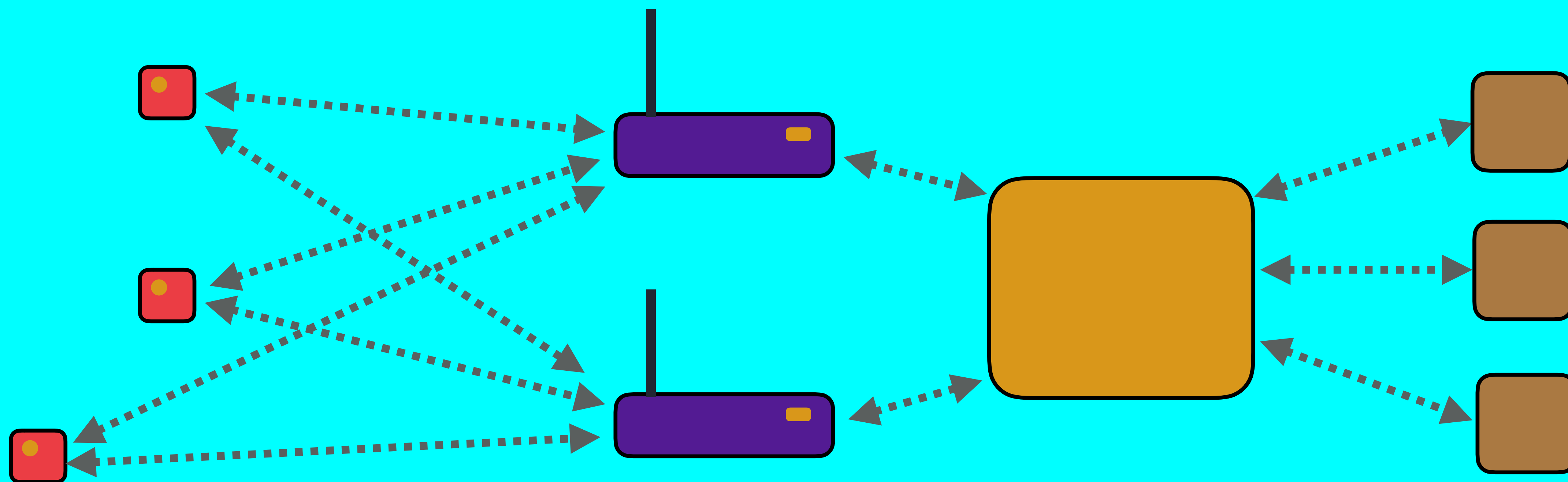# LORA / LORAWAN TUTORIAL 2

What is LoRa & LoRaWAN

v1.0.0

INTRO

- In this tutorial I will explain what the difference is between LoRa and LoRaWAN.

- Several products will be shown in this video. They are not payed endorsements. I have bought all these products myself.

- There are many LoRa gateway and Lora development board manufacturers.
  If you plan to buy such products do your own research.

LORA

- LoRa is an acronym for **Lo**ng **Ra**nge and it is a wireless technology where a low powered sender transmit small data packages (0.3 kbps to 5.5 kbps) to a receiver over a long distance.

- A gateway can handle hundreds of devices at the same time.

The Things Gateway
(gateway / concentrator)

The Things Uno
(end node)

LORA END NODE

- A LoRa end node consists of 2 parts:

  - A radio module with antenna.

  - A microprocessor to process for example the sensor data.

- End nodes are often battery powered.

- A LoRa device (end node) has a wireless transceiver.
  If this device also has sensors, this device acts as a
  remote sensor.
  Such a device is called a mote, short for remote.

printed antenna

radio module
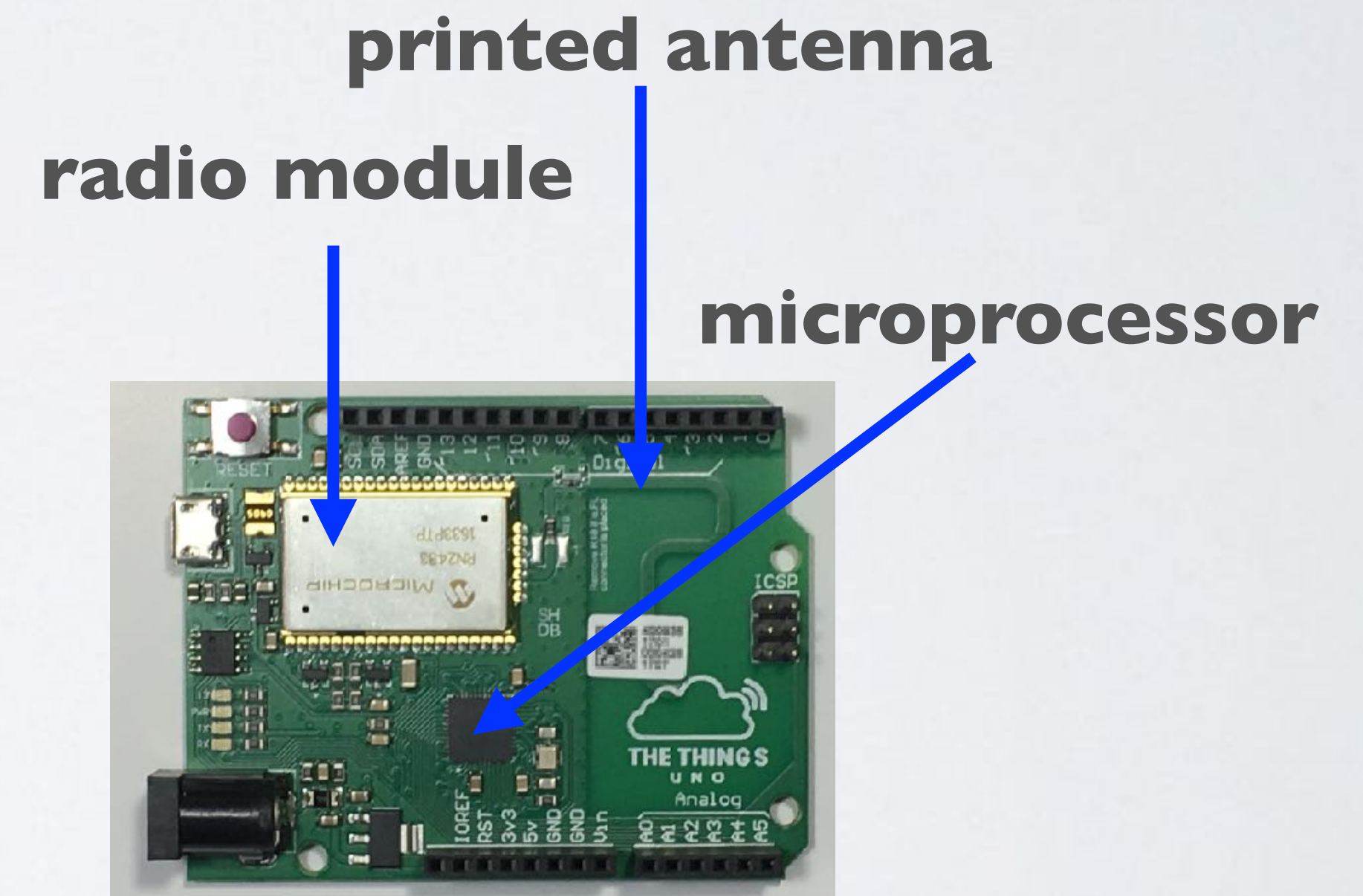
microprocessor

LORA GATEWAY

- A LoRa gateway consists of 2 parts:

  - A radio module with antenna.

  - A microprocessor to process the data.

- Gateways are mains powered and connected to the Internet.

- Multiple gateways can receive data from the same end node.

- The gateways can listen to multiple frequencies simultaneously, in every spreading factor at each frequency.
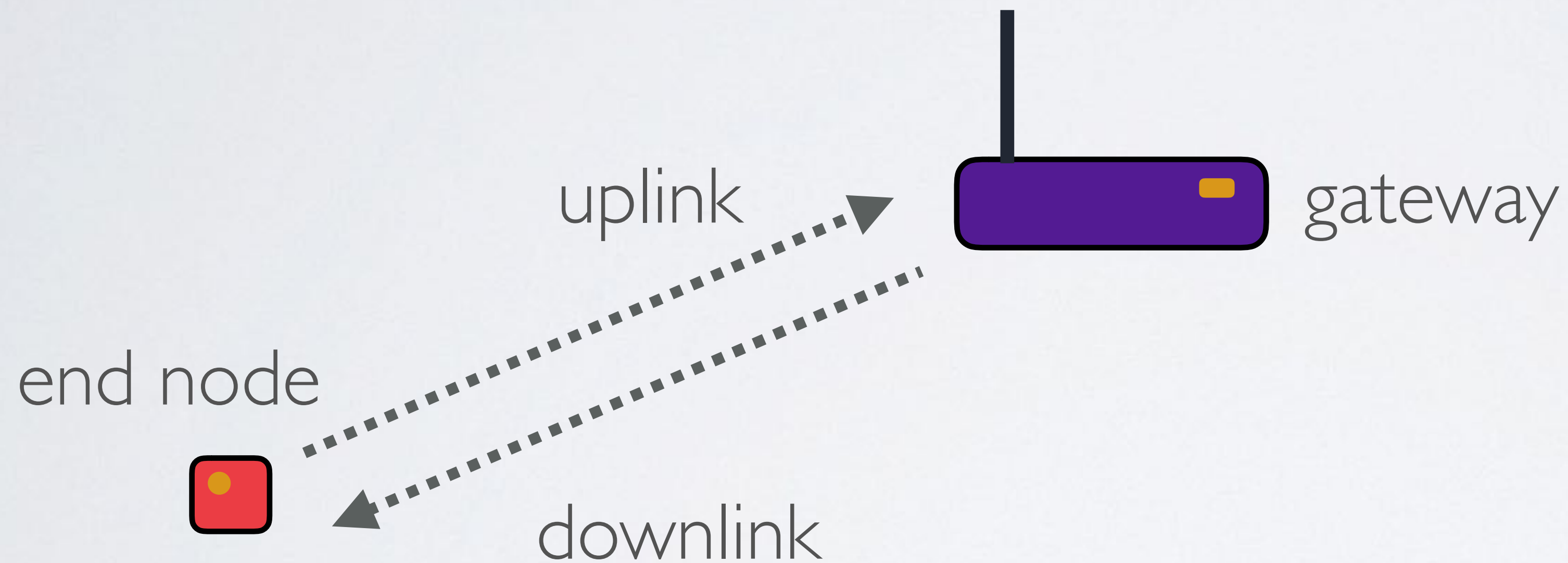
LORAWAN NETWORK
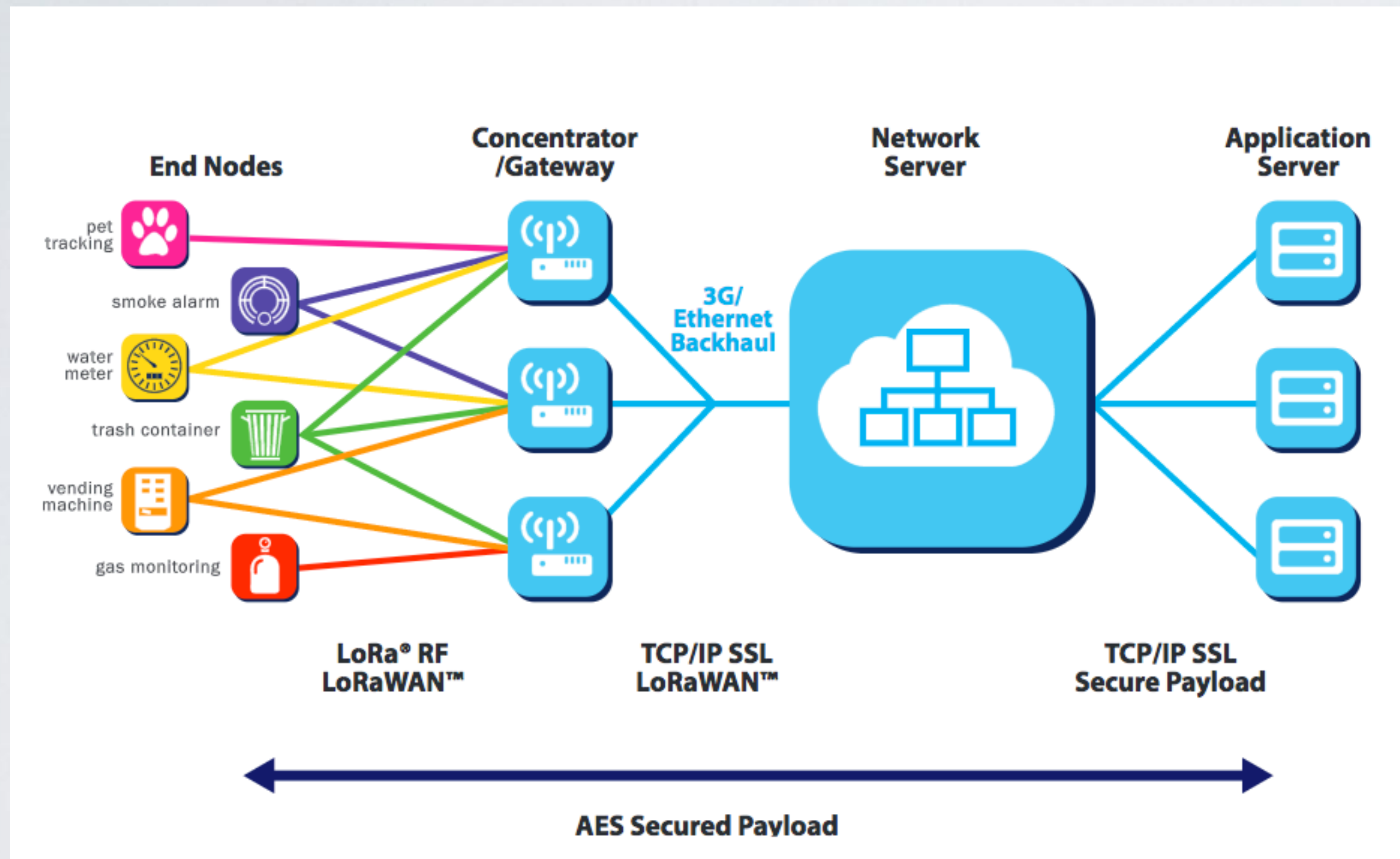
- LoRaWAN network architecture is deployed in a star topology.

- The communication between the end node and gateway is bidirectional which means the end node can send data to the gateway but it can also receive data from the gateway.

Source: https://lora-alliance.org/sites/default/files/2018-04/what-is-lorawan.pdf

UPLINK AND DOWNLINK

• When an end node transmits data to the gateway it is called an uplink.

• When the gateway transmits data to the end node it is called a downlink.

uplink

gateway

end node

downlink

LORAWAN HOW IT WORKS

- An end node broadcast its data to every gateway in its vicinity.

- The gateways forward this packet to the network server.

- The network server collects the messages from all gateways and filters out the duplicate data and determines the gateway that has the best reception.

- The network server forwards the packet to the correct application server where the end user can process the sensor data.

- Optionally the application server can send a response back to the end node. When a response is send, the network server receives the response and determines which gateway to use to broadcast the response back to the end node.

LORAWAN HOW IT WORKS
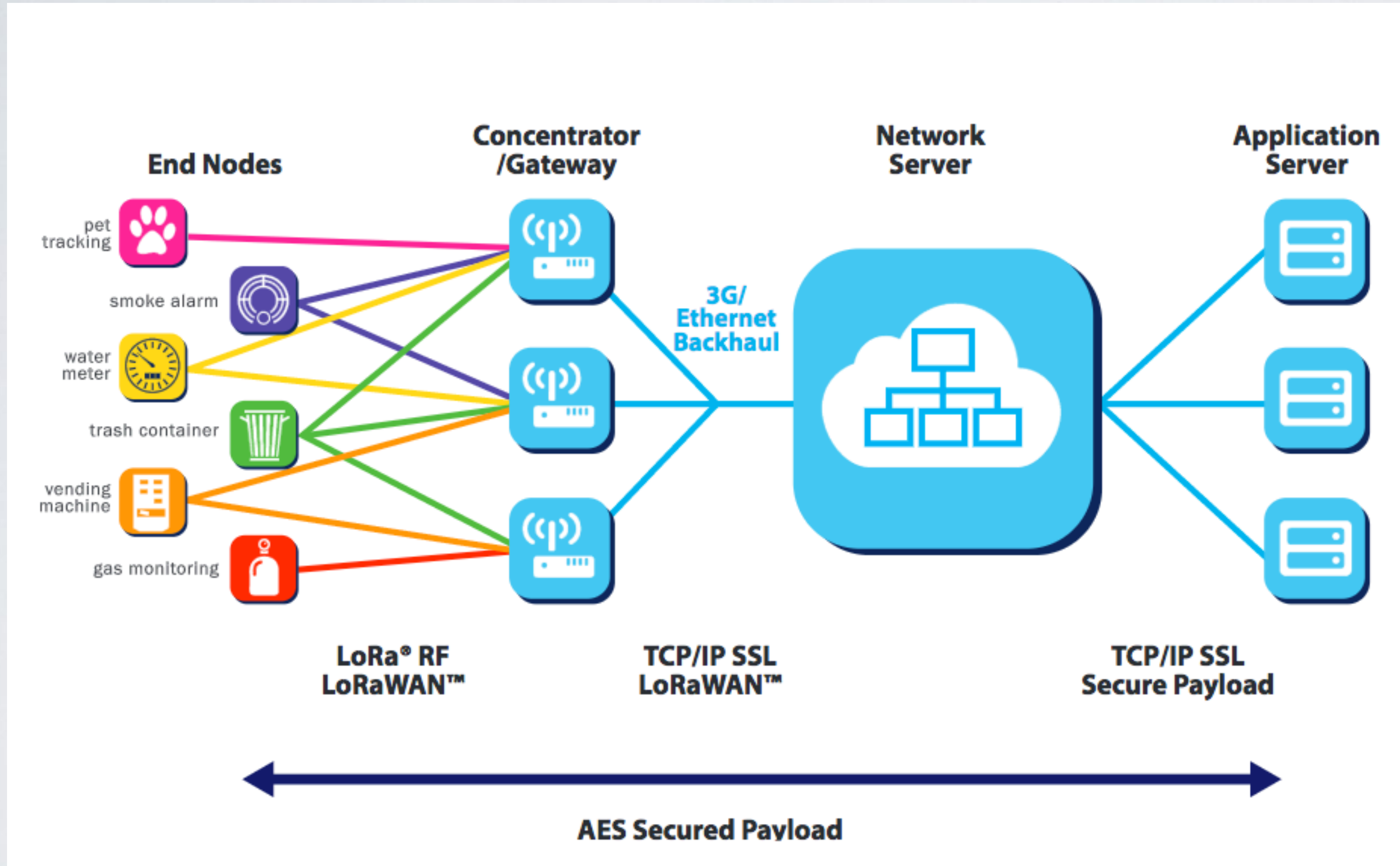
DIRECT COMMUNICATION BETWEEN LORA DEVICES

• The LoRaWAN protocol does not support direct communication between end nodes.

• If you want direct communication between LoRa devices without the use of gateways, use the RadioHead Packet Radio library for embedded microprocessors. It provides a complete object-oriented library for sending and receiving packet sized messages via a variety of radios such as LoRa on a range of embedded microprocessors: https://www.airspayce.com/mikem/arduino/RadioHead/

• RadioHead does not have an official GitHub repo but several people have cloned the Radiohead library on GitHub.
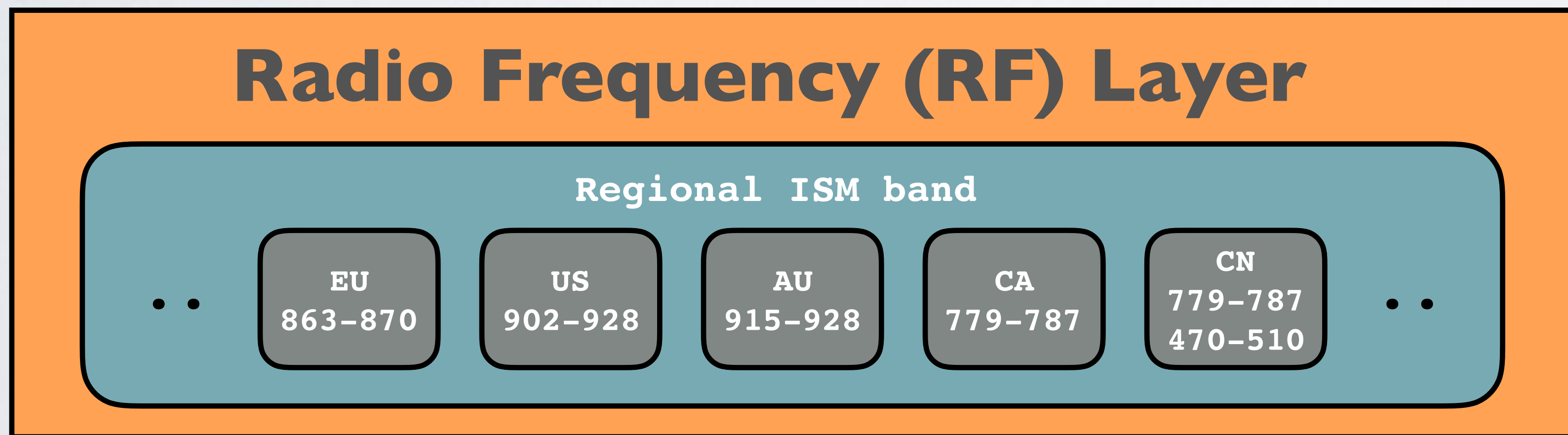
LORA ALLIANCE

• The LoRaWAN protocols are defined by the LoRa Alliance.

• It is a non-profit organisation of more than 500 member companies, committed to enabling large scale deployment of LPWAN IoT through the development and promotion of the LoRaWAN open standard.

• More information about the LoRa Alliance:
https://lora-alliance.org/
https://youtu.be/2Y0bMX3TVi0