



IETF 79

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Technical Plenary

IPv6 Deployment Experience

Overview and Implications

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Background

- Comcast's IPv6 program started over 5 years ago
- Incrementally planned and deployed IPv6
 - Today, entire network is IPv6-capable or enabled
 - Back office systems upgraded to support IPv6
 - Access network is largely IPv6 capable, requires software upgrades and configuration
- Initial focus was to ready infrastructure to support device management
 - With incremental extension, support for IPv6 CPE could be introduced
- Trials announced in January 2010
- Over 7,000 subscribers volunteered to participate



6to4

- 6to4 is supported on a number of popular operating systems and home networking equipment
 - In many cases it is enabled by default
- It is important to note that 6to4 is being used *whether operators have deployed 6to4 relays or not*
 - There are a number of public 6to4 relays available today
 - Before we added our own relays, our customers were using a relay at Univ. of Wisconsin - Madison
- 6to4 relays were also straightforward to deploy
 - Leveraging Linux-based relays, open source
 - Four are currently deployed, a fifth is targeted for deployment by EOY2010
- Deployment of 6to4 relays *dramatically* reduced latency (50%+ better)
- Substantially more devices support 6to4 than 6RD, and 6to4 is enabled by default
- Dramatically increased IPv6 traffic volume



6RD

- 6RD is an enhanced version of 6to4
 - Mainly alleviates the requirement to use 6to4 IPv6 anycast
 - Allow for more predictable return path
- 6RD border relays (BR) were straight forward to deploy
 - Centrally located 6RD BRs will affect geo-location
- 6RD, like 6to4, is still the tunneling of IPv6 over IPv4
 - Placement and quantity of 6RD BRs is a factor in latency
- Limited supported for residential CPE for 6RD
 - Resulted in manual configuration of CE
- DHCP servers require enhancement to support newly ratified 6RD DHCP options
 - Will likely be required to support wide scale 6RD deployments
- Trial supports /64 for each 6RD CE
 - LAN side auto-configuration, static addressing

Native Dual Stack

- Native Dual Stack expected to offer superior experience
 - No need for tunneling, translation, en/decapsulation
 - Direct, end-to-end routing/connectivity
- Delegated prefix is minimally a /64 by default for trial (LAN-side)
- CPE support for native dual stack *is* increasing
 - Though many existing home networking devices do not support IPv6 and/or do not meet the necessary requirements

Observations

- Availability of content continues to be lacking
 - This is obvious when observing aggregate native IPv6 traffic patterns
 - Collaborate with content providers
- Tunneling solutions are straightforward to deploy
 - The latency even though improved may remain a challenge when delivering certain types of services
 - There is a non-trivial volume of 6to4 traffic today
 - Operators should consider deploying 6to4 relays to facilitate transition
- Operators should go with what is available now
 - Depending upon new drafts to become RFCs, be adopted in equipment and software, and mature to become stable & scalable will take more time than you may actually have
- Start exercising IPv6 capabilities now
 - it's not easy & takes a lot more time than you think
 - Find problems now while you have time to mature the software/network



Thank You!

**Information on Comcast's
IPv6 work at:
<http://www.comcast6.net>**

