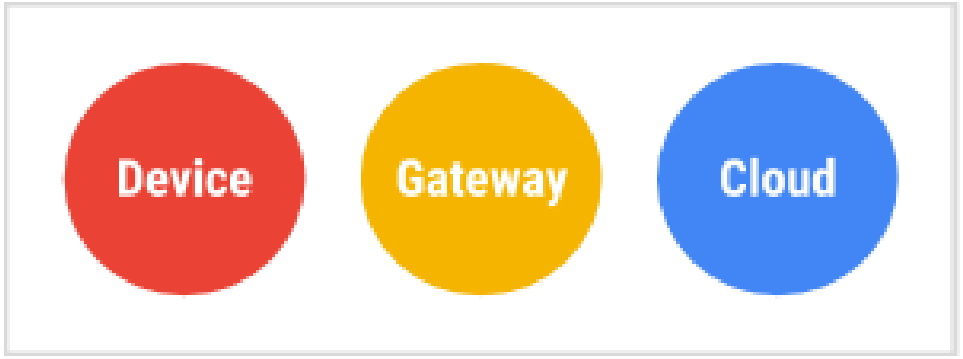
Internet of Things

Αρχιτεκτονική Συστημάτων IoT

Top-level components



Source: https://cloud.google.com/architecture/iot-overview

Devices

- **IoT devices** are pieces of **hardware**, such as **sensors**, **actuators**, gadgets, appliances, or machines, that are **programmed for certain applications** and can **transmit data** over the **Internet** or **other networks**. They can be **embedded** into other mobile devices, industrial equipment, environmental sensors, medical devices, and more.

Source: https://www.arm.com/glossary/iot-devices

Parking sensor

Source: https://cicicom.gr/pages/lora-wan/lora-parking-sensor/

Asset tracker

Source: https://www.digitalmatter.com/devices/guppy-lorawan/

Gateways

- An **IoT gateway** is a physical device or virtual platform that **connects** sensors, IoT modules, and smart devices to the **cloud**.

- Gateways serve as a **wireless access portal** to give IoT devices access to the **Internet**.

- **All the information** moving through an IoT ecosystem – from an IoT device to the cloud, or vice versa – **goes through a connected IoT gateway**.

Source: https://www.thalesgroup.com/en/markets/digital-identity-and-security/iot/inspired/iot-gateway

Gateways

- An IoT Gateway **collects** massive data from many connected devices and sensors in any given IoT ecosystem.

- The gateway **pre-processes** the data before passing it along to cloud platforms, where the heavy lifting of transforming data into meaningful intelligence is accomplished.

- IoT gateways also **receive** information from the cloud, sent back to devices to allow autonomous management of devices in the field.

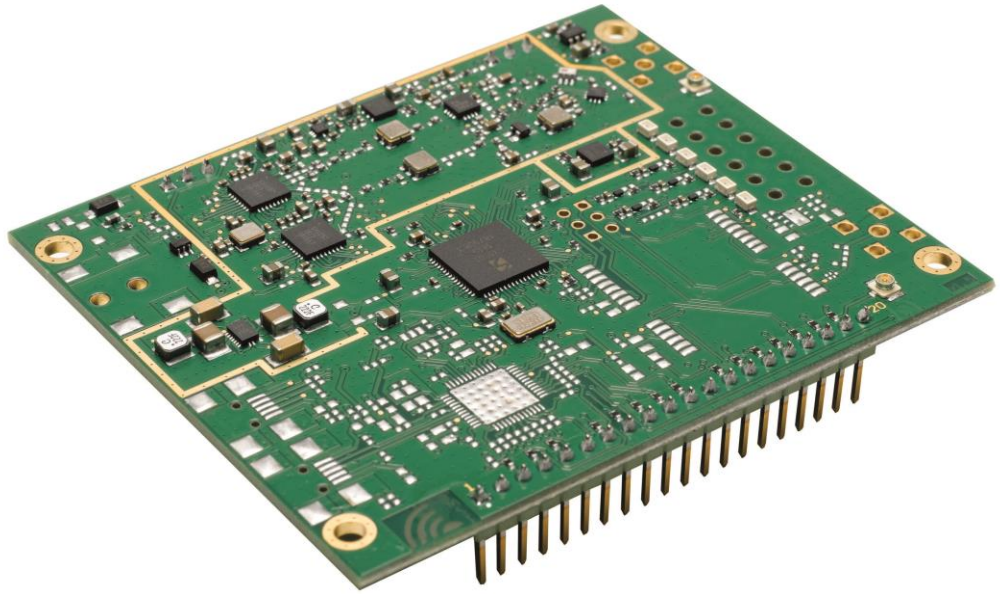
Source: https://www.thalesgroup.com/en/markets/digital-identity-and-security/iot/inspired/iot-gateway

LoRa gateway

Source: https://webshop.ideetron.nl/LARANK-8_PLUS

LoRa gateway

Source: https://beagleboard.org/green



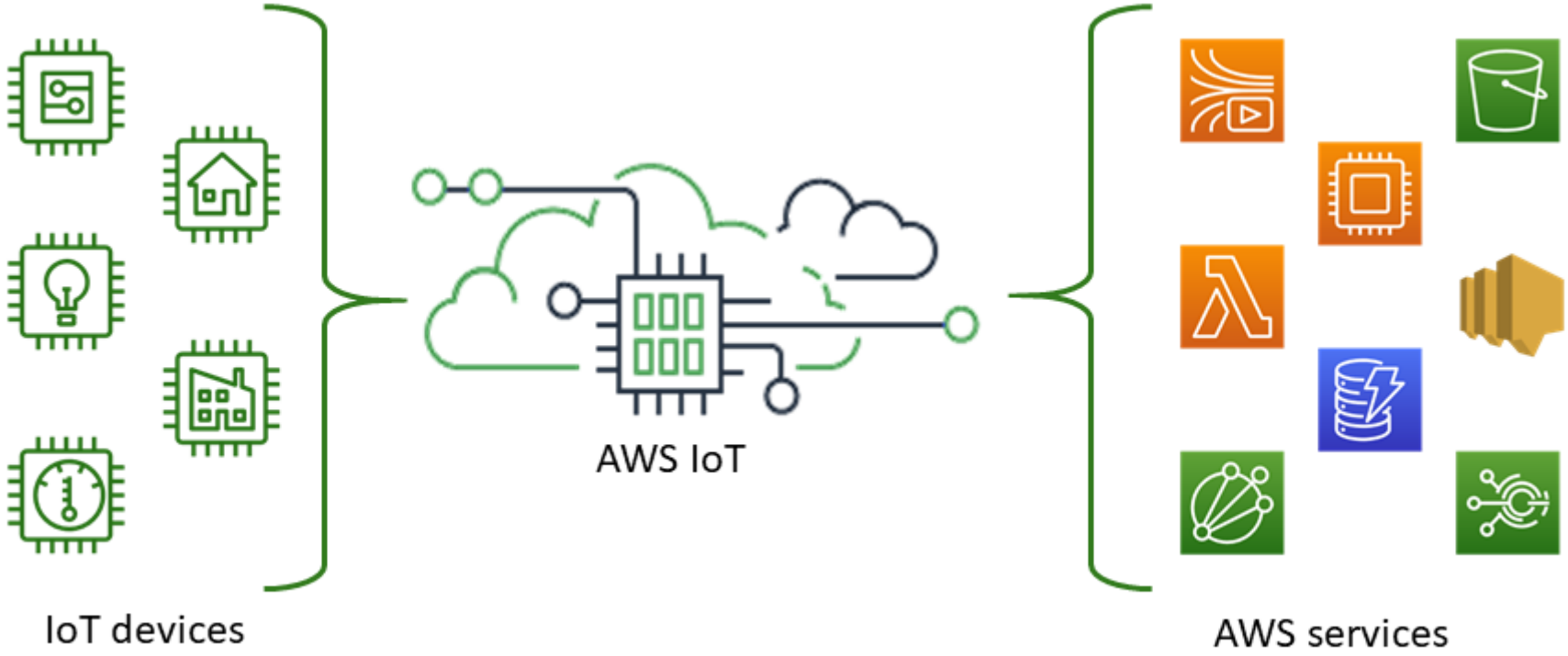
Source: https://wireless-solutions.de/products/lora-solutions-by-imst/radio-modules/ic880a-spi/

IoT platform

- An **IoT platform** is typically a **third-party vendor provided/hosted SaaS-based tool** that is used to support IoT device and endpoint management, connectivity and network management, data management, processing and analysis, application development, cybersecurity, access control, monitoring, event processing, and interfacing/integration.

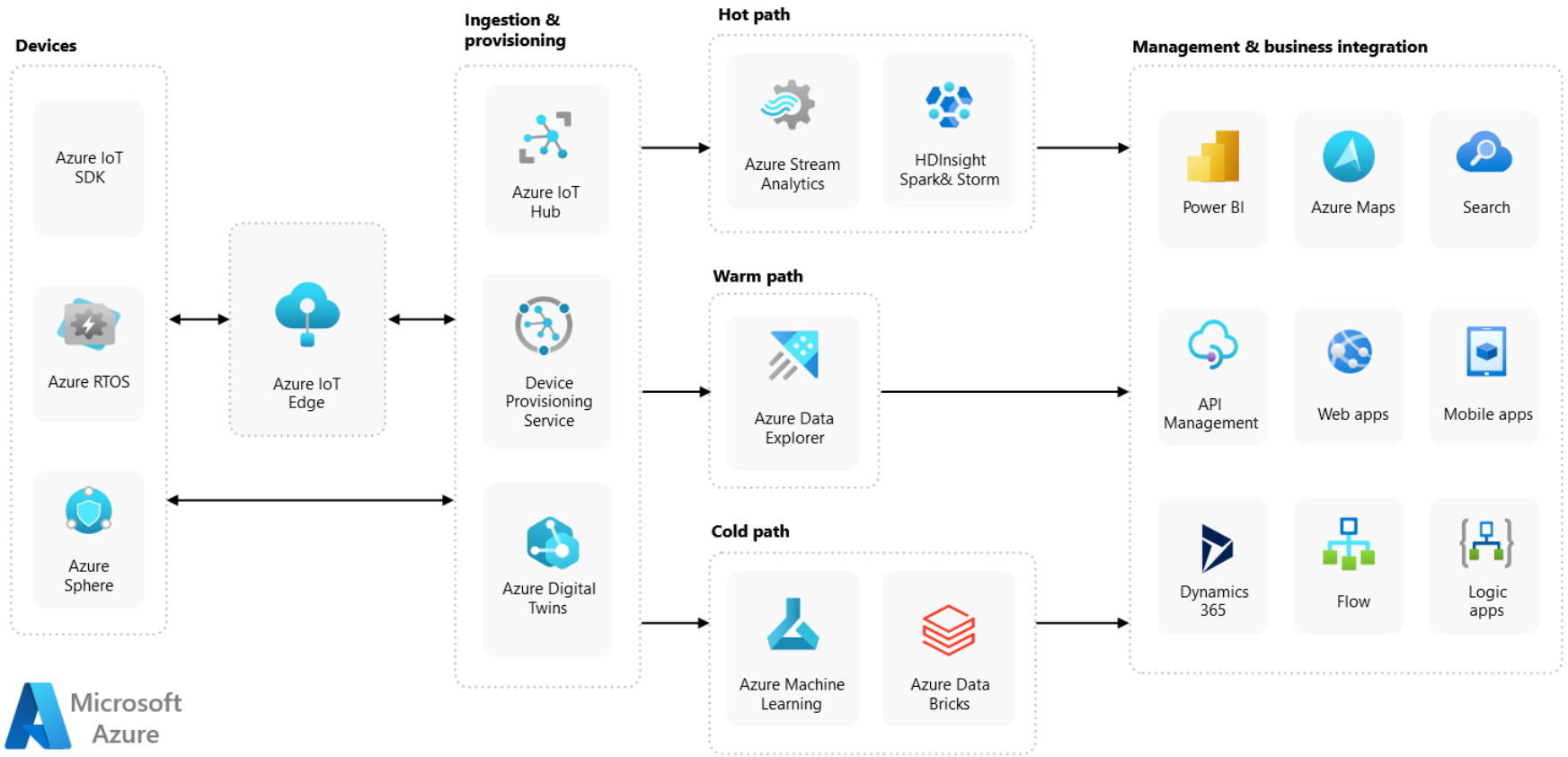
Source: https://csrc.nist.gov/glossary/term/iot_platform

AWS IoT



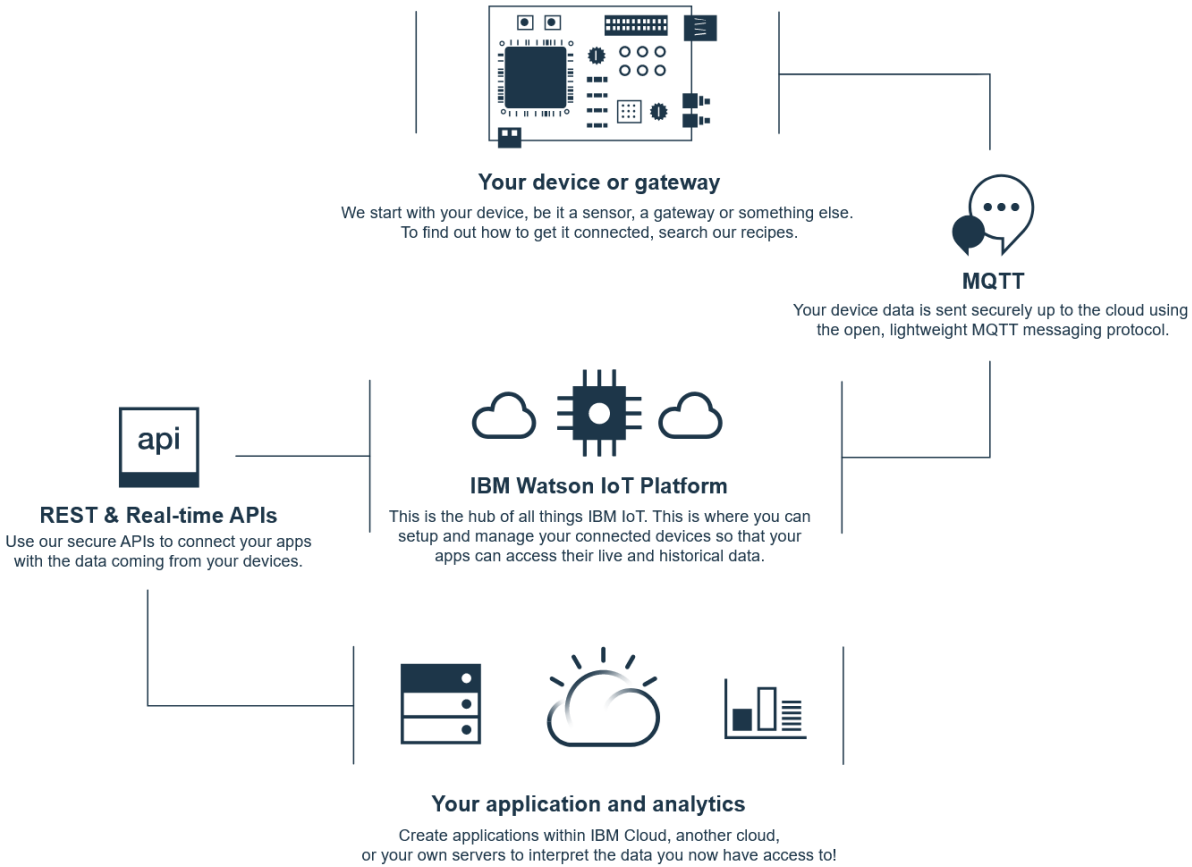
Source: https://docs.aws.amazon.com/iot/latest/developerguide/what-is-aws-iot.html

Azure IoT



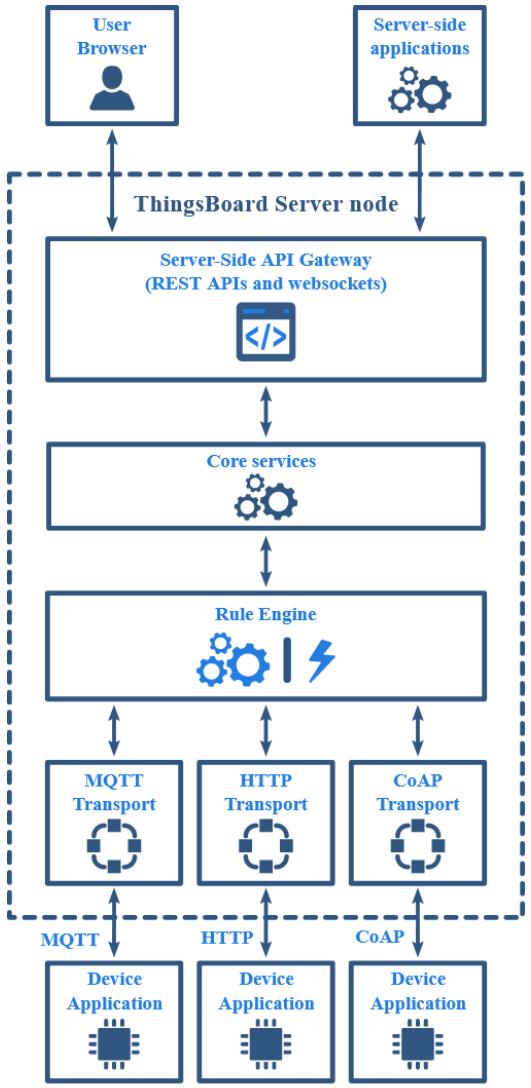
Source: https://learn.microsoft.com/en-us/azure/architecture/reference-architectures/iot

IBM Watson



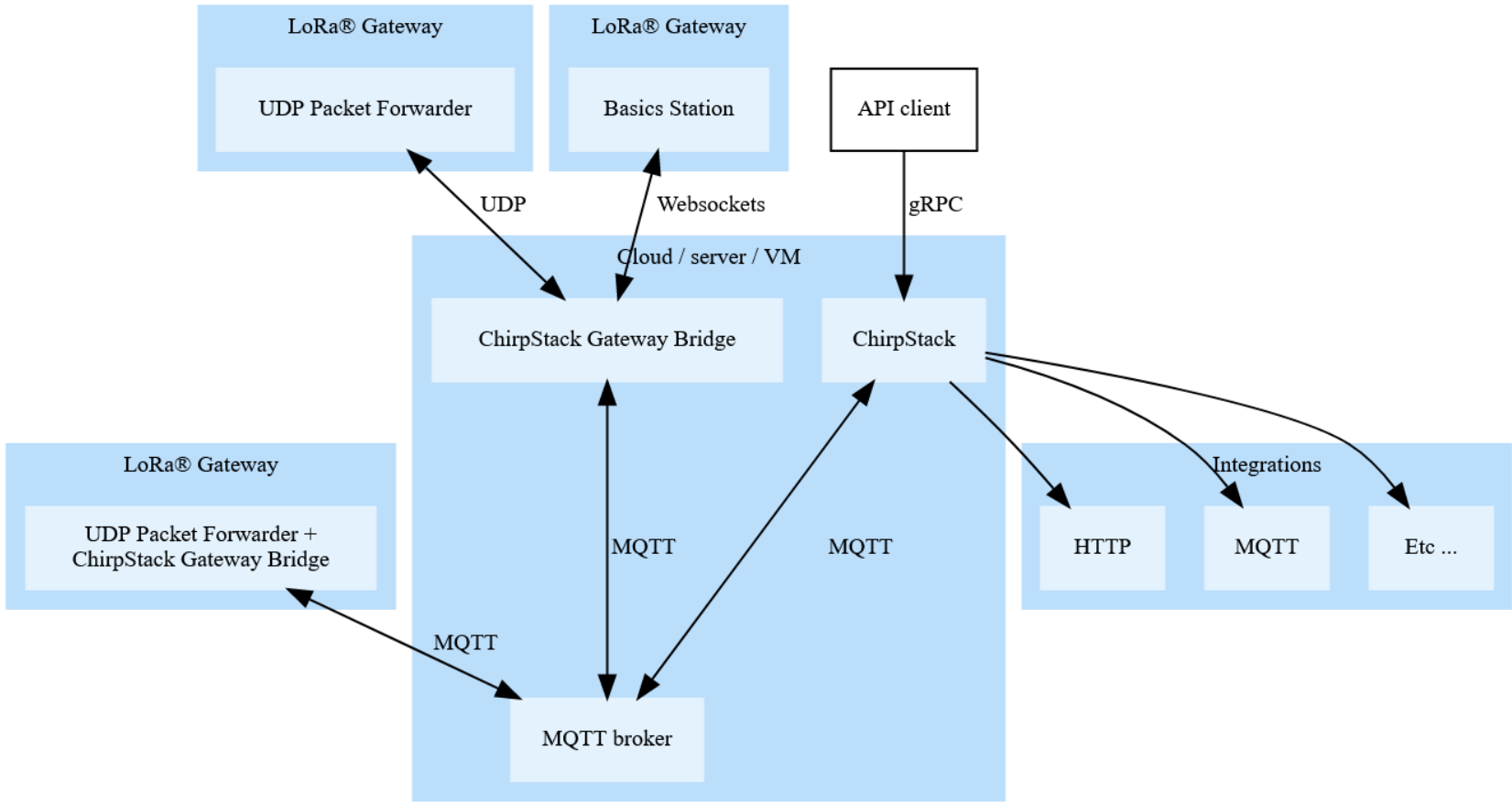
Source: https://internetofthings.ibmcloud.com/

ThingsBoard



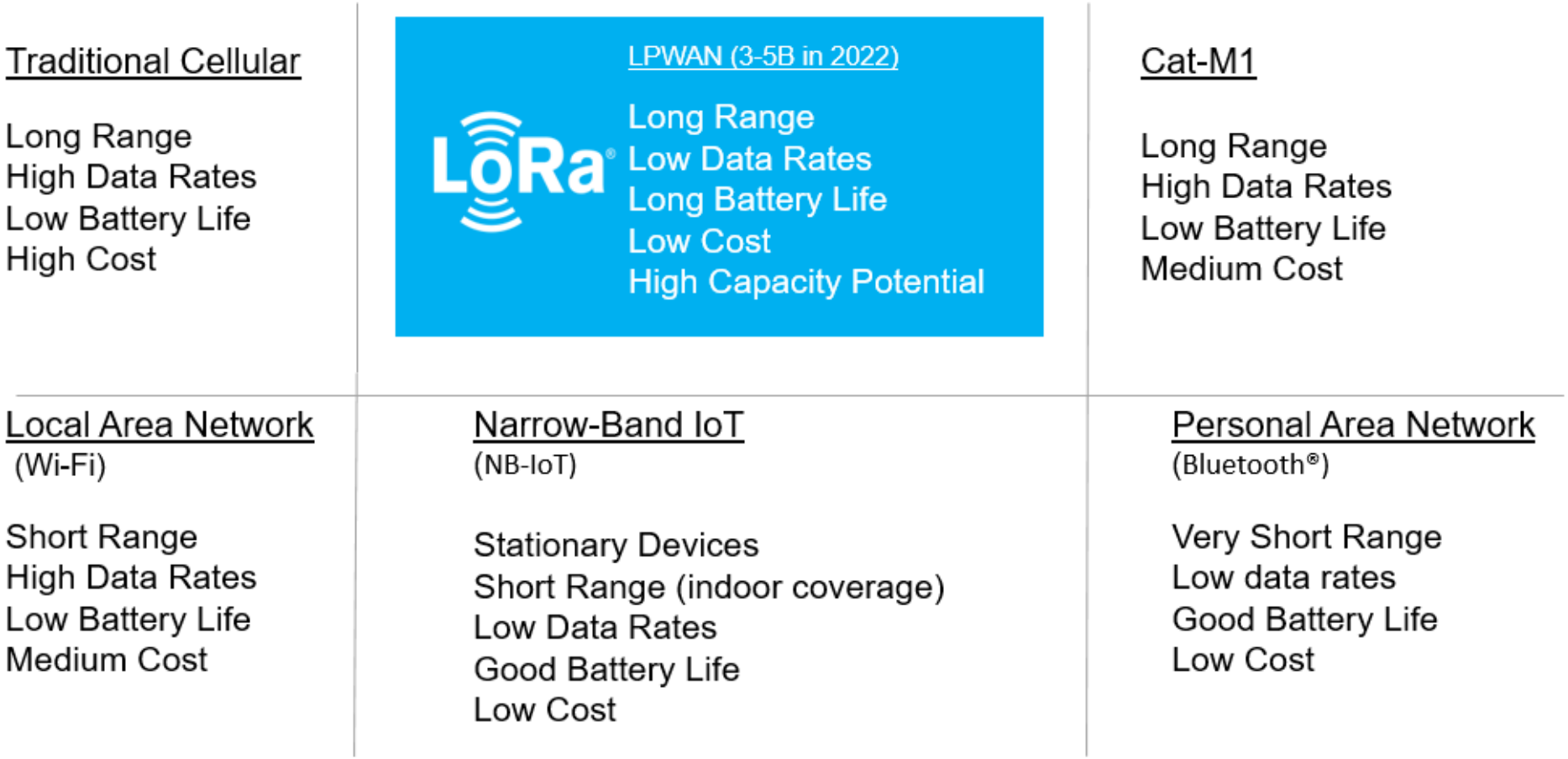
Source: https://thingsboard.io/docs/reference/architecture/

ChirpStack



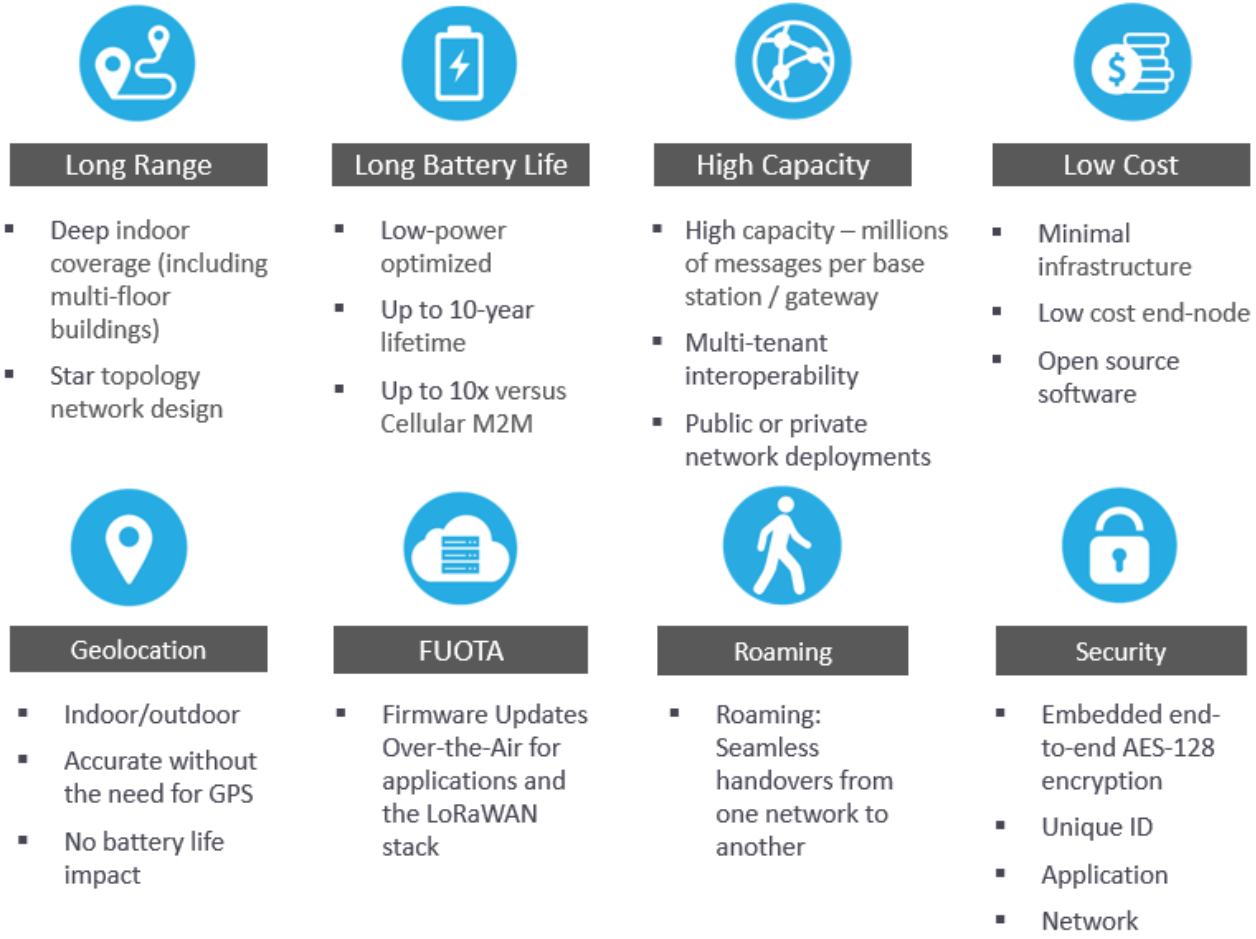
Source: https://www.chirpstack.io/docs/architecture.html

LoRa



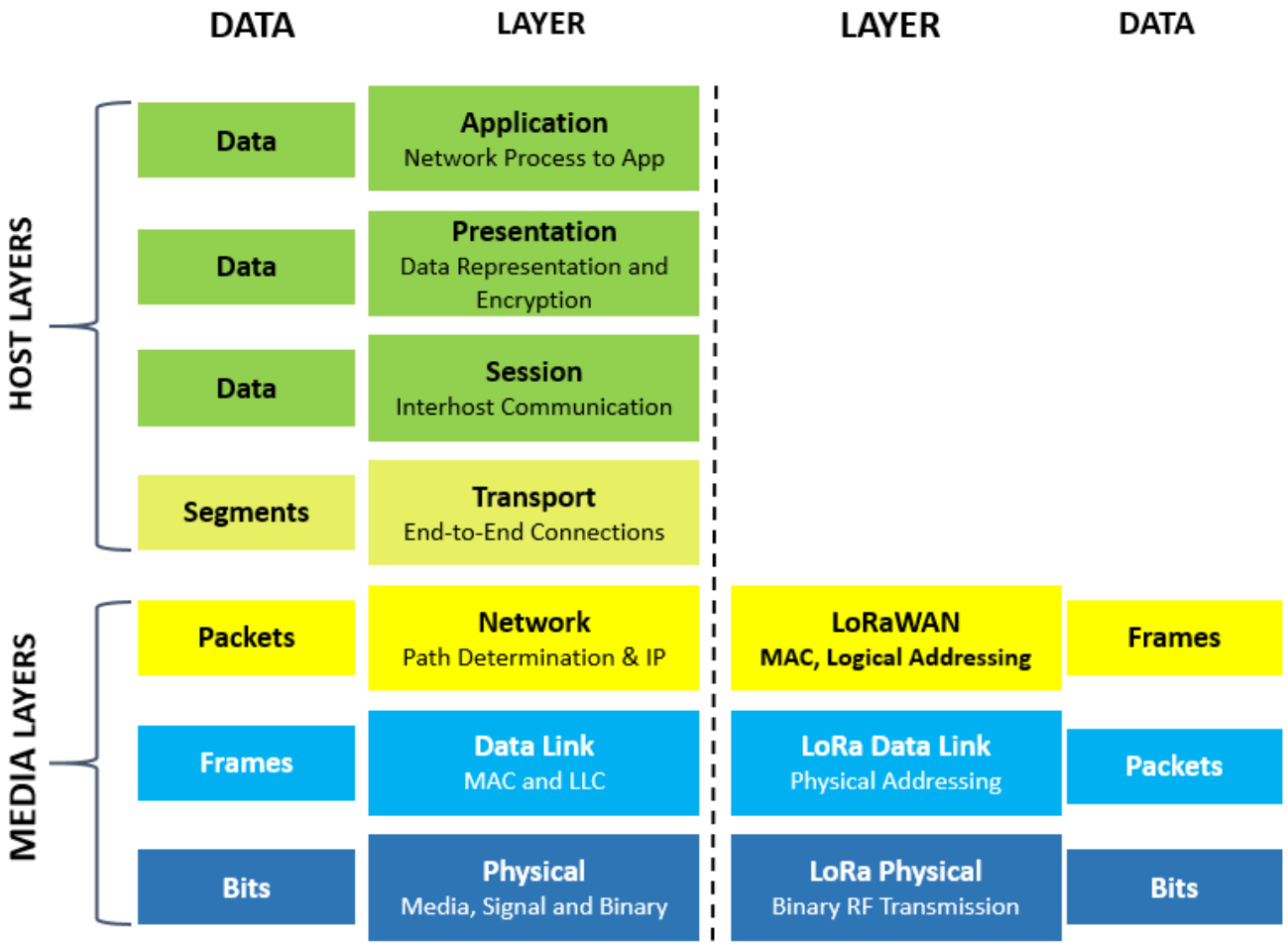
Source: https://lora-developers.semtech.com/documentation/tech-papers-and-guides/lora-and-lorawan/

LoRaWAN



Source: https://lora-developers.semtech.com/documentation/tech-papers-and-guides/lora-and-lorawan/

LoRa/LoRaWAN



Source: https://lora-developers.semtech.com/documentation/tech-papers-and-guides/lora-and-lorawan/

Device activation

- All end devices that participate in a LoRaWAN network must be activated.

- There are two methods of activation:
  1. Over-the-air activation (**OTAA**)
  2. Activation by personalization (**ABP**)

Source: https://lora-developers.semtech.com/documentation/tech-papers-and-guides/lorawan-device-activation/device-activation

Device activation

- The **OTAA** and **ABP** activation methods each result in secret session keys being held by both the end device and the network server, which are used to secure messages being sent and received across the network.
- In **ABP**, these session keys are stored on the end device during the manufacturing process.
- In **OTAA**, the session keys are generated during a series of exchanges with the network server.
- **OTAA** is the more secure option, since the keys can be replaced at any time by rejoining the network.

Source: https://lora-developers.semtech.com/documentation/tech-papers-and-guides/lorawan-device-activation/device-activation

Payload decoding

- LoRa devices send their readings as bytes instead of a full JSON object in order to save bandwidth.

- Payload decoding refers to the process of converting a simple byte sequence to usable data.

Source: https://docs.datacake.de/lorawan/payload-decoders

Payload decoding

Guppy LoRaWAN Uplink Decoder

Port: 1

Hex/Base64: C382


```
{
  "type": "status",
  "inTrip": true,
  "batV": 3.358,
  "temp": 25,
  "manDown": null,
  "inclinationDeg": null,
  "azimuthDeg": null,
  "xyz": null
}
```


Source: https://www.oemserver.com/tools/GuppyLoRaWAN/UplinkDecoder.html