Interpeak Products for DoD IPv4/IPv6 Standards Profiles

1 Background

On September 29, 2003, the DoD published a memorandum titled: "Internet Protocol Version 6 (IPv6) Interim Transition Guidance."

The DoD memorandum established the goal of transitioning all current and future DoD networks to the next generation of IP – IPv6 – by fiscal year 2008 (starting in October, 2007). A key strategy, encouraged by the DoD, was to minimize later transition costs by ensuring that IPv6 capable products are available starting before fiscal year 2008. These products need to operate (in a dual-mode implementation) in the current IPv4 environment.

The DoD defined an IPv6 capable product as "a product that is capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4." The specific criteria is:

- Conformant with the DoD IPv4/IPv6 Standards Profile
- Maintaining interoperability with IPv4
- Migration path and upgrades as IPv6 evolves
- Availability of vendor IPv6 technical support

The DoD IPv4/IPv6 Standards Profile was formally developed to support the transition to IPv6 capable products. The Standards Profile lists Mandatory and Emerging requirements. The Emerging requirements have not yet achieved Mandatory status but all vendors of IPv4/IPv6 products are encouraged to adopt Emerging standards thereby ensuring a smooth transition to future requirements.

2 Why IPv6 in the DoD?

Why is IPv6 Needed? IPv4 cannot support the demand and capabilities required in future Combat Systems. These requirements are:

- Network ubiquity that is IP centric
- Mobility and ad-hoc networking using dynamic addressing
- Improved security using IPSec

IPv6 addresses the needs of future Combat Systems by providing:

- Expanded Address Space for Global and Geographic Addressing
- Multiple IPv6 Address per Interface
- Authentication and Privacy

- Improved Security with IPsec
- Auto-configuration
- Wireless
- Address Mobility
- Mobile IP Communications
- Ad-Hoc Networking
- Advanced Routing
- Quality of Service

The DoD has recognized that there are significant barriers to the implementation of IPv6. The proposed transition plan (outlined in the DoD memorandum) allows IPv6 vendors to engage with the various Programs to affect a smooth transition at minimal cost while maintaining the current IPv4 systems.

3 Interpeak Solution

Interpeak's expertise in network protocols, security, and real-time software systems provided the ideal background for the creation of a set of software protocols that provide a complete IPv6 transition mechanism:

- IPv4/IPv6 dual-mode protocol stack
- Security: IPSec, crypto, firewall, wireless
- Wireless
- Mobile IP
- Virtual Private Networks
- Virtual LANs
- Quality of Service
- Routing
- Tunneling
- Multicast

To further ease the transition, the Interpeak products are completely independent of the underlying OS and processor. Integrating the Interpeak products into a current product can be accomplished with minimum impact on the existing hardware and software system.

The table beginning on the next page lists, by function and RFC standard, each requirement of the DoD Standards Profile. The far right column indicates the Interpeak conformance to each required standard.

Interpeak's focus is embedded real-time and the DoD Standard Profiles that do not apply to embedded real-time are also shown.

The legend for the Interpeak column is:

Yes	Available now from Interpeak with full technical support (also includes new releases in conformance with upgraded Standards)
Yes*	Currently on development roadmap – will be available within 90 days
Note 1	Interpeak uses SNTP instead of NTP
Note 2	Interpeak uses DHCP (as per RFCs) for this functionality
Note 3	Van Jacobson header compression – RFC 1332 – is on Interpeak roadmap
NA	Not Applicable to embedded real-time applications

Additional information can be found at www.interpeak.com.

4 Host Services Requirement

RFC	Description		IPv4 Mandated	IPv4 Emerging	IPv6 Mandated	IPv6 Emerging	Interpeak
1122	Requirements for Internet Hosts - Communication Layers	Host Reqmnts	X				Yes
1123	Requirements for Internet Hosts - Application and Support	Host Reqmnts	X				Yes
1034	Domain names - concepts and facilities	Domain Name System	X		X		Yes
1035	Domain names - implementation and specification	Domain Name System	X		X		Yes
2136	Dynamic Updates in the Domain Name System (DNS UPDATE)	Domain Name System	X		X		Yes
1886	DNS Extensions to support IP version 6	Domain Name System			X		Yes
3152	Delegation of IP6.ARPA	Domain Name System			X		Yes*
1995	Incremental Zone Transfer in DNS	Domain Name System		X		X	Yes

1996	A Mechanism for Prompt Notification of Zone Changes (DNS NOTIFY)	Domain Name System		X		X	Yes

959	File Transfer Protocol	File Transfer	X		X		Yes
2428	FTP Extensions for IPv6 and NATs	File Transfer			X		Yes

855	Telnet Option Specifications	Remote Access	X		X		Yes
854	Telnet Protocol Specification	Remote Access	X		X		Yes

1305	Network Time Protocol (Version 3) Specification	Network Time	X				Note 1

951	Bootstrap Protocol	Network Config	X				Note 2
1542	Clarifications and Extensions for the Bootstrap Protocol	Network Config	X				Note 2
2131	Dynamic Host Configuration Protocol	Network Config	X				Yes
2132	DHCP Options and BOOTP Vendor Extensions	Network Config	X				Yes
3315	Dynamic Host Configuration Protocol for IPv6 (DHCPv6)	Network Config				X	Yes*

2616	Hypertext Transfer Protocol (HTTP) 1.1	HTTP	X		X		Yes

1738	Uniform Resource Locators (URLs)	URL	X		X		Yes
2396	Uniform Resource Identifiers (URI): Generic Syntax	URL	X		X		Yes
2732	Format for Literal IPv6 Addresses in URLs	URL				X	-

Mil Std	Mil STD 2045-47001C	Connectionless Transfer	X				NA

793	Transmission Control Protocol	TCP	X		X		Yes
2581	TCP Congestion Control	TCP	X		X		Yes

768	User Datagram Protocol	UDP	X		X		Yes

1006	ISO transport services on top of the TCP: Version 3	OSI over IP	X				NA
2126	ISO Transport Service on top of TCP (ITOT)	OSI over IP		X		X	NA

791	Internet Protocol	IP	X				Yes
950	Internet Standard Subnetting Procedure	IP	X				Yes
919	Broadcasting Internet Datagrams	IP	X				Yes
922	Broadcasting Internet datagrams in the presence of subnets	IP	X				Yes
792	Internet Control Message Protocol	IP	X				Yes
1112	Host extensions for IP multicasting	IP	X				Yes
2460	Internet Protocol	IP			X		Yes
2461	Neighbor Discovery for IP Version 6 (IPv6)	IP			X		Yes
2462	IPv6 Stateless Address Autoconfiguration	IP			X		Yes
2463	Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification	IP			X		Yes
2236	"Internet Group Management Protocol, v2"	IP	X				Yes
1770	IPv4 Option for Sender Directed Multi-Destination Delivery	IP	X				Yes*
2710	Multicast Listener Discovery (MLD) for IPv6	IP				X	Yes
1981	Path MTU Discovery for IP version 6	IP				X	Yes

3513	Internet Protocol Version 6 (IPv6) Addressing Architecture	IP				X	Yes
3587	IPv6 Global Unicast Address Format	IP				X	Yes

2507	IP Header Compression	Compression		X		X	Note 3

2794	Mobile IP Network Access Identifier Extension for IPv4	Mobility		X			Yes
3344	IP Mobility Support for IPv4	Mobility		X			Yes

2473	Generic Packet Tunneling in IPv6 Specification	Tunneling				X	Yes

2205	Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification	QOS		X		X	-

5 Router Requirement

RFC	Description		IPv4 Mandated	IPv4 Emerging	IPv6 Mandated	IPv6 Emerging	Interpeak
1812	Requirements for IP Version 4 Routers	Router Rqmnts	X				Yes
768	User Datagram Protocol	UDP	X		X		Yes
793	Transmission Control Protocol	TCP	X		X		Yes
854	Telnet Protocol Specification	Remote Access	X		X		Yes
855	Telnet Option Specifications	Remote Access	X		X		Yes
1034	Domain names - concepts and facilities	Domain Name System	X		X		Yes
1035	Domain names - implementation and specification	Domain Name System	X		X		Yes
1886	DNS Extensions to support IP version 6	Domain Name System			X		Yes
3152	Delegation of IP6.ARPA	Domain Name System			X		-

951	Bootstrap Protocol	Network Config	X				Note 2
1542	Clarifications and Extensions for the Bootstrap Protocol	Network Config	X				Note 2
2131	Dynamic Host Configuration Protocol	Network Config	X				Yes
2132	DHCP Options and BOOTP Vendor Extensions	Network Config	X				Yes
3315	Dynamic Host Configuration Protocol for IPv6 (DHCPv6)	Network Config				X	Yes

1350	The TFTP Protocol (Revision 2)	TFTP	X				Yes

791	Internet Protocol	IP	X				Yes
950	Internet Standard Subnetting Procedure	IP	X				Yes
919	Broadcasting Internet Datagrams	IP	X				Yes
922	Broadcasting Internet datagrams in the presence of subnets	IP	X				Yes
792	Internet Control Message Protocol	IP	X				Yes
1112	Host extensions for IP multicasting	IP	X				Yes
2460	Internet Protocol	IP			X		Yes

2461	Neighbor Discovery for IP Version 6 (IPv6)	IP			X		Yes
2462	IPv6 Stateless Address Autoconfiguration	IP			X		Yes
2463	Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification	IP			X		Yes
2236	"Internet Group Management Protocol, v2"	IP	X				Yes
1770	IPv4 Option for Sender Directed Multi-Destination Delivery	IP	X				Yes*
2710	Multicast Listener Discovery (MLD) for IPv6	IP				X	Yes
1981	Path MTU Discovery for IP version 6	IP				X	Yes
3513	Internet Protocol Version 6 (IPv6) Addressing Architecture	IP				X	Yes
3587	IPv6 Global Unicast Address Format	IP				X	Yes

2507	IP Header Compression	Compression		X		X	Note 3

2794	Mobile IP Network Access Identifier Extension for IPv4	Mobility		X			Yes

3344	IP Mobility Support for IPv4	Mobility		X			Yes

2328	OSPF Version 2	Interior Routing	X				Yes
2740	OSPF for IPv6	Interior Routing			X		Yes

1771	A Border Gateway Protocol 4 (BGP-4)	Exterior Routing	X		X		Yes
1772	Application of the Border Gateway Protocol in the Internet	Exterior Routing	X		X		Yes
2545	Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing	Exterior Routing			X		Yes
2858	Multiprotocol Extensions for BGP-4	Exterior Routing			X		Yes

2205	Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification	QOS		X		X	-
2207	RSVP Extensions for IPSEC Data Flows	QOS		X		X	-
2210	The Use of RSVP with IETF Integrated Services	QOS		X		X	-

2380	RSVP over ATM Implementation Guidelines	QOS		X		X	-
2474	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers	QOS		X		X	Yes
3031	Multiprotocol Label Switching Architecture	QOS		X		X	Yes
3168	The Addition of Explicit Congestion Notification (ECN) to IP	QOS		X		X	Yes
3175	Aggregation of RSVP for IPv4 and IPv6 Reservations	QOS		X		X	Yes*
IEEE	802.1Q:1998 VLAN Tagging	QOS		X		X	Yes
ISO	IEC 15802-3:1998	QOS		X		X	NA

6 Sub-Networks Requirement

RFC	Description		IPv4 Mandated	IPv4 Emerging	IPv6 Mandated	IPv6 Emerging	Interpeak
894	Standard for the transmission of IP datagrams over Ethernet networks	IP Ethernet	X				Yes
2464	Transmission of IPv6 Packets over Ethernet Networks	IP Ethernet				X	Yes
826	Ethernet Address Resolution Protocol	ARP	X				Yes
1661	The Point-to-Point Protocol (PPP)	PPP	X		X		Yes
1662	PPP in HDLC-like Framing	PPP	X		X		Yes
1332	The PPP Internet Protocol Control Protocol (IPCP)	PPP	X				Yes
1570	PPP LCP Extensions	PPP	X		X		Yes
1989	PPP Link Quality Monitoring	PPP	X		X		Yes*

2472	IP Version 6 over PPP	PPP				X	Yes
1994	PPP Challenge Handshake Authentication Protocol (CHAP)	PPP	X		X		Yes
1990	The PPP Multilink Protocol (MP)	PPP		X			-
3241	Robust Header Compression (ROHC) over PPP	PPP		X		X	-

1618	PPP over ISDN	IP over ISDN	X				NA

ATM	"ATM Forum af-lane-0084,000"	IP over ATM	X				NA
ATM	ATM Forum af-mpoa-0087.000	IP over ATM	X				NA

2401	Security Architecture for the Internet Protocol	IPSEC	X		X		Yes
2402	IP Authentication Header	IPSEC	X		X		Yes
2404	The Use of HMAC-SHA-1-96 within ESP and AH	IPSEC	X		X		Yes
2406	IP Encapsulating Security Payload (ESP)	IPSEC	X		X		Yes

2407	The Internet IP Security Domain of Interpretation for ISAKMP	IPSEC	X		X		Yes
2408	Internet Security Association and Key Management Protocol (ISAKMP)	IPSEC	X		X		Yes
2409	The Internet Key Exchange (IKE)	IPSEC	X		X		Yes