

CS 118 Homework 5

Wenxuan Liu 805152602

Problem 1

- (a) No. Because to avoid data collision, only one packet is allowed to be delivered by the bus each time in the shared bus topology.
- (b) No. Because the memory read or write operation is performed one at a time through the shared bus in switching via memory.
- (c) Yes. Because two packets can be forwarded to different ports at the same time given that the input and output ports are interconnected, and the delivery can happen simultaneously.

Problem 2

First, calculate the bits needed for each of the three subnets, each subnets need 2 extra address for broadcast:

For subnet1 with 60 interfaces: 6 bits can support $2^6 = 64$ addresses > 62

For subnet2 with 90 interfaces: 7 bits can support $2^7 = 128$ addresses > 92

For subnet3 with 8 interfaces: 4 bits can support $2^4 = 16$ addresses > 10

Then, calculate the netmasks:

Subnet1: $32 - 6 = 26$

Subnet2: $32 - 7 = 25$

Subnet3: $32 - 4 = 28$

Last, find appropriate subnet addresses:

Subnet1: 224.1.17.128/26, 11100000.00000001.00010001.10000000

Subnet2: 224.1.17.0/25, 11100000.00000001.00010001.00000000

Subnet3: 224.1.17.192/28, 11100000.00000001.00010001.11000000

Problem 3

(a) $\left\lceil \frac{2400-20}{800-20} \right\rceil_{roundup} = \left\lceil \frac{2380}{780} \right\rceil_{roundup} = 4$, so 4 fragments are generated.

(b)

Fragment 1

Header length: 20B

Total length: 796B

Identification: 421

MF flag: 1

Fragment offset: 0

Fragment 2

Header length: 20B

Total length: 796B

Identification: 421

MF flag: 1

Fragment offset: 97

Fragment 3

Header length: 20B

Total length: 796B

Identification: 421

MF flag: 1

Fragment offset: 194

Fragment 4

Header length: 20B

Total length: 72B

Identification: 421

MF flag: 0

Fragment offset: 291

Problem 4

- (a) The checksum is recalculated at every router because the IP header changes on every hop due to the TTL for IPv4 or the Hop Limit for IPv6. If we do not recalculate the checksum, there would be mismatch even when no bit error occurred since IP header has changed.
- (b) IP checksum only covers header field. Each time the fragment is processed the checksum is recalculated as some of the header field changes each time.

TCP checksum is created based on a 96-bit Pseudo header. This Pseudo header is not sent with the packet, contains the source address, destination address, protocol and TCP length, and it is only used for checksum calculation.

Problem 5

This technique is not possible to be devised. Because either Arnold or Bob need to initiate the connection between them in order to establish the TCP connection. Since the NATs covering them would drop the SYN packets when arriving from the WAN side, the TCP connection cannot be initiated.