Evolution of ARM

A Brief Overview by :-

Vishal (150050014)
Silu(150050024)
Deepak (150050039)
Anshu (150050077)
Arunavo (150050062)

Introduction

- ARM, previously Advanced RISC Machine, originally Acorn RISC Machine, is a family of reduced instruction set computing (RISC) architectures for computer processors, configured for various environments.
- Developer and License Holder:- Arm Holdings
- ARM Holdings designs cores that implement this instruction set and licenses these designs to a number of companies that incorporate those core designs into their own products.
- Usage:- Systems-on-chips (SoC) and systems-on-modules (SoM) for memory, interfaces, radios, etc.

Why is ARM the most popular?

- A typical RISC architecture consists of a large uniform register file, load and store architecture, simple addressing mode and uniform fixed length instruction field. we achieve high performance, low code size, low power consumption and low silicon area.

- Fewer transistors than CISC which improves cost, power consumption, and heat dissipation.

- Highly optimized as a lot of generations have been developed over the years.

Why ARM is most popular?

- ARM is available from a great many manufacturers, more than any other microcontroller, and each has a number of versions to choose from

- ARMs are inexpensive; ARM was probably the first 32-bit controller to break the USD 1 barrier.

- ARM allows an instruction set called “Thumb‟, which comprises 32-bit instructions to 16-bits, enabling programs to be coded much more density than standard RISC instruction set

Evolution

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Introduction to ARM Architecture families

Version	Family
ARMv1	ARM1
ARMv2	ARM2, ARM3
ARMv3	ARM6, ARM7
ARMv4	Strong ARM, ARM7TDMI, ARM9TDMI
ARMv5	ARM7EJ, ARM9E, ARM10XE
ARMv6	ARM11
ARMv7	Cortex

Versions

Version1: The ARM version1 architecture:

- Software interrupts
- 26-bit address bus
- Data processing is slow
- It supports byte, word and multiword operations.

Version2:

- 26-bit address bus
- Automatic instructions for thread synchronisation
- Co-processor support

Versions

Version 3:

- 32-bit addressing
- Multiple data support (like 32 bit = 32*32 = 64)
- Faster than ARM Version1 and Version2

Version 4:

- 32-bit addressing
- It supports T variant: 16 bit THUMB instruction set
- It supports M variant: long multiply means give a 64 bit result.

Versions

Version5:

- Improved ARM THUMB inter-workin g.
- It supports CCL instructions.
- It supports E variant: Enhanced DSP instruction set.
- It supports S variant: Acceleration of Java byte code execution.

Version6:

- Improved memory system
- It supports a single instruction multiple data.

Versions

Version7:

- **ARM Cortex A series:** The Arm Cortex-A series of applications processors provide a range of solutions for devices undertaking complex compute tasks. Cortex A72 introduced compatibility for 64 bit.
- **ARM Cortex R series:** The Arm Cortex-R series provides a range of processors optimized for high performance, hard real-time applications.
- **ARM Cortex M series:** The Arm Cortex-M series contains the smallest/lowest power processors build by Arm, optimized for discrete processing and microcontrollers.

Project Trillium

- Arm's Machine Learning (ML) platform, enables a new era of advanced, ultra-efficient inference at the edge. Specifically designed for ML and neural network (NN) capabilities, the architecture is versatile enough to scale to any device, from IoT to connected cars and servers.

- Built from the ground up for optimal performance and efficiency, Project Trillium completes the Arm Heterogenous ML compute platform with the Arm ML processor, the second-generation Arm Object Detection (OD) processor and open-source Arm NN software.

1. ARM ML processor

- Most efficient solution to run neural networks.
- Designed for the mobile and adjacent markets.
- Optimized, ground-up design for machine learning acceleration.
- Best-in-class performance with state-of-the-art, fixed-function engines.
- Programmable engines for future innovation and algorithms.

2. ARM OD processor

Cutting-edge people detection running on mobile or embedded cameras.

1. Enables cloud-connected cameras to limit up-streaming to when people are detected, significantly reducing bandwidth and cloud storage.

2. The Object Detection Processor data streams amount to a few kilobytes, reducing bandwidth to the cloud and enabling aggregation of several thousand streams per server compared to a few hundred video streams providing significant economies of scale.

Thank you!