IPv6 EYOD Experiments

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Goal of Experiments

- Eat our own dog food
- Is IPv6 practically usable?
- What improvements need to be made to make it practically usable?
- NANOG, APRICOT & IETF all recently conducted experiments to sample and foster usability
- AFNOG, RIPE, ARIN, etc.. Experimenting as well
- Goals more educational and documentary than demonstrative

The Enterprise Usage Model

- Consumers depends on ISPs, many models there
- Enterprises likely to be first ones who can NOT obtain new or additional IPv4 address space
- Enterprises are more "controlled" environments
- They're Randy's customers :-)

So what is it like to be an Enterprise that can only get IPv6 space?

A Pure IPv6 Network Today…

- Would not get access to >99.9% of the 'net
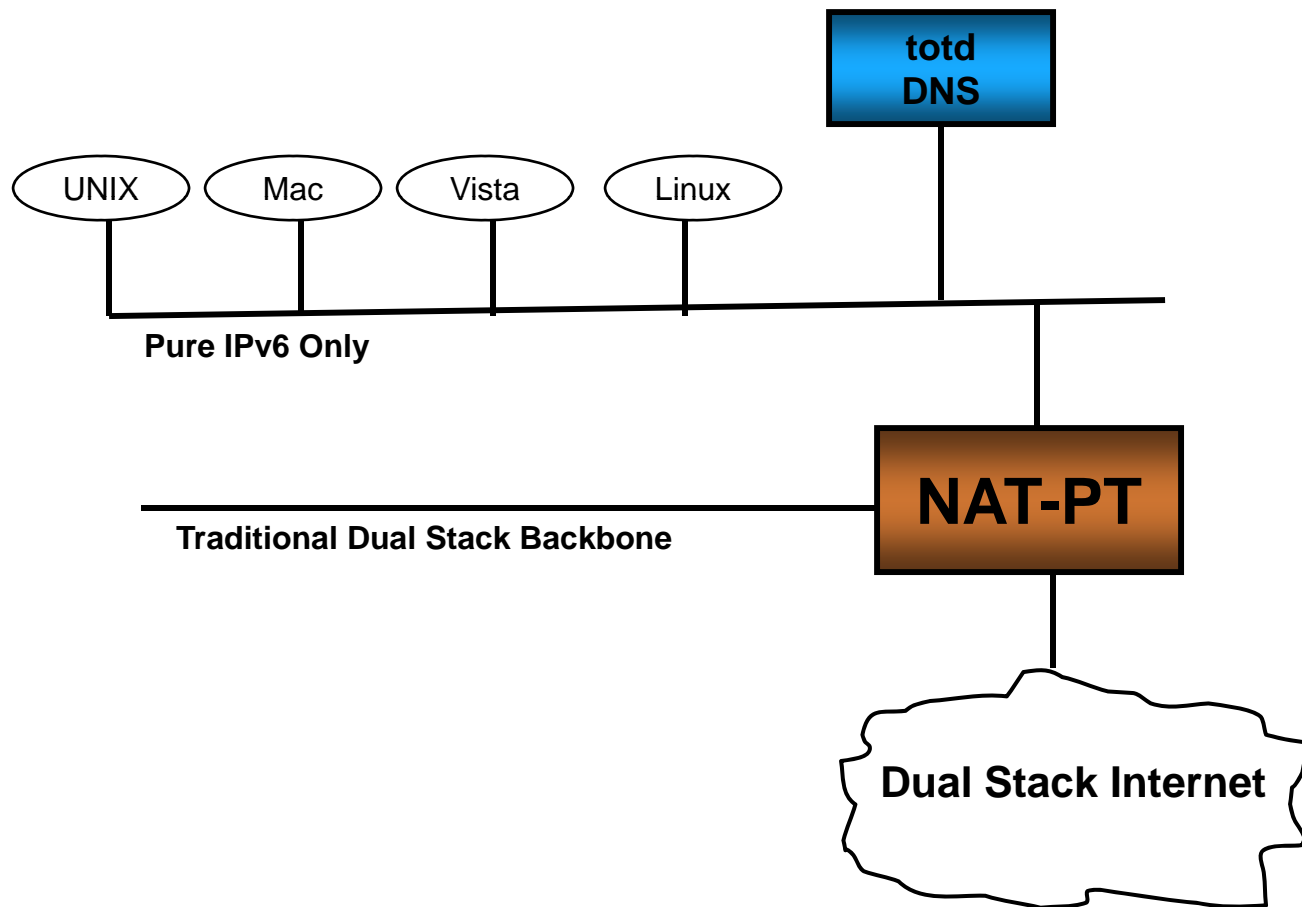- So you could see the dancing kame turtle (http://www.kame.net)

QuickTime™ and a
decompressor
are needed to see this picture.

- But not much else….
- Mainly because of bits on the wire incompatibilities with IPv4 and IPv6

A Pragmatic IPv6 LAN Today

- An IPv6-only network with NAT-PT at the border and totd

- Now we can get to the IPv6 world AND the IPv4 Internet

- See the kame and see Yahoo!

- This should work for UNIx, Linux, Mac, Vista, …

NANOG/APRICOT IPv6 Network

totd
DNS

UNIX   Mac   Vista   Linux

Pure IPv6 Only

NAT-PT

Traditional Dual Stack Backbone

Dual Stack Internet

NAT-PT

- IPv6-only inside, dual-stack IPv4 and IPv6 on the other

- Stateful translation of TCP when no IP addresses are embedded

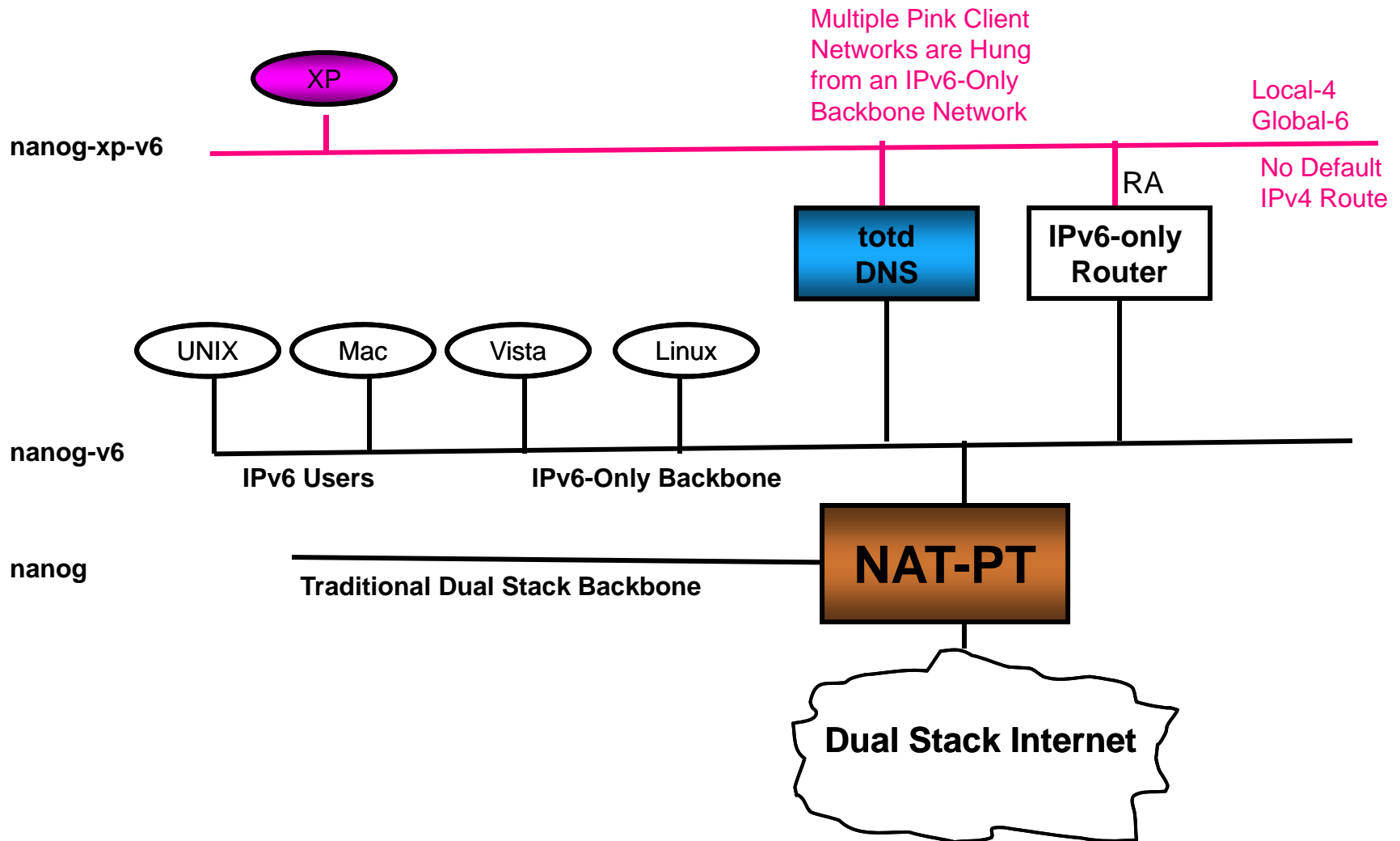- ALGs needed for FTP, RTP, … where addresses are embedded

The DNS Hack

- On a pure IPv6 network, if I get an A record, what do I do?

- Panic, you can't use an A record!

- So the local DNS cache has a hack, *totd*, which takes an A, embeds it within a hacked IPv6 prefix, and synthesizes an AAAA

- NAT-PT knows the hack prefix, and strips it back to IPv4 to dual-stack

TOTD - DNS Translation Proxy

2

3

QuickTime™ and a
decompressor
are needed to see this picture.

1

4

6

5

7

8

1-4 DNS Query Path
5-8 Client/Server Transaction Path

Diagram by Vasaka Visoottiviseth
http://mucc.mahidol.ac.th/~ccvvs/totd-setup.html

Windows XP

- XP can move payload over IPv6
- But does NOT do DNS over IPv6 transport (nor AD, or other things! "Buy Vista")
- So, the LAN has 1918 IPv4 space to carry DNS, but no exit for IPv4
- You get an IPv6 and IPv4 address, but should use the IPv6 for all real transport as IPv4 has no default

Modified Network

Multiple Pink Client
Networks are Hung
from an IPv6-Only
Backbone Network

Local-4
Global-6

No Default
IPv4 Route

nanog-xp-v6

XP

RA

**totd
DNS**

**IPv6-only
Router**

UNIX   Mac   Vista   Linux

nanog-v6

IPv6 Users   **IPv6-Only Backbone**

nanog

Traditional Dual Stack Backbone

NAT-PT

Dual Stack Internet

Access

- All SSIDs up from start
  - **nanog** normally fully dual-stack
  - **nanog-v6** with NAT-PT
  - **nanog-xp-v6** with 1918 DNS translation
- At APRICOT, for 90 minutes on Wednesday **apricot** went away, at NANOG for 60 minutes on Tuesday
- At NANOG some stats were gathered, none really collected at APRICOT

What We Learned

- 3/4 of users said they could not get on net but it was actually more like half
- Every component except UNIXes had bugs: NAT-PT, Vista, MacOS, XP, …
- The prize to MacOS, which dropped capital 'A' from DNS server entry
- We hope vendors now working to fix

NANOG MAC Address Stats

MAC address counts by VLAN at NANOG42; Data from Tuesday, Feb. 19 2008
(times corrected to PST)
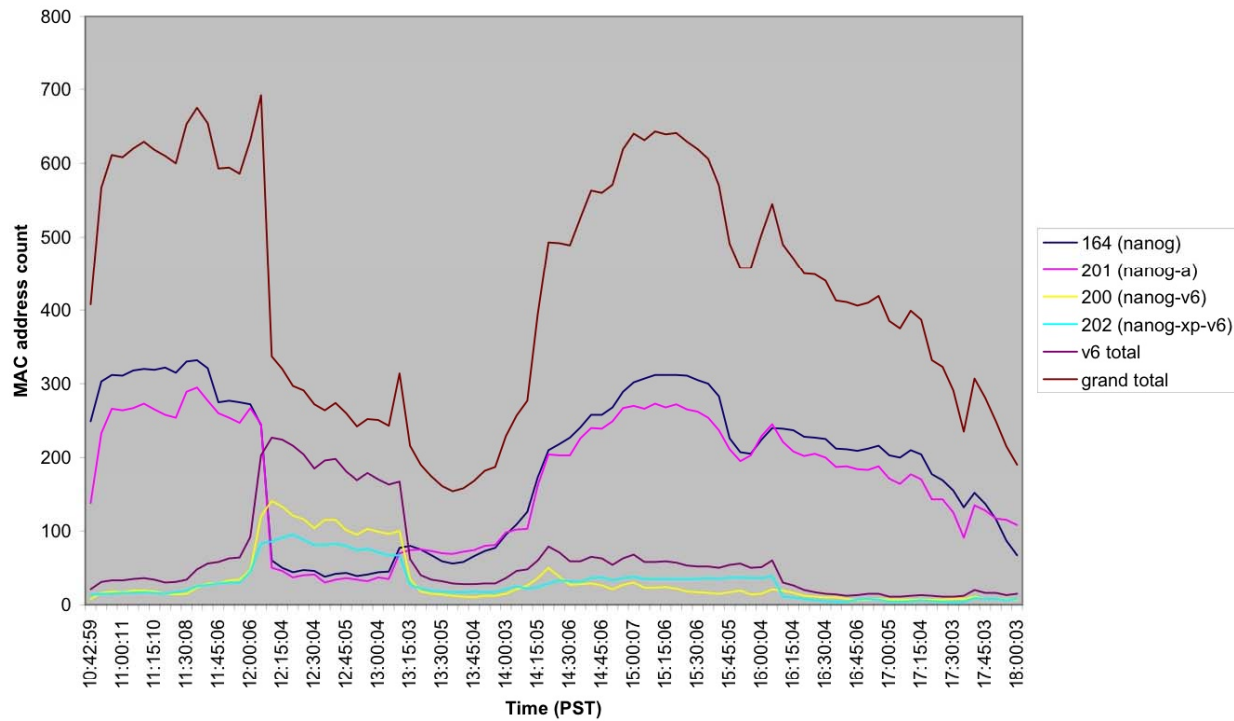
IETF 71 Experiment

- Held during IESG plenary session on Wednesday evening
- Already learned much from NANOG and APRICOT experiments
- Unique things:

Other IETF observations..

- Some issues..
  - No workie:
    - iTunes Store
    - Apple Bug Reporter
    - Skype
  - Jabber (server issues with OpenFire per html v. txt transcripts, Adium client seemed OK - though many IM servers not reachable - e.g., google talk - though translators made available)
  - iChat will only work if there's still an IPv4 address on the system somewhere
  - www.ripe.net worked, but not others such as lirportal.ripe.net and ris.ripe.net
  - www.apple.com
  - jabber.psg.com had no AAAA records, although there is a www.psg.com one. Exists now :-)

IETF Experiment Notables

- There was a power outage just before the IPv6 outage
- ipv6.google.com launched
  - Local stuff worked
  - Not much else
- Mark Andrews provided BIND fix for Windows XP to subvert DNS resolution issue (i.e., run local bind resolver)
- All IETF Web sites worked
- Made /. - "The Night the IETF Shut Off IPv4"
- /. not reach via IPv6

Double NAT - v4v6v4

- Double NAT model to accommodate
- Described in
  - draft-durand-v6ops-natv4v6v4-01.txt
- Distributed NAT model where globally routed v4 addresses are shared among a pool of users
- MTU & ALG considerations
- Still very much research

How You Can Play

- http://www.civil-tongue.net/6and4/
- Has instructions for platforms
- Has instructions how to turn it back off when you go home!
- Is a wiki, so .. If you want to play:
  - Create a login ID, open a ticket and request editor privileges
  - You can also use tickets to report problems, send feedback, etc..
  - Share your experiences

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- APRICOT, NANOG & IETF Sponsors
- And Philip Smith…