The importance of Wi-Fi surveys for your network

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WIRELESS TECHNOLOGY

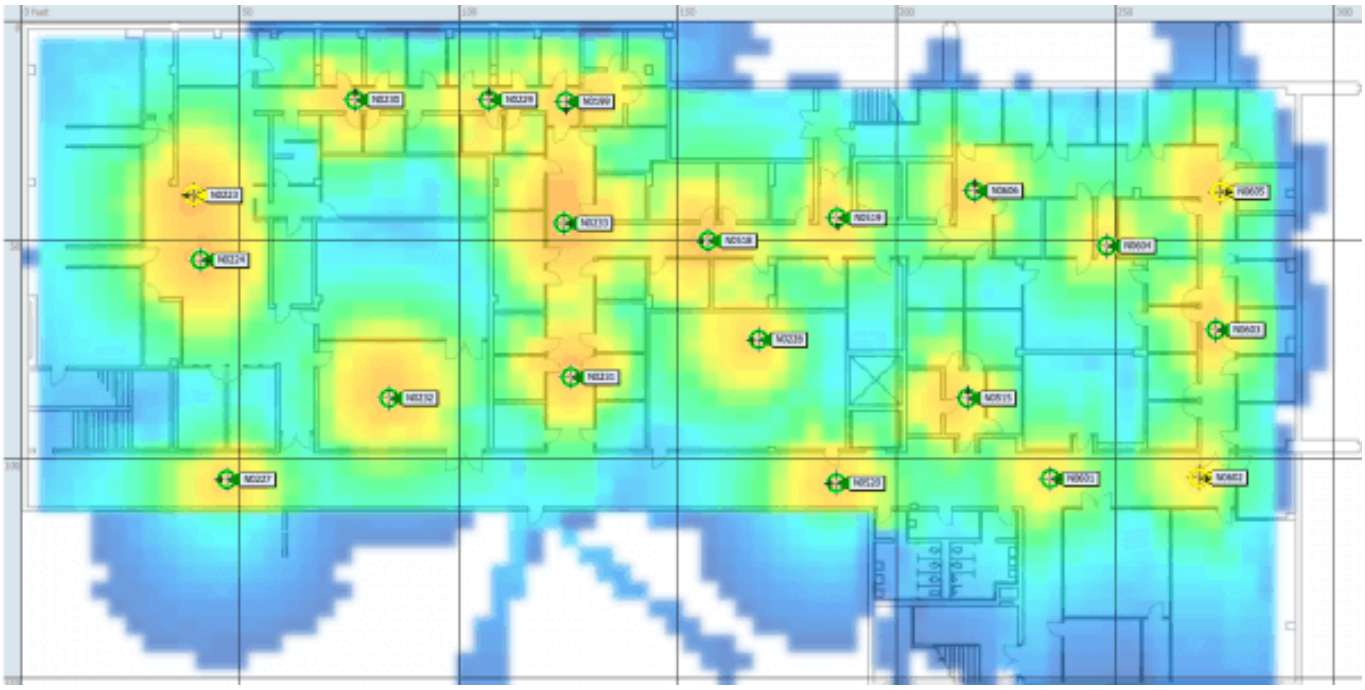
What is a Wi-Fi survey?
A Wireless Site Survey is a physical survey of a premises to assess the Radio Frequency (RF) behaviour in a specific environment where a wireless network may be installed. A site survey report helps visualise or predict the wireless network coverage areas and data rates. Wireless technicians use commercial tools that record actual measurements to extrapolate and create a coverage model that shows signal strength and performance across the site.

In the simplest form of site survey, the technician walks through a facility with a handheld spectrum analyser and measure the signal strength and possible interferences. Prediction tools are also employed by technicians that use building floor plans and proposed access point locations to predict coverage and performance using industry standardised propagation models.

Why is it important?
A Wireless Site Survey is considered essential when implementing any wireless network where performance and coverage is important. Wi-Fi networks have transitioned in recent years from simple non-essential radio networks with basic data capabilities, to now be seen as a key facilitator of the mobile workforce and Industry 4.0 technologies. For many industries the use of Wi-Fi is a critical component of competitive advantage, enabling technologies such as mining fleet autonomy, augmented reality smart eyewear, optical recognition, and autonomous environment identification, and more. Such technologies impose extreme demands on Wi-Fi data rates, latencies, and five-nine uptimes.

To achieve optimal wireless coverage and performance the technician needs to understand the Layer-1 Radio Frequency (RF) behaviour of the wireless network. A wireless site survey will provide the necessary information by revealing places of signal interference, places where the signal has deteriorated and areas of no signal (dead zones). A wireless survey also helps to avoid interference due to existing radio sources along with attenuation and reflections caused by physical structures such as columns, beams, walls, warehouse pallet racking and stock, and metal objects. In fact, anything can affect the radio signal profile of a site including furniture and people. The primary objective of a wireless site survey is to determine how a wireless network could be developed to meet the client's needs within the client's physical and economic constraints.

A wireless site survey helps to determine where to place Wi-Fi Access Points (APs) to best avoid interference and prevent channel overlap from other APs. One of the most



fundamental Wi-Fi design principles is to use the fewest possible access points to achieve the coverage objectives. Historically, many network managers have arbitrarily placed Wi-Fi APs and simply installed additional Wi-Fi APs or increased the transmit power when extra coverage is needed or when they get complaints about bad Wi-Fi access. In such a deployment the network manager has no idea what kind of interference exists and how the site's coverage profile changes with each addition or power increase. In these cases, often the additional access point does more damage than good, improving one area within the building to the detriment of others. Wireless site surveys are essential to optimising access point placement through minimisation of channel overlap, accounting for external hostilities, and maintaining the SNR and data rates required to facilitate the services provided by the Wi-Fi network.

It is important to understand that a wireless site survey is a snapshot of the site's radio signal profile at that time. As the site changes with additions of people, cubicles, furniture, and electronic equipment, the radio signal profile changes and may require a new site survey.

What Wi-Fi standards need to be covered in a site survey?

The most common Wi-Fi in use include 802.11a/b/g/n/ac/ax, which are in use on both the 2.4 and 5 GHz frequency bands. Fortunately, modern survey tools are standards-agnostic and capture sufficient L1 and L2 characteristics to accurately determine the behaviour of each standard and both frequency bands in one survey. This means the surveying technician need only conduct a single walkthrough to determine the performance and coverage of a multitude of device types.

Modern Wi-Fi networks are 802.11ax "Wi-Fi 6", which uses both 2.4 and 5 GHz frequency bands simultaneously, along with advanced radio and antenna techniques (such as MU-MIMO, beamforming, SDR, SSR) to achieve access point throughputs as high as 10 Gb/s. It should be no surprise that with the rapid

advancement of Wi-Fi 6 technologies the pressure is now on to network managers to skilfully deploy access points with the precision necessary to achieve the advertised data rates.

Types of site surveys

There are three types of wireless site surveys passive, active, and predictive.

A passive site survey tool listens to existing access points and other signal sources for signal strength, interference, and access point (AP) coverage. In a passive site survey, the listening Wi-Fi adapter does not need to link to the AP, it just passively listens to give a picture of the Radio Frequency (RF) characteristics of a wireless network site. Passive surveys are often performed when upgrading existing wireless networks such as adding additional APs.

In an active site survey, the survey Wi-Fi adapter is linked to the AP(s). This allows the gathering of detailed information such as network traffic, throughput packet loss, and data rates. An active site survey is often performed in conjunction with a passive site survey at the start of a new wireless network deployment.

A predictive site survey is performed without any type of field measurements. It uses RF planning software tools that can predict the wireless coverage of the APs. To perform this site survey, a floor-plan drawing (AutoCAD, JPEG, PDF) is required. Predictive site surveys are used when the site or building is not yet built and are helpful for budgeting purposes.

The goal of all wireless site surveys is to provide detailed information that allows the technician to optimise the Wi-Fi network and meet the client's coverage requirements. Before implementing or attempting to optimise a wireless network, you'll want to understand all the possible sources of interference, AP placements, power considerations, and wiring requirements that are needed. A wireless site survey can provide all of this information and more, so you have the tools you need to design, implement, and optimise your wireless network.