IPv6 in Asia
A Consumer Perspective

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SANOG Lightning Talk

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Next Generation Internet

- **Lots of press coverage**
  - OECD Statement – June 19
  - US Government Mandate Expiry - June
  - EC Action Plan – May 27
  - 1000 Days to IPv4 Exhaustion - May
  - Root Servers v6 Enabled – Feb 06
- **Ready for primetime?**

- (No… not that one)
- Objectives
  - Get connected to v6 from home
  - See the Kame dancing turtle
  - Report on the experience
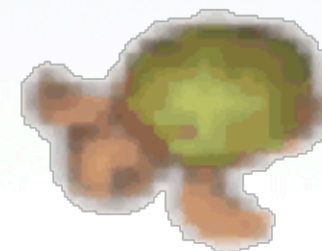
OK... let's get started

- **Connectivity Options**
  - Native
  - 6to4
  - Tunnel Broker
- **Contact ISP Customer service…**

```
From     : <rho███████████.com>
To       :  ███████ Technical Support <techsupp@███████████.com>
Date     : 2008/7/31 15:13:31
Subject : Customer Service(category:TechnicalSupport)


Do you provide IPv6 service for ███████ users?
```

Eye Pee Vee What?

寄件者: ▨▨▨▨ Technical Support <techsupp@▨▨▨▨>
日期: 2008/08/02 星期六 下午 12:48:14 HKT
收件者: <rho▨▨▨▨com>
主旨: Re: Customer Service(category:TechnicalSupport) (KMM352554I23896L0KM)

Our Reference:181306/KMM352554I23896L0KM

Dear Sir/Madam,

Thank you for emailing ▨▨▨▨

With regards to your enquiry about IP address. Please kindly be informed
that the IP address for residential broadband customer are assigned
automatically (i.e. dynamic IP) when connected to internet. If you want
to check the IP address, please kindly follow steps below;

- Connect to internet with Microsoft Windows
- Click "Start"
- Click "Run"
- Type "cmd" then press enter
- Type "ipconfig /all" and find the IP address assigned.

In addition, as a customer oriented company, we will always do our best
to keep our service/technology up to date in order to cope with the
customer's need.

If you have any further enquiries, please feel free to email us again or
speak with our Hotline representatives directly at ▨▨▨▨

Yours sincerely,

Frankie Leung
▨▨▨▨ Email Team
Contact us: techsupp@▨▨▨▨com

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Choosing the right CPE

- **Apple AirPort Extreme**
  - Built in 6to4 Client

- **Linux Based Router**
  - Linksys/Dlink/etc
  - Not available by default. Need to roll firmware…
  - DD-WRT/OpenWRT

- **Cisco CRS-1**

- ## Let's find the nearest 6-to-4 Gateway

```
hkg-br2#trace 192.88.99.1

Type escape sequence to abort.
Tracing the route to 192.88.99.1

  1 202.83.208.137 [AS 17888] 4 msec 0 msec 4 msec
  2 202.83.208.213 [AS 17888] 0 msec 4 msec 0 msec
  3 203.208.172.241 [AS 7473] 4 msec 0 msec 4 msec
  4 so-0-1-0-0.plapx-ar2.ix.singtel.com (203.208.171.37) [AS 7473] 184 msec 188 msec 184 msec
  5 ge-1-0-1-0.plapx-dr1.ix.singtel.com (203.208.172.189) [AS 7473] 184 msec
    ge-1-0-0-0.plapx-dr1.ix.singtel.com (203.208.168.122) [AS 7473] 168 msec
    ge-1-0-1-0.plapx-dr1.ix.singtel.com (203.208.172.189) [AS 7473] 184 msec
  6 208.50.13.185 [AS 3549] 188 msec
    208.50.13.165 [AS 3549] 172 msec
    208.50.13.185 [AS 3549] 200 msec
  7 swiCE2-G3-12.switch.ch (64.214.146.110) [AS 3549] 384 msec 384 msec 384 msec
  8 swiLS2-10GE-1-3.switch.ch (130.59.37.2) [AS 559] 384 msec 384 msec 384 msec
  9 swiBE1-10GE-1-1.switch.ch (130.59.37.130) [AS 559] 388 msec 388 msec 384 msec
 10 swiBE2-10GE-1-4.switch.ch (130.59.36.198) [AS 559] 388 msec 384 msec 384 msec
 11 swiFR2-G2-3.switch.ch (130.59.36.105) [AS 559] 388 msec 388 msec *
hkg-br2#
```

- ## My closest gateway is in Switzerland

Tunnel Broker Service

- **Tunnel Broker Service in Asia**
    - IIJ (Customers only)
    - SingNet (down)
    - ASCC Taiwan (TSP)
    - MyTBS Malaysia (Fixed IP only)

- **Settled for Hurricane Electric TB**
    - Setup instructions!
    - But… US West Coast, 200ms away

- **Followed instruction**
  - Applied for tunnel broker account, got assignments
  - Enabled IPv6 on router (reboot)
  - Cannot reach tunnel broker anymore!
    - PPPoE assigned different address, tunnel broken
    - Tunnel broker has AAAA record, no v6 connectivity
  - Disabled IPv6 on client, update tunnel endpoint, manually configured router from command line, re-enabled IPv6 on client

- Kame Turtle captured!
- Now what?
  - Let's find some IPv6 websites
  - Ipv6.google.com is exactly the same as google.com
  - http://www.ipv6.org/v6-www.html
    - Last updated March 2003….
    - Half the sites are gone…
    - And a quarter just get stuck on loading, times out and gives me an IPv4 page

- **Further troubleshooting shows…**
  - pings work
  - telnet to port 80 works
  - GET / HTTP/1.0 works
  - Why won't the page load?

- **MTU issues**
  - MTU mismatch on links?
  - No en-route fragmentation, ICMP unreachable/frag needed messages disabled on router or filtered by firewall?

```
traceroute6 to ipv6.▓▓▓▓▓▓▓. (2001:4860:0:2001::68) from 2001:470:1f05:43e:21f:5bff:fe81:68ba, 30 hops max, 12 byte
packets
<snip>
 5  10g-2-4.core1.ash1.ipv6.he.net (2001:470:0:35::2)  361.094 ms  280.228 ms  321.069 ms
 6  pr61.iad07.net▓▓▓▓▓▓▓ (2001:504::2:0:1:5169:1)  273.322 ms  315.715 ms  273.285 ms
<snip>


$ ping6 -s 1232 2001:504::2:0:1:5169:1
PING6(1280=40+8+1232 bytes) 2001:470:1f05:43e:21f:5bff:fe81:68ba --> 2001:504::2:0:1:5169:1
1240 bytes from 2001:504::2:0:1:5169:1, icmp_seq=0 hlim=59 time=381.447 ms
^C


$ ping6 -s 1233 2001:504::2:0:1:5169:1
PING6(1281=40+8+1233 bytes) 2001:470:1f05:43e:21f:5bff:fe81:68ba --> 2001:504::2:0:1:5169:1
^C
--- 2001:504::2:0:1:5169:1 ping6 statistics ---
4 packets transmitted, 0 packets received, 100% packet loss


$ ping6 -s 1233 2001:470:0:35::2
PING6(1281=40+8+1233 bytes) 2001:470:1f05:43e:21f:5bff:fe81:68ba --> 2001:470:0:35::2
1241 bytes from 2001:470:0:35::2, icmp_seq=2 hlim=60 time=393.759 ms
1241 bytes from 2001:470:0:35::2, icmp_seq=3 hlim=60 time=342.07 ms


$ ping6 -s 1233 ipv6▓▓▓▓▓▓▓
PING6(1281=40+8+1233 bytes) 2001:470:1f05:43e:21f:5bff:fe81:68ba --> 2001:4860:0:2001::68
^C
--- ipv6.▓▓▓▓▓▓▓ ping6 statistics ---
5 packets transmitted, 0 packets received, 100% packet loss
```
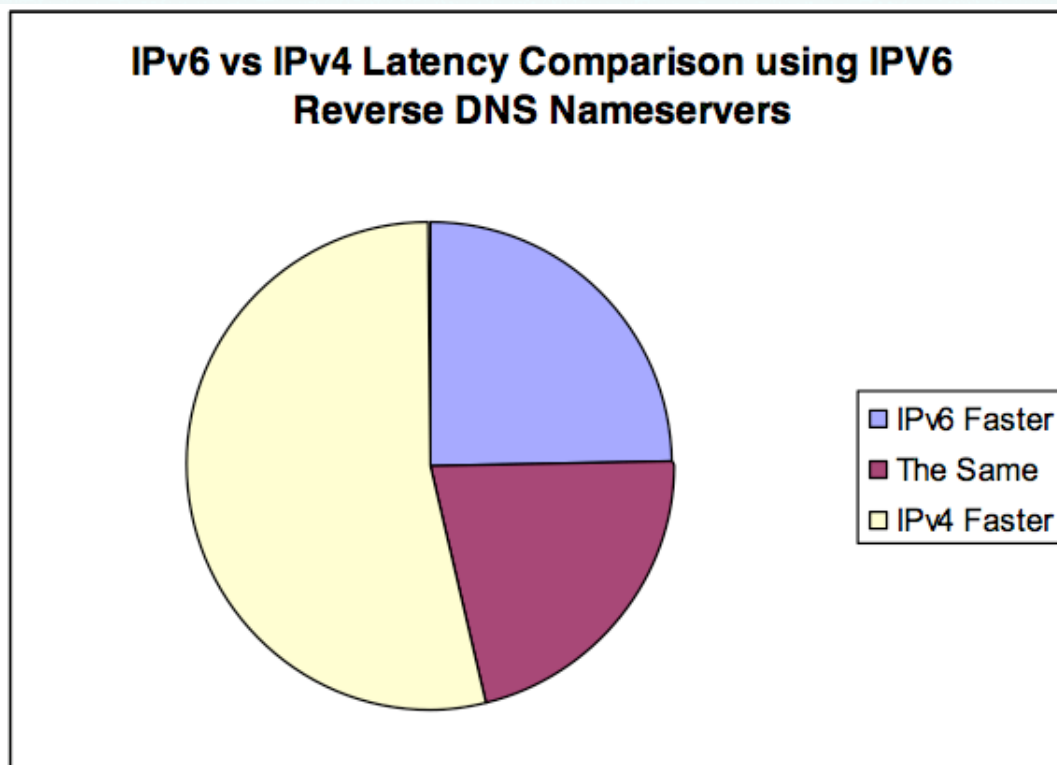
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Performance issues

- **Comparison between v4 and v6 pings**
  - Tunneled to US West Coast…

IPv6 vs IPv4 Latency Comparison using IPV6 Reverse DNS Nameservers

- IPv6 Faster
- The Same
- IPv4 Faster

Source: Going Native, Mike Leber Hurricane Electric http://bgp.he.net/going-native.pdf

Ready for Primetime?

- **Major improvements from 10 years ago**
- **Still some work required to hit the mainstream**
  - Service Availability
    - Native or Tunneled IPv6
  - Performance
    - Tunnel penalty
    - CDN Infrastructure?
  - CPE/Equipment
  - Content/Search Engine
    - IPv6 exclusive content
    - IPv6 content search engine?

- **Consistent IPv6 MTU settings at Exchange points, routers and endpoints**
  - Minimum MTU = 1280
  - Tunnel MTU = 1280/1480
- **ICMP settings on routers/firewall**
- **Push CPE vendors for IPv6 capability**
- **Improve peering and transit arrangements**
- **Make IPv6 available to consumers**
  - Native, 6to4 gateways and tunnel brokers
  - Give your Tunnel Broker separate URI for v4 and v6
- **Make it "Cool" to be on IPv6**