Lab4 Report

Network Address Configurations
in Cisco Packet Tracer

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Computer communication - EDA344

1 Task 1

(a) IP address : 191.89.181.12
Subnet mask: 255.255.255.128

(b) 10111111.01011001.10110101.00001100
191 = 10111111
89 = 01011001
181 = 10110101
12 = 00001100

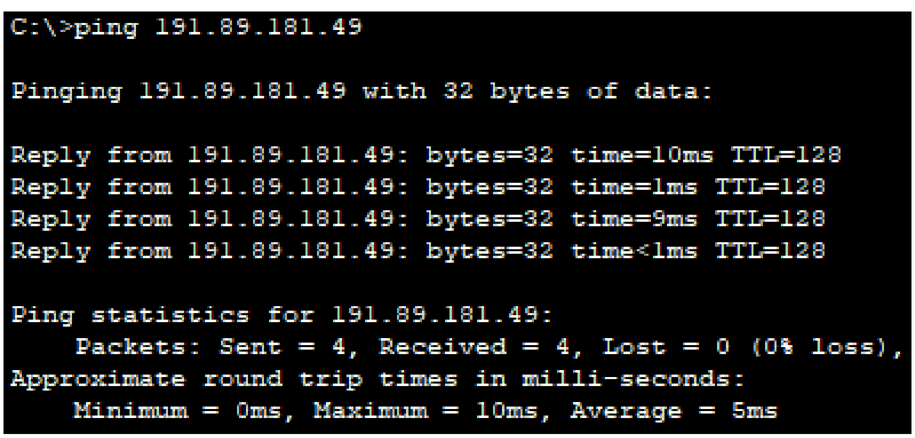
(c) Since the subnet mask is 255.255.255.128, which means the first 25 bits of the IP address represent the network prefix, and the last 7 bits represent the host part. 10111111.01011001.10110101.0 [network prefix] / 0001100 [host part].

(d) The MAC address for the active interface is 0090.2B0B.BAB2

2 Task 2

Default Gateway: 191.89.181.1
My computer:
IP address: 191.89.181.49
Subnet mask: 255.255.255.128

(a) Ping still works. PC6-2 can still ping as the the network prefix is still the same and they are on the same subnet, the ARP protocol is used to find the MAC address and the new IP address of the computer PC6-1, the updated information is stored in ARP table, thus ping still works.



```
C:\>ping 191.89.181.49

Pinging 191.89.181.49 with 32 bytes of data:

Reply from 191.89.181.49: bytes=32 time=10ms TTL=128
Reply from 191.89.181.49: bytes=32 time=1ms TTL=128
Reply from 191.89.181.49: bytes=32 time=9ms TTL=128
Reply from 191.89.181.49: bytes=32 time<1ms TTL=128

Ping statistics for 191.89.181.49:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 5ms
```

Figure 1: Ping from PC6-2 to PC6-1

(b) PING PC3-1 : IP address: 199.87.133.12

```
C:\>ping 199.87.133.12

Pinging 199.87.133.12 with 32 bytes of data:

Request timed out.
Reply from 199.87.133.12: bytes=32 time=30ms TTL=124
Reply from 199.87.133.12: bytes=32 time=33ms TTL=124
Reply from 199.87.133.12: bytes=32 time=8ms TTL=124

Ping statistics for 199.87.133.12:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 8ms, Maximum = 33ms, Average = 23ms
```

Figure 2: Ping from PC6-1 to PC3-1

(c) It still works ping from PC6-1 to PC3-1, when PC3-1 answered to PC6-1's ping, the entry in Figure 4 was used in Router 6, this is because when the router 6 looking for forwarding table entry for a given destination address, it use longest address prefix that matches destination address, in this case, the destination IP is 191.89.181.49(PC6-1), 191.89.181.0/25 match the the destination IP most, therefore, the package will be forwarded to GigabitEthernet0/0.

```
     191.89.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       191.89.181.0/25 is directly connected, GigabitEthernet0/0
```

Figure 3: Entry used in router6 when forwarding PC3-1's package answered to PC6-1's ping

3 Task 3

(a) This time the PC6-1's IP address is changed to 191.89.181.179/25. By checking the network prefix of PC6-1 and PC6-2, they are now in different subnet. However, ARP resolves IP addresses only for hosts and router interfaces on the same subnet. Thus, PC6-1 can not ping successfully to its neighbour PC6-2.

(b) The ICMP packets were dropped in PC6-1, since by using ARP, it cannot find the mapping of PC6-2's IP address to MAC address, thus PC6-1 dropped the ICMP package.

(c) Now, the PC6-2's IP address is changed to 191.89.181.180/25. PC6-1 and PC6-2 are in the same subnet, thus by using ARP they can ping successfully to each other, note that switch itself is transparent to the hosts and routers.

```
C:\>ping 191.89.181.180

Pinging 191.89.181.180 with 32 bytes of data:

Reply from 191.89.181.180: bytes=32 time=1ms TTL=128
Reply from 191.89.181.180: bytes=32 time<1ms TTL=128
Reply from 191.89.181.180: bytes=32 time<1ms TTL=128
Reply from 191.89.181.180: bytes=32 time<1ms TTL=128

Ping statistics for 191.89.181.180:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figure 4: Ping from PC6-1 to PC6-2 after changing both of their IP address

(d) It doesn't work if PC6-1 ping a computer on another table, e.g. PC3-1, because the interface of Router 6 that connected to Table 6 is GigabitEthernet0/0 and its IP address is 191.89.181.1/25, this IP address(gateway IP address) is not in the same subnet with PC6-1 and PC6-2, which means PC6-1 and PC6-2 cannot ping successfully to Router 6, in addition, if PC6-1 want to communicate with host in other table(in different subnet), they need to communication through lay3 IP address. Thus if PC6-1 cannot communicate with its gateway then centainly it cannot communicate with other hosts in other subnets.

```
C:\>ping 199.87.133.12

Pinging 199.87.133.12 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 199.87.133.12:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Figure 5: Ping from PC6-1 to PC6-2 after changing both of their IP address

4 Task 4

(a) The screenshot of the interconnected switches can be seen in Figure 6.

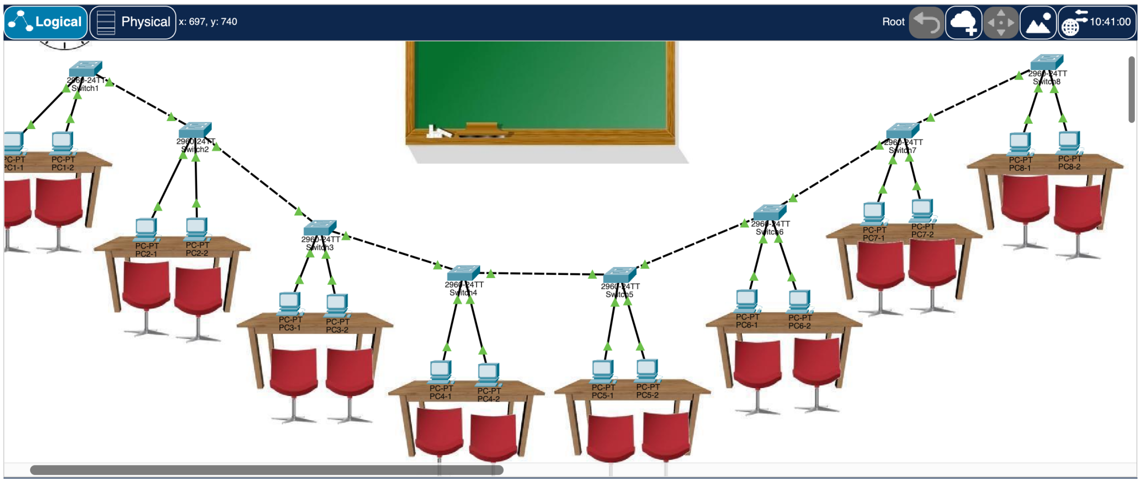


Figure 6: Screenshot of the interconnected switches

(b) In this case, since all computers IP addresses are in the same subnet(200.150.100.0/24) and interconnected, all other hosts' IP addresses and MAC addresses could be achieved by ARP, and the ARP table contains mappings of IP address to MAC address, when a data needed to be transfered from one host to another, the destination IP address will be first translated to MAC address and then the data will be encapsulated and sent in link-layer frame.
In task3(a), the computer cannot successfully ping its neighbour, this is because these two computers are in different subnets, and ARP resolves IP addresses only for hosts and router interfaces on the same subnet.

(c) The gateway will be used in layer 3(network layer) connection when routing are implemented, in the case above, all the communications are link-layer communications, thus the gateway is not used.

5 Task 5

(a) In each subnet, 27 bits should be used for the subnet part (subnet mask) and 5 bits used for the host part. The subnet mask used in dot-decimal notation is 255.255.255.224.

(b) The address details for each subnet can be seen in Figure 1.

SN#	Subnet Address	Host IP Addresses	Broadcast Address
1	200.150.100.0	200.150.100.1 up to 200.150.100.30	200.150.100.31
2	200.150.100.32	200.150.100.33 up to 200.150.100.62	200.150.100.63
3	200.150.100.64	200.150.100.65 up to 200.150.100.94	200.150.100.95
4	200.150.100.96	200.150.100.97 up to 200.150.100.126	200.150.100.127
5	200.150.100.128	200.150.100.129 up to 200.150.100.158	200.150.100.159
6	200.150.100.160	200.150.100.161 up to 200.150.100.190	200.150.100.191
7	200.150.100.192	200.150.100.193 up to 200.150.100.222	200.150.100.223
8	200.150.100.224	200.150.100.225 up to 200.150.100.254	200.150.100.255

Table 1: Separation of the IP addresses into different subnet spaces.

(c) The host part all zero is used to identify a network ID, e.g. 192.168.1.0/24, thus a interface IP address cannot have all zeros in the host part. The IP address which host part is all ones is used for broadcast, if one datagram's destination ip is a broadcast address, which means the datagram will be transmitted to all of the hosts on the local subnet.

6 Task 6

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC6-1	ICMP
	0.000	--	PC6-1	ARP
	0.001	PC6-1	Switch6	ARP
	0.002	Switch6	PC6-2	ARP
	0.002	Switch6	Switch5	ARP
	0.002	Switch6	Switch7	ARP
	0.003	PC6-2	Switch6	ARP
	0.003	Switch5	PC5-1	ARP
	0.003	Switch5	PC5-2	ARP
	0.003	Switch5	Switch4	ARP
	0.003	Switch7	PC7-1	ARP
	0.003	Switch7	PC7-2	ARP
	0.003	Switch7	Switch8	ARP
	0.003	--	Switch6	STP
	0.004	Switch6	PC6-2	STP
	0.004	Switch6	PC6-1	STP
	0.004	Switch6	Switch7	STP
	0.004	Switch4	PC4-1	ARP
	0.004	Switch4	PC4-2	ARP
	0.004	Switch4	Switch3	ARP
	0.004	Switch8	PC8-1	ARP
	0.004	Switch8	PC8-2	ARP
	0.004	--	Switch6	ARP
	0.005	Switch6	PC6-1	ARP
	0.005	Switch3	PC3-1	ARP
	0.005	Switch3	PC3-2	ARP
	0.005	Switch3	Switch2	ARP
	0.005	--	PC6-1	ICMP
	0.006	PC6-1	Switch6	ICMP
	0.006	Switch2	PC2-1	ARP
	0.006	Switch2	PC2-2	ARP
	0.006	Switch2	Switch1	ARP
	0.007	Switch6	PC6-2	ICMP
	0.007	Switch1	PC1-2	ARP
	0.007	Switch1	PC1-1	ARP
	0.008	PC6-2	Switch6	ICMP
	0.009	Switch6	PC6-1	ICMP
	0.566	--	Switch2	STP
	0.567	Switch2	PC2-2	STP
	0.567	Switch2	PC2-1	STP
	0.567	Switch2	Switch1	STP

Figure 7: Screenshot of the interconnected switches

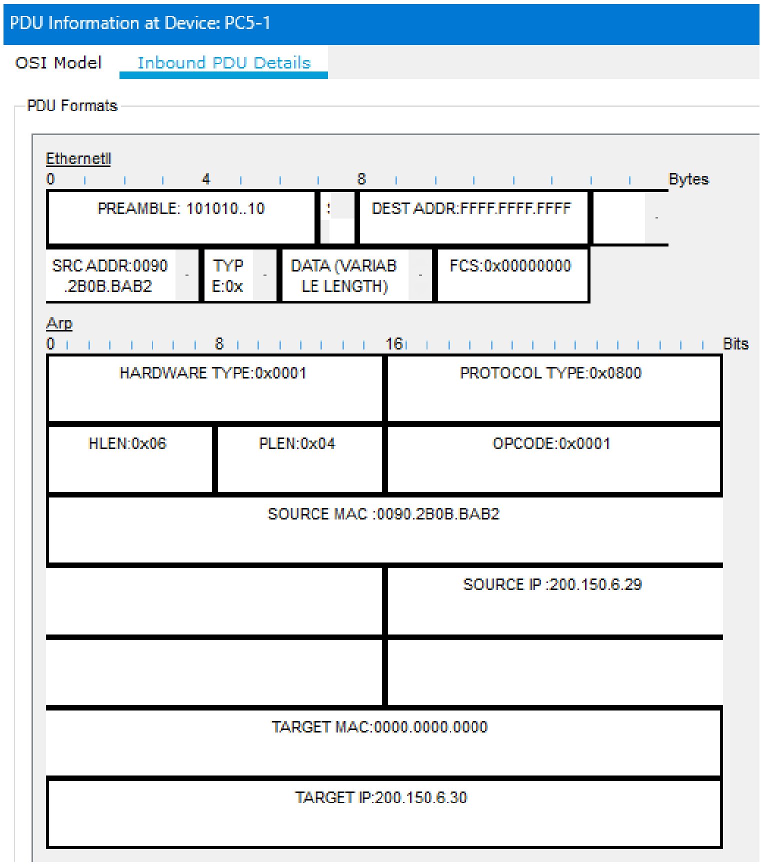


Figure 8: Screenshot of the interconnected switches

(a) In this case, PCX-1 and PCX-2 are in the same subnet, when ping from PCX-1 to PCX-2, first PCX-1 looks into its ARP table in its memory, if there is a mapping of PCX-2 IP address to MAC address, PCX-1 directly send the ICMP to the MAC address of PCX-2. However, if ARP table in PCX-1 doesn't have an entry for PCX-2 IP address, as we can see in Figure 8, then PCX-1 will send a broadcast ARP query package to query all other hosts on the subnet. Interestingly, when the local switch revived the ARP query, the local switch check its destination MAC address which is 0000.0000.0000, it will broadcast this package to all of its interfaces, and other neighbour switches receive the frame and do the same thing, thus the ARP request has been sent to every switch.

(b) The ARP request contains a target IP and the host device will check if its IP-address matches the target IP-address of the ARP request, if it does it will send back a reply. Otherwise it will discard the message.

(c) For each incoming frame received on the switch's interface, the switch would update its table as long as the frame bring new information of the frame's source address and its MAC address. Also, the switch would delete one record(IP address, MAC address, time) from its table if it doesn't receive any frame from that IP address after certain a period of time.

(d) Because now the MAC table has been updated and as such the source can append the MAC address to the ping request sent.

7 Task 7

(a) Every request will time out. After the PC sends the ICMP package to the switch, the switch will send STP packages to every other switch in the network. Which is a way to put all available links in forwarding tables to prevent redundant links. This will however not lead to anything as all requests will time out.

(b) After setting PCX's default gateway to PCY's IP address, PCX still cannot ping successfully to PCY, but it's a little bit different from 7(a), PCX-1 will send a broadcast ARP query package to query all other hosts on the subnet and the switches will broadcast the ARP query package to the whole network, PCY can receive the ARP query package from PCX, but PCY will drop the ARP query package because the ARP source IP address is not in the same subnet. That leads to no ARP response to the query message, thus PCX will then drop the ICMP package because there is no where to go!

(c) There are different ways to archive this. Routers are needed for hosts belonging to different subnets to communicate with each other, switches can process frames only up through layer 2, however routers can routing package from different subnets by destination IP addresses. One possible way is to change the subnetmask to be 255.255.0.0 instead of 255.255.255.0. A third way would be to manually update the computers routing table and add PCY.

(d) While subnets segments devices based on IP-addresses, VLAN instead segments on MAC addresses. VLAN is a more secured way of segmenting than subnetting as on switches and routers today it is possible to not only segment by MAC addresses but also by setting LAN ports to different VLANs. As subnetting is in hardware no special software is needed and is therefore more widely available, even with older devices.