CN101.3 Data Communication and Networks

Tutorial 1 – Chapter 1: Data Communications, Data Networks and the Internet

with Answers

Review Questions 1

- Three different factors have driven the architecture and evolution of data communications and networking facilities. Name these three factors.
  - 1. Advances in technologies
  - 2. Development of new services
  - 3. Network traffic growth at high and steady rate

Review Questions 2

- Describe two examples which will require high speed LANs.
  - 1. Colour publishing operation, where huge images have to be downloaded to imaging workstations.
  - 2. Software development group which uploads software patches to their servers and a large user group downloads these patches.
- Other examples:
  - Software simulations which require data in several workstations to run and update;
  - Real time video broadcasts;

Review Questions 3

- Explain how the rapid growth in digital technology has impacted the Internet.
  - Due to the rapid growth in digital technology, new devices capable of storing large amounts of data have come up. Examples are CD-ROM, DVD, Blu-ray disk, etc. The linking of data on these devices on to the internet has therefore, increased the internet traffic.

Review Questions 4

- Sketch a block diagram showing the essential elements of a simplified communications model.

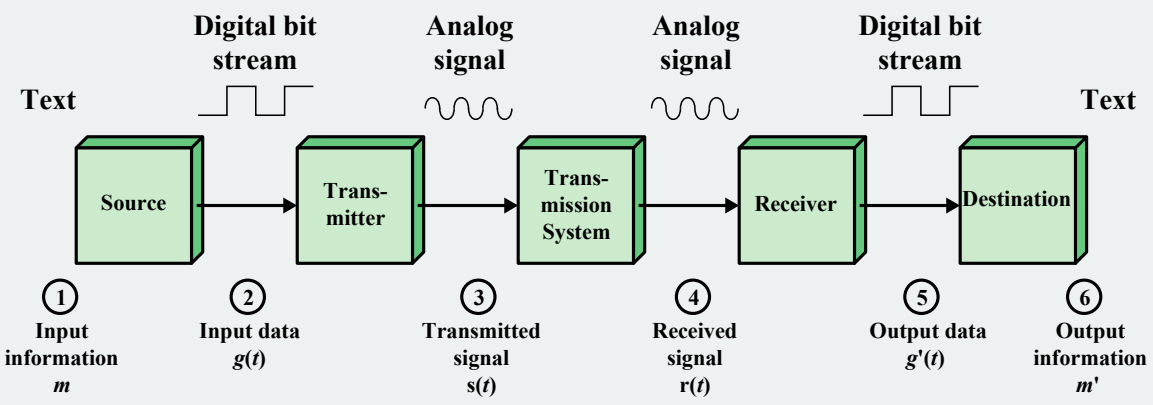

Figure 1.4 Simplified Data Communications Model

Review Questions 5

- List ten tasks that must be performed in a data communication system. From your list, select two and describe them in detail.
  1. Signal generation
  2. Synchronisation
  3. Error detection and correction
  4. Flow control
  5. Addressing
  6. Routing
  7. Recovery
  8. Message formatting
  9. Security
  10. Network Management

Review Questions 5 …

- Addressing

  In addressing both the sender's address and receiver's address are included. Receiver's address will indicate where the message has to go. Sender's address is required if part of a message gets lost during transmission, to ask the sender to re-send that part of the message again, or for any acknowledgement of receipt, etc.

- Flow Control

  In data communication different devices may operate at different speeds. Therefore, when a message is in transit some devices will have to temporary store the message before re-transmission, to avoid data overflow. This is part of the flow control.

Review Questions 6

- From a business point of view, what are the key aspects to consider when providing a transmission line.
  - 1. Capacity – how much data can the transmission line can carry;
  - 2. Reliability – how many times can the transmission line can carry data without any errors;
  - 3. Cost – how much will it cost?

Review Questions 7

- List two transmission mediums which are currently driving the evolution of data communications' transmission.
  - 1. Optical fibre transmission
  - 2. Wireless transmissions

Review Questions 8

- List and explain two major technical approaches used to increase the efficiency in transmission services.
  - 1. Multiplexing – In multiplexing the transmission medium is shared between several users. Two multiplexing methods are time division multiplexing (TDM) and frequency division multiplexing (FDM).
  - In TDM, each user is allocated a time slot and several timeslots are transmitted in the shared medium.
  - In FDM, each user's information is modulated onto a different carrier frequency and these modulated signals are transmitted in the shared medium at the same time.

Review Questions 8 …

- List and explain two major technical approaches used to increase the efficiency in transmission services.
  - 2. Compression – With compression, the data is squeezed down without using much information. For example, you may squeeze a 100MB of data into 95MB, thereby reducing your original data by 5MB, without losing much of its useful content. You may not even notice that the data has been compressed. There are various compression technologies and which technology to use depends on the format of the data. For example, whether they are text, images or video.

Review Questions 9

- List and describe the two traditional technologies used to implement Wide Area Networks (WANs).
  - 1. Circuit switching
  - In circuit switching, a dedicated connection is established between the sender and the receiver before any data is transmitted. The establishment of the connection will take some time. Once the connection is made, data will be transferred without much of a delay. Even if there is no data transfer, the connection will still be there, until it is terminated.
  - 2. Packet switching
  - In packet switching, a long message is broken down into smaller manageable pieces called packets. Each packet will have some control information containing the source and destination addresses, a sequence number, an error detection code, etc. Packets may be routed through the network in any order. Unlike with circuit switching, there is no dedicated connection between the sender and receiver.

Review Questions 10

- List the key elements of the Internet, and describe the purpose of the Internet.
- Key elements:
  - End systems comprising of PCs, workstations, servers, mainframes, mobile devices, etc.
  - Backbone comprising routers, switches, cables, etc
- Purpose of the Internet:
  - Interconnect end systems.