AgriTech - Water Management

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Project Objective

Problem Statement:

- Design simple system to manage and actuate sprinklers based on Soil temperature and Moisture in a large farm.
- Setup should be deployable to on different farms as needed.

Specifications:

- Configurable number of Soil sensors (Temperature and Moisture) and sprinklers. Default 20 soil sensors and 5 sprinklers.
- Configurable mapping of Soil sensors to different sprinklers.
- Configurable Latitude and Longitude information for farm.
- Samples Air Temperature and Humidity via Weather API periodically and uses this information along with Soil Sensors to determine Sprinkler Action.
- Analytics support for understanding trends over period of time.
- Soil Sensor and Weather API data are stored in Dynamo DB tables for ease of run time and debug access.

Modules

Device Onboarding: This module populates all devices information (sensors and sprinklers) and their mapping information (like each sensor device associated with a sprinkler)

Weather Data Populator: This module runs every 5 minutes schedule. It queries device_info and picks the latitude and longitude data for devices and get the weather details for the location and push it to table weather_info.

Soil Sensor Simulator: This module simulates soil sensor data for temperature and moisture and push the data to table soil_sensor_info.

Sprinkler Controller: This module hold the main algorithm to decide on which sprinkler whether is has to be switched ON/OFF

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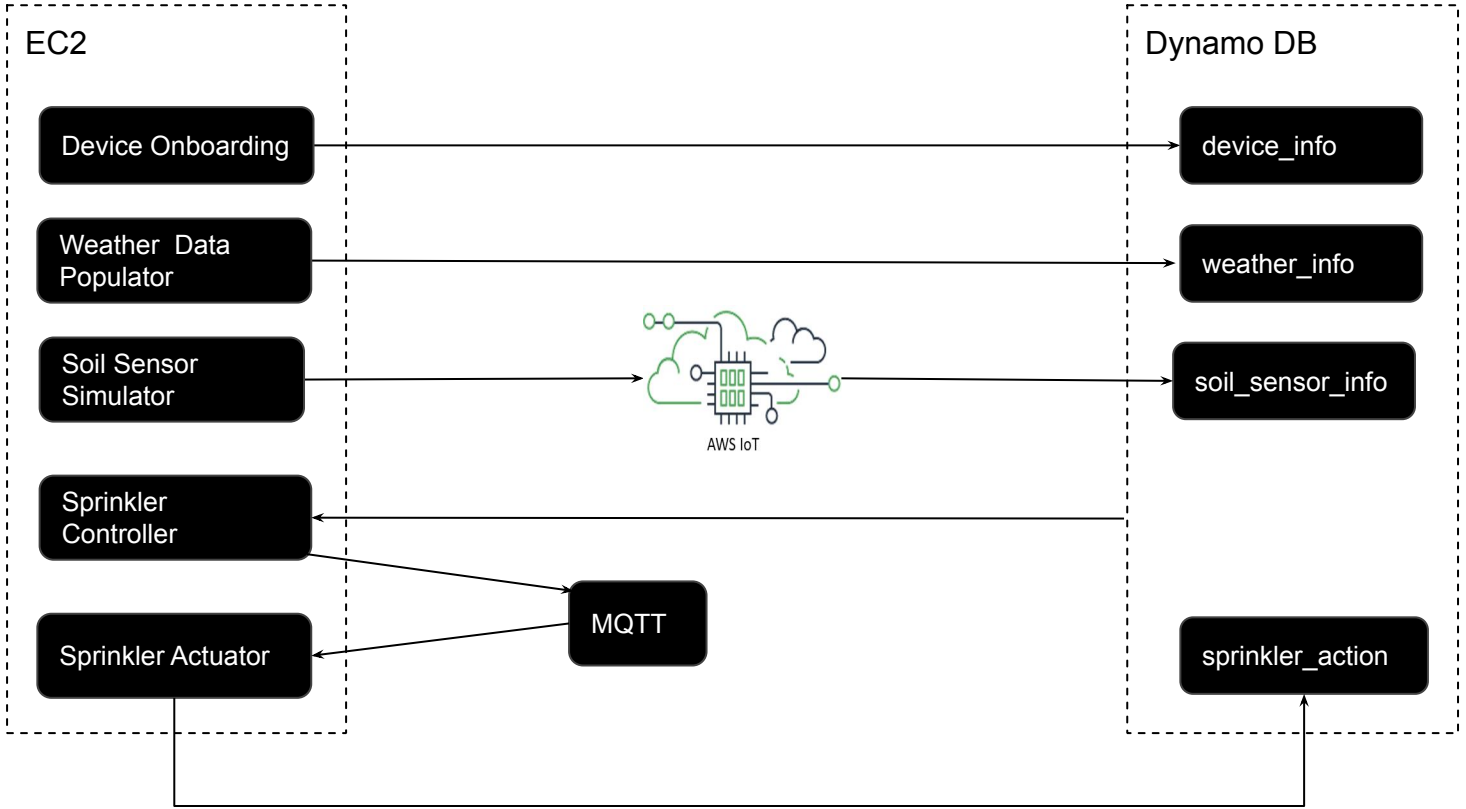
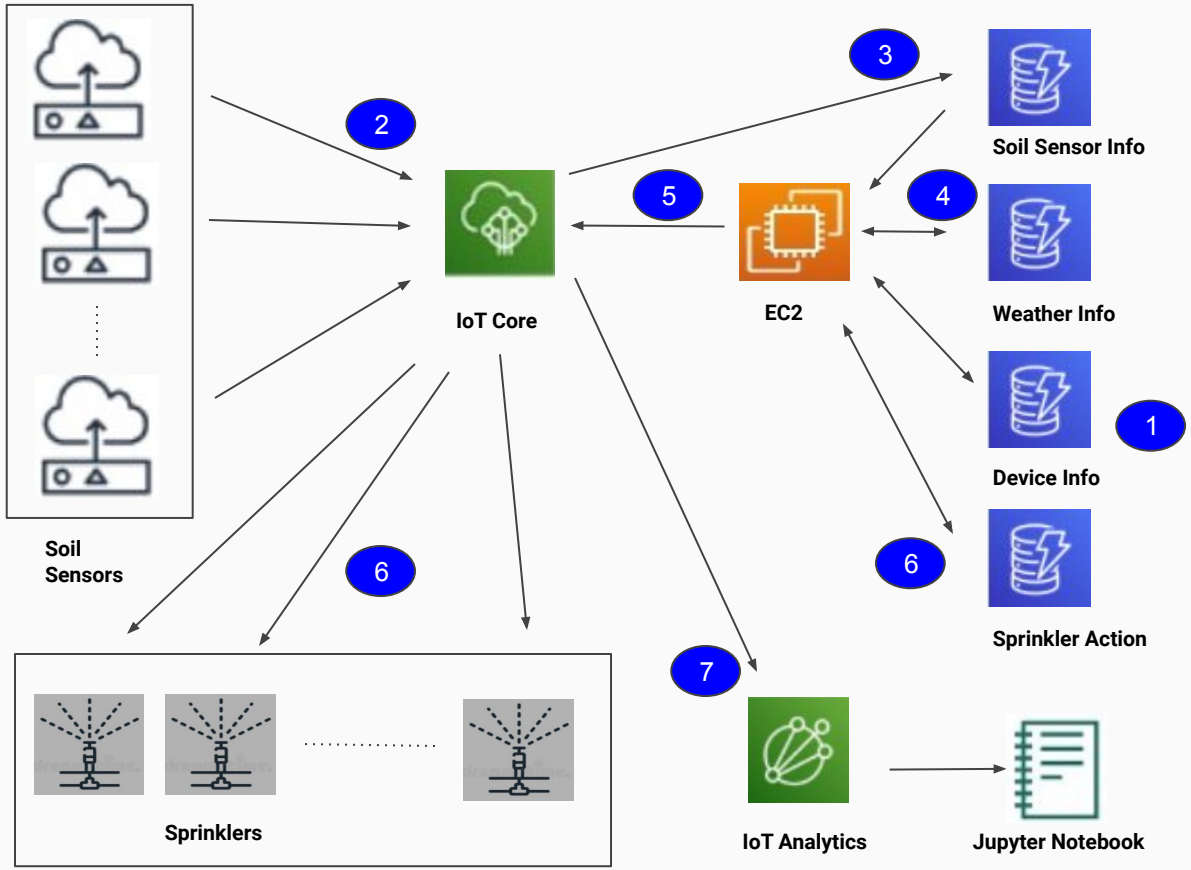
Sprinkler Actuator: This module is the implementation of actual sprinkler simulator, which gets decision from Sprinkler Controller and executes the decision and push the decision to table sprinkler_action

Architecture



Flow



1. At setup, Device Onboarding run in EC2 sets up Device Info table based on Configuration input. Other tables are also setup.
2. Soil sensors publish sensor values at periodic intervals via MQTT topic to AWS IoT Core.
3. Based on IoT Rule, AWS IoT Core sends topics received from soil sensors to Soil Sensor Info Dynamo dB table.
4. Weather Data Populator code running in EC2 periodically gets weather information for configures latitude, longitude and writes that into Weather Info table.
5. Sprinkler Controller code running in EC2 reads data from Soil Sensor Info, Weather Info and Device Info for last defined time interval. It runs an algorithm to find per Sprinkler state (ON/OFF). Accordingly it publishes a topic for each sprinkler to change its state.
6. Sprinkler have already subscribed to topics from Sprinkler Controller. They change their state (ON/OFF) based on topic received from Sprinkler Controller. Sprinkler state is updated in Sprinkler_Action table.
7. IoT Analytics receive topics from Soil Sensors and run analysis via Notebook