Worldwide IPv6 Summit 2006

Comcast

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Overview

- Background
- Motivations
- Technology
- Strategy
- Challenges
- Future

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Company Profile

Comcast Corporation (Comcast) is a broadband cable provider in the United states and offers a wide variety of consumer entertainment and communication products and services, serving more than 23 million video subscribers, 10 million high-speed Internet subscribers and 1.6 million phone subscribers.

The Company manages its operations through two segments:

- Cable - The Cable segment develops, manages and operates its broadband cable systems, including video, high-speed Internet and phone services (cable services).
- Content - The Content segment includes its six national cable networks: E! Entertainment Television, Style Network, The Golf Channel, OLN, G4 and AZN Television (formerly known as the International Channel)

The other business interests include Comcast Spectacor, which owns the Philadelphia Flyers (Ice Hockey), the Philadelphia 76ers (NBA Basketball), two multi-purpose arenas in Philadelphia, and manages other facilities for sporting events, concerts and other events.

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Cable Terminology

- CM – Cable Modem
- MTA – Media Terminal Adapter (VoIP device)
- STB – Set top Box
- eMTA – Embedded MTA (CM-MTA in one device)
- eSTB – Embedded STB (CM-STB in one device)
- DOCSIS – Data over cable standard Interface specification
- PacketCable – Specification to provision and support MTA's behind a CM
- Provisioning – Assigning an IP-address and a service tier to CM, MTA, etc.

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Motivations

- Expanded address space of IPv6 is the main motivation
- Use of RFC1918 (NET10) address space has already been exhausted
- A common infrastructure that will provide scalability, redundancy and extensibility to support the growing needs of the business
  - High Speed Data
  - Voice over IP
  - Video (IP-based set-top box management)
  - Wireless
  - Commercial Services
- More customers and more devices means
  - More IP Addresses
  - More servers
  - Larger network
  - More management and support overhead
- IP address requirements forecasted to exceed 100M
- Eventually leverage IPv6 to offer new services

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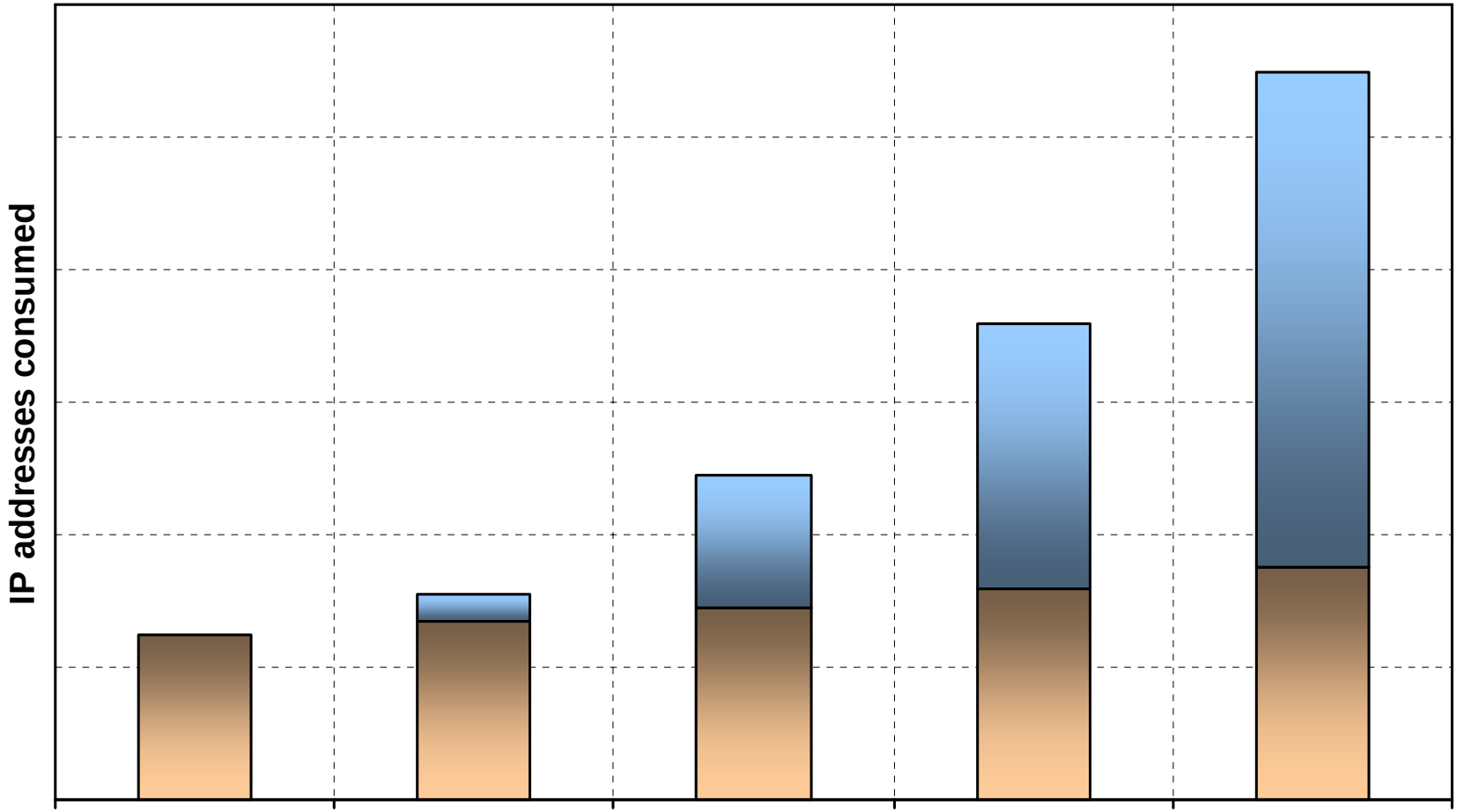
IP Addresses: Natural Growth vs New Services

(in the coming years)



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Approach

- Demand for IPv4 Addresses is increasing for Comcast
  - What happens if address allocations from American Registry for Internet Numbers (ARIN) becoming more difficult to obtain?
- Approach of deployment
  - Network architecture is dual-stack at the core, IPv6 at the edges
  - Adoption will logically work from core of the network to the edges
    - And in time beyond
  - Deployment of IPv6 on the Control Plane for the Management and Operation of Edge Devices
    - Device IP version may be diverse
  - Deploy IPv6 only where it is absolutely necessary
  - Objective is to maintain existing operational models and not introduce new ones specific to IPv6
  - Operational preparedness for IPv6 is critical

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DOCSIS

- CableLabs' DOCSIS 3.0 specification
  - Specifies IPv6 support for DOCSIS devices
    - CMTS
    - Cable modems
    - STB
    - Others
- DOCSIS cable modem operation
  - IP modes supported include IPv6, IPv4, or dual stack
  - Cable modem can forward IPv4 and IPv6 traffic regardless of IP provisioning mode
- Provisioning of DOCSIS devices specifies the use of DHCPv6
- CMTS support for single or dual stack operations
  - IPv4 only for legacy
  - Dual stack to support adoption of IPv6

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Standards

- Application of DHCPv6
  - For stateful assignment of IPv6 addresses and configuration information
  - To obtain IPv6 prefixes using DHCP PD
  - Used to facilitate interactions with DNS
- DNS is critical to the adoption of IPv6
- Leveraging IETF initiatives including
  - Standards and extensions underway or completed by DHC WG
  - Valuable IPv6 work of other working groups
- Specification and standards works are very important, offering the building blocks required to adopt IPv6

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Provisioning Infrastructure

- Provisioning support for IPv6 is critical to the adoption of IPv6
  - Required to support activation of devices in appropriate version of IP
  - Fundamental to delivering services over IP devices managed using IPv6
  - Extensibility required to support diverse types of devices
- Services critical to the provisioning include
  - DHCPv6
  - IPv6 TFTP and TOD
- DHCPv6 Deployment Challenges
  - Redundancy and scalability are critical to support growing business needs
  - High performance is required to ensure reliable service delivery and recovery

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Impact on DNS Infrastructure

- Adopting IPv6
  - Larger address size
  - Harder to memorize and type
  - Need to use simple names to access device
- All devices on the network with a valid IPv4 and or IPv6 address will have to be added to DNS
- Will need to support ~120 million devices by end of 2009 and ~300 million by 2012
  - 240 million to potentially 600 million resource records in DNS
- Client Machines queries
  - Two queries for every lookup, potential for 50% increase in DNS traffic
    - Windows Vista (50% penetration of Vista by 2008)
    - Some Linux OS's also send two queries

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DNS Challenges

- Management
  - The ability to manage DNS configuration and data is essential to providing best in class DNS services
  - Robust management is paramount to providing an accurate and easy to use global view of the name space
- Scalability and Redundancy
  - Increased reliance on and usage of DNS further increases the need for reliability and scalability
  - The volume of data will grow over time as IPv6 deployment progresses
- High Availability
  - No down time – 99.999% availability of the DNS Service
    - Voice Service depend on DNS availability
    - Video Services are next

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DNS Challenges (continued)

- Performance
  - Robust DNS infrastructure must allow for high performance dynamic updates
- Security
  - Protecting integrity of DNS infrastructure is critical
    - Securing updates and governing access
- Sound DNS architecture must allow for seamless growth, manageability and recovery
- Training & Education
  - Provide technical education related to adoption of IPv6
  - Offer insight of importance of DNS to the business

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Management Challenges

- Management challenges related to adoption of IPv6
  - Management of IP Addresses and Prefixes
    - For visibility and insight into utilization
    - To ensure accuracy and prevent duplication or overlap
- DHCPv6 Management
  - Control server behavior
  - To uniformly govern configuration data and option configuration
- Management of DNS Data and Configuration

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Strategy

- Start early, start now
- Affects of adopting IPv6 MUST be minimized, limiting affect on existing business
- Target initial adoption of IPv6 where greatest demand and or need exists
  - On control plane for management and operation of devices under provider control
- IPv6 must be included in the roadmap of next generation equipment and devices
  - Existing IPv6 support will vary and may require augmentation
  - Others may have none
- IPv6 readiness must initially include critical elements of infrastructure and systems required for deployment
- Remember unlike IPv4, IPv6 is not as time tested and known to the masses

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Education

- Education is critical to success of IPv6 adoption
  - Early education is critical to support
    - IPv6 analyses
    - Defining vendor requirements and managing the same
    - Defining architecture and designs
  - Continuing education to support deployment and operations
  - Hands on is essential to gaining familiarity

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Future

- Initial deployments address issues of the day but also establishes the foundation that will allow for future service offerings

- Sound foundation for any technology will allow for effective long term use of the same

- Must be able to efficiently introduce and manage the genesis of devices and services

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Conclusion

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