



## FF4 - MCF548x implementation

**This course covers MCF548X ColdFire MCUs, for instance the MCF5485**

### Objectives

- Optimized code writing based on pipeline knowledge.
- Memory controller understanding, especially DDR SDRAM controller.
- Understanding the operation of the Fast Ethernet controller.
- Detailing the reset sequence.
- Programming of an Interrupt Service Routine.
- Parameterizing the PCI bridge to perform inbound and outbound transactions.

- This course has been delivered several times to companies developing transportation equipments.

*A lot of programming examples have been developed by ACSYS to explain the boot sequence and the operation of complex peripherals, such as Fast Ethernet.*

- *They have been developed with CodeWarrior compiler and are executed under CodeWarrior debugger.*

*A more detailed course description is available on request at [formation@ac6-formation.com](mailto:formation@ac6-formation.com)*

### Prerequisites

- Experience of a 32 bit processor or DSP is mandatory.

### Related courses

- Ethernet and switching, reference [N1 - Ethernet and switching](#) course
- PCI 3.0, reference [IC1 - PCI 3.0](#) course
- USB 2.0, reference [IP2 - USB 2.0](#) course
- CAN bus, reference [IA1 - CAN bus](#) course

### Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - 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.

### Evaluation modalities

- The prerequisites indicated above are assessed before the training by the technical supervision of the trainee in his company, or by the trainee himself in the exceptional case of an individual trainee.
- Trainee progress is assessed by quizzes offered at the end of various sections to verify that the trainees have assimilated the points presented

- At the end of the training, each trainee receives a certificate attesting that they have successfully completed the course.
  - In the event of a problem, discovered during the course, due to a lack of prerequisites by the trainee a different or additional training is offered to them, generally to reinforce their prerequisites, in agreement with their company manager if applicable.

## Plan

### INTRODUCTION TO THE MCF548X FAMILY

#### Overview

- ColdFire core versions
- Architecture of a typical 548X board
- Mapping of internal resources

### CORE ARCHITECTURE

#### THE V4e COLD FIRE CORE

- Pipeline basics
- Description of assembly instructions
- Floating Point Unit description
- Mac instructions, implementation of a fixed point DFT
- ColdFire instruction set architecture enhancements
- Stack management, subroutine call and return
- C to assembly interface, organization of the stack frame
- Position dependent code vs position independent code
- Section definition
- Exception management : vector table, priority, masking, precise faults
- Memory Management Unit : translation and access control, process protection
- TLB initialization
- Cache basics
- 32-kB cache data and instruction, a four-way set associative organization
- Cache coherency and invalidation, software control
- Internal 32-kB SRAM, initialization code
- Power management

#### DEBUG FACILITIES

- Intrusive vs non-intrusive debug
- BDM port
- Hardware breakpoints
- Trace port

### PLATFORM

#### RESET

- Reset sources
- Clocking, system clock generation, PLL control, loss of clock detection
- Reset control flow
- Requirements of the boot routine

#### SIU & INTERRUPT CONTROLLER

- System Control Module

- Internal bus arbitration
- The interrupt controllers : vectorized vs auto-vectorized mode, edge Port Module

## **HARDWARE IMPLEMENTATION**

- Electrical specification, supply voltage sequencing
- Flexbus
- DDR SDRAM basics
- DDR SDRAM Controller
- PCI Controller
- Error management

## **TIMERS**

- Programmable Interrupt Timer Modules
- General Purpose Timer Modules
- Input capture capability

## **THE MULTI CHANNEL DMA CONTROLLER**

- DMA task memory
- DMA sources
- Transfer control descriptors

## **INTEGRATED I/Os**

## **COMMUNICATION CONTROLLERS**

- The PSC Module
- The DSPI
- The I2C controller
- The FlexCAN controller
- The Fast Ethernet Controller
- The USB 2.0 device controller

## **INTEGRATED SECURITY ENGINE**

- Crypto-channels
- ARC four execution unit
- Multi-function data packet descriptors

## **Renseignements pratiques**

**Duration : 4 days**

**Cost : 1950 € HT**