CSS 432, HW4, Spring 2018

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1.

a)

d_{prop} = m / s where m is the distance between two hosts and s is the prop speed

b)

d_{trans} = L / R where L is the packet length and R is the rate

c)

d = d_{prop} + d_{trans} (above) . Ignoring the processing and queuing delay

d)

The last bit of the package just leaves A

e)

If d_{pop} is greater than d_{trans}, then at t = d_{trans}, the first bit of the packet is still in the transmission and have not yet reached B

f)

The first bit of the packet already reached B

2.

One RTT to initiate TCP Connection

One RTT for HTTP request and first few bytes of HTTP response to return

File Transmission Time

=> Non-persistent HTTP response time = 2 RTT + file transmission time

a) Non-persistent HTTP with no parallel TCP connections

So 2 RTT to get the HTML page

To get the other 8, repeat the same process

So 2 * 8 = 16 RTT to get total 8 objects

- ⇨ Total Time is 18 (16 + 2) RTT. Because it needs to get the HTML page first then request other object later

b) Non-persistent HTTP with the browser configured for 5 parallel connections?

So same like above. It will take 2 RTT to get the HTML page
But this time with the parallel connections. Meaning that within 1 time we request, we can get 5 objects. So we need to make 2 request (5 for the first time and 3 for the second time).
Each time is 2RTT like above

So the total time it will take is: 2 RTT + 2* 2 RTT = 6 RTT

c) Persistent HTTP

By using persistent HTTP, we just need to set up the connection once (2 RTT to get the HTML page) and just one RTT for all the objects
So the total time is 3RTT

3

A)

Assuming sliding window is sufficient to send 5 data segments

For the Go-back-N protocol: Assuming that A send 5 data segments at first. The first one is received by B and B send back the Ack. The second one is lost. And B received 3,4,5. B will send ack for message 1 3 times total. A at this point know that package 2 has been lost. So, it retransmit 2,3,4,5. B at this point, receive them and send back ack for 2,3,4,5.

So, in total, A send 9 data packages. B will send back 8 Acks

The order that they were sent for A is:

1,2 (lost in channel),3,4,5,2,3,4,5

The ack that B sent is:

1,1,1,1,2,3,4,5

For the selective repeat algorithm: A send 5 segments at first. The first one is received by B and B send back ack for 1. The second one was lost in the channel. B then received 3,4,5 and send back ack for 3,4,5. A at this point received ack for 1,3,4,5. It knows that 2 is missing so it resend the message. B then receive the data and send back ack for 2

So in total, A send 6 packets and B send 5 acks

A sent:

1,2 (Lost in the channel) 3,4,5,2

B sent

1,3,4,5,2

For TCP:

A send 5 segments at first. The first one is received by B and B send back that ack for 2 (meaning that it is expected to see 2). The second one is lot in the channel. B then receive 3,4,5 and buffer those. But it still send ack for 2 3 more times. A at this point realize that B have not received 2, so it sends 2. B then received 2. And combined with all buffered data, send an ack for 6 (Meaning that it has received 3,4,5 in sequence and is expecting 6)

A sent:

1,2,3,4,5

B send:

1,1,1,1,6

B)

TCP because if the duplicate ack reach a certain amount, it will transit to fast retransmit and resend the unacked segment with the smallest sequence number before that segment's timer expires

4

A)

The slow start is from 1 – 6 because at that period, the congestion window size keeps double and also from 23 to 26

B)

Congestion avoidance is from 6 – 16. Because at those time, the window size follows a linear increase. Even though 17 – 22 also follows a linear increase, it is in fast recovery state instead

C)

At transmission 16, there's a drop for the window size. If it were a time out, then the window size should drop to 1. However, it didn't so this is a duplicate ack

D)

At the 22nd transmission, the window size drop to 1 from 29. So, this must be the a time out for 1 of the packet

E)

At 16, there was a duplicate ack. Because to this , the ssthresh is cut in half of the window size. The previous window size at 16 is 42. So, the ssthresh is now 21.

5

8 bit host address. Using prefix match:

X X X X X X X X

Interface 0:

00 * * * * * *

Interface 1:

0 1 0 * * * * *

Interface 2:

0 1 1 * * * * *

Interface 3:

1 0 * * * * * *

Interface 4:

1 1 * * * * * *

So Interface 0 is from: and is has 64 addresses

0 0 0 0 0 0 0 0 – 0 0 1 1 1 1 1 1

Interface 1 is from: and it has 32 addresses

0 1 0 0 0 0 0 0 - 0 1 0 1 1 1 1 1

Interface 2 is from: and it has 32 addresses

0 1 1 0 0 0 0 0 – 0 1 1 1 1 1 1 1

Interface 3 is from: and it has 64 addresses

1 0 0 0 0 0 0 0 – 1 0 1 1 1 1 1 1

Interface 4 is from: and it has 64 addresses

1 1 0 0 0 0 0 0 – 1 1 1 1 1 1 1 1

6

Each node initially knows the costs to each of its neighbor. Show the distance table at node z using distance vector

Here is the link-state, just to double check

Step	N’	D(u), p(u)	D(y), p(y)	D(v), p(v)	D(x),p(x)
0	Z			6,Z	2,Z
1	ZX		5,X	5,X	2,Z
2	ZXV	6,V	5,X	5,X	2,Z
3	ZXVY	6,V	5,X	5,X	2,Z
4	ZXVYU	6,V	5,X	5,X	2,Z

Here is the distance vector algorithm, blank cell will indicate as either don’t know (yet)

Here is the table for node Z,X,V at first

	V	X	U	Y	Z
Z	6	2			0
X	3	0		3	2
V	0	3	1		6
U	1		0	2	
Y		3	2	0	

At the second iteration. Stop at here because we are only interested in Z

	V	X	U	Y	Z
Z	5 (This was changed because of X)	2	6 (Assuming this is updated after V is updated. Else need another iteration to change from 7 to 6)	5	0
X	3	0	4	3	2
V	0	3	1	6	6
U	1		0	2	
Y		3	2	0	

7.

A)

eBGP is used as the routing protocol to learn about the neighbor outside its network

B)

Router 3a learned about x from 3b, which is on the iBGP

C)

Router 1c learns about x from 3a. Which is through the eBGP

D)

Router 1d learns about x from the protocol iBGP

The reason why OSPF and RIP was not mentioned because X is outside of the network

8.

Using slotted ALOHA

A)

Probability that slot A success in a slot is

$P(1-p)^3$ where is is N – 1 and N is 4 . Let's call this P(success)

For node A to succeeds for the first time in slot 5, it must all fail at the previous slots

The probability of failure for previous 4 times is $(1 - P(\text{success}))^4$

Combine with the probability to succeeds =>

$(1-P(\text{success}))^4 * P(\text{Success})$

Put P(success) above into the equation

=> $(1 - P(1-P)^3)^4 * P(1-P)^3$

B)

Probability that any node succeeded is just the sum of the probability for any node to succeed in a slot

- ⇨ $4\ P(1-P)^3$

C)

Question b is the probability of success for any node. So that probability that no node success is :

$1-4P(1-P)^3$

The first success in slot 3 means that for the first 2 slots, no node success and some node success at slot 3

So probability the no node success for first 2 slots is:

$(1-4P(1-P)^3)^2$

Multiply that with the probability that some node will success at slot 3

$(1-4P(1-P)^3)^2 * 4P(1-P)^3$

9

A through F will have its links interface labeled as 1 – 6:

B sends a frame to E

So at this moment, we know that B is from 2

The table does not know where E. is So it broadcast the frame, E pick it up and reply. So now we know E, which is 5

A sends a frame to B. The router knows that A is from link 1. And it already knows that B is for link 2. It sends the frame to link 2

B replies with a frame to A

The router received the frame, it already know that A is from link 1 and just forwarded the message

So in the end after 4 operations, we now know A,B,E

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A)

When two stations, each associated with a different ISP, attempt to transmit at the same time.

When a new user go into the café, the users will connect to one of the AP. By scanning channels, listening for beacon frames containing AP’s name (SSID) and MAC address. And select an AP to associate with

. Hence, when of the user transmit the data, even though the data go to both AP since they are in the same channel, the other AP will not process because it is not for that AP. So, they can both work together, but the bandwidth will be used more and have higher interference

B)

If they use different channels, there will be no interference between two AP and the bandwidth will not be affected as well