Recommendation Report on Missisquoi Valley Union High School Network

For: School Network Administrators

By: Peter Crespi
Andrew Dunham
Andrew Joiner
Mathew Kittle
David Lindquist
Alan Murray
William Purcell

April 22, 2008

As the Missisquoi Valley Union High School network was constructed as needed, the network is not as ideal as a new installation would be. This report will analyze the various networking components of the school as well as a recommendation s to better enhance the school network.

Table of Contents

Executive Summary

Missisquoi Valley Union High School's network was constructed as it was needed and therefore requires special attention to various areas to better enhance the capability of the network.

An on-site inspection was completed by Champlain College Network Design class and after recording and analyzing a few different areas, suggestions on improvements were made.

Some of the major findings include having a better server room ventilation system and rewiring The Media Room in A-Pod. Microsoft Office productivity software should be upgraded from Office XP to at least Office 2003on student and faculty systems and the school should look for donations from companies to upgrade the servers, as well as student machines.

Introduction

Missisquoi Valley Union High School, referred as MVUHS hereafter, is a High School situated in Franklin County, Vermont. The series of circular buildings, known as pods are interconnected servicing grades 7-12 consisting of around 1,000 students.

The computer network has an extended history which will be covered in greater detail in this report, but briefly, it is an ad-hoc type of network. As devices are added, new technologies are connected together by older technologies making the network design not exactly idea.

The purpose of this report is to provide a network recommendation report to provide the school with stimulating ideas to better enhance the network. To begin this process a brief on-site inspection of the schools data network was conducted. Afterwards, network design details learned through our own knowledge as well as the Champlain College Network Design class will be covered in this recommendation report. As the on-site inspection was short in duration, details mostly concerning the major congestion sites will be covered in greater detail.

In comparing the different network congestion sites, information concerning security of equipment, the environment of the equipment, speed of links, and network topologies in particular rooms will be covered.

The following is a detailed recommendation to the administration at MVUHS made by the networking students at Champlain College. Hopefully, we are able to aid you in your mission of providing the best technology to your students to satisfy both your educational and professional needs.

Research Methods

In this study, the school contacted Computer Networking Professor Jim Hoag from Champlain College to evaluate the MVUHS network and provide adequate salutations. The Network Design class at Champlain College embarked on a fieldtrip journey to MVUHS for an on-site inspection of the data network at the school. During this inspection, the key points in making the network work were analyzed and later on solutions to possible drawbacks were constructed. The analyzing details are found in the next section.

The criteria for analysis are as follows:

- History of MVUHS Network
- Connectivity Between Pods
- A-Pod Analysis
- C-Pod Analysis
- D-Pod Analysis
- F-Pod Analysis
- Server Room Analysis
- Future Growth

Results

History of MVUHS Network

When Missisquoi Valley Union High School first opened, no one could have even imagined the need to have a computer network. The layout of the buildings was created for aesthetics and convenience, not for running wires. As technology in the school systems became more common practice, MVUHS had to reevaluate its architecture and figure out how they could accommodate the growing trend of educational technology.

The first system that MVUHS had in place was a simple network. There were only a handful of computers assigned to specific teachers and rooms. There were only a dozen or so email addresses for the entire faculty; and there really was no vision for needing more. The computers on this network were linked via a bus topology. Connected through coaxial cable, each of the systems would talk to the next. If a message needed to be sent from one room to another, it had to pass through every computer in between on the chain. The problem with this type of network was: if one of the systems went down, the entire network was broken. The cable between each of the terminals would have to be checked as well as the computers themselves. This required a good deal of time and manpower just to maintain. More often than not, bus topologies are more trouble than they are worth.

With time, better types of networks came out. More computers were required to meet the growing technological needs of the high school. A bus topology was not going to work anymore. The logical solution for the new network was a star topology. Each of the systems

would be linked to a central hub and they would be independent of each other. This allows for many computers to be on the network, as well as the ability to add/remove computers at will. Also, unlike a bus topology, if one link goes down, the rest of the network stays active, unless the central unit connecting the nodes together fails.

The network was not, however, able to be worked into the existing architecture of the building. Holes were drilled and wires were run, both copper CAT5 and Fiber to the best of the electrician's ability.

Connectivity Between Pods

Each of the pods has a sufficient physical connection to the rest of the network. All pods are connected to the central server room in a star topology using fiber. The star method is good in this scenario as all traffic will flow directly from the pods to the server room. The potential drawback to a star topology is having a single point of failure. If one of the fiber links were to go down, the entire pod would lose connectivity.

A-Pod Analysis

The library, media room, and classrooms have more machines than any other pod in the building. As a result, A-Pod generates more traffic than any other pod in the network. In this segment, the switch is 100Mb/s connected to a 100Mb/s fiber line to the central server room. Since this pod will most likely generate the most traffic, it can be suggested to upgrade the switch and copper to fiber media converters to 1 Gb/s.

The library has a few connections to the wiring closet; however, improvements can be made on purchasing larger switches to accommodate the entire cluster of network devices on the switch to form the least amount of extended stars as possible.

The current configuration of the media room is functional but networking improvements can be made. Each row is connected to a centralized switch. Within each row, another switch is used to extend the network to reach a few more clients towards the end of the rows. For network connectivity, the logic works, but for network performance, this type of configuration should be improved. One way to increase the efficiency of the media room would be to have a central switch in the ceiling which all the clients connect to. Having a central switch will prevent addressing issues and packet collisions. Another benefit is increased network security and easier troubleshooting if a connection goes down. With the current configuration, the switches could be easily stolen or tampered with. At times we noticed switches lying on the floor that could be stepped on which increases the possibility of accidental network damage. Overall, we counted about ten switches in the media room. Two switches in this room would improve organization and efficiency of the network.

C-Pod Analysis

C POD didn't have many machines in comparison to other PODS at the school. With only a little more then a dozen machines, most of which are teacher stations, this aspect of the school wouldn't require immediate attention. These systems are all connected to a Linksys 24 port gigabyte switch, which is then connected to the school network by a gigabit fiber connection.

Along with the gigabyte switch in the C POD switch room there is also a HP fast Ethernet 24

port switch which is a good idea to have as a backup in the event the gigabyte switch were to fail for some reason. The biggest suggestion would be the eventual replacement of the switches or hubs located in the classrooms to gigabyte speed, as they need to be replaced or added.
The other recommendation would be the eventual replacement of the machines as warranted. Throughout every POD there are numerous different systems ranging from Micron PC to newer Dell's and an attempt to stay with one manufacture and model may potentially allow you to get better deals if you buy in bulk from a single manufacturer. It will also make it simpler to maintain and service only a few models from one manufacturer in comparison to the range of models from multiple manufactures.

D-Pod Analysis

D POD contained about three-dozen network devices the majority of which were desktop computers. These systems, similarly to C Pod ware all makes and models, which once again can cause to be difficult when working with a range of systems. A few items found which weren't in A or C are two network printers and a Linksys wireless access point. A recommendation for the Linksys WAP along with all other wireless access points, would to have it set up to be a secure instead of open which would prevent unauthorized access to the system from guests or people on the outside of the building. One idea would be to set up a RADIUS server to authorize the users onto the system preventing one from unauthorized access.

The switch room for D POD was in room D22 that was also used as a storage room where many others have easy access to such as teachers and janitorial staff. Having such open access to the switches can lead to unauthorized people trying to fix things, which can often worsen the

problem. A recommendation is to secure the switch setup utilizing a lockable-vented rack or sectioning off a part of the room. For POD D there was a media converter which took a gigabit connection and converted it to Cat 5e and went into a 24 port switch with 2 gigabyte uplink ports which currently suffices at the moment but will be needed to expanded upon if anymore systems are introduced into the D Pod.

F-Pod Analysis

F-Pod had two large computer labs. Both of the computer labs had about 20 workstations that were interconnected together by little switches. An ideal solution would be to purchase two larger switches and setup both labs off of those as it would be much better for the network in not only F-Pod, but throughout all the Pods. While the current configuration does work, it is not the best practice to take and should look at potentially fixing this when resources come available.

Server Room Analysis

The server room is a small room with a variety of different key components. The major concern for this room is the lack of adequate ventilation. All components in the room are under stress due to the heat. Hard drives failures as well as equipment failures are common symptoms of poor ventilation. This room should at least have positive pressure and cooling the room to even 70 degrees can make the equipment last years longer.

Conclusions

As it stands though, the network is a mess of excess cabling as well as the overuse of 5-port switches. Even with the addition of a fiber optic backbone to the school, the network suffers because of the disorganization.

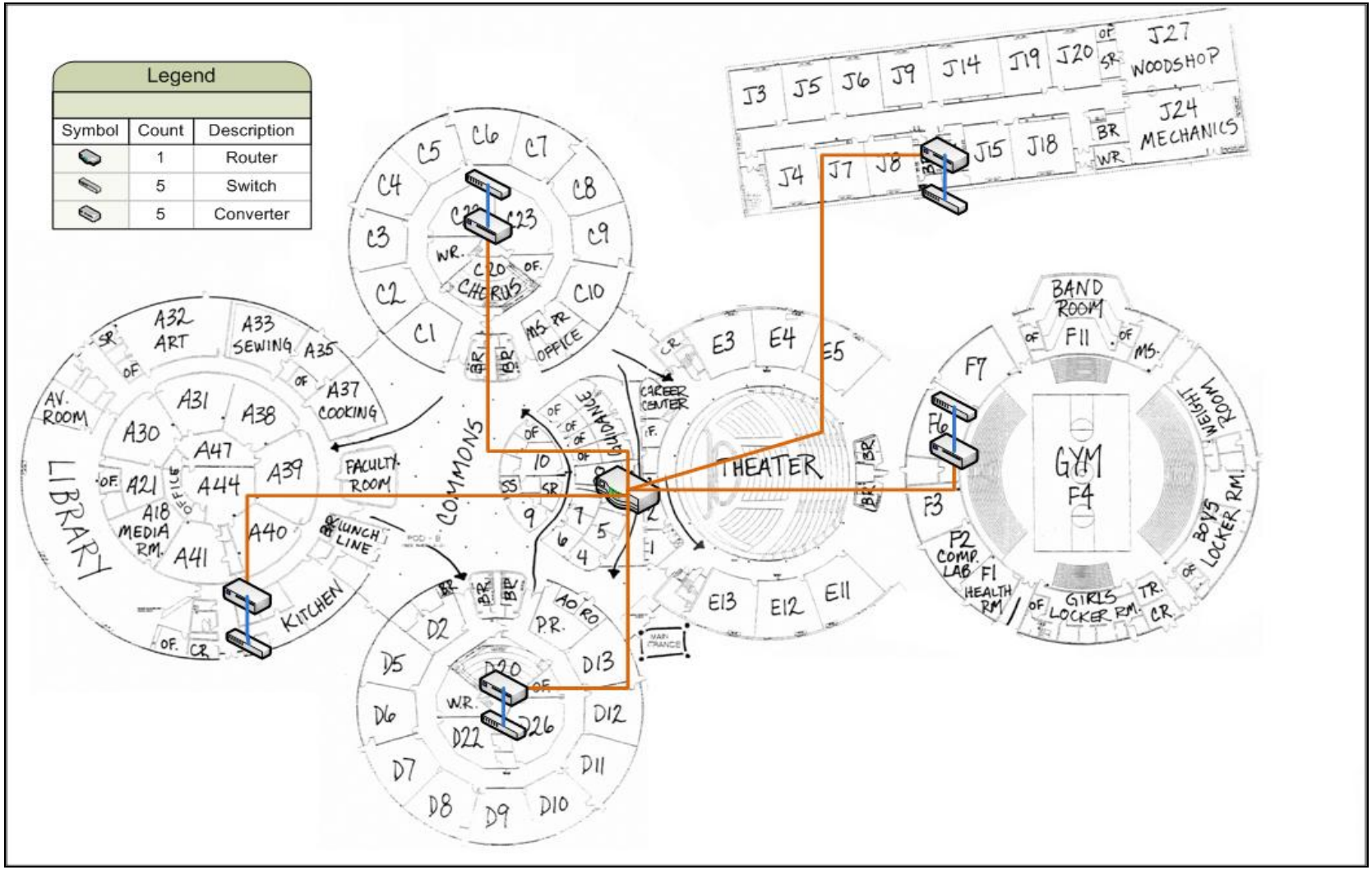
Without a formal analysis of average bandwidth in a busy school time, it would be difficult to say if there is a great deal of congestion that might be improved from reorganization of the network. Using what the school currently has in its possession, the newer tech could improve the way the network runs as well as providing students with a better experience with more modern equipment.

The server closet was warm, and on a busy day it would get even warmer. Improved cooling and ventilation of the room will allow for greater efficiency of machines and less of a likelihood of mechanical failure. If there was a natural or unnatural disaster that happened to the school within the vicinity of the server room there is a good chance that the machines would be destroyed resulting in a loss of data and valuable equipment. It would be a good idea to have another server room at a different side of the school, or separate building such as J-Pod so that total loss of information would not be as great a possibility.

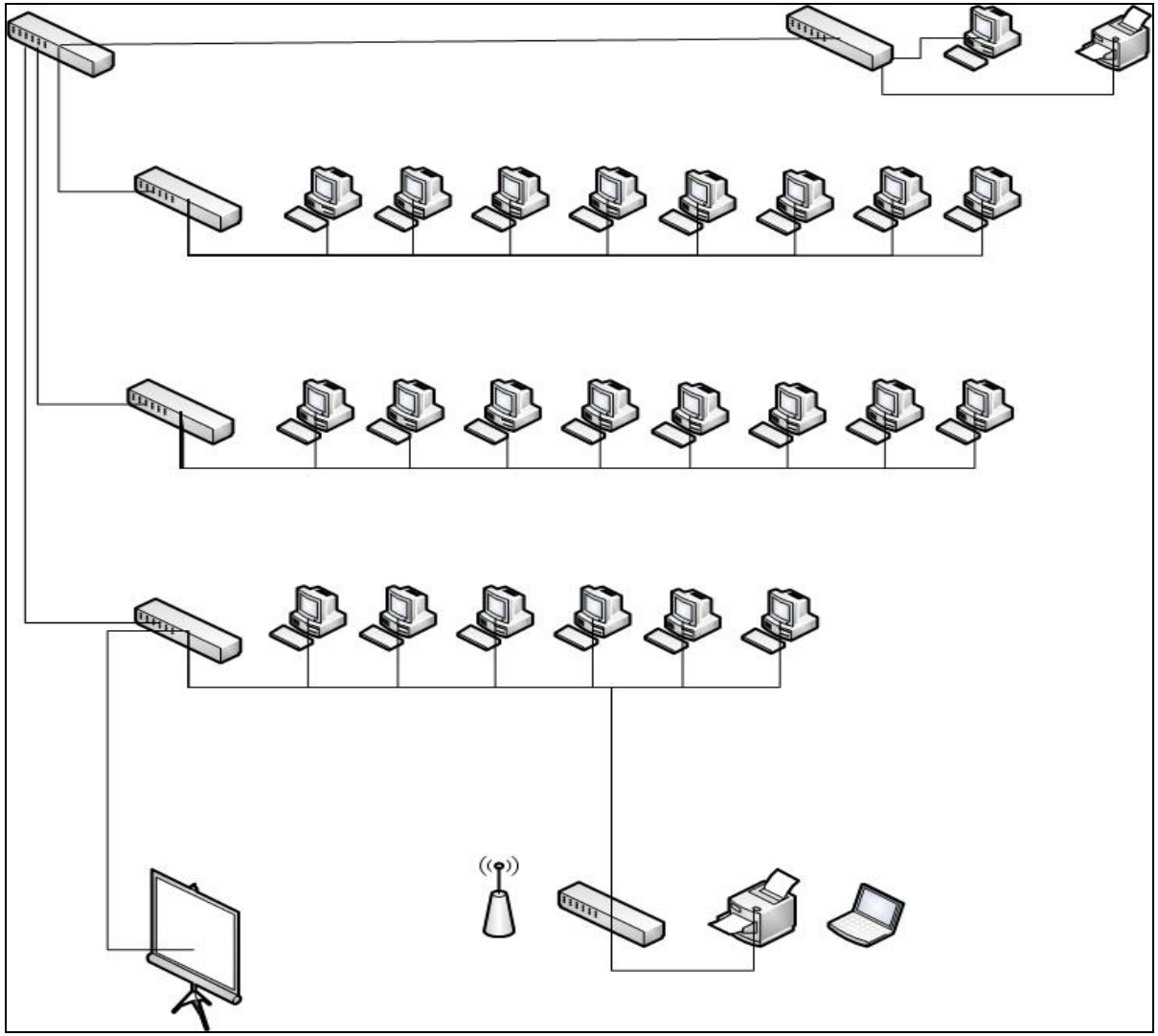
Many times businesses such as IBM upgrade their systems. Applying for donations or reduced prices on equipment might help the high school save money when looking for more recent machines.

List of Appendix Maps

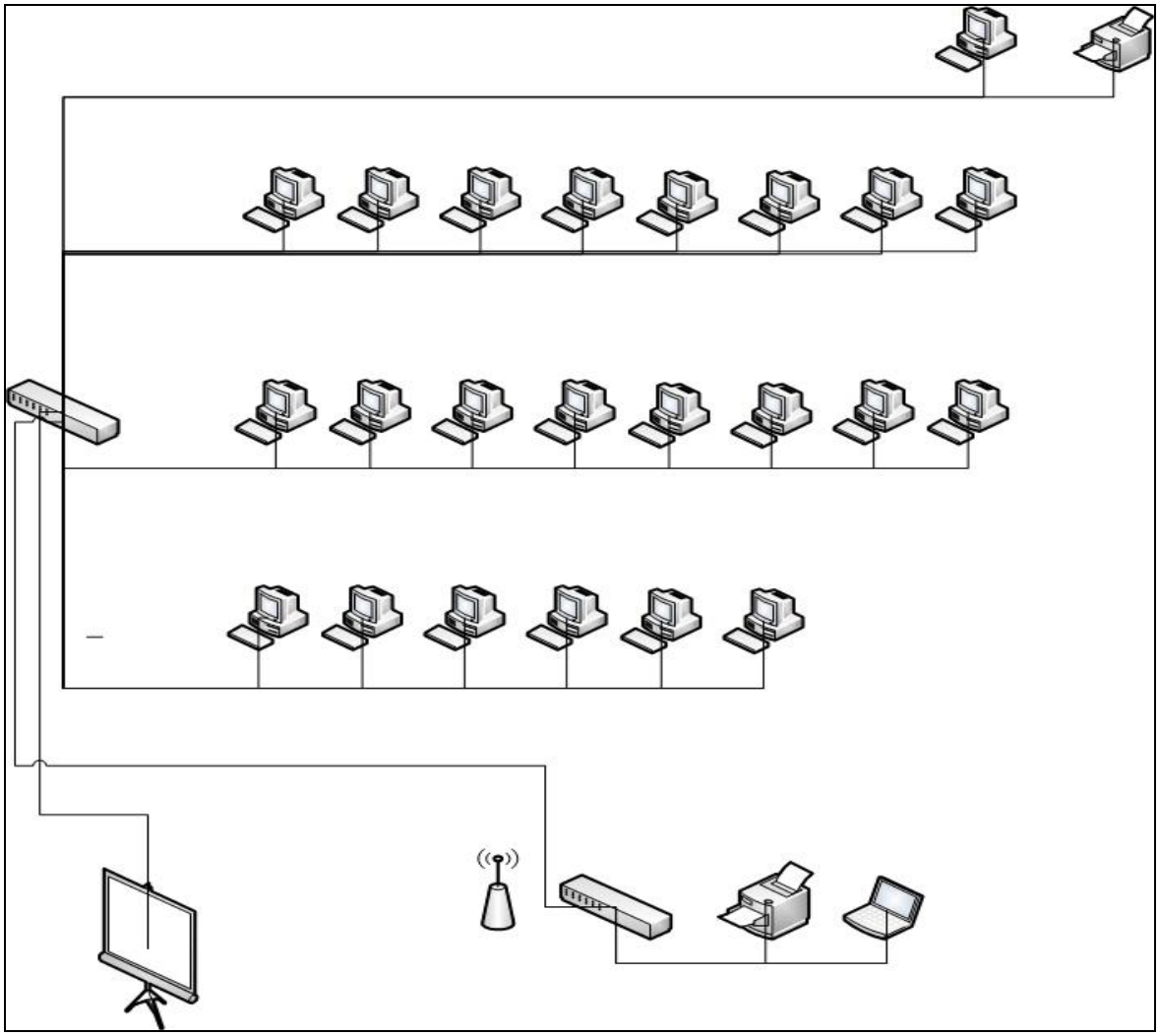
MVUHS Overview



Current Media Room

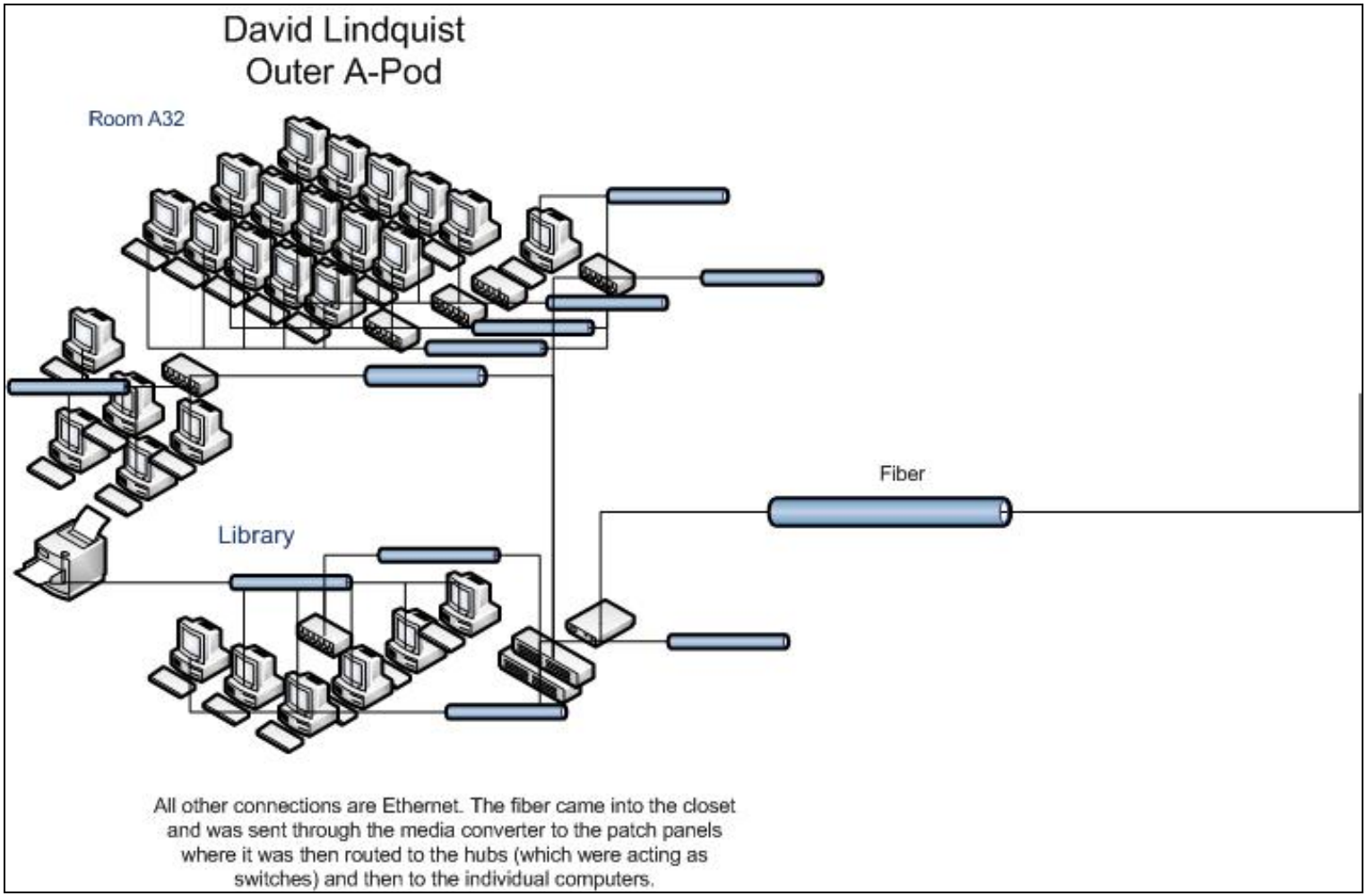


Revised Media Room

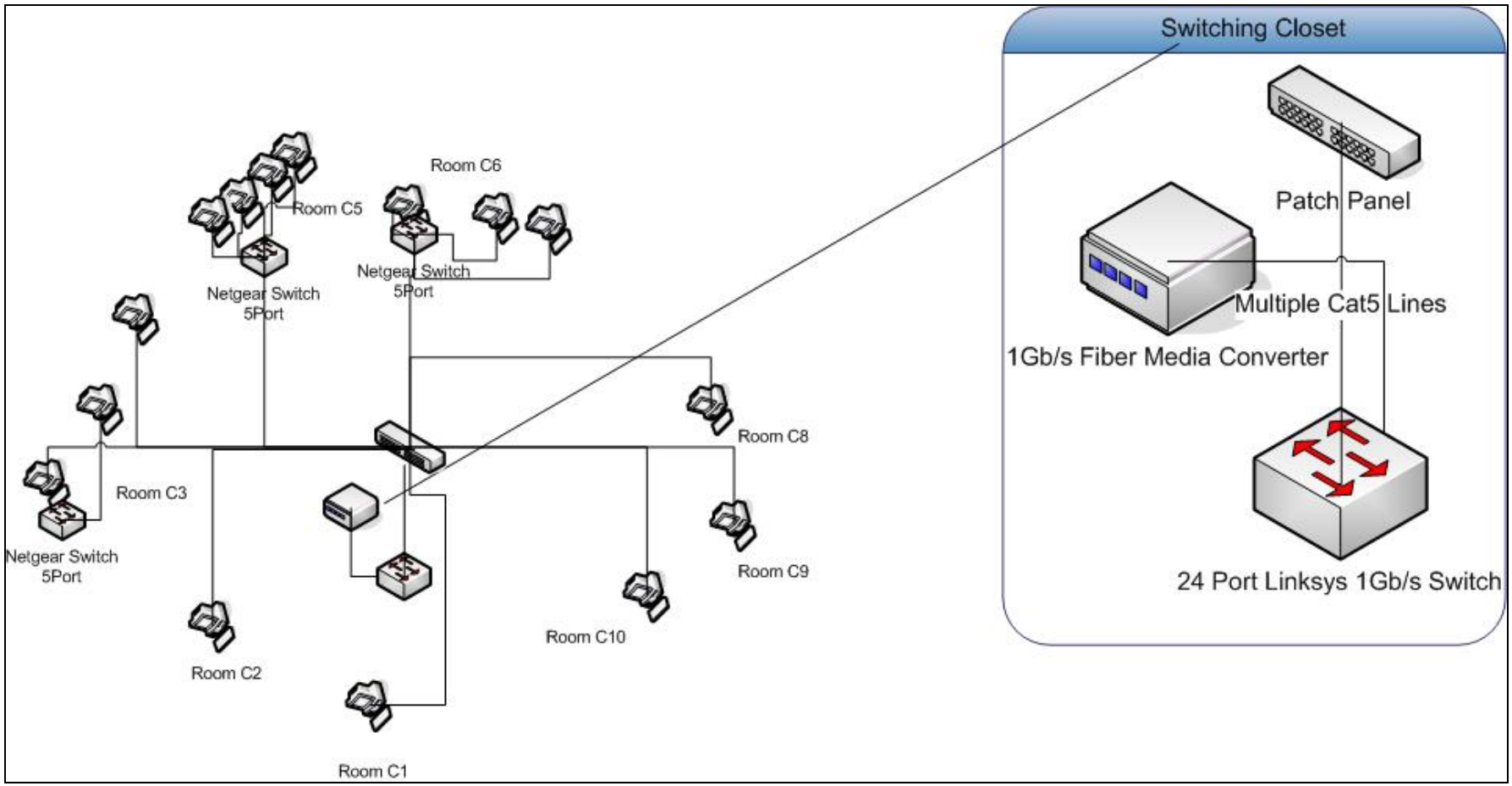


D

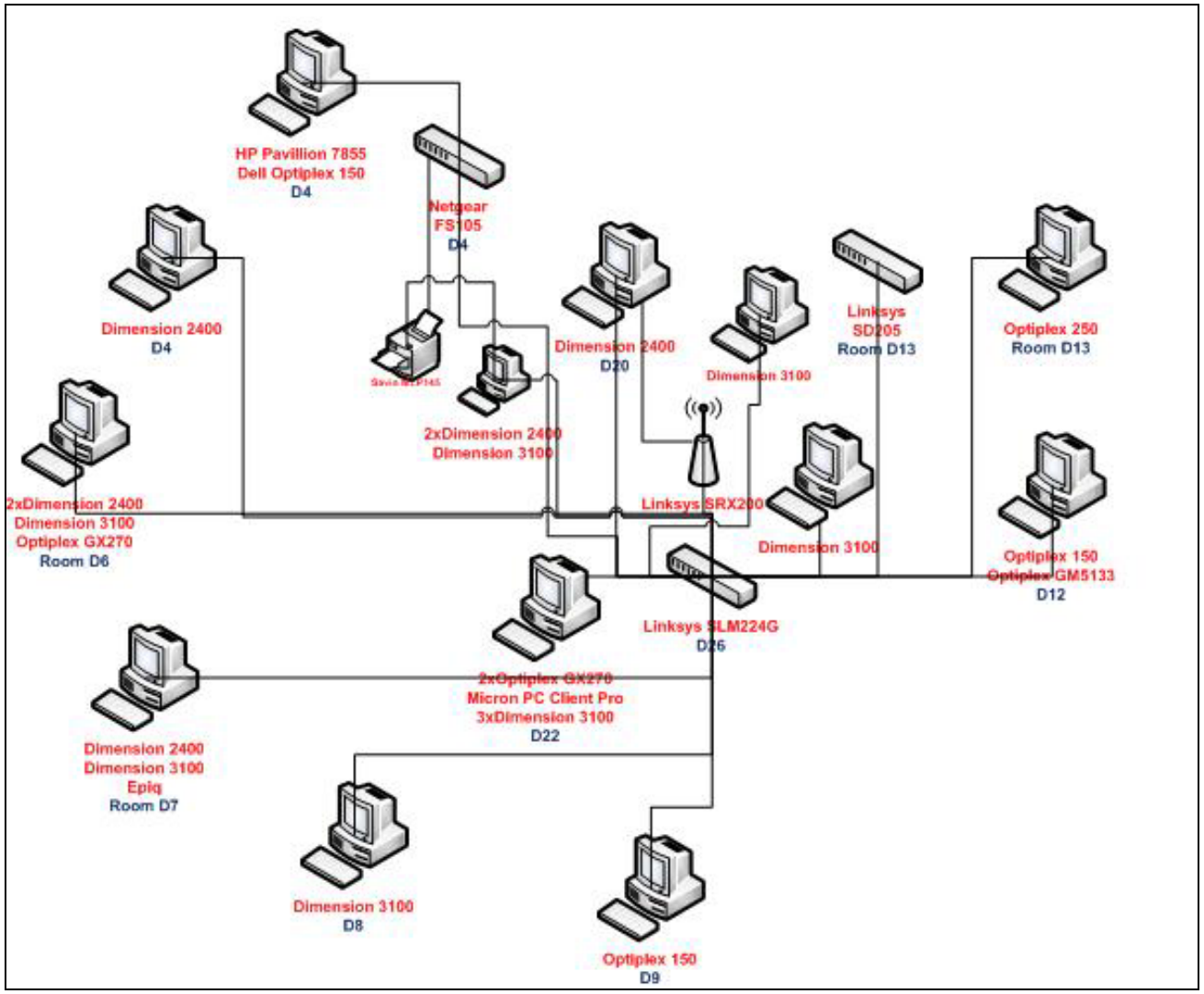
A-Pod


David Lindquist
Outer A-Pod
Room A32
Fiber
Library
All other connections are Ethernet. The fiber came into the closet and was sent through the media converter to the patch panels where it was then routed to the hubs (which were acting as switches) and then to the individual computers.

C-Pod


Switching Closet
Patch Panel
Multiple Cat5 Lines
1Gb/s Fiber Media Converter
24 Port Linksys 1Gb/s Switch
Room C5
Room C6
Netgear Switch
5Port
Netgear Switch
5Port
Room C8
Room C3
Netgear Switch
5Port
Room C9
Room C10
Room C2
Room C1

D-Pod


HP Pavillion 7855
Dell Optiplex 150
D4
Netgear
FS105
D4
Dimension 2400
D4
Dimension 2400
D20
Dimension 3100
Linksys
SD205
Room D13
Optiplex 250
Room D13
2xDimension 2400
Dimension 3100
2xDimension 2400
Dimension 3100
Optiplex GX270
Room D6
Linksys SRX200
Dimension 3100
Optiplex 150
Optiplex GM5133
D12
Linksys SLM224G
D26
2xOptiplex GX270
Micron PC Client Pro
3xDimension 3100
D22
Dimension 2400
Dimension 3100
Epiq
Room D7
Dimension 3100
D8
Optiplex 150
D9

F-Pod Computer Lab