Group 5

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SDN Network Performance Monitor and Visualizer

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Introduction

This Network Performance Monitor and Visualizer transforms ONOS—an open-source SDN controller—into a physically interactive simulation where users manually control network events and instantly observe system responses through vibrant LED feedback and real-time metrics.

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Components and Software

Arduino Uno R3
Microcontroller

Raspberry Pi 4
SBC

HW-504
Joystick

HW-483
Button

HW-479
RGB LED

Green LED

HW-506
Temp Sensor

Jumper Wires

Breadboard

Components and Software

ONOS

SDN controller for network management

Mininet

Network topology emulation

Python

Integration and communication layer

PlatformIO

Arduino development environment

pySerial

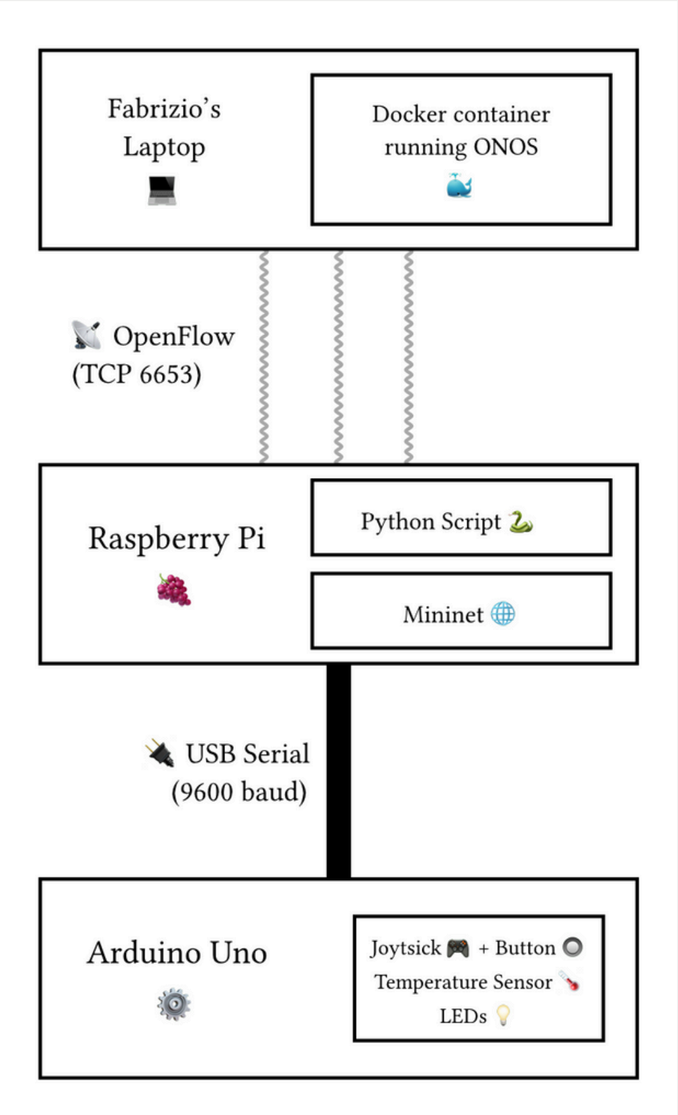
Serial communication library

Requests

HTTP library for ONOS REST API

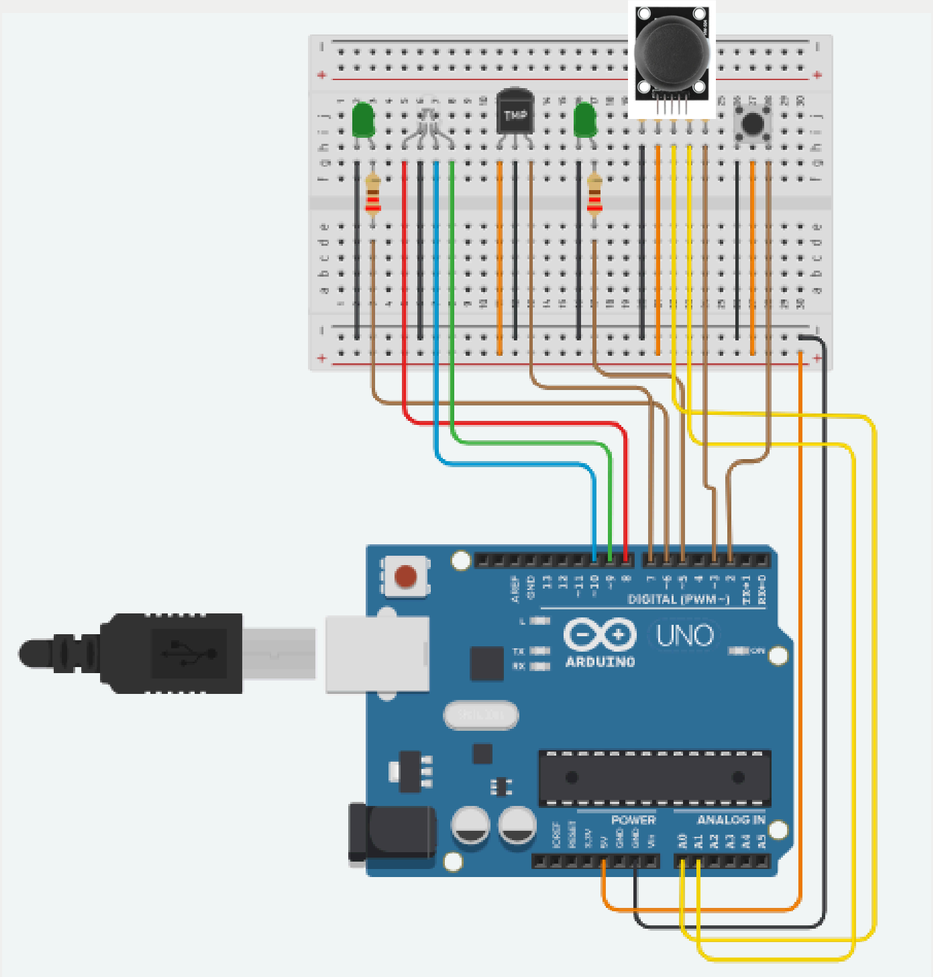
System Architecture

The system consists of three layers that communicate to create real-time interaction between physical hardware and virtual network behavior.



Implementation

Hardware Assembly



Implementation

Software components

Raspberry Pi	• Mininet → Network simulation • PlatformIO → Arduino development • Python (PySerial) → Communication bridge
Laptop	• ONOS 2.7.0 (Docker) → SDN controller • Web UI: localhost:8181
Key connections	• Arduino ↔ Pi: USB Serial (9600 baud) • Pi ↔ Laptop: WiFi/LAN • Mininet ↔ ONOS: OpenFlow (port 6653)

Implementation

Hardware Integration

Arduino

Connected via
USB serial cable
at 9600 baud

Raspberry Pi

Connected via
WiFi network
(both devices on
the same LAN)

Fabri's Laptop

Mininet

Connected via
OpenFlow
Protocol
on port 6653

ONOS

Implementation

Operational Behavior

To start the system, the following sequence is followed:

Step 1

Start ONOS on the laptop (e.g., docker start onos).

Step 2

Start Mininet on the Raspberry Pi, connecting it to the remote ONOS controller.

Step 3

Run the Python bridge script (bridge.py) on the Raspberry Pi.

Live Demo

Github
Repositotry

Thank you!