Module 3

Communication Process And Layered Architecture

Lesson

7

Osi Layers And Protocols

LESSON OBJECTIVE

General

This lesson will focus upon the layered architecture in communication process (computer architecture)

Specific

The learner shall be able to

1. Understand the concept of layered architecture
2. Identify the different OSI layers
3. Enumerate the tasks performed by the different layers in the OSI layered architecture.

3.3.1 INTRODUCTION

When there are more than two user computers and communication may be initiated by any computer to any computer then we have a computer network. The computer network will therefore have nodes and branches. The nodes have to carry out functions known as networking tasks like routing. Addressing the messages is another important requirement in a computer network. Thus the number of tasks in a network is much more than those between only two computers users. In order that a single layer is not loaded heavily to carry out many tasks, the number of layers is increased from 3 in fig 1 to 7. More is the number of layers, higher is the number of interfaces required. Therefore it is not advisable to make a layer for a single task. Similar tasks are grouped together into a layer, so that the design and implementation of the layer becomes handy. Historically the computer networks were modeled into 5 or 7 layers. The International Standard Organization (ISO) came up with an idea of Open System Interconnection (OSI) model, where all the communication related tasks are grouped into seven layers a shown in figure. This is popularly known as 7 layer OSI network model. Depending on the requirement, a few or all the layers are implemented in the network. Even the number of tasks in the layer is flexible to the network designer and operator. The basic physical

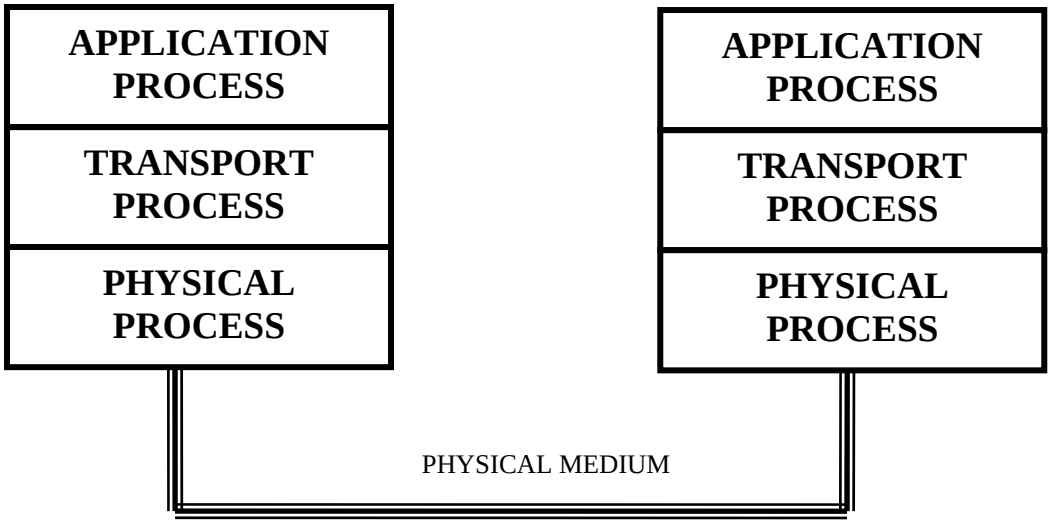

Figure 3.3.1 Three layer communication model

process is sub-divided into bottom three layers, and the basic application process is sub-divided into three top layers in the OSI model. The three bottom layers are The Physical Layer, Datalink Layer, Network layer, and are together termed as network processes. The top three layers are The Application layer, The Presentation Layer, and the Session Layer, and are generally called the application process. These layers are shown in figure 3.3.2. The transport layer provides an interface between top three and bottom three layers. All the users in principle should have the seven layers.

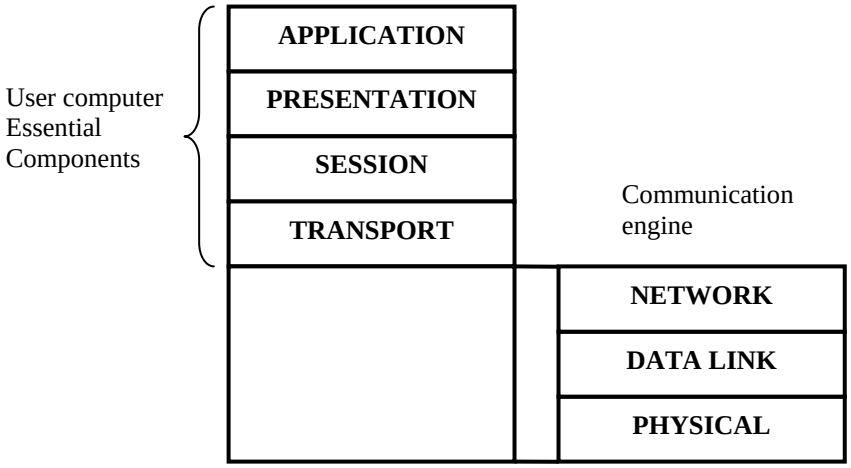

Figure 3.3.2 Communicating terminal

When any two computers communicate, then the layers communicate virtually on a peer-peer basis e.g. the application layer of user A will communicate with the application layer of user B only. Similarly the datalink layer of A will communicate with datalink layer of B. Only the physical layers are connected to the physical medium. So they have direct physical connection. The path for information flow between any two users is provided by the nodes. Therefore the nodes should also perform all the communication tasks related to the physical process. They will hence have the bottom three layers. Since the nodes are not supposed to use the information of the end user, they do not require the upper three layers. The upper three layers are required only at the end users. Obviously the interface layer i.e the Transport layer is required only at the end users. This seven layer concept between two end users connected via an intermediate node is depicted in figure 3.3.3

The procedures for carrying out a task at the layer and the virtual peer-peer communication between the corresponding layers are known as protocol. Thus in the seven layer OSI network model there are basically 7 protocols viz. Application layer protocol, Presentation layer protocol, Session layer protocol, Transport layer protocol, Network layer protocol, Datalink layer protocol, Physical layer protocol. These protocols only define the procedures and rules. They are advisory in nature and thus provide guidelines only. For multi-user and multi-vendor working and compatibility between the networks, these protocols are standardized for convenience. The standards relating to the seven layers are discussed in detail in the next lessons. It is now desirable to explain the functions of the seven layers.

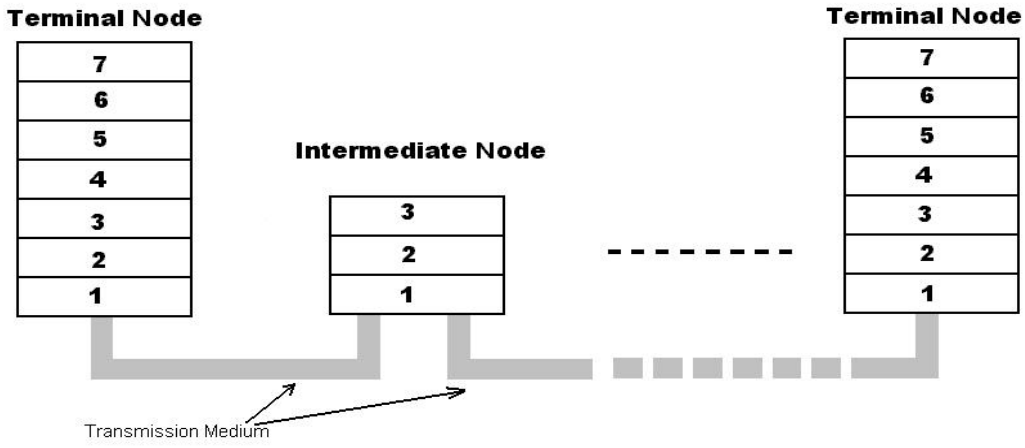

Figure 3.3.3 Layers in terminal and intermediate nodes

3.3.2 TASKS PERFORMED BY DIFFERENT LAYERS IN THE OSI MODEL.

APPLICATION:

- E-mail,
- File transfer,
- Remote login (TELNET).
- Directory service,
- Robots, computer aided education
- Virtual terminals,
- Moving the cursor

PRESENTATION:

- Syntax,
- Semantics,
- Encoding (ASCII. ABCDIC),
- Data structures,
- Name-date-characters-integers representation,
- 1's-2's complement representation.
- Compression.
- Security/encryption.

SESSION:

- Establishment and management of sessions,
- Dialogue management,
- Token management
- Synchronization (very important in multimedia),
- Continuous transmission,
- Interruption management

TRANSPORT:

- Class of service (The transport layer specifies the service, but do not provide it)
- Multiplexing (from the several transport connection to some network connection),
- Splitting (from the same transport connection to several network connection),
- To see that the application reaches the destination application with integrity.

NETWORK:

- Switching,
- Overall routing,
- Routing tables,

- Packetization / Depacketization,
- Congestion control,
- Packet size,
- Addressing,
- Billing

DATALINK:

- Virtual link between two nodes, not users,
- Frame control,
- Error control including lost, damaged and duplicate frames,
- Acknowledgement,
- Link management

PHYSICAL:

- Handles raw bits, voltage levels, bit duration,
- Simplex/duplex/half-duplex connection,
- Hand shaking,
- Termination,
- Mechanical properties,
- Electrical characteristics,
- Procedural aspects,
- Channel coding.

Objective Questions

7.01 Osi Consists Of _____ Layers

7.02 Communication Engine Consists Of _____ , _____ , _____ Layers

7.03 The _____ Layer Provides An Interface Between Top Three And Bottom Three Layers.

7.04 State The Layers To Which The Following Tasks Belong

- Email
- Ftp
- Semantics
- Interruption Management
- Switching
- Addressing
- Link Management
- Mechanical Properties

Subjective Questions

7.11 Give A Detailed Description Of The Osi Layers.

7.12 Discuss The Sna Layers Introduced By Ibm.

Level 2 Questions

7.21