STR6 - STM32 F2-Series implementation

This course covers STM32F205, STM32F207, STM32F215, STM32F217 ARM-based MCU family

Objectives

- This course has 5 main objectives:
  - Describing the hardware implementation and highlighting the pitfalls
  - Describing the ARM Cortex-M3 core architecture
  - Becoming familiar with the IDE and low level programming
  - Describing the units which are interconnected to other modules, such as clocking, interrupt controller and DMA controller, because the boot program generally has to modify the setting of these units
  - Describing independent I/O modules and their drivers.
- Note that this course has been designed from the architecture of the most complex STM32 F2-series device, the STM32F217.
- Consequently, a chapter has been designed by Acsys for each possible integrated IP.
  - According to the actual reference chosen by the customer, some chapters may be removed.
- Products and services offered by ACSYS:
  - ACSYS is able to assist the customer by providing consultancies. Typical expertises are done during board bringup, hardware schematics review, software debugging, performance tuning.
  - ACSYS has also an expertise in FreeRTOS porting and uIP /LWIP stack or Interniche stack integration.

This document is necessary to tailor the course to specific customer needs and to define the exact schedule.

Prerequisites and related courses

- This course provides an overview of the ARM Cortex-M3 core. Our course reference cours RM2 - Mise en œuvre du Cortex-M3 details the operation of this core.
- The following courses could be of interest:
  - USB Full Speed High Speed and USB On-The-Go, reference cours IP2 - USB 2.0
  - Ethernet and switching, reference cours N1 - Ethernet et commutation
  - IEEE1588, reference cours N2 - IEEE1588 - Precise Time Protocol
  - CAN bus, reference cours IA1 - Bus CAN
  - SD / MMC, reference cours IS2 - eMMC 5.0

Environnement du cours

- Cours théorique
  - Support PDF (en anglais), imprimé en présentiel ; à distance via Teams.
  - Assistance du formateur tout au long de la formation.
- Chaque session débute par un point avec les stagiaires.

Audience visée

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

Plan du cours

ARCHITECTURE OF STM32F2XX MCUs

- ARM core based architecture
- Description of STM32F20X and STM32F21X SoC architecture
- Clarifying the internal data and instruction paths: AHB-lite interconnect, peripheral buses, AHB-to-APB bridges
- Integrated memories
- SoC mapping

The ARM Cortex-M3 core

- V7-M core family
- Core architecture
- Programming
- Exception behavior, exception return
- Basic interrupt operation, micro-coded interrupt mechanism

Becoming familiar with the IDE

- Acsys covers 3 IDEs: Keil, IAR and GCC / Lauterbach
- Thus the customer has just to indicate which one he has chosen
- Getting started with the IDE
- Parameterizing the compiler / linker
- Creating a project from scratch
- C start program

Programming and debugging

- Debug interface
- Programming

Reset, power and clocking

- Power control
- Reset
- Clocking
- Low power modes

Internal interconnect

- Bus matrix
- DMA

Hardware implementation

- Power pins
- Pinout
- GPIO module
- System configuration controller
- External Interrupts

Integrated memories

- Embedded flash memory

- Internal SRAM

Memory interface

- SDIO
- Flexible Static Memory Controller

Timers

- Advanced-control timers TIM1 and TIM8
- General-purpose timers (TIM2 to TIM5)
- General-purpose timers (TIM9 to TIM14)
- Basic timers (TIM6 and TIM7)
- Real Time Clock
- Independent Watchdog
- Window Watchdog

Analog modules

- 16-bit Analog-to-Digital Converter and Programmable Gain Amplifier
- 12-bit Digital-to-Analog Converter

Security and integrity

- CRC calculation unit
- Random Number Generation
- Hash processor
- Cryptographic processor
- Device Electronic Signature

Connectivity and communication

- SPI
- SPI in I2S mode
- UART
- I2C
- bxCAN modules
- USB FS
- USB HS
- ISO7816 smartcard interface

User interface

- Digital camera interface