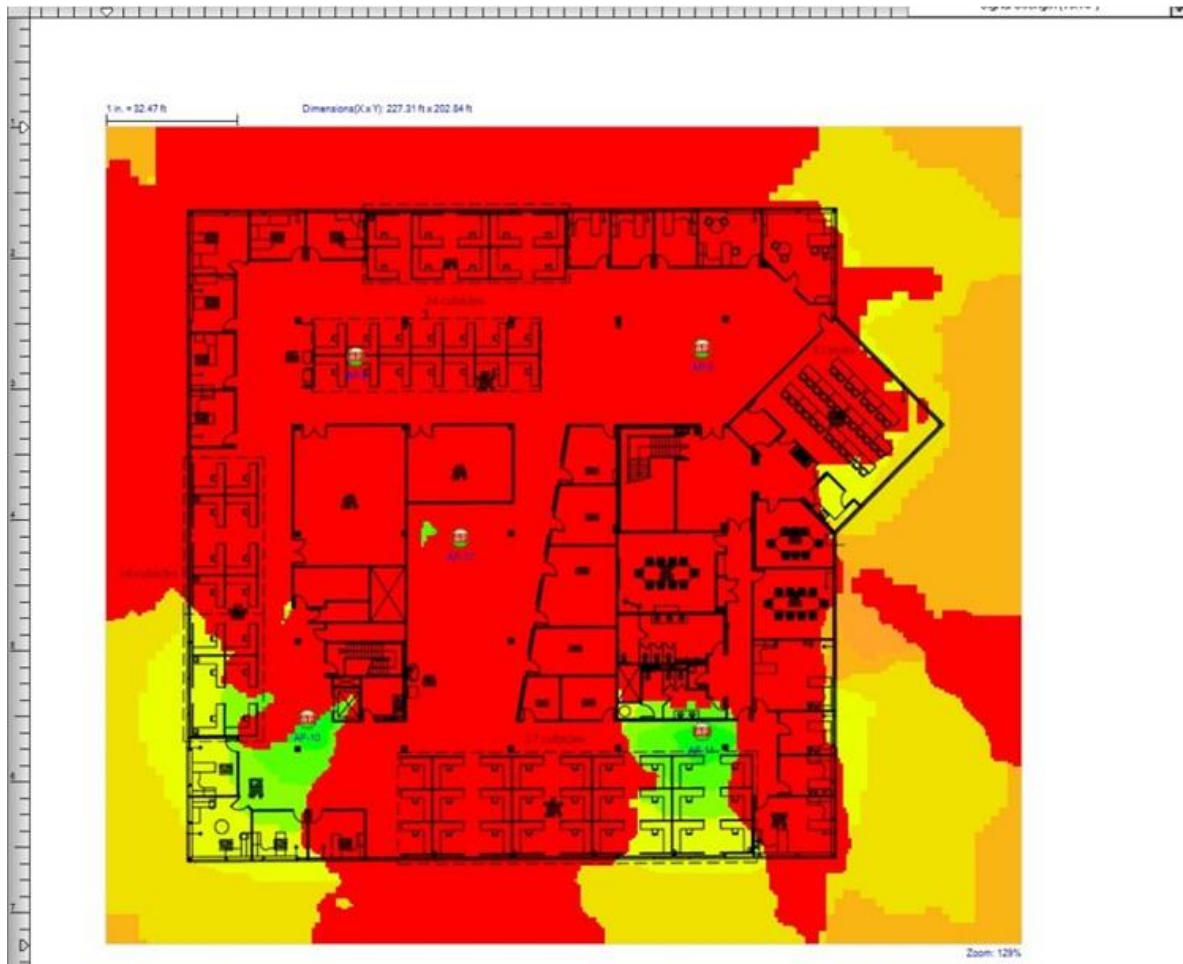
Note: *The overlap areas of the AP coverage cells are shown in red.*

How to Identify Provisioned Bandwidth and Speed

To identify the provisioned bandwidth and speed of an AP for an Active or Iperf survey:

1. From the Project Window, select a data file.
2. From the Channel/SSID List, select the **SSID** tab and highlight the SSID of interest.
3. From the Data Type drop-down menu, select Measured PHY Data Rate Up/Measured PHY Data Rate Down (iperf Survey only). The Legend on the right changes to a color bar consisting of different color blocks, each representing a specific speed.
4. Place the cursor at a spot on the site map to get detailed data from the tooltip.
5. Click a location on the site map. The Measurement Details pane appears at the bottom of the screen, showing the details of the measurements.

*Note: When using an 802.11ac adapter, the option changes to **PHY Connection Rate**. Choosing this option displays the single PHY data rate for the connection that is reported from the non-preferred adapter.*
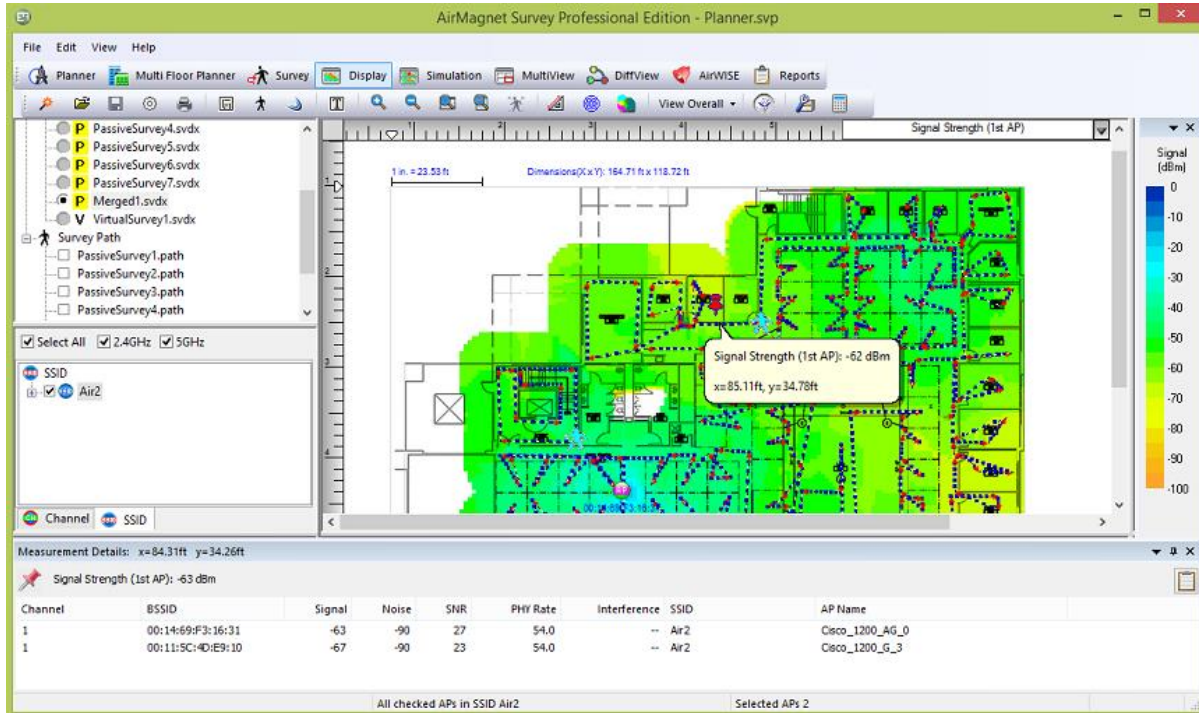
How to Identify Predictive Downlink Bandwidth and Speed

To identify the provisioned bandwidth and speed of an AP:

1. From the Project Window, select a data file.

2. From the Channel/SSID List, select the SSID tab and highlight the SSID of interest.

3. From the Data Type drop-down menu, select **Predictive PHY Data Rate Down** and then **Predictive PHY Data Rate Down (AP)**. The Legend changes to a color bar consisting of different color blocks, each representing a specific speed. The heatmap shows the predicted PHY Data Rate.

Note: If there are multiple APs covering a given location, the PHY rate for the AP with the strongest signal strength will be shown.

The Measurement Details appear at the bottom of the screen, showing the details of the measurements.

4. Place the cursor at a spot on the site map to get detailed data from the tooltip.

5. Click a location on the site map. The Measurement Details pane appears at the bottom of the screen, showing the details of the measurements.
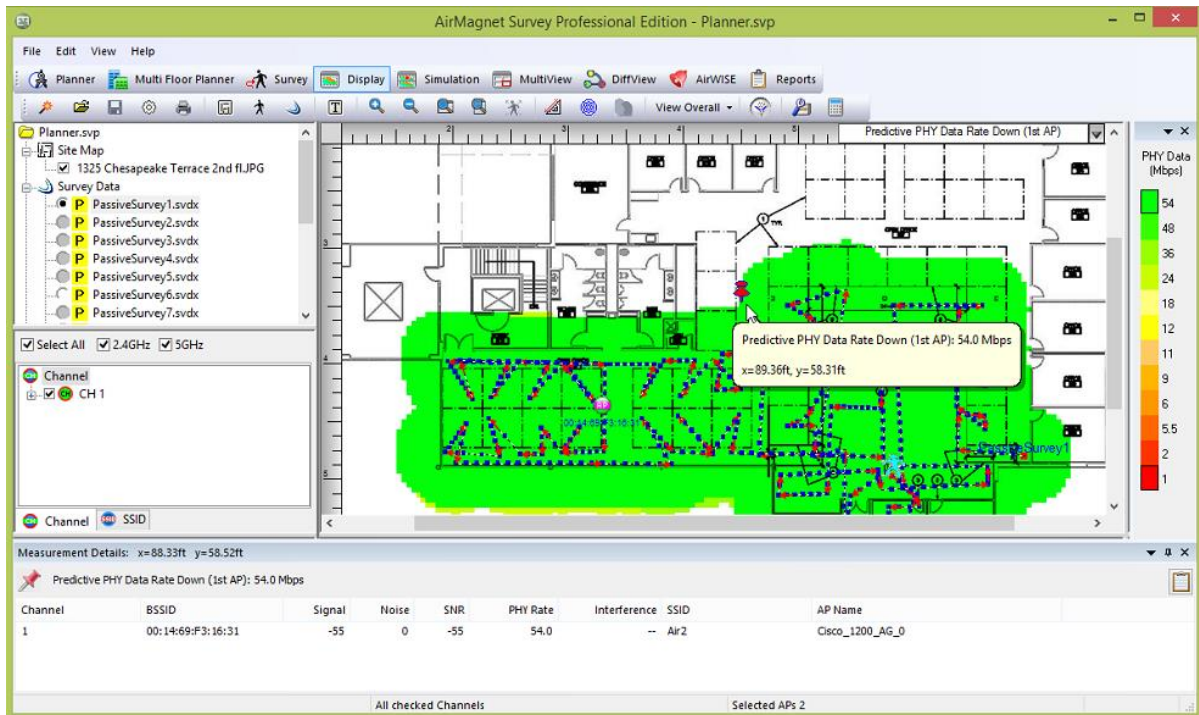
How to Identify Adjacent or Co-Channel Interference in Display Mode

To identify adjacent channel or co-channel interference in Display Mode:

1. If your project includes more than one survey, you may choose to merge the survey data files before performing data analysis.

2. From the Project Window, select the desired data file.

3. From the **Channel/SSID** pane, click the Channel tab and select the channels adjacent to each other, such as Channels 1, 2, 3, or 4, 5, 6, and so on.

4. From the **Data Type** drop-down menu, click **Channel Interference**.

5. On the Legend bar, drag up from the bottom (weakest signal strength) to set the minimum interference level to be shown. This ensures that only areas that exceed a certain amount of interference are displayed.
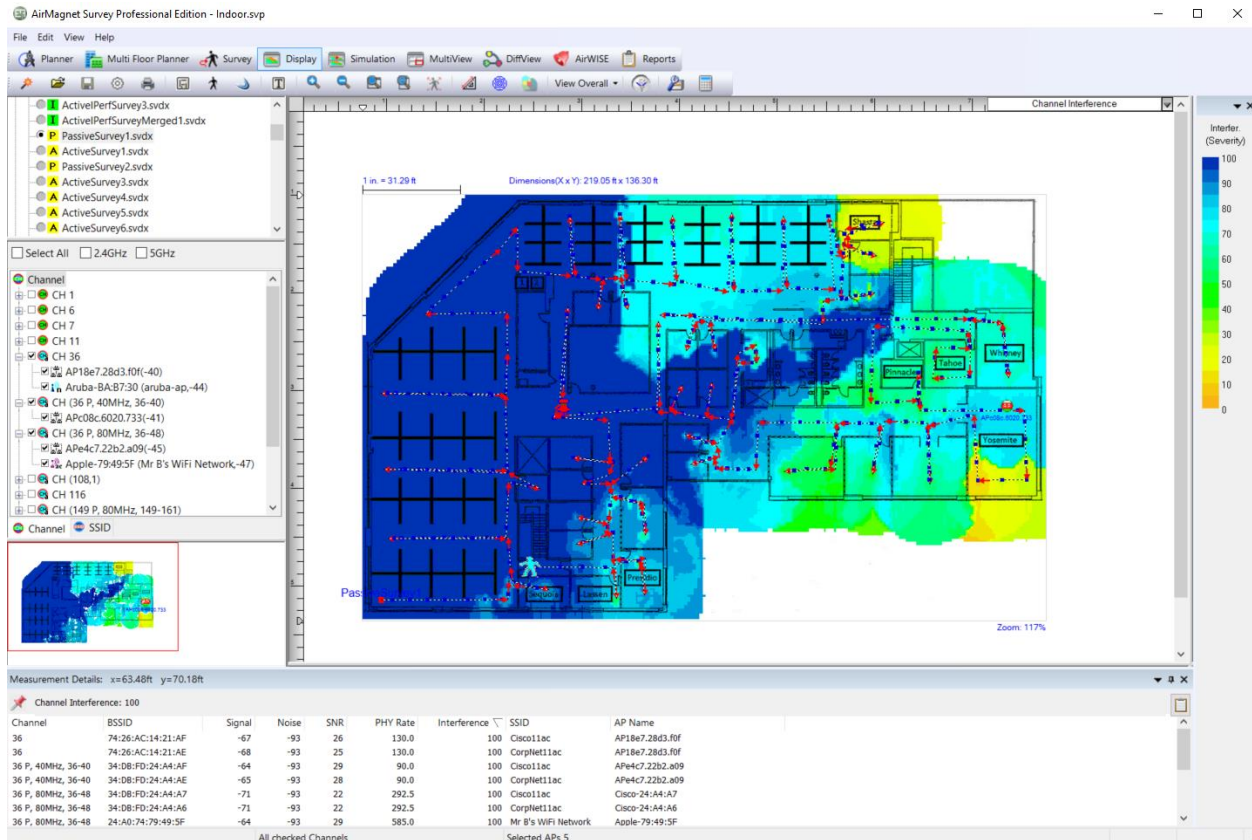
How to View Current Channel Allocation

To identify current channel allocation:

1. If your project includes more than one survey, you may choose to merge the survey data files before performing data analysis.

2. From the Project Window, select the desired data file.

3. From the **Channel/SSID** pane, select the Channel tab, make sure all channels are selected (checked), and highlight Channel at the top of the channel list.

4. From the **Data Type** drop-down menu, select **Signal Strength**.

5. From the Toolbar drop-down, select **View Per Channel**. Each of the channels that are selected are displayed in different a color.
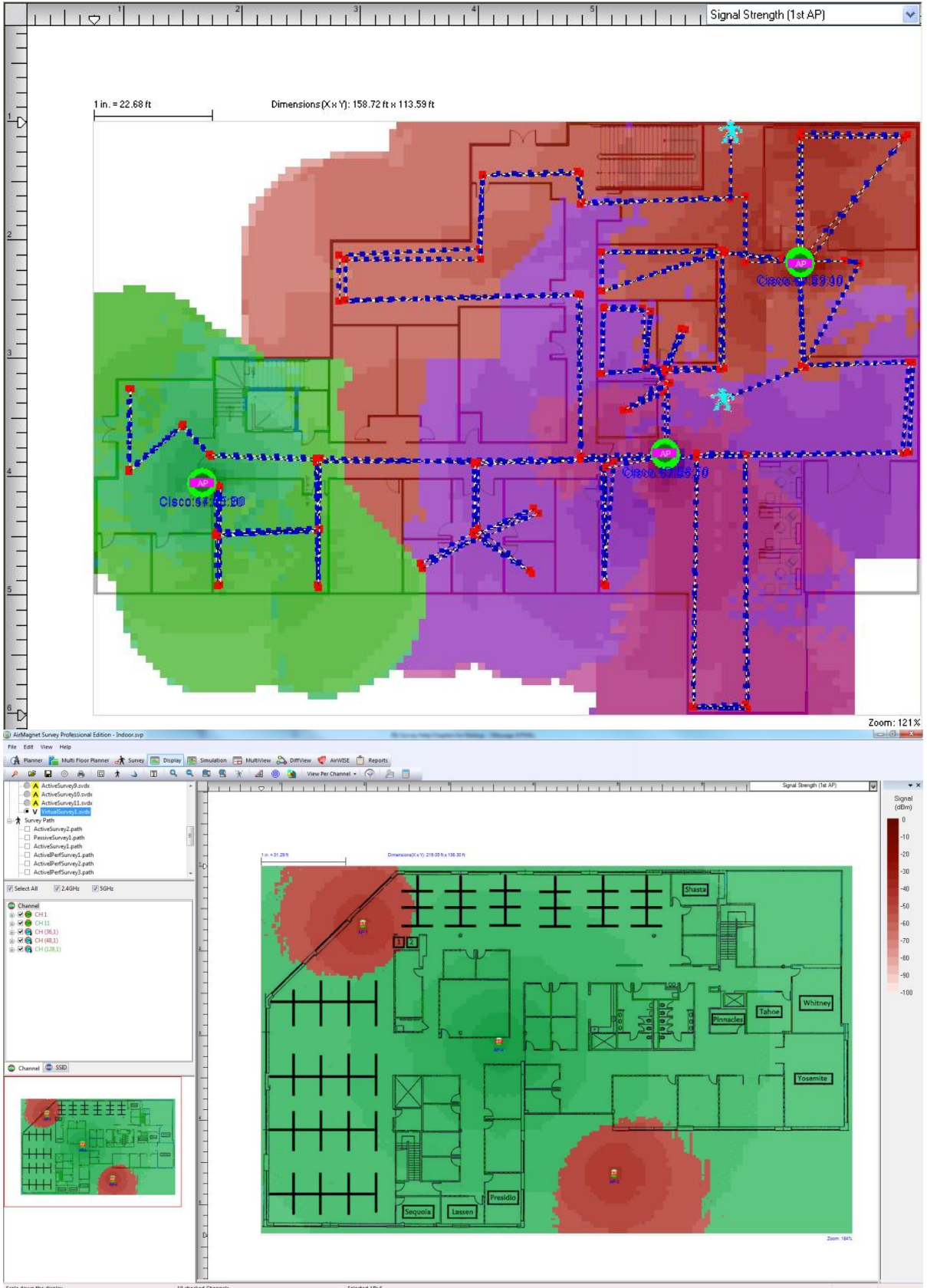
> **Note:** *The channels in the Channel tab are color-coded; the colors in the Map Window indicate the channels in use.*

How to Identify Channel Noise

To identify channel noise:

1. If your project includes more than one survey, you can choose to merge the survey data files before performing data analysis.

2. From the Project Window, select the desired data file.

3. From the **Channel/SSID** pane, click the **Channel** tab.

4. From the **Data Type** drop-down menu, select **Noise Level**. The Legend changes to a color bar consisting of different color blocks, each representing a specific noise level.

5. Place the cursor at a spot on the site map to get detailed data from the tooltip.

6. Click a location on the site map. The Measurement Details pane appears at the bottom of the screen, showing the details of the measurements.
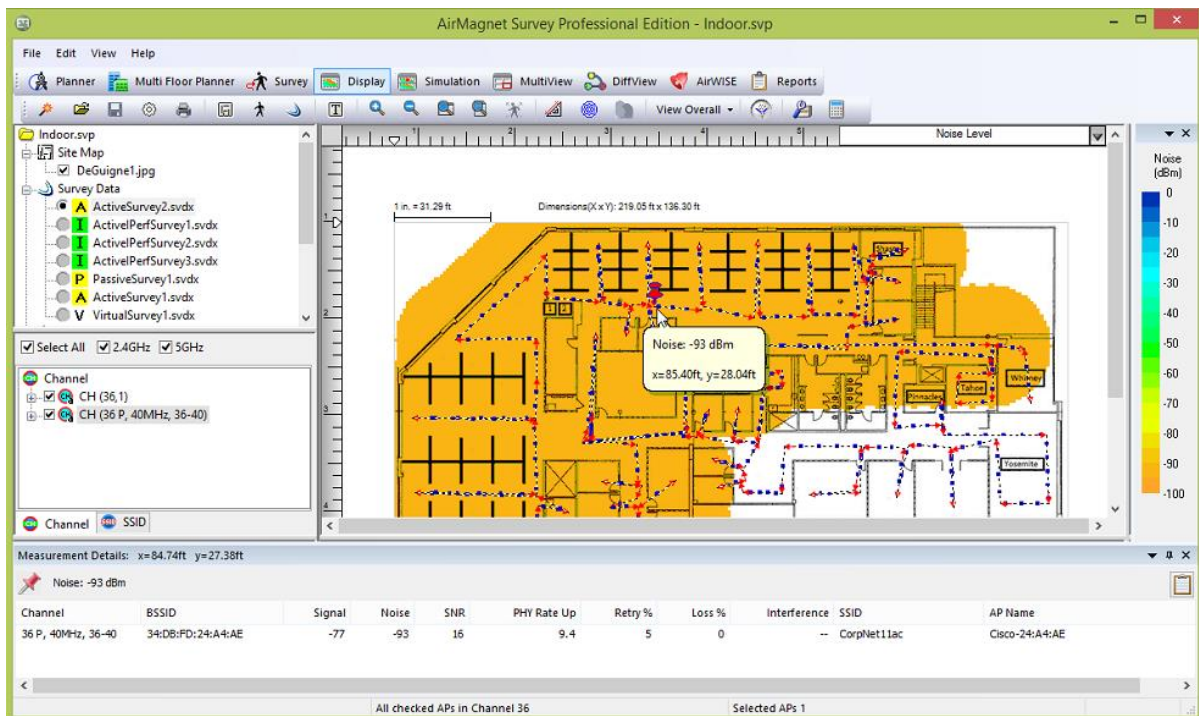
How to Evaluate Site Security Status

This section helps you identify any unexpected or unidentified APs or stations in the current wireless environment. The presence of such devices could signify potential network attacks at worst and improperly configured network devices at best.

To evaluate site security status:

1. From the Project Window, select a passive survey data file.
2. Wait until the data are loaded and displayed in the Map Window.
3. From the **Data Type** drop-down menu, select **Signal Strength**.
4. From the **Channel/SSID** pane, click the **SSID** tab, look for any SSID marked "Unknown," and select it.

How to Compare Surveys and/or Site Plans

> *Note:* *The dimensions of projects (width and height) must identical to use this feature.*

Oftentimes you may wish to display multiple projects or data files (surveys and/or site plans) side-by-side in order to view the differences between them. This can be particularly useful in displaying changes made to a network environment over time. For example, a newly-conducted site survey or site plan can be compared with one taken months earlier to identify any new sources of interference or devices that have been added in the meantime.
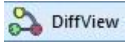
If the data files you intend to compare are in different projects, you must use the (**Import Survey Data**) button to import the data file from the project.

Typically, you can compare the same data types; however, the Diff view enables the comparison of some different data types. If the data type is not available, the data type will revert to blank.

For example, as shown in the following screen shot, you may compare 802.11ac actual uplink throughput in an Iperf data file to PHY Data Uplink Rate. In this case, you must choose Iperf Throughput Down in the bottom left (source) and PHY Data Downlink Rate in the bottom right (destination).
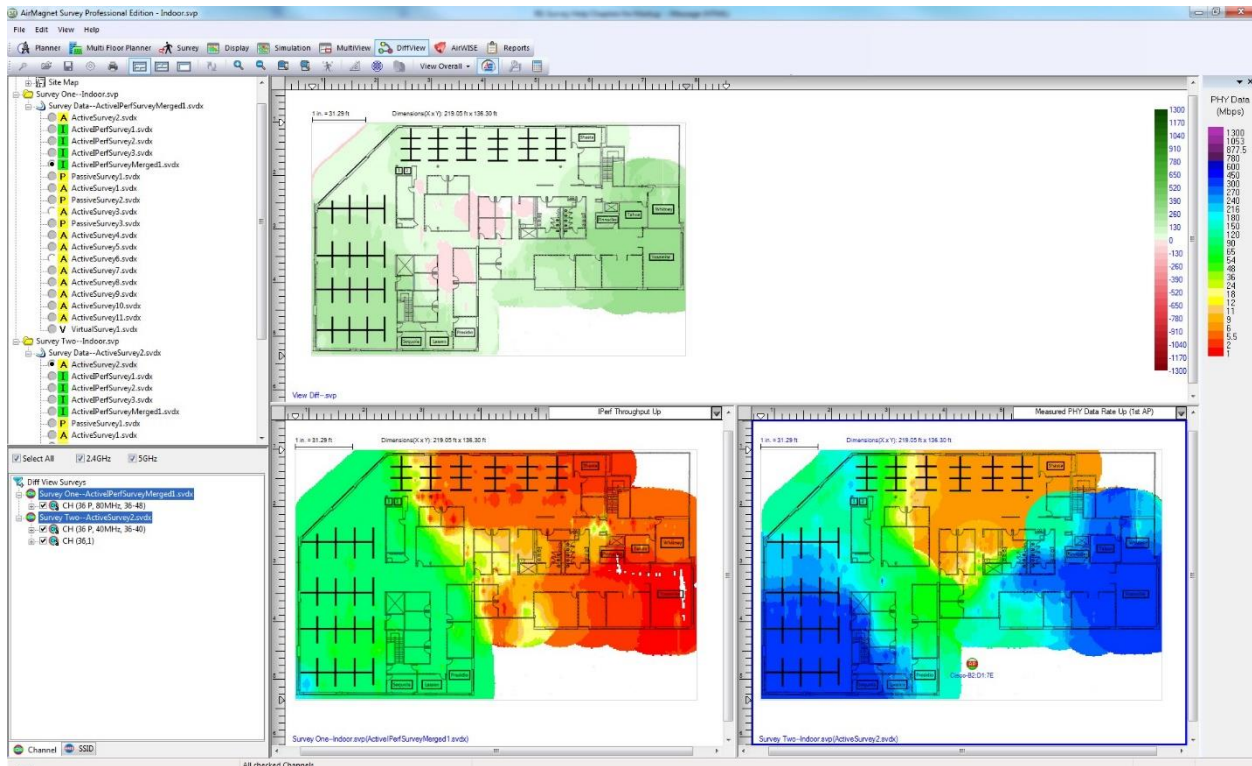
To compare the results of two data files:

1. Open the project that contains the two data files for comparison. As noted above, if the data files are in different projects, open one project and import the data file into it.

2. From the Navigation bar, click ![DiffView] (**Diffview**) to open the project in multiple frames.

3. From the Project Window, click the '+' sign to expand the Survey Data under Survey One, select to open the first data file.

4. From the Project Window, click the '+' sign to expand the Survey Data under Survey Two, select to open the second data file. Now data contained in the two files are displayed on the view.
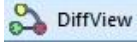
The top pane of the view now displays a heatmap that shows the difference between the two surveys at any given location on the site (map). Areas marked in red indicate that Survey One (bottom left pane) is stronger and areas marked in green indicate that Survey Two (bottom right pane) is stronger.

You may use the data type drop-down in each bottom pane to view data by various data type options. In some cases you may be able to compare different data types. If the application permits the comparison, the choices will be accepted, otherwise unselected panes will show as blank in the data type drop-down.

The blue border around a pane indicates it is the pane in focus.

Viewing Specific Signal Comparison Data

You can compare the signal strength of any location on the heatmap in the selected data files using the DiffView window.

1. Open the project that contains the two data files for comparison. As noted above, if the data files are in different projects, open one project and import the data file into it.

2. From the Navigation bar, click DiffView (**Diffview**) to open the project in multiple frames.

3. In the bottom two panes (one for each project), select **Signal Strength**. While the bottom panes show data from two different survey projects, the top pane allows you to see the difference between the two.

4. Place the cursor at a spot on the site map to get the measurement details of that location.
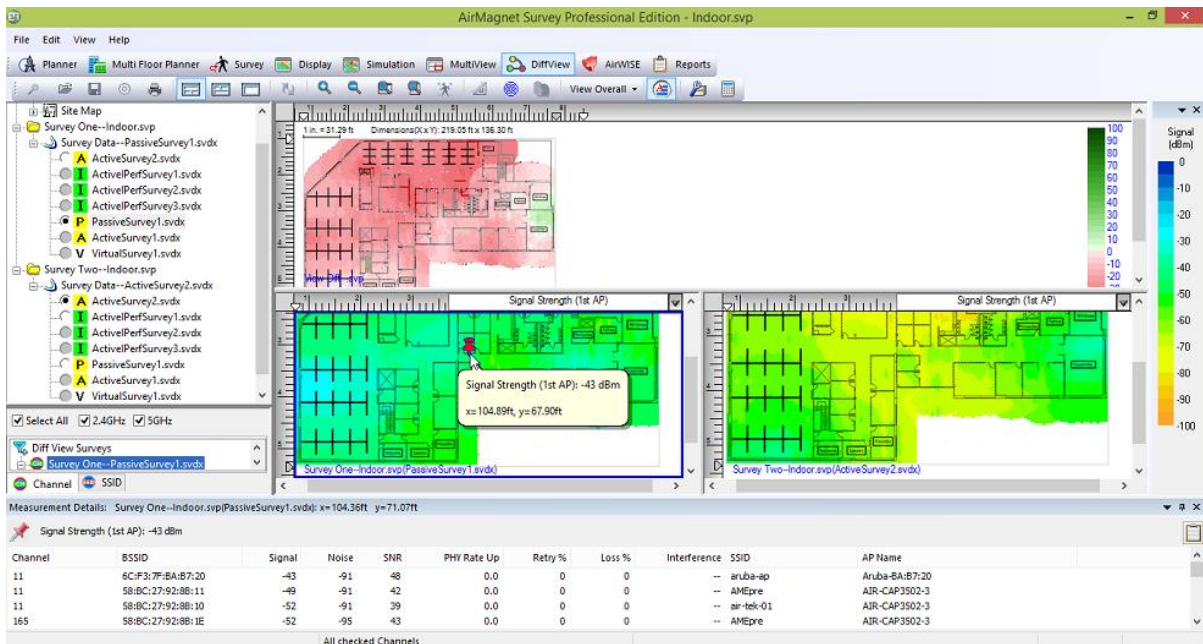
How to View 802.11n/ac/ax Operating Mode

In order to provide a better view of 802.11n/ac/ax information in the wireless network, Survey's Display view provides an 802.11n/ac/ax AP Operating Mode heatmap selection. When you view this data type, the heatmap displays different colors for areas where APs are utilizing Legacy, Mixed, Mixed VHT, Mixed HE, or Greenfield operating modes.

To view the 802.11n/ac/ax operating mode heatmap:

1. From Survey's Display view, load a data file with 802.11n, 802.11ac, and 802.11ax information.

2. Use the Data Type drop-down to select **AP Operating Mode**.

3. Hover the mouse over any segment of the new heatmap to view the operating mode of the AP detected at that location.

4. Click any spot on the heatmap to see the detailed measurements for that spot at the bottom of the screen.
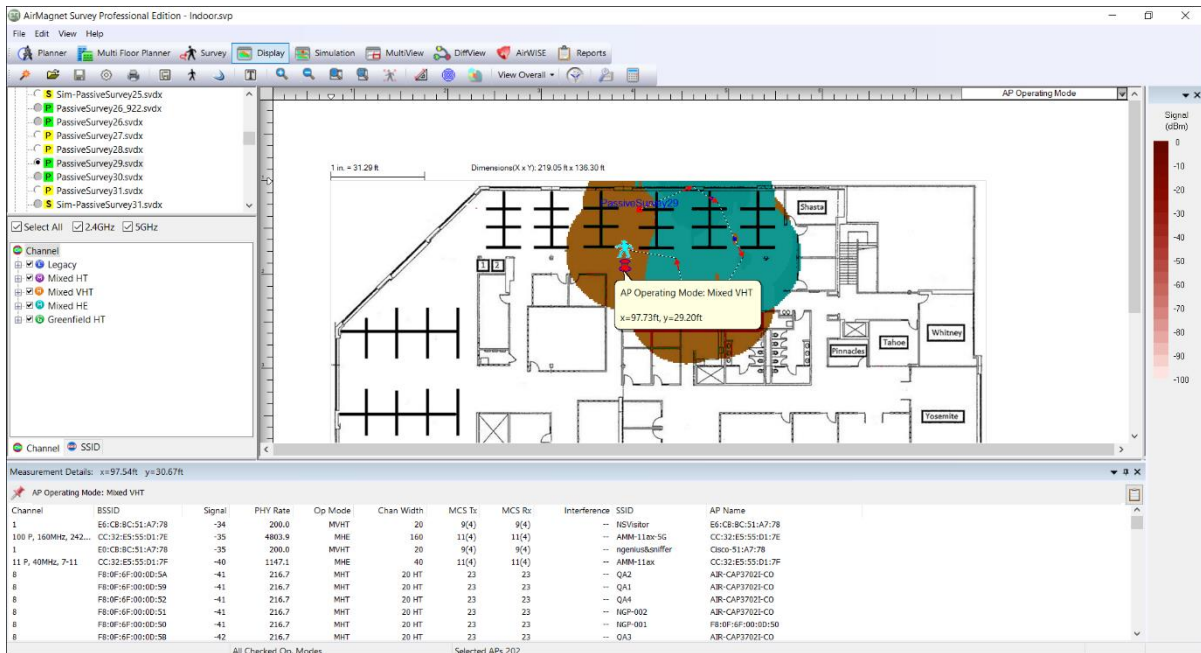
The heatmap indicates the signal strength of the strongest AP detected in the mode color. The table below describes the meaning of each color.

Color	Mode	Description
Blue	Legacy	Legacy mode represents areas where non-802.11n devices are operating. Blue portions of the map are regions where a "legacy" device (802.11a/b/g AP) is strongest.
Purple	Mixed	Mixed mode contains both 802.11n and legacy devices. Purple portions of the heatmap indicate that an 802.11n AP is running in the mixed mode.
Orange	Mixed VHT	Mixed VHT (Very High Throughput) mode is for 802.11ac APs only. The .11ac standard runs only in this mode. Orange portions of the heatmap represent regions where the strongest .11ac AP is running.
Cyan	Mixed HE	Mixed HE (High Efficiency) mode is for 802.11ax APs only. The .11ax standard runs only in this mode. Cyan portions of the heatmap represent regions where the strongest .11ax AP is running.
Green	Greenfield	Greenfield mode contains APs operating at High-Throughput (HT) transfer rates. These rates can be sustained by 802.11n devices. Green portions of the heatmap represent regions where the strongest AP is running at HT transfer rate.

How to View 802.11n/ac/ax MCS Index Data

During an Active, Active Iperf or Passive survey, AirMagnet Survey automatically records the Modulation Coding Scheme (MCS) detected from 802.11n/ac/ax APs. This number can

range from 0 to 31 for 802.11n APs, 0 to 9 for 802.11ac APs, or 0 to 11 for 802.11ax APs, with higher numbers corresponding to higher data transfer rates.

You can view MCS information for both Tx (transmission rate) and Rx (receive rate) for detected APs. These data indicate the MCS for the AP with the strongest signal strength at a given point on the survey floor plan.

To view MCS information:

1. From the Display view, load a data file that contains 802.11n and/or 802.11ac APs.
2. Select *802.11n, 802.11ac,* or *802.11ax: Max MCS (AP Tx)* or *(AP Rx)* data type. The heatmap refreshes.
3. Hover over any point in the survey to see the tooltip of the exact MCS index for the strongest 802.11n, 802.11ac, or 802.11ax AP detected for that spot.
4. Click any point in the heatmap to see the measurement details at the bottom of the screen.
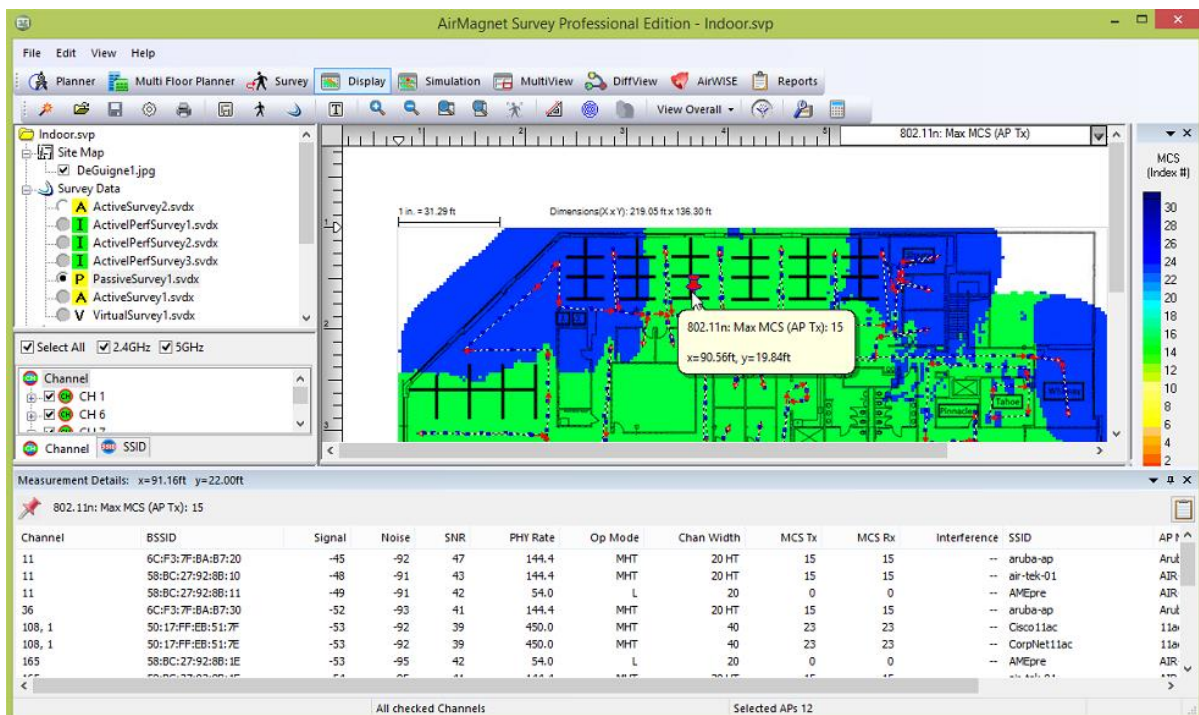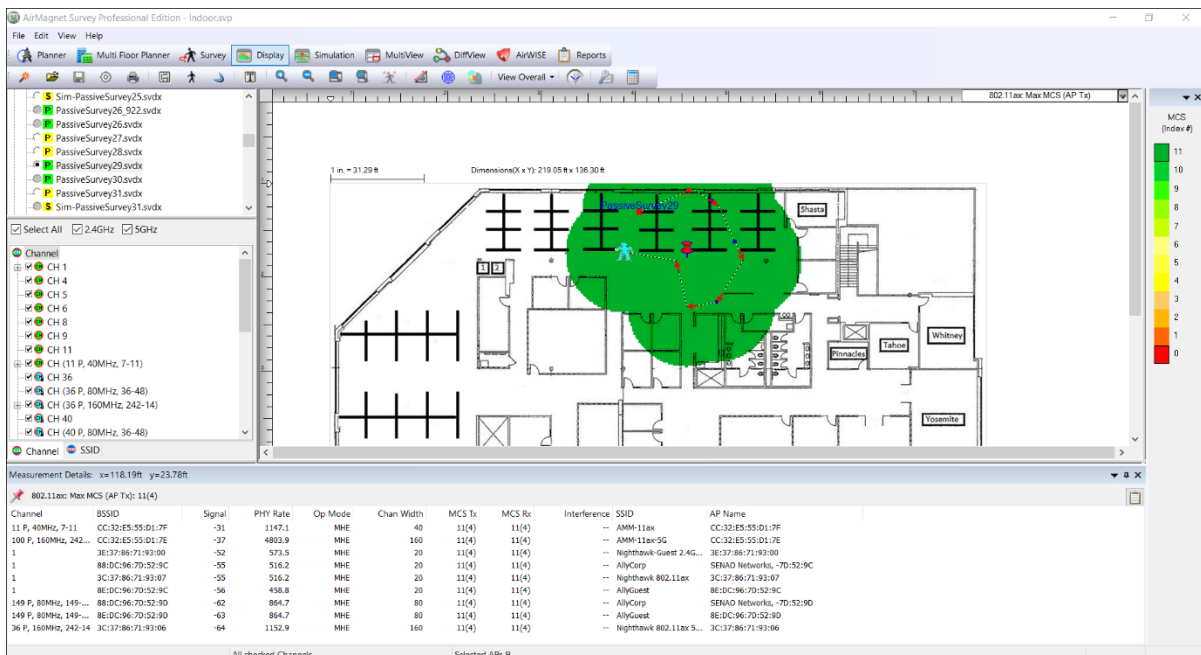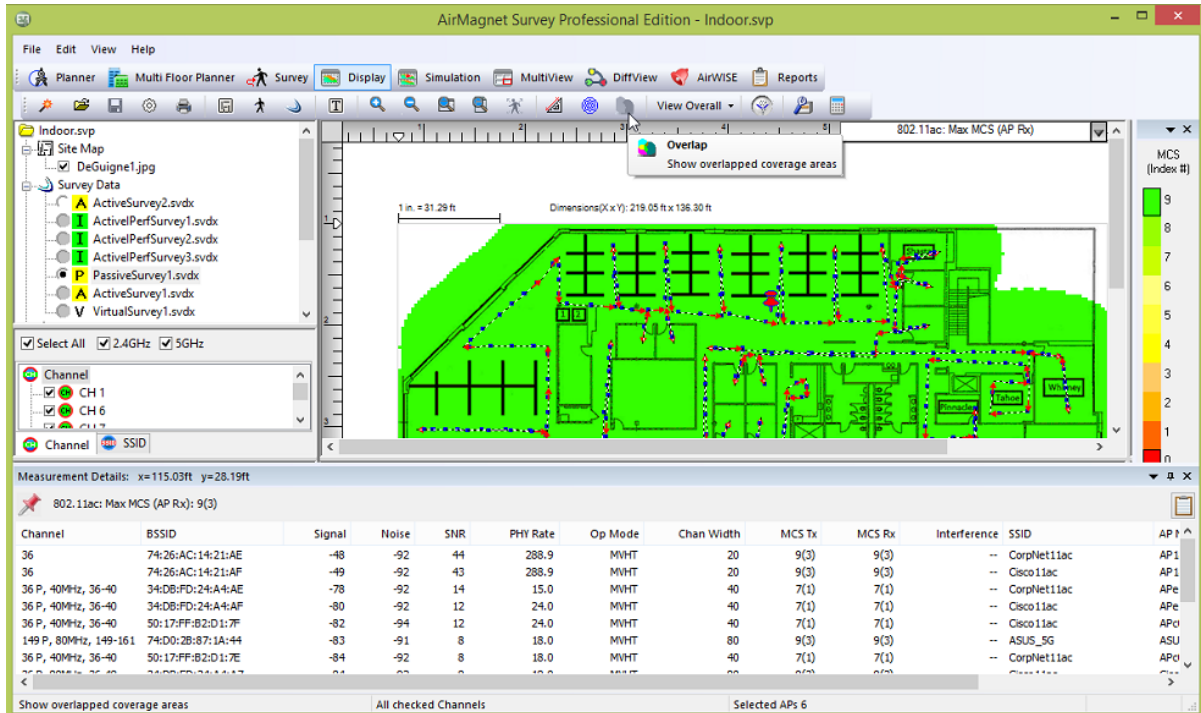
How to View 802.11n/ac/ax Channel Width

The Channel Width data type allows you to easily view the different channel width used by 802.11n/ac/ax devices in the network environment.

To view the channel width heatmap:

1. From the Display view, load a data file that contains 802.11n, 802.11ac, and/or 802.11ax APs.

2. Select the Channel Width data type. The view refreshes.

3. Hover the mouse over any point in the heatmap to see the tooltip for the channel width at that spot.

4. Click any point on the heatmap to see detailed measurements at the bottom of the screen.
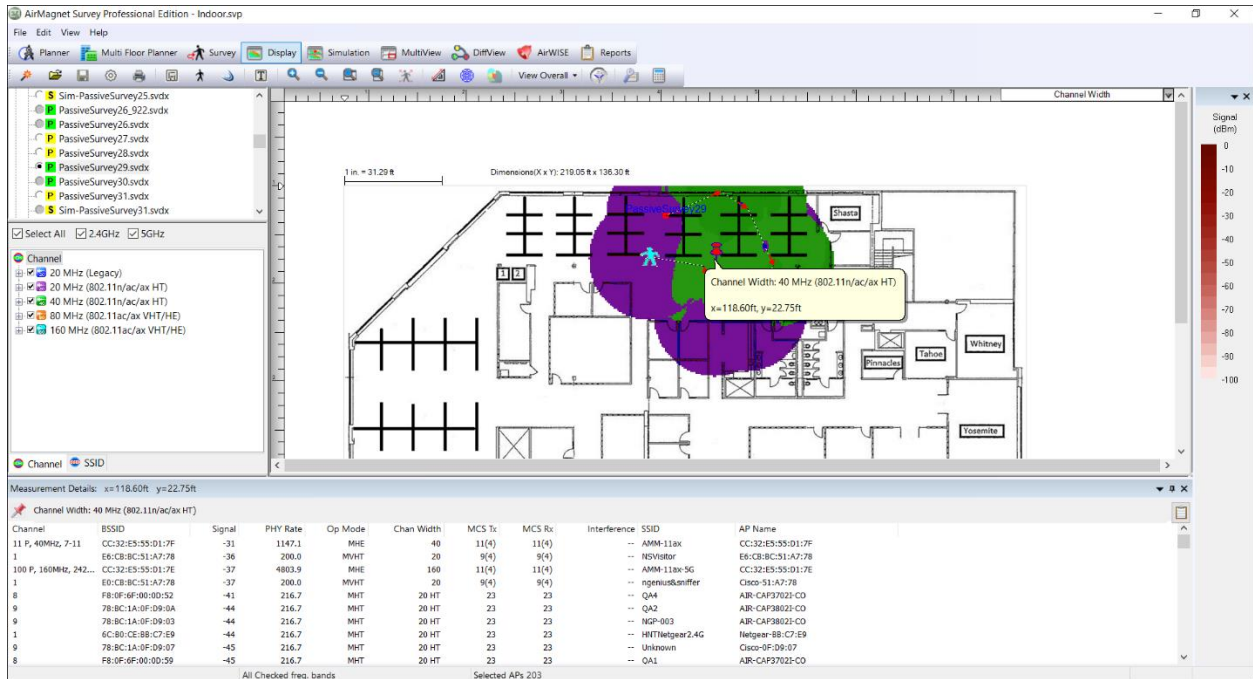
The heatmap displays the colors corresponding to the strongest AP's channel width color at the given point.

The table below describes the color schemes for various channel widths.

Color	Width
Blue	20 MHz (channel width used by 802.11a/b/g or 802.11n APs operating at legacy speeds).
Purple	20 MHz-HT (used by 802.11n/ac/ax APs operating at HT speeds).
Green	40 MHz (used by 802.11n/ac/ax APs). Note: 802.11n communications utilizing 40 MHz bands are also conducted at HT speeds.
Orange	80 MHz (used by 802.11ac/ax APs operating at VHT/HE speeds).
Light Blue	160 MHz (used by 802.11ac/ax APs operating at VHT/HE speeds).

How to Identify 802.11ac Channel Overlap

While wider 802.11ac channels are capable of transmitting higher throughput rates, they are also more susceptible to RF issues such as channel interference, utilization, etc. If an 802.11ac radio detects an issue, it can attempt to retransmit at a smaller available channel width in accordance to the 802.11ac specifications.

> Example:
>
> A 160 MHz channel can retry as a 80 MHz wide channel.
>
> A 80 MHz channel can retry as a 40 MHz wide channel.
>
> A 40 MHz channel can retry as a 20 MHz wide channel.

An 802.11ac wide channel uses a specific 20 MHz channel as the primary channel. This primary channel will contain the Wi-Fi beacon information, for example. The remaining 20 MHz channels used by an 802.11ac wide channel are referred to as secondary channels.

If an 802.11ac radio retransmits at a smaller channel than originally allocated, this will affect overall throughput and performance. This reduction in throughput and performance of an 802.11ac wide channel is what the 802.11ac Channel Overlap heatmap conveys.

To identify 802.11ac channel overlap:

1. From the Display view, load a data file that contains 802.11ac information.
2. From the data type drop-down menu, select 802.11ac Channel Overlap.
3. Hover the mouse over any point in the heatmap to see the tooltip for the channel overlap information for that spot.
4. Click any spot in the heatmap to see detailed measurements at the bottom of the screen.
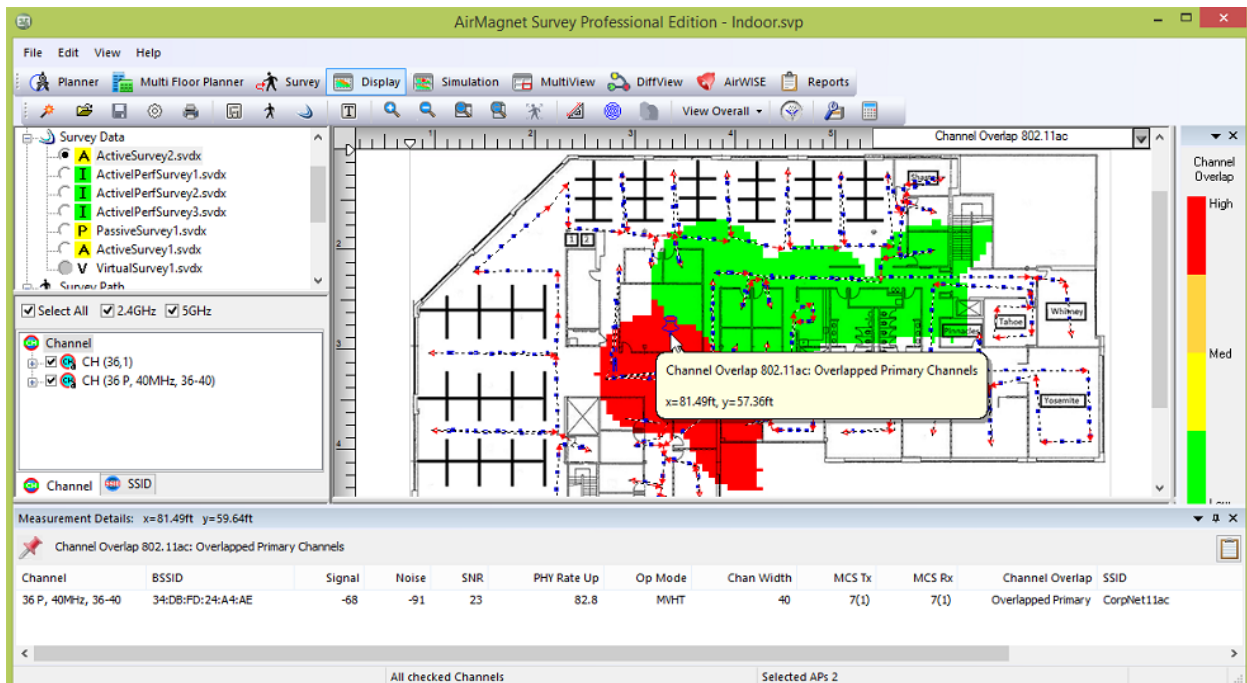
Please note that for all of the following examples, AP #1 and AP #2 will have overlapping coverage.

Red areas indicate overlapped primary channels. These are areas where overall performance will be significantly lower because two AP/Client connections cannot transmit simultaneously on the overlapping channel.

> Example:
>
> AP #1 is set to transmit an 802.11ac 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
>
> AP #2 is set to transmit an 802.11ac 40 MHz wide channel with the primary channel on channel 36 (36P + 40).
>
> or
>
> Example:
>
> AP #1 is set to transmit an 802.11ac 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
>
> AP #2 is set to transmit a 20 MHz channel on channel 36.

Orange areas indicate overlapped secondary channels that cause fallback to a 20 MHz channel. These are areas where overall performance will be much lower because two AP/Client connections on overlapping 802.11ac wide channels must fallback to a slower 20 MHz channel to transmit simultaneously.

> Example:
>
> AP #1 is set to transmit an 802.11ac 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
>
> AP #2 is set to transmit an 802.11ac 40 MHz wide channel with the primary channel on channel 40 (36 + 40P).
>
> AP #1 reduces its transmitting channel to a single 20 MHz channel on channel 36. AP #1 is unable to use channels 40, 44, and 48.
>
> AP #2 reduces its transmitting channel to a single 20 MHz channel on channel 40. AP #2 is unable to use channel 36.

Yellow areas indicate overlapped secondary channels that cause fallback to a 40 MHz channel. These are areas where overall performance will be slightly lower because two AP/Client connections on overlapping 802.11ac wide channels must fallback to a slower 40 MHz channel to transmit simultaneously.

> Example:
>
> AP #1 is set to transmit an 802.11ac 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
>
> AP #2 is set to transmit an 802.11ac 80 MHz wide channel with the primary channel on channel 48 (36 + 40 + 44 + 48P).

AP #1 reduces its transmitting channel to a 40 MHz wide channel on channels 36P and 40. AP #1 is unable to use channels 44 and 48.

AP #2 reduces its transmitting channel to a 40 MHz wide channel on channels 44 and 48P. AP #2 is unable to use channels 36 and 40.

Green areas indicate no significant channel overlap. These are areas where overall performance will not be impacted by channel overlap. An 802.11ac wide channel does not have a 20 MHz channel that is overlapped by any 20 MHz channels from other APs.

Example:

AP #1 is set to transmit an 802.11ac 40 MHz wide channel with the primary channel on channel 36 (36P + 40).

AP #2 is set to transmit an 802.11ac 40 MHz wide channel with the primary channel on channel 48 (44 + 48P).

Background
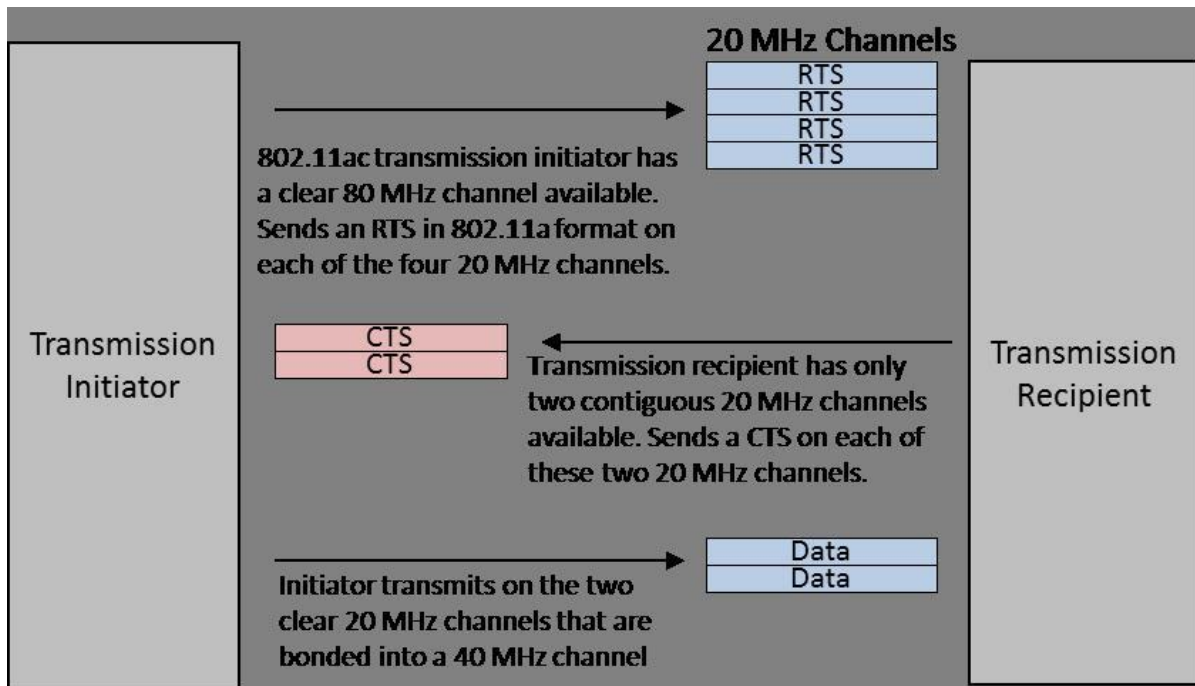
In 802.11ac, a transmission initiator sends a Request to Send (RTS) message set with a channel bandwidth to use for a transmission; for example, 80 MHz. A transmission recipient sends a Clear to Send (CTS) message set indicating how much channel width is available and not currently utilized. This mechanism allows two APs with overlapping 80 MHz channels to transmit simultaneously by falling back to an available 40 MHz or 20 MHz channel, if the full 80 MHz channel is not available. An example of how this works is shown in the following diagram:

| Example 1: Red | Example 2: Orange | Example 3: Yellow |
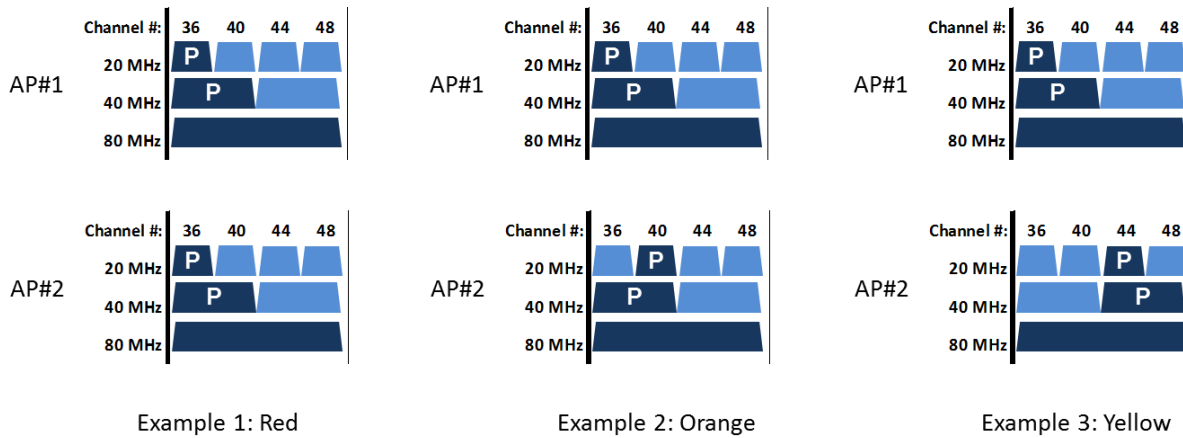
In each example, AP#1 and AP#2 have overlapping 80 MHz channels. The primary 20 MHz and 40 MHz channels are indicated by "P". Each example has a different level of potential performance impact due to the difference in primary channel assignments.

Example 1 shows the situation highlighted in red in the Channel Overlap heatmap. Each AP has the same primary channel. Therefore, they cannot transmit simultaneously if any of the 20 MHz sub-channels are in use.

Example 2 shows the situation highlighted in orange in the Channel Overlap heatmap. Each AP has a different 20 MHz primary sub-channel, but the same 40 primary MHz sub-channel. Therefore, to transmit simultaneously, each AP can fallback to its 20 MHz primary sub-channel to transmit, but not to a 40 MHz sub-channel.

Example 3 shows the situation highlighted in yellow in the Channel Overlap heatmap. Each AP has a different 20 MHz primary sub-channel and a different 40 MHz primary sub-channel. Therefore, to transmit simultaneously, each AP can fallback to its 40 MHz primary sub-channel to transmit.

Tooltip Text Explanation
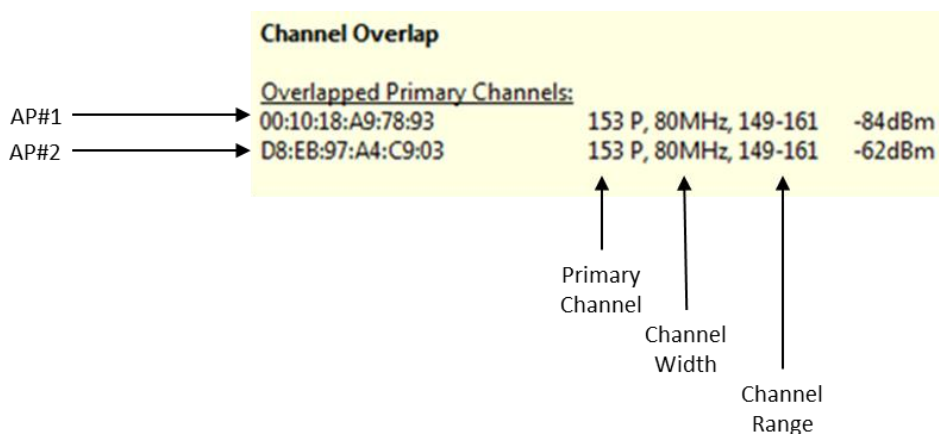
The heatmap tooltip text for **Overlapped Primary Channels** is shown above. There are two APs with 80 MHz channels that overlap completely on channels 149, 153, 157, and 161. The primary channel of each AP is the same: 153. Therefore, these two APs cannot transmit simultaneously.

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Channel Overlap

Overlapped Secondary Channels – Fallback to 20 MHz:

AP#1 ——→ 84:1B:5E:03:DF:71   149 P, 80MHz, 149-161   -56dBm
AP#2 ——→ D8:EB:97:A4:C9:03   153 P, 80MHz, 149-161   -68dBm

Primary
Channel

Channel
Width
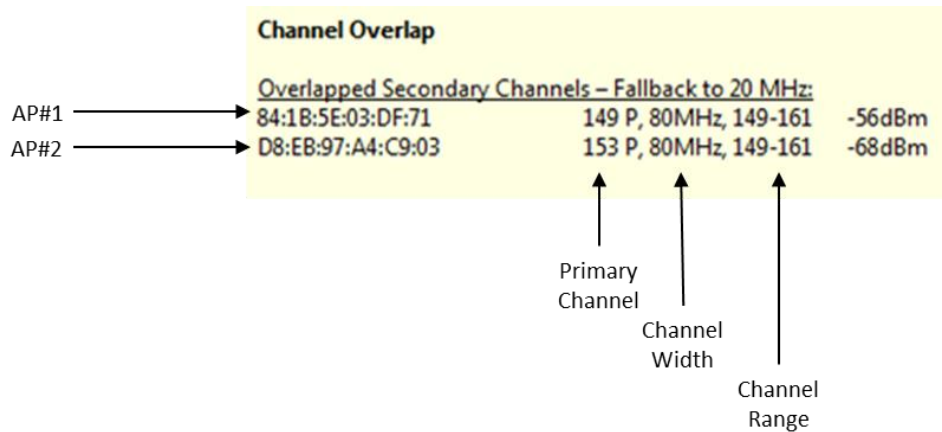
Channel
Range

The heatmap tooltip text for **Overlapped Secondary Channels** with Fallback to 20 MHz is shown above. There are two APs with 80MHz channels that overlap completely on channels 149, 153, 157, and 161. The primary channel of AP#1 is 149 and the primary channel of AP#2 is 153. A 40 MHz channel fallback for each AP would be on channels 149-153 which would overlap and prevent simultaneous transmission. Therefore, these two APs must fallback to their non-overlapping 20 MHz primary channels – 149 and 153 – to transmit simultaneously.

Channel Overlap

Overlapped Secondary Channels – Fallback to 40 MHz:

AP#1 ——→ 84:1B:5E:03:DF:71   149 P, 80MHz, 149-161   -56dBm
AP#2 ——→ D8:EB:97:A4:C9:03   157 P, 80MHz, 149-161   -68dBm

Primary
Channel

Channel
Width
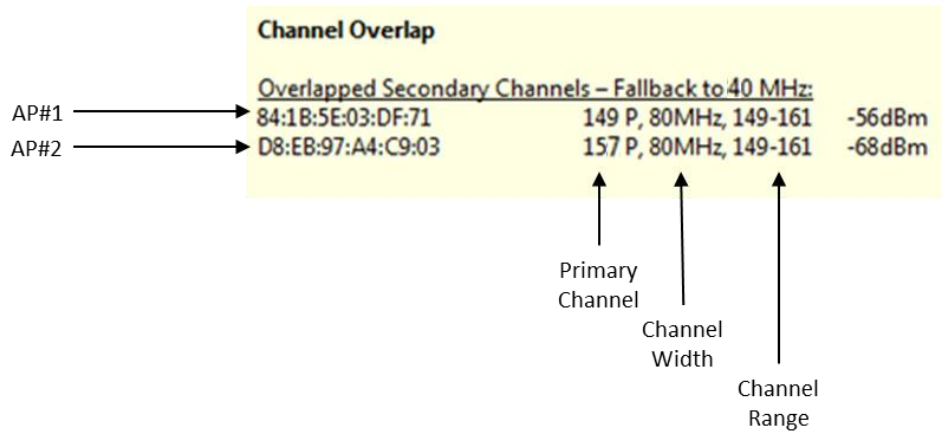
Channel
Range

The heatmap tooltip text for **Overlapped Secondary Channels** with fallback to 40 MHz is shown above. There are two APs with 80MHz channels that overlap completely on channels 149, 153, 157, and 161. The primary channel of AP#1 is 149 and the primary channel of AP#2 is 157. AP#1 can fallback to a 40 MHz channel on 149-151, and AP#2 can fallback to a 40 MHz channel on 157-161, to transmit simultaneously.

How to Use the Real-Time AP Locator

Survey's AP Locator feature uses collected survey data to calculate approximate locations for detected APs. Before starting to survey the desired location for a particular AP, you must perform the following steps to configure the feature and fine-tune the scanning process. These steps will ensure that the device is located with both precision and speed.

Note: These steps are directed towards users conducting a GPS survey; consequently, this information may vary slightly for users conducting AP Location surveys on non-GPS projects.

To locate an AP:

1. During project creation, import the map of the site to be surveyed; you must specify the type of environment in which the AP is located (that is, Restricted Closed Office for a standard office building) for the Survey Environment, as shown in the figure below.
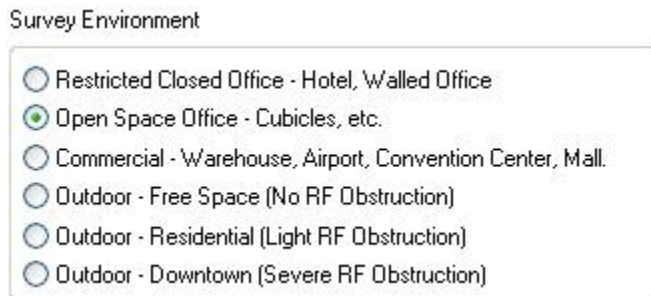
Note: If the site is a small portion of a larger GPS map, the image should be cropped just to cover the specific area to be surveyed.

2. From the **Settings** tab of Survey's Configuration dialog box, check **Auto Position APs with signal greater than ___ dBm** and specify a minimum signal level to be used (if desired). Click **OK** to save the changes.
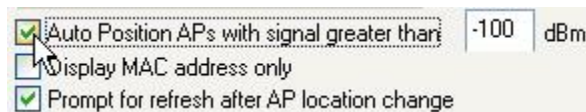
Note: If "Auto Position APs..." is enabled, the survey retract button will be grayed out (unavailable).

3. Place the external antenna (outside) on the roof of the car. It is recommended that an omni-directional antenna be used for best results.

4. Select the band (2.4 or 5 GHz) in which Survey should operate and the channel on which the device is located, if known. See the figure below.
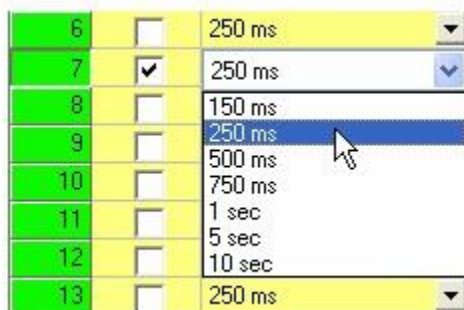
Note: As shown in the figure above, the scan interval should be set to 250ms for best results.

5. From the Survey view, select the **Passive Survey** option and use the drop-down list to select **SSID** or **AP**, as needed. See the figure below.

6. If known, select the specific **AP** or **SSID** to be located from the drop-down list. Refer to the figure below.
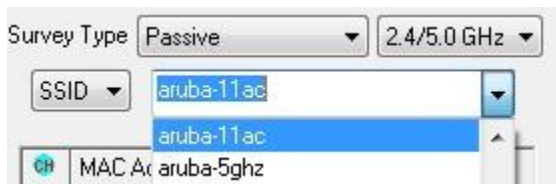
Note: If the user selects ANY from the SSID list, the Survey view will not be able to calculate AP placement until a specific AP is selected. This can be done during the survey process by selecting the desired AP from the scrolling list in the passive survey window, as shown in the figure below. After the selection has been made, the application will attempt to calculate the device's location. However, after the survey is completed, calculated positions of any additional APs detected will be shown on the Display view.

7. Start the survey and drive slowly (between 5-10 mph) around the perimeter of the site.

Note: After some data are collected, an icon () representing the selected AP will appear on the site map in its calculated position. This icon will move about during the course of the survey as its location is recalculated from new data. The AP icon is color-coded based on Survey's confidence in the current location; the colors will progress from red (lowest confidence) through yellow, green, and finally, black (greatest confidence). This confidence level is also displayed in the Passive Survey frame in place of the Signal/Noise ratio.

8. When the survey is completed, stop the survey and save the data.
9. View the data on the **Display** view to analyze the results of the survey.
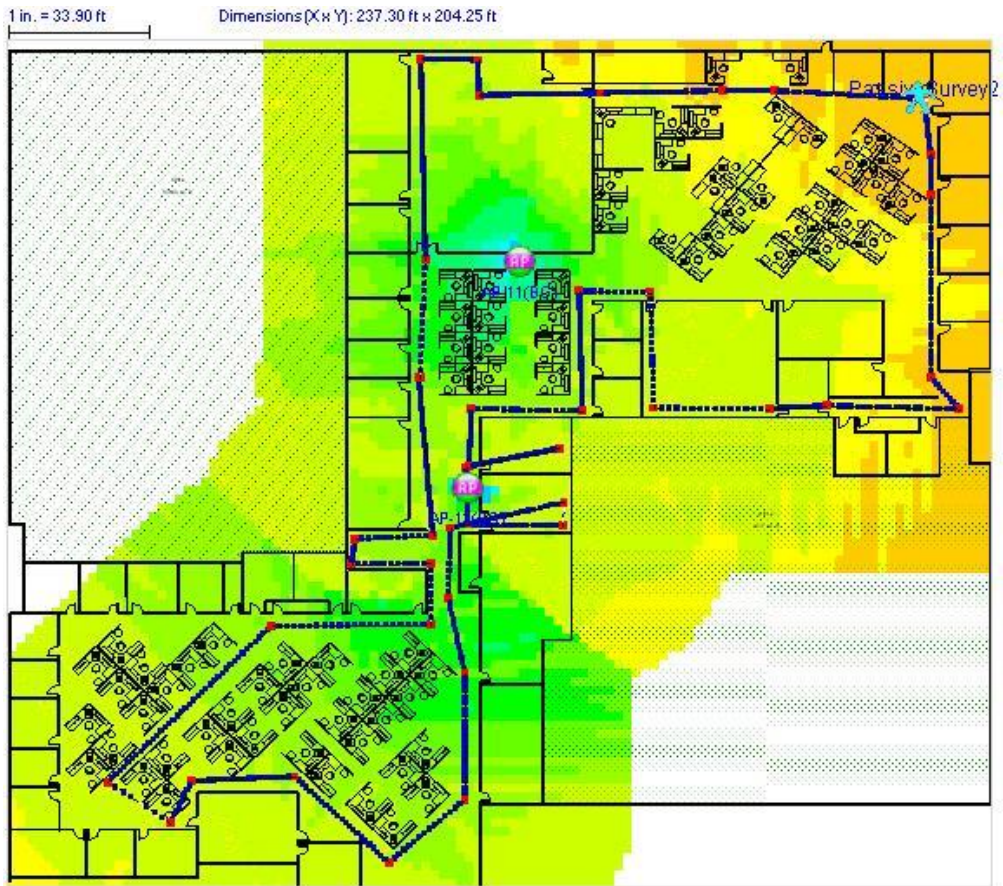
Note: As shown in the figure above, the Display view automatically places all APs detected during the survey even though only one AP is shown on the Survey view.

VoFi Data

Analyzing VoFi Survey Data

Since it is far easier to troubleshoot and repair issues with a VoFi wireless deployment prior to supporting active users with it, users are strongly urged to conduct and analyze a VoFi survey before attempting to activate it in a real-world scenario. This process can be drastically different from deploying a standard data network simply because what would amount to a small issue for a wireless data installation (slight drop in signal strength, small wireless dead zone, and so on) can be a much greater problem when the deployment is intended to support voice traffic. A disconnect that lasts for two seconds would go largely unnoticed in a standard wireless deployment, but the same disconnect during a VoFi call can result in dropped calls and overall diminished call quality.

The process of analyzing data collected from a VoFi survey is generally similar to that of a standard survey, but VoFi surveys contain additional data (such as roaming information) that can help users identify problem zones in their VoFi deployment coverage.

- VoFi Data Types
- Roaming Analysis
- Troubleshooting Poor Call Quality

VoFi Data Types

The Data Type List Menu for VoFi-specific surveys contains selections that are unique to voice deployments, as shown below.
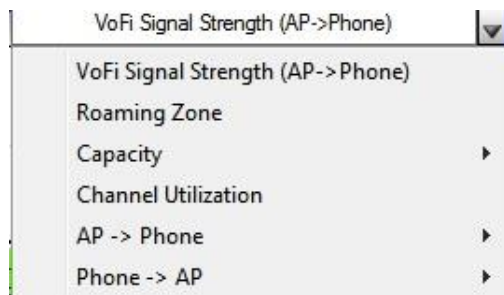
Each selection provides information designed to help users troubleshoot and maintain VoFi deployments.

- **VoFi Signal Strength:** shows the signal strength detected at each point along the survey path. Note that this selection provides data on transmissions from the AP to the phone.
- **Roaming Zone:** displays the regions in which phones are most likely to roam. When this map is loaded, potential roaming zones are displayed in red.
- **Capacity**: **Number of Station(s)** shows the number of stations detected on the AP during the survey. Note that "stations" can refer to other VoFi phones in addition to other wireless clients (such as notebooks or wireless-enabled desktops). **Number of Active Call(s)** shows the number of active calls detected during the survey. This value includes the call monitored during the VoFi survey process.

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- **Channel Utilization**—displays the overall utilization on the current channel. Note that this value accounts for standard wireless traffic in addition to VoFi traffic on the channel.

The **AP -> Phone** and **Phone -> AP** options each provide three additional display types. These selections provide data detected from transmissions between the AP and the VoFi phone.

- **WiMOS Score**—much like the MOS score widely used to monitor the quality of wired communications, the WiMOS score provides a value to display the call quality at each point during the survey process. This value can range from 1 (poor) to 4.5 (excellent).
- **PHY Data Rate**—displays the data transfer rate detected during the survey. This value is measured in Mbps.
- **Packet Retry Rate**—shows the percentage of packet retries over the course of the survey path. Excessive packet retries can indicate wireless hazards (such as interferers) in the surveyed environment. Note that this percentage is calculated as a percentage of retry packets transmitted over the past second.

Roaming Analysis

The fact that VoFi phones will inevitably roam in even the best of VoFi deployments renders this aspect of the survey analysis critical to ensuring that users can enjoy uninterrupted service during these roaming periods. AirMagnet Survey PRO allows the user to review roaming information captured during the VoFi survey process, including each instance in which the phone roamed, its location, and the time it took to re-associate to the new AP. These data can subsequently be used to determine potential hazards or holes in the VoFi wireless deployment.

> **Note:** *Roaming events are displayed in real-time during the VoFi survey process. Refer to* [Conducting VoFi Surveys](#) *for more details.*

Survey's VoFi Roaming Events tab provides a summary of all captured instances of roaming as well as the pertinent data associated with each event.
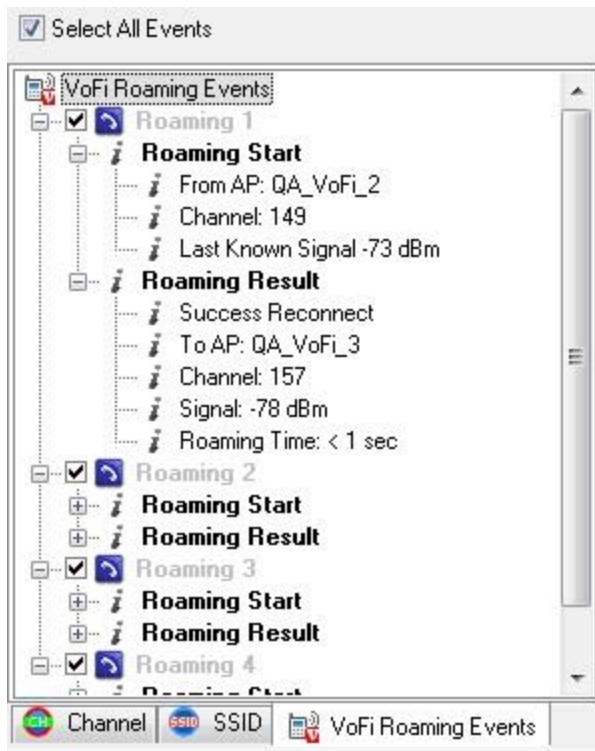
Each instance in which the VoFi phone roamed during the survey process is included in this tab and has a checkbox allowing the user to view the roam location on the map. By default, all roaming events are automatically checked when a VoFi data file is loaded. The roaming instances are displayed on the site map with icons that demonstrate where the roaming started and stopped, as shown below.
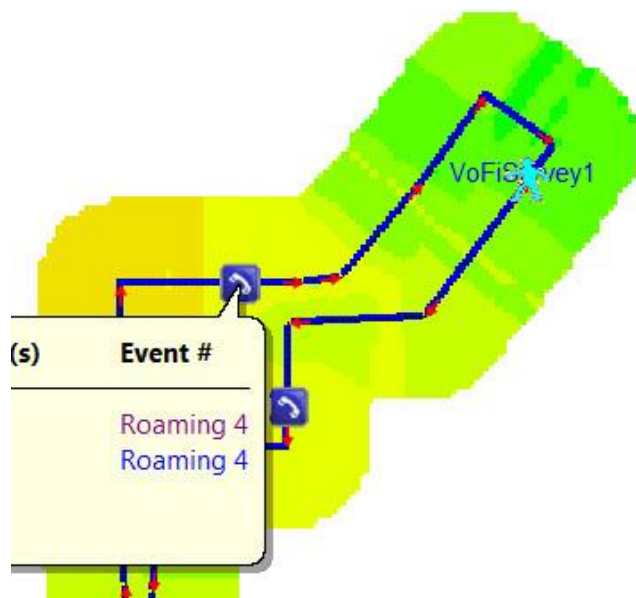
The ![icon](Roaming Start) icon allows the user to identify the location at which the phone enters and exits the roaming state. You can hover the mouse over these instances to view additional data regarding the roam.
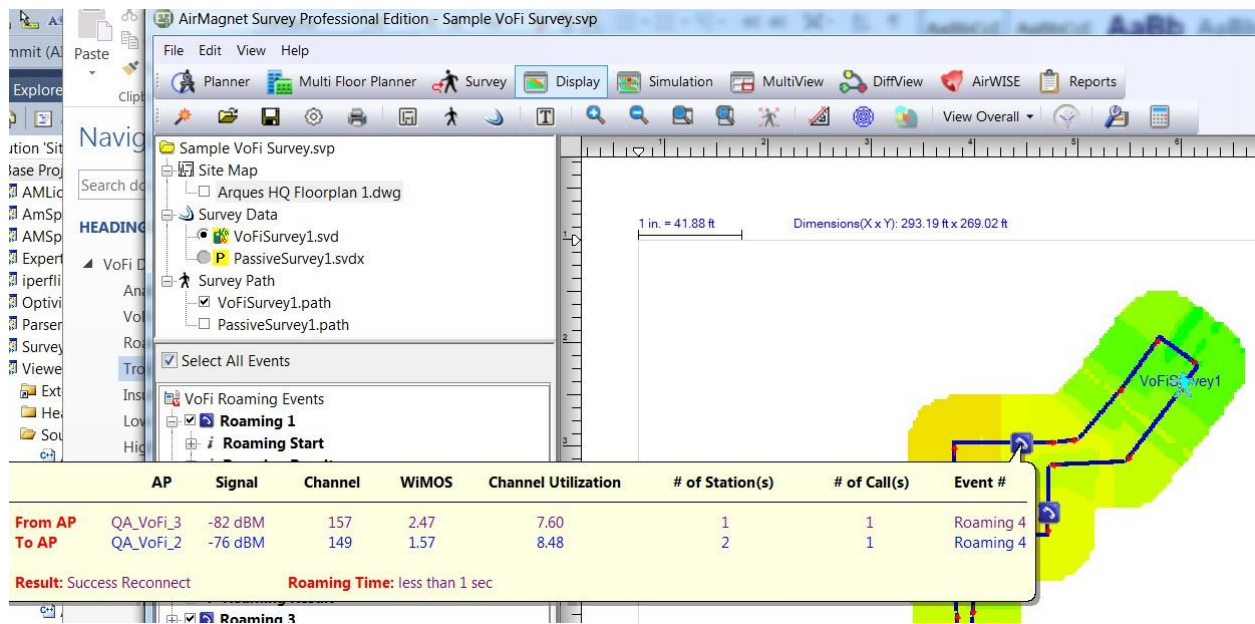
The bubble help pop-up allows the user to attempt to determine the reason that the phone roamed at this point on the map. The information is displayed for each AP involved in the roam (for example, the original AP and the one to which the phone roamed), as summarized in the table below.

Column	Description
AP	Displays the name for both APs in the roaming transaction. The original AP is listed first, followed by the new AP (for example, the one to which the phone roamed).
Signal	The signal strength detected from each AP at the roaming point. In most cases, the phone will attempt to roam from an AP with lower signal strength to one with a stronger signal.
Channel	The channel on which each AP is operating.
WiMOS	The WiMOS value for the call before and after the roam. A higher score indicates improved call quality.
Utilization	The percentage of available bandwidth on the channel being utilized at the time of the roam.
Station(s)	The total number of stations associated to each AP. Note that this value includes other phones, which are recognized as stations.
Call(s)	The number of active VoFi calls being supported by each AP.
Results	Displays whether the roaming attempt was successful or failed. Failed attempts result in the call being lost.
Roaming Time	The amount of time that passed while the phone was attempting to roam.

Troubleshooting Poor Call Quality

VoFi call quality can suffer due to various different factors in the wireless environment. This section is designed to help you identify the root cause of a problem detected during the VoFi
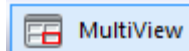
survey process. The MultiView ![MultiView] feature allows you to view up to four different data types for a VoFi survey data file at any given time. This can be extremely useful when attempting to identify and troubleshoot a region in which the WiMOS value unexpectedly drops on the map. The steps below illustrate the recommended method for diagnosing the root cause behind a low WiMOS.

Refer to the MultiView View topic, starting with Map Window for instructions on using MultiView.

To troubleshoot a region with low WiMOS:

1. After identifying the problem area on the map, import the same project containing the VoFi data file into the MultiView window four times (Refer to MultiView File Menu).

2. Select the same VoFi data file for each view pane.

3. Make sure the Automatic Multi-Select option is off (Refer to MultiView Toolbar).

4. Use the Data Type drop-down list to load the following heatmaps into the four panes:

   o Signal Strength (from AP -> Phone)

   o PHY Data Rate (from AP -> Phone)

   o Packet Retry Rate (from AP -> Phone)

   o Channel Utilization

3. Assess the signal coverage at the region with a low WiMOS using the Signal Strength map. If the signal strength is low (for example, -67dBm or lower), the signal coverage provided by the deployment is insufficient to support a VoFi implementation. Refer to Insufficient Signal.

4. If the signal level is sufficient, look at the PHY Data Rate at that area. If it is lower than 24MBps, the conversation is not being transmitted at a high enough data rate for high quality conversation levels. Refer to Insufficient Signal.

5. In the case where the speed is adequate for the conversation, the problem may lie in the Packet Retry Rate map. Excessive retries can mean that transmissions from the AP to the phone are not always going through, which can result in call information (i.e., the conversation) being lost. Refer to High Retry Rate.

6. Finally, if the other three maps have been verified to be problem-free, the overall utilization of the channel may simply be too high. Any 802.11 deployment is inherently limited in the number of transactions that can be supported simultaneously, and as utilization climbs, traffic may be transmitted at slower speeds in order to give the infrastructure more time to process exchanges. Consequently, if you find that too much of the network is being utilized at a given time, the infrastructure may need to be upgraded with additional APs to support the volume of traffic detected. Refer to Low PHY Data Rate.

Insufficient Signal

Ensuring adequate signal coverage is a significant challenge for standard data network implementations; however, Voice-enabled deployments present unique challenges, not the least of which is the fact that a VoFi implementation requires a much higher signal level in order to ensure adequate call quality. If you are finding that your signal coverage is

insufficient for either type of implementation, this can generally be caused by several different factors:

- **Insufficient infrastructure:** Perhaps the easiest factor to diagnose (albeit not the easiest to remedy), if a deployment doesn't contain enough APs to ensure adequate signal coverage throughout the entire region, transmissions will suffer. This is particularly noticeable for VoFi deployments, as voice traffic requires a strong signal in order to ensure that voice-quality transmission speeds are maintained. Although it may seem that adding more APs to the deployment should be the obvious answer to this problem, this is not always the case. In some situations, this may be the best solution; however, due to the nature of the wireless spectrum, APs that are placed too closely to each other (both in physical proximity as well as in adjacent channels on the same band) can create interference for each other, causing additional problems. In some cases, users may find it more helpful to rearrange the placement of the existing APs by sacrificing coverage in areas that do not require VoFi signal strengths (e.g., break rooms, lobbies, and so on) in order to maintain adequate signal in the most heavily-utilized areas.

- **Interferers:** Network interference can come from two major sources: 802.11 and non-802.11 devices. 802.11 devices include all existing wireless devices currently active on the network, including APs, stations, VoFi phones, and so on. Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting. In cases where 802.11 devices are creating interference, this is most often due to APs on the same network operating on the same (or adjacent) channels. Standard wireless practice recommends that APs placed in close proximity be configured to utilize channels that are at least five apart (common practice for the 2.4GHz band is to use channels 1-6-11, although standards may vary depending on country/region). Non-802.11 interference can be reduced by ensuring that any APs be placed far from potential interferers, particularly microwaves or wireless cameras. For advanced analysis, users can identify all sources of interference in the environment by using [AirMagnet Spectrum XT](), which can be purchased separately and integrated with the Survey software.

- **Obstacles:** Large or dense physical objects in the middle of a wireless deployment can reduce signal coverage in their immediate vicinity, creating "holes" in the network's coverage. These are most commonly pillars or thick walls, but can also be bodies of water, rooms full of equipment, etc. Since moving obstacles in the wireless environment is often unfeasible, the best solution for this issue is often similar to that for insufficient infrastructure; namely, to either add or rearrange APs within the deployment.

Low PHY Data Rate

The rates at which packets are transmitted through the wireless network can drastically affect the quality of service for users, most particularly during VoFi conversations. This can be caused by a number of different factors, two of which are detailed below:

- **Mixed-mode devices:** Wireless deployments that are designed to operate at high speeds (such as those provided by 802.11g or 802.11n devices) can have those speeds dramatically reduced when slower devices (such as those that operate on 802.11b-only) are introduced into the environment. Such "legacy" devices can cause traffic from all sources to be transmitted at lower rates due to the simple fact that they cannot operate at the higher rates.

In these cases, eliminating the legacy devices is the easiest solution. This can often be done simply by upgrading or replacing the older components, ensuring that the replacements can meet the higher speeds required for the deployment.

- **Interferers:** Network interference can come from two major sources: 802.11 and non-802.11 devices. 802.11 devices include all existing wireless devices currently active on the network, including APs, stations, VoFi phones, etc. Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting.
In cases where 802.11 devices are creating interference, this is most often due to APs on the same network operating on the same (or adjacent) channels. Standard wireless practice recommends that APs placed in close proximity be configured to utilize channels that are at least five apart (common practice for the 2.4GHz band is to use channels 1-6-11, although standards may vary depending on country/region). Non-802.11 interference can be reduced by ensuring that any APs be placed far from potential interferers, particularly microwaves or wireless cameras. For advanced analysis, users can identify all sources of interference in the environment by using [AirMagnet Spectrum XT](#), which can be purchased separately and integrated with the Survey software.

- [Insufficient signal coverage](#)

High Retry Rate

Installations that experience high levels of packet retry attempts indicate that packets are being lost during transmission. This can create problems for standard data networks (due to slower transmission rates), but can drastically impair the quality of voice transactions conducted on the same deployment. Dropped packets can cause jitter or gaps in a conversation, quickly rendering a VoFi connection unintelligible. High percentages of retries can be caused by:

- **Interferers**: Network interference can come from two major sources: 802.11 and non-802.11 devices. 802.11 devices include all existing wireless devices currently active on the network, including APs, stations, VoFi phones, and so on. Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting.
In cases where 802.11 devices are creating interference, this is most often due to APs on the same network operating on the same (or adjacent) channels. Standard wireless practice recommends that APs placed in close proximity be configured to utilize channels that are at least five apart (common practice for the 2.4GHz band is to use channels 1-6-11, although standards may vary depending on country/region). Non-802.11 interference can be reduced by ensuring that any APs be placed far from potential interferers, particularly microwaves or wireless cameras. For advanced analysis, users can identify all sources of interference in the environment by using [AirMagnet Spectrum XT](#), which can be purchased separately and integrated with the Survey software.

- **Excessive Devices**: Deployments that are attempting to support more devices than they have the infrastructure for can result in transmission collisions, or ultimately, traffic being ignored in favor of devices with a better signal.
Deployments that are utilizing large numbers of devices basically have two options: expand the infrastructure (that is, add APs) or reduce the total number of stations requiring service.

Simulation View

About Simulation view

The Simulation view allows network professionals to perform channel, SSID, and power simulation to see how the network would function in different scenarios. As such, you can explore various WLAN deployment plans without having to have the hardware devices actually installed. You can open the Simulation view by clicking ![Simulation] (**Simulation**) on the Navigation Bar.
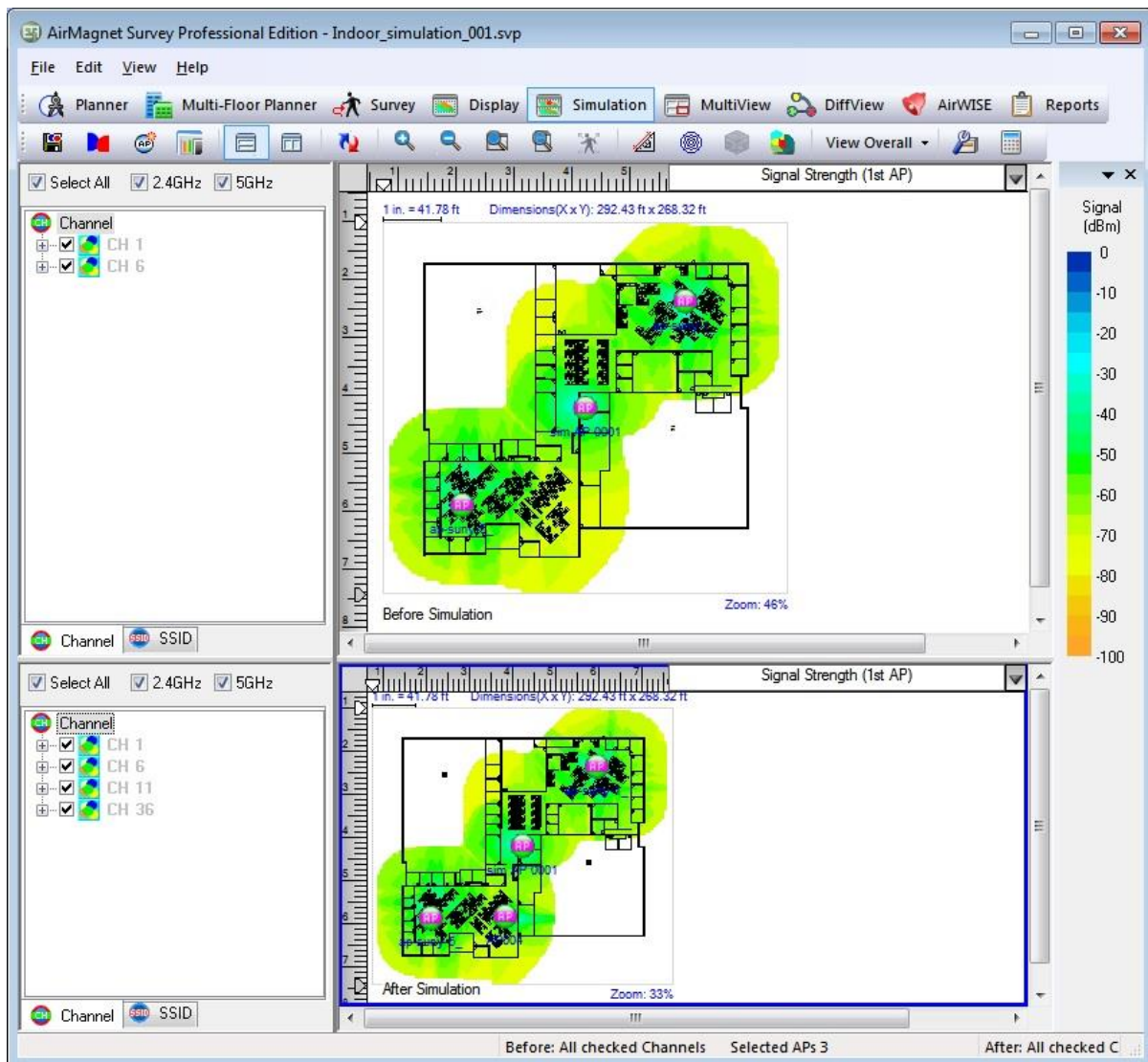
The Simulation view can be divided into the following sections:

- Channel/SSID List (Before_Simulation)
- Channel/SSID List (After-Simulation)
- Map Window

- [File Menu](#)
- [View Menu](#)
- [Toolbar](#)
- [Legend](#) (same as the one on Display view)

File Menu

The Simulation view includes an additional option on the File menu: Save Simulation opens the **Save Simulation** dialog box where you can save the simulated data as a file.

View Menu

The View menu on the Simulation view includes additional options:

Menu Option	Description
Vertical View Compare	Allows you to compare pre- and post-simulation data side by side.
Horizontal View Compare	Allows you to compare pre- and post-simulation data horizontally.

Simulation Toolbar

The following table describes additional tool available in the Simulation view.

Icon	Name	Description
	Save Sim	Same as [File>Save Simulation.](#) Enables you to save the simulation project.
	Vertical Compare	Same as [View>Vertical View Compare](#). Changes the Map view to vertical orientation.
	Horizontal Compare	Same as [View>Horizontal View Compare](#). Changes the Map view to horizontal orientation.
	Simulation	Opens the Simulation window, which allows you to perform data simulations.
	Add Simulation AP	Opens the New AP Properties window where you can specify the properties of the AP to be used in data simulation.
	Help	Opens AirMagnet Survey's Help window.
	Throughput Simulator	Opens the Throughput Simulator tool, which allows users to view predicted throughput speeds and bandwidth consumption for a custom-designed network. Refer to ["Simulating Network Throughput"](#) for more details.

Setting Up Data Simulation

Before conducting data simulation, you will need to place and "power" APs on the site map in the **Display** view at locations where the actual APs are located:

1. Create a survey project and conduct the survey. Refer to [Creating an Indoor Survey Project](#).

2. Navigate to **Display** view and **Refresh** the view.

3. Expand the Channel or SSID list and drag an AP to its physical location on the site map. Continue to do this for all the APs in the list. This step primarily relates to APs under your management, although you may place any or all APs in the list.

4. Right-click an AP you placed on the site map and select **AP Properties**.

5. Check **Apply Power Setting** and set the **Original Power mWatts**. Use the setting that matches the setting for the AP. Click **OK**.

6. Navigate to **Simulation** view. Now you may place simulation APs on the site map. On the toolbar, click **Add Simulation AP**. This opens the **New AP Properties** dialog. Modify any default settings (MAC Address, SSID and Original Power settings are required). When finished, click **OK**.

The AP is placed on the site map. You may drag the AP to the desired location. Click **Refresh** to view changes to the heatmap.

Before-Simulation Channel/SSID List

"Before Simulation" Channel/SSID List which appears on the upper-left part of the Simulation view. It lists the APs contained in the un-simulated data. You can view the APs either by channel or by SSID using the corresponding tab at the bottom of the list.

After-Simulation Channel/SSID List

"After Simulation" Channel/SSID List appears in the lower-left part of the Simulation view. It lists the APs contained in the simulated data. You can view the APs either by channel or by SSID using the corresponding tab at the bottom of the list.

Conducting Data Simulation

The Simulation view allows you to test a number of what-if hypotheses using data collected from actual site surveys. Therefore, you must perform site surveys to collect the real data you need. Also, you need to open the data file on the Display view first before you switch to the Simulation view. Otherwise, the Simulation view will not be available. You can conducting two types of simulations:

- Simulating Data Configuration
- Simulating Channel Allocation

Simulating Data Configuration

To conduct data simulation:

1. From the Display view, open a survey data file.

2. From the Navigation Bar, click 　Simulation　. The Simulation dialog box appears.
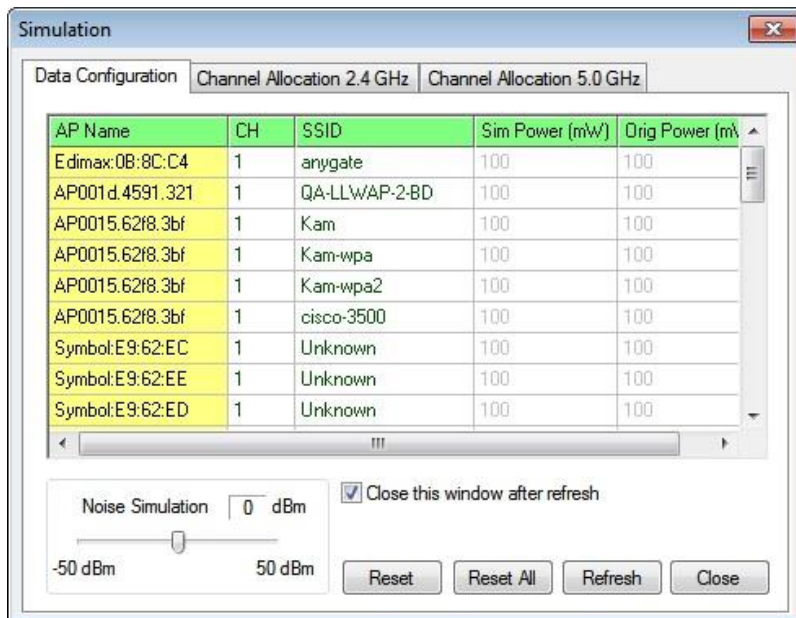
3. Highlight the AP of your choice, and do any or all of the following:
   - Click the **CH field** and select a channel from the drop-down list.
   - Click the **SSID field** and select an SSID.
   - Drag the scale to set a **Noise Simulation** level.
4. Click **Refresh**. The Loading Date File view appears. The graph refreshes once the simulation process is completed.
5. Click **Close**.

Note: Make sure that the APs are placed in their exact locations and that the correct values of the original output power are used. APs placed on Survey's Display view are 'display-only' by default. Consequently, you will be unable to modify the AP power settings for APs placed on the Simulation screen unless the APs are first changed to Power APs. Placing APs and enabling power can be done on the Display view. Refer to Channel/SSID List.

Simulating Channel Allocation

Simulating channel allocation enables you to find out the optimal channel assignment or distribution for the APs currently detected in the survey. It helps you make well-informed decisions on the number of APs needed on the network or at a certain part of the network: if multiple APs are covering the same area on the same channel, the chances are that not all of the APs may be necessary.

Note: You can choose to simulate channel allocation on either the 2.4 or 5.0 GHz band by using their respective tabs across the top of the dialog box.

To simulate channel allocation:

1. From the Toolbar, click **Simulation** (not to be confused with Throughput Simulation). This opens the **Simulation** dialog.
2. Click the **Channel Allocation** tab. The view refreshes.
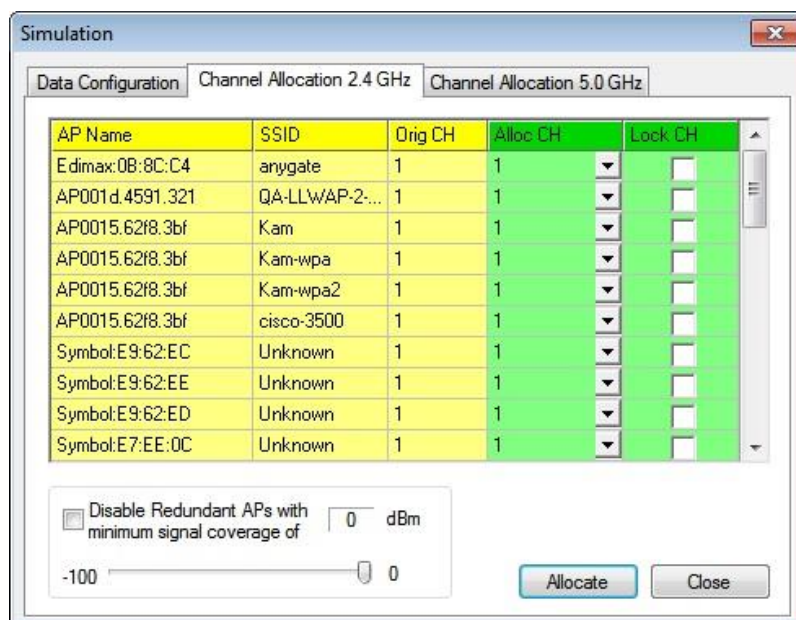
Note: All APs that are detected are identified by AP name, SSID, and (original) channel.

3. Select the AP of your choice and click the down arrow to specify its new channel, if desired.
4. Check the **Lock CH** box to lock the channel for the corresponding APs, if you want to ensure that the simulation process doesn't alter that AP's setting.

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> **Note:** *802.11ac/ax APs are automatically locked ("Lock CH" column is checked) in Channel Allocation.*

5. Check the **Disable Redundant APs**, if desired.

> **Note:** *This allows the application to disable the APs it considers redundant. The slider allows you to configure the signal strength required for APs to be considered redundant. If all points meet the specified signal requirement, any APs below that level will be eliminated. Once the simulation is completed, Survey will automatically disable those APs that it considers redundant.*

6. Use the slider to set a minimum signal coverage value.

7. Click **Allocate**.
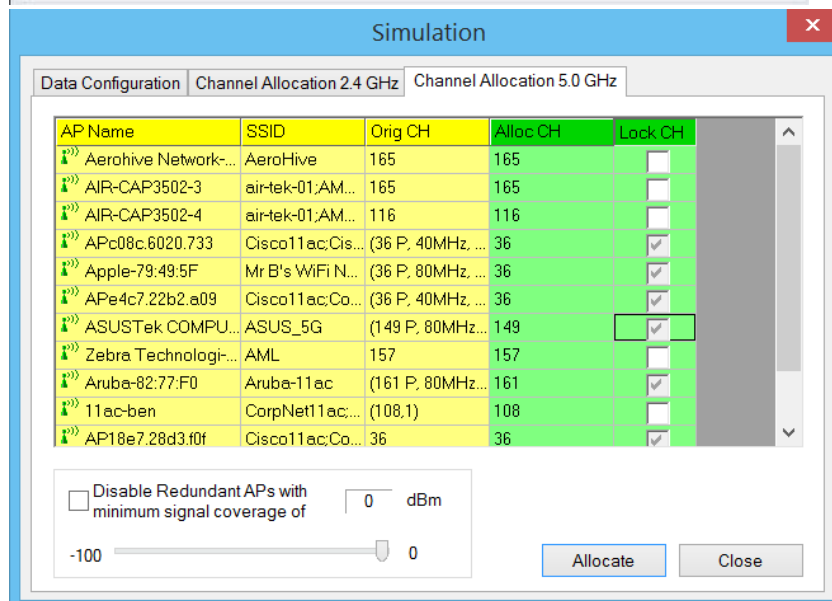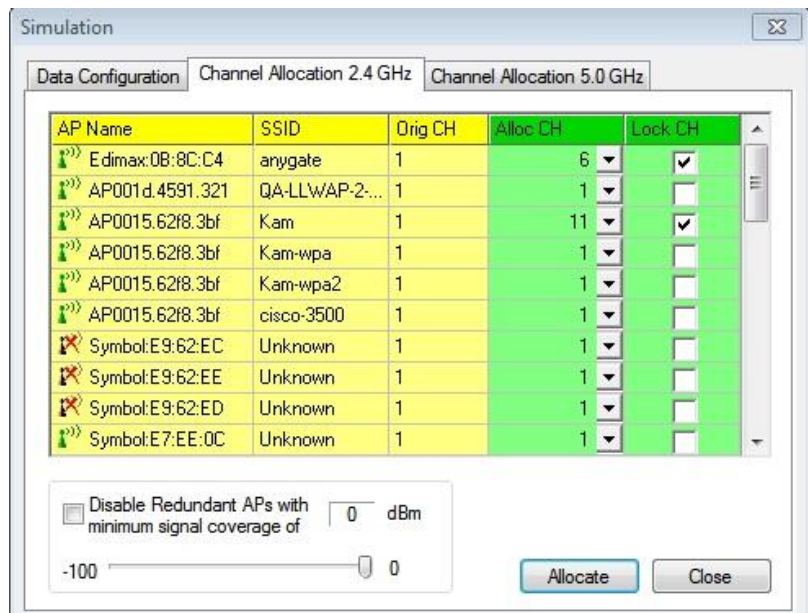
> **Note:** *You can also add APs or relocate APs to certain areas on the site map and then use the Simulation tool to see how the changes will affect the signal coverage in the target areas.*

Simulating Network Throughput

Survey's Throughput Simulator allows you to set up theoretical network implementations and view the expected levels of traffic that the specified devices will experience. You can create entire simulated networks from scratch in order to test a planned implementation or use devices already detected in the current survey file in order to see how new additions to the environment will affect the overall performance of the existing infrastructure.

The Throughput Simulator is a utility for calculating network, node and media throughput, utilization and overhead (as measured at the 802.11 Link Layer) under various network and node configurations. It allows you to add and configure up to fifty 802.11a, 802.11b, 802.11g and/or 802.11n nodes on a "virtual channel". The Simulator's engine applies additional network and node parameters based upon the type and settings of the nodes present. The Simulator runs in a "perfect" environment, assuming that all nodes can "hear" each other (negating the possibility of packet collisions and frame retries) and that all nodes transmit as much (and as fast) as they possibly can (based upon their individual and overall network parameters). The result of such simulation provides a baseline measurement of the (somewhat theoretical) maximum link-layer throughput that can be achieved for a particular configuration.

To use the WLAN Throughput Simulator:

1. From the Simulation view, click (**Throughput Simulator**). The **Throughput Simulator** window appears.
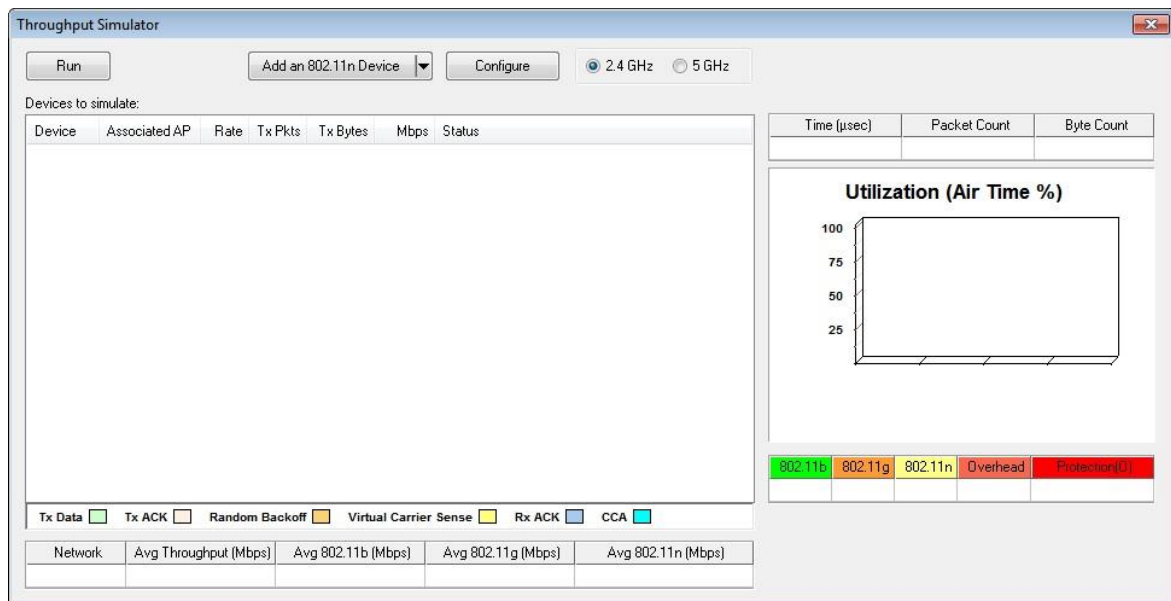
2. From the menu bar, click Add Device and select an option as described in the table below.

Option	Description
Add 802.11x Device…	Drop-down that enables you to select one or more devices to be added from the information contained in the current survey data file.
802.11a Device…	Opens the Device Configuration dialog box, which allows you to select a type of device to be added, as well as its physical data rate. **Note:** *An AP must be added before the Throughput Simulator will allow a station to be created.*
802.11b Device…	Opens the Device Configuration dialog box, which allows you to select a type of device to be added, as well as its physical data rate. **Note:** *An AP must be added before the Throughput Simulator will allow a station to be created.*
802.11g Device…	Opens the Device Configuration dialog box, which allows you to select a type of device to be added, as well as its physical data rate. **Note:** *An AP must be added before the Throughput Simulator will allow a station to be created.*
802.11n Device…	Opens the Device Configuration dialog box, which allows you to select a type of device to be added, as well as its MCS index. A series of checkboxes also allow you to specify the devices various configuration parameters, including Greenfield, channel width, etc. **Note:** *An AP must be added before the Throughput Simulator will allow a station to be created.*

Note: *To remove a device from the Throughput Simulator, right-click the desired device and select Delete Node.*

3. After the necessary devices have been added, click each station's Associated AP column to select an AP to which it should associate.

Note: *You must associate at least one station to each AP in order to simulate network throughput. Note that APs with associated stations cannot be removed.*

4. After all the necessary associations have been made, click **Run** to start the simulation. For descriptions of the throughput simulation data fields, refer to Analyzing Simulated Throughput Data.

Analyzing Simulated Throughput Data

During network simulation, the Throughput Simulator window will update dynamically as new information is calculated. These data are displayed in three major portions of the view, as highlighted in the image below.

Throughput Simulator Summary

The Throughput Summary portion of the Throughput Simulator displays the simulated network throughput separated based on media type, allowing the user to see how much throughput is dedicated to each type of device. These data are described in the table below:

Field	Description
Network	The combined aggregate throughput of all wireless media (which may include 802.11a/b/g/n, depending on the frequency band selected, that is, 2.4 GHz vs. 5 GHz).
Average	The average node throughput (that is, the network throughput divided by the number of nodes).
Avg 802.11a	The average node throughput for all 802.11a devices. Note that this column only appears when the 5 GHz band is selected.
Avg 802.11b	The average node throughput for all 802.11b devices. Note that this column only appears when the 2.4 GHz band is selected.
Avg 802.11g	The average node throughput for all 802.11g devices. Note that this column only appears when the 2.4 GHz band is selected.
Avg 802.11n	The average node throughput for all 802.11n devices.

Throughput Simulator Device Table

The Device Table portion of the Throughput Summary displays the status of each device as the simulation proceeds. The data in this portion of the window are described in the following table:

Column	Description
Device	The name of the device. For actual detected devices, this name is provided by the survey data. For devices added manually, these names are numbered generic entries (for example, AP_1, STA_2).
Associated AP	The AP to which a station has been associated. APs will not have any information displayed in this field.
Rate	The rate at which the device is set to transmit. This number is specified by the user when devices are added.
Tx Packets	The number of simulated packets transmitted by the device.
Tx Data Bytes	The number of simulated data bytes transmitted by the device.
Throughput	The device's throughput (in Mbps).
Status	The current operating state of the nodes which can be any of the following: • TX Data • Tx ACK • Random Backoff • Virtual Carrier Sense • Rx ACK • CCA **Note:** *The Status column of the Device Table is color-coded as described by the color legend listed across the bottom of the Throughput Simulator window.*

AirWISE View

About AirWISE view

The AirWISE view enables wireless LAN planners and administrators to make well-informed decisions regarding the requirements for their WLAN deployment and maintenance based on the actual data collected from site surveys. You can open the AirWISE view by clicking ![AirWISE] on the Navigation Bar.

AirWISE Summary

The AirWISE Summary pane on the AirWISE view lists the default AirWISE requirement policy included with AirMagnet Survey. As described in this section, new policies may be created and the default requirements can be customized to conform to your particular needs.

The AirWISE Summary pane displays the following AirWISE information:

- **AirWISE Requirements:** Lists each AirWISE Requirement policy. The list contains the default AirWISE requirements included with AirMagnet.

- **% of Good Area:** Shows the status of the survey data in terms of compliance with requirement's configurable threshold value. For example, if the requirement threshold value is set to -67 and all the data is -67 or greater for this requirement, the percentage of good area will be 100%. N/A indicates that this particular requirement is not applicable to the type of survey data selected in the Display view.

- **Pass/Fail:** A configurable value that indicates whether the "% of good area" is within an acceptable threshold. For example, if the Pass/Fail value is set to 100% and the "% of good area" is 80%, the Pass/Fail column will read "Fail." However, if the Pass/Fail value is set to 80% and the "% of good area" is 80%, the Pass/Fail column will read "Pass."

In addition, by selecting an AirWISE Requirements listing, you can view the associated heatmap and policy explanation.

Channel/SSID List

The figure below shows the Channel/SSID List on the AirWISE view, which allows you to group the APs contained in the survey data either by channel or by SSID using the corresponding tab.
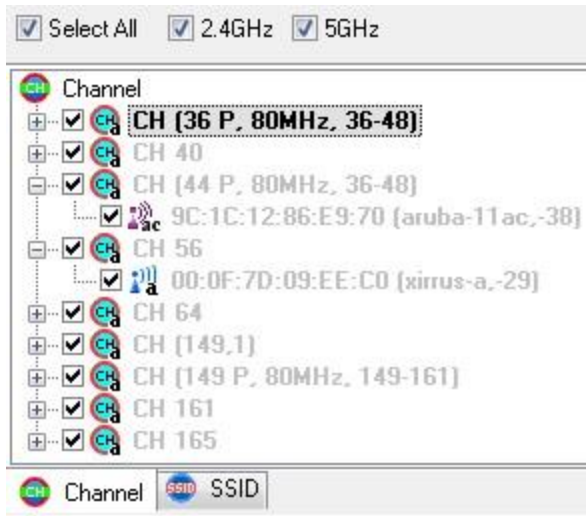
Also, if your survey includes simulated data (refer to About Simulation view), you may choose whether to use original data or simulated data by selecting "**Use Simulated Data**" from the View menu (checked is enabled).

File Menu

The File menu on the AirWISE view includes some additional options:

Menu Option	Description
New AirWISE Policy...	Opens the New Requirement Policy dialog box. Refer to Creating Custom Requirement Policies for more information.
Save AirWISE Policy	Saves any changes made to the current AirWISE policy. **Note:** *If the current policy is one of the preconfigured policies packaged with Survey, an error message will be displayed prompting you to save under a different name.*
Save AirWISE Policy As...	Brings up the Save As dialog box which allows you to save a current AirWISE Policy using a different file name.
Import AirWISE Policy...	Brings up the Open dialog box, which allows you to open a previously created AirWISE policy file into the current project.
Export AirWISE Policy...	Brings up the Save As dialog box which allows you to save a current AirWISE Policy using a different file name to a separate location (for example, to a USB external drive). Two files will be created: The .SAR file and .PCT file. Both of these files will need to be imported into another installation of AirMagnet Survey PRO.
Remove AirWISE Policy...	Opens the Remove Policy dialog box. Refer to Removing AirWISE Policies for more information.
Load AirWISE Areas...	Brings up the Open dialog box, which allows you to open an AirWISE Area (.saa) File. The file contains data regarding areas drawn on the AirWISE view to define requirement regions.
Save AirWISE Areas	Saves the current AirWISE areas.
Save AirWISE Areas As...	Saves the current AirWISE areas under a new file name.

View Menu

The View menu of the AirWISE view includes the option to **"Use Simulated Data"**. If your survey includes simulated data (refer to About Simulation view), you may choose whether to use original data or simulated data (checked indicates Use Simulated Data).

Toolbar

The following table provides description for additional Toolbar tools available in the AirWISE view.

Icon	Tool Name	Description
↺	Reset AirWISE Requirements	Same as the File>Reset AirWISE Requirements. Refer to the AirWISE File Menu topic.
📂	Load AirWISE Requirements	Same as File>Load AirWISE Requirements. Refer to the AirWISE File Menu topic.
💾	Save AirWISE Requirements	Same as File>Save AirWISE Requirements. Refer to the AirWISE File Menu topic.
▢	Rect Region Tool	Allows you to mark and select a rectangular area on the site map in the AirWISE window.
⬡	Arbitrary Region Tool	Allows you to mark and select an area of any shape.
✂	Clear Last Region	Allows you to remove the area selection mark you last made on the site map.
✕	Clear All Regions	Allows you to remove all area selection marks you have made on the site map in the AirWISE window.

Legend

The figure below shows the Legend on the AirWISE view. It shows the level of compliance to AirWISE Requirements according to the threshold (signal value) you specify. Areas that meet the requirements are shown in green; areas that fail to meet the requirements are shown progressively in shades of yellow and red, reflecting the different levels of non-compliance. The heavier the color, the worse the non-compliance.

You can use the Refresh button on the toolbar to update the view after you have adjusted the threshold value.
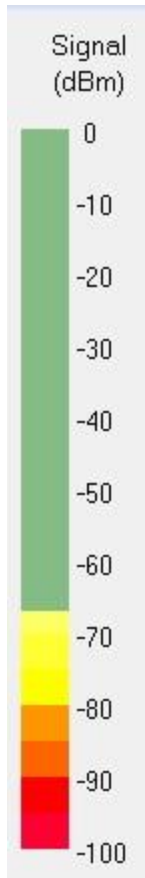
AirWISE Content Window

When you select an AirWISE Requirements listing in the AirWISE Summary pane, the AirWISE Content window displays a heatmap of the associated requirement.
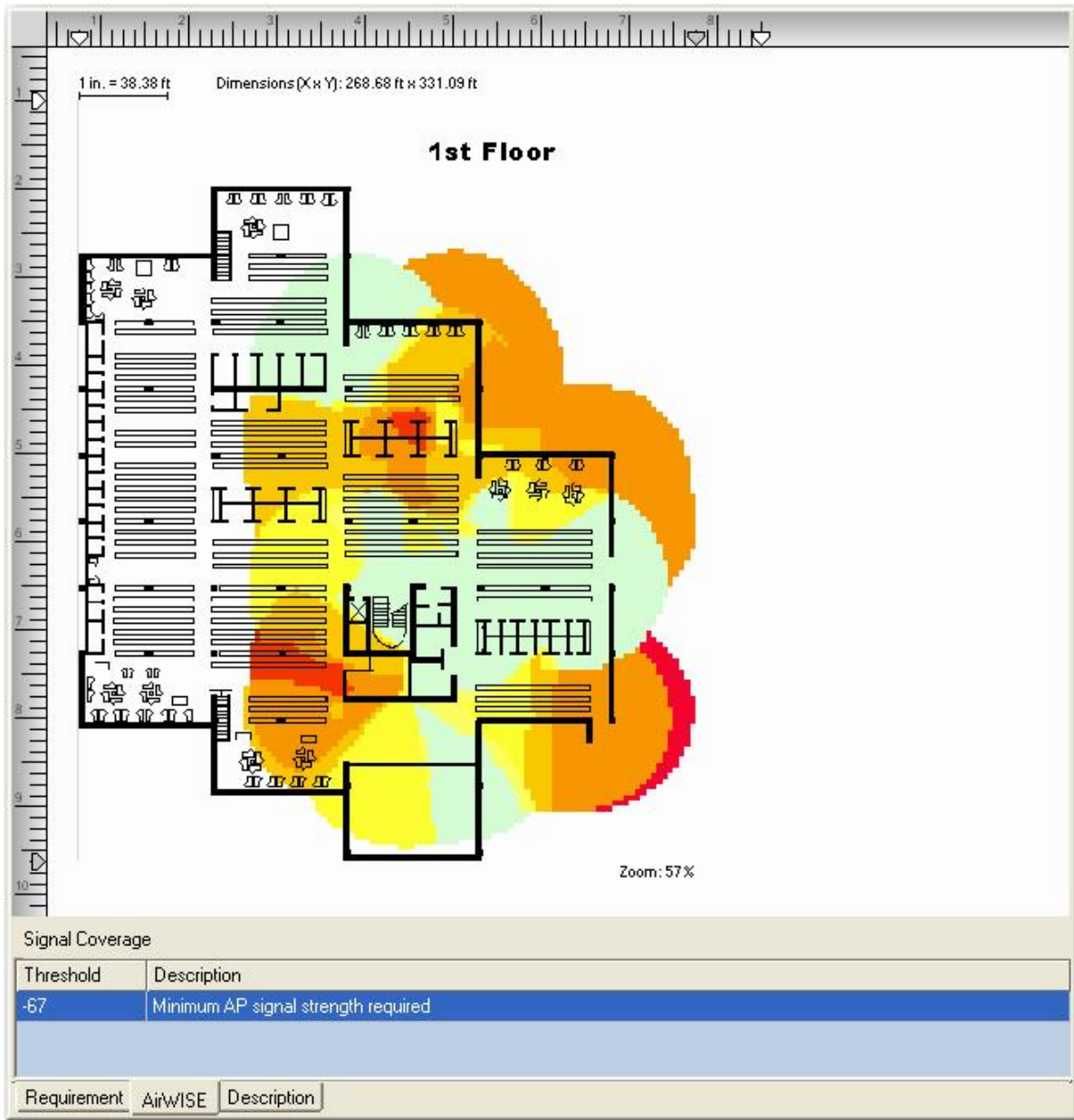
As shown in the figure above, there are three tabs in the bottom-left corner of the Content Window view:

- **Requirement**: This tab opens the AirWISE Requirements window, which summarizes all the AirWISE requirements and the compliance status of the WLAN site according to the data contained in the survey project file.

- **AirWISE**: This tab opens the AirWISE Content window that shows the site map contained in the survey data collected. It allows you to customize certain parameters to see how the changes would affect compliance with AirWISE Requirements.

- **Description**: This tab opens the Description window on the AirWISE view, which provides a detailed explanation about the selected AirWISE requirement and offers advice on how to comply with it.

Working in Requirement Window

This section explains how to change a requirement threshold value in order to affect compliance to the related AirWISE Requirement.

> **Note:** In order to analyze survey data on the AirWISE view, you must first load the selected survey data on the Display view and then switch to the AirWISE view. The following explanation assumes that you have already loaded the data on the Display view.

1. When AirWISE is opened, the default view shows a list of requirements and associated configurable threshold values in the right-side table. However, if a particular AirWISE policy is selected from the list of AirWISE requirements in the left-side table, you can click the "**Requirement**" tab to display the table.

2. Within the "Threshold" column, select a value to change and overwrite it with the new value.

3. Then click (**Refresh**). The change and its impact on the network's compliance with the selected AirWISE Requirement are reflected instantly in the AirWISE Summary section of the view.

AirWISE Requirements	% of Good Area	Pass/Fail
Signal Coverage	100.0	Pass
Multiple AP Signal Coverage	100.0	Pass
Channel Interference	1.9	Fail
Measured PHY Data Rate Up ...	N/A	N/A
Measured PHY Data Rate Do...	N/A	N/A
Predictive PHY Data Rate Do...	100.0	Pass
Signal Noise Ratio Coverage	N/A	N/A
Noise Level	N/A	N/A
User Capacity	N/A	N/A
Operating Mode	100.0	Pass
Channel Width	100.0	Pass
802.11n Highest MCS Index	100.0	Pass
802.11ac Highest MCS Index	100.0	Pass
802.11ax Highest MCS Index	100.0	Pass

4. With the requirement selected, click the "AirWISE" tab in the lower-left corner of the Content Window to view how the change is reflected in the heatmap.
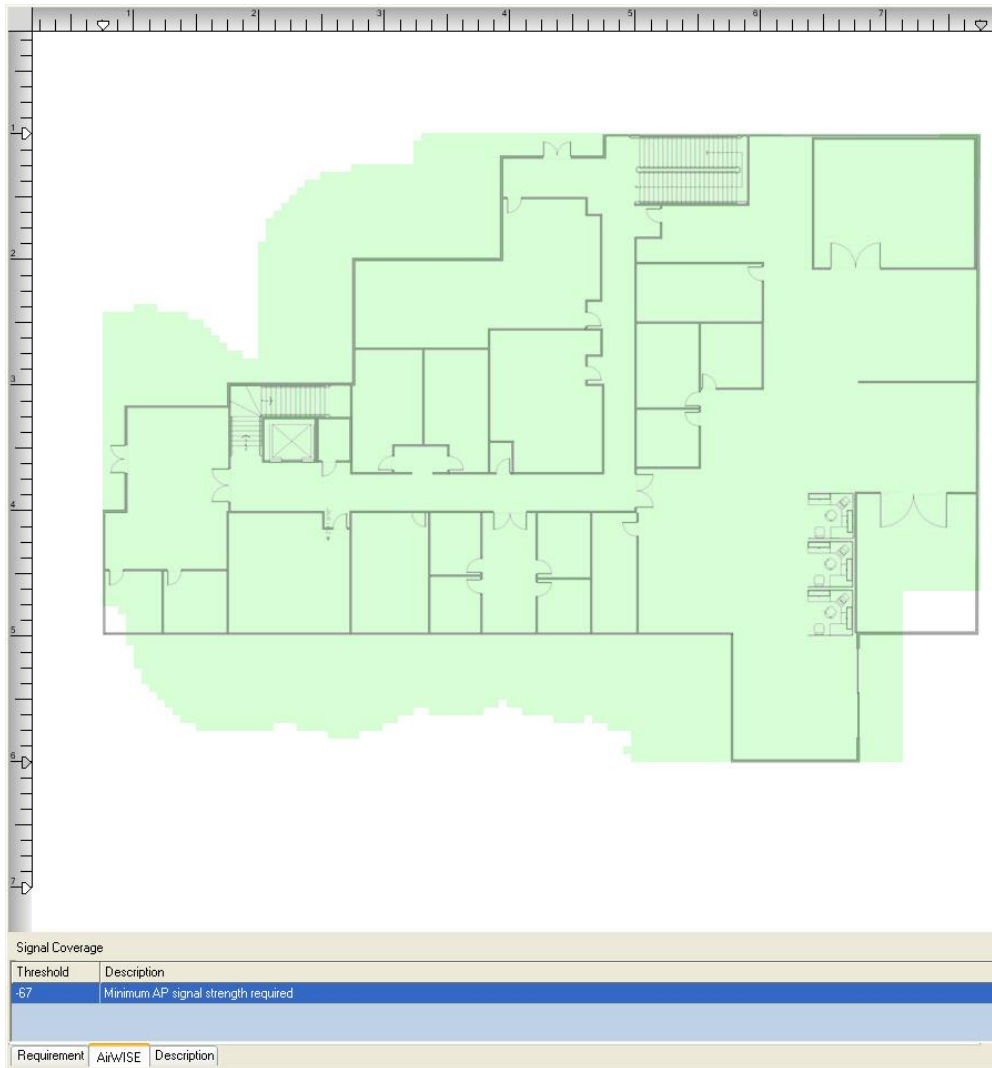
Configuring Pass/Fail Threshold Values

Each requirement includes a Pass/Fail option. This is a configurable percentage value that indicates whether the "% of good area" is within an acceptable threshold. For example, if the Pass/Fail value is set to 100% and the "% of good area" is 80%, the Pass/Fail column will read "Fail." However, if the Pass/Fail value is set to 80% and the "% of good area" is 80%, the Pass/Fail column will read "Pass."

1. Click the **Edit Pass/Fail Threshold** icon .
2. To select the type(s) of alarm you want, click the desired check box(es) to the left of the **Alarm Type** column.
3. Edit the value in the **Minimum % of coverage to pass** column.
4. Click **Save**.

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On	Alarm Type	Minimum % of coverage to pass
☑	Signal Coverage	100.0
☑	Multiple AP Signal Coverage	100.0
☑	Channel Interference	100.0
☑	Measured PHY Data Rate Up Coverage	100.0
☑	Measured PHY Data Rate Down Coverage	100.0
☑	Predictive PHY Data Rate Down Coverage	100.0
☑	Signal Noise Ratio Coverage	100.0
☑	Noise Level	100.0
☑	User Capacity	100.0
☑	Operating Mode	100.0
☑	Channel Width	100.0
☑	802.11n Highest MCS Index	100.0
☑	802.11ac Highest MCS Index	100.0
☑	802.11ax Highest MCS Index	100.0

☑ Select/Unselect All Alarms   [Default]   [Save]   [Cancel]

Testing AirWISE Requirements Compliance on Site Map

A change of threshold in signal coverage can significantly affect the size of the area with good signal coverage as can be seen graphically in the Content Window when you select the AirWISE tab. The AirWISE view offers a variety of troubleshooting features. This section shows how to visually test several what-if hypotheses you may have in relation to any of the AirWISE Requirements on a site map in the AirWISE view.

Note: *In order to analyze survey data on the AirWISE view, you must first load the selected survey data on the Display view and then switch to the AirWISE view. The following discussion assumes that you have already loaded the data on the Display view.*

To test AirWISE requirements on the site map:

1. While you are on the AirWISE view, click Multiple AP Signal Coverage. The AirWISE view refreshes.
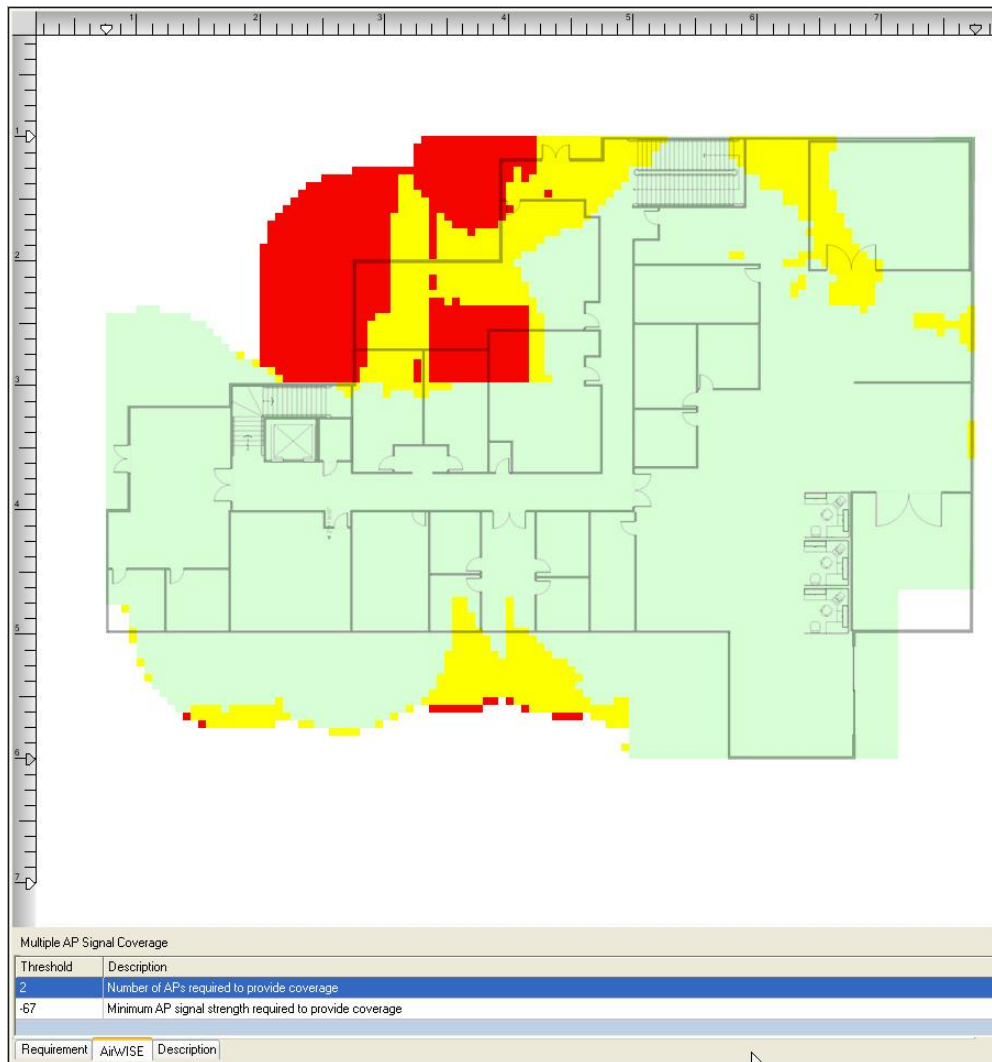
> **Note:** *The figure above shows a network's compliance status to the Multiple AP Signal Coverage requirement based on the survey data collected. A large part of the site is in RED, which implies that the signal coverage there is bad. You can try to rectify this situation either by increasing signal strength of the existing APs or by removing one of the APs from the network. Steps 2 through 3 below are just for illustration purposes.*

2. From the bottom of the Content Window, reduce the minimum signal strength.

3. Click (**Refresh**). The AirWISE view refreshes.
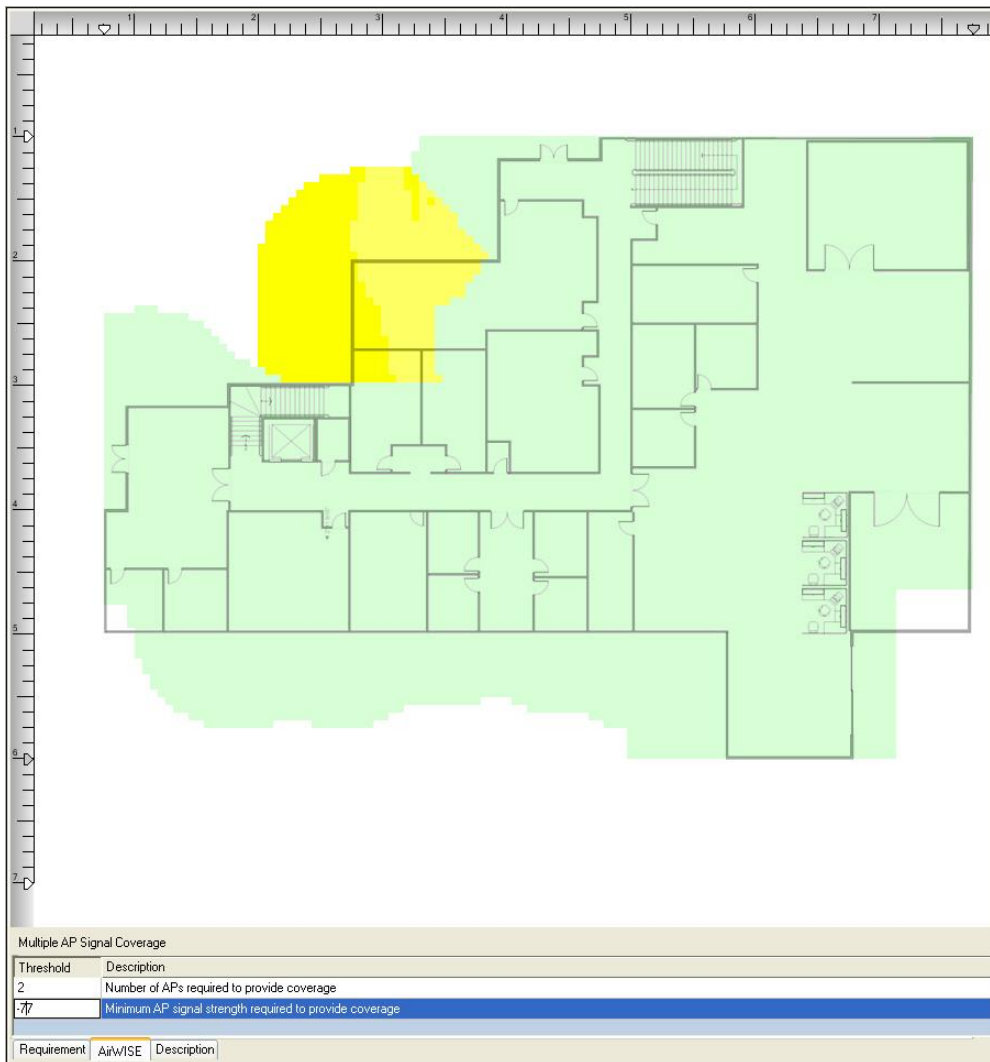
Note: *As shown above, the WLAN site is now 91.3% covered when the signal strength was decreased to -77dBm. Based on this result, you can probably use two APs to cover the entire site with a minimum signal strength of -77dBm.*

Determining the Number of APs Needed in an Area

The AirWISE view not only enables you to easily determine the number of APs needed to provide adequate signal coverage for an entire WLAN site, but also allows you to quickly figure out on the view the optimal number of APs that are needed to cover a certain area of the site using a certain channel. As a result, you can save the resources that would otherwise have to be used in numerous trial-and-error attempts to find the best solution.

Note: *In order to analyze survey data on the AirWISE view, you must first load the selected survey data on the Display view and then switch to the AirWISE view. The following section assumes that you have already loaded the data on the Display view.*

To determine the number of APs needed for an area of the network:

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1. While you are on the AirWISE view, click ▢ (R**ect Region Tool**) on the Toolbar.

2. On the site map, click a starting point and mark an area of interest by dragging a rectangular frame around it.

3. Click 🔁 (**Refresh**). The AirWISE view refreshes.
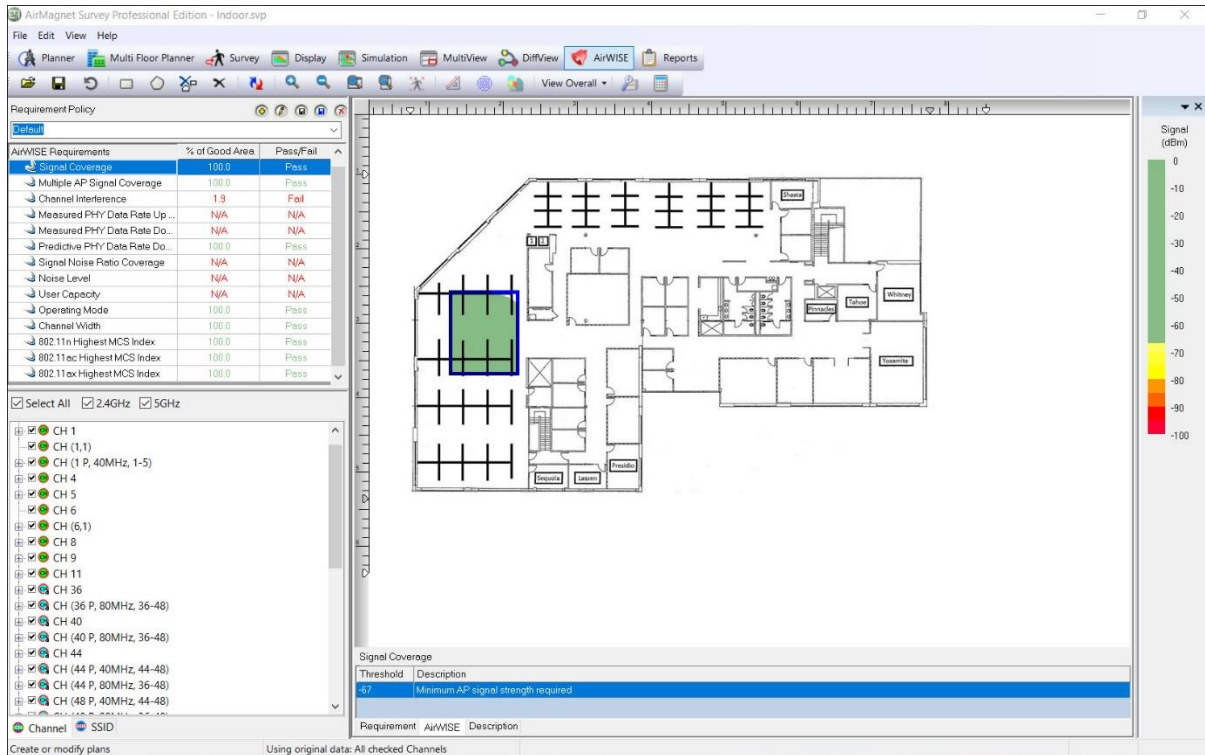
4. From the Channel/SSID pane, select the **Channel** tab.

5. Click the **Select All** check box to deselect all entries in the Channel/SSID pane.

6. Manually select the entries by checking the corresponding check boxes.
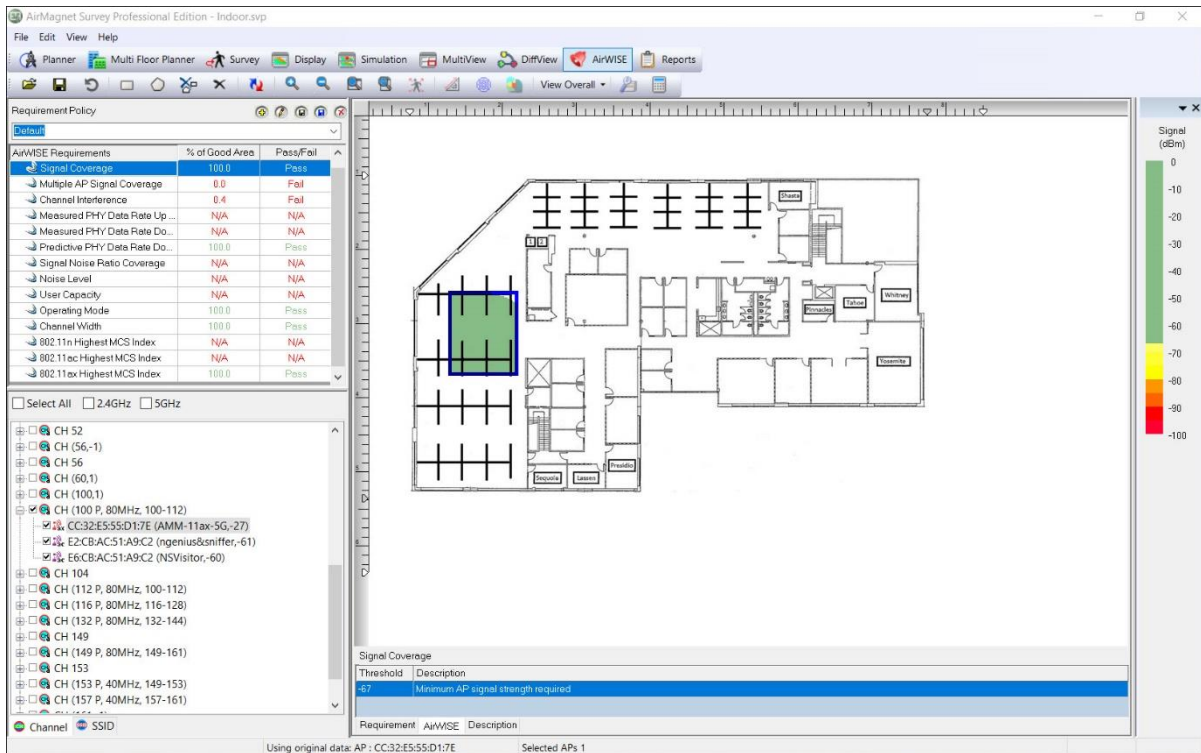
*N**ote:** The figure above shows that the marked area of the WLAN site is mostly not covered by the other APs.*

Getting AirWISE Advice

If you need information about any of the AirWISE Requirements in question (shown on the view) or advice on what you need to do in order to comply with a certain AirWISE requirement, click the **Description** tab in the lower-left corner of the Content Window. You will get detailed information and advice related to the AirWISE Requirement.
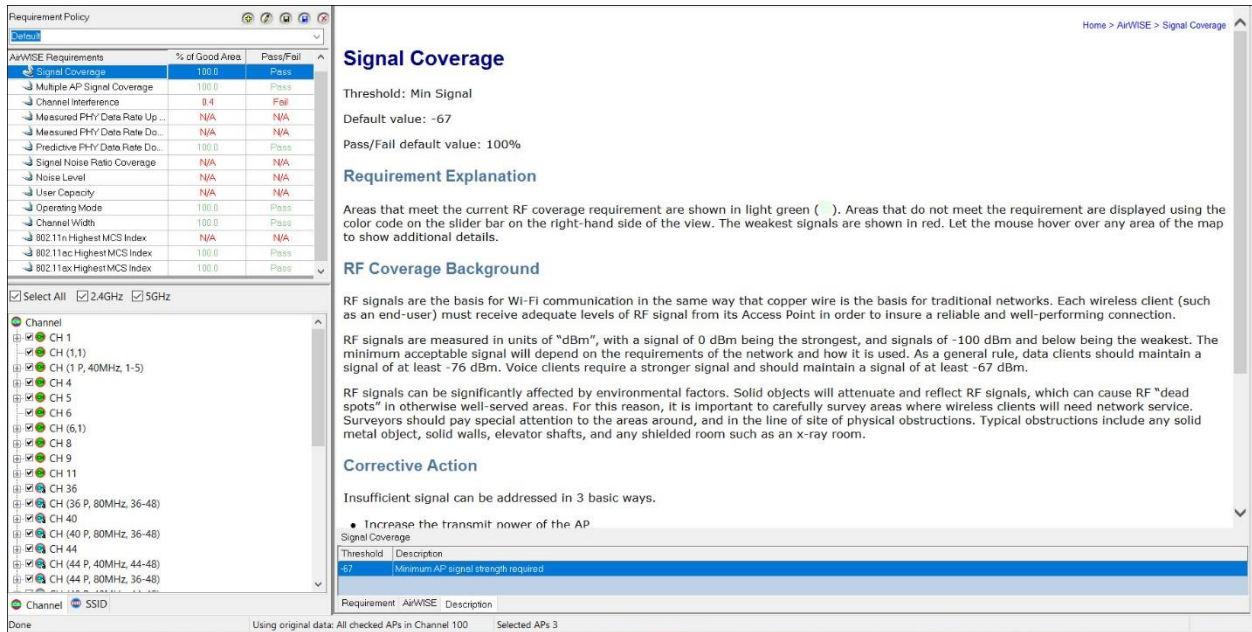
Managing AirWISE Requirement Policies

AirWISE Requirement Policies are designed to allow you to easily maintain multiple different requirement profiles, which can be applied as necessary to any existing Survey projects. This makes it easy to ensure compliance with various corporate requirements over different projects, or even in different areas of a single project. This can be particularly useful for organizations that must enforce two levels of wireless compliance, for example, if both wireless voice (VOIP) and data infrastructures are in place. Due to the potentially wide variations in requirements for voice traffic as opposed to standard data transmissions, these two implementations will require different minimum signal levels, AP placement, and PHY data rate information.

The policy management portion of the view contains five main functions, as shown in the image below. These functions are described in more detail in the following sections.

Note: *AirMagnet Survey currently includes preconfigured policies for Cisco phone models 7920, 7921, and 7925, as well as Vocera badges. Note that the policies included with Survey cannot be modified or removed.*

Selecting an AirWISE Requirement Policy

The AirWISE policy selection drop-down list allows the user to specify the current profile in use. This list includes preconfigured policies as well as any user-defined profiles that have been created. To select a new profile, click the drop-down and make the desired selection from the list.

Note: *Several policies are included with AirMagnet Survey by default; these policies cannot be modified or removed.*

Creating Custom Requirement Policies

Although Survey includes several preconfigured policies designed for standard deployment types, many users prefer to customize their own policies tailored to their wireless environments. This section describes the basic steps for creating and modifying a custom policy.

To create a new AirWISE policy:

1. From the Requirement Policy window, click (**New policy**). The New Requirement Policy window appears.

2. Enter the desired name for the new policy.

3. At this point, the user has two options:

- Create the policy using the default values for all requirements—In this case, leave the **Create New Policy** option selected.

- Create the policy by copying the values of another policy—Select **Copy From**: and use the resulting drop-down field to select the policy to be copied.

Click **OK** to continue after making the desired selection. The new policy will be selected on the AirWISE view.

After the new policy has been created, the user can modify any of the thresholds as needed using the same steps described in Adjusting AirWISE Requirement Thresholds.

Note: *User-created policies can be deleted by clicking* *with the policy selected.*

Saving Changes to AirWISE Policies

After changes have been made to a custom policy, you must save the changes in order to ensure that they aren't discarded after the project is closed or navigates away from the AirWISE view. This can be performed by simply clicking (**Save policy**).

However, if you have made changes to one of the preconfigured policies, the changes must be saved under a different profile name. This operation can be performed using (**Save policy as...**).

Note: *If unsaved changes exist when the user attempts to navigate away from the AirWISE view, a message will appear asking if the changes should be saved.*

Removing AirWISE Policies

Clicking (**Remove policy**) opens the Remove Policy dialog box, which allows you to manage the attributes of the current project's policies.

As seen above, the Remove Policy window provides three major options for the policies:

- **Remove**: Deletes the selected policy application.
- **Set Read Only**: Sets the selected policy to Read Only, which ensures that the policy cannot be modified or removed.
- **Done**: Closes the Remove Policy window.

Verifying VoFi Network Compliance

With the implementation of preconfigured AirWISE profiles for various different VoFi phone types, you can conduct a standard survey of their wireless environment and assess the results to see if the deployment is ready for a VoFi implementation. This important step can help ensure that the VoFi deployment is prepared with minimal impact on the existing wireless activity.

To assess VoFi compliance:

1. After conducting a standard passive or active survey on the area, navigate to the AirWISE view.

2. Use the Requirement Policy drop-down list to select the profile for the phone models to be used in the VoFi implementation.

3. View the AirWISE Requirements listed and assess which aspects of the network don't meet the standards for a VoFi implementation. Note that the *Multiple AP Signal Coverage* requirement is of particular importance as redundancy is a critical factor in a VoFi deployment.

Note: *This procedure can be performed both prior to deploying the VoFi installation (to verify that the network is ready) as well as after (to verify that the wireless infrastructure remains sufficient after VoFi activity is present).*

AirWISE

Channel Interference

Threshold: Min Signal to Interference, Min Signal of interferer

Default value: -75, -85

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Channel Interference are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. Let the mouse hover over any point of the map to show additional details.

> **Important Note:** *AirMagnet Survey measures interference from the point of view of a particular AP. Thus for a given AP, AirMagnet shows a cumulative view of all the various Wi-Fi sources that are interfering with that one AP. As a result, you should deselect all APs that are not the focus of investigation (using the device tree on the left). The signals from de-selected devices are still considered when determining interference to other APs.*

Background

Interference represents a serious threat to the performance of a wireless network. The most common source of interference is co-channel interference, which is caused by wireless access points that are operating on the same channel or on an overlapping channel.

Networks should be designed to avoid co-channel interference whenever possible. It is important to note that there are technically 11 or more channels in the 802.11b/g spectrum, that only 3 of those channels are non-overlapping. For this reason, most networks are designed to use an arrangement of Channel 1, Channel 6, and Channel 11 in order to minimize interference.
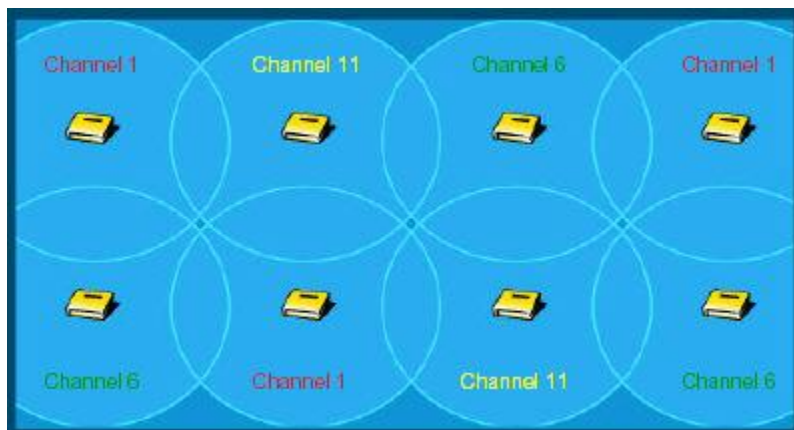
Site Surveyors should also note that interference is cumulative in nature. Several weak sources of interference can combine to create a large overall interference for a specific AP. For this reason, AirMagnet Survey always shows the total interference from the perspective of a single AP. By selecting an AP of interest, users can see the total distribution of interference for that single device.

Channel Width

Threshold: Allowed or Not Allowed

Default values: 40, 80 and 160 MHz Allowed; 20 MHz and 20 MHz HT Not Allowed

Pass/Fail default value: 100%

Requirement Explanation

This requirement allows you to view the various channel widths detected within the survey data file in use. For example, if the Wireless network being installed is required to only support 40 MHz channels, you would set the Thresholds to "Allowed" for the 40 MHz and "Not allowed" for 20 MHz, 20 MHz HT, 80 MHz, and 160 MHz. After loading the desired survey data, the AirWISE view would show you whether the data meets the

requirements. The heatmap shows a light green (   ) color for passing and red (█) for failing. This requirement is pass or fail based.

Background

Legacy 802.11 systems operate on channels that are 20 MHz wide (actually the channels are 22 MHz wide even though they are generally referred to as 20 MHz). 802.11n defines both 20-MHz and 40-MHz-wide channel operation. When operating in 40-MHz mode, the capacity of the channel is effectively double that of legacy systems. One may liken this to "doubling the number of lanes on a freeway so that twice as many cars may pass through".

The fourteen 802.11 channels in the 2.4-GHz band (eleven usable channels in the US) are spaced 5 MHz apart, with center frequencies from 2412 MHz to 2477 MHz.
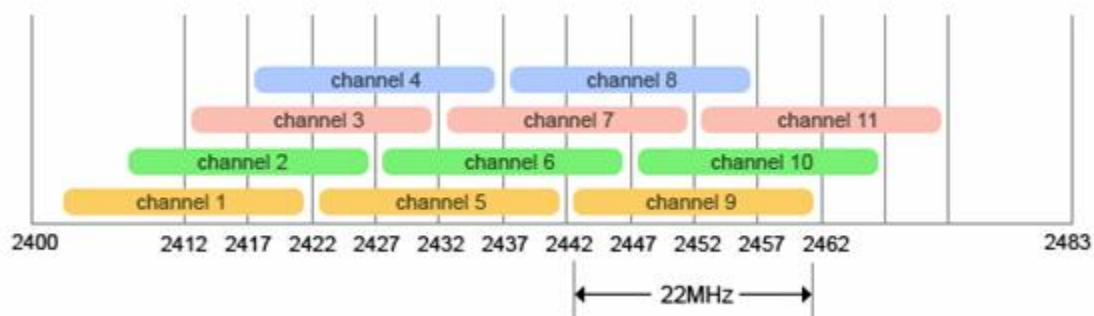
RF channels do not have exact edges. The modulated portion of a (20-MHz) 802.11 RF signal "falls" into +/- 11 MHz of the center frequency (thus, it is 22 MHz wide); there is however some "bleed over", or unmodulated RF energy that is present to about +/- 30 MHz of the center frequency (at relatively much lower power levels). The spectrum mask defines how much RF energy may be present outside the channel boundary of +/- 11 MHz.
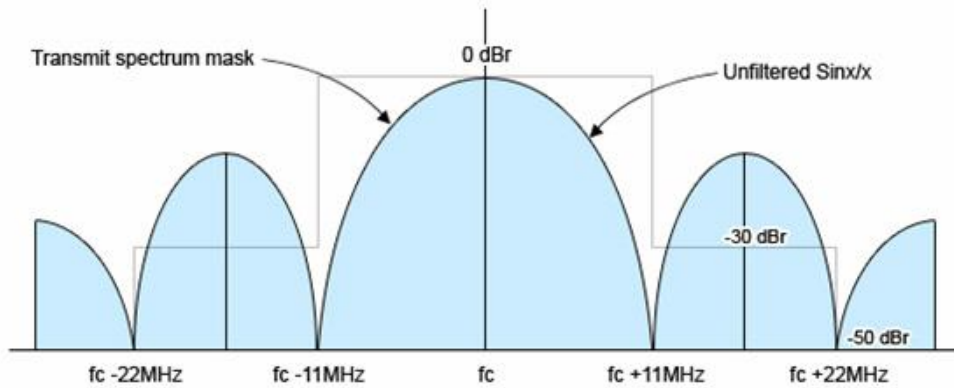
An 802.11 transmission thus "takes up" 5 channels (the center, two left adjacent and two right adjacent channels). Depending on transmit power and receiver sensitivity, a transmission may even cause interference on several additional channels (up to 5 away from the center).

For instance, a device transmitting on channel 6 will certainly cause significant interference on channels 5 and 7 and some interference on channels 4 and 8. It may even cause (usually negligible) interference on channels 2, 3, 9, and 10 as well. This is why, in FCC regulated domains, there are effectively just 3 simultaneously usable 802.11 20-MHz channels in the 2.4-GHz band. A typical North American 802.11 b/g deployment will place APs on channels 1, 6 and 11 to cope with "bleed over". This channel deployment scheme allows APs in close proximity to each other to minimize interference with each other.

Operating 40-MHz mode in the 2.4-GHz band exacerbates this problem significantly. As can be seen in the following figure, the 40-MHz spectrum mask (necessarily) allows higher signal energy to be present on adjacent channels. *See an illustration*.
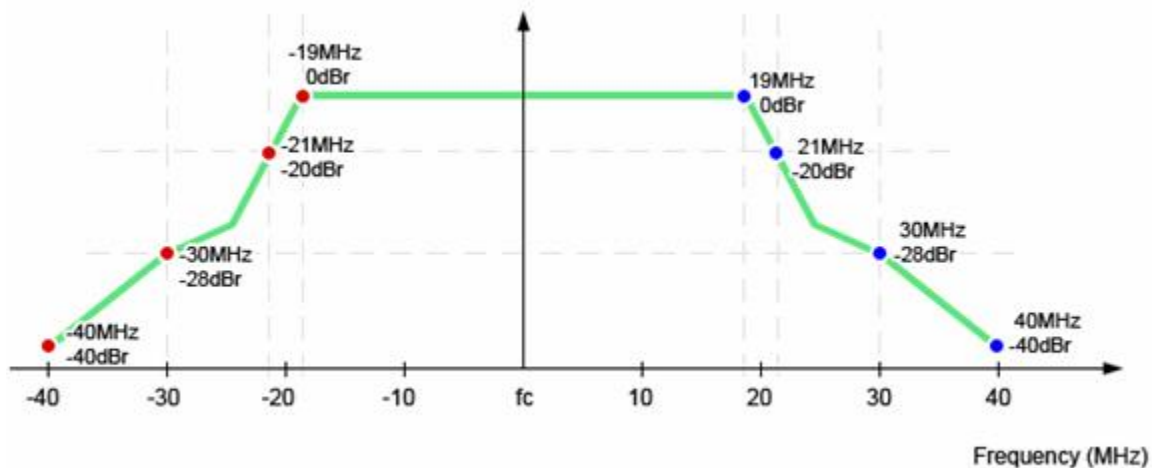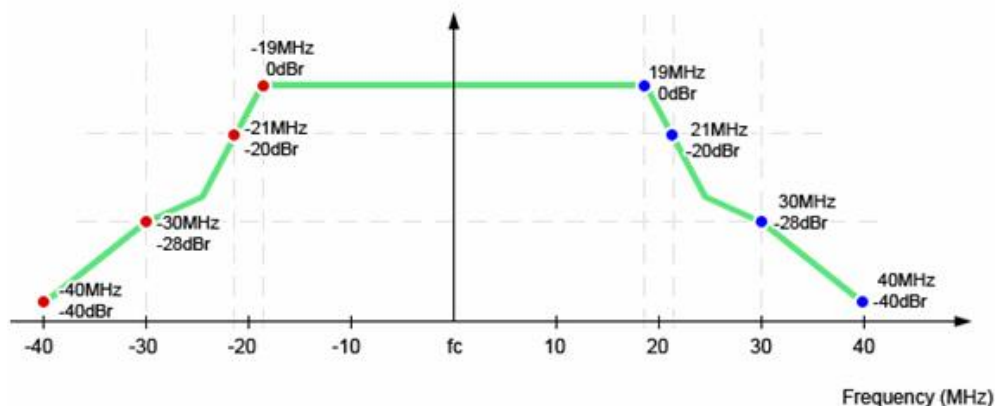
Thus, a 40-MHz 802.11 transmission in the 2.4-GHz band takes up 9 channels (the center, four left adjacent and four right adjacent channels). One may immediately see how 40-MHz transmission in the 2.4-GHz band may cause problems, where there are only 11 usable channels. Coexistence mechanisms help to address this, but it is difficult to design and deploy an efficient multi-user network where a single transmission may use more than 80% of the available spectrum in the band.

Fortunately, 802.11n allows operating in both the 2.4- and 5-GHz bands, and 802.11ac operates exclusively in the 5-GHz band. In most regulatory domains, there are many more usable channels in the 5-GHz band and the channels are spaced 20 MHz apart. This provides for much more "room" for 40-, 80- and 160-MHz wide channel operation. Additionally, it should be noted that the 2.4-GHz band is much more crowded than the 5-GHz band, as stations operating in the 2.4-GHz band must also contend with Bluetooth devices, microwave ovens, and other common sources of 2.4-GHz interference, such as cordless phones.

5 GHz Band
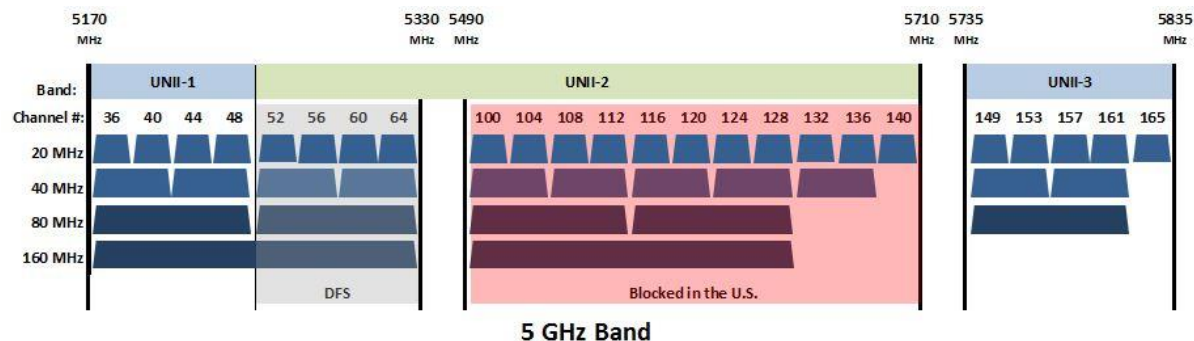
- 802.11a/b/g use _20 MHz_ channels
- 802.11n introduced _40 MHz_ channels
- 802.11ac introduces _80 MHz_ channels now; _160 MHz_ channels in phase 2.
- Rate improvements: rate of 80 MHz channel ≈ 2x rate of 40 MHz ≈ 4x rate of 20 MHz

802.11n/ac/ax APs and STAs exchange information about what channel widths are supported using HT or VHT Information Element and HT, VHT, or HE Capabilities Element frame fields. APs operating a 40-MHz BSS must continuously monitor the environment for legacy or non-40 MHz capable HT STAs in both the primary and secondary channels.

> **Note:** The scenario below describes some possible causes behind a network that is designed to implement 40 MHz operation but has other channel widths in use detected during the survey.

Thresholds: 40 MHz Allowed, 20 MHz HT and 20 MHz Not Allowed

Symptom: 40 MHz channel width is allowed but you are detecting 20 MHz HT or 20 MHz in use.

Possible diagnoses:

- **Interference detected in the secondary channel by AP/STA**: The APs (and/or STA) have determined that there is too much interference in the secondary channel to effectively use both the primary and secondary channels. You will need to determine which 802.11 devices may be causing this interference. Using AirMagnet Spectrum Analyzer may also help to identify non-802.11 interference in the secondary channel.

- **Associated STAs do not support 40 MHz transmission**: One or more Stations which are associated to the AP do not support 40 MHz operation, which causes 40 MHz AP/STAs to use protection protocols for 40 MHz transmissions. Review the survey data to determine exactly which APs are operating in 20 MHz mode. You can then examine the Stations around those APs to determine which station is causing the network to fall back into 20 MHz channel usage.

- **40 MHz Intolerant announced**: An AP or STA in this or a neighboring BSS has broadcasted "40 MHz Intolerant". An AP broadcasts this when it does not allow 40 MHz transmissions in neighboring BSSs. A STA broadcasts this to indicate to its associated AP that the AP is required to restrict the use of 40 MHz transmissions within its BSS. The AirMagnet WiFi Analyzer product can help to analyze the 40 MHz Intolerant announcements via the coexistence section of the Efficiency Analysis Tool.

IPERF Throughput Up

Threshold: Min Iperf throughput up

Default value: 24.0

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Iperf throughput are displayed in light green ( ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the heatmap to show additional details.

Background

Throughput provides a direct insight into how well the network will support a real-world end-user client. An Active Iperf Survey is required in order to obtain throughput data. A low

throughput rate directly translates to lower performance for an end-user. Consistently low throughput speeds are indicative of either insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The throughput speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00
802.11ac	6.5, 7.2, 13.0, 13.5, 14.4, 15.0, 19.5, 21.7, 26.0, 27.0, 28.9, 29.3, 30.0, 32.5, 39.0, 40.5, 43.3, 45.0, 52.0, 54.0, 57.8, 58.5, 60.0, 65.0, 72.2, 78.0, 81.0, 86.7, 87.8, 90.0, 97.5, 104.0, 108.0, 115.6, 117.0, 120.0, 121.5, 130.0, 135.0, 144.4, 150.0, 156.0, 162.0, 173.3, 175.5, 180.0, 195.0, 200.0, 216.0, 216.7, 234.0, 240.0, 243.0, 260.0, 263.3, 270.0, 292.5, 300.0, 324.0, 325.0, 351.0, 360.0, 364.5, 385.2, 390.0, 400.0, 405.0, 433.3, 450.0, 468.0, 486.0, 520.0, 526.5, 540.0, 585.0, 600.0, 650.0, 702.0, 780.0, 866.7, 877.5, 975.0, 1053.0, 1170.0, 1300.0
802.11ax	8.6, 17.2, 25.8, 34.4, 36, 43, 51.6, 60.2, 68.8, 72.1, 77.4, 86, 103.2, 108.1, 114.7, 120.4, 129, 137.6, 143.4, 144.1, 154.9, 172.1, 180.1, 180.7, 206.5, 216.2, 229.4, 232.3, 240.9, 252.2, 258.1, 275.3, 286.8, 288.2, 309.7, 324.3, 344.1, 360.3, 361.3, 387.1, 412.9, 430.1, 432.4, 458.8, 464.6, 480.4, 481.8, 504.4, 516.2, 540.4, 542, 550.6, 573.5, 576.5, 600.5, 602.2, 619.4, 645.2, 648.5, 688.2, 716.9, 720.6, 722.6, 756.6, 774.3, 802.9, 825.9, 860.3, 864.7, 903.3, 917.6, 929.1, 960.8, 963.5, 972.8, 1003.7, 1008.8, 1032.4, 1080.9, 1084, 1101.2, 1147.1, 1152.9, 1201, 1204.4, 1238.8, 1290.4, 1297.1, 1376.5, 1433.8, 1441.2, 1445.3, 1513.2, 1548.5, 1605.9, 1621.3, 1651.8, 1720.6, 1729.4, 1801.5, 1806.6, 1835.3, 1921.6, 1945.6, 2007.4, 2017.6, 2064.7, 2161.8, 2269.9, 2294.1, 2305.9, 2402, 2522.1, 2594.1, 2702.2, 2882.4, 3002.5, 3026.5, 3242.6, 3362.7, 3458.8, 3602.9, 3783.1, 3843.1, 3891.2, 4035.3, 4203.4, 4323.5, 4539.7, 4611.8, 4803.9, 5044.1, 5188.2, 5404.4, 5764.7, 6004.9, 6052.9, 6485.3, 6725.5, 6917.6, 7205.9, 7566.2, 7686.3, 8406.9, 8647.1, 9607.8

End-user throughput speeds change automatically from a higher throughput rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world throughput at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real throughput data.

IPERF Throughput Down

Threshold: Min Iperf throughput down

Default value: 24.0

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Iperf throughput are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the map to show additional details.

Background

Throughput provides a direct insight into how well the network will support a real-world end-user client. An Active Iperf Survey is required in order to obtain throughput speed data. A low throughput rate directly translates to lower performance for an end-user. Consistently low throughput speeds are indicative of either insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The connection speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00
802.11ac	6.5, 7.2, 13.0, 13.5, 14.4, 15.0, 19.5, 21.7, 26.0, 27.0, 28.9, 29.3, 30.0, 32.5, 39.0, 40.5, 43.3, 45.0, 52.0, 54.0, 57.8, 58.5, 60.0, 65.0, 72.2, 78.0, 81.0, 86.7, 87.8, 90.0, 97.5, 104.0, 108.0, 115.6, 117.0, 120.0, 121.5, 130.0, 135.0, 144.4, 150.0, 156.0, 162.0, 173.3, 175.5, 180.0, 195.0, 200.0, 216.0, 216.7, 234.0, 240.0, 243.0, 260.0, 263.3, 270.0, 292.5, 300.0, 324.0, 325.0, 351.0, 360.0, 364.5, 385.2, 390.0, 400.0, 405.0, 433.3, 450.0, 468.0, 486.0, 520.0, 526.5, 540.0, 585.0, 600.0, 650.0, 702.0, 780.0, 866.7, 877.5, 975.0, 1053.0, 1170.0, 1300.0
802.11ax	8.6, 17.2, 25.8, 34.4, 36, 43, 51.6, 60.2, 68.8, 72.1, 77.4, 86, 103.2, 108.1, 114.7, 120.4, 129, 137.6, 143.4, 144.1, 154.9, 172.1, 180.1, 180.7, 206.5, 216.2, 229.4, 232.3, 240.9, 252.2, 258.1, 275.3, 286.8, 288.2, 309.7, 324.3, 344.1, 360.3, 361.3, 387.1, 412.9, 430.1, 432.4, 458.8, 464.6, 480.4, 481.8, 504.4, 516.2, 540.4, 542, 550.6, 573.5, 576.5, 600.5, 602.2, 619.4, 645.2, 648.5, 688.2, 716.9, 720.6, 722.6, 756.6, 774.3, 802.9, 825.9, 860.3, 864.7, 903.3, 917.6, 929.1, 960.8, 963.5, 972.8, 1003.7, 1008.8, 1032.4, 1080.9, 1084, 1101.2, 1147.1, 1152.9, 1201, 1204.4, 1238.8, 1290.4, 1297.1, 1376.5, 1433.8, 1441.2, 1445.3, 1513.2, 1548.5, 1605.9, 1621.3, 1651.8, 1720.6, 1729.4, 1801.5, 1806.6, 1835.3, 1921.6, 1945.6, 2007.4, 2017.6, 2064.7, 2161.8, 2269.9, 2294.1, 2305.9, 2402, 2522.1, 2594.1, 2702.2, 2882.4, 3002.5, 3026.5, 3242.6, 3362.7, 3458.8, 3602.9, 3783.1, 3843.1, 3891.2, 4035.3, 4203.4, 4323.5, 4539.7, 4611.8, 4803.9, 5044.1, 5188.2, 5404.4, 5764.7, 6004.9, 6052.9, 6485.3, 6725.5, 6917.6, 7205.9, 7566.2, 7686.3, 8406.9, 8647.1, 9607.8

End-user connection speeds change automatically from a higher throughput rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world throughput rate at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real throughput data.

802.11n MCS Index

Threshold: Minimum Tx MCS Index required

Default value: 15

Pass/Fail default value: 100%

Requirement Explanation

This requirement allows you to view precisely which areas of the current survey data file meet the requirements specified by the Minimum Tx MCS Index required threshold. Areas that meet the requirement are displayed in light green (   ), whereas regions that do not reach the required MCS are displayed in a color assigned by the color-codes on the legend. Hover the mouse over any given point to view a bubble help pop-up that displays detailed information about the APs detected at that location.

Background

802.11n defines MCS (Modulation and Coding Scheme) which is an integer value (0 through 76) which determines the modulation, coding rate, and number of spatial streams for a transmission. The following PHY data rate table illustrates the possible combinations of MCS, Channel Width, and Short Guard Interval (SGI) which determines the PHY data rate, for MCS 0-31.

MCS Index	Spatial Streams	Modulation Type	Coding Rate	Data Rate (Mbit/s)			
				20 MHz Channel		40 MHz Channel	
				Non-SGI	SGI	Non-SGI	SGI
0	1	BPSK	1/2	6.50	7.20	13.50	15.00
1	1	QPSK	1/2	13.00	14.40	27.00	30.00
2	1	QPSK	3/4	19.50	21.70	40.50	45.00
3	1	16-QAM	1/2	26.00	28.90	54.00	60.00
4	1	16-QAM	3/4	39.00	43.30	81.00	90.00
5	1	64-QAM	2/3	52.00	57.80	108.00	120.00
6	1	64-QAM	3/4	58.50	65.00	121.50	135.00
7	1	64-QAM	5/6	65.00	72.20	135.00	150.00
8	2	BPSK	1/2	13.00	14.40	27.00	30.00
9	2	QPSK	1/2	26.00	28.90	54.00	60.00
10	2	QPSK	3/4	39.00	43.30	81.00	90.00
11	2	16-QAM	1/2	52.00	57.80	108.00	120.00
12	2	16-QAM	3/4	78.00	86.70	162.00	180.00
13	2	64-QAM	2/3	104.00	115.60	216.00	240.00

14	2	64-QAM	3/4	117.00	130.00	243.00	270.00
15	2	64-QAM	5/6	130.00	144.40	270.00	300.00
16	3	BPSK	1/2	19.50	21.70	40.50	45.00
17	3	QPSK	1/2	39.00	43.30	81.00	90.00
18	3	QPSK	3/4	58.50	65.00	121.50	135.00
19	3	16-QAM	1/2	78.00	86.70	162.00	180.00
20	3	16-QAM	3/4	117.00	130.00	243.00	270.00
21	3	64-QAM	2/3	156.00	173.30	324.00	360.00
22	3	64-QAM	3/4	175.50	195.00	364.50	405.00
23	3	64-QAM	5/6	195.00	216.70	405.00	450.00
24	4	BPSK	1/2	26.00	28.80	54.00	60.00
25	4	QPSK	1/2	52.00	57.60	108.00	120.00
26	4	QPSK	3/4	78.00	86.80	162.00	180.00
27	4	16-QAM	1/2	104.00	115.60	216.00	240.00
28	4	16-QAM	3/4	156.00	173.20	324.00	360.00
29	4	64-QAM	2/3	208.00	231.20	432.00	480.00
30	4	64-QAM	3/4	234.00	260.00	486.00	540.00
31	4	64-QAM	5/6	260.00	288.80	540.00	600.00

An 802.11n STA is required to support MCS 0-7 in 20-MHz (non-SGI) mode; an 802.11n AP is required to support MCS 0-15 in 20-MHz (non-SGI) mode; all other MCS values and modes are optional.

MCS 32 is defined as 40-MHz HT duplicate format (BPSK ½ on both halves of the 40-MHz channel). MCS 33 through 76 define Unequal Modulation MCS values, where the modulation type differs across spatial streams. For instance, MCS 33 defines a 2 spatial stream transmission with stream 1 modulated with 16-QAM and stream 2 modulated with QPSK.

802.11ac MCS Index

Threshold: Minimum Tx MCS Index required

Default value: 9

Pass/Fail default value: 100%

Requirement Explanation

This requirement allows you to view precisely which areas of the current survey data file meet the requirements specified by the Minimum Tx MCS Index required threshold. Areas that meet the requirement are displayed in light green (   ), whereas regions that do not reach the required MCS are displayed in a color assigned by the color-codes on the legend. Hover the mouse over any given point to view a bubble help pop-up that displays detailed information about the APs detected at that location.

Background

Selecting a modulation and coding set (MCS) is much simpler in 802.11ac than it was in 802.11n. Rather than the 70-plus options offered by 802.11n, the 802.11ac specification has only 10. The reason for the dramatic simplification is that 802.11ac separates the spatial stream number from the MCS number, and each spatial stream has the same MCS for 802.11ac radios. An MCS number for 802.11ac is really about the modulation scheme of a spatial stream. The first 8 (0-7) are mandatory, and most venders will support all 10 MCS options in all products they bring to market. The following table illustrates the possible combinations of MCS, Spatial Stream number, Short Guard Interval, and Channel Widths.

Spatial Streams	802.11ac MCS Index	Guard Interval	20 MHz Channel PHY Data Rate	40 MHz Channel PHY Data Rate	80 MHz Channel PHY Data Rate	160 MHz Channel PHY Data Rate
1	0	LGI	6.5	13.5	29.3	58.5
1	0	SGI	7.2	15.0	32.5	65.0
1	1	LGI	13.0	27.0	58.5	117.0
1	1	SGI	14.4	30.0	65.0	130.0
1	2	LGI	19.5	40.5	87.8	175.5
1	2	SGI	21.7	45.0	97.5	195.0
1	3	LGI	26.0	54.0	117.0	234.0
1	3	SGI	28.9	60.0	130.0	260.0
1	4	LGI	39.0	81.0	175.5	351.0
1	4	SGI	43.3	90.0	195.0	390.0
1	5	LGI	52.0	108.0	234.0	468.0
1	5	SGI	57.8	120.0	260.0	520.0
1	6	LGI	58.5	121.5	263.3	526.5
1	6	SGI	65.0	135.0	292.5	585.0
1	7	LGI	65.0	135.0	292.5	585.0
1	7	SGI	72.2	150.0	325.0	650.0
1	8	LGI	78.0	162.0	351.0	702.0
1	8	SGI	86.7	180.0	390.0	780.0
1	9	LGI	not used	180.0	390.0	780.0
1	9	SGI	not used	200.0	433.3	866.7
2	0	LGI	13.0	27.0	58.5	117.0
2	0	SGI	14.4	30.0	65.0	130.0
2	1	LGI	26.0	54.0	117.0	234.0
2	1	SGI	28.9	60.0	130.0	260.0
2	2	LGI	39.0	81.0	175.5	351.0
2	2	SGI	43.3	90.0	195.0	390.0
2	3	LGI	52.0	108.0	234.0	468.0
2	3	SGI	57.8	120.0	260.0	520.0
2	4	LGI	78.0	162.0	351.0	702.0
2	4	SGI	86.7	180.0	390.0	780.0
2	5	LGI	104.0	216.0	468.0	936.0
2	5	SGI	115.6	240.0	520.0	1040.0
2	6	LGI	117.0	243.0	526.5	1053.0

2	6	SGI	130.0	270.0	585.0	1170.0
2	7	LGI	130.0	270.0	585.0	1170.0
2	7	SGI	144.4	300.0	650.0	1300.0
2	8	LGI	156.0	324.0	702.0	1404.0
2	8	SGI	173.3	360.0	780.0	1560.0
2	9	LGI	not used	360.0	780.0	1560.0
2	9	SGI	not used	400.0	866.7	1733.3
3	0	LGI	19.5	40.5	87.8	175.5
3	0	SGI	21.7	45.0	97.5	195.0
3	1	LGI	39.0	81.0	175.5	351.0
3	1	SGI	43.3	90.0	195.0	390.0
3	2	LGI	58.5	121.5	263.3	526.5
3	2	SGI	65.0	135.0	292.5	585.0
3	3	LGI	78.0	162.0	351.0	702.0
3	3	SGI	86.7	180.0	390.0	780.0
3	4	LGI	117.0	243.0	526.5	1053.0
3	4	SGI	130.0	270.0	585.0	1170.0
3	5	LGI	156.0	324.0	702.0	1404.0
3	5	SGI	173.3	360.0	780.0	1560.0
3	6	LGI	175.5	364.5	not used	1579.5
3	6	SGI	195.0	405.0	not used	1755.0
3	7	LGI	195.0	405.0	877.5	1755.0
3	7	SGI	216.7	450.0	975.0	1950.0
3	8	LGI	234.0	486.0	1053.0	2106.0
3	8	SGI	260.0	540.0	1170.0	2340.0
3	9	LGI	260.0	540.0	1170.0	not used
3	9	SGI	385.2	600.0	1300.0	not used
4	0	LGI	26.0	54.0	117.0	234.0
4	0	SGI	28.9	60.0	130.0	260.0
4	1	LGI	52.0	108.0	234.0	468.0
4	1	SGI	57.8	120.0	260.0	520.0
4	2	LGI	78.0	162.0	351.0	702.0
4	2	SGI	86.7	180.0	390.0	780.0
4	3	LGI	104.0	216.0	468.0	936.0
4	3	SGI	115.6	240.0	520.0	1040.0
4	4	LGI	156.0	324.0	702.0	1404.0
4	4	SGI	173.3	360.0	780.0	1560.0
4	5	LGI	208.0	432.0	936.0	1872.0
4	5	SGI	231.1	480.0	1040.0	2080.0
4	6	LGI	234.0	486.0	1053.0	2106.0
4	6	SGI	260.0	540.0	1170.0	2340.0
4	7	LGI	260.0	540.0	1170.0	2340.0
4	7	SGI	288.9	600.0	1300.0	2600.0
4	8	LGI	312.0	648.0	1404.0	2808.0

4	8	SGI	346.7	720.0	1560.0	3120.0
4	9	LGI	not used	720.0	1560.0	3120.0
4	9	SGI	not used	800.0	1733.3	3466.7
5	0	LGI	32.5	67.5	146.3	292.5
5	0	SGI	36.1	75.0	162.5	325.0
5	1	LGI	65.0	135.0	292.5	585.0
5	1	SGI	72.2	150.0	325.0	650.0
5	2	LGI	97.5	202.5	438.8	877.5
5	2	SGI	108.3	225.0	487.5	975.0
5	3	LGI	130.0	270.0	585.0	1170.0
5	3	SGI	144.4	300.0	650.0	1300.0
5	4	LGI	195.0	405.0	877.5	1755.0
5	4	SGI	216.7	450.0	975.0	1950.0
5	5	LGI	260.0	540.0	1170.0	2340.0
5	5	SGI	288.9	600.0	1300.0	2600.0
5	6	LGI	292.5	607.5	1316.3	2632.5
5	6	SGI	325.0	675.0	1462.5	2925.0
5	7	LGI	325.0	675.0	1462.5	2925.0
5	7	SGI	361.1	750.0	1625.0	3250.0
5	8	LGI	390.0	810.0	1755.0	3510.0
5	8	SGI	433.3	900.0	1950.0	3900.0
5	9	LGI	not used	900.0	1950.0	3900.0
5	9	SGI	not used	1000.0	2166.7	4333.3
6	0	LGI	39.0	81.0	175.5	351.0
6	0	SGI	43.3	90.0	195.0	390.0
6	1	LGI	78.0	162.0	351.0	702.0
6	1	SGI	86.7	180.0	390.0	780.0
6	2	LGI	117.0	243.0	526.5	1053.0
6	2	SGI	130.0	270.0	585.0	1170.0
6	3	LGI	156.0	324.0	702.0	1404.0
6	3	SGI	173.3	360.0	780.0	1560.0
6	4	LGI	234.0	486.0	1053.0	2106.0
6	4	SGI	260.0	540.0	1170.0	2340.0
6	5	LGI	312.0	648.0	1404.0	2808.0
6	5	SGI	346.7	720.0	1560.0	3120.0
6	6	LGI	351.0	729.0	1579.5	3159.0
6	6	SGI	390.0	810.0	1755.0	3510.0
6	7	LGI	390.0	810.0	1755.0	3510.0
6	7	SGI	433.3	900.0	1950.0	3900.0
6	8	LGI	468.0	972.0	2106.0	4212.0
6	8	SGI	520.0	1080.0	2340.0	4680.0
6	9	LGI	520.0	1080.0	not used	4680.0
6	9	SGI	674.1	1200.0	not used	5200.0
7	0	LGI	45.5	94.5	204.8	409.5

7	0	SGI	50.6	105.0	227.5	455.0
7	1	LGI	91.0	189.0	409.5	819.0
7	1	SGI	101.1	210.0	455.0	910.0
7	2	LGI	136.5	283.5	614.3	1228.5
7	2	SGI	151.7	315.0	682.5	1365.0
7	3	LGI	182.0	378.0	819.0	1638.0
7	3	SGI	202.2	420.0	910.0	1820.0
7	4	LGI	273.0	567.0	1228.5	2457.0
7	4	SGI	303.3	630.0	1365.0	2730.0
7	5	LGI	364.0	756.0	1638.0	3276.0
7	5	SGI	404.4	840.0	1820.0	3640.0
7	6	LGI	409.5	850.5	not used	3685.5
7	6	SGI	455.0	945.0	not used	4095.0
7	7	LGI	455.0	945.0	2047.5	4095.0
7	7	SGI	505.6	1050.0	2275.0	4550.0
7	8	LGI	546.0	1134.0	2457.0	4914.0
7	8	SGI	606.7	1260.0	2730.0	5460.0
7	9	LGI	not used	1260.0	2730.0	5460.0
7	9	SGI	not used	1400.0	3033.3	6066.7
8	0	LGI	52.0	108.0	234.0	468.0
8	0	SGI	57.8	120.0	260.0	520.0
8	1	LGI	104.0	216.0	468.0	936.0
8	1	SGI	115.6	240.0	520.0	1040.0
8	2	LGI	156.0	324.0	702.0	1404.0
8	2	SGI	173.3	360.0	780.0	1560.0
8	3	LGI	208.0	432.0	936.0	1872.0
8	3	SGI	231.1	480.0	1040.0	2080.0
8	4	LGI	312.0	648.0	1404.0	2808.0
8	4	SGI	346.7	720.0	1560.0	3120.0
8	5	LGI	416.0	864.0	1872.0	3744.0
8	5	SGI	462.2	960.0	2080.0	4160.0
8	6	LGI	468.0	972.0	2106.0	4212.0
8	6	SGI	520.0	1080.0	2340.0	4680.0
8	7	LGI	520.0	1080.0	2340.0	4680.0
8	7	SGI	577.8	1200.0	2600.0	5200.0
8	8	LGI	624.0	1296.0	2808.0	5616.0
8	8	SGI	693.3	1440.0	3120.0	6240.0
8	9	LGI	not used	1440.0	3120.0	6240.0
8	9	SGI	not used	1600.0	3466.7	6933.3

802.11ax MCS Index

Threshold: Minimum Tx MCS Index required

Default value: 11

Pass/Fail default value: 100%

Requirement Explanation

This requirement allows you to view precisely which areas of the current survey data file meet the requirements specified by the Minimum Tx MCS Index required threshold. Areas that meet the requirement are displayed in light green (   ), whereas regions that do not reach the required MCS are displayed in a color assigned by the color-codes on the legend. Hover the mouse over any given point to view a bubble help pop-up that displays detailed information about the APs detected at that location.

Background

802.11ax has a similar modulation and coding set (MCS) as 802.11ac with two additional modulations, 1024-QAM 3/4 and 1024-QAM 5/6. However, 802.11ax uses a fixed 0.8 μs Guard Interval for indoor environments. The following table illustrates the possible combinations of MCS, Spatial Stream number, and Channel Widths.

802.11ax MCS Index	Spatial Stream	20 MHz Channel PHY Data Rate	40 MHz Channel PHY Data Rate	80 MHz Channel PHY Data Rate	160 MHz Channel PHY Data Rate
0	1	8.6	17.2	36	72.1
1	1	17.2	34.4	72.1	144.1
2	1	25.8	51.6	108.1	216.2
3	1	34.4	68.8	144.1	288.2
4	1	51.6	103.2	216.2	432.4
5	1	68.8	137.6	288.2	576.5
6	1	77.4	154.9	324.3	648.5
7	1	86	172.1	360.3	720.6
8	1	103.2	206.5	432.4	864.7
9	1	114.7	229.4	480.4	960.8
10	1	129	258.1	540.4	1080.9
11	1	143.4	286.8	600.5	1201
0	2	17.2	34.4	72.1	144.1
1	2	34.4	68.8	144.1	288.2
2	2	51.6	103.2	216.2	432.4
3	2	68.8	137.6	288.2	576.5
4	2	103.2	206.5	432.4	864.7
5	2	137.6	275.3	576.5	1152.9
6	2	154.9	309.7	648.5	1297.1
7	2	172.1	344.1	720.6	1441.2
8	2	206.5	412.9	864.7	1729.4
9	2	229.4	458.8	960.8	1921.6

10	2	258.1	516.2	1080.9	2161.8
11	2	286.8	573.5	1201	2402
0	3	25.8	51.6	108.1	216.2
1	3	51.6	103.2	216.2	432.4
2	3	77.4	154.9	324.3	648.5
3	3	103.2	206.5	432.4	864.7
4	3	154.9	309.7	648.5	1297.1
5	3	206.5	412.9	864.7	1729.4
6	3	232.3	464.6	972.8	1945.6
7	3	258.1	516.2	1080.9	2161.8
8	3	309.7	619.4	1297.1	2594.1
9	3	344.1	688.2	1441.2	2882.4
10	3	387.1	774.3	1621.3	3242.6
11	3	430.1	860.3	1801.5	3602.9
0	4	34.4	68.8	144.1	288.2
1	4	68.8	137.6	288.2	576.5
2	4	103.2	206.5	432.4	864.7
3	4	137.6	275.3	576.5	1152.9
4	4	206.5	412.9	864.7	1729.4
5	4	275.3	550.6	1152.9	2305.9
6	4	309.7	619.4	1297.1	2594.1
7	4	344.1	688.2	1441.2	2882.4
8	4	412.9	825.9	1729.4	3458.8
9	4	458.8	917.6	1921.6	3843.1
10	4	516.2	1032.4	2161.8	4323.5
11	4	573.5	1147.1	2402	4803.9
0	5	43	86	180.1	360.3
1	5	86	172.1	360.3	720.6
2	5	129	258.1	540.4	1080.9
3	5	172.1	344.1	720.6	1441.2
4	5	258.1	516.2	1080.9	2161.8
5	5	344.1	688.2	1441.2	2882.4
6	5	387.1	774.3	1621.3	3242.6
7	5	430.1	860.3	1801.5	3602.9
8	5	516.2	1032.4	2161.8	4323.5
9	5	573.5	1147.1	2402	4803.9
10	5	645.2	1290.4	2702.2	5404.4
11	5	716.9	1433.8	3002.5	6004.9
0	6	51.6	103.2	216.2	432.4
1	6	103.2	206.5	432.4	864.7

2	6	154.9	309.7	648.5	1297.1
3	6	206.5	412.9	864.7	1729.4
4	6	309.7	619.4	1297.1	2594.1
5	6	412.9	825.9	1729.4	3458.8
6	6	464.6	929.1	1945.6	3891.2
7	6	516.2	1032.4	2161.8	4323.5
8	6	619.4	1238.8	2594.1	5188.2
9	6	688.2	1376.5	2882.4	5764.7
10	6	774.3	1548.5	3242.6	6485.3
11	6	860.3	1720.6	3602.9	7205.9
0	7	60.2	120.4	252.2	504.4
1	7	120.4	240.9	504.4	1008.8
2	7	180.7	361.3	756.6	1513.2
3	7	240.9	481.8	1008.8	2017.6
4	7	361.3	722.6	1513.2	3026.5
5	7	481.8	963.5	2017.6	4035.3
6	7	542	1084	2269.9	4539.7
7	7	602.2	1204.4	2522.1	5044.1
8	7	722.6	1445.3	3026.5	6052.9
9	7	802.9	1605.9	3362.7	6725.5
10	7	903.3	1806.6	3783.1	7566.2
11	7	1003.7	2007.4	4203.4	8406.9
0	8	68.8	137.6	288.2	576.5
1	8	137.6	275.3	576.5	1152.9
2	8	206.5	412.9	864.7	1729.4
3	8	275.3	550.6	1152.9	2305.9
4	8	412.9	825.9	1729.4	3458.8
5	8	550.6	1101.2	2305.9	4611.8
6	8	619.4	1238.8	2594.1	5188.2
7	8	688.2	1376.5	2882.4	5764.7
8	8	825.9	1651.8	3458.8	6917.6
9	8	917.6	1835.3	3843.1	7686.3
10	8	1032.4	2064.7	4323.5	8647.1
11	8	1147.1	2294.1	4803.9	9607.8

Measured PHY Data Rate Downlink Coverage

Threshold: Min Downlink Data Rate Supported

Default value: 54.0

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Downlink Data Rate Supported are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the map to show additional details.

Background

Connection data rate provides a direct insight into how well the network will support a real-world end-user client. An Active Iperf Survey is required in order to obtain connection speed data. A low connection PHY data rate directly translates to lower throughput and performance for an end-user. Consistently low connection speeds are indicative of either insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The connection speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00
802.11ac	6.5, 7.2, 13.0, 13.5, 14.4, 15.0, 19.5, 21.7, 26.0, 27.0, 28.9, 29.3, 30.0, 32.5, 39.0, 40.5, 43.3, 45.0, 52.0, 54.0, 57.8, 58.5, 60.0, 65.0, 72.2, 78.0, 81.0, 86.7, 87.8, 90.0, 97.5, 104.0, 108.0, 115.6, 117.0, 120.0, 121.5, 130.0, 135.0, 144.4, 150.0, 156.0, 162.0, 173.3, 175.5, 180.0, 195.0, 200.0, 216.0, 216.7, 234.0, 240.0, 243.0, 260.0, 263.3, 270.0, 292.5, 300.0, 324.0, 325.0, 351.0, 360.0, 364.5, 385.2, 390.0, 400.0, 405.0, 433.3, 450.0, 468.0, 486.0, 520.0, 526.5, 540.0, 585.0, 600.0, 650.0, 702.0, 780.0, 866.7, 877.5, 975.0, 1053.0, 1170.0, 1300.0
802.11ax	8.6, 17.2, 25.8, 34.4, 36, 43, 51.6, 60.2, 68.8, 72.1, 77.4, 86, 103.2, 108.1, 114.7, 120.4, 129, 137.6, 143.4, 144.1, 154.9, 172.1, 180.1, 180.7, 206.5, 216.2, 229.4, 232.3, 240.9, 252.2, 258.1, 275.3, 286.8, 288.2, 309.7, 324.3, 344.1, 360.3, 361.3, 387.1, 412.9, 430.1, 432.4, 458.8, 464.6, 480.4, 481.8, 504.4, 516.2, 540.4, 542, 550.6, 573.5, 576.5, 600.5, 602.2, 619.4, 645.2, 648.5, 688.2, 716.9, 720.6, 722.6, 756.6, 774.3, 802.9, 825.9, 860.3, 864.7, 903.3, 917.6, 929.1, 960.8, 963.5, 972.8, 1003.7, 1008.8, 1032.4, 1080.9, 1084, 1101.2, 1147.1, 1152.9, 1201, 1204.4, 1238.8, 1290.4, 1297.1, 1376.5, 1433.8, 1441.2, 1445.3, 1513.2, 1548.5, 1605.9, 1621.3, 1651.8, 1720.6, 1729.4, 1801.5, 1806.6, 1835.3, 1921.6, 1945.6, 2007.4, 2017.6, 2064.7, 2161.8, 2269.9,

2294.1, 2305.9, 2402, 2522.1, 2594.1, 2702.2, 2882.4, 3002.5, 3026.5, 3242.6, 3362.7, 3458.8, 3602.9, 3783.1, 3843.1, 3891.2, 4035.3, 4203.4, 4323.5, 4539.7, 4611.8, 4803.9, 5044.1, 5188.2, 5404.4, 5764.7, 6004.9, 6052.9, 6485.3, 6725.5, 6917.6, 7205.9, 7566.2, 7686.3, 8406.9, 8647.1, 9607.8

End-user connection speeds change automatically from a higher connection data rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world connection data rate at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real connection data such as connection data rate.

Measured PHY Data Rate Uplink Coverage

Threshold: Min Uplink Data Rate Supported

Default value: 5.5

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Uplink Data Rate Supported are displayed in light green ( ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the map to show additional details.

Background

Connection data rate provides a direct insight into how well the network will support a real-world end-user client. An Active Survey is required in order to obtain connection speed data. A low connection PHY data rate directly translates to lower throughput and performance for an end-user. Consistently low connection speeds are indicative of either insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The connection speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00

802.11ac	6.5, 7.2, 13.0, 13.5, 14.4, 15.0, 19.5, 21.7, 26.0, 27.0, 28.9, 29.3, 30.0, 32.5, 39.0, 40.5, 43.3, 45.0, 52.0, 54.0, 57.8, 58.5, 60.0, 65.0, 72.2, 78.0, 81.0, 86.7, 87.8, 90.0, 97.5, 104.0, 108.0, 115.6, 117.0, 120.0, 121.5, 130.0, 135.0, 144.4, 150.0, 156.0, 162.0, 173.3, 175.5, 180.0, 195.0, 200.0, 216.0, 216.7, 234.0, 240.0, 243.0, 260.0, 263.3, 270.0, 292.5, 300.0, 324.0, 325.0, 351.0, 360.0, 364.5, 385.2, 390.0, 400.0, 405.0, 433.3, 450.0, 468.0, 486.0, 520.0, 526.5, 540.0, 585.0, 600.0, 650.0, 702.0, 780.0, 866.7, 877.5, 975.0, 1053.0, 1170.0, 1300.0
802.11ax	8.6, 17.2, 25.8, 34.4, 36, 43, 51.6, 60.2, 68.8, 72.1, 77.4, 86, 103.2, 108.1, 114.7, 120.4, 129, 137.6, 143.4, 144.1, 154.9, 172.1, 180.1, 180.7, 206.5, 216.2, 229.4, 232.3, 240.9, 252.2, 258.1, 275.3, 286.8, 288.2, 309.7, 324.3, 344.1, 360.3, 361.3, 387.1, 412.9, 430.1, 432.4, 458.8, 464.6, 480.4, 481.8, 504.4, 516.2, 540.4, 542, 550.6, 573.5, 576.5, 600.5, 602.2, 619.4, 645.2, 648.5, 688.2, 716.9, 720.6, 722.6, 756.6, 774.3, 802.9, 825.9, 860.3, 864.7, 903.3, 917.6, 929.1, 960.8, 963.5, 972.8, 1003.7, 1008.8, 1032.4, 1080.9, 1084, 1101.2, 1147.1, 1152.9, 1201, 1204.4, 1238.8, 1290.4, 1297.1, 1376.5, 1433.8, 1441.2, 1445.3, 1513.2, 1548.5, 1605.9, 1621.3, 1651.8, 1720.6, 1729.4, 1801.5, 1806.6, 1835.3, 1921.6, 1945.6, 2007.4, 2017.6, 2064.7, 2161.8, 2269.9, 2294.1, 2305.9, 2402, 2522.1, 2594.1, 2702.2, 2882.4, 3002.5, 3026.5, 3242.6, 3362.7, 3458.8, 3602.9, 3783.1, 3843.1, 3891.2, 4035.3, 4203.4, 4323.5, 4539.7, 4611.8, 4803.9, 5044.1, 5188.2, 5404.4, 5764.7, 6004.9, 6052.9, 6485.3, 6725.5, 6917.6, 7205.9, 7566.2, 7686.3, 8406.9, 8647.1, 9607.8

End-user connection speeds change automatically from a higher connection data rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world connection data rate at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real connection data such as connection data rate.

Multiple AP Signal Coverage

Threshold: Min No. of AP, Min Signal

Default value: 2, -67

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirements for AP coverage are displayed in light green (   ). This requirement contains two requirements. One requirement is based on the number of APs present in the area, and the second is based on the minimum signal required of the present APs. Both of these requirements must be met in order to be considered compliant. Either of these requirements can be shown for non-compliant areas of the map. To view problem areas in terms of AP count, click the Minimum Number of APs row in the thresholds area, just below the main view. To see how close the actual AP signal is to meeting your requirement, click the Minimum Signal row in the thresholds area. Let the mouse hover over any point of the map to show additional details.

Background

Wireless networks with stringent performance requirements should insure that all areas are served by at least two access points on non-overlapping channels. Each of these APs should

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meet the minimum signal requirement for the network (typically between -67 dBm and -75 dBm). In the 2.4-GHz band, only channels 1, 6, and 11 are considered non-overlapping.

Corrective Actions

Users have 3 basic options to insure coverage from multiple APs:

- Increase the transmit power of existing APs
- Reposition APs to improve overlapping cells
- Add additional APs

Increasing the transmit power of an AP is an option, but many APs transmit at their maximum power by default. Some APs support the use of external high-gain antennas which can also boost the strength of signal. However, use of these antennas is strictly regulated by the FCC, and you should be careful to stay within the boundaries of the law. Furthermore, high-gain antennas do not truly add any overall signal to the environment. You just compress the signal that is already available. As a result, a high-gain antenna may improve signal in location and worsen it to another.

Properly positioning APs is also an important step. Ideally, APs should have a clear "line of site" to the areas that they will serve. Installing APs on the ceiling or high on walls is often a helpful option when trying to avoid physical obstructions.

If the measures described above do not alleviate the problem, it may be necessary to install an additional AP. When an AP is added to the environment, users should configure that AP to use a Wi-Fi channel that does not overlap with the APs that are already deployed.

Noise Level

Threshold: Max Noise Level

Default value: -90

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for noise are displayed in light green ( ). Areas that do not meet the requirement are displayed using the color code on the slider bar on the right-hand side of the view. Noise levels are displayed in dBm with areas of highest noise shown in red. Let the mouse hover over any point of the map to show additional details.

Background

Any energy in the Wi-Fi spectrum that is not recognized as 802.11 traffic is considered noise. High levels of environmental noise will interfere with 802.11 signals and lead to serious performance problems for the wireless network.

Noise is a very common problem especially in the 2.4 GHz band that supports 802.11b, 802.11g, and 802.11n. The 2.4 GHz band is "unlicensed" and is commonly used by a variety

of technologies including Bluetooth, cordless phones, frequency hopping devices, wireless cameras, and more. Other devices such as microwave ovens can emit noise simply as a byproduct of their normal operation.

Like signal, noise is measured in units of "dBm", with a signal of 0 dBm being the strongest, and signals of -100 dBm and below being the lowest. The maximum acceptable noise will depend on the requirements of the network. As a general rule, a wireless network should aim to keep noise levels below -85 dBm. For normal data traffic, and under -90 dBm for networks that will support voice.

Corrective Actions

High environmental noise can be addressed either by removing the source of the noise, or avoiding it by moving 802.11 traffic to a less noisy portion of the Wi-Fi spectrum. However, avoidance of noise may not always be an option. To remove the source of noise, technical staff must identify the noise source. This is most reliably done with a tool such as the AirMagnet Spectrum Analyzer, which can analyze the waveform of the noise to pin down a unique source of the noise.

Operating Mode

Threshold: Allowed or Not Allowed

Default values: Greenfield, Mixed VHT, and Mixed HE Allowed; Mixed and Legacy Not Allowed

Pass/Fail default value: 100%

Requirement Explanation

The requirement is triggered by any 802.11n, 802.11ac, or 802.11ax networks that fall outside of the selected threshold settings. For example if the Wireless network being surveyed is designed to provide "Very High Throughput" (VHT), then the Threshold setting would be set to "Allowed" for the VHT Operating Mode and Not Allowed for the remaining thresholds. After completing the Survey by using the AirWise section one can determine if the desired network environment is actually in place. The heatmap shows a light green (   ) color for passing and red ( ) for failing. This requirement is a pass or fail based threshold

Background

The PHY- and MAC-layer improvements introduced in the 802.11n amendment and extended in the 802.11ac and 802.11ax amendment brings Wi-Fi network performance to an unprecedented level in terms of range, throughput, and stability. However, given the current state of the Wi-Fi network infrastructure which is largely built upon the legacy 802.11a/b/g standards, the new 802.11n protocols may have the potential of interfering with or even hampering the normal operation of legacy (i.e., 802.11a/b/g) networks.

Like the present 802.11g networks that are backward-compatible to the 802.11b networks, the new 802.11n networks will and must be backward-compatible with stations that are built upon the legacy 802.11a/b/g standards. Towards that end, 802.11n wireless access points must be able to inter-operate smoothly in a mixed WLAN environment to the extent

that they can support both legacy 802.11a/b/g transmissions over 20-MHz channels and high-throughput transmissions over 40-MHz channels.

To effectively address the backward compatibility and coexistence issue, 802.11n wireless access points must be able to automatically choose the appropriate operating mode as is dictated by the changing dynamics of the wireless environment in which they are operating. According to the 802.11n draft 2.0, 802.11n access points should be able to function in any of the following operating modes, depending on the real-time circumstances of the wireless network.

Greenfield

An 802.11n AP using HT (High Throughput) mode – also known as Greenfield mode – assumes that there are no nearby legacy stations using the same frequency band. The highest performance of an 802.11n network is achieved in this mode, with only 802.11n stations in the network and no legacy devices within reach. If legacy stations or networks are present, 802.11n devices must communicate using protection mechanisms, which may reduce the efficiency of the 802.11n network. HT mode is optional.
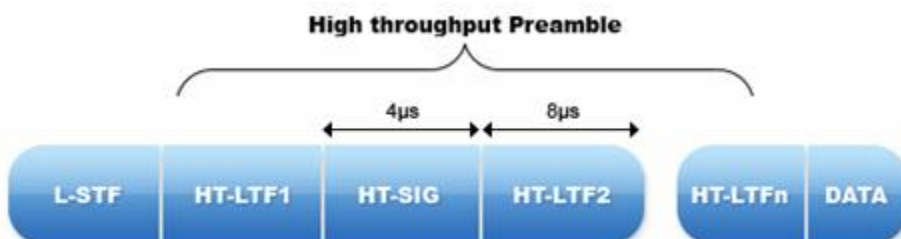

HT Mixed

The mandatory HT Mixed mode will be the most common 802.11n AP operating mode. In this mode, HT enhancements can be used simultaneously with HT Protection mechanisms that permit communication with legacy stations. HT Mixed mode provides backwards compatibility, but 802.11n devices pay significant throughput penalties as compared to Greenfield mode.
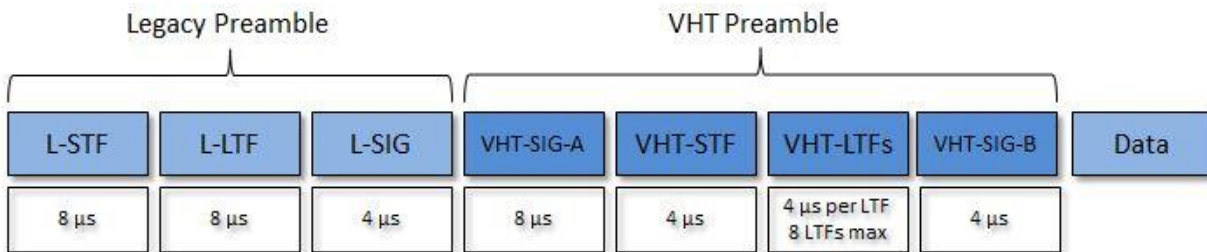

Legacy

An 802.11n AP using Non-HT (Non-High Throughput) mode - also known as legacy mode - sends all frames in the old 802.11a/b/g format so that legacy stations can understand them. That AP must use 20-MHz channels and none of the new HT features. All Wi-Fi-certified 802.11n products on the market must support this mode to ensure backward compatibility, but an 802.11n AP using Non-HT delivers no better performance than 802.11a/g.
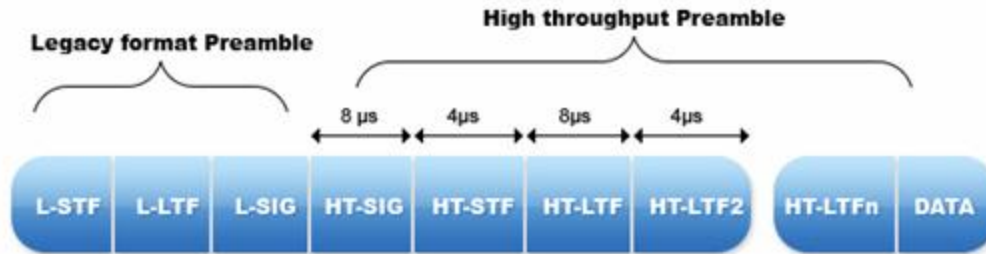
Likewise, 802.11ac is designed to be backwards compatible with 802.11a and 802.11n stations in the 5 GHz band. The 802.11ac standard defines only one operating mode: Very High Throughput.

VHT

802.11ac simplifies WLAN networks by introducing one operating mode (VHT) that works for all 802.11 technologies in the 5 GHz band. By definition, VHT is mixed in that it supports new 802.11ac connections along with legacy 802.11a and 802.11n connections. A VHT frame is transmitted with a legacy preamble that is recognized by 802.11a and 802.11n radios, followed by a VHT preamble.

HE

Like 802.11n/ac, the 802.11ax frame begins with the preamble. Within the preamble are legacy (non-HE) training fields followed by the HE preamble. The initial legacy segment includes L-STF, L-LTF and L-SIG, which legacy devices can decode, to support backwards compatibility. Only 802.11ax capable devices can decode the HE preamble portion.

The image below shows the PPDU formats' overall composition and a breakdown of the field sections.
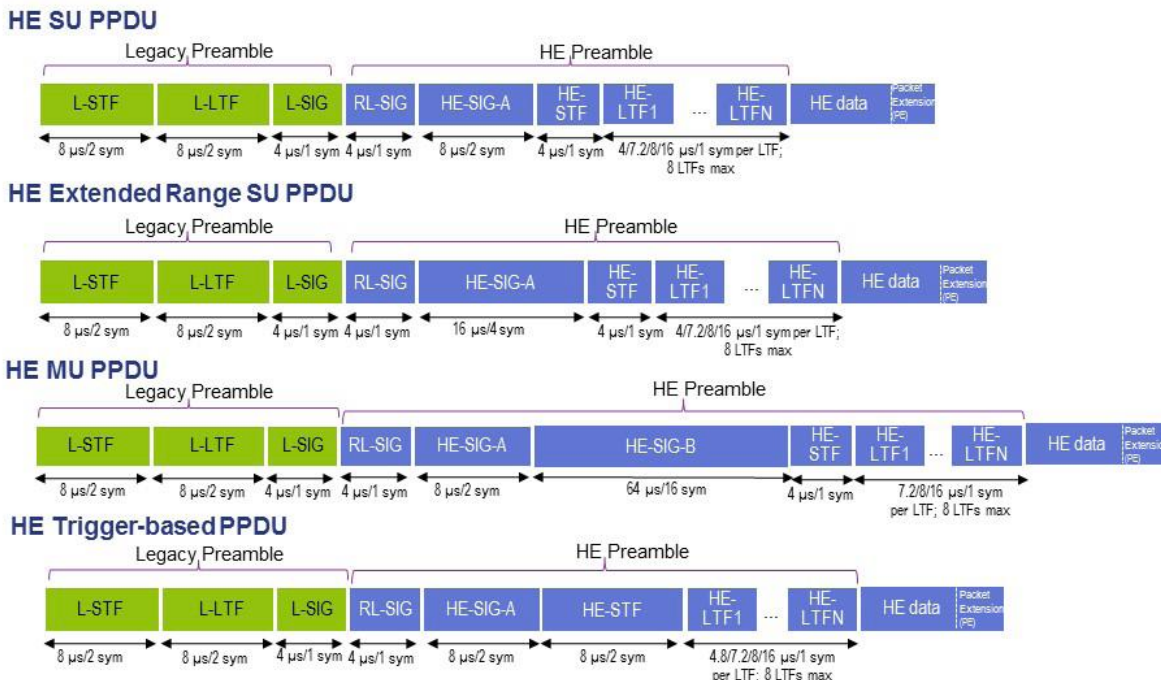
Predictive PHY Data Rate Downlink Coverage

Threshold: Min Downlink Data Rate Supported

Default value: 54.0

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Downlink Data Rate Supported are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the map to show additional details.

Background

Connection Rates provide a direct insight into how well the network will support a real-world end-user client. When doing a Passive survey the ability to see the actual Data rate is not available. In order to provide Data Rates while doing a Passive survey we use Signal Strength to Data Rate mapping table. Take the detected signal strength and map it to a known Data Rate. A low Data Rate connection directly translates to lower throughput and performance for an end-user. Consistently low connection Rates are indicative of insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The connection speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00
802.11ac	6.5, 7.2, 13.0, 13.5, 14.4, 15.0, 19.5, 21.7, 26.0, 27.0, 28.9, 29.3, 30.0, 32.5, 39.0, 40.5, 43.3, 45.0, 52.0, 54.0, 57.8, 58.5, 60.0, 65.0, 72.2, 78.0, 81.0, 86.7, 87.8, 90.0, 97.5, 104.0, 108.0, 115.6, 117.0, 120.0, 121.5, 130.0, 135.0, 144.4, 150.0, 156.0, 162.0, 173.3, 175.5, 180.0, 195.0, 200.0, 216.0, 216.7, 234.0, 240.0, 243.0, 260.0, 263.3, 270.0, 292.5, 300.0, 324.0, 325.0, 351.0, 360.0, 364.5, 385.2, 390.0, 400.0, 405.0, 433.3, 450.0, 468.0, 486.0, 520.0, 526.5, 540.0, 585.0, 600.0, 650.0, 702.0, 780.0, 866.7, 877.5, 975.0, 1053.0, 1170.0, 1300.0
802.11ax	8.6, 17.2, 25.8, 34.4, 36, 43, 51.6, 60.2, 68.8, 72.1, 77.4, 86, 103.2, 108.1, 114.7, 120.4, 129, 137.6, 143.4, 144.1, 154.9, 172.1, 180.1, 180.7, 206.5, 216.2, 229.4, 232.3, 240.9, 252.2, 258.1, 275.3, 286.8, 288.2, 309.7, 324.3, 344.1, 360.3, 361.3, 387.1, 412.9, 430.1, 432.4, 458.8, 464.6, 480.4, 481.8, 504.4, 516.2, 540.4, 542, 550.6, 573.5, 576.5, 600.5, 602.2, 619.4, 645.2, 648.5, 688.2, 716.9, 720.6, 722.6, 756.6, 774.3, 802.9, 825.9, 860.3, 864.7, 903.3, 917.6, 929.1, 960.8, 963.5, 972.8, 1003.7, 1008.8, 1032.4, 1080.9, 1084, 1101.2, 1147.1, 1152.9, 1201, 1204.4, 1238.8, 1290.4, 1297.1, 1376.5, 1433.8, 1441.2, 1445.3, 1513.2, 1548.5, 1605.9, 1621.3, 1651.8, 1720.6, 1729.4, 1801.5, 1806.6, 1835.3, 1921.6, 1945.6, 2007.4, 2017.6, 2064.7, 2161.8, 2269.9, 2294.1, 2305.9, 2402, 2522.1, 2594.1, 2702.2, 2882.4, 3002.5, 3026.5, 3242.6, 3362.7, 3458.8, 3602.9, 3783.1, 3843.1, 3891.2, 4035.3, 4203.4, 4323.5, 4539.7, 4611.8, 4803.9, 5044.1, 5188.2, 5404.4, 5764.7, 6004.9, 6052.9, 6485.3, 6725.5, 6917.6, 7205.9, 7566.2, 7686.3, 8406.9, 8647.1, 9607.8

End-user connection speeds change automatically from a higher connection data rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world connection data rate at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real connection data such as connection data rate.

RSSI Neighboring Cell Coverage

Threshold: Min Signal

Default value: -67

Pass/Fail default value: 100%

Requirement Explanation

Areas that meet the current RSSI neighboring cell coverage requirement are shown in light green (   ). Areas that do not meet the requirement are displayed using the color code on

the slider bar on the right-hand side of the view. The weakest signals are shown in red. Let the mouse hover over any point of the map to show additional details.

RF Coverage Background

RF signals are the basis for Wi-Fi communication in the same way that copper wire is the basis for traditional networks. Each wireless client (such as an end-user) must receive adequate levels of RF signal from its Access Point in order to insure a reliable and well-performing connection.

RF signals are measured in units of "dBm", with a signal of 0 dBm being the strongest, and signals of -100 dBm and below being the weakest. The minimum acceptable signal will depend on the requirements of the network and how it is used. As a general rule, voice clients should maintain a signal of at least -67 dBm.

RF signals can be significantly affected by environmental factors. Solid objects will attenuate and reflect RF signals, which can cause RF "dead spots" in otherwise well-served areas. For this reason, it is important to carefully survey areas where wireless clients will need network service. Surveyors should pay special attention to the areas around, and in the line of site of physical obstructions. Typical obstructions include any solid metal object, solid walls, elevator shafts, and any shielded room such as an x-ray room.

Corrective Action

Insufficient signal can be addressed in 3 basic ways.

- Increase the transmit power of the AP
- Add additional APs to provided additional coverage
- Reposition APs to avoid obstructions

Increasing the transmit power of an AP is an option, but many APs transmit at their maximum power by default. Some APs support the use of external high-gain antennas which can also boost the strength of signal. However, use of these antennas is strictly regulated by the FCC, and users should be careful to stay within the boundaries of the law. Furthermore, high-gain antennas do not truly add any overall signal to the environment. They simply compress the signal that is already available. As a result, a high-gain antenna may improve signal in location and worsen it to another.

Properly positioning APs is also an important step. Ideally, APs should have a clear "line of site" to the areas that they will serve. Installing APs on the ceiling or high on walls is often a helpful option when trying to avoid physical obstructions.

If the measures described above do not alleviate the problem, it may be necessary to install an additional AP. When an AP is added to the environment, users should configure that AP to use a Wi-Fi channel that does not overlap with the APs that are already deployed.

RSSI Serving Cell Coverage

Threshold: Min Signal

Default value: -67

Pass/Fail default value: 100%

Requirement Explanation

Areas that meet the current RSSI serving cell coverage requirement are shown in light green (   ). Areas that do not meet the requirement are displayed using the color code on the slider bar on the right-hand side of the view. The weakest signals are shown in red. Let the mouse hover over any point of the map to show additional details.

RF Coverage Background

RF signals are the basis for Wi-Fi communication in the same way that copper wire is the basis for traditional networks. Each wireless client (such as an end-user) must receive adequate levels of RF signal from its Access Point in order to insure a reliable and well-performing connection.

RF signals are measured in units of "dBm", with a signal of 0 dBm being the strongest, and signals of -100 dBm and below being the weakest. The minimum acceptable signal will depend on the requirements of the network and how it is used. As a general rule, voice clients should maintain a signal of at least -67 dBm.

RF signals can be significantly affected by environmental factors. Solid objects will attenuate and reflect RF signals, which can cause RF "dead spots" in otherwise well-served areas. For this reason, it is important to carefully survey areas where wireless clients will need network service. Surveyors should pay special attention to the areas around, and in the line of site of physical obstructions. Typical obstructions include any solid metal object, solid walls, elevator shafts, and any shielded room such as an x-ray room.

Corrective Action

Insufficient signal can be addressed in 3 basic ways.

- Increase the transmit power of the AP
- Add additional APs to provided additional coverage
- Reposition APs to avoid obstructions

Increasing the transmit power of an AP is an option, but many APs transmit at their maximum power by default. Some APs support the use of external high-gain antennas which can also boost the strength of signal. However, use of these antennas is strictly regulated by the FCC, and users should be careful to stay within the boundaries of the law. Furthermore, high-gain antennas do not truly add any overall signal to the environment. They simply compress the signal that is already available. As a result, a high-gain antenna may improve signal in location and worsen it to another.

Properly positioning APs is also an important step. Ideally, APs should have a clear "line of site" to the areas that they will serve. Installing APs on the ceiling or high on walls is often a helpful option when trying to avoid physical obstructions.

If the measures described above do not alleviate the problem, it may be necessary to install an additional AP. When an AP is added to the environment, users should configure that AP to use a Wi-Fi channel that does not overlap with the APs that are already deployed.

Signal Coverage

Threshold: Min Signal

Default value: -67

Pass/Fail default value: 100%

Requirement Explanation

Areas that meet the current RF coverage requirement are shown in light green (   ). Areas that do not meet the requirement are displayed using the color code on the slider bar on the right-hand side of the view. The weakest signals are shown in red. Let the mouse hover over any area of the map to show additional details.

RF Coverage Background

RF signals are the basis for Wi-Fi communication in the same way that copper wire is the basis for traditional networks. Each wireless client (such as an end-user) must receive adequate levels of RF signal from its Access Point in order to insure a reliable and well-performing connection.

RF signals are measured in units of "dBm", with a signal of 0 dBm being the strongest, and signals of -100 dBm and below being the weakest. The minimum acceptable signal will depend on the requirements of the network and how it is used. As a general rule, data clients should maintain a signal of at least -76 dBm. Voice clients require a stronger signal and should maintain a signal of at least -67 dBm.

RF signals can be significantly affected by environmental factors. Solid objects will attenuate and reflect RF signals, which can cause RF "dead spots" in otherwise well-served areas. For this reason, it is important to carefully survey areas where wireless clients will need network service. Surveyors should pay special attention to the areas around, and in the line of site of physical obstructions. Typical obstructions include any solid metal object, solid walls, elevator shafts, and any shielded room such as an x-ray room.

Corrective Action

Insufficient signal can be addressed in 3 basic ways.

- Increase the transmit power of the AP
- Add additional APs to provided additional coverage
- Reposition APs to avoid obstructions

Increasing the transmit power of an AP is an option, but many APs transmit at their maximum power by default. Some APs support the use of external high-gain antennas which can also boost the strength of signal. However, use of these antennas is strictly regulated by the FCC, and users should be careful to stay within the boundaries of the law. Furthermore, high-gain antennas do not truly add any overall signal to the environment. They simply compress the signal that is already available. As a result, a high-gain antenna may improve signal in location and worsen it to another.

Properly positioning APs is also an important step. Ideally, APs should have a clear "line of site" to the areas that they will serve. Installing APs on the ceiling or high on walls is often a helpful option when trying to avoid physical obstructions.

If the measures described above do not alleviate the problem, it may be necessary to install an additional AP. When an AP is added to the environment, users should configure that AP to use a Wi-Fi channel that does not overlap with the APs that are already deployed.

Signal-to-Noise Ratio Coverage

Threshold: Min Signal-to-Noise Ratio

Default value: 25

Pass/Fail default value: 100%

Requirement Explanation

Areas that meet the current Signal-to-Noise (SNR) coverage requirement are shown in light green (   ). Areas that do not meet the requirement are displayed using the color code on the slider bar on the right-hand side of the view. The weakest SNR values are shown in red. Let the mouse hover over any area of the map to show additional details.

SNR Background

SNR is a key measurement of the quality of the wireless signal transmission. A good SNR value means that a higher modulation and coding scheme (MCS) can be used which will increase the data rates over the wireless connection.

SNR is measured in units of "dB", representing the difference in a signal level measurement in dBm and a noise level measurement in dBm. For example, a signal level of -40 dBm and a noise level of -65 dBm results in an SNR of 25 dB. The minimum acceptable SNR will depend on the requirements of the network and how it is used. As a general rule, an SNR of 25 dB or more is desired for good data rates. To achieve the higher data rates available in 802.11n, and SNR of 27 is desired. To achieve the even higher rates available in 802.11ac, an SNR of 32 is desired. Keep in mind that data rates also depend on other factors such as channel width and the number of spatial streams.

SNR is affected by two factors: the signal level from the transmitting AP or client, and the background noise level including noise from interferers. Providing higher signal levels and/or lower noise levels will improve SNR. See the sections on Signal Coverage and Noise Level for more details on these.

Corrective Action

Insufficient SNR can be addressed in several ways.

- Increase the transmit power of the AP
- Add additional APs to provided additional coverage
- Reposition APs to avoid obstructions
- Select a different WLAN channel that has less noise and interference

- Mitigate interference sources (remove or relocate them)

Throughput Downlink Coverage

Threshold: Min Downlink Throughput Supported

Default value: 5.5

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for Min Downlink Throughput Rate Supported are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. This scale is shown in terms of Mbps. Let the mouse hover over any point of the map to show additional details.

Tips

When designing your Planner/Advisor project keep in mind the type of wireless traffic your project is expected to support. For example if the Wi-Fi usage is intended to support video traffic, then the Frame size required would most likely be a larger frame size. This is will change your throughput calculation. The larger frames will have less overhead while transferring data. If you intend to support VoFi traffic then you would want to use a smaller frame size to emulate typical VoFi packets. Smaller frame will provide less throughput mostly due to the increased overhead required to transfer data packets.

Throughput calculations can provide a direct insight into how well the network will support a real-world end-user client. When creating virtual Survey's with Planner/Advisor the Physical Data Rates are calculated from an Signal Strength to Data Rate mapping table. Then, take this number with the Selected (Frame Size) and calculate the Throughput rate the client can expect to see.

User Capacity

Thresholds: Maximum Users Supported per AP, With Load Balancing

Default values: 15, True

Pass/Fail default 100%

Requirement Explanation

Intelligent capacity planning is required for any wireless network that demands high availability or provides access to critical applications. The end result of capacity planning is to ensure that all network users have access to an adequate amount of bandwidth, and that wireless access points are arranged in a way to logically share the client load.

To perform a capacity plan, the site surveying engineer should first establish the bandwidth that each end user will require in order to meet his or her networking needs. Once the

average end-user requirements are established, the engineer can then calculate the maximum number of end-user clients that should associate with an access point based on the total throughput available from the AP. With these two pieces of information, users can use AirMagnet Survey to map out a scientific capacity plan using the following steps.

Identify key end-user client areas. This can be easily done by selecting ☐ (Rectangular Region Tool) from the Toolbar, and then drawing a box covering the area where end users will be supported. Enter the number of users that will need to be supported in this area, and enter the length and width of the area in terms of end-users. Repeat this process until you have accounted for all the end users that the network will support and all locations. The program will automatically tell you right away whether the users are all covered or not.

Using the "With Load Balancing" Threshold

> **Note:** Load Balancing refers to a setting that can be enabled on certain APs that support this feature. Consequently, users should only enable this setting if they know that their network operates with APs that support and use load balancing.

If the AirWISE requirement for "With Load Balancing" is set to "True", the AirWISE display will attempt to distribute the users in the defined areas evenly amongst the APs that cover that area. For example, if there are three APs that all provide coverage to a given block of cubes with six users in them, each AP will have two users assigned to it. If the "With Load Balancing" field is set to "False", the user stations will be assigned to whichever AP provides the strongest signal in their respective areas.

Each end-user area is automatically broken into equal-sized cells that represent the area for each user. Areas in green (   ) meet the capacity requirements set in the application, while a red area (█) will indicate a client that will be connected to an overloaded AP. An area that is grey in color (█) means that NO Service is available in that area. Let your mouse hover over any area of the map to see the strongest AP at that location and any other APs that are operating nearby. Use the simulation tool to simulate the result of relocating the APs, adjusting AP power, and adding additional APs to meet the capacity requirements.

VoFi Packet Retry

Threshold: Maximum percentage of packet retry allowed

Default value: 10%

Pass/Fail default value: 100%

Requirement Explanation

The WLAN RF spectrum is open, dynamic, shared, and subject to noise, interference, packet collisions, multipath, hidden node syndrome, etc. When there are errors caused by any of the above issues, the transmitter of the error frame would not receive an 802.11 control frame called an **acknowledgement** frame. When there is no acknowledgement observed, the transmitter, assuming that the receiver did not receive the frame successfully, would re-transmit the unacknowledged frame with the **Retry** bit in the frame set to one. This indicates a re-transmission. The figure below illustrates the **Retry** field in the 802.11 frame header.

Background

The VoFi packet retry policy takes rates recorded from transactions from the phone to the AP (uplink) as well as those from the AP to the phone (downlink) into account when displaying these data. As shown in the legend bar on the right-hand portion of the view, the data rate is color-coded to display the combined status of the two transmission directions:

- Areas of the map in which both uplink and downlink retry rates are good are displayed in light green (   ).
- Areas in which the uplink retry rate is good but the downlink retry rate is not are displayed in yellow.
- Areas in which the downlink retry rate is good but the uplink retry rate is not are displayed in orange.
- Areas in which both uplink and downlink retry rates are bad are displayed in red.

Let the mouse hover over any point of the map to show additional details.

VoFi PHY Data Rate

Threshold: Minimum data rate required

Default value: 24.0

Pass/Fail default value: 100%

Requirement Explanation

The VoFi PHY data rate policy takes rates recorded from transactions from the phone to the AP (uplink) as well as those from the AP to the phone (downlink) into account when displaying these data. As shown in the legend bar on the right-hand portion of the view, the data rate is color-coded to display the combined status of the two transmission directions:

- Areas of the map in which both uplink and downlink rates are good are displayed in light green (   ).
- Areas in which the uplink rate is good but the downlink rate is not are displayed in yellow.
- Areas in which the downlink rate is good but the uplink rate is not are displayed in orange.
- Areas in which both uplink and downlink rates are bad are displayed in red.

Let the mouse hover over any point of the map to show additional details.

Background

Connection data rate provides a direct insight into how well the network will support a real-world end-user phone. A VoFi Survey is required in order to obtain connection speed data. A low connection PHY data rate directly translates to lower throughput and performance for an end-user phone. Consistently low connection data rates are indicative of either, insufficient signal coverage, interference, noise, or mis-configured wireless devices.

The connection speeds supported by each of the 802.11 protocols are listed below:

802.11 Standard	Supported Speeds (in Mbps)
802.11b	1, 2, 5.5, 11
802.11g	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54
802.11a	6, 9, 12, 18, 24, 36, 48, 54
802.11n	1.00, 2.00, 5.50, 6.00, 6.50, 7.20, 11.00, 12.00, 13.00, 13.50, 14.40, 15.00, 18.00, 19.50, 21.70, 24.00, 26.00, 27.00, 28.90, 30.00, 36.00, 39.00, 40.50, 43.30, 45.00, 48.00, 52.00, 54.00, 57.80, 58.50, 60.00, 65.00, 72.20, 78.00, 81.00, 86.70, 90.00, 104.00, 108.00, 115.60, 117.00, 120.00, 121.50, 130.00, 135.00, 144.40, 150.00, 156.00, 162.00, 173.30, 175.50, 180.00, 195.00, 208.00, 216.00, 216.70, 231.10, 234.00, 240.00, 243.00, 260.00, 270.00, 288.90, 300.00, 324.00, 360.00, 364.50, 405.00, 432.00, 450.00, 480.00, 486.00, 540.00, 600.00

End-user connection speeds change automatically from a higher connection data rate to a lower one in response to a deteriorating connection quality. The best method for determining the real-world connection data rate at a given location is to perform a VoFi Survey. During a VoFi Survey, the surveyor "follows" the AP's connection to the phone and actively collects real connection data such as connection data rate.

VoFi Signal Coverage

Threshold: Minimum AP signal strength required

Default value: -67 dBm

Pass/Fail default value: 100%

Requirement Explanation

Areas that meet the current RF coverage requirement are shown in light green (   ). Areas that do not meet the requirement are displayed using the color code on the slider bar on the right-hand side of the view. The weakest signals are shown in red. Let the mouse hover over any point of the map to show additional details.

RF Coverage Background

RF signals are the basis for Wi-Fi communication in the same way that copper wire is the basis for traditional networks. Each wireless client (such as an end-user) must receive adequate levels of RF signal from its Access Point in order to insure a reliable and well-performing connection.

RF signals are measured in units of "dBm", with a signal of 0 dBm being the strongest, and signals of -100 dBm and below being the weakest. The minimum acceptable signal will depend on the requirements of the network and how it is used. As a general rule, data clients should maintain a signal of at least -76 dBm. Voice clients require a stronger signal and should maintain a signal of at least -67 dBm.

RF signals can be significantly affected by environmental factors. Solid objects will attenuate and reflect RF signals, which can cause RF "dead spots" in otherwise well-served areas. For this reason, it is important to carefully survey areas where wireless clients will need network service. Surveyors should pay special attention to the areas around, and in the line of site of physical obstructions. Typical obstructions include any solid metal object, solid walls, elevator shafts, and any shielded room such as an x-ray room.

VoFi-Specific Coverage Data

In contrast to the general Signal Coverage requirement, the VoFi Signal Coverage represents the information gathered from the AP to which the VoFi phone is associated during the survey process. Consequently, it should not be interpreted as representing all coverage detected on the VoFi deployment; other VoFi APs may be placed in the vicinity of the survey path but not displayed since the phone did not associate with them during the survey.

WiMOS Coverage

Threshold: Minimum WiMOS coverage required

Default value: 4.0

Pass/Fail default value: 100%

Requirement Explanation

Areas of the map that meet the current requirement for desired WiMOS Score are displayed in light green (   ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. The lowest WiMOS scores are shown in red. Let the mouse hover over any ppint of the map to show additional details.

Background

VoFi call quality can be indicated by several different parameters, one of which is the Wireless Mean Opinion Score (WiMOS), a numerical measurement similar to the MOS value assigned to calls performed on wired networks. WiMOS scores are the most commonly used way by which respondents are asked to rate the quality of a call (that is, how it sounds) on a 1 (bad) to 5 (excellent) scale. Anything that is above 4 is considered excellent. However, such rating is in and of itself very subjective due to the lack of an objective and scientific methodology.

Lower WiMOS may lead to choppy audio, one-way conversations, and ultimately even calls getting dropped entirely.

User Satisfaction	WiMOS Score
Unacceptable	1.0 ~ 1.9
Mildly dissatisfied	2.0 ~ 2.9
Slightly dissatisfied	3.0 ~3.9
Completely satisfied	4.0 ~ 4.5

Cisco Location-based Services

Threshold: Number of placed APs required to provide coverage, AP signal strength required to provide coverage

Default Value: 3, -75

Minimum APs: 3, Maximum APs: 16

Minimum signal strength: -85dBm, Maximum signal strength: 0

Pass/Fail default value: 100%

Requirement Explanation

If three APs or more, that are placed on the floor plan, create a "convex hull" configuration (see diagram below) and meet the requirements for location-based services coverage (readiness), the convex hull area will be displayed as green. The non-compliant area (outside the hull) is displayed as pink.

The creation of a convex hull requires at least three placed APs on the floor plan to form the hull. In addition, any location point within the hull must not have a signal strength weaker than the defined minimum signal strength value (based on the placed APs). Both of these requirements must be met in order for the hull to be considered "ready" for location-based services.

However, if signal strength drops below the minimum requirement and/or AP count drops below the requirement inside the hull, these locations will be color-coded as indicated by the legend.

To view areas in terms of AP count, click the "Number of placed APs required to provide coverage" row in the thresholds area, just below this view. To see how close the actual AP signal is to your requirement, click the "AP signal strength required to provide coverage" row in the thresholds area. Let the mouse hover over any point of the map to show additional details. For the purpose of this requirement, any placed APs closer together than one meter are considered as one physical AP.

The "% of Good Area" indicates the area of the floor plan that meets the requirements. To determine the percentage of good area within the convex hull you may use the "Arbitrary Region Tool" to outline the convex hull and create a region.

Note: After conducting a survey, you must place all the APs intended for Cisco Location-based services on the floor plan. Refer to [Channel/SSID List](#).

Legend explanation

Item	Description
Green	Both the number of APs and signal strength threshold criteria are met.
Pink	Area outside the convex hull.
Silver (gray)	All the APs meet the signal strength threshold; however, the number of APs requirement is not met.
With Signal Strength requirement selected.	Colors besides green or gray inside the hull indicate the strongest signal strength in areas where the AP requirement and/or signal strength threshold are not met.
With AP requirement selected.	Colors (besides green) indicate areas where either the total number of APs making up the hull falls below the requirement or the number of APs providing the required signal strength coverage falls below the requirement.

Background

Location-based services generally involve determining the geographical location of assets or persons. Some applications of location-based services include RFID tracking solutions; location monitoring of Voice-over-Wi-Fi phones; and locating rogue access points.

Proper placement of access points is an important consideration for planning location-based services (such as a location-aware Cisco Unified Wireless Network).

This policy applies the "convex hull" technique for determining compliance. The convex hull technique involves establishing a perimeter of at least three placed APs in which one could imagine a rubber band wrapped around the "outside" APs. As you move an AP, the perimeter border (rubber band) adjusts accordingly.

The interior area encompassed by this band can be considered as possessing high potential for good location accuracy. As tracked devices stray into the area outside the convex hull, accuracy can begin to deteriorate.
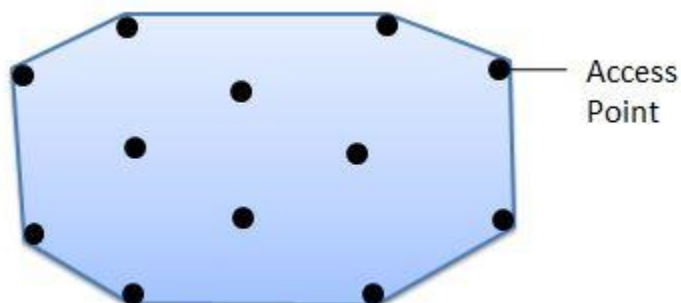
Cisco recommendations

This section contains an excerpt from "Best Practices—Location-Aware WLAN Design Considerations" Used by permission © Cisco, Inc. All rights reserved.

For Cisco "Location-aware" deployments, Cisco recommends that designs that make use of only clustered or straight-line access point placement should be augmented or redesigned in favor of those that combine center access-point placement with perimeter and corner placement.
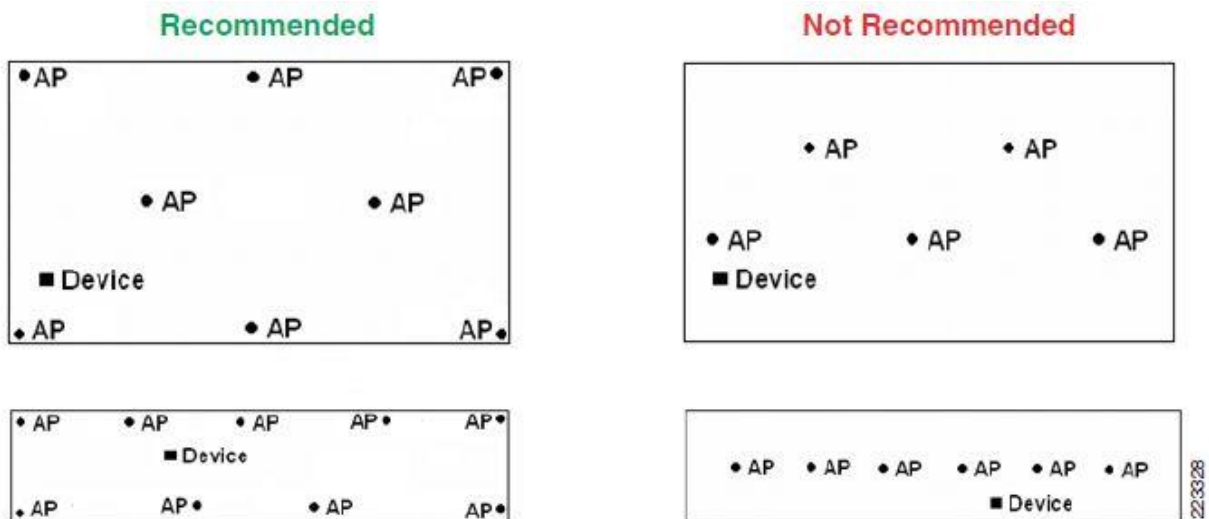
If possible, mount antennas such that they have an unencumbered 360º view of all areas around them, without being blocked at close range by large objects. For example, if possible, avoid placing access point antennas directly against large objects such as steel columns. One option is to mount the access point along with its antennas to a ceiling location (provided that this allows an acceptable mounting height). Another option is to use short, low loss cable extension to allow separation between antennas and such obstructions.

In general, for access points deployed indoors at antenna heights of 20 feet or less, the range of any point on the floor to at least three detecting access points on that floor (one in each of at least three of the four quadrants surrounding it) is maintained within approximately 70 feet in an indoor environment. This is a general recommendation that is intended to assist designers in avoiding situations where excessive inter-access point distance may be a contributing factor to location inaccuracy.

Corrective Actions

Users have 3 basic options to insure location-based coverage readiness:

- Increase the transmit power of existing APs
- Reposition APs to meet requirements
- Add additional APs

Increasing the transmit power of an AP is an option, but many APs transmit at their maximum power by default. Some APs support the use of external high-gain antennas which can also boost the strength of signal. However, use of these antennas is strictly regulated by the FCC, and users should be careful to stay within the boundaries of the law. Furthermore, high-gain antennas do not truly add any overall signal to the environment. They simply compress the signal that is already available. As a result, a high-gain antenna may improve signal in location and worsen it to another.

Properly positioning APs is also an important step. Ideally, APs should have a clear "line of site" to the areas that they will serve. Installing APs on the ceiling or high on walls is often a helpful option when trying to avoid physical obstructions.

If the measures described above do not alleviate the problem, it may be necessary to install an additional AP. When an AP is added to the environment, users should configure that AP to use a Wi-Fi channel that does not overlap with the APs that are already deployed.

MultiView View

MultiView Map Window

The MultiView map window displays the site maps for up to four different surveys at a time. When multiple surveys are loaded, each pane in the window acts individually, allowing the user to view different survey data files in each pane. The currently active pane is highlighted by a blue box, as shown below.
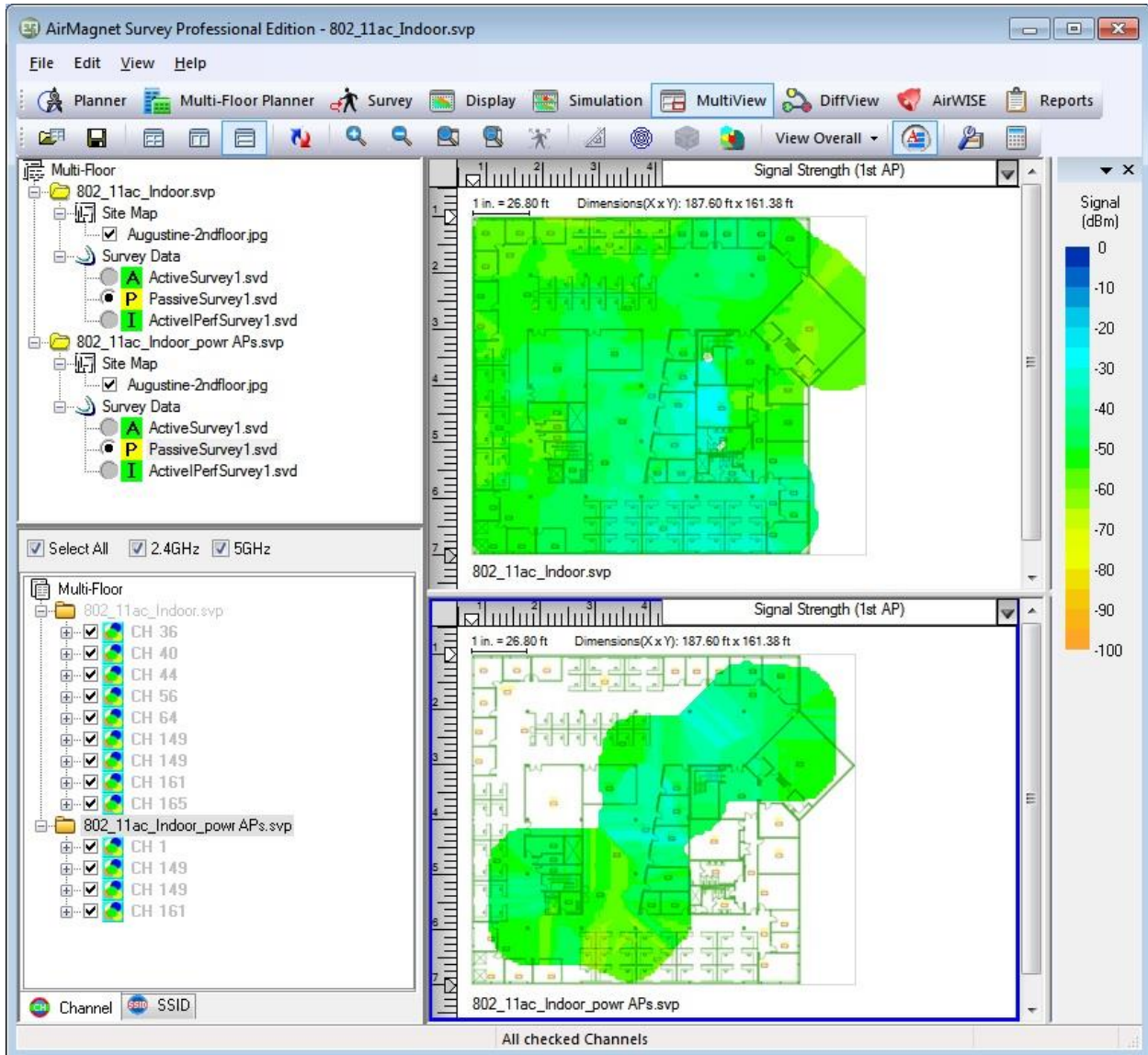
Project Window

The Project Window on the MultiView view displays all the survey projects that you have opened (imported), including the individual components in each project.
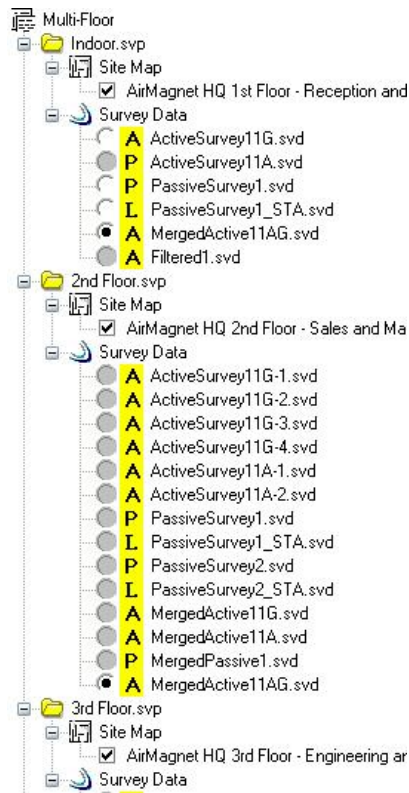
Note: *AirMagnet Survey displays multiple survey projects in the order they are opened, with the one that is opened first placed on top of the list of projects in the Project Window. For this reason, the main project should appear on the top because it is supposed to be opened first.*

Channel/SSID Tree

The Channel/SSID Tree on the MultiView view shows the APs and SSIDs detected in the current data file(s). The following figure illustrates how channels and SSIDs are organized under their respective projects. This makes it easy to view, check and uncheck APs and SSIDs as desired to see how changes are reflected in multiple surveys.
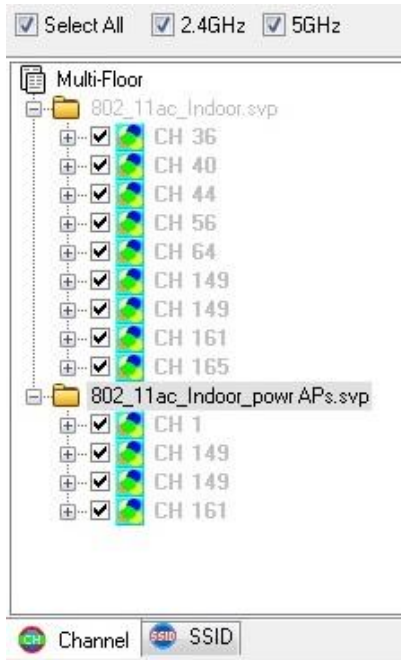
The Toolbar includes **Automatic Multi Select** . This feature enables you to turn the automatic selection feature on or off. With it turned on, data about the APs selected in one Map Window will automatically show up in the other Map Window(s) if its RF signals are also contained (collected) in the subproject(s). This enables you to easily visualize and compare how RF signals propagate across the floors.

File Menu

The File menu in MultiView includes the following options:

Import MultiView Project: Use this option to import up to four projects for MultiView comparison.

Close Subproject: Enables you to select a subproject file to close without closing the entire survey project.

View Menu

The View menu on the MultiView view includes the following options:

Swap Left/Right Views: Toggles two images left and right.

Swap Top/Bottom Views: Toggles two images up and down.

MultiView Toolbar

The toolbar contains the commonly used tools for analyzing multi-floor data. Most of these tools are identical to the options found in the File or View menus of the view. Some additional tools for Multiview are described in the following table:

Icon	Name	Description
	Open Subproject	Allows you to select and open a subproject of a multi-floor survey project.
	Four View	Displays the site maps used in a multi-floor project in four separate mini windows.
	Swap Left/Right	Toggles two images between left and right.
	Swap Top/Bottom	Toggles two images between up and down.
	Automatic Multi Select	Turn the automatic selection feature on or off. With it turned on, data about the APs selected in one Map Window will automatically show up in the other Map Window(s). Refer to Channel/SSID Tree.

Single Project in MultiView

When you import additional project in MultiView, you may also choose to view a single project in the four different panes.

To view a single project in multi-view mode:

1. Open the **Project Import** view.
2. Check the box for the file you wish to view (you may need to browse to find the project to import).
3. Check the "**Single Project Multi View**" box at the bottom.
4. Click **Import**. You will now see the single project you loaded displayed in all four panes.
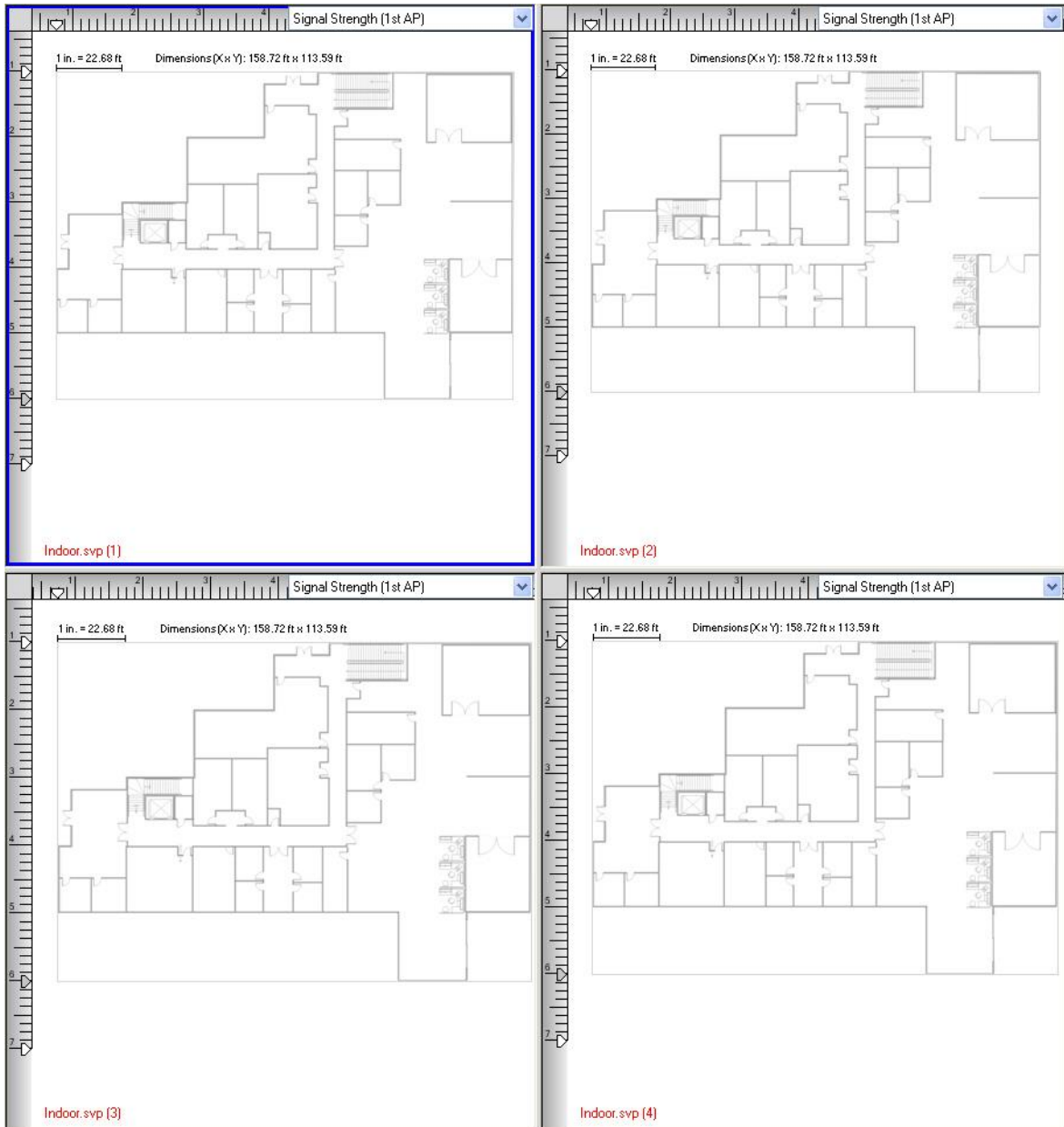
5. Click the radio buttons for the survey data you wish to load in each individual pane. Select your desired view options.

Opening Multi-Floor Survey Projects

The MultiView view is used for analyzing whether APs on a certain floor can provide RF signals strong enough to cover wireless stations on floors above and/or below and how APs on adjacent floors could interfere with one another in terms of channel allocation, service quality, network security, etc. However, in order to analyze RF data across multiple floors in a single building, you must collect data from each of the floors involved. This means that you first of all need to create a Survey project for each of the floors, perform the site surveys individually floor by floor, and save the survey data for each floor separately. Once data are collected, you need to open the one of the Survey projects first on the Display

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view, and then bring up the MultiView view to open (import) the other survey projects. After all the projects are loaded on the MultiView view, you can use the tools on the view to analyze the data.

The following procedures show how to open and analyze survey data involving multiple floors.

To analyze multi-floor survey data:

1. From the Display view, click **File>Open Project.**... The Open dialog box appears.
2. Browse to a Survey project (svp) file and click **Open**. The project opens on the **Display** view.
3. Click the radio button in front of the Survey Data file. The data loads.
4. Click [MultiView] on the Navigation bar. The **MultiView** view opens with the project displayed.
6. To import additional floors, click **File>Import Multi-Project**.... The Project Import window appears.
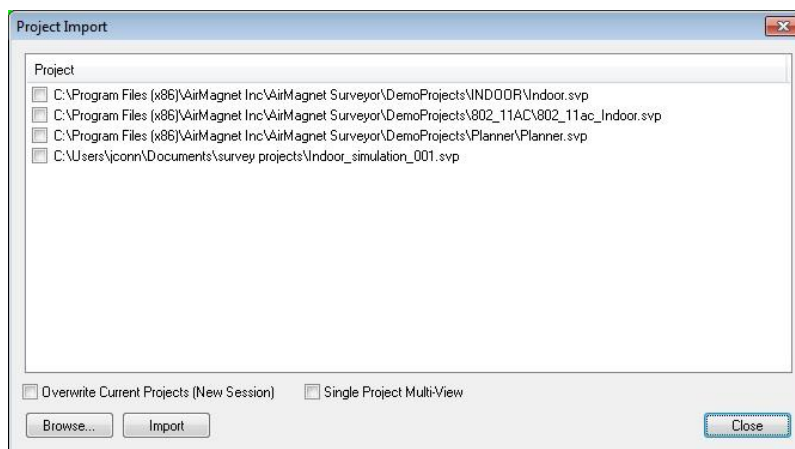
7. Click the check box(es) corresponding to the subproject file(s) you wish to import, and click Import. The selected project file(s) appear on the Multi View view.

Note: A "main project" is the survey project that you first open on the Display view. Any survey project that is opened (imported) afterwards on the MultiView view is a "subproject". AirMagnet Survey PRO allows you to display multi-floor survey data for up to four floors on the MultiView view at the same time. For better data representation, it is recommended that you merge all the survey data for each floor to create a merged file and then compare the merged files on the Multi View view.

The MultiView view can also help users compare several different surveys within a single project, using the Single Project Multi View function.

Analyzing RF Data Across all Floors

After all the data are opened on the MultiView view, the next step is to use the tools available on the view to analyze them, just as you do on the Display view.

Click a single map window to make it the focus. Any options are then applied to that Map window.

> *Note: Analyzing survey data involving multiple floors basically uses the same tools and follows the same procedures as surveying a single floor. Therefore, you may want to see the Display view for ways to analyze survey data.*

Reports

Reports Introduction

The Reports feature enables you to generate a report based on the data file selected in the Display view.

A variety of pre-configured reports are available. The following options enable you to customize any report:

- Edit an existing report by adding and/or removing sections.
- Duplicate a report and modify the duplicate.
- Start with a blank report and add desired sections.
- Revise the text of any heading and/or section content.
- Localize a report automatically to any of the following languages: English, German, French, Arabic, Russian, and Japanese. Additionally, manually revise any translated text.
- Localize a report by manually modifying any or all text to the target language.
- Customize the Title Page graphics
- Customize to show/hide cover page, table of contents, header, footer, page number, and each section's title and contexts.

You can access the Reports view by clicking **Reports** on the navigation bar.

Double-click a report to generate it. The generated report will be displayed in the main view.
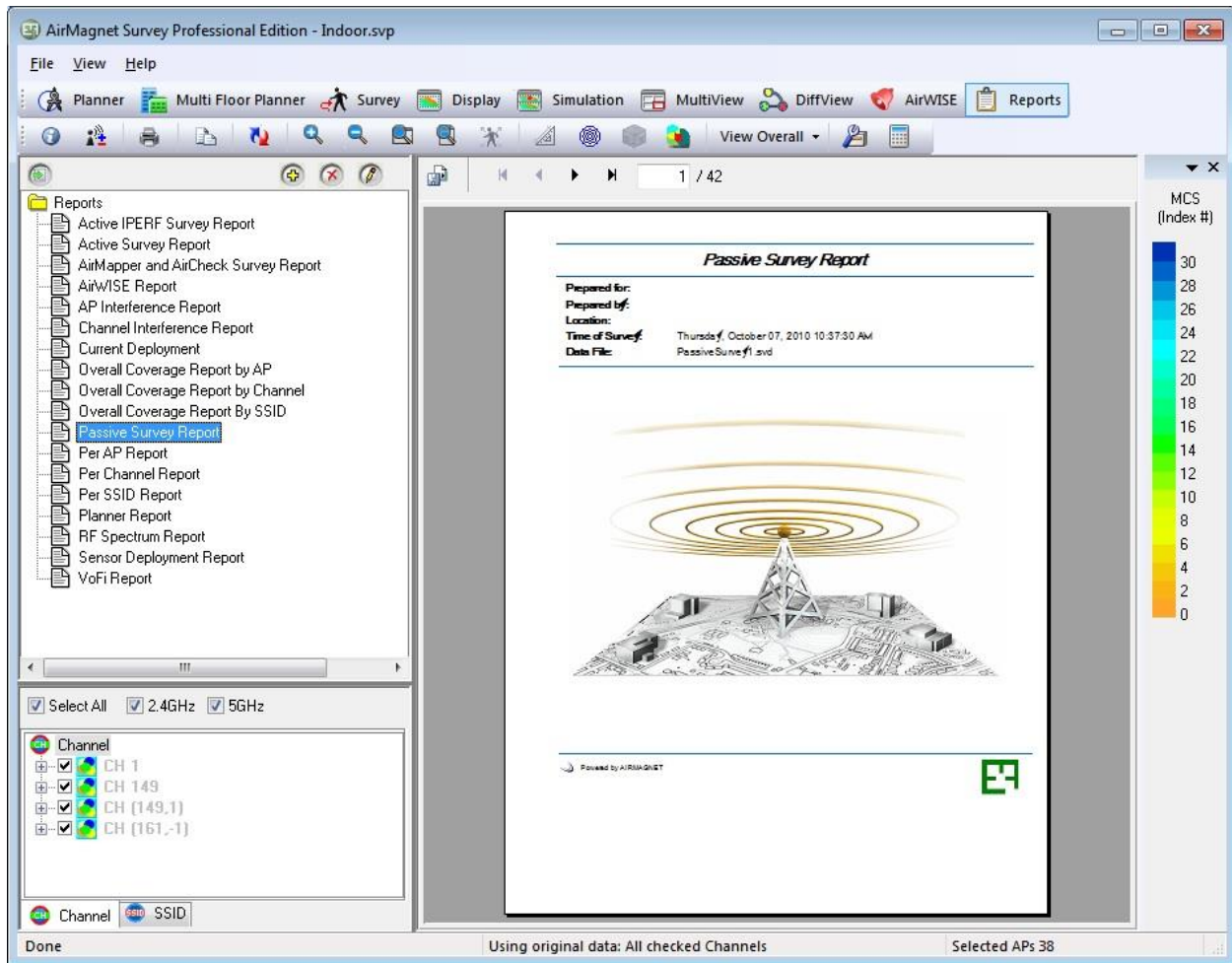
File Menu

The Reports File menu includes some options for managing and distributing survey data reports.

Option	Description
Report configuration...	Opens the General Information tab in the Report Template manager where you can modify aspects of the report, including logo, footer, and location.
ACL...	Opens the ACL (Access Control List) window where you can add APs to or delete them from the ACL table. This feature enables you to categorize access points discovered during a survey into two groups: those that you manage (ACL) and those that you do not manage. Non-ACL access points include those from your neighboring businesses and rogue access points. Click **Add**"to display a list of Access Points contained in the survey. Check the APs you want to include in ACL. Click **OK**. If the ACL feature is used, the report will sort the APs into these two groups.
Print...	Allows you to print the current report.

Print Setup...	Allows you to configure the printing settings of the current report.

View Menu

The View menu on the Reports view provides an additional option:

Landscape Orientation: Switch the report orientation from portrait to landscape. Once in Landscape orientation, the report may be changed back to Portrait orientation by unselecting **Landscape Orientation**.

Report Template List

The Report List displays the Report Templates. Each template is pre-configured to generate a report containing topics relevant to the title of the report (for example, Passive Survey Report). However, you may fully customize any report to meet your needs.

> **Note:** A report is based on the selected data file in Display view. Therefore, the report may only contain data included in that data file. For example, your report cannot contain VoFi information if the associated data file does not contain a VoFi survey.
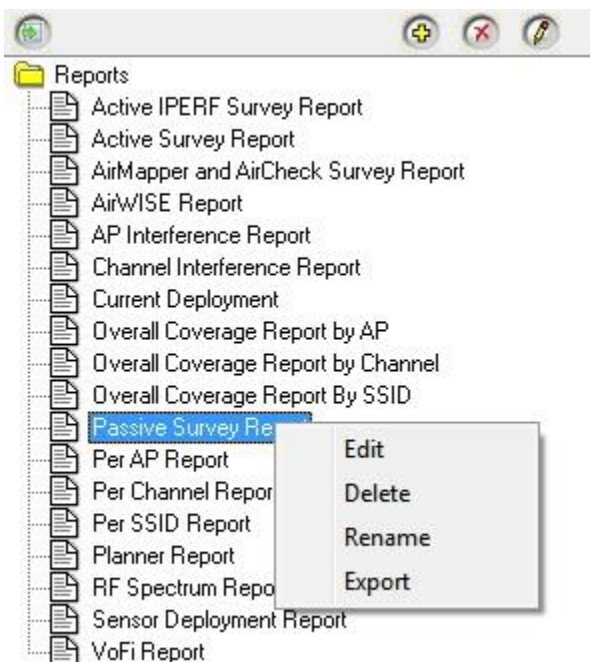
Within the Report List, the following actions are available:

Item	Description
⊕ or right-click the "Reports" folder and select "New Custom Report Template"	Add a new, blank template or copy an existing template. Type a name for the template. Choose "none" for a blank template or choose a listing from the drop-down to create a duplicate template. Click **OK**.
✎ or right-click and select Edit	Edit the selected template.

⊗ or right-click and select Delete	Delete the selected template. Once deleted, the template cannot be restored unless the product is re-installed.
Right-click and select Rename	Rename the selected template.
Right-click and select Export	Export the selected template. A browse dialog is opened to enable the export of the selected template in ZIP format to a desired directory location.
Import	Right-click the "Reports" folder, select "Import Custom Report Template" and browse to the desired ZIP file. Click **Open**.

Customizing a Report Template

If you choose to Edit or Create a report template (refer to [Report List](#)), the **Create Custom Report Template** manager opens with the **Report Template** tab displayed.

- If you chose to **Create** a new template, the left-side of the manager will be empty. This enables you to build the template by adding the desired section from the **Available Categories** section.

- If you chose to **Edit** a template, the left-side of the manager will contain the pre-configured sections associated with the template title. You may choose to remove undesired sections from the **Custom Report Template** area on the left and/or you may add sections from the **Available Categories** list.
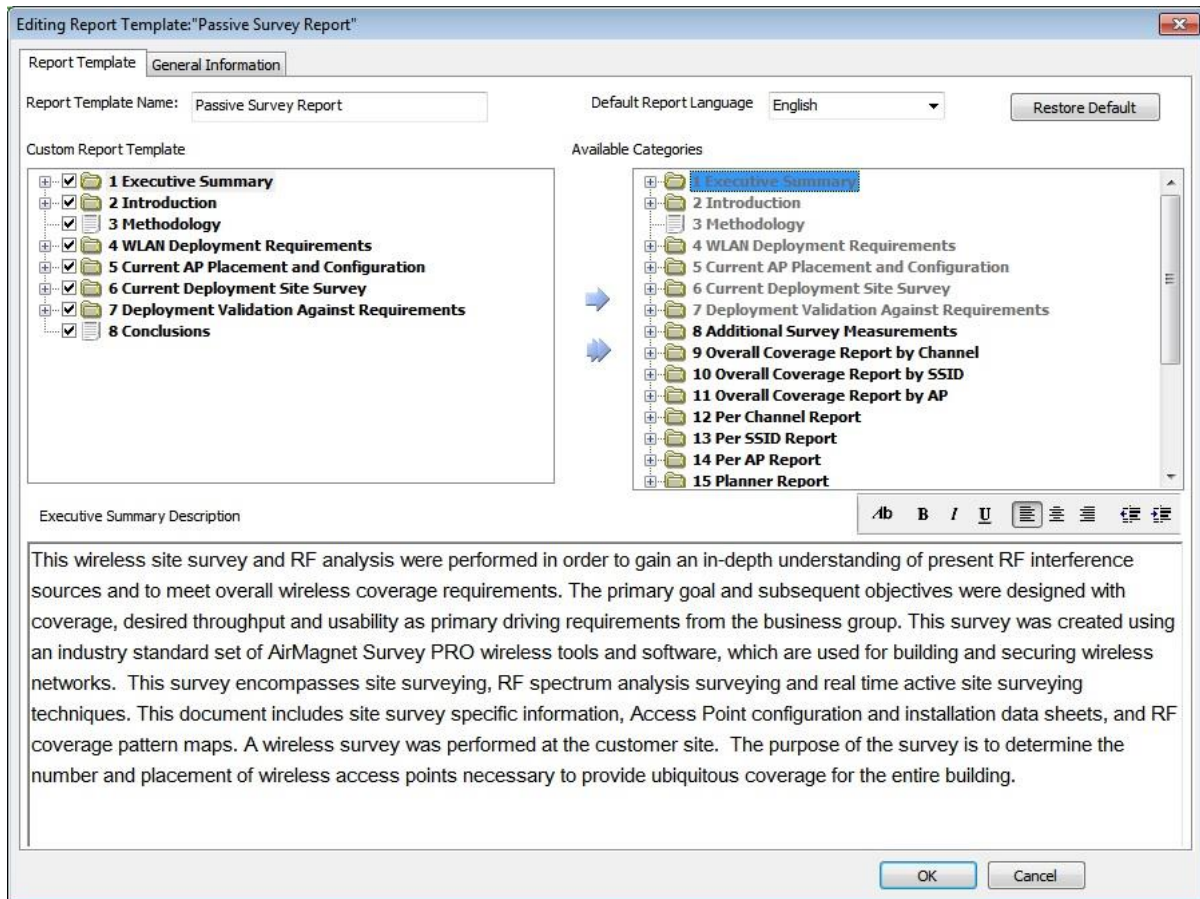
1. To subtract a section from the report, locate the desired section by expanding the **Custom Report Template** tree. Select the section. Click the right facing arrow to move the section to **Available Categories**.

2. To add a section to the report, locate the desired section by expanding the **Available Categories** tree. Select the section. Click the left facing arrow to move the section to **Custom Report Template.**

3. You may also modify any of the default description text associated with section. Select the section in the **Custom Report Template** tree. This will display the text (if any) in the description area at the bottom. Modify the text.

4. Click **OK** to save changes

General information

Click the **General Information** tab to customize information such as the survey title, surveyor name, survey location, custom report header and footer, and so on.

This tab also includes the Translation button that enables some additional translation features. Refer to [Report Translation](#).
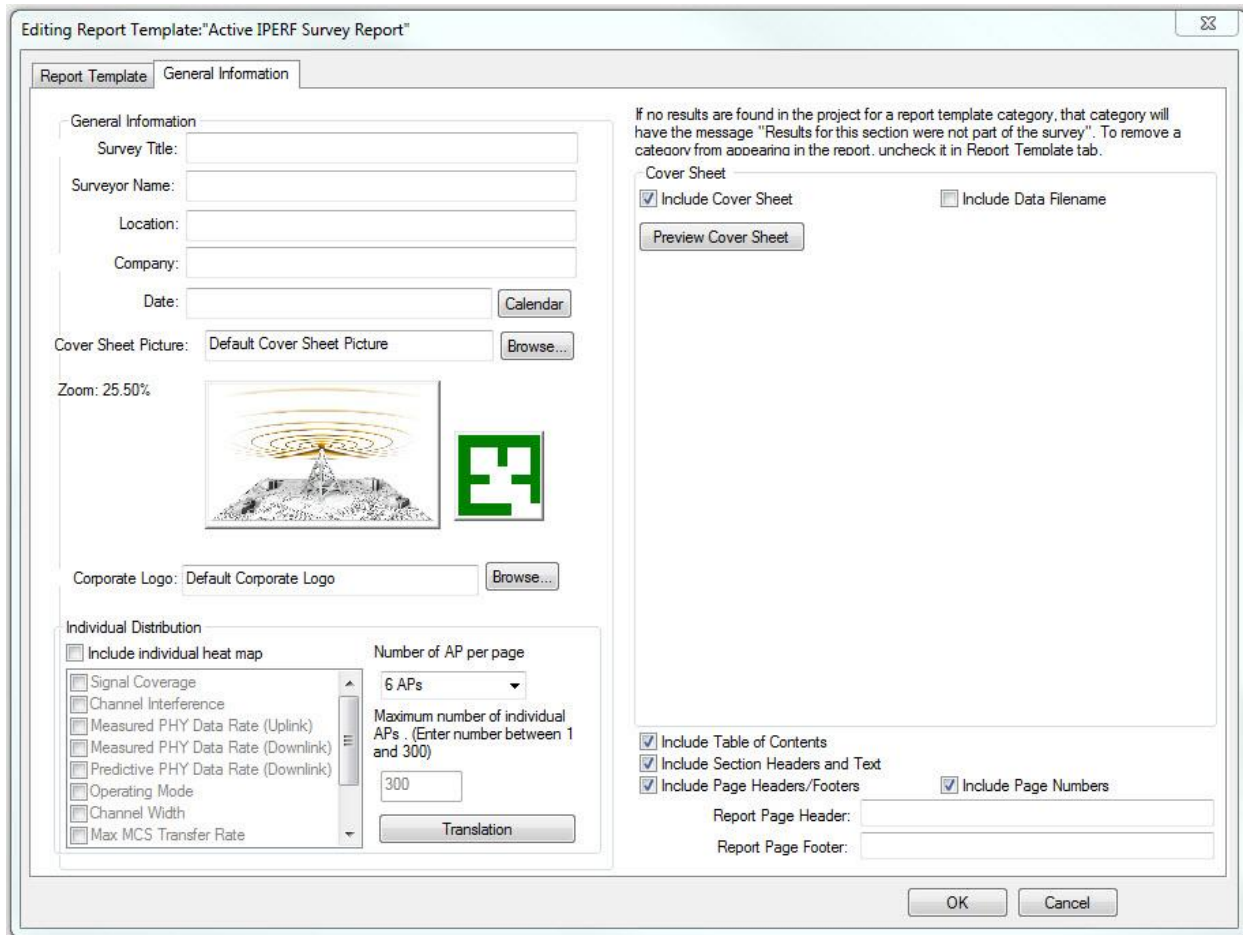
After modifying the properties desired, the user can preview a sample of the report's cover sheet in the right-hand portion of the window by clicking Preview Cover Sheet. The table below describes the fields available for customization.

Field	Description
Survey Title	The title of the survey. Note that this differs from the name of the template in that the Survey Title will be printed on the cover page of the report itself.
Surveyor Name	The name of the person who conducted the survey.
Location	The location at which the survey was taken.
Company	The company for which the survey was conducted.
Date	The date of the survey.
Cover Sheet Picture	The picture that will be displayed on the cover sheet of the finished report. Recommended size is 650w x 400h pixels. This image will appear in the cover sheet of all reports. BMP, JPG, PNG and GIF are supported. When browsing for an image, be sure to select the correct image type desired from drop-down.
Corporate Logo	If desired, users can specify a logo to be displayed in the lower-right corner of the cover page. Recommended size is 164w x 164h pixels. This image will appear in the cover sheet of all reports. BMP, JPG, PNG and GIF are supported. When browsing for an image, be sure to select the correct image type desired from drop-down.

Individual Distribution	This option allows the user to force the report to display a limited number of APs in each heatmap display. In this manner, users can view fewer devices per page and get a better idea of each AP's coverage area. This mechanism can be enabled for any or all of the heatmaps displayed within the report.
Translation	Enables report text to be localized to the language of choice. Refer to Report Translation.
Report Page Header & Footer	If desired, users can enter text to appear in the header and footer portions of the report. This will be displayed in addition to the default page number shown on all reports.
Include Cover Page, Data Filename, Table of Contents, Section Headers and Text, Page Headers/Footers, and Page Number	Check the corresponding boxes to include/hide different parts of report.

Report Translation

Within the **Report Template** manager, there are some options available for enabling you to localize a report to a desired language.

By default, the Windows setting for "Display Language" is presented, so translation in this regard refers to editing text.

Note: Before modifying a template, you may find it desirable to first duplicate a report template and include the desired language in the file name, for example, Passive Survey (German).

- **Default Report Language**: This drop-down, located on the Report Template tab, enables you to view report text in the following languages: English, German, French, Arabic, Russian, and Japanese. After selecting a language option from the drop-down, click **Restore Default** to apply the language to any sections in the **Custom Report Template** area of the template manager.

- **Manually edit any text**: You may manually edit the text in any section by selecting the section and then editing the text that appears in the text editor area (the lower section of the template manager).

- **Manually edit any header text (category headers)**: right-click a heading in the **Custom Report Template** area of the template manager. Select **Rename** and type the desired text.

- **Incidental items on the report pages:** Additionally, there is some incidental text in the report not included in the methods above. From the **General Information** tab, click **Translation**. Translate the items in the left column into the desired language using the fields in the right column.
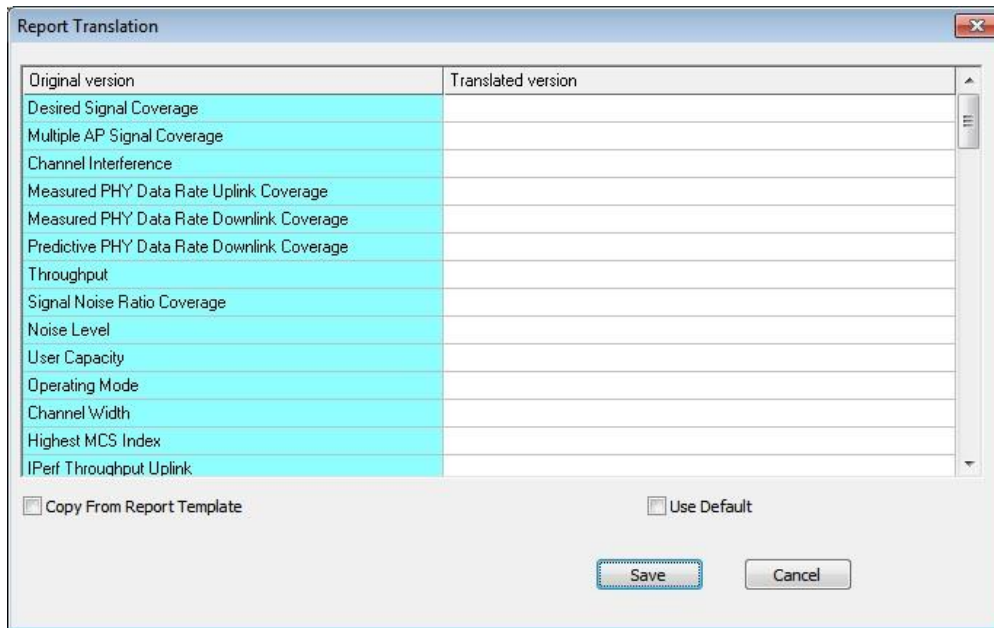
Once translation is completed, click **OK** to save any changes and close the Report Template manager.

Channel/SSID Tree

This part of the Reports view allows you to tailor the content of the report. In general, the reports can be displayed by channel or by SSID. You can toggle between the two by clicking

. The image below shows all the APs on each available channel as well as the SSID and maximum RF signal level of each AP.
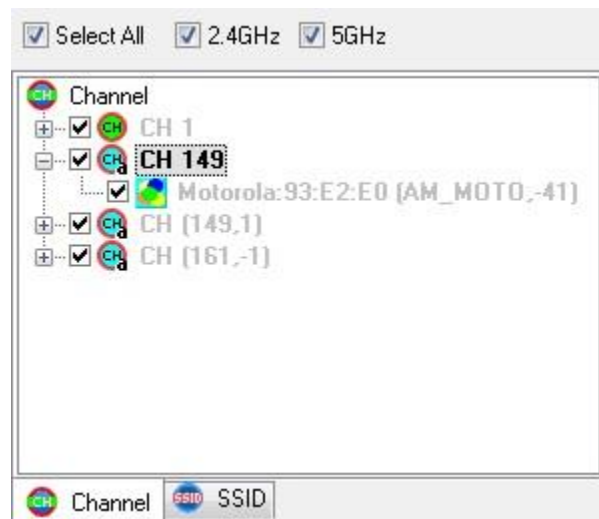
As seen above, there are check boxes above the Channel/SSID Tree:

- **Select All**: This function enables you to select or deselect all entries on the Channel/SSID Tree with a click of the button. By default, all the entries in the Channels/SSID Tree are selected when the Reports view opens. It is a good idea to use this button to deselect all the entries and then manually select only the entries in which you are interested. In this way you can customize your survey data reports using data about the selected devices.

- **2.4 GHz:** This checkbox selects only the channels in the 2.4-GHz band.

- **5 GHz:** This checkbox selects only the channels in the 5-GHz band.

Report Window

The Report Window displays the report based on the options selected from the Report List and Channel/SSID Tree. There are a number of tools across the top of the Report Window. They are specifically designed for viewing and sharing survey data reports, as described below.

Icon	Name	Description

	Export	Brings up the Export dialog box which allows you to export the current report to a specific destination in a selected format.
	To First Page	Allows you to move to the beginning of the current report.
	Back	Allows you to return to the previous page of the report.
2 of 38	Page Count	Shows the total number of pages contained in the current report and the page you are viewing. Note: You can directly navigate to a specific page in the report by highlighting the current page number and then entering the page number of interest and pressing the Enter key on your keyboard.
	Forward	Allows you to move to the following page of the report.
	To Last Page	Allows you to move to the end of the current report.

Toolbar

The toolbar contains the commonly used tools for viewing and printing reports. Most of these tools are identical to the options found in the File or View menus of the view.

Icon	Name	Description
	Zoom In	Enlarges the size of the current report on the view.
	Zoom Out	Reduces the size of the current report on the view.
	Zoom to Fit	Fits the current report to the size of the Report Window.
	Actual Size	Resets the current report to actual printing size.
	Refresh Report	Refreshes the data in the current report.
	Report Information	Opens the Report Configuration view, where you can specify or modify information that appears on the reports to be generated.
	ACL	Opens the ACL window, where you can add or delete APs from the ACL table.
	Landscape	Allows you to switch the orientation of the report on the view between portrait (default) and landscape.
	Print	Allows you to print the current report.

Viewing Survey Data Reports

The following are the general procedures for viewing a data report:

1. While in the Display view, open a survey data file.

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2. From the Navigation bar, click . The Reports view appears.

3. From the Report List, select a report.

4. From the Channel/SSID Tree, click the Channel or SSID tab.

5. Use the controls on the view to adjust your viewing options.

The heatmap colors displayed in reports are somewhat dependent on monitor display settings.

Printing Reports

To print a survey data report:

1. From the **Report List** Window, double-click to open a report.

2. Click (**Print Report**). The Print view appears.

3. Make the selections and/or entries as shown on the view, and click **OK**.

Exporting Reports

You can export reports in more than a dozen electronic file formats and to a number of destinations. This makes it possible to share and back up your survey data with ease.

To export a survey data report:

1. Customize the report, if necessary, using the Channel/SSID Tree.

2. Double-click the desired report from the **Report List** Window.

3. Click (**Export Report**). The Export view appears.

4. Click the **Format** down arrow and select a file format from the drop-down list.

5. Click the **Destination** down arrow and select a destination for the file to be exported.

6. Click **OK**. The Export Options dialog box appears.

7. Select one of the export options and click **OK**.

> **Note:** Depending on the option you select in Step 5, the report can be exported to a disk drive or sent out as an email attachment. You can then open and view the report in the format you have selected, provided that you have the application that supports it (file format).

Using WLAN Tools

Main Topics

This section describes the four important diagnostic tools AirMagnet Survey provides for evaluating and troubleshooting a WLAN. All these tools can be accessed from the Tools window.
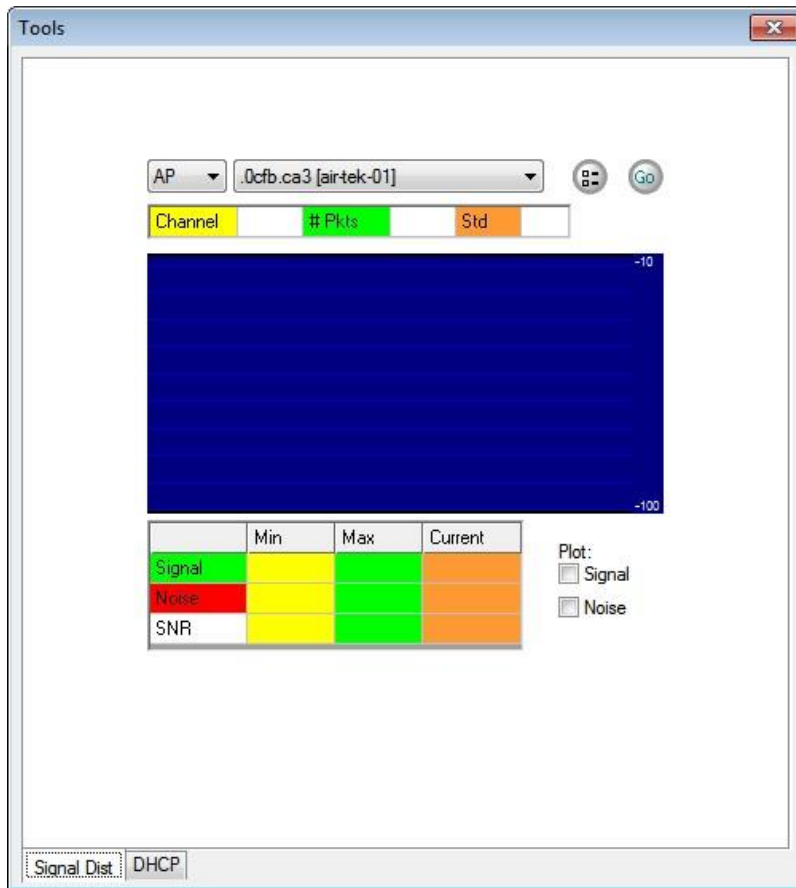
- Signal Distribution
- DHCP
- Ping
- GPS Information

Signal Distribution

The Signal Distribution tool is designed to enable WLAN professionals to detect RF signal problems (for example, signal multipath) by visually analyzing RF signal distribution patterns. The sample image below shows healthy signal distribution as indicated by the yellow dashed lines clustering within a single range. In case of multipath, the yellow dashed lines would be scattered all over the chart.

To access the Signal Distribution tool:

1. From the Toolobar, click (**Tools**). The Tools window appears. By default, the **Signal Dist.** tab (**Signal Distribution**) is automatically selected when the **Tools** window opens.

2. Click the down arrow in the upper-left corner of the window to select AP or STA.

3. Click the down arrow in the upper-right corner, and select the AP or STA to be analyzed.

4. Click **Logging Option**. The **Signal Distribution** Option window appears.
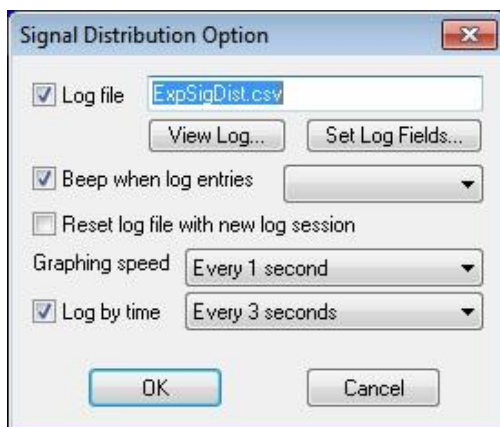
5. Make the desired selections and click **OK**.

6. From the lower-right corner of the Tools window, select either or both of the following:

   o   Signal

    o   Noise

7. Click **Go**. The signal distribution pattern of the selected AP or STA will be plotted on the chart.

Using the DHCP Tool

WLAN connectivity problems can arise from 802.11 data link layer malfunction or IP network layer misconfiguration. In order to troubleshoot and pinpoint the cause of the problems, the interaction between the two network layers must be investigated. AirMagnet Survey's embedded DHCP tool emulates a WLAN client acquiring IP-level connectivity beginning from the initial 802.11 client association procedure.

To access the DHCP tool:

1. From the **Tools** window, click the **DHCP** tab. The **Tools** window refreshes.

2. From the top left corner of the **Tools** window, click the down arrow to select **AP** or **SSID**.

3. From the top right corner of the **Tools** window, click the down arrow and select the **AP** or **SSID** from the drop-down list.

4. Click **Start**. AirMagnet Survey will start associating with the selected AP or SSID and perform the tests.

> **Note:** *During the association, AirMagnet Survey uses the 802.11 configuration parameters for the AP or SSID, which can be accessed using **File>Configure...>802.11**. The associated AP or SSID will be shown on the view. An error message will pop up on the view if an unintended AP is associated or the intended association fails. This serves as a confirmation that a data link layer problem exists.*

5. Verify the DHCP acquisition of the IP address for the client service, default gateway, and DNS server.

6. Click **Renew** to initiate the DHCP request once the association with the intended AP has been confirmed. The following IP-level configuration parameters will be filled in on the view if DHCP request/reply is successful:

   o Device IP address

   o Subnet mask

   o Default gateway

   o DNS server

If it turns out that these parameters are NOT the ones you expected or if you received a DHCP failure message, the chances are that there is an error in the WEP key configuration. If the problem persists after you have verified the correct WEP key, there might be a problem with the DHCP server.

Using the Ping Tool

You can add a **Ping** test to DHCP test to verify end-to-end connectivity. It is used after all the IP configuration parameters are collected and confirmed using DHCP.

To add a Ping test:

1. From the **Tools** window, click the **DHCP** tab.

2. Check the **Ping** option.

2. Configure the following options:

   o AP/SSID

   o # Pings

   o Timeout

   o Delay

   o Length

3. Enter the end node's domain name, for example, www.yahoo.com.

4. Click **Go**. Real-time Ping responses will appear on the view.

> **Note:** *If the Ping test shows time-out, it means that the Ping connectivity with the local LAN has failed. In this case, you should check the health of the default gateway and the physical connection between the associated AP and the wired LAN. Enter a host name on your corporate network such as your internal Web server, for example, www.internal.My/computer.com, and click **Go**.*

Verifying GPS Information

This tool is used to verify if your AirMagnet Survey is receiving GPS signals. In order to use AirMagnet Survey to conduct large-scale, outdoor, GPS-aided site surveys, your Survey must be able to communicate with the GPS device it is connected with. When using GPS software in conjunction with AirMagnet Survey, the GPS software must receive GPS position data before the survey is started.

Note: This feature is available only in Survey Pro and only when the GPS port is enabled.

To verify GPS Information:

From the **Tools** dialog box, click **GPS Information**. The Tools dialog box refreshes.
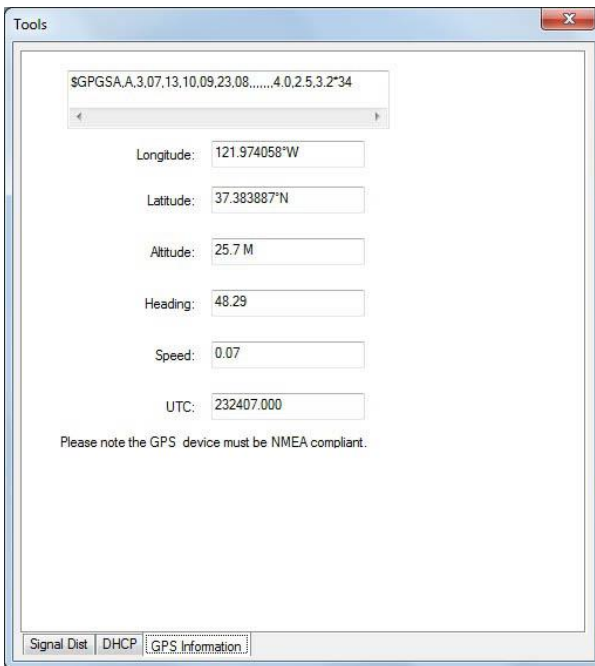
Note: If your AirMagnet Survey is successfully connected to a GPS device, you will get a dialog box similar to the one shown above when you click the GPS Information tab. For more information, click here.

Calculating WLAN Parameters

Calculating WLAN Parameters Introduction

This section explains the calculation of some parameters critical to wireless network deployment, such as MilliWatt and dBm Conversion, System Operating Margin, Free Space Loss, Fresnel Zone, Downtilt Angle, and Downtilt Coverage.

All the calculations are performed in the Calculator tool, which can be accessed by clicking

[icon] (**Calculator**) on the Toolbar.

- Converting Between milliWatt and dBm
- System Operating Margin
- Free Space Loss
- Fresnel Zone Clearance
- Downtilt Angle
- Downtilt Coverage

Converting Between milliWatt and dBm

The Milliwatts and dBm Conversion tab of the calculator provides two conversion operations: from dBm to milliWatt and from milliWatt to dBm. dBm is used to express an absolute value of power relative to a milliWatt.
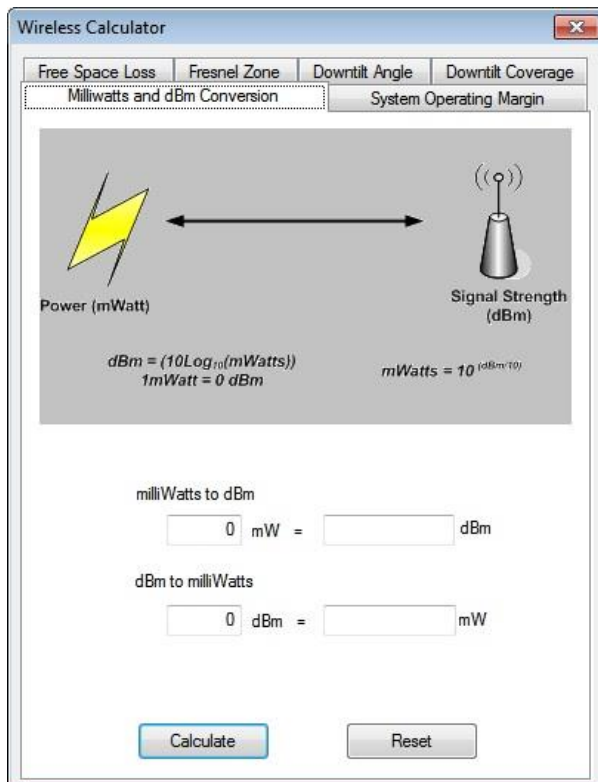
To convert milliWatts to dBm:

1. From the **Calculator** window, select the **Milliwatts and dBm Conversion** tab (if it not selected). By default, this tab is selected when the Calculator is launched.

2. Under **milliWatts to dBm**, enter a value in milliWatts (from 0 to 1000).

3. Click **Calculate**. The system will convert the value to dBm.

To convert dBm to milliWatts:

1. Under **dBm to milliWatts**, enter a value in dBm (from -100 to 100).

2. Click **Calculate**. The system will convert the value to milliWatts.

System Operating Margin

System Operating Margin (SOM) is the difference between the signal a radio is actually receiving versus that which is needed for good data recovery (i.e, Receiver Sensitivity). It measures in dB the signal loss a system can sustain before it degrades to the error rate specified at the Receiver Sensitivity threshold. In another word, SOM takes into account all the gains and losses in the components (for example, transmitter power, type of antenna, distance, and so on.) that make up a wireless network system to make sure that the system has sufficient power to send radio signals to their destination.

Normally, a minimum 20-dB SOM is recommended. However, due to factors such as inadequate Fresnel clearance, desensitization, and so on., many wireless network systems are designed with a 30 (or greater) dB SOM. SOM calculation assumes an interference-free open space.

To calculate System Operating Margin:

1. Click the **System Operating Margin** tab. The Calculator window refreshes.
2. Make the following entries:
   o Frequency
   o Power
   o Distance
   o Tx Cable Loss
   o Tx Antenna Gain
   o Rx Cable Loss
   o Rx Antenna Gain
   o Rx Sensitivity
3. Click **Calculate**. The following values will be calculated:
   o Free Space Loss
   o Rx Signal Level
   o System Operating Margin

Free Space Loss

Free Space Loss refers to signal attenuation that would occur if all absorbing, diffracting, obstructing, refracting, scattering and reflecting influences were sufficiently removed to the extent that they have no effect on RF signal propagation. Free space loss is mainly caused by beam divergence, i.e., signal energy spreading over larger areas at increased distances from the source.
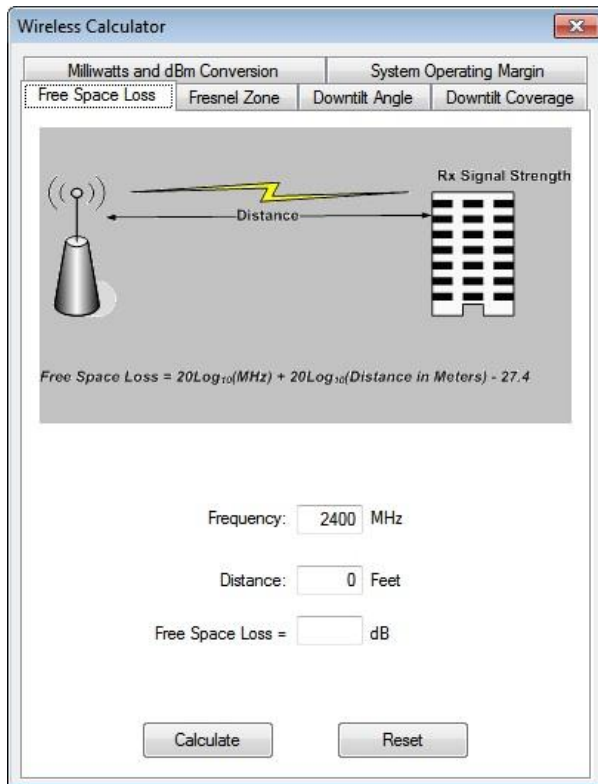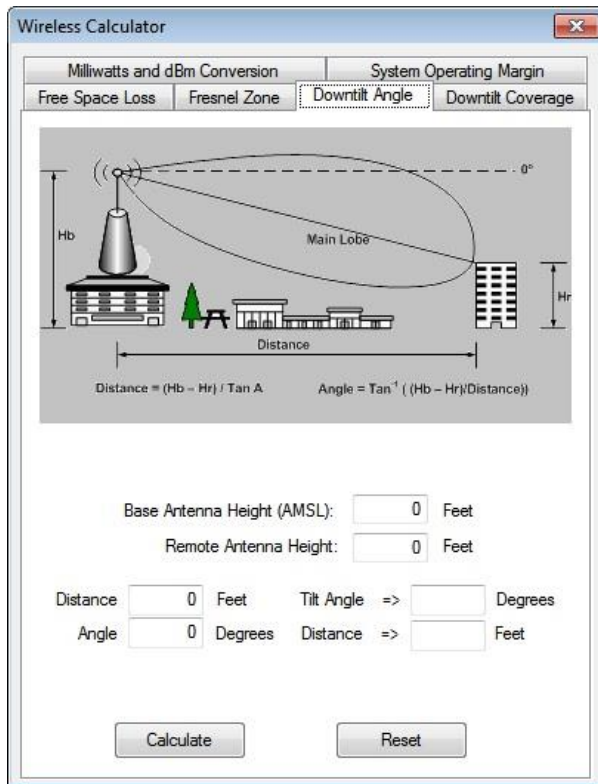
To Calculate the Free Space Loss:

1. From the **Calculator** window, select the **Free Space Loss** tab. The Calculator window refreshes.

2. Make the following entries:
   o Frequency
   o Distance

3. Click **Calculate**.

Fresnel Zone Clearance

The line-of-sight condition between the transmitter and the receiver is crucial in high-frequency radio communication. The Fresnel Zone is an elliptical-shaped area between two antennas where no obstacles may exist in order for radio signals to be transmitted. It defines how much clearance is needed for optimal radio transmission. By calculating the Fresnel Zone, you can determine antenna height so that radio signals can travel between the AP and the client stations without any obstacles.
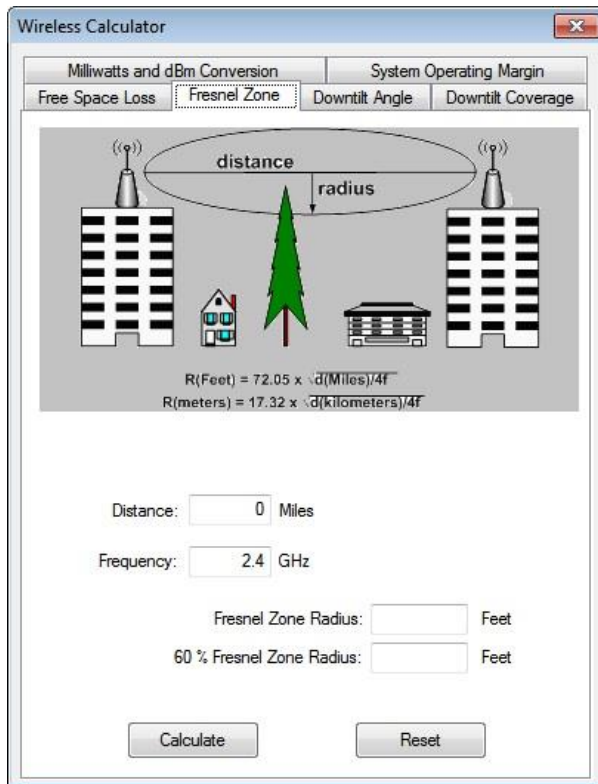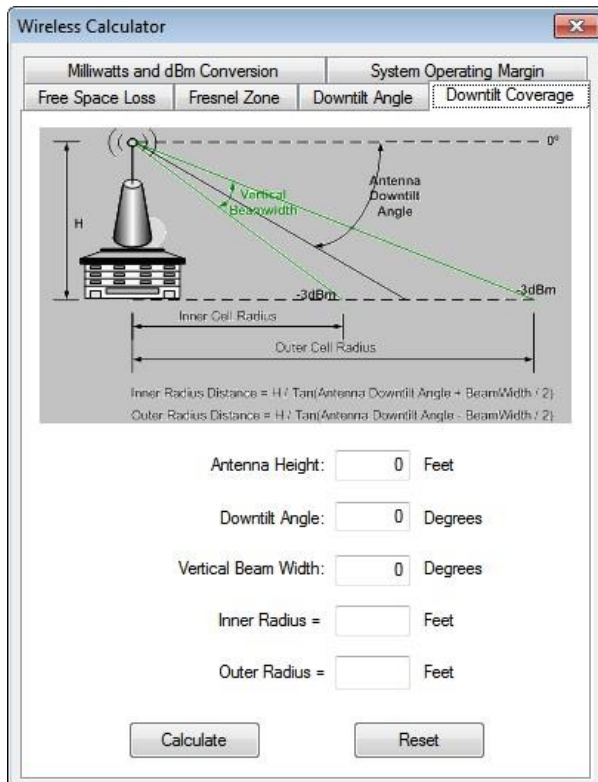
To calculate Fresnel Zone:

1. From the Calculator window, select the **Fresnel Zone** tab. The Calculator window refreshes.
2. Make the following entries:
   - Distance
   - Frequency
3. Click **Calculate**. The following values will be automatically calculated:
   - Fresnel Zone Radius
   - 60% Fresnel Zone Radius

Downtilt Angle

Antenna downtilt affects radio signals travelling between the transmitter and the receiver. As a rule of thumb, the higher the transmitter antenna and the shorter the distance, the more tilt is required. For instance, for a 30-meter high transmitting antenna, a 0.35-degree antenna tilt is required in order to reach a 12-meter high receiving antenna at a distance of 3,000 meters.

To calculate the Downtilt Angle:

1. From the Calculator window, select the **Downtilt Angle** tab. The Calculator window refreshes.
2. Make the following entries:
   o Base Antenna Height
   o Remote Antenna Height
   o Distance
   o Angle
3. Click **Calculate**.

Downtilt Coverage

Downtilt Coverage defines the area into which the antenna of an AP can beam.

To calculate the Downtilt Coverage:

1. From the Calculator window, select the **Downtilt Coverage** tab. The Calculator window refreshes.
2. Make the following entries:
   o Antenna Height
   o Downtilt Angle
   o Vertical Beam width
3. Click **Calculate**.

Integrating Cisco Prime Infrastructure

Introduction

Whether you are enabling Cisco Prime Infrastructure to create a project from an AirMagnet Planner project or exporting the survey data as an XML file to export to Cisco Prime Infrastructure, this topic will help you easily integrate the two products.

> **Note:** To use Cisco Prime Infrastructure with AirMagnet Survey requires a Cisco 'Plus' license.

AirMagnet Survey Project

Step 1 - Applying a Cisco Patch for Cisco WCS

This step explains how to create a new AirMagnet Survey project.

Prior to creating a new AirMagnet Survey project, a mandatory Cisco WCS patch to allow AirMagnet Survey PRO integration with Cisco WCS must be applied. This patch is not required for Cisco Prime NCS. Once the patch has been applied, you will be able to generate a CSV file from Cisco WCS to be used to create a Cisco Prime Infrastructure Survey project in AirMagnet Survey. The patch and instructions to apply the patch are as follows:

> **Note:** Instructions are also located in the AirMagnet Survey installation folder under the folder Cisco-WCS. The filename is Cisco_WCS_Readme.

1. On the system running Cisco WCS, go to the <WCS Install Dir> and unzip the file "patch.zip".
2. Restart Cisco WCS.
3. Login to Cisco WCS and go to the following URL: https://<WCS IP>/webacs/ncsDiag.do
4. Click the <AirMagnet Query Tool> and follow instructions.

Step 2 - Exporting the Cisco Prime Infrastructure Site

You need to download an existing Cisco Prime Infrastructure site as a .tar file. Make sure the APs are placed in the correct location on the floor plan in the Cisco Prime Infrastructure site, as follows:

1. Login to Cisco Prime Infrastructure and go the following URL: https://<WCS IP>/webacs/ncsDiag.do, where <WCS IP> is the IP address of the Cisco Prime Infrastructure. Note: The URL is case sensitive.
2. Click **AirMagnet Tool** and use the drop-down menu to select the site, building and floor you would like to use. Click **Export CSV**..

3. A window will appear. Save the .tar.gz folder.

4. Unzip the .tar.gz file onto the local machine hosting AirMagnet Survey.

5. Unzip the resulting .tar file onto the local machine hosting Airmagnet Survey.

6. Export each floor to a separate folder.

Step 3 - Creating a Cisco Prime Infrastructure Survey Project in AirMagnet Survey

From the AirMagnet Survey application, do one of the following:

1. From the Main Menu, select **File>New Project**, or

2. From the *Toolbar, click* (**Project Wizard***)*.

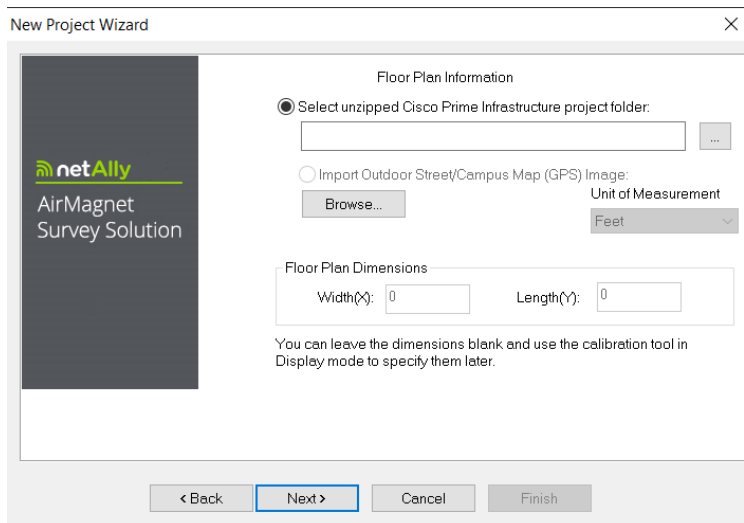The New Project Wizard view appears. See Figure below.

3. Where it says "Specify Project Name", enter a unique name for the new project.

4. Select the **Cisco Prime Infrastructure Survey Project** type.

5. Save the project using one of the following options:

- To save the project to the default location, simply click **Next.** The New Project Wizard view refreshes.

- To save the project to a location other than the default, click to specify a location of your choice, and then click **Next.** The New Project Wizard view refreshes.

By default, AirMagnet Survey automatically saves the project to the C drive on your computer, using the name you specify. Check "Set as default project directory" to ensure that subsequent AirMagnet Survey projects are saved to the same location, if desired. If you go inside a directory to create a project, it will not work. You need to browse and select a directory (folder) that AirMagnet Survey will create inside the folder you choose.


6. Click to locate and import the unzipped Cisco Prime Infrastrucure site folder location.

Note: *Be sure to select at the folder level and not the individual extracted file. It will contain a floorplan and a .csv file.*
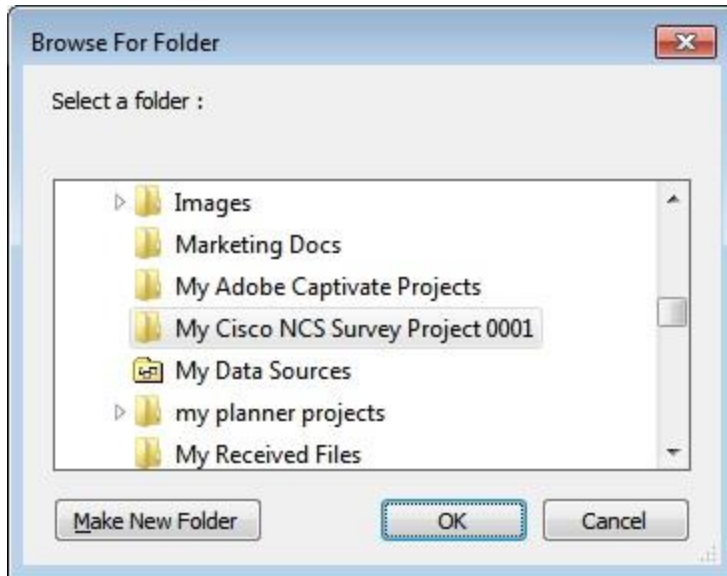
7. Once located, click **Select**.

8. The wizard then populates the unit of measurement and floor plan dimensions info into the UI.

9. Click **Next**. The New Project Wizard view refreshes. Refer to the figure below.
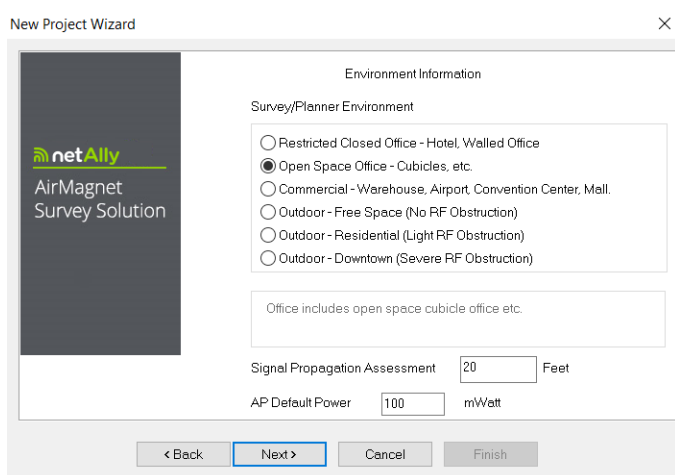
10. For **Survey Environment**, select an option that resembles the site environment where the survey is to be conducted.

11. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the site environment you select.

AirMagnet Survey assigns the Signal Propagation Assessment value based on the estimate of the distance RF signals could travel in each of these typical site environments. Normally,

AirMagnet recommends that you accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you enter will affect the way the program interpolates site data.

12. For **AP Default Power**, do nothing (normally).

If you know the value of the AP power, enter it now. The value will be used when conducting data simulation.

13. Click **Next**. The New Project Wizard view refreshes.
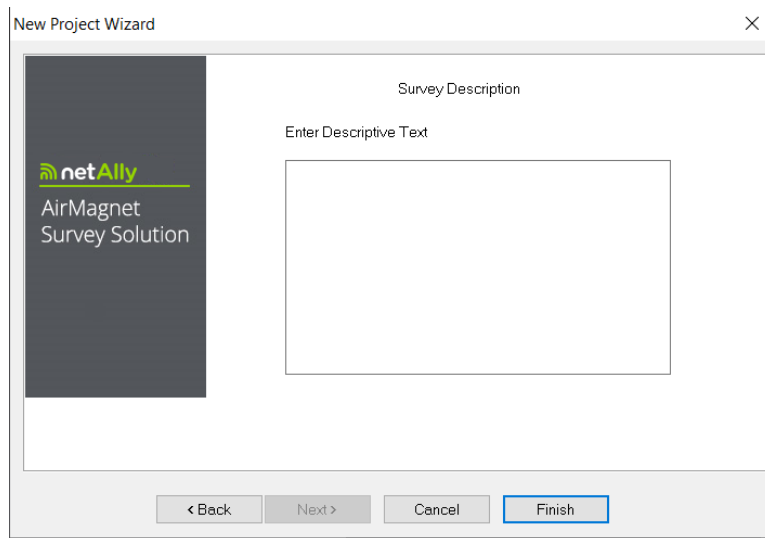
14. In the **Enter Descriptive Text** field, type a brief description of the project. (Optional.)

Note: *Cisco Prime Infrastructure requires a minimum of 150 data points and at least 50 distinct locations for calibration. In addition, each distinct location needs to be at least 8 feet apart. Therefore, when performing AirMagnet surveys, be sure you have at least 150 data points and 50 distinct locations (where each location is at least 8 feet apart) for the AP that was placed in the Cisco Prime Infrastructure site. When exporting survey data (**Cisco Prime Infrastructure Export> Survey Export**) the total number of data points exported will be displayed.*

15. Click **Finish**. The newly created AirMagnet Survey project automatically appears in the Project Window, and the site map is displayed in the Map Window.

Note: *AirMagnet Survey will not show the location of the imported APs in the survey or display pages (or any other page). Also, APs you manually placed within AirMagnet Survey will be ignored when doing the export back to Cisco Prime Infrastructure.*
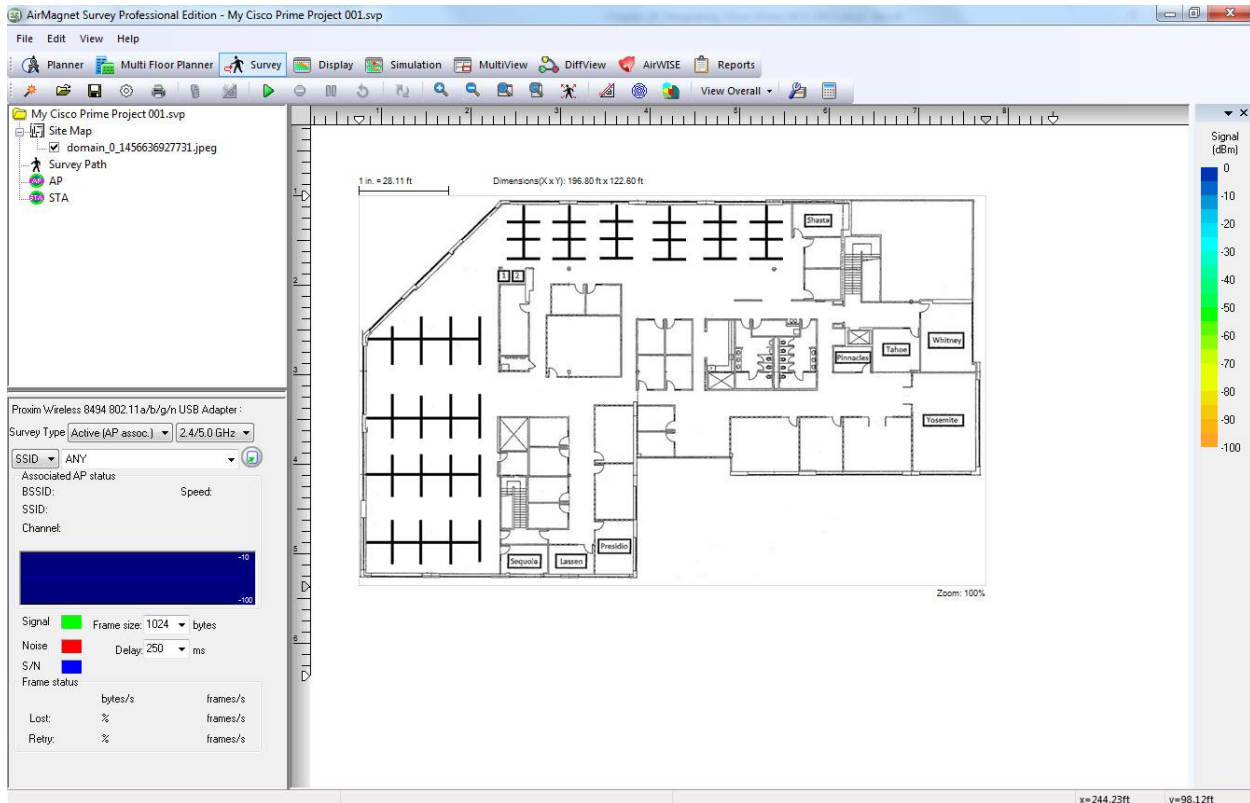
Note: *You can create as many projects as needed by following the same procedures outlined above. By default, a new project will automatically open on the Display view as soon as it is created.*

Step 4- Performing Surveys

You can now perform surveys. Once you have performed your survey, you can export them from AirMagnet Survey and then import them into Cisco Prime Infrastructure.

Step 5- Exporting out of AirMagnet Survey

To export the collected survey data as an XML file:

1. Open the Cisco Prime Infrastructure AirMagnet Survey project.
2. On the navigation bar, select the **Display** view.
3. Load the data file you wish to export.
4. Click **File**, then select **Cisco Prime Infrastructure Export**.
5. Click **Survey Export**. The Survey Export Folder view appears.
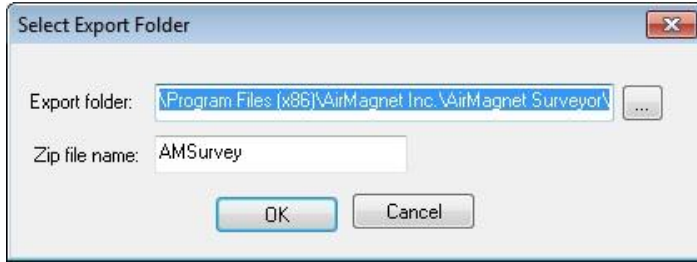
5. Click to choose the folder to where you would like the survey data exported.

6. Enter a name for the zip file.

7. Click **OK**.

The survey has now been exported. The zip file contains the folder xmlDir. This is the file you will use to import into Cisco Prime Infrastructure.

Step 6- Importing into Cisco Prime Infrastructure

1. Log onto Cisco Prime Infrastructure.

2. Select **Monitor> Maps** [for NCS select Site Maps] from the Navigation bar on the top of the page.

3. Select **Import Maps** from the drop-down menu on the right of the page and click **GO**.

4. Select **XML format**, then click **Next**.

5. Browse to .zip file containing the exported survey data.

6. Click **Next**. The following error message may appear "images not found in imported file". This is expected behavior. Click **OK**.

7. Scroll to the bottom of the page and click **Next**.

8. Click **OK**.
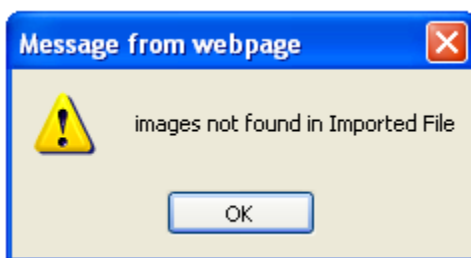
Import Maps Error Page

> **Important:** *When importing the XML file into Cisco WCS: If the calibration model doesn't exist, the calibration model will be created, however, the data points will not get imported. To overcome this limitation: Import the XML file again. After validation is completed, choose the overwrite option. Doing this will create the data points. The calibration model will then automatically reference the floor (based on the floor reference provided in the XML file. This is not required for Cisco Prime NCS.*

9. Select RF Calibration Models from the **Monitor Maps** page [for NCS select Site Maps].

10. Click **GO**.

11. Click the **AirMagnet Survey** link.

12. Select **Calibrate.** Click **GO**.

Once completed, status shows Calibrated.

13. Select **Apply to Maps** -> Click **GO**. This will apply AirMagnet Survey results to Cisco maps.

14. Select **Floor Area** in the "Apply to" field.

15. Select **Campus** (in example is AirMagnet Sunnyvale).

16. Select **Building** (in example is Engineering).

17. Enable the map by checking the line item (for example, lobby). Refer to the figure below.
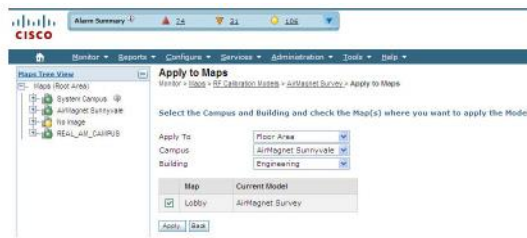
18. Click **Apply**.

19. When completed, the following window displays. -> Click **OK**.

20. From **Maps Tree** View, expand the project (AirMagnet Sunnyvale) to the floor level and select the Floor Level (in example is Lobby)

21. The heatmap displays.

AirMagnet Planner Project

Step 1 - Creating a new Cisco Prime Infrastructure Planner Project within the AirMagnet Survey application

Note: *You may see an error in Cisco WCS when importing a Cisco WCS Planner project which uses a CAD image. In this case, refer to the Cisco WCS Version 7.0 MR1 Release Note for the workaround.*

1. From the AirMagnet Survey application, do one of the following:

• From the Main Menu, select **File>New Project**, or

• From the Toolbar, click (**Project Wizard**).

The New Project Wizard view appears.

2. Where it reads **Specify Project Name**, enter a unique name for the new project.

3. Select the **Cisco Prime Infrastructure Planner** project type.

4. Save the project using one of the following options:

- To save the project to the default location, simply click **Next**. The New Project Wizard view refreshes.

- To save the project to a location other than the default, click [...] to specify a location of your choice, and then click **Next**. The New Project Wizard view refreshes.

By default, AirMagnet Survey automatically saves the project to the C:\ drive on your computer, using the name you specify. Check **Set as default project directory** to ensure that subsequent AirMagnet Survey projects are saved to the same location, if desired. If you go inside a directory to create a project, it will not work. You must browse and select a directory (folder) that AirMagnet Survey will create inside the folder you choose.

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5. Locate the Floor Plan image by clicking on .

6. Select U**nit of Measurement** and fill in Floor Plan dimensions. You must also select the Unit of Measurement (Feet or Meters). Click **Next**.

Note: Dimension refers to the entire area covered by the site map. It may or may not be the same as the dimension of the facility that resides on the site. If you are not sure of the exact width and/or length, you may enter the approximate values and then let AirMagnet Survey recalibrate the values for you later. Refer to the message on the view for more information.

7. Click **Next**. The New Project Wizard view refreshes. Refer to the figure below.

8. For **Survey Environment**, select an option that resembles the site environment where the survey is to be conducted.

9. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the site environment you select.

Note: AirMagnet Survey assigns the Signal Propagation Assessment value based on the estimate of the distance RF signals could travel in each of these typical site environments. Normally, AirMagnet recommends you accept the default value the program assigns. However, if you want to set a value of your own, you must be aware that the value you enter will affect the way the program interpolates site data.

10. For **AP Default Power**, do nothing (normally).

If you know the value of the AP power, enter it now. The value will be used when conducting data simulation.
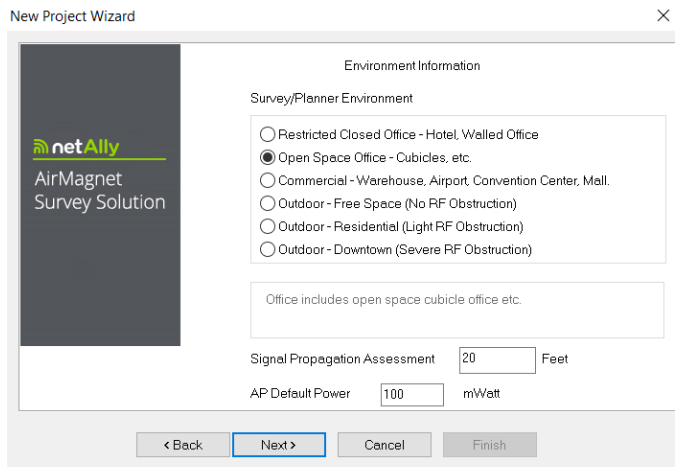
11. Click **Next**. The New Project Wizard view refreshes.
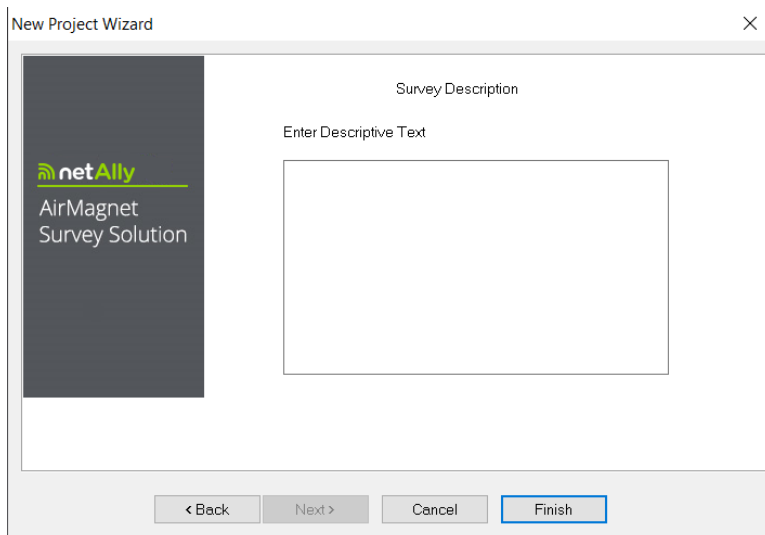
12. In the **Enter Descriptive Text** field, type a brief description of the project. (Optional.)

13. Click **Finish**. The newly created AirMagnet Planner project automatically appears in the Project Window, and the site map is displayed in the Map Window.

14. The default is the **Survey** view, so Click **Planner** on the Navigation bar. See Figure below.
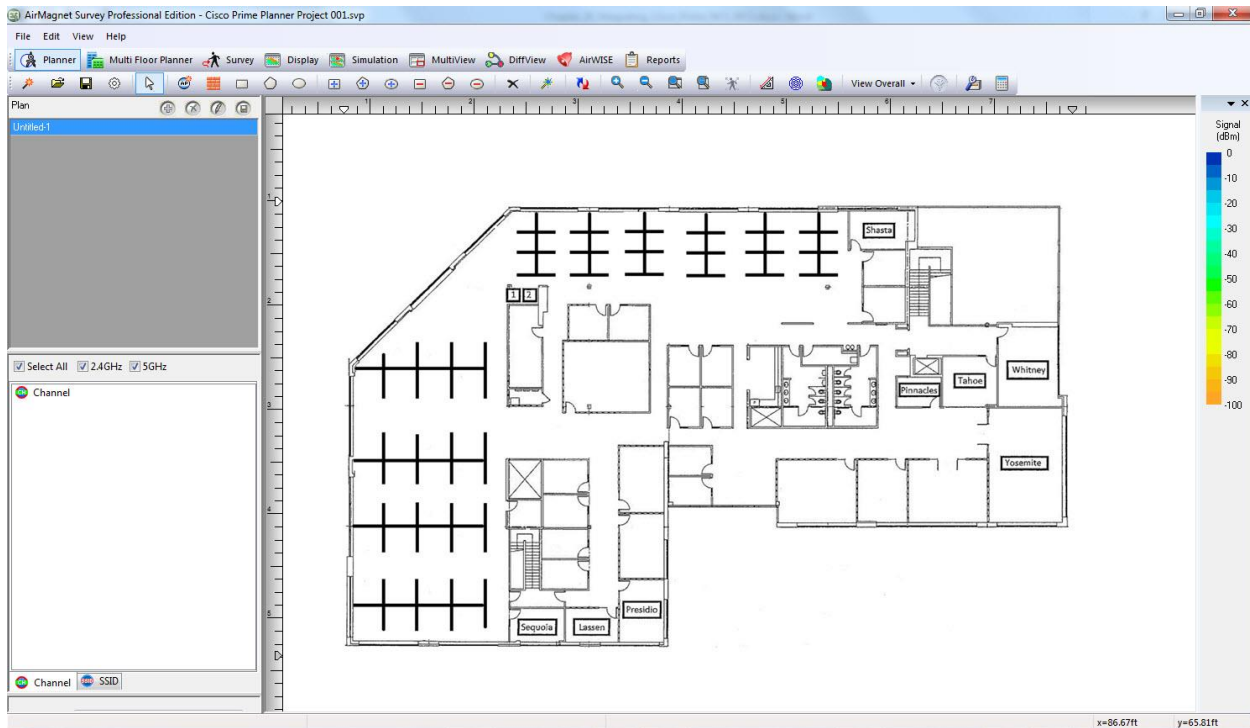
N*ote:* *You can create as many projects as needed by following the same procedures outlined above. By default, a new project will automatically open on the Display view as soon as it is created.*

Step 2- Creating a site plan

When planning multi-floor deployment, create individual site plans for each floor. After creating the project, you will need to create a site and arrange components necessary to properly project signal coverage for an area (refer to Chapter 17 on how to create a site plan). Once complete, you can use the Planner Export option to export out of AirMagnet Planner and import into Cisco Prime Infrastructure (refer to section below).

Note: *After the site plan is created, you do not need to process the data as only AP location and certain AP properties along with wall information will be exported from AirMagneSurvey. Be sure to save the project before going to the display view.*

When importing an AirMagnet Cisco Prime Infrastructure Planner project into Cisco Prime Infrastructure , the following areas do not get imported: Coverage Areas, Exclusion Areas or Attenuation Areas. The Cisco Prime Infrastructure Planner functionality supports only the unit of measure "feet". Planner projects created in meters in AirMagnet Survey will be converted to feet when imported into Cisco Prime Infrastructure. When importing an AirMagnet Cisco Prime Infrastructure Planner project into Cisco Prime Infrastructure, the following AirMagnet Planner AP settings get imported: AP Name, Transmit Power (mWatt) and Antenna. The following Planner AP settings do not get imported: Channel, MAC Address, IP Address, SSID, Antenna Angle or Height, 11n Support.

Step 3 - Exporting from AirMagnet Planner

The following section details how to export an AirMagnet Cisco Prime Infrastructure Planner project to Cisco Prime Infrastructure. Once you export the project, you can import the project into Cisco Prime Infrastructure.

To export a completed AirMagnet Cisco Prime Infrastructure Planner project:

1. Open the AirMagnet Cisco Prime Infrastructure Planner project.
2. On the navigation bar, select the **Display** view.
3. Click **File**, then select **Cisco Prime Infrastructure Export**.
4. Click **Planner Export**... The Export Planner to Cisco Prime Infrastructure view appears.

5. Fill in all required fields. The number of floors/basements must be between 0 and 100. For Floor/Basement Height Units, select Feet or Meters.

6. Click on **Add Floor/Basement**... to add floors and basements. Click on the [...] icon and select the site plan to be used.

Note: Make sure you select the appropriate site plan for the selected floor. If you are unsure of the site plan, view the .spi file within the project folder to get the site plan name to floor plan name mapping.
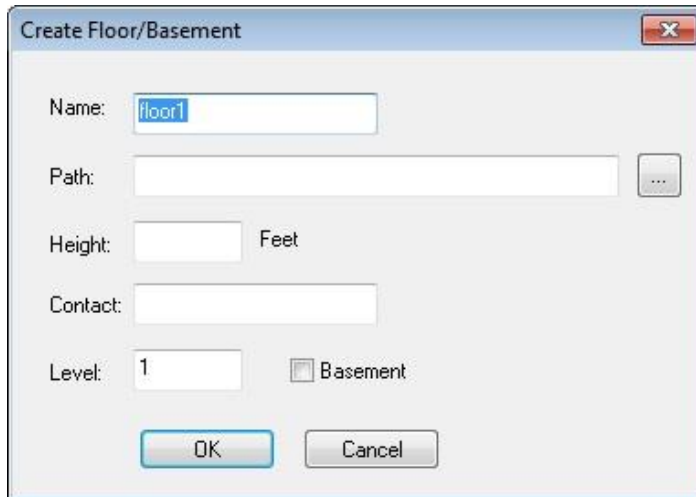
7. Enter all required information in the fields. Enter a floor count between 0 and 100 in the level field. Or if Basement is enabled, enter a basement count between 0 and -100.

8. Once complete, click **OK**.

9. Click **Add Floors/Basements** to add more floors/basements.

10. The exported folder (AMPlanner.zip) is placed in the folder specified on the view under the Export folder field.

11. Click **OK** to export.

12. A zip file containing folders, images and xmlDir gets created. This is the file you will use to import into Cisco Prime Infrastructure.

Step 4- Importing into Cisco Prime Infrastructure

1. Log on to Cisco Prime Infrastructure.

2. Select **Monitor> Maps** [for NCS select Site maps].
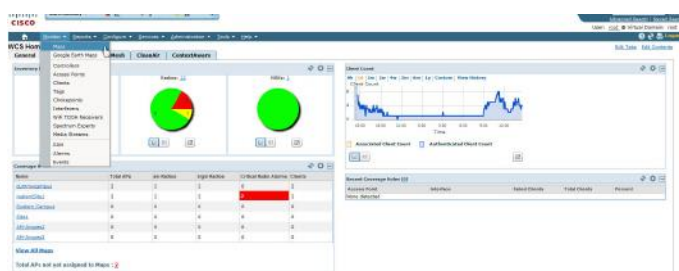
3. From the drop-down menu on the **Monitor>Maps** page [for NCS select Site Maps], select **Select a command - Import Maps.**
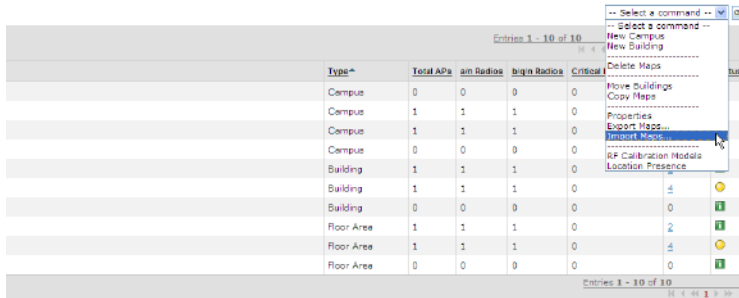
4. Select **GO**.

5. Select **XML format**, then **Next**.

6. Select **Browse** [for NCS select Choose File] and browse to .zip file that was created with Cisco Prime Infrastructure Export\Planner Export.
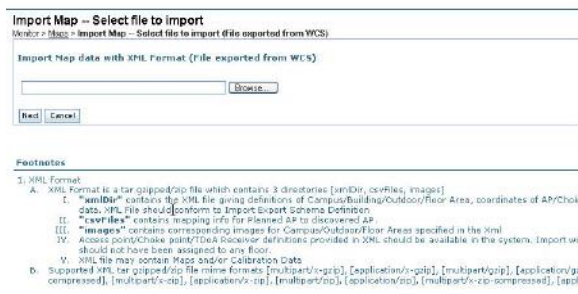
7. Below the file field, click **Next**.

8. On the **Map Import Validation** Result view, scroll to the bottom and click **Next**.
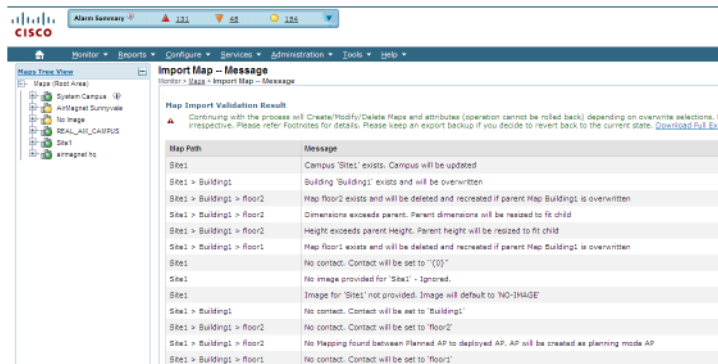
9. On the **Import Map Result** view, scroll down to the bottom left hand corner and click **OK**. Please make note of the status information in the right hand column of the results view.

10. Expand the Site Name (which has just been imported) from the Maps Tree View in the upper left hand corner and select the desired floor.

11. From the drop-down menu on the ... **Select a command - Planning Mode** and click **GO**.

12. The APs will be displayed on the floor plan.

13. Select the **Map Editor** to view walls.

Note: *AP type defaults to AP 1250.*

Working with Spectrum XT

Introduction to Spectrum XT Integration

> **Note:** This feature is available only on AirMagnet Survey PRO. AirMagnet Survey supports integration with AirMagnet Spectrum XT, AirMagnet Spectrum Analyzer, and Cisco Spectrum Expert.

This section describes AirMagnet Survey's ability to integrate with supported spectrum analyzers. This integration brings AirMagnet Survey to a new level by allowing you to view RF traffic across the entire wireless spectrum. Spectrum Analyzers display potential sources of wireless interference detected during a survey. This can help users identify (and thereby eliminate) RF hazards in the wireless environment as soon as they are detected.

> **Note:** To use this feature, you must have AirMagnet Survey PRO, a supported spectrum analyzer installed and the associated spectrum analyzer adapter enabled on their laptop.

Enabling Spectrum Analyzer

To enable a spectrum analyzer:

1. From the Survey view, click **File>Configure**…. The Survey Configuration view appears.

2. Click [Spectrum Integration]. The Spectrum Analyzer dialog box appears.
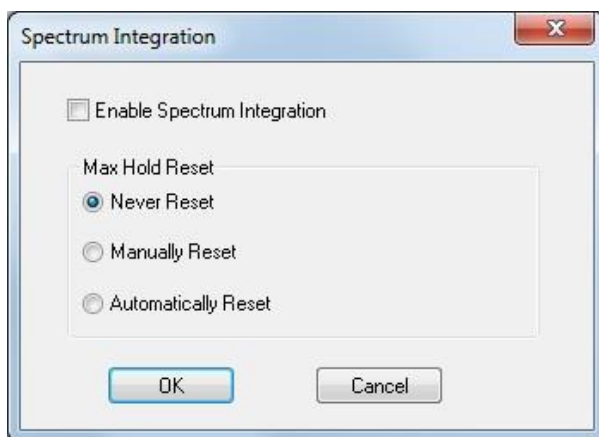
3. Check **Enable Spectrum Integration** and select one of the **Max Hold Reset** options.

Option	Description
Never Reset	If selected, the Max Hold value will never be reset.
Manually Reset	If selected, the Max Hold value will be reset each time you click on the site map as you move along the survey path.

Automatically Reset	If selected, the Max Hold value will be automatically reset each time or at each point data are collected or logged.

4. Click **OK** to finish. You must restart the application for the new settings to take effect.

Collecting Spectrum Data

The integrated Spectrum Analyzer Window appears below the Map Window on the Survey view, provided that a supported spectrum analyzer adapter is installed (inserted) and that this option is enabled in AirMagnet Survey. A close-up look at the Spectrum Analyzer Window is provided below.
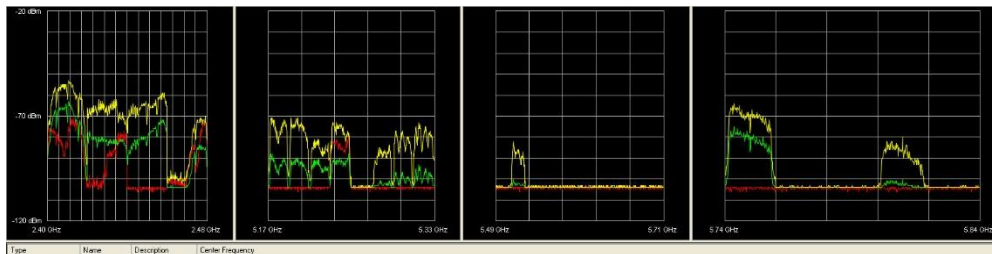
The Spectrum Analyzer Window displays the FFT (Fast Fourier Transform) plot which contains three types of data represented by the line charts in distinctive colors. The table below briefly describes each of these data. If you wish to have more information on AirMagnet Spectrum XT, refer to the AirMagnet Spectrum XT User Guide or the Help file within the stand-alone AirMagnet Spectrum XT software application.

Color	Data Type	Description
Yellow	Max Hold	The maximum power value detected at any time since the plot was initiated. Max Hold means that the plot holds onto the maximum power value up to the present.
Red	Max	The maximum power value detected during the most recent measurement interval.
Green	Average	The average power value detected during the most recent measurement interval.

Viewing Spectrum Data

With spectrum analyzer integration, you can see the integrated spectrum analyzer Window on the Display view if they have this featured enabled. You can also display and analyze spectrum data by mousing over any data point along the survey path.

Note: *When you mouse over a point on a survey path, you not only see a tip view showing the 802.11 data collected at that spot but also a pushpin that is related to what you see in the Spectrum Analyzer Window below. In other words, the Spectrum Analyzer Window reflects the spectrum data collected at the spot indicated by the pushpin. With spectrum data on the view, a tip view will pop up if you mouse over any spot on the FFT plot in the Spectrum Analyzer Window. This tip view shows more spectrum data about that spot.*
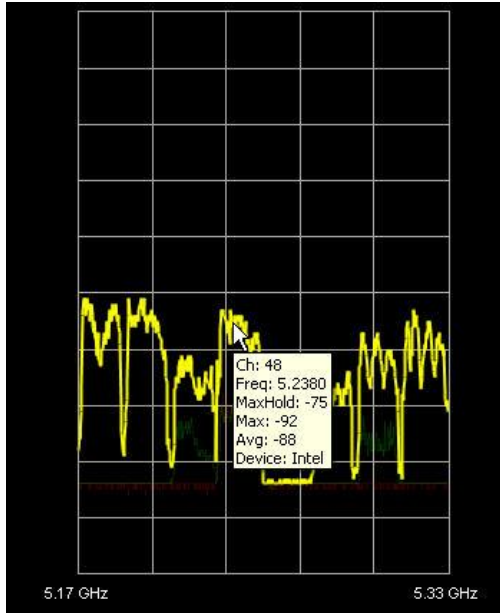
Spectrum integration allows you to identify non-802.11 devices that cause interference with the wireless deployment (henceforth known as "interferers"). Click here for more details.

You can also use Spectrum XT to display a spectrum heatmap to help locate major sites of spectrum traffic.

Spectrum Heatmap Display

In order to provide a more comprehensive and user-accessible means of viewing spectrum data, Survey implements a spectrum heatmap option when spectrum analyzer integration is enabled. This allows you to view all RF traffic in the entire spectrum, including both Wi-Fi (APs, stations, and so on) and non-Wi-Fi (Bluetooth devices, microwaves, and so on) sources. The spectrum heatmap displays the average spectrum level for each channel at any given point on the map. The color-coded display makes it easy to determine areas of unusual spectrum traffic, allowing you to quickly troubleshoot problem spots.

To view the spectrum heatmap:

1. From the Display page, load the spectrum data file.
2. Click the data type drop-down list in the map window and select *Spectrum*. The heatmap refreshes, displaying spectrum data.
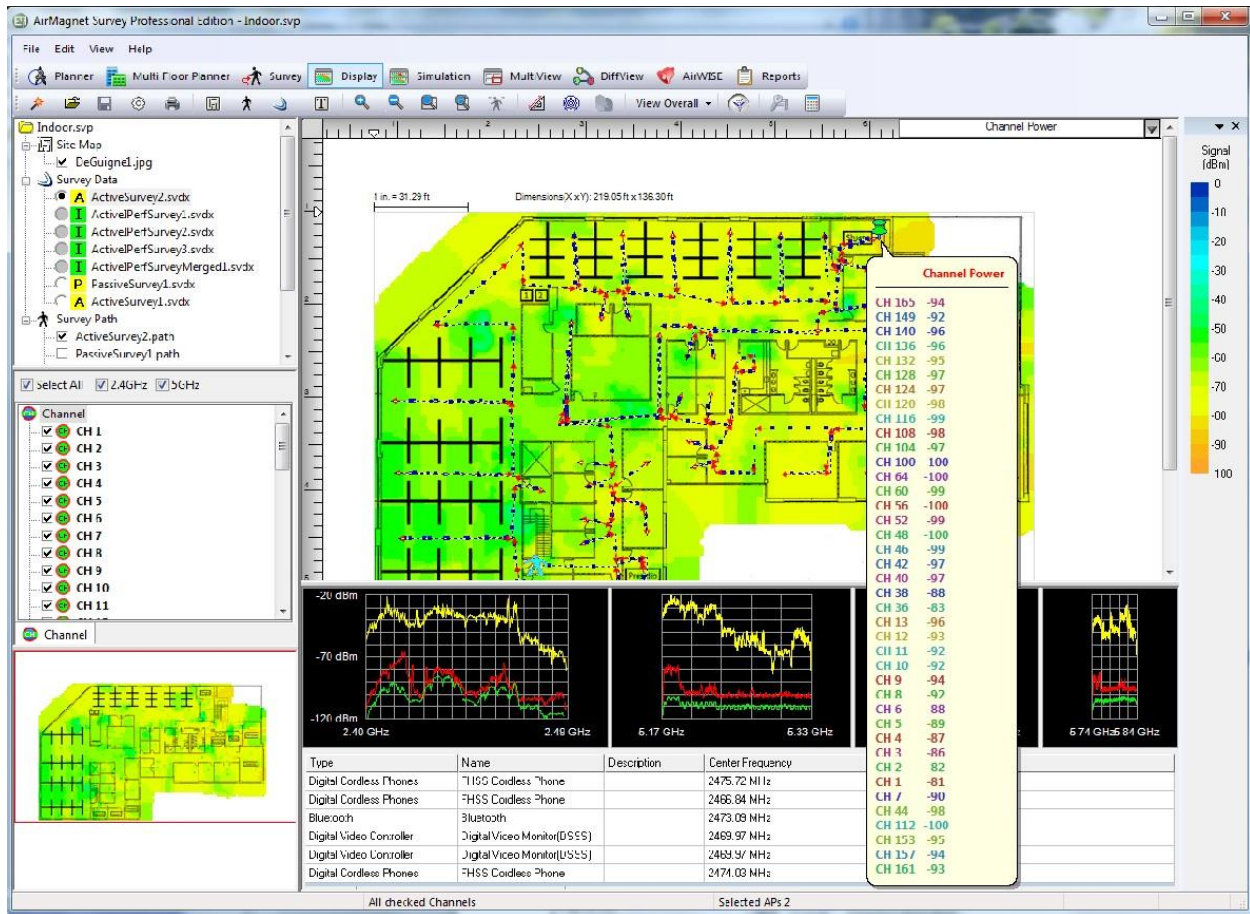
You can narrow the displayed spectrum to a specific channel, allowing you to identify unusual traffic at the particular frequency of interest. Depending on the card used when conducting the survey, this can include both 802.11a and 802.11b/g channels.

Note: The heatmap displays an overview of spectrum information. You can still mouse over a point on the survey path to view specific spectrum data for that exact location.

The spectrum heatmap can be particularly useful when you want to determine the optimal channel for a new AP. By viewing the heatmap on the desired channel, you can see whether there is excessive spectrum traffic at that location. If the spectrum traffic level is high, you must change the environment to eliminate interferers or select a new location.

Spectrum Interferers

Interferers can be viewed in a list and as detected in the deployment by using the interferer heatmap provided on the Display view. The interferer power heatmap shows the power levels for any such devices detected during the survey process and also provides a list of the devices found. This can be useful for identifying potential interference sources that may not be picked up by a standard 802.11 survey.

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After gathering interferer data, you can view the interferers detected listed in the Categories tree towards the left of the view.
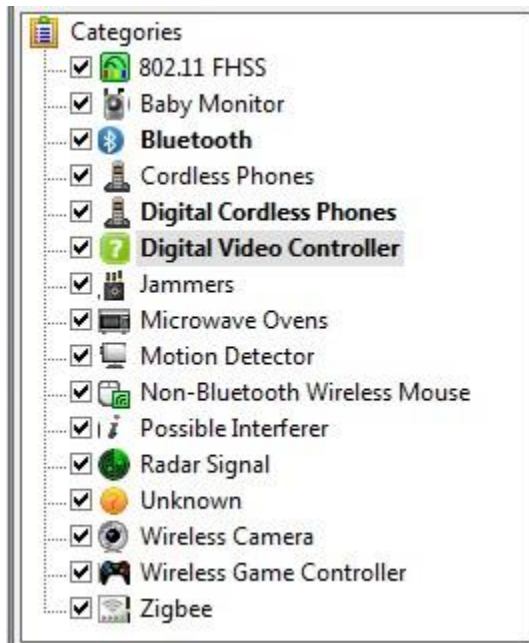
Bold categories indicate that devices that match that particular category were detected during the survey (that is, in the first figure above, the system detected interference from Bluetooth devices, cordless phones, and both continuous and fixed-frequency devices over the course of the survey). You can identify the location of the devices by selecting the desired type; the heatmap will refresh to highlight only the location(s) in which that device was detected.

All interferers detected across the entire survey path are displayed in the bottom pane of the window, below the spectrum graphs. This table provides various data regarding the detected interferers, including the Type, Name, a brief description, and its center frequency (if known).

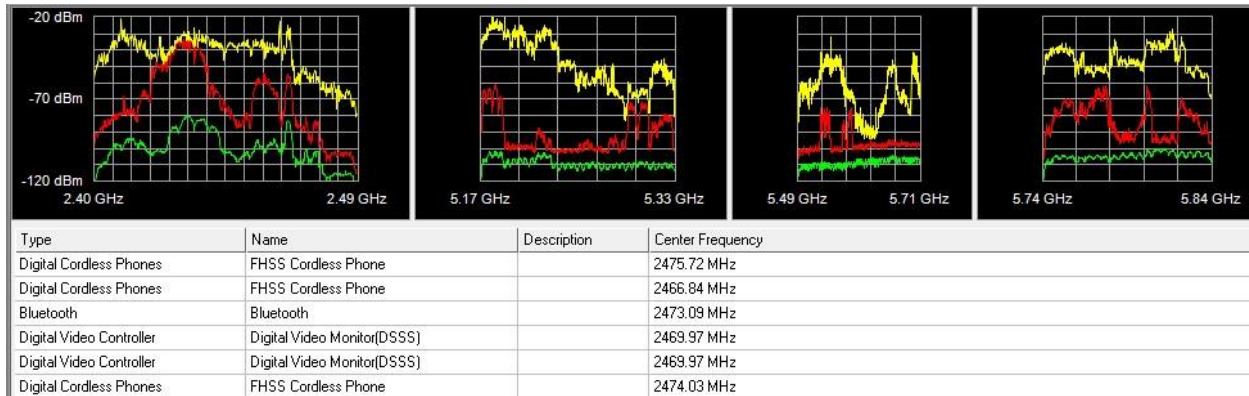| Type	Name	Description	Center Frequency
Digital Cordless Phones	FHSS Cordless Phone		2475.72 MHz
Digital Cordless Phones	FHSS Cordless Phone		2466.84 MHz
Bluetooth	Bluetooth		2473.09 MHz
Digital Video Controller	Digital Video Monitor(DSSS)		2469.97 MHz
Digital Video Controller	Digital Video Monitor(DSSS)		2469.97 MHz
Digital Cordless Phones	FHSS Cordless Phone		2474.03 MHz

Generating Spectrum Analyzer Reports

AirMagnet Survey not only enables you to collect and analyze the enormous amount of spectrum data in the airwave over your WLAN site, but also allows you to convert these valuable data into reports, making it convenient to share, archive, and further analyze the data.

However, in order to generate and view spectrum analyzer reports, you must make sure that first of all spectrum data are being collected during the site survey. To do so, you have to make sure that the following requirements are met at the time of the survey:

1. You have AirMagnet Survey PRO installed on your laptop;

2. You have the associated spectrum analyzer adapter inserted in your system;

3. You have the Spectrum Integration feature enabled on AirMagnet Survey, which can be done by selecting **File>Configure...>Spectrum Integration>Enable Spectrum Integration**.

If these three requirements are met, you should be able to see the Spectrum Analyzer Window with spectrum data in it at the bottom of the Survey view when you are doing the survey.

Once spectrum data are collected, the next step is to open the data file on the Display view and mark the spectrum data collection points on the survey path. This is equally important because even though spectrum data are collected, no Spectrum Analyzer report will show up on the Reports view unless spectrum data collection points are marked on the survey

path. Otherwise, you will encounter an error message when you are trying to open the Spectrum Analyzer Report on the Reports view. To see how to mark spectrum data collection points along the survey path on the Display view, click here.

Once you have marked all the spectrum data collection points on the Display view, AirMagnet Survey will automatically generate the Spectrum Analyzer Report which can be viewed from the Reports view just as with any of the other reports. For instructions, click here.

Marking Spectrum Data Collection Points

To mark spectrum data collection points:

1. From the Display view, click to open the data file that contains the spectrum data.

2. Right-click inside the Map Window. A right-click pop-up menu appears.

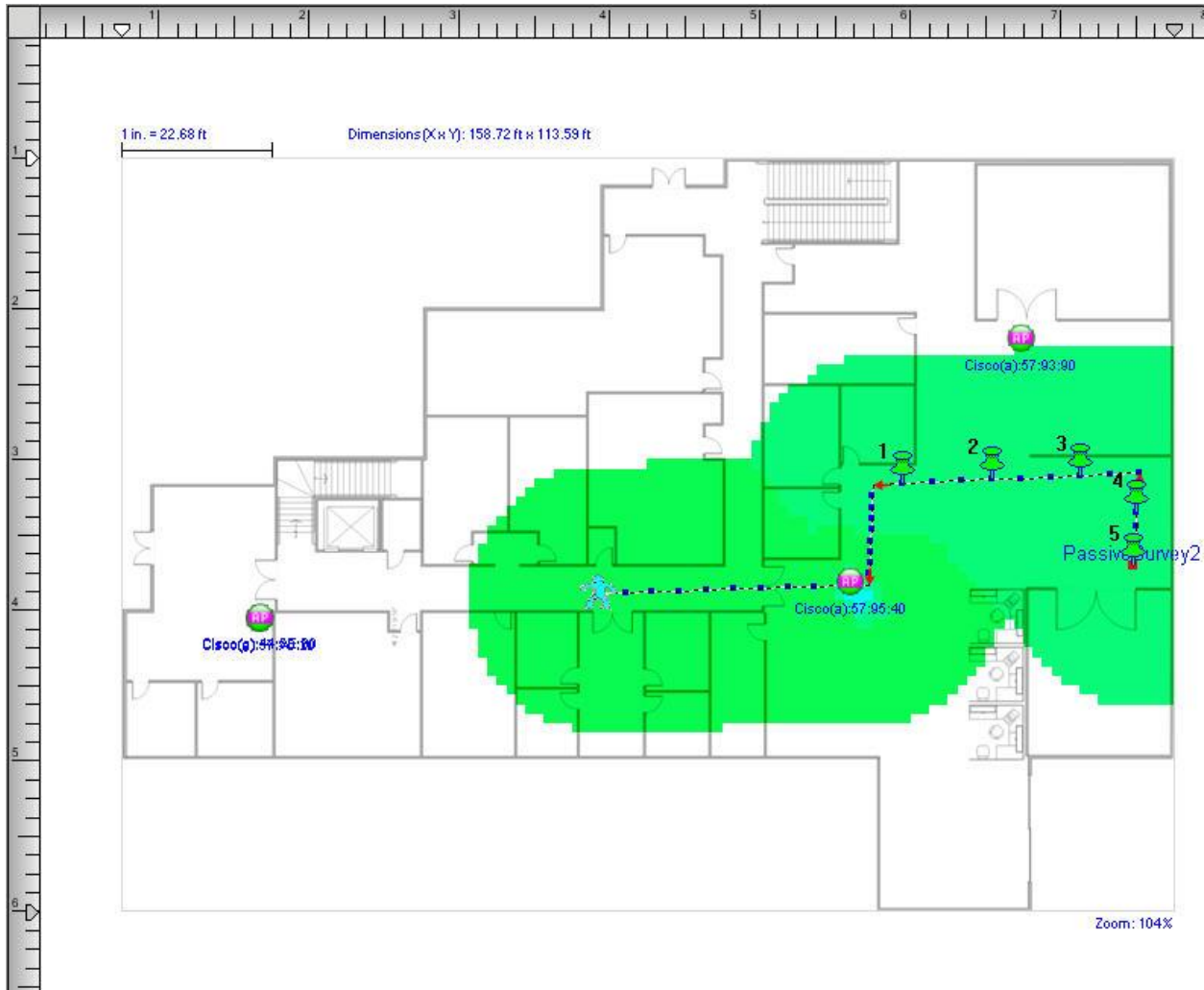3. From the right-click menu, select *Mark Spectrum Data Mode*.

Note: A check mark appears in front of Mark Spectrum Data Mode when this feature is activated.

4. In the Map Window, click to select the spectrum data collection points along the survey path.

Note: *Pushpin icons appear where you click. They are automatically numbered in the order they appear. As you click along, spectrum data will also appear in the Spectrum Analyzer Window. Be sure to click along the survey path. Otherwise, you will see no pushpin icons, meaning that no spectrum data point is marked.*

Viewing AirMagnet RF Spectrum Reports

To view the RF Spectrum Report:

1. Click 📋 Reports on the Navigation bar to switch to the Reports view
2. From the Report List Window, select *RF Spectrum Report*.
3. Navigate through the report using the tools on the view.

Note: *Normally, the number of pages contained in a report depends on the amount of data in the data file selected. However, in the case of the RF Spectrum Report, the length of the report is determined by the number of data collection points (you have marked), which in turn determine the amount of data contained in the report.*

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(v01-Oct-19)

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Graph.cpp - Version 3.0 (Brian Convery, May, 2001)

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LineChartCtrl.h : header file

Written by Yuheng Zhao (yuheng@ministars.com)

http://www.ministars.com

The original idea and part of the code from Ken C. Len's CHistogramCtrl // http://www.codeguru.com/controls/histogram_control.shtml

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CellRange.h: header file

MFC Grid Control - interface for the CCellRange class.

Written by Chris Maunder <cmaunder@mail.com>

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For use with CGridCtrl v2.20+

ODBCRecordset Source Codes

FILE: ODBCRecordset.cpp

Author: Stefan Tchekanov (stefant@iname.com)

Description: CODBCRecordset and CDBField classes implementation

Created By : Stefan Tchekanov

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jpeglib.h

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This file defines the application interface for the JPEG library.

Most applications using the library need only include this file, and perhaps jerror.h if they want to know the exact error codes.

Parser Share, Common, Util Source Code

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@(#) $Header: /AIRMAGNET-WF9.1-SRV8.2/common/Parser/ParseLLC.h 1   7/08/11 11:21a Airbuild $ (LBL)

ProgressCtrlX Source Code

Class CProgressCtrlX

Author: Yury Goltsman

Email: ygprg@go.to

Page: http://go.to/ygprg

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ZipArchive

ZipArchive.h: interface for the CZipArchive class.

ZipArchive 1.5.1, March 2001

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ZLib

Version 1.2.2, October 3rd, 2004

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Jean-loup Gailly   Mark Adler

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files http://www.ietf.org/rfc/rfc1950.txt (zlib format), rfc1951.txt (deflate format) and rfc1952.txt (gzip format).