Unit 2

LoRA

Dr L S Jayashree
Professor, Dept of CSE
PSG College of Tech

Popularity of **L**ow **P**ower **W**ide **A**rea **N**etwork

Long Range

Low Power

Low Data Rate

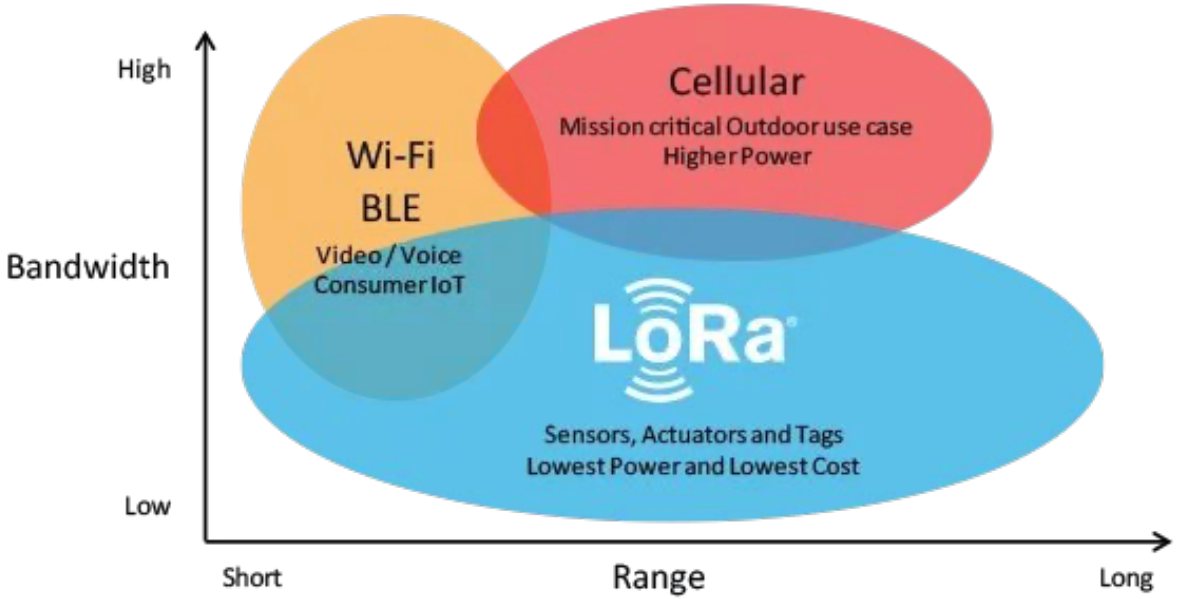
LPWAN is becoming popular day-by-day

LoRA overview

LoRa is a long-range wireless communication protocol that is also known as Low Power Wide Area Network (LP-WAN).

LP-WAN enables the huge number of IoT devices to connect to the Internet; the WAN part of LP-WAN implies that it is determined to achieve very long range connectivity

The single most unique aspect of LoRaWAN - a single gateway is sufficient to cater to the communication needs of thousands of end devices which are available a few kilometres away.


High
Bandwidth
Low
Short
Range
Long
Wi-Fi
BLE
Video / Voice
Consumer IoT
Cellular
Mission critical Outdoor use case
Higher Power
LoRa
Sensors, Actuators and Tags
Lowest Power and Lowest Cost

Different LPWANs

SIGFOX
One network A billion dreams

LoRa™

LoRa is one of the most popular LPWANs

Frequency	Region
868 MHz	Europe
915 MHz	North America
433 MHz	Asia

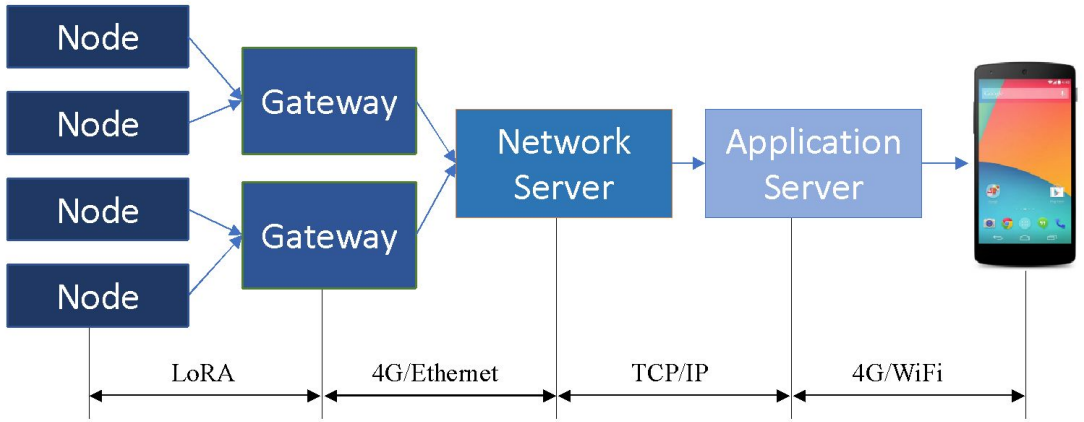
does not use the universally adopted license free ISM band which is centered around 2.4 GHz and hence a LoRa device should be bought in a region specific manner.

LoRa achieves extremely long range connectivity, to an extent of several kilometres, greater than that achieved by wide area mobile Internet standards like GSM, UMTS, LTE and VoLTE.

Such a very high range of coverage is achieved by means of trading off the network bandwidth

LoRa allows a maximum data rate of 27 kbps

LoRa Architecture



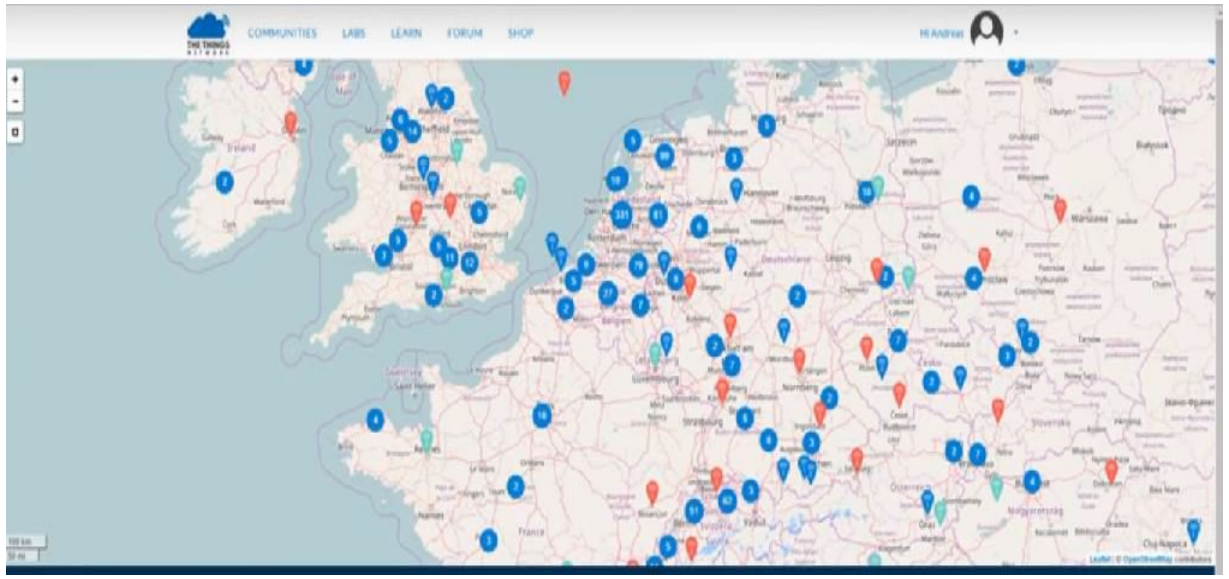
The gateways are equipped with concentrators to receive packets from huge number of end devices.

The devices in the LoRaWAN network can transmit low bandwidth messages up to a distance about 5 to 15 kms for several months to a few years.

A LoRa gateway can be installed either on commercial basis or community basis

The community approach relies on interconnecting the distributed gateways that are privately built and maintained

Live Map of LoRA gateway geo spatial distribution



Courtesy: The Things Network
https://www.thethingsnetwork.org/community

The Things Network (TTN)

TTN, leads a community approach to build a worldwide, open, crowd sourced LoRaWAN network

TTN provides a live map of available LoRa gateways across several regions of the World

It also encourages private operators to install their LoRa gateways in a regions which currently has no coverage, so that this gateway can be used by multiple other applications subsequently.

A recent press release from Netherland says that it
has the world's first nationwide LoRa network built for IoT

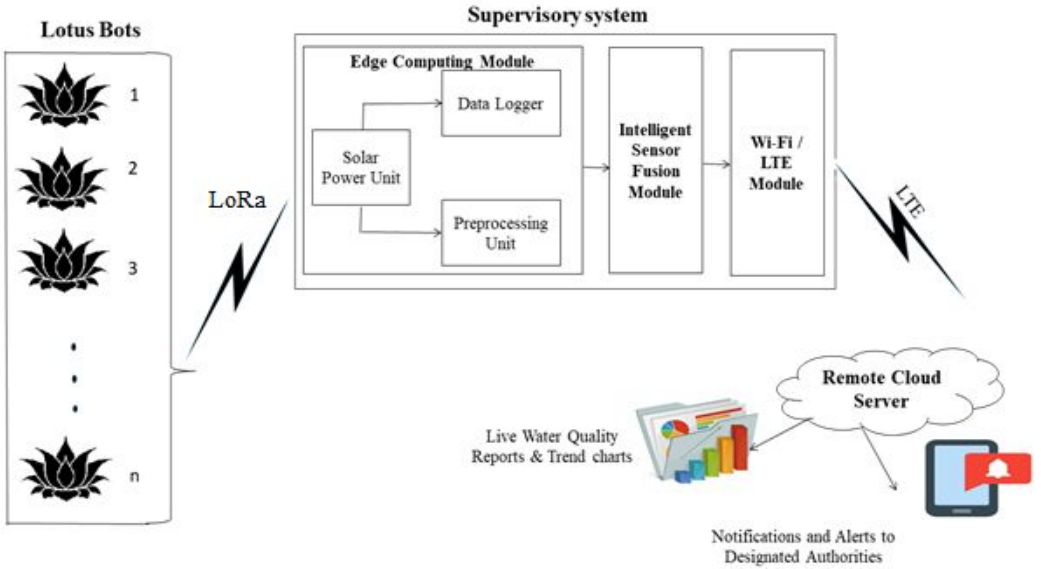
LoRa – an ideal choice for Smart City Projects

LoRa, a long range low power wireless technology is the perfect choice for such intermittent low data rate connectivity over long distances (10-15kms) with better battery performance (~10 years).

It is deployed in numerous smart city applications such as:

- smart metering and lighting solutions
- structural health monitoring system
- smart water leakage detection, smart flood sensors, parking management
- energy and pollution meters
- fire detection systems, traffic signal management etc

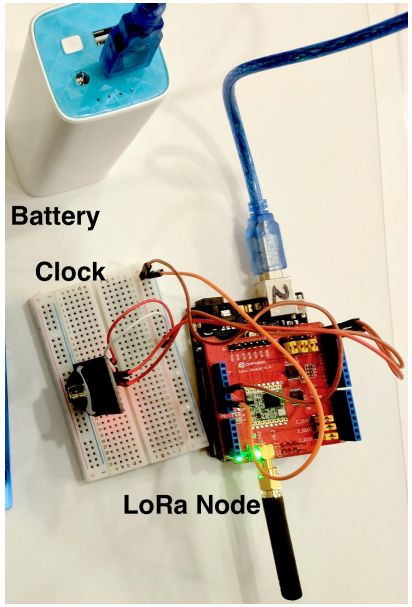
Design and Development of Low cost Technology Using Solar powered Lake Water Quality Assessment Network for Smart Cities (Lotus Swan)



Robot swans to measure water quality in Singapore-
https://internetofbusiness.com/robot-swans-singapore

LoRa Node

- Components: A LoRa radio shield with an Arduino Uno.
- LoRa radio shield: transceiver SX1272/73.
- Software: IBM lmic Library.
- Power: 10,000mAh USB power bank.
- Clock: an external real-time clock.



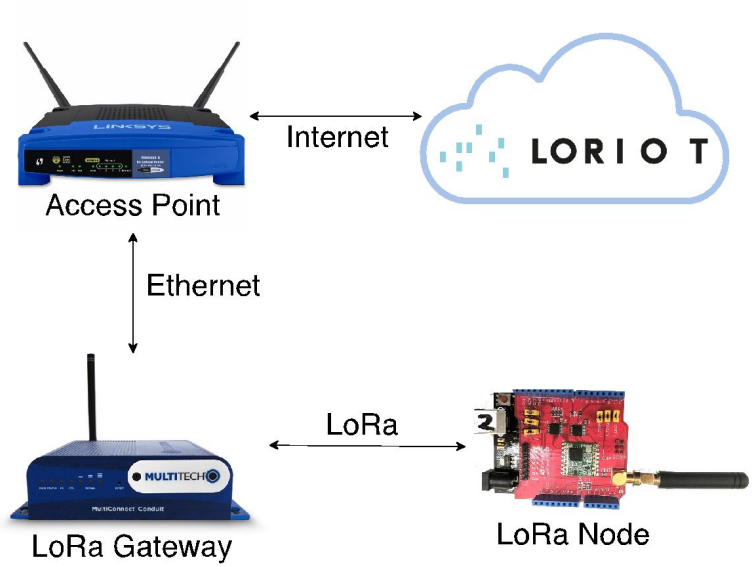
LoRA Gateway

- Multitech Conduit device.
  - Runs on an enhanced closed source embedded Linux platform.
  - a configurable and scalable Internet gateway for industrial IoT.
- listens to one sub-band at a time.
  - a gateway can listen to eight channels simultaneously.


LoRa Gateway

Implementation (Application Server)

Setup


Internet
LORIOT
Access Point
Ethernet
LoRa
LoRa Gateway
LoRa Node

Setup