AirMagnet® Survey PRO

Wi-Fi Design & Site Survey Analysis Software

User Guide

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For additional product resources, visit:
https://www.netally.com/products/airmagnet-survey-pro/

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Introduction

AirMagnet Survey PRO contains powerful, easy-to-use tools for planning, collecting, and analyzing WLAN site radio frequency (RF) data crucial for successful WLAN deployment. Operating at the RF level, AirMagnet Survey helps you quickly and easily conduct RF site surveys and determine the optimal number and placement of WLAN infrastructure devices to provide the best coverage and throughput in a cost-effective way. You can understand the behavior of radio waves in a facility *before* you install any wireless network access points.

Product Overview

AirMagnet Survey PRO contains powerful, easy-to-use tools for planning, collecting, and analyzing WLAN site radio frequency (RF) data crucial for successful WLAN deployment. Operating at the RF level, AirMagnet Survey helps you quickly and easily conduct RF site surveys and determine the optimal number and placement of WLAN infrastructure devices to provide the best coverage and throughput in a cost-effective way. You can understand the behavior of radio waves in a facility *before* you install any wireless network access points.

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 you form a migration strategy from existing legacy 802.11a/b/g/n networks to Wi-Fi 5/Wi-Fi 6 technology.

AirMagnet Planner can be purchased as a separate product or as a fully integrated feature of AirMagnet Survey. When integrated with AirMagnet Survey, you 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. (A Survey Viewer license is available only for products under current AllyCare Support or maintenance contracts.)

	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
	Wi-Fi 4, 5, and 6 (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 NetAlly product reseller or NetAlly Technical Support.

- An AirMagnet Spectrum XT Adapter is required 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 G3, EtherScope nXG, or CyberScope and then analyze the data with AirMagnet Survey PRO.

  You have two options to transfer survey data from a NetAlly AirCheck G3 or EtherScope nXG:

  Link-Live Download

  1. When saving an AirMapper survey, select Link-Live as the destination.
  2. Log into 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 G3, EtherScope nXG, or CyberScope, 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 prompted to save the new project, browse to preferred destination, and then click on the **OK** button.

  After the import is complete, a new Survey Project (.svp) file is created using the data collected by the AirMapper application. You can then use all AirMagnet Survey functionality to analyze your AirMapper survey data, including:

  - Heatmaps
    - Signal Strength
    - Noise
    - SNR
    - Interference
    - Predictive PHY Data Rates
    - Max MCS
    - AP Operating Mode
    - Channel Width
  - Simulation Mode
  - MultiView
  - DiffView
  - AirWISE
  - Reports
  - Comment support: The Display View shows comments made at survey points in the AirMapper survey.
  - Support for Active and Passive surveys for AirCheck G3, EtherScope nXG, or CyberScope as well as dual surveys (simultaneous surveys conducted with both Wi-Fi radios in the unit.

  Please be aware of the following while using this functionality:

  - You cannot import an AirMapper (.amp) file into an existing Survey Project (.svp) project, a new project is always created. However, you can import the .svdx file from the new project into other projects.
  - A converted AirMapper project is named with the same name as the .amp file.
  - The Adapter Name under Survey properties is *AirMapper*.
  - Open Space Office is the default Environment. You can change this default with the Project Properties screen. Signal Propagation Assessment matches the value used on the AirMapper application.
  - The AP Default Power is set at 100.0 mW. You can change this value through the Project Properties screen. (This setting is only used by the Simulation tool.)
  - 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 or 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 troubleshooting, 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 analysis 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 visualize the differences between two surveys taken of the same area. This can help 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 you 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. You 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** (MFP) enables you to view how signal propagation occurs between floors in a multi-floor building. With MFP, 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

PCs—Laptop, Notebook, or Tablet

- Supported operating system:
  - Microsoft Windows 10 Pro/Enterprise 64-bit
  - Microsoft Windows 11 Pro/Enterprise 64-bit
- Intel® Core™ i5 2.00 GHz minimum (Intel® Core™ i7 or higher recommended)
- 4 GB memory minimum (8 GB or higher recommended)
- One available USB port for each external adapter or NetAlly multi-adapter kit (see https://www.net-ally.com/products/airmagnet-survey-pro/ (click on **Models & Accessories**).
- AirMagnet-supported wireless network adapter(s) or Aircheck™ G3, EtherScope® nXG, or CyberScope™ with AirMapper™ (recommended). For more information, see:
  - Guideline for Use of Wi-Fi Adapters
  - https://www.netally.com/wp-content/uploads/APA_FL_21_V2.pdf
- A site map in a format supported by AirMagnet Survey. See Supported Image File Formats.

- (Survey PRO only) Google Earth must be installed to export the GPS data for outdoor surveys to Google Earth.
- For GPS surveys: a supported GPS device. (If you do not see your GPS device on the list, go to https://www.netally.com/products/airmagnet-survey-pro/ and click on **System Requirements** to check for updates.)
  - US GlobalSat BU-353-S4 (Recommended)
  - Garmin eTrex LEGEND HCx
  - Garmin GPS18X USB
  - Microsoft GPS-500 SIRF III
  - Garmin GPSMap 60
  - DeLormeEarthmate GPS LT-20
  - DeLormeEarthmate GPS LT-40
  - Garmin eTrex
  - Garmin eTrex Legend
  - Garmin GPS 18 Deluxe
  - Magellan eXplorist 500
  - Pharos iGPS-180

Apple® MacBook® Pro:

- Operating System: MAC OS X v10.5 (Leopard™) running a supported Windows OS (see "PCs—Laptop, Notebook, or Tablet" on the previous page) using Boot Camp®
- Intel® Core™ i5 2.00 GHz, Intel® Core™ i7 or higher recommended
- 4 GB memory minimum, 8 GB or higher recommended
- USB port for external adapter use. If using multiple adapters, NetAlly recommends the use of its multi-adapter kit (see https://www.netally.com/products/airmagnet-survey-pro/ (click on **Models & Accessories**). Otherwise, an additional slot/port is required for each adapter.
- AirMagnet-supported wireless network adapter(s) or Aircheck™ G3, EtherScope® nXG, or CyberScope™ with AirMapper™ (recommended). For more information, see:
  - Guideline for Use of Wi-Fi Adapters
  - https://www.netally.com/wp-content/uploads/APA_FL_21_V2.pdf
- A site map in a format supported by AirMagnet Survey. See Supported Image File Formats.
- (Survey PRO only) Google Earth must be installed to export the GPS data for outdoor surveys to Google Earth.
- (Optional for Survey PRO only) AirMagnet Spectrum XT adapter and license (required for viewing spectrum data and heatmap)
- For GPS surveys: a supported GPS device. If you do not see your GPS device on the list, go to https://www.netally.com/products/airmagnet-survey-pro/ and click on **System Requirements** to check for updates.
  - US GlobalSat BU-353-S4 (Recommended)
  - Garmin eTrex LEGEND HCx
  - Garmin GPS18X USB
  - Microsoft GPS-500 SIRF III
  - Garmin GPSMap 60
  - DeLormeEarthmate GPS LT-20
  - DeLormeEarthmate GPS LT-40
  - Garmin eTrex
  - Garmin eTrex Legend
  - Garmin GPS 18 Deluxe
  - Magellan eXplorist 500
  - Pharos iGPS-180

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 NetAlly and are recommended for use with AirMagnet Survey PRO. Drivers have been customized for extended feature support. For a complete, up-to-date listing of AirMagnet Preferred wireless adapters, visit: https://www.netally.com/wp-content/uploads/APA_FL_21_V2.pdf

Other Adapters: These adapters can be used with AirMagnet Survey PRO but have not been tested by NetAlly. Drivers have not been customized, provide limited features, and could provide inaccurate data.

> **NOTE:** When installing Intel® and USB adapters, be sure to deselect (uncheck) the option to install the adapter's client utility in addition to the driver software.
>
> **NOTE:** With the correct adapter, the 6 GHz band is fully supported.

Limitations of Other Network Adapters

Any Wi-Fi 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.

NOTE: 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 Wi-Fi 4 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 using multiple adapters. See Using Multiple Adapters.
- There is no roaming control for active and iPerf surveys.
- Due to the inability to disable roaming on the adapter, active and iPerf surveys can only be conducted the "by SSID" (not "by AP").

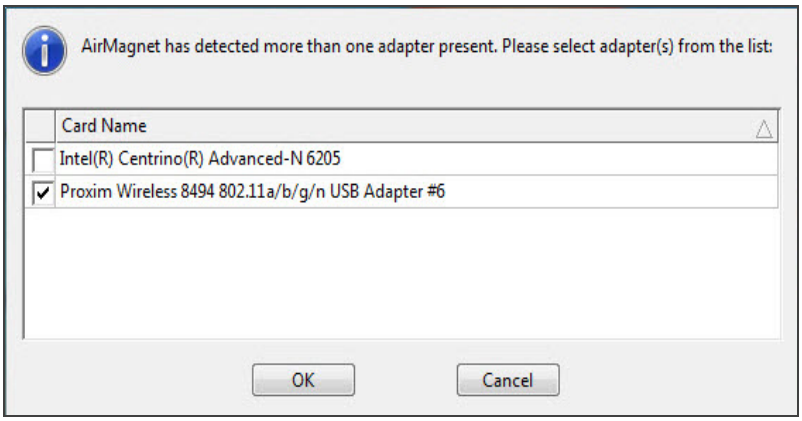
Wi-Fi Adapter Driver Packages

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

Using Multiple Adapters

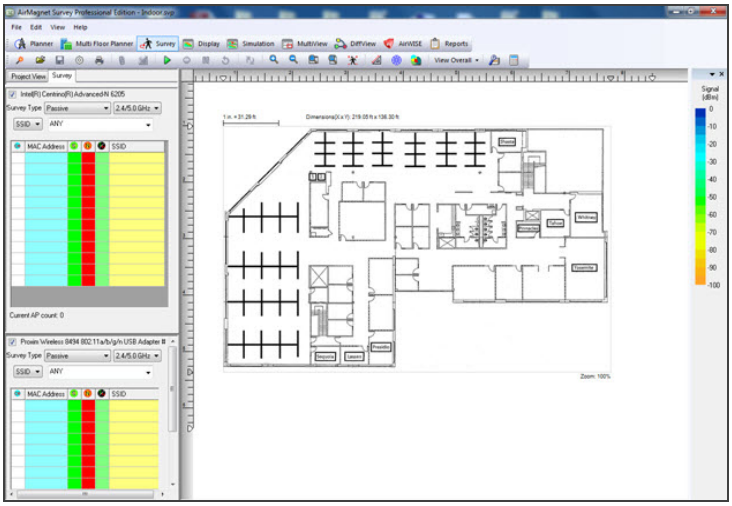
Note: Use of multiple adapters is supported by AirMagnet Survey PRO only. AirMagnet Survey Express can use only a single adapter at a time.

AirMagnet Survey supports up to two simultaneous adapters. If multiple supported wireless adapters are connected at launch, you are prompted to select the adapters to use for the survey process.



Note: In some cases, you must have multiple adapters inserted to use the multi-adapter functionality. See https://www.net-ally.com/wp-content/uploads/APA_FL_21_V2.pdf for more information about which adapters are supported in multi-adapter mode.

When operating in multi-adapter mode, Survey's user interface adjusts slightly on many screens to reflect the simultaneous use of multiple wireless adapters.



Each adapter has its own survey pane so that you can easily track the devices and signal levels detected by each independent device. You also get additional control over the adapters in Survey's Scan configuration (**File > Configure > Scan**), where you can adjust each device manually to specify the channels to be scanned.

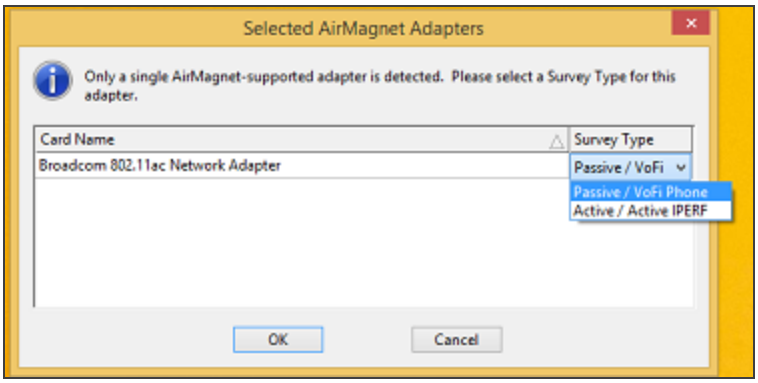
Note: When you select a survey type in either of the drop-down menus, the second menu displays only the types supported with the first selection.

The table below shows the possible surveys that you can conduct simultaneously using two adapters.

	Passive	**Active**	**VoFi**	**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 Wi-Fi 5 Network Adapter.



Supported GPS Devices

(Survey only)

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.
- Must be capable of generating serial data which can be verified via Hyperterminal.
- Must be recognized by the laptop as a COM port.

If your GPS device is not NMEA compliant, you may use a 3rd party software solution that allows the GPS USB to be detected as a COM port. You 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 the format for Autodesk's 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 AutoCAD 2023 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 bitmap 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. Consult a reference on digital imaging to learn which format best fits your needs.

- By default, a floor map is displayed in an 8.5”x 11” or 21.6 cm x 28 cm dimension.
- Make sure that the map is legible and as accurate as possible. A good map should be clear enough to view at a normal scale (1:1) without zooming.
- Try to keep your map image file in a reasonable size. Larger-sized images take longer to upload and if too large may even cause the program to crash. If you have problems loading a large map image, consider using a graphics editor to divide the image into sections.

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. You 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/.

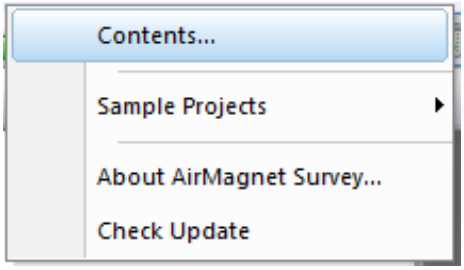
Contact Us

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.

Help and Sample Projects

Display help options from the **Help** menu.



Press the **F1** key to display context-sensitive help for the current view. Context-sensitive help (if available) is displayed.

- **Contents...** - Displays
- **Sample Projects** - Select to display a menu of sample projects. You can use these projects to learn more about Survey PRO or modify them to suit your own project.
- **About AirMagnet Survey** - Display version and update information.
- **Check Update** - Checks for software updates.

Sharing Projects

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

Here is 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 is the only file available to open.

Installation

In this chapter:

Preparing for Software Installation

NetAlly strongly recommends that you review this information before starting product 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 Technical Support immediately.

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 anti-virus 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 is displayed during product launch when 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 is listed in **Registered Products > Downloads** section under Software Download.

An active support contract is required 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.

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 must install a unique software license to successfully run the software application. The program prompts you to install the license when you launch the product 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 must enter 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 are 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 automatically downloads 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 is 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 are 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

NetAlly 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.

Installing Product Software

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

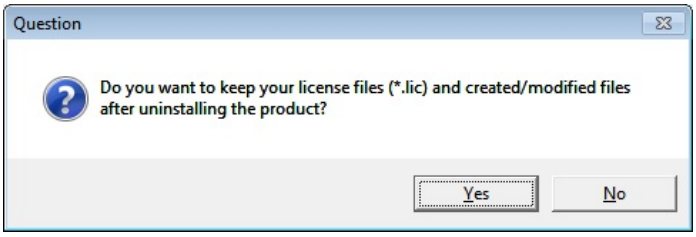
1. Install all available Windows updates.
2. From the Registered Products page of your My AirMagnet account, click the software download link, and run or save the file. (If you save the file, double-click the .exe file to run the installer.)
3. Use the Windows Control Panel to uninstall any previous version of AirMagnet Survey before installing the current version of Survey PRO or Planner.

   NOTE: Do not use the Windows Repair function. This may result in unreliable performance in some versions of Windows.
4. Agree to the Software License Agreement to proceed with installation.
5. Set the installation destination folder. (Accept the Program Files default or browse to a different location.)
6. Click **Finish** to complete the installation.
7. Select another option from the installer, or click **Exit** to close the installer.

Uninstalling Product Software

1. From the **Windows > Settings** menu (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 are 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 are not deleted.
- **No**: The license file and created/modified files are deleted.



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. The current predefined template is replaced, and the 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 merges the new files (for example, new antenna patterns) but does not replace any files from the above groups if they already exist on the target system. This applies 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 must validate your license and install it.

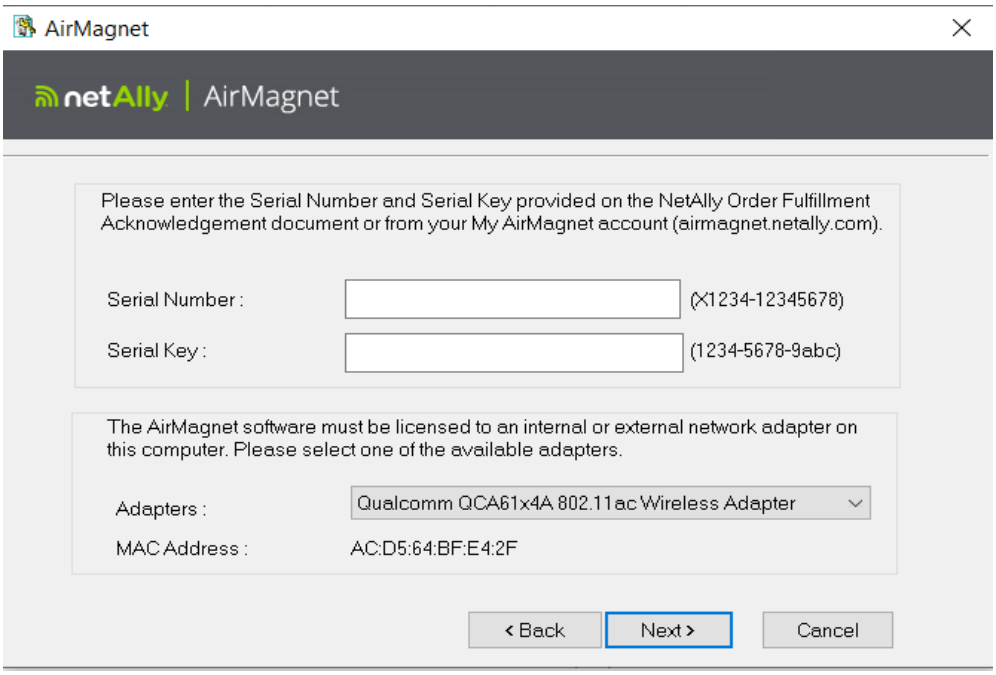
License Method

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 is downloaded from the NetAlly website.
- **Browse to a license:** You are 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 displays, 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, check for the following:

- **Your license does not support a newer version of the product:** 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 Technical Support. Be ready to provide the serial number and serial key for the product in question.

When Using USB Adapters

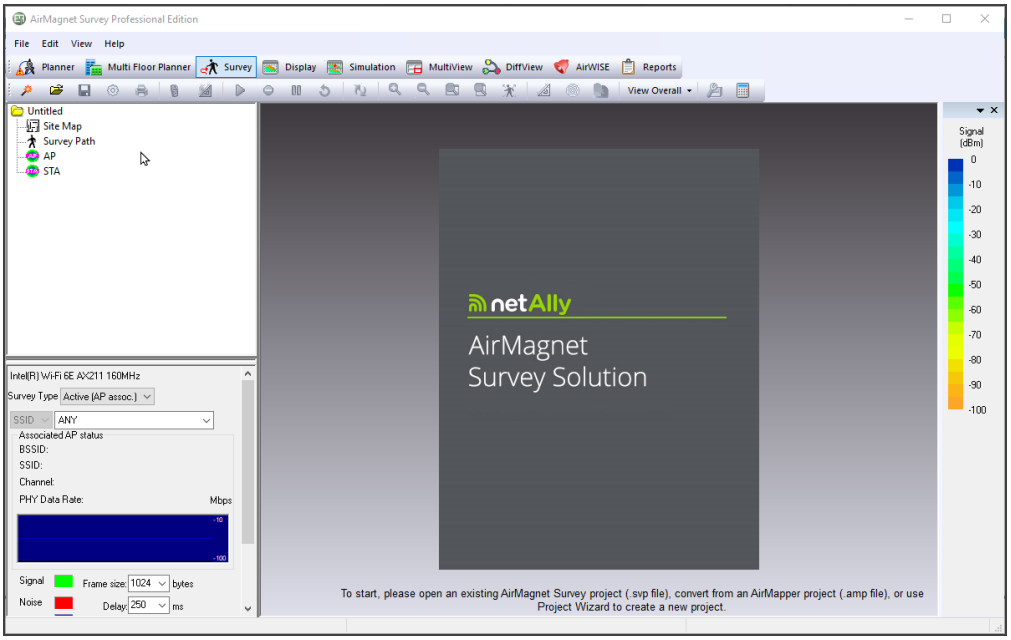
- **It is best to always use the same USB port for the adapter.** When using any of the USB wireless adapters, you may need to re-create wireless profiles after plugging the adapter into a different USB port. (Profiles are stored based on the port, not the adapter itself.)
- Important: When installing new Intel® and USB adapters, uncheck the option to install the adapter’s client utility in addition to the driver software.
- To run AirMagnet Survey using a USB preferred adapter, you must install the adapter driver using the installer found at https://airmagnet.netally.com/my_airmagnet/public/documents/#3rdpartydriver (login required).

Quick Start Instructions

In this chapter:

AirMagnet Survey Main View

To open AirMagnet Survey: Open the Windows Start menu, and then select **AirMagnet Survey > Survey**. The application opens in Survey mode with a default blank Map view.



To open an existing project: Click **Open** or select **Open Project** from the **File** menu and navigate to the project file. If you select an AirMapper project file (.amp) you are 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" setting matches between the existing project and the computer on which you open the project.

To start a new Survey or Multi Floor Planner (MFP) project, click **Project Wizard**.

You can also access sample projects from the **Help** menu.

Note: If you choose to open or start a new MFP project, make sure you use the Navigation bar to change the view to **Multi Floor Planner**.

Navigation Bar

The Navigation bar lets you quickly open the functional views:

Note: The image above shows the Navigation Bar for AirMagnet Survey PRO. (Some tools are disabled for AirMagnet Survey Express, which has fewer features than AirMagnet Survey PRO. See the comparison chart below for more information.

Button	Description
Multi Floor Planner	Simulate AP signal propagation for a building to determine optimal AP placement and configuration *before* deployment.
Survey	Perform site surveys by collecting RF data on a WLAN site. **Note:** This view is not 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 inter-relationship 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 does 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'.

Using AirMagnet Survey

In this chapter:

Introduction to Survey

The Survey view is the main window used for conducting WLAN site surveys to collect RF data in the airwaves over the site.

Note: The Survey view is NOT available for AirMagnet Survey that is installed or operated for display only.

With Survey, you can:

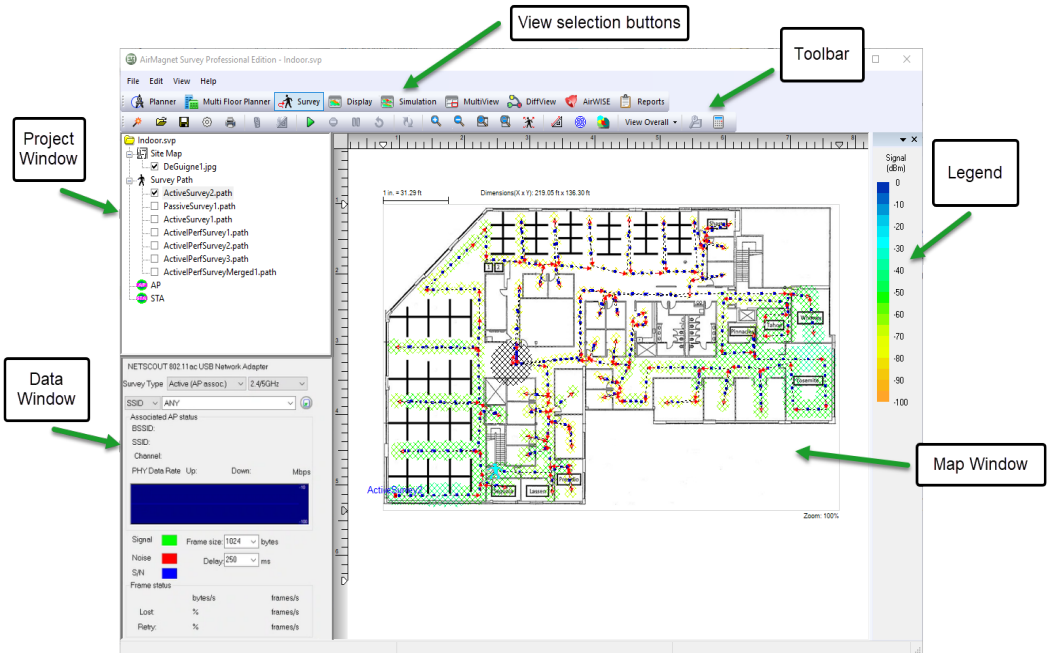
- Set up indoor, outdoor, or VoFi surveys.
- Select between active, passive, or active iPerf surveys.

To open the Survey view from any other view, simply click 

on the Navigation Bar.

You can use start a project or open an existing project from the File menu. You can also use sample Wi-Fi 5 or Wi-Fi 6 projects from the **Help > Sample Project** menu option.

The main screen has these features:



Steps in Using Survey

- See Survey Configuration Overview to learn how to start the MFP project.
- See Conducting Indoor Site Surveys for an introduction to indoor surveys.
- See Creating Outdoor (GPS) Surveys for an introduction to GPS-aided outdoor surveys.
- See Conducting VoFi Surveys for details on creating reports for finished site plans.
- See the Survey User Interface Reference for information on using the interface.

To learn more about using the interface options for the Survey View, see:

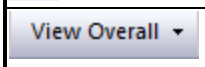
Survey View: Menus, Buttons, and Windows
Toolbar
Project window • Right-click Pop-up Menu
Data Window • Media Type Button • Active Survey Data Window

Survey View: Menus, Buttons, and Windows
• Passive Survey Data Window
Map window
• Heatmap Legend
Modifying Project Properties
Sharing a Survey Project
Survey Menu Reference

Toolbar

The table below shows toolbar icons for the Survey view. The icons link to 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. See File menu.
	Open Project	Opens an existing Survey (.svp) file. See File menu.
	Save	Saves changes made to the current project. (Ctrl+S)
	Configuration	Opens Survey Configuration window.
	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.
	Measure Mode	Re-calibrates site dimensions of a floor plan.
	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), the "Auto Position APs with signal greater than __ dBm" setting may be enabled. See How to Locate an AP.
	Refresh	Updates the display with the latest data.
	Zoom In	Enlarges the view of the site map. (You can also use your mouse's scroll wheel.)
	Zoom Out	Reduces the view of the site map. (You can also use your mouse's scroll wheel.)
	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	Expands the Map Window to the entire window. To restore the default view, click the button again.
	Measure Mode	Turns on Measure Mode, which lets you measure the distance between any two points on the site map. You can also choose to recalibrate the site dimensions based on the measurement.
	Toggles Outline	Enables you to view an outline of where a heatmap transitions from one legend value to the next value.

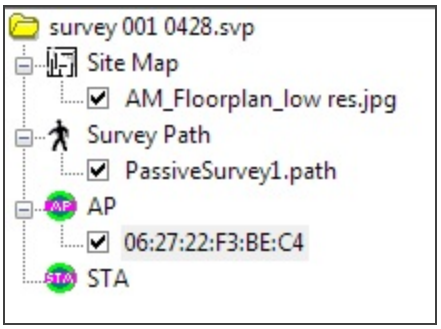
	**Overlap**	Show or hide areas of coverage overlap for a selected AP in the Map Window.
	**View Overall or Per Channel**	Click to select between an overall view or a per-channel view of an AP.
	**Tools**	Opens the Signal and DHCP tools.
	**Calculators**	Click to open a dialog with various calculators. See Calculating WLAN Parameters Introduction for more information.

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.

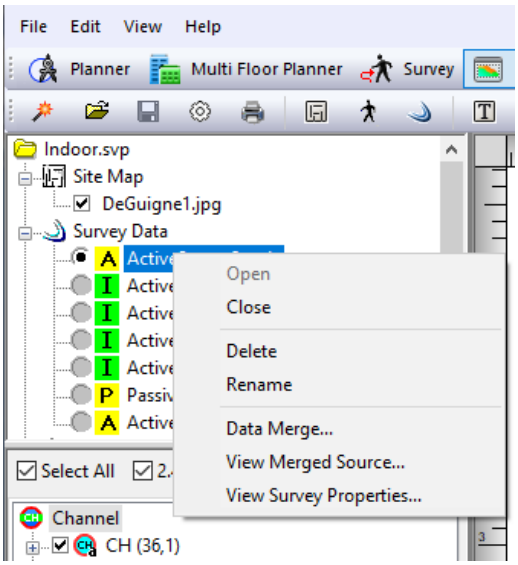


See also: Right-click Pop-up Menu

Right-click Pop-up Menu

The Project Window on the Survey view and Display view 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.



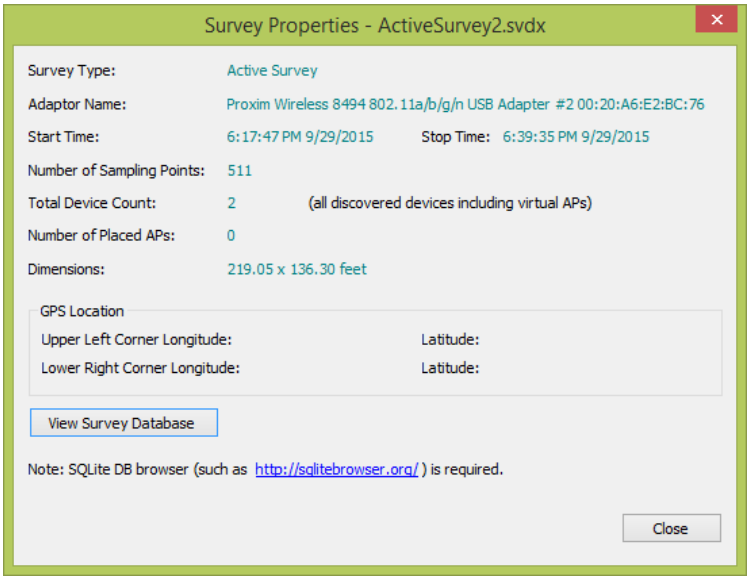
Menu Option	Description
Close	Closes the selected data file. (Display view only)
Delete	Deletes the selected (right-clicked) item.
Rename	Renames the selected data file. (Display view only)
Data Merge...	Merge two or more data files.
View Merged Source ...	Shows the sources from which a merged data file was created. (Display view only)
View Survey properties ...	Opens a properties window for the file. (Display view only)

View Survey properties

From the Project Window, right-click a survey data file (.svdx), and then 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

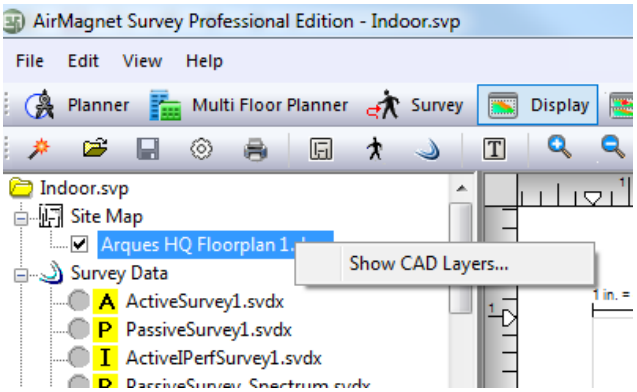
The Survey properties includes an option to view in-depth, database details included in the selected survey data file.

To view the database, you need a database viewer application such as DB Browser for SQLite, downloadable at: http://sqlitebrowser.org/

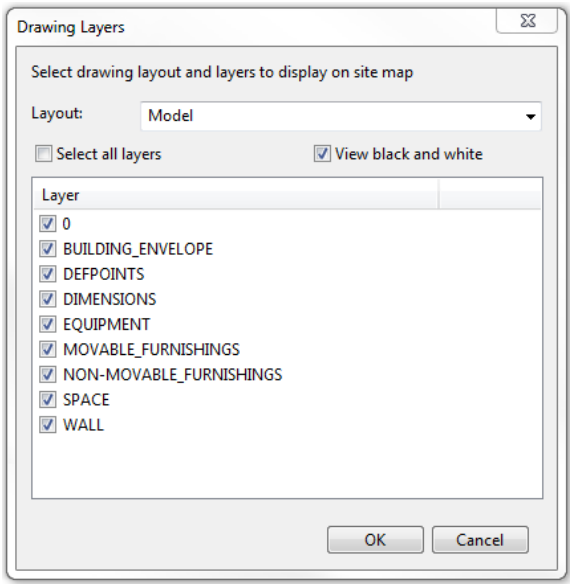
Click **View Survey Database**. You may be prompted by Windows to associate the database with the desired database viewer application.

Right-Click to Show CAD Layers...

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



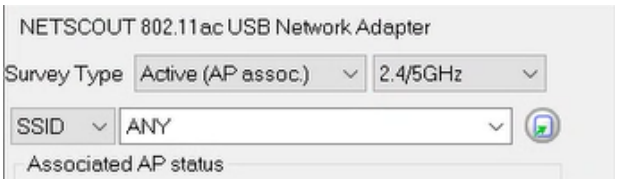
The Drawing Layers... dialog opens, as shown below.



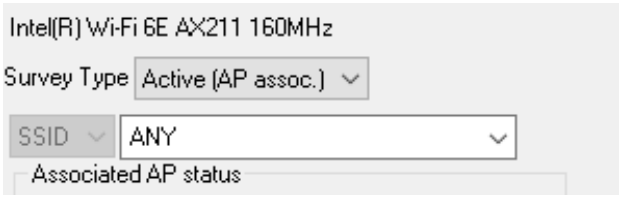
Data Window

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 and if you are using a Wi-Fi adapter supported by NetAlly.

For example, using a Wi-Fi adapter supported by NetAlly enables the Media Type drop-down menu, the SSID/AP drop-down menu, and the Roaming button:



When using an unsupported Wi-Fi adapter, such as the adapter built into your laptop, the Media Type drop-down menu, the SSID/AP drop-down menu, and the Roaming button do not appear:



See Active Survey Data Window and Passive Survey Data Window for more information.

Media Type Button

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

NetAlly highly recommends that you select a media type before you start on a site survey. This allows you to focus on APs using a specific type of media during the survey.

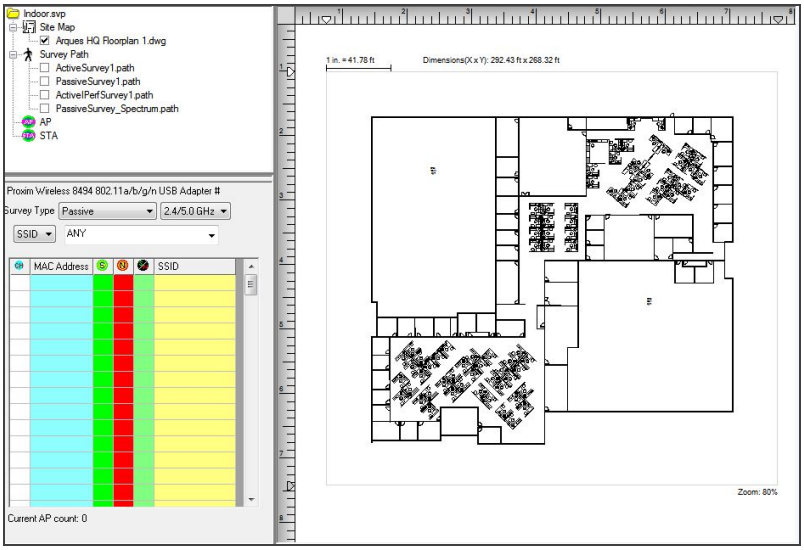
The 

(**Media Type**) drop-down is located in the Data window of the Survey view. Click this button to display a drop-down menu of media types that determine the type of data to be collected and displayed by the wireless network card. It offers the following options:

- **2.4 GHz**: Scans data from APs in the 2.4 GHz band only (generally, 802.11b/g/n/ax media types).
- **5.0 GHz**: Scans data from APs in the 5.0 GHz band only (generally, 802.11a/n/ac/ax media types).
- **2.4/5.0 GHz**: Scans data from both bands.

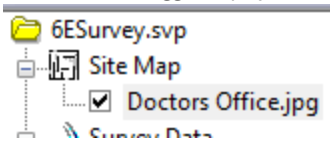
Map Window

The figure below shows the Map Window on the Survey view for a 2.4 GHz and 5 GHz survey, with a site map displayed.



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, make sure that the project and site map match the survey location.

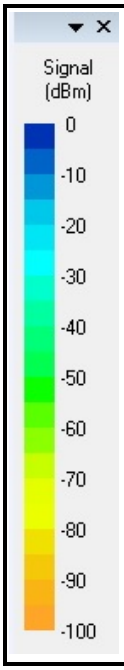
NOTE: You can toggle display of the site map by selecting or deselecting the checkbox in the Project Window.



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 displayed. It is identical to what is selected from the Data Type list menu on top the Map Window.
- Drag up from the bottom of the Legend or down from the top of the Legend to set the upper or lower limit of RF data (signal, noise, interference, and so on) shown in the Map Window.
- You can also adjust the color scheme. See Configuring Legend Color Schemes.

Survey Configuration Overview

Your site survey results are affected by AirMagnet Survey's settings. Careful configuration of AirMagnet's parameters can help you achieve what you intend to accomplish. This section explains how to configure the various settings on AirMagnet Survey:

The Configuration dialog defines the way AirMagnet Survey PRO collects and processes data. You can also optimize certain attributes on the wireless network adapter to maximize its performance with the application.

To access the Configuration dialog:

Do either of the following:

- Click **File > Configure**...
- Click the Configuration button  on the main Toolbar.

This opens the configuration dialog with the project name in the title bar. By default, to the Settings tab is displayed. You can select from the tabs, set options, or enter parameter values as needed. Click **OK** when you have finished to save the changes.

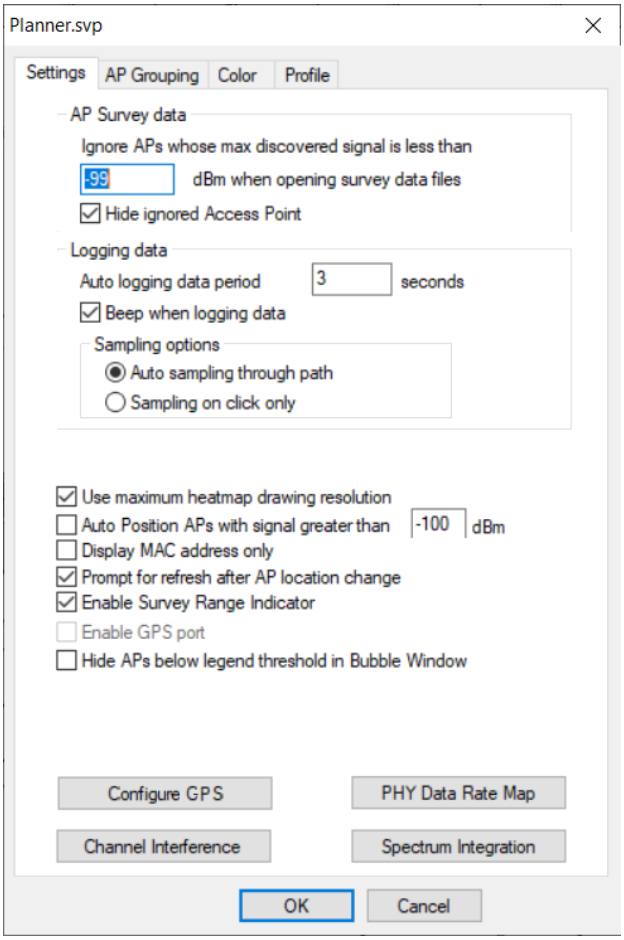
Use the following configuration tabs to set up basic parameters for Survey:

- Configuring Program Settings
- Configuring AP Grouping

- Configuring Color Schemes
- Configuring Wi-Fi 4 Parameters
- Configuring Channel Scan
- Configuring Survey profiles

Configuring Program Settings

The Settings tab for the Survey project defines the way AirMagnet Survey PRO collects and processes data. You can also optimize certain attributes on the wireless network adapter to maximize its performance with Survey.



You can change the following parameters for the Settings tab. Click **OK** to accept the changes. You can also choose another tab or click one of the buttons to change additional settings.

Parameter	Description
Ignore APs whose max discovered signal strength is less than	Enter a threshold value for AP signal strength. **Note:** APs with signal strengths below this value are ignored. The value of signal strength ranges from 0 (strongest) to -100 (weakest).
Hide ignored Access Point	Hides APs with maximum signal strengths that fall below the threshold (Channel/SSID Tree in the Display view).
Auto logging data period	Enter a value in seconds. This option sets how frequently the application automatically logs data points during a site survey. (Default value is once every three seconds.)

Beep when logging data	Enables an audio beep each time Survey logs data. This beep can serve as an indicator that Survey is working properly. **Note:** The frequency of the beeping depends on the data sampling interval specified above.
Auto sampling through path	Automatically marks data sampling points on the site map, shown by blue dots along the survey path. **Note:** The data sampling interval is determined by the value you specified in the Auto logging data period. See above.
Sampling on click only	Samples data only when you click on the site map. **Note:** When conducting a Click to Sample survey, make sure that the application has 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. Check the progress bar at the bottom of the survey screen to see the progression through the configured scan pattern. Wait until the bar indicates that a full scan cycle has completed before you click to record data. Once the meter reaches 100%, a new scan is started and the meter resets to 0. (This progress bar appears only when you use adapters that support user-defined scan patterns.)
Use maximum heatmap drawing resolution	Displays smoother looking heatmaps for floor plans with dimensions less than 400 feet (122 meters).
Auto position APs with signal strength greater than	Automatically places the APs that meet your specification in their optimal locations on the site map. (You may also need to set a signal strength value in the space below.)
Display MAC address only	Displays all APs by MAC address alone without including a vendor ID or custom name.
Prompt for refresh after AP location change	Tells AirMagnet Survey to prompt you to refresh the view each time you reposition an AP.
Enable Survey Range Indicator	Enables automatic marking of the survey data sampling range (radius) as you click on the site map.
Enable GPS port	Enables the **Configure...** button, which opens the GPS settings. See Creating a GPS-Aided Survey Project Using an Existing Site Map.
Hide APs below legend threshold in Bubble Window	When selected, excludes APs placed on the floor plan are not displayed in the Bubble window listing.
Configure GPS	Opens the dialog to configure GPS integration for conducting a GPS survey. See Configuring the GPS COM Port.
Channel Interference	Opens the Interference dialog where you can configure the minimum values of AP signals that the program takes into account when calculating signal interference.
Spectrum Integration	Opens the Spectrum Integration dialog box where you can choose to show or hide the Spectrum Integration window, which displays below the Map Window on the Survey and Display screens. See AirMagnet Spectrum Analyzer introduction.
PHY Data Rate Map	Generates speed data for passive surveys. See Calibrating Wireless Network Adapter Speed.

3. Click **OK** to save and apply the settings.

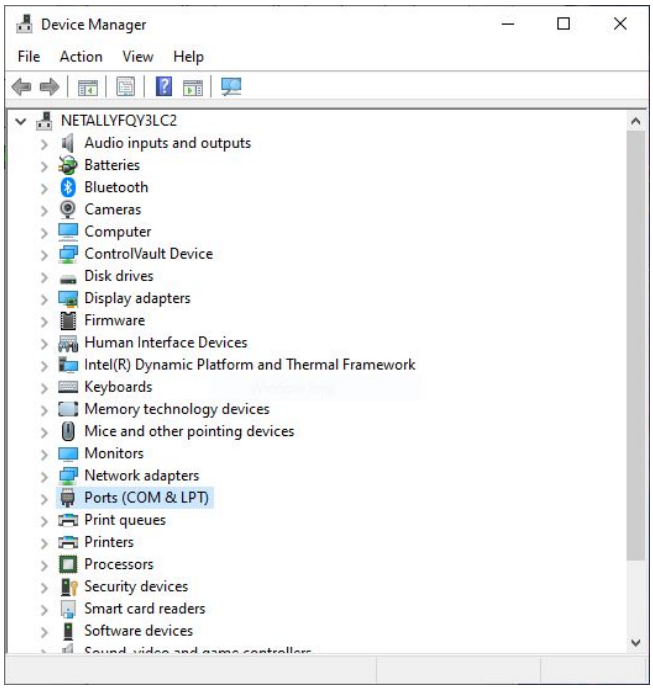
Configuring the GPS COM Port

If you plan to create a GPS-aided outdoor Survey project, you must configure Survey's GPS COM port to communicate with the GPS device to which it is connected.

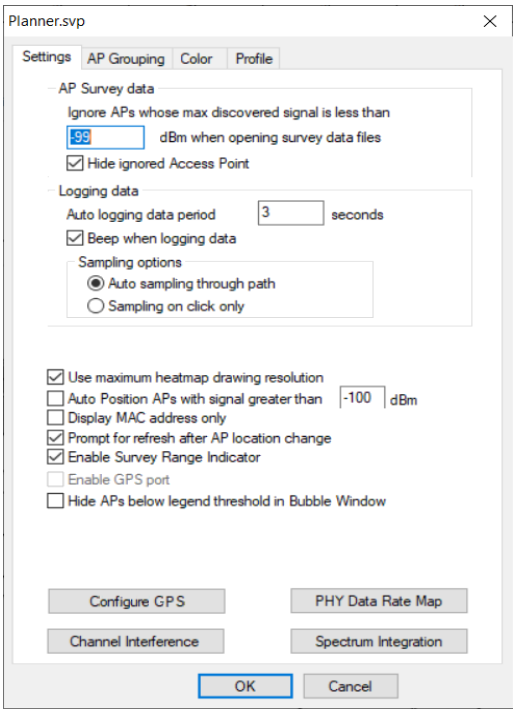
To configure Survey's GPS COM port:

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

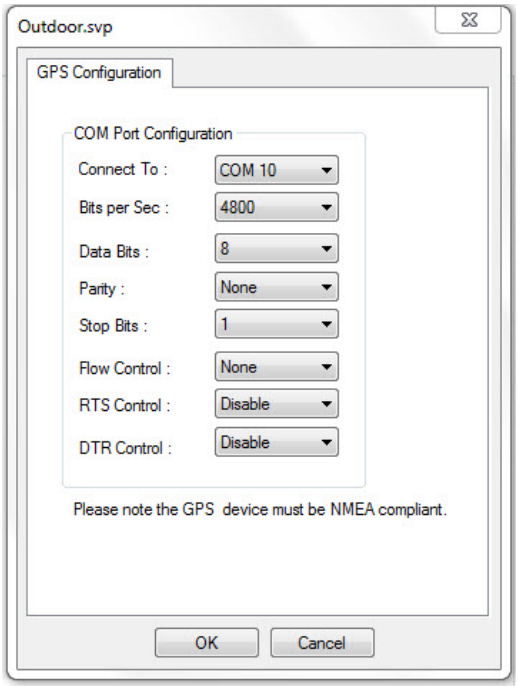
   Note: Accessing the Windows Device Manger procedure may differ somewhat depending on the Windows operating system. See **Windows Help > Device Manager**.



2. Click **Ports (COM & LPT)**.
3. Write down the COM port number listed after the device's name.
4. Close **Device Manager**.
5. From AirMagnet Survey's Survey or Display view, click **File > Configure**.... The Survey Configuration dialog box appears at the default **Settings** tab.



6. Check **Enable GPS Port** and click **Configure GPS**.... The GPS COM Configuration dialog box appears.



7. Under **Connect to**, select the COM port identical to the one you found in Step 2.
8. Under **Flow Control**, select **None**, and click **OK**.
9. Click **OK** to close the **Survey Configuration** dialog box.

   Note: 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.

See Creating Outdoor (GPS) Surveys for more information about GPS surveys.

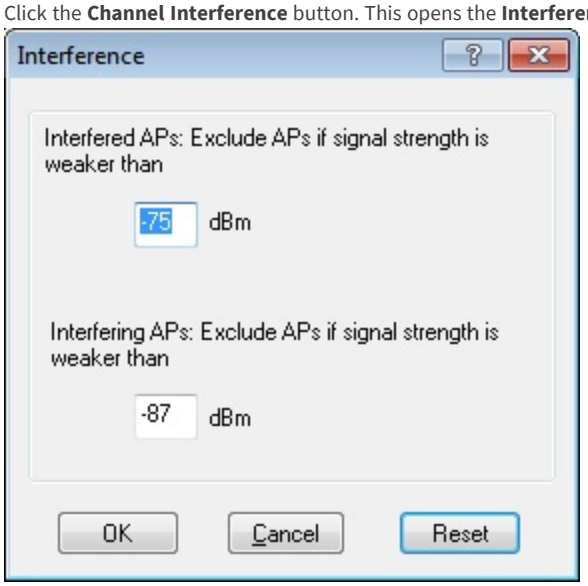
Channel Interference Settings

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, the program does not consider any signal from an adjacent AP as interference if it falls below this value.

To specify interference settings:

1. From the Main Menu, select **File > Configure** to display the Configuration dialog.
2. Click the **Channel Interference** button. This opens the **Interference** dialog box.



3. Specify the desired values for interference and noise, and then 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.

Configuring the PHY Data Rate Map

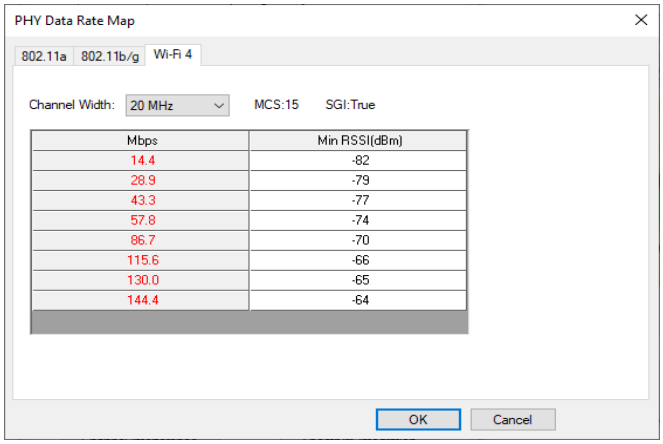
The **PHY Data Rate Map** button in the Settings dialog opens the **PHY Data Rate Map** table, which lets you specify speed transmission information for the wireless network adapter in use. This information helps with speed data calculations for passive or virtual surveys.

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

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. See the adapter's technical specifications from the vendor's website.

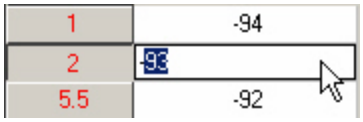
To adjust speed settings on a wireless network adapter:

1. Click **File > Configure**…
2. From the **Settings** tab, click **PHY Data Rate Map**. The **PHY Data Rate Map** table appears.



Note: As shown above, the table has three tabs, each for a different media type (802.11a, 802.11b/g, and Wi-Fi 4). For the 802.11b/g tab, the Vocera B2000 Badge Speed Map option is only for surveying a Vocera deployment. When this option is enabled, the speed map values are hidden.

3. Click the tab that matches the media type in use.
4. To modify a value, highlight the value and enter the new value.



Note: The value you enter must lie between the values above and below the entry.

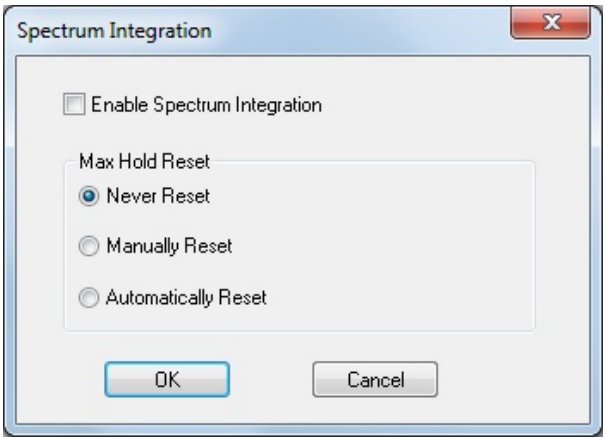
5. Click **OK** to save the changes.
6. (Optional) To restore the default values, click **Restore to Default**.

Configuring a Spectrum Analyzer

To configure and enable a spectrum analyzer:

1. Open the Spectrum Integration dialog by clicking **File > Configure...** and then clicking the 

button.



2. Check the **Enable Spectrum Integration** checkbox.
3. Select one of the **Max Hold Reset** options.

Option	Description
Never Reset	If selected, the Max Hold value never resets.
Manually Reset	If selected, the Max Hold value resets each time you click on the site map as you move along the survey path.
Automatically Reset	If selected, the Max Hold value automatically resets each time or at each point data are collected or logged.

4. Click **OK** to save your selections.
5. Restart Survey for the new settings to take effect.
6. See Working with Spectrum Analyzers for more information.

Configuring AP Grouping

This dialog allows you to set up specific names for single devices that use 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.

To open the AP grouping dialog, click the Configuration icon  , and then click the **AP Grouping** tab. You can also right-click on a channel or AP in the Channel Tree View and then select the AP Grouping option

A few predefined 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) for the 2.4 GHz, 5 GHz, or 6 GHz frequency band. This groups 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 groups 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.

  Note: An enabled (checked) user defined rule (New) takes precedence over an "ANY" rule.

  Note: AP Grouping information is saved as a comma-separated (.csv) file:
  <drive letter>:\Program Files (x86)\AirMagnet Inc\AirMagnet Surveyor\AP-Grouping.csv

  To add 6 GHz AP grouping rules, you must either manually edit AP-Grouping.csv or delete that file and let Survey PRO regenerate it when you create new rules.

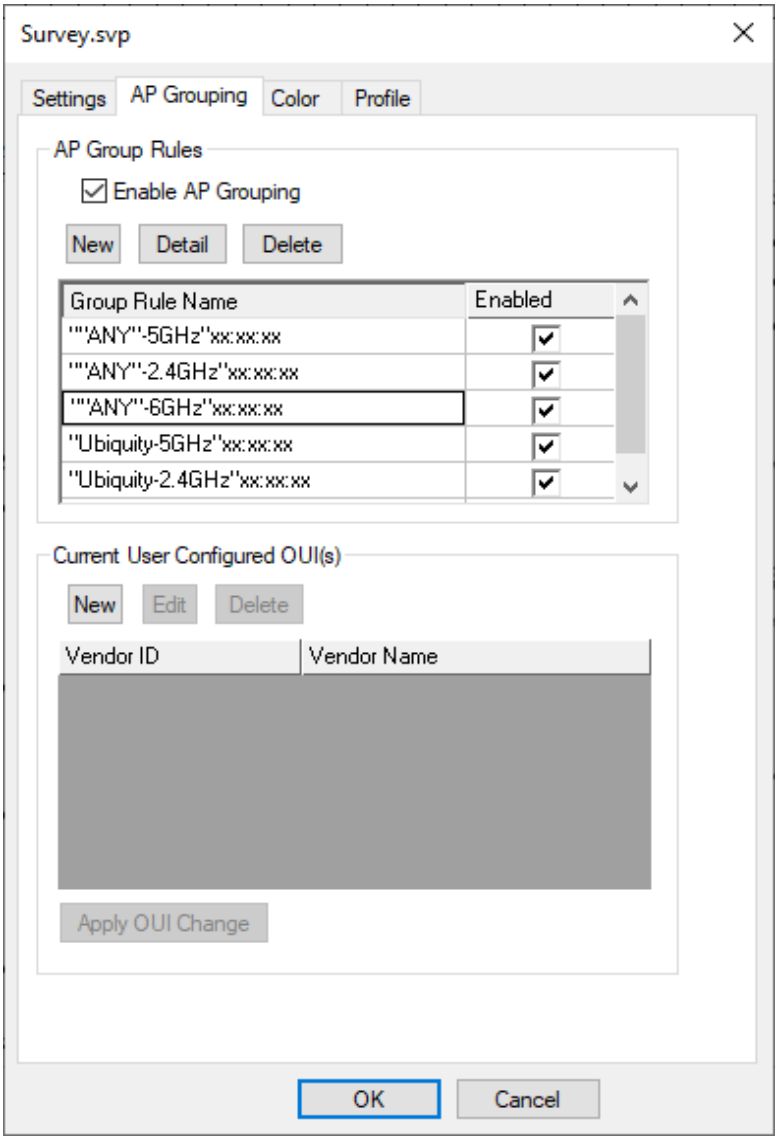
AP Grouping Limitations

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 is displayed if "Display Best Name" is selected in the filter view, for example, Name is the same as if its MAC address is selected unless there is a known AP name.
- The existing OUI to create grouping rules is not modified.
- AP grouping does not attempt to group dual radio APs into a single device.

To configure AP grouping using predefined settings:

1. From the **Survey Configuration** dialog box, select the **AP Grouping** tab.



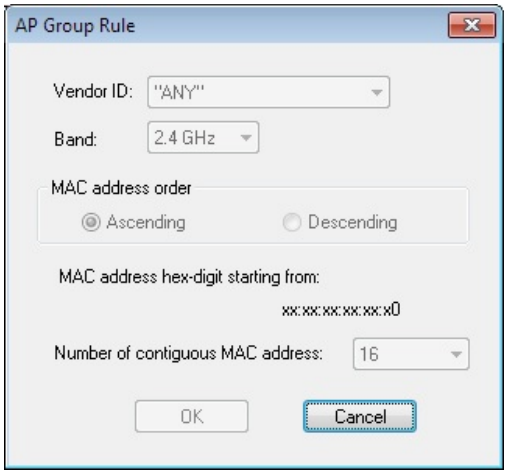
2. Check **Enable auto grouping**.
3. Check the desired listings in the **Group Rule Name** table.
4. Click **OK**.

Disable AP Grouping by unchecking **Enable AP Grouping**.

Viewing AP Grouping Rules

To 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 the device's frequency band.
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 preconfigured 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 the **c:\AirMagnet\Surveyor\OUI** folder. You 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 are either 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 predefined rule.

Using 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 applies to all IDs associated with that vendor name.

Creating an ID 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.

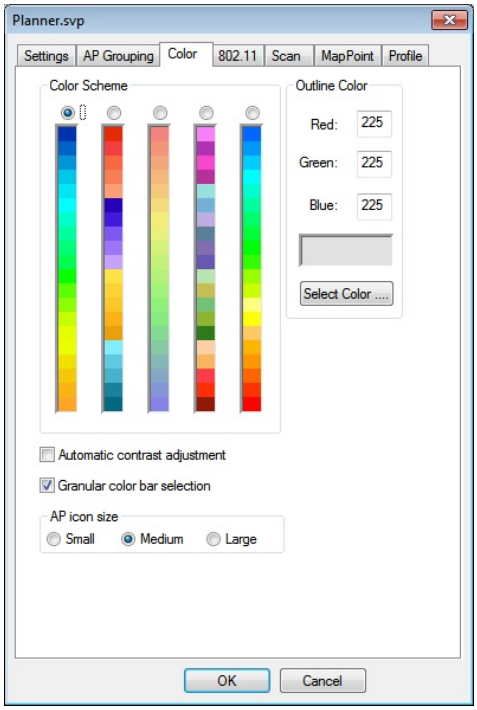
The new entry is implemented the next time you start AirMagnet Survey.

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 is automatically used by color legend after you click **OK**.
Outline Color	Change any of the color values (Red, Green, Blue) by highlighting it and then typing new color values or by clicking **Select Color...** and then choosing 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	Automatically adjusts the color contrast as you drag the color box up or down the Legend.
Granular color bar selection	Changes the color shade one grade at a time as you drag the color box up or down the Legend.
AP icon size	Use the radio buttons to set the AP icon size.

3. Click **OK** when finished.

Configuring 802.11 Parameters

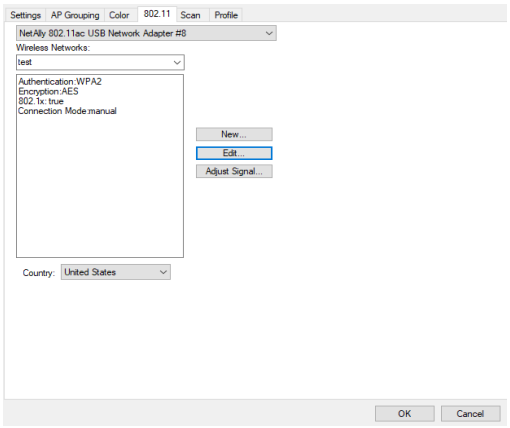
To perform Active and Active iPerf surveys, the adapter needs to associate with the desired AP or SSID. This often requires establishing the authentication method and security password for the AP or SSID. You can set up these requirements outside of AirMagnet Survey using Windows Wireless settings, and then you can use AirMagnet Survey's 802.11 configuration.

Notes:

- This option displays on the configuration dialog only if you are using a NetAlly supported adapter.
- Typically, you do not have to make 802.11 adjustments unless you have to accommodate specific requirements for enterprise networks.

To configure 802.11 parameters:

1. Use the Windows Wireless settings to set up the authentication method and security password for the AP or SSID associated with the adapter.
2. Use the Windows Wireless settings to select and connect to each of your adapters. (Do *not* select the **Connect automatically** option.)
3. From the Main Menu in Survey, select **File > Configure...** or else click the Configure button.
4. Click the **802.11** tab.



5. Click **New** to create a new profile. Provide a **Name** for the AP or SSID, and then click **OK**.
6. Select the SSID or AP name in the **Wireless Networks** drop-down, and then click **Edit**.
7. Make the desired entries and/or selections in the **Connections** tab and **Security** tab as you normally would for a new Windows Wireless connection, and then click **OK**.
8. (Optional) Click **Adjust Signal** to make custom RF signal adjustments. See Custom Adjustments for more information.
9. Click **OK** to close the configuration dialog.

Configuring Channel Scan

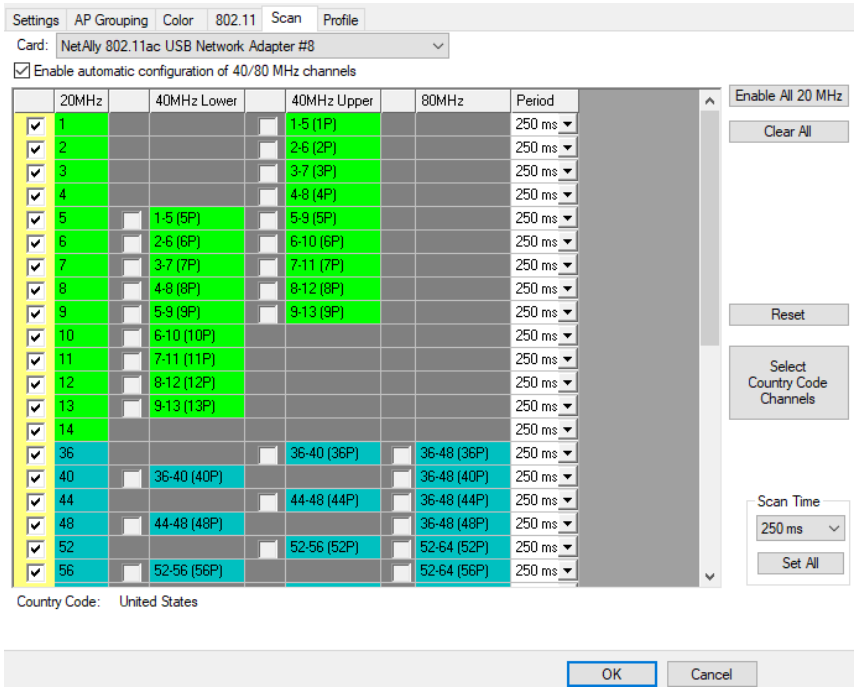
Configuring channel scan settings allows you to specify the channels you want the wireless network adapter to scan and to set the frequency at which the scanning occurs.

Notes:

- This option displays on the configuration dialog only if you are using a NetAlly supported adapter.
- Make sure that you have enabled the scan feature for those channels using this view. (Use the check boxes or enable/disable channels and the **Select Country Code Channels** button on the right of the window.)

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 appears at the top of the window to select the desired device. Select the adapter you want to configure from the list.

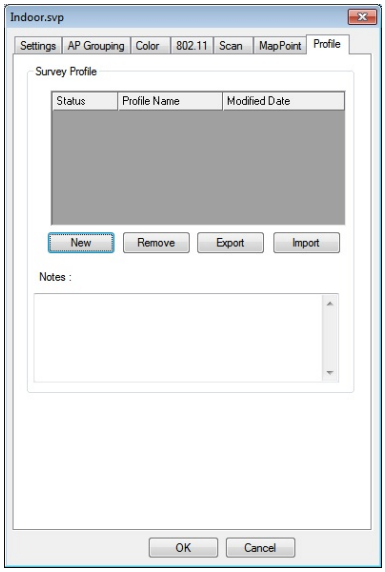
3. (Optional) Unchecking the **Enable automatic configuration of 40/80 MHz channels** option if you want to manually specify scanning of upper or lower portions of channels. After unchecking the box, select the channels, and then check the upper or lower channel desired for each channel. (By default, AirMagnet Survey automatically configures 40 MHz and 80 MHz channels.)
4. (Optional) Click the **Select Country Code Channels** button on the right of the window to select which channels are available for scanning based on the country code configured for the Wi-Fi adapter. (To set the Country Code, see Configuring 802.11 Parameters.)
5. 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 are scanned.
   - Click **Clear All** to disable all the channels so that no channel is scanned.
6. Set the scan intervals:
   - Click the **Period (ms)** field, and select a scan frequency for the individual channels from the drop-down list.
   - Click the 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.
7. Click **OK** to accept the configuration changes.

Configuring a Survey profile

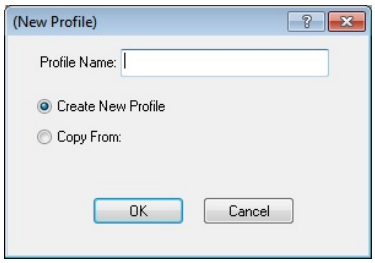
The Profile tab allows you to store settings made in Survey's configuration and reapply them for future surveys. You can save these settings to an AirMagnet Profile (.apf) file and then upload the file onto another computer using AirMagnet Survey. This feature can help you with repeated site surveys. 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.



3. Click **New**. The New Profile dialog appears.



4. Enter a unique name for the profile. (This creates the profile's file name, for example, "Profilename.apf").
5. Leave the **Create New Profile** radio button selected.

   Note: The **Copy From** button allows you to duplicate the settings configured in an existing profile and apply them to the new profile.
6. Click **OK**. The new profile appears in the profile list window.
7. Enter any comments about the new profile in the Comments field below the Profile List (optional).
8. Click **OK**.

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

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 before 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 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 use 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), NetAlly recommends that you break the survey up into several smaller instances. This ensures that you do 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.

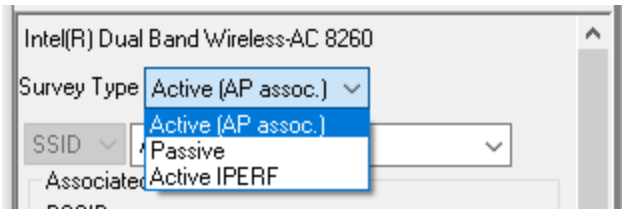
This section discusses indoor site surveys, which typically are small-scale surveys conducted inside an office complex or warehouse, etc.

Choosing a Survey Mode

Choosing a Survey Mode

After you create an AirMagnet Survey, choose the survey mode:

1. In the Data Window, click the **Survey Type** drop-down list.



2. Select one of the following survey types:

- **Active Survey:** (Default) The Wi-Fi card actively associates itself with the selected AP or SSID to send and receive RF packets.
    - To perform the active survey on an individual AP, select **AP** from the drop-down list on the left and then choose a specific AP from the drop-down list on the right. The Wi-Fi card associate only with that AP.
    - To perform a survey on an entire network, select **SSID** from the drop-down list on the left and then choose an SSID from the drop-down list on the right. The Wi-Fi card associates with the AP that has the strongest RF signal in the SSID group as you roam the site during the survey.
    - See Active Survey Data Window for more information on the data window.
- **Passive Survey:** The Wi-Fi 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.
    - Leave the **SSID** field set to **Any**, or
    - Select a specific **SSID**or**AP** from the drop-down.
    - See Passive Survey Data Window for more information on the data window.
- **Active iPerf Survey:** This option enables AirMagnet Survey's integration with the open-source iPerf software. This works like a standard active survey but with more initial configuration information to provide additional transmission data. You can gather transmission data for both uplink and downlink rates (as opposed to just the former). See Using iPerf Integration for information on configuring and activating iPerf integration.

Pre-Installation Site Surveys

A properly conducted predeployment 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 details how to conduct a basic survey of the network environment before 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 consist of the following steps:

1. Conduct a passive survey of the entire site to collect data regarding ambient traffic, noise levels, frequency usage, floor-to-ceiling height, height between each floor, and signal loss per foot between floors. (You can divide this survey step into several shorter surveys, if necessary.)
2. Use AirMagnet Planner to create a model of the new site, including anticipated layout, obstacles, and so on.

   Note: You must have an AirMagnet Planner license to model the network using AirMagnet Planner. For steps on manually planning out the environment, see Manually Planning the Deployment. 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. See Generating a Multi Floor Planner Advisor Layout for more details.
4. Use Survey's Display view to analyze the Planner results (or the results from the manual plan) 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 before 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.
5. Save the survey data.
6. Switch AirMagnet Survey to the Display view.
7. Merge all the active and passive survey data files. For instructions on how to merge data files, see Merging Survey Data.
8. Display the merged data by channel or by SSID. See Project Window and Channel/SSID List.

Note: For better results, NetAlly recommends that you: 1) merge the active survey data files collected at each location, 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 (the active survey data from all locations). This provides 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 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 contain the following steps:

1. Conduct a passive survey of the entire deployed environment . (You can break this survey step up into several shorter surveys, if necessary.)
2. Compare the results to those generated during the planning stage of the predeployment process described above.

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

   Note: This step is necessary because 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 before installation.

4. Conduct an active survey 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: Even though active surveys are more complex, they provide a variety of additional benefits over passive surveys. See Choosing a Survey Mode for more information.

5. Repeat this procedure at least every three months 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 frequency band at a time. Attempting a survey of more than band may take less time, but it can cause gaps in the data.
- Plan the survey path ahead of time to conduct the most complete survey in minimal time. Planning and walking the path ahead of time can help you identify obstacles, potential trouble spots, etc.
- Be sure to survey from all areas of the network; do not assume that coverage on one side of the APs is 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

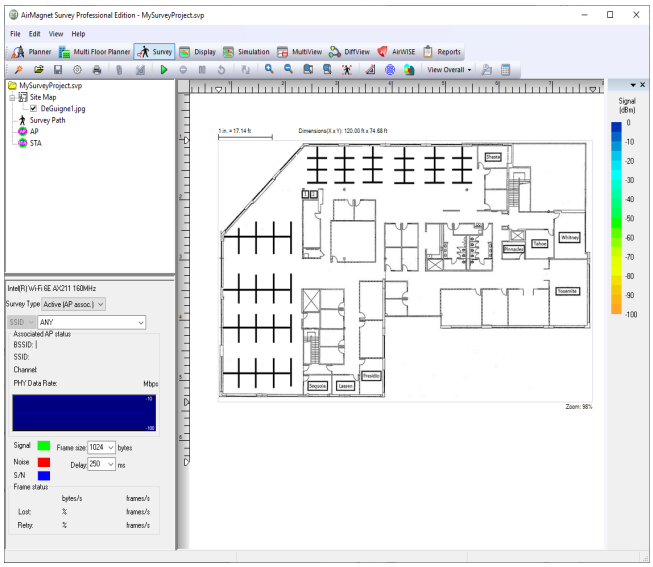
A passive survey offers a quick and easy method to gather all available 802.11 information in the wireless environment. You can view any traffic present, whether it comes from a neighboring network or from ambient noise. The steps below detail the basic process of conducting a passive survey.

When you start a survey, the application begins collecting data about the environment. Then you walk a systematic path through the areas for which you want to measure signal coverage.

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

To conduct a passive survey:

1. From 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.
4. Click 2.4/5.0 GHz (**Media Type**) and select a media type (**2.4 GHz**, **5.0 GHz**, or **Both** from the drop-down list.
5. From the Data Window, click the **Survey Type** drop-down list and select **Passive**.

See Passive Survey Data Window for more information.

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

6. Click (**Start Survey**) and walk through a planned survey path that covers all areas you want to measure. clicking as necessary to indicate each step in the survey.
   - Click a point when you start the survey and then each time. (By default, AirMagnet Survey automatically spaces data points over time.)
   - Walk at a slow steady pace (slower than a normal walk) to gather plenty of data.
   - Click on 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.
   - Save your data from time-to-time as you travel along your survey path.
   - An inactivity timer automatically pauses the survey if you do not click in the system-specified time. You then receive a warning prompt and a count- down timer before the survey is automatically paused.

Note: NetAlly recommends that you walk at a slow steady pace (slower than a normal walk) to gather as much data as possible.

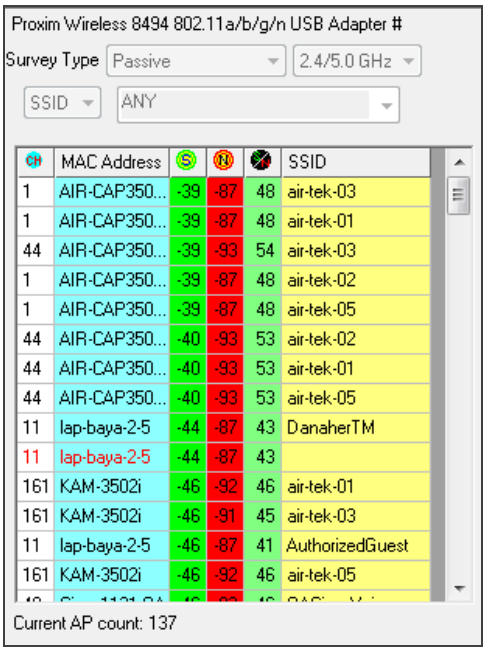
7. Click (**Stop Survey**) once you have covered the survey area.
8. Save the survey data when prompted.

For instructions on how to view and analyze survey data, see DiffView: Compare Surveys and Site Plans.

Passive Survey Data Window

The figure below shows the Data Window during a survey when set in Passive Survey mode using an adapter that supports both the 2.4 GHz and 5 GHz bands.

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 displays in red, instead of the usual black to distinguish it from the broadcasting SSID APs.



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 GHz**, **5.0 GHz**, or **Both**. **NOTE:** This option is displayed only if you are using a NetAlly supported adapter.
SSID/AP	Detects devices by AP or SSID during the survey. A drop-down lets you choose a specific device to survey or choose **ANY** to capture data for all detected devices (SSID or AP). **NOTE:** This option is displayed only if you are using a NetAlly supported adapter.
Channel	Captures the RF channel each AP is using. 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 SNR ratio usually means better network performance, because less noise affects the signal.
SSID	The name of the network to which an AP belongs.
Current AP Count	The total number of APs currently detected.

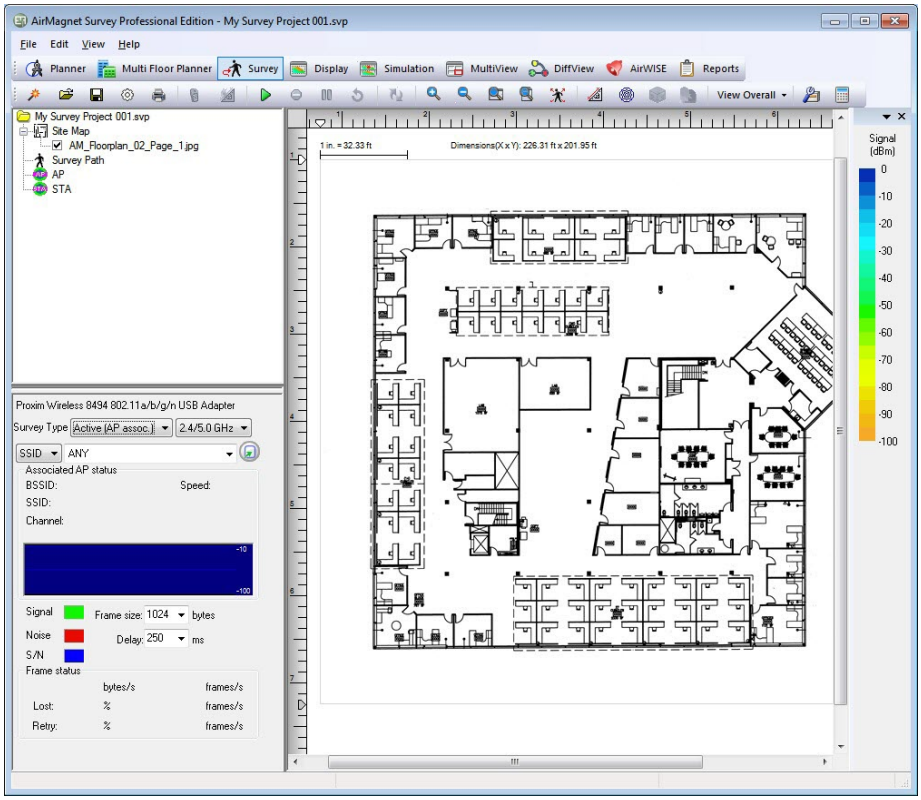
Before beginning a passive survey, you may drag-and-drop APs from the Data Window onto the Map Window floor plan. Once the survey begins, this option is not available; however, after concluding the survey, this option becomes available in the Display View. See Channel/SSID List.

Conducting an Active Survey

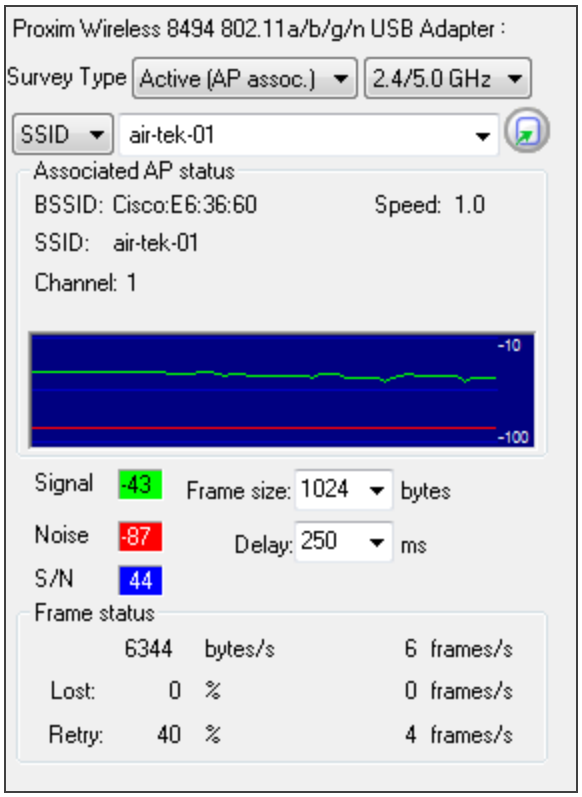
As explained previously, active surveys are more difficult to set up and perform than passive surveys, but have the advantage of providing real-world data for PHY Data Rate, packet loss/retry, and uplink/downlink rates. Active surveys require some configuration and initial setup before collecting data, but they give the most accurate reflection of the network's performance for end-users.

To conduct an active survey:

1. In AirMagnet Survey, click  (**Open Project**) on the Toolbar.
2. Locate and open the Survey project (.svp) file you want. 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  (**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 **Active**.



See Active Survey Data Window for additional information.

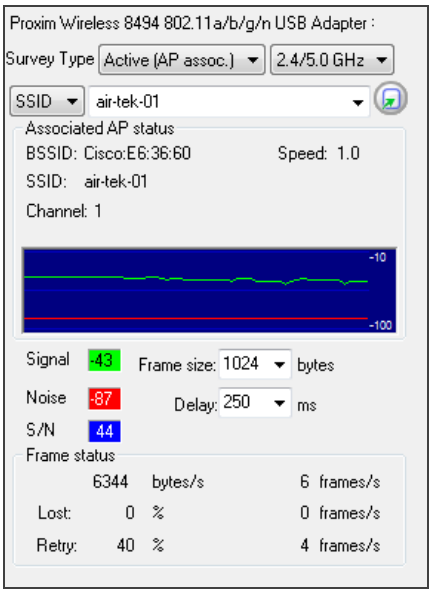
6. Use the first drop-down to select the frequency band (media type), either **2.4 GHz**, **5.0 GHz**, or **Both**.
7. Use the first drop-down to select **SSID** (to associate to a specific SSID) or **AP** (to associate to a specific AP).
8. Use the second drop-down to select the **SSID** or **AP** to which the application should associate.
9. If the selected SSID or AP requires a specific authentication mechanism, configure this information via the 802.11 tab from the **File > Configure**… menu or Windows' Network and Internet Settings. See Configuring 802.11 Parameters for more information. If no authentication is necessary, continue to Step 9.
10. Click (Start Survey) and walk through the planned survey path, clicking as necessary to indicate each step in the survey.
    - Survey automatically spaces data points over time, so you only need to click a point when you start the survey or when you change direction.
    - While conducting a survey, click from time-to-time to save the data as you travel along your survey path. Otherwise, an inactivity timer automatically pauses the survey. (You are prompted and a countdown timer appears before the automatic pause.)

    Note: AirMagnet recommends that you maintain a steady pace slower than a normal walk to gather as much data as possible.
11. Click (**Stop Survey**) once enough data have been collected.
12. Save the survey data when prompted.

For instructions on how to view and analyze survey data, See Introduction to Data Analysis.

Active Survey Data Window

The figure below shows the Data Window when AirMagnet Survey is set in active survey mode using a NetAlly supported adapter that supports both the 2.4 GHz and 5 GHz bands.



Option	Description
Adapter	The adapter used for the survey is listed at the top of the window.
Survey Type	Options are **Active**, **Passive** and **Active iPerf**.
Media Type	Options are **2.4 GHz**, **5.0 GHz**, or **Both**. **NOTE:** This option is displayed only if you are using a NetAlly supported adapter.
SSID/AP	Choose from the drop-down menu to select a specific AP or SSID during the active survey. **NOTE:** This option is displayed only if you are using a NetAlly supported adapter.
Roaming	Allows you to set the roaming criteria for the survey. See Setting Roaming Properties. **NOTE:** This option is displayed only if you are using a NetAlly supported adapter.
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 bands being scanned (2.4 GHz, 5 GHz) band. The lower the value, the less the noise.
S/N	The signal-to-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

Use the (**Roaming Option**) button in the upper-right corner of the active survey window to control the roaming capability of the wireless network adapter. You can define precisely when the adapter roams, based on the properties that you configure in the Set Roaming Criteria dialog box. See the figure below.

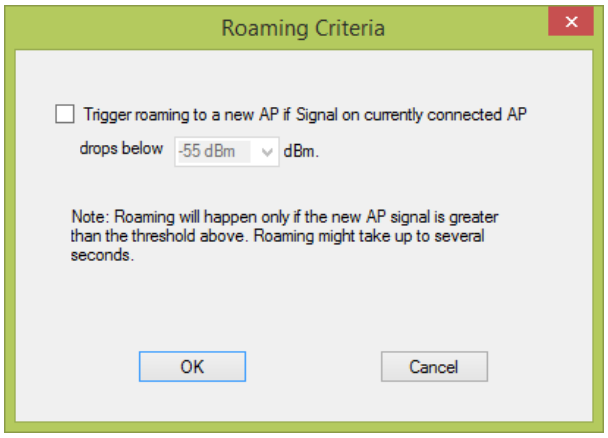
A list of adapters that support this feature may be found under the "Supported Adapters" section of the AirMagnet website at: https://www.netally.com/wp-content/uploads/APA_FL_21_V2.pdf. Locate the desired adapter, and then click **FEATURE DETAILS**. See the column labeled "Roaming Control for Active Surveys."

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

Note: To test roaming during an active survey, 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 a value.
4. Click **OK**.

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

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.

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 "epiphany". (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 Akbar.
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 then 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 can run both upload and download throughput measurements at the same time. While using iPerf 3, you can run upload or download tests only. iPerf 3 does not support the option to run both tests at the same time.
- You 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 cannot perform an iPerf 2 survey against the NetAlly Test Accessory.
- iPerf 3 surveys are only supported while using Wi-Fi 5/Wi-Fi 6 adapters. (You can still 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.

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.

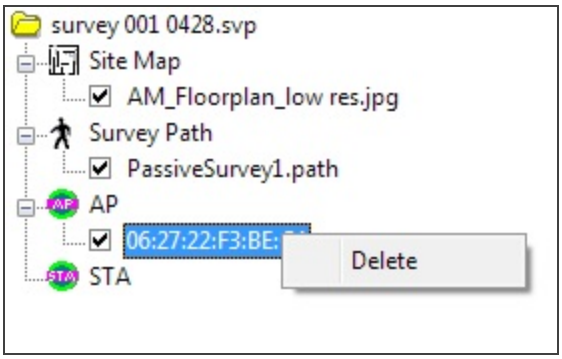
Passive Survey: When you Start a Passive Survey (Click **Start Survey**), detected AP(s) are listed in the Active Survey Data window. Before the first click, you can drag a desired AP listing on to the floor plan to indicate its actual location. You can do this one-at-a-time for as many APs as desired.

When you stop and save the survey, any APs on the floor plan get saved in the associated Survey Data Files (.svdx) that gets 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 are 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 are in the next survey (since the last survey was saved and closed) or, if you do not conduct another survey, these APs are 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) still contains 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 appear in the data file in Display view (see 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; it is kept in the survey project.

Merging Survey Data

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 then use this consolidated (.svp) file to plan and enhance your wireless network.

NetAlly 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).

See How to Merge Survey Data for more information.

Documenting Your Surveys and Analyses

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

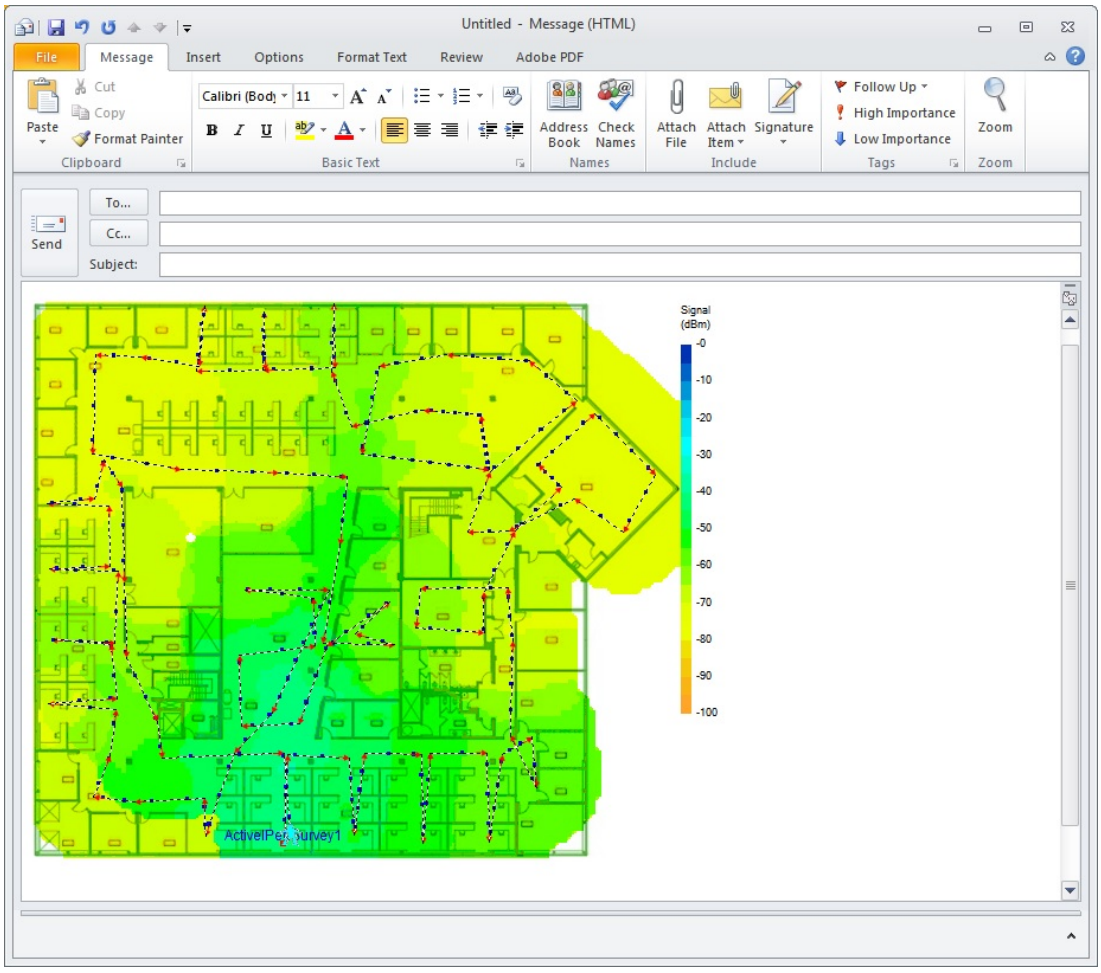
Copying Your Data into Other Applications

You can copy your survey data and the results of your analysand (displayed in the Map Window) into any software application that supports the copy-and-paste function. The copied data contains 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.

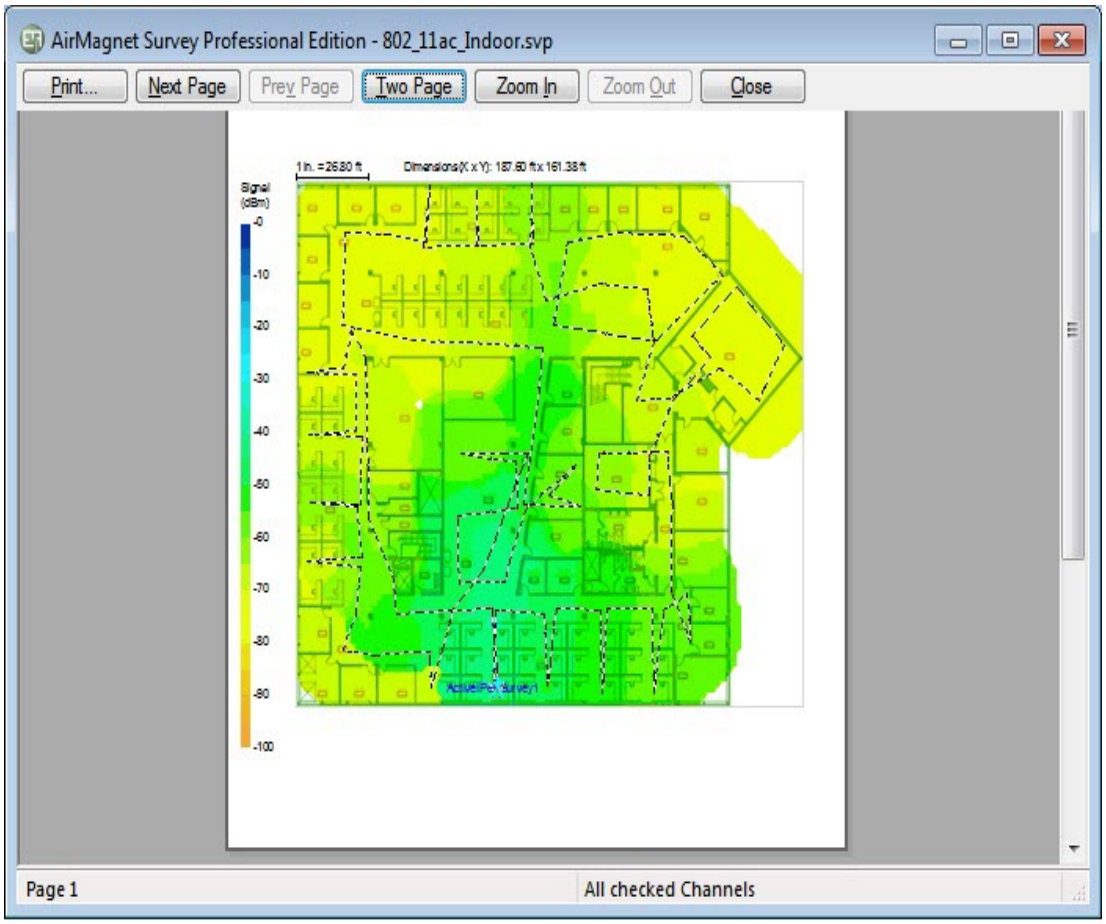


Printing Your AirMagnet Survey Data

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 analysis, simulation, or filtering. This can be an effective way to document your site surveys and WLAN infrastructure, as well as an easy way to share your work.

To print your survey data:

1. Display the file in the *Map Window.*
2. Click **File > Print Preview.** A *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. Choose your desired print options, and then click **OK**.

Creating Outdoor (GPS) Surveys

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

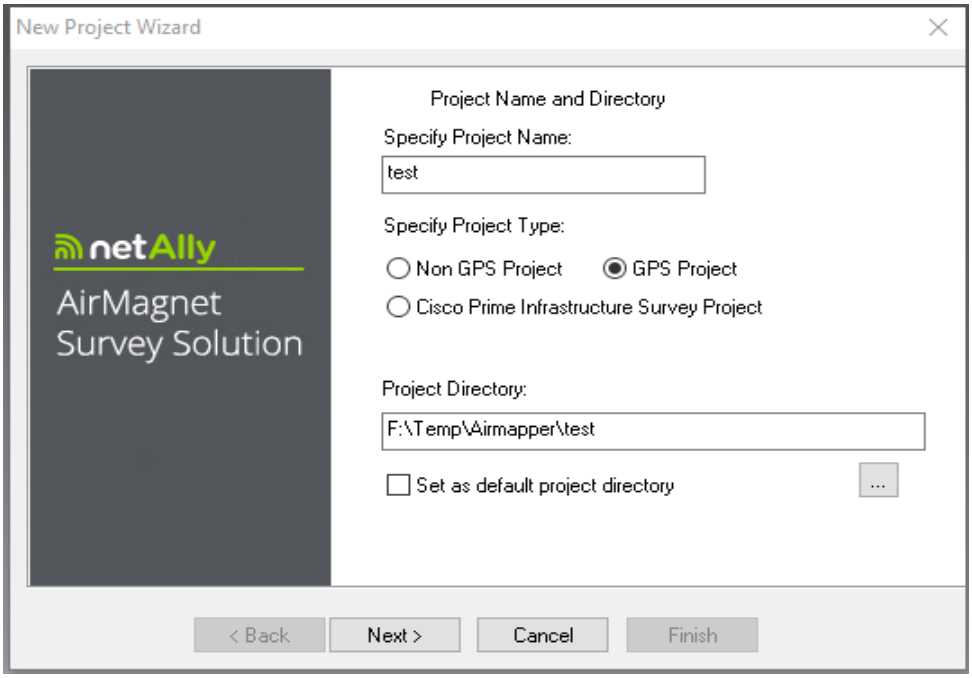
NOTE: Before you begin, make sure that you have configured and enabled the GPS port. See Configuring the GPS COM Port.

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.
4. Create a new GPS Survey project (see details below).
5. 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 displays the GPS coordinates of the spot where you clicked.

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

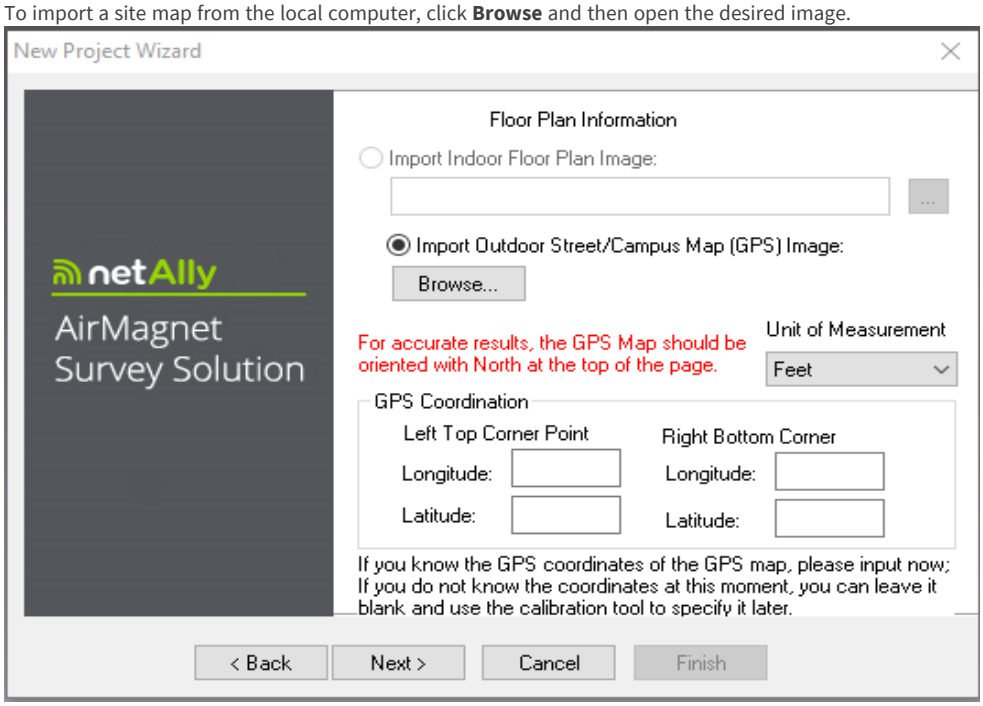
1. Start AirMagnet Survey and click **File > New Project....** The New Project Wizard view appears.



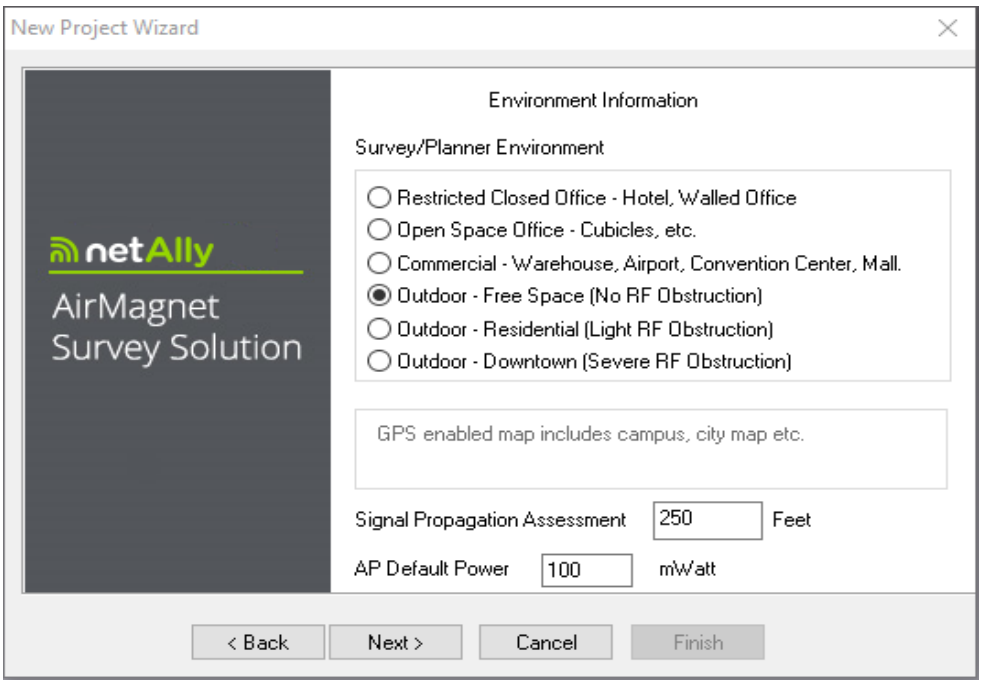
2. Specify the name of the new project.
3. Select **GPS Project**.
4. Type the directory path or browse to the location where you want to store the project file.
5. Click **Next**.

   Note: The following steps assume you want to import a site map (image file) from your local computer.
6. Click the **Import Outdoor Street/Campus Map (GPS) Image** radio button. The "Select Type" drop-down appears, which lets you browse for a map.

7. To import a site map from the local computer, click **Browse** and then open the desired image.



8. If you know the values of GPS coordinates, enter them now. (You can also use the calibration tool  to calibrate the data later. For more information about GPS calibration, see Performing a GPS-Aided Site Survey.)
9. Click **Next**. The New Project Wizard view refreshes.



10. For **Survey Environment**, check the outdoor option that best matches the environment to be surveyed.
11. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the survey environment you have 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, NetAlly recommends that you accept the default value the program assigns. (You can set a value of your own, but note that the value you specify affect the way the program interpolates survey data.

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

    Note: If you know the value of AP power, enter it now. (It is used for data simulation.)

13. Click **Next**. The New Project Wizard view refreshes.
14. Enter a short description of the project in the space, and then click **Finish**. The newly created Survey project automatically opens on the Display view with the site map in the Map Window.

Creating Outdoor (GPS) Surveys

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

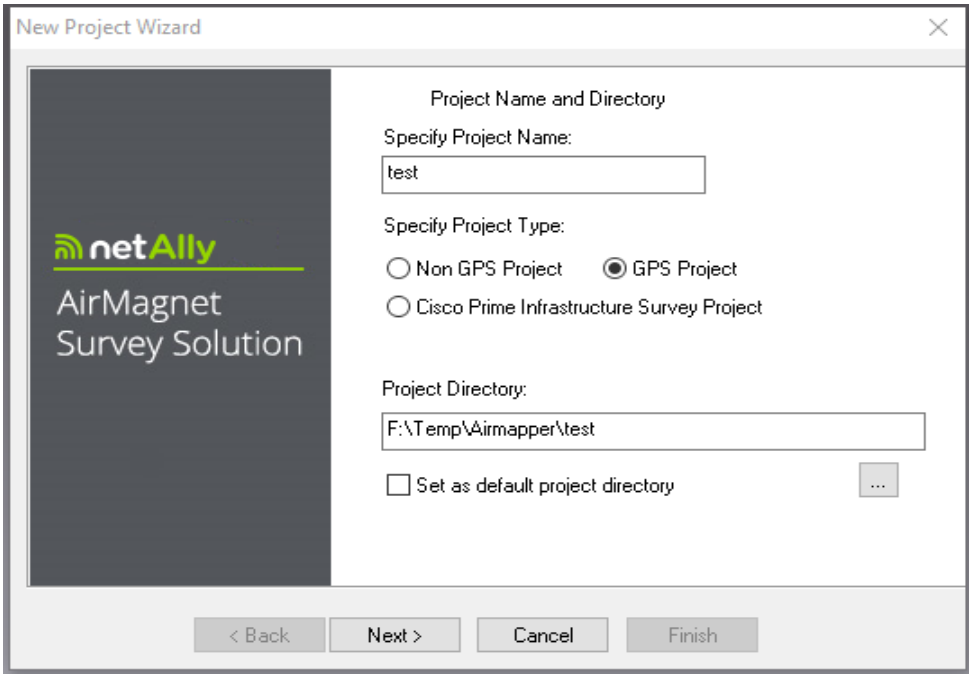
NOTE: Before you begin, make sure that you have configured and enabled the GPS port. See Configuring the GPS COM Port.

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.
4. Create a new GPS Survey project (see details below).
5. 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 displays the GPS coordinates of the spot where you clicked.

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

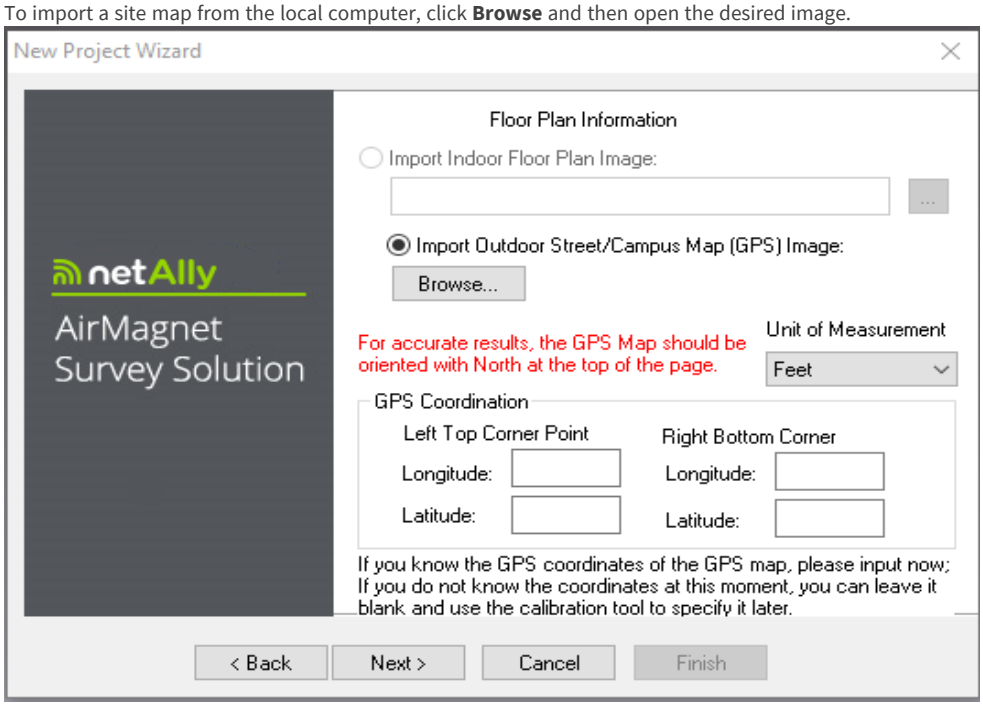
1. Start AirMagnet Survey and click **File > New Project....** The New Project Wizard view appears.



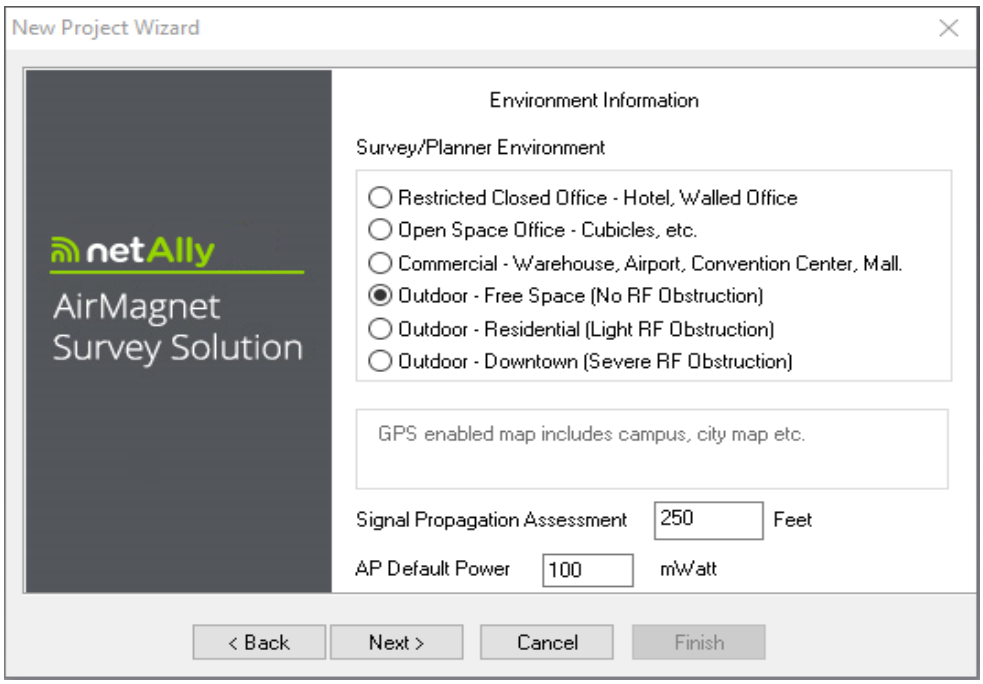
2. Specify the name of the new project.
3. Select **GPS Project**.
4. Type the directory path or browse to the location where you want to store the project file.
5. Click **Next**.

   Note: The following steps assume you want to import a site map (image file) from your local computer.
6. Click the **Import Outdoor Street/Campus Map (GPS) Image** radio button. The "Select Type" drop-down appears, which lets you browse for a map.

7. To import a site map from the local computer, click **Browse** and then open the desired image.



8. If you know the values of GPS coordinates, enter them now. (You can also use the calibration tool  to calibrate the data later. For more information about GPS calibration, see Performing a GPS-Aided Site Survey.)
9. Click **Next**. The New Project Wizard view refreshes.



10. For **Survey Environment**, check the outdoor option that best matches the environment to be surveyed.
11. For **Signal Propagation Assessment**, do nothing (normally), since AirMagnet Survey can automatically assign the value according to the survey environment you have 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, NetAlly recommends that you accept the default value the program assigns. (You can set a value of your own, but note that the value you specify affect the way the program interpolates survey data.

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

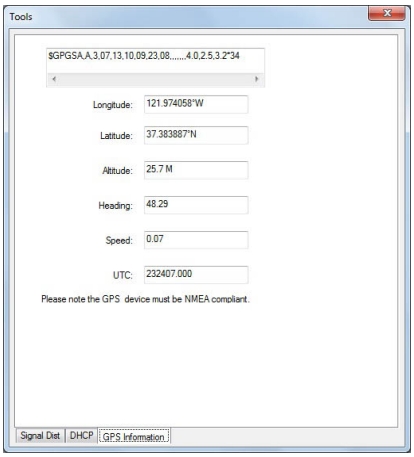
    Note: If you know the value of AP power, enter it now. (It is used for data simulation.)

13. Click **Next**. The New Project Wizard view refreshes.
14. Enter a short description of the project in the space, and then click **Finish**. The newly created Survey project automatically opens on the Display view with the site map in the Map Window.

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, check the connection between Survey and the GPS device. No data can be collected if communication has failed.

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

Performing a GPS-Aided Site Survey

After you establish the communication between AirMagnet Survey and the GPS device, you can start performing the 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 displays the GPS coordinates of the spot where you clicked.

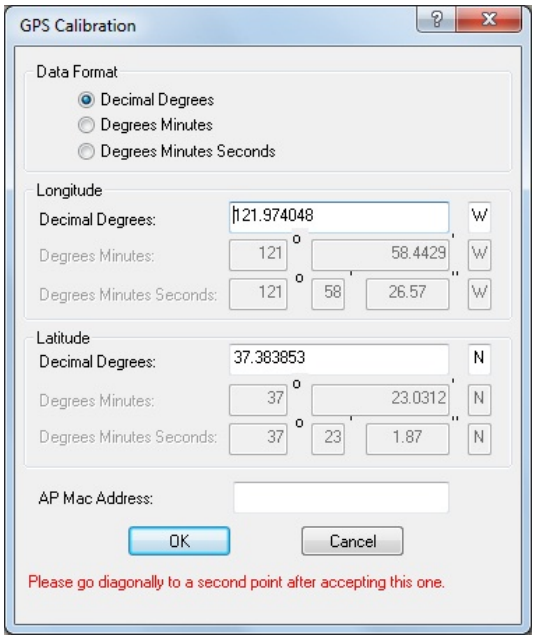
To calibrate the GPS Coordinates:

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."

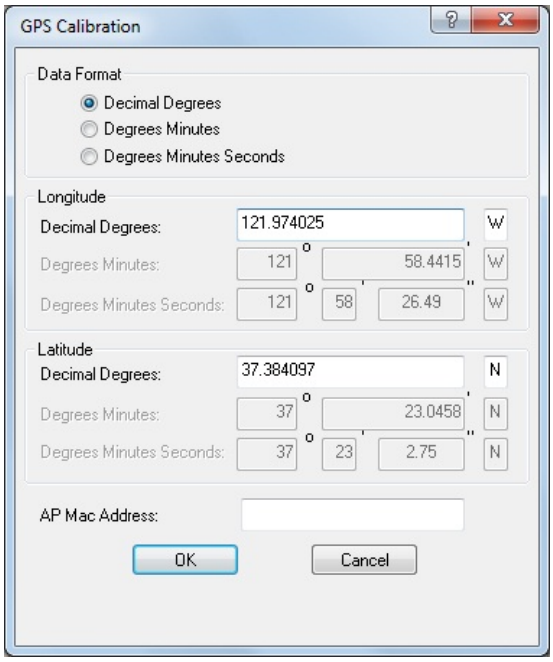
1. Open a GPS-aided survey project that you have created.
2. From the GPS map, determine the two locations where GPS coordinates are to be taken.

    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  (**Calibrate GPS**), and then click the first spot on the GPS map. AirMagnet Survey starts to recalibrate the GPS information.



4. Click **OK** to close the view.
5. Move to the second location and click the corresponding point in the map. Survey recalibrates the GPS coordinates for this location.

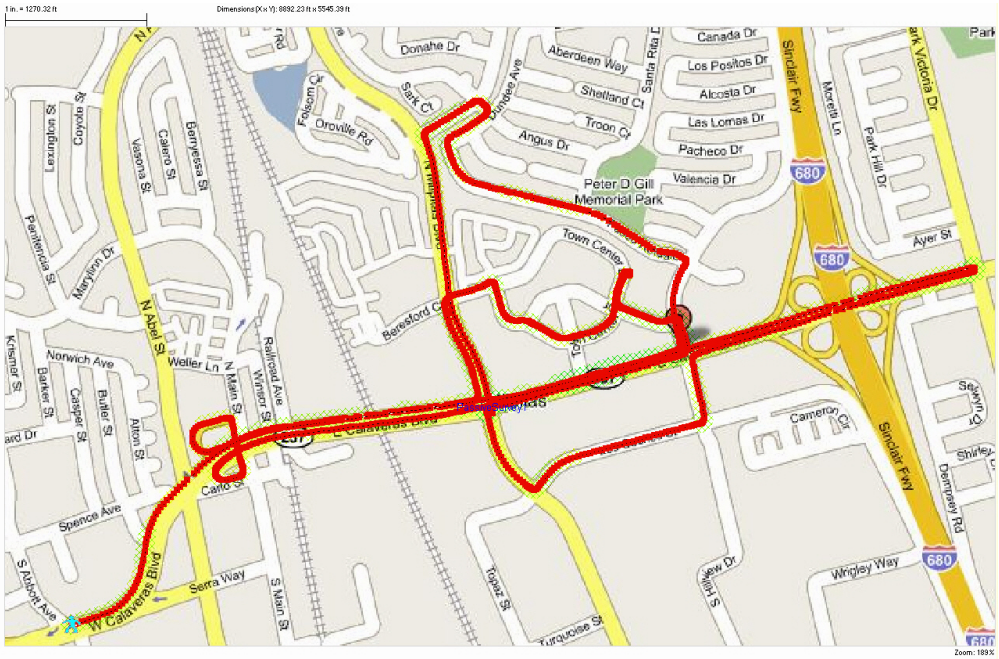


6. Click **OK** to close the view. A dialog box appears asking if you wish to start the survey.
7. Click **Yes** or go to "Starting the GPS Survey" to do so manually.

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

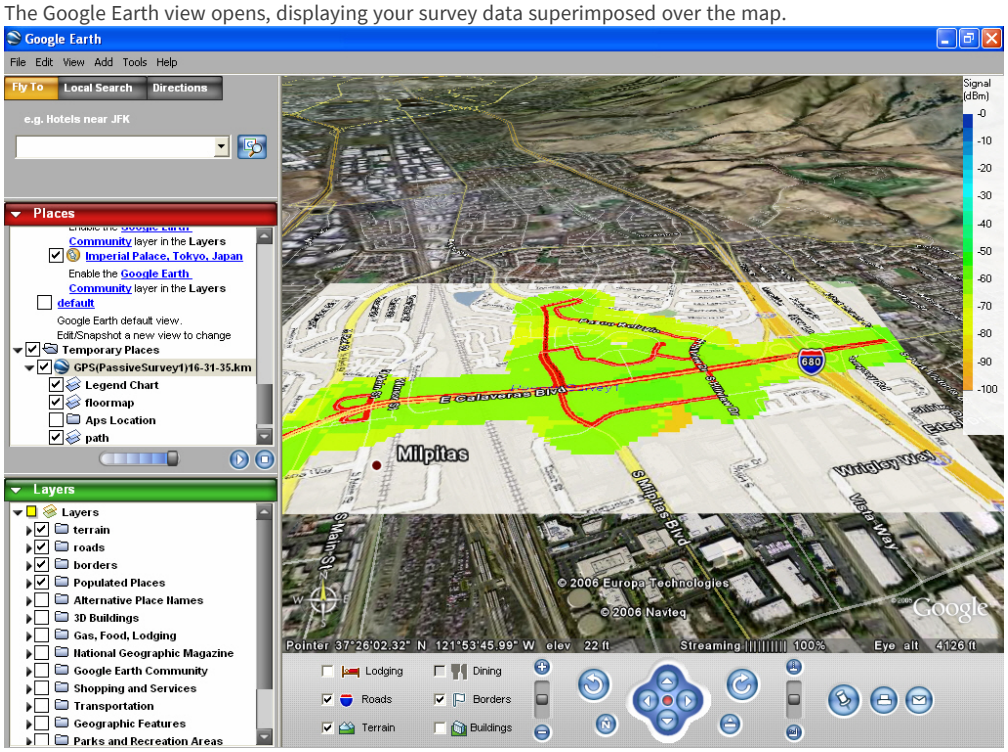
You can export your survey data collected during a GPS-aided site survey to Google Earth so that you can view the data on a larger scale.

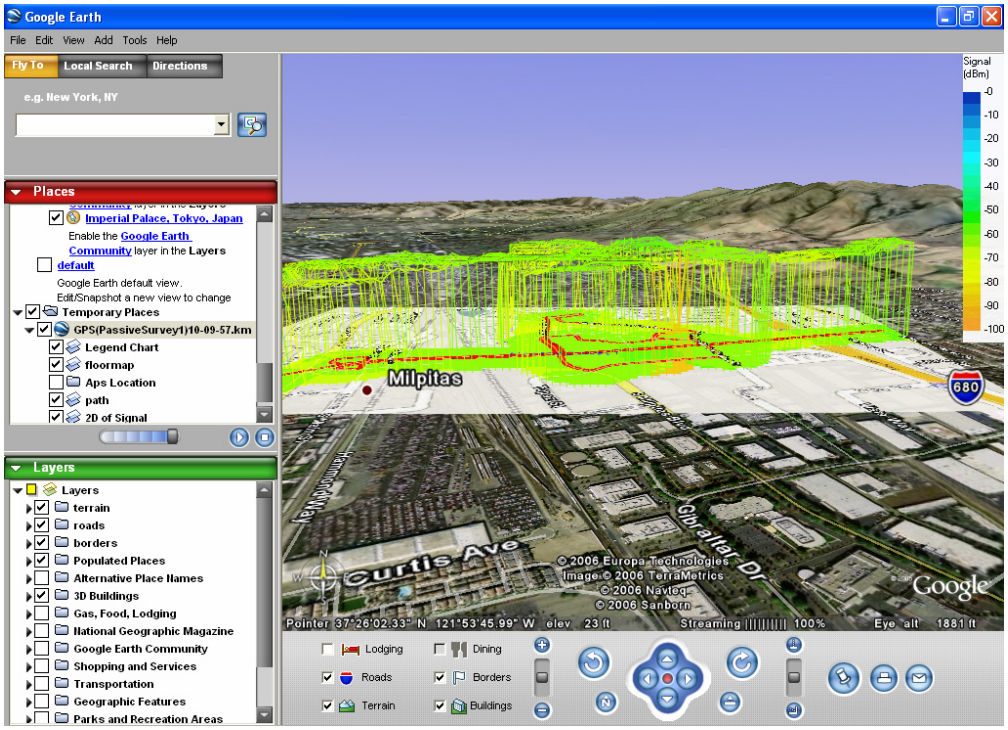
Note: You must be working from the Display view to export data to Google Earth.

To export into Google Earth:

1. Download and install Google Earth software (if not already done) from https://earth.google.com/intl/earth/download/ge/agree.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.





Conducting VoFi Surveys

VoFi surveys can help you troubleshoot problems in a VoFi deployment by providing details about active calls such as WiMOS, roaming frequency, and signal strength. A VoFi survey is a critical part of planning any voice-over-WLAN deployment because you get a comprehensive view of the wireless environment from the perspective of a VoFi phone. A VoFi survey helps you identify any problems or wireless hazards before the network is fully operational when such problems are much easier to fix. Taking time to properly survey and troubleshoot the predeployment environment can greatly improve the resulting install-ation.

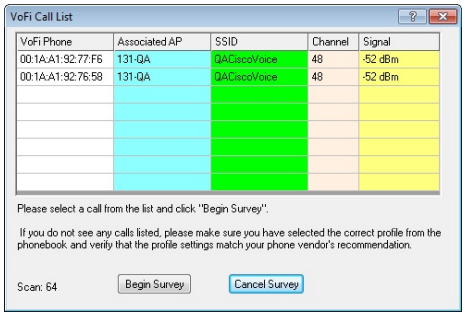
VoFi surveys gather data from an active connection between a wireless AP and a VoFi phone. Before starting the survey, you must establish a call between two phones. (One must be a VoFi phone; the other may be VoFi or wired phone, but it must remain stationary during the survey.) Once Survey detects the call, you can start collecting the survey data.

Notes:

- To verify that an existing wireless deployment is VoFi-ready, follow the instructions provided with the Verifying VoFi Network Compliance.
- 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.
- Not supported for the 6 GHz band.

To conduct a VoFi survey:

1. Create a new survey project.
2. Configure Survey's VoFi phone book.
3. In 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 then 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.
7. Click **Begin Survey**.
8. Click regularly along the survey path to collect data, just as you would when performing a standard data survey. A pop-up status window appears whenever the phone roams.
9. Once the survey is completed, click (**Stop Survey**).
10. Save the data.

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

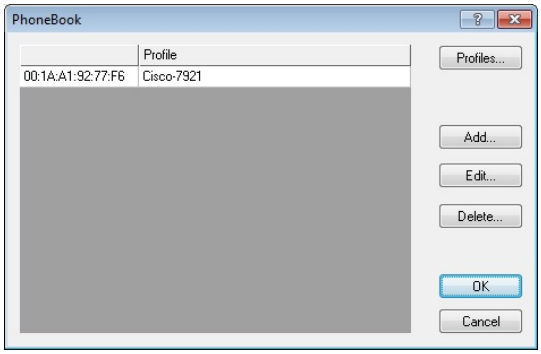
Configuring a VoFi Phone Book

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 to ensure that Survey can properly interpret the data received from VoFi surveys. This process consists of you creating VoFi phone profiles in Survey's phone book 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.



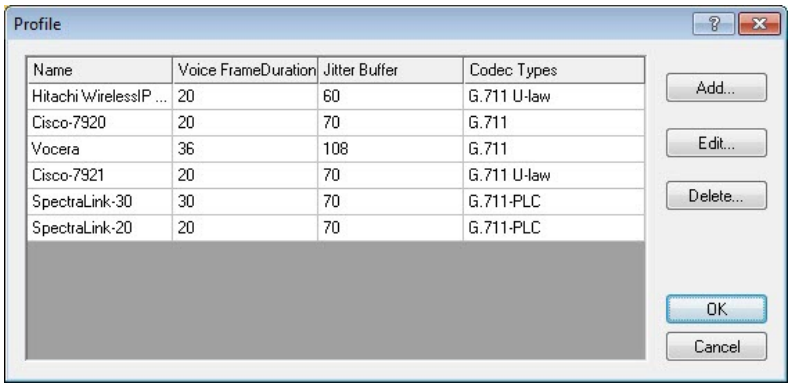
Note: The phone book configuration process consists of two steps: create a VoFi phone profile and add the VoFi phones to the Phonebook. Click the links for more details.

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. If you do not create profiles in Survey that correspond to the phone types in use, you may not get 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 (NetAlly 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. See 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.
7. When finished, click **OK** to close the VoFi Profiles window.

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

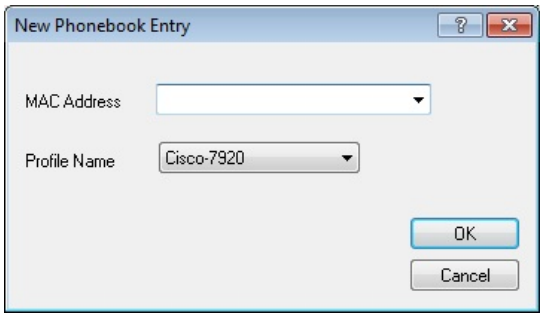
Once all necessary profiles are implemented, you can add phones to their corresponding profiles, as described here.

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.

Conducting VoFi Surveys

VoFi surveys can help you troubleshoot problems in a VoFi deployment by providing details about active calls such as WiMOS, roaming frequency, and signal strength. A VoFi survey is a critical part of planning any voice-over-WLAN deployment because you get a comprehensive view of the wireless environment from the perspective of a VoFi phone. A VoFi survey helps you identify any problems or wireless hazards before the network is fully operational when such problems are much easier to fix. Taking time to properly survey and troubleshoot the predeployment environment can greatly improve the resulting installation.

VoFi surveys gather data from an active connection between a wireless AP and a VoFi phone. Before starting the survey, you must establish a call between two phones. (One must be a VoFi phone; the other may be VoFi or wired phone, but it must remain stationary during the survey.) Once Survey detects the call, you can start collecting the survey data.

Notes:

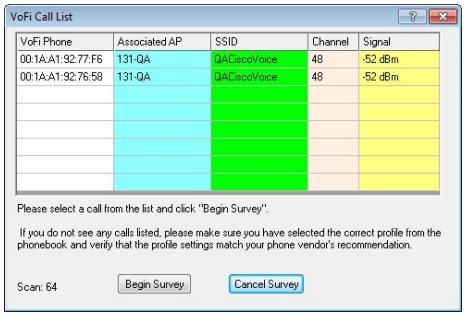
- To verify that an existing wireless deployment is VoFi-ready, follow the instructions provided with the Verifying VoFi Network Compliance.
- VoFi surveys require that you carry an actively connected VoFi phone along with the laptop during the survey process. For best results, attach the phone to the 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.

- Not supported for the 6 GHz band.

To conduct a VoFi survey:

1. Create a new survey project.
2. Configure Survey's VoFi phone book.
3. In 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 then select **VoFi Phone Survey**.
5. Start a call with the VoFi phone and click (**Start Survey**). The **VoFi Call List** dialog box appears.

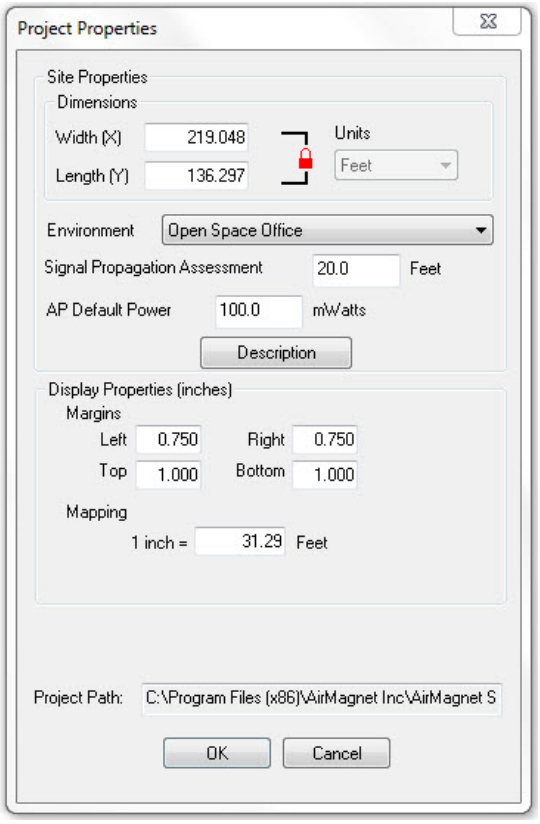


6. Select the phone's MAC address from the call list.
7. Click **Begin Survey**.
8. Click regularly along the survey path to collect data, just as you would when performing a standard data survey. A pop-up status window appears whenever the phone roams.
9. Once the survey is completed, click (**Stop Survey**).
10. Save the data.

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

Modifying Project Properties

You can use the Survey view to change the properties that you specified when you created a project. For example, the dimensions of the site may need correction, new infrastructure may have been installed, or a site map may appear to be stretched.



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 you 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 you 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. See The Toolbar for more details.
Project Path	Directory location for the open project.

Sharing a Survey Project

You can share an AirMagnet Survey project with other users who have AirMagnet Survey or AirMagnet Viewer installed on their computer along with a valid license. (For viewer restrictions, see Survey Viewer License.)

To share your project with another user:

1. Locate the survey project folder (the folder created when you set up your new project). The folder name matches the project name you gave your project. The default location is in the My Documents folder.

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.

Survey User Interface Reference

To learn more about the interface options for the Survey View, see:

File Menu

Item	Description
New Project...	Crete a new Survey project and open the XXX dialog. The file extension is .bml
Open...	Open a multi-floor building project. The file extension is .bml
Save	Saves the current project.
Save Project As...	Opens a file management window so you can save the current project under a different name.
Close Project	Closes the current project after prompting you to save any unsaved changes.
Configure...	Opens the project settings dialog to the Settings tab.
Phonebook...	Displays the VoFi Phonebook.
Print...	Opens the system Print dialog.
Print Preview	Open a print preview of the current view.
Print Setup...	Opens the system Print Setup dialog.
Recent Projects	List any previously opened project files.
Open AirMagnet Planner Project	Opens an AirMagnet Planner Planner project in Multi Floor Planner.
Exit	Closes Survey.

Edit Menu

Item	Description
Copy Heatmap Image	This menu has only one option, **Copy Heatmap Image (Ctrl+C)**. Selecting this option copies the heatmap from the map window to the clipboard as a .png file.

View Menu

Option	Description
 **Zoom In**	Enlarges the view of the current floor map in the map window. (You can also use your mouse's scroll wheel.)
 **Zoom Out**	Reduces the view of current floor map in the map window. (You can also use your mouse's scroll wheel.)
 **Zoom to Fit**	Fits the current floor map to the map window.
 **Zoom to Actual Size**	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 an AutoCAD 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.
Project Properties...	Opens the Project Properties window where you can adjust the properties for 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.

Help Menu

Item	Description
View Help	Open Help documentation
Sample Projects	Open a sample Survey projects for indoor, outdoor, or VoFi surveys.
About AirMagnet Survey PRO	View basic information about Survey such as version and build number.
Check Update	Find out if there is a newer version of AirMagnet Survey PRO.

Multi Floor Planner

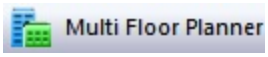
In this chapter:

Introduction To Multi Floor Planner

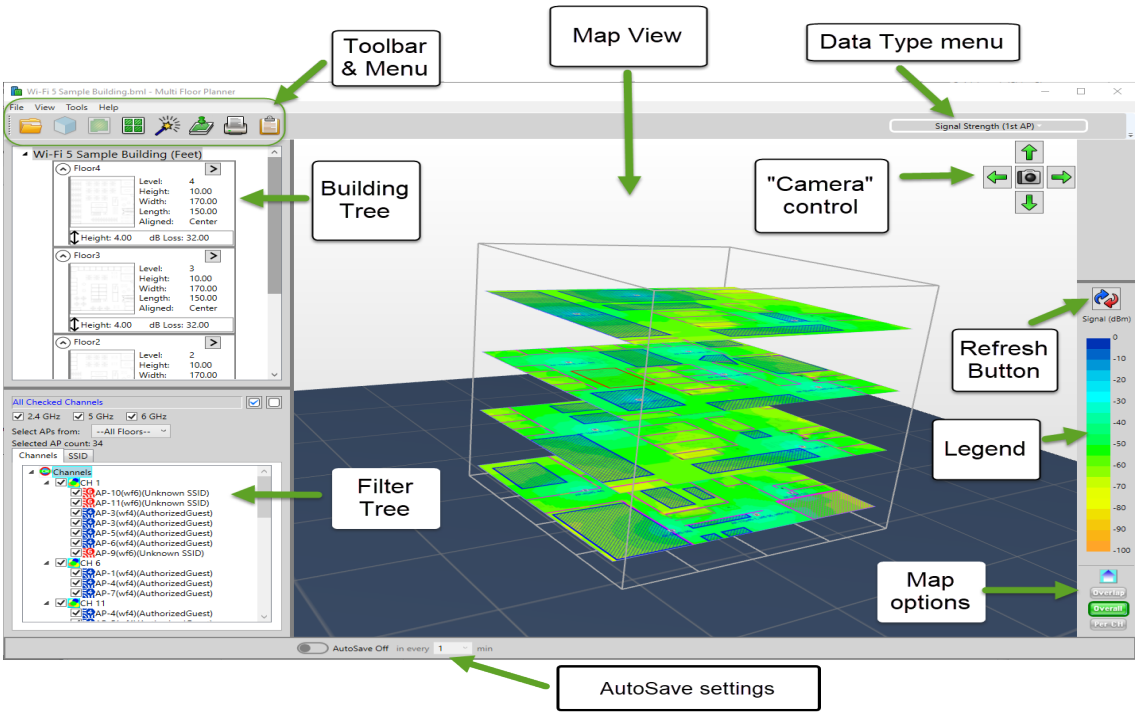
Multi Floor Planner (MFP) allows you to simulate AP signal propagation for a building before deployment to determine optimal AP placement and configuration, plus view signal propagation that occurs between floors in a multi-floor building. With MFP, you can:

- Create a building projects that consists of multiple floors.
- Create floor plans for each floor in the building.
- Determine the best location and configuration for APs on each floor.
- View predictive heatmap visualizations of how APs on one floor may affect signal strength coverage to other floors or create channel interference.

Open MFP by clicking the **Multi Floor Planner** button:



Once you open a project (you can open a sample Wi-Fi 5 or Wi-Fi 6 project from **Help > Sample Project**), the main screen has these features:



(See Viewing Multi Floor Data for more information about the main MFP screen.)

Steps in Using Multi Floor Planner

- See Starting the Multi Floor Planner Building Project to learn how to start the MFP project.
- See Creating a Site Plan for instructions on adding walls, identifying coverage areas, placing APs, and more.
- See Viewing Multi-floor Data for additional viewing tips and controls.
- See Multi Floor Planner Reports for details on creating reports for finished site plans.
- See Export to CAD for information on exporting site plan results to CAD format.
- See the Multi Floor Planner Menu and Toolbar Reference for information on using the interface.

See also:

- See Using Legacy AirMagnet Planner Projects for notes on setting up projects based on single-floor AirMagnet Planner projects.

Using Legacy AirMagnet Planner Projects

Multi Floor Planner (MFP) has several features to make it easier to use existing AirMagnet Planner site plans and information.

- You can open multiple AirMagnet Planner projects directly into a new Multi Floor Planner (MFP) project and then assign the projects to a floor.
  - See Starting the Multi Floor Planner Building Project for more information.
  - **TIP:** You may find it convenient to copy the .spi files, floor plan files, and .svp files for each Planner project into a common directory that you can then open in MFP. (Do not delete the original Planner project files or directories.)
- You can import single AirMagnet Planner projects to specific floors in a MFP project. See To add and manage floors in a building project for more information.
- You can import area and wall definitions from AirMagnet Planner to MFP. See "Configuring Walls and Areas" on page 85.

CAUTION: When you use existing AirMagnet Planner site plans into a MFP building project, they are added by reference (absolute directory path). Therefore, saving changes in MFP updates the source files. If you want to avoid modifying existing projects, make a copy of original project folder to use with MFP.

Creating a Site Plan

Now that you have created a project and imported your site map, you must draw up your planned office arrangement so you can analyze your AP setup. AirMagnet Planner's drawing tools help you design your ideal office and then determine how many APs you need to realize that goal.

Click on the links below to view each section.

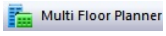
- Adding APs to the Plan
- Generating the Advisor Layout
- Drawing Attenuation, Coverage, and Exclusion Areas
- Use the wall tool or automatic wall extraction (AWE) tool to create walls. (AWE is available only if you used an AutoCAD format drawing for your floor plan.)
- Using Antenna Manager

Starting the Multi Floor Planner Building Project

This topic describes how to create and edit a Multi Floor Planner (MFP) building project. Subtopics include:

- Open Multi Floor Planner
- To create, import, or open an existing project
- To create or edit basic building properties
- To add and manage floors in a building project
- To configure each level in the building project

Open Multi Floor Planner

Click 

on the navigation Bar or from the **File** menu. MFP opens in a new window.

To create, import, or open an existing project

- To create a new building project, select **File > New** from the File menu. This opens the New Building dialog. See below for more information.
- To open an existing project:

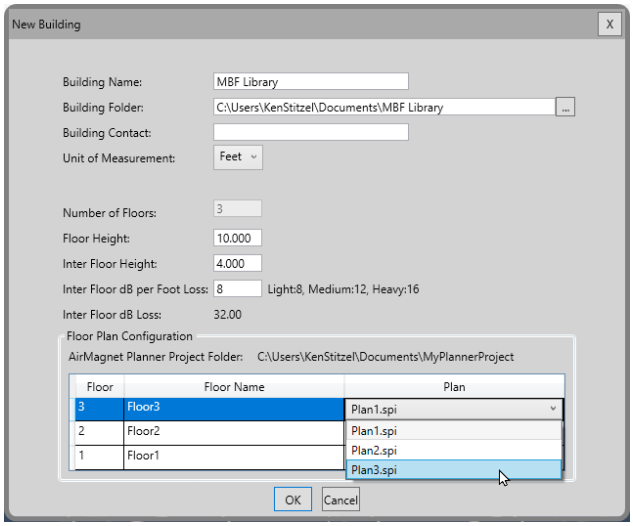
- Select **File > Open**. Browse to the building project file.
- To open an AirMagnet Planner legacy project, select **File > Open AirMagnet Planner Project**. Browse to the building project file. See Using Legacy AirMagnet Planner Projects.

- To import a project:
  In MFP, select **File > Import**. Browse to the building project .zip file and open it.

  Note: The building project must have been previously exported (**File > Export**) to create the .zip file.

Add or edit basic building properties

1. Access the New Building dialog or Edit Building dialog:
   - For a new building project, the New Building dialog opens automatically. (This dialog is the same as the Edit Building dialog.)
   - For an existing project or an imported a project, select **View > View Building Properties**. This opens the Edit Building dialog. (This dialog is the same as the New Building dialog.)
2. Fill out the information on the New Building dialog, and then click **OK**.

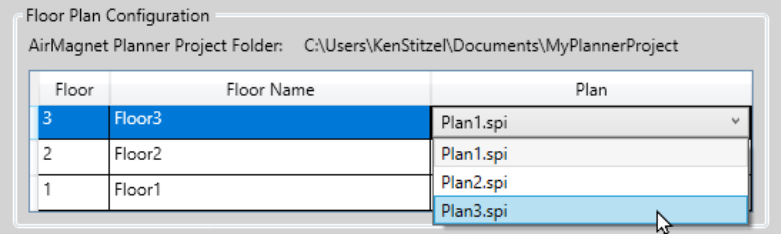


NOTE: The New Building dialog contains the Floor Plan Configuration section only when you have opened a AirMagnet Planner project. See Floor plan configuration for AirMagnet Planner projects.

Item	Description
Building Name	Type a building name or description.
Building Folder	Enter the directory path for the project files.
Building Contact	Type a name for company or person to contact with questions about the project.
Unit of Measurement	Choose **Feet** or **Meters**. If you are not sure of the dimensions, you can enter approximate values here and then recalibrate the values more accurately later. See Measuring and Calibrating the Floor Plan Scale.
Number of Floors	Enter the total number of floors in the building.
Floor height	Enter the floor-to-ceiling distance for each floor.
Inter-Floor Height	Enter the amount of space between each floor that is not part of the floor-to-ceiling distance.
Inter-Floor dB per <unit> Loss	Choose a number for light, medium, or heavy loss of signal between floors.

Floor plan configuration for AirMagnet Planner projects

The Floor Plan Configuration section appears only when you have opened a AirMagnet Planner project. Use this part of the dialog to match single-floor projects to floors in the MFP project.



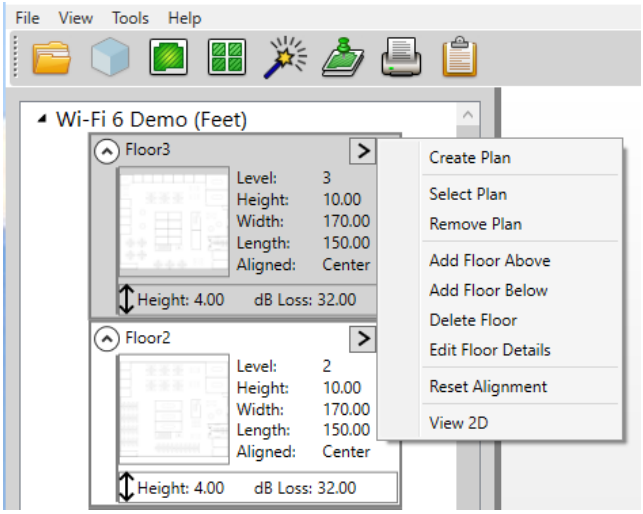
1. Click on the floor to select it.
2. Use the Plan drop-down menu to select the legacy plan to match the Floor number.
3. Click **OK** when you have matched each floor.

Notes:

- The number of floors is determined automatically by the number of .spi files. You can add (or delete) floors as needed after you finish creating the building project.
- Different floors can use the same .spi file. (To avoid file conflicts with the .spi file, MFP creates a new folder for the building project when you use the same .spi file.)
- You do not have to use all of the available .spi files.

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 (or click)	Creates a new floor plan project for this floor.
Select Plan (or click)	Imports a site plan to this floor.
Remove Plan	Removes the floor site plan from this floor.
Add Floor Above	Insert a new floor above this floor.
Add Floor Below	Inserts a new floor below this floor.
Delete Floor	Deletes this floor from the building and 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.

NOTE: If you use the **Select Plan** option to import a floor plan, the plan is imported "by reference": if you modify the floor plan in MFP and save the project, the original floor plan is modified to reflect the changes. (Likewise, any changes you make to the floor plan in AirMagnet Survey PRO are also shown when you re-open the project in MFP.)

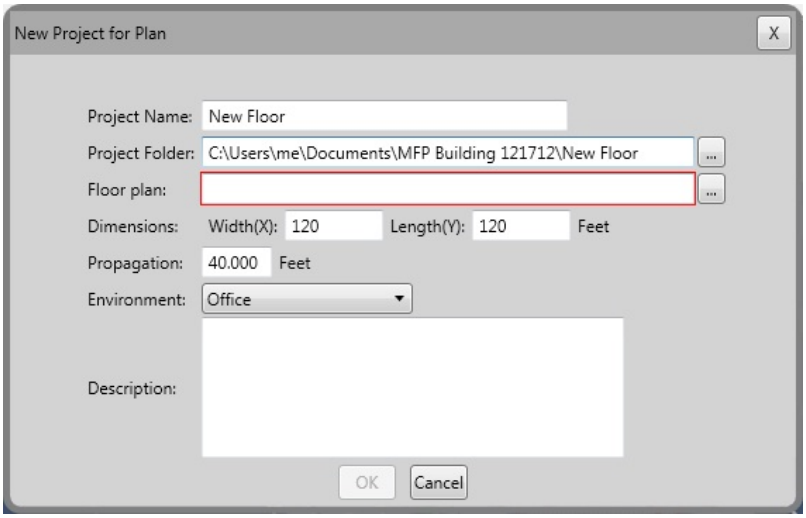
To configure each floor in the building project

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

For 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 site plan. A valid site plan has a .spi file extension.

For 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 is created is in 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. See Supported Image File Formats. **Note:** The Microsoft 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. See Measuring and Calibrating the Floor Plan Scale.
Propagation	A default value default based on the estimated distance that RF signals can travel in a typical site environments. NetAlly recommends that you accept the default value the program assigns. If you change this value, be aware that the value affects the way the program interpolates data for the entire site.
Environment	Select an option that best matches the actual site environment.
Description	(Optional) Type a text description of the project here.

Each floor in the building tree includes a summary of the values that you entered.

For additional configuration options:

- Configuring Multi Floor Planner to set general default values.
- Configure Plan for information on adjusting the sampling density.

Next Steps:

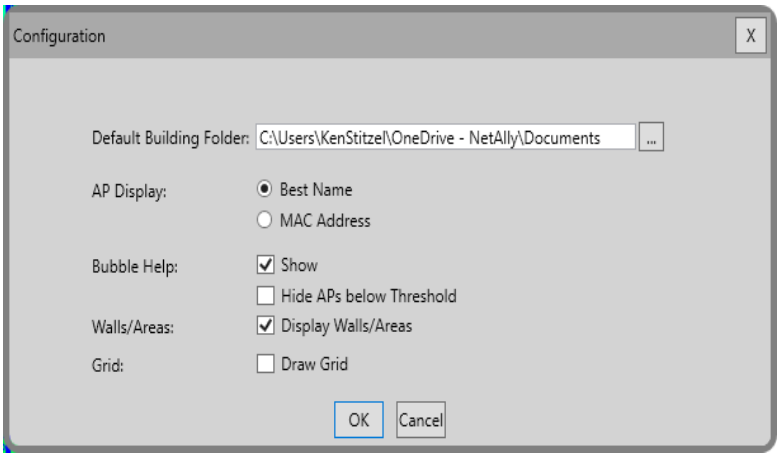
- Creating a Site Plan

Configuring Multi Floor Planner

The Tools menu provides several optional configuration steps for setting up your MFP project.

General Configuration

To set up general configuration choices, select **Tools > Configure** to show the general configuration dialog. This dialog lets you set the default folder for buildings and display options.

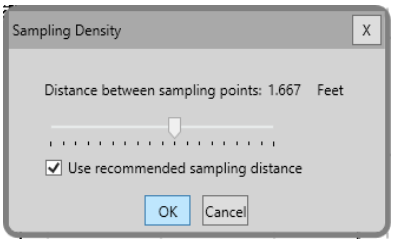


Item	Description
Default Building Folder	Enter the default directory path for the storing project files.
AP Display	Choose either **Best Name** (to display a text name for each AP) or **MAC Address** (to display by the MAC address).
Bubble Help	Check or uncheck to display AP information bubble when you hover the mouse help over an AP in the floor plan/map view.
Hide APs below Threshold	Check or uncheck to toggle display all APs or to hide APs that don't exceed the required signal threshold.
Walls/Areas	Check or uncheck to toggle display of grid lines in the floor plan/map view.

Configuring the Plan (Signal Density)

To set the signal density for Configuring the sampling density is an optional step. Selecting **Tools > Configure Plan** to open the Sampling Density dialog. This dialog has a slider that lets you control the precision with which Multi Floor Planner (MFP) processes signal data.

- Setting a value toward the left (low) end of the bar means that processing signal data takes less time but is less comprehensive.
- Setting a value toward the right (high) end the bar means that signal data results have more detail but take more time to process.
- (Optional) Select the **Use recommended sampling distance** checkbox to have MFP automatically calculate a suggested value. MFP calculates this value based on the size and complexity of the site plan in use. Larger maps have a larger recommended value to reduce processing time.

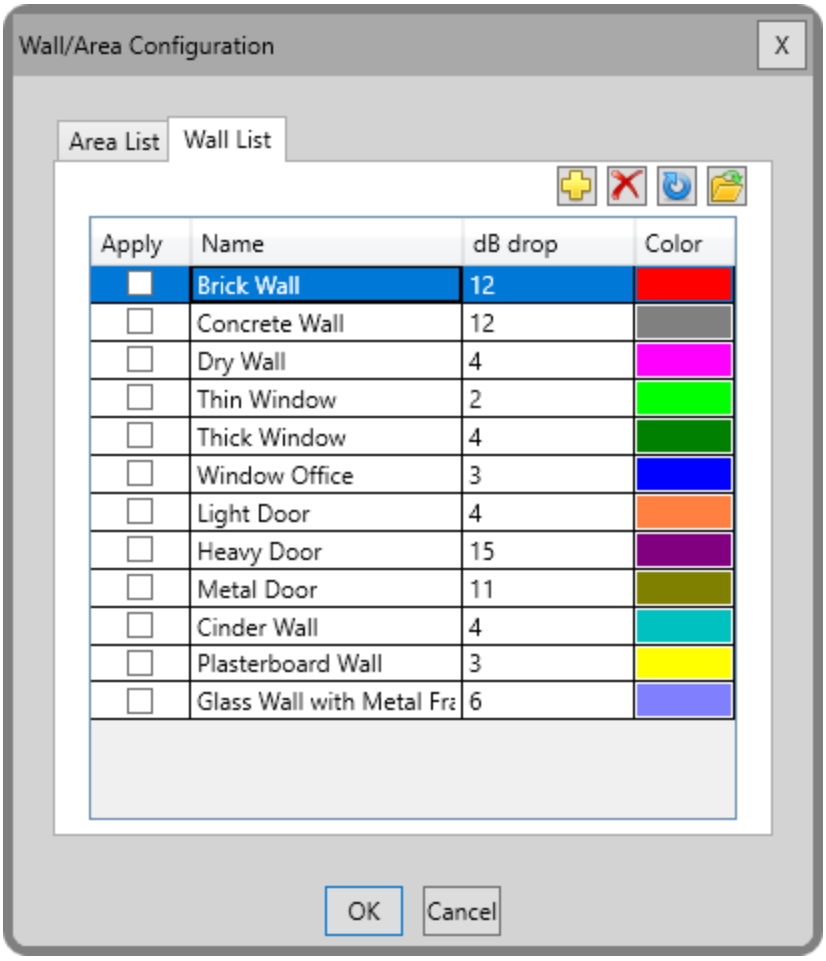


Configuring Walls and Areas

To configure walls and areas, select **Tools > Configure Walls/Areas**. This shows the Wall/Area Configuration dialog. You can

- Create new areas or walls.
- Set the Attenuation Index values for areas.
- Set the db Drop values for walls.

- Change the color for each wall or area.
- Import wall and area definitions from AirMagnet Planner.



You can take the following actions:

Item	Description
Area List tab	Select to display the master list of areas.
Wall List tab	Select to display the master list of walls.
☐ / ☑	Select the check box to apply changes that you make in the dialog to areas or walls that are already placed in the floor plan. (If you leave the box unchecked, changes apply only to new walls or areas that you add.)
	Click the **Add** button to add a new area or wall. This opens a new line at the bottom of the wall or area list. Enter the new unique Name, Attenuation Index or db Drop value. A color is automatically assigned. (You can change the color by double clicking it and selecting a new one.)
	To delete a new area or wall, click on an area or wall. (You can select multiple areas or walls by holding down the Ctrl or Delete key while clicking.) Then click on the **Delete** button. This deletes the area or wall.
	To restore the factory defaults for walls and areas, click on the **Restore** button. This restores the factory defaults definitions and values for walls and areas. **CAUTION:** Any unsaved changes in the dialog are lost when you click Restore.
	To import custom wall or area definitions from AirMagnet Planner, click the **Import** button to import any walls or areas that are different from ones in the list for MFP.

	To change the color of an area or wall, double-click the color to open the Color selection dialog. Select a new color, and then click **OK**.

Floor Alignment

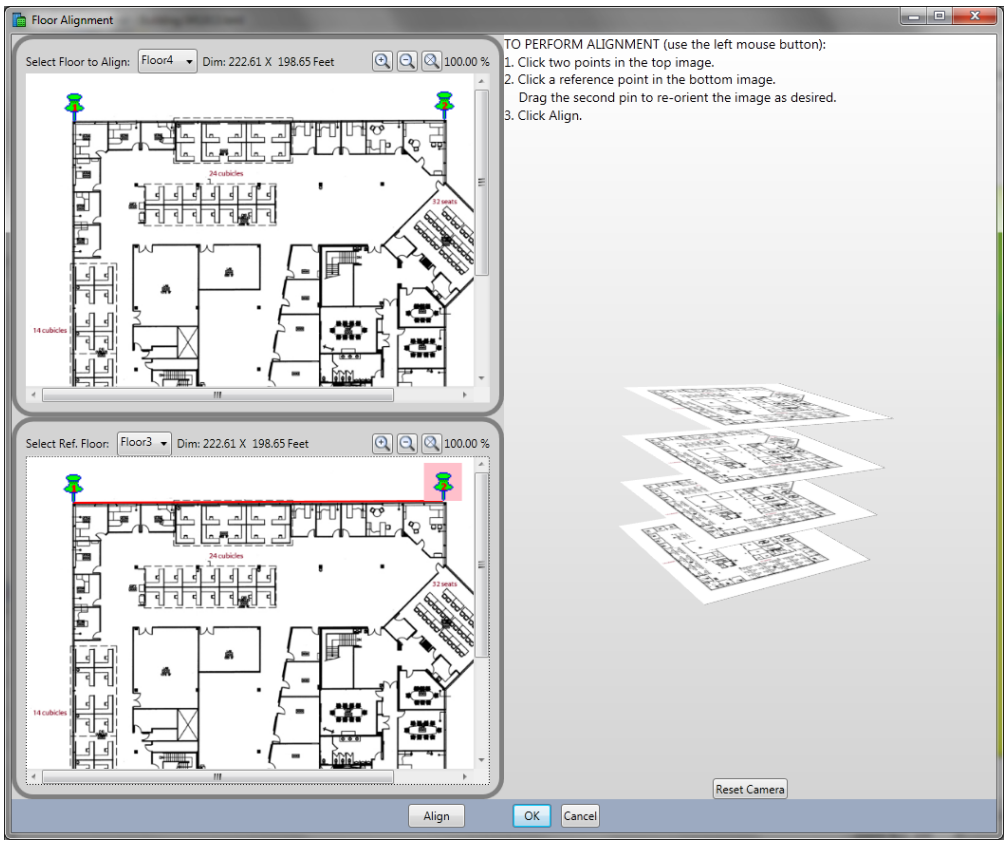
By default, all levels in the building project are aligned vertically to their center point. Each level may be re-aligned based on common walls, elevators, stairwells, and so on to create a more accurate representation of the building.

1. Click **Align Floors** or select **Align Floors** from the MFP 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 is aligned.
4. On the floor plan at the top, click the first point of alignment. A push pin icon appears. Click the second point of alignment. A second push pin icon appears. The distance 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 is 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 pinto 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 exceptions:

   - If you use a floor as a reference floor and then aligned it to another reference floor, any floors previously aligned the first reference floor remain their current position.
   - You cannot align a reference floor to another floor that is already aligned to the reference floor. For example, if floor 1 is a reference floor and you then align floor 2 to floor 1, you can no longer align floor 1 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**.



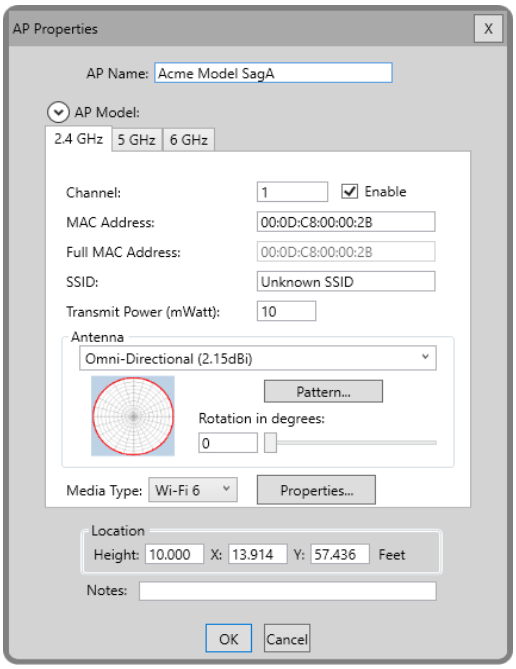
Adding and Editing APs

You can manually add APs or edit existing APs where needed. You can also use the MFP Advisor to automatically add APs at optimal locations.

TIP: Add APs in arbitrary locations and update the heat map to see the resulting coverage. You can roughly but quickly determine the number and placement of APs to give you coverage for your site.

To place new APs:

1. Use the building tree view (upper left) to select the floor on which you want to place the AP.
2. Click the **View 2D** button  . This displays the floor in the display view along with the tool bar.
3. Click and hold on the **Add AP**  icon on the toolbar. This changes the cursor to AP placement mode.
4. Place the mouse cursor at the location that you wish to place the AP on the site plan and then click.
   - To change back to the normal cursor, click the **Select** tool  or press the **Esc** key
   - Repeat this process to place additional APs.
5. For each new AP, double-click on the AP icon or right-click one the icon and then select **Properties...**. The **AP Properties** dialog box appears.



Item	Description
AP Name	Enter a name for the AP.
AP Model  / 	Open or close the AP Model controls. See To save or re-use AP models below.
Band (2.4 GHz, 5 GHz, 6 GHz)	Select the tab for the APs frequency band (**2.4 GHz**, **5 GHz**, or **6 GHz**).
PSC Only checkbox	(6 GHz only) Check this box to limit channels to preferred scanning channels.
Channel	Enter the channel the device operates on.
Channel selection menu	(6 GHz only) Select a channel from the drop-down menu. If the **PSC Only** checkbox is checked, this lists only preferred scanning channels.
Enable checkbox	Check this box to enable or disable the frequency band. (If your AP does not operate on all bands, disable the bands that are not applicable.)
MAC Address	Modify the default value as desired to identify virtual APs.

Full MAC Address	Auto populates the field in the event APs on different floors have the same MAC address.
SSID	Enter the SSID, if desired, to identify a virtual AP.
Transmit Power (mW)	Enter a number that closely matches the true transmit power setting of the AP.
Antenna	Use the drop-down menu to select the type of antenna your device uses. This displays the antenna's coverage field in the diagram on the left. • Click **Pattern** to open Antenna Manager, which allows you to search in more detail or to create a custom antenna pattern. • After selecting or creating an antenna pattern, adjust the antenna orientation by entering the rotation in degrees or by dragging the slider control.
Media Type	Use the drop-down menu to choose the protocol for the AP.
Properties	Displays the Properties dialog to select additional properties based on the Media Type. See Wi-Fi 4 Properties, Wi-Fi 5 Properties, or Wi-Fi 6 Properties.
Location	Enter the planned height (in feet) for the AP. The X and Y fields represent your device's X and Y coordinates on the map if your layout is in a grid format.
Note	(Optional) Enter a text description for the AP.

7. Click **OK**. The filter view now shows each AP radio as an icon representing its media type:
   - 802.11a:
   - 802.11b:
   - 802.11g:
   - Wi-Fi 4:
   - Wi-Fi 5:
   - Wi-Fi 6:
   - Wi-Fi 6E:
   - Channel 2.4 GHz band:
   - Channel 5 GHz band:
   - Channel 6 GHz band:
8. Click (**Refresh**) or press **F5** to update the heatmap view.

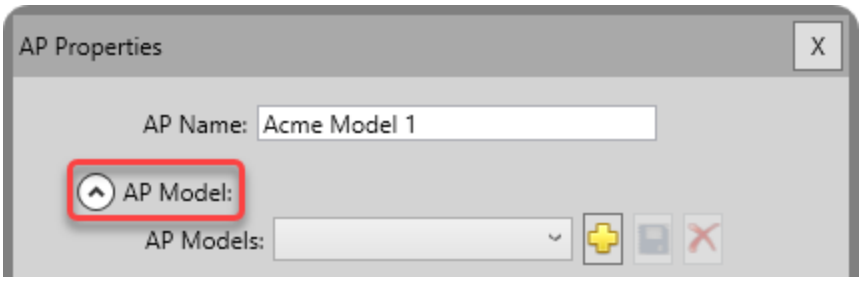
To view or edit current APs

- To view or edit APs:
  1. Select the floor with the AP you want to view in the building tree view (upper left).
  2. Click the **View 2D** button . This displays the floor in the display view.
  3. Double-click on an AP icon or right-click an AP located on the site map and select **Properties** to open the AP Properties dialog (described above). You can then view or edit the AP properties.
- To move an existing AP, click on the **Select** tool , and then click and drag the AP on the site map.
- Click (**Refresh**) or press **F5** to update the heatmap view.

To save or re-use AP models

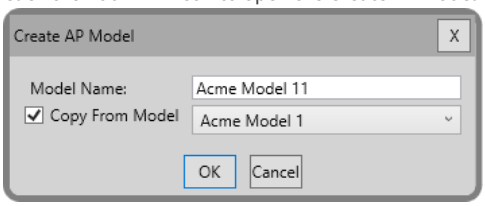
The AP Model controls let you create a master list of AP models so that you can easily select and re-use an AP models that you have already defined.

To open or close the AP Model controls, click the Open or close icon near the top of the AP Properties dialog.



- To add an AP model to the master list :

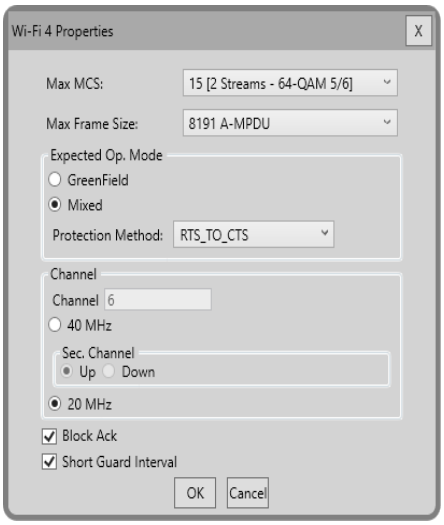
  1. Click the Add icon to open the Create AP Model dialog.



  2. Enter a model name.
  3. (Optional) To copy the settings from an existing AP, select the Copy checkbox, and then select an existing AP from drop-down.
  4. Click the Save icon to save the new AP model to the master list.
  5. Click **OK** to return to the AP Properties dialog.

- To delete a model from the AP model list, select the model from the drop-down list, and then click the Delete icon.

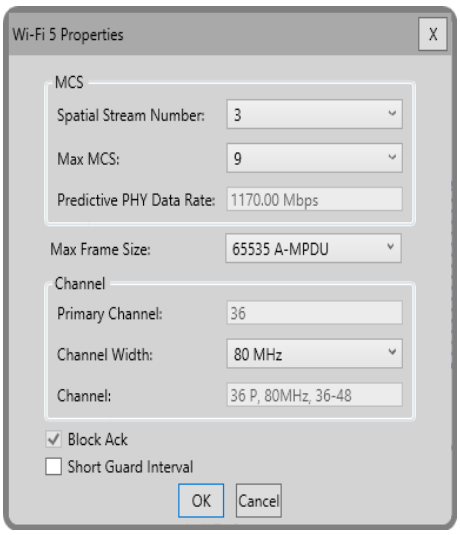
Wi-Fi 4 Properties



Option	Description
Max MCS	Use the drop-down menu to select a MCS (Modulation and Coding Scheme) value, an integer in the range of 0 to 31. This value corresponds to the maximum data transfer rate supported by the AP.
Max Frame Size	Use the drop-down menu to select the preferred maximum frame size. Wi-Fi 4 devices support frame sizes up to 64 KB. A larger frame size can reduce the number of frames required per transmission and reduce wireless overhead.
Expected Op. Mode	**Greenfield** mode is for a deployment that consists purely of Wi-Fi 4-capable devices. An AP set to Greenfield mode cannot service legacy (802.11a/b/g) clients. **Mixed** mode means a network that includes device types older than Wi-Fi 4.
Protection Method	(If you selected Mixed mode) Use the drop-down menu to select the type of protection mechanism in use on the AP.
Channel	Wi-Fi 4 devices can operate on 40 MHz channel widths. 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	Select this checkbox to use the Block ACK frame type. This allows an AP to acknowledge blocks of multiple frames with a single ACK frame. (In contrast, legacy devices must send an ACK frame for every frame received, which significantly increases network overhead and decreases performance.)
Short Guard Interval	Select this checkbox to specify a short Guard Interval (the period of time that passes between data transmissions). The Wi-Fi 4 specification provides two guard interval options: 400 ns and 800 ns. By default, most Wi-Fi 4 devices are set to 800 ns. However, a shorter interval can help prevent wireless hazards such as propagation delays, echoes, or reflections.

Wi-Fi 5 Properties

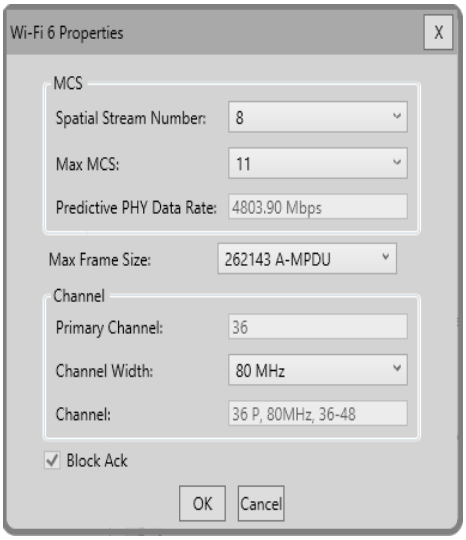
If you have selected a Media Type of Wi-Fi 5 in the AP Properties dialog, this dialog lets you specify additional properties.



Item	Description
Spatial Stream Number	Use the drop-down menu to select predictive MIMO support for up to 3 spatial streams.
Max MCS	Use the drop-down menu to select Predictive MCS support for index values 0-9.
Predictive PHY Data Rate	A calculated value based on your selections for Spatial Stream Number and Max MCS.
Max Frame Size	Use the drop-down menu to select a frame size option. (All options are for Aggregate MAC protocol data unit (A-MPDU).)
Primary Channel	Lists the Primary Channel selected for this AP.
Channel Width	Use the drop-down menu to select a channel width of 20, 40, 80 and 160 MHz.
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	Select this checkbox to specify a short Guard Interval (the period of time that passes between data transmissions). The Wi-Fi 5 specification provides two guard interval options: 400 ns and 800 ns. A shorter interval can help prevent wireless hazards such as propagation delays, echoes, or reflections.

Wi-Fi 6 or 6E Properties

If you have selected a Media Type of Wi-Fi 6 or Wi-Fi 6E in the AP Properties dialog, this dialog lets you specify additional properties.



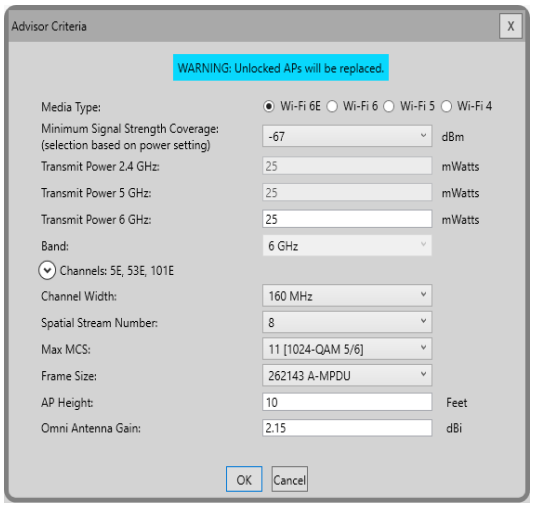
Item	Description
Spatial Stream Number	Use the drop-down menu to select predictive MIMO support for up to 8 spatial streams.
Max MCS	Use the drop-down menu to select Predictive MCS support for index values 0-9.
Predictive PHY Data Rate	A calculated value based on your selections for Spatial Stream Number and Max MCS. (Wi-Fi 6E defaults to a higher rate.)
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. (Wi-Fi 6E defaults to a higher rate.)
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.

Automatically Adding APs with Advisor

The Advisor tool automatically places APs in a Multi Floor Planner (MFP) floor plan. You can also add and edit APs manually and use the drawing tools to create and edit walls or create and edit coverage, attenuation, and exclusion areas to help Advisor generate an optimal AP layout.

To generate an Advisor layout:

1. Click the  (**Advisor**) button in the toolbar. The **Advisor Criteria** dialog appears so that you can specify the type of APs you want to add.

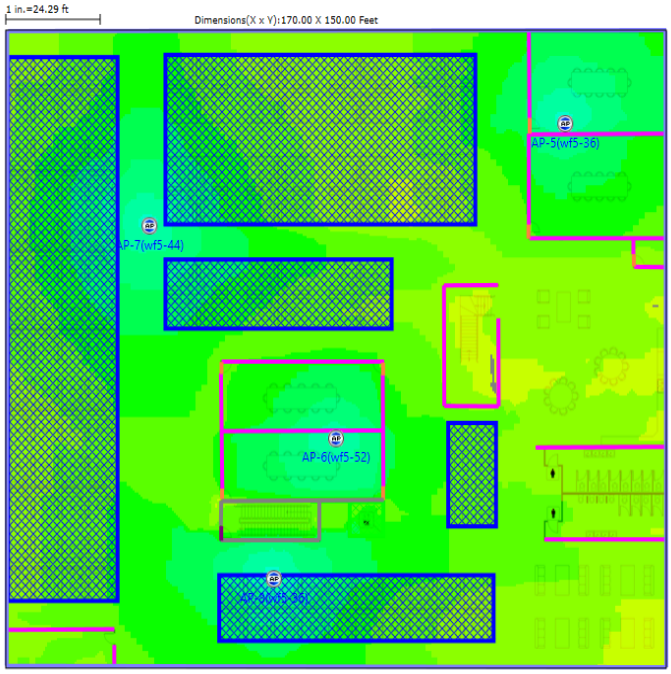


2. Make any desired changes to the dialog information.

Field	Description
Media Type	Specifies the Wi-Fi standard supported by the Advisor-placed APs. (This selection may change the available range of other settings below.)
Minimum Signal Strength Coverage	Defines the minimum strength required at any point in a coverage area (based on the power setting). The signal strength cannot drop below this value in areas that require coverage.
Transmit Power 2.4 GHz	Defines the transmit power for the 2.4 GHz APs placed by Advisor.
Transmit Power 5 GHz	Defines the transmit power for the 5 GHz APs placed by Advisor.
Transmit Power 6 GHz	Defines the transmit power for the 6 GHz APs placed by Advisor.
Band	Defines the frequency band to be used by Advisor's placed APs.
Channels	Opens the **Channel Allocation** drop-down menu, which lets you select which channels in each band that Advisor can use to place APs. • You must select a minimum of three channels for each band in use.
Channel Width	Specifies the channel width to be used by Advisor-placed APs. • The Wi-Fi 4 media type supports 20 MHz and 40 MHz channel widths. • The Wi-Fi 5 and Wi-Fi 6 media types support 20 MHz, 40 MHz, 80 MHz, and 160 MHz channel widths.
Spatial Stream Number	Specifies the number of spatial streams to be used by Advisor-placed APs. (Used by Wi-Fi 5 and Wi-Fi 6 media types and ranges from 1 to 8.)
Max MCS	Specifies the Modulation Coding Scheme (MCS) index used by Advisor-placed APs. The MCS setting corresponds to the maximum data transfer rate supported by the AP. • Wi-Fi 4 range: 0 to 31 • Wi-Fi 5 range: 0 to 9 • Wi-Fi 6, 6E range: 0 to 11
Frame Size	Specifies the maximum frame size used by the Advisor-placed APs. The range is 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 height of the AP. This setting directly affects signal coverage. APs placed higher than standard ceiling height do not cover as wide an area.
Omni Antenna Gain	Defines each AP's antenna gain. (Advisor assumes omnidirectional antennas.)

3. Click **OK** to start the Advisor. Advisor processes the site data, tests AP locations, and then places APs on the plan, as

shown in the following example:



Using the Wall Tool

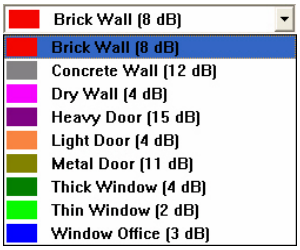
The following steps guide you through the process of outlining your building's walls and doors.

Note: If you use an AutoCAD format drawing for your site map, you can use the Automatic Wall Extraction tool to create walls.

Create a New Wall

1. Select a single floor from your MFP project.
2. Click the **View 2D** button  to show the floor in the display view.
3. Select the **Create Wall**  tool from the toolbar. This displays a drop-down list of wall types in the top-right corner of the map window. Each preset wall type has a preset dB drop level (the attenuation affect that the wall has on wireless signals).

   Note: In a Cisco Prime NCS/WCS Planner project, only Cisco NCS/WCS type walls appear in the drop-down menu.
4. Select the wall type and dB drop for the wall.



5. Click the place on the floor plan/map where one end of the wall starts. 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 bends and curves as needed. Right-click to conclude this portion of the wall. This fills in the wall in the display.

- If you click the wrong spot while drawing your wall, press **Ctrl+Z** on the keyboard to undo the action caused by the last click. Keep pressing **Ctrl+Z** to continue to reverse the previous action.
- To cancel drawing the wall, press **Esc**, and the wall is erased. (The drawing tool then defaults to the cursor.)

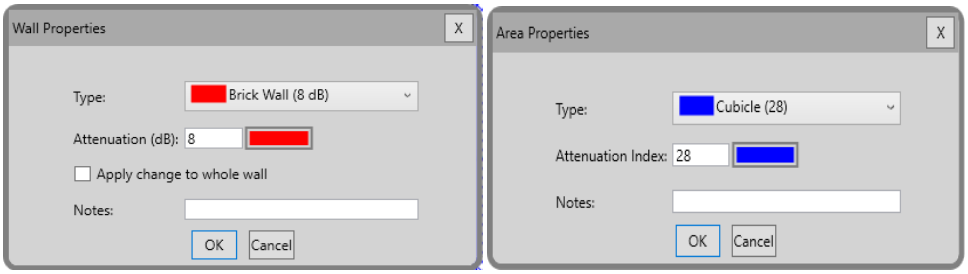
6. Repeat step 3 until all of your walls are filled in. Select different wall types (windows, doors, and so on) from the drop-down as needed.

Edit or Delete a Completed Wall

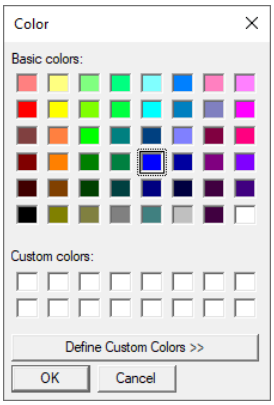
- To delete a wall, right-click on the wall, and then select **Delete**.
- To edit the wall properties, right-click on the wall, and then select **Properties...** This opens the Wall Properties dialog. Make your selections, and then click **OK**. See Area/Wall Properties for more information about the property options.

Area/Wall Properties

To modify the properties of an existing wall or area, right-click on the object and then select **Properties** from the drop down menu to display the properties dialog.



NOTE: Color is the only property that you can change for coverage areas and AP exclusion areas. Selecting **Properties** for these areas opens the Color selection dialog.



Use the following options to configure the wall or area properties:

Option	Description
Type	Opens a drop-down menu of wall or area types and the default attenuation index or dB drop value (in dB) for areas or walls of the selected type. (To change the default values, see Configuring Walls and Areas.)
Attenuation (dB) **or** **Attenuation Index**	Enter an attenuation value to assign to the selected wall or area. • The attenuation or dB drop value of a wall is the drop in signal strength (measured in dB) when the signal passes through a wall. You can measure signal strength directly (using AirMagnet Survey, for example) on both sides of a wall and then calculate the difference between the two sides to get the wall's dB drop value. • The Attenuation Index is the drop in signal strength caused by distance as it passes through open areas.
(Color)	Click the color box to open the color selection dialog for the wall or area object. Make your selections, and then click **OK**.
Apply change to whole	Select this check box to apply the change to the entire wall. If you do not select this option, the

wall (for walls only)	change is applied *only* to the currently selected segment of the wall.
Notes	(Optional) Type a text note to describe the change in properties.

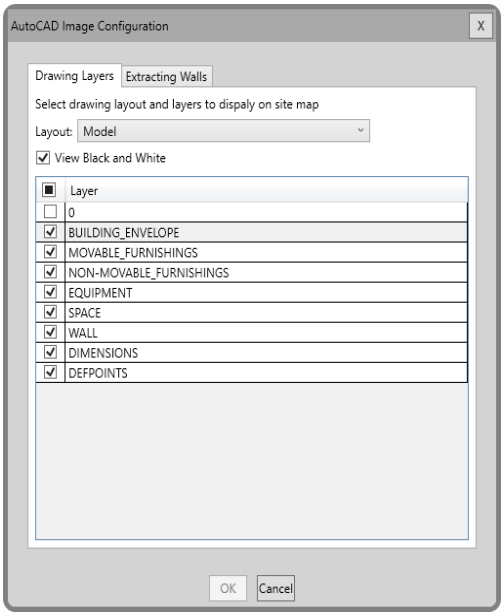
CAD Layers and Automatic Wall Extraction

If your project uses an AutoCAD floor plan, Multi Floor Planner (MFP) lets you import wall data from the AutoCAD files. You can select which layers contain walls, and automatically draw walls in MFP at those locations.

1. Select the CAD Layers to use
2. Extract the Walls
3. (Optional) Modify walls as needed. See Using the Wall Tool.

Select the CAD Layers

1. Select a single floor from your MFP project.
2. Click the **View 2D** button  to show the floor in the display view.
3. Select **Tools > Configure CAD Floor Plan**. A window similar to the following appears. This window allows you to decide which AutoCAD layers you want to display on your map.

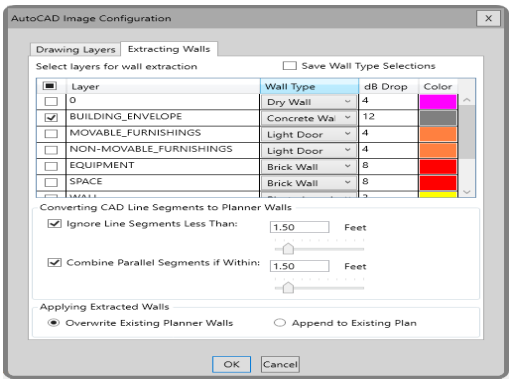


Note: AutoCAD drawings can have many layers. Try to limit your choices to layers that represent actual walls or that otherwise help you work with your floor plan.

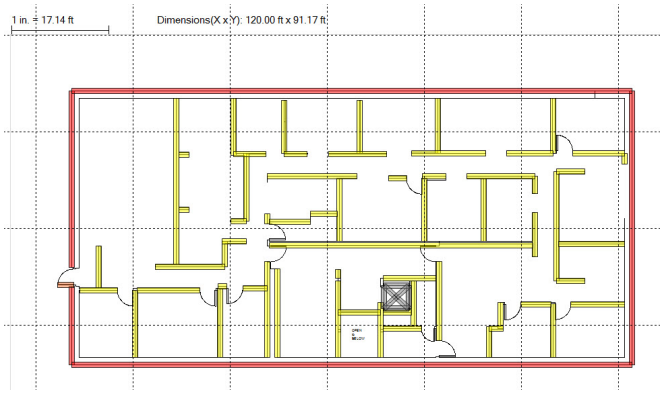
4. Use the drop-down menu/check boxes as follows:
   - **Layout:** Some AutoCAD files may have multiple layouts in them. Use the Layout drop=down box to select from available layouts in the AutoCAD file.
   - **Select all Layers**: Selects/deselects all layers.
   - **View black and white**: Some AutoCAD files use colors on layers, but the colors could interfere with visibility of heatmaps. Select this option to set all layers to display in black and white by default.
5. Click **OK** when you have finished selecting layers.

Extract the Walls

1. Select **Tools > Configure CAD Floor Plan**. A window similar to the following appears, displaying the layers that you selected.



2. Select the layers you want to extract by clicking the check boxes in the Layer column.
3. Click on the Wall Type in any row to open a drop-down menu to select a wall composition 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.)
4. Click **db Drop** in any row to modify the db Drop value. This is the amount of attenuation that you expect from the wall type.
5. Select or deselect the following check boxes. These options can help you avoid importing artifacts from AutoCAD files that aren't true wall segments.
   NOTE: These options are for vertical and horizontal lines (not diagonal).
   - **Ignore line segments less than:** Specify a value to ignore short line elements that may be recognized as walls but that create a large amount of "visual noise". This option may reduce this visual noise.
   - **Combine parallel segments if in**: Many AutoCAD 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.
6. Select **Overwrite Existing Planner Walls** or **Append to Existing Plan**.
   - **Overwrite Existing Planner Walls:** Use this option only if you are creating are importing a single AutoCAD drawing and do *not* plan to add other layers.
   - **Append to Existing Plan:** Use this option if you are adding an additional layers to the floor plan. This prevents a layer being added multiple times, which makes editing difficult.
7. Click **OK**. This imports the AutoCAD drawing and displays the floor plan, such as the example below.



8. (Optional) Repeat this procedure to add more layers.

You can now use the various MFP wall tools and options to move, modify, or delete extracted walls, just as you can with drawn non-AutoCAD walls.

See Also:

- Using the Wall Tool (designing for your floor plan and determining how many APs you need)
- Drawing Attenuation Areas (changing the decibel values of walls and other objects)
- Adding APs to the Plan

- Using the Right-Click Menu

Drawing Attenuation, Coverage, and Exclusion Areas

Use the tools in the right sidebar to draw out the internal layout components of your office (walls, cubicles, offices, and so on). You can mark the floor plan with the following:

- Attenuation areas: open areas that are large enough that Wi-Fi coverage may fall off with distance from an AP.
- Coverage areas: areas that require Wi-Fi coverage.
- Exclusion areas: areas that do not require Wi-Fi coverage.

Marking these areas helps MFP automatically place APs at the most effective locations on the floor plan map later in the process.)

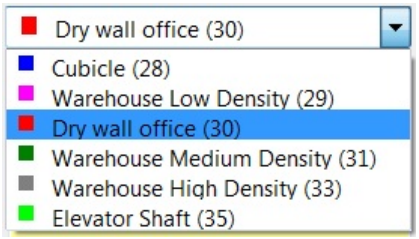
- Drawing Attenuation Areas
- Drawing Coverage or Exclusion Areas
- Editing Area Properties

Note: Do not use the Wall Tool or the area marking tools 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.

Drawing Attenuation Areas

To mark an area that can attenuate a Wi-Fi signal:

1. Select a single floor from your MFP project.
2. Click the **View 2D** button  to show the floor in the display view.
3. Choose one of the attenuation area buttons from the side toolbar:
   -  **Create Rectangular Attenuation Area**
   -  **Create Arbitrary Attenuation Area**
   -  **Create Arbitrary AP Exclusion Area**
4. A drop-down list appears in the top right corner of the map view when you select any of the attenuation types with a preset Attenuation Index. Select an area type from the menu.



   - The numbers displayed with each area type show the built-in attenuation index for that type. This index is a measure of the rate of signal degradation for RF traffic that moves across an open area.
   - A larger value corresponds to a greater drop in signal strength. Larger spaces have higher attenuation indexes.
   - This value is not identical to the dB drop value for a signal passing through a wall.
5. Mark the attenuation area:
   - For rectangular areas, right-click the corner of the area you wish to designate. Then move the mouse cursor to the opposite corner of the rectangular area. Right-click or double-click to complete the area.
   - For arbitrary areas, right-click once at the point you wish to start drawing . Then move the cursor to the next corner of the area and single-click. Then repeat for the next corner, and so on. When you have marked the last corner, right-click or double-click to automatically connect the final point to the first point to complete the area.

- For elliptical areas, click once at one side of the ellipse, and then drag the cursor to the other side of the area. Release the click when the ellipse is the correct size.

6. Repeat this process for any further attenuation areas you wish to draw.

Drawing Coverage or Exclusion Areas

These tools mark areas that must have good coverage or that can be excluded from coverage. (These tools work like the attenuation area tools, except that you do not have to choose an area type.)

To draw an arbitrary region:

1. Choose one of the coverage or exclusion area tools from the side toolbar:
   -  **Create Rectangular AP Coverage Area**
   -  **Create Rectangular AP Exclusion Area**
   -  **Create Arbitrary AP Coverage Area**
   -  **Create Arbitrary AP Exclusion Area**
   -  **Create Elliptical AP Coverage Area**
   -  **Create Elliptical AP Exclusion Area**
2. Mark the coverage or exclusion area:
   - For rectangular areas, right-click the corner of the area you wish to designate. Then move the mouse cursor to the opposite corner of the rectangular area. Right-click or double-click to complete the area.
   - For arbitrary areas, right-click once at the point you wish to start drawing . Then move the cursor to the next corner of the area and single-click. Repeat for the next corner, and so on. When you have marked the last corner, right-click or double-click to automatically connect the final point to the first point to complete the area.
   - For elliptical areas, click once at one side of the ellipse, and then drag the cursor to the other side of the area. Release the click when the ellipse is the correct size.
3. Repeat this process until you have marked all your desired areas.

Editing or Deleting Areas

- To delete an area, right-click on the area, and then select **Delete**.
- To edit area properties, right-click on the are, and then select **Properties...** This opens the Area Properties or Color dialog.
  - Selecting **Properties** for coverage areas or AP exclusion areas opens the Color selection dialog. Color is the only property that you can change for these areas. Make your selections in the dialog, and then click **OK**.
  - For attenuation areas, selecting **Properties...** opens the Area Properties dialog. Make your selections in the dialog, and then click **OK**. See Area/Wall Properties for more information about the property options.

Using Antenna Manager

The Antenna Manager (**Tools > Antenna Manager**) on Multi Floor Planner manages existing antennas and lets you create new antenna patterns. It also contains an antenna pattern modification tool that lets you match patterns that your antenna generates.

- Viewing Included Antenna Properties
- Creating a Custom Antenna Pattern

Get the Latest Antenna Patterns

Each release of AirMagnet Survey PRO provides updated antenna patterns as of the release date. If you subscribe to AllyCare, NetAlly's comprehensive support and maintenance service, you can download the most recent patterns using the following procedure. (If you do not subscribe to AllyCare, you can use the procedure to see if an antenna pattern exists, but you cannot download it.)

1. Sign in to your MyAirMagnet account. (You can use this page to view the status of your support contract under the Registered Products section.)
2. Click on the **Planner Antenna Patterns** link to display a list of patterns, sorted by manufacturer. The list includes the release date and a link to the list of updated patterns for the manufacturer.
3. Follow the screen instructions to download and begin using the new patterns.

Viewing Included Antenna Properties for Multi Floor Planner

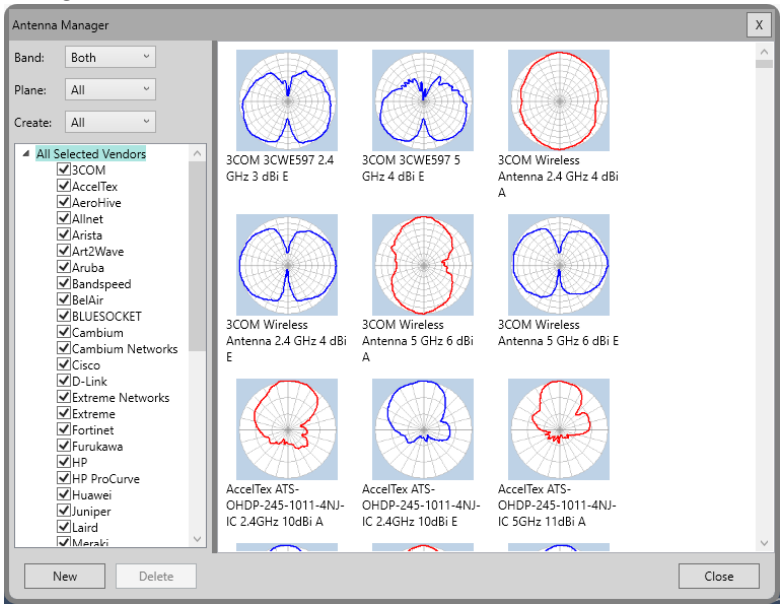
In this topic:

- Locate and View Antenna Properties
- Create or Delete a User Defined Pattern

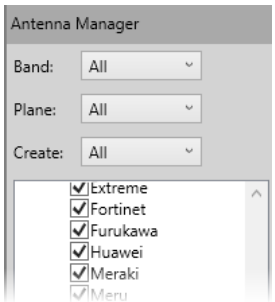
Locate and View Antenna Properties

You can find your antenna in the list of presets included with Multi Floor Planner (MFP).

1. Click **Tools > Antenna Manager...** to open the Antenna Manager. (You can also open it from the AP Properties dialog by clicking the **Pattern** button.)



2. Use the filter options and vendor selection list at the top left of the window to display antennas that match the selections.

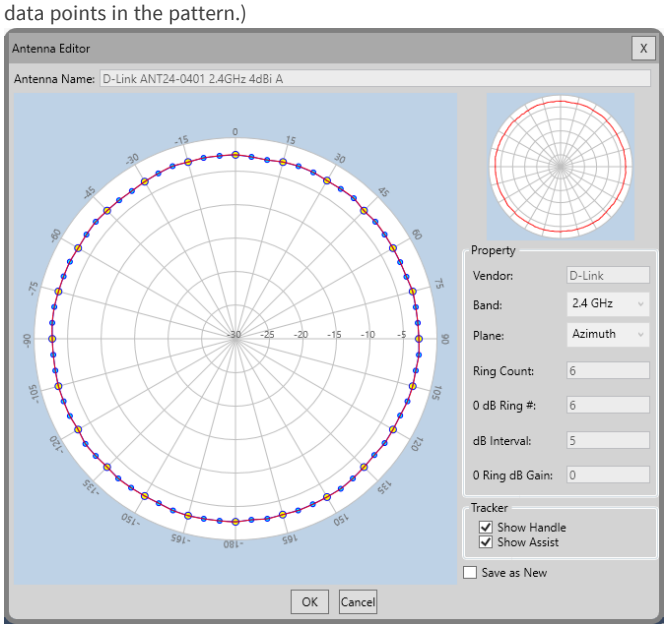


Field	Description
Band	Click select the frequency band: **2.4 GHz**, **5 GHz**, **6 GHz**, or **All**.
Plane	Click to display to antenna patterns using the **Azimuth** (top view), **Elevation** (side view), or **All** (the default).
Create	Click to display antenna patterns by **Pre Defined** (patterns supplied by MFP), **User Defined** (patterns you

	have created yourself—see Creating a Custom Antenna Pattern for Multi Floor Planner), or **All** (the default).

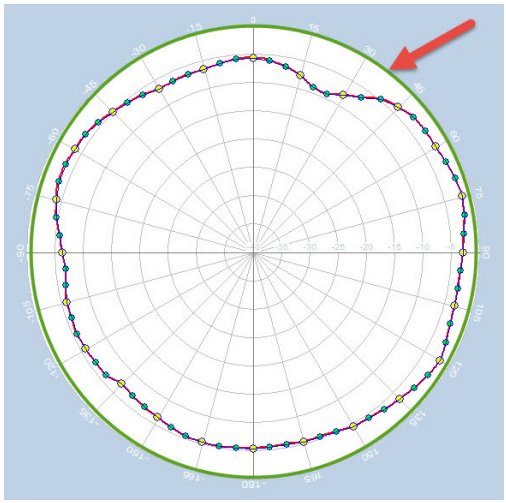
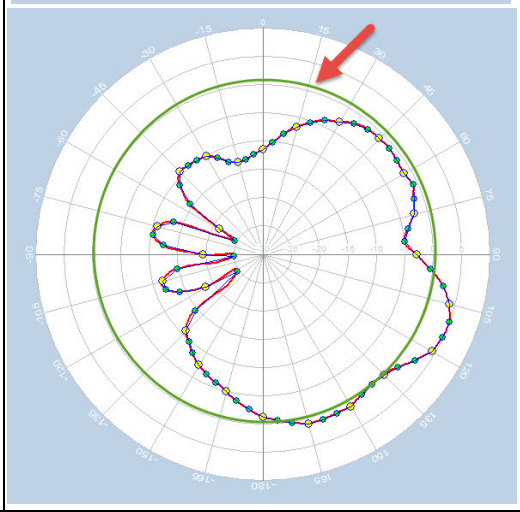
Vendor Selection List	Use this list to sort the pattern display by vendor.
	• **Right-click + All Selected Vendors** - Displays a pop-up menu to:
	  • **Check All** (default, displays patterns for all predefined vendors)
	  • **Uncheck All** (clears all selections, displays nothing until you check a vendor name or choose **Check All**).
	• To display patterns from a specific vendor when all vendors are selected, just click on the vendor name (do *not* select the check box). This displays the patterns for that vendor on the right side of the screen.
	• See Get the Latest Antenna Patterns for instructions on checking for more recent antenna patterns.

3. To view the properties for a pattern, double-click it in the display area. This opens the antenna pattern dialog with an enlarged picture of the pattern and properties. (A smaller diagram in the upper right displays the best fit of a curve to the data points in the pattern.)



Note: You cannot modify the predefined antenna patterns. However, you can use the pattern to create your own antenna by following the steps in Creating a Custom Antenna Pattern for Multi Floor Planner.

Field	Description
Vendor	The name of your antenna's vendor or manufacturers.
Band	Select **2.4 GHz**, **5 GHz**, **6 GHz**, or **All**.
Plane	Either **Azimuth** (horizontal plane/top view) or **Elevation** (vertical plane/side view).
Ring Count	The number of concentric circles displayed in the field diagram, including the outermost ring.
0 dB Ring #	The number of dB rings from the center to the 0 dB ring of the diagram.
dB Interval	The interval in dB between each ring of the diagram.
0 Ring dB Gain	• Shows the peak gain value provided in the antenna vendor's user documentation/data sheet • Shows a 0 if the field pattern reaches or exceeds the peak gain at any point. • In the following examples, the 0 dB ring is highlighted in bold and shown by an arrow. In the first example, the antenna pattern does not exceed the peak gain value, so the 0 Ring dB Gain value is 3.00 as per the vendor's documentation. In the example on the right, the antenna pattern exceeds the peak gain, so the 0 Ring dB Gain value is 0.

	 
Show Handle	Displays straight lines connecting the yellow points on the field, as well as the red curved fit line.
Show Assist	Displays intermediate blue points, which are connected by the best-fit (red) curved line.
Save as New	Select this checkbox to create a new pattern based on the properties for the current antenna pattern. Then follow the steps in Creating a Custom Antenna Pattern for Multi Floor Planner.

Create or Delete a User Defined Pattern

You can create new User Defined patterns based on preset Defined patterns or by creating a pattern from a vendor's specifications. You can also delete User Defined patterns.

- To create a new User Defined pattern directly:
  1. Click on the **New** button. This opens the antenna pattern dialog.
  2. Follow the steps in Creating a Custom Antenna Pattern.
- To create a new User Defined pattern based on a preset Defined vendor pattern:
  1. Locate the preset pattern as described in Locate and View Antenna Properties above.
  2. Select the pattern.
  3. Follow the steps in Creating a Custom Antenna Pattern.
- To delete a User-Defined pattern:
  1. Locate a User Defined pattern as described in Locate and View Antenna Properties above.
  2. Select the pattern.

3. Click on the **Delete** button.

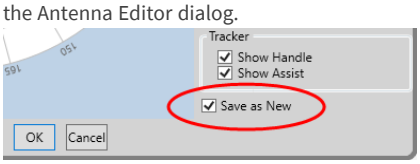
   Note: You cannot delete the Pre Defined patterns.

Creating a Custom Antenna Pattern

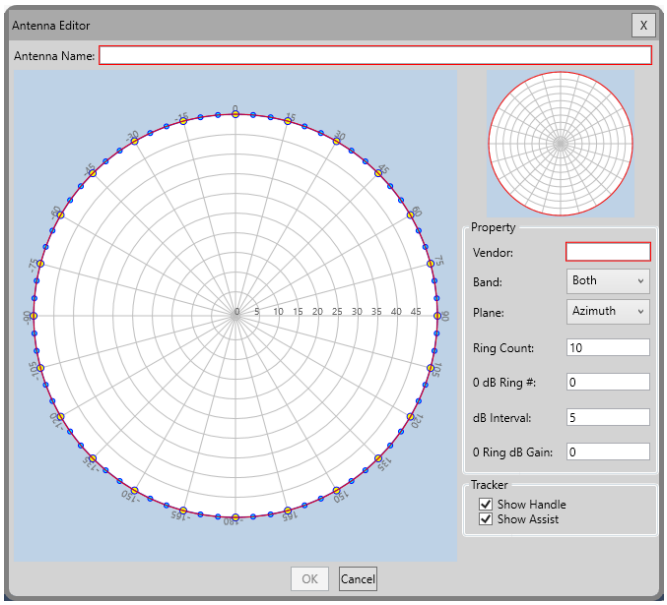
If your antenna is not listed in the presets, you can create a customized antenna pattern based on the vendor's specifications or one of the predefined vendor patterns. This enables Multi Floor Planner to accurately project the desired pattern.

To create a new antenna pattern

1. From the Antenna Manager, either click the **New** button to open the Antenna Editor dialog or use the following procedure to start from a predefined pattern:
   a. Use the steps in Viewing Included Antenna Properties to select an antenna with a pattern that resembles the pattern you want to create.
   b. Double-click on the antenna pattern to display the Antenna Properties dialog.
   c. Select the **Save as New** checkbox in the lower right corner of the dialog. This opens the pattern and its properties in the Antenna Editor dialog.

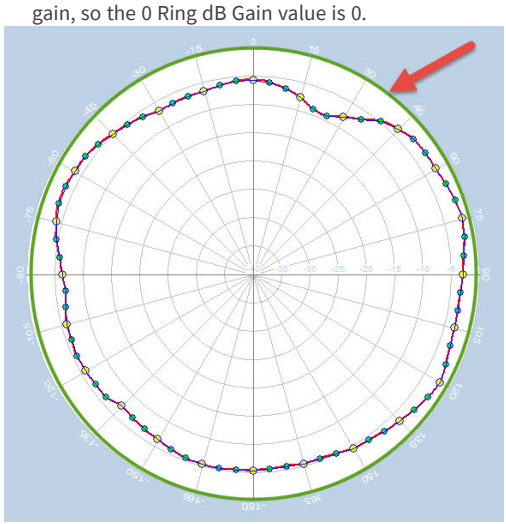
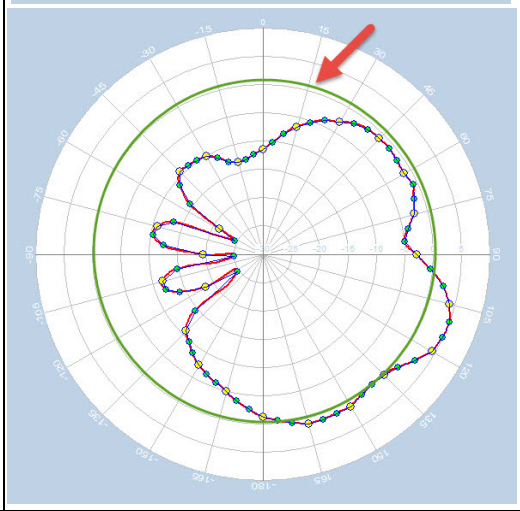


TIP: It often saves time to use an existing pattern that is similar to the one you want to create.

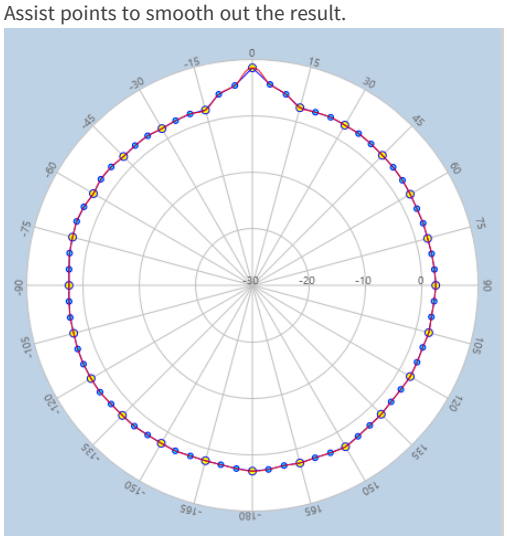


2. For the **Antenna Name**, enter a unique name for the new antenna pattern. NetAlly recommends a naming standard such as the following, separated by spaces:
   <Vendor name>
   <Model and frequency band, separated by dashes>
   <Antenna gain dBi>
   <A or E, to indicate if the pattern is for azimuth or elevation dispersion>
   For example: **Cisco Catalyst 9164I 6GHz 4dBi A**
3. Configure the antenna properties as described in the following table. Use the antenna diagram as needed:

Field	Description
Vendor	Enter the name of your antenna's vendor or manufacturers.
Band	Select **2.4 GHz**, **5 GHz**, **6 GHz**, or **All**.

Plane	Select either **Azimuth** (horizontal plane/top view) or **Elevation** (vertical plane/side view).
Ring Count	Enter the number of concentric circles that you want displayed in the field diagram, including the outer-most ring.
0 dB Ring #	Enter the number of db rings from the center to the 0 dB ring.
dB Interval	The interval in dB between each ring of the diagram. (For example, if there is a 5 dB interval between each ring, enter 5.)
0 Ring dB Gain	• Enter the peak gain value if it is provided in the antenna vendor's user documentation/data sheet • Enter a 0 if the field pattern reaches or exceeds the peak gain at any point. • In the following examples, the 0 dB ring is highlighted in bold and shown by an arrow. In the first example, the antenna pattern does not exceed the peak gain value, so the 0 Ring dB Gain value is 3.00 as per the vendor's documentation. In the example on the right, the antenna pattern exceeds the peak gain, so the 0 Ring dB Gain value is 0.  
Show Handle	If you choose to manually adjust the antenna pattern in the next step, select this checkbox to display straight lines connecting the yellow points on the field, as well as the red "best fit" curved line. These yellow points appear only on the lines radiating outward from the center of the circle. Use these points to make larger changes to the field pattern.
Show Assist	If you choose to manually adjust the antenna pattern in the next step, select this checkbox to display only the blue points, which are connected by the best-fit (red) curved line. These blue points allow you to fine-tune the field in-between the Handle points. Use these points to make detailed changes to the field pattern. (Selecting **Show Handle** at the same time displays the final field view.)

4. Adjust the antenna pattern drawing by dragging the Handle and Assist points on the pattern diagram as needed. Handle points (yellow points) allow for larger changes while the Assist points (blue points) let you fine-tune the pattern. The following example shows the result of dragging the yellow Handle point at the top upward and then using the adjacent Assist points to smooth out the result.



TIP: Get an electronic image of the product antenna pattern diagram if possible. Size the image to the same size as the diagram (antenna drawing) in the Antenna Manager. Trace the outline of the product antenna pattern onto a transparency. Overlay the transparency on the Antenna Manager. Drag the handles to conform to the trace image.

TIP: You may find it easiest to uncheck the Show Assist box and then make large changes to the field pattern using only the yellow Handle points. You can then re-check Show Assist to fine-tune the pattern drawing.

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

Note: To use the new antenna pattern, create a new AP or select an existing AP on the floor plan. Double-click the AP to open its properties. Then select the new pattern from the drop-down menu in the AP Properties dialog.

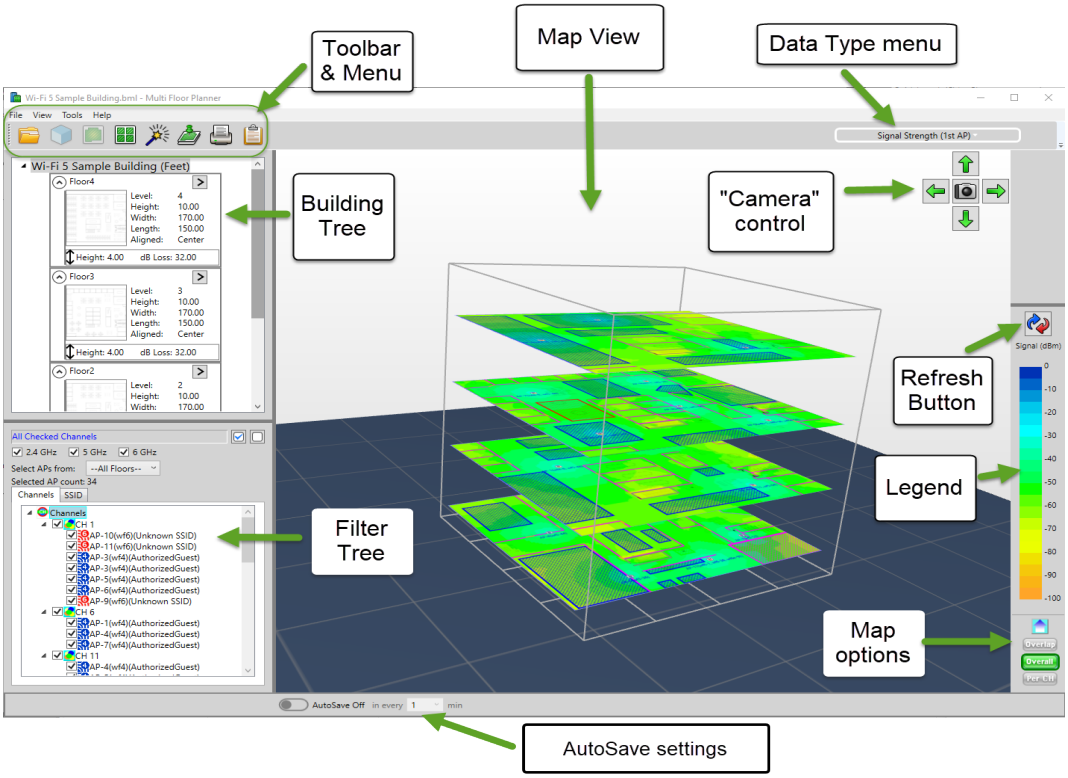
To delete the new pattern, select it from the list of User Defined patterns, and then click **Delete**. (You cannot delete any of the preset patterns.)

Viewing Multi-floor Data

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

To get started, click **Refresh**  or press **F5** . MFP processes the project to show a color-coded heatmap display. The color-codes correspond to the legend at the far right.

The following example shows the 3D view. Note that the Building Tree view is not included in the 2D view.

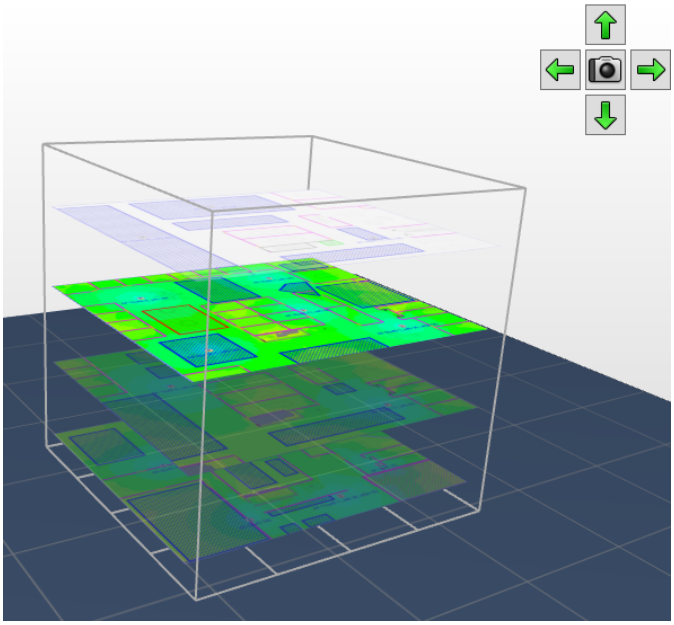


You can adjust various controls in the user interface to view data in various ways. examine various predictive scenarios (see Data Filtering Examples).

3D View

You can enter the default three-dimensional view in these ways:

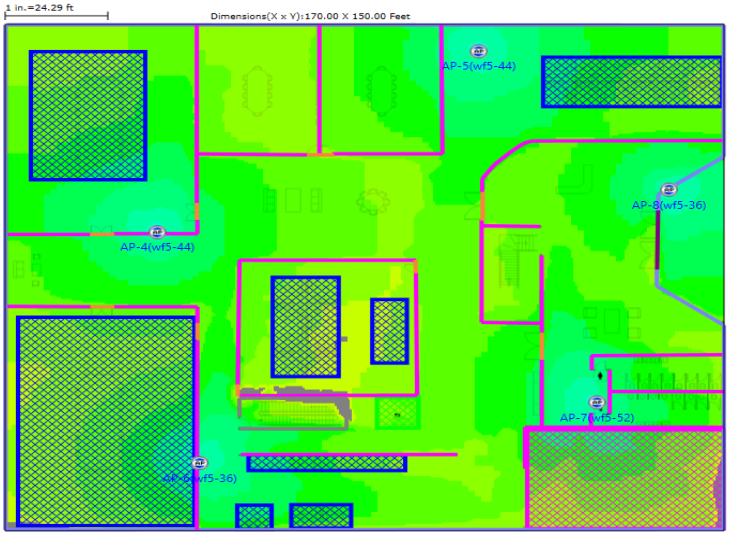
- Select **View > View 3D**.
- Click the **3D View** button in MFP. The 3D view displays all building floors in the Map view. Place the cursor on the view and drag the mouse to rotate the building on the associated axis (see Menu Reference). Selecting a level from the Building Project tree focuses on the selected level in the 3D view and dims the other levels.



2D View

You can enter the two-dimensional view in these ways:

- Select **View > View 2D**.
- Select a floor in the building tree view (upper left of main screen), and then click **2D View** button.
- Select the **View Thumbnail** button, and then double-click on the floor that you want to view in the 2D view.



Thumbnail View

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

AP Data

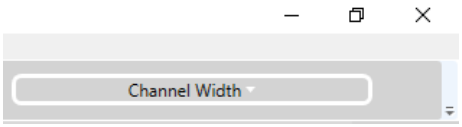
- In the Map view:
  - Double-click the AP icon to open the AP Properties dialog.
  - Right-click an individual AP icon to display a menu of AP options:
    - **Properties**: Select to view the AP Properties dialog
    - **Delete:** Select to delete the currently selected AP.
    - **Lock AP:** Select to lock the currently selected APs in its current location. This prevents the AP location from being overwritten if you use MFP Advisor.
    - **Default AP:** Select to set the properties of the currently selected AP as the default for the AP placement tool. Selecting Default AP places a check mark beside the option in the pop-up. Deselecting this option restores the default setting.
- In the Filter view, right-click an individual AP icon and then select **View Properties** to display the AP Properties dialog. See Adding and Editing APs for more information.
- Select **View > View AP List** to open a list of all APs currently placed on the site plan. See Viewing a List of APs.

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.
- For more about using the Building Tree controls, see Starting the Multi Floor Planner Building Project.

Data Type Filters

You can filter multi-floor data using the Data Type drop-down, located in the upper right corner above the site map.



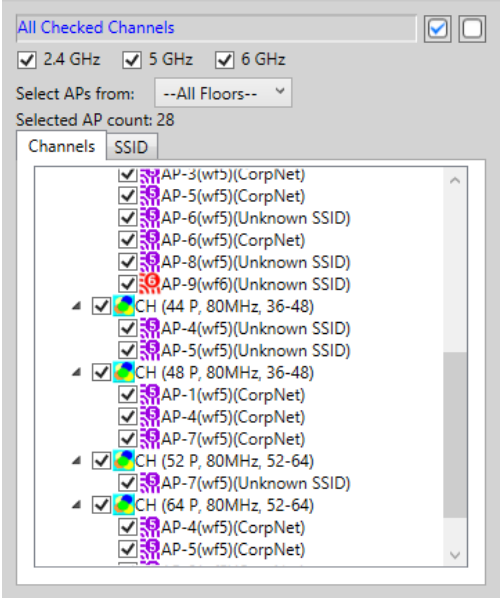
The following options are available:

- Signal Strength (for 1st, 2nd, or 3rd APs)
- Channel Interference
- Predictive PHY Data Rate Downlink (for 1st, 2nd, or 3rd APs)
- Throughput
- Wi-Fi 4 Max MCS (AP Tx)
- Wi-Fi 5 Max MCS (AP Tx)
- Wi-Fi 6 Max MCS (AP Tx)
- Channel Overlap Wi-Fi 5
- AP Operating Mode
- Channel Width

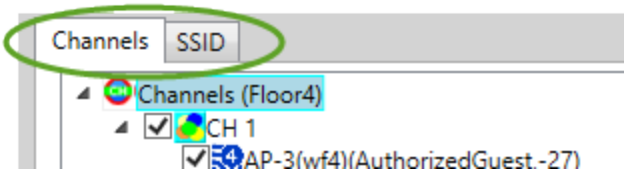
(These data types options are a subset of the AirWISE Requirements. See AirWISE View for more information.)

Using the Filter Tree View

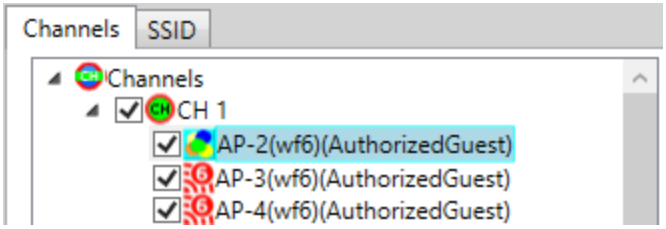
The Filter Tree view on the bottom left of the MFP screen lists the APs placed on the site plans for each floor. (In the 2D view, this view fills the left side of the MFP screen.)



- Click the **Channels** tab to list APs by channel or click **SSID** to list APs by SSID.

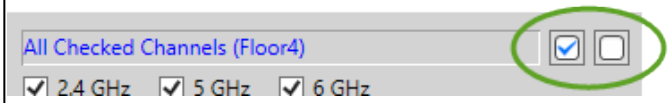


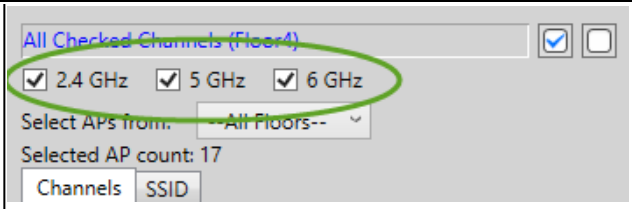
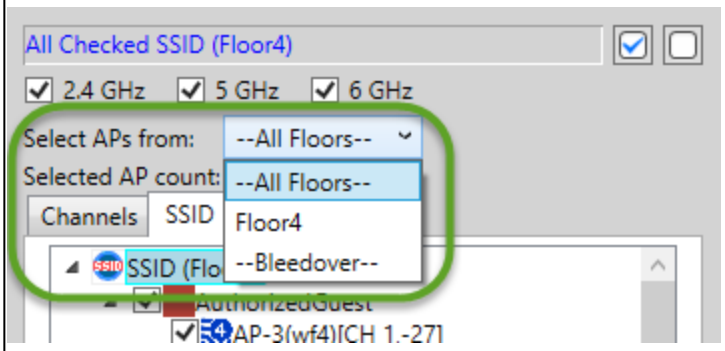
- Clicking on an AP in the list shows a heatmap of the AP's signal in the floor plan.



- Filter Tree options that are not checked are not included in the heatmap in the Map view. Re-check the option to include the data.
- Click **Refresh**  or press **F5** to update the heatmap after making changes.

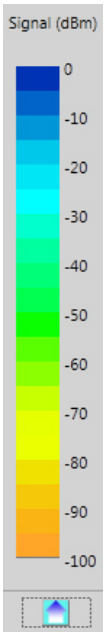
Filter Tree Controls

Item	Description
Check All / Uncheck All	 • Click the Select all check box (the left-hand check box) at the top of the Filter Tree to select all Channels or SSIDs. • To clear all selections, click the clear all check box (the right-hand check box).
Frequency band	Select **2.4 GHz**, **5 GHz**, or **6 GHz**.

	
Select APs from:	Use this drop-down menu to control what AP information to display.  • **All Floors:** Shows data from all APs on all floors. • **Floor #:** Shows currently selected floor only or (if you have not selected a floor) lets you select from multiple floors. • **Bleedover:** (Appears only when you have selected a floor.) Filters out the data from the APs on the currently selected floor while showing bleed-over data from other floors. (Data may be easier to see in 2D view.)
Selected AP Count:	Total APs selected.
Channels tab	Click this tab to list APs by their corresponding channel setting.
SSID tab	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 enables or removes 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.



- Click and drag down from top of the legend to filter out the top ranges of data.
- Click and drag up from the bottom of the legend to filter out the lower ranges of data.
- Use the arrow button below the legend to toggle the which color starts at zero.
- See Configuring Legend Color Schemes for more information about configuring the legend.

Map Controls: Overlap, Overall, Per Channel, Per SSID Controls

These heatmap filtering buttons appear on the lower right side of the Map view.

NOTE: If these controls are not visible in the lower right below the Color Legend, click on the separator bar above the legend and drag up until the show the Map controls.

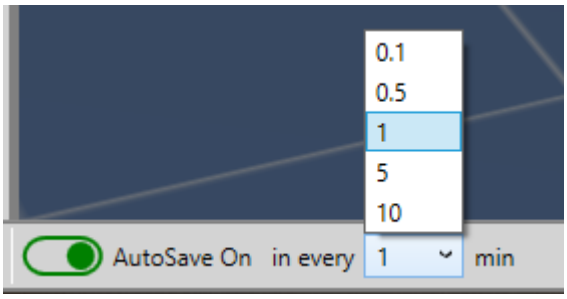
Overlap 	Displays signal overlap or channel interference in the Map Window. Based on the Data Type selected, Overlap displays *only* overlap data, filtering out all information that does not overlap. Can be combined with **Overall**, **Per CH** or **Per SSID** or **Per AP**.
Overall 	(Default) Displays overall site signal strength coverage. Can be combined with **Overlap**.
Per CH 	(If the Channels tab is selected in the Filter Tree) Displays data by channel. Can be combined with **Overlap**.
Per SSID 	(If the SSID tab is selected in the Filter Tree) Displays data by SSID. Can be combined with **Overlap**.
Per AP 	(If you select an individual AP in the Filter Tree) Displays data by AP. Can be combined with **Overlap**.

For more information about using these filters, see DiffView and Data Analysis.

Auto Save Settings

The Auto Save settings appear on the status bar. When enabled, Auto Save automatically saves your changes in the selected interval.

NOTE: Heatmap data is not saved with Auto Save. You can save heatmap data by selecting the File > Save menu item or by responding Yes when you close the current project and prompted to save your work.

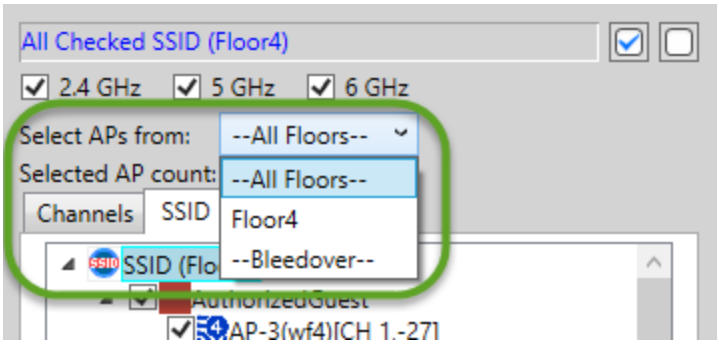


- To enable/disable AutoSave, click the **AutoSave** button
- To set the save interval, click the arrow to display a menu of interval values (in minutes), and then select a value.

Data Filtering Examples

To Filter by Floors or Bleedover

Use the **Select APs From** drop-down menu to control what AP information to display.



- **All Floors:** (Active only when you have *not* selected a floor) Shows data from all APs on all floors.
- **Floor #:** Shows currently selected floor only or lets you select from multiple floors.
- **Bleedover:** (Appears only when you have selected a floor.) Filters out the data from the APs on the currently selected floor while showing bleed-over data from other floors.

  NOTE: Bleedover information may be of only limited use if antennas do not include elevation dispersion patterns or if the building project has significant attenuation between floors (such as thick reinforced concrete floors).

Signal Propagation from the Selected Floor

To see how the signal strength from one floor affects the entire building:

1. Click on the refresh icon or press **F5** to generate the heatmap.
2. Select the **Signal Strength** option (for **1st AP**, **2nd AP**, or **3rd AP**) option from the data type menu.
3. Activate data filtering on all floors by selecting the parent **Building Name** in the Building Tree.
4. Use the Select All checkbox to select all APs in the Filter Tree.
5. From the **Select APs from** drop-down in the Filter Tree area, 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

To see how the signal strength is propagated by channel or SSID:

1. Click on the refresh icon or press **F5** to generate the heatmap.
2. Select one of the **Signal Strength** options from the data type menu.
3. Selecting the parent **Building Name** in the Building Tree view to activate data filtering on all floors.
4. Select the **Channel** or **SSID** tab in the Filter Tree area.
5. Select **Per CH** or **Per SSID** from the Map controls:

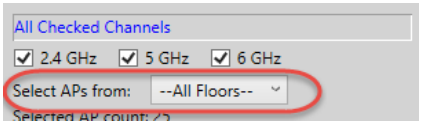
   

   NOTE: If the Map controls are not visible in the lower right below the Color Legend, click on the separator bar above the legend and drag up to show the Map controls.
6. Select the desired parent or child listing in the Filter Tree to show data from all channels, from individual channels, or from individual APs.

Signal Bleed-over Between Floors

To include the effects of how the signal strength of particular AP or set of APs can propagate to other floors:

1. Select the **Signal Strength** option.
2. Activate data filtering on all floors by selecting the 3-D view icon and then clicking on the **Building Name** in the Building Tree view (upper left of screen).
3. Selecting **All Floors** from the Filter Tree drop-down.



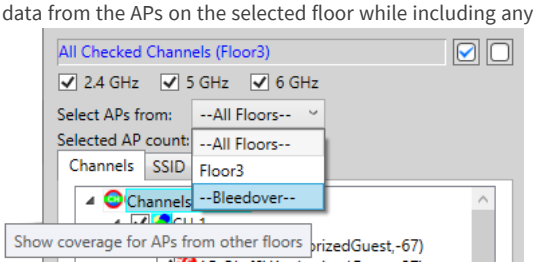
(Click on the refresh icon if the APs are not displayed in the Filter Tree.)

4. Use the All Checked Channels option in the Filter Tree to view all inter-floor effects, or deselect all APs and then select APs individually to view effects of specific APs.

Signal Bleed-over on a Single Floor

To view how the signal strength from other floors affects a selected floor:

1. Select the **Signal Strength** Data Type option.
2. Select the floor in the Building Tree view (upper left of screen) to activate data filtering.
3. In the Filter Tree area, click on the **Select APs from** drop-down, and then select **Bleedover**. This option filters out the data from the APs on the selected floor while including any bleed-over data from other floors.



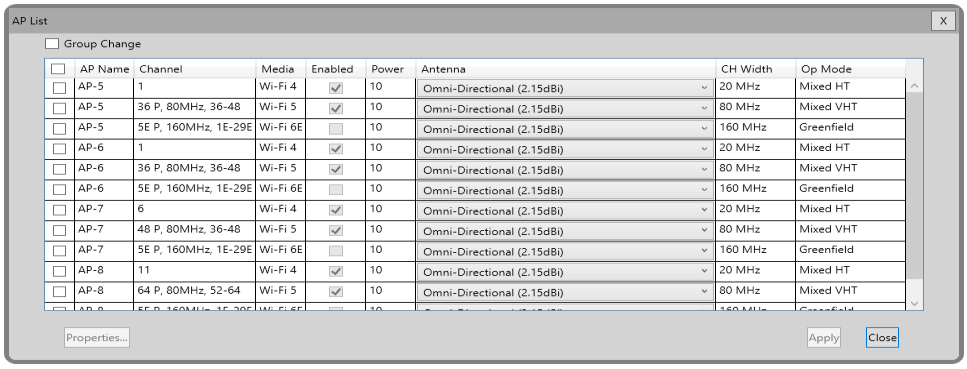
TIP: This data may be easier to view in the 2-D view .

View the AP List

You can display a list of all APs currently in your building plan on a floor-by-floor basis.

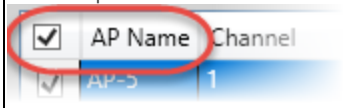
To List All APs on a Floor

1. Select the floor in the Building Tree view (upper left of screen).
2. Click on the 2-D view icon .
3. Select **View > Show AP List**. This option opens the **AP List** window.



To Modify the APs Settings List

- You can modify the power setting for an AP by clicking on the AP, clicking on the AP's Power field, and then typing a new value. Click the **Apply** button at the lower right corner of the dialog to save your changes.
- You can modify the antenna selection for an AP by clicking on the AP, clicking on the Antenna field to display a drop-down menu, and then selecting an antenna from the list. Click the **Apply** button at the lower right corner of the dialog to save your changes.
- To modify all other properties, double-click on the selected AP or select the AP and click the **Properties...** button to open the AP Properties dialog, and then make changes in the dialog.

Column	Description
Group Change	Useful for batch changing Power and Antenna settings. First, select all APs you wish to change. Then check **Group Change**. Making a change to one property in the group changes that property for the entire group.
Select/Unselect All AP	Use this option to select all or deselect all APs. 
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 milliwatts). You can edit this field for a selected AP.
Antenna	The antenna currently used by the AP. You can click on this field and select an antenna from a drop-down menu.
Ch. Width	The channel width in use by the AP.
Op. Mode	The Operating Mode specified in the AP's properties: • **Greenfield:** for deployments using only Wi-Fi 4 or Wi-Fi 6 APs. • **Legacy** for 802.11a/b/g only. • **Mixed HT:** for deployments using Wi-Fi 4 and legacy APs together. • **Mixed VHT:** for a mix of Wi-Fi 5 APs with other modes. • **Mixed HE:** for a mix of Wi-Fi 6 APs with other modes.

Click **Apply** or **OK** to accept your changes.

Multi Floor Planner Reports

The MFP Reports feature enables you to generate a report based on the current multi floor project.

A variety of preconfigured reports are available. The following options enable you to work with the report results and to customize reports and report templates:

- Export a report to a variety of printable and editable formats.
- Print a report.
- Perform text searches.
- Customize the 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.

To generate a report of the building project, click **Refresh** on the sidebar, and then click the **Report** icon. This replaces the map view with a report toolbar at the top of the map area:

To run the basic Default Planner Report, click the green arrow icon. (If the icon is not enabled, click **Refresh** on the sidebar, and then try again.)

- Click the Add icon to create a new report template. You can select a template name, language, and the template on which the new template is based.
- Click the Delete icon to delete the selected report template. (You cannot delete the Default Planner Report template.)
- Default Planner Report Click the report selection drop down menu to select from a menu of saved report templates. (The Default Planner Report template is always listed.)
- Click the Edit icon to edit the template. You can then use the Edit Report Template dialog to change the General Information (title, preparation information, location, time, cover sheet picture, logo, description, and header) and Report Template information (report category selections, description, and executive summary).
- English Click the Language icon to select the report language from a drop-down menu (select English, Arabic, French, German, or Russian). This automatically localizes the report to the selected language when you run the report.
- Run the selected report. This creates (or re-runs) the report and displays it in the main viewing area. (If the icon is not enabled, click **Refresh** on the sidebar, and then try again.)

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 floor is selected, the report generates information *only* for that floor.
- Information is generated according to the way the filters are set in the Filter Tree (see Viewing Multi-floor Data). For example, if "Bleedover" is selected, the report generates *only* for bleedover information.
- Legend settings (that is, the **Overlap**, **Overall** or **PerCH** buttons in the lower right corner of the planner window.

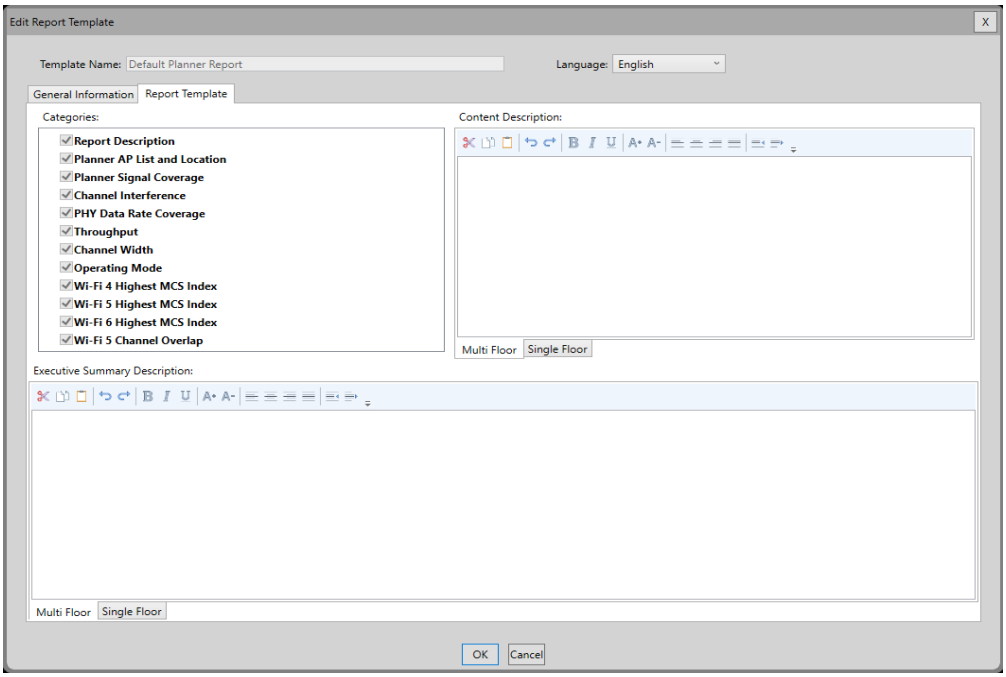
Note: If any of the above settings are changed, you must regenerate the report to reflect the changes. To re-generate, click .

For actions you can take with the completed report, see Viewing Multi-floor Reports.

Edit Report Template

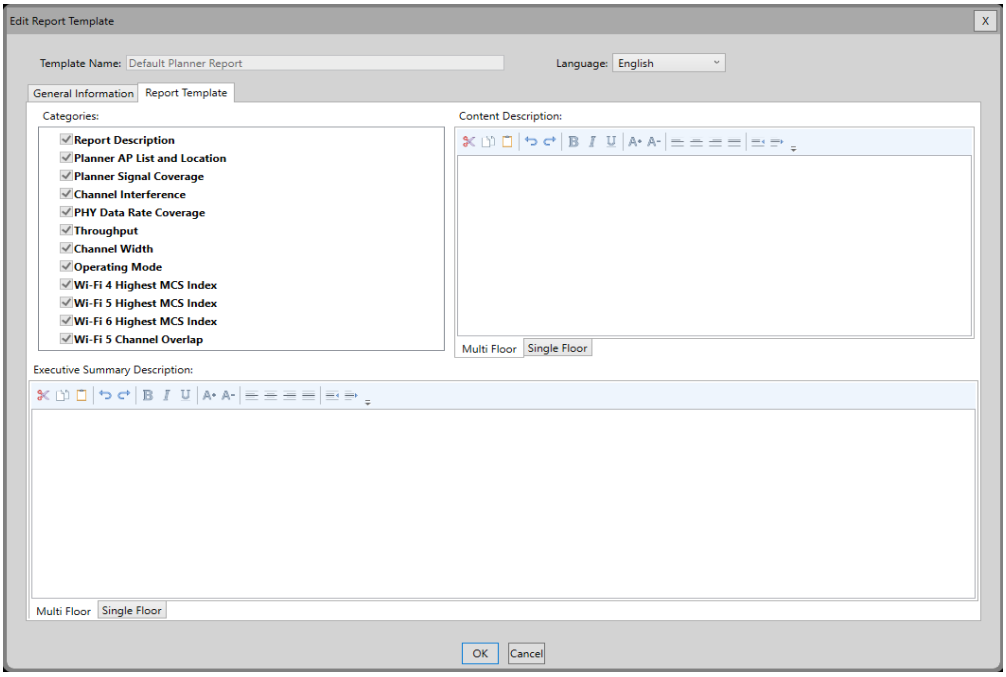
To edit a report template, select the template, and then click  . This displays the Edit Report Template dialog. Change the template properties as needed, and then click **OK** to close the dialog and save changes.

General Information Tab



Field	Description
Survey Title	Formal title for survey.
Prepared for	Recipient of the report.
Prepared by	Report preparer.
Location	Geographic location or address.
Time of Planning	Automatic date stamp (editable).
Cover Sheet Picture	Path to a picture to display on the cover sheet of the finished report. Recommended size is 650w x 400h pixels. (Larger dimensions may cut off the image or display part of it on a new page.)
Corporate Logo	A logo to be displayed in the lower-right corner of the cover page. Recommended size is 164w x 164h pixels. (Larger dimensions may cut off the image or display part of it on a new page.)
Plan Description	A brief paragraph describing the plan.
Report Page Header & Footer	Text for running headers and footers. Both align with the left side of the page. A default page number is automatically included at the bottom right corner of each page.
Preview Cover Sheet	Click this button to display a preview of the cover page in the space below the button.

Report Template Tab



This tab lets you choose predefined categories to include with the report and to customize the material for the introduction, table of contents, and executive summary that precedes each section.

- **Categories** - the list of categories that you can include. (The default template includes all categories.)
  - Click a category item to display the predefined content description and executive summary.
  - Use the text editing tools to customize the text as needed.
  - To remove a category from the template, uncheck (deselect) the selection box next to the item.
- **Content Description** - Summary information for a category that appears in the table of contents.
- **Executive Summary Description** - Summary information for a category that appears at the beginning of the report section for that category.
- **Multi Floor tab** - Select the **Multi Floor** tab to edit the description for the entire multi-floor report. This information precedes the report for all floors for a report category.
- **Single Floor tab** - Select the **Single Floor** tab to edit the description for each floor. This information precedes the report for a single floors for a category.

To Read Descriptions of Each Report Category

You can read detailed descriptions of each report category from MFP.

1. From the main MFP screen, click the **Report** icon .
2. In the reports toolbar, select the **Default Planner Report** in the reports toolbar.

3. In the reports toolbar, select the **Edit Report Template** . This displays the Edit Report Template dialog.
4. Select the **Report Template Tab**.
5. Select one of the report categories in the Categories list. This displays a detailed description of the report in the dialog.

Viewing Reports

After you run a report by clicking the green arrow icon , the report displays in the report view.

Use the controls at the top of the Report Window to navigate, search, print, or export the report.

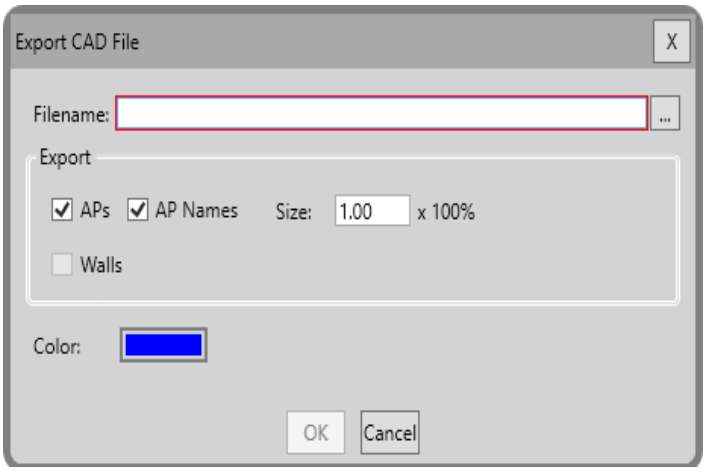
Icon	Name	Description
	Export Report	Opens the Export dialog box, which allows you to export the current report to a specific destination in a selected format (rpt, pdf, csv, xls, xlsx, rtf, or xml).
	Print Report	Opens a print dialog.
	First Page	Goes to the first page of the report.
	Back	Displays the previous page.
	Forward	Displays the next page.
	Last Page	Goes to the last page of the report.
3 /15	**Page Count**	Shows the current page number and total pages in the report. To go to a specific page, highlight the current page number, type a new page number, and then press **Enter**.
	Find	Opens a text search dialog.
	Zoom	Opens a dialog that lets you increase or decrease the magnification.

Export to CAD

If you imported an AutoCAD image for your project, this option enables you to export the image along with any APs and wall data that was added to the image.

Note: To use this feature, you must use an AutoCAD image for your AirMagnet Planner project.

Note: If you chose to show or hide individual layers of the AutoCAD image, these changes are reflected in your exported AutoCAD file.



To export to CAD:

1. From the **File** menu, select **Export to CAD**. This opens the **Export CAD File** dialog.
2. Type the path and name for your exported file in the Filename field, or else click the **Browse** button to the right of the text box. (Be sure to use a file extension that is one of the supported CAD file formats.)
3. Use the options in the Export box to specify the information to include in the export file:
   - **APs:** Include APs.
   - **AP Names:** Include names that you have added for APs.
   - **Size:** Enter a scaling factor for the floor plan. (The default is no scaling: 1.00 x 100%.)
   - **Walls:** Include walls that you have defined in MFP.
4. (Optional) Double-click the **Color** box to open a color selection dialog for the default color for the exported information. Select a color, and then click **OK** to set the default color.
5. Click **OK** to export the file.

Multi Floor Planner Menu and Toolbar Reference

See also: "Using the Right-Click Menu" on page 124.

Toolbars

Item	Description
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 highlight s that particular floor. Clicking the parent Building Name highlights 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**. (After you have generated a heatmap, you can mouse over the 2D floor plan to display a pop-up of data details.)
View Thumbnails	Displays a 2D view of all the floors. (Double-click on a thumbnail to enlarge the view of that floor.)
Open Advisor	Opens the Multi Floor Advisor, which helps you optimize the layout of APs on each floor.
Align Floors	Opens the Floor Alignment feature.
Print	Print the current view.
Report	Generate the Multi Floor Planner Reports.

Side Toolbar

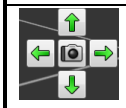
The side of the map view contains a toolbar for changing the map and objects.

NOTE: This toolbar works with the 2D view  only, not with the 3D view or the Thumbnail view.)

Item	Description
Enlarge rectangular area	Select this icon, then click and drag to outline a rectangle on the map. Release the click to zoom to the rectangle.
Selector	Changes cursor to selection arrow.
Zoom in/out	Click the + icon to zoom in. Click the - icon to zoom out. (You can also use your mouse's scroll wheel.)
View Thumbnails	The left icon resizes the map to fit in the available window space. The right icon restores the map to its normal size.
Add AP	Adds an AP to the plan.
Measure Mode	Turns on Measure Mode, which lets you measure the distance between any two points on the site map. You can also choose to recalibrate the site dimensions based on the measurement.
Create Wall	Create walls and select types for the floor plan. See Using the Wall Tool.
Create Rectangular Attenuation Area	Selects an area type (cubicle, office, etc.) and draws a rectangular area.
Create Arbitrary Attenuation Area	Lets you draw an arbitrary shape for an attenuation area.
Create Elliptical Attenuation Area	Selects an area type (cubicle, office, etc.) and draws an elliptical area.
Create Rectangular Coverage Area	Draws a draw a rectangular area.
Create Rectangular Excluded Area	Draws a rectangular excluded area (for use with Planner Advisor).
Create Arbitrary Coverage Area	Draws an arbitrary coverage area.
Create Arbitrary Excluded Area	Draws an arbitrary excluded area (for use with Planner Advisor).
Create Elliptical Coverage Area	Draws an elliptical coverage area.

Create Elliptical Excluded Area	Draws an elliptical excluded area (for use with Planner Advisor).
Clear All Objects	Removes all placed objects or all objects of a certain type (APs, attenuation areas, walls, etc.).
Undo	Undoes the previous action.
Refresh	Generate and refresh the heatmap (or press **F5**)

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.
Right-click	You can modify or remove objects in the planner map view by right-clicking to display a pop-up menu. See Using the Right-Click Menu.
Hover	After you generate the heatmap by clicking the **Refresh** button , hovering the mouse over any location on the heatmap displays coverage and AP information for that point.

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
Open AirMagnet Planner Project	Opens an AirMagnet Planner Planner project in Multi Floor Planner.
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.
Export to CAD	If you used an AutoCAD format file for your site map, you can export the map back to AutoCAD. If you imported an AutoCAD image for your project's site map, this option lets you to export your project to AutoCAD along with any APs and walls data that was added to the image. See Export to CAD.
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 MFP.

View Menu

Item	Description

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

Tools Menu

Item	Description
Align Floors	See 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	Copies the current view. If you have a zoomed-in view, this choice captures the zoom area only.
Configure	Opens the Configuration dialog, which lets you enter the project default directory and display options for APs, bubble help, walls/areas, and grids.
Configure Plan	Enter a custom Sampling Density.
Configure Walls/Areas	Sets default values for areas and walls. See Configuring Walls and Areas.
Configure CAD Floor Plan	Available only if you created a floor plan using an AutoCAD file. You can select the AutoCAD layers to include in the floor plan and extract walls. See Using Automatic Wall Extraction.
Antenna Manager	See Using Antenna Manager with Multi Floor Planner.

Help Menu

Item	Description
View Help	Open Help documentation
Sample Project	Open a sample MFP building project for Wi-Fi 5 or Wi-Fi 6.
About Multi Floor Planner	View basic information about MFP such as version and build number.

Using the Right-Click Menu

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

Note: The options listed in the menu depend on the object selected. For example, the **Locked AP** and **Default AP** options only appear if you have right-clicked on an AP.

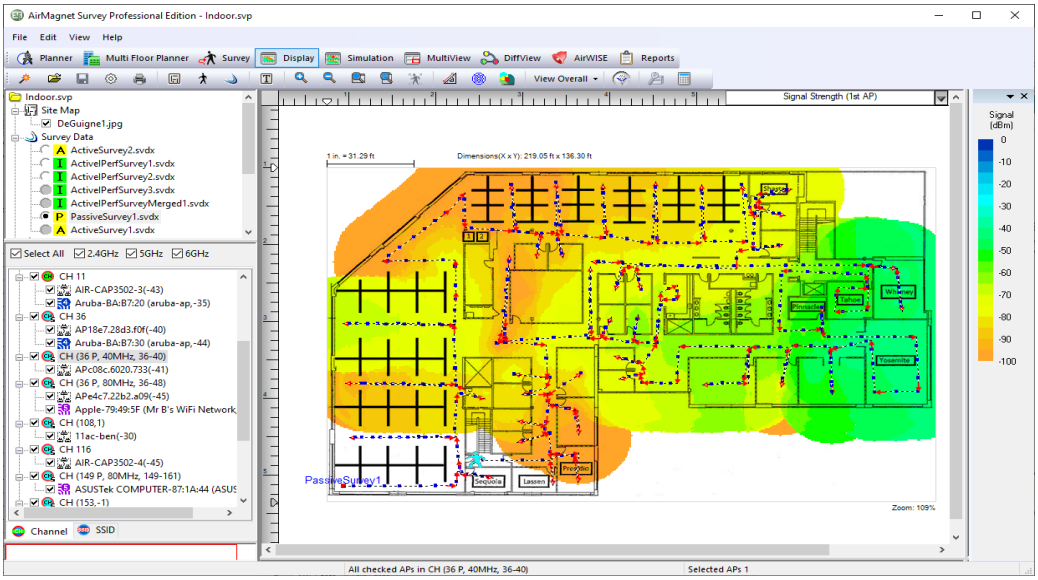
Option	Description
Properties...	Opens either the AP Properties or Wall/Area Properties dialog box, depending on the object selected.
Delete	Deletes the selected object.
Locked AP	Locks the selected AP. This ensures that the Advisor cannot modify any of the AP's properties.
Default AP	Specifies the properties of the selected AP as Planner's default AP settings. Any APs placed after selecting this reflect the current AP's settings.

Display View

In this chapter:

About Display view

The Display view is designed for viewing, analyzing, and manipulating data. Normally, you use this view only after you have saved a completed survey and/or site plan. To open the Display view, click Display on the Navigation Bar.



The Display view appears by default when you open a project file (.svp). The view may show the site map only, without any data. To show data over the site map, click the corresponding radio button for one of the data files listed under Survey Data in the Project Window.

NOTE: The Spectrum XT Window may appear if you are running AirMagnet Survey PRO, provided that this feature is enabled. See Configuring a Spectrum Analyzer.

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 is 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

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.

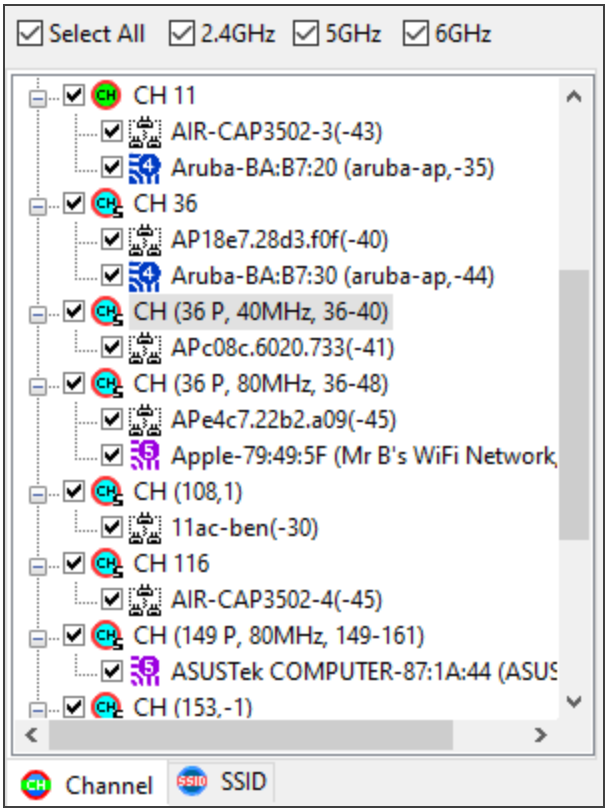
To hide the survey path: Uncheck the check box in front of the survey path.

Channel/SSID List

The Channel/SSID List shows the 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 display an associated 802.11a/b/g/n/ac/ax icon (for example, ). Wi-Fi 5/Wi-Fi 6 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 deselect 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 is 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 are 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 (802.11b/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 (802.11a/n/ac/ax) spectrum. Enabling this option along with the 2.4 GHz option described above displays all media types detected in an environment that uses 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. See Creating Filtered Data Files.

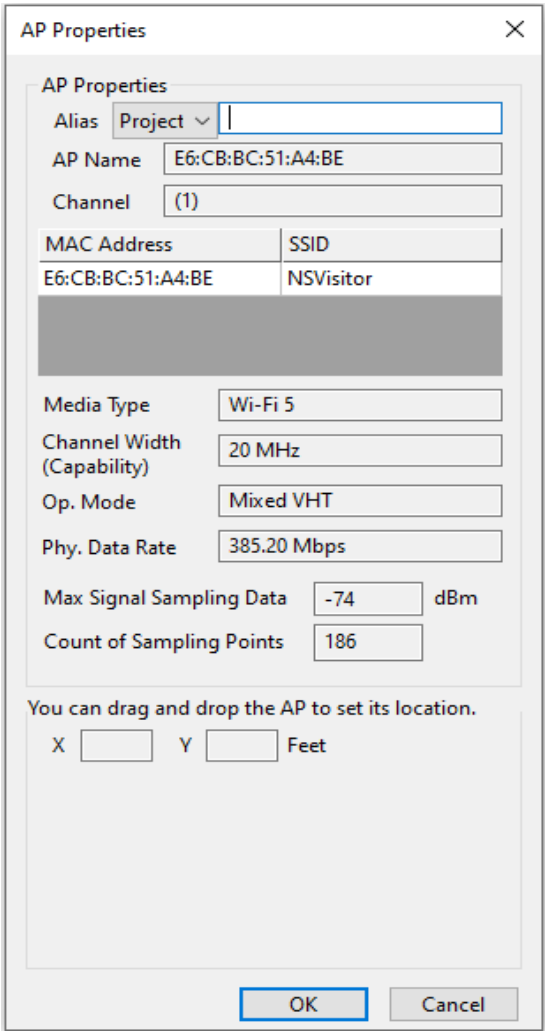
Placing APs on the Floor Plan

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
- 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.

To change the AP properties after placement, right-click the AP and select **AP Properties**. This opens the **AP Properties** dialog. (Only a few options are editable.)



Alias Name: 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, see Placing APs in the Survey.

Comments

AirMapper site surveys performed with an AirCheck G3 or EtherScope nXG support comments for survey points on a floor plan. You can view these comments in the Display View.


Indicates a single comment for a survey point.


Indicates multiple comments for the same survey point. (This may happen after you have merged two data files that have comments at the same survey point.)

To view comments, mouse over the comment icon. A pop-up bubble displays comment text.

- Right-click on a comment icon to display the comment dialog for that icon.
  - When more than one comment exists for the same location, all of the comments show up in the same dialog. Each comment is timestamped to make it easier to identify.
  - The dialog allows you to scroll up and down and to scroll through comments.
  - If there are duplicate comments, only the most recent of the duplicates is shown.
- To hide or unhide comment icons, right-click on the floor plan. Select **Hide Comments Icons** to hide comments. If the Hide Comments Icons option is checked, it indicates comments are hidden. To redisplay the comments, right-click on the floor plan and uncheck **Hide Comments Icons**.
- When you merge site survey files, all comments included on the source files are included in the merged file.
- When you filter a site survey file, all comments are copied from the original file to the filtered file.
- Except for reports, comments show up on all views for which an Access Point location is supported.
- Comments cannot be edited; they are read only.

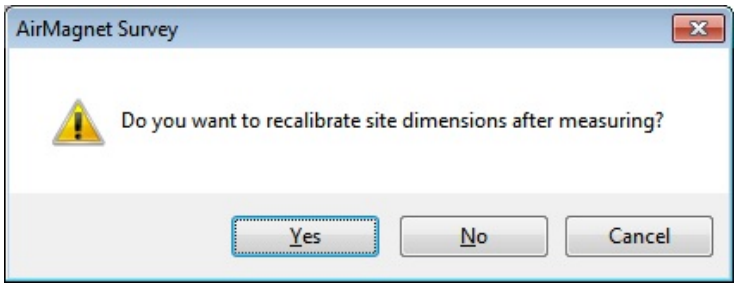
Measuring and Calibrating the Floor Plan Scale

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).

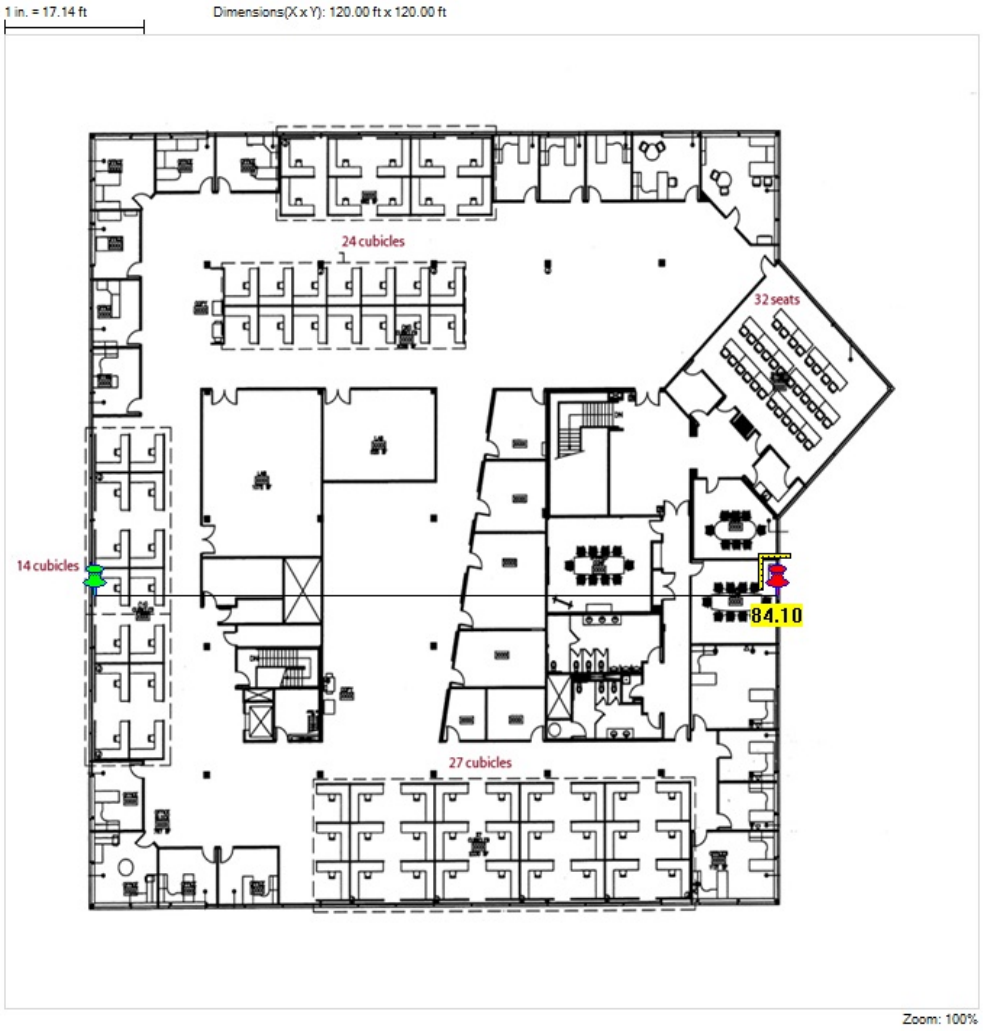
When you create a new project and load a floor plan image, there is an option to enter the dimensions of the floor plan image in feet or meters (X and Y dimensions). Keep in mind that entering dimensions using this method includes any white space outside the perimeter of the building that may be included 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 are prompted at the conclusion of the project wizard to recalibrate the default scale.

To recalibrate the scale of the floor plan:

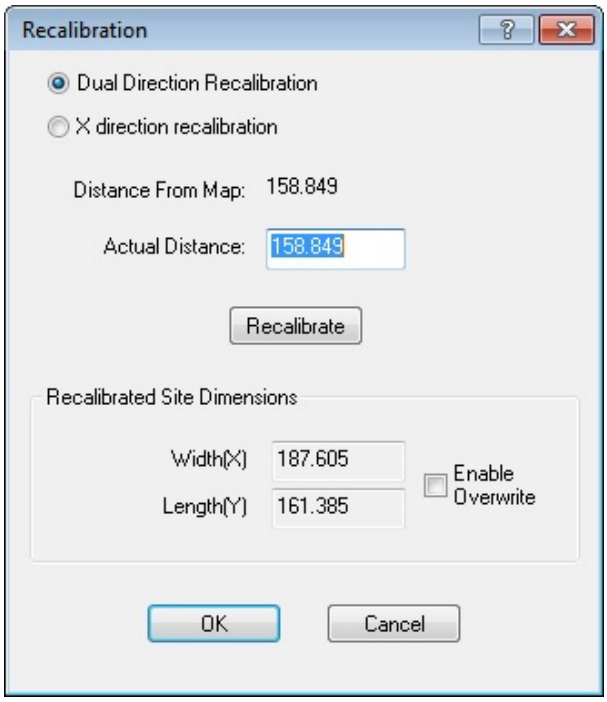
1. From the Toolbar, click the **Measurement** tool  . A prompt is displayed to choose whether to measure or recalibrate. To recalibrate, click **Yes**.



2. Click two points on the floor plan where you know the actual distance between the points. (In general, using a longer distance tends to be more precise than a shorter distance.) This opens the Recalibration dialog.

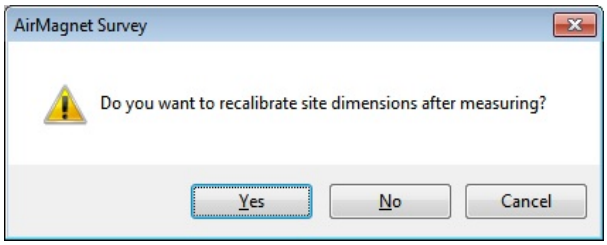


3. Enter the correct value for the "Actual distance" you measured, click **Recalibrate**, and then click **OK**.



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 shown in feet or meters depending on

the unit of measure selected for the project. Click an end point to complete the measurement.

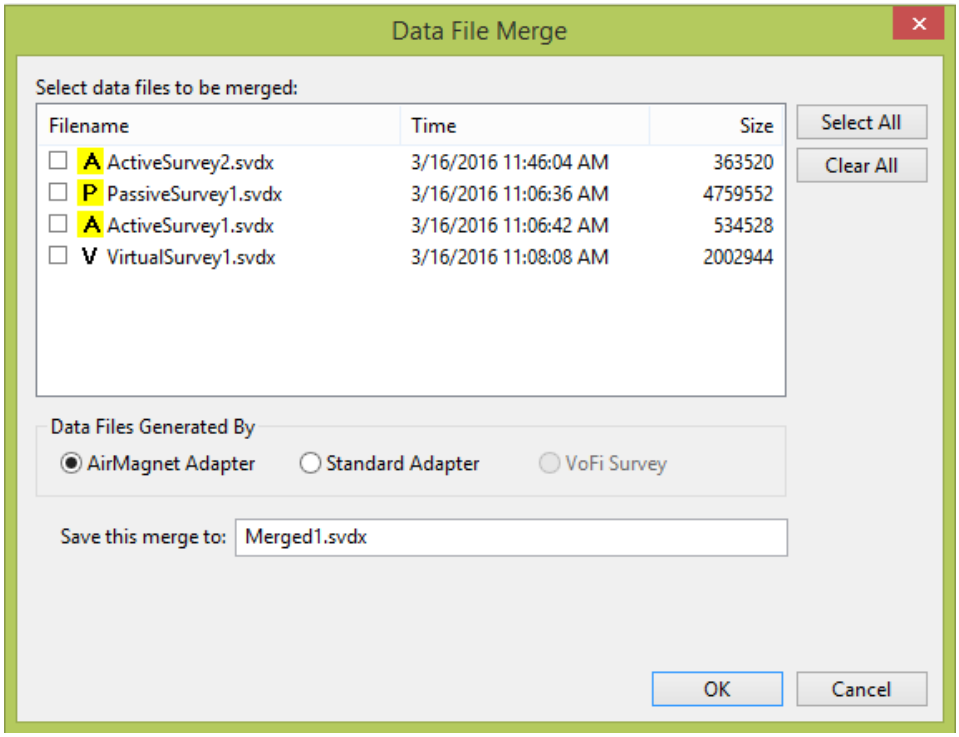
How to Merge Survey Data

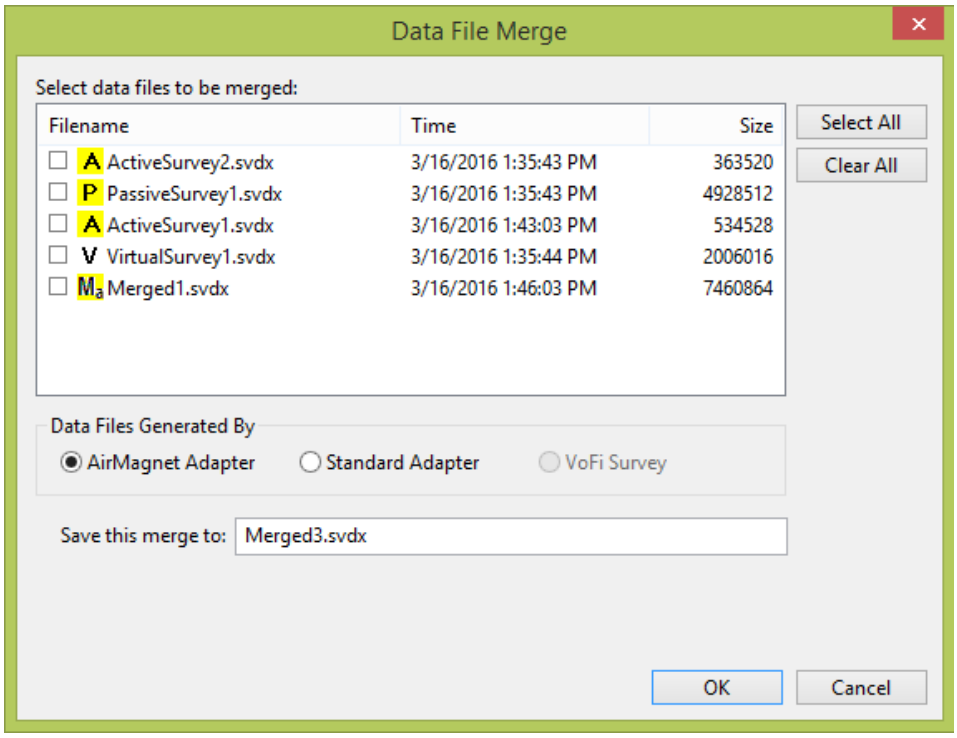
Merging survey data means combining different survey data files into one file that includes all the data collected from the individual files.

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:

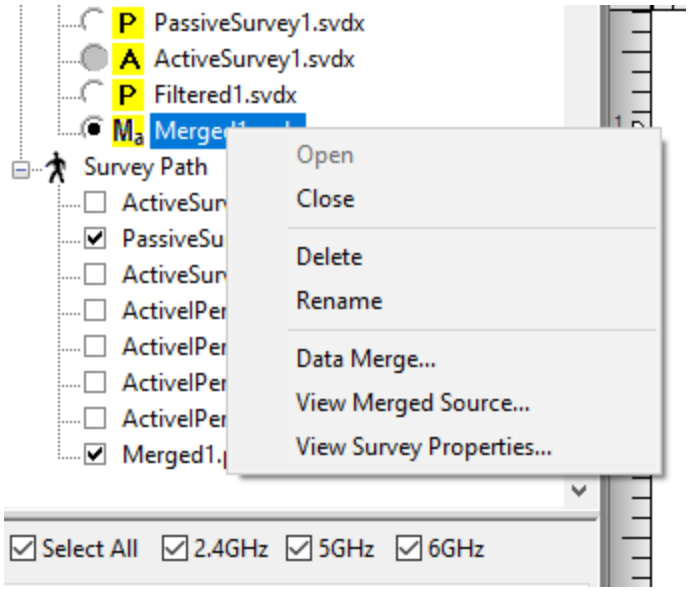
1. Click **File > Data Merge**.... The Data File Merge window appears.





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 are 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.

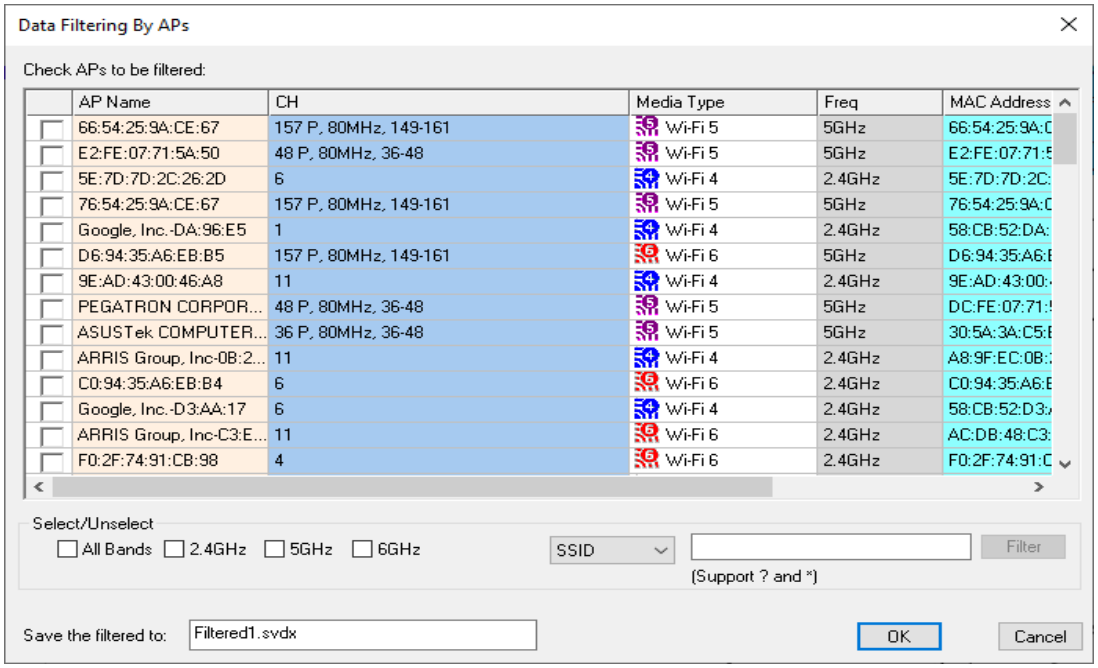


Creating Filtered Data Files

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. Check boxes by AP names to select the APs you want to include.
4. Use the 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.
   - **6 GHz** check box selects only APs set to 6 GHz.
   - Filter the list by selecting an option from the Filter drop-down (**SSID**, **AP Name**, **MAC**) or type the desired name into the text entry box. (Two wild cards are supported. Use ***** for incomplete names (e.g. 00*) or **?** to replace an unknown character, such as Cisco-123?. Matches are case sensitive.) Then click **Filter**.
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**.

Display View Menus and Windows

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

DISPLAY VIEW: MENUS, BUTTONS, AND WINDOWS

File menu

Edit menu: This menu has only one option, **Copy Heatmap Image (Ctrl+C)**. Selecting this option copies the heatmap displayed in the map window to the clipboard as a .png file.

View menu

Toolbar

Project window

- Right-click Pop-up Menu
- Data Type List Menu

Overview Window

Map window

- Heatmap Legend
- Using Context-Sensitive Pop-up Menu

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. See 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 (which has 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.

Zoom Out	Reduces the view of current floor map in the map window.
Zoom to Fit	Fits the current floor map to the map window.
Zoom to Actual Size	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 an AutoCAD 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	Opens 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. See 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	Turns on Measure Mode, which lets you measure the distance between any two points on the site map. You can also choose to recalibrate the site dimensions based on the measurement.
Throughput Simulator	Opens the Throughput Simulator. See About Simulation view.
Refresh	Refresh the heatmap display to reflect any changes.

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. See File menu.
	Open Project	Opens an existing Survey (.svp) file. See File menu.
	Save	Saves changes you have made in the current project.
	Configuration	Opens Survey Configuration window. See 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. See 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 areas of coverage overlap for a selected AP in the Map Window.
	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:

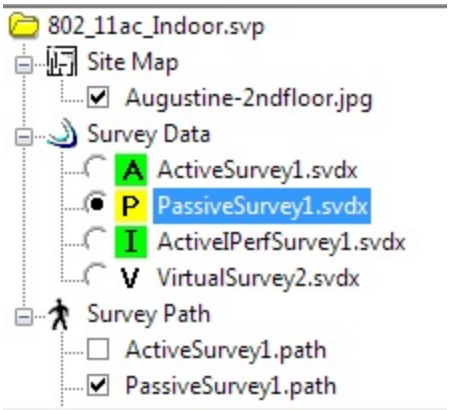
View Overall: Displays overall RF coverage in the Map Window. This option is active by default.

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.

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 is 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-to-noise ratio, etc. captured during the survey. File types are as follows:

Code	Survey Type
A	Active survey
P	Passive survey
A_n	Survey Mobile app survey
A_m	AirMapper active survey file from the 1x1 radio on the EtherScope nXG
I	iPerf survey
M_a	Merge survey
M_s	Merged survey
S	Simulation survey
	VoFi survey
V	Virtual survey

- **Survey Path**(applies to Survey projects only, not to Multi Floor 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 unchecking 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

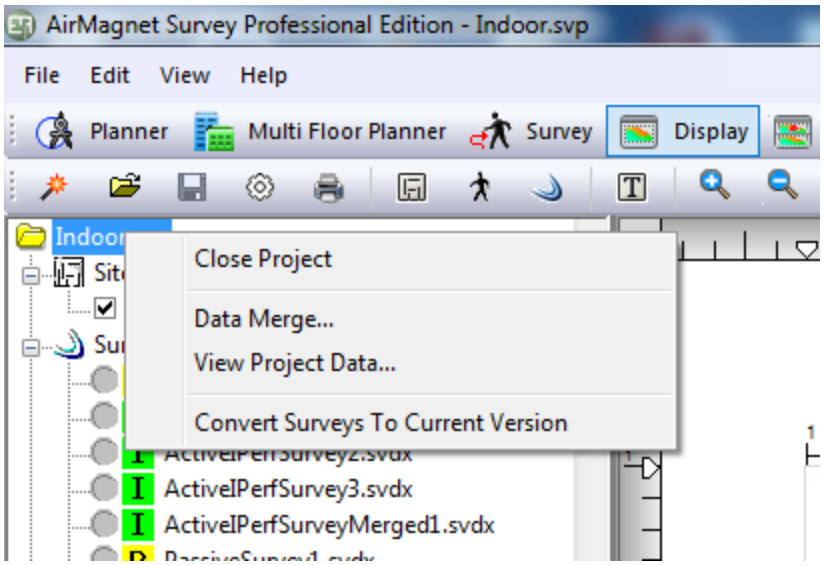
Beginning with Survey PRO/Planner version 8.8, the project data file extension was changed from .svd to .svdx. A project containing data files having the .svd extension may be opened in version 8.8 and higher; however, if the data file is selected in Display view (for example), you are prompted to convert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

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.

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**.



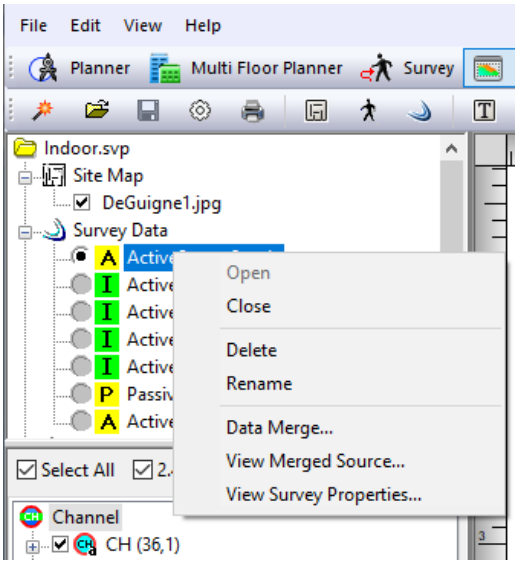
2. Click **Yes** to confirm and start the conversion process.

A progress window shows the files being converted. If you click **Cancel** during file conversion, the process is canceled 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 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	Closes the selected data file. (Display view only)
Delete	Deletes the selected (right-clicked) item.
Rename	Renames the selected data file. (Display view only)
Data Merge...	Merge two or more data files.
View Merged Source ...	Shows the sources from which a merged data file was created. (Display view only)
View Survey prop-	Opens a properties window for the file. (Display view only)

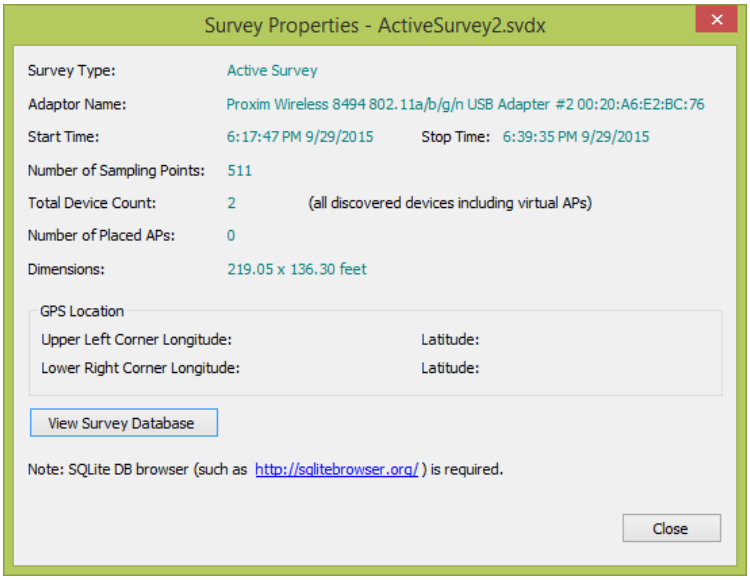
erties ...	

View Survey properties

From the Project Window, right-click a survey data file (.svdx), and then 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

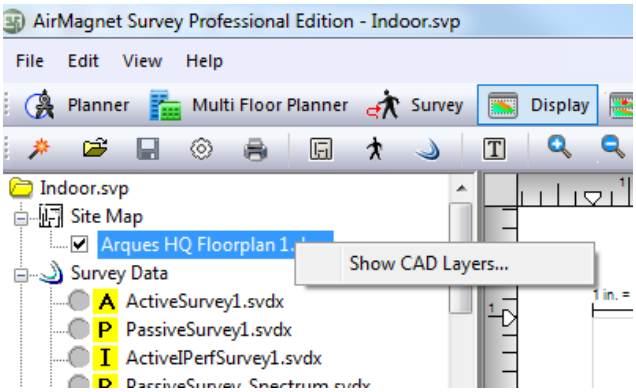
The Survey properties includes an option to view in-depth, database details included in the selected survey data file.

To view the database, you need a database viewer application such as DB Browser for SQLite, downloadable at: http://sqlitebrowser.org/

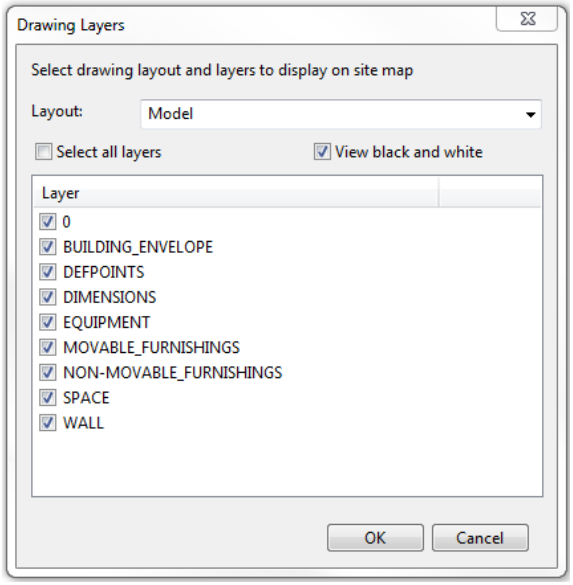
Click **View Survey Database**. You may be prompted by Windows to associate the database with the desired database viewer application.

Right-Click to Show CAD Layers...

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



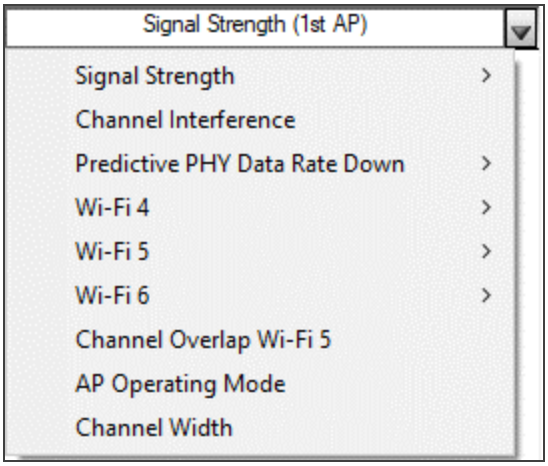
The Drawing Layers... dialog opens, as shown below.



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.



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.

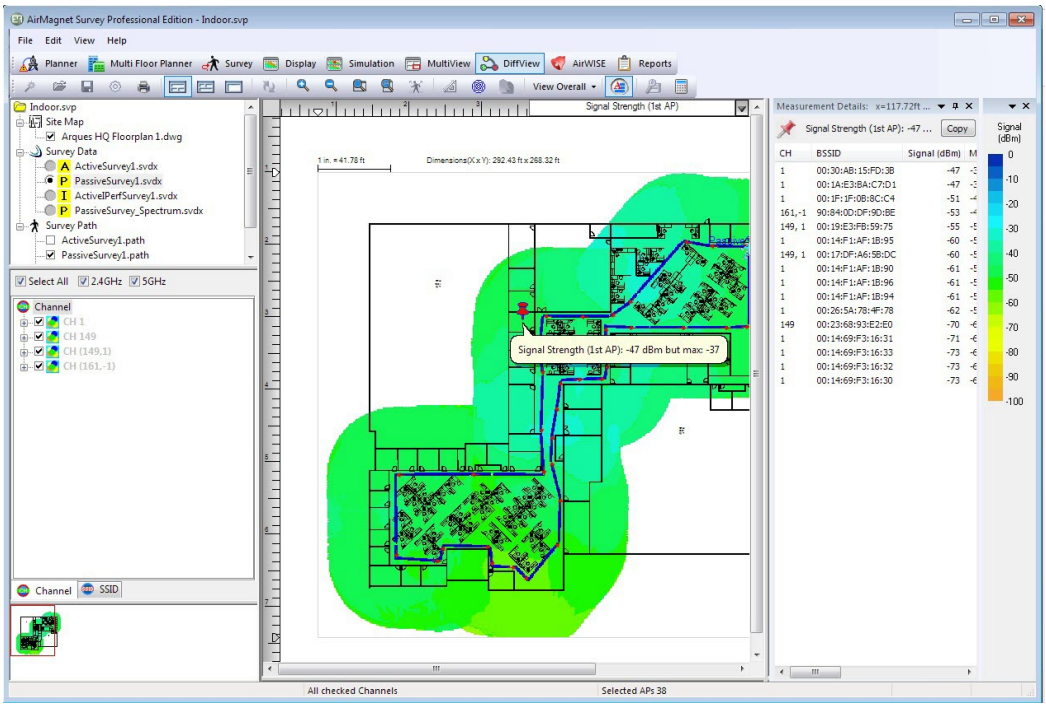
Data at any location on the site (XY coordinates) may be viewed in two ways: Mouse hover and Measurement Details. In each case, the data displayed depends on the Data Type selection in the drop-down at the top of the Display view.

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 opens 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.

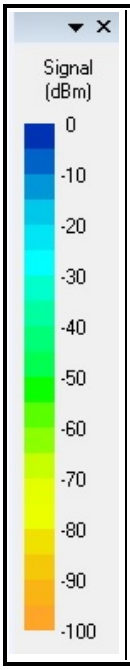
You can also visualize and analyze the data using different color schemes and analytical tools. See Introduction to Data Analysis for more information.



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 displayed. It is identical to what is selected from the Data Type list menu on top the Map Window.
- Drag up from the bottom of the Legend or down from the top of the Legend to set the upper or lower limit of RF data (signal, noise, interference, and so on) shown in the Map Window.
- You can also adjust the color scheme. See Configuring Legend Color Schemes.

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:

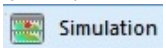
1. Right-click any part of the map view. The context-sensitive pop-up menu appears.

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	Hides the AP icons so that they do not display in reports.
Disable Measurement Tooltip and Details Window	Prevents tip screens from popping up when you mouse over the Map Window.
Hide APs Below Legend Threshold	Hides APs outside threshold range set for the Legend. (You can adjust the range by clicking on either end of the Legend and then dragging toward the center.)
Smaller Survey Man	Shrinks the icon of a person on the map. (Applies only to a site survey.)
Show Arrows in Path	Adds directional arrows to survey paths. These arrows indicate the beginning to end course of the path taken during the survey. (Not applicable to Multi Floor Planner.)
Show Heatmap	Removes the heatmap from the view.
Delete location information for this AP	Removes the location information of the selected AP.
Set Zoom...	Sets the zoom level.
Copy	Same as View Menu.
Copy Current View	Copies the content in the current Map Window for pasting into another application. (This may be useful for copying a zeroed-in area for detailed analysis.)
Print Current View	Prints the content view in the current Map Window to another application. (Printing a zeroed-in area may help with detailed analysis.)
Export to Google Earth	Exports the data to Google Earth.

Simulation View

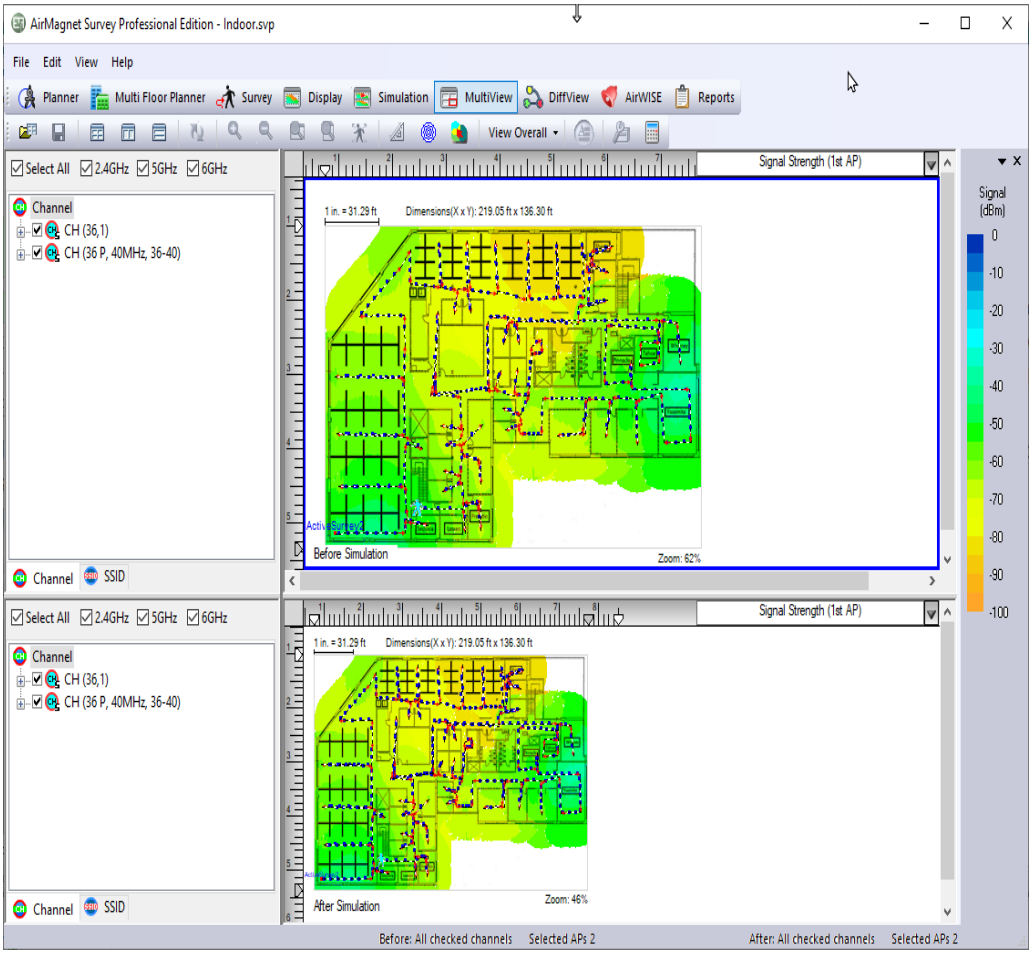
In this chapter:

About Simulation View

The Simulation view allows you to perform channel, SSID, and power simulation to see how the network would function in different scenarios. 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**) on the Navigation Bar.

The map window on the Simulation view is divided into two parts: the top shows survey data before simulation, and the bottom shows survey data after simulation. This helps you easily visualize differences between the simulated and unsimulated data.



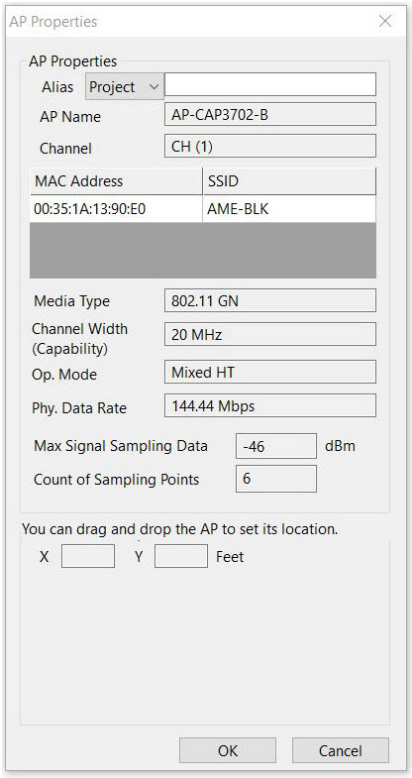
The Simulation view can be divided into the following sections:

- Channel/SSID List (Before_Simulation)
- Channel/SSID List (After-Simulation)
- Simulation View Menu Options
- Legend (same as the legend for Display view)

Setting Up Data Simulation

Before conducting data simulation, you must place and "power" APs on the site map in the **Display** view at locations where actual APs are located:

1. After you have created a survey project and conducted the survey, click on the **Display** view button.
2. 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.)
3. Right-click an AP you placed on the site map and select **AP Properties**.
4. Check **Apply Power Setting** and set the **Original Power milliwatts**. Use the setting that matches the setting for the AP. Click **OK**.
5. Navigate to **Simulation** view and 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**. This places the AP is placed on the site map. You may drag the AP to the desired location.
6. 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**. This places the AP is placed on the site map. You may drag the AP to the desired location.



7. Click **Refresh** to view changes to the heatmap.

Before-Simulation Channel/SSID List

The Before Simulation Channel/SSID List appears on the upper-left part of the Simulation view. It lists the APs contained in the unsimulated 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

The 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.

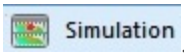
Conducting Data Simulation

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 is not be available. You can conducting two types of simulations:

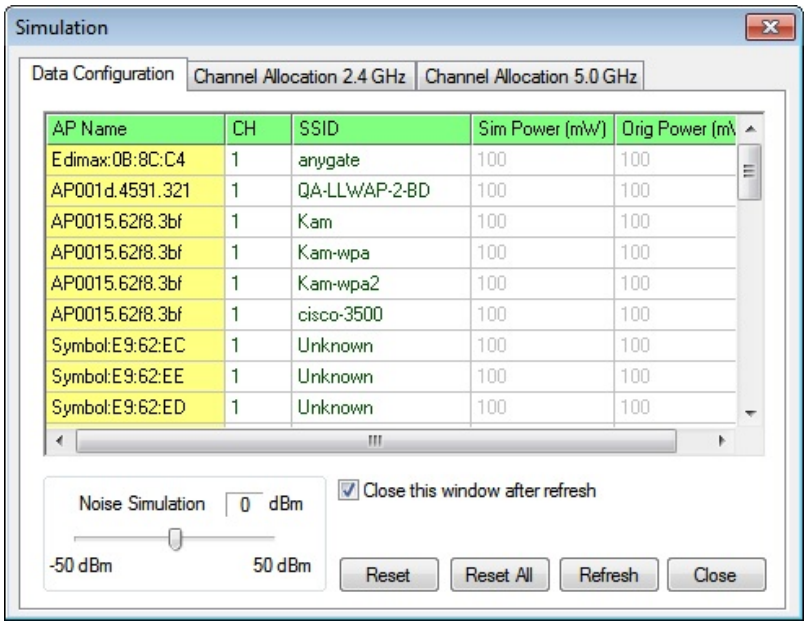
- Simulating Data Configuration
- Simulating Channel Allocation

Simulating Data Configuration

To conduct data simulation:

1. From the Display view, open a survey data file.
2. From the Navigation Bar, click 

. The Simulation dialog box appears.



NOTE: Wi-Fi 6E APs are not supported in Simulation mode.

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. Therefore, you cannot 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. See Channel/SSID List.

Simulating Channel Allocation

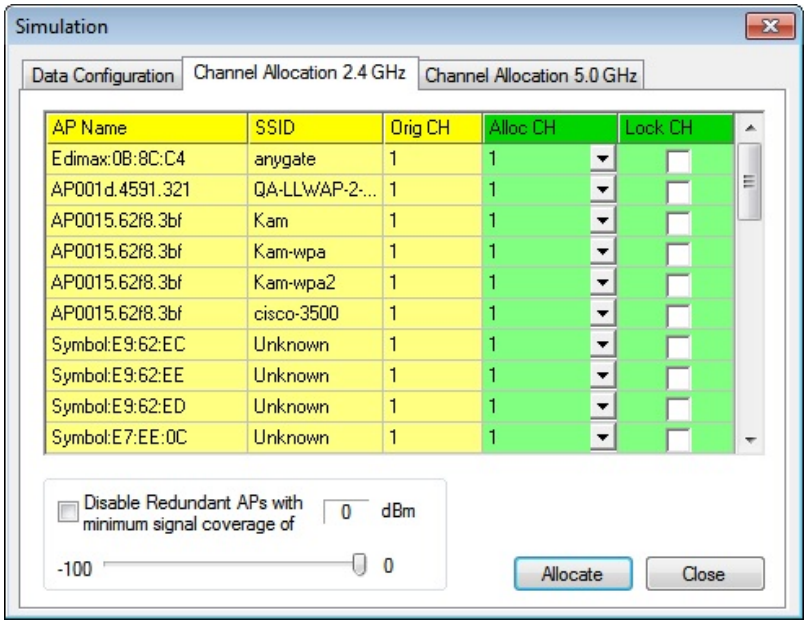
Simulating channel allocation enables you to find out the optimal channel assignment or distribution for the APs currently detected in the survey. It helps you make well-informed decisions on the number of APs needed on the network or at a certain part of the network: if multiple APs are covering the 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.

NOTE: Wi-Fi 6E APs are not supported in Simulation mode.

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.

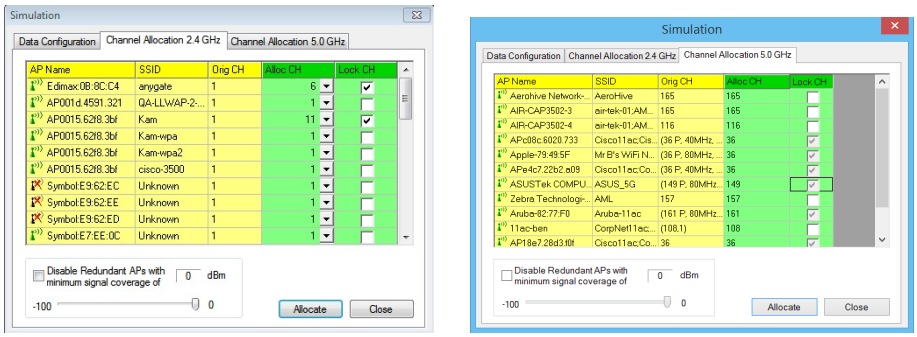


NOTE: All APs that are detected are identified by AP name, SSID, and (original) channel. Wi-Fi 6E APs are not supported in Simulation mode.

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.

   Note: Wi-Fi 5/Wi-Fi 6 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 are eliminated. Once the simulation is completed, Survey automatically disables 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 affects the signal coverage in the target areas.

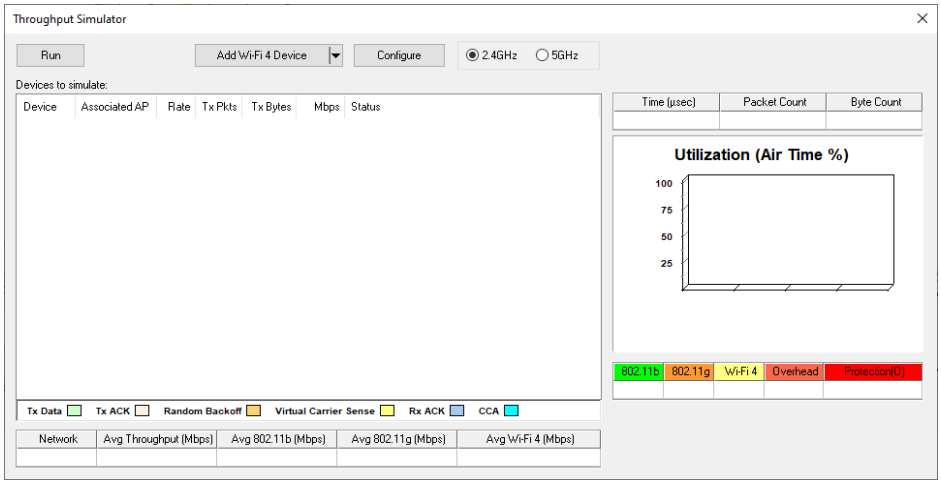
Simulating Network Throughput

Survey's Throughput Simulator allows you to set up theoretical network implementations and view the expected levels of traffic that the specified devices experience. You can create entire simulated networks from scratch to test a planned implementation or use devices already detected in the current survey file to see how new additions to the environment affects the overall performance of the existing infrastructure.

The Throughput Simulator calculates 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 Wi-Fi 4 nodes on a "virtual channel". The Simulator applies additional network and node parameters based on the type and settings of the nodes present. The Simulator runs in a "perfect" environment, assuming that all nodes can "hear" each other (to negate 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 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.

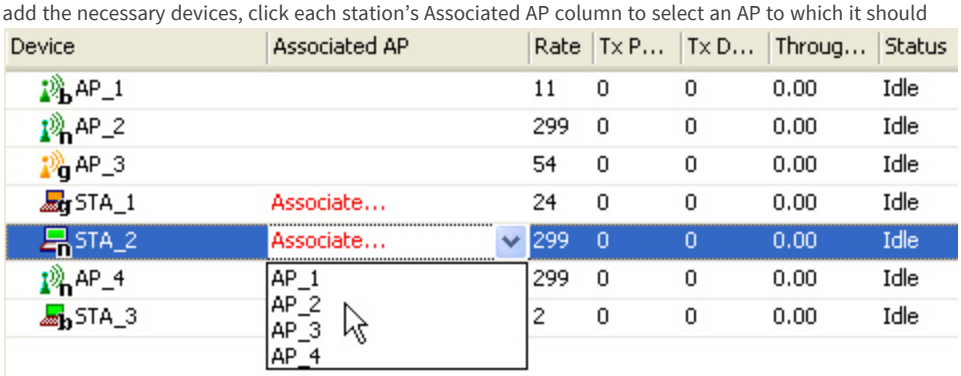
   Note: For all options, you must add an AP before the Throughput Simulator allows you to create a station.

   NOTE: Wi-Fi 6E APs are not supported in Simulation mode.

   Note: To remove a device from the Throughput Simulator, right-click the desired device, and then select **Delete Node**.

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 and the device's physical data rate.
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.
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.
Wi-Fi 4 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.

3. After you add the necessary devices, click each station's Associated AP column to select an AP to which it should associate.



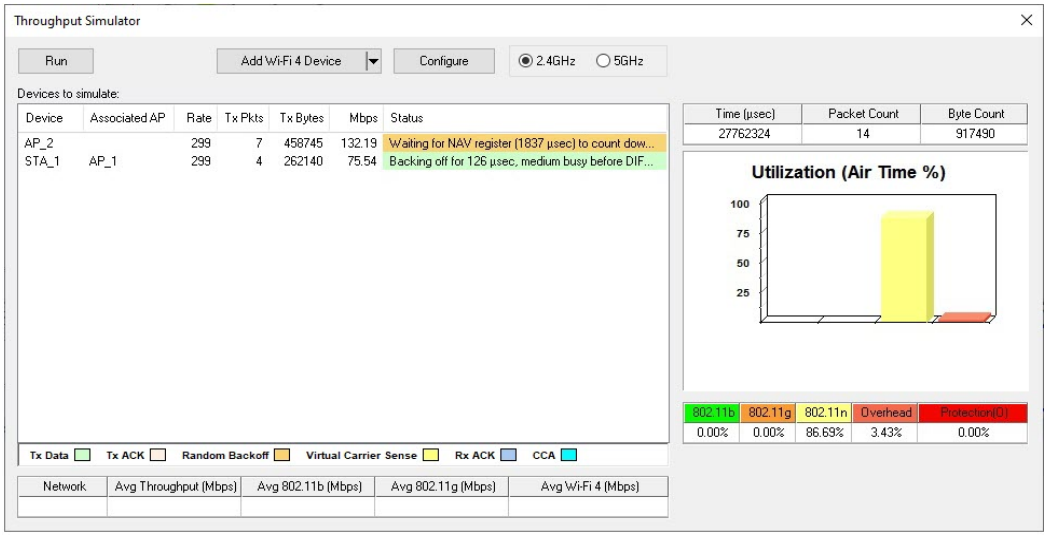
Note: You must associate at least one station to each AP to simulate network throughput. Also note that APs with associated stations cannot be removed.

4. After all the necessary associations have been made, click **Run** to start the simulation. For descriptions of the throughput simulation data fields, see Analyzing Simulated Throughput Data.

Analyzing Simulated Throughput Data

During network simulation, the Throughput Simulator window updates dynamically as new information is calculated. These data are displayed in three major portions of the view, as highlighted in the image below.

NOTE: Wi-Fi 6E APs are not supported in Simulation mode.



Throughput Simulator Summary

The Throughput Summary portion of the Throughput Simulator displays the simulated network throughput separated based on media type, allowing you to see how much throughput is dedicated to each type of device. These data are described in the table below:

Field	Description
Network	Combined aggregate throughput of all wireless media (which may include 802.11a/b/g/n/x, depending on the frequency band selected.
Average	Average node throughput (that is, the network throughput divided by the number of nodes).
Avg 802.11a	Average node throughput for all 802.11a devices. Note that this column only appears when the 5 GHz band is selected.
Avg 802.11b	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	Average node throughput for all 802.11g devices. Note that this column only appears when the 2.4 GHz band is selected.
Avg Wi-Fi 4	Average node throughput for all Wi-Fi 4 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 do not display any information in this field.)
Rate	The rate at which the device transmits. This number is specified when you add devices.
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.

Simulation View Menus and Windows

The Menu bar on the Simulation view also has three menu groups, each containing various menu options for simulating survey data. The File and View menus contain options that are specific to the Simulation view only. (The Help menu content is the same for all screens.)

File Menu

The Simulation view includes an additional option to the standard File menu options: **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 tools 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 you to view predicted throughput speeds and bandwidth consumption for a custom-designed network. See Simulating Network Throughput for more details.

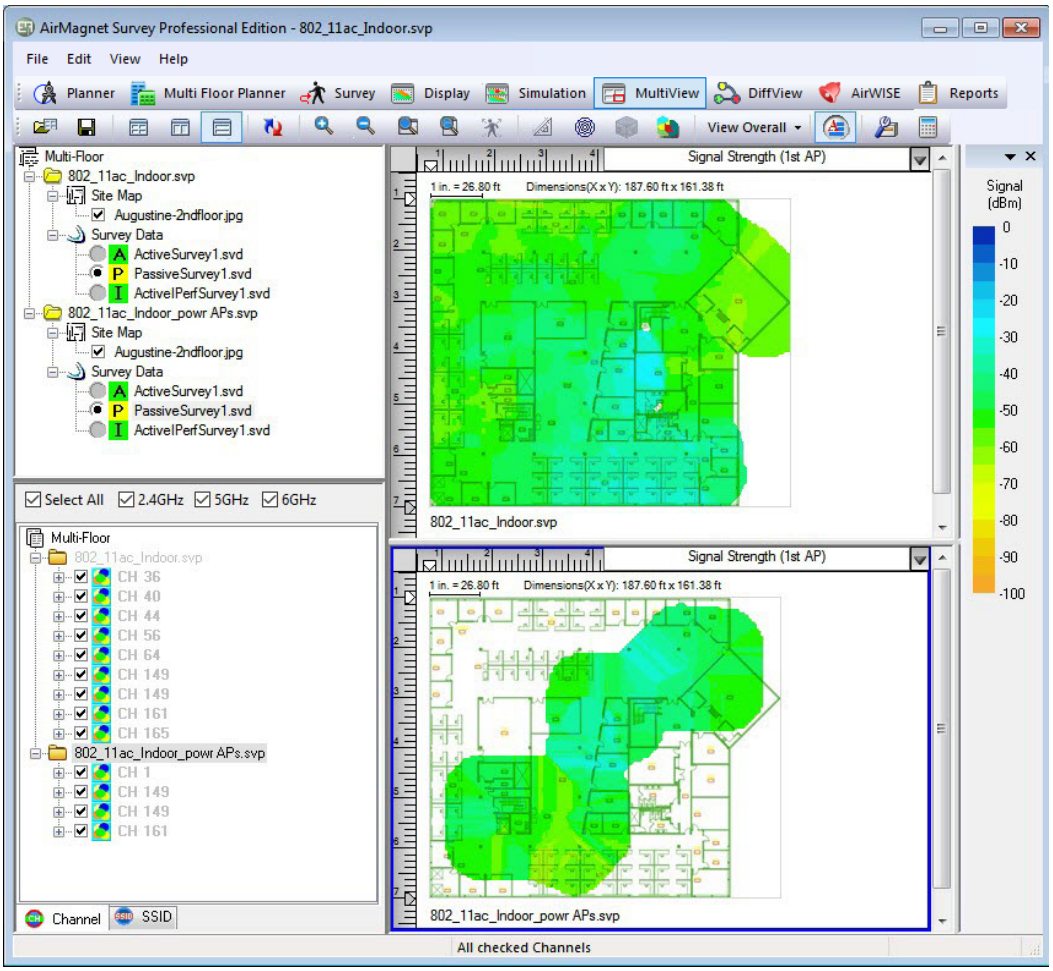
Multiview Map View

In this chapter:

MultiView Overview

MultiView is similar to the Display view but you can display and compare up to four different surveys at the same time. When multiple surveys are loaded, each pane in the window acts individually. You can view different survey data files in each pane. A blue box highlights the currently active pane, as shown below.

- Begin by opening the projects that you want to include. You can then select various options to compare surveys, bands, channels, SSIDs, etc. between the projects.
- You can also open a single project in the MultiView View to compare different parts of the same project in each pane.



For more information, see

- The Project Window , which information for all survey projects opened in the MultiView, including individual components in each project.
- The Channel/SSID Tree, which shows the APs and SSIDs detected in the current data file(s).
- MultiView Menus and 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, 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

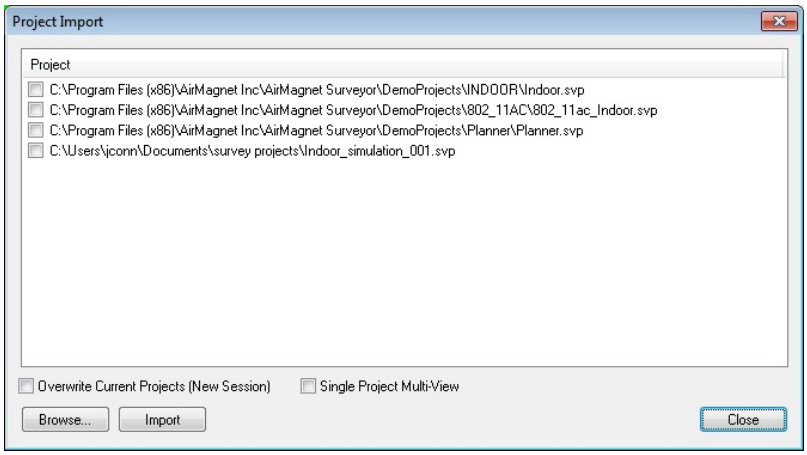
separately. Once data are collected, you need to open the one of the Survey projects first on the Display view, and then bring up the MultiView view to open (import) the other survey projects. After all the projects are loaded on the MultiView view, you can use the tools on the view to analyze the data.

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 

on the Navigation bar. The **MultiView** view opens with the project displayed.
5. 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) afterward 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.

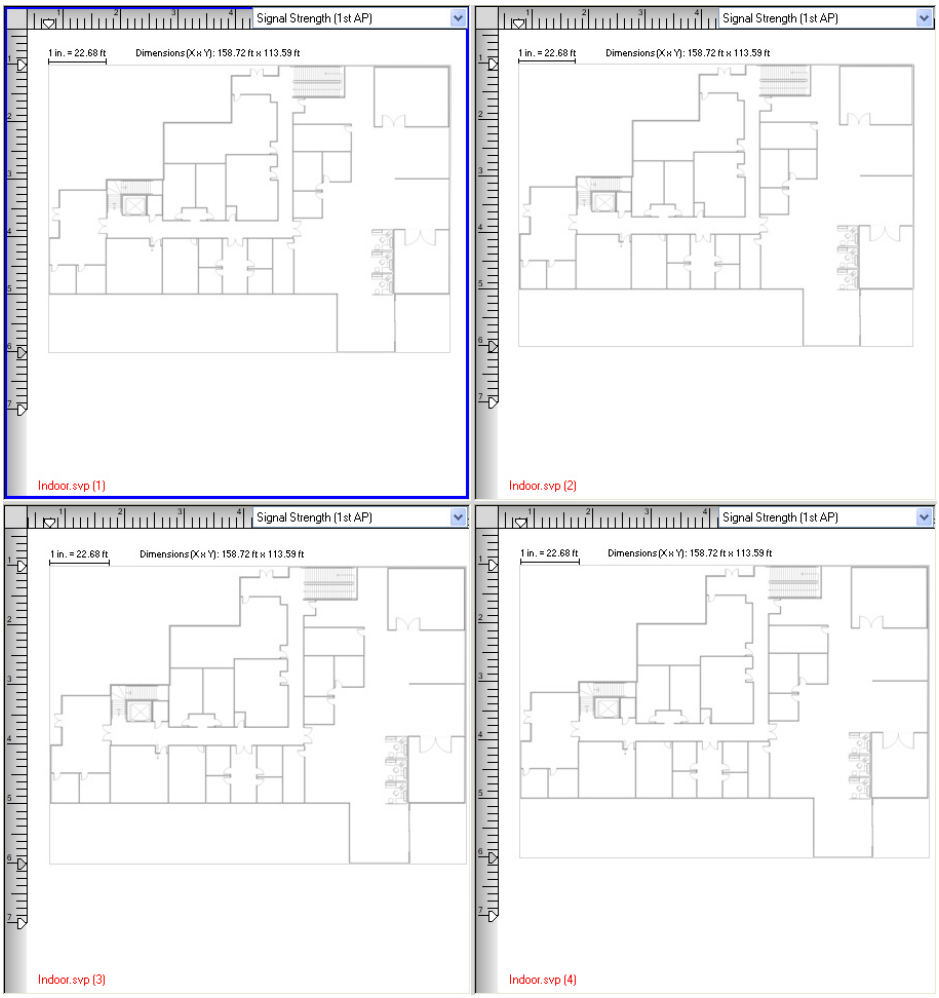
The MultiView view can also help you compare several different surveys in a single project, using the Single Project Multi View function.

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 compare different parts of the same project in each pane.

To view a single project in MultiView mode:

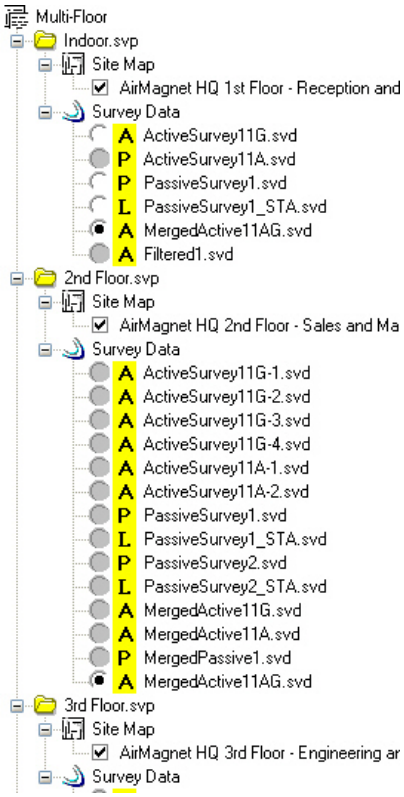
1. Open the **Project Import** view.
2. Check the box for the file you wish to view (you may need to browse to find the project to import).
3. Check the “**Single Project Multi View**” box at the bottom.
4. Click **Import**. This displays the single project you loaded displayed in all four panes.



5. Click the radio buttons for the survey data you wish to load in each individual pane. Select your desired view options.

Project Window

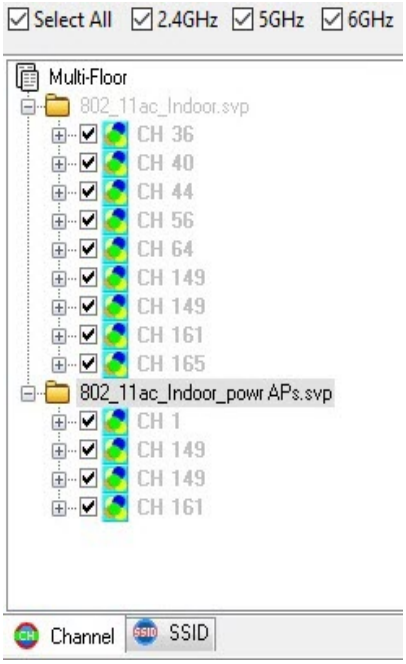
The Project Window on the MultiView view displays all the survey projects that you have opened (imported), including the individual components in each project.



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 automatically displays in the other Map Window(s) if its RF signals are also contained (collected) in the preset(s). This enables you to easily visualize and compare how RF signals propagate across the floors.

MultiView Menus and Options

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 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 is automatically displayed in the other Map Window(s). See Channel/SSID Tree.

Legend

The color legend on the Multi View view works in the same manner as the one found on the Display view.

DiffView and Data Analysis

AirMagnet Survey's DiffView and other powerful analytical features allow you to visually analyze network performance and validate WLAN deployment using collected data. This section explains how to use the various analytical tools on the Display view and DiffView to analyze data you have collected.

In this chapter:

DiffView: Compare Surveys and Site Plans

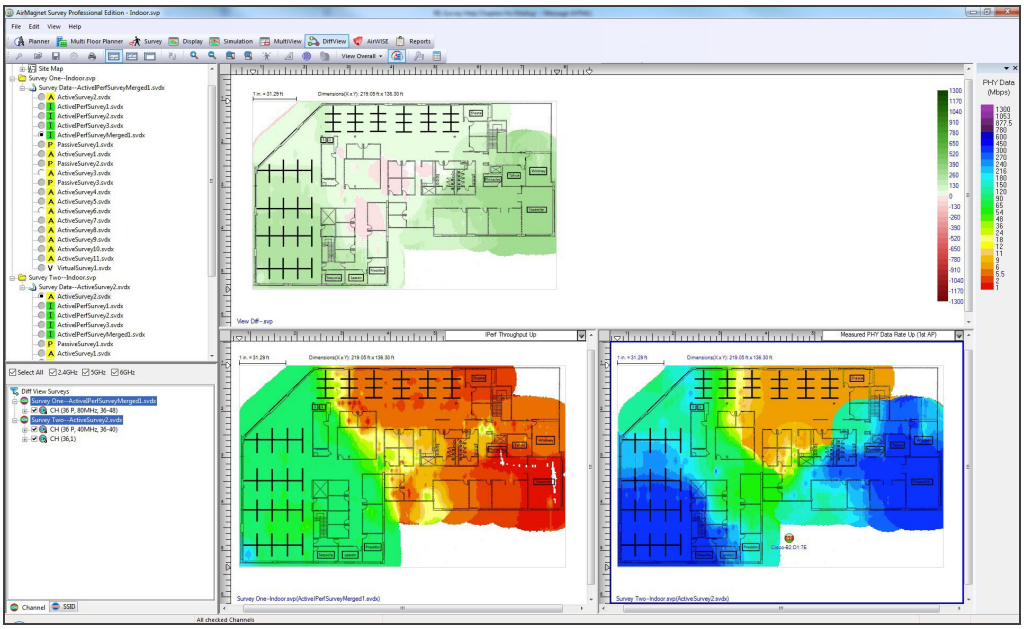
Note: The dimensions of projects (width and height) must be identical to use this feature.

Oftentimes you may wish to display multiple projects or data files (surveys and/or site plans) side-by-side 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 reverts to blank.

For example, as shown in the following screen shot, you may compare Wi-Fi 5 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**) 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 are accepted, otherwise unselected panes show as blank in the data type drop-down.

The blue border around a pane indicates it is the pane in focus.

See also:

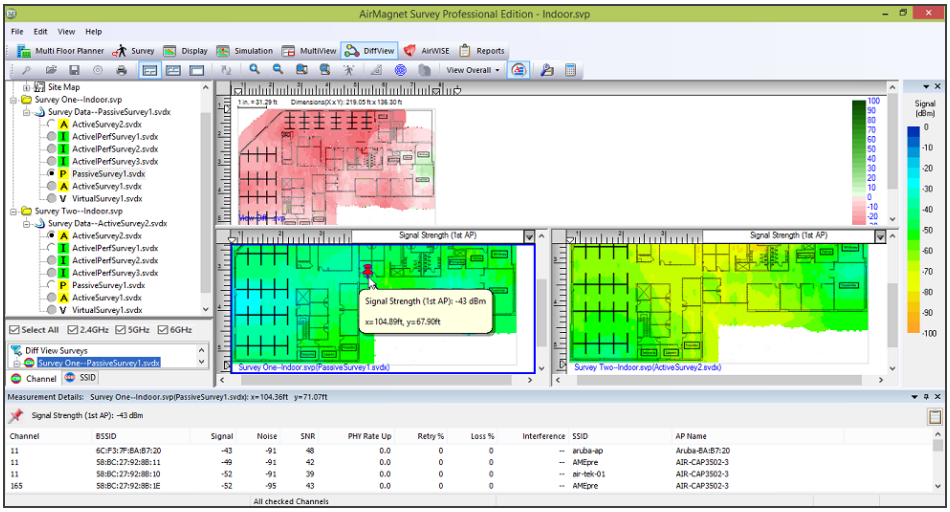
Viewing Specific Signal Comparison Data

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. (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** 

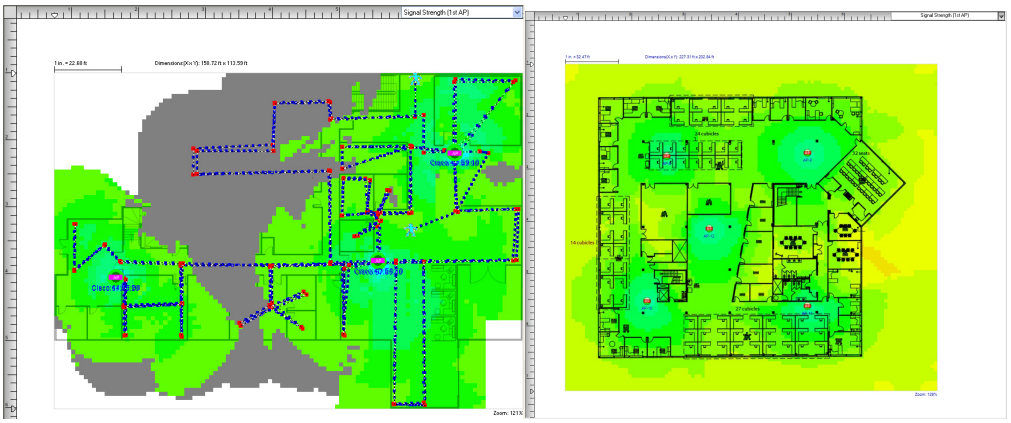
to open the project in multiple frames, one for each project.
3. Select **Signal Strength** for each of the bottom panes. These show data from two different survey projects, and the top pane shows the differences between the two.
4. Place the cursor at a spot on the site map to get the measurement details of that location.



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.

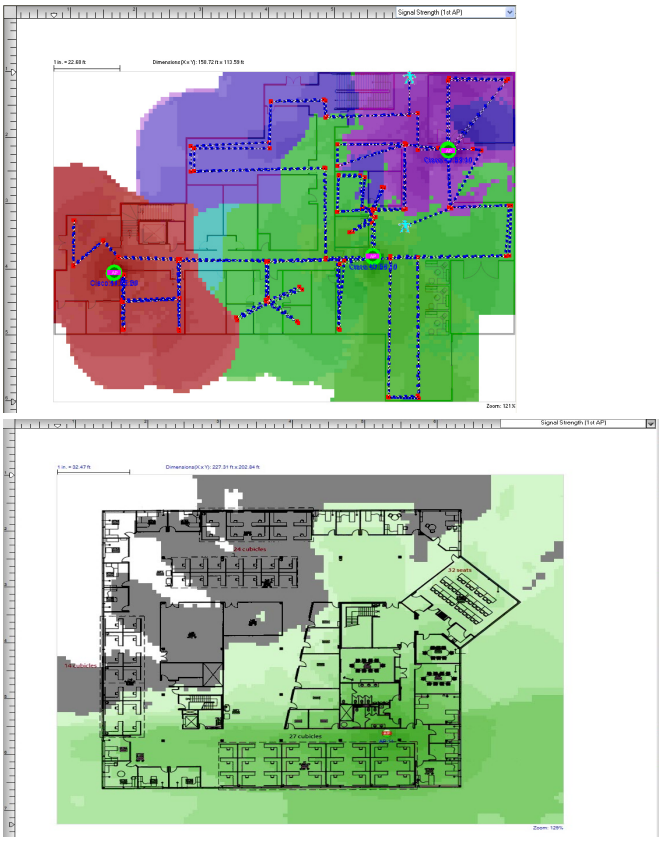


Note: Areas of different signal strengths are indicated by different shades of colors. Areas that fall out of the signal strength range are gray (as shown above).

Identifying 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, as shown in the following examples.

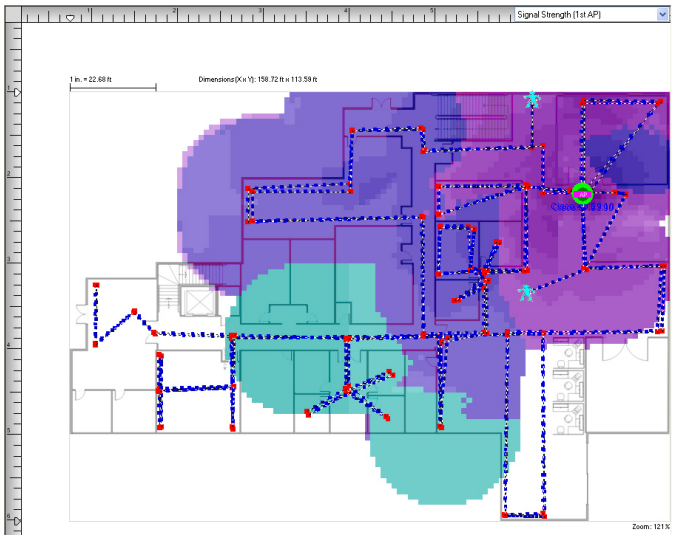


Determining the Number and Placement of APs

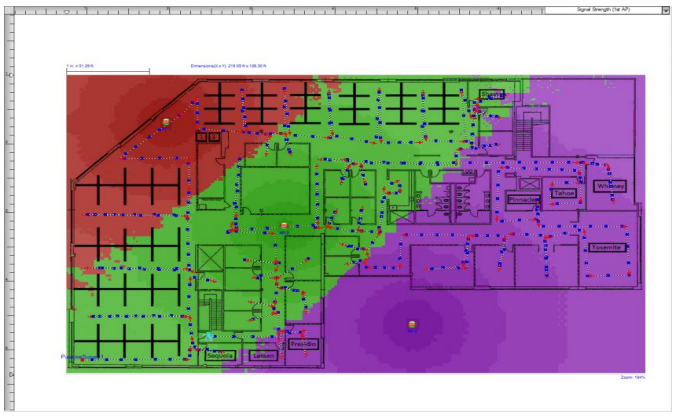
To determine the optimal number and placement of APs:

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.

   For Survey:



   For Planner:

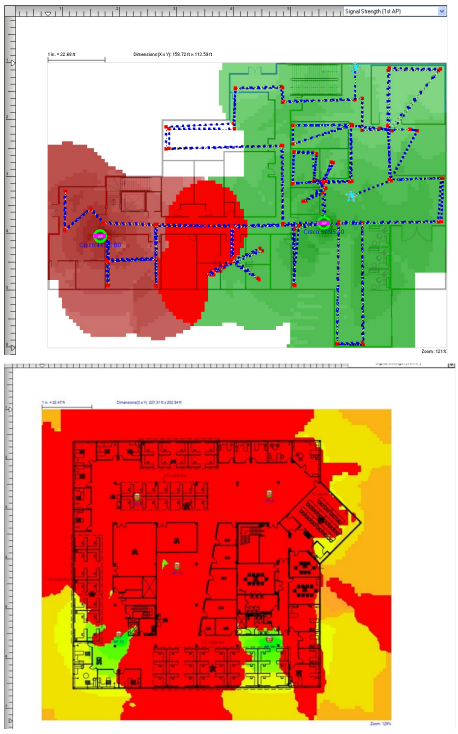


Note: The figures above shows two APs selected; the heatmap reveals that these APs provide coverage for virtually the entire map.

Determining 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**).



Note: The overlap areas of the AP coverage cells are shown in red.

Identifying 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. Hover the cursor over a spot on the site map to get a pop-up detailed data from the tooltip.
5. Click a location on the site map to get a detailed measurement display at the bottom of the screen.

Note:When using an Wi-Fi 5 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.

Identifying Predictive Downlink Bandwidth and Speed

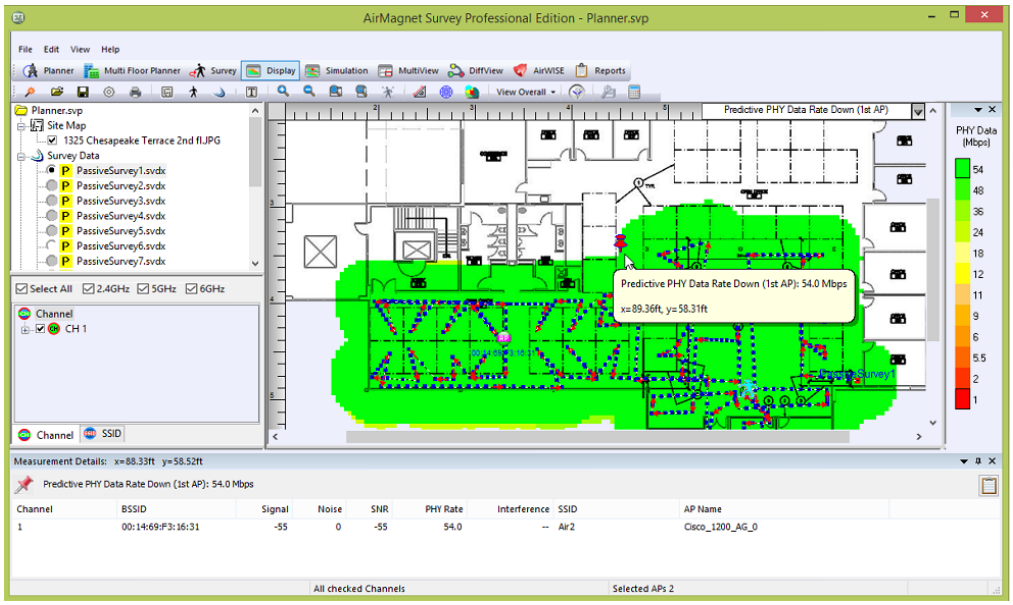
To identify the provisioned bandwidth and speed of an AP:

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.

   The Measurement Details appear at the bottom of the screen, showing the details of the measurements.

   Note: If there are multiple APs covering a given location, the PHY rate for the AP with the strongest signal strength is shown.
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

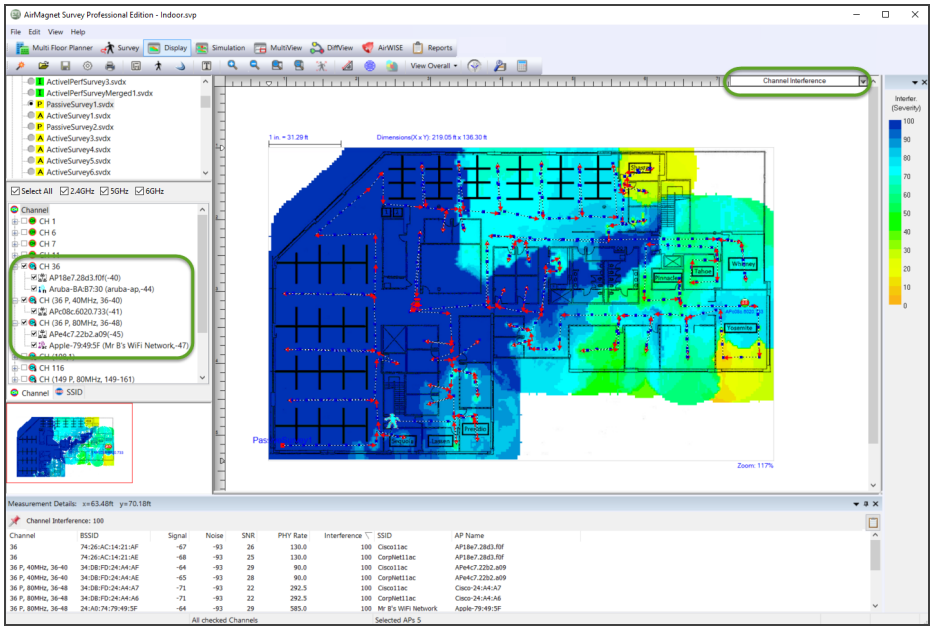
of the measurements.



Identifying Adjacent or Co-Channel Interference

To identify adjacent channel or co-channel interference in Display View or MultiView:

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.



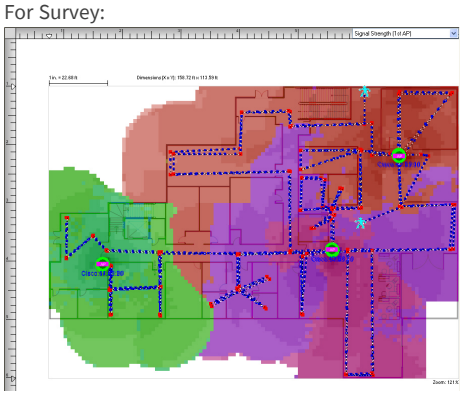
NOTE: Some single APs may use multiple SSIDs under different BSSIDs, which can create the appearance that there is much more interference than really exists. You can use AP grouping to assign these multiple SSIDs to the same AP. See AP Grouping for more information.

Viewing Current Channel Allocation

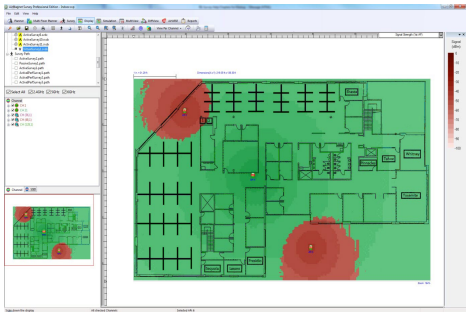
To identify current channel allocation:

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.

   For Survey:



   For Multi Floor Planner:



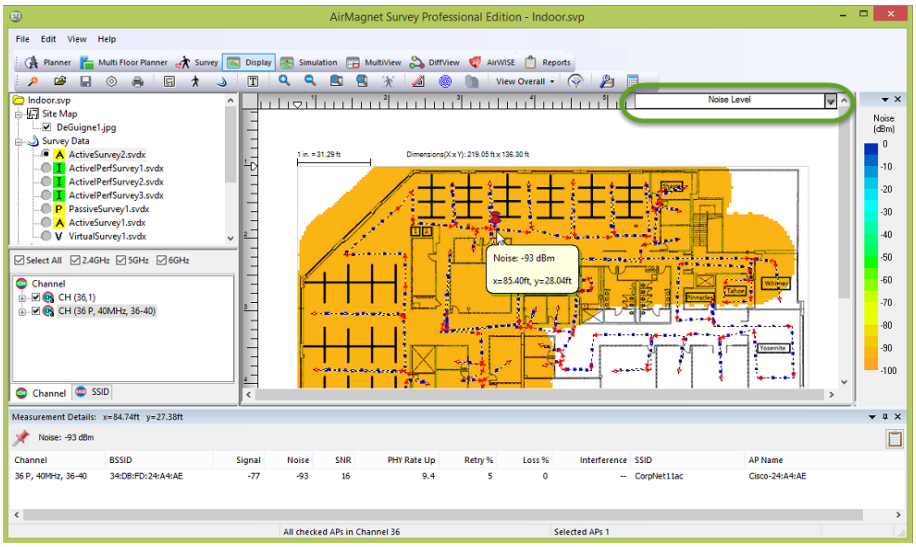
   Note: The channels in the Channel tab are color-coded; the colors in the Map Window indicate the channels in use.

Identifying 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.



Evaluating 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:

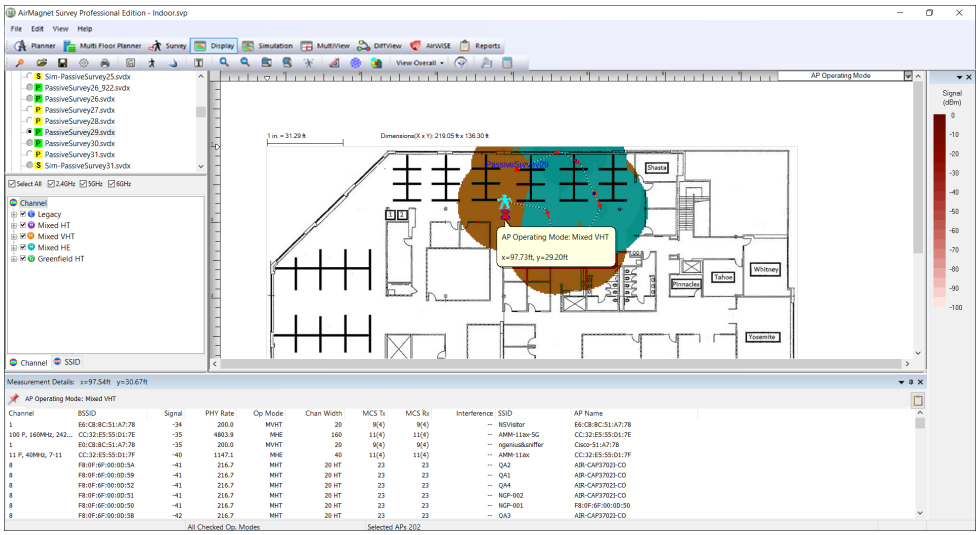
1. From the Project Window, select a passive survey data file.
2. Wait until the data are loaded and displayed in the Map Window.
3. From the **Data Type** drop-down menu, select **Signal Strength**.
4. From the **Channel/SSID** pane, click the **SSID** tab, look for any SSID marked "Unknown," and select it.

Viewing Wi-Fi 4, 5, and 6 Operating Mode

To provide a better view of Wi-Fi 4, 5, and 6 information in the wireless network, Survey's Display view provides a Wi-Fi 4, 5, and 6 AP Operating Mode heatmap selection. When you view this data type, the heatmap displays different colors for areas where APs are using Legacy, Mixed, Mixed VHT, Mixed HE, or Greenfield operating modes.

To view the Wi-Fi 4, 5, and 6 operating mode heatmap:

1. From Survey's Display view, load a data file with Wi-Fi 4, Wi-Fi 5, and Wi-Fi 6 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-Wi-Fi 4 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 Wi-Fi 4 and legacy devices. Purple portions of the heatmap indicate that an Wi-Fi 4 AP is running in the mixed mode.
Orange	Mixed VHT	Mixed VHT (Very High Throughput) mode is for Wi-Fi 5 APs only. The Wi-Fi 5 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 Wi-Fi 6 APs only. The Wi-Fi 6 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 Wi-Fi 4 devices. Green portions of the heatmap represent regions where the strongest AP is running at HT transfer rate.

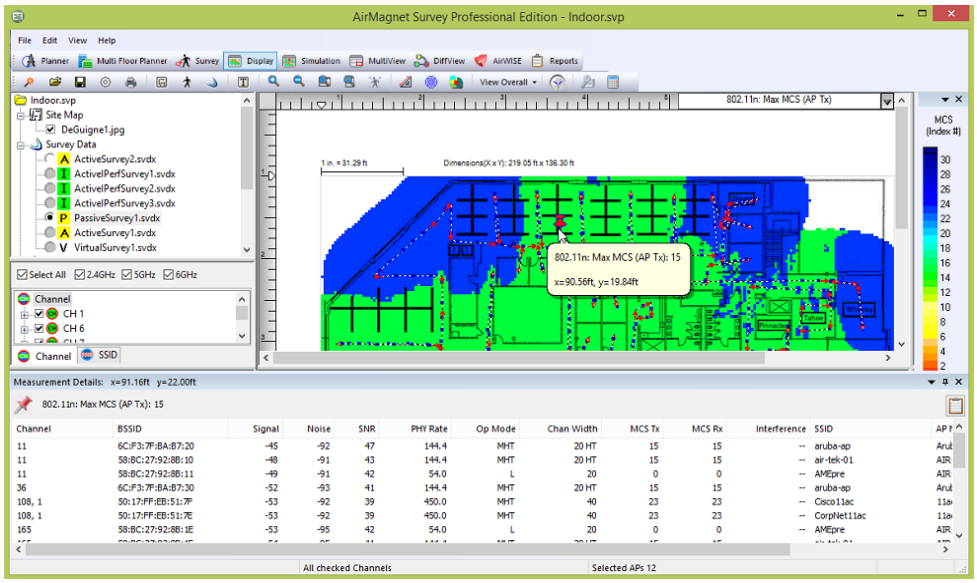
View Wi-Fi 4, 5, and 6 MCS Index Data

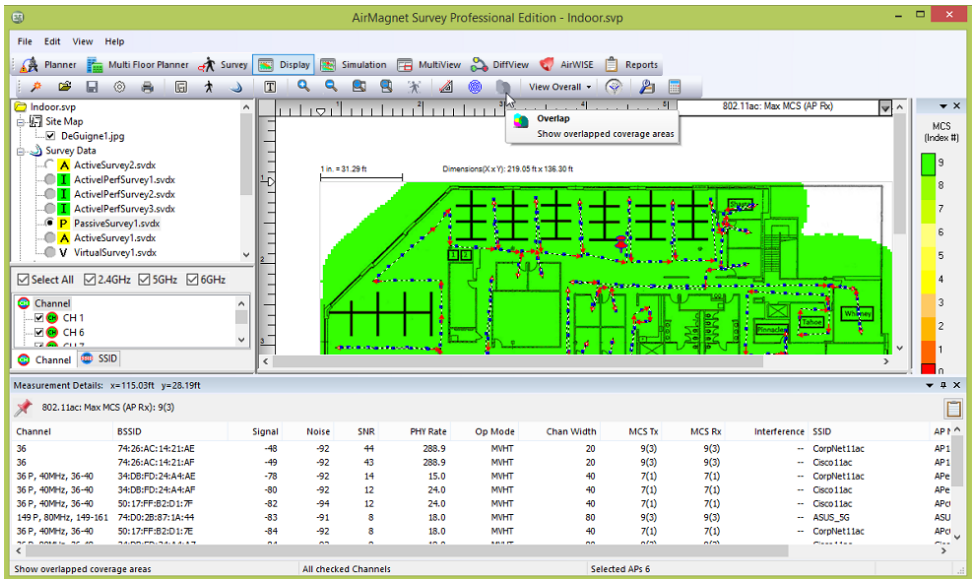
During an Active, Active iPerf or Passive survey, AirMagnet Survey automatically records the Modulation Coding Scheme (MCS) detected from Wi-Fi 4, 5, and 6 APs. This number can range from 0 to 31 for Wi-Fi 4 APs, 0 to 9 for Wi-Fi 5 APs, or 0 to 11 for Wi-Fi 6 APs, with higher numbers corresponding to higher data transfer rates.

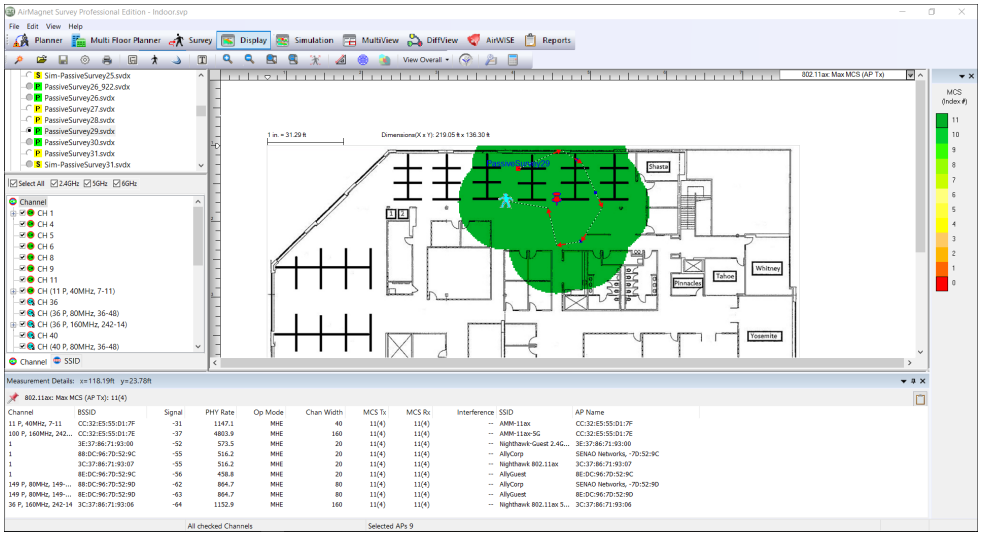
You can view MCS information for both Tx (transmission rate) and Rx (receive rate) for detected APs. These data indicate the MCS for the AP with the strongest signal strength at a given point on the survey floor plan.

To view MCS information:

1. From the Display view, load a data file that contains Wi-Fi 4 and/or Wi-Fi 5 APs.
2. Select *Wi-Fi 4, Wi-Fi 5,* or*Wi-Fi 6: Max MCS (AP Tx)* or *(AP Rx)* data type. The heatmap refreshes.
3. Hover the cursor over any point in the survey to view the tooltip of the exact MCS index for the strongest Wi-Fi 4, Wi-Fi 5, or Wi-Fi 6 AP detected for that spot.
4. Click any point in the heatmap to see the measurement details at the bottom of the screen. (See the examples below.)


AirMagnet Survey Professional Edition - Indoor.svp
802.11n: Max MCS (AP Tx)
802.11n: Max MCS (AP Tx): 15
x=90.56ft, y=19.84ft
Measurement Details: x=91.16ft y=22.00ft
802.11n: Max MCS (AP Tx): 15
All checked Channels
Selected APs 12


AirMagnet Survey Professional Edition - Indoor.svp
802.11ac: Max MCS (AP Rx)
Overlap
Show overlapped coverage areas
Measurement Details: x=115.03ft y=28.19ft
802.11ac: Max MCS (AP Rx): 9(3)
Show overlapped coverage areas
All checked Channels
Selected APs 6

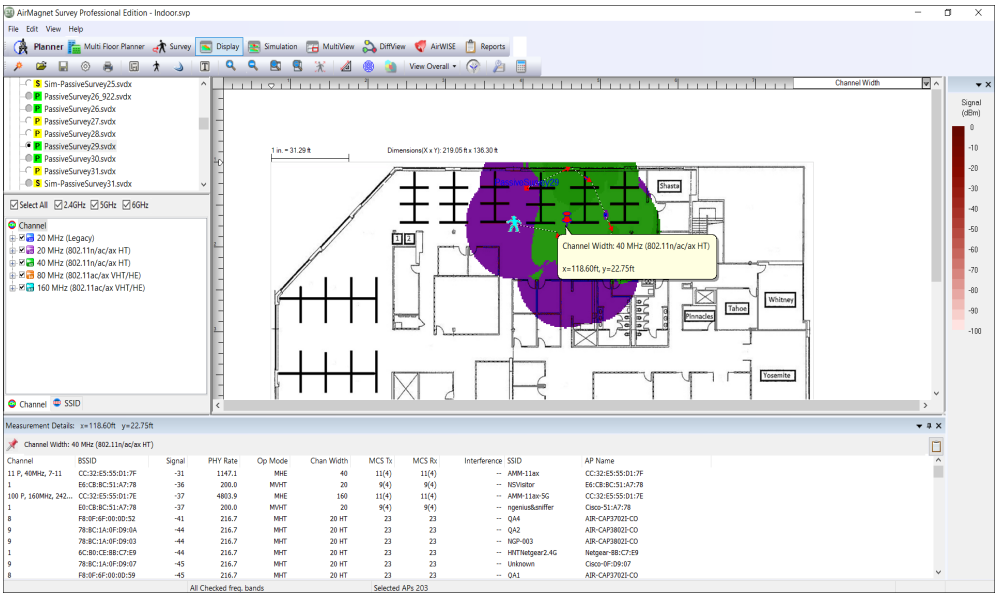


Viewing Wi-Fi 4, 5, and 6 Channel Width

The Channel Width data type allows you to easily view the different channel width used by Wi-Fi 4, Wi-Fi 5, and Wi-Fi 6 devices in the network environment.

To view the channel width heatmap:

1. From the Display view, load a data file that contains Wi-Fi 4, Wi-Fi 5, and/or Wi-Fi 6 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 Wi-Fi 4 APs operating at legacy speeds).
Purple	20 MHz-HT (used by Wi-Fi 4, 5, and 6 APs operating at HT speeds).
Green	40 MHz (used by Wi-Fi 4, 5, and 6 APs). Note: Wi-Fi 4 communications using 40 MHz bands are also conducted at HT speeds.
Orange	80 MHz (used by Wi-Fi 5/Wi-Fi 6 APs operating at VHT/HE speeds).
Light Blue	160 MHz (used by Wi-Fi 5/Wi-Fi 6 APs operating at VHT/HE speeds).

Identifying Wi-Fi 5 Channel Overlap

While wider Wi-Fi 5 channels are capable of transmitting higher throughput rates, they are also more susceptible to RF issues such as channel interference, utilization, etc. If an Wi-Fi 5 radio detects an issue, it can attempt to retransmit at a smaller available channel width in accordance to the Wi-Fi 5 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.

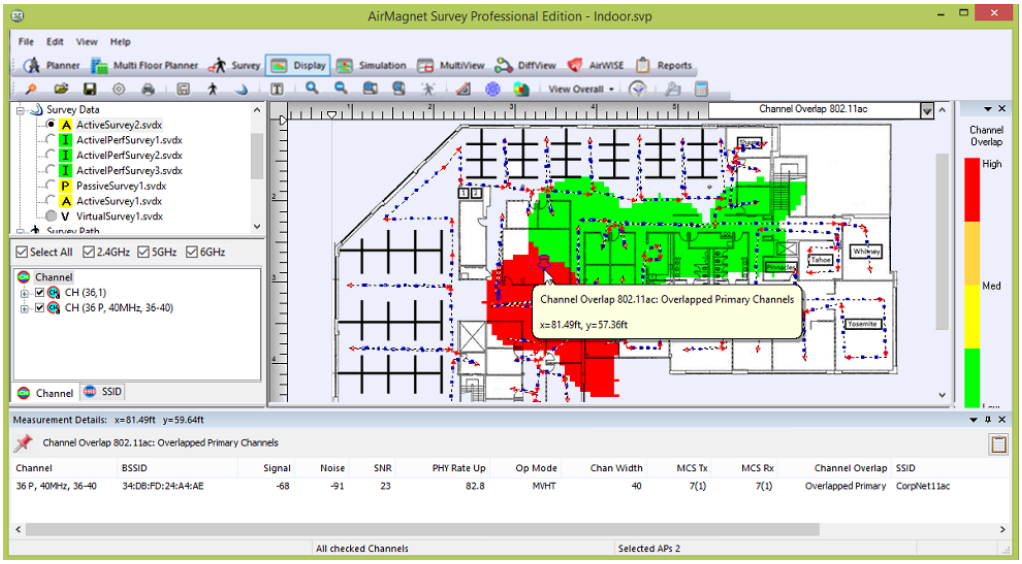
A 40 MHz channel can retry as a 20 MHz wide channel.

An Wi-Fi 5 wide channel uses a specific 20 MHz channel as the primary channel. This primary channel contains the Wi-Fi beacon information, for example. The remaining 20 MHz channels used by an Wi-Fi 5 wide channel are referred to as secondary channels.

If an Wi-Fi 5 radio retransmits at a smaller channel than originally allocated, this affects overall throughput and performance. This reduction in throughput and performance of an Wi-Fi 5 wide channel is what the Wi-Fi 5 Channel Overlap heatmap conveys.

To identify Wi-Fi 5 channel overlap:

1. From the Display view, load a data file that contains Wi-Fi 5 information.
2. From the data type drop-down menu, select **Wi-Fi 5 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 have overlapping coverage.

Red areas indicate overlapped primary channels. These are areas where overall performance is significantly lower because two AP/Client connections cannot transmit simultaneously on the overlapping channel.

For example:

- AP #1 is set to transmit an Wi-Fi 5 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
- AP #2 is set to transmit an Wi-Fi 5 40 MHz wide channel with the primary channel on channel 36 (36P + 40).

or:

- AP #1 is set to transmit an Wi-Fi 5 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 is much lower because two AP/Client connections on overlapping Wi-Fi 5 wide channels must fallback to a slower 20 MHz channel to transmit simultaneously.

For example:

- AP #1 is set to transmit an Wi-Fi 5 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
- AP #2 is set to transmit an Wi-Fi 5 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 is slightly lower because two AP/Client connections on overlapping Wi-Fi 5 wide channels must fallback to a slower 40 MHz channel to transmit simultaneously.

For example:

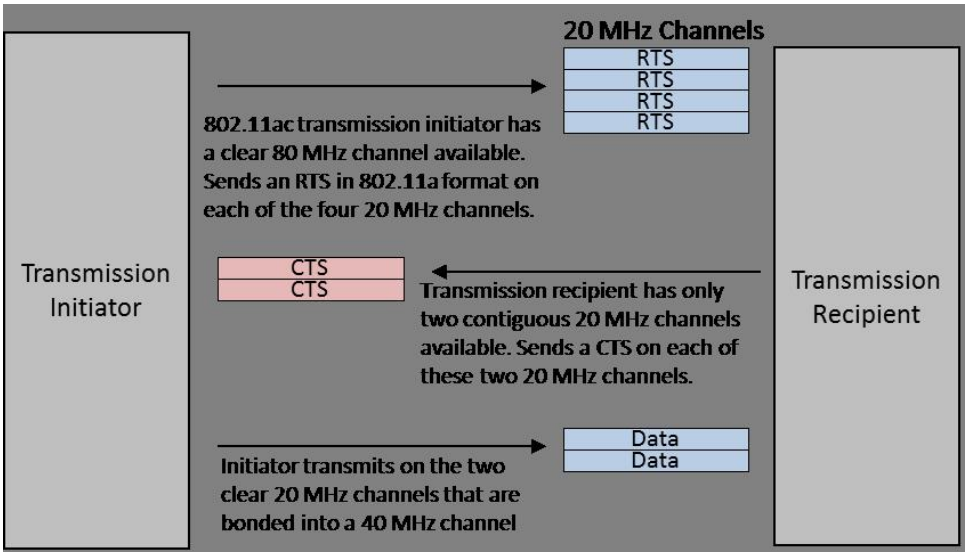
- AP #1 is set to transmit an Wi-Fi 5 80 MHz wide channel with the primary channel on channel 36 (36P + 40 + 44 + 48).
- AP #2 is set to transmit an Wi-Fi 5 80 MHz wide channel with the primary channel on channel 48 (36 + 40 + 44 + 48P).
- AP #1 reduces its transmitting channel to a 40 MHz wide channel 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. Channel overlap does not impact overall performance in these areas. An Wi-Fi 5 wide channel does not have a 20 MHz channel that is overlapped by any 20 MHz channels from other APs.

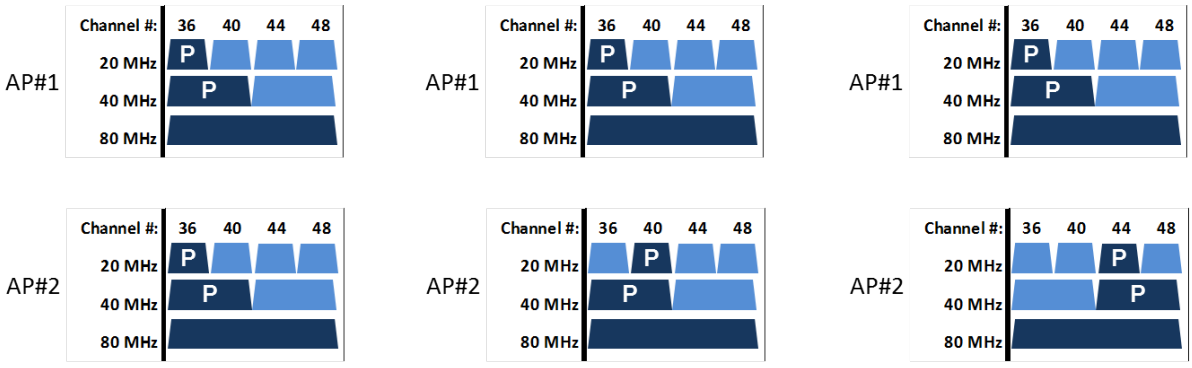
For example:

- AP #1 is set to transmit an Wi-Fi 5 40 MHz wide channel with the primary channel on channel 36 (36P + 40).
- AP #2 is set to transmit an Wi-Fi 5 40 MHz wide channel with the primary channel on channel 48 (44 + 48P).

Background



In Wi-Fi 5, 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 used. 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

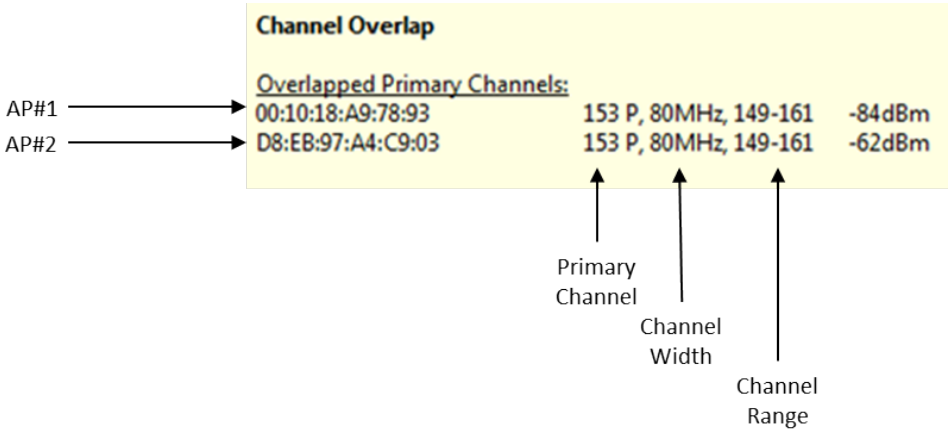
In each example, AP#1 and AP#2 have overlapping 80 MHz channels. The primary 20 MHz and 40 MHz channels are indicated by "P". Each example has a different level of potential performance impact due to the difference in primary channel assignments.

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.

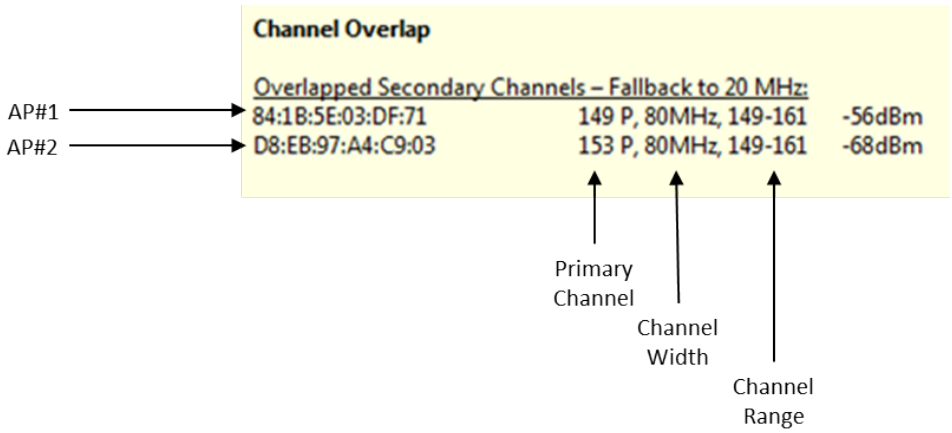
Example 2 shows the situation highlighted in orange in the Channel Overlap heatmap. Each AP has a different 20 MHz primary sub-channel, but the same 40 primary MHz sub-channel. Therefore, to transmit simultaneously, each AP can fallback to its 20 MHz primary sub-channel to transmit, but not to a 40 MHz 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.

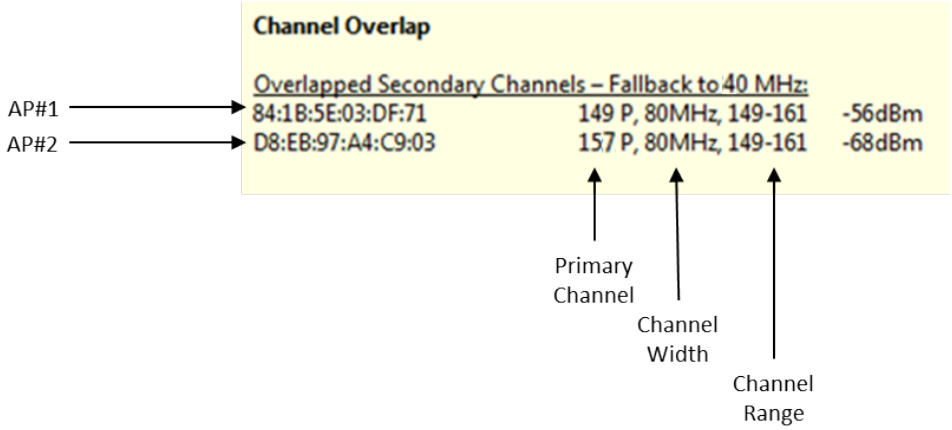
Tooltip Text Explanation



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.



The heatmap tooltip text for **Overlapped Secondary Channels** with Fallback to 20 MHz 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 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.



The heatmap tooltip text for **Overlapped Secondary Channels** with fallback to 40 MHz 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 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.

Using 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 ensure that the device is located with both precision and speed.

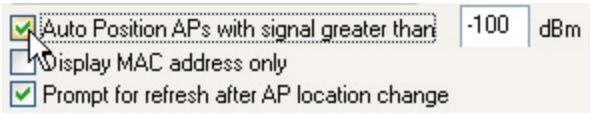
Note: These steps focus on conducting a GPS survey; this information may vary slightly if you are conducting AP Location surveys on non-GPS projects.

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.

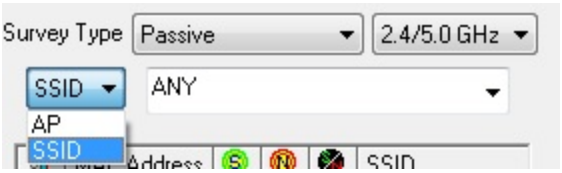


Note: If "Auto Position APs..." is enabled, the survey retract button are grayed out (unavailable).

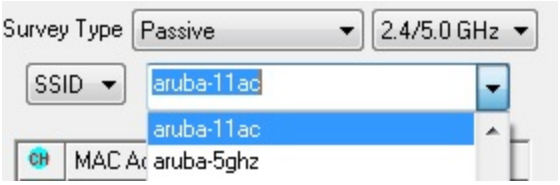
3. Place the external antenna (outside) on the roof of the car. It is recommended that an omnidirectional antenna be used for best results.
4. Select the band (2.4 or 5 GHz) in which Survey should operate and the channel on which the device is located, if known. See the figure below.

Note: As shown in the figure above, the scan interval should be set to 250 ms 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.

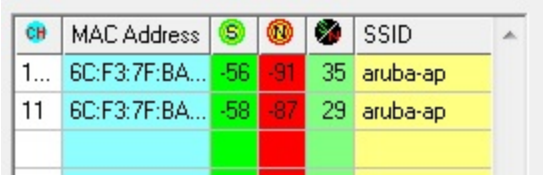


6. If known, select the specific **AP** or **SSID** to be located from the drop-down list. See the figure below.



Note: If you select **ANY** from the SSID list, the Survey view cannot 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 tries to calculate the device's location. However, after the survey is completed, calculated positions of any additional APs detected are shown on the Display view.



CH	MAC Address	S	N		SSID
1...	6C:F3:7F:BA...	-56	-91	35	aruba-ap
11	6C:F3:7F:BA...	-58	-87	29	aruba-ap

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 appears on the site map in its calculated position. This icon moves 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 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: The Display view automatically places all APs detected during the survey, even though only one AP is shown on the Survey view.

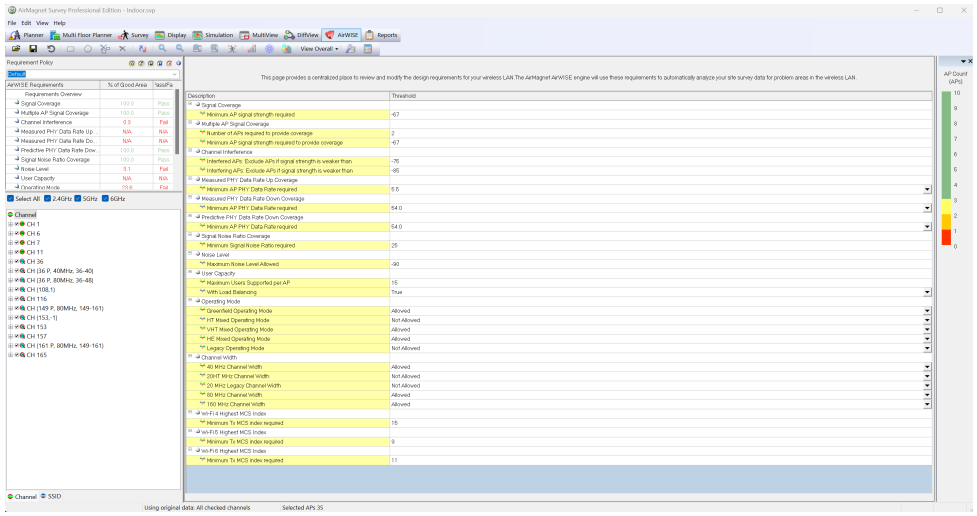
AirWISE View

In this chapter:

About AirWISE View

AirWISE is a powerful and easy-to-use tool to review and change the design requirements for your wireless LAN. AirWISE uses these requirements to automatically analyze your site survey data for problems.

To open the AirWISE view, click AirWISE on the Navigation Bar after you have opened a project.



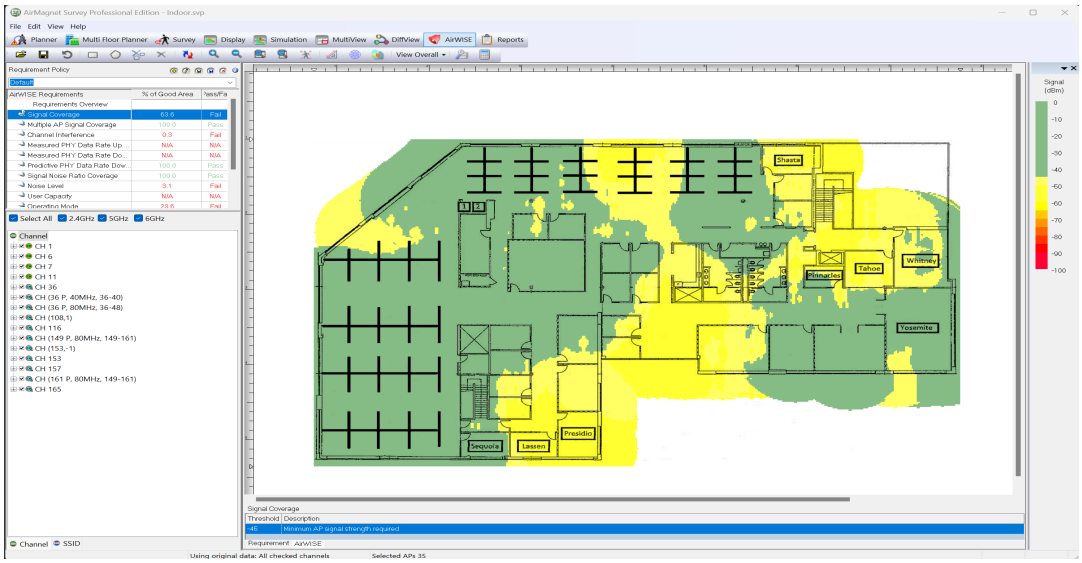
The list of requirements varies depending on which policy you select in the AirWISE Requirements Window. For more details on each AirWISE requirement, see:

- Signal Coverage
- Multiple AP Signal Coverage
- Channel Interference
- Predictive PHY Data Rate Down Coverage
- Signal Noise Ratio Coverage
- Noise Level
- User Capacity
- Operating Mode
- Channel Width
- Wi-Fi 4 Highest MCS Index
- Wi-Fi 5 Highest MCS Index
- Wi-Fi 6 Highest MCS Index
- iPerf Throughput Up
- iPerf Throughput Down
- Cisco Location-based Services
- Measured PHY Data Rate Up Coverage
- Measured PHY Data Rate Down Coverage
- RSSI Neighboring Cell Coverage
- RSSI Serving Cell Coverage
- Throughput Downlink Coverage
- VoFi Packet Retry
- VoFi PHY Data Rate
- VoFi Signal Coverage
- VoFi WiMOS

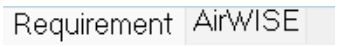
For more information, see the "AirWISE Requirements Window" below.

AirWISE Content Pane

When you select an AirWISE Requirements listing in the AirWISE Summary pane, the AirWISE Content window displays a heatmap of the associated requirement.



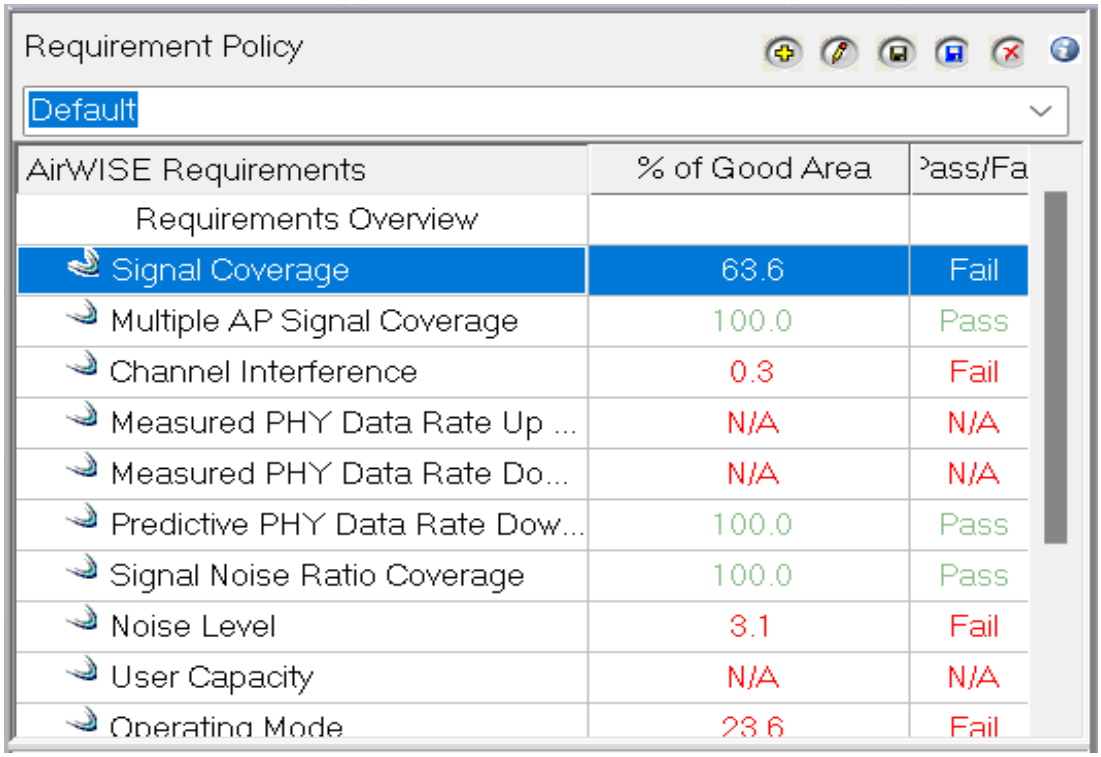
You can display additional information by clicking on the tabs in the bottom-left corner:



- **Requirement**: 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**: Opens the AirWISE Content window, which 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.

AirWISE Requirements Window

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:** Click the down-arrow to select from a list of AirWISE Requirement policies. The list contains the default AirWISE requirements included with AirMagnet plus any policies that you add.
- **% 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 is 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 in 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 reads "Fail." However, if the Pass/Fail value is set to 80% and the "% of good area" is 80%, the Pass/Fail column reads "Pass."

In addition, by selecting an AirWISE Requirements listing, you can view the associated heatmap and policy explanation in the Content Pane.

Wi-Fi 4 MCS Index

- Threshold: Minimum Tx MCS Index required
- Default value: 15
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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

Wi-Fi 4 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 Wi-Fi 4 STA is required to support MCS 0-7 in 20-MHz (non-SGI) mode; an Wi-Fi 4 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.

For other AirWISE requirements, see AirWISE Summary.

Wi-Fi 5 MCS Index

- Threshold: Minimum Tx MCS Index required
- Default value: 9
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 Wi-Fi 5 than it was in Wi-Fi 4. Rather than the 70-plus options offered by Wi-Fi 4, the Wi-Fi 5 specification has only 10. The reason for the dramatic simplification is that Wi-Fi 5 separates the spatial stream number from the MCS number, and each spatial stream has the same MCS for Wi-Fi 5 radios. An MCS number for Wi-Fi 5 is really about the modulation scheme of a spatial stream. The first 8 (0-7) are mandatory, and most venders 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	Wi-Fi 5 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

Wi-Fi 6 MCS Index

- Threshold: Minimum Tx MCS Index required
- Default value: 11
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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

Wi-Fi 6 has a similar modulation and coding set (MCS) as Wi-Fi 5 with two additional modulations, 1024-QAM 3/4 and 1024-QAM 5/6. However, Wi-Fi 6 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.

Wi-Fi 6 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

Channel Interference

- Threshold: Min Signal to Interference, Min Signal of interferer
- Default value: -75, -85
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

Requirement Explanation

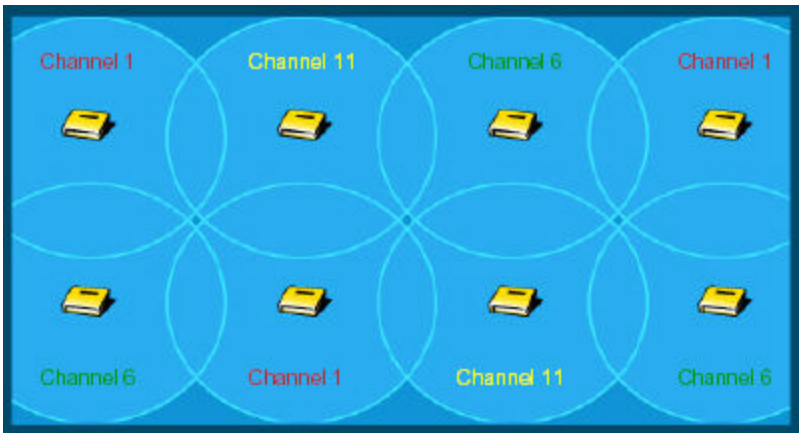
Areas of the map that meet the current requirement for Channel Interference are displayed in light green ( ). Areas that do not meet the requirement are displayed according to the color code on the slider bar on the right-hand side of the view. Let the mouse hover over any point of the map to show additional details.

Important: AirMagnet Survey measures interference from the point of view of a particular AP. This means that AirMagnet shows a cumulative view of all the various Wi-Fi sources that are interfering with that one AP. Therefore, make sure that you deselect all APs that are not the focus of your investigation. (Use the device tree on the left side of the screen). Note that signals from deselected 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.

Design networks to avoid co-channel interference whenever possible. Note that although there are technically 11 or more channels in the 802.11b/g spectrum, 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 to minimize interference.



Site surveyors 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. When you select an AP of interest, you 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%

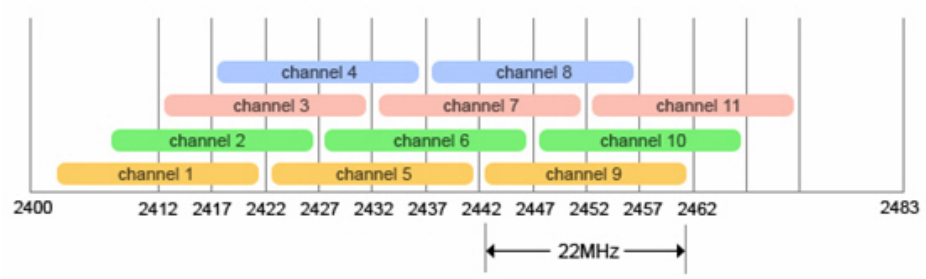
Requirement Explanation

This requirement lets you view the various channel widths detected in the survey data file in use. For example, if the wireless network being installed must support only 40 MHz channels, 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.

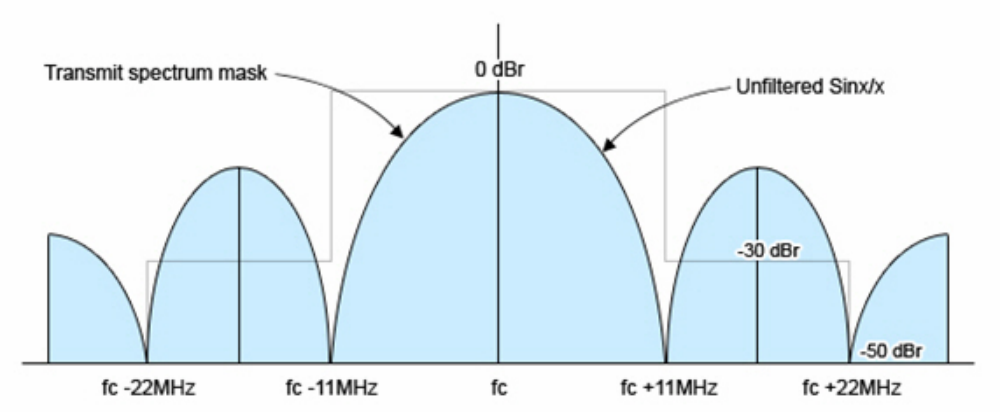
Background

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). Wi-Fi 4 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 Wi-Fi 4 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.



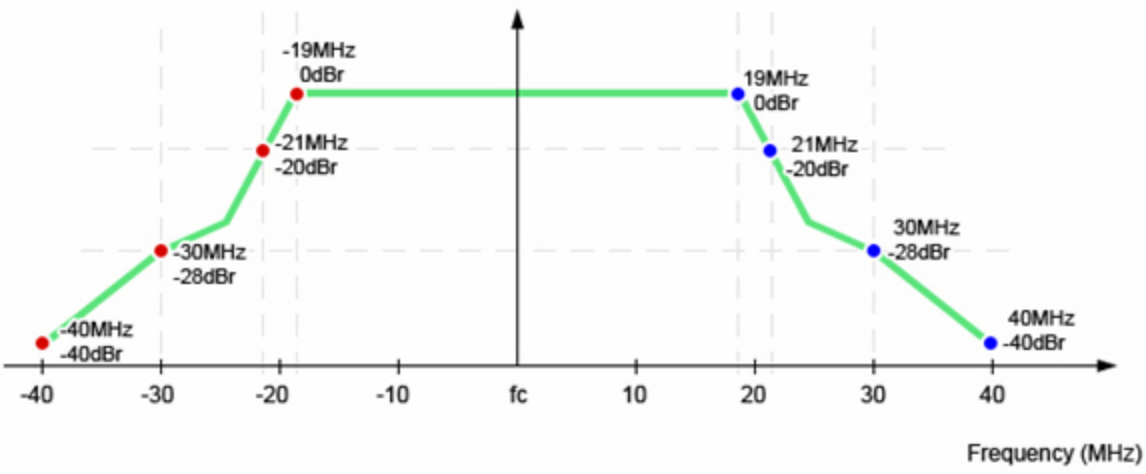
RF channels do not have exact edges. The modulated portion of a (20-MHz) Wi-Fi 4 RF signal “falls” into +/- 11 MHz of the center frequency (thus, it is 22 MHz wide); there is however some “bleed over”, or unmodulated RF energy that is present to about +/- 30 MHz of the center frequency (at relatively much lower power levels). The spectrum mask defines how much RF energy may be present outside the channel boundary of +/- 11 MHz.



A Wi-Fi 4 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).

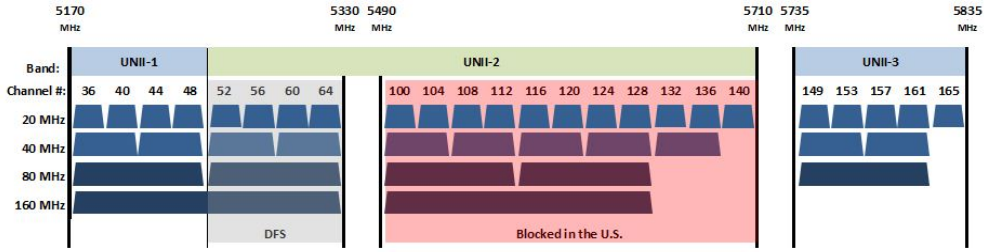
For instance, a device transmitting on channel 6 would certainly cause significant interference on channels 5 and 7; some interference on channels 4 and 8; and might cause (usually negligible) interference on channels 2, 3, 9, and 10. This is why, in FCC regulated domains, there are effectively just 3 simultaneously usable Wi-Fi 4 20-MHz channels in the 2.4 GHz band. A typical North American 802.11 b/g deployment places 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 in 40-MHz mode in the 2.4 GHz band makes this problem worse. The 40-MHz spectrum mask (necessarily) allows higher signal energy to be present on adjacent channels, as shown in the graph below.



Thus, a 40-MHz Wi-Fi 4 transmission in the 2.4 GHz band takes up 9 channels (the center, four left adjacent and four right adjacent channels). Thus, the 40-MHz transmission in the 2.4 GHz band (where there are only 11 usable channels) could cause problems because a single transmission could use more than 80% of the available spectrum in the band. Additionally, the 2.4 GHz band is much more crowded than the 5 GHz band because stations must also contend with Bluetooth devices, microwave ovens, and other common sources of 2.4 GHz interference. Coexistence mechanisms can help reduce but not eliminate the problem in this band.

Fortunately, Wi-Fi 4 allows operating in both the 2.4 GHz and 5 GHz bands, and Wi-Fi 5 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.



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

Wi-Fi 4, 5, and 6 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 must then 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 broadcast "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 in its BSS. The AirMagnet Wi-Fi Analyzer product can help to analyze the 40 MHz Intolerant announcements via the coexistence section of the Efficiency Analysis Tool.

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: -85 dBm, Maximum signal strength: 0
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 displays as green. The non-compliant area (outside the hull) displays 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 in 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 are 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 in 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. See 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.

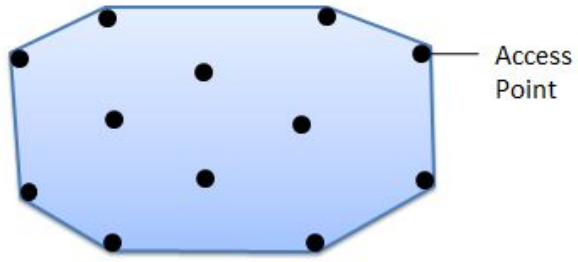
Background

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 beg into deteriorate.



Cisco recommendations

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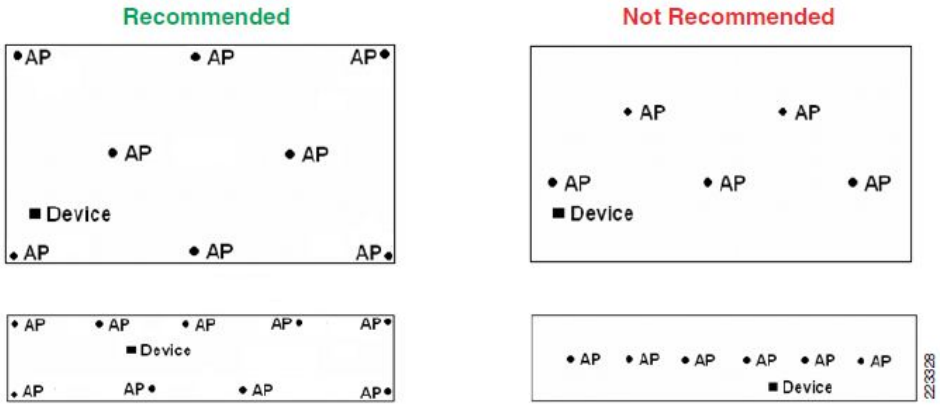
For Cisco "Location-aware" deployments, Cisco recommends that designs that make use of only clustered or straight-line access point placement should be augmented or redesigned in favor of those that combine center access-point placement with perimeter and corner placement.



If possible, mount antennas such that they have an unencumbered 360° 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 in 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

You 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: 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, these antennas are strictly regulated and require extra care to stay in the legal boundaries. Furthermore, high-gain antennas may not add any overall signal to the environment. They may instead compress the signal that is already available. This can cause a high-gain antenna to improve a signal in one location and but make it worse in another location.

Repositioning APs: Ideally, APs should have a clear “line of site” to the areas they serve. Installing APs on the ceiling or high on walls can helpful with avoiding physical obstructions.

Adding APs: If the measures described above do not alleviate the problem, you may have to install an additional AP in the environment and configure the AP to use a Wi-Fi channel that does not overlap with APs already deployed.

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 supports a real-world end-user client. An Active iPerf Survey is required 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 misconfigured 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
Wi-Fi 4 (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
Wi-Fi 5 (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
Wi-Fi 6 (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 supports a real-world end-user client. An Active iPerf Survey is required 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
Wi-Fi 4 (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
Wi-Fi 5 (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
Wi-Fi 6 (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.

Measured PHY Data Rate Downlink Coverage

- Threshold: Min Downlink Data Rate Supported
- Default value: 54.0
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 supports a real-world end-user client. An Active iPerf Survey is required 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
Wi-Fi 4 (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
Wi-Fi 5 (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
Wi-Fi 6 (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%
- For other AirWISE requirements, see AirWISE Summary.

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 supports a real-world end-user client. An Active Survey is required 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
Wi-Fi 4 (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
Wi-Fi 5 (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
Wi-Fi 6 (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%
- For other AirWISE requirements, see AirWISE Summary.

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 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 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

You 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: 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, these antennas are strictly regulated and require extra care to stay in the legal boundaries. Furthermore, high-gain antennas may not add any overall signal to the environment. They may instead compress the signal that is already available. This can cause a high-gain antenna to improve a signal in one location and but make it worse in another location.

Repositioning APs: Ideally, APs should have a clear “line of site” to the areas they serve. Installing APs on the ceiling or high on walls can helpful with avoiding physical obstructions.

Adding APs: If the measures described above do not alleviate the problem, you may have to install an additional AP in the environment and configure the AP to use a Wi-Fi channel that does not overlap with APs already deployed.

Noise Level

- Threshold: Max Noise Level
- Default value: -90
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 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 Wi-Fi 4. 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 depends 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 support voice.

Corrective Actions

High environmental noise can be addressed either by removing the source of the noise, or avoiding it by moving Wi-Fi 4 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%
- For other AirWISE requirements, see AirWISE Summary.

Requirement Explanation

The requirement is triggered by any Wi-Fi 4, Wi-Fi 5, or Wi-Fi 6 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

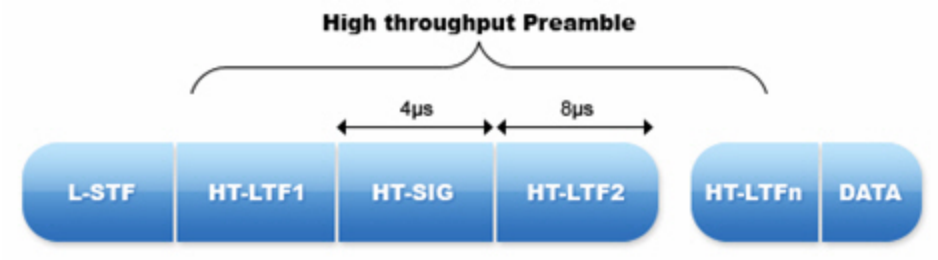
The PHY- and MAC-layer improvements introduced in the Wi-Fi 4 amendment and extended in the Wi-Fi 5 and Wi-Fi 6 amendment brings Wi-Fi network performance to an unprecedented level in terms of range, throughput, and stability. However, given the current state of the Wi-Fi network infrastructure which is largely built upon the legacy 802.11a/b/g standards, the new Wi-Fi 4 protocols may have the potential of interfering with or even hampering the normal operation of legacy (802.11a/b/g) networks.

Like the present 802.11g networks that are backward-compatible to the 802.11b networks, Wi-Fi 4 networks are backward-compatible with stations built on the legacy 802.11a/b/g standards. Thus, Wi-Fi 4 wireless access points must inter-operate smoothly in a mixed WLAN environment so 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, Wi-Fi 4 wireless access points must automatically choose the appropriate operating mode as is dictated by the changing dynamics of the wireless environment in which they are operating. Wi-Fi access points must function in any of the following operating modes, depending on the real-time cir-cumstances of the wireless network.

Greenfield

An Wi-Fi 4 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 Wi-Fi 4 network is achieved in this mode, with only Wi-Fi 4 stations in the network and no legacy devices in reach. If legacy stations or networks are present, Wi-Fi 4 devices must communicate using protection mechanisms, which may reduce the efficiency of the Wi-Fi 4 network. HT mode is optional.

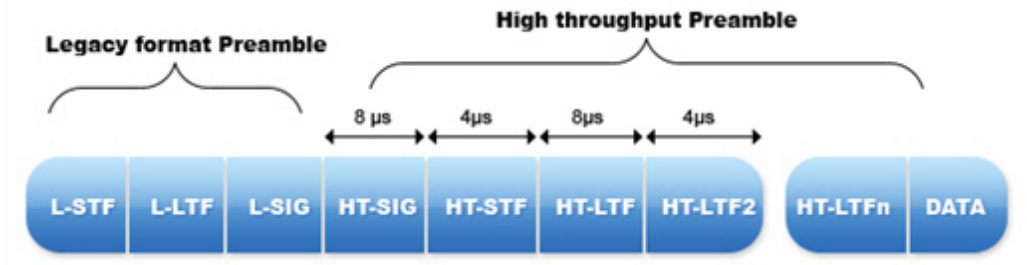


HT Mixed

The mandatory HT Mixed mode is the most common Wi-Fi 4 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 Wi-Fi 4 devices pay significant throughput penalties as compared to Greenfield mode.

Legacy

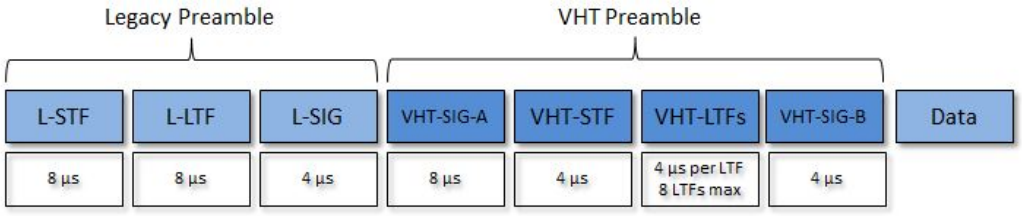
An Wi-Fi 4 AP using Non-HT (Non-High Throughput) mode - also known as legacy mode - sends all frames in the old 802.11a/b/g format so that legacy stations can understand them. That AP must use 20-MHz channels and none of the new HT features. All Wi-Fi-certified Wi-Fi 4 products on the market must support this mode to ensure backward compatibility, but an Wi-Fi 4 AP using Non-HT delivers no better performance than 802.11a/g.



Likewise, Wi-Fi 5 is designed to be backwards compatible with 802.11a and Wi-Fi 4 stations in the 5 GHz band. The Wi-Fi 5 standard defines only one operating mode: Very High Throughput.

VHT

Wi-Fi 5 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 Wi-Fi 5 connections along with legacy 802.11a and Wi-Fi 4 connections. A VHT frame is transmitted with a legacy preamble that is recognized by 802.11a and Wi-Fi 4 radios, followed by a VHT preamble.

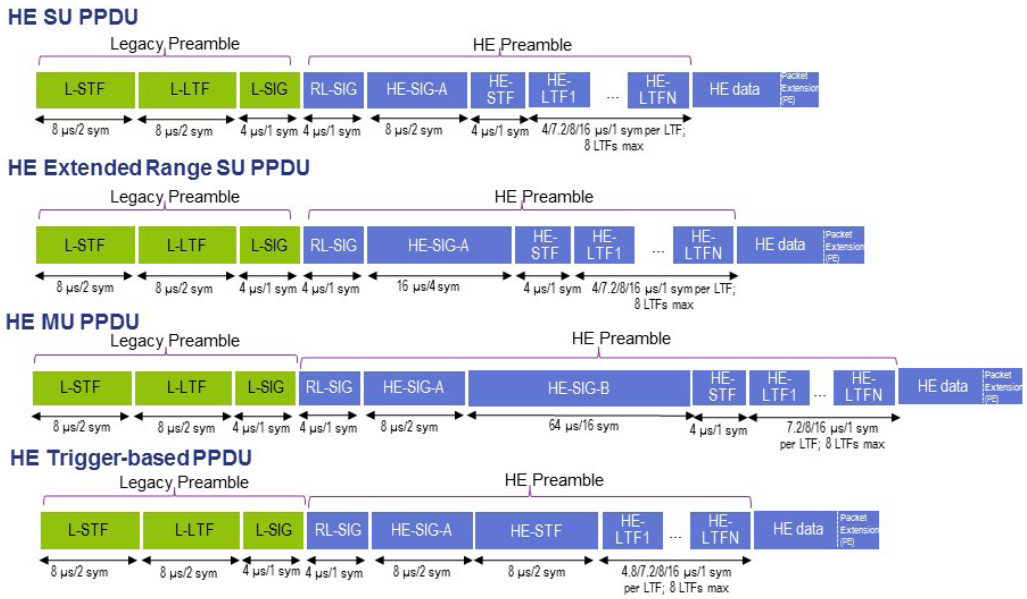


HE

Like Wi-Fi 4 and 5, the Wi-Fi 6 frame begins with the preamble. in 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 Wi-Fi 6 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%
- For other AirWISE requirements, see AirWISE Summary.

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 supports a real-world end-user client. When doing a Passive survey the ability to see the actual Data rate is not available. 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
Wi-Fi 4 (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
Wi-Fi 5 (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
Wi-Fi 6 (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%
- For other AirWISE requirements, see AirWISE Summary.

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 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 depends 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.

Environmental factors significantly affect RF signals. Solid objects attenuate and reflect RF signals, which can cause RF “dead spots” in otherwise well-served areas. This means that your must carefully survey areas where wireless clients need network service. Pay special attention to the areas around and in the line of site of physical obstructions such as solid metal object (beams, pillars, structural elements), solid walls, elevator shafts, and any shielded rooms, such as an x-ray room.

Corrective Actions

You 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: 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, these antennas are strictly regulated and require extra care to stay in the legal boundaries. Furthermore, high-gain antennas may not add any overall signal to the environment. They may instead compress the signal that is already available. This can cause a high-gain antenna to improve a signal in one location and but make it worse in another location.

Repositioning APs: Ideally, APs should have a clear “line of site” to the areas they serve. Installing APs on the ceiling or high on walls can helpful with avoiding physical obstructions.

Adding APs: If the measures described above do not alleviate the problem, you may have to install an additional AP in the environment and configure the AP to use a Wi-Fi channel that does not overlap with APs already deployed.

RSSI Serving Cell Coverage

- Threshold: Min Signal
- Default value: -67
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 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 depends 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.

Environmental factors significantly affect RF signals. Solid objects attenuate and reflect RF signals, which can cause RF “dead spots” in otherwise well-served areas. This means that your must carefully survey areas where wireless clients need network service. Pay special attention to the areas around and in the line of site of physical obstructions such as solid metal object (beams, pillars, structural elements), solid walls, elevator shafts, and any shielded rooms, such as an x-ray room.

Corrective Actions

You 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: 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, these antennas are strictly regulated and require extra care to stay in the legal boundaries. Furthermore, high-gain antennas may not add any overall signal to the environment. They may instead compress the signal that is already available. This can cause a high-gain antenna to improve a signal in one location and but make it worse in another location.

Repositioning APs: Ideally, APs should have a clear “line of site” to the areas they serve. Installing APs on the ceiling or high on walls can helpful with avoiding physical obstructions.

Adding APs: If the measures described above do not alleviate the problem, you may have to install an additional AP in the environment and configure the AP to use a Wi-Fi channel that does not overlap with APs already deployed.

Signal Coverage

- Threshold: Min Signal
- Default value: -67
- Pass/Fail default value: 100%
- To set the default value: AirWISE requirements, see AirWISE Summary.

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 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 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.

Environmental factors significantly affect RF signals. Solid objects attenuate and reflect RF signals, which can cause RF “dead spots” in otherwise well-served areas. This means that your must carefully survey areas where wireless clients need network service. Pay special attention to the areas around and in the line of site of physical obstructions such as solid metal object (beams, pillars, structural elements), solid walls, elevator shafts, and any shielded rooms, such as an x-ray room.

Corrective Actions

You 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: 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, these antennas are strictly regulated and require extra care to stay in the legal boundaries. Furthermore, high-gain antennas may not add any overall signal to the environment. They may instead compress the signal that is already available. This can cause a high-gain antenna to improve a signal in one location and but make it worse in another location.

Repositioning APs: Ideally, APs should have a clear “line of site” to the areas they serve. Installing APs on the ceiling or high on walls can helpful with avoiding physical obstructions.

Adding APs: If the measures described above do not alleviate the problem, you may have to install an additional AP in the environment and configure the AP to use a Wi-Fi channel that does not overlap with APs already deployed.

Signal-to-Noise Ratio Coverage

- Threshold: Min Signal-to-Noise Ratio
- Default value: 25
- Pass/Fail default value: 100%
- For other AirWISE requirements, see AirWISE Summary.

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 to 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 depends 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 Wi-Fi 4, and SNR of 27 is desired. To achieve the even higher rates available in Wi-Fi 5, 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 improves the 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%
- For other AirWISE requirements, see AirWISE Summary.

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

Design your Planner/Advisor project with knowledge of the type of wireless traffic the network must support. For example, a Wi-Fi usage to supports a lot of video traffic might require a larger frame size. This changes your throughput calculation. Larger frames 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 frames 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 supports 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%
- For other AirWISE requirements, see AirWISE Summary.

Requirement Explanation

Intelligent capacity planning ensures 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, you should first establish the network bandwidth that each end user needs. Then, you can 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, you can use AirMagnet Survey to map out a scientific capacity plan using the following steps.

Identify key end-user client areas. Select the (Rectangular Region Tool) from the Toolbar, and then draw a box covering the area where end users need support. Enter the number of users that need to be supported in this area, and enter

the length and width of the area. Repeat this process until you have accounted for all network end users and all locations. The program automatically tells you whether the users are covered or not.

Using the "With Load Balancing" Threshold

Note: Load Balancing is a setting on certain APs. Do not enable this setting unless you know that the 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 attempts to distribute the users in the defined areas evenly among 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 gets two users assigned to it. If the "With Load Balancing" field is set to "False", the user stations are assigned to whichever AP provides the strongest signal in their respective areas.

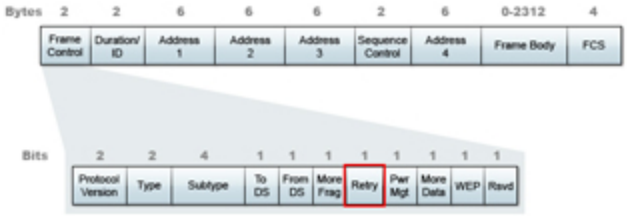
Each end-user area is automatically broken into equal-sized cells that represent the area for each user. Areas in green ( ) meet the capacity requirements set in the application, while a red area ( ) indicates a client that connects to an overloaded AP. An area in gray ( ) means that NO Service is available 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%
- For other AirWISE requirements, see AirWISE Summary.

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 **acknowledgment** frame. When there is no acknowledgment 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%
- For other AirWISE requirements, see AirWISE Summary.

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 supports a real-world end-user phone. A VoFi Survey is required 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
Wi-Fi 4 (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%
- For other AirWISE requirements, see AirWISE Summary.

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 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 depends 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.

Environmental factors can significantly affect RF signals. Solid objects attenuate and reflect RF signals, which can cause RF “dead spots” in otherwise well-served areas. Therefore, you should pay special attention to the areas around, and in the line of site of physical obstructions. Typical obstructions can 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. This information does *not* represent all coverage detected on the VoFi deployment. Other VoFi APs may be placed in the vicinity of the survey path but not be displayed because 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%
- For other AirWISE requirements, see AirWISE Summary.

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 point of the map to show additional details.

Background

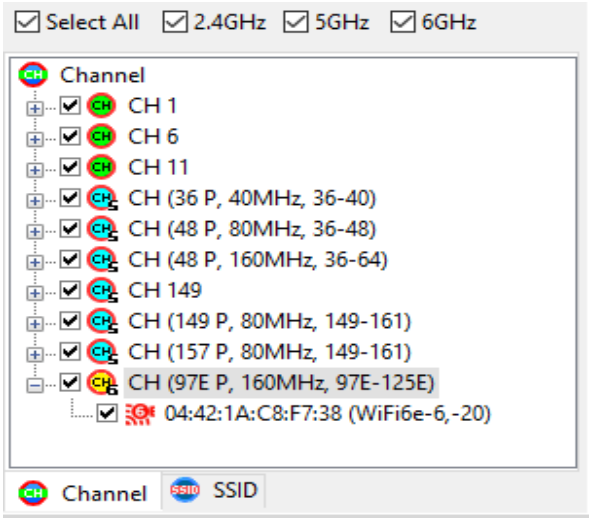
VoFi call quality can be indicated by several different parameters, one of which is the Wireless Mean Opinion Score (WiMOS), a numerical measurement similar to the MOS value assigned to calls performed on wired networks. WiMOS scores are the most commonly used way by which respondents are asked to rate 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

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.

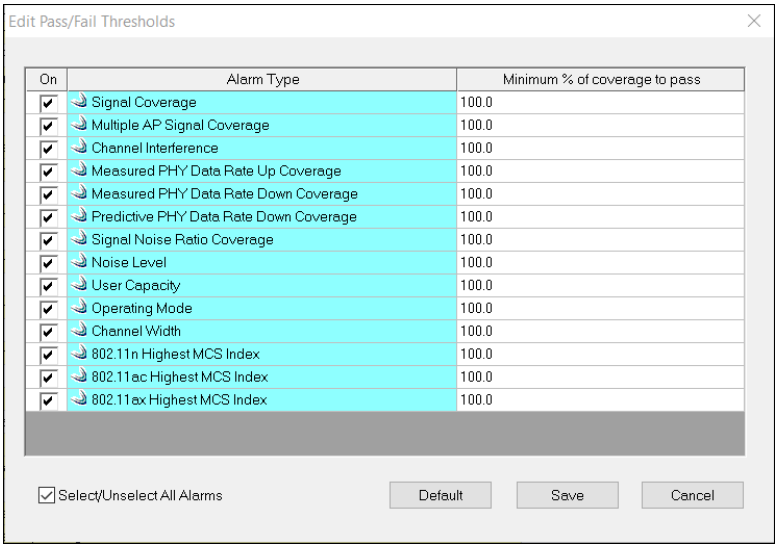


Also, if your survey includes simulated data (see About Simulation view), you may choose whether to use original data or simulated data by selecting **Use Simulated Data** from the View menu (checked is enabled).

Configuring Pass/Fail Threshold Values

Each requirement includes a Pass/Fail option, a configurable percentage value that indicates whether the "% of good area" lies in 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 reads "Fail." However, if the Pass/Fail value is set to 80% and the "% of good area" is 80%, the Pass/Fail column reads "Pass."

1. Click the **Edit Pass/Fail Threshold** icon  .
2. Use the On column to select (check) the alarm types you want.
3. Edit the value in the **Minimum % of coverage to pass** column.
4. Click **Save**.



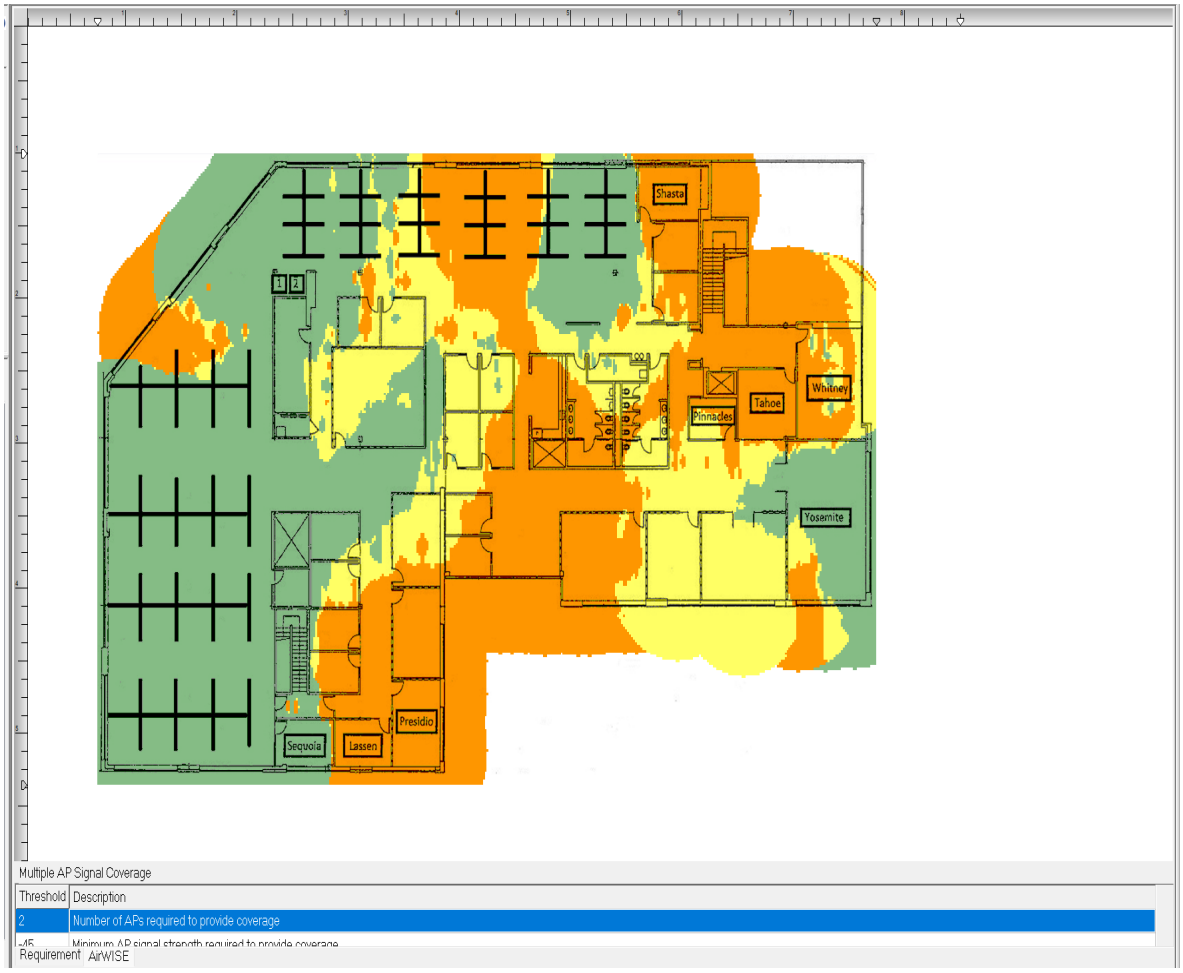
Testing AirWISE Requirements Compliance on Site Map

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: 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.

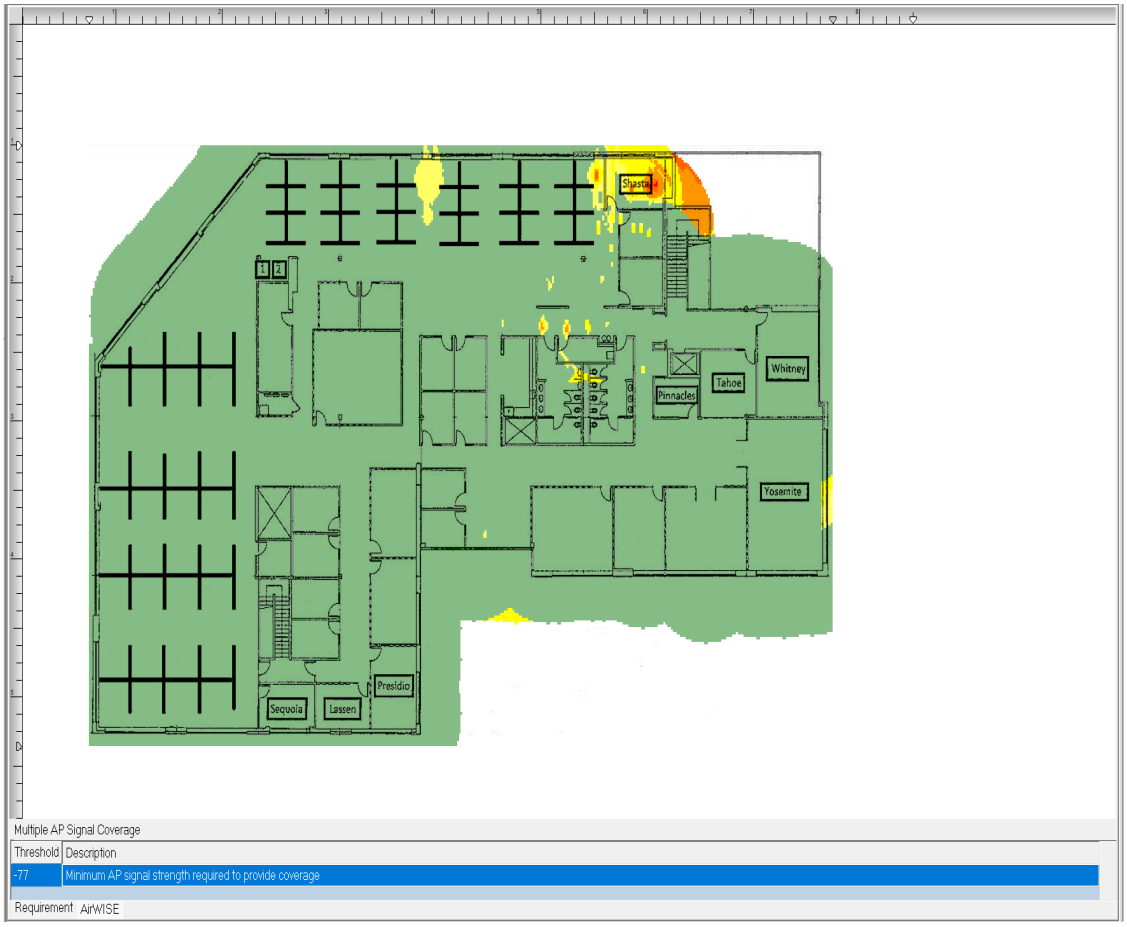
To test AirWISE requirements on the site map:

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 -77 dBm. Based on this result, you can probably use two APs to cover the entire site with a minimum signal strength of -77 dBm.

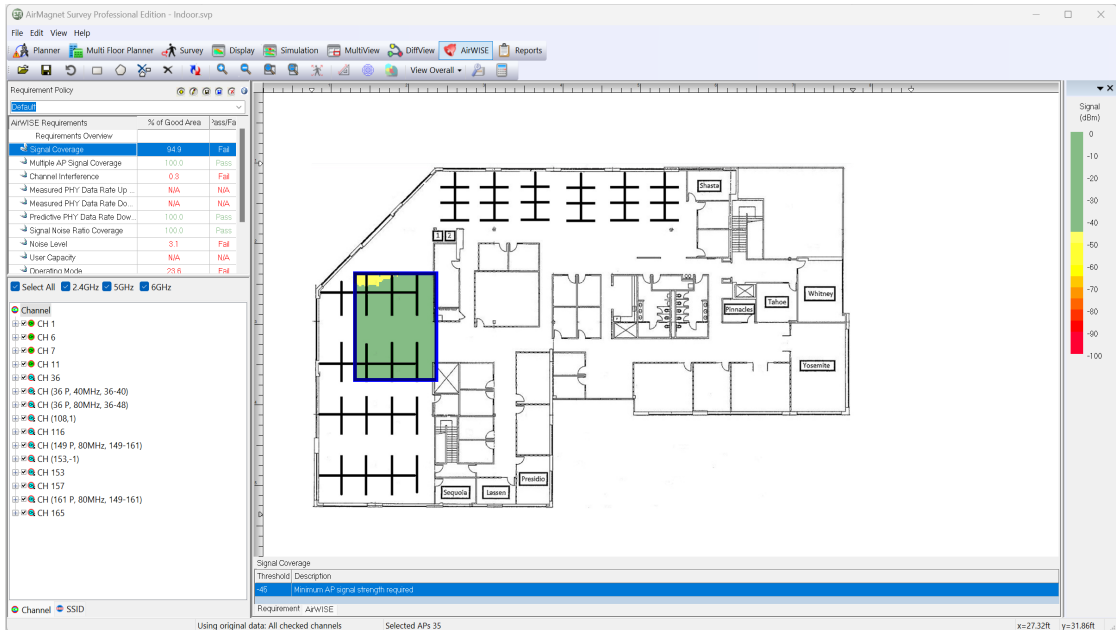
Determining the Number of APs Needed in an Area

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.

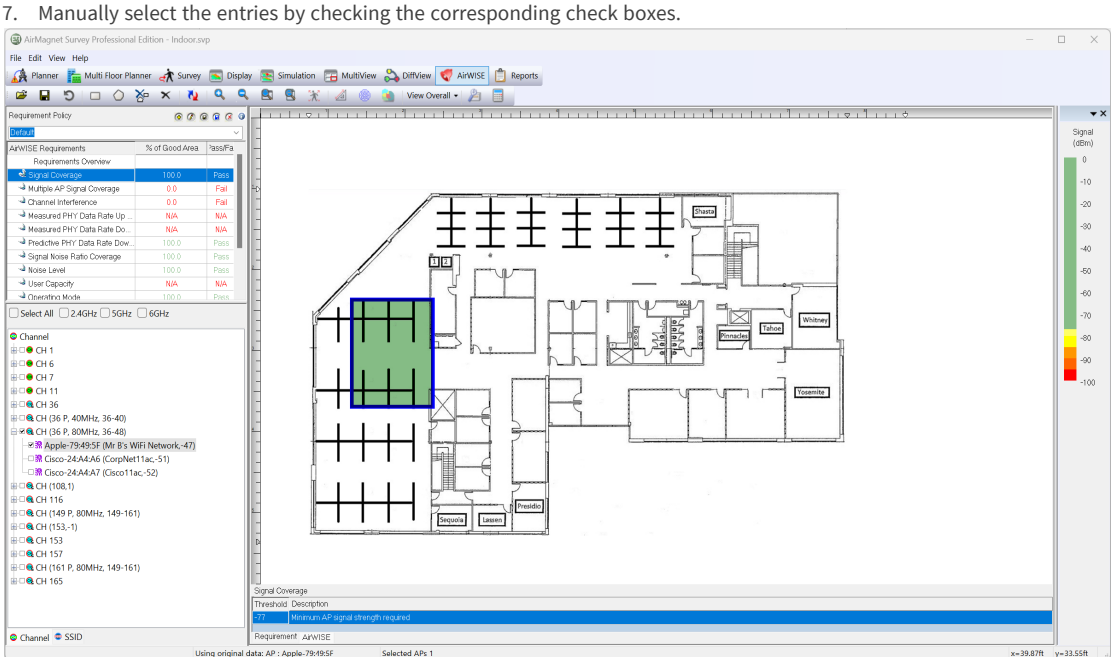
Note: To analyze survey data on the AirWISE view, you must first load the selected survey data on the Display view and then switch to the AirWISE view. The following section assumes that you have already loaded the data on the Display view.

To determine the number of APs needed for an area of the network:

1. Select a requirement in the Summary Pane to display the heatmap for that requirement in the Content area.
2. In the Display view, click (**Rectangular Region Tool**) on the Toolbar.
3. On the site map, click a starting point and mark an area of interest by dragging a rectangular frame around it.
4. Click (**Refresh**). The AirWISE view refreshes.



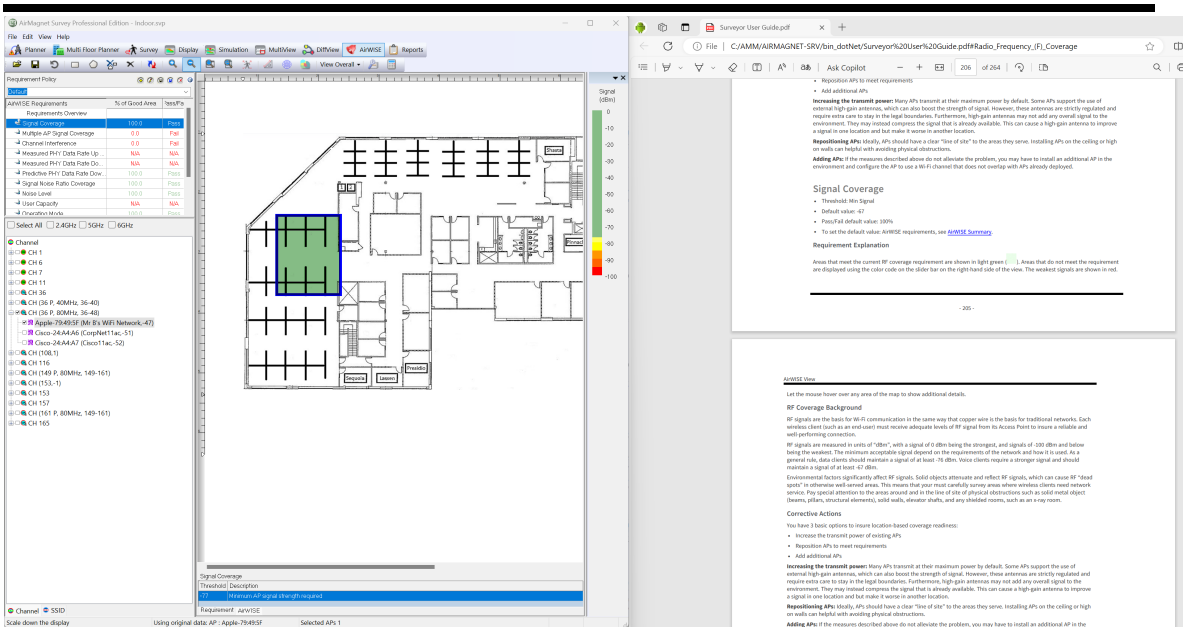
5. From the Channel/SSID pane, select the **Channel** tab.
6. Click the **Select All** check box to deselect all entries in the Channel/SSID pane.
7. Manually select the entries by checking the corresponding check boxes.



Note: 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 to comply with a certain AirWISE requirement, click on button next to requirement policy buttons. You get detailed information and advice related to the AirWISE Requirement in on-line helps .



Managing AirWISE Requirement Policies

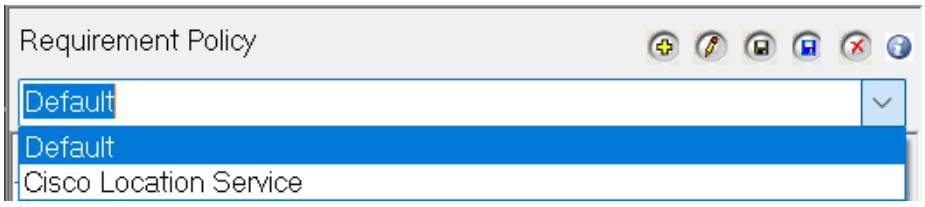
AirWISE Requirement Policies allow you to maintain different requirement profiles, which you can then apply to existing Survey projects. This helps you ensure compliance with various corporate requirements over different projects (or even in different areas of a single project). You can also enforce two levels of wireless compliance, such as locations where 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 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 you 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.



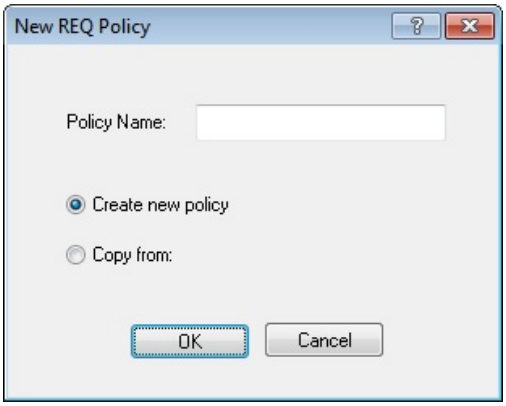
Note: Two policies are included with AirMagnet Survey by default; these policies cannot be modified or removed.

Creating Custom Requirement Policies

Although Survey includes several preconfigured policies designed for standard deployment types, you may also customize your own policies tailored to your wireless environment. 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. Choose one of the options:

- **Create new policy** (default): Creates the policy using the default values for all requirements.
- **Copy from**: Creates the policy by copying the values of another policy. Selecting **Copy From** displays a drop-down menu to select the policy to be copied.

Click **OK** to continue after making the desired selection. The new policy is selected on the AirWISE view.

After the new policy has been created, you can modify any of the thresholds as needed. Use the same steps described in Adjusting AirWISE Requirement Thresholds.

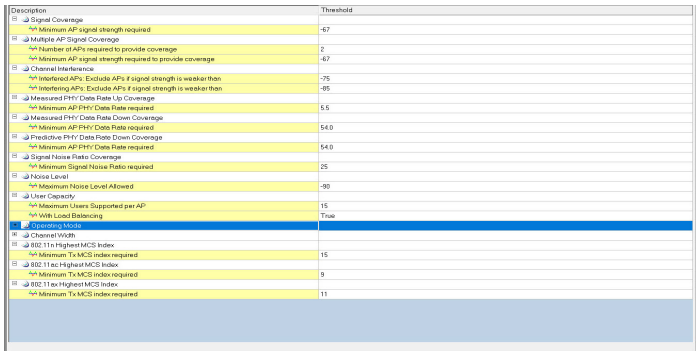
Note: To delete a user-created policy, click  with the policy selected.

Working in Requirement Window

This section explains how to change a requirement threshold value to affect compliance to the related AirWISE Requirement.

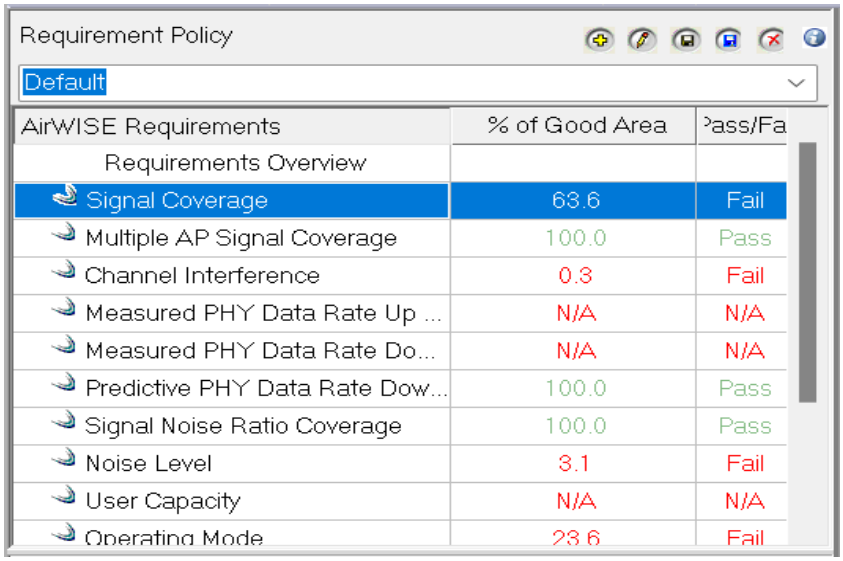
Note: To analyze survey data on the AirWISE view, you must first load the selected survey data on the Display view and then switch to the AirWISE view. The following explanation assumes that you have already loaded the data on the Display view.

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.

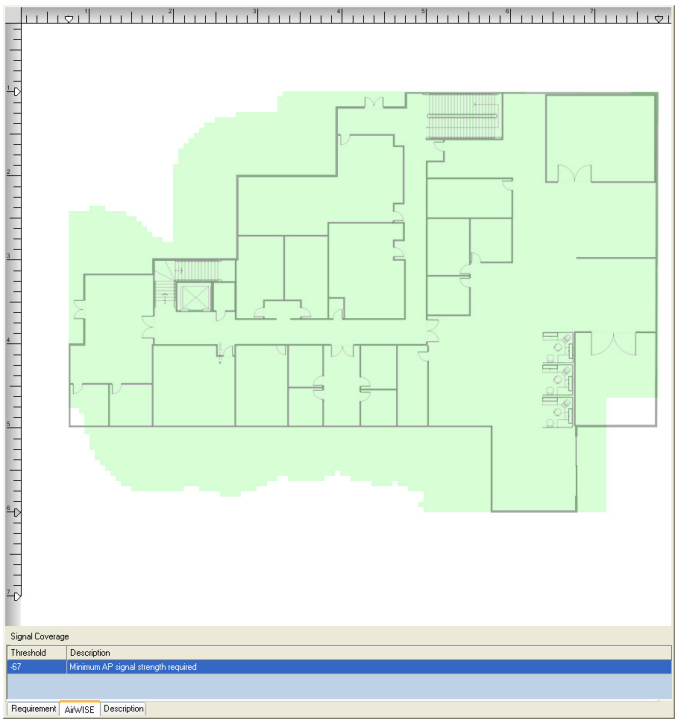


2. In the Threshold column, select a value to change and overwrite it with the new value.

3. 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.



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.



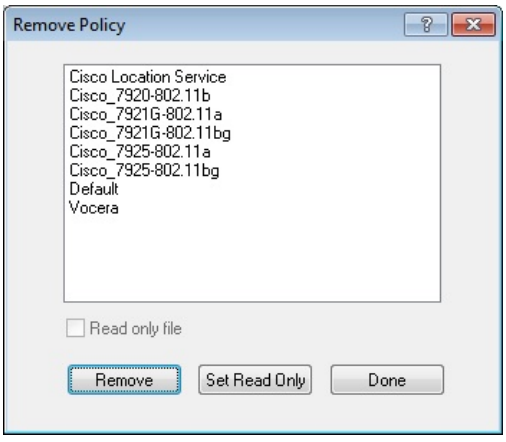
Saving Changes to AirWISE Policies

After changes have been made to a custom policy, you must save the changes 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 you attempts to navigate away from the AirWISE view, a message asks 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 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 do not 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: You can perform this procedure before deploying the VoFi installation (to verify that the network is ready) or after (to verify that the wireless infrastructure remains sufficient after VoFi activity is present).

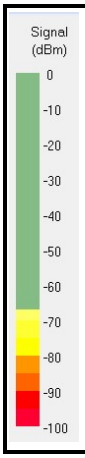
AirWISE Menu and Toolbar Reference

Toolbar

The following table provides description for additional Toolbar tools available in the AirWISE view.

Icon	Tool Name	Description
	**Reset AirWISE Requirements**	Changes all AirWISE settings back to their defaults.
	**Load AirWISE Requirements**	Same as **File > Load AirWISE Requirements**.
	**Save AirWISE Requirements**	Same as **File > Save AirWISE Requirements**.
	**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 Legend on the AirWISE view 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 more red the color, the worse the non-compliance.
- Use the **Refresh** button on the toolbar to update the view after you have adjusted the threshold value.

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. See 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 is displayed prompting you to save under a different name.
Save AirWISE Policy As...	Opens the Save As dialog box which allows you to save a current AirWISE Policy using a different file name.
Import AirWISE Policy...	Opens the Open dialog box, which allows you to open a previously created AirWISE policy file into the current project.
Export AirWISE Policy...	Opens 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 are created: The .SAR file and .PCT file. Both files must be imported into another installation of AirMagnet Survey PRO to share the policy.
Remove AirWISE Policy...	Opens the Remove Policy dialog box. See Removing AirWISE Policies for more information.
Load AirWISE Areas...	Opens 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.

Edit Menu

The only option for the Edit menu is Copy Heatmap Image. Select this option to copy the current heatmap image to the clipboard.

View Menu

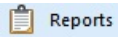
Option	Description
Zoom In	Enlarges the view of the current floor plan (same as **Ctrl+Page up**).
Zoom Out	Reduces the view of current floor plan (same as **Ctrl+Page Down**).
Zoom to Fit	Fits the current floor map to the map window.

Zoom to Actual Size	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.
Toolbars and Docking Windows	Choose to show or hide the Legend and Status Bar (show is checked). Reset Toolbar: Dragging the Toolbar handles undocks the Toolbar. Clicking this option reset the Toolbar to its default setting.
Show Rulers	Shows or hides rulers along the edge of the map window.
Show Grids	Shows or hides grids in the map window.
Use Simulated Data	The View menu of the AirWISE view includes the **Use Simulated Data** option. When your survey includes simulated data (see About Simulation view), you can choose whether to use original data or simulated data (checked indicates Use Simulated Data).
Refresh	Generate and refresh the heatmap.

Help Menu

Item	Description
View Help	Open Help documentation
Sample Project	Open a sample MFP building project for Wi-Fi 5 or Wi-Fi 6.
About Multi Floor Planner	View basic information about MFP such as version and build number.

Reports View

AirMagnet Survey can automatically convert any survey data shown on the Display view into a variety of data reports, which can be viewed, printed, or distributed from the Reports view. You can access the Reports view by clicking  on the navigation bar.

Note: You must have an open data file in the Display view and also select an option from the Report List before you can view data reports.

In this chapter:

Reports Introduction

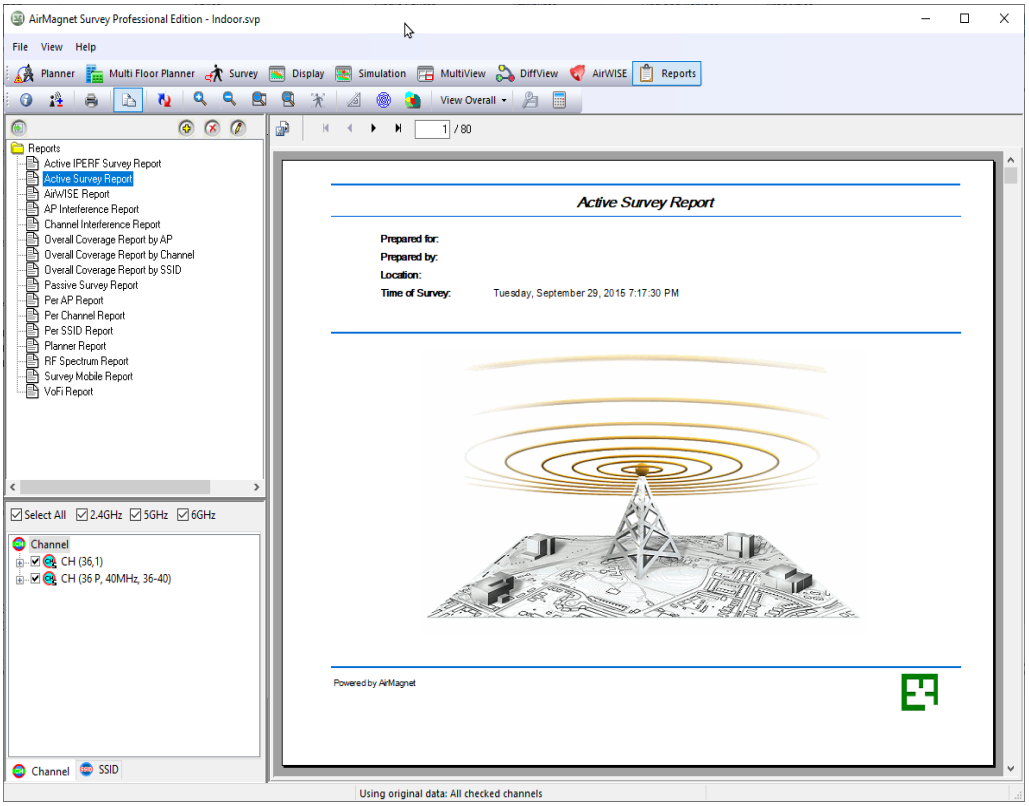
The Reports feature enables you to generate a report based on the data file selected in the Display view.

A variety of preconfigured 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. You can also manually revise the translated text.
- 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 report displays in the main view.



File Menu

The Reports File menu includes options that can help you manage and distribute 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, and then click **OK**. If the ACL feature is used, the report sorts the APs into these two groups.
Print...	Print the current report.
Print Setup...	Change print settings for the current report.

View Menu

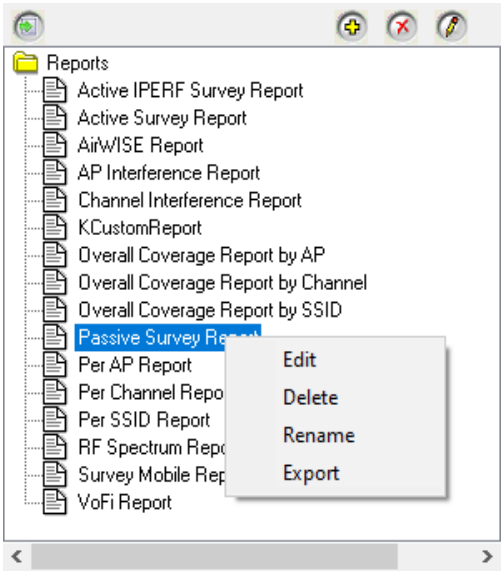
The View menu on the Reports view provides an additional option:

Landscape Orientation: Switch the report orientation from portrait to landscape. Once in Landscape orientation, the report may be changed back to Portrait orientation by deselecting **Landscape Orientation**.

Report Template List

The Report List displays the Report Templates. Each template is preconfigured 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.



in the Report List, the following actions are available:

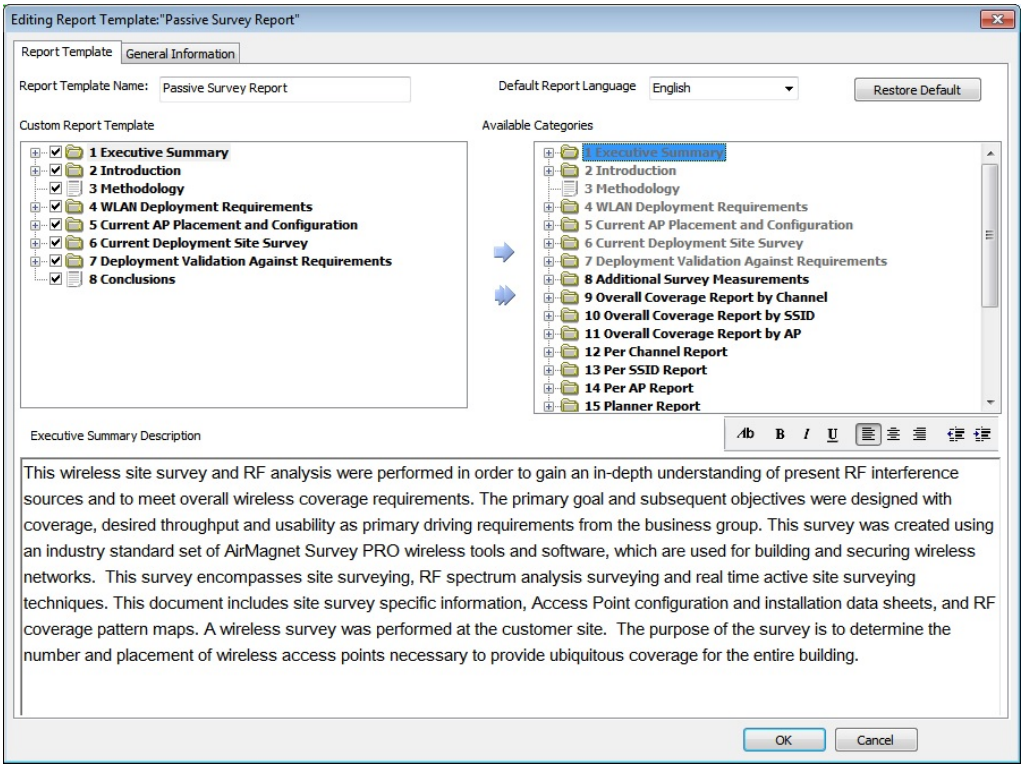
Item	Description
right-click the folder *or* **Reports** and then select **New Custom Report Template**	Add a new, blank template or copy an existing template. Type a name for the template. Choose **none** for a blank template or choose a listing from the drop-down to create a duplicate template. Then click **OK**.

right-click and select **Edit** *or*	Edit the selected template.
right-click and select **Delete** *or*	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**	Opens a file window that lets you select a folder to export the selected template in ZIP format.
Import	Right-click the **Reports** folder, select **Import Custom Report Template**, and then browse to the desired ZIP file. Click **Open**.

Customizing a Report Template

If you choose to Edit or Create a report template (see 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 is 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 contains the preconfigured 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.

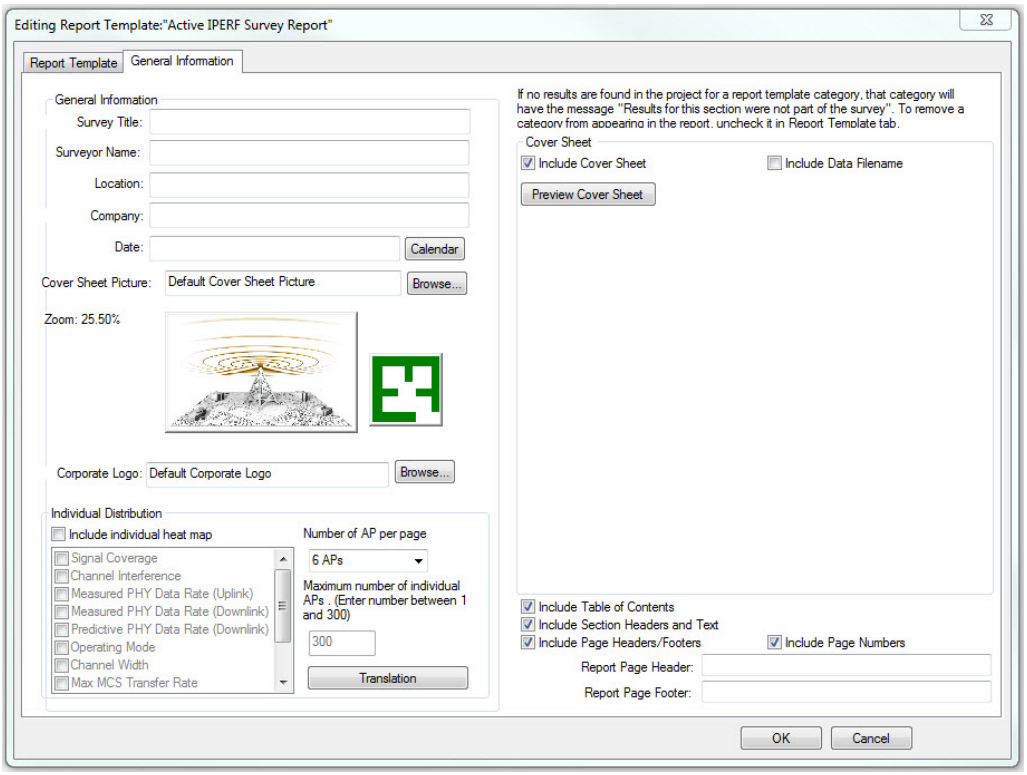


1. To subtract a section from the report, locate the desired section by expanding the **Custom Report Template** tree. Select the section. Click the right facing arrow to move the section to **Available Categories**.
2. To add a section to the report, locate the desired section by expanding the **Available 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 displays the text (if any) in the description area at the bottom. Modify the text.
4. Click **OK** to save changes

General information Tab

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. See Report Translation.



After modifying the properties desired, you 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 is 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 is displayed on the cover sheet of the finished report. Recommended size is 650w x 400h pixels. This image appears 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, you 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 appears 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 you to force the report to display a limited number of APs in each heatmap display. In this manner, you 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 in the report.
Translation	Enables report text to be localized to the language of choice. See Report Translation.
Report Page Header & Footer	If desired, you can enter text to appear in the header and footer portions of the report. This is 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.

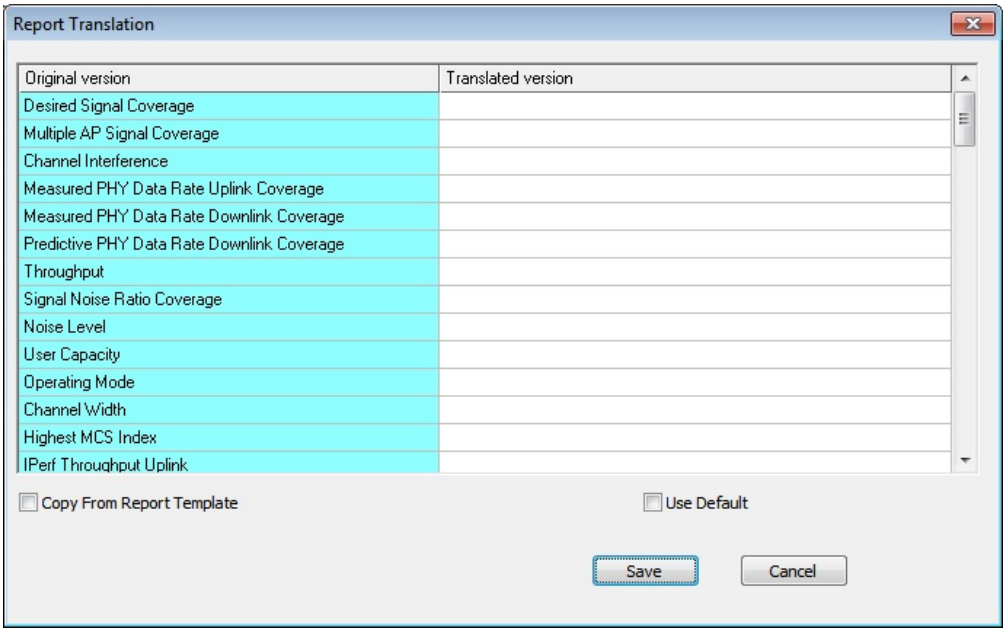
Report Translation

in 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.

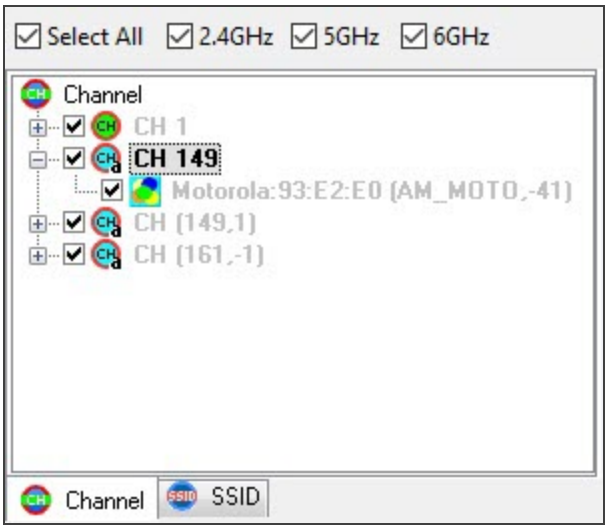


Once translation is completed, click **OK** to save any changes and close the Report Template manager.

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.

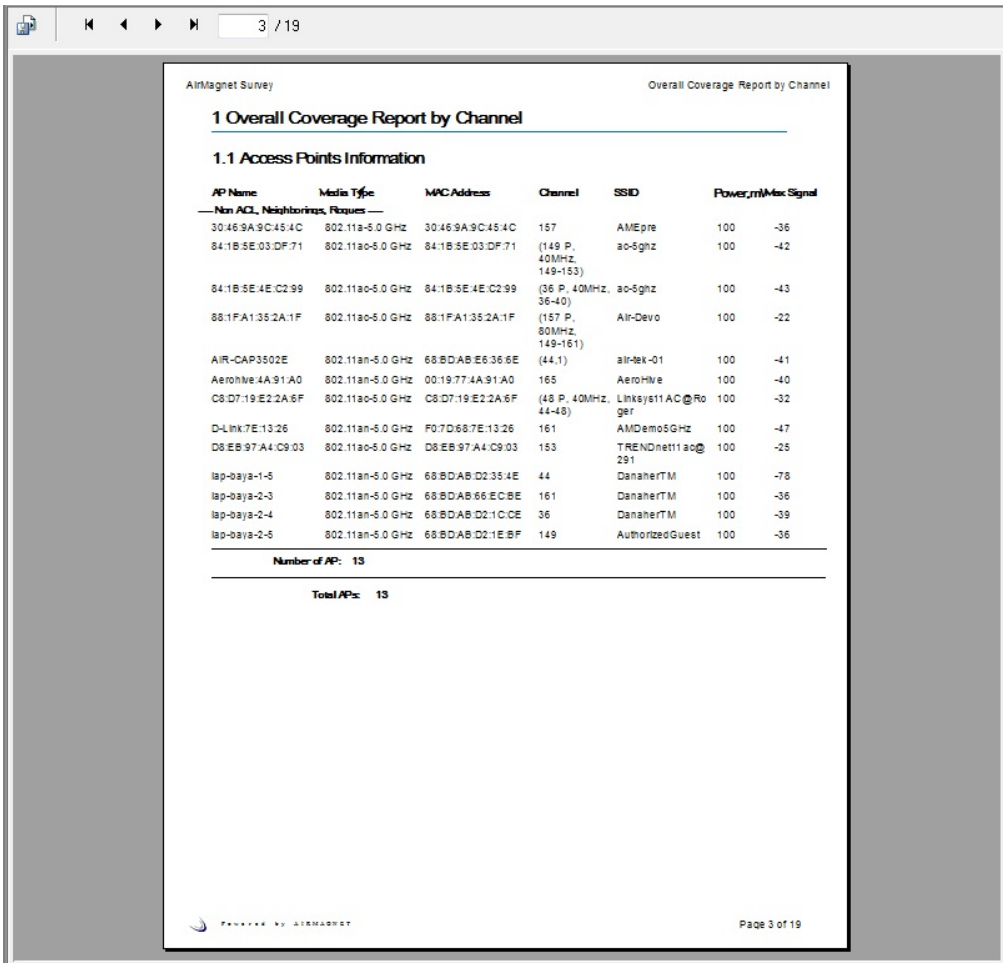


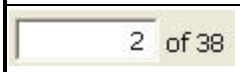
As seen above, there are check boxes above the Channel/SSID Tree:

- **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.
- **6 GHz:** This checkbox selects only the channels in the 6 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.
	**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. (You can also use your mouse's scroll wheel.)
	**Zoom Out**	Reduces the size of the current report on the view. (You can also use your mouse's scroll wheel.)
	**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.
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).

RF Signal Adjustments

In this chapter:

About Signal Adjustment

You can choose a wide variety of 802.11 wireless network adapters. However, there is a possibility that manufacturing differences between the vendors can result in different signal readings.

To reduce this problem, NetAlly has a list of “preferred” Wi-Fi adapters, which you can view here: https://www.net-ally.com/wp-content/uploads/APA_FL_21_V2.pdf

NOTE: Signal adjustment on channels in the 6 GHz band are not supported.

Using 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... > Wi-Fi 4 > Adjust Signal....**

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

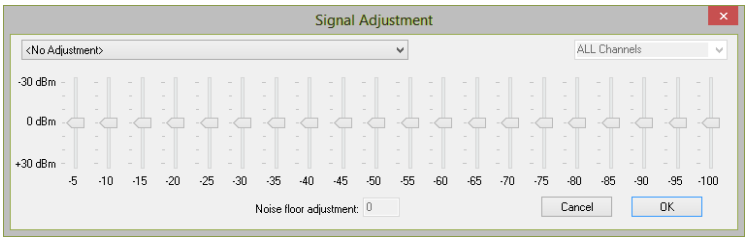
- No Adjustment
- Pre-Defined Adjustment (This is the entry below **No Adjustment,** for example, AirMagnet 802.11 a/b/g/n Wireless PC card.)
- Custom Adjustment

No Adjustment

No Adjustment means no adjustment offsets are applied by AirMagnet to the wireless network adapter. This option should be used when you prefer to use 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. (See the figure below.)



   Note: When you have selected **No Adjustment** option, all other controls in the Signal Adjustment dialog box are grayed out (unavailable).

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

Pre-Defined Adjustment

If the wireless network adapter you are using is on the pre-adjusted list, then the AirMagnet application automatically recognizes the adapter and displays the predefined adjustment option. You can then select and use the AirMagnet-adjusted values or make changes to the predefined settings. (This is customizing a pre-adjusted wireless network adapter, discussed below.)

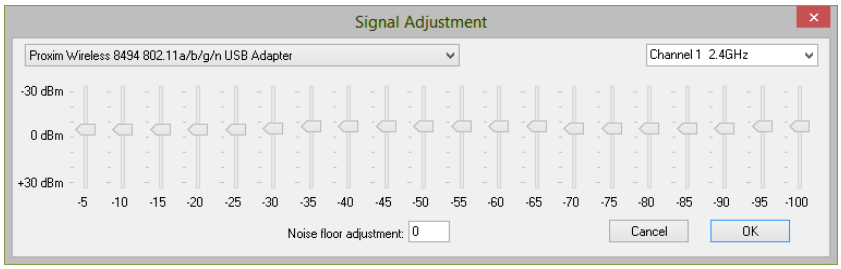
NOTE: All tests for defining the adjusted values for the wireless adapter were performed using adjusted spectrum analyzers in a professionally shielded isolation chamber to ensure the best possible accuracy. The adjustment first uses the spectrum analyzer to measure the down-link (from AP to station) 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 is tuned down to -30 dBm. As a result, the AP signal strength is -30 dBm when received by the spectrum analyzers. The measurements are carried out at on all channels applicable to the wireless protocol used on the wireless network adapter being adjusted. Once the benchmark values are established using the spectrum analyzer, the same measurement procedures are

performed with the 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.

For example, 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 predefined offsets are relative to the spectrum analyzer. In other words, the predefined adjustment patterns make the target Wi-Fi adapter 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 to derive the predefined adjustment values. All adjustment data involving those pre-adjusted wireless network adapters are included in the application.

To use predefined adjustment, do the following:

1. Click the down arrow and locate your wireless network adapter in the predefined adjustment entries.



2. Select the adapter (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: You can make any change to a pre-adjusted wireless network adapter by making custom adjustments on the basis of a predefined adjustment. Custom adjustments do no change any of the signal values that depend on the pre-adjustment settings. See the next section.

To change predefined adjustments, 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. Enter a 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 because the changes apply to a single channel only.

Custom Adjustment

Custom adjustment lets you create your own adjustment table for your wireless network adapters. This process uses Signal Adjustment dialog box.

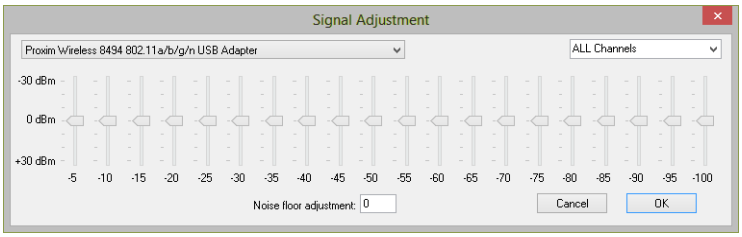
Custom adjustment patterns can equalize the signal strength readings between any combination of Wi-Fi adapters. Begin by measuring (similar to the process defined in pre-adjustment section) two different radios with zero offsets at varying distances, comparing the received signal strengths at each distance, 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 -30 dB to +30 dB) 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). See 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.

VoFi Data and Surveys

In this chapter:

Analyzing VoFi Survey Data

Since it is far easier to troubleshoot and repair issues with a VoFi wireless deployment before supporting active users with it, NetAlly strongly recommends that you 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.

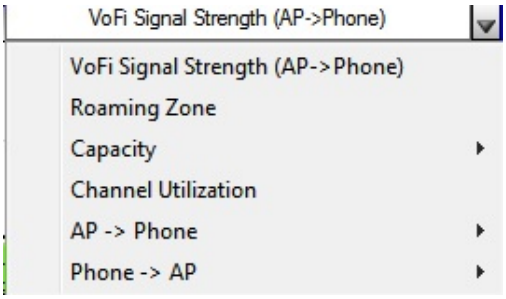
The process of analyzing data collected from a VoFi survey is generally similar to that of a standard survey, but VoFi surveys contain additional data (such as roaming information) to help identify problem zones in the VoFi deployment coverage.

NOTE: VoFi surveys are not supported for the 6 GHz band.

- 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 for troubleshooting and maintaining 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 see 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.
- **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.

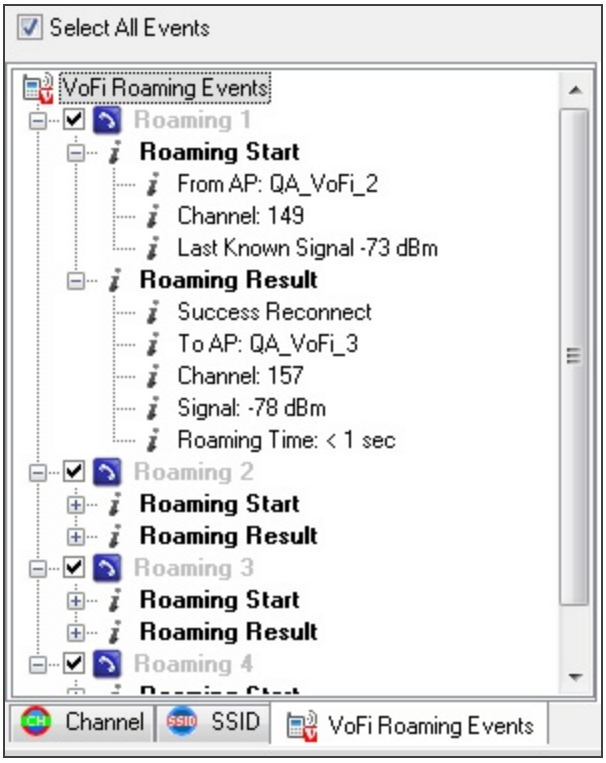
- **WiMOS Score**—much like the MOS score widely used to monitor the quality of wired communications, the WiMOS score provides a value to display the call quality at each point during the survey process. This value can range from 1 (poor) to 4.5 (excellent).
- **PHY Data Rate**—displays the data transfer 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

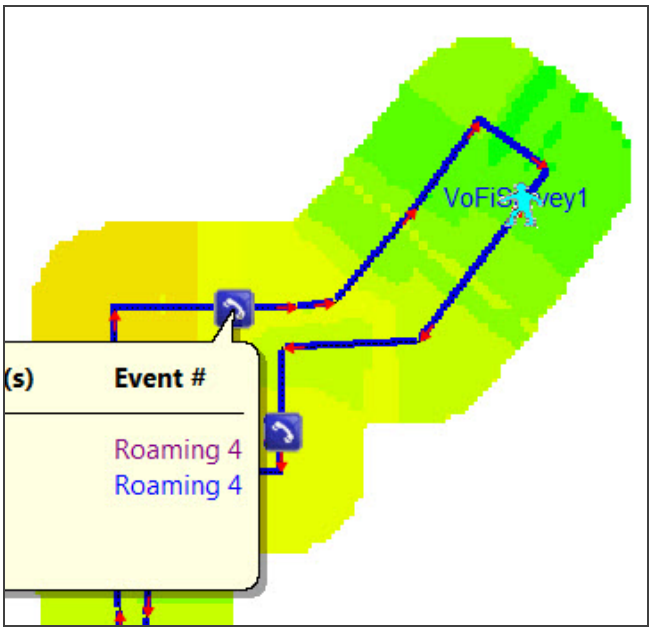
VoFi phones roam in even the best of VoFi deployments, so a roaming analysis is critical to ensuring that users can enjoy uninterrupted service during these roaming periods. AirMagnet Survey PRO allows you to review roaming information captured during the VoFi survey process, including each instance 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. See Conducting VoFi Surveys for more details.

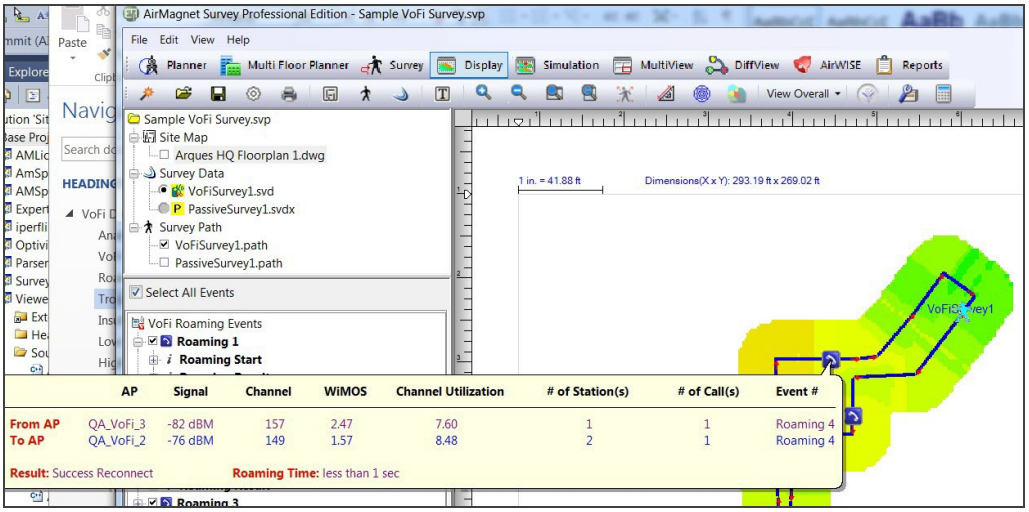
Survey's VoFi Roaming Events tab provides a summary of all captured instances of roaming as well as the pertinent data associated with each event.



Each instance in which the VoFi phone roamed during the survey process is included in this tab and has a checkbox allowing you 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  (***Roaming Start***) icon allows you 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.

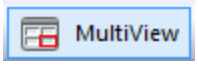


The bubble help pop-up allows you to attempt to determine the reason that the phone roamed at this point on the map. The information is displayed for each AP involved in the roam (for example, the original AP and the one to which the phone roamed), as summarized in the table below.

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 attempts 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 used at the time of the roam.
Station(s)	Total number of stations associated to each AP. 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 

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.

See 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 (See MultiView File Menu).
2. Select the same VoFi data file for each view pane.
3. Make sure the Automatic Multi-Select option is off (See MultiView Toolbar).
4. Use the Data Type drop-down list to load the following heatmaps into the four panes:

- Signal Strength (from AP -> Phone)
- PHY Data Rate (from AP -> Phone)
- Packet Retry Rate (from AP -> Phone)
- 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, -67 dBm or lower), the signal coverage provided by the deployment is insufficient to support a VoFi implementation. See Insufficient Signal.
4. If the signal level is sufficient, look at the PHY Data Rate at that area. If it is lower than 24 Biopsy, the conversation is not being transmitted at a high enough data rate for high quality conversation levels. See 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 a call being lost. See 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 Wi-Fi 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 to give the infrastructure more time to process exchanges. If you find that too much of the network is being used at a given time, you may need to upgrade the infrastructure with additional APs to support the volume of traffic detected. See 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 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:** This factor is easiest to diagnose but may not be easiest to remedy. If a deployment does not have enough APs to ensure adequate signal coverage throughout the entire region, transmissions suffer. This is particularly noticeable for VoFi deployments, because voice traffic requires a strong signal 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, you 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) to maintain adequate signal in the most heavily-used 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. Most often this interference comes from 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 use channels that are at least five apart. Common practice for the 2.4 GHz band is to use channels 1-6-11, although standards may vary depending on country/region.
  - Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting. Reduce this interference by placing APs far from potential interferers, particularly microwaves or wireless cameras.
  - For advanced analysis, you 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. Obstacles are most commonly pillars or thick walls, but can also include bodies of water, rooms full of equipment, etc. Moving obstacles in the wireless environment is often unfeasible, so you may need to either add or rearrange APs in 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:

- **Mixed-mode devices:** Wireless deployments that are designed to operate at high speeds (such as those provided by 802.11g or Wi-Fi 4 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, and so on. Most often this interference comes from 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 use channels that are at least five apart. Common practice for the 2.4 GHz band is to use channels 1-6-11, although standards may vary depending on country/region.
  - Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting. Reduce this interference by placing APs far from potential interferers, particularly microwaves or wireless cameras.
  - For advanced analysis, you 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

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) and 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. Most often this interference comes from 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 use channels that are at least five apart. Common practice for the 2.4 GHz band is to use channels 1-6-11, although

standards may vary depending on country/region.

- Non-802.11 sources can include a wide variety of common items, including cordless phones, Bluetooth devices, microwave ovens, or even fluorescent lighting. Reduce this interference by placing APs far from potential interferers, particularly microwaves or wireless cameras.
- For advanced analysis, you 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**: Some deployments have more devices than the network infrastructure can support. This can result in transmission collisions and traffic being ignored in favor of devices with a better signal. You can address the problem by expanding the infrastructure (that is, add APs) or by reducing the total number of stations requiring service.

Using WLAN Tools

In this chapter:

Introduction to WLAN Tools

This section describes the four diagnostic tools AirMagnet Survey provides for evaluating and troubleshooting a WLAN. Access these tools from the Tools window.

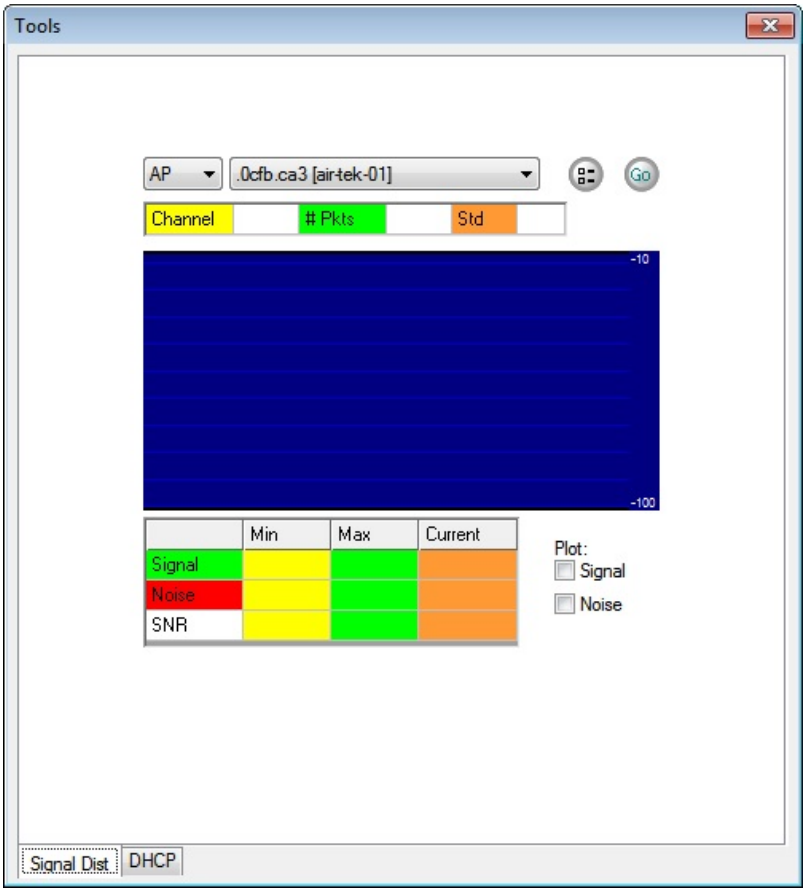
- Signal Distribution
- DHCP
- Ping
- GPS Information

Signal Distribution

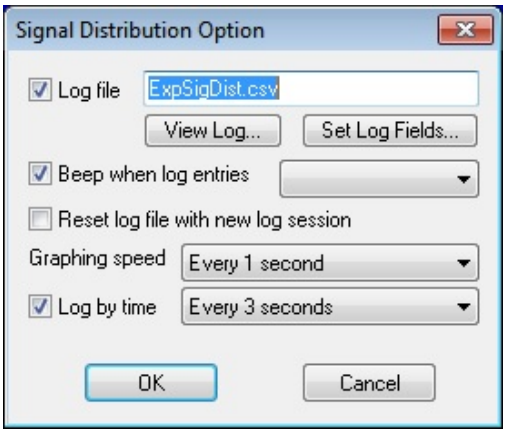
The Signal Distribution tool is designed to enable WLAN professionals to detect RF signal problems (for example, signal multipath) by visually analyzing RF signal distribution patterns. The sample image below shows healthy signal distribution as indicated by the yellow dashed lines clustering in a single 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 Toolbar, 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:

- Signal
- Noise

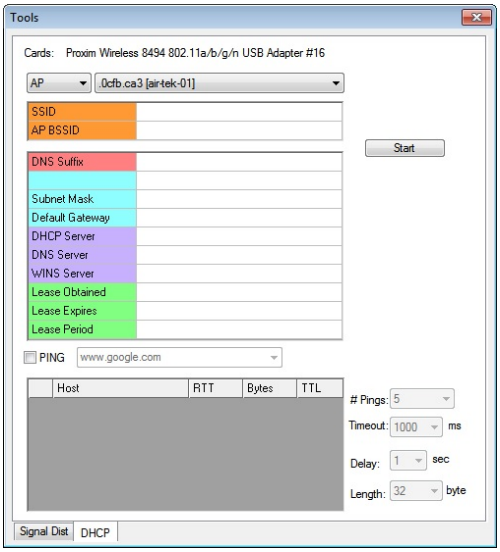
7. Click **Go**. The signal distribution pattern of the selected AP or STA is plotted on the chart.

Using the DHCP Tool

WLAN connectivity problems can arise from data link layer malfunctions or IP network layer misconfiguration. To troubleshoot and pinpoint the cause of the problems, you must investigate the interaction between the two network layers. 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 starts 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 is shown on the view. An error message pops 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 are filled in on the view if DHCP request/reply is successful:

- Device IP address
- Subnet mask
- Default gateway
- 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:

- AP/SSID
- # Pings
- Timeout
- Delay
- Length

3. Enter the end node's domain name, for example, www.yahoo.com.
4. Click **Go**. Real-time Ping responses appears 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.in-ternal.My/computer.com, and click **Go**.

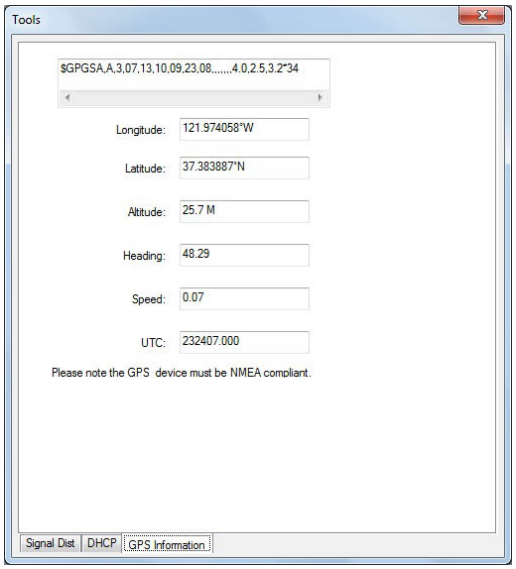
Verifying GPS Information

This tool is used to verify if your AirMagnet Survey is receiving GPS signals. 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. Survey PRO connects to the GPS device and displays a dialog box. For more information, see Creating a GPS-Aided Survey Project Using an Existing Site Map.

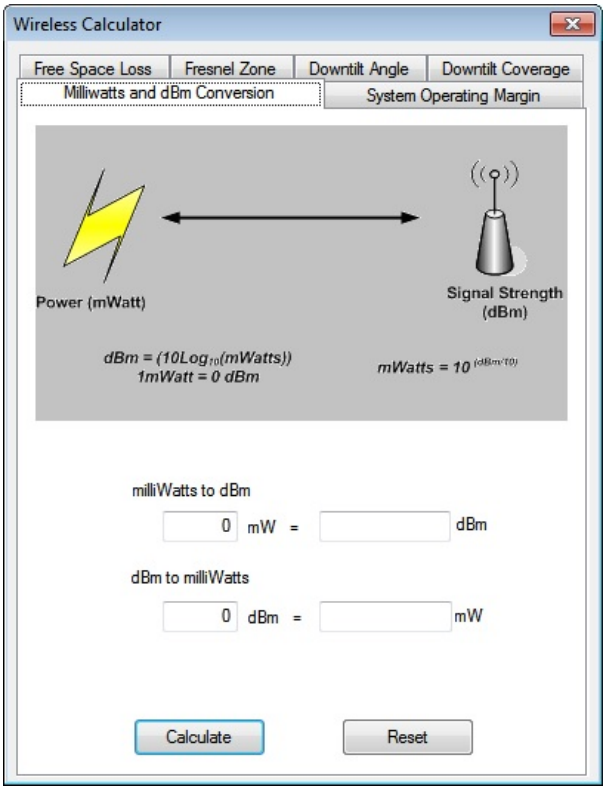

Tools
$GPGSA,A,3,07,13,10,09,23,08,,,,,,,4.0,2.5,3.2*34
Longitude:
121.974058°W
Latitude:
37.383887°N
Altitude:
25.7 M
Heading:
48.29
Speed:
0.07
UTC:
232407.000
Please note the GPS device must be NMEA compliant.
Signal Dist
DHCP
GPS Information

Calculating WLAN Parameters

In this chapter:

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.
2. Under **milliwatts to dBm**, enter a value in milliwatts (from 0 to 1000).
3. Click **Calculate**. The system converts the value to dBm.

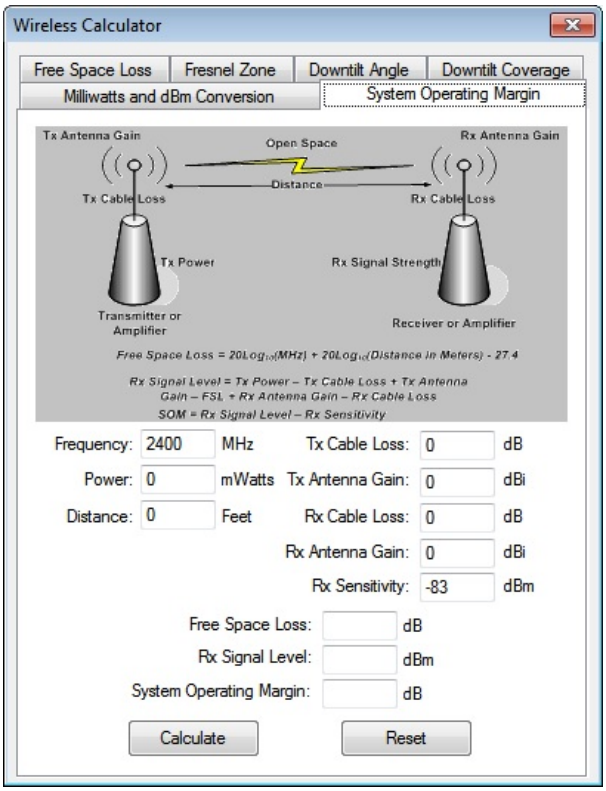
To convert dBm to milliwatts:

1. Under **dBm to milliwatts**, enter a value in dBm (from -100 to 100).
2. Click **Calculate**. The system converts the value to milliwatts.

System Operating Margin

System Operating Margin (SOM) is the difference between the signal a radio actually receives versus that the signal needed for good data recovery (ice, Receiver Sensitivity). SOM measures in dB the signal loss a system can sustain before it degrades to the error rate specified at the Receiver Sensitivity threshold. SOM accounts for all gains and losses in the components (such as transmitter power, type of antenna, distance, etc.) that make up a wireless network system. The goal is 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, factors (inadequate Fresnel clearance, desensitization, etc.) require many network designs to use a 30 dB (or greater) SOM. SOM calculation assumes an interference-free open space.

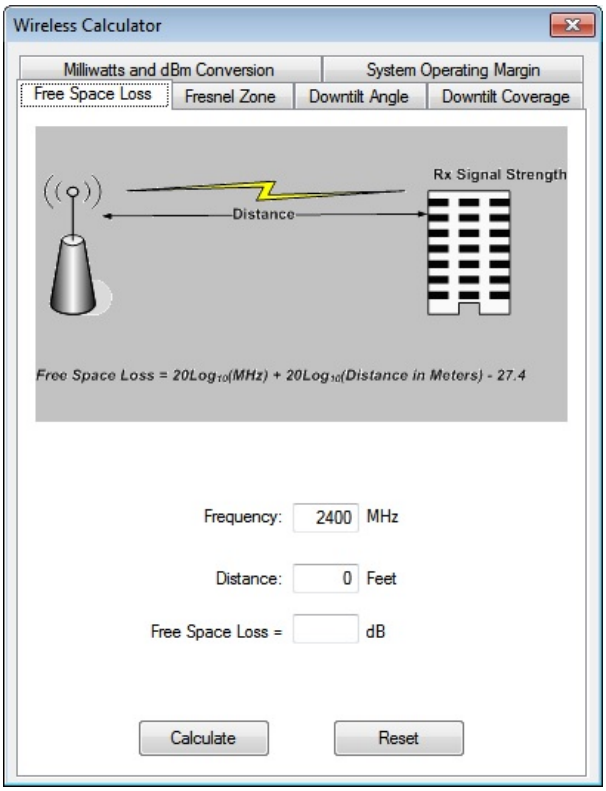


To calculate System Operating Margin:

1. Click the **System Operating Margin** tab. The Calculator window refreshes.
2. Make the following entries:
   - Frequency
   - Power
   - Distance
   - Tx Cable Loss
   - Tx Antenna Gain
   - Rx Cable Loss
   - Rx Antenna Gain
   - Rx Sensitivity
3. Click **Calculate**. The following values are calculated:
   - Free Space Loss
   - Rx Signal Level
   - System Operating Margin

Free Space Loss

Free space loss refers to signal attenuation that occurs assuming that all absorbing, diffracting, obstructing, refracting, scattering, and reflecting influences are removed and have no effect on RF signal propagation. Free space loss is mainly caused by beam divergence (signal energy spreading) over larger areas at increased distances from the source.

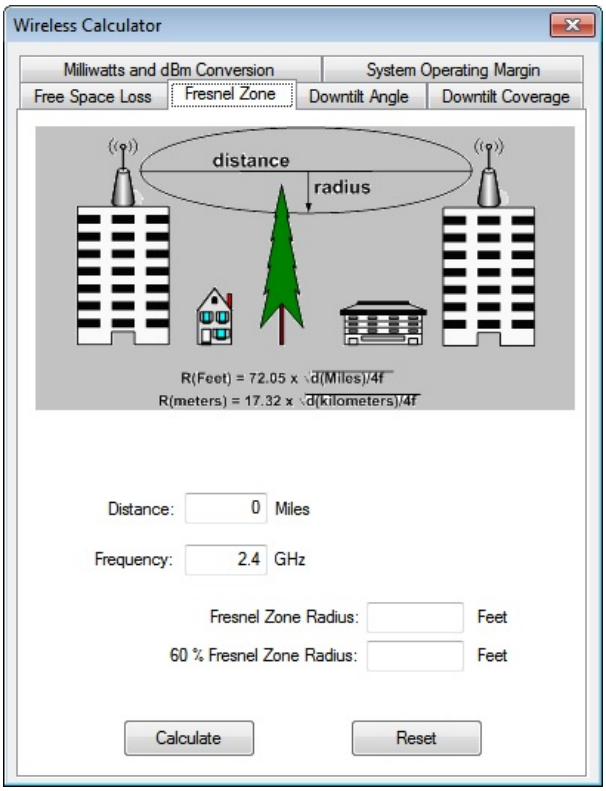


To calculate the free space loss:

1. From the **Calculator** window, select the **Free Space Loss** tab. The Calculator window refreshes.
2. Make the following entries:
   - Frequency
   - 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 so that radio signals can be transmitted. The zone defines the optimum clearance and lets you determine the best antenna height between the AP and the client stations without any obstacles.

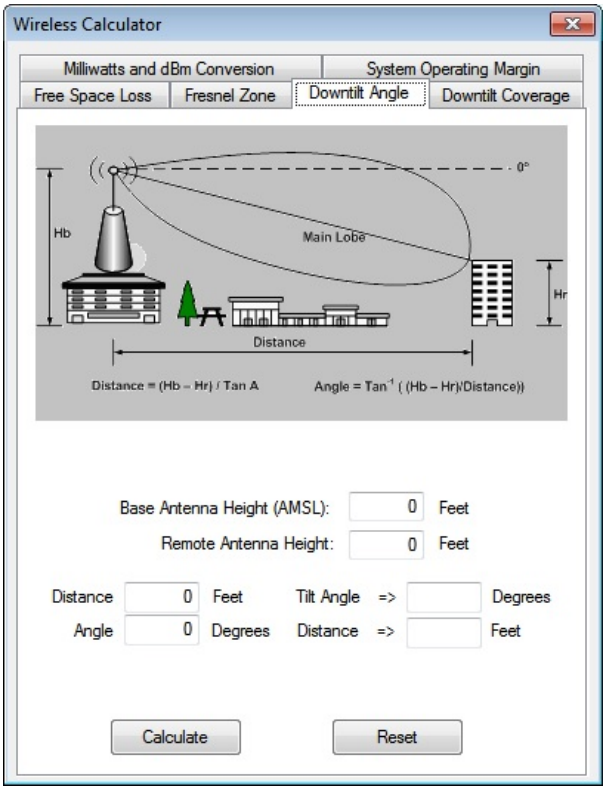


To calculate Fresnel Zone:

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 are automatically calculated:
   - Fresnel Zone Radius
   - 60% Fresnel Zone Radius

Downtilt Angle

Antenna downtilt affects radio signals traveling 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 to reach a 12-meter high receiving antenna at a distance of 3,000 meters.

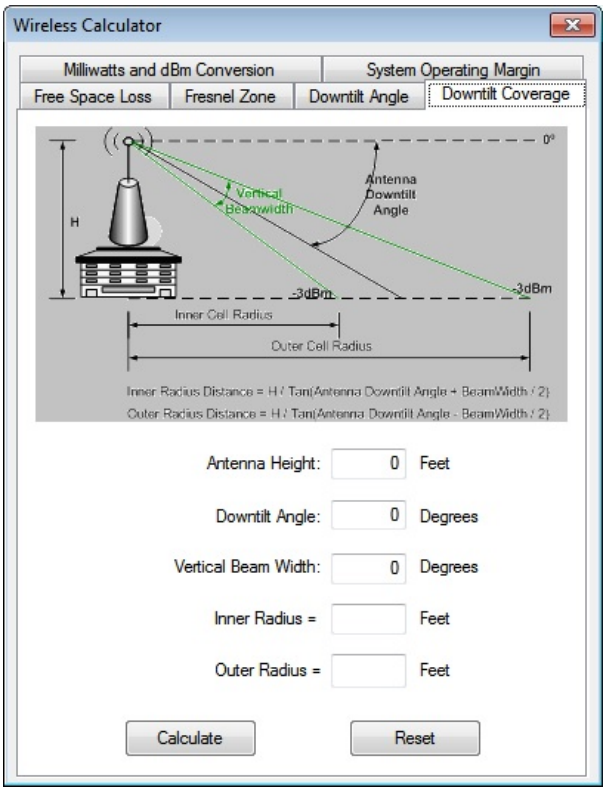


To calculate the Downtilt Angle:

1. From the Calculator window, select the **Downtilt Angle** tab. The Calculator window refreshes.
2. Make the following entries:
   - Base Antenna Height
   - Remote Antenna Height
   - Distance
   - 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:
   - Antenna Height
   - Downtilt Angle
   - Vertical Beam width
3. Click **Calculate**.

Working with Spectrum XT

In this chapter:

Working with Spectrum Analyzers

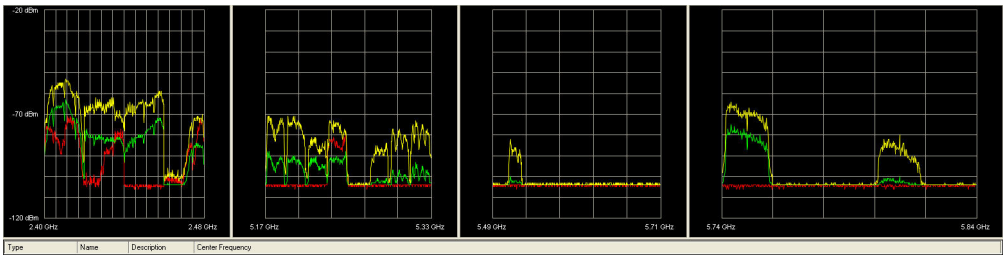
This section describes AirMagnet Survey's ability to integrate with supported spectrum analyzers. This integration brings AirMagnet Survey to a new level by allowing you to view RF traffic across the entire wireless spectrum. Spectrum Analyzers display potential sources of wireless interference detected during a survey. This can help you identify and eliminate RF hazards in the wireless environment as soon as they are detected.

Notes:

- This feature is available only on AirMagnet Survey PRO.
- AirMagnet Survey supports integration with the following supported analyzers:
  - AirMagnet Spectrum XT
  - AirMagnet Spectrum Analyzer
  - Cisco Spectrum Expert
- To use this feature, you must have install the supported spectrum analyzer and configure it on your laptop. See Configuring a Spectrum Analyzer for more information.
- Not supported for the 6 GHz band.

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.

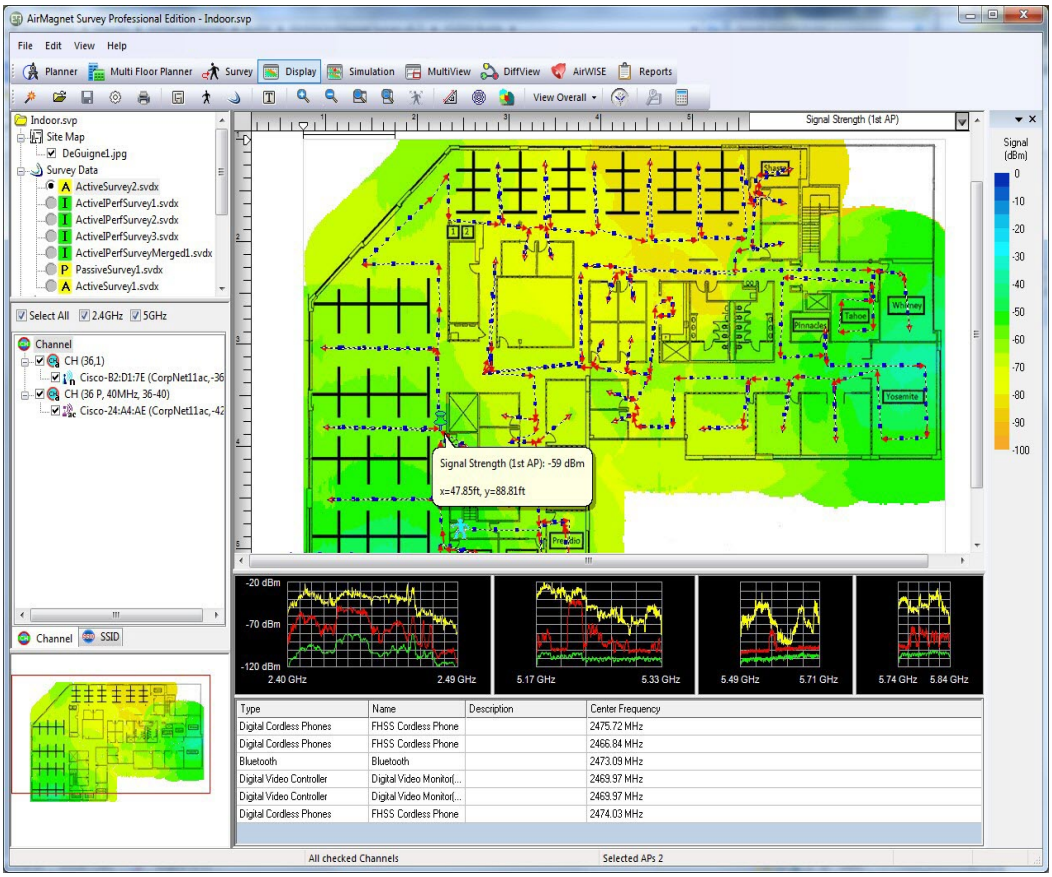


The Spectrum Analyzer Window displays the FFT (Fast Fourier Transform) plot which contains three types of data represented by the line charts in distinctive colors. The table below briefly describes each of these data. If you wish to have more information on AirMagnet Spectrum XT, see the AirMagnet Spectrum XT User Guide or the Help file in the stand-alone AirMagnet Spectrum XT software application.

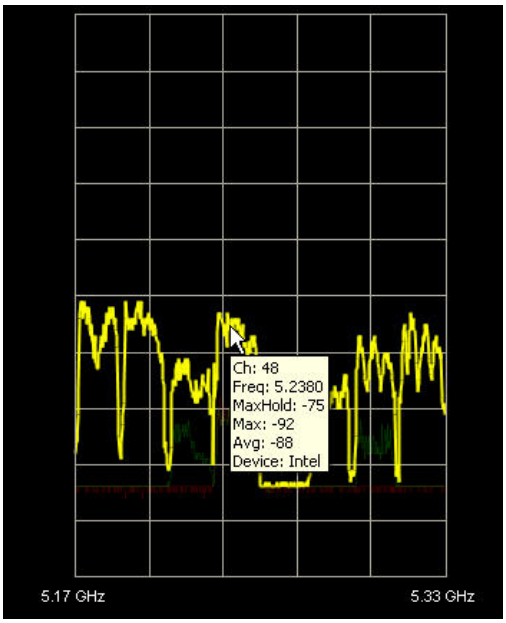
Color	Data Type	Description
Yellow	Max Hold	The maximum power value detected at any time since the plot was initiated. Max Hold means that the plot holds onto the maximum power value up to the present.
Red	Max	The maximum power value detected during the most recent measurement interval.
Green	Average	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 Wi-Fi data collected at that spot but also a pushpin that is related to what you see in the Spectrum Analyzer Window below. With spectrum data on the view, a tip view pops 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.

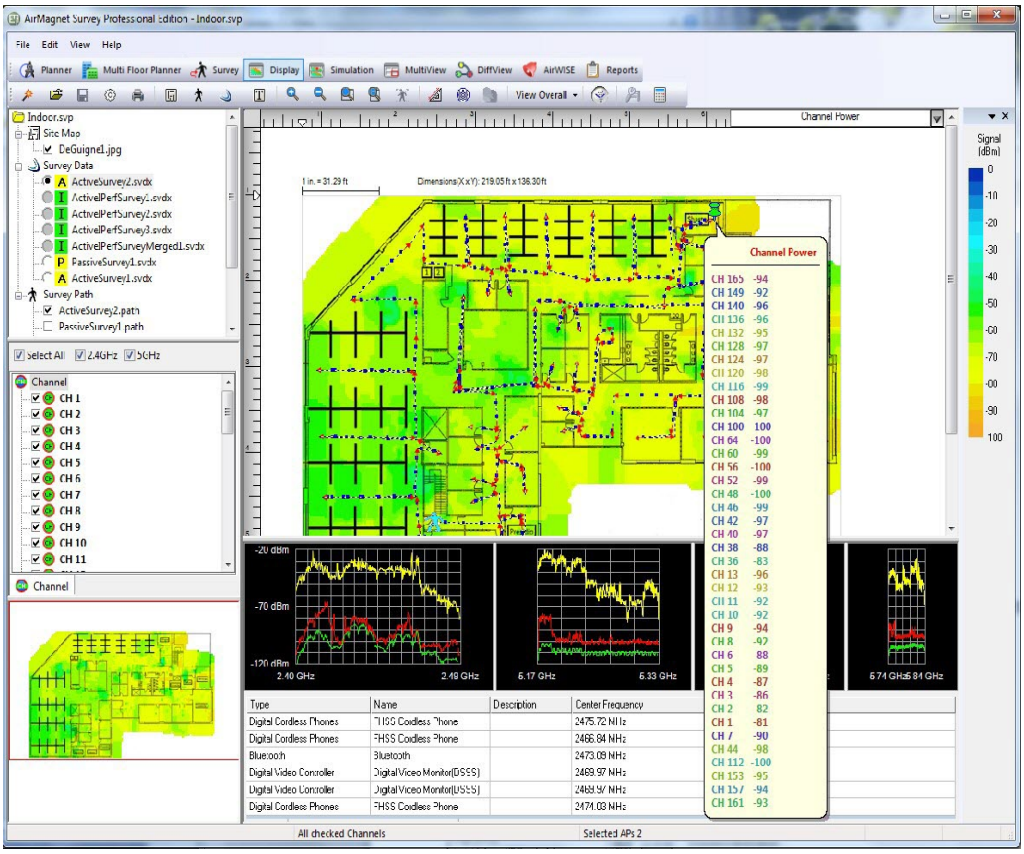
You can also use Spectrum XT to display a spectrum heatmap to help locate major sites of spectrum traffic.

Spectrum Heatmap Display

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.

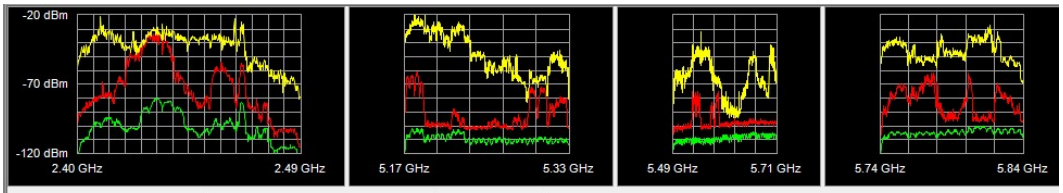
Spectrum Interferers

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/Wi-Fi 4 survey.

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. (For example, 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 refreshes 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, 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.

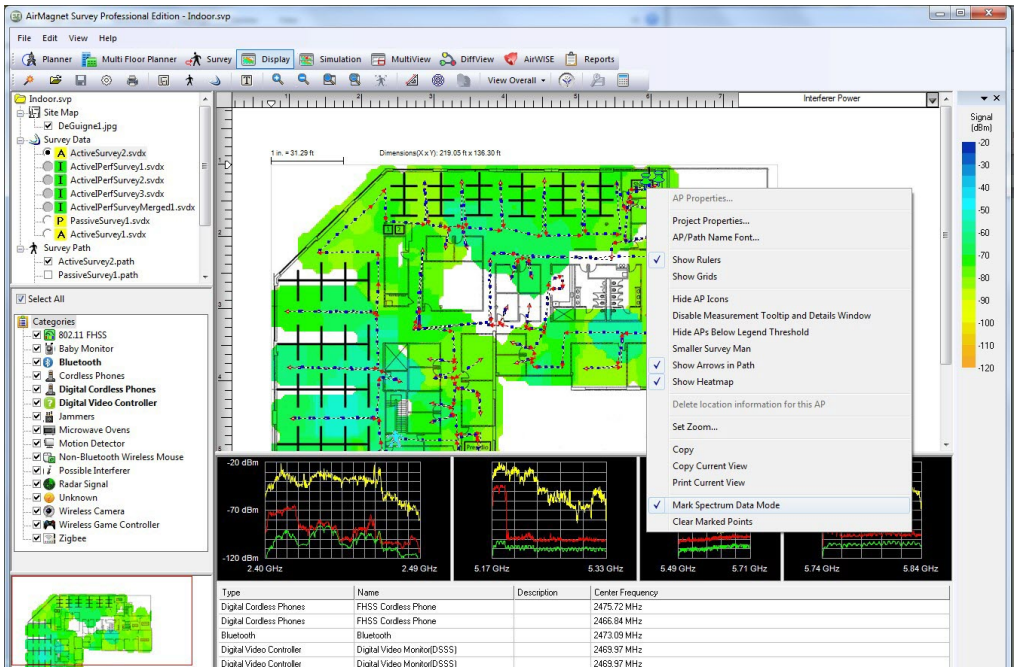
Once spectrum data are collected, the next step is to open the data file on the Display view and mark the spectrum data collection points on the survey path. This is important because even though spectrum data are collected, no Spectrum Analyzer report shows up on the Reports view until the spectrum data collection points are marked on the survey path. Otherwise, you get an error message when you try 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 automatically generates 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:

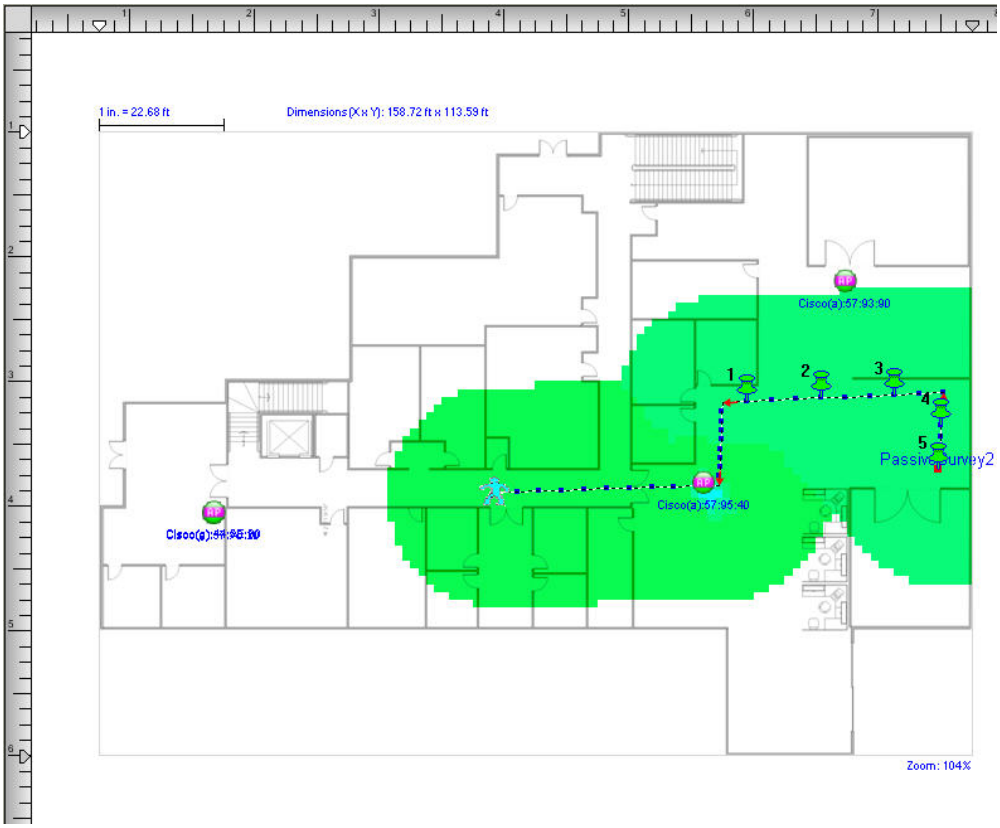
1. From the Display view, click to open the data file that contains the spectrum data.
2. Right-click inside the Map Window. A right-click pop-up menu appears.



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: Pin icons appear where you click. Pins are automatically numbered in the order they appear. As you click, spectrum data also appears in the Spectrum Analyzer Window. Be sure to click along the survey path. Otherwise, no icon appears and no spectrum data point is marked.

Viewing AirMagnet RF Spectrum Reports

To view the RF Spectrum Report:

1. Click 

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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