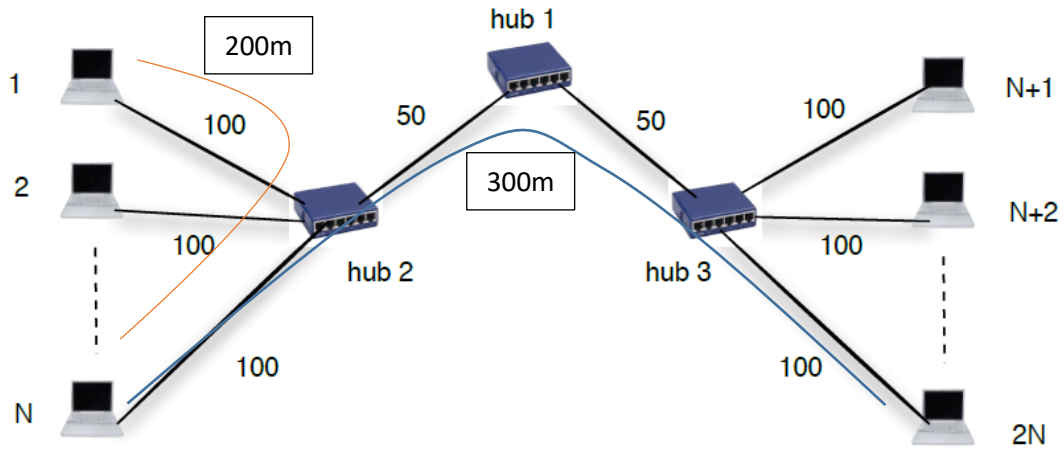
COMP9121 Tutorial Week 4

1. CSMA-CD Performance with Hub/Switch

2N computers have been connected in a network as illustrated. The length of each link is written in meters. Each computer generates 1000 packets per second with each packet being 500 bytes. The maximum rate of all links is 1 Gbps. The propagation speed in the medium is 2.0×10^8 meters/second.



(1) What is the maximum number of nodes supported in the network if CSMA-CD is used on the shared medium? (Recall that the CSMA-CD efficiency is $\frac{1}{1+5\frac{t_{prop}}{t_{trans}}}$)

"300" is because the max span of the network is 300 m

$t_{prop}=300/(2*10^8)=1.5$ us
$t_{trans}=4$ us
efficiency$=1/(1+5\frac{t_{prop}}{t_{trans}})=0.3478$
$2N=0.3478*10^9/(1000*500*8)=86$

(2) Assume that hub1 is replaced with a switch. Find the maximum number of nodes supported in the network if CSMA-CD is used on the shared medium. Assume that half of the traffic is kept in its own side and half of the traffic goes to the other side.

The switch separates the network into two collision domains. At each collision domain:

"200" is because the max span of each collision domain is 200 m

$t_{prop}=200/(2*10^8)=1$ us
$t_{trans}=4$ us
efficiency $= 1/(1+5\frac{t_{prop}}{t_{trans}})= 0.444444444$

$(N/2+N)=444*10^6/(1000*500*8)=111$
N/2 because the switch carries half of traffic from the other side.

To account for the switch, we have N=74

2N=148

2. IP Allocation

A company has been granted a block of IP addresses starting with 150.12.16.0/24. The address space should be allocated to four subnets A, B, C and D. Subnet A needs 9 addresses, subnet B needs 18 addresses, subnet C needs 28 addresses, and subnet D needs 12 addresses. The IP addresses have been assigned in the following order A, B, C, and D (subnet A has the smallest IP addresses and subnet D has the largest IP addresses). What is the starting IP address of subnet C?
A150.12.16.00000000 - 150.12.16.00001111
B150.12.16.00100000 - 150.12.16.00111111
C150.12.16.01000000 - 150.12.16.01011111
Answer 150.12.16.64/27

A	0	0	0	0	0000-1111	16 addresses
	0	0	0	1	0000-1111	16 addresses
B	0	0	1	0	0000-1111	16 addresses
	0	0	1	1	0000-1111	16 addresses
C	0	1	0	0	0000-1111	16 addresses
	0	1	0	1	0000-1111	16 addresses
	0	1	1	0	0000-1111	16 addresses
	0	1	1	1	0000-1111	16 addresses

Warning: The following allocation is illegal in this course.

A	0	0	0	0	0000-1111	16 addresses
B	0	0	0	1	0000-1111	16 addresses
	0	0	1	0	0000-1111	16 addresses
C	0	0	1	1	0000-1111	16 addresses
	0	1	0	0	0000-1111	16 addresses
	0	1	0	1	0000-1111	16 addresses
	0	1	1	0	0000-1111	16 addresses
	0	1	1	1	0000-1111	16 addresses

Host portion must start with all zeros, end with all ones. So that we can use one single prefix to represent a subnet.
In this example: For BLOCK B, host portion starts with 10000, ends with 01111. It is not possible to use one single prefix to represent BLOCK B. This example is illegal.

Also, please note that k-bit can provide 2^k-2 usable addresses. “All 0” is reserved for the netid and “all 1” is reserved for broadcasting. For example, Block A:150.12.16.00000000 - 150.12.16.00001111, there are 16 addresses, but only 14 are usable. 150.12.16.00000000 is reserved for the subnet id and 150.12.16.00001111 is reserved for broadcasting.

3. Routing Table

A router has the following CIDR entries in its routing table (Table **1):**
Table **1:** Routing table

Address/ mask	**Interface**
150.12.192.0/19	Interface 1
150.12.0.0/16	Interface 2
150.12.216.0/21	Interface 3
Default	Interface 4

A packet with address 150.12.218.51 arrives. Which interface would the packet be forwarded to?

150.12.110
150.12.
150.12.11011

150.12.11011010.

Answer 3