Cisco IPv6 Solutions

Introduction

The continuous growth of the global Internet requires that its overall architecture evolve to accommodate the new technologies that support the growing numbers of users, applications, appliances, and services. Internet Protocol Version 6 (IPv6) is designed to meet these requirements and enable a global environment where the addressing rules of the network are again transparent to the applications.

Cisco believes in providing its customers and partners with comprehensive information regarding significant emerging technologies so that they are fully informed and can work jointly with Cisco to implement the best solutions for their environments.

This paper describes the Cisco position and details current and future IPv6 support across Cisco® strategic product families.

Market Drivers

The current IP address space is unable to satisfy the potentially huge increase in the number of users or the geographical needs of the Internet expansion, let alone the requirements of emerging applications such as Internet-enabled wireless devices, home and industrial appliances, Internet-connected transportation systems, integrated telephony services, sensor networks such as radio frequency ID (RFID), IEEE 802.15.4/6LoWPAN (IPv6 over Low power Wireless Personal Area Networks), and distributed computing or gaming.

IPv6 quadruples the number of network address bits from 32 bits (in IPv4) to 128 bits, which provides more than enough globally unique IP addresses for every networked device on the planet. The use of globally unique IPv6 addresses simplifies the mechanisms used for reachability and end-to-end security for network devices, functionality that is crucial to the applications and services that are driving the demand for the addresses.

The lifetime of IPv4 has been extended using techniques such as address reuse with translation and temporary-use allocations. Although these techniques appear to increase the address space and satisfy the traditional client-server setup, they fail to meet the requirements of innovative applications and environments. The need for always-on environments (such as residential Internet through broadband, cable modem, or Ethernet to the home as well as new generation wireless infrastructure through 3G, Wi-Fi, WiMAX, and others) to be contactable precludes these techniques of IP address conversion, pooling, and temporary allocation. The ready-to-use capability required by consumer Internet appliances further increases the address requirements. IPv6 reintroduces end-to-end security and quality of service (QoS) that are not always readily available throughout a Network Address Translation (NAT)-based network.

In addition to the benefits of larger address space, IPv6 includes improvements that simplify network administration, such as:

- Simplified header for routing efficiency
- Deeper hierarchy and policies for network architecture flexibility, enabling efficient support for routing and route aggregation
- Serverless autoconfiguration, easier renumbering, and improved ready-to-use support

- Security with mandatory IP Security (IPsec) implementation for all IPv6 devices
- Improved support for Mobile IP and mobile computing devices (direct path)
- Enhanced multicast support with increased addresses and efficient mechanisms

For detailed information related to the market for IPv6, please refer to the Cisco response to the U.S. Department of Commerce IPv6 RFC: http://www.ntia.doc.gov/ntiahome/ntiageneral/ipv6/comments/Cisco_IPv6_RFC_response.pdf.

Integration and Coexistence

Industry is in the early stages of large-scale IPv6 production deployment - few IPv6 innovative applications are in the market, and first-generation products need to make tradeoffs between available IPv6 services. Although the success of IPv6 will ultimately depend on the new applications that run over IPv6, a key part of the IPv6 design is its ability to integrate into and coexist with existing IPv4 networks. It is expected that IPv4 and IPv6 hosts will need to coexist for a substantial time during the steady migration from IPv4 to IPv6, and the development of transition strategies, tools, and mechanisms has been part of the basic IPv6 design from the start.

Cisco has been part of this activity, participating in the development of transition techniques and deployment strategies for its products that satisfy a range of customer and network requirements for both service providers and enterprise customers, whether they are planning a trial deployment or deploying live in a controlled environment.

Selection of a deployment strategy, or strategies, depends on the current network environment, and on factors such as the forecast amount of IPv6 traffic, and the availability of IPv6 applications on end systems and appliances, and at a given stage in the deployment. Generic deployment scenarios are described in Cisco IPv6 deployment documentation available at: https://supportforums.cisco.com/docs/DOC-13985.

As part of its IPv6 a solution, Cisco implements the main integration techniques, dual-stack, tunneling and translation required by all environments and adheres to the following overall objectives:

- Network planning and operations managers scheduling an IPv6 deployment must be able to do it when and where needed
- New or updated applications must be protocol-agnostic. IPv4 or IPv6 services are possible between hosts or applications
- Incremental upgrade and deployment, no “flag day”[1]
- Minimize operational cost, learning curve, and support requirements

IPv6 Innovations at Cisco

Cisco has taken a leading role in the definition and implementation of the IPv6 architecture within the IETF and continues to lead the industry in standardization. Core IPv6 standards are already published by the IETF, while at the same time enhancements are work in progress.

- Cisco engineers have been and continue to be involved on co-chairing multiple IETF Working Groups:
  - IPv6 WG from 1990s to 2003
  - NGTrans WG from 1990s to 2003
  - Dynamic Host Configuration (DHC) WG since 2003

[1] A flag day means you reconfigure all routers during a short period of time, during which service is interrupted.

    - Mobile IPv6 WG since 2003
    - V6Ops WG since 2005
- Cisco IOS® Software IPv6 technology releases have been extensively proven in the 6Bone network (http://www.6bone.net) from 1996 to 2006.
- Since the creation of the IPv6 Forum in 1999, Cisco is a founding member of the forum (http://www.ipv6forum.com) and participates in the National IPv6 Task Force's efforts, such as within the North-America IPv6 Task Force (http://www.nav6tf.org).
- Since May 2001, Cisco IOS Software releases integrate the full IPv6 commercial feature set, with worldwide Cisco Technical Assistance Center (TAC) support.
- Cisco's long-term involvement in large-scale deployments of IPv6 such as 6NET (http://www.6net.org) and Moonv6 (http://www.moonv6.org) means Cisco Professional Services are now able to offer highly experienced consultations on IPv6 projects.
- Two Cisco Press® books have been published (http://www.ciscopress.com/title/1587052105, http://www.ciscopress.com/title/1587050862), and Cisco has participated in dissemination projects such as 6DISS (http://www.6diss.org) and 6Deploy (http://www.6deploy.org).

In addition to offering similar features to IPv4, Cisco develops new features that bring innovation to the IPv6 world, offering technology previews for evaluation before these features are added to commercial Cisco IOS Software products:

- Cisco IOS IPv6 Provider Edge Router (6PE) over Multiprotocol Label Switching (MPLS) and Cisco IPv6 VPN Provider Edge Router (6VPE) over MPLS.
- Cisco IOS IPv6 Broadband Access feature set, including Dynamic Host Configuration Protocol Version 6 (DHCPv6) Prefix Delegation; generic prefix configuration; and authentication, authorization, and accounting (AAA) for IPv6.
- Full IPv6 multicast services such Embedded Rendezvous Point (Embedded RP) or source-specific multicast (SSM), for next-generation triple play services.
- Cisco Mobile Wireless Home Agent IPv6 and Mobile Access Router IPv6.
- IPv6 First Hop Security, including stateful firewall and IPsec hardware encryption.

Cisco IPV6 Solutions

Products and functions not specifically named in this document are not covered as part of this Statement of Direction. Customers interested in specific details on a given Cisco product should contact their local Cisco sales office.

Cisco IOS Software

In June 2000, Cisco Systems announced a three-phase Cisco IOS Software IPv6 roadmap as documented in the Cisco IPv6 Statement of Direction. In May 2001, the first commercial release of Cisco IOS Software Release 12.2T train integrated IPv6, followed by Cisco IOS Software Release 12.0S support on Cisco 12000 Series Routers to enable integration of the new Internet protocol on core infrastructures. Today, the availability of Cisco IOS General Production, Technology, and Service Providers releases enabled IPv6 production deployment for all Cisco-based networks (see Table 1).

Table 1. Cisco IOS Software IPv6 Releases

Software Release	Platforms
Cisco IOS-XR Software Release	CRS-1 and Cisco 12000 Series Routers
Cisco IOS-XE Software Release	Cisco ASR 1000 Series Aggregation Services Routers, Cisco Catalyst® 4500-E and 4500-X Series Switches
Cisco IOS Software Release 12.3M and 12.4M	General Production
Cisco IOS Software Release 12.3T and 12.4T	Technology Development
Cisco IOS Software Release 12.0S	Cisco 12000 and 10720 Series Routers for Service Provider Infrastructure
Cisco IOS Software Release 12.2SB	Cisco 10000 and 7304 Series Routers
Cisco IOS Software Release 12.2SE	Cisco Catalyst 3750-E, 3750-X, 3560-E, 3560-X, 2960-S Series Switches
Cisco IOS Software Release 12.2SG	Cisco Catalyst 4500 and 4900 Series Switches
Cisco IOS Software Release 12.2SR	Cisco 7200 and 7600 Series Routers
Cisco IOS Software Release 12.2SX	Cisco Catalyst 6500 Series Switches

Before deploying one of these releases, please refer to Cisco Feature Navigator (http://www.cisco.com/go/fn) and to the respective platform's configuration guide to help ensure that you have all hardware and software prerequisites for your environment.

Cisco IOS Software releases deliver the most complete IPv6 feature set to the market. Cisco IOS Software developments are focused on creating additional IPv6 features and innovations. A detailed list of IPv6 features and minimum software releases is available from the "IPv6 Start Here" document: http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-roadmap.html.

Cisco Hardware

Cisco IPv6 solutions are packaged in a feature set that is supported on specific platforms and applications packages. On Cisco IOS Software platforms, Cisco Feature Navigator (http://www.cisco.com/go/fn) dynamically updates the list of supported platforms as support for new platforms as features are added.

IPv6 services are part of Cisco IOS Software releases, and any router that runs IPv6 must conform to the minimum memory size required by the selected Cisco IOS Software release and feature set.

As on IPv4, high-end routers and Layer 3 switching may implement assisted hardware acceleration for IPv6. Cisco devices that benefit from IPv6 hardware forwarding are listed in Table 2.

To obtain updated information about platform support for IPv6, visit Cisco.com or contact your local Cisco sales team.

Note: Not all hardware supports all features. Consult the release notes to determine which hardware platform receives features from a particular Cisco IOS Software release train.

Table 2. Cisco IPv6 Layer 3 Solutions

Product	IPv6 Status	IPv6 Hardware Forwarding Assistance	Comments
Cisco CRS-1	Now	Yes	HW performance up to 40 Gbps (OC-768 line card)
Cisco 12000 Series	Now	Yes	HW performance up to 10 Gbps (Engine 5)
Cisco 10720 Series	Now	Yes	
Cisco 10000 Series	Now	Yes	With PRE-2 and PRE-3
Cisco ASR 1000 Series	Now	Yes	

Product	IPv6 Status	IPv6 Hardware Forwarding Assistance	Comments
Cisco 10000 Series	Now	Yes	With PRE-2, PRE-3, and PRE-4
Cisco 7600 Series	Now	Yes	With Cisco IOS Supervisor Engine 720, 720-3BXL, and 32W, RSP720, as well as 10-Gbps support (10 Gigabit Ethernet and OC-192)
Cisco 7500 Series	Now	-	End of Life
Cisco 7304	Now	-	
Cisco 7301	Now	-	
Cisco 7200 Series	Now	-	
Cisco AS5850	Now	-	
Cisco AS5400	Now	-	
Cisco AS5350	Now	-	
Cisco 4000 Series	-	-	End of Life
Cisco 3800 Series	Now	-	
Cisco 3700 Series	Now	-	
Cisco 3600 Series	Now	-	Refer to Product Bulletin #1975 on Cisco 3620
Cisco 3200 Series	Now	-	
Cisco 2800 Series	Now	-	
Cisco 2600 Series	Now	-	Refer to Product Bulletin #1975 for non-XM Cisco 2600 (except 2691)
Cisco 2500 Series	Now	-	End of Life Limited support from Cisco IOS Software Release 12.2T
Cisco 1800 Series	Now	-	
Cisco 1700 Series	Now	-	
Cisco 870 Series	Now	-	
Cisco 860 Series	No	-	No IPv6 support
Cisco 850 Series	No	-	No IPv6 support
Cisco 830 Series	Now	-	Beginning on Release 12.3(4)XG
Cisco Catalyst 6500 Series	Now	Yes	With Cisco IOS Supervisor Engine 720 and 720-3BXL, and 32W as well as 10-Gbps support (10 Gigabit Ethernet and OC-192)
Cisco Catalyst 4500-E Series	Now	Yes	With Supervisor Engine 6E/LE, 7E/LE
Cisco Catalyst 4500-X Series	Now	Yes	
Cisco Catalyst 3750-X and 3750-E Series	Now	Yes	
Cisco Catalyst 3560-X and 3560-E Series	Now	Yes	
Cisco Catalyst 3560v2 and 3750v2 Series	Now	Yes	IPv6 QoS trust only, limited ACL capabilities. Please refer to configuration guides
Cisco Catalyst 3560C	Now	Yes	IP Base only

Layer 2 Switching

IPv6 traffic forwarding does not impact Layer 2 LAN switches, since these devices do not need to look at the Layer 3 header to forward an IPv6 frame. Thus, IPv6 hosts can be transparently attached to the following Cisco products when acting as Layer 2 switches. In addition, Layer 2 switches may integrate dedicated IPv6 features such as native IPv6 network management or Multicast Listener Discovery (MLD) snooping:

- Cisco Catalyst 2960-C and 3560-C Series Switches
- Cisco Catalyst 2960 and 2960-S Series Switches
- Cisco Catalyst 3560V2, 3560-E, 3560-X, 3750V2, 3750-E and 3750-X Series Switches
- Cisco Catalyst 4500 and 4500-E Series Switches with Cisco Catalyst Supervisor Engine 6 and 7
- Cisco Catalyst 4500-X Series
- Cisco Catalyst 6500 Series Switch

Cable Routers

Today, IPv6 services can be offered on Cisco UBR7200 Series Universal Broadband Routers by configuring IPv6 over IPv4 tunnels, but native IPv6 requires an update to the DOCSIS® specifications. As an active contributor to the CableLabs' efforts, Cisco proposed to incorporate IPv6 support into DOCSIS 3.0 specifications.

Wireless LAN Solutions

In the Cisco Unified Wireless Network software releases prior to 7.2, IPv6 unicast and multicast traffic are transparently forwarded by Cisco Wireless LAN devices.

The Cisco Unified Wireless Network Software Release 7.2 introduces IPv6 intelligence in the control plane to enable secure, reliable wireless connectivity for IPv6 clients. IPv6 client support provides a consistent end-user experience along with complete visibility and control for administrators.

The IPv6 client support features of the Cisco Unified Wireless Network Software Release 7.2 are supported on the following platforms.

- Cisco Aironet® access points running Control and Provisioning of Wireless Access Points protocol (CAPWAP)
- Cisco 2500 and 5500 Series Wireless LAN Controllers
- Cisco Catalyst 6500 Series Wireless Services Module 2 (WiSM2)
- Cisco Wireless LAN Controller Module Enhanced (WLCM-E) for Integrated Services Routers
- Cisco 3300 Series Mobility Services Engine (MSE)
- Cisco Prime™ Network Control System 1.1 (NCS)

Details on Cisco Unified Wireless Network Software Release 7.2 and IPv6 client support features can be found at: http://www.cisco.com/en/US/docs/wireless/controller/release/notes/crn7_2.html.

The support of IPv6 addresses for management access on wireless LAN devices, including access points, controllers, Network Control System (NCS), and Mobility Service Engine (MSE) is planned for future releases. Mobile service providers who need to enable IPv6 in their environment can have the benefits of IPv6 support from the Cisco Gateway GPrS Support Node (GGSN) Release 7.0. For more information, visit: http://cisco.com/en/US/products/sw/wirelssw/ps873/products_data_sheet0900aecd80581de2.html.

Data Center Switches

The Cisco Nexus® 7000 Series Switch has been designed to support IPv6 since its inception (for product details, visit: http://www.cisco.com/en/US/products/ps9402/index.html). Customers can enable IPv6 by configuring the protocol on Cisco NX-OS Software Release. To read more details about the IPv6 feature set on the Cisco Nexus 7000 Series, please refer to the Cisco NX-OS documentation.

Multilayer Storage

The Cisco MDS 9000 Series Multilayer Switch has been designed to support IPv6 since its inception. Customers can enable IPv6 by upgrading their Cisco MDS 9000 Series products to Cisco MDS SAN-OS Release 3.x, which supports IPv6. Management will be supported through the Cisco Fabric Manager. It should be noted that no new hardware is required to support IPv6 on the existing platforms.

IPv6 functionality on Cisco MDS 9000 Series can be classified into three applications:

- IPv6 on the Out-of-Band Ethernet Port for management. This interface is used for command-line interface (CLI), Simple Network Management Protocol (SNMP), and the Storage Management Initiative Specification (SMI-S)-based management access.
- Internet Small Computer System Interface (iSCSI) protocol on the IP Storage Ports (IPS) on IP Storage Service modules for transport of SCSI protocol over IP networks.
- Fibre Channel over IP (FCIP) protocol on the IP Storage Ports (IPS) on IP Storage Service modules for transport of Fibre Channel protocol over IP networks.

The following Cisco MDS 9000 Series products support IPv6 with SAN-OS Release 3.x:

- MDS 9509 Multilayer Director
- MDS 9506 Multilayer Director
- MDS 9216 Multilayer Fabric Switch
- MDS 9216i Multilayer Fabric Switch
- MDS 9140 Multilayer Fabric Switch
- MDS 9120 Multilayer Fabric Switch
- IPS-4/8 MDS 9000 Module
- FC-32 MDS 9000 Module
- FC-16 MDS 9000 Module

The IPv6 feature set on the MDS 9000 Series can be found in the SAN-OS Release 3.x documentation: http://www.cisco.com/en/US/products/ps6493/index.html.

Security

As networking infrastructures evolve to accommodate the new Internet Protocol, security services are a key element to guarantee this adoption. Several technologies and mechanisms (packet filtering, stateful firewall, IPsec, and so on) have been made available on IPv4 in past years to face the increasing challenge of protecting the network and its resources. Although IPsec is mandated in the IPv6 specifications, it is expected that the current IPv4 solutions need to be upgraded to support IPv6 before innovation can take place. Based on its integration and coexistence strategy, Cisco is planning the required security services on its IPv6 portfolio, enabling IPv6 to be set up on production environments (see Table 3).

Table 3. Cisco Security Solutions

Feature Set	Solution/Product	Status
Packet filtering	Cisco IOS Software standard ACL	Now
	Cisco IOS Software extended ACL including option header filtering and parsing; hardware support on platforms doing IPv6 hardware forwarding	Now
	Cisco IOS Software reflexive ACL	Now
IPv6 over IPv4 tunnels protection	Cisco IOS IPv4 IPsec to protect configured, 6 to 4 tunnels	Now
	IPv6 over Cisco VPN client IPv4 IPsec tunnels	Now
IPv6 IPsec	OSPFv3 authentication on Cisco IOS Software	Now
	Site-to-site tunnel	Now
	Mobile IPv6 authentication	CY09
	IPv6 hardware encryption modules - NM-AIM/VPN, VAM2+	Now
Firewall	Cisco IOS Software IPv6 firewall	Now
	Cisco PIX Firewall	Now
	Cisco ASA 5500 Series Adaptive Security Appliances	Now
	Cisco Catalyst 6500/7600 Series Firewall Services Module (FWSM)	Now
Security applications	IPv6 packet flow control and analysis: access control packet protocol decode analysis via network access module (NAM) and real-time monitor (RTM)	Now
	CiscoWorks Access Control List Manager (ACLM) and Cisco Secure Access Control Server (ACS)	
	Configuration and control of security features of IPv6-capable devices: CiscoWorks VPN/Security Management Solution (VMS) Configuration tools	
	Security monitoring of IPv6 networks	
VMS monitoring tools	CiscoWorks QoS Policy Manager (QPM)	

Network Management Applications

Fundamental to the successful deployment of IPv6 is the smooth integration of the protocol into network management applications. Several elements must be considered before a fully native IPv6 management solution becomes available. These elements are:

- IPv6 stack on Network Management Station (NMS)
- IPv6 stack on network devices
- NMS applications running over an IPv6 stack
- SNMP over an IPv6 transport
- IPv6 address family support on public and private MIB when required

As it is expected that both IPv4 and IPv6 must be simultaneously managed for several years, the development of IPv6-specific management applications will be aligned with customer requirements and hardware device instrumentation support over time. Beginning now, this integration and coexistence strategy applies to Cisco network management solutions as well (Table 4).

Table 4. Cisco IPv6 Network Management Solution

Feature Set	Solution/Product	Comments
Instrumentation		Cisco IOS IPv6 Start Here manual: http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-roadmap.html.

Feature Set	Solution/Product	Comments
Cisco-IETF-IP-MIB and IP-MIB	Cisco IOS Software	Cisco-IETF-IP-MIB is based on early draft (ID-00) of RFC 4293. New releases of Cisco IOS software replace Cisco-IETF-IP-MIB implementation by IP-MIB, which complies with RFC 4293. Refer to Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software releases.
Cisco-IETF-IP-Forwarding MIB and IP-Forward MIB	Cisco IOS Software	Cisco-IETF-IP-Forwarding-MIB is based on early draft (ID-00) of RFC 4293. New releases of Cisco IOS software replace Cisco-IETF-IP-Forwarding MIB implementation by IP-Forward- MIB, which complies with RFC 4292. Refer to Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software releases.
NetFlow IPv6 record	Cisco IOS Software	Refer to Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software releases.
Applications running over an IPv6 network layer		
CNS Agents, Config logger, HTTP, Netconf, Simple Object Access Protocol (SOAP), Tool Command Language (TCL)	Cisco IOS Software	Refer to Table 1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
SNMP over an IPv6 network layer	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases. http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-roadmap.html.
Syslog over an IPv6 network layer	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
Secure Shell (SSH)	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
Telnet	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
Domain Name System (DNS) Resolver	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
Dynamic Host Configuration Protocol Version 6 (DHCPv6) Server, Relay and Prefix Delegation	Cisco IOS Software	Refer to Table-1 of Cisco IOS IPv6 Start Here to get the appropriate Cisco IOS Software Releases.
Network Management Applications (NMA)		
NetFlow Collector	NFC 5.x	To manage NetFlow IPv6 records.
DNS/DHCP servers for IPv6	Cisco CNS Network Registrar 6.2	
IPv6 traffic monitoring	NAM modules on Catalyst 6500 and Cisco Integrated Services Routers (ISR)	Refer to product bulletin #2170.
Campus and devices management	CiscoWorks LAN Management Server (LMS) 2.5	Enable IPv6 management functionality using SNMP over IPv4 transport on dual stacks. Support for SNMP, SSH/Telnet over IPv6 transport. The IPv4 stack is still required on the CiscoWorks LAN Management Server.
Network Management Appliances		
Network Analyzer Module (NAM)	Cisco Catalyst 6500 and Cisco ISR routers	NAM Software Release 3.x

IPv6 Assessment and Migration Services

Networks today are critical to business operations and to the mission-critical operations of both commercial companies and government agencies and institutions. The challenge of migration from IPv4 networks to IPv6 networks, and the coexistence of both IPv4 and IPv6 in many networks, will require thoughtful planning to prevent disruption of network services. The federally mandated IPv6 network by June 30, 2008 creates added pressure for successful migration planning by the federal government and its agencies.

Cisco offers expert advice and services to support your network as you prepare, plan, design, implement, operate, and optimize an IPv6 network. Cisco provides comprehensive services in which engineers can work with your team or partner to plan, design, implement, and optimize the foundational components of your IPv6 network and help you successfully meet your goals for network migration.

Cisco can assess the implications of IPv6 for your environment, including product compliance, address provisioning and management, routing policies, security, and infrastructure design. This assessment also identifies opportunities to take advantage of IPv6 features and functionality to simplify your environment, as well as areas of risk to be considered during your transition to IPv6.

Making changes to your network architecture requires careful planning and preparation. Cisco will analyze your architecture requirements from business, technical, and implementation viewpoints. Service deliverables include a requirements analysis, site survey, logical network design, physical network design, documentation, and an acceptance test plan. Cisco can facilitate a smooth implementation process through proven, written procedures and side-by-side coaching.

For more information on Cisco IPv6 Assessment and Migration Services, please contact your local Cisco representative.

Conclusion

Fundamental to the successful market adoption of the new Internet Protocol standard is the smooth integration and coexistence of IPv6 on the existing IPv4 Internet. Since June 2000, Cisco has taken a leadership role to address this by incrementally integrating IPv6 into its technology portfolio. Cisco has planned for both IPv4 and IPv6 versions to coexist for the foreseeable future, and both IPv4 and IPv6 will be included in Cisco portfolio upgrades. As market requirements mature and adoption grows, Cisco will continue to enhance and deliver additional standards-compliant IPv6 features across its products.

For additional information on Cisco IPv6 solutions, visit: http://www.cisco.com/ipv6.

Customers interested in testing or deploying Cisco IPv6 solutions should contact their local sales office.

Appendixes

Understanding IPv6 Addressing and Allocation Policies

Information related to the IPv6 address format and allocation policies from the Regional Internet Registries (RIR)

- Global Policy for IPv6- Background Report: http://www.icann.org/announcements/ipv6-report-06sep05.htm
- IPv6 Addressing Architecture (RFC 4291): http://www.ietf.org/rfc/rfc4291.txt
- IPv6 Global Unicast Address Format (RFC 3587): http://www.ietf.org/rfc/rfc3587.txt
- Deprecating Site Local address (RFC 3879): http://www.ietf.org/rfc/rfc3879.txt
- Unique Local IPv6 Unicast Addresses (RFC 4193): http://www.ietf.org/rfc/rfc4193.txt
- IPv6 Top Level Aggregator (TLA) Assignment: http://www.iana.org/assignments/ipv6-tla-assignments
- IPv6 Multicast Address Assignment: http://www.iana.org/assignments/ipv6-multicast-addresses
- IPv6 Allocation List Regional Registries: http://www.ripe.net/rs/ipv6/stats/index.html

- AFRINIC IPv6 Policies: http://www.afrinic.net/docs/policies/afpol-v6200407-000.htm
- APNIC IPv6 Resources Guide: http://www.apnic.net/services/ipv6_guide.html
- ARIN IPv6 Registration Services: http://www.arin.net/registration/ipv6/index.html
- LACNIC IPv6 Registration Services: http://lacnic.net/en/registro/ipv6.html
- RIPE NCC Registration Services: http://www.ripe.net/rs/ipv6/index.html

Supported List of RFCs

Detailed List of IPv6 Supported RFCs or draft RFCs across Cisco products: http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/configuration/15-2mt/ip6-rfcs.html.

References

- Cisco.com IPv6 information at: http://www.cisco.com/ipv6
- IETF IPv6 specifications defined by the IETF IP Next-Generation Working Group at: http://www.ietf.org/html.charters/ipv6-charter.html. Additional details at http://playground.sun.com/ipv6
- The former IETF NGTrans WG designing the protocols and mechanisms to transition the Internet from IPv4 to IPv6 at: http://www.ietf.org/html.charters/v6ops-charter.html
- IETF v6 Ops WG has essentially replaced the NGtrans effort. The difference is that v6ops is focused on outlining transition scenarios and identifying the specific tools (many from the NGtrans effort) that will be used in a transition. Visit: http://www.ietf.org/html.charters/v6ops-charter.html. Additional v6ops information at: http://www.6bone.net/v6ops/
- IETF Multi6 WG considers the problem of how to multihome sites in IPv6: http://www.ietf.org/html.charters/multi6-charter.html
- IETF MIPv6 WG Mobile IPv6 (MIPv6) specifies routing support to permit an IPv6 host to continue using its “permanent” home address as it moves around the Internet: http://www.ietf.org/html.charters/mip6-charter.html
- IETF Shim6 WG: http://www.ietf.org/html.charters/shim6-charter.html
- The 6Bone was an IPv6 pilot network set up to test the deployment and evolution of IPv6 protocol around the world. Since June 6, 2006, 6Bone has been phased-out. http://www.6bone.net/
- The IPv6 Forum. Cisco is a founding and active member of the IPv6 Forum. The mission is to promote the use of IPv6 protocol: http://www.ipv6forum.com/
- IPv6 Task Force around the World: http://www.ipv6tf.org/
  - North-America IPv6 Task Force: http://www.nav6tf.org/
  - European IPv6 Task Forces: http://www.ipv6tf.org/meet/tf/eutf.php
  - Japan IPv6 Promotion council: http://www.v6pc.jp/en/index.html
  - Korea IPv6 Task Force: http://www.ipv6.or.kr/eng/index.html
- A Pragmatic Report on IPv4 Address Space Consumption: http://www.cisco.com/en/US/about/ac123/ac147/archived_issues/ipj_8-3/ipv4.html
- http://www.potaroo.net/tools/ipv4/
- U.S. Office of Management & Budget memo - Transition Planning for Internet Protocol Version 6 (IPv6): http://www.whitehouse.gov/omb/memoranda/fy2005/m05-22.pdf

- IPv6 and National Strategies on Information and Communication Technologies: http://www.cisco.com/en/US/products/ps6553/products_white_paper0900aecd8032b2ad.shtml
- IPv6 commercial services in Japan: http://www.ipv6style.jp/en/statistics/services/index.shtml
- Microsoft Windows Vista Release - Dual Stack IPv4 and IPv6:
  - http://www.microsoft.com/technet/community/columns/cableguy/cg0905.mspx
  - http://www.microsoft.com/windowsserver2003/technologies/ipv6/default.mspx
- Cable Industry - DOCSIS 3.0 integrates IPv6 for Cable: http://www.cabledatacomnews.com/may05/may05-1.html

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