IPv6 @ Comcast

NIC.BR

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Deployment Update (continued)

- Approximately **~2.6%** of Comcast's customers provisioned with native dual stack broadband
  - 100+% increase since May 2012
  - ~60% standalone computers, ~40% customer home routers
  - Split shifting rapidly (~76%/~24%) as of June 2012
- Cornerstone of the IPv6 program at Comcast has been **incremental deployment**
  - Phased deployment provides foundation for seamless introduction of IPv6

Deployment Update (continued)

- Today IPv6 is deployed to approximately **50%** of Comcast's broadband network
  - Completion of first deployment phase targeted for mid-2013
- Significant increase in residential broadband customers actively using IPv6 planned for 4Q2012 and CY2013
  - Non-trivial population of DOCSIS 3.0 and pre-DOCSIS 3.0 cable modem will be enabled
  - Conservatively targeting **~10%** by end of CY2013

Deployment Update

- DOCSIS commercial IPv6 pilots planned for 4Q2012, production launch scheduled for CY2013
  - Represents customer base that most actively requests support for IPv6!
- Metro Ethernet support for IPv6 ready and awaiting productization

Customer Premise Equipment Breakdown

- Standalone computers
  - Almost exclusively devices running IPv6 capable Microsoft operating systems
  - Microsoft IPv6 capable based devices represent ~60% of all IPv6 enabled customer devices today
- Customer home routers
  - Largely retail customer home routers
  - Open source or other customer home router platforms also supported and interoperable
    - FreeBSD-based, pfSense, Linux-based, etc
  - Detailed analysis of customer home router adoption underway

Content and Services (continued)

- Main Internet properties launched with native dual stack support in advance of World IPv6 Launch
  - Comcast and Akamai hosted content included
  - Stay tuned, more Comcast content to be IPv6 enabled!
- 2012 Olympics streaming via YouTube supported IPv6
  - **~6%** of Olympics over YouTube to Comcast customers was over IPv6

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Content and Services

- Over ~1% IPv6 traffic to Xfinity content by Comcast IPv6 enabled broadband customers
- Approximately ~1% overall IPv6 traffic for Comcast content globally
- Popular content support for IPv6 significantly improved
    - Long tail content expected to introduce support for IPv6 over time
- Messaging platform support for IPv6 launched summer 2012

World IPv6

- Comcast's successful participation in World IPv6 Launch
  - All goals exceeded in **advance** of June 6, 2012
- Deployment of IPv6 and participation in World IPv6 Launch have been seamless for Comcast customers

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Traffic

- **375%** increase in IPv6 traffic compared to World IPv6 Day (June 2011)
  - Majority of increase occurred between January and June 2012
  - Approximately **1%** of overall Internet traffic is IPv6
- Majority of traffic over IPv6 YouTube and Netflix
- Tunneled IPv6 traffic also increased in some cases
  - Teredo, 6to4, and Protocol 41 doubled

Adoption

- Estimated traffic percentage per IPv6 enable customer observed up to a maximum of 40%
  - Bulk of IPv6 traffic represented by YouTube and Netflix
  - Does not include Olympics over IPv6 care of YouTube
- Per device and operating system analysis underway
  - Important indicator of IPv6 adoption across the consumer electronics ecosystem
- Enablement of broadband IPv6 support is critical to facilitate transition off of IPv4

Consumer Electronics (continued)

- Home or premise networking support improving, momentum is non-trivial and growing
- Consumer electronics support for IPv6 is critical to the long term adoption of and transition to IPv6
  - Absent devices that support and are enabled with IPv6 by default, divorce from IPv4 will be delayed
  - The usage of IPv6 enabled broadband and content requires that Internet connected devices (and content) also support IPv6

Consumer Electronics

- In home/premise consumer electronics slow to adopt, support is lacking
  - Potential to hamper IPv6 adoption
- Consumer Electronics Association (CEA) IPv6 deployment working group formed to facilitate transition across CE ecosystem
  - Goals include expanding awareness and providing guidelines to facilitate adoption and implementation

Wi-Fi and IPv6 (continued)

- Near to mid term objective is to deploy native dual stack support
  - Long term goal is IPv6 only
- Support for IPv6 is the introduction of IPv6, not the replacement of IPv4 - yet
  - IPv4 support will continue to be required for some time
  - Deployment models for IPv4 may vary from operator to operator
- Preference is incremental enablement and introduction of IPv6 support

Wi-Fi and IPv6 (continued)

- Introduction of IPv6 must not adversely impact performance and stability of IPv4
- Challenges for Wi-Fi and IPv6 are similar to IPv6 challenges for other access technologies
- Shared media and IPv6 introduces specific challenges that are not typically present with IPv4
  - Link local communications are generally link local multicast in scope
  - Host to host communications require IPv6 neighbor and router discovery

Wi-Fi and IPv6

- Enable IPv6 support for as many devices as possible
  - Capabilities differ for IPv6
  - Requires expansion of base configuration and functionality
- Ensure privacy concerns specific to IPv6 are accounted for in advance
  - Addressing algorithms
  - Link local communications
  - Client to client visibility

Measurements and Monitoring

- Extensive measurements and instrumentation implemented to measure IPv6 deployment
  - Focus has been to ensure IPv6 does not alter customer experience or quality of experience
- Measurement framework developed to compare IPv6 to IPv4 for most popular sites on the Comcast network
  - Used to determine where IPv6 remains to be launched by content providers
  - Facilitates rapid identification of IPv6 related issues

Roadmap (continued)

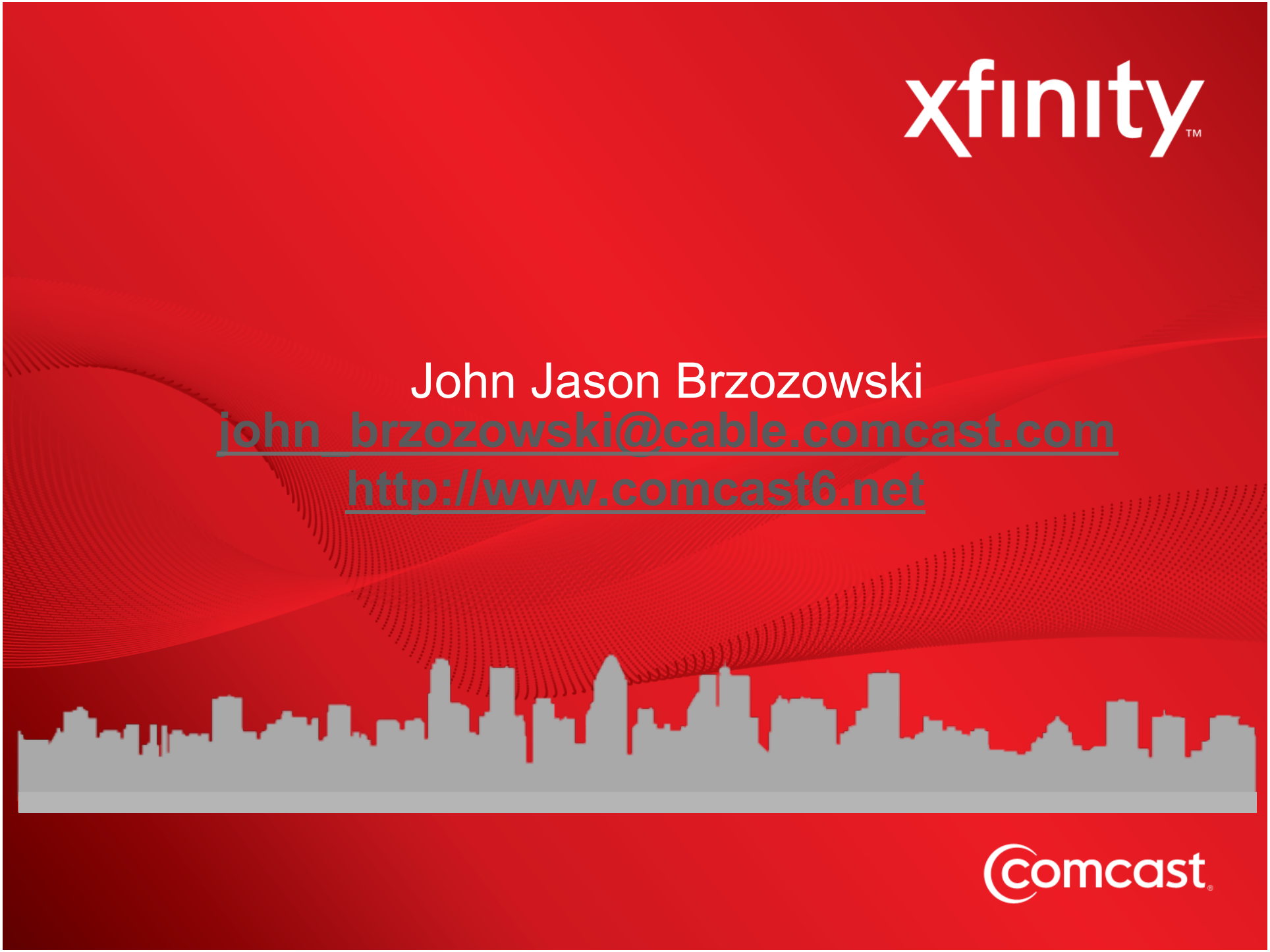
- Plans for IPv6 support across all service offerings
  - Voice, video, data
  - Home security and automation and Wi-Fi
- IPv6 is central to ensuring optimal customer experience
  - Exploring techniques to leverage IPv6 to enhance and automate native IP connectivity premise wide

Roadmap

- Premise wide, native IP is a potential enabler of improved customer experience measurements
- Customer metrics plays into larger, evolving strategy to improve network efficiency
  - Related technologies possibly include CDN, SDN
- Exploring possible performance gains through the use of IPv6

Considerations

- Launching IPv6 support across the enterprise
  - Required for Comcast staff to properly support the deployment of IPv6 and our customers
  - IPv6 is only being enabled across the enterprise where absolutely required
- IPv6 security readiness is essential for key functional areas
  - Core and access network
  - Enterprise network
  - Systems, applications, and services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