

Module 3

Communication Process And Layered Architecture

3.0 INTRODUCTION

Communication is the basic animal instinct and it is more so for the human beings. They need to communicate for conveying their requirements and feelings to each other. Human beings are blessed with five senses which are appropriately termed as intelligences through which they exchange information. These senses are speech and hearing, vision, touch, taste and smell. Through these intelligences the human beings know about their environment and the nature around them. They gather information about the environment and nature through these senses and adjust their living accordingly. They communicate with their fellow beings about themselves and the environment around.

Communication can be visualized as a process which takes place in different steps as a function of time. The first and foremost is the generation of information/idea where the mind comes into picture. Then the idea which needs to be conveyed to others has to be represented in appropriate forms suitable for the five senses. Then for actual communication the physical media is required to carry the information. It may please be noted that this three stage communication process has to be associated with appropriate control and signaling. The purpose of control is to decide when to communicate and when to stop. Similarly signaling is required for indicating the intention of communication.

The basic process of communication can be represented by the three layers as shown in figure 3.1. The topmost layer is the application

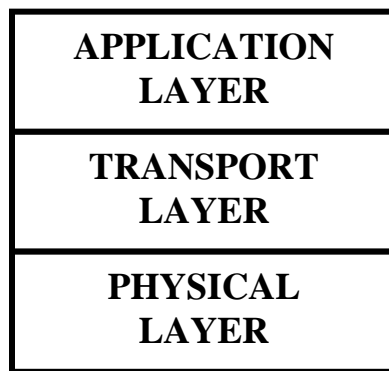


Fig. 3.0.1 Three layers of the Communication process

layer which relates to the origin of idea and the purpose of communication. A simple example of the application layer is where a student wants to

request the principal for sanction of leave for some work at home. The bottommost layer is the physical layer where, the request has to reach the principal. The student, therefore, has to write down the request on a sheet of paper and send it to the principal. The idea or the application which originated in the mind of the student needs to be represented in suitable form which may be English language. The application layer has to be interfaced with the Physical layer called the transport layer. For example the request in English has to be written down on a sheet of paper with the hand or with the help of a typing device. They thus act as interface between the application which is a request for leave and the physical layer which requires a piece of paper. In fact any communication can be conceived as a three layer process. In the following lessons the communication process will be elaborated and applied to machine communication.

Lesson

5

Communication Process

LESSON OBJECTIVE

General

This lesson will develop the understanding of the process of communication with its various aspects. It will also focus upon the communication process in different scenarios.

Specific

The learner shall be able to

1. Understand the concept of communication process.
2. Enlist the different phases of communication.
3. Define various service primitives.

3.1.1 INTRODUCTION

As explained earlier, communication can be thought of as a process with basic two layers, i.e. the application and the physical layer. In any communication process there has to be a source and a destination. The physical layer connects through a medium the source and the destination. The application originates at the source, is converted into suitable form at the physical layer, and is then delivered to the destination through the physical medium. At the destination the physical layer accepts the information and passes it onto the application layer for appropriate action. This process is illustrated in figure 3.1.1.

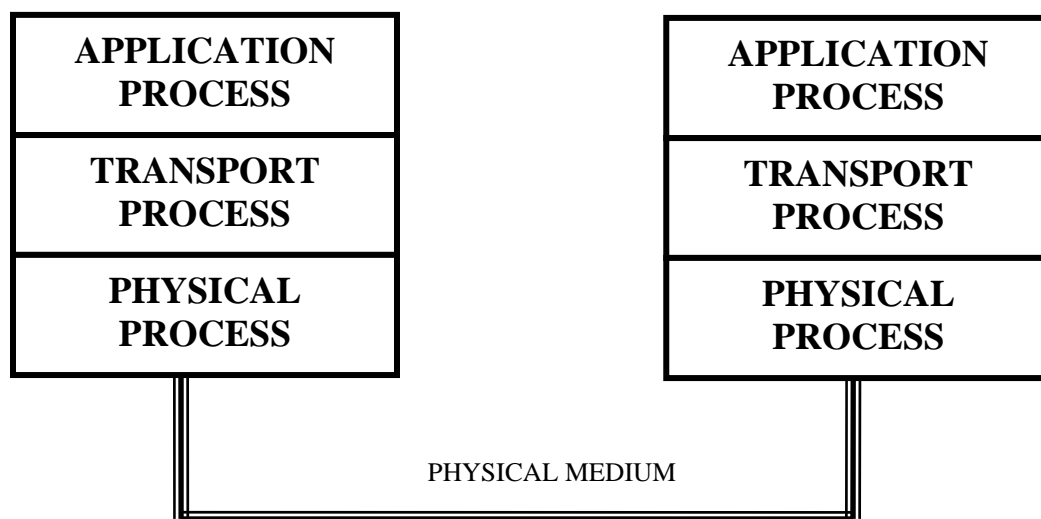


Fig. 3.1.1 Layers of communication between two machines

It is necessary to have an interface between the application process and the physical process as the application process is rather abstract while the physical process has to implement the communication. This interfacing is done by the transport process. This three layer concept for the communication process need be expanded further for being able to design systems enabling machines to communication. The elaboration of the three layers of the communication process will be taken up later after discussing the technique of making two computers communicate.

3.1.2 SERVICE PRIMITIVES

Communication is a form of service and the users has to pay the network provider for providing this service. As with any other service, we also have some service primitives used for carrying out communication. **Service primitives** may be defined as a set of services offered by the service provider to the user. We shall explain service primitives used in computer communication with an example.

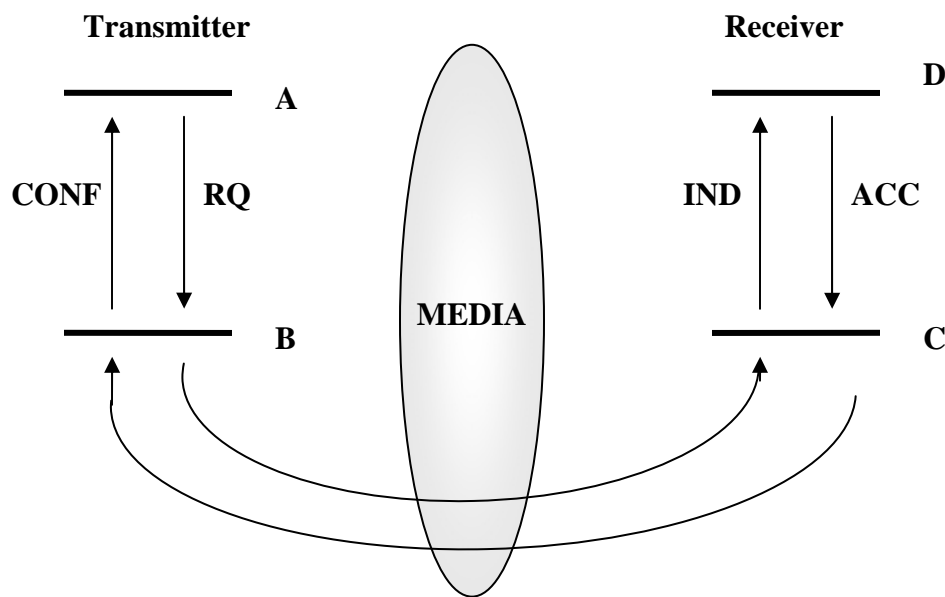


Fig. 3.1.2 Machine communication using service primitives

We have a generalized method of machine communication as shown in figure 3.1.2. The communication system has three basic components: The Transmitter, The Receiver and The Medium. Entity **A** and Entity **D** are users. They transmit with the help of Entities **B** and **C** who work as mediators between A and D. Entities **B** and **C** can use the media.

When **A** wants to transmit to **D**, it sends a request (RQ) to **B**, which in turn

forwards it to **C**. **C**, notifies **D** through a primitive termed Indicate (IND). If **D** is ready to receive then it sends a primitive accept (ACC) to **C**. **C** transfers it to **B** and **B** then sends the confirm signal (CONF) to **A**. These four (RQ, IND, ACC, CONF) are the basic primitives required for communication. Now **A** can send data to **D**. **B** and **C** merely passes on the messages to and from **A** and **D** respectively, if we compare the above situation with the postal system then **A** and **D** are the users (humans) while **B** and **C** perform the job of the post office.

3.1.3 PHASES OF COMMUNICATION

Any good communication has three phases:

1. *Connection establishment*—needed especially in case of connection oriented services
2. *Data or message transfer*—the process of actually transferring the data from sender to the receiver.
3. *Connection release*--necessary because the network provides a connection for communication and as soon as it is over it should be handed over to the network for further use.

Further the four service primitives are used in each of these phases as shown in figure 3.1.3 below.

Primitive	Phase
Rq	CE
Ind	CE
Acc	CE
Con	CE

Primitive	Phase
Rq	DT
Ind	DT
Acc	DT
Con	DT

Primitive	Phase
Rq	CR
Ind	CR
Acc	CR
Con	CR

Fig. 3.1.3 Service primitives

If the data is of 100 packets, then the DT phase would have 100 such sets of 4 primitives.

Objective Questions

- 5.01 Tasks such as switching, addressing and routing that are performed by the computers are known as communication / networking / processing / delaying tasks.
- 5.02 Between a pair of adjacent layers there is an interface / medium / peer / level.

Subjective Questions

- 5.11 Explain the phases of communication.
- 5.12 What are the tasks performed by the network interface card.
- 5.12 Give a justification for the basic three layer model of communication.

Level 2 Questions

5.21

Source: <http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Communication%20network/pdf/3.1%20Lesson%205.pdf>