# Comcast IPv6 Trials

## NANOG50

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# Overview

**Background**

**Goals and Objectives**

**Trials**

**Observations**

# Background

- Comcast 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

# Background (continued)

- Trials launched in January 2010
  - http://www.comcast6.net
  - http://www.xfinity6.net
- Over 7,000 subscribers registered to participate
- Comcast sites with IPv6 enabled for trial include
  - http://ipv6.comcast.net
  - http://ipv6.comcast.com
  - http://ipv6.xfinity.net
  - http://ipv6.xfinity.com

# Goals and Objectives

- Ensure that underlying infrastructure can support content and service parity over IPv4 and IPv6
    - Native IPv6 is preferred versus the use of tunnels and other techniques
- Understand and identify issues, challenges, and gaps associated with offering content and services over IPv6
- To broaden the adoption of IPv6 among consumers and those who provide content and services.
    - Availability of IPv6 should be transparent to subscribers

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# TRIALS

# 6to4

- RFC3056 provides additional information about 6to4
- 6to4 is a well known IPv6 transition technology
  - IPv6 packets are encapsulated over IPv4
- 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

# 6to4 (continued)

- 6to4 relays were also straight forward to deploy
  - Leveraging Linux based relays
  - Four are currently deployed, a fifth is targeted for deployment by EOY2010
- Deployment of 6to4 relays dramatically reduced latency
- Substantially more devices support 6to4 and 6to4 is enabled by default
- Dramatically increased native IPv6 traffic volumes

# 6rd

- 6rd is an enhanced version of 6to4
  - Mainly alleviates the requirement to use the 6to4 IPv6 anycast prefix (2002::/16)
  - See draft-ietf-softwire-ipv6-6rd for additional details
- 6to4 is a well known IPv6 transition technology
  - IPv6 packets are encapsulated over IPv4
- 6rd can be used to enable IPv6 connectivity to hosts that are connected to IPv6-incapable access networks
  - IPv6 packets are expected to be natively routed by the 6rd BR

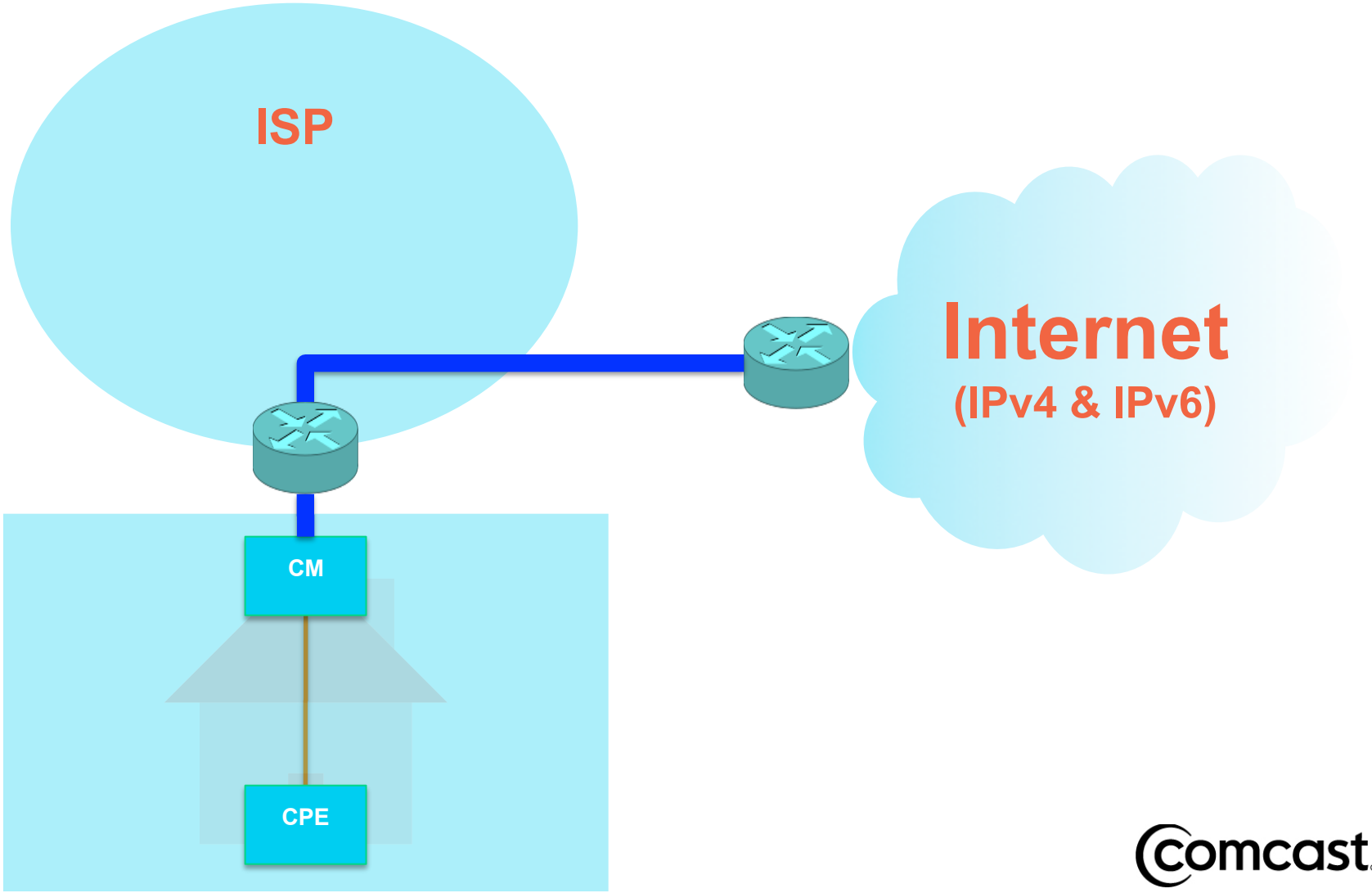
# 6rd (continued)

- 6rd border relays (BR) were straight forward to deploy
  - Centrally located 6rd BRs will impact geo-location
- 6rd like 6to4 is still the tunneling of IPv6 over IPv4
  - Placement and quantity of 6rd BRs will be a factor specifically with regards to latency
- Limited supported for residential CPE for 6rd
  - Resulted in manual configuration of CE

# 6rd (continued)

- DHCP servers will like require enhancement to support recently ratified DHCP options for 6rd
  - Will likely be required to support wide scale 6rd deployments
- Trial supports /64 for each 6rd CE
  - LAN side auto-configuration, static addressing

# Subscriber IPv6 CPE

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# Pre-requisite Highlights for CPE

- For subscriber CPE directly connected to cable modem
    - Support for dual stack CPE by underlying network which includes provisioning
    - IPv6 stack and stateful DHCPv6
    - Applications that support the use of IPv6 transport

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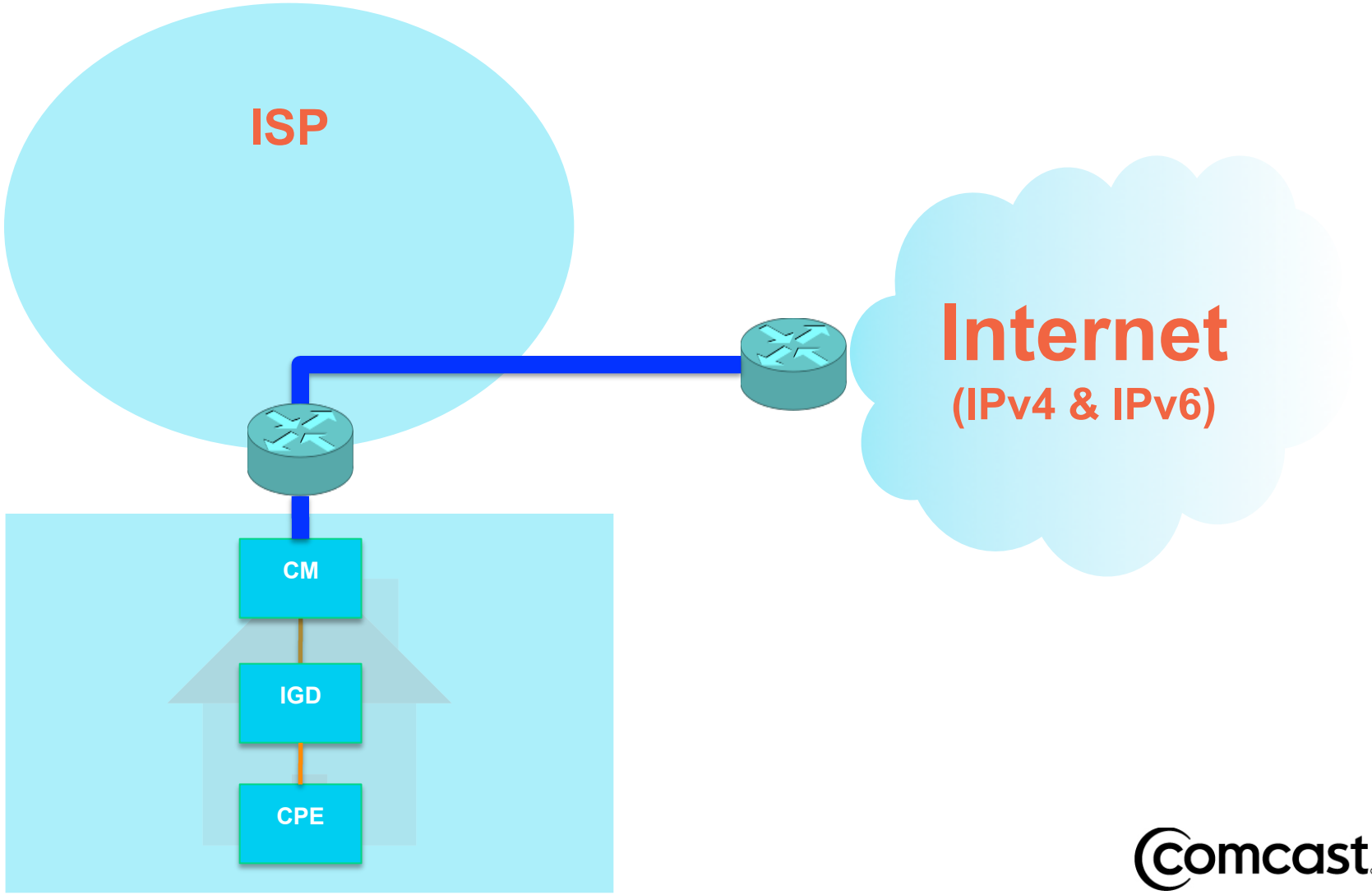
# Subscriber IPv6 IGD

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# Pre-requisite Highlights for IGD

- For subscriber IGD connected to cable modem
  - Support for dual stack CPE by underlying network which includes provisioning
  - IPv6 stack and stateful DHCPv6 (WAN) including prefix delegation
  - Configuration and addressing on subscriber LAN
  - IPv6 routing (and firewall)
  - Subscriber CPE must also support IPv6 including applications

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# Native Dual Stack

- Existing IPv4 services remain as-is
- Native IPv6 is introduced in addition to classic IPv4 access
  - Applies to IPv6 capable standalone CPEs
  - Applies to IPv6 capable home/SOHO routers
- Commercial non-DOCSIS access services are also included
  - Fiber/Metro Ethernet leverages a similar approach

# Native Dual Stack (continued)

- Upgrades and configuration of existing hardware is underway
- Native dual stack trials are geographically limited at this time
  - Several areas across the footprint are being targeted
- Controlled introduction using known and tested hardware combinations
  - Will expand device diversity over time as part of the trials

# Native Dual Stack (continued)

- Standalone CPE and CPE routers will be supported
- Provisioning of operator facing interfaces is required to be stateful in nature
  - Autoconfiguration is not supported
- Wider range of LAN side provisioning alternatives
- Standalone CPEs provisioned with /128s
- CPE routers provisioned with /128 (WAN) and a delegated prefix
  - Delegated prefix is minimally a /64 (LAN)

# 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

# Observations (continued)

- CPE support for native dual stack is increasing
  - Many existing home networking devices do not support IPv6 and/or do not meet the necessary requirements

# Q&A

- Contact information

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