



life.augmented

Home & building automation Connectivity and sensors solutions

Yawei Bai

Industrial Competence Center

PDSA, STMicroelectronics

**Industrial
Automation**
Competence Center



Agenda

1 Home & Building Automation Overview

2 Gateway Block Diagram

3 Smart Sensor Block Diagram

4 E-Lock Block Diagram

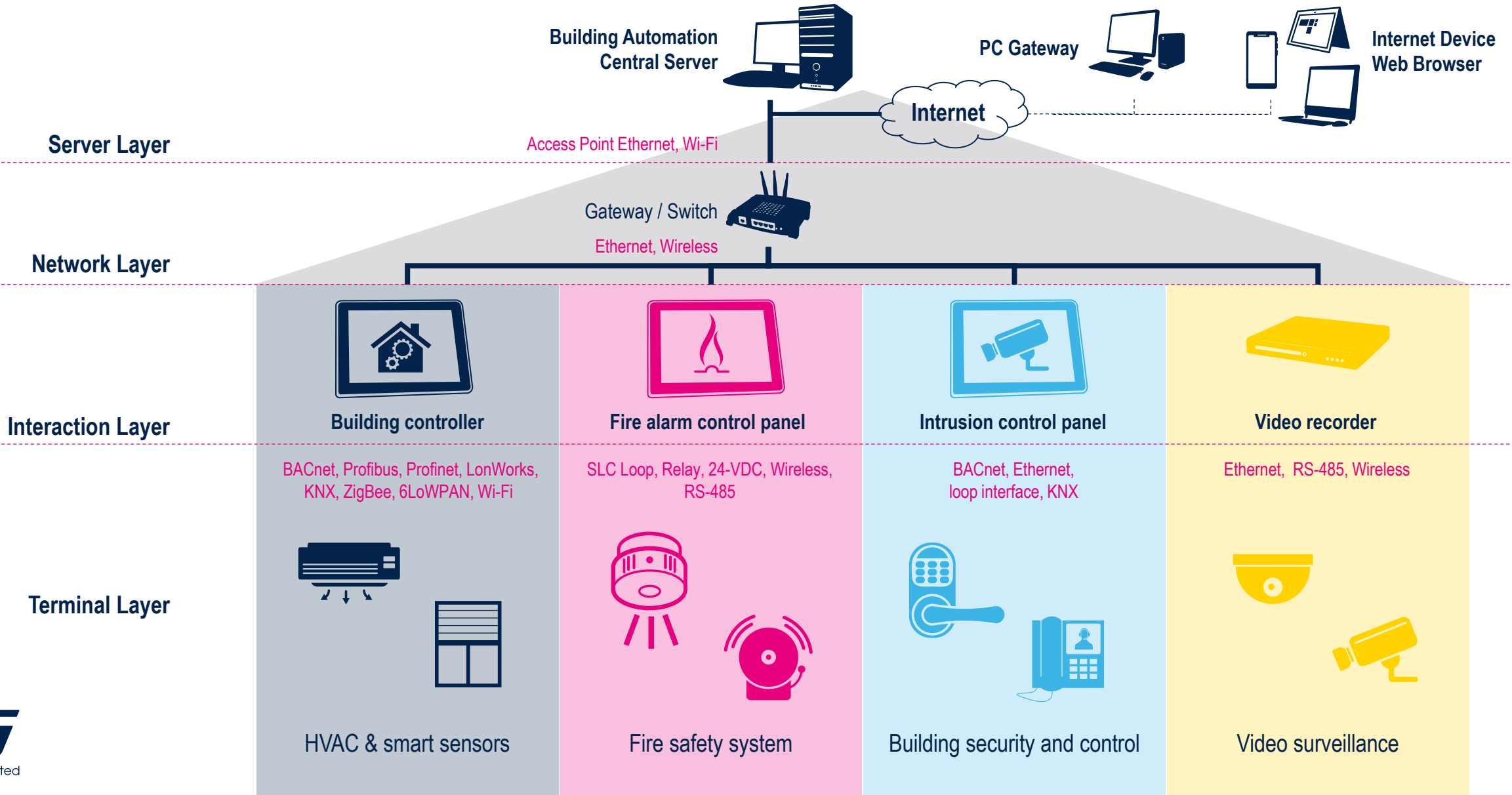
5 ST Connectivity Solution

6 ST Sensors Solution

7 ST Secure Solution

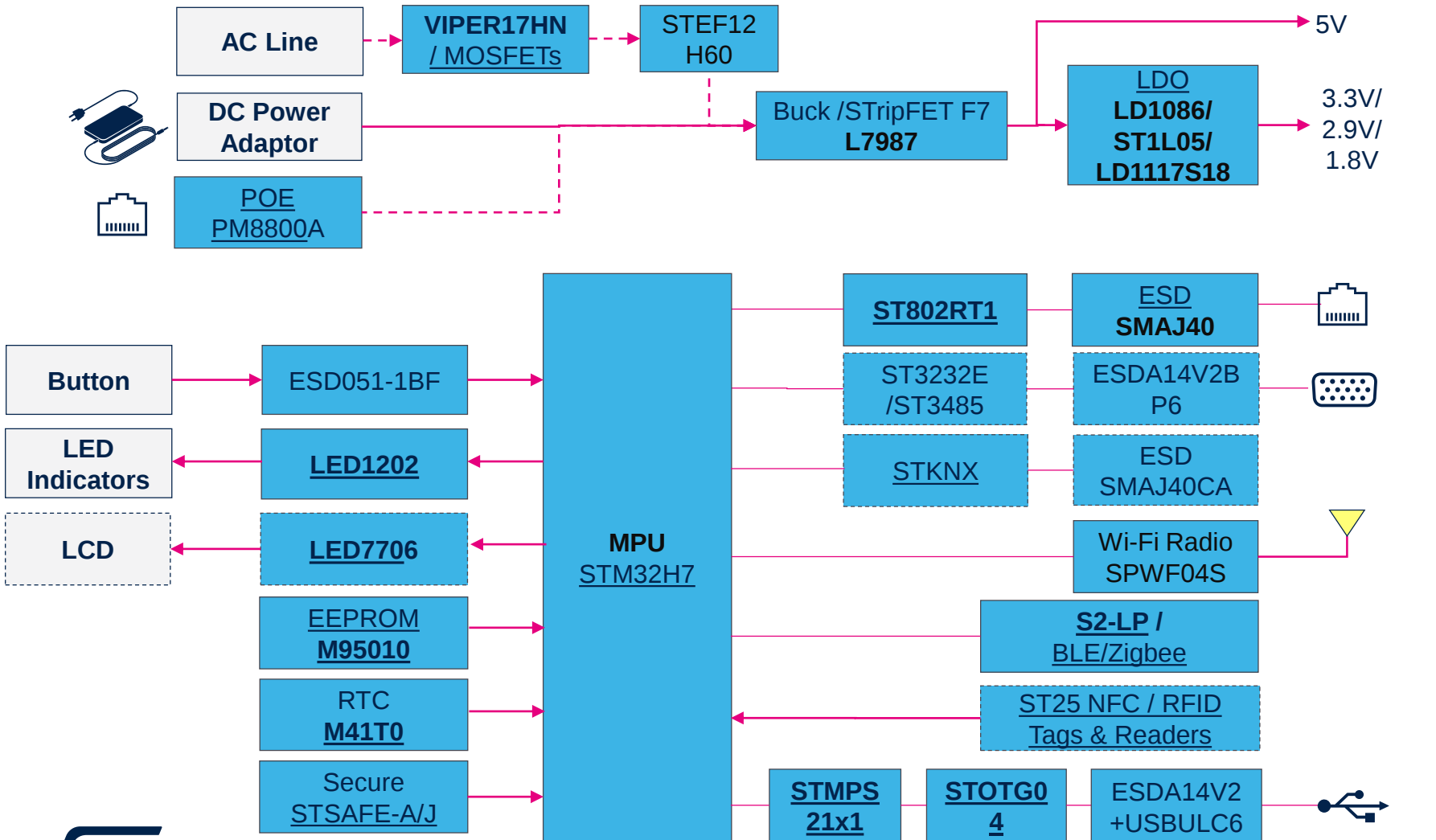
8 Q&A

Home & building automation overview





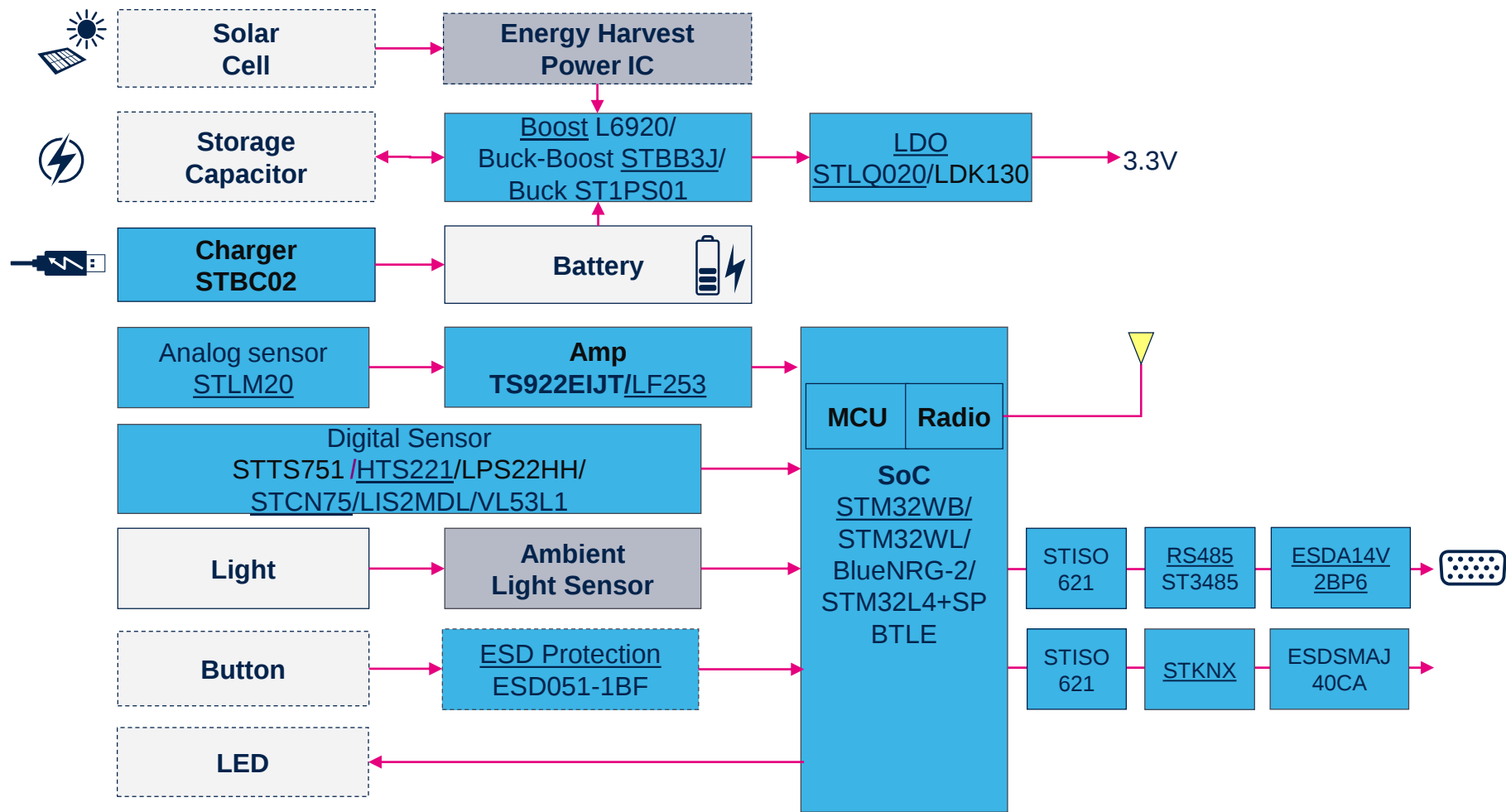
Gateway block diagram



Option	
Type	Device
ACDC Converter	VIPER17HN
DCDC BUCK	L7987、 L5983
LDO	LD1086/ST1L05/STLQ020/ST732
POE	PM8800
MCU	STM32H7
EEPROM	M95010
RTC	M41T0
Wireless	STM32WB50CGU5/BlueNRG-2/S2-LP
NFC	ST25
USB	STOTG04
Power Switch	STMPS2151
KNX	STKNX
RS485/RS232	ST3485/ST3241EB
Ethernet Transceiver	ST802RT1



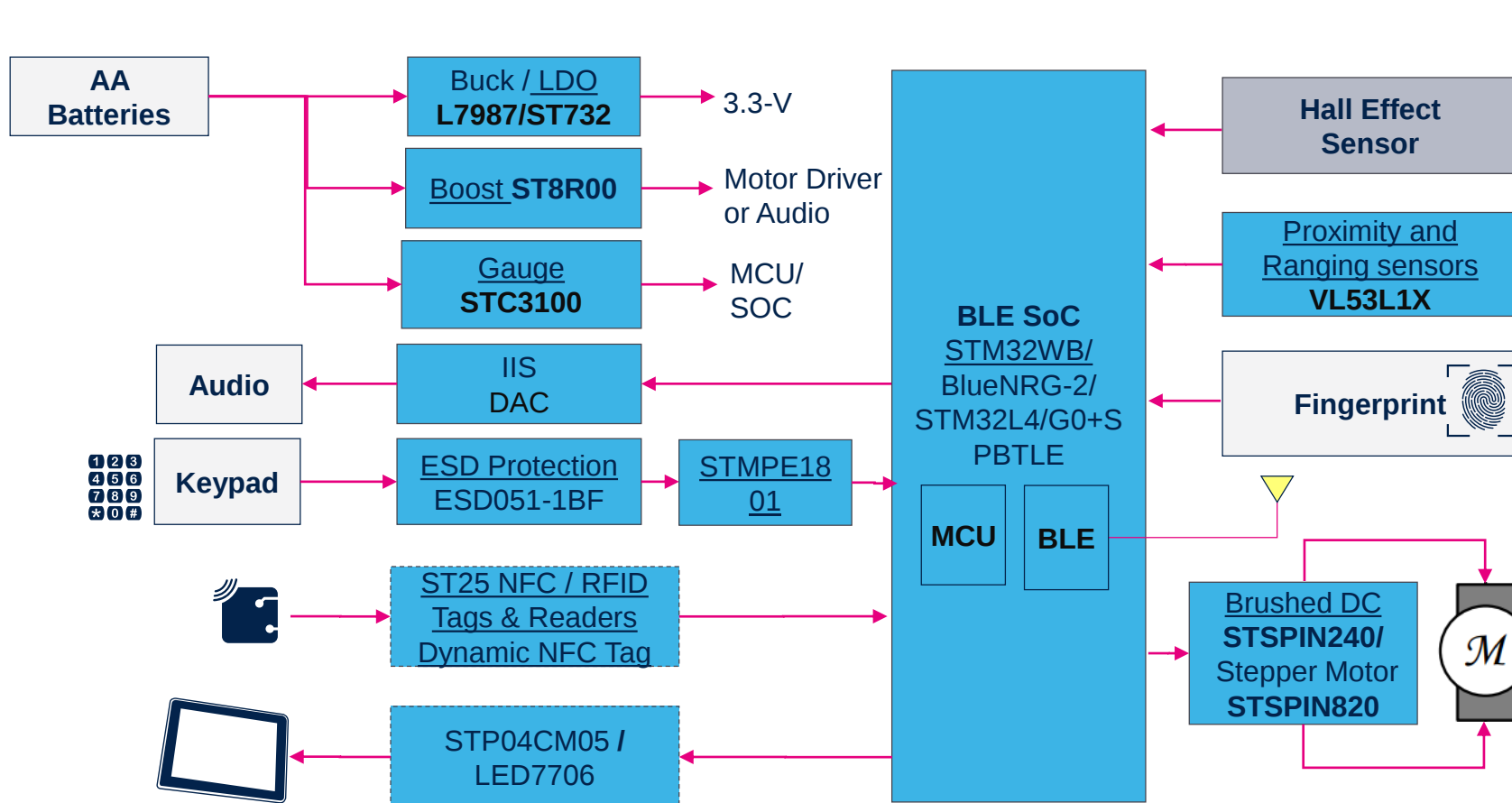
Environmental sensor block diagram



Option	
Type	Device
BUCK-BOOST	STBB3JR
DCDC BOOST	L6920
DCDC BUCK	ST1PS01EJR
Charger	STBC02
LDO	STLQ020/LDK130/ ST732
MCU	STM32G0/L4
Wireless	STM32WB50CGU5/ STM32WLE5/Blue NRG-2
Wired	STKNX/ST3485
Analog Sensors	STLM20
Digital Sensor	STCN75 HTS221
Amplifier	TS922EIJT/LF253



Smart e-lock SoC block diagram



Option	
Type	Device
DCDC BUCK	L7987
LDO	STLQ020/ST732
Battery Gauge	STC3100
DCDC BOOST	ST8R00
MCU	STM32G0
Wireless	STM32WB50CGU5 /BlueNRG-2
Ranging Sensor	VL53L1X
NFC	ST25
Stepper Motor Driver	STSPIN820
Brushed DC Motor Driver	SISPIN240
LED Driver/backlight	STP04CM05 /LED7707
Keypad Controller	STMPE1801

- STM32WB55CGU6 for basic usage
- STM32WB55RGV6 for more Keypad extension
- STM32WB50CGU5/BlueNRG-2 for cost sensitivity

ST complete portfolio



Power Discretes & Modules



Smart power



Connectivity & Communication



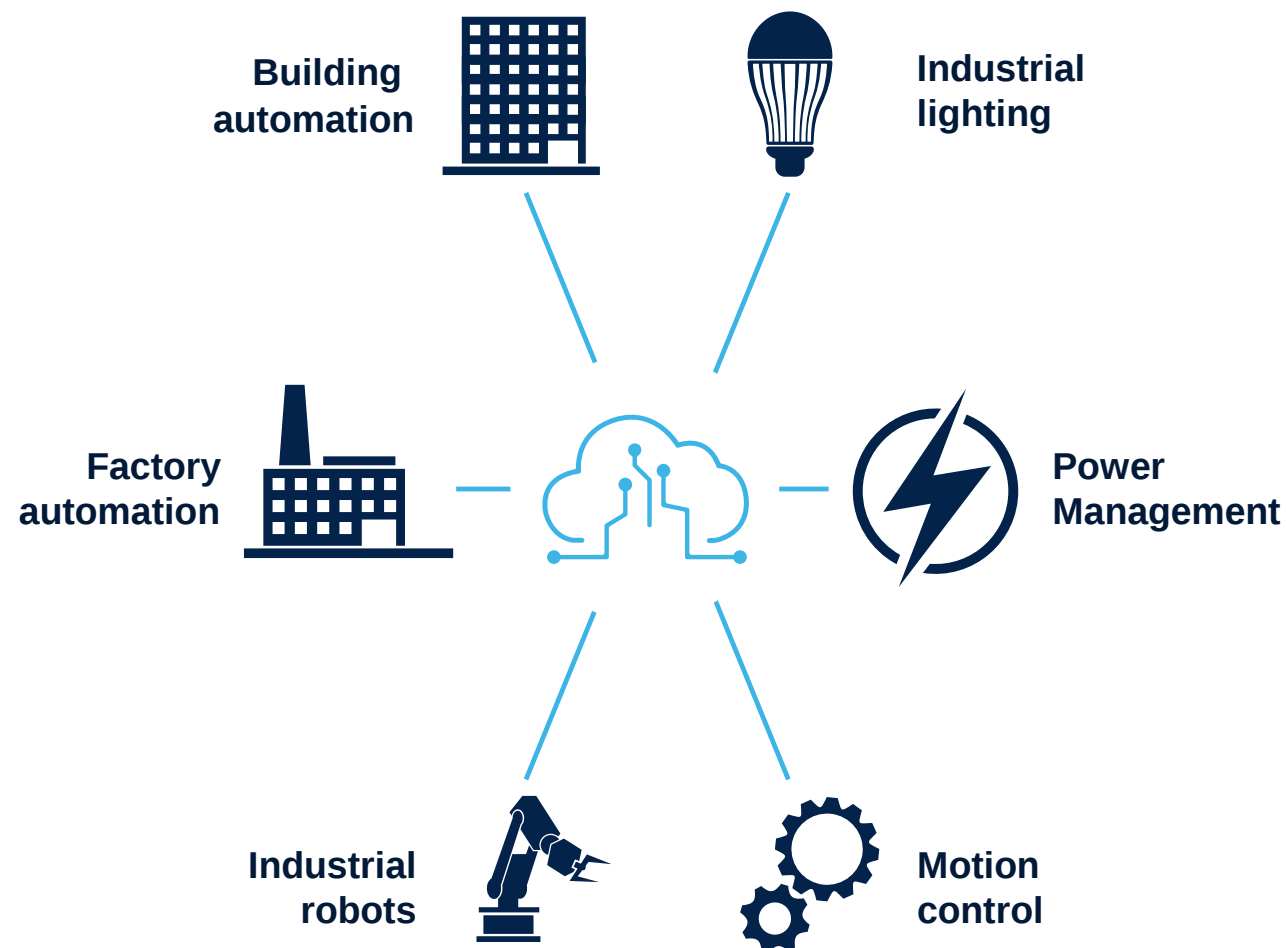
Microcontrollers & Secure solutions



Sensors & actuators

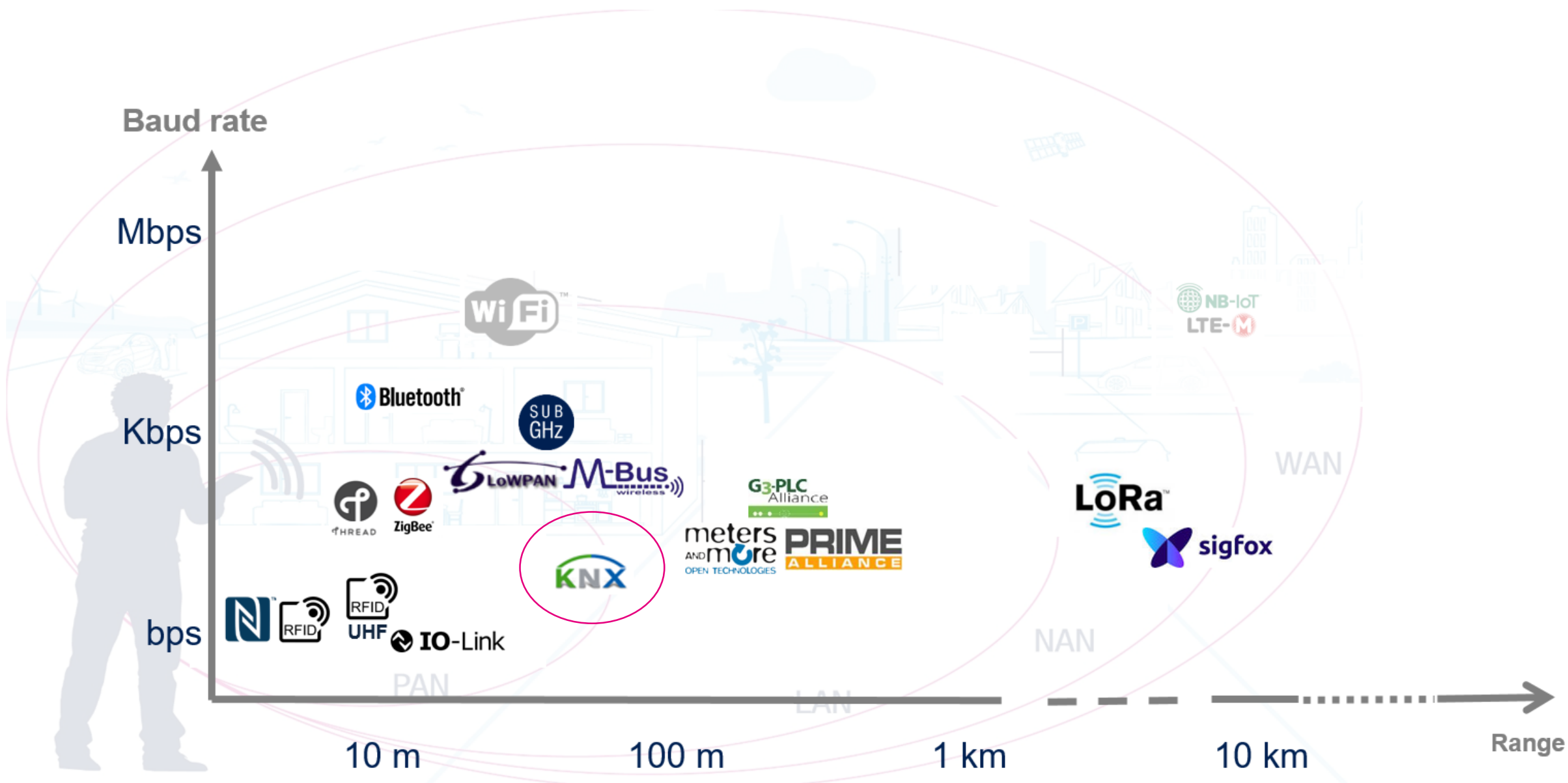


Analog & Signal conditioning



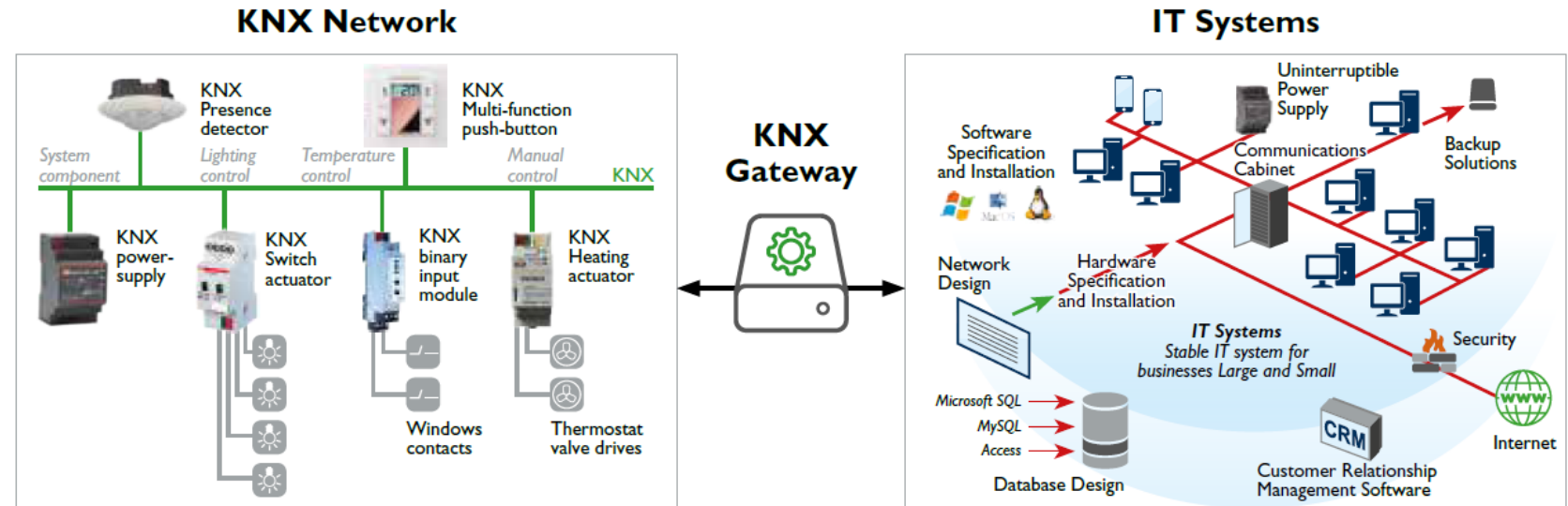
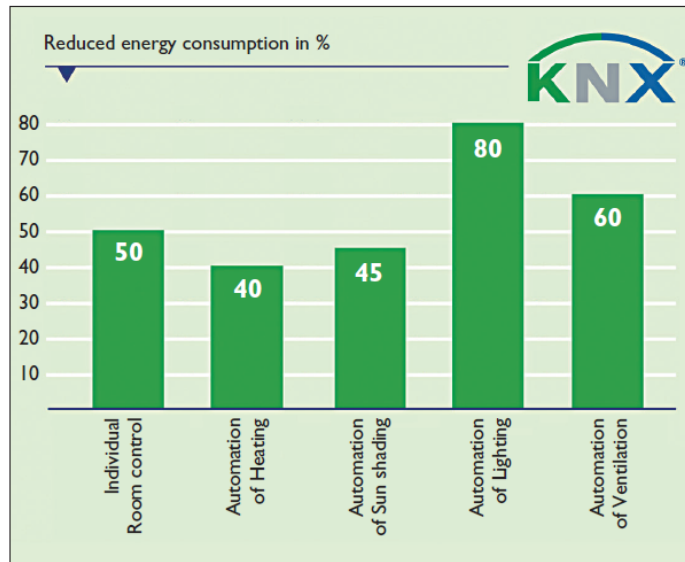
Connectivity

ST connectivity



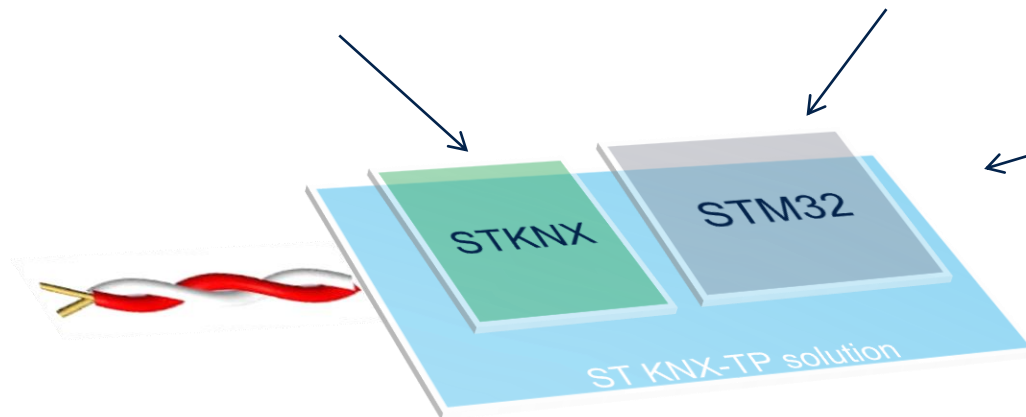
Low power consumption and compatible with IT systems

* KNX Energy Reduction



*Data Source: www.knx.org < [KNX-Basics_en.pdf](#) >

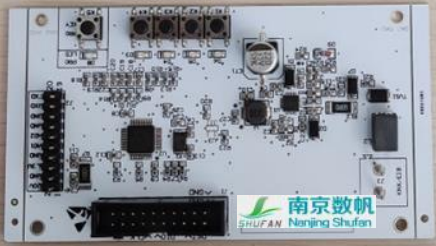
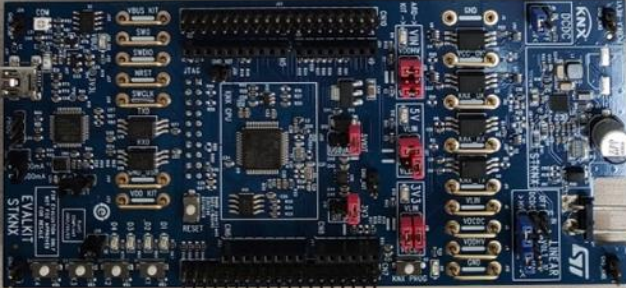
STKNX total solution



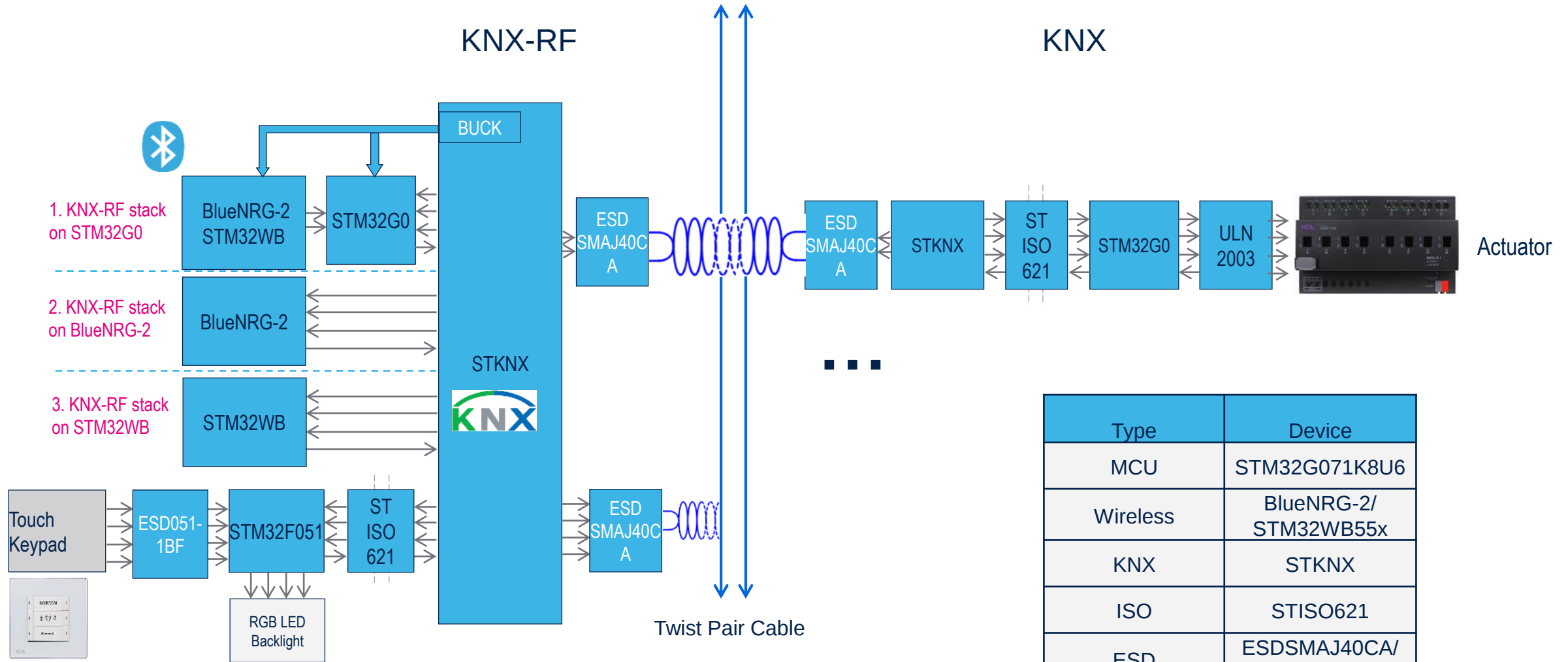
- STKNX third party partners
- Provide KNX protocol stack development support
- KNX product certification test



Home & building automation KNX demo and solution available

	GVSSTKNX1	32*24mm	STM32F051K8T6, STKNX	07B0	KNX stack integrated, use UART for data communication with external application MCU	GVS	SMD	Limited stock
	GVSSTKNX2	33*32	STM32F051K8T6, STKNX	07B0	KNX stack integrated, use UART for data communication with external application MCU	GVS	DIP	Need to order
	GVSSTKNX3	3*32 mm 94*53mm	STM32F030C8T6, STM32F051K8T6, STKNX	07B0	KNX core board plus external function expansion board, easy to extend the RS-485, Wifi, Bluetooth etc	GVS	DIP	Need to order
	USBSTKNX	52*23mm	STM32F1030C8T6, STKNX	07B0	Use to connect between PC & KNX bus, for ETS configuration tool	GVS	Micro USB	Need to order
	SFSTKNX1	100*60mm	STM32F071C8T6, STKNX	0705	Best evaluation board to evaluate/test with Shufan's KNX software/stack	Shufan	SWD, JTAG	Limited stock
	EVALKITSTKNX	155*70	STM32F1030C8T6, STM32F103RBT6, STKNX	NA	To evaluate the KNX transceiver with plenty of resource of user guide/application note/sch/PCB reference design and the miniature transceiver STKNX demonstration firmware for evaluation	ST	Mini USB, JTAG, SWD	Limited stock

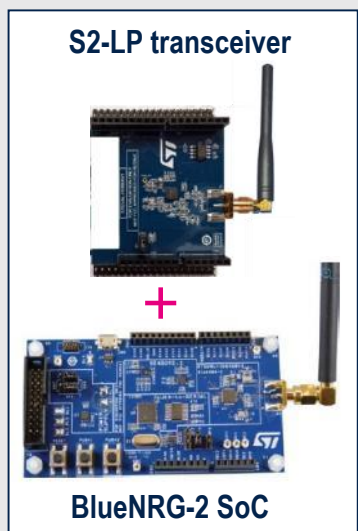
KNX-RF block diagram



Type	Device
MCU	STM32G071K8U6
Wireless	BlueNRG-2/ STM32WB55x
KNX	STKNX
ISO	STISO621
ESD	ESDSMAJ40CA/ ESD051-1BF
Driver	ULN2003

KNX ecosystem demo setup proposal

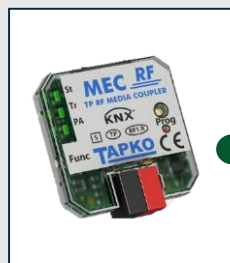
KNX-RF radio switch Settings using BLE



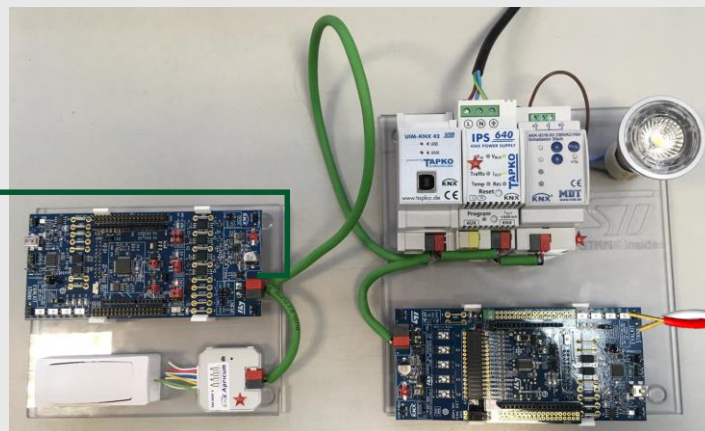
iOS BLE
application



KNX RF & TP
gateway

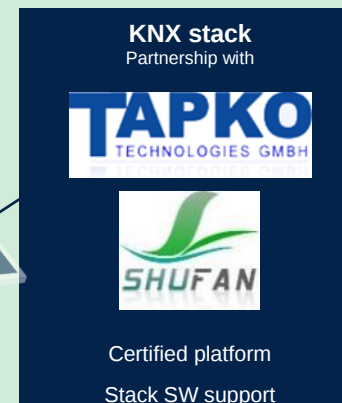
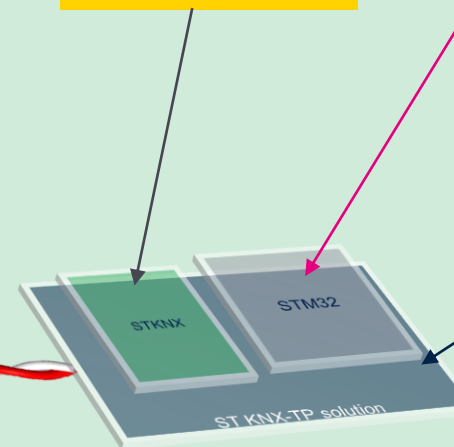
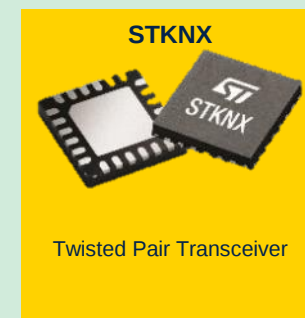


KNX-RF LED application

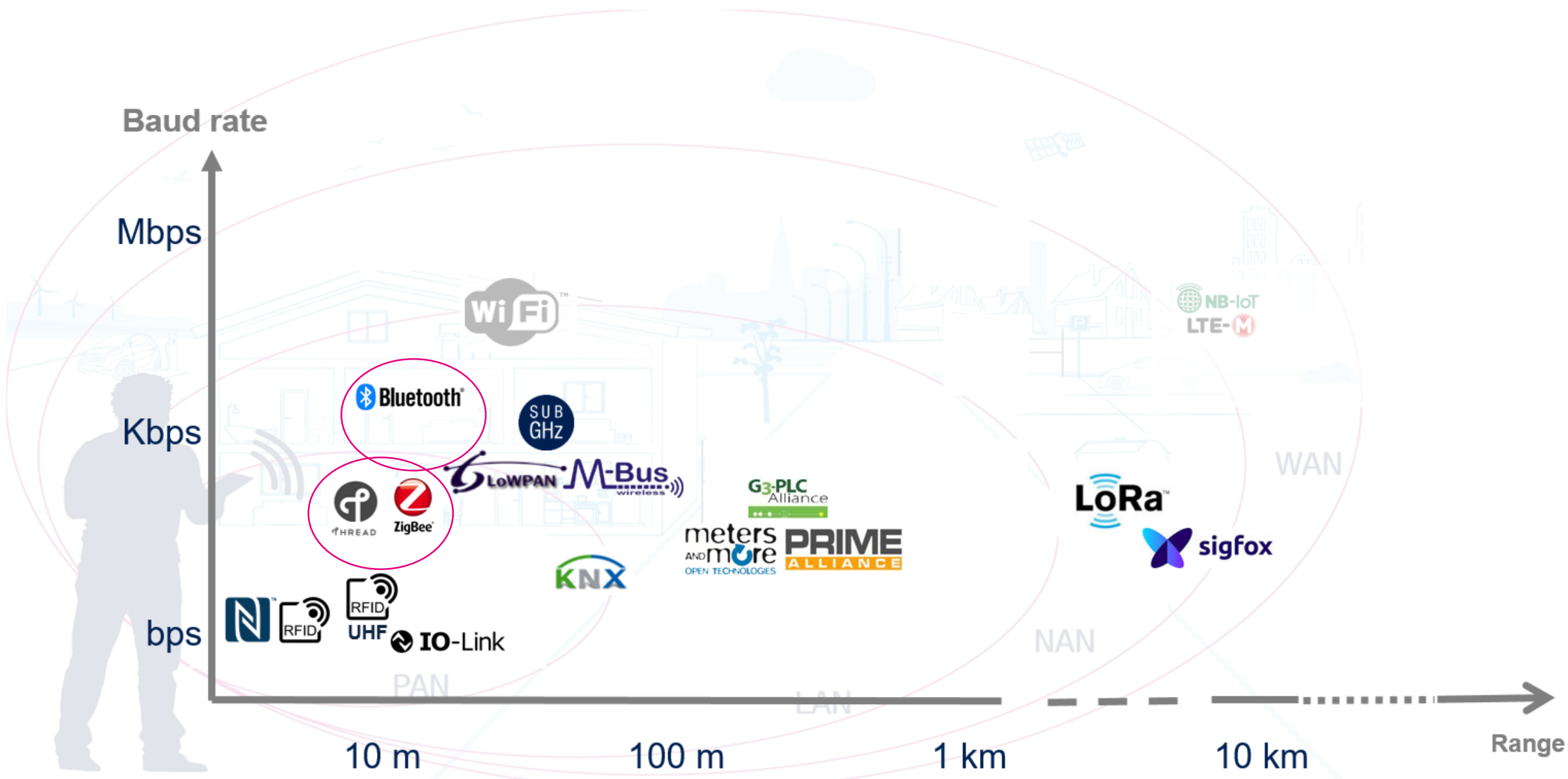


STKNX demo included

STKNX solution

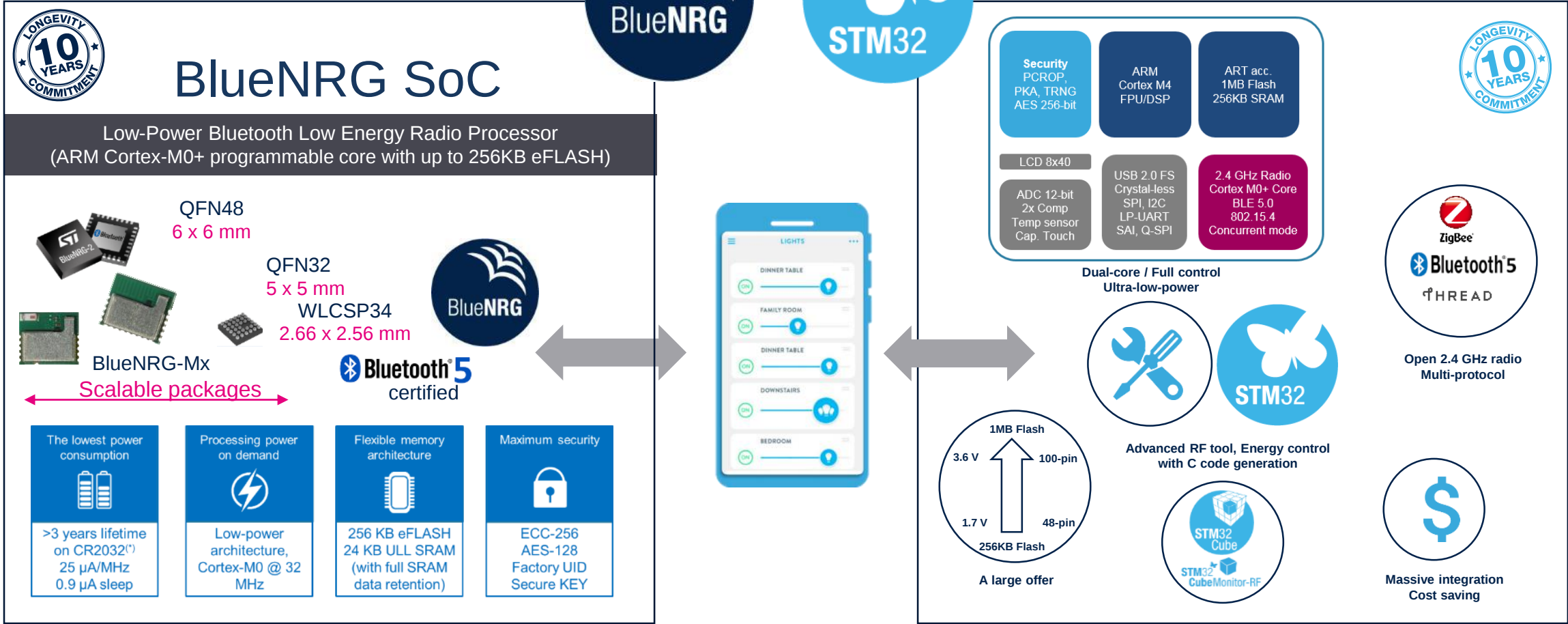


Bluetooth® Low Energy and 2.4 GHz



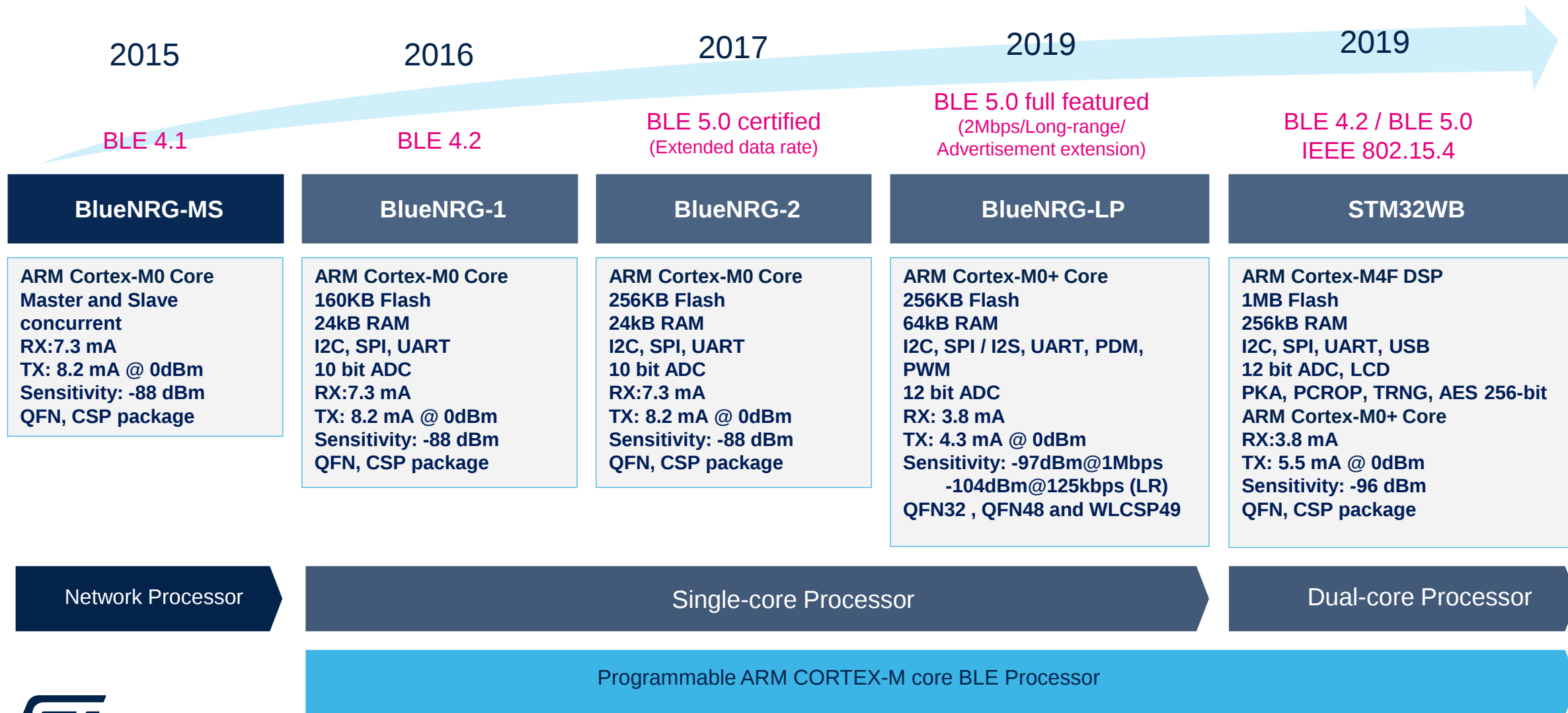


ST Bluetooth® Low Energy



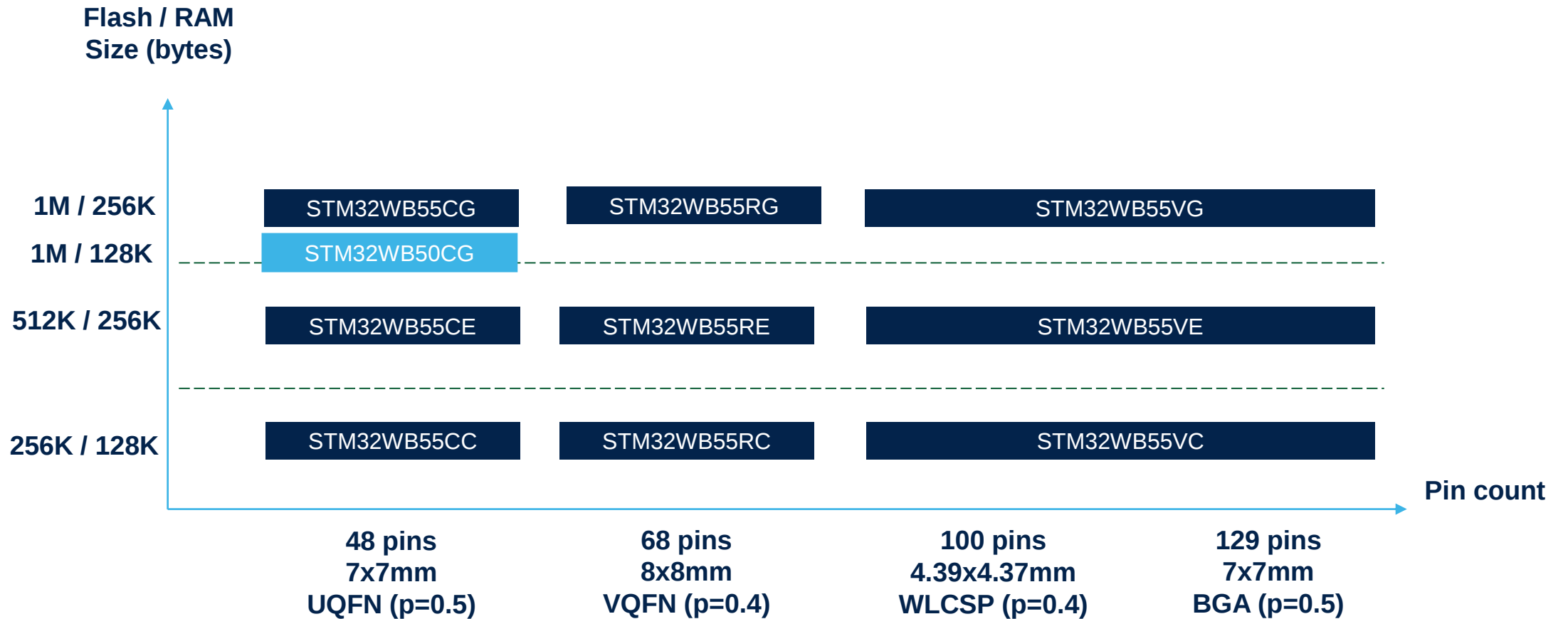


ST Bluetooth® Low Energy product roadmap





STM32WB5 series portfolio



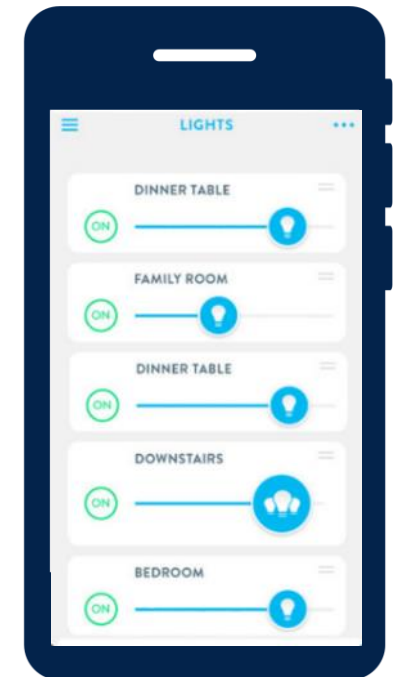


BlueNRG SoC for smart lighting

Bluetooth LE 5.0 certified SoC solution



 **Bluetooth[®] 5**
certified



Extended temperature range
-40°C to +105°C



BlueNRG SoC for audio streaming

Future in wireless audio starts today

BlueVoice: Voice streaming over Bluetooth Low Energy 5.0



STSW-BLUEMIC-1: Digital audio signal acquisition, compression, and transmission

Where:

- Audio Entertainment & Gaming
- Voice controlled TV remote
- Smart home
- Wearables

How:

- Audio @ 8-16 kHz
- Bitrate 32-64 kbps
- IMA **ADPCM** Codec
- Low latency and low power (4.5 mW in streaming)

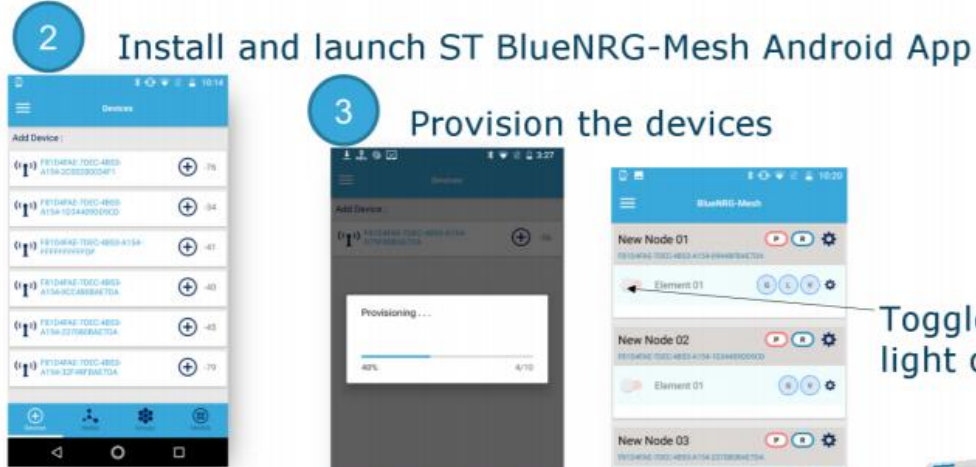




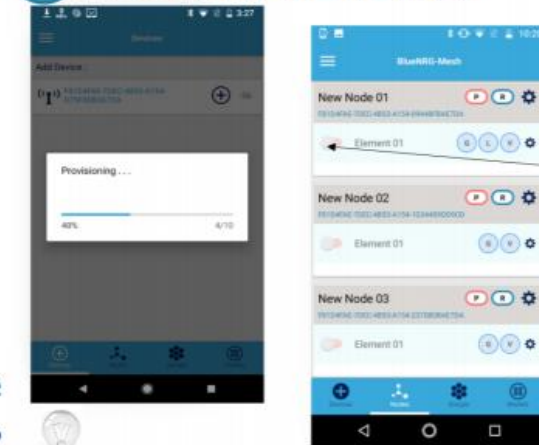
BlueNRG-Mesh DK Lighting and sensing demo

1 Download and flash the hex image

2 Install and launch ST BlueNRG-Mesh Android App



3 Provision the devices



Toggle this to turn the light on or off

Powerful **Getting starting Guide**

UM2180: Getting started Android

UM2361: Getting started iOS

4 Control the lighting device



STEVAL-IDB008V2



STEVAL-BLUEPLUG1



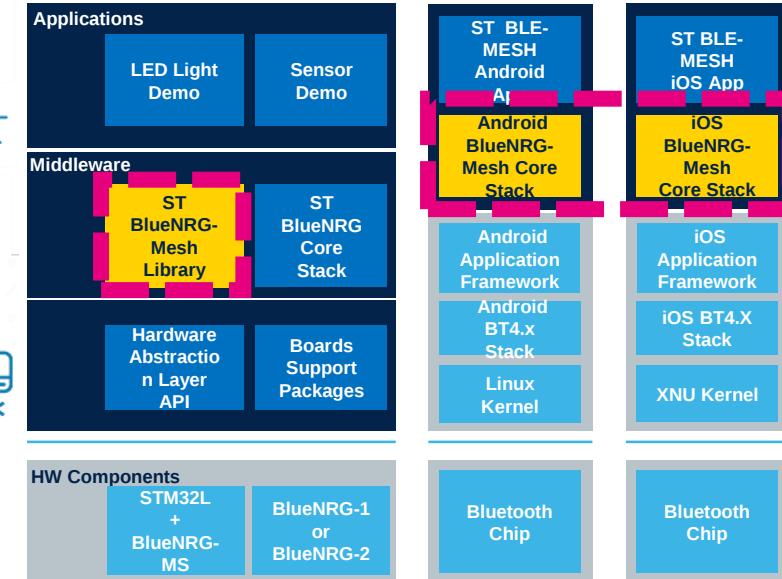
P-NUCLEO-WB55



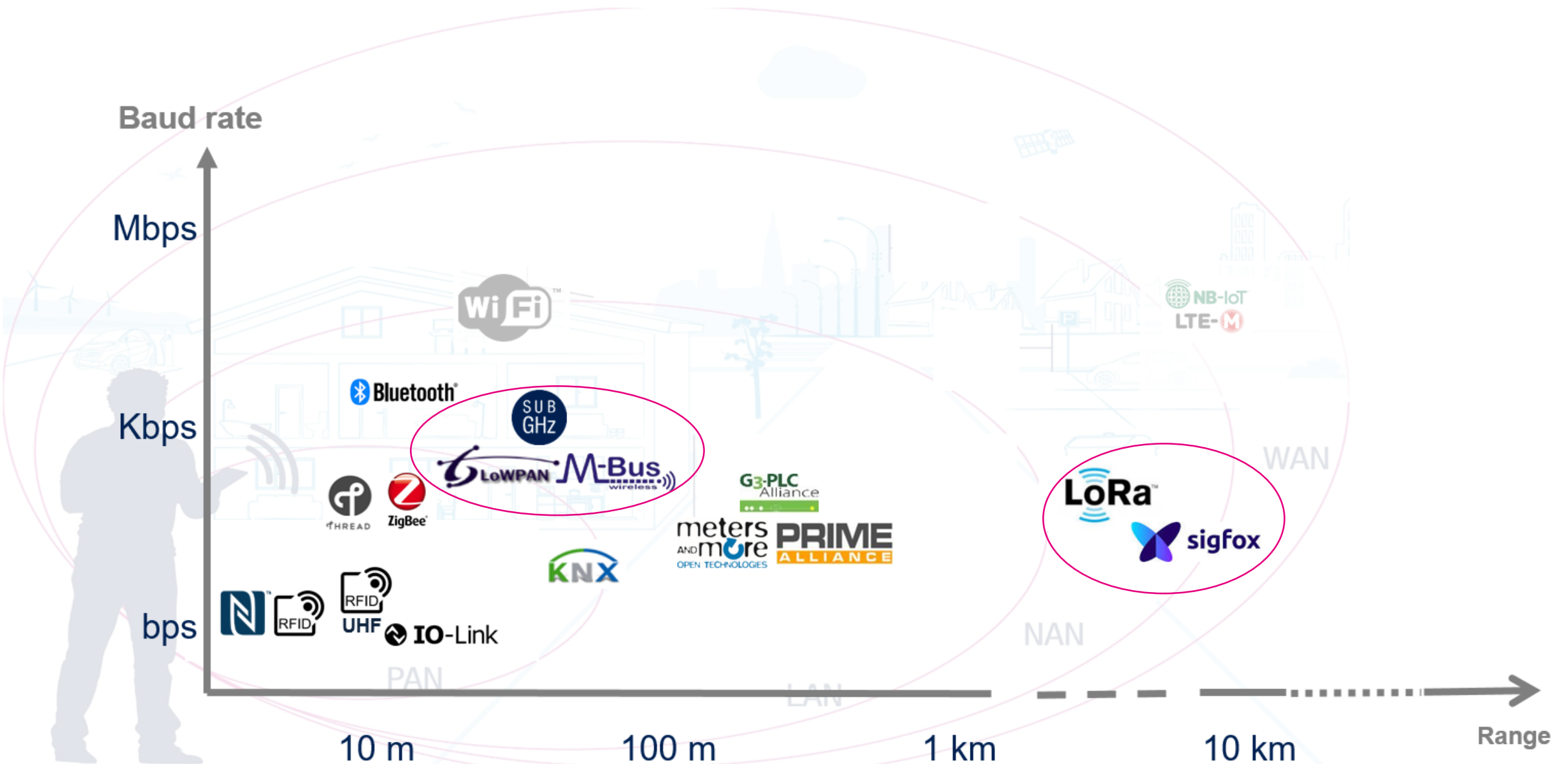
STEVAL-BCN002V1B



BlueNRG-MESH SDK Android SDK iOS SDK



Sub-1 GHz and LPWAN





Sub-1 GHz proprietary radio for the remote monitoring and control



150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz



SPIRIT1

- RX: **9.2 mA** / TX: **19.5 mA** @ +11 dBm
- Sleep/Stby: **850 nA** / **600 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-120dBm**
- Mod: 2(G)FSK, OOK
- QFN20 4x4

Home and Building
automation



Alarm Systems



Wireless sensor network



Smart Metering



Industrial Monitoring
and Control



413-479 MHz ●
826-958 MHz ●
452-527 MHz ●
904-1055 MHz ●



S2-LP / S2-LPCB

- RX: **7 mA** / TX: **10 mA** @ +10 dBm
- Sleep/Stby: **700 nA** / **500 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-130 dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4

S2-LPTX

- S2-LP Based Radio Transmitter



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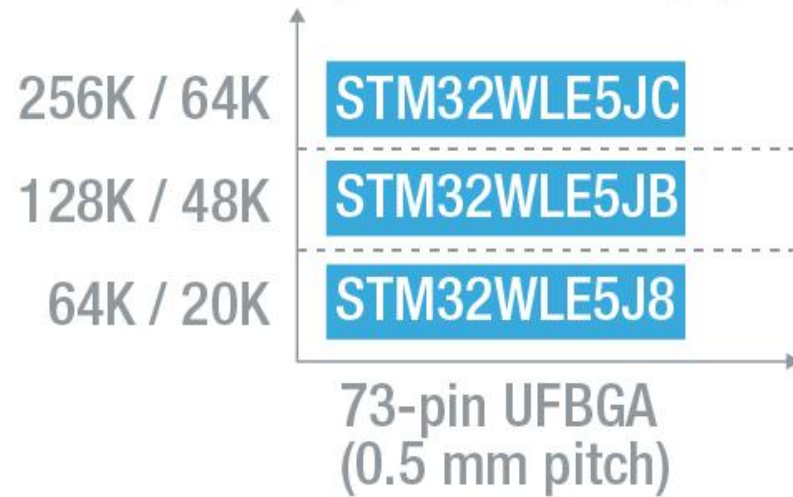


STM32WL – Portfolio and modulations



Up to 43 GPIOs for full flexibility
+
Tiny package footprint

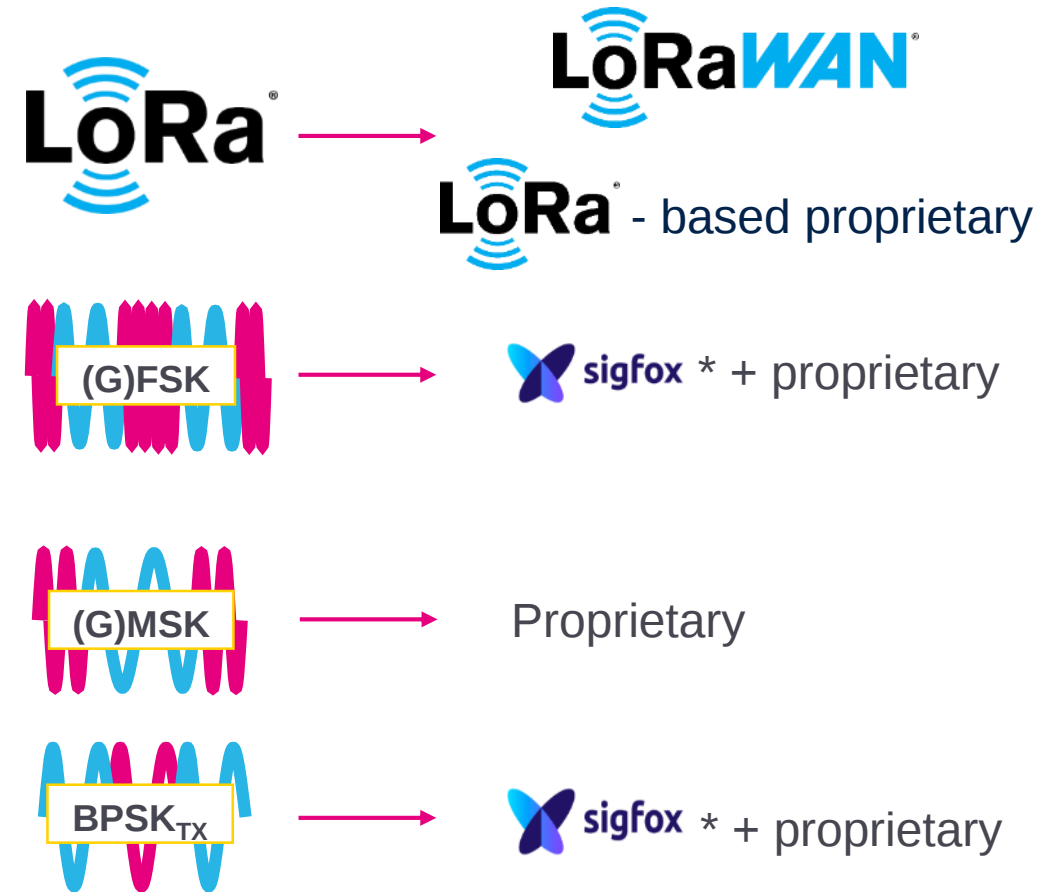
Flash memory / RAM size (bytes)



Legend: ■ In production



Pin count



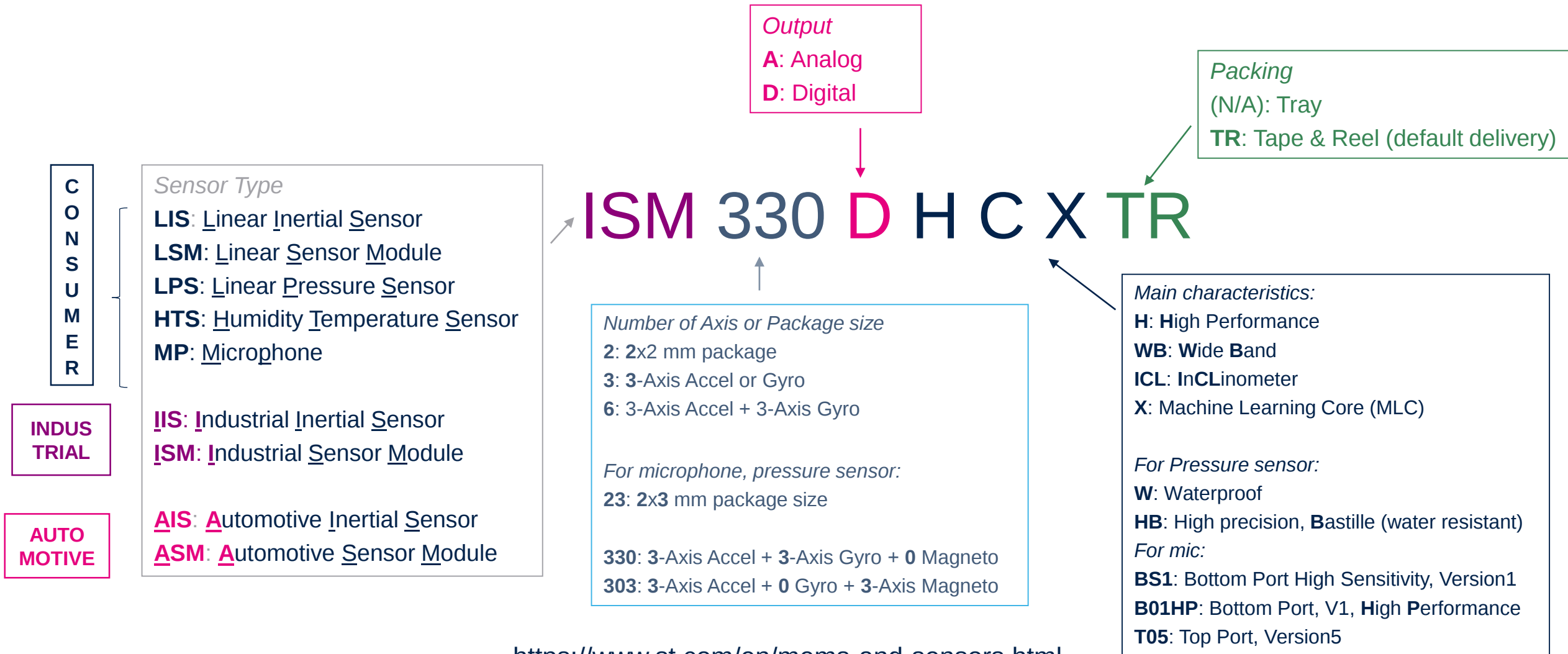
* Coming soon

Sensors

ST offer: Sensors & Motion MEMS

	Products	Applications
CONSUMER Features Wide offer, intro of new products Competitive price	 Accelerometers  iNEMO® Inertial Module  Temperature & Humidity Sensors  Digital Compasses  Pressure Sensors  MEMS Microphones	• IOT • Wearable • Alarm • Smart Home • Remote Control • Voice Assistant
INDUSTRIAL High Accuracy Dedicated products 10 Years Longevity	 Accelerometers  Gyroscopes  Temperature Sensors  Dedicated Accelerometers  iNEMO® Inertial Module 	• Industrial robot • Positioning • Tracking • Tilt • Vibration
AUTOMOTIVE AEC-Q100 >10 Years Longevity	 Accelerometers  Gyroscopes  iNEMO® Inertial Module	• Alarm • E-call • Telematic • Vehicle tracking

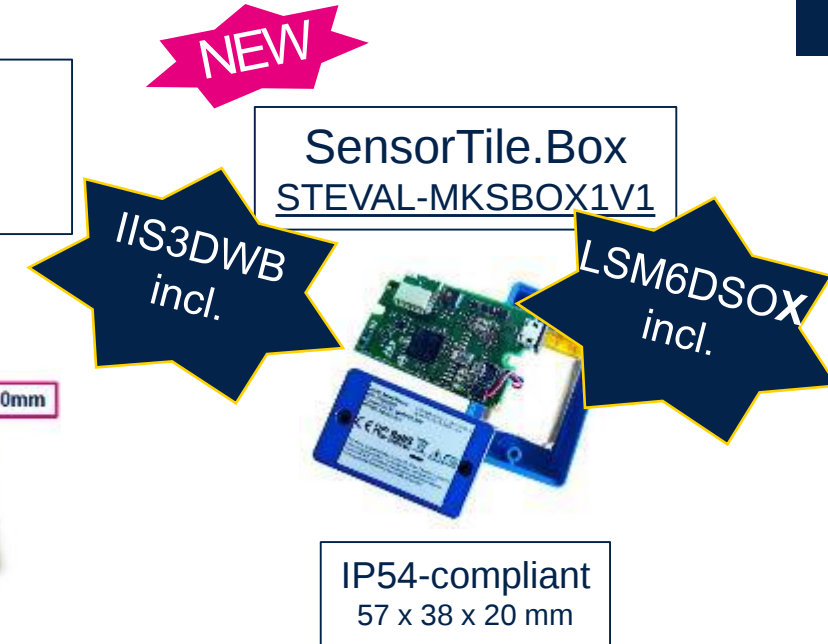
Sensors & Motion MEMS references*



<https://www.st.com/en/mems-and-sensors.html>

* This is a “general rule” – exception always exist

Main boards available

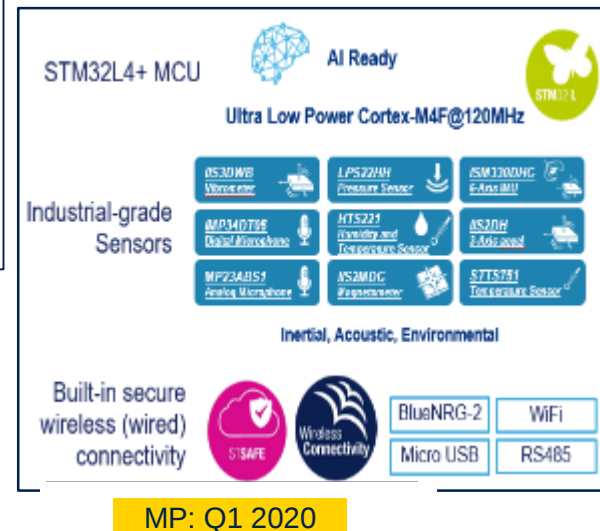


- **X-Nucleo for Consumer Sensors**
- **LSM6DSO**: 6-axis IMU
- **LIS2MDL**: Magnetometer
- **LIS2DW12**: Accelerometer
- **LPS22HH**: Barometer
- **HTS221**: humidity and temperature
- **STTS751**: temperature sensor
- **X-Nucleo for Industrial Sensors**
- **ISM330DHCX**: 6-axis IMU
- **IIS2MDC**: Magnetometer
- **IIS2DLPC**: Accelerometer
- **IMP34DT05**: Dig Microphone
- **DIL 24-pin**: Socket for MEMS adapters

In Mass Prod

- **Sensors**
- **LSM6DSO**: 6-axis IMU
- **LPS22HH**: Barometer
- **LIS2MDL**: Magnetometer
- **HTS221**: Relative Humidity & Temp
- **VL53L1**: Time of Flight
- **MP34DT05TR-A**: MEMS Microphone

In Mass Prod



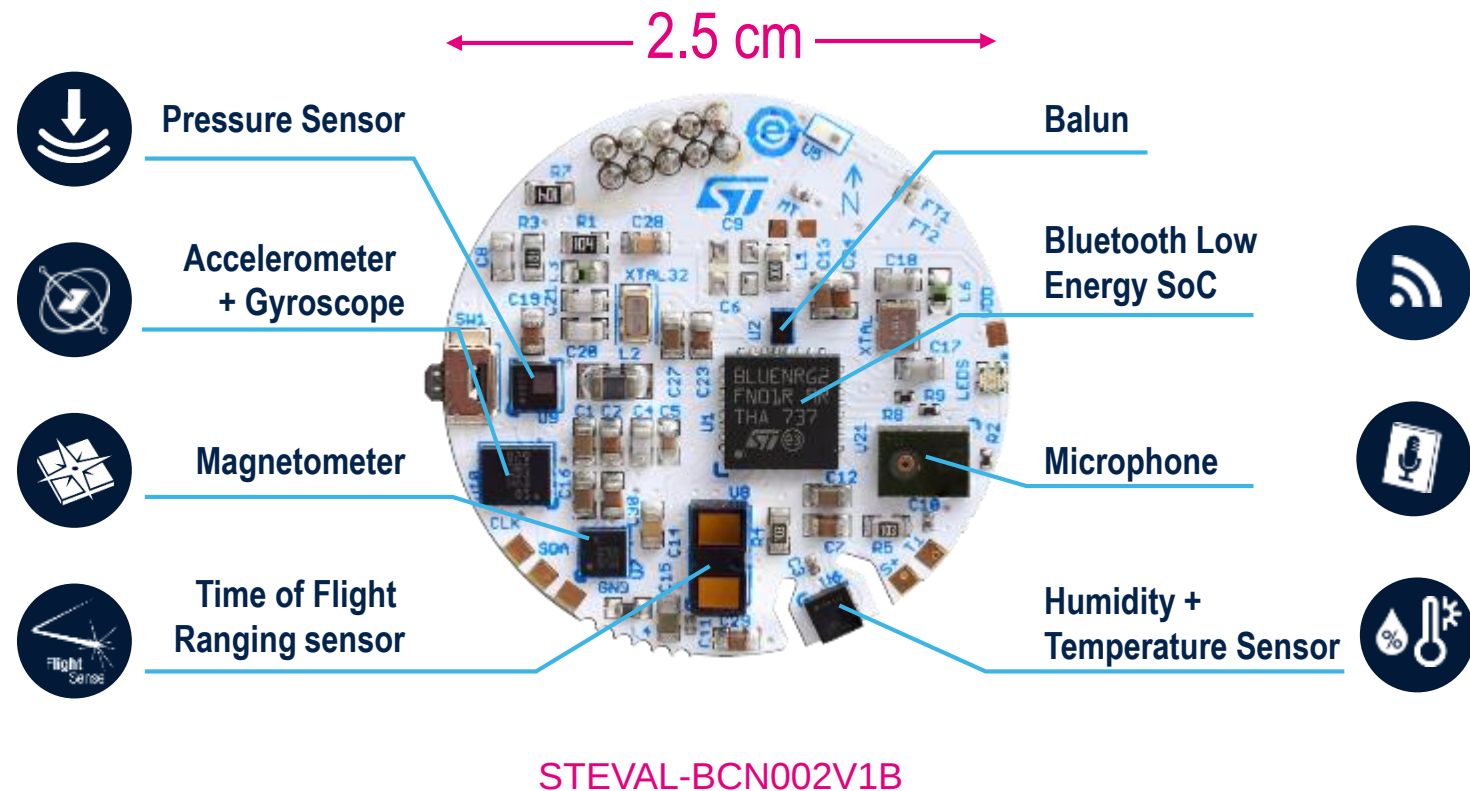
- **Sensors:**
- **LSM6DSOX**: 6-axis IMU with FSM & MLC
- **LIS2DW12 & LIS3DHH**: Accelerometer & Inclinator
- **LIS2MDL**: magnetometer
- **LPS22HH**: barometer
- **MP23ABS1**: wide band analog microphone
- **HTS221**: humidity and temp sensors
- **STTS751**: temp sensor

In Mass Prod



STEVAL-BCN002V1B - BlueNRG-Tile

Sensing, processing and streaming



2 LAYER PCB

FCC/CE certified



Ultra-low-power software libraries & ready-to-use SW development kits for

Motion Algorithms

Gesture and Activity recognition

[\[STSW-BLUETILE-DK development kit\]](#)

Voice over BLE

High quality voice capturing and compression

[\[STSW-BLUETILE-DK development kit\]](#)

BLE Mesh

Range-extending networks with duplex communication

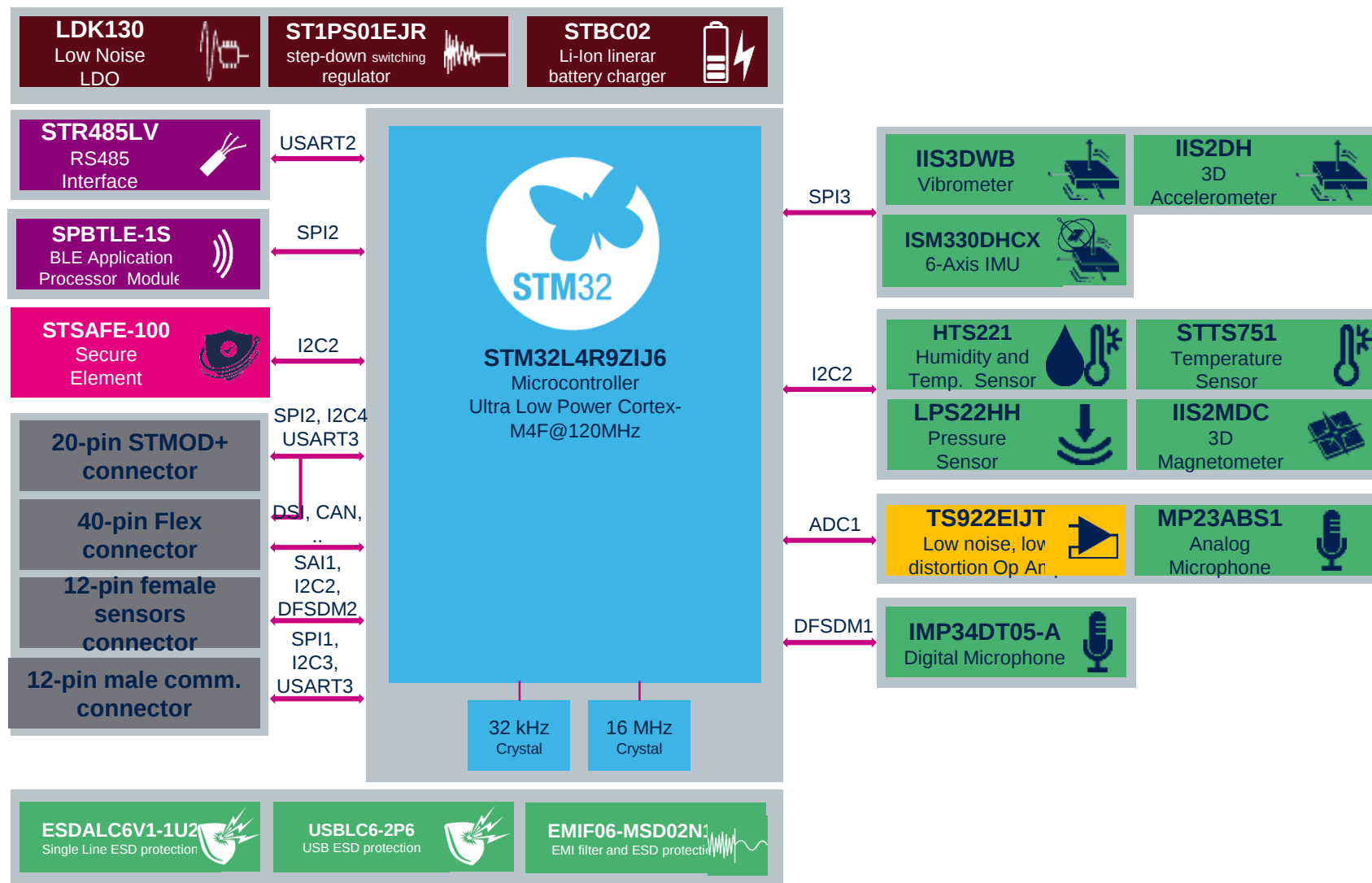
[\[STSW-BNRG-MESH development kit\]](#)



STEVAL-STWINKT1

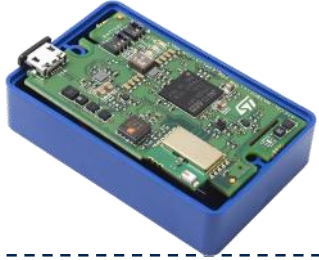
Block diagram, ICs and features in one slide

- Power supply: Li-Po battery or ext. 5V
- Best-in-class Industrial Grade Sensors (i.e. ultrasound detection, to vibration analysis)
- Smart Power to increase battery life
- Multiple algorithms running on the STM32L4+
- Secure Connection and Authentication with **STSAFE-100** (footprint)
- BLE Connectivity
- Connectivity and sensor expansions support
- USB and SD-Card holder



Sensortile.Box

Sensing, processing, power management & connectivity



Motion Sensors



Low-power 6-axis IMU,
embedding Decision tree logic
LSM6DSOX



High-performance inclinometer
and low power accelerometer
LIS3DHH & LIS2DW12



Magnetometer
LIS2MDL

Environmental Sensors



Altimeter / Pressure sensor
LPS22HH



Accurate temperature sensor
STTS751



Humidity sensor
HTS221



Analog wide-band microphone
MP23ABS1
+ TS922EIJT OpAmp

Processing



STM32L4 low-power MCU
STM32L4R9ZIJ6

Connectivity



Bluetooth Low Energy Module
SPBTLE-1S

Power management & Analog



STBC02 - Battery charger
STBB3JR - Buck / Boost DCDC
LDK130 - Linear Voltage Regulator
USBLC6-2SC6 - ESD protection

Authentication & IoT secure solutions

Authentication

Multiple Secure Applications in two main segments



Peripherals



Consumables

Brand Protection



IoT nodes



Gateways

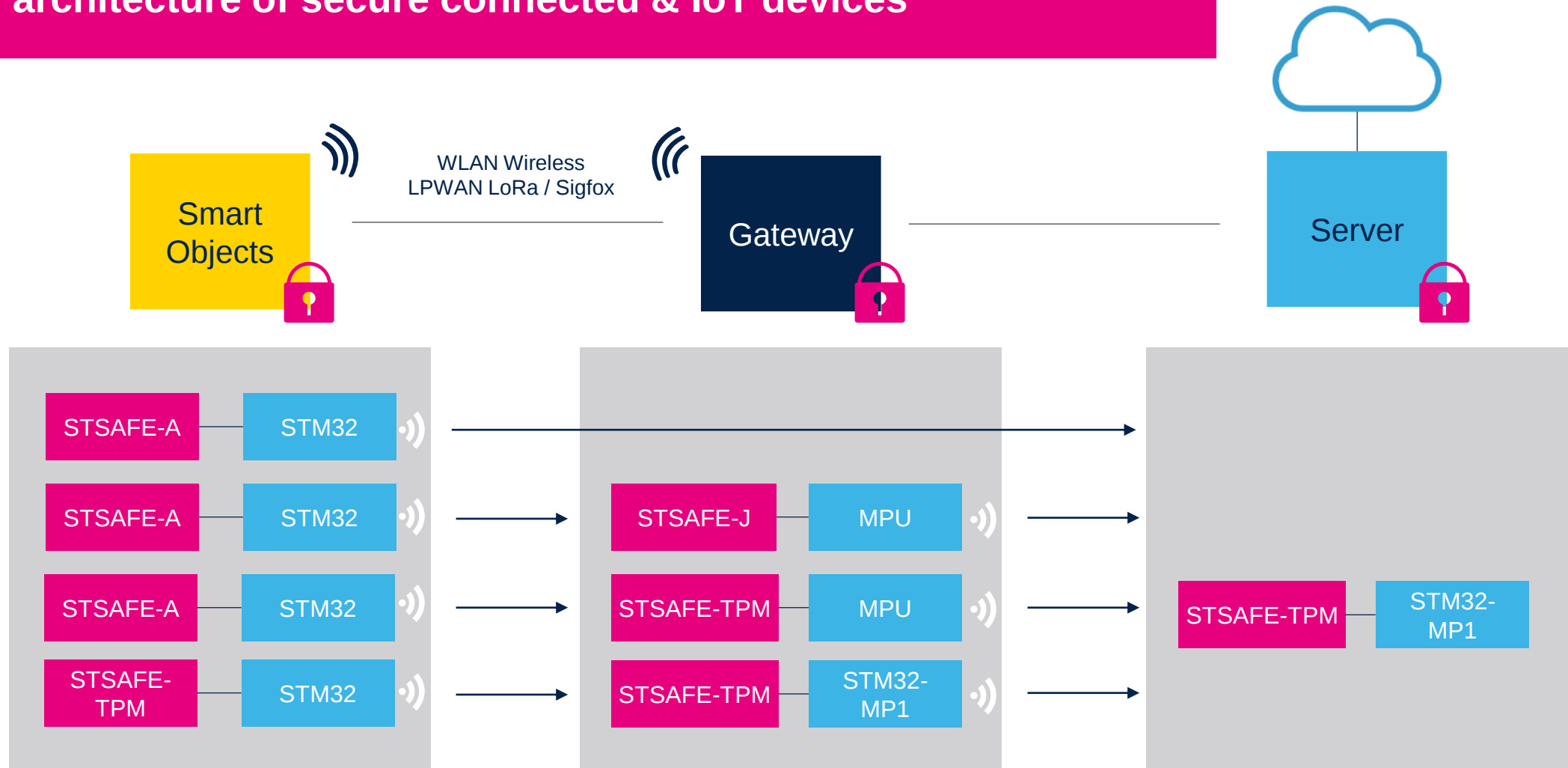


Computer & Servers

Security for connected devices

Secure connected devices

Typical architecture of secure connected & IoT devices



STSAFE™ family secure element

Security certified solutions from IoT nodes to IoT infrastructure

HW CERTIFIED CC EAL5+

Optimized

STSAFE-A

- Fixed features set:
 - Authentication
 - Secure connection establishment
 - Secure storage
 - LPWAN LoRa / Sigfox compliant
- Personalization services
- Seamless integration with STM32 ODE package

CERTIFIED CC EAL5+, BSI

Flexible

STSAFE-J

- Javacard based OS
- Applets specific features set:
 - Authentication
 - Secure connection establishment
 - Secure storage
- Personalization services
- Linux based MPU Development kit

CERTIFIED CC EAL4+, TCG 2.0, FIPS140-2

Standardized

STSAFE-TPM

- Platform integrity
 - Secure Boot
 - Secure Firmware upgrade
- Trusted network access
- Secure storage
- Linux based MPU Development kit



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Power & SPIN Microsite



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