

18-345 Introduction to Telecommunication Networks

Quiz 1

Problem 1 (2 point)

Standards were discussed regarding the economics of a successful network. Name one benefit of having standards. (2 point)

Standards allow for interoperability, which allows for different companies products to work together.

Problem 2 (10 points)

a. Describe the differences between TCP and UDP. (2 point)

TCP – connection oriented, provides for reliable stream of packets, error detection

UDP – connectionless, best-effort service, no guarantee of packet order or arrival

b. Give an advantage and disadvantage for each. (4 points)

TCP – adv: reliability, error detection, order guaranteed

Disadv: slower, requires connection

UDP- adv: faster, no connection required

Disadv: no error detection reliability or order guarantee

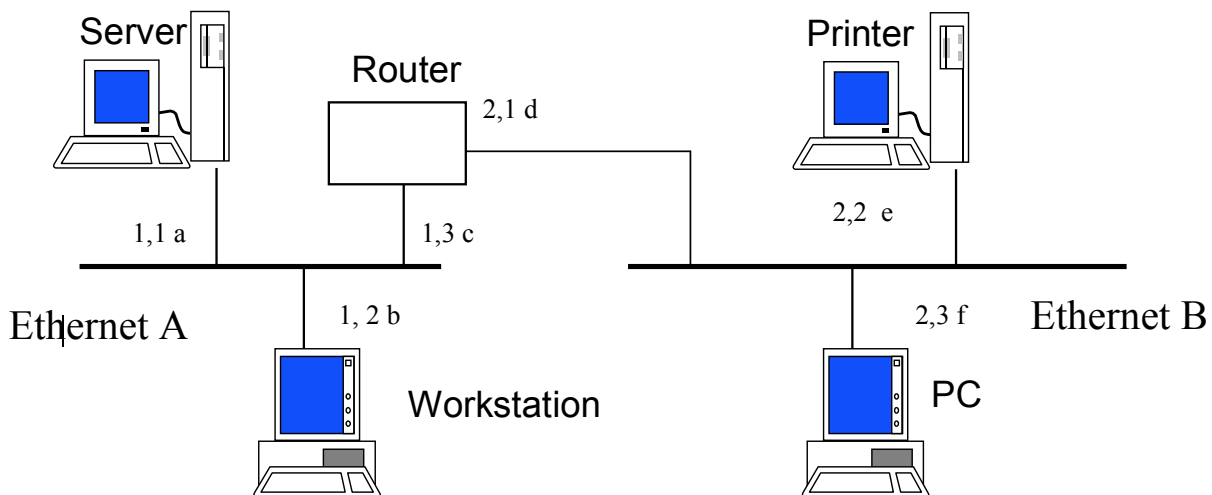
b. Suppose you are logged into the Andrew network at a cluster on campus. You are sending email back home. Your email client uses Simple Mail Transfer Protocol (SMTP), an application level protocol. Below is a packet sent by your email client en route to its destination. Name the protocol that will use the headers shown in the packet below (4 points)

1	2	3	4	data	CRC
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1. [Ethernet \(this is the data link layer\)](#)
2. [IP \(this is the network layer\)](#)
3. [TCP \(this is the transport layer\)](#)
4. [SMTP \(this is the application layer\)](#)

Problem 3 (8 points)

In the network shown in the figure below, we have a set of hosts that are connected by a *router*. The numbers indicate the IP (*network id, host id*) and the letters indicate the MAC layer addresses of the devices. An HTTP packet is sent from the PC to the server.



Questions:

- a) Describe the process of sending a packet to the printer in terms of the OSI layers (you can combine the application, presentation and session layers). What does the packet structure look like at each step in the process? (4 points)

Assume packet from workstation:

The packet will first go to the router encapsulated with Ethernet header info b as sender MAC and c as receiver MAC. The network layer has (1,2) as the sender IP address (2,2) as the destination IP. TCP and application layer protocols would be encapsulated on top of this.

At the router, the router captures the packet with the destination MAC c and passes the packet to its IP layer which sees that it is being sent to (2,2). The Ethernet layer is now changed to have MAC destination e.

The printer receives the frame and processes it.

OR

Assume packet from PC:

The packet will have sender MAC as f and receiver as e. It will have a network layer of IP sender address 2,3 and destination address 2,2. TCP and application layer protocols would be encapsulated on top of this.

The printer receives the frame and processes it.

- b) Suppose you want to replace Ethernet A by a wireless local area network. Will you have to change the network topology or modify the protocol stacks that run on the nodes? If so, describe the changes that have to be made on each node. If not, describe why. (2 points)

- No, Other than replacing the hardware and software that implement the physical and data link layer, each layer is designed to work independently so that they can be replaced by another implementation without affecting the other components in the system.
- The only requirement is that the two sender and receiver on the layer speak the same protocol, which would be satisfied if we use a wireless link.
- Hence, replacing Ethernet A by wireless local area network does not affect the network topology or protocol stacks so it is not required to change them.

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c) Suppose you want to replace the TCP transport module on the server to a new transport module. Will you have to change the network topology and/or modify the protocol stacks that run on the nodes? If so, describe the changes that have to be made on each node. If not, describe why. (2 points)

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- Yes. You need to change other parts of the network: specifically, the two endpoints of the transport layer will have to speak the same protocol, so hosts will have to be modified to use the new transport layer.
- The other layers will not have to be modified as long as the new transport layer has the same service interface as TCP.

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Problem 4 (2 points)

Suppose you are the owner of an **analog** communication network. You are thinking of switching to a **digital** communication network. Describe the major disadvantage of an analog network and why this is not a problem for digital networks

The major disadvantage of analog networks is that the data cannot be precisely replicated by the receiver. Regenerators are needed over long distances and each regeneration produces a slightly distorted analog signal. Over many regeneration data is lost. This is not true of digital networks. When a digital signal is regenerated it is brought back to a value that is clearly a 1 or 0.