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INTERNET TECHNOLOGY HOMEWORK #2

1) Consider sending a 2400 byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

→ Datagram size = 2400 bytes
MTU = 700 bytes
IP header size = 20 bytes (as standard)
available size per data set = 700 - 20
= 680 bytes
Identification = 422 (given)

Fragments required for sending 2400 bytes data = (2400/680)
= 3.53
= 4 fragments

Hence, 4 fragments are required for sending 2400 bytes of data.

Fragment offset:
Fragment 1: data = 680 → offset = 0
Fragment 2: data = 680 → offset = 680/8 = 85
Fragment 3: data = 680 → offset = 1360/8 = 170
Fragment 4: data = 360 → offset = 2040/8 = 255

* Fragment fields (lengths)

- Fragment 1
  → length = 700 bytes
- fragment 2
  → length = 700 bytes
- fragment 3
  → length = 700 bytes
- Fragment 4
  → length = ~~860+20~~
  = ~~880 bytes~~
  = 360 − 20
  = 340

* Identification = 422

* Fragment offsets:

fragment 1 : 0
fragment 2 : 85
fragment 3 : 170
fragment 4 : 255

* More fragments (MF):

fragment 1 : 1
fragment 2 : 1
fragment 3 : 1
fragment 4 : 0

Fragment #	offset	Datasize	total length	MF	Identification
1	0	680	700	1	422
2	85	680	700	1	422
3	170	680	700	1	422
4	255	360	~~3800~~ ~~880~~ 340	0	422

2) (a) Consider a router that interconnects three subnets: subnet 1, subnet 2 and subnet 3. Suppose all of the interfaces in each of these three subsets are required to have prefix 223.1.17/24. Also suppose that subnet 1 is required to support up to 16 interfaces. Provide three network addresses (of the form a.b.c.d /x) that satisfy these constraints.

(b) Consider a subnet with prefix 128.119.40.128/26 Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

→ a) Network addresses:

Subnet 1 → 223.1.17.128/26
Subnet 2 → 223.1.17.0/25
Subnet 3 → 223.1.17.192/28

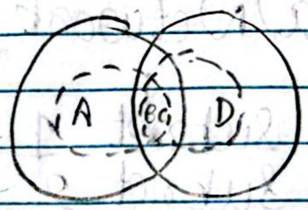
Subnet	Network add.	Prefix	# of add.
Subnet 2	223.1.17.0/25	/25	128
Subnet 1	223.1.17.128/26	/26	64
Subnet 3	223.1.17.192/28	/28	16

b) Prefix for four equal size subnet:

128.119.40.64/28
128.119.40.80/28
128.119.40.96/28
128.119.40.112/28

Q3:) Consider the wireless topology below. The solid circles represent the transmission radius of nodes A and D, respectively, and the dashed circles represent the transmission range of B and C, respectively. ~~and the~~ In these problems, assume that losses only occur due to collisions. list the potential hidden terminals and exposed terminals when

i) A is transmitting to B
ii) B is transmitting to A
iii) A is transmitting to C
iv) D is transmitting to B.



i)

Hidden terminals:

when A is transmitting to B, D can't receive A, Since D is outside the A's transmission range. But B and C falls within the transmission range A. Thus, D is hidden to A.

Exposed terminals:

when A is transmitting to B, C could transmit to D. Actually C to D transmission may not interfere the transmission between A and B. But C senses the medium and found busy. Thus, C is unnessarily. Therefore, C is exposed to B.

∴ C and B fall in the transmission radius of A hence they are exposed while D is hidden from A.

ii) Hidden terminals: when B is transmitting to A, D can't receive B, since D is outside the B's transmission range. Thus, D is hidden terminal to B.

Exposed terminals: while B is transmitting to A, only A and C falls withine the transmission radius. Hence, exposed.

iii) Hidden terminals: when A is transmitting to C, D can't receive A, since D is outside the A's transmission range. Thus, D is ~~be~~ hidden terminal to A.

Exposed terminals: A is transmitting, hence the B and C can transmit. Hence, exposed.

iv) Hidden terminals: When D is transmitting to B, A can't receive D, since A is outside D's range. Thus A is hidden terminal.

Exposed terminals: C and B falls with in transmission radius of D. Hence, Exposed.

Q4.) Consider a fully connected three-node topology shown on the right side. Let the link costs be $c(x,y)=3$, $c(y,z)=6$, $c(z,x)=1$. Compute the distance tables after the initialization step and after each iteration of distance-vector algorithm as done for the example in the lecture slides.

→ $D_x(y) = \min\{c(x,y) + D_y(y),\ c(x,z) + D_z(y)\}$

$c(x,y)=3$
$c(y,z)=6$
$c(z,x)=1$

→ **Node x-tables:**

(Before) cost to

from	x	y	z
x	0	3	∞
y	∞	∞	∞
z	∞	∞	∞

(iteration 1) cost to

from	x	y	z
x	0	3	9
y	3	0	6
z	1	∞	0

(iteration 2) cost to

from	x	y	z
x	0	3	9
y	3	0	6
z	1	4	0

→ **Node y-tables:**

(Before) cost to

from	x	y	z
x	∞	∞	∞
y	3	0	6
z	∞	∞	∞

(iteration 1) cost to

from	x	y	z
x	0	3	∞
y	3	0	6
z	1	∞	0

(iteration 2) cost to

from	x	y	z
x	0	3	9
y	3	0	6
z	1	4	0

→ Node z-tables

(Before)

		cost to		
		x	y	z
from	x	∞	∞	∞
	y	∞	∞	∞
	z	1	∞	0

(iteration 1)

		cost to		
		x	y	z
from	x	0	3	∞
	y	3	0	6
	z	1	4	0

(iteration 2)

		cost to		
		x	y	z
from	x	0	3	9
	y	3	0	6
	z	1	4	0

Hence, Final Distance Tables:

→ Node x's Final table:-

		cost to		
		x	y	z
from	x	0	3	9
	y	3	0	6
	z	1	4	0

→ Node y's Final table:-

		cost to		
		x	y	z
from	x	0	3	9
	y	3	0	6
	z	1	4	0

→ Node z's Final table:-

		cost to		
		x	y	z
from	x	0	3	9
	y	3	0	6
	z	1	4	0