Hardwarepraktikum Internet-Technologien

Task 2: Network setup and temperature sensor in the Raspberry Pi

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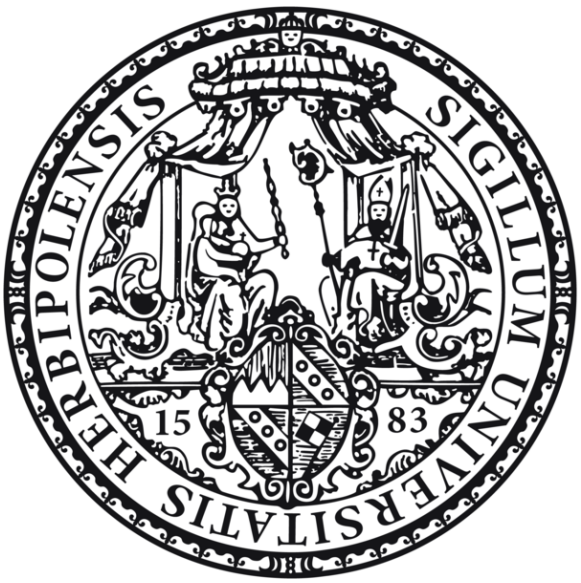

Julius-Maximilians-Universität Würzburg

Chair of Computer Science III

A project report submitted by **Group 11**

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2.2. First connection: DHCP service on your end device

After connecting the Raspberry directly to the PC, we needed to discover its IP address. First, on our computer, we used the function to share the Internet connection, in order for the DHCP service to start. Our IP address now is 10.42.0.1.

We open Wireshark after this and check the Ethernet interface. There is a lot of traffic, but after filtering for UDP port 68, we see a DHCP Ack, sent from our IP address to another IP address, 10.42.0.162. This address is the Raspberry Pi one.

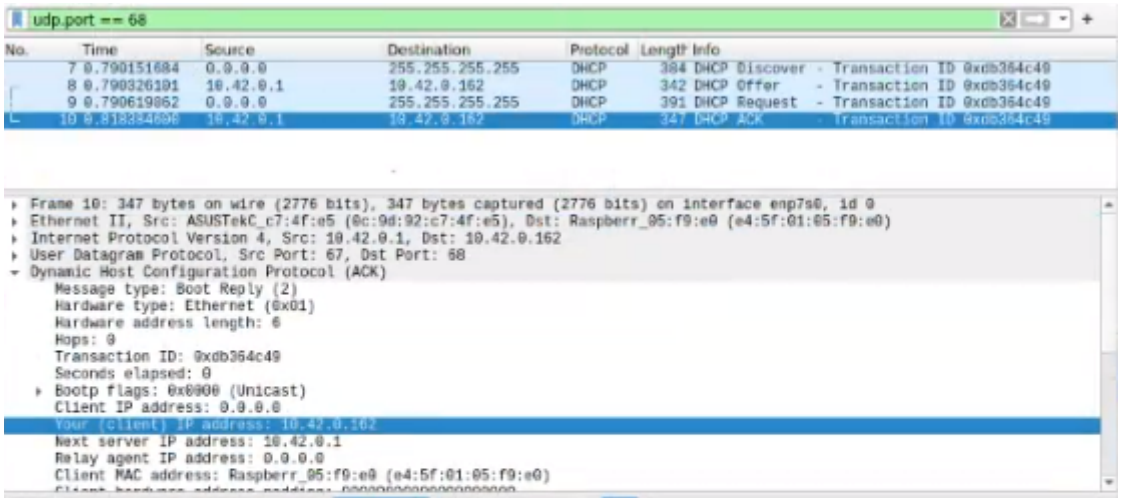

Figure 2.1: DHCP Messages on Wireshark

We check pinging this address, receiving a response.

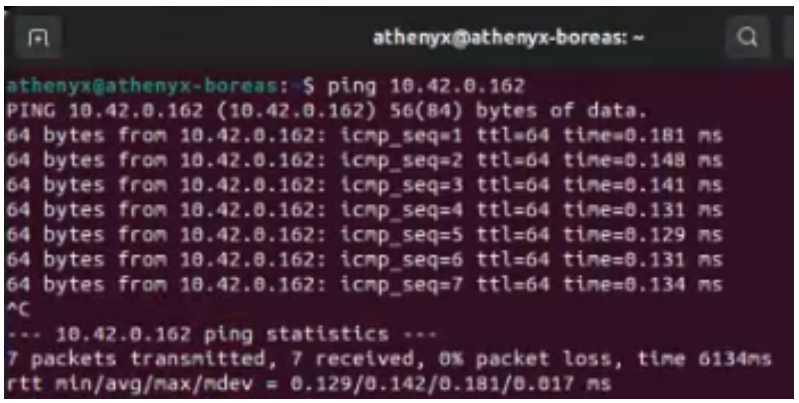

Figure 2.2: Pinging the Raspberry

2.3. Assignment of static IP addresses

Since we want to use fixed IP addresses on our end devices instead of having dynamic ones via DHCP, we need to change the Raspberry configuration. To do so, we connect to the Raspberry using SSH.

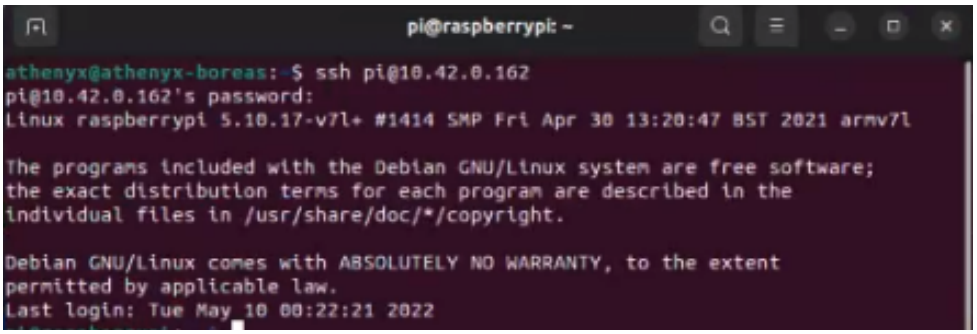

Figure 2.3: Connecting to the Raspberry using SSH

After that, we run ifconfig to find out the name of our Ethernet interface. We see that the name of our Raspberry's Ethernet interface is eth0 and its MAC address is e4:5f:01:05:f9:e0.

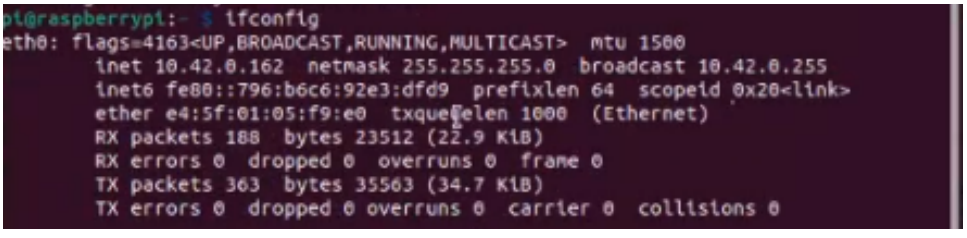

Figure 2.4: Checking the Ethernet interface of the Raspberry

In order to change the Raspberry IP address to one belonging to our group, we have to edit the dhcpcd.conf file, which manages the DHCP client daemon. We change the eth0 interface, using the 10.11.1.1 address for the Raspberry, and setting the gateway under routers to the 10.11.1.2 address, which will later be our PC's IP address. After saving, we reboot the Raspberry to apply the changes, using sudo reboot.

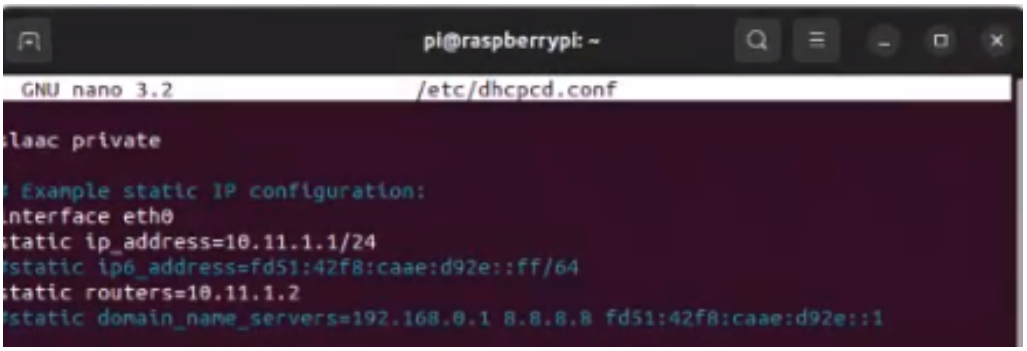

Figure 2.5: Editing the DHCP configuration file

Of course, after rebooting, we lose connection on our PC. To establish a connection again, we need to change the IP address of our PC to be in the same subnet as the Raspberry. We use the 10.11.1.2 address. We check if the Raspberry is accessible using ping, which it is, and then, we connect to it using SSH.

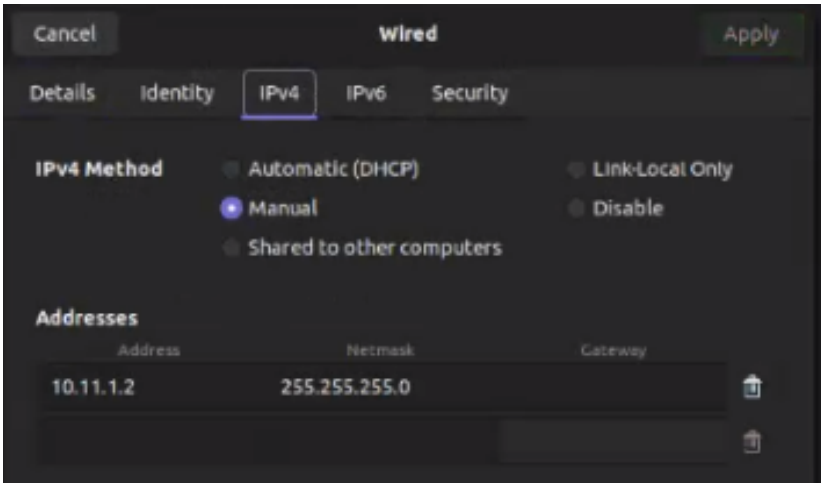

Figure 2.6: Changing the IP address of our PC

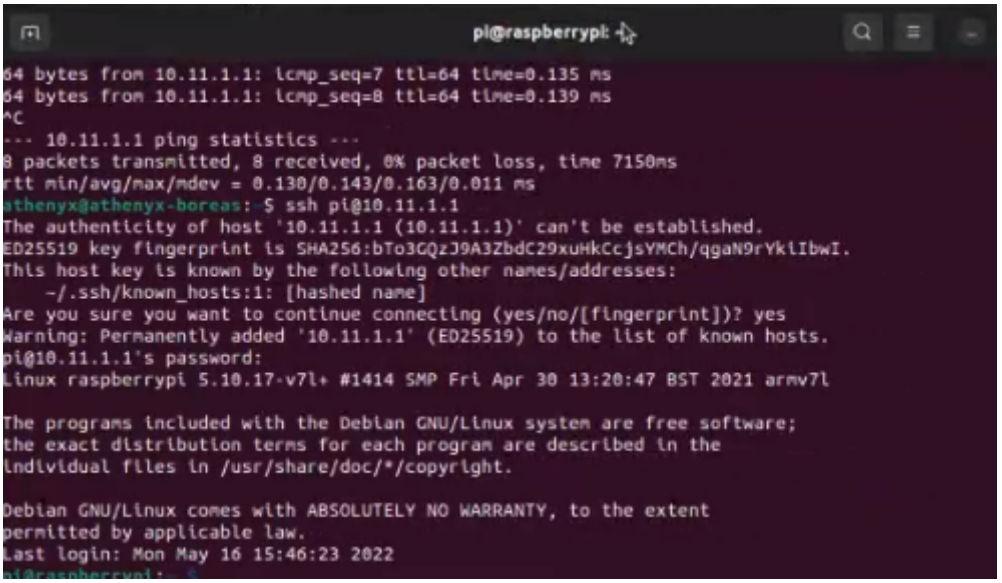

Figure 2.7: Connecting to the Raspberry with static IP

2.4. Temperature sensor setup

Next up, we turned our attention to the breadboard. There, we had 3 resistors and a temperature sensor. We connected the temperature sensor to the Raspberry using one of the 3.3V pins, one of the ground pins and pin 4. In the breadboard, the voltage is connected to the 4.7 kΩ resistor and the voltage pin of the temperature sensor. The ground is connected to the ground pin of the temperature sensor and the 4th pin to the data pin of the sensor.

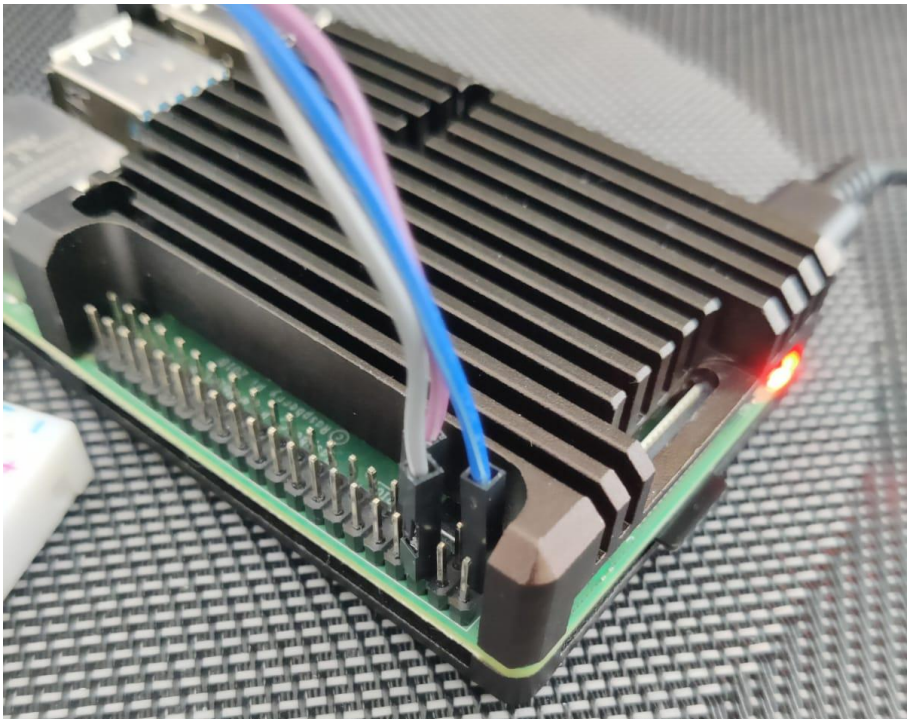

Figure 2.8: Physical connections on the Raspberry

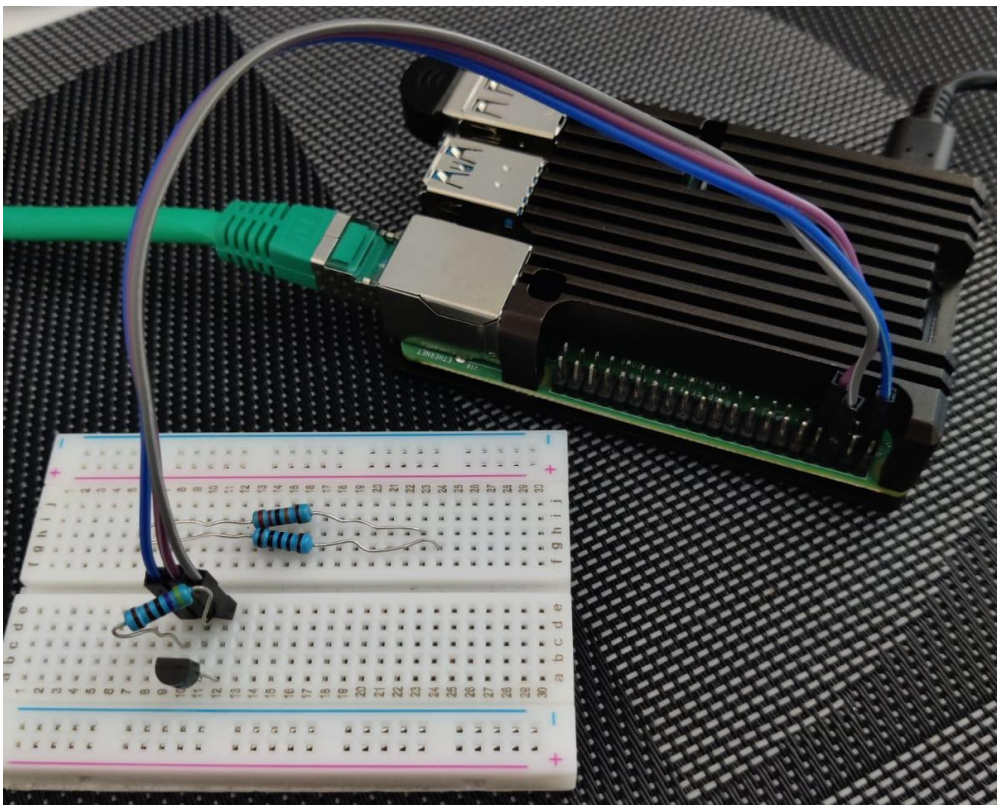

Figure 2.9: Full picture of the physical connections

Since to connect to the temperature data, we use the *One-Wire Interface* or W1-GPIO, we need to enable its kernel. For that, we add the dtoverlay=w1-gpio line to the config.txt file the Raspberry reads on boot. Now that the kernel is implemented after a restart, we need to load both w1-gpio and w1-therm modules.

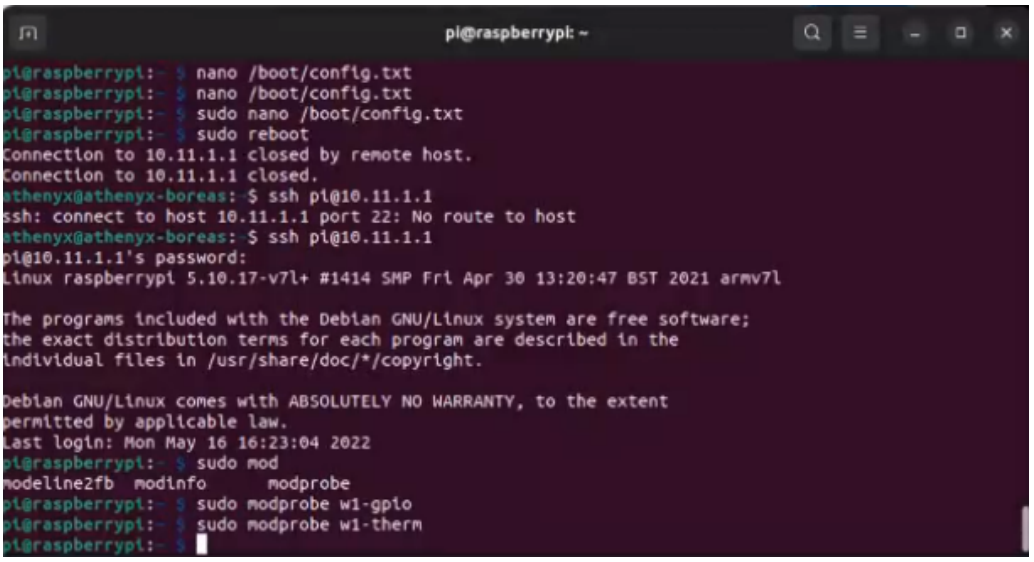

Figure 2.10: One-Wire Interface kernel configuration

Finally, we check that the w1 folder appears under /sys/bus. Inside it, there is a folder called 28-01143d293faa, which represents our temperature sensor. If we read the w1_slave file contained inside that folder, we can check that the temperature sensor was measuring 28.000ºC.

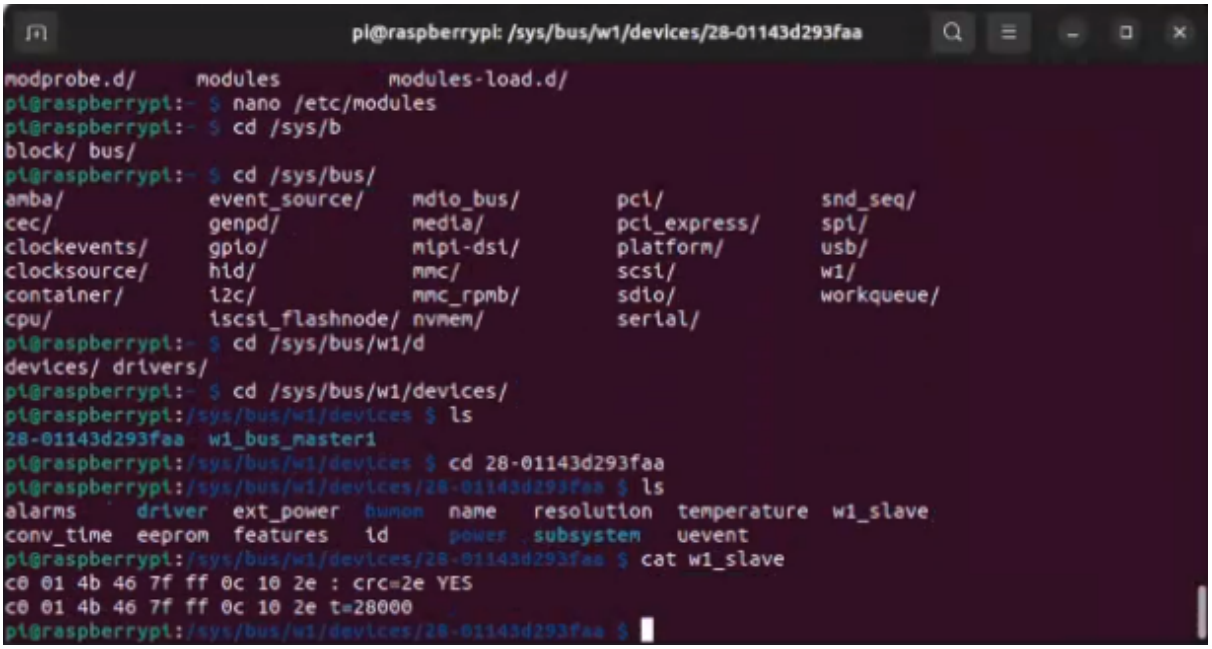

Figure 2.11: Temperature sensor detection and output