1 THE TEAM

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Contents

2 GOAL

- Create a system to collect, transport, analyze, store, and visualize sensor data
- Control external systems manually or automatically according to sensor inputs
- Access user interface anywhere with an internet connection

3 OBJECTIVES

- Build sensor modules built around existing sensors that interface and draw power from the wireless node
- Build wireless nodes that connect to the sensor module over a unified hardware interface. The nodes will form a mesh network to establish communication with the base station
- The base station will interface with the nodes and sensors, both reading sensor values and controlling modules. It will also host the database to store historic data and a server to interface with mobile apps
- The mobile app will allow the user to interface with our system; reading sensors, configuring nodes, and controlling nodes.

4 BACKGROUND

- Microcontroller Programming and Interfacing
- Wireless Communication and Networking
- Data Storage, Processing, and Serving
- Mobile App Development

5 FEASIBILITY

- ESP8266 Microcontroller
  - Economical ($15 Development Kit)
  - Integrated WiFi with 400+ m range
  - Interface with multiple sensors
- WiFi Communication
  - Commonly available
  - Use mobile app to configure nodes via WiFi
  - Connect to existing network to access internet
  - Connect mobile device to local network to interface with sensors
- Data Storage, Processing, & Serving
  - Use Raspberry Pi or router running Linux
  - Store sensor data on USB Drive using SQL server
  - Perform analytics on data
    - Energy Usage
    - Run time
    - Temperature Variations
  - Configure controllers

    - Send data to mobile device for viewing via websockets
- Mobile App Development
    - Do initial setup of sensor
    - View sensor data
    - Configure controllers
    - Connect locally or over the internet through online account

6 INPUTS/OUTPUTS

The logical datapath for the project is diagramed in Figure 6.1. The network diagram for connecting different physical modules are presented in Figure 7.1. The inputs/outputs are summarized below.

- Sensor Data
    - Temperature
    - Humidity
    - Wind Speed
    - Rainfall
    - Barametric Pressure
    - Voltage / Current
    - Brightness
    - Sound
- Control Data
    - AC / Heater
    - LEDs
    - Outlet
    - Light
- Node Configuration
    - Sampling Rate
    - Precision
    - Control Conditions
    - Network
    - Link to Account
- Plotted Sensor Data
    - Organize sensor data graphically for user
- Sensor Data Analytics
    - Averages
    - Cummulative Totals
- Network Status
    - Nodes online
    - Last sensor readings

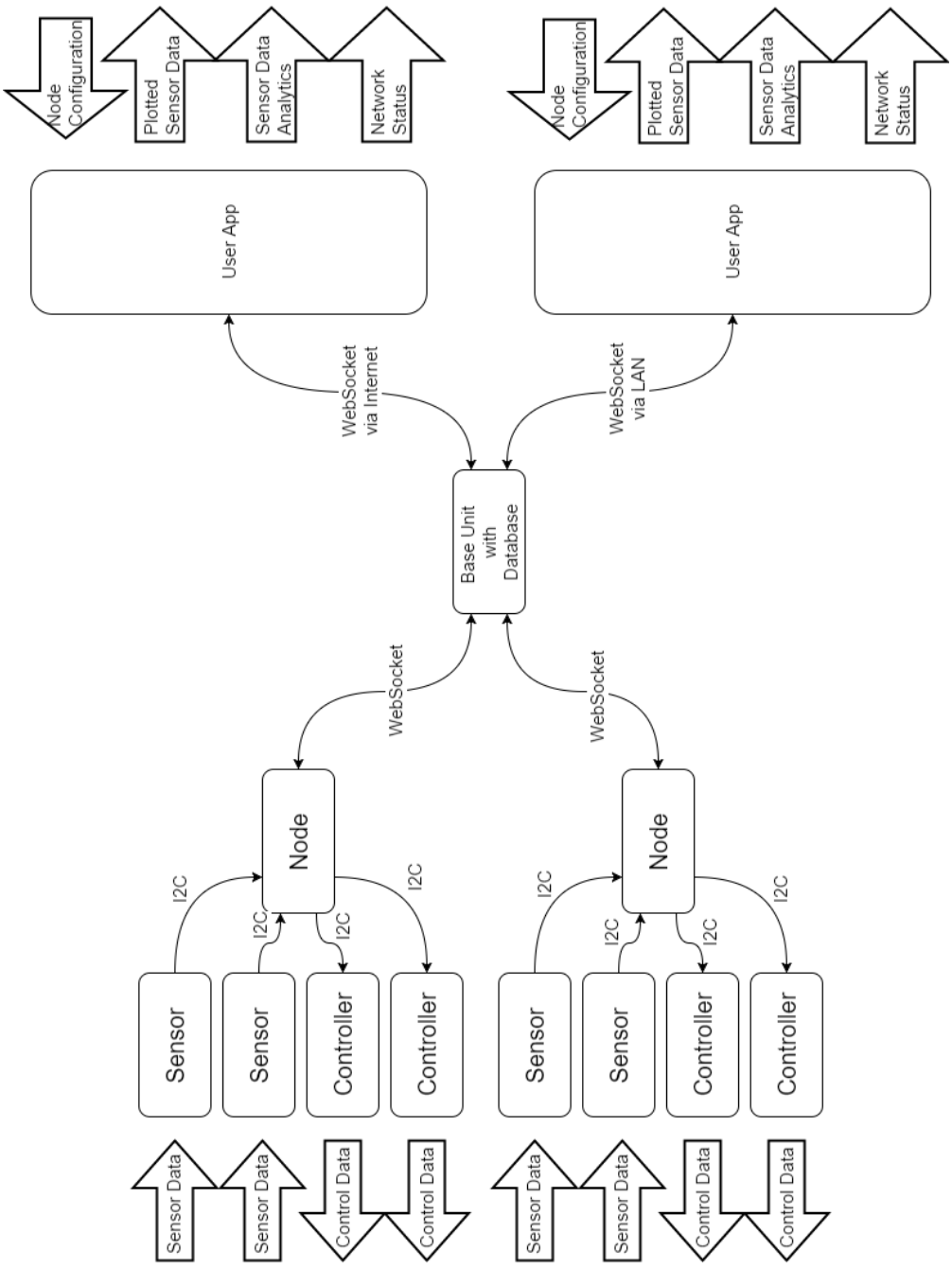

Figure 6.1: The Logical Datapath

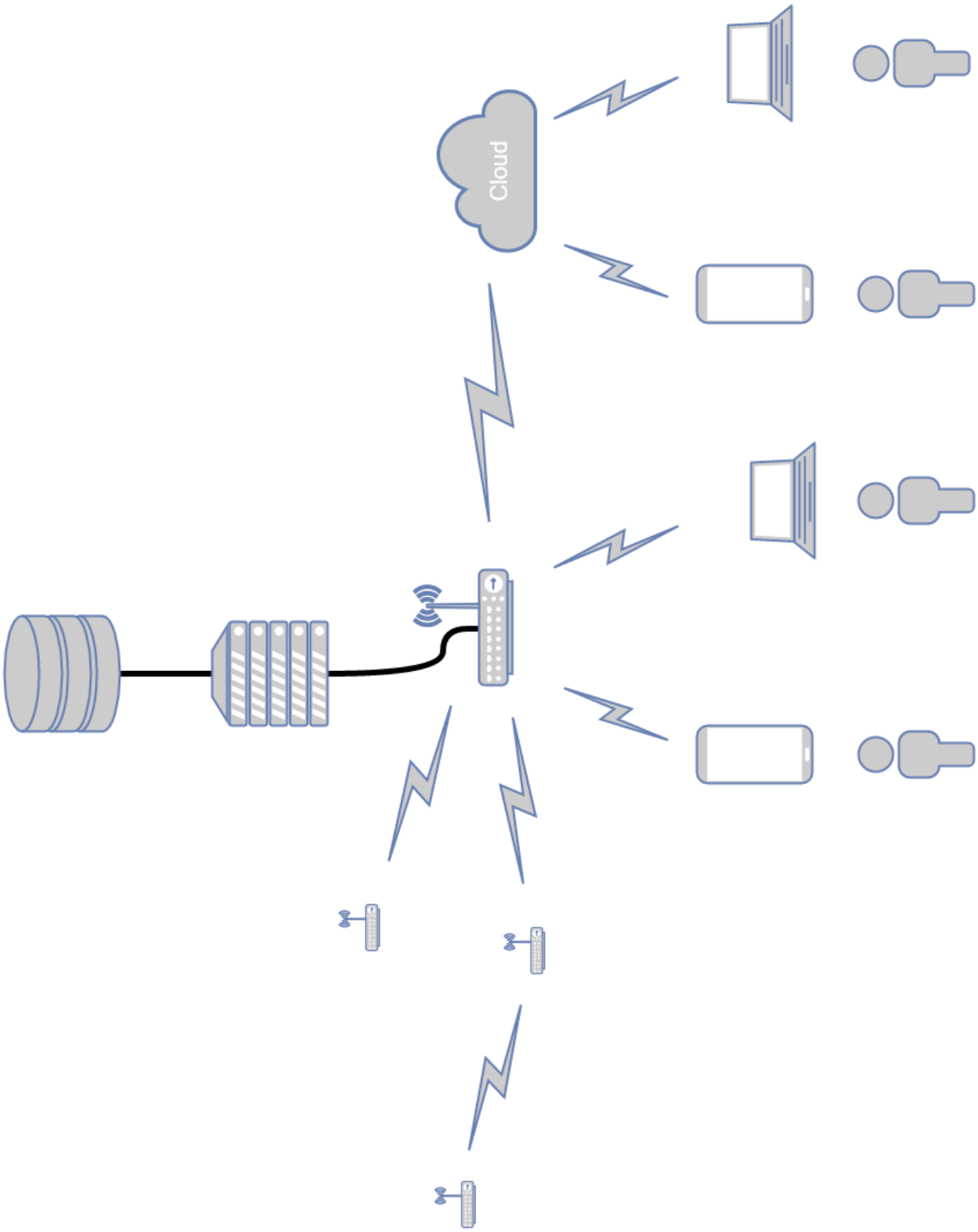

Figure 6.2: The Physcical Datapath

7 PROJECT TIMELINE

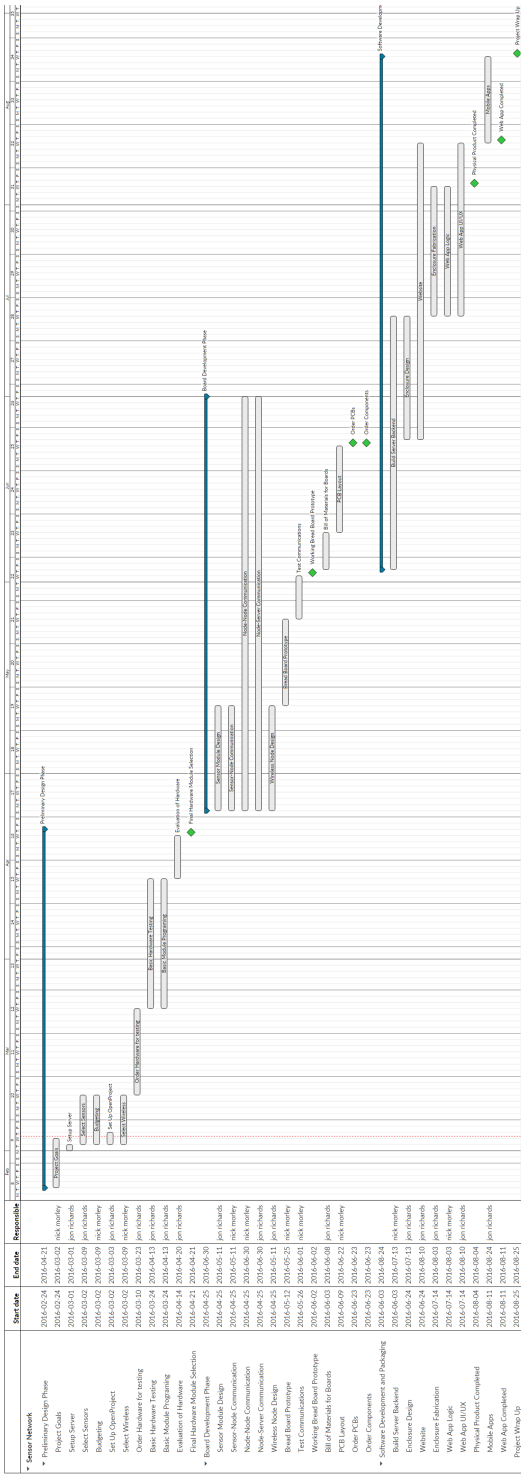

Figure 7.1: Gant Chart for Project Timeline