IPv6 via Tunnels

Using Hurricane Electric

Brian Roberson
for: OLUG

IPv6 Primer

1. eight groups of four hex digits separated by colons / mask
2. There's no place like ::1
3. colons used to express multiple 0's in groups - can only be used once
4. some common prefixes:
    1. fe80:: Link local
    2. ff00:: Multicast
5. Common subnetting technique is using a /64 - which gives you 18,446,744,073,709,551,616 unique addresses (insane)
6. Uses ICMPv6 - NOT ARP! to find neighbors. (ND / NA / ICMP Requirements)

The IPv6 Address Space

Prefix	Purpose
::/8	Reserved by IETF
100::/8	Reserved by IETF
200::/7	Reserved by IETF
400::/6	Reserved by IETF
800::/5	Reserved by IETF
1000::/4	Reserved by IETF
2000::/3	IANA Global Unicast
4000::/3	Reserved by IETF
6000::/3	Reserved by IETF
8000::/3	Reserved by IETF
A000::/3	Reserved by IETF
C000::/3	Reserved by IETF
E000::/4	Reserved by IETF
F000::/5	Reserved by IETF
F800::/6	Reserved by IETF
FC00::/7	Unique-Local Addresses
FE00::/9	Reserved by IETF
FE80::/10	Link-Local
FEC0::/10	Site-Local (Deprecated)
FF00::/8	Multicast

Whats my address? Stateless config (SLAAC)

Uses ICMPv6 to determine

1. network and prefix
2. available routers
3. routers can tell clients to use DHCPv6, or NOT!
4. One problem: no DNS servers learned (ouch) unless your OS supports rfc 5006

Whats my address? Statefull config DHCPv6

you need a router/radvd to tell your clients to use DHCPv6 huh?

you need to set the "other" config flag to pull non address options from the DHCP server.

OH - AND DHCPv6 does not TELL YOU YOUR DEFAULT ROUTER! <DOH> the RA does this....

WTH? Address management?

The answer? Use both stateless and statefull options to config your clients.

Use SLAAC to: assign address/prefix
Use DHCP to: assign name resolution options

Jointly: use dynamic dns updates (or dhcp->dns update options)

Address Resolution (DNS?) YES!

uses AAAA records (every time I hear this, I think of the the famous ATHF episode when the mooninites form the quad laser)

Most registrars are supporting ipv6 glue now

chicken and the egg - my suggestion: dual stack - always

Most recent OS's will default to v6 and fail to v4 - gracefully

Hurricane electric: use a tunnel!

http://www.tunnelbroker.net
uses ipv6ip tunnel (v6 in v4)
assigns a /64 to your point-point and another /64 routed across it
uses tunnel type: v4tunnel (protocol 41 if your behind a firewall or NAT)

Requirements: (duh)
ipv6 support in kernel (most recent flavors have it by default)
the ip command is helpful (from the iproute package)
test -f /proc/net/if_inet6 && echo "Running kernel is IPv6

More Tunnel config

debian (ubuntu) interface file:

bring up the tunnel!
XXXXXXXXXXXX
auto hetunnel
iface hetunnel inet6 v4tunnel
address 2001:470:1f10:dc::2
netmask 64
ttl 64
gateway 2001:470:1f10:dc::1
endpoint 209.51.181.2
local 69.164.219.168

you could secondary an address of your /64 to lo0, but I chose to use eth0 instead:
XXXXXXXXXXXX
iface eth0 inet6 static
address 2001:470:1f11:dc::1
netmask 64
ttl 64

Cool "from" addresses!

```
roberson@olug.org's password:
Linux ln02.olug.org 2.6.32.16-linode28 #1 SMP Sun Jul 25 21:32:42 UTC 2010 i686 GNU/Linux
Ubuntu 10.04.2 LTS

Welcome to Ubuntu!
 * Documentation:  https://help.ubuntu.com/
No mail.
Last login: Fri Apr  1 13:26:39 2011 from 2001:470:1f11:d4b:d092:207e:2692:8e
roberson@ln02:~$
```

how to tell what your daemon is doing

use netstat!

```
netstat -anp | grep LISTEN
<snip>
tcp        0      0 69.164.219.168:53       0.0.0.0:*               LISTEN      -
tcp6       0      0 :::53                   :::*                    LISTEN      -
```

See the difference?

Some do that, some are smarter:

```
tcp6       0      0 :::80                   :::*                    LISTEN      -
```

Make your linux box an ipv6 router

enable ipv6 forwarding (in /etc/sysctl.conf)

net.ipv6.conf.default.forwarding=1

stateless config? u need a daemon: radvd

config file: /etc/radvd.conf

```
interface eth0
{
AdvSendAdvert on; prefix 2001:470:1f11:d4b::/64 { AdvOnLink on; AdvAutonomous on; }; };
```

statefull config? u need a daemon: DHCPv6

config file: YIKES (looks the same as its IPv4 little bro)

Firewalling? yes!

Use: ip6tables!

Other miscellany

Multicast... coolness
FF02::1 All Hosts :)
FF02::2 All Routers :)

try: ping6 -I eth0 FF02::1

LINKS

https://wiki.ubuntu.com/IPv6