



NETWORK ENERGY CONSULTING, LLC

DESIGN PLAN

KING HALL – FLOOR 3, WING A

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Introduction

Incorporating robust networking solutions is critical in an era where connectivity changes the education landscape and organizational effectiveness. With this in mind, we shift focus to King Hall, named in memory of Dr. Martin Luther King Jr, to begin our planning into network design and execution. Within the bounds of architectural brilliance, academic ambition and technical innovation are optimized by rigorous network engineering.

King Hall became a central feature of Cal State LA's campus environment. Built during a period of phenomenal growth and expansion, King Hall exemplified the university's commitment to providing modern instructional facilities to fulfill the demands of a varied student body. King Hall has hosted classrooms, administrative offices, and academic departments throughout the years, functioning as a teaching, learning, and administration hub.

Background

The A wing of King Hall contains 30 rooms, each providing a function critical to the university's operations. For example, the computer lab in A wing is an essential location for student learning and is equipped with the necessary tools to aid academic success. It includes thirty modern workstations designed for student usage and an administrative workstation for management functions. A network printer is also installed in the lab to provide printing capabilities for users. The computer lab has an efficient Cat 6 cabling system ensures fast and dependable connectivity between workstations. This cabling system improves data transfer efficiency, allowing digital resources to operate more smoothly in the lab and connectivity. The A Wing also houses administrative offices equipped with wired and wireless infrastructure to efficiently support students, faculty, and staff. Each office room has a mix of desktop and laptop workstations for versatility and network printers for printing purposes.

Feasibility Study

Project Situation

Planning and Analysis: Conducting a thorough needs evaluation, defining project objectives, and developing a detailed execution strategy.

Procurement and Installation: Acquiring essential hardware, software licenses, and cabling infrastructure, followed by installation and configuration of network components.

Testing and Optimization: Performing broad testing to ensure the network infrastructure's functionality, performance, and security.

Training and Documentation: End-users will receive training for network usage, maintenance, and disaster recovery.

Network Scope

This proposed network is designed to help serve Wing A on the third floor of King Hall at CSULA and will cover 30 rooms. This network on Wing A is designated to assist with academic and administrative services as well. This floor will also contain different rooms that serve various purposes. These rooms include administrative offices, a computer lab, an equipment room, and classrooms.

Network Goals

This network is designed to achieve objectives before being considered a functioning network for the university.

Reliable Internet Connectivity

Ensure consistent and high-quality internet access throughout Wing A to support academic research, communication, online learning, and administrative tasks. The objective is to minimize downtime, latency, and disruptions, allowing for a seamless digital learning and working environment.

Academic Support

This network provides reliable connectivity and resources to support academic activities within Wing A. It will facilitate faculty and students' access to online research databases, course materials, and educational collaboration tools.

Administrative Efficiency

This network supports administrative processes by providing secure access to administrative systems. This includes student records, registration, grading, scheduling, efficient communication among administrative staff, and faculty resources.

Mitigating Security Risks

With the creation of a network design, it is essential to implement secure measures to mitigate security risks that will allow the network to protect sensitive academic or administrative data. By mitigating these security risks with tools such as firewall protection, intrusion detection, and encryption, we can minimize security risks within the network.

Resource Sharing

The network will enable efficient access to the sharing of resources for students and staff. This resource sharing will allow faculty members and students to efficiently access shared printers for printing lecture materials or research papers, connect to shared projectors for presentations or classroom activities, and utilize shared scanners for digitizing documents.

Scalability

The network design is scalable to accommodate future growth and technological advancements within Wing A in the future. This allows for the addition of new devices and services within the university. By creating future-proofing in this network design, we can ensure that the network remains adaptable to evolving network requirements.

Network Design Features

Lobby

The lobby of King Hall's 3rd floor, Wing A, will be the entry point to the academic and administrative facilities. It will be designed to create a welcoming environment for students, faculty, and visitors, providing a comfortable space for gathering and waiting. The design features of the lobby include:

- **Seating Area:** Comfortable seating arrangements will be provided for visitors, with chairs and benches strategically placed to accommodate varying group sizes.
- **Information Desk:** An information desk will be stationed in the lobby to assist visitors and direct them to their intended destinations.
- **Wayfinding Signage:** Clear signage will be installed throughout the lobby to guide visitors to different areas within Wing A, including classrooms, administrative offices, and the computer lab.
- **Aesthetics:** The lobby will feature aesthetically pleasing decor and design elements, such as artwork, plants, and ambient lighting, to create a positive first impression.

Equipment Room

The Equipment Room on King Hall's 3rd floor will serve as the central hub for network infrastructure components. It will house the essential equipment required for the operation of the network that will ensure reliability and efficiency. The design features of the equipment room include:

- **Network Components:** The room will contain servers, switches, routers, an Uninterruptible Power Supply System (UPS), firewalls, and other networking hardware required to support the network infrastructure.
- **Cooling and Ventilation:** Proper air-conditioning and ventilation systems will be installed to regulate the temperature and airflow within the equipment room, preventing overheating of network equipment.
- **Security Measures:** Security measures, such as access control systems and surveillance cameras, will be implemented to prevent unauthorized access to the equipment room and safeguard network assets.

- **Cable Management:** A cable management system will be in place to organize and route network cables neatly, minimizing clutter and facilitating maintenance and troubleshooting.

Administrative Offices

For the administrative offices to be able to help students, faculty, and staff efficiently, they will need to utilize and operate on wired and wireless circumstances. They will also need to work with printers for the necessary paperwork.

- **Wired and Wireless Connectivity:** Wired and wireless network infrastructure will be available in the offices to ensure seamless connectivity for desktop and laptop workstations.
- **Workstations:** Each office room will have a mix of desktop and laptop workstations to accommodate user preferences and requirements.
- **Network Printers:** Network printers will be installed in each office for printing purposes, including black and white and color laser printers.
- **Space Optimization:** The layout of the office rooms will be optimized to maximize space utilization and promote efficient workflow, with consideration given to workstation placement and ergonomic design.

Classrooms

The classrooms in King Hall's 3rd floor, Wing A, will provide an interactive learning environment for students. The design features of the classrooms include:

- **Smart Technology:** Each classroom will have smart boards or interactive displays to facilitate dynamic presentations and multimedia content sharing.
- **Audio-Visual Equipment:** Audio-visual equipment, such as projectors and sound systems, will be installed to support instructional activities and presentations.
- **Flexible Seating:** Flexible seating arrangements will be adopted to accommodate different teaching styles and group activities, with options for traditional seating, collaborative workspaces, and lecture-style seating.
- **Accessibility:** The classrooms will be designed for students with disabilities, with features such as wheelchair-accessible desks and hearing assistance systems.

Computer Lab

The computer lab on King Hall's 3rd floor, Wing A, will be a dedicated space for student computing and learning activities. The design features of the computer lab include:

- **Workstations:** Thirty state-of-the-art workstations will be provided, each equipped with a computer unit, keyboard, mouse, and monitor with integrated speakers for enhanced audio output.
- **Administrative Workstation:** One dedicated administrative workstation will be available in the lab for management functions and oversight of lab operations.

- **Network Printer:** A network printer, specifically a black and white laser printer, will be stationed within the lab to provide student printing services.
- **Cabling Infrastructure:** The lab will be supported by a robust Cat 6 cabling infrastructure, ensuring high-speed and reliable connectivity between workstations and network components.
- **Room Configuration:** The layout and configuration of the lab will be designed to maximize space utilization and promote a conducive learning environment, with consideration given to workstation placement and ergonomic design.

Design Assumptions

For the design of this network, the following assumptions are made:

- **Fresh Installation:** A fresh installation will be conducted for the network and all associated equipment.
- **Internet Service Provider (ISP):** Internet service will be provided by an unspecified ISP.
- **Firewall Utilization:** CSULA's firewall will provide protection and manage information sent along the network.

Network Needs Analysis

The network needs analysis for the 3rd floor of King Hall, Wing A, at Cal State LA University encompasses business and technical requirements essential for successfully designing and implementing the proposed network infrastructure.

Data Types

The network will primarily serve various data types essential for academic and administrative functions, including:

- Reports
- Classroom bulletins
- Accounting information
- Personnel profiles
- Educational software data
- Web pages

Additional data sources include:

- Standard Windows utilities (e.g., Paint, Notepad)
- Multimedia applications (e.g., Media Player)
- Collaboration tools (e.g., NetMeeting)

Access to the network will be limited unless the user is authorized to have access within the university environment.

Data Sources

- Data will be generated and accessed across all workstations on the network.

- Workstations will primarily operate within a Windows 11 environment, utilizing software applications such as Microsoft Office Suite (Word, Excel, PowerPoint, Access, and Outlook).

Numbers of Users and Priority Levels

- The maximum number of concurrent users on the network is approximately 300 individuals, primarily students, faculty, and administrative staff.
- Network resources will be prioritized to support management functions, ensuring the smooth operation of administrative tasks and academic activities.

Transmission Speed Requirements

- The network infrastructure is expected to provide seamless and transparent connectivity to users, offering high-speed data transmission to facilitate efficient communication and information exchange.
- Our network on King Hall's 3rd floor, Wing A, will offer high-speed data transmission using UTP cables capable of supporting Gigabit Ethernet speeds up to 1000 Mbps.
- Additionally, we'll deploy Optical Fiber cables with 1000BASE-SX standards, delivering even higher transmission speeds and greater bandwidth capacity over longer distances. This dual approach ensures seamless communication for academic and administrative needs.

Load Variation Estimates

- Peak network traffic is anticipated during weekdays, particularly during peak hours of academic activities, typically between 7:00 a.m. and 9:00 a.m. and 5:00 p.m. and 7:00 p.m.
- These periods coincide with class schedules and administrative duties, necessitating robust network infrastructure capable of handling fluctuating load demands without degradation in performance.

Hardware and Infrastructure Considerations

- To meet the identified needs, the network design for King Hall's 3rd floor, Wing A, will incorporate a combination of networking hardware, including switches, routers, and wireless access points strategically positioned throughout the area.
- In addition to switches and wireless access points, our network design will include a router to manage network traffic efficiently and ensure seamless connectivity.
- The router will support Gigabit Ethernet connectivity, providing fast data transmission speeds with low latency.
- Use security features, including firewall protection, to safeguard against cyber threats and risks.
- Its modular design will allow future scalability and expansion to meet evolving network requirements.

- Additionally, Wireless access points (APs) throughout King Hall's 3rd floor, Wing A, will utilize WPA2 with 802.11i security protocol, ensuring robust encryption and authentication to protect against unauthorized access and data breaches.

Implementation Planning

- The network implementation plan will outline the phased approach for deploying and configuring the proposed network infrastructure.
- This will include tasks such as cable installation, hardware setup, IP addressing scheme design, security configuration, and testing procedures to validate the functionality and performance of the network before full deployment.

By conducting a comprehensive network needs analysis, we aim to ensure that the proposed network design aligns with the specific requirements and objectives of King Hall's 3rd floor, providing a robust and scalable infrastructure to support academic and administrative functions effectively.

Network Requirements

Reliability Requirements

- **99.9% Runtime:** The LAN is expected to have a runtime of 99.9%.
- **0.001% Undiscovered Error Rate:** The LAN is expected to have an undiscovered error rate of 0.001%.

Security Requirements

- **Firewall Implementation:** CSULA's firewall will be utilized to limit unauthorized users.
 - Non-CSULA users will be given limited access if they provide their email address and agree to CSULA's Terms of Use.
 - Users with verified CSULA accounts will have more access.
 - Network managers will have access to more features than regular users.

Software and Hardware Requirements

Hardware

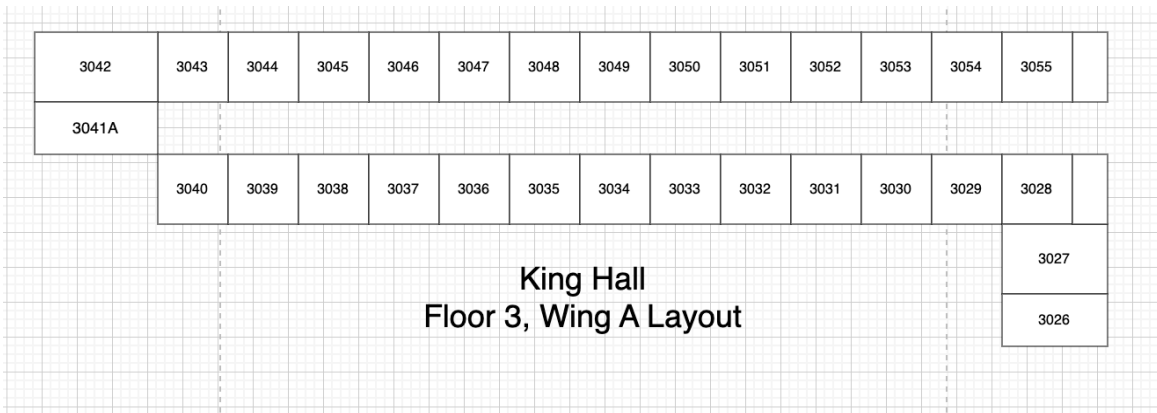
- **Uninterrupted Power Supply System (UPS)**
- **Server:** PowerEdge T340 Dell
- **Router:** Cisco ISR 1100
- **Switches (24 Port):** Cisco C9200-24P-E
- **Wireless Access Points (WAPs):** Cisco C9136I-E
- **Cat5e and Cat6 Cables**
- **Desktop Computers (With Monitors and Peripherals)**
- **Laptop Computers**
- **Firewall**
- **Black & White Printers**

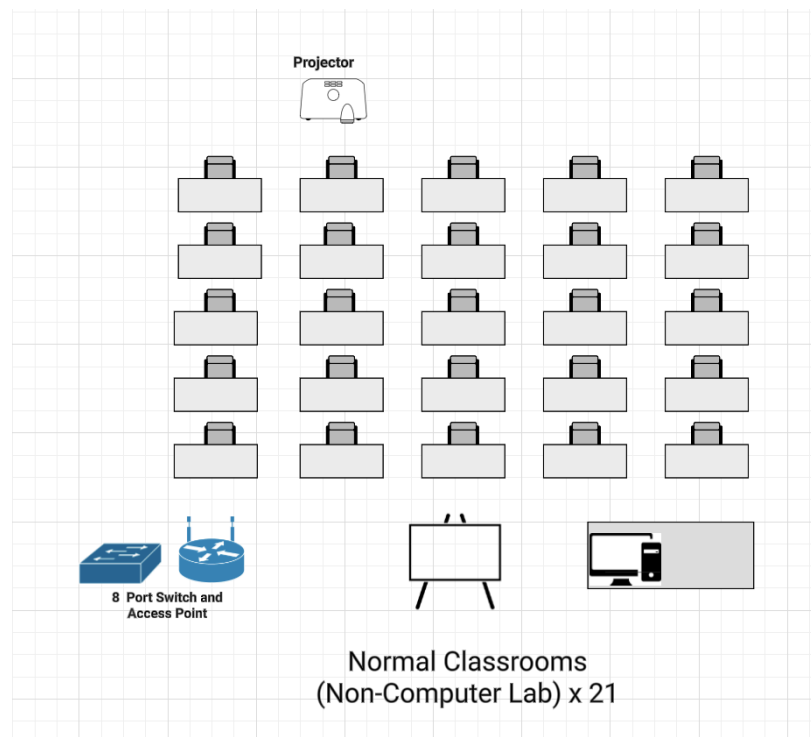
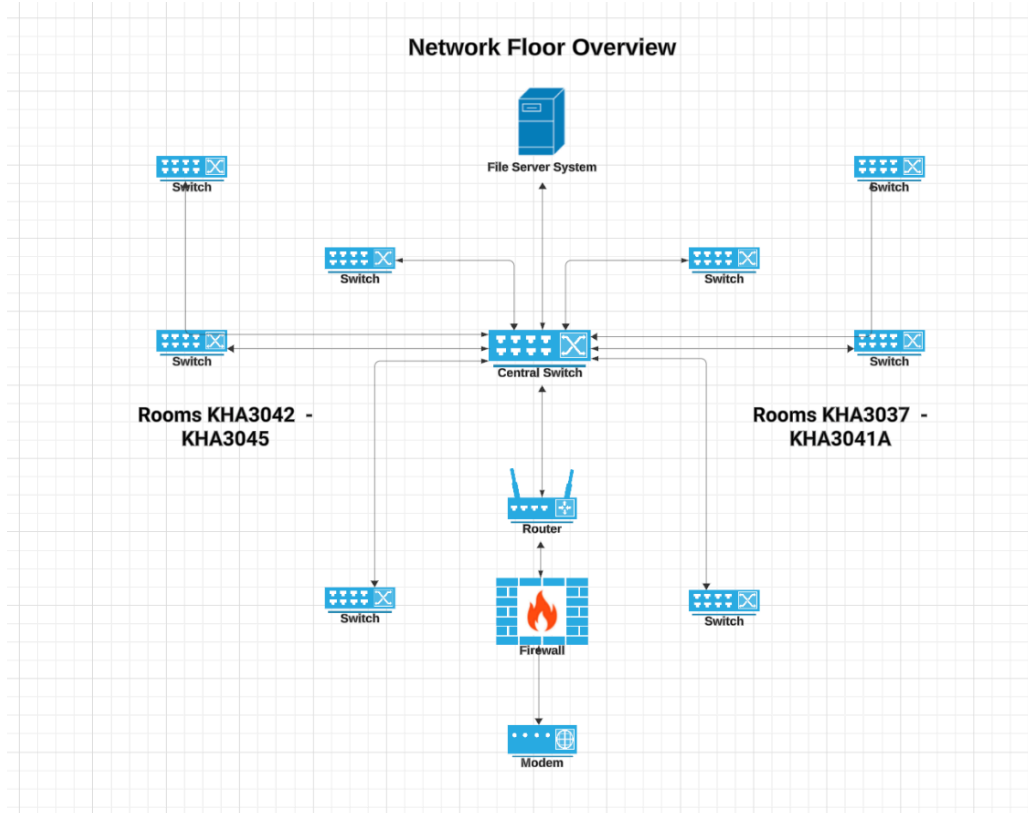
- **Colored Laser Printers**

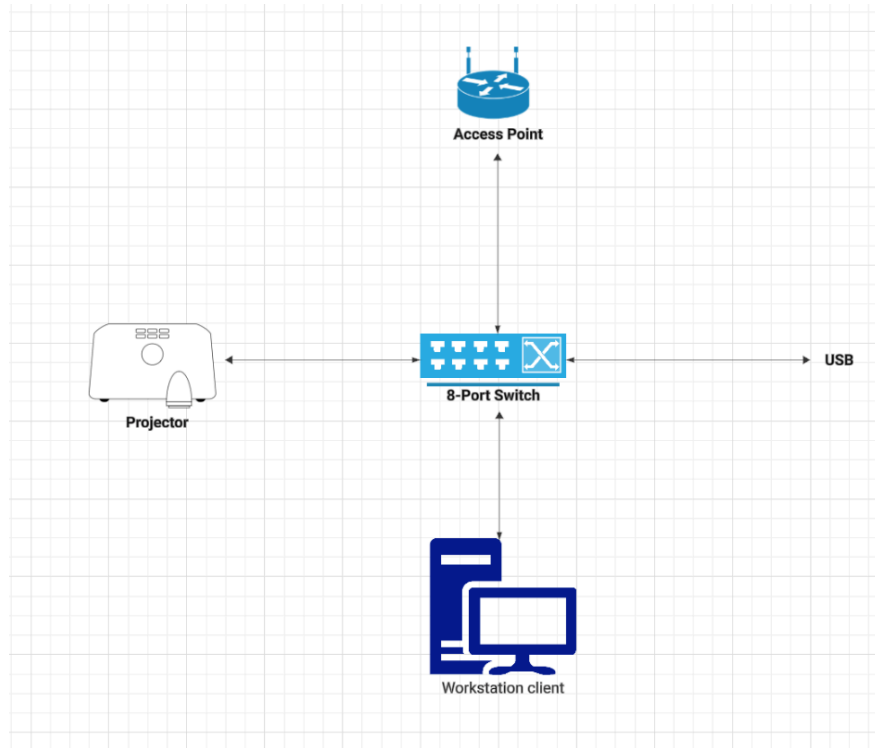
Software

- **Operating System:** Microsoft Windows 11 Pro on all laptop and desktop computers
- **Microsoft Office Suite:** Microsoft Office 365 on all laptop and desktop computers
- **Antivirus Software:** Installed on all hardware as necessary
- **Server Software:** Microsoft Server 2022
- **Firewall Software**
- **Future Updates:** Ensure that any outdated software is updated as required

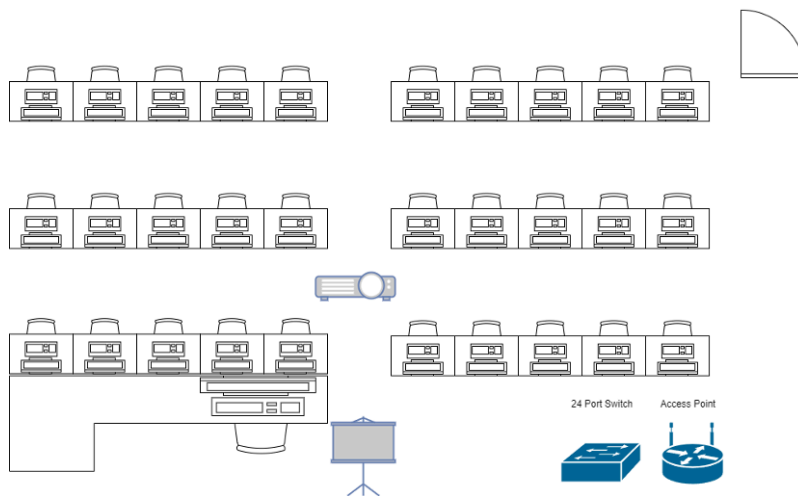
Network Diagrams and Topologies

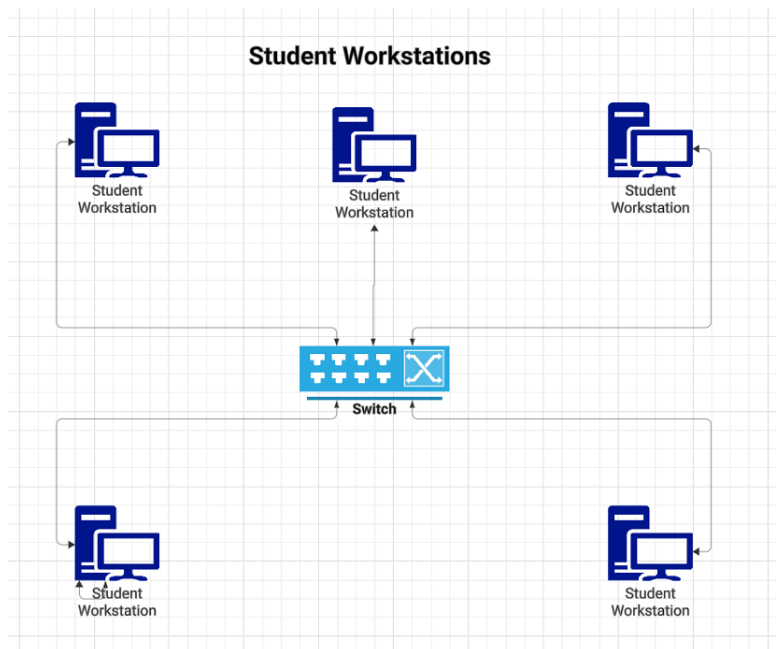
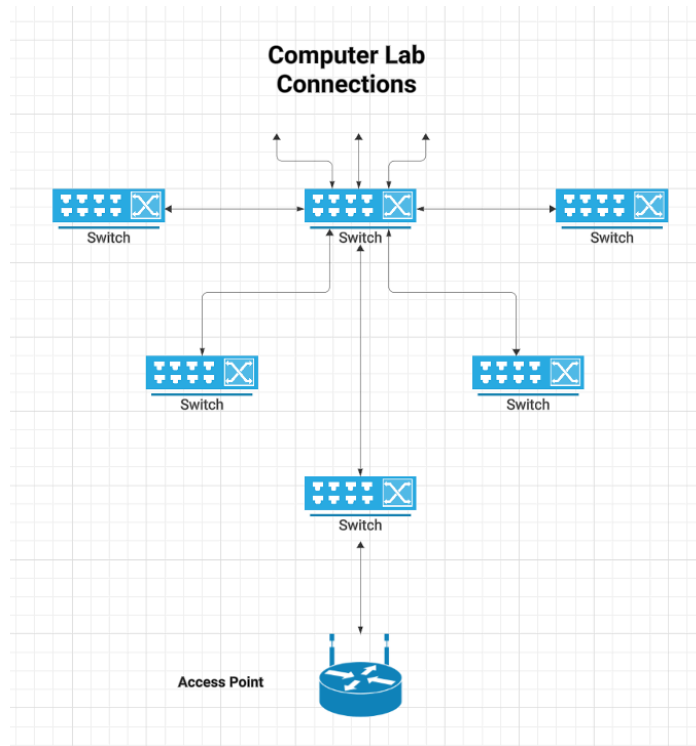






Computer Lab Layout





Budget and Expenses Analysis

Item	Units	Cost ea.	Total Cost	URL	Labor Est.
Workstations	64	\$919.00	\$58,816.00	OptiPlex Dell	\$1,200
Monitors	64	\$74.99	\$4,799.36	Philips Monitor	\$0
Laptops	8	\$379.99	\$3,039.92	Inspiron Dell	\$0
Servers	1	\$3,440.98	\$3,440.98	PowerEdge T340 Dell	\$425
Server Rack	1	\$1,470.93	\$1,470.93	Tripp Lite 42U	\$0
Switches (24 port)	2	\$1,833.45	\$3,666.90	Cisco C9200-24P-E	\$200
Router	1	\$1,424.25	\$1,424.25	Cisco ISR 1100	\$100
UPS	1	\$679.00	\$679.00	APC Smart-UPS 1500VA	\$150
Licenses (Windows 11 Corp)	1	\$309.00	\$309.00	Windows 11 Corporate Licenses	\$50
Licenses (Microsoft Office)	72	\$429.00	\$6,177.60	Microsoft Office Licenses	\$150
Networking Cabling (CAT 6)	1	\$346.99	\$346.99	CAT 6 Networking Cables	\$1,025
RJ-45 Connectors (100 pack)	2	\$58.99	\$117.98	RJ-45 Connectors	\$0
Firewall	1	\$1,556.98	\$1,556.98	Firewall	\$75
Wireless Access Point	2	\$2,000.13	\$4,000.26	Cisco C9136I-E	\$175
Color Laser Printer	1	\$699.99	\$699.99	Color Laser Printers	\$25
Black & White Laser Printer	1	\$199.99	\$199.99	Black & White Laser Printers	\$25
Total			\$90,746.13		\$3,600
Grand Total			\$94,346.13		

Cost-Benefit Analysis

Item	Total Cost
Tangible Costs	\$94,346.13
Intangible Costs	
Total 3-year Cost Analysis	\$94,346.13

Benefit Analysis

Item	Annual Benefit
Increased Productivity	\$25,000
Decreased Anxiety	\$4,000
Less Training Time	\$6,000
Increased Connectivity	\$10,000
Ease of Record Keeping	\$25,000
Increased Security	\$30,000
Increased Community Support	\$30,000
Increased Staff Morale	\$15,000
Better Informed Public	\$20,000
Total Annual Benefit	\$165,000

Cost-Benefit Ratio

Total Cost	Total Benefit	Ratio
\$94,346.13/year	\$165,000/year	1.75

- The tangible costs for implementing the proposed network infrastructure amount to \$94,346.13 over a three-year period.
- There are no specified intangible costs provided.
- The total annual benefit of implementing the network is estimated to be \$165,000, which includes increased productivity, decreased anxiety, reduced training time, enhanced connectivity, easier record-keeping, improved security, increased community support, increased staff morale, and a better-informed public.
- The cost-benefit ratio is $\$165,000 \text{ (total benefits)} / \$94,346.13 \text{ (total costs)} = 1.75$. Since the ratio is greater than 1, it indicates that the benefits outweigh the costs.
- The project is expected to pay for itself within a year, as the annual benefit exceeds the annualized cost.
- Additionally, the network infrastructure is estimated to reach functional obsolescence in approximately three years.

Explanation:

Increased Productivity: Estimated at \$25,000 per year, this reflects the extra work accomplished due to faster access to information and improved collaboration.

Decreased Anxiety: Estimated at \$4,000 per year, it represents reduced stress from network issues, leading to better morale and fewer disruptions.

Less Training Time: Estimated at \$6,000 per year, it reflects time saved on training due to a user-friendly network.

Increased Connectivity between Offices: Estimated at \$10,000 per year, it signifies improved communication and collaboration.

Ease of Record Keeping: Estimated at \$25,000 per year, it reflects time saved and improved accuracy in record-keeping processes.

Increased Security: Estimated at \$30,000 per year, it represents the value of enhanced protection against cyber threats and data breaches.

Increased Community Support: Estimated at \$30,000 per year, it indicates stronger ties with the community due to improved services.

Increased Staff Morale: Estimated at \$15,000 per year, it reflects the positive impact of the network on employee satisfaction and engagement.

Better Informed Public: Estimated at \$20,000 per year, it represents improved communication with the public, leading to better community relations.

The cost-benefit analysis demonstrates that the proposed network infrastructure has a favorable ratio, indicating that the benefits of implementing the network outweigh the costs. With an estimated annual benefit of \$165,000 and a total cost of \$94,346.13 per year, the project is expected to generate a positive return on investment. The benefits include increased productivity, decreased anxiety, reduced training time, enhanced connectivity, easier record-keeping, improved security, increased community support, increased staff morale, and a better-informed public. By investing in this network infrastructure, the University can expect to achieve greater efficiency,

effectiveness, and security in its operations, leading to improved overall performance and competitiveness.

Disaster Recovery Plan

Objective

To ensure the continuity of operations and minimize downtime during instances of system failure.

Data Backup

- Implement automatic backup of critical data on servers to secondary hard drives.
- Utilize off-site backup service to limit redundancy.
- Schedule backups to be run weekly.

System Restoration

- Maintain documentation outlining steps for system restoration in case of data loss or system failure.
- Designate trained personnel responsible for initiating the restoration process.
- Regularly test the restoration process to ensure effectiveness and identify potential issues.

Disaster Response Plan

- Develop a plan outlining procedures to be followed in the event of a disaster, such as natural disasters or cyberattacks.
- Establish communication protocols to ensure timely coordination among key personnel during a crisis.
- Identify alternate facilities or locations where operations can be temporarily relocated if necessary.

Documentation and Training

- Maintain current documentation of the disaster recovery strategy, including contact information for important staff and contractors.
- Conduct regular drills and exercises to test the effectiveness of the disaster response plan and familiarize personnel with their roles and responsibilities.

Continuous Improvement

- Review and update the disaster recovery plan regularly, considering lessons learned from drills, exercises, and real-world situations.

- Stay current on evolving risks and technology to improve the effectiveness of disaster recovery strategies.

Acceptance & Authorization Form

Statement of Work

The terms and conditions of the Statement of Work apply to all services and goods offered under this agreement.

The undersigned parties have signed this Statement of Work lawfully authorized, confirming its legal validity and enforceability. [Network Synergy Consulting], Inc. [California State University, Los Angeles].

[Your Full Name]

[Client's Full Name]

[Your Signature]

[Client's Signature]

[Date]

