

## **Arm7/ Arm9/ Arm10/ Arm11™: Architecture and Embedded Programming - Face-to-Face Training**

### **Objectives**

You know the Arm architecture and can write software in C and Assembler. You can locate programs in memory and test them. This is the perfect start for designing Arm based systems.

### **Participants**

Software and hardware developers

### **Requirements**

A basic understanding of ANSI-C and microcontrollers.

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### **Content**

#### **Arm Processor Architecture**

- Operating modes, states, pipeline, register organization
- User mode, fast interrupt (FIQ) mode, interrupt (IRQ) mode
- Supervisor mode, system mode, undefined mode
- Thumb-2 state, Arm state, Thumb state, Jazelle state
- Arm register file
- Status register

#### **Arm Processor Cores: Overview**

- Arm7 / Arm9 / Arm10 / Arm11 processor core
- Cortex®-M, Cortex®-R, Cortex®-A processor cores

#### **Arm, Thumb and DSP Instruction Sets**

- v4, v4T, v5, v6 instructions
- v7 - Thumb-2 instruction set overview
- Arm/Thumb interworking
- Assembler directives

#### **Exception Handling**

- FIQ, IRQ, ABORT, UNDEF, SVC
- Vector table
- Exception handler templates
- Vectored interrupt controller (VIC)

#### **System Control Coprocessor, CP15**

- Arm coprocessor concept
- Overall system control & configuration
- Cache configuration and cache management
- Memory management unit (MMU) configuration
- System performance monitoring

#### **VFP2 Floating Point Unit**

- VFP2 architecture
- VFP2 instruction set overview

**Level 1 Memory Interface**

- Tightly coupled memory
- Cache architecture
- DMA interface

**Level 2 Memory System**

- Advanced microprocessor bus architecture (AXI)
- AXI bus masters
- AXI bus slaves
- Second level caches
- On-chip RAM, peripherals
- External memory

**Memory Management Unit (MMU)**

- Translation lookaside buffer (TLB)
- Page tables, attributes

**Memory Protection Unit (MPU) for Embedded Systems****Clock, Reset and Power Control****Arm Debug Support**

- Embedded trace macrocell (ETM)
- Performance monitoring unit (PMU)
- CoreSight debug components
- Debug coprocessor, CP14

**Embedded Software Development**

- Adjustment of library routines to HW (retargeting)
- Locating code and data in memory (scatter loading)
- Linker description file
- Reset, start-up, start-up file

**Efficient C Programming for the Arm Architecture**

- Compiler optimization, compiler options
- Interface C - assembler
- Programming guidelines for Arm compilers
- Efficient use of local and global variables

**Hardware-near C**

- C statements and their execution in Assembler
- Access to peripherals in C
- Software architecture for embedded systems
- Structured (object oriented) description of peripherals

**Practical Exercises with Arm RealView Tools**

- Different tools can be used on request
- All programs are tested on an evaluation board

**FACE-TO-FACE TRAINING****Price \*                      Duration**

2.800,00 €                      4 days

Training code: E-ARM-7/9

\* Price per attendee, in Euro plus VAT

**Face-To-Face - German****Duration**

4 days

**Coaching**

Our coaching services offer a major advantage: our specialists introduce their expertise and experience directly in

your solution process, thus contributing to the success of your projects.

We will be happy to provide you with further information or submit a quotation tailored to your requirements.