installation of raspberry pi os

# Introduction

This lab will guide you through the process of installing Raspberry Pi OS on a raspberry PI. The PI will be connected wirelessly to the internet using Eduroam and will be connected to your computer through a network cable. A command window connected to the pi through an SSH connection will be used for most of the configuration. A demonstration of file transfer with WinSCP and Remote desktop with VNC Viewer is also shown.

## Equipment

• SD card reader

• Network cable

• Raspberry Pi in a case

• Power cable (depending on your Pi version, you need either micro usb or USB-C)

• USB-wall charger. (230V to USB).

• Computer with ethernet port or ethernet dongle (Programs: Notepad++, Raspberry Pi Imager, VNC Viewer, WinSCP).

# Guide

This chapter will describe all the steps necessary to get your raspberry pi up and running.

## Install software required for installation

Install these two programs:

1. Raspberry pi Imager (<https://downloads.raspberrypi.org/imager/imager_latest.exe>)
2. Notepad++ ([Downloads | Notepad++ (notepad-plus-plus.org)](https://notepad-plus-plus.org/downloads/))

## Prepare a file with Eduroam login details

Now, create a file that tells the Pi what network to connect to:

* Open Notepad++
* Copy the following text into the editor.

ctrl\_interface=/var/run/wpa\_supplicant GROUP=netdev  
update\_config=1  
country=no  
network={  
 ssid="eduroam"  
 eap=PEAP  
 key\_mgmt=WPA-EAP  
 phase2="auth=MSCHAPV2"  
 identity="**121212@usn.no**"  
 password="**yourpassword**"

}

* Replace identity and password with your own credentials.
* Select Edit 🡪 EOL Conversion 🡪 Unix (LF)
  + This will turn the newline characters in the file into linefeed characters used by Unix systems.
* Save the file as “wpa\_supplicant.conf” in a safe place. It will be used later.

## Flash the SD card

* Plug the microSD card into your computer.
* Flash the SD card with Raspberry Pi Imager.
  + First, select the default option for the operating system and select your SD card
  + Open the advanced options page and set new password to ”lab\_porsgrunn” and enable SSH.
  + Finally, press «write».

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* Remove the SD card and insert it into your computer one more time.
* If you didn’t do it in the earlier steps, a different way to enable SSH (Secure Shell Protocol) is to create an empty file called “ssh” (no extension). Save it in the root folder of the SD card.
* To enable Eduroam connection, copy and paste the “wpa\_supplicant.conf” file created earlier into the root folder of the SD card (root = top folder, same folder as bootcode.bin, loader.bin, start.elf, kernel.img, cmdline.txt…).
* If you didn’t use Raspberry Pi Imager and need headless mode: Set username and password by writing it into a file called “userconf.txt”. Place it in the root folder. Format: <user>:<encryptedpassword>

## First connection

* Insert the SD card into your raspberry pi.
* Connect power to your Raspberry Pi and wait for it to start. Connect a network cable between your computer and the Pi. Set your own computers IP to 169.254.1.0 on the relevant network adapter.
* Use cmd and ping “raspberrypi.local” Hopefully you get a response similar to:
  + Reply from fe80::abc1:a831:7f4:b4d9%6: time=2ms
  + If not successful. Search for the IP address of the Raspberry Pi with a network scanner.
* Now, we need to connect with SSH. In cmd type in: ssh pi@raspberrypi.local
  + Enter yes to confirm that you trust the device
  + Enter the password “raspberry” (or “lab\_porsgrunn” if you specified it earlier).
  + If problems with host key mismatch, delete file “C:\Users\user\.ssh\known\_hosts” on your computer.
* You should now be logged in to the terminal! When you are logged in to the terminal through SSH, you have access to all the PIs command line services.
* Check if the Pi has access to the internet:
  + «ping google.com» (stop pinging by pressing Ctrl+C).

## If EDUROAM doesn’t work, configure it from the terminal

These steps should only be done if you were not able to connect to Eduroam in the previous section. You need to be connected to the Pi via SSH in the following steps.

* First, open the file that contains the wifi configuration:
  + sudo nano /etc/wpa\_supplicant/wpa\_supplicant.conf
* This file should look exactly like the wpa\_supplicant.conf file created in chapter 2.2. If the file is empty, you can manually write in the file content.
* Save the file:
  + Ctrl + x 🡪 J 🡪 Enter
* Wait for the changes to take effect or reboot: sudo reboot
* More than one network can also be added. This is done by adding several network sections:

network={

ssid="SCHOOLS NETWORK NAME"

psk="SCHOOLS PASSWORD"

# Give the network an appropriate name:

id\_str="school"

}

network={

ssid="HOME NETWORK NAME"

psk="HOME PASSWORD"

# Give the network an appropriate name:

id\_str="home"

}

Example network configurations can be found here: [Link](https://w1.fi/cgit/hostap/plain/wpa_supplicant/wpa_supplicant.conf)

## Configuration

You need to be connected to the Pi via SSH in the following steps.

* Change the password to “lab\_porsgrunn” (only if you did not do it when you flashed the SDcard).
  + Type in the command “passwd”.
  + Type in existing password and new password when asked.
* Set your country and other important settings.
  + Type in “sudo raspi-config” to enter the menu.
  + Configure the settings described in the table.

|  |  |
| --- | --- |
| Localization options 🡪 Timezone | Select Europe, Oslo |
| Interface Options 🡪 VNC | Select Enable |
| Screen 🡪 VNC Screen resolution | Select 1280x720 |

* + Press “Finish” to leave the menu.
* Update the system (might take some time) :
  + “sudo apt-get update”
  + “sudo apt-get upgrade”
* Reboot your raspberry pi to make the changes take effect:
  + “sudo reboot”
* Alternatively, turn off your Raspberry Pi:
  + “sudo shutdown now -h”

## Information about commands

* “Sudo” is a command you type in front of your other commands in order to get administrator privileges.
* An overview of the most important commands in the Linux terminal can be found here: <https://www.lifewire.com/raspberry-pi-terminal-commands-4054108>

## Transfer files with WinSCP

WinSCP uses the SSH based Secure copy protocol to display remote files and folders graphically.

* Install WinSCP
* Open WinSCP and open the Login window. Graphical user interface

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* In the session area, Choose
  + File Protocol: “SFTP”
  + Host Name: raspberrypi (alternatively the IP address)
  + Username: pi
  + Password: lab\_porsgrunn
  + Port number: 22
* Press Login
* You should now see the content of the folder /home/pi/ on the Raspberry Pi in the window. This is the home folder for the user called pi and should only have some default foders. In this folder, we can later add our own files and projects.
* We will now add a folder and a file for testing purposes:
  + Right click in empty area of the remote /home/pi/ folder and select new directory. Name it test.
  + Enter the new folder, right click and create a new file. Name it “Shopping list” and write in some things you can find in a shopping center.
  + Press the save icon and then close the file editor window.
* You will now see the new file like this:

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## Viewing a file in the SSH terminal window

This section will teach you how to navigate in files and folders using only the terminal window. For now, we will only use the following commands:

* Cd (Change directory)
* Ls (lists files in a directory)
* Nano (a simple file editor)
* Pwd (print working directory)

Steps:

* SSH into your Raspberry Pi. You will be met with this line:  It tells us that we are logged on to the raspberry pi and that the current folder is “ ~ ” which means our home folder.
* Type in the command “pwd”. It should show you the actual file path of the folder you are in.  
  
* Next, type in the command ls. This will list the files and folders inside your home directory. One of the items should be the test folder you created earlier.
* Move into the test folder. This can be done by typing “cd test” or “cd /home/pi/test”. When inside the folder, it is shown in blue in the terminal. List the folder content again using ls.  
  Text

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* You should see your shopping list file (added with WinSCP). We can now use the nano command to open the file: “nano “Shopping List” ”. You can press tab to autocomplete the filename.   
  Text

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* When the file is open, you can see the file content. Close it again by pressing “Ctrl + x”.
* Finally we can move back up to the home folder. This is done with “cd ..”. The two dots means that we are moving up to the parent directory.   
  Text

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## Connect to desktop GUI using VNC Viewer

* Install VNC Viewer on your computer: <https://www.realvnc.com/en/connect/download/viewer/>
  + Connect to: raspberrypi.local
  + Type in username “pi” and the password.
  + You should now be able to see the desktop GUI.

# Troubleshooting

## Reported error 1

Error message when trying to ping [www.google.com](http://www.google.com): “Temporary failure in name resolution”.

Solution1: Change file content of “/etc/resolv.conf'” to this:

Text

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Solution 2:

Add DIR in the file wpa\_supplicant.conf as follows: ctrl\_interface=DIR=/var/run/wpa\_supplicant GROUP=netdev