Radio Frequency (RF) and Free Space Optics (FSO) Site Survey for Optimum Wireless Bridge Performance

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Site Survey for Optimum Wireless Bridge Performance

Introduction

Increased demand for network connectivity and real-time information has resulted in organisations needing to integrate geographically isolated parts of the company or increase the bandwidth to those already within their network.

A wireless bridge provides a fixed cost solution offering sufficient bandwidth to fulfil business network connectivity goals and an extremely attractive rate of return on investment (ROI).

Wireless technology provides a solid unmetered solution, free of dedicated leased line carrier fees. A Simply Wireless Site Survey for Optimum Wireless Bride Performance provides detailed recommendations ensuring the level of link availability and network reliability is commensurate with its level of criticality.

The Importance of a Site Survey

The primary objective of a **Wireless Bridge Site Survey** is to ensure that the locations identified by the customer are able to reliably support the proposed wireless network bridge.

The Site Survey also identifies any potential interference resulting from the implementation of a wireless bridge. Any potential interference is taken into account to ensure coexistence with your organisation's pre-existing wireless technologies.

A Simply Wireless Site Survey provides you with a realistic understanding of the infrastructure required for the proposed wireless link. The Site Survey also assists in predicting network capability and aggregate throughput as well as indicating the exact location and power levels required. Where applicable, interference issues from existing devices or neighbouring sites are also addressed during the site survey. This process allows Simply Wireless to provide accurate pricing for the relevant wireless bridge implementation(s), a complete network design and any appropriate security recommendations.

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

1. Bandwidth Requirements Analysis

Simply Wireless engineers will discuss your anticipated organisational growth, application usage and bandwidth requirements for your wireless bridge implementation. A bandwidth analysis allows our wireless network engineers to isolate a number of appropriate and cost-effective wireless bridge solutions for your technological requirements – identifying a range of suitable technological options facilitates a highly focused and effective Site Survey.

2. Site Observations

The second step of the Site Survey is a visual inspection of the proposed site(s). The inspection enables Simply Wireless engineers to identify the optimum placement positions for wireless bridge end-points. The optimum position provides sufficient vertical clearance to maximise link availability, removes any line-of-site obstructions and minimises the total cost of installation for all parties involved.

3. Radio Frequency Planning

Where a Radio Frequency (RF) link is proposed, radio frequency planning is performed to ensure that the wireless bridge has unobstructed access to the desired sections of the relevant range of spectrum. Extensive experience and custom built RF analysis tools enable Simply Wireless engineers to analyse the surrounding IEEE 802.11 networks and non-IEEE 802.11 sources of interference and identify the portion of the RF spectrum where interference levels can be minimised.

4. Path Loss Analysis

Using the longitude, latitude and elevation attributes of GPS coordinates taken from each of the potential end-points Simply Wireless engineers perform a path loss analysis on the proposed wireless link. The path loss analysis also takes into account a calculation of the resultant Fresnel Zone, any interference from the Radio Frequency Planning phase of the Site Survey and the height of any physical obstructions along the wireless bridge path.

Figure 1 shows the initial stage of a Path Loss Analysis performed by Simply Wireless engineers. Customised software provides best-case theoretical results using supplied GPS coordinates. Results are then cross-referenced against any spectrum interference and the positions of any physical obstructions.

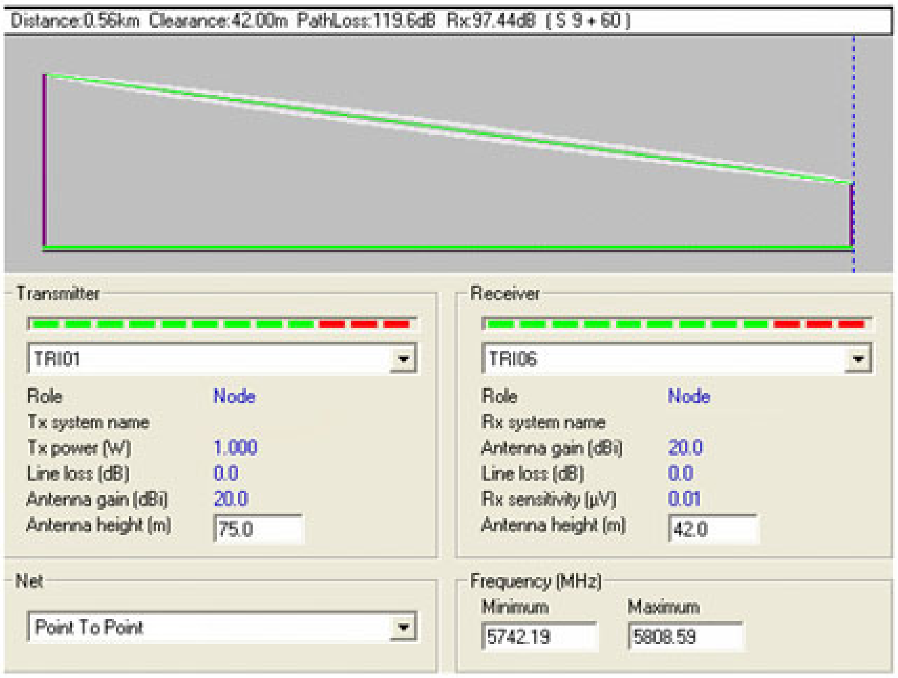

Figure 1 – Initial Stages of a Path Loss Analysis

Figure 2 is an example of a topographical map produced by Simply Wireless engineers during a Path Loss Analysis. Topographical analysis allows further evaluation of the wireless bridge end-points and the proposed link path.

Figure 2 – Topographical view produced during a Path Loss Analysis

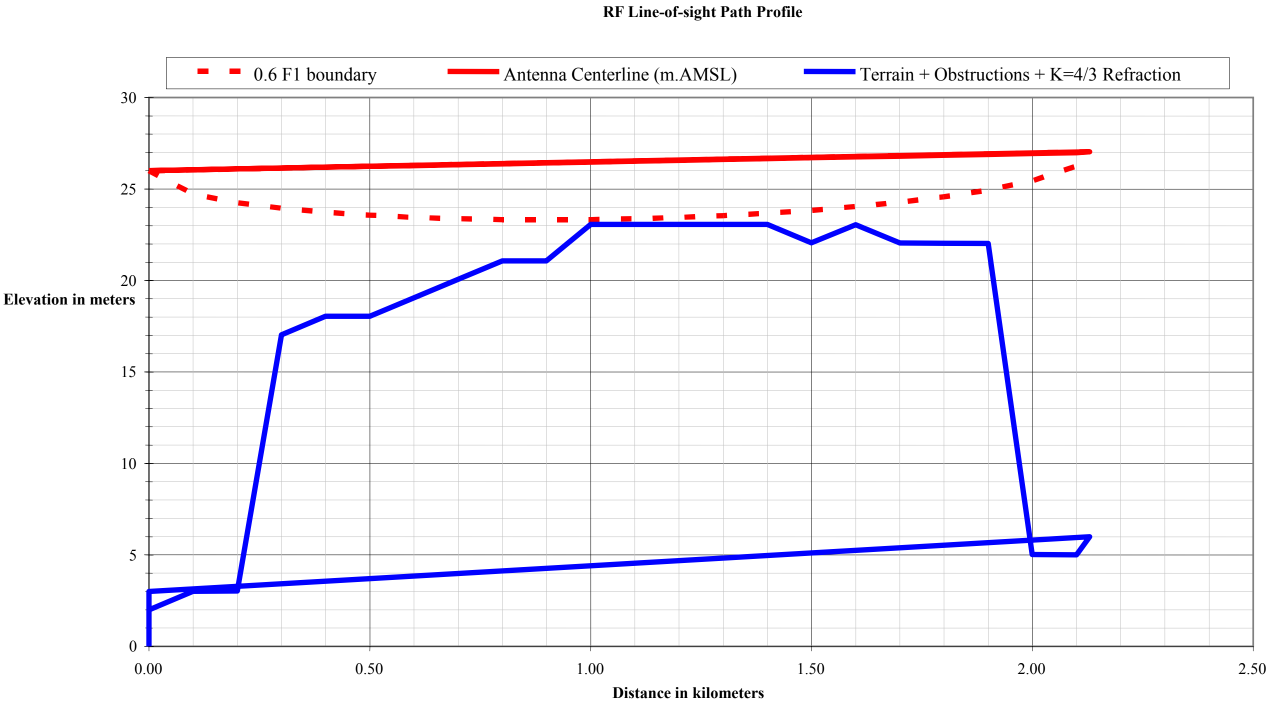

Figure 3 –Sample Path Loss Analysis Results

5. Local Environmental Conditions

Environmental factors including lightning, smoke, fog and general humidity can greatly affect the quality of a wireless bridge. Simply Wireless engineers have undergone specialist training to identify any relevant environmental conditions when recommending the exact type, or configuration of, a wireless bridge solution. These recommendations are based on vendor recommendations, industry best practises and the experience of the Simply Wireless engineers.

The role of the antenna in any implementation of RF based wireless technology is paramount. Simply Wireless engineers may be able to modify the coverage pattern of a wireless bridge. converting a single point-point link into a scaleable point-multipoint wireless architecture, by using different antennae. The choice of antennae is crucial for the optimum wireless bridge coverage, signal quality, signal strength, availability and scalability.

Antennae can be divided into two categories:

1. Omni-Directional Antennae

Omni–Directional antennae have a torus-shaped propagation pattern of 360° in the horizontal (x) axis, this looks very similar to a doughnut shape. Omni–Directional antennae come in several different types; **Plane Antennae, Diploe Antennae** and **Rubber Ducky Antennae**. The Plane antennae are usually used when the wireless bridge end-point requires a radiation pattern of 360°.

2. Directional Antennae

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

Yagi and Parabolic Dish antennae are primarily used where a wireless bridge requires a highly focused beam to obtain the required distance from the wireless link. These antennae can be used to confine the beam width to reduce auxiliary interference or alter the signal radiation pattern to increase network quality and reliability in a particular direction. Parabolic Dishes usually have a beamwidth of a few degrees and a gain from 20 to 30dBi. Yagi Antennae, 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 antennae are commonly used during indoor installations and are generally not applicable for wireless bridges implementations. They allow for a slightly increased range of a RF bridge point and are particularly versatile from an installation location point of view. Sector Antennae usually have around 180 degree beamwidth and a gain from 3 to 10dBi. Patch Antennae and Panel Antennae have minimal gain and are used to better ‘shape’ the wireless signal.

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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 signal strength and achievable distance of a RF wireless bridge link by reducing both the vertical and horizontal direction that the antenna is able to transmit to and receive signals from. Simply Wireless engineers use logarithmic algorithms and results of the site's Path Loss Analysis to determine the effect of an increase or decrease in the gain on a wireless bridge point.

Positioning Antennae for Best Results

Positioning, orientation and the power output of the antennae ultimately determine the performance of any wireless bridge. Factors such as line of sight, obstacles and other issues (as discussed above) are directly related to the performance of the link. Relevant training and experience enable Simply Wireless engineers to determine the correct bridge technology and antennae positioning for your site.

Simply Results

Once the Site Survey is complete, Simply Wireless engineers collate the information gathered to produce a detailed **Site Survey Report**.

The report contains general recommendations for a wireless bridge implementation, any site-specific recommendations, end-point selection information, a detailed coverage map showing the wireless bridge path, locality and elevation diagrams, and a detailed list of the equipment required to perform the installation.

All information and recommendations contained within a Simply Wireless Site Survey is fully guaranteed for a period of 30 days from the date of the inspection (subject to terms and conditions).

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