
2023 Midwest Collegiate Computing Conference Network Design Competition

**Do not put your name(s) or your school's name on anything that you submit.
Doing so will result in disqualification of your team.
The only identifying information you should use is your team number.**

The Southwest Michigan Medical Center, located in Kalamazoo, MI is looking to upgrade some of its legacy systems along with upgrading its network architecture. The primary hospital in Kalamazoo has two satellite clinics located in South Haven, MI and Three Rivers, MI. The Three Rivers location is a newly built facility that will be opening its doors in 2024.

The SWM group has 2,500 employees, 500 beds, a 24hr emergency room, and sees around 35,000 patients per year. The patients will also have visitors which can be counted by approximately 2 visitors per person. The infrastructure includes 1,500 networked devices in total which comprise of end devices such as workstations, servers, access points, routers, and additional medical equipment that are part of the network. The guest network should be rated to handle 35,000 devices over the course of the year with an average connection time of less than 8 hours, plan accordingly. Their entire network will need to be updated by the year 2026.

Your team's job will be to test and roll out separate phases of the network upgrade. You'll primarily focus on the first deployment phase in this project. This phase will include creating a new three-tier hierarchical model for the primary backbone of the hospital. However, your team may find another model more efficient. The SWM data center houses core network equipment and servers on the 2nd floor. There is one switch closet for each of the hospital's six floors. These closets will act as your access layer IDFs and house switches and telecom equipment. The switches in these closets will need to be upgraded to support 40Gb uplinks to the distribution layer located in the data center. Built-in redundancy is a must. The distribution layer will need to be upgraded along with the core layer. The hospital is run in a Microsoft Windows environment, with some Linux servers. There will need to be a solution to host a backup domain controller in the cloud along with active directory unless a better solution is provided. DHCP and local DNS are currently hosted in the data center in the hospital.

The two satellite clinics will need a secure solution to communicate back to the data center for patient information and other processing needs.

When designing the network, consider the following:

- The SWM network is hosted on 150.10.x.x.
- 1,500 networked devices in total =
 - 1,000 Workstations used by SWM staff
 - 100 servers
 - Medical equipment, such as X-ray machines, scanners, lab equipment, etc., is live on the SWM network.
 - Consider access points hosting any number of visitors to the facilities.
- 35,000 wireless guest devices with an average connection time of less than 8 hours.
- There are currently L2 switches in the access layer and L3 switches in the Distribution layer.
- The hospital is currently using Cisco ASA appliances for their firewalls; however, they do not want to continue to do so unless the team provides a strong recommendation. There's a significant push from IT management and the board of governors to upgrade security in both east-west traffic and north-south traffic.
- With all the above in mind, network segmentation and access control must be used.
- Ensure all devices communicate properly while minimizing address space and maximizing network efficiency.

In addition to the network backbone needing to be upgraded, your team is tasked with finding a new vendor for the SWM wireless network. The rollout of this new wireless network will be tested on the 4th floor of the hospital. Each floor is approximately 300,000 sq. ft. Once testing is complete, this will be added to the remaining floors and satellite clinics. Your team's responsibility is to spec out and configure the new wireless network. The 4th floor of the hospital is depicted below. Place your access points in the best location possible. List what security protocols you will be using, channels, and type of AP along with any other information you find important. It will be important to remember to include a secondary wireless network for guests. This should be separate from your primary wireless network, and still follow the best security practices. You can overlay your design onto the current floor plan below:



The board of governors is also concerned with ransomware targeting the hospital. There will need to be a solution in place to mitigate such attacks.

When your project manager submits the cost analysis to the board of governors, be sure to provide the vendors used in the upgrade, specific model numbers, and a detailed cost of equipment, software, and licensing needed to satisfy the requirements of the upgrade. In addition, include all proposed documents, spreadsheets, and topology designs in your submission. All documents must have your team's number on them.

Any solution that does not provide accurate citing of professional resources will be removed from consideration.

Examples include any of the following:

- Copying and pasting diagrams and images from a website
- Using descriptions and product data verbatim from source
- When in doubt, cite your source

Good Luck!