A10 Networks // Performance by Design //

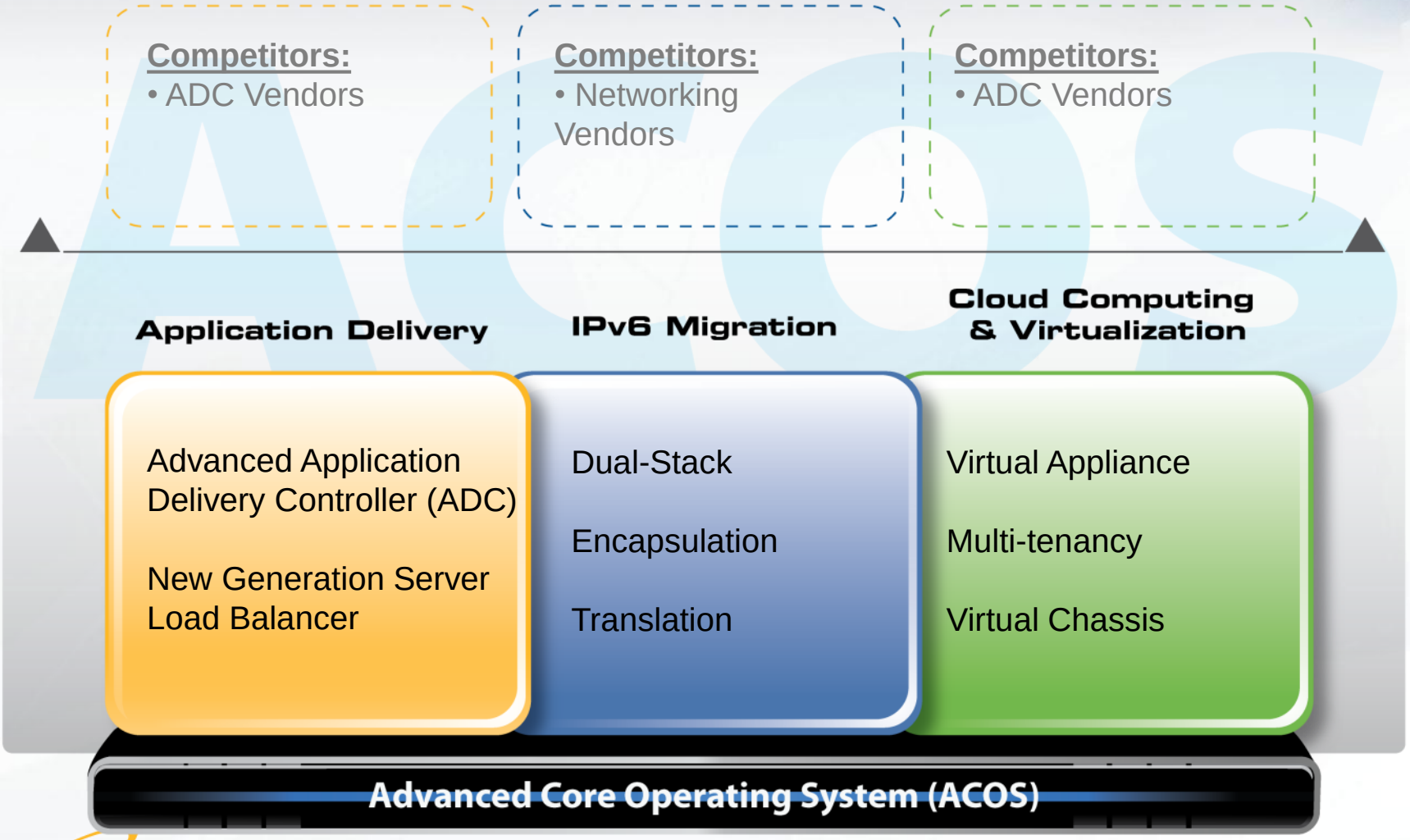
Real World IPv6 Implementations Today

December 2011

A10 Networks Company Overview

- Flagship product: AX Series
- Lee Chen – founder/CEO
- HQ in San Jose, California
- 350+ employees worldwide
- Profitable
- #1 fastest growing private Computer Hardware company in North America
- 2nd fastest growing private company in Silicon Valley

A10 Markets and Competitors



Application Delivery and Load Balancing Overview

- Site Always Available
- Faster Response

Users

- High Volume Traffic & Unpredictable Spikes
- Disparate Devices & Protocols

External Network

Backup Datacenter

Primary Datacenter

ADC

- Application Delivery Controller

Internal Network

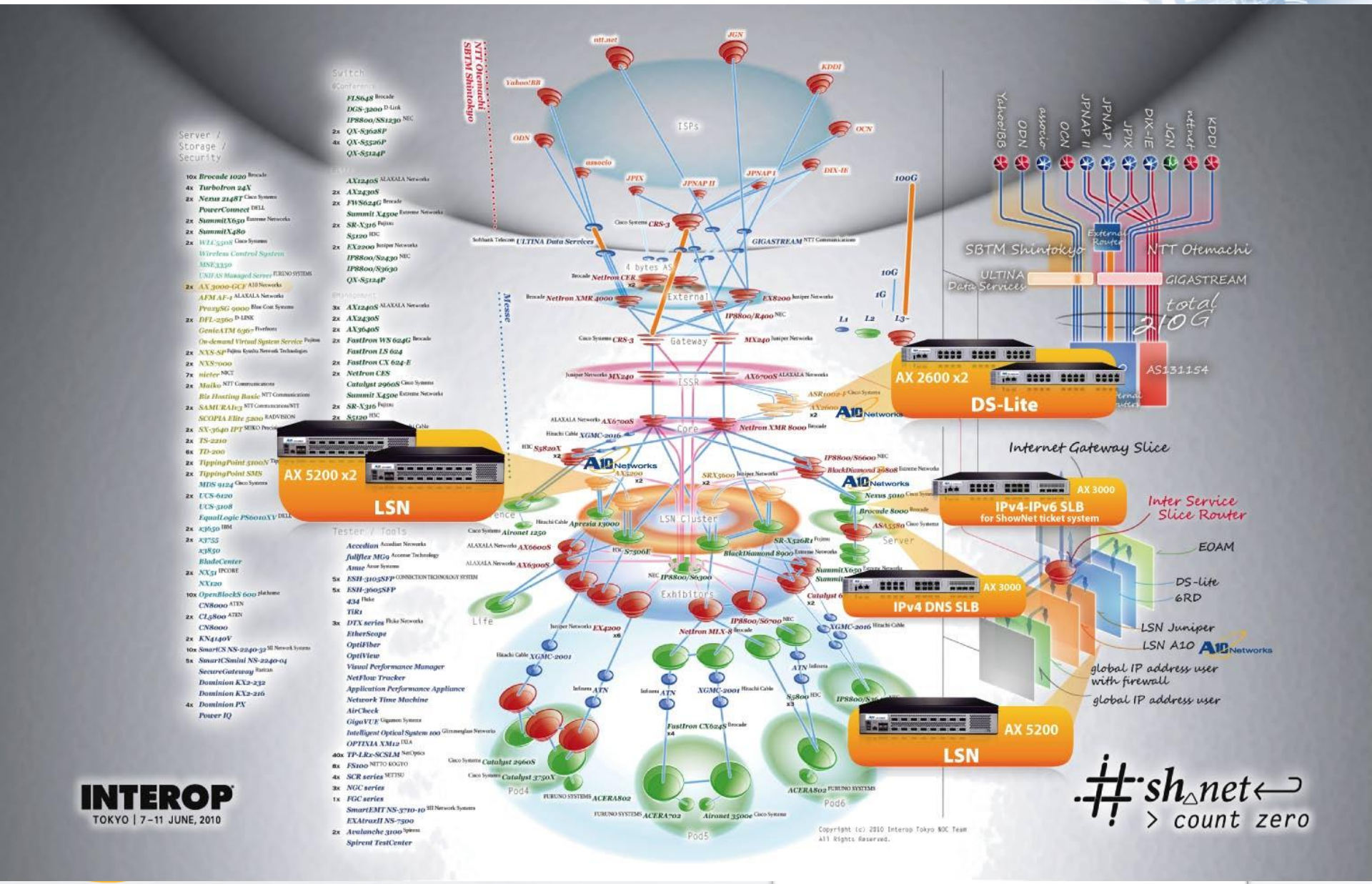
- Efficient Distribution
- Reduced Connections
- Normalized Traffic

Servers

- CPU & Network Off-load
- Easier Management
- Connection Efficiency

- Automatic Failover
- Datacenter Redundancy & Disaster Recovery

Industry-leading Implementations



First Live Deployment - NTT Plala, Japan

The IPv6 network, model for the future?

- Project: Hikari-TV, implementation and live in 2008
- Purpose: IPTV broadcasting and video on-demand service (and Karaoke!)
- Network: Native IPv6-based, fiber-to-the-home network
- First large-scale, commercially successful application of IPTV service that runs over a IPv6 network
- *"After a comparative test...we selected A10's AX Series..as the high-performance server load balancer platform for 'Hikari-TV'...video distribution" service..."*


NTT Communications | NTT America

NTT Plala Takes Hold of the Future With Hikari-TV

Hikari-TV service comprises 76 channels, more than 10,000 video on demand titles, and over 13,000 titles in its karaoke service.

Network (NGN), a closed end-to-end IPv6 over fiber to the home (FTTH) network. NTT Plala receives live broadcasts from TV stations, and encodes and simultaneously delivers the broad-

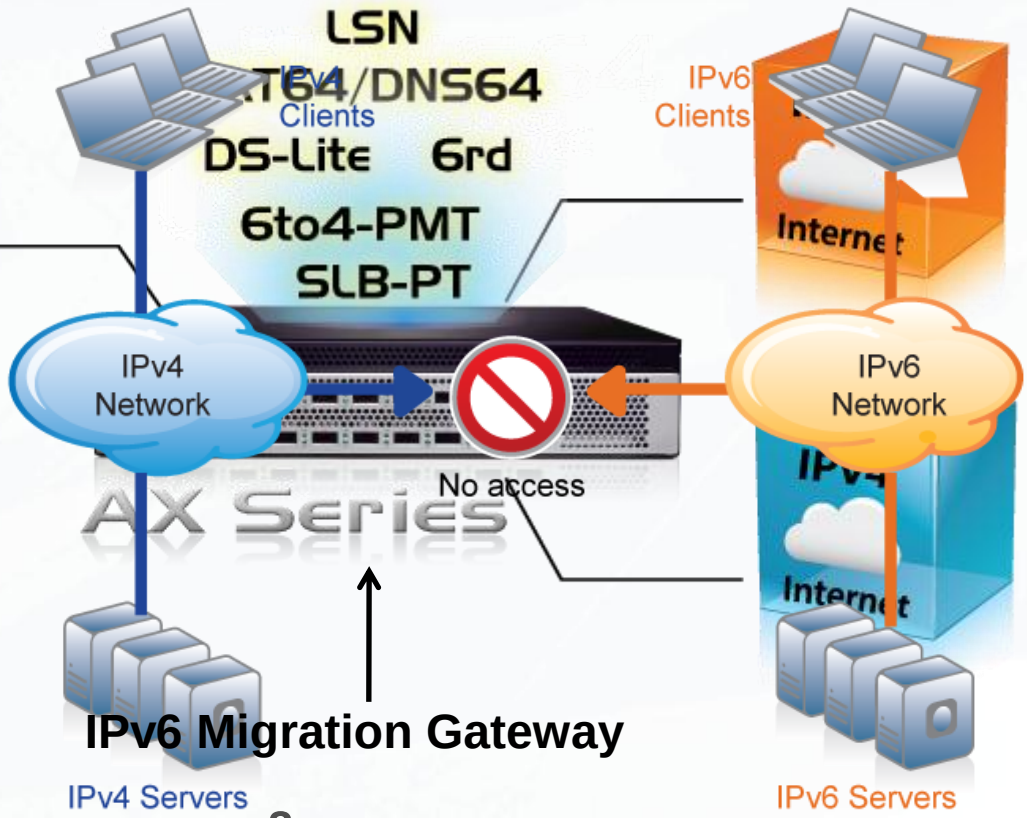
Where Will They Go Next?

The growing interest in IPTV combines

NTT Plala

IPv6 Solutions

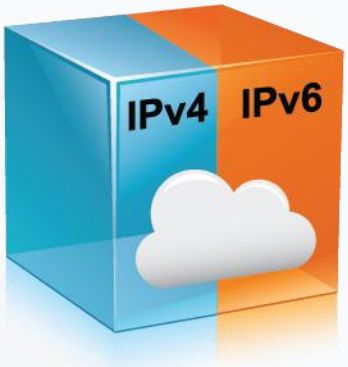
- No standard compatibility
- Different requirements
  - Home
  - Enterprise
  - Service Provider
- "IPv4 Legacy Networks"



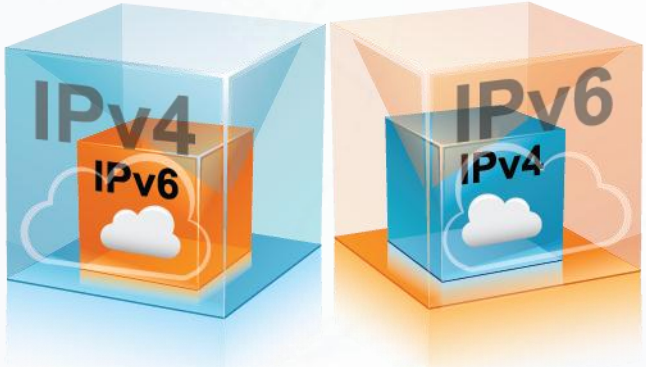
- Each solution has its own pros & cons

IPv6 Migration Techniques

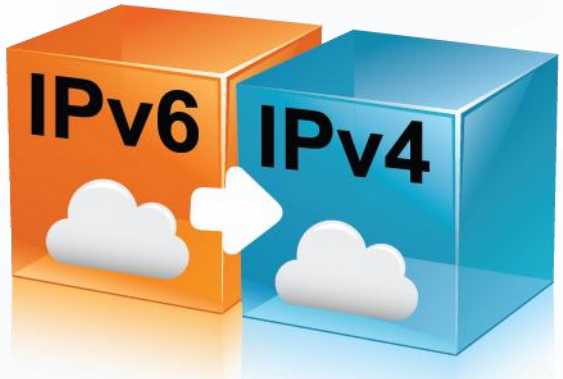
Dual-Stack



Encapsulation

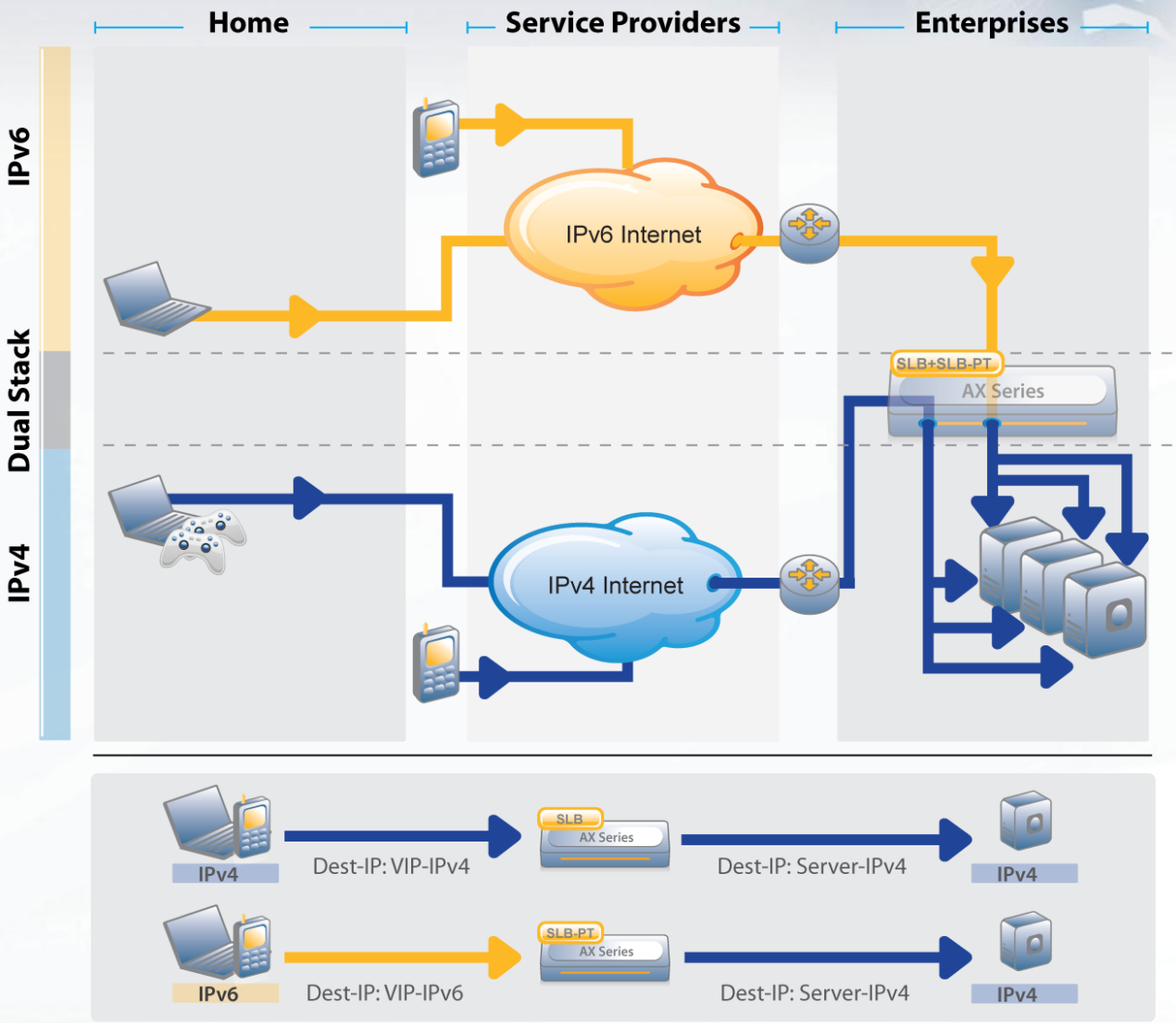


Translation



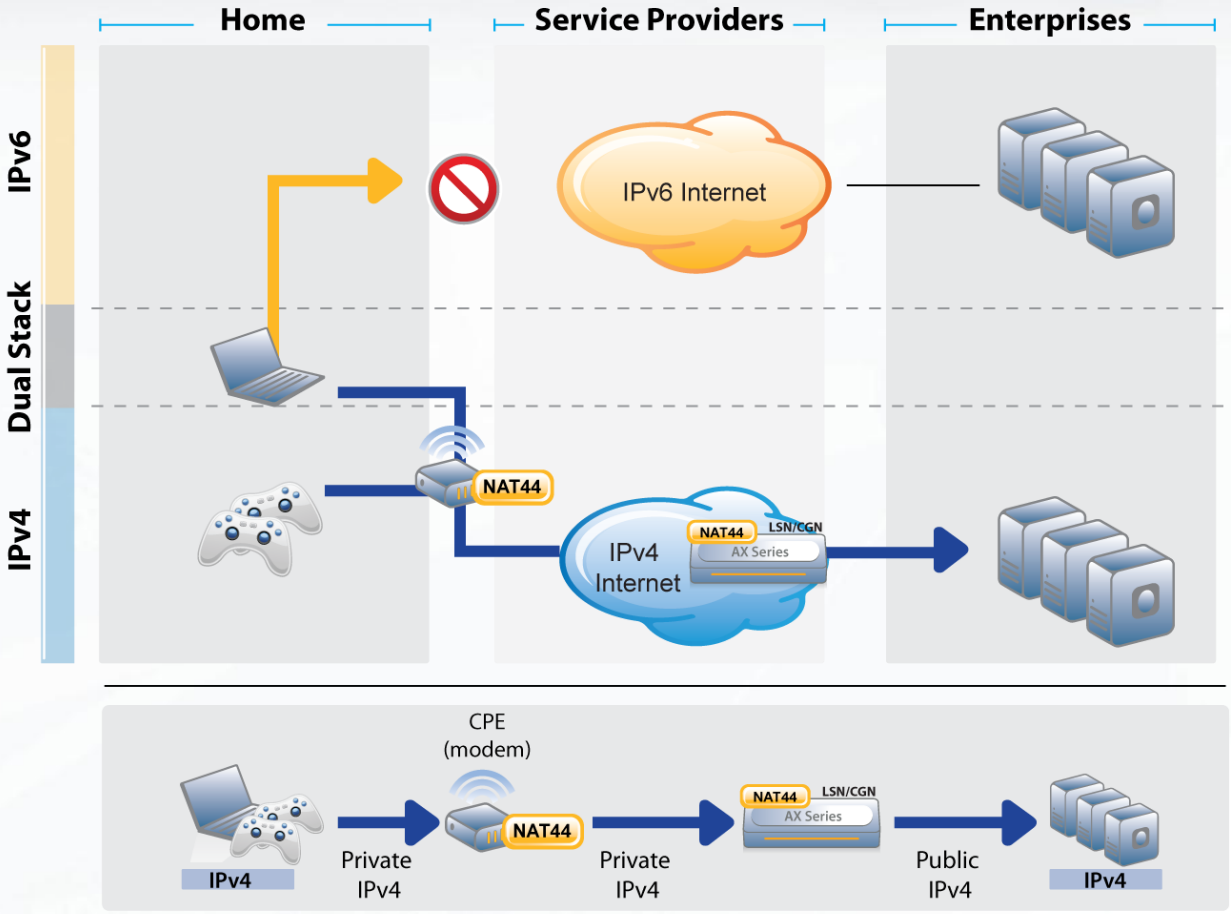
Server Load Balancing Protocol Translation (SLB-PT aka SLB-64)

- **Main interest:**
  - Enterprises
  - Content Providers
- **Usage:**
  - Looked into by many Enterprises / Content Providers and already deployed today
- **Goal:**
  - Offer IPv6 services quickly with minimal changes



Large Scale NAT (LSN, aka CGN/NAT444)

- **Main SP interest:**
  - ISPs
- **Usage:**
  - Looked into/tested by many ISPs
- **Goal:**
  - Resolve IPv4 exhaustion quickly with minimal changes
  - Maximize IPv4 address capacity

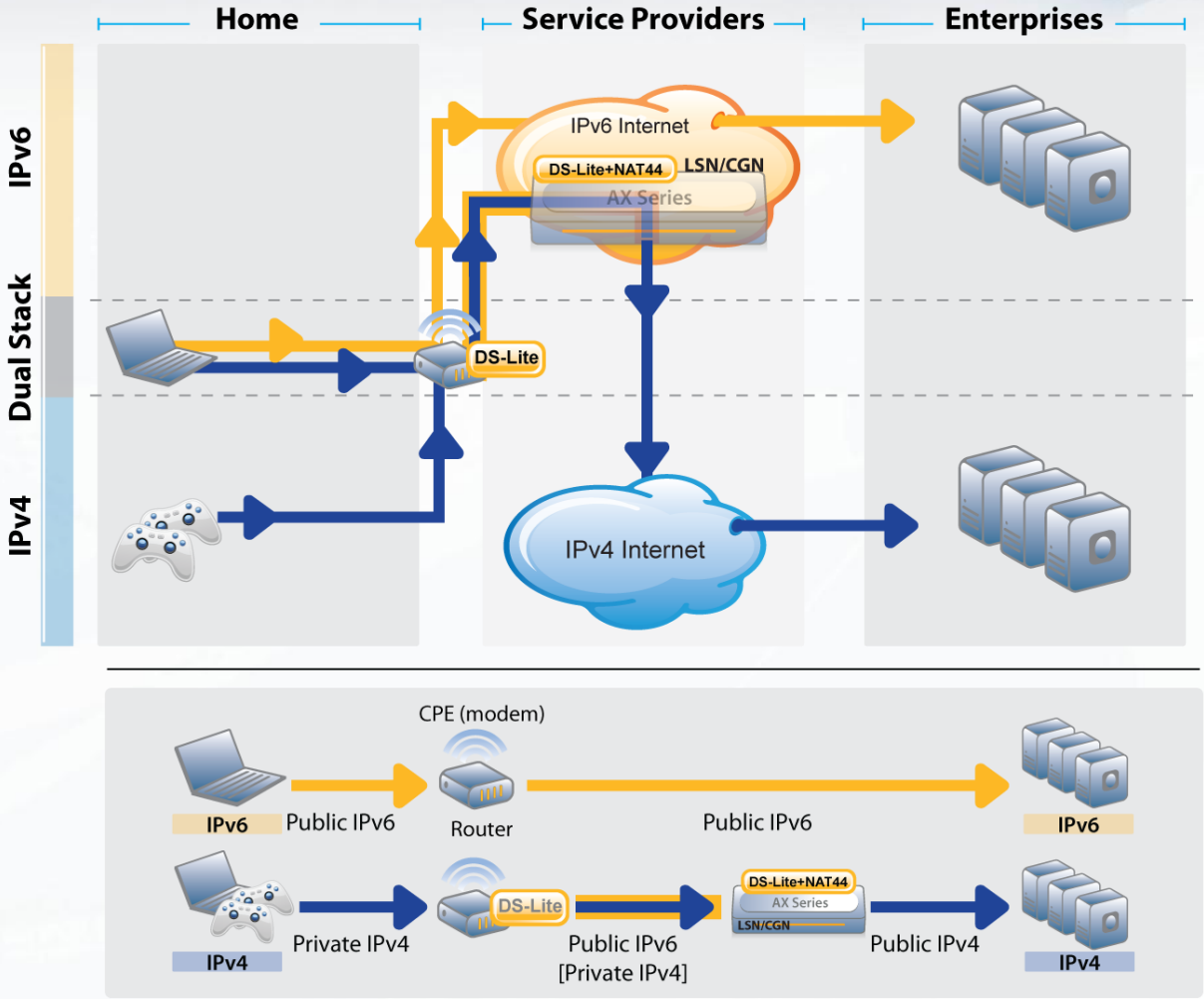


Note: LSN is also called "Carrier Grade NAT" (CGN) or NAT444.

DS-Lite (Dual-Stack Lite) + NAT with LSN/CGN

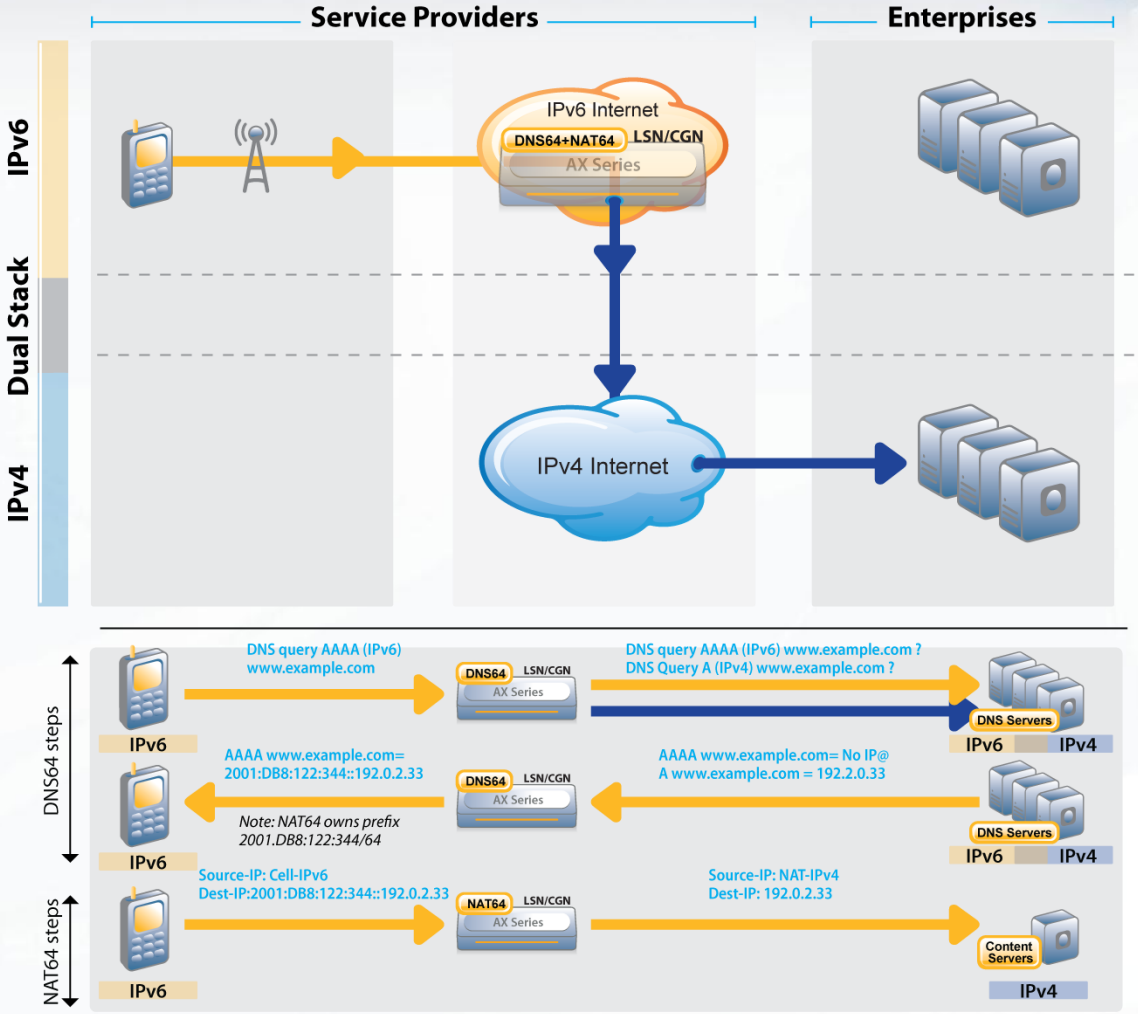
- **Main SP interest:**
  - ISPs
- **Usage:**
  - Currently being evaluated by some ISPs
- **Goal:**
  - Provide IPv4 service access to IPv4 clients and IPv6 service to IPv6 clients without having a dual-stack SP network
  - IPv6 core network

Note: Some ISPs look at combining DS-Lite with DNS64/NAT64



NAT64/DNS64

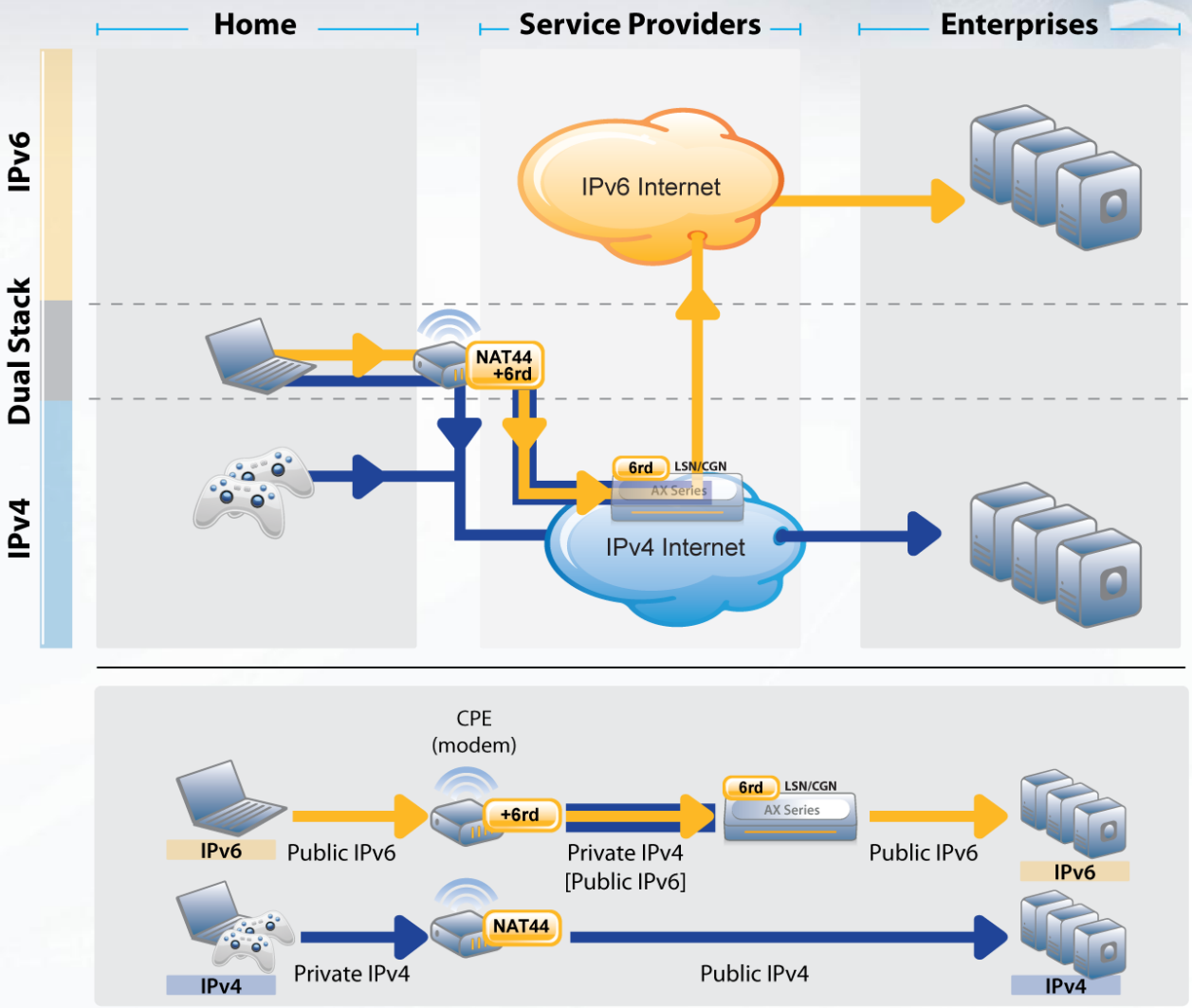
- **Main SP interest:**
  - MNOs and ISPs
  - Enterprises
- **Usage:**
  - Looked into by many operators and enterprises, production deployments started
- **Goal:**
  - Provide IPv4 content access to IPv6-only clients
  - “Improves” IPv6, more content returned



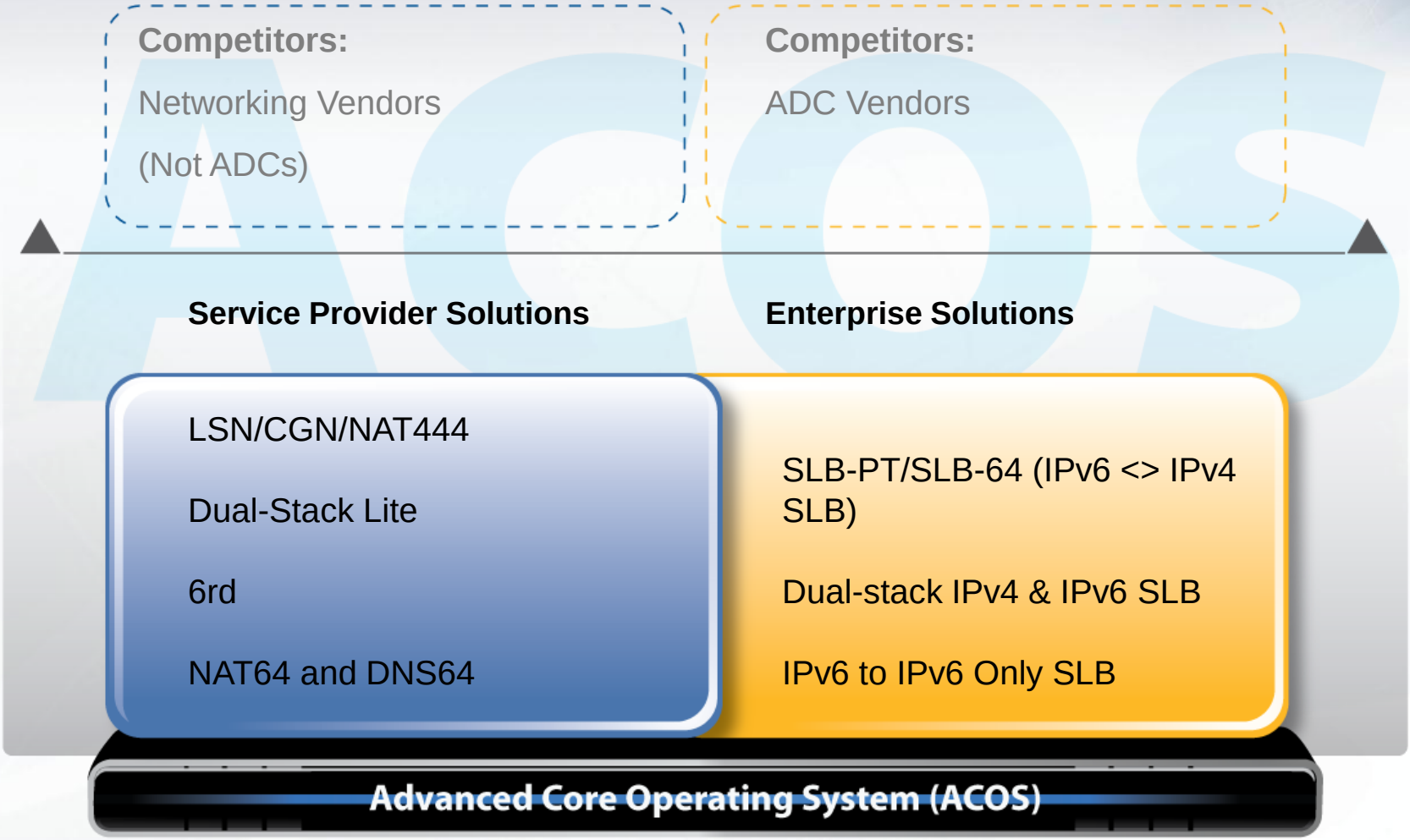
6rd (IPv6 Rapid Deployment)

- **Main SP interest:**
  - ISPs
- **Usage:**
  - Looked into/tested by some ISPs and deployed by a few
- **Goal:**
  - Provide IPv6 service access before core Network IPv6 upgrade
  - IPv4 core network

Note: Some ISPs look at combining 6rd with NAT444 + DNS64/NAT64

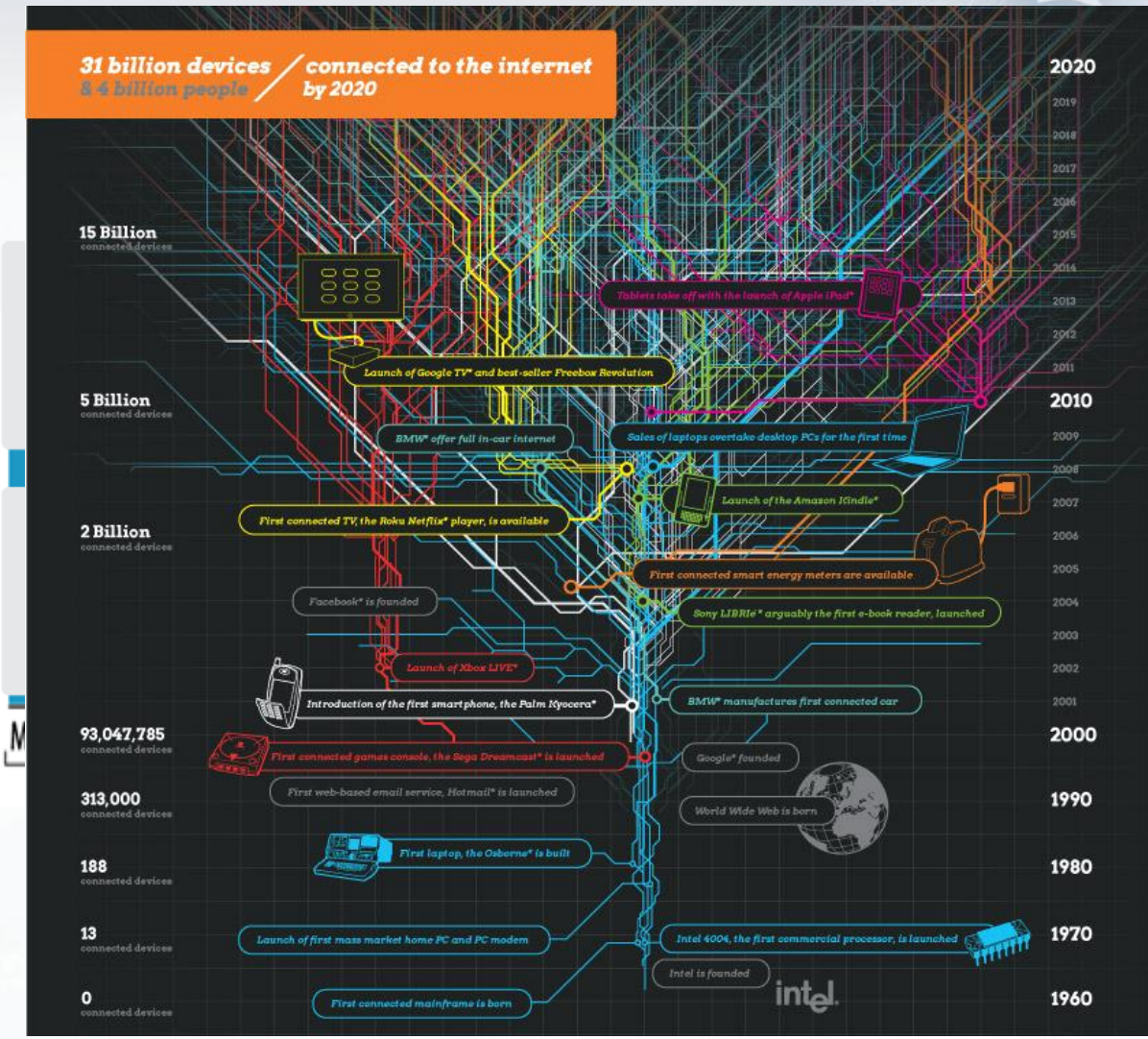


IPv6 Migration Market



2011: Massive, and Accelerating, Growth

- Jan: IANA assigns all addresses to RIRs
- March: Microsoft to acquire Nortel's IPv4 addresses for $7.5-million
- April: RIR APNIC assigns all addresses
- April: AT&T added 1.6M non-phone wireless devices, total passes 12M



Source: Intel

IPv6 Adoption Chain

- **End-devices/Clients**
  - IPv6 transition has been in the works (e.g. dual-stack on Windows Vista & 7, MacOS 10.x, smart phones)
  - Older devices with no, or limited, IPv6 (older Windows, game consoles, etc.)

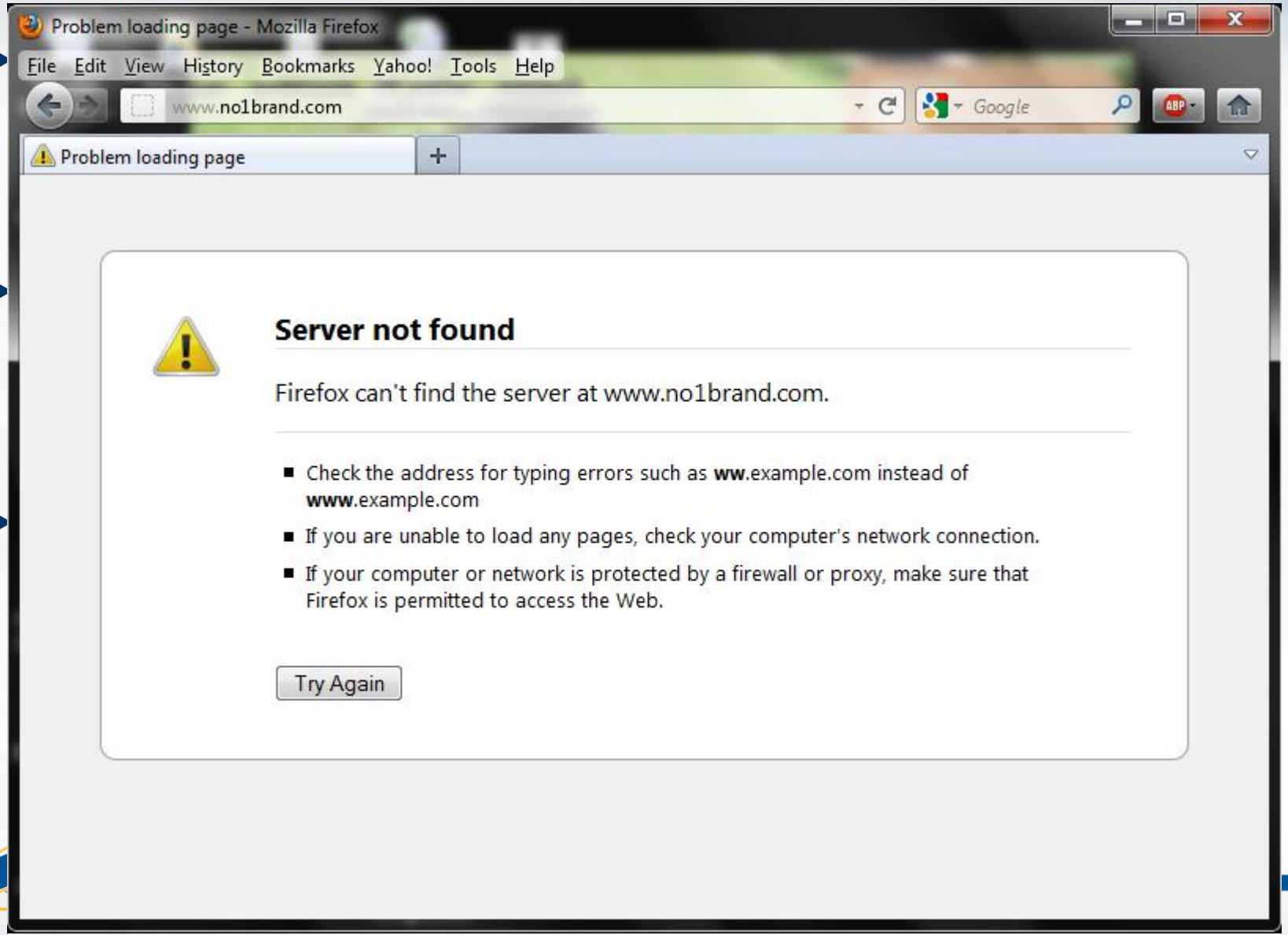
- **Service Providers (Carriers, ISPs, MNOs)**
  - Investigated during the last 3+ years
  - Pilots, live trials and production

- **Enterprises/Content Providers**
  - Adoption accelerating, external websites now enabled
  - Jan 0.15% of top million web sites available via IPv6
  - Nov 0.80% of top million web sites available via IPv6
  - More adoption in 2011 than previous years combined
  - Increased attention - World IPv6 Day, June 8, 2011

IPv6 Landscape Maturity and Regulations

- **Worldwide interest**
- **Example government mandates and backing**
  - UK government endorsement (6UK)
  - Singapore and Philippine government mandates
- **IPv6 certifications**
- **High adoption rates and interest**
  - Requirement in RFPs

What's the ROI?



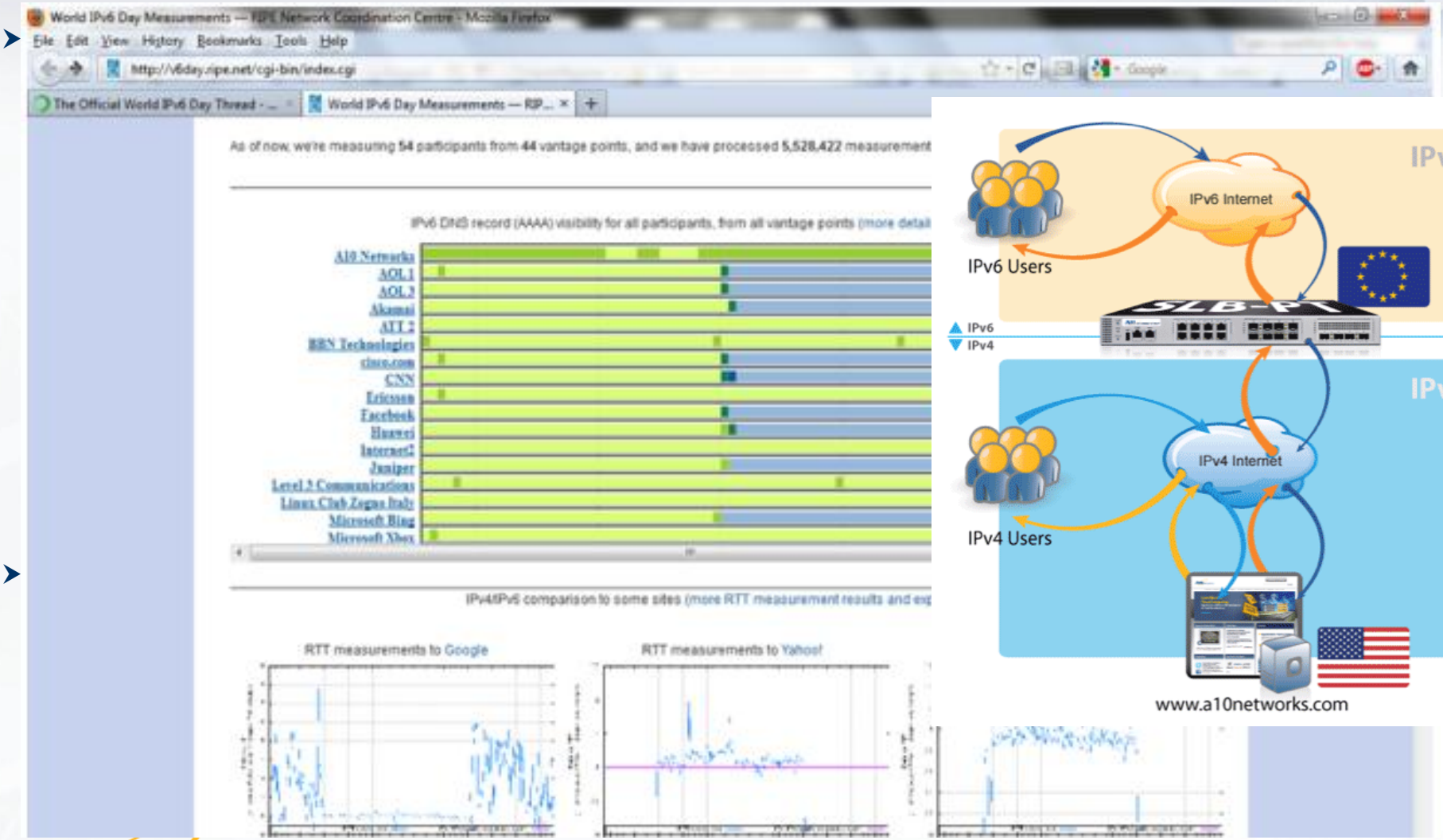
World IPv6 Day 2011 Observations

- **IPv6 "Test" Day**
- **Broad cross section of the Internet community:**
  - A large US web portal
  - A major US news organization
  - A number of Web 2.0 and Cloud companies
  - DNS providers
  - Other content and business web sites

A10 Customers on World IPv6 Day

- **Utilized a variety of pure IPv6 load balancing and SLB-PT**
  - Predominantly IPv6 > IPv6 and IPv6 > IPv4
- **One large customer, exclusively using A10 ADCs for the event reported:**
  - Well over a million unique IPv6 addresses hitting its infrastructure's front-end A10 IPv6 VIPs
  - AX units in multiple data centers
  - Extensive testing prior due to complex applications
  - No major infrastructure issues were encountered
  - IPv6 traffic was a small fraction of overall traffic (far less than 1%), but was higher than expected
- **A10 received zero support calls related to World IPv6 Day**

A10 as a Participant in World IPv6 Day



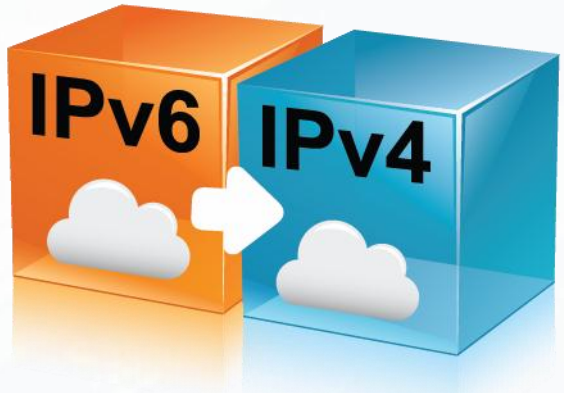
World IPv6 Day 2011 Vendor Perspective

- **Preparation in the weeks and months before by customers meant issues had been addressed prior; World IPv6 Day itself was uneventful**
- **Unique test bed – one issue found and resolved before World IPv6 Day**
  - Community provided absolute and detailed description of the issue
  - Multiple confirmations in < 24 hours that the patch was successful
  - Millions of connections stress testing the AX IPv6 configurations without issue; proving the solutions are production ready
  - Provided a large “real world” test bed versus lab
- **Native IPv6 SLB and SLB-PT used, initial expectation was a SLB-PT focus, but both were used extensively**

IPv6 Service Provider Deployment – Netherlands

Major service provider required filling of the final IPv6 connectivity hole

- **Background: IPv6 access for all customers and systems, Nov 2011 saw 15,000th IPv6 connection added, default IPv6 connectivity for customers**
- **Purpose: IPv6 ready to allow IPv6 resources to communicate with Asian partners, catalyst being they may be IPv6 only with APNIC address depletion**
- **Network: Dual-stack IPv4 and IPv6 connectivity**
- *"By our choice…of A10 load balancers all consumer websites are now accessible via IPv6...in one fell swoop a significant portion of our services over IPv6!"*



What To Do Next?

- **Test applications**
- **Evaluate impact on existing infrastructure**
- **Ensure new purchases are IPv6 compatible**
- **Train your staff**
- **Start small – enable your website**
  - Dual-stack, native IPv6 or NAT-PT (or SLB-PT)
- **Internal connectivity? Pilot IPv6 in your network**
  - Contact your service provider and investigate NAT64/DNS64
- **Short of IPv4 addresses? What is the exact issue?**
  - Acquire more IPv4 addresses or test CGN/LSN

A10 IPv4-to-IPv6 Migration Advantages

- **Industry-leading and mature implementation**
  - Interop shownet, evaluations, lab and field trials
  - Multiple live production deployments
  - Significant marquee customers
  - Proven interoperability, flexible deployment

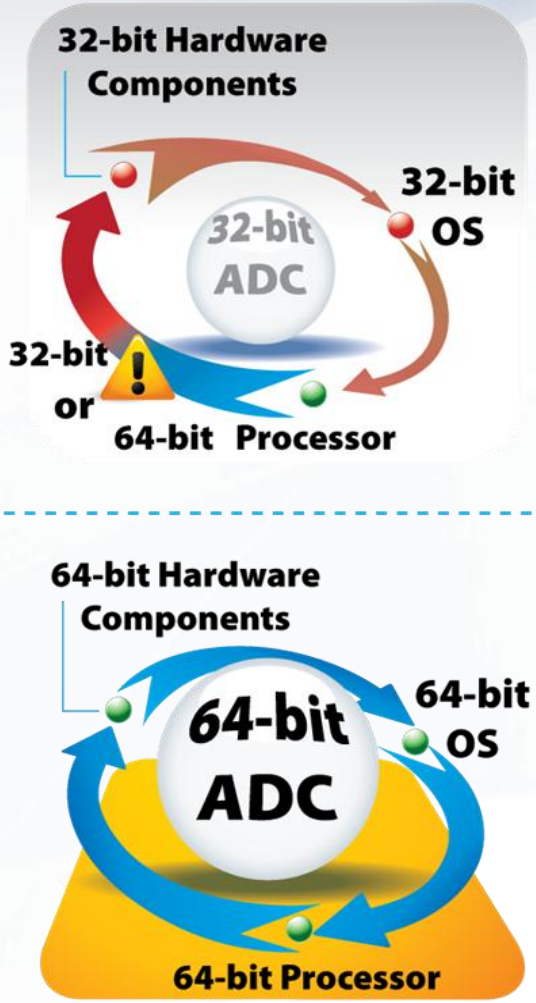
- **High performance**
  - Very high session establishment rate
  - Large number of concurrent sessions
  - Very high NAT processing PPS & throughput

- **Ideal 'green' form factor**
  - 1U/2U with least power consumption

- **Price/performance advantage**
  - All-inclusive

Advanced Core OS (ACOS)

- Development started in June 2005
- Multi-core CPU, shared memory architecture
- 64-bit scalability
- Efficient design
  - Power, memory, space & resource consumption
- Scalable Symmetrical Multi-processing (SSMP)
- Flexible design



IPv6 (and IPv4) Advanced Traffic Management

- **ACOS platform recap**
  - Application Delivery (ADC) and Server load balancing
  - IPv6 migration and IPv4 preservation
  - Widest choice of virtualization solutions

- **Recommended Resources**
  - eLearning: A10 Quick Classes - Deploying an IPv6-ready Website for Your Enterprise (#3)
  - White Paper - The End of IPv4? Migration paths to IPv6
  - Case Study: A10 Networks (SLB-PT)

Thank You

www.a10networks.com