NAT DEPLOYMENT OBSERVATIONS

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Use-cases and observations

Agenda

- General observations on IPv6 migration strategies

- NAT444

- SLB664

- NAT64 (services)

- NAT46

- NAT64 (access)

IPv6: Finding the Pragmatic Path
Seeing past the black and white

IPv4 Diehards	IPv6 Purists	Pragmatic View
• There are millions of IPv4 addresses left	• The world is already out of IPv4 addresses	• Exhaustion is real, but there's time to plan
• We can use Network Address Translation (NAT) to make IPv4 work forever	• It will all be IPv6 in 18 months	• Two-protocol world is the new reality—demands new solutions
• IPv6 has no economic motivators	• IPv6 is simply "the right thing to do"	• There are business reasons to move parts of your network to IPv6—the foundation of any IPv6 plan

Brocade IPv6 Strategic Blueprint

It's a marathon, not a sprint

| Phase 1	Phase 2	Phase 3	Phase 4
IPv6 Presence	**Dual-Stack Core**	**IPv4/IPv6 Inter-Operation**	**IPv4 to Dual Stack**
• Public services and content on IPv6 Internet • IPv6 security	• Transport and visibility • Core services and backbones	• IPv6-only endpoints access to IPv4 Internet • IPv4-only endpoints access to IPv6 services	• Client and server migration to IPv4 and IPv6 services on natural refresh cycles • …and eventually onward to v6-only as needs dictate.

Why NAT on an Application Delivery Controller?

Observations about two popular topology choices
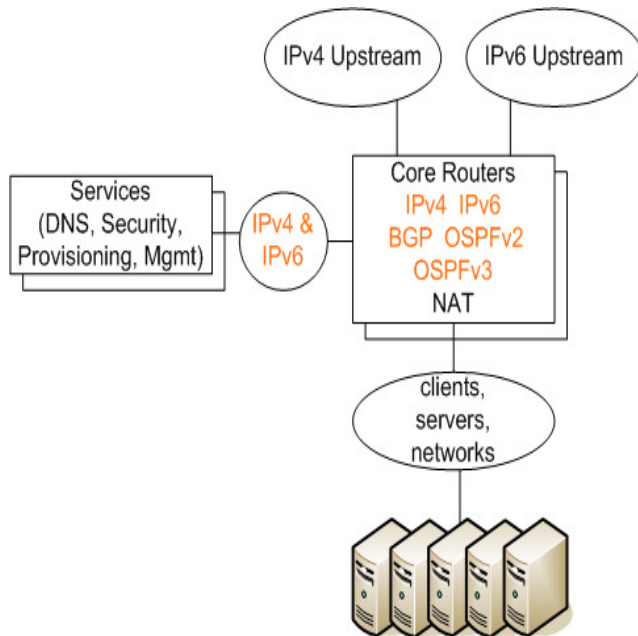
- In-core solutions
- ADC-based solutions
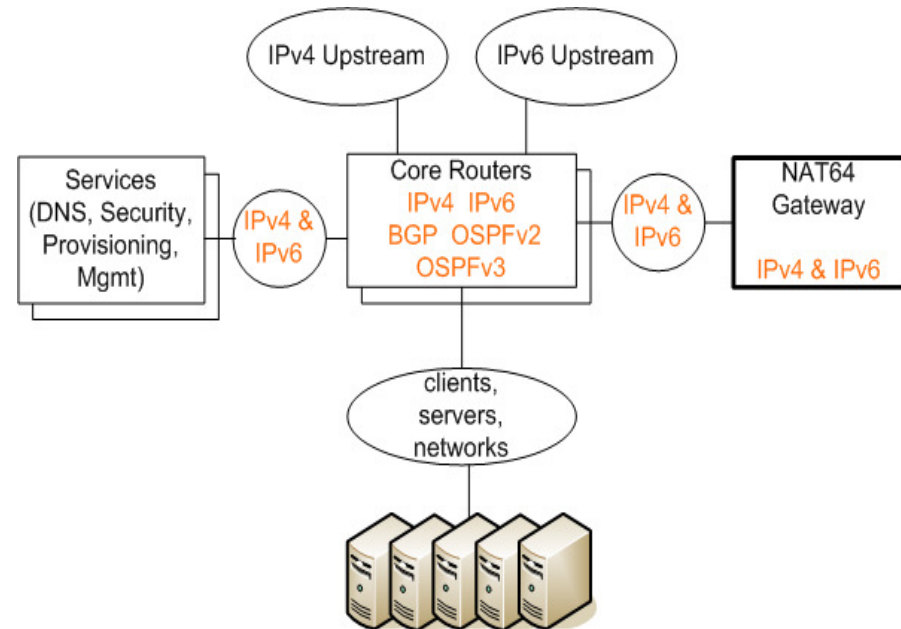
Making Sense of the Standards:
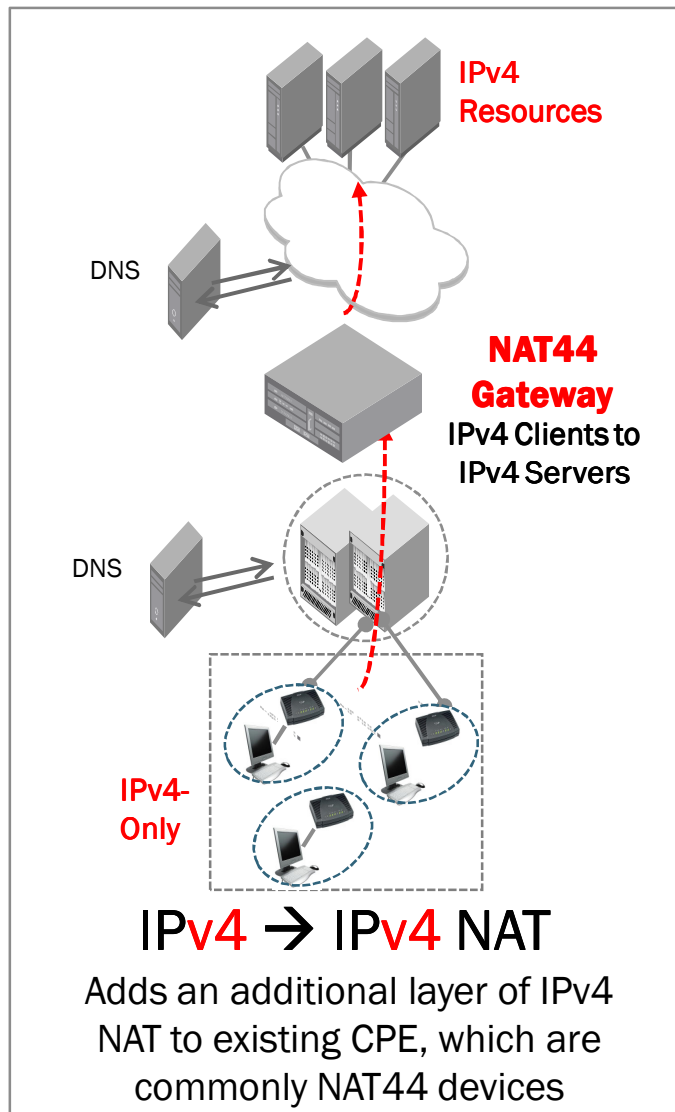# Why NAT on an App Delivery Controller, ct'd
Layer 7 intelligence coupled with Layer 3 translation

	NAT64	6rd	DS-Lite	NAT444
Brief explanation of the technology	**Address translation** between IPv4 and IPv6	**CPE-driven stateless translation** to carry IPv6 over carrier's IPv4	**Tunnel client IPv4** over carrier's IPv6 and then NAT to IPv4 Internet	**Double NAT client IPv4 (private and carrier)**; No traffic to IPv6 networks
Client transparent (i.e., no change required on CPE)?	Yes	No	No	Yes
Designed as gateway to IPv6, or preservation of IPv4 addresses?	IPv6 transition	IPv6 transition	IPv4 preservation	IPv4 preservation

- NAT64 offers a simple, fast, and practical IPv6 gateway strategy and migration path
- Application Delivery Controllers are the right platform for NAT:
  - Tracking and auditing NAT-translated flows
  - Application layer intelligence for embedded Layer 3 information
  - Example: Inserting the end-client IPv6 address in the HTTP header for visibility by upper-layer applications
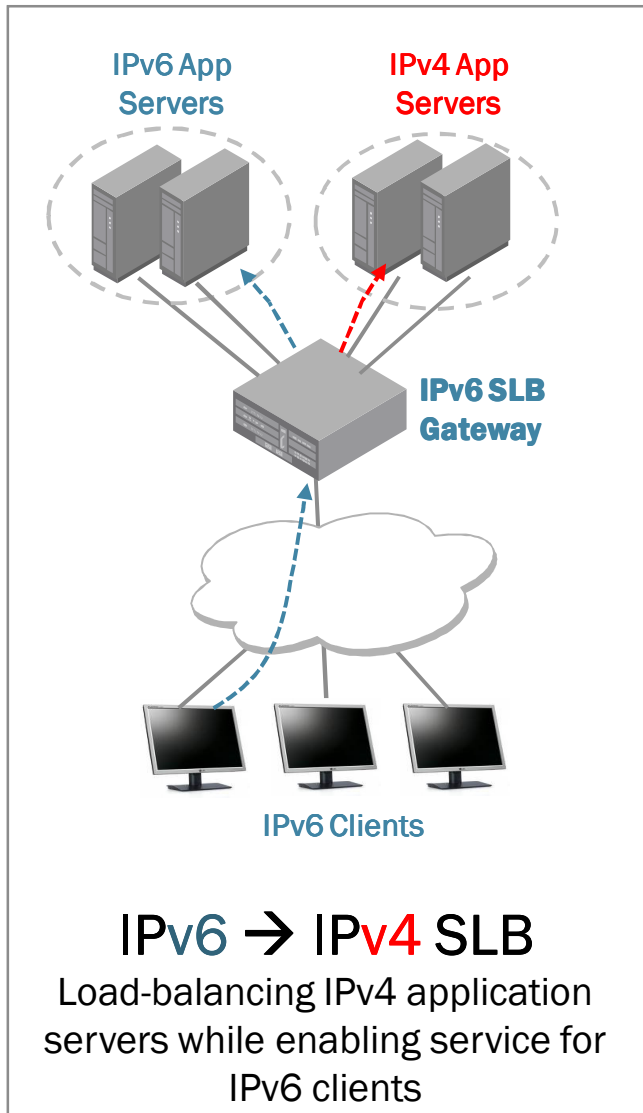- Highly available, high-speed platforms — millions of concurrent sessions

NAT444

IPv4 Resources

DNS

NAT44 Gateway
IPv4 Clients to IPv4 Servers

DNS

IPv4-Only

IPv4 → IPv4 NAT

Adds an additional layer of IPv4 NAT to existing CPE, which are commonly NAT44 devices

- Use-cases
- Mapping & session methodologies
- Depth of v6 deployment
- Topology
- DNS methodologies
- Coexistence
- Operations
- Training

SLB 6-6-4

Rapid Enablement for Enterprises, Managed Hosting, etc.

IPv6 App Servers

IPv4 App Servers

IPv6 SLB Gateway

IPv6 Clients

IPv6 → IPv4 SLB

Load-balancing IPv4 application servers while enabling service for IPv6 clients

- Use-cases

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- Depth of v6 deployment

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SLB664 Example: Brocade IT and IPv6
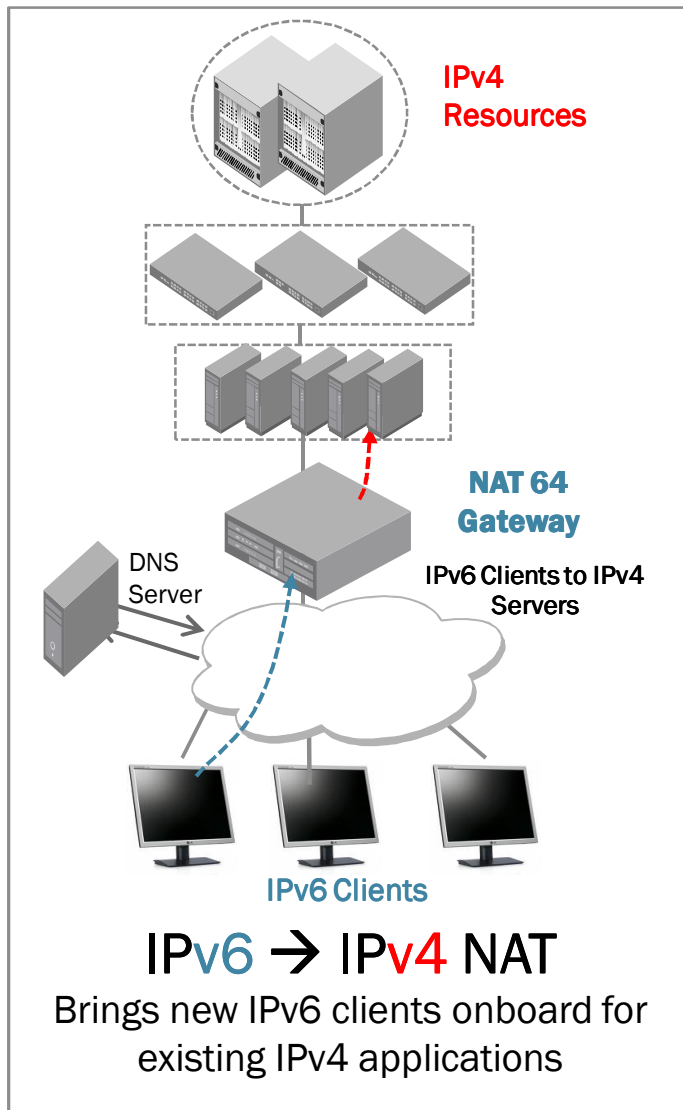
June 2010

- Brocade was asked to demonstrate IPv6 commitment
  - DoD/DREN/SPAWAR are pressing vendors for IPv6 timelines
  - As DREN migrates to IPv6, so does .mil and .gov

August 9, 2010

- Brocade went "green across the board" for DREN's IPv6 capability test for DNS, WWW, and SMTP (20 days ahead of schedule)
  - Without SLB664, this would have been impossible in the same timeframe
  - Utilized a wide range of ADC functionality to meet the IPv6 capability requirements
  - Project was completed while the entire company was relocating into a new campus (limited resources)
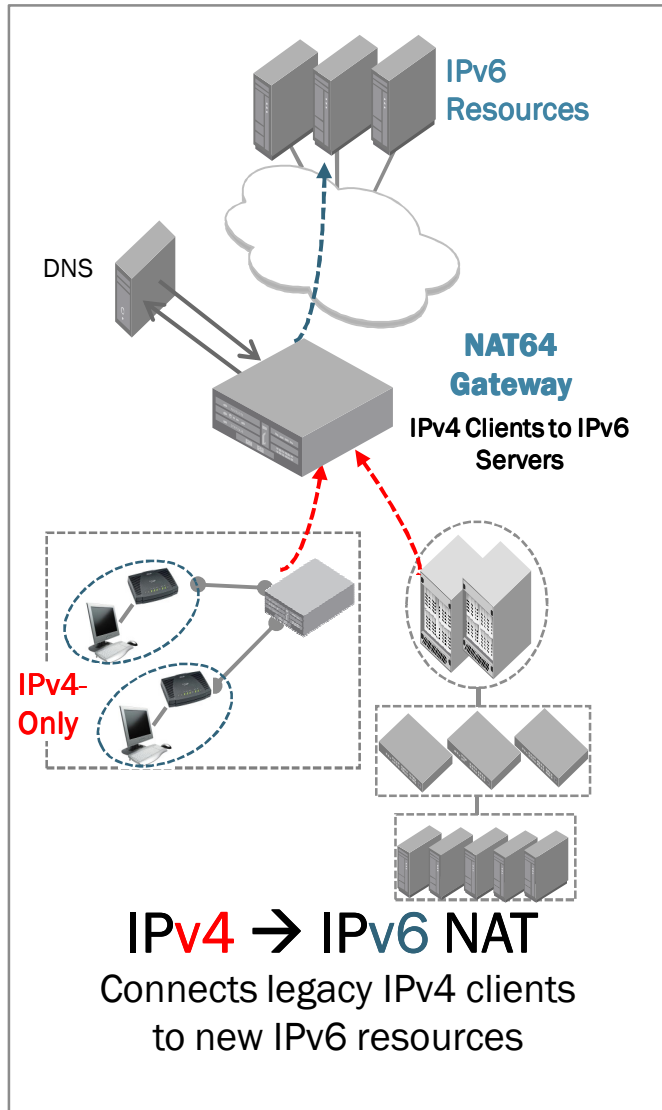
NAT64: v4 services

IPv4 Resources

NAT 64 Gateway

IPv6 Clients to IPv4 Servers

DNS Server

IPv6 Clients

IPv6 → IPv4 NAT
Brings new IPv6 clients onboard for existing IPv4 applications

- Use-cases

- Mapping & session methodologies

- Depth of v6 deployment

- Topology

- DNS methodologies

- Coexistence

- Operations

- Training

"NAT46" methodology

IPv6 Resources

DNS

NAT64 Gateway

IPv4 Clients to IPv6 Servers

IPv4-Only

IPv4 → IPv6 NAT
Connects legacy IPv4 clients to new IPv6 resources

- Use-cases

- Mapping & session methodologies

- Depth of v6 deployment

- Topology

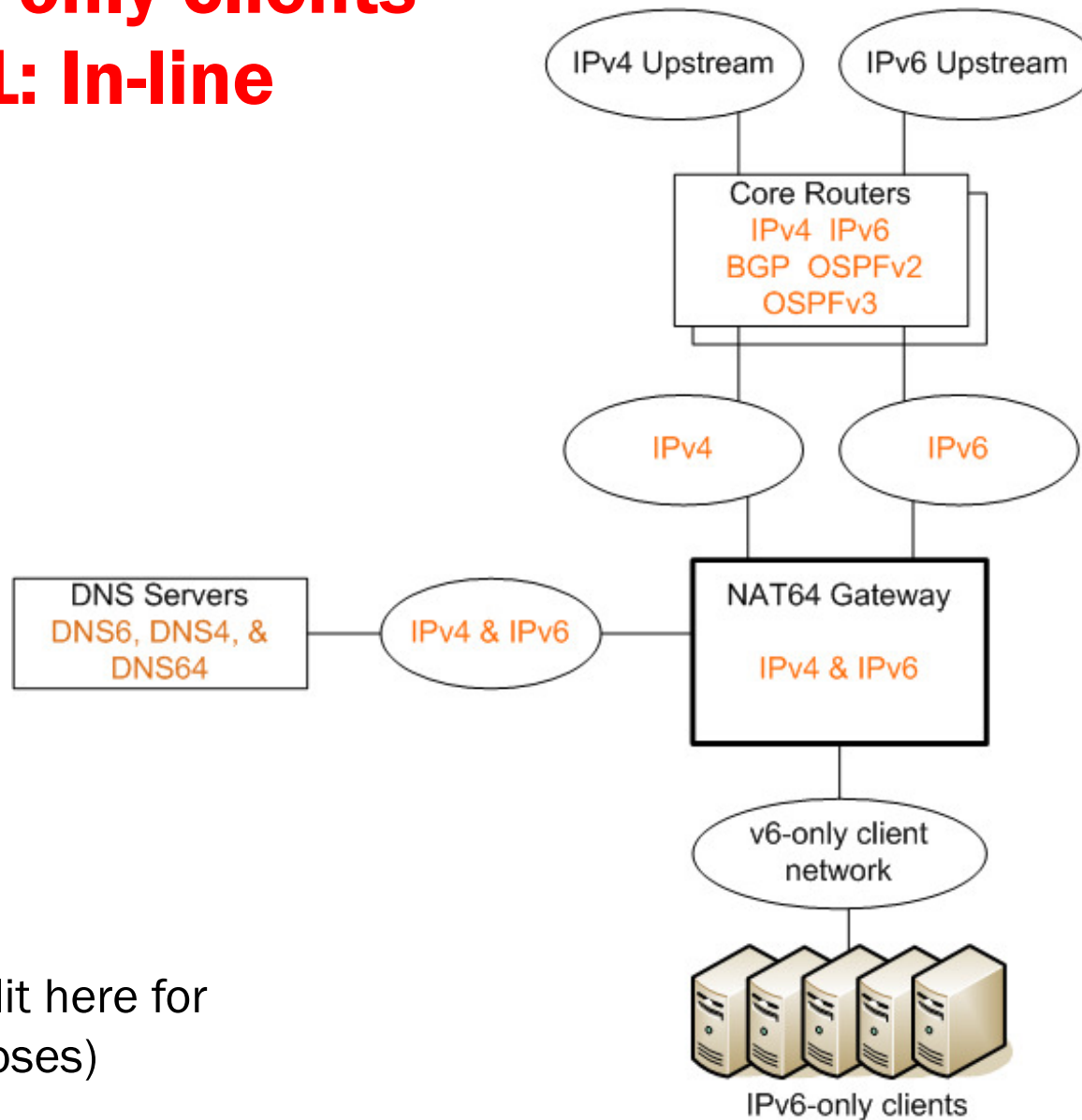- DNS methodologies

- Coexistence
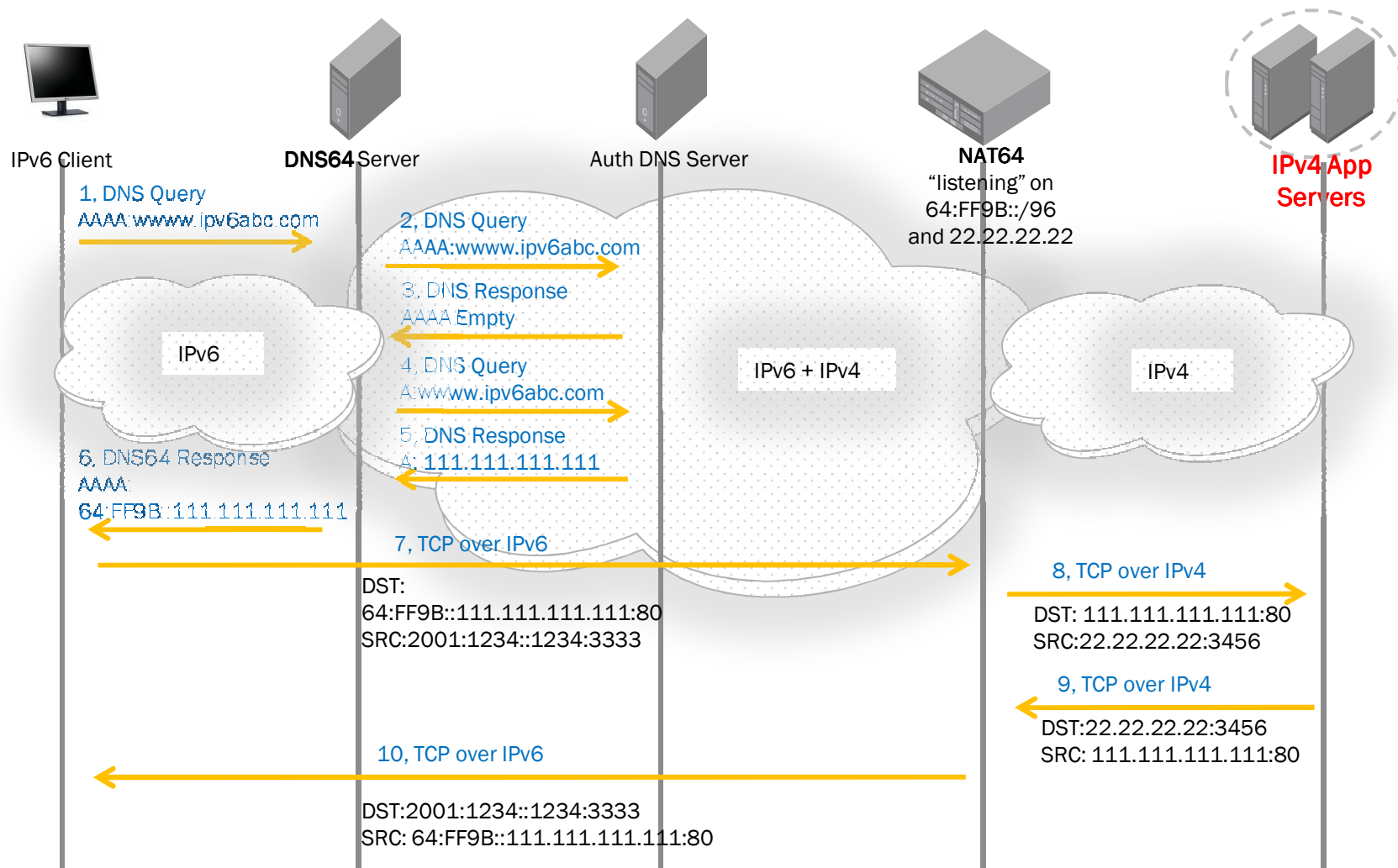
- Operations

- Training

NAT64: v6-only clients
Topology 1: In-line

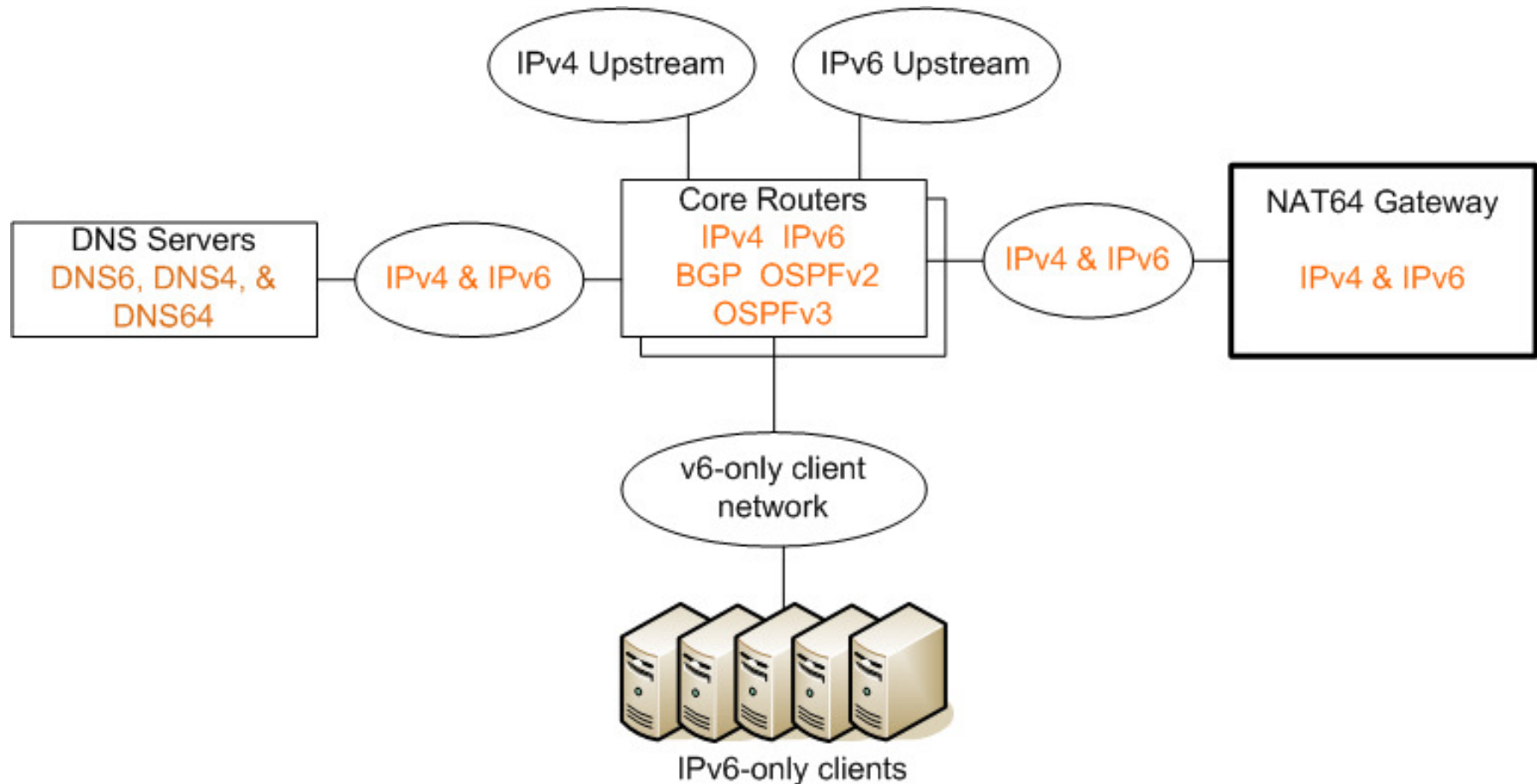(v4/v6 paths split here for illustrative purposes)

How NAT64 works for v6-only access clients
...or more importantly, how DNS64 works

IPv6 Client

DNS64 Server

Auth DNS Server

NAT64
"listening" on
64:FF9B::/96
and 22.22.22.22

**IPv4 App
Servers**

IPv6

IPv6 + IPv4

IPv4

1, DNS Query
AAAA:wwww.ipv6abc.com

2, DNS Query
AAAA:wwww.ipv6abc.com

3, DNS Response
AAAA Empty

4, DNS Query
A:www.ipv6abc.com

5, DNS Response
A: 111.111.111.111

6, DNS64 Response
AAAA:
64:FF9B::111.111.111.111

7, TCP over IPv6

DST:
64:FF9B::111.111.111.111:80
SRC:2001:1234::1234:3333

8, TCP over IPv4

DST: 111.111.111.111:80
SRC:22.22.22.22:3456

9, TCP over IPv4

DST:22.22.22.22:3456
SRC: 111.111.111.111:80

10, TCP over IPv6

DST:2001:1234::1234:3333
SRC: 64:FF9B::111.111.111.111:80

NAT64: v6-only clients
Topology 2: Routed/out of critical path

In Conclusion...

We're hearing new use-cases every week!

- All of these can be tested with minimal IPv6 access

- ...but start lab testing now!

- Know your use-case(s)

- Understand the application flow(s)

- Include cross-functional teams while planning NAT implementation (don't miss monetization opps!)

- Train all teams appropriately, including support and PM – Brocade can help with that

- Don't rip & replace the whole network

(...It's a marathon, not a sprint!)

Thank You