The Standard

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The Standard is the journal of IPv6 Now Pty Ltd, the only company in Australia dedicated solely to IPv6. IPv6Now has specialised in IPv6 training, consulting and services since 2007.

6now.net
ipv6now.com.au

ipv6.org.au

Open for Business
17-19 Oct 2012
ipv6.org.au/summit

What is IPv6?

IPv6 is an improved addressing system for Internet devices which leads to larger, cheaper, and more efficient networks. IPv6 offers massive numbers of addresses and better networking, mobility and security.

Achieving IPv6

In future years we'll look back on the last decade of IPv6 debate with amazement and ask how anyone could have argued against connectivity on such a breathtaking scale: a leap in Internet capability and capacity as significant as the birth of the Internet itself. If you think that's over the top, see inside for *Birth of the Internet Itself? Oh, Come On!*

Bottom-line – does anyone imagine the US and Australian governments have mandated IPv6 just for fun? They know what's at stake and are willing to put money and effort into it. They're not chasing yesterday's innovation (Facebook IPO, anyone?) they're looking towards tomorrow's.

IPv6Now believes the time for simply advocating IPv6 is over. Far more important today is assistance for those tackling their own IPv6 transitions, and that is the focus of our new website at 6now.net.

6now.net provides a list of tools for debugging IPv6. It also offers a guide to IP Address Management (IPAM) packages, both free and commercial, also reprinted in this newsletter.

Free Book Offer for World IPv6 Launch

To celebrate World IPv6 Launch on 6 June 2011, IPv6Now is offering free pdf copies of *The Lookup Book*, our unique, compact reference to IPv6. See book details on page 2 and go to 6now.net to get it.

On 6 June it's World IPv6 Launch, and this time global enterprises are turning IPv6 on and leaving it on. Last year Studentnet, IPv6Now and ISOC-AU had a lot of fun getting students to stress-test IPv6Now networks: see more inside.

In this *Standard* we have a roundup of some of the most interesting issues in IPv6 transition. *Shadow Networks and the Boardroom* argues that IPv6 security begins at the top, while *Second-hand Space* looks at developments in IPv4 address broking. Also see *Smarter Clouds need IPv6* and *Is Business Continuity IPv6's Killer App?* And why has Apple's AirPort gone backwards?

The Australian IPv6 Summit will be *Open for Business* in 2012, covering opportunities, green computing, security, Asia-Pacific IPv6, and the IPv6 deadlines governments plan to meet in 2012. If you're open for business, you're ready for IPv6! ipv6.org.au/summit.

Please feel free to contact us to discuss anything that interests you in this edition of *The Standard*. Email *editor@6now.net* or phone 1800 222 085.

(Right) IPv6Now exhibit at the IPv6 Summit October 2011, with IPv6Now personnel Karl Auer, Mike Biber, Kate Lance and Tony Hill.

Contents

Some of you may know that IPv6Now's MD, Tony Hill, recently became ill in Beijing. He received immediate and successful treatment, and is currently on sick leave while he recuperates. Tony and IPv6Now would like to thank everyone who expressed their kind wishes while Tony and his family were going through this difficult time.

Easy IPv6: The Lookup Book (Second Edition)

We've published an expanded Second Edition of *The Lookup Book* because the First Edition sold out so quickly. This wasn't surprising: *The Lookup Book* is unique! It is the only compact, precise, quick reference to IPv6 technical definitions available.

To celebrate World IPv6 Launch, we are offering the PDF version of *The Lookup Book* for FREE: get it from 6now.net. Offer available 6June to 6July 2012.

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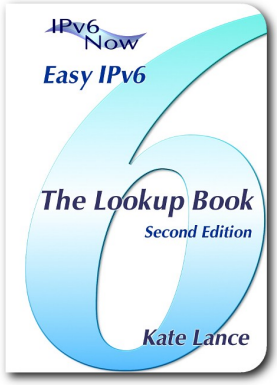


Format

The book is available in PDF format via email, or in paperback (cost includes postage, overseas books are sent via Air Mail). Go to 6now.net/lookup.php to order and pay online.

Second Edition, 28pp, colour pocket-size paperback, spiral bound, 105 x 148 mm
ISBN 978-0-9872113-0-9

Destination	Cost	Format
All	**FREE**	**PDF***
Australia	**AU$23.50**	Paperback
Asia Pacific	**AU$26.00**	Paperback
Rest of World	**AU$27.50**	Paperback

*PDF documents require the free Adobe Reader.

IPv6 Addressing Primers

Here's some articles to help with understanding IPv6 notation, prefixes, subnets and network design.

The IPv6 Prefix Primer by Karl Auer
6now.net/primers/IPv6PrefixPrimer.pdf
A brief, easy-to-follow introduction to IPv6 notation, prefixes and subnetting.

IPv6 Address Design by Jeff Doyle
networkworld.com/community/blog/ipv6-address-design
An introduction to scale, simplicity and efficiency in IPv6 address planning.

How Are Your Hexadecimal Skills? Jeff Doyle
networkworld.com/community/blog/how-are-your-hexadecimal-skills
Some tips on easy hexadecimal manipulation.

Birth of the Internet Itself? Oh, Come On!

Is IPv6 as significant as the birth of the Internet itself? After working in the IPv6 world for many years, it's easy to see the protocol changeover as simple technical replumbing, no exaggeration required, thank you very much. But occasionally an example pops up that knocks the business-as-usual thinking sideways.

Simple enough: despite all of our technical skills everyone's wellbeing and security is, and always will be, dependent upon the weather. From food production to transportation, dwellings, livelihoods, physical security, air quality, pollution risks and changes in climate, weather affects every one of us in the most fundamental way.

Weather predictions from computer modelling are limited by physics. Multiple observations are the only way to truly develop accurate predictions, but the network of weather observation points – balloons, satellites, ground stations – is limited.

The true worth of IPv6 lies in the incremental jump in complexity that becomes possible with vastly larger networks

What could a sensitive network of literally billions of environmental reporting-points all over the world tell us? Just about everything we need to know to instantly maximise safety and wellbeing. But there's no way such a network is possible with the current, outdated IPv4 protocol.

With IPv6? Perfectly doable. And the economic implications of better weather forecasting? Better environmental change data? Better pollution warnings? Stunningly valuable for everyone on the planet.

Scientists point to the difference in animal and human capabilities as directly related to the numbers of connections between brain neurons, just the value of network connectivity grows exponentially with every node that's added to it. The true worth of IPv6 lies in the incremental jump in complexity that becomes possible with its vastly larger networks.

Keep in mind that the Internet has had many incremental steps, not one simple birth – most memorably in the early 1990s, when it moved dramatically out of academia into global functionality.

Yes of course, even with IPv6 it's still the Internet: but undergoing a brand new phase of massive network complexity, unknown and unexplored. We'll probably only understand the significance in hindsight, but there's possibilities even today that suggest IPv6's potential – just like the Internet in 1990 – has barely begun to be comprehended.

Guide to IPv6 Address Management Packages

See **6now.net/addresses.php** for the online version.

Software to help with IP address management (IPAM) has long been available for IPv4, and now IPv6 versions are becoming available. Because of IPv6's greater complexity, working by hand with addresses is open to errors, but IPAM software can help admins reliably maintain address schemes.

Here are some open source and commercial IPAM packages. (IPv6Now does not guarantee any packages, list supplied for information only.)

If you use and have opinions on any of these IPAM packages, or would like to suggest others to be added to the list, please email editor@6now.net.

Free IPv6 IPAM Packages

- **GestióIP:** automated, Web based IPv4/IPv6 address management software. The online subnet calculator includes a hierarchical IPv6 addressing plan builder for creation of organisation-specific IPv6 allocation schemes. It features powerful network discovery functions, search and filter functions and an automated VLAN management system.

- **NetDot:** an open source tool to help network administrators collect, organise and maintain information. Features IPv4 and IPv6 address space management including hierarchical organisation, address block visualisation and IP and MAC address location and tracking. Also provides device discovery via SNMP, Layer 2 topology discovery and graphing, generates zone files for ISC BIND and ISC DHCPD configurations.

- **6Connect/IPAM Automation:** commercial product, but free version is available. IPv4 and IPv6 subnet calculations for tracking of assignments and unassigned space, supports IPv4 and IPv6 through single dynamic interface, integrated with ARIN and RIPE APIs for IP assignments, ties reverse DNS records to IP assignments automatically, DNSSEC support built-in, including signed zone management and DS key generation.

- **phpIPAM:** an open-source web IP address management application. Its goal is to provide light and simple IP address management. It is ajax-based using jQuery libraries, php scripts, javascript and some HTML5/CSS3 features. Features IPv4/IPv6 address management, IPv4/IPv6 address calculator.

- **HaCi:** an IP address/network admin tool with IPv6 support. It stores data efficiently in a relational database and uses a treelike structure to illustrate supernets and subnets. Manage network trees ordered by roots, add IPv4 and IPv6 networks, show subnets, split, copy, move, delete etc, import networks from other sources, language localisation.

- **IPplan:** a free (GPL), web based, multilingual, TCP/IP address management and tracking tool written in php 4. Also includes DNS administration, configuration file management, circuit management and storing of hardware information. Support for IPv6 (currently in BETA from version 6.00-BETA1).

Commercial IPv6 IPAM Packages

- **Crypton/Easy-IP:** an IP address management solution designed to help you understand, plan and manage IP address space across your entire network infrastructure. Control IP address assignment, migrate seamlessly from IPv4 to IPv6, discover existing network devices, find out your subnet utilisation, document IP address plans. Using a powerful SNMP auto-discovery engine, Easy-IP maintains an accurate, up-to-date inventory for all subnets, IP addresses and network devices.

- **BTDiamondIP/IPControl™:** cohesive and simplified management of IP address space, subnets, individual address assignment, DNS and DHCP in one integrated solution. Available as a software application or pre-installed on appliances. Provides centralised, full lifecycle management of IP management functions, including IPv4 and IPv6 address space assignment, allocation/reallocation, pool monitoring and utilisation tracking and deployment of multi-vendor DNS and DHCP configurations.

- **Icognito Software/Address Commander:** uses robust Java APIs to incorporate IP address allocations and reclaims into your OSS. Manages IPv4 and IPv6 dynamic scopes and static IP assignments through a single interface. Maintains data validity and detects problematic configurations and duplicate assignments. Easily generates comprehensive reports detailing IP address allocations. Integrates multiple regional DHCP deployments.

- **Internet Associates/IPal™:** supports IPv4, IPv6 and ASN in one interface, supports multiple instances of IP space, optimises aggregation of addresses between regions, prevents premature reuse of deallocated addresses, address reclamation capability for renumbering and merging networks, graphic representation, equipment models with interface and DHCP allocations, automatic DNS generation from network architecture, address layout function for generating address plans.

- **EfficientIP/SOLIDserver™ Appliance:** IPv6 address management through an appliance and a centralised, web-based interface. Detects IPv4 and IPv6 addresses on your network and centralises all data in the interface. Helps implement Dual Stack configs to maintain communication between IPv4 and IPv6 devices. Supports DNS AAAA and PTR (DNAME) records for IPv6 DNS resolution, as well as ip6.int and ip6.arpa domains.

- **Men and Mice/IP Address Management Module:** licence free for 6 months for IPv6 migration purposes only. Part of Men & Mice Suite Management Modules: DNS Management, DHCP Management, IP Address Management, DNS Expert and DNS Expert AD Monitor. Working together, the modules provide a unique management solution that enables organisations to keep track of their IP address space, individual hosts on the network, and their associations in DNS and DHCP.

Apple AirPort Goes Retro

A focus this year of World IPv6 Launch is testing IPv6-enabled home routing equipment. To be included in the list of participating Home Router Vendors, the vendors must undergo testing by the University of New Hampshire InterOperability Laboratory:

> Home networking equipment makers are committing to enable IPv6 by default through their range of home router products … 'Enabled by default' means the product will not require any IPv6-specific configuration by an end-user …

The lack of IPv6-enabled home gateways has long been a major roadblock in widespread IPv6 deployment, so this is a very encouraging program. The four vendors who have so far complied with the testing requirements are Cisco, D-Link, NDM Systems and ZyXEL Communications Corp.

So it's all the more bewildering that Apple recently took the strange step of leaving out IPv6 support from Version 6.0 of its AirPort Utility, which allows users to set up and manage Apple Wi-Fi networks. Although version 5.6 can be used instead, users of OS X Lion are seeing incompatibility issues with version 6.0.

"It's a little concerning. We hoped to see more IPv6 support, not less among vendors."

John Brzozowski, chief architect for IPv6 at Comcast, said "Apple has taken the ability to seamlessly support IPv6 away from the AirPort Utility. It was one of the first versions of a home router that had IPv6 support. It's a little concerning. We hoped to see more IPv6 support, not less among vendors."

Others have suggested that version 6.0 is a new, rewritten user interface, and IPv6 may yet return to v6.1. Apple have not confirmed this. Whatever the case, its appears to be a retrograde step for the vendor, especially sad since Macs were among the first to support native IPv6.

Oh well, at least we can still use Cisco, D-Link, NDM and ZyXEL equipment …

World IPv6 Launch, 6 June 2012

- **FREE IPv6 Helpline**
  Ph 1800 222 085
- **FREE Try6 Internet access**
  6now.net/free.php
- **FREE Instant6 web visibility**
  6now.net/free.php
- **FREE email advice**
  info@6now.net

Internet service providers, home networking equipment manufacturers, and web companies around the world are coming together to *permanently* enable IPv6 for their products and services by 6 June 2012, see worldipv6launch.org. Major participants are: Akamai, AT&T, Cisco, Comcast, D-Link, Facebook, Free Telecom, Google, Internode, KDDI, Limelight, Microsoft Bing, Time Warner Cable, XS4ALL, Yahoo!, as well as hundreds of other Internet providers and equipment manufacturers. For IPv6 providers in Australia see ipv6.org.au.

6now.net provides free IPv6 help, not just for World IPv6 Launch day, but every day.
Get a FREE pdf copy of our unique IPv6 guide *The Lookup Book* from 6now.net

Last Year on World IPv6 Day 2011

IPv6Now and Studentnet®, in conjunction with ISOC-AU, celebrated World IPv6 Day on 8 June 2011 trying to break the IPv6 Internet with the help of some enthusiastic students from Wollondilly Anglican College and Waverley College. One student called it "the best school day ever!" Everyone had a lot of fun while learning about the next-generation IPv6 Internet. Studentnet uses IPv6 infrastructure to *invisibly* supply email and collaboration services for 14,000 Australian school students. World IPv6 Day 2011 provided the opportunity for students to directly experience IPv6 for themselves: the communications foundation these young people will be using over their lifetimes. (Images Sharon's Photography.)

Australian IPv6 Summit 2012
Open for Business Melbourne 17-19 October 2012
ipv6.org.au/summit

If you're open for business, you're ready for IPv6
Global IPv6 deadlines must be met in 2012: what impact will that have on your business? Four streams: Seizing IPv6 Opportunities, Security & IPv6, Meeting IPv6 Deadlines, Asia Pacific.

One-day IPv6Now training workshops after the Summit: experience IPv6 for yourself.

Is Business Continuity IPv6's Killer App?

An article by Carolyn Duffy Marsan in Network World on 12 April 2012 proposed that business continuity is emerging as the latest IPv6 killer app. It points out that at last enterprises are starting to implement IPv6, but it's not for the usual technical reasons such as mobile and wireless operations, video streaming, online gaming, cloud computing or Internet of Things.

Instead, it's to guarantee business continuity as IPv4 addresses disappear and IPv6 is phased in. A Cisco engineer stated they've seen "a ridiculous spike in actual deployments of IPv6 in the enterprise around the Internet edge."

Rather than focussing on internal operations, businesses are directing their IPv6 adoption efforts towards avoiding isolation from the developing IPv6 Internet, keeping their websites, email and other external-facing services accessible to growing numbers of IPv6 users.

John Curran, CEO of ARIN, offers a slightly different viewpoint. He sees it more as quality of delivery, due to the return of the end-to-end experience with IPv6.

"The Internet content industry wants quality access to the users, with high bandwidth, low latency, low jitter and with consistent network information. Connectivity via NAT (network address translation devices) doesn't cut it ... The content industry is well aware of what it takes to deliver quality content, and it isn't IPv4. It's IPv6."

"The content industry is well aware of what it takes to deliver quality content, and it isn't IPv4. It's IPv6."

In Australia the deadline for Federal Government external services to be IPv6-capable is December 2012, a mere eight months away.

A further aspect is that of corporate governance and responsibility. Boards must always be aware of approaching issues that will impact on the bottom line. Maintaining connectivity is now essential to modern business viability, and the time is long past when ignorance about the IPv6 transition could be used as a defence for losing business through outdated technology.

Governments in both Australia and the USA are taking IPv6 very seriously. The US government has mandated its agencies must support both IPv4 and IPv6 on all externally facing web services by 30 September 2012, and must upgrade to support IPv6 on all internal services by September 2014. In Australia the deadline for Federal Government external services to be IPv6-capable is December 2012, a mere eight months away.

It's interesting that despite the costs, governments see the IPv6 transition as essential. Perhaps they understand it's more than just a matter of business continuity, it's continuity of communication in general. Perhaps IPv6 doesn't need its own killer app. As Ron Broersma from DREN stated: "The business case for IPv6 is business survival. *The killer app is the Internet itself.*"

Moving to 6…

Kevin Karp, MD of PPS Internet, IPv6Now's IPv6 infrastructure provider, believes his commitment to IPv6 is beyond question. Recently PPS completed a successful and long-planned move of all network equipment from one floor of their transit provider to another. It was only after the exhausting relocation was completed that he realised they'd gone from Level 4 to Level 6…

Second-Hand Space

A year ago we reported on the emerging market for buying and selling IPv4 addresses. In March 2011 the bankrupt company Nortel was offered US$7.5 million by Microsoft for 666,624 IPv4 addresses: the final deal worked out to US$11.25 per address. In December 2011, bankrupt bookseller Borders sold 65,536 IPv4 addresses (a /16 block) to software provider Cerner for $12 per address.

IPv4 address space brokers Addrex state they have a complete /8 block for sale, containing 16.8 million addresses. Due to its scarcity value they estimate it will sell for 0.5 to 1.5 billion dollars. That's an extraordinary amount of money. At (say) a round billion, it's $60 per address.

It's hard to understand how even the most backward-looking company could see spending a billion dollars to avoid upgrading to IPv6 as a good deal

It's hard to understand how even the most backward-looking company could see spending a billion dollars to avoid upgrading to IPv6 as a good deal. Given that most current network equipment and operating systems are already IPv6-enabled, transition costs are more likely to be staff-related: and for a billion dollars you could pay many, many network engineers for a very long time! *And* you'd end up with a modern, future-proofed network as well.

74% of New Zealand's export trade value is with countries whose governments are pursuing some form of mandated adoption of IPv6

New Zealand IPv6 Task Force member Donald Clark points out, "Currently around 74% of New Zealand's export trade value is with countries whose governments are pursuing some form of mandated adoption of IPv6. Companies wanting to do business with these countries will need to be able to talk IPv6."

Regarding businesses stockpiling IPv4 addresses and delaying the migration to IPv6, Clark says, "Feel free to run IPv4 on your internal networks for as long as you wish, but if you want to remain a part of the internet you will need to also run IPv6."

This is echoed by John Curran, CEO of ARIN: "As the Internet moves over, people have to realize the growth will be on v6. If they don't make the change, people will still talk to them but eventually you will find yourself in the backwater of the Internet, running only IPv4."

Perhaps Neal Stephenson's superb In the Beginning was the Command Line says it best. He describes those who refuse to upgrade old Linux software being dealt with "in the same way that Eskimos supposedly dealt with senior citizens: if you insist on using old versions … you will sooner or later find yourself drifting through the Bering Straits on a dwindling ice floe."

And even 16.8 million IPv4 addresses won't get you safely ashore in an IPv6 world.

Smarter Clouds Need IPv6

For the last few years IBM has been backing a vision of Internet development they call the Smarter Planet. As the world's systems and industries are becoming more instrumented, interconnected and intelligent, IBM believes they can be used to achieve economic growth, efficiency, sustainable development and societal progress.

A major key to this vision is the Internet of Things, devices world-wide supported by vast cloud-computing infrastructure. R. Colin Johnson reports that IBM believes that the number of cloud-ready devices will surpass one trillion nodes within three years.

IBM anticipates the emergence of "a global electronic nervous system, with trillions of individual sensors monitoring the status of everything of interest to humans, and streaming the resultant exabytes of data to cloud-based cluster supercomputers that extract the ultimate value from the data using analytics software modeled on the human mind."

… streaming the resultant exabytes of data to cloud-based cluster supercomputers that extract the ultimate value from the data …

Only IPv6 can allow the cloud to scale into the foreseeable future

But, says Juha Holkkola, "not many people have realized how critical IP addresses and DNS are for the cloud orchestration process. To commission or decommission a virtual machine, one needs to reserve or to free an IP address, preferably within a window of 300 milliseconds.

"Further, in order for that newly commissioned virtual machine to be easily accessed, a DNS entry is also needed. With Infrastructure 1.0 utilizing IPv4 spaces managed with Excel spreadsheets, the cloud doesn't scale."

Holkkola is convinced that IPv4 cannot deal with massively distributed cloud infrastructure, and "*only IPv6 can allow the cloud to scale into the foreseeable future. In this light, IPv6 can be viewed as a similar enabler to the cloud as IPv4 was for the Internet.*"

So IPv6 will enable the Cloud to support the Internet of Things to create a Smarter Planet. Go IPv6!

Shadow Networks and the Boardroom

Network security is supposed to be the IT department's job, isn't it? Usually, yes. But in this bizarre will-we-won't-we IPv6 world, a circular finger-pointing exercise seems to have left a gaping security hole. The techies say they can't implement IPv6 because management won't let them. Management say they can't see the point of it: and both are playing Wait-And-See.

But unfortunately you can't see much when you're not looking. Many organisations believe that if they don't deliberately implement IPv6 their networks are protected from the new protocol. But the opposite is true. If you think your network's not carrying IPv6, think again: it just means you don't know about it!

If you think your network's not carrying IPv6, think again: it just means you don't know about it!

Do you use Microsoft or Apple or Linux computers? Modern routers and switches? Then you're probably running IPv6 in what Blue Coat Systems calls a 'shadow network'.

"As network and PC infrastructure, and BYOD (bring your own device) items like smartphones and iPads come into the enterprise environment, they're increasingly IPv6 capable and IPv6 configured," said Mark Urban from Blue Coat, in an interview with Fierce Telecom. "So what we've seen is the emergence of these shadow networks operating in traditional IPv4 environments."

Blue Coat Chief Scientist Qing Li said, "This is happening. Sometimes when we plug devices into a client's infrastructure and say – Look, you have IPv6 traffic. Are you aware of it? – ninety-nine percent of the time they will say no."

While IPv6 itself poses no inherent security threat, curiosity or carelessness or malicious intent can easily open IPv6 routing to the Internet, so it becomes the perfect covert channel. "IPv6 tunnels and auto-configuration can introduce serious risks by enabling end-to-end connectivity where the administrators never intended it," says Gordon Lyon, lead developer of Nmap. "Admins may think their IPv4 firewall and intrusion detection systems are protecting them, while IPv6 traffic slips in under the radar." Nmap, the network-scanning utility, now has full IPv6 capabilities.

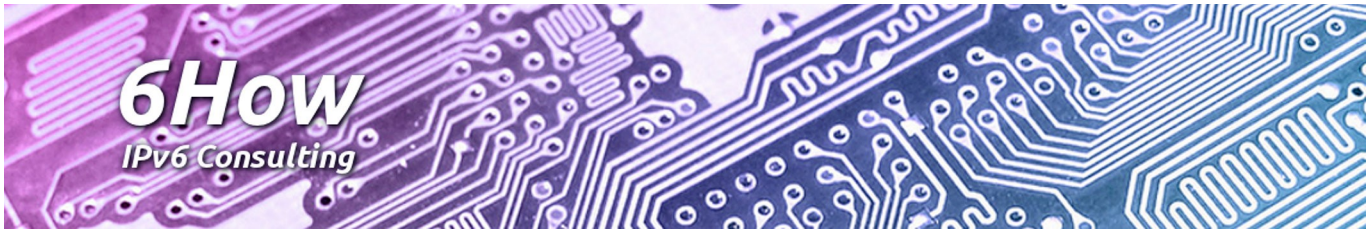
IPv6 is here. It's in almost every system and network device made in the last few years. It's not a secret.

Modern Windows, Mac OS X and Linux systems can send and respond to IPv6 as well as tunnel IPv6 traffic inside IPv4 packets. And if a company's firewalls and intrusion detection systems do not recognise IPv6, attackers can use it to map networks, execute denial-of-service attacks or steal data.

IPv6 is here. It's in almost every system and network device made in the last few years. It's not a secret. But now potential security problems are arising because companies have procrastinated and held back from committing to IPv6.

Why? Most technical staff have been aware of the issue, but have not been able to get the go-ahead or resources to implement IPv6. Have they not been convinced – or convincing – enough? Have management had too much on their plates to imagine a protocol upgrade affecting networks so fundamentally? There is no question that the changeover to IPv6 has necessary costs. There's fewer in the area of equipment (if it's recent) and more in the area of staff, who need training to deal effectively with IPv6. But are avoiding those costs really worth the security trade-off?

It's not the 1990s any more, when adventurous techies could implement new ideas without asking anyone. So whose responsibility is it to push for IPv6 adoption? Today, it seems to be the Boardroom that needs to come to grips with the problem of shadow networks – and start pushing for IPv6 security from the top.



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