

An Essential U.S. Government Agency Transition Guide to IPv6 Routing and Addressing

Executive Summary

This executive summary provides an overview of *An Essential U.S. Government Agency Transition Guide to IPv6 Routing and Addressing*.

The IPv6 World Report Series from Juniper Networks provides IT professionals with valuable insights for meeting the challenges of transitioning to Internet Protocol version 6 (IPv6). Building on the first two volumes of the series, this report offers an in-depth analysis of IPv6 routing and addressing issues intended to help IT professionals to understand transition challenges, identify solutions, and leverage useful tools and checklists to make their organizations' transitions to IPv6 successful.

In this report, you will learn:

- Critical routing and addressing issues to consider during the transition to IPv6
- Alternative solutions that complement a core IPv6 network transition
- Routing architectures and approaches suitable for IPv6 deployment
- IPv6 transition support tools & checklists
- Steps necessary to justify and acquire IPv6 addresses

IPv6 Challenges

IPv6 has begun to take root in the U.S. government. Shortly after the Office of Management and Budget issued memorandum M-05-22, Transition Planning for IPv6, federal agencies began the difficult task of determining the path to IPv6 by the June 2008 milestone. In addition, a recent survey by Juniper Networks shows that state and local government agencies have also begun planning and are seeking assistance for the transition to IPv6.

In some cases, the undertaking will be business as usual, but for others, it will be a rather challenging exercise in managing priorities. Regardless of when agencies are able to implement IPv6, routing and addressing will play critical roles in the process. These two issues, both essential to successful deployment of IPv6, lie at the heart of core network transition.

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IPv6 supports a new 128-bit addressing schema as well as numerous internal routing protocols, which are not significantly different from previous routing protocols. The approach taken to addressing and routing will not only determine the successful implementation of IPv6 in the near term, but will also have a profound effect on the network's ability to support advanced IPv6 capabilities. Transitioning networks to IPv6 will require a new look at routing architectures and perhaps reorientation of interior and exterior routing protocols to ensure that IPv4 and IPv6 can coexist throughout the transition period.

While agency IPv6 transition leaders have become proficient at understanding a number of the primary transition issues, most will not have a strong background in IP-based routing and addressing issues. This report provides a basic understanding of routing and addressing issues that must be considered for successful deployment of IPv6.

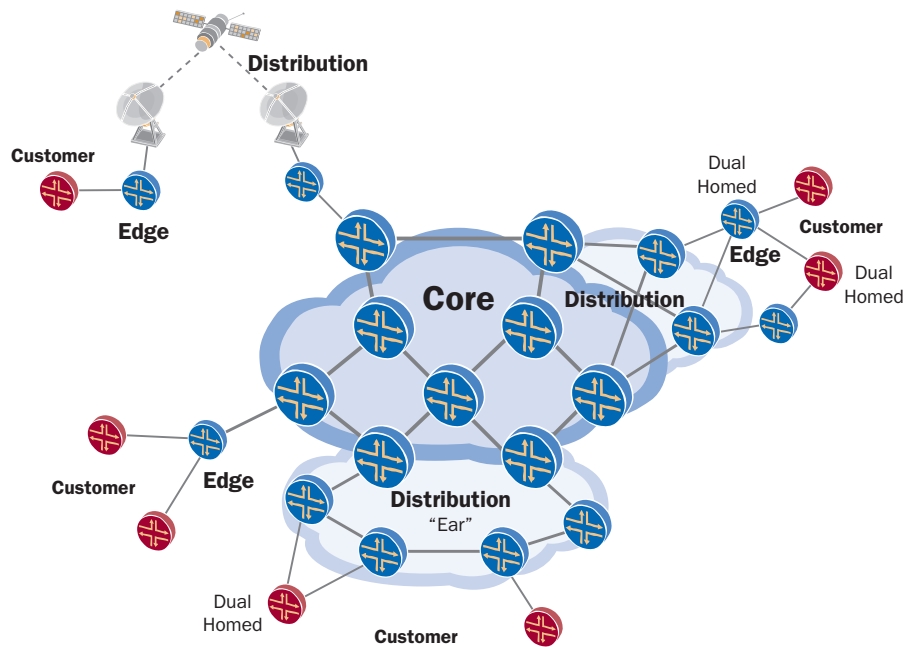
IPv6 Routing Concepts

From a transition perspective, IPv6 routing concepts are almost exactly the same as for IPv4. The changes are only minor. The issues that need to be addressed in IPv6 routing stem from the selection and deployment of interior and exterior routing protocols to support the transition phase and to provide network capabilities needed by users.

The routing architectures in this report describe an approach for providing connectivity to edge users or enclaves in the most efficient manner. In general, network architectures describe three basic levels of networks: the core, distribution, and edge networks.

This report explains the difference between “routed” protocols that utilize the TCP/IP stack for transport and “routing” protocols that support the transport of IP packets. A complete explanation of a network’s interior and exterior routing protocols is provided to show the complexity of routing issues.

As the transition to IPv6 occurs, the routing issues will evolve. The various alternatives to transitioning are investigated in this report, including translation, managed tunnels, dual stack, and Multi-Protocol Label Switching (MPLS).



Agencies need to understand routing IPv6 across networks with a combination of IPv4-only and IPv4/IPv6 routers

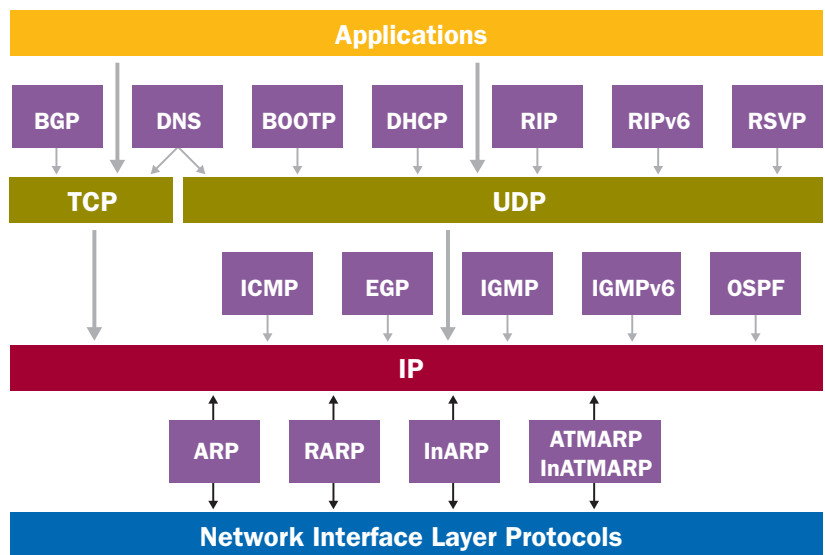
Network Transition

Network transition is described in three unique phases with alternative approaches to each phase that can provide IPv6 to the edge sooner, and support IPv4 legacy networks and applications well into the future. This report also describes the relationships between the various protocols that must be considered for a successful transition, including the relationship of non-network protocols to the network layer.

A complete listing of relevant routing Requests for Comment (RFC) and a checklist for transitioning a core network are also included in the report. The checklist starts with the required component inventory and continues through protocol analysis, planning, modeling and simulation, testing, and deployment.

IPv6 Addressing

The report outlines the fundamentals of IPv6 addressing and provides the knowledge necessary for an organization to begin planning for and obtaining IPv6 addresses.



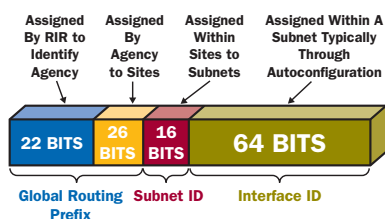
Interior and exterior routing protocol relationships within the TCP/IP framework

A complete and detailed description of the various types of IPv6 addresses is provided, including unicast, multicast, and anycast addresses and their basic structure and use.

As an added feature, information is provided to help an organization understand how IPv6 addresses could be used to address its specific uses and the allocation of addresses to sites, subnets, and interfaces.



Two Parts of the IPv6 Address Block



Example of an Agency IPv6 Address Assignment

The address acquisition and management guidelines and policies are revealed, showing the international organizational structure dedicated to Internet numbers and names. This information will make the role of the Regional Internet Registries (RIRs) clear and understandable.

The specified and intended goals of addressing policies are clarified to aid planners in understanding how to determine addressing needs. Addressing goals include:

- Uniqueness
- Registration
- Aggregation
- Conservation
- Fairness, and
- Minimized Overhead.

Addressing is often a confusing issue for many planners. This report explains Classless Inter-Domain Routing nomenclature, the definition of a “site,” the recommended allocation for addresses, and the host-density ratio measurement used to request additional address allocations.

To learn more:

This executive summary provides an overview of *An Essential U.S. Government Agency Transition Guide to IPv6 Routing and Addressing*. This is the third volume in the IPv6 World Report Series. To request the complete version, please go to www.juniperIPv6.com

Request your copies of Volume 1, *A Guide for Federal Agencies Transitioning to IPv6 and Volume 2, IPv6 Capable – A Guide for Federal Agencies: Understanding IPv6 Requirements and Technology to Enable the Next Generation Internet* at www.juniperIPv6.com or call 1.866.298.6428 for more information.