

# Computer Networks(CS F303)

## Group Members

- A Boodhayana S Vishwamithra (2017B4A70761H)
- Anuj Kharbada (2017B4A71508H)
- Giridhar Bajpai (2017B4A71451H)
- Vinay Agarwal (2017B3A70661H)
- Soumil Agarwal (2017B4A71606H)
- Thejas Sasikumar (2017B4A70614H)

## PROTOCOL DESIGN SPECIFICATION

The following specification ensures-

1. The prevention of loss or corruption of application messages by using re-transmission.
2. The in-order transport of application layer messages.

**Assumptions**(Network, protocol and application assumptions)

1. The Client-Server paradigm is followed.
2. Selective repeat protocol is used. Only the packets that get lost are re-transmitted.
3. The window size is fixed to a certain number, say 100 packets.
4. Each message is treated as a separated packet. In the case when a message has length exceeding the maximum size allocated to the packet, the message is split between two packets.
5. One packet contains a single message or a part of a single message.
6. UDP transport protocol is used.

### Structure of the Message

Type of Message
Sequence / Acknowledgement
Message/ Data

The above fields are concatenated to form a string which is then passed to the UDP. The resulting string forms the **Payload Data** for the UDP. The receiver program separates these fields from the **UDP payload**.

### Type of Message

This takes 1 byte(8-bits) of data.

SYN = 0

ACK = 1  
DATA = 2

### **The Connection establishment**

2-Way SYN-SYNACK sequence (2-way handshake) is used to establish connection between server and client.

### **The packets**

1. The data packet- which constitutes either the request sent by the client or the response sent by the server
2. The acknowledgement packet that is sent by server as an acknowledgement to a request being received.
3. The SYN packet which is used to establish the connection between server and client.

### **The Sequence Number(SN)**

The sequence number is a 16-bit integer literal used to index the application layer messages. Each packet is indexed with a Sequence Number before it is sent to the UDP for the communication.

### **The acknowledgement Number**

The acknowledgement number is a 16-bit number which denotes the packet that is being acknowledged. The sequence number of the acknowledged packet is stored in this header.

### **The acknowledgement**

The acknowledgement is cumulative, meaning that a positive acknowledgement received for a packet 'n' implies that all previous packets are correctly delivered.

If a particular packet did not reach the server/client, the acknowledgement for that missing packet is sent continuously until the packet is safely delivered following the re-transmission. After all the packets corresponding to the window are received and acknowledged, they are delivered to the host program.

### **The expected\_sequence\_number(ESN)**

ESN is used to store the sequence number of the expected packet

There are 3 cases-

1.  $SN < ESN$  : This is a case of duplicated transmission. An already acknowledged packet is retransmitted. The packet is dropped and an acknowledgement is sent(to the packet with greatest SN which is correctly received). ESN is incremented by 1.
2.  $SN = ESN$  : The sequence number of the received packet matches with the expected sequence number. An acknowledgement is sent and the packet is added to the receive\_buffer(of window size 100).

3.  $SN > ESN$  : The packet corresponding to the SN will be transmitted again in the future. So the packet is dropped and no action is taken.

### **Message/ Data**

The message from the application that needs to be sent is stored in this field. The size should not exceed

### **Timeout**

A fixed value is set for the timeout. If an acknowledgement is not received before timeout happens, the packet is retransmitted.( fixed it to 100ms)

### **Re-transmission**

The following are the plausible causes for re-transmission.

1. Loss of data packet packet leading to repeat acknowledgement of a packet with lesser sequence number.
2. Loss of an acknowledgement packet leading to timeout.

### **Sliding Window-**

The sliding window with selective repeat is used for the retransmission of the packets that are lost or corrupted. A fixed value(say, 100) is fixed to the size of the sliding window. This means that there can be a maximum of 100 sent yet unacknowledged packets with the sender(client/ server). Both the server and client need to maintain the sliding window since both transmit data packets.