

The background of the slide is a grayscale aerial view of a city, likely New York City, with the Empire State Building prominently visible. Overlaid on this image is a network diagram. It features several location pins connected by dashed lines, representing a LoRa network. Three specific distances are labeled: "3km" between two pins in the lower left, "21km" between two pins in the upper left, and "8km" between two pins in the upper right. The title "LoRA Introduction" is centered in large, bold, red text.

LoRA Introduction

KiET & JU system

1. Introduction



- LoRa(**Long Range**)
- Long range and low power consumption solution
 - . 4 ~ 16Km, 6month Battery lifetime(AA Battery)
- Simple access procedures, large device acceptance, and low system deployment costs
- ADR (Adaptive Data Rate) application provides strong interference and optimal frequency utilization
- Open system construction through LoRa Alliance (150 members)



True Location

- ❑ In/out door
- ❑ Accurate
- ❑ Per message



Bidirectional

- ❑ Bidirectional
- ❑ Scalable Capacity
- ❑ Broadcast
- ❑ Network management



Global Mobility

- ❑ True Mobility
- ❑ Seamless
- ❑ Roaming



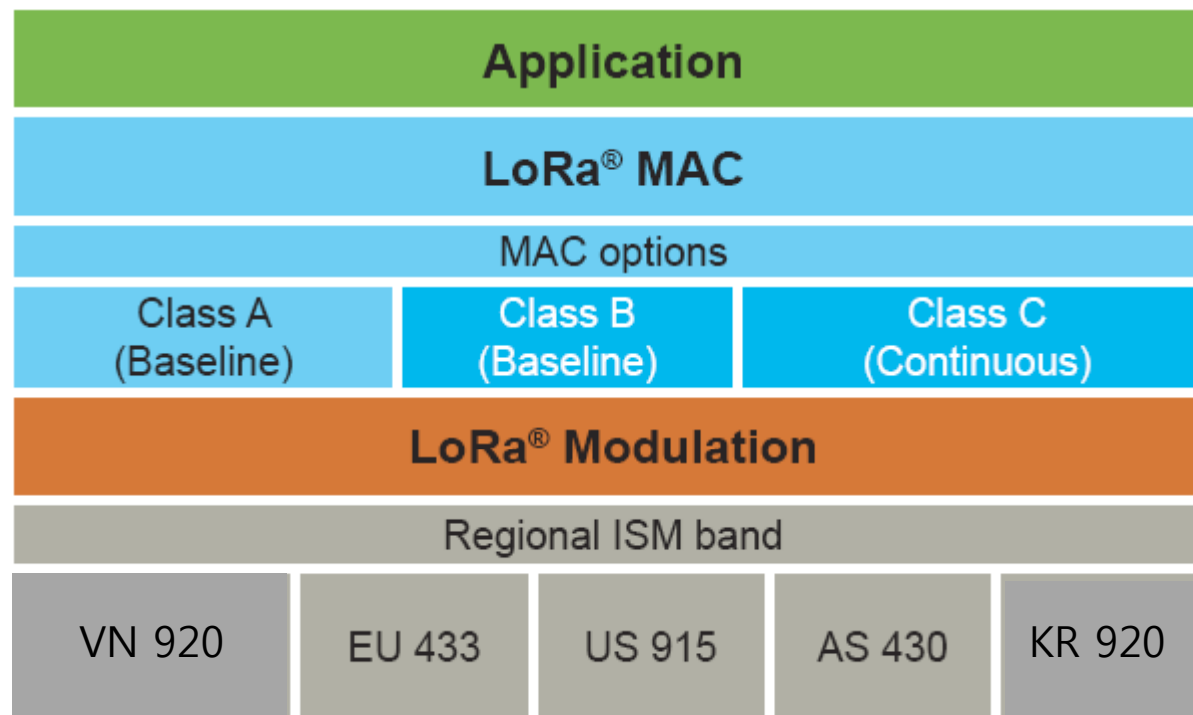
Security

- ❑ Device Unique
- ❑ Application
- ❑ Network

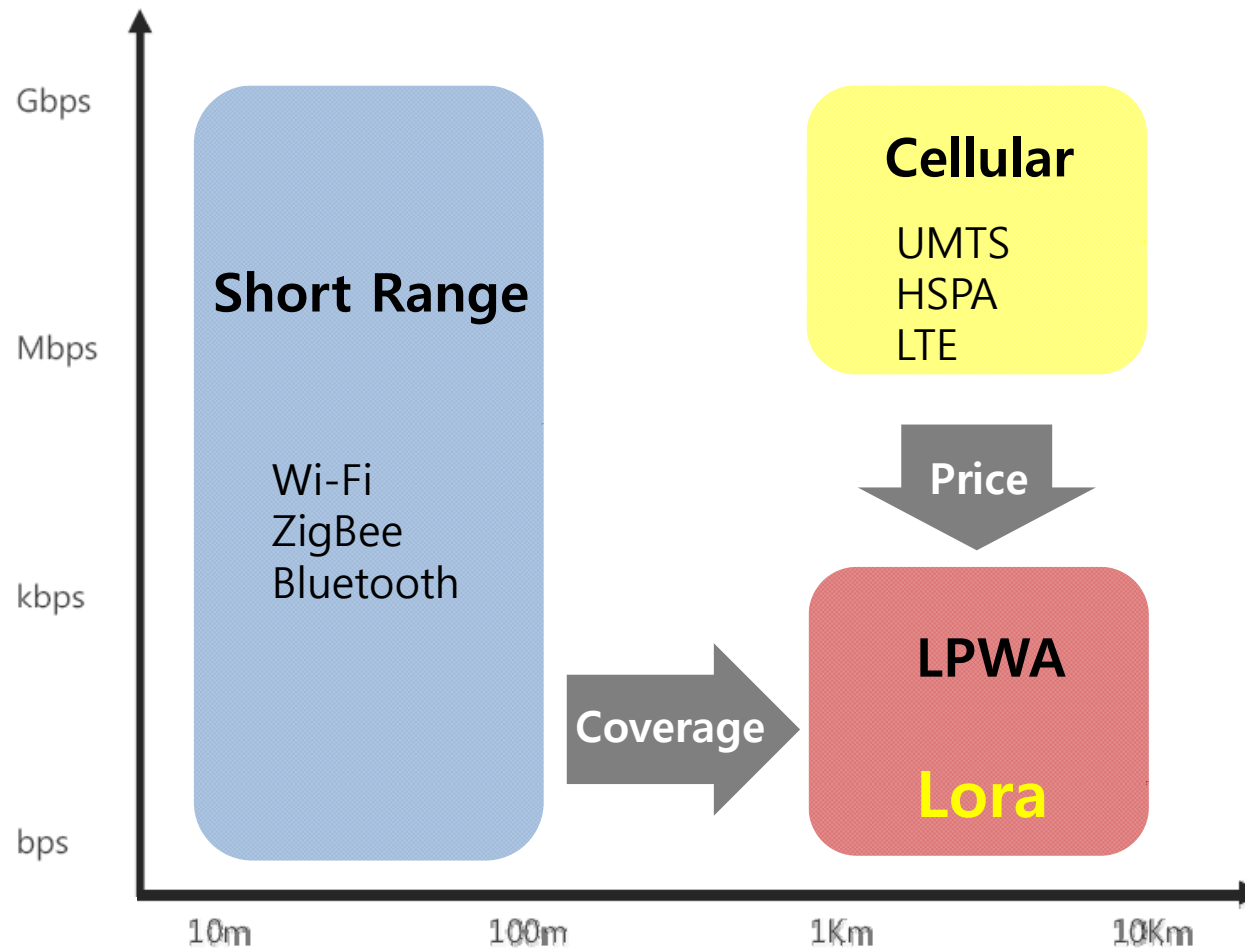
2. Technical Features



- ISM Band(470MHz ~ 928MHz, 2.4GHz)
- Communication types : Class A/B/C
- Security(Encryption : AES-128)
- ADR(Adaptive Data Rate : SF7~SF12) Applications
- Channel Hopping



3. LPWA(Low Power Wide Area) Comparision

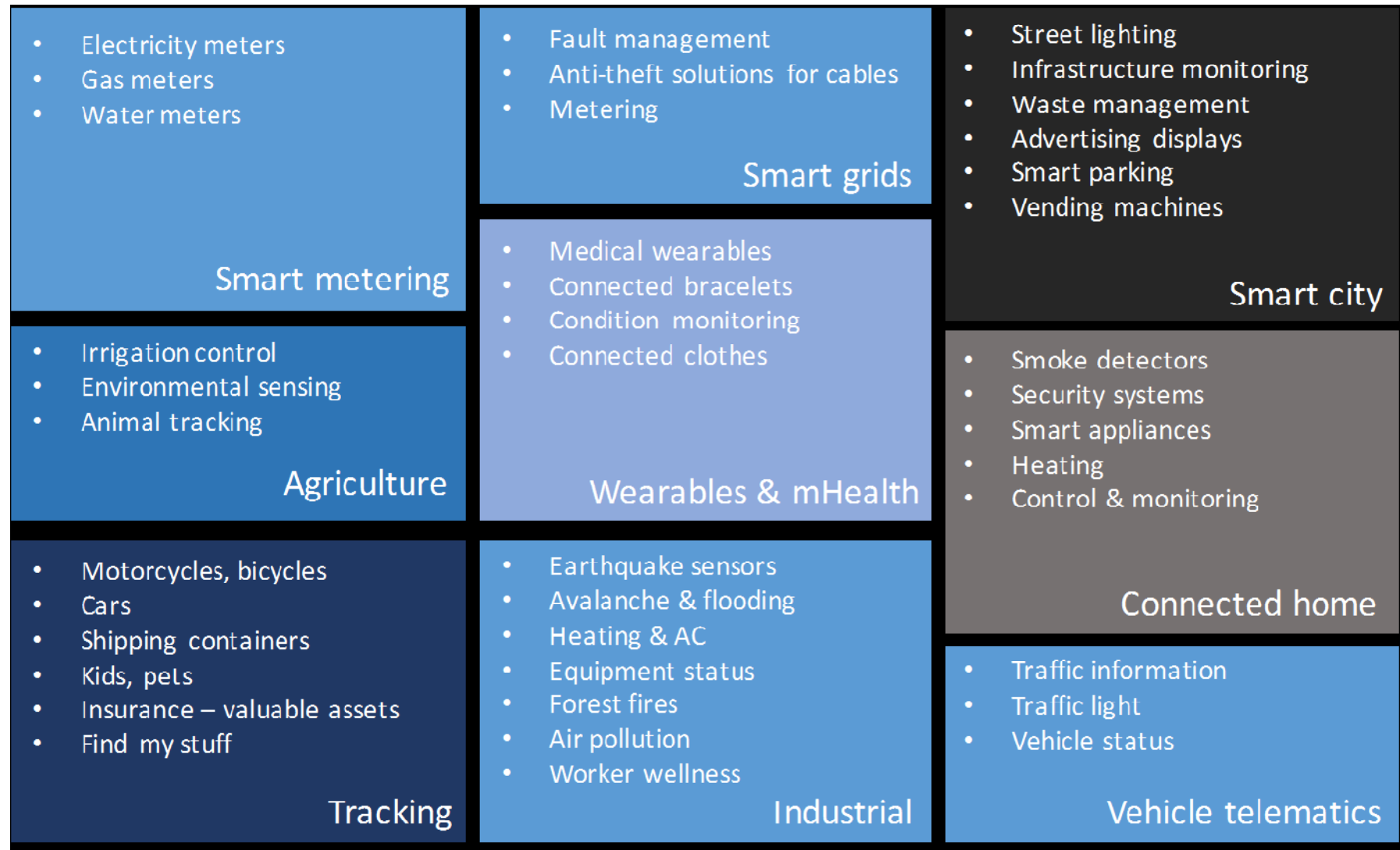


4. Low Power WAN Table



Feature	LoRaWAN	Narrow-Band	LTE Cat-1 2016 (Rel12)	LTE Cat-M 2018 (Rel13)	NB-LTE 2019(Rel13+)
Modulation	SS Chirp	UNB / GFSK/BPSK	OFDMA	OFDMA	OFDMA
Rx bandwidth	500 - 125 KHz	100 Hz	20 MHz	20 - 1.4 MHz	200 KHz
Data Rate	290bps - 50Kbps	100 bit/sec 12 / 8 bytes Max	10 Mbit/sec	200kbps – 1Mbps	~20K bit/sec
Max. # Msgs/day	Unlimited	UL: 140 msgs/day	Unlimited	Unlimited	Unlimited
Max Output Power	20 dBm	20 dBm	23 - 46 dBm	23/30 dBm	20 dBm
Link Budget	154 dB	151 dB	130 dB+	146 dB	150 dB
Battery lifetime - 2000mAh	105 months	90 months		18 months	
Power Efficiency	Very High	Very High	Low	Medium	Med high
Interference immunity	Very high	Low	Medium	Medium	Low
Coexistence	Yes	No	Yes	Yes	No
Security	Yes	No	Yes	Yes	Yes
Mobility / localization	Yes	Limited mobility, No loc	Mobility	Mobility	Limited Mobility No Loc

5. APPLICATIONS



5. APPLICATIONS



- **Smart Home**

Lighting control, theft / surveillance, air conditioning / boiler control, temperature measurement, remote meter reading ..



Key Benefits

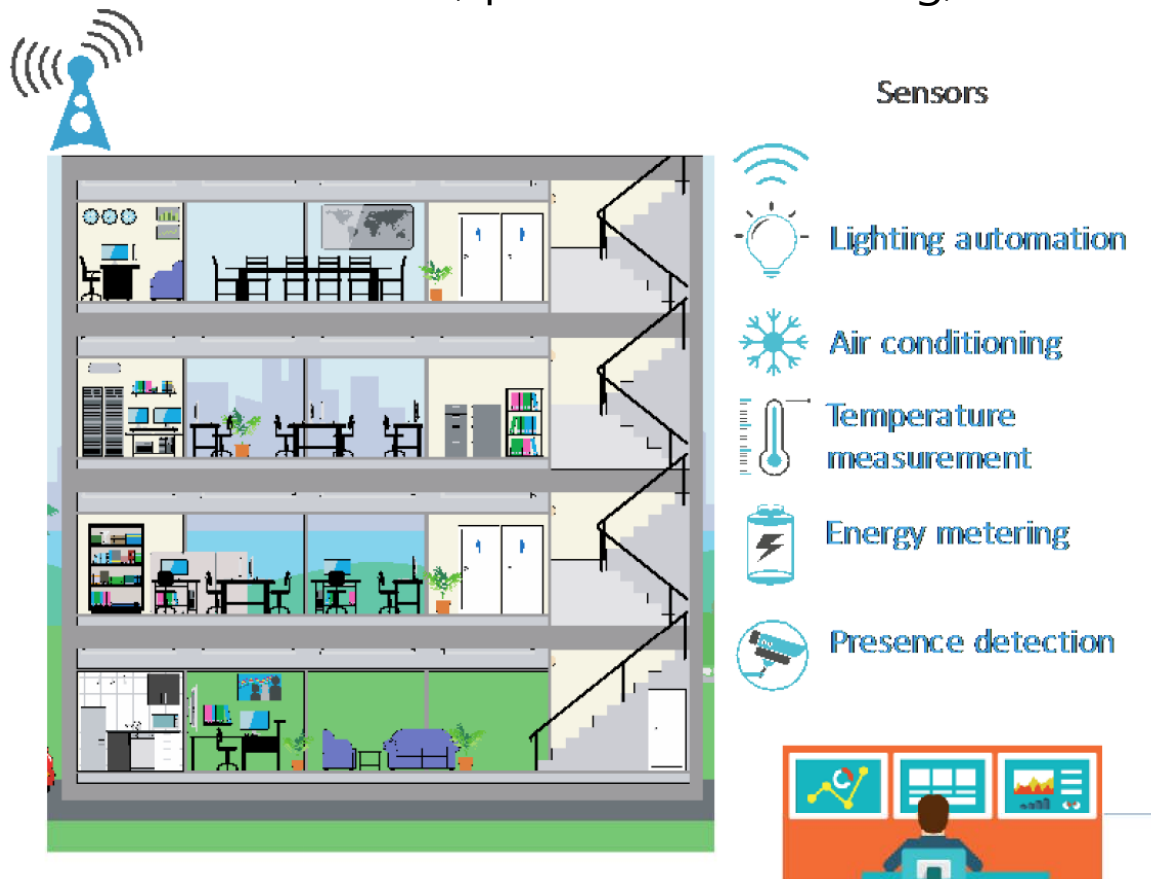
- ✓ Monitor in-home comfort
- ✓ Temperature, humidity, air quality, smoke alarm, door/windows opening detection
- ✓ Energy consumption monitoring
- ✓ Security & surveillance system management
- ✓ Smart lighting & heating operations
- ✓ No need for a local concentrator or gateways

5. APPLICATIONS



- **Facility Management**

System lighting control, system air conditioner control, temperature measurement, power meter reading, theft detection ..



Key Benefits

- ✓ Turn on necessary devices only if there is a human presence
- ✓ Reduce energy consumption
- ✓ Monitor in real time all the parameters and detect potential losses
- ✓ Reduce cleaning time by only cleaning locations where a presence has been previously detected

5. APPLICATIONS



- **Hospital Operation / Management**

Pressure monitoring, Gas monitoring, Cylinder position detection, Freezer temperature control ..



Pressure monitoring

Gas level monitoring

Cylinder location

Refrigerated storage
temperature control



Key Benefits

- ✓ Be able to locate indoor & in real-time all the gas cylinders in the hospital
- ✓ Monitor pressure & level on all cylinders to avoid potential malfunctions & accidents
- ✓ Automate purchase orders & supply chain and provisioning when quantities run low
- ✓ Global overview of operations on hospitals network

5. APPLICATIONS



- **Factory / Industrial Site Management**

Pressure monitoring, gas monitoring, fuel measurement, tank / cylinder position detection



Key Benefits

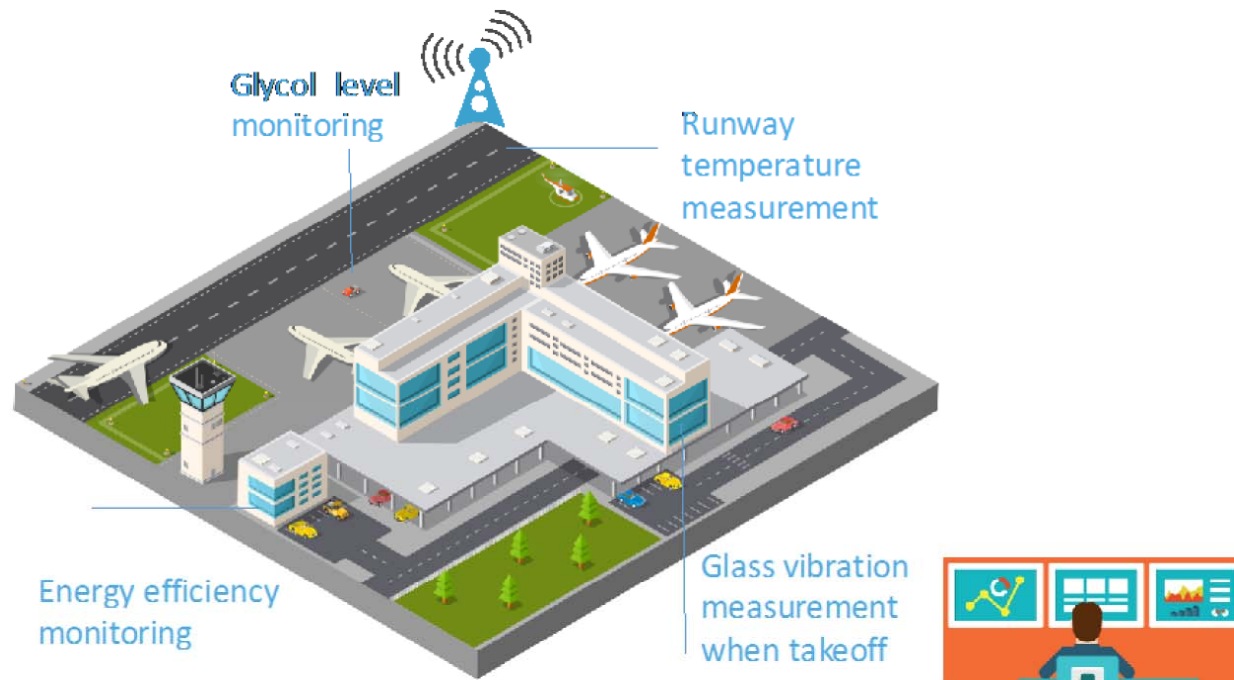
- ✓ Be able to locate onsite & in real-time all the industrial gas cyclinders
- ✓ Monitor pressure & level on all cylinders
- ✓ Automate purchase orders & supply chain and approvisioning when quantities decrease
- ✓ Increase security by avoiding accidents

5. APPLICATIONS



- **Airport Operations / Management**

Glycol monitoring, sliding temperature measurement, windshield vibration measurement at take-off ..



Key Benefits

- ✓ Able to measure all parameters and evaluate impact on airplane security and user comfort
- ✓ Optimise energy consumption
- ✓ Increase security by avoiding glycol outage
- ✓ Centralised data visualisation & control

5. APPLICATIONS



- **Smart Parking**

Vehicle Parking Detection, Parking Garage Notification, Parking Lot Number Check ...



Key Benefits

- ✓ Lora sensor detects if the parking place is full or vacant
- ✓ Reduced time to search for a place
- ✓ Monitor in real time all the free parking spaces
- ✓ Reduced pollution due to vehicles looking for a parking spot
- ✓ Fluid vehicle traffic

5. APPLICATIONS



- **Streetlight control**

Day / night street light on / off control and brightness control ..



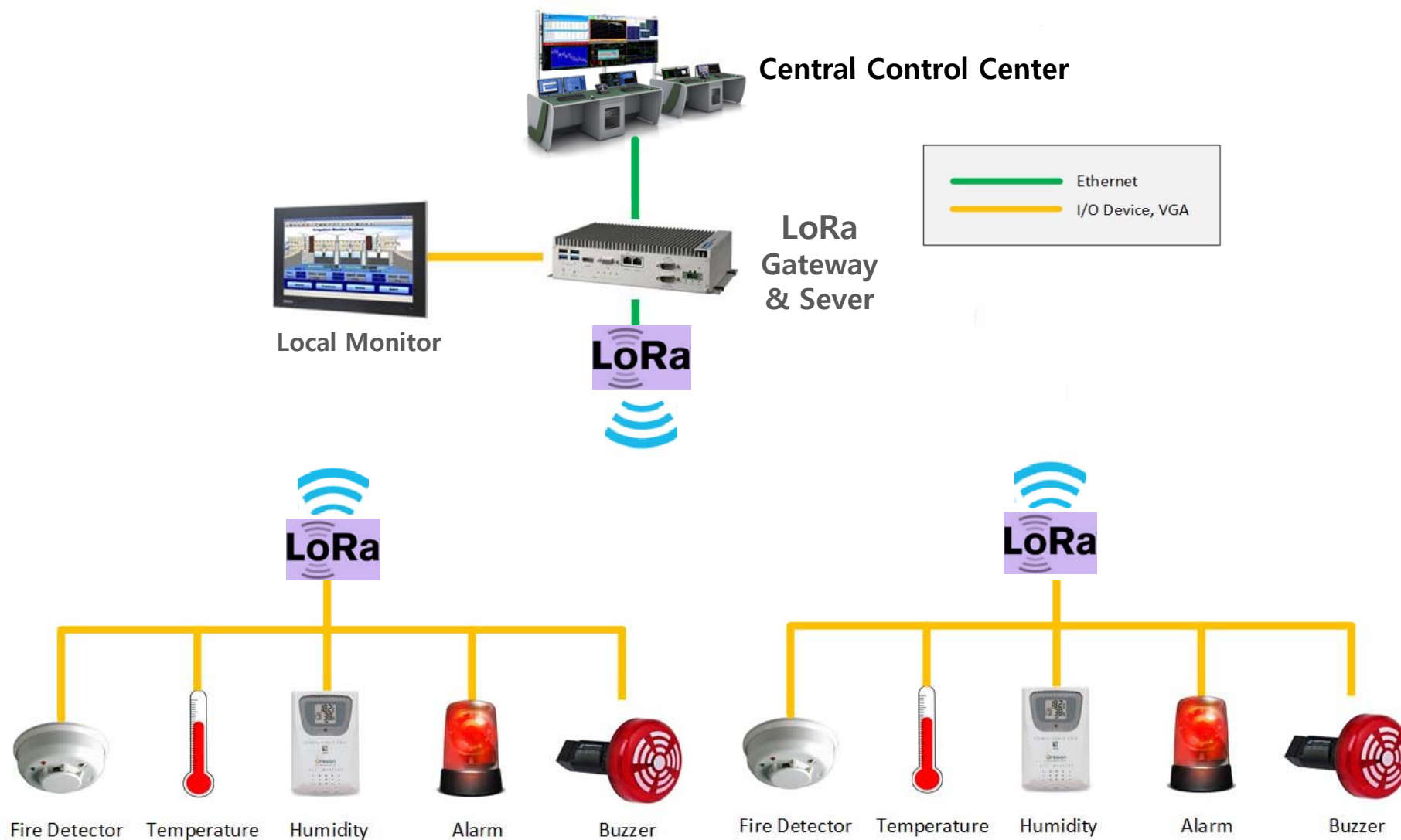
Key Benefits

- ✓ Lora sensor detects if someone passes by and adapts the light level accordingly
- ✓ Optimized power consumption
- ✓ Monitor in real time the status of all the street lights
- ✓ Easy installation

5. APPLICATIONS



- Smart Fire prevention



5. APPLICATIONS



- **Waste management**

Real time monitoring of trash bin status



Key challenge :

Optimise the waste management operations

Actility solution :

- LoRaWAN technology enabled waste containers that monitor the filling level of the container

Key benefits :

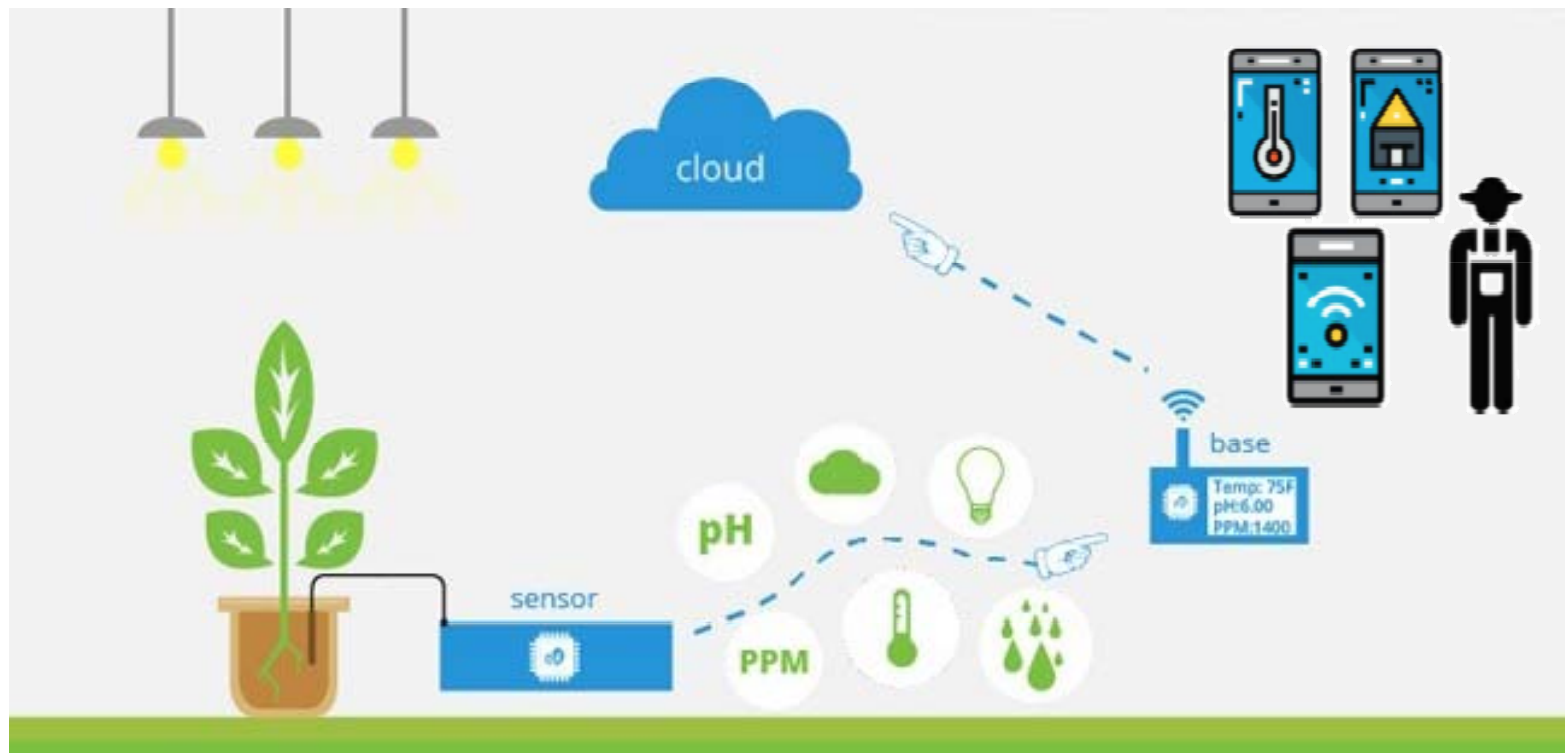
- ✓ Real-time location and monitoring of waste containers
- ✓ Containers are emptied only if they are detected as full
- ✓ Waste vehicle operations are adapted and directed in real-time towards 100% full waste containers

5. APPLICATIONS



- **Smart Farm**

Intelligent agriculture, remote monitoring and control



6. Developed LoRa PlatForm Solution



- **Scan Platform**

- 1: 255 Connection & Long Distance(about ~2km)
- Gateway to Client Polling(Scanning Algoism)
- Auto Scan(Power On)
- 1 Client : Sensor(6ch), Control(2ch)
- Address : 031-100-001 ~ 031-100-255(Region-GID-CID)
 - Smart Factory, Smart Home/Office, Smart Farm

- **Event Call Platform**

- 1:255 Connection & Long Distance(about ~2km)
- Client to Gateway call
- Address : 031-100-001 ~ 031-100-255(Region-GID-CID)
 - » Fire/Gas Alarm, Production defect check, Intrusion detection

- **485 Communication Replacement**

- 1:255
- BUS Communication
- Address : Same Address(Master <-> Slave)
- Speed : 19,200 Bps
- Data Byte : 100 Byte

6. LoRa PlatForm Solution to be Develop



- **Scan Platform 915/2.4GHz(STM base, WiFi On/Off)**

- 1: 255 Connection & Long Distance(about ~2km)
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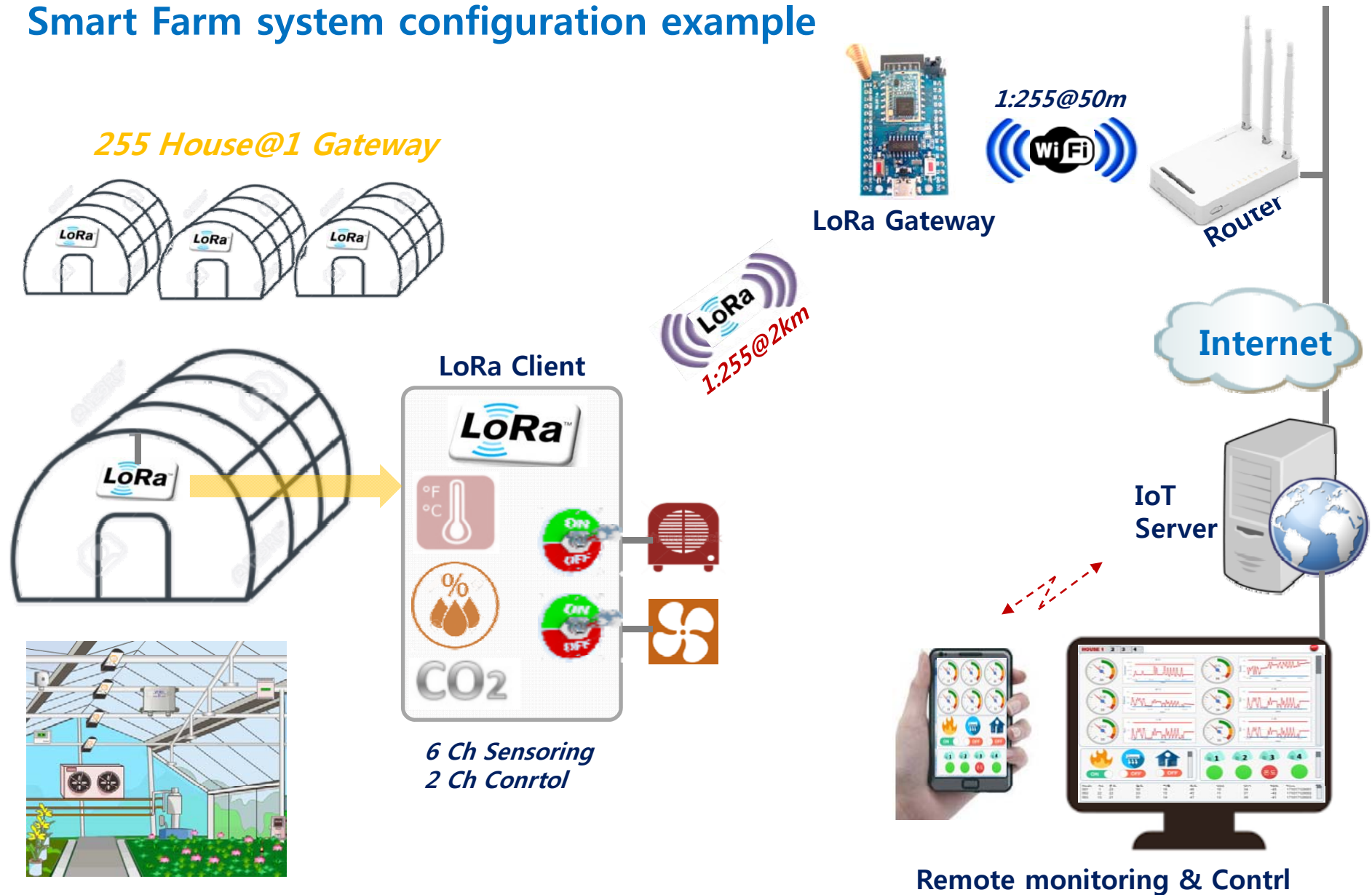
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6. LoRa PlatForm Solution



Smart Farm system configuration example



6. LoRa PlatForm Solution



Server Login(<http://lora.kiet.co.kr/>)

LoRa IOT

ID (E-m ail)

Password

Security Num ber : c6t0o4p

숫자만 입력하세요.

로그인

Powered by NexSys.

6. LoRa PlatForm Solution



PC Monitoring

한백화해

- My Device
- My Client
- My Space
- My Sensor

LORA Client List

Search within results

#	PSN	gHID gUD CID	Client Space	Client Location	S1	S2	S3	S4	S5	S6	Ctrl 1	Ctrl 2	Ctrl 3	Reg. Date	Action
32	USECID, 0311 00001	031 100 001			x	x	x	지열	온도	습도	x	x	x	2018.01.07	
8	USECID, 0311 00004	031 100 004	B2동		x	x	x	지열	온도	습도	x	x	x	2017.10.29	
7	USECID, 0311 00003	031 100 003	B4동	삼목상	x	x	x	지열	온도	습도	x	x	x	2017.11.01	
5	USECID, 0311 00002	031 100 002	A5동		x	x	x	지열	온도	습도	x	x	x	2017.11.01	

Showing 1 to 4 of 4 entries

Previous
1
Next

031 100 004 031 100 003 **031 100 001** 031 100 002

LoRa IoT Sensing Data

USECID,031100001-한백화해--

측정 날짜	게이트 (HID)	게이트 (LID)	Client ID	지열 (s4)	온도 (s5)	습도 (s6)	RSSI
2018.01.08 15:27:33	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:27:27	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:27:20	31	100	1	13 °C	14 °C	52 %	-63
2018.01.08 15:27:13	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:26:43	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:26:35	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:26:28	31	100	1	13 °C	14 °C	52 %	-64
2018.01.08 15:26:20	31	100	1	13 °C	14 °C	52 %	-64

6. LoRa PlatForm Solution



Remote Control

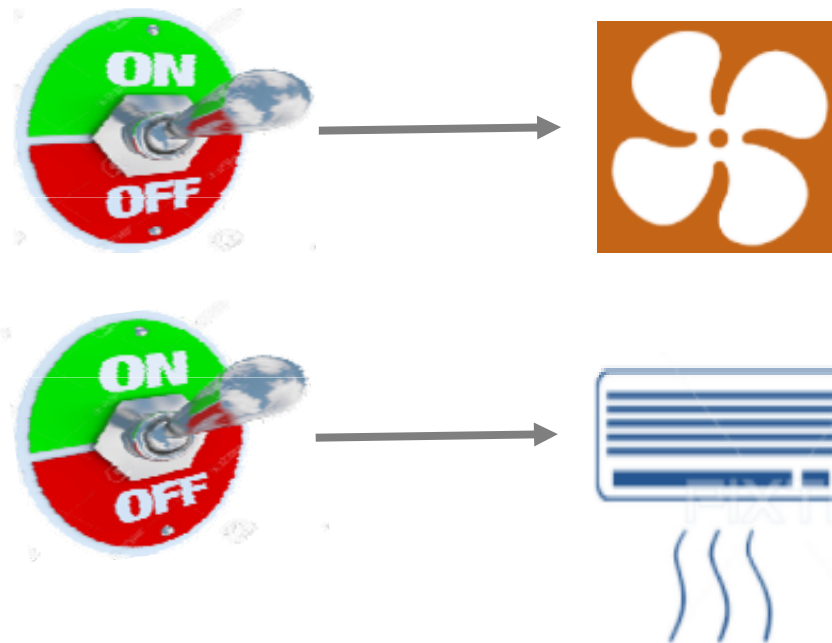
LoRa Clients Control

031 101 001

Ctrl 1 :	히터	Off → On
Ctrl 2 :	Not Defined	-
Ctrl 3 :	Not Defined	-



Waiting for
control response.



6. LoRa PlatForm Solution



PC Monitoring GUI



6. LoRa PlatForm Solution



Mobile Phone GUI

