

Chapter 1

System Overview

1.1 Concept

1.1.1 Monitoring

The solar panel generates electricity and feed it into the converter after being measured by the current and voltage sensor. The converter converts the electricity from a higher voltage to a desired votlage, which can be measured again by the sensor and used to charge the battery. The sensing data consist of input current and voltage, and output current and voltage, which are fed into the microcontroller. The microcontroller has a 4G cellular modem which enables communication with the surrounding 4G cellular base station, and the internet access is provided by the gateway at the base station. That means, the sensing data can be be sent from the microcontroller to the server through the 4G cellular network. Once the sensing data reaches the server, the data is processed, store into the database, and send to the client such as a web application. The concept for monitoring is shown in the figure 1.1.

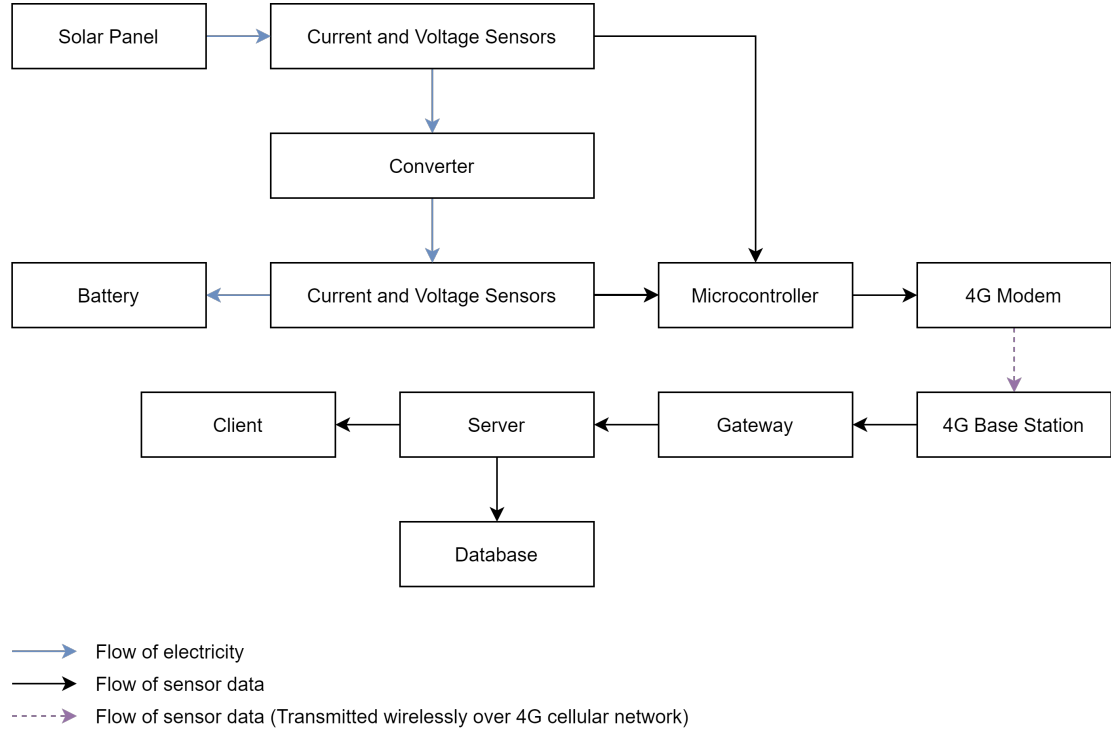


Figure 1.1: Concept of the proposed system for monitoring.

1.1.2 Controlling

The lifecycle of a command begins at the client initiated by the user. The command can be anything from setting the output voltage, to shutting down the converter. Once initiated, the client contact the server to let it know a command had been issued, and the server store it in the database.

On the other hand, the microcontroller performs periodic polling, that is, querying the server if there are new commands issued by the user every second. Similar to the monitoring, the query that is sent from the microcontroller to the server and the reply of the server that is consisting of a list of new commands are transmitted over the 4G cellular network. Finally, the commands are received by the microcontroller and the changes are applied to the converter. The concept for controlling is shown in the figure 1.2.

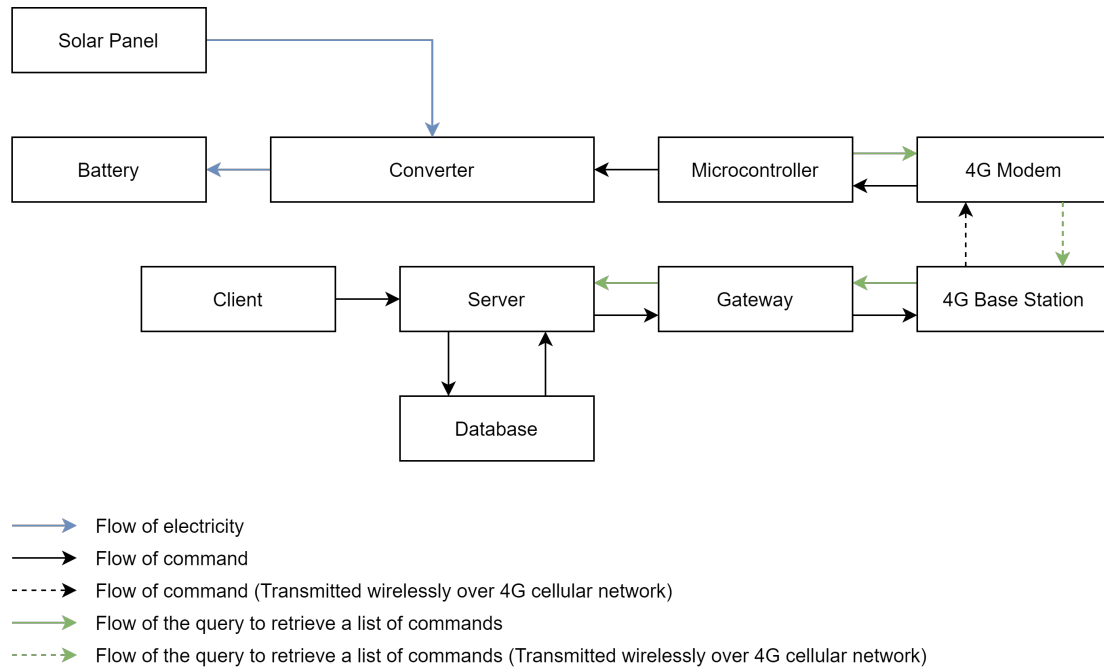


Figure 1.2: Concept of the proposed system for controlling.

1.2 Composition

The proposed system is composed of five layers separated by responsibilities. They are:

- Storage Layer
- Server Layer
- Relay Layer
- Simulation Layer
- Sensing Layer

The storage layer is responsible for storing the state of the server and sensing data received from the microcontrollers. The server layer is where the data processing logic, system monitoring, and data visualisation services are located. The relay layer contains the 4G infrastructures and providing internet access to 4G enabled devices. The sensing layer is responsible for measuring the data and control the generation of power. Lastly, the simulation layer is used to simulate the behaviour of the sensing layer for benchmarking purposes.

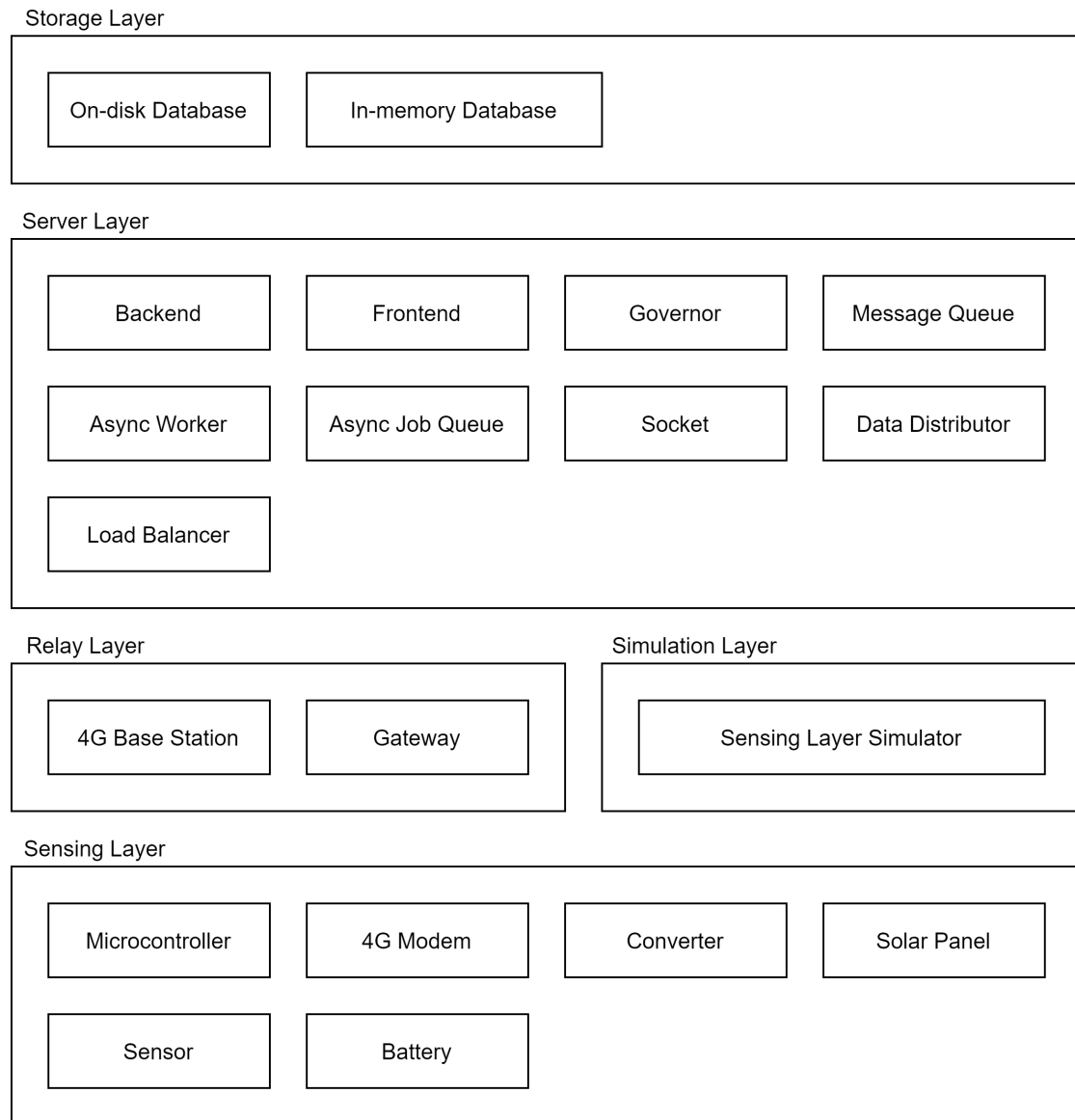


Figure 1.3: Layers and components of the proposed system.

1.3 Hardware

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1.4 Software

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1.5 Cost estimate

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