

The age of connectedness

The foundation has been laid for upgrading the Internet to a truly global level. Everything that is connected to the Internet—websites, computers, printers, mobile phones, and more—needs an “internet address” to locate it on the network. When the Internet was developed in the 1980s, programmers had no idea how big it would become. They gave each address a “16-bit” number, which meant that the number of available addresses totaled four billion (2 to the power of 32)—actually 4,294,967,296.

But as use grew, it became clear that the protocol, IPv4, wasn't big enough, so a new one was developed based on “32-bit numbers” (or 2 to the power of 128). This will increase the number of available addresses to 340 undecillion, 282 decillion, 366 nonillion, 920 octillion, 938 septillion. IPv6 creates enough IP addresses for every person on Earth (six billion human beings) to each have 1,000 web-enabled devices.

Devices use an IP address (Internet Protocol address) to identify and communicate with each other on a computer network. Any network device—including routers, computers, servers, printers, Internet fax machines, and telephones—must have their own unique address. An IP address can also be thought of as the equivalent of a street address or a phone number for a computer or other network device. Just as each street address and phone number uniquely identifies a building or telephone, an IP address uniquely identifies a specific device on a network. Numerical addresses are mapped to names by domain name servers. For example, the domain name www.rit.edu directs requests to specific computers with an Internet Protocol address 184.201.175.173, which identifies the computer hosting the site. There are 13 root domain name servers that hold the master records for all such address mappings.

A new identification technology, IPv6, has been built into a number of the Internet's master, or “root” servers, which supply subsidiary servers. This was announced by the independent body that coordinates the Internet's address system, the Los Angeles-based Internet Corporation for Assigned Names and Numbers (ICANN). IPv4 is running out and about two thirds of the 4.3 billion numbers allocated have been used up.

IPv6 will increase the number of numerical addresses massively, increasing capacity to 340 billion, billion, billion, billion—340,282,366,920,938,000,000,000,000,000,000,000,000 to be exact. This should allow a huge number of new computers and devices to be connected to the Internet in the future. Someday, it is possible that every person on earth will have their own Internet address—“Hi, I'm 184.309.195.273, but you can call me ‘184.309.’”

North American Internet Protocol addresses account for 70 percent of the current 4.3 billion possible addresses and there are now about 1 billion original IP addresses left. That may sound like a lot, but many countries are rapidly draining their allotment from the Internet Assigned Numbers Authority, raising the danger of a shortfall. Those countries include broadband-saturated Korea, India (with 2 million IP addresses) China, and European countries, where Web-enabled phones are used by 70 percent of the population.

IPv6 does not involve any new cables, nor will there be any burden on customers, for whom the change will appear seamless. It will greatly improve the quality of certain Internet services, especially phone calls, which are not suited to IPv4. The U.S. Government has told departments to make their systems “IPv6-ready” by 2008. IPv6 also has reliability and security enhancements and will run in parallel with IPv4 for 20 years.

One can think beyond computers and envision a home where kitchen appliances and entertainment systems have their own Internet addresses to allow control and monitoring from websites. Automobiles, ATM machines, and other devices of modern life could also be “addressable.”

DID YOU HEAR?

- 62 percent of Web users who view TV online watch news clips or entertainment. 53 percent said they view TV online by streaming it for free, while 49 percent said they have downloaded shows for free (The Conference Board).
- 6.2 million U.S. households are disconnecting their telephone land lines and becoming completely wireless (Yankee Group).
- Google handled 61 percent of the 204 billion searches worldwide in the last year (Forbes).
- 100,000 new blogs are created each day (Technorati).
- Content, in all forms, will grow from 16 exabytes to 32 exabytes in the next two years. One exabyte is the contents of ten Libraries of Congress (Univ. of CA-Berkeley).
- 202 million disposable cameras were sold last year in the U.S., down from 218 million in 2004 (Photo Marketing Association).
- Overall, 42 percent of adult Americans, or 84 million people, have broadband, compared to 30 percent a year ago (Pew Internet and American Life Project).
- TV CRTs will fall from 14.4 million units this year to 10.4 million in 2007, while sales of LCD TVs will rise from 10.9 million units to 17.8 million. By 2010, CRTs will account for only 2.1 million of the 44 million televisions sold (iSuppli).
- The average business wastes over \$180,000 per year by sending out direct mail that is not relevant or does not reach the intended recipient (QAS/Experian).
- Since 2000, inflation-adjusted U.S. commercial printing shipments (NAICS 323 M3 shipments adjusted using the CPI) have dropped from \$118 billion to about \$90 billion (Dr. Joe Webb).

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SHORT TAKES: FACTS AND OPINIONS

A new handheld device for the blind, combining a personal digital assistant and a digital camera, converts print to audio. Developed by inventor Ray Kurzweil and the National Federation of the Blind, a membership organization of more than 50,000 blind people, it has been dubbed the Kurzweil National Federation of the Blind Reader. The Federation expects the reader to sell for about \$3,500 through Massachusetts-based Kurzweil Education Systems Inc. and will be available on the Internet and in stores.

In the 1970s, Kurzweil invented the first device that could convert the text from books into audio; it was about the size of a Maytag washing machine. The machine was an omni font OCR scanner that could "read" virtually any text font and then "speak" the text using a voice synthesizer—and it was this technology that evolved into software that could be used by a computer and scanner to perform the same function. The latest device, about the size of a paperback book, introduces portability. There are about 10 million blind and visually impaired people nationwide, and that number is expected to double in the next 30 years as baby boomers age.

It has been dubbed "a camera that talks."

Mouna Andraos and Sonali Sridhar designed a jacket "inhabited" by a Printed Organism that appears and grows on the garment only when it is being worn. When you wear the cotton jacket, the pattern, like an animal or plant image, slowly comes to life as color until it reaches full visual bloom. When the jacket is removed, the organism slowly fades into a printed pattern. The human body acts as a host and provides the support structure on which the organism grows—body heat. The printed organism is created using thermo-chromic inks and is electrically controlled through conductive circuitry printed directly on the fabric of the jacket or other apparel.

If you are running a fever, the image may get bigger.

Deep in the catacombs of the Newark Public Library are a few million documents that tell the story of American life. Books and pamphlets, maps, and microfiche printed by the Government Printing Office are stored in the library's basement. The library in downtown Newark has been keeping federal documents for a century. The items have been available to the public through the Federal Depository Library Program, established by Congress in 1813 to grant access to government information. The Newark Library is one of about 1,250 institutions across the country which collect government publications. In 1963, it became a regional depository, one of 52 nationwide. Most are affiliated with public universities and state libraries, and Newark is only one of four public libraries (with Boston, Denver, and Milwaukee). The Newark library keeps about 500,000 paper items and about 3 million items on microfiche. The oldest document is a Senate journal from 1790; it describes a session of Congress held in Philadelphia.

Last year, the GPO distributed 5.3 million items around the country, including 10,300 books, magazines, CD-ROMs, microfiche, and other materials to Newark. In years past, the Newark Library received almost 20,000 items. The volume has been going down because of the amount of information on the Web—many of the government's documents are now published only to the Web. The Government Printing Office said about 50 percent of federal government documents today—775,000 titles are on the GPO website—are now digitally published to the Web and will never be printed by the agency.

The public has access to more information today than it did about the government even 10 years ago. But will it have it 100 years from now? Will anyone be able to read those CD-ROMs?

A Japanese recording engineer has developed the world's first glass CD guaranteed not to warp or distort. Glass CDs must be made by hand, but glass is a great receptor of sound. Information on the glass CD is read by laser and the sound quality is superb. Because existing plastic CDs are not completely transparent, information on them cannot be read perfectly. They are also susceptible to bending or warping if left in sunlight or humid areas, which leads to sound distortion. Glass CDs are not affected by heat or humidity and remain in perfect condition forever.

People who listen to glass CDs shouldn't play rock music.

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Editor-in-chief: FRANK J. ROMANO, EDP

Editors: Toby Cobrin, EDP; Roberta McKee, EDP;
Jeanne Mowlds, EDP; Sidney F. Huttner, Univ. of Iowa
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EDSF

The Electronic
Document Systems
Foundation

608 Silver Spur Road, Suite 280
Rolling Hills Estates, CA 90274
USA
Tel: +1-310-265-5510
Fax: +1-310-265-5588
info@edsf.org
www.edsf.org

POWER TO THE PEOPLE

Google is calling on the computer industry to create a simpler and more efficient power supply standard that could save billions of kilowatt-hours of energy annually. At the Intel Developer Forum, Google said that the industry is mired in inefficiency for historical reasons which date to the introduction of the first IBM PC in 1981. At that time, standard power supplies, which convert high-voltage alternating current to low-voltage direct current, were required to provide multiple output voltages. Modern PC designs shift the control of voltage to the motherboards, making the multiple voltage requirements of industry standard power supplies unnecessary.

The Google plan calls for a shift from multivoltage power supplies to a single 12-volt standard. Although voltage conversion would still take place on the PC motherboard, the simpler design of the new power supply would make it easier to achieve higher overall efficiencies. The Google proposal is similar in its intent to an existing effort by the electric utility industry which offers computer makers financial incentives to design more efficient power supplies for personal computers. Existing PC power supplies vary widely in efficiency, from as high as 90 percent to as low as 20 percent.

The existing effort, 80 Plus, sets an 80 percent efficiency standard as a goal. It is a partnership between Ecos Consulting, an environmental consulting firm, and a group of electric utility companies. Ecos began measuring the efficiency of computer power supplies in 2003 and found that none of them met the efficiency standard. There are now 70 compliant designs from 15 to 20 manufacturers. The new designs are just becoming available in commercial products.

The significant design flaw in today's PC power supplies, described as "overprovisioning," is like putting a 400-horsepower engine in every car, just because some cars have to tow large trailers every once in a while. Deploying new power supplies in 100 million desktop PCs running eight hours a day will save 40 billion kilowatt-hours over three years, or more than \$5 billion (Google). According to EPRI Solutions, an energy research and consulting firm, over 2.5 billion AC/DC power supplies are used in the United States and 6 to 10 billion worldwide. Currently, EPRI said, power supplies account for more than 2 percent of the nation's electricity consumption; more efficient design could cut use in half, saving nearly \$3 billion in electricity costs.

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Near the Oregon-Washington border Google is building a giant data center. The company has linked together a global network of computers—the Googleplex—to form what may be the biggest computer in the world. While the design of the Google center 80 miles east of Portland has been a corporate secret, there are two buildings, with a third that Google has a permit to build, to house tens of thousands of inexpensive processors and disks, held together with Velcro tape in a practice that allows easy swapping of components. Cooling plants are vital because of the heat produced by so much computing power. The complex taps into the region's surplus of fiber optic networking, left over from the dot-com boom. The company also has major operations in Ireland and a large center in Atlanta, all connected by a high-capacity fiber optic network.

Google, Microsoft, and Yahoo are spending vast sums of capital to build out their computing capabilities to run both search engines and a variety of Web services that encompass e-mail, video, and music downloads, and online commerce. Google is known as a search engine, but in many ways it is foremost an effort to use the latest academic research to build a network of supercomputers able to process more data than its rivals. The rate at which the Google computing system has grown is as remarkable as its size. In March 2001, when the company was serving about 70 million Web pages daily, it had 8,000 computers. By 2003 the number had grown to 100,000. Google may now have more than 450,000 servers spread over at least 25 locations around the world. Microsoft's Internet computing effort is currently based on 200,000 servers, expected to grow to 800,000 by 2011 under its most aggressive forecast.

The Environmental Protection Agency estimates that people threw away 2.5 million tons of electronic equipment, known as e-waste, last year—about 10 percent of which was recycled. While federal law regulates the disposal of electronics by businesses and government agencies, it does not affect individual consumers who account for more than half the e-waste produced annually. Every old computer monitor contains about four pounds of lead, and other parts contain heavy metals like mercury, arsenic, cadmium and chromium. They have toxins that hover in the air after incineration or leach into the water supply when buried in landfills. Carnegie Mellon University researchers say that dumps around the nation's major cities hold more than 60 million computers.

A method based on a process used to print electronic circuit boards has been developed for constructing complex three-dimensional devices such as a micro-reformer for fuel cells. The new method could be a way to fabricate fuel cells for recharging PCs. The process builds up hundreds of layers of specially formulated inks containing various materials, such as polymers, metals, and ceramics, to form a 3D structure, with hollow passages and chambers sealed inside. For each layer, the technology prints both the materials that will make up components of the final device and space-holder materials that help support the next printed layer. Each layer is cured by a flash of ultraviolet light before the next layer is printed. The layers form 33 discrete components, such as heating coils, catalyst beds, chambers, passageways, a diffuser section, a reformer section, and a combustion section. Methanol is fed into the device, and a combination of steam and catalysts free the hydrogen. The unit is the size of two dominoes. It will supply enough hydrogen for micro fuel cells that recharge 20-watt mobile communication devices.

Dollars and scents

Consumers are being led by the nose. Major package-goods marketers including Mars, PepsiCo, Kraft, and Procter & Gamble hope that scents will help them get attention among fragmented audiences. Mars has recently used scent technology to spread the aroma of chocolate around its M&M's World retail outlets and displayed Pedigree dog-food-scented stickers in supermarkets and pet stores. Pepsi spread the smell of black-cherry vanilla on *People* magazine inserts and store displays for Diet Pepsi Jazz. Verizon Wireless stores used a chocolate scent for LG Chocolate phones. "Multisensory communications" vendor ScentAir is combining 8,000-scent delivery systems called Smellavision into flat panel screens in Kroger stores and other retailers. Cost and implementation hurdles have prevented media plans that involved attaching scent to transit shelters and bathroom mirrors. ScentAir has signed on with music and broadcasting service Muzak to offer scent wherever there is sound and video.

The olfactory sense is the most primal of all the senses and is extremely powerful, with scents much better remembered than reading or hearing. In the book "Brand Sense," Martin Lindstrom predicts that the world of marketing is about to see "seismic shifts," analogous to moving from black and white television to high-definition screens, in the way in which consumers perceive brands. The revolution will come about as businesses look beyond their traditional palette to include as many sensory cues as possible in their marketing and product development.

Web 3.0

It is now called Web 3.0, and it is the offspring of IBM, Amazon, Google, and others who are searching for greater meaning from the universe of content that resides on the Internet. We are now experiencing Web 2.0—the ability to connect individuals, applications, and services over the Internet. The concept of Web 3.0 (known as the "semantic Web" in some circles) originated with Tim O'Reilly and MediaLive International.

Web 3.0 will change the way corporations and consumers, government, and individuals interact with and among each other. Text mining technology like (to list only a few) Web Fountain, Engenium, Linguamatics, and PropheSEE measure, analyze, and extract insight from content. The promise of Web 3.0 is that there will be a layer of meaning that will evolve over the existing Web and will eventually be able to sustain systems that will be able to "reason."

Natural language queries would generate relevant answers without sifting, clicking, or wading through pages of links. Applications could gather intelligence in real time about user behavior and past experiences that would be used to filter current contextual requests. On demand systems based on predictive adaptability intelligence could deliver personalized experiences. A decade ago Web 1.0 was a just a few flat, static HTML pages; today Web 2.0 is a robust network of audio, video, and integrated dynamic applications that allow us to do everything from shop to bank to earn a degree. Web 3.0 is about meaning.

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The Electronic
Document Systems
Foundation

608 Silver Spur Road, Suite 280
Rolling Hills Estates, CA 90274-3616

Connectedness

Dollars and scents

Web 3.0

Power to the people

Facts and opinions