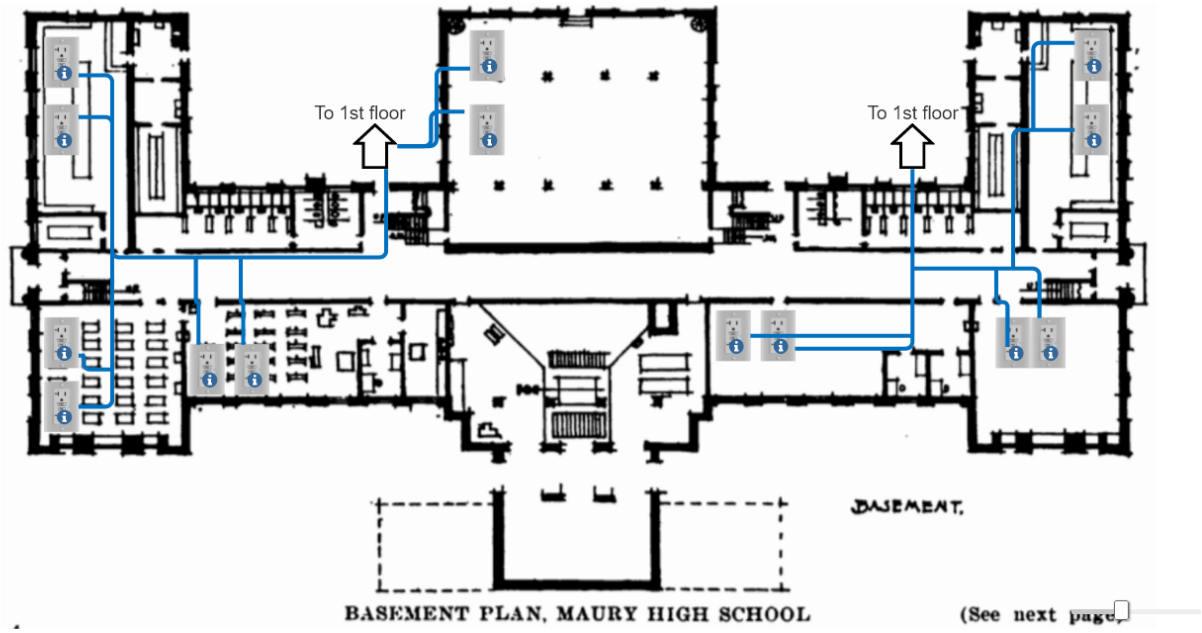
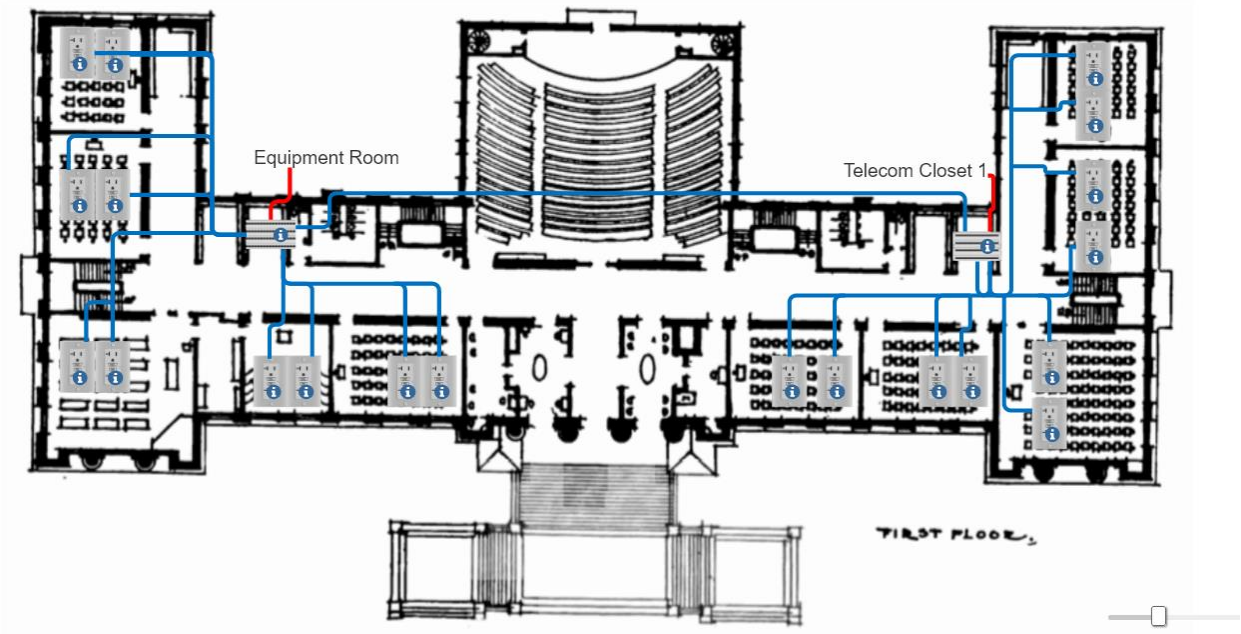
Case Analysis

Part 1: (25 points) A plan and budget for the wiring of the building that includes an estimated total of the cable runs to each room and between the equipment room and the telecomm closets, along with an estimate of the total amount of cabling needed.

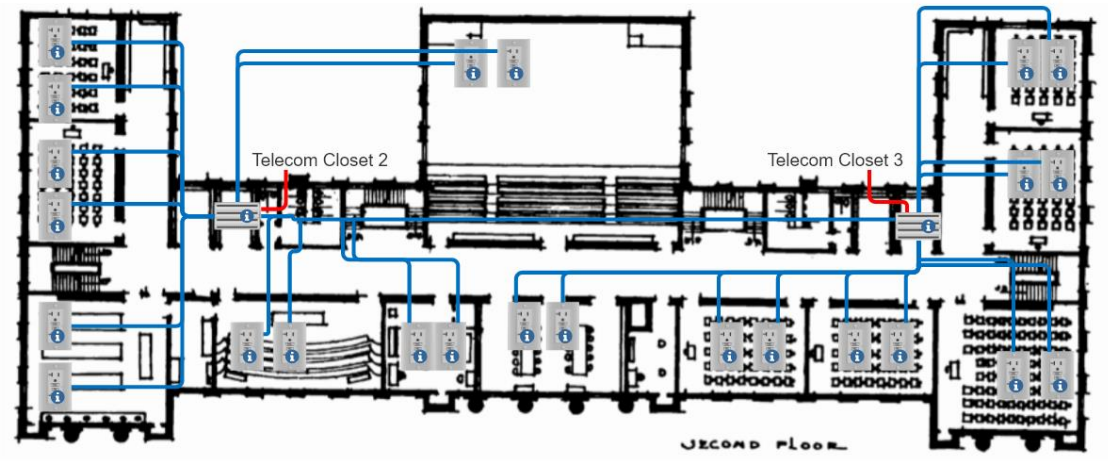
Basement



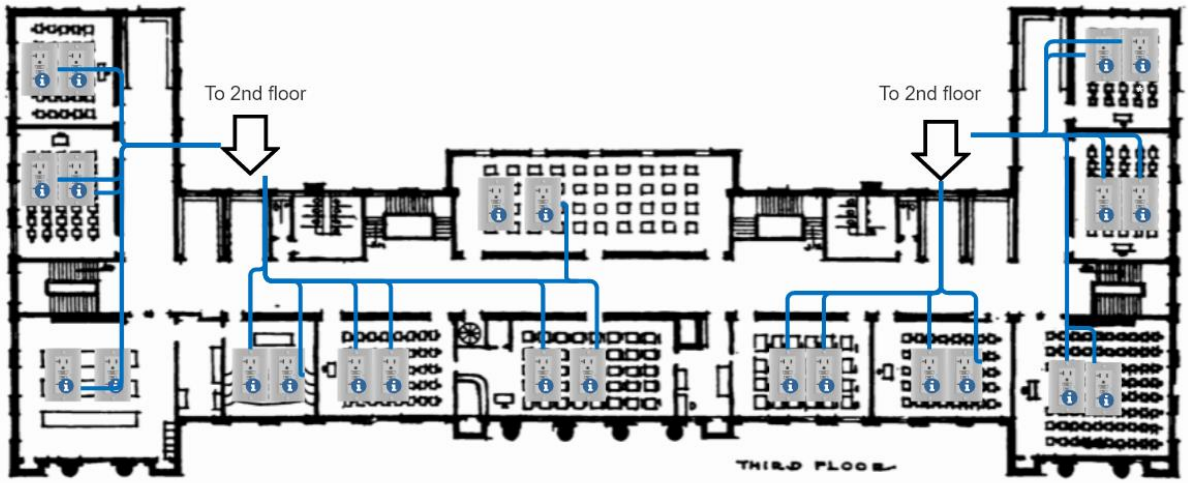
1st Floor



2nd Floor



3rd Floor



Estimate of the total amount of cabling needed:

Equipment Room: Connects to 9 offices/classrooms with 2 outlets each (18 cables) and connects to 3 telecom closets (64 cables) for a total of 82 cables. The longest cable run is 190ft and the shortest cable run is 37.5ft. The longest cable run that does not lead to a telecom closet is 165ft. Because the majority of these cables led to a telecom closet, I calculated my estimate of those separately. The cables leading to one of the three telecom closets add up to an estimated 15,580ft. The average length of cable between a classroom/office and the equipment room multiplied by the number of classrooms/offices is 1,822.5ft. The combined total is 17,402.5ft of cable.

Telecom Closet 1: Connects to 8 offices/classrooms with 2 outlets each (16 cables) and connects to equipment room (16 cables) for a total of 32 cables. 16 of those cables are included in the estimate for the equipment room. The longest cable run from the telecom closet to an office/classroom is 125ft. The shortest cable run is 25ft. The total estimated cable length for the telecom closet is 1,200ft.

Telecom Closet 2: Connects to 13 offices/classrooms with 2 outlets each (total of 26 cables) and connects to equipment room (26 cables) for a total of 52 cables. 26 of those cables are included in the estimate for the equipment room. The longest cable run from the telecom closet to an office/classroom is 150ft. The shortest cable run is 37.5ft. The total estimated cable length is 2,437.5ft.

Telecom Closet 3: Connects to 11 offices/classrooms with 2 outlets each (22 cables) and connects to equipment room (22 cables) for a total of 44 cables. 22 of those cables are included in the estimate for the equipment room. The longest cable run from the telecom closet to an office/classroom is 110ft. The shortest cable run is 25ft. The total estimated cable length is 1,485ft.

Grand total cable length: 1,822.5ft for equipment room to classroom/office connections, 15,580ft for connecting managed switches together, 1,200ft for telecom closet 1, 2,437.5ft for telecom closet 2, 1,485ft for telecom closet 3 = 22,525ft of cable.

Pricing:

Bulk Solid Cabling: https://www.cablestogo.com/networking/ethernet-cables/cat6-cables/1000ft-304-8m-cat6-bulk-unshielded-utp-ethernet-network-cable-with-solid-conductors-riser-cmr-rated-taa-compliant-black/p/cg-56027 Cat6 Bulk Unshielded (UTP) Ethernet Network Cable – 23 at $419.99 per 1000 feet = $9,659.77

Face Plates: https://www.amazon.com/Ethernet-Single-Female-Coupler-Faceplates/dp/B08NJYYSF1/ref=sr_1_3?keywords=cat6%2Bwall%2Bplates&qid=1701508260&sr=8-3&th=1 4 Pack Ethernet Wall Plate with Single Port (Standard Size Faceplate & RJ45 Cat6 Jack) – 2 plates needed per classroom. 41 classrooms requiring 82 wall plates. 21 4-packs at $12.99 each = $272.79

RJ45 connectors: https://www.amazon.com/CableCreation-100-PACK-Connector-Connectors-Transparent/dp/B01K9Z4FT2?th=1 Cat6 RJ45 Ends, 100-PACK Cat6 Connector – 146 total cables, 292 connectors required. 3 packs of 100 at $13.97 each = $ 41.91

Patch Panels: https://www.newegg.com/black-monoprice-107253-patch-panels/p/0N6-01B8-00240 24-Port Cat6 Patch Panel. 4 needed for equipment room, 2 for telecom closet 1, 3 for telecom closet 2, 2 for telecom closet 3. Total 11 at $30.76 each = $ 338.36

Total cost for this part: $10,312.83

Part 2: (15 points) A plan and budget of where and what equipment is needed to support an Ethernet network that connects all of the rooms in Maury High School, including patch cables and managed switches.

Core Switch: https://www.serversupply.com/NETWORKING/SWITCH/96%20PORT/CISCO/N3K-C31128PQ-10GE_254506.htm Cisco N3K-C31128PQ-10GE Nexus 31128PQ - Switch - 96 ports - Managed - rack-mountable – 1 for the equipment room at $2,650.00

Managed switches: https://www.linksys.com/24-port-managed-gigabit-ethernet-switch-with-4-10g-sfp-uplinks-lgs328c/LGS328C.html 24-Port Managed Gigabit Ethernet Switch - 4 for equipment room, 2 for telecom closet 1, 3 for telecom closet 2, 3 for telecom closet 3. Total of 12 at $249.95 each = $2,999.40

Crossover patch cables: https://www.amazon.com/Orange-Ethernet-Crossover-Snagless-Molded/dp/B000I21WMK?th=1 Cat6 Ethernet Crossover Cable required to connect switches together. 82 needed to connect to the core switch at $5.75 each = $471.5

Straight-through patch cables: https://www.amazon.com/Ethernet-Network-Patch-Cable-Black/dp/B002024KSE?th=1 7 Ft (7ft) Cat6 Ethernet Network Patch Cable Black 10 pack - 82 needed for equipment room, 32 for telecom closet 1, 52 for telecom closet 2, 44 for telecom closet 3. Total of 210 required. 21 10-packs at $72.49 each = $1,522.29

Total cost for this part: $7,643.19

Part 3: (10 points) A plan and budget for securing network traffic within Maury and to the Internet, including a firewall that supports 200-300 users. Your plan should include a network diagram with separate subnets/VLANs to separate staff traffic from student traffic. Your firewall should be able to allow and block traffic from any internal subnet or address to any Internet subnet or address. Indicate the sources of your pricing information.

Because the offices, classrooms, or miscellaneous rooms such as bathrooms were not labeled on the diagram, I assumed that any room that I included in the network with a clear podium and group of circles that resembled a desk and chairs was a classroom, and any other room included was an office. Any other room looked to me like it was too small to work as an office or classroom or resembled a room that would have a different purpose (e.g., I did not include the auditorium, bathrooms, or similar rooms in the diagram.)

Equipment Room: Connects to 6 offices and 3 classrooms.

Telecom Closet 1: Connects to 3 offices and 5 classrooms.

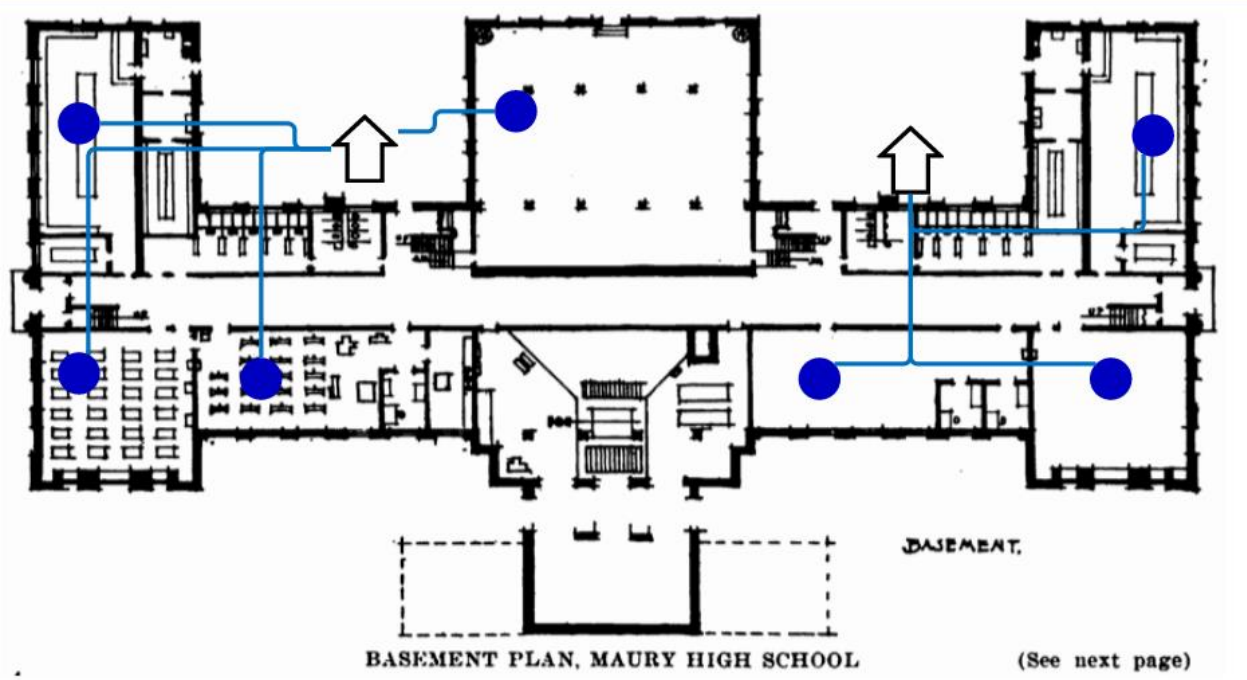
Telecom Closet 2: Connects to 6 offices and 7 classrooms.

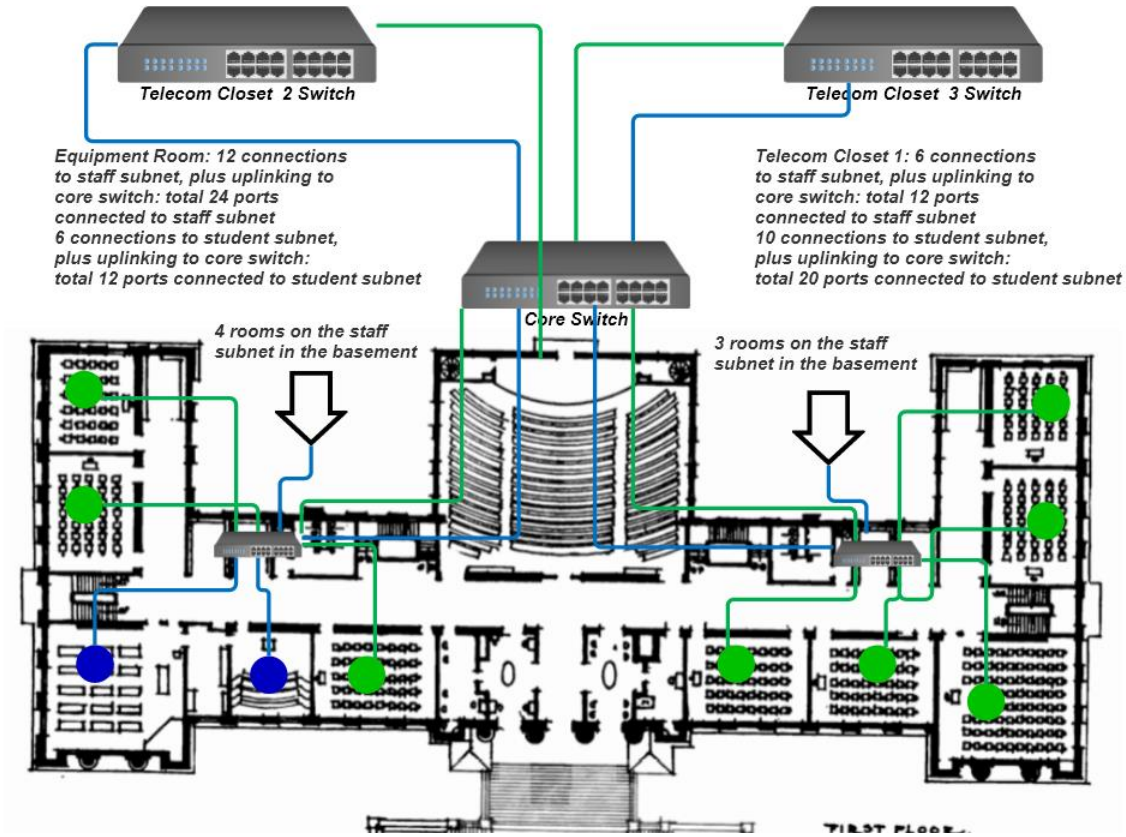
Telecom Closet 3: Connects to 1 office and 10 classrooms.

Total: 16 rooms on staff subnet, 25 on student subnet. 32 total connections to staff subnet, 50 to student subnet.

Blue: Staff subnet

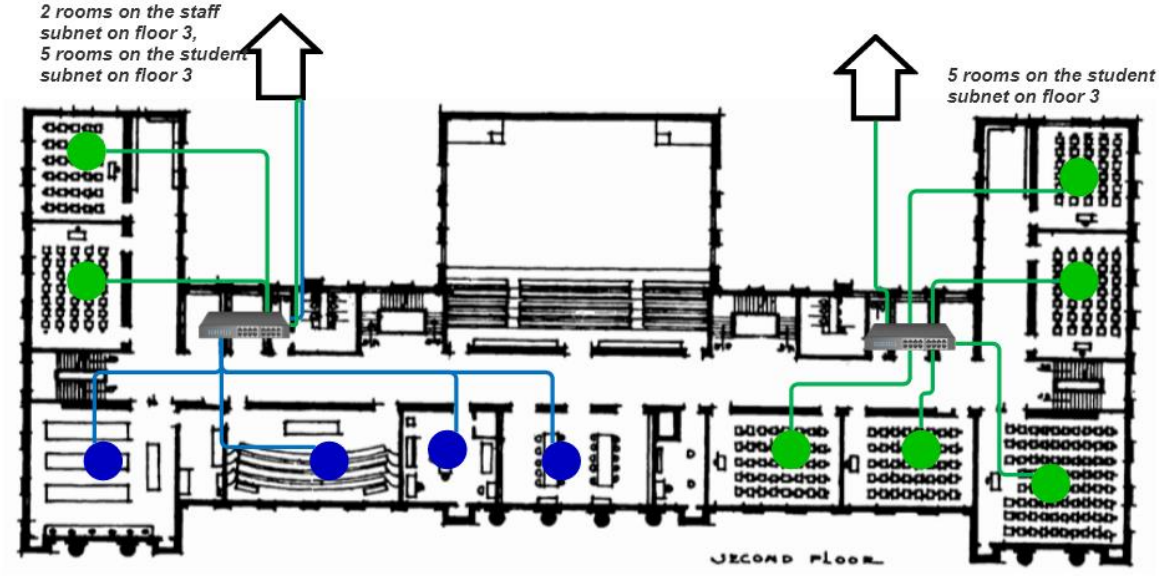
Green: Student subnet

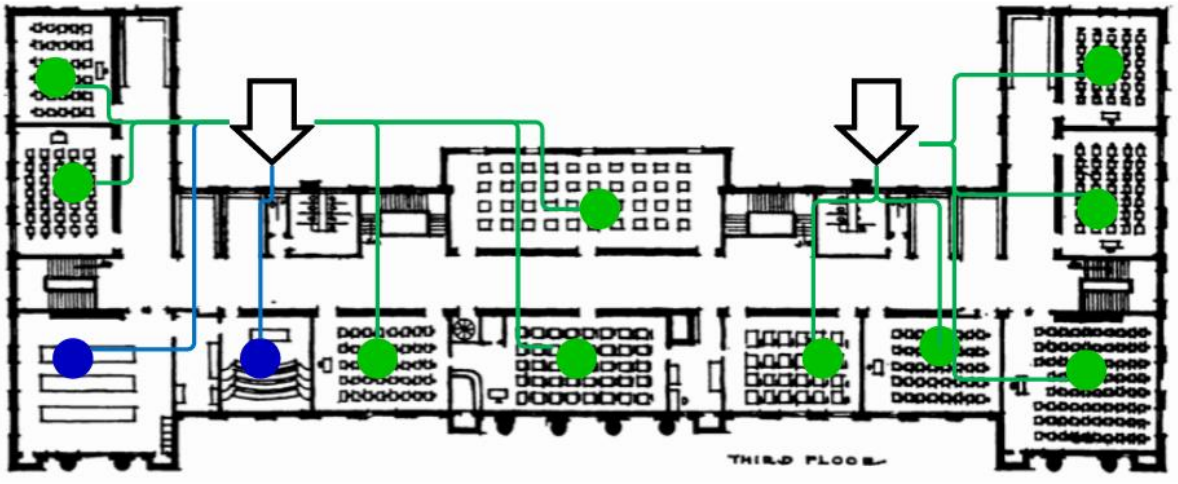




Telecom Closet 2: 12 connections to staff subnet, plus uplinking to core switch: total 24 ports connected to staff subnet
14 connections to student subnet, plus uplinking to core switch: total 28 ports connected to student subnet

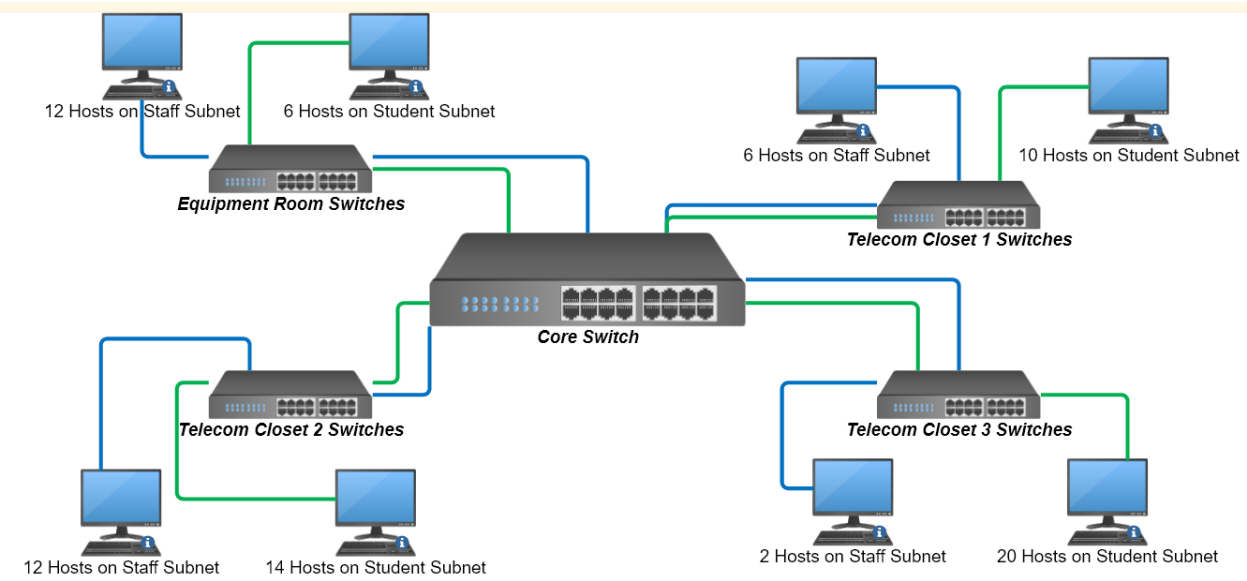
Telecom Closet 3: 2 connections to staff subnet, plus uplinking to core switch: total 4 ports connected to staff subnet
20 connections to student subnet, plus uplinking to core switch: total 40 ports connected to student subnet





Equipment Room: 12 connections to staff subnet, plus uplinking to core switch: total 24 ports connected to staff subnet; 6 connections to student subnet, plus uplinking to core switch: total 12 ports connected to student subnet
Telecom Closet 1: 6 connections to staff subnet, plus uplinking to core switch: total 12 ports connected to staff subnet; 10 connections to student subnet, plus uplinking to core switch: total 20 ports connected to student subnet
Telecom Closet 2: 12 connections to staff subnet, plus uplinking to core switch: total 24 ports connected to staff subnet; 14 connections to student subnet, plus uplinking to core switch: total 28 ports connected to student subnet
Telecom Closet 3: 2 connections to staff subnet, plus uplinking to core switch: total 4 ports connected to staff subnet; 20 connections to student subnet, plus uplinking to core switch: total 40 ports connected to student subnet
Core Switch: 32 ports connected to staff subnet, 50 ports connected to student subnet.
Total: 96 ports across all switches should be configured to connect to the staff subnet with the vlan. 150 ports across all switches should be configured to connect to the student subnet with the vlan.

Subnet Diagram:



Firewall: https://www.firewalls.com/fortinet-fortigate-90g-8-x-ge-rj45-ports-2-x-10ge-rj45-sfp-shared-media-wan-ports.html?srsltid=AfmBOorCruVSRrn5N0xxLFkesZdixLzgqNt1QNV5EgcW86SwSgnvziRxSSY

Fortinet FortiGate 90g Firewall FG-90G

Firewall supports 201-500 users.

$1,677.00

Grand total price for Maury High School: $10,312.83 + $7,643.19 + $1,677.00

= $19,633.02