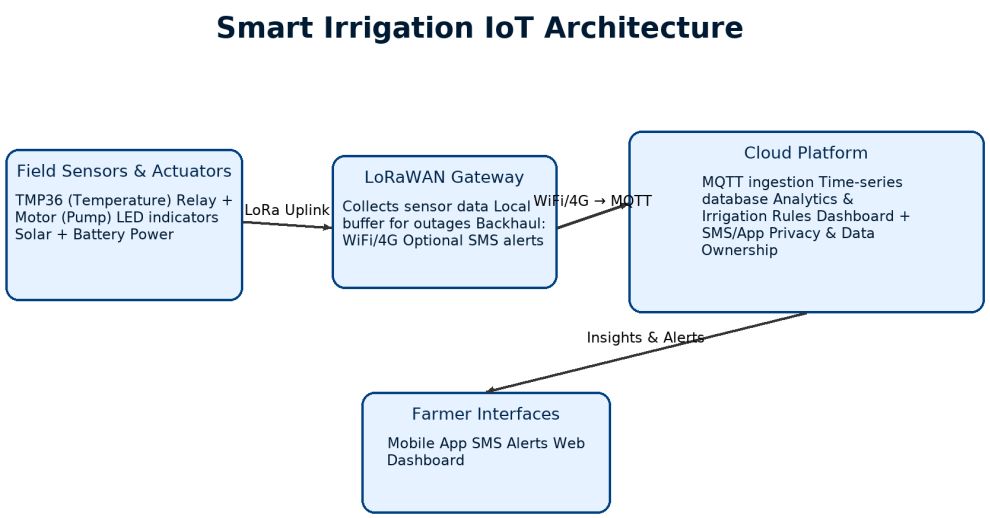
Laboratory 3 – Part A

Smart Irrigation IoT Architecture



Assumptions: field size 1–2 ha, one gateway covers the farm, sensors transmit every 10 min, solar powered.
Constraints: intermittent connectivity managed with gateway buffering, limited energy → low duty cycle.
Ethics: farmer owns the data, consent is required, anonymization for regional statistics.

The proposed smart irrigation IoT system uses TMP36 temperature sensors deployed in the field, powered by solar panels and batteries. Data is transmitted via LoRaWAN to a gateway, which aggregates sensor readings, buffers them during connectivity outages, and forwards them to the cloud through WiFi or 4G backhaul using the MQTT protocol. In the cloud platform, the data is ingested into a time-series database and processed with analytics and irrigation rules. Based on these rules, irrigation pumps (motor controlled by relay) are activated, and feedback is sent to the field. The platform also enforces privacy and data ownership policies, ensuring that farmers control their own data. Farmers access system insights through mobile applications, SMS alerts, or web dashboards, enabling them to monitor temperature trends, irrigation status, and receive recommendations in real time. **Assumptions:** The field covers 1–2 hectares, with a single LoRa gateway sufficient for coverage. Sensors transmit every 10 minutes and are solar-powered.
Constraints: Connectivity may be intermittent; the gateway buffers data locally. Energy constraints require low duty cycles.
Ethics: Farmers own their data, explicit consent is required, and data is anonymized when used for regional statistics.