Basic Protocol Functions

Connection Establishment/Release

A data transfer can be a communication-oriented transfer or connectionless transfer. The connectionless services are the most unreliable services. Most of the protocols provide connection-oriented services. If a large volume of data transfer is required, connectionoriented services are always better.

Encapsulation

A protocol defines how the data is encapsulated in the frame or packet. Each packet in all PDUs contains three fields for control information along with the data field. There are three control information fields such as Address, Error Control and Protocol Control.

Segmentation and Reassembly

In a layered architecture, when the application entity sends data to another host's application entity, it moves from the application layer to the physical layer of the same host. Then the data packet travels on transmission media and then again from the physical layer to the application layer of destination.

In this process, the lower level protocol breaks up the data into smaller blocks and adds extra control information for peer-level use. This process is called Segmentation. Similarly, when the packet reaches the destination and it moves from the lower level to the upper-level. The upper level protocols recombine the blocks to get actual data after removing control information added by the sender's lower level protocols. This is called reassembly.

Data Transfer Management

If the sender can generate the data at the rate of 10 MBps and the receiver can accept at a speed of 1 MBps, then it is the protocol that synchronized them properly to provide matching and sequencing.

Multiplexing/Demultiplexing

The multiplexing function of the protocol is more related to addressing. One of the two types of multiplexing is used in protocols such as upward multiplexing or downward multiplexing. In upward multiplexing, several higher level connections are multiplexed or a single lower-level

connection. In contrast, in downward multiplexing, a single higherlevel connection is built on top of multiple lower-level connections.

Addressing

Addressing is a process of defining the address of entities during communication. The concept of addressing is complex and includes addressing level, addressing scope, connection identifiers and addressing modes.

Ordered Delivery

If the communicating machine is not connected directly, they are indirectly connected in a network. There lies a possibility of data packets not reaching their destination in the same sequence in which they were sent. The basic reason for a break of the sequence is that the data units (PDUs) traverse different network paths.

Error Control

The damage of data and loss of data must be adequately monitored when data transmission takes place. The damage or error in data controls is detected by the error control methods defined in the protocol. The error control is implemented in two steps as follows−

- Error Detection
- Retransmission of data

For error detection, some error detection code is sent by the sender with each PDU. The receiver knows that code and checks if the code in the received data is correct or not. Suppose any error is detected, the receiver requests the sender to retransmit the data. On the other hand, if no error is detected, the receiver transmits an acknowledgement for correct receiving data to the sender.

Flow Control

Flow control is also a necessary process to control the problems like congestion, overloading, loss of data etc. Flow control is a function performed by the receiving machine to limit the data rate being sent by the transmitting machine. The stop and wait protocols are the simplest methods to control the data flow. Flow control is a must, especially if the communicating machines have different transmission and reception data rates.