netnod

FACT SHEET

WHAT IS IPV6?

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Every device connected to the Internet needs a unique Internet Protocol (IP) address so it can communicate with other devices. IP addresses identify devices within networks, allowing the Internet's routing system to transfer packets of data between hosts (such as a computer, website, or mobile device). IPv4 and IPv6 are the forms of IP addresses in use today.

An IPv4 address is a 32-bit number, such as **172.16.254.1**. There are (around 4.3 billion) unique IPv4 addresses, a large proportion of which is already deployed.

An IPv6 address is a 128-bit number, written in hexadecimal notation, such as **fc3b:0db8:85a3:0042:1000:8a2e:0370:7334**. There are 2^{128} (around 340 trillion trillion trillion, or ~1038) unique IPv6 addresses.

IPv4: 2^{32} = 4.3 Billion

IPv6: 2^{128} = ~ 340 trillion trillion trillion

Unlike the practice in IPv4 addressing, where end users typically receive only a single IP address, IPv6 end users are assigned a reasonably large range of IPv6 addresses, supporting growth in end user networks and the number of connected devices. Likewise, most ISPs will receive an IPv6 allocation that greatly exceeds their needs. The tradeoff of these practices is that only a relatively small percentage of the total IPv6 address pool is actually available for addressing. But, the total pool is so vast, that even this reduced amount represents a huge increase in effective address space compared to IPv4, and will easily meet foreseeable demand.

Why are there two Internet Protocols?
IPv4 has been in use since the beginning of the Internet. Internet expansion and rapid increases in the number of connected devices brought corresponding growth in demand for IP addresses. It became clear by the end of the 1980s that the pool of IPv4 addresses was not going to be able to meet future demand. Fortunately, the Internet Engineering Taskforce (IETF) had already begun to develop a successor for IPv4. The IPv6 specification was completed in the late 1990s and the first IPv6 address delegations were made in 1999. The massive pool of IPv6 address space allows for the expected increase in the number of connected devices and will enable growth of the Internet well into the future.

> "The massive pool of IPv6 addresses will enable growth of the Internet well into the future"

Why do we still need to use both protocols?
IPv4 and IPv6 are not directly interoperable and many devices and networks are not IPv6-enabled or compatible. Networks and devices using only IPv4 cannot communicate directly with those using only IPv6 – and vice versa – without using various translation gateways.

What is a IPv6?

So, to ensure that the Internet is reachable for those connecting with either protocol, IPv4 and IPv6 networks need to be maintained in parallel for the foreseeable future.

Why is it so important to deploy IPv6?
On 31 January 2011, the Internet Assigned Numbers Authority (IANA) distributed the final unallocated IPv4 address space equally to the world's five Regional Internet Registries (RIRs). In accordance with a global policy, each RIR received one "/8" range (equivalent to 16.8 million IPv4 addresses).
By September 2012, the RIRs that allocate IP address space in the Asia Pacific region (APNIC) and the Europe and Middle East region (RIPE NCC) had allocated all of the IPv4 address space they had reserved for general distribution to their members.
In these regions, the remaining IPv4 address space is available to members in small quantities under special criteria. Now, the only options for members that need a large amount of address space are to request IPv6 space from the RIR or to arrange an inter-member IPv4 space transfer.

Although the other three RIRs (AFRINIC, ARIN, and LACNIC) currently still hold IPv4 space for general allocation, their supply is limited and will not be able to support the predicted growth of the Internet in the coming years. At some point in the future all IPv4 address space will either be allocated or reserved for specific reasons. If IPv6 is not universally deployed, there is a real possibility that the parts of the Internet using only IPv4 may become unreachable for those future users who will have no option but to connect using only IPv6.

> "Netnod has been fully IPv6 enabled for several years."

Why isn't IPv6 already deployed everywhere?
Although modern standard equipment supports IPv6 and most modern operating systems already use dual protocol software, there are many reasons why network operators, governments, content providers, and other enterprises have not yet deployed IPv6.

These include inadequate capacity building programmes, investment plans and upgrade cycles that do not take IPv6 deployment and transition mechanisms into account, and a lack of understanding about the urgent need for IPv6 deployment.

Netnod and IPv6
Netnod has been operating an IPv6-enabled infrastructure for several years and offers all of its services over IPv6. The Netnod IX platform to exchange Internet traffic, the Netnod DNSNODE anycast infrastructure, and the i.root-servers.net DNS root nameserver are all accessible using IPv6. As an early adopter and advocate of IPv6 deployment, Netnod is ready to handle the expected increase in the number of customers using its services over IPv6 in the coming years, and is ready to serve future users coming online, many of whom may be able to connect using only IPv6.

More information:
- http://www.netnod.se/ipv6
- http://www.internetsociety.org/deploy360/
- http://www.ipv6actnow.org/