Strategies for Getting Started with IPv6

IPv6 Transition Acceleration Options for Web Applications and Services

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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?

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Source: Cisco
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.
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

Source: Cisco
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 organizations 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!