

Deploying Wireless (LAN) in the Technology Buildings on the Campus of Elizabeth City State University

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Abstract- The 2005-2006 Wireless Networking Team's project involved configuring access points (APs) and installing antennas to create a wireless local area network (WAN) in two locations on the campus of Elizabeth City State University. The buildings will have one hundred percent coverage throughout each building. The two locations on campus are the Technology building (Dixon Hall) and the Math and Computer Science building (Lester Hall). The researchers on the 2005-2006 Wireless Networking Team conducted site surveys and chose appropriate antennas for the access points. In order to choose and antenna the student conducted a site survey along with antenna calculations. The site survey used for antenna selection included; coverage area, maximum distance, indoor/outdoor location, and antenna signal strength factors. Existing wireless networks in Dixon and Lester Hall are 37 series catalysts Cisco switches. To replace these existing networks the team used 1200 series Cisco wireless access points and 5.2 dBi Ceiling Omni Cisco antennas. MAC address filtering was used to improve the security of the wireless network; without this filtering method any wireless clients can join the network with knowledge of the Service Set Identifier (SSID)[1].

I. Introduction

Many colleges and universities are taking on the idea of deploying a wireless WAN on campuses throughout the United States. On average more than 90% of public universities have some type of wireless network, while the remaining 10% of those provide campus wide public access [1].

Wireless WANs are vulnerable to eavesdropping and illegal accessing which leads to a considerable amount of planning before configuration and installation of antennas [1]. The radio coverage of the wireless WAN can be maximized by the choice of

a suitable antenna. All antennas are broken up into two categories: omni directional and directional radiation patterns [1]. Omni directional provides a 360-degree radiation pattern and is usually used when coverage in all directions is required [2]. Directional antennas provide a stronger radiation pattern in a specific direction [2].

Both Lester and Dixon Hall contained wiring closets where the antennas were installed. Other areas where antennas were placed were in selected rooms where data jacks were available.

This paper will explain the process of displaying a wireless WAN in selected technology buildings on the campus of Elizabeth City State University.

II. Methodology

In order to configure access points and install antennas into the building, measurements of the building was recorded. With the use of a measuring wheel, each building was thoroughly measured inside and out and then the area (length* width) was determined to conclude on which type of antennas were to be used for each building. Soon all the measurements for the buildings were obtained, next various types of Cisco antennas were observed to choose and install into the buildings. Figures 1-7 show a layout of APs at Lester Hall and Dixon using software called Visio.

Lester Hall 1st Floor

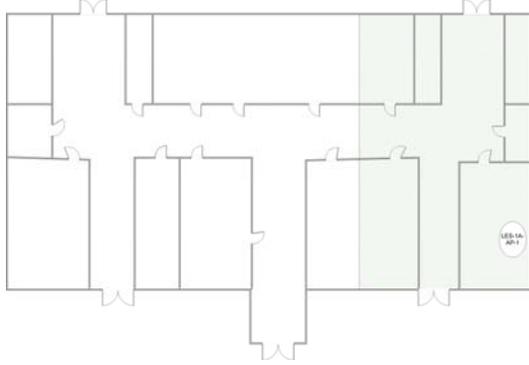


Figure 1. LES-1A-AP1

Lester Hall 2nd Floor

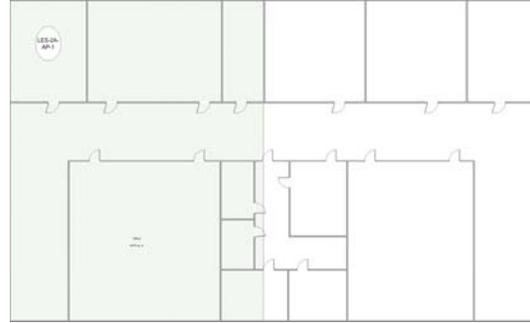


Figure 4 LES-2A-AP-1

Dixon Hall 1st Floor

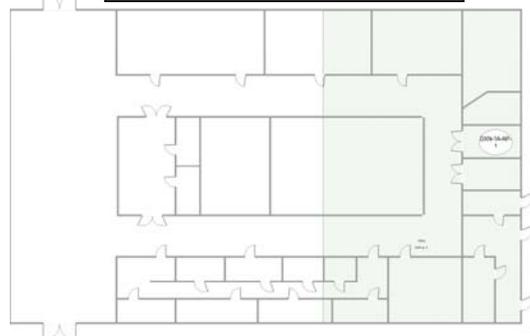


Figure 5 DIXN-1A-AP1

Dixon Hall 2nd Floor

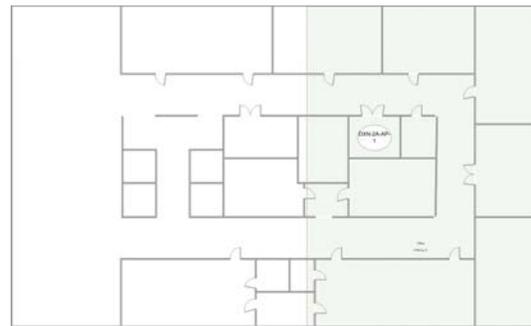


Figure 6 DIXN-2A-AP1

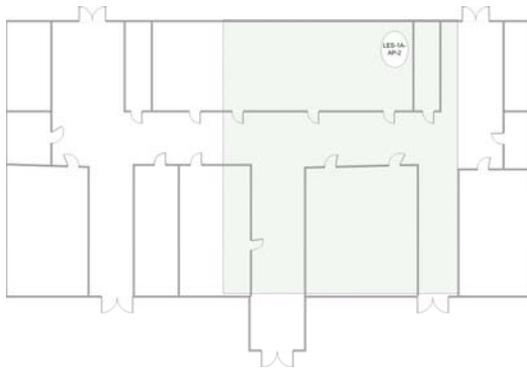


Figure 2. LES-1A-AP-2

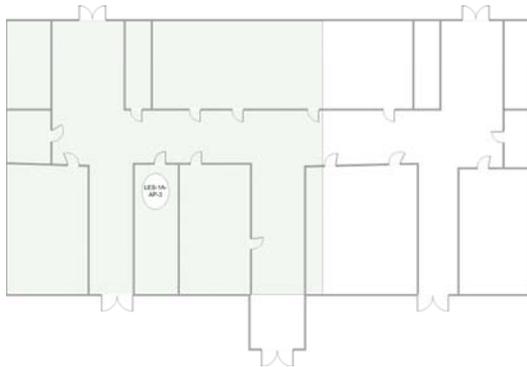


Figure 3 LES-1A-AP3

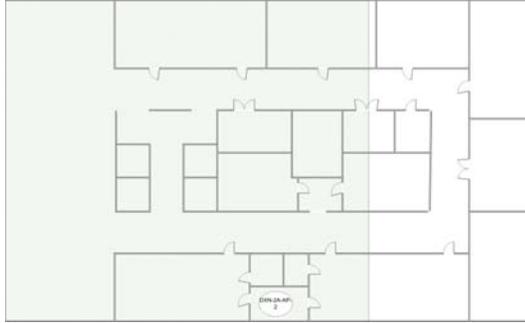


Figure 7 DXN-2A-AP2

The antenna that was chosen to install into the buildings was a 5.2 dBi Ceiling Omni Cisco antenna. Before installation of antennas a site survey was conducted to test potential access points throughout each building. The first building that was tested was Lester Hall, which is the smaller of the two buildings. It was necessary that one familiarize them with the building by locating potential access points with the best signal strength. These steps were repeated with Dixon Hall in locating access points.

After analyzing each building an AP was chosen, which prepared for configuration. Four locations in Lester Hall were chosen for access points. These locations were the first and second floor wiring closets, room 113A (ONR research lab), and room 110, which is the main office of the Math and Computer Science Department at Elizabeth City State University. Dixon Hall was only allowed three access points, and they were the first and second floors wiring closets and room 232, which is the Center of Excellence in Remote Sensing (CERSER) Lab.

The next step was to program the access points in each building. The access points were given names and assigned IP addresses according to the building. This information was provided by the Information Technology Center on the campus of Elizabeth City State University. In order to configure, each access point was plugged in to a power switch by a RJ45 patch Ethernet cable. A console cable was also used to connect the access point to a laptop computer. The configuration process started by opening up a command prompts window and a Hyper Terminal;

this enabled one to console into numerous devices. Once inside the Hyper Terminal window it enabled one to view configuration code and copy and paste it into the command prompt window. Before copying the code various changes had to be made every time a new access point was configured. These changes were the: host name, password, SSID, IP address, and default gateway.

Once the code was copied and pasted into the window, we typed a command called “config t”, which started the process of configuring. More commands were typed to complete the process. These commands were: “exit”-exited the access point of screen, “enable”- enable one to type commands, we had to re-enter our password and type “show run” to make sure that all the information was correct in the code and the changes that were made. These steps were repeated for the remaining six APs.

Once each location was configured at each access point it was then time to start installing the antennas. When installing the antennas one had to make sure that there was power given to the access points by the power switch. There are three lights located on top of each access point. If the middle light is green and blinking, this means that no one is connected to that network. If there was no power and no green lights were shown on the access point then we had to use a power adapter to regain power for the access point. This problem occurred in the second floor-wiring closet in Lester Hall. Another factor that was important to know while setting up the antennas was to make sure that both antennas at each access point were set in opposite direction so that they can get the maximum distance away from each other also this way the antennas would not be covering the same area.

Microsoft Excel was used to create a database of information on each access point. In order to obtain certain information one had to open up another command prompt window and type in commands to get the model/serial number and the current code. Table 1 shows the database of access point information.

Closet	Model #	Current Code	IP Address	Device Name
110	AIR-AP1220- IOS-UPGRD	12.2(11)JA3	10.32.5.11	LES-1A-AP-1
113A	AIR-AP1220- IOS-UPGRD	12.2(11)JA3	10.32.5.12	LES-1A-AP-2
120	AIR-AP1220- IOS-UPGRD	12.2(11)JA3	10.32.5.13	LES-1A-AP-3
207	AIR-AP1220- IOS-UPGRD	12.3(2)JA2	10.32.7.11	LES-2A-AP1
Wiring Closet	AIR-AP1220- IOS-UPGRD	12.3(7)JA2	10.24.5.11	DXN-1A-AP-1
Wiring Closet	AIR-AP1220- IOS-UPGRD	12.3(7)JA2	10.24.5.12	DXN-2A-AP-1
232	AIR-AP1220- IOS-UPGRD	12.3(2)JA2	10.24.5.13	DXN-2A-AP-2

Table 1. Database of Access Point Information

After creating a database for the access points the Internet was needed to type the IP address of each access point as a URL. Once inside the web interface of the access point changes were made to the type of channel used, and this helped with the closing of the configuration and installation process of each AP.

III. Results

Originally in Lester Hall, there were only supposed to be three APs installed. Due to site surveys another AP was needed to cover areas around the main office. This allowed two APs on the first floor and one AP on the second floor. On the other hand, in Dixon Hall the plan was to install and configure two APs, and as mentioned earlier by conducting site surveys, it was realized that another AP was needed on the second floor. In all Dixon hall contained three APs; two on the second floor and one on the first floor. Because of these observations during the site survey each building now has one hundred percent coverage of a wireless LAN environment [3].

IV. Future Research

In addition to the completion of deploying a wireless WAN in technology buildings on the

campus of ECSU, the Information Technology team can go back and mount each antenna device into place. Presently they are in safe places so that no damage can be done to them. Certain factors to be considered in this case are the building type. Future wireless teams can conduct research on deploying wireless WAN in other technology buildings and major office areas where it is needed on the campus of ECSU. Also future teams can consider wireless cell phones and how they can interfere with the WAN while operating in the same spectrum.

Acknowledgement

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References

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