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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**

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

It’s a marathon, not a sprint

Phase 1
IPv6 Presence
• Public services and content on IPv6 Internet
• IPv6 security

Phase 2
Dual-Stack Core
• Transport and visibility
• Core services and backbones

Phase 3
IPv4/IPv6 Inter-Operation
• IPv6-only endpoints access to IPv4 Internet
• IPv4-only endpoints access to IPv6 services

Phase 4
IPv4 to Dual Stack
• 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

<table>
<thead>
<tr>
<th>Brief explanation of the technology</th>
<th>NAT64</th>
<th>6rd</th>
<th>DS-Lite</th>
<th>NAT444</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address translation between IPv4 and IPv6</td>
<td>CPE-driven stateless translation to carry IPv6 over carrier’s IPv4</td>
<td>Tunnel client IPv4 over carrier’s IPv6 and then NAT to IPv4 Internet</td>
<td>Double NAT client IPv4 (private and carrier); No traffic to IPv6 networks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Client transparent (i.e., no change required on CPE)?</th>
<th>Yes</th>
<th>No</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Designed as gateway to IPv6, or preservation of IPv4 addresses?</th>
<th>IPv6 transition</th>
<th>IPv6 transition</th>
<th>IPv4 preservation</th>
<th>IPv4 preservation</th>
</tr>
</thead>
</table>

- 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

- 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.

- Use-cases
- Mapping & session methodologies
- Depth of v6 deployment
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IPv6 \(\rightarrow\) IPv4 SLB
Load-balancing IPv4 application servers while enabling service for IPv6 clients
### SLB664 Example: Brocade IT and IPv6

<table>
<thead>
<tr>
<th>June 2010</th>
<th>August 9, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Brocade was asked to demonstrate IPv6 commitment</td>
<td>• Brocade went “green across the board” for DREN’s IPv6 capability test for DNS, WWW, and SMTP (20 days ahead of schedule)</td>
</tr>
<tr>
<td>• DoD/DREN/SPAWAR are pressing vendors for IPv6 timelines</td>
<td>• Without SLB664, this would have been impossible in the same timeframe</td>
</tr>
<tr>
<td>• As DREN migrates to IPv6, so does .mil and .gov</td>
<td>• Utilized a wide range of ADC functionality to meet the IPv6 capability requirements</td>
</tr>
<tr>
<td></td>
<td>• Project was completed while the entire company was relocating into a new campus (limited resources)</td>
</tr>
</tbody>
</table>

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NAT64: v4 services

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

IPv6 → IPv4 NAT
Brings new IPv6 clients onboard for existing IPv4 applications
“NAT46” methodology

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

IPv4 \(\rightarrow\) IPv6 NAT

Connects legacy IPv4 clients to new IPv6 resources
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

1. DNS Query AAAAA:www.ipv6abc.com
2. DNS Query AAAAA:www.ipv6abc.com
3. DNS Response AAAAA Empty
4. DNS Query A www.ipv6abc.com
5. DNS Response A 111.111.111.111
6. DNS64 Response AAAAA 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
NAT64: v6-only clients
Topology 2: Routed/out of critical path

- DNS Servers: DNS6, DNS4, & DNS64
- IPv4 Upstream
- IPv6 Upstream
- Core Routers: IPv4, IPv6, BGP, OSPFv2, OSPFv3
- v6-only client network
- IPv6-only clients
- NAT64 Gateway: IPv4 & IPv6
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