DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) **12 Jan 09**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of Zebra S4M Family of Printers Running Both Software (SW) Versions ZSP1189A, and ZSP1191A, and Using the Zebra SEH PS105-Z External and Zebra SEH PS102-Z Internal Print Servers Running SW Version 10.2.z for Internet Protocol Version 6 Capability

References: (a) DoDD 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01D, "Interoperability and Supportability of Information Technology and National Security Systems," 8 March 2006
(c) through (h), see Enclosure 1

1. References (a) and (b) establish the Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The Zebra S4M printer running both software (SW) Versions ZSP1189A and ZSP1191A, and using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers running SW Version 10.2.z, met the Internet Protocol (IP) Version 6 (IPv6) Capable interoperability requirements of a Simple Server as described in the Department of Defense (DoD) Information Technology Standards Registry, "DoD IPv6 Standard Profiles for IPv6 Capable Products Version 2.0," 1 August 2007, reference (c). The Zebra S4M printer running both SW Versions ZSP1189A and ZSP1191A, and using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers running SW Version 10.2.z have successfully completed the related IPv6 Interoperability portions of the "DoD IPv6 Generic Test Plan (GTP) Version 3," August 2007, reference (d), and is certified for listing on the Unified Capabilities (UC) Approved Products List (APL) as IPv6 Capable. The Zebra S4M printer is part of a family of printers which includes the Zebra ZM400 ZM600, RZ400, and RZ600 printers that were not tested. The Zebra ZM400 ZM600, RZ400, and RZ600 printers use only the Zebra SEH PS105-Z external print server. JITC analysis determined these printers to be functionally identical for certification purposes. Therefore, all members of this family of printers using both the SEH PS105-Z external and SEH PS102-Z internal print servers are certified as IPv6 capable. This certification expires upon changes that could affect interoperability, but no later than 3 years from the date of this memorandum.

3. This special certification is based upon IPv6 Capable Interoperability testing conducted by JITC at Fort Huachuca, Arizona, and the vendor's Letter of Compliance (LoC) dated 22 August 2008. Interoperability testing was conducted from 10 through 14 November 2008, at JITC's Advanced IP Technology Capability. Conformance testing was confirmed by Zebra, and was verified in the LoC provided. Enclosure 2 documents the summary test results and describes the devices. Users should verify interoperability before deploying the devices in an environment that varies significantly from that described.

4. The devices' interoperability status summary is in Table 1, and Table 2 contains the equipment listing

Table 1. Interoperability Status Summary

Zebra S4M Printer Using the Zebra PS105-Z and PS102-Z Print Servers		
Functional Category	**Requirement**	**Verified**
Base IPv6	M	Yes
IPSec	S+	No
Transition Mechanisms	S	No
Quality of Service	O	No
Mobility	CS	No
Bandwidth Limited Networks	O	No
Server	O	Yes
Host	S	No

LEGEND:

CS	Conditional Should	S	Should
IPSec	Internet Protocol Security	S+	Should Plus
IPv6	Internet Protocol Version 6	O	Optional
M	Must		

NOTE: The terms Must, Conditional Should, Should, Should Plus, and Optional are used to reference specific required Request for Comments from the Internet Engineering Task Force, the Department of Defense Information Technology Standards Registry, and the Department of Defense Internet Protocol Version 6 Generic Test Plan.

Table 2. Equipment Listing

Zebra S4M Printer Using the Zebra PS105-Z and PS102-Z Print Servers		
Component	**Firmware/Software**	**Interface**
Zebra S4M Printer	ZSP1189A	RJ45 Gigabit Ethernet
Zebra S4M Printer	ZSP1191A	RJ45 Gigabit Ethernet
Zebra SEH PS105-Z External Print Server	10.2.z	RJ45 Gigabit Ethernet
Zebra SEH PS102-Z Internal Print Server	10.2.z	RJ45 Gigabit Ethernet

LEGEND:
RJ Registered Jack

5. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet), or http://199.208.204.125 (SIPRNet). Information related to IPv6 Capable testing is on the UC APL at http://jitc.fhu.disa.mil/adv_ip/register/register.html.

6. The JITC point of contact is Donald L. Hann, DSN 879-5130, commercial (520) 538-5130, or e-mail: don.hann@disa.mil.

FOR THE COMMANDER:

2 Enclosures a/s

for RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

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Zebra Technologies Corporation, Attn: Jim Rehberger, 333 Corporate Woods Parkway, Vernon Hills, IL 60061-3109

ADDITIONAL REFERENCES

(c) Department of Defense (DoD) Information Technology Standards Registry (DISR), "DoD Internet Protocol Version 6 (IPv6) Standard Profiles for IPv6 Capable Products Version 2.0," 1 August 2007
(d) Joint Interoperability Test Command, "DoD IPv6 Generic Test Plan Version 3," August 2007
(e) DoD Chief Information Officer (CIO) Memorandum, "IPv6," 9 June 2003
(f) DoD CIO Memorandum, "IPv6 Interim Transition Guidance," 29 September 2003
(g) DoD IPv6 Transition Office, "DoD IPv6 Master Test Plan, Version 2," September 2006
(h) DoD, "DISR Global Information Grid (GIG) Convergence Master Plan (GCMP), Version 5.25," 29 March 2006

INTERNET PROTOCOL VERSION 6 CAPABLE TESTING SUMMARY

1. SYSTEM TITLE. The Zebra S4M printer running both software (SW) Versions ZSP1189A, and ZSP1191A, and using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers running SW Version 10.2.z, hereafter referred to as the devices under test (DUTs).

2. PROPONENT. Department of Defense (DoD) Internet Protocol (IP) Version 6 (IPv6) Transition Office (DITO).

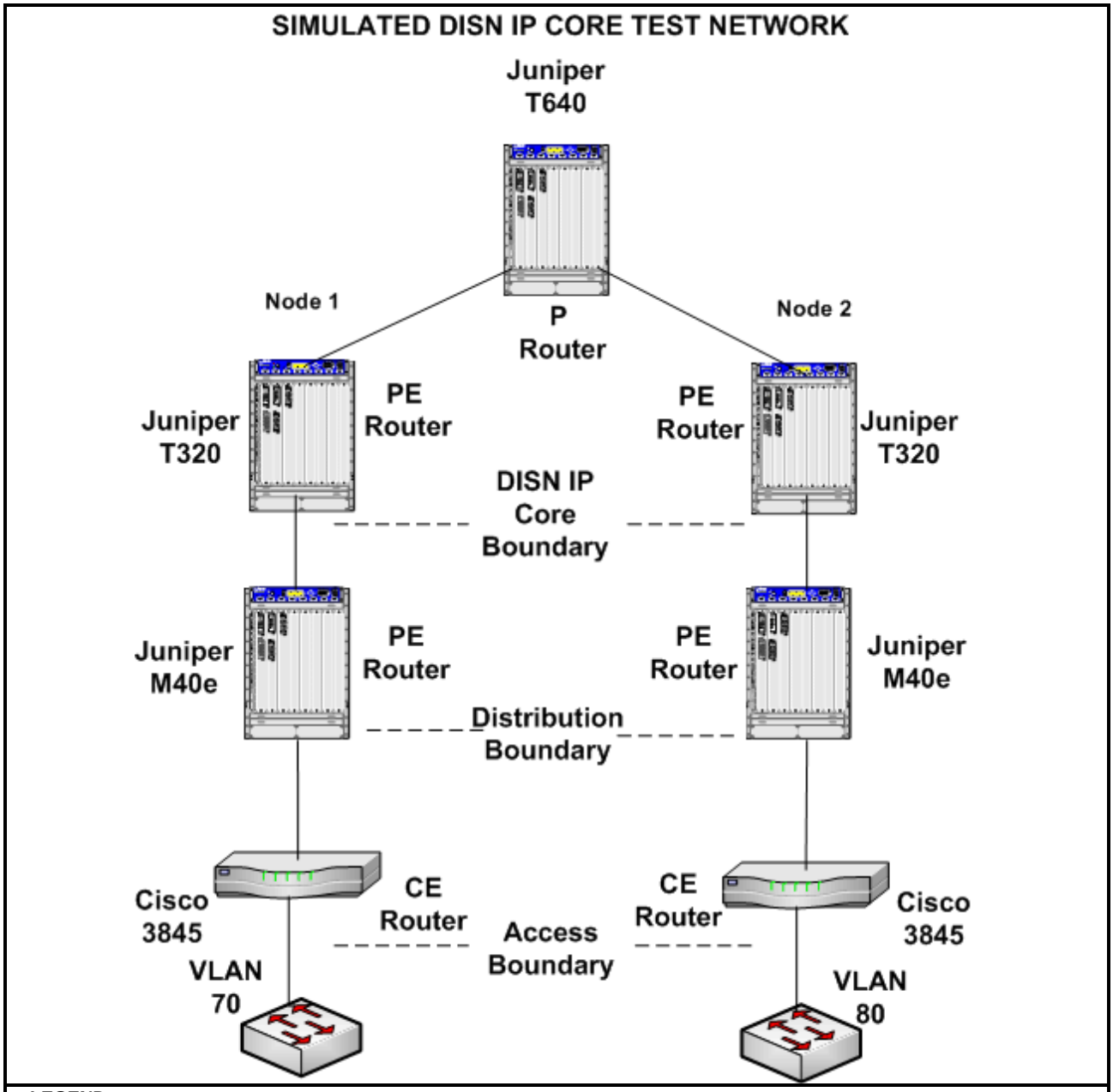
3. PROGRAM MANAGER/USER POC. DITO, Defense Information Systems Agency (DISA), Attn: GE36 Sam Assi, P.O. Box 4502, Arlington, VA 22204-4502, (703) 882-0241, e-mail: sam.assi@disa.mil.

4. TESTER. Donald L. Hann, Joint Interoperability Test Command (JITC), P.O. Box 12798, Fort Huachuca, AZ 85670-2798, DSN: 879-5130, commercial: (520) 538-5130, e-mail: don.hann@disa.mil.

5. DEVICE UNDER TEST DESCRIPTION. The DUTs were a Zebra thermal label printer and the optional factory or field installable devices that connect the network and ZebraLink-enabled printers.

6. OPERATIONAL ARCHITECTURE. The operational architecture was the JITC simulated Defense Information Systems Network (DISN) IP Core Network as depicted in Figure 2-1.

7. REQUIRED DEVICE INTERFACES. All IPv6-capable products to be included on the Unified Capabilities Approved Product List must meet the requirements of the DoD Information Technology Standards Registry (DISR), “DoD IPv6 Standard Profiles for IPv6 Capable Products Version 2.0,” 1 August 2007. Product testing conducted against these requirements is in accordance with the “DoD IPv6 Generic Test Plan (GTP) Version 3,” August 2007. The IPv6 Simple Server profile requirements for conformance and interoperability are in Table 2-1.



LEGEND:

CE	Customer Edge	LAN	Local Area Network
DISN	Defense Information Systems Network	P	Provider
IP	Internet Protocol	PE	Provider Edge
JITC	Joint Interoperability Test Command	VLAN	Virtual LAN

Figure 2-1. JITC Simulated DISN IP Core Network

Table 2-1. IPv6 Capability Requirements and Status

Zebra S4M Printer With the Zebra PS105-Z and PS102-Z Print Servers							
RFC	RFC Title	Testing Completed		Simple Server		Implemented	Comments
		Conformance	Interoperability	Requirement	Met/Not Met		
IPv6 Base							
2460	Internet Protocol version 6 (IPv6) Specification	Stated in LoC	Yes	M	Met	Yes	
4443	Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification	Stated in LoC	Yes	M	Met	Yes	
2461	Neighbor Discovery for IP version 6 (IPv6)	Stated in LoC	Yes	M	Met	Yes	
1981	Path Maximum Transmission Unit Discovery for IPv6	Not Stated	Not Tested	S	Not Tested	No	
2462	IPv6 Stateless Address Auto configuration	Stated in LoC	Yes	M	Met	Yes	Note 1
3315	DHCPv6 (Client)	Not Stated	Not Tested	M	Not Tested	No	Note 1
4291	IPv6 Addressing Architecture	Stated in LoC	Yes	M	Met	Yes	
4007	IPv6 Scoped Address Architecture	Stated in LoC	Yes	M	Met	Yes	
4193	Unique Local IPv6 Unicast Addresses	Stated in LoC	Yes	M	Met	Yes	
2710	Multicast Listener Discovery (MLD)	Stated in LoC	Yes	M	Met	Yes	
3810	Multicast Listener Discovery Version 2 (MLDv2) for IPv6	Not Stated	Not Tested	S	Not Tested	No	
2464	Transmission of IPv6 Packets over Ethernet Networks	Stated in LoC	Yes	CM	Met	Yes	
IPSec							
4301	Security Architecture for the Internet Protocol	Not Stated	Not Tested	S+	Not Tested	No	
4302	IP Authentication Header	Not Stated	Not Tested	S	Not Tested	No	
4303	IP Encapsulating Security Payload (ESP)	Not Stated	Not Tested	S+	Not Tested	No	
4304	Extended Sequence Number (ESN) Addendum to IPsec Domain of Interpretation (DOI) for Internet Security Association and Key Management Protocol (ISAKMP)	Not Stated	Not Tested	S	Not Tested	No	
4305	Cryptographic Algorithm Implementation Requirements for Encapsulating Security Payload (ESP) and Authentication Header (AH)	Not Stated	Not Tested	S+	Not Tested	No	
4869	Suite B Cryptographic Suites for IPsec	Not Stated	Not Tested	S+	Not Tested	No	
4309	Using Advanced Encryption Standard (AES) CCM Mode with IPsec Encapsulating Security Payload (ESP)	Not Stated	Not Tested	CS	Not Tested	No	
3971	Secure Neighbor Discovery	Not Stated	Not Tested	S	Not Tested	No	

Table 2-1. IPv6 Capability Requirements and Status (continued)

Zebra S4M Printer With the Zebra PS105-Z and PS102-Z Print Servers							
RFC	RFC Title	Testing Completed		Simple Server		Implemented	Comments
		Conformance	Interoperability	Requirement	Met/Not Met		
3972	Cryptographically Generated Addresses	Not Stated	Not Tested	S	Not Tested	No	
3041	Privacy Extensions for Stateless Address Auto configuration in IPv6	Not Stated	Not Tested	S	Not Tested	No	
4306	Internet Key Exchange Version 2 (IKEv2) Protocol	Not Stated	Not Tested	S+	Not Tested	No	
4307	Cryptographic Algorithms for Internet Key Exchange Version 2 (IKEv2)	Not Stated	Not Tested	S+	Not Tested	No	
Transition Mechanisms							
4213	Transition Mechanisms for IPv6 Host and Routers	Stated in LoC	Yes	S	Met	Yes	
2766	Network Address Translation – Protocol Translation (NAT-PT)	Not Stated	Not Tested	SN	Not Tested	No	
3053	IPv6 Tunnel Broker	Not Stated	Not Tested	CS	Not Tested	No	
QoS							
2474	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers	Not Stated	Not Tested	O	Not Tested	No	
2205	Resource ReSerVation Protocol (RSVP) – Version 1 Functional Specification	Not Stated	Not Tested	O	Not Tested	No	
2207	RSVP Extensions for IPSEC Data Flows	Not Stated	Not Tested	O	Not Tested	No	
2210	The Use of RSVP with IETF Integrated Services	Not Stated	Not Tested	O	Not Tested	No	
2750	RSVP Extensions for Policy Control	Not Stated	Not Tested	O	Not Tested	No	
3175	Aggregation of RSVP for IPv4 and IPv6 Reservations	Not Stated	Not Tested	O	Not Tested	No	
Mobility							
3775 (sec 9)	Mobility Support in IPv6	Not Stated	Not Tested	CS	Not Tested	No	
Bandwidth Limited Networks							
3095	Robust Header Compression (RoHC)	Not Stated	Not Tested	O	Not Tested	No	
3241	RoHC over PPP	Not Stated	Not Tested	O	Not Tested	No	
3843	RoHC: A Compression Profile for IP	Not Stated	Not Tested	O	Not Tested	No	
4362	RoHC: A Link-Layer Assisted Profile for IP/UDP/RTP	Not Stated	Not Tested	O	Not Tested	No	
2507	IP Header Compression	Not Stated	Not Tested	O	Not Tested	No	
2508	Compressing IP/UDP/RTP Headers for Low-Speed Serial Links	Not Stated	Not Tested	O	Not Tested	No	
Server							
959	File Transfer Protocol	Not Stated	Not Tested	O	Not Tested	No	

Table 2-1. IPv6 Capability Requirements and Status (continued)

Zebra S4M Printer With the Zebra PS105-Z and PS102-Z Print Servers							
RFC	RFC Title	Testing Completed		Simple Server		Implemented	Comments
		Conformance	Interoperability	Requirement	Met/Not Met		
2428	FTP Extensions for IPv6 and NAT	Not Stated	Not Tested	O	Not Tested	No	
2821	Simple Mail Transfer Protocol (SMTP)	Not Stated	Not Tested	O	Not Tested	No	
2911	Internet Printing Protocol	Not Stated	Not Tested	O	Not Tested	No	
3162	RADIUS (Remote Authentication Dial-In User Service) and IPv6	Not Stated	Not Tested	O	Not Tested	No	
4330	Simple Network Time Protocol	Not Stated	Not Tested	O	Not Tested	No	
3226	DNS Security and IPv6 A6 Aware Server/Resolver Message Size Requirements	Not Stated	Not Tested	O	Not Tested	No	
3261	Session Initiation Protocol (SIP)	Not Stated	Not Tested	O	Not Tested	No	
3596	DNS Extensions to Support IPv6	Not Stated	Not Tested	O	Not Tested	No	
2616	Hypertext Transfer Protocol – HTTP/1.1 – Web Server Role	Stated in LoC	Yes	None	Met	Yes	
Host							
3484	Default Address Selection for IPv6	Not Stated	Not Tested	S	Not Tested	No	
3596	DNS Extensions to Support IPv6	Not Stated	Not Tested	S	Not Tested	No	
3986	Uniform Resource Identifier (URI): Generic Syntax	Not Stated	Not Tested	S	Not Tested	No	

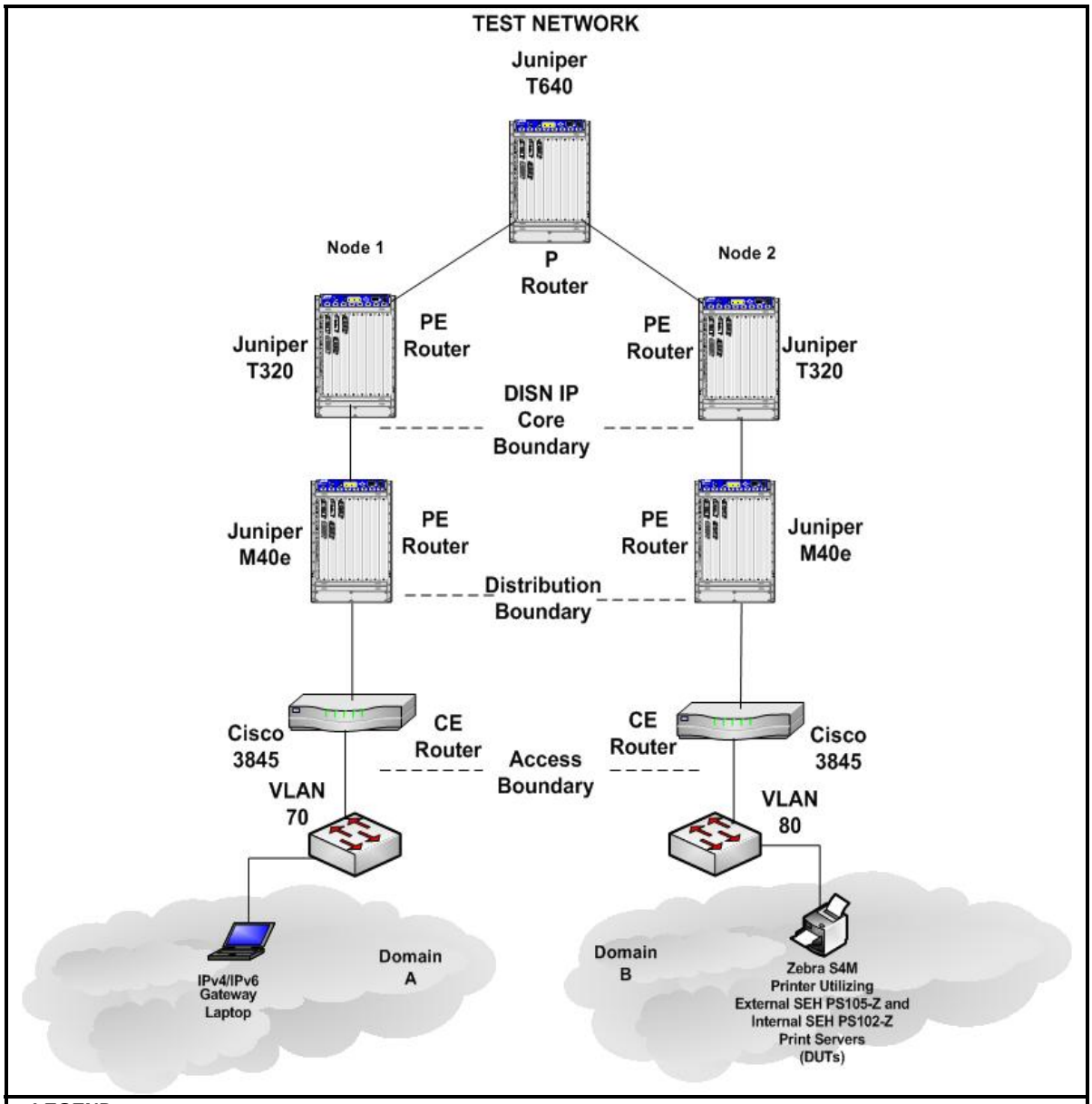
LEGEND:

CBC	Cipher Block Chaining	LoC	Letter of Conformance
CCM	CBC MAC Mode	M	Must
CM	Conditional Must	MAC	Message Authentication Code
CS	Conditional Should	O	Optional
DHCPv6	Dynamic Host Configuration Protocol Version 6	PPP	Point-to-Point Protocol
DNS	Domain Name Service	QoS	Quality of Service
DoD	Department of Defense	RFC	Request for Comments
FTP	File Transfer Protocol	RoHC	Robust Header Compression
GTP	General Test Plan	RSVP	Resource ReSerVation Protocol
IETF	Internet Engineering Task Force	RTP	Real-Time Transport Protocol
IP	Internet Protocol	S	Should
IPSec	Internet Protocol Security	S+	Should Plus
IPv4	Internet Protocol Version 4	SLAAC	Stateless Address Auto-configuration
IPv6	Internet Protocol Version 6	SN	Should Not
ISAKMP	Internet Security Association and Key Management Protocol	UDP	User Datagram Protocol

NOTES:

1. All Product Classes MUST support a method of autonomous configuration, either SLAAC or DHCPv6 client.
2. The terms Conditional Must, Conditional Should, Must, Optional, Should, Should Plus, and Should Not are used to reference specific required Request for Comments from the Internet Engineering Task Force, the Department of Defense Information Technology Standards Registry Department of Defense IPv6 Standard Profiles for IPv6 Capable Products Version 2.0, and the Department of Defense Internet Protocol Version 6 Generic Test Plan..

8. TEST NETWORK DESCRIPTION. The DUTs were tested as part of the JITC simulated DISN IP Core Network managed by the Advanced IP Technology Capability, and configured as shown in Figure 2-2.



LEGEND:

CE	Customer Edge	IPv6	Internet Protocol Version 6
DISN	Defense Information Systems Network	P	Provider
DUT	Device Under Test	PE	Provider Edge
IP	Internet Protocol	VLAN	Virtual Local Area Network
IPv4	Internet Protocol Version 4		

Figure 2-2. Test Network

9. DEVICE CONFIGURATIONS. Table 2-2 provides hardware and software components used in the test network.

Table 2-2. Test Configuration Hardware and Software

Equipment Name	Model Number	IOS/OS/Version(s)
Hardware		
Zebra Printer - DUT	S4M	ZSP1189A and ZSP1191A
Zebra External Print Server - DUT	SEH PS105-Z	10.2.z
Zebra Internal Print Server - DUT	SEH PS102-Z	10.2.z
2 Cisco Routers	Cisco 3845	12.4(11)T
2 Juniper Routers	Juniper M40e	V 7.6R3.6
2 Juniper Routers	Juniper T320	V 7.5R4.4
Juniper Router	Juniper T640	V 7.5R4.4
Gateway Notebook	450ROG	Microsoft Windows XP Professional
Software		
Microsoft Windows XP Professional	N/A	Build 5.1.2600 SP 2
Xlight FTP Server	N/A	V 1.57
VLC Media Player	N/A	V 0.8.6b
Wireshark	N/A	V 1.0.2 (SVN Rev 25698)

LEGEND:

DUT	Device Under Test	Rev	Revision
FTP	File Transfer Protocol	SP	Service Pack
IOS	Internetworking Operating System	SVN	Software Version Number
LAN	Local Area Network	T	New Technology
N/A	Not Applicable	V	Version
OS	Operating System	VLC	Video LAN Client
R	Release		

10. TEST LIMITATIONS. None.

11. TEST RESULTS.

a. IPv6 Base.

Test Case C.1.2. The Request for Comments (RFC) 2460 IPv6 Specification is the base specification of the IPv6 protocol. It specifies a number of parameters that enable successful completion of IPv6 traffic addressing and control. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.14. The RFC 4443 Internet Control Message Protocol (ICMP) for the IPv6 specification identifies ICMP messages for the IPv6 protocol. It includes message format and identifies two types of messages: error and informational. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.3. The RFC 2461 Neighbor Discovery for IPv6 specifies the neighbor discovery function that is similar to address resolution protocol in IP Version 4. It is necessary for implementing neighbor solicitations and neighbor advertisements within IPv6. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.4. The RFC 2462 IPv6 Stateless Address Auto-configuration specifies how a host auto-configures its interfaces in IPv6. These steps include determining whether the source addressing should be stateless or stateful, whether the information obtained should be solely the address or include other information, and whether Duplicate Address Detection identifies duplicate addresses on the network, and then issues a new address accordingly. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.13. The RFC 4291 IPv6 Addressing Architecture defines the specifications for the addressing architecture of the IPv6 protocol. The definitions cover unicast addresses, anycast addresses, and multicast addresses. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.11. The RFC 4007 IPv6 Scoped Address Architecture defines the nature and characteristics for the usage of IPv6 addresses of different scopes. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.12. The RFC 4193 Unique Local IPv6 Unicast Addresses defines globally unique local addresses. Local IPv6 unicast addressing is intended to be used for local communications and is not expected to be routed to the Internet. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.8. The RFC 2710 Multicast Listener Discovery for IPv6 specifies the protocol used by an IPv6 router to discover the presence of multicast listeners (i.e., nodes wishing to receive multicast packets) on its directly attached links, and to discover specifically which multicast addresses are of interest to those neighboring nodes. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

Test Case C.1.5. The RFC 2464 Transmission of IPv6 Packets over Ethernet Networks specifies the frame format for transmission of IPv6 link-local addresses and statelessly auto-configured addresses on Ethernet networks. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

b. Transition Mechanisms.

Test Case C.3.18. The RFC 4213 Transition Mechanisms for IPv6 Host and Routers specifies IPv4 co-existence mechanisms that can be implemented by IPv6 devices. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

c. Server.

Test Case Not Applicable. The RFC 2616 Hypertext Transfer Protocol is an application level protocol used for distributed, collaborative, hypermedia information systems. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met the test requirement.

d. Conclusion. The Zebra S4M printer using the Zebra SEH PS105-Z external and Zebra SEH PS102-Z internal print servers met all the required RFCs.

12. TEST AND ANALYSIS REPORT. All test data is maintained in the Advanced IP Technology Capability and is available upon request. This certification is available on the Joint Interoperability Tool (JIT). The JIT homepage is http://jit.fhu.disa.mil (NIPRNet), or http://199.208.204.125/ (SIPRNet). The JIT has links to JITC interoperability documents to provide the DoD community, including the warfighter in the field, easy access to the latest interoperability information. System interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/.gov users on the NIPRNet at: https://stp.fhu.disa.mil/.