Computer Networking

Homework 1

**Name: 陈应权**

**Student number: 2022280297**

Problem 1: Packet switching and delay (30 points)

1）0.6s

From the question

Given:

Link capacity = 5 Mbps

Message size = 106bits

And

Transmission delay = Message size / Link capacity

So, Transmission delay = 106bits/ 5 Mbps=106 bits/(5\*106bps)=0.2s

It will take 0.2s to move the message from the source host to the first packet switch.

Total time = Transmission delay (source to first switch) + Transmission delay (first switch to second switch) + Transmission delay (second switch to destination)

=0.2s+0.2s+0.2s=0.6s

0.6s is the total time to move the message from source host to destination host.

2)0.002s ; 0.004s

Given:  
Packet size = 10,000 bits  
Link capacity = 5 Mbps

Transmission delay = Packet size / Link capacity

Transmission delay = 10,000 bits / 5 Mbps

Transmission delay = 0.002 seconds

Therefore, it takes approximately 0.002 seconds to move the first packet from the source host to the first switch.

When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch.

Since the second packet is being sent from the source host to the first switch, it will take the same amount of time as the first packet to reach the first switch, which is approximately 0.002 seconds.

The first packet switch fully receives the second packet：2\*0.002s=0.004s.

3) 0.204s

As calculated in the second question, the time for a split packet to pass through a link is 0.002s.

So, the total time of message segmentation=(100+2)\*0.002s=0.204s.

Comparing this result with the answer in part (a), where the message was sent without message segmentation, we can see that using message segmentation reduces the total time to move the file. Without segmentation, the total time was 0.6 seconds, while with segmentation, the total time is 0.204 seconds.

It is important to note that message segmentation allows for parallel transmission of packets, which can improve overall efficiency and reduce the time required to transmit large files.

Problem 2: HTTP1.1 (20 points)

1. .

Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object?

Obtain the address of the Web server=

Send Request=

Total time=

2)a. .

b.

c. or

Suppose the HTML file references eight very small objects on the same server. Neglecting transmission times, how much time elapses with

1. Non-persistent HTTP with no parallel TCP connections?
2. Non-persistent HTTP with the browser configured for 6 parallel connections?
3. Persistent HTTP?

a.

its characteristic is downloading multiple objects required multiple connections

so, total time= RTT1 +…+ RTTn + 2RTTo + 8⋅ 2RTTo = .

b.

You can get six files after setting up a connection, but there are still two files left, so you have to set up again, so total time= RTT1 +…+ RTTn + 2RTTo + 2 ⋅ 2RTT =

c.

①If it's non-pipelined,

Each time an object request is sent, one RTT is occupied.

So，the time = RTT1 +…+ RTTn + 2RTTo + 8RTT =

②If it's pipelined,

Pipelined: The request time for sending multiple objects can be reduced to one RTT.

So, the time = RTT1 +…+ RTTn + 2RTTo + RTT =

Problem 3: HTTP/2 (20 points)

1)2015 frame times

If all the video frames are sent first without interleaving, it would take 2000 frame times to send all the video frames. Only after that, the images can be sent.

Since each image consists of three frames, it would take 5 images × 3 frame times per image = 15 frame times to send all five images.

Therefore, in this scenario, a total of 2000 video frame times + 15 image frame times = 2015 frame times would be needed.

2) If frames are interleaved, each frame time would alternate between sending a video frame and an image frame.

There are 2000 video frames and 5 × 3 = 15 image frames. In each frame time, 2 frames (1 video frame and 1 image frame) would be sent. So, the number of frame times required to send all 2000 video frames and 15 image frames would be (2000 + 15) / 2 = 1007.5 frame times.

Problem 4: Web Cache (20 points)

1. 3.611s

Find the total average response time.

a=850000bits/15Mbps=0.0567s

b=16times/seconds

Mean access delay=a/(1-ab)=0.0567/(1-16\*0.0567)=0.611s

Mean internet delay=3s

the total average response time=0.611s+3s=3.611s

2)

Hit rate=1-0.4=0.6

1. In the case of cache not hits :

The traffic intensity on the access link is reduced by 60% since the 60% of the

requests are satisfied within the institutional network. Thus the average access delay

is:

Average access delay=a/(1-0.4ab)=0.0567/(1-0.4\*16\*0.0567)=0.089s

total time =0.124s+3s=3.124s

② In the case of cache not hits:

 the Internet connection latency is about 0, and the Internet latency is 0

Delay=850000bits/100Mbps=0.0085s≈0

Average delay=0.4\*3.124s+0.6\*0=1.249s

Problem 5: P2P (10 points)

1. Yes , his claim is possible. Because the optimistic unchoking.as long as there are enough peers staying in the swarm for a long enough time, he will receive the file by other peers.
2. His claim is also true. He can run a client on each host, let each client “free-ride,” and combine the collected chunks from the different hosts into a single file. It simply requires each host to request a different chunks and finally combine them together which can get the whole file. His behavior is a kind of sybil attack in P2P networks.