

Today is IPv6 BoF
(tomorrow is 6NET @ 4.15pm)

Networkshop 2002
Nottingham, March 26th

Agenda

- IPv6 overview/tutorial
 - Implementations, getting started
 - Transition tools, getting connected
 - Tech stuff covering IPv6 service
- JANET IPv6 Experimental Service
 - Rob Evans (ULCC)
- Juniper and IPv6
 - Jean-Marc Uze (Juniper)
- Q & A
 - Charter for IPv6 Working Group?

IPv6 overview

- A successor to IPv4
- 128-bit addressing
 - Improves scalability and reachability
- Hierarchical addressing from outset
- Auto configuration ("plug and ping")
- IPsec implementation "mandated"
- Better support for Mobile IP
- Still uses TCP/UDP we know and love
 - New APIs for applications, e.g. for C and Java

Why university/HE interest?

- IPv6 is deploying elsewhere, esp. Asia
 - Gain understanding of deployment issues
 - What needs to change, what remains the same
- Deploy to support research activities
- Better peer to peer application support
 - No NATs, restoration of end to end principle
 - IPv6 may be important for GRID activities
 - Potential for ADSL+802.11b+IPv6 to the home
- 3G is set to use IPv6, and may be open...

IPv6 projects in UK

- Academic projects
 - Bermuda (UCL, Lancaster, Southampton)
 - Various EU 5th Framework projects
 - 6NET (31 partners! UKERNA plus above)
- Trials by commercial providers
 - BT Exact, NTT, UUNet, C&W, ...
- Individual initiatives
 - Some listed on <http://www.ipv6.org.uk/>

Implementations

- Windows XP/.NET
- *BSD
- Linux
- Solaris 8+
- Compaq Tru64
- AIX 4.3+
- HP/UX 11.0+
- Irix
- Cisco IOS
- Juniper
- Hitachi
- *BSD
- Zebra, ZebOS
- Ericsson Telebit
- 6WIND
- +others...

IPv6 Transition

- How can IPv4 and IPv6 co-exist?
 - Includes IPv4 and IPv6 systems communicating
- Different transition aspects
 - Site transition
 - ISP (MAN or NREN) transition
 - Being studied within 6NET project
- How to deploy IPv6 in an IPv4 network
 - Includes DNS, firewalls, email,

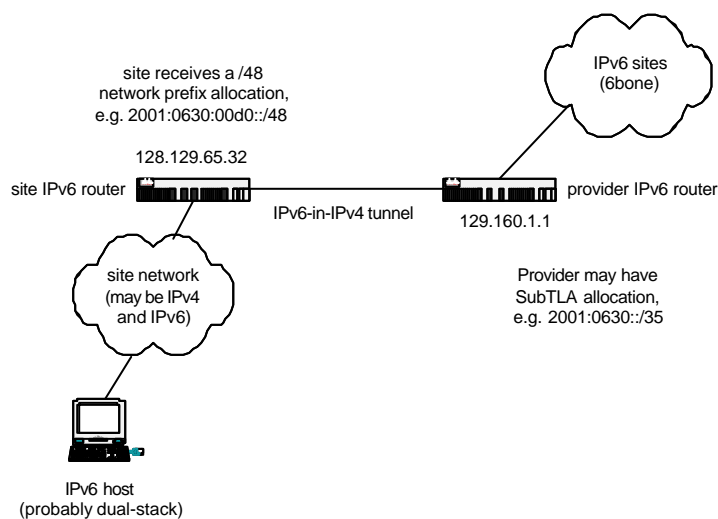
Getting started with IPv6

- The basics...
 - Certainly a host that supports IPv6
 - And ideally a router supporting IPv6
 - Can run IPv6-only, but most likely dual stack
- An IPv6 connection to wider IPv6 Internet
 - IPv6 worldwide testbed known as the "6bone"
 - Probably tunnelled, possibly native
- IPv6 address space
 - Inherited from/allocated by upstream provider

Getting connected...

- You have an IPv6 router and IPv6 host(s)
 - These are most likely dual-stack IPv4 and IPv6
- Use IPv4 network as a link for IPv6 connectivity to upstream IPv6 provider
 - Tunnel IPv6 in IPv4 (protocol 41)
- Use static routing to set up tunnel
 - Can use BGP4+, if AS number available
 - Receive IPv6 address space allocation from the upstream provider, under their allocation

Using tunnelled connectivity



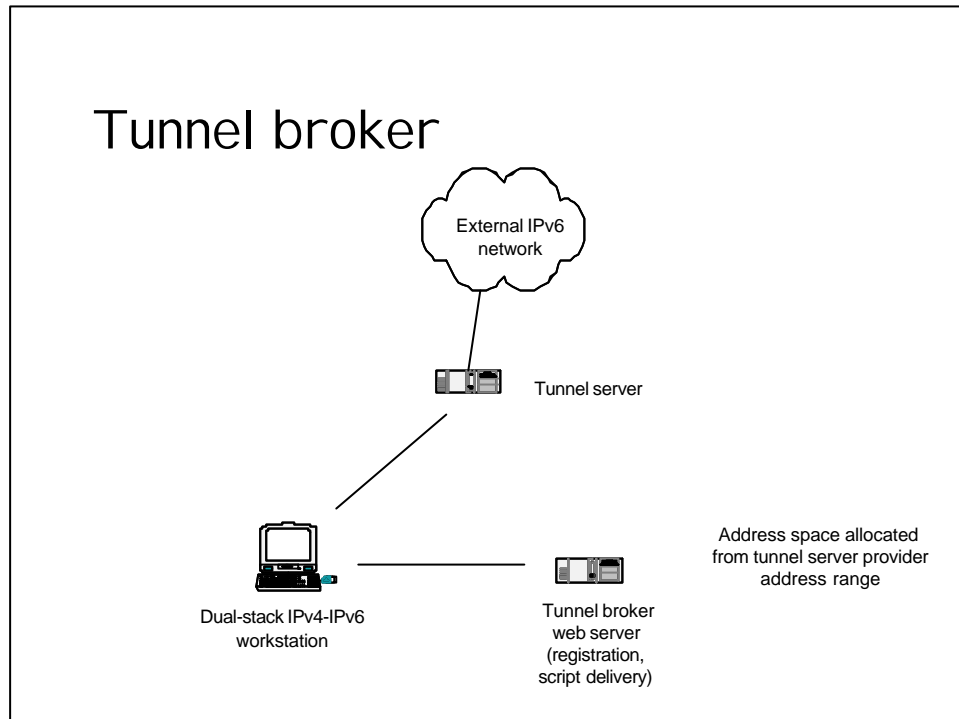
IPv6 addressing and DNS

- Receive a /48 prefix from provider
 - Allows 16 bits of network space with 64 bits of host space, so better than IPv4 Class A prefix.
- Set up DNS for IPv6 addresses
 - Uses "quad A" records, e.g.
 - `foo IN AAAA 2001:0630:00d0:20:<host part>`
 - Can have A and AAAA for same host
 - Beware what the applications do here!
- Obtain reverse DNS delegation
 - Currently under ip6.int, soon ip6.arpa.

Tunnel brokers for single hosts

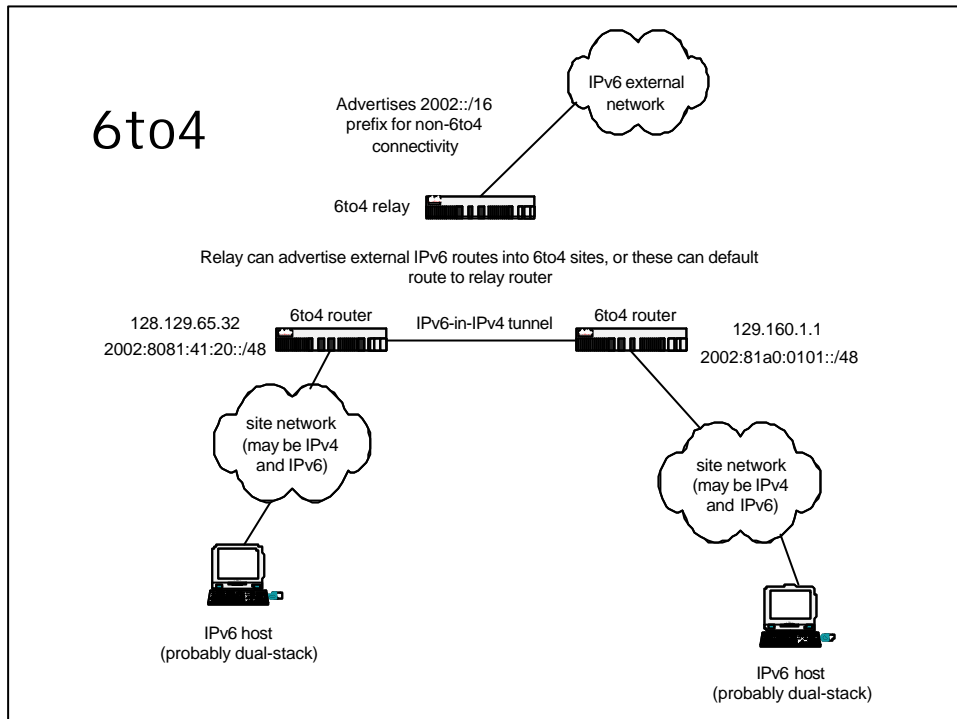
- Can connect with one host, a very popular method being using a tunnel broker
 - Needs to be dual stack IPv4 and IPv6
 - Freenet6.net is world's most popular
 - But located in Canada!
 - Bypasses site admin, except for IP tunnel...
- Register at web page, receive script
 - Script creates the tunnel from your host to the tunnel server
 - JANET Experimental service will offer broker

Tunnel broker



Automatic site tunnels: 6to4

- Avoids need for manual tunnel setup to multiple sites by offering an automatic tunnel method using a single IPv4 address
 - 6to4 address format $2002:\langle IPv4 \rangle::/48$
 - On seeing $2002::/16$ destination, 6to4 router creates tunnel to IPv4 target in address.
- May be useful in community such as JANET
- A 6to4 relay advertises the $2002::/16$ prefix, giving connectivity into 6to4 cloud.
 - JANET Experimental service will offer 6to4



Intra-site IPv6

- In university environment, IPv4 address space likely to be ample at present
 - Thus can run dual stack IPv4-IPv6
- Can run internal IPv6 routed hierarchy, e.g. on BSD routers and overlaying IPv6 on IPv4 VLANs
 - Or can use automatic internal tunnelling from hosts to access router (e.g. using a method called ISATAP, supported in Linux).

I Pv6 monitoring tools

- Desirable to monitor network
- Tools include
 - Basic ping and traceroute
 - I Pv6 looking glass
 - AS path viewers (ASpathTree)
 - Custom tools, e.g. trout6
- 6NET is porting and deploying more tools
 - JANET Experimental service will include looking glass

You want to run I Pv6 only?

- Certainly possible
 - Many routers can run I Pv6-only
 - But may need I Pv4 if you want, e.g., SNMP.
 - Many hosts can run I Pv6-only
 - But issues like DNS lookups over I Pv6
- Need mechanisms to access I Pv4-only sites
 - e.g. NAT-PT or DSTM
- Want I Pv4 sites to be able to reach you?

Combining dual-stack/IPv6 only

- Place public services on dual-stack servers
 - e.g. web, DNS, FTP, e-mail
- Use IPv6-only for new applications
 - Aimed at allowing peer-to-peer between IPv6 clients: IPv6 enables the client-server paradigm to be replaced by peer-to-peer.
- Take care with firewalling
 - Don't let IPv6 testbed be a back door!

IPv6 applications

- Basic applications/services available
 - BIND9, sendmail, Apache, OpenLDAP
 - Most Linux/BSD commands enabled out of box
- Media applications include
 - MICE tools: vic & rat for videoconferencing
 - ISABEL collaborative working suite
 - VideoLAN: MPEG-2 streaming (DVDs)
- 6NET is porting the Globus toolkit to IPv6

So...

- Get a router
 - Be it a "spare" commercial router or a PC router running on Linux/BSD.
- Get an upstream link
 - Ideally from the JANET pilot service
- Set up an internal host
 - e.g. run Apache web server with IPv6
- Don't forget DNS and security
- Join in on the ipv6-users@jiscmail.ac.uk list

More info

- JANET Experimental Service
 - <http://www.ja.net/development/ipv6/>
- IPv6 pilot and project info
 - <http://www.ipv6.ac.uk>
 - <http://www.ipv6.ac.uk/bermuda2/>
 - <http://www.6net.org>
- IPv6 email list
 - ipv6-users@jiscmail.ac.uk

UK IPv6 Working Group

- Aims:
 - Provide help for IPv6 newcomers
 - Can be centred on the ipv6-users e-mail list
 - Offer assistance on connectivity
 - Part of the JANET Experimental Service
 - Run workshops, with hands-on IPv6
 - Run USENIX-like events
 - Show off IPv6 applications, tools, innovative uses, share ideas and code...