Wireless Camera and Site Survey issues over an IEEE 802.11b based wireless network test bed

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Abstract

Wireless LAN systems based on IEEE 802.11 have been a proved and sought after technological innovation, over the past few years. In this paper, we discuss some of the technical aspects for testing and deploying a wireless LAN system at the University of New Mexico, Albuquerque, New Mexico. This shall serve as a model test bed for future research and development, under the aegis of Ibero American Science and Technology Education Consortium (ISTEC).

Keywords

Site Survey, IEEE *802.11b,* access point, signal to noise ratio, wireless video.

1. Introduction

This paper reports and analyzes the creation of a test bed for wireless equipments and devices, which shall serve as an excellent learning guide for the future exponents of the facilities of the *Electrical Engineering & Computer Engineering* (EECE) Department at the *University of New Mexico* (UNM), Albuquerque, New Mexico. The basis of such a test bed would be a wireless LAN system [1], which links to the backbone wired Ethernet [2] network. The wireless protocol employed is *IEEE 802.11b* [3].This test bed project is scheduled to be replicated throughout Latin-America across the *ISTEC's* 120 member universities, establishing some of the labs overseas as well as using the content generated in the project and contributing with services to other members and the pioneering test bed in New Mexico.

The plan of action for the whole scheme is a thorough surveys of the proposed area of implementation, comprising of a : Site Survey or a RF building survey Wireless camera signaling survey and Wireless video transmission survey.

2. Site Survey

We employed a *Cisco Aironet® 350* series Access Point, *Cisco Aironet® 350* Series Client Adapter Cards and a *D-Link® DCS 1000W 802.11b* VGA quality Wireless internet Camera, for the surveys. The measurements were based on the placement of a single access point, radiating anywhere between 5 –100 mW of power, at a suitable location, such that it would be advantageous to all three floors of the building. This was done to economize the number of access points that shall be totally used in the end. The analyses were based upon the three performance parameters, namely: Signal Quality, Received Signal Power in absolute percentage and *Signal to Noise Ratio* (SNR) in dB. Figures 1.(a) and (b) give an idea of the signal strength variations in dB across a floor and the dependence of the above mentioned parameters on the distance of the moving wireless PC card attached to a laptop, from the access point. From these data, attenuation due to distance can be easily observed, although there are slight fluctuations in the values. Long distances between the access point and the *Ethernet* card caused the signal to degrade. Also the fact that, a Line-of-sight between the access point and the wireless PC card always gives the best signal quality, is exemplified by the values obtained. Because of this, the location of the access point forms an important part of the design of a wireless network in a building.
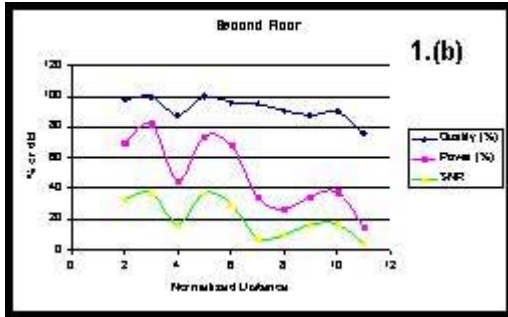

1.(a)
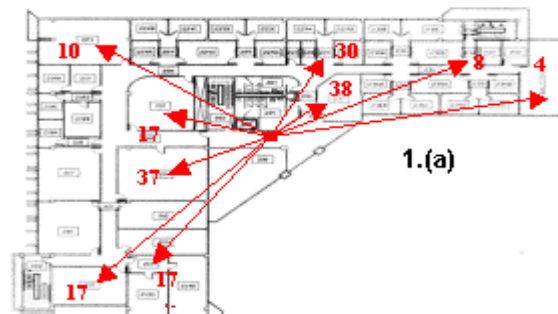
Figure 1.(a) and (b): Coverage Map and variation of the performance parameters with respect to the Normalized Distance in meters.

The observed swings in the recorded parameters can be explained by the material between the access point and the user, which has an impact on the attenuation of the signal. The concrete slabs that make up the floors of the building have a much greater impact on the received signal that say the drywall that separates the rooms on each floor. As shown in Table 1,a reading taken of an access point at 20 mW on the 2nd floor approximately 10 m away in a room on the same floor gave a result of 58% power and a rating of "Good" while a measurement directly beneath that same access point approximately 2 m away on the 1st floor resulted in a signal power of 19% and a rating of "Poor".

Location	Quality (%)	Power (%)	Grade	SNR
108	100	19	P	11
137	100	15	P	6
123	no	signal	received	associated
131	no	signal	received	associated
Atriun	100	38	F	19
237	100	81	E	44
232	100	58	G	30
215	100	19	P	7
210	100	36	F	15
Balcony	100	38	F	18

Table 1: A survey result over the three floors of the building.

We discovered in the survey that it is not practical to have one access point at 100 mW radiate the entire building. Much stronger signals were attained outside the building than in some parts of the interior. One access point, with under 10 mW power levels, in the center of the building still does not generate enough power to reach the far corners of the building, as well as some of the rooms. But power levels of around 20-30 mW were suited to the topography of the building and provided ideal and satisfactory coverage in most parts of the structure.

3. Wireless Camera Survey

The wireless camera survey was conducted, with the help of a *D-Link® DCS 1000W* wireless internet camera, attached to the access point via its *MAC* and *IP* address. The image from the camera was obtained from a computer screen by simply typing in the IP address of the camera on a web browser. We were able to access the image from an access device like a laptop using the Wireless PC card, by connecting directly to the access point, or from a computer connected to the *UNM* network, or from an independent Internet service provider via the Internet.

Access Device	Wireless Link Speed	Image Quality
Laptop	11 MBps	>20 Fps
Pocket PC	11 MBps	>15Fps
Laptop	5.5 MBps	>15Fps
Pocket PC	5.5 MBps	>10Fps

Table 2: Average link Speeds and image quality of video transmissions received by the access devices.

A video stream result has been tabulated in Table. 2. The received video quality was satisfactory throughout the entire mapped part of the building. It is however important to remember that these measurements were taken on a non saturated wireless medium.

4. Conclusions

We have proposed and analyzed the initial setting up of a wireless LAN infrastructure at the *EECE* Department of the University of New Mexico. The initial site survey and wireless camera gave us useful results and insights into the future logistics and the planning schemes during the actual realization phase of this on going initiative. The implementation parameters of the scalable network should closely mirror our test data and results, and shall be appropriately reported in the near future.

References

[1] W. Stallings, "IEEE 802.11: Moving closer to practical wireless LANs", *IT Professional*, Vol. 3, No. 3, pp. 17- 23, May- June 2001.

[2] *IEEE 802.3* website: http://grouper.ieee.org/groups/802/3.

[3] *IEEE 802.11* website and task groups therein: http://grouper.ieee.org/groups/802/11.