



STR20 - STM32WB (BLE/Thread/Zigbee)

This course describe the STM32 WB architecture and practical examples

Objectives

- Understand dual-core WB: CM4 (app) + CM0+ (wireless coprocessor).
- Install/verify FUS and wireless stack images (BLE/Thread/Zigbee).
- Use IPCC/TL/ACI to drive the stack; handle events and errors.
- Build BLE GAP/GATT apps (services, security, notifications).
- Bring up Thread or Zigbee nodes (commissioning, messaging).
- Explore multiprotocol (BLE + 802.15.4) basics and constraints.
- Apply low-power with RF, measure impact, and set TX power.
- Prepare OTA/DFU, NVM/bonding data, and a production checklist.

Course Environment

- Theoretical course
 - PDF course material (in English) supplemented by a printed version for face-to-face courses.
 - Online courses are dispensed using the Teams video-conferencing system.
 - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- Practical activities
 - Practical activities represent from 40% to 50% of course duration.
 - Code examples, exercises and solutions
 - For remote trainings:
 - ▶ One Online Linux PC per trainee for the practical activities.
 - ▶ The trainer has access to trainees' Online PCs for technical and pedagogical assistance.
 - ▶ QEMU Emulated board or physical board connected to the online PC (depending on the course).
 - ▶ Some Labs may be completed between sessions and are checked by the trainer on the next session.
 - For face-to-face trainings:
 - ▶ One PC (Linux ou Windows) for the practical activities with, if appropriate, a target board.
 - ▶ One PC for two trainees when there are more than 6 trainees.
 - For onsite trainings:
 - ▶ An installation and test manual is provided to allow preinstallation of the needed software.
 - ▶ The trainer come with target boards if needed during the practical activities (and bring them back at the end of the course).
- Downloadable preconfigured virtual machine for post-course practical activities
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

Day 1

Dual-core & wireless stack overview

- CM4 app vs CM0+ network.
- FUS role and lifecycle.
- Stack images (BLE/Thread/Zigbee).
- Flash/NVM partitions.
- RF basics: SMPS/VDDPA/TX power.

Exercise: Stack check

Transport layers: IPCC / TL / ACI

- IPCC channels & mailboxes.
- TL scheduler & queues.
- ACI/SHCI command flow.
- Event callbacks pattern.
- Error & reset handling.

Exercise: Event logger

Project bring-up (CubeWB/CubeMX)

- Clocking for RF (HSE/LSE).
- GPIO/LED/Button/UART.
- BD_ADDR selection policy.
- Minimal main loop + TL task.
- Build & debug checklist.

Exercise: App skeleton

BLE basics: GAP/GATT

- Roles: peripheral/central.
- Advertising & scanning.
- GATT services/chars/UUIDs.
- CCCD & properties.
- Conn params (interval/latency).

Exercise: Custom service

BLE security & power

- Pairing/bonding basics.
- Passkey/Numeric compare.
- Privacy (RPA) overview.
- Adv interval vs current.
- TX power vs range.

Exercise: Pair & measure

Day 2

BLE notifications & throughput

- Notify vs indicate.
- ATT_MTU & data length.
- App buffer strategy.
- Flow control tips.
- Error stats & retries.

Exercise: Notify demo

BLE central role (scan/connect)

- Filtered scanning.
- Auto-connect policy.
- GATT client reads/writes.
- Service discovery.
- Multi-link notes.

Exercise: Simple central

802.15.4 & Thread (track A)

- PHY/MAC channels.
- OpenThread roles.
- Network dataset.
- CoAP/UDP quick use.
- Commissioning steps.

Exercise: Thread pair

Zigbee (track B)

- Coordinator/Router/EndDev.
- Clusters & endpoints.
- On/Off cluster basics.
- Binding/groups.
- Commissioning flow.

Exercise: Zigbee on/off

Multiprotocol overview

- Time-sliced scheduling.
- BLE + 802.15.4 co-exist.
- Radio timeslots & limits.
- NVM sharing & keys.
- Typical use cases.

Exercise: Dual-role demo

Day 3

OTA/DFU & FUS workflows

- App OTA over BLE.
- Image slots & versioning.
- FUS stack updates.
- Rollback basics.
- Failure recovery plan.

Exercise: OTA update

NVM, bonding & data model

- Bond store format.
- Keys & privacy data.
- App params in Flash.
- Wear considerations.
- Backup/erase policy.

Exercise: Bond persist

RF & hardware design notes

- Antenna types/keep-outs.
- Match network hints.
- Crystal accuracy (HSE/LSE).
- TX power/regulatory.

Exercise: RSSI sweep

Low-power with RF

- Sleep while RF runs.
- Stop/Standby limits.
- Wake sources & latencies.
- Adv/conn current trade-offs.
- Measurement method.

Exercise: LP profiles

Production checklist (wrap-up)

- Stack/FUS versions fixed.
- BD_ADDR policy set.
- Bond/NVM procedure.
- RF test/Tx power notes.
- App version/CRC tags.

Exercise: Self-audit