Network Design - Matadors Shipping Inc.
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IS 435 Prof. Daeeun Choi
ET3
Carolyn Babaian, Niko Gevorgian, De'Andra Kohl, Eduardo Ochoa Aragon, Mkrtich Taymizyan

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Summary

Matadors Shipping incorporation has a problem facing that the building is old and not up-to-date with the newest and current technology. The building manages a fleet of trucks, the current technology that is in the building, is not powerful enough to keep up with the current demand. Matadors Shipping has experienced rapid growth and the infrastructure that is set in place is under a large amount of strain. The whole building and the one-story secondary building needs to be revamped completely with a new network infrastructure. A new network infrastructure can aid in the productivity and efficiency of the employees, it will allow them to collaborate with each other better, as well as streamline technology.

Some technical solutions are to replace current wires with brand new ones, and update the pre existing infrastructure. We will be adding more servers to some departments so they could be connected together. We will also be adding updated wires to the current building and routers and switches to departments so they could be connected to their respective server. The preexisting wire will be replaced with more updated ones such as newer LAN cables and CAT 7 wiring throughout the whole building(s) as well as new routers and switches will also be added. Our goal is to make the network for Matadors Shipping both efficient and cost effective.

Matadors Shipping Inc. business estimated budget is a total of $100,000 to design and implement the new network for this shipping service. This will include design, equipment acquisition costs, installation labor costs, and training expenses. Below in Figure4 is a more detailed budget summary showing each cost for equipment acquisition costs, installation labor cost, and training expenses.

Key Assumptions

The Information Technology employees are assumed to have dedicated software, such as a database management system (DBMS) and a maintenance team. The conference room will not need an individualized Local Area Network (LAN), the same will follow for the president's office. Both rooms can share a LAN. Moreover, a direct network can be between Customer Service, Presidents Room, Fleet Maintenance room, Dispatch room and Customer Services can be connected directly to the Server Rack. Furthermore, the two rooms for Inter/Intrastate Operations can be founded upon the same Local Area Network with no issues, thus reducing possible network issues. The lobby and reception can be connected to the internet via a separate virtual network, routing separate from company processes. This allows visitors and employees to enjoy access to the internet without creating possible threats, this would bring about the need to implement a Wireless Local Area Network for the lobby and the reception area. We also assume that our current Server Room has a sufficient capacity to cool itself, so as not to damage any of our equipment via a heat warp.

Project Scope

This project involves updating the network communications devices, and creating Local Area Network (LAN) for each department. To start we will replace everything the company currently has with new and updated devices. Replacing network components such as LAN cables, LAN Hubs. The project scope will include network design, leading to equipment acquisition and labor cost. A budget will be necessary to evaluate the total cost of the network implementation and necessary training cost for employees. We also need the President's Office, Customer Service, and Fleet Maintenance and Dispatch to be interconnected together to serve as the network backbone. The current switches and routers will also be replaced with new devices.

Network Architecture

Traffic Type

The traffic type we will be using is a local area network (LAN), which consists of a series of computers linked together to form a network in a circumscribed location. Each department in the Matador's Shipping Inc will have its own LAN. The computers are then connected to each other via TCP/IP ethernet. For example, the Data Processing department would get traffic related to processing data about purchases, returns, account updates, etc. Each department would have their own respective traffic related to what role they accomplish in the business. Marketing and Sales would have traffic from people visiting the website ordering things or doing something else related to that department.

Performance Criteria

Some departments will be expected to carry out a specific role in this company and be evaluated to maximize performance. Departments should be able to do their jobs smoothly and efficiently without compromising performance within the company. Customer service should be able to effectively help resolve any problems with customers without creating any problems that would leave the customer upset about anything relating to their transaction.

Network Design Topology

Below in Figures 1 and 2, you will see the network architecture that we have decided to use, which is a client/server network. It is a communication model in which multiple client programs share the services of a common server program. The model is also efficient in delivering resources to the client and requires low-cost maintenance. The client/server network is easy to manage and can be easily delivered to the client. As more data is collected the system becomes more secure and serves added security to the data.

Network topology design

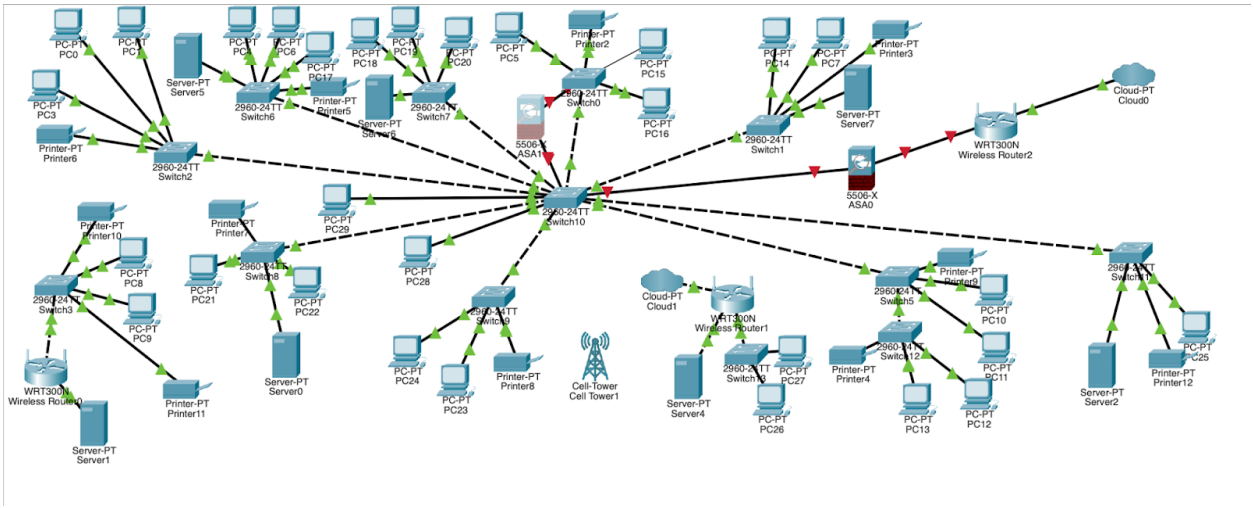

Figure 1

Essential diagrams

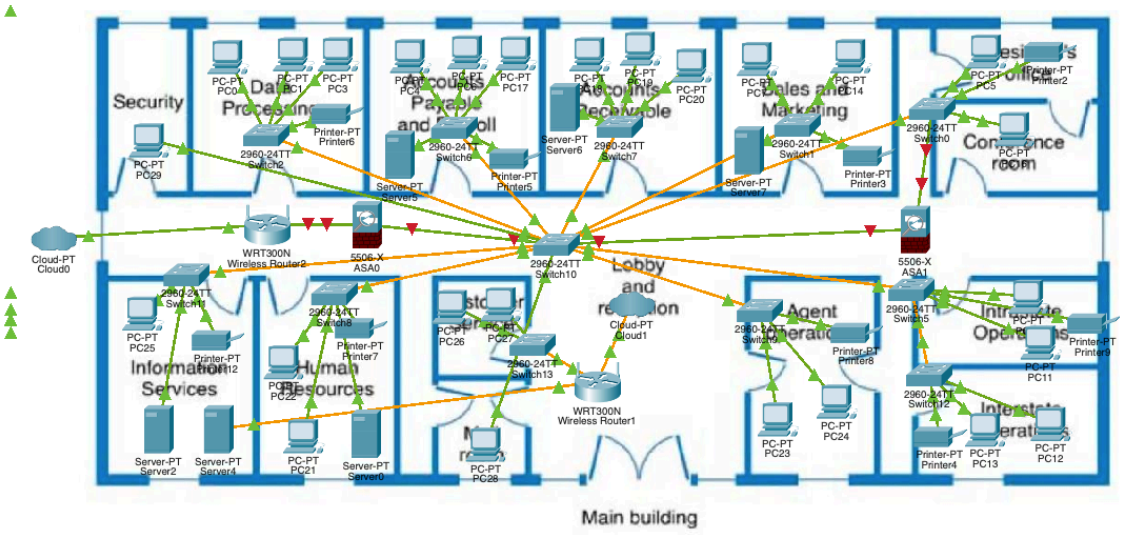

Figure 2

Reasoning

There are nine mandatory LANs that must be accounted for beforehand. Those departments' rooms consist of Information Services which must hold two servers; consisting of a Mail Server and a Web Server. The Web Server is connected to local computers in the Information Service room. The Mail server is then connected to the inner

switch to be operated remotely via the vicinity of the building. Other department rooms having their own LAN are; Data Processing, Accounts Payable and Payroll, Accounts Receivable, Sales and Marketing, Agent Operations, Intrastate Operations, and Interstate Operations. Each of these rooms will have their own personal switches, which creates a LAN for the department to use.

Particular rooms that did not require a LAN can still access the network via the main switch, such as the Customer Service Room, Mail Room, President's Office, and Conference room. These are regions of the main building that would still benefit from having access to the network's LAN to conduct necessary organizational operations. To connect all these switches to the server we suggest using CAT 7 LAN cables. This is beneficial for future proofing the network for Matador Shipping Inc for years to come. A firewall must also be implemented for the well being of the organization's business interest. The firewall will manage and intercept possible threats from the internet, which then analyzes which packets are malicious and what packets are allowed to enter the building network to the desired port and MAC address.

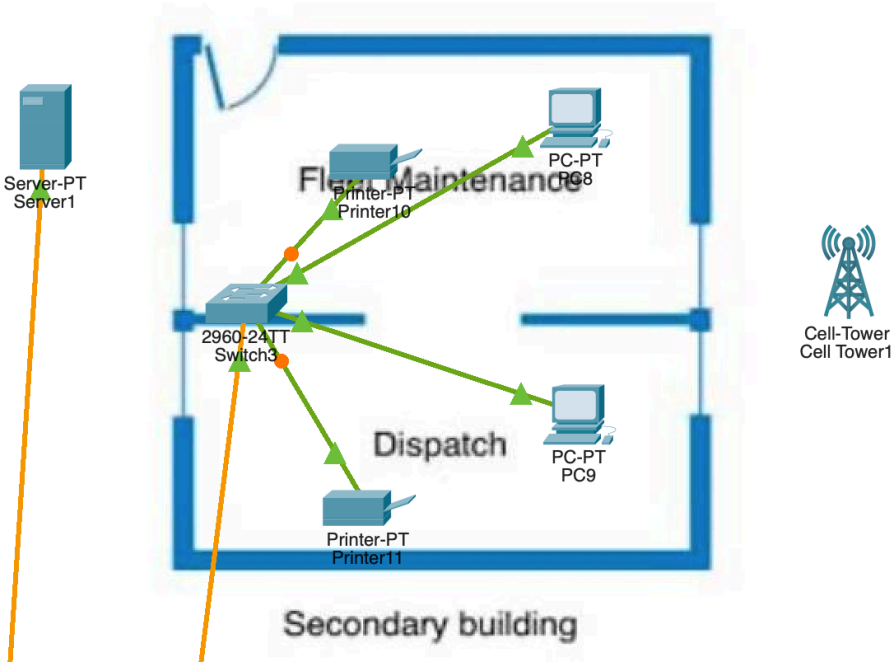

Figure 3

Reasoning

In the secondary building, the Fleet Maintenance and Dispatch rooms have stand alone computers in the vicinity. These computers need to have their own local area network (as shown in Figure 3) to potentially fulfill business needs that may arise in the near future. The switch would be connected to the switch inside the main building to allow the secondary building to attain particular information that has been authorized to receive, such as databases or the Mail server. It is necessary that the dispatch room is connected in real time, as real time communication is improved with high quality components such as CAT 7 improved data transfer speeds over CAT5e LAN cables.

Budget

Matador's Shipping Inc.	
Network Redesign Project	
Total Allocated Funds: $100,000.00	
Category	Cost
Dell PowerEdge R250 Server (6@$995.64/each)	$5,973.84
CAT7 Cabling - 1000ft (2@$519.00/each)	$1,038.00
RJ45 Cat7 Connectors 30pcs (25@$34.99/pack)	$874.75
APC SmartUPS 300 (2@$1801.99/each)	$3,603.98
TeSmart 16 port KVM Switch	$369.99
Ubiquiti UniFi Dream Machine Pro	$379.00
Cisco ISR4331/K9 Integrated Service Router	$1,575.00
Cisco SG350-10MP-K9 Managed L3 PoE+ Switch (13@$580/each)	$7,540.00
TP-Link AX1800 WiFi 6 Router (14@$69.99/each)	$979.86
Network Designer (8hrs@$67/hr)	$536.00
Labor Cost (10hr@$100/hr x 8 workers x 2 days)	$16,000.00
Training (40min footage @ $300/min)	$12,000.00
weBoost Office 200 Signal Booster Kit	$1,699.99
Paessler PRTG Network Monitor	$12,000.00
Total Estimated Cost (excluding taxes):	$64,570.41
Funds Remaining:	$35,429.59

Figure 4

Budget Reasoning

Matador's Shipping total network upgrade cost was calculated based on the need of items, and based on what is reasonably priced and efficient for the office. The main goal for Matador's Shipping was to provide them with an uninterrupted service and reliable network. There shouldn't be a need to get the best high end hardware available if we could get something cheaper that might not perform as well but still gets the job done. An overhaul will be done on the current system by replacing current cables, getting more servers, routers, and switches to keep everything connected. Both the software and the hardware acquisition cost is included in the budget sheet.

Hardware Acquisition

In regards to the hardware aspect, the switches that the office will be utilizing are powerful and can handle growth as well if the office were to expand. A great pro is that it offers enhanced thermal efficiency and it has a faster boot time with UEFI Secure Boot. It is great for file, print, mail, messaging, point of sale, web hosting, and collaboration. The APC Smart-UPS was chosen for the office because it has an LCD display for easy configuration, 8 outlets and monitoring flexibility for cloud monitoring. It has trusted protection and reliability. The TeSmart 16 port KVM switch was chosen for Madator's Shipping because it can monitor 16 computers all while using only 1 keyboard set which includes a mouse and a display. Matador's Shipping will also use Ubiquiti Unifi Security Gateway which features enhanced security and sophisticated routing features.

Cisco ENCS was chosen for Matador's Shipping because it is reliable and Matador's Shipping can easily visualize their network if needed. It is powerful and has exceptional routing performance. The TP-Link router has extensive and reliable WiFi coverage, quad core processing, and has 8 Gbps speeds. The current cables will be replaced in the building with updated ones rather than using the existing 10BaseT and switched 100BaseT LANs with CAT 7 4XEM cables. Matador's

Shipping will also have a cell phone signal booster in the office. The weBoost cell phone signal booster will provide the office with speedy data speeds, reliable and uninterrupted phone calls, and strong connectivity.

Software Acquisition

For the software aspect, Matador's Shipping will be using a monitoring system to make sure everything in the office is running smoothly. The monitoring system will be Paessler PRTG Network Monitor. There are a few pros for using this system. A CPU load sensor and a memory sensor will be able to use SNMP to check the capacity and monitor each switch to see if it is being properly utilized. It is also able to perform bandwidth analysis and it measures traffic by using NetFlow and sFlow to see the throughput at each and every switch, which in result, will help us identify which switches are causing bottlenecks in the network. Existing servers and computer resources will also remain as they are adequate to perform their functions.

Report Narrative

Figure 1 & 2: Figure 1 on page 5 and Figure 2 on page 6 shows our design for how the new network is going to be designed. It shows various images of servers, switches, computers and printers all being connected to one another.

Figure 3: Figure 3 on page 7 shows a closer in depth view of our network and of how two departments can be connected to the same switch to save money rather than having a switch for each department when one can be shared for smaller departments.

Figure 4: Figure 4 on page 9 shows our budget with various different things like servers, switches, cables and routers all with their prices and the total calculated cost for everything needed to be implemented into the current system.

References

Links for items in budget sheet:

Cat8 Shielded Riser (CMR) - 40Gb, 22AWG, 2000MHz, S/FTP, Solid, Bulk Networking Cable (1000FT):
https://infinity-cable-products.com/products/cat8-cmr-riser-40g-22awg-2000mhz-s-ftp-solid-1000ft-bulk-networking-cable?variant=28328398553175&currency=USD&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&utm_campaign=gs-2021-10-01&utm_source=google&utm_medium=smart_campaign&gclid=Cj0KCQiA99ybBhD9ARIsALvZavWBK77uI6fZ-cP-QYJMqxu3CUVdAJD5jJlh63zOFDtkbZ7oej4btBQaAgnFEALw_wcB

weBoost Office 200 Cell Signal Booster Kit:
https://www.signalboosters.com/weboost-for-business-office-200-signal-booster-kit/

PowerEdge R250 Rack Server
https://www.dell.com/en-us/shop/enterprise-deals/poweredge-r250-rack-server/spd/poweredge-r250/pe_r250_15318_vi_vp

APC Smart-UPS 3000VA SmartConnect Port Sinewave 2U Rackmount, LCD, 120V:

https://www.cdw.com/product/apc-smart-ups-3000va-smartconnect-port-sinewave-2u-rackmount-lcd-120v/4894882?gclid=CjwKCAiAhKycBhAQEiwAgf19eqvqbZ5fQDl6CLmyYdzeP1dco_MNSuJVV1NfbVYht8dumRT9-2__iBoCRvYQAvD_BwE&cm_ven=acquirgy&cm_cat=google&cm_pla=NA-NA-APC_BA&cm_ite=4894882&ef_id=CjwKCAiAhKycBhAQEiwAgf19eqvqbZ5fQDl6CLmyYdzeP1dco_MNSuJVV1NfbVYht8dumRT9-2__iBoCRvYQAvD_BwE:G:s&s_kwcid=AL!4223!3!492072829374!!!g!389718407483!!209521579!115273157966

16 Port HDMI KVM Switch 4K30Hz Support RS232/LAN Control:
https://www.tesmart.com/products/tesmart-kvm-hdmi-switch-4k-uhd-3840x2160-30hz-16x1-16-in-1-out-kvm-hdmi-switcher-box-with-rs232-lan-16-port-hdmi-kvm-switch?gclid=CjwKCAiAhKycBhAQEiwAgf19eiLyTeU1Rwbmeh0ZrPj0Pe-o62rvmqZkiRT6potlW3faCOPkDNMWIBoClHsQAvD_BwE

Ubiquiti Unifi Security Gateway:
https://store.ui.com/products/unifi-security-gateway

Cisco ISR4331/K9 4331 Integrated Services Router
https://www.serversupply.com/NETWORKING/ROUTER/3%20PORT/CISCO/ISR4331K9_224285.htm?gclid=CjwKCAiAhKycBhAQEiwAgf19eh6Doau9jZAcZqIUcb4XwB9oZXZ4aAe9Mc4HbHmYFFJHbEUdMrKGxxoCWUAQAvD_BwE

Cisco SG350-10MP-K9 Managed L3 Switch 8 PoE+ Ethernet Ports:
https://www.serversupply.com/NETWORKING/SWITCH/10%20PORT/CISCO/SG350-10MP-K9_325418.htm?gclid=CjwKCAiAhKycBhAQEiwAgf19eq2S2TP6KDcBV23XMojeRTlhXCCZAoOnK6Jvg3jmugfi9TtNZ5ThABoC-AAQAvD_BwE
TP-Link AX1800 WiFi 6 Router
https://www.amazon.com/WiFi-6-Router-Gigabit-Wireless/dp/B08H8ZLKKK

Paessler PRTG Network Monitor:

https://www.paessler.com/prtg/prtg-network-monitor

Network Designer Cost
https://www.salary.com/research/salary/alternate/network-engineer-expert-consultant-hourly-wages#:~:text=The%20average%20hourly%20wage%20foraNetwork,falls%20between%20%2461%20and%20%2473.

Cost of Training Videos
https://elearningindustry.com/how-much-corporate-training-video-cost

Network Installation Cost
https://www.forbes.com/home-improvement/internet/ethernet-installation-cost/#:~:text=Average%20labor%20rates%20per%20hour,the%20size%20of%20your%20network.

CAT 7 LAN Cable 2000 FT
https://www.cdw.com/product/4xem-bulk-cable-1000-ft-black/7131727?pfm=srh

RJ 45 Connector Pass Through Connectors for CAT 7
https://www.amazon.com/Through-connectors-Shielded-Performance-Ethernet/dp/B07PLP2V9K