Cairo University
Faculty of Engineering
Computer Department

Computer Networks
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Sheet 9

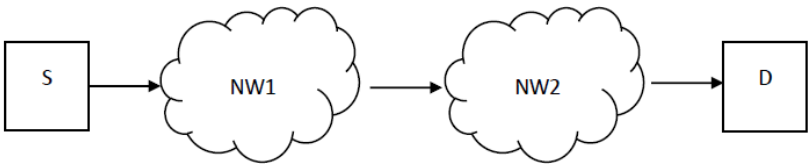
1. Fragmentation is an essential problem in internetworking why it is needed?
2. Give two reasons why an intermediate router isn't allowed to reassemble fragments.
3. The following are possible solutions for fragmentations, state one disadvantage of each:
   a. Route only through networks that can accommodate the source MTU.
   b. Perform MTU path discovery and Fragment according to the smallest MTU.
   c. Perform fragmentation in intermediate routers as needed.
4. Suppose you have two hosts (S , D) connected to two networks (NW1 , NW2) , the two networks have maximum transmission unit ***MTU*** is (10 bytes and 5 bytes accordingly) , assume the host ***S*** wants to send the following payload(10 bytes) to ***D*** ,if the networks use non-transparent fragmentation technique ,and Flat fragmentation is used.

   Show the fragments in each network assuming that the header size is 2 bytes.

   The Payload:

A	B	C	D	E	F	G	H	I	J

   The network:



5. Solve problem 5 again if transparent fragmentation is used.
6. Consider a packet with a total length of 250 bytes (including the header(20byte)), sent from a host A to a host B, passing through routers X and Y. Assume that the subnet where host A is connected has an MTU of 500 bytes, the subnet where host B is connected has an MTU of 100 bytes and the subnet between X and Y has an MTU of 120 bytes. Calculate the total number of transmuted fragments through the network from host A to Host B using.
   a. Non transparent fragmentation
   b. transparent fragmentation

7. Most IP datagram reassembly algorithms have a timer to avoid having a lost fragment tie up reassembly buffers forever. Suppose that a datagram is fragmented into four fragments. The first three fragments arrive, but the last one is delayed. Eventually, the timer goes off and the three fragments in the receiver's memory are discarded. A little later, the last fragment stumbles in. What should be done with it?

8. Describe one situation when it is better to use the leaky bucket and when it is better to use token bucket.

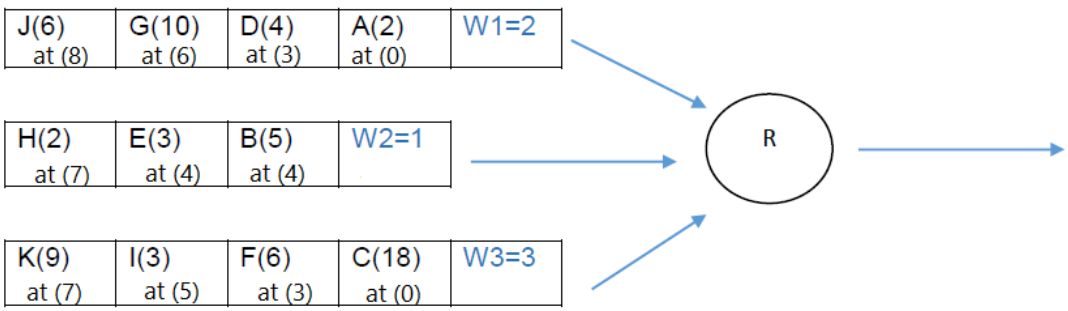
9. Suppose you have a token bucket with capacity B , Tokens arrive at a rate allowing output at 2 MB/sec. Assuming the token bucket is full when burst arrives, the bucket can drain at the full 50 MB/sec for about 11 msec. Then it has to cut back to 2 MB/sec during normal periods, what is the bucket capacity B?

10. Suppose a host sends a burst of data at rate 12 MB/sec for 2 seconds, then the host is silent for 5 seconds and then sends data at a rate of 2 MB/sec for 3 seconds, a leaky bucket is used to smooth the traffic, what is the required draining rate to send the whole traffic in 10 seconds.

11. A token bucket with a capacity of 1GB and burst rate of 20MB/sec and the token arrives in a rate of 10 MB/sec. Assume that when the bucket is empty, a burst of 50 MB of data has arrived in one second then no more data has arrived for 2 seconds then another burst of 30 MB has arrived again in one second. How long it takes the token bucket to leak all its data?
    a. 7 seconds
    b. 8 seconds
    c. 4 seconds
    d. 5 seconds

12. A Leaky bucket with a capacity of 1GB and drain rate of 20 MB/sec. Assume that when the bucket is empty, a burst of 50 MB of data has arrived in one second then no more data has arrived for 2 seconds then another burst of 30 MB has arrived again in one second. How long it takes the token bucket to leak all its data?
    a. 7 seconds
    b. 8 seconds
    c. 4 seconds
    d. 5 seconds

13. Assume a network uses a modified version of assured forwarding to manage the traffic flow. A packet is marked as one of the following categories: { Gold (weight=3) , Silver (weight=2)



and Bronze (weight=1) }. The packets are arranged in the following traffic flow queues, and each packet is combined with its length as well as its arrival time. Show the transmission order of each packet after applying the weighted fair queuing WFQ algorithm.

14. Assume a network uses admission control to manage the traffic flow. Assume a host H1 uses a leaky packet with drain rate RD. the host together with a number of other hosts are connected to a router R. the router feeds a link with maximum capacity of 1 Gbps. If you know that the router uses weighted fair queuing and the summation of the weights of all the host queues is 100, and among them a weight of 2 is assigned to H1. What is the maximum drain rate RD, that can be accepted in this network.