Engineering and Technology Building

Network Design Project

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California State University, Los Angeles

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Professor Liuliu Fu

Presented By:

Group 1

Angel Contreras

Jason Ceja

Waley Chan

Mariella Cruz

Vinh Chau

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Introduction

When implementing a new network, it is crucial to recognize environmental and architectural constraints before implementing a new network infrastructure because of their potential influence on the network design. Recognizing these constraints plays a crucial role in the development of this network, ensuring the proposed network's goals are aligned with the building structure. This will lead to a more efficient development process and ensure compliance with the building and its structure. The ability to recognize these constraints during the early stages of the process will help minimize the cost of the project and prevent delays, which will prevent issues that arrive from being behind schedule.

Business goal for the project

The goal of this project is to plan and set up an advanced and innovative network system for California State University, Los Angeles's Engineering and Technology building. As further of the goal of the project, it aims to help students, teachers, and staff with any of their work including their school work, research, and administrative needs by giving the whole building a reliable, fast, and safe internet access. This advanced of a network system will make and help studying easier, having a much better time when researching or gathering any information online without facing any corrupting issue such as internet lag; It will also make school and work operation much more faster and efficient, as well as setting the stage for future growth as the university continues to improve and adapt to new technology.

For reliable performance and the ability to adapt to any changes in needs, the suggested network design will use a very well designed internet cable along with other technologies. Crucial parts include a fiber-optic cable for fast connection, Wi-Fi 6E access points for smooth and stable wireless connections, and Cisco Catalyst 9600 switches for flexible and customizable network capacity and quick data handling and analyzing. There will be a reliable network that can support many people and devices, like computers in the classroom, printers, and administrative systems as to fit the intention of this project is to create a safe and fast working environment for any person in the Engineering and Technology building. With the goal of also being flexible enough to accommodate new applications and higher bandwidth needs in the future.

Regulation and safety rules such as LA's Article 3 and and Article 80 Electrical code of California, are very important to this project. Making sure that the approach meets the highest safety standards is extremely crucial. Building and transportation issues will be also taken care of, including how each and every single classroom is set up, how wires are routed, getting rid of old cable management systems and adapting to a new strategy of routing the wires. Because the project needs to go as smoothly as it possibly can, it will be carefully planned, organized and executed with university stakeholders to make sure that it fits with the academic calendar. This will make the implementation phase less stressful for the students and the staff.

The network design will come with a very detailed and very well structured plan that includes the logical and physical layouts, prices, and a schedule for putting the plan into action in stages. There will be success metrics set up to measure the network's performance, dependability, safety and ability to grow post-implementation. With the goal of making sure that everything is undercontrolled,met and adapted to any new technologies and user needs.

By using a modern, fast-reliable internet, this project aims to help the university to create a more flexible learning environment for any upcoming or current students attending the Cal State University, Los Angeles in general and for the staff, professor and student working in the Engineering and Technology specifically by giving them a safe and fast network access to fit their needs. Beside that, this project also aims to lower the long-term cost and damage to the environment showing that the university is dedicated to being environmentally and budget friendly.

This project will not only advance the Engineering and Technology building networking system but also ensure the adaptability to any new technologies, operations or programs in the future. Making sure that each and every single student will have the best, safe and fast internet to finish any school work and ensure a safe working environment for the professor and staff also.

Scope of the project

This project is all about designing, implementing and testing a new network system for the Engineering and Technology Building at California State University, Los Angeles with the goal of creating a safe, fast and reliable network for any students, staff and professor in helping them finish any administrative, and school work which includes:

1. Gathering informations:
    - Holding any meetings the stakeholders, faculty, IT staff and administration to gather and analyze any information about the current state of the building network and how to improve or implement a new networking system.
2. Designing and planning:
    - Taking a look at how the building is structured, and how the wire would be routed.
    - Researching and selecting the right hardware such as, fiber-optic cable, a Wifi 6 or 6E or 7 access point and the switches (Cisco Catalyst 9600).
    - Developing a plan that the new hardware could fit into how the building is structured and have room for future improvements.
3. Implementing:
    - Making sure that when replacing or installing any new hardware, it doesn't interfere with the student study schedule.

- Replacing old cables and making room for new hardware.
4. Connecting and replacing cables:
    - Fiber-optic cables should be used instead of old cables, and Wi-Fi 6E access points should be put in classes, offices, and common areas.
    - Set up and set up Cisco Catalyst switches to handle data easily and connect quickly.
    - Making sure that all devices like printers and computers will be connected to the new network system.
5. Testing the new network:
    - Making sure that everything runs smoothly, no lags or delays.
    - Meet the board, students, staff and professor needs of the new network.
6. Improving and maintaining the system:
    - Making sure that the IT teams have the training needed to keep updating the network, fixing any problems, or preventing any hackers from hacking the building network.
7. Feedback and room for improvements:
    - Create any polls or ways to interact with the students,staff or professor using the new network system weekly or monthly to make sure that everything runs smoothly.
    - Use tools for analytics and reporting to find trends and make choices about improvements based on the gathered information.
    - Review system goals on a regular basis to make sure they are still relevant to the university's changing needs and new technologies.

Information on Applications

Operating System Installation

Windows Server 2025 Enterprise edition was installed on the server.

Microsoft Windows Server 2025 prepares you for tomorrow while delivering the security, performance, and flexibility you need today. Be more productive with easier networking, faster storage, and hybrid cloud capabilities that adapt to your needs. Get ahead of what's next with forward-looking security, and AI-ready compute.

Windows 2025 Server
- $729.99
- Available/In Stock
- 5 Licenses included, Full Version
- Maintained by Computer Services as needed

Key Features:
- **Hybrid:** Adapt quickly across hybrid, cloud and on-premise. Easier to connect to Azure Arc to bridge on-premises and cloud-based servers. Deliver Azure capabilities to your on-premises servers.
- **Security:** Hardware and software-level security to deter cyberattacks; next-generation Active Directory that improves security and scalability. Enable a tailored security baseline and configure drift protection from the start.
- **Modern,** future-ready platform: Windows Server 2025 is now easier to upgrade and scale, with better-than-ever app compatibility. Windows Server 2025 desktop brings a consistent client and server UI experience, plus conveniences like WiFi and Bluetooth.
- **Performance:** Faster and easier networking and storage; live hotpatching for reduced downtime; GPU partitioning for inferencing at the edge. Improvements in flash-based storage make Windows Server an even better platform for SQL Server.

Details:
- Host requires a minimum of a 16-core license
- Includes Hyper-V and activates one physical server and two virtual machines
- Requires Client Access Licenses (CALs) for users accessing the server
- License is based on the number of physical cores on the server

Active Directory Domain Services
First active directory was installed on the server.

Floorplan of 2nd Floor (Engineering & Technology Building)

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Technical Requirements

Since budget is not an issue for this project, I will max out and purchase some top-notch gadgets.

 The Engineering and Technology Building is roughly 77,232 square feet. source:Google Earth

Bandwidth:

·   Every single cable in the building will be replaced with fiber optic cables, to handle all of the devices in the building. There are approximately 25 computers in each classroom and over 25 classrooms per floor with a total of 6 floors.

·   Access Points (Wi-Fi) Wi-Fi 6E will be implemented in all of the classrooms to provide fast and reliable internet connections for staff and students.

Network Infrastructure:

·   Cisco Catalyst 9600 will support 10 Gbps or higher

·   Access Point: each classroom will get their own AP (Wi-Fi 6E) to guarantee stable and fast wireless connection throughout the entire building

·   All of the end devices, desktops, printers, and phones in the classroom will use fiber optic cables.

Cable Types

- **Fiber Optic Cables:**

- - **Single-mode fiber optic cables will be used for all backbone connections (between core and distribution layers, and between floors). This allows for high-speed, long-distance data transfer without signal degradation.**

Network Infrastructure

- **Core Network**:
  - Use switches such as **Cisco Catalyst 9600**

Environmental or Architectural Constraints

Building Overview and Infrastructure Consideration

      The Engineering and Technology building's primary use is to support engineering and CIS students. Within the building, the courses offered focus on hands-on work over theory; its goals focus on students' development and prepare them with the skills needed for success in today's fast-paced industry.

      The building is a two-story structure; the second floor consists of four primary pathways. The building contains multiple classrooms, offices, and restrooms. There are five exits: two stairwell exits towards the east side of the building, one elevator exit and stairwell exit towards the west end, and one towards the south end of the building. Fire extinguishers and fire alarm pull stations are all near the designated stairwell exits and elevator exits.

      Multiple classrooms within the Engineering and Technology building contain computers for the students; with a rough estimation of 25 computers in each class. The computers are set up in rows, which means there is limited access across the middle for any network infrastructure design. All classrooms contain a desk and table at the front of the classroom for professors; however, it can be moved if needed to accommodate the plans. Many of the rooms have accessible pathways through the sides. Many of the rooms have multiple outlets, spread out evenly throughout. There should not be issues in terms of access to power. The building's hallways offer plenty of space, and congestion within them shouldn't be an issue. This space can be useful for storage and transitioning of equipment due to its accessibility to multiple classrooms and offices.

Current standards, implementation challenges, and proposed solutions

The engineering and technology building has a respectable foundation. The cable management within the building can be used or improved. In the classrooms, the wires running throughout the rooms are protected and do not cause issues for the students and staff in normal day-to-day activities. However, a significant amount of the wire is under cable path tape. Which will require proper and safe removal before establishing the new network design in the building. The cable management within the building is effective, and using the wiring routes could be rather effective and timely efficient. It is important to have proper cable management or receive specific approval that open wiring is okay to ensure compliance with LA's Article 3 Electrical Code, which states, "For any parts of the Code that allow open or exposed live electrical parts (wiring or systems) or allow access to these systems by qualified people, special permission must be given each time."

Most notable hardware within each room, such as the routers, projectors, and access points, are attached to the roof. They will not cause any type of issues during the implementation of the new network. They will only require removal.

The computer hardware within each of the classrooms may provide challenges because of the high quantity in each room. It is recommended to plan accordingly a strategy with the obstacles in each room or to plan the possibility for temporary removal of computer hardware if needed.

To ensure efficient time and resource management. It is crucial to plan accordingly with the campus of California State University, Los Angeles. To minimize as much as possible the number of disruptions occurring throughout the installation. It is recommended to plan with the school a time frame when classes are not happening. This will significantly reduce the amount of foot traffic in the building, which will lead to less disruptions.

Proper communication between the project team and school is also important when establishing the safety standards that want to be enforced. This is crucial because of LA's Article 3 Electrical Code, which states, "1. If there are two or more rules about safety and they're different, the rule that offers the highest level of safety will be the one that gets followed. This means prioritizing whatever rule best protects people, property, and public welfare. 2. The *Superintendent of Building* (essentially, the person in charge of building code enforcement) has the authority to decide what each rule in the code means and how to apply it.". Effective communication with the campus and the person in charge of the building will prevent any type of delays because of knowing the goals of the building safety prioritization and what the campus may prefer.

Conclusion

The Engineering and Technology building is an important building on this beloved CSU campus. It has a significant impact on students enrolled in the engineering and CIS programs offered. The skills and knowledge that are learned within the building are important for not only the students themselves but for those who they can make an impact on. Which is why ensuring the process for the new network design running smoothly is important. The current infrastructure

within the building has efficient cable management and wiring routes that can be used. It contains accessible hardware, which will lead to easier removal if needed.

  Key challenges to consider during this process are the high quantity of computers that may need removal, cable path tape removal from the wiring, and possible disruptions such as foot traffic.With these things considered and proper coordination between the campus and project team. I believe this project can be completed efficiently and on time.

Preliminary Schedule

Phase	Task	Duration	Start Date	End Date
Phase 1: Project Initiation	Define project scope, goals, and requirements.	1 week	Week 1	Week 2
Goal 1	Assign roles to team members.	1 week	Week 1	Week 2
Goal 2	Conduct initial research on the building layout and constraints.	1 week	Week 1	Week 2
Phase 2: Data Collection	Measure dimensions of the floor/building and collect room data.	1 week	Week 2	Week 3
Goal 1	Inventory current hardware, software, and devices.	1 week	Week 2	Week 3
Goal 2	Identify user needs and specific	1 week	Week 2	Week 3

	application requirements.			
Phase 3: Logical Design	Develop logical network topology and VLAN structure.	2 weeks	Week 3	Week 5
Goal 1	Plan IP addressing and subnetting.	2 weeks	Week 3	Week 5
Goal 2	Define network protocols and security configurations.	2 weeks	Week 3	Week 5
Phase 4: Physical Design	Create a layout for device placement (switches, routers, WAPs).	2 weeks	Week 5	Week 7
Goal 1	Determine cabling and power requirements.	2 weeks	Week 5	Week7
Goal 2	Evaluate environmental or architectural constraints.	2 weeks	Week 5	Week 7
Phase 5: Budget & Cost Analysis	Research hardware, software, and installation costs.	1 week	Week 6	Week 7
Goal 1	Prepare cost estimates and budget breakdown.	1week	Week 6	Week 7
Phase 6: Implementation Plan	Develop a step-by-step deployment strategy.	1 week	Week 7	Week 8
Goal 2	Define testing and	1 week	Week 7	Week 8

	validation procedures.			
Phase 7: Documentation & Submission	Compile design document, including all diagrams and justifications.	1 week	Week 7	Week 8
Goal 1	Review and finalize submission.	1 week	Week 7	Week 8

Acceptance and Authorization

The terms and conditions of the Professional Services Agreement apply in full to the services and products provided under this Statement of Work.

IN WITNESS WHEREOF, the parties hereto each acting with proper authority have executed this Statement of Work, under seal.

Group 1   California State University Los Angeles

_____   _____

Full Name   Full Name

_____   _____

Title   Title

_____   _____

Signature   Signature

_____   _____

Date   Date

References

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