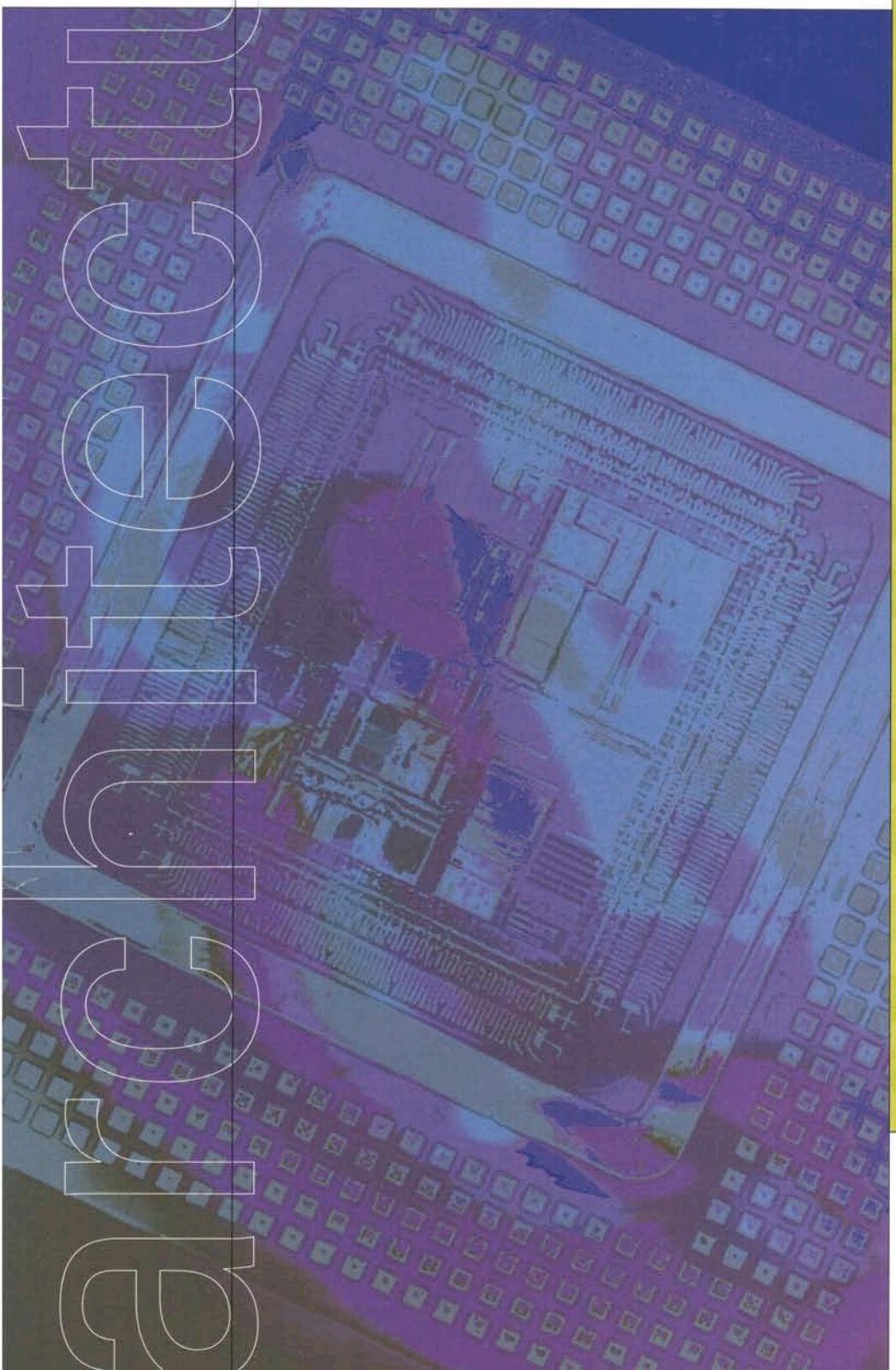
MIPS Technologies, Inc.

RISC architecture



high-performance embedded processor intellectual property

MIPS TECHNOLOGIES INC

MIPS Technologies

enriching the human experience through powerful digital technology

MIPS Technologies, Inc., a pioneer of RISC (Reduced Instruction Set Computing) microprocessor technology, designs and licenses instruction-set architecture (ISA) technology, processors, cores, custom designs, and related intellectual property to industry leaders in the area of semiconductor manufacturing, fabless design, system OEM, and foundry companies. MIPS strategic partners manufacture MIPS-based designs, and may choose to develop and manufacture their own derivative designs.

Since its founding in 1984, MIPS Technologies has been a leader in high-performance processors and graphics-imaging technology. Now, MIPS Technologies is focusing these strengths on designing modular processor cores and ISA extensions to support fast design-turnaround and low-cost manufacturing of integrated solutions for the emerging digital consumer and high-end control-oriented embedded applications.

"We required a processor architecture that is high-performance, cost effective, well supported by software development tools, and has strong industry-wide support. MIPS Technologies was able to meet all of those requirements."

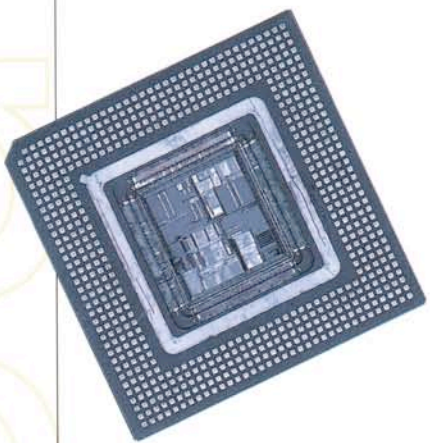
Dr. Henry T. Nicholas, III, Broadcom's President and CEO

"The [MIPS] architecture appears in most, if not all, of the newest high-volume market segments."

Microprocessor Report, June 1, 1998

"The new [IDT] RC32364 processor offers terrific performance for its price, drastically undercutting the best PowerPC and StrongArm processors."

Microprocessor Report, June 1, 1998



exponential growth

MIPS Technologies and its strategic partners are on a dramatic growth curve, providing the processors for many of today's most successful digital embedded products. In 1997, MIPS-based processors dominated the RISC marketplace with 48 million processors shipped — twice the volume of our nearest competitor — and also achieved the highest growth rate of RISC processor shipments.

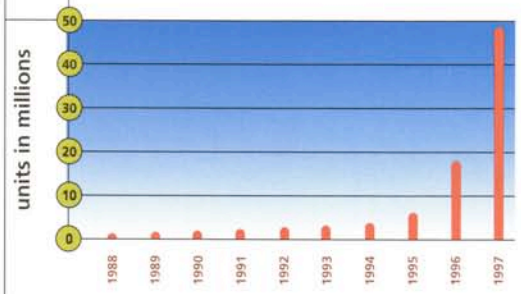
MIPS Technologies and its licensees also attained these performance and support achievements in the 1997 processor market:

- The industry leader in price/performance (Dollars per MIPS)
- An industry leader in performance/power (MIPS per Watt)
- Greatest number of RISC-processor implementations (over 50)
- Broadest range of RISC semiconductor licensees and development-tool vendors
- Largest group of experienced RISC-based system developers

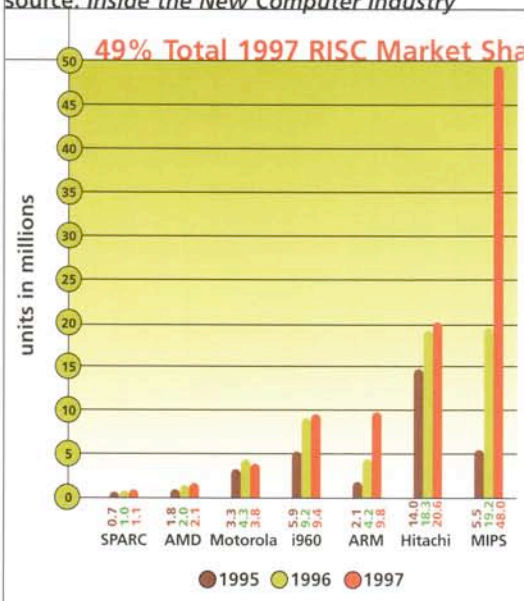
The breadth of MIPS-based product lines and their support infrastructure is the result of powerful alliances with licensees. MIPS licensees provide multiple sourcing of standard parts, competitive pricing, and specialty parts. OEM system developers value the ability to quickly select from a broad range of off-the-shelf MIPS-compatible processors, quickly customize core designs in alliance with MIPS licensees, quickly select familiar development tools, and quickly port or modify a huge base of existing system and application software using those development tools.

The high performance and low cost of MIPS-based processors has made them especially successful in the video games market, where price/performance is a dominant factor. But the diversity of MIPS-based processors currently in production, plus the number of new implementations in the design phase, make these processors competitively available for virtually all existing and emerging digital applications.

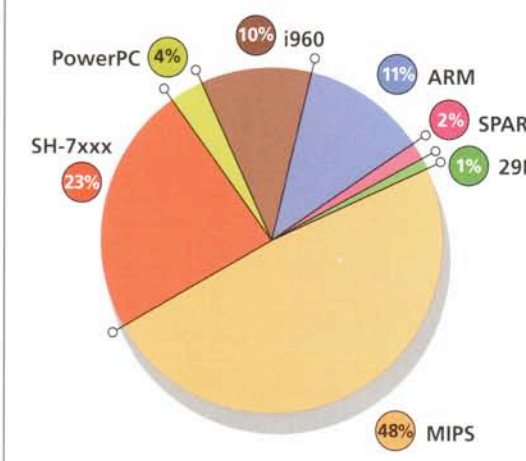
MIPS-based Processor
unit shipments, 1988–1997
source: *Inside the New Computer Industry*



RISC-Processor
unit shipments, 1988–1997
source: *Inside the New Computer Industry*



1997 RISC-Processor market share (units)
source: *Inside the New Computer Industry*



the MIPS architecture

development history

MIPS Technologies is a pioneer of RISC architecture. The company was founded in 1984 by researchers and design engineers from the Stanford University/Silicon Valley community. RISC architectures move execution complexity out of the processor hardware and into the compiler, to support the design and manufacture of simpler, faster, lower-cost processors.

MIPS Technologies designed its first ISA in 1984 and implemented it a year later in the R2000, the world's first commercial VLSI RISC processor. There have been four upward-compatible ISA extensions since then. The complete set of ISAs is:

- MIPS I (1984). The original architecture, with 32-bit instructions and addresses. Implemented in the R2000 and R3000 processors and derivatives.
- MIPS II (1990). Added instructions and registers for 64-bit floating-point math and multiprocessor synchronization. Implemented in the R6000 processor and derivatives.
- MIPS III (1991). Added 64-bit instructions, addresses, and data types, plus more floating-pointing instructions. Implemented in the R4000, R4200, R4300i, R4400, R4600, and R4700 processors and derivatives.
- MIPS IV (1994). Added prefetching and further refinements for floating-point operations. Implemented in the R5000, R8000, and R10000 processors and derivatives.
- MIPS V (1996). Added SIMD (single-instruction, multiple-data) operations on floating-point values for high-performance graphics.

Each ISA extension includes the former levels, and each new processor can implement any ISA level.

In recent years, the demand for embedded 32- and 64-bit processors in high-volume applications has created the need to support a greater range of high-performance graphics in low-cost products. In 1996, the company defined two Application Specific Extensions (ASEs) for these special needs:

- MIPS Digital Media eXtensions (MDMX): Added instructions for high-performance signal processing, including multimedia applications such as audio and video.
- MIPS16: Added compression of 32-bit and 64-bit instructions into 16-bit instructions for improved code density and reduced memory-chip requirements in low-cost systems.

strengths of the MIPS architecture

MIPS Technologies has its roots in high-performance design. It has one of the industry's richest track records in the design of high-performance functions — such as superscalar and superpipelined execution, out-of-order execution and register renaming, speculative execution across multiple branches, dynamic instruction issue, instruction predecoding, dynamic branch prediction, cache structures for out-of-order instruction fetching, multiprocessor virtual-memory management and coherence, supercomputing floating-point operations, and split-transaction system buses. MIPS Technologies has implemented these features in scalable designs running at very high clock rates.

By first creating an architecture to solve the most challenging computational problems, MIPS Technologies is positioned to bring its huge portfolio of high-performance design solutions to the cost- and power-sensitive digital consumer and high-end control-oriented embedded markets. This top-down approach distinguishes the MIPS architecture from others that target only embedded applications and attempt to scale up in performance.

The MIPS architecture has proven to be highly scalable. MIPS-based implementations now range from a low-end 2 mm^2 die executing 50 Dhrystone MIPS — at its introduction, the world's smallest commercial RISC processor — to high-end 290 mm^2 die executing more than 500 Dhrystone MIPS. With over 50 implementations to choose from, developers can find a processor for almost any price point or performance level.

"Its high performance, integrated FPU, large caches, and moderate die size have made the [NEC] VR4300 a price/performance leader."

Microprocessor Report, December 8, 1997

"After looking at every microprocessor architecture available, the IDT R4640... was the hands-down winner.... We were amazed by the performance it offered for such a low price."

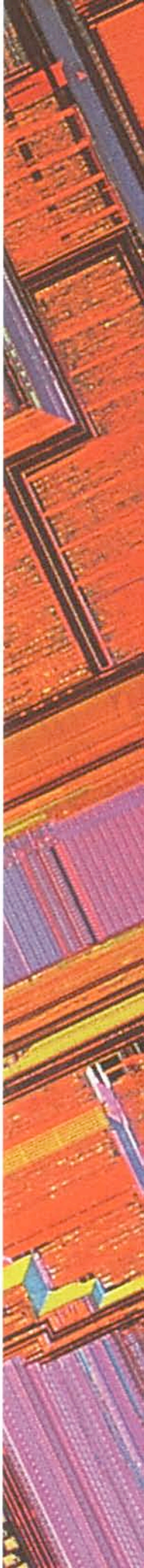
Tim Bucher, Director of Hardware Engineering, WebTV, 1997

"Shipments of MIPS-based processors shot up somewhere beyond 17 million units, ... more than triple the previous year's shipments, which were more than triple the volume of the year before that."

Microprocessor Report, January 27, 1997

a shared and diversified architecture expands the market

Because MIPS strategic partners are free to develop and manufacture their own derivative designs, as well as those provided by MIPS Technologies, a shared and diversified architectural standard is emerging. Diverse implementations provide broad choice of compatible processors for the ever-growing group of MIPS system developers. This greatly benefits system developers in all market segments, and it is a powerful stimulus to the expansion of the entire market for MIPS-based products.



the largest selection of RISC development tools

tools and tool vendors

There are well over 150 hardware and software development tools available for MIPS-based system development — more tools than for any other RISC architecture. The tools include several types of compilers, debuggers, real-time and handheld operating systems, hardware and software simulators, software models, software-development environments, evaluation boards, logic analyzers and preprocessors, in-circuit emulators, network interfaces, page-description languages, and printer interfaces.

These tools are provided by more than 50 tool vendors, each of whom has made a substantial investment in their MIPS-compatible products. Chances are very good that the tool an OEM developer is using today also supports the MIPS Technologies processor family.

To complement this large selection of development tools, OEM developers also have the advantages of multiple sources for MIPS-based processors, system-controller chip sets tailored for MIPS-based processors, the industry's largest body of RISC developer talent, and a wealth of experience from past MIPS-based system designs.

The MIPS Technologies Web site — www.mips.com — lists all of the development tools, processors, and chips sets. Select the Development Tools link at the home page.

integration and testing support

MIPS Technologies is a founding member of the Virtual Socket Interface (VSI) Alliance, a group of the most prominent ASIC vendors, EDA tool vendors, and design firms. The VSI Alliance is targeting system-on-a-chip products. It will accomplish this by creating interchange standards for ASIC macrocells.

MIPS Technologies was the first commercial processor organization to provide OEMs with complete and timely documentation on chip errata, a practice since embraced by Intel and other processor vendors. MIPS Technologies and its licensees recently began development of an enhanced JTAG (EJTAG) in-circuit emulation (ICE) standard for the MIPS architecture. This specification — an extension of the Joint Test Action Group (JTAG) standard — enables engineers to more easily debug new MIPS chips by designating a common interface for accessing the CPU and debug code. Standardizing on an efficient debug tool results in faster product time-to-market and reduced testing costs.

These efforts to make the system development process more efficient and reliable are part of MIPS Technologies' commitment to support its licensees and system developers.

MIPS development tool vendors

- 5D Solutions
- Accelerated Technology
- Adobe
- Agfa
- Algorithmics
- Apogee Software
- Applied Microsystems
- Bitstream
- Blohm/ Beratuny
- CAE Technology
- CaseTools
- CMX
- Cogent Engineering
- Corelis
- Crescent Heart Software
- Cygnus Solutions
- Densan Systems
- dli
- Embedded Performance
- Emulation Technology
- Galileo Technology
- Green Hills
- Heurikon
- Hewlett Packard
- IDT
- Integrated Systems (ISI)
- JMI Software Systems
- Kadak Products
- LSI Logic
- Mentor Arc
- Mentor Graphics
- Metro Link
- MetroWerk
- Microsoft
- Microware
- NEC
- Netmanage
- NKK
- Papillon Research
- PCPI Technologie
- Personal Computer Products
- Philips Semiconduct
- Pipeline Associates
- QNX Software System
- Rational Software
- Siemens-Nixdorf
- Simulation Technology
- Smart Modular Technologie
- Synergex
- Synopsis
- Tasking
- TDL System
- Tektronix
- UNISOFT
- US Softwar
- Vigilant Technologie
- VisionSoft
- Wind River Systems

strength in strategic alliances

MIPS licensees

MIPS Technologies creates investment strength and market dominance through strategic alliances. Licensees fabricate MIPS-based designs, create and fabricate derivative designs, and sell the resulting products in the open market. In 1997, there were over 37 chip-design teams working on various implementations of standard MIPS designs and MIPS-derivative implementations.

Current licensees include:

IDT
Powering What's Next

Integrated Device Technology Inc., (IDT)
www.idt.com

LSI LOGIC

LSI Logic Corporation
www.lsilogic.com

NEC

NEC Electronics Inc.
www.nec.com

NKK

NKK Corporation
www.nkk.co.jp/LSI

PHILIPS

Philips Semiconductors
www.semiconductors.philips.com

Quantum Effect Design, Inc.

Quantum Effect Design, Inc., (QED)
www.qedinc.com

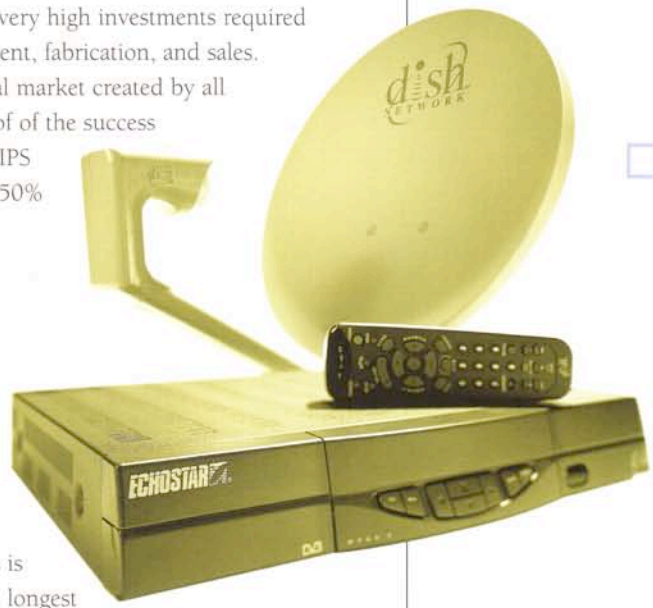
TOSHIBA

Toshiba America
Electronic Components Inc.
www.toshiba.com/taec

licensing and business model

The MIPS Technologies licensing model encourages innovative development, diversity, multisourcing, and competitive pricing. MIPS Technologies provides its licensees with design information on standard parts, down to the mask level. Each licensee is able to create derivative products from the licensed core designs. Together, the licensees — each focusing on their unique strength — offer a broad selection of standard, enhanced, or application-specific processors for the market segments in which they are best suited.

The MIPS Technologies business model leverages the cost of developing, fabricating, and marketing this broad selection of processors through its strategic alliances. This collaboration allows the entire MIPS team, including tool vendors, to make the very high investments required for leading-edge processor development, fabrication, and sales. Each team member shares in the total market created by all members working together. The proof of the success of this strategy lies in the fact that MIPS licensees have already gained nearly 50% of the RISC-processor market.



a simple choice

RISC architectures deliver higher performance at lower cost than any other type of processor architecture. And MIPS Technologies is the RISC-technology leader, with the longest and strongest consistent growth, the best track record for price/performance and power/performance innovation, the technological diversity to serve the emerging digital consumer and high-end control-oriented embedded applications, and the financial strength to push its growth curve well into the future.

No other architecture offers the breadth, scalability, and sustainability of the MIPS RISC architecture.

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