**CISC3001 Homework 2 (WONG KAI YUAN DC026157)**

1)

(i) Four types of delay in packet switching including:

- Nodal processing delay

- Queuing delay

- Transmission delay

- Propagation delay

(ii)

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| --- | --- |
| Queuing Delay | Transmission Delay |
| - Time waiting for transmission inside network device  - Affected by network traffic load & congestion levels. | - Time for network device to push all the bits of the packet onto transmission medium.  - Affected by packet size & speed of the link |

(iii)

The reason of packet loss is because the network device’s buffer is getting full due to (packet going out is slower than packet going in). Therefore, network device’s buffer become full, and the packet will be drop when there’s incoming packet. As a result, the packet is lost.

2)   
Known condition :   
packet size (L), distance (d), link bandwidth (R), signal propagation in each link(v).  
Node processing delay + Queuing delay as T.

There will be :   
Sending host to 1st router : Transmission Delay + Propagation Delay

1st router to 2nd router : Nodal processing delay + Queuing delay + Transmission delay + propagation delay.

2nd router to receiving host : Nodal processing delay + Queuing delay + Transmission delay + propagation delay.

So, in total, 3 Transmission Delay, 3 Propagation Delay, 2 Nodal Processing Delay, 2 Queuing Delay.

Transmission Delay = packet size / bandwidth = L/R

Propagation Delay = distance / propagation speed = d/v

Overall delay = 2T(processing+queing) + 3(L/R) + 3(d/v)

**= 2T + 3L/R + 3d/v**

3)

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| Client/ Server (CS) service model | Peer to Peer (p2p) service model |
| * Centralized, where client get service or data from servers. * Always on host * Do not communicate directly with each other. * Server has permanent address, client may have dynamic address * Stable and convenient for management, but difficult to scale | * Decentralized architectural pattern. * No always on host * Can directly communicate with each other as peer (can be client, can be server) * Peers are intermittently connected and change address * Flexible and scalable, but difficult to manage. |

4)

File size, F = 20M. Number of Peers N.

Server upload bandwidth Us = 40MHz.

Peer upload bandwidth Ui = 5Mhz. Peer download bandwidth di = 10Mhz.

1. Client/Server service model

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| --- | --- |
| N=5 | Dcs = max{NF/us , F/min(di)}   = max {1/2 N , 2}  = 1/2N = 2.5s |
| N=10 | Dcs = 1/2N = 5s |
| N=20 | Dcs = 1/2N = 10s |
| N=40 | Dcs = 1/2N = 20s |
| N=60 | Dcs = 1/2N = 30s |

1. Peer to Peer service model

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| --- | --- |
| N=5 | Dp2p = max{F/us, F/min(di), NF/(us + Σ ui)}   = max { ½, 2, 1.538}  = 2s |
| N=10 | Dp2p = max {1/2 , 2, (10x20)/(40+5x10)}  = 2.22s |
| N=20 | Dp2p = max {1/2 , 2, (20x20)/(40+5x20)}  = 2.85s |
| N=40 | Dp2p = max {1/2 , 2, (40x20)/(40+5x40)}  = 3.33s |
| N=60 | Dp2p = max {1/2 , 2, (60x20)/(40+5x60)}  = 3.53s |

1. When the number of users increase, P2P tend to have better performance. The gap between P2P and CS model got bigger as number of users increase.
2. If the number of users N = ∞.   
   CS model will take (½)N = ∞ ,

P2P model will take F/ui = 20/5 = 4

5)   
(i) Five Layers in TCP/IP reference model :

- Application Layer

- Transport Layer

- Network layer

- Link layer

- Physical Layer

(ii) Seven Layers in the ISO/OSI reference model :

- Application Layer

- Presentation Layer

- Session Layer

- Transport Layer

- Network layer

- Link layer

- Physical Layer

6) Three types on network attacks including:

- Denial of Service (DOS) : attackers make resources unavailable to legitimate traffic by overwhelming resource with bogus traffic

- Packet Sniffing: Promiscuous network interface reads all packets passing by

- IP spoofing: send packet with false source address.

7)

(i) The functionality of the data link layer is hop by hop transmission, moving frames from one node to the next. It provides reliable and error free data transmission over physical medium.

(ii) Host A sends a packet to Host F.

We assume the route will be: A -> B -> E -> F

So, when A send out data, it will have 1 encapsulation between data link layer and network layer.

When B receive, it will decapsulation, and then encapsulation and send to next network device E.

When E receive, it will decapsulation, and then encapsulation and send to host F.

When F receive, it will do decapsulation.

In total, **3 encapsulation, and 3 decapsulation** between data-link layer and network layer.