Briefing Paper:

IPv6: Why and how Governments should be involved

The Internet Society's Briefing Papers are intended to act as an orientation paper for members of the Internet Society on a given topic. They provide background, outline current issues, challenges and opportunities, and provide suggestions as to ways forward. The Internet Society welcomes your comments on this topic. Please send your comments to pubpol-briefing@isoc.org.

Introduction

Issues related to global addressing, and particularly the depletion of Internet Protocol version 4 (IPv4) and the deployment of IPv6, affect and involve all stakeholders, including the private sector, the public sector, the technical community, civil society, the research community and academia. In this particular Briefing Paper, the Internet Society looks at one key stakeholder – governments – and outlines what they can do to increase IPv6 awareness and facilitate IPv6 take-up.

A short introduction to the global addressing challenge of IPv4 depletion and IPv6 take-up is included at the end of this Briefing Paper.

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Opportunities and challenges

Governments have a key role to play in raising awareness and encouraging the deployment of IPv6. A number of governments around the globe have designated IPv6 deployment to be of importance to government services' growth and continuity. They are raising awareness through measures designed to engage with a range of stakeholders and, in some cases, through test beds, incentives, and/or mandates and procurement measures. In addition, governments operate networks, provide content, develop services and applications, and as such can play a significant role in leading by example and spurring IPv6 take-up, However, not enough governments are engaged; lack of awareness with regard to issues surrounding IPv4 depletion and IPv6 take-up could be detrimental to seamless global addressing and, therefore, national competitiveness and continuity of government services.

Seamless global addressing ensures that Internet based communications continue to be routed in the most efficient manner and to the right addressees, that government and business services continue operate smoothly and that digital economies continue to flourish. Seamless addressing is taken for granted today, but a piecemeal transition to IPv6 could threaten the smooth functioning of the Internet, to the detriment of all. It is critical to the stability and continuity in the internal networks of the government and in external facing e-services and applications on the one hand, and innovation, growth and economic competitive advantage on the other.

E-services are becoming an increasingly important way for governments to interact with the populace, from filing tax returns to voting – they are, effectively, reshaping the relationship between the elected official and the citizen. Addressing stability and continuity through the availability of a significantly larger pool of addresses will ensure that governments are not limited or stymied in the roll out of increasingly innovative and citizen-centric services.

Addressing stability and continuity are also essential to the evolution and functioning of the Internet and our flourishing digital economies. There is much focus by governments on the importance of broadband infrastructure, particularly high speed connectivity, to economic competitiveness. The Internet Society would argue that seamless addressing through a stable and unlimited supply of Internet addresses is of equal importance. Just as with broadband, governments need to see IPv6 as a key economic enabler, with the potential to spur economic opportunity and innovation in such areas such as the Internet of things, nomadic lifestyles, smart grids, and smart infrastructure and buildings.

There are a number of implementation-related challenges. Issues such as costs, lack of expertise and deployment complexities are all cited as impediments to moving forward with IPv6. However, information provided by a number of organizations that have started to deploy IPv6 suggests that such concerns are less of a burden than originally thought[1]. There is also much talk of the need for a "killer application" to drive IPv6 demand and deployment. The Internet Society disagrees: the drivers for IPv6 are, in the near term, business and government services continuity and, in the longer term, the promise of significant future opportunity in service and application innovation[2].

[1] http://www.isoc.org/pubs/2009-IPv6-OrgMember-Report.pdf

[2] For more on these issues please see the Internet Society Briefing Paper on "IPv6 deployment: state of play and the way forward", http://www.isoc.org/pubpolpillar/docs/ipv6-way-forward.pdf

The way forward

Given the imminent depletion of IPv4 addresses, increased public sector awareness of the consequences and the importance of IPv6 take-up are essential. Taking first steps in this regard can be daunting. And while there is no one model of engagement for governments, research[3] indicates that those governments that have become more engaged have taken a number of similar actions:

- First and foremost is **outreach and assessment**. This has been done by engaging both with industry and the Internet community, and particularly the relevant Regional Internet Registries. Governments have also set up multi-stakeholder advisory groups on IPv6 (in some cases, tasking them with producing or contributing to a national action plans). Finally, governments are also undertaking internal IPv6 assessment audits to establish the scale of the task of enabling their networks.

- Second is **leading by example**. Governments have put a section or agency in charge of the issue, and ensuring that it is endowed with sufficient authority to elicit cooperation from other agencies and departments. They have also establishing reporting criteria or measurements and set up working groups to respond to the issues, particularly with regard to ensuring the continuity of government services in the transition to IPv6. Some have also started to IPv6-enable their networks, either on a departmental or agency basis.

- Third is **persuasion**. Once a government has decided that IPv6 is important then it becomes a matter of communications and persuasion. Senior government/political endorsement and selecting an IPv6 champion has proven to be effective. Governments have also found that declaring that IPv6 will play an important part in the future of their societies and economies can stimulate interest in IPv4 depletion and IPv6 take-up across key stakeholders.

- Some governments have gone further and also implemented **incentives**, both non-monetary, in the form of public procurements requirements related to IPv6, and monetary in the form of investments in research into networks, applications, and test beds that use IPv6.

At a minimum, all governments should take steps to understand the issue thoroughly, through reaching out to and engaging with relevant stakeholders, and particularly the Internet community.

Conclusion

IPv4 depletion and IPv6 deployment are multi-stakeholder issues with significant import at national and global levels.

In this Briefing Paper we have chosen to focus on one stakeholder, governments. As we have reviewed, governments have a unique role to play in ensuring that the stability and viability of the Internet are not compromised, through: 1) communicating the importance of IPv6 and seamless global addressing to business continuity and national economy; and 2) encouraging players to deploy IPv6 through leading by example.

[3] Research undertaken for the Internet Society in 2008

The Internet Society appreciates that a number of governments have made great strides in engaging on this important issue. However, much more needs to be done, not just by governments, but by all stakeholders.

Entire economies depend upon the continued stability and growth of the Internet. The Internet Society urges much greater awareness of and preparedness for IPv6. Sitting on the sidelines or taking a wait and see approach could be detrimental to business and government services continuity and national competitiveness.

Background

The global Internet addressing system – the means by which packets of information are delivered to the intended location and/or recipient across the breadth of the Internet – is running out of addresses.

The current addressing protocol (Internet Protocol version 4, or IPv4) created approximately 4 billion addresses, and due to the Internet's enormous success, the pool of remaining addresses is expected to be depleted in the next 18 to 36 months. The new address protocol, IPv6, offers an address space that is some 340 trillion trillion trillion addresses large, dwarfing the number of IPv4 addresses. With this expanded address space, IPv6 brings a number of advantages in terms of stability, flexibility, and simplicity in network management. The IPv6 era is also likely to bring a new wave of innovation in applications and service offerings as it removes the need for shared addresses and network hiding in many instances.

IPv6 is being slowly implemented across networks and will coexist with IPv4 until a transition to IPv6 occurs (a transition that is likely to take many years). While the technical work related to the protocol has been largely accomplished[4], what remains is deployment. Unfortunately this is not occurring fast enough and could become a significant challenge to continued seamless global addressing.

While awareness and implementation of IPv6 is growing, many organizations, whether in the public or private sector, are adopting a "wait and see" approach, sometimes along with tactical "work-arounds" (such as Network Address Translation (NATs)) designed to prolong the viability of the existing pool of IPv4 resources. The Internet Society does not believe that these approaches are viable in the longer term: ultimately IPv6 is necessary for the continuity, stability, and evolution of the Internet.

[4] The Internet technical community, particularly the IETF, has spearheaded the development of IPv6; the work program is now largely completed – in IETF parlance the IPv6 work is now in “maintenance mode” (fixing bugs as they arise) and in "new features mode" (looking at how new applications and services can be supported).