The History of The ARM Architecture: From Inception to IPO

By Markus Levy, Convergence Promotions

Acorn – the Beginning

The year was 1979. Atari introduced a coin-operated version of Asteroids. The programming language ADA was born. 3COM, Oracle, and Seagate were founded. TI entered the computer market. Hayes marketed its first modem, which became the industry standard for modems. The Motorola 68K and Intel 8088 were released. And Hermann Hauser and Chris Curry, with the support of a group of students and researchers from Cambridge University's many laboratories, set up Acorn Computers to make personal computers in Cambridge, England.

The first product from Acorn was the British home computer, the Atom, with a blazing-fast 1MHz processor and 12kbytes of ROM and RAM. From here, the company went on to work with the British Broadcasting Corporation (BBC) to produce and market a home computer, intended to increase UK computing awareness. The resulting product, the BBC micro, became a smashing success upon its release in 1982.

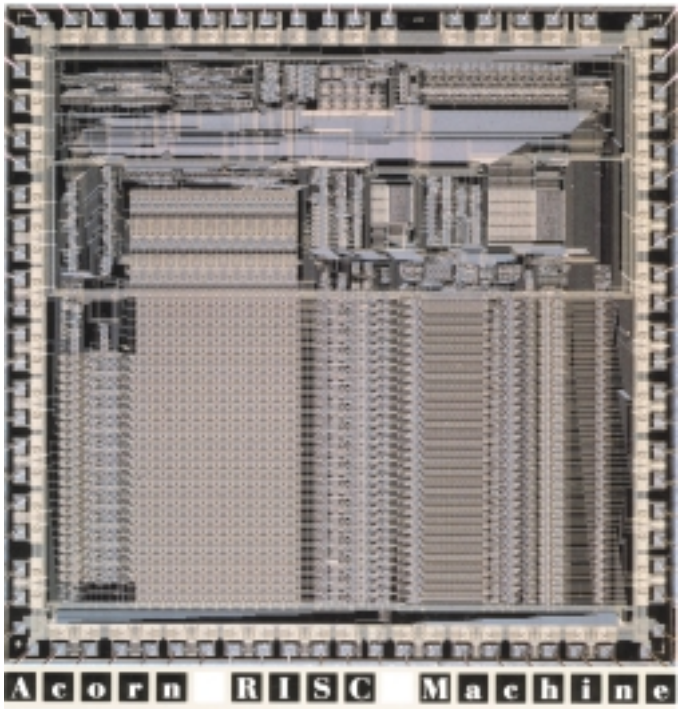
However, the rest of the computer world was not standing idle. For example, Apple launched the Lisa, which combined the first commercial windowing environment in a PC with a 16-bit processor. This made the folks at Acorn aware that increased performance would be needed beyond the existing 8-bit machines. As a direct result, a team was set up within Acorn's Advanced Research and Development section, to try and develop a special project for a Reduced Instruction Set Computing (RISC) processor – an idea that was at that time quite revolutionary.

The Birth of ARM Processors

The outcome of this research project was the first ARM processor, the Acorn RISC Machine (which was later changed to Advanced RISC Machine). Acorn delivered the first samples in 1985, that yielded working silicon the first time it was fabricated using a 3µm process at VLSI Technology. It bettered the stated design goals while using fewer than 25,000 transistors.

The ARM1 was soon superceded by the ARM2, the first production version of the ARM processor, and quite possibly the simplest RISC processor in the world, at the time, with only 30,000 transistors. The instruction set improved upon that of the ARM1 in order to maximize the performance of systems based around it. It featured a true 32-bit data bus, and a 26-bit address bus, with 16 registers and no on-chip cache. In particular, the Multiply and Multiply and Accumulate instructions were added to facilitate digital signal processing, which was to be used to generate sounds, an important feature of home and educational computers. Despite the additions, the ARM2 still maintained its small die size and low transistor count; it was also manufactured by VLSI, which garnered rights to sell chips using the design.

The first ARM2-based product was the ARM Development System, which included the ARM processor and three support chips, 4 Mb of RAM and a set of development tools with an enhanced version of BBC BASIC.



Above: The first ARM core.

The second ARM processor-based product was Acorn's multimedia PC, the Archimedes, released in mid-1987. It featured an 8 MHz version of the ARM2 and three support chips (MEMC, VIDC, and IOC), an input/output controller, and a simple operating system. The Archimedes received a lukewarm response at its launch because personal computing appeared to be consolidating behind the IBM PC standard while Acorn had introduced a computer with a new processor, a new operating system, and no base of software to provide users with the applications they needed. It took two to three years for a credible amount of applications software native to the ARM processor and the Archimedes PC to be developed. After that Acorn refined and improved its computer models to confirm its position as a leader in the British home and educational computing market.

After the launch of the Archimedes, Acorn continued to support its research and development team in creating improved versions on the ARM processor. To expand the design so that it offered the kind of performance expected of a high-end personal computer, a 4 Kbytes on-chip data and instruction cache was added, the clock rate was increased to 25 MHz, and the ARM3 was launched. In 1990, the new processor found a home in Acorn's desktop computers.

The Acorn Fell From the Tree: Apple and the Newton

Hermann Hauser meanwhile had started a new business, the Active Book Company, which focused on the emerging personal digital assistant (PDA) market. The ARM design team redesigned the product to be static so as to reduce the power dissipation of the chip when the clocks were stopped – a requirement for this application.

Apple meanwhile was also entering the PDA market and had produced the first Newton, based on the AT&T low power processor called 'Hobbit.' John Stockton, Research Fellow of VLSI Technology infected the design team with a passion for ARM, and Larry Tesler who headed a team at Apple, both agreed that Apple wanted to use the ARM processor but wanted to work with a separate company from Acorn for competitive reasons. In only six weeks, a joint venture was negotiated between Apple, VLSI Technology, and Acorn in 1990.

The bizarre twist in the tale was that Hermann did a deal with AT&T over the Active Book Company and it became EO Ltd. The EO design swapped from the ARM processor to Hobbit and the Apple Newton design moved from Hobbit to the ARM processor!

Twelve Engineers and a Pub

In an earlier venture, Hermann Hauser had also created the Cambridge Processor Unit or CPU. While at Motorola, Robin Saxby supplied chips to Hermann at CPU and therefore, the two of them already had a relationship. Robin was interviewed and offered the job as CEO for this new venture, but before accepting, requested he be able to meet the team of twelve. Robin remembers, "A key decision was going to be whether I could grow from within the team and not have to add costs by hiring in from outside. I decided on the latter approach after this meeting." The team recalls that Robin wanted to meet us in a neutral venue so they chose a pub nearby. All arrived punctually, but Robin had already been there for ten minutes. Robin was known to the team as the hatchet man who had cleaned up the ES2 business, so his greeting of "You're four minutes late – another minute and I'd have gone" left a lasting impression!

ARM Ltd. headquarters

The New ARM at a Crossroads

In his new role as CEO, Robin officially launched Advanced RISC Machines Ltd. (ARM) on November 27th, 1990. The goal of the new company was to "address and attack the growing market for low-cost, low-power, high-performance 32-bit RISC chips", according to Robin.

At this juncture, Robin was faced with a variety of strategic decisions. One option was to merge the business with a semiconductor company, then lead the new division with financial muscle. Another option was to create a semiconductor company that would design and market chips but subcontract manufacturing. Alternatively, ARM could have partnered with Apple to drive all future product development. However, the option that was adopted was to design a base technology and then license the intellectual property (IP). The original thinking for ARM was to create a "Partnership Model" through which global standards could be created. This evolved into the IP Licensing model used today.

"Intel offers its sincerest congratulations on ARM's 20th anniversary. Through our development of the Intel XScale® technology, the highest performing ARM compliant solution in the market today, Intel has been pleased to be an architectural licensee of ARM. As a company who knows innovation, Intel recognizes ARM's significant contribution to the area of embedded computing and bid them well on the future. We are looking forward to many more years of successful collaboration."

Sam Arditi, Vice President and General Manager,
Intel's Cellular and Handheld Group

"The solid relationship between ARM and Microsoft can be attributed to a long and successful history in mobile and embedded technologies. We began working with ARM at the very beginning of development efforts for Windows CE and since then have strengthened the relationship during the past 8 years. The ARM architecture continues to be an important processor platform for developers looking to create advanced digital solutions, and we have supported the architecture with our development of Windows CE in addition to Windows Mobile-based products including Pocket PC, Smartphone and Portable Media Center. We congratulate ARM on their 20th anniversary of the ARM architecture and look forward to working closely with them to shape tomorrow's mobile and embedded products."

Andy Haon, Director of Platforms Product Management and Planning,
Mobile and Embedded Devices Division at Microsoft Corp.

"In the early 1990s, TI began what has become a close, collaborative relationship with ARM and was the first company to bring a high-volumn ARM core-based wireless solution to the market. Since this time, industry leaders across a broad range of markets have turned to TI and ARM-based silicon solutions to power their new products. Together, TI and ARM have created a leading standard for wireless solutions. We congratulate ARM on their 20 year anniversary of the ARM architecture."

Alain Mutricy, Vice President and GM,
Cellular Systems Solutions, Texas Instruments

"Congratulations to ARM, a successful and long-time EDA industry partner who shares our view of system design challenges and enables us to anticipate and better serve the rapidly evolving needs of our mutual customers. We salute you on your 20th anniversary and wish you much continued success."

Walden C. Rhines, Chairman and CEO,
Mentor Graphics Corporation.

"NEC Electronics licensed the ARM7TDMI in June of 1996, and since that time we have continued to license a number of other cores from ARM and built a strong relationship with the company over the years. In October 2003, we inked a strategic partnership agreement with ARM for symmetric multiprocessors, which are now being applied in markets where we expect to see solid growth. We look forward to continuing our partnership with ARM, and to furthering the development of both companies."

Hirokazu Hashimoto, Executive Vice President, NEC Electronics

"Magma and ARM have many common customers who are focused on high-performance electronics products. We have seen designers use the ARM processors in innovative ways that revolutionized EDA tool methodology. This pushing-the-envelope, very positive collaboration in supporting these demanding designs shows that ARM continues to be at the forefront of embedded CPU technology. We congratulate them on their leading-edge technology focus and on ARM's 20th anniversary."

Rajeev Madhavan, Chairman & CEO, Magma Design Automation

"Agilent Technologies was one of the first to integrate a standard processor into an ASIC over a decade ago, and since then, we've developed a long standing partnership with ARM that has helped solidify our position as a leader in the integration of SoCs. To take full advantage of ARM's synthesizable products, we've developed expertise in the synthesis of dense, fast processor cores. This allowed us to be the first to synthesize the ARM946ES core in 0.18 micron and the first to use a synthesized ARM7TDMI-S core in an eDRAM process. These developments give our customers a significant competitive advantage, and we look forward to more successes with ARM in the future. Congratulations to ARM on 20 years of excellence."

Young Sohn, President,
Agilent Technologies' Semiconductor Products Group

"Verisity and ARM have worked closely together for several years to address the enormous complexities of verification. Our close collaboration ensures that ARM's IP products are of the highest quality and enables easy integration of ARM cores. Our mutual customers - as well as Verisity - have benefited greatly from this partnership. Congratulations ARM on 20 successful years of the ARM architecture."

Moshe Gavrielov, CEO, Verisity

"Since becoming a pure-play foundry in 1995, UMC has been the sector's fastest growing company. Our relationship with ARM and our membership in their Foundry program along with providing support for 5 ARM cores has been a major contributing factor to our rapid growth. We congratulate ARM on their 20th anniversary of the ARM architecture."

Jackson Hu, President and CEO, UMC

"In 1994, Samsung entered a strategic partnership with ARM by signing an ARM6 and ARM7 license. Samsung has since then become a world-leading provider of ARM-based solutions for the mobile, consumer electronics, storage, networking and imaging markets.

I strongly believe that such a success would have never been possible without the close relationship that Samsung has developed with ARM. Congratulations to ARM on their 20th anniversary. Samsung really appreciates ARM's commitment to our cooperation and I look forward to even greater achievements together in the future."

Yun-Tae Lee, Vice President,
System LSI division, Semiconductor Business, Samsung Electronics Co., Ltd

As the semiconductor industry has developed since the 1960s, the players have become less and less vertically integrated. This first exhibited itself with companies selling off their internal semiconductor manufacturing equipment divisions. Fairchild, Motorola and Texas Instruments have all gone down this path. In the 1980s, Silicon Valley spawned some new businesses, christened fab-less companies, which used subcontract manufacturing from Japan and Taiwan. In the 1990s a new model emerged with small, innovative companies creating IP which was then designed into products by other companies, whom subsequently sold and marketed the products – a model that ARM pioneered.

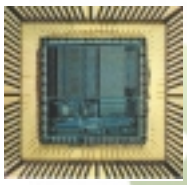
ARM's First Year

ARM launched despite skepticism from the industry. One of Robin's personal, venture capital friends stated "that joint ventures never work" because all of the partners (who were also ARM's first customers) had an investment – Acorn provided the people, Apple Computers provided financial support, and VLSI Technology provided the design tool technology. The challenge in the first year was that ARM nearly ran out of money. As Robin stated, "In the early days we were very lean and mean, clocking up a lot of air miles. The start-up phase was very tough, and getting a credit line was also tough. Eventually an old bank manager contact gave me a credit line." As one of the cost-saving measures, the small ARM team set up their offices in a converted barn in Swaffham Bulbeck near Cambridge.

Where's ARM4 and ARM5?

These were never made but ARM created a space for ARM4 and ARM5 in case they wanted to go to simpler products. As the engineering transitioned from Acorn to ARM Ltd., the number scheme for the processor was changed. As such the numbers 4 and 5 were skipped.

ARM's First Chip



Although the ARM processor were developed as a custom device for a highly specific purpose, the team designing it felt that the best way to produce a good custom solution was to produce a processor with good all-round performance. However, it's interesting to note that the ARM's architectural fate was sealed accidentally. While most of the RISC processor vendors were designing relatively huge chips (SPARC RISC, Intel i860, AMD 29000, etc.), ARM opted to develop a small-scale processor. One of the reasons the ARM processor was designed as a small-scale solution was that the resources to design it were not sufficient to allow the creation of a large and complex device. While this is now a technical plus for the ARM processor, it began as a necessity for a processor designed by a team of talented, but inexperienced designers (outside of university projects, most team members were programmers and board-level circuit designers) using new tools, some of which were far from state-of-the-art.

Despite the unusal working quarters, the motivation and excitement of the small team was high and the company had an open, communicative style that helped maintain the "buzz". As with most start-up's, ARM's primary goal was to get the first product out; in this case, it was the ARM610, designed specifically for Apple. This product included full 32-bit addressing and endian-ness support, one of many changes requested by Apple in order to use the ARM processor in its planned products. An improved video controller, VIDC20, was also developed as well as a floating-point processor. Apple's goal was to use the IP product within a hand-held personal organizer processor. The processor became known as ARM600, from which the 20 MHz ARM610 used in the Newton was later derived. At the same time, ARM Ltd.'s software team developed the ARM Cross Development Toolkit, a suite of software that allowed designers working on a range of platforms to use ARM development tools, assembler, compilers, and debugging and emulation programs.

Hardware evaluation kits were also produced to enable designers to test the ARM6 processor and to begin to develop operating system and support software for use with their own designs before the availability of finished systems. ARM Ltd. developed the PIE (Platform Independent Evaluation) Card, which allowed system designers to test their ideas on an ARM processor card attached to a host machine running the Cross Development Toolkit.

The First Real Deals

By the end of 1991 ARM got its first real commercial break when it licensed its products to GEC-Plessey Semiconductor in the UK.

In the meantime Sharp had licensed the Apple Newton and this had raised interest in the ARM processor. ARM negotiated with Sharp in the UK, Japan, and America, but the final negotiation was in a hotel near Maidenhead, UK. The companies negotiated into the evening but had not come to a resolution; the hotel came in to say the meeting room was booked for a wedding and they would need to leave. Robin rang his wife, and said they were coming home. Rather than pressure his family, the whole Sharp team, the ARM team, and Robin's family went out for dinner, finalized the deal -- and then discussed football!

The crucial break for ARM came in 1993 with Texas Instruments (TI). This was the break that gave ARM credibility and proved the successful viability of the company's novel licensing business model. The deal drove ARM to formalize their licensing business model and also drove them to make more cost-effective products.

Following TI, Samsung approached ARM for a license and after only four meetings a deal was struck! Networking within the industry was crucial in infecting enthusiastic support for ARM's products and in gaining new licensing deals. These licensing deals also led to new opportunities for the development of the RISC architecture. ARM's relatively small size and dynamic culture gave it a response-time advantage in product development, an important factor in such a fast moving industry. In this vein, the Digital Equipment Corporation (DEC) license was a driving force that led ARM to implement a version of the ARM10 called StrongARM.

Time to Float the Company

By the end of 1997, ARM had grown to become a £26.6m business with £2.9m net income and the time had come to float the company. Although the company had been preparing to float for three years, Robin advises anyone thinking about a float "Wait until you think you are ready, then wait another six months."

On April 17th, 1998, ARM Holdings plc completed a joint listing on the London Stock Exchange and Nasdaq. The reason for the joint listing was twofold. First, Nasdaq was the market through which ARM believed it would gain the sort of valuation it deserved. Second, the two major shareholders of ARM were American and English, respectively, and ARM wished to allow existing Acorn shareholders in the UK to have continued involvement.

Another challenge for Warren, and ARM as a whole, is managing their brand as it requires expansion into other audiences including the consumer. "Our architecture is at the heart of a wide selection of consumer electronics and we need to consider the impact and importance of creating awareness amongst the consumer" explains Warren. "A greater awareness among consumers will help throughout the value chain for both ARM and our partners. But, we won't accomplish this alone. Our success is based on the strategic relationship we have with our partners and we will continue to build our strategies, including branding, through close collaboration with them." As a footnote, through my conversations with Warren and other ARM exec's it is clear to see the first 20 years of the ARM architecture story have been exciting, but it will pale in comparison to the next 20.

"In our quest to connect everything in the new digital age ARM has become an important partner in our mission to be a leading provider of highly integrated semiconductor solutions that enable broadband communications and networking of voice, video and data services. Many solutions in our diverse product portfolio leverage the ARM architecture. We congratulate ARM on their 20th anniversary of the ARM architecture and look forward to continuing our relationship in the future."

Ed Frank, Vice President, Research and Development, Broadcom

"Marvell, a technology leader in extreme broadband communications and storage solutions, has had a long term association with ARM. In 2001, Marvell entered into a relationship with ARM by signing the ARM946 and ARM966 license. Marvell has since strengthened this relationship by announcing a family of high performance, proprietary embedded microprocessors that fully run the ARM Instruction Set Architecture by signing an architectural licensing agreement with ARM in 2004. Congratulations to ARM on their 20th anniversary. Marvell really appreciates ARM's commitment to our cooperation and we look forward to even greater achievements together in the future."

Alan Armstrong, Vice President Marketing,
Marvell Semiconductors

"Synopsys congratulates ARM and the ARM design community on the 20th anniversary of the ARM1. ARM has enabled the design of a wealth of outstanding products with the ARM1 descendants. It's amazing to look back on some of the breakthroughs we've been able to deliver to the market together, from synthesizable ARM processors to the first implementation in silicon of ARM's energy-saving Intelligent Energy Manager (IEM) technology. The design community has benefited from this long-standing and fruitful relationship, and Synopsys looks forward to empowering the design of tomorrow's leading digital electronic products through our ongoing partnership with ARM."

Aart de Geus, Chairman and CEO, Synopsys, Inc.

"Freescale is proud of our close relationship with ARM Ltd. Freescale engages in a variety of cooperative endeavors with ARM at a truly strategic level -- a level that goes much deeper than mere "technical collaboration". This rich engineering interplay reflects the tremendous amount of respect and trust ARM and Freescale place in each other's technical expertise. We are honored to be a lead partner and applaud ARM on a successful 20 years of embedded processor market leadership."

Dr. Franz Fink, Senior Vice President and General Manager,
Wireless and Mobile Systems Group, Freescale Semiconductor

"Agere Systems has become one of the leading users of ARM technologies and we have enjoyed a lot of success with your technology. Along the way Agere has become quite skilled at integrating ARM processors in complex devices for our customers, such as the wireless basestation ASIC we developed that integrated eight ARM9 cores on a single device. We have also become quite close allies in the industry, and we appreciate your continued support. Congratulations on your 20th anniversary."

Jonathan Fields,Vice President,
Design Platforms Organization, Agere

A Conversation with Warren East

By Markus Levy, Convergence Promotions

The question is often asked "What's the best job in the entire semiconductor industry?". When that question was posed to Warren East, CEO of ARM, he simply replied "mine". Few would probably argue with him considering the growth and success ARM has had in their climb to becoming a world renowned processor architecture. With the upcoming 20th Anniversary of the ARM Architecture, I felt that we had spent so much time reminiscing about the events and people who were instrumental in shaping ARM's short, 20-year history, I also needed to speak with one of the leaders of ARM who is helping to take ARM forward. The following conversation took place in early February with Warren East, the CEO of ARM.

What's the best job in the entire semiconductor industry? *"Well, that would have to be mine."*

What exactly is so great about it? Warren answers *"Although I'm an engineer by background, since I became CEO in 2001, my favorite part of this job is selling ARM: to customers, to shareholders, to journalists, and of course selling ARM to employees. I know I drive my family quite nuts by insisting that all the digital products around and throughout our lives have to be ARM Powered."* And there certainly are a lot of devices available these days that contain ARM cores.

Certainly another fun and interesting part of Warren's job is working with the charismatic Sir Robin Saxby, who is now Chairman of ARM. Warren declares that *"Robin is great to work with and I admire his extreme enthusiasm. Robin is one of the reasons I joined ARM. I recall the day – over 10 years ago – when I came for a job interview. Late in the evening, he was marching around engineers' desks after they'd gone home and enthusiastically showing me plots of layouts and circuit diagrams – parts of the ARM designs. To this day, his fervor hasn't changed."*

People who know both Robin and Warren realize that these guys have very different personalities. So, how does Warren follow in Robin's footsteps? The answer is quite simple: he doesn't.

By the end of 2001, when Warren took the helm, ARM was moving on to a very different stage in its business model. As Warren confidently proclaims, *"Robin was such an incredible visionary, perfect for the early years of ARM. But now ARM has reached a real state of maturity and there are huge commitments to customers and shareholders alike. Clearly our long-term success will be derived from our vision and continued forward-thinking. It's critical though that we get the balance right and stay sufficiently focused on meeting the day-to-day commitments as we go along."* Warren thinks strategically but measures progress through the tactical steps to accomplish the goals.

Meeting the objectives within a company is, in large part, facilitated by the CEO's ability to inspire employees. Fortunately, inspiration is a large part of ARM's culture and according to Warren, *"When it comes to carrying forward ARM's culture, I'm keen on pragmatism, being different, achieving consensus and team work, building partnerships, and encouraging innovation. A big challenge is to keep people thinking out of the box. You have to reward innovation but at the same time ensure that there's no punishment if every once in a while when somebody is trying hard, something goes wrong; inevitably it will.*

As great as any job may be, there's always got to be a downside. Warren's most troubling aspect of the job is keeping people motivated during the bumps in the road. *I had a serious challenge when we announced the Artisan acquisition last year. The London shareholders were not excited, but despite the pessimism of the investment community, ARM's board had carefully thought through the details of this acquisition and felt that it was absolutely the right thing to do. But one of toughest parts was convincing employees, that despite spending a huge sum on the acquisition we still needed to work inside ARM with strong cost controls to maintain a balanced budget and continue to drive up profitability. Employees are generally the toughest of the stakeholders. I feel more responsibility towards them. You know, we've got 1180 people in the company and I often feel like I've got 1179 bosses!"*

Part of keeping employees happy, as well as shareholders and customers, is keeping the business growing. You might surmise that since ARM has licensed to the majority of its available market, that it won't be possible to keep the company growing. The obvious solution is that ARM must continually create new and better products and sell these to its already large group of customers.

Fortunately, the industry continues to evolve, new applications will arise, and ARM is definitely in a high-growth area of the embedded market. Warren feels that ARM's share of the processor market is still relatively small, therefore, there's plenty of room for growth. *"There are products based on older technology – devices currently using 8- and 16-bit microcontrollers, that will be a candidates for having an ARM processor in the future. There are new products which appear from nowhere because our technology makes them technically and economically possible. There's tremendous growth opportunity for us here", states Warren. "Furthermore, one of ARM's jobs is to facilitate changes in the industry so that the benefits of technological progress are delivered to the consumers at affordable prices. IP companies will become more evident as they shoulder a greater responsibility for the overall task of our industry. For example, our role continues to expand as the entire industry faces the challenges of developing increasingly complex designs in shorter amounts of time. ARM's acquisition of Artisan is just one part of the solution to this challenge."*

Another big challenge for Warren, and ARM as a whole, is getting its processors known at the consumer level. A few years ago, ARM predicted it would take 10 years; Warren would like to see this accomplished sooner. *"A greater awareness among consumers will help throughout the value chain. And we won't accomplish this by ourselves, so we will continue to expand on our basic strengths by stressing the value of our partnerships. Following this train of thought, we need to keep doing the right things. People will only continue to develop around the ARM processor if it makes economic sense and because it's good for them to do so."*

Commemorating the 20th Anniversary of the ARM Core:

From Acorns to Mighty Oaks

- **1985** Acorn Computer Group developed the world's first commercial RISC processor
- **1987** Acorn's ARM processor debuts as the first RISC processor for low-cost PC's
- **1990** Advanced RISC Machines (ARM) spins out of Acorn and Apple Computers collaboration efforts with a charter to create a new microprocessor standard
- **1992** VLSI introduced its first embedded RISC core, the ARM6 processor
- **1994** ARM7 processor introduced
- **1995** ARM announced the Thumb architecture extension, which provided 32-bit RISC performance at 16-bit system cost while offering industry leading code density
  - First StrongARM core from Digital Semiconductor and ARM launched
- **1997** ARM & Sun announce direct JavaOS support for ARM architecture
  - ARM7TDMI processor family announced
  - ARM7500FE multimedia system chip for the Network Computer announced
  - ARM & Microsoft extend WindowsCE support to the ARM architecture
- **1998** Flotation of ARM Holdings plc on LSE and Nasdaq
  - ARM9 family of processors introduced
  - ARM develops synthesizable version of the ARM7TDMI processor
  - ARM10 family of processors announced
  - ARM Partners ship more than 50 million ARM Powered products
  - Synthesizable ARM9E family of processors introduced
- **2000** ARM SecurCore family for smartcards introduced
  - Jazelle technology for Java introduced
  - SIMD technology for multimedia applications announced
  - ARM922T processor introduced
- **2001** ARM share of the 32-bit embedded RISC microprocessor market grows to 76.8%
  - ARM ATAP partner program expanded membership to 25 companies in 15 countries
- **2002** ARM partners announced that they had shipped more than one billion microprocessor cores.
  - ARM11 micro-architecture and ARM1026EJ-S launched
  - ARM RealView family of development tools launched
- **2003** ARM acquires Adelante Technologies
  - AMBA 3.0 AXI methodology announced
  - Thumb-2 technology announced
  - ARM acquires Axys Design Automation
- **2004** ARM acquires Artisan Components, Inc. and expands technology offering to include Physical IP components
  - ARM Cortex-M3 processor announced – first of a new intelligent computing processor family
  - NEON media acceleration technology announced
  - OptimoDE technology launched, new groundbreaking embedded signal processing technology

ARM