IPv6
Transition Strategies

Justin Chiah

Category Team Manager,

HP Networking Asia Pacific and Japan,

May 2012

Agenda

Drivers and Operational Advantages

Strategic Approach to IPv6 transformation

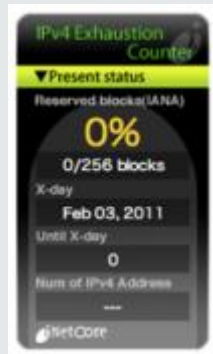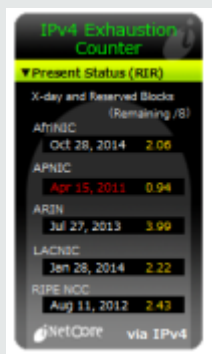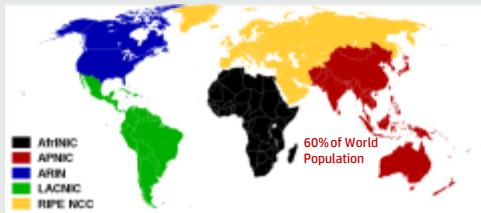Transition Strategies

HP IPv6 Consulting Portfolio

Why IPv6? Why now?

The new Internet

Internet is running on "empty"

- Explosion of users, devices, connected appliances and applications
- Virtualization and cloud computing
- IPv6 is already on a network close to you

IPv6 enables you to flip the ratio from operations to innovation

60% of World Population

AfriNIC
APNIC
LACNIC
RIPE NCC

IPv4 Exhaustion Counter
▼Present Status (RIR)
X-day and Reserved Blocks (Remaining /8)
AfriNIC   Oct 28, 2014   2.06
APNIC   Apr 15, 2011   0.94
ARIN   Jul 27, 2013   3.99
LACNIC   Jan 28, 2014   2.22
RIPE NCC   Aug 11, 2012   2.43
NetCore   via IPv4

IPv4 Exhaustion Counter
▼Present status
Reserved blocks(IANA)
0%
0/256 blocks
X-day
Feb 03, 2011
Until X-day
0
Num of IPv6 Address
....
NetCore

Traditional IT

Private and Public Cloud

More with less

BYOD

Instant-On

New IT project initiatives

Needs to be

Ongoing IT operations

INNOVATION OPERATIONS

Today's Reality

Quality of Experience is evermore critical

Mitigation techniques (like NAT) to handle the address pool depletion are now inherent as a dominant business model
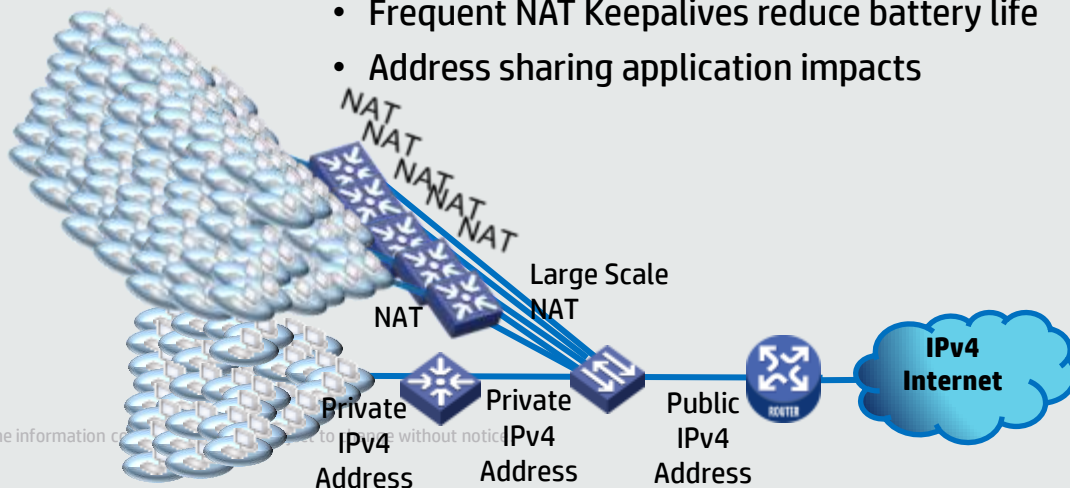
- Complexity pushed onto Applications and Content providers

This is how NAT abuse will be handled by content providers.

CGN NAT

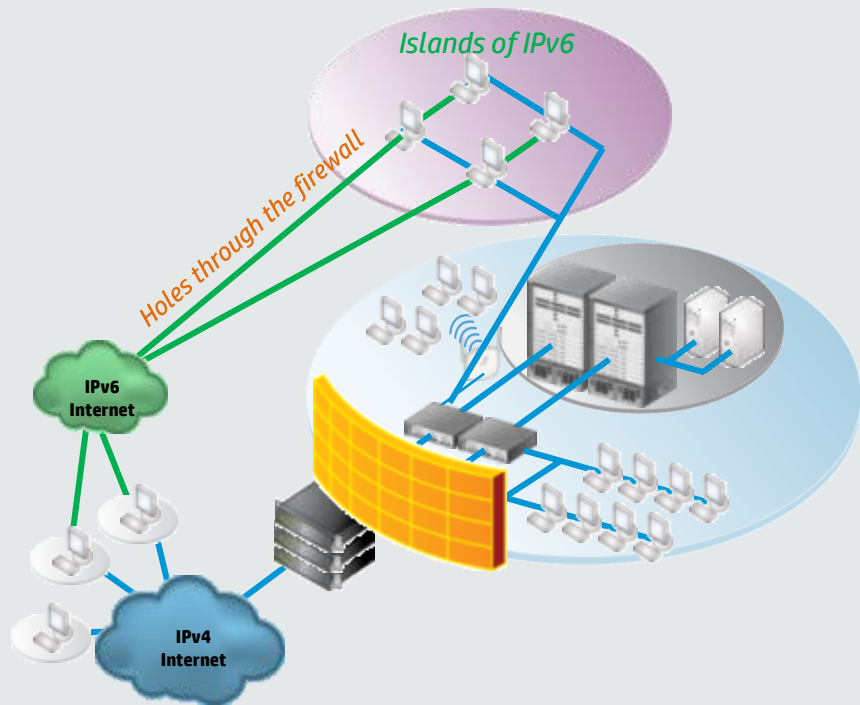Jason Fesler Yahoo! feb. 2012

Address sharing issues

- Amplification of security issues/ policing/ penalty boxes
- Traceability of network usage and abusage (for law enforcement)
- Geo-location and Geo-proximity services
- Frequent NAT Keepalives reduce battery life
- Address sharing application impacts

NAT NAT NAT NAT NAT

Large Scale NAT

NAT

Private IPv4 Address

Private IPv4 Address

Public IPv4 Address

IPv4 Internet

Today's Reality

Security is evermore critical

Islands of IPv6

Holes through the firewall

IPv6 Internet

IPv4 Internet

Security Operational Challenges

- Complexity due deployment of IPv4 mitigation techniques
- IPv6 is already present on your network
- Very often unmonitored
- IPv6 deployed along IPv4 increases the size of the attack vector
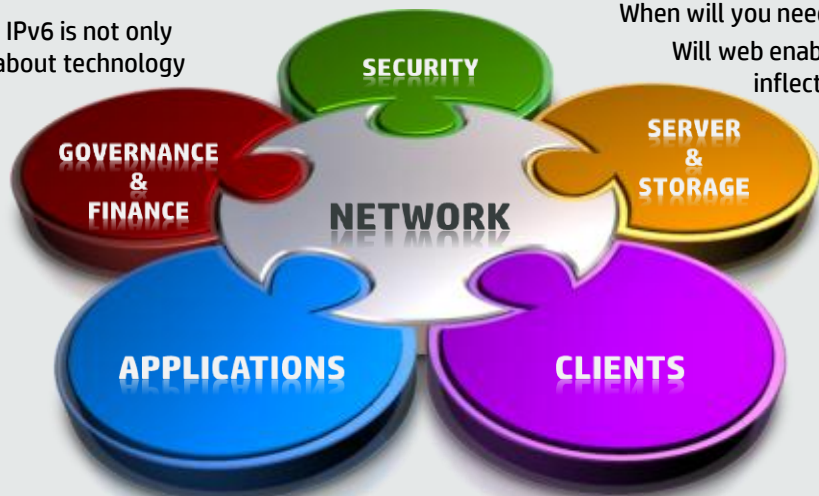
Not just about the Network

IPv6 has implications across the entire IT environment

Establish a Task Force

IPv6 traffic is already in your network now and uncontrolled

IPv6 is not only about technology

When will you need IPv6 inside the DC?

Will web enablement be your inflection point?

Are your applications IP dependent?

Many clients default and prefer IPv6 now

IPv6 Operational Advantages

Much more than just a larger addressing space

Unlock the potential of IPv6

- Robust, Effective, Efficient. Unlimited Address space.
- Extensibility. Enhanced Mobility.
- Optimized for next generation networks.
- End to End Services and applications.
- Free manpower from ordinary tasks
- Enable Service Automation.
- Better Support for QoS.
- Policy driven operations.
- Free manpower from ordinary tasks.
- Rapid deployment.

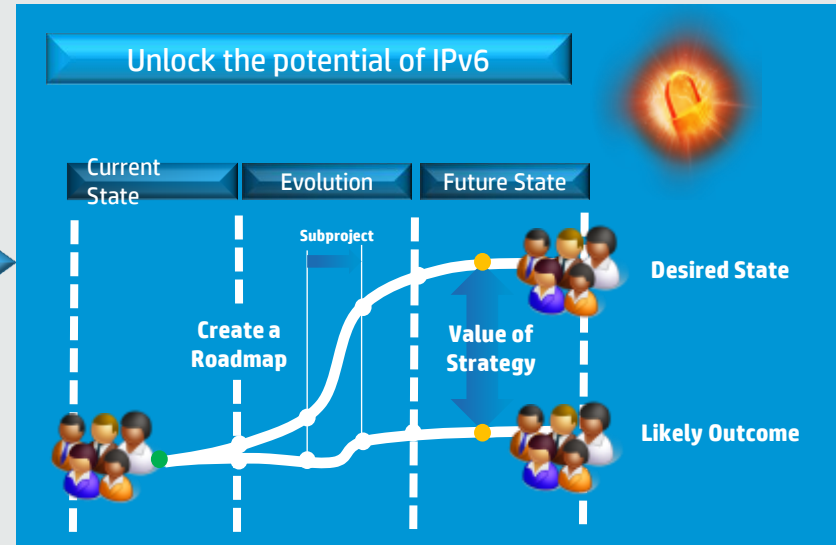# Strategy to achieve Transformational Benefits

How will you get there?

Facts

- IPv6 is inevitable, what is your inflection point?
- You control how and what role you want to play
- If your business is reliant on the internet, IPv6 is a necessity.
- Late start rapid deployments of IPv6 increases risk and cost
- Ignoring IPv6 introduces security risks

Pain Points

- Content consumption is breaking down on IPv4
- Instant Connectedness is not possible with IPv4

Unlock the potential of IPv6

Current State — Evolution — Future State

Subproject

Create a Roadmap

Value of Strategy

Desired State

Likely Outcome

IPv6 Transformation Journey

Joint Business & IT Task Force ensures a smooth path toward IPv6

Often overlooked

Customer Requirements

Applications

Business Model

Security
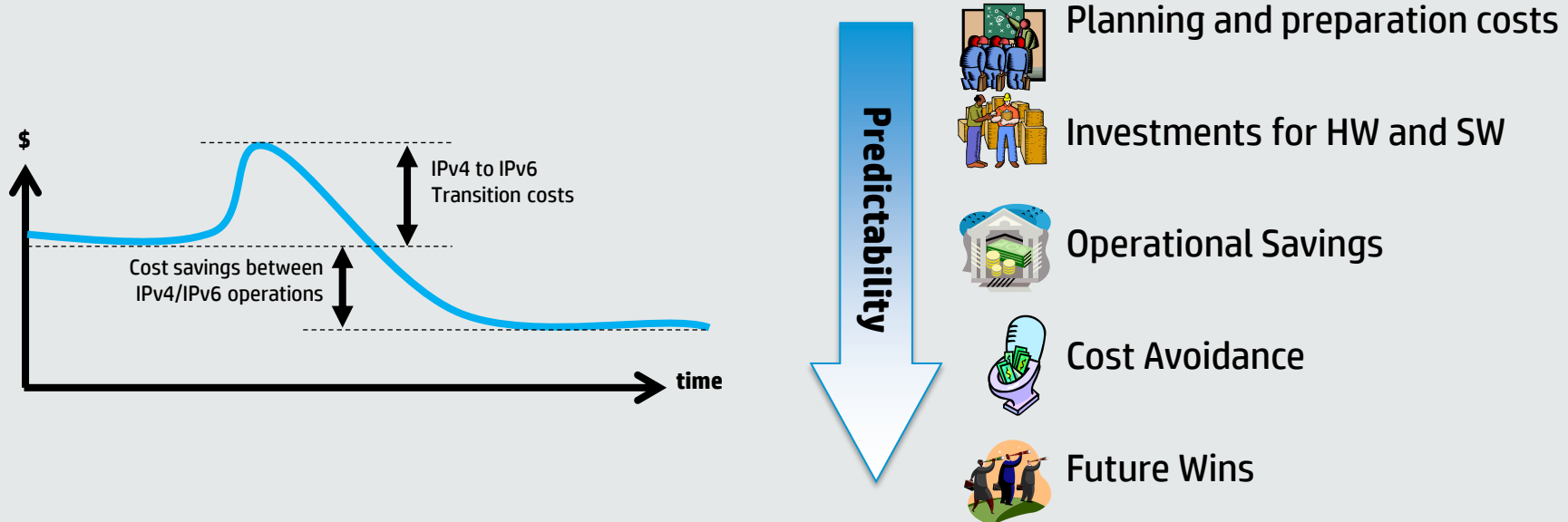
Business Goals

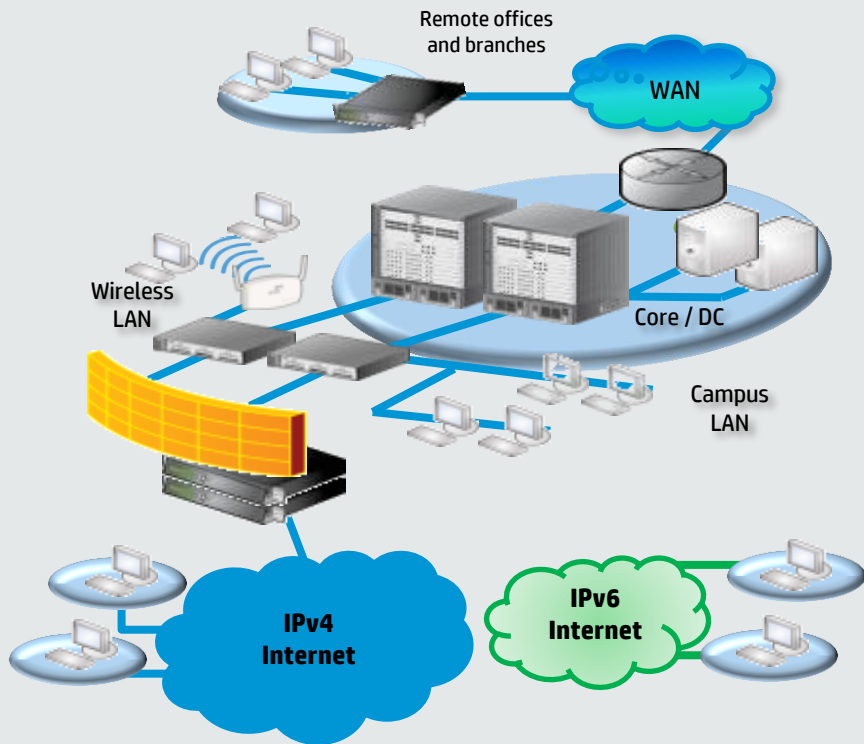Infrastructure

Business Process

Network

Value Proposition

IPv6

Yesterday's thinking won't solve today's opportunities

- Determine how IPv6 affects all business units
- Find ways IPv6 can help achieve your business and IT goals
- Analyze risks

- Remember Transforming IP dependent applications is time consuming task

Financial Impact

$

IPv4 to IPv6
Transition costs

Cost savings between
IPv4/IPv6 operations

time

Predictability

Planning and preparation costs

Investments for HW and SW

Operational Savings

Cost Avoidance

Future Wins

Transition Strategy

Remote offices and branches

WAN

Wireless LAN

Core / DC

Campus LAN

IPv4 Internet

IPv6 Internet

Current State Disconnected from IPv6 Internet

Three main categories

Dual Stack

- Provides complete support for IPv4 and IPv6 protocols

Tunneling

- Encapsulates IPv6 packets in IPv4 headers (and in later IPv4 packets in IPv6 headers)
- Requires dual-stack devices at either end of the connection

Translation

- Translates IPv6 addresses and into IPv4 addresses

Dual Stack Transition Strategy

Simple and widely used. Recommended Strategy

Use IPv4 or IPv6

- IPv4 and IPv6 protocol stacks implemented on the same device.

- + Most simple and recommended approach, network is the same. Applications can select which network protocol to be used

- – IPv4-only cannot communicate with IPv6-only, need to maintain 2 routing tables, need to maintain 2 firewall rule sets, requires additional memory and power, …
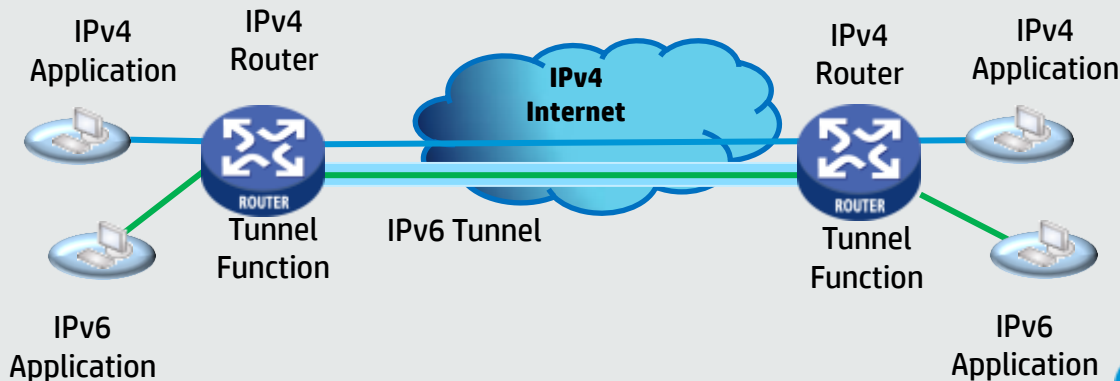

Application

Application
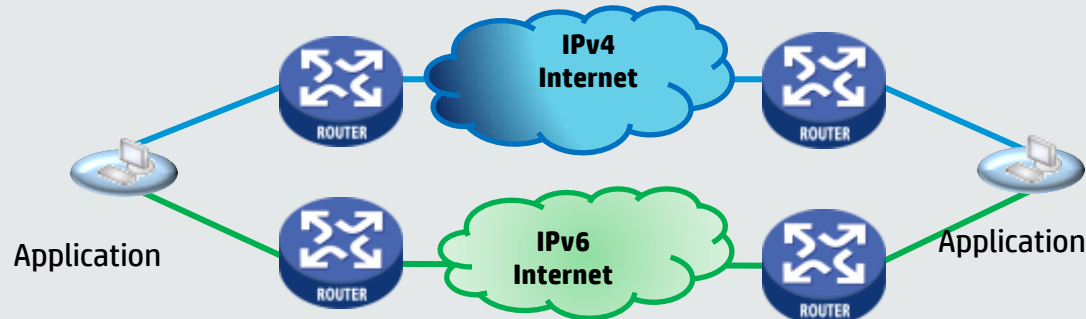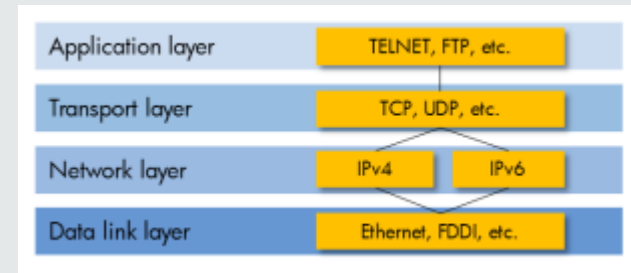
* IPv4 and IPv6 Networks can share a single link
* IPv4 and IPv6 can be enabled on the same router

IPv6 Tunneling

Simple and widely used

One transport protocol is encapsulated as the payload of the other (6-in-4 or 4-in-6)

- + Connect Islands of IPv6 or IPv4 (compatible nodes across incompatible networks) recommended for site-to-site

- – Security issues with tunneled protocols through FW (FW can't inspect payload) reduced performance, complicated network management + troubleshooting
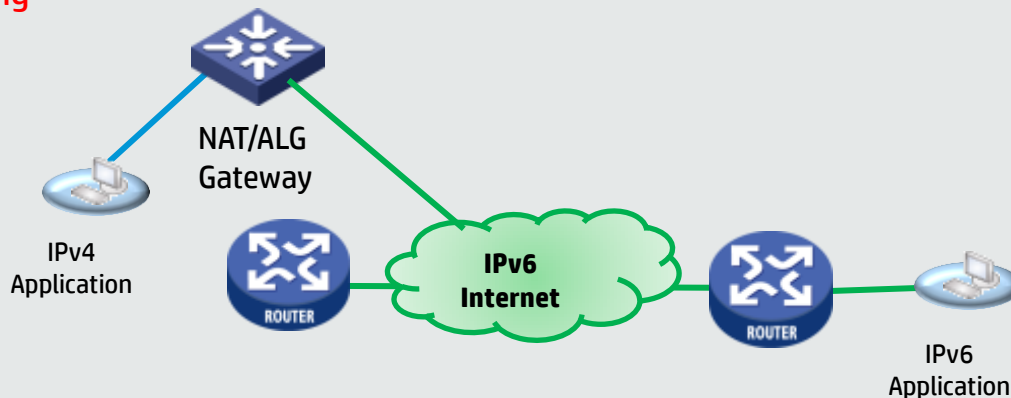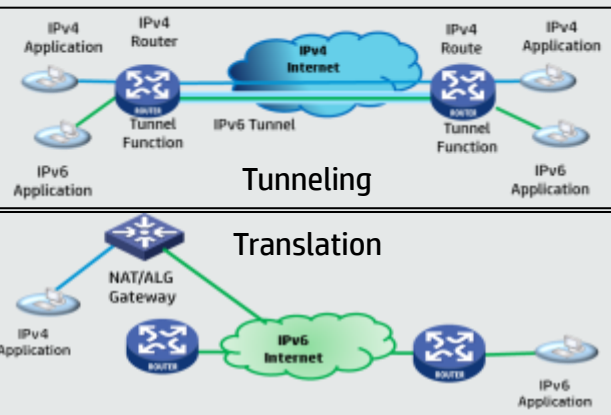
- Can be manual or automatic

IPv4
Application

IPv4
Router

**IPv4
Internet**

IPv4
Router

IPv4
Application

ROUTER

Tunnel
Function

IPv6 Tunnel

ROUTER

Tunnel
Function

IPv6
Application

IPv6
Application

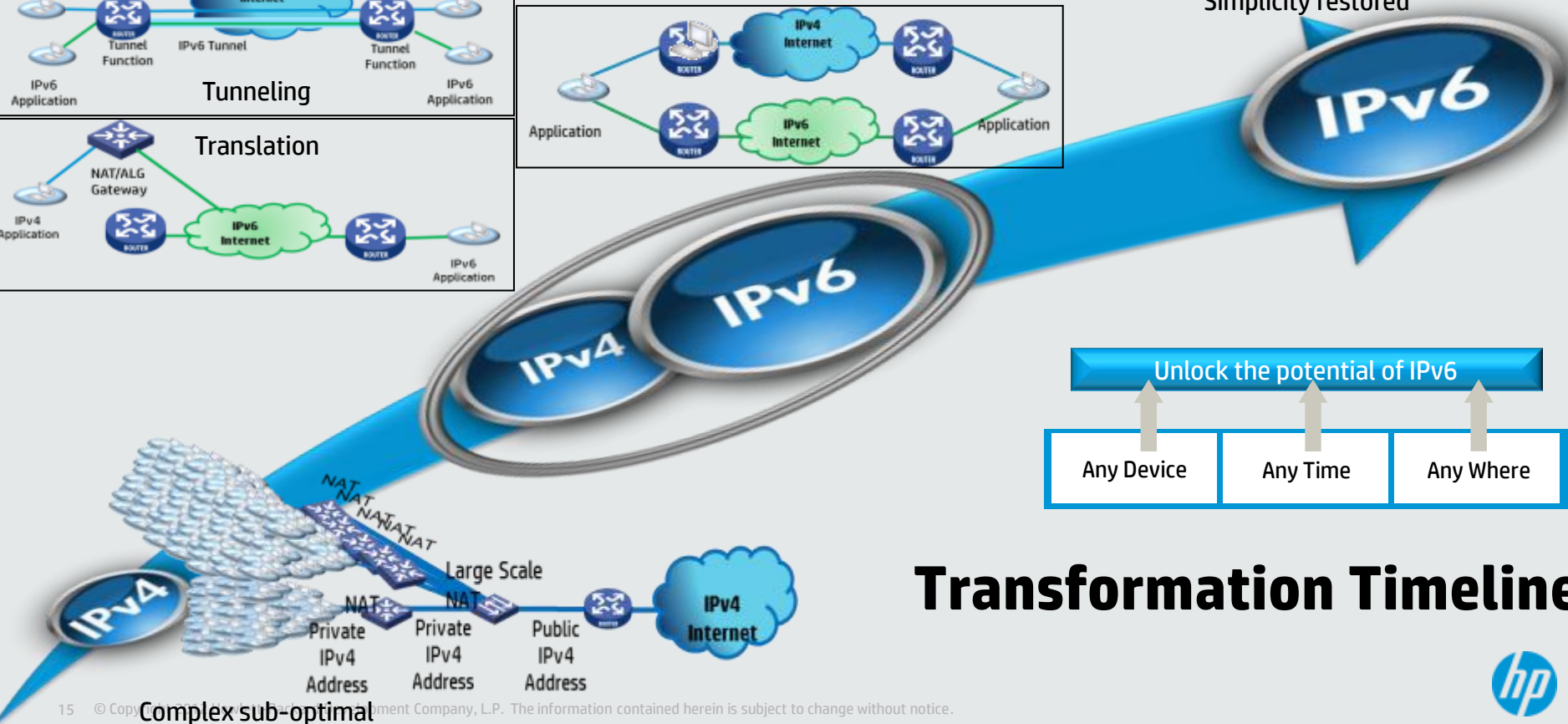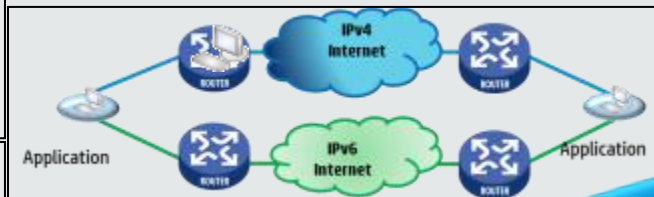# IPv6 Translation

If you must!

Between IPv4 and IPv6 (NAT64/DNS64)

- Translates IPv6 names & addresses into IPv4 names & addresses (and vice versa).

- + Enables IPv6-only host to communicate with IPv4-only hosts (and vice versa), No modification to IPv4 or IPv6 end nodes, only at boundary routers

- – Application incompatibilities (e.g. VoIP), need for ALG, and has all NAT drawbacks Increased complexity in network topology, Reduced Performance (dep. on HW), complicated troubleshooting
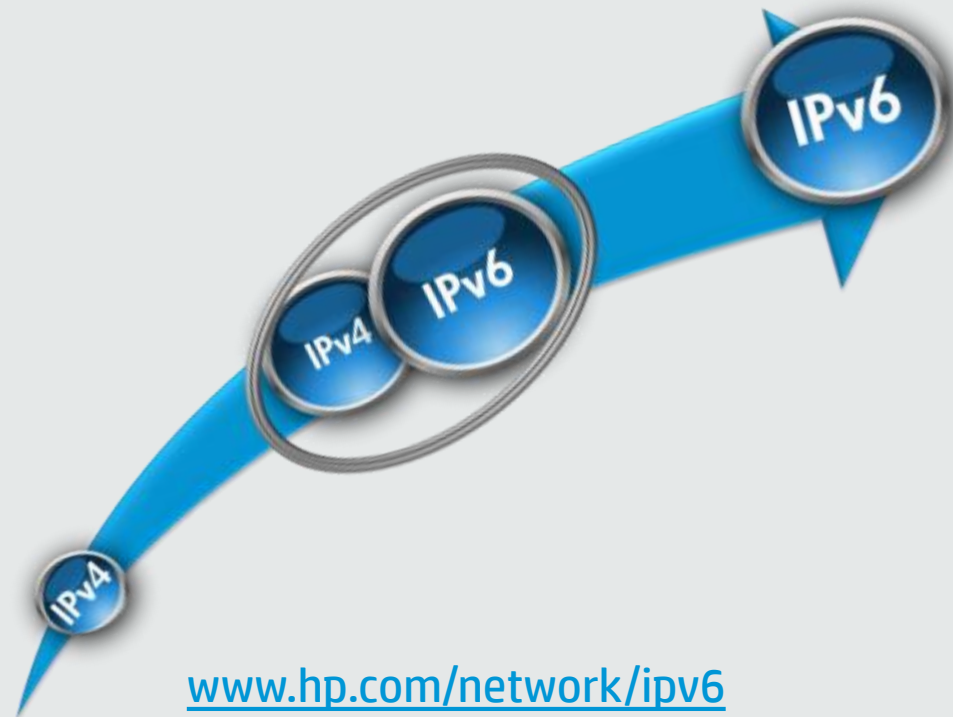
NAT/ALG
Gateway

IPv4
Application

ROUTER

**IPv6
Internet**

ROUTER

IPv6
Application

Tunneling

Translation

Dual-Stack

Simplicity restored

Transformation Timeline

Unlock the potential of IPv6

Any Device | Any Time | Any Where

Complex sub-optimal

HP has already delivered IPv6

HP supports IPv6 across all its product lines today

- Integrity Servers, ProLiant Servers, Business Critical Servers, Storages, Personal Workstation, Printers, HP Networking (3Com, H3C, ProCurve and TippingPoint IPS) and HP Software
- We have the ability to bring solutions and expertise to every corner of the IPv6 conversation
- IPv6 standards committees
- Network & IT Consulting expertise

www.hp.com/network/ipv6
www.hp.com/services/ipv6

IPv6 @ HP the Enterprise

Business Drivers

- Inevitability of IPv6.
- Business Continuity issue
- External
  – hp.com e-commerce reachability via IPv6
- Internal
  – Unified communication

Architectural Principle

- Stepwise deployment
- Ensure application and network services support IPv6
- Allow no IPv4 disruption
- Standardize on Dual-stack
- Managed environment
  – Use DHCPv6 where you can in favor of SLAAC
- Run IPv6 on HP products

Status

- Started deployment in 2001
- Today (Mar 2012)
  – 300+ IPv6 subnets available
  – 120 IPv6 R&D labs deployed
    - Labs interconnected with Tunnels.
  – Core Dual-stack.
  – Each existing subnet are being migrated to native IPv6 WAN.

HP IPv6 Consulting Portfolio
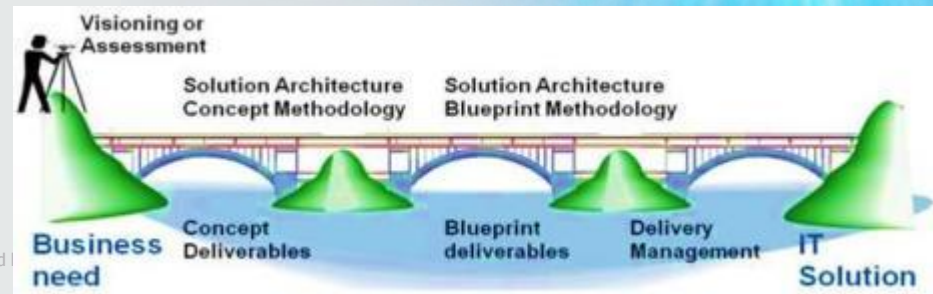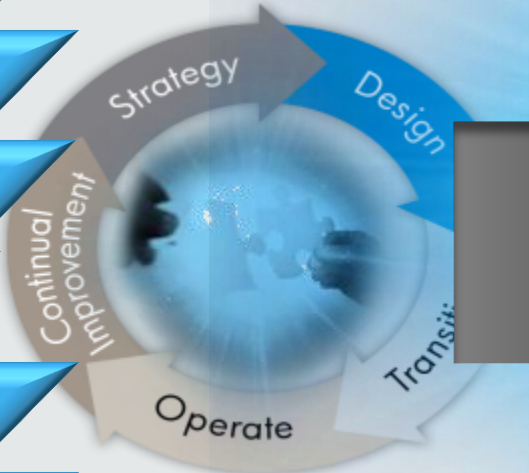
- IPv6 Transformation Experience Workshop
- IPv6 Readiness Assessments
- IPv6 Architecture and Design
- IPv6 Web Start Service
- IPv6 Transition Consulting
- IPv6 Integration & Deployment

HP at the forefront of IPv6

HP took an early Lead with IPv6

1993
- HP helped define the IP Next Generation protocol in the IETF

1995
- First Public HP IPv6 demos & experiments

1996
- HP 6bone connection active

1999
- HP Founding member of the IPv6 Forum
- Jim Bound CTO and member of the Board of Directors of IPv6 Forum
- Yanick Pouffary IPv6 Forum Fellow

2000
- First HP IPv6-enabled server products

2001
- HP launched industry leading IPv6 and Mobile IPv6 solution demos

2002
- HP chairs North American IPv6 Task Force and is Technology Director.
- NAv6TF influences Whitehouse U.S. Cyber Security Office to promote IPv6 leading to US DoD mandating the integration of IPv6 to be ready by Oct 2008 (June 2003)
- HP IT launched a world wide IPv6 test bed

HP at the forefront of IPv6
HP took an early Lead with IPv6

2003
- HP participating in North American IPv6 interoperability Network Pilot – Moonv6
- HP helped define IPv6 ready logo
- HP OpenView Network Node Manager IPv6 support
- Internal HP IPv6 initiative

2004
- NAv6TF works with White House Office of Management (OMB) leading to June 2005 OMB mandate
- HP IPv6 servers acquire IPv6 ready logo
- HP ProCurve IPv6 VLANs support

2005
- HP was among the first printer companies to release an IPv6 product
- NAv6TF works with OMB to produce OMB IPv6 transition guidance

2006
- HP Printer first vendor on the US DoD IPv6 Approved Product list
- HP StorageWorks Division provides a customer statement of support committing support of IPv6 per the US OMB mandate

2007
- HP Network Automation (HPNA) is capable of discovering both IPv4 and IPv6 devices in an automated fashion.

2008-2010
- HP operates more than 120 R&D sites on IPv6 for Product Development R&D teams and Labs.

Tools to Help

Learn about [IPv6 Services](#) from HP Technology Services

Download the brochure [Capitalize on the next-generation Internet](#)

Download the white paper [Prepare today for tomorrow's IPv6 world](#)

Engage your HP account team

Learn about [networking career certifications](#) from HP ExpertONE

Thank you