

SmartGarden

A child wearing yellow pants and pink rubber boots is watering a small green plant in a garden bed. The child is holding a red watering can, and water is spraying out of the spout onto the plant. The garden bed is filled with dark brown soil, and there are other plants and vines in the background.

IoT Project

Keren Mazaki & Shalom Ben-Yair



Agenda

- Why SmartGarden
- How – IoT aspects of SmartGarden
- Conclusions & Questions



Why SmartGarden

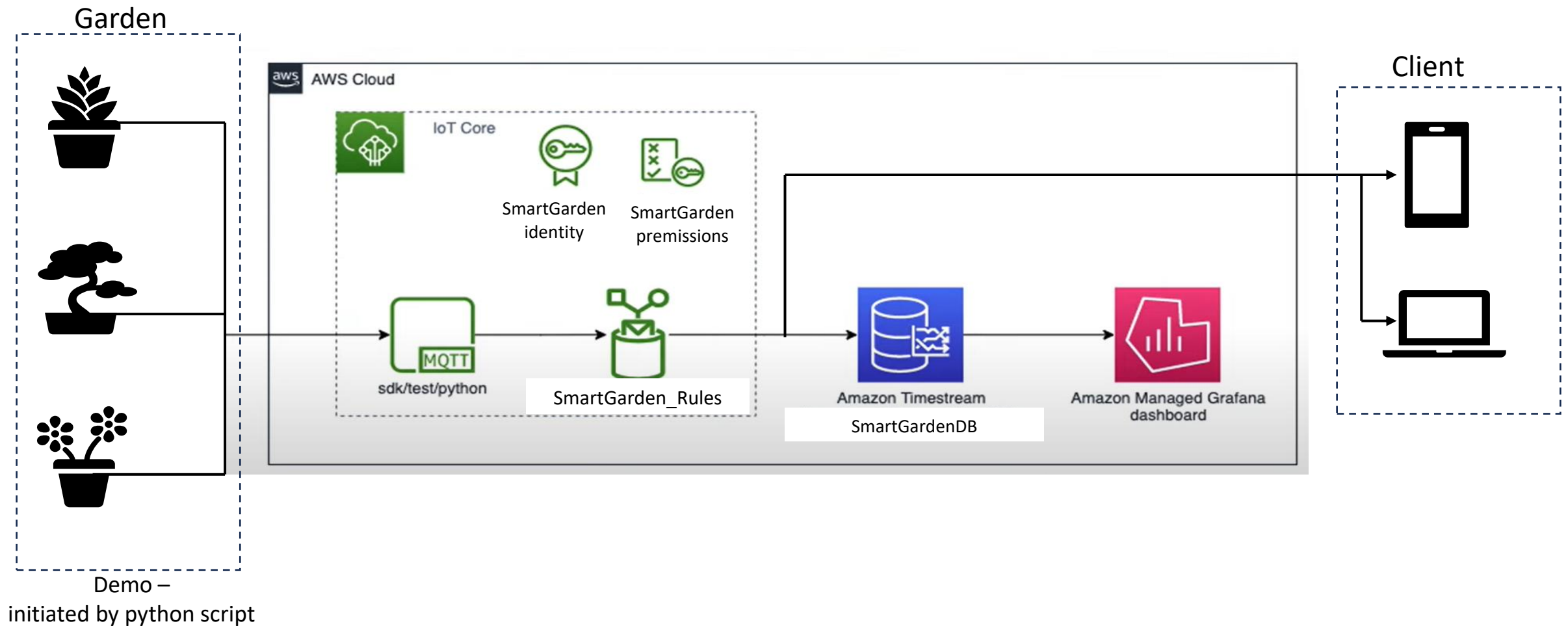
- No more dead plants due to neglect
- Better management for Non-gardeners
- Flourishing garden with minimal effort



How – IoT aspects of SmartGarden

- Plant sensors collect data (humidity, illuminance, etc.)
- Data analyzed via python script
- AWS cloud receives Analyzed data via MQTT messages
- AWS cloud Visualizes data using Grafana and sends notifications to user

SmartGarden IoT Flow



MQTT messages

▼ sdk/test/python

March 04, 2024, 11:47:59 (UTC+02:00)

```
{
  "Mint_Temperature": 43,
  "Mint_Humidity": 46,
  "Mint_Illuminance": 1619,
  "Tomatos_Temperature": -23,
  "Tomatos_Humidity": 86,
  "Tomatos_Illuminance": 3375,
  "Bonsai_Temperature": 14,
  "Bonsai_Humidity": 92,
  "Bonsai_Illuminance": 2113,
  "Cucumbers_Temperature": 40,
  "Cucumbers_Humidity": 112,
  "Cucumbers_Illuminance": 4509,
  "basil_Temperature": 50,
  "basil_Humidity": 61,
  "basil_Illuminance": 1306
}
```

The data is received via MQTT protocol.

New message is received every second in simulation.

In real life, we want to receive one message per day.



Notification Rules

SQL statement

```
SELECT Basil_Humidity, "need to water Basil" as  
messege FROM 'sdk/test/python' WHERE Basil_Humidity <  
15
```

SQL statement

```
SELECT Basil_Temperature, "move to a shadowed area"  
as messege FROM 'sdk/test/python' WHERE  
Basil_Temperature > 40
```

SQL statement

```
SELECT average_Basil_Illuminance, "move basil outside  
to get some sunlight" as messege FROM 'sdk/test/  
python' WHERE average_Basil_Illuminance < 2000
```

- when humidity is under 15 percent, send “need to water basil”
- when temperature is over 40°, send “move to a shadowed area”
- When average luminosity of last 5 days is under 2000 lux, send “move plant outside to get some sunlight



Setting up SNS subscriptions

Subscriptions (1)

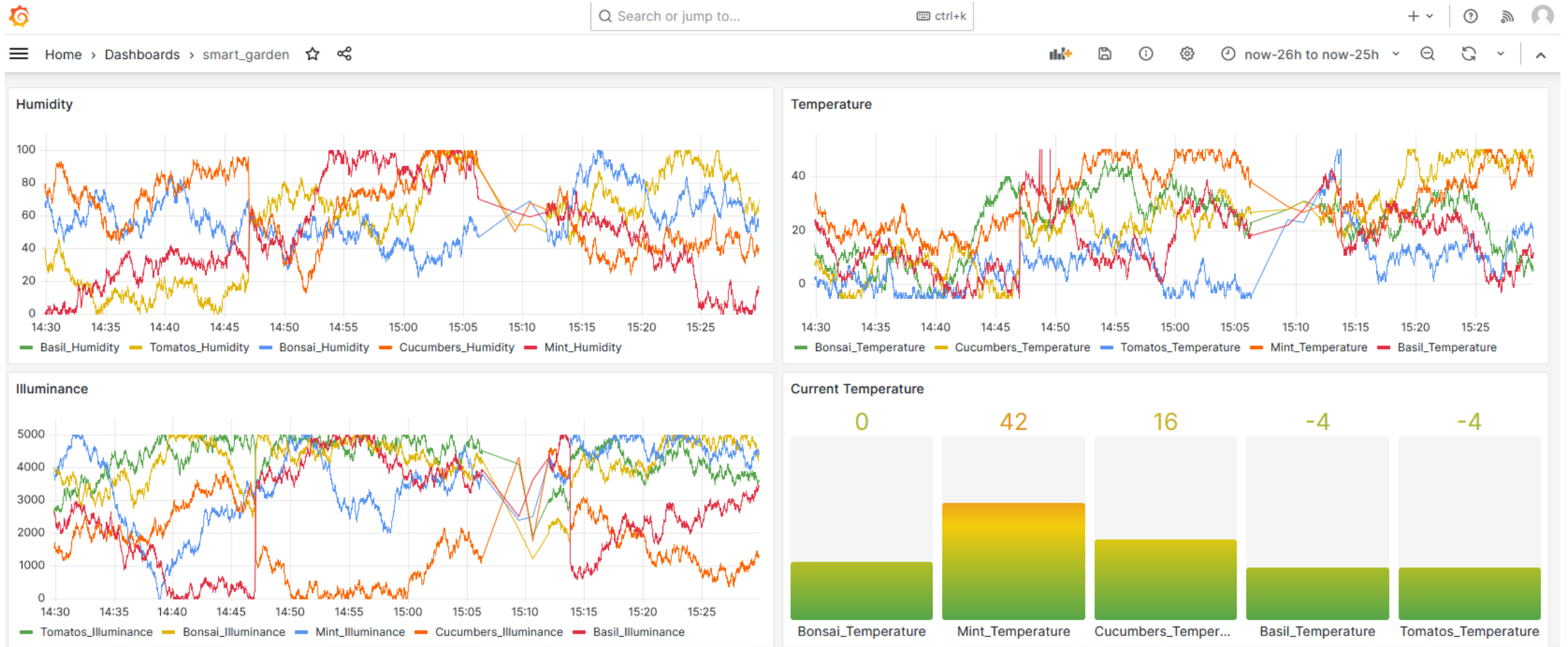
EditDeleteRequest confirmationConfirm subscriptionCreate subscription

< 1 > ⚙

	ID ▲	Endpoint ▼	Status ▼	Protocol ▼	Topic ▼
<input type="radio"/>	cb1d736e-fbd9-...	kerenmazaki15@...	✔ Confirmed	EMAIL	smart_garden_push

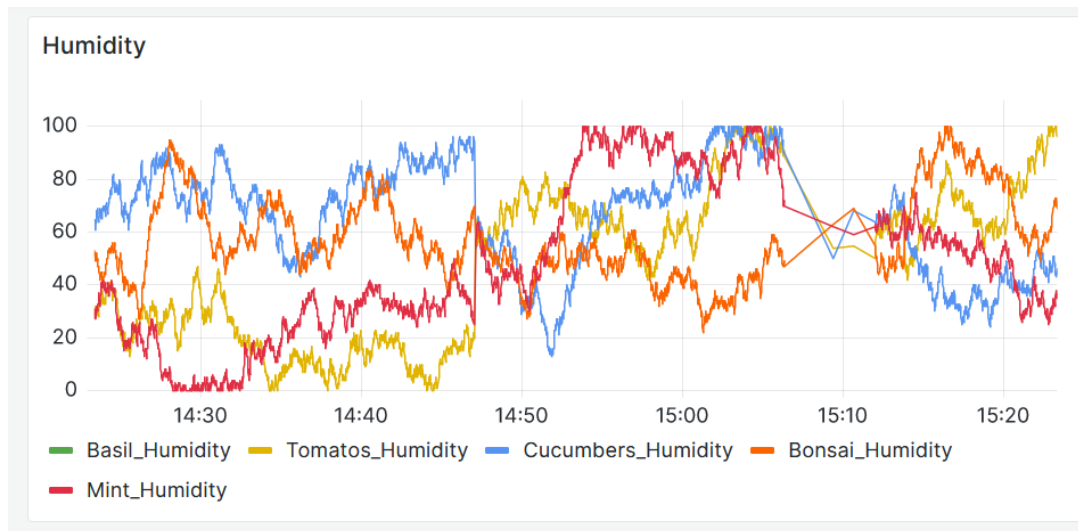


Creating a Grafana dashboard



Results

Grafana timestream data of plant's Humidity



Example- Email sent to user when a plant needs water



AWS Notifications 15:18



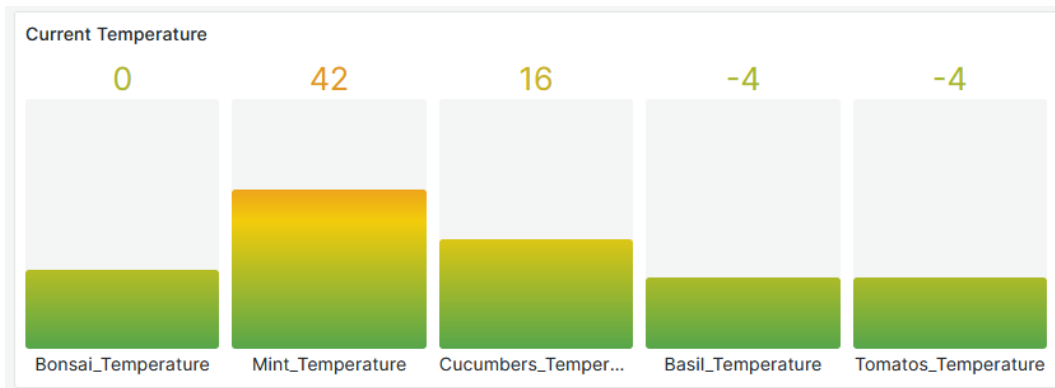
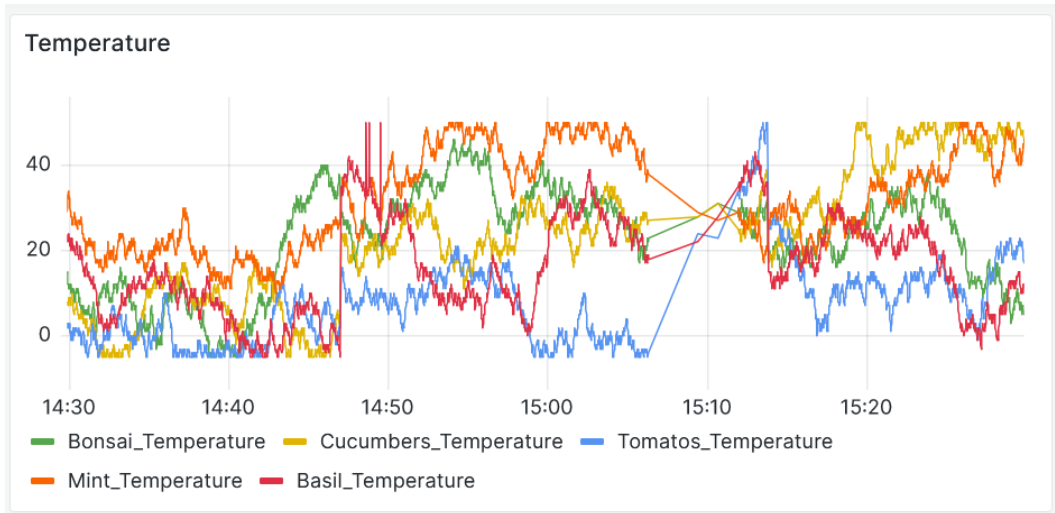
to me ▾

```
{"Basil_Humidity":13,"messege":"need to water Basil"}
```



Results

Grafana timestream data of plant's Temperature



Example- Email sent to user when a plant's temperature is too high



AWS Notifications 15:12

to me ▾

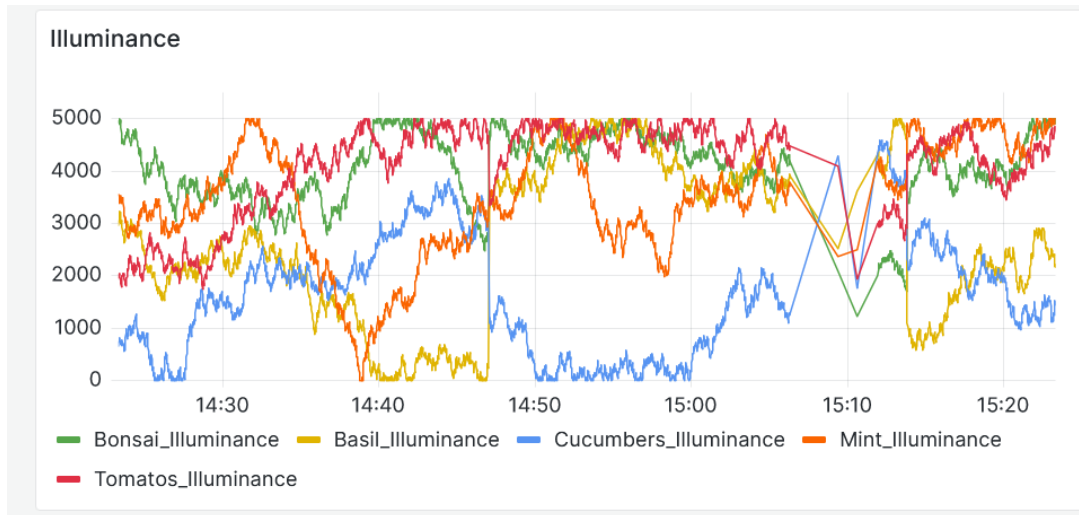


`{"Basil_Temperature":43,"messege":"move to a shadowed area"}`



Results

Grafana timestream data of plant's luminosity rate



Example- Email sent to user when a plant has been too long in the shade



AWS Notifications 15:17

to me ▾



```
{"average_Basil_Illuminance":1  
969.5,"messege":"move basil outside to get some  
sunlight"}
```

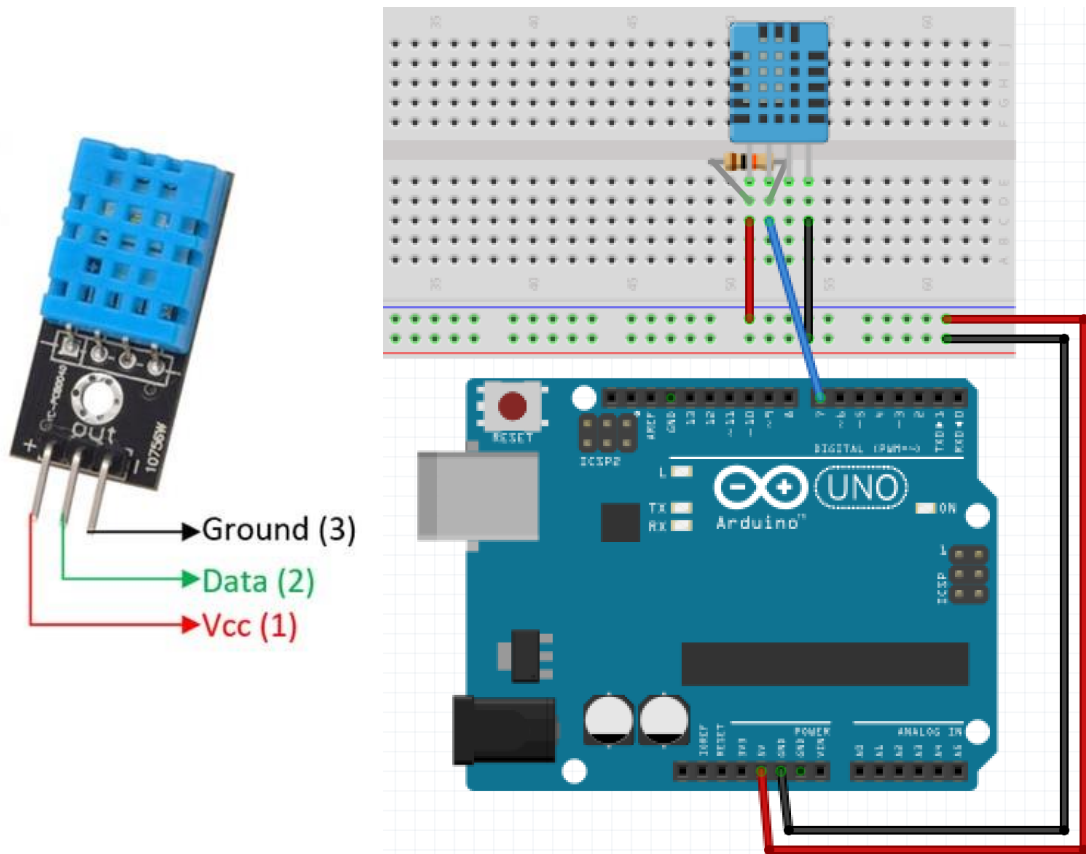


Hardware



[Purchase link](#)

Temperature sensor



- DHT11 Temperature sensor with 8-bit microcontroller
- Voltage: 3.5-5.5 V
- Current: 60uA – 0.3mA
- Temperature range: 0°C to 50°C
- Accuracy: $\pm 1^\circ\text{C}$ and $\pm 1\%$

Hardware

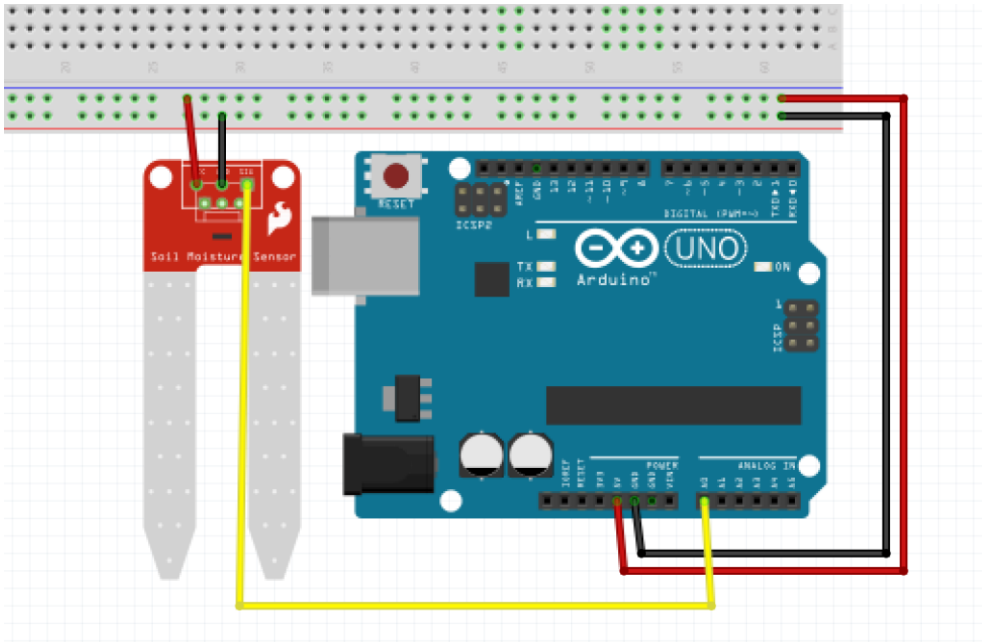


Purchase link

Soil moisture sensor



- Soil moisture sensor based on soil resistivity measurement
- 2.0 cm X 6.0 cm grove module
- Voltage: 3.3-5 V
- Current: 0-35 mA



Hardware



[Purchase link](#)

Light Dependent Resistor (LDR)



- Resistivity changes by light intensity
- made with photosensitive semiconductor materials

A photograph of a vineyard during harvest. In the foreground, a large wooden bin is filled with dark purple grapes and green leaves. In the background, a person wearing a blue shirt is seen from behind, working in the vineyard. The scene is set in a lush green vineyard with rows of grapevines stretching into the distance. The text "Conclusions & Questions" is overlaid in the center of the image.

Conclusions & Questions