Essay Web Technology

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IPv6

At the moment we use IPv4. IPv4 has about 4 billion addresses (2^{32}). This looked sufficient in the early stages of the internet. But nowadays, when your tv and fridge has an IP address. The latest estimates say that we'll run out of IPv4 addresses in June 2011.
The sollution to this all is IPv6, designed with an 128bit address space. The very large IPv6 address space supports a total of 2^{128} (about 3.4×10^{38}) addresses—or approximately 5×10^{28} (roughly 2^{95}) addresses for each of the roughly 6.5 billion (6.5×10^{9}) people alive in 2006. In a different perspective, this is 2^{52} (about 4.5×10^{15}) addresses for every observable star in the known universe. IPv6 is also easier on routers. Although the adress is larger, the packet header is simpler. All the rare options are moved to the optional extended header. So the normal option-less header is fixed.

IPv6 addresses are written in hexadecimal with colon separators like 2001:db8:85a3::8a2e:370:7334. IPv4 is written in the dot-decimal notation. IPv6 is composed of two logical parts: a 64-bit (sub-)network prefix, and a 64-bit host part.
IPv6 addresses are classified into three types: unicast addresses which uniquely identify network interfaces, anycast addresses which identify a group of interfaces (mostly at different locations) for which traffic flows to the nearest one, and multicast addresses which are used to deliver one packet to many interfaces. Broadcast addresses are not used in IPv6. Each IPv6 address also has a 'scope', which specifies in which part of the network it is valid and unique. Some addresses have node scope or link scope; most addresses have global scope.

Until IPv6 completely supplants IPv4, a number of transition mechanisms are needed to enable IPv6-only hosts to reach IPv4 services and to allow isolated IPv6 hosts and networks to reach the IPv6 Internet over the IPv4 infrastructure:
<u>Dual stack:</u>
Since IPv6 represents a conservative extension of IPv4, it is relatively easy to write a network stack that supports both IPv4 and IPv6 while sharing most of the code. Such an implementation is called a dual stack, and a host implementing a dual stack is called a dual-stack host. Most current implementations of IPv6 use a dual stack. Some early experimental implementations used independent IPv4 and IPv6 stacks.
<u>IPv4-mapped addresses</u>
Dual stack IPv6/IPv4 implementations typically support a special class of addresses, the IPv4-mapped addresses. This address type has its first 80 bits set to zero and the next 16 set to one while its last 32 bits represent an IPv4 address. These addresses are commonly represented with their last 32 bits written in the customary dot-decimal notation of IPv4; for example, ::ffff:192.0.2.128 is the IPv4-mapped IPv6 address for IPv4 address 192.0.2.128.
<u>Tunneling</u>
In order to reach the IPv6 Internet, an isolated host or network must use the existing IPv4 infrastructure to carry IPv6 packets. This is done using a technique known as tunneling which consists of encapsulating IPv6 packets within IPv4, in effect using IPv4 as a link layer for IPv6.

There are adoption problems with IPv6. There is legacy hardware that doesn't support IPv6. And the manufactures do nothing about it. Also, there is no publicity about IPv6 to the general public. So no end-users are persuaded to upgrade to IPv6. ISP are not investing in or preparing for IPv6.

Home routers are usually not IPv6 ready. As for the CableLabs consortium, the 160 Mbit/s DOCSIS 3.0 IPv6-ready specification for cable modems has only been issued in August 2006. IPv6 capable Docsis 2.0b was skipped while the widely used DOCSIS 2.0 does not support IPv6. The new 'DOCSIS 2.0 + IPv6' standard also supports IPv6, which may on the cable modem side only require a firmware upgrade. It is expected that only 60% of cable modems' servers and 40% of cable modems will be DOCSIS 3.0 by 2011. Other equipment which is typically not IPv6-ready range from Skype and SIP phones to oscilloscopes and printers. Professional network routers in use should be IPv6-ready. Most personal computers should also be IPv6-ready, because the network stack resides in the operating system. Most applications with network capabilities are not ready, but could be upgraded with support from the developers. Since February 2002, with J2SE 1.4, all applications that are 100% Java have implicit support for IPv6 addresses.

The 2008 Summer Olympic Games were a notable event in terms of IPv6 deployment, being the first time a major world event has had a presence on the IPv6 Internet at http://ipv6.beijing2008.cn/en (IP addresses 2001:252:0:1::2008:6 and 2001:252:0:1::2008:8) and all network operations of the Games were conducted using IPv6. It is believed that the Olympics provided the largest showcase of IPv6 technology since the inception of IPv6.