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NAT64 + DNS64 SOLUTIONS

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About Brocade and Secure64

ServerIron ADX and DNS Cache

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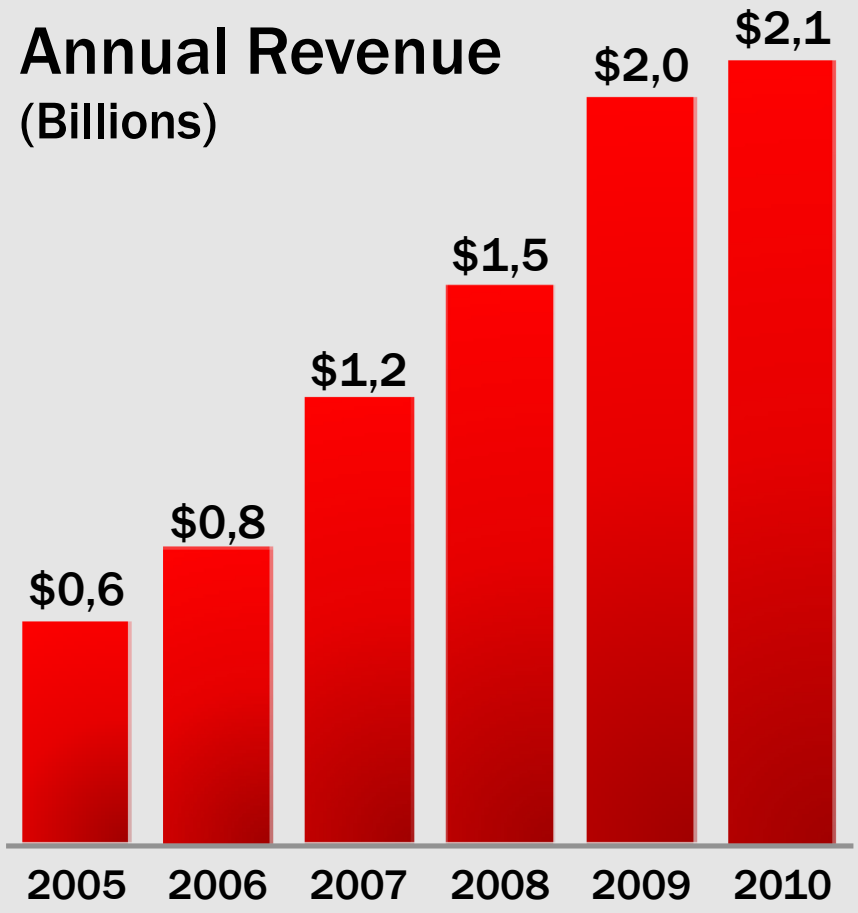
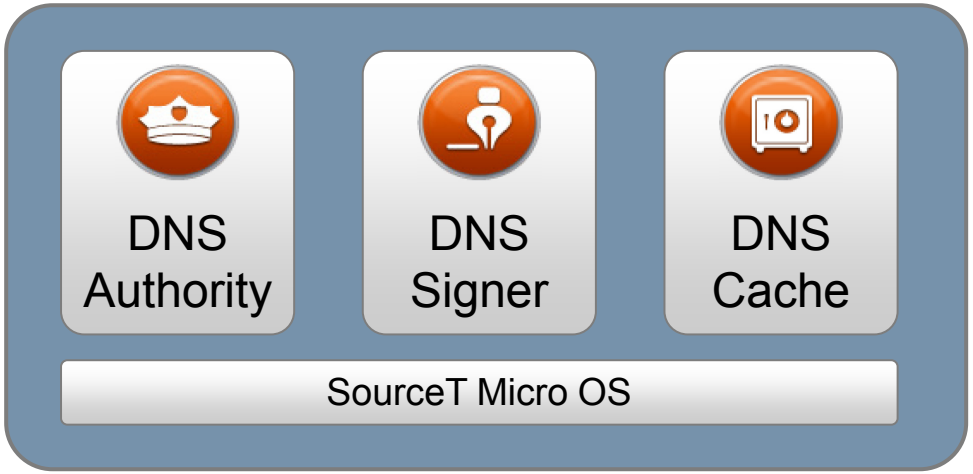
Brocade at a Glance

- Networking Company
- Founded in 1995
- Acquired Foundry in 2008
- 4,700+ employees worldwide
- Headquartered in San Jose, CA
- Operating in more than 160 countries
- $2+ billion in annual



Secure64 the leader in DNS

- DNSSEC
- DDoS protection
- Performance
- IPv6
- Blacklisting
- Cache poisoning protection
- More…



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IPv6: Finding the Pragmatic Path

Seeing past the black and white

IPv4 Diehards	IPv6 Purists	Pragmatic View
• There are millions of IPv4 address left! • We can use NAT to make IPv4 work forever! • IPv6 has no economic motivators	• The world is already out of IPv4 addresses! • It'll all be IPv6 in 18 months! • IPv6 is simply "the right thing to do"	• Exhaustion is real; but there's time to plan • Two-protocol world is the new reality—demands new solutions • There are business reasons to move parts of your network to v6; that is the foundation of any

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.

Brocade ServerIron ADX

Flagship product for application delivery switch

Extreme Performance

- 70+ Gbps of throughput
- Wirespeed DDoS attack protection
- Extremely Low Latency for content switched requests
- Highest performing TCP, DNS, UDP & IPv4/IPv6 performance

Scale for Growth

- Enable processors, memory, interfaces and functionality via software licenses
- Modular platforms for performance that grows with the business

Simplified Orchestration & Automation

- Capacity on Demand
- Automated configuration in response to changes in application demand
- Integrated with leading VM Orchestration software

Brocade ServerIron ADX

Flagship product for application delivery switch

ADX 10000

- 10 U Chassis
- Up to 4 ASMs (Application Switch Module)
- Up to 32 application cores
- 2GB memory per core
- Same line card module as ADX 4000
- Redundant management modules

ADX 4000

- 4 U Chassis
- Up to 2 ASMs (Application Switch Module)
- Up to 16 application cores
- 2GB memory per core
- Each Line Card = 4 x 10 GbE and 12 x 1 GbE
- Dual-core management module

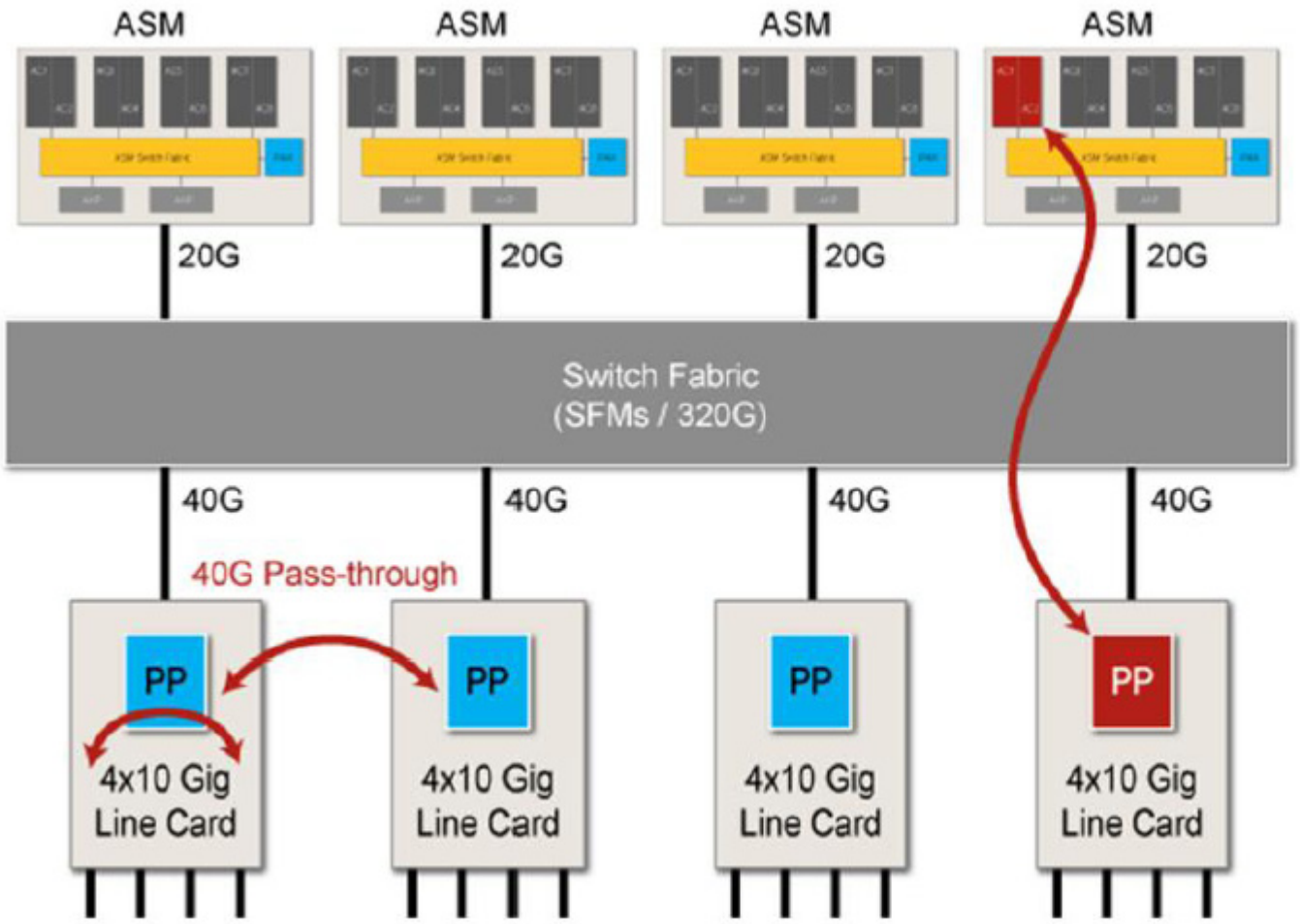
ADX 1000

- 1 U Fixed configuration
- 2 Platforms: ADX 1000 and ADX 1000F Platform
- Pay as You Grow Model with software upgrade license
- Up to 24 * x 1 GbE and 2 x 10 GbE ports
- Up to 4 application cores
- Built-in SSL hardware
- Dual-management cores

** 1000F has up to 24 x 1 GbE Ports; 1000 has up to 16 x 1 GbE Ports*

Brocade ServerIron ADX

Traffic Flow through Hardware



- Doesn't consume CPU unless necessary
- Extremely low-latency;
- FPGA-based features add HW-based security

Packet Processor
- L2-3 wire speed
- L4-7 classification

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NAT64 & DNS64 Solution Overview

For v6-only client access in a two-stack world

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Terminology

Alphabet Soup? Clearing up common misconceptions & errors

- NAT64 = **Translation**
  RFC 6146 and 6147
- 6to4 & 6in4 = **Tunneling** / encapsulation
- *...There's no such thing as "NAT6to4".*

- DNS64 – Synthesize IPv6 AAAA records when only IPv4 A records are available
- *...Not all DNS6 includes DNS64 functionality, and DNS64 isn't used in every NAT64 use-case.*

Stateful NAT64:
IPv6 Clients → IPv4 Resources

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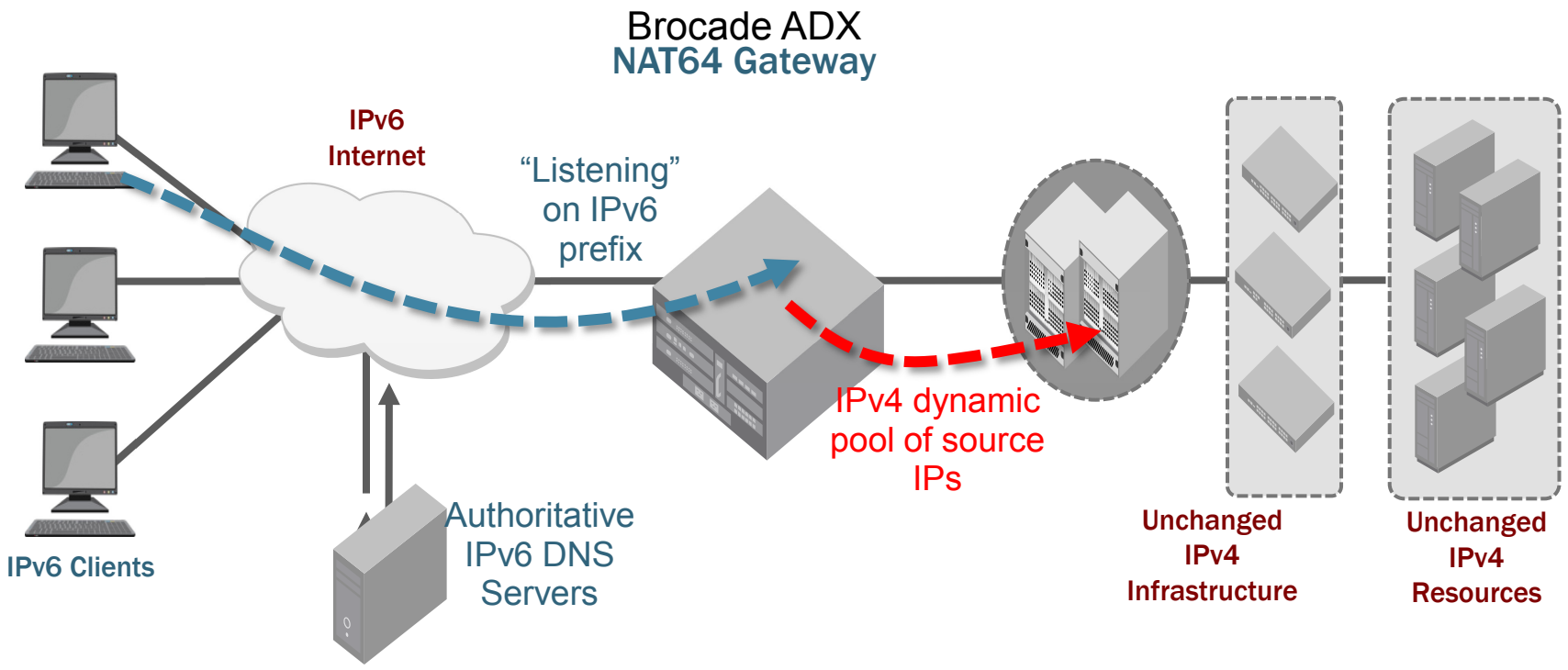
Most commonly used by content providers in front of existing v4 services, web farms, and existing v4-only infrastructure.

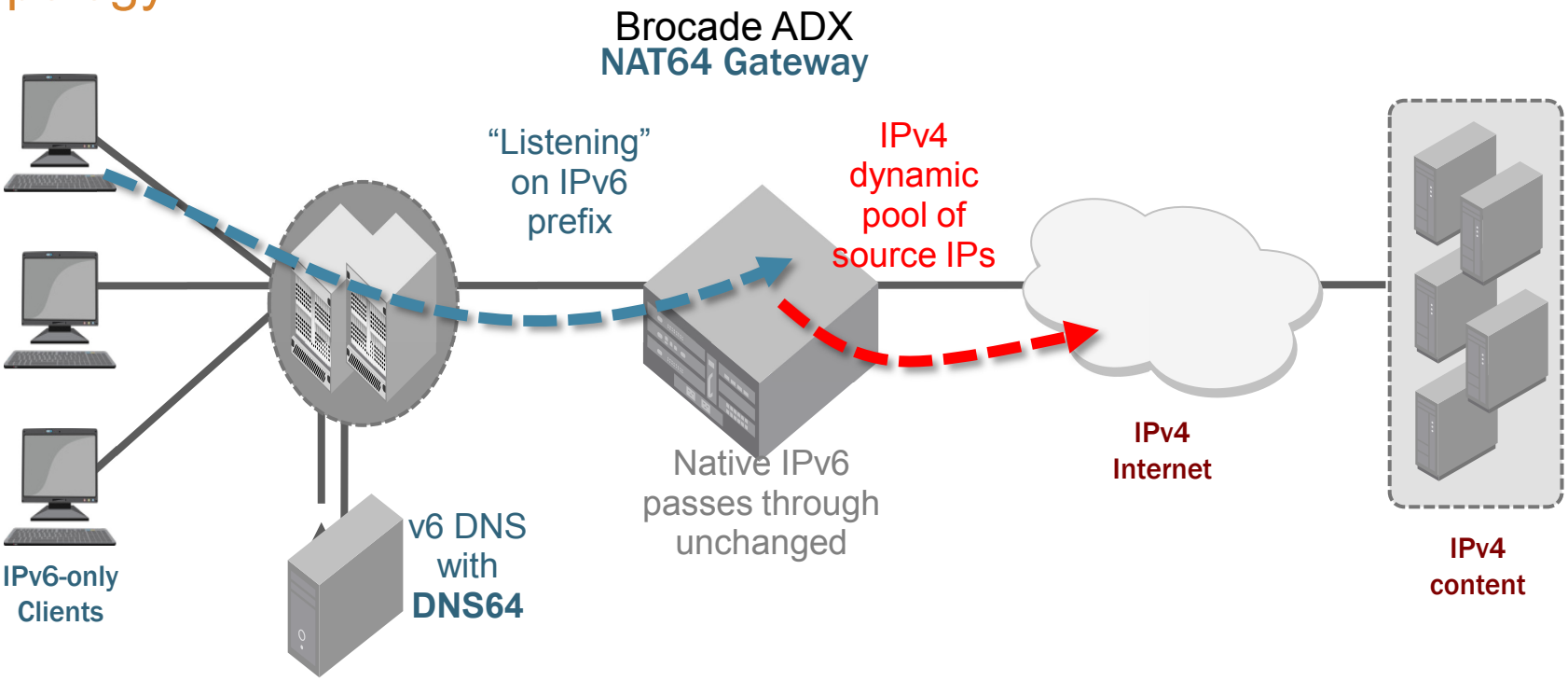


IPv6 Interoperability Use Case:

Rapid v6-enablement for existing v4 server farms & infrastructure

Stateful NAT64:
IPv6 Clients → IPv4 Resources

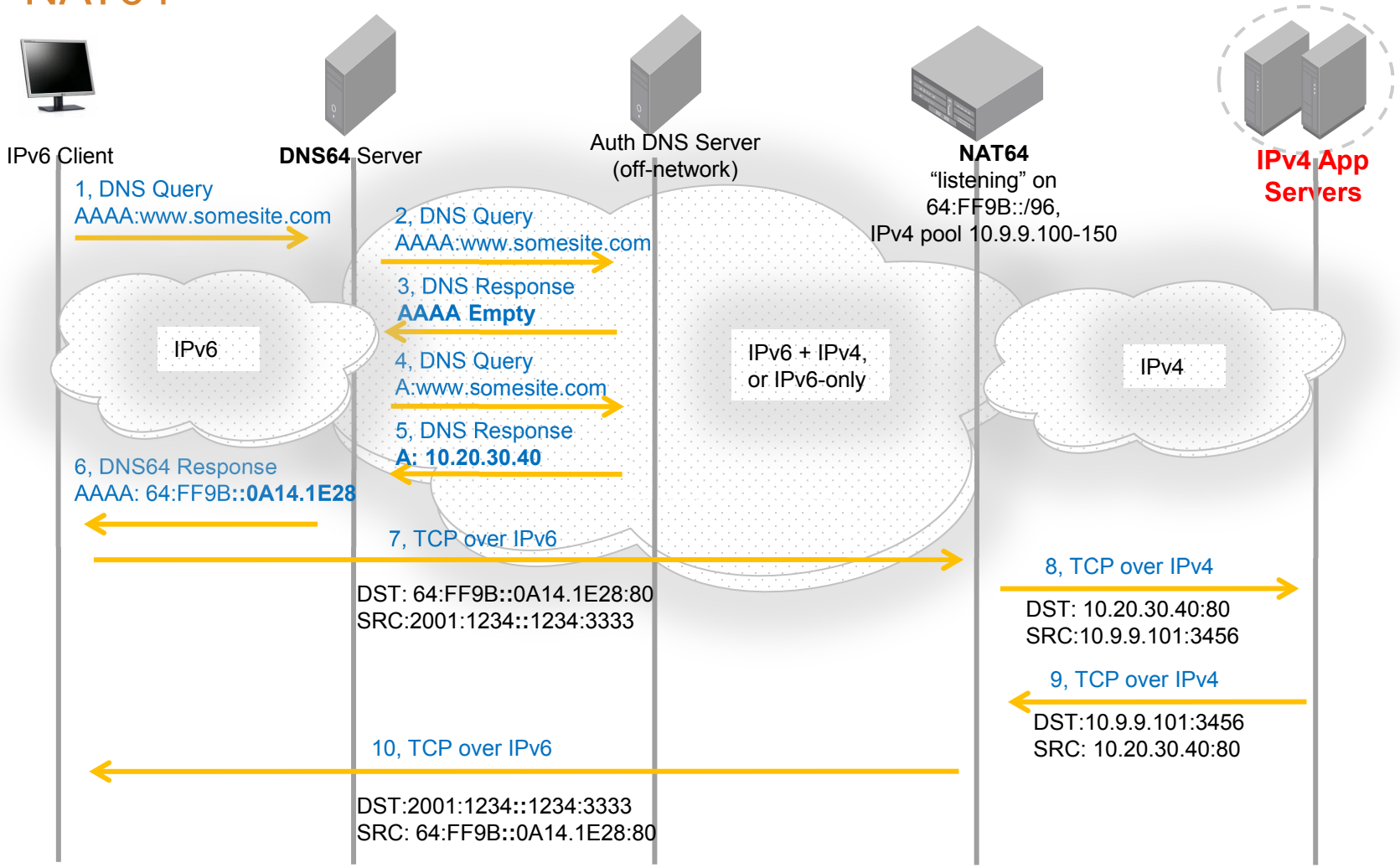
The same technology is also used for providing IPv6-only **client access** after IPv4 addresses are no longer available, but in a different topology.



IPv6 Interoperability Use Case:
Enabling New IPv6-only Clients Access To Existing IPv4 Services

Basic DNS64 functionality

As applied to the v6-only client access use-case for Stateful NAT64



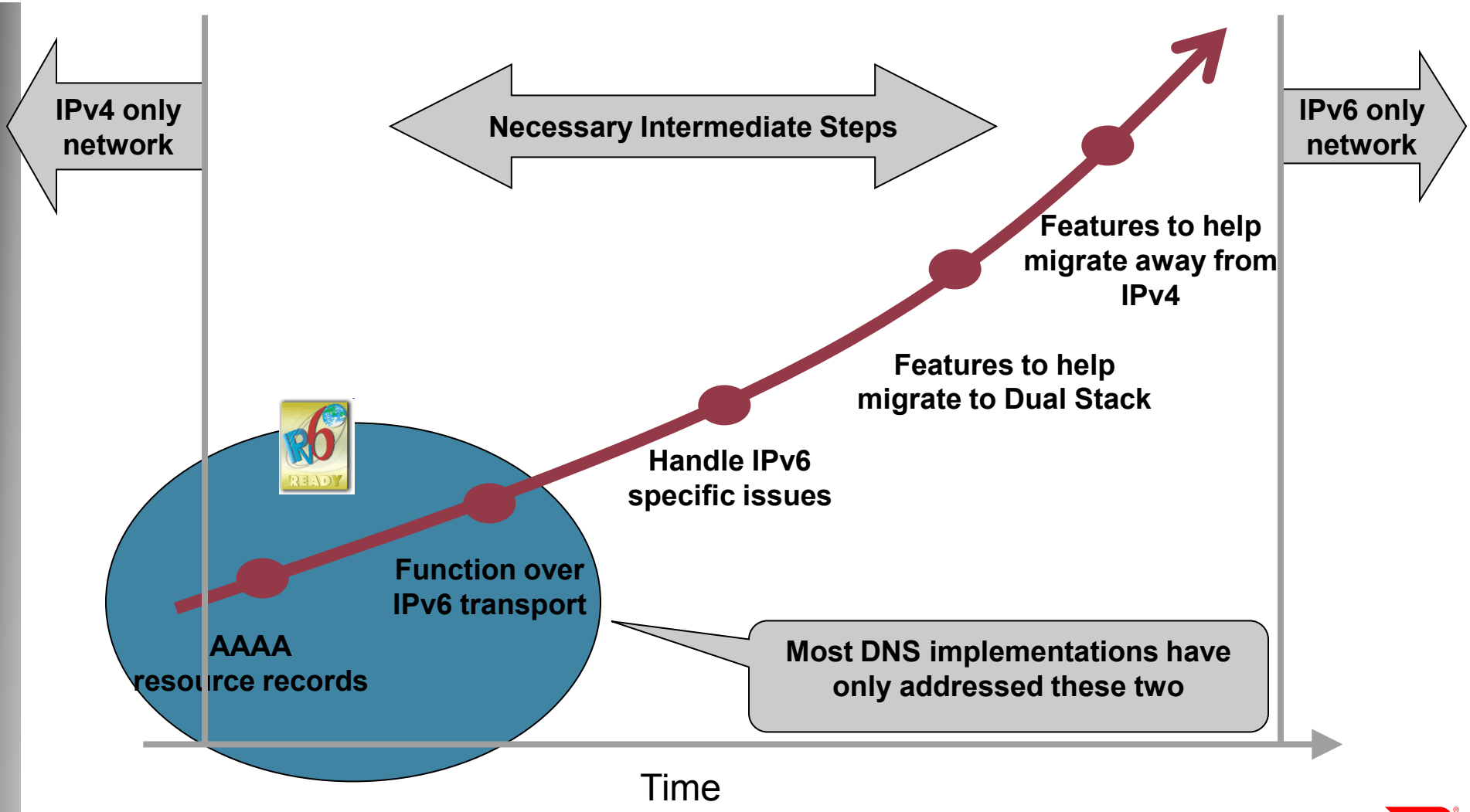
How is the IPv6 destination address constructed?

Synthesizes

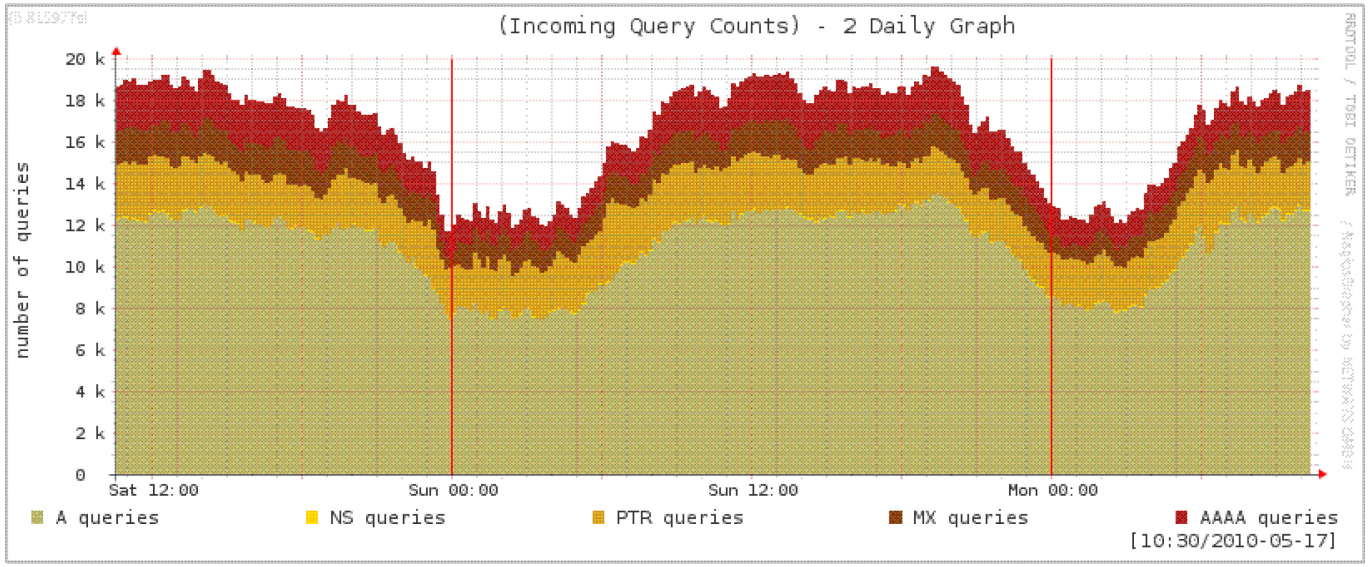
IPv6 network + IPv4 destination = IPv6 destination

Example:
64:ff9b::/96
+
10.20.30.40
=
64:ff9B::0a14.1e28:80

Supporting IPv6 in DNS



x2 load on DNS

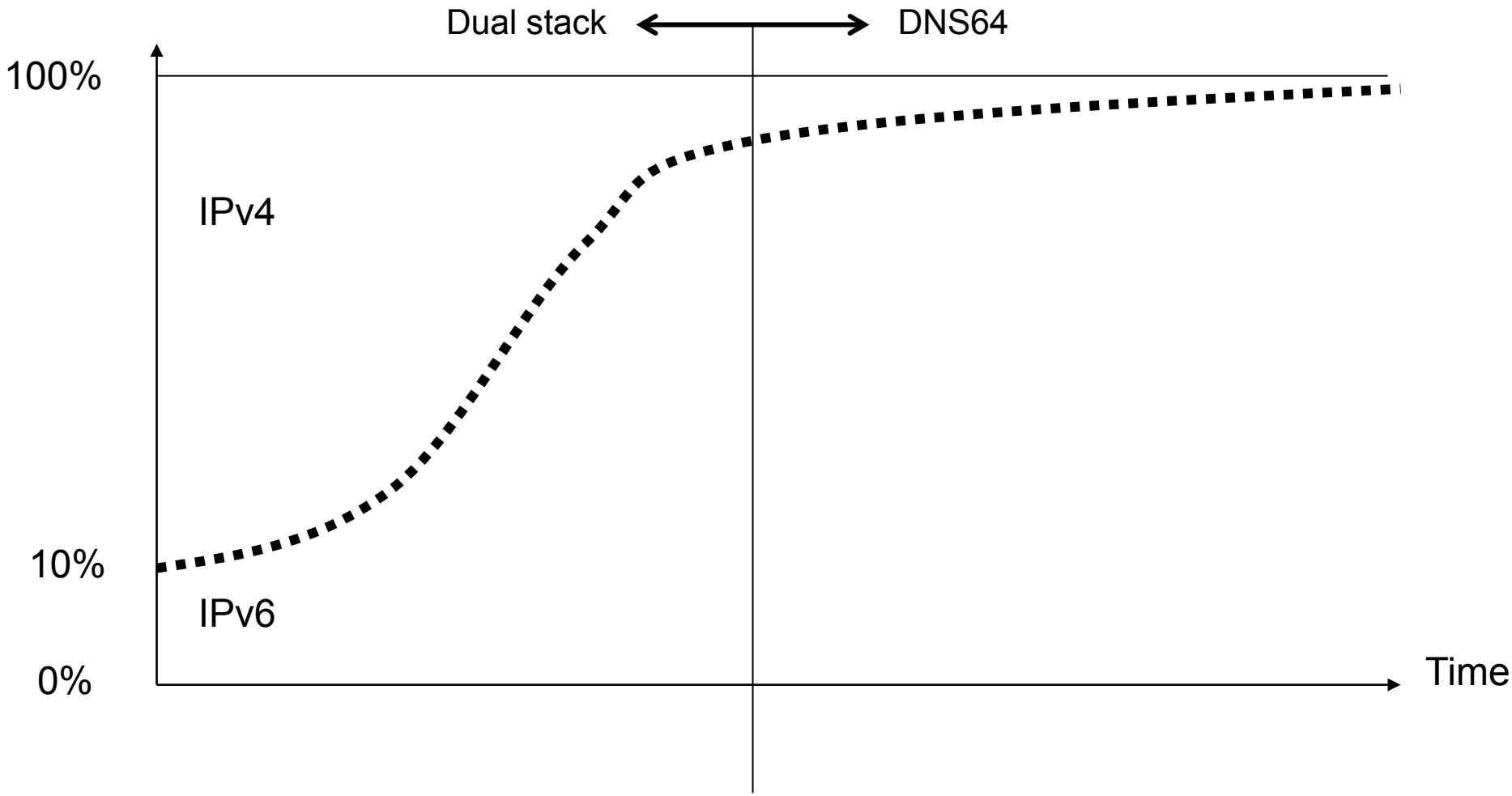


getaddrinfo()

A

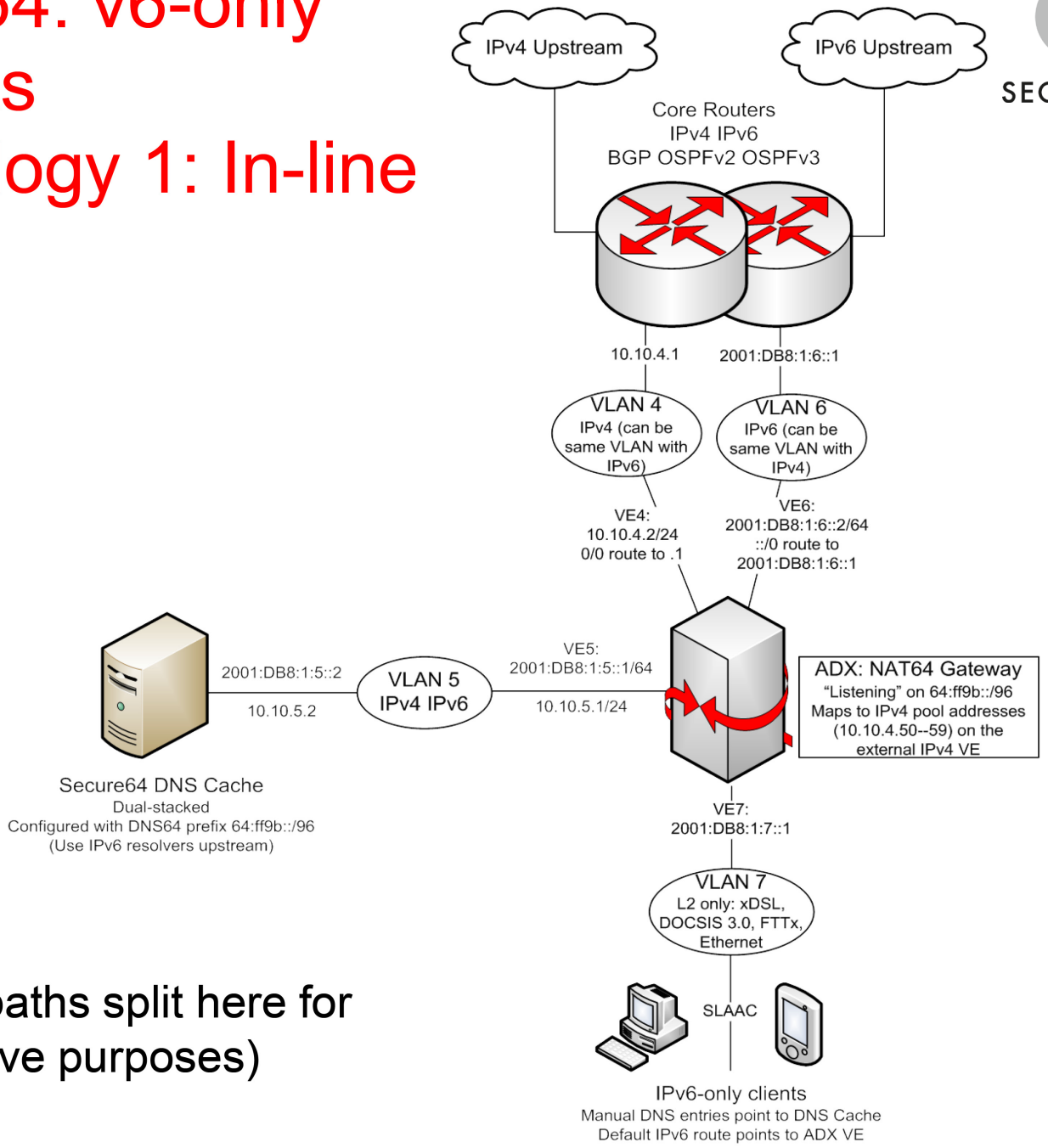
AAAA

DNS64 and the long tail of IPv4



Configuration Overview and Options

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



(v4/v6 paths split here for illustrative purposes)

ServerIron ADX configuration

Using the in-line topology

```
vlan 4 name v4-upstream by port
  untagged ethe 4
  router-interface ve 4
vlan 5 name DNS by port
  untagged ethe 5
  router-interface ve 5
vlan 6 name v6-upstream by port
  untagged ethe 6
  router-interface ve 6
vlan 7 name v6-clients by port
  untagged ethe 7
  router-interface ve 7
ip route 0.0.0.0 0.0.0.0 10.10.4.1
ipv6 route ::/0 2001:db8:1:6::1
interface ve 4
  ip address 10.10.4.2 255.255.255.0
interface ve 5
  ipv6 address 2001:db8:1:5::1/64
  ipv6 enable
```

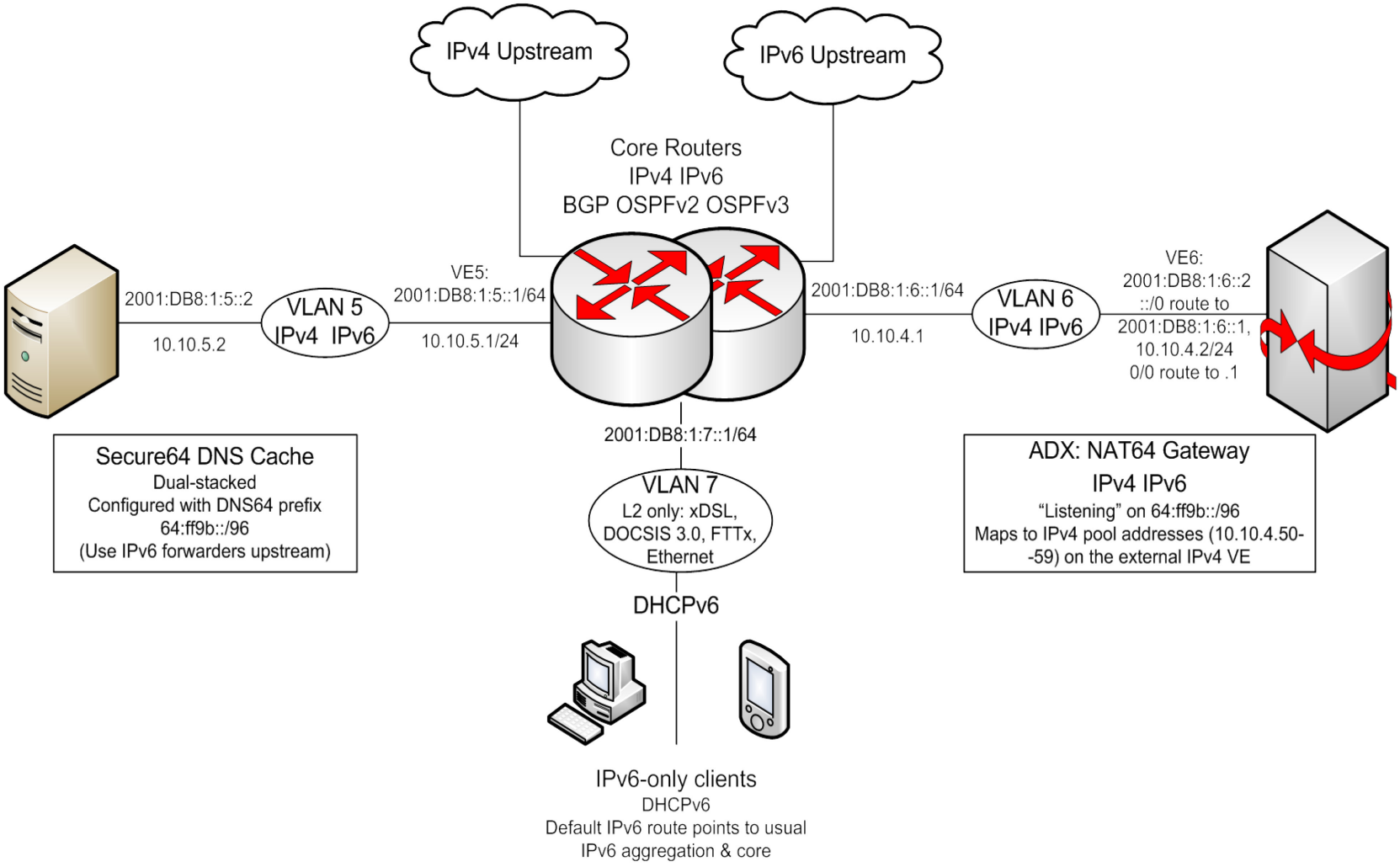
```
interface ve 6
  ipv6 address 2001:db8:1:6::2/64
  ipv6 enable
interface ve 7
  ipv6 address 2001:db8:1:7::1/64
  ipv6 enable
exit


nat64 ipv6-prefix 64:ff9b::/96

nat64 pool test1 10.10.4.50 10.10.4.59
 prefix-len 24

server msl 2
```

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



ServerIron ADX configuration

Using the routed topology

```
vlan 6 name gateway64 by port
  untagged ethe 6
  router-interface ve 6
ip route 0.0.0.0 0.0.0.0 10.10.4.1
ipv6 route ::/0 2001:db8:1:6::1
interface ve 6
  ip address 10.10.4.2 255.255.255.0
  ipv6 address 2001:db8:1:6::2/64
  ipv6 enable
exit

nat64 ipv6-prefix 64:ff9b::/96

nat64 pool test1 10.10.4.50 10.10.4.59 prefix-len 24

server msl 2
```

- Also add a route for the IPv6-prefix and IPv4 pool to their respective ADX interfaces from the core router.

Secure64 DNS Cache configuration

Using either of the topologies above

```
[view@Secure64]#> enable sysadmin
[sysadmin@Secure64]#> route default 10.10.5.1
[sysadmin@Secure64]#> route default 2001:DB8:1:5::1
[sysadmin@Secure64]#> route sym
[sysadmin@Secure64]#> ifconfig eth1 10.10.5.2 255.255.255.0
[sysadmin@Secure64]#> ifconfig eth2 2001:DB8:1:5::2/64
[sysadmin@Secure64]#> activate
[sysadmin@Secure64]#> save
[sysadmin@Secure64]#> show config

[view@Secure64]#> enable cachednsadmin
[cachednsadmin@Secure64]# edit cache.conf
  interface: 10.10.5.2
     interface: 2001:DB8:1:5::2
     outgoing-interface: 10.10.5.2
     outgoing-interface: 2001:DB8:1:5::2
     access-control: 0.0.0.0/0 allow
     access-control: ::0/0 allow
  dns64-prefix: 64:ff9b::/96
<CTRL-X to save and exit>

[cachednsadmin@Secure64]# stop cachedns
[cachednsadmin@Secure64]# start cachedns
```

Why ADC based solution?

- Horizontally scaling
- Not in critical path
- Saves slot in your core
- Intrinsically multiprotocol devices with NAT & security functions
- Hardware-based security features

Observations from v6-only clients

- **Overall surfing experience is seamless to v6-only end-users/customers.**
- Things to Look for:
  - Hard-coded IPv4 content in HTML pages
  - Apps that use embedded IPs or names/lookups, etc. (certain chat-type apps)
  - Asynchronous protocols
- OS behavior in v6-only mode:
  - Win7, Vista – Stellar, seamless, but Temporary addresses may cause Ops confusion
  - Linux, BSD – Stellar, seamless
  - XP, 2000 – No good DNS facilities – time to start migration planning!
  - Mac OS X – Very good, but no good DHCPv6 facilities built-in prior to OS X Lion
- SLAAC versus DHCPv6
  - SLAAC simply “works”, but need to manually specify DNS (pre-RFC5006).
  - DHCPv6 is absolutely a requirement for true NAC and provisioning, as always.
- In-line versus routed

Client visibility?

- Clients real IPv6 addresses can for example be inserted in HTTP requests.
- Translations tracking

Client IP insertion.
==========
GET /abc/index.html HTTP 1/0\r\n
Host: foo.com\r\n
…
Connection: Keep-Alive\r\n
X-Forwarded-For: 2001:db8::6401:101\r\n
\r\

Examples where NAT64 fits in

- **Mobile Smartphone** providers wishing to widely deploy IPv6 to customer devices
- **Broadband** ISP deployments conserving limited IPv4 resources by deploying an IPv6-only access tier
- **Utility device networks**, such as “smart grid” devices requiring access to existing networks
- IPv6-capable **Set-Top Box** (STB) networks requiring access to legacy resources

Additional DNS64 Functionality Options

via Secure64 DNS Cache

Additional DNS64 Functionality Options

via Secure64 DNS Cache

- *Sticky clients*
  - *You don't want a client to change from one NAT64 gateway to another during a session*
- *Mixed deployments using views*
  - *Any combination of Dual stack, IPv4 only, IPv6 only*
- *Load balancing via DNS*
  - *Multiple DNS64 prefixes*
- *High availability*
  - *Provision multiple DNS servers to the clients*
  - *How can we take a NAT64 out of rotation?*

Conclusions

- You can start using NAT64/DNS64 with minimal IPv6 access
- Overall surfing experience is seamless to v6-only end-users/customers
- Check your use cases – enterprise customers?
- It's a step in right direction (compare NAT444)

Additional Resources and Reference

- Brocade ADP: www.brocade.com/adx
- Secure64: www.secure64.com
- Brocade and Secure64 Joint Whitepaper
  - http://www.brocade.com/forms/getFile?p=documents/white_papers/Deploying-NAT64_GA-SG64_Final.pdf
  - *Go to Brocade.com/adx and look for "***Deploying NAT64 and DNS 64 with the Brocade ServerIron ADX and Secure64 DNS Cache Platforms***"* under Whitepaper tab.

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Thank You