Ex No: 10

Date:

WRITE A PROGRAM FOR CONGESTION CONTROL IN A NETWORK USING LEAKY BUCKET ALGORITHM.

Aim:

To simulate network congestion control using the Leaky Bucket algorithm.

Theory:

After the completion of this experiment, student will be able to

- Understand the Leaky Bucket algorithm and its role in network congestion control.
- Simulate the process of packet regulation using the Leaky Bucket mechanism.
- Analyze how packet loss occurs when the bucket capacity is exceeded.
- Interpret the relationship between input packet size, bucket size, and output packet size in maintaining steady network transmission.
- Understand the importance of traffic shaping techniques in managing network bandwidth and preventing congestion.

A simple leaky bucket algorithm can be implemented using FIFO queue. A FIFO queue holds the packets. If the traffic consists of fixed-size packets (e.g., cells in ATM networks), the process removes a fixed number of packets from the queue at each tick of the clock. If the traffic consists of variable-length packets, the fixed output rate must be based on the number of bytes or bits.

Algorithm:

Step-1: Initialize a counter to n at the tick of the clock.

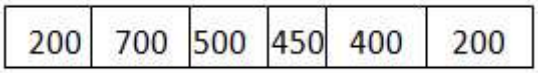
Step-2: Repeat until n is smaller than the packet size of the packet at the head of the queue.

- Pop a packet out of the head of the queue, say P.
- Send the packet P, into the network
- Decrement the counter by the size of packet P.

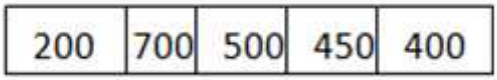
Step-3: Reset the counter and go to step 1.

Example: Let n=1000

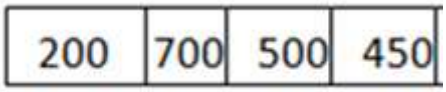
Packet=



Since n > size of the packet at the head of the Queue, i.e. n > 200
Therefore, n = 1000-200 = 800
Packet size of 200 is sent into the network.



Now, again n > size of the packet at the head of the Queue, i.e. n > 400
Therefore, n = 800-400 = 400
Packet size of 400 is sent into the network.



Since, n < size of the packet at the head of the Queue, i.e. n < 450
Therefore, the procedure is stopped.

Initialise n = 1000 on another tick of the clock.
This procedure is repeated until all the packets are sent into the network.

Program:

```
import java.io.*;
import java.util.*;

class LEAKYB {
    public static void main(String[] args)
    {
        int no_of_queries, storage, output_pkt_size;
        int input_pkt_size, bucket_size, size_left;

        // initial packets in the bucket
        storage = 0;

        // total no. of times bucket content is checked
        no_of_queries = 4;
```

```
        // total no. of packets that can
        // be accommodated in the bucket
        bucket_size = 10;

        // no. of packets that enters the bucket at a time
        input_pkt_size = 4;

        // no. of packets that exits the bucket at a time
        output_pkt_size = 1;
        for (int i = 0; i < no_of_queries; i++) {
            size_left = bucket_size - storage; // space left

            if (input_pkt_size <= (size_left)) {
                storage += input_pkt_size;
            }
            else {
                System.out.println("Packet loss = "
                        + input_pkt_size);
            }
            System.out.println("Buffer size= " + storage
                    + " out of bucket size= "
                    + bucket_size);
            storage -= output_pkt_size;
        }
    }
}
```

Sample Output:

```
Buffer size= 4 out of bucket size= 10
Buffer size= 7 out of bucket size= 10
Buffer size= 10 out of bucket size= 10
Packet loss = 4
Buffer size= 9 out of bucket size= 10
```

Screenshot of output:

Result:

Thus the program for network congestion control using the Leaky Bucket algorithm has been simulated successfully, by implementing java code.