



Horizontal Impact of IPv6 in Enterprise Architecture Planning

FOSE April 3rd, 2008



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Important Trends in Government

- The World is “Flattening”
- Geopolitical setting – global race for IT dominance
- Rapidly changing military requirements
- Rapid maturity of sensor technology
- Mainstream need for ad-hoc communications

Notable Considerations

- Everything Over IP (EoP)
- Net Centricity 2.0
- Ad-hoc Mobility
- Networks on the Move
- Ubiquitous Connectivity
- Workforce transition

Transformational Technologies

- IPv6
- Data Virtualization
- Mobility
- Unified Communications

Goals of the New IP Design

- High growth expectation of “always-on” technologies
xDSL, cable, Ethernet-to-the-home, Cell-phones, etc.
- Expectation of new users with multiple devices.
China, India, etc. as new growth
Consumer appliances as network devices
(10¹⁵ endpoints)
- Expectation of millions of new networks.
Expanded competition and structured delegation.
(10¹² sites)

IP Version 6 (IPv6)

The second generation Internet Protocol that:

- Increases the quantity of unique IP addresses available to network devices to an almost infinite number
- Fosters broad Internet expansion
- Enables new levels of instant, personal mobility
- Creates new information sharing and security possibilities
- Provides the foundation to radically change the way we communicate

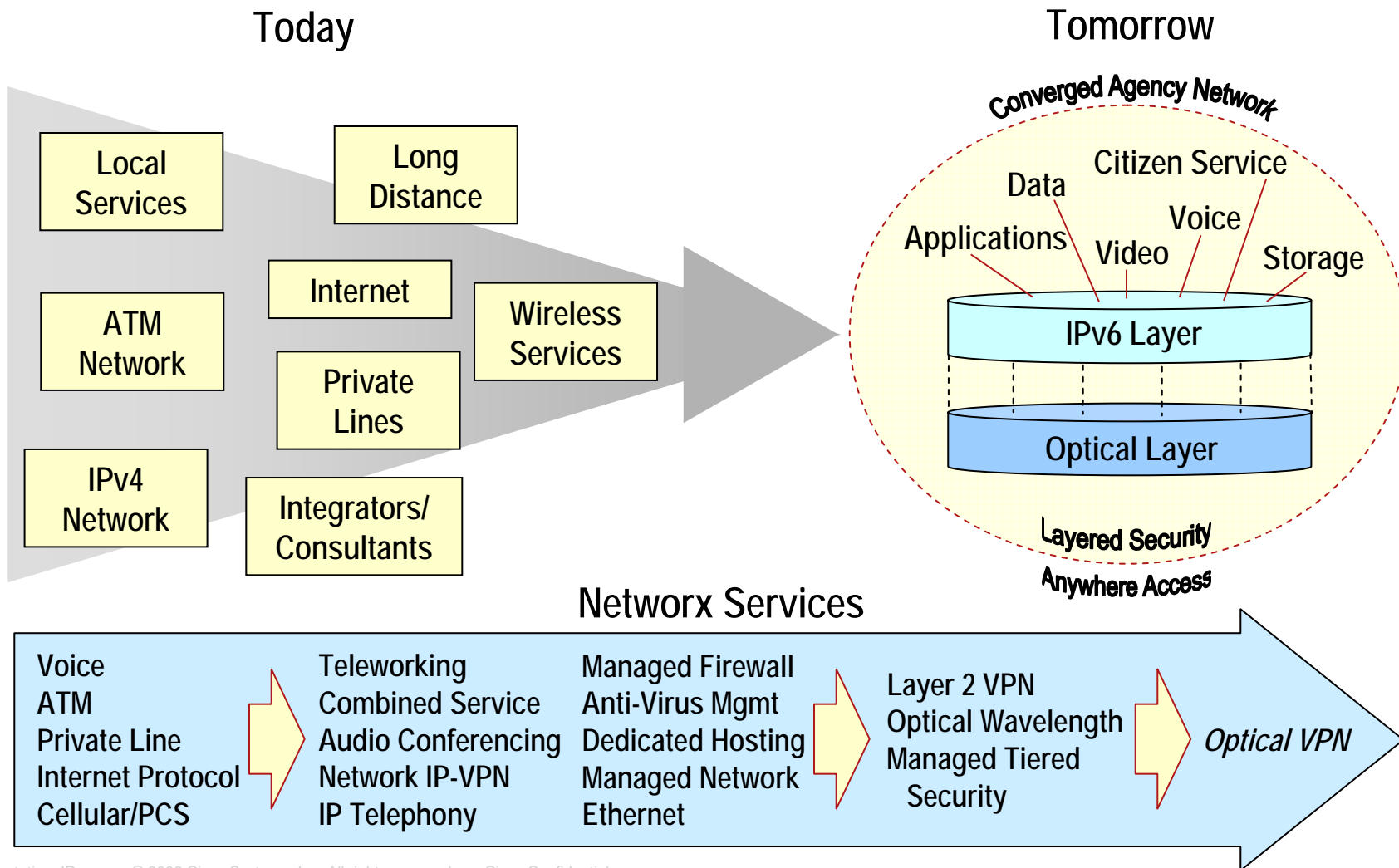
Mission Architecture Influencers

Archetype Domains

1. *Battlefield Communications*
2. *Force Protection*
3. *Logistics/Transportation*
4. *Border Security*
5. *Medical and Healthcare*
6. *Cyber Operations*



Federal Architecture GSA Network – Roadmap



The Scope of IPv6 Transition

Web Content Management
Applications & Application Suites

Data Center Servers

Client Access (PC's)

Printers

Collaboration Devices & Gateways

Sensors & Controllers

Networked Device Support

DNS & DHCP

Load Balancing & Content Switching

Security (Firewalls & IDS/IPS)

Content Distribution

Optimization (WAAS, SSL acceleration)

VPN Access

Networked Infrastructure Services

Deployment Scenario

IPv6 over IPv4 Tunnels (Configured, 6to4, ISATAP, GRE)

Dual-Stack

IPv6 over MPLS (6PE/6VPE)

IP Services (QoS, Multicast, Mobility, Translation)

Hardware Support

Connectivity

IP Addressing

Routing Protocols

Instrumentation

Basic Network Infrastructure

Staff Training and Operations
Roll-out Releases & Planning

Horizontal Reach

- IPv6 will touch every network connected element, service, application regardless of where it may reside
 - Core, Distribution, Access
 - Data Center, Campus, Branch
 - Service Provider capabilities
 - PC User, Mobile User, Device, Platform, Sensor
- Peer-to-peer users, applications
- Scaling IP multicast (ie personal video services)
- Key to “Services Oriented” world
- Key to enabling and scaling the next generation of government workforce services and capabilities

IPv6 Transition Approach

- First coexistence

Some parts of the network continue to use only IPv4 while others move to dual-stack IPv4/IPv6

- Consider where the network needs to be in 3-5 years

mobility, sensors, appliances ...

- Per Network Decision: Center out vs. Edge in

Management concerns drive deployment schedule

Application value drives the business need

General Strategy

- **Train architects and planners immediately**, then schedule full training program to complete around planned use date.
- Acquire IPv6 capable equipment and software well in advance of planned use date.
- Use normal upgrade & replacement cycle to avoid significant explicit IPv6 costs.
- Start talking to application vendors now to find out their plan for IPv6 capable releases.

Strategy - Value to early deployment

- Early requirements drive priorities
- Enables smooth interaction with global economic partners motivated by limited IPv4 allocations
- Allows managing the pace of local action before the inevitable urgency arises

Strategy - Value in caution

- Allows others to work through early implementation inconsistencies
- Allows extended development and testing time for custom applications
- Allows normal life-cycle replacements to establish a capability baseline before turning on IPv6

Strategy - Value in transition tools

- Primary approach of dual-stack enables independent deployment of applications in line with local business need
- **Tunneling tools decouple decisions** about application & end system deployment from infrastructure deployment
- Transition tools allow timing upgrades as part of a normal life-cycle plan, or to optimize investments

Lessons from other past transitions

- IPv6 Integration and Co-Existence
 - Business driven, no deadline, no D-day
- Application's transition must be the main focus
- **IPv6 is IP**
 - No opposition as *"ATM versus IP"*
 - No real alternative to scale the Internet growth
- Telecommunication's Industry already went through several Renumbering & Protocol's changes
 - Telephone systems
 - X.25, DECnet, Appletalk, IPX, SNA

EA Planning Considerations

- IPv6 seems simple - Impacts multiple levels
- Requires holistic planning – Not organic usage
- People, Process, Short / Long Term Operational Cost
- Legacy transition plans will take years
- IPv4 will continue to live (where required)
- “Islands versus oceans”

IPv6 Impact Analysis

- OMB M-05-22 memo to CIOs required impact assessment and risk assessment
- Cost estimate
 - All costs related to IPv6 migration
 - Equipment upgrades, lab, training, cost of migration effort, ...
- Risk Analysis
 - OMB risk analysis methodology
 - 18 different areas to address the impact of IPv6

IPv6 Transition Plan

- OMB M-05-22 memo to CIOs required a transition plan
- OMB's Federal Enterprise Architecture Assessment Framework:
 - ✓ Requirements analysis to identify current scope of IPv6 within an agency, current challenges using IPv4, and target requirements
 - ✓ Sequencing plan for IPv6 implementation, integrated with agency enterprise architecture
 - ✓ IPv6-related policies and enforcement mechanisms
 - ✓ Training material for stakeholders
 - ✓ Test plan for IPv6 compatibility and interoperability
 - ✓ IPv6 using a phased approach
 - ✓ Management Strategy
 - ✓ Target Architecture

IPv6 Design Impact

- Organizational structure and current topology impact
- IPv6 will use some of the same topology and traffic patterns

IPv4 made heavy use of Unicast and client/server model

IPv6 will add more mobile and peer-to-peer traffic flows

- Addressing based on current topology

The physical topology won't drastically change with IPv6

Security Architecture

- Important to focus on Transitioning your security architecture not just a single box.
- Perimeter security is no longer enough
 - Need to detect IPv6 deployments internal to the network
 - Who is tunneling traffic internal to Campus
 - New attacks due to tunneling
- Security must be pervasive

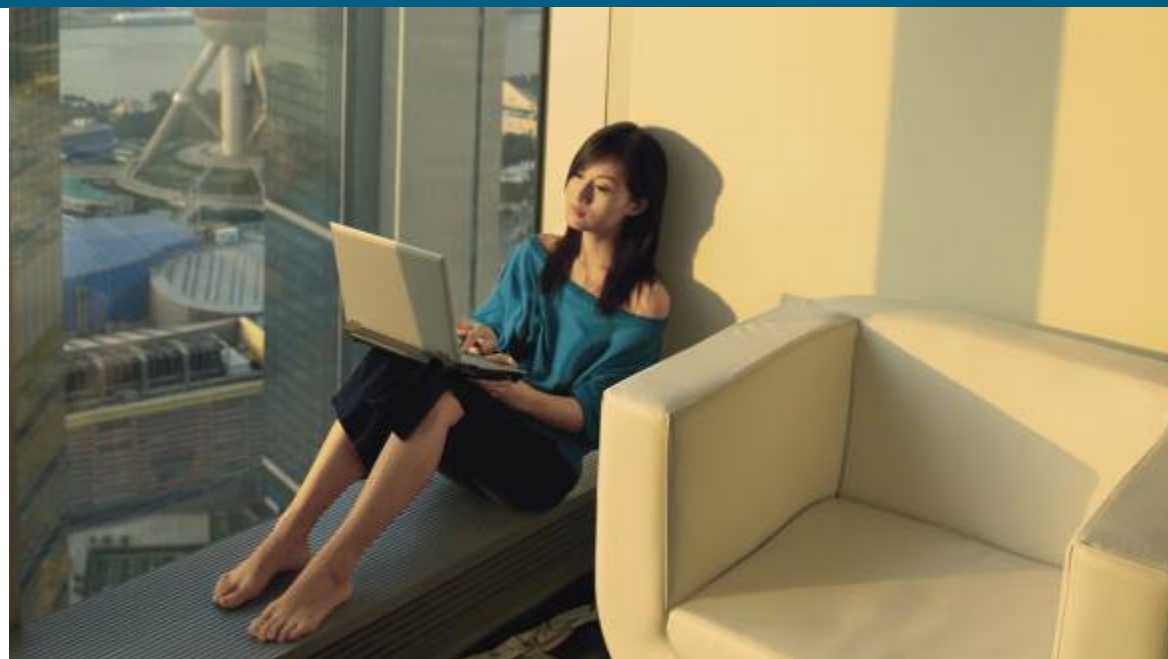
To Learn More...

- **Cisco IPv6 technology:** www.cisco.com/ipv6
- **Other agency's experiences integrating IPv6:** blogs.technet.com/ipv6
- **Cisco IOS Software for various Cisco switches and routers:**
www.cisco.com/en/US/products/sw/iosswrel/ps5187/products_configuration_guide_chapter09186a00801d65ed.html
- **Deploying IPv6 in campus networks:**
www.cisco.com/application/pdf/en/us/guest/netsol/ns107/c649/ccmigration_09186a00807753a6.pdf
- **Products that have received IPv6 Special Interoperability Certification:**
<http://jitc.fhu.disa.mil/apl/ipv6.html>
- **Certification activities:**
 - Joint Interoperability Test Command: <http://jitc.fhu.disa.mil/apl/ipv6.html>
 - National Institute of Standards and Technology IPv6 Profile Paper:
<http://www.antd.nist.gov/usgv6-v1-draft.pdf>
 - IPv6 Ready Logo Program: <http://www.ipv6ready.org/frames.html>
- **IPv6 in general**
 - <http://www.6diss.org/>
 - <http://go6.net/>
 - <http://www.ipv6forum.com/>
 - <http://www.ietf.org/html.charters/v6ops-charter.html>

Closing Thoughts...

- IPv6 Provides the foundation to radically change the way we communicate – “Internet 2.0”
- The best example in our time of Horizontal Integration in Enterprise Architectures, key to SOA transformation
- Creating geopolitical leverage, transforming all levels of Federal, State & Local government capabilities and services
- **Delivers innovation without limits!**

Q and A



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