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A background image of a city skyline at night, with a river and bridges. Overlaid on the image is a network of glowing blue nodes connected by white arcs, representing the Internet of Things (IoT).

Internet of Things (IoT)

IoT Nodes : System Architecture

Amit Kumar

1st Aug 2022

Agenda

#1 Introduction to Internet of Things(IoT)

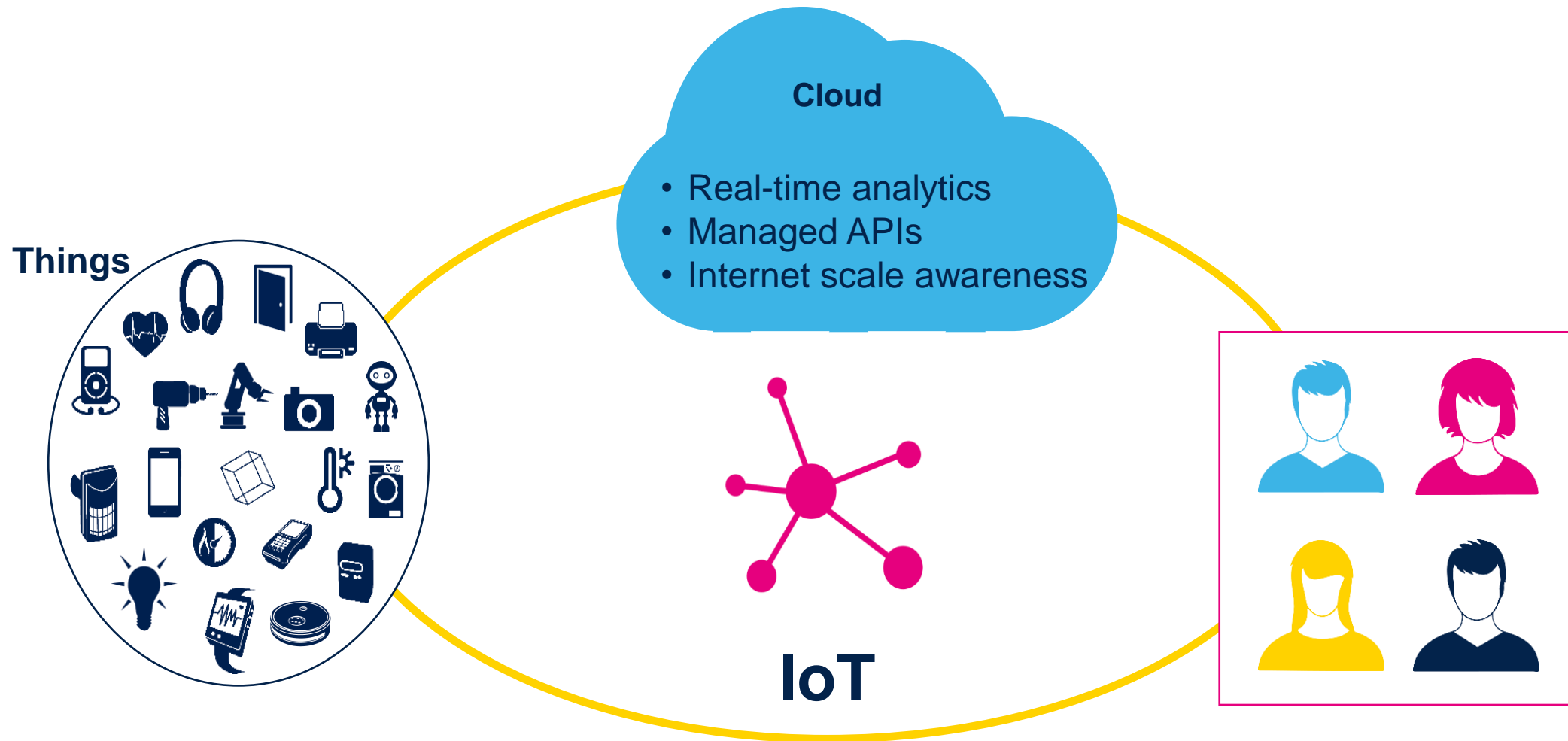
#2 IoT Node Details

#3 IoT Case Study : Smart Metering

#4 IoT Case Study : High End Gateway

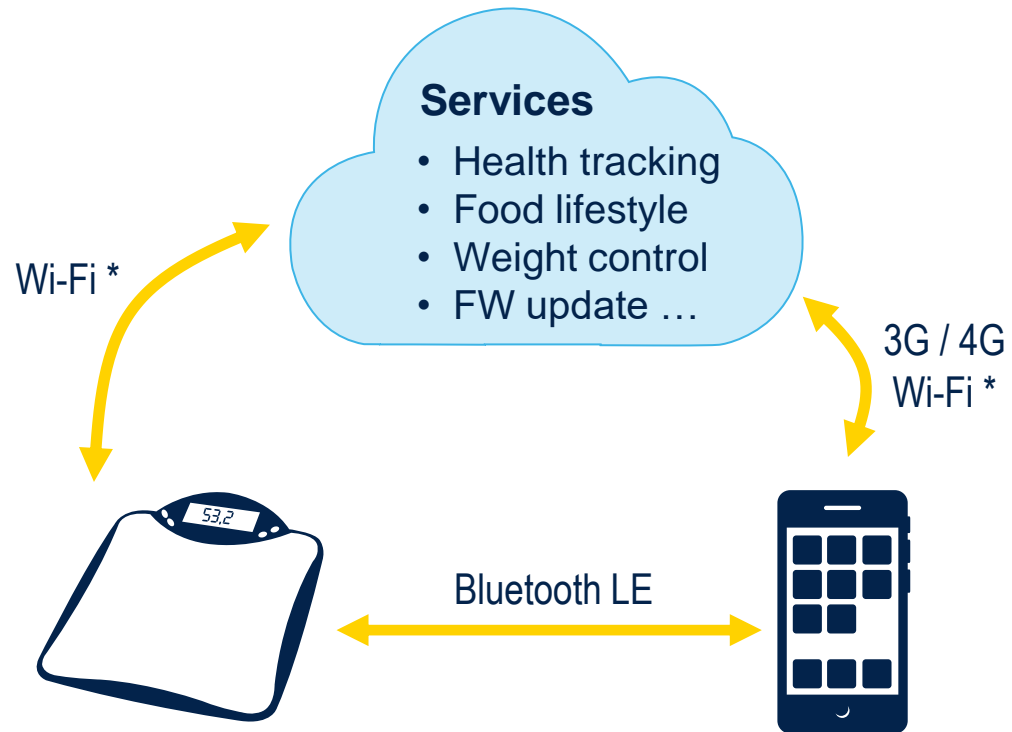
Introduction to IoT

What is IoT ?



Cosumer IoT

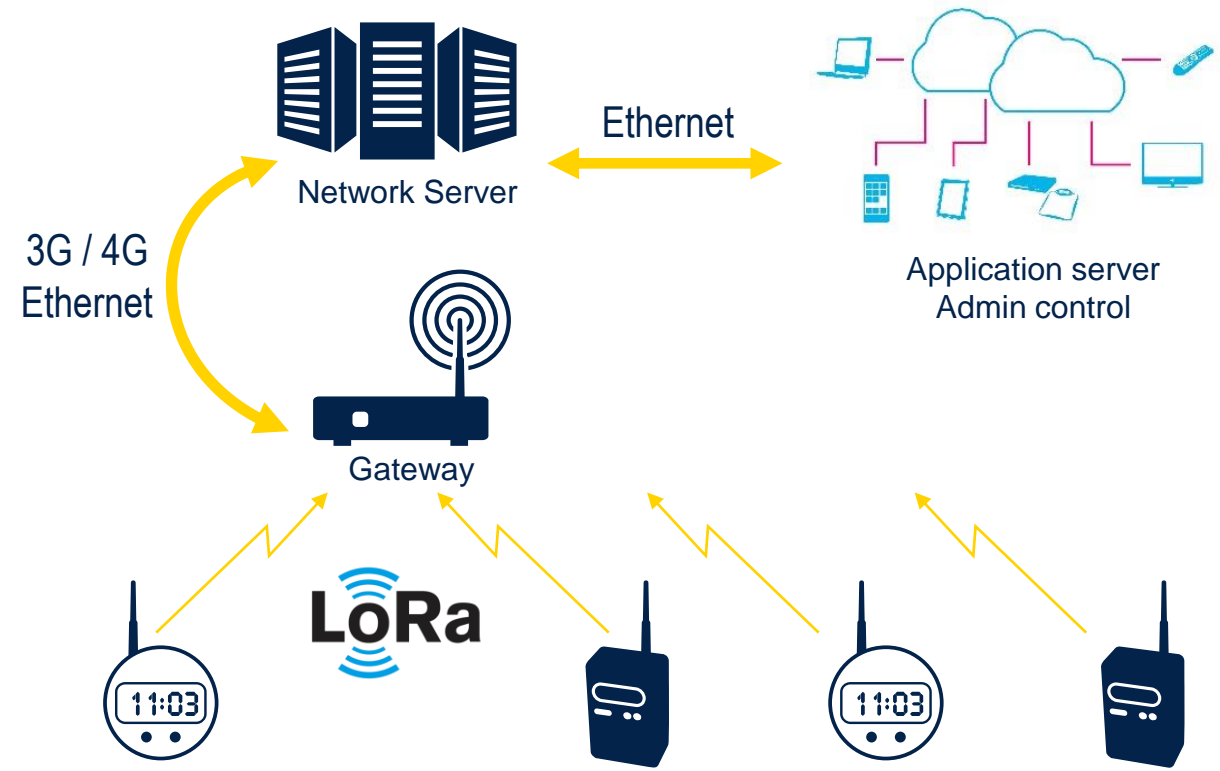
Rely on Bluetooth® LE, Wi-Fi and 4G



* Wi-Fi to Cloud connection via a Gateway

Industrial IoT

Extend the range of connected objects

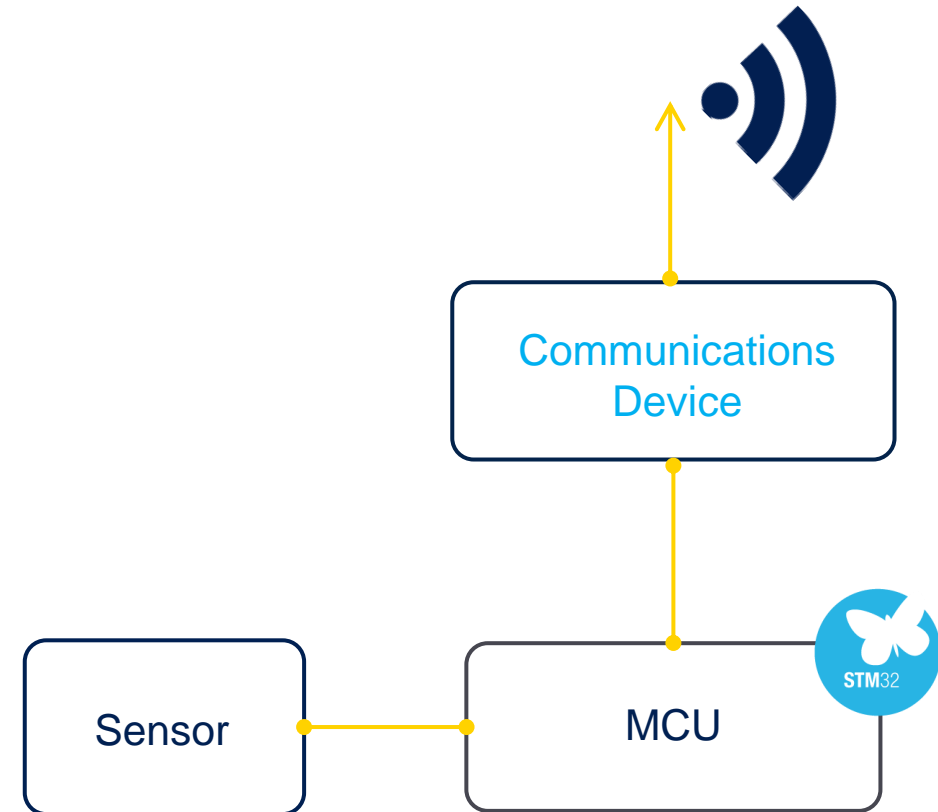
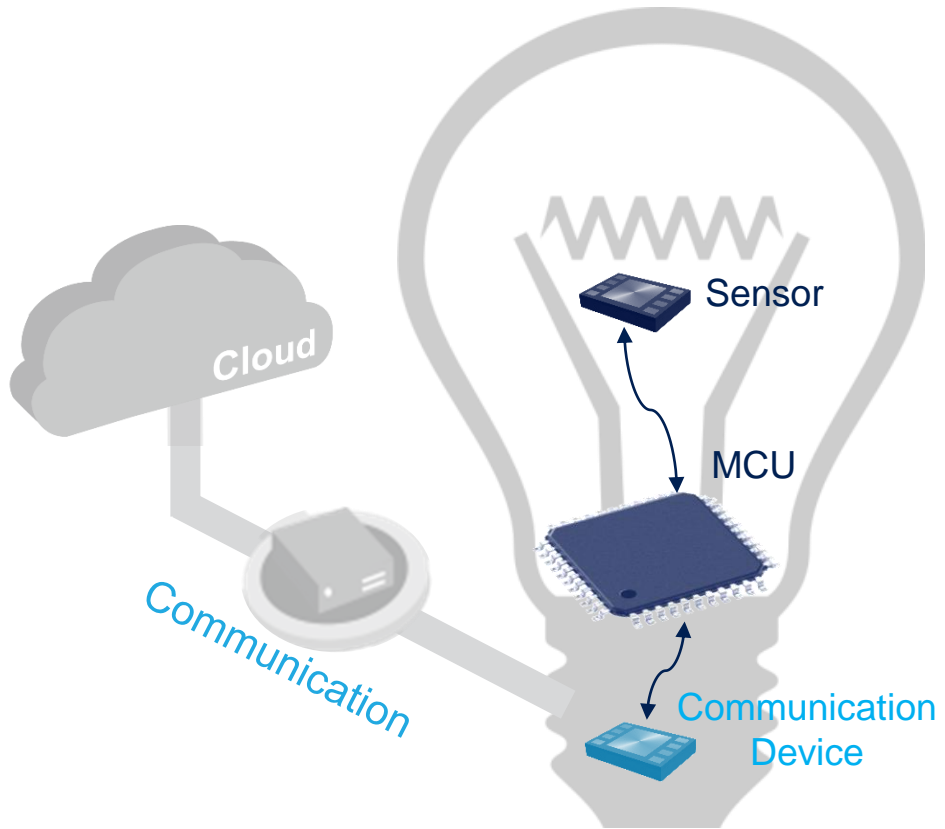


IoT and Wireless connectivity are deeply linked

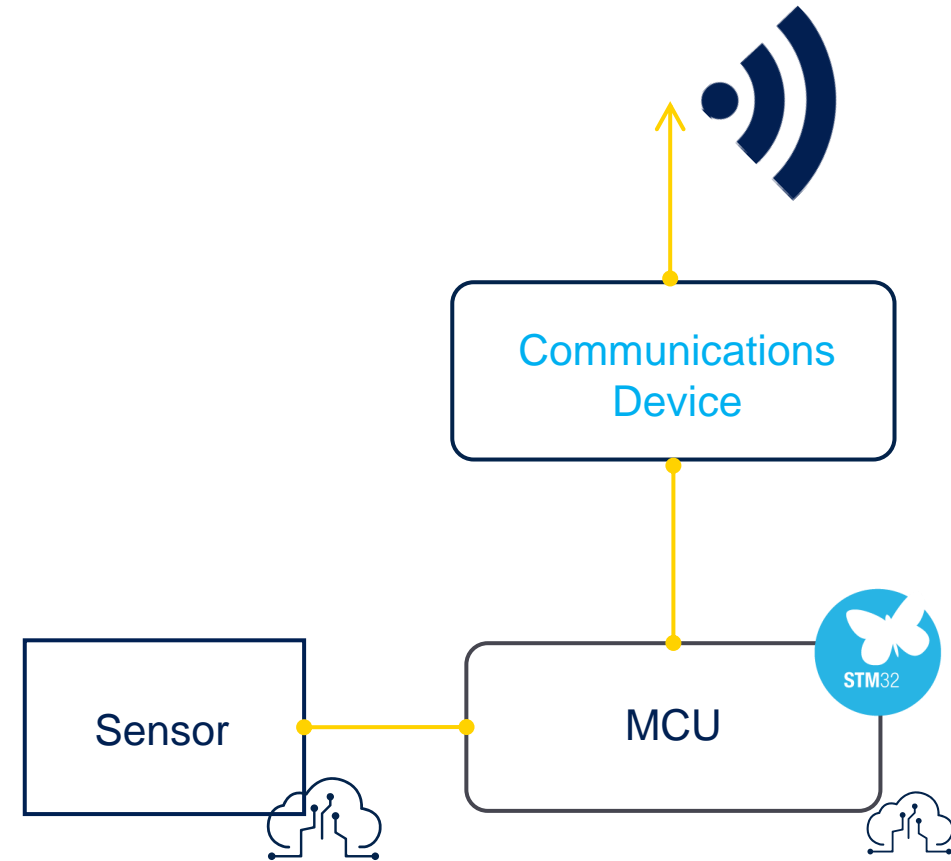
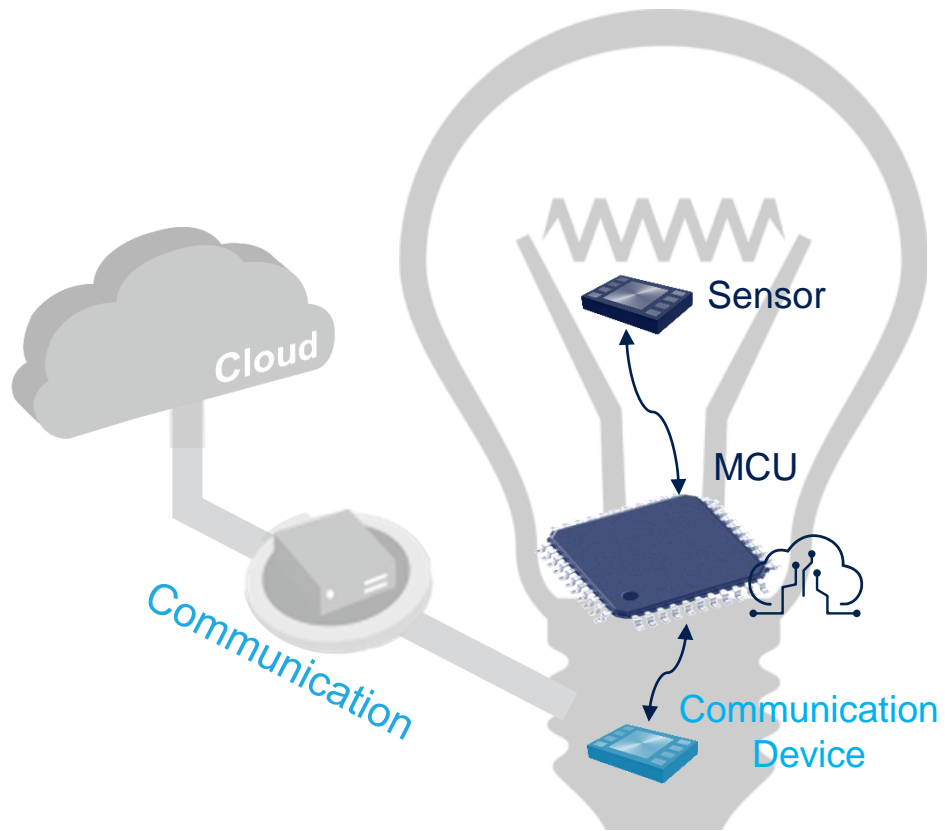


IoT Node















Simple IoT Device



Simple IoT Device with Edge AI



The Building Blocks of the IoT Device

	Processing	Security	Sensing & Actuating	Connectivity	Conditioning & Protection	Motor Control	Power & Energy Management
Smart Things							
Smart Home & City	Ultra-Low Power to High Performance	Scalable security solutions	Full range of sensors and actuators	10 cm to 10 km	Nano Amps to Kilo Amps	Power conversion Monitoring Drivers	Nano Watt to Mega Watt
Smart Industry							

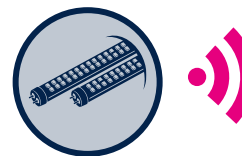
Smart Industry 4.0

Revolution boosted by sensors, edge processing & connectivity



Edge processing

Presence & environmental sensing



Edge processing

Positioning, navigation



Edge processing

Predictive maintenance



Edge processing

Tracking & monitoring



Edge processing

Tracking & monitoring



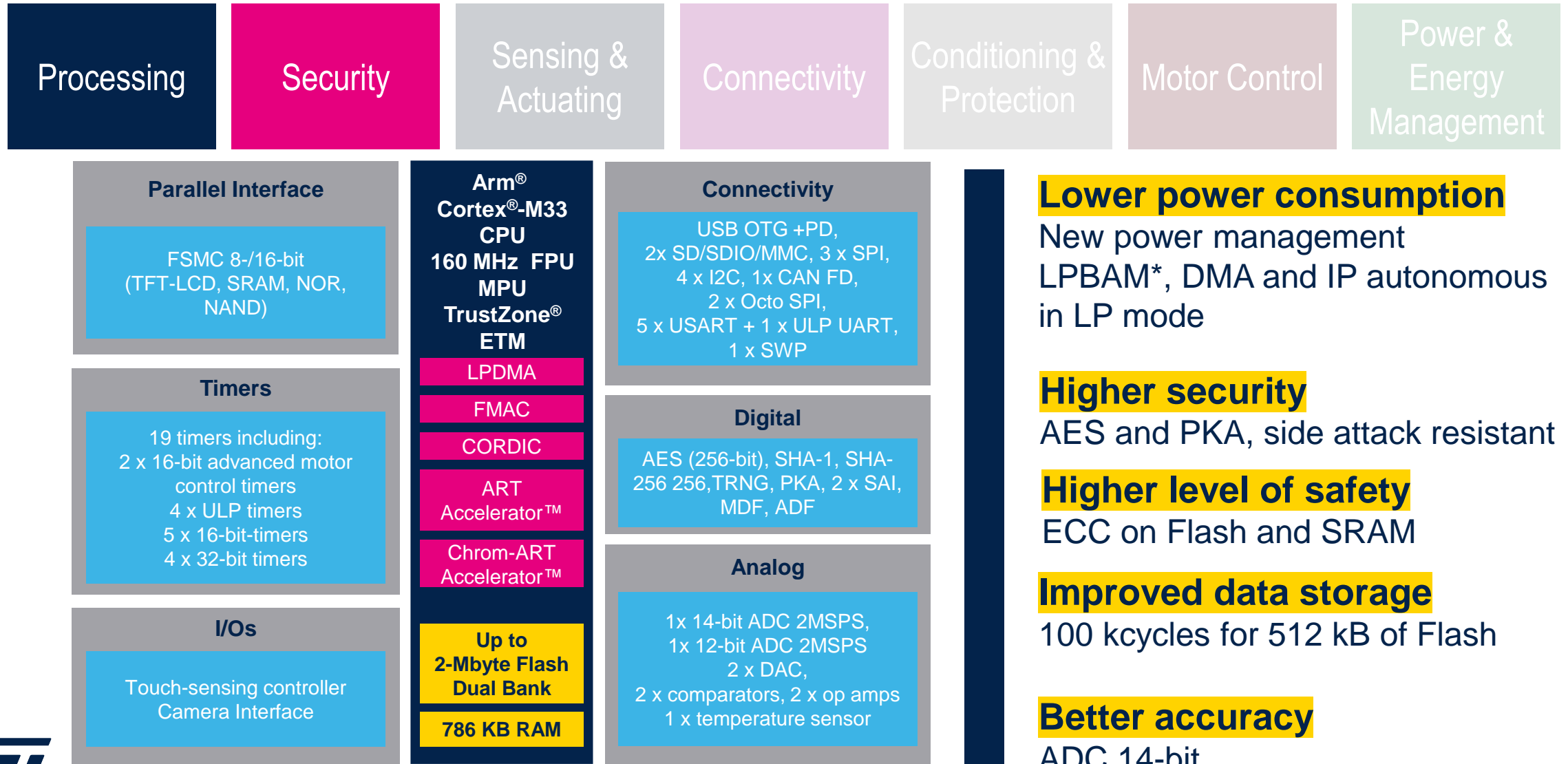
- Data collection
- Security
- Local processing



- Decision
- Action

- Analytics
- Post processing
- Machine learning
- Security

MCU Platform : STM32U5

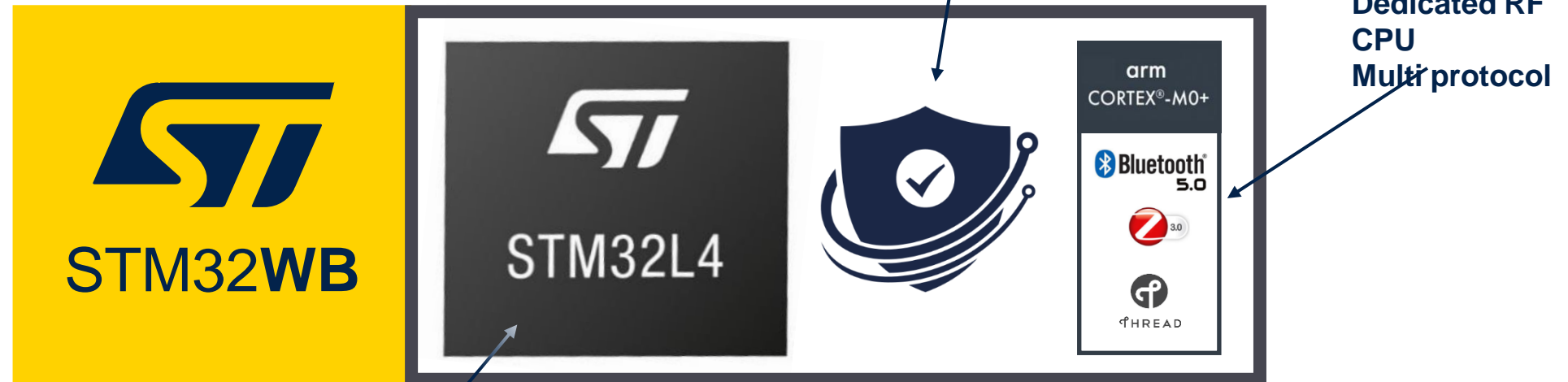




System on Chip: STM32WB



A 2.4GHz wireless dual-core MCU: one die, many possibilities ...



Leveraging on STM32L4 best in class ultra-low-power MCU

Built-in security feature

Certified Platform: BLE 5.0, Zigbee 3.0, Thread



SoC STM32WL

Processing

Security

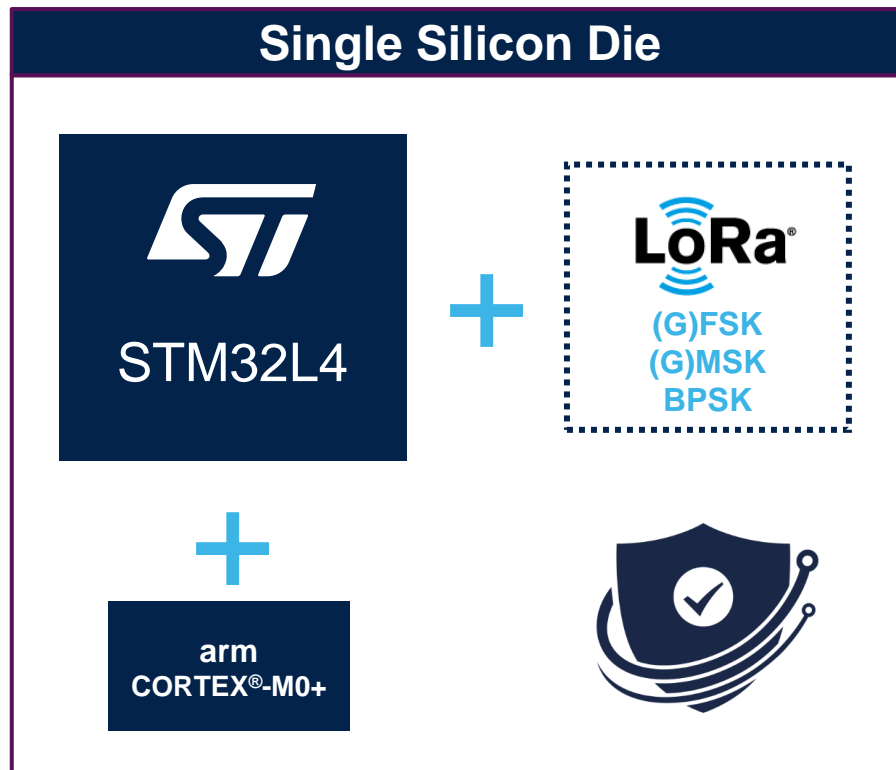
Sensing &
Actuating

Connectivity

Conditioning &
Protection

Motor Control

Power &
Energy
Management





STM32 MCUs and MPUs



 MPU


STM32MP1
4158 CoreMark
Up to 800 MHz Cortex-A7
209 MHz Cortex-M4

 High Perf MCUs

STM32F2 Up to 398 CoreMark 120 MHz Cortex-M3	STM32F4 Up to 608 CoreMark 180 MHz Cortex-M4	STM32F7 1082 CoreMark 216 MHz Cortex-M7	STM32H7 Up to 3224 CoreMark Up to 550 MHz Cortex -M7 240 MHz Cortex -M4
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 Mainstream MCUs

STM32F0 106 CoreMark 48 MHz Cortex-M0	STM32G0 142 CoreMark 64 MHz Cortex-M0+	STM32F1 177 CoreMark 72 MHz Cortex-M3
	STM32F3 245 CoreMark 72 MHz Cortex-M4	STM32G4 569 CoreMark 170 MHz Cortex-M4
<i>Mixed-signal MCUs</i>		

 Ultra-low Power MCUs

STM32L0 75 CoreMark 32 MHz Cortex-M0+	STM32L1 93 CoreMark 32 MHz Cortex-M3	STM32L4 273 CoreMark 80 MHz Cortex-M4	STM32L4+ 409 CoreMark 120 MHz Cortex-M4	STM32L5 443 CoreMark 110 MHz Cortex-M33	STM32U5 651 CoreMark 160 MHz Cortex-M33
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 Wireless MCUs

	STM32WL 162 CoreMark 48 MHz Cortex-M4 48 MHz Cortex-M0+	STM32WB 216 CoreMark 64 MHz Cortex-M4 32 MHz Cortex-M0+ 
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ST Sensors

Processing

Security

Sensing &
Actuating

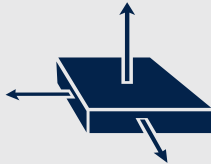
Connectivity

Conditioning &
Protection

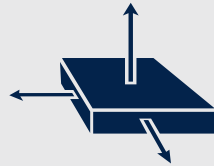
Motor Control

Power &
Energy
Management

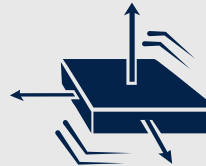
Accelerometers



Inclinometers



Vibration sensors



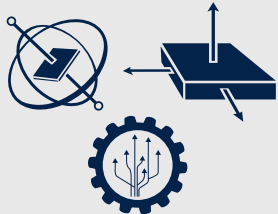
Pressure sensors



**Temperature
sensors**



**6-axis IMU
+ Machine Learning**



High performance

High accuracy

High reliability

**High-bandwidth
microphones**



Connectivity: Low-power RF technologies

Bluetooth® 5

LoRa®

Bluetooth® SIG Mesh

sigfox

M-Bus
wireless

LoWPAN



Wearable, healthcare,
smart appliances

Water Meter, Gas
Meter

Sensor networks,
home appliances,
industrial

Asset tracking,
Sensor-to-Cloud

Remote metering,
energy management

Sensor networks,
home, industrial
automation

- Security
- Interoperability
- BT SIG Standard

- Long range
- Security By default
- High receiver sensitivity

- Mesh topology
- Large scale
- BT SIG Standard

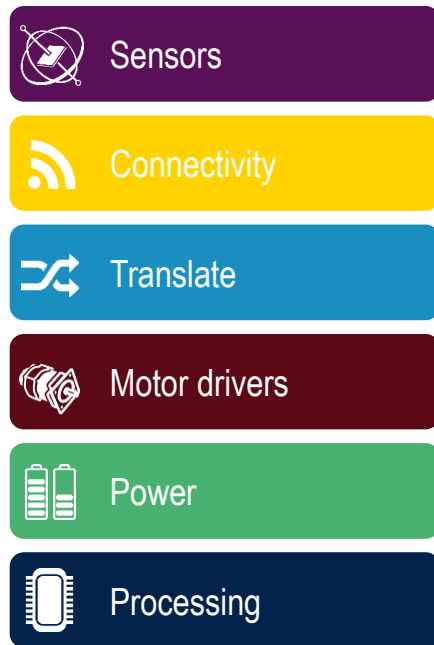
- Global and reliable
- Geo-localization
- Security by-default

- European standard
- Star topology
- Master / slave

- Mesh topology
- Large scale
- Installation flexibility
- IPv6

Quick Prototyping of IOT Application

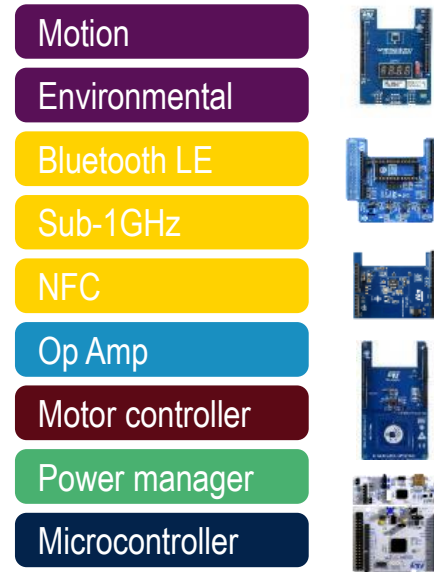
Your need



Application software
and development tools

The building blocks

Processor boards (Nucleo 64)
Expansion boards (X-NUCLEO)



Integrated Development Environment
and middleware

Our answer

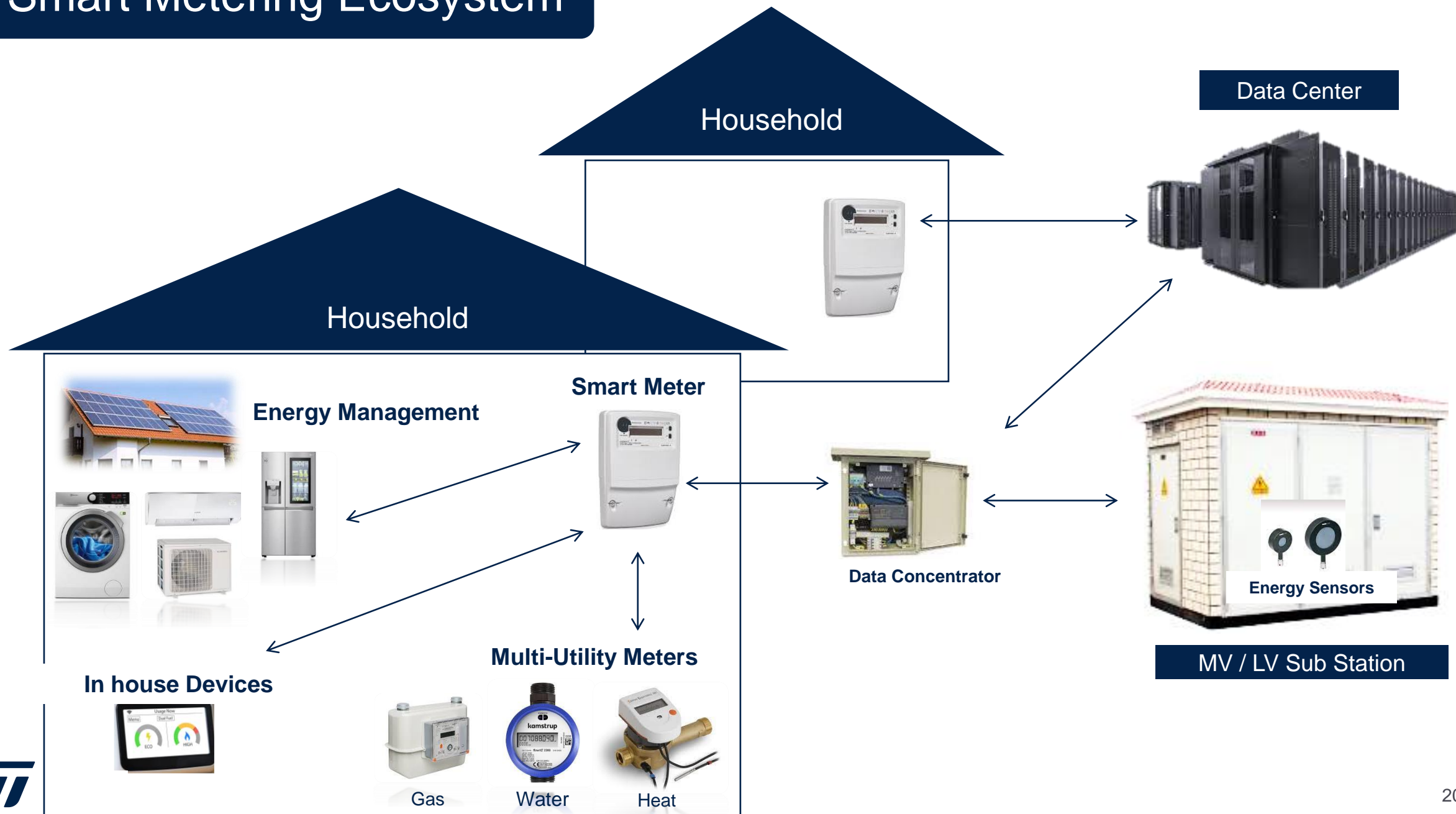
Function Packs (FP)

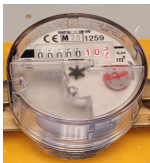


Ready-to-use
application-oriented package

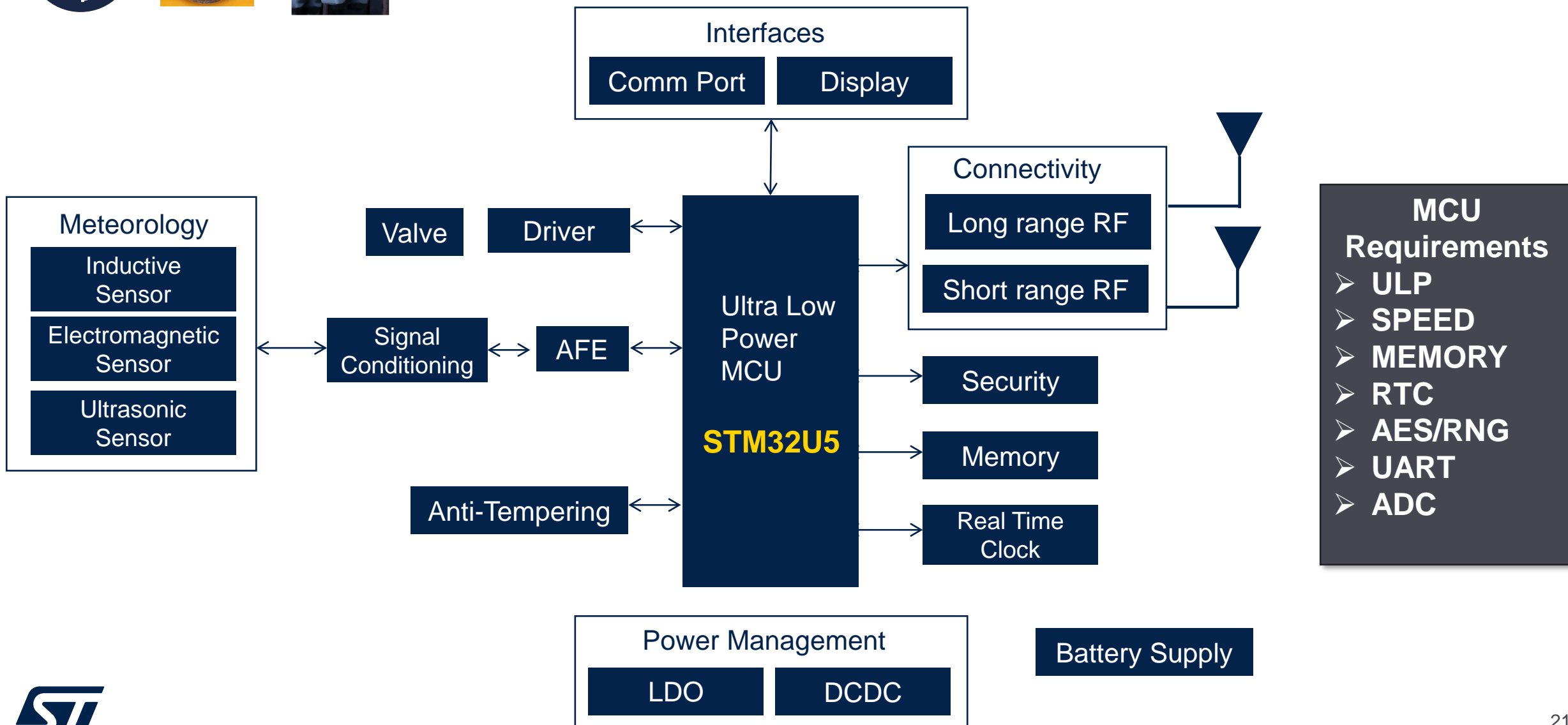
IoT Case Study : Smart Metering

The Smart Metering Ecosystem

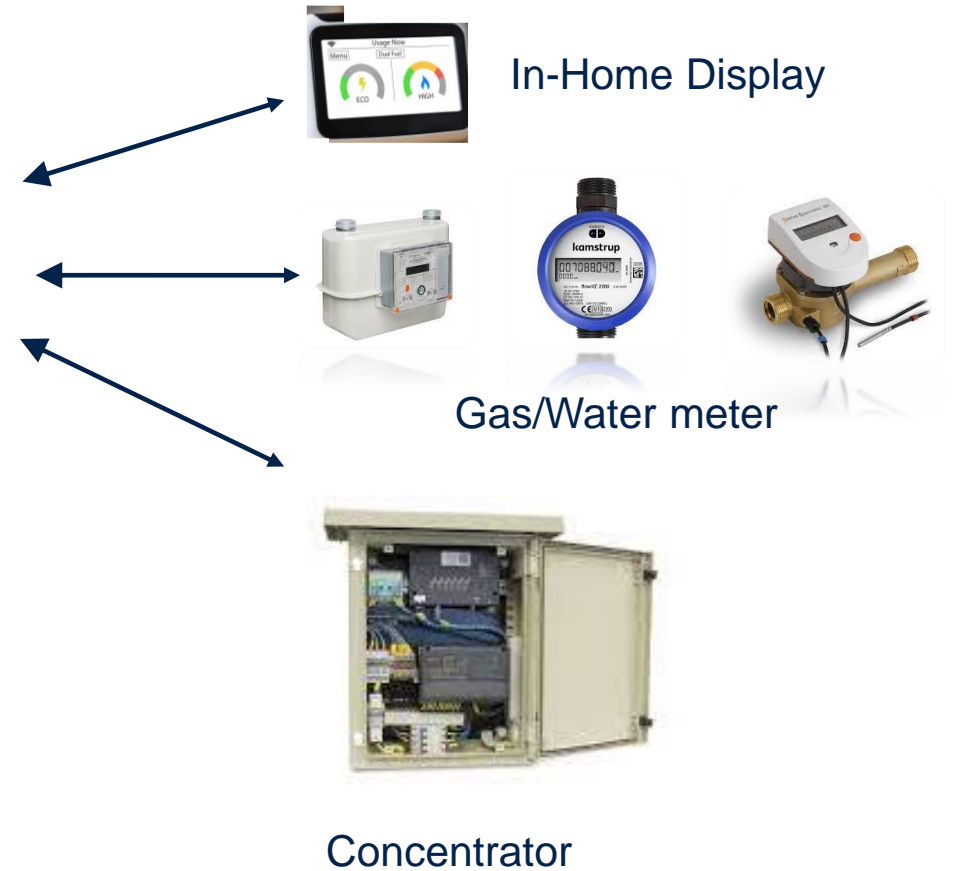
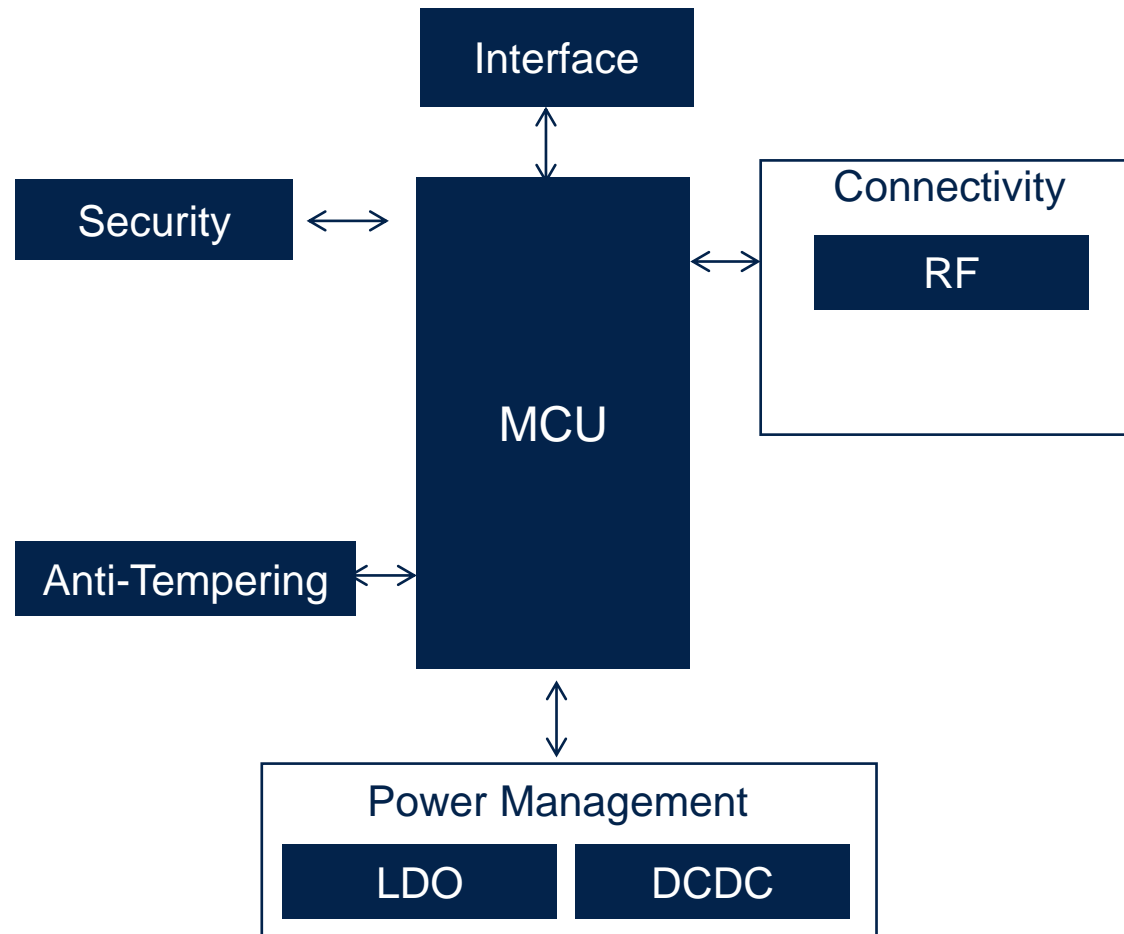




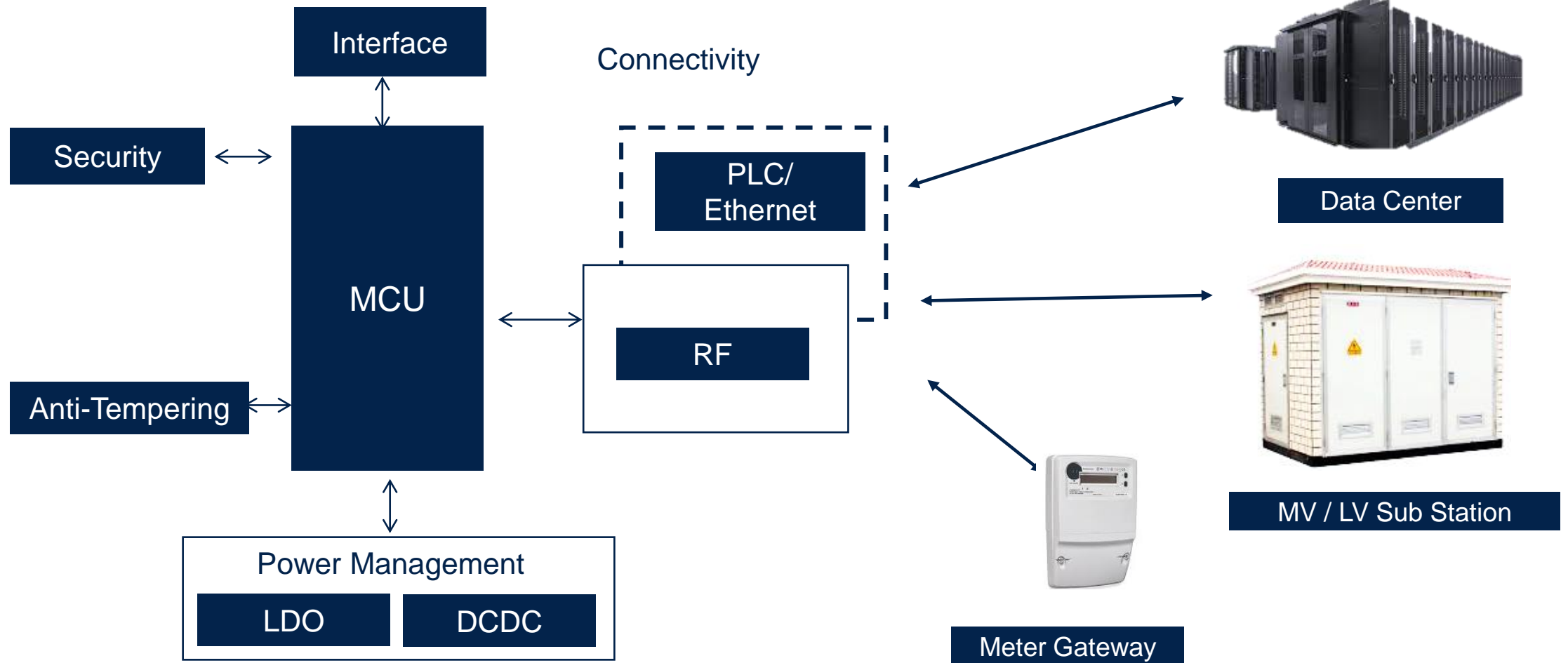
Water & Gas Meter Block Diagram



Metering Gateway

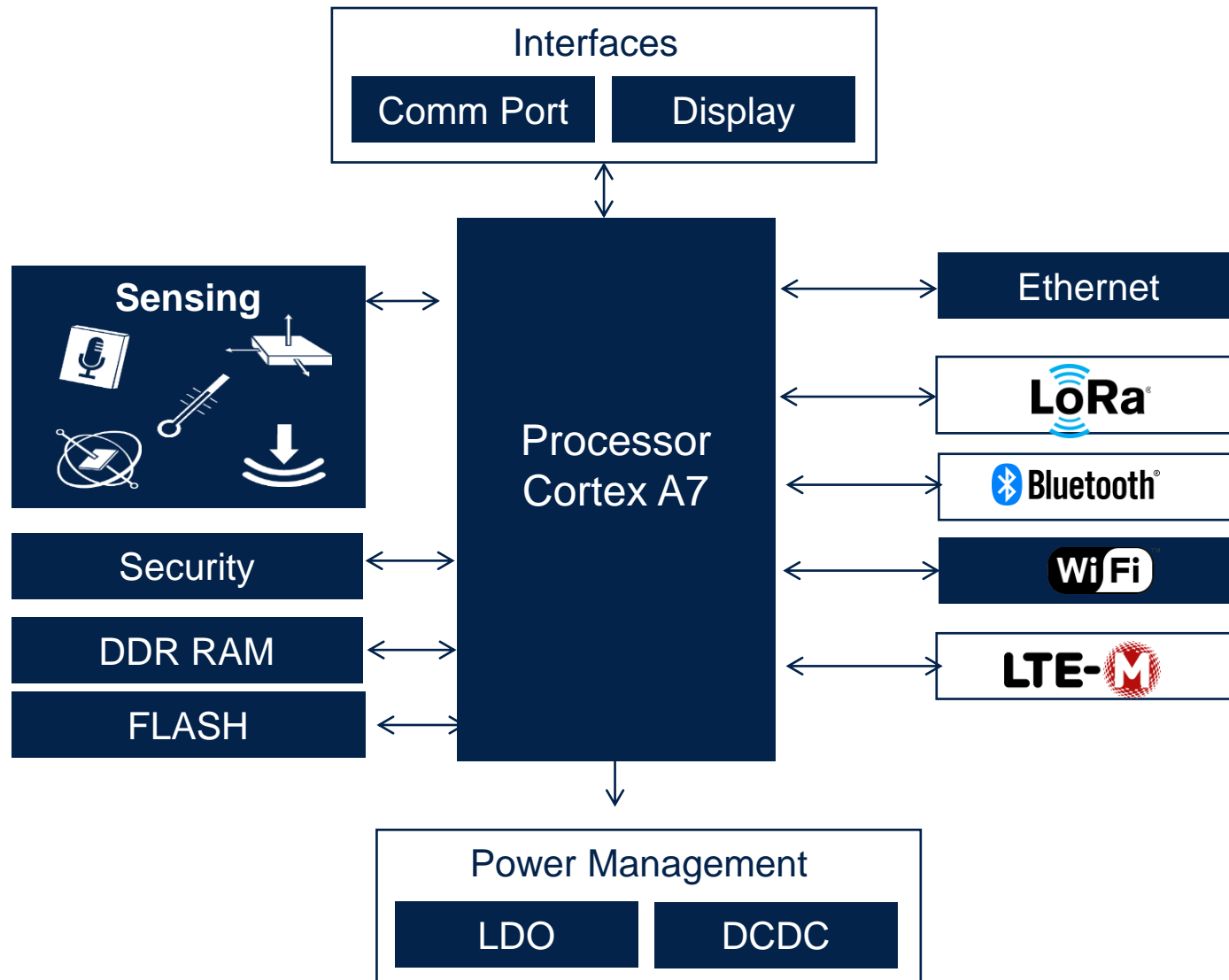


Data Concentrator



IoT Case Study : High End Gateway

Industrial Gateway



Example of STM32MP1
Discovery board used for EDGE
processing

Our technology starts with You



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