

# Strategies for Getting Started with IPv6

IPv6 Transition Acceleration Options for  
Web Applications and Services

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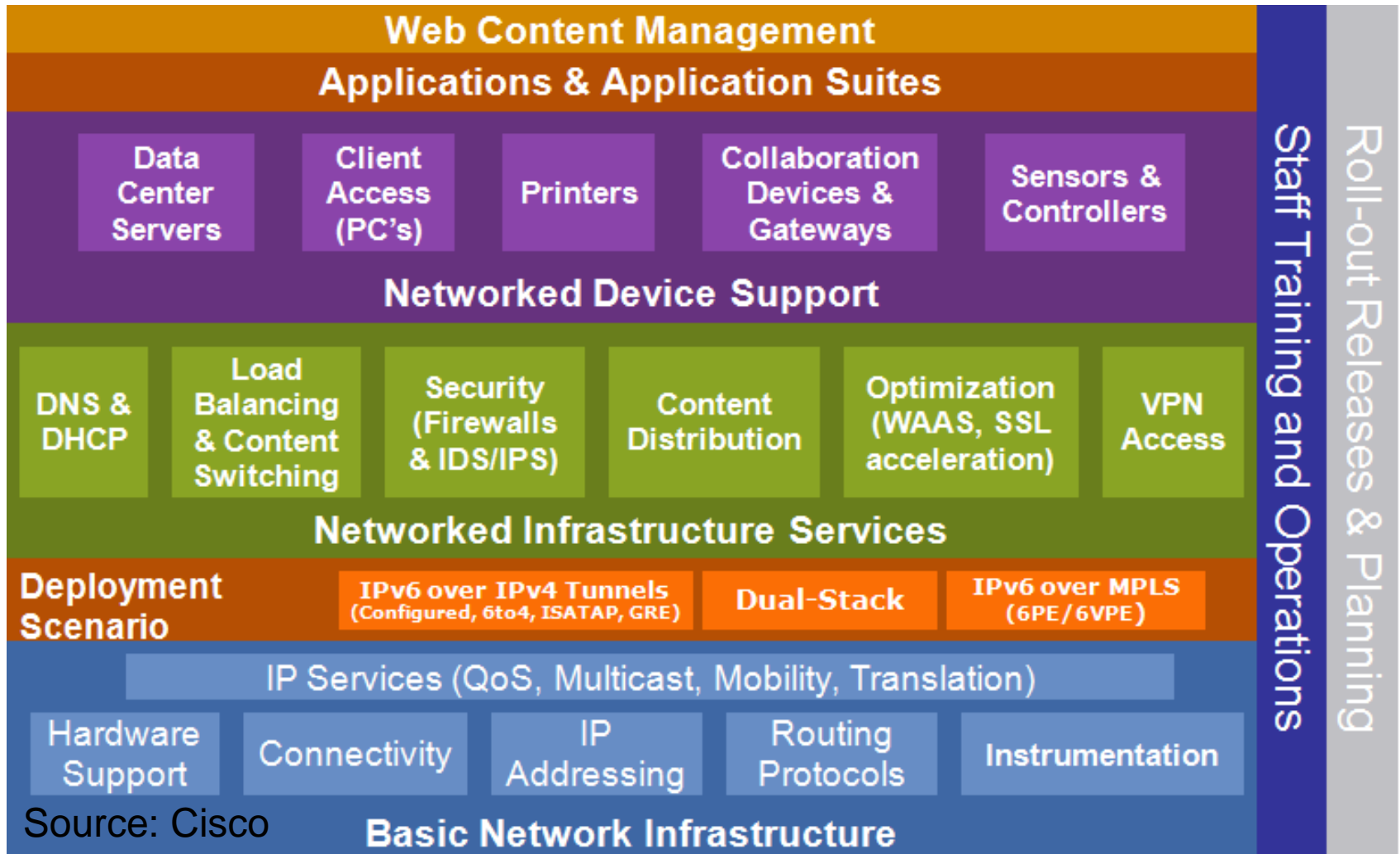
CCIE #5133, CISSP #4610

# IPv6 Transition Planning

- Many are confused about how to start planning for IPv6.
- Many organizations start by creating an inventory of everything they have that uses an IP address and determine IPv6 capability.
- Then they create a transition plan that includes:
  - Training program
  - Cost of equipment upgrades, lab, and all costs (Capex, Opex) related to IPv6 migration
  - Project plan for the migration
  - Test plan for IPv6 compatibility/interoperability
  - Technical plan for deployment



## The Scope of IPv6 Deployment?



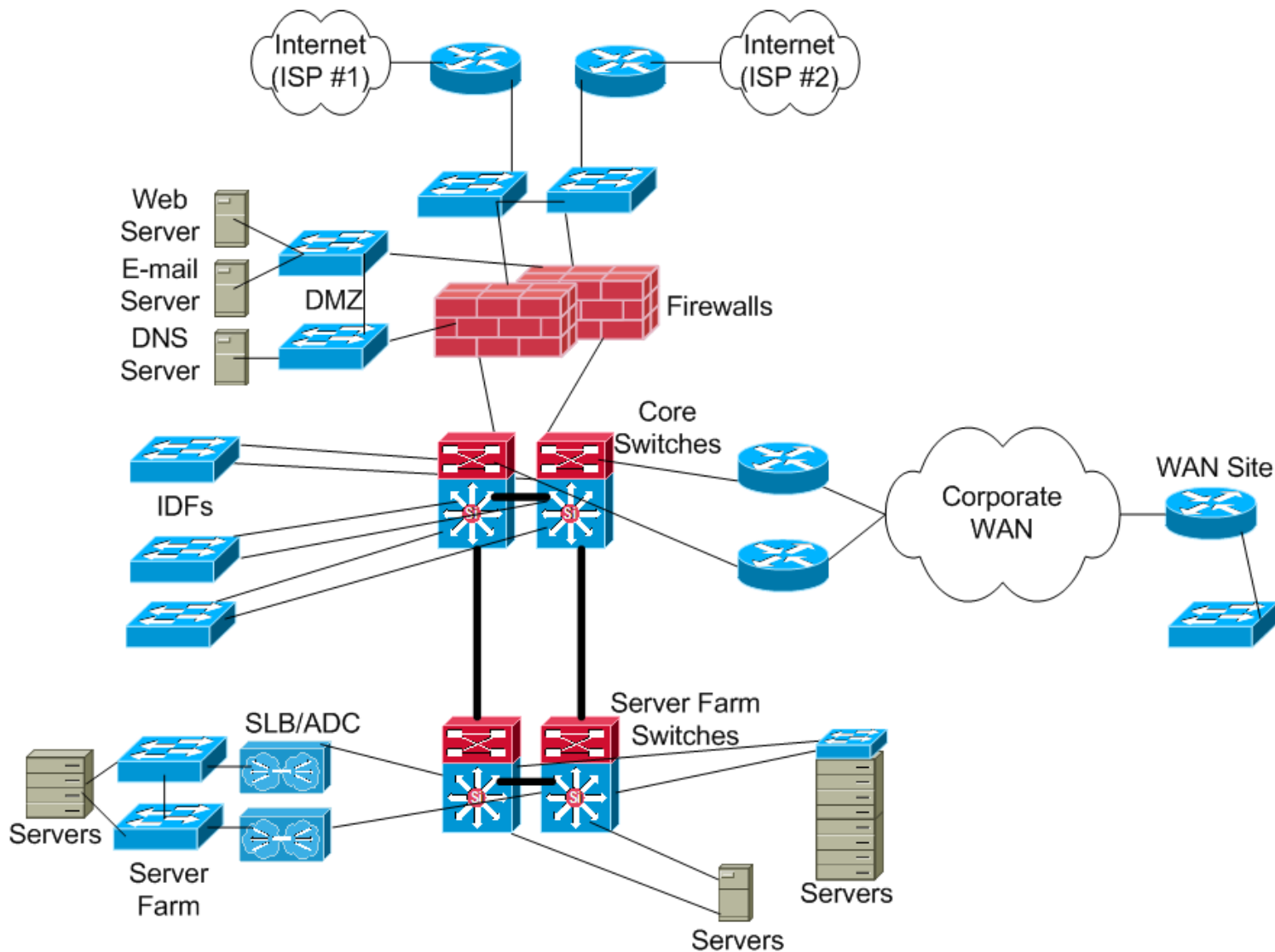
# Practical Transition to IPv6

- IPv6 has had time to “mature” and now it comes standard in many products.
- Much of the network infrastructure, operating systems and applications we own already contain IPv6 capabilities.
- DNS Servers and most of the Internet root name servers now support IPv6.
- Internet Service Providers now offer IPv6 Internet connectivity options.
- Routers, firewalls, and other systems already have robust IPv6 functionality.

# Internet Edge Deployment

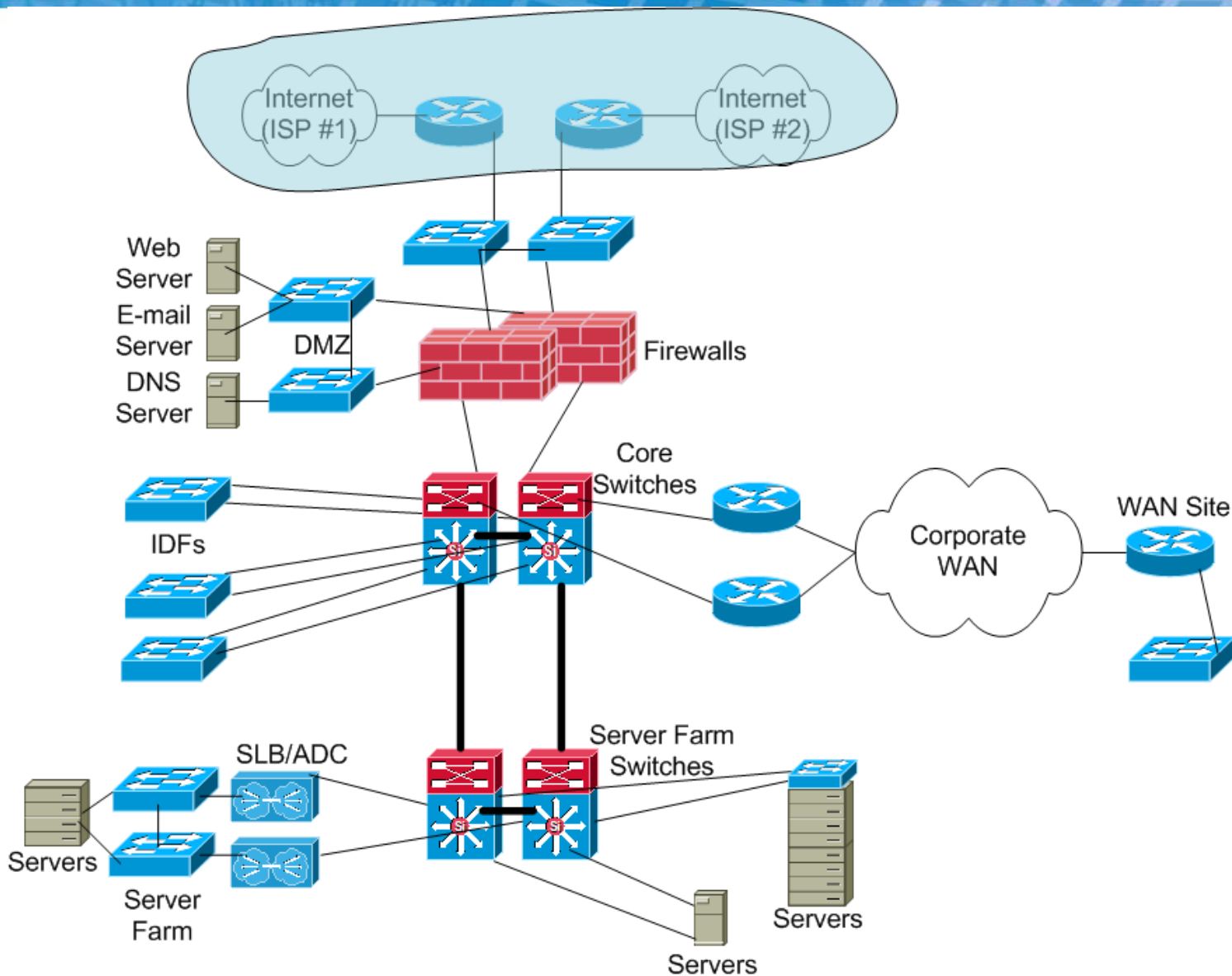
- Your Internet edge is the logical area to focus your initial IPv6 efforts.
- That is where you have Internet connectivity, authoritative DNS, web servers, E-mail, and Internet-facing applications.
- You will need to IPv6-enable the Internet edge before you deploy IPv6 further into your internal backbone network.
- Native IPv6 connectivity must be deployed contiguously so it must grow one layer-3 step at a time.

# The Critical Path to IPv6



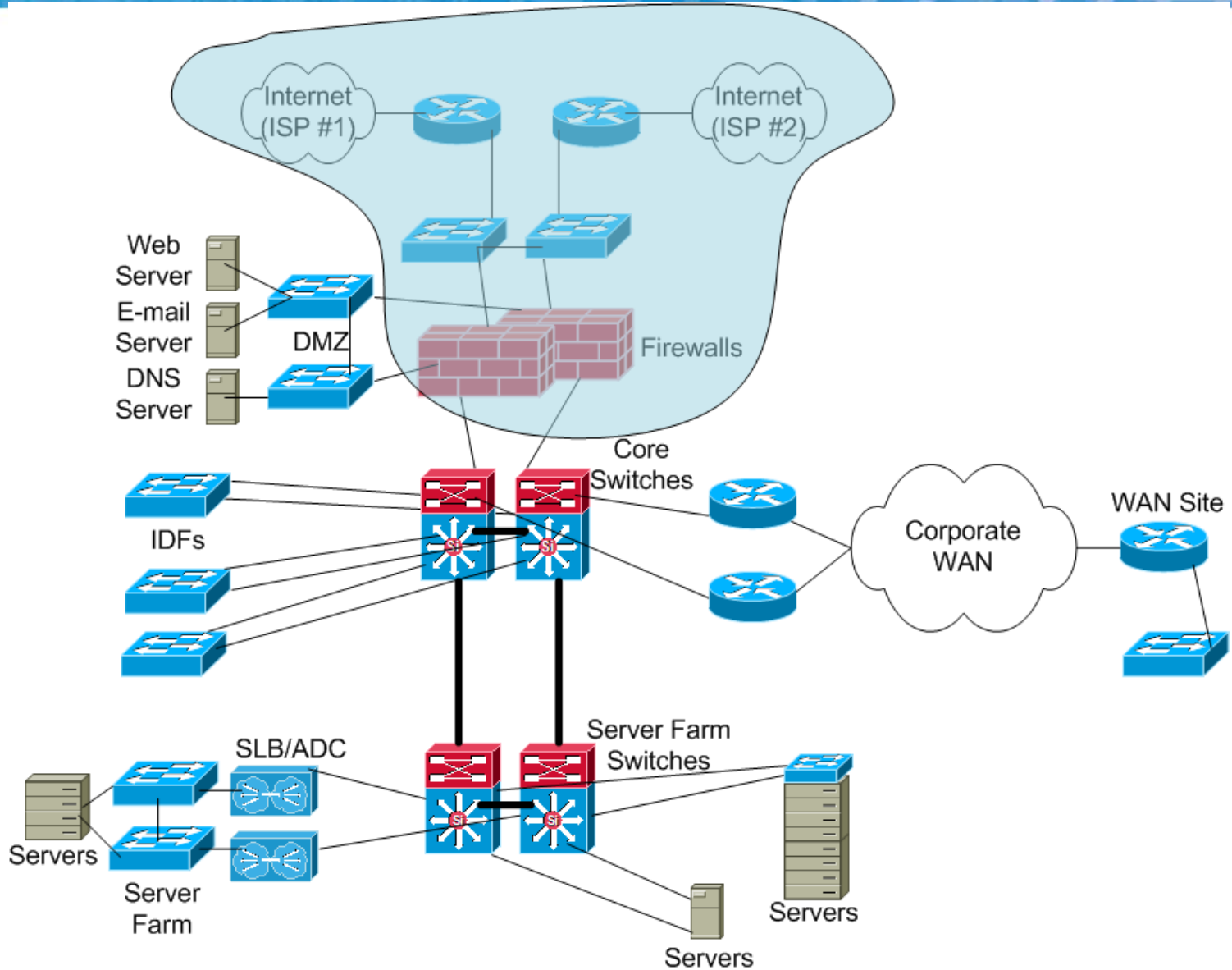
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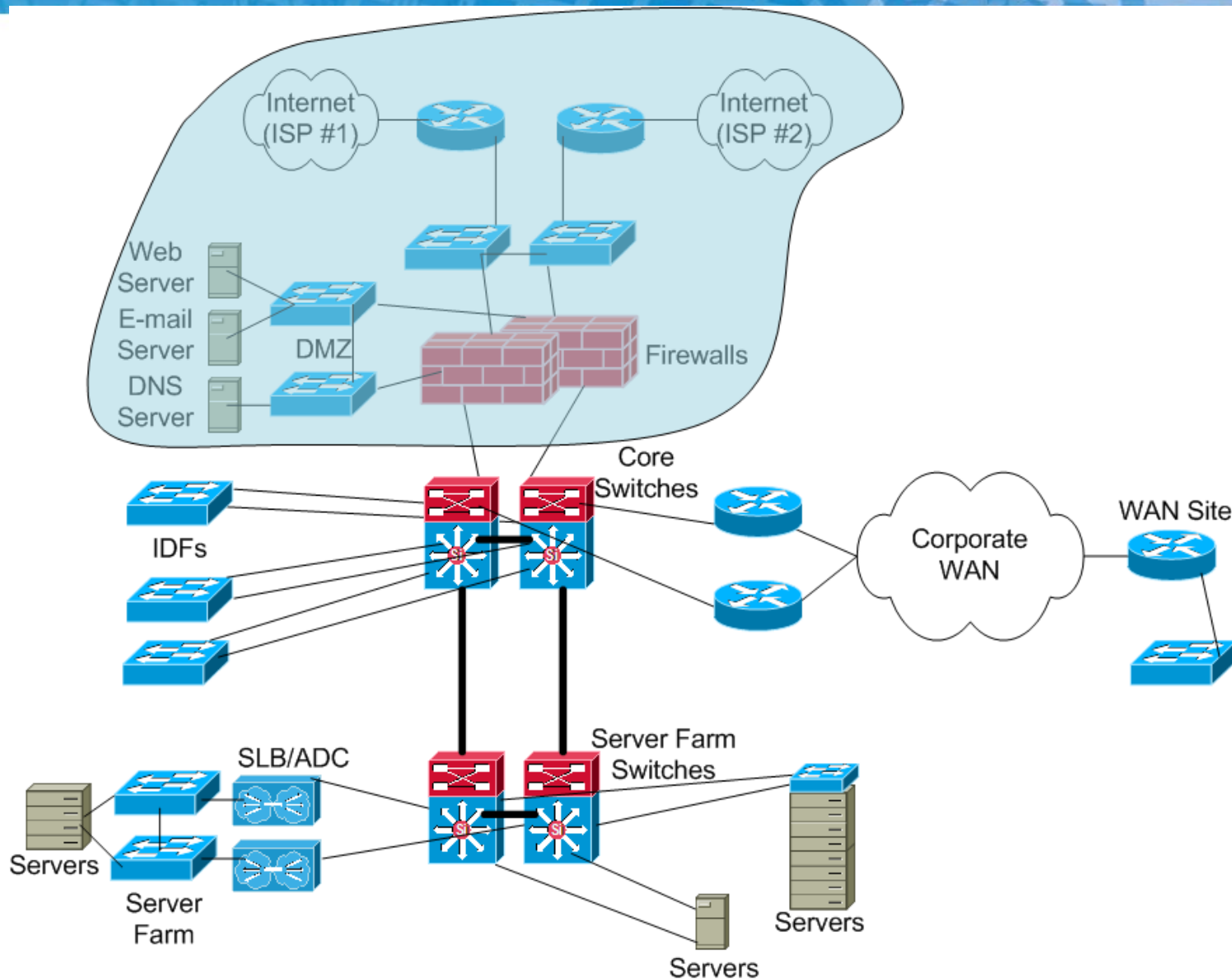
# IPv6





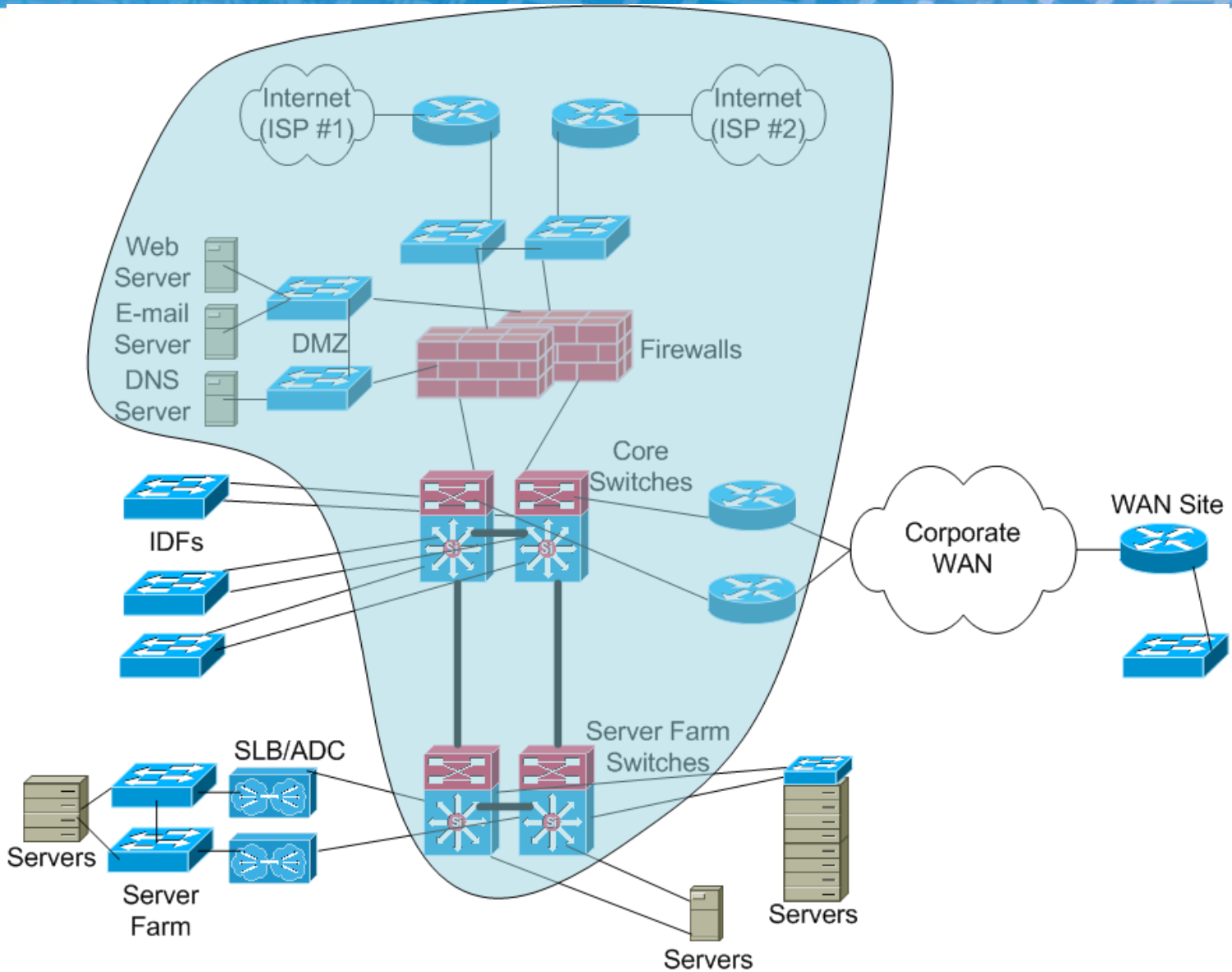
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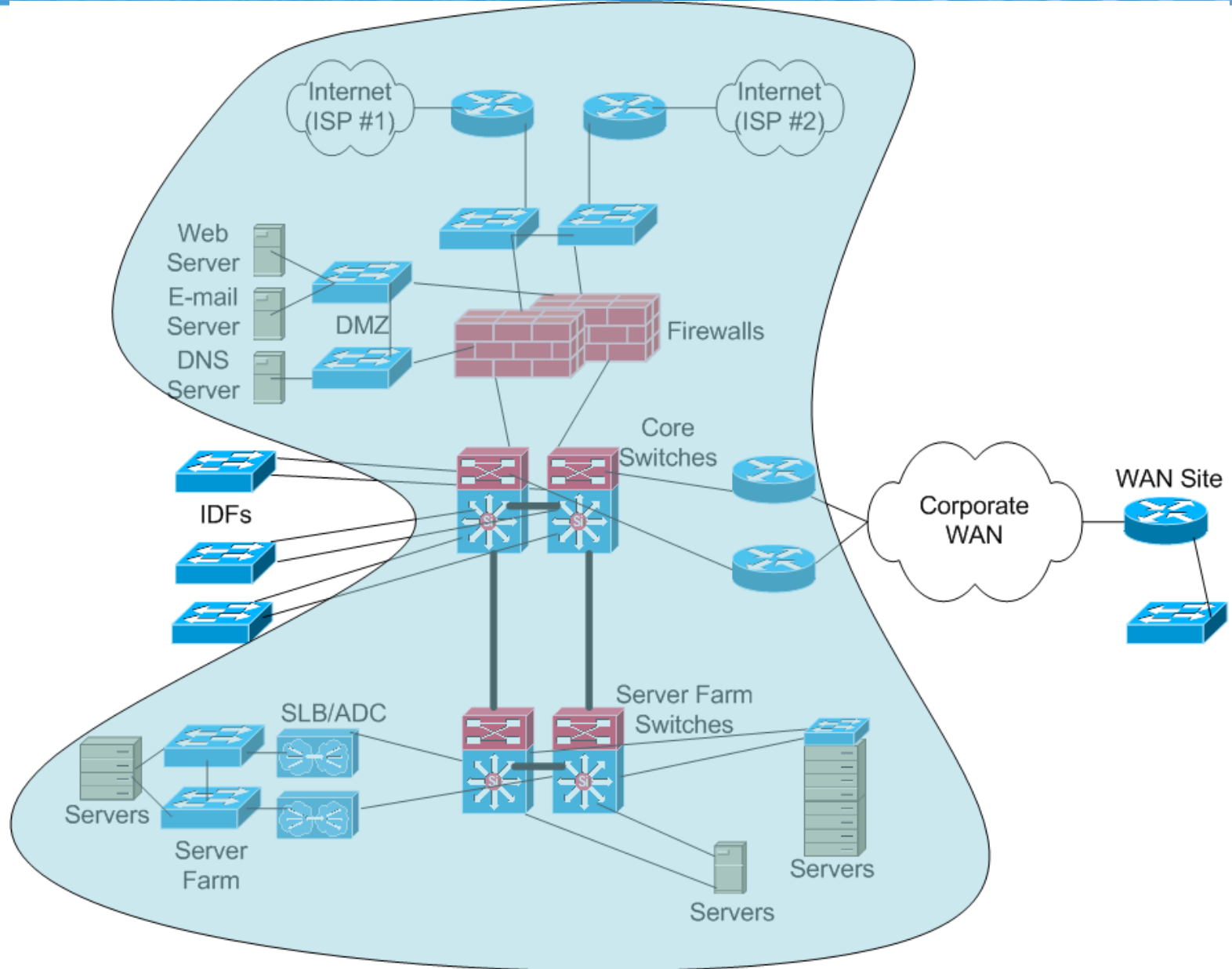
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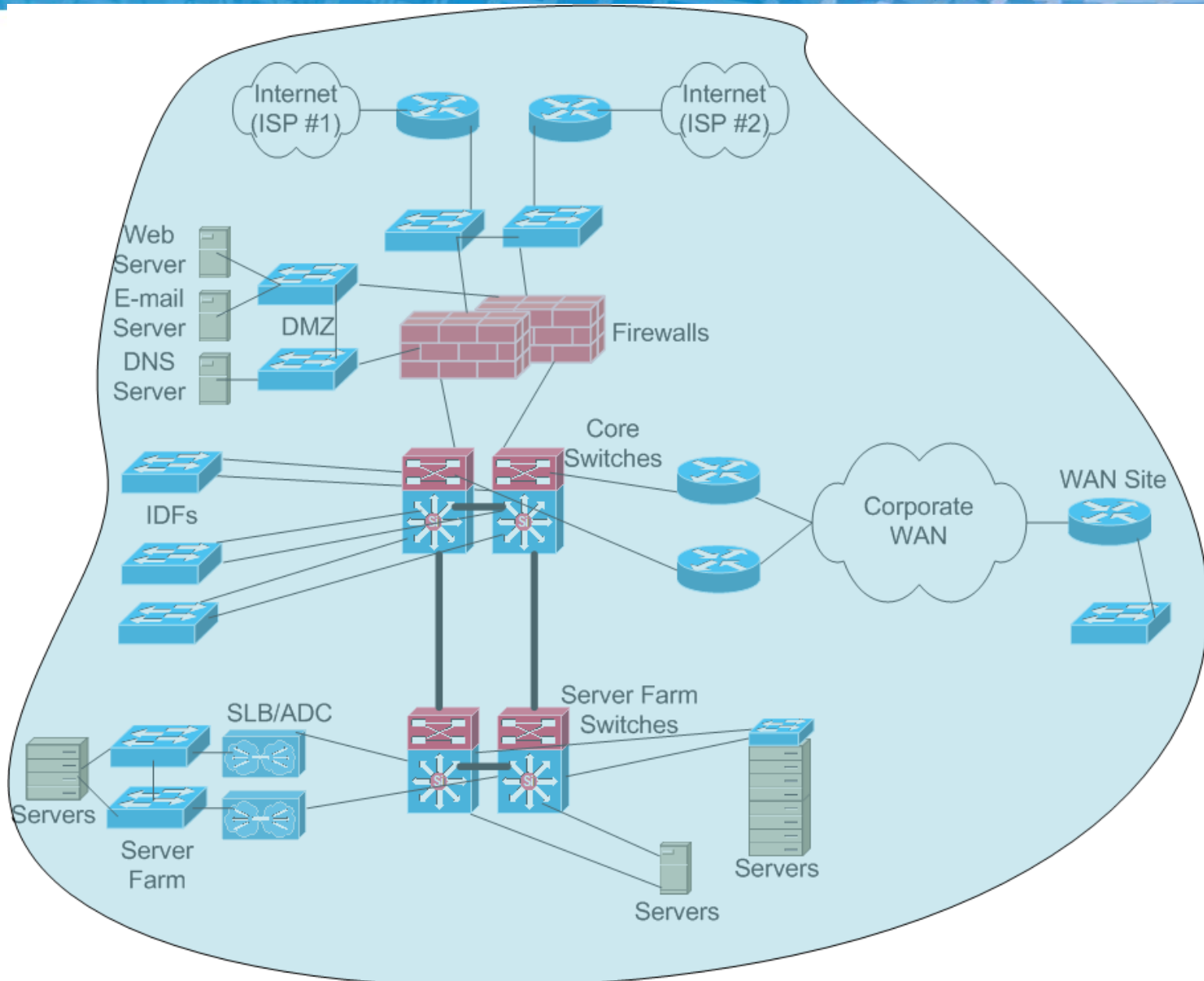


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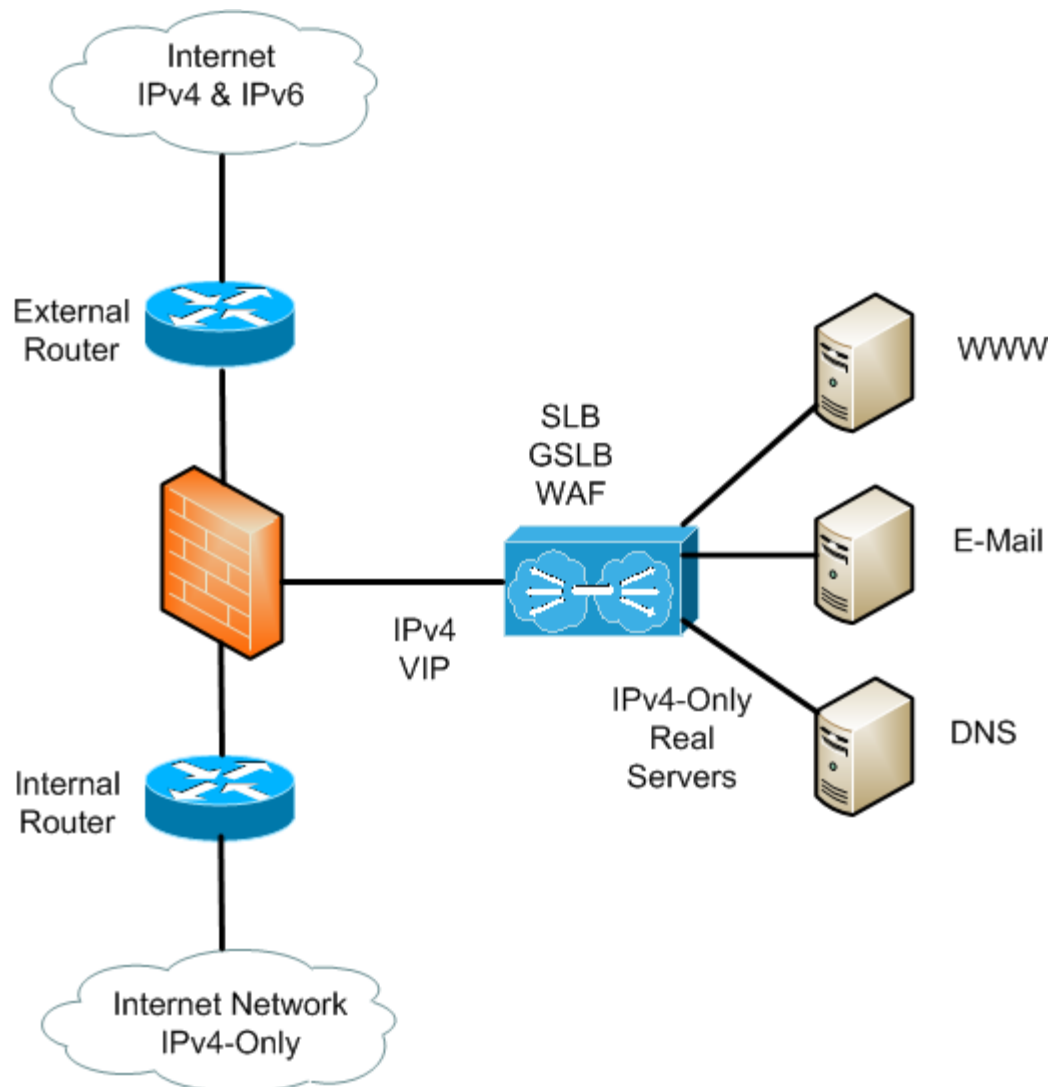
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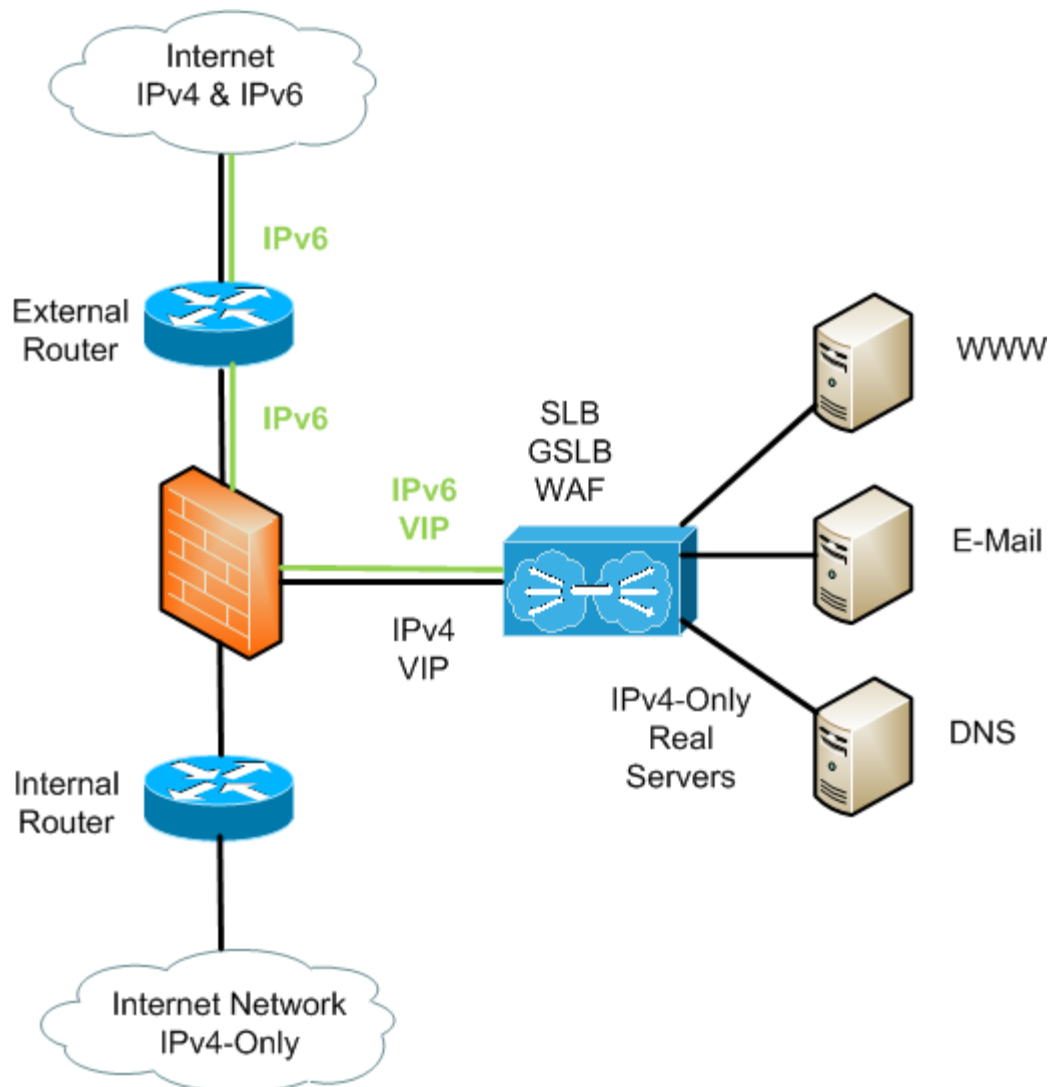
# Advantages of Edge Approach

- Perimeter servers and services can remain IPv4-Only for some time.
- IPv6 capability is quickly configurable without overhauling entire perimeter.
  - IPv6 configuration required on Internet perimeter router and firewall
    - Most routers and firewalls support IPv6
  - Deployment of Server Load Balancing (SLB) or Application Delivery Controller (ADC) platform
    - Positions perimeter systems for Web Application Firewall (WAF) and Geographical SLB (GSLB)

## IPv6 Migration at the Internet



## IPv6 Migration at the Internet



# IPv6 Internet Connectivity

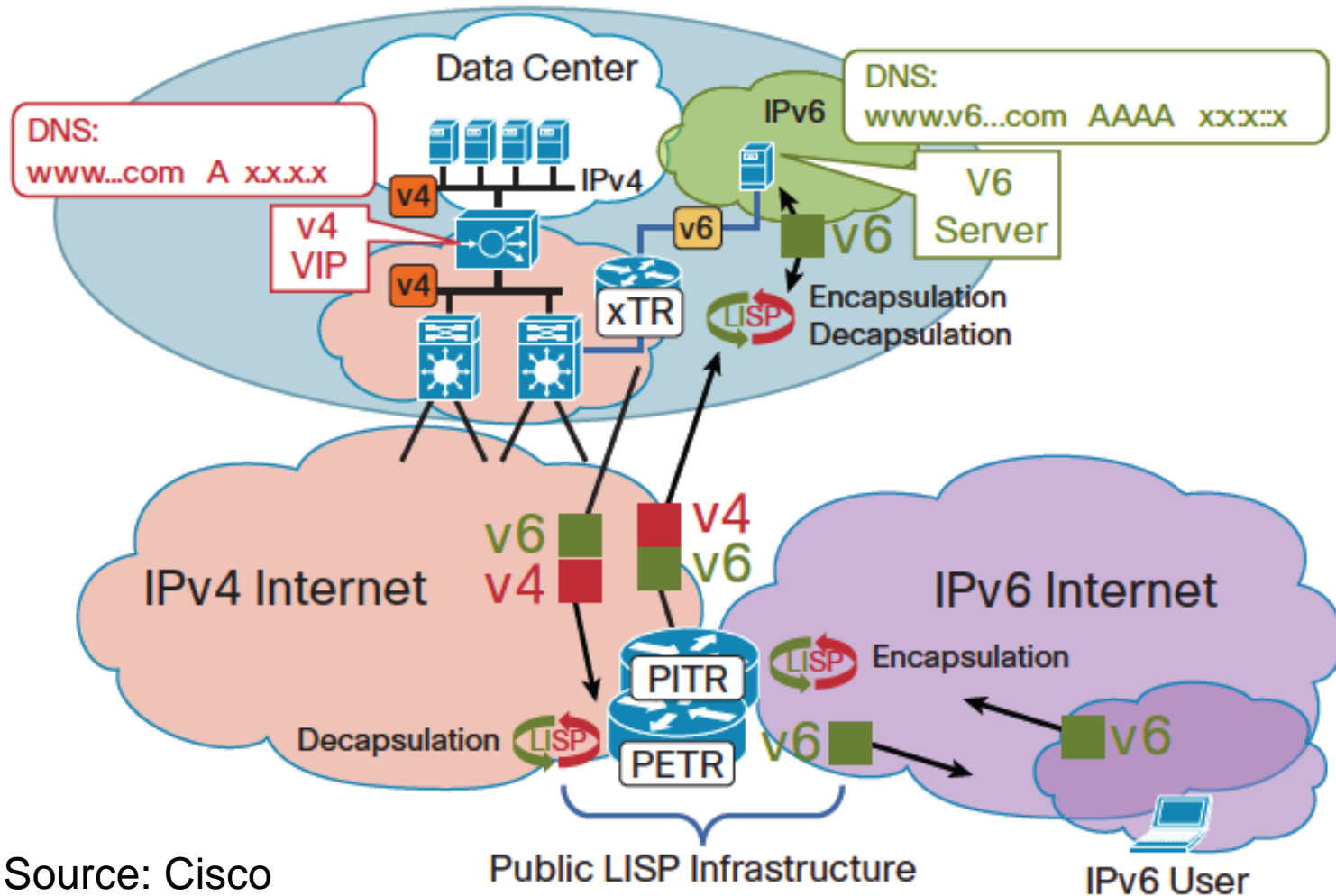
- Your current ISP may already have native IPv6 Internet connectivity available for no additional cost.
- If your ISP only offers IPv4 then you could switch providers or tunnel over your current ISP.
  - Manually-configured tunnels are easy to configure and supported in your current network equipment.
  - Using a Locator/ID Separation Protocol (LISP) your Internet router can create a 6-in-4-tunnel as another alternative for reaching the IPv6 Internet.



# Locator/ID Separation Protocol

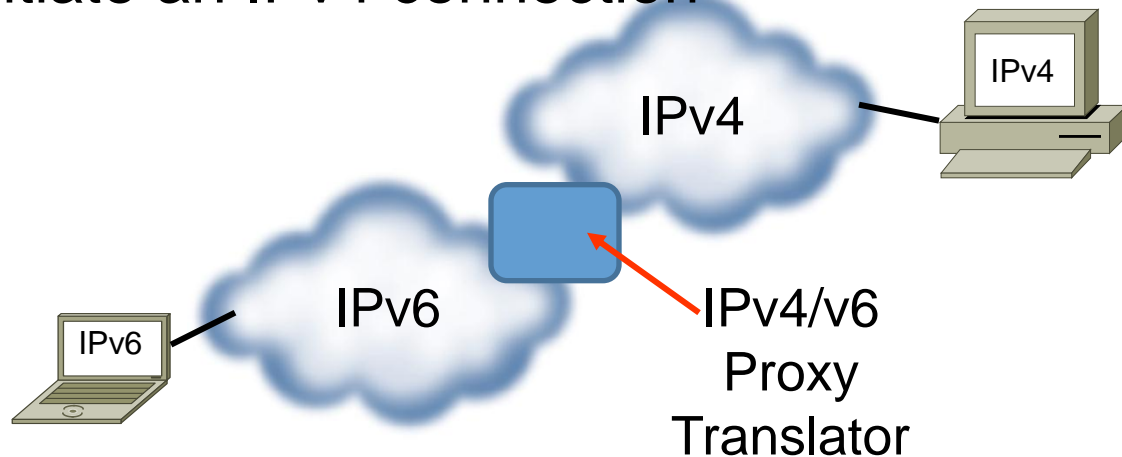
- LISP splits the namespace into two sections
  - One used for routing; Routing Locator (RLOC)
  - One used for the end-node; Endpoint Identifier (EID)
- LISP also maps addresses and encapsulates packets
- LISP is an "over-the-top" tunneling method adding a 32-byte UDP port 4341 LISP header
- LISP mapping service uses UDP 4342 packets to resolve the EIDs to locators defined in the mapping database.
- No changes to host IP stacks, routing infrastructure, firewalls, IPSs, etc.
- Facebook uses LISP for IPv4 and IPv6

## LISP IPv6 Transition Use Case



# IPv4/IPv6 Translation/Proxy

- If you want to keep your Internet perimeter applications using IPv4 then you could use an Application Layer Gateway (ALG) or Application Layer Proxy
  - These systems can terminate an IPv4 connection and initiate an IPv6 connection or terminate an IPv6 connection and initiate an IPv4 connection
- Protocol Translation is typically a last-resort migration strategy
- Proxy is OK



# IPv4/IPv6 Proxy

- IPv4/IPv6 Proxy can be performed SLB/ADC appliance
- These major vendors have significant IPv6 capabilities
  - A10 AX Series Application Delivery Controller (ADC)
  - Brocade ServerIron ADX
  - Cisco ACE 30 & ACE 4710
  - Citrix NetScaler 9.3
  - F5 BIG-IP Local Traffic Manager (LTM)
  - Riverbed (was Zeus and Aptimize)

# A10 Networks



- AX Series ADCs include support for IPv6 for free
- AX platform has multi-core 64-bit architecture, greater memory efficiency resulting in higher connections per second
- IPv4 and IPv6 load balancing for IPv4 and IPv6 real servers using IPv4 and IPv6 VIPs
- High-availability with IPv6 session synchronization
- IPv6 static routing, dynamic routing coming soon
- Partitions (contexts) and on-board GSLB
- A10 has developed DNS ALGs (NAT64, etc.) along with DS-Lite and 6rd support today
- IPv6 management (Ping, SSH, HTTP, SCP, SFTP)

# Other Commercial Solutions

- There are other commercially-available IPv6 products on the market
  - Array Networks
  - BalanceNG V3
  - CoyotePoint Systems Equalizer
  - Exceliance Aloha
  - IBM WebSphere Application Server Load Balancer 6.1
  - Microsoft PortProxy
  - Microsoft Windows Server 2008 Network Load Balancing (NLB)
  - Radware AppDirector 2.20
  - Rackspace.com Cloud Load Balancers

# Open Source Solutions

- There are also open source solutions available for organization who want to set up a quick and inexpensive deployment.
  - Apache 2.X mod\_proxy.so
  - IPVS
  - Loaded
  - Nginx
  - Pound



# IPv6 Features in SLBs/ADCs

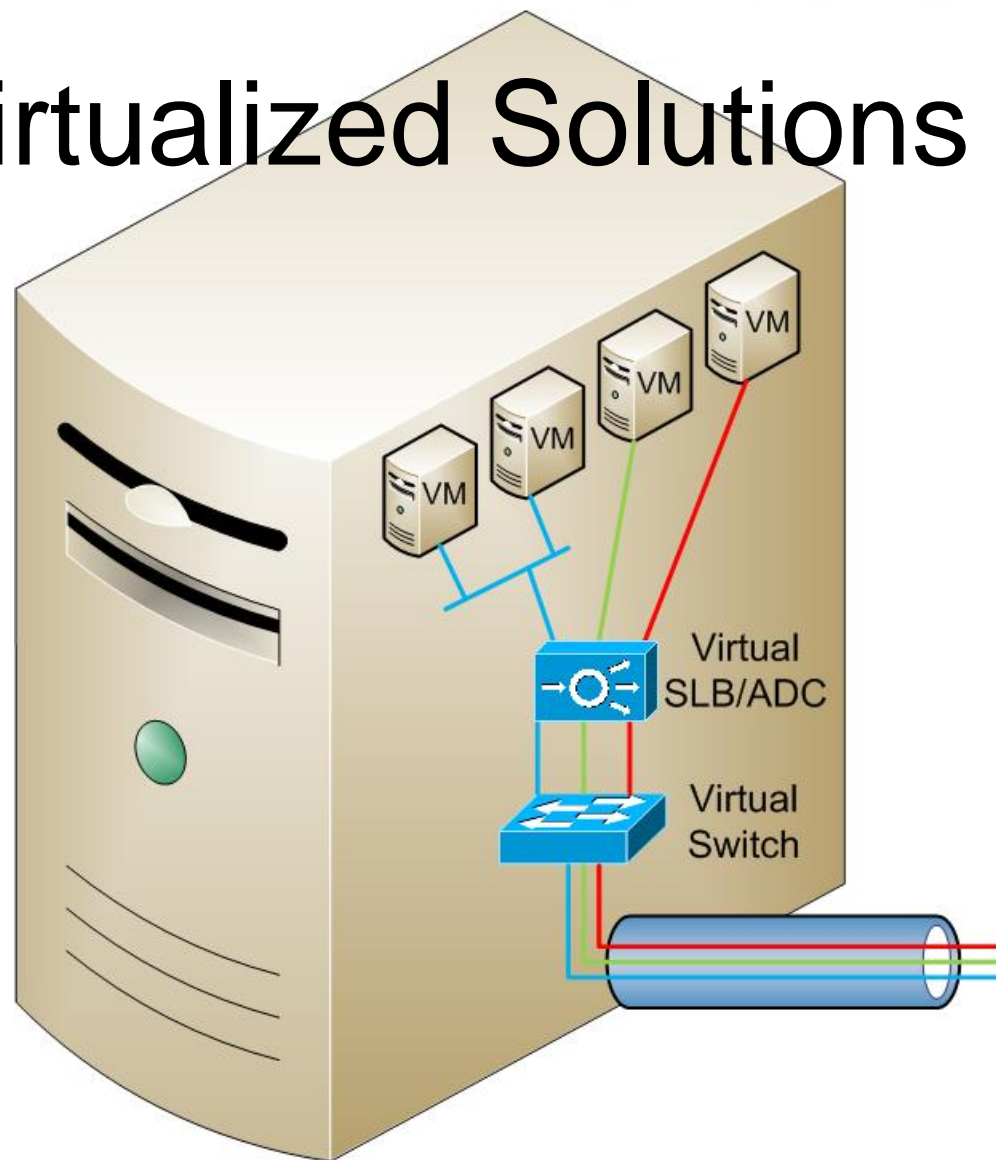
- Organizations should look for products with the following characteristics
  - IPv6 capabilities for SLB and reverse proxy functions
  - SSL offload with IPv6
  - SYN-cookies for IPv6 connections
  - High-availability for IPv6 connections (synchronization of IPv6 state information between HA pairs)
  - ICMPv6 filtering
  - Ability to check the IPv6 neighbor cache entries
  - Stateful ACLs for IPv6 packets
  - Denial of RH0 packets
  - IPv6 static routing
  - Ability to perform content filtering, regular expression matching, URL rewriting, for IPv6 connections
  - IPv6 management access
  - Logging of IPv6 events on the SLB appliance



# SLB/ADC Deployment Options

- In-line as a layer-3 proxy-server
  - Public addresses on the external interface and private addresses on the internal interface
  - Fully-Stateful – TCP Normalization security benefit
  - With IPv6 no reason to use private (ULA) addresses behind SLB/ADC
- Virtually in-line as a proxy server
  - Uses Source-NAT, Policy-Based Routing (PBR)
  - Can allow Direct Server Return (DSR) – non-stateful
  - Servers can have SLB/ADC as their default gateway
- Layer-2 bridge between two VLANs or subnets
  - Uses BVI or proxy and/or Source-NAT
- Virtual appliance at the hypervisor layer
  - VMs use the virtual appliance as their proxy-server or default gateway

## Virtualized Solutions



# Summary



- An IPv6-enabled Internet already exists.
- An IPv6 transition is already underway in the U.S. Federal Government and other parts of the world.
- Your IPv6 infrastructure and Host OSs are ready now!
- Regional Internet Registries (RIRs) have IPv6 addresses to give you.
- Service providers have initial IPv6 services and are continuing to expand their deployments.
- You may already own IPv6-capable routers, firewalls, and SLB/ADC systems.
- The cost to deploy IPv6 at your organization's Internet edge is minimal.
- It just requires some of your time to set it up.
- Now is the time to deploy IPv6!