IPv6 in India : the promises and challenges

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Abstract

Newspapers have been reporting that IPv4 addresses will get over soon, and that we will have to shift to IPv6. In this short piece, Pranesh Prakash gives a layperson's introduction to the IPv6 Internet we will be entering into soon, and what that means for you.

Reports suggest that the global pool of IPv4 addresses will run dry by 2011, and thus the shift to IPv6 is imminent. But what does that mean? There are excellent resources that explain this in technical language. Below I shall try to do so in non-technical language.

What is IPv6?

Internet Protocol version 4 (IPv4) is a standard defined in 1981, which is central to the Internet, allowing vastly different computers on vastly different kinds of networks to communicate with each other. (Think of how diplomatic protocols enables diplomats from vastly different cultures to communicate effectively by agreement on certain common minimums (such as a handshake, etc.).) IPv4 was defined when there were relatively few computers, and even fewer connected to networks. Many things have changed since then, with one of the most important change being the burgeoning of the Internet and the World Wide Web. Each computer on the Internet has something known as an IP address. Each 'packet' of data transmitted over the Internet must have associated from and to IP addresses (which can sometimes be ranges of addresses). IPv4 can accommodate 4,294,967,296 (2^32) unique IP addresses, whereas IPv6 can handle 340 undecillion (2^128) unique addresses. When you consider that every device with Internet connectivity has an IP address (from laptops to Blackberries to even alarm clocks), a lot of IP addresses are required. Since the early 1990s, people have been talking about some of the limitations of IPv4, the primary one being the lack of expandability of IPv4.

Benefits of IPv6

1. Greater number of computers on the Internet, as it uses more
2. Better reliability and security, as IPSec, a protocol for authenticating and securing all IP data, is built into IPv6 as a default.

3. More efficient and thus faster than IPv4. Despite carrying much more data, IPv6 packets are simpler to route (just as addresses with pincodes are easier for post offices to handle).
4. More features can be added more easily. If at a later point of time more features are required, those can be added without a whole new protocol being designed.

What all does IPv6 require?

1. IPv6-capable Internet Service Providers providing consumers IPv6 addresses
2. IPv6-capable networking hardware (modems, routers)
3. IPv6-capable operating systems on consumer devices (smartphones, computers, etc.)
4. IPv6-capable websites, which depends on (1)

The shift to IPv6

Apart from IPv6 *capability*, at some point the *shift* to IPv6 must happen, since IPv4 and IPv6 are not compatible. Translators, which allow an IPv6 address to be understood by a computer using IPv4, do exist, but they are quite expensive to deploy. Currently, it is estimated that around 1% of the world's Internet traffic is conducted using IPv6. The most successful example of IPv6 being used on a large scale was the 2008 Olympics where *all* network operations (from security camera transmissions to a special IPv6 website). So why haven't more ISPs shifted to IPv6? Because of network externalities. While telephones make sense, being the only person in the world with a telephone doesn't. Similarly, while IPv6 is the way for the future, it only makes economic sense for ISPs to shift (or even prepare for the shift, by using translators) when there are plenty of others using IPv6. While some ISPs (like Sify) are already prepared for the shift, others need to gear up. Importantly, the government step in to encourage (and, perhaps, at some point, mandate) this transition. Following the governments of the US, EU, and China, the Indian government too sees the immensity of this shift, and has tasked the Telecommunication Engineering Centre (TEC) of the Department of Telecommunications to take the lead in this. The TEC has convened meetings with experts, and thus India seems to be on the right track.

What does all this mean for you?

Perhaps a lot or not very much, depending on how you look at things. Most modern modems and routers (which are usually provided by your ISP) *support* IPv6, but are, by default, configured for IPv4. Many smartphones don't work on IPv6, but generally phones have a shorter shelf life and chances are that market forces will goad manufacturers to support IPv6 by the time the IPv6 Internet becomes more popular. Thus, while IPv4 addresses might be find themselves near the end of their natural life within one to three years, they will live on thanks to various mechanisms that translate IPv4 to IPv6 (which won't work well with certain applications such as peer-to-peer file-sharing). Eventually,

even those translators will have to be abandoned if we are to embrace a brave new Internet.