



## 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 [training@ac6-training.com](mailto:training@ac6-training.com)

### Prerequisites

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

### Related courses

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

### 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.

# Plan du cours

## INTRODUCTION TO THE MCF548X FAMILY

### Overview

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

## CORE ARCHITECTURE

### THE V4e COLDFIRE 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