LoRa Network Implementation

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28th April 2017

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Introduction

- Project Concept and Objectives
- System Overview
- Project Design
- Technology and Components
- Discussion of Project

What is LoRa?

- Wireless modulation technology
- It provides significantly longer range than competing technologies
- Low bandwidth, Low power
- Excellent range and penetration
- Operates in the unlicensed ISM bands
  - 433MHz, 868MHz, 915Mhz
  - Within regulation (power, duty-cycle, bandwidth)

Project Objectives

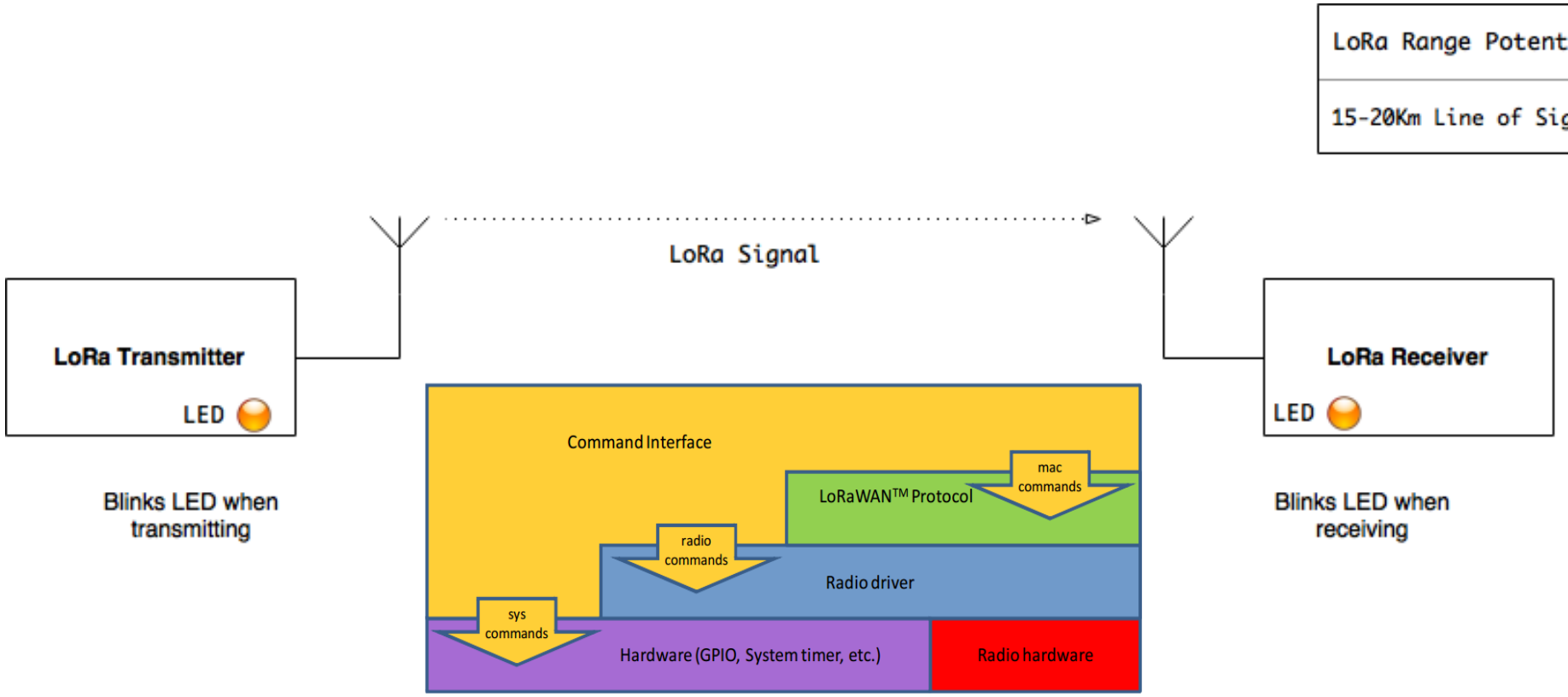
- Design and implement a proof of concept LoRa Network
- Integrate network server/cloud connectivity
- Develop an Android application to query the backend
- Make system fully bi-directional

A LoRa Network consists of:

- Gateways
- Remote Devices
- Network Servers

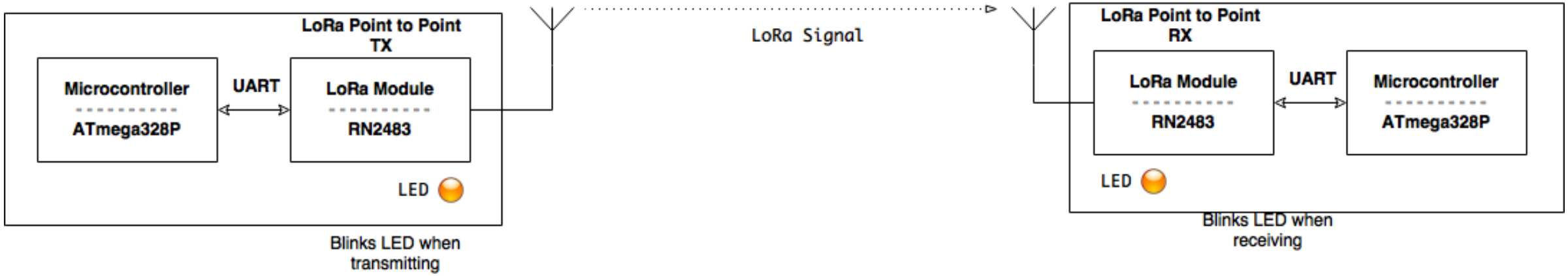
Basic Design Concept

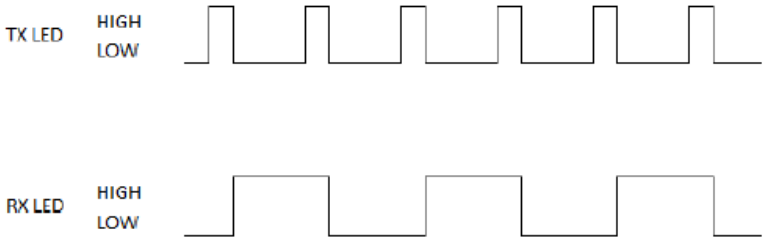
LoRa Range Potential
15-20Km Line of Sight



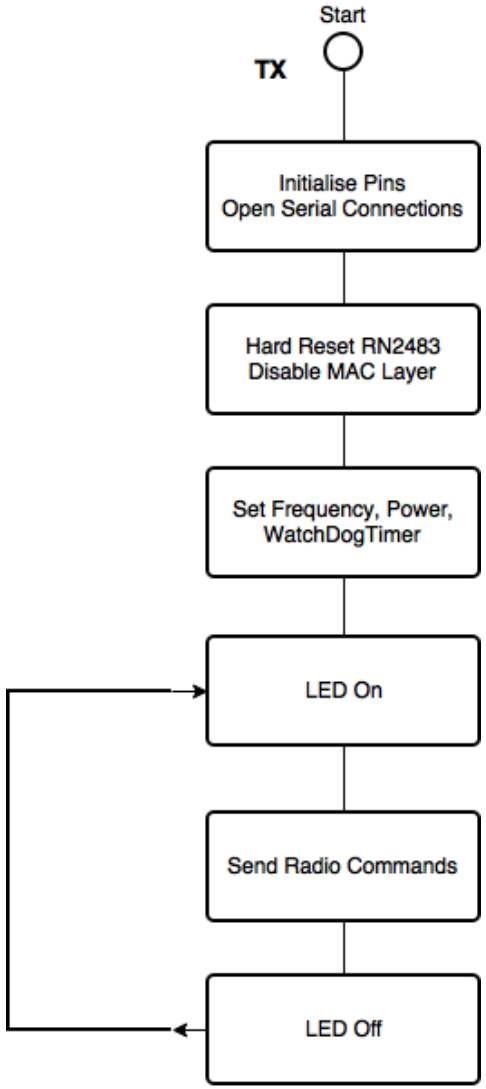
Point to Point System

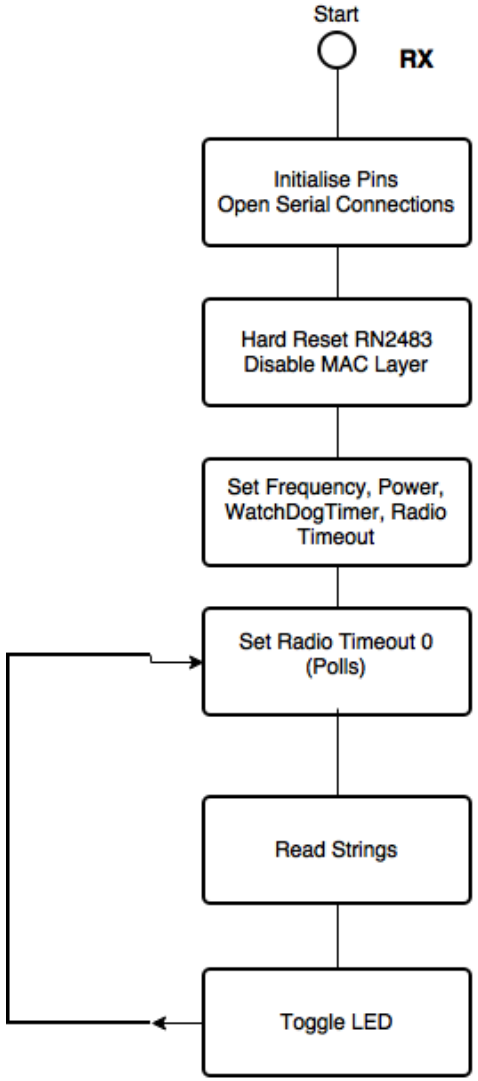
LoRa Range Potential
15-20Km Line of Sight



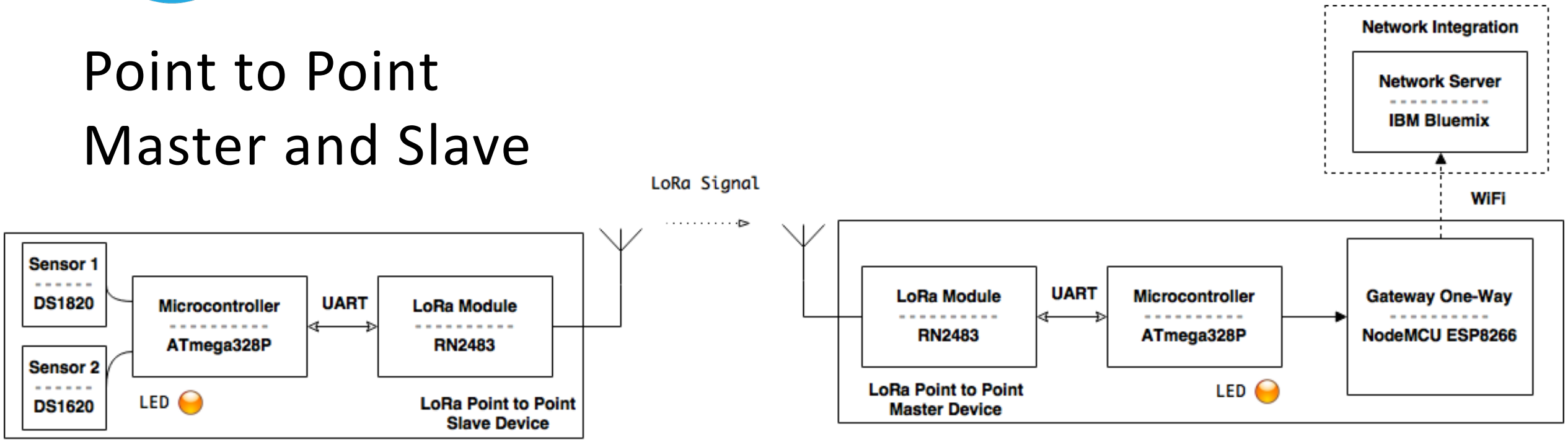


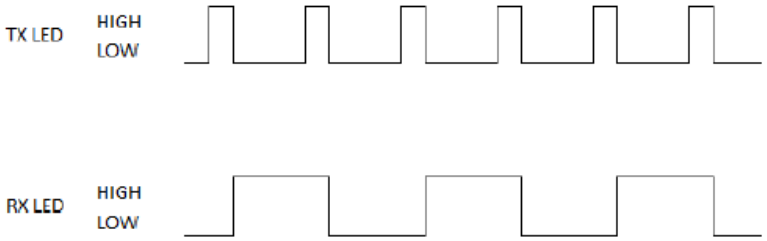
Point to Point System



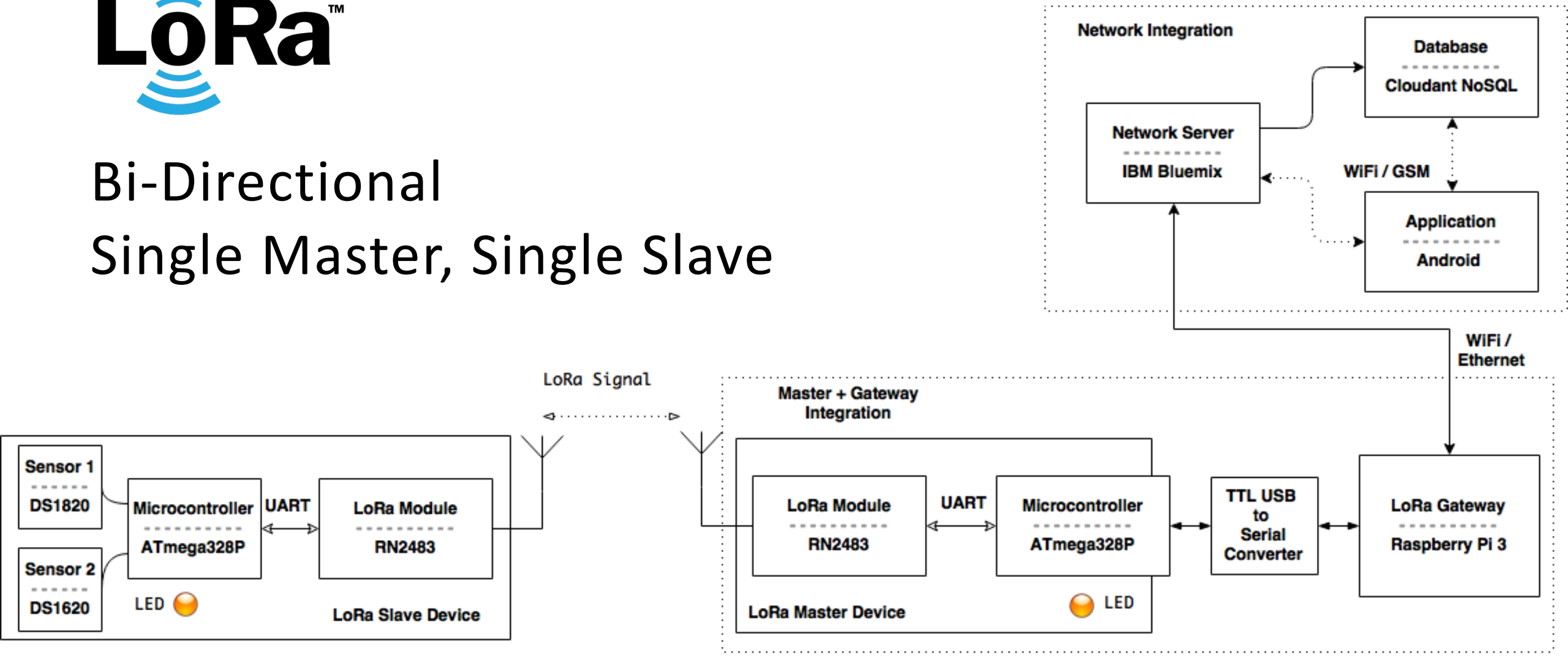


Point to Point
Master and Slave

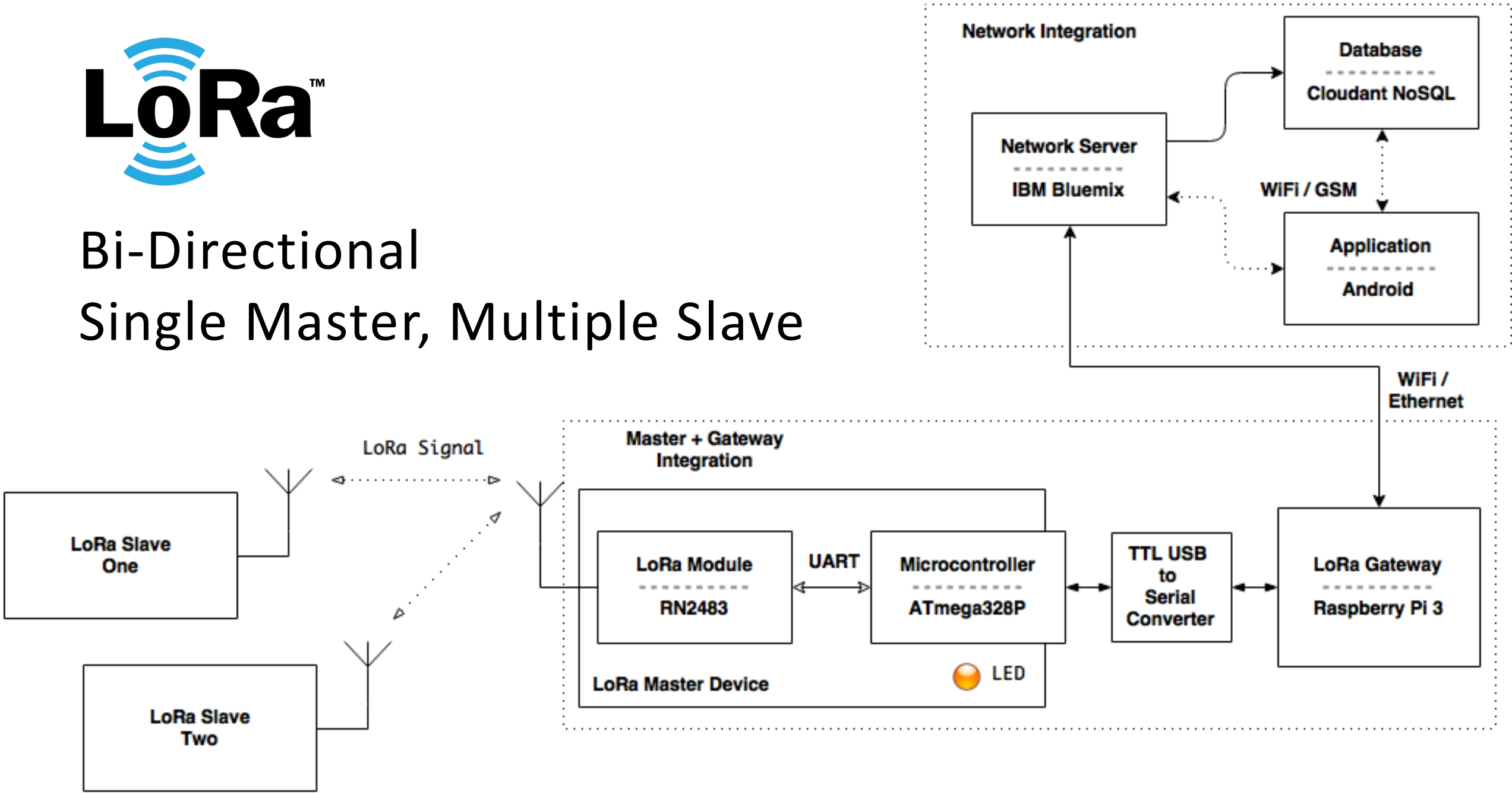




Bi-Directional
Single Master, Single Slave

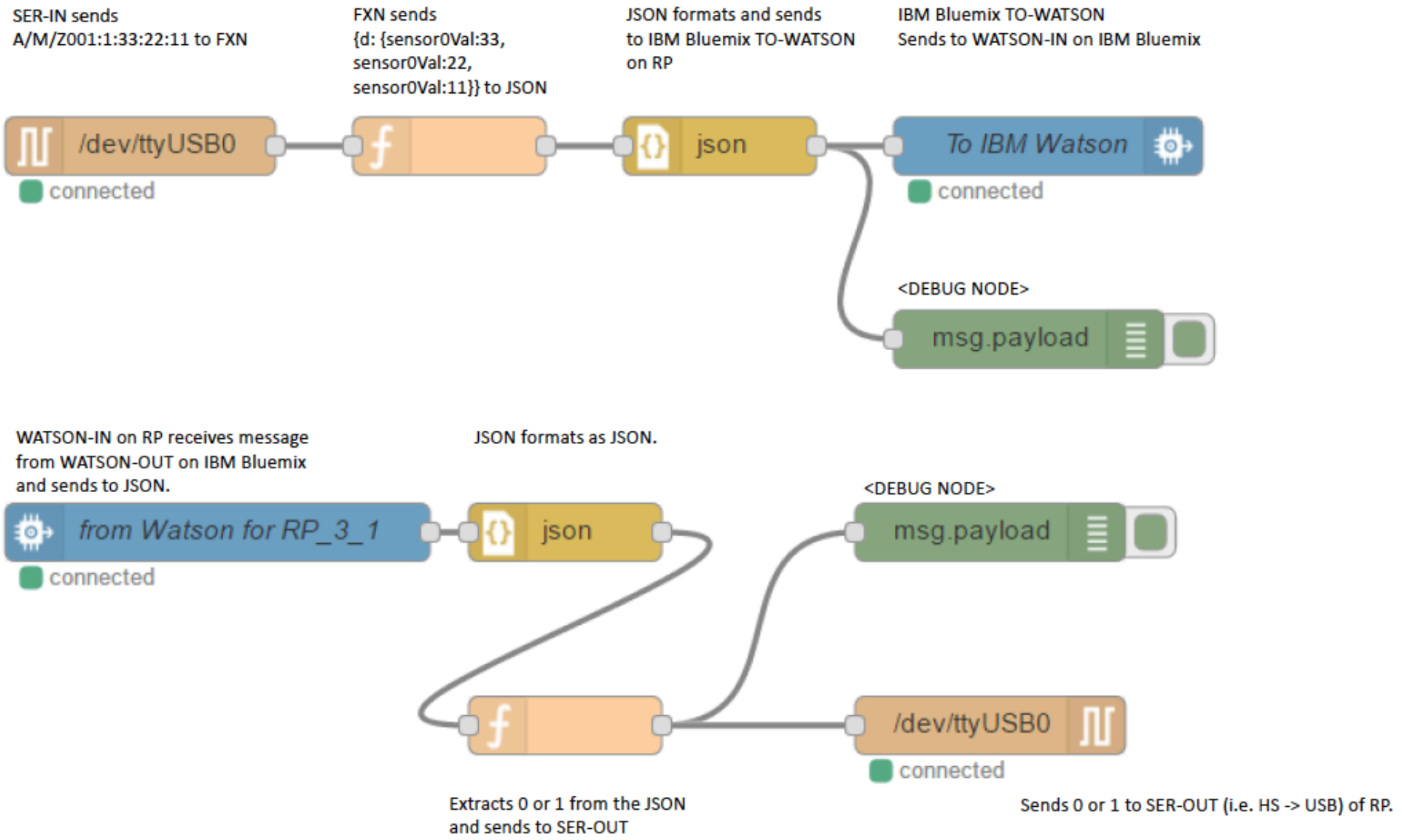


Bi-Directional
Single Master, Multiple Slave



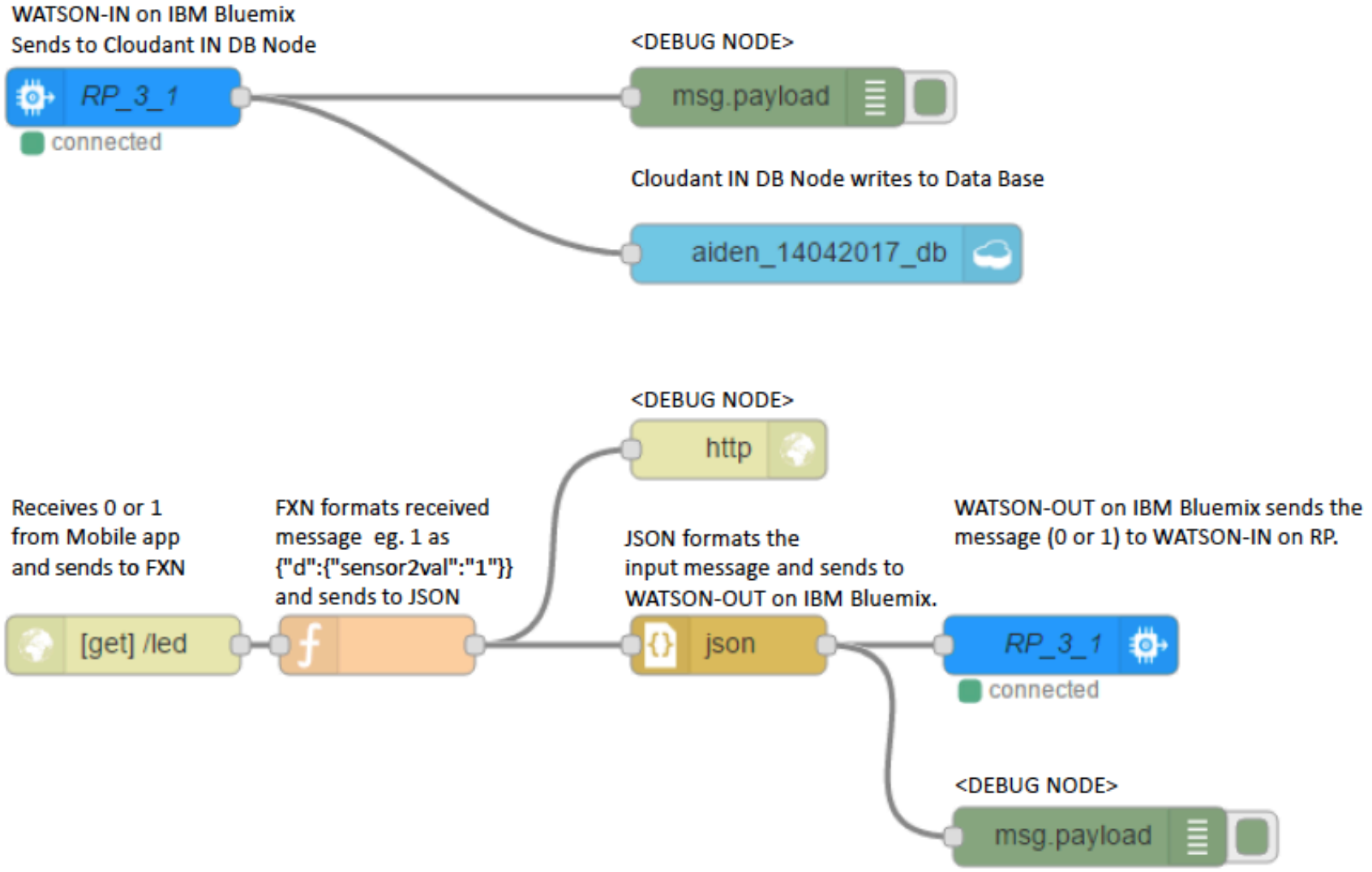
Gateway Setup

ON RASPBERRY PI 3



Network Server Setup

ON IBM BLUEMIX



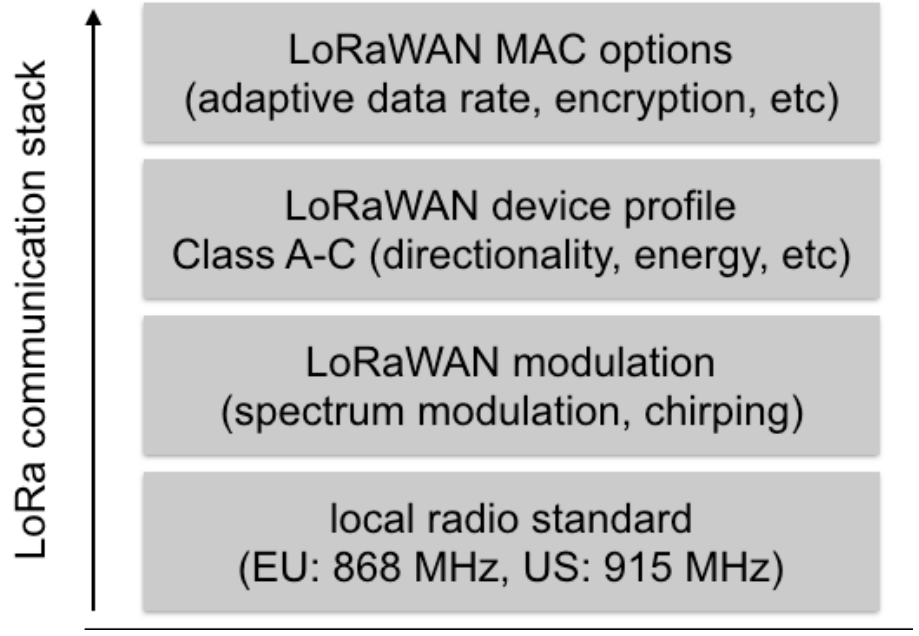
Project Discussion

- Ground up development hinders end goal delivery
- Power consumption reduction
- Prototype master and slave setup is backwards for testing reasons
- Scalability is becomes complex when dealing with several nodes
- App integrates geo-location share features

Thank You. Questions?

LoRaWAN

- LoRaWAN is the Network MAC Layer of the LoRa stack.
- Communication protocol and architecture that utilizes the LoRa physical layer to enable wide area network capability.
- Supports
  - secure bi-directional communication,
  - mobility
  - Localization
  - Security – AES 128bit



Range Improvements

- Increase the height of gateway and antenna
- Outdoor signal is better than indoor
- Keep short distance between gateway and antenna to reduce attenuation
- Use a good connector (N-type)
- Use omni-directional antenna
- Prevent multipath propagation by having obstacles close to antenna
- Avoid strong interference from GSM/WiFi, etc.