Hands-On Workshop: MCUXpresso Software and Tools

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SECURE CONNECTIONS FOR A SMARTER WORLD

Agenda

- Overview of MCUXpresso SW and Tools
  - MCUXpresso IDE, SDK, Config Tools
- Roadmap Overview
  - Typical Release Schedule / Roadmap
  - New features of May 2018 Release
- MCUXpresso SW and Tools Workflow
- Hands-on Overview of Tools
- Hands-on Getting Started Lab

MCUXpresso Software and Tools

MCUXpresso IDE

MCUXpresso SDK

MCUXpresso Config Tools

MCUXpresso Software and Tools

for LPC & Kinetis MCUs and i.MX RT crossover processors

MCUXpresso IDE

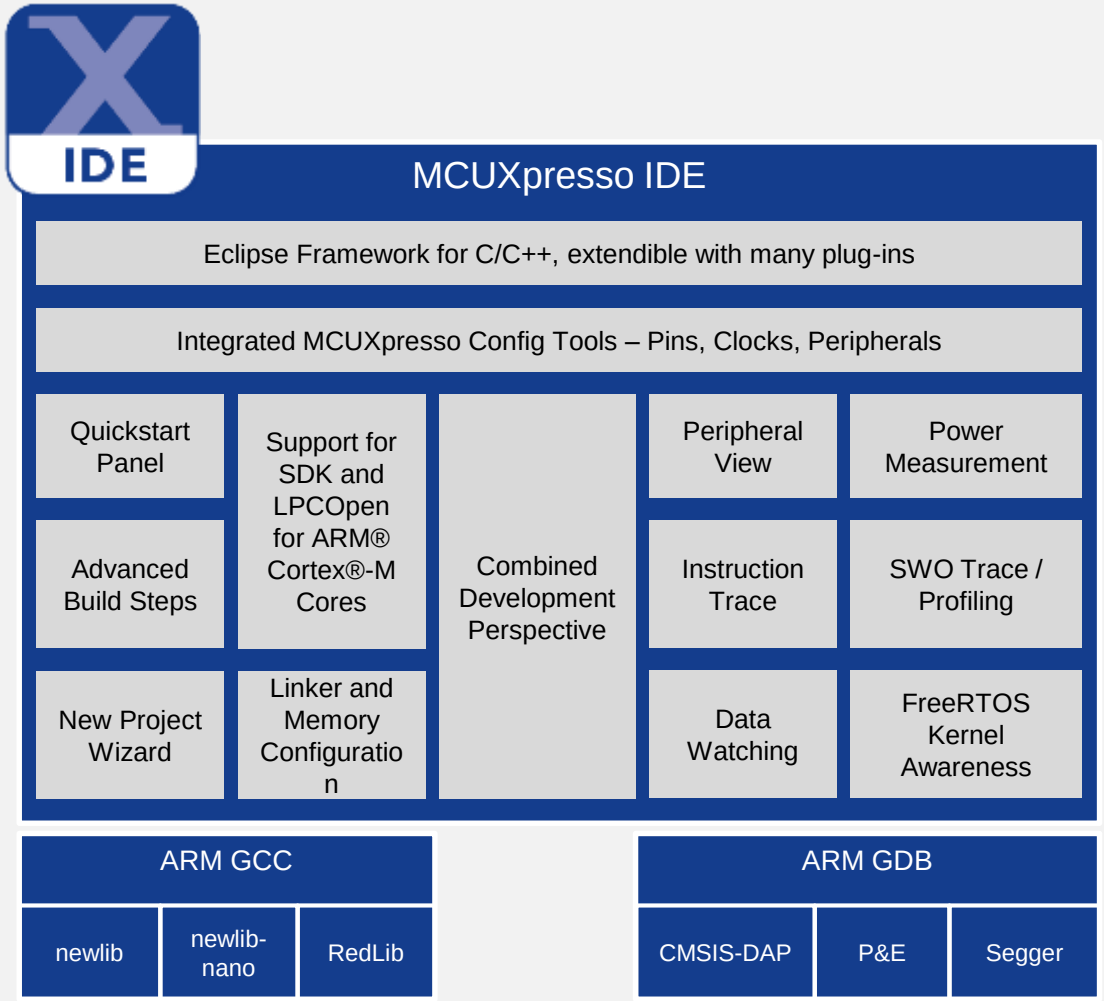
Edit, compile, debug and optimize in an intuitive and powerful IDE

MCUXpresso SDK

Runtime software including peripheral drivers, middleware, RTOS, demos and more

MCUXpresso Config Tools

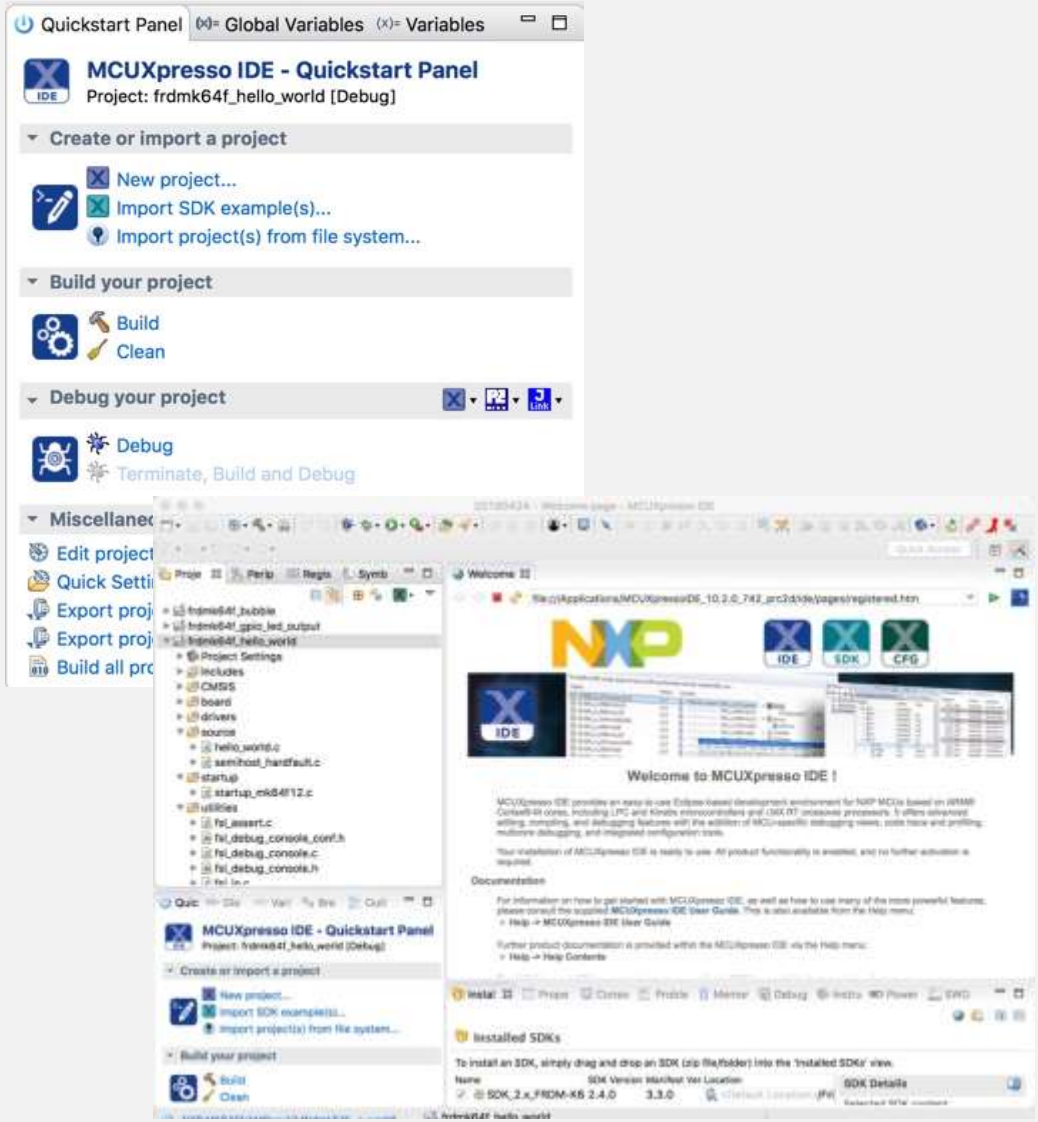
Online and desktop tool suite for system configuration and optimization



MCUXpresso IDE

Free Eclipse / GCC-based Development

- Feature-rich, unlimited code size, optimized for ease-of-use, based on industry standard Eclipse framework for NXP's Kinetis and LPC MCUs and i.MX RT crossover processors
- Application development with Eclipse and GCC-based IDE for advanced editing, compiling and debugging
- Supports custom development boards, Freedom, Tower and LPCXpresso boards with debug probes from NXP, P&E and Segger
- Free: Full Featured, unlimited Code Size, no special activation needed, community based support, advanced trace capabilities
- Works in conjunction with MCUXpresso Config Tools and MCUXpresso SDK to provide complete development environment



MCUXpresso IDE

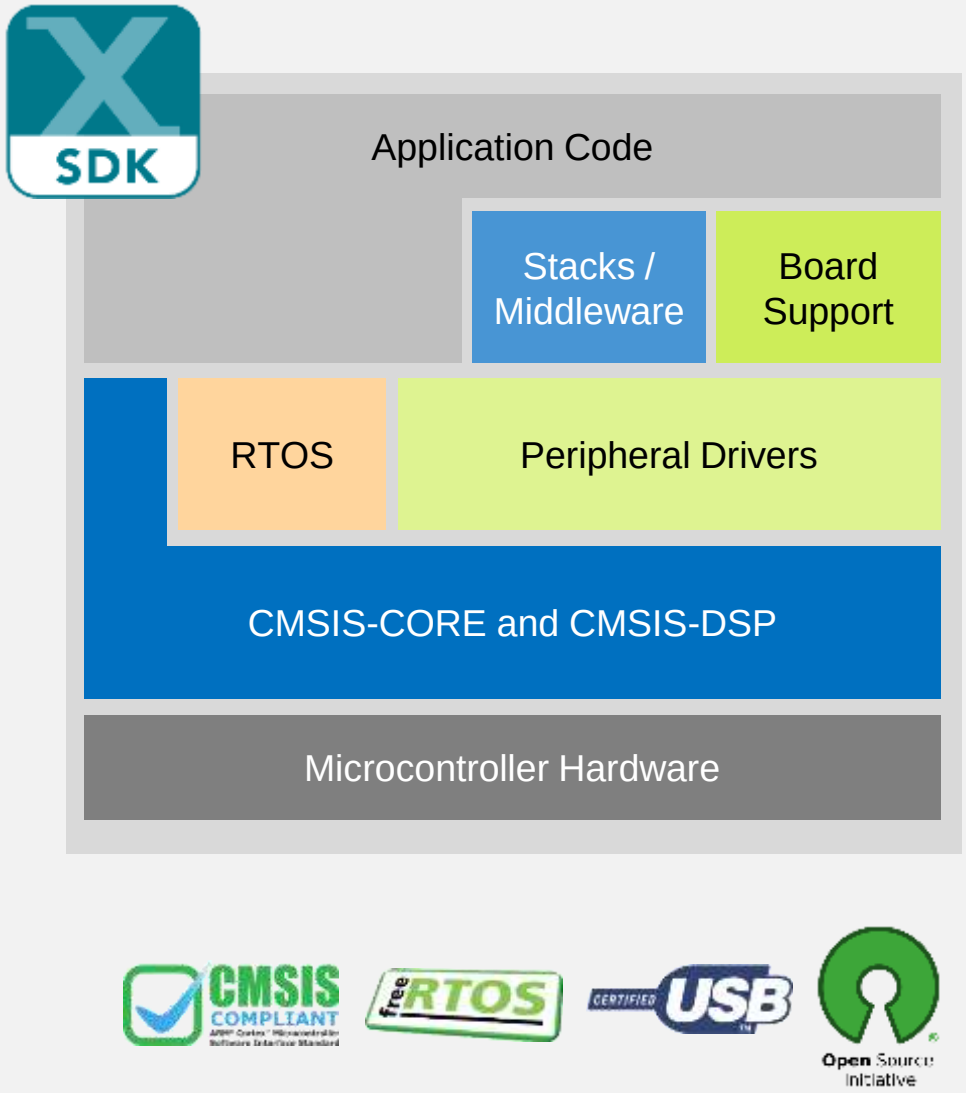
Built for Ease of Use

- Quickstart Panel guides users to most commonly used options
  - One-Click access to most used functions (Create, Build, Debug)
  - Direct access to standard debug functions (Debug, Attach, Program, Erase)
- Develop Perspective for both project editing and debugging
  - Simplifies Eclipse usage
- GUI Flash Tool for simplified programming with support for LinkServer, P&E, and Segger

MCUXpresso IDE

New Project Wizard

- SDK MCUs (LPC and Kinetis)
- Preinstalled LPC and generic Cortex®-M
- Installable device support through SDK packages (data driven)
- Selection of package, RTOS, drivers, utilities
- Standalone and linked projects
- Advanced project settings



MCUXpresso SDK

Software framework and Drivers

Architecture:

- CMSIS-CORE compatible
- Single driver for each peripheral
- Transactional APIs w/ optional DMA support for communication peripherals

Integrated RTOS:

- Amazon FreeRTOS
- RTOS-native driver wrappers

Integrated Stacks and Middleware:

- USB Host, Device and OTG
- lwIP, FatFS, LittleFS
- Crypto acceleration plus wolfSSL & mbedTLS
- SD and eMMC card support
- QCA WiFi Stack

Reference Software:

- Peripheral driver usage examples
- Application demos
- FreeRTOS usage demos
- AWS WiFi and lwIP examples

License:

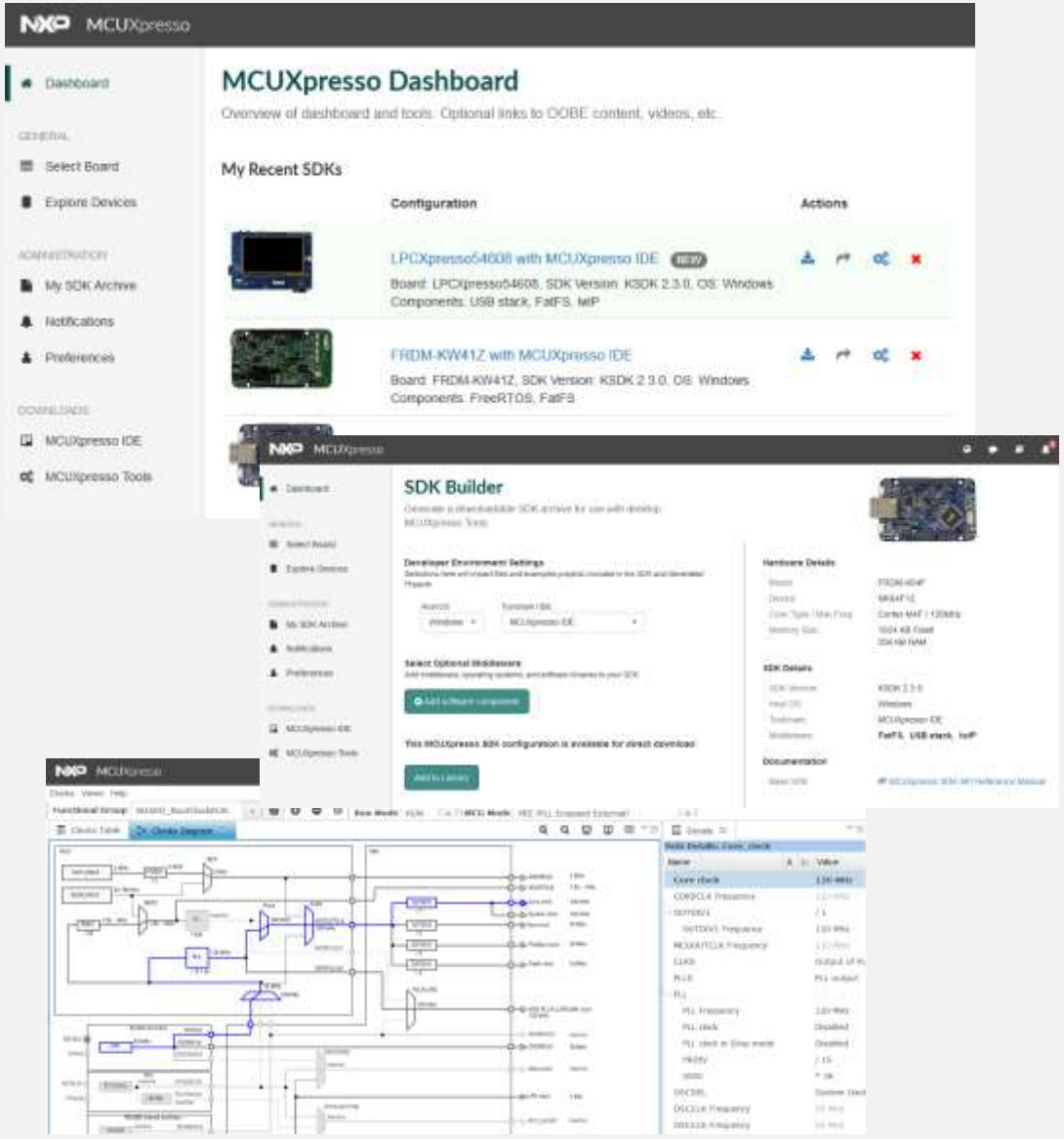
- Clear BSD 3-clause for startup, drivers, USB stack

Toolchains:

- MCUXpresso IDE
- IAR®, ARM® Keil®, GCC w/ Cmake

Quality:

- Production-grade software
- MISRA 2004 compliance
- Checked with Coverity® static analysis tools



MCUXpresso SDK

Online Builder and Dashboard

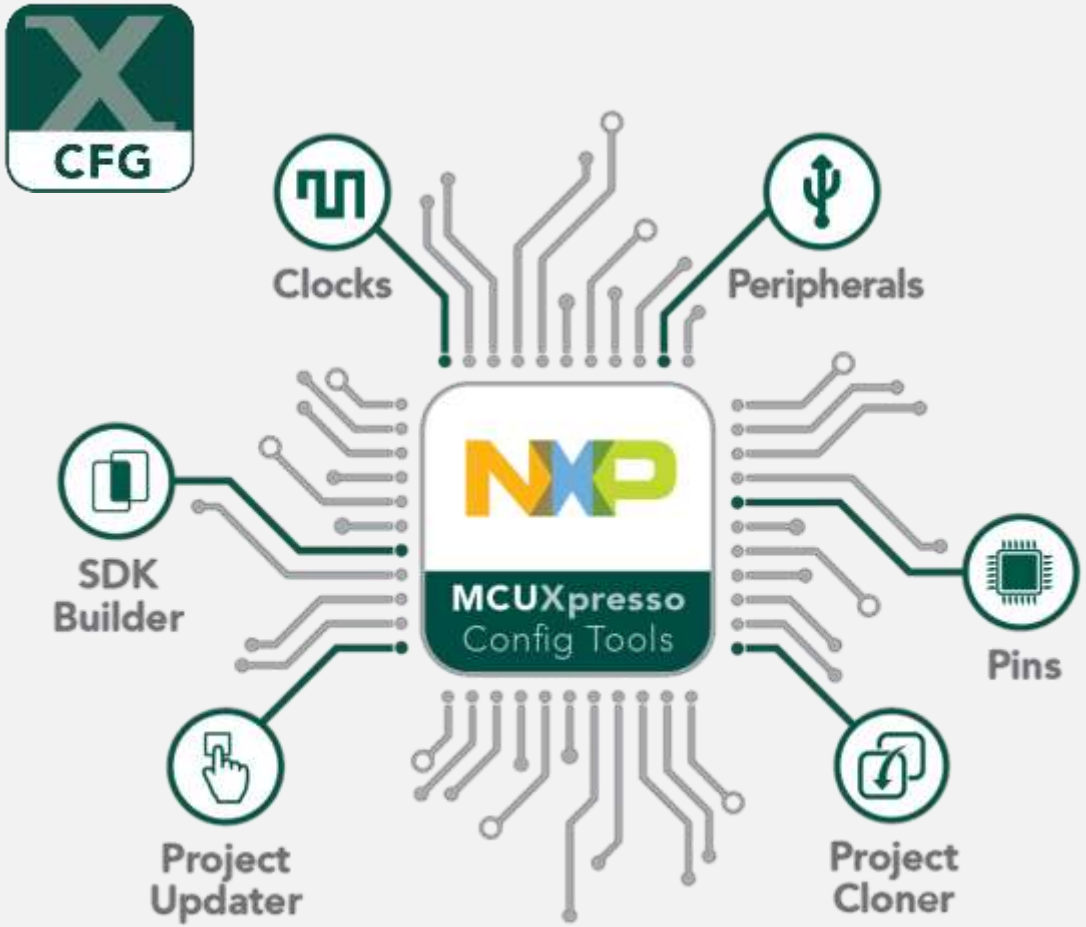
- MCUXpresso Dashboard
  - Access all previously downloaded SDKs
  - Notifications of update SDK content specific to your own SDK packages
  - Share SDK archive with other users
- MCUXpresso SDK Builder
  - Build customized SDKs for selected development board or device
  - Specify optional middleware, with dependency resolution
- Online MCUXpresso Config Tools
  - Run basic checks on Pin Muxing and Clock Configuration to aid in ideal device selection
  - Download Config Tool output for further development with desktop Config Tools

MCUXpresso SDK

Integrated Middleware

- Amazon FreeRTOS
  - FreeRTOS Kernel
  - AWS IoT Device SDK
- Filesystem:
  - FatFS, littleFS
- TCP/IP stack (lwIP)
- SSL/TLS:
  - mbedTLS, wolfSSL
- QCA Wifi stack
- SEGGER emWIN Graphics
- NAND Flash Management
- JPEG Encode / Decode
- USB Stack (Host, Device, OTG)
- SDMMC
- Crypto Acceleration Software Libraries
- Real-Time Control Embedded Software Libraries
  - Motor Control, Math Functions, Digital Filtering
- BLDC / PMSM Motor Control Algorithms
- Companion Product Support
  - NTAG, IoT Sensing SDK, Touch Software
- Wireless Stacks:
  - Thread, BLE, 802.15.4 MAC, Zigbee, GenFSK, SMAC
- DMA Manager (DMAMUX)
- EMV Level 1 Contact Stack
- Multicore support
  - eRCP (embedded Remote Procedure Call)
  - RPMSG-lite (Remote Processor Messaging)
  - Multicore Manager Software Libraries

Learn more at: www.nxp.com/mcuxpresso/config



MCUXpresso Config Tools

Configuration and Code Generation

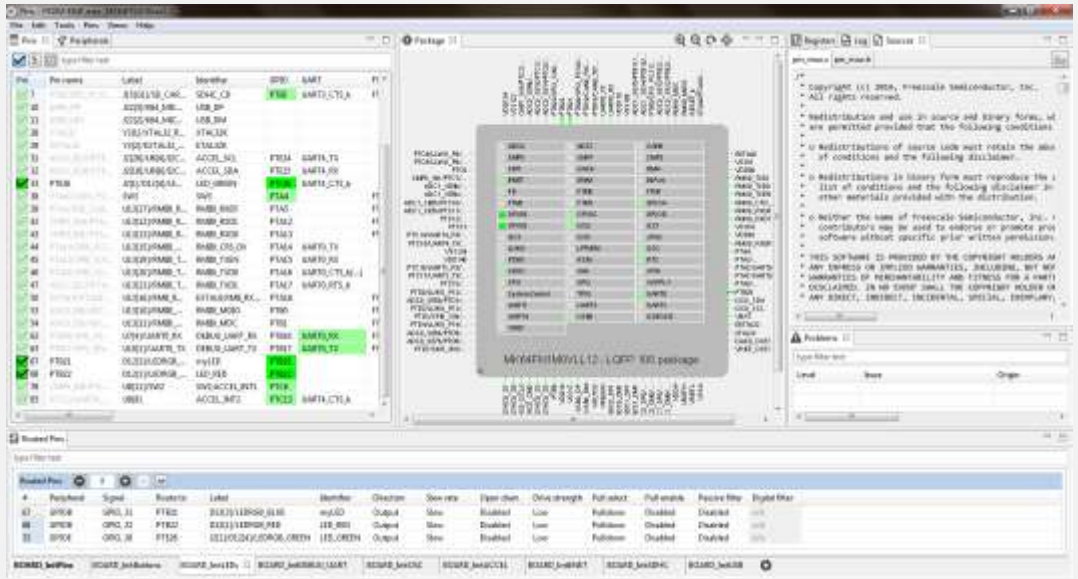
SDK Builder packages custom SDKs based on user selections of MCU, evaluation board, and optional software components.

Pins, Clocks, and **Peripheral** tools generate initialization C code for custom board support. Features validation of inputs and cross-tool conflict resolution.

Project Update works directly with existing SDK-based IDE projects with generated Pins, Clocks, and Peripheral source files.

Project Cloning creates a standalone SDK project based on a example application available within SDK release.

Easy-to-use muxing and pin assignments

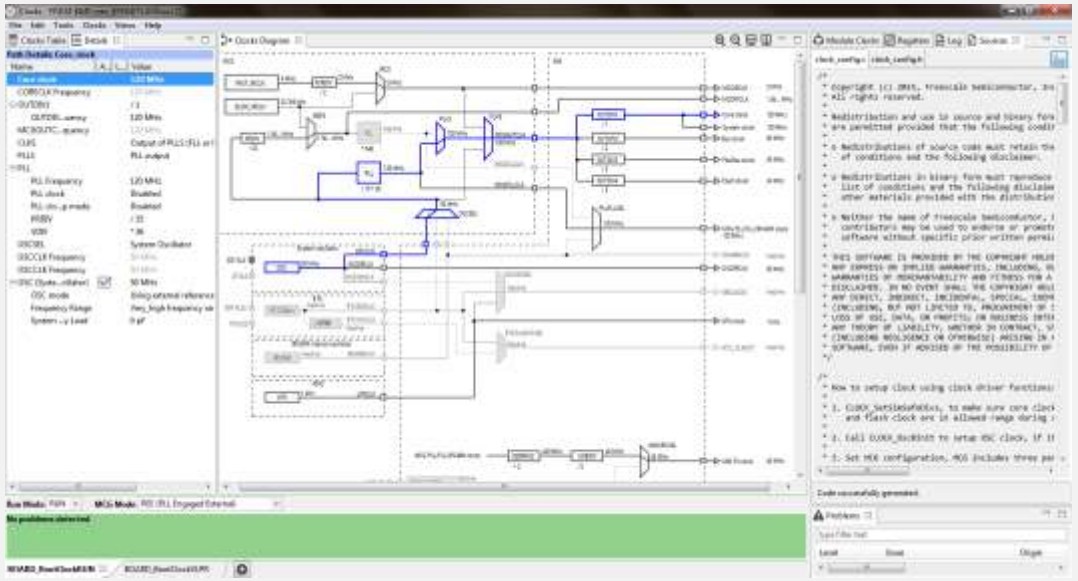


MCUXpresso Config Tools

Pins Configuration

- Muxing and pin configuration with consistency checking
- ANSI-C configuration code
- Graphical processor package view
- Wizard for optimized assignments of functionality to available pins
  - Selection of Pins and Peripherals
  - Routed pins with electrical characteristics
  - Registers with configured and reset values
  - Source code for C/C++ applications
  - GPIO Input / Output initialization
- Documented and easy to understand source code
- Report generation
- Integrates with any compiler and IDE

Clock configuration and diagram view

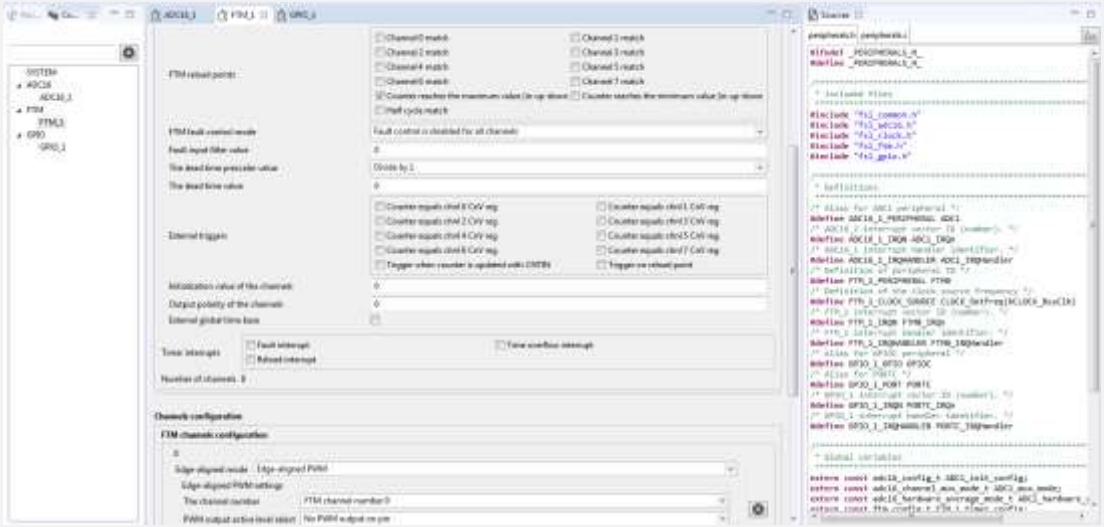


MCUXpresso Config Tools

Clock Configuration

- System clock configuration with consistency checking
- ANSI-C initialization code
- Graphical clock diagrams
- Easy-to-use guided graphical user interface
  - Selection of Clock Sources
  - Configuration of prescalers and clock outputs
  - Details and Full Diagram views with clock path
  - Registers with configured and reset values
  - Source code for C/C++ applications
- Documented and easy to understand source code
- Report generation

Clock configuration and diagram view

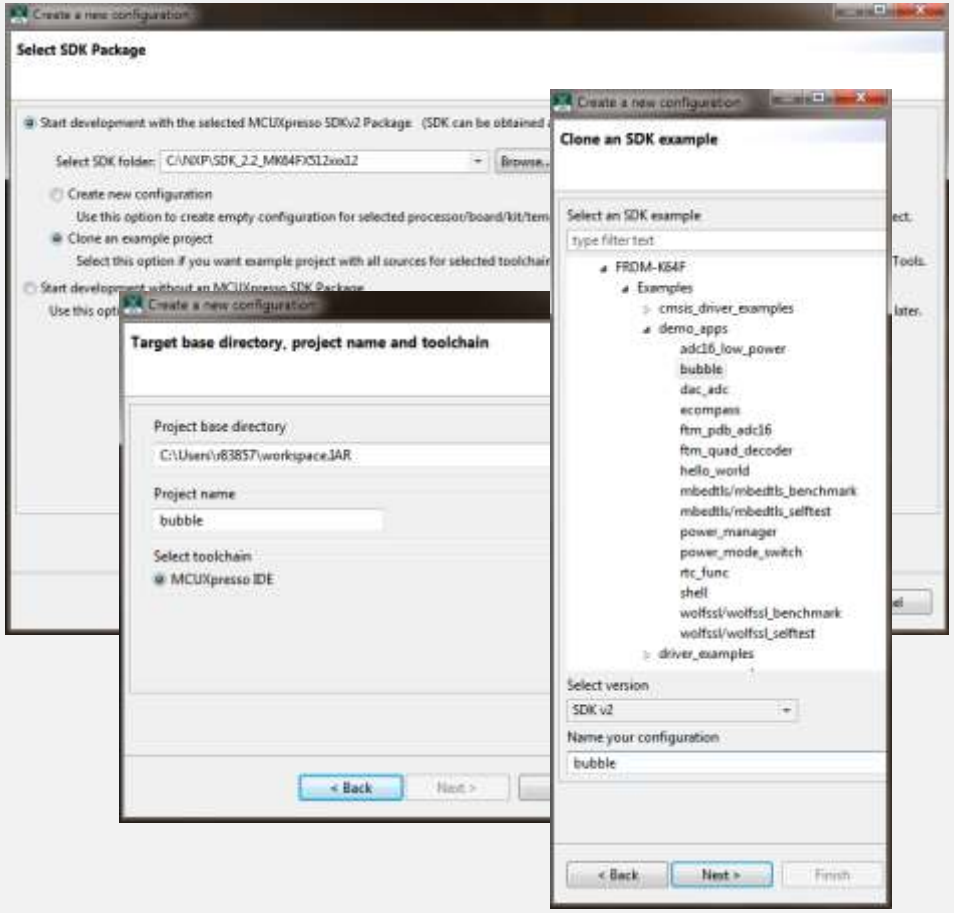


MCUXpresso Config Tools

Peripheral Configuration

- SDK peripheral configuration
- Validation of user inputs / selection
- ANSI-C initialization code
- Generation of MCUXpresso SDK Initialization Structure
- Selection of common use case configurations
- Initial support for most common peripherals
  - GPIO, UART, ADC, LPTMR, I2C, FTM
  - Additional peripheral planned for 2018
- Documented and easy to understand source code
- Report generation

MCUXpresso SDK Project Cloning



MCUXpresso Config Tools

Cloning Utility

- Ability to generate a fully standalone MCUXpresso project cloned from one of the many included examples.
- Provide a native IDE project for any toolchain supported in your SDK configurations
- Available in the desktop version on the MCUXpresso Config Tool as part of the “New configuration dialog”
- Available in the online version of the MCUXpresso SDK Builder and webpage.
- Clones example projects can be downloaded directly from the MCUXpresso webpage. Online cloned projects provide all project and SDK files required to quickly have an application running on a support NXP development board in a single download.

MCUXpresso SW and Tools

Typical Release Schedule / Roadmap

New features of May 2018 Release

MCUXpresso SW and Tool Release Overview

- Comprised of three primary tools:
  SDK, IDE, and Config Tools
- Major releases targeted for twice a year
  (Q2 / Q4)
- Pending release
  May 2018
- Next major release date scheduled for
  Nov 2018
- MCUXpresso SW and Tools originally launched on
  March 2017

- May 2018 Release:
  SDK v2.4.0
- Support for current Kinetis, LPC, and i.MX RT devices
- New device support released throughout year as required to support device availability.
- **Major semi-annual releases** include updated drivers, middleware releases, and improvements

- May 2018 Release:
  IDE v10.2.0
- Support for current Kinetis, LPC, and i.MX RT devices
- Additional support for legacy LPC devices
- Device support is included via SDK releases.
- **Major semi-annual releases** include updated eclipse framework, compiler versions, and performance improvements

- May 2018 Release:
  Config Tool v4.1
- Include configuration for Pins, Clocks, and key Peripherals
- New device data and peripheral support released throughout year, tool will update when connected online
- **Major semi-annual releases** include new features, additional peripheral support, and workflow improvements

MCUXpresso SW and Tool - New Features (SDK)

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New features in **SDK v2.4.0**

- Updated support for:
  - iMXRT1050, LPC8xx, LPC54018, LPC546xx
- Updated to latest GNU Arm Embedded Toolchain compiler: GCC Version 7-2017-q4-major
- Expanded Device / Board support for:
  - Amazon FreeRTOS v10, LittleFS, QCA Wifi, Amazon Web Services
- Updated included middleware:
  - FatFS R0.13a, lwIP 2.0.3
- Updates to NXP developed middleware:
  - USB, SDMMC

MCUXpresso SW and Tool - New Features (IDE)

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New features in **IDE v10.2.0**

- All Pro features incorporated into Free version (Pro version discontinued)
- Redesigned Quickstart Panel, including dedicated debug operation links
- Updated GUI Flash tool with easy binary programming and erase capabilities
- Compile and Debug performance improvements
- Live graphical visualization of global variables
- Enhanced self configuring external flash drivers for flashless MCUs
- Access to SDK documentation from IDE
- Updated to Eclipse Oxygen
- Simple built-in Terminal view (used to display UART or VCOM output)

MCUXpresso SW & Tool – New Features (Config Tools)

- Comprised of three primary tools:
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New features in Config Tools v4.1

- Pin Muxing and GPIO Initialization now included in Pins Tool
- New Config Tool Overview screen with individual tool summary
- Support for Undo / Redo functionality
- Improved Peripheral Tool UI and support, including support for multiple Peripheral Component versions
- SDK Project cloning available directly within New Project Dialog
- Improved IDE Project Import with simplified source code import
- Improved Clock source enabling mechanism within Clock Tool diagram view
- Support for LPC Switch Matrix Pin Muxing
- Updated to Eclipse Oxygen

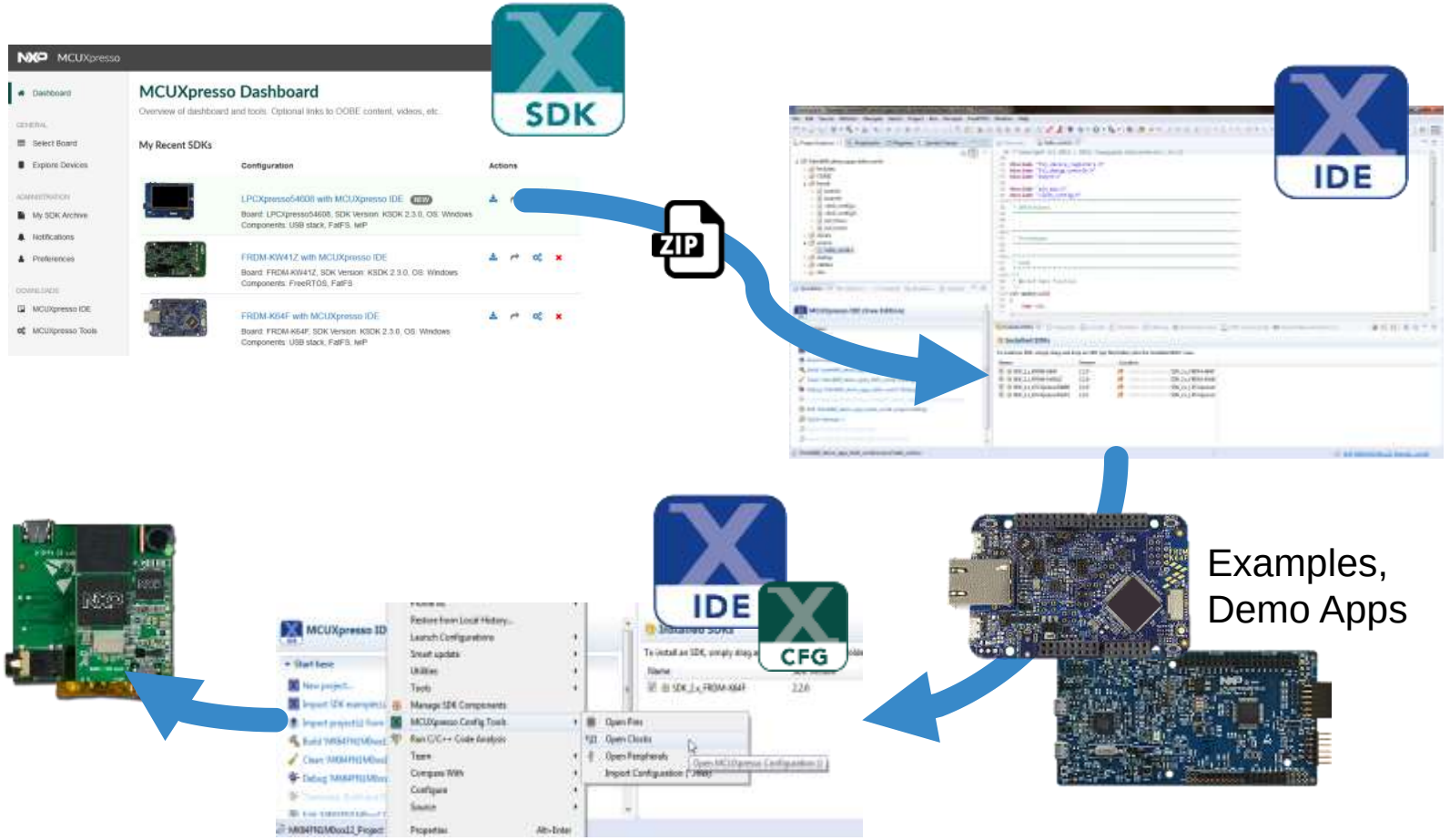
MCUXpresso SW and Tools Workflow

Efficient Development Flow

- SDK Configuration and Installation
- Integrated Config Tools

MCUXpresso SW and Tools

Efficient Development Flow



- Online Custom SDK Builder
- Drag-and-Drop installation of SDK into IDE
- SDK Project Importing / Cloning
- Demo applications, SDK driver examples, middleware use case projects
- Management of SDK drivers and middleware components
- Integrated Config Tools
- Pins and Clocks initialization for user defined boards

MCUXpresso Software and Tools

Additional Resources

- **Web pages**
  - MCUXpresso Software and Tools: www.nxp.com/mcuxpresso
    - MCUXpresso SDK: www.nxp.com/mcuxpresso/sdk
    - MCUXpresso IDE: www.nxp.com/mcuxpresso/ide
    - MCUXpresso Config Tools: www.nxp.com/mcuxpresso/config
- **Communities**
  - MCUXpresso Software and Tools: https://community.nxp.com/community/mcuxpresso
    - MCUXpresso SDK: https://community.nxp.com/community/mcuxpresso/mcuxpresso-sdk
    - MCUXpresso IDE: https://community.nxp.com/community/mcuxpresso/mcuxpresso-ide
    - MCUXpresso Config Tools: https://community.nxp.com/community/mcuxpresso/mcuxpresso-config
- **Supported devices**
  - Supported Devices Table (Community Doc)

Hands-On Lab
Overview of Tools

Online MCUXpresso SDK Builder

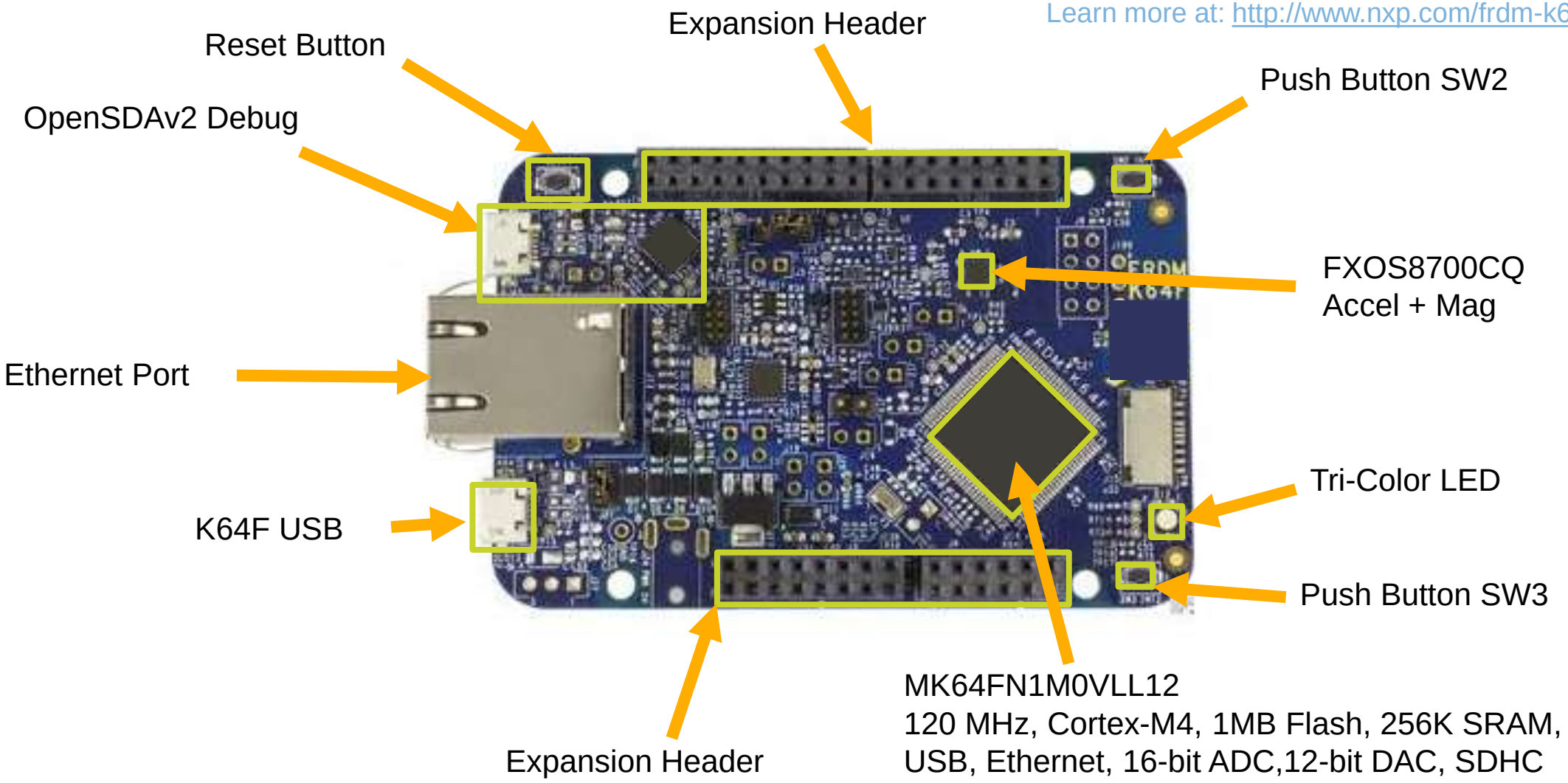
Importing MCUXpresso SDK into MCUXpresso IDE

Basic functionality of MCUXpresso IDE

Enabling / Using MCUXpresso Config Tools

FRDM-K64F Hardware Overview

Learn more at: http://www.nxp.com/frdm-k64f



Hands-On Lab
Getting Started with MCUXpresso

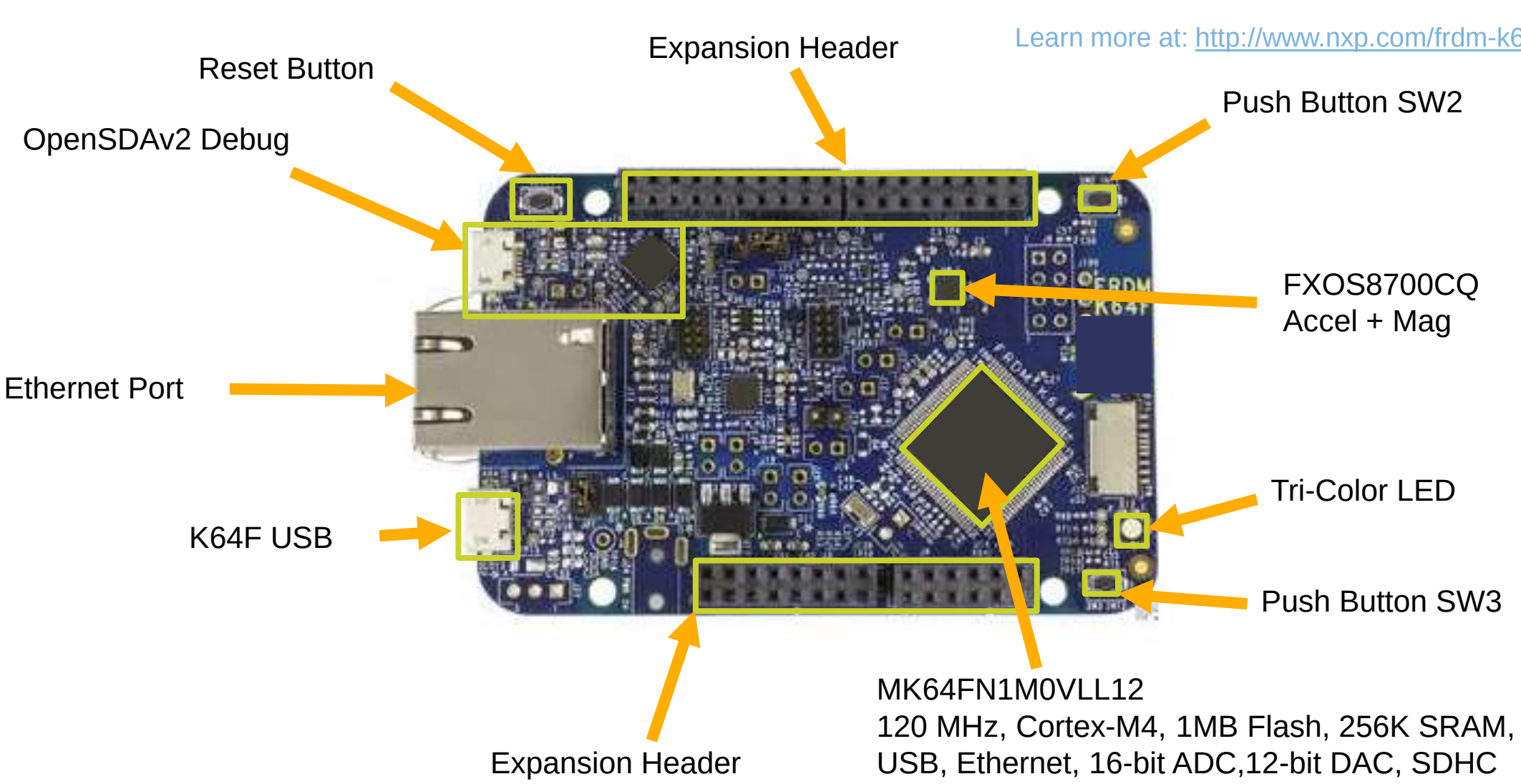
Creating new IDE project

Working with Config Tools

Working with SDK APIs

FRDM-K64F Hardware Overview

Learn more at: http://www.nxp.com/frdm-k64f



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