

IPv6, a Real World View

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Agenda

- Market Demand for IPv6
- Realities of IPv6 Implementation
- Compatibility of IPv6
- IPv6 as an Enabler
- Examples
- Verizon Business and IPv6
- Lessons Learned
- End-User Implementation Considerations

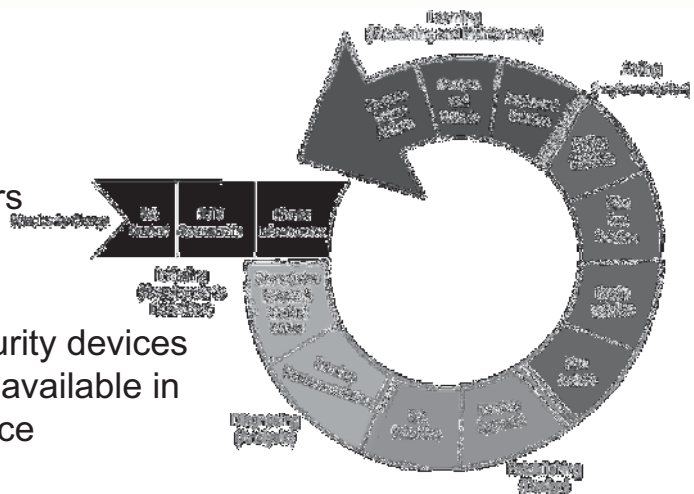


Market Demand for IPv6

- Initial demand for IPv6 is beginning to manifest, but future slope of market adoption curve is uncertain
 - Commercial adoption is slow, but making headway and gaining momentum
 - Customer RFPs for Internet services are beginning to contain IPv6 requirements
- Basic Demand Drivers
 - Driving force is IPv4 address depletion
 - Demand for IPv6 by early adopters and US Government IPv6 mandate
 - End-to-end communications and transparency (eliminate proxies and intermediaries)
 - Proliferation of IP-enabled appliances (Toshiba, Panasonic, Sony, etc)
 - Microsoft Windows Vista (uses IPv6 by default)
- Potential Strategic Business Opportunities
 - Dynamic communities of interest
 - Mobility and situational awareness
 - RFID coupled with Sensor networks, monitoring, and telemetry applications
 - Integrated logistics management

Realities of IPv6 Implementation

- All at once or staged
- Operational readiness
- Support capabilities, internally and with partners or developers
- Challenges, such as:
 - Lack of IPv6-enabled security devices and software applications available in the commercial marketplace
 - Budgetary constraints
 - Training hurdles



Compatibility of IPv6

- Existing environments
- IPv6 and IPv4 – coexist?
- Transparency to end user
- Networking implications
- Private and public networks
- Business enablement, features and expectations



Dual-stack techniques

Tunneling techniques

Translation techniques

IPv6 as an Enabler

- Mobility – increasing numbers of wireless devices (push to talk etc)
- Quality of Service (flow label), VoIP, Mobile IPv6
- Increased address space (Japan, India, China etc.)
- Security (eg. IPSec and NAT)
- Improved network efficiency (less NAT, firewalls etc)
- Other (e.g. Windows Server 2008 “IPv6 Ready”)

IPv6 Enabled Applications

Building monitoring and control systems

RFID inventory, shipping and delivery tracking

Personal health monitoring systems

Product tethering

Distributed applications



Telematics (Mobile networks within a vehicle)

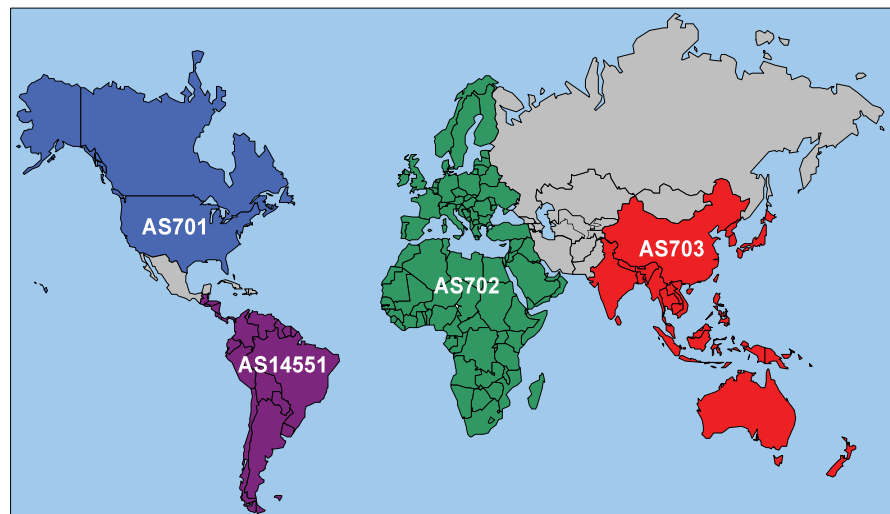
Environment sensing, modeling and alarming

Verizon Business Global Public IP Overview

Global facilities based vertically integrated network infrastructure

One of the most expansive global Internet backbones

Spectrum of IP communications services for business and consumer markets





Verizon Business History of IPv6

Legacy Verizon Business IPv6 Historical Evolution

Most of the IPv6 initiatives prior to 2006 were driven by MCI, before the merger with Verizon

- 1998: Experimental IPv6 Service through vBNS
- 2002: MAE Internet Exchange IPv6 peering service
- 2004: Global Public IPv6 Internet Service
- 2004: Commencement of Moonv6 test participation
- 2006: Private IPv6 Internet Service
- 2007: Dual-stack Public IPv6 Internet Service



Verizon Business IPv6 Status & Service Evolution

Current Status

- Dual Stack IPv6 was deployed in North America in early 2007
 - Limited initial deployment because of vendor technology deficiencies
- Effort is underway to expand the dual-stack footprint to all key US markets
- The IPv6 rollout will be taken globally in late 2009 and 2010

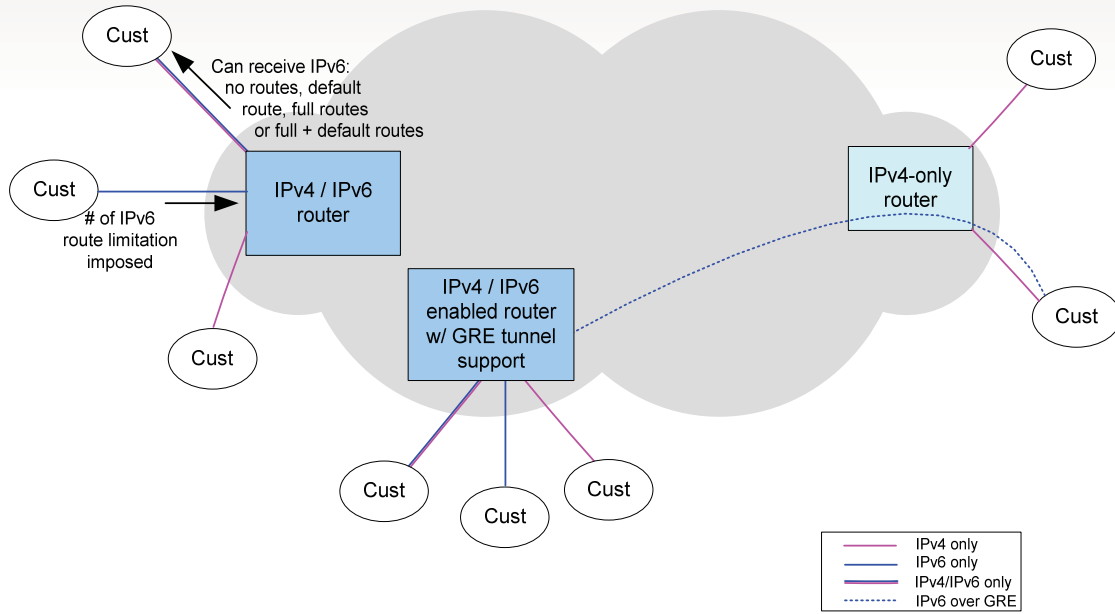
DNS Support

- IPv6 Authoritative and Caching DNS servers in 3 different locations
 - Additional locations as IPv6 demand evolves

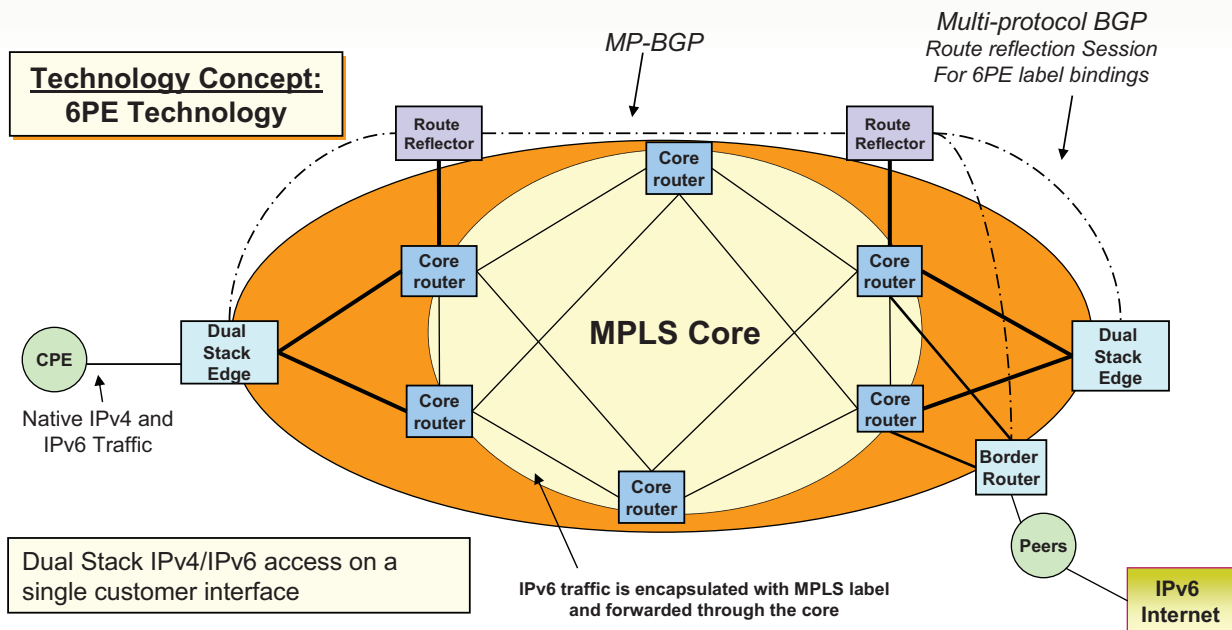
Service Evolution

- Initial service goal is to achieve parity with existing IPv4 access services
- Longer term goal is to offer value added services that harvest new business opportunities enabled by IPv6

IPv6 Connectivity Options



Simplified View of Current VzB AS701 Public IPv6 Implementation



Status: Currently deployed in North America VZ Public IP Backbone (AS701)

Lessons Learned

- In the short run, IPv6 does not offer revenue growth opportunities
- Commonly used IPv4 applications may not always work as expected with IPv6
- Potential security issues because some routers, firewalls, and proxies do not have the capability to filter IPv6 traffic
- Network Management considerations:
 - Many contemporary network management applications do not support IPv6
 - Some IPv6 SNMP MIBs are not yet well-defined or implemented by vendors
- Hardware that is optimized for IPv4 may not necessarily handle IPv6 traffic efficiently
- Router memory and CPU limitations may preclude IPv6 deployment on older equipment
- Adopters should exploit scheduled technology refresh cycles to deploy IPv6 capabilities
- Global routing practices are still evolving for IPv6

End User IPv6 Implementation Considerations

- Begin experimenting with IPv6 technology at the earliest opportunity
- Establish a lab, if possible, to gain familiarity and certify the technology prior to deployment
 - Verizon Business maintains permanent labs that model the production network.
 - New features are not deployed until thoroughly tested.
- MPLS provides a means for easy deployment of new services
 - The multi-protocol nature of MPLS simplifies initial IPv6 deployment.
 - IPv6 could be introduced only on the edge versus updating core network infrastructure.
 - This applies to service providers and may not be appropriate for some enterprises
- Think carefully to identify dependencies on IPv4
 - DNS
 - Performance measurement and reporting
 - Fault management tools and trouble ticketing systems
 - Firewalls
 - Address management tools
 - Staff training

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Sources

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- Press Release: [Fourth Annual ICSA Labs Forum Advances Security Standard for Next Generation of IP. Successful Testing Helps Advance IPv6](#)
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