DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) **16 Dec 11**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Avaya Ethernet Routing Switch (ERS)4500 Series with Release 5.4.100.069

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 Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The Avaya ERS4550T-PWR, ERS4548GT-PWR, ERS4526GTX-PWR, and ERS4526FX with Release 5.4.100.069 is hereinafter referred to as the System Under Test (SUT). The ERS4550T, ERS4548GT, ERS4526GTX, ERS4526T, ERS4526T-PWR, ERS4524GT, ERS4524GT-PWR are also in the family and were not tested; however, they employ the same software and similar hardware as the SUT. The JITC analysis determined these systems to be functionally identical to the SUT for interoperability certification purposes and they are also certified for joint use. 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) Layer 2 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: 1000Base-SX, 1000Base-LX, 10Gbase-SR, 10Gbase-LR, 10/100/1000BaseT, 100Base-FX. JITC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined the 10BaseT interface is low risk for certification based on the vendor's Letter of Compliance (LoC) to the Institute of Electrical and Electronics Engineers, Inc. (IEEE) 802.3i standard and the testing data collected at all other data rates. 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 no later than three years from the date the Defense Information Systems Agency (DISA) Certifying Authority (CA) provided a positive recommendation.

3. This finding is based on interoperability testing conducted by JITC, review of the vendor's LoC, and DISA CA Recommendation. Interoperability testing was conducted by JITC, Fort Huachuca, Arizona, from 3 August 2011 through 28 September 2011. Review of the vendor's LoC was completed on 15 August 2011. DISA adjudication of open test discrepancy reports was completed on 30 November 2011. The DISA CA provided a positive Recommendation on 13 December 2011 based on the security testing completed by DISA-led Information Assurance (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/FR for ASLAN components are established by Section 5.3.a of Reference (c) and were used to evaluate the interoperability of the SUT.

Table 1. UC APL Product Summary

Component(See note.)	Release	Sub-Component(See note.)	Certification Applicability		
			Core	Distribution	Access
ERS4550T-PWR ERS4550T **ERS4548GT-PWR** ERS4548GT ERS4524GT-PWR ERS4524GT **ERS4526GTX-PWR** ERS4526GTX ERS4526T ERS4526T-PWR **ERS4526FX**	5.4.100.069	**RPSU 15 chassis** **RPSU Power Supply**	No	No	Yes

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.

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LEGEND:

APL	Approved Products List	RPSU	Redundant Power Supply Unit
JITC	Joint Interoperability Test Command	UC	Unified Capabilities

Table 2. SUT Interface Interoperability Status

Interface	Applicability			UCR 2008, Change 2 Reference	Threshold CR/FR[1]	Status	Remarks
	Co	D	A				
10Base-X	C	C	C[2]	5.3.1.3.1	1-6	Met[3]	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	Met	SUT met CRs and FRs with the following IEEE Standard: 802.3u (100Base-FX, 100Base-T)
1000Base-X	R	R	C[2]	5.3.1.3.1	1-6	Met	SUT met CR and FRs with the following IEEE Standards: 802.3ab (1000Base-T), 802.3z (1000Base-SX, 1000Base-LX)
10000Base-X	C	C	C	5.3.1.3.1	1-6	Met	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 Tested[4]	
802.11b	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.11g	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.11n	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.16	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	

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. JITC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined the 10BaseT interface is 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.

LEGEND:

A	Access	ID	Identification
C	Conditional	IEEE	Institute Of Electrical And Electronics Engineers, Inc.
Co	Core	JITC	Joint Interoperability Test Command
CR	Capability Requirement	LoC	Letter of Compliance
D	Distribution	R	Required
FR	Functional Requirement	SUT	System Under Test
		UCR	Unified Capabilities Requirements

Table 3. SUT CRs and FRs Status

CR/FR ID	Capability/ Function	Applicability[1]	UCR 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	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]	
2	**E2E Performance Requirements**				
	Voice Services	Required	5.3.1.4.1	Met[3]	
	Video services	Required	5.3.1.4.2	Met[3]	
	Data services	Required	5.3.1.4.3	Met[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	
	Traffic Engineering	Required	5.3.1.7.3	Met[4]	Configured with four queues, each set to 25% of total bandwidth.
	Availability	Required	5.3.1.7.6	Met	100% availability during test. Met by vendor LoC
	Redundancy	Conditional	5.3.1.7.7	Met	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested[5]	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested[5]	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Partially Met[6]	

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 system under test 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 described in reference (c) Section 5.4. Detailed IA requirements are included in Reference (e).
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 in accordance with deployment guide and engineering guidelines provided in UCR 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 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.
5. MPLS was not tested and is not certified for joint use. MPLS is conditional and; therefore, not required for a Core, Distribution, or Access switch.
6. The SUT does not support scope address architecture zones in accordance with RFC 4007. This discrepancy was adjudicated by DISA as having a minor impact with vendor POA&M of 1 April 2012.

LEGEND:

C2	Command and Control	MPLS	Multiprotocol Label Switching
CR	Capability Requirement	NM	Network Management
DISA	Defense Information Systems Agency	POA&M	Plan of Action and Milestones
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	RFC	Request for Comment
IA	Information Assurance	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
IPv6	Internet Protocol version 6	VLAN	Virtual Local Area Network
LoC	Letter of Compliance	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. All associated data is available on the Defense Information Systems Agency Unified Capability Coordination Office (UCCO) website located at http://www.disa.mil/ucco/.

6. The JITC point of contact is Capt Stephane Arsenault, DSN 879-5269, commercial (520) 538-5269, FAX DSN 879-4347, or e-mail to Stephane.Arsenault@disa.mil. The JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Tracking Number for the SUT is 1108902.

FOR THE COMMANDER:

3 Enclosures a/s

for BRADLEY A. CLARK
Chief
Battlespace Communications Portfolio

Distribution (electronic mail):
Joint Staff J-6
Joint Interoperability Test Command, Liaison, TE3/JT1
Office of Chief of Naval Operations, CNO N6F2
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Department of the Army, Office of the Secretary of the Army, DA-OSA CIO/G-6 ASA (ALT), SAIS-IOQ
U.S. Marine Corps MARCORSYSCOM, SIAT, MJI Division I
DOT&E, Net-Centric Systems and Naval Warfare
U.S. Coast Guard, CG-64
Defense Intelligence Agency
National Security Agency, DT
Defense Information Systems Agency, TEMC
Office of Assistant Secretary of Defense (NII)/DoD CIO
U.S. Joint Forces Command, Net-Centric Integration, Communication, and Capabilities Division, J68

ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense, "Department of Defense Unified Capabilities Requirements 2008, Change 2," 31 December 2010
(d) Joint Interoperability Test Command, "ASLAN Component Test Plan (UCTP)," November 2010
(e) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Avaya Ethernet Routing Switch (ERS)4500 Series 5.4.1xx (Tracking Number 1108902),"

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. The Avaya Ethernet Routing Switch (ERS)4550T-PWR, ERS4548GT-PWR, ERS4526GTX-PWR, and ERS4526FX with Release 5.4.100.069; hereinafter referred to as the System Under Test (SUT).

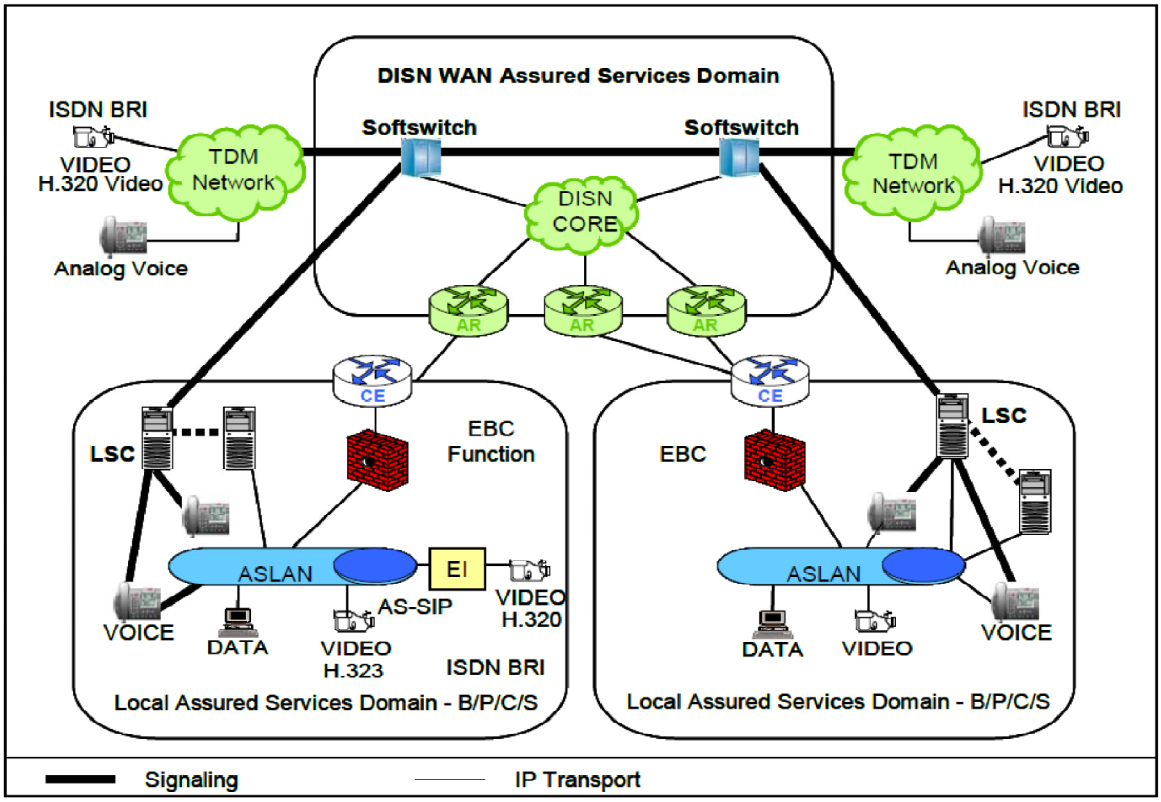
2. SPONSOR. Headquarters United States Army Information Systems Engineering Command (HQUSAISEC).

3. SYSTEM POC. Mr. Jordan Silk, ELIE-ISE-TI, Building 53302, Fort Huachuca, Arizona, 85613-5300, telephone: (520) 533-7218, e-mail: jordan.silk@us.army.mil.

4. TESTER. Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.

5. SYSTEM DESCRIPTION. 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 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: 1000Base-SX, 1000Base-LX, 10Gbase-SR, 10Gbase-LR, 10/100/1000BaseT, 100Base-FX. JITC tested all these interfaces with the exception of the 10BaseT interface. The JITC analysis determined the 10BaseT interface is low risk for certification based on the vendor's Letter of Compliance (LoC) to the Institute of Electrical and Electronics Engineers, Inc. (IEEE) 802.3i standard and the testing data collected at all other data rates.

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 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.



LEGEND:

ASLAN	Assured Services Local Area Network	IP	Internet Protocol
AS-SIP	Assured Services - Session Initiation Protocol	ISDN	Integrated Services Digital Network
B/P/C/S	Base/Post/Camp/Station	ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
BRI	Basic Rate Interface		
CE	Customer Edge (CE Router)	LSC	Local Session Controller
DISN	Defense Information System Network	TDM	Time Division Multiplexing
EBC	Edge Boundary Controller	VTC	Video Teleconferencing
EI	End Instrument	WAN	Wide Area Network
H.320	ITU-T standard for narrowband VTC		

Figure 2-1. ASLAN 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
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
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

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 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	ID	Identification
ASLAN	Assured Services Local Area Network	IEEE	Institute of Electrical and Electronics Engineers, Inc.
C	Conditional	R	Required
Co	Core	SUT	System Under Test
CR	Capability Requirement	UCR	Unified Capabilities Requirements
D	Distribution		
FR	Functional Requirement		

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. The SUTs

features and capabilities and its aggregated requirements in accordance with 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 CR and FR Status

CR/FR ID	Capability/ Function	Applicability[1]	UCR 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]	
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
	Traffic Engineering	Required	5.3.1.7.3	Site requirement
	Availability	Required	5.3.1.7.6	Partially driven by topology
	Redundancy	Conditional	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 2, Section 5.4. Detailed IA requirements are included in Reference (e).

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	

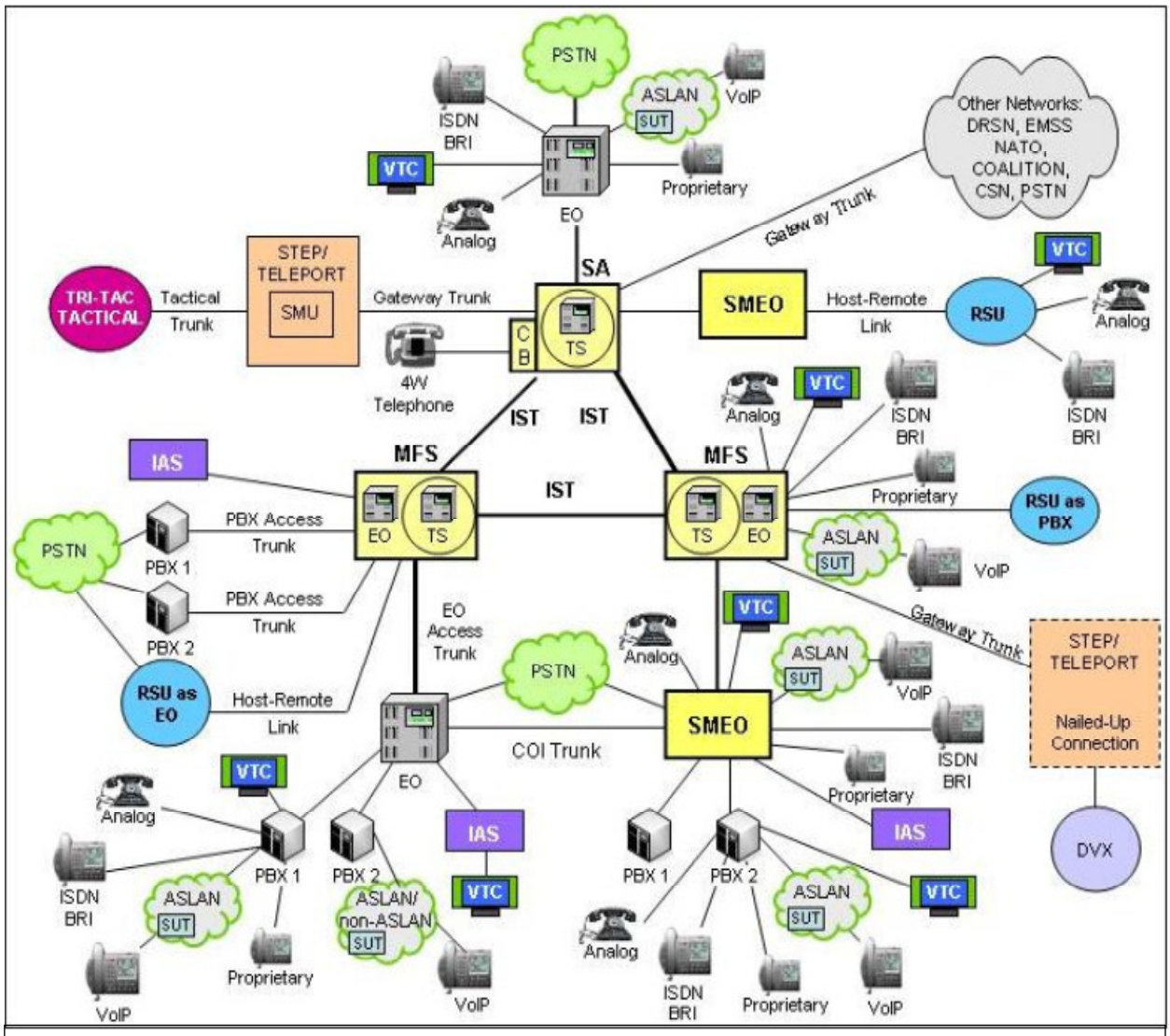
NOTE: The annotation of 'required' refers to a high-level requirement category. Refers to IA requirements for UCR Section 5.4.

LEGEND:

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 Systems 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 Figures 2-3 through 2-5. Figure 2-3 depicts the ASLAN components in a homogeneous configuration. Figures 2-4 and 2-5 depict the ASLAN components in heterogeneous configuration with Brocade and 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	PC	Personal Computer
CSN	Canadian Switch Network	PSTN	Public Switched Telephone Network
DISN	Defense Information Systems Network	RSU	Remote Switching Unit
DRSN	Defense Red Switch Network	SMEO	Small End Office
DVX	Deployable Voice Exchange	SMU	Switched Multiplex Unit
EMSS	Enhanced Mobile Satellite System	STEP	Standardized Tactical Entry Point
EO	End Office	TDM/P	Time Division Multiplex/Packetized
IAS	Integrated Access Switch	Tri-Tac	Tri-Service Tactical Communications Program
IP	Internet Protocol	TS	Tandem Switch
ISDN	Integrated Services Digital Network	VoIP	Voice over Internet Protocol
IST	Interswitch Trunk	VTC	Video Teleconferencing
MFS	Multifunction Switch	SUT	System Under Test

Figure 2-2. DISN Architecture

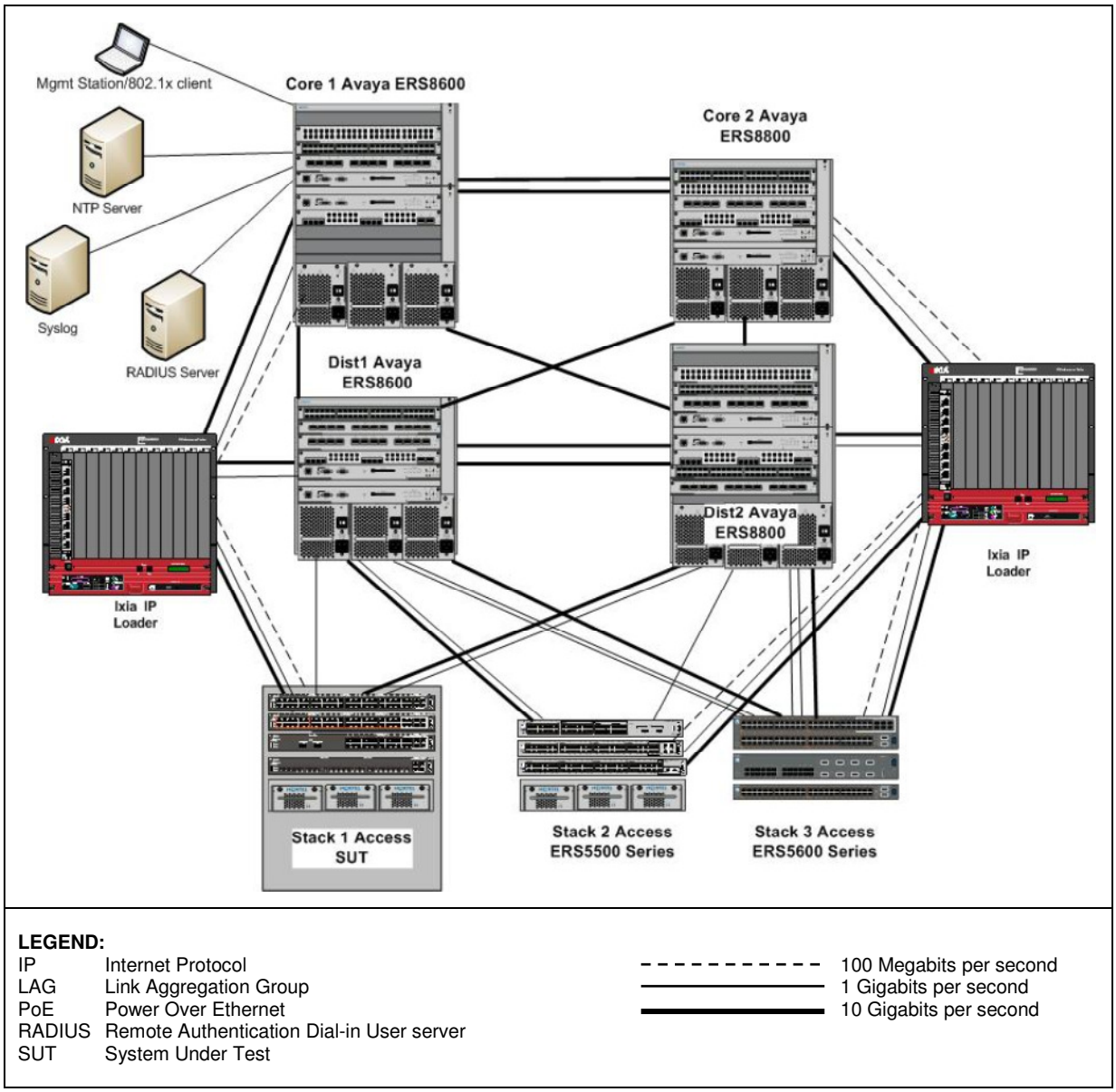
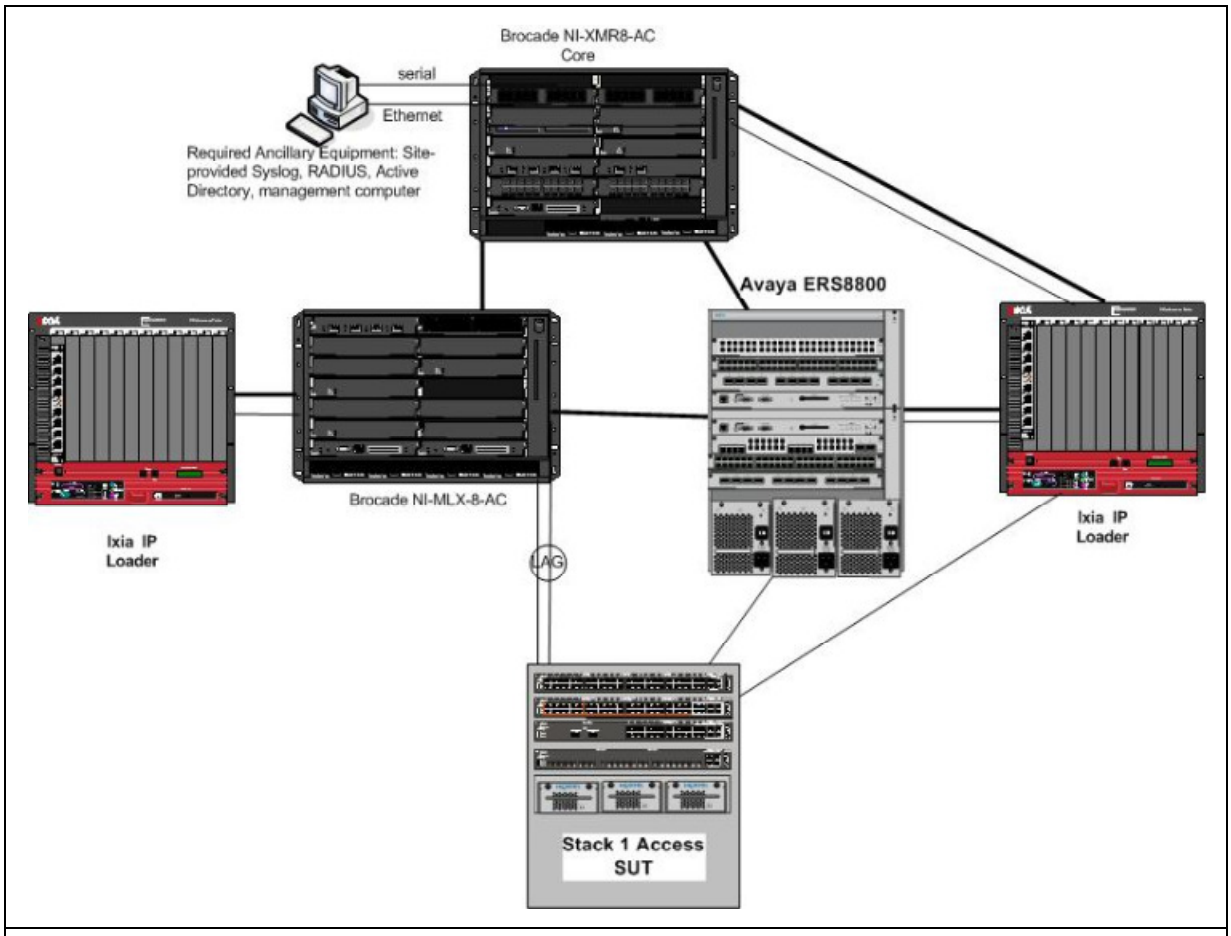


Figure 2-3. SUT Homogeneous Test Configuration

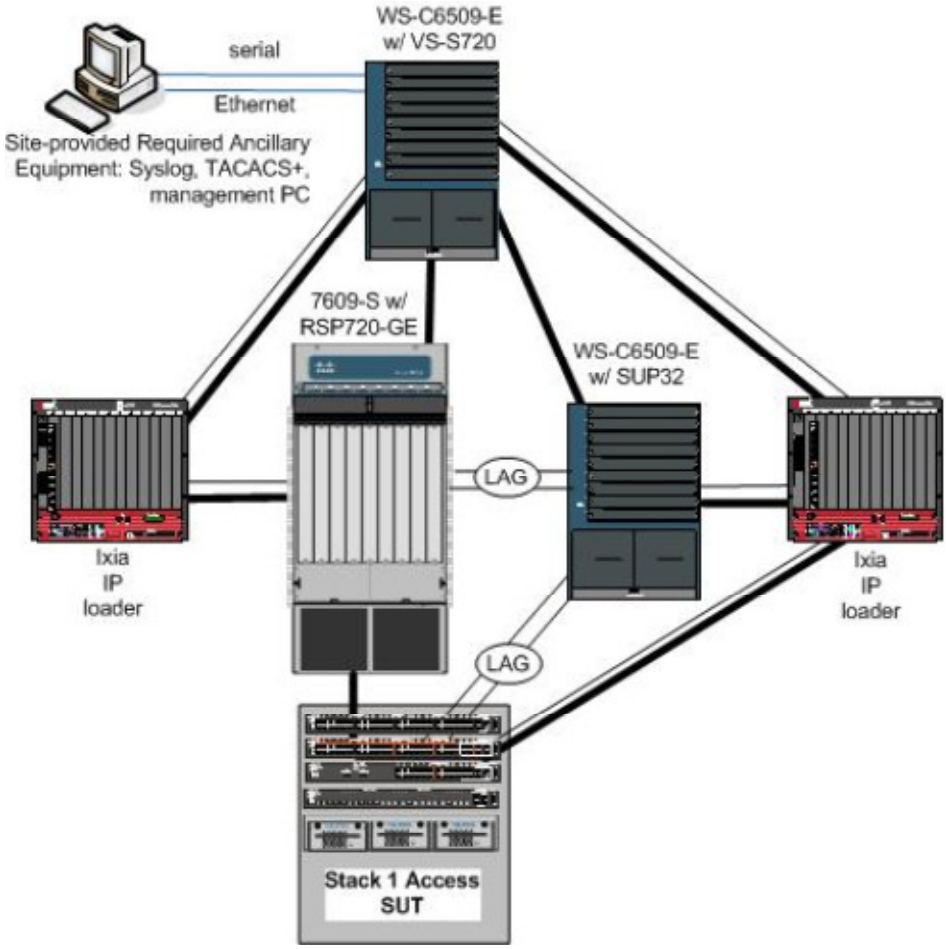


LEGEND:

IP	Internet Protocol
LAG	Link Aggregation Group
RADIUS	Remote Authentication Dial-in User server
SUT	System Under Test

1 Gigabits per second
10 Gigabits per second

Figure 2-4. SUT Heterogeneous Test Configuration with Brocade



LEGEND:

IP	Internet Protocol	———	1 Gigabits per second
LAG	Link Aggregation Group	━━━	10 Gigabits per second
SUT	System Under Test		
TACACS+	Terminal Access Controller Access Control System Plus		

Figure 2-5. SUT Heterogeneous Test Configuration with Cisco

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 ASLAN	**Cisco Hardware**			**Cisco Software**
	WS-C6509-E			IOS® 12.2(33)SX14
	7609-S			IOS® 12.2(33)SRE2
Brocade ASLAN	**Brocade Hardware**			**Brocade Software**
	NI-XMR-8-AC			NI 5.1.01
	NI-MLX-8-AC			NI 5.1.01
Avaya	**Hardware**			**Avaya Software**
	ERS8600			7.1.0.100_B068
	ERS8800			7.1.0.100_B068
	ERS5500 Series			6.2.100.073
	ERS5600 Series			6.2.100.073
SUT	**Release**	**Function**	**Sub-Component** (See note.)	**Description**
ERS4550T-PWR ERS4550T **ERS4548GT-PWR** ERS4548GT ERS4524GT-PWR ERS4524GT **ERS4526GTX-PWR** ERS4526GTX ERS4526T ERS4526T-PWR ERS4526FX	5.4.100.069	Access	**RPSU 15 chassis**	Redundant Power Supply Unit Chassis
			RPSU Power Supply	Redundant Power Supply Unit with 3 Power Supplies

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.

LEGEND:

ASIC	Application-Specific Integrated Circuit	PoE	Power over Ethernet
ASLAN	Assured Services Local Area Network	RADIUS	Remote Authentication Dial-In User Server
GBIC	Gigabit Interface Converter	RPSU	Redundant Power Supply Unit
Gig, GbE	Gigabit Ethernet	SFP	Small Form Factor Pluggable
JITC	Joint Interoperability Test Command	T	Twisted Pair
N/A	Not Applicable		

10. TESTING LIMITATIONS. None

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for a Layer 2 Access switch in accordance with (IAW) UCR 2008, Change 2, 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 2 Reference	Threshold CR/FR[1]	Status	Remarks
	Co	D	A				
10Base-X	C	C	C[2]	5.3.1.3.1	1-6	Met[3]	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	Met	SUT met CRs and FRs with the following IEEE Standard: 802.3u (100Base-FX, 100Base-T)
1000Base-X	R	R	C[2]	5.3.1.3.1	1-6	Met	SUT met CR and FRs with the following IEEE Standards: 802.3ab (1000Base-T), 802.3z (1000Base-SX, 1000Base-LX)
10000Base-X	C	C	C	5.3.1.3.1	1-6	Met	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 Tested[4]	
802.11b	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.11g	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.11n	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	
802.16	C	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested[4]	

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. 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. JITC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined the 10BaseT interface is low risk for certification based on the vendor's LoC to the IEEE 802.3i standard 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.

LEGEND:

A	Access	IEEE	Institute of Electrical and Electronics Engineers, Inc.
C	Conditional	JITC	Joint Interoperability Test Command
Co	Core	LoC	Letter of Compliance
CR	Capability Requirement	R	Required
D	Distribution	MPLS	Multiprotocol Label Switch
FR	Functional Requirement	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements

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	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	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]	
2	**E2E Performance Requirements**				
	Voice Services	Required	5.3.1.4.1	Met[3]	
	Video services	Required	5.3.1.4.2	Met[3]	
	Data services	Required	5.3.1.4.3	Met[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	
	Traffic Engineering	Required	5.3.1.7.3	Met[4]	Configured with four queues, each set to 25% of total bandwidth.
	Availability	Required	5.3.1.7.6	Met	100% availability during test. Met with vendor LoC
	Redundancy	Conditional	5.3.1.7.7	Met	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested[5]	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested[5]	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Partially Met[6]	

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 system under test 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 2, Section 5.4. Detailed IA requirements are included in Reference (e).
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 in accordance with deployment guide and engineering guidelines provided in UCR 5.3.1.4.
4. This requirement was met with testing and vendor's submitted LoC. 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.
5. MPLS was not tested and is not certified for joint use. MPLS is conditional and; therefore, not required for a Core, Distribution, or Access switch.
6. The SUT does not support scope address architecture zones in accordance with RFC 4007. This discrepancy was adjudicated by DISA as having a minor impact with vendor POA&M of 1 April 2012.

LEGEND:

C2	Command and Control	MPLS	Multiprotocol Label Switching
CR	Capability Requirement	NM	Network Management
DISA	Defense Information Systems Agency	POA&M	Plan of Action and Milestones
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
LoC	Letter of Compliance		

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

(1) Performance Parameters. IAW UCR 2008 Change 2, Section 5.3.1.3. The SUT met the performance parameters depicted in the UCR 2008, Change 2 Section 5.3.1.3. The SUT operated in the required 12.5 percent non-blocking for the Access layer which met this requirement.

Jitter was measured to be 0.002 milliseconds (ms). Latency was measured to be 0.103 ms average. Packet loss was zero percent. All performance requirements were met by the SUT.

(2) Port Interface Rates. The UCR 2008, Change 2, Section 5.3.1.3 states that Access products shall minimally support one of the following interface rates: 10 Mbps IAW IEEE 802.3i & j, 100 Mbps IAW IEEE 802.3u, and 1000 Mbps IAW IEEE 802.3z & 802.3ab. The SUT supports all of the following required port rates interfaces: 1000Base-SX, 1000Base-LX, 10Gbase-SR, 10Gbase-LR, 10/100/1000BaseT, 100Base-FX. JITC tested all these interfaces with the exception of the 10BaseT interface. JITC analysis determined the 10BaseT interface is low risk for certification based on the vendor's LoC to the 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 2, Section 5.3.1.3 states that 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 SUT was tested to confirm Auto-negotiation, Force Mode, Link Aggregation, Spanning Tree and IA confirmed 802.1 x authentications. The SUT met these requirements with testing and vendor's LoC.

(4) Class of Service (CoS) Markings. The UCR 2008, Change 2, paragraph 5.3.1.3.3 states that the SUT shall be able to:

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

- 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).

- Support the prioritization of aggregate service classes with queuing according to QoS features.

The SUT preserved CoS and conformed to all required Request for Comments (RFC). DSCP values were handled correctly by the queuing mechanism in the SUT. Therefore, the SUT met all these requirements.

(5) Virtual Local Area Network (VLAN) Capabilities. The SUT met VLAN capabilities IAW UCR 2008, Change 2, paragraph 5.3.1.3.4. 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 which met this requirement.

(6) Protocols. The SUT met all of the protocols IAW UCR 2008, Change 2, paragraph 5.3.1.3.5 for IPv4 and Section 5.3.5 for IPv6 with a vendor's LoC. The following protocols operated as expected, and were fully interoperable with other vendor ASLAN components in a heterogeneous network: Link Aggregation Control Protocol (LACP), Simple Network Management Protocol (SNMP), Spanning Tree, etc. The Multilink Trunks (MLT) was utilized in the homogeneous configuration in place of LACP.

(7) QoS Features. The UCR 2008, Change 2, Section 5.3.1.3.6 states that 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 QoS, which includes rate-shaping, performed as configured. All variance was within the limitation of resolution of the test instruments.

In addition, the UCR 2008, Change 2 states that the ASLAN infrastructure components shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and assign that packet to a QoS behavior. 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. Network Monitoring via Simple Network Management Protocol (SNMP) was evaluated by the DISA-led IA team and published in a separate report, Reference (e).

(9) Security. 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. Voice, Video and Data Services. These requirements were 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 2008, Change 2, paragraph 5.3.1.4. E2E performance was evaluated in a homogeneous and heterogeneous configuration as depicted in Figures 2-3 through 2-5.

1. Voice Services.

a. Latency. The UCR 2008, Change 2, paragraph 5.3.1.4.1.1 states that latency shall not be more than 6 ms E2E across the ASLAN as measured under congested conditions. The SUT was tested at .132 ms which met this requirement.

b. Jitter. The UCR 2008, Change 2, paragraph 5.3.1.4.1.2 states that when transporting voice IP packets E2E jitter shall not be more than 3 ms over any 5 minute measured period of congested conditions. The SUT was tested at .006 ms which met this requirement.

c. Packet Loss. The UCR 2008, Change 2, paragraph 5.3.1.4.1.3 states that actual measured packet loss across the LAN shall not exceed 0.045 percent within the defined queuing parameters. The packet loss requirement shall be achievable over any 5 minute measured period under congested conditions. The SUT was tested at 0 percent which met this requirement.

2. Video Services.

a. Latency. The UCR 2008, Change 2, paragraph 5.3.1.4.2.1 states that latency shall not be more than 30 ms E2E across the ASLAN as measured under congested conditions. The SUT was tested at .012 ms which met this requirement.

b. Jitter. The UCR 2008, Change 2, paragraph 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 of congested conditions. The SUT was tested at .102 ms which met this requirement.

c. Packet Loss. The UCR 2008, Change 2, paragraph 5.3.1.4.2.3 states that actual measured packet loss across the LAN shall not exceed 0.015 percent within the defined queuing parameters. The packet loss requirement shall be achievable over any 5-minute measured period under congested conditions. The SUT was tested at 0 percent which met this requirement.

3. Data Services.

a. Latency. The UCR 2008, Change 2, paragraph 5.3.1.4.2.1 states that latency shall not be more than 45 ms E2E across the ASLAN as measured under congested conditions. The SUT was tested at .001 ms which met this requirement.

b. Jitter. The UCR 2008, Change 2, paragraph 5.3.1.4.2.2 states that there are no jitter requirements for preferred data IP packets.

c. Packet Loss. The UCR 2008, Change 2, paragraph 5.3.1.4.2.3 states that actual measured packet loss across the LAN shall not exceed 0.015 percent within the defined queuing parameters. The packet loss requirement shall be achievable over any 5-minute measured period under congested conditions. The SUT was tested at 0 percent which met this requirement.

c. Network Management (NM) Requirements. The following NM requirements were met by vendor's LoC and evaluated by IA under a separate report, Reference (e):

(1) Configuration Control. IAW UCR 2008, Change 2, paragraph 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 2, paragraph 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 2, paragraph 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 2, paragraph 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 2, paragraph 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) Physical Media. Per UCR 2008, Change 2, paragraph 5.3.1.7.1, Copper Media, wires used for the LAN shall not be lower than a Category 5 performance. The links connected to the SUT used the recommended copper media during testing and met the requirement. To meet requirements, the SUT must be deployed in accordance with its deployment guide and the engineering guidelines provided in this section.

(2) Traffic Engineering. According to UCR 2008 Change 2 paragraph 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. Video over IP Bandwidth, list available video bandwidth based on 25 percent traffic engineering and how many sessions are possible at a video rate of 384 kbps. The LAN will be traffic engineered to support data traffic based on utilization of voice and video traffic engineering (0-25 percent voice/signaling, 0-25 percent video, 0-25 percent preferred data). Best Effort data traffic can burst up to the full link capacity if voice and video are not present. The SUT was configured with four queues each set to 25% of total bandwidth and there was no single point of failure within the ASLAN which met the requirement. To meet requirements, the SUT must be deployed in accordance with its deployment guide and the engineering guidelines provided in this section.

(3) Availability. According to UCR 2008, Change 2, paragraph 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. This requirement was met by vendors submitted LoC.

(4) Redundancy. UCR 2008, Change 2, paragraph 5.3.1.7.7 states no single point of failure affecting more than 96 users, may take longer than five seconds for the network to resume IP traffic. The SUT has more than 96 ports and requires redundancy. MLT was used in the homogeneous configuration. MLT failover occurred in 257 milliseconds for IPv4 and IPv6 traffic which met the requirement. In a heterogeneous network, Link Aggregate Control Protocol (LACP) failover occurred in 2 seconds for IPv4 and IPv6 traffic when configured with Brocade and 195ms when configured with Cisco which met the requirement. Non-LACP failover occurred in 1.8 seconds for IPv4 and IPv6 traffic when configured with Brocade and 268 ms when configured with Cisco which met the requirement. Each component has its own processor and the entire stack has a primary base unit and multiple back up units. Stack failover was tested in the homogeneous configuration and occurred in 2.9 seconds for IPv4 and IPv6 traffic meeting the requirement. Stack failover occurred in 3.5 seconds for IPv4 and IPv6 traffic when configured with Brocade and 1 ms when configured with Cisco which met the requirement. The site is responsible for configuring the SUT in a manner which meets the user requirement.

e. Multiprotocol Label Switching (MPLS) Requirements. MPLS was not evaluated and is not certified for joint use. This is a conditional requirement for a Core, Distribution, or Access switch.

f. IPv6 Requirements. Most IPv6 requirements were met by testing. However, the SUT does not support scope address architecture zones in accordance with RFC 4007. This discrepancy was adjudicated by DISA as having a minor impact with vendor Plan of Action and Milestones (POA&M) of 1 April 2012. 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 2-7 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.

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. 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% for core and distribution layer switches and 12.5% blocking for access layer switches. (R)		5.3.1.3
3	Maximum of 1 ms of jitter for voice and 10 ms for video for all ASLAN components. (R) Does not apply to preferred data and best effort data.		5.3.1.3
4	Maximum of .015% packet loss for voice and .05 % for video and preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
5	Maximum of 2 ms latency for voice, 10 ms for video, and 15 ms for preferred data for all ASLAN components. (R) Does not apply to best effort data.		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 at least one of the following IEEE interfaces for access layer components: 802.3i, 802.3j, 802.3u, 802.3ab, and 802.3z. (R)		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) Conditional for Core	
11		Filtering IAW RFC 1812. (R)	
12		Link Aggregation IAW IEEE 802.3ad (output/egress ports only). (R)	
13		Spanning Tree Protocol IAW IEEE 802.1D. (R) Conditional for Core	
14		Multiple Spanning Tree IAW IEEE 802.1s. (R) Conditional for Core	
15		Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w. (R) Conditional for Core	
16	LACP link Failover and Link Aggregation IAW IEEE 802.3ad (uplink ports only) core and distribution switches (C)		5.3.1.3.2, 5.3.1.7.7.1
17	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
18	VLAN Capabilities IAW IEEE 802.1Q. (R)		5.3.1.3.4
19	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 RFC 2460, 5095, 2464, and be able to queue packets based on DSCPs in accordance with RFC 2474.		5.3.1.3.5
20	QoS Features	Shall support minimum of 4 queues. (R)	5.3.1.3.6
21		Must be able to assign VLAN tagged packets to a queue. (R)	
22		Support DSCP PHBs per RFCs 2474, 2597, 2598, and 3246. (R: LAN Switch). Note: Layer 2 switch is required to support RFC 2474 only.	
23		Support a minimum of one of the following: WFQ IAW RFC 3662, PQ IAW RFC 1046, or Class-Based WFQ IAW RFC 3366. (R)	
24		Must be able to assign a bandwidth or percent of traffic to any queue. (R)	
25	Network Monitoring	SNMP IAW RFC's 1157, 2206, 3410, 3411, 3412, 3413, and 3414. (R)	5.3.1.3.7
26		SNMP traps IAW RFC1215. (R)	
27		Remote monitoring IAW RFC1281 and AES Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. (R)	
28	Product Requirements Summary IAW UCR 2008, Change 2, Table 5.3.1-5. (R)		5.3.1.3.9
29	E2E Performance (Voice)	No more than 6 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.1
		No more than 3 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .045% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	

Table 3-1. SUT CRs and FRs (continued)

ID	Requirement (See note.)		UCR Reference
30	E2E Performance (Video)	No more than 30 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.2
		No more than 30 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
31	E2E Performance (Data)	No more than 45 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.3
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
32	LAN Network Management	Configuration Control for ASLAN and non-ASLAN. (R)	5.3.1.6.1
33		Operational Controls for ASLAN and non-ASLAN. (R)	5.3.1.6.2
34		Performance Monitoring for ASLAN and non-ASLAN. (R)	5.3.1.6.3
35		Alarms for ASLAN and non-ASLAN. (R)	5.3.1.6.4
36		Reporting for ASLAN and non-ASLAN. (R)	5.3.1.6.5
37	Redundancy	Redundant Power Supplies. (Required on standalone redundant products.)	5.3.1.7.7
38		Chassis Failover. (Required on standalone redundant products.)	
39		Switch Fabric Failover. (Required on standalone redundant products.)	
40		Non-LACP Link Failover. (R)	
41		Fiber Blade Failover. (R)	
42		Stack Failover. (C) (Required if the stack supports more than 96 users.)	
43		CPU (routing engine) blade Failover. (R)	
44	MPLS	MPLS May not add measurable Loss or Jitter to system. (C)	5.3.1.8.4.1
45		MPLS Conforms to RFCs in Table 5.3.1-14. (C)	5.3.1.8.4.1
46		MPLS Support L2 and L3 VPNs. (C)	5.3.1.8.4.2.1 /2
47	IPv6 Product Requirements: Dual Stack for IPv4 and IPv6 IAW RFC 4213 if routing functions are supported. (C)		5.3.5.4
48	IPv6 System Requirements	Support IPv6 IAW RFCs 2460 and 5095 if routing functions are supported. (C)	5.3.5.4
49		Support IPv6 packets over Ethernet IAW RFC2464. (R)	5.3.5.4
50		Support MTU discovery IAW RFC 1981 if routing functions are supported. (R)	5.3.5.4.1
51		Support a minimum MTU of 1280 IAW RFCs 2460 and 5095. (C)	5.3.5.4.1
52		Shall support IPv6 addresses IAW RFC 4291. (R)	5.3.5.4.3
53		Shall support IPv6 scoped addresses IAW RFC4007. (R)	5.3.5.4.3
54		if routing functions are supported: If DHCP is supported must be IAW RFC3315, if DHCPv6 is supported it shall be IAW RFC 3313. (C)	5.3.5.4.4
55	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
56		If the system supports routing functions, the system shall include the MTU value in the router advertisement message for all links in accordance with RFCs 2461 and 4861. (C)	
57		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)	
58	IPv6 Neighbor Discovery	if routing functions are supported: Neighbor discovery IAW RFCs 2461 and 4861. (C)	5.3.5.4.5
59		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)	
60		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)	
61	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 in accordance with RFCs 2462 and 4862. (C)	5.3.5.4.6
62		If the product supports IPv6 SLAAC, the product shall have a configurable parameter that allows the function to be enabled and disabled. (C)	
63		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)	

Table 3-1. SUT CRs and FRs (continued)

ID	Requirement (See note.)		UCR Reference
64		If the product supports stateless IP address auto-configuration including those provided for the commercial market, the DAD shall be disabled in accordance with RFCs 2462 and 4862. (R)	
65		The system shall support manual assignment of IPv6 addresses. (R)	
66		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)	
67	IPv6 ICMP	The system shall support the ICMPv6 as described in RFC 4443. (R)	5.3.5.4.7
68		The system shall have a configurable rate limiting parameter for rate limiting the forwarding of ICMP messages. (R)	
69		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.	
70		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. (R)	
71		The system shall validate ICMPv6 messages, using the information contained in the payload, prior to acting on them. (R)	
72	IPv6 Routing Functions	If the system supports routing functions, the system shall support the OSPF for IPv6 as described in RFC 5340. (C)	5.3.5.4.8
73		If the system supports routing functions, the system shall support securing OSPF with Internet Protocol Security (IPSec) as described for other IPSec instances in UCR 2008, Section 5.4. (C)	
74		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-SHA1-96 with ESP and AH as described in RFC 2404, shall support OSPFv3 IAW RFC 4552. (C)	
75		If the system supports routing functions, the system shall support the MLD process as described in RFC 2710 and extended in RFC 3810. (C)	
76	Site Requirements	Engineering Requirements: Physical Media for ASLAN and non-ASLAN. (R) (Site requirement)	5.3.1.7.1
77		Battery Back up two hours for non-ASLAN components and eight hours for ASLAN components. (R) (Site requirement)	5.3.1.7.5
78		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
79	IA Security requirements	Port-Based access Control IAW IEEE 802.1x. (R) Conditional for Core	5.3.1.3.2
80		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
81		Security (R)	5.3.1.3.8
82		Must meet IA requirements IAW UCR 2008, Change 2, 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.

Table 3-1. SUT CRs and FRs (continued)

LEGEND:

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