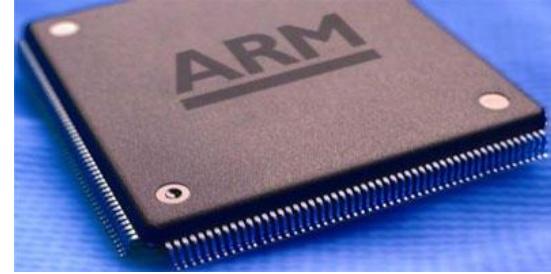


History of ARM



ARM - Advanced RISC Machines
previously known as Acorn RISC Machines

Dr. Sarwan Singh

Introduction



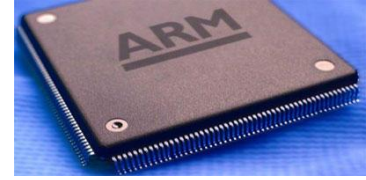
- ▶ ARM Holdings plc. holds Intellectual Property for RISC Processors and SoC (System on a Chip)
- ▶ The company does not manufacture its own chips, instead producing designs that its technology partners can produce.
- ▶ Also produces a suite of development tools, as well as hardware and software products.

Acorn

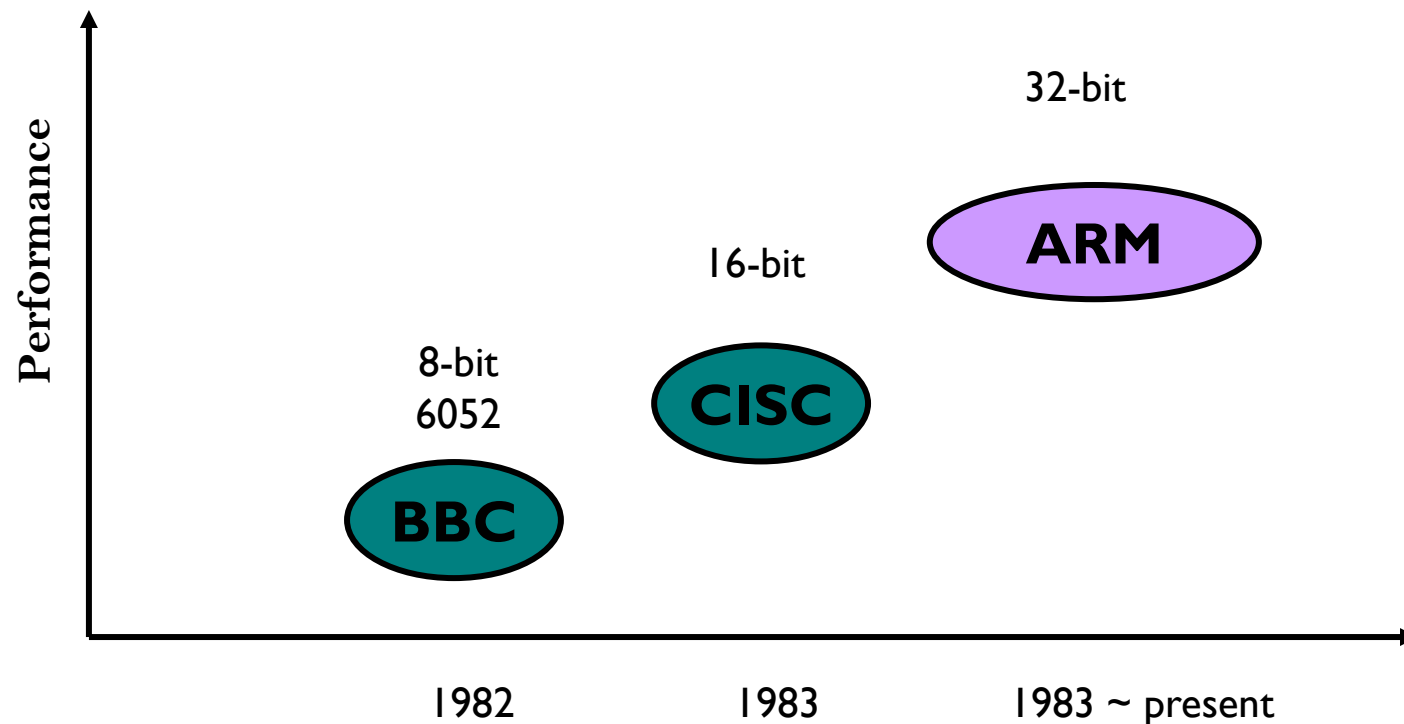


- ▶ Acorn computers: a British computer company founded in Cambridge, England, in 1978, by Hermann Hauser and Chris Curry. They produced computers like Acorn Electron, BBC Micro & Acorn Archimedes.
- ▶ They dominated UK educational computer market during 1980s and 1990s
- ▶ VLSI technology Inc. Produced the first ARM processor based on Acorn design.
- ▶ ARM based PCs did not sell well, Acorn acquired by Olivetti in 1985
- ▶ The company was broken up into several independent operations in 2000, one of which notably was ARM holdings
- ▶ ARM holding primary business model is to license its RISC based designs to other manufactures.

Introduction



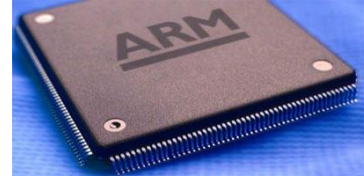
- ▶ The first ARM processor was developed at Acorn
- ▶ In 1990, ARM stood for Acorn RISC Machine
 - ▶ Acorn developed a 32-bit RISC processor for its own use (used in Acorn Archimedes)
- ▶ Later, ARM stood for Advanced RISC Machine



ARM Partnership Model



ARM Powered Products



History



- ▶ Founded in November 1990 at Cambridge UK
 - ▶ Advanced RISC Machine Limited
 - ▶ Spun out of Acorn Computers
 - ▶ Joint venture between Apple computer, Acron Computer Group and VLSI technology
 - ▶ First product in 1991: the embedded RISC-based ARM6™ family
 - ▶ 12 employees in Cambridge, UK

History



- ▶ The leading intellectual property (IP) provider
 - ▶ high-performance
 - ▶ low-cost
 - ▶ power-efficient RISC processors
 - ▶ Peripherals
 - ▶ system-on-chip (SoC) designs.
- ▶ License IP to leading international electronics companies
 - ▶ semiconductor providers
 - ▶ original equipment manufacturers (OEM)

History



- ▶ Develop technologies to assist with the design-in of the ARM architecture
 - ▶ Software tools
 - ▶ Boards
 - ▶ debug hardware
 - ▶ application software
 - ▶ bus architectures, peripherals etc

History



▶ Year 1999

- ▶ 182 million unit of ARM-based products were shipped
- ▶ 58% of all RISC shipment for the entire year

▶ Year 2000

- ▶ 414 million units of ARM-based products were shipped
- ▶ 77% of all RISC shipments for the entire year

▶ Now

ARM ships 90 products every second

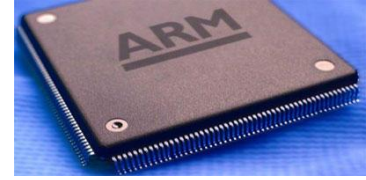
Reference: Andrew Allison, *Inside the New Computer Industry*

Global Reach



- ▶ In April 1998, the company listed on the London Stock Exchange (ARM) and Nasdaq (ARMHY).
- ▶ Gained several Global Investors at the early stages of maturation.
- ▶ Facilities located in 12 countries, on three continents 1500 employees (July 2006)

Company Expansion



- ▶ In 1999 and 2000, ARM acquired Micrologic, Allant Software, and Infinite Designs.
- ▶ In 2001, ARM acquired the engineering team of Noral Micrologics.
- ▶ In 2003, ARM acquired Adelante Technologies.
- ▶ In 2004, ARM acquired Axys Design Automation and Artisan Components.
- ▶ In 2005, ARM acquired KEIL Software.
- ▶ In 2006, ARM acquired Falanx.

Design Focus



- ▶ Power Efficient
- ▶ Best performance for applications needs
- ▶ RISC-Based
- ▶ Capable of High Volume with a short Time To Market
- ▶ Investment in Advanced R&D which coincides with customers and partners

Target Applications



- ▶ Home: Digital Set-top boxes, MP3 Players
- ▶ Mobile: Cellular Phones, Portable Gaming
- ▶ Enterprise: Networking Appliances, Hard Drive Controllers
- ▶ Embedded: Automotive, Industrial, to washing machines and toys
- ▶ Emerging: Mass adoption for volume production.

Success Story



- ▶ ARM is one of the most licensed and thus widespread processor cores in the world
- ▶ Used especially in portable devices due to **low power** consumption and reasonable performance (MIPS / watt)
- ▶ Several interesting extensions available or in development like **Thumb instruction set** and **Jazelle Java machine**

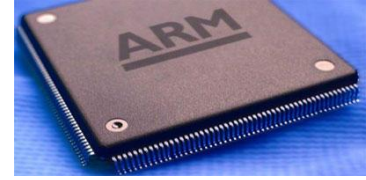
ARM CPUs



- ▶ Processor cores: ARM6, ARM7, ARM9, ARM10, ARM11
- ▶ Extensions: Thumb, El Segundo, Jazelle etc.
- ▶ IP-blocks: UART, GPIO, memory controllers, etc

CPU	Description	ISA	Process	Voltage	Area mm2	Power mW	Clock / MHz	Mips / MHz
ARM7TD MI	Core	V4T	0.18u	1.8V	0.53	<0.25	60-110	0.9
ARM7TD MI-S	Synthesizable core	V4T	0.18u	1.8V	<0.8	<0.4	>50	0.9
ARM9TD MI	Core	V4T	0.18u	1.8V	1.1	0.3	167-220	1.1
ARM920T	Macrocell 16+16kB cache	V4T	0.18u	1.8V	11.8	0.9	140-200	1.05
ARM940T	Macrocell 8+8kB cache	V4T	0.18u	1.8V	4.2	0.85	140-170	1.05
ARM9E-S	Synthesizable core	V5TE	0.18u	1.8V	?	~1	133-200	1.1
ARM1020 E	Macrocell 32+32kB cache	V5TE	0.15u	1.8V	~10	~0.85	200-400	1.25

GPIO



- ▶ PINSEL – to choose the configuration of the pin
(one pin can do upto 4 functions in lpc2148)
- ▶ IOPIN - read or write values
 - ▶ IO_xPIN i.e. IO₀PIN for PORT₀ and IO₁PIN for PORT₁.
- ▶ IODIR - GPIO Port Direction Control register and is used to set the direction i.e. either input or output of individual pins { 0- input , 1- output }
- ▶ IOSET – set value HIGH
- ▶ IOCLR – set value LOW

