

Case Study #1

By Julian Mato-Hernandez & Evan Jurdan

Executive summary:

For this network the customer needed a nearly complete ground up design of their network. This network contains new equipment (PC, Laptops, Infrastructure, and security devices) along with a host of software (Email, Storage, Network Monitoring, and security). The customer needs these basic services to be as reliable and functional as possible. We will be providing a cloud based work environment centered around Microsoft Azure, this will provide AD, Storage, backups, email, notifications, and parts of security. Along with this cloud infrastructure we will be providing a Full unified wired and wireless network to both buildings.

Introduction:

Project Outline

In this paper we will be discussing all components of the customers network that where addressable along with recommendations for next steps. This network has a breath of constraints including but not limited to needing to connect both buildings, providing inter department file transfer, internet access, wireless networking, reliability, budget in expandability, and all within \$100,000. We chose a cloud hybrid solution to maximise reliability and expandability along with easing the cost of onsite IT with service contracts from a cloud provider.

Document Outline

- [Executive summary](#)
- [Introduction](#)
 - [Project Outline](#)
 - [Document Outline](#)
- [Requirements Analysis](#)
 - [General Requirements](#)
 - [Hardware Requirements](#)
 - [Software Requirements](#)
- [Customer Synopsis](#)
- [Network Architecture -Three tier architecture](#)
- [Network Maps](#)
 - [Building Scematic](#)
 - [Drops And Host Names](#)
- [Populating the Network](#)
 - [Device Map](#)
- [Budget / Justification](#)

- [Scalability Considerations](#)
- [Summary and Comments for Future Growth](#)

Requirements Analysis:

General Requirements

This building had only a small network in accounting. The business needed to have Computers for employees and secure storage and transfer of confidential records. They are a government business and need their data to be secure but they also needed to be able to share between certain departments and better analyze data.

Hardware Requirements

The company needed an entire network from scratch. They needed a desktop computer per employee as well as a laptop per employee. There were also 54 micro computers to put in classroom labs. Each desktop and micro computer needed a monitor and peripherals. We needed to design a network and purchase the hardware to put it in place so we had to buy switches, a support server, and access points to implement the network that they wanted. We planned all of the Cat6 cable runs throughout the building as well as the fiber lines connecting our Layer 3 switches and the fiber connection under the road to the other building. They wanted a lot of office printers and a larger printer/scanner/copier, in order to better fit in the budget not everyone could get individual printers but the people we didn't give a printer to are in extremely close proximity to the large communal printer. We mapped where there should be power drops, each power drop would have 4 connections and each internet drop would have 2 connections.

Software Requirements

Since it is a government organization they needed a secure network and a secure storage. The Azure suite had all of the components needed to build a network that was secure and accessible. We have secure storage set up and backed up with a separate storage for accounting for added security. Azure also has active directory so our network has security that insures only people who are allowed to look at or edit something are allowed to view it. We also have Office 365 for each person so that they have access to word processing, spreadsheet, and presentation software to aid in the recording of information, the analyzing of data, and the formation of presentations.

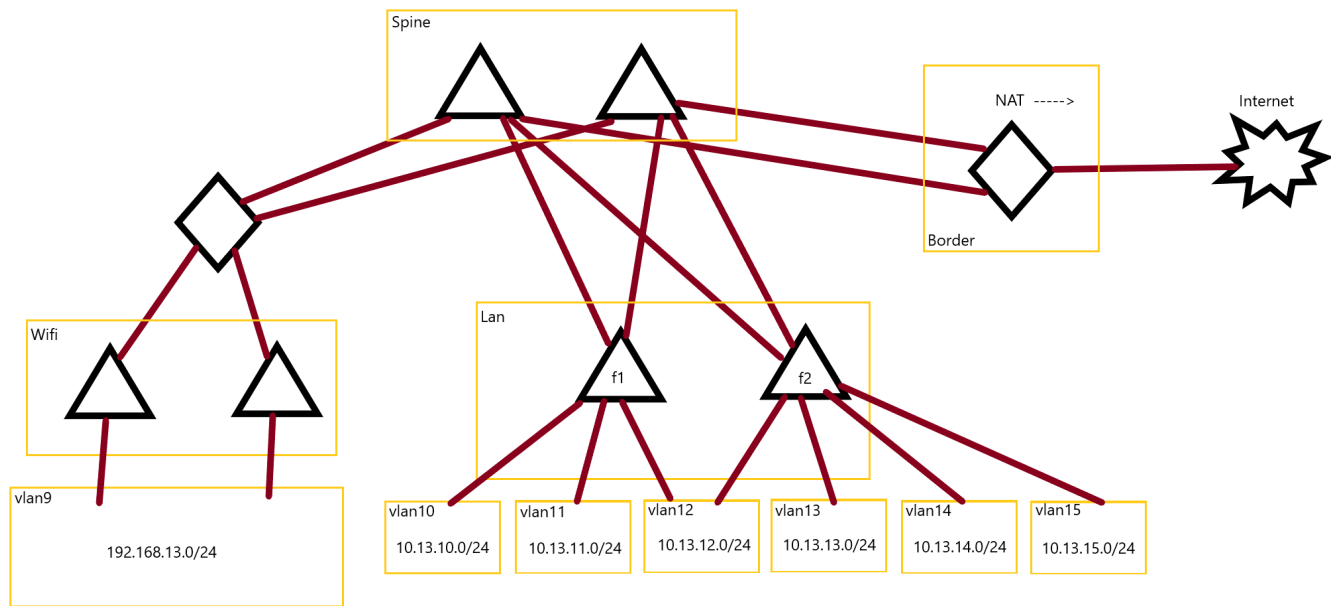
Customer Synopsis:

The customer wanted a network that met the requirements listed in the document. They were unsure what type of network and seemed to not be particular about how we structured it. They didn't have restrictions on hardware and their only request was that every employee needed a laptop as well as their desktop.

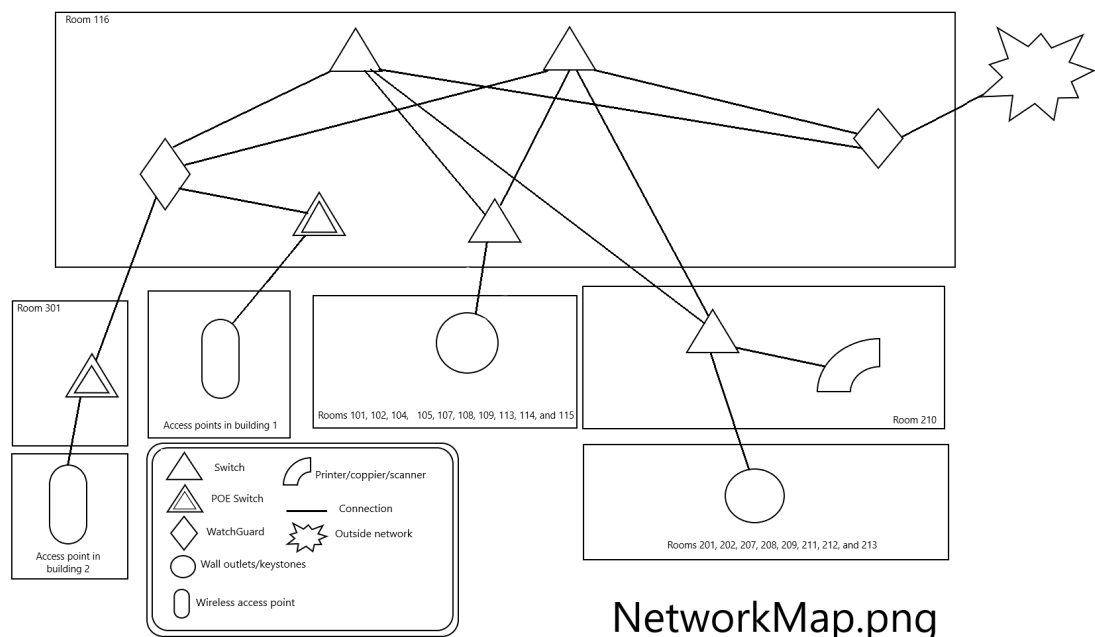
Network Architecture:

Three tier architecture

ThreeTierArchitecture.png



Network Maps:

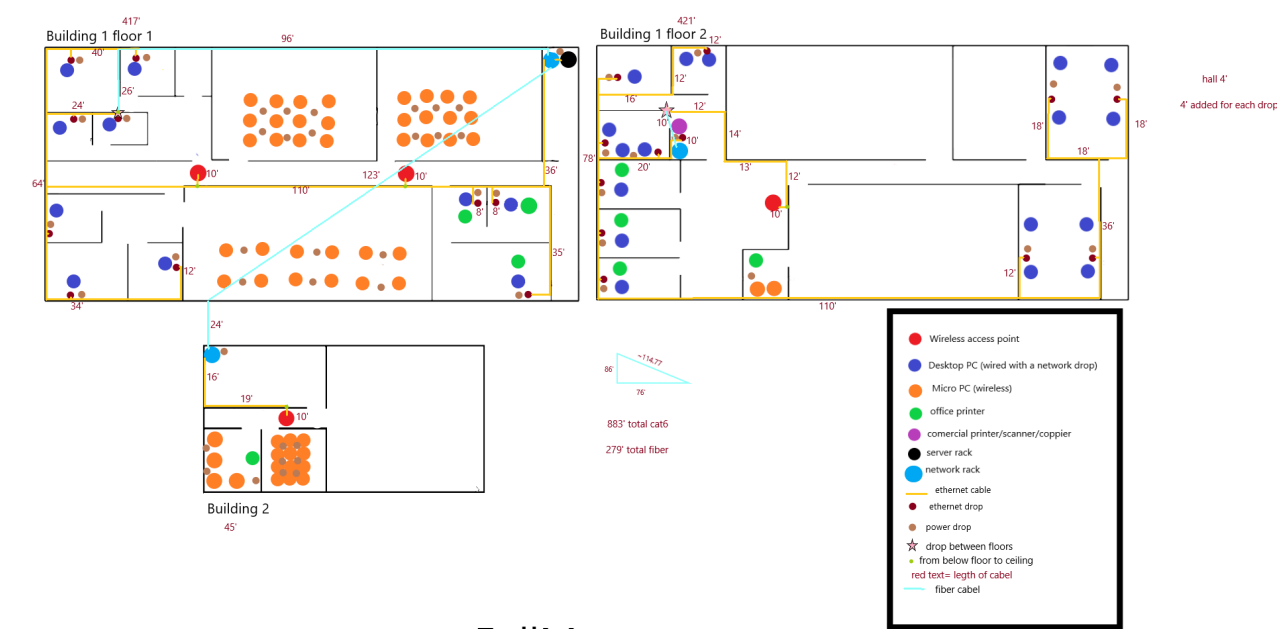


NetworkMap.png

BuildingScematic.png

Populating the Network:

4 / 6



FullMap.png

Budget / Justification:

Cloud

Microsoft Azure Estimate					
Case Study 1					
Service type	Custom name	Region	Description	Estimated monthly cost	Estimated upfront cost
Storage Accounts	Accounting	East US	File Storage, Transaction Optimized Performance Tier, G	\$189.35	\$0.00
Azure Backup	Accounting Backup	East US	Azure Files, 1 Instance(s) x 2 TB, LRS Redundancy, Low A	\$121.75	\$0.00
Storage Accounts	Company wide	East US	File Storage, Transaction Optimized Performance Tier, G	\$511.55	\$0.00
Azure Backup	Company Wide Storage Ba	East US	Azure Files, 1 Instance(s) x 7 TB, LRS Redundancy, Low A	\$72.80	\$0.00
Azure ExpressRoute			ExpressRoute, Zone 2, Premium, Metered; 50 Mbps Circ	\$206.20	\$0.00
Microsoft Sentinel		East US	Logs ingested - 7 GB Basic logs per day, 3 GB Analytics I	\$585.50	\$0.00
Azure Active Directory (Azure AD)		East US	Premium P1 - 19 users, Premium P2 - 10 users, Enterpris	\$264.00	\$0.00
Azure Cost Management and Billing			No charge for managed Azure spend. Additional premiu	\$0.00	\$0.00
Notification Hubs		East US	Basic tier, 1 million additional pushes	\$10.00	\$0.00
Support			Support	\$1,000.00	\$0.00
			Licensing Program	Microsoft Customer Agreement (MCA)	
			Billing Account		
			Billing Profile		
			Total	\$2,961.16	\$0.00
Disclaimer					
All prices shown are in United States – Dollar (\$) USD. This is a summary estimate, not a quote. For up to date pricing information please visit https://azure.microsoft.com/pricing/calculator/ This estimate was created at 3/16/2022 5:53:40 PM UTC.					

Final

Amount	Product name	Manufacturer	single unit cost in \$	Billing Period	Cloud Y/N	Expense per month in \$	per year in \$	OTC in \$	Notes		
N/A	Office 365 with Enterprise Outloo	Microsoft	\$22.00	Monthly	Y	\$594.00	\$7,128.00	N/A	27 Employees		Total First Month in \$
N/A	Azure	Microsoft	N/A	Monthly	Y	\$2,961.16	\$35,533.88	N/A			\$3,694.36
12	Aruba Central one device - 1 year	HPE / Aruba	\$11.60	Monthly	Y	\$139.20	\$1,670.40	N/A	unefied management system for aruba		
4	Aruba AP-505	HPE / Aruba	\$506.00	one time	N	N/A	N/A	\$2,024.00			Total per year in \$
2	Aruba 2530 8G PoE+ (J9780A)	HPE / Aruba	\$792.00	one time	N	N/A	N/A	\$1,584.00	Layer 2 wirles access point Network		\$44,332.28
3	Aruba 6100 24G 4SFP+ (JL678A)	HPE / Aruba	\$999.00	one time	N	N/A	N/A	\$2,997.00	Layer 2 leaf		
2	Aruba 3810M 16SFP+ (JL075A)	HPE / Aruba	\$4,524.12	one time	N	N/A	N/A	\$9,048.24	Core		Total OTC in \$
2	WatchGuard Firebox M290 High	Watchguard Technologies	\$1,232.39	one time	N	N/A	N/A	\$2,464.78			\$101,913.63
54	ThinkCenter M70q Tiny	ThinkCenter	\$478.00	one time	N	N/A	N/A	\$25,812.00			
27	ThinkCenter M80t ES	ThinkCenter	\$614.00	one time	N	N/A	N/A	\$16,578.00			First Month + OTC
8	Brother HL-L2325DW	Brother	\$90.00	one time	N	N/A	N/A	\$720.00			\$105,607.99
1	HP Color LaserJet MFP M578dn	HPE	\$2,299.00	one time	N	N/A	N/A	\$2,299.00			
81	Dell 22 Monitor SE2222H	Dell	\$120.00	one time	N	N/A	N/A	\$9,720.00			
3	NavePoint 6U Net Rack	NavePoint	\$222.44	one time	N	N/A	N/A	\$225.44			
1	Tripp Lite SMART1500LCD UPS	Tripp Lite	\$248.71	one time	N	N/A	N/A	\$249.71			
1	NavePoint 18U Rack Enclosure	NavePoint	\$866.49	one time	N	N/A	N/A	\$866.49			
1	Dell EMC PowerEdge R240	Dell	\$1,445.99	one time	N	N/A	N/A	\$1,445.99			
2	Seagate 16TB Exos X18	Seagate	\$339.97	one time	N	N/A	N/A	\$679.94			
30	HP 250 GB Netbook PC	HPE	\$636.00	one time	N	N/A	N/A	\$19,080.00			
20	Inter Campus Tunneling	Construction	\$200.00	one time	N	N/A	N/A	\$4,000.00			
3	YubiKey 5 NFC FIPS - 10 Pack	Yubico	\$550.00	one time	N	N/A	N/A	\$1,650.00			
2	1000ft Shielded Gray Cat6	cablewholesale	\$234.52	one time	N	N/A	N/A	\$469.04			

We went a little over budget and it was extreemly dificult to trim it down this much. we also feel that the security in the building is not up to the standards required by government buissnesses and have several plans to discuss further regaurding how to make things more secure. unfortunately there was no budget to build a networking lab though if we could extend the buget a bit we could get together a rudimentary networking lab.

Scalability Considerations:

With the spine and leaf topology you could add more switches to the network following how the existing switches are set up and easily expand to another building or use the AZURE suite to expand to more locations or to expand storage capacity. The wireless network is able to be added to in a similar way and you could add more access points or even other switches with access points connected to expand the network. We also secmented the network into vlans based on department and if nessisary other vlans could be added for incoming departments or more computers could be added to existing networks easily.

Summary and Comments for Future Growt:

in summary here is a layout, scematics, and price of a new network install. It is an incredibly secure network up to government standards and it turns this building with no technology in it into a very extensive network. There is a secure and redundant Lan with a desktop for each employee. There is a wifi network for all of the classroom computers that will help facilitate learning and that wifi also allows the employees to take their work from their desk to meetings or presentations securly with their secure laptop instead of a flash drive or some less secure medium. There is a guest wifi seperated from the other vlans to keep things secure. the secondary building has a direct connection to the network and the classroom there has micro computers to help learn as well. There is space on the switch to add more connections or even other close buildings and the AZURE suite lets there be other locations that securly connect to the same storage if more locations are founded in the future.