



MUST

Wisdom & Virtue

MIRPUR UNIVERSITY OF SCIENCE AND TECHNOLOGY (MUST), MIRPUR
DEPARTMENT OF SOFTWARE ENGINEERING



Computer Networks

Lecture [1] : Introduction to Computer Networks

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(Lecturer)



COURSE DESCRIPTION

Course Learning Outcomes (CLOs)

- 1. Describe the key **terminologies** and **technologies** of computer networks*
- 2. Explain the **services** and **functions** provided by each **layer** in the Internet protocol stack*
- 3. Identify various **internetworking devices** and **protocols**, and their functions in a network*
- 4. Analyze **working** and **performance** of key technologies, **algorithms** and protocols*
- 5. Build **Computer Network** on various Topologies*



COURSE TEXTBOOKS

Book 1 → Data Communication and Networking (5th or latest Edition)

By Behrouz A. Forouzan

Book 2 → Computer Networks: (5th or latest edition) By Andrew S. Tanenbaum



Marks Division

Total Marks: 150

1: Quizzes:	15 Marks (3-4 Quizzes)
2: Assignments:	15 Marks (2 Assignments with viva)
3: Midterm:	45 Marks
5: Final Terminal:	75 Marks



Topics discussed in Today's Lectures

- Description of Data communication
- Characteristics of Effective Communication
- Components of communications system
- Data Representation



Computer Network

Computer Network

- It means a collection of autonomous computers interconnected by a single technology
- Two computers are said to be interconnected if they are able to exchange information
- They are usually connected together to make larger networks, with the **Internet** being the most well-known example of *a network of networks*.



DATA COMMUNICATIONS

What is Data Communication?

- The word **data** refers to information presented in whatever form is agreed upon by the parties creating and using the data
- When we **communicate**, we are sharing information
- The term **telecommunication** means communication at a distance
- **Data communication** is *the exchange of data between two devices via some form of transmission medium such as a wire cable*
- Involve combination of hardware (physical equipment) and software (programs)



Effective Communication

The **effectiveness** of a data communications system depends on four fundamental characteristics: **delivery**, **accuracy**, **timeliness**, and **jitter**

i. **Delivery**

- The system must deliver data to the **correct destination**
- Data must be received by the **intended device** or user and only by that device or user

ii. **Accuracy**

- The system must deliver the data accurately
- Data that have been **altered in transmission** and **left uncorrected** are unusable



Effective Communication (Contd.)

iii. Timeliness

- The system must deliver data in a **timely manner**
- Data delivered late are **useless**
- In the case of **video** and **audio**, timely delivery means *delivering data as they are produced*
 - In the **same order** that they are produced, and without **significant delay**
- This kind of delivery is called **real-time transmission**

iv. Jitter

- Jitter refers to the **variation in the packet arrival time**
- It is **the uneven delay** in the delivery of audio or video packets
- **For example**, let us assume that video packets are sent every 30 ms. If some of the packets arrive with 30-ms delay and others with 40-ms delay, an **uneven/irregular quality** in the video is the result



Components of Communication Model

A communication System comprises of following five components:

i. Message

- The message is the information (data) to be communicated
- Popular forms of information include [text](#), [numbers](#), [pictures](#), [audio](#), and [video](#)

ii. Sender

- The sender is the device that sends the data message
- It can be a:
 - [Computer](#)
 - [Workstation](#)
 - [Telephone](#)
 - [Mobile](#)
 - [Video camera](#), and so on.



Components of Communication Model (Contd.)

iii. Receiver.

- The receiver is the device that receives the message
- It can be a computer, workstation, telephone, mobile, television, and so on

iv. Transmission medium.

- The transmission medium is the physical path by which a message travels from sender to receiver
- Some examples of transmission media include:
 - Twisted-pair wire
 - Coaxial cable
 - Fiber-optic cable
 - Radio waves



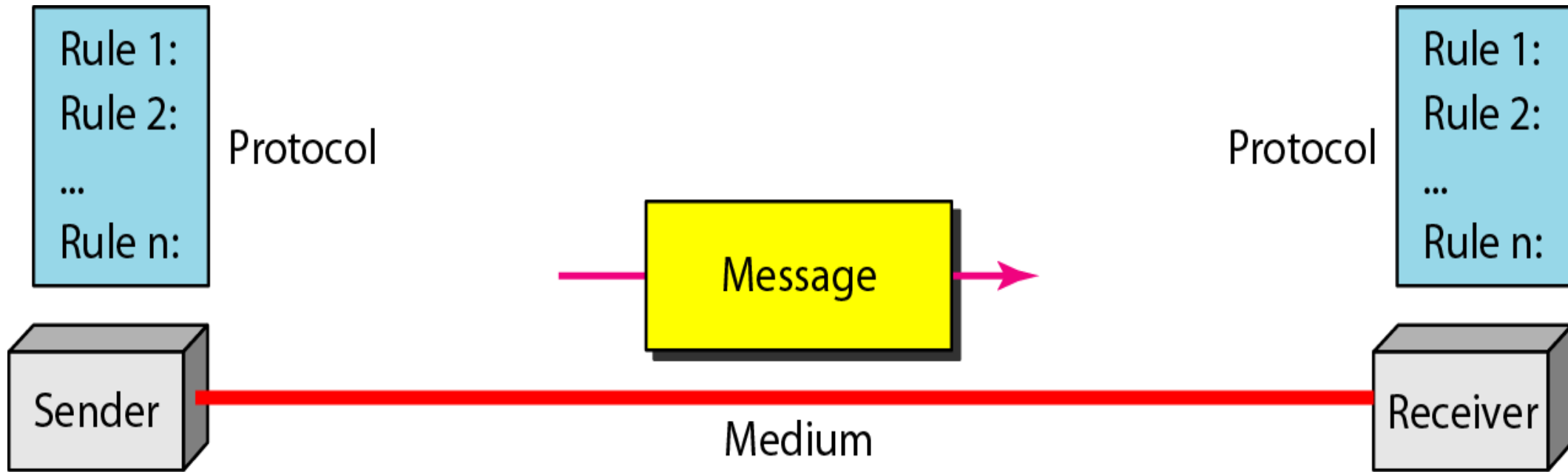
Components of Communication Model (Contd.)

v. Protocol

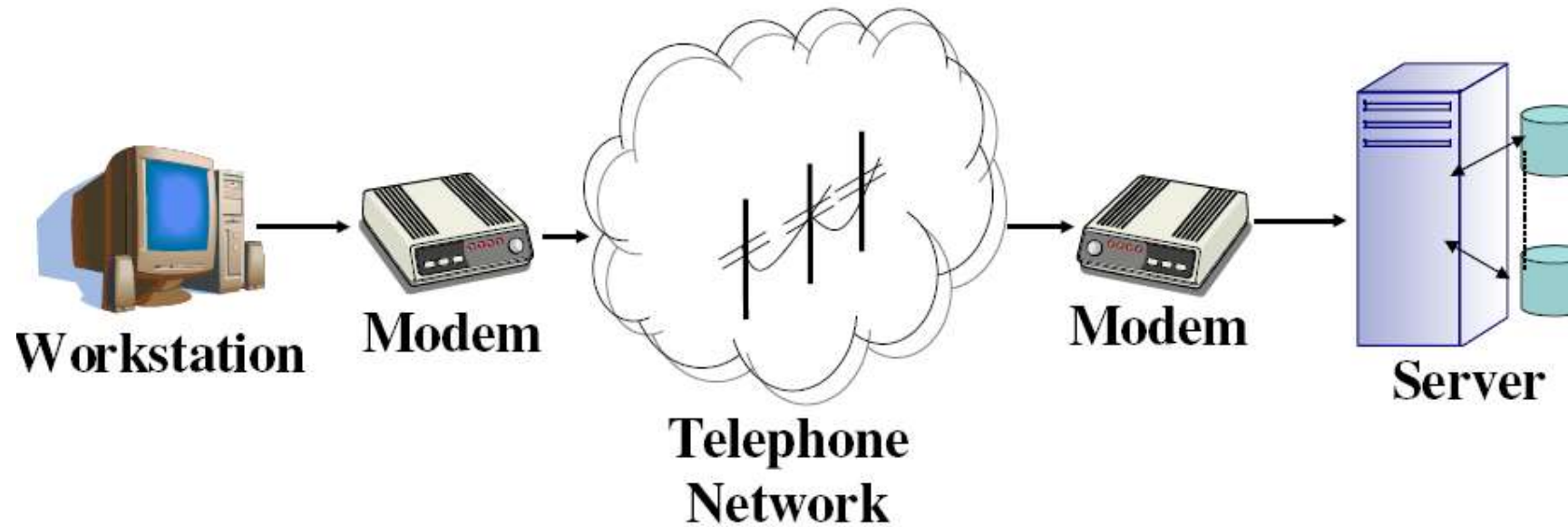
- A protocol is a **set of rules** that govern data communications
- It represents an agreement between the communicating devices
- Without a protocol, two devices may be connected but not communicating:
 - Just as a person speaking French cannot be understood by a person who speaks only Japanese



Figure 1.1 Components of a Data Communication System



Communication System example



Data Representation

- Information today comes in different forms such as text, numbers, images, audio, and video.

In data communications,

- **Text** is represented as a bit pattern, a sequence of bits (0s or 1s) named as Codes
 - Different sets of bit patterns have been designed to represent text symbols
 - Each set is called a code, and the process of representing symbols is called coding
 - Popular text coding schemes are Unicode, American Standard Code for Information Interchange (ASCII)
- **Numbers** are also represented by bit patterns
 - However, a code such as ASCII is not used to represent numbers
 - Number is directly converted to a binary number to simplify mathematical operations

Data Representation (Contd...)

- **Image** is composed of a matrix of **pixels** (picture elements)
 - Each pixel is a **small dot**
 - The size of the pixel depends on the **resolution**
 - For example, an image can be divided into 1000 pixels or 10,000 pixels
 - In the case of 10,000 pixels, there is a **better representation** of the image (better resolution), but more memory is needed to store the image
 - For an image made of only black and-white dots, a 1-bit pattern is enough to represent a pixel i.e. 0 shows **Black** and 1 represents **White**
 - Color image are shown by method known as **RGB** (Red, Green, Blue) and **YCM** (Yellow, Cyan, and Magenta)

Data Representation (Contd...)

- **Audio** refers to the recording or broadcasting of **sound or music**
 - Audio is by nature different from text, numbers, or images
 - It is **continuous**, not discrete
 - When we use a microphone to change voice to an electric signal, we create a continuous signal
- **Video** refers to the recording or broadcasting of a picture or movie
 - Video can either be produced as a continuous entity (e.g., by a TV camera), or
 - It can be a combination of images, each a discrete entity, arranged to convey the idea of **motion**

References

Chapter 1

Data Communication and Networking (5th Edition)
By Behrouz A. Forouzan

THANKS