The switch to IPv6

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As IPv4 addresses run out, organizations no longer have a choice about how long they can put off adopting IPv6. Where do regions of the world stand on IPv6 readiness, and how enterprises, service providers and governments are easing the transition?

Thursday, February 3, 2011, marked a milestone for the development of the Internet. It was the day the last blocks of the 4.3 billion IPv4 Internet addresses were allocated. Without a unique IP address, additional users, services or devices will not be able to make use of the Internet, limiting its growth.

This looming crisis was anticipated back in 1999, when IPv6 was first introduced. While IPv4 addresses consist of four 8-bit numbers, providing a total of 4.3 billion addresses, IPv6 allows for many, many more: **340 undecillion addresses - that's 340 followed by 36 zeroes.**

A decade later the depletion of IPv4 addresses is a reality and demand for IP addresses are set to explode even more with the advent of mobile broadband Internet and the proliferation of smartphones, tablets and other smart devices, each of which need a unique IP address to talk to the Internet as well as the secure end to end communications given by IPsec which is mandatory under IPv6. Cisco's Visual Index for global mobile data indicates that in 2010 global mobile data traffic grew 2.6 fold, nearly tripling for the third year in a row. Mobile data traffic is forecast to increase 26 fold from 2010 to 2015 at a compound annual rate of 92per cent. The other domain which is a natural for IPv6 is machine-to-machine communication in smart grids, smart buildings, tracking networks, green IT and cloud computing. Most recent forecasts predict up to 7 trillion connected devices within the next decade. (Source: Amdocs paper may 27th http://www.amdocs.com/Whitepapers/Connected-World-Vision-WP.pdf)

Getting ready for IPv6

The tier one global Internet service providers have their networks very much ready for the expected surge in IPv6 traffic. The situation is patchier on the national and regional level. Governments in many countries are by far the biggest consumer of

telecommunications services and equipment and play a major role in catalyzing the adoption of new technologies. It was widely perceived that Asia Pacific had an insurmountable lead for IPv6 over Europe and even more so over North America, but the balance shifted when the US Department of Commerce (DOC) and Department of Defence (DoD) started to mandate IPv6 support in Federal Government ICT procurement.

National research and education (R&E) networks connect universities and research labs and have traditionally been at the forefront of IPv6 adoption. The People's Republic of China went the furthest with CERNET2, the world's largest IPv6-only R&E network. It showcased IPv6 at the 2008 Olympics and at the Shanghai World Expo in 2010. Japan under the leadership of NTT has pioneered commercial IPv6 deployment all the way to the end-user.

At the mainstream level, commercial enterprises had been reluctant to adopt IPv6, perceiving it as an expense that does not contribute to short term revenue growth. With a dearth of IPv4 addresses however, businesses have both commercial and technical imperatives to go for IPv6 now. An increasing number of service providers and major consulting houses now start to provide Professional Services and training to assist the enterprise sector in the transition to IPv6.

Tide turns towards IPv6

Things are changing. According to APNIC, the Regional Internet Registry (RIR) issuing IP addresses for the Asia Pacific region, 2010 saw a dramatic increase in the number of IPv6 address blocks requested globally, by the likes of Asia Pacific carriers, Internet Service Providers and content providers. This will accelerate even further as APNIC has now itself run out of t of IPv4 address blocks and is applying strict rationing doling out only tiny slices at a time for the last remaining 'slash 8 block ' it has.

Many Governments are setting the benchmark. They are getting more serious and forceful in respect to IPv6 support in their procurement and are setting concrete deadlines for adoption. As IPv6 support is now mandatory for all US Federal Government ICT procurements, there has been a frenzy of activity on the supply side to satisfy Government specifications. It is good to see similar Government initiatives in Asia such as India where as of end of 2012 all Government-procured ICT goods and services will have to support IPv6.

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From the Tata Communications global network perspective we have seen a remarkable growth as 36% of our IP transit wholesale customers now connect in dual stack, meaning in both IPv4 and IPv6, up from less than 24% a year ago.

The strong motivation of the major content providers as hosting companies such as Google, Akamai, Limelight to see a smooth transition to IPv6 is quite straightforward as many business models are predicated on an open and reachable, un-fragmented internet. This has led them to be the major drivers for the June 8th World IPv6 day when the world's major content sources will be made accessible in IPv6.

Easing the transition

While awareness is growing, there is still quite some confusion, especially in the enterprise sector, about what IPv6 really means and what the transition implies from a cost and operational perspective. . Although enterprises today may take a gradual approach to upgrade their internal processes , all external customer-facing applications such as e-mail or corporate websites will have to support both IPv4 and IPv6 in order to ensure business continuity. This in turn will ensure that the growing number of IPv6-only customers is not alienated, and that existing IPv4 customers are not left behind. In addition a number of transition mechanisms will ease access to IPv4 only content and applications by IPv6 only customers. A rapidly growing number of Internet Service Providers are activating IPv6 support in mostly "dual stack" mode, offering both IPv4 and IPv6 in parallel. The "dual stack" method is the most cost-effective solution for service providers as the same transmission and routing equipment is retained. The real bonus is is that supporting both protocols gives peace of mind and guarantees business continuity as nobody really knows at what speed IPv6 traffic will grow, overtake and ultimately replace IPv4 traffic.

Tata Communications, which facilitated the world's first intercontinental native IPv6 connection in 1998, completed native IPv6 deployment in its core network in 2006. Almost all new customers and renewals are now opting for dual stack connectivity, supporting both IPv4 and IPv6. Tata Communications' domestic IP network in India also provides both IPv4 and IPv6 access using 6PE (IPv6 Provider Edge with MPLS transport in the core) to all major cities and will extend the service as demand grows. The Indian

Department of Telecommunications (DoT) mandates IPv6 support starting in December 2011

Towards the Future

The staggering growth in video content and streaming continues unabated. Youtube has just turned six years old and is now carrying 3 billion views daily and uploading two days worth of video every minute. (Source: http://www.washingtonpost.com/business/technology/as-youtube-turns-6-years-old-daily-views-shoot-up-to-3-billion-yes-3-billion-daily/2011/05/25/AGnj4DBH_story.html)

The proliferation of smartphones and now tablets combine with the growth of mobile broadband, the issuance of 3G licences in India where around 20 million new cellphone subscribers are added every month and the runaway adoption of 4G and LTE technology is adding a new dimension to anytime, anywhere connected.

The third growth vector is the burgeoning machine 2 machine communications where we are marching to an era where everything that can benefit from communicating will communicate be it human, animal or every human made object. Even nature will communicate with sensor networks monitoring weather, pollution, seismic activity, tsumami risks , solar flares... all with unprecedented level of granularity, detail and accuracy.

A shorter term challenge to IPv6 will be an enormous inventory of legacy customer premise equipment that is not easily upgradeable to IPv6. This will be gradually solved under the natural customer churn and upgrade cycles with new installations IPv6 ready by default. Creative transition solutions like local tunnelling techniques. As exemplified by the tremendous success of France's Freenet who can boast the largest number of IPv6 ready end-users of any commercial ISP

The guessing game of the last decade has been - when will we run out of IPv6 addresses, The verdict is now out and we can now proceed to the next phase asking the question: With the proportion of IPv6 traffic now at roughly 1% of all internet traffic, when will it reach 50%? 2015?

The only certainty is that organisations, depending in any way or form on the internet to conduct their business, simply cannot afford to put-on-hold IPv6 adoption any longer.