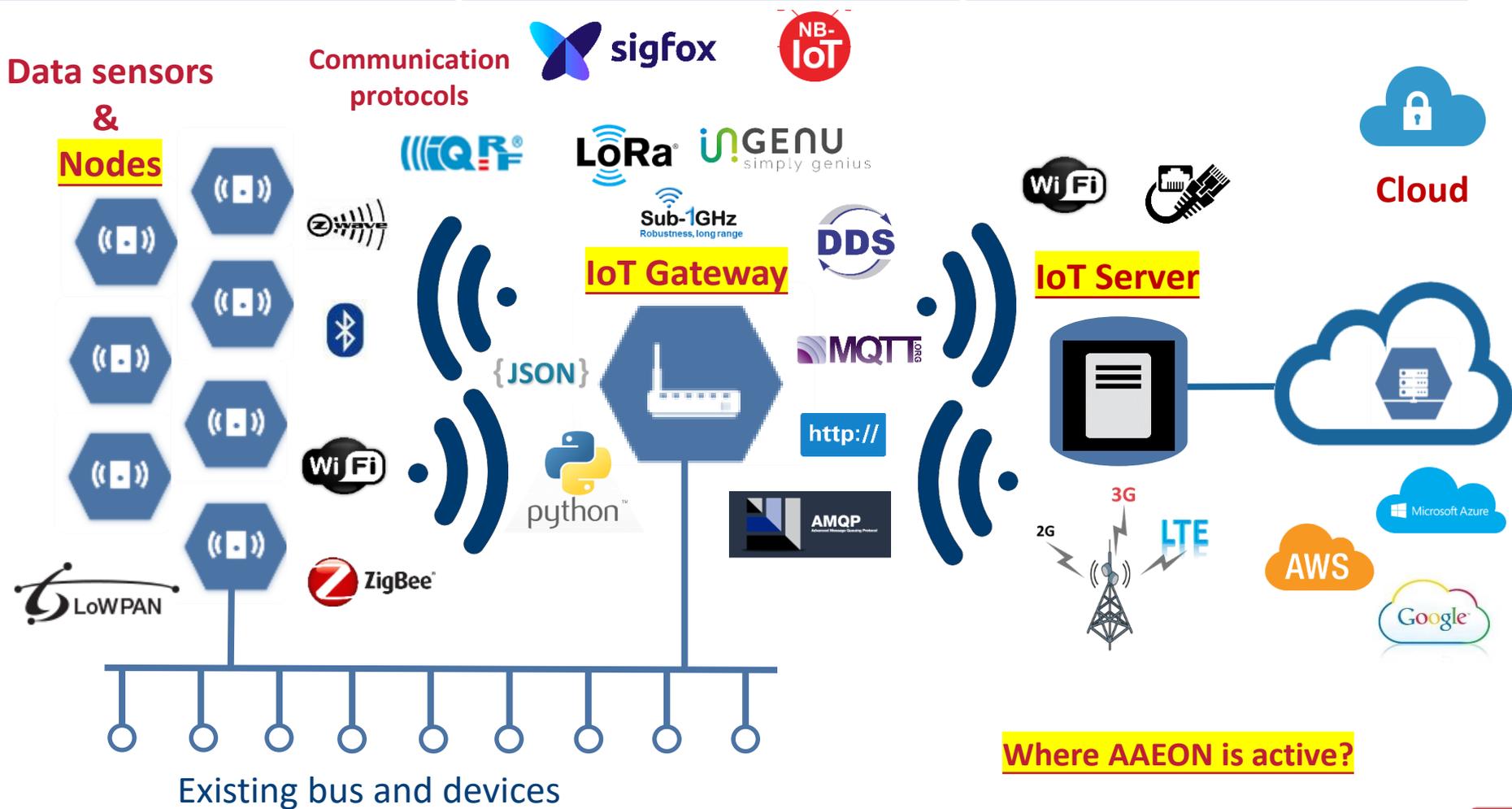# AAEON IoT solutions

Presenter : Marco Barbato
Position   : EU Technical Director
Date   : 2017.05.24
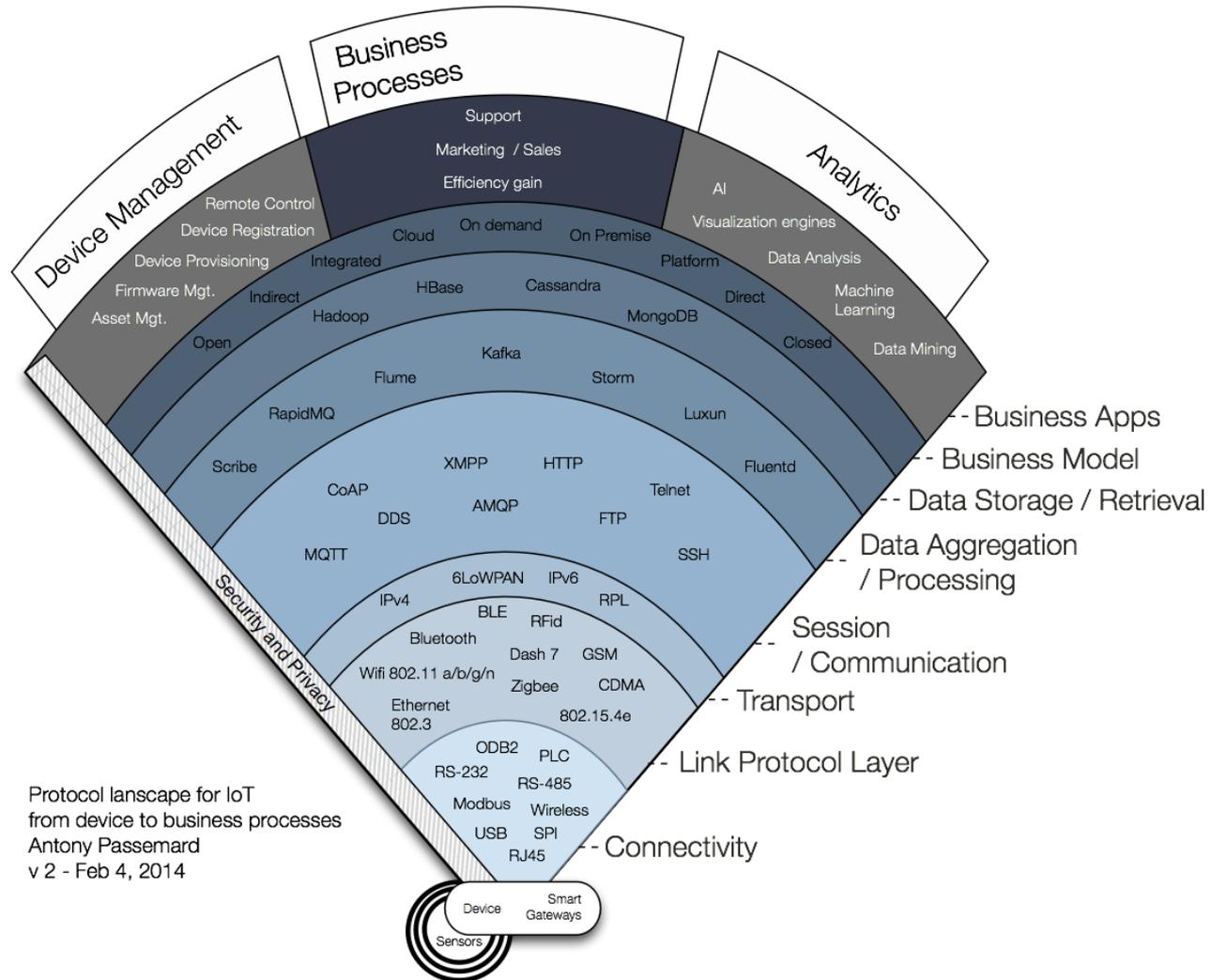
IoT application pattern

Event detection/Actuation › Collection/Elaboration › Data analysis

Data sensors
&
Nodes

Communication protocols

sigfox

NB-IoT

IQRF

LoRa

INGENU
simply genius

Zwave

Sub-1GHz
Robustness, long range

DDS

Wi Fi

IoT Gateway

{JSON}

python

MQTT.ORG

http://

AMQP
Advanced Message Queuing Protocol

ZigBee

6LoWPAN

Wi Fi

IoT Server

2G 3G LTE

Cloud

Microsoft Azure

AWS

Google

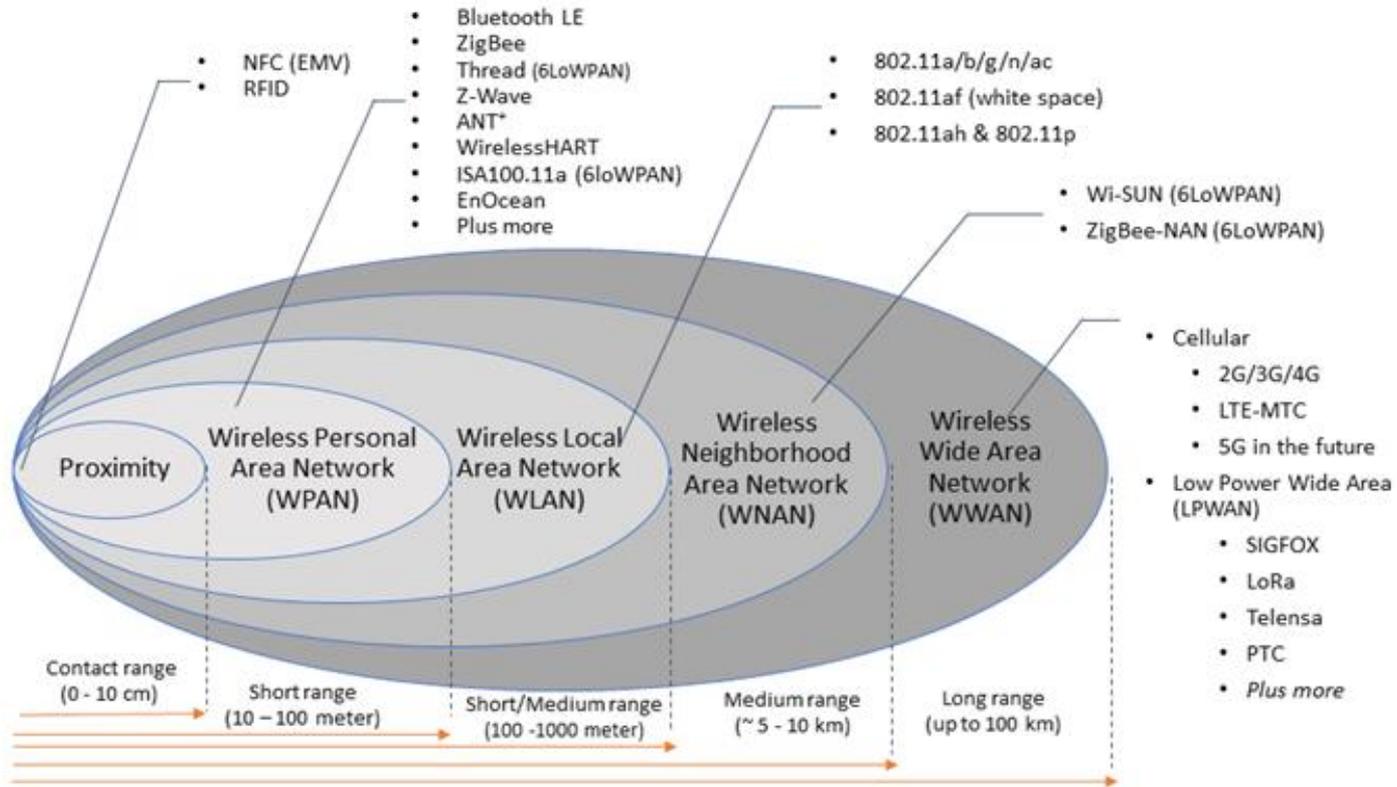**Where AAEON is active?**

Existing bus and devices

IoT protocol variety

Protocol lanscape for IoT
from device to business processes
Antony Passemard
v 2 - Feb 4, 2014
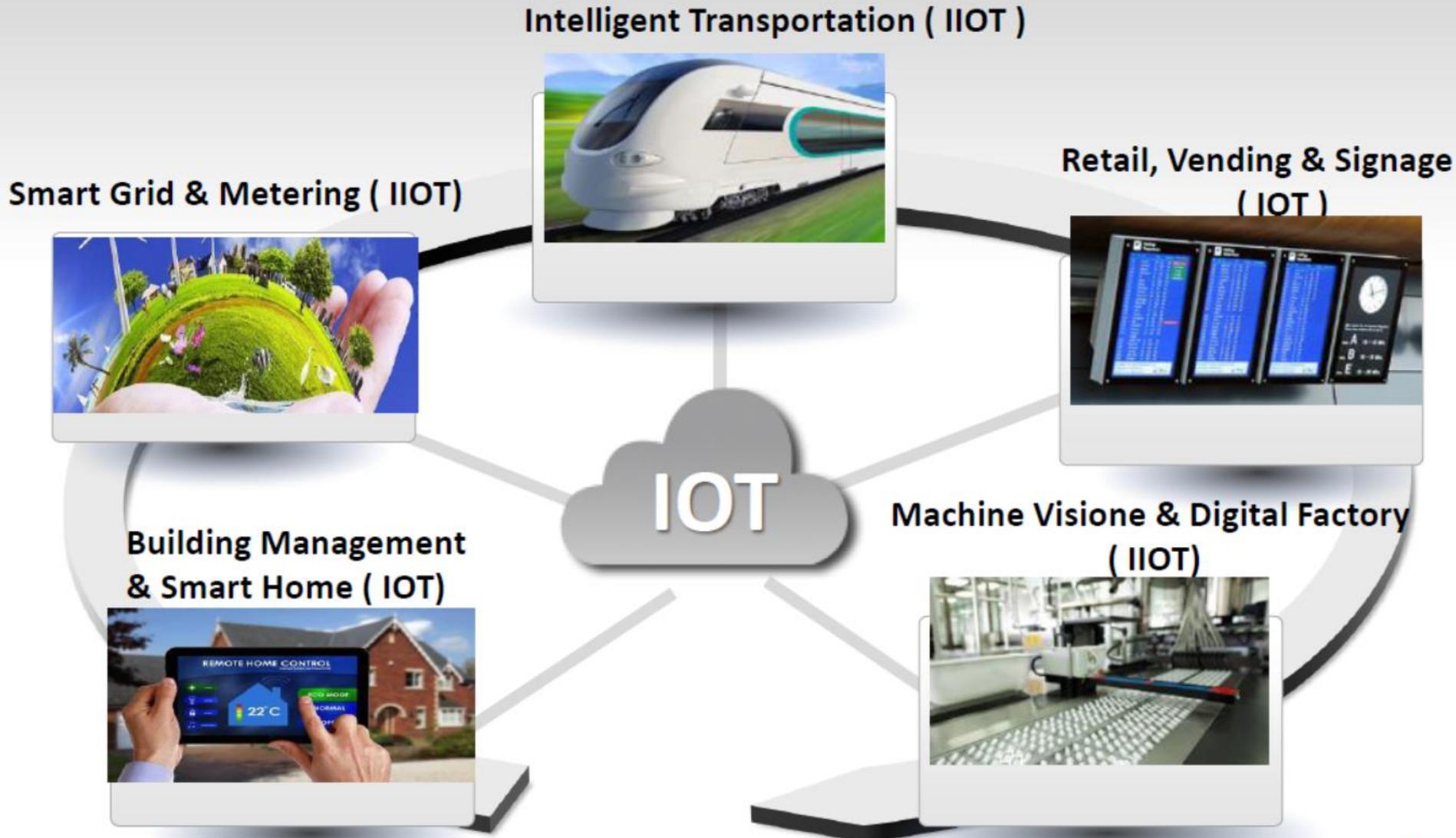
IoT communication networks variety

IoT LPWAN networks variety

From «Market Data for LPWA and IOT Networks» by independent analysis completed by ABI Research, Inc.

	Sigfox	LoRa	EC-GSM-IoT	NB-IoT	LTE Cat-M1	RPMA
Bandwidth	100Hz	125kHz	600kHz	180kHz	1.08MHz	1MHz
Coverage	149dB	157dB	164dB	164dB	160dB	177dB
Capacity	50,000/cell	40,000/cell	190,000/cell	200,000/cell	1M/cell	500,000/cell
Battery Life	10 years +	10 years +	10 years +	10 years +	10 years +	10 years +
Throughput	100bps	290bps - 50kbps	473kbps	250kbps	1Mbps	624kbps
2-Way Data	No	Class dependent	Yes	Yes	Yes	Yes
Security	16bit	32bit	3GPP (128-256bit)	3GPP (128-256bit)	3GPP (128-256bit)	AES 128bit
Scalability	Low	Medium	High	High	High	High
Mobility Support	No	Yes	Idle Mode	Idle Mode	Connected+Idle Mode	Yes
Location Support	No	Yes	Needs GPS	Needs GPS	Needs GPS	Needs GPS
Range	**30-50km rural** **10km urban**	**15km rural** **5km urban**		**15km rural**	**5km**	**>500km LoS** **(2.4GHz bandwodth)**

AAEON Europe - Focus in IoT and IIOT

Intelligent Transportation (IIOT)

Smart Grid & Metering (IIOT)

Retail, Vending & Signage (IOT)

IOT

Building Management & Smart Home (IOT)

Machine Visione & Digital Factory (IIOT)

Strategy elements

Connectivity solution
Short Range, Long Range; Low speed/data rate, High speed/data rate

Application Environment
Indoor, Outdoor

System Integration
HW, SW, Data

Development stage
Prototyping, Market-in, Serial production

Vertical market

Strategy

- Gateway and Embedded Server solutions + board level offering for SI.
- Scalability of approaches and performances (prototyping, entry level to high end)
- Focus on vertical applications&markets and specific technologies (LoRa, IQRF…)
- Fog Computing concept
- Move towards focused ecosystem with specialist partners for more dedicated solutions (HW, SW, API, Network)

Products development directions

- Scalable : Prototyping, Entry level and High end (from board up to Edge computing and IoT Server)
- Indoor/outdoor: matching with vertical market/Application
- Networks support: LoRA, IQRF, beyond the classic ones (4G, WiFi…)
- Vertical markets/applications:
  - Building and Home automation
  - Factory automation
  - Smart cities (Intelligent parking, environment, lighting…)
  - Smart agriculture
  - Transportation
  - Retail
  - Smart metering (M-Bus,….)

- Key words: retrofit, predictive maintenance, scalability, partnership

AAEON IoT Gateways offering

Catalogue solutions

UP-GW03
IP68 Outdoor IoT Gateway

COMING SOON

Extended Temperature

MP September

LoRa Wi Fi Lte IQRF

UP-GWS02
IIoT LoRA Gateway & Network Server

MP June

5V DC In HDMI USB 3.0 OTG Ethernet USB 2.0 SMA for Antenna

Wi Fi LoRa

UP-GWS01
Entry level IoT Gateway

MP Now

Wi Fi IQRF Bluetooth

Solutions concepts (available by project)

AIOT-CHT01
High performance Industrial Gateway

AIOT-BT01
Home thin client

Wi Fi ZigBee

AIOT-DRM
Building automation gateway

xxxxxx
Industrial Automation 3G Gateway

3GPP

5V DC In HDMI USB 3.0 OTG Ethernet USB 2.0 SMA for Antenna

UP-GWS01
Entry level IoT Gateway

CPU	Intel® Atom™ x5-Z8350 Quad Core Processor
System Memory	DDR3L, Memory Down, Non-ECC, 2GB, 1600Mhz
Storage	1 x eMMC 32GB Onboard
Multimedia IO	1 x HDMI
USB Ports	1 x USB 3.0 OTG
	4x USB 2.0
Network Interface	1 x 1GbE LAN
Expansions	WiFi IEEE 802.11 a/b/g/n or b/g/n (Optional)
	Bluetooth 4.0 (Optional)
Temperature range	0-40°C
Power input	5VDC
OS Support	Windows 10,
	Ubilinux / Ubuntu Linux / Yocto Linux
	Android 6.
Certifications	CE/FCC Class A
Mounting	Desktop mount
	VESA mount

5V DC In
HDMI
USB 3.0 OTG
Ethernet
USB 2.0
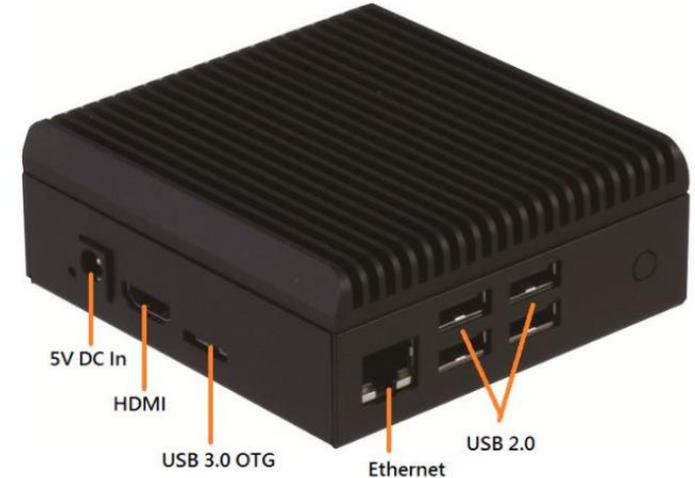
UP-GWS02
Industrial IoT LoRa Gateway & Network server

CPU	Intel® Atom™ x5-Z8350 Quad Core Processor
System Memory	DDR3L, Memory Down, Non-ECC, 2GB, 1600Mhz
Storage	1 x eMMC 32GB Onboard
Multimedia IO	1 x HDMI
USB Ports	1 x USB 3.0 OTG 4x USB 2.0
Network Interface	1 x 1GbE LAN
Expansions	WiFi IEEE 802.11 a/b/g/n or b/g/n (Optional)
Temperature range	0-40°C
LoRA	SX1301 base band processor Frequency band 868MH 8 channels
Power input	5VDC
OS Support	Windows 10, Ubilinux / Ubuntu Linux / Yocto Linux Android 6.
Certifications	CE/FCC Class A
Mounting	Desktop mount VESA mount DIN Rail

LoRa™

WiFi™

UP-GWS03
Outdoor IP68 Gateway

CPU	Intel® N3350/N4200 SoC
Memory	Onboard 2GB / 4GB / 8 GB LPDDR4 memory
Graphics	Intel® Gen 9 HD, supporting 4K Codec Decode and Encode for HEVC4, H.264, VP8
Storage	Onboard 32 GB / 64 GB / 128 GB eMMC
Ethernet	1 x Realtek RTL8111G Gigabit Ethernet, RJ-45
Audio	1 x HDMI Audio
External I/O Connector	1x RJ45 Connector
	1 x HDMI Connector
	1 x USB 3.0 Connector
	1X M12 Connector(8PIN RS232)
	1x M12 Connector(3PIN DCIN)
	4x Antenna
	1x GND Screw
3G/mSATA	1 x Mini Card slot (full size) for 3G /mSATA
WIFI/BT	1 x M.2 slot for WIFI/BT module
LORA function	Frequency band 868MHz
Power	5V DC Only
Form Factor	220 mm x 140 mm x 165 mm
Operating Temperature	0-60°C / -20~+70
Operating Humidity	0% ~ 90% relative humidity, non-condensing
Certification	CE Class A, FCC
OS Support	Microsoft Windows 10 (full), Windows IOT Core, Linux (ubilinux, Ubuntu, Yocto)
IP	IP68

LoRa™ WiFi™ lte™

IQRF®

AIOT-BT01
Home thin client

CPU	Intel® ATOM E3815
System Memory	1 x SODIMM support up to 4GB Memory
Network Interface	1 x Intel GbE LAN
Storage	eMMC 16G & MicroSD
Zigbee	TI cc2538SF53 (512K Flash)
BIOS	64Mbit Flash ROM, AMI BIOS
Storage	2 x Full-size Mini PCIe Slot Slot1 – USB2.0 and PCIe Slot2 – USB 2.0 and mSATA
USB	1 x USB 3.0 port 1 x USB 2.0 Port
Power Input	12Vdc or 7 ~ 30Vdc Power Input
Thermal Solution	Fanless (Optional Fan available) 0-50°C
Dimension	144(L) x 140(W) x 39(H) mm
Mounting	Wall Mount / DIN Rail Mount
Operating System	Microsoft Windows / Linux Yocto

Focus • Agility • Competitiveness

AIOT-CHT01
High Performance IoT Gateway

CPU	Intel® Atom™ x5-Z8350 Quad Core Processor
System Memory	DDR3L, Memory Down, Non-ECC, 2GB, 1600Mhz
Storage	1 x eMMC 32GB Onboard
	1 x MicroSD Card Slot
Multimedia IO	1 x HDMI
	Realtek ALC5642 (2x3.5mm Audio Jack for Line Out and Mic)
USB Ports	1 x USB 3.0 OTG
	1x UART to USB Debug port
	2x USB 2.0 Connectors from AX88760 LAN + USB Hub
Network Interface	2 x 1GbE LAN
IO	1 x [2x5] pins HSUART RS232 connector
	1 x [2x5] pins HSUART RS485 connector
	1 x SPI header (2x4 pin header w/ 2.54mm pitch)
	1 x Intel XDP connector
TPM	1 x Infineon SLB9635TT1.2 TPM chip
Expansions	1 x M.2 connector for 3G module
	1 x PCI-E connector for WiFi Module
Temperature Range	0-60°C

AIOT-DRM
Building automation gateway

CPU	Intel® Quark SoC x1021 (discontinued by Q4 2017)
System Memory	Onboard 512MB DDR3 800MHz ECC, un-buffered memory
Storage	eMMC 4GB
Network Interface	10/100, RJ-45 x 1
IO	1 x RS232 connector
	1x Isolated RS-485 on terminal block
	1x Analog input
	6x DI; 6x DO; 4x ADC; 1x DAC
Expansions	1 x Mini Card PCI-E connector for WiFi Module/3G/Bluetooth + Antenna holes
Temperature Range	0-40°C
Power input	DC24V
Mouting	DIN RAIL
OS Support	Wind River Linux

Modular design
Upgradable by project

Focus • Agility • Competitiveness

Industrial Automation 3G Gateway

CPU	Intel® Atom™ x5-Z8350 Quad Core Processor
System Memory	DDR3L, Memory Down, Non-ECC, 2GB, 1600Mhz
Storage	1 x eMMC 32GB Onboard
Multimedia IO	1 x HDMI
USB Ports	1 x USB 3.0 OTG
	4x USB 2.0
Network Interface	1 x 1GbE LAN
Expansions	WiFi IEEE 802.11 a/b/g/n or b/g/n Bluetooth 4.0 3G modem
Temperature range	0-40°C
IOs	1x Serial port RS-232/485 configurable by jumper
Power input	5VDC
OS Support	Windows 10, Ubilinux / Ubuntu Linux / Yocto Linux Android 6.
Certifications	CE/FCC Class A
Mounting	Desktop mount VESA mount DIN Rail

RS-232/485

Focus • Agility • Competitiveness

Other product updates

- **Intel Quark based gateways phase-out announcement (released on May 5th)**
  - Quark CPUs X100x phase out by Intel
  - Lack of strong SW support
  - AAEON solutions discontinued by 31/12/2017
  - Ongoing projects will be supported
  - Will be offered assistance to migrate early stage opportunities on Quark GWs

Partnerships

Partneriships

- Network communication
  - Joined LoRA Alliance (August 2016)
  - Joined IQRF Alliance (Sept 2016)
  - Joined EnOcean Alliance (June 2016)
- Network carrier solutions (YTC)
  - MVNOs for classic cellular and sub-GHz
  - The Things Network/Industries
  - Stream Technologies
- RF partners
  - IMST Gmbh and others
- IoT GW/Edge/Cloud Software integrators
  - SW houses (EMUTEX, BSQUARE….)
  - Vertical applications (Predictive maintenace, vending, energy management…)
  - IoT agents and visualization solutions (Mydevices Cayenne)

IQRF

- **What's is it:** IQRF is a platform (HW Transc+ SW+Cloud) for low power, low speed and low data volume wireless connectivity
- **Technology:** Radio 868MHz (916/433), license free
- **Features:** bit rate 20kb/s, ultra low power (SB <uA, 15uA RX), Mesh Network
- **Range:** tens and hundreds of meters
- **Number of devices:** Up to 65 000 devices in one network under OS, up to 240 devices under DPA
- **Applications:** telemetry, industrial control and automation of buildings and cities (street lights, parking etc.).
- **Learn more:**
  - www.iqrf.org
  - https://youtu.be/EKW11E-acAA

Webinar on June 23rd

IQRF

Makes devices wireless

IQRF OS — Operating system — RF implementation

Makes devices connectable via Internet

IQRF IDE — Development environment — Network visualisation & management

Makes devices simply accessible

IQRF Cloud — Cloud server — IoT

IQRF Wireless Mesh network

Local control USB — IQRF IDE

IQRF gateways — Plug & Play

HTTP + AES — GSM — WiFi — Ethernet

MQTT + TLS — Any Internet connection

Devices with RF transceivers with OS (and DPA) inside

C, Java or **Python devices** — e.g. Raspberry Pi

Internet / LAN

Ready-to-use server — cloud.iqrf.org

MySQL API — IQRF Cloud — Data — Control

MySQL API — Licensed server — User-operated

3rd party cloud — e.g. Bluemix, InteliGlue or Azure

IQRF DPA — Network framework — Application without programming

IQRF SDK — Libraries — Rapid SW development

IQRF-ready offering

- Prototyping
  - Starter kit based on UP board with transceiver, sensors and all SW supply
  - Reference http://www.iqrf.org/products/development-tools/development-sets/iot-starterkit-01
  - Release: June 7th
  - Where to buy: UP-shop

IQRF-ready offering

- Indoor Gateway kit for Production
  - Elements: UP-GWS01 + GW-USB-06 (migrating to antenna-integrated solution)
  - Reference: http://www.iqrf.org/products/gateways/gw-usb-06
  - Release: single parts ready, kit under finalization
  - Where to buy: UP-shop.org and http://eshop.iqrf.org/
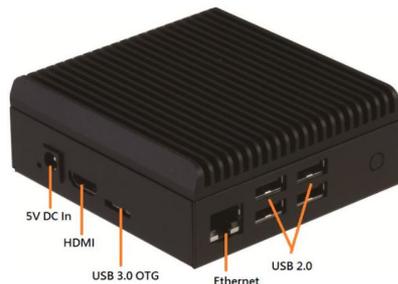
IQRF-ready offering

- Outdoor Gateway kit for Production
  - Elements: UP-GWS03 + Antenna–integrated solution
  - Reference: TBD
  - Release: sample by June 7th, MP by September (TBC)
  - Where to buy: TBD

LoRa

- **What's is it:** LoRaWAN™ is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery operated Things in a regional, national or global network.
- **Technology:** Radio 868MHz (916/433), license free
- **Features:** bit rate up to 38.4kb/s, ultra low power (SB 200 nA, 10mA RX), Star Network, Private Networks
- **Range:** up to 20km open air
- **Number of devices:** Up to several hundred thousands per GW
- **Applications:** telemetry, industrial control and automation of buildings and cities (street lights, parking etc.).
- **Learn more:**
  - https://www.lora-alliance.org/
  - http://www.semtech.com/wireless-rf/lora/LoRa-FAQs.pdf

IoT LoRa™ application pattern

Concentrator/Gateway · Network Server · Application Server

asset tracking · gas monitor · water meter · trash container · vending machine · fire detection

3G/Ethernet Backhaul

LoRa® RF LoRaWAN™

TCP/IP SSL LoRaWAN™

TCP/IP SSL Secure Payload

AES Secured Payload Application Data
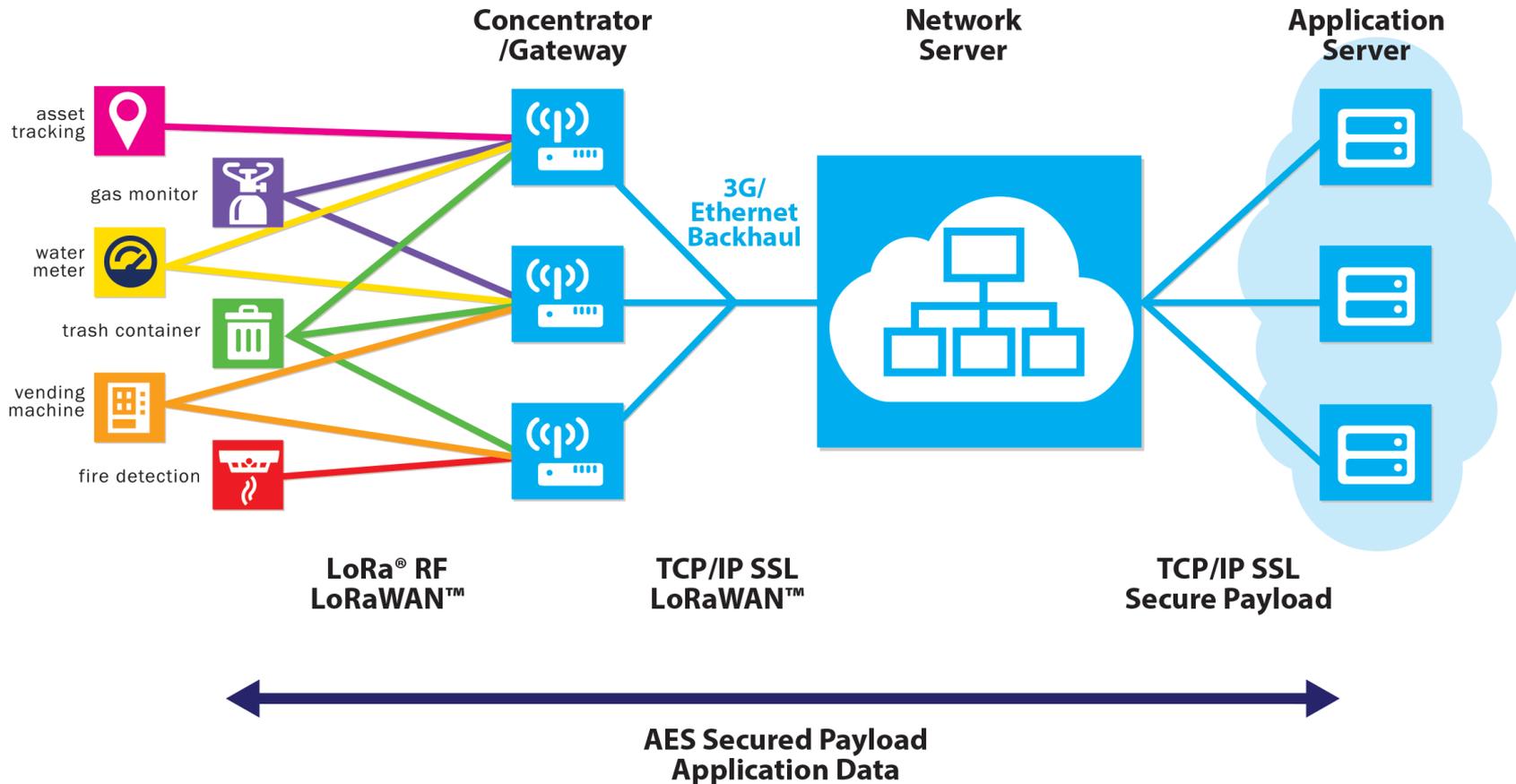
Main differences between public Lora™ Network and on-site private Network

| Public Networks	Private Networks (on premises)
Network owned by Virtual Network Operator	private network owned by customer (not the same for LoRa competitors)
Network Server not present or owned by Network operator	Network Server owned by customer, as well as gateways
Usually with public network, the gateway does not have the network server embedded, so frames are transmitted to the network server on the cloud and ACK (if necessary) are sent to the end-device from the cloud	With private network, the gateway do have the network server embedded, so the ACK is sent to the end-device from the gateway.
Security keys are shared with the service provider	Security keys are kept on-site
QoS is dependent on service provider	QoS is easily controlled by placing extra gateways
Data is processed on a third party server	Data is processed on-ste

Important notice

- LoRa, is the physical layer or the (wireless) modulization which creates the long range communication link.
- LoRaWAN is about the communication protocol and system architecture for the network as the LoRa Alliance puts it. Or even simpler: LoRaWAN is the network *(WAN = Wide Area Network)*.
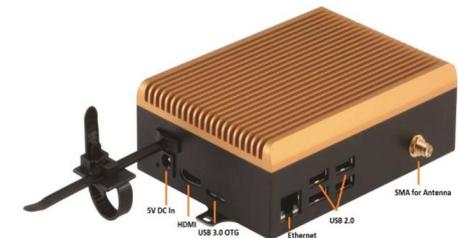
LoRA-ready offering

- Prototyping
  - Elements: Starter kits based on UP board with IMST concentrator connected to The Things Network (Public) and Gateway solution UP-GWS02 + The Things Network Industries SW stack (Private)
  - Reference: https://www.thethingsnetwork.org/

    https://www.thethingsindustries.com/
  - Release: end of June 2017
  - Where to buy: UP Shop/AAEON

Webinar soon!
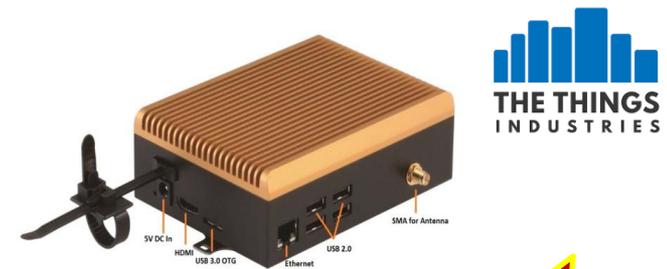
LoRA-ready offering

- Indoor Gateway and Network server for Production
  - Elements: UP-GWS02
  - Reference: http://www.aaeon.com/en/p/intel-lora-gateway-system-server
  - Notice: SW by public stack (Github Semtech) or 3rd party:
    - Stream Technology solution is ready, http://stream-technologies.com/lora/
    - The Things Industries still under development
  - Release: Pilot run now, MP by 1st week of June
  - Where to buy: AAEON

LoRA-ready offering

- Outdoor Gateway and Network server for Production
  - Elements: UP-GWS03
  - Reference: TBD
  - Notice: SW by public stack or 3rd party
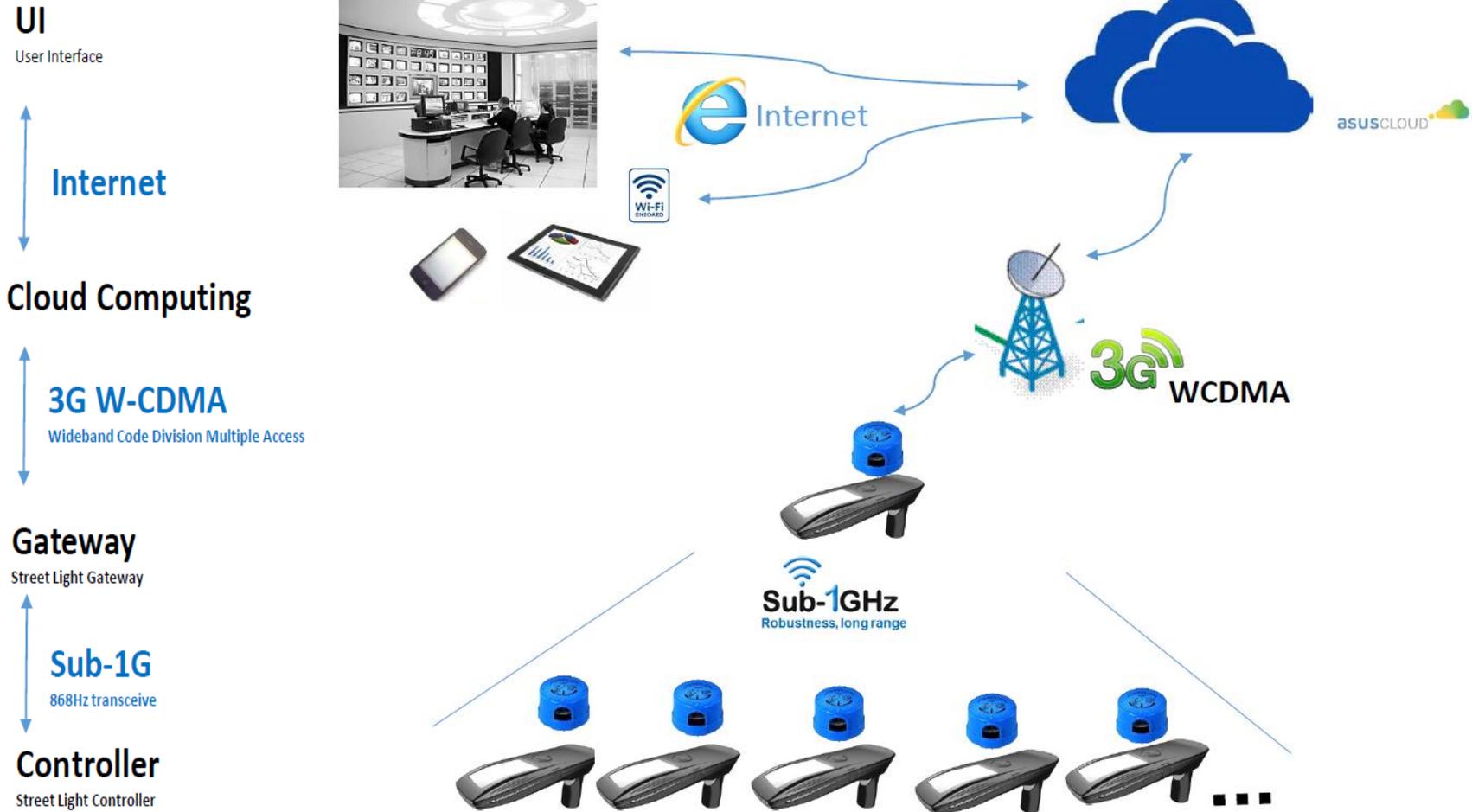 - Release: 1st sample now, MP by September (TBC)
  - Where to buy: AAEON

LoRA-ready offering

- Industrial End Node **(Developing)**
  - Elements: LoRa certified Industrial End node with retrofit interfaces
  - Reference: TBD
  - Notice: it will come with firmware and IDE
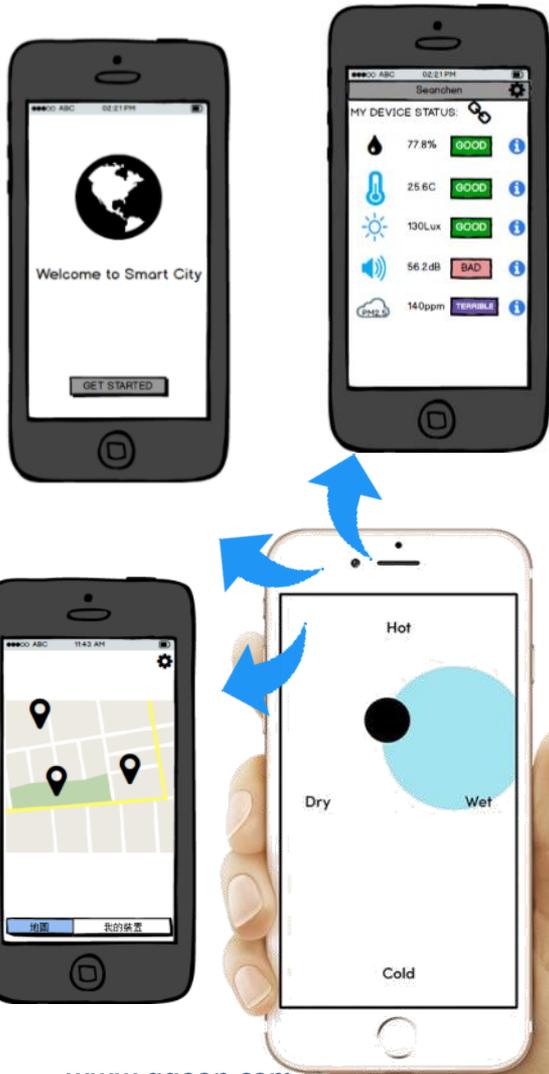 - Release: internal samples by mid of July, released TBD
  - Where to buy: AAEON

Application stories

Smart Lighting System

Air Sensing - AirBox

Airbox APP

AirBox Sensors
I.g. Co2 affects study concentration

Devices
(Airbox/IPcam/
Smartfones/Wearable)

Research Agencies
I.g. 23andMe, Genetic research for Medical Purpose

Gov. /Agencies
3rd Party DataBase

空氣盒子
研揚科技 華碩雲端

Data Ownership Authorization

2C

2B

asusCLOUD

Data Collecting
Cross-Reference

V1.0-Edimax/Realtek   **V2.0-AAEON/TI**

PM 2.5   Humidity   Temp.

More Gas Sensors
CO、CO2、VOC and etc

Welcome to Smart City

GET STARTED

Seanchen
MY DEVICE STATUS:
77.8%   GOOD
25.6C   GOOD
130Lux GOOD
56.2dB BAD
140ppm TERRIBLE

Hot
Dry   Wet
Cold

….more to come

- IQRF
  - Energy metering
  - Smart building
  - Ourdoor Gateway for smart metering
  - Street lighting
- LoRa
  - Smart agriculture
  - Smart retail hub

Resources

Promotional resources

- Marketing materials:
  - Dedicated website
  - Dedicated brochure
  - eDMs
  - Dedicated AAEON mini website (ready in June)
- Demonstration kits
  - Fully working demo kits from data acquisition to representation
- Main event:
  - IoT World Congress, Barcelona 3-5 October

Thanks