Group 4: Danila Ristikartano, Touhid Sadiq, Md.Mahfuzur Rahaman

Final Assignment Report

**Hardware 1: Networks**

School of ICT

Metropolia University of Applied Sciences

14.1.2024 (v1.0)

**Version history**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ver** | **Description** | **Date** | **Author(s)** |
| 1.0 | Created structure for the final assignment report. | 14.1.2024 | Saana Vallius |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Contents

1 Introduction 1

2 Setting up the Network 1

3 Setting up the Raspberry Pi 2

4 Raspberry Pi Configuration 2

5 Setting up MQTT 2

6 Setting up the Raspberry Pi Pico 2

References 3

# Introduction

This report documents the completion of the Final Assignment on the Networks part of the Hardware 1 course.

The assignment's primary objectives were to establish a network infrastructure using a wireless router, configure Raspberry Pi devices, implement MQTT communication, and integrate Raspberry Pi Pico into the network. Our motivation for completing this assignment was to enhance practical skills in networking, hardware configuration, and IoT protocols. The document comprises sections dedicated to each weekly assignment, detailing the steps taken, accompanied by relevant screenshots and illustrations.

# Setting up the Network

During Week 1 exercises, our team focused on configuring the wireless router provided for the network setup. We logged into the router's management interface, changed the default admin password, customized WLAN settings including SSID and security parameters, and configured additional services such as DHCP, NAT, and port forwarding to ensure network connectivity and security. Below are the screenshots illustrating some of the steps taken:

Screenshot: Accessing the router's management interface.

A computer screen shot of a computer

Description automatically generated

Screenshot: Configuring WLAN settings.

A screenshot of a computer

Description automatically generated

Screenshot: Setting the port forwarding

A screenshot of a computer

Description automatically generated

# Setting up the Raspberry Pi

In Week 2, our team proceeded with setting up Raspberry Pi devices. This included downloading the Raspberry Pi Imager, selecting the appropriate OS image, customizing settings such as network configuration and enabling SSH, and initializing the operating system on the SD card. Subsequently, remote access to the Raspberry Pi devices was established using SSH. Below are the screenshots illustrating some of the steps taken:

Screenshot: Using Raspberry Pi Imager to select OS image.

A screenshot of a computer

Description automatically generated

Screenshot: Configuring Raspberry Pi

A screenshot of a login screen

Description automatically generated

Screenshot: Establishing SSH connection to Raspberry Pi.

A screenshot of a computer program

Description automatically generated

# Raspberry Pi Configuration

Week 3 exercises focused on configuring user accounts, group settings, and sudo privileges on the Raspberry Pi devices. Additionally, static IP addressing was implemented to ensure consistent connectivity, and connectivity tests were conducted to verify network functionality. Below are the screenshots illustrating some of the steps taken:

Screenshot: Creating user accounts on Raspberry Pi.

A screenshot of a computer

Description automatically generated

Screenshot: Configuring static IP address on Raspberry Pi.

A screenshot of a computer

Description automatically generated

Screenshot: Pinging from the Raspberry Pi to check connection

A screen shot of a computer

Description automatically generated

A screen shot of a computer

Description automatically generated

# Setting up MQTT

During Week 4, MQTT (Message Queuing Telemetry Transport) service was set up on the Raspberry Pi as a broker to facilitate communication between devices. Mosquitto server and client applications were installed, and MQTT messaging was tested locally. Configuration adjustments were made to allow external device communication. Below are the screenshots illustrating some of the steps taken:

Screenshot: Installing Mosquitto on Raspberry Pi.

A screenshot of a computer program

Description automatically generated

Screenshot: Testing MQTT messaging locally.

A computer screen with white text

Description automatically generated

# Setting up the Raspberry Pi Pico

Week 5 exercises involved integrating Raspberry Pi Pico into the network. Firmware updates were applied, and necessary modules were installed using Thonny IDE. Example programs were executed to connect the Raspberry Pi Pico to the WLAN, install MQTT library, and publish MQTT messages. Below are the screenshots illustrating some of the steps taken:

Screenshot: Connecting to Raspberry Pi Pico.

A screenshot of a computer

Description automatically generated

Screenshot: Installing MQTT module on Raspberry Pi Pico.

A screenshot of a computer

Description automatically generated

Screenshot: Pico test

A screenshot of a computer

Description automatically generated

# References

* Raspberry Pi Imager.: <https://www.raspberrypi.com/software/>.
* Mosquitto: <https://mosquitto.org/>.
* MQTTX: <https://mqtt-x.com/>.
* <https://gitlab.metropolia.fi/saanapi/hardware-1-networks-final-assignment>
* <https://projects.raspberrypi.org/en/projects/get-started-pico-w/2>
* *http://www.asusrouter.com*