Raspberry Pi Lab I

In this lab we will start experimenting with the Raspberry PIs. Please form groups for this lab. We have the following material available for up to 5 groups (though you might not need all of it):

- 4 Raspberry PIs
- 4 SD Cards
- 4 USB Power cables
- 4 Ethernet cables
- 2 HDMI cables
- 2 mice
- 2 keyboards
- 1-2 USB Power adapters (for powering the other RPIs, use the USB ports of the desktop machines available in the labs)
- 2 Router

The SD cards come with the Raspbian operating system preinstalled. Raspian is a Debian-based graphical operating system for RPIs. It comes along with a graphical texteditor (leafpad), Java Runtime Environment, and a Python compiler.

If you want to flash the SD cards on your own, you can use the preconfigured images available on the course webpage. On Windows, for instance the program Win32Diskimager can be used to copy the images.[1]

1. Set Up Static IP Adresses

Connect the Raspberry PIs using the router, and see which IP addresses they have, using `sudo ifconfig` on the command line. Most likely they will automatically assign themselves IP addresses starting with 169. This is called zeroconf[2]. Can you ping the other machines? Can you play Minecraft together?

Next, assign static IP addresses to your RPIs as explained here:

[1] http://lifehacker.com/how-to-clone-your-raspberry-pi-sd-card-for-super-easy-r-1261113524
[2] https://en.wikipedia.org/wiki/Zero-configuration_networking

http://thepihut.com/blogs/raspberry-pi-tutorials/16683276-how-to-setup-a-static-ip-address-on-your-raspberry-pi

Can you play Minecraft together now?

2. Setting Up A DHCP-Server

Set up a DHCP server as per the following instructions:

http://www.noveldevices.co.uk/rp-dhcp-server

Observe the communication between the DHCP server and the clients, doing the following commands on the **client** PIs: Firstly, to shut down the Ethernet interface and give back your IP address to the DHCP server, enter this command:

```
sudo ifdown eth0
```

Next, use the following command to start up the Ethernet interface and get an IP address from the DHCP server:

```
sudo ifup eth0
```

You should see `DHCPDISCOVER`, `DHCPREQUEST`, `DHCPOFFER`, and `DHCPACK` lines if you execute "tail /var/log/syslog" on the server. What is the meaning of each these commands?

You can also inspect the leases on the server at /var/lib/dhcp/dhcpd.leases.

3. Try on your own

- What happens if you give two machines the same IP address?
- What happens if you connect with a static IP address to the internet?
- What happens if you set up two DHCP servers in the same network?
- Try remote controlling your RPIs with this guide: https://www.raspberrypi.org/guides/teachers/vnc-classroom-guide.md
- Try playing Minecraft in your network ☺

Please leave the desktop machines in their original state when finishing the lab, i.e., plug back in any monitor/Ethernet/other cables.