

LECTURE #3

Communication Tasks

There are some key tasks that must be performed in a data communication system
Elements can be added, deleted, or merged together

Transmission System utilization	Interfacing
Signal Generation	Synchronization
Exchange Management	Error Detection and Correction
Flow Control	Addressing
Routing	Recovery
Security	Network Management

❖ **Transmission System Utilization**

Need to make efficient use of Transmission facilities that are shared among a no. of communicating devices

For Example:

- ✓ Techniques like **Multiplexing** to allow multiple users to share total capacity of a Transmission Medium
- ✓ **Congestion Control**: TX. System should not be overwhelmed by traffic

❖ **Interfacing**

A device must have an Interface with the Transmission System/Transmission Medium

❖ **Signal Generation**

Electromagnetic Signals travel over Transmission Medium. Once an interface is established, Signal generation is required

➤ **Properties of Signals**

- ✓ Capable of being propagated over Tx. Medium
- ✓ Interpretable as data at the Receiver

❖ **Synchronization**

The transmission and the reception should be properly synchronized. Synchronization means that the receiver must be able to determine, when to expect a new transmission and when to send acknowledgements. In other words transmitter and receiver should have an agreement on the nature as well as timing of the signals

❖ **Exchange Management**

If the data needs to be exchanged in both directions over a period of time, both parties must cooperate as follows

- Whether both devices must transmit simultaneously or take turns
- Amount of Data to be sent at one time
- Format of the Data
- What to do when an Error Arises

❖ **Error Detection and Correction**

In all comm. Systems, there is a potential risk for errors and impairments.

Tx. Signals are distorted to some extent before reaching their destination. Error Detection & Correction needs to be employed in Data Processing Systems where a change in say the contents of a file cannot be tolerated

❖ **Flow Control**

To make sure that source does not overwhelm destination by sending data faster than it can be handled and processed

❖ **Addressing & Routing**

If tx. facility is shared by two or more devices, source must specify the identity or the address of the destination system and if Tx. System is itself a system, a proper route must be allocated that the data will take in order to reach the desired destination

❖ **Recovery**

If a data transmission is interrupted due to a fault somewhere in the system, recovery techniques are needed. The objective is either to resume activity at the point of interruption and to restore the state of the system to what it was prior to the interruption

❖ **Security**

Security is very important issue in a Data Communication System. The sender needs to be assured that

- Only the Intended receiver receives the data
- Data is delivered unaltered

Introduction to Protocol

In computer Networks, communication occurs between two entities in different systems.

- Entity is anything sending and receiving information
- SYSTEM is a physical object containing more than one entities

Now, two entities in different systems cannot just send data and expect to be understood. For communication to occur, these entities must agree on a PROTOCOL

PROTOCOLS

As discussed earlier, **“Protocol is a set of rules governing communication”**

- Two computers cannot just send bit streams to each other and expect to be understood
- Entities must agree on a PROTOCOL
 - ✓ Same Example French and German

Protocol defines:

- What is Communicated?
- How it is Communicated?
- When it is Communicated?

KEY elements of a PROTOCOL

❖ **Syntax:**

- Represents the Structure or the format of the Data
- Meaning the order in which data is presented

For Example

- ✓ First eight bits to be Sender address
- ✓ Next eight to be Receiver's Address
- ✓ The Rest to be Data

❖ **Semantics:**

- Refer to the Meaning of each section of bits

- How is a particular pattern to be interpreted?
- What action should be taken based on interpretation?

For Example

- ✓ Does an address identify the route to be taken or the final destination of the message?

❖ **Timing**

Refers to 2 characteristics:

- When data should be sent?
- How fast it should be sent?

For Example

- ✓ If sender produces data at 100 Mbps
- ✓ But Receiver can only process data at 1 Mbps
- ✓ The TX. will overload receiver and data will be lost

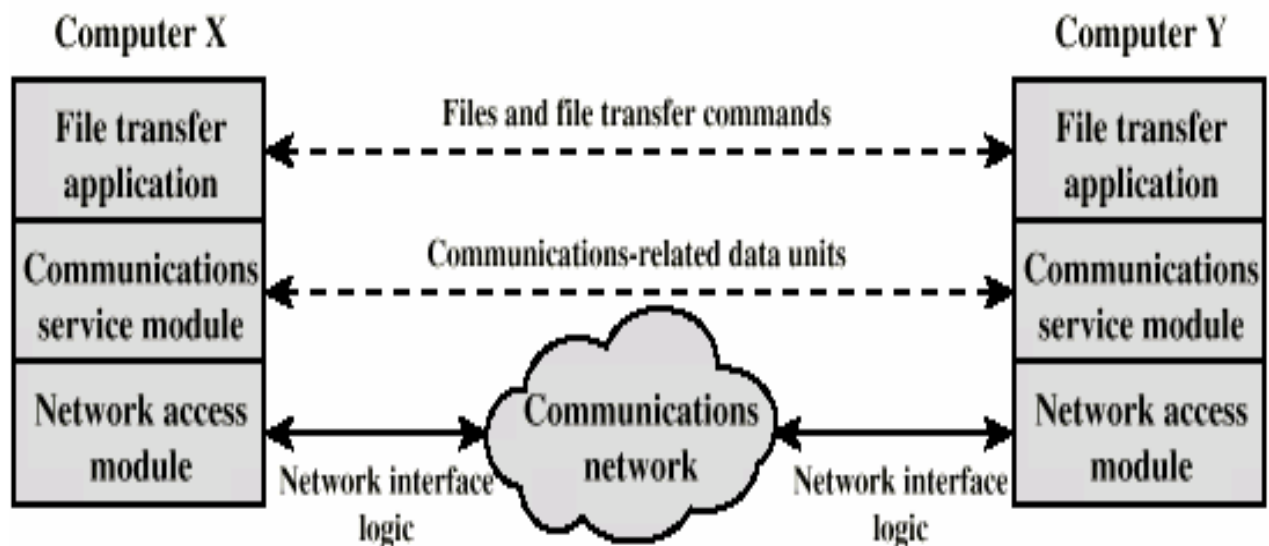
Protocol Architecture

Instead of having a single Module for performing communication, there is a structured set of modules that implement communications function”

This structure is called Protocol Architecture

Lets explain it by an example of File transfer system.

Simplified File Transfer Architecture



In the above example File transfer could use three modules

- File transfer application
- Communication service module

- Network access module

❖ **File transfer application**

File Transfer contains all of the logic is unique to the file transfer application such as :

- Transmitting passwords
- File Commands
 - ✓ Checking File System on other machine if it is ready
 - ✓ Check File System Compatibility
- File records

❖ **Communication service module**

Instead of allowing File Transfer Module to deal with actual transfer of data and commands, we can have a separate module for this transfer. This module must make sure that the receiver system is ready to receive and look into the reliable exchange of data

❖ **Network access module**

Nature of the exchange between systems is independent of the network that connects them. That allows us to have a 3rd module that handles the details of the Network interface and interacts with the network. If Network to be used changes, only Network access Module has to change

Characteristics of a Protocol

- Direct or indirect
- Monolithic or structured
- Symmetric or asymmetric
- Standard or nonstandard

❖ **Direct**

- Systems share a point to point link or
- Data can pass without intervening active agent
- Simple Protocol

❖ **Indirect**

- Switched networks or
- Internetworks or internets
- Data transfer depend on other entities
- Complex Protocol

❖ **Monolithic or Structured**

- Communications is a complex task
- Too complex for single unit
- Structured design breaks down problem into smaller units
- Layered structure

❖ **Symmetric or Asymmetric**

Symmetric

- Communication between peer entities

Asymmetric

- Client/server

Standard or Nonstandard

- Nonstandard protocols built for specific computers and tasks

Summary

- ◆ Communication Tasks
- ◆ Protocols
- ◆ Protocol Architecture
- ◆ Characteristics of a Protocol

Reading Sections

- ◆ Section 1.4 “Data Communications and Networking” 2nd Edition by Behrouz A. Forouzan
- ◆ Sections 1.1, 2.1 “Data and Computer Communication” 6th Edition by William Stallings