



RTW - West, MCUXpresso SDK and Kconfig

West fundamentals and NXP ecosystem

Objectives

- Understand MCUXpresso SDK (MCUXSDK) structure
- Manage multi-repository projects using Zephyr West
- Use Kconfig and prj.conf for configuration
- Build, flash and debug on NXP targets
- Create and integrate custom boards
- Extend projects with FreeRTOS
- Integrate with VSCode for development and debugging
- Perform advanced analysis: multicore sysbuild, SPDX and memory footprint

Course environment

- Theoretical course
 - PDF course material (in English)
 - The trainer to answer trainees' questions during the training and provide technical and pedagogical assistance

Exercise : Practical activities

- Practical activities represent from 40% to 50% of course duration
- Example code, labs and solutions
- NXP FRDM Board or simulated board (IMXRT) using Zazu Simulator

Prerequisite

- C Language knowledge (see for example our L2 training course)
- Familiarity with Git and command-line tools

Environnement du cours

- Cours théorique
 - Support de cours imprimé et au format PDF (en anglais).
 - Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique.
- Activités pratiques
 - Les activités pratiques représentent de 40% à 50% de la durée du cours.
 - Elles permettent de valider ou compléter les connaissances acquises pendant le cours théorique.
 - Exemples de code, exercices et solutions
 - Un PC (Linux ou Windows) par binôme de stagiaires (si plus de 6 stagiaires) pour les activités pratiques avec, si approprié, une carte cible embarquée.
 - Le formateur accède aux PC des stagiaires pour l'assistance technique et pédagogique.
- Une machine virtuelle préconfigurée téléchargeable pour refaire les activités pratiques après le cours
- Au début de chaque demi-journée une période est réservée à une interaction avec les stagiaires pour s'assurer que le cours répond à leurs attentes et l'adapter si nécessaire

Audience visée

- Tout ingénieur ou technicien en systèmes embarqués possédant les prérequis ci-dessus.

Plan du cours

First day

Introduction to MCUXpresso SDK

- SDK structure and components
- Toolchains, CMake and Ninja integration
- Application structure and examples

West Tool

- Overview
- Application components and structure
- Application
 - Application
 - Modules
 - West workspace
- Why West? Problems solved
- West as a meta-tool: repository + commands
- Alternatives (git submodules, repo) and limitations
- West
 - West structure
 - Using west
 - West manifest
 - West commands
- West topologies
- Anatomy of west.yml
- Specific commands and common extensions
 - Init, update, list, config
 - Build, debug, attach, flash
 - Other common commands
- Extending West with custom commands

Exercise : Exercise: Getting started with West and MCUXpresso SDK

Exercise : Exercise: Create a custom workspace manifest while importing only required projects

Development Environment

- Setting up host tools (Git, Python, CMake, Ninja)
- Integrating LinkServer, Jlink and other debuggers
- Debugging workflow with GDB
- VSCode integration (tasks, debug sessions)
- MCUXpresso for VSCode

Exercise : Exercise: Build, flash and debug using command line and customize IDE

MCUXpresso Config Tools

- Overview of the configuration tool suite (Pins, Clocks, Peripherals, Device settings)
- How Config Tools integrate with MCUXpresso SDK and West builds
- Generating initialization code (pin_mux.c/h, clock_config.c/h, peripheral setup)
- Using the graphical interface to configure GPIO, UART, and system clocks
- Exporting configuration files and re-integrating them into applications
- Limitations and best practices when combining with Kconfig/prj.conf

Exercise : Exercise: Customize existing boards

Customization and Extensions

- Custom manifests for minimal projects
- Writing custom West commands
- Modifying in-tree applications (LED blinky)
- Freestanding applications outside the SDK

Exercise : Exercise: Extend west commands

Exercise : Exercise: Create a custom freestanding application

Second day

Integration and Analysis

- Adding FreeRTOS using West
- Multicore projects with Sysbuild
- SPDX analysis and compliance check
- Memory footprint and Puncover analysis

Exercise : Exercise: Extend the workflow with FreeRTOS and advanced tools

Exercise : Exercise: Using west memory analysis features

Kconfig and Project Configuration

- Configuration phase in West/CMake
- Kconfig framework:
 - Enabling/disabling global features
 - Tuning and conditional compilation
 - Default values and symbol dependencies
- Role of prj.conf and fragments
- Interactive configuration (menuconfig, guiconfig)
- Generated config files: .config, mcux_config.h
- Writing new Kconfig entries (symbols, menus, defaults)
- Limitations and best practices
- MCUXpresso SDK specifics (custom prefixes, no CONFIG_ macros)

Exercise : Exercise: Customize prj.conf

Exercise : Exercise: Create and use custom kconfig options

Developing Custom Boards

- Board Architecture Overview
- Structure and components of a board port
- Creating a New Board Definition
- Configuring custom boards
- Board debuggers
- Linker Script
- Integrating the custom Board into the SDK

Exercise : Exercise: Write a custom board

External MCUX Modules

- Why to use modules?
- Module structure
- Out-of-tree module
- Module's YAML
- Module CMakeLists.txt

Exercise : Exercise: Create a custom library module