**Network Design Project #1**

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**Fundamentals of Data Communication**

**Texas State University**

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**Introduction:**

ABC Company is a quickly growing business seeking evaluation of their current network and potential expansion. For this assignment we are to evaluate their current situation and identify the information we need to know in order to improve their network. The company plans to expand further every year, although this assignment does not depict those future changes. Currently ABC contains 9 departments including administration and is spread across 3 buildings. The role of each of the 8 departments is not currently provided. They utilize a single 1GbE switch across all campuses.

**Company’s Projected Growth:**

|  |  |
| --- | --- |
| Growth of Employees | |
| 5 Years Ago: | 20 Employees |
| Present Day: | 348 Employees |
| Growth Rate: | 164% Over 5 Years  77.06% Annual Growth |
| Year 1: | 616 Employees |
| Year 2: | 1,091 Employees |
| Year 3: | 1,932 Employees |
| Year 4: | 3,421 Employees |
| Year 5: | 6,057 Employees |

The table above depicts the expected growth in the number of employees. If we assume that the company will grow at a consistent rate starting 5 years ago we can predict the amount of hosts we will be dealing with. With 20 employees increasing to 348 in a span of 5 years we receive a growth rate of 164%, or a 77.06% annual growth. These numbers are relatively high so we may need to consider the accuracy of the growth. By further analyzing the data received in this table, we can begin to plan for the expected growth and the impact it will have on our network. Because of the importance of these numbers we need to ensure we base them off an accurate growth rate and may need to re-evaluate the current percentage.

|  |
| --- |
| **Growth by Department Assuming 77.06% Annual Growth Rate** |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Dept 1 | Dept 2 | Dept 3 | Dept 4 | Dept 5 | Dept 6 | Dept 7 | Dept 8 | Admins |
| Present Day: | **56** | **64** | **29** | **27** | **9** | **97** | **36** | **18** | **12** |
| Year 1: | **100** | **113** | **51** | **48** | **16** | **172** | **64** | **32** | **21** |
| Year 2: | **177** | **200** | **90** | **85** | **28** | **305** | **113** | **57** | **37** |
| Year 3: | **313** | **354** | **159** | **151** | **50** | **540** | **200** | **101** | **66** |
| Year 4: | **554** | **627** | **282** | **267** | **89** | **956** | **354** | **179** | **117** |
| Year 5: | **981** | **1110** | **499** | **473** | **158** | **1,693** | **627** | **317** | **207** |

The table above assumes the overall growth rate and expands it across all departments including administration. If the number of employees in each department grows consistently with the overall company, we can further analyze the future needs of the network. Although this data may be inaccurate as some departments may grow inconsistently with the others. Information we can receive involving each department’s unique growth rate as well as the role each department plays can help us improve upon their current network.

**Physical Layout of Building:**

In order to create an efficient and effective network, we need more information on the physical dimensions and layout of each building. Currently we are not provided any details on the physical properties of the buildings used in the company. Physical dimensions of the buildings allow us to accurately depict how many access points we may need, or if additional hardware would be required. The layout and properties of the building can have an impact on signal strength by creating interference. Sources of interference such as metal shelving, thick walls, or heavily used phone lines will require consideration during the implementation or improvement of a network.

**Logical Model:**







The above images are all logical models for the current network situation for ABC company. Each floor is split up into two wings containing a WLAN, and hosts from a specified department. In order to split the workload on each level I split the users in the departments across the floors to attempt to create an even distribution of traffic and stay under the switches’ maximum of 48 hosts. Currently without knowing the specific roles of each department it is difficult to depict an accurate number of users that should be working in a given space. It may be safe to assume that since building 2 contains the administration hosts the building is a headquarters for the business. This is important to know because most headquarters will require significantly stronger hardware in order to deal with the increased traffic in their building. Business headquarters may also contain data centers, which ideally will have stronger switches connecting them to the building backbone.

**Physical Model:**



The current physical model for ABC company is depicted in the image above. Currently they utilize a 1GbE switch that can support up to 48 hosts throughout the company. The architecture is currently unison throughout all 3 buildings but even with the information we currently have can be improved upon. Each building could contain a stronger switch on their first floor that connects all the switches to the router, eliminating the risk of a bottleneck. Apart from that, specific departments such as administration may benefit from using stronger switches. Currently we have each west and east wing containing a wireless LAN that is connected to the building backbone via the provided 1GbE switch. The backbone connects to a router on the first floor, that in turn connects to the campus backbone that allows communication throughout all buildings of the business.

**Security:**

Security may consist of encryption methods on the wireless network that causes host to enter a user name and password assigned by administration in order to connect to an access point. Once the user is connected to the access point, they may need to log in to use a browser or other web-based applications used in the company. By further understanding the needs and expectations of each department we can create security methods that are unique and beneficial to their organization.

**Conclusion:**

If we want to improve this network and prepare for future expansion, there is still plenty of information we need to know. The overall rate of growth needs to be re-evaluated for accuracy, and growth rates by departments would also help in planning for expansion. Knowledge on the roles of each department is needed, as well as the location of their data center. The physical properties and dimensions of the buildings needs to be provided to plan for hardware usage and interference. Overall the more information we have collectively, the more efficient and effective network we can create.