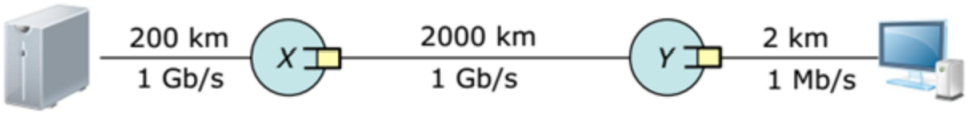
Waris Damkham 6388014 Sec 1

1. A payload of the transport layer size 3000 bytes needs to be transmitted to a web client. However, the communication link between the web server and the web client has an MTU of 580 bytes.
   a. What is the size of the IP datagram payload from the transport layer? 3000
   b. Due to the packet sent through the communication link between the web server and the web client,
      i. What is the size of the IP datagram (without IP header)? 560
      ii. How many fragments are created? 6
      iii. What are the offsets of the 2nd and the 3rd fragments? 70 and 140
      iv. What is the size of the last fragmented IP datagram (without IP header) ? 220
      v. What is the size of the last fragmented IP datagram (with IP header)? 240

2. The figure above shows a network path connecting a server to a client in optical fibers. The transmission rate of the server and the Router X is 1 Gb/s but the transmission rate of the Router Y is 1 Mb/s. Assume that the speed of light is 200,000 km/s.



   a. What is the propagation delay for a packet going from the server to the client?

$$\frac{2202\ \text{km}}{200{,}000\ \text{km/s}} = 0.011101\ \text{s} \times 1000 = 11.01\ \text{ms}$$

   b. If the packet size is 10,000 bits on all of the links, what is the total transmission delay?

$$= \frac{10^4}{10^9} + \frac{10^4}{10^9} + \frac{10^4}{10^6}$$

$$= 10^{-5} + 10^{-5} + 10^{-2} = 0.01\ \text{ms} + 0.01\ \text{ms} + 10\ \text{ms} = 10.02\ \text{ms}$$

3. Host A wants to send a file size 4 million bytes to Host B. The bandwidths between Host A to R1, R1 to R2, and R2 to Host B are 500 Kbps, 2 Mbps, and 1 Mbps, respectively. Answer the following questions.
   a. Assume no other traffic in the network, what is the throughput for this file transfer?

500 kbps

   b. Per your throughput answer above, what is the file transmission time from the Host A and the Host B?

4 million byte = 32,000,000 bits

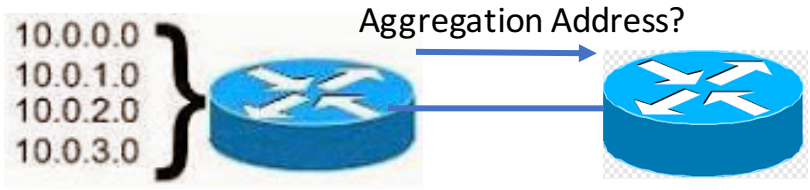
$$\frac{32{,}000{,}000}{500 \times 10^3} = 64 \text{ seconds}$$

4. Given an IP address 172.16.28.252 with a subnet mask of 255.255.240.0. Answer the following questions.
   a) The Network address is 172.16.16.0
   b) The number of addresses for this given network (including broadcast and network addresses) is $2^{12} = 4096$
   c) The number of host addresses is 4096 - 2 = 4094
   d) The broadcast address is 172.16.31.255
   e) The first host address of this network is 172.16.16.1
   f) The last host address of this network is 172.16.31.254

172.16.0001 1100.252 → 0
255.255.240.0
255.255.1111 0000.0 → 12

5. From this figure, **what is the most appropriate summarization for these routes or the aggregate address?**

A. 10.0.0.0 /21
B. 10.0.0.0 /22
C. 10.0.0.0 /23
D. 10.0.0.0 /24



6. You are working in a data center environment and are assigned the address range **10.188.30.0/20**. You are asked to develop an IP addressing plan to allow the maximum number of subnets with as many as **1000 hosts** each. What are IP address range that meet these requirements?

1000 hosts = $2^{(32-X)} - 2$

$= 2^{(32-X)} - 2 = 2^{10} - 2$

$= X - 22$

$X = 22$

IP Address range = 10.188.30.0/22