Sub-track III – IoT & Connectivity Presentation
STM32 wireless & IoT solutions

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Wireless Product Marketing, APAC
STMicroelectronics
Leverage billions of devices at the Edge!

**Data center Cloud**
Analytics, storage, compute

**Edge nodes**
IoT gateways, micro datacenters

**Edge things**
Real time, local processing

Distributed artificial intelligence approach
The STM32 portfolio

Five product categories

- **Wireless MCU**: Short- and long-range connectivity
- **Ultra-low-power MCU**: 32-bit general-purpose microcontrollers: from 75 to 3,224 CoreMark score
- **Mainstream MCU**: 32- and 64-bit microprocessors
- **High-performance MCU**: 32- and 64-bit microprocessors
- **Embedded MPU**: 32- and 64-bit microprocessors

Enabling edge AI solutions
Scalable security
ST solutions: Sub-1G, and 2.4G
Sub-1 GHz markets

- Smart industry
- Smart city
- Smart home
- Smart agriculture

- Asset tracking
- Metering
- Alarm system
- Heat cost allocator

STMicroelectronics serves all markets
System-on-chip made for versatility

A long-range wireless microcontroller: one die, many IoT possibilities

World first!

Single Silicon Die

STM32L4 + LoRa® (G)FSK (G)MSK BPSK + Arm® Cortex®-M0+ = STM32WL
STM32WL
Sole LoRa-enabled SoC in the world

System-on-Chip (SoC)
Only one Silicon die in one package

The integration pyramid

- **System-in-Package**
  - Different silicon dice inside the same package
  
  ![Image of silicon dice inside package](source: PTI Blog)

- **Module**
  - Different packages on a very tiny piece of re-packaged PCB

- **PCB**
  - Different discrete packages on a BIG electronic board
Ultralow-power ANALOG SENSING UNIT
L-C based measurement of fluid flow metering

• Designed for cost-effective mechanic-wheel fluid metering
  • Measuring of L-C network oscillations enable detection of fluid flow metering

• Feature is based on L-C network oscillation measurement
  • Supporting up to 3x L-C networks
  • Autonomous metering circuitry (no MPU intervention, Cortex M0+ in deepstop)
  • Very few µA average current for continuous L-C metering

STM32WL ultralow power LC sensor controller (LCSC)
STM32WL

Extended battery life: dedicated wake-up radio

Ultralow-power wireless proximity detection and system wake-up

**Wide band:** 1 single BOM for worldwide ISM (100MHz – 2.4GHz)

<5μA
Continuous RX

Dedicated to proximity detection (tens of meters) ~-50dBm sensitivity

OOK modulated packet detection

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**Asset tracking application**

- Local or LPWAN gateway
- In-door beacon
- Wake-up signal
- Asset tracker dashboard

**Metering application**

- Walk-by/drive-by gateway
- Wake-up signal
- Proprietary signal
- Meter icon
- M-Bus icon
2.4G markets
matter makes connected home simple

“Smart home devices should be secure, reliable, and seamless to use. And with Matter, they are.”

The Connectivity Standards Alliance

- **A great user experience**
  Matter ensures connected objects from multiple brands can work together seamlessly

- **Wide adoption**
  Matter is an application layer which addresses many applications in an open-source delivery and certification infrastructure

- **Release V1.0 Q4’2022**
# STM32 MCU 2.4 GHz portfolio

## STM32WB series
- **MCUs**
  - STM32WB55
  - STM32WB35
  - STM32WB15
  - STM32WB50
  - STM32WB30
  - STM32WB10
- **Modules**
  - STM32WB5M
  - STM32WB1M

## STM32WBA series
- **STM32WBA52**
  - Arm® Cortex®-M33 / TrustZone® 100 MHz
  - 1 Mbyte of flash memory / 128 Kbytes of RAM
  - Up to +10 dBm output power

## BlueNRG series
- **System on Chips**
  - BlueNRG-1
  - BlueNRG-2/2N
  - BlueNRG-LP
  - BlueNRG-LPS

## STM32WB0 series
- **STM32WB09**
  - Arm® Cortex®-M0+ at 64 MHz
  - 512 Kbytes of flash memory / 64K bytes of RAM
  - Bluetooth® Low Energy 5.3 (long range, 2 Mbps, Adverting ext, AoA/AoD, Isochronous channel)
  - Up to +8 dBm of output power
Integrated 2.4GHz radio
Bluetooth® Low Energy 5.4 (long range, 2Mmps, advertising extension)
+10 dBm output power

High performance
- Arm® Cortex®-M33 at 100MHz
- 407 CoreMark score
- 100 K cycles for 256 Kbytes of Flash

Enhanced security
- TrustZone® technology, target SESIP Level 3

Leveraging STM32U5 ultra-low-power platform
- Low-power direct memory access (LP-DMA)
- Flexible power-saving states with fast wake-up times
- Same digital and analog peripherals

Built using 40nm process technology

An ultralow power Bluetooth® Low Energy 5.4 platform
STM32WBA increases security in wireless devices

Extensive functionalities to protect your assets

<table>
<thead>
<tr>
<th>Security services</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32Trust TEE TF-M</td>
</tr>
<tr>
<td>Secure boot &amp; secure updates</td>
</tr>
<tr>
<td>Secure firmware install</td>
</tr>
<tr>
<td>NIST - CAVP certified CryptoLib</td>
</tr>
</tbody>
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State-of-the-art security assurance level

New features for STM32WBA are highlighted
Matter over thread: ST available demonstration

**Bridge device demonstration**

- **Matter Thread Border Router**
  - MP157F-DK2
  - OpenThread
  - Border Router

- **Ethernet Commissioning & Control**

- **STM32 Matter bridge**

- **Optional wired or wireless connectivity**

- **Nucleo-H753 Matter & Ethernet**

- **Non Matter environment**

**End device demonstration**

- **Matter Thread Border Router**
  - MP157F-DK2
  - OpenThread
  - Border Router + Access Point

- **RCP**

- **Nucleo-WB Thread**

- **End Device**
  - STM32WB-DK
  - Matter Thread & BLE

**Smartphone**

- **Matter app**
  - Wi-Fi
  - BLE

**BLE Commissioning**

**Control**

**Thread**
What’s more.....
Le audio unicast / broadcast

- Connected Audio Stream
- One-to-One
- Bidirectional

- Broadcasted Audio Stream
- One-to-many
- Unidirectional
Setup - many source many sink

Music Source (Laptop or Smartphone with 3.5mm jack output)

Public Broadcast Source 1

Use joystick to switch source

Public Broadcast Sink

Public Broadcast Source 2

Use joystick to switch source

Public Broadcast Sink

Public Broadcast Source 3

Use joystick to switch source

Public Broadcast Sink
Available as a module to reduce your time to market
STM32WB5M - module

Easy to integrate - Light certification for customer

Key advantages

• WLCSP100 package integrated
• Maximum of features exposed
• Low-cost PCB for the mother board
STM32WB1M - module

Easy to integrate - Light certification for customer

Key advantages

- **STM32WB15 MCU** with 320KB flash and 48KB RAM

- Internal antenna, as well as pins for attaching an external antenna.

- **STM32CubeWB MCU package** provides resources including hardware abstraction layer (HAL) firmware, Low-Layer APIs, File system, and RTOS
IPD (integrated passive device)
IPD* - basic RF system

Two blocks required

- **Matching Network** – Transformation to 50 Ω impedance
- **Harmonic Filter** – Reduce out-of-band TX harmonic emissions and RX susceptibility

*IPD: Integrated Passive Device*
STM32 IPD integrated passive device

STM32WL RF Front end in a 1.2mm²

BEFORE

Wireless MCU
Discrete balun & matching network

11 discretes 72 mm²

AFTER

RF IPD balun & matching network

1 component 1.2 mm²
RF IPDs products companion chip to STM32WL
how to pick up the right one

STM32WL

862-928 MHz

- High-Power mode 22dBm
  - 4-layer PCB
  - BALFHB-WL-01D3
- Low-Power mode 15dBm
  - 4-layer PCB
  - BALFHB-WL-04D3

470-530 MHz

- High-Power mode 22dBm
  - 2-layer PCB
  -BALFHB-WL-03D3
  - 4-layer PCB
  - BALFHB-WL-02D3
- Low-Power mode 15dBm
  - 4-layer PCB
  - BALFHB-WL-05D3
  - 2-layer PCB
  - BALFHB-WL-06D3

BAL=balun
F = Filter
HB = high-band
LB = Low-band
WL=STM32WL
D3= CSP package

N: FE= Tours,
BE=Shenzhen
237: W37-2022
G: ecopack2/Rohs
STM32 ecosystem for developers

Hardware development tools
- Evaluation boards
- Debug & programming probes

Software development tools
- Configuration, development, debugging & monitoring tools

Embedded software
- Drivers
- RTOS
- Stacks & application bricks

Information and sharing
- Developer zone
- Product selectors
- Wiki, GitHub
- Communities & social media

Ecosystem

Open source
Partners
Designed by ST
Key takeaway: end-to-end ecosystem

Software tools

1. Configuration
   - STM32CubeMX
   - STM32CubeIDE

2. Development
   - STM32CubeIDE
   - IAR SYSTEMS
   - arm KEIL

3. Programming
   - STM32CubeMPROgrammer

4. Monitoring
   - STM32CubeMonitor

Embedded software

STM32Cube MCU Package

STM32Cube Expansions & Function Packs

Drivers

Middleware

User application

LoRaWAN

Bluetooth

OpenThread

sigfox

Z-Wave
Prototyping made as easy as 1,2,3

STM32CubeMX/STM32CubeWB/STM32CubeProg & STM32CubeMonitor
Code generation
Power calculation
What’s more……

BLE Sniffer by STM32WB55-Nucleo EVM
What ST offers (Today’2023)

Short Range
- BLE Application Processors
- BLE Network Co-Processors
- Thread
- Zigbee
- Ultra Wideband
- 60 GHz Contactless
- matter

Long Range
- LoRaWAN
- Sigfox
- Wireless M-Bus
- KNX-RF
- Wi-Sun
- LoWPAN
- 6LoWPAN
- Sub-1GHz
- Proprietary Sub-1GHz
- Narrowband-IoT (NB-IoT)

AND MORE…… TO BE CONTINUED

st.com/en/wireless-connectivity.html
Our technology starts with You