



IPv6 On Everything: The New Internet

IPv6 helps network architects address the IP address shortage, Security, QoS, Multicast and Management.

The famous words of Dr. Vint Cerf¹ in 1977- "32 bits should be enough address space for Internet" did stand for 20 years. Now, as honorary chairman of the IPv6 Forum, his strong voice calls for immediate IPv6 adoption in order to take the Internet where no other network has gone before! The IPv6 Forum's prime mission is to foster IPv6 around the world by addressing the critical limitations of the current Internet in terms of address space, security and quality of service, building robust and scalable foundations of the New Internet. States **Latif Ladid, President, IPv6 Forum, Vice President, Ericsson Telebit**

Now that they've put the millennium bug behind them, net architects might think some relaxation is in order. But there's no rest for the weary: If the Y2K problem is solved, then it must be time to address IPv4 (a problem to become known as Yv4!). For one thing, there isn't the same stroke-of-midnight deadline pressuring net managers to make the move to IPv6. For another, there are so many ways to make the transition from IPv4 that simply scanning the options can be confusing. Add to that all the smoke and noise surrounding the subject of IPv6, and it's easy to see why the decision will be so difficult.

Difficult—but it has to be done. Despite strict rationing, the IPv4 address space is being depleted as more nodes and networks are added to an already overburdened Internet routing structure. Though IPv4 can theoretically support as many as 4 billion unique addresses, the way the space has been allocated effectively locked up as much as three quarters of that. A small number of entities that got Class A IP addresses in the early days, like MIT and AT&T, each control over 16 million; most companies now applying for IP addresses have to make do with a fraction of the remaining Class C addresses.

But IPv6 has 128 bits of address space, pushing the theoretical limit on unique IPv6 nodes to roughly 3.4 times 10 to the 38th power—or about 340 billion billion billion billion unique addresses. Look at it another way: Every person on earth could have a single IPv6 network with as many as 18,000,000,000,000,000,000 nodes on it—and the IPv6 address space would still be almost completely unused.

Matters of Time

One of the problems surrounding the IPv6 debate is that there isn't a specific date looming out there on which all the IPv4 addresses will dry up. Optimists say IPv4 has a few good decades left; pessimists say it's more like a few years.

But there is a big push out there for IPv6. Nations like China and Japan—which didn't receive much IPv4 address space—are major proponents. And so are nascent industries: Providers of next-generation mobile digital telephony services and vendors of networked appliances point out they'll need IP addresses for millions of devices for data networking.

¹ Dr. Vint Cerf is Senior Vice President of Internet Architecture and Engineering at MCI WorldCom and Internet pioneer credited to be the father of the Internet.

There's also movement on the part of the IETF, whose IPng (Internet Protocol, Next Generation) working group continues to plug away at IPv6 specifications and the newly formed IPv6 Forum to promote the new IP protocol in order to build the New Internet.

Get Moving

"Most people who are doing applications haven't the foggiest idea of what the IP address space looks like and whether there's a risk of Version 4 vs. Version 6. If anybody should be paying attention to this, it's the ISPs. Most of them are betting the farm on NAT boxes in the near term" stated recently Vint Cerf.

Net managers who think the long time frame allows them to put off their IPv6 decisions should think again. It's not too early to begin planning, deploying, and testing IPv6 networks. Preparing for the transition now rather than later means building a solid knowledge base and avoiding the kind of chaotic response characteristic of so many Y2K efforts.

Transition Architecture

There is no getting around the fact that IPv6 will have to interoperate with—or tunnel through—IPv4. The good news is that IPv6 creates no order dependencies: Net architects can upgrade their hosts first and then the routers, or their routers first and then the hosts. They could even upgrade some hosts, some routers, and leave the rest alone. As for which of the three main interoperability mechanisms—tunnels, translators, or dual stacks—will predominate, is quite open

The IPv6 Infrastructure

The IETF has done its part in developing IPv6 protocols. ICANN has published the policy document on IPv6 address allocation and assignment (see www.arin.net/). Since 1996, nearly 400 networks in more than 40 countries are connected to the 6bone IPv6 network.

BENEFITS OF THE NEW INTERNET

Today, it is as hard to predict the future of the Internet and e-business as it would have been for the pilot of a World War I biplane to visualise jumbo jets and modern airports. We simply can't foresee all the ways that the New Internet of the future will be used or the full impact it will have.

But we do know that the Internet is already transforming business, education, entertainment-- almost every aspect of our lives. And we do know that even larger changes are coming--as the Internet becomes faster, more robust, and more versatile.

Most descriptions of the future of the Internet have focused on bandwidth. But the Next Generation Internet is about a lot more than just high-speed networks. It's really about applications. It's not what the technology can do; it's what you can do with it.

Reliability and Scalability

One of the biggest differences between today's Internet and the New Internet is simple -- you'll be able to rely on the New Internet being available when you want to use it! This means your access will be:

- "Always On" -- just like today's telephone, you'll just start using the Internet without the need of an elaborate dial-up/log-on sequence in preparation.
- "Always There" -- not only will you be able to connect to the Internet instantly, but the sites and applications you're trying to use will also be accessible, instead of vanishing and reappearing depending on network load.

Privacy and Security

To realize the full potential of the New Internet, users must be able to trust on-line information and transactions as much as or more than they trust hard-copy documents today. As digital information itself becomes a major commodity, it must be both protected and authenticated (like physical goods). What you

see must be what you get and what was sent. And we must be able to control our data and protect our privacy in cyberspace. This requires easy, inexpensive, universally available mechanisms for security and authentication in cyberspace. In particular, we need fail-safe means to:

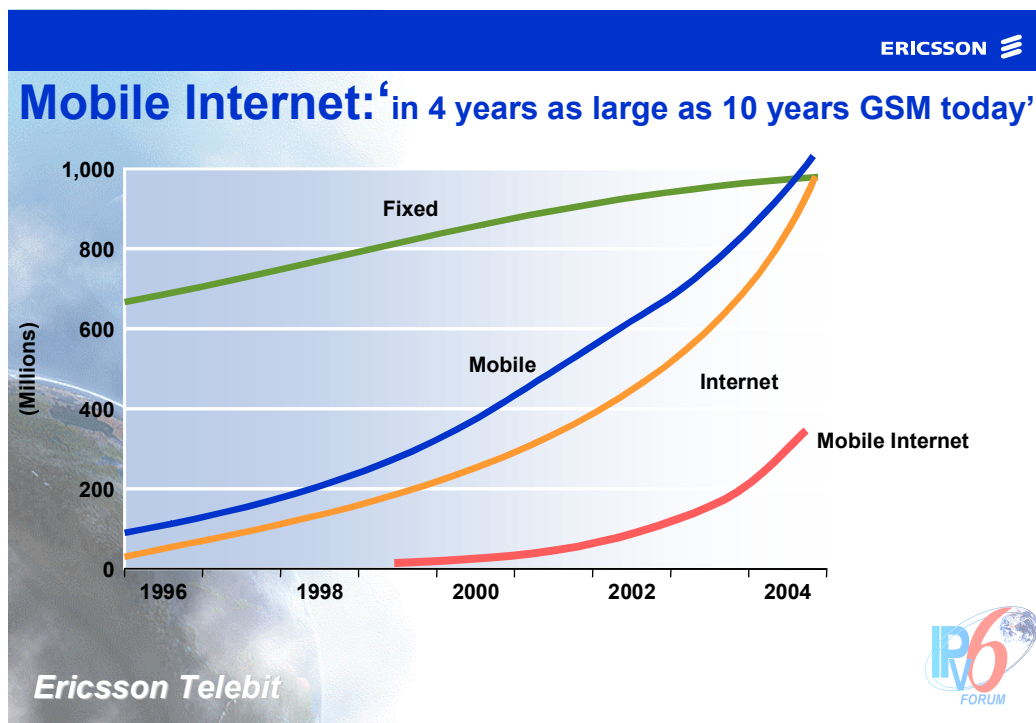
- ensure the confidentiality of data sent over the Internet
- prove that private data will be kept private
- verify that a message was sent and received properly
- authenticate individuals and information on the Web
- prove that someone signed an electronic document
- certify that a transaction happened at a particular time

Ubiquitous Access

Today, when you walk into a house or an office, you typically see one, at most two, computers. Imagine walking into a house and seeing dozens or even hundreds of computers, PDAs, and other devices, all connected to the Internet. Imagine a world where almost everything you purchase that's worth more than \$10 or \$20--whether a refrigerator, a shirt, or a bicycle--contains a tiny smart card that can communicate via a wireless link to the Internet?

In such a world, connectivity is as common as air and your watch, trees - even your dog - radiate data. Your watch could serve as a pager. Sensors on trees around your house could tell you--or your sprinkler--that the trees need watering. Your dog's collar could tell you where he is. Best of all, your lost car keys will be able to tell the Internet where they are.

The wireless chart:



Collaboration and Conversation

Today's Internet is a powerful medium for communication, whether one-to-one, one-to-many, or many-to-many. In the future, new applications and interfaces will make it even easier and more natural to

collaborate in cyberspace. New media technologies will allow you to "walk" into a room thousands of miles away for a business meeting; use virtual reality goggles to visit a "virtual showroom" and have a sales person give you a tour of a 3-D computer model of a car you're thinking of buying; or sit inside a 360-degree panoramic, video display and "travel" to a rock concert in California. These new tools for collaboration will enable us to communicate AT LEAST as effectively on-line as we do in person.

The IPv6 FORUM

" Ericsson has a clear business and technology vision about how IPv6 enables the performance and service offerings mandated by both mobile infrastructure (GPRS, UMTS), broadband networks, consumer electronics and terminals, and the interoperability/management thereof, extending therefore full support to the IPv6 Forum", emphasizes Jan Uddenfeldt , Senior VP and Technical director of L.M.Ericsson.

A world-wide consortium of 60 leading Internet vendors, Research & Education Networks are shaping the IPv6 FORUM, with a mission to promote IPv6 by dramatically improving the market and user awareness of IPv6, creating a quality and secure Next Generation Internet and allowing world-wide equitable access to knowledge and technology, embracing a moral responsibility to the world.

To this end the IPv6 FORUM will

- Establish an open, international FORUM of IPv6 expertise
- Share IPv6 knowledge and experience among members
- Promote new IPv6-based applications and global solutions
- Promote interoperable implementations of Ipv6 standards
- Co-operate to achieve end-to-end quality of service
- Resolve issues that create barriers to IPv6 deployment

" IPv6 is here and now, so take the Internet where no other network has gone before! ” comments Dr. Vint Cerf, Chairman of the Internet Societal Task Force and known as one of the fathers of the Internet.

" We've known for some years that IP version 4 was heading towards its limits, and the IETF has been working on IPv6 since 1994. Now, the basic standards are agreed and implemented, and it is time to move forward," adds Dr. Brian E. Carpenter, Chair of the IETF's Internet Architecture Board, and a Program Director in IBM's Internet Division.

" The IPv6 FORUM's noble objectives will be to promote this new technology on a world-wide basis sharing knowledge, experience and interoperability and creating common grounds for the New Internet of the next millennium", states Latif Ladid, President of the IPv6 FORUM & VP at Telebit Communications.

There are plenty of IPv6 resources on the Web. Just click on these URLs for information.

www.ipv6forum.com

This is the home page of the IPv6 Forum, a consortium of network vendors and providers, including IBM, Cisco, Compaq, Ericsson, HP, Sun, MCI Worldcom, Microsoft, Ericsson Telebit, and others.

www.6bone.net/

Visit this site for more on 6bone, the experimental test bed for IPv6. 6bone currently links close to 400 networks in more than 40 countries.

www.6ren.net/

Get set on 6ren here. It's the free and open initiative to link research and educational networks using IPv6.

www.arin.net/

Click here for the home page of ARIN, the organization responsible for allocating and administering IPv4 addresses in North and South America, the Caribbean, and sub-Saharan Africa.

www.internet2.edu/

Click here for more information on Internet2, described as "a collaborative effort to develop advanced Internet technology and applications vital to the research and missions of higher education." Internet2 is expected to be involved in research and development as IPv6 gains momentum.
