DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) 28 August 2018

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Joint Interoperability Certification of the Aruba 2930F Switch Series, Software Release 16.04

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 Aruba 2930F Switch Series with Software Release 16.04, hereinafter referred to as the System Under Test (SUT), meets the critical requirements of the Unified Capabilities Requirements, Reference (b), and is certified for joint use as an Assured Services Local Area Network (ASLAN) Layer 2 Access Switch, with the conditions 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

Condition	Operational Impact	Remarks
Not applicable; The Aruba 2930F Switch Series with software release 16.04 meets all of the Unified Capabilities Requirements (UCR), Reference (b) joint critical interoperability requirements as an Assured Services Local Area Network (ASLAN) Layer 2 Access Switch.		

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

Table 2. Interface Status

Interface (See note 1.)	Applicability (ASLAN)			Status	Remarks
	Co	D	A		
Network Management Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Not Tested	See note 3.
IEEE 802.3u (100BaseT UTP)	C	C	C	Not Tested	See note 3.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	
Access (User) Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseFX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Not Tested	See note 5.
IEEE 802.3ae (10GBaseX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ba (40GBaseX)	O	O	O	Not Tested	See note 5.
IEEE 802.3ba (100GBaseX)	O	O	O	Not Tested	See note 5.
Uplink (Trunk) Interfaces (See note 2.)					
IEEE 802.3u (100BaseT UTP)	O	O	O	Not Tested	See note 5.
IEEE 802.3u (100BaseFX)	O	O	O	Not Tested	See note 5.
IEEE 802.3ab (1000BaseT UTP)	O	O	O	Not Tested	See note 5.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 6.
IEEE 802.3ae (10GBaseX)	C	C	C	Met	
IEEE 802.3ba (40GBaseX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ba (100GBaseX)	C	C	C	Not Tested	See note 5.

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. Testing on management ports was performed on the 1 Gbps interfaces. JITC analysis determined the 10BaseX and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at higher data rates.
4. All Access (User) link testing was performed on the 1 Gbps interfaces. JITC analysis determined the 10BaseX and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at higher data rates.
5. The SUT does not support this Conditional/Optional interface.
6. All Uplink (Trunk) testing was performed on the 10 Gbps interfaces. JITC analysis determined the 1000BaseX interface are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3ab standards and the testing data collected at higher data rates.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps	C	Conditional
802.3ae	10 Gbps Ethernet	Co	Core
802.3ba	40 and 100 Gigabit Ethernet Architecture	D	Distribution
802.3i	10BaseT Mbps over twisted pair	GBaseX	Gbps Ethernet over Fiber or Copper
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	Gbps	Gigabits per second
		IEEE	Institute of Electrical and Electronics Engineers
802.3z	Gigabit Ethernet Standard	JITC	Joint Interoperability Test Command
A	Access	LoC	Letter of Compliance
ASLAN	Assured Services Local Area Network	Mbps	Megabits per second
BaseFX	Mbps Ethernet over Fiber	O	Optional
BaseT	Mbps (Baseband Operation, Twisted Pair) Ethernet	SUT	System Under Test
BaseX	Mbps Ethernet over Fiber or Copper	UTP	Unshielded Twisted Pair

Table 3. ASLAN Capability Requirements and Functional Requirements Status

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

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 JITC Cybersecurity test team conducted Security testing and published the results in a separate report, Reference (d).
3. The redundancy requirements do not apply to the SUT when deployed as a standalone Access switch because it supports less than 96 subscribers. When used in a stacked configuration, the SUT has multiple power supplies, switch fabrics, and processors and meets this requirement.
4. The SUT does not support this optional requirement.

LEGEND:

ASLAN	Assured Services Local Area Network	LAN	Local Area Network
CR	Capability Requirement	O	Optional
FR	Functional Requirement	R	Required
ID	Identification	SUT	System Under Test
JITC	Joint Interoperability Test Command	UCR	Unified Capabilities Requirements

Table 4. SUT Product and Certification Summary

Product Identification			
Product Name	Aruba 2930F		
Software Release	16.04		
DoDIN Product Type(s)	ASLAN Access Switch		
Product Description	ASLAN Layer 2 Access Switch		
DoDIN Certified Function	**Component/Sub-component Name (See notes 1 and 2)**	**Tested Version**	**Remarks**
ASLAN L2 Access	**Aruba 2930F**	16.04	Access Switch

NOTE(S):
1. Enclosure 3 provides the detailed component and subcomponent list.
2. Components bolded and underlined were tested by JITC. 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 components and JITC analysis determined they were functionally identical for interoperability certification purposes.

LEGEND:

ASLAN	Assured Services Local Area Network	L2	Layer 2
DoDIN	Department of Defense Information Network	SUT	System Under Test
JITC	Joint Interoperability Test Command		

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 the inclusion on the DoDIN APL. JITC conducted IO testing at the Global Information Grid Network Test Facility, Fort Huachuca, Arizona, from 16 July 2018 through 3 August 2018 using test procedures derived from Reference (c). Review of the vendor's LoC completed on 3 August 2018. A JITC Cybersecurity (CS) test team conducted CS testing and published the results in a separate report, Reference (d). Enclosure 2 documents the test results and describes the tested network and system configurations. Enclosure 3 provides a detailed list of the 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 Internet Protocol (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 Joint 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 DoDIN 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 http://www.disa.mil/Network-Services/UCCO.

6. Point of Contact (POC). JITC certification POC: Ms. Sibylle Gonzales; commercial phone (520) 538-5483; DSN 879-5483; e-mail address: sibylle.j.gonzales.civ@mail.mil; mailing address: Joint Interoperability Test Command, ATTN: JTE (Ms. Sibylle Gonzales), P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The APCO tracking number for the SUT is 1802502.

FOR THE COMMANDER:

CLARK.BRADLEY.ALAN.1231466564 Digitally signed by CLARK.BRADLEY.ALAN.1231466564 Date: 2018.08.28 14:03:36 -07'00'

3 Enclosures a/s

for RIC HARRISON
Chief
Networks/Communications &
DoDIN Capabilities Division

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NSG Interoperability Assessment Team
DOT&E, Netcentric Systems and Naval Warfare
Medical Health Systems, JMIS IV&V
HQUSAISEC, ELIE-ISE-ME
APCO

ADDITIONAL REFERENCES

(c) Joint Interoperability Test Command, "Assured Services Local Area Network (ASLAN) and Non-ASLAN Test Procedures Version 1.2 for Unified Capabilities Requirements (UCR) 2013 Change 2," November 2017
(d) Joint Interoperability Test Command, "Cybersecurity Assessment Report for Aruba 2930F Series Switch (Tracking Number 1802502)," Draft, August 2018

CERTIFICATION SUMMARY

1. SYSTEM AND REQUIREMENTS IDENTIFICATION. The Aruba 2930F Switch Series with Software Release 16.04 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	Ms. Susan Scotten, e-mail: susan.scotten@hpe.com , phone: 916-785-8742
System Name	Aruba 2930F
Increment and/or Version	16.04
Product Category	ASLAN Layer 2 Access Switch
System Background	
Previous certifications	none
Tracking	
APCO ID	1802502
System Tracking Program ID	8383
Requirements Source	
Unified Capabilities Requirements	Unified Capabilities Requirements 2013, Change 2 Section 4.2, 5.2, and 7.2
Remarks	None
Test Organization(s)	JITC, Fort Huachuca, Arizona

LEGEND:

APCO	Approved Products Certification Office	JITC	Joint Interoperability Test Command
ASLAN	Assured Services Local Area Network	MED	Mission Engineering Directorate
ID	Identification	USAISEC	U.S. Army Information Systems Engineering Command

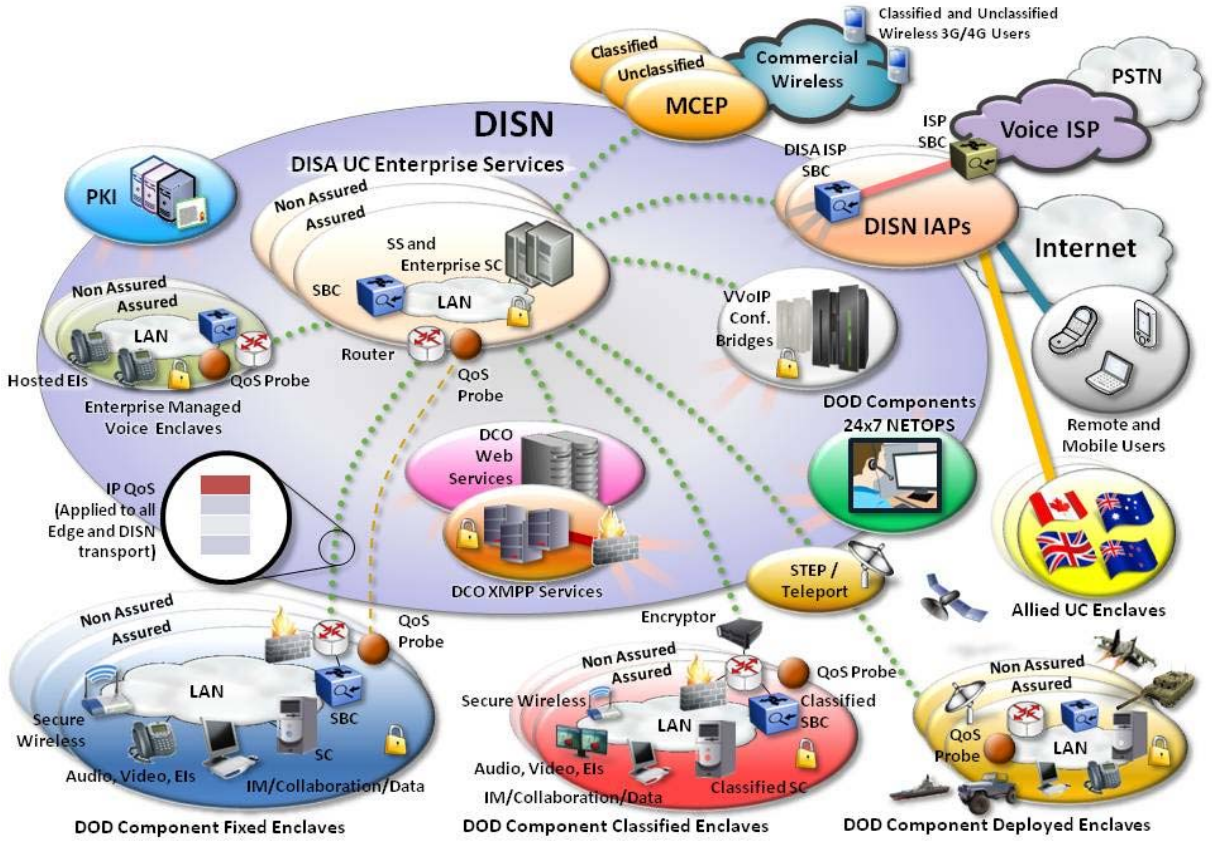
2. SYSTEM DESCRIPTION. The Unified Capabilities Requirements (UCR) 2013, Change 2, defines two types of Local Area Networks (LANs): Assured Services Local Area Networks (ASLANs) and Non-ASLANs. The LANs are designed to meet traffic engineering and redundancy requirements, as required by applicable mission 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 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 Aruba 2930F Switch Series is a Layer 2 Ethernet Switch that has 10/100/1000baseT with up to 30 Watts of PoE+ support on 24 or 48 downlink ports. The Uplinks support either 1 Gbps SFP or 10 Gbps SFP+ Transceivers. Switching functions include Virtual Switch Framework (VSF) Stacking.

3. OPERATIONAL ARCHITECTURE. The Department of Defense Information Network (DoDIN) architecture is a two-level network hierarchy consisting of Defense Information Systems Network (DISN) backbone switches and Service/Agency installation switches. The Department of Defense (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 Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona in a manner and configuration similar to that of a notional operational environment depicted in Figure 2-1. Testing of the ASLAN L2 Access functions was conducted heterogeneously with Juniper and Brocade DoDIN Approved Products List (APL) certified products. Figure 2-2 and Figure 2-3 depicts the high-level test network configuration typically used for heterogeneous testing, and is performed by placing the SUT components into an ASLAN which is produced by a different manufacturer. SUT testing in a heterogeneous test environment verifies the interoperability of the ASLAN components within Voice and Video over IP network (VVoIP). Cybersecurity testing used the same configuration.

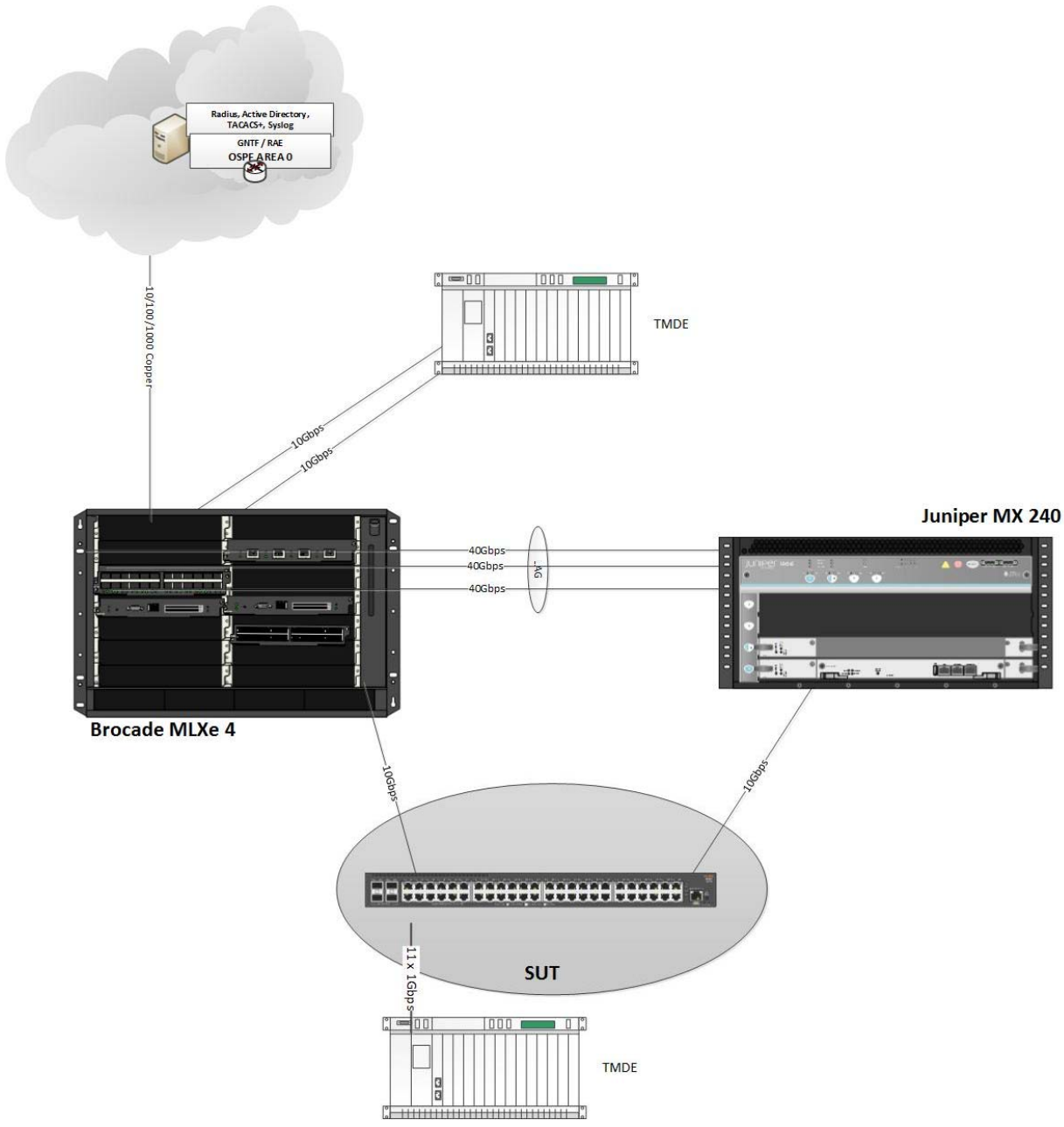
5. METHODOLOGY. JITC conducted heterogeneous testing using ASLAN requirements derived from the UCR 2013, Change 2, Reference (b), and the test procedures, Reference (c). In addition to testing, an analysis of the vendor's Letters of Compliance (LoC) verified that letter "R" requirements have been met. Any discrepancies noted were documented in Test Discrepancy Reports (TDRs). The vendor submitted Plan of Action and Milestones (POA&M) as required. 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 Defense Information Systems Agency (DISA) via a vendor POA&M, which will address all new critical TDRs within 120 days of identification.



LEGEND:

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

Figure 2-1. Notional DoDIN Network Architecture

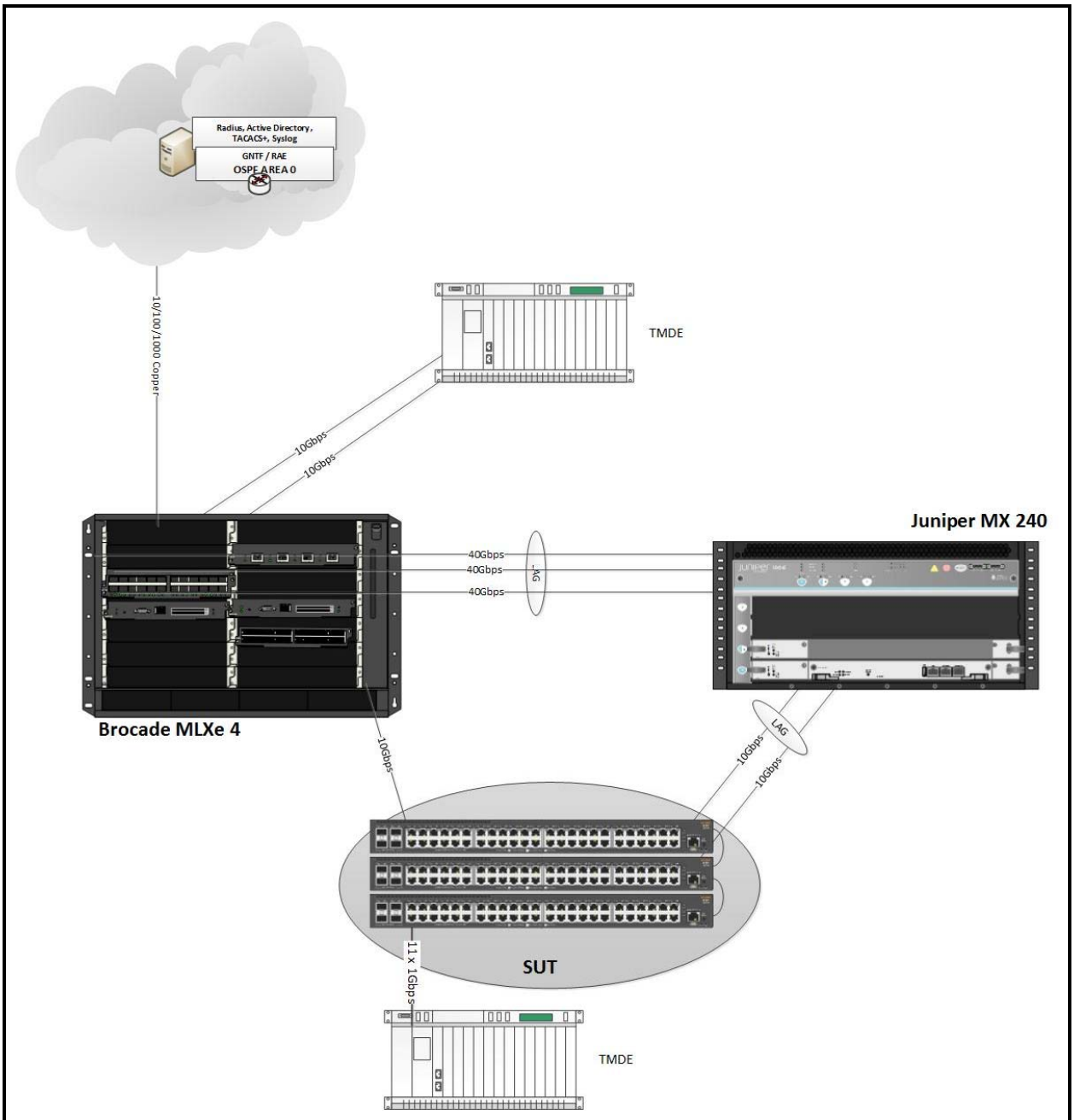


NOTE(S): The Aruba 2930F switch was tested and certified as a standalone Layer 2 Access switch.

LEGEND:

Gbps	Gigabit per second	OSPF	Open Shortest Path First
GNTF	Global Information Grid Network Test Facility	SUT	System Under Test
LAG	Link Aggregation Group	Syslog	System Log
RADIUS	Remote Authentication Dial-In User Service	TACACS	Terminal Access Controller Access Control System
RAE	Required Ancillary Equipment	TMDE	Test, Measurement, & Diagnostic Equipment

Figure 2-2. SUT Single Switch Architecture with Heterogeneous Test Configuration



NOTE(S): The Aruba 2930F switch was tested and certified in a stacked configuration as a Layer 2 Access switch

LEGEND:

Gbps	Gigabit per second	OSPF	OPEN SHORTEST PATH FIRST
GNTF	Global Information Grid Network Test Facility	SUT	System Under Test
LAG	Link Aggregation Group	Syslog	System Log
RADIUS	Remote Authentication Dial-In User Service	TACACS	Terminal Access Controller Access Control System
RAE	Required Ancillary Equipment	TMDE	Test, Measurement, & Diagnostic Equipment

Figure 2-3. SUT Stacked Architecture with Heterogeneous Test 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 2, sections 4.2, 5.2, and 7.2. Table 3-1 provides the SUT interface interoperability status, and Table 3-2 provides the CR and 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. The SUT met this requirement with testing and the vendor's LoC. When not stacked, the switch performs at line rate (1 to 1). The blocking factor results are listed in Enclosure 3, Table 3-3.

2. Distribution and Core Products. Distribution and Core products shall not have a blocking factor that exceeds 2 to 1. The SUT was tested as an Access switch and this requirement does not apply. The blocking factor results 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 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	0.09 ms voice / 0.10 ms video latency	2 ms / 10 ms
10000BaseX	0.09 ms voice / 0.10 ms video latency	2 ms / 10 ms
40000BaseX	Not Tested (See note 2.)	2 ms / 10 ms
100000BaseX	Not Tested (See note 2.)	2 ms / 10 ms

NOTE(S):
1. All testing was performed on the 1 and 10 Gbps interfaces. JITC analysis determined the 10 and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at all other data rates.
2. The SUT does not support this interface.

LEGEND:

802.3i	10BaseT 10 Mbps Ethernet over twisted pair	JITC	Joint Interoperability Test Command
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	LoC	Letter of Compliance
		ms	millisecond
BaseX	Ethernet over Fiber or Copper	SUT	System Under Test
Gbps	Gigabits Per Second	UCR	Unified Capabilities Requirements
IEEE	Institute of Electrical and Electronics Engineers		

(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	0.06 ms voice / 0.07 ms video jitter	1 ms / 10 ms
10000BaseX	0.06 ms voice / 0.07 ms video jitter	1 ms / 10 ms
40000BaseX	Not Tested (See note 2.)	1 ms / 10 ms
100000BaseX	Not Tested (See note 2.)	1 ms / 10 ms

NOTE(S):
1. All testing was performed on the 1 and 10 Gbps interfaces. JITC analysis determined the 10 and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at all other data rates.
2. The SUT does not support this interface

LEGEND:

802.3i	10BaseT 10 Mbps Ethernet over twisted pair	IEEE	Institute of Electrical and Electronics Engineers
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	JITC	Joint Interoperability Test Command
		Mbps	Megabits per second
BaseT	Mbps (Baseband Operation, Twisted Pair) Ethernet	ms	millisecond
BaseX	Mbps Ethernet over Fiber or Copper	SUT	System Under Test
Gbps	Gigabits Per Second	UCR	Unified Capabilities Requirements

(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 five-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	0.00%	0.00%	0.00%	0.00%	0.015%	0.05%	0.05%	
10000BaseX	0.00%	0.00%	0.00%	0.00%	0.015%	0.05%	0.05%	
40000BaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	
100000BaseX	Not Tested (See note 2.)				0.015%	0.05%	0.05%	

NOTE(S):
1. All testing was performed on the 1 and 10 Gbps interfaces. JITC analysis determined the 10 and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at all other data rates.
2. The SUT does not support this interface

LEGEND:

802.3i	10BaseT 10 Mbps Ethernet over twisted pair	IEEE	Institute of Electrical and Electronics Engineers
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	JITC	Joint Interoperability Test Command
BaseT	Mbps (Baseband Operation, Twisted Pair) Ethernet	LoC	Letter of Compliance
BaseX	Mbps Ethernet over Fiber or Copper	Mbps	Megabits per second
Gbps	Gigabits Per Second	SUT	System Under Test
		UCR	Unified Capabilities Requirements

(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 may be 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 In Accordance With (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 four fiber interfaces for connecting to WAN and Distribution products. Distribution products that support assured services shall have a minimum of four 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. The SUT met the following requirement with testing and the vendor's LoC. The SUT was tested as an Access switch, therefore this requirement does not apply.

- 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
- 100 Gbps IAW IEEE 802.3ba

(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). The SUT met this requirement with testing and the vendor's LoC for 1000 Mbps interface. JITC analysis determined the 10 Mbps and 100 Mbps interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3 standards testing data collected at higher data rates.

- 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.

(c) Minimally, Access products shall provide one of the following trunk-side interface rates (other rates and IEEE standards may be provided as optional interfaces). The SUT met this requirement with testing and the vendor's LoC for the 10 Gbps interfaces. JITC analysis determined the 1 Gbps interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3 standards and testing data collected at higher data rates.

- 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).

(d) Access products that support assured services and more than 96 telephony subscribers shall have a minimum of two fiber interfaces to connect to the distribution layer. The SUT met this requirement with four SFP+ 10 Gigabit Ethernet (GbE) capable ports.

(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). The SUT does not support this optional requirement; therefore, it is not included in this certification. If provided, the interface must meet the RFCs:

- RFC 4338, Transmission of Internet Protocol version 6 (IPv6), Internet Protocol version 4 (IPv4), and Address Resolution Protocol (ARP) Packets over Fibre Channel.
- RFC 4044, Fibre Channel Management.

(f) The Core, Distribution, and Access products may provide one or more of the following wireless LAN interface rates. The SUT does not support the optional wireless interfaces; therefore, it is not included in this certification.

- 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 Metropolitan Area Networks (MANs).
- Other approved IEEE wireless interfaces may be implemented as optional 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 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 meet this requirement through testing and the vendor's LoC.

(b) Force mode IAW IEEE 802.3. The SUT was forced to half and full duplex on 10/100/1000 Mbps interfaces. The SUT meet this requirement through testing and the vendor's LoC.

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

(d) Filtering IAW appropriate RFC 1812 sections (sections applying to filtering). The SUT met this requirement with vendor's LoC.

(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 met this requirement with testing and the vendor's LoC.

(f) Spanning Tree Protocol IAW IEEE 802.1D (Optional: Core). The SUT supports this requirement. The SUT met this requirement with testing and the vendor's LoC.

(g) Multiple Spanning Tree IAW IEEE 802.1s (Optional: Core). The SUT supports this requirement. The SUT met this requirement with the vendor's LoC.

(h) Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w (Optional: Core). The SUT supports this requirement. The SUT met this requirement with the vendor's LoC.

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

(j) Link Layer Discovery Protocol (LLDP) IAW IEEE 802.1AB (Optional Core, Distribution, and Access). The SUT met this requirement with vendor's LoC.

(k) Link Layer Discovery – Media Endpoint Discovery IAW ANSI/ Telecommunications Industry Association (TIA)-1057 (Optional Core, Distribution, and Access). The SUT does not support this optional requirement; therefore, it is not included in this certification.

(l) Power over Ethernet (PoE) IAW either 802.3af-2003 or 802.3at-2009 (Required only for Voice and Video over Internet Protocol [VVoIP] solutions; for data applications or non-Assured Services (AS) solutions, Power over Ethernet [PoE] is optionally required.) The SUT supports this optional requirement. 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 Intermediate System to Intermediate System (IS-IS) as routing protocol). The SUT does not support this optional requirement; therefore, it is not included in this certification.

(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 Fibre Channel over Ethernet (FCoE) and Point-to-Point Protocol (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 requirement; therefore, it is not included in this certification.

(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 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. Although this requirement is not applicable to L2 switches, 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 6.2.2, Differentiated Service Code Point. (Optional: Access products). Although this requirement is not applicable to L2 switches, 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. Although this requirement is not applicable to L2 switches The SUT supports this requirement. The SUT met this requirement testing and with 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:

a. 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 L2 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. Even though this product was submitted as a Layer 2 switch, the SUT met this requirement with testing and the vendor's LoC.

b. 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.

(b) 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 the 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 was submitted as L2 Access only; therefore, this requirement does not apply.

(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) Protocols 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 Department of Defense (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 protocols through testing and vendor's LoC.

(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 supports the four-queue model and met these requirements with testing and the 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 when configured as a standalone switch. When configured in a stacked architecture the SUT met this requirement on the egress interface of the stack, but did not prioritize queues on the stacking ports.

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 as follows. The product shall calculate the bandwidth associated with traffic conditioning, which requires that the queue size should account for the L3 header (i.e., IP header), but not the L2 headers (i.e., PPP, MAC, and so on) within a margin of error of plus or minus 10 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 supports six queues; however, testing was performed using a four queue configuration.

(b) The product shall support the DSCP plan, as shown in Table 7.2-3, DSCP Assignments. DSCP 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:

1. Simple Network Management Protocol Version 3 (SNMPv3) IAW RFCs 3411, 3412, 3413, 3414, 3415, 3416, and 3417. The Solarwinds SNMP Test Suite was used to capture SNMP traps. The SUT met this requirement with testing and the vendor's LoC.

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

3. 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.

4. The Advanced encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. JITC led Cybersecurity test teams tested Cybersecurity and published the results in a separate report, Reference (d).

(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 UCR and Security Technical Implementation Guides (STIGs) requirements, the STIGs requirements will take precedence. The SUT met the requirements in the UCR 2013, Change 2, Section 4, with the vendor's LoC. In addition, security requirements were tested by a JITC led Cybersecurity test team and the results are published 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).

(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. The SUT met this requirement when configured in a stacked architecture through testing and LOC.

- 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.

The single product redundancy requirement does not apply to the SUT when deployed as a standalone unit because it does not support more than 96 users. When in a stacked configuration, the SUT has multiple power supplies, switch fabrics and processors. The SUT met this requirement through testing with a measured failover time of 2.53 seconds.

(2) Dual Product Redundancy Requirements. If the SUT provides redundancy through dual products, then the following requirements are applicable. Non-ASLAN products do not need to meet any redundancy requirements because they are non-assured. The SUT uses single product redundancy therefore this requirement does not apply.

(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 as follows:

- The product shall support Border Gateway Protocol (BGP) for inter-domain routing. The SUT was submitted as L2 Access switch, therefore this requirement does not apply.

- 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 was submitted as L2 Access switch, therefore this requirement does not apply.

- If OSPF is supported, the product shall support OSPFv2 Graceful restart (RFC 3623 and OSPFv3 Graceful Restart (RFC 5187). The SUT was submitted as L2 Access switch, therefore this requirement does not apply.

- If the IS-IS protocol is supported, IS-IS shall be compliant with RFC 1195 – "Use of Open Systems Interconnect (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 IS-IS Point-to-Point Adjacencies", 2002. For IPv6, IS-IS shall meet RFC 5340, Routing IPv6 with IS-IS. The SUT was submitted as L2 Access switch, therefore this requirement does not apply.

- Graceful Restart for BGP (RFC 4724) is required for core and distribution infrastructure products. The SUT was submitted as L2 Access switch, therefore this requirement does not apply.

- The product shall support Virtual Router Redundancy Protocol (VRRP) – RFCs 2787 and RFC 5798 - to provide redundancy to L2 switches that lose connectivity to a Layer 3 router. The Distribution product shall employ VRRP to provide survivability to any product running L2 (normally the Access Layer).

The SUT was submitted as ASLAN L2 Access switch; therefore, the survivability requirements do not apply and are not included in the certification.

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. The SUT met these requirement with testing and the vendor's LoC.

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. The SUT does not support this optional requirement; therefore, it is not included in the certification.

(2) MPLS VPN Augmentation to VLANs. If an ASLAN product supports MPLS, it shall support MPLS L2 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 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). The SUT does not support this optional MPLS requirement; therefore, it is not included in the certification.

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

8. TESTING LIMITATIONS. None.

9. CONCLUSION(S). The SUT meets the critical interoperability requirements for an ASLAN L2 Access switch in accordance with the UCR, Reference (b), and is certified for joint use with other certified products listed on the DoDIN Approved Products List (APL).

DATA TABLES

Table 3-1. Interface Status

Interface (See note 1.)	Applicability (ASLAN)			Status	Remarks
	Co	D	A		
Network Management Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Not Tested	See note 3.
IEEE 802.3u (100BaseT UTP)	C	C	C	Not Tested	See note 3.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	
Access (User) Interfaces (See note 2.)					
IEEE 802.3i (10BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseT UTP)	C	C	C	Met	See note 4.
IEEE 802.3u (100BaseFX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ab (1000BaseT UTP)	C	C	C	Met	
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Not Tested	See note 5.
IEEE 802.3ae (10GBaseX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ba (40GBaseX)	O	O	O	Not Tested	See note 5.
IEEE 802.3ba (100GBaseX)	O	O	O	Not Tested	See note 5.
Uplink (Trunk) Interfaces (See note 2.)					
IEEE 802.3u (100BaseT UTP)	O	O	O	Not Tested	See note 5.
IEEE 802.3u (100BaseFX)	O	O	O	Not Tested	See note 5.
IEEE 802.3ab (1000BaseT UTP)	O	O	O	Not Tested	See note 5.
IEEE 802.3z (1000BaseX Fiber)	C	C	C	Met	See note 6.
IEEE 802.3ae (10GBaseX)	C	C	C	Met	
IEEE 802.3ba (40GBaseX)	C	C	C	Not Tested	See note 5.
IEEE 802.3ba (100GBaseX)	C	C	C	Not Tested	See note 5.

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. Testing on management ports was performed on the 1 Gbps interfaces. JITC analysis determined the 10BaseX and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at higher data rates.
4. All Access (User) link testing was performed one on the 1 Gbps interfaces. JITC analysis determined the 10BaseX and 100BaseX interfaces are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3i and 802.3u standards and the testing data collected at higher data rates.
5. The SUT does not support this Conditional/Optional interface.
6. All Uplink (Trunk) testing was performed on the 10 Gbps interfaces. JITC analysis determined the 1000BaseX interface are low risk for certification based on the vendor's Letter of Compliance (LoC) compliance with the IEEE 802.3ab standards and the testing data collected at higher data rates.

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps	C	Conditional
802.3ae	10 Gbps Ethernet	Co	Core
802.3ba	40 and 100 Gigabit Ethernet Architecture	D	Distribution
802.3i	10BaseT Mbps over twisted pair	GBaseX	Gbps Ethernet over Fiber or Copper
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	Gbps	Gigabits per second
		IEEE	Institute of Electrical and Electronics Engineers
802.3z	Gigabit Ethernet Standard	JITC	Joint Interoperability Test Command
A	Access	LoC	Letter of Compliance
ASLAN	Assured Services Local Area Network	Mbps	Megabits per second
BaseFX	Mbps Ethernet over Fiber	O	Optional
BaseT	Mbps (Baseband Operation, Twisted Pair) Ethernet	SUT	System Under Test
BaseX	Mbps Ethernet over Fiber or Copper	UTP	Unshielded Twisted Pair

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	Met
	Port Parameter	Required	7.2.1.2	Met
	Class of Service Markings	Required	7.2.1.3	Met
	Virtual LAN Capabilities	Required	7.2.1.4	Met
	Protocols	Required	7.2.1.5	Met
	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 2.)
2	**LAN Switch and Router Redundancy**			
	Single Product Redundancy	Conditional	7.2.2.1	Met (See note 3.)
	Dual Product Redundancy	Conditional	7.2.2.2	N/A
3	**LAN Product Requirements Summary**			
	LAN Product Requirements Summary	Required	7.2.3	Met
4	**MPLS in ASLANs**			
	MPLS	Optional	7.2.4.1	Not Tested (See note 4.)
	MPLS ASLAN	Optional	7.2.4.2	Not Tested (See note 4.)
	MPLS VPN Augmentation to VLANs	Optional	7.2.4.3	Not Tested (See note 4.)

NOTE(S):
1. The annotation of "required" refers to a high-level requirement category. The SUT does not need to provide conditional requirements; however, if a capability is provided, it must function according to the specified requirements.
2. The JITC Cybersecurity test team conducted Security testing and published the results in a separate report, Reference (d).
3. The redundancy requirements do not apply to the SUT when deployed as a standalone Access switch because it supports less than 96 subscribers. When used in a stacked configuration, the SUT has multiple power supplies, switch fabrics, and processors and meets this requirement.
4. The SUT does not support this optional requirement.

LEGEND:

ASLAN	Assured Services Local Area Network	MPLS	Multiprotocol Label Switching
CR	Capability Requirement	N/A	Not Applicable
FR	Functional Requirement	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
JITC	Joint Interoperability Test Command	VPN	Virtual Private Network
LAN	Local Area Network	VLAN	Virtual LAN

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

Component (See note 1.)	Tested Version	Sub-component	Description	Blocking Factor (See notes 1 and 2.)	
				C/D	A
2930F	**16.04**	**JL263A**	**24G PoE+ 4SFP+ Switch**	Not Tested	**Met**
		JL264A	**48G PoE+ 4SFP+ Switch**	Not Tested	**Met**
		JL559A	**48G PoE+ 4SFP+ 740W Switch**	Not Tested	**Met**

NOTE(S):
1. Components bolded and underlined were tested by JITC. 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 components and JITC analysis determined they were functionally identical for interoperability certification purposes.
2. For Core and Distribution, the Minimum blocking factor is 2 to 1. For Access, the Minimum blocking factor is 8 to 1.

LEGEND:

A	Access	PoE+	Power over Ethernet Plus
C	Core	SFP+	Small Form-factor Pluggable Plus
D	Distribution	SUT	System Under Test
G	Gigabits Ethernet	W	Watt
JITC	Joint Interoperability Test Command		

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

System Name	Software Release	Function
Required Ancillary Equipment		
Windows Server	2008 Enterprise SP1 UGM Army Server 2008R2	Active Directory
Windows Server 2012 R2	Kiwi v9.6	SysLog Server
Test Network Components		
Juniper MX480	JUNOS 16.1R3.10	Heterogeneous Interoperability
Brocade MLXe-4	5.9.0T165	Heterogeneous Interoperability
Ixia IxNetwork	7.12.860.56GA	TMDE

LEGEND:

JUNOS	Juniper Operating System	TMDE	Test, Measurement & Diagnostic Equipment
R	Release	UGM	Universal Golden Master
SP	Service Pack	v	Version
SysLog	System Log		