About this project

In this project we are going to learn the basics of LoRa communication.

Basics of LoRa:

LoRa is a wireless data communication technology that uses a radio modulation technique that can be generated by Semtech LoRa transceiver chips.

This modulation technique allows long range communication of small amounts of data (which means a low bandwidth), high immunity to interference, while minimizing power consumption. So, it allows long distance communication with low power requirements.

LoRa uses unlicensed frequencies that are available worldwide. These are the most widely used frequencies:

- 868 MHz for Europe
- 915 MHz for North America
- 433 MHz band for Asia

Because these bands are unlicensed, anyone can freely use them without paying or having to get a license.

More about the project:

The project consists of two separate boards.One has the transmitter,the dht(temperature and humidity sensor),and the ESP32(supplied by 3.3V (DC)).The second has the receiver,the ESP32, and an OLED display to visualize the package received.

How the ESP32 Works:

ESP32 is created by Espressif Systems with a series of SoC (System on a Chip) and modules which are low cost with low power consumption.

This new ESP32 is the successor to the well-known ESP8266(became very popular with its inbuilt WiFi). ESP32 not only has Built-in WiFi but also has Bluetooth and Bluetooth Low Energy. In other words we can define ESP32 as “ESP8266 on Steroids”.

ESP32 chip ESP32-D0WDQ6 is based on a Tensilica Xtensa LX6 dual core microprocessor with an operating frequency of up to 240 MHz.

The small ESP32 package has a high level of integrations such as:

- Antenna switches
- Balun to control RF
- Power amplifier
- Low noise reception amplifier
- Filters and power management modules

On top of all that, it achieves very low power consumption through power saving features including clock synchronization and multiple modes of operation. The ESP32 chip's *quiescent current is less than 5 μA*which makes it the ideal tool for your battery powered projects or IoT applications .

How the DHT22 works:

The DHT22 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

Simply connect the first pin on the left to 3-5V power, the second pin to your data input pin, and the rightmost pin to ground. Although it uses a single wire to send data it is not Dallas One Wire compatible! If you want multiple sensors, each one must have its own data pin.

We have an Adafruit Learning System guide with schematics, Arduino & CircuitPython code, datasheets, and more!

Compared to the DHT11, this sensor is more precise, more accurate, and works in a bigger range of temperature/humidity, but it's larger and more expensive.

Comes with a 4.7K - 10K resistor, which you will want to use as a pullup from the data pin to VCC.

How the SSD1306 Oled display work:

The OLED display doesn't require backlight, which results in a very nice contrast in dark environments. Additionally, its pixels consume energy only when they are on, so the OLED display consumes less power when compared with other displays.

The SSD1306 controller operates at 1.65V to 3.3V, while the OLED panel requires a 7V to 15V supply voltage. All of these various power requirements are fulfilled by internal charge pump circuitry. This makes it possible to connect the display to an Arduino or any other 5V logic microcontroller without requiring a logic level converter.

The model we're using here has only four pins and communicates with the Arduino using I2C communication protocol. There are models that come with an extra RESET pin. There are also other OLED displays that communicate using SPI communication.