GILDER
TECHNOLOGY REPORT
NOVEMBER 1996 Volume I Number 4

THE NEW PARADIGM

"Listen to the technology. Find out what it is telling you."
–Carver Mead, California Institute of Technology.

In listening to technology, you cannot master every detail. You will founder amid the baffling complexity of millions of components in hardware and software systems shifting in the kaleidoscopes of innovation and enterprise. In technology, it is paradigms–or broad patterns of change–that convey the crucial signals of opportunity.

In the light of a new paradigm, the old one shrinks into triviality and new worlds open for the alert entrepreneur.

In the new paradigm, the central processing unit becomes a peripheral, and the network central.

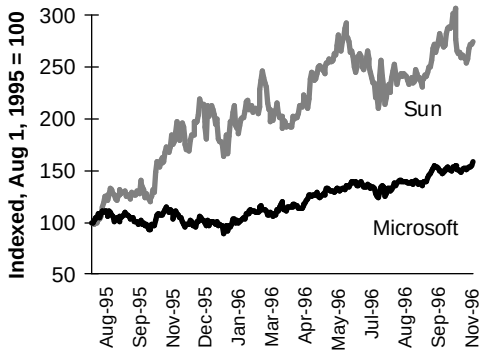
To those in the grip of the old paradigm, however, the new one will seem nonsensical. That is why a rapidly changing technology opens a cornucopia of opportunity for new companies.

It was less than one year ago on a late November day in Redmond that Bill Gates leapt to his feet in his modest **Microsoft** (MSFT) office and asked: "Who screwed your head around?" How could I imagine that a new programming language, Java, could transform an industry? How could I suppose that a new dumb terminal, renamed a network computer, could prevail?

It was difficult to discuss these matters with someone without a technical background, but surely I had heard of Smalltalk, Ada, Fortran 90, Modula, Lisp and other languages launched with huge fanfare and now mostly forgotten. Surely I knew about x-terminals and 3270 machines and their mediocre fate. Java and the network computer would meet a similar sad end.

"Somebody who thinks that because of a browser that anyone can clone, because of a language that is magic, they [**Sun** (SUNW) and **Netscape** (NSCP)] can overthrow the world–that person can't even think two chess moves ahead. You're not even in the game I'm playing."

Chart 1
Sun and Microsoft Share Prices



Maybe not. But Gates, so it turned out, was in the wrong game, following the wrong paradigm. The power of paradigms exerted its force even in Redmond, where Microsoft is now struggling to become the paramount Java, browser, and network computer company.

Let's imagine a new paradigm: an economy like a cathedral–iridescent architectures of sand and glass and air, enabled by the most advanced technologies of the era and informed by a new scripture of canonical software. With recent breakthroughs in microchips, fiber optics, wireless communications, and platform independent programs, this new economy is now emerging massively on the horizon. It is the Internet economy, based on Java component software. In the new regime, the central processing unit (CPU) becomes a peripheral, and the network central. Dictating new language and new strategy, it will change everything not pinned down by biology or God.

Eclipsing mere hardware, bandware will subvert existing architectures and business structures. At the same time, it opens up a vast array of opportunities.

The new paradigm will unfold in four parallel threads: sand, glass, air, and software. The sand will come in the form of the familiar silicon chip, as small as your thumbnail, inscribed with a logical pattern as complex as a street map of America switching its traffic in trillionths of seconds. Rising to a density of billions of transistors over the next seven years–one billion by the year 2000 and moving forward in exponential steps–the microchip appears to be the dominant force in the world economy.

The beginning of investment wisdom under the new paradigm, however, is to grasp that this technology of sand, for all its awesome momentum and impact, will fall rapidly behind the technologies of glass, air, and software in shaping the new era. The dynamics of the new economy will ride the technologies in a stage of acceleration rather than the technologies in a stage of inertia, however formidable. The microchip will continue on its Moore's Law trajectory, doubling densities every 18 months or so. But the technologies of fiber optics, wireless, and Java internet software will ascend at a pace perhaps 10 times the Moore's Law trendline.

In information systems, a growing gap will open between Moore's Law processing power and accelerating communications power, between silicon hardware and network bandware. Bandware comprises all the key components of the networked economy, from routers and webservers to teleputers and network management tools, from languages and development systems to cable modems and fiber optic amplifiers. Eclipsing mere hardware, bandware will subvert existing architectures and business structures–from the Public Switched Telephone Network to the Wintel Computer, from the TV networks to the broadcast advertisers. At the same time, it opens up a vast array of opportunities.

What old paradigm executives and investors can see, however, is an array of new problems. Your local area network (LAN) has become too complex to manage. Your maintenance and upgrade costs seem to slip out of control. You double the megahertz of your processor and you gain no detectable increase in performance. Your PC freezes when you switch from the LAN to the Internet. Your software development costs soar while bugs multiply. Your portfolio of high technology companies misses many of the fastest growing firms and lags the market.

Don't solve problems. Solving problems, as Peter Drucker has explained, you feed your failures, starve your successes, and achieve costly mediocrity. In a competitive global arena, costly mediocrity goes out of business. Don't solve problems; pursue opportunities.

That is much easier said than done. But Drucker also offered a guide for the opportunity scout: look for upside surprises. Let us list the upside surprises that collectively intimate the looming shapes of a new economy emerging behind the facades of the old order. In identifying these unexpected bonanzas, we must be sure to capture all of them, including breakthroughs that seem to support the established paradigm. For there will be aspects of that paradigm with great momentum and significance.

Starting with the technology of sand, the most dramatic upside surprise is the success of **Intel**'s (INTC) Pentium microprocessor. In 1996, Intel will ship some 60 million units. This Intel contribution implies total personal computer sales of perhaps 72 million units, including **Advanced Micro Devices** (AMD), **Cyrix** (CYRX), and **IBM** (IBM) processors, Mac machines and clones, and workstations from Sun, **Hewlett Packard** (HWP), **Silicon Graphics** (SGI), and others. This newsletter predicted that development ("a sharp upside surprise in computer sales–and thus in semiconductors–through 1997") in a preparatory outline in May and in July's inaugural issue, at a time when many seers were predicting a PC slump. Since then, semiconductor and computer companies have exceeded analysts earnings expectations by 19 percent (chips) and 11 percent (boxes), and semiconductor stocks rose 44 percent and computers 27.4 percent (excluding IBM), while the overall market edged up 10.7 percent.

The rise in PC sales reflects the triumph of the Internet, vastly increasing the resources of content and software available to a typical PC at any price level. This effect feeds further on the collapse of the prices of DRAMs, hard drives, liquid crystal displays, and modems, all key PC components dropping in price (or rising in price-performance) by some 75 percent or more over the last two years. The fall in Pentium prices followed in the train of a faster drop in the price per bit of DRAMs and hard drives and the price per kilobit per second of modems.

The key rule is that lower prices drive the expansion of the business; PCs are hugely elastic throughout the value chain. What the Pentium and PC upside surprises signify is the huge price elasticity of demand for networked computers. That means lower prices yield higher revenues and profits. In chips and PCs alike, price drops are nearly always good news. Until real Java stations become available in volume, linked to broadband connections, people will purchase PCs in growing volumes. But the 20 percent Pentium rise is a lagging indicator, springing from Moore's Law and the technology of sand.

The principal cause of lower prices is the famed law of the learning curve: costs drop by some 30 percent for every doubling of accumulated volume. Conceived in the semiconductor industry by **Texas Instruments** (TXN) in the early 1970s in their drive to take over the calculator business, this phenomenon applies to nearly all products and services, from printers to bandwidth. It means, as microprocessor pioneer Nick Tredennick explains in October's IEEE Computer, "a no-win situation for performance-oriented systems, and a repeated lesson for the semiconductor-based businesses: Volume drives the industry."

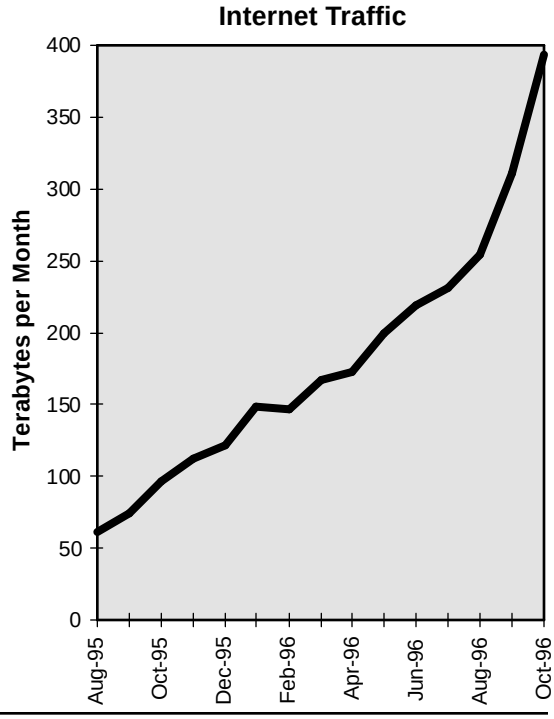
That is the old paradigm. If volume prevails in microprocessors, however, why is not **Zilog** (ZLG)

Internet Explodes

Despite the prophecies of doom, the Internet smashed through the hype of skeptics again in October. It survived a 26% increase in traffic through the Network Access Points (NAPs) and Metropolitan Area Exchanges (MAEs) on the heels of September's 22% increase. The two month growth of 54% is the highest since last September-October when there was a similar surge of 58%. The supposition that the pattern partly reflects an increase in student and academic related traffic at the start of a new school year is supported by traffic data which showed another significant rise in January following the steady but slower growth of last November and December. Our data from the end of October and first week of November of this year suggest a repetition of slower November growth. The plotted drop in February, 1996, traffic and later jump in May is a result of data collection problems at MAE East which had failed to count traffic through new ports.

Note: Chart 2 does not plot total Internet traffic, but only the traffic transiting through the NAPs and MAEs which replaced the NSFNet and some of the newer exchange points. At present, we have no means of tracking traffic within a single network (Netcom, Uunet, etc.), transiting through private exchange points (MCI-Sprint, etc.) and at other exchanges (more than 50) which are either overseas, new or not reporting data. –KE

Chart 2



The rise in PC sales reflects the triumph of the Internet, vastly increasing the resources of content and software available to a typical PC at any price level.

the king of the business, since their Z-80 is embedded in thousands of products and has been produced in volumes of more than half a billion. If volume prevails in semiconductors in general, why did not the Japanese, as predicted by most experts, take over the microprocessor business?

The Japanese with some 80 percent share of the DRAM market could move their fabrication costs far down the learning curve ahead of all US manufacturers. With a typical DRAM design at the time selling a billion units, compared to a few 100 thousand for an Intel CPU microprocessor, Intel's unit manufacturing costs would exceed those of the Japanese by at least 20 fold. The Japanese could then perfect the multiple metal layers that differentiate microprocessors from memories and eat Intel for lunch. Having departed the DRAM trade in 1984, shutting down their Hillsboro, Oregon, memory expansion, and cancelling Amr Mohsen's 256K design, Intel seemed to have no answer for this Japanese strategy.

Enter a new paradigm. Intel's lead stemmed not from its manufacturing volumes but from a paradigm shift. Intel prevailed not because it commanded volumes twenty times greater than its microprocessor rivals; it gained superior volumes by dominating the new paradigm of open platform PCs. Capturing the learning curve profits of late 1980s and 1990s manufacturing were not chiefly the DRAM producers but the semiconductor capital equipment manufacturers, led by **Applied Materials** (AMAT)and **Nikon**, **KLA** (KLAC) and **TEL**.

With the gains of learning in manufacture shared by all semiconductor companies that could afford leading edge capital equipment, Intel dominated by spearheading a PC platform open enough to mobilize the vast majority of software and peripheral developers. This is the army of creative people who translate your dumb hardware into products usable by customers. Eventually some 400 thousand designers and programmers enlisted behind the Wintel banner, making it the definitive standard. Intel and Microsoft won not chiefly because of the talents of their own some four thousand designers but because an entire industry comprising millions of programmers and customers was working for them.

In the arena of new paradigm microprocessors, Intel's competitive edge derives from amortization not of production costs but of development costs. With annual volumes of 60 million and above, Intel's unit development costs are about one tenth of the costs of their competition in the workstation and MacIntosh domains. As Tredennick shows, moreover, development costs increase by 25 percent for each generation of processor. This means that in competing with Intel, you have to increase your total sales around 25 percent per design generation, just to keep even.

Intel defeated the Japanese DRAM giants in microprocessors, despite their huge lead in total silicon volume and experience, by developing microprocessors that captured much of the value added in the new PC paradigm. The CPU, as Tredennick puts it, "has been the only high margin component because it is the point of leverage for performance improvement" in the open PC paradigm where most other devices, including Zilog's, became commodities. Intel feasted amid the fat filled finances of IBM CPUs.

In 1985, 75 percent of the profits in the computer industry went to hardware manufacturers led by IBM; by 1995, 75 percent of the profits in the industry went to Intel and Microsoft. Just as profits in manufacture migrated to the capital equipment companies, profits in systems migrated to the PC silicon and software firms.

Chart 3

PC Lead Over TVs is Unstoppable

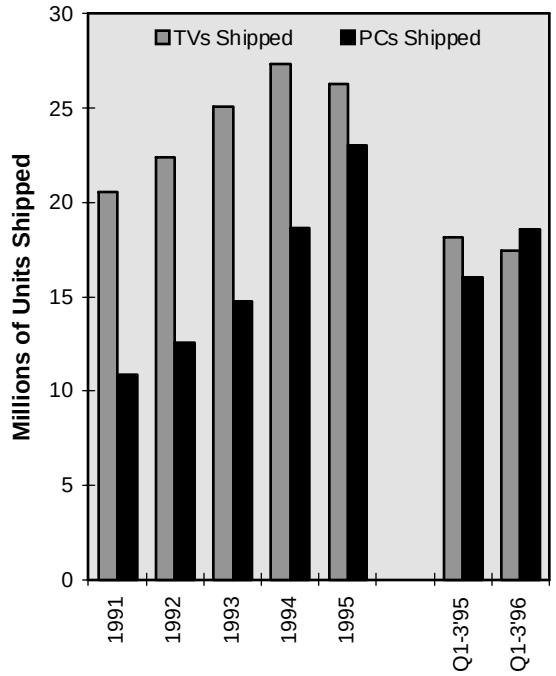
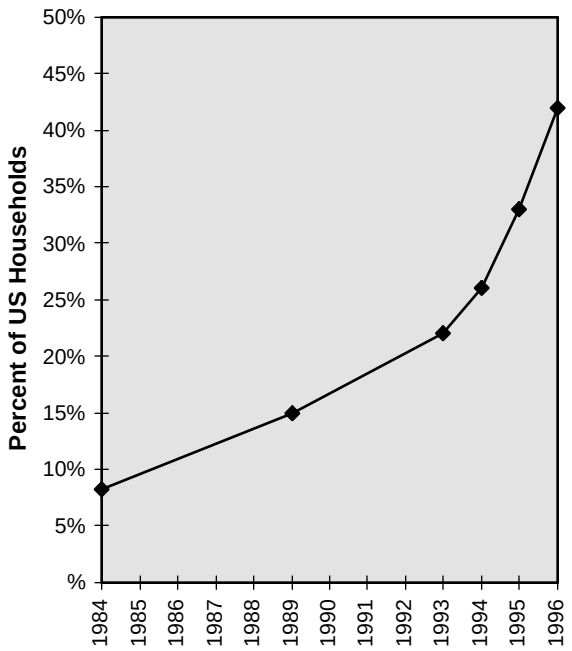


Chart 4

PC Household Penetration



*US PC shipments lead TV shipments throughout Q1-3 of 1996 (**Chart 3**). Our projections for the remainder of the year, Dataquest and IDC forecasts of 4Q96 PC shipments, and the continuing drop in TV shipments (down 10% in October) all suggest that 1996 will be the year that PCs surpass TVs both in units shipped and as the dominant electronic media device. While computers have long held a preeminent position in corporate America, the most recent survey of PC penetration into homes (Yankelovich Partners, Inc., September 19-22) suggests that 42% of homes now have PCs, continuing the trend documented by surveys and US census data since the birth of personal computing (**Chart 4**).*

*Until recent years, the dramatic effects of Moore's Law on the price-performance improvements of computer components (see July 1996,GTR) had little impact on the most obvious similarity between PCs and TVs–the display. Today's CRT monitors look and weigh remarkably the same as the earliest TV tubes. But, advances in silicon screen technology are now bringing the benefits of the learning curve to display production. Whereas the goal previously was to equal CRT display quality the new aim of leading edge LCD manufacturers is to surpass CRTs. Production of 9.5 inch displays has all but stopped as equipment capable of producing several small screens is now being used to create single large workstation screens. Even 10.4 inch displays have recently risen in price as production has shifted instead to 12.1 inch screens and the 13.3 inch screens ready to debut (**Chart 5**).*

*With the phenomenal growth of the Internet, TV and other consumer electronics producers are rushing to add Internet access and computer functionality to their product lines and cable service providers are joining the crowded field of Internet Service Providers (ISP). **Chart 6** continues our effort to document and quantify changes in the online provider industry by plotting the market capitalization per subscriber of four leading access providers. Mindspring is a formerly regional ISP which now offers national service and is in the process of purchasing subscriber accounts from PSINet. –KE*

Chart 5

Flat Panel Display Prices

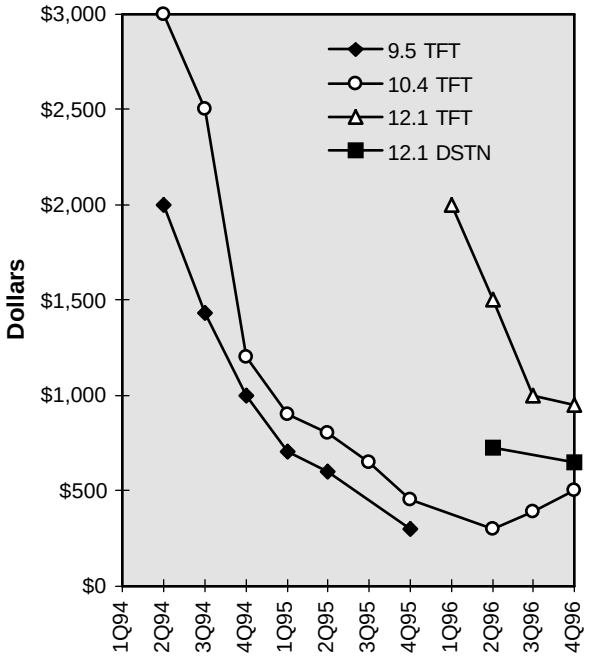


Chart 6

Market Cap Per Online Subscriber

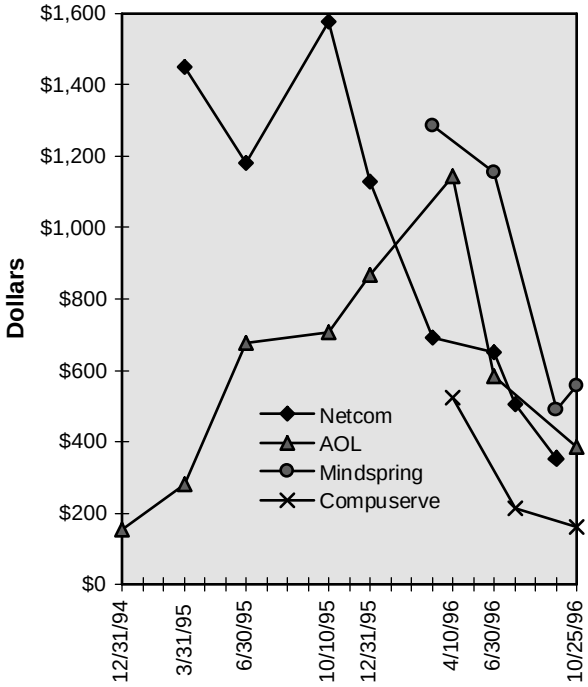


Chart 7

Netscape Intranet Payoff

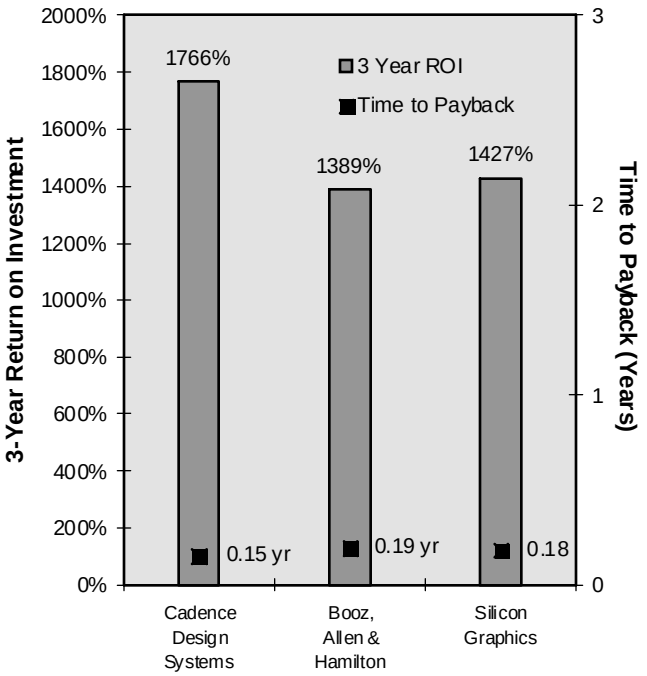
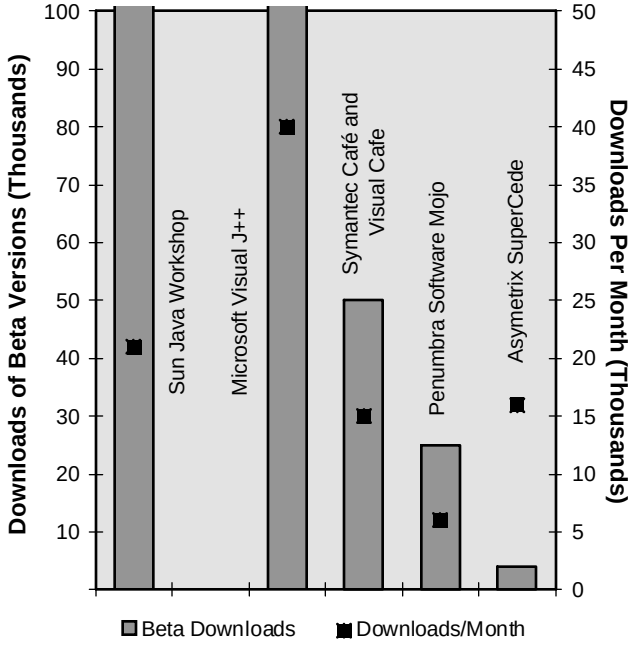


Chart 8

Java Tools in Developers' Hands



*The measurable benefits to a corporation from the implementation of an intranet are dramatically demonstrated by short payback periods and high returns on investment documented in an International Data Corporation (IDC) study of Netscape intranets (**Chart 7**). Savings include: reduced hardware and development costs; lower training time and expense; savings from decreased and eliminated fax, overnight mail, phone and paper expenses; time and productivity gains in the distribution/retrieval of accurate information; and improved collaborative efforts. The promise and demonstrated results of intranets has resulted in their swift adoption. IDC and InfoWorld data shows that by August, 1996, 39% of corporations surveyed were already using or implementing an intranet and an additional 15% were planning one. And, 43% agreed that the browser/web server is emerging as the primary interface for all new application development.*

*The overwhelming support for the internetworking paradigm is partly made possible by the rise of Java as the highly productive language for developing intranet applications. Early complaints about a lack of development tools for Java have been answered with the release of a number of new products. Already some 300,000 copies of Java development tools have been downloaded from just five vender's web sites, with Sun and Microsoft each claiming over 100,000 downloads of the beta versions of their respective products and Asymetrix distributing 4,000 copies of SuperCede in its first week of beta release (**Chart 8**).*

*A September survey by Zona Research of 110 business, government and educational sites running a combined total of 1,185 internet and intranet servers gives an informative glance at intranet servers behind security firewalls, expanding our understanding of Internet data. **Chart 9** shows the operating system running each server, with unix servers totaling 52% and Windows NT at 42%. By contrast, a 1995 Mirai survey of Internet sites (**Chart 10**) found that NT (4.5%) and Windows (9.7%) were the OSs on just 14% of the servers, less than Apple's 17% share. The web server software running on top of the OS was also broken out by the Zona study (**Chart 11**). The finding that Netscape software was running on 84% of unix servers and 74% of NT servers (80% of the total), apparently contradicting the Netcraft survey of public Internet servers which put the Netscape share at 14% (Chart 12), reminds us of the caution that must be used when extrapolating from the Internet to intranets. Netscape explains that only 20% of the server software they sell is used for public web sites with the other 80% being used for intranets. The other part of the explanation involves the concept of virtual hosts on the Internet in which one server (computer) may represent itself to the world as being several different servers (host names and IP addresses), thus, receiving a higher count. Apache software ("public domain," along with NCSA and CERN, in the Zona survey) is evidently much more adept at this than Netscape.* –KE

Chart 9: Server Operating Systems: Internet & *Intranet*
September, 1996

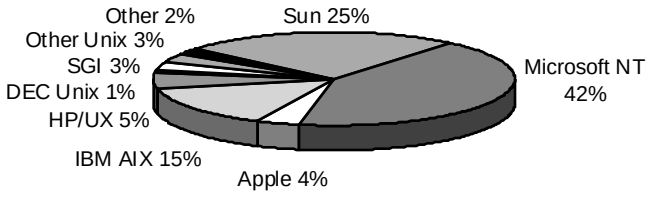


Chart 11: Web Server Software: Internet & *Intranet*
Percent of Servers

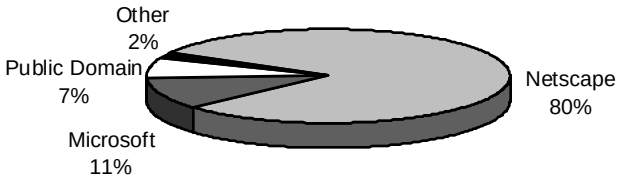


Chart 10: Server Operating Systems: The Internet
August, 1995

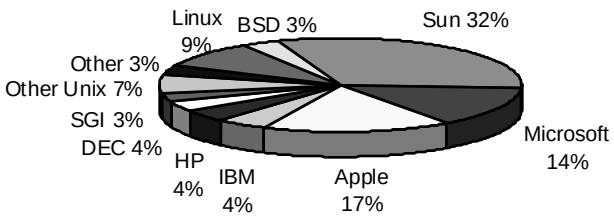
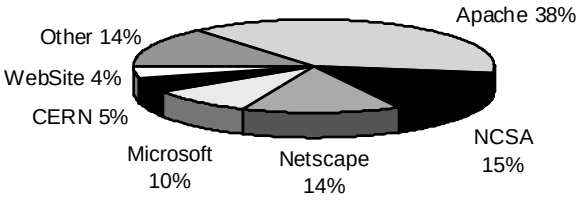
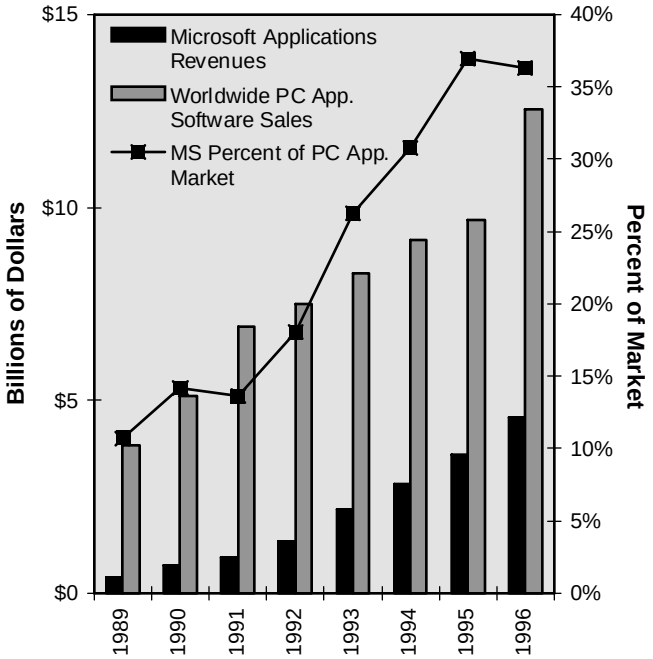


Chart 12: Web Server Software: The Internet
Percent of Hosts



As Microsoft increasingly sucks up Windows application revenues, profits, and projects to Redmond, developers are flocking to the Java banner.

Chart 13
Microsoft Dominates PC Applications



The conditions for success of Sun's Java and Netscape's product family as an alternate to offerings from Microsoft derive from Microsoft's own past success. From a position in 1989 when Microsoft was responsible for 10.7% of all applications software sales, Microsoft has succeeded in capturing more than 36% of PC applications software sales dollars in 1996. The result is a diverting of wealth from the third party developers which made Windows the dominant computing platform. If 4,560 of Microsoft's 6,884 research and development employees were active in applications development then they each would have participated in generating $1,000,000.00 of revenue for the company. If the non-Microsoft applications sales dollars were equally divided, only 8,000 non-Microsoft programmers could share in such revenue generation. If we divide non-Microsoft sales among the 2.5 million plus developers Microsoft estimates to be developing for Windows worldwide, each could hope to generate a mere $3,199.68 in annual sales dollars. Developers are hungry for new opportunities for wealth. Now beckons the Internet, intranets and an entirely new market for Java based network applications. –KE

Alright. It was a great decade. But don't let it go to your heads.

In the face of a new paradigm, the Wintel edge in volumes and profits is less an asset than a burden. Bridging the 1980s paradigm with the millennial paradigm is the key role of Bill Joy's Law: most of the smartest people are always in other companies. The winner is not the company with the smartest people designing the fastest system but the company with the most fertile system. Beware the company that thinks it can outwit the field. The key is enlisting the new generation of developers.

In 1989, Microsoft with some 2400 developers earned just 10.7 percent of the revenues in Windows and DOS applications. Nearly 90 percent of the money was on the table. If you wanted to build a company in the computer business, you joined the Wintel camp.

Today, 36 percent of the revenues in Windows applications go to Microsoft. More important if you are a developer, revenues and profits per developer are even more concentrated in Redmond. But most significant of all, with a market capitalization of 9.1 times sales, Microsoft overwhelmingly dominates the charts for wealth per developer. In the idiom of Ross Perot, there is a microsucking sound from Redmond. By contrast, new paradigm leader Sun Microsystems commands a market capitalization of just 1.5 times sales. Currently foundering firms such as **Symantec** (SYMC) and **Corel** (COSFF) that are aggressively embracing the new Java paradigm are valued near their revenues. Stories appear in Wired Magazine about generation X Microserfs disgruntled by lordly boomer millionaires in the company who benefitted from soaring options. Options in Microsoft will never soar again.

If you are a developer, the Wintel paradigm is looking less fertile by the day. For example, the Windows platform is fragmenting into several domains, each largely incompatible with the others: DOS, Windows 3.1, Windows 95, Windows CE, and Windows NT. Developers who want to cover this market as it advances must compile, debug, and test their programs for each of these systems. Microsoft now prefers its most distinctive and incompatible system, NT. The triumph of NT is a blessing for Microsoft but a grave setback for the coherence of the Wintel platform. Taking some 80 megabytes of storage and requiring at least 32 megabytes of memory, NT shares only 60 percent of the Win 32 interfaces with Windows 95, which in turn is incompatible with many of the hundreds of thousands of programs for Windows 3.1 and with the new programs for PDAs and other appliances with small memories. In compatibility, 99 and one half won't do. Moreover, the Windows standard is becoming less stable, changing daily as more and more internet features are adopted. A fragmenting and changing environment does not offer an inviting platform for outsiders.

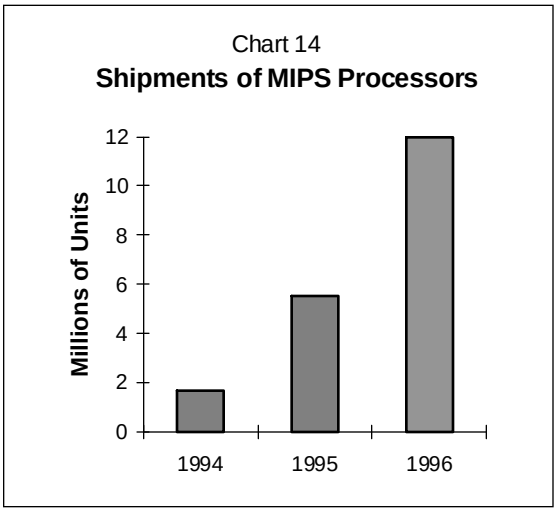
Developers would grin and bear it if there were no alternative. But the explosive rise of the Internet means that customers are more concerned with efficiency in reaching remote memories than in efficiency in tapping the hard drive on their own machine. Developers are more interested in reaching this new market rapidly than in more rapidly executing Intel instructions. Time to market is more important than processor cycle time.

This change in the orientation of customers and developers has produced a new paradigm. In inventing the Java programming model, James Gosling of Sun saw that the constant improvement of processor speeds allowed a new tradeoff. Developers could waste processor cycles in exchange for

reliability of memory, ease of programming, and suitability for the net. At first, experts responded as one might expect. Java was way too slow for serious applications. By eliminating direct access to memory addresses and prohibiting pointers, Java crippled itself. After all, accessing and pointing to memory addresses is what most programs do most of the time. Everyone said it was a serious problem and Gosling's object model for memory access seemed hopelessly cumbersome and slow.

Then, in an upside surprise signalling a huge opportunity, reports came forth from early adopters outside of Sun that Java programmers were three to five times more productive than programmers in C or C++. Lo and behold, the reason for the increase was not only improved portability–write-once-use-anywhere–but also reduced memory conflicts and bugs. Goslings new memory architecture, with automatic garbage collection and management, and no memory address collisions, was working beyond highest expectations.

Since constant downloads from the network would be cumbersome, network based programs could prosper only if they did not periodically freeze your machine as most new C programs do. The chief source of system freezes is memory conflicts now obviated by Java. Since the network necessarily holds a menagerie of incompatible systems (some 55 percent of Internet servers, including most of the large heavily trafficked sites, are Unix or Mac OS), portability is not a mere option or convenience; it is an imperative. Perhaps, five times slower execution of code was an acceptable price to pay for three times faster creation of more stable, robust, and portable programs.



Slow execution, however, might turn out to be temporary. Hundreds of companies, from Microsoft itself to **Asymetrix**, **Borland** (BORL), Symantec, and Sun were creating Java accelerators and just-in-time compilers to cut down the C and C++ speed advantage. They were constantly improving the efficiency of the Java runtime engines or virtual machines on which programs executed. Sun was also promising new chips optimized for the language, and other producers of RISC processors, from Silicon Graphics and **ARM** to IBM and Intel, were rushing to adapt their machines for Java.

More important for the hardware side of the new paradigm, CPUs were no longer the point of leverage for performance improvement. The new keys to the kingdom were modem speed, network bandwidth, browser design, and optimization for the Internet. Existing architectures were bogging down. Processor speeds, rising 60 percent a year, were outpacing memory access times by a factor of 10. This problem is fundamental. As Dave Clark of MIT put it, "You can buy memory capacity and bandwidth with more money, but access times depend on the speed of light and you can't bribe God." This was a problem and Bill Gates was working on it. Meanwhile, hurry up and wait became the Wintel theme.

The key reason that the Pentium retained its high margins was its compatibility with legacy systems. This has always been a showstopper for Intel rivals. But a processor optimized for the net could access far more programs in Java than a processor limited to the contents of one hard drive or server, filled with cumbersome suites permanently purchased and only fitfully used.

These problems make the developer restive. Then to cap off the argument, the developer sees that, in a stream of further upside surprises, Netscape–the spearhead of the new model–had created an entire stable of Generation X millionaires, that **Kleiner-Perkins**, the premier venture capital firm, is doling out an $100 million fund among Java startups, and that **Oracle** (ORCL) is launching an entire new suite of office applications with Netscape.

The developer sees that Netscape — the spearhead of the new model — created an entire stable of Generation X millionaires.

The result is that as Microsoft increasingly sucks up Windows application revenues, profits, and projects to Redmond, developers are flocking to the Java banner. Over a three month period in the fall, Sun's estimate of the total number of Java developers – based on attendance in classes, purchase of serious texts and developer kits, and creation of new courses–doubled from 200 thousand to 400 thousand. This crucial upside signal suggests that within six months, the number of Java programmers will exceed the number of pure C and C++ programmers. By early November, an InfoWorld survey showed that 35 percent of companies with websites were already developing in Java and 57 percent of them said it was "strategic to their organization."

In the hardware domain, similar shifts were erupting. In the past, no processor could compete in personal computer markets without the Intel instruction set that underlay Wintel dominance. In a world of platform independent programs, however, the instruction set nexus becomes a burden rather than a benefit. This is a new paradigm opening a large opportunity for hardware producers previously bound to Intel. For example, the explosive sales of the new 64 bit **Nintendo** game machine, the increasing promise of **Time-Warner** (TWX) cable modems–both long delayed, together with **Sony**'s (SNE) Playstation, **DirecTV** and **Echostar** (DISH) settop boxes, **Cisco** (CSCO) routers, and

Chart 15

Fiber Terminating on Premise

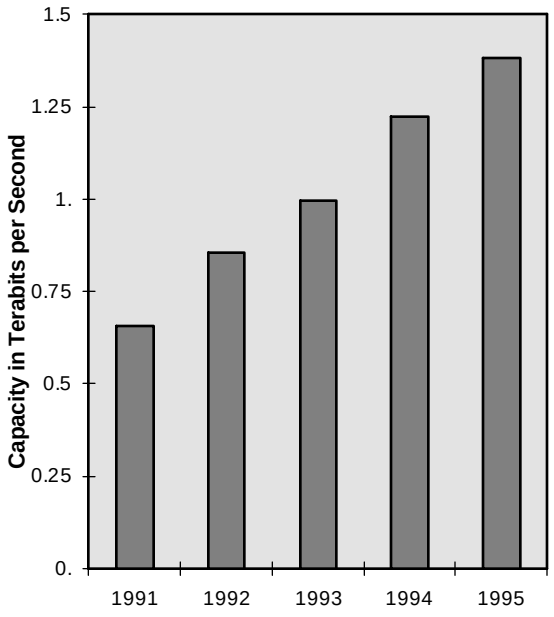
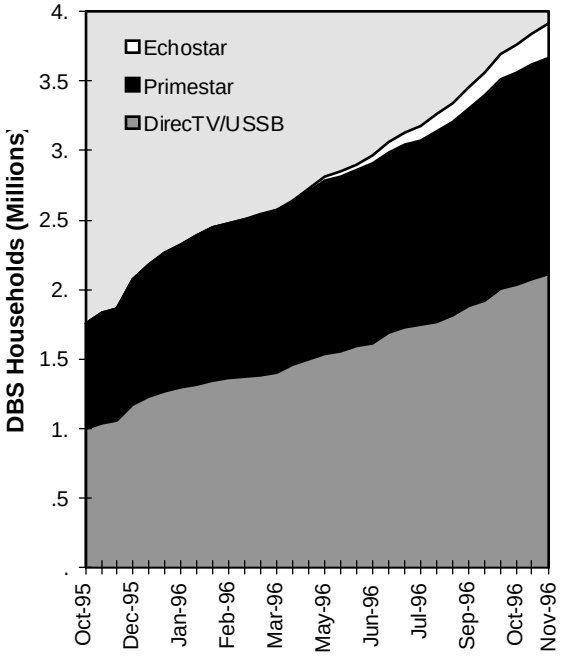


Chart 16

Satellite Household Count



In the three previous issues of the Gilder Technology Report, we examined the deployment of fiber optics in the Telephone, Cable Television and Utility Industries. With each fiber mile deployed, high bandwidth fiber is moving closer to businesses and homes throughout the nation. ***Chart 15*** *is derived from data the RBOCs file annually with the FCC and shows the steady increase in the capacity of fiber terminating on customers premises, with the underlying data showing a trend toward higher capacity connections. Although no comparable partial-year data is currently available, GTE says that the number of "special access lines" is up 42% over last year and Pacific Telisis reports that through September, 1996, DS1 (1.544Mbps) and DS3 (44.736Mbps, mostly fiber) facilitiess grew 55% and 120%, respectively, over the same period last year. Another advance is the October 16 Nynex announcement of an agreement with Next Level Communications to provide fiber to the curb (FTTC) to between one and five million customers in the Boston and New York City areas, allowing for future high-speed data, Internet and video services*

Chart 16*. The Gateway promotion with EchoStar to provide a free digital Direct Broadcast Satellite (DBS) system to PC buyers who sign up for an annual subscription is the first nationwide offering for a free DBS system and represents part of Echostar's strategy to catch up to Primestar and DirecTV/USSB. The move also positions Echostar for future offerings of broadcast data services to a predefined market of PC owners. (See the August, 1996, GTR for a discussion of the DirecPC satellite Internet service).* –KE

Oracle-Netscape designs for Network Computers signify a real possibility of the MIPs microprocessor moving into striking distance of the Pentium in unit sales.

In May, SGI announced that of some 10 million MIPS devices in the field, 80 percent had shipped in the previous 18 months, and projected shipments of 10 million units in 1996. In early November, even as Microsoft is terminating NT development for the MIPS architecture, SGI announced an upside surprise and raised the 1996 projection to 12 million, bringing the cumulative total to 20 million. Perhaps equalling or exceeding the previous Nintendo platforms that collectively shipped as many as 50 million units, the Nintendo 64 promises to become an all time leader in video game sales. Unlike Zilog Z-80s and other embedded devices, the MIPS machine is fully competitive with the Pentium in performance and already offers the graphics capabilities that the Pentium is just now acquiring through its MMX instructions. Reported complaints about Java speed problems from MIPS designers, however, reveal old paradigm thinking. These attitudes better give way to the major efforts, also rumored at SGI, to upgrade the device for Java. No non-Intel processor can prosper in the new era without optimization for Java.

Under the new paradigm, the old platforms will gradually wither in the face of network oriented designs. Leading in unit sales, the most common personal computer of the new era is likely to be a digital cellular phone. It will be as portable as a watch, as personal as a wallet. It will recognize speech, navigate streets, collect mail, conduct transactions, contain a Java runtime engine, and command an Internet address. It will link to a variety of displays and collapsible keyboards through infrared or radio frequency connectors. It will embody a new wireless paradigm. Whether it will be produced by PDA companies such as **US Robotics** (USRX), HP, **Sharp**, and **Psion** or by telephone makers such as **Motorola** (MOT) and **Nokia** (NOK) remains in doubt. But the winner will be the firm that first converges the two functions, creating Java teleputers in a cellular phone form factor.

Moving into homes and offices linked to new fiber optic lines, satellite feeds, and broadband modems will be fixed machines with lower unit sales but still higher total profits. Just as the mobile teleputer will displace telephony under the new paradigm, the fixed teleputer will displace the TV. Both new devices will use Java and the Internet and both will benefit from the new bandware paradigms of glass and air. They are opening a world of bandwidth abundance, that bypasses much of the Public Switched Telephone Network. Under the new regime, bandwidth will serve as a substitute both for switching and power.

Neither of the teleputers are likely to be Wintel devices. But you can never tell. Microsoft and Intel are both determined to succeed in the new era. That means that they must become fully committed new paradigm firms. History is against them. But both firms have created history before, and defied it. What is sure is that the competition will provide upside surprises galore for the entire industry and the world.

George Gilder–November 7, 1996

Gilder Technology Report *is published by* ***Gilder Technology Group, Inc.***
Editor: George Gilder; Associate Editors: Charles Frank and David Minor;
Director of Research: Kenneth Ehrhart.
Monument Mills P.O. Box 660 Housatonic, MA 01236 USA
Tel: (413) 274-0211 Toll Free: (888) GTG-2727 Fax: (413) 274-0213
Email: gtg@gilder.com