



**MASARYK
UNIVERSITY**
Czech Republic

PV198 – One-chip Controllers

Introduction





Content

1. **Organizational information**
2. Course overview
3. Lectures
4. Hardware introduction
5. Hello World
6. Software introduction – MCUXpresso
 1. Integrated Development Environment (IDE)
 2. Software Development Kit(SDK)
 3. Config Tools



Organizational information

- Takes place in room A415
- 13 lessons (2 hours)
- Max 2 unexcused absences
- Mandatory homeworks for every lesson
 - deadline- until next lesson
 - 1/0.5/0 points per homework
 - 2 points lost mean failure
- Exam at the end of course
 - Implement homework-ask program
 - Extra oral question



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Course overview

- Expected knowledge of C language
- Create embedded applications
- Get to know common peripherals and how to use them

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Lectures

- Basic peripherals
 1. GPIO
 2. Interrupts/Timers
 3. PWM
 4. ADC
- Communication interfaces
 5. SPI
 6. I2C
 7. UART
- Advanced peripherals(use of libraries)
 8. LCD
 9. Memory Card + Sound
 10. USB
 11. Ethernet



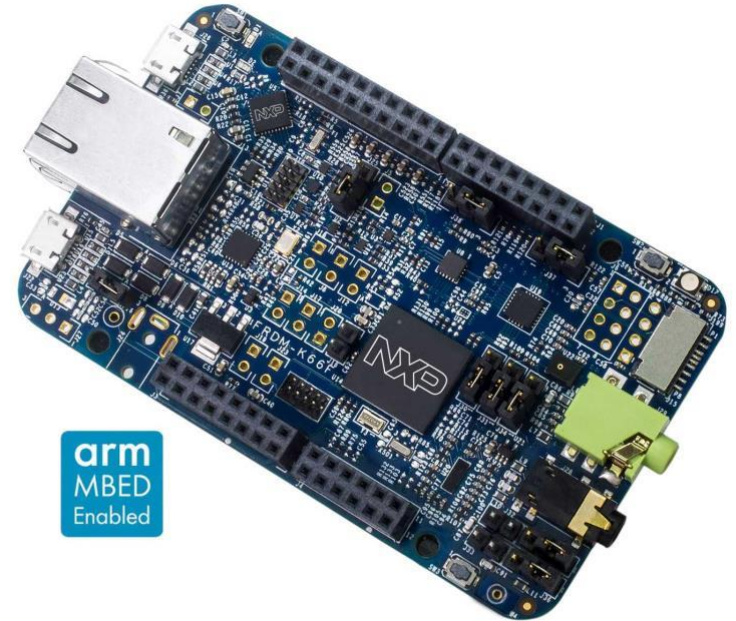
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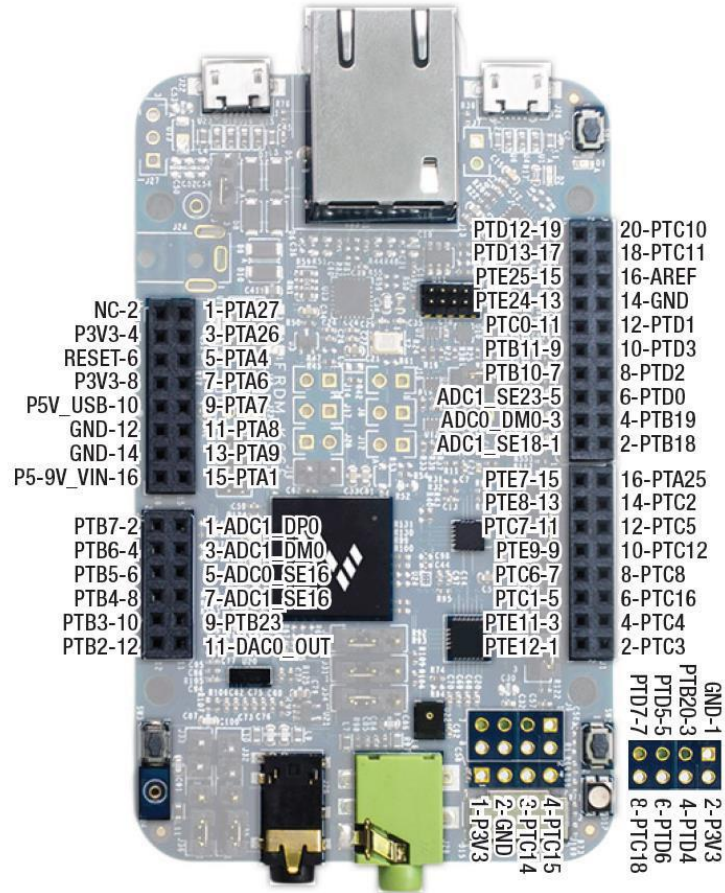
Hardware introduction

NXP FRDM-K66F board

- MK66FN2M0VMD18 MCU
- 180 MHz
- 2 MB Flash memory
- 256 kB SRAM
- Accelerometer, Magnetometer
- 3-colored LED
- 2 push buttons
- USB
- Ethernet
- Audio
- ... and more



Hardware introduction



Hardware introduction

- [Product page](#): main source of information – description, guide, links
- [Additional information](#): detailed information
- [Get started](#): step-by-step guide with pictures and videos

- Documentation:
 - [Board user guide](#): information about the board and its peripherals
 - [K66 reference manual](#): MCU information – features, registers description
 - [K66 data sheet](#) – technical data: MCU characteristics
 - [Board schematics](#)



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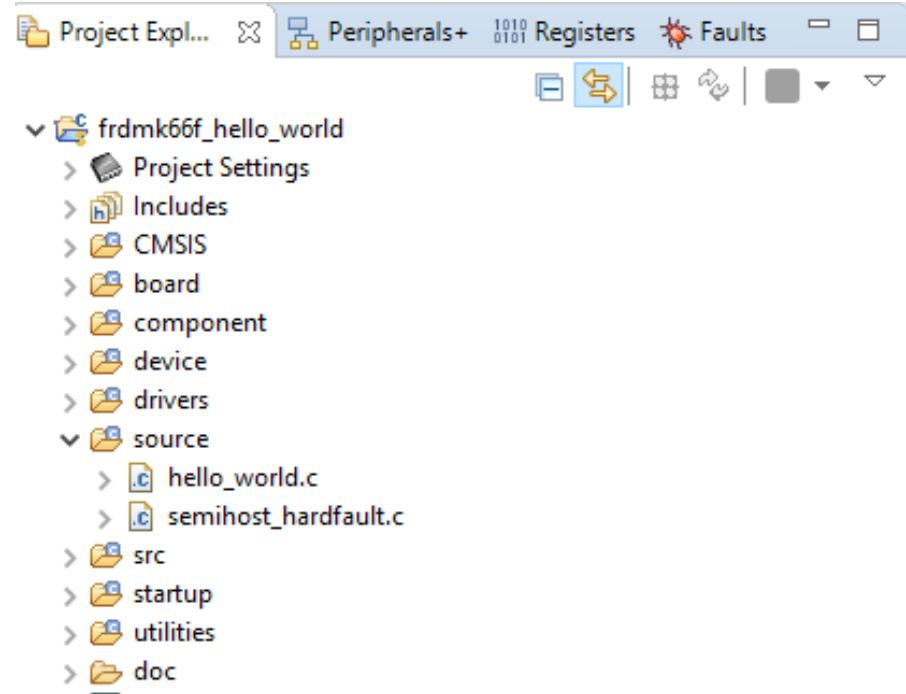
Hello World

Get started: step-by-step guide with pictures and videos

- Step #3 – Use MCUXpresso IDE

Hello World

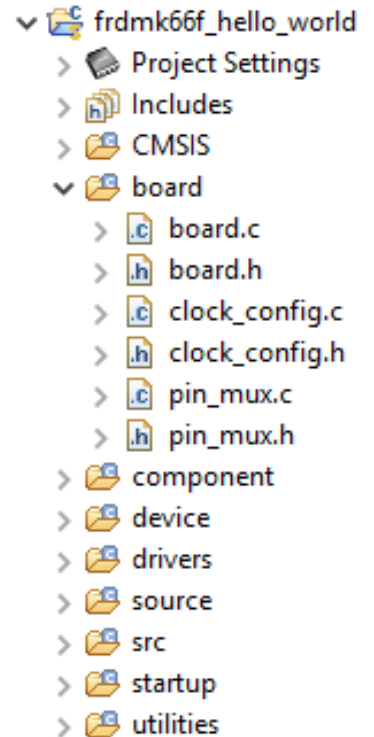
- Explore project content



Hello World

Board folder

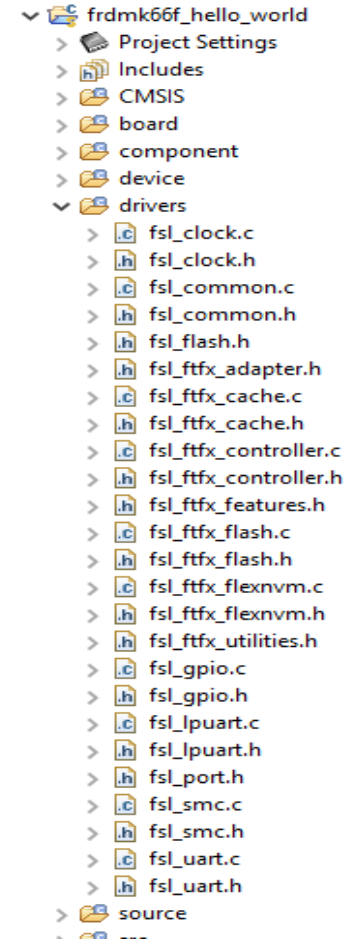
- Files generated by MCUXpresso Config Tools
 - clock_config, pin_mux and peripherals
- Board definitions
 - E.g. defines for LEDs, buttons, debug, etc.



Hello World

Drivers folder

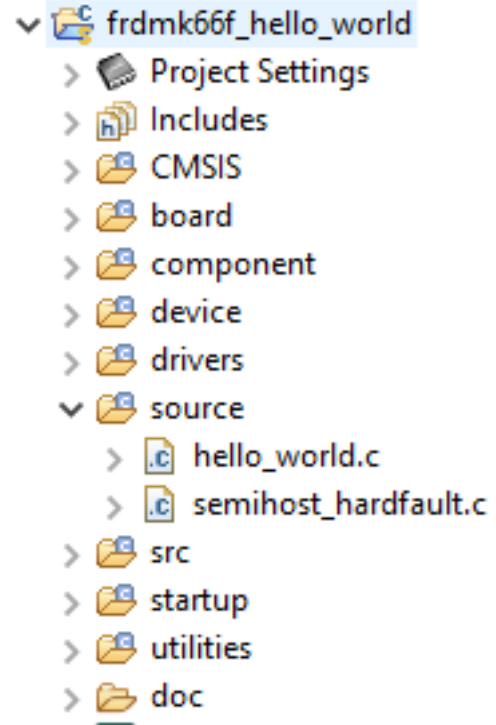
- SDK files
 - Provides API to control peripherals



Hello World

Source folder

- Contains your application code
- Contains main function



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MCUXpresso



MCUXpresso SDK

An open-source software development kit (SDK) built specifically for your processor and evaluation board selections.



MCUXpresso IDE

An easy-to-use integrated development environment (IDE) for creating, building, debugging, and optimizing your application.



MCUXpresso Config Tools

A comprehensive suite of system configuration tools, including pins, clocks, SDK builder and more.

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MCUXpresso IDE

- Eclipse-based development environment for NXP®MCUs
- Free
- Code size unlimited
- Integrated configuration tools, including pins,clock and peripherals tools
- Multicore debugging
- Visualisation of- registers,variables,heap,stack,... ; values
- Can be extended with Eclipse plug-ins

MCUXpresso IDE

- Console / Terminal
- Quickstart Panel
- Project explorer – always select your project
- Debugging – pause, breakpoints, variables, step over, step into, which icons to use
- Config Tools – how to open, save, update



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MCUXpresso SDK

- Framework equivalent
- Production-grade software with integrated RTOS(optional), integrated stacks and middleware, reference software, and more
- Open-source peripheral drivers that provide stateless, high performance, easy-to-use APIs
- MISRA-C:2004 compliant and checked with Coverity static analysis tools
- Stacks/middleware: USB, FatFs, lwIP, SDMMC, TensorFlow, ...

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MCUXpresso Config Tools

- **Generate initialization C code**
- Pins tool – assigns internal signals to external pins, sets, electrical properties
- Clocks tool – graphical representation of the MCU clock tree system
- Peripherals tool – configures peripherals
- Trusted Execution Environment(TEE) – Configures protection and isolation of sensitive parts of the application



MCUXpresso Config Tools - tips

- Check selected project in the combo box
- Don't forget to "Update Code"

Homework

- Import SDK project for FRDM-K66F called “bubble”
- Run the application on the board

- Clone your **GIT** repository.
- Create new branch called: “Week_01”
- Create new commit with single file and commit it
- Create “git tag” and push it to repository with commit