

Radio Frequency (RF) Site Survey for Optimum Wireless LAN Performance



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Introduction

As companies extend their existing networking infrastructure to include wireless networks, they will need to thoroughly define how wireless technology will be utilised within their organisation.

For most companies Wireless Local Area Networks (WLAN's) must be more extensive than the existing wired network (LAN), handle an equivalent level of data and provide continuous, clear and reliable signal coverage.

The Importance of a Site Survey

The primary objective of a **Site Survey** is to ensure that all users of the WLAN do not experience "drop-outs" or "black-spots", which could potentially cause irreversible data loss, as users roam within the WLAN infrastructure.

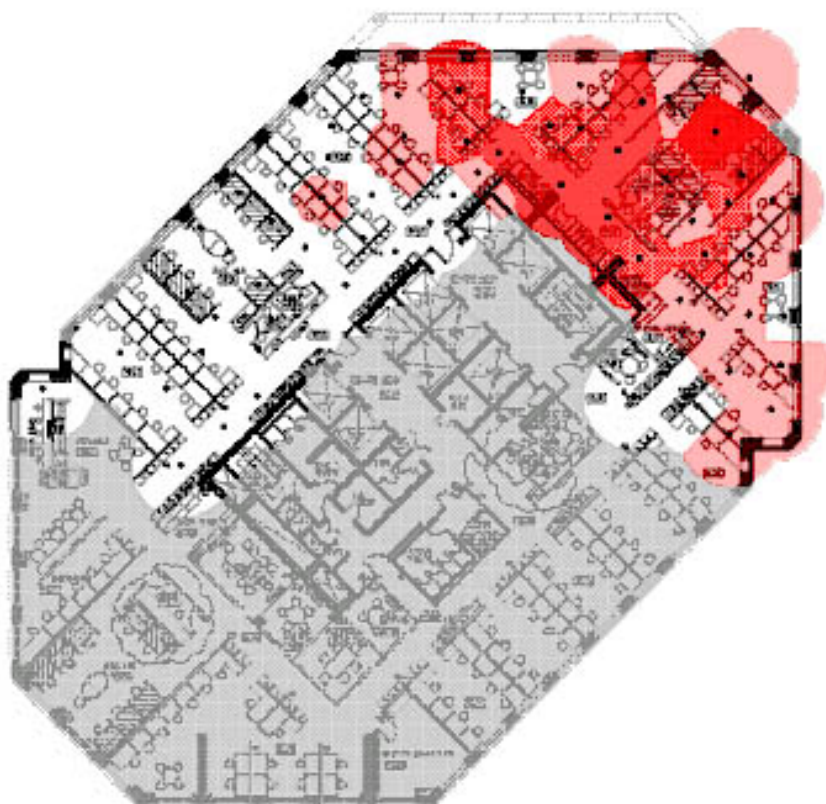
The Site Survey will also report the potential impact of the adding a WLAN to your existing wired LAN.

Performing a Site Survey provides us with a realistic understanding of infrastructure required for a given wireless network. The Survey can also assist in predicting trends in network traffic, indicate high load areas and resolve difficult RF interference issues from existing devices or neighbouring sites. The collation of all this data enables Simply Wireless to provide accurate pricing, a complete network design and all required security recommendations.

Simply Wireless' engineers will consider five major areas while conducting a Site Survey.

1. Range and Coverage Analysis

Range and Coverage Analysis is the first phase in the survey process. Our engineers will use 802.11 diagnostics software and custom built RF hardware to define range constraints for your network environment. By taking into account issues such as signal propagation, LOS (Line of Sight) analysis and Signal Shaping, our engineers can determine which type of access point and antenna pairing is best suited for your environment.



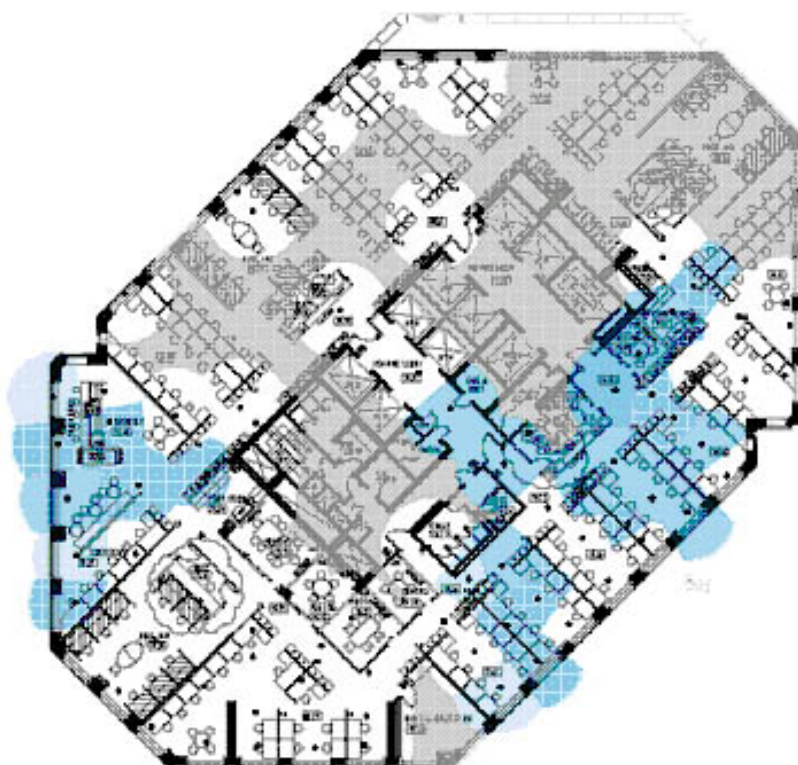
*Figure 1 – An example floor plan overlaid with our WLAN signal coverage analysis
Areas with coverage can be seen in red.*

2. Multi-path Fading Analysis

Multi-path Fading Analysis is the second phase in a Site Survey. Our engineers will analyse all objects and obstacles that may inhibit (attenuate) the wireless signal, such as metal objects, concrete or brick walls, etc. The positioning of access points will be determined based on the location of any obstacles in order to obtain the maximum signal strength to all required areas throughout your organisation.

3. Interference and Dampening Analysis

Interference and Dampening Analysis is another crucial phase of the Site Survey. Our engineers will use amplified multi-frequency receivers to detect any opposing signals in the local 2.4 GHz or 5.3 / 5.8 GHz spectrums. This could include high power microwave ovens, long range cordless phones, or even existing wireless networks. Our engineers will measure the interference caused by these devices and assess the effect on your wireless network. As required compensation calculations will be made so that the final implementation will operate flawlessly.



*Figure 2 - An example floor plan overlaid with our WLAN interference analysis.
Areas with interference can be seen in blue.*

4. Legacy Cohesion Analysis

Legacy Cohesion Analysis is an integral part of the Site Survey analysis. Our engineers will take a close look at the existing network in your company and document all significant criteria that may affect the installation of a wireless network. Items such as types of operating systems, server configuration, security policies and user collaboration will all be taken into account at during this phase. This process ensures that the installation will run smoothly and with minimal unforeseen variables. In addition Simply Wireless can also integrate custom corporate software into any wireless networking solution.

5. Bandwidth Requirements Analysis

Simply Wireless engineers will discuss any network throughput or bandwidth requirements of your WLAN implementation as well as perform an evaluation whilst onsite. Through Bandwidth Analysis our wireless network engineers will unlock any potential bottlenecks in the proposed system and look to increase bandwidth for particular sectors that have greater connectivity needs.

Site Survey Process

Figure 3 shows the initial stage of a Site Survey - as the diagram shows the example site is high in RF obstacles and signal propagation (spread) is poor. Large coverage gaps appear which will cause drop outs and black spots even if the client is in close proximity to the access point.

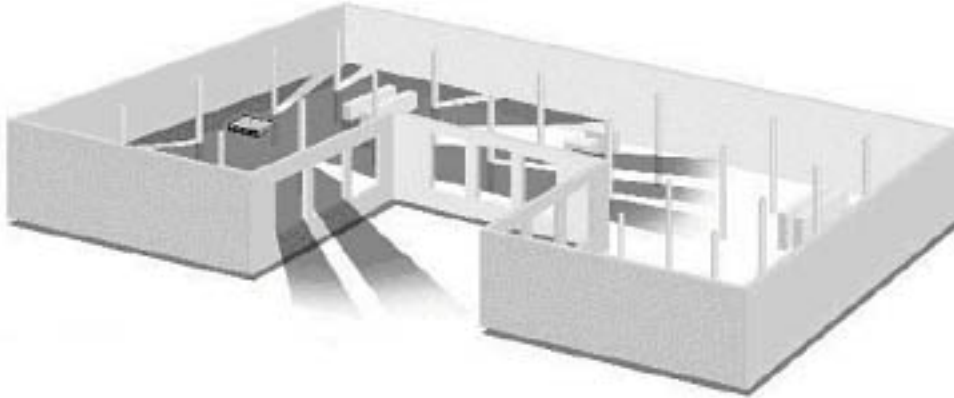


Figure 3

As shown in **Figure 4**, black spots can be eliminated and full coverage achieved via the precise placement of the access points.

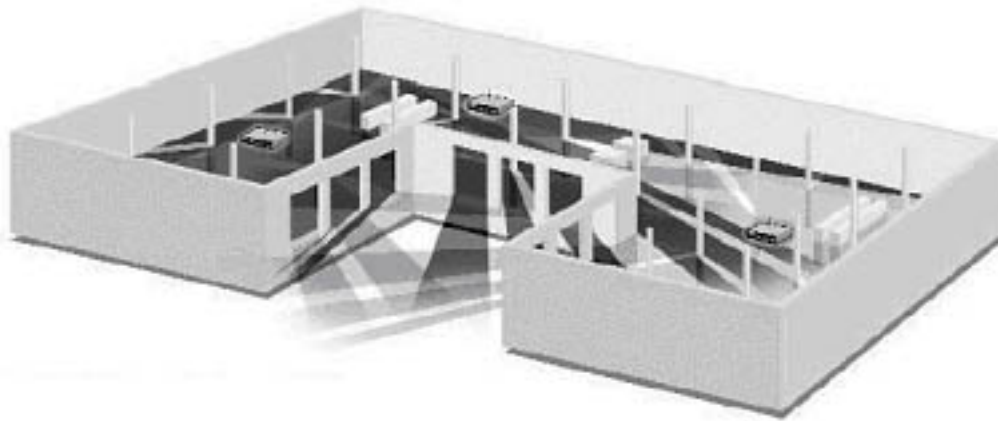


Figure 4

Signal Shaping - Choosing the Right Antenna

The role of the Antenna is of paramount importance – by using different antennas the engineer can modify the coverage pattern of the access point. This is crucial in order to allow for maximum density of clients (end user PC's), maximum signal reception and to reduce external signal leakage. Antennas can be divided into two logical categories:

1. Omni-Directional Antennas have a torus-shaped propagation pattern in 360°, this looks very similar to a doughnut shape. Omni-Directional Antennas come in several different types; **Plane Antennas, Dipole Antennas** and **Rubber Ducky Antennas**. The Plane and Dipole are usually used when the base station requires radiation in all directions.

2. Directional Antennas concentrate RF in a particular direction. This produces a conical-shaped or flashlight-shaped pattern. Different Directional Antennas are described by their beam width and gain. The most common type of directional antennae are; **Parabolic Dish Antennas, Yagi Antennas, Sector Antennas, Patch Antennas** and **Panel Antennas**

Yagi and Parabolic Dish antennas are used mainly in outdoor, building-to-building installs or for coverage down a long corridor. Parabolic Dishes usually have a beamwidth of a few degrees and a gain from 20 to 30dBi. Yagi Antennas, on the other hand, have a beamwidth of between 10 to 30 degrees and a gain from 10 to 20 dBi.

Sector, Patch and Panel antennas are commonly used in indoor installations. They allow increased range of an access point and are particularly versatile from an installation location point of view. Sector Antennas usually have around 180 degree beamwidth and a gain from 3 to 10dBi. Patch Antennas and Panel Antennas have minimal gain and are used to better 'shape' the wireless signal.

Calculating Antenna Coverage

The use of an antenna to increase signal strength is called Antenna Gain and is measured in decibels (dB). Gain improves the coverage area of an access point. For a 1dB increase in the gain, the coverage of an indoor access point is increased by approximate 2.5%. For a 1dB increase in the gain, the coverage of an indoor access point is increased by approximate 5%. These figures can vary depending on the number and size of obstacles.

Use of Diversity Antennae to Increase Performance

Diversity is where the radio can switch between different antennas to minimise interference and noise due to multi-path signals. Diversity allows the radio to reconstruct the best signal using two or more different antennae.

Positioning Antennas for Best Results

Positioning and orientation of the antenna ultimately determines the eventual performance of any given WLAN - factors such as line of sight, obstacles and other issues (as discussed above) are directly related to performance of the WLAN. Our engineers have all of the relevant training and experience enabling them to find the right series of Access Point locations for your site.

OUTCOMES – What you get out of a Simply Wireless Site Survey

Once the Site Survey is completed, the Simply Wireless engineer will collate all the information gathered to produce a professional **Site Survey Report**.

This report contains such information as General Recommendations, Specific Recommendations related to your site, a detailed Coverage Map of the area to be covered, Interference Problem Areas, all the Equipment required to perform the installation and the proposed configuration for each access point.

Simply Wireless Site Survey fully guarantees signal coverage in the areas described in the Report for a 30 day period (subject to terms and conditions).

Simply Wireless prides itself on the quality of its Site Surveys - the report is extensive, detailed and accurate. We look forward to helping your company make the most of its wireless infrastructure.