SOLUTION NOTE

NIOS FOR IPV6-ONLY NETWORKS

Infoblox NIOS Eases the Transition to and Management of IPv6-only Networks

INTRODUCTION

In today's evolving digital landscape, adopting IPv6 is either mandated or becoming increasingly imperative for organizations aiming to expand their IT infrastructure sustainably. Network teams need to know that their infrastructure can accommodate IPv6-only and have the insights and considerations for how best to make the transition and maintain an IPv6-only network. Fortunately, for Infoblox customers, the existing NIOS DNS, DHCP, and IP address management (DDI) infrastructure can help facilitate a smooth migration and successful ongoing operation.

UNDERSTANDING THE NEED FOR IPV6 ADOPTION

IPv4 Exhaustion:

The need for IPv6 adoption primarily stems from the exhaustion of available IPv4 addresses. IPv4, the current standard for internet addressing, uses 32-bit addresses, allowing for approximately 4.3 billion unique addresses. With the exponential growth of internet-connected devices, this pool of addresses has been depleted. IPv6, on the other hand, uses 128-bit addresses, providing an astronomical number of unique addresses (about 340 undecillion). This abundance of addresses ensures that there will be more than enough IP addresses to accommodate the growing number of devices and users on the internet.

Government Mandates:

In many countries, governments have issued mandates[1] or regulations requiring the adoption of IPv6 in government networks and/or by Internet Service Providers (ISPs). These mandates often aim to accelerate the transition to IPv6 and ensure that critical infrastructure is prepared for the future.

Industry Standards:

Various industry standards organizations, such as the Internet Engineering Task Force (IETF) and the Internet Society, have been promoting IPv6 adoption and developing standards to support its deployment.

Vendor Support:

Most modern networking equipment and operating systems support IPv6, encouraging organizations to transition as they upgrade their infrastructure.

BENEFITS OF IPV6 ADOPTION

IPv6 adoption is essential for ensuring the continued growth and stability of the internet. Not only does it address the limitations of IPv4, but it also provides a foundation for supporting the expanding ecosystem of connected devices and services. Adopting IPv6 provides various key benefits:

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1 *The US government's mandate is OMB M-21-07, "Completing the Transition to Internet Protocol Version 6 (IPv6)".*

Abundant Address Space:

As noted, IPv6 provides an immense pool of addresses, ensuring that every device can have its unique address without the need for Network Address Translation (NAT) techniques.

Improved Addressing and Routing Efficiency:

IPv6 simplifies the packet header structure, which enhances routing efficiency and reduces the overhead of packet processing on routers.

Enhanced Security:

IPv6 includes features such as built-in IPsec (Internet Protocol Security) support, which provides native encryption and authentication for network traffic, enhancing security compared to IPv4.

Autoconfiguration:

IPv6 supports stateless address autoconfiguration, allowing devices to automatically generate their own IP addresses without manual configuration or DHCP servers, simplifying network administration.

Quality of Service (QoS) Support:

IPv6 includes support for QoS features, enabling better handling of real-time and multimedia traffic, leading to improved performance for services like video streaming and VoIP.

Future-Proofing:

With the vast address space and improved features, IPv6 is designed to meet the requirements of future internet growth and emerging technologies, ensuring long-term scalability and sustainability.

PLANNING THE IPV6-ONLY NETWORK

To support the transition to and to realize the benefits of IPv6, an IPv6 address plan is required. Planning involves getting an IPv6 network assigned to the organization by an address registry (e.g., see where to get IPv6 addresses at the DoD High-Performance Computing Modernization Program) and determining how to segment that address space into sites and subnets. For those new to IPv6 address planning or need a refresher, Tom Coffeen's book, IPv6 Address Planning, is a helpful resource.

Once address planning is completed for the IPv6 network, the next step is to create sites (and maybe some subnets) in the NIOS DDI database and use Extensible Attributes to tag them with relevant metadata, such as the site name, responsible person, and the person's contact details. Extensible Attributes not only provide useful information but will also become the framework for later configuration of DHCPv6 and the population of IPv6-speaking devices by both DHCPv6 and network discovery.

USING DHCPV6 TO SUPPORT IPV6 ADDRESS ASSIGNMENT

IPv6 supports two methods of dynamic address assignment: Stateless Address Autoconfiguration (or SLAAC) and DHCPv6. Both perform similar functions, but some legacy devices only support one of the two mechanisms. There are also a few cases that specify one or the other to designate required configurations. SLAAC can handle the address assignment but may still need NIOS to deliver some DHCP parameters with DHCPv6. Some DHCP parameters can also be assigned using Router Advertisements.

NIOS fully supports DHCPv6. NIOS-based DHCPv6 servers will need to be configured to support the IPv6-only network. Once configured, information from IPv6-speaking devices will appear on the existing IPv6 subnets.

ENGAGING NETWORK DISCOVERY TO IDENTIFY IPV6 ADDRESSES

During the IPv6 migration, it is important to know which devices use IPv6 currently and which are still using IPv4. NIOS's network discovery capabilities can help determine how many and which devices are using IPv6 and/or IPv4 and whether those devices sourced their addresses from DHCPv6, SLAAC, or through manual configuration. Network discovery will help identify devices that only use IPv6 or are still configured with IPv4.

For more information, visit Infoblox.com or contact your account team to discuss your specific project.

APPLYING AAAA RECORDS TO ADVERTISE SERVICES OVER IPV6

Once the internal servers are configured to support IPv6, it's important to advertise the services they offer using Authentication, Authorization, Accounting, and Auditing (also known as AAAA, Quad A, or IPv6 address) records. AAAA records map domain names to IPv6 addresses. Without them, clients trying to access the services by the servers' domain names will always use IPv4. To control when clients should connect to the servers over IPv6, adding AAAA records enables administrators to manage when the migration occurs. It is also possible to remove the servers' A records (which advertise their IPv4 addresses) later, once (and if)the organization is ready to move off of IPv4 entirely. In addition, NIOS fully supports DNS over IPv6 and mapping domain names to IPv6 addresses.

USING NAT64 AND DNS64 TO REACH IPV4-ONLY RESOURCES

In cases where organizations are mandated to move to IPv6-only, even while much of the "old Internet," including some of the organization's own internal network, still runs IPv4, administrators will need a way to enable communications between new IPv6-only-speaking devices and IPv4-only-speaking web servers and devices. One transition mechanism that allows IPv6-only devices to communicate with IPv4-only servers is DNS64/NAT64. DNS64 transparently shunts requests from IPv6-only clients through NAT64 stateful address translators, enabling those clients to communicate with IPv4-only servers as though the servers themselves spoke IPv6. Further, NIOS fully supports DNS64 and can be used together with any router or firewall that supports NAT64.

SUMMARY

A mature, enterprise-grade DDI solution such as Infoblox's NIOS can help with both the transition from a dual-stack IPv4 and IPv6 network to an IPv6-only network and with the ongoing support and management of an IPv6-only network. NIOS's IPAM features can help document the results of IPv6 address planning, while network discovery can benchmark the progress of the migration and identify pockets of IPv4 resources that have yet to be migrated. DHCPv6 and DNS's AAAA records are required to support any IPv6 network, and DNS64, together with NAT64, allow IPv6-only devices to communicate with legacy IPv4 services.

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