



DEFENSE INFORMATION SYSTEMS AGENCY

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IN REPLY
REFER TO: Joint Interoperability Test Command (JTE)

20 July 12

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Brocade FastIron CX (FCX) Series with Release 7.3.0c

References: (a) DoD Directive 4630.05, "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 (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 test certification.

2. The Brocade FCX648S-HPOE-ADV Release 7.3.0C is hereinafter referred to as the System Under Test (SUT). The SUT meets all of its critical interoperability requirements and is certified for joint use within the Defense Information System Network (DISN) as an Assured Services Local Area Network (ASLAN) Core and Distribution switch in a stacked configuration and as a Layer 2/Layer 3 Access switch in either a stacked or single component configuration. The SUT is certified as interoperable for joint use with other ASLAN components listed on the UC APL with the following interfaces: 100/1000Base SX/LX, 10GbaseX, and 10/100/1000BaseT. The FCX648 and FCX624 product series listed in Table 1 employs the same software and similar hardware as the SUT. JITC analysis determined these systems to be functionally identical to the SUT for interoperability certification purposes and therefore, they are also certified for joint use. The SUT meets the critical interoperability requirements set forth in Reference (c), using test procedures derived from Reference (d).

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.

No other configurations, features, or functions, except those cited within this document, are certified by JITC. This certification expires upon changes that could affect interoperability, but

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no later than three years from the date of the Unified Capabilities (UC) Approved Product List (APL) memorandum.

3. This finding is based on interoperability testing conducted by JITC, review of the vendor's Letters of Compliance (LoC), DISA adjudication of open test discrepancy reports (TDRs), and DISA Certifying Authority (CA) Recommendation. Interoperability testing was conducted by JITC, Fort Huachuca, Arizona, from 12 March through 5 April 2012. Review of the vendor's LoC was completed on 9 April 2012. DISA adjudication of outstanding TDRs was completed on 24 April 2012. The DISA CA provided a positive Recommendation on 13 July 2012 based on the security testing completed by DISA-led IA test teams and 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 interoperability status and Table 3 provides the Capability Requirements (CR) and Functional Requirements (FR) status. The threshold CR/FRs for ASLAN components are established by Section 5.3.a of Reference (c) and were used to evaluate the interoperability of the SUT. Enclosure 3 provides a detailed list of the interface, capability, and functional requirements.

Table 1. UC APL Product Summary

SUT (See note.)	Release	Function	Sub-component	Description
<u>Brocade FCX648S-HPOE-ADV</u> , FCX624-E, FCX624-E-ADV, FCX624-I, FCX624-I-ADV, FCX624S, FCX624S-ADV, FCX624S-HPOE, FCX624S-HPOE-ADV, FCX624S-F, FCX624S-F-ADV, FCX648-E, FCX648-E-ADV, FCX648-I, FCX648-I-ADV, FCX648S, FCX648S-HPOE	7.3.0c	Core, Distribution, Access	Not Applicable	One rack-unit high stackable switch
<p>NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and similar hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.</p> <p>LEGEND: APL Approved Products List HPOE High Power over Ethernet</p> <p style="text-align: right;">JITC Joint Interoperability Test Command UC Unified Capabilities</p>				

Table 2. SUT Interface Interoperability Status

Interface	Applicability			UCR 2008, Change 3 Reference	Threshold CR/FR ¹	Status	Remarks
	Co	D	A				
Serial	C	C	C	5.3.1.3.9	1-4	Certified	The SUT met the CRs and FRs with the following standard: EIA-232.
10Base-X	C	C	C ²	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3i (10BaseT).
100Base-X	R	R	C ²	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3u (100BaseT).
1000Base-X	R	R	C 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).
Wireless	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested ³	

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 SUT does not support this interface. This interface is not required for a core, distribution, or access switch.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)	EIA	Electronic Industries Alliance
802.3ae	10 Gbps Ethernet	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
802.3i	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	FR	Functional Requirement
802.3z	Gigabit Ethernet Standard	Gbps	Gigabits per second
A	Access	ID	Identification
C	Conditional	IEEE	Institute of Electrical and Electronics Engineers
Co	Core	Mbps	Megabits per second
CR	Capability Requirement	R	Required
D	Distribution	SUT	System Under Test
		UCR	Unified Capabilities Requirements

Table 3. SUT CRs and FR Status

CR/FR ID	Capability/Function	Applicability ¹	UCR Reference	Status
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	Met
	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
2	E2E Performance Requirements			
	Voice Services	Required	5.3.1.4.1	Met ²
	Video services	Required	5.3.1.4.2	Met ²
	Data services	Required	5.3.1.4.3	Met ²
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 ³
	Wireless	Conditional	5.3.1.7.2	Not Tested
	Traffic Engineering	Required	5.3.1.7.3	Met ³
	Availability	Required	5.3.1.7.6	Met ³
	Redundancy	Required	5.3.1.7.7	Met ^{3,4}
5	MPLS			
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested
6	IPv6 Requirements			
	Product Requirements	Required	5.3.5.4	Partially Met ^{5,6,7}

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 system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements in order to be certified for that capability.
2. 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 in accordance with deployment guide and engineering guidelines provided in UCR Change 3, paragraph 5.3.1.4.
3. 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 Section 11.2 d. of Enclosure 2 and that does not create a single point of failure which could impact more than 96 C2 users.
4. The SUT operates in a stack configuration. In the stack, there is an element which is the Master and another which is the Standby. Remaining elements will be Members and may assume the role of standby upon failure of the Master. Upon failure of the Master element, the standby element becomes Master. However, IPv6 streams required up to 25 seconds before they were resumed. If a Member or Standby element of the stack failed, then IPv6 streams resumed within the required 5 seconds. DISA adjudicated this as minor with the vendor POA&M stating this will be corrected in version 8.0 scheduled to be released by 30 June 2013.

Table 3. SUT CRs and FR Status (continued)

NOTES (continued):			
5. The SUT does not support the following IPv6 RFC: RFC 2711. DISA adjudicated this as minor with the vendor POA&M stating this will be supported in version 8.0 scheduled to be released by 30 June 2013.			
6. The SUT does not support the following IPv6 RFC: RFC 4302. DISA adjudicated this deficiency as minor because this RFC addresses requirements for IPSec, which is not implemented in the fielded configuration.			
7. The SUT does not support the following IPv6 RFC: RFC 5340. DISA adjudicated this as minor with the vendor POA&M stating this will be supported in version 8.0 scheduled to be released by 30 June 2013.			
LEGEND:			
C2	Command and Control	NM	Network Management
CR	Capability Requirement	POA&M	Plan of Action and Milestones
DISA	Defense Information Systems Agency	QoS	Quality of Service
E2E	End-to-End	RFC	Request For Comment
FR	Functional Requirement	SUT	System Under Test
IPSec	Internet Protocol Security	UCR	Unified Capabilities Requirements
IPv6	Internet Protocol version 6	VLAN	Virtual Local Area Network
MPLS	Multiprotocol Label Switching	VPN	Virtual Private Network

5. No detailed test report was developed in accordance with the Program Manager's request. 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). Information related to 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-certification-office@mail.mil.

6. The JITC point of contact is Mr. Edward Mellon, DSN 879-5159, commercial (520) 538-5159, FAX DSN 879-4347, or e-mail to edward.a.mellon.civ@mail.mil. JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Tracking Number for the SUT is 1132701.

FOR THE COMMANDER:

3 Enclosures a/s


for RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

JITC Memo, JTE, Special Interoperability Test Certification of the FastIron CX (FCX) Series with Release 7.3.0c

Distribution (electronic mail):

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ADDITIONAL REFERENCES

- (c) Office of the Assistant Secretary of Defense, "Department of Defense Unified Capabilities Requirements 2008, Change 3," September 2011
- (d) Joint Interoperability Test Command, "ASLAN Component Test Plan (UCTP)," November 2010
- (e) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Brocade FCX Series Release (Rel.) 7.3.0c (Tracking Number 1132701)," Draft

CERTIFICATION TESTING SUMMARY

- 1. SYSTEM TITLE.** Brocade FastIron CX (FCX) Series with Release 7.3.0c.
- 2. SPONSOR.** Headquarters United States Army Information Systems Engineering Command (HQUSAISEC), Mr. Jordan R. Silk, USAISEC ELIE-ISE-ES, Building 53301, Fort Huachuca, Arizona 85613, e-mail: jordan.r.silk.civ@mail.mil.
- 3. SYSTEM POC.** Mr. Eric Creason, 130 Holger Way, San Jose, California 95134, e-mail: ecreason@brocade.com.
- 4. TESTER.** Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.
- 5. SYSTEM DESCRIPTION.** The Brocade FCX648S-HPOE-ADV is hereinafter referred to as the System Under Test (SUT). The SUT is used to transport voice signaling and media as part of an overall voice, video, and data 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 for joint use as an Assured Services Local Area Network (ASLAN) Core and Distribution switch in a stacked configuration and as a Layer 2/Layer 3 Access switch in either a stacked or single component configuration. The SUT is interoperable for joint use with other ASLAN components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 10000/1000Base SX/LX, and 10/100/1000BaseT. The Brocade FCX624-E, FCX624-E-ADV, FCX624-I, FCX624-I-ADV, FCX624S, FCX624S-ADV, FCX624S-HPOE, FCX624S-HPOE-ADV, FCX624S-F, FCX624S-F-ADV, FCX648-E, FCX648-E-ADV, FCX648-I, FCX648-I-ADV, FCX648S, and FCX648S-HPOE employ the same software and similar hardware as the SUT. JITC analysis determined these systems to be functionally identical to the SUT for interoperability certification purposes and therefore, they are also certified for joint use.
- 6. OPERATIONAL ARCHITECTURE.** Figure 2-1 depicts an ASLAN notional operational architecture that the SUT may be used in. 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.

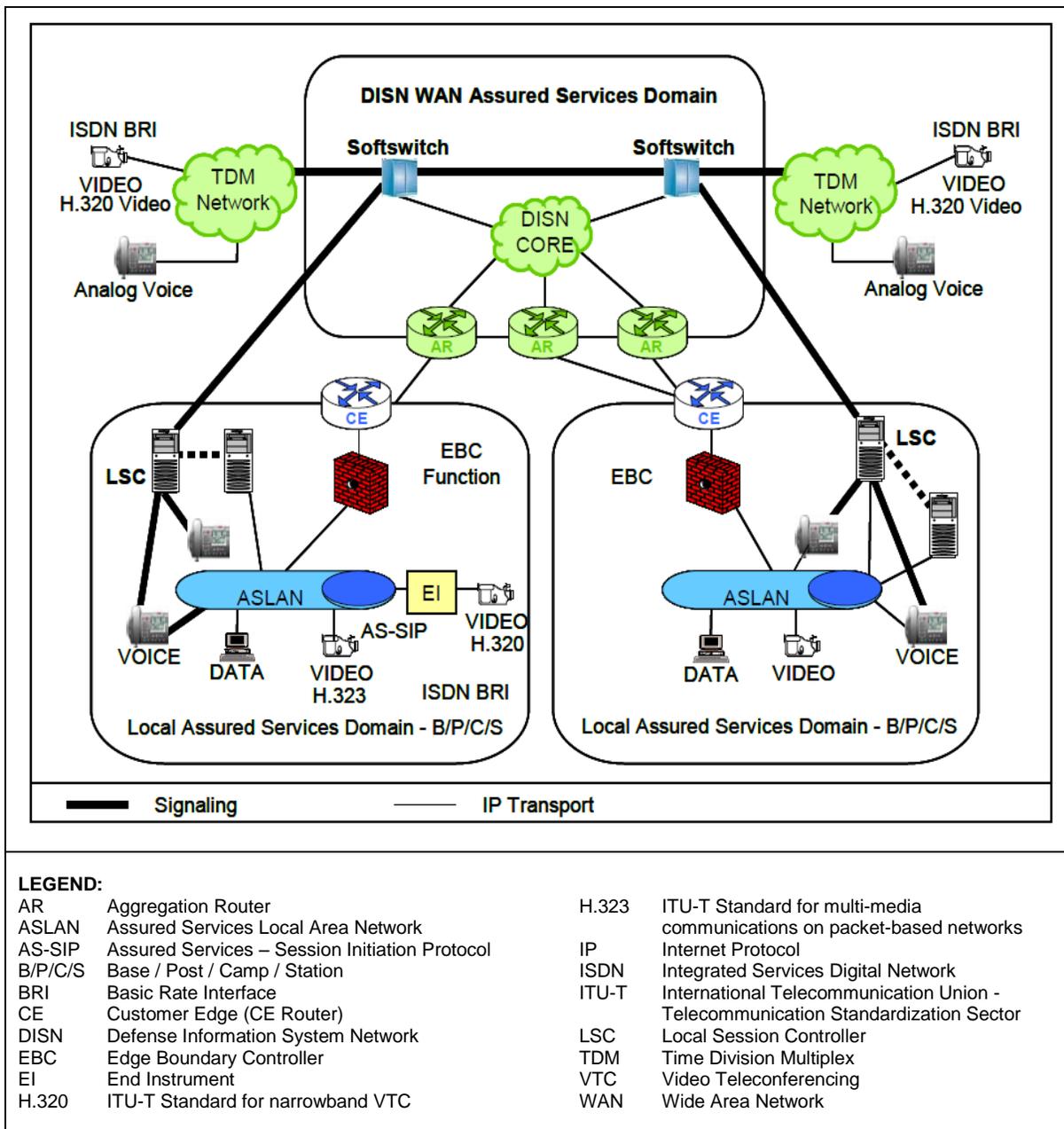


Figure 2-1. DISN Unified Capabilities Notional Operational Architecture

7. INTEROPERABILITY REQUIREMENTS. The interface, Capability Requirements (CR) and Functional Requirements (FR), 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 Ref	Criteria 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 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 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 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 ²	5.3.1.3.1	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.ae.	C	C	C
Wireless	5.3.1.3.1 and 5.3.1.7.2	Support minimum threshold CRs/FRs 1-6 and meet interface criteria for IEEE 802.11a/b/g/n or 802.16.	C	C	C

NOTES:

- 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.
- 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 (100BaseTX/FX), 802.3z (1000BaseX), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.

LEGEND:

A	Access	FR	Functional Requirement
ASLAN	Assured Services Local Area Network	ID	Identification
C	Conditional	IEEE	Institute of Electrical and Electronic Engineers
Co	Core	R	Required
CR	Capability Requirement	SUT	System Under Test
D	Distribution	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). The SUT does not need to provide non-critical (conditional) requirements. If they are provided, they must function according to the specified requirements in order to be certified for that capability. 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 ¹	UCR Reference
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
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 Requirements³		
	Physical Media	Required	5.3.1.7.1
	Wireless	Conditional	5.3.1.7.2
	Traffic Engineering	Required	5.3.1.7.3
	Availability	Required	5.3.1.7.6
	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 in order to be certified for that capability.
2. Refers to IA requirements for UCR 2008, Change 3, Section 5.4. Detailed IA requirements are included in Reference (e).
3. The engineering requirements include site requirements. The SUT must be deployed in accordance with deployment guide and engineering guidelines provided in UCR Change 3, paragraph 5.3.1.7.

LEGEND:

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
MPLS	Multiprotocol Label Switching		

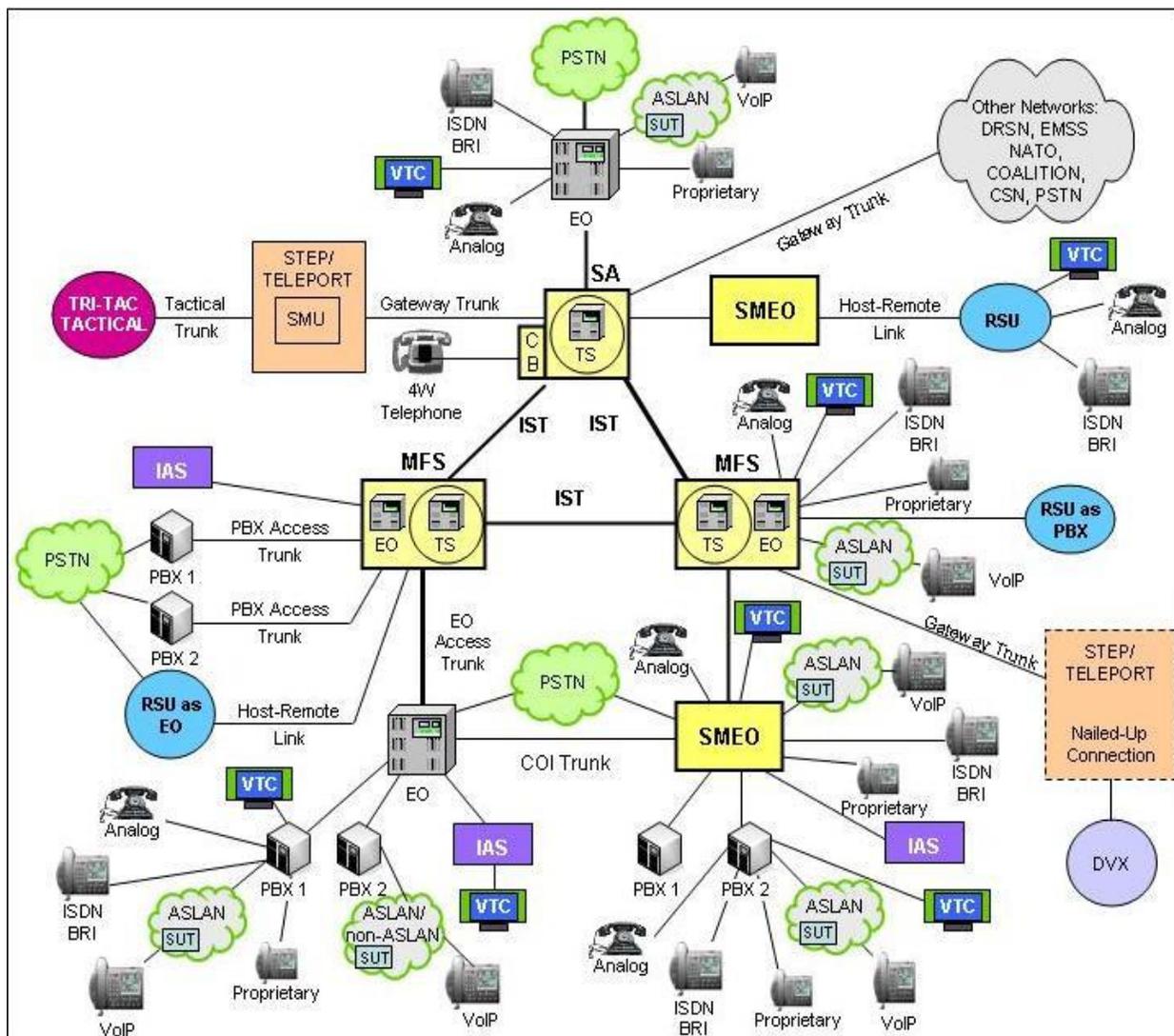
7.3 Information Assurance (IA). Table 2-3 details the IA requirements applicable to the ASLAN products.

Table 2-3. ASLAN Products IA Requirements

Requirement	Applicability (See note.)	UCR 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									
<p>NOTE: The annotation of 'required' refers to a high-level requirement category. Refers to IA requirements for UCR 2008, Change 3, Section 5.4.</p> <p>LEGEND:</p> <table> <tr> <td>ASLAN</td> <td>Assured Services Local Area Network</td> <td>IATP</td> <td>IA Test Plan</td> </tr> <tr> <td>IA</td> <td>Information Assurance</td> <td>UCR</td> <td>Unified Capabilities Requirements</td> </tr> </table>				ASLAN	Assured Services Local Area Network	IATP	IA Test Plan	IA	Information Assurance	UCR	Unified Capabilities Requirements
ASLAN	Assured Services Local Area Network	IATP	IA Test Plan								
IA	Information Assurance	UCR	Unified Capabilities Requirements								

7.4 Other. None

8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC in a manner and configuration similar to that of a notional operational environment. The UCR 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 Cisco ASLAN components.



LEGEND:

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

Figure 2-2. DISN Architecture

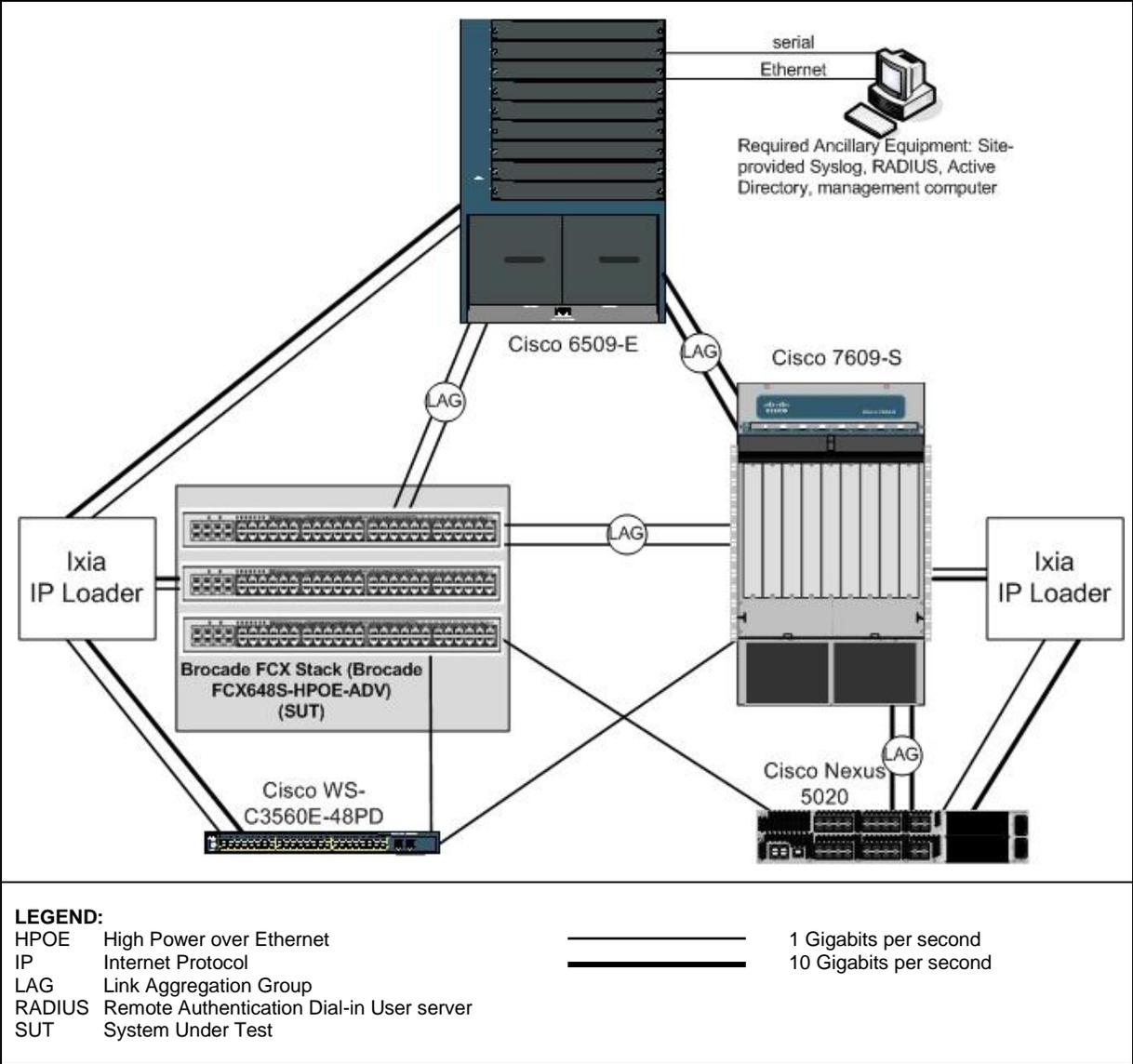


Figure 2-3. SUT Heterogeneous Test Configuration

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

Table 2-4. Tested System Configurations

System Name	Equipment															
Required Ancillary Equipment (site-provided)	Active Directory															
	Public Key Infrastructure															
	RADIUS															
	SysLog Server															
Additional Equipment Needed	Site-provided Management Workstation															
Cisco	Component	Release														
	Cisco Nexus 5020	Nexus Operating system (NX-OS®) 4.2(1)N1(1)														
	Cisco 7609-S	Internetwork Operating System 12.2 (33) SRD														
	Cisco 6509-E	Internetwork Operating System 12.2 (50) SG														
	Cisco WS-C3560E-48POE	Internetwork Operating System 12.2 (46) SE														
SUT (See note.)	Release	Function	Sub-component	Description												
<u>Brocade FCX648S-HPOE-ADV,</u> FCX624-E, FCX624-E-ADV, FCX624-I, FCX624-I-ADV, FCX624S, FCX624S-ADV, FCX624S-HPOE, FCX624S- HPOE-ADV, FCX624S-F, FCX624S-F-ADV, FCX648-E, FCX648-E-ADV, FCX648-I, FCX648-I-ADV, FCX648S, FCX648S-HPOE	7.3.0c	Core, Distribution, Access	Not Applicable	One rack-unit high stackable switch												
<p>NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and similar hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.</p> <p>LEGEND:</p> <table> <tr> <td>HPOE</td> <td>High Power over Ethernet</td> <td>RADIUS</td> <td>Remote Authentication Dial In User Service</td> </tr> <tr> <td>JITC</td> <td>Joint Interoperability Test Command</td> <td>SUT</td> <td>System Under Test</td> </tr> <tr> <td>PC</td> <td>Personal Computer</td> <td></td> <td></td> </tr> </table>					HPOE	High Power over Ethernet	RADIUS	Remote Authentication Dial In User Service	JITC	Joint Interoperability Test Command	SUT	System Under Test	PC	Personal Computer		
HPOE	High Power over Ethernet	RADIUS	Remote Authentication Dial In User Service													
JITC	Joint Interoperability Test Command	SUT	System Under Test													
PC	Personal Computer															

10. TESTING LIMITATIONS. None

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for a Core and Distribution switch in a stacked configuration and as a Layer 2/Layer 3 Access switch in either a stacked or single component configuration in accordance with UCR 2008, Change 3, Section 5.3.1, and 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 ¹	Status	Remarks																																												
	Co	D	A																																																
Serial	C	C	C	5.3.1.3.9	1-4	Certified	The SUT met the CRs and FRs with the following standard: EIA-232.																																												
10Base-X	C	C	C ²	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3i (10BaseT).																																												
100Base-X	R	R	C ²	5.3.1.3.1	1-6	Certified	The SUT met CRs and FRs with the following IEEE standard: 802.3u (100BaseT).																																												
1000Base-X	R	R	C 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).																																												
Wireless	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested ³																																													
<p>NOTES:</p> <p>1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 2-6. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.</p> <p>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.</p> <p>3. The SUT does not support this interface. This interface is not required for a core, distribution, or access switch.</p> <p>LEGEND:</p> <table border="0"> <tr> <td>802.3ab</td> <td>1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)</td> <td>EIA</td> <td>Electronic Industries Alliance</td> </tr> <tr> <td>802.3ae</td> <td>10 Gbps Ethernet</td> <td>EIA-232</td> <td>Standard for defining the mechanical and electrical characteristics for connecting Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) data communications devices</td> </tr> <tr> <td>802.3i</td> <td>10BaseT Mbps over twisted pair</td> <td>FR</td> <td>Functional Requirement</td> </tr> <tr> <td>802.3j</td> <td>10 Mbps over fiber</td> <td>Gbps</td> <td>Gigabits per second</td> </tr> <tr> <td>802.3u</td> <td>Standard for carrier sense multiple access with collision detection at 100 Mbps</td> <td>ID</td> <td>Identification</td> </tr> <tr> <td>802.3z</td> <td>Gigabit Ethernet Standard</td> <td>IEEE</td> <td>Institute of Electrical and Electronics Engineers</td> </tr> <tr> <td>A</td> <td>Access</td> <td>Mbps</td> <td>Megabits per second</td> </tr> <tr> <td>C</td> <td>Conditional</td> <td>R</td> <td>Required</td> </tr> <tr> <td>Co</td> <td>Core</td> <td>SUT</td> <td>System Under Test</td> </tr> <tr> <td>CR</td> <td>Capability Requirement</td> <td>UCR</td> <td>Unified Capabilities Requirements</td> </tr> <tr> <td>D</td> <td>Distribution</td> <td></td> <td></td> </tr> </table>								802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)	EIA	Electronic Industries Alliance	802.3ae	10 Gbps Ethernet	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	802.3i	10BaseT Mbps over twisted pair	FR	Functional Requirement	802.3j	10 Mbps over fiber	Gbps	Gigabits per second	802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	ID	Identification	802.3z	Gigabit Ethernet Standard	IEEE	Institute of Electrical and Electronics Engineers	A	Access	Mbps	Megabits per second	C	Conditional	R	Required	Co	Core	SUT	System Under Test	CR	Capability Requirement	UCR	Unified Capabilities Requirements	D	Distribution		
802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)	EIA	Electronic Industries Alliance																																																
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C	Conditional	R	Required																																																
Co	Core	SUT	System Under Test																																																
CR	Capability Requirement	UCR	Unified Capabilities Requirements																																																
D	Distribution																																																		

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 ¹	UCR Reference	Status
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	Met
	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	
2	E2E Performance Requirements			
	Voice Services	Required	5.3.1.4.1	Met ²
	Video services	Required	5.3.1.4.2	Met ²
	Data services	Required	5.3.1.4.3	Met ²
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 ³
	Wireless	Conditional	5.3.1.7.2	Not Tested
	Traffic Engineering	Required	5.3.1.7.3	Met ³
	Availability	Required	5.3.1.7.6	Met ³
	Redundancy	Required	5.3.1.7.7	Met ^{3,4}
5	MPLS			
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested
6	IPv6 Requirements			
	Product Requirements	Required	5.3.5.4	Partially Met ^{5,6,7}

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 system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements in order to be certified for that capability.
2. 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 in accordance with deployment guide and engineering guidelines provided in UCR Change 3, paragraph 5.3.1.4.
3. 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 Section 11.2 d. of Enclosure 2 and that does not create a single point of failure which could impact more than 96 C2 users.
4. The SUT operates in a stack configuration. In the stack, there is an element which is the Master and another which is the Standby. Remaining elements will be Members and may assume the role of standby upon failure of the Master. Upon failure of the Master element, the standby element becomes Master. However, IPv6 streams required up to 25 seconds before they were resumed. If a Member or Standby element of the stack failed, then IPv6 streams resumed within the required 5 seconds. DISA adjudicated this as minor with the vendor POA&M stating this will be corrected in version 8.0 scheduled to be released by 30 June 2013.

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

NOTES (continued):			
5. The SUT does not support the following IPv6 RFC: RFC 2711. DISA adjudicated this as minor with the vendor POA&M stating this will be supported in version 8.0 scheduled to be released by 30 June 2013.			
6. The SUT does not support the following IPv6 RFC: RFC 4302. DISA adjudicated this deficiency as minor because this RFC addresses requirements for IPSec, which is not implemented in the fielded configuration.			
7. The SUT does not support the following IPv6 RFC: RFC 5340. DISA adjudicated this as minor with the vendor POA&M stating this will be supported in version 8.0 scheduled to be released by 30 June 2013.			
LEGEND:			
C2	Command and Control	NM	Network Management
CR	Capability Requirement	POA&M	Plan of Action and Milestones
DISA	Defense Information Systems Agency	QoS	Quality of Service
E2E	End-to-End	RFC	Request For Comment
FR	Functional Requirement	SUT	System Under Test
IPSec	Internet Protocol Security	UCR	Unified Capabilities Requirements
IPv6	Internet Protocol version 6	VLAN	Virtual Local Area Network
MPLS	Multiprotocol Label Switching	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 the vendor's Letters of Compliance (LoC). The SUT operated in the required 50 percent non-blocking mode on all interfaces for all Core and Distribution layers and 12.5 percent non-blocking for the Access layer.

(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) in accordance with Institute of Electrical and Electronics Engineers (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: 10000/1000Base SX/LX, and 10/100/1000BaseT. 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 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 sub-paragraphs 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 0 to 4095, 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 with the vendor's LoC.

(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, and 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, met the requirements. 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 DISA-led IA team and published in a separate report, Reference (e). Based on this evaluation, the SUT met all requirements.

(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 is accomplished via DISA-led IA test teams and published in a separate report, Reference (e).

b. End-to-End (E2E) Performance Requirements. These requirements were verified using simulated voice, video, and data traffic in an emulated operational environment. To meet E2E requirements the SUT must be deployed in accordance with deployment guide and engineering guidelines provided in UCR 2008, Change 3, section

5.3.1.4. Congested condition is defined as 100 percent of link capacities (as defined by baseline traffic engineering). E2E performance was evaluated in a heterogeneous configuration as depicted in Figure 2-3.

(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 millisecond (ms) E2E across the ASLAN over any 5-minute measured period under congested conditions. The measured latency for the SUT was 1 ms, which met the requirement.

b. Jitter. The UCR 2008, Change 3, section 5.3.1.4.1.2, states that when transporting voice IP packets, the E2E jitter shall not be more than 3 ms over any 5-minute measured period under congested conditions. The measured jitter for the SUT was 1 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 five-minute measured period 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 be more than 30 ms E2E across the ASLAN over any 5-minute period measured under congested conditions. The measured latency for the SUT was 1 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 be more than 30 ms over any 5-minute measured period under congested conditions. The measured jitter for the SUT was 1 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 measured period 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 be more than 45 ms E2E across the ASLAN over any 5-minute period as measured under congested conditions. The measured latency for the SUT was 1 ms, 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 five-minute measured period under congested conditions. The measured packet loss for the SUT was 0.00 percent, 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 IA under 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 five 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 will 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 will 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. The SUT does not support wireless and it is not covered under this certification.

(3) Traffic Engineering. IAW UCR 2008, Change 3, section 5.3.1.7.3, bandwidth in the LAN shall be engineered so that Voice IP subscribers do not exceed more than 25 percent of available trunk bandwidth and no single point of failure within the ASLAN can cause a voice service outage to more than 96 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. C2 users may not be supported by a non-ASLAN. It is the site responsibility to configure the SUT in a manner which meets the user requirement and that 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, 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 calls that are active shall not be disrupted (loss of existing connection requiring redialing) and the path through the network shall be restored within five 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. The SUT operates in a stack configuration. In the stack, there is an element which is the Master and another which is the Standby. Remaining elements will be Members and may assume the role of standby upon failure of the Master. Upon failure of the Master element, the standby element becomes Master. However, IPv6 streams required up to 25 seconds before they were resumed. If a Member or Standby element of the stack failed, then IPv6 streams resumed within the required 5 seconds. DISA adjudicated this as minor with the vendor Plan of Action and Milestones (POA&M) stating this will be corrected in version 8.0 scheduled to be released by 30 June 2013. Other than the above issue, the SUT met all of these

requirements. All of the redundant components were tested and found to meet all the failover and access requirements with a measured restoral within 5.

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, which is a conditional requirement, was not evaluated and is not covered under this certification.

f. IPv6 Requirements. All UC products must meet the IPv6 requirements IAW UCR 2008, Change 3, section 5.3.5.4. IPv6 requirements were met by testing with the following exception: The SUT did not meet RFCs 2711 and 5340. This discrepancy was adjudicated by DISA on 24 April 2012 as having a minor operational impact with a vendor POA&M stating RFCs 2711 and 5340 will be supported in version 8.0 scheduled to be released by 30 June 2013. The SUT does not support RFC 4302. DISA adjudicated this deficiency as minor because this RFC addresses requirements for Internet Protocol Security (IPSec), which is not implemented in the fielded configuration. The SUT was tested and certified for joint use with IPv6 voice, video, and data traffic.

11.3 Information Assurance (IA). Security testing is accomplished via DISA-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 in accordance with the Program Manager's request. 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). Information related to 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-certification-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 does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements in order to be certified for that capability. The detailed Functional requirements (FR) and Capability Requirements (CR) 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 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, 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)
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 802.3AX (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		Link Layer Discovery Protocol (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)	5.3.1.3.2
19	Class of Service Marking: Layer 3 DSCPs IAW RFC 2474. (R) Layer 2 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: Layer 2 Switch). Note: Layer 2 switch is required to support only RFCs 2460, 5095, 2464, and be able to queue packets based on DSCPs in accordance with 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)
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)	5.3.1.3.6
27	Network Monitoring	SNMP IAW RFCs 3411, 3412, 3413, 3414, 3415, 3416 and 3417. (R)
28		SNMP traps IAW RFC 1215. (R)
29		Remote monitoring IAW RFC 2819 and Advanced Encryption Standard (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

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

ID	Requirement (See note.)		UCR Reference
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 must be IAW RFC 3315, if DHCPv6 is supported it shall be IAW RFC 3313. (C)	
61	IPv6 Router Advertisements	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 in accordance with 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)	
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)	

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

ID	Requirement (See note.)	UCR Reference
67	If the system supports stateless IP address Auto-configuration, the system shall support IPv6 SLAAC for interfaces supporting UC functions in accordance with 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 in accordance with 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	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	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 Multicast Listener Discovery (MLD) process as described in RFC 2710 and extended in RFC 3810 and RFC 2711. (C)	
82	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	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
90	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

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

NOTE: All requirements are for core, distribution, and access layer components unless otherwise specified.

LEGEND:

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