

The ARM Architecture



Introduction to ARM Ltd

Programmers Model

Instruction Set

System Design

ARM Ltd

ARM[°]

- Founded in November 1990
 - Spun out of Acorn Computers
- Designs the ARM range of RISC processor cores
- Licenses ARM core designs to semiconductor partners who fabricate and sell to their customers.
 - ARM does not fabricate silicon itself
- Also develop technologies to assist with the design-in of the ARM architecture
 - Software tools, boards, debug hardware, application software, bus architectures, peripherals etc





ARM Partnership Model





ARM Powered Products





Intellectual Property

- ARM provides hard and soft views to licencees
 - RTL and synthesis flows
 - GDSII layout
- Licencees have the right to use hard or soft views of the IP
 - soft views include gate level netlists
 - hard views are DSMs
- OEMs must use hard views
 - to protect ARM IP



ARM

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ARM

Data Sizes and Instruction Sets

- The ARM is a 32-bit architecture.
- When used in relation to the ARM:
 - Byte means 8 bits
 - Halfword means 16 bits (two bytes)
 - Word means 32 bits (four bytes)
- Most ARM's implement two instruction sets
 - 32-bit ARM Instruction Set
 - 16-bit Thumb Instruction Set
- Jazelle cores can also execute Java bytecode



Development of the ARM Architecture







Early ARM architectures

Halfword and signed halfword / byte support

System mode

SA-110

SA-1110

Thumb instruction set

ARM7TDMI

ARM9TDMI

ARM720T

ARM940T

Improved ARM/Thumb Interworking

CLZ

Saturated maths

DSP multiplyaccumulate instructions

ARM1020E

XScale

ARM9E-S

ARM966E-S

Jazelle

Java bytecode execution



ARM9EJ-S

ARM926EJ-S

ARM7EJ-S

ARM1026EJ-S

SIMD Instructions

Multi-processing

V6 Memory architecture (VMSA)

Unaligned data support

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ARM1136EJ-S



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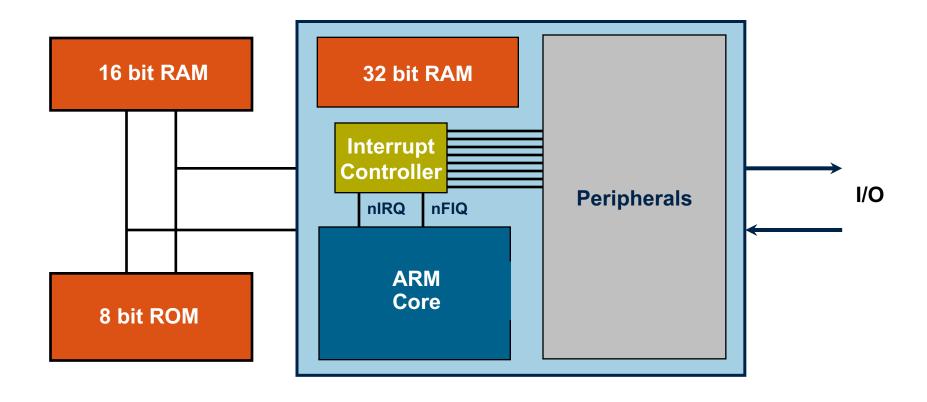


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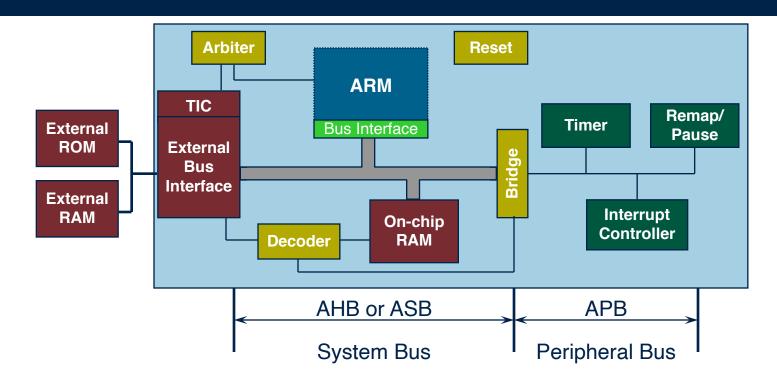


Example ARM-based System



AMBA





AMBA

 Advanced Microcontroller Bus Architecture

ADK

Complete AMBA Design Kit

ACT

AMBA Compliance Testbench

■ PrimeCell

ARM's AMBA compliant peripherals



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The RealView Product Families

Compilation Tools

ARM Developer Suite (ADS) – Compilers (C/C++ ARM & Thumb), Linker & Utilities



RealView Compilation Tools (RVCT)

Debug Tools

AXD (part of ADS)
Trace Debug Tools
Multi-ICE
Multi-Trace

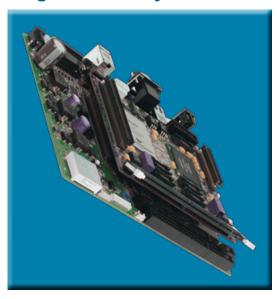


RealView Debugger (RVD)
RealView ICE (RVI)

RealView Trace (RVT)

Platforms

ARMulator (part of ADS)
Integrator™ Family

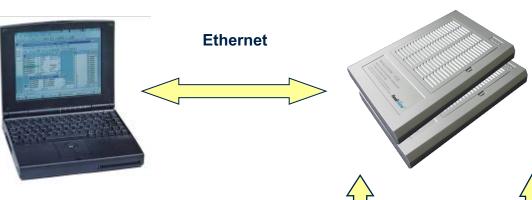


RealView ARMulator ISS (RVISS)



ARM Debug Architecture

Debugger (+ optional trace tools)



EmbeddedICE Logic

Provides breakpoints and processor/system access

JTAG interface (ICE)

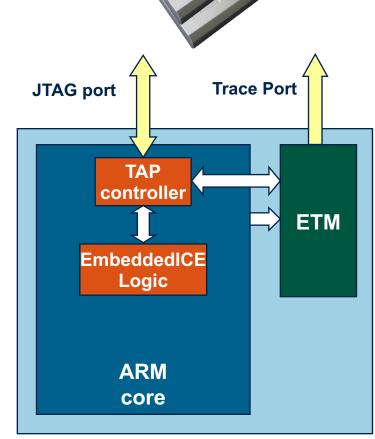
Converts debugger commands to JTAG signals

Embedded trace Macrocell (ETM)

- Compresses real-time instruction and data access trace
- Contains ICE features (trigger & filter logic)

Trace port analyzer (TPA)

Captures trace in a deep buffer





THE ARCHITECTURE FOR THE DIGITAL WORLD™