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Freiburg, 18-11-2009

Practical Exercises
Communication Systems (Rechnernetze II)
Topic IP/DHCP

In this exercise two methods for connecting computers based on the Internet Protocol (IP) will be provided. One is the tool **avahi** which allows an automatic configuration of network interfaces without central control like e.g. a DHCP server. With avahi IP addresses are computed based on an interface's MAC address and possible conflicts are resolved using ARP. On the other hand the Dynamic Host Configuration protocol (DCHP) allows interface configuration via a central server transmitting relevant information like IP address, subnet mask, gateway etc. to its clients.

This exercise is only possible using one of the provided laptops or your own laptop, as root access is required.

Exercise 1:
In exercise 1 the central switch will be used , make sure your laptop is connected.

1. Start wireshark and use the avahi command (`sudo avahi-autoipd ethX`) to set an IP address to your interface. Analyze the packets sent and try to find out how avahi works.
2. What command can be used to explore the network (Tip: avahi provides a tool for this)? Browse the network and check the packets used in wireshark.
3. In the next exercise we will configure a dhcp server. Before disconnecting from the switch, pair up in groups of two. One of you will need to install the dhcp server:
   - `sudo avahi-resolve-host-name -4 dhcpserver.local`
     use the IP address you receive in this step with the proxy next.
   - `gedit /etc/apt/apt.conf`
   - add the line `ACQUIRE {http::proxy ´´http://XX.XX.XX.XX:3128´´}`
   - run `sudo apt-get −−fix-missing install dhcp3-server`
     If you are asked to use this command `apt-get -f install` execute it and then proceed this step again

   Make sure you stop the avahi process before continuing.

Exercise 2:
For exercise 2 you have created groups of two in which one of you installed the dhcp server and the other plays the client´s role. Use a direct connection between the two laptops by directly connecting the two network interfaces to each other. For each step try to analyze the generated traffic using wireshark.

1. **DHCP server**: setup your IP address :`10.5.5.X` and netmask `255.255.255.0`

2. Configure the DHCP server :

   - `sudo gedit /etc/dhcp3/dhcpd.conf`
   - use one of the existing subnet configurations that are currently disabled (e.g. the one starting line 54) and set the subnet information (i.e. network address,subnet mask and optionally the other information)
   - set the lease-time of the server to a small value (e.g. 10 seconds) , save it once you are done.
   - restart the DHCP server `sudo /etc/init.d/dhcp3-server restart`

3. Start the DHCP client process (`sudo dhclient ethX`) and look at the DHCP performance using wireshark. Who initiates the process? Why isn't the server keeping track of alive clients? Can you trust the the answer from the DHCP server - what are security implications?

4. Try to request a specific IP address the server does not provide (look at `/etc/dhcp3/dhclient.conf`).

5. Have a look at the lease file of your client (`/var/lib/dhcp3/dhclient-ethX.lease`).

6. Take a look at some more options of the dhcp server (e.g. using the man-page of dhcpd.conf or dhcp-options) and configure your server:

   - configure the server so the client always gets the same IP address
   - provide an NTP server to the client

   Restart the server and client and check how it works.