Helpful resources:

- Adafruit Liquid Level Sensor (12"): https://www.adafruit.com/product/464
- Jumper wires: https://www.adafruit.com/product/1952
- Reference project: https://learn.adafruit.com/smart-measuring-cup
- FeatherS2: https://unexpectedmaker.com/shop/feathers2-esp32-s2
- Swarm GitHub: https://github.com/Swarm-Technologies/Getting-Started
- Code with Mu: https://codewith.mu/
- Swarm Developer Tools: https://swarm.space/developertools/

Installation Instructions:

1. Download a copy of "Example-Liquid-Level" from Swarm's Github repository

2. Remove the cover from the eval kit

3. Remove the stacked OLED display and connect the sensor to the eval kit's FeatherS2 as shown in the hardware section of this tutorial: https://learn.adafruit.com/smart-measuring-cup

   The example code uses pin23/IO17/A0 to measure the analog voltage

4. Connect your FeatherS2 to your computer using a USB-C cable and open the storage folder

5. Create a backup of all the files stored on the FeatherS2 in case you need to revert back to the previous project that was being used

6. Delete all of the files located on the FeatherS2

7. Copy the contents of the root folder from the "Example-Liquid-Level" repository to the FeatherS2

8. Set up the liquid level sensor in the intended container and fill it to the lowest level of liquid allowed. This value will be used to send an email message when the liquid level reaches this value
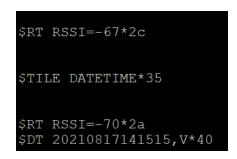
9. Open the file named "code.py"
   a. Uncomment line 182 and monitor the serial output
   b. After a few measurements, record the average value in line 28 as the "lowLevelVoltage" and comment out line 182
   c. Change the "to" and "from" email addresses in line 126 to the email addresses you would like to use. Comment out line 125 which is intentionally left uncommented to ensure that the email address fields are updated
   d. Save code.py to the FeatherS2

10. The code.py file is used to take a measurement of the sensor once every ~30 minutes. The timestamp of the measurement and voltage level of the sensor is logged. The data is then formatted into a $TD message for transmission to the Hive. The frequency of sensor measurements can be changed in the code.py file in line 112. The code also uses the RGB LED on the eval kit to display the RSSI range with the colors red, yellow, and green depending on the type of Swarm Modem being used.
    a. If the liquid level is higher than the set low level threshold, then a message with the timestamp of the measurement, and the voltage level from the sensor, will be queued for transmission on the Swarm Modem
    b. If the liquid level is lower than the low level threshold, then the code will generate a $TD command for AppID 65000. This $TD command is used to send an email when the liquid level is too low. The threshold can be changed in line 28 based on the project's requirements

11. Unplug the USB-C cable from the FeatherS2 and power on your eval kit

12. Connect the FeatherS2 to your PC using the USB-C cable. Start a serial terminal session using the following settings:

Parameter	Value
Baud Rate	115200
Data Bits	8 Bits
Parity	None
Stop bits	1 Bit
Flow Control	None

Note: The FeatherS2's COM port can be found under the device manager

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13. You will see the device's RSSI values printed in the terminal session along with the Swarm Modem startup information. You will also see the datetime values once the Swarm Modem has acquired its date and time

```
$RT RSSI=-67*2c


$TILE DATETIME*35


$RT RSSI=-70*2a
$DT 20210817141515,V*40
```

14. Unplug the USB-C cable from the FeatherS2

15. Mount the eval kit onto its tripod and place it in an area with a clear view of the sky. Monitor the RGB LED and ensure that it is green

16. The eval kit will queue a message onto the Swarm Modem every ~30 minutes (default) formatted as *timestamp, sensor voltage*
    a. If the liquid level is lower than the programmed threshold, then a special $TD command is queued that will send an email based on the parameters entered in line 126 of code.py

17. The messages queued on the Swarm Modem will transmit when a satellite is in range and the device is powered on. Please ensure that the device is placed in a location where it has a clear view of the sky and there are no objects placed close to the antenna. Satellite passes over your location can be checked using Swarm's pass checker

18. Once a message has been transmitted, it will show on the Hive under the device ID for the Swarm Modem that is installed in the eval kit. If the low level threshold is triggered, then the message sent to AppID 65000 will trigger an email to be sent to the specified email address

19. The data can then be pulled from the Hive using Swarm's REST API or webhooks (BETA)