

INTERNET PROTOCOL VERSION 6 (IPv6) NETWORKING FOR THE SOLARIS™ 8 OPERATING ENVIRONMENT

Advances in microprocessors and network technology have led to an exponential growth in the Internet. IPv6, the next-generation Internet Protocol, overcomes the limitations of the current version — IPv4 — by providing larger address space. Now available in the Solaris™ 8 Operating Environment, IPv6 enables developers to build applications for the next-generation Internet and users to start testing and experimenting with the new protocol.

THE SOLARIS OPERATING ENVIRONMENT

Today's explosive levels of growth — in terms of bandwidth, networks, and digital devices — have created the phenomenon known as the Net Effect. It's forcing organizations to rethink how they create, manage, extend, and ultimately deliver information technology (IT) services. Yet at the same time, it's creating massive opportunities for innovation with regard to service and functionality.

For more than 15 years, Sun has been telling the world that The Network Is The Computer™, and has led the way in helping our customers harness the transforming power of the Net Effect. As the foundation for Sun™ systems, the Solaris 8 Operating Environment enables your IT organization to deliver on the promise of massive scale, continuous real-time computing, and secure systems — while increasing service levels, reducing risk, and decreasing costs. With Solaris 8 software, you can efficiently manage resources and provide a higher level of service. It also helps reduce complexity by providing easy-to-use interfaces and comprehensive administration tools — all designed to help lower your IT risk. And by optimizing your resources and enabling them to scale to meet demand, the Solaris 8 Operating Environment helps you to minimize costs and lower your total cost of ownership.

IPv6 PREPARES YOU FOR THE INTERNET EXPLOSION

The Internet is growing at an incredible rate — an annual increase of 51 percent since January 2000, as estimated by the Internet Software Consortium (ISC). The current Internet Protocol, IPv4, will prove inadequate in the near future because its 32-bit address space limits the number of unique Internet addresses to a few hundred million users. There are already over 100 million hosts connected to the Internet, and further growth is being fueled by the explosion of new wireless devices connecting to the Internet, such as PDAs, pagers, telephones, and automobiles.

To overcome the limitations of IPv4, the Internet Engineering Task Force (IETF) developed the standard for version 6 (IPv6) of the Internet Protocol. By using a 128-bit Internet address scheme, IPv6 enables a far broader number of systems to be deployed on the Internet. IPv6 networking in the Solaris 8 Operating Environment provides the core functionality that developers and customers need to start testing and deploying solutions on a limited basis. Full functionality will be released in future Solaris software updates.

EASY IMPLEMENTATION

IPv6 for the Solaris Operating Environment is easy to turn on and use. The dual-stack configuration of IPv6 for Solaris software allows a network to operate using either IPv4 or IPv6, so existing applications continue to work without modification.

For developers, porting a typical socket application requires only a few lines of code changes. With the IPv6 *Socket Scrubber*, Sun provides a tool to run against your code to help you find IPv4 dependencies. Also available, free of charge, is a porting guide that provides detailed explanations and guidelines for porting and writing IPv6-enabled applications and a white paper that explains IPv6 and includes samples of both IPv4 and IPv6 code.

- IPv6 provides a far greater number of addressable nodes by increasing the IP address size from 32 bits to 128 bits, thus providing a virtually unlimited number of IP addresses
- Existing applications may be upgraded to use the new IPv6 interface as time and upgrade requirements warrant
- Any existing IPv4 application will work on the dual IPv4 and IPv6 stack machine
- Sun's IPv6 Socket Scrubber helps application developers identify potential IPv4 dependencies in their code
- Offers expanded routing and addressing, including multicast and anycast support
- Improved support for options enhances future flexibility
- Provides support for IETF standards

CONNECTING WITH IPV6

With IPv6 for the Solaris 8 Operating Environment, you can now connect an IPv6 network to another IPv6 network through IPv4 using the Sun tunnel driver. You can also connect to the 6bone — the IPv6 network backbone.

IPv6 for the Solaris platform also provides new APIs that support IPv6. Socket API and ONC+ RPC API work with both IPv4 and IPv6 — separately or together. These APIs reside in *libsocket* and *libnsl*. IPv6 applications and utilities for Solaris software include:

- Sendmail
- ifconfig
- ndd
- telenet/in.telnetd
- inetd
- finger/in.fingerd
- tftp/in.tftpd
- rcp
- rsh
- in.rexecd
- in.rshd
- in.rlogind
- rlogin
- rdist
- rdate
- mconnect
- printing

Tools with new IPv6 extensions to help debug and analyze networks include:

- snoop
- ping
- route
- traceroute
- netstat
- getent
- nslookup

Name services that support IPv6 include:

- BIND (v6 format addresses resolved over a v4 transport)
- NIS
- NIS+

IPV6 IMPROVEMENTS

IPv6 for the Solaris platform provides a number of enhancements that equip your business with the agility of the Internet, while continuing to deliver predictability of robust business-critical applications.

EXPANDED ROUTING AND ADDRESSING

IPv6 increases the IP address size from 32 bits to 128 bits to support increased levels of addressing hierarchy, provide a far greater number of addressable nodes, and allow auto-configuration of addresses. Of the 128 bits, 48 bits are reserved for public typology, 16 bits to design a site typology, and 64 bits to identify a machine in a subnet. This provides a virtually infinite number of IP addresses per subnet.

SIMPLIFIED HEADER FORMATS

Some header fields that were previously required in IPv4 have been dropped or made optional in IPv6. This reduces the common-case processing cost of packet handling and keeps the bandwidth cost of an IPv6 header as low as possible, despite the increased size of the address. Even though an IPv6 address is four times longer than an IPv4 address, the IPv6 header is only twice the size of the IPv4 header.

IMPROVED SUPPORT FOR OPTIONS

Changes in the encoding of IP header options allow for more efficient forwarding, less stringent limits on the length of options, and greater flexibility for introducing new options in the future.

RFCS SUPPORTED

IPv6 for Solaris software supports the following RFCs as defined by the IETF:

- 1886 – DNS extensions to support IPv6
- 2893 – Transition mechanisms for IPv6 hosts and routers
- 1981 – Path MTU discovery for IPv6
- 2019 – Transmission of IPv6 packets over FDDI
- 2080 – RIPng for IPv6
- 2373 – IPv6 Addressing Architecture

- 2374 – IPv6 Aggregatable Global Unicast Address Format
- 2428 – FTP Extensions for IPv6 and NATs
- 2452 – IPv6 Management Information Base for the Transmission Control Protocol
- 2454 – IPv6 Management Information Base for the User Datagram Protocol
- 2460 – IPv6 Specification
- 2461 – Neighbor discovery for IPv6
- 2462 – IPv6 Stateless Autoconfiguration
- 2463 – Internet Control Message Protocol for IPv6
- 2464 – Method for transmission of IPv6 packets over Ethernet networks
- 2465 – Management Information Base for IPv6: Textual conventions and General Group
- 2466 – Management Information Base for IPv6: ICMPv6
- 2553 – Basic Socket Interface extensions for IPv6

FUTURE DEVELOPMENTS FOR IPV6

In keeping with Solaris software's position as the market leader in Internet operating environments, Sun is tracking IETF standards and is committed to expanding its IPv6 functionality. Future plans involve integrating:

- Programming Language: Java™ technology support for IPv6
- Security: IPsec for IPv6 will provide authentication, data integrity, and confidentiality capabilities
- Naming Services: Sun is working closely with the ISC to integrate the full name resolution over IPv6 transport
- Mobility: Sun is actively involved in the process of setting standards for mobile IP

FOR MORE INFORMATION

To learn more about IPv6 and the Solaris Operating Environment, please visit our Web site at www.sun.com/solaris. The IPv6 Socket Scrubber utility, porting guide, and white paper are available as a download from www.sun.com/solaris/ipv6.