

# IPv6 Enterprise Deployment



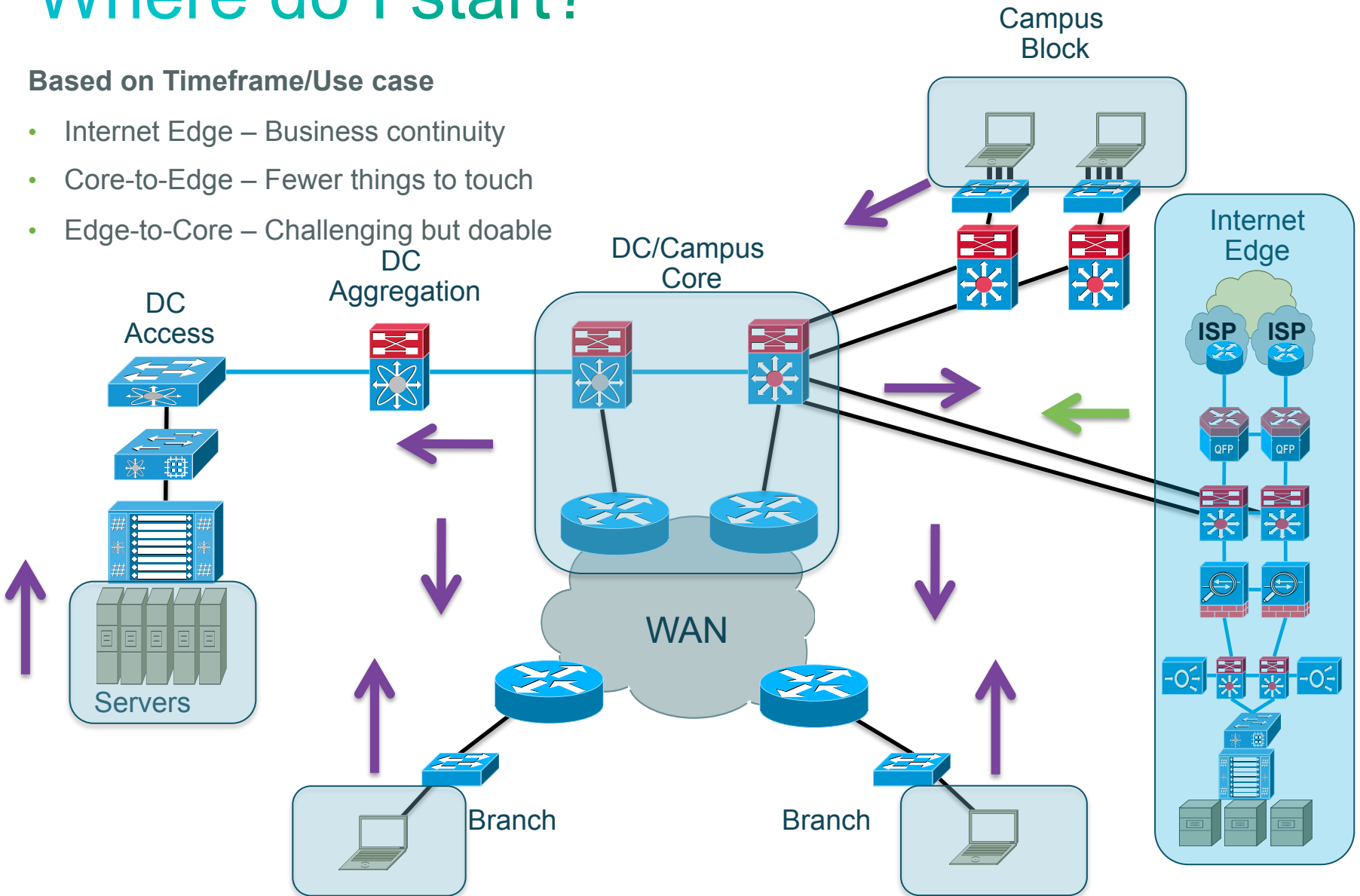
# IPv6 integration



# Where do I start?

## Based on Timeframe/Use case

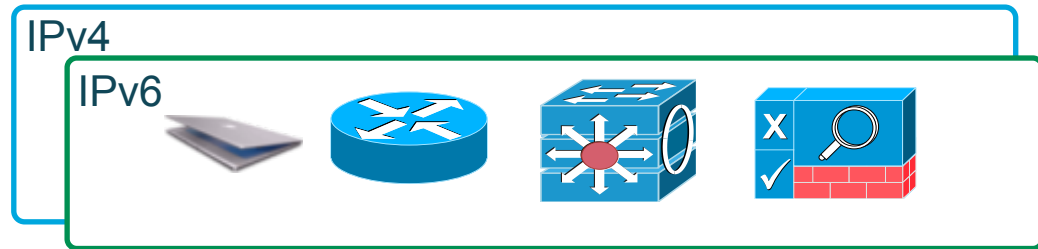
- Internet Edge – Business continuity
- Core-to-Edge – Fewer things to touch
- Edge-to-Core – Challenging but doable



# IPv6 Co-existence Solutions

## Dual Stack

**Recommended Enterprise  
Co-existence strategy**

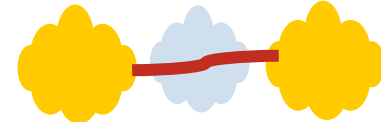


## Tunneling Services

Connect Islands of IPv6 or  
IPv4



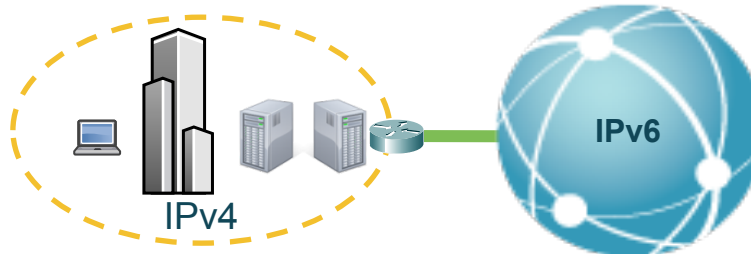
IPv4 over IPv6



IPv6 over IPv4

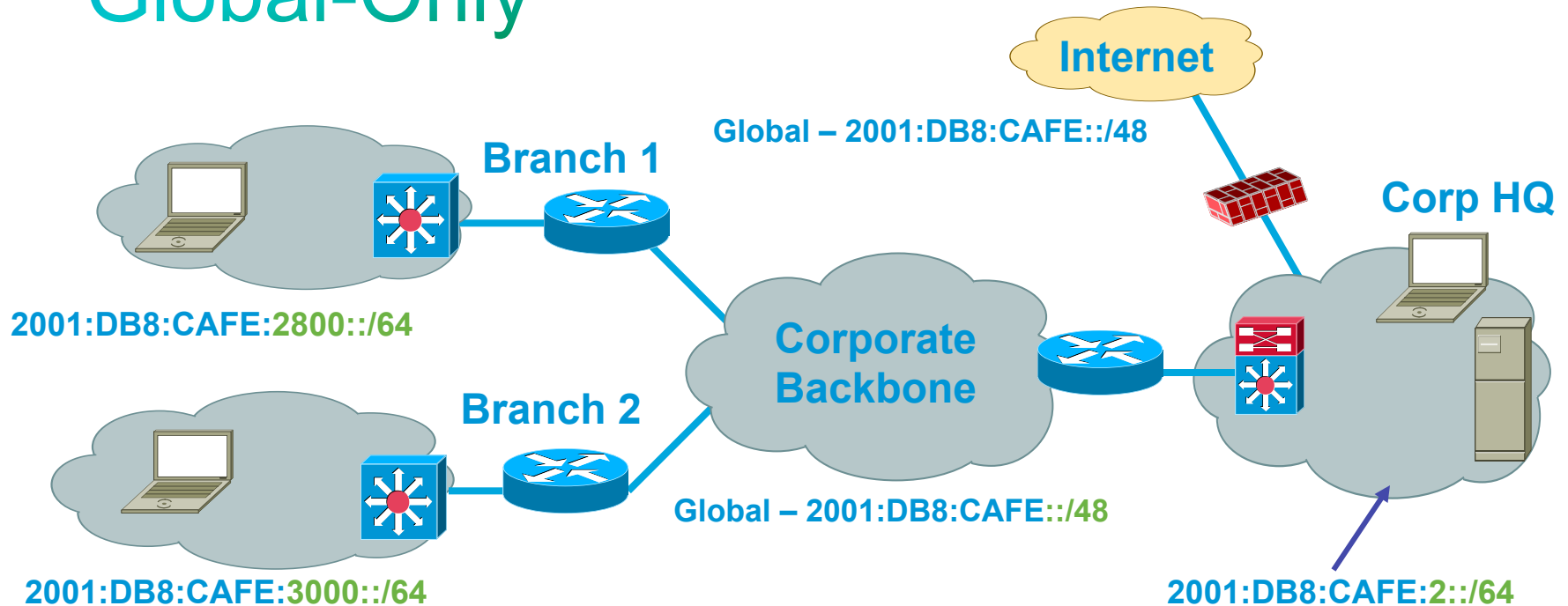
## Translation Services (NAT)

Connect to the IPv6  
community



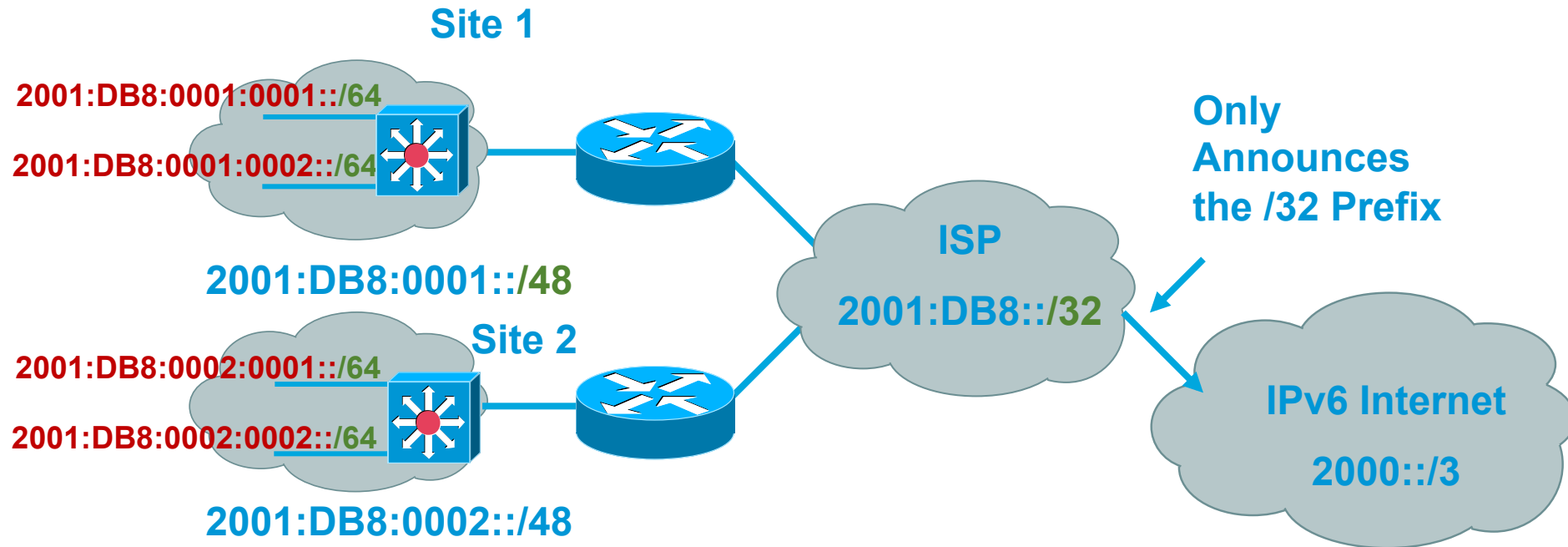
Business Partners  
Government Agencies  
International Sites  
Remote Workers  
Internet consumers

# Global-Only



- Global is used everywhere
- No issues with SAS
- No requirements to have NAT for ULA-to-Global translation—but, NAT may be used for other purposes
- Easier management of DHCP, DNS, security, etc.
- Your heartburn comes from the security team – topology hiding

# Hierarchical Addressing and Aggregation



- Use only **/64** as a subnet assignment.
- For loopback still **/128** is recommended

# Internet Edge/Campus/WAN

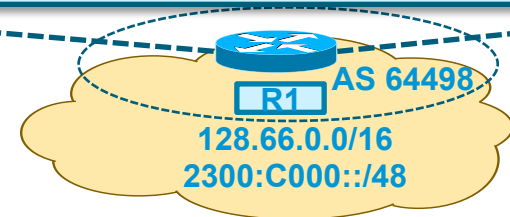


# Common Deployment Scenario

## AF Neighbor Activation

- Configure Neighbors under BGP <ASN> process
- We **Activate** and Configure Policies for each Neighbor under each respective Address Family

```
R1# show run | section bgp
router bgp 64498
  no bgp default ipv4-unicast
  neighbor 10.0.0.1 remote-as 64499
  neighbor 10.0.0.1 description IPv4_PEER_ISP_A
  neighbor 2100:A000:1:1::1 remote-as 64499
  neighbor 2100:A000:1:1::1 description IPv6_PEER_ISP_A
!
address-family ipv4
  neighbor 10.0.0.1 activate
exit-address-family
!
address-family ipv6
  neighbor 2100:A000:1:1::1 activate
exit-address-family
```





# Dual-Stack: Main concern is IPv6 sec

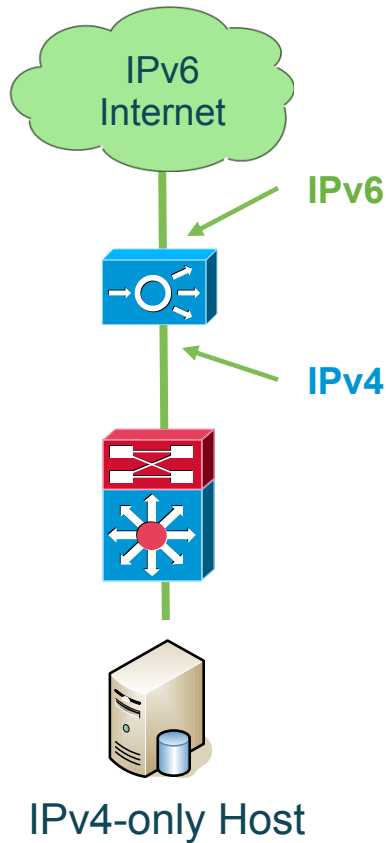
- **ASA Firewall**    **Recommended**
  - Since version 7.0 (released 2005)
  - Flexibility: Dual stack, IPv6 only, IPv4 only
  - SSL VPN for IPv6 (ASA 8.0)
  - Stateful-Failover (ASA 8.2.2)
- FWSM
  - IPv6 in software... 80 Mbps ... Not an option
  - Next firewall Service Module supports IPv6
- IOS Firewall
  - IOS 12.3(7)T (released 2005)
  - Zone-based firewall on IOS-XE 3.6 (CY 2012)
- IPS
  - Since 6.2 (released 2008), management over IPv6: Q1 2012
- Email Security Appliance (ESA)
- Web Security Appliance (WSA) CY 2012

# ASA Firewall IPv6 Support

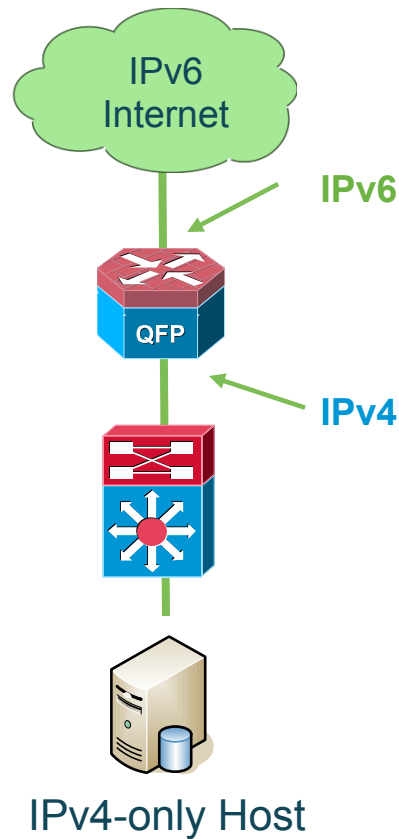
- Since version 7.0 (April 2005)
- Dual-stack, IPv6 only, IPv4 only
- Extended IP ACL with stateful inspection
- Application awareness
  - HTTP, FTP, telnet, SMTP, TCP, SSH, UDP
- uRPF and v6 Frag guard
- IPv6 header security checks
  - Always block routing-header (type 0 and 2)
- Management access via IPv6
  - Telnet, SSH, HTTPS
- ASDM support (ASA 8.2)
- Routed & transparent mode (ASA 8.2)
- Fail-over support (ASA 8.2.2)
- **Caveats:**
  - Cannot block specific extension headers**

# What if I Can't Dual Stack My Inet Edge?

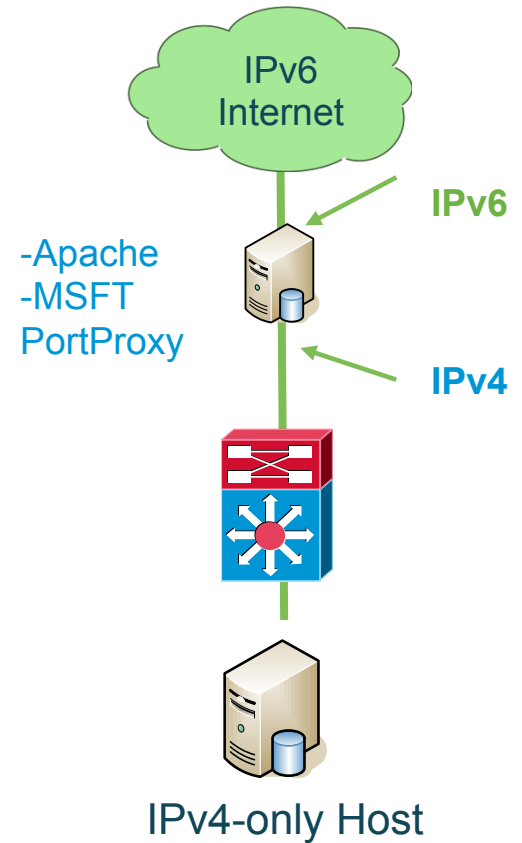
## Server Load Balancer



## Stateful NAT64



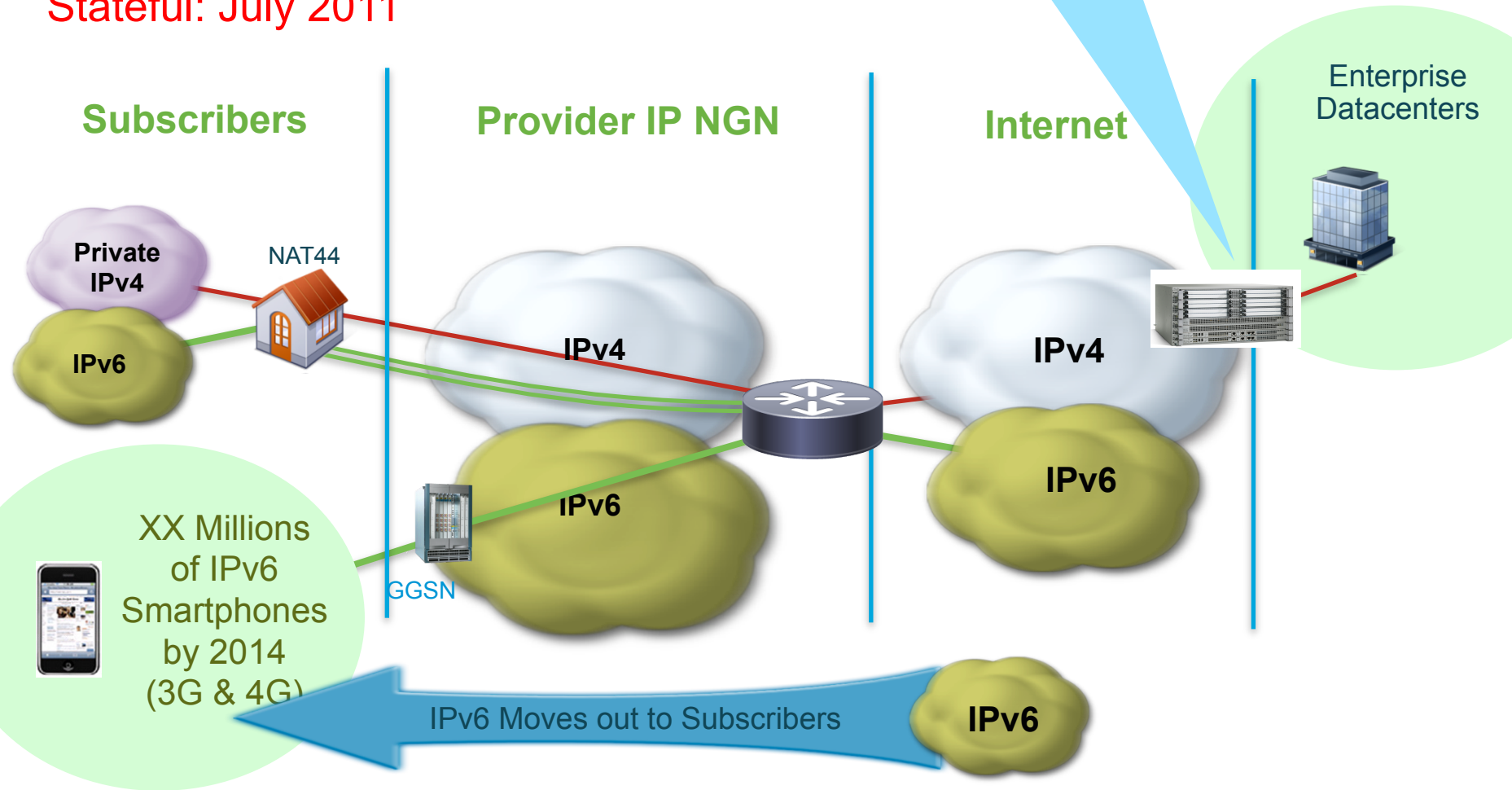
## Proxy



# Providing Content to IPv6-only Clients Using ASR1000

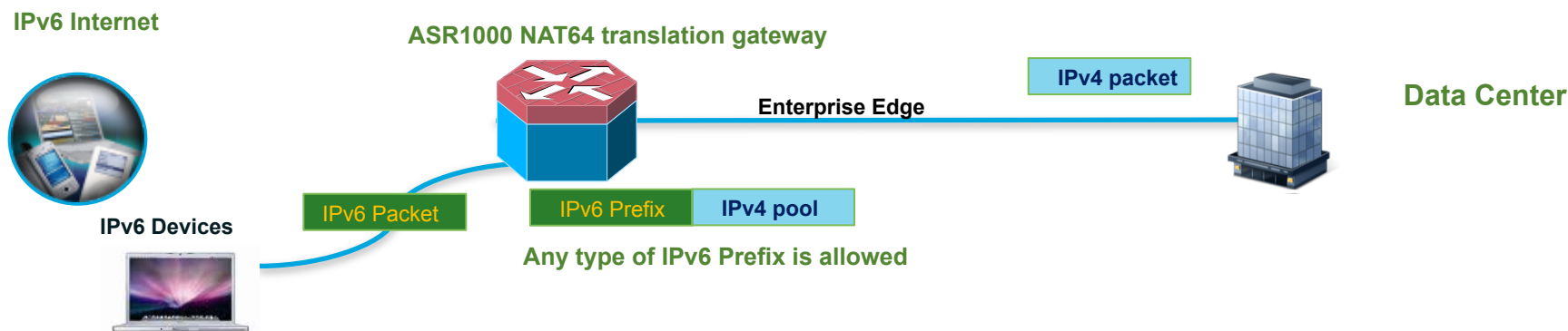
Stateless: Available

Stateful: July 2011



# NAT64 on ASR1000 – scale numbers

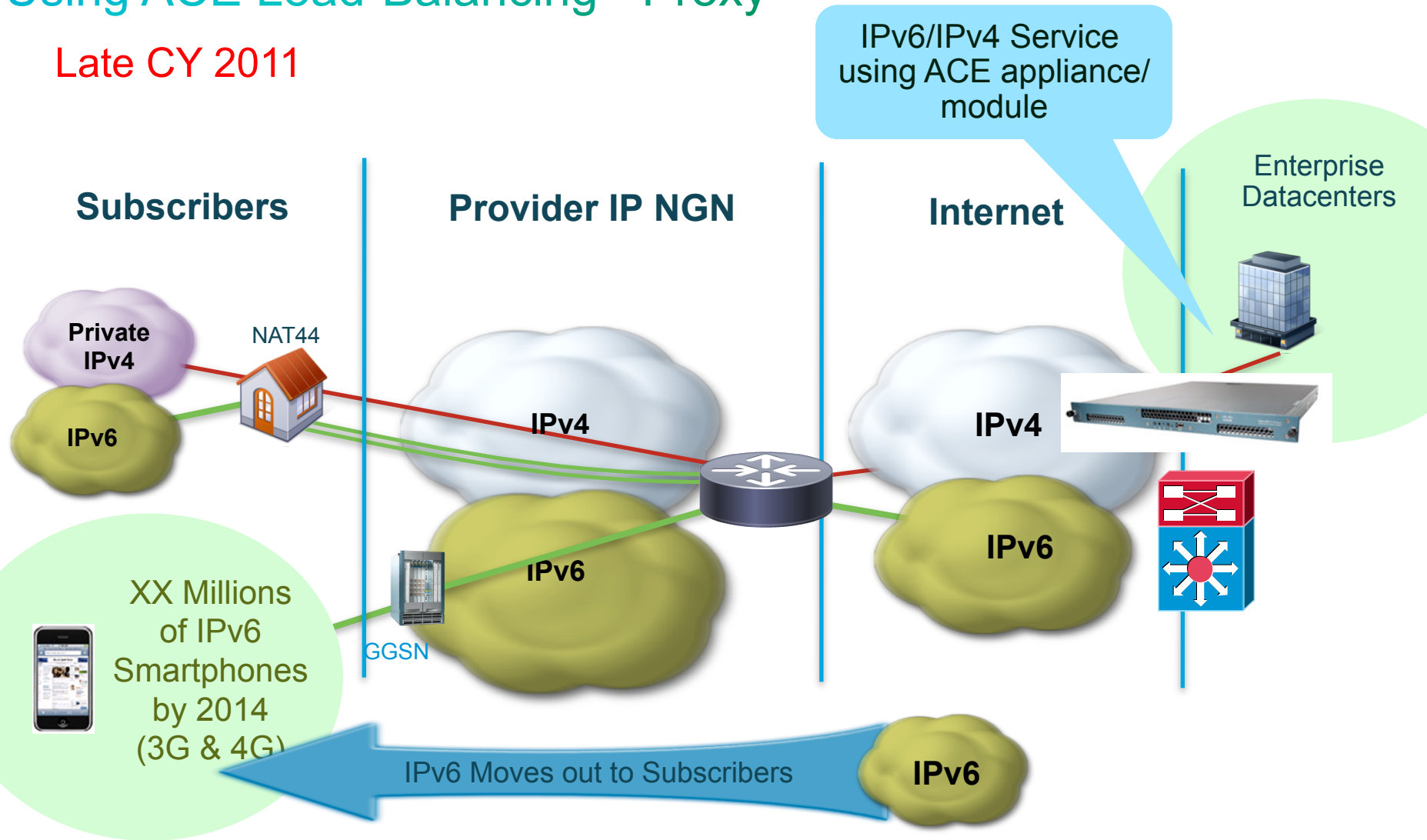
- Expected Scale: **1.3 Million Stateful NAT** Translations with HA enabled
- Expected Performance: **78K Translations per Second** with HA enabled, with integrated IP Services
- IPv6 adoption: Allows connectivity between IPv6 internet and IPv4 network
- Position on Internet Edge with Stateful NAT64 functionality or as dedicated translation device



# Providing Content to IPv6-only Clients

## Using ACE Load-Balancing - Proxy

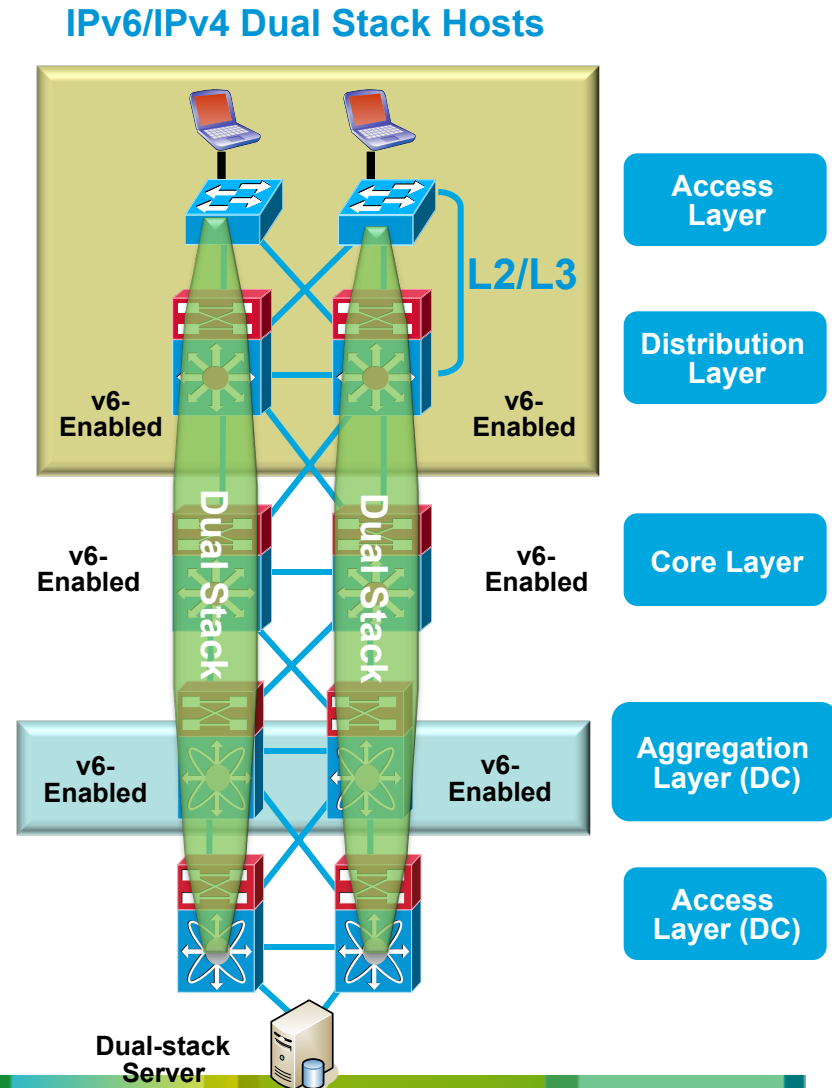
Late CY 2011



# Campus IPv6 Deployment Options

## Dual-Stack IPv4/IPv6

- Dual Stack = Two protocols running at the same time (IPv4/IPv6)
- #1 requirement—switching/ routing platforms **must support hardware based forwarding** for IPv6
  - 3560/3750 +
  - 4500 Sup6E +
  - 6500 Sup32/720 +
- IPv6 is transparent on L2 switches but consider:
  - L2 multicast—MLD snooping
  - IPv6 management—Telnet/SSH/HTTP/SNMP
  - Intelligent IP services on WLAN
- Expect to run the same IGP as with IPv4

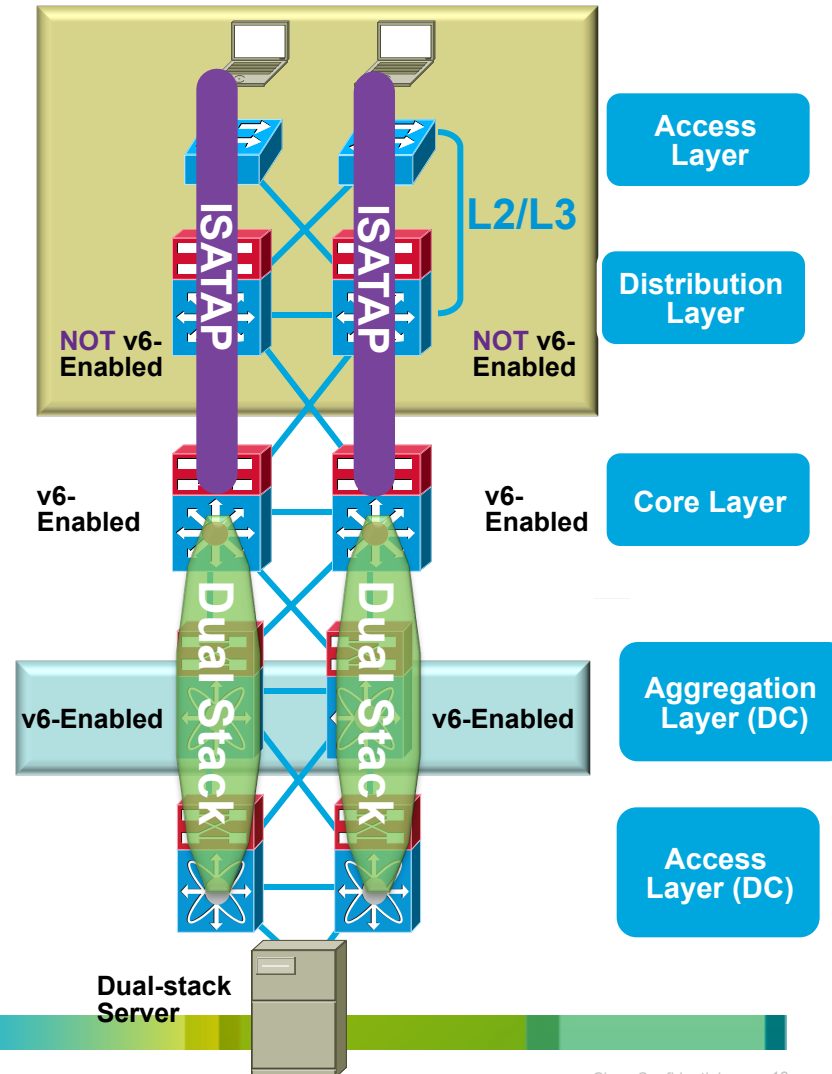


# Campus IPv6 Deployment Options

## Hybrid Model

- Plan “B” if Layer 3 device can’t support IPv6 but you have to get IPv6 over it
- 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)
- Any sizable deployment will be an operational management challenge
- ISATAP creates a flat network (all hosts on same tunnel are peers)
- Provides basic HA of ISATAP tunnels via old Anycast-RP idea

### IPv6/IPv4 Dual Stack Hosts

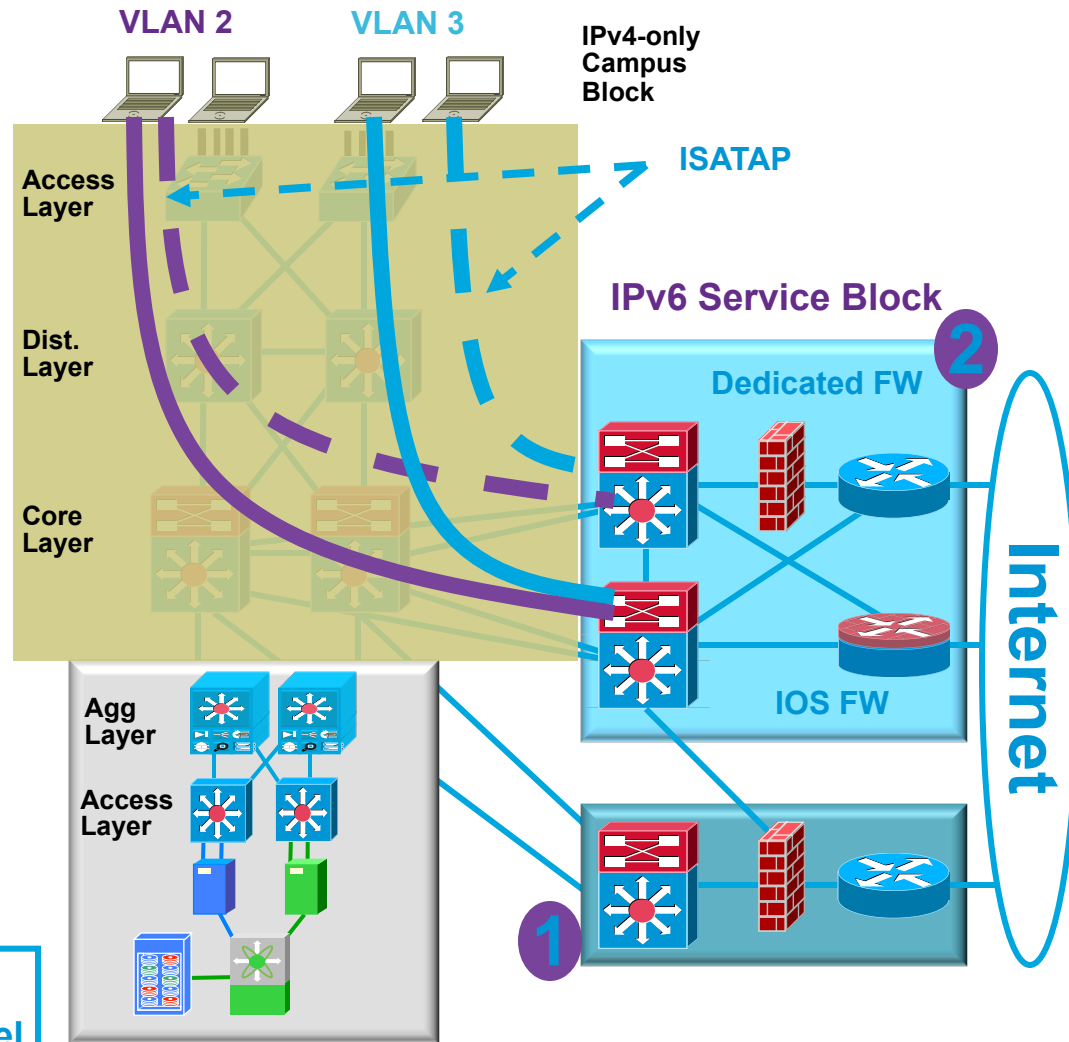




# Campus IPv6 Deployment Options

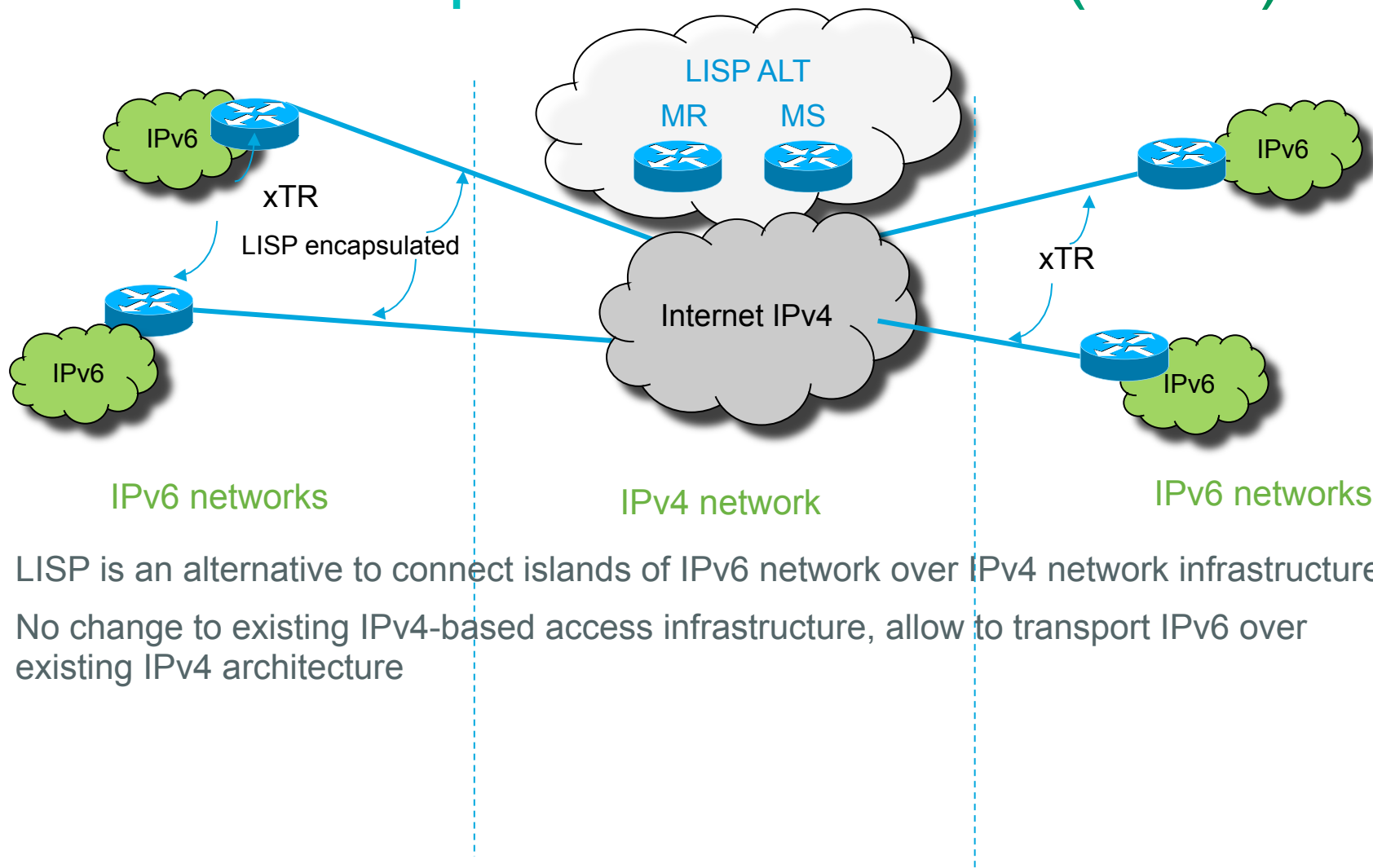
## IPv6 Service Block—Rapid Deployment/Pilot

- 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)
- Get lots of operational experience with limited impact to existing environment**
- Similar challenges as Hybrid Model – Lots of tunneling**
- 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



**Primary ISATAP Tunnel**  
**Secondary ISATAP Tunnel**

# Locator/ID Separation Protocol (LISP)



- LISP is an alternative to connect islands of IPv6 network over IPv4 network infrastructure
- No change to existing IPv4-based access infrastructure, allow to transport IPv6 over existing IPv4 architecture

# My favorite routing architecture - LISP

## IPv6 Migration Support

### Needs:

- Rapid IPv6 Deployment
- Minimal Infrastructure disruption

### LISP Solution:

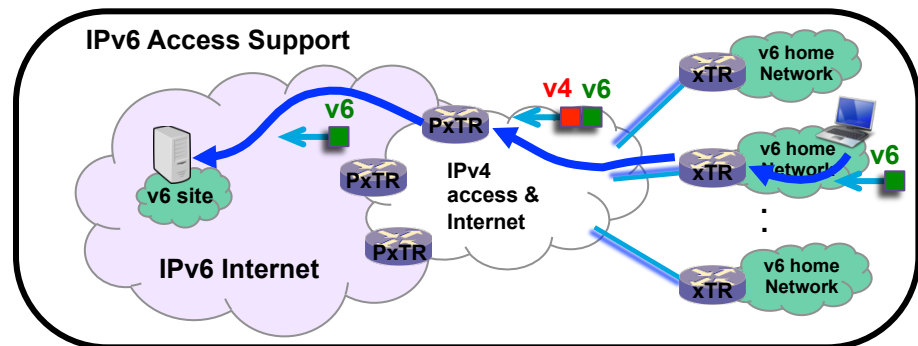
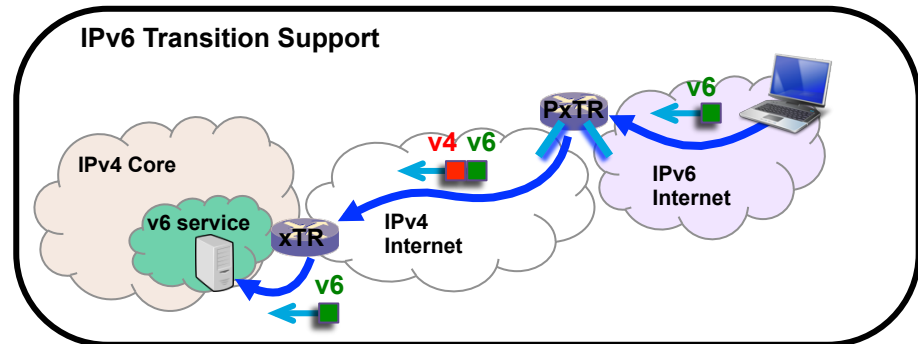
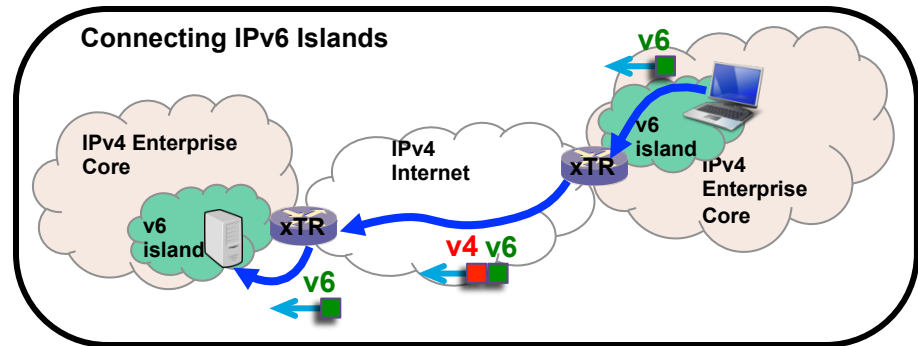
- LISP encapsulation is Address Family agnostic

IPv6 interconnected over IPv4 core

IPv4 interconnected over IPv6 core

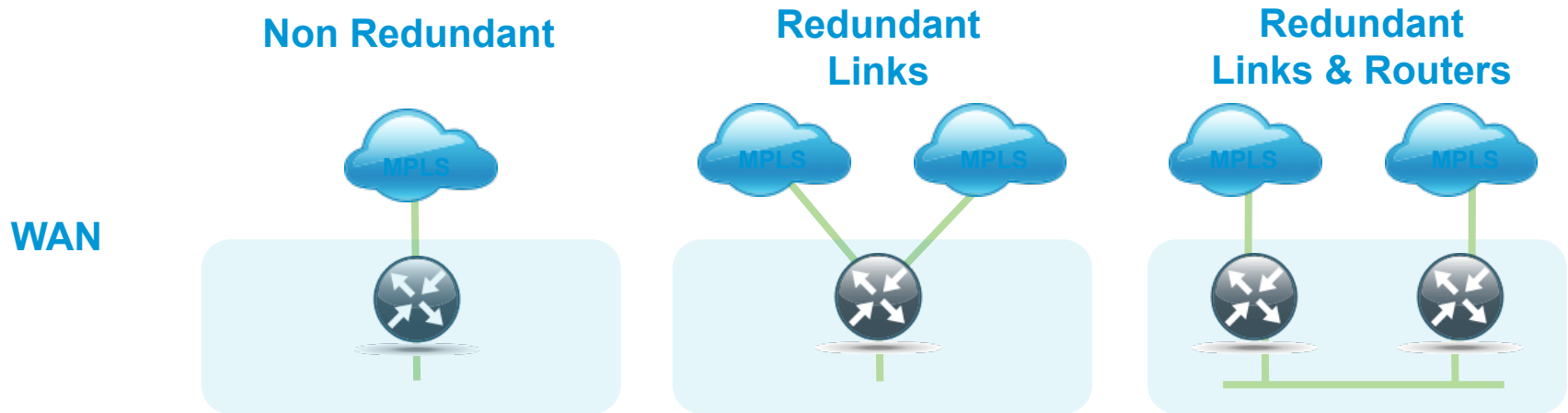
### Benefits:

- Accelerated IPv6 adoption
- Minimal added configurations
- No core network changes
- Can be used as a transitional or permanent solution



# IPv6 Enabled Branch

## Take Your Pick—Mix-and-Match



- **Recommended** Dual-Stack if native IPv6 – Tunnels otherwise
- Site to site Encryption: IPSec VPN (IPv4/IPv6), DMVPN for IPv6
- Security: IOS Firewall (IPv4/IPv6)
- Unified Communications – IPv4/IPv6
- QoS: application or service-dependent instead of protocol (IPv4 or IPv6) dependent.
- Application Performance Visibility: Flexible Netflow, NBAR2, IP SLA, Performance Monitoring, ...

# Conclusion



# You can do it!

- **In 2011 You will need IPv6 is you are using Internet for business!**
- Plan it early
- Team-up with server, telephony and etc. IT departments
- Play with IPv6 in lab environment first

Thank you.

