Objectives:

- Identify the types of connections for intermediate and end device connections in a LAN.
- Identify different cabling types, standards, and ports.

Intro:

Because of your good work at ACME Inc. you were contacted by another company, called Enam Inc. They need an entire network project to be done as quickly as possible and your experience with ACME Inc. will be vital. Because they trust your skills, chances are you get future contracts with them too.

After a meeting with XYZ Inc. people, you learn the protocols and application they will run and their major needs/expectations about the new computer network. Once the information is gathered, you are ready to start.

The Scenario:

XYZ will need Internet access and it has a few servers which must be reachable by internal devices. Such servers store crucial data to the company and a high amount of traffic is expected on their links. Public accessible servers as web servers and mail servers will be hosted by a third party company and the link to the internet is a serial link leased from an ISP. XYZ also has explicit requirements regarding their internal traffic. Because they plan to expand and have Voice over IP (VoIP), traffic must be separated in VLANs in order to improve performance.

Question 1:

Why web and mail servers are being considered Public Servers?

Answer: Servers like web and mail usually need to be accessed by devices outside the limits of the internal network. Ex: A customer visiting XYZ's webpage or a salesman exchanging emails with a customer.

Question 2:

How can VLANs help to improve voice traffic?

Answer: Functions like QoS work better once traffic is separate in VLANs.

Based on the items described above, you design a topology shown below. Your topology is based on layers hierarchy (Core, Distribution and Access layers).

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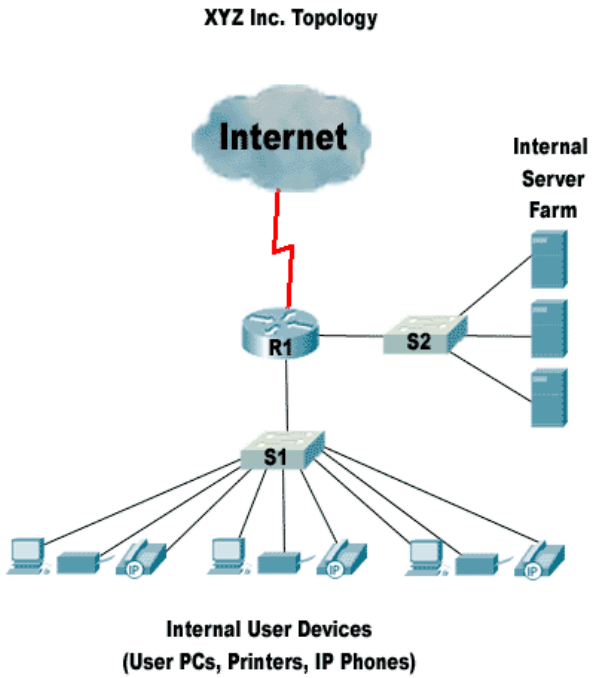
Topology:



Question 3:

Are all 3 layers explicit visible? If not, which layers were merged together and what is the merge point? Should this be considered a poor project design?

Answer: The Core and Distribution are merged together on R1 because the network is small at the moment. Even though those layers are merged, the hierarchical structure was respected. Because of that, as the network grows bigger, the process of separate Core from Distribution is simple and natural and thus should not be considered a poor design.

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Question 4:

Cabling is an important part of the design. Describe on the table below the types of cables necessary on the topology shown above and explain their need.

Location	Cable Type	Reason
Cables from S1 to user devices		
Cable from Server Farm to S2		
Cable from to S1/S2 to R1		
Cable from R1 to Internet		

Answers:

Location	***Cable Type***	***Reason***
Cables from S1 to user devices	*Straight-Through cables*	*S1 ports are already crossed. No need of a cross-over cable*
Cable from Server Farm to S2	*Straight-Through cables*	*S2 ports are already crossed. No need of a cross-over cable*
Cable from to S1/S2 to R1	*Straight-Through cables*	*S1/S2 ports are already crossed. No need of a cross-over cable*
Cable from R1 to Internet	*Serial cable (usually depends on the ISP choice)*	*ISP links are usually a WAN link and depends on the ISP choice (*)*

(*) Common WAN OSI Layer 1 links are over coaxial, telephone wires (xDSL links) and synchronous serial cables.

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Question 5:

When is necessary to use a crossover Ethernet cable?

Answer: The 10BASE-T and 100BASE-TX Ethernet standards use one wire pair for transmission in each direction. The Tx+ line from each device connects to the tip conductor and the Tx- line is connected to the ring. This requires that the transmit pair of each device be connected to the receive pair of the device on the other end. When a terminal device is connected to a switch or hub, this crossover is done internally in the switch or hub. A standard straight through cable is used for this purpose where each pin of the connector on one end is connected to the corresponding pin on the other connector. One terminal device may be connected directly to another without the use of a switch or hub, but in that case the crossover must be done externally in the cable. Since 10BASE-T and 100BASE-TX use pairs 2 and 3, these two pairs must be swapped in the cable. This is a crossover cable. A crossover cable must also be used to connect two internally crossed devices (e.g., two hubs) as the internal crossovers cancel each other out.

Question 6 (Challenge Question):

In most cases the serial link between ISP and the customer device (CPE) is a synchronous serial link. The main characteristic of a synchronous serial links is the need of a clock signal to synchronize the data traveling into the cable. Such clock signal is generated by one of the ends of the serial link (on this case, either the ISP or the CPE device)

a. What is most common situation, the clock being generated by ISP or by CPE?
b. From the clock signal viewpoint, how are both ends of a serial link called?
c. Is the clock signal also necessary on an asynchronous serial link? If not how is the data synchronized while traveling through such links?

Answers:

a. The clock signal is usually generated by the ISP devices.
b. Data Communications Equipment (DCE) is the device generation the clock and Data Termination Equipment (DTE) is the end following the generated clock. On this case, ISP is DCE and R1 is DTE.
c. Asynchronous serial links don't require a clock signal (that's why they are called asynchronous). The data is synchronized by specific fields at the beginning of each transmitted frame. Such fields define a new frame is following and its size which synchronizes both ends of the connection.

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