IPv6 Today

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What is IPv6?

- IPv6 is the Next Generation of Internet Addressing
- Allows more features, usability and security
  - IPsec (IP-Level Security & Encryption) is in the specification
  - Provides more addresses, abolishes need for NAT and associated problems
  - Anycast, Link-Local Addresses, Multicast (Native)
- Provides 340,282,266,920,938,463, 463,374,607,431,768,211,465 addresses

How did it come about

- 1990: Vancouver IETF meeting: Class B assignment expected to be exhasuted by March 1994
- Solutions/Stop Gap Measures developed
  - CIDR (Allocated multiple Class C's)
  - Aggregated Routing (to reduce routing tables)
- Even theoritically, address assignment effiency far less

How did it come about

- Stop gap measures introduction, assigning multiple class C's
- Routing tables expanded, already growing rapidly
- Taken over 8 years to get decent world-wide support for IPv6

Addressing

- Uses 8 sections of 4 Hexadecimal characters
- FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF
- Leading 0s can be removed. i.e. :0003: becomes :3:
- Any number of :0000: can be replaced with ::
- :: can only appear once in an address
- Alone, :: is the ’unspecifi ed’ address
- ::1 is the loopback address
- Example: 3ffe:0b80:11a5:0000:0000:0000:0000:0001

  3ffe:b80:11a5:0:0:0:0:1 3ffe:b80:11a5::1

Addressing

- 3 types of addresses
  - Unicast
  - Multicast
  - Anycast
- Unicast - destined for a specific address
- Multicast - reaches all hosts identified by that address (i.e. FF02:A020::2)
- Anycast - A unicast address which reaches the nearest interface determined by underlying routing protocols.

Addressing

- Link-local and site-local addresses provided
- Site/Link-local addresses can be used for private LANs
  - Link-local: fe80::/8
  - Site-local: fec0::/8
- Link local addresses can be scoped to a single link, i.e. bootstrapping workstations

Addressing

- Represented in Address/Subnet format
- Prefix-length is a decimal value specifying how many of the leftmost contiguous bits comprise of the prefix
- i.e. 2001:388:7094:40A0::/64
- NB: 2001:388:7094:40A0/64 is incorrect

Addressing

- First 3 bit are the FP (Format Prefi x)
- TLA (Top Level Aggregator) can be a big telecom company/backbone
- NLA (Next Level) could be a big ISP
- SLA (Site Level) can be a large company, geographic region...
- The layout allows you to reduce the routing tables, merely needing to fi nd the TLA to get to the NLA to the SLA etc.
- With the current 6mess, routing like this tends to cause issues because it tunnels over multiple IPv6-in-IPv4 tunnels causing mass latency

Getting your own connection

- You can tunnel over the IPv4 Internet to a Tunnel Broker to get free IPv6 access
- You can get a tunnel from NextGenCollective.net at http://www.nextgencollective.net/request.html
- You can be allocated a /64 subnet which has more IP addresses than you can dream of (18,446,744,073,709,551,616)

6to4: Another Connection Method

- 6to4 stores the IPv4 gateway in the second and third octet
- Uses the prefix 2002::/8
- E.G. 130.95.13.9 -> 825F:0D09 -> 2002:825F:D09::/48
- ```
  $ printf "%02x%02x:%02x%02x" 10 1 2 3\;
  ```

  0a01:0203

  # ip addr add 2002:0a01:0203::1 dev sit0

  # ip -6 route add 2000::/3 via ::192.88.99.1
- Allow protocol 41 inbound through your firewall
  ```

What are its uses

- IPv6 abolishes the need for stop-gap measures such as NAT where enough addresses aren't available
- Allows for all devices and hosts to have a unique world-routable address
- Many research and production networks are already in place with many native IPv6 exchanges appearing
- One major use of IPv6 is embedded devices that need many IP addresses, however many devices do not yet support IPv6 which is holding back further development in this area

What supports it

- Windows 95/98/Me (with 3rd Party Addon)
- Windows 2000, NT has official NT development
- Windows XP ships with IPv6 Support
- Linux
- FreeBSD
- Cisco IOS
- AIX/IRIX
- Solaris
- Many more...

Autoconfiguration

- IPv4 uses DHCP commonly
- An implementation of DHCP for IPv6 (DHCPv6) exists
- IPv6 also has another form of autoconfiguration which is known as stateless
- However DHCPv6 provides the capability to get adresses where a /64bit prefix for autoconfiguration is unavailable.

Stateless Autoconfiguration

- Address is configured with help of local IPv6 router 'advertising'
- The node combines its 48-bit MAC address with a 64bitx -prefix to make a 128bit address
- The extra 16bits are 'ff:ee' put in the middle of the mac address
- Minimal router configuration, no host configuration - simple 'works' (TM)
- 2001:388:7094:4080:2e0:29ff:fe07:1e72
- MAC: 00:E0:29:07:1E:72, PREFIX: 2001:388:7094:4080::/64
  - Rtadvd - FreeBSD
  - Radvd - Linux

DNS Extensions

- IPv4 uses ’A’ records
- IPv6 uses ’AAAA’ records, a host can have both IPv4 and IPv6 addresses associated
- Reverse dns is handled under the ’ip6.int’ and ’ip6.arpa’ domains
- ’ip6.int’ is being phased out, current best practive is to provide both

Example Host File

```
; SOA Section
@ IN SOA ns1.bur.st. hostmaster.bur.st. ( 2002090518 ;
Serial number 10800 ; Refresh 3600 ; Retry 3600000 ;
Expiry 86400 ) ; Minimum TTL
; IPv6 Hosts router IN AAAA 3ffe:b80:11a5:1::1 deltaflyer
IN AAAA 3ffe:b80:11a5::2 gravity IN AAAA
3ffe:b80:11a5::1 coffee IN AAAA 3ffe:b80:11a5::c0:ffee
enterprise IN AAAA 3ffe:b80:11a5:3::1
```

Example Reverse Zone

```
; IPv6 reverse zone for 3ffe:b80:11a5::/48 ; $TTL 3D
@ IN SOA ns1.bur.st. support.bur.st. ( 2002090501 ; serial 3H ; refresh 15M ; retry 1W ;
expiry 1D ) ; mininum $ORIGIN 5.a.1.1.0.8.b.0.e.f.f.3.ip6.int.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 IN PTR router.irc-desk.net.
2.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 IN PTR deltaflyer.irc-desk.net.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 IN PTR gravity.irc-desk.net.
e.e.f.f.0.c.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 IN PTR coffee.irc-desk.net.

1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.3.0.0.0 IN PTR enterprise.irc-desk.net. ; End of zone
```

How much support is there

- IPv6 has admittedly been around for a long time, but support for it is booming now more than ever
- More supporting ISPs, Tunnel Brokers, Universitys and Internet Exchanges are getting involved
- The ’6bone’ plans to be phased out within a year or two to use the 2000::/3 production prefi x (recent notice/RFC)
- One of the major restraints is windows support, once Windows 98 is less popular and Windows 2000-XP+ is used, it is no longer an issue

Is IPv6 Excessive?

- Does IPv6 Have too many addresses?
- Is IPv6 ever going to become a realitity?
- Is it really worth it?
- What's wrong with NAT?

- All of these questions are perfectly valid questions, but there are arguments either way. Some even say IPv6 is just a stop gap measure untill 1024-bit addressing

OK, I Have IPv6, Now What?

- You can use a large number of IRC networks
  - Striked.org
  - Freenode
  - Undernet
  - EFnet
- Some websites - kame, hs247, mew.org, altavista support IPv6.
- There is a growing number of IPv6 Mirrors - ftp.mew.org, ftp.ipv6.estpak.ee (Debian, FreeBSD, Suse, Redhat...) ftp.heanet.ie, ftp.ipv6.digital.com

Applications supporting IPv6

- Internet Explorer
- Mozilla
- Icecast
- XMMS
- Apache[2]
- Putty
- Java
- BitchX, irssi
- tin
- fetchmail
- squid
- sendmail
- postfix
- oidentd
- ping6, tracepath6....

IPv6... The Debian Way

- the ’debian-ipv6’ arhchive has ipv6-enabled packages
- Yay, free upgrades
- deb ftp://ftp.uwa.edu.au/debian/mirrors/linux/debian-ipv6 stable ipv6
- Free while on campus!
- Simply apt-get update and apt-get upgrade to install
- SSH, XFree86, xmms, wget, vsftpd, samba, python2.2+, php4.3+, postfi x, nmap, apache, apache2...

Where can I find our more?

- http://www.hs247.com/ is a great news resources
- http://www.nextgencollective.net/ - Tunnel Broker/Reesources
- http://www.tldp.org/HOWTO/Linux+IPv6-HOWTO/ - Linux IPv6 HOW-TO
- IETF IPv6 Charter - http://www.ietf.org/html.charters/ipv6-charter.html
- http://www.kame.net/ - FreeBSD IPv6 Stack
- http://www.linux-ipv6.org/ - Linux IPv6 Stack

The real reason for IPv6...

-:- trent (trent@i.am.a.leet.h4x0r.org) has joined #striked

Oh.. the other reason

Questions?

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hs247.com
Abdul Basit
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