

Solution Brief

IPv6

Today, Internet growth is driven not only by the sheer number of people and organizations that need access, but also by several emerging factors, including

- global appeal and scope of the Internet,
- multiservice networks offering voice, video, and data,
- popularity of wireless and mobile devices, and
- potential for IP-enabled consumer devices.

IP version 6 (IPv6) is becoming increasingly important to keep pace with such growing demand for IP services. With its greatly expanded addressing and IP services capabilities, IPv6 ensures that the Internet will continue to prosper. As such, Juniper Networks, Inc. offers a rich portfolio of IPv6 addressing, forwarding, routing, management, and IP services capabilities.

IPv6: Facilitating Internet Globalization

Clearly, address depletion is increasingly a concern. Service providers and enterprises alike, particularly international ones, often have difficulty obtaining useful address blocks and are forced to use gateway methods, such as NAT. IPv6 supports a significantly larger IP address space by increasing the IP address size from 32 bits to 128 bits, which allows for up to 3.4×10^{38} possible addresses.

In addition, IPv6 offers other enhancements for facilitating Internet globalization.

- Supports more levels of addressing hierarchy, and thus a greater number of addressable nodes.
- Simplifies IP address management issues by supporting plug-and-play, stateless autoconfiguration. Hosts and routers can dynamically obtain IP address information.
- Restricts the number of backbone routing entries by advocating route aggregation. This simplified routing hierarchy offers better route summarization.
- Increases flexibility to offer new IP applications, such as mobile Internet services, by offering extensions that provide more tailored IP services.
- Improves security by supporting extensions to authentication, data integrity, and data confidentiality.

Advantages

Juniper Networks IPv6 implementation ensures you can leverage the potential of a broad range of IPv6 addressing features that are available across M-series platforms, with each platform running the same reliable JUNOS Internet software. Our initial implementation includes the following key features.

Features	Benefits
<ul style="list-style-type: none"> ■ IPv6 addressing <ul style="list-style-type: none"> ■ IPv6 forwarding in hardware ■ 128-bit link local, site local, and global addressing ■ Neighbor discovery ■ Path MTU discovery ■ Optional extension header 	<ul style="list-style-type: none"> ■ Ensures uncompromising performance. ■ Increases available addresses by expanding IP address space from 32 bits to 128 bits. ■ Increases scalability. ■ Enables more aggregation through hierarchical IPv6 addresses. ■ Increases configuration flexibility.
<ul style="list-style-type: none"> ■ Stateless autoconfiguration 	<ul style="list-style-type: none"> ■ Hosts dynamically configure their own addresses.
<ul style="list-style-type: none"> ■ Routing <ul style="list-style-type: none"> ■ BGP ■ IS-IS ■ RIPng ■ Static 	<ul style="list-style-type: none"> ■ Increases scalability. ■ Increases configuration flexibility. ■ Provides IPv4 and IPv6 routing. ■ Enables routing protocol interoperability.
<ul style="list-style-type: none"> ■ Transition mechanisms <ul style="list-style-type: none"> ■ Dual stack ■ Configured tunnels ■ MPLS transport 	<ul style="list-style-type: none"> ■ Enables you to connect IPv6 networks over IPv4 networks. ■ Enables seamless integration of IPv4 and IPv6 networks.
<ul style="list-style-type: none"> ■ ICMPv6 	<ul style="list-style-type: none"> ■ Enhances error and information reporting.
<ul style="list-style-type: none"> ■ Consistent management across platforms <ul style="list-style-type: none"> ■ CLI ■ JUNOScript API 	<ul style="list-style-type: none"> ■ Simplifies configuration and operation.

IPv6 Operational Efficiency

Juniper Networks IPv6 implementation ensures operational efficiency by

- delivering exceptional performance with IP services enabled,
- being deployed on all current M-series platforms,
- offering simplified management tools, and
- easing transition from IPv4 to IPv6.

IPv6 Performance without Compromise

Juniper Networks ASIC-based forwarding and JUNOS software have consistently proven superior performance even under network duress. Successful deployment in worldwide service provider networks and precise benchmark testing have demonstrated Juniper Networks excellence in IP routing. IPv6 is no different. You can be assured of the successful deployment of IPv6 in production environments with uncompromising performance. Moreover, you can concurrently run IPv4 and IPv6 while delivering stable, scalable IP services.

Common IPv6 M-series Support

Across the board, our product design ensures reliability and delivers common IP services by sharing the same JUNOS software. This design means full compatibility across critical applications and environments: core management, access, public and private peering, content and Web hosting, and mobile services. Similarly, IPv6 is supported on all M-series platforms and interfaces, thus delivering a highly scalable solution and offering you the same configurational and operational simplicity you have come to expect with all Juniper Networks products.

Simplified IPv6 Deployments

Supported in both the CLI and JUNOScript API, you can configure and maintain IPv6 via user-friendly interfaces. With JUNOScript API, in particular, IPv6 is immediately supportable by your OSS; hence, there is minimal interruption between the time you configure IPv6 and have it running in your production network.

We also offer a complete portfolio of Internet-caliber IGP and EGP routing protocols that simplify IPv6 deployment. IS-IS and RIPng support provides flexibility in choosing an internal routing scheme, while Juniper Networks robust BGP implementation for IPv6 ensures true Internet-class routing. Static routing is also supported.

Smooth Transition from IPv4 to IPv6

Integration and transition tools and mechanisms play a key role in simplifying operations and minimizing costs when introducing IPv6. While numerous transition mechanisms have been proposed, initially we offer those most important for taking the first steps toward smoothly transitioning from IPv4 to IPv6.

Dual Stack

The dual-stack method runs both IPv4 and IPv6 protocol stacks in parallel. IPv4 applications communicate with IPv4 hosts, IPv6 applications communicate with IPv6 hosts, and there is no translation between IPv4 and IPv6. We support both IPv4 and IPv6 on all interfaces.

Configured Tunnels

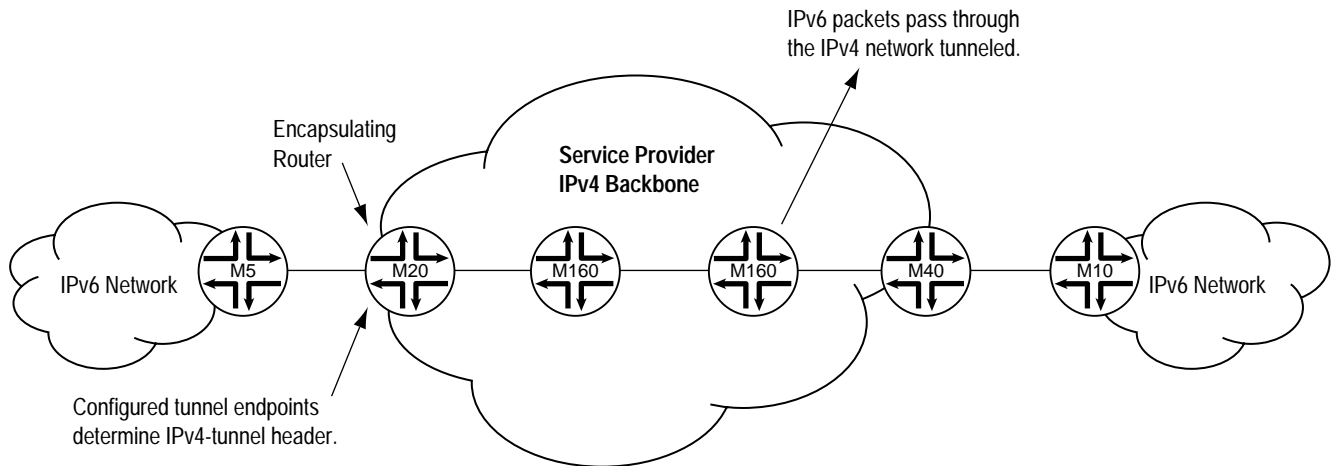
For sites that are regularly exchanging traffic, you can connect IPv6 hosts or networks over an existing IPv4 infrastructure using configured tunnels. In this method, which is compliant with RFC 2893, IPv6 packets are encapsulated in IPv4 headers. The encapsulating router uses the configured tunnel endpoint as the destination address for the IPv4-tunnel packet.

MPLS Transport

Using MPLS Circuit Cross-connect, you can enable IPv6 hosts to communicate over an IPv4 network via a point-to-point configured tunnel. IPv6 packets are encapsulated in MPLS headers. You need only configure the ingress router with the tunnel address.

MPLS Layer 2 VPNs simplify MPLS transport by employing BGP for VPN signaling, thus eliminating the need to manually map every circuit to a label switched path.

Configured Tunnels



Specifications

For a list of supported IPv6 RFCs, see the *JUNOS Internet Configuration Guide: IPv6* on <http://www.juniper.net/techpubs/software.html>.

Acronyms

API	application programming interface
ASIC	application-specific integrated circuit
BGP	Border Gateway Protocol
CLI	command-line interface
DNS	domain name system
EGP	exterior gateway protocol
ICMP	Internet Control Message Protocol
IGP	interior gateway protocol
IP	Internet Protocol
IPv4	IP version 4
IPv6	IP version 6
IS-IS	Intermediate System to Intermediate System
MPLS	Multiprotocol Label Switching
MTU	maximum transmission unit
NAT	Network Address Translation

OSS	operations support systems
RFC	Request for Comments
RIPng	Routing Information Protocol next generation
VPN	virtual private network

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