AT1 - AT91SAM7SE microcontroller implementation

This course covers AT91SAM7SE ARM based microcontroller

Objectives

- The course details the hardware implementation of the AT91SAM7 microcontrollers.
- The boot sequence and the clocking are explained.
- Practical lab on integrated peripherals are based on I/O functions provided by Atmel.
- The course focuses on the low level programming of the ARM7TDMI core.
- The course provides examples of internal peripheral software drivers.

- Note that ACSYS does not sell emulation probes and IDEs. Consequently this course has not been designed to convince attendees to buy a particular IDE. The unique objective consists in providing sufficient knowledge to attendees so that they can successfully design a system based on AT91SAM7.

- This course has been delivered several times to companies developing embedded systems, such as badges and RF equipments.

A lot of programming examples have been developed by ACSYS to explain the boot sequence, the vector table and the operation of embedded peripherals.
• They have been developed with 2 different IDEs : Keil and IAR.
• Consequently for on site course, it is up to the customer to select the IDE under which labs will be run.
A more detailed course description is available on request at training@ac6-training.com

Prerequisites and related courses

- This course provides an overview of the ARM7TDMI core. Our course reference R1 - ARM7/9 implementationcourse details the operation of this core.
- The following course could be of interest:
  - USB Full Speed High Speed and USB On-The-Go, reference IP2 - USB 2.0course

Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

INTRODUCTION TO AT91SAM7

Overview

- ARM core based architecture
- APB internal busses
- The main three blocks : platform, core and input / output peripherals

THE PROCESSOR CORE

THE ARM7TDMI CORE

- Operating modes
- ALU data path
- ARM vs Thumb instruction sets, interworking
- Access to memory-mapped locations
- Stack management
- Benefits of condition set capability in ARM state
- C-to-Assembly interface
- Exception mechanism, handler table

PLATFORM

INFRASTRUCTURE

- Power supplies, internal regulator
- Clock generator
- Reset controller
- SAM-BA default boot program
- Memory controller
- Internal high-speed flash
- External Bus Interface
- Power management controller
- Advanced interrupt controller
- Parallel input / output controller
- Peripheral DMA controller

INTEGRATED I/Os

NON COMMUNICATION ORIENTED INPUT / OUTPUT PERIPHERALS

- Timers
  - Periodic Interval Timer
  - Windowed Watchdog
  - Real-time timer
  - 3-channel timer / counter
  - 16-bit PWM controller
- Analog-to-Digital Converter
  - 8-channel 10-bit ADC
  - Conversion trigger
  - ADC timings

COMMUNICATION CONTROLLERS

- 2-wire interface
  - I2C protocol basics
  - Transmit and receive sequences
- SPI
  - SPI protocol basics
  - External chip-select
  - Transfer sequence
- USART
  - Individual baud rate generators
  - IrDA modulation / demodulation
  - Support for Smart Card
  - RS485 support
- Synchronous Serial Controller
  - I2S analog interface support
  - Time Division Multiplexed support
  - High speed continuous data stream capabilities
- USB
  - Full speed operation
  - Endpoint configuration