LoRaWAN is an open standard that defines a communication protocol for LPWAN technology based on LoRa chips. LoRaWAN defines Media Access Control (MAC) at the data link layer and is maintained by the LoRa Alliance.

LoRa is a proprietary modulation format owned by Semtech. It is a modulation technology of the physical layer in LoRaWAN communication technology. The relationship between the three can be roughly understood as: LoRaWAN+LoRa=LPWAN.

In our project, due to budgetary reasons, we do not have a LoRa gateway, so we cannot implement LoRaWAN networking. In order to allow multiple terminals to access the AWS cloud, we use the MQTT protocol. But we have achieved LoRa point-to-point communication through a single board.

MQTT is a lightweight message transmission protocol based on the publish/subscribe model. It is specially designed for IoT applications in low-bandwidth and unstable network environments. It can provide real-time and reliable message services for networked devices with very little code. Simple and easy to implement

Support QoS (equipment network environment is complex)
Lightweight and bandwidth-saving
Data-independent (don't care about Payload data format)
Persistent session awareness (know whether the device is online at all times)

Architecture
In our project, we achieved the target requirements of level 5 and level 6. The first show is level 5. We use a terminal composed of 3 DHT22 sensors and ESP32 development boards, they all have LoRa wireless air interface technology, and then we use a board to simulate a LoRa gateway for data reception, pay attention. Because it is not a LoRa gateway, it can only realize point-to-point communication between boards.

We can see that when the receiving board is close to which terminal, which terminal's data will be automatically transmitted. The LoRa wireless air interface transmission technology is used here. When the data is received, the data is transferred to the AWS cloud through the MQTT protocol. It can be seen from here that the data transmitted through LoRa first, and then transmitted through the MQTT protocol are piled up, indicating that LoRa collects multiple data first, and then sends them to MQTT at one time.

Next is the realization of level 6. We realized that three terminals are independently connected to the AWS cloud through the MQTT protocol, and the data can be transmitted in real time. Here, we issue an AWS authentication certificate to each device,

and configure the certificate into the development board