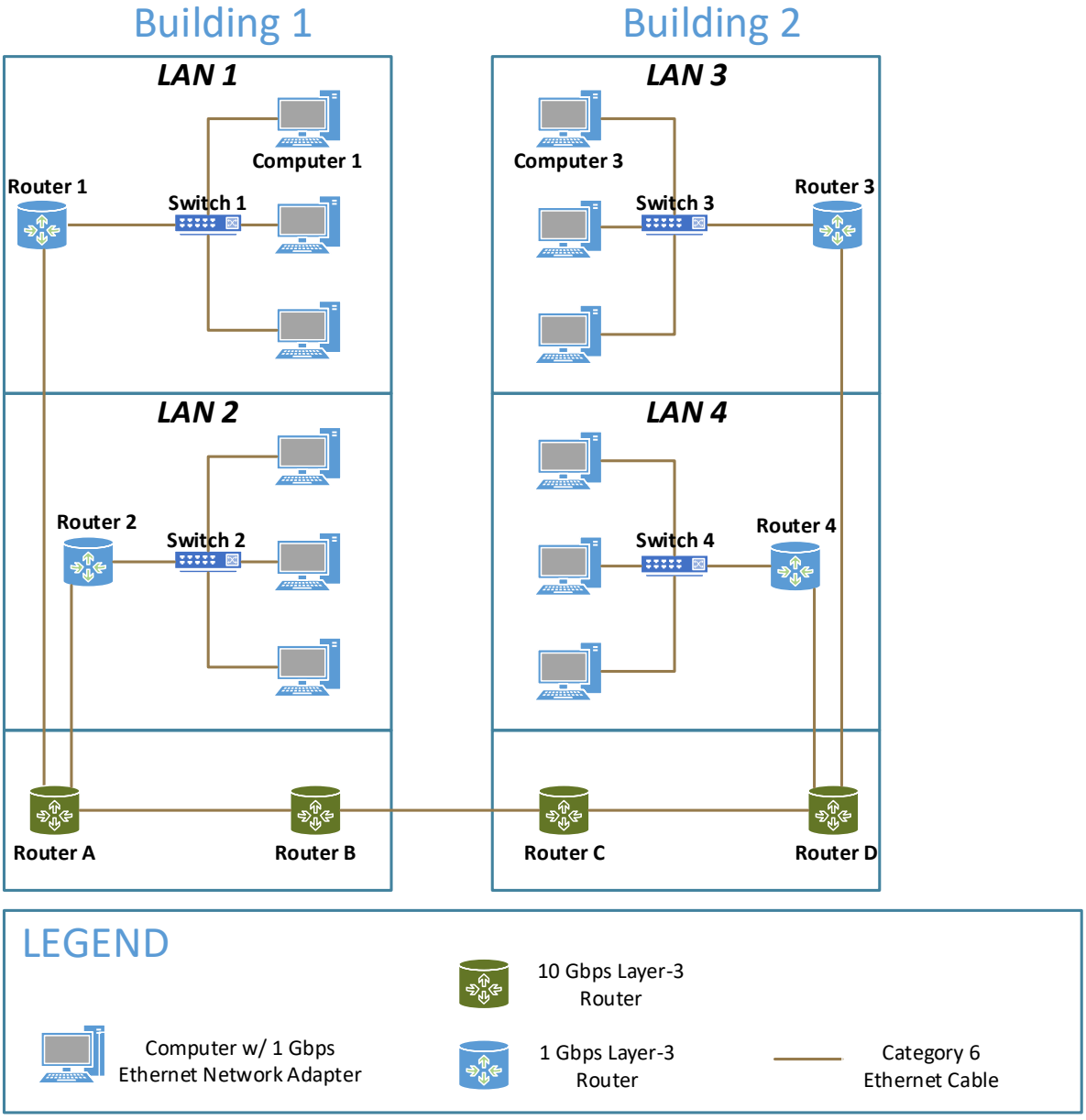
There are two parts to this assignment. Please make sure to complete all parts.

Part 1: Backbone Networks

Review the diagram of the backbone network below, and then answer the series of questions.



1. The textbook explains the three layers that exist in a backbone network. The diagram above has several labeled computers, switches, and routers that are part of these layers. For all labeled devices, identify their layer, and explain the function the device plays in this backbone network.

Access layer:

1. Switch 1, switch 2, switch 3, switch 4 are at the access layer and they provide

end-connectivity of hosts in LAN1 with the router 1.

2. Computers: Computer 1 and computer 3 are hosts and they send as well as receive data over the network .

Distribution layer: Router 1, router 2, router 3, router 4, Router A, Router D. They are using to distributes network traffic to and from the LANs

Core layer: Router B, Router C. They are using to connect 2 buildings.

2. The textbook describes three types of backbone networks – switched, routed, and a mixture of the two. What type of backbone network does this diagram illustrate? Explain your answer.

Diagram illustrates routed backbone network because there are routers in the core layers and distribution layers and switches at the access layers.

3. Imagine that Computer 1 broadcasts a data-link layer frame.

a. Would other computers or devices on LAN 1 receive this broadcast? Explain your answer.

Yes. Other computers or devices on LAN 1 would receive broadcast because switches do not break broadcast domain.

b. Would this broadcast be restricted only to a single LAN, or to multiple LANs? Explain your reasoning.

Yes. This broadcast be restricted only to a single LAN (LAN 1) because there is router 1 (Each router interface represents a single broadcast domain and break network into separate subnets) connect to switch 1.

4. Imagine that Computer 1 generates an IPv4 packet that is destined for Computer 3. Assume that Computer 1 knows the IPv4 address of Computer 3, and also assume that the forwarding and routing tables of all switches and routers respectively are fully populated to ensure readily available end-to-end communication between any two devices. Explain step-by-step how that IPv4 packet will travel the network to arrive at its destination. In your answer, make sure to identify the source and destination MAC and IPv4 addresses by labeling them with the attached device name, for example, "Computer 3's MAC address" or "Computer 3's IP address".

Because computer 1 knows the IPV4 address of computer 3, and the forwarding and routing tables of all switches and routers are fully populated, so we have:

First, Computer 1 will create a packet and add the source address (computer 1's IP address) and destination address (computer 3's IP address) in its IP header. Then create frame and put MAC address in it, for the source MAC address will be computer 1's MAC address and destination MAC address will be router 1's MAC address. And then, Computer 1 forward IPv4 packet destined for Computer 3's IP address to Switch 1 and to Router 1 (Router 1's MAC address).

And from the Router 1, We are flowing same pattern, every time the router want to route that packet, I will add MAC address of itself along with MAC address of destination (Router 1 → Router A → Router B → Router C → Router D → Router 3 → Switch 3 → Computer 3)

5. Imagine that all of the routers except for Router B and Router C are replaced with switches.

a. What would the new backbone architecture be (switched, routed, or hybrid)? Explain.

New backbone architecture would be hybrid because it consists of switches in the distribution layers and access layers (switches backbone but there are routers in the core layers (Router B and Router C, routed backbone).

b. If Computer 1 broadcasts a data-link layer frame with this new architecture, which LANs and devices would receive this broadcast?

LAN 1, LAN 2 and all computers in LAN 1 and LAN 2 will receive the computer 1's broadcasts because All routers are replaced except router B and router C (Core layers) and we know that switches forward traffic on all their interfaces, except the one they received the broadcast on, and switch do not break broadcast domain.

c. Suppose that a total of few hundred employees work in Building 1 and Building 2 with many more LANs than what is illustrated in the diagram. What would be the advantages and disadvantages of this new architecture as compared to the old?

Advantages:

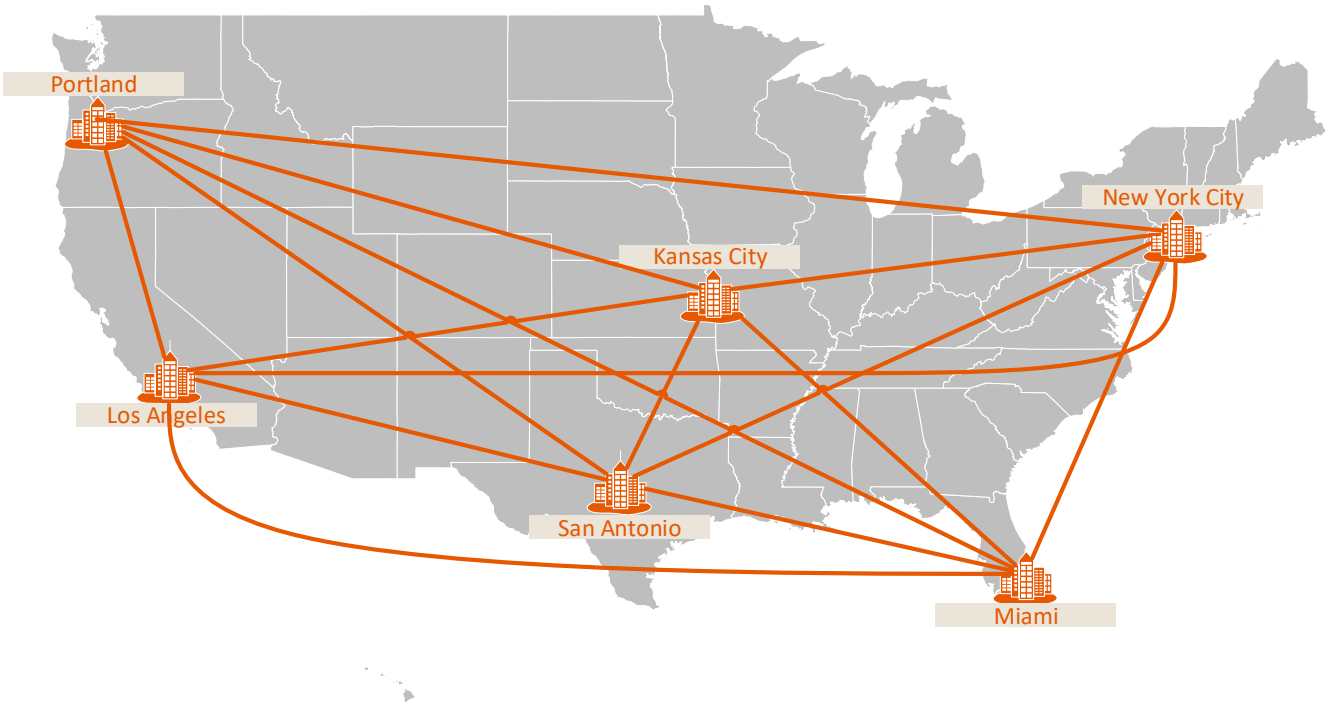
- The cost is less expensive
- Flexibility, simple to add new models with additional ports as the LAN grows and to upgrade the switch to use new technologies
- Easier to maintenance because all networks can be assigned in one location
- Increase the performance of the network
- Have less frame collisions.

Disadvantages:

- Network connectivity issues are difficult to be traced through network switch.
- Proper design and configuration are needed in order to handle multicast packets

Part 2: Wide Area Networks (WANs)

Review the architectural diagram of the WAN below, which illustrates a single organization's WAN links between its campuses across the United States.



6. The textbook describes four types of WAN configurations – ring, star, partial mesh, and full mesh. Which configuration is illustrated in the diagram above? Explain your answer.

The diagram illustrated the full mesh configuration because every computer is connected to every other computer.

7. Imagine that network traffic is coming from Portland and traveling to Miami. The most obvious route the traffic can take is Portland to Miami, due to the direct connection between the two campuses. Assuming all WAN links are operational, identify a two-hop route, a three-hop route, a four-hop route, and a five-hope route between Portland and Miami.

A two-hop route: Portland to San Antonio to Miami.
A three-hop route: Portland to Los Angeles to San Antonio to Miami.
A four-hop route: Portland to Los Angeles to Kansas City to New York City to Miami.
A five-hop route: Portland to Los Angeles to Kansas City to San Antonio to New York City to Miami.

8. Now imagine that both Kansas City and San Antonio are entirely offline. How many operational routes would there be from Portland to Miami? Identify each route along with its number of hops.

One -hop route: Portland to Miami.
Two-hop route: Portland to Los Angeles to Miami.
Two-hop route: Portland to New York City to Miami.
Three-hop route: Portland to Los Angeles to New York City to Miami.

9. Imagine that the organization needs to remove four WAN links to save on cost (and that all links are operational again). Identify four links to be removed. You should ensure that, between any two campuses, the new configuration has at least one route that contains no more than two hops. It is fine if other routes are more than two routes, but there should be at least one route that is no more than two hops between any two campuses.

1. Portland To New York City
2. Miami To Los Angeles
3. New York city To Miami
4. Los Angeles – New York city

10. With the four WAN links removed, what is the new WAN configuration, ring, star, partial mesh, or full mesh? What are the advantages of the new configuration over the old? Explain your answer.

With the four WAN links removed, the new WAN configuration is partial mesh because all the devices (campuses) are nor connected to each other as full mesh. Ex. Only San Antoni and Kansas City are connected to all campuses in WAN and The rest are not connected with all cities in the WAN.

The advantages of the partial mesh over full mesh:

- Partial mesh is more practical as compared to the full mesh.
- Less complex than full mesh.
- All nodes are not necessary to be connected with one another during a network.
- Implementation cost of partial mesh is less expensive than full mesh.

Your assignment will be evaluated according to the following rubric.

	Grade	Qualities Demonstrated by the Assignment Submission	Grade Assigned
Content (70%) Measures the quality of the content in the assignment	A+ ➔ 100	The content demonstrates exceptional understanding of all relevant subject matter and its inter-relationships. All major relevant issues are thoroughly covered, and all content is very focused and on-topic. There is no known way to improve the content, and there are absolutely no technical or coverage errors present.	
	A ➔ 96	The content demonstrates exceptional understanding of all relevant subject matter and its inter-relationships. All major relevant issues are thoroughly covered, and all content is very focused and on-topic. At most one insignificant technical or coverage error may be present	
	A- ➔ 92	The content demonstrates deep understanding of all relevant subject matter and its inter-relationships. All major relevant issues are covered, and all content is on-topic.	
	B+ ➔ 88	The content demonstrates understanding of all relevant subject matter and its inter-relationships. Almost all major relevant issues are covered, and the content is at least reasonably on-topic.	
	B ➔ 85	The content demonstrates understanding of most relevant subject matter and its inter-relationships. Almost all major relevant issues are covered, and all content is at least reasonably on-topic.	
	B- ➔ 82	The content demonstrates moderate understanding of much relevant subject matter and its inter-relationships. There is reasonable coverage of major relevant issues, and the content is at least reasonably on-topic.	
	C+ ➔ 78	The content demonstrates some understanding of relevant subject matter and its inter-relationships. Some major relevant issues are covered, and at least some content is on-topic.	
	C ➔ 75	The content demonstrates understanding of a small portion of the relevant subject matter and its inter-relationships. Some major relevant issues are covered, and at least a small portion of the content is on-topic.	
	C- ➔ 72	The content demonstrates little understanding of and insight into the relevant subject matter and its inter-relationships. A small portion of the major relevant issues are covered. The focus of the content may be off topic or on insubstantial or secondary topics	
	D ➔ 67	The content demonstrates almost no understanding of or insight into the relevant subject matter and its inter-relationships. Almost none of the major relevant issues are covered, and the content may be almost entirely off-topic.	
	F ➔ 0	The content demonstrates no understanding of or insight into the relevant subject matter and its inter-relationships. No major relevant issues are covered, and the content is entirely off-topic.	
Exposition (30%) Measures how well the content is expressed	A+ ➔ 100	The presentation of all ideas and designs is exceptionally clear and persuasive; the entire submission is exceptionally organized. There is no known way to improve the clarity or organization of the submission.	
	A ➔ 96	The presentation of all ideas and designs is exceptionally clear and persuasive; the entire submission is exceptionally organized. There may be at most one insignificant way to improve the clarity or organization of the submission.	
	A- ➔ 92	The presentation of all ideas and designs is very clear and persuasive; the entire submission is very organized.	
	B+ ➔ 88	The presentation of all ideas and designs is clear and persuasive; the entire submission is organized.	
	B ➔ 85	The presentation of most ideas and designs is clear and persuasive; most of the submission is organized.	
	B- ➔ 82	The presentation of most ideas and designs is generally clear; most of the submission is reasonably organized.	
	C+ ➔ 78	Some parts of the submission are hard to understand; some parts are disorganized.	
	C ➔ 75	About half of the submission is hard to understand; about half is disorganized.	
	C- ➔ 72	Most parts of the submission are hard to understand; most parts are disorganized.	
	D ➔ 67	Almost all of the submission is hard to understand and disorganized.	
	F ➔ 0	The entire submission is hard to understand and disorganized.	
Overall Assignment Grade:			

Use the **Ask your Facilitator Discussion Board** if you have any questions regarding how to approach this assignment.

Save your assignment as ***lastnameFirstname_assignment4.doc*** and submit it in the *Assignments* section of the course.

For help uploading files please refer to the *Technical Support* page in the syllabus.