STR5 - STM32 F1-Series implementation

This course covers STM32F100XX, STM32F101XX, STM32F103XX, STM32F105XX and STM32F107XX 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 F1-Series device, the STM32F107.
- 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 - Cortex-M3 implementation 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 and switching
  - IEEE1588, reference cours N2 - IEEE1588 - Precise Time Protocol
  - CAN bus, reference cours IA1 - CAN bus
  - SD / MMC, reference cours IS2 - eMMC 5.0

Environnement du cours

- Cours théorique
  - Support de cours au format PDF (en anglais) et une version imprimée lors des sessions en présentiel
  - Cours dispensé via le système de visioconférence Teams (si à distance)
  - Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique
- 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.

Course Outline

ARCHITECTURE OF STM32F2 MCUs

- ARM core based architecture
- Description of STM32F10X 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
- 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

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

SECURITY AND INTEGRITY

- CRC calculation unit
- Device Electronic Signature

CONNECTIVITY AND COMMUNICATION

- SPI
- SPI in I2S mode
- UART
- I2C
- bxCAN modules
- USB FS
- Fast ethernet with IEEE1588
- ISO7816 smartcard interface