



DEFENSE INFORMATION SYSTEMS AGENCY

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25 Mar 09

Joint Interoperability Test Command (JTE)

IN REPLY
REFER TO:

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Dell PowerConnect 6224 Family of Layer-3 Switches Running Software Version 3.0.0.0 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 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(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 Dell PowerConnect 6224 Layer-3 (L3) Switch running software Version 3.0.0.0 met the Internet Protocol Version 6 (IPv6) Capable interoperability requirements of the L3 Switch product class, 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). This device has 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 Dell PowerConnect 6224 L3 Switch is part of a family of Dell PowerConnect L3 Switches, including the PowerConnect 6224F, 6224P, 6248, and 6248P L3 Switches that were not tested. JITC analysis determined that the members of this Dell PowerConnect 6224 L3 Switch family are functionally identical for certification purposes. Therefore, the Dell PowerConnect 6224F, 6224P, 6248, and 6248P L3 Switches are also certified as IPv6 Capable. This certification expires upon changes that could affect interoperability, but no later than 4 years from the date of this memorandum.

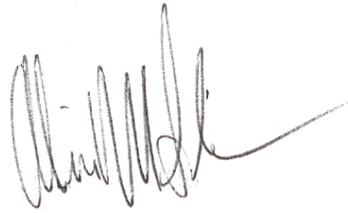
3. This special certification is based on IPv6 Capable Interoperability testing conducted by JITC at Fort Huachuca, Arizona, and the vendor's Letter of Conformance (LoC) dated 20 November 2007. Interoperability testing was conducted from 9 through 12 March 2009 at JITC's Advanced IP Technology Capability. Conformance testing was confirmed by Broadcom 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 device's interoperability status summary is in Table 1, and Table 2 contains the equipment listing.

JITC Memo, JTE, Special Interoperability Test Certification of the Dell PowerConnect 6224 Family of Layer 3 Switches Running Software Version 3.0.0.0 for Internet Protocol Version 6 Capability

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:



for RICHARD A. MEADOR
Chief
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2 Enclosures a/s

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DITO, Defense Information Systems Agency (DISA), Attn: GE36, P.O. Box 4502, Arlington, VA 22204-4502

Broadcom Corporation, Attn: Mr. Walter Scott, 100 Perimeter Park Drive, Suite H, Morrisville, NC 27560

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 Dell PowerConnect 6224 Layer-3 (L3) Switch running software Version 3.0.0.0, hereafter referred to as the device under test (DUT).
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 DUT is an L3 switch designed by Broadcom and Dell for high performance and advanced core switching capabilities for the small to medium enterprise.
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 L3 Switch product class profile requirements for conformance and interoperability are in Table 2-1.

Table 2-1. IPv6 Capability Requirements and Status

Dell PowerConnect 6224 L3 Switch							
RFC	RFC Title	Testing Completed		L3 Switch		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	Stated in LoC	Yes	M	Met	Yes	
2462	IPv6 Stateless Address Auto configuration	Stated in LoC	Yes	M	Met	Yes	Note 1
3315	DHCPv6	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	Stated in LoC	Yes	S	Met	Yes	
2464	Transmission of IPv6 Packets over Ethernet Networks	Stated in LoC	Yes	CM	Met	Yes	Note 2
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	
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	

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

Dell PowerConnect 6224 L3 Switch							
RFC	RFC Title	Testing Completed		L3 Switch		Implemented	Comments
		Conformance	Interoperability	Requirement	Met/Not Met		
4306	Internet Key Exchange (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	O	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	CM	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	
Network Management							
3411	An Architecture for Describing Simple Network Management Protocol Version 3 (SNMPv3)	Stated in LoC	Yes	CM	Met	Yes	
3412	Message Processing and Dispatching for the SNMP	Stated in LoC	Yes	CM	Met	Yes	
3413	SNMP Applications	Stated in LoC	Yes	CM	Met	Yes	
3595	Textual Conventions for IPv6 Flow Label	Not Stated	Not Tested	CM	Not Tested	No	
4022	Management Information Base for the Transmission Control Protocol	Not Stated	Not Tested	CM	Not Tested	No	
4113	Management Information Base for the User Datagram Protocol	Not Stated	Not Tested	CM	Not Tested	No	
4087	IP Tunnel MIB	Not Stated	Not Tested	CM	Not Tested	No	
4293	Management Information Base (MIB) for IP	Not Stated	Not Tested	CM	Not Tested	No	
4295	Mobile IP Management MIB	Not Stated	Not Tested	CM	Not Tested	No	
4807	IPsec Security Policy Database Configuration	Not Stated	Not Tested	CM	Not Tested	No	
4292	IP Forwarding Table MIB	Not Stated	Not Tested	CM	Not Tested	No	

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

Dell PowerConnect 6224 L3 Switch							
RFC	RFC Title	Testing Completed		L3 Switch		Implemented	Comments
		Conformance	Interoperability	Requirement	Met/Not Met		
Routing							
4271	A Border Gateway Protocol 4 (BGP-4)	Not Stated	Not Tested	CM	Not Tested	No	
1772	Application of the Border Gateway Protocol in the Internet	Not Stated	Not Tested	CM	Not Tested	No	
2545	Border Gateway Protocol Extensions for IPv6 Interdomain Routing	Not Stated	Not Tested	CM	Not Tested	No	
2858	Multi-Protocol Extensions for BGP-4	Not Stated	Not Tested	CM	Not Tested	No	
LEGEND:							
BGP-4	Border Gateway Protocol 4		LoC		Letter of Conformance		
CBC	Cipher Block Chaining		M		Must		
CCM	CBC MAC Mode		MAC		Message Authentication Code		
CM	Conditional Must		MIB		Management Information Base		
CS	Conditional Should		NAT		Network Address Translation		
CS+	Conditional Should+		O		Optional		
DHCPv6	Dynamic Host Configuration Protocol Version 6		OSPF		Open Shortest Path First		
DNS	Domain Name Service		PPP		Point-to-Point Protocol		
DoD	Department of Defense		QoS		Quality of Service		
FTP	File Transfer Protocol		RFC		Request for Comment		
FSP	Flexible Service Processor		RoHC		Robust Header Compression		
IETF	Internet Engineering Task Force		RSVP		Resource ReSerVation Protocol		
IKEv2	Internet Key Exchange Version 2		RTP		Real-Time Transport Protocol		
IP	Internet Protocol		S		Should		
IPSec	Internet Protocol Security		SLAAC		Stateless Address Auto-configuration		
IPv4	Internet Protocol Version 4		SN		Should Not		
IPv6	Internet Protocol Version 6		S+		Should+		
L3	Layer-3		UDP		User Datagram Protocol		
NOTES:							
1. All Product Classes MUST support a method of autonomous configuration, either SLAAC or DHCPv6 client.							
2. The device must be conformant to at least one of the Connection Technologies protocols.							
3. The terms Must, Conditional Must, Should, Should+, Conditional Should, Conditional Should +, Should Not, and Optional are used to reference specific required RFCs from the IETF, the DoD Information Technology Standards Registry, and the DoD IPv6 Generic Test Plan.							

8. TEST NETWORK DESCRIPTION. The DUT was 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.

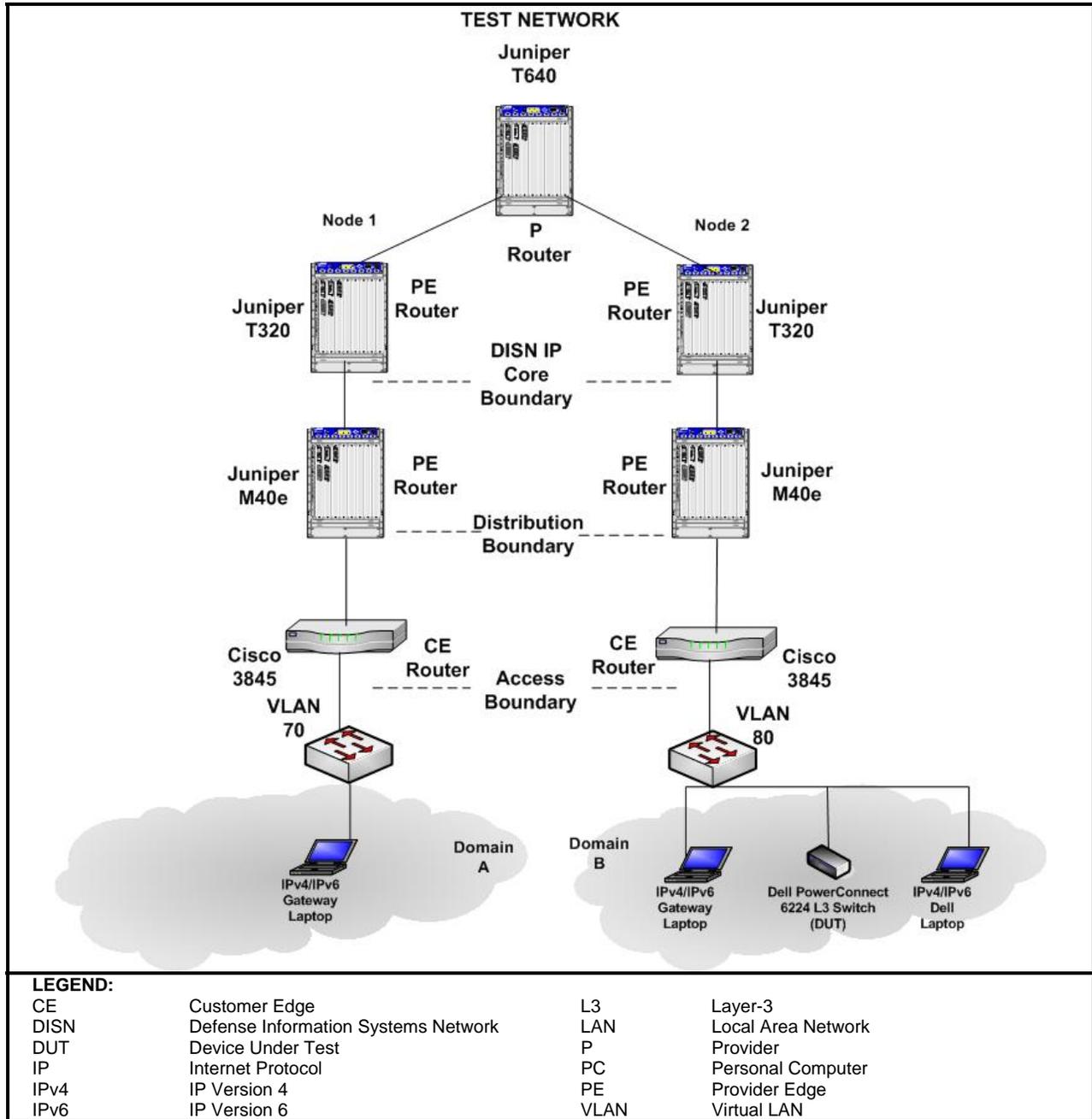


Figure 2-2. Dell Test Network

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

Table 2-2. Dell Test Configuration Hardware and Software

Equipment Name	Model Number	IOS/OS/Version(s)	
Hardware			
Dell PowerConnect L3 Switch - DUT	6224	V 3.0.0.0	
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	
Dell Notebook	Latitude	MS Windows XP Professional SP3	
2 Gateway Notebooks	450ROG	MS Windows XP Professional SP1	
Software			
MS Windows XP Professional	N/A	Build 5.1.2600 SP 1	
MS Windows XP Professional	N/A	Build 5.1.2600, SP 3	
MS Windows Server 2003	N/A	Build 5.2.3790 SP 1	
Wireshark	N/A	V 0.99.2 (SVN Rev 18752)	
LEGEND:			
DUT	Device Under Test	R	Release
IOS	Internetworking Operating System	Rev	Revision
L3	Layer-3	SP	Service Pack
MS	Microsoft	SVN	Software Version Number
N/A	Not Applicable	T	New Technology
OS	Operating System	V	Version

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 Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.1.14. The RFC 4443 identifies Internet Control Message Protocol messages for the IPv6 protocol. It includes message format and identifies two types of messages: error and informational. The Dell PowerConnect 6224 L3 Switch 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 (IPv4). It is necessary for implementing neighbor solicitations and neighbor advertisements within IPv6. The Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.1.1. The RFC 1981 Path Maximum Transmission Unit Discovery for IPv6 is necessary for proper IPv6 implementations. It acts as a mechanism to determine the maximum size of packets to traverse the network without fragmentation. The Dell PowerConnect 6224 L3 Switch 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 Duplicate Address Detection. The Dell PowerConnect 6224 L3 Switch 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 Dell PowerConnect 6224 L3 Switch 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 Dell PowerConnect 6224 L3 Switch 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 Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.1.8. The RFC 2710 Multicast Listener Discovery (MLD) 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 Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.1.10. The RFC 3810 MLD Version 2 for IPv6 adds support for “source filtering”, when compared to MLD Version 1, i.e., the ability to listen to packets *only* from specific source addresses, or from *all but* specific source addresses. The Dell PowerConnect 6224 L3 Switch 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 Dell PowerConnect 6224 L3 Switch 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 Dell PowerConnect 6224 L3 Switch met the test requirement.

c. Network Management.

Test Case C.3.9. The RFC 3411 describes the architecture for Simple Network Management Protocol (SNMP) Management Frameworks. The architecture is designed to be modular to accommodate the evolution of SNMP standards over time. The SNMP Version 3 (SNMPv3) incorporates User Authentication, a Message Processing Subsystem, a Security Subsystem, an Access Control Subsystem, and other applications that provide specific functional processing of management data. The Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.3.10. The RFC 3412 describes Message Processing and Dispatching for messages within the SNMP architecture. It describes the SNMPv3 Message Processing Model and specifies the procedures for dispatching SNMP messages to the proper Message Processing Models when multiple versions of SNMP messages are present. This RFC also defines the procedures for dispatching Protocol Data Units to SNMP applications. The Dell PowerConnect 6224 L3 Switch met the test requirement.

Test Case C.3.11. The RFC 3413 Simple Network Management Protocol Applications describes five types of SNMP applications which make use of an SNMP engine described in Standard 62, RFC 3411. The applications described are: Command Generators, Command Responders, Notification Originators, Notification Receivers, and Proxy Forwarders. The Dell PowerConnect 6224 L3 Switch met the test requirement.

d. Conclusion. The Dell PowerConnect 6224 L3 Switch 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/>.