

IPv6

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Why write about a technology that most PR practitioners may not see fully implemented before they retire?

That's a good question but the technology in question is IPv6, the next generation of the internet. Internet Protocol version 6 is due to replace the current protocol, IPv4, incrementally. Everyone predicts the changeover will be slow and many internet users will never know when or whether they are in version 4 or version 6. China and the US government have declared they will go to IPv6. China is building its network and US government agencies are due to switch to the new protocol in 2008. The rest of the world will change eventually, if ever. It is important to become acquainted with IPv6 for a number of reasons, most importantly because it will change the internet's infrastructure and may expand the way PR practitioners communicate.

Why IPv6?

The simplest answer is that the internet is running out of IP numbers to assign to internet users so their machines can be recognized on the internet. Every device connected to the internet has to have a numerical address from which it sends data packets and to which responses are returned. Without numerical addresses, the internet cannot operate. Depending on the estimate you accept, shortages of numerical addresses will occur as early as 2010-12 or perhaps, never, if IT directors choose to stay with workarounds, such as Network Address Translation. The American Registry for Internet Numbers (ARIN) has announced that IPv4 address numbers will be exhausted by 2010 and only 19 percent of the IPv4 address space is still available. ARIN is one of four organizations that give out IP numbers in Latin America; the Caribbean; Africa, Asia and the Pacific; Europe and the rest of the world.

The challenge is that when IPv4 was created as the internet addressing protocol in 1981, no one knew or could predict that its 32-bit numerical address field that allows a total of 4,294,967,296 unique addresses would not be enough for the internet age. But, by 2010 there will be an estimated 1 billion personal computers in the marketplace, not including billions of internet-enabled devices such as mobile phones, personal digital assistants, home entertainment systems, Voice over Internet telephones and TV. In addition, with an increase in public use of the internet, there has been skyrocketing demand for "always-on" Digital Subscriber lines (DSL), cable modems and fiber optic internet service that require a unique IP address

number for each device connected to the “always on” service. This further increases demand for IP address numbers.

Internet address availability is not a new issue. Early in the life of IPv4, its creators saw the limitations of the addressing system. By 1992, 11 years after the development of IPv4, they foresaw the need to upgrade address availability. That was well before the internet explosion. By 1996, still before the massive growth of the internet, they proposed IPv6. However, they knew then that the internet had grown to the point where one could not change the system from one version to another. It had to be an evolution, which is beginning to occur 11 years later.

Information technology managers have been dealing with it for a number of years through a technique called Network Address Translation (NAT) and “sub-masking.” This technique is simple enough in concept. A manager gets one IP address number for an office then assigns subsidiary numbers (sub-masks) to the IP number in order to identify each device connected to the internet in the office. Think of a telephone switch board with one main number and extensions. Using NAT, one IP number serves dozens of devices. Managers rely on software in their computer servers to translate between the IP and network address. When a computer sends data over the internet, NAT removes the sub-mask number, keeps track of the communication and re-applies the sub-mask when a distant site returns information or messages. The problem with NAT is that it is cumbersome and requires more work to set up and maintain.

What does IPv6 do?

At its simplest, IPv6 vastly expands the availability of internet address identifier numbers through a change in the addressing system. IPv4 uses a 32-bit addressing system. IPv6 uses 128-bits. The new system provides for approximately 340 billion billion billion billion discrete internet addresses, or hundreds of billions of addresses for every human alive on the planet today. Developers of IPv6 didn’t want to deal with an address shortage again in their lifetimes or the lifetimes of generations after them. The availability of so many IP address numbers and other changes will remake the way the internet works. Much of it is of little concern to PR practitioners but some of the new technology is ripe for applications that will make the internet easier to use.

Among the first steps to simplification with IPv6 is that it gets rid of NAT. There is no need for network address translation when every machine and device on the web from PC to mobile phone to printer to sensor has its own unique 128-bit numerical IP address. This greatly simplifies administration while vastly expanding the address tables needed to keep track of billions of

devices. However, internet addressing computers are built to handle the expansion and even with the longer address, they shouldn't be slowed.

A second – and greatly desired step toward simplification -- is that IPv6 allows for auto-configuration of IP addresses. Rather than time-consuming handwork that goes into assigning internet addresses today, IPv6 provides for hosts to detect and assign IP numbers automatically to devices (except for routers.) The internet will be easier to use and for most people, PR practitioners included, close to plug and play. If you have had the experience of trying to connect a machine to the internet, you know the time it can take and hours on the phone with technical help. The idea that your IT manager can walk into your office, place a new laptop on your desk, plug it into the internet and leave without fiddling around with settings is something your IT manager desires.

A third advantage of IPv6 is a change in how computers connect through the internet. IPv6 allows for three kinds of connectivity. The first is standard -- machine talks to machine, such as an e-mail sent from one user to another or a web page called up on your PC. This is called unicasting and most internet traffic is unicast traffic. The second kind of connectivity exists in IPv4 but it is less common. It is called multicasting. One computer talks to multiple identified machines. We see this today with such things as music performances broadcast through the internet to thousands of fans, but it is difficult technologically with IPv4 to multicast. With IPv6, multicasting is standard. The third kind of connectivity is a new form addressing whose practical use has not been fully identified. It is called Anycasting where an internet packet is delivered to one interface of previously identified machines. Anycasting may prove valuable in the future, or it might be a technological dead-end that disappears over time.

A fourth advantage that IPv6 brings over IPv4 is built-in security. When IPv4 was created, few foresaw immense security threats from spam, worms and viruses. As these dangers arose, security was bolted onto IPv4. Security in IPv6 is built into the system. Integral security is more efficient and has less problems than components fashioned for later addition. With the number of virus catchers, spam blockers and other security devices that PR practitioners deal with today, a better security system will be welcome, even if it doesn't prevent all intrusions.

What does IPv6 mean for PR?

IPv6 will bring several advantages to PR practitioners of the future:

- **Mobility.** Because each device has a unique 128-bit numerical address, it is easy for the system to find and recognize a device even

when moved from one network to another. In a fully developed IPv6 system, there is complete mobility of devices. It will be easier to transport computers, printers, and phones to a site of an event, for example, plug them into the internet and be operational. This will greatly simplify such things as trade shows, responding to crises or traveling with a spokesperson. In essence, PR practitioners will always be in the office even though the physical location of the office changes constantly. The idea that one has to dial an e-mail provider or play around with connectivity will disappear. This also should lead to fewer devices. One only needs a portable all-in-one PDA, laptop or phone to handle all communications, calendar and computing needs anywhere at any time. One can envision a PDA that clips into a docking station linked to a screen, keyboard, mouse or trackball, headset and speakers. All other items on or around the desktop can disappear. Practitioners will have one universal e-mail address and phone number anywhere in the world simply by connecting to the internet. IPv6 will converge wireless and landline phones through Voice over the Internet protocol.

- Multicasting. The possibilities for multicasting are endless, especially when multicasting will be easy to do. There will be no difficulty in having a CEO conduct a town hall with live internet video feeds to every computer in an organization, for example. It will be easy to do the same for financial analysts and investors during quarterly and annual earnings calls. Multicasting may become a preferred communications methodology for PR practitioners because of its ease of use.
- Collaboration and sharing. Computers connecting directly to other computers is at the heart of peer-to-peer networking. In a peer-to-peer network, each computer is its own server without need of a central router. IPv6 makes direct contact to another machine, no matter where it is in the world, easier to achieve. In essence, a company or department can set up file sharing among computers no matter where they are in the world in virtual networks based on unique IP addresses. Moving a huge PowerPoint presentation from a machine in Hong Kong directly to a machine in Hoboken, NJ will be a point and click exercise. Finding the PowerPoint file on the Hong Kong machine from Hoboken will also be point and click. While information has been liberated in the internet age, it will be even more available when IPv6 is fully operational.
- Visible connectivity. In the Harry Potter novels, there is a magical parchment called The Marauder's Map that provided the location of everyone in Hogwarts through little identification flags moving about the

parchment's map. The Marauder's Map will not be fiction when internet devices are combined with GPS, as is happening with mobile phones. It will be possible, for example, at a major event with thousands of participants to know where every person is at all times no matter the device the person is carrying, even if it is something as simple as a Radio Frequency Identification sensor in a name tag. This alone will make a PR practitioner's life easier. Rather than bulletin boards, public address announcements and searching, one will only need to consult a database that shows where the individual is at any moment. This, of course, has implications for privacy and security, which must be addressed. Future PR practitioners will develop systems for searching and notification that are easier, faster and as secure as systems today.

- **Monitoring and responding:** Although IPv6 has technology to protect privacy, with unique IP addresses it will be harder for activists and others to masquerade under phony IP addresses or anonymous names. PR practitioners will more easily trace where e-mails and web pages come from. This has strong privacy and Free Speech implications – a concern expressed about the Chinese IPv6 system being built now. PR practitioners may assume the responsibility for protecting the right of citizens to speak out while at the same time using IP numbers to determine whether attacks are the work of one disgruntled person or of groups. While this can be done today using IPv4, it is by no means easy nor accurate.

These advantages are the beginning of what IPv6 can do because technologists have yet to exploit its functionality. It is hard today to envision the future even though requirements for expanded addressing were developed more than a decade ago. But, one-device-one-address expands enormously system awareness and connectivity. It is likely we will see new applications arising in the US government and Chinese systems. These systems will serve as test beds for ideas, some of which will produce distinctive advantages.

How long will we wait for IPv6?

IPv6 is built to co-exist with IPv4 until there are more IPv6 networks available. IPv6 can run over an IPv4 system or “tunnel” through it, as needed. Computer operating systems are prepared to use IPv6. It is native to Microsoft's new Vista operating system and upgrades on other systems are easy to do. That written, it will be a long time until IT directors replace what they have and upgrade – a task that will cost tens of billions of dollars.

If IPv4 addresses run out as scheduled, expect to see IPv6 becoming a topic of conversation in three to five years. Meanwhile, know that it is coming, and

that it will change the way that you work on the internet for the better someday. If a “killer application” is developed, a rush to migrate systems might occur, but don’t expect it. On the other hand, if China and the US government successfully transition their systems, that alone may be the stimulus for transition. It will be discouraging if in 10 years, we are still talking about moving to IPv6 someday in the future.

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