ARM Java Extensions - Jazelle™

- Direct execution of Java ByteCode
- 8x Performance of Software JVM (Embedded CaffeineMark3.0)
- Over 80% power reduction for Java Applications
- Single Processor for Java and existing OS/applications
- Supported by leading Java Run-time environments and operating systems
- Available in ARM9, ARM10 & Jaguar families

ARM Media Extensions (ARM v6)

- Applications
  - Audio processing
  - MPEG4 encode/decode
  - Speech Recognition
  - Handwriting Recognition
  - Viterbi Processing
  - FFT Processing
- Includes
  - 8 & 16-bit SIMD operations
  - ADD, SUB, MAC, Select
- Up to 4x performance for no extra power
- Introduced in ARM v6 architecture, Available in Jaguar

ARM Architectures

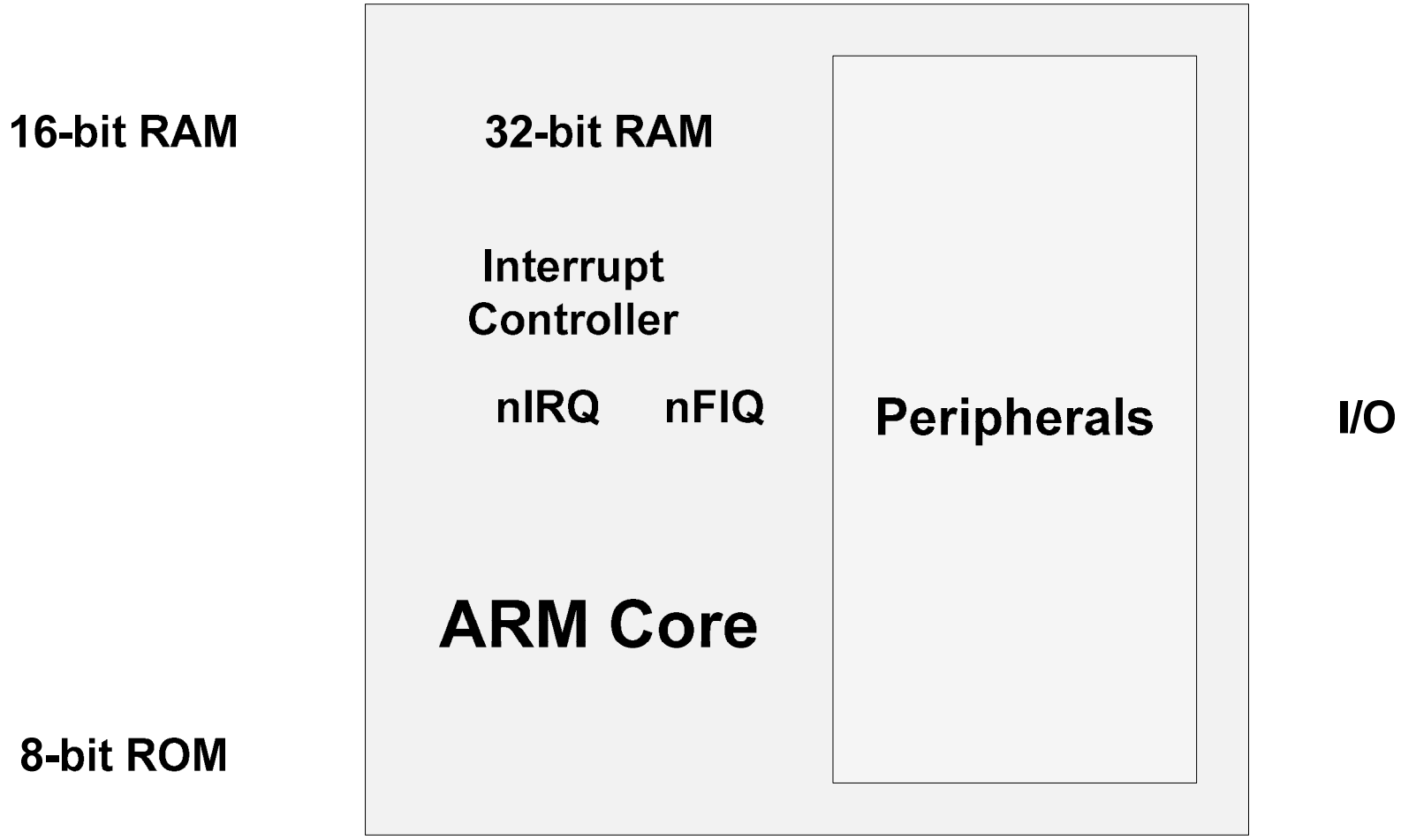
	Feature Set			
Architecture	THUMB™	DSP	Jazelle™	Media
v4T	✓			
v5TE	✓	✓		
v5TEJ	✓	✓	✓	
v6	✓	✓	✓	✓

- Enhance performance through innovation
  - THUMB™: 30% code compression
  - DSP Extensions: Higher performance for fixed-point DSP
  - Jazelle™: up to 8x performance for java
  - Media Extensions up to 4x performance for audio & video
- Preserve Software Investment through compatibility

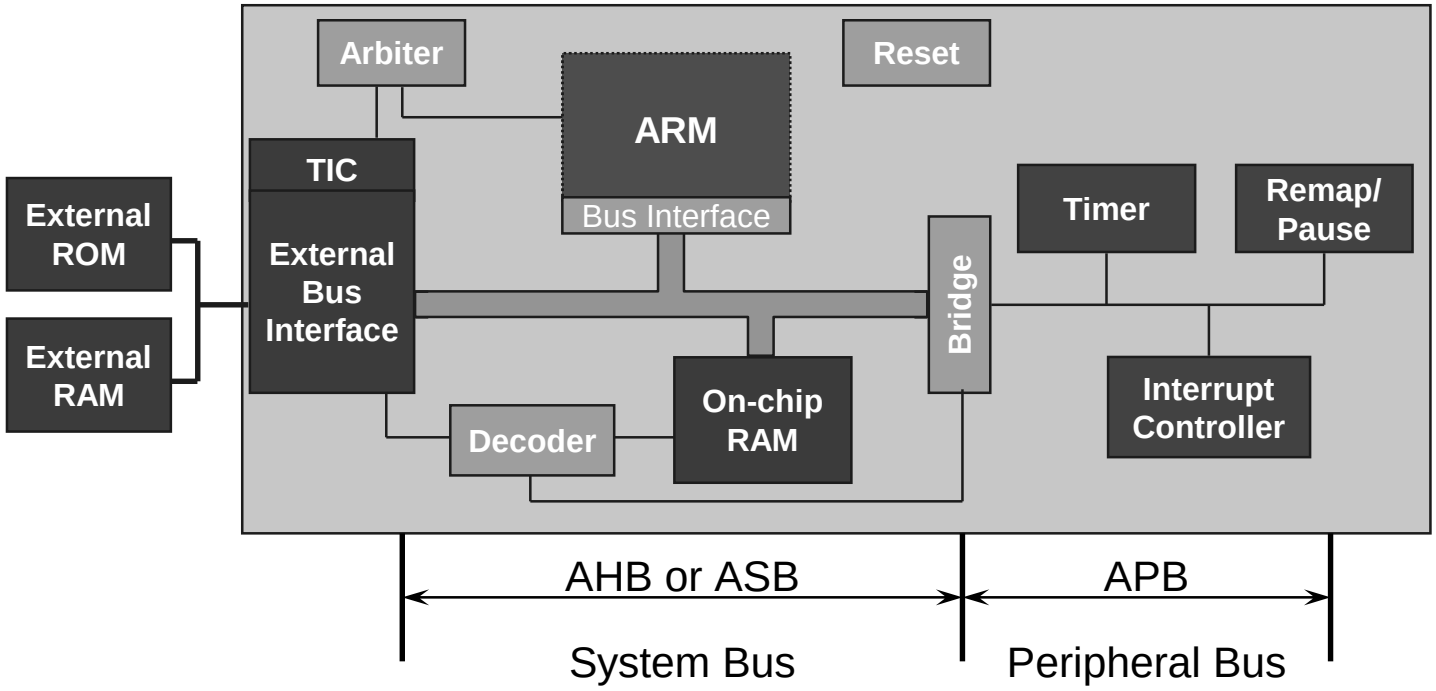
Outline

- Introduction
- Programmers model
- Instruction set
- **System design**
- Development tools

Example ARM-based System



AMBA



- **AMBA**
  - **Advanced Microcontroller Bus Architecture**
- **ADK**
  - **Complete AMBA Design Kit**
- **ACT**
  - **AMBA Compliance Testbench**
- **PrimeCell**
  - **ARM's AMBA compliant peripherals**

reference: http://www.intel.com/education/highered/modelcurriculum.htm

ARM Coprocessor Interface

- ARM supports a general-purpose extension of its instructions set through **the addition of hardware coprocessor**
- **Coprocessor architecture**
  - Up to 16 logical coprocessors
  - Each coprocessor can have up to 16 private registers (any reasonable size)
  - Using load-store architecture and some instructions to communicate with ARM registers and memory.

ARM7TDMI Coprocessor Interface

- Based on “bus watching” technique
- The coprocessor is attached to a bus where the ARM instruction stream flows into the ARM
- The coprocessor copies the instructions into an internal pipeline
- **A “hand-shake” between the ARM and the coprocessor confirms that they are both ready to execute coprocessor instructions**

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Development Tools (1)

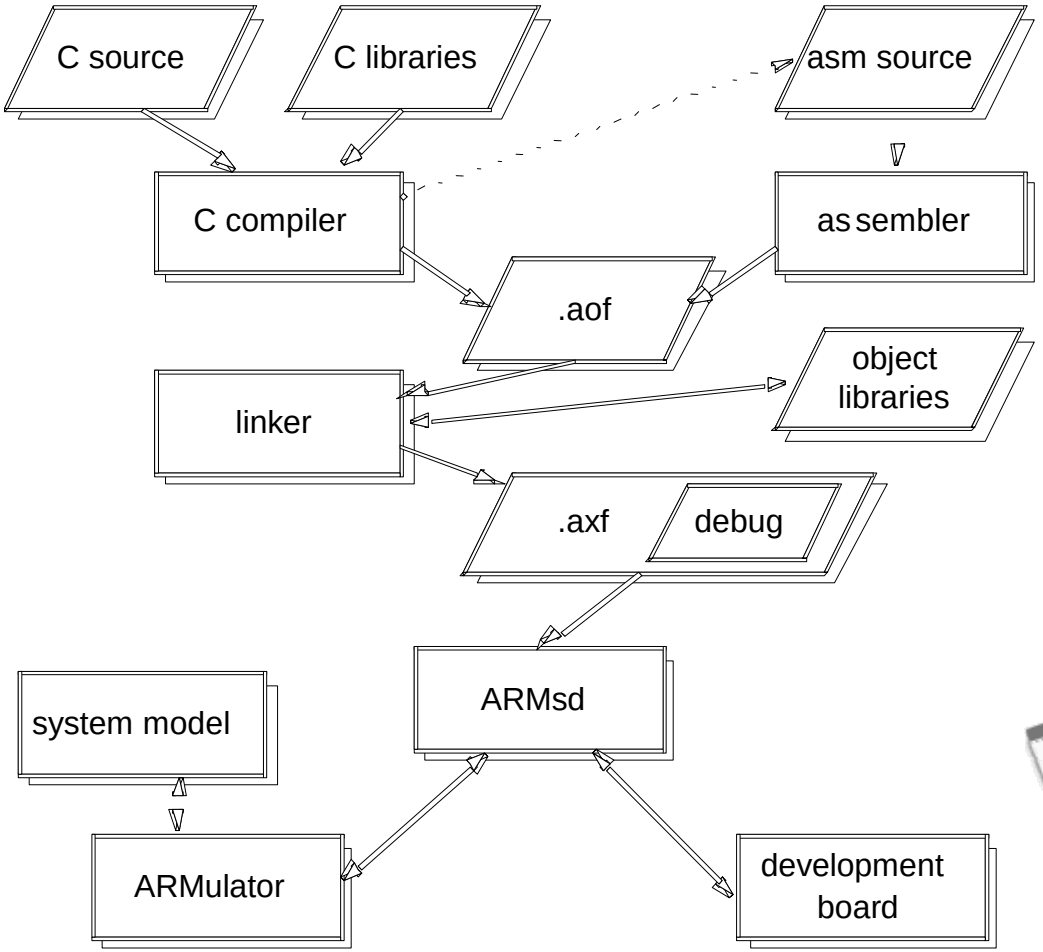
- **Commercial**
  - ARM
  - **IAR**
  - **…**
- **Open source**
  - GNU

Best code quality

Development Tools (2)

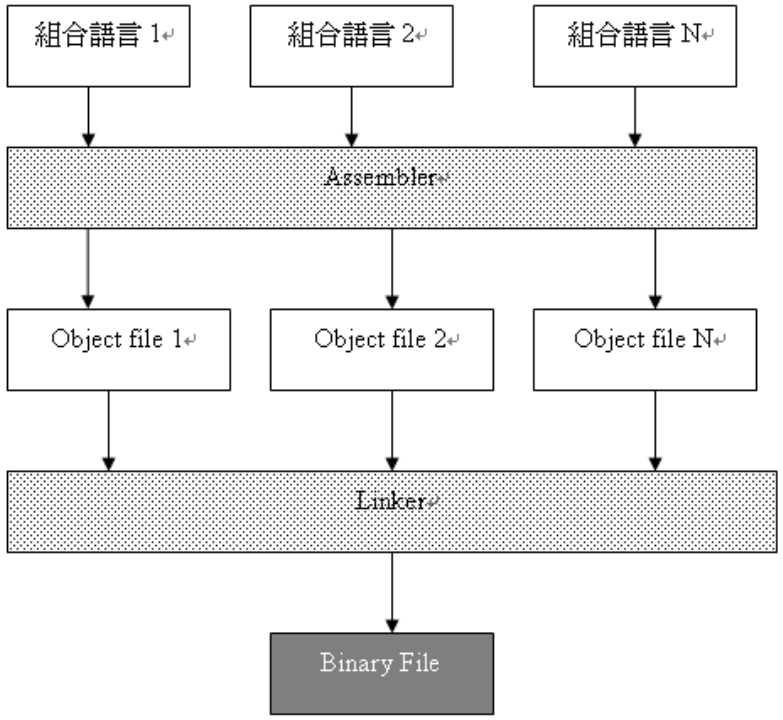
	ARM ADS	**GNU**
Compiler	armcc	gcc
Assembler	armasm	binutils
Linker	armlink	binutils
Format converter	fromelf	binutils
C library	C library	newlib
Debugger	Armsd, AXD	GDB, Insight
Simulator	ARMulator	Simulator in GDB

The Structure of ARM Cross-Development Toolkit



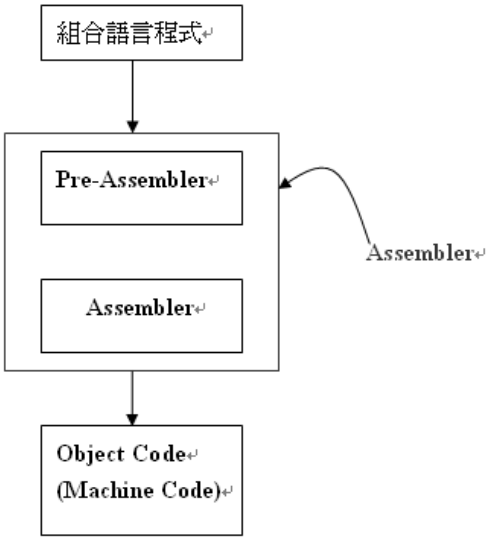
ADS-Assembler

- Compiler：產生Object
- Linker：產生ELF 可執行碼



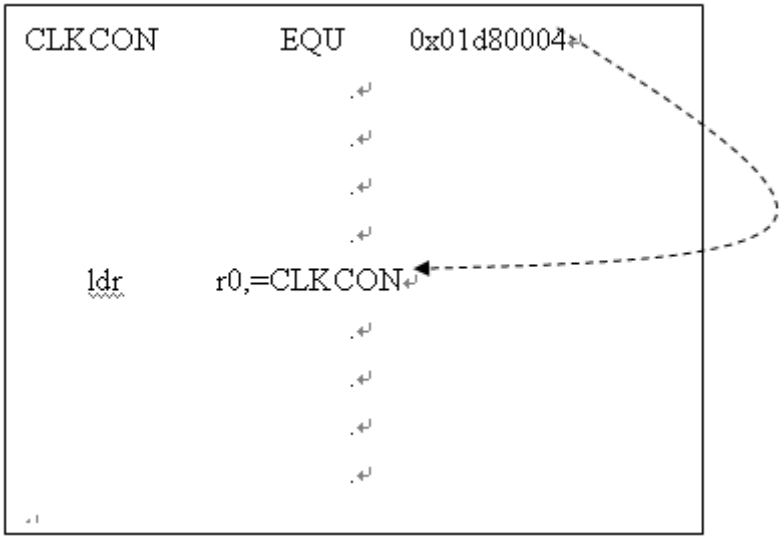
ADS- Pre-assembler

- Pre-assembler
  - Pseudo code -> assembler -> Object



Example

- Example of pr-compiler



Example

- Example of pr-compiler