DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) **2 Apr 13**

SUBJECT: Joint Interoperability Certification of the Juniper Networks EX3200 Switch with Software Release JUNOS 12.1

References: (a) Department of Defense (DoD) Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Chairman, Joint Chiefs of Staff Instruction (CJCSI) 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c) through (e), see Enclosure 1

1. References (a) and (b) establish the Defense Information Systems Agency (DISA), Joint Interoperability Test Command (JITC), as the responsible organization for interoperability (IO) test certification.

2. The Juniper Networks EX3200 switch with software release JUNOS 12.1 is hereinafter referred to as the system under test (SUT). The SUT meets all of its critical IO requirements and is certified for joint use within the Defense Information System Network (DISN) as an Assured Services Local Area Network (ASLAN) Layer 2/Layer 3 Access switch. The SUT is certified as interoperable for joint use with other ASLAN components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 10/100/1000BaseT and 100/1000BaseX for access, and 10000BaseX for uplink. All of these interfaces were tested with the exception of the 10BaseT interface. The Joint Interoperability Test Command (JITC) analysis determined that the 10BaseT interface is a low risk for certification based on the vendor's Letter of Compliance (LoC) to comply with the Institute of Electrical and Electronics Engineers (IEEE) 802.3i standard and the testing data collected at all other data rates. The SUT meets the critical IO requirements set forth in Reference (c), using test procedures derived from Reference (d). The Juniper Networks switches listed under components in Table 1 all employ the same software and similar hardware as the SUT. JITC analysis determined these systems to be functionally identical to the SUT for IO certification purposes, and they are also certified for joint use.

The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but is limited to supporting calls that are originated at ROUTINE precedence only. Non-ASLANs do not meet the availability or redundancy requirements for C2 or Special C2 users and therefore are not authorized to support precedence calls originated above ROUTINE.

Testing of the SUT did not include video services or data applications; however, simulated video traffic, preferred data, and best effort data were generated during testing to determine the SUT's ability to prioritize and properly queue voice media and signaling traffic. No other configurations, features, or functions, except those cited within this document, are certified by JITC. This certification expires upon changes that affect IO but no later than three years from the date of this memorandum.

3. This finding is based on IO testing conducted by the United States Army Information Systems Engineering Command, Technology Integration Center (USAISEC TIC), review of the vendor's LoC, DISA adjudication of open test discrepancy reports (TDRs), and the DISA Certifying Authority (CA) Recommendation. The IO testing was conducted by the USAISEC TIC, Fort Huachuca, Arizona, from 1 Oct through 16 Nov 2012. Review of the vendor's LoC was completed on 13 November 2012. The DISA adjudication of outstanding TDRs was completed on 18 December 2012. The DISA CA provided a positive recommendation on 4 December 2012, based on the security testing completed by USAISEC TIC-led Information Assurance (IA) test teams. Those test results are published in a separate report, Reference (e). Enclosure 2 documents the test results and describes the tested network and system configurations.

4. Table 1 provides a UC APL product summary. Table 2 provides the SUT interface IO status and Table 3 provides the Capability Requirements (CRs) and Functional Requirements (FRs) status. The threshold CRs/FRs for ASLAN components are established by Section 5.3.a of Reference (c) and were used to evaluate the IO of the SUT. Enclosure 3 provides a detailed list of the interface, capability, and functional requirements.

Table 1. UC APL Product Summary

Component (See Note 1)	Release	Sub-Component (See Note 1, 2)	Certification Applicability		
			Core	Distribution	Access
EX3200-24P	JUNOS 12.1	**EX-UM-2X4SFP** EX-UM-2XFP EX-UM-4SFP	N/A	N/A	Yes (L2/L3)
EX3200-24T					
EX3200-24T-DC					
EX3200-48P					
EX3200-48T					
EX3200-48T-DC					
EX3200-24P-TAA					
EX3200-24T-TAA					
EX3200-48P-TAA					
EX3200-48T-TAA					

NOTE:
1. Components bolded and underlined were tested by the USAISEC TIC. The other components in the family series were not tested; however, they utilize the same OS software and similar hardware. JITC analysis determined them to be functionally identical for IO certification purposes and they are also certified for joint use.
2. Tthe sub-component uplink modules are described as follows:
   - EX-UM-2X4SFP: EX3200 2-Port 10G SFP+ / 4-port 1G SFP+ Uplink Module (optics sold separately)
   - EX-UM-2XFP: EX 3200 2-Port 10G XFP Uplink Module (optics sold separately)
   - EX-UM-4SFP: EX 3200 4-Port 1G SFP Uplink Module (optics sold separately)

LEGEND:

APL	Approved Products List	N/A	Not Applicable
ASLAN	Assured Services Local Area Network	OS	Operating System
IO	Interoperability	TIC	Technology Integration Center
IOS	Internetworking Operating System	UC	Unified Capabilities
JITC	Joint Interoperability Test Command	UCR	Unified Capabilities Requirements
L2	Layer 2	USAISEC	U.S. Army Information Systems Engineering Command
L3	Layer 3		

Table 2. SUT Interface Interoperability Status

Interface	Applicability			UCR 2008, Change 3 Reference	Threshold CR/FR (See Note 1)	Status	Remarks
	Co	D	A				
Serial	C	C	C	5.3.1.3.9	1-4	Not Certified (See Note 5)	N/A
10Base-X	C	C	C (See Note 2)	5.3.1.3.1	1-6	Certified (See Note 3)	The SUT met CRs and FRs with the following IEEE standard: 802.3i (10BaseT).
100Base-X	R	R	C (See Note 2)	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3u (100BaseT/F).
1000Base-X	R	R	C (See Note 2)	5.3.1.3.1	1-6	Certified	The SUT met CR and FRs with the following IEEE standards: 802.3ab (1000BaseT), 802.3z (1000Base-SX, 1000Base-LX).
10000Base-X	C	C	C	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3ae (10GBase-SR, 10GBase-LR).
802.11a	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11b	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11g	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11n	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.16	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 3. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Core and Distribution products must minimally support 100Base-X (802.3u) and 1000Base-X (802.3z). Access products must minimally support one of the following standards: 802.3i (10BaseT), 802.3j (10BaseF), 802.3u (100BaseT/F), 802.3z (1000BaseF), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.
3. The USAISEC TIC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined that the 10BaseT interface is a low risk for certification based on the vendor's LoC to the IEEE 802.3i and the testing data collected at all other data rates.
4. The SUT does not support this interface, the interface was not tested, therefore, is not certified for use.
5. The SUT does support this interface for Command Line Interface (CLI) connectivity during initial setup only. This interface was not tested and is not certified for UC connectivity use.

Table 2. SUT Interface Interoperability Status (continued)

LEGEND:

802.3ab	1000BaseT Gbps Ethernet Over Twisted Pair at 1Gbps (125 Mbps)	C	Conditional
802.3ae	10 Gbps Ethernet	Co	Core
802.3i	10BaseT Mbps Over Twisted Pair	CR	Capability Requirement
802.3j	10 Mbps Over Fiber	D	Distribution
802.3u	Standard for Carrier Sense Multiple Access with Collision Detection at 100 Mbps	EIA	Electronic Industries Alliance
802.3z	Gigabit Ethernet Standard	EIA-232	Standard for Defining the Mechanical and Electrical Characteristics for Connecting Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) Data Communications Devices
802.11/16	IEEE Wireless Standards		
10BaseF	10 Mbps Ethernet Over Fiber	FR	Functional Requirement
10BaseT	10 Mbps (Baseband Operation, Twisted Pair) Ethernet	Gbps	Gigabits Per Second
		ID	Identification
10Base-X	10 Mbps Ethernet Over Fiber or Copper	IEEE	Institute of Electrical and Electronics Engineers
100BaseF	100 Mbps Ethernet Over Fiber	JITC	Joint Interoperability Test Command
100BaseT	100 Mbps (Baseband Operation, Twisted Pair) Ethernet	LoC	Letter of Compliance
		LR	Long Range Optics
100Base-X	100 Mbps Ethernet Over Fiber or Copper	LX	Single-Mode Fiber Optics
1000BaseF	1000 Mbps Ethernet Over Fiber	Mbps	Megabits Per Second
1000Base-LX	1000 Mbps Ethernet Over Fiber	N/A	Not Applicable
1000Base-SX	1000 Mbps Ethernet Over Fiber	R	Required
1000BaseT	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet	SR	Short Range Optics
		SX	Multi-Mode Fiber Optics
1000Base-X	1000 Mbps Ethernet Over Fiber or Copper	SUT	System Under Test
10000Base-X	10000 Mbps Ethernet Over Fiber or Copper	TIC	Technology Integration Center
10GBase-LR	10000 Mbps Ethernet Over Fiber	UCR	Unified Capabilities Requirements
10GBase-SR	10000 Mbps Ethernet Over Fiber	USAISEC	U.S. Army Information Systems Engineering Command
A	Access		

Table 3. SUT CRs and FRs Status

CR/FR ID	Capability/Function	Applicability (See Note 1)	UCR 2008, Change 3 Reference	Status	Remarks
1	**General Performance Parameters**				
	Performance Parameters	Required	5.3.1.3	Met	
	Port Interface Rates	Required	5.3.1.3.1	Met	
	Port Parameter Requirements	Required	5.3.1.3.2	Met	
	Class of Service Markings	Required	5.3.1.3.3	Met	
	VLAN Capabilities	Required	5.3.1.3.4	Met	
	Protocols	Required	5.3.1.3.5	Partially Met (See Note 2)	
	QoS Features	Required	5.3.1.3.6	Met	
	Network Monitoring	Required	5.3.1.3.7	Met	
	Security	Required	5.3.1.3.8	Met (See Note 6)	
2	**E2E Performance Requirements**				
	Voice Services	Required	5.3.1.4.1	Met (See Note 3)	
	Video Services	Required	5.3.1.4.2	Met (See Note 3)	
	Data Services	Required	5.3.1.4.3	Met (See Note 3)	
3	**NM Requirements**				
	Configuration Control	Required	5.3.1.6.1	Met	
	Operational Changes	Required	5.3.1.6.2	Met	
	Performance Monitoring	Required	5.3.1.6.3	Met	
	Alarms	Required	5.3.1.6.4	Met	
	Reporting	Required	5.3.1.6.5	Met	
4	**Engineering Requirements**				
	Physical Media	Required	5.3.1.7.1	Met (See Note 4)	
	Wireless	Conditional	5.3.1.7.2	Not Tested (See Note 5)	
	Traffic Engineering	Required	5.3.1.7.3	Met (See Note 4)	
	Availability	Required	5.3.1.7.6	Met (See Note 4)	
	Redundancy	Required	5.3.1.7.7	Met (See Note 4)	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested (See Note 5)	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested (See Note 5)	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	

Table 3. SUT CRs and FRs Status (continued)

NOTES:
1. The annotation of "required" refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The SUT does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. The SUT does not comply with the following protocols:
   a. RFC 2737: Partial Comply - MIB (Entity). DISA adjudicated this as a minor impact with no POAM required.
   b. RFC 4502: Partial Comply - RMON MIB. DISA adjudicated this as a minor impact with no POAM required.
3. This requirement was verified and met using simulated voice, video, and data traffic in an operational emulated environment to meet E2E requirements. The SUT must be deployed IAW deployment guide and engineering guidelines in UCR 2008, Change 3, Section 5.3.1.4.
4. This requirement was met with the following stipulations: It is the site's responsibility to configure the SUT in a manner which meets the engineering requirements listed in Enclosure 2, Section 11.2 d, and that it does not create a single point of failure which could impact more than 96 C2 users.
5. Wireless and MPLS requirements are conditional, were not tested, and, therefore, are not certified for use.
6. Security testing was accomplished via USAISEC TIC-led IA test teams and published in a separate report, Reference (e).

LEGEND:

ASLAN	Assured Services Local Area Network	LAN	Local Area Network
BGP	Border Gateway Protocol	Mbps	Megabits Per Second
C2	Command and Control	MIB	Management Information Base
CE	Customer Edge	NM	Network Management
CR	Capability Requirement	OCSP	Online Certificate Status Protocol
DISA	Defense Information Systems Agency	OSPF V2	Open Shortest Path First Version 2
E2E	End-to-End	PKI	Public Key Infrastructure
FR	Functional Requirement	POA&M	Plan of Action and Milestones
Gbps	Gigabits Per Second	QoS	Quality of Service
GbE	Gigabit Ethernet	RFC	Request For Comment
IAW	In Accordance With	RMON	Remote Monitoring
ID	Identification	SUT	System Under Test
IOS	Internetworking Operating System	UCR	Unified Capabilities Requirements
IPv4	Internet Protocol Version 4	VLAN	Virtual Local Area Network
IPv6	Internet Protocol Version 6	VPN	Virtual Private Network

5. In accordance with the Program Manager's request, no detailed test report was developed. JITC distributes IO information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive IO status information is available via the JITC System Tracking Program (STP), which 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). Information related to DISN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. All associated data is available on the DISA Unified Capability Coordination Office (UCCO) website located at http://www.disa.mil/ucco/. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly from U.S. Government civilian or uniformed military personnel at the UCCO; e-mail: disa.meade.ns.list.unified-capabilities-certificaion-office@mail.mil.

6. The testing point of contact Mr. James Hatch, DSN 821-2860, commercial (520) 533-2860, or email to james.d.hatch12.civ@mail.mil. The JITC point of contact is Ms. Anita Mananquil, DSN 879-5164, commercial (520) 538-5164, FAX DSN 879-4347, commercial (520) 538-4347, or e-mail to anita.l.mananquil.civ@mail.mil. JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Tracking Number for the SUT is 1212805.

FOR THE COMMANDER:

3 Enclosures a/s

for RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

DISTRIBUTION (electronic mail):
DoD CIO
Joint Staff J-6, JCS
USD(AT&L)
ISG Secretariat, DISA, JTA
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US Army, DA-OSA, CIO/G-6 ASA(ALT), SAIS-IOQ
US Air Force, A3CNN/A6CNN
US Marine Corps, MARCORSYSCOM, SIAT, A&CE Division
US Coast Guard, CG-64
DISA/TEMC
DIA, Office of the Acquisition Executive
NSG Interoperability Assessment Team
DOT&E, Netcentric Systems and Naval Warfare
Medical Health Systems, JMIS IV&V
Defense Information Systems Agency, NS2

ADDITIONAL REFERENCES

(c) Office of the DoD Chief Information Officer, "Department of Defense Unified Capabilities Requirements 2008 (UCR 2008), Change 3," September 2011

(d) Joint Interoperability Test Command, "ASLAN Component Test Plan (UCTP)," February 2012

(e) U.S. Army Information Systems Engineering Command, Technology Integration Center (USAISEC TIC), "Information Assurance (IA) Assessment of Juniper EX3200 (Tracking Number 1212805)," 9 November 2012

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Juniper Networks EX3200 Switch with Software Release JUNOS 12.1

2. SPONSOR. Program Manager (PM) Installation Information Infrastructure Modernization Program (I3MP), point of contact (POC): Mr. Jordan Silk, United States Army Information Systems Engineering Command, Technology Integration Center (USAISEC TIC), Building 53302, Fort Huachuca, Arizona 85613; e-mail: jordan.r.silk.civ@mail.mil

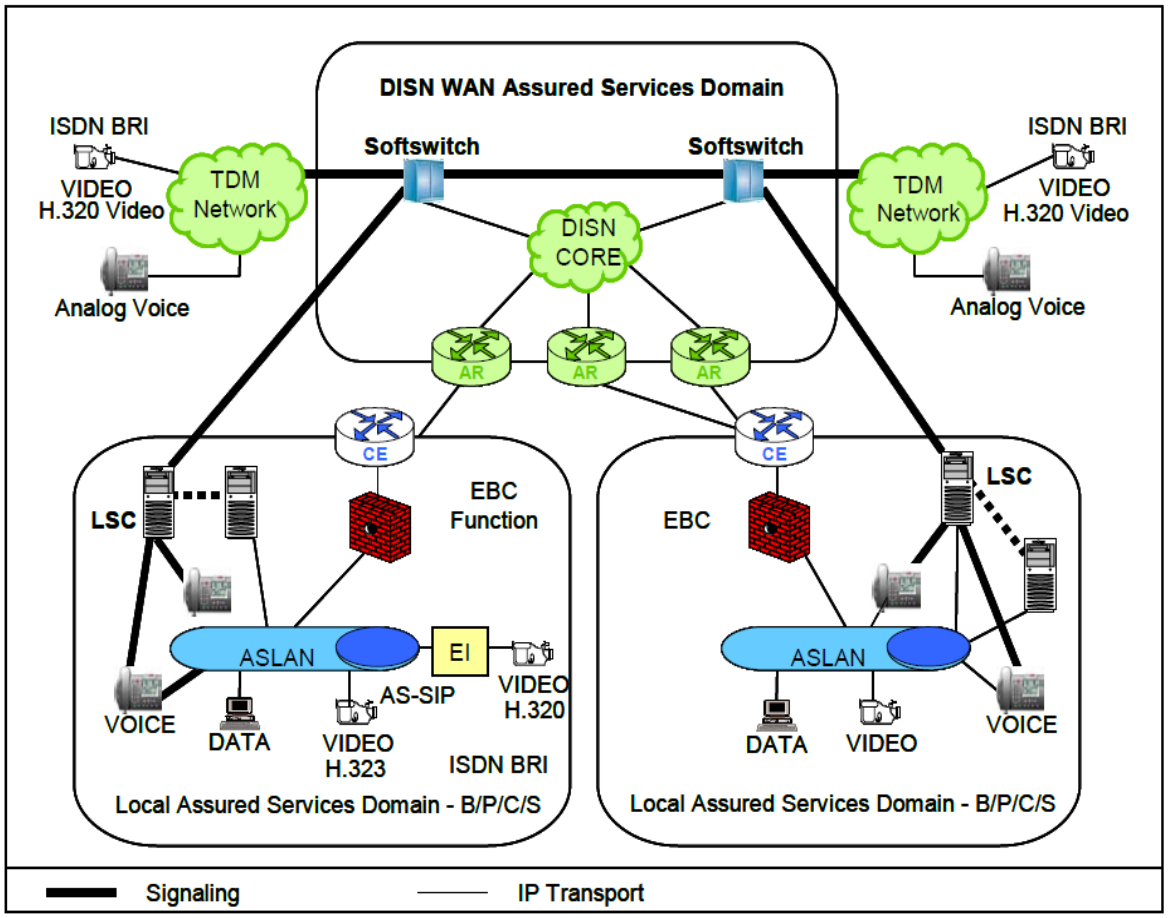
3. SYSTEM POC. Juniper Networks UC APL Certification Team, 2251 Corporate Park Drive Suite 100, Herndon, VA 20171, e-mail: uc-apl@juniper.net, website: www.juniper.net

4. TESTER. USAISEC TIC, Fort Huachuca, Arizona

5. SYSTEM DESCRIPTION. The Juniper Networks EX3200 switch with software release JUNOS 12.1 is hereinafter referred to as System Under Test (SUT). The SUT is used to transport voice signaling and media as part of an overall Voice over Internet Protocol (VoIP) system. The SUT provides availability, security, and Quality of Service (QoS) to meet the operational requirements of the network and Assured Services for the Warfighter. The SUT is certified as a Layer 2/Layer 3 Access switch and is interoperable for joint use with other Assured Services Local Area Network (ASLAN) components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 10/100/1000BaseT and 100/1000BaseX for access, 10000BaseX for uplink. All of these interfaces were tested with the exception of the 10BaseT interface. The Joint Interoperability Test Command (JITC) analysis determined that the 10BaseT interface is a low risk for certification based on the vendor's Letter of Compliance (LoC) to comply with the Institute of Electrical and Electronics Engineers (IEEE) 802.3i standard and the testing data collected at all other data rates. The Juniper Networks switches listed in Table 2-4 all employ the same software and similar hardware as the SUT. JITC analysis determined these systems to be functionally identical to the SUT for IO certification purposes, and they are also certified for joint use.

6. OPERATIONAL ARCHITECTURE. Figure 2-1 depicts an ASLAN notional operational architecture in which the SUT may be used. The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE calls only) (C2(R)) or non-C2 voice subscribers. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but is limited to supporting calls that are originated at ROUTINE precedence only. Non-ASLANs do not meet the availability or redundancy

requirements for C2 or Special C2 users, and therefore, are not authorized to support precedence calls originated above ROUTINE.



LEGEND:

AR	Aggregation Router
ASLAN	Assured Services Local Area Network
AS-SIP	Assured Services – Session Initiation Protocol
B/P/C/S	Base / Post / Camp / Station
BRI	Basic Rate Interface
CE	Customer Edge (CE Router)
DISN	Defense Information System Network
EBC	Edge Boundary Controller
EI	End Instrument
H.320	ITU-T Standard for Narrowband VTC
H.323	ITU-T Standard for Multi-Media Communications on Packet Based Networks
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
LSC	Local Session Controller
TDM	Time Division Multiplex
UC	Unified Capabilities
VTC	Video Teleconferencing
WAN	Wide Area Network

Figure 2-1. DISN UC Notional Operational Architecture

7. INTEROPERABILITY REQUIREMENTS. The interface, Capability Requirements (CRs) and Functional Requirements (FRs), Information Assurance (IA), and other

requirements for ASLAN infrastructure products are established by Section 5.3.1 of Reference (c).

7.1 Interfaces. Table 2-1 depicts the physical ASLAN product interfaces and the associated standards.

Table 2-1. ASLAN Products Interface Requirements

Interface	UCR 2008, Change 3 Reference	Criteria (See Note 1)	Applicability		
			Co	D	A
Serial	5.3.1.3.9	Support minimum threshold CRs/FRs 1-4 and meet interface criteria for applicable EIA/TIA standard.	C	C	C
10Base-X (See Note 2)	5.3.1.3.1	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.3i or 802.3j.	C	C	C
100Base-X (See Note 2)	5.3.1.3.1	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.3.u.	R	R	C
1000Base-X (See Note 2)	5.3.1.3.1	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.3z, or 802.3ab.	R	R	C
10000Base-X (See Note 2)	5.3.1.3.1	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.3ae.	C	C	C
802.11a	5.3.1.3.1 and 5.3.1.7.2	1-6	C	C	C
802.11b	5.3.1.3.1 and 5.3.1.7.2	1-6	C	C	C
802.11g	5.3.1.3.1 and 5.3.1.7.2	1-6	C	C	C
802.11n	5.3.1.3.1 and 5.3.1.7.2	1-6	C	C	C
802.16	5.3.1.3.1 and 5.3.1.7.2	1-6	C	C	C

Table 2-1. ASLAN Products Interface Requirements (continued)

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 2-2. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Core and Distribution products must minimally support the following standards: 802.3u (100Base-X) and 802.3z (1000Base-X). Access products must minimally support one of the following standards: 802.3i (10BaseT), 802.3j (10BaseF), 802.3u (100BaseTX/FX), 802.3z (1000Base-X), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet Over Twisted Pair at 1 Gbps (125 Mbps)
802.3ae	10 Gbps Ethernet
802.3i	10BaseT Mbps Over Twisted Pair
802.3j	10 Mbps Over Fiber
802.3u	Standard for Carrier Sense Multiple Access with Collision Detection at 100 Mbps
802.3z	Gigabit Ethernet Standard
802.11/16	IEEE Wireless Standards
10BaseF	10 Mbps Ethernet Over Fiber
10BaseT	10 Mbps (Baseband Operation, Twisted Pair) Ethernet
10BaseX	10 Mbps Ethernet Over Fiber or Copper
100BaseFX	100 Mbps Ethernet Over Fiber
100BaseTX	100 Mbps (Baseband Operation, Twisted Pair) Ethernet
100Base-X	100 Mbps Ethernet Over Fiber or Copper
1000BaseFX	1000 Mbps Ethernet Over Fiber
1000BaseT	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet
1000Base-X	1000 Mbps Ethernet Over Fiber or Copper
10000Base-X	10000 Mbps Ethernet Over Fiber or Copper
A	Access
ASLAN	Assured Services Local Area Network
C	Conditional
Co	Core
CR	Capability Requirement
D	DistributionEIA/TIA Electronics Industries Alliance/Telecommunications Industry Association
FR	Functional Requirement
Gbps	Gigabits Per Second
ID	Identification
IEEE	Institute of Electrical and Electronic Engineers
Mbps	Megabits Per Second
R	Required
SUT	System Under Test
UCR	Unified Capabilities Requirements

7.2 CR and FR. Switches have required and conditional features and capabilities that are established by Section 5.3.1 of the Unified Capabilities Requirements (UCR) 2008, Change 3, Reference (c). The SUT does not need to provide non-critical (conditional) requirements. If they are provided, they must function according to the specified requirements. The SUTs' features and capabilities and its aggregated requirements in accordance with (IAW) the ASLAN requirements are listed in Table 2-2. Detailed CR/FR requirements are provided in Table 3-1 of Enclosure 3.

Table 2-2. ASLAN CRs and FRs

CR/FR ID	Capability/Function	Applicability (See Note 1)	UCR 2008, Change 3 Reference	Remarks
1	**General Performance Parameters**			
	Performance Parameters	Required	5.3.1.3	
	Port Interface Rates	Required	5.3.1.3.1	
	Port Parameter Requirements	Required	5.3.1.3.2	
	Class of Service Markings	Required	5.3.1.3.3	
	VLAN Capabilities	Required	5.3.1.3.4	
	Protocols	Required	5.3.1.3.5	
	QoS Features	Required	5.3.1.3.6	
	Network Monitoring	Required	5.3.1.3.7	
	Security	Required	5.3.1.3.8[2] (See Note 2)	
2	**E2E Performance Requirements**			
	Voice Services	Required	5.3.1.4.1	
	Video Services	Required	5.3.1.4.2	
	Data Services	Required	5.3.1.4.3	
3	**NM Requirements**			
	Configuration Control	Required	5.3.1.6.1	
	Operational Changes	Required	5.3.1.6.2	
	Performance Monitoring	Required	5.3.1.6.3	
	Alarms	Required	5.3.1.6.4	
	Reporting	Required	5.3.1.6.5	
4	**Engineering Requirements**			
	Physical Media	Required	5.3.1.7.1	Site requirement
	Wireless	Conditional	5.3.1.7.2	
	Traffic Engineering	Required	5.3.1.7.3	Site requirement
	Availability	Required	5.3.1.7.6	Partially driven by topology
	Redundancy	Required	5.3.1.7.7	
5	**MPLS**			
	MPLS Requirements	Conditional	5.3.1.8.4.1	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	
6	**IPv6 Requirements**			
	Product Requirements	Required	5.3.5.4	

NOTES:
1. The annotation of "required" refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The SUT does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. Refers to IA requirements for UCR 2008, Change 3, Section 5.4. Detailed IA requirements are included in Reference (e).

LEGEND:

ASLAN	Assured Services Local Area Network	MPLS	Multiprotocol Label Switching
CR	Capability Requirement	NM	Network Management
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	SUT	System Under Test
IA	Information Assurance	UCR	Unified Capabilities Requirements
ID	Identification	VLAN	Virtual Local Area Network
IPv6	Internet Protocol Version 6	VPN	Virtual Private Network

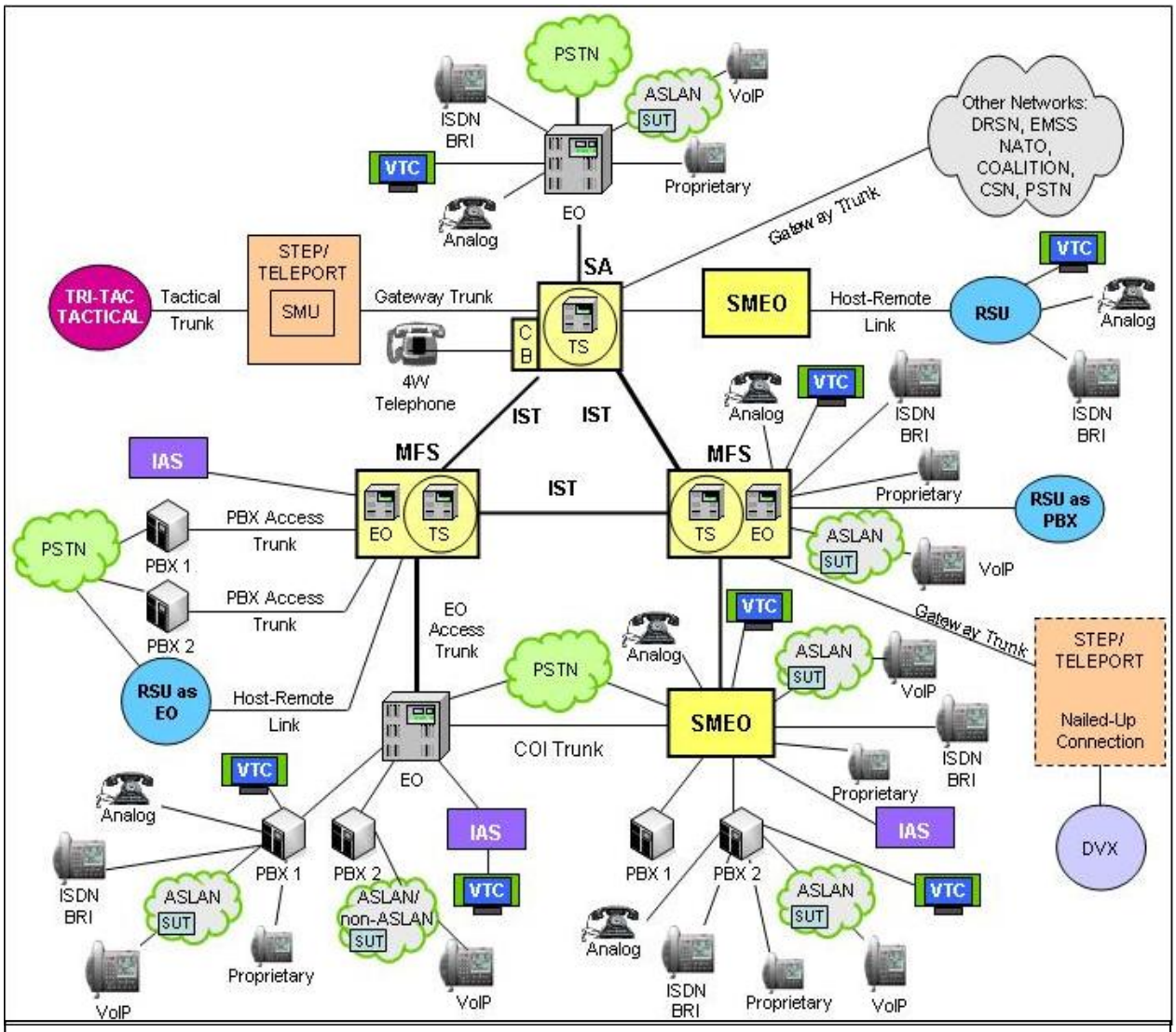
7.3 Information Assurance. Table 2-3 details the IA requirements applicable to the ASLAN products.

Table 2-3. ASLAN Products IA Requirements

Requirement	Applicability (See Note)	UCR 2008, Change 3 Reference	Criteria
General Requirements	Required	5.4.6.2	Detailed requirements and associated criteria for ASLAN products are listed in Reference (c) Section 5.4.
Authentication	Required	5.4.6.2.1	
Integrity	Required	5.4.6.2.2	
Confidentiality	Required	5.4.6.2.3	
Non-Repudiation	Required	5.4.6.2.4	
Availability	Required	5.4.6.2.5	
NOTE: The annotation of "required" refers to a high-level requirement category. Refers to IA requirements for UCR 2008, Change 3, Section 5.4.			
LEGEND: ASLAN Assured Services Local Area Network IA Information Assurance		UCR Unified Capabilities Requirements	

7.4 Other. None

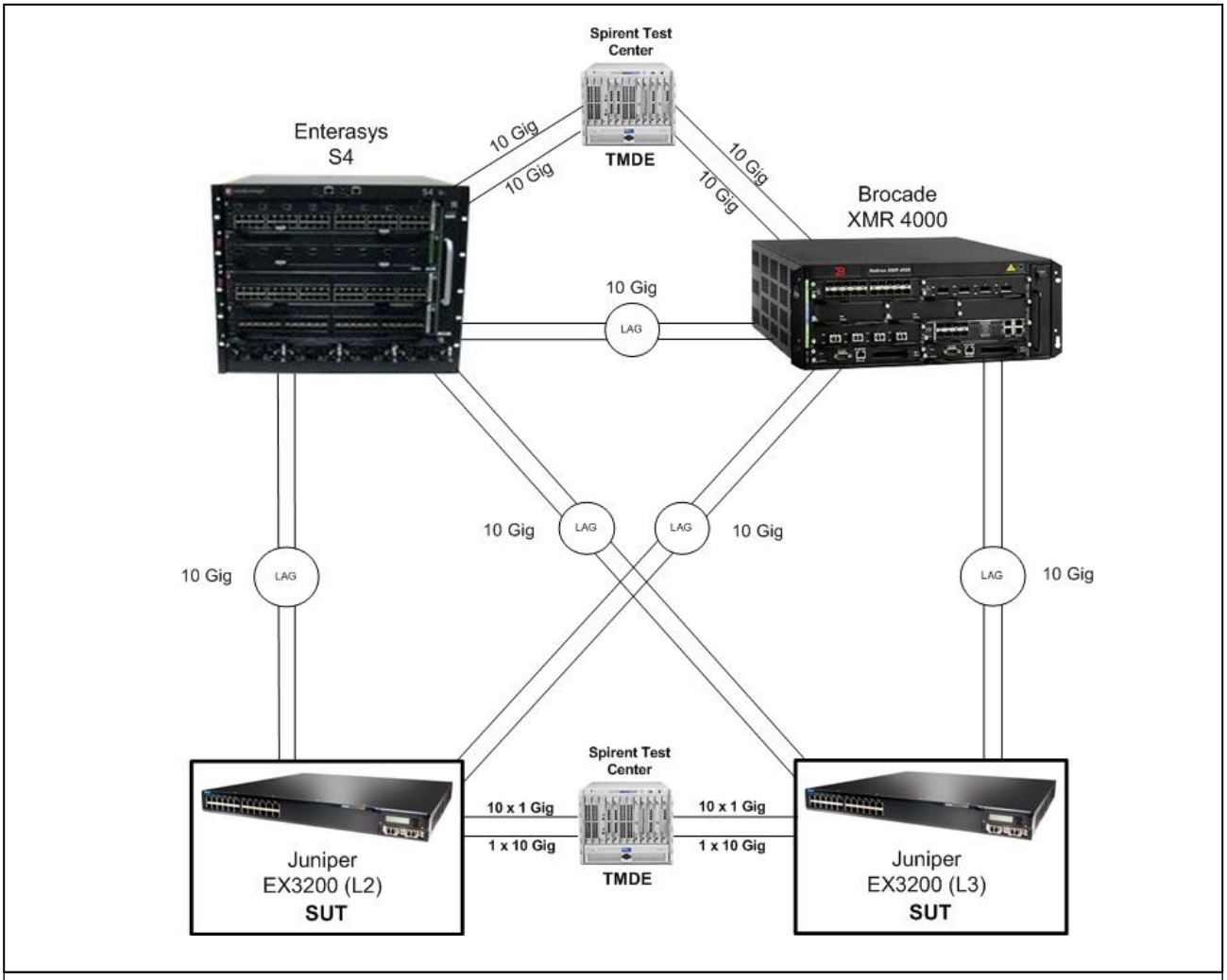
8. TEST NETWORK DESCRIPTION. The SUT was tested at the USAISEC TIC, a Department of Defense (DoD) component test lab, in a manner and configuration similar to that of a notional operational environment. The UCR 2008, Change 3, operational Defense Information System Network (DISN) Architecture is depicted in Figure 2-2, which depicts the relationship of the ASLAN and non-ASLAN to the DISN switch types. Testing the system's required functions and features was conducted using the test configurations depicted in Figure 2-3. Figure 2-3 depicts the ASLAN components in a heterogeneous configuration with Brocade and Enterasys ASLAN components. The SUT was not tested in a homogenous network.



LEGEND:

4W	4-Wire
ASLAN	Assured Services Local Area Network
BRI	Basic Rate Interface
CB	Channel Bank
COI	Community of Interest
CSN	Canadian Switch Network
DISN	Defense Information System Network
DRSN	Defense Red Switch Network
DVX	Deployable Voice Exchange
EMSS	Enhanced Mobile Satellite System
EO	End Office
IAS	Integrated Access Switch
IP	Internet Protocol
ISDN	Integrated Services Digital Network
IST	Interswitch Trunk
MFS	Multifunction Switch
NATO	North Atlantic Treaty Organization
PBX	Private Branch Exchange
PBX 1	Private Branch Exchange 1
PBX 2	Private Branch Exchange 2
PSTN	Public Switched Telephone Network
RSU	Remote Switching Unit
SA	System Administrator
SMEO	Small End Office
SMU	Switched Multiplex Unit
STEP	Standardized Tactical Entry Point
SUT	System Under Test
Tri-Tac	Tri-Service Tactical Communications Program
TS	Tandem Switch
VoIP	Voice over Internet Protocol
VTC	Video Teleconferencing

Figure 2-2. DISN Architecture



LEGEND:

Gig	Gigabits Per Second	SSA	S-Series Stand Alone
L2	Layer 2	Sup7L-E	Supervisor Engine 7L-E model
LAG	Link Aggregation Group	SUT	System Under Test
Mbps	Megabits Per Second	TMDE	Test, Measurement, and Diagnostic Equipment

Figure 2-3. Heterogeneous Test Configuration with Brocade and Enterasys

9. SYSTEM CONFIGURATIONS. Table 2-4 provides the system configuration, hardware, and software components tested with the SUT. The SUT was tested in an operationally realistic environment to determine its IO capability with associated network devices and network traffic.

Table 2-4. Tested System Configurations

System Name			Release	
Brocade NetIron XMR 4000			5.3	
Enterasys S4			7.41	
SUT[1]	**Release**	**Function**	**Sub-component (See Note 1, 2)**	**Description**
EX3200-24P	JUNOS 12.1	L2/L3 Access	**EX-UM-2X4SFP** EX-UM-2XFP EX-UM-4SFP	24-port 10/100/1000BaseT PoE 600W AC PS
EX3200-24T				24-port 10/100/1000BaseT (8-ports PoE) 320W AC PS
EX3200-24T-DC				24-port 10/100/1000BaseT 190W DC PS
EX3200-48P				**48-port 10/100/1000BaseT PoE 930W AC PS**
EX3200-48T				48-port 10/100/1000BaseT (8-ports PoE) 320W AC PS
EX3200-48T-DC				48-port 10/100/1000BaseT 190W DC PS
EX3200-24P-TAA				24-port 10/100/1000BaseT PoE 600W AC PS
EX3200-24T-TAA				24-port 10/100/1000BaseT (8-ports PoE) 320W AC PS
EX3200-48P-TAA				48-port 10/100/1000BaseT PoE 930W AC PS
EX3200-48T-TAA				48-port 10/100/1000BaseT (8-ports PoE) 320W AC PS

NOTE:
1. Components bolded and underlined were tested by the USAISEC TIC. The other components in the family series were not tested; however, they utilize the same OS software and similar hardware. JITC analysis determined them to be functionally identical for IO certification purposes and they are also certified for joint use.
2. The sub-component uplink modules are described as follows:
   - EX-UM-2X4SFP: EX3200 2-Port 10G SFP+ / 4-port 1G SFP+ Uplink Module (optics sold separately)
   - EX-UM-2XFP: EX 3200 2-Port 10G XFP Uplink Module (optics sold separately)
   - EX-UM-4SFP: EX 3200 4-Port 1G SFP Uplink Module (optics sold separately)

LEGEND:

10GBASE-T	10000 Mbps Ethernet Over Copper	OS	Operating System
100Base-X	100 Mbps Ethernet Over Fiber	PoE	Power Over Ethernet
1000Base-X	1000 Mbps Ethernet Over Fiber	SFP	Small Form Factor Pluggable
IO	Interoperability	SUT	System Under Test
OS	Operating System	TDR	Time-Domain Reflectometer
JITC	Joint Interoperability Test Command	TIC	Technology Integration Center
JUNOS	Juniper Operating System	USAISEC	U.S. Army Information Systems Engineering Command

10. TESTING LIMITATIONS. None.

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical IO requirements for a Layer 2/Layer 3 Access switch IAW UCR 2008, Change 3, Section 5.3.1, and it is certified for joint use with other network infrastructure products listed on the UC APL. Additional discussion regarding specific testing results is located in subsequent paragraphs.

11.1 Interfaces. The interface status of the SUT is provided in Table 2-5.

Table 2-5. SUT Interface Requirements Status

Interface	Applicability			UCR 2008, Change 3 Reference	Threshold CR/FR (See Note 1)	Status	Remarks
	Co	D	A				
Serial	C	C	C	5.3.1.3.9	1-4	Not Certified (See Note 5)	N/A
10Base-X	C	C	C (See Note 2)	5.3.1.3.1	1-6	Certified (See Note 3)	The SUT met CRs and FRs with the following IEEE standard: 802.3i (10BaseT).
100Base-X	R	R	C (See Note 2)	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3u (100BaseT/F).
1000Base-X	R	R	C (See Note 2)	5.3.1.3.1	1-6	Certified	The SUT met CR and FRs with the following IEEE standards: 802.3ab (1000BaseT), 802.3z (1000Base-SX, 1000Base-LX).
10000Base-X	C	C	C	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3ae (10GBase-SR, 10GBase-LR).
802.11a	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11b	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11g	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.11n	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A
802.16	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Supported (See Note 4)	N/A

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 3. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Core and Distribution products must minimally support 100Base-X (802.3u) and 1000Base-X (802.3z). Access products must minimally support one of the following standards: 802.3i (10BaseT), 802.3j (10BaseF), 802.3u (100BaseT/F), 802.3z (1000BaseF), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.
3. The USAISEC TIC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined that the 10BaseT interface is a low risk for certification based on the vendor's LoC to the IEEE 802.3i and the testing data collected at all other data rates.
4. The SUT does not support this interface. This interface is not required for a Core, Distribution, or Access switch.
5. The SUT does support this interface for Command Line Interface (CLI) connectivity during initial setup only. This interface was not tested and is not certified for UC connectivity use.

Table 2-5. SUT Interface Requirements Status (continued)

LEGEND:

802.3ab	1000BaseT Gbps Ethernet Over Twisted Pair at 1 Gbps (125 Mbps)	C	Conditional
802.3ae	10 Gbps Ethernet	Co	Core
802.3i	10BaseT Mbps Over Twisted Pair	CR	Capability Requirement
802.3j	10 Mbps Over Fiber	D	Distribution
802.3u	Standard for Carrier Sense Multiple Access With Collision Detection at 100 Mbps	EIA	Electronic Industries Alliance
802.3z	Gigabit Ethernet Standard	EIA-232	Standard for Defining the Mechanical and Electrical Characteristics for Connecting Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) Data Communications Devices
802.11/16	IEEE Wireless Standards	FR	Functional Requirement
10Base-X	10 Mbps Ethernet Over Fiber or Copper	Gbps	Gigabits Per Second
10BaseF	10 Mbps Ethernet Over Fiber	ID	Identification
10BaseT	10 Mbps (Baseband Operation, Twisted Pair) Ethernet	IEEE	Institute of Electrical and Electronics Engineers
		JITC	Joint Interoperability Test Command
100BaseF	100 Mbps Ethernet Over Fiber	LoC	Letter of Compliance
100BaseT	100 Mbps (Baseband Operation, Twisted Pair) Ethernet	LR	Long Range Optics
		LX	Single-mode Fiber Optics
100Base-X	100 Mbps Ethernet Over Fiber or Copper	Mbps	Megabits Per Second
1000BaseF	1000 Mbps Ethernet Over Fiber	N/A	Not Applicable
1000Base-LX	1000 Mbps Ethernet Over Fiber	OS	Operating System
1000Base-X	1000 Mbps Ethernet Over Fiber or Copper	R	Required
1000Base-SX	1000 Mbps Ethernet Over Fiber	SR	Short Range Optics
1000BaseT	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet	SX	Multi-mode Fiber Optics
		SUT	System Under Test
10000Base-X	10000 Mbps Ethernet Over Fiber or Copper	TIC	Technology Integration Center
10GBase-LR	10000 Mbps Ethernet Over Fiber	UCR	Unified Capabilities Requirements
10GBase-SR	10000 Mbps Ethernet Over Fiber	USAISEC	U.S. Army Information Systems Engineering Command
A	Access		

11.2 CR and FR. The SUT CR and FR status is depicted in Table 2-6. Detailed CR/FR requirements are provided in Enclosure 3, Table 3-1.

Table 2-6. SUT CRs and FRs Status

CR/FR ID	Capability/Function	Applicability (See Note 1)	UCR 2008, Change 3 Reference	Status	Remarks
1	**General Performance Parameters**				
	Performance Parameters	Required	5.3.1.3	Met	
	Port Interface Rates	Required	5.3.1.3.1	Met	
	Port Parameter Requirements	Required	5.3.1.3.2	Met	
	Class of Service Markings	Required	5.3.1.3.3	Met	
	VLAN Capabilities	Required	5.3.1.3.4	Met	
	Protocols	Required	5.3.1.3.5	Partially Met (See Note 2)	
	QoS Features	Required	5.3.1.3.6	Met	
	Network Monitoring	Required	5.3.1.3.7	Met	
	Security	Required	5.3.1.3.8	Met (See Note 6)	
2	**E2E Performance Requirements**				
	Voice Services	Required	5.3.1.4.1	Met (See Note 3)	
	Video Services	Required	5.3.1.4.2	Met (See Note 3)	
	Data Services	Required	5.3.1.4.3	Met (See Note 3)	
3	**NM Requirements**				
	Configuration Control	Required	5.3.1.6.1	Met	
	Operational Changes	Required	5.3.1.6.2	Met	
	Performance Monitoring	Required	5.3.1.6.3	Met	
	Alarms	Required	5.3.1.6.4	Met	
	Reporting	Required	5.3.1.6.5	Met	
4	**Engineering Requirements**				
	Physical Media	Required	5.3.1.7.1	Met (See Note 4)	
	Wireless	Conditional	5.3.1.7.2	Not Tested (See Note 5)	
	Traffic Engineering	Required	5.3.1.7.3	Met (See Note 4)	
	Availability	Required	5.3.1.7.6	Met (See Note 4)	
	Redundancy	Required	5.3.1.7.7	Met (See Note 4)	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested (See Note 5)	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested (See Note 5)	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	

Table 2-6. SUT CRs and FRs Status (continued)

NOTES:

1. The annotation of "required" refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The SUT does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. The SUT does not comply with the following protocols:
   a. RFC 2737: Partial Comply - MIB (Entity). DISA adjudicated this as a minor impact with no POAM required.
   b. RFC 4502: Partial Comply - RMON MIB. DISA adjudicated this as a minor impact with no POAM required.
3. This requirement was verified and met using simulated voice, video, and data traffic in an operational emulated environment to meet E2E requirements. The SUT must be deployed IAW deployment guide and engineering guidelines in UCR 2008, Change 3, Section 5.3.1.4.
4. This requirement was met with the following stipulations: It is the site's responsibility to configure the SUT in a manner which meets the engineering requirements listed in Enclosure 2, Section 11.2 d, and that it does not create a single point of failure which could impact more than 96 C2 users.
5. Wireless and MPLS requirements are conditional, were not tested, and, therefore, are not certified for use.
6. Security testing was accomplished via USAISEC TIC-led IA test teams and published in a separate report, Reference (e).

LEGEND:

C2	Command and Control	MPLS	Multiprotocol Label Switching
CR	Capability Requirement	NM	Network Management
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	SUT	System Under Test
IAW	In Accordance With	UCR	Unified Capabilities Requirements
ID	Identification	VLAN	Virtual Local Area Network
IPv6	Internet Protocol Version 6	VPN	Virtual Private Network

a. General Performance Parameters: Internet Protocol Version 4 (IPv4) and Internet Protocol Version 6 (IPv6).

(1) Performance Parameters IAW UCR 2008, Change 3, Section 5.3.1.3. The SUT met the performance parameters depicted in the UCR 2008, Change 3, Section 5.3.1.3 with both testing and vendor's LoC. The SUT operated in the required 12.5 percent non-blocking mode on all interfaces for the Layer 2/Layer 3 Access.

(2) Port Interface Rates. The UCR 2008, Change 3, Section 5.3.1.3.1, states that Core and Distribution products shall minimally support 100 Megabits per second (Mbps) IAW IEEE 802.3u and 1 Gigabit per second (Gbps) IAW with IEEE 802.3z. Access products must minimally provide one of the following interface rates: 10 Mbps IAW IEEE 802.3i and j, 100 Mbps IAW IEEE 802.3u, and 1000 Mbps IAW IEEE 802.3z and 802.3ab. The SUT is certified as interoperable for joint use with other ASLAN components listed on the UC APL with the following interfaces: 10/100/1000BaseT and 100/1000BaseX for access, 10000BaseX for uplink. All of these interfaces were tested with the exception of the 10BaseT interface. JITC analysis determined that the 10BaseT interface is a low risk for certification based on the vendor's LoC to comply with the Institute of IEEE 802.3i standard and the testing data collected at all other data rates. All the SUT interfaces linked up at the required rates and negotiated for the correct rates, which met this requirement.

(3) Port Parameter Requirements. The UCR 2008, Change 3, Section 5.3.1.3.2, states that Core, Distribution, and Access products shall provide the following parameters on a per port basis: Auto-negotiation IAW IEEE 802.3, Force mode IAW IEEE 802.3, and Filtering IAW Request for Comments (RFC) 1812. Port parameters were configurable, and conformed to the requirements. The vendor met these requirements with testing and the vendor's LoC.

(4) Class of Service (CoS) Markings. The UCR 2008, Change 3, Section 5.3.1.3.3, states that the SUT shall support Differentiated Services Code Points (DSCPs) for both IPv4 and IPv6 as shown in the subparagraphs below. The SUT met these requirements with both testing and the vendor's LoC.

(a) Accept any packet tagged with a DSCP value (0-63) on an ingress port and assign that packet to a QoS behavior.

(b) Accept any packet tagged with a DSCP value (0-63) on an ingress port and reassign that packet to any new DSCP value (0-63).

(c) Support the prioritization of aggregate service classes with queuing according to QoS features.

(5) Virtual Local Area Network (VLAN) Capabilities. The SUT met VLAN capabilities IAW UCR 2008, Change 3, Section 5.3.1.3.4, with testing and the vendor's LoC. The VLAN markings were preserved on the SUT, VLAN tagged traffic was separated and managed according to IEEE 802.1q. The SUT successfully performed both port-based and address-based VLANs and can assign any VLAN tag any value from 1 through 4094 (0 and 4095 are excluded), which met this requirement.

(6) Protocols. The SUT met all of the protocols IAW UCR 2008, Change 3, Section 5.3.1.3.5, for IPv4 and Section 5.3.5 for IPv6 by testing and the vendor's LoC with the following exceptions:

(a) RFC 2737: Partial Comply - MIB (Entity). DISA adjudicated this as a minor impact with no POAM required.

(b) RFC 4502: Partial Comply - RMON MIB. DISA adjudicated this as a minor impact with no POAM required.

(7) QoS Features. The UCR 2008, Change 3, Section 5.3.1.3.6, states that the Core, Distribution, and Access products shall be capable of providing a minimum of four queues, assign any "tagged" session to any of the queues, support Differentiated Services per hop behaviors and traffic conditioning with an assigned bandwidth percentage per queue, and meet traffic conditioning requirements. The SUT QoS, which includes rate-shaping, performed as configured. All variance was within the limitation of resolution of the test instruments. The test equipment recorded that the

higher prioritized traffic was properly queued above lower prioritized best effort traffic; therefore, the SUT met this requirement.

(8) Network Monitoring. The UCR 2008, Change 3, Section 5.3.1.3.7, states that Core, Distribution, and Access products shall support network monitoring features. Network Monitoring via Simple Network Management Protocol (SNMP) was evaluated by the USAISEC TIC-led IA test teams and published in a separate report, Reference (e). Based on this evaluation, the SUT met all requirements.

(a) SNMP IAW RFCs 3411, 3412, 3413, 3414, 3415, 3416, and 3417. The SUT met the requirements through the vendor's LoC and testing. The SilverCreek SNMP Test Suite was used to capture SNMP traps.

(b) Remote Monitoring (RMON) IAW RFC 2819. The SUT met this requirement through the vendor's LoC.

(c) Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework IAW RFC 3584. The SUT met this requirement through the vendor's LoC.

(d) Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. Security was tested by USAISEC TIC-led IA test teams, and published in a separate report, Reference (e).

(9) Security. The UCR 2008, Change 3, Section 5.3.1.3.8, states that the Core, Distribution, and Access products shall meet the security protocol requirements listed in UCR 2008, Change 3, Section 5.4. Security testing was accomplished via USAISEC TIC-led IA test teams and published in a separate report, Reference (e).

b. End-to-End (E2E) Performance Parameters. These requirements were verified using simulated voice, video, and data traffic in an emulated operational environment. To meet these requirements, the SUT must be deployed IAW deployment and engineering guidelines provided in UCR 2008, Change 3, Section 5.3.1.4.1. Congested condition is defined as 100 percent of link capacities (as defined by baseline traffic engineering). The general performance was evaluated in a heterogeneous configuration, as depicted in Figure 2-3. This requirement was verified and met using simulated voice, video, and data traffic in an operational emulated environment to meet E2E requirements. The SUT must be deployed IAW deployment guide and engineering guidelines in UCR 2008, Change 3, Section 5.3.1.4.

(1) Voice Services

a. Latency. The UCR 2008, Change 3, Section 5.3.1.4.1.1, states that latency shall not be more than 6 ms E2E across the ASLAN over any 5-minute measured period under congested conditions. The measured latency for the SUT was 0.047 ms, which met the requirement.

b. Jitter. The UCR 2008, Change 3, Section 5.3.1.4.1.2, states that when transporting voice Internet Protocol (IP) packets, the E2E jitter shall not exceed 3 ms over any 5-minute measured period under congested conditions. The measured jitter for the SUT was 0.009 ms, which met the requirement.

c. Packet Loss. The UCR 2008, Change 3, Section 5.3.1.4.1.3, states that actual measured packet loss across the local area network (LAN) shall not exceed 0.045 percent within the defined queuing parameters. The packet loss requirement shall be achievable over any 5-minute period measured from ingress sports to egress ports under congested conditions. The measured packet loss for the SUT was 0.00 percent, which met the requirement.

(2) Video Services

a. Latency. The UCR 2008, Change 3, Section 5.3.1.4.2.1, states that latency shall not exceed 30 ms E2E across the ASLAN over any 5-minute period measured under congested conditions. The measured latency for the SUT was 0.109 ms, which met the requirement.

b. Jitter. The UCR 2008, Change 3, Section 5.3.1.4.2.2, states that when transporting voice IP packets E2E jitter shall not exceed 30 ms over any 5-minute measured period under congested conditions. The measured jitter for the SUT was 0.013 ms, which met the requirement.

c. Packet Loss. The UCR 2008, Change 3, Section 5.3.1.4.2.3, states that actual measured packet loss across the LAN shall not exceed 0.15 percent within the defined queuing parameters. The packet loss requirement shall be achievable over any 5-minute period measured from ingress sports to egress ports under congested conditions. The measured packet loss for the SUT was 0.00 percent, which met the requirement.

(3) Data Services

a. Latency. The UCR 2008, Change 3, Section 5.3.1.4.3.1, states that latency for prioritized data IP packets shall not exceed 45 ms E2E across the ASLAN over any 5-minute period as measured under congested conditions. The measured latency for the SUT was 0.044 ms for Preferred Data and 0.053 ms for Best Effort Data, which met the requirement.

b. Jitter. The UCR 2008, Change 3, Section 5.3.1.4.3.2 states that there are no jitter requirements for preferred data IP packets.

c. Packet Loss. The UCR 2008, Change 3, Section 5.3.1.4.3.3, states that actual measured packet loss across the LAN shall not exceed 0.15 percent within

the defined queuing parameters. The packet loss requirement shall be achievable over any 5-minute period measured from ingress sports to egress ports under congested conditions. The measured packet loss for the SUT was 0.00 percent for Preferred Data and 0.18 percent for Best Effort Data, which met the requirement.

c. Network Management (NM) Requirements. The NM requirements in the subparagraphs below were met by testing and the vendor's LoC and evaluated by USAISEC TIC-led IA test teams, and the results are published in a separate report, Reference (e).

(1) Configuration Control. IAW UCR 2008, Change 3, Section 5.3.1.6.1, the SUT Network Management System (NMS) shall report configuration change events in near-real-time (NRT). The system shall report the success or failure of authorized configuration change attempts in NRT. NRT is defined as within 5 seconds of detecting the event, excluding transport time.

(2) Operational Changes. IAW UCR 2008, Change 3, Section 5.3.1.6.2, LAN infrastructure components must provide metrics to the NMS to allow them to make decisions on managing the network. The SUT NMS shall have an automated NM capability to obtain the status of networks and associated assets in NRT 99 percent of the time (with 99.9 percent as an Objective Requirement).

(3) Performance Monitoring. IAW UCR 2008, Change 3, Section 5.3.1.6.3, all LAN components shall be capable of providing status changes 99 percent of the time (with 99.9 percent as an Objective Requirement) by means of an automated capability in NRT. The SUT NMS will have an automated NM capability to obtain the status of networks and associated assets 99 percent of the time (with 99.9 percent as an Objective Requirement) within 5 seconds of detecting the event, excluding transport. The NMS shall collect statistics and monitor bandwidth utilization, delay, jitter, and packet loss.

(4) Alarms. IAW UCR 2008, Change 3, Section 5.3.1.6.4, all LAN components shall be capable of providing SNMP alarm indications to an NMS. The SUT NMS shall have the NM capability to perform automated fault management of the network, to include problem detection, fault correction, fault isolation and diagnosis, problem tracking until corrective actions are completed, and historical archiving.

(5) Reporting. IAW UCR 2008, Change 3, Section 5.3.1.6.5, to accomplish Global Information Grid E2E situational awareness, an NMS shall have the NM capability of automatically generating and providing an integrated/correlated presentation of network and all associated networks.

d. Engineering Requirements.

(1) Copper Media. IAW UCR 2008, Change 3, Section 5.3.1.7.1, cabling used for the LAN shall not be lower than a Category 5 performance.

(2) Wireless. The UCR 2008, Change 3, Section 5.3.1.7.2, states that wireless LAN implementations are considered as extensions of the physical layer. If an ASLAN supports wireless, it must meet all of the applicable requirements of this section. This requirement is conditional, was not tested, and therefore, not certified for use.

(3) Traffic Engineering. IAW UCR 2008, Change 3, Section 5.3.1.7.3, bandwidth in the LAN shall be engineered so Voice IP subscribers do not exceed more than 25 percent of available trunk bandwidth. This requirement was met with the following stipulations: It is the site's responsibility to configure the SUT in a manner which meets the engineering requirements listed in Enclosure 2, Section 11.2 d, and that it does not create a single point of failure which could impact more than 96 C2 users.

(4) Availability. IAW UCR 2008, Change 3, Section 5.3.1.7.6, system reliability must be engineered for 99.999 percent for FLASH/FLASH OVERRIDE users, 99.997 for IMMEDIATE/PRIORITY users in an ASLAN. ROUTINE users may be supported by a non-ASLAN with a reliability of only 99.9 percent. The C2 users may not be supported by a non-ASLAN. This requirement was met with the following stipulations: It is the site's responsibility to configure the SUT in a manner which meets the engineering requirements listed in Enclosure 2, Section 11.2 d, and that it does not create a single point of failure which could impact more than 96 C2 users.

(5) Redundancy. The UCR 2008, Change 3, Sections 5.3.1.2.1, 5.3.1.7.7, 5.3.1.7.7.1, and 5.3.1.7.7.2, state that ASLAN components can have no single point of failure for more than 96 users for C2 and Special C2 users. The UCR 2008, Change 3, Section 5.3.1.7.7, states the following Redundancy requirements: redundancy can be met if the product itself provides redundancy internally or a secondary product is added to the ASLAN to provide redundancy to the primary product. Single-product redundancy may be met with a modular chassis that at a minimum provides the following: dual power supplies, dual processers, termination sparing, redundancy protocol, no single point of failure, and switch fabric or backplane redundancy. In the event of a component failure in the network, all active calls shall not be disrupted (loss of existing connection requiring redialing) and the path through the network shall be restored within 5 seconds. If a secondary product has been added to provide redundancy to a primary product, the failover to the secondary product must meet the same requirements. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. All of the redundant components were tested with the exception of chassis failover because it does not require for Access layer switch. The SUT found to meet all of the failover and access requirements with a measured restoral within 5 seconds, with no loss of existing active circuits. This requirement was met with the following stipulations: It is the site's responsibility to configure the SUT in a manner which meets the engineering requirements listed in Enclosure 2, Section 11.2 d, and

that it does not create a single point of failure which could impact more than 96 C2 users.

e. Multiprotocol Label Switching (MPLS) Requirements. IAW UCR 2008, Change 3, Section 5.3.1.7.8, MPLS may be used to improve the performance of the ASLAN Core layer for implementations covering a large geographical area. MPLS was not evaluated and is not covered under this certification. This is a conditional requirement for a Core, Distribution, or Access switch. This requirement is conditional, was not tested, and therefore, not certified for use.

f. IPv6 Requirements. All UC products must meet the IPv6 requirements IAW UCR 2008, Change 3, Section 5.3.5. The IPv6 requirements were met by testing and the vendor's LoC.

11.3 Information Assurance (IA). Security testing was accomplished via USAISEC TIC-led IA test teams and published in a separate report, Reference (e).

11.4 Other. None

12. TEST AND ANALYSIS REPORT. No detailed test report was developed IAW the Program Manager's request. JITC distributes IO information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive IO 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). Information related to Defense Switched Network (DSN) testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly through government civilian or uniformed military personnel from the Unified Capabilities Certification Office (UCCO); e-mail: disa.meade.ns.list.unified-capabilities-certificaion-office@mail.mil.

SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Assured Services Local Area Networks (ASLAN) components have required and conditional features and capabilities that are established by Section 5.3.1 of the Unified Capabilities Requirements (UCR). The system under test (SUT) does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements. The detailed Functional Requirements (FRs) and Capability Requirements (CRs) for ASLAN products are listed in Table 3-1. Detailed Information Assurance (IA) requirements are included in Reference (e).

Table 3-1. ASLAN Products CRs and FRs

ID	Requirement (See note.)		UCR 2008, Change 3 Reference
1	ASLAN components can have no single point of failure for >96 users for C2 and Special C2 users. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. (R)		5.3.1.2.1, 5.3.1.7.7
2	Non-blocking of any voice or video traffic at 50% Core/Distribution (R), 12.5% Non-Blocking Access. (R)		5.3.1.3
3	Maximum of 1 ms of voice jitter for all ASLAN components,10 ms for video. (R)		5.3.1.3
4	Maximum of 0.015% voice, 0.05% video, and 0.05% Preferred Data packet loss. (R)		5.3.1.3
5	Maximum of 2 ms latency for voice, 10 ms for video. (R)		5.3.1.3
6	100 Mbps IAW IEEE 802.3u and 1 Gbps IAW IEEE 802.3z for Core and Distribution layer components and one of : 10 Mbps IAW IEEE 802.3i/j, 100 Mbps IAW IEEE 802.3u, or 1000 Mbps IAW IEEE 803.3z/ab for Access layer components. (R) May provide Fiber Channel IAW INCITS T11.2/3, but if provided, must support RFC 4338 and RFC 4044. (C)		5.3.1.3.1
7	Force mode and auto-negotiation IAW IEEE 802.3, filtering IAW RFC 1812, and flow control IAW IEEE 802.3x. (R)		5.3.1.3.2
8	Port Parameter Requirements	Auto-negotiation IAW IEEE 802.3. (R)	5.3.1.3.2
9		Force mode IAW IEEE 802.3. (R)	
10		Flow control IAW IEEE 802.3x. (R)	
11		Filtering IAW RFC 1812. (R)	
12		Link Aggregation IAW IEEE 802.1AX (output/egress ports only). (R)	
13		Spanning Tree Protocol IAW IEEE 802.1D. (R)	
14		Multiple Spanning Tree IAW IEEE 802.1s. (R)	
15		Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w. (R)	
16		LLDP IAW IEEE 802.1AB. Core and Distribution (C) Access (R)	
17		Link Layer Discovery- Media Endpoint Discovery IAW ANSI/TIA-1057. Core and Distribution (C) Access (R)	
18		Power over Ethernet IAW either 802.3af-2003 or 802.3at-2009. (R)	
19	Class of Service Marking: L3 DSCPs IAW RFC 2474. (R) L2 3-bit user priority field of the IEEE 802.1Q 2-byte TCI field. (C)		5.3.1.3.3
20	VLAN Capabilities IAW IEEE 802.1Q. (R)		5.3.1.3.4
21	Protocols IAW DISR profile (IPv4 and IPv6). IPv4 (R: LAN Switch, Layer 2 Switch): IPv6 (R: LAN Switch, C: L2 Switch). Note: L2 switch is required to support only RFCs 2460, 5095, 2464, and be able to queue packets based on DSCPs IAW RFC 2474. Must conform to UCR 2008, Change 3, Table 5.3.1-4.		5.3.1.3.5
22	QoS Features	Shall support minimum of 4 queues. (R)	5.3.1.3.6
23		Must be able to assign VLAN tagged packets to a queue. (R)	
24		Support DSCP PHBs per RFCs 2474, 2597, 3140, and 3246. (R: LAN Switch).	
25		Support RFCs in Table 5.3.1-5, FIFO 3670 (C), and one of the following RFCs: WFQ 3662, CQ 3670, PQ 1046 and CB-WFQ 3366. (R)	
26		Must be able to assign a bandwidth or percent of traffic to any queue. (R)	

Table 3-1. ASLAN Products CRs and FRs (continued)

ID	Requirement (See note.)		UCR 2008, Change 3 Reference
27	Network Monitoring	SNMP IAW RFCs 3411, 3412, 3413, 3414, 3415, 3416 and 3417 . (R)	5.3.1.3.7
28		SNMP traps IAW RFC 1215. (R)	
29		Remote monitoring IAW RFC 2819 and AES Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. (R)	
30		Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework IAW RFC 3584 (R)	
31	Product Requirements Summary IAW UCR 2008, Change 3, Table 5.3.1-5. (R)		5.3.1.3.9
32	E2E Performance (Voice)	No more than 6 ms latency over any 5-minute period measured under congestion. (R)	5.3.1.4.1
		No more than 3 ms jitter over any 5-minute period measured under congestion. (R)	
		Packet loss not to exceed 0.045% engineered (queuing) parameters over any 5-minute period under congestion. (R)	
33	E2E Performance (Video)	No more than 30 ms latency over any 5-minute period measured under congestion. (R)	5.3.1.4.2
		No more than 30 ms jitter over any 5-minute period measured under congestion. (R)	
		Packet loss not to exceed engineered 0.15% (queuing) parameters over any 5-minute period under congestion. (R)	
34	E2E Performance (Data)	No more than 45 ms latency over any 5-minute period measured under congestion (R)	5.3.1.4.3
		Packet loss not to exceed 0.15% engineered (queuing) parameters over any 5-minute period under congestion. (R)	
35	LAN Network Management	Configuration Control for ASLAN and non-ASLAN. (R)	5.3.1.6.1
36		Operational Controls for ASLAN and non-ASLAN. (R)	5.3.1.6.2
37		Performance Monitoring for ASLAN and non-ASLAN. (R)	5.3.1.6.3
38		Alarms for ASLAN and non-ASLAN. (R)	5.3.1.6.4
39		Reporting for ASLAN and non-ASLAN. (R)	5.3.1.6.5
40	Redundancy	Redundant Power Supplies. (Required on standalone redundant products.)	5.3.1.7.7
41		Chassis Failover. (Required on standalone redundant products.)	
42		Switch Fabric Failover. (Required on standalone redundant products.)	
43		Non-LACP Link Failover. (R)	
44		Fiber Blade Failover. (R)	
45		Stack Failover. (C) (Required if the stack supports more than 96 users.)	
46		CPU (routing engine) blade Failover. (R)	
47	MPLS	MPLS may not add measurable loss or jitter to system. (C)	5.3.1.8.4.1
48		MPLS conforms to RFCs in UCR 2008, Change 3, Table 5.3.1-14. (C)	5.3.1.8.4.1
49		MPLS Support L2 and L3 VPNs. (C)	5.3.1.8.4.2.1/2
50	IPv6 Product Requirements: Dual Stack for IPv4 and IPv6 IAW RFC 4213 if routing functions are supported. (C)		5.3.5.4
51	IPv6 System Requirements	Support IPv6 IAW RFCs 2460 and 5095 if routing functions are supported. (C)	5.3.5.4
52		Support IPv6 packets over Ethernet IAW RFC 2464. (R)	5.3.5.4
53		Support MTU discovery IAW RFC 1981 if routing functions are supported. (C)	5.3.5.4.1
54		Support a minimum MTU of 1280 IAW RFCs 2460 and 5095. (R)	5.3.5.4.1
55		Shall not use the Flow Label field as described in RFC 2460. (R)	5.3.5.4.2
56		Shall be capable of setting the Flow Label field when forwarding packets. (R)	5.3.5.4.2
57		Shall be capable of ignoring the Flow Label field when receiving packets. (R)	5.3.5.4.2
58		Shall support IPv6 addresses IAW RFC 4291. (R)	5.3.5.4.3
59		Shall support IPv6 scoped address IAW RFC 4007. (R)	5.3.5.4.3
60		If routing functions are supported: If DHCP is supported, the product shall support RFC 3315; if DHCPv6 is supported, it shall be implemented IAW RFC 3315. (C)	5.3.5.4.4
61	IPv6 Router Advertise-ments	If the system supports routing functions, the system shall inspect valid router advertisements sent by other routers and verify that the routers are advertising consistent information on a link and shall log any inconsistent router advertisements, and shall prefer routers that are reachable over routers whose reachability is suspect or unknown (C).	5.3.5.4.5.2
62		If the system supports routing functions, the system shall include the MTU value in the router advertisement message for all links IAW RFC 2461 and RFC 4861. (C)	
63		IPv6 Neighbor Discovery: The system shall not set the override flag bit in the neighbor advertisement message for solicited advertisements for anycast addresses or solicited proxy advertisements. (R)	

Table 3-1. ASLAN Products CRs and FRs (continued)

ID	Requirement (See note.)		UCR 2008, Change 3 Reference
64	IPv6 Neighbor Discovery	If routing functions are supported: Neighbor discovery IAW RFCs 2461 and 4861. (C)	5.3.5.4.5
65		The system shall not set the override flag bit in the neighbor advertisement message for solicited advertisements for anycast addresses or solicited proxy advertisements. (R)	
66		The system shall set the override flag bit in the neighbor advertisement message to “1” if the message is not an anycast address or a unicast address for which the system is providing proxy service. (R)	
67	IPv6 SLAAC and Manual Address Assignment	If the system supports stateless IP address Auto-configuration, the system shall support IPv6 SLAAC for interfaces supporting UC functions IAW RFC 4862. (C)	5.3.5.4.6
68		If the product supports IPv6 SLAAC, the product shall have a configurable parameter that allows the function to be enabled and disabled. (C)	
69		If the product supports IPv6 SLAAC, the product shall have a configurable parameter that allows the “managed address configuration” flag and the “other stateful configuration” flag to always be set and not perform stateless auto-configuration. (C)	
70		If the product supports stateless IP address auto-configuration including those provided for the commercial market, the DAD shall be disabled IAW RFC 4862. (C)	
71		The system shall support manual assignment of IPv6 addresses. (R)	
72		If the system provides routing functions, the system shall default to using the “managed address configuration” flag and the “other stateful flag” set to TRUE in their router advertisements when stateful auto-configuration is implemented. (C)	
73	IPv6 ICMP	The system shall support the ICMPv6 as described in RFC 4443. (R)	5.3.5.4.7
74		The system shall have a configurable rate limiting parameter for rate limiting the forwarding of ICMP messages. (R)	
75		The system shall support the capability to enable or disable the ability of the system to generate a Destination Unreachable message in response to a packet that cannot be delivered to its destination for reasons other than congestion. (R) Required if LS supports routing functions.	
76		The system shall support the enabling or disabling of the ability to send an Echo Reply message in response to an Echo Request message sent to an IPv6 multicast or anycast address (C). Required if LS supports routing functions.	
77		The system shall validate ICMPv6 messages, using the information contained in the payload, prior to acting on them. (C) Required if LS supports routing functions.	
78	IPv6 Routing Functions	If the system supports routing functions, the system shall support the OSPF for IPv6 as described in RFC 5340. (C) This replaces RFC 2740.	5.3.5.4.8
79		If the system supports routing functions, the system shall support securing OSPF with IPSec as described for other IPSec instances in UCR 2008, Change 3, Section 5.4. (C)	
80		If the system supports routing functions, the system shall support OSPF for IPv6 as described in RFC 2740, router to router integrity using IP authentication header with HMAC-SHA1-128 with ESP and AH as described in RFC 4302 (IA superseding requirement), shall support OSPFv3 IAW RFC 4552. (C)	
81		If the system supports routing functions, the system shall support the MLD process as described in RFC 2710 and extended in RFC 3810 and RFC 2711. (C)	
82	IPv6 Network Management	If nodes are managed via SNMP it shall use MIBs in conformance with RFC 4293. (R)	5.3.4.4.10/ 5.3.2.17.3.1.5
83		If the product performs routing functions and is managed by SNMP, the product shall support the IP Forwarding MIB as defined in RFC 4292. (R)	5.3.4.4.10
84	Site Requirements	Engineering Requirements: Physical Media for ASLAN and non-ASLAN. (R) (Site requirement)	5.3.1.7.1
85		Wireless. (C)	5.3.1.7.2
86		Traffic Engineering. (R)	5.3.1.7.3
87		VLAN Design and configuration. (R)	5.3.1.7.4
88		Battery back-up 2 hours for non-ASLAN components and 8 hours for ASLAN components. (R) (Site requirement)	5.3.1.7.5
89		Availability of 99.999 percent (Special C2), and 99.997 percent (C2) for ASLAN (R), and 99.9 percent (non-C2 and C2(R) for non-ASLAN. (R) (Site requirement)	5.3.1.7.6

Table 3-1. ASLAN Products CRs and FRs (continued)

ID	Requirement (See note.)		UCR 2008, Change 3 Reference
90	IA Security Requirements	Port-Based Access Control IAW IEEE 802.1x. (R)	5.3.1.3.2
91		Secure methods for network configuration. SSH2 instead of Telnet and support RFCs 4251-4254. Must use HTTPS instead of HTTP, and support RFCs 2660 and 2818 for ASLAN and non-ASLAN. (R)	5.3.1.6
92		IPSec shall be IAW RFC 4301. (R if IPSec is supported)	5.3.1.3.8/ 5.3.5.4.9
93		Must meet IA requirements IAW UCR 2008, Change 3, Section 5.4 for ASLAN and non-ASLAN. (R)	5.3.1.5

NOTE: All requirements are for Core, Distribution, and Access layer components unless otherwise specified.

LEGEND:

AES	Advance Encryption Standard
AH	Authentication Header
ANSI	American National Standards Institute
ASLAN	Assured Services Local Area Network
C	Conditional
C2	Command and Control
C2(R)	Command and Control ROUTINE Only
CB-WFQ	Class Based-Weighted Fair Queuing
CPU	Central Processing Unit
CQ	Custom Queuing
DAD	Duplicate Address Detection
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol for IPv6
DISR	Department of Defense Information Technology Standards Registry
DSCP	Differentiated Services Code Point
E2E	End-to-End
ESP	Encapsulating Security Payload
FIFO	First-In First-Out
Gbps	Gigabits Per Second
HMAC	Hash-Based Message Authentication Code
HTTP	Hypertext Transfer Protocol
HTTPS	Hyper Text Transfer Protocol, Secure
IA	Information Assurance
IAW	In Accordance With
ICMP	Internet Control Message Protocol
ICMPv6	Internet Control Message Protocol for IPv6
ID	Identification
IEEE	Institute of Electrical and Electronics Engineers
INCITS	InterNational Committee for Information Technology Standards
IP	Internet Protocol
IPSec	Internet Protocol Security
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
L2	Layer 2
L3	Layer 3
LACP	Link Aggregation Control Protocol
LAN	Local Area Network
LLDP	Link Layer Discovery Protocol
LS	LAN Switch
Mbps	Megabits per second
MIB	Management Information Base
MLD	Multicast Listener Discovery
MPLS	Multiprotocol Label Switching
ms	Millisecond
MTU	Maximum Transmission Unit
OSPF	Open Shortest Path First
OSPFv3	Open Shortest Path First Version 3
PHB	Per Hop Behavior
PQ	Priority Queuing
QoS	Quality of Service
R	Required
RFC	Request for Comments
SHA1	Secure Hash Algorithm Version 1.0
SLAAC	Stateless Auto Address Configuration
SNMP	Simple Network Management Protocol
SSH2	Secure Shell Version 2
TCI	Tag Control Information
TIA	Telecommunications Industry Association
UC	Unified Capabilities
UCR	Unified Capabilities Requirements
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WFQ	Weighted Fair Queuing