

**Provide a detailed network design proposal. Your task is to design the network for this new building with the following criteria:**

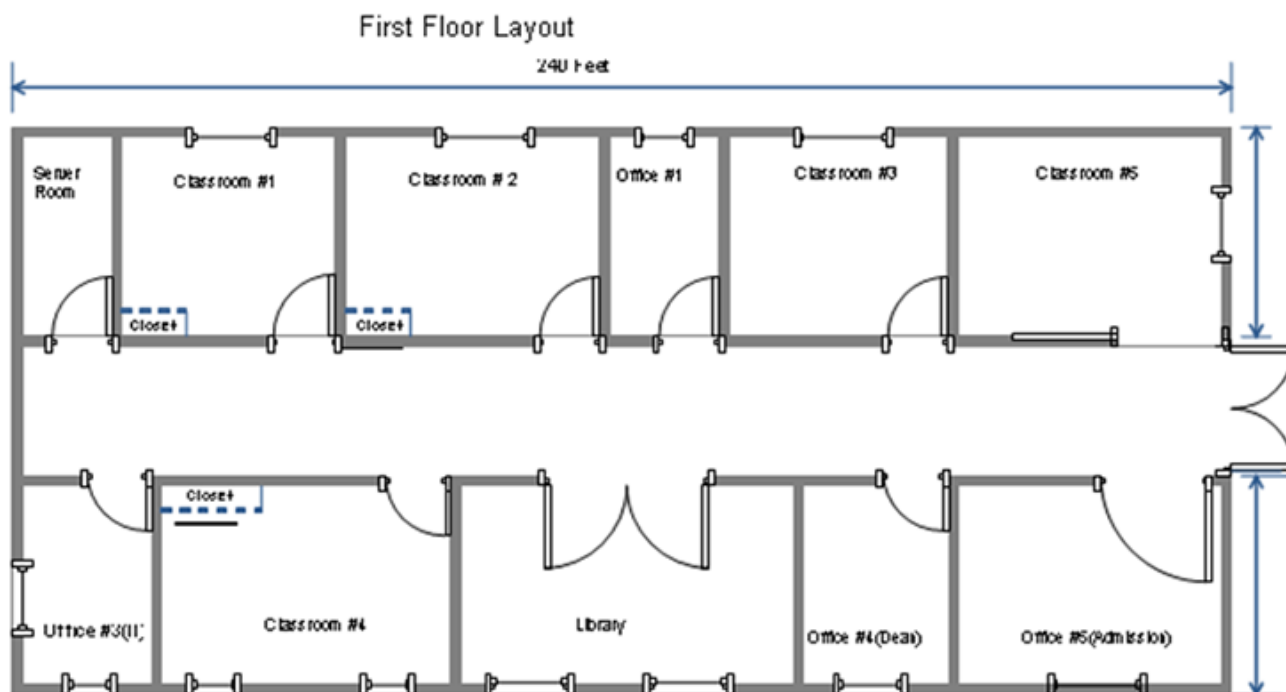
Student-accessed computers should be on separate network from the staff-accessed computers. Computers for public use should be on a separate network.

There must be a minimum of 40 Mbps Internet connection, with a backup line capable of at least 20Mbps. Cable, DSL, or FIOS should not be used for primary Internet service.

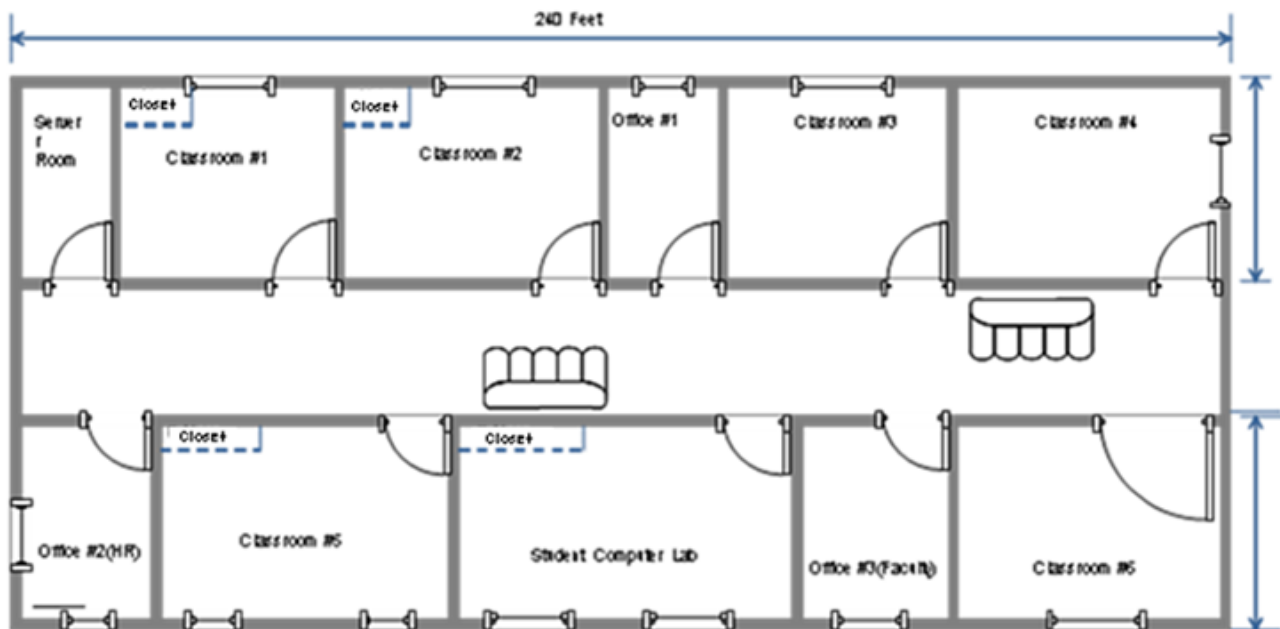
The network should use physical cable, not wireless. But do provide wireless access in the Student Lobby area (second-floor hallway). Set the maximum simultaneous wireless users to 254.

The network has been assigned the 10.11.12.0/23 network address for all computers and devices

**The 50-year-old, two-story building has the following layout:**



Second Floor Layout



Building dimensions: Length: 240 Feet, Width: 95 Feet, Height: 30 Feet

The building will house six computer labs that will be used for instruction. In the building diagrams above, the labs are labeled Classroom #1, Classroom #2, and Classroom #4 on the first floor and Classroom #1, Classroom #2, and Classroom #5 on the second floor; each computer lab will have a closet. Each lab will have 32 computers: 30 student computers, 1 instructor computer, and 1 server in the closet for instructional use.

In addition, there will be a Student Computer Lab that will provide computer access to students to do their homework. There will be 50 computers in this lab and a server in the closet. To allow students access to library resources, the library will also have 10 computers for students and 5 computers for library staff.

Finally, there are various offices in the building. Each of these offices will have one computer for staff use, with the exception of the admissions office, which will have five computers. There will be two server rooms, one on the first floor and one on the second floor.

**Your proposal should have three major sections:**

### I. Physical Network Design

In this section, address each of the following.

1. Define the topology that will be used. Provide business needs and justification.
2. Select the appropriate network media. Provide business needs and justification.
3. Select the appropriate network connecting devices, including network security devices. Provide business needs and justification.
4. Select the appropriate computer systems to use to support the network design. Provide business needs and justification.
5. Determine a physical layout of the computers on the floor plan, along with the network wires (network wiring diagram).
6. Provide justifications for each element of your network design (numbers 1–4 above).

## I. Network Addressing

In this section, address each of the following.

1. Define the subnets (based on rooms, floor, department, or other criteria).
2. For each subnet, explain which devices/groups/users/rooms will be on this subnet, define the network address, subnet mask, and available IP addresses to be used by computers or devices.

## I. Network Services Design

In this section, address each of the following.

1. Identify network services needed.
2. List additional servers or network devices needed to implement the network.
3. List network security measures to be implemented.
4. Justify the need for the network services, security measures, and devices you've selected.

**Below is the format this needs to be in as a proposal. I have attempted some of it but it needs completed and with exact details and some required diagrams. Thank you for your help with this!**

# Network Design Proposal

**Prepared for:**  
**University College**

**Prepared by:**  
**Jer**

**I. Physical Network Design**

**A. Network Topology**

**Business Needs**

The University College's lease of a two-story building in Adelphi, Florida needs to be outfitted with a high-speed, stable, and secure computer network. The installation is essential for UC to continue providing students and staff with advanced technological resources and accomplish their daily missions.

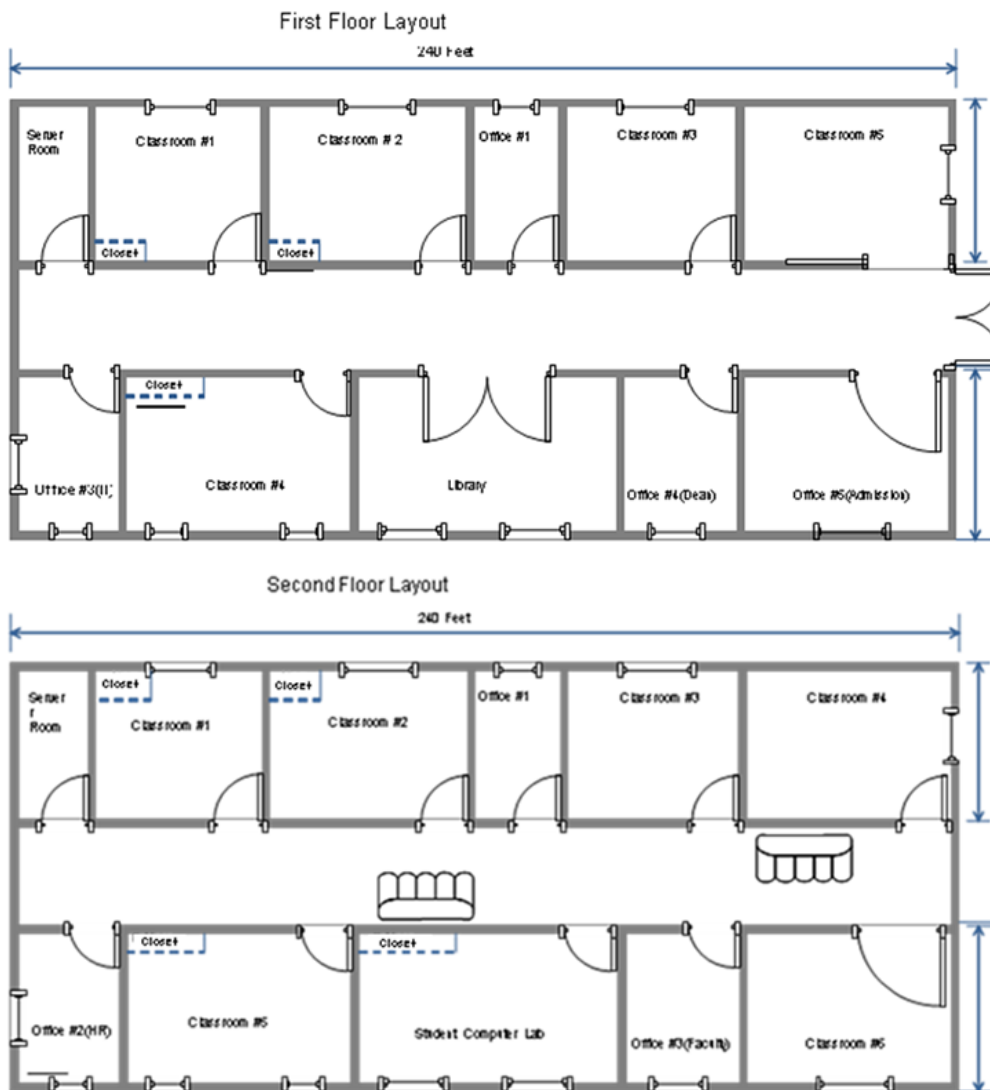
UC is in need of student-accessed, staff-accessed, and public computers that are on separate networks from each other. The Internet connection speed will have a minimum speed of 40 Mbps with a backup line capable of a minimum speed of 20 Mbps. The network will use physical cable connectivity with wireless connectivity only in the Student Lobby area of the second-floor hallway. The wireless network will have a maximum of 254 simultaneous users. The network will be assigned the 10.11.12.0/23 network address for all computers and devices.

**Proposed Topology**

Select one or more topologies to use for this design. This section should be used to provide details of the selected infrastructure or equipment. Include the model, manufacturer, features, and cost.

This proposal is for a computer network that will provide a secure, stable, and high-speed computer network throughout the 50-year-old, two-story building to include:

Building dimensions: Length: 240 Feet, Width: 95 Feet, Height: 30 Feet



Six computer labs for instruction – First and second floors

- 132 total computers
- Each lab with 30 student computers, 1 instructor computer, and 1 instructional server

Student Computer Lab for homework – Second floor

- 50 computers
- 1 server in closet

Library – First floor

- 10 student computers and 5 library staff computers

#### Various building offices

- Admissions office – First floor

5 computers

- Various offices – First and second floors

6 computers

A star topology will be used for this design; the computers in each classroom and office are to be connected to a central device (switch).

#### Justification

The use of a star topology allows for the network to be expanded without disruption, it is easy to implement troubleshooting and a break in any single cable will not cause the entire network to fail. This topology will meet needs of UMUC and everyone needing to use the network.

## B. Network Media

### Business Needs

### Proposed Network Media (include network wiring diagrams)

Select one or more network media to use for this design.

Switch x11 – For each room that requires more than one computer and the server rooms. The reason for this is so that ports can be allocated accordingly to staff or students as well.

Patch Panel x11 – For each room that has a switch so that multiple computers can access the ports on the switch. The patch panel will provide the network with a connection point between network equipment and the ports to which the PCs are connected.

Router x1 – This is where the default gateway for the network will be and is located at the demarcation point. It is used to route information obtained by the network and deliver packets returned by the Internet.

Wireless Access Point x1 – The WAP will be located in the Library and is used to grant wireless access to the internet via the router to those who need it.

### Justification

The routers allow for a fully routed network. Since we are using different subnets, we need to have means to route packets from/to the correct networks.

## C. Network Devices

**Business Needs**

**Proposed Network Devices**

**Justification**

## **D. Network Security Devices**

**Business Needs**

**Proposed Network Security Devices**

**Justification**

## **E. Computer Systems**

**Business Needs**

**Proposed Computer Systems**

**Justification**

# **II. Network Addresses Design**

## **A. Subnetting**

**Business Needs**

**Proposed Subnetting (include the calculations)**

List the quantity of subnets needed. For each subnet, provide the IP addressing info (network address, broadcast address, range of available IP addresses) and the systems, devices, or equipment that will be on that network. Also provide the calculations on how those IP addressing information are determined.

Subnets:

11 total subnets

○ 6 subnets

One per lab

- 1 subnet

One for Student Computer Lab

- 1 subnet

One for all staff members in all offices

- 1 subnet

One for Library

- 1 subnet

One for all instructors in the 5 lecture rooms

- 1 subnet

One for the servers on the first and second floors

Network Address: 10.11.0.0

Network Mask: 255.255.0.0

A minimum of 11 subnets

- A minimum of 31 addresses per subnet

Instructional Computer labs:

10.11.0.0/24 Addresses: 10.11.0.1 to 10.11.0.254

10.11.1.0/24 Addresses: 10.11.1.1 to 10.11.1.254

10.11.2.0/24 Addresses: 10.11.2.1 to 10.11.2.254

10.11.3.0/24 Addresses: 10.11.3.1 to 10.11.3.254

10.11.4.0/24 Addresses: 10.11.4.1 to 10.11.4.254

10.11.5.0/24 Addresses: 10.11.5.1 to 10.11.5.254

Student Computer Lab

10.11.10.0/24 Addresses: 10.11.10.1 to 10.11.10.254

Staff members in all offices

10.11.20.0/24 Addresses: 10.11.20.1 to 10.11.20.254

Students in the library

10.11.30.0/24 Addresses: 10.11.30.1 to 10.11.30.254

Instructor's on the 5 lecture rooms



10.11.40.0/24 Addresses: 10.11.40.1 to 10.11.40.254

Servers on first and second floor (DMZ):

10.11.100.0/24 Addresses: 10.11.100.1 to 10.11.100.254

### **Justification**

## **III. Network Services Design**

### **A. Network Services**

#### **Business Needs**

Assess the business needs

#### **Proposed Network Services**

Implement a DNS server and a DHCP server. Implement routers, bridges, an Ethernet hub, and routing tables.

#### **Justification**

Justify your determination that the network services are needed and will meet the business needs

A DNS server is needed to easily find and access network services.

A DHCP server is needed for automatic, centralized IP address management.

Routers are needed to extend/segment networks by forwarding packets from one logical network to another.

Bridges are needed to join two network segments together, allowing computers on either segment to access resources on the other.

An Ethernet hub is needed to amplify signals and counteract the effects of attenuation.

Routing tables are needed to keep track of all known network addresses and possible paths throughout the interwork.

### **B. Network Security Measures**

#### **Business Needs**

UMUC will need security measures in place to protect the network from harm. Installation of security software will ensure the protection of the system.

#### **Proposed Network Security Measures**

Firewalls

Antivirus software

Intrusion Detection System

ification

## **Bibliography**

