

IPv6 LAN and WAN Deployment Issues

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AGENDA

- Introduction to IPv6
- What's New?
 - Addressing
 - Routing etc.
- Available Tools & Toys
 - Platforms
 - Networking
- So, What Does All This Mean To Me?
 - Where, What, How to Start
 - Availability
 - Outstanding Issues
- Links

IP WHAT ?!

- IPv6 or IPng (pssst....where is v5?)
- Why?
 - Exhaustion of addressing space, Explosion of routing tables, Lack of support for inter-networked environments, Need of real-time traffic, No security features etc.
- What?
 - IETF consensus through the 2 evolving initiatives Simple IP and Pip which became SIPP Plus or IPv6.
- When?
 - Call for proposals for IPng in July 1992. Major milestone RFC 1752 in Jan 1995 which specifies requirements including routing, addressing, security etc.
 - Since then, 6bone started with RFC2471 "IPv6 Testing Address Allocation"
- How and what is the Current Implementation? –Lets take a look.

What's New

- Most Noticeable

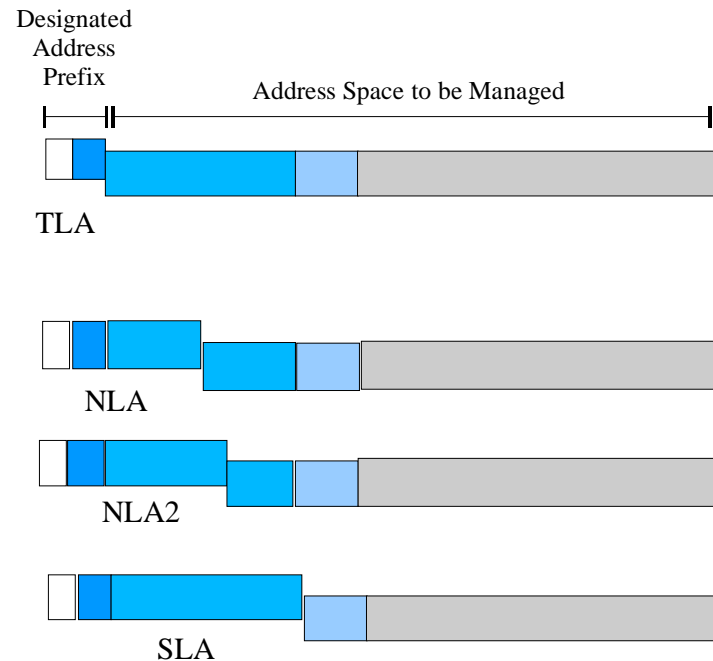
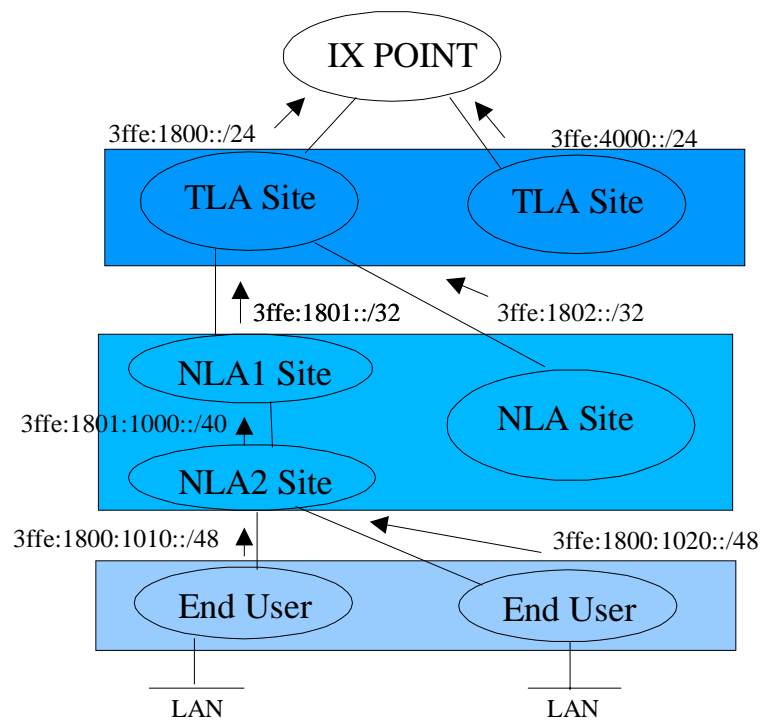
- Addressing (aggregatable): Hexadecimal notation with a lot of colons

- From **203.106.4.16** to **3ffe:1800:2030:1000:2050:daff:fe07:ff2f**

- Initial 6 bone allocations are 3ffe:/16 (TLA) 3ffe:0000:/24 or 28 (pTLA)

- APNIC IPv6 assignment and allocation policy document is at:

<http://www.apnic.net/drafts/ipv6/ipv6-policy-280599.html>



What's New

- Addressing.....*cont...*
 - Types
 - Unicast – global, link–local, site–local, IPv4 compatible and loopback.
 - Multiple addresses for a single interface and not node (defined)
 - Anycast^{New} – source to specify delivery to any one node from a given group typically to the nearest distance measured in routing
 - Internet Draft draft–itojun–IPv6–anycast–analysis–01.txt
 - Multicast – same concept different implementation
 - Inherent in address architecture
 - Some predefined, for e.g.
 - FF02:0:0:0:0:0:0:101 means all NTP servers on the same link as the sender.
 - FF05:0:0:0:0:0:0:101 means all NTP servers at the same site as the sender.
 - 2080:0:0:0:8:800:200C:417A a unicast address
 - FF01:0:0:0:0:0:0:101 a multicast address
 - 0:0:0:0:0:0:0:1 the loopback address
 - 0:0:0:0:0:0:0:0 the unspecified addresses

What's new? 2

- Noticeable
 - Routing
 - Hierarchical and Structured – Aggregatable
 - Smaller routing tables / faster lookup
 - Autoconfig
 - No DHCP Server
 - Network prefix advertised to node

Tools & Toys 1

- Platforms and Operating Systems
 - **KAME/FreeBSD**
 - Most mature IPv6 codes developed by WIDE. Kernel is solid.
 - Snap Kit released every Monday
 - Platforms with KAME code merged in:
 - FreeBSD 4.0 and beyond OpenBSD 2.7 and beyond
 - NetBSD 1.5 and beyond BSD/OS 4.2 and beyond
 - What works : **Kernel**
 - IPsec, IKE, IPComp, ATM PVC support, FAITH–v4/v6 relay router, ALTQ, Neighbour discovery, v4/v6 translator, encapsulation etc.
 - : **Userland**
 - SMTP, POP, telnet, ftp, ssh, nameserver, resolver, and a whole bunch of other things.
 - What has yet to happen:
 - Multi–homing and renumbering, DNS discovery, RSVP, diffserv.

Tools & Toys 2

- Platforms....*cont...*
 - Linux/USAGI
 - 2nd Stable Release of USAGI (UniverSAI playGround for IPv6) on February 5th, 2001. Two kernels available on this release
 - linux-2.2.18-usagi kernel and linux-2.4.0-usagi kernel.
 - The following distributions are supported: RedHat, debian, Turbo Linux, Vine Linux, Kondara/MNU Linux
 - Stuff they're working on:
 - IPv6 stack in the Linux Kernel,
 - IPv6 APIs in the glibc library and
 - IPv6 capable applications.
 -and soon,
 - Anycast, Routing header, Router renumbering protocol, IPsec, Mobile Ipv6
 - Others : MacOSX, IBM AIX Version 4.3, Hewlett-Packard HP-UX IP Developer's Kit 1.1 Compaq Tru64 UNIX V5.1, SunSOLARIS 8.0 etc.

Tools & Toys 3

- Platforms...*cont.*
 - Microsoft
 - The IPv6 Technology Preview for Windows 2000 contains a set of sample applications IPv6-based traffic
 - Diagnostic tools such as ping6 and tracert6 and the following are provided:
 - HTTP client: Internet extensions dynamic link library (DLL), Wininet.dll, provides IPv6 capability for the web browser
 - FTP client: File Transfer Protocol (FTP) client, Ftp.exe is capable of establishing FTP sessions with IPv6 FTP servers.
 - Telnet client & server: Telnet.exe & Tlntsvr.exe enables establishing Telnet sessions with IPv6 Telnet servers.
 - Trumpet Winsock v5.0 is a fully-featured 32-bit dialer used with Win95/98 and NT and comprising of IPv6 capabilities.
<http://www.trumpet.com/winsock/>
 - Hitachi ToolNet6: Patch for Win(R)95 /98, WinNT (R)4.0
<http://www.hitachi.co.jp/Prod/comp/network/pexv6-e.htm>

Tools & Toys 4

- Network Products and Solutions
 - CISCO
 - The "thanksgiving" release (based on Cisco IOS 12.0T) is freely available from CCO at <http://www.cisco.com/ipv6/>. Follow the "Obtain IOS IPv6 Beta Software" link under the "Cisco IOS Ipv6"
 - MBGP, RIPv6, ICMPv6, ND, Tunnel Support, 6to4, Access List
 - Official support for IPv6 will begin with IOS 12.2(1)T, currently scheduled for Q1 CY2001. In the meantime, EFT images are available from Cisco.
 - Protocol Translation v6–v4,v6 over MPLS etc.
 - Beyond mid 2001 – OSPF6, Multicast, IPSec, VoIP, Mobility
 - HITACHI
 - IPv6 beta software for GR2000 Gigabit Router family
 - employs the KAME stack based on the snap version on April 3, 2000 for BSD/OS3.1, for driving IPv6
 - Software is currently available in Japanese market only

Tools & Toys 5

- TELEBIT
 - Router capabilities include : Native IPv6, RIPv6, OSPFv6, IDRPv6, PIM (SM and DM), RSVP for IPv6, Mobile IPv6, ND & support for ATM, ICMPv6, IPv6 multicast etc.
- OTHERS:
 - Nokia: Mobile IPv6 capabilities, experimental and demo
 - 3Com: Delivered IPv6 capability for the NETBuilderII and PathBuilder S500 routers since the 11.0 software version Jan, 1998
 - 6WIND: IPv6 Edge Device providing VPN, QoS management and IPv4/v6 migration features.
 - GateD Consortium: 1.0 release is only available to consortium members
 - Zebra routing software is distributed under GNU GPL and runs on Linux, *BSD, and support RIPng, BGP-4+ and OSPFv3
 - Multi-threaded Routing Toolkit (MRT), Nortel Networks, BayRS, Sumitomo,

So, What does all this mean to me?

- Limitless Addresses (well....for quite a long time, anyway)
 - Address allocation and connectivity
 - Test addresses from 6bone by tunneling or native connectivity. Tunneling sites include Freenet6, Microsoft etc.
 - Allocations from RIR or upstream ISP / IX
- Platforms
 - KAME/BSD – most mature with stable kernel and various applications working on native v6 in merged stack (check particular BSD variants)
 - LINUX – check supported kernel version
 - MS – Win2000 support for MS, Hitachi patch or dialer from Trumpet
- Networking
 - KAME – again, most mature available
 - Production Routers – check hardware / OS support and keep updated on services supported.

.....more

- Concise Routing Tables
 - Explosion under control due to aggregated routing information employing bgp4+ (KAME, ZEBRA etc.). RIPng, OSPFv3 ready.
- Autoconfiguration
 - Link local : MAC address is converted (fe80::.....)
 - Global address : Router advertises prefix
 - No need for DHCP server
- Instant Multicast Network
 - No more tunneling, Routing available (pim6dd), Test applications (mchat, vic, vat) available
- IPSec
 - Security in Layer 3 / 4.
 - AH : Authentication & ESP : Payload Encryption
 - md5 & sha1 for AH, des, 3des, blowfish, cast128, rc5 for ESP available from KAME.

Pretty cool links..

- KAME [*http://www.kame.net*](http://www.kame.net)
- SUN [*http://playground.sun.com/pub/ipng/html/ipng-main.html*](http://playground.sun.com/pub/ipng/html/ipng-main.html)
- 6bone [*http://www.6bone.net/*](http://www.6bone.net/)
- Freenet6 [*http://www.freenet6.net/*](http://www.freenet6.net/)
- IPv6 Forum [*http://www.ipv6forum.com/*](http://www.ipv6forum.com/)
- USAGI project [*http://www.linux-ipv6.org/*](http://www.linux-ipv6.org/)
- Microsoft IPv6 [*http://ipv6.research.microsoft.com*](http://ipv6.research.microsoft.com)
- Stardust [*http://www.stardust.com/ipv6/*](http://www.stardust.com/ipv6/)
- Trumpet [*http://www.trumpet.com.au/ipv6.htm*](http://www.trumpet.com.au/ipv6.htm)