# The great IP crunch of 2010

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by Mark Frauenfelder

(IDG) -- Bank panics. blackouts. food riots. doomsayers haven't had so much fun since, well, since Y1K. So what will they do when Y2K has come and gone? Most likely they'll set their sights on technology's next day of judgment: the Great IP Crunch of 2010. That's the year the Internet Engineering Task Force predicts that every available Internet Protocol address will be taken, making new connections to the Net impossible.

How could such a thing happen? Before you accuse the Internet's creators of shortsightedness, recall that the Arpanet (the predecessor of the Internet) was designed simply to help researchers at U.S. universities share precious computing resources, not to provide every PC, cell phone and toaster oven on the planet with its own node. How were Vint Cerf, Jon Postel and Danny Cohen supposed to know that the system they sketched out on a piece of cardboard would one day be carrying everything from international currency transactions to Marilyn Manson videos? It's a testament to their genius that the Internet Protocol they designed 20 years ago still holds up under the billions of bits sent today.

But there's only so much the Internet can take. Experts say that by 2010 the current Internet Protocol, IPv4, will reach the end of its tether.

First, some background. IP is the set of rules the Internet uses to send data from one computer to another. IPv4, the current Internet Protocol, uses 32-bit addresses. Problem is, you can juggle 32 bits into only 4 billion or so combinations. That means only 4 billion or so addresses, which means only 4 billion or so computers on the Net. Period.

Of course, back in the old days, 4 billion addresses seemed like an inexhaustible supply. When a company needed addresses for its network, the Internet Assigned Numbers Authority often gave it far more than it actually needed. Companies like IBM (IBM) , AT&T and MIT each received 17 million IP addresses. Only in the past several years has it become clear that the addresses are running out - about half of them have already been allocated. The Internet Assigned Numbers Authority is now a lot more careful in assigning IP addresses but the end is in sight. What happens then?

Enter IPv6. (IPv5 was a short-lived experimental protocol.) IPv6 is the proposed replacement for IPv4. It has been in development by the Internet Engineering Task Force for about four years. IPv6 offers many improvements over IPv4, most notably its much larger number of potential addresses.

How many addresses can you get from IPv6's 128-bit header? Here's one way to look at it: Imagine 1 trillion Bill Gateses standing in a circle (not a pretty picture, but play along for a moment). Now ask each one to convert his fortune into pennies and toss them in a collective pile. If each penny contained 1 trillion tiny computers and each computer had its own IP address, you'd still have used only a fraction of IPv6's potential space.

There's more - IPv6 offers things like quality of service, encryption and authentication, all of which were welcome improvements to IPv4 four years ago. However, these days a number of IPv4 add-on applications do a fine job of making up for many of the protocol's shortcomings. Essentially, there are now only three reasons to switch to IPv6: more addresses, better routing.
and autoconfiguration.

First, autoconfiguration. Whenever a company adds a new computer to its network, that computer has to be set up with an IP address, DNS server, default router and so forth. All of this information has to be manually entered either by the user, by a system administrator or through the use of DHCP (Dynamic Host Configuration Protocol), which automates much of the assignment procedure but requires its own maintenance. In these days of massive company mergers, it's not uncommon for a company to switch ISPs, which requires that every node be reassigned a new IP address. With IPv6, getting on the network is as simple as plugging a cable into your computer's Ethernet port.

The second real advantage IPv6 has over IPv4 is the way it handles routing - how data packets hop from node to node as they travel to their final destinations. A router controls traffic on a network or at an ISP, and it must maintain a table of all available routes so it can send data packets on their way. As more organizations come online, the routing tables grow.

"[IPv4] allocates and manages routing tables in ways that don't scale well with the Internet's growth," says Richard Draves, who leads the IPv6 Forum, a pro-IPv6 consortium of service providers and carriers, President Latif Ladid issued a warning: "Y2K will be a stopgap, Draves says. "If the Internet came to rely on NAT fundamentally, the Internet would end up being much less maintainable overall and much more fragile."

But the most urgent reason to move to IPv6 is still the address problem. With addresses in short supply, many companies can’t get enough to assign to all the computers on their network. When a firm has more computers than IP addresses, it uses a NAT (Network Address Translation) box to create a temporary connection between a computer and the Internet. NAT systems are currently in widespread use around the world. According to Martin McNealis, IP product-line manager at Cisco (CSCO) ’s IOS Product Marketing division, NAT boxes are actually preferred over IPv6 by most Cisco customers. Why? For one thing, everyone’s still using IPv4. "There's an old maxim that says, 'Things that work persist,' which is why there's still Cobol floating around," says Vint Cerf, who created TCP/IP with Robert Kahn in the 1970s and is now a senior VP at MCI WorldCom.

Clearly, switching over to IPv6 is not simple, especially for large sites with custom Internet software written for 32-bit IP addresses. Steve Deering, lead designer of IPv6, compares the problem of upgrading that software to the Y2K problem. But instead of changing two-digit years into four-digit years, programmers have to sniff out 32-bit address fields and change them to 128-bit fields. It’s a messy job, and another reason why many companies are dragging their feet in the switch to IPv6.

But all things considered, Cerf and Deering say it’s well worth the trouble. Cerf is almost religious in his belief: "Some of us feel NAT boxes are sort of an abomination because they really do mess about with the basic protocol architecture of the Internet." The more NAT boxes that are patched into the Internet, the less the Internet behaves as it was designed. NAT boxes tremendously complicate the system. "They introduce all sorts of problems into the Net," says Deering, who also cochairs the IETF’s Internet Protocol Next Generation working group and is a technical leader at Cisco Systems. Imagine, Deering says, having to go down to the post office to borrow a street address each time you wanted to send or receive mail. NAT should be viewed only as a stopgap, Draves says. "If the Internet came to rely on NAT fundamentally, the Internet would end up being much less maintainable overall and much more fragile."

To help push IPv6 forward, the Internet Assigned Numbers Authority on July 19 gave regional registries around the world the go-ahead to begin assigning numbers based on the new standard. So far, the majority of the organizations that requested IPv6 numbers are research departments and universities. The only commercial ISPs to ask for such address blocks are two Japanese firms, Internet Initiative Japan and Nippon Telegraph & Telephone. ISPs outside the U.S. may be more keen on switching to IPv6 than those in the U.S. because they’ve had a tough time getting enough IPv4 addresses. But if the number of mobile Internet devices takes off, more U.S. commercial companies may start clamoring for IPv6 addresses. NAT doesn’t work well with mobile devices, and if the world is flooded with hundreds of millions of handheld Web browsers, there’ll be little choice but to switch to IPv6.

Of course, if everyone waits until the last minute, it could end up costing much more not just to engineer the transition, but in the cost of the disruption to what has become a crucial part of our economic and social infrastructure. At a meeting in July to launch the IPv6 Forum, a pro-IPv6 consortium of service providers and carriers, President Latif Ladid issued a warning: "Y2K will be peanuts compared with moving from IPv4," he said. "If nothing is done, in 10 years' time it will be 10 times more expensive."

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Return Of The Living Hard Drive

Just like Freddy and Jason, they keep coming back...but for how long?

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Some old technologies just won't die. Take hard drives, for example: Every year or two, doomsayers claim it's the end of the road for this technology that dates back some 50 years.
Tech CEOs Say Add More Foreign Workers

By Mary Mosquera, TechWeb

Washington, D.C. -- Congress should again raise the limits on visas for skilled foreign workers to address the shortage of U.S. high-tech workers, industry executives told lawmakers on Thursday.

The shortage of highly skilled workers is restraining U.S. high-tech companies from competing and innovating to their fullest potential, said William Archey, president of the American Electronics Association, an industry group.

The Family Tree

Today's hard drives can trace their lineage to 1952, when IBM invented the "NRZ" (non-return-to-zero) encoding that's still used today to write data as magnetized spots on a metallic surface. It was first used on tape-and–drum storage, but by 1956, IBM employed the technology in its RAMAC (Random Access Method of Accounting and Control) system. A marvel in its day, the units -- the size of a large washing machine or a small refrigerator -- stored 5 Mbytes of data on 50 platters, each 24 inches (roughly 600 mm) wide.

RAMACs seem unbelievably crude today, but were revolutionary then. Unlike tape -- where the magnetic medium moves serially past a stationary read/write head -- the RAMAC featured read/write heads that could move randomly across the magnetic medium. This meant the heads could access any data stored on the disks without having to wade through all the intervening data to get there.

By 1969, the technology was much faster and smaller. The IBM 5444 disk storage device (used on System/3 computers) matched the RAMAC's initial storage of 5 Mbytes in just one fixed and one removable disk.

The modern era of hard drive technology began in earnest in 1973 with the introduction of the 3340 "Winchester" drive -- so called because of its "30/30" design of two spindles, each carrying 30 Mbytes. This was a sealed hard drive that used a ski-like aerodynamic shield around the heads to let them float or fly just above the surface of the platters cushioned on a very thin film of air. The close proximity of head and disk meant the magnetic heads could work on very small areas of the hard drive, vastly increasing storage capacity. It also brought a new term into computer jargon: the "head crash", when the air cushion failed, allowing the magnetic heads to touch, and damage, the surface of the platters.

Over the next few years, IBM invented "thin film" heads. By making the magnetic heads smaller and flying them ever closer to the surface of the platter, absolute hard drive capacity kept going up. Or, conversely, relative size went down.

In 1979, Seagate shipped the first PC hard drive. It matched the refrigerator-sized RAMAC's 5-Mbyte capacity in a package that fit into one full-height bay in a PC. It was, in its time, a wonder of miniaturization in consumer technology.

Of course, today, full-height drives are almost unknown, and notebook PCs come with hard drives the size of small matchboxes. New desktop PCs routinely come with half-height 10- 20-Gbyte hard drives as standard equipment. If you shop around, you can find standard PC-type drives up to about 50 Gbytes in size without having to get into exotic, custom-order status.

But at each stage of the evolution of hard drive technology, naysayers have predicted the end of the line. However, at each juncture, clever researchers have found a way around whatever limit they faced, and new generations of drives have emerged that spin faster, have lower seek times, or pack the bits tighter.

All these factors affect the end speed of a hard drive. But there's another: The speed with which magnetic bits can be switched. Under ideal laboratory conditions, today's best magnetic heads max out at around 2 nanoseconds to flip a bit from 1 to 0 or vice versa. That seemed to set a limit as to how fast hard drives could write data.

Until recently, that is: Researcher Christian Back of the Swiss Federal Institute of Technology and his colleagues (including some from IBM, which has maintained a leading presence in hard drive technology from day one) recently used an electron beam to trigger magnetic reversals in a thin cobalt film. The kicker: They triggered a magnetic reversal in as little as two picoseconds, or roughly 1,000 times faster than today's previous best times. (More info? See http://www.sciencenews.org/sn_arc99/8_7_99/fob3.htm )

I don't know about you, but orders of magnitude impress me. Three orders is a stunning difference.

Of course, this technology is a long way from commercialization. Still, it does suggest we're nowhere near the end of the road for this half-century-old technology -- at least until or unless it's simply overtaken by a newer, better technology. Perhaps optical storage (CDs or DVDs), or some of the newer exotic molecular storage techniques now bubbling through various R&D labs might do the trick.
"A shortage of high-tech workers shortchanges not just the businesses directly affected, but the overall national economy," Archey told the Senate Judiciary Committee immigration panel.

The dilemma is that the United States does not generate enough highly skilled graduates, so companies look overseas. A limited number of H-1B visas are awarded to foreign high-tech workers. Last year, the cap on H-1B workers was reached halfway through the year. The number of H-1B workers allowed for fiscal 2000 promises to be met even earlier despite last year's legislation.

Critics don't want to expand the number of H-1B workers because it may make it easier to hire foreign workers who may demand lower salaries instead of funding training for more U.S. employees. Computer companies told lawmakers during a high-tech summit last spring that improving public K-12 education is key to increasing skilled workers in the United States. Expanding the number of foreign workers is the only short-term action available to reduce the shortages, Archey said.

Legislation is being considered that raises the annual cap on H-1B visas to 200,000 workers from the present 115,000. Over three years, the proposal would nearly double the number of H-1B visas.

Foreign workers who have obtained a master's degree or higher or earn at least $60,000 a year would be exempt from the visa limit.

Meanwhile, tech companies are boosting training and giving more to education, said the Technology Network, an industry group. U.S. companies spend $210 billion annually on training for their IT work force, and provide $4 billion to support schools. A portion of the fees for H-1B visas is used for scholarships and technical skills training programs.

The total number of students with undergraduate, graduate, and doctoral high-tech degrees dropped 5 percent between 1990 and 1996. Bachelor's degrees in electrical engineering fell 33 percent during that period, and degrees in computer and information sciences shrank 27 percent, the American Electronics Association said.

But by 2006, the Labor Department estimates the demand for database administrators, computer support specialists, and computer scientists will accelerate 118 percent, to 461,000; the demand for computer engineers will increase 109 percent, to 451,000; and the demand for systems analysts will double, to more than one million.

H-1B visa workers play a vital role in keeping the U.S. technology industry globally competitive, said Roberta Katz, CEO of the Technology Network.

"Studies have estimated that every additional skilled immigrant supports the creation of three to five new Silicon Valley jobs for American employees," Katz said.

One-third of start-up companies in Silicon Valley are run by Indian or Chinese immigrants, she said. H-1B visas are often granted to foreign-born students who have graduated from American universities. Almost one-half of advanced degrees in computer, electrical, and electronic engineering awarded by U.S. universities go to foreign nationals, Katz said.

A public policy group proposed that the federal government invest up to $60 million annually to support industry-led regional skills alliances, said Robert Atkinson, director of the technology and new economy project at the Progressive Policy Institute. Companies in the same or similar industries should collaborate at the regional level to tackle training and employment needs and pool resources, he said.
You Can Decouple IE From Win 98 – Continued...

rated, a fix has been found to remove IE painlessly from your system, by a biologist.

With two changes to the Windows 98 registry, Shane Brooks' 98Lite 2.0 program (available from www.98lite.net) can decouple Internet Explorer from Windows 98, thus deactivating the HTML engine in the Windows Explorer and giving the user a 20 per-

cent performance improvement and greater stability.

"The stability is amazing," said Jim McWilliams, a sound engineer and president of Jmac Computer in Springcity, Pa. "Three to four hours of processing DirectX plug-ins on a Windows 98 system without 98Lite would lock up the system many times, forcing me to reboot. I am now up to 26 hours with no crashes whatsoever."

McWilliams said performance varies between applications, but a large, resource-intensive programs such as Samplitude 2496, which he uses for music editing, benefit more than smaller apps. "There are no delays and no system crashes whatsoever," he said. "Graphics are popping up much faster. I would say there's somewhere around a 15 to 20 percent improvement with 98Lite 2.0."

A Solution From Down Under
98Lite came about because Brooks, an Australian biologist currently visiting the University of Maryland while doing research on the state's efforts to revive damaged waterways, was using Windows 98 on a very slow computer. He wanted the driver support and new features in Win98, but the speed of Win95.

Byte Newsgroups:
Join the discussion about Win98 and this amazing breakthrough at either news.cmpnet.com or our Web version.

The solution, which became 98Lite 1.0, was to replace the Windows 98 Explorer and two DLLs with the Windows 95 versions. This sped up the computer, at the cost of Windows 98 features like Windows Update and single-click launch.

With 98Lite 2.0, Brooks made the program a little more elegant. Instead of copying older files, 98lite 2.0 leaves your Windows 98 files in place and makes changes to the Registry to separate the Explorer executable from two files, Shdocvw.dll and Mshtml.dll. Those two files are the HTML rendering engine and make up half of IE's technology, he said.

Despite Microsoft's contention that IE can't be removed, Brooks has done just that with a few changes to the registry.

"I would contend that IE is well and truly woven into the system, but it doesn't have to be an integral part of the system," Brooks said.

"It's unfortunate that Microsoft hasn't chosen to do this itself, to offer a reduced-bloat OS, but that wouldn't work with its agenda to paint IE across the entire landscape," said Dwight Davis, an analyst at Summit Strategies. "If he could do it, then Microsoft, with all its high-power talent, could do it if it chose to. Microsoft has a broader agenda, and memory speed stability and footprint take a back seat to getting the browser broadly deployed."

98Lite can be used before or after an installation. If run before installing Windows 98 on a computer, it modifies the install proc-

ess, so when the installation is completed, IE is disabled in the system. For systems already running Windows 98, it will disable or remove IE. It supports all versions of Windows 98.

Although disabled, the two DLLs are left behind because there are some programs that require them, such as Outlook Express. You have the option of simply disabling Internet Explorer or removing it and support files, like the Java Virtual Machine and ActiveX controls. Removing IE frees up around 35 megabytes of disk space. Leaving IE lets the user use IE as their browser of choice. Either way, you get the speed and stability gains while removing all of the Webification of the desktop.

In addition to removing IE, 98Lite 2.0 gives the user the option of converting system features into modules they can install or remove if they want. Features like the Task Scheduler and Tune Up Manager can be removed if the user wants. An aggressive use of 98Lite can result in a Windows 98 installation being cut in half, from 110 Mbytes in size to less than 50 Mbytes.
You Can Decouple IE From Win 98 – Continued...

98Lite has its drawbacks. You lose some OS features, like the Web-top interface and Windows Update. There are some programs that require the integrated browser, such as Office 2000 and Money 2000, that simply won't work with IE removed.

For its part, Microsoft had no comment either way on 98lite and what it does, and said it would continue to support users who run 98lite on their systems.

There is no charge for 98Lite. It's available from the 98Lite home page (available from www.98lite.net)

SSG – Mission
The Student Systems Group's (SSG) purpose is to act as a link between the academic and business world through an affiliation with a professional information resource management association.

Newsletter – Mission
To disseminate information on current events and issues concerning the Information Technology field.

Free Candy at the Halloween Jamica!

That’s right, Free Candy from the Student Systems Group! We’ll be setting up shop at the Halloween Jamica this Thursday and would like to invite you all to stop by.

Are you wondering about us? What is the SSG? Find out from the people who know! Ask us at the Halloween Jamica on Thursday from 10:00 a.m. – 4:00 p.m.

Tips & Tricks – Universal Messenger

There has been a raging messenger war between AOL, Microsoft, Yahoo, ICQ, PowWow, and others for some time now. The user has been hopelessly caught in the web of protocols and custom configurations for each of these with the handicap of not being able to get in touch with friends and family that use a different messenger than theirs. You may ask, “What's in it for me?” Well, until now, nothing except for a free messenger and you had ICQ for free, already.

Software Fusion now brings you Universal Messenger!

Universal Messenger, an instant messaging client that allows people to communicate with members of AOL Instant Messenger, ICQ, MSN Messenger, PowWow, and Yahoo Messenger. Some of the newest features of UM are: file transfer, contact management (including contact grouping and ignoring), external application launching (for voice chat, gaming, and other internet related software), and new version notification. This is a must have utility for universal connectivity and management of online contacts. Get your copy today! http://www.softwarefusion.com