**Assignment 5: Group A (Unit I & II)**

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| --- | --- | --- | --- | --- | --- | --- |
| **W (4)** | **C (4)** | **D (4)** | **V(4)** | **T (4)** | **Total** | **Sign** |
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**Date of Performance \_\_\_\_\_\_\_\_\_\_\_\_**

**Date of Completion** :\_\_\_\_\_\_\_\_\_\_\_\_\_

**Problem Definition:**

**Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in Peer-to-Peer mode.**

**Problem Definition:**

Implementation of sliding window protocol Java.

**1.1Prerequisite:**

Data Link layer working

**1.2 Learning Objective:**

* To understand how data is transferred reliable and in-order.
  1. **Theory:**
     1. **Introduction**

A **sliding window protocol** is a feature of packet-based [data transmission](http://en.wikipedia.org/wiki/Data_transmission) [protocols](http://en.wikipedia.org/wiki/Protocol_%28computing%29). Sliding window protocols are used where reliable in-order delivery of packets is required, such as in the [Data Link Layer](http://en.wikipedia.org/wiki/Data_Link_Layer) ([OSI model](http://en.wikipedia.org/wiki/OSI_model)) as well as in the [Transmission Control Protocol](http://en.wikipedia.org/wiki/Transmission_Control_Protocol) (TCP). Conceptually, each portion of the transmission is assigned a unique consecutive sequence number, and the receiver uses the numbers to place received packets in the correct order, discarding duplicate packets and identifying missing ones.

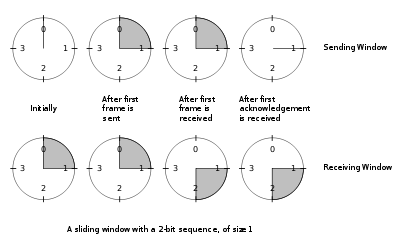
Sliding window is used by most connection oriented network protocol, among others, the Point-to-Point protocol (PPP) which many people use to establish their home PC as temporary Internet node via a phone-line connection to an existing node.

* + 1. **Working of Sliding window Protocol**

**Sliding Window Protocols** assumes two-way communication (full duplex). It uses two types of frames:

1. Data
2. Ack (sequence number of last correctly received frame)

The basic idea of sliding window protocol is that both sender and receiver keep a ``window'' of acknowledgment. The sender keeps the value of expected acknowledgment; while the receiver keeps the value of expected receiving frame. When it receives an acknowledgment from the receiver, the sender advances the window.



In sliding window method, multiple frames are sent by sender at a time before needing an acknowledgment. The term "window" on the transmitter side represents the logical boundary of the total number of packets yet to be acknowledged by the receiver. The receiver informs the transmitter in each acknowledgment packet the current maximum receiver buffer size (window boundary). The TCP header uses a 16 bit field to report the receive window size to the sender. Therefore, the largest window that can be used is 216 = 64 kilobytes.

Sliding windows usually start out with a given size, however, more sophisticated protocols will dynamically adapt the window size, trying to find an agreed-upon size between sender and receiver.

The **characteristics of sliding windows u**sed at the sender and receiver usually involve

1. error correction (by retransmission),
2. flow control and
3. message ordering by sender (FIFO).
   * 1. **Examples**

|  |  |
| --- | --- |
| **Stop-And-Wait** | |
| **One Bit Sliding Window Protocol**  One bit sliding window protocol is also called Stop-And-Wait protocol. In this protocol, the sender sends out one frame, waits for acknowledgment before sending next frame, thus the name Stop-And-Wait.  Problem with Stop-And-Wait protocol is that it is very inefficient. At any one moment, only in frame is in transition. The sender will have to wait at least one round trip time before sending next. The waiting can be long for a slow network such as satellite link.    **Stop-And-Wait ARQ**  Error correction in Stop-and-Wait ARQ is done by keeping a copy of the sent frame and retransmitting of the frame when the timer expires. Lost frames are more difficult to handle than corrupted ones. The received frame could be the correct one, or a duplicate, or a frame out of order.  The solution is to number the frames. When the receiver receives a data frame that is out of order, this means that frames were either lost or duplicated. The completed and lost frames need to be present in this protocol. If the receiver does not respond when there is an error, how can the sender know which frame to resend? To remedy this problem, the sender keeps a copy of the sent frame. At the same time, it starts a timer. If the timer expires and there is no ACK for the sent frame, the frame is resent, the copy is held, and the timer is restarted. Since an ACK frame can also be corrupted and lost, it too needs redundancy bits and a sequence number. The ACK frame for this protocol has a sequence number field.  **Sequence Number**   * A field is added to the data frame to hold the sequence number of that frame. * The sequence numbers of course can wrap around. For example, if we decide that the field is m bits long, the sequence numbers start from 0, go to 2m - 1, and then are repeated. * Let us reason out the range of sequence numbers we need. Assume we have used x as a sequence number; we only need to use x + 1 after that. There is no need for x + 2   **Acknowledgement Number**   * The acknowledgment numbers always announce the sequence number of the next frame expected by the receiver. * For example, if frame 0 has arrived safe and sound, the receiver sends an ACK frame with acknowledgment 1 (meaning frame 1 is expected next). * If frame 1 has arrived safe and sound, the receiver sends an ACK frame with acknowledgment 0 (meaning frame 0 is expected). |  |
| **Go-Back-n** | |
| If there is one frame k missing, the receiver simply discard all subsequent frames k+1, k+2, ..., sending no acknowledgments. So the sender will retransmit frames from k onwards. Figure 3-15(a) on page 208. This effectively sets the receiver window size to be 1. This can be a waste of bandwidth. |  |
| http://www.site.uottawa.ca/%7Eelsaddik/abedweb/applets/Applets/Sliding_Window/sample1.gif | |
| **Selective Repeat** | |
| Another strategy is to re-send only the ones that are actually lost or damaged. The receiver buffers all the frames after the lost one. When the sender finally noticed the problem (e.g. no ack for the lost frame is received within time-out limit), the sender retransmits the frame in question. |  |
| http://www.site.uottawa.ca/%7Eelsaddik/abedweb/applets/Applets/Sliding_Window/sample2.gif | |

**1.5 Assignment Question:**

* 1. What are the functions of Data Link Layer?
  2. Explain in detail Sliding window protocol?
  3. Explain Selective Repeat Protocol & Go Back N ARQ Protocol?
  4. Compare Sliding Wondow, Selective Repeat & Go Back N ARQ Protocol?

**Conclusion:**

**Hence we Studied that how Sliding window protocol works in Data link layer.**