IPv6 LAN and WAN Deployment Issues

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AGENDA

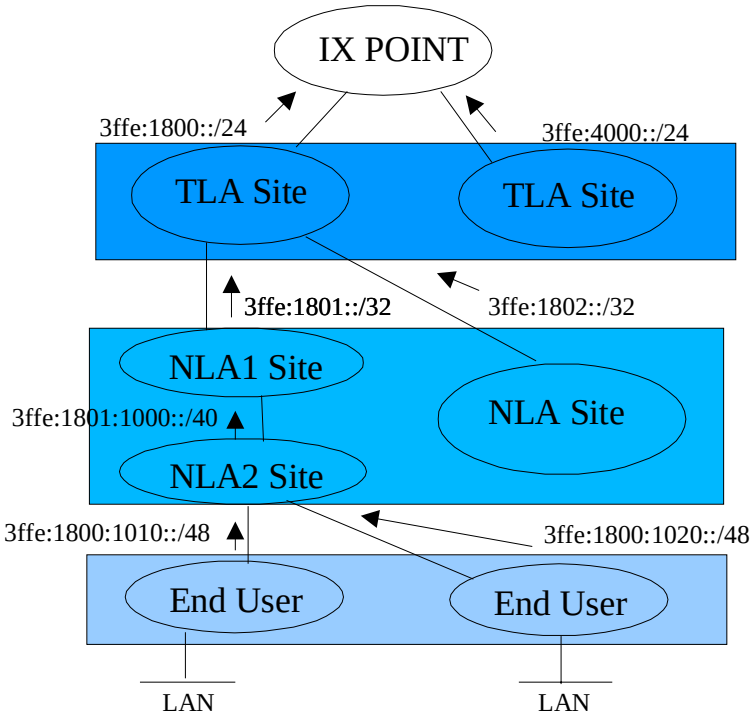
- Introduction to IPv6
- What's New?
  - Addressing
  - Routing etc.
- Available Tools & Toys
  - Platforms
  - Networking
- So, What Does All This Mean To Me?
  - Where, What, How to Start
  - Availability
  - Outstanding Issues
- Links

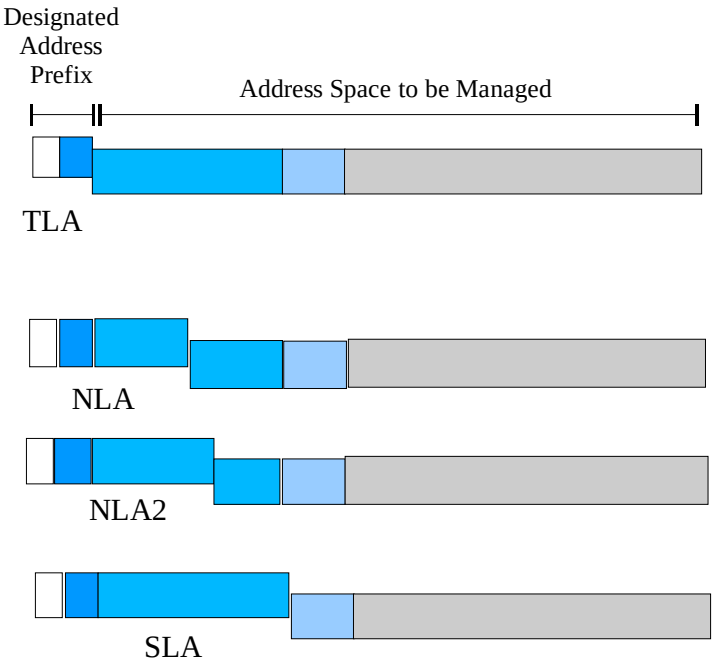
IP WHAT ?!

- 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, diffsserv.

Tools & Toys 2

- Platforms....*cont*...
  - Linux/USAGI
    - 2nd Stable Release of USAGI (UniverSAl 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*
- SUN *http://playground.sun.com/pub/ipng/html/ipng-main.html*
- 6bone *http://www.6bone.net/*
- Freenet6 *http://www.freenet6.net/*
- IPv6 Forum *http://www.ipv6forum.com/*
- USAGI project *http://www.linux-ipv6.org/*
- Microsoft IPv6 *http://ipv6.research.microsoft.com*
- Stardust *http://www.stardust.com/ipv6/*
- Trumpet *http://www.trumpet.com.au/ipv6.htm*