Lab4: Network Address Configurations

in Cisco Packet Tracer

Romaric Duvignau

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Computer Communication Remote Lab

Department of Computer Science and Engineering,
with contributions and support from Hans-Martin Heyn,
Roman Melnik, Ali Salehson and Marina
Papatriantafilou.

Lab4, 7 tasks, 25 questions.

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1 IP Address Configuration and Subnetting

1.1 Introduction: IP addressing

To start with the lab, reload the lab room file used in the previous lab: lab3.pkt[1]. Here again, **PCX-1** or "your computer" refers to the computer you have used in the previous lab, and **PCX-2** is the other computer connected to the same switch.

Task 1. (a) What is the IP address and subnetwork mask of PCX-1?

(b) What is the corresponding binary representation of the IP address of PCX-1?

(c) What part of the IP address represents the network prefix and respectively the host part? Separate the binary representation into network prefix and host parts.

(d) What is PCX-1's MAC address for its active interface?

Hint

You can find those information at several places, but one that gather them all is always the **ipconfig /all** command-line.

[1] http://www.cse.chalmers.se/~duvignau/packet-tracer-lab/lab3.pkt

1.1.1 Changing the IP address within the same subnet

Now you are going to assign a new IP address to **your computer**. If your computer's IP address was **A.B.C.D**, your computer's new address should be **A.B.C.(20+N)** where **N** is replaced by your *group number*, eg if "ComputerCommunicationLabGroup 88" had address **200.100.50.11**, its new address should be **200.100.50.108**. Now, change manually the computer's configuration to use the new address[2] and keep the rest of the parameters unchanged!

Tips

The address can be changed from the network parameters of your device. Click on the device you want to configure, then **Desktop** and finally **IP configuration**. To assign a fix IP, you need to switch from DHCP to **Static** and provide the IP address. If you press press enter then, subnet mask is set automatically.

Once you have changed your IP address you might realize that you also need to manually set an address for the default getaway if you want to send packets outside of your own subnet. To do so, you can just set the network prefix as the same one as the one of your IP address and use **1** for the host part, or alternatively you can switch back to DHCP and write down your default gateway address before switching to static and fill up the address.

Side-note: you can also look at the other TCP/IP configuration parameters that are possible to change (but leave them as they are) and try to explain them.

Task 2. (a) After changing your computer's IP address, ping your starting computer from the other computer at the same workplace i.e. **PCX-2** should ping **PCX-1**. Does it work? Can you explain shortly why?

(b) Now ping from **PCX-1** a computer at another table than yours, and insert a small screenshot in your report. Since you want to communicate with a computer beyond your subnet, don't forget to set first the **default gateway** to the right value in the IP configurations!

(c) Does it work this time? Which entry in your router's forwarding table is used when the computer you have pinged **answers** to your ping? (remember to check the entry corresponding on the **response** and not the packet you've sent!)

Hint

You can find a router's forwarding table by inspecting it: use **Magnifying glass icon** in the menu bar then left click on your router and choose "Routing Table".

Tips

As with an ordinary prompt, you can access the history with ↑ and abort with **Ctrl+C**.

1.1.2 Changing IP to a different subnet

For the next task, use the **simulation mode** to simulate a few frame transfers and identify the reason why your packets were dropped by inspecting packets as in the preparatory instructions (click on packets and identify the explanation while scrolling through layers with the "Next layer" button).

Tips

While in simulation mode, feel free to uncheck **Misc** → **STP** in **Edit Filters** because we will not be interested in those packets in this lab. Same applies to **CDP**.

[2] knowing you, perhaps you've tried to steal your neighbor's address, but packet tracer forbids you to do so!

Task 3. Change your computer's address to **A.B.C.(150+N)** where **N** is replaced by your *group number*, eg "ComputerCommunicationLabGroup 88" should assign the address **A.B.C.238** and ping again your neighbor.

(a) Why doesn't it work this time whereas last time it was fine?

(b) Where were the packets actually dropped? Use the hint below to locate the reason.

Now change also your neighbor's address to be **A.B.C.(150+N+1)** where **N** is your group number (that is your current IP "+1"). Ping PCX-2 from PCX-1, and insert a small screenshot in your report and answer the following:

(d) Does it work this time and why?

(e) What about if you ping a computer on another table, does it work and why? Check the following hint when writing about the reason.

Hint

You have changed the IP address of your computer and specifically the network part which results in that the network part of the computer's IP address differs now from that of the **default gateway**'s subnet.

1.2 Create a single LAN

For this last part, we won't need the routers so delete them or download and open the lab room without them: lab4.pkt [3].

From now on, your computer's new address should be **200.150.100.N** where **N** is replaced by your *group number*, eg "ComputerCommunicationLabGroup 88" should assign the address **200.150.100.88**, and also update your subnet mask to consider only 24 bits in the network part of the address. Do the same for your neighbor so that its new address is **200.150.100.(N+1)/24**.

As if you were also acting for other groups performing the same task that you did at your table, change now all the other PC IPs in the virtual room to be in the range **200.150.100.0/24**. You can choose any IP address for the other computers as long as your network is working.

Tips

You may want to save your network now.

Next step is that you will interconnect your network part to the other groups' parts using switches to build one single IP network for all computers allowing them to communicate directly.

Task 4. (a) Connect your switch with another group's switch using crossover cable. Then interconnect all switches such that all computers can communicate with each other. Once you have tested the connectivity within the large network and made sure it works, take a screenshot of your master piece and include it in your report.

(b) Explain why all computers can now be reached directly by your computer, and compare with Task 3 where the same was not working because computers were part of different subnets.

(c) Note that currently there is no default gateway for the new IP network. What would be the purpose of adding a default gateway to this network?

[3] http://www.cse.chalmers.se/~duvignau/packet-tracer-lab/lab4.pkt

SN#	Subnet Address	Host IP Addresses	Broadcast Address
1	200.150.100.0	200.150.100.01 up to 200.150.100.30	200.150.100.31
2			
3			
4			
5			
6			
7			
8			

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

Hint

There are many different solutions to the previous task (try to figure out what could be the other possible designs), the only important thing is that the full network is directly interconnected and all computers now belong to one large IP network. You can choose to keep the routers or not.

Tips

It is recommended to save your work at this point.

1.3 Reconfigure the single network into a number of subnets

The single IP network will be reconfigured into a number of subnets. Your next task will be to divide the address space (200.150.100.0/24) into **8 equal-size subnets**, i.e. to create one subnet for each workplace. You will again change the IP address of your computer, making your network part different from the one of all other workspaces. Note that creating 8 subnets is sufficient for connecting each group's computers together and still leaves plenty of room for the IP addresses of computers within each subnet.

Task 5. (a) How many bits should be used for the subnet part (subnet mask) and for the host part in each subnet? What is then the subnet mask to use in dot-decimal notation?

(b) Reproduce and complete Table 1 which shows the address details for each subnet.

(c) What does it mean when an IP address has the host part as all zeroes (for example `192.168.1.0/24`) and when the host part is all ones (eg `192.168.1.255/24`)? Use the following hint.

Hint

The first address of a subnet is usually forbidden to use as it is used to identify the network as a whole, and the same holds for the last address as it is dedicated to broadcast.

You will now perform a logical separation of the subnets. Workspace 1 (PC1-1 and PC1-2) should use subnet 1, workspace 2 should use subnet 2, etc. Leave the *first* available host address for a possible router interface connected to your subnetwork, i.e. for the default gateway (configuring the router is outside the scope of this lab). One computer should use the *second* IP host address in the subnet and the other uses the *last* IP host address in the subnet.

Configure now all computers with these new IP addresses! Make sure to also configure the new subnetwork mask!

Tips

It is recommended to save your work at this point, but of course, use a different name!

Task 6. Start simulation mode, then send a ping from **PCX-1** to **PCX-2**, and examine the ARP and ICMP captured packets in the simulation panel. For each of the following items, identify a packet and **copy-paste** the reason/explanation found in the PDU information (retrieved on inspecting individual packets); insert a screenshot of the simulation panel in your report and discuss the following:.

(a) why the ARP request has been sent to every switch.

(b) why the ARP request is dropped by other computers than PCX-2.

(c) what is the moment when your local switch updates its MAC table.

(d) why subsequent pings do not generate an ARP flood in the network anymore.

Task 7. Do not set any default gateway and ping a computer **PCY** on a different table.

(a) Identify what happened with packet inspection.

(b) Now set your default gateway to **PCY**'s IP address and try again to ping PCY. What's the difference now and does it work? Identify the reason in PDU information.

(c) What will be needed for reaching **PCY**, or in general to allow communication between all the hosts now belonging to different subnets?

(d) Discuss the pros and cons of using this kind of logical grouping of hosts by subnetting although hosts are still physically connected using switches. You should consider the concept of virtual LANs and compare with physically separated subnets.