

ARM1176 SoC Design

Standard Level – 5 days

ARM cores are the *de facto* standard for 32 bit microcontroller applications. ARM provides a wide range of cores, from the very low cost ARM7TDMI to the high performance and feature-rich ARM1176.

Doulos has been an ARM Approved Training Partner for many years, and in addition to standard ARM training offers a wide range of ARM based training modules for team-based training.

ARM1176 SoC Design is a single program to fulfil team-based training requirements. As a vendor-independent training company, Doulos can provide workshops in the context of your own choice of synthesis and simulation tools. Please contact Doulos to discuss your specific tool requirements.

The 5-day course comprises the following modules:

- **Introduction to ARM Architecture** (days 1-2) provides hands-on training for new ARM users and introduces the architecture and instruction sets for ARM7 to ARM11 processor families, including the handling of exceptions. An introduction to the ARM RealView software tools is included.
- **ARM1176 Hardware Design** (days 3-5) is based on the 'Introduction to ARM Architecture' module and extends it to provide in-depth tuition on ARM11 based system-on-chip (SoC) design. It introduces the AMBA3.0 (AXI) interface and the connection of new IP blocks into an existing ARM system. It also covers essential special features of the core: debug features, Intelligent Energy Management (IEM), initialisation and bootstrap, the v6 memory system, and clocks and resets.

Based on these modules, team-based training on your site can be customised to fit your requirements for content, scope and duration. Please ask to speak to a member of the Doulos technical team to discuss your requirements.

Who should attend?

- System design engineers, software design engineers and hardware design engineers who wish to develop systems and applications based on ARM cores.

What will you learn?

- Introduction to ARM processor architecture and pipelining
- RealView Developer Suite (RVDS)
- ARM1176 processor core
- ARM and Thumb instruction sets
- Exception handling
- ARM core integration
- Hands-on use of development systems
- AHB, AXI and APB Protocol
- ARM1176 Memory Subsystem
- ARM1176 Memory Management
- ARMv6 Memory Types
- ARM1176 L1 and L2 Memory interface
- ARM1176 L2 Caches
- PrimeCell VIC interrupt controller
- ARM1136/76 Interrupts
- Introduction to TrustZone

For further information contact your local Doulos [Sales Office](#).



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- Introduction to IEM
- ARM1176 clocks, resets and power management
- ARM1176 initialisation and bootstrap
- ARM processor simulation models
- ARM11 embedded core debug
- ARM1176 integration

Pre-requisites

All participants must be computer literate and have a basic understanding of the C programming language and a hardware description language such as VHDL or Verilog. An in-depth knowledge of microprocessors is not essential, but would be advantageous.

Course materials

Doulos course materials are renowned for being the most comprehensive and user friendly available. Their style, content and coverage is unique in the EDA training world, and has made them sought after resources in their own right. Fees include:

- Fully indexed course notes creating a complete reference manual
- Workbooks full of practical examples and solutions to help you apply your knowledge

Structure and content

Introduction to the ARM Architecture (days 1-2)

The ARM Architecture

ARM architecture • Overview of ARM • ARM based applications • ARM instruction set overview • ARM programmer's model • supporting technologies

ARM Processor Core

ARM7TDMI and ARM9TDMI pipelines • ARM7TDMI family • ARM9TDMI family • ARM10E family • ARM11 family • StrongARM and XScale • Datapaths and instruction decoding

Real View Developer Suite (RVDS) Overview

Compilers • Assembler • Linker • Codewarrior • Debuggers

Real View Introductory Workbook

Practical work using RVDS

Exception handling

Overview of how to handle the different exceptions of an ARM core. Includes detailed examples.

ARM1176 Hardware Design (days 3-5)

ARM1176 CPU Architectures

ARM7TDMI and ARM9TDMI pipelines • ARM7TDMI family • ARM9TDMI family • ARM10E family • ARM11 family • StrongARM and XScale • Datapaths and instruction decoding

AMBA3.0 interface

Detailed description of the new AMBA3.0 interconnect methodology • AXI, AHB and APB interconnect

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standards • PL300 bus matrix IP

ARM1176 L1 Interface

Introduction to the Level1 Sub-System • System Control Coprocessor (CP15) features • Cache organisation • Tightly Coupled Memory (TCM) • DMA Interface • Cache timing • Write buffer

ARM1176 L2 Interface

Introduction to the Level2 interface and memory system • Clock domains • L2 interface clocking, cache line fills • Non-cacheable fetches • Data interface • Peripheral interface • DMA interface

ARM1176 L2 Caches

Inner and outer caches • Caching policies • TEX Remap • Communicating cache policy • Example system with L2 cache

ARM Processor Simulation Models

The different ARM models and their use in the SoC design process • The new ARM RealView SoC Designer (SystemC based) design tool

ARM1136/76 Interrupts

An overview of the ARM11 interrupt features, the factors contributing to low interrupt latency and an understanding of the ARMv6 re-startable instructions

Introduction to TrustZone

Introduction to ARM's TrustZone and its features • The new ARM secure mode and its functionality

Introduction to IEM

Principles of the Intelligent Energy Manager (IEM) • Understanding the IEM software and its functions

ARM1176 Clocks, Resets and Power Management

Overview of clock and reset behaviour and requirements • The different power management modes

ARM1176 Memory Management

Introduction to the ARMv6 memory system • Caching policy and ARM1176 memory management

ARM1176 Booting

Necessary steps for booting an ARM1176 core • Sample bootstrap code.

ARM11 Embedded core debug

Integrated debug features of the ARM11 family

ARM1176 Integration

Key system design considerations • Summary of steps for the integration of an ARM ARM1176 macrocell

Related Courses

- ARM SoC Modelling using RealView SoC designer (3-days)
- Modular ARM SoC Design (1–5 days)
- ARM Embedded Software (4 days)
- Software Guide to ARM11

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