White Paper

Array APV Series as an IPv6 Gateway

APV Series Application Delivery Controllers

Introduction

As the Internet has expanded exponentially – and as a myriad of new, connected technologies have arisen – the underlying architecture of the 'Net came under increasing pressure due to the limitations of IPv4 address spaces. Thus, IPv6 was created to meet needs well into the future through 128-bit addressing.

IPv6 also includes a number of advanced features beyond simply scaling the address space, such as security and reliability features. However, due to the long lifespan of IPv4, the majority of previously installed devices and networks still run on IPv4. Newer network technologies, devices and services will increasingly run only IPv6, necessitating that IT managers be ready and able to support, manage and otherwise adapt to a dual-network infrastructure as the transition plays out.

Migration Challenges in Moving to an IPv6 Platform

Unfortunately, many of the existing IPv4-based technologies also have a relatively long lifespan, and cannot be easily upgraded (if at all) to support IPv6. And in large and complex networks, the problem is further compounded. In order to ensure a smooth transition to IPv6, enterprises and other organizations need to design for and then manage applications as well as infrastructures that can support both protocols. This model extends beyond the network itself, however, to include services that use the network. Mission-critical applications, networks and services – like next-gen firewalls, access control mechanisms, load balancers and others – need to be included in the overall IPv6 migration planning.

This is not to say that IPv4 will disappear completely, at least not for the foreseeable future. Some corporate locations, such as remote and branch locations, as well as certain services will likely not be candidates for transitioning to IPv6 for some time. It simply would not make economic sense in many such situations. The goal for IT becomes that of ensuring that users and services that continue to utilize IPv4, as well as those that are migrated to IPv6, can continue to interoperate seamlessly and transparently without disruptions.

Array's Application Delivery Controller: Full support for IPv4 and IPv6

As a global leader in ADC platforms, Array provides application delivery services ranging from high availability, SSL processing, and caching and compression, to more advanced services such as application security. For all application delivery services, the APV Series ADC platform functions as a native IPv4-to-IPv6 gateway by transparently managing application delivery in any type of network topology. The APV Series was the first application delivery controller to be gold-certified by the IPv6 Forum.

For organizations needing an IPv6 Web presence, server load balancing protocol translation (SLBPT) transforms existing IPv4 Web sites into IPv6 compatible sites and greatly reduces the need for duplicate equipment, content and management. Where there is a need to make the most of depleted IPv4

resources, NAT and dual NAT (dual-stack IPv6) allow multiple clients to utilize a single IPv4 address. In migration environments, Array IPv6 solutions support both NAT64 and DNS64 to enable IPv6 clients to connect with IPv4 servers and content. To ensure a consistent application experience across IPv4 and IPv6 clients and networks – and to enable fully-capable, next-generation solutions – IPv6 feature parity is supported for all Array APV Series application delivery controllers.

IPv6 Flow

About NAT64 and DNS64:

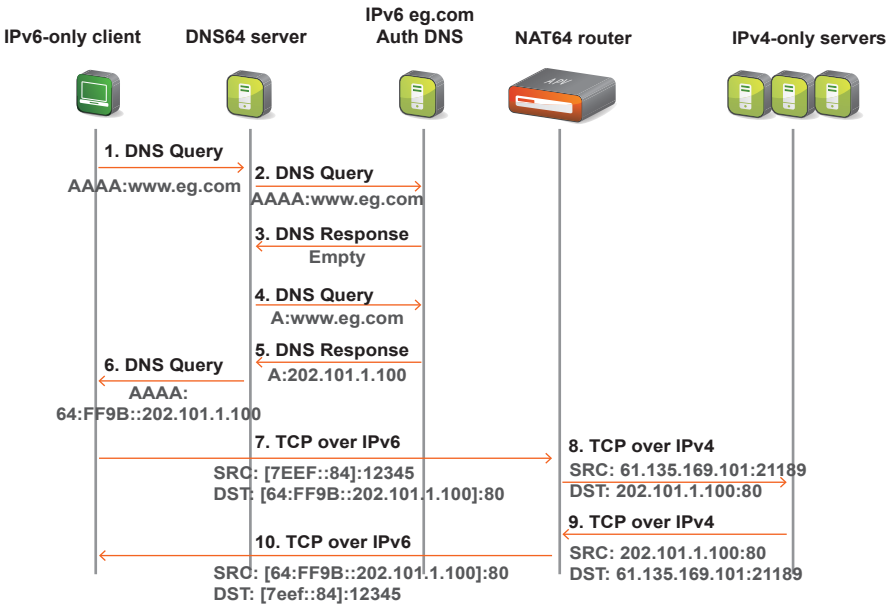
- The NAT64 function is a protocol translation technology. It is used to interconnect mixed IPv6 – IPv4 users and servers.
- NAT64 is devoted to solving the problem of how IPv6-only clients access IPv4 servers. It is usually deployed on the edge of the IPv6 network that will attempt to connect to the IPv4 internet.
- The DNS64 function is implemented as a DNS ALG (Application Layer Gateway). It co-works with the NAT64 in a loose-coupled way. It translates the resource records from IPv4 to IPv6 and vice versa

DNS64/NAT64 Basic Principles:

- When an IPv6 client wants to connect an IPv4 server, it should first acquire the server's IP address with the DNS protocol. This DNS request is sent to the DNS64 server, which will do the translation work and give back a local IPv6 address which maps the IPv4 address of the destination server. In this way, every destination server has a mapped local IPv6 address.
- The client initiates the connection to the server by using the mapped local IPv6 address as the destination address. The traffic is transmitted to the NAT64 router, which will then forward it to the IPv4 server. The NAT64 router will do the protocol translation to allow the IPv6 client and the IPv4 server to be interconnected

IPv6 requires DNS64 with dynamic NAT64 features to provide IPv6 clients with access to IPv4 applications.

The DNS64 function converts the DNS AAAA queries sent from IPv6 clients to DNS A queries and then converts the DNS A responses to DNS AAAA responses. This ensures that IPv6 clients can access IPv4 servers. The APV appliance returns the translated IPv6 addresses to IPv6 clients. When IPv6 clients use these IP addresses to access IPv6 servers, the NAT64 (Network Address Translation IPv6 to IPv4) function converts the IPv6 packets sent from these clients to IPv4 packets. When the APV appliance receives IPv4 packets from IPv4 servers, the NAT64 function converts IPv4 packets to IPv6 packets. This ensures that IPv6 clients can communicate with IPv4 servers normally. The DNS64 and NAT64 functions can be deployed on two APV appliances separately, or deployed on a single APV appliance.



Working Mechanism

The DNS64 and NAT64 functions are applicable to the "IPv6 to IPv4" scenario, as shown in the following figure, and also to the "IPv4 to IPv6" scenario. The working process of the DNS64 and NAT64 functions for IPv6 to IPv4 scenarios as follows; the opposite process would be in effect for IPv4 to IPv6.

- An IPv6 client (2012:1081::a03:30b) sends a DNS AAAA query to the APV appliance (2012:1001::3ff:40b) to resolve the domain name "www.example.com".
- The APV appliance sends the DNS AAAA query to the DNS AAAA authoritative server for the domain name.
- If the DNS AAAA authoritative server has no AAAA record for the domain name, it will return an empty DNS AAAA response to the APV appliance. The APV appliance will ignore this response.

The working process of the DNS64 and NAT64 functions is as follows:

- The APV appliance waits for 100 ms after sending the DNS AAAA query. If the APV appliance does not receive a valid DNS AAAA response, it will send a DNS A query to the DNS A authoritative server for the domain name.
- The APV appliance receives the DNS A response (for example, A: www.example.com - 192.168.2.10) from the DNS A authoritative server.

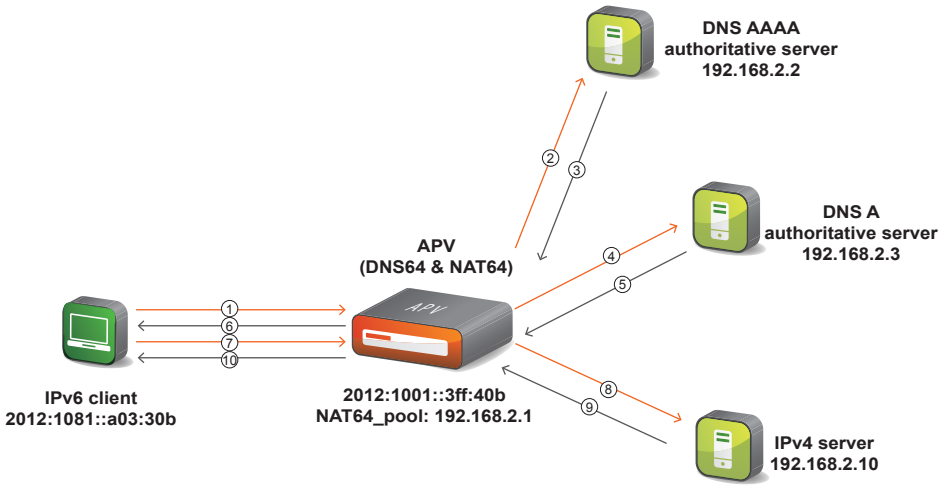


Figure 1-1 "IPv6 to IPv4" Application Scenario

- The APV appliance converts the DNS A response to a DNS AAAA response (for example, AAAA: www.example.com - 64:ff9b::192.168.2.10) by adding the configured IPv6 prefix. Then, the APV appliance returns the converted DNS AAAA response to the IPv6 client.
- The IPv6 client uses the converted IPv6 address to access "www.example.com".
- The APV appliance converts the IPv6 packet (src: 2012:1081::a03:30b; dst: 64:ff9b::192.168.2.10) sent from the client to an IPv4 packet (src: 192.168.2.1; dst: 192.168.2.10), and sends the IPv4 packet to the target IPv4 server.
- The IPv4 server returns an IPv4 packet (src: 192.168.2.10; dst: 192.168.2.1) to the APV appliance.
- The APV appliance converts the IPv4 packet to an IPv6 packet (src: 64:ff9b::192.168.2.10; dst: 2012:1081::a03:30b) and returns the IPv6 packet to the IPv6 client.

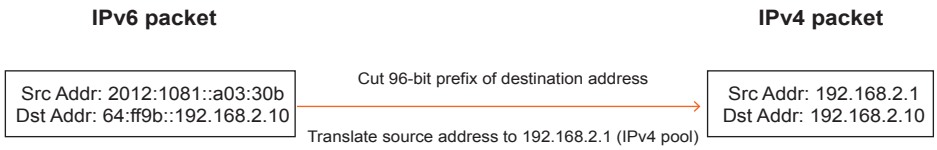


Figure 1-2 NAT64 Address Translation

Summary

For the foreseeable future, IT departments will need to support both IPv4 and IPv6 networking components, applications and services, and will need to provide a means to allow users and services to function smoothly across both protocols whenever and wherever needed. The Array APV Series application delivery controller provides an easy-to-use, reliable and flexible means of providing access across both protocols, with the added benefit of improved application delivery and security. The combination of these capabilities results in an improved user experience and productivity regardless of infrastructure protocol support.

About Array Networks

Array Networks is a global leader in application delivery networking with over 5000 worldwide customer deployments. Powered by award-winning SpeedCore® software, Array application delivery, WAN optimization and secure access solutions are recognized by leading enterprise, service provider and public sector organizations for unmatched performance and total value of ownership. Array is headquartered in Silicon Valley, is backed by over 250 employees worldwide and is a profitable company with strong investors, management and revenue growth. Poised to capitalize on explosive growth in the areas of mobile and cloud computing, analysts and thought leaders including Deloitte, IDC and Frost & Sullivan have recognized Array Networks for its technical innovation, operational excellence and market opportunity.

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