Final Exam

Due No due date **Points** 56 **Questions** 29
Available Apr 26 at 10am - Apr 26 at 8pm 10 hours **Time Limit** 120 Minutes

Instructions

The exam time is 2 hours unless with special accommodation.

Attempt History

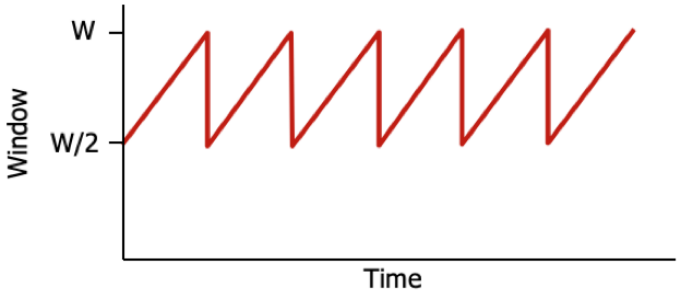
	Attempt	Time	Score
LATEST	Attempt 1	46 minutes	24 out of 56

Correct answers will be available on Apr 29 at 12am.

Score for this quiz: **24** out of 56
Submitted Apr 26 at 12:10pm
This attempt took 46 minutes.

Question 1 — 1 / 1 pts

Let us ignore TCP's slow-start phases that occur after timeout events, and assume that (i) there are always data to send, and (ii) the network always drops a packet from the connection when the window size increases to *W*. The resulting "saw tooth" behavior is shown in figure below. Let us denote the round-trip time by *RTT*, please answer the following questions:



(1) What is the maximum transmission rate?

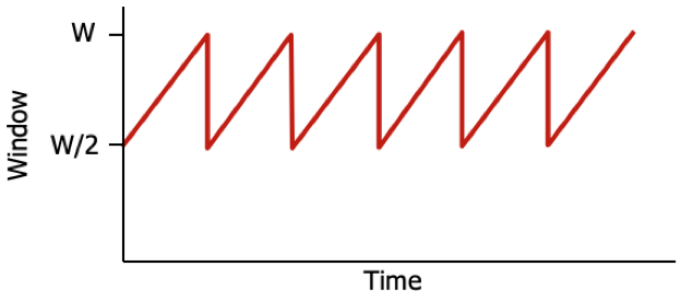
- 0.5W/RTT
- 0.85W/ETT
- 0.75W/RTT
- 0.65W/ETT
- W/RTT

Incorrect

Question 2

0 / 1 pts

Let us ignore TCP's slow-start phases that occur after timeout events, and assume that (i) there are always data to send, and (ii) the network always drops a packet from the connection when the window size increases to *W*. The resulting "saw tooth" behavior is shown in figure below. Let us denote the round-trip time by *RTT*, please answer the following questions:



(2) What is the average throughput?

- 0.85W/RTT
- W/RTT
- 0.75W/RTT
- 0.65W/RTT

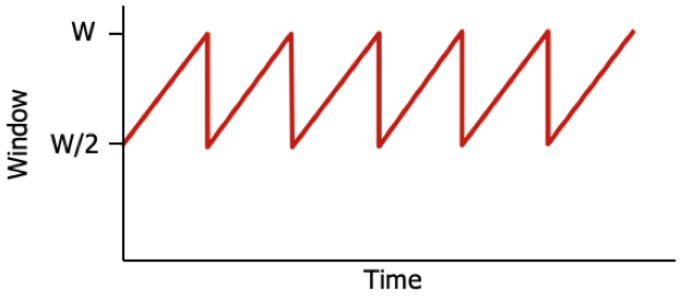
0.5W/RTT

Incorrect

Question 3

0 / 1 pts

Let us ignore TCP's slow-start phases that occur after timeout events, and assume that (i) there are always data to send, and (ii) the network always drops a packet from the connection when the window size increases to *W*. The resulting "saw tooth" behavior is shown in figure below. Let us denote the round-trip time by *RTT*, please answer the following questions:



(3) Assume that only one packet is lost when the window size reaches *W*, then what is the loss rate (fraction of packets lost)?

- 3W^2/4
- 4/(3W^2)
- 8/(3W^2)
- 8/(3W)
- 3W^2/8
- 4/(3W)

Question 4

1 / 1 pts

Suppose Host A sends one segment with sequence number 38 and 4 bytes of data over a TCP connection to Host B. In this same segment, the acknowledgment number is necessarily 42.

- ○ True
- ◉ False

Incorrect

Question 5

0 / 1 pts

UDP and TCP use 1s complement for their checksums. Suppose you have the following three bytes: 01010011, 01100110, 01110100. The 1s complement of the sum of these bytes is 11100100.

- ◉ True
- ○ False

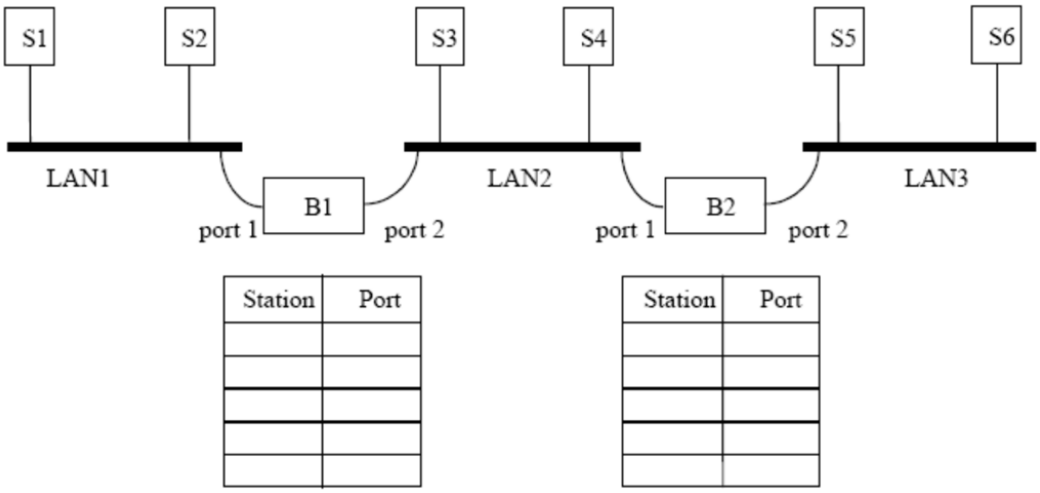
Partial

Question 6

1.5 / 5 pts

Six stations (S1-S6) are connected to an extended LAN through transparent bridges (B1 and B2), as shown in the figure below. Initially, the forwarding tables are empty. Suppose the following stations transmit frames: S2 transmits to S1, S5 transmits to S4, S3 transmits to S5, S1 transmits to S2, and S6 transmits to S5. Fill in the forwarding tables with appropriate entries after the frames have been completely transmitted (10 points).

(Hint: a bridge is a switch with only 2 ports; recall the self-learning of an Ethernet switch)



(1) What's the content of the table of B1 on the left?

* Note: for autograding purpose, use "S1", "S2", etc. for the station entry, and "1", "2" for the port entry; do not add quotation marks.

* The last few entries could be empty and please fill in "N/A" in this case.

Entry 1: S1 | 1

Entry 2: S2 | 1

Entry 3: S3 | 2

Entry 4: S4 | 2

Entry 5: S4 | 1

Answer 1:

S1

Answer 2:

1

Answer 3:

S2

Answer 4:

1

Answer 5:

S3

Answer 6:

2

Answer 7:

S4

Answer 8:

2

Answer 9:

S4

Answer 10:

1

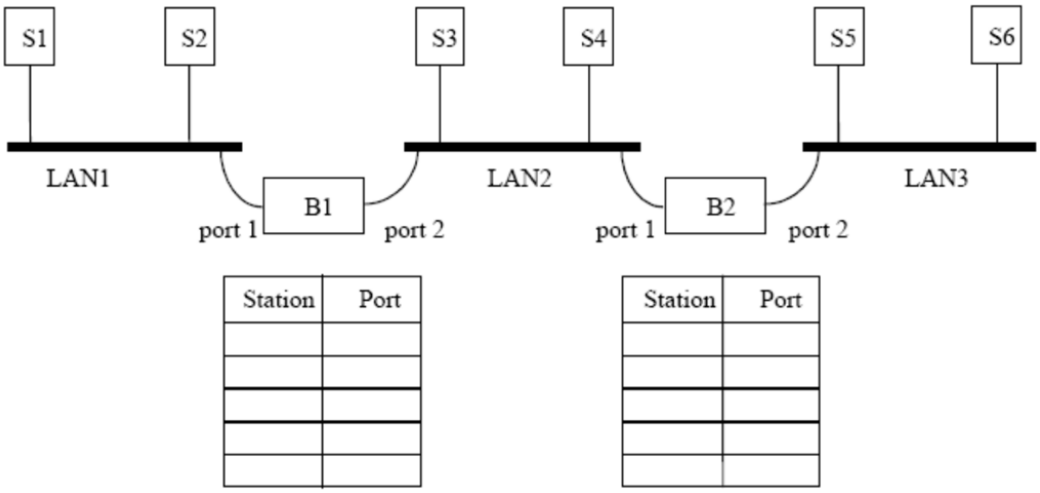
Partial

Question 7

1 / 5 pts

Six stations (S1-S6) are connected to an extended LAN through transparent bridges (B1 and B2), as shown in the figure below. Initially, the forwarding tables are empty. Suppose the following stations transmit frames: S2 transmits to S1, S5 transmits to S4, S3 transmits to S5, S1 transmits to S2, and S6 transmits to S5. Fill in the forwarding tables with appropriate entries after the frames have been completely transmitted (10 points).

(Hint: a bridge is a switch with only 2 ports; recall the self-learning of an Ethernet switch)



(2) What's the content of the table of B2 on the right?

* Note: for autograding purpose, use "S1", "S2", etc. for the station entry, and "1", "2" for the port entry; do not add quotation marks.

* The last few entries could be empty and please fill in "N/A" in this case.

Entry 1: S3 | 2

Entry 2: S4 | 1

Entry 3: S5 | 2

Entry 4: S6 | 2

Entry 5: S6 | 2

Answer 1:

S3

Answer 2:

2

Answer 3:

S4

Answer 4:

1

Answer 5:

S5

Answer 6:

2

Answer 7:

S6

Answer 8:

2

Answer 9:

S6

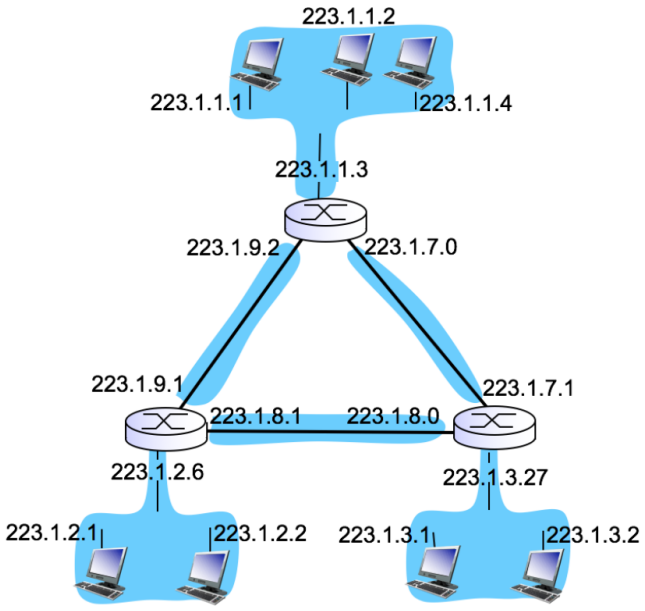
Answer 10:

2

Question 8

1 / 1 pts

The figure below contains ___ subnets.



- 5
- 6
- 3
- 4

Incorrect

Question 9

0 / 1 pts

The size of the TCP Receive Window never changes throughout the duration of the connection.

- True

RecvWindow is used to give the sender an idea of how much free buffer space is available at the receiver. Thus as the amount of unacknowledged TCP data varies the RecvWindow also changes. After each ACK, the window slides forward.

- False

Incorrect

Question 10

0 / 1 pts

Suppose that the last SampleRTT in a TCP connection is equal to 1 sec. Then the current value of TimeoutInterval for the connection will necessarily be >= 1 sec

- (●) True

  Depending on the value of or EstimatedRTT it may or may not be greater than 1.

- ( ) False

Incorrect

Question 11

0 / 1 pts

TCP waits until it has received ____ duplicate ACKs before performing a fast retransmit.

- ( ) 2
- ( ) 3
- ( ) 5
- (●) 1
- ( ) 4

Question 12

1 / 1 pts

Bursty traffic suffers more losses with drop tail than RED gateways.

- (●) True

Consider the case when the queue gets almost full. In droptail gateways an arrival of a burst would result in several losses as most of the burst will be lost. In contrast in RED gateways, it drops packets early so as not to allow the queue to grow fully. So when a burst arrives, it will only drop some of the packets of the burst. The number of packets dropped will be roughly proportional to their share of the bandwidth. Hence the bursty flow should lose fewer packets in RED.

- ( ) False

Question 13

1 / 1 pts

Border Gateway Protocol (BGP) is a standardized exterior gateway protocol designed to exchange routing and reachability information among autonomous systems (AS) on the Internet.

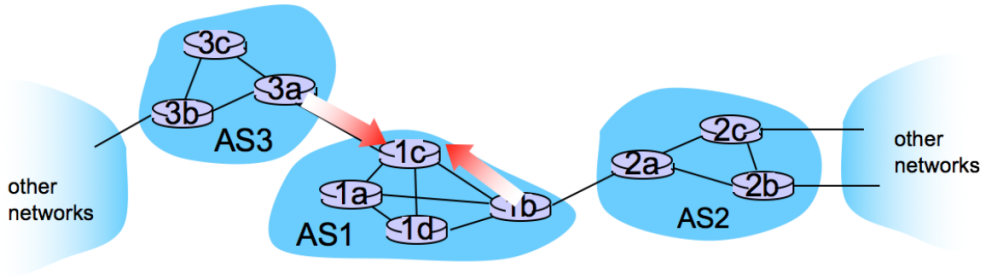
- (●) True
- ( ) False

Incorrect

Question 14

0 / 1 pts

In the following figure, assume that the target is reachable with AS-paths “AS3 AS131” or “AS2 AS17”, then 1c will route through AS3.



True

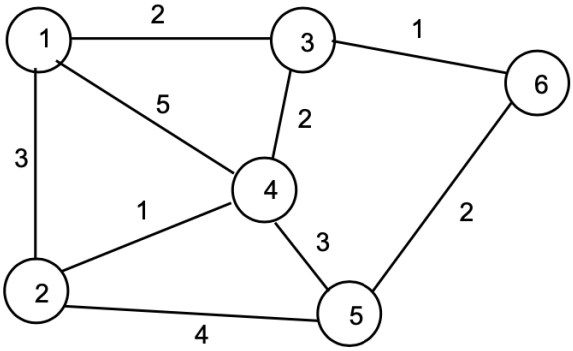
False

Hot-potato routing

Question 15

5 / 5 pts

Consider the following network.



(1) Use the Dijkstra algorithm to find the set of shortest paths from node 4 to other nodes. What's the order that nodes are selected in each iteration?

4, 2 , 3 , 5 ,

6 , 1

Answer 1:

2

Answer 2:

3

Answer 3:

5

Answer 4:

6

Answer 5:

1

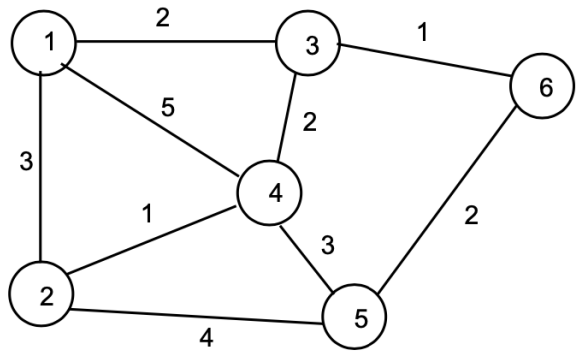
Iteration	N	D_1	D_2	D_3	D_5	D_6
Initial	{ 4 }	5	1	2	3	∞
1	{ 2, 4 }	4	**1**	2	3	∞
2	{ 2, 3, 4 }	4	1	**2**	3	3
3	{ 2, 3, 4, 5 }	4	1	2	**3**	3
4	{ 2, 3, 4, 5, 6 }	4	1	2	3	**3**
5	{1, 2, 3, 4, 5, 6}	**4**	1	2	3	3

Partial

Question 16

2.5 / 5 pts

Consider the following network.



(2) Find the set of associated routing table entries.

Destination	Next Node	Cost
1	3	4

2	1	1
3	6	2
5	6	3
6	5	3

Answer 1:

3

Answer 2:

4

Answer 3:

1

Answer 4:

1

Answer 5:

6

Answer 6:

2

Answer 7:

6

Answer 8:

3

Answer 9:

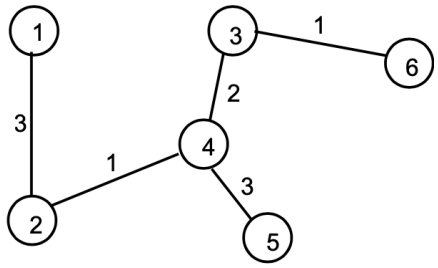
5

Answer 10:

3

(b) Find the set of associated routing table entries.

Destination	Next Node	Cost
1	2	4
2	2	1
3	3	2
5	5	3
6	3	3



Incorrect

Question 17

0 / 1 pts

Protocols used in intra-domain routing are known as Interior-gateway protocols. Please choose all that applies as interior-gateway protocols:

- [ ] RIP
- [x] BGP
- [ ] OSPF

Incorrect

Question 18

0 / 1 pts

In Link State Routing, each node learns complete network topology, but has the count to infinity problem.

- (•) True
- ( ) False

It is Distance Vector Routing that has the count to infinity problem.

Incorrect

Question 19

0 / 1 pts

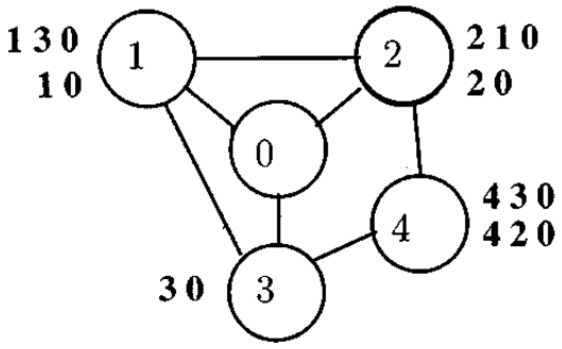
Which technique can mitigate the count to infinity problem.

- Poisoned Reverse
- Hybrid Link State/Path Vector (HLP)
- Bellman-Ford
- Dijkstra

Question 20

1 / 1 pts

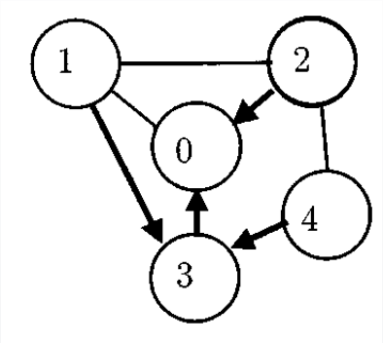
BGP is solving the stable path problem (SSP). The following scenario is a good gadget for SSP.



- True

False

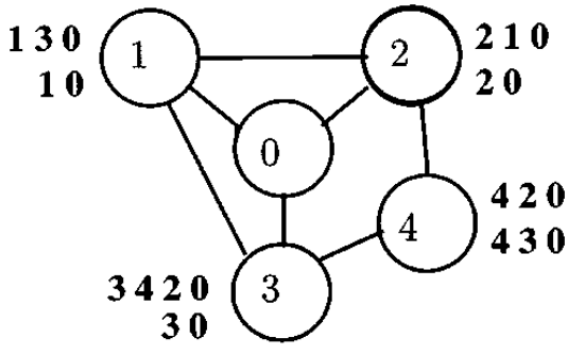
It can reach the following stable topology:



Question 21

1 / 1 pts

BGP is solving the stable path problem (SSP). The following scenario is a good gadget for SSP.



True

False

Question 22

1 / 1 pts

In the congestion avoidance phase of TCP, each time a segment is ACKed, cwnd++

- True
- False

If *cwnd* >= *ssthresh* **then**

- each time a segment is ACKed, increment *cwnd* by 1 / *cwnd*
- *i.e.,* (*cwnd* += *1/cwnd).*

Incorrect

Question 23

0 / 1 pts

In TCP Reno, when RTO (Retransmission Timeout) expires, set *cwnd* to *ssthresh* / 2.

- True
- False

After a fast-retransmit, set *cwnd* to *ssthresh* / 2

But, when RTO expires **still do** *cwnd* = 1

Incorrect

Question 24

0 / 1 pts

In Windows, TCP CUBIC is adopted.

True

False

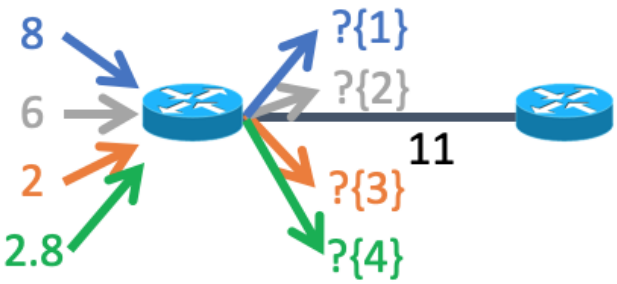
- Compound TCP (Windows)
- TCP CUBIC (Linux)

Partial

Question 25

2 / 4 pts

Please give answers to the following output numbers assuming fair queueing is adopted.



{1} 8

{2} 6

{3} 2

{4} 2.8

Answer 1:

8

Answer 2:

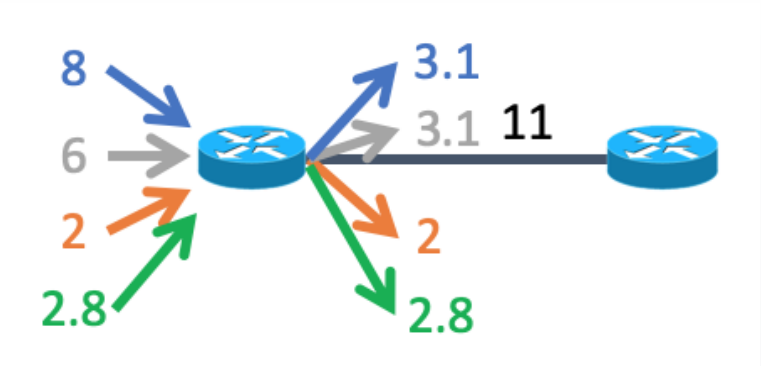
6

Answer 3:

2

Answer 4:

2.8



AVG1 = 11 / 4 = 2.75

Remain1 = 11 – 2 = 9

AVG2 = 9 / 3 = 3

Remain2 = 9 – 2.8 = 6.2

Partial

Question 26

4 / 6 pts

Resource Record (RR) defines the elements or attributes of a domain name in DNS zone file, which helps in name resolution.

Please fill the type of RR into the blanks below, by providing type names such as NS, MX, CNAME, PTR, A, AAAA, etc.

- IPv4 Address Record A

- IPv6 Address Record AAAA

- Canonical Hostname NS

- Get Canonical Name of Mail Server MX

- Reverse IP Lookup PTR

- Name of DNS Server for Given Domain CNAME

Answer 1:

A

Answer 2:

AAAA

Answer 3:

NS

Answer 4:

MX

Answer 5:

PTR

Answer 6:

CNAME

Incorrect

Question 27

0 / 1 pts

How do you know that a given name -> IP mapping is correct? Using _____ that cryptographically sign critical resource records.

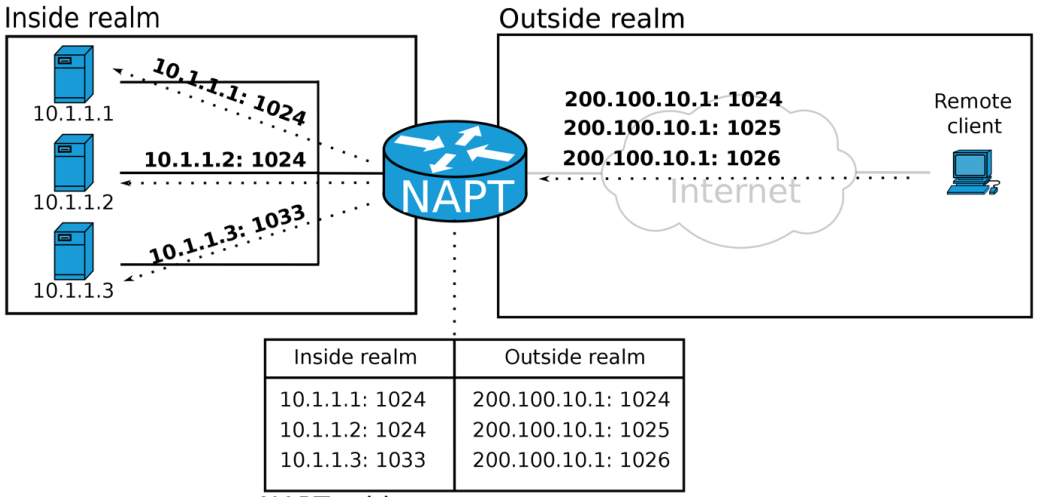
MACA

Incorrect

Question 28

0 / 1 pts

In computer networking, _____ is an application of network address translation (NAT) that redirects a communication request from one address and port number combination to another while the packets are traversing a network gateway, such as a router or firewall.



Inside realm	Outside realm
10.1.1.1: 1024	200.100.10.1: 1024
10.1.1.2: 1024	200.100.10.1: 1025
10.1.1.3: 1033	200.100.10.1: 1026

OSI

Incorrect

Question 29

0 / 4 pts

Tick all application-level protocols for hole punching through NATs.

- [ ] TURN
- [x] SMTP

- [ ] TELNET
- [x] HTTPS
- [ ] STUN

Quiz Score: **24** out of 56