Computer Facilities and Network Management

BUS3150

Tutorial - Week 11

***** 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 - IPv4 is known as a best-effort delivery service. What are the implications of this?

Question 2 - Consider the case where an organisation has an Ethernet (802.3) LAN and a Wireless (802.11) LAN. The organisation wishes to connect these two LANs together using a router.

(a) Draw a diagram showing the network design and show the protocol stack when using TCP/IP in the end systems and router. Use the diagram in Slide 10 of the lecture notes as a guide.

See Figure 1.

(b) There are three addresses in use during a data transfer through this network. Briefly describe each of these addresses and explain at which layer in the TCP/IP protocol stack each address is used.

- *Physical network addresses, logical IP addresses and port addresses.*
- *Physical addresses are dependent on the subnetwork to which they are connected. For the LANs above they are Ethernet and 802.11 addresses. The physical addresses are used in the Medium Access Control (MAC) layers and they need to be unique within the subnetwork on which they are used (not globally unique).*
- *IP addresses are used to identify a single computer or router (system) on the network. The IP addresses are used in the IP layer and need to be globally unique.*
- *The port address specifies a single application on a computer. The port address is used by the transport layer and needs only to be unique within the application layer of the computer system.*

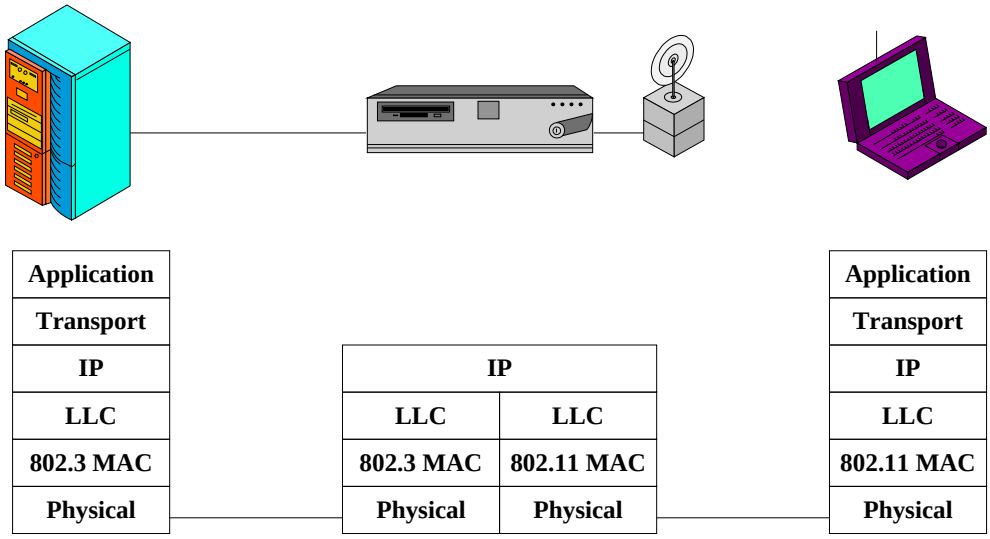

Figure 1: Router and protocol stack.

(c) User Datagram Protocol (UDP) is a transport level protocol which provides a datagram service to user applications. Since IP is already a datagram protocol, why is UDP required? Why can't a user program directly access IP?

Applications can't access IP directly due to the lack of application level (port) addressing. UDP adds a port addressing capability to IP. It also includes an optional checksum for the user data which provides error checking.

Question 3 - If dynamic routing is used, the potential exists for a datagram to loop indefinitely through the Internet. How is this problem overcome in the IP architecture?

The IP header includes a time to live field. Each router the IP datagram passes reduces this value. When the value reaches zero, the datagram is discarded. Traditionally, this fields was the time to live in seconds. However, it is typically implemented as a hop count. Therefore each router reduces the value by one.

Question 4 - If datagrams can be fragmented in the course of their travels, the question arises as to where they should be reassembled.

(a) What are implications of allowing immediate router reassembly (at the next router after fragmentation)?

Each router would require a larger enough buffer to reassemble multiple IP datagrams. A router would also require more complex logic to reconstruct the datagram and deal with the situation where not all fragments were successfully received by the router. Most importantly however is the fact that IP datagrams are not required to follow the same path to reach a destination due to dynamic routing. Different fragments may take different paths through the network making reassembly in any given router impossible.

(b) What are the implications of performing reassembly of a fragmented datagram at the destination only?

Since IP datagrams can only become more fragmented in their path through the network, they will get smaller as they traverse the Internet. This may reduce the efficiency of some networks which perform better with larger packet sizes.