

## ARMv7 32-bit Architecture

### Training

#### Let MindShare Bring “ARMv7 32-bit Architecture” to Life for You

ARM processors are at the heart of many mobile phones, digital cameras, and other small portable devices. ARM processors are also heavily used in embedded and real-time control applications. This course focuses on the ARM v7 ISA that is at the heart of Cortex-M, -R, -A (minus A53/A57) processors.

#### You Will Learn:

- ARM architecture (ARMv7)
- 32-bit ISA (registers, instruction set etc)
- Memory and paging architecture
- Interrupt handling and architecture environment
- Architecture extensions such as floating point, security (TrustZone), SIMD (NEON)
- Overview of 32-bit processor pipelines

**Course Length:** 3-Days

#### Target Audience:

This course is aimed at software developers and system architects developing for systems powered by ARMv7-A processors such as Cortex-A5/A7/A8/A9/A15 Processors. It is relevant for operating system development, device drivers, low-level coding and for application software.

#### Course Outline:

- Software Architecture
  - Architecture Profiles and their significance – Application (e.g. Cortex-A15), Embedded (e.g. Cortex-R4), and Microcontroller (e.g. Cortex-M4)
  - Instruction sets and environments (AArch32 - ARM, Thumb, ThumbEE, and AArch64)
  - Version 7 registers, and the banking of the registers.
  - Version 7 privileges, modes and states.
  - Memory and IO access, and system control.
  - Memory ordering model, and software control.
  - Architectural extensions – Vector Floating Point, SIMD (Neon), security (Trust Zone)
  - Version 7 Interrupts and Exceptions.
  - Memory protection and paging mechanisms, including v7 page tables, support for large physical address space (>4 GBytes)
  - Caches, TLBs and branch prediction
  - Multiprocessing extensions
  - Implementation specific issues
- Processor Core Microarchitecture overview that implement version 7 32-bit architecture
  - Pipeline overview
    - Application processors (A8, A9, A5, A15, A7)
    - Real-time processors (R4/R5)
    - Microcontroller processors (M3/M4)
  - Impacts of the different implementations on software, issues such as predictability

#### Recommended Prerequisites:

Computer architecture knowledge

#### Course Materials:

Students will be provided with an electronic version of the slides used in class.