



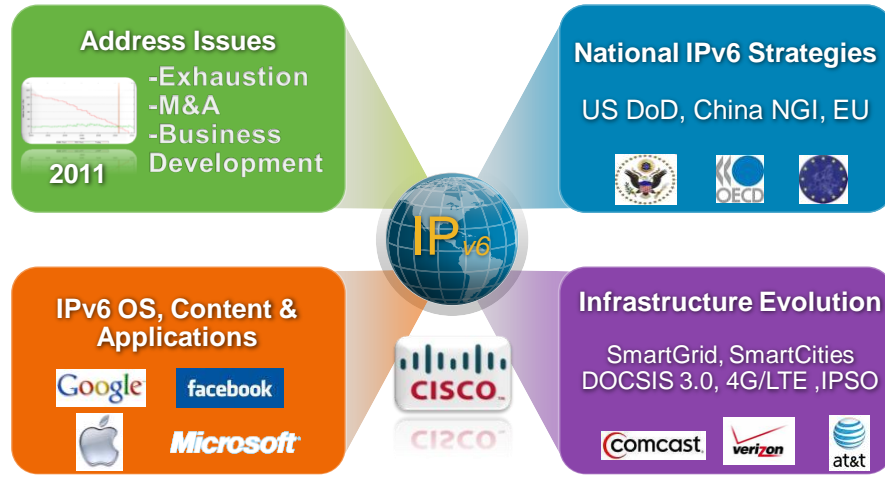
IPv6 Deployment in Enterprise Networks



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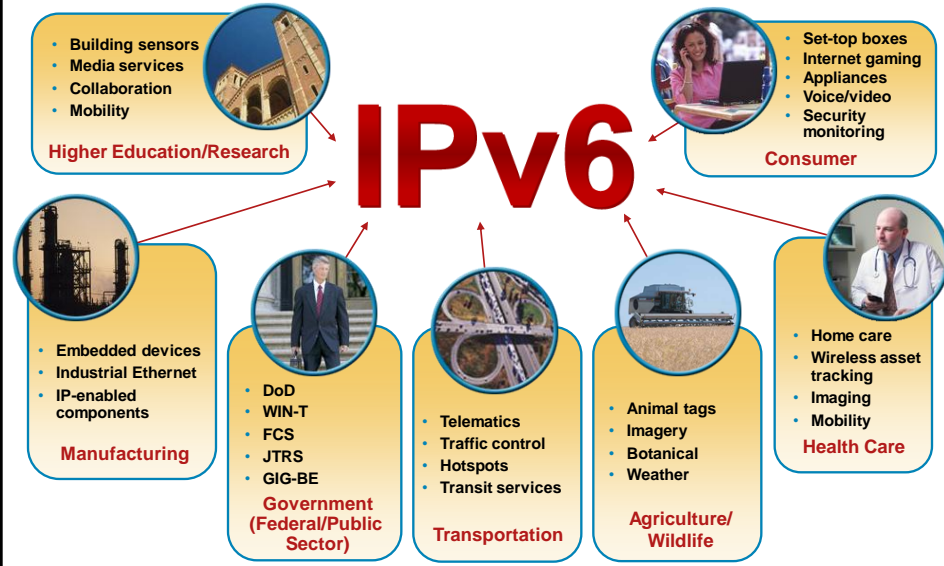


Market Factors Driving IPv6 Deployment



www.oecd.org: Measuring IPv6 adoption

IPv6 Provides Benefits Across the Board



Dramatic Increase in Enterprise Activity

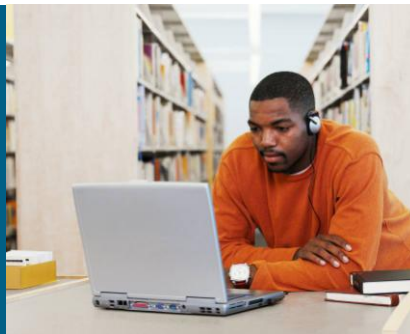
Why?

- Enterprise that is or will be expanding into emerging markets
- Enterprise that partners with other companies who may use IPv6 (larger enterprise, located in emerging markets, government, service providers)
- Adoption of Windows 7, Windows 2008, DirectAccess
- Frequent M&A activity
- Energy – High density IP-enabled endpoints (SmartGrid)

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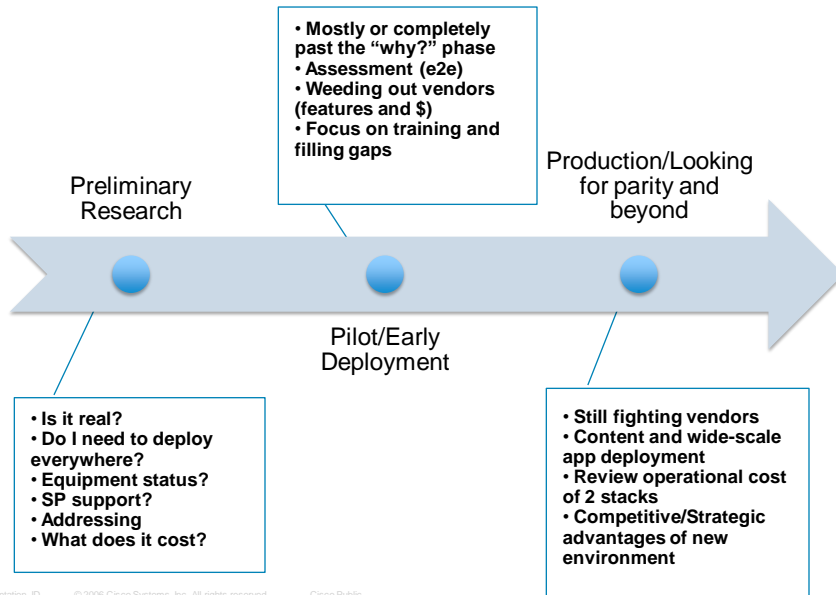
Planning & Deployment Summary



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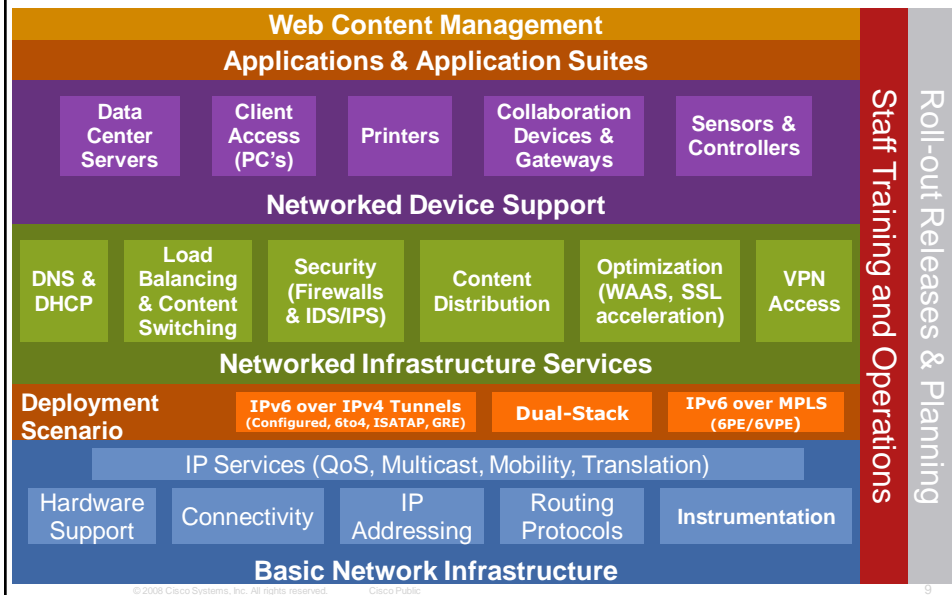
Enterprise Adoption Spectrum



IPv6 Integration Outline

Pre-Deployment Phases	Deployment Phases
<ul style="list-style-type: none"> • Establish the network starting point • Importance of a network assessment and available tools • Defining early IPv6 security guidelines and requirements • Additional IPv6 “pre-deployment” tasks needing consideration 	<ul style="list-style-type: none"> • Transport considerations for integration • Campus IPv6 integration options • WAN IPv6 integration options • Advanced IPv6 services options

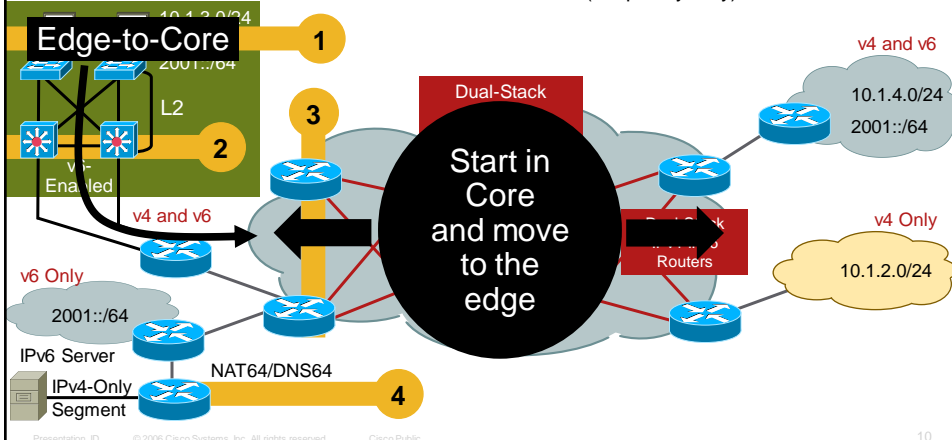
The Scope of IPv6 Deployment



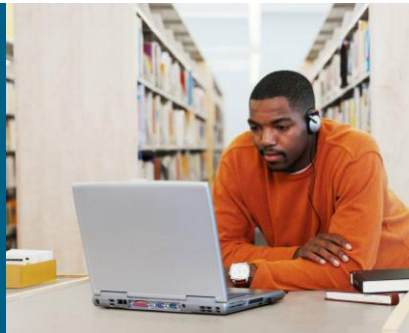
Integration/Coexistence Starting Points

Example: Integration Demarc/Start Points in Campus/WAN

- 1 Start dual-stack on hosts/OS
- 2 Start dual-stack in campus distribution layer (details follow)
- 3 Start dual-stack on the WAN/campus core/edge routers
- 4 NAT64 for servers/apps only capable of IPv4 (temporary only)



Infrastructure Deployment



Start Here: CiscoIOS Software Release Specifics for IPv6 Features
<http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-roadmap.html>

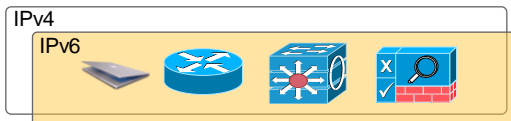
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IPv6 Co-existence Solutions

Dual Stack



Recommended Enterprise Co-existence strategy

Tunneling Services



Connect Islands of IPv6 or IPv4

Translation Services



Connect to the IPv6 community

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Campus/Data Center



Deploying IPv6 in Campus Networks:
<http://www.cisco.com/univercd/cc/td/doc/solution/campip6.pdf>

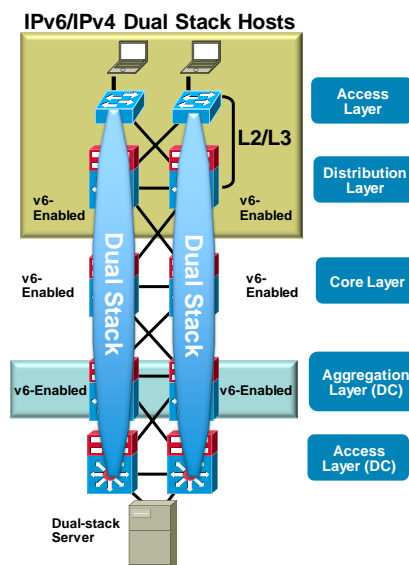
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Campus IPv6 Deployment Options

Dual-stack IPv4/IPv6

- #1 requirement - switching/routing platforms **must** support **hardware** based forwarding for IPv6
- IPv6 is transparent on L2 switches but...
 - L2 multicast - MLD snooping
 - IPv6 management — Telnet/SSH/HTTP/SNMP
- Expect to run the same IGPs as with IPv4
- Keep feature expectations simple



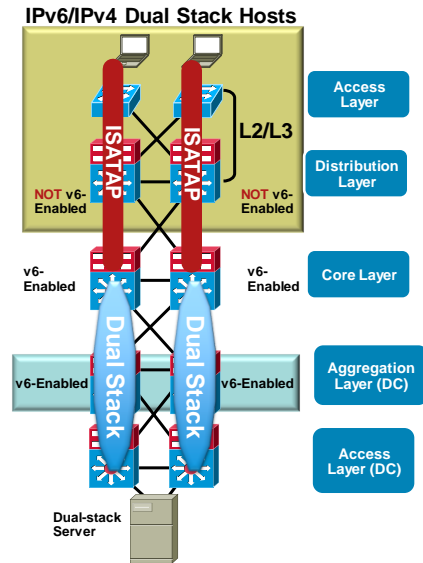
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Campus IPv6 Deployment Options

Hybrid Model

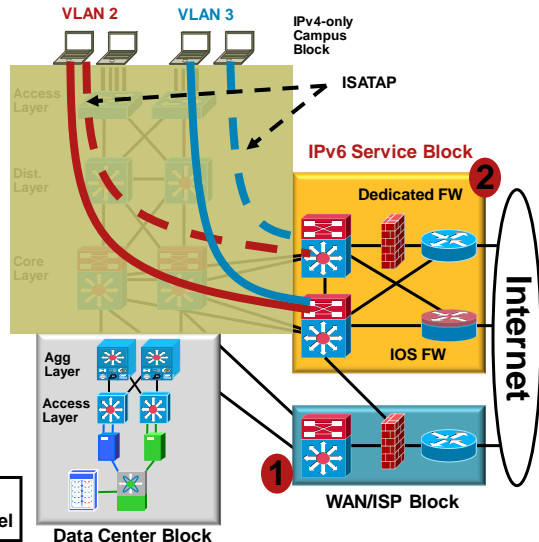
- Offers IPv6 connectivity via multiple options
 - Dual-stack
 - Configured tunnels – L3-to-L3
 - ISATAP – Host-to-L3
- Leverages **existing** network
- Offers natural progression to full dual-stack design
- May require tunneling to less-than-optimal layers (i.e. Core layer)
- Understand the limitations and operational issues with ISATAP
 - DNS-based assignment vs. static assignment
 - Non-congruent paths
 - Tunnel head-end availability
 - Limited OS support
- Provides basic HA of ISATAP tunnels via old Anycast-RP idea
- For better or worse, ISATAP is used a LOT in the enterprise



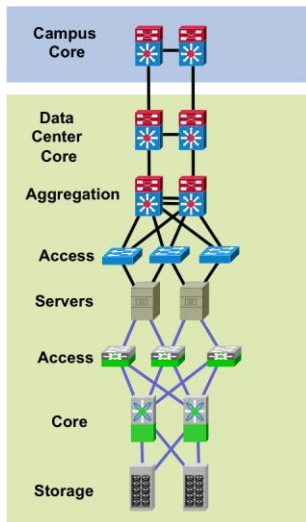
Campus IPv6 Deployment Options

IPv6 Service Block – An Interim Approach

- Provides ability to **rapidly deploy IPv6** services without touching existing network
- Provides **tight control of where IPv6 is deployed** and where the traffic flows (maintain separation of groups/locations)
- Offers the same advantages as Hybrid Model without the alteration to existing code/configurations
- Configurations are very similar to the Hybrid Model
 - ISATAP tunnels from PCs in Access layer to Service Block switches (instead of core layer – Hybrid)
- 1) Leverage existing ISP block for both IPv4 and IPv6 access
- 2) Use dedicated ISP connection just for IPv6 – Can use IOS FW or PIX/ASA appliance



IPv6 Data Center Integration



- Front-end design will be similar to campus based on feature, platform and connectivity similarities – Nexus, 6500 4900M
- The single most overlooked and potentially complicated area of IPv6 deployment
- IPv6 for SAN is supported in SAN-OS 3.0
- Stuff people don't think about:
 - NIC Teaming, iLO, DRAC, IP KVM, Clusters
 - Innocent looking Server OS upgrades – Windows Server 2008 - Impact on clusters – Microsoft Server 2008 Failover clusters full support IPv6 (and L3)
- Build an IPv6-only server farm?

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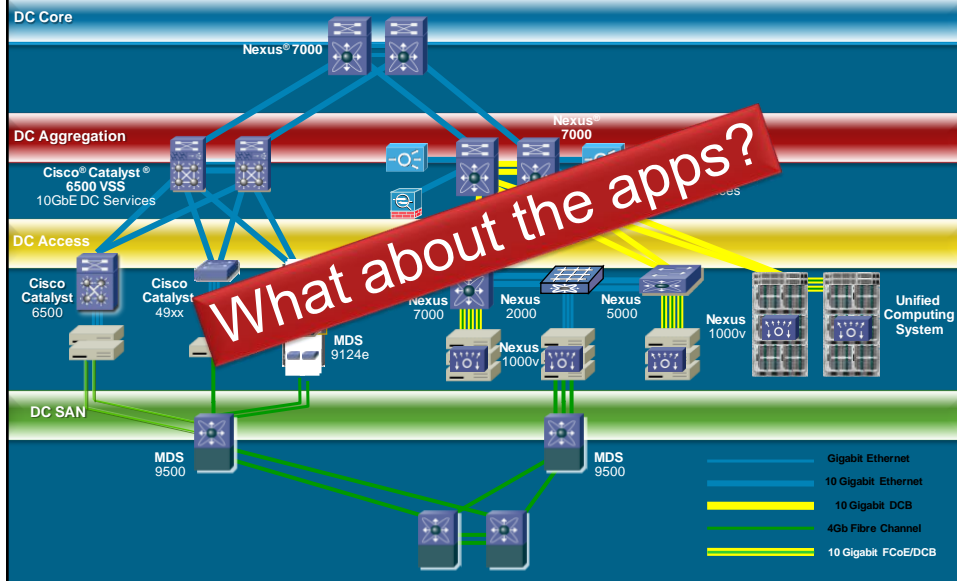
IPv6 in the Enterprise Data Center Biggest Challenges Today

- Network services above L3
 - SLB, SSL-Offload, application monitoring (probes)
 - Application Optimization
 - High-speed security inspection/perimeter protection
- Application support for IPv6 – Know what you don't know
 - If an application is protocol centric (IPv4):
 - Needs to be rewritten
 - Needs to be translated until it is replaced
 - Wait and pressure vendors to move to protocol agnostic framework
- Virtualized and Consolidated Data Centers
 - Virtualization *'should'* make DCs simpler and more flexible
 - Lack of robust DC/Application management is often the root cause of all evil
 - Ensure management systems support IPv6 as well as the devices being managed

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Virtualized DC Solutions



Commonly Deployed IPv6-enabled OS/Apps

Operating Systems

- Windows 7
- Windows Server 2008/R2
- SUSE
- Red Hat
- Ubuntu
- The list goes on

Virtualization & Applications

- VMware vSphere 4.1
- Microsoft Hyper-V
- Microsoft Exchange 2007 SP1/2010
- Apache/IIS Web Services
- Windows Media Services
- Multiple Line of Business apps

**Most commercial applications won't be your problem
– it will be the custom/home-grown apps**

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WAN/Branch/ Remote Access



Deploying IPv6 in Branch Networks:
<http://www.cisco.com/univercd/cc/td/doc/solution/brchipv6.pdf>

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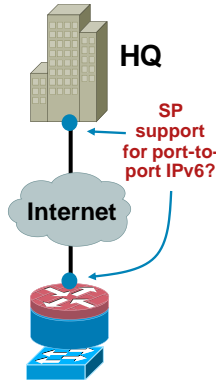
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IPv6 Enabled Branch

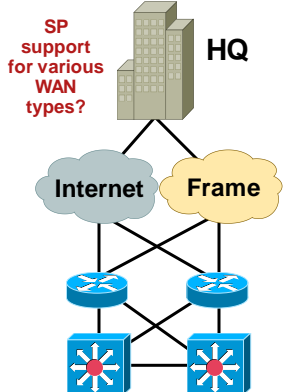
Focus more on the provider and less on the gear

Branch Single Tier



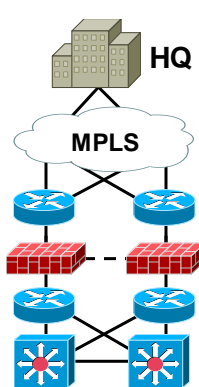
Dual-Stack
 IPSec VPN (IPv4/IPv6)
 Firewall (IPv4/IPv6)
 Integrated Switch
 (MLD-snooping)

Branch Dual Tier



Dual-Stack
 IPSec VPN or Frame Relay
 Firewall (IPv4/IPv6)
 Switches (MLD-snooping)

Branch Multi-Tier



Dual-Stack
 IPSec VPN or
 MPLS (6PE/6VPE)
 Firewall (IPv4/IPv6)
 Switches (MLD-snooping)

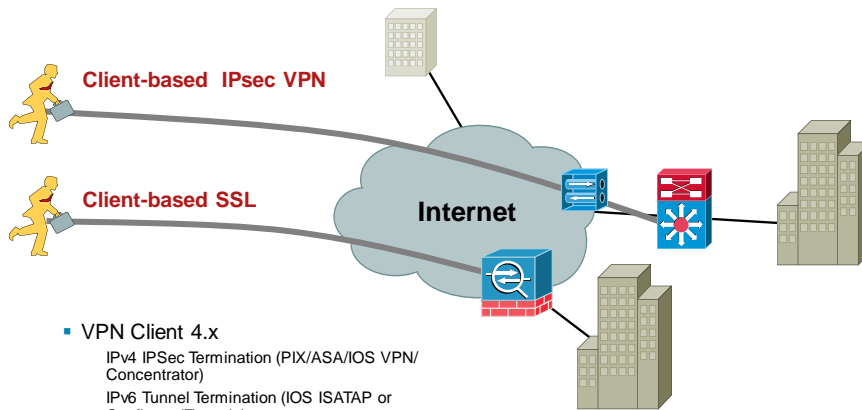
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IPv6 Remote Access Options

Don't leave this until the end



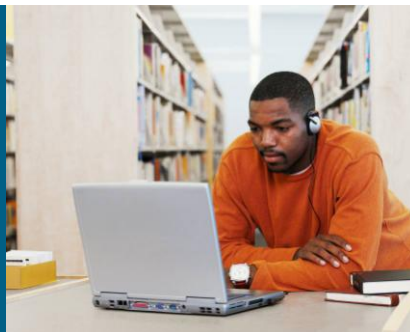
- VPN Client 4.x
 - IPv4 IPsec Termination (PIX/ASA/IOS VPN/ Concentrator)
 - IPv6 Tunnel Termination (IOS ISATAP or ConfiguredTunnels)
- AnyConnect Client 2.x
 - SSL/TLS or DTLS (datagram TLS = TLS over UDP)
 - Tunnel transports both IPv4 and IPv6 and the packets exit the tunnel at the hub ASA as native IPv4 and IPv6.

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Cisco/PIX/IOS

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Provider Considerations

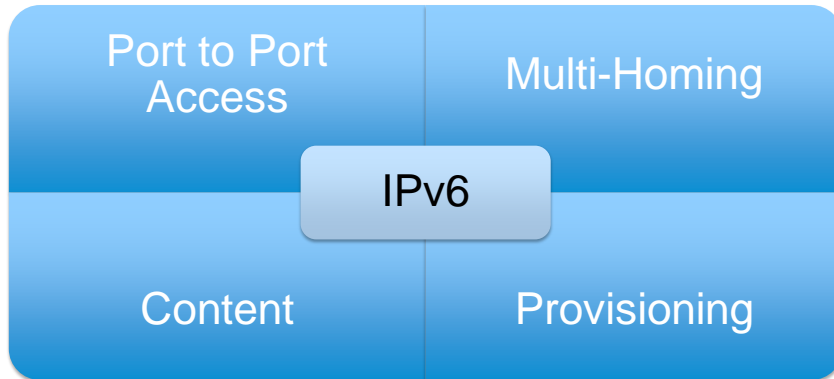


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Top SP Concerns for Enterprise Accounts



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Port-to-Port Access



Basic Internet *

- Dual-stack or native IPv6 at each POP
- SLA driven just like IPv4 to support VPN, content access

MPLS

- 6VPE
- IPv6 Multicast
- End-to-End traceability

Hosted (see content)

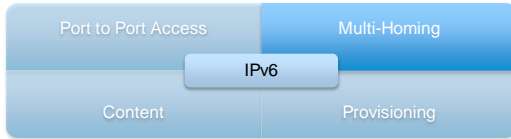
- IPv6 access to hosted content
- Cloud migration (move data from Ent DC to Hosted DC)

* = most common issue

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Multi-Homing



PI/PA Policy Concerns *

- PA is no good for customers with multiple providers or change them at any pace
- PI is new, constantly changing expectations and no "guarantee" an SP won't do something stupid like not route PI space
- Customers fear that RIR will review existing IPv4 space and want it back if they get IPv6 PI

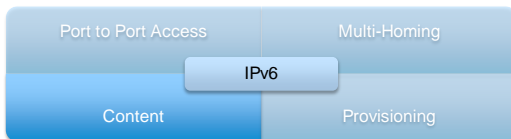
NAT

- Religious debate about the security exposure – not a multi-homing issue
- If customer uses NAT like they do today to prevent address/policy exposure, where do they get the technology from – no scalable IPv6 NAT exists today

Routing

- Is it really different from what we do today with IPv4? Is this policy stuff?
- Guidance on prefixes per peering point, per theater, per ISP, ingress/egress rules, etc.. – this is largely missing today

Content



Hosted/Cloud Apps today *

- IPv6 provisioning and access to hosted or cloud-based services today (existing agreements)
- Salesforce.com, Microsoft BPOS (Business Productivity Online Services), Amazon, Google Apps

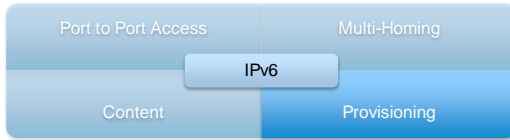
Move to Hosted/Cloud

- Movement from internal-only DC services to hosted/cloud-based DC
- Provisioning, data/network migration services, DR/HA

Contract/Managed Marketing/Portals

- Third-party marketing, business development, outsourcing
- Existing contracts – connect over IPv6

Provisioning



SP Self-Service Portals

- Not a lot of information from accounts on this but it does concern them
- How can they provision their own services (i.e. cloud) to include IPv6 services and do it over IPv6

SLA *

- More of a management topic but the point here is that customers want the ability to alter their services based on violations, expiration or restrictions on the SLA
- Again, how can they do this over IPv6 AND for IPv6 services

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Cisco's Strategy



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John on Cisco IPv6 Strategy

- Google's 2010 IPv6 developers conference



"...if we don't overcome the challenges of IPv4 (...) we will slow down the growth of the Internet and lose momentum as an industry"

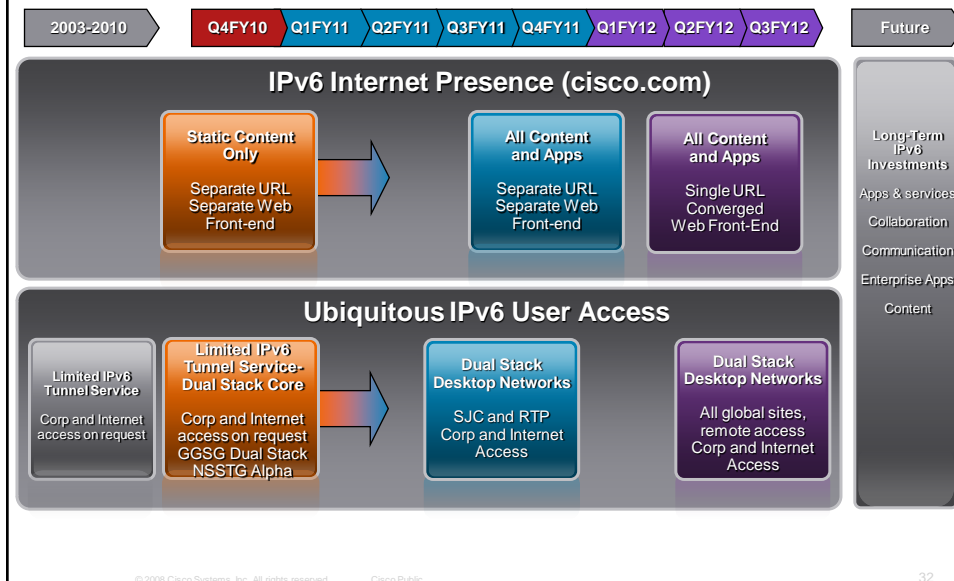
"IPv6 is important to all of us (...) to everyone around the world, it is crucial to our ability to tie together everyone and every device."

"At Cisco we are committed architecturally to IPv6 across the board: All of our devices, all of our applications and all of our services".

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Cisco IT's IPv6 Strategy



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Recommended Reading



Deploying IPv6 in Broadband Networks - Adeel Ahmed, Salman Asadullah | ISBN 0470193387, John Wiley & Sons Publications®

Coming Soon!!

Conclusion

- “Dual stack where you can – Tunnel where you must”
- Create a virtual team of IT representatives from every area of IT to ensure coverage for OS, Apps, Network and Operations/Management
- Microsoft Windows Vista, 7 and Server 2008 will have IPv6 enabled by default—understand what impact any OS has on the network
- Deploy it – Lab > Pilot > Production
- Perform a detailed assessment of what you have (network, apps, management, etc...)

You must know what you do not know

Identify gaps – relentlessly pursue filling them (you won't fill them all)

Time IPv6 deployment along with or at the end of a refresh cycle (cheap-to-free)



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