Computer Facilities and Network Management
BUS3150

Tutorial - Week 3

*** FOR TUTORS ONLY ***

The answers provided here are only brief guides. If you have any comments or suggestions for improvement to this, please let me know so that your improvements may be included in this document.

Objective of this tutorial:
The objective of this tutorial is to strengthen the conceptual understanding of the material covered in the lecture by reflecting on the material in small groups. The tutor will provide feedback to enhance your understanding and diminish misunderstandings, if any.

How to participate in the tutorial:
Form groups of four to five students in each and discuss the answers for the following reflective questions with the group members. After spending about ten minutes for each question, discussing with group members, discuss your solutions with the tutor and other groups. The tutor will provide feedback on your solutions.

Question 1 - Consider the case where you wish to order pizza for a party of guests.

(a) Using the layer models in Figure 1, describe the ordering and delivery of a pizza, indicating the interaction at each level.

The guest effectively places the order with the cook. The host communicates this order to the clerk, who places the order with the cook. The phone system provides the physical means for the order to be transported from host to clerk. The cook gives the pizza to the clerk with the order form (acting as a "header" to the pizza). The clerk boxes the pizza with the delivery address, and the delivery van encloses all of the orders to be delivered. The road provides the physical path for the delivery.

(b) Imagine if the delivery van were to have an accident on the road and not reach its destination. Explain how the guests might still get their pizza.

The host waits for the pizza but it does not arrive (time out). The host communicates the order to the clerk again to resend another pizza. Or, the delivery van does not return (ACK) and so the clerk sends another pizza. Note that it is not the guests job to make sure the pizza is delivered.

Question 2 - Consider the OSI seven layer protocol architecture.

(a) Discuss the requirements that should be considered when defining a layer of the OSI protocol architecture.

- *Each layer should be independent of other layers.*
- *Well defined protocol for communication between peer layers.*

Guests		Pizza Cook
Host		Order Clerk
Telephone		Telephone

Telephone Line

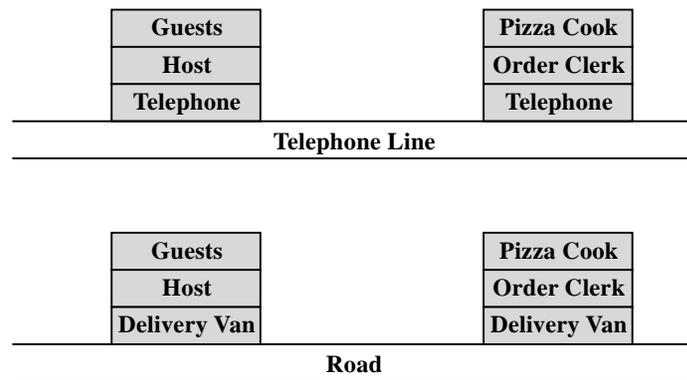| Guests		Pizza Cook
Host		Order Clerk
Delivery Van		Delivery Van

Road

Figure 1: Architecture for Question 1.

- *A set of service specifications the layer provides to the layer above.*
- *Addressing to support multiple entities (applications) on the end systems.*

(b) Select a layer of the OSI model and briefly describe its functions.

(c) Is it possible to combine presentation, session and application layers of the OSI model into a single application layer? Explain why or why not.

Yes. The bottom four layers of the OSI model implement functions necessary for reliable exchange of data and support various quality of service. The remaining requirements, such as maintaining a session and recovery, defining the data format and providing data transformation services etc. can be combined into a single layer. For example, if we do not require translation of the presentation format (two entities have same format), encryption or compression, we can combine the presentation and application layers. Similarly, the session layer can be combined. The TCP/IP protocol architecture combines these three layers into one.

Question 3 - The diagram in Figure 2 shows communication between two computers attached to two networks that use the TCP/IP architecture. Discuss how data transmission takes place from one computer to the other. Include in this discussion the method used to exchange control information between the computers.

- *Application X on host A sends data to TCP layer.... etc.*
- *Network access layer uses Network 1 to communicate with router J and transmit the packet.*
- *Router J uses Network 2 to transmit the packet to Host B.*
- *The network layer at Host B receives the packet... etc. The TCP layer, using the port address, delivers the data to application X.*
- *Control information is exchanged between peer layers using encapsulation into protocol data units (PDU). Data from the layer above has control information added to the start in the form of a header. The data combined with the header forms the PDU.*

Question 4 - The TCP/IP model in Figure 2 requires three levels of addressing to communicate across the network. List these three levels of addressing and explain why each is required. In what ways do the addresses need to be unique for each level of addressing?

- *Physical network addresses, logical IP addresses and port addresses.*
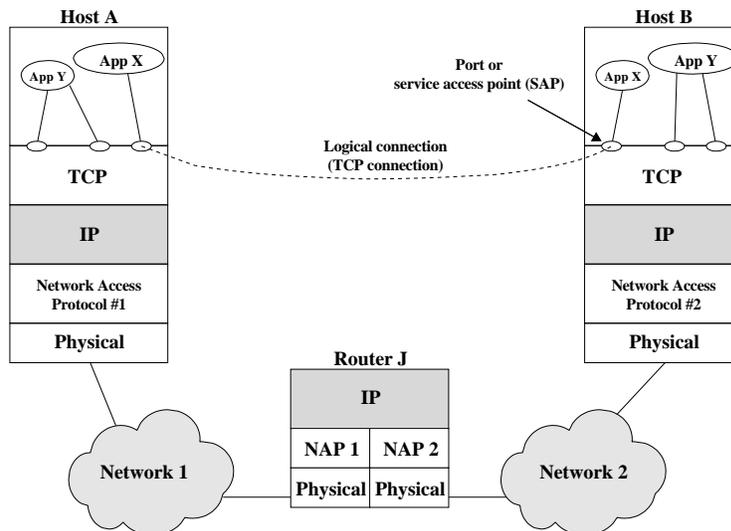
Figure 2: An example TCP/IP Architecture for Questions 3 and 4.

- *Physical addresses are dependent on the subnetwork to which they are connected. For a LAN they could be Ethernet or Token Ring MAC addresses, or for a WAN, Frame Relay addresses or ATM virtual circuit identifiers. The address needs to be unique within the subnetwork, but not globally unique.*

- *IP addresses are used to identify a single computer or router (system) on the network. The IP address needs to be globally unique.*

- *The port address specifies a single application on a computer. The port address needs only to be unique within the application layer of the computer system.*