DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) 16 July 2021

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Joint Interoperability Certification of the Schweitzer Engineering Laboratories, Inc. (SEL)-2740S and SEL-2742S Software Defined Network (SDN) Switches with Software Release R107 and SEL-5056 SDN Flow Controller with Software Release version 2.5

References: (a) Department of Defense Instruction 8100.04, "DoD Unified Capabilities (UC)," 9 December 2010
(b) Office of the Department of Defense Chief Information Officer, "Department of Defense Unified Capabilities Requirements 2013, Change 2," September 2017
(c) through (d), see Enclosure 1

1. Certification Authority. Reference (a) establishes the Joint Interoperability Test Command (JITC) as the Joint Interoperability Certification Authority for the Department of Defense Information Network (DoDIN) products, Reference (b).

2. Conditions of Certification. The Schweitzer Engineering Laboratories, Inc. (SEL)-2740S and SEL-2742S Software Defined Network (SDN) Switches with Software Release R107 and SEL-5056 SDN Flow Controller with Software Release version 2.5, is hereinafter referred to as the System Under Test (SUT). The SUT meets all the critical requirements of the Unified Capabilities Requirements (UCR), Reference (b), as a non-Assured Services Local Area Network (non-ASLAN) L2 Access Switch and is certified for joint use with the conditions as described in Table 1. This certification expires upon changes that affect interoperability, but no later than the expiration date specified in the DoDIN Approved Products List (APL) memorandum.

Table 1. Conditions

Description	Operational Impact	Remarks
UCR Waivers		
1-Year Internet Protocol Version 6 (IPv6) requirements waiver.	Minor	On 18 November 2020, the DoD CIO approved a 1-Year IPv6 requirements waiver for the SUT as a Non-ASLAN Access IP Switch

(Table continues on next page.)

Table 1. Conditions (continued)

Description		Operational Impact	Remarks
TDR#	**Conditions of Fielding (CoFs)**		
SEL-0779-002	EDG-000080: Per Vendor LoC, the SUT partially complies. The SUT supports 802.3 with auto-negotiation and force mode, flow control, filtering, link aggregation, and 802.3X. Due to the SDN nature of the SUT, STP is not needed in the fabric and is not supported. However, the SUT does support configuration to allow transport of STP BPDUs from switches connected to the fabric. See Vendor Application Guide "Setting up a Fully Redundant RSTP-to-SDN Tie Point".	Minor with CoF	DISA adjudicated this discrepancy as minor with CoF: Vendor must include a workaround guide in the MUDG.
TDR#	**Open Test Discrepancies**		
SEL-0779-001	EDG-000055: Per Vendor LoC, the SUT partially complies. The SUT supports Fibre channels IAW RFC 4338, but provides Port status using the Interface Group MIB, not the Fibre Channel Management MIB IAW RFC 4044.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-003	EDG 000130: Per Vendor LoC, the SUT partially complies. The SUT meets these requirements for IPv4. The SUT does not support IPv6.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-006	EDG 000130: Per Vendor LoC, the SUT does not provide network probe functionality IAW RFC 4502. Remote monitoring can be accomplished by configuring the switch to mirror traffic to a remote network-monitoring device.	None UCR Change Requirement	DISA adjudicated this discrepancy as a UCR Change Requirement
SEL-0779-008	EDG-000070: Per Vendor LoC, the SUT does not support IPv6 IAW RFC 2464. The SUT operates on specialized industrial control, Operational Technology (OT) networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-009	EDG-000090: Per Vendor LoC, the SUT does not support IPv6 IAW RFC 2460.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0010	EDG-000120: Per Vendor LoC, SUT does not support IPv6. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0011	EDG-000130: Per Vendor LoC, SUT does not support IPv6. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0012	EDG-000140: Per Vendor LoC, the SUT does not support IPv6. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0013	EDG-000150: Per Vendor LoC, the SUT does not support IPv6 IAW RFC 4291. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0014	EDG-000160: Per Vendor LoC, the SUT does not support IPv6 IAW RFC 4007. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0015	EDG-000520: Per S Vendor LoC, the SUT does not support IPv6 RFC 4443. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver

(Table continues next page.)

Table 1. Conditions (continued)

Description		Operational Impact	Remarks
TDR#	**Open Test Discrepancies** (continued)		
SEL-0779-0016	EDG-000530: Per SEL LoC, the SUT does not support IPv6. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0017	EDG-000540: Per SEL LoC, the SUT does not support IPv6 IAW RFC 4443. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0018	EDG-000560: Per SEL LoC, the SUT does not support IPv6. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver
SEL-0779-0019	EDG-001150: Per SEL LoC, the SUT does not support IPv6 IAW RFC 2474. The SUT operates on specialized industrial control OT networks that are distinct from the DISN network.	Minor with IPv6 Waiver	DISA adjudicated this discrepancy as minor with IPv6 Waiver

LEGEND:

ASLAN	Assured Services Local Area Network	MUDG	Military Unique Deployment Guide
BPDU	Bridge Protocol Data Unit	OT	Operational Technology
CIO	Chief Information Officer	RFC	Request For Comment
CoF	Condition of Fielding	RSTP	Rapid Spanning Tree Protocol
DISA	Defense Information Systems Agency	SDN	Software Defined Network
DISN	Defense Information System Network	SEL	Schweitzer Engineering Laboratories
DoD	Department of Defense	STP	Spanning Tree Protocol
EDG	Edge	SUT	System Under Test
IAW	In Accordance With	TDR	Test Discrepancy Report
IP	Internet Protocol	UCR	Unified Capabilities Requirements
LoC	Letter of Compliance	v	version
MIB	Management Information Base		

3. Interoperability Status. Table 2 provides the SUT interface interoperability status, Table 3 provides the Capability Requirements and Functional Requirements status, and Table 4 provides a DoDIN APL Product Summary, to include subsequent Desktop Review (DTR) updates.

Table 2. Interface Status

Interface (See note 1.)	Applicability (Non-ASLAN)			Status	Remarks
	Co	D	A		
Network Management Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Met	
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	

(Table continues next page.)

Table 2. Interface Status (continued)

Interface (See note 1.)	Applicability (Non-ASLAN)			Status	Remarks
	Co	D	A		
Access (User) Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Not Tested	See note 4.
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseFX)	C	C	C	Met	See note 4.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 4.
IEEE 802.3bz (2.5/5GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ae (10GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3by (25GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3ba (40GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3cd (50GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3ba (100GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3bs (400GBaseX)	C	C	C	Not Tested	See note 3.
Uplink (Trunk) Interfaces (See note 2.)					
IEEE 802.3u (100BaseT UTP)	O	O	O	Met	See note 4.
IEEE 802.3u (100BaseFX)	O	O	O	Met	See note 4.
IEEE 802.3ab (1000BaseT UTP)	O	O	O	Met	See note 4.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 4.
IEEE 802.3bz (2.5/5GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ae (10GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3by (25GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ba (40GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3cd (50GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ba (100GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3bs (400GBaseX)	O	O	O	Not Tested	See note 3.

NOTE(S):
1. The SUT high-level requirements are depicted in Table 3. These high-level requirements refer to a more detailed list of requirements provided in Enclosure 3, Table 3-2.
2. Core, Distribution, and Access products must minimally support one of the interfaces listed in this table as conditional for the given role. Other rates and standards may be provided as optional interfaces.
3. The SUT does not support this Conditional/Optional interface.
4. USAISEC-TIC tested the 100BaseX/1000BaseX interfaces, but not the 10BaseX interfaces. Analysis determined the 10BaseT interfaces are low risk for certification based on the vendor's Letters of Compliance to comply with the IEEE 802.3 standards and the testing data collected at all other data rates.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over Twisted Pair	BaseX	Megabit Ethernet over Fiber or Copper
802.3ae	10 Gbps Ethernet over Fiber	C	Conditional
802.3ba	40/100 Gigabit Ethernet over Twisted pair and Fiber	Co	Core
802.3bs	400 Gbps Ethernet over Fiber	D	Distribution
802.3by	25 Gbps Ethernet over Multi-Mode Fiber	GBaseX	Gigabit Ethernet over Fiber or Copper
802.3bz	2.5/5 Gbps Ethernet over balanced Twisted Pair	Gbps	Gigabits per second
802.3cd	50 Gigabit Ethernet Standard	IEEE	Institute of Electrical and Electronics Engineers
802.3i	10BaseT 10 Mbps Ethernet over Twisted Pair	Mbps	Megabits per second
802.3u	Fast Ethernet at 100 Mbps, copper and Fiber	O	Optional
802.3z	Gigabit Ethernet over Fiber	SUT	System Under Test
A	Access	TIC	Technology Integration Center
ASLAN	Assured Services Local Area Network	USAISEC	U.S. Army Information Systems Engineering Command
BaseFX	Megabit Ethernet over Fiber	UTP	Unshielded Twisted Pair
BaseT	Megabit (Baseband Operation, Twisted Pair) Ethernet		

Table 3. ASLAN Capability Requirements and Functional Requirements Status

CR/FR ID	UCR Requirement (High-Level) (See note 1.)	UCR 2013 Change 2 Reference	Status
1	General LAN Switch and Router Product Requirements (R)	7.2.1	Partially Met (See notes 2, 3, and 4.)
2	LAN Switch and Router Redundancy Requirements (R)	7.2.2	Met (See notes 2, 3 and 4.)
3	LAN Product Requirements Summary (R)	7.2.3	Met (See notes 2, 3 and 4.)
4	Multiprotocol Label Switching (O)	7.2.4	Not Tested (See note 5.)
5	IPv6 (R)	5.2	Not Tested (See note 6.)

NOTE(S):
1. The annotation of "required" refers to a high-level requirement category. Enclosure 3 addresses the applicability of each sub-requirement.
2. A USAISEC TIC-led Cybersecurity test team tested Security and published the results in a separate report, Reference (d).
3. Non-ASLAN DoDIN Products must meet the same interface and functional requirements as ASLAN with the exception of redundancy requirements. Section 6 of Enclosure 3 provides additional details about applicability of UCR 2013 requirements for ASLAN and non-ASLAN implementations.
4. Reference Table 1 for limitations and exceptions.
5. The SUT does not support this optional requirement.
6. On 18 November 2020, the DoD CIO approved a 1-Year IPv6 requirements waiver on for the SUT as a Non-ASLAN Access IP Switch, as noted in Table 1.

LEGEND:

ASLAN	Assured Services Local Area Network	LAN	Local Area Network
CIO	Chief Information Officer	O	Optional
CR	Capability Requirement	R	Required
DoD	Department of Defense	SUT	System Under Test
DoDIN	Department of Defense Information Networks	TIC	Technology Integration Center
FR	Functional Requirement	UCR	Unified Capabilities Requirements
ID	Identification	USAISEC	U.S. Army Information Systems Engineering Command
IPv6	Internet Protocol version 6		

Table 4. DoDIN APL Product Summary

Product Identification			
Product Name	SEL-2740S and SEL-2742S SDN Non-ASLAN Switches and SEL-5056 SDN Flow Controller		
Software Release	SEL-2740S and SEL-2742S: R107, SEL-5056: 2.5		
UCR Product Type(s)	Non-ASLAN Switch		
Product Description	The SEL 2740S and 2742S Series switches deliver voice-class availability, 10BaseT and 100/1000BaseX for switching VoIP, video, and data traffic. The SEL-5056 Flow Controller streamlines SDN configuration and management of the SEL-2740S and SEL-2742S switches.		
DoDIN Certified Function	**Component/Sub-component Name** (See notes 1 and 2.)	**Tested Version**	**Remarks**
OpenFlow Controller	**SEL-5056**	**2.5**	**SDN Flow Controller** (See note 3.)
Non-ASLAN Access	**SEL-2740S**	**R107**	**SDN Switch 20-Port Modular Switch**
	SEL-2742S		**SDN Switch 12-port (Ruggedized) Ethernet and Fiber Switch**

NOTE(S):
1. Table 3-3 of Enclosure 3 provides the detailed component and subcomponent descriptions.
2. Components bolded and underlined were tested by USAISEC-TIC. The other components in the family series were not tested; however, JITC certified the other components for joint use because they utilize the same software and similar hardware as tested and certified components and JITC analysis determined they were functionally identical for interoperability certification purposes.

(Table continues next page.)

Table 4. DoDIN APL Product Summary (continued)

NOTE(S): (continued)
3. The SEL-5056 SDN Flow Controller was used only to upload configuration data to the Layer 2 Non-ASLAN Access switches prior to start of certification testing. The network management capabilities of the SEL-5056 SDN Flow Controller were not tested and are not included in this certification.

LEGEND:

APL	Approved Products List	SEL	Schweitzer Engineering Laboratories, Inc.
ASLAN	Assured Services Local Area Network	SUT	System Under Test
BaseT	Megabit (Baseband Operation, Twisted Pair) Ethernet	TIC	Technology Integration Center
BaseX	Megabit Ethernet over Fiber or Copper	UCR	Unified Capabilities Requirements
DoDIN	Department of Defense Information Network	USAISEC	U.S. Army Information Systems Engineering Command
JITC	Joint Interoperability Test Command	v	Version
SDN	Software Defined Network	VoIP	Voice over Internet Protocol

4. Test Details. JITC based this certification on interoperability testing, review of the Vendor's Letters of Compliance (LoC) and DISA adjudication of open Test Discrepancy Reports (TDRs) for inclusion on the DoDIN APL. The U.S. Army Information Systems Engineering Command (USAISEC) – Mission Engineering Directorate (MED), Technology Integration Center (TIC), hereafter referred to as USAISEC-TIC, conducted testing at Fort Huachuca, Arizona, from 5 April through 16 April 2021 using test procedures derived from Reference (d), and completed review of the Vendor's LoC on 10 May 2021. DISA adjudicated outstanding TDRs on 10 May 2021. A USAISEC-TIC-led Cybersecurity (CS) test team conducted CS testing and published the results in a separate report, Reference (c). Enclosure 2 documents the test results and describes the tested network and system configurations. Enclosure 3 provides the detailed interface, capability, and functional requirements and test results.

5. Additional Information. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Sensitive but Unclassified IP Data (formerly known as NIPRNet) e-mail. Interoperability status information is available via the JITC System Tracking Program (STP). STP is accessible by .mil/.gov users at https://stp.fhu.disa.mil/. Test reports, lessons learned, and related testing documents and references are on the JITC Industry Toolkit (JIT) at https://jit.fhu.disa.mil/. Due to the sensitivity of the information, the CS Assessment Package (CAP) containing the approved configuration and deployment guide must be requested directly from the Approved Products Certification Office (APCO) via e-mail: disa.meade.ie.list.approved-products-certification-office@mail.mil. All associated information is available on the DISA APCO website located at https://aplits.disa.mil/.

JITC Memo, JTE, Joint Interoperability Certification of the Schweitzer Engineering Laboratories, Inc. (SEL)-2740S and SEL-2742S Software Defined Network (SDN) Switches with Software Release R107 and SEL-5056 SDN Flow Controller with Software Release version 2.5

6. Point of Contact (POC). USAISEC-TIC testing POC: Mr. James Hatch; commercial telephone (520) 533 2860; DSN telephone 821-2860; e-mail address: james.d.hatch12.civ@mail.mil. JITC certification POC: Ms. Lisa Esquivel; commercial telephone (520) 538-5531; DSN telephone 879-5531; DSN FAX: 879-4347; e-mail address: lisa.r.esquivel.civ@mail.mil; mailing address: Joint Interoperability Test Command, ATTN: JTE (Ms. Lisa Esquivel), P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The APCO tracking number for the SUT is 2016002.

FOR THE COMMANDER:

CLARK.BRADLEY.ALAN.1231466564 Digitally signed by CLARK.BRADLEY.ALAN.1231466564 Date: 2021.07.16 09:00:05 -07'00'

3 Enclosures a/s

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DoDIN Capabilities Division

Distribution (electronic mail):
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Joint Staff J-6, JCS
ISG Secretariat, DISA, JT
U.S. Strategic Command, J66
USSOCOM J65
USTRANSCOM J6
US Navy, OPNAV N2/N6FP12
US Army, DA-OSA, CIO/G-6, SAIS-CBC
US Air Force, SAF/A6SA
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US Coast Guard, CG-64
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OUSD Intel, IS&A/Enterprise Programs of Record
DLA, Test Directorate, J621C
NSA/DT
NGA, Compliance and Assessment Team
DOT&E
Medical Health Systems, JMIS PEO T&IVV
HQUSAISEC, AMSEL-IE-IS
APCO

ADDITIONAL REFERENCES

(c) U.S. Army Information Systems Engineering Command – Mission Engineering Directorate, Technology Integration Center (USAISEC-MED-TIC), "Cybersecurity Assessment Report for Schweitzer Engineering Laboratories, Inc. SEL-2740S, SEL-2742S, SEL-5056, Firmware Release SEL-2740S-R107, Firmware Release SEL-2742S-R107, Software Release SEL-5056 v2.5 (Tracking Number TN 2016002)," May 2021
(d) Joint Interoperability Test Command, "Assured Services Local Area Network (ASLAN) and Non-ASLAN Test Procedures Version 1.0 for Unified Capabilities Requirements (UCR) 2013 Change 2," October 2017

CERTIFICATION SUMMARY

1. SYSTEM AND REQUIREMENTS IDENTIFICATION. Schweitzer Engineering Laboratories, Inc. (SEL)-2740S and SEL-2742S Software Defined Network (SDN) Switches with Software Release R107 and SEL-5056 SDN Flow Controller with Software Release version 2.5, is hereinafter referred to as the System Under Test (SUT). Table 2-1 depicts the SUT identifying information and requirements source.

Table 2-1. System and Requirements Identification

System Identification	
Sponsor	United States Army
Sponsor Point of Contact	Mr. Jordan Silk, USAISEC MED, Building 53302, Fort Huachuca, Arizona 85613, e-mail: jordan.r.silk.civ@mail.mil
Vendor Point of Contact	Tim Watkins, Schweitzer Engineering Laboratories, Inc. 2350 NE Hopkins Court Pullman, WA 99163, e-mail: Tim_Watkins@selinc.com
System Name	SEL-2740S and SEL-2742S SDN Switches and SEL-5056 SDN Flow Controller
Increment and/or Version	SEL-2740S and SEL-2742S: R107, SEL-5056: 2.5
Product Category	Non-ASLAN L2 Access Switch
System Background	
Previous certifications	None
Tracking	
APCO ID	2016002
System Tracking Program ID	9539
Requirements Source	
Unified Capabilities Requirements	Unified Capabilities Requirements 2013, Change 2 Sections 4.2, 5.2, and 7.2
Remarks	None
Test Organization(s)	USAISEC-MED, TIC, Fort Huachuca, Arizona

LEGEND:

APCO	Approved Products Certification Office	SDN	Software Defined Network
ASLAN	Assured Services Local Area Network	SEL	Schweitzer Engineering Laboratories
ID	Identification	TIC	Technology Integration Center
L2	Layer 2	USAISEC	U.S. States Army Information Systems Engineering Command
MED	Mission Engineering Directorate	v	Version

2. SYSTEM DESCRIPTION. The Unified Capabilities Requirements (UCR) 2013, Change 2, defines two types of Local Area Networks (LANs): Assured Services Local Area Networks (ASLANs) and non-ASLANs. The LANs are designed to meet traffic engineering and redundancy requirements, as required by applicable mission needs. The ASLANs and non-ASLANs may be designed to use any combination of the layers and functional capabilities. ASLANs support assured services and provide enhanced availability and backup power while non-ASLAN need not meet assured services requirements. The Department of Defense Information Network (DoDIN) LAN components for both ASLAN and non-ASLAN are Core, Distribution, and Access switches. The core layer is a high-speed switching backbone designed to switch packets as quickly as possible. The distribution layer is the demarcation point between the access and core layers. The distribution layer helps to define and differentiate the core,

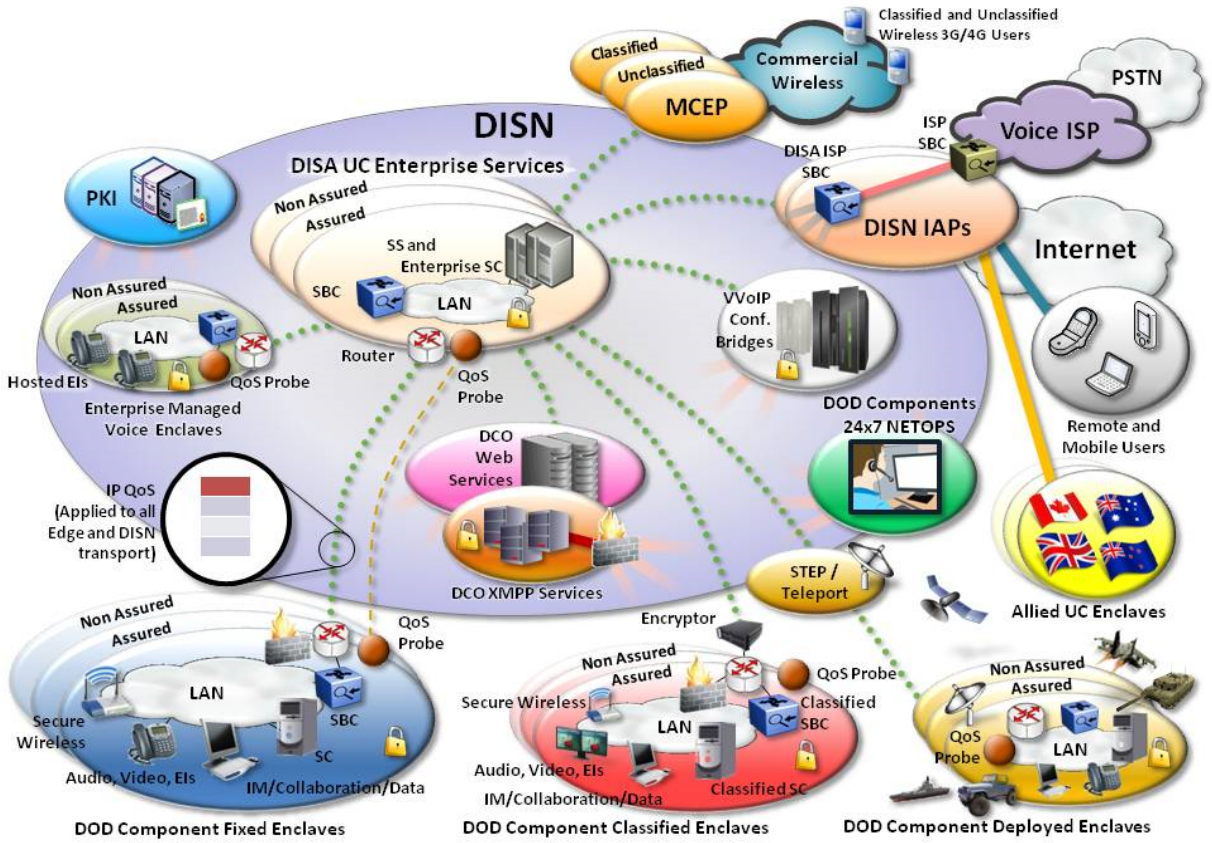
provides boundary definition, and is the place at which packet manipulation can take place. The access layer is the point at which local end users are allowed into the network. This layer may use access lists or filters to optimize further the needs of a particular set of users.

The SUT was tested as a Non-ASLAN Access switch with Ethernet switching capabilities and provides Access layer functionality with Quality of Service (QoS) capabilities using the SEL-5056 SDN Flow Controller for SDN configuration of the SEL-2740S and SEL-2742S switches. The SDN network management capabilities of the SEL-5056 were not tested and are not certified for use. The SUT is available in a 1 rack unit (RU) SEL-2740S switch with five modular slots for copper and fiber Ethernet interface options (in sets of four) and a 1 rack unit (RU) SEL-2742S switch with switch configurations that support 10/100/1000MbE interfaces rates. The SUT is certified as Non-ASLAN Access. Reference Table 1 for limitations and conditions and Table 3-3 in Enclosure 3 for a list of individual components and descriptions.

3. OPERATIONAL ARCHITECTURE. The DoDIN architecture is a two-level network hierarchy consisting of Defense Information Systems Network (DISN) backbone switches and Service/Agency installation switches. The DoD Chief Information Officer (CIO) and Joint Staff policy and subscriber mission requirements determine which type of switch can be used at a particular location. The DoDIN architecture, therefore, consists of several categories of switches. Figure 2-1 depicts the notional operational DoDIN architecture in which the SUT may be used.

4. TEST CONFIGURATION. The test team tested the SUT at USAISEC TIC, Fort Huachuca, Arizona in a manner and configuration similar to that of a notional operational environment depicted in Figure 2.1. The test team verified the SUT's required functions and features by conducting interoperability testing of the Non-ASLAN SUT's components heterogeneously with different Vendor DoDIN Approved Products List (APL) certified products as illustrated in Figures 2-2 and 2-3. Cybersecurity testing used the same configuration.

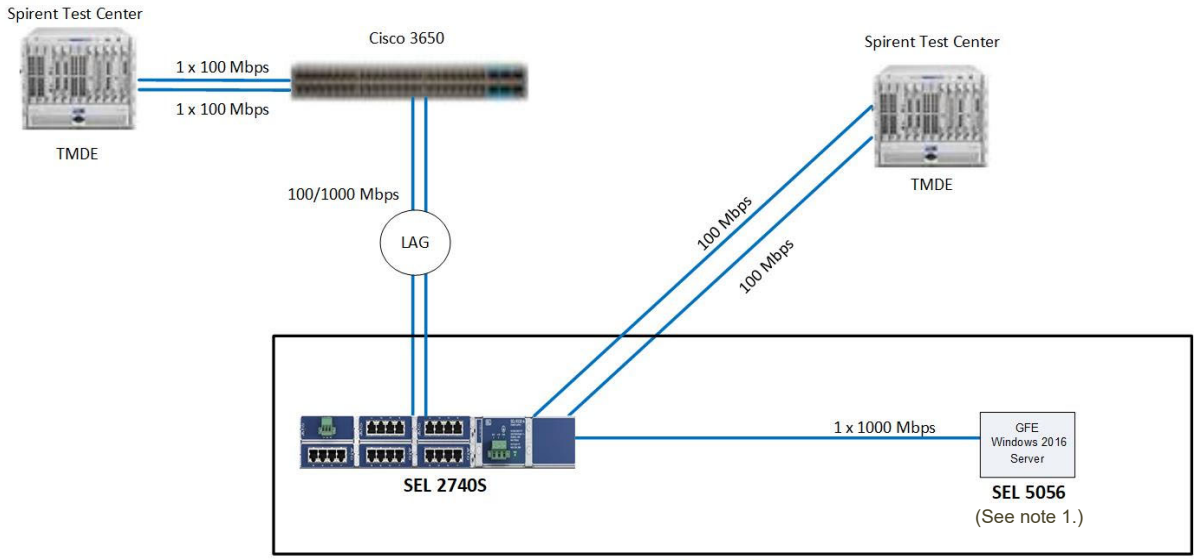
5. METHODOLOGY. The USAISEC-TIC conducted heterogeneous testing of the Non-ASLAN components using LAN requirements derived from the UCR 2013, Change 1, Reference (b), and the test procedures, Reference (c). Heterogeneous testing was performed by placing the SUT components in a LAN comprised of multi-vendor LAN products (see Figures 2-2 and 2-3). These configurations verified the interoperability of the LAN components within a Voice and Video over IP (VVoIP) network. In addition to testing, an analysis of the Vendor's Letter of Compliance (LoC) verified that letter "R" requirements were met. Any discrepancies noted were documented in Test Discrepancy Reports (TDRs). Any new discrepancy noted in the operational environment will be evaluated for impact on the existing certification. These discrepancies will be adjudicated to the satisfaction of DISA via a Vendor POA&M, which will address all new critical TDRs within 120 days of identification.



LEGEND:

DCO	Defense Connection Online	NETOPS	Network Operations
DISA	Defense Information Systems Agency	PKI	Public Key Infrastructure
DISN	Defense Information Systems Network	PSTN	Public Switched Telephone Network
DoD	Department of Defense	QoS	Quality of Service
DoDIN	Department of Defense Information Network	SBC	Session Border Controller
EI	End Instrument	SC	Session Controller
IAP	Internet Access Point	SS	Softswitch
IM	Instant Messaging	STEP	Standardized Tactical Entry Point
IP	Internet Protocol	UC	Unified Capabilities
ISP	Internet Service Provider	VVoIP	Voice and Video over IP
LAN	Local Area Network	XMPP	Extensible Messaging and Presence Protocol
MCEP	Multi Carrier Entry Point		

Figure 2-1. Notional DoDIN Network Architecture



SUT Layer 2 Access (See note 2.)

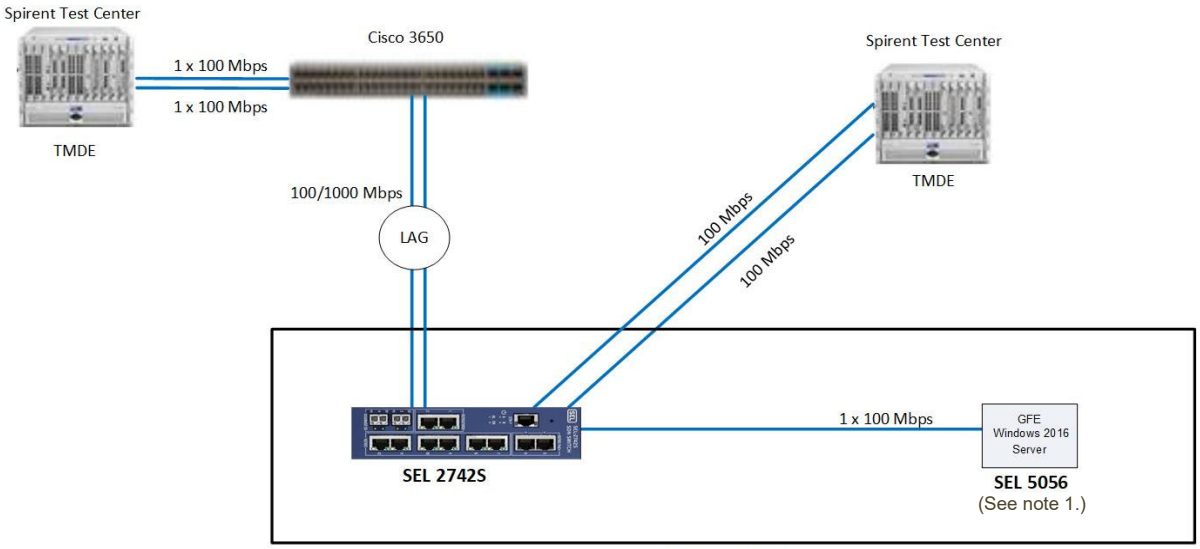
NOTE(S):

1. The SEL-5056 SDN Controller was used only to upload configuration data to the SEL 2740S switch prior to start of certification testing. The network management capabilities of the SEL-5056 SDN Controller were not included in certification testing.
2. USAISEC-TIC tested the SUT 100/1000Mbps interfaces with SEL-2740S Firmware Release R107 and SEL-5056 Software Release 2.5 using Failover, Jitter, Latency, Packet Loss, Blocking Factor and Queue Shaping test procedures, Reference (d). Analysis was based on the test data and review of the Vendor's software release notes and LoC.

LEGEND:

C	Catalyst	SEL	Schweitzer Engineering Laboratories
Mbps	Megabits Per Second	SUT	System Under Test
LAG	Link Aggregation Group	TIC	Technology Integration Center
LoC	Letter of Compliance	TMDE	Test Measurement, and Diagnostic Equipment
R	Release	USAISEC	U.S. Army Information Systems Engineering Command
SDN	Software Defined Network	v	version

Figure 2-2. SEL-2740S Interoperability Layer 2 Access Heterogeneous Tested Configuration



NOTE(S):

1. The SEL-5056 SDN Controller was used only to upload configuration data to the SEL 2742S switch prior to start of certification testing; the network management capabilities of the SEL-5056 SDN Controller were not included in certification testing.
2. USAISEC-TIC tested the SUT 100/1000Mbps interfaces with SEL-2742S Firmware Release R107 and SEL-5056 Software Release 2.5 using Failover, Jitter, Latency, Packet Loss, Blocking Factor and Queue Shaping Analysis test procedures, Reference (d). Analysis was based on the test data and review of the Vendor's software release notes and LoC.

LEGEND:

C	Catalyst	SUT	System Under Test
Mbps	Megabits Per Second	IC	Technology Integration Center
LAG	Link Aggregation Group	TMDE	Test Measurement, and Diagnostic Equipment
LoC	Letter of Compliance	USAISEC	U.S. Army Information Systems Engineering Command
R	Release	v	version
SEL	Schweitzer Engineering Laboratories		

Figure 2-3. SEL-2742S Interoperability Layer 2 Access Heterogeneous Tested Configuration

6. INTEROPERABILITY REQUIREMENTS, RESULTS, AND ANALYSIS. The interface, Capability Requirements (CR) and Functional Requirements (FR), Cybersecurity, and other requirements for DoDIN ASLAN and non-ASLANs are defined by UCR 2013, Change 1, sections 4.2, 5.2, and 7.2. Table 3-1 provides the SUT interface interoperability status, and Table 3-2 provides the Capability Requirements (CR) and Functional Requirements (FR) status. Testing details and results are provided in the following sub-paragraphs.

a. The UCR 2013, Change 2, section 7.2.1 includes the General LAN Switch and Router Product Requirements. Core, Distribution, and Access products shall be capable of meeting the following parameters:

1) The general requirements are listed in the subparagraphs below.

a) Non-blocking: Non-blocking is defined as the capability to send and receive a mixture of 64 to 1518 byte packets at full duplex across all ports, through the component's backplane without losing any packets. In a non-blocking switch, all ports can run at full wire speed without any loss of packets.

b) Blocking: Blocking factor is defined as the ratio of all traffic to non-blocked traffic (i.e., a blocking factor of 8 to 1 means that 12.5 percent of the traffic must be non-blocking.)

1. Access Products. Access products (including PONs that are used as access devices) shall not have a blocking factor that exceeds 8 to 1.

2. Distribution and Core Products: Distribution and Core products shall not have a blocking factor that exceeds 2 to 1.

The SUT met this requirement with testing and the Vendor's LoC. The non-blocking results for all tested components are listed in Enclosure 3, Table 3-3.

c) Latency. All Core, Distribution, and Access products shall have the capability to transport prioritized packets (media and signaling) as follows. The latency shall be achievable over any 5-minute period measured from ingress ports to egress ports under congested conditions. A congested condition is defined as 100 percent bandwidth utilization. Prioritized packets are defined as packets having a service class above best effort. Voice packets may have no more than 2 milliseconds (ms) latency. Voice and video signaling packets may have no more than 2 ms latency. Video packets may have no more than 10 milliseconds (ms) latency. The SUT met this requirement with testing. The SUT measured latencies are shown in Table 2-2.

Table 2-2. SUT Measured Latency

Interface	SUT Measured Latency	UCR Requirement for Voice/Video
10BaseX	Not Tested (See note 1.)	2 ms / 10 ms
100BaseX	Not Tested (See note 1.)	2 ms / 10 ms
1000BaseX	0.038 ms voice / 0.038 ms video (See note 1 and 2.)	2 ms / 10 ms
2.5GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
5GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
10GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
25GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
40GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
50GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
100GBaseX	Not Tested (See note 3.)	2 ms / 10 ms
400GBaseX	Not Tested (See note 3.)	2 ms / 10 ms

NOTE(S):
1. USAISEC-TIC tested the 1000 Mbps interfaces but not the 10/100BaseX interface. JITC analysis determined the 10/100BaseX interface was low risk for certification based on the Vendor's Letter of Compliance to comply with the IEEE 802.3z standards and the testing data collected at all other data rates.
2. The SUT measured latency was captured E2E. Based on analysis of the E2E measurement, USAISEC TIC determined that the SUT met the component latency requirements.
3. The SUT does not support this interface.

LEGEND:

802.3z	Gigabit Ethernet over Fiber	Mbps	Megabits per second
BaseX	Megabit Ethernet over Fiber or Copper	ms	millisecond
E2E	End-to-end	SUT	System Under Test
GBaseX	Gigabit Ethernet over Fiber or Copper	TIC	Technology Integration Center
IEEE	Institute of Electrical and Electronics Engineers	UCR	Unified Capabilities Requirements
JITC	Joint Interoperability Test Command	USAISEC	U.S. Army Information Systems Engineering Command

d) Jitter. All Core, Distribution, and Access products shall have the capability to transport prioritized packets (media and signaling) as follows. The jitter shall be achievable over any five-minute period measured from ingress ports to egress ports under congested conditions. Congested condition is defined as 100 percent bandwidth utilization. Voice packets may have no more than 1 ms jitter. Video packets may have no more than 10 ms jitter. The SUT met this requirement with testing. The SUT measured jitter for each interface is shown in Table 2-3.

Table 2-3. SUT Measured Jitter

Interface	SUT Measured Jitter	UCR Requirement for Voice/Video
10BaseX	Not Tested (See note 1.)	1 ms / 10 ms
100BaseX	Not Tested (See note 1.)	1 ms / 10 ms
1000BaseX	0.025 ms voice / 0.017 ms video (See note 1 and 2.)	1 ms / 10 ms
2.5GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
5GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
10GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
25GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
40GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
50GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
100GBaseX	Not Tested (See note 3.)	1 ms / 10 ms
400GBaseX	Not Tested (See note 3.)	1 ms / 10 ms

1. USAISEC-TIC tested the 1000 Mbps interfaces but not the 10/100BaseX interface. JITC analysis determined the 10/100BaseX interface was low risk for certification based on the Vendor's Letters of Compliance to comply with the IEEE 802.3z standards and the testing data collected at all other data rates.
2. The SUT measured jitter was captured E2E. Based on analysis of the E2E measurement, USAISEC TIC determined that the SUT met the component jitter requirements.
3. The SUT does not support this interface.

LEGEND:

802.3z	Gigabit Ethernet over Fiber	Mbps	Megabits per second
E2E	End-to-end	ms	millisecond
BaseX	Megabit Ethernet over Fiber or Copper	SUT	System Under Test
GBaseX	Gigabit Ethernet over Fiber or Copper	TIC	Technology Integration Center
IEEE	Institute of Electrical and Electronics Engineers	UCR	Unified Capabilities Requirements
JITC	Joint Interoperability Test Command	USAISEC	U.S. Army Information Systems Engineering Command

e) Packet Loss. All Core, Distribution and Access products shall have the capability to transport prioritized packets (media and signaling) as follows. The packet loss shall be achievable over any 5-minute period measured from ingress ports to egress ports under congested conditions. Congested condition is defined as 100 percent bandwidth utilization. The SUT met this requirement with testing. The SUT measured packet loss for each interface is shown in Table 2-4.

Table 2-4. SUT Measured Packet Loss

Interface	SUT Measured Packet Loss				UCR Requirement			
	Voice	Video	Preferred Data	Best Effort Data	Voice	Video	Preferred Data	Best Effort Data
10BaseX	Not Tested (See note 1.)				0.015%	0.05%	0.05%	No minimum requirement in the UCR
100BaseX	Not Tested (See note 1.)				0.015%	0.05%	0.05%	
1000BaseX (See note 1.)	0.00%	0.00%	0.00%	0.00%	0.015%	0.05%	0.05%	
2.5GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
5GbaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
10GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
25GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
40GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
50GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
100GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
400GBaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	

NOTE(S):
1. USAISEC-TIC tested the 1000 Mbps interfaces but not the 10/100BaseX interface. JITC analysis determined the 10/100BaseX interface was low risk for certification based on the Vendor's Letters of Compliance to comply with the IEEE 802.3z standards and the testing data collected at all other data rates.
2. The SUT does not support this interface.

LEGEND:

802.3z	Gigabit Ethernet over Fiber	Mbps	Megabits per second
BaseX	Megabit Ethernet over Fiber or Copper	SUT	System Under Test
GBaseX	Gigabit Ethernet over Fiber or Copper	TIC	Technology Integration Center
IEEE	Institute of Electrical and Electronics Engineers	UCR	Unified Capabilities Requirements
JITC	Joint Interoperability Test Command	USAISEC	U.S. Army Information Systems Engineering Command

2) Port Interface Rates Requirements

a) Minimally, Core and Distribution products shall support the following interface rates [other rates and Institute of Electronics and Electrical Engineers (IEEE) standards maybe provided as optional interfaces]. Rates specified are the theoretical maximum data bit rate specified for Ethernet; link capacity and effective throughput is influenced by many factors. For calculation purposes, link capacities are to be calculated IAW definitions contained in Request for Comments (RFC) 2330 and RFC 5136. Network Management (NM) interfaces are defined in Section 2.19. Core products that support assured services shall have a minimum of 4 interfaces for connecting to WAN and Distribution products. Distribution products that support assured services shall have a minimum of 4 fiber interfaces for interconnecting to the core, peer distribution, and access products.

The product must minimally support one or more of the following fiber interfaces.

- 1 Gbps IAW IEEE 802.3ab
- 1 Gbps IAW IEEE 802.3z
- 10 Gbps IAW IEEE 802.3ae.
- 10 Gbps IAW IEEE 802.3an
- 40 Gbps IAW IEEE 802.3ba (single mode fiber).
- 100 Gbps IAW IEEE 802.3ba (single mode fiber).

The SUT met this requirement with testing, analysis and the Vendor's LoC. The SUT met this requirement with 1Gigabit per second (Gbps) interfaces.

b) Minimally, Access products shall provide one of the following user-side interface rates (other rates and IEEE standards may be provided as optional interfaces).

- 10 Mbps IAW IEEE 802.3i.
- 10 Mbps IAW IEEE 802.3j.
- 100 Mbps IAW IEEE 802.3u.
- 1000 Mbps IAW IEEE 802.3z.
- 1000 Mbps IAW IEEE 802.3ab.
- 10 Gbps IAW IEEE 802.3ae.

The SUT met this requirement with testing, analysis and the Vendor's LoC for 10/100/1000 Megabits per second (Mbps) interfaces. See Table 3-3 in Enclosure 3 for a list of individual components and descriptions.

c) Minimally, Access products shall provide one of the following access to distribution interface rates (other rates and IEEE standards may be provided as optional interfaces).

- 1 Gbps IAW IEEE 802.3ab
- 1 Gbps IAW IEEE 802.3z
- 10 Gbps IAW IEEE 802.3ae.
- 10 Gbps IAW IEEE 802.3an
- 40 Gbps IAW IEEE 802.3ba (single mode fiber).
- 100 Gbps IAW IEEE 802.3ba (single mode fiber).

The SUT met this requirement with testing, analysis and the Vendor's LoC for 1Gbps interfaces.

d) Access product that support assured services and more than 96 telephony subscribers shall have a minimum of two 1 Gbps fiber interfaces to connect to the distribution layer. Reference Table 3-3 in Enclosure 3 for a list of individual components and descriptions. The SUT met this requirement with testing, analysis and the Vendor's LoC.

e) The Core, Distribution, and Access products may provide a fibre channel interface IAW American National Standards Institute (ANSI) International Committee for Information Technology Standards (INCITS) T11.2 and T11.3 (previously known as X3T9.3). Fibre channel was not submitted for certification. If provided, the interface must meet the following RFCs:

- RFC 4338, Transmission of Internet Protocol version 6 (IPv6), IPv4, and Address Resolution Protocol (ARP) Packets over Fibre Channel.
- RFC 4044, Fibre Channel Management.

The SUT does support this requirement for IPv4, but not support IPv6. On 18 November 2020, the DoD CIO approved a 1-Year IPv6 requirements waiver for the SUT as a Non-Assured Services Local Area Network (Non-ASLAN) Access IP Switch, as noted in Table 1.

f) The Core, Distribution, and Access products may provide one or more of the following wireless LAN interface rates:

- 54 Mbps IAW IEEE 802.11a.
- 11 Mbps IAW IEEE 802.11b.
- 54 Mbps IAW IEEE 802.11g.
- 300–600 Mbps IAW IEEE 802.11n.

- 500 – 1000 Mbps IAW IEEE 802.11ac.
- IEEE 802.16-2012: Broadband wireless communications standards for MANs.
- Other approved IEEE wireless interfaces may be implemented as optional interfaces.

The SUT does not support the optional wireless interfaces.

g) If any of the above wireless interfaces are provided, then the interfaces must support the requirements of Section 7.3, Wireless LAN. The SUT does not support the optional wireless interfaces.

3) Port Parameter Requirements. The Core, Distribution, and Access products shall provide the parameters on a per port basis as specified in the following subparagraphs. These are required for core, distribution, and Layer 2 (L2)/Layer 3 (L3) access unless specified otherwise.

a) Auto-negotiation IAW IEEE 802.3. All interfaces shall support auto-negotiation even when the IEEE802.3 standard has it as optional. This applies to 10/100/1000-T Ethernet standards (i.e., IEEE Ethernet Standard 802.3, 1993; or IEEE, Fast Ethernet Standard 802.3u, 1995; and IEEE, Gigabit Ethernet Standard 802.3ab, 1999). The SUT met this requirement with the Vendor's LoC.

b) Force mode IAW IEEE 802.3. The SUT met this requirement with the Vendor's LoC.

c) Flow control IAW IEEE 802.3x (Optional: Core). The SUT met this requirement with the Vendor's LoC.

d) Filtering IAW appropriate RFC 1812 sections (sections applying to filtering). The SUT meets this requirement with the Vendor's Military Unique Deployment Guide (MUDG).

e) Link Aggregation IAW IEEE 802.1AX (applies to output/egress trunk-side ports only) (Optional Access). For non-ASLAN product certification, Core, Distribution, or Access products do not have to meet link aggregation failover requirements. The SUT meets this requirement with the Vendor's MUDG.

f) Spanning Tree Protocol IAW IEEE 802.1D (Optional: Core). The SUT meets this requirement with the Vendor's MUDG.

g) Multiple Spanning Tree IAW IEEE 802.1s (Optional: Core). The SUT meets this requirement with the Vendor's MUDG.

h) Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w (Optional: Core). The SUT meets this requirement with the Vendor's MUDG.

i) Port-Based Access Control IAW IEEE 802.1x (Optional: Core, Distribution, and Access). The SUT met this requirement with Vendor's LoC.

j) Link Layer Discovery Protocol (LLDP) IAW IEEE 802.1AB (Optional Core, Distribution, and Access). The SUT meets this requirement with the Vendor's MUDG.

k) Link Layer Discovery – Media Endpoint Discovery IAW ANSI/ Telecommunications Industry Association (TIA)-1057 (Optional Core, Distribution, and Access). The SUT met this requirement with the Vendor's LoC.

l) Power over Ethernet (PoE) IAW either 802.3af-2003 or 802.3at-2009. (Required only for VVoIP solutions; for data applications or non-Assured Services (AS) solutions, PoE is optionally required.) Per analysis of Vendor's documentation, the SUT does not support PoE 802.3af-2003 or 802.at-2009 for VVoIP hard phones and other PoE-dependent subtending equipment. The SUT met this requirement with the Vendor's LoC.

m) Shortest Path Bridging (SPB) [Optional]. If supported, the product shall provide shortest path bridging (SPB) IAW RFC 6329 and IEEE 802.1aq. (Note: Requires IS-IS as routing protocol.) The SUT does not support this optional SPB requirement.

n) Transparent Interconnection of Lots of Links (TRILL) [Optional]. If supported, the product shall provide TRILL IAW RFCs 6325, 6326, 6327, 6349, and 6350. Devices may support conditional interfaces (FCoE and PPP). If the conditional interfaces are provided RFCs 6847 (FCoE) and 6361 (PPP) shall be applicable. (Note: Requires IS-IS as routing protocol.) The SUT does not support this optional TRILL requirement.

4) Class of Service Markings Requirements

a) The Core, Distribution, and Access products shall support Differentiated Services Code Points (DSCPs) IAW RFC 2474 for both Internet Protocol (IP) IPv4 and IPv6 Packets, as follows:

1. Core and Distribution Products. The Core and Distribution products shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and assign that packet to a Quality of Service (QoS) behavior listed in Section 7.2.1.6, Quality of Service Features. The SUT met this requirement with testing and the Vendor's LoC.

2. Core and Distribution Products. The Core and Distribution products shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and reassign that packet to any new DSCP value (0-63). Current DSCP values are provided in Section 6.3.2, Traffic Conditioning Specification. (Optional: Access products). The SUT met this requirement with testing and the Vendor's LoC.

3. Core and Distribution Products. The Core and Distribution products must be able to support the prioritization of aggregate service classes with queuing according to Section

7.2.1.6, Quality of Service Features. The SUT met this requirement with testing and the Vendor's LoC.

4. Access products. Access products shall be capable of supporting the prioritization of aggregate service classes with queuing according to Section 7.2.1.6, Quality of Service Features. Queuing may be supported in either of the two following class of service (CoS) methods:

The SUT supports IPV4 requirements, but does not support IPv6. On 18 November 2020, the DoD CIO approved a 1-Year IPv6 requirements waiver for the SUT as a Non-Assured Services Local Area Network (Non-ASLAN) Access IP Switch).

b) Layer 3 CoS. Layer 3 CoS involves support for DSCP IAW RFC 2474 for IPv4 and IPv6. Within this CoS method, the access product shall support queuing by either: a) queuing directly based on the DSCP within the IP header (IPv4 and IPv6). The original DSCP value must also be preserved and passed unaltered through the product; or, b) The product shall inspect the IP header (IPv4 and IPv6). Based on the DSCP value contained within the IP header, the product may map the DSCP value (0-63) to the Ethernet priority field (decimal values 0-7). Queuing may be based on the mapping of the DSCP to a layer 2 priority field value. Any received DSCP value (0-63) must be able to be mapped to any priority value (0-7). The original DSCP value must be preserved and passed unaltered through the product. The SUT met this requirement for IPv4 with testing and the Vendor's LoC. On 18 November 2020, the DoD CIO approved a 1-Year Internet Protocol Version 6 (IPv6) requirements waiver on for the SUT as a Non-ASLAN Access IP Switch

c) Layer 2 CoS. Layer 2 CoS shall use the Virtual LAN identification (VLAN ID), see Section 7.2.1.4, defined in IEEE 802.1Q to perform queuing assignment. Access devices shall be capable of assigning any VLAN ID (either directly or through the 3 Ethernet priority bits (decimal values 0 through 7) to any of the 4 queues. The SUT met this requirement with the Vendor's LoC.

d) The Core, Distribution, and Access products may support the 3-bit user priority field of the IEEE 802.1Q 2-byte Tag Control Information (TCI) field (see Figure 7.2-1, IEEE 802.1Q Tagged Frame for Ethernet, and Figure 7.2-2, TCI Field Description). Default values are provided in Table 7.2-1, 802.1Q Default Values. If provided, the following Class of Service (CoS) requirements apply:

1. Core, Distribution, and Access Products. The Core, Distribution, and Access products shall be capable of accepting any frame tagged with a user priority value (0–7) on an ingress port and assign that frame to a QoS behavior listed in Section 7.2.1.6, Quality of Service Features. The SUT met this requirement with Vendor's LoC.

2. Core and Distribution Products. The Core and Distribution products shall be capable of accepting any frame tagged with a user priority value (0-7) on an ingress port and reassign that frame to any new user priority value (0-7) (Optional: Distribution and Access). The SUT met this requirement with Vendor's LoC.

5) Virtual LAN Capabilities Requirements

a) The Core, Distribution, and Access products shall be capable of the following:

1. Accepting Virtual Local Area Network (VLAN) tagged frames according to IEEE 802.1Q (see Figure 7.2-1, IEEE 802.1Q Tagged Frame for Ethernet, and Figure 7.2-2, TCI Field Description). The SUT met this requirement with testing and the Vendor's LoC.

2. Configuring VLAN IDs (VIDs). VIDs on an ingress port shall be configurable to any of the 4094 values (except 0 and 4095). The SUT met this requirement with testing and the Vendor's LoC.

3. Supporting VLANs types IAW IEEE 802.1Q. The SUT met this requirement with testing and the Vendor's LoC.

b) The DoDIN products must be capable of accepting VLAN tagged frames and assigning them to the VLAN identified in the 802.1Q VID field (see Figure 7.2-4, IEEE 802.1Q-Based VLANs). The SUT met this requirement with testing and the Vendor's LoC.

6) Protocol Requirements. The Core, Distribution, and Access products shall meet protocol requirements for IPv4 and IPv6. The RFC requirements are listed in UCR 2013, Change 2, Table 7.2-2, ASLAN Infrastructure RFC Requirements. Additional IPv6 requirements by product profile are listed in UCR 2013, Change 2, Section 5, IPv6. These RFCs are not meant to conflict with DoD Cybersecurity policy [e.g., Security Technical Implementation Guidelines (STIGs)]. Whenever a conflict occurs, DoD Cybersecurity policy takes precedence. If a conflict occurs with Section 5, RFCs applicable to IPv6 in Section 5 take precedence. The SUT demonstrated support for all IPv4 protocols through testing and the Vendor's LoC. On 18 November 2020, the DoD CIO approved a 1-Year IPv6 requirements waiver on for the SUT as a Non-ASLAN Access IP Switch

7) Quality of Service Features Requirements

a) The Core, Distribution, and Access products shall be capable of the following QoS Features:

1. Providing a minimum of four queues. The SUT met this requirement with testing and Vendor's LoC.

2. Assigning any incoming access/user-side "tagged" session to any of the queues for prioritization onto the egress (trunk-side/network-side) interface. The SUT met this requirement with testing and the Vendor's LoC.

3. Supporting Differentiated Services (DS), Per-Hop Behaviors (PHBs), and traffic conditioning IAW RFCs 2474, 2597, and 3246. The SUT met this requirement with testing and the Vendor's LoC.

4. All queues shall be capable of having a bandwidth (BW) assigned (i.e., queue 1: 200 Kbps, queue 2: 500 kbps) or percentage of traffic (queue 1: 25 percent, queue 2: 25 percent). The BW or traffic percentage shall be fully configurable per queue from 0 to full BW or 0 to 100 percent. The sum of configured queues shall not exceed full BW or 100 percent of traffic. The SUT met this requirement with testing and the Vendor's LoC.

5. Core, Distribution, and Access products shall meet the traffic conditioning (policing) requirements of Section 6.2.4. The product shall calculate the bandwidth associated with traffic conditioning, which requires that the queue size should account for the Layer 3 header (i.e., IP header), but not the Layer 2 headers (i.e., Point-to-Point Protocol [PPP], MAC, and so on) within a margin of error of plus or minus10 percent. When the other queues are not saturated, the Best Effort traffic may surge beyond its traffic-engineered limit. The SUT met this requirement with testing and the Vendor's LoC.

6. Optionally provide a minimum of six queues (see Six-Queue Design). The SUT was tested with four queues.

b) The product shall support the Differentiated Services Code Point (DSCP) plan, as shown in Table 7.2-3, DSCP Assignments. DS assignments shall be software configurable for the full range of six bit values (0-63 Base10) for backwards compatibility with IP precedence environments that may be configured to use the Type of Service (TOS) field in the IP header but do not support DSCP. The SUT met this requirement with testing and the Vendor's LoC.

8) Network Monitoring Requirements. The Core, Distribution, and Access products shall support the following network monitoring features:

a) Simple Network Management Protocol Version 3 (SNMPv3) IAW RFCs 3411, 3412, 3413, 3414, 3415, 3416, and 3417. The SUT met this requirement with testing and Vendor's LoC.

1. Remote Monitoring (RMON) IAW RFC 2819. The product shall minimally support the following RFC 2819 groups: Ethernet statistics, history control, Ethernet history, and alarm. The SUT met this requirement with the Vendor's LoC.

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

3. The Advanced encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. The SUT met this requirement with the Vendor's LoC.

9) Security Requirements. The Core, Distribution, and Access products shall meet the security protocol requirements listed in Section 4, Cybersecurity, as follows: Core and Distribution products shall meet all requirements annotated as Router (R) and LAN Switch (LS).

Access switches shall meet the cybersecurity requirements annotated for LS. In addition to wireless cybersecurity requirements previously specified, Wireless Local Area Network Access Systems (WLASs) and Wireless Access Bridges (WABs) shall meet all cybersecurity requirements for LSs. Wireless End Instruments (WEIs) shall meet all cybersecurity requirements annotated for End Instruments (EIs). When conflicts exist between the Unified Capabilities Requirements (UCR) and STIG requirements, the STIG requirements will take precedence. The SUT met the requirements in the UCR 2013, Change 2, Section 4, with the Vendor's LoC. In addition, a USAISEC-TIC-led Cybersecurity test team conducted Security testing and published the results in a separate report, Reference (d).

b. The UCR 2013, Change 2, section 7.2.2 includes the LAN Switch and Router Redundancy Requirements. The ASLAN (High and Medium) shall have no single point of failure that can cause an outage of more than 96 IP telephony subscribers. A single point of failure up to and including 96 subscribers is acceptable; however, to support mission-critical needs, FLASH/FLASH OVERRIDE (F/FO) subscribers should be engineered for maximum availability. To meet the availability requirements, all switching/routing platforms that offer service to more than 96 telephony subscribers shall provide redundancy in either of two ways:

- The product itself (Core, Distribution, or Access) provides redundancy internally.
- A secondary product is added to the ASLAN to provide redundancy to the primary product (redundant connectivity required).

This requirement is no applicable for non_ASLAN products.

1) **Single Product Redundancy Requirements**. If a single product is used to meet the redundancy requirements, then the following requirements are applicable to the product.

- Dual Power Supplies
- Dual Processors (Control Supervisors)
- Termination Sparing
- Redundancy Protocol
- No Single Failure Point
- Switch Fabric or Backplane Redundancy
- In the event of a component failure in the product, all calls that are active shall not be disrupted (loss of existing connection requiring redialing) and all traffic flows shall be restored within 5 seconds.

This requirement is not applicable for non-ASLAN products.

2) **Dual Product Redundancy Requirements**. If the SUT provides redundancy through dual products, then the requirements in the following subparagraphs are applicable. Non-ASLAN products do not need to meet any redundancy requirements because they are non-assured.

a) The failover over to the secondary product must not result in any lost calls (loss of existing connection requiring redialing).

b) Failover to the secondary product shall complete within 5 seconds with all traffic flows restored.

This requirement is not applicable for non-ASLAN products.

3) **Survivability**. An ASLAN product is required to use routing protocols IAW the DoD Information Technology (IT) Standards Registry (DISR) to provide survivability. The minimum routing protocols that must be supported are as follows:

- The product shall support Border Gateway Protocol (BGP) for inter-domain routing. The SUT was not submitted for this optional requirement.
- The product shall support Open Shortest Path First (OSPF), Version 2, for IPv4 and OSPF Version 3 for IPv6, July 2008, and IAW RFC 5340. The SUT met this requirement with testing and the Vendor's LoC.
- If OSPF is Supported, the product shall support OSPFv2 Graceful restart (RFC 3623) and OSPFv3 Graceful Restart (RFC 5187). The SUT met this requirement with testing and the Vendor's LoC.
- If the Intermediate System to Intermediate System (IS-IS) protocol is supported, IS-IS shall be compliant with RFC 1195 – "Use of OSI IS-IS for Routing in TCP/IP and Dual Environments", 1990; RFC 2763 – "Dynamic Host Name Exchange Mechanism for IS-IS", 2000; RFC 2966 – "Domain-wide Prefix Distribution with Two-Level IS-IS", 2000; and RFC 3373 – "Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies", 2002. For IPv6, IS-IS shall meet RFC 5340, Routing Ipv6 with IS-IS. This optional requirement was not submitted for this SUT; therefore, it was not tested and is not included in this certification.
- Graceful Restart for BGP (RFC 4724) is required for core and distribution infrastructure products. This requirement is not applicable for non-ASLAN products.
- The product shall support Virtual Router Redundancy Protocol (VRRP) – RFCs 2787 and RFC 5798 - to provide redundancy to Layer 2 switches that lose connectivity to a Layer 3 router. The Distribution product shall employ VRRP to provide survivability to any product running Layer 2 (normally the Access Layer). This requirement is not applicable for non-ASLAN products.

c. The UCR 2013, Change 2, section 7.2.3 includes the LAN Product Requirements Summary. Table 7.2-4 summarizes the LAN product requirements. These requirements were verified via a combination of Letter(s) of Compliance (LoCs) are addressed in other sections of this document. The SUT met these requirements with testing and the Vendor's LoC. See Table 3-3 in Enclosure 3 for a list of individual components and descriptions.

d. The UCR 2013, Change 2, section 7.2.4 includes the Multiprotocol Label Switching Requirements in ASLANs. The implementation of ASLANs sometimes may cover a large geographical area. For large ASLANs, a data transport technique referred to as Multiprotocol Label Switching (MPLS) may be used to improve the performance of the ASLAN core layer.

1) **MPLS ASLAN**. An ASLAN product that implements MPLS must still meet all the ASLAN requirements for jitter, latency, and packet loss. The addition of the MPLS protocol must not add to the overall measured performance characteristics with the following caveats: The MPLS device shall reroute data traffic to a secondary pre-signaled Label Switched Path (LSP) in less than 5 seconds upon indication of the primary LSP failure. The ASLAN Core and Distribution products that will be used to provide MPLS services must support the RFCs contained in Table 7.2-5, ASLAN Product MPLS Requirements. This optional requirement was not submitted for this SUT; therefore, it was not tested and is not included in this certification.

2) **MPLS VPN Augmentation to VLANs**. If an ASLAN product supports MPLS, it shall support MPLS layer 2 VPNS IAW RFC 4762. The product may additionally support RFC 4761 and RFC 5501. ASLAN products that support MPLS shall also support MPLS layer 3 VPNs IAW RFC 4364, RFC 4382, RFC 4577, RFC 4659, and RFC 4684. The MPLS device must support QoS in order to provide for assured services. The product must support one of the following QoS mechanisms: DSCP mapping to 3 bit EXP field (E-LSP) or Label description of PHB (L-LSP). This optional requirement was not submitted for this SUT; therefore, it was not tested and is not included in this certification.

7. HARDWARE/SOFTWARE/FIRMWARE VERSION IDENTIFICATION: Table 3-3 in Enclosure 3 provides the SUT components' hardware, software, and firmware tested. USAISEC-TIC tested the SUT in an operationally realistic environment to determine its interoperability capability with associated network devices and network traffic. Table 3-4 in Enclosure 3 provides the hardware, software, and firmware of the components used in the test infrastructure.

8. TESTING LIMITATIONS. None.

9. CONCLUSION(S). The SUT meets the critical interoperability requirements for Layer 2 Access switches in accordance with the UCR, Reference (b), and is certified for joint use with other products listed on the DoDIN APL with the conditions described in Table 1.

DATA TABLES

Table 3-1. Interface Status

Interface (See note 1.)	Applicability (Non-ASLAN)			Status	Remarks
	Co	D	A		
Network Management Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Not Tested	See note 4.
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	See note 4.
Access (User) Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Not Tested	See note 4.
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseFX)	C	C	C	Met	See note 4.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 4.
IEEE 802.3bz (2.5/5GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ae (10GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3by (25GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3ba (40GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3cd (50GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3ba (100GBaseX)	C	C	C	Not Tested	See note 3.
IEEE 802.3bs (400GBaseX)	C	C	C	Not Tested	See note 3.
Uplink (Trunk) Interfaces (See note 2.)					
IEEE 802.3u (100BaseT UTP)	O	O	O	Met	See note 4.
IEEE 802.3u (100BaseFX)	O	O	O	Met	See note 4.
IEEE 802.3ab (1000BaseT UTP)	O	O	O	Met	See note 4.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 4.
IEEE 802.3bz (2.5/5GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ae (10GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3by (25GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ba (40GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3cd (50GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3ba (100GBaseX)	O	O	O	Not Tested	See note 3.
IEEE 802.3bs (400GBaseX)	O	O	O	Not Tested	See note 3.

NOTE(S):
1. The SUT high-level requirements are depicted in Table 3. These high-level requirements refer to a more detailed list of requirements provided in Enclosure 3, Table 3-2.
2. Core, Distribution, and Access products must minimally support one of the interfaces listed in this table as conditional for the given role. Other rates and standards may be provided as optional interfaces.
3. The SUT does not support this Conditional/Optional interface.
4. USAISEC-TIC tested the 100BaseX/1000BaseX interfaces, but not the 10BaseX interfaces. Analysis determined the 10BaseX interfaces are low risk for certification based on the vendor's Letters of Compliance to comply with the IEEE 802.3 standards and the testing data collected at all other data rates.

(Table continues next page.)

Table 3-1. Interface Status (continued)

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over Twisted Pair	C	Conditional
802.3ae	10 Gbps Ethernet over Fiber	Co	Core
802.3ba	40/100 Gigabit Ethernet over Twisted pair and Fiber	D	Distribution
802.3bs	400 Gbps Ethernet over Fiber	GBaseX	Gigabit Ethernet over Fiber or Copper
802.3by	25 Gbps Ethernet over Multi-Mode Fiber	Gbps	Gigabits per second
802.3bz	2.5/5 Gbps Ethernet over balanced Twisted Pair	IEEE	Institute of Electrical and Electronics Engineers
802.3cd	50 Gigabit Ethernet Standard	Mbps	Megabits per second
802.3i	10BaseT 10 Mbps Ethernet over Twisted Pair	O	Optional
802.3u	Fast Ethernet at 100 Mbps, copper and Fiber	SUT	System Under Test
802.3z	Gigabit Ethernet over Fiber	TIC	Technology Integration Center
A	Access	TN	Tracking Number
BaseFX	Megabit Ethernet over Fiber	USAISEC	U.S. Army Information Systems Engineering Command
BaseT	Megabit (Baseband Operation, Twisted Pair) Ethernet	UTP	Unshielded Twisted Pair
BaseX	Megabit Ethernet over Fiber or Copper		

Table 3-2. Capability and Functional Requirements and Status

CR/FR ID	Capability/Function	Applicability (See note 1.)	UCR 2013 Change 2 Reference	Status
1	**General LAN Switch and Router Product**			
	Port Interface Rates	Required	7.2.1.1	Partially Met (See notes 2 and 3.)
	Port Parameter	Required	7.2.1.2	Met (See note 4.)
	Class of Service Markings	Required	7.2.1.3	Met (See note 2.)
	Virtual LAN Capabilities	Required	7.2.1.4	Met
	Protocol Requirements	Required	7.2.1.5	Partially Met (See note 2 and 3.)
	Quality of Service Features	Required	7.2.1.6	Met
	Network Monitoring	Required	7.2.1.7	Met
	Security	Required	7.2.1.8	Met (See note 5.)
2	**LAN Switch and Router Redundancy**			
	Single Product Redundancy	Optional	7.2.2.1	N/A (See note 6.)
	Dual Product Redundancy	Optional	7.2.2.2	N/A (See note 6.)
	Survivability	Required	7.2.2.3	Met
3	**LAN Product Requirements Summary**			
	LAN Product Requirements Summary	Optional	7.2.3	Met
4	**Multiprotocol Label Switching**			
	MPLS ASLAN	Optional	7.2.4.1	Not Tested (See note 7.)
	MPLS VPN Augmentation to VLANs	Optional	7.2.4.2	Not Tested (See note 7.)

NOTE(S):
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in UCR 2013, Change 2, Reference (b). The SUT is not required to provide conditional requirements; however, if the SUT provides a capability, it must function according to the specified requirements.
2. The DoD CIO was approved a 1-year IPv6 requirements waiver for the SUT as a Non-ASLAN Access IP Switch, as noted in Table 1.

(Table continues next page.)

Table 3-2. Capability and Functional Requirements and Status (continued)

NOTE(S): (continued)
3. Reference Table 1 for limitations and exceptions.
4. The SUT does not support the optional SPB or TRILL requirements.
5. A USAISEC-TIC-led Cybersecurity test team conduced Security testing and published the results in a separate report, Reference (d).
6. The redundancy requirements do not apply to non-ASLAN products.
7. The SUT does not support this Optional requirement.

LEGEND:

ASLAN	Assured Services Local Area Network	RSTP	Rapid Spanning Tree Protocol
CIO	Chief Information Officer	SDN	Software Defined Network
CR	Capability Requirement	SPB	Shortest Path Bridging
DoD	Department of Defense	SUT	System Under Test
FR	Functional Requirements	TIC	Technology Integration Center
ID	Identification	TRILL	Transparent Interconnection of Lots of Links
IPv6	Internet Protocol version 6	UCR	Unified Capabilities Requirements
LAN	Local Area Network	USAISEC	U.S. Army Information Systems Engineering Command
MPLS	Multiprotocol Label Switching	VLAN	Virtual Local Area Network
MUDG	Military Unique Deployment Guide	VPN	Virtual Private Network
PoE	Power over Ethernet		

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor

Component (See note 1.)	Tested Version	Sub-component (See notes 1 and 2.)	Description	Blocking Factor (See note 3.)	
				C/D	A
SEL-5056 (See note 4.)	**2.5**	N/A	**SDN Flow Controller**	N/A	N/A
SEL-2740S with Sub-components					
SEL-2740S Non-ASLAN Access	**R107**	**SEL-9620-0023**	**1000BASE-SX Multimode, No conformal coating, Multimode Fiber (Max distance: 500 m), 1Gbps, 4 ports, IEEE 802.3z**	N/A	**Met**
		SEL-9620-0024	**1000BASE-SX Multimode, with conformal coating, Multimode Fiber (Max distance: 500 m), 1Gbps, 4 ports, IEEE 802.3z**	N/A	**Met**
		SEL-9620-0008	**10/100/1000BASE-T RJ45, (1000Mbps on slot D only), No conformal coating, Copper, 4 ports, IEEE 802.3i, 802.3u, and 802.3ab**	N/A	**Met**
		SEL-9620-0010	**10/100/1000BASE-T RJ45, (1000Mbps on slot D only), With conformal coating, Copper, 4 ports, IEEE 802.3i, 802.3u, and 802.3ab**	N/A	**Met**
		SEL-9620-0007	SDN Flow Processor, Mechanical Relay Contact, No conformal coating	N/A	Met
		SEL-9620-0002	SDN Flow Processor, Mechanical Relay Contact, No conformal coating	N/A	Met
		SEL-9620-0009	SDN Flow Processor, Mechanical Relay Contact, With conformal coating	N/A	Met
		SEL-9620-0004	SDN Flow Processor, Mechanical Relay Contact, With conformal coating	N/A	Met
		SEL-9620-0003	10/100/1000BASE-T RJ45, (1000Mbps on slot D only), No conformal coating, Copper, 4 ports, IEEE 802.3i, 802.3u, and 802.3ab	N/A	Met
		SEL-9620-0005	10/100/1000BASE-T RJ45, (1000Mbps on slot D only), With conformal coating, Copper, 4 ports, IEEE 802.3i, 802.3u, and 802.3ab	N/A	Met

(Table continues next page.)

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor (continued)

Component (See note 1.)	Tested Version	Sub-component (See notes 1 and 2.)	Description	Blocking Factor (See note 3.)	
				C/D	A
SEL-2740S with Sub-components (continued)					
SEL-2740S Non-ASLAN Access (continued)	**R107**	SEL-9620-0019	100BASE-FX Multimode (Max distance: 2 km), No conformal coating, 4 ports, IEEE 802.3u	N/A	Met
		SEL-9620-0012	100BASE-FX Multimode (Max distance: 2 km), No conformal coating, 4 ports, IEEE 802.3u	N/A	Met
		SEL-9620-0025	100BASE-FX Multimode, (Max distance: 2 km), with conformal coating, 4 ports, IEEE 802.3u	N/A	Met
		SEL-9620-0015	100BASE-FX Multimode, (Max distance: 2 km), with conformal coating, 4 ports, IEEE 802.3u	N/A	Met
		SEL-9620-0020	1000BASE-LX Single-mode, (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0013	1000BASE-LX Single-mode, (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0021	1000BASE-LX Single-mode, (Max distance: 10 km), With conformal coating,4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0016	1000BASE-LX Single-mode, (Max distance: 10 km), With conformal coating,4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0011	1000BASE-SX Multimode, No conformal coating, Multimode Fiber (Max distance: 500 m), 1Gbps, 4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0014	1000BASE-SX Multimode, with conformal coating, Multimode Fiber (Max distance: 500 m), 1Gbps, 4 ports, IEEE 802.3z	N/A	Met
		SEL-9620-0026	100BASE-LX10 Single-mode (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3ah	N/A	Met
		SEL-9620-0017	100BASE-LX10 Single-mode (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3ah	N/A	Met
		SEL-9620-0022	100BASE-LX10 Single-mode (Max distance: 10 km), With conformal coating, 4 ports, IEEE 802.3ah	N/A	Met
		SEL-9620-0018	100BASE-LX10 Single-mode (Max distance: 10 km), With conformal coating, 4 ports, IEEE 802.3ah	N/A	Met
		SEL-9620-0029	1000BASE-EX Single-mode Fiber (Max distance: 40 km), No conformal coating, 4 ports, Non-IEEE standard	N/A	Met
		SEL-9620-0027	1000BASE-EX Single-mode Fiber (Max distance: 40 km), No conformal coating, 4 ports, Non-IEEE standard	N/A	Met
		SEL-9620-0030	1000BASE-EX Single-mode Fiber (Max distance: 40 km), With conformal coating, 4 ports, Non-IEEE standard	N/A	Met
		SEL-9620-0028	1000BASE-EX Single-mode Fiber (Max distance: 40 km), With conformal coating, 4 ports, Non-IEEE standard	N/A	Met
		SEL-9620-0031	10BASE-FL Fiber (Max distance: 2 km), No conformal coating, 4 ports, IEEE 802.3j,	N/A	Met
		SEL-9620-0033	10BASE-FL Fiber (Max distance: 2 km), No conformal coating, 4 ports, IEEE 802.3j	N/A	Met
		SEL-9620-0032	10BASE-FL Fiber (Max distance: 2 km), With conformal coating, 4 ports, IEEE 802.3j, 10BASE-FL	N/A	Met

(Table continues next page.)

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor (continued)

Component (See note 1.)	Tested Version	Sub-component (See notes 1 and 2.)	Description	Blocking Factor (See note4 3.)	
				C/D	A
SEL-2740S with Sub-components (continued)					
SEL-2740S Non-ASLAN Access (continued)	**R107**	SEL-9620-0034	10BASE-FL Fiber (Max distance: 2 km), With conformal coating, 4 ports, IEEE 802.3j,10BASE-FL	N/A	Met
		SEL-9620-0037	1000BASE-SX (2) 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 500 m), No conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3z	N/A	Met
		SEL-9620-0035	1000BASE-SX (2) 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 500 m), No conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3z,	N/A	Met
		SEL-9620-0038	1000BASE-SX (2) 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 500 m), With conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3z	N/A	Met
		SEL-9620-0036	1000BASE-SX (2) 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 500 m), With conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3z	N/A	Met
		SEL-9620-0041	1000BASE-LX (2) 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3ah	N/A	Met
		SEL-9620-0039	1000BASE-LX (2), 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 10 km), No conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3ah	N/A	Met
		SEL-9620-0042	1000BASE-LX (2), 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 10 km), With conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3ah	N/A	Met
		SEL-9620-0040	1000BASE-LX (2), 10/100/1000BASE-T RJ45 (2), Copper, Fiber (Max distance: 10 km), With conformal coating, 4 ports, IEEE 802.3i, 802.3u, 802.3ab, and 802.3ah	N/A	Met
SEL-2742S Components					
2742S#B948	**R107**	N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), Conformal coating, DIN Rail mount	N/A	Met
2742S#N6GB		N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), Conformal coating, Surface mount	N/A	Met
2742S#C479		N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), No conformal coating, Side DIN Rail mount	N/A	Met
2742S#2CH7		N/A	**4x 100BASE-SX, 8 x 10/100BASE-T, No conformal coating, DIN Rail mount**	**N/A**	**Met**
2742S#8MBM		N/A	**4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, DIN Rail mount**	**N/A**	**Met**

(Table continues next page.)

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor (continued)

Component (See note 1.)	Tested Version	Sub-component (See note 1.)	Description	Blocking Factor (See note 3.)	
				C/D	A
SEL-2742S Components (continued)					
2742S#46B7		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, DIN Rail mount	N/A	Met
2742S#CBBK		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, Surface mount	N/A	Met
2742S#7NF8		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, DIN Rail mount	N/A	Met
2742S#HBKJ		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, Surface mount	N/A	Met
2742S#7J6N		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, Side DIN Rail mount	N/A	Met
2742S#H2BM		N/A	2 x 1000BASE-SX, 2 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#B4G9		N/A	4x 100BASE-SX, 8 x 10/100BASE-T, No conformal coating, Surface mount	N/A	Met
2742S#M7MG		N/A	4x 100BASE-SX, 8 x 10/100BASE-T, Conformal coating, DIN Rail mount	N/A	Met
2742S#MHF6		N/A	4x 100BASE-SX, 8 x 10/100BASE-T, Conformal coating, Surface mount	N/A	Met
2742S#H698		N/A	4x 100BASE-SX, 8 x 10/100BASE-T, No conformal coating, Side DIN Rail mount	N/A	Met
2742S#6KJN	**R107**	N/A	4x 100BASE-SX, 8 x 10/100BASE-T, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#KD7J		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, No conformal coating, DIN Rail mount	N/A	Met
2742S#CD96		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, No conformal coating, Surface mount	N/A	Met
2742S#2CCG		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, Conformal coating, DIN Rail mount	N/A	Met
2742S#JCBM		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, Conformal coating , Surface mount	N/A	Met
2742S#6GB8		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, No conformal coating , Side DIN Rail mount	N/A	Met
2742S#C98G		N/A	2 x 1000BASE-SX, 2 x 1000BASE-LX, 8 x 10/100BASE-T, Conformal coating , Side DIN Rail mount	N/A	Met
2742S#D4FN		N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, No conformal coating , DIN Rail mount	N/A	Met
2742S#89BN		N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, No conformal coating , Surface mount	N/A	Met
2742S#HD9N		N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, Conformal coating , DIN Rail mount	N/A	Met

(Table continues next page.)

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor (continued)

Component (See note 1.)	Tested Version	Sub-component (See note 1.)	Description	Blocking Factor (See note 3.)	
				C/D	A
SEL-2742S Components (continued)					
2742S#CKC4	**R107**	N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, Conformal coating , Surface mount	N/A	Met
2742S#C6B9		N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, No conformal coating , Side DIN Rail mount	N/A	Met
2742S#CK22		N/A	2 x 10/100/1000BASE-T, 2 x 1000BASE-SX 2 x 10/100BASE-T. 2 x 100BASE-LX 4 x 100BASE-FX, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#DCFG		N/A	4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, Surface mount	N/A	Met
2742S#2G7H		N/A	4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, DIN Rail mount	N/A	Met
2742S#C8GB		N/A	4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, Surface mount	N/A	Met
2742S#FDBC		N/A	4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, No conformal coating, Side DIN Rail mount	N/A	Met
2742S#M466		N/A	4 x 10/100/1000BASE-T, 8 x 10/100BASE-T, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#692J		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, No conformal coating, DIN Rail mount	N/A	Met
2742S#NC6K		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, No conformal coating, Surface mount	N/A	Met
2742S#K69F		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, Conformal coating, DIN Rail mount	N/A	Met
2742S#2JDD		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, Conformal coating, Surface mount	N/A	Met
2742S#28CF		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, No conformal coating, Side DIN Rail mount	N/A	Met
2742S#CJJ2		N/A	4 x 1000BASE-LX, 6 x 100BASE-FX, 2 x 10/100BASE-T, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#JDKM		N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, No conformal coating, DIN Rail mount	N/A	Met
2742S#M67M		N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, No conformal coating, Surface mount	N/A	Met
2742S#NMN8		N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, Conformal coating, DIN Rail mount	N/A	Met
2742S#F7D4		N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, Conformal coating, Surface mount	N/A	Met
2742S#FH9F		N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, No conformal coating, Side DIN Rail mount	N/A	Met

(Table continues next page.)

Table 3-3. SUT Hardware/Software/Firmware Version Identification with Interface Card Blocking Factor (continued)

Component (See note 1.)	Tested Version	Sub-component (See note 1.)	Description	Blocking Factor (See note 3.)	
				C/D	A
SEL-2742S Components (continued)					
2742S#9DC9	**R107**	N/A	4 x 1000Mbps single-mode fiber (40km), 8 x 10/100Mbps Ethernet, Conformal coating, Side DIN Rail mount	N/A	Met
2742S#4JB6		N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), No conformal coating, DIN Rail mount	N/A	Met
2742S#M4H2		N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), No conformal coating, Surface mount	N/A	Met
2742S#GCFH		N/A	4 x 1000Mbps single-mode fiber (40km), 2 x 10/100Mbps Ethernet, 6 x 100Mbps multi-mode fiber (802.3u), Conformal coating, Side DIN Rail mount	N/A	Met

NOTE(S):

1. Components bolded and underlined were tested by USAISEC-TIC. The other components in the family series were not tested; however, JITC certified the other components for joint use because they utilize the same software and similar hardware as tested and certified components and JITC analysis determined they were functionally identical for interoperability certification purposes.
2. The SEL-2740S sub-components are supported only in the 20 port Modular SDN Switch.
3. Blocking factor is defined as the ratio of all traffic to non-blocked traffic (i.e., a blocking factor of 8 to 1 means that 12.5 percent of the traffic must be non-blocking). Access products shall not have a blocking factor that exceeds 8 to 1. Distribution and Core products shall not have a blocking factor that exceeds 2 to 1.
4. The SEL-5056 SDN Flow Controller was used only to upload configuration data to the Non-ASLAN Access switches prior to start of certification testing. The network management capabilities of the SEL-5056 SDN Flow Controller were not tested and are not included in this certification.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted Pair	D	Distribution
802.3ah	Ethernet in the First Mile	DIN	Deutsches Institut fur Normung
802.3i	10BaseT 10 Mbps Ethernet over twisted Pair	Gbps	Gigabits per second
802.3j	10BaseFX 10 Mbps over optical fiber	IEEE	Institute of Electrical and Electronics Engineers
802.3u	Fast Ethernet at 100 Mbps, copper and fiber	JITC	Joint Interoperability Test Command
802.3z	Gigabit Ethernet over Fiber	km	Kilometer
A	Access	m	Meter
ASLAN	Assured Services Local Area Network	Mbps	Megabits per second
Base-EX	Ethernet transmission	N/A	Not Applicable
Base-FL	Multimode fiber optic cable	RJ45	Registered Jack connector with eight pins
Base-FX	Megabit Ethernet over Fiber	SDN	Software Defined Network
Base-LX	5 km over 10 µm single-mode fiber	SEL	Schweitzer Engineering Laboratories, Inc.
Base-SX	optical fiber Gigabit Ethernet standard for operation over multi-mode fiber	SUT	System Under Test
		TIC	Technology Integration Center
BaseT	Megabit (Baseband Operation, Twisted Pair) Ethernet	µm	Micrometer or Micron
C	Core	USAISEC	U.S. Army Information Systems Engineering Command

Table 3-4. Test Infrastructure Hardware/Software/Firmware Version Identification

System Name	Software Release	Function
Required Ancillary Equipment (Site-Provided)		
Windows Server	2012 Enterprise SP1 UGM Army Server 2012R2	Active Directory
Windows 10 Enterprise SP1 Army Golden Master Windows 10	Kiwi v9.6	SysLog Server
Test Network Components		
Windows Server (Site-Provided)	Windows 2016 Standard (AGM) 10.0.14393	Host for SEL-5056 SDN Flow Controller v2.5
Cisco 3650	IOS 16.9	Heterogeneous Interoperability
Spirent TestCenter	v4.95	TMDE

LEGEND:

AGM	Army Golden Master	SysLog	System Log
R	Release	TMDE	Test, Measurement and Diagnostic Equipment
SDN	Software Defined Network	UGM	Universal Golden Master
SP	Service Pack	v	Version
SUT	System Under Test		