



DEFENSE INFORMATION SYSTEMS AGENCY

P. O. BOX 4502
ARLINGTON, VIRGINIA 22204-4502

IN REPLY
REFER TO: Battlespace Communications Portfolio (JTE)

13 Aug 09

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases

References: (a) DoD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01D, "Interoperability and Supportability of Information Technology and National Security Systems," 8 March 2006
(c) through (f), see Enclosure 1

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

2. The Cisco ASLAN and non-ASLAN with Specified Software Releases is hereinafter referred to as the system under test (SUT). The SUT meets all of its critical interoperability requirements and is certified as interoperable for joint use within the Defense Switched Network (DSN). The ASLAN is certified to support DSN Assured Services over Internet Protocol. The SUT components which are bolded and underlined in the tables throughout this certification letter are components that were tested in the JITC laboratory for this certification. The SUT components which are not bolded and not underlined, but also listed throughout the tables in this letter, are certified for joint use in the DSN as well. The JITC analysis determined these components contain the same hardware and software and are functionally identical to the tested components for interoperability certification purposes. If a system meets the minimum requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. The SUT is certified for joint use as a non-ASLAN for C2R and non-C2 traffic. Non-ASLANs may also be used to receive all levels of precedence, but are limited to originating ROUTINE precedence only. Non-ASLANs do not need to meet the availability or redundancy requirements of the C2 or Special C2 users, C2 users and Special C2 users are not authorized as subscribers on a non-ASLAN.

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

JITC Memo, JTE, Special Interoperability Test Certification of the Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases

3. This finding is based on interoperability testing conducted by JITC, DISA adjudication of open test discrepancy reports, review of the vendor's Letters of Compliance (LoC), and Defense Information Assurance (IA)/Security Accreditation Working Group (DSAWG) accreditation. Testing was conducted at JITC's Global Information Grid Network Test Facility at Fort Huachuca, Arizona, from 23 February through 10 April 2009. Review of the vendor's LoC was completed on 2 June 2009. DISA adjudication of outstanding test discrepancy reports and review of the vendor's LoC was completed on 2 June 2009. DSAWG grants accreditation based on the security testing completed by DISA-led Information Assurance test teams and published in a separate report (reference (c)). DSAWG accreditation was granted on 11 August 2009. Enclosure 2 documents the test results and describes the tested network.

4. The overall interoperability status of the SUT is indicated in Table 1. The ASLAN and non-ASLAN system requirements are listed in Table 2. In addition to system level requirements, components that comprise the SUT must meet specific criteria to be certified for use as core, distribution, or access components. The interoperability status of the SUT components is listed in Table 3. The ASLAN and non-ASLAN requirements used to certify the components are listed in Table 4. This interoperability test status is based on the SUT's ability to meet:

- a. Assured Services as defined in reference (d).
- b. Local Area Network system requirements specified in reference (e) verified through JITC testing and/or vendor submission of LoC.
- c. The overall system interoperability performance derived from test procedures listed in reference (f).

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Table 1. SUT Interoperability Status

System Interoperability Status																																							
Components (See note 1.)	Release	Status	Remarks																																				
CISCO7603, CISCO7603-S, CISCO7604, CISCO7606, CISCO7606-S, CISCO7609 ² , <u>CISCO7609-S</u> ² , CISCO7613	IOS 12.2 (33) SRD	Certified	All ASLAN and non-ASLAN system requirements were met when the SUT was configured in accordance with architecture provided in Enclosure 2. Additional details about component level certification are provided in Table 3. Security testing is accomplished through DISA-led Information Assurance Test teams and published in a separate report.																																				
WS-C6503, WS-C6503-E, WS-C6504, WS-C6504-E, WS-C6506, WS-C6506-E, WS-C6509, <u>WS-C6509-E</u> ² , WS-C6509-NEB, WS-C6509-NEB-A, WS-C6513	IOS 12.2 (33) SXI																																						
<u>ME-C6524GS-8S</u> , ME-C6524GT-8S	IOS 12.2 (33) SXI																																						
WS-C4503 ³ , WS-C4503-E ³ , WS-C4506 ³ , WS-C4506-E ³ , <u>WS-C4507R</u> ³ , <u>WS-C4507R-E</u> ³ , WS-C4510R, WS-C4510R-E	IOS 12.2 (50) SG																																						
<u>WS-C3560E-12D</u> ⁴ , <u>WS-C3560E-12SD</u> ⁴ , WS-C3560E-24TD, WS-C3560E-48TD, WS-C3560E-24PD, <u>WS-C3560E-48PD</u>	IOS 12.2-46.SE																																						
WS-C3750E-24TD, <u>WS-C3750E-24PD</u> , WS-C3750E-48TD, <u>WS-C3750E-48PD</u> , WS-C3750E-48PD-F	IOS 12.2-46.SE																																						
<p>NOTES:</p> <ol style="list-style-type: none"> Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use. Indicates these switches support one processor when using the Sup720 series and must be configured to failover to a redundant Core or Distribution switch. Indicates these switches support Sup II-plus processor at the access layer only for this certification. Indicates these switches support one processor and must be configured to failover to a redundant Distribution switch. <p>LEGEND:</p> <table> <tr> <td>-A</td> <td>Version A</td> <td>NEB</td> <td>Network Equipment Building</td> </tr> <tr> <td>ASLAN</td> <td>Assured Services Local Area Network</td> <td>PD</td> <td>Power over Ethernet (PoE) 10 Gigabit Ethernet</td> </tr> <tr> <td>D</td> <td>10 Gigabit Ethernet</td> <td>R</td> <td>Redundancy</td> </tr> <tr> <td>DISA</td> <td>Defense Information Systems Agency</td> <td>-S</td> <td>Version S</td> </tr> <tr> <td>-E</td> <td>Enhanced</td> <td>SD</td> <td>Small Form-Factor Pluggable (SFP) 10 Gigabit Ethernet</td> </tr> <tr> <td>-F</td> <td>Full Power</td> <td>SUT</td> <td>System Under Test</td> </tr> <tr> <td>IOS</td> <td>Internetwork Operating System</td> <td>TD</td> <td>Twisted Pair Ethernet 10 Gigabit Ethernet</td> </tr> <tr> <td>JITC</td> <td>Joint Interoperability Test Command</td> <td>WS</td> <td>Workgroup Switch</td> </tr> <tr> <td>ME</td> <td>Metro Ethernet</td> <td></td> <td></td> </tr> </table>				-A	Version A	NEB	Network Equipment Building	ASLAN	Assured Services Local Area Network	PD	Power over Ethernet (PoE) 10 Gigabit Ethernet	D	10 Gigabit Ethernet	R	Redundancy	DISA	Defense Information Systems Agency	-S	Version S	-E	Enhanced	SD	Small Form-Factor Pluggable (SFP) 10 Gigabit Ethernet	-F	Full Power	SUT	System Under Test	IOS	Internetwork Operating System	TD	Twisted Pair Ethernet 10 Gigabit Ethernet	JITC	Joint Interoperability Test Command	WS	Workgroup Switch	ME	Metro Ethernet		
-A	Version A	NEB	Network Equipment Building																																				
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JITC Memo, JTE, Special Interoperability Test Certification of the Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases

Table 2. ASLAN and non-ASLAN System Requirements

System Requirements																																
Requirement	Criteria		UCR Paragraph	Required																												
Delay	One-way packet delay for voice packets of an established call (signaling and media) shall be 5 ms or less averaged over any 5-minute period.		A3.3.2.1	Yes																												
Jitter	For voice media packets, jitter shall be 5 ms or less averaged over any 5-minute period.		A3.3.2.2	Yes																												
Packet Loss	Voice packet loss within the LAN shall not exceed 0.05% averaged over any 5-minute period.		A3.3.2.3	Yes																												
Network Management	LAN Network Management Interface. One of the following methods: In-band or Out-of-band		A3.3.7.1	Yes																												
	LAN Configuration Control		A3.3.7.2	Yes																												
	LAN Operational Changes		A3.3.7.3	Yes																												
	LAN Performance Monitoring		A3.3.7.4	Yes																												
	LAN Alarms		A3.3.7.5	Yes																												
Availability	ASLAN	99.999% Availability	A3.3.9.2	Yes																												
	non-ASLAN	99.9% Availability	A3.3.9.2	Yes																												
Redundancy	ASLAN	No Single Point of Failure that can cause an outage of more than 64 IP telephony subscribers	A3.3.9.3	Yes																												
	non-ASLAN	No Single Point of Failure that can cause an outage of more than 64 IP telephony subscribers	A3.3.9.3	No																												
Survivability	ASLAN	Service continuity in the presence of faults within the network	A3.3.9.4	Yes																												
	non-ASLAN	Service continuity in the presence of faults within the network	A3.3.9.4	No																												
Traffic Engineering	Voice bandwidth not to exceed 25 percent of available bandwidth, ITU-T G.711 codec with 20ms sample size.		A3.3.9.6	Yes																												
IPv6	All IP devices shall be IPv6 capable.		1.7, A3.2.8, and A11	Yes																												
Security	DIACAP/IA (See note.)		A3.3.8	Yes																												
<p>NOTE: Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report, reference (c).</p> <p>LEGEND:</p> <table> <tr> <td>A</td> <td>Appendix</td> <td>IPv6</td> <td>Internet Protocol version 6</td> </tr> <tr> <td>ASLAN</td> <td>Assured Services LAN</td> <td>ITU-T</td> <td>International Telecommunication Union - Telecommunication Standardization Sector</td> </tr> <tr> <td>DIACAP</td> <td>Department of Defense Information Assurance Certification and Accreditation Process</td> <td>LAN</td> <td>Local Area Network</td> </tr> <tr> <td>DISA</td> <td>Defense Information Systems Agency</td> <td>ms</td> <td>milliseconds</td> </tr> <tr> <td>G.711</td> <td>PCM of voice frequencies</td> <td>PCM</td> <td>Pulse Code Modulation</td> </tr> <tr> <td>IA</td> <td>Information Assurance</td> <td>UCR</td> <td>Unified Capabilities Requirements</td> </tr> <tr> <td>IP</td> <td>Internet Protocol</td> <td></td> <td></td> </tr> </table>					A	Appendix	IPv6	Internet Protocol version 6	ASLAN	Assured Services LAN	ITU-T	International Telecommunication Union - Telecommunication Standardization Sector	DIACAP	Department of Defense Information Assurance Certification and Accreditation Process	LAN	Local Area Network	DISA	Defense Information Systems Agency	ms	milliseconds	G.711	PCM of voice frequencies	PCM	Pulse Code Modulation	IA	Information Assurance	UCR	Unified Capabilities Requirements	IP	Internet Protocol		
A	Appendix	IPv6	Internet Protocol version 6																													
ASLAN	Assured Services LAN	ITU-T	International Telecommunication Union - Telecommunication Standardization Sector																													
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Table 3. SUT Component Interoperability Status

Component Interoperability Status					
Component (See note 1.)	Release	Sub-component (See note 1.)	Status	Layer (s)	Remarks
CISCO7613, CISCO7609, <u>CISCO7609-S</u> ² , CISCO7606, CISCO7606-S, CISCO7604, CISCO7603, CISCO7603-S	IOS 122- 33.SRD	<u>WS-SUP720-3B</u>	Certified	Core, Distribution, Access	All CRs and FRs were met.
		WS-SUP720-3BXL	Certified		
		<u>RSP720-3C-GE</u>	Certified		
		<u>7600-ES20-10G3C</u>	Certified		
		<u>7600-ES20-GE3C</u>	Certified		
		<u>7600-SIP-400</u>	Certified		
		7600-SIP-200	Certified		
		<u>7600-SIP-600</u>	Certified		
		<u>WS-X6148A-GE-45AF</u>	Certified		
		<u>WS-X6548-GE-TX</u>	Certified		
		<u>WS-X6708-10GE</u>	Certified		
		<u>WS-X6748-SFP</u>	Certified		
		<u>SPA-2X1GE-V2</u>	Certified		
		<u>WS-X6708-10G-3CXL</u>	Certified		
		<u>SPA-5X1GE-V2</u>	Certified		
		WS-X6708-10G-3C	Certified		
		SPA-8X1GE-V2	Certified		
		<u>SPA-1X10GE-L-V2</u>	Certified		
		WS-X6148-RJ45V	Certified		
		WS-X6148-RJ-45	Certified		
		WS-X6148-RJ-21	Certified		
		<u>WS-X6148-45AF</u>	Certified		
		WS-X6148-21AF	Certified		
WS-X6548-RJ-21	Certified				
WS-X6548-RJ-45	Certified				
WS-X6548-GE-45AF	Certified				
WS-X6548V-GE-TX	Certified				
<u>ME-C6524GS-8S</u> ³ , ME-C6524GT-8S	IOS 122- 33.SXI	Not Applicable	Certified	Core, Distribution	All CRs and FRs were met.

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Table 3. SUT Component Interoperability Status (continued)

Component (See note 1.)	Release	Sub-component (See note 1.)	Status	Layer (s)	Remarks
WS-C6503-E, WS-C6504-E, WS-C6506-E, WS-C6509-E , WS-C6509-NEB-A, WS-C6513, WS-C6503, WS-C6504, WS-C6506, WS-C6509 , WS-C6509-NEB	IOS 122-33.SXI	WS-SUP720-3B	Certified	Core, Distribution, Access	All CRs and FRs were met.
		WS-SUP720	Certified		
		WS-SUP720-3BXL	Certified		
		WS-SUP32-GE-3B	Certified		
		WS-SUP32-10GE-3B	Certified		
		WS-X6148-RJ45V	Certified		
		WS-X6148-RJ-45	Certified		
		WS-X6148-RJ-21	Certified		
		WS-X6148-R21V	Certified		
		WS-X6148-45AF	Certified		
		WS-X6148-21AF	Certified		
		WS-X6708-10G-3CXL	Certified		
		WS-X6148X2-45AF	Certified		
		WS-X6148-FE-SFP	Certified		
		WS-X6704-10GE	Certified		
		WS-X6816-GBIC	Certified		
		WS-X6708-10GE	Certified		
		WS-X6148V-GE-TX	Certified		
		WS-X6148-GE-TX	Certified		
		WS-X6148-GE-45AF	Certified		
		WS-X6148A-GE-45AF	Certified		
		WS-X6148A-GE-TX	Certified		
		WS-X6148A-RJ-45	Certified		
		WS-X6148A-45AF	Certified		
		WS-X6348-RJ45V	Certified		
		WS-X6348-RJ45	Certified		
		WS-X6348-RJ21V	Certified		
		WS-X6516-GE-TX	Certified		
		WS-X6516-GBIC	Certified		
		WS-X6516A-GBIC	Certified		
		WS-X6548V-GE-TX	Certified		
		WS-X6548-GE-TX	Certified		
		WS-X6548-RJ-21V	Certified		
WS-X6548-RJ-45	Certified				
WS-X6548-GE-45AF	Certified				
WS-X6816-GBIC	Certified				
WS-X6748-SFP	Certified				
WS-X6724-SFP	Certified				
WS-X6748-GE-TX	Certified				
WS-X6708-10G-3C	Certified				
WS-X6148X2-RJ-45	Certified				
WS-X6196-RJ-21	Certified				
WS-X6196-21AF	Certified				

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Table 3. SUT Component Interoperability Status (continued)

Component (See note 1.)	Release	Sub-component (See note 1.)	Status	Layer (s)	Remarks
WS-C4510R, <u>WS-C4507R</u> ⁴ , WS-C4506, WS-C4503, WS-C4503-E, WS-C4506-E, <u>WS-C4507R-E</u> ⁴ , WS-C4510R-E	IOS 122- 50.SG	<u>WS-X4013+10GE (Sup II+)</u>	Certified	Core, Distribution, Access	All CRs and FRs were met.
		WS-X4013+	Certified		
		<u>WS-X45-SUP6-E</u>	Certified		
		WS-X45-SUP6-E/2	Certified		
		WS-X45-SUP6-E=	Certified		
		<u>WS-X4306-GB</u>	Certified		
		WS-X4302-GB	Certified		
		WS-X4506-GB-T	Certified		
		<u>WS-X4148-RJ45V</u>	Certified		
		WS-X4124-RJ45	Certified		
		WS-X4148-RJ	Certified		
		WS-X4148-RJ21	Certified		
		<u>WS-X4148-FX-MT</u>	Certified		
		WS-X4124-FX-MT	Certified		
		WS-X4248-FE-SFP	Certified		
		WS-X4148-FE-BD-LC	Certified		
		WS-X4148-FE-LX-MT	Certified		
		<u>WS-X4232-GB-RJ</u>	Certified		
		WS-X4232-RJ-XX	Certified		
		<u>WS-X4248-RJ45V</u>	Certified		
		WS-X4248-RJ21V	Certified		
		WS-X4224-RJ45V	Certified		
		<u>WS-X4548-GB-RJ45V</u>	Certified		
<u>WS-X4548-GB-RJ45</u>	Certified				
WS-X4524-GB-RJ45V	Certified				
WS-X4448-GB-RJ45	Certified				
WS-X4424-GB-RJ45	Certified				
WS-X4648-RJ45V-E	Certified				
<u>WS-X4606-X2-E</u>	Certified				
<u>WS-X4648-RJ45V-E</u>	Certified				
WS-X4648-RJ45V+E	Certified				
WS-C3750E-24TD <u>WS-C3750E-24PD</u> , WS-C3750E-48TD, <u>WS-C3750E-48PD</u> WS-C3750E-48PD-F	IOS 122- 46.SE	Not Applicable	Certified	Access	All CRs and FRs were met. See note 3.
<u>WS-C3560E-12D</u> ³ , <u>WS-C3560E-12SD</u> ³	IOS 122- 46.SE	Not Applicable	Certified	Distribution	All CRs and FRs were met.
WS-C3560E-24TD, WS-C3560E-48TD, WS-C3560E-24PD, <u>WS-C3560E-48PD</u>	IOS 122- 46.SE	Not Applicable	Certified	Access	All CRs and FRs were met.

NOTES:

- 1 Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.
- 2 Indicates these switches support one processor when using the Sup720 series and must be configured to failover to a redundant Core switch
- 3 Indicates these switches support one processor and must be configured to failover to a redundant core or distribution switch.
- 4 Indicates these switches support the Sup 6E and Sup II-plus processors. The Sup 6E processor must be configured to failover to a redundant core or distribution switch. The Sup II-plus is supported at the access layer only.

LEGEND:

CRs	Capability Requirements	RJ	Registered Jack
E	Enhanced	RSP	Route Switch Processor
FRs	Feature Requirements	S	Standard
FX-MT	Foreign Exchange, ATM Term	SFP	Small Form Factor Pluggable
GB	Gigabit GBIC	SUP	Supervisor
IOS	Internetwork Operating System	SUT	System Under Test
JITC	Joint Interoperability Test Command	TX	The designation of a copper RJ-45 connection for Fast Ethernet
ME	Metro Ethernet	WS	Workgroup Switch
NEB	Network Equipment Building		

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Table 4. ASLAN and non-ASLAN Component Requirements

Core/Distribution/Access Component Requirements				
Requirement	Criteria		UCR Paragraph	Required
Traffic Prioritization	Traffic within LAN components shall be prioritized by session media type in accordance with the NCIDs.		A3.3.3	Yes
Traffic Priority Method	LAN components shall support DSCP, and IEEE 802.1p to DSCP mapping.		A3.3.3.1	Yes
Queuing	LAN components shall support one of the following: - Priority Queuing - Weighted Fair Queuing - Class Based Weighted Fair Queuing		A3.3.4.1	Yes
	LAN components shall be capable of - four hardware queues (Expedited Forwarding, Assured Forwarding, Assured Forwarding Preferred, and Default) - Assigning any "tagged" session to any hardware queues		A3.3.4.1	Yes
LAN Behaviors	LAN components shall support Differential Service Per-Hop Behaviors per RFCs 2474, 2475, and 3260		A3.3.4.2	Yes
VLANs	LAN components shall support: - Port based VLANs - MAC address based VLANs - Shall be capable of reassigning VLAN IDs - Accepting VLAN tagged frames in accordance with IEEE 802.1Q		A3.3.5	Yes
IEEE Conformance	LAN components shall support: - IEEE 802.1d – Bridging - IEEE 802.1p/Q – Priority tagging/VLAN tagging - IEEE 802.1s – Per-VLAN Group Spanning Tree - IEEE 802.1v – VLAN Classification by port and protocol - IEEE 802.1w –Rapid Reconfiguration of Spanning Tree - IEEE 802.1x – Port Based Network Access Control - IEEE 802.3ad – Link Aggregation Protocol - IEEE 802.3af - Power over Ethernet (Conditional)		A3.3.9.1	Yes
Single Device Redundancy	ASLAN	LAN components shall support: - ASLAN components shall have a reliability of .99999 or better - Dual power supplies and dual processors (more than 64 users) - N+1 sparing for access (more than 64 users) - Redundancy protocol ¹ - 2 second path restoral - No single point of failure will cause loss of more than 64 users	A3.3.9.3.1	Yes
	non-ASLAN	This requirement is conditional for a non-ASLAN.	A3.3.9.3.1	No
Security	LAN components shall employ the Network Infrastructure and VoIP STIGs. ²		A3.3.8	Yes
IPv6	All IP devices shall be IPv6 capable.		1.7, A3.2.8, and A11	Yes
NOTES:				
1 In accordance with UCR 2007, Appendix 3, A3.3.9.4, OSPF, IS-IS, and BGP are the routing protocols supported for core and distribution components. The redundancy protocol shall be VRRP or equivalent protocol for access components.				
2 Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (c).				

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Table 4. ASLAN and non-ASLAN Component Requirements (continued)

LEGEND:		
802.1d	Standard for Local and Metropolitan Area Networks: MAC Bridges	ASLAN Assured Services LAN
802.1p	LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization	BGP Border Gateway Protocol
802.1Q	Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks	CoS Class of Service
802.1s	Standard for Local and Metropolitan Area Networks - Amendment 3 to 802.1Q Virtual Bridged Local Area Networks: Multiple Spanning Trees	CSMA/CD Carrier Sense Multiple Access with Collision Detection
802.1v	Standard for Local and Metropolitan Area Networks - Virtual Bridge Local Area Networks - Amendment 2: VLAN Classification by Protocol and Port (Amendment to IEEE 802.1Q, 1998 Edition)	DISA Defense Information Systems Agency
802.1w	Standard for Local and metropolitan area networks - Common Specifications - Part 3: Media Access Control (MAC) Bridges: Rapid Configuration	DSCP Differentiated Services Code Point
802.1x	Standard for Local and Metropolitan Area Networks Port-Based Network Access Control	IEEE Institute of Electrical and Electronics Engineers
802.3ad	Standard for Information Technology – Local and Metropolitan Area Networks – Part 3: CSMA/CD Access Method and Physical Layer Specifications–Aggregation of Multiple Link Segments	ID Identification
802.3af	Standard for CSMA/CD Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)	IP Internet Protocol
A	Appendix	IPv6 Internet Protocol version 6
		IS-IS Intermediate system-Intermediate System
		LAN Local Area Network
		MAC Media Access Control
		NCID Net-Centric Implementation Document
		N total VoIP users / 64
		OSPF Open Shortest-Path First
		QoS Quality of Service
		RFC Request for Comment
		SNMP Simple Network Management Protocol
		STIGs Security Technical Implementation Guides
		UCR Unified Capabilities Requirements
		VLANs Virtual LANs
		VoIP Voice over Internet Protocol
		VRRP Virtual Router Redundancy Protocol

5. No detailed test report was developed in accordance with the Program Manager’s request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <https://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (SIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.

6. The JITC point of contact is Mr. Edward Mellon, DSN 879-5159, commercial (520) 538-5159, FAX DSN 879-4347, or e-mail to edward.mellon@disa.mil. The JITC’s mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The tracking number for the SUT is 0821001.

FOR THE COMMANDER:

2 Enclosures a/s


 for RICHARD A. MEADOR
 Chief
 Battlespace Communications Portfolio

JITC Memo, JTE, Special Interoperability Test Certification of the Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases

Distribution (electronic mail):

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Department of the Army, Office of the Secretary of the Army, DA-OSA CIO/G-6 ASA (ALT), SAIS-IOQ

U.S. Marine Corps MARCORSSYSCOM, SIAT, MJI Division I

DOT&E, Net-Centric Systems and Naval Warfare

U.S. Coast Guard, CG-64

Defense Intelligence Agency

National Security Agency, DT

Defense Information Systems Agency, TEMC

Office of Assistant Secretary of Defense (NII)/DOD CIO

U.S. Joint Forces Command, Net-Centric Integration, Communication, and Capabilities Division, J68

Defense Information Systems Agency, GS23

ADDITIONAL REFERENCES

- (c) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases (Tracking Number 0821001)," 11 August 2009
- (d) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01C, "Policy for Department of Defense Voice Services with Real Time Services (RTS)," 9 November 2007
- (e) Defense Information Systems Agency, "Department of Defense Networks Unified Capabilities Requirements," 21 December 2007
- (f) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP), Change 2," 2 October 2006

CERTIFICATION TESTING SUMMARY

- 1. SYSTEM TITLE.** Cisco Assured Services Local Area Network (ASLAN) and non-ASLAN with Specified Software Releases are hereinafter referred to as the system under test (SUT).
- 2. PROPONENT.** Headquarters United States Army Information Systems Engineering Command (HQUSAISEC).
- 3. PROGRAM MANAGER.** Gary Kitsmiller, AMSEL-IE-IS, Building 53301 Arizona Street, Fort Huachuca, Arizona, 85613-5300, e-mail: gary.kitsmiller@us.army.mil.
- 4. TESTER.** Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.
- 5. SYSTEM UNDER TEST DESCRIPTION.** The SUT is used to transport voice signaling and media as part of an overall Voice over Internet Protocol (VoIP) system. All of the SUT switches provide availability, security, and Quality of Service (QoS) to meet the operational requirements of the network and Assured Services for the warfighter. The SUT components which are bolded and underlined in the tables throughout this certification letter, are components that were tested in the JITC laboratory for this certification. The SUT components which are not bolded and not underlined, but also listed throughout the tables in this letter, were determined by JITC analysis to contain the same hardware and software as, and to be functionally identical to, the tested components for interoperability certification purposes. The ASLAN is certified to support Defense Switched Network (DSN) Assured Services over Internet Protocol (IP).

The SUT is composed of the following components:

The Cisco 7600 series is available in 3-, 4-, 6-, 9-, and 13-slot chassis. The Cisco 7600 series features a range of integrated services modules, including 10-gigabit fiber cards, 1-gigabit fiber cards, 100-megabit fiber cards, 1-gigabit Small Form-Factor Pluggable (SFP) cards, 10/100BaseT cards and 10/100/1000BaseT Megabits per second (Mbps) switchblades used as access points. For data and voice applications, users can connect to the Local Area Network (LAN) using any Ethernet interface on the access devices. The Cisco 7600 series was tested with the Sup720 and Route Switch Processor (RSP) series processors and is only certified for an ASLAN as a single processor per chassis and must be deployed with a dual chassis for the core or distribution layers.

The Cisco Catalyst 6500 and 6500-E series are available in 3-, 4-, 6-, 9-, and 13-slot chassis. The Cisco Catalyst 6500 series features a range of integrated services modules, including 10-gigabit fiber cards, 1-gigabit fiber cards, 100-megabit fiber cards, 1-gigabit SFP cards, 10/100BaseT cards and 10/100/1000BaseT Mbps switchblades used as access points. For data and voice applications, users can connect to the LAN using any Ethernet interface on the access devices. The 6500 series with Sup32

processor is certified in a dual processor single chassis or a single processor dual chassis configuration. The Cisco Catalyst 6500 series tested with the Sup720 series processor is only certified for an ASLAN in a single processor per chassis and must be deployed with a dual chassis for the core or distribution layer.

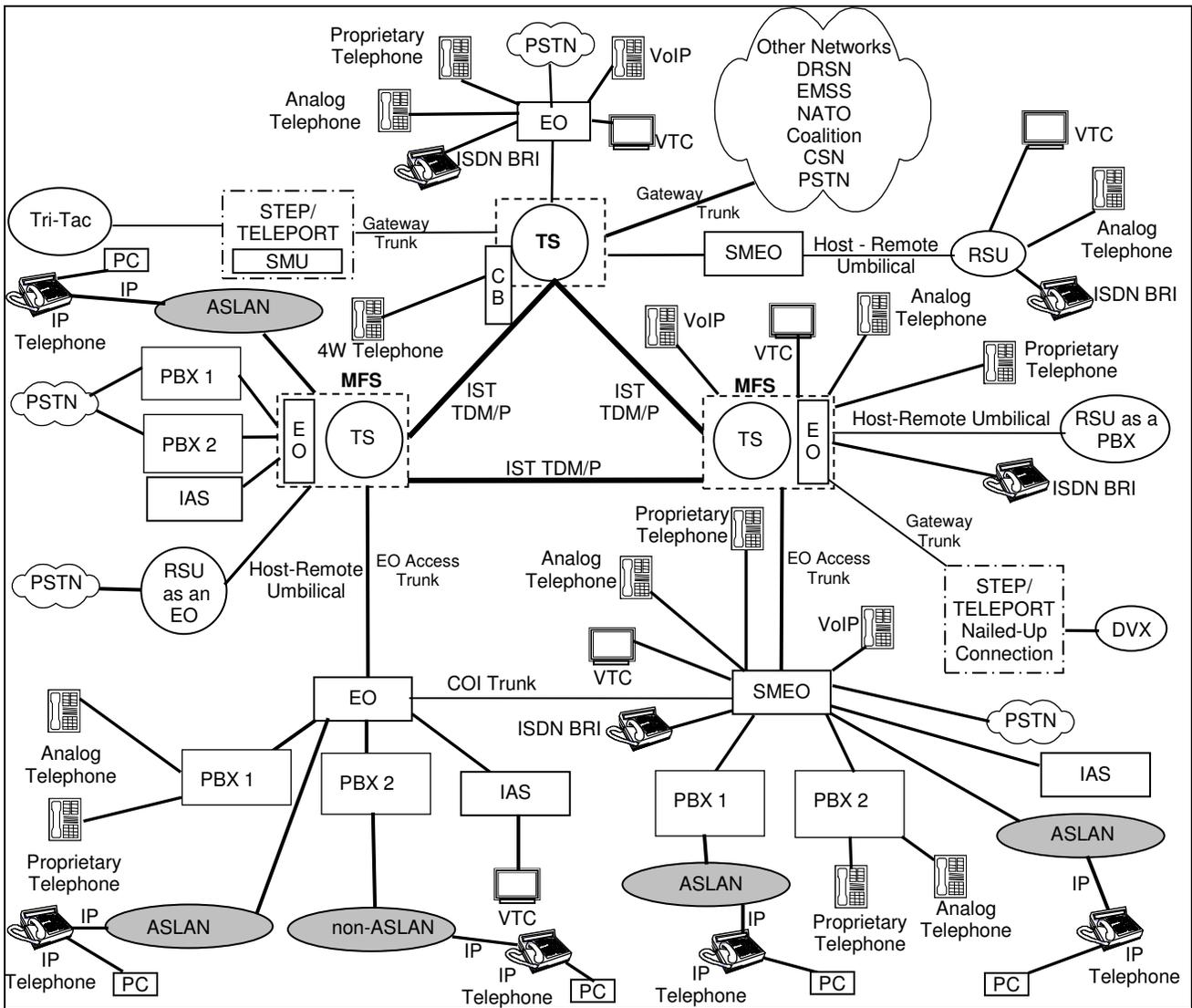
The Cisco Catalyst ME 6524 is a multilayer switch that provides QoS and security for network operations in two configurations. The Cisco Catalyst ME-C6524GS-8S provides 24+8 1-gigabit/100-megabit SFP ports. The Cisco Catalyst ME-C6524GT-8S provides 24 10/100/1000BaseT and 8 1-gigabit/100-megabit SFP ports.

The Cisco Catalyst 4500 and 4500-E series are available in a multi-slot chassis for 10-gigabit fiber cards, 1-gigabit fiber cards, 100-megabit fiber cards, 10/100BaseT cards and 10/100/1000BaseT Mbps access ports to the LAN. The framework allows for a redundant architecture to ensure no single point of failure for hardware operations. Some slots are reserved for special functions such as supervisor engines. Most slots can be configured for specific user needs. All line card capabilities including bandwidth, throughputs, and routing are dependent on the supervisor engine. The Cisco Catalyst 4500 series tested with the Sup 6E and Sup II+ processors. The Sup 6E processor is only certified with a single processor per chassis and must be deployed with a dual chassis when deployed in the core or distribution layer. The Sup II+ processor is certified at the access layer only.

The Cisco Catalyst 3750-E series utilizes stackable components to provide a redundant architecture. Each switch utilizes 64-Gigabits per second (Gbps) interconnect cables on the back of each switch to connect up to nine stackable switches. Each switch contains a single power supply and processor. The Cisco Catalyst 3750-E stackable switches provides a variety of switching options including a 24 10/100/1000BaseT port with 4 1-gigabit SFP or 2 10-gigabit X2 port switch, and a 48 10/100BaseT port with 4 1-gigabit SFP or 2 10-gigabit X2 port switch.

The Cisco Catalyst 3560E-12D, a 12-port 10-Gigabit Ethernet switch, and the Cisco Catalyst 3560E-12SD, a 12-port SFP Gigabit Ethernet switch with two 10-Gigabit Ethernet uplink ports are multilayer switches that provide QoS and security for network operations. The Cisco Catalyst 3560E-12D has dynamic routing, dual hot-swappable power supplies, and redundant field-replaceable fans.

6. OPERATIONAL ARCHITECTURE. The DSN architecture is a two-level network hierarchy consisting of DSN backbone switches and Service/Agency installation switches. Service/Agency installation switches have been authorized to extend voice services over IP infrastructures. The Unified Capabilities Requirements (UCR) operational DSN Architecture is depicted in Figure 2-1, which depicts the relationship of the ASLAN and non-ASLAN to the DSN switch types. The installation ASLAN VoIP architecture is depicted in Figure 2-2 and the non-ASLAN VoIP architecture is depicted in Figure 2-3. The ASLAN and non-ASLAN combined VoIP architecture is depicted in Figure 2-4.



LEGEND:

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

Figure 2-1. DSN Architecture

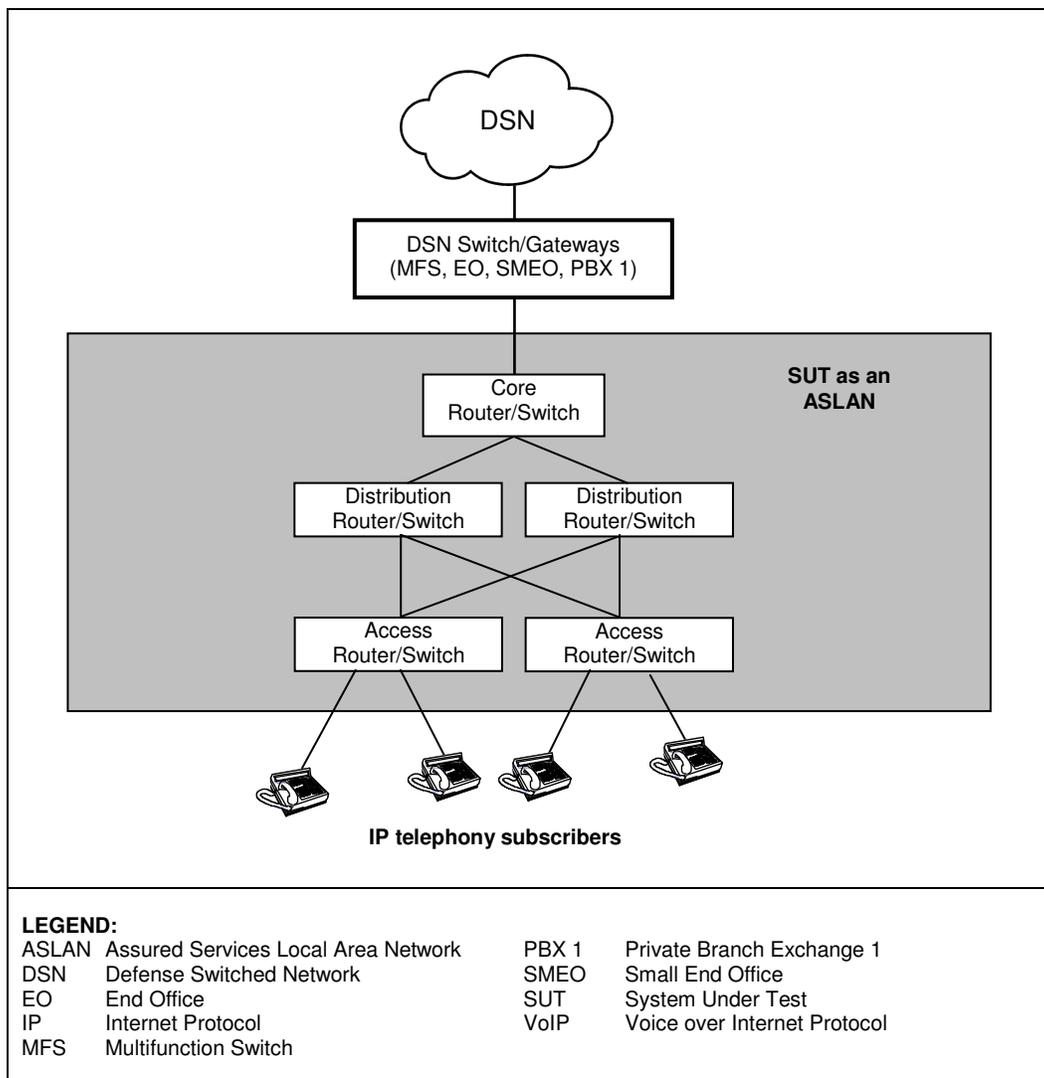


Figure 2-2. ASLAN VoIP Architecture

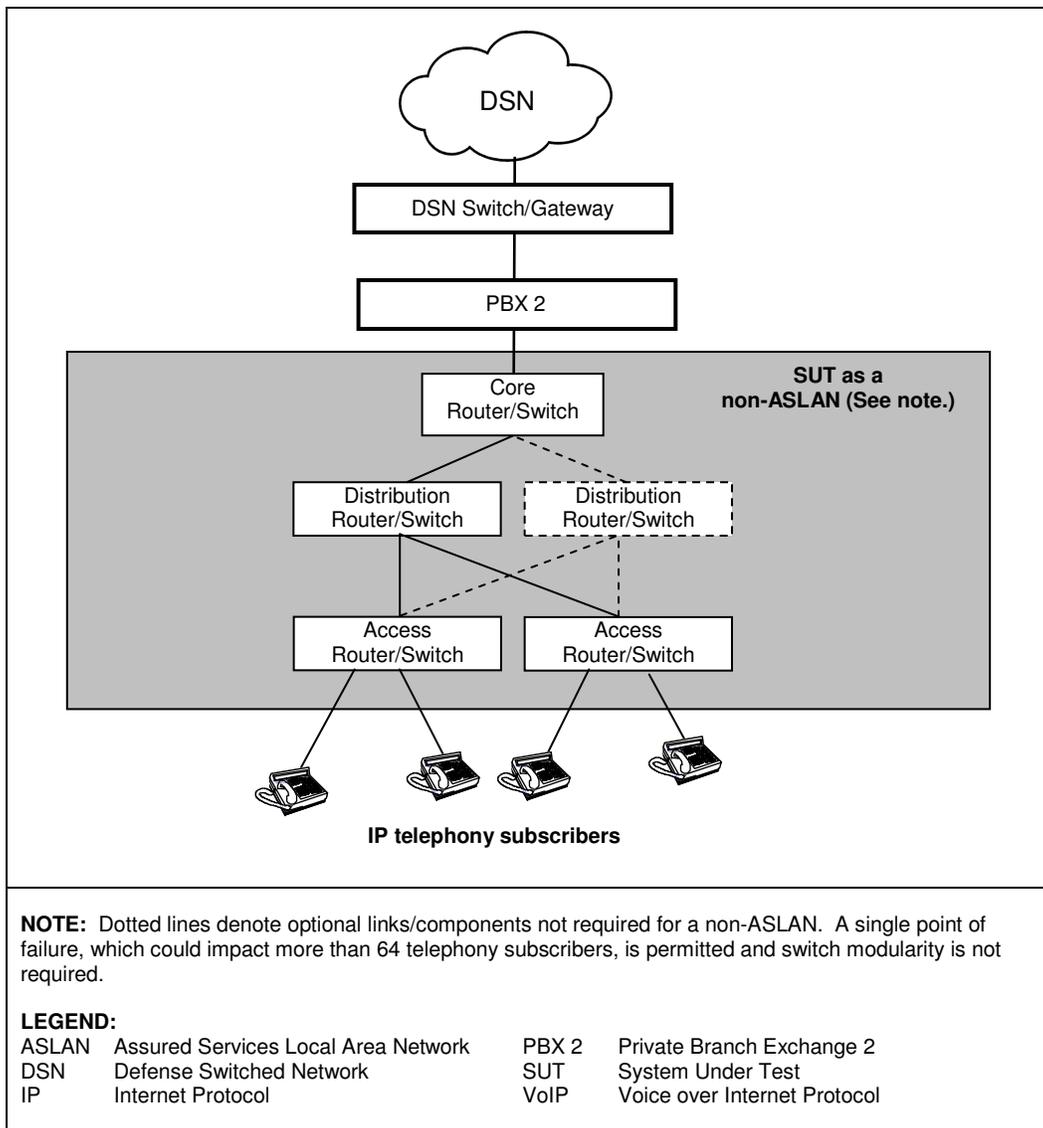
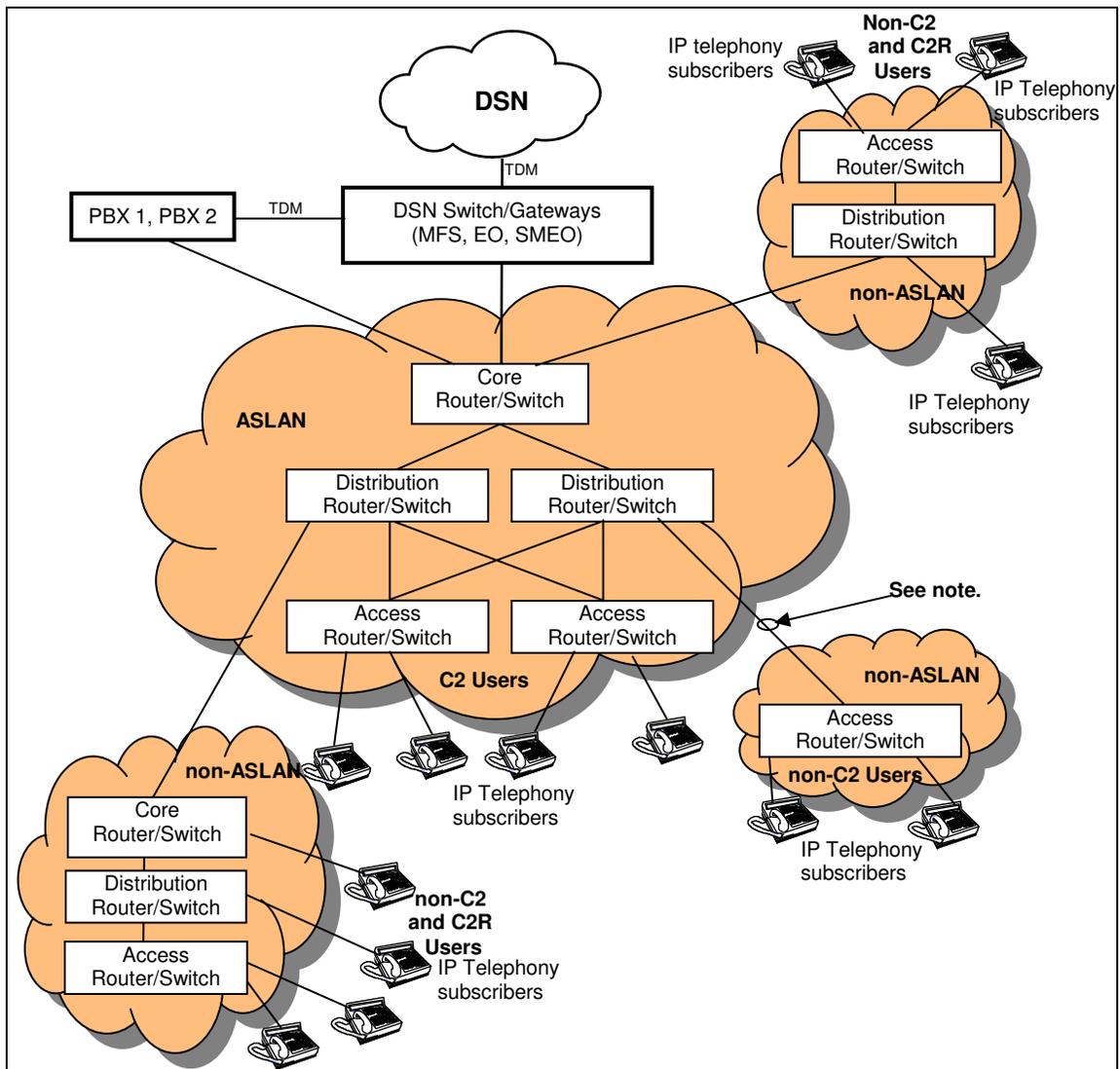


Figure 2-3. non-ASLAN VoIP Architecture



NOTE: A non-ASLAN switch can connect to an ASLAN switch at any layer provided that the connection does not cause the ASLAN to exceed the traffic engineering limits as depicted in Table 2-5. A single point of failure, which could impact more than 64 telephony subscribers, is permitted and switch modularity is not required.

LEGEND:

ASLAN	Assured Services Local Area Network	PBX 1	Private Branch Exchange 1
C2	Command and Control	PBX 2	Private Branch Exchange 2
DSN	Defense Switched Network	SMEO	Small End Office
EO	End Office	TDM	Time Division Multiplexing
IP	Internet Protocol	VoIP	Voice over Internet Protocol
MFS	Multifunction Switch		

Figure 2-4. ASLAN and non-ASLAN Combined VoIP Architecture

7. REQUIRED SYSTEM INTERFACES. The SUT ASLAN and non-ASLAN system requirements are listed in Table 2-1. The requirements specific to the SUT ASLAN and non-ASLAN components are shown in Table 2-2. These requirements are derived from:

a. DSN services for Network and Applications specified in Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01C, "Policy for Department of Defense Voice Services with Real Time Services (RTS)."

b. UCR, appendix 3, Capability Requirements (CRs) and Feature Requirements (FRs) verified through JITC testing and/or vendor submission of Letters of Compliance (LoC).

Table 2-1. ASLAN and non-ASLAN System Requirements

System Requirements																															
Requirement	Criteria		UCR Paragraph	Required																											
Delay	One-way packet delay for voice packets of an established call (signaling and media) shall be 5 ms or less averaged over any 5-minute period.		A3.3.2.1	Yes																											
Jitter	For voice media packets, jitter shall be 5 ms or less averaged over any 5-minute period.		A3.3.2.2	Yes																											
Packet Loss	Voice packet loss within the LAN shall not exceed 0.05% averaged over any 5-minute period.		A3.3.2.3	Yes																											
Network Management	LAN Network Management Interface. One of the following methods: In-band, or Out-of-band		A3.3.7.1	Yes																											
	LAN Configuration Control		A3.3.7.2	Yes																											
	LAN Operational Changes		A3.3.7.3	Yes																											
	LAN Performance Monitoring		A3.3.7.4	Yes																											
	LAN Alarms		A3.3.7.5	Yes																											
Availability	LAN Reporting		A.3.3.7.6	Yes																											
	ASLAN	99.999% Availability	A3.3.9.2	Yes																											
Redundancy	non-ASLAN	99.9% Availability	A3.3.9.2	Yes																											
	ASLAN	No Single Point of Failure that can cause an outage of more than 64 IP telephony subscribers	A3.3.9.3	Yes																											
Survivability	non-ASLAN	No Single Point of Failure that can cause an outage of more than 64 IP telephony subscribers	A3.3.9.3	No																											
	ASLAN	Service continuity in the presence of faults within the network	A3.3.9.4	Yes																											
Traffic Engineering	non-ASLAN	Service continuity in the presence of faults within the network	A3.3.9.4	No																											
	Voice bandwidth not to exceed 25 percent of available bandwidth, ITU-T G.711 codec with 20ms sample size.		A3.3.9.6	Yes																											
IPv6	All IP devices shall be IPv6 capable.		1.7, A3.2.8, and A11	Yes																											
Security	DIACAP/IA (See note.)		A3.3.8	Yes																											
<p>NOTE: Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report, reference (c).</p> <p>LEGEND:</p> <table border="0"> <tr> <td>A</td> <td>Appendix</td> <td>IPv6</td> <td>Internet Protocol version 6</td> </tr> <tr> <td>ASLAN</td> <td>Assured Services LAN</td> <td>ITU-T</td> <td>International Telecommunication Union - Telecommunication Standardization Sector</td> </tr> <tr> <td>DIACAP</td> <td>Department of Defense Information Assurance Certification and Accreditation Process</td> <td>LAN</td> <td>Local Area Network</td> </tr> <tr> <td>DISA</td> <td>Defense Information Systems Agency</td> <td>ms</td> <td>milliseconds</td> </tr> <tr> <td>G.711</td> <td>PCM of voice frequencies</td> <td>PCM</td> <td>Pulse Code Modulation</td> </tr> <tr> <td>IA</td> <td>Information Assurance</td> <td>UCR</td> <td>Unified Capabilities Requirements</td> </tr> <tr> <td>IP</td> <td>Internet Protocol</td> <td></td> <td></td> </tr> </table>				A	Appendix	IPv6	Internet Protocol version 6	ASLAN	Assured Services LAN	ITU-T	International Telecommunication Union - Telecommunication Standardization Sector	DIACAP	Department of Defense Information Assurance Certification and Accreditation Process	LAN	Local Area Network	DISA	Defense Information Systems Agency	ms	milliseconds	G.711	PCM of voice frequencies	PCM	Pulse Code Modulation	IA	Information Assurance	UCR	Unified Capabilities Requirements	IP	Internet Protocol		
A	Appendix	IPv6	Internet Protocol version 6																												
ASLAN	Assured Services LAN	ITU-T	International Telecommunication Union - Telecommunication Standardization Sector																												
DIACAP	Department of Defense Information Assurance Certification and Accreditation Process	LAN	Local Area Network																												
DISA	Defense Information Systems Agency	ms	milliseconds																												
G.711	PCM of voice frequencies	PCM	Pulse Code Modulation																												
IA	Information Assurance	UCR	Unified Capabilities Requirements																												
IP	Internet Protocol																														

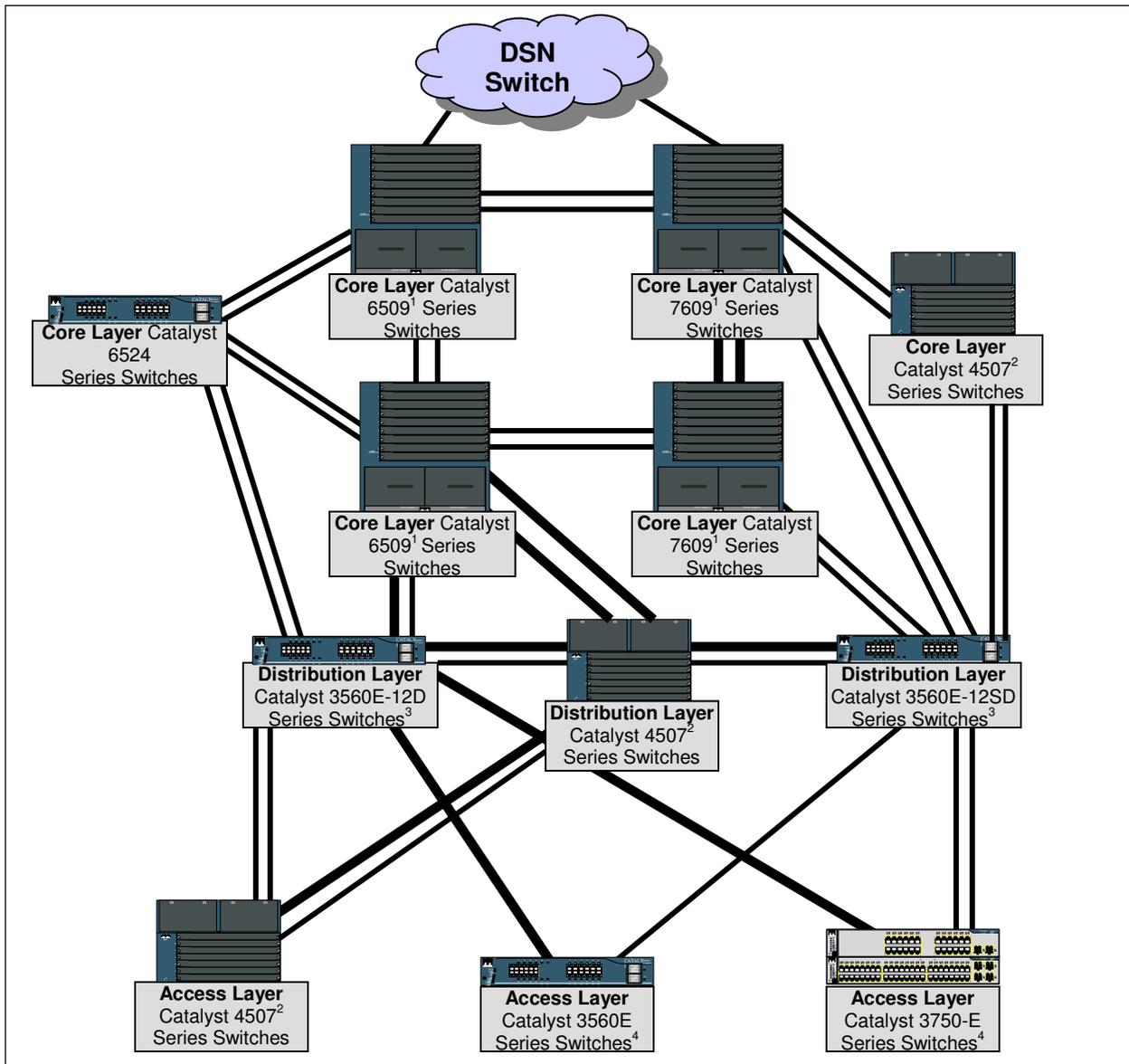
Table 2-2. ASLAN and non-ASLAN Component Requirements

Core/Distribution/Access Component Requirements				
Requirement	Criteria		UCR Paragraph	Required
Traffic Prioritization	Traffic within LAN components shall be prioritized by session media type in accordance with the NCIDs.		A3.3.3	Yes
Traffic Priority Method	LAN components shall support DSCP, and IEEE 802.1p to DSCP mapping.		A3.3.3.1	Yes
Queuing	LAN components shall support one of the following: - Priority Queuing - Weighted Fair Queuing - Class Based Weighted Fair Queuing		A3.3.4.1	Yes
	LAN components shall be capable of - four hardware queues (Expedited Forwarding, Assured Forwarding, Assured Forwarding Preferred, and Default) - Assigning any "tagged" session to any hardware queues		A3.3.4.1	Yes
LAN Behaviors	LAN components shall support Differential Service Per-Hop Behaviors per RFCs 2474, 2475, and 3260		A3.3.4.2	Yes
VLANs	LAN components shall support: - Port based VLANs - MAC address based VLANs - Shall be capable of reassigning VLAN IDs - Accepting VLAN tagged frames in accordance with IEEE 802.1Q		A3.3.5	Yes
IEEE Conformance	LAN components shall support: - IEEE 802.1d – Bridging - IEEE 802.1p/Q – Priority tagging/VLAN tagging - IEEE 802.1s – Per-VLAN Group Spanning Tree - IEEE 802.1v – VLAN Classification by port and protocol - IEEE 802.1w –Rapid Reconfiguration of Spanning Tree - IEEE 802.1x – Port Based Network Access Control - IEEE 802.3ad – Link Aggregation Protocol - IEEE 802.3af - Power over Ethernet (Conditional)		A3.3.9.1	Yes
Single Device Redundancy	ASLAN	LAN components shall support: - ASLAN components shall have a reliability of .99999 or better - Dual power supplies and dual processors (more than 64 users) - N+1 sparing for access (more than 64 users) - Redundancy protocol ¹ - 2 second path restoral - No single point of failure will cause loss of more than 64 users	A3.3.9.3.1	Yes
	non-ASLAN	This requirement is conditional for a non-ASLAN.	A3.3.9.3.1	No
Security	LAN components shall employ the Network Infrastructure and VoIP STIGs. ²		A3.3.8	Yes
IPv6	All IP devices shall be IPv6 capable.		1.7, A3.2.8, and A11	Yes
<p>NOTES:</p> <p>1 In accordance with UCR 2007, Appendix 3, A3.3.9.4, OSPF, IS-IS, and BGP are the routing protocols supported for core and distribution components. The redundancy protocol shall be VRRP or equivalent protocol for access components.</p> <p>2 Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (c).</p>				

Table 2-2. ASLAN and non-ASLAN Component Requirements (continued)

LEGEND:		
802.1d	Standard for Local and Metropolitan Area Networks: MAC Bridges	ASLAN Assured Services LAN
802.1p	LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization	BGP Border Gateway Protocol
802.1Q	Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks	CoS Class of Service
802.1s	Standard for Local and Metropolitan Area Networks - Amendment 3 to 802.1Q Virtual Bridged Local Area Networks: Multiple Spanning Trees	CSMA/CD Carrier Sense Multiple Access with Collision Detection
802.1v	Standard for Local and Metropolitan Area Networks - Virtual Bridge Local Area Networks - Amendment 2: VLAN Classification by Protocol and Port (Amendment to IEEE 802.1Q, 1998 Edition)	DISA Defense Information Systems Agency
802.1w	Standard for Local and metropolitan area networks - Common Specifications - Part 3: Media Access Control (MAC) Bridges: Rapid Configuration	DSCP Differentiated Services Code Point
802.1x	Standard for Local and Metropolitan Area Networks Port-Based Network Access Control	IEEE Institute of Electrical and Electronics Engineers
802.3ad	Standard for Information Technology – Local and Metropolitan Area Networks – Part 3: CSMA/CD Access Method and Physical Layer Specifications– Aggregation of Multiple Link Segments	ID Identification
802.3af	Standard for CSMA/CD Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)	IP Internet Protocol
A	Appendix	IPv6 Internet Protocol version 6
		IS-IS Intermediate System-Intermediate System
		LAN Local Area Network
		MAC Media Access Control
		NCID Net-Centric Implementation Document
		N total VoIP users / 64
		OSPF Open Shortest-Path First
		QoS Quality of Service
		RFC Request for Comment
		SNMP Simple Network Management Protocol
		STIGs Security Technical Implementation Guides
		UCR Unified Capabilities Requirements
		VLANs Virtual LANs
		VoIP Voice over Internet Protocol
		RRRP Virtual Router Redundancy Protocol

8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC’s Global Information Grid Network Test Facility in a manner and configuration similar to that of the DSN operational environment. Figure 2-5 depicts the SUT test configuration.



NOTES:

- 1 The SUT Catalyst 7600/6500 series switches are certified for the access, distribution, and core layer. The Cisco 7600 series was tested with the Sup720 and Route Switch Processor (RSP) series processors and is only certified for an ASLAN as a single processor per chassis and must be deployed with a dual chassis for the core or distribution layers.
- 2 The Catalyst 4500 and 4500-E series are certified with Sup II+ and 6E processors when deployed as a component in an ASLAN. The 6E processors must be deployed in a single processor dual-chassis configuration when deployed in the core or distribution layer. The SUPII+ is certified only at the access layer.
- 3 The SUT Catalyst 3560E-12D series switches are certified for the distribution layer only when deployed as a component of an ASLAN or non-ASLAN.
- 4 The Catalyst 3750-E series and Catalyst 3560-E series are certified in the access layer when deployed as a component in an ASLAN or non-ASLAN.

LEGEND:

ASLAN	Assured Services Local Area Network	SUT	System Under Test		10 Gigabit Ethernet
DSN	Defense Switched Network				1 Gigabit Ethernet

Figure 2-5. SUT Test Configuration

9. SYSTEM CONFIGURATIONS. Table 2-3 provides the system configurations, hardware, and software components tested with the SUT. The SUT is certified with switching systems listed on the Unified Capabilities (UC) Approved Products List (APL) that are certified for use with an ASLAN or non-ASLAN.

Table 2-3. Tested System Configurations

System Under Test Components with Current Operating System			
Component (See note 1.)	Release	Sub-component (See note 1.)	Function
CISCO7613, CISCO7609, CISCO7609-S , CISCO7606, CISCO7606-S, CISCO7604, CISCO7603, CISCO7603-S	IOS 122- 33.SRD	WS-SUP720-3B	Cisco 7600 Supervisor 720 Fabric MSFC3 PFC3B
		WS-SUP720-3BXL	Cisco 7600 Supervisor 720 Fabric MSFC3 PFC3BXL
		RSP720-3C-GE	Cisco Supervisor 720
		RSP720-3CXL-GE	Cisco Supervisor 720
		7600-ES20-10G3C	Cisco 7600 Series Ethernet Services 20G Line Card, 2-port 10 GE XFP and DFC-3C
		7600-ES20-GE3C	Cisco 7600 Series Ethernet Services 20G Line Card, 20-port GE SFP and DFC-3C
		7600-ES20-GE3CXL	Cisco 7600 Series Ethernet Services 20G Line Card, 20-port GE SFP and DFC-3CXL
		7600-SIP-400	Cisco 7600 Series SPA Interface Processor-400
		7600-SIP-200	Cisco 7600 Series SPA Interface Processor-200
		7600-SIP-600	Cisco 7600 Series SPA Interface Processor-600
		WS-X6148A-GE-45AF	Cisco 48-Port PoE 802.3af 10/100/1000, w/Jumbo Frame
		WS-X6548-GE-TX	Cisco 48-port fabric-enabled 10/100/1000 Module
		WS-X6708-10GE	Cisco 8 port 10 Gigabit Ethernet module
		WS-X6748-SFP	Cisco 48-Port Gigabit Fiber Port Adapter
		SPA-2X1GE-V2	Cisco 2-Port Gigabit Ethernet Shared Port Adapter
		SPA-5X1GE-V2	Cisco 5-Port Gigabit Ethernet Shared Port Adapter
		SPA-8X1GE-V2	Cisco 8-Port Gigabit Ethernet Shared Port Adapter
		SPA-1X10GE-L-V2	Cisco 1-Port 10Gigabit Shared Port Adapter
		WS-X6148-RJ45V	Catalyst 6500 48-port 10/100 Inline Power, RJ-45
		WS-X6148-RJ-45	Catalyst 6500 48-Port 10/100, Upgradeable to Voice, RJ-45
		WS-X6148-RJ-21	Catalyst 6500 48-Port 10/100 Upgradeable to Voice, RJ-21
		WS-X6148-R21V	Catalyst 6500 48-port 10/100 Inline Power Module, RJ-21
		WS-X6148-45AF	Catalyst 6500 PoE 802.3af 10/100, 48 port(RJ45) line card
		WS-X6148-21AF	Catalyst 6500 PoE 802.3af 10/100, 48 port (RJ21) line card
		WS-X6708-10G-3CXL	Catalyst 6500 8 port 10 Gigabit Ethernet module with DFC3CXL (req. X2)
		WS-X6708-10G-3C	Catalyst 6500 CEF720 8 port 10GE with DFC
		WS-X6548-RJ-21	Catalyst 6500 48-port 10/100, RJ-21, fabric-enabled
WS-X6548-RJ-45	Catalyst 6500 48-port 10/100, RJ-45, x-bar		
WS-X6548-GE-45AF	Catalyst 6500 PoE 802.3af 10/100/1000 48-port(RJ45)CEF256 card		
WS-X6548V-GE-TX	Catalyst 6500 48-port fab-enabled 10/100/1000 inline power mod		
ME-C6524GS-8S ME-C6524GT-8S	IOS 122- 33.SXI	Not Applicable	Cisco ME6524 Switch - 24 GE SFP + 8GE SFP Cisco ME6524 Switch - 24 10/100/1000 + 8GE SFP

Table 2-3. Tested System Configurations (continued)

System Under Test Components with Current Operating System			
Component (See note 1.)	Release	Sub-component (See note 1.)	Function
WS-C6503-E, WS-C6504-E, WS-C6506-E, WS-C6509-E , WS-C6509-NEB-A, WS-C6513, WS-C6503, WS-C6504, WS-C6506, WS-C6509 , WS-C6509-NEB,	IOS 122- 33.SXI	WS-SUP720-3B	Catalyst 6500 Supervisor 720 Fabric MSFC3 PFC3B
		WS-SUP720	Catalyst 6500 Supervisor 720 Fabric MSFC3 PFC3A
		WS-SUP720-3BXL	Catalyst 6500 Supervisor 720 Fabric MSFC3 PFC3BXL
		WS-SUP32-GE-3B	Catalyst 6500 Supervisor 32 with 8 GE uplinks and PFC3B
		WS-SUP32-10GE-3B	Catalyst 6500 Supervisor 32 with 2 ports 10GbE and PFC3B
		WS-X6148-RJ45V	Catalyst 6500 48-port 10/100 Inline Power, RJ-45
		WS-X6148-RJ-45	Catalyst 6500 48-Port 10/100, Upgradeable to Voice, RJ-45
		WS-X6148-RJ-21	Catalyst 6500 48-Port 10/100 Upgradeable to Voice, RJ-21
		WS-X6148-R21V	Catalyst 6500 48-port 10/100 Inline Power Module, RJ-21
		WS-X6148-45AF	Catalyst 6500 PoE 802.3af 10/100, 48 port (RJ45) line card
		WS-X6148-21AF	Catalyst 6500 PoE 802.3af 10/100, 48 port (RJ21) line card
		WS-X6708-10G-3CXL	Catalyst 6500 8 port 10 Gigabit Ethernet module with DFC3CXL (req. X2)
		WS-X6708-10G-3C	Catalyst 6500 8 port 10 Gigabit Ethernet module with DFC3XL (req. X2)
		WS-X6148X2-45AF	Catalyst 6500 PoE 802.3af 10/100, 96-Port (RJ-45) line card
		WS-X6148-FE-SFP	Catalyst 6500 48-port 100FX SFP Ethernet Module
		WS-X6704-10GE	Catalyst 6500 CEF720 4 port 10-Gigabit Ethernet
		WS-X6816-GBIC	Catalyst 6500 16-port GigE mod, 2 fab I/F, (Req. GBICs, DFC/DFC3)
		WS-X6708-10G-3CXL	Catalyst 6500 CEF720 8 port 10GE with DFC
		WS-X6708-10G-3C	Catalyst 6500 CEF720 8 port 10GE with DFC
		WS-X6148V-GE-TX	Catalyst 6500 48-port 10/100/1000 Inline Power Module, RJ-45
		WS-X6148-GE-TX	Catalyst 6500 48-port 10/100/1000 GE Mod., RJ-45
		WS-X6148-GE-45AF	Catalyst 6500 PoE 802.3af 10/100/1000, 48 port (RJ45) line card
		WS-X6148X2-RJ-45	Catalyst 6500 48-Port Ethernet Module 96/10/100
		WS-X6148A-GE-45AF	Catalyst 6500 48-Port PoE 802.3af 10/100/1000, w/Jumbo Frame
		WS-X6148A-GE-TX	Catalyst 6500 48-port 10/100/1000 w/Jumbo Frame, RJ-45
		WS-X6148A-RJ-45	Catalyst 6500 48-Port 10/100 w/TDR, Upgradable - PoE 802.3af
		WS-X6148A-45AF	Catalyst 6500 48-Port PoE 802.3af 10/100, card w/TDR
		WS-X6348-RJ45V	Catalyst 6500 48-port 10/100 Inline Power, RJ-45
		WS-X6348-RJ45	Catalyst 6500 48-port 10/100, RJ-45
		WS-X6348-RJ21V	Catalyst 6500 48-port 10/100 Inline Power, RJ-21
		WS-X6516-GE-TX	Catalyst 6500 16-port 10/100/1000 GE Module, Cross-Bar
		WS-X6516-GBIC	Catalyst 6500 16 port GigE line card - Optical interface
		WS-X6516A-GBIC	Catalyst 6500 16-port GigE Mod, fabric-enabled (Req. GBICs)
		WS-X6548V-GE-TX	Catalyst 6500 48-port fab-enabled 10/100/1000 inline pwr mod
		WS-X6548-GE-TX	Catalyst 6500 48-port fabric-enabled 10/100/1000 Module
		WS-X6548-RJ-21	Catalyst 6500 48-port 10/100, RJ-21, fabric-enabled
		WS-X6548-RJ-45	Catalyst 6500 48-port 10/100, RJ-45, x-bar
		WS-X6548-GE-45AF	Catalyst 6500 PoE 802.3af 10/100/1000 48-port(RJ45)CEF256 card
		WS-X6816-GBIC	Catalyst 6500 16-port GigE mod, 2 fab I/F, (Req GBICs, DFC/DFC3)
		WS-X6748-SFP	Catalyst 6500 48-port GigE Mod: fabric-enabled (Req. SFPs)
WS-X6724-SFP	Catalyst 6500 24-port GigE Mod: fabric-enabled (Req. SFPs)		
WS-X6748-GE-TX	Catalyst 6500 48-port 10/100/1000 GE Mod: fabric enabled, RJ-45		

Table 2-3. Tested System Configurations (continued)

Component (See note 1.)	Release	Sub-component (See note 1.)	Function
WS-C4510R, <u>WS-C4507R</u> , <u>WS-C4507R-E</u> , WS-C4506, WS-C4503, WS-C4503-E, WS-C4506-E, WS- C4510R-E	IOS 122- 50.SG	<u>WS-X4013+10GE</u>	Catalyst 4500 Sup II+10GE, 2x10GE (X2) and 4x1GE (SFP)
		WS-X4013+	Catalyst 4500 Supervisor II-Plus (IOS), 2GE,Console(RJ-45)
		<u>WS-X45-SUP6-E²</u>	Catalyst 4500 E-Series Sup 6-E, 2x10GE(X2) w/ Twin Gig
		WS-X45-SUP6-E/2	Catalyst 45xxR E-Series Sup 6-E, 2x10GE(X2) w/ Twin Gig
		WS-X45-SUP6-E=	Catalyst 4500 E-Series Sup 6-E, 2x10GE(X2) w/ Twin Gig
		<u>WS-X4306-GB</u>	Catalyst 4500 Gigabit Ethernet Module, 6-Ports (GBIC)
		WS-X4302-GB	Catalyst 4500 Gigabit Ethernet Module, 2-Ports (GBIC)
		WS-X4506-GB-T	Catalyst 4500 6-Port 10/100/1000 PoE or SFP (Optional)
		<u>WS-X4148-RJ45V</u>	Catalyst 4500 pre-standard PoE 10/100, 48-Ports (RJ45)
		WS-X4124-RJ45	Catalyst 4500 10/100 Module,24-Ports(RJ45)
		WS-X4148-RJ45	Catalyst 4500 10/100 Auto Module, 48-Ports (RJ-45)
		WS-X4148-RJ21	Catalyst 4500 10/100 Module, 48-Ports Telco (4xRJ21)
		<u>WS-X4148-FX-MT</u>	Catalyst 4500 100BaseFX (FX-MT)
		WS-X4124-FX-MT	Catalyst 4500 FE Switching Module, 24- 100FX (MTRJ)
		WS-X4248-FE-SFP	Catalyst 4500 48-Port 100BASE-X (SFPs Optional)
		WS-X4148-FE-BD-LC	Catalyst 4500 FE Module, 48-Port BX-D (LC) (1550)
		WS-X4148-FE-LX-MT	Catalyst 4500 FE module, 48-port 100LX SMF (MTRJ)
		<u>WS-X4232-GB-RJ</u>	Catalyst 4500 32-10/100 (RJ-45),2-GE(GBIC)
		WS-X4232-RJ-XX	Catalyst 4500 10/100 Module,32-ports(RJ45)+Modular uplinks
		<u>WS-X4248-RJ45V</u>	Catalyst 4500 PoE 802.3af 10/100, 48-Ports (RJ45)
		WS-X4248-RJ21V	Catalyst 4500 PoE 802.3af 10/100, 48-Ports (RJ21)
		WS-X4224-RJ45V	Catalyst 4500 10/100 PoE 802.3af 24-ports (RJ45)
		<u>WS-X4548-GB-RJ45V</u>	Catalyst 4500 PoE 802.3af 10/100/1000, 48-Ports (RJ45)
		<u>WS-X4548-GB-RJ45</u>	Catalyst 4500 Enhanced 48-Port 10/100/1000 Base-T (RJ-45)
		WS-X4524-GB-RJ45V	Catalyst 4500 PoE 802.3af 10/ 100/1000 24-ports (RJ45)
		WS-X4448-GB-RJ45	Catalyst 4500 48-Port 10/100/1000 Module (RJ45)
		WS-X4424-GB-RJ45	Catalyst 4500 24-port 10/100/1000 Module (RJ45)
		WS-X4648-RJ45V-E	Catalyst 4500 E-Series 48-Port PoE 802.3af 10/100/1000 (RJ45)
		<u>WS-X4606-X2-E</u>	Catalyst 4500 E-Series 6-Port 10GbE (X2)
		<u>WS-X4648-RJ45V+E</u>	Catalyst 4500 E-Series 48-Port Premium PoE 10/100/1000
		WS-X4648-RJ45V-E	Catalyst 4500 E-Series 48-Port PoE 802.3af 10/100/1000 (RJ45)

Table 2-3. Tested System Configurations (continued)

Component (See note 1.)	Release	Sub-component (See note 1.)	Function																																												
WS-C3750E-24TD	IOS 122-46.SE	Not Applicable	Catalyst 3750 24 Ethernet 10/100/1000 ports and 2 X2 10 Gigabit Ethernet uplinks																																												
<u>WS-C3750E-24PD</u>			Catalyst 3750 24 Ethernet 10/100/1000 ports with PoE and 2 X2 10 Gigabit Ethernet uplinks																																												
WS-C3750E-48TD			Catalyst 3750 48 Ethernet 10/100/1000 ports and 2 X2 10 Gigabit Ethernet uplinks																																												
<u>WS-C3750E-48PD</u>			Catalyst 3750 48 Ethernet 10/100/1000 ports with PoE and 2 X2 10 Gigabit Ethernet uplinks																																												
WS-C3750E-48PD-F			Catalyst 3750 48 Ethernet 10/100/1000 ports with less than 15.4 watts PoE on all 48 ports and 2 X2 10 Gigabit Ethernet uplinks																																												
<u>WS-C3560E-12D</u> ²			IOS 122-46.SE	Not Applicable	Catalyst 3560E 12 Ten GE (X2) ports																																										
<u>WS-C3560E-12SD</u> ²	Catalyst 3560E 12 SFP+2*10GE(X2)																																														
WS-C3560E-24TD	Catalyst 3560E 24 10/100/1000+2*10GE(X2)																																														
WS-C3560E-48TD	Catalyst 3560E 48 10/100/1000+2*10GE(X2)																																														
WS-C3560E-24PD	Catalyst 3560E 24 10/100/1000 PoE+2*10GE(X2)																																														
<u>WS-C3560E-48PD</u>	Catalyst 3560E 48 10/100/1000 PoE+2*10GE(X2)																																														
<u>WS-C3560E-48PD-F</u>	Catalyst 3560E 48 10/100/1000 15.4W PoE+2*10GE(X2)																																														
<p>NOTES:</p> <p>1 Components and sub-components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same operating software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.</p> <p>2 Indicates these switches support one processor and must be configured to failover to a redundant distribution switch.</p> <p>LEGEND:</p> <table> <tr> <td>DFC</td> <td>Daughter Feature Card</td> <td>S</td> <td>Standard</td> </tr> <tr> <td>E</td> <td>Enhanced</td> <td>SFP</td> <td>Small Form Factor Pluggable</td> </tr> <tr> <td>GBIC</td> <td>Gigabit Interface Converter</td> <td>T1</td> <td>Trunk level 1</td> </tr> <tr> <td>GE</td> <td>Gigabit Ethernet</td> <td>TDR</td> <td>Time Domain Reflectometer</td> </tr> <tr> <td>IOS</td> <td>Internetwork Operating System</td> <td>TX</td> <td>The designation of a cooper RJ-45 connection for Fast Ethernet</td> </tr> <tr> <td>JITC</td> <td>Joint Interoperability Test Command</td> <td>SE</td> <td>Systems Engineering</td> </tr> <tr> <td>LAN</td> <td>Local Area Network</td> <td>SW</td> <td>Station Wire</td> </tr> <tr> <td>NEB</td> <td>Network Equipment Building</td> <td>WS</td> <td>Workgroup Switch</td> </tr> <tr> <td>POE</td> <td>Power over Ethernet</td> <td>XFP</td> <td>Ten Gigabit Form Factor Pluggable</td> </tr> <tr> <td>Req.</td> <td>requires</td> <td></td> <td></td> </tr> <tr> <td>RJ</td> <td>Registered Jack</td> <td></td> <td></td> </tr> </table>					DFC	Daughter Feature Card	S	Standard	E	Enhanced	SFP	Small Form Factor Pluggable	GBIC	Gigabit Interface Converter	T1	Trunk level 1	GE	Gigabit Ethernet	TDR	Time Domain Reflectometer	IOS	Internetwork Operating System	TX	The designation of a cooper RJ-45 connection for Fast Ethernet	JITC	Joint Interoperability Test Command	SE	Systems Engineering	LAN	Local Area Network	SW	Station Wire	NEB	Network Equipment Building	WS	Workgroup Switch	POE	Power over Ethernet	XFP	Ten Gigabit Form Factor Pluggable	Req.	requires			RJ	Registered Jack	
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10. TESTING LIMITATIONS. None.

11. TEST RESULTS

a. Discussion. The SUT met the minimum interoperability requirements of the UCR, appendix 3, for an ASLAN. If a system meets the minimum requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN. The network consisted of three main components: core, distribution, and access switches. The SUT system and component test results are provided below.

(1) LAN Traffic Prioritization. The UCR, appendix 3, section A3.3.3, outlines several methodologies to implement prioritization. The SUT employed IEEE 802.1p/Q at the Data Link Layer (L2) and Differentiated Services Code Point (DSCP) at the Network Layer (L3) and 802.1p/Q to DSCP mapping, which was verified by capturing packets at both layers within the network.

(2) LAN Traffic Priority Methods. As required by the UCR 2007 A3.3.3.1, all LAN components supported DSCP and 802.1p to DSCP mapping. DSCP marking ensured voice signaling would get the highest level of priority; voice media stream would be prioritized lower than voice signaling but higher than data, and data traffic would receive the lowest priority. At L2, packets were tagged as: Data traffic = 0, Voice media = 5 and Voice Signaling and Network Management = 6, for L3 prioritization, DSCP were marked 0, 46, and 48 respectively for IPv4. The traffic class for IPv6 was marked as: 0x00000000 for data, 0x000000b8 for Voice Signaling and 0x000000e0 for Signaling and Network Management respectively. Uplinks were filled to capacity with data packets and voice packets were transmitted across the SUT. The voice packets were placed in a higher queue and were not delayed through the network. The SUT configuration for all access layer ports was trusted. This was accomplished by default or by assigning the trust QoS statements to all ports.

(3) LAN Queuing. The UCR, appendix 3, paragraph 3.3.4.1, outlines that an ASLAN must support at least one of the following queuing mechanisms: Priority Queuing, Custom Queuing, Weighted Fair Queuing, or Class-Based Weighted Fair Queuing. The SUT supports all of the queuing mechanisms; however, only Priority Queuing was tested and is covered under this certification. Priority Queuing supports queues from high to low. All packets of a higher priority queue will be transmitted before any packets from a lower priority queue. Queues are serviced in order of queue priority. The highest queue gets serviced first until the queue is empty and then the next lower priority queue is serviced. If a lower priority queue is being serviced and a packet in the higher queue enters the higher queue, the higher priority queue gets serviced immediately after the current packet from the lower queue is sent. Then, once the higher priority queue is empty, the lower priority queue continues being serviced.

(4) LAN Behaviors. The SUT implemented DiffServ Class-Based Shaping (CBS) that uses DSCP values to define how traffic is treated at each individual network node. DSCP values are used from the L3 IP header.

Traffic Policing limits the input or output transmission rate of a class of traffic based on user-defined criteria and marks packets by setting the IP Precedence value, the QoS group, or the DSCP value. The UCR, appendix 3, paragraph A3.3.4.2, outlines that the ASLAN must meet at least one of the following policing mechanisms: DiffServ PHB, Generic Traffic Shaping (GTS), or CBS. The SUT implemented DiffServ PHB which uses DSCP values to define how traffic is treated at each individual node, which meets the requirement.

(5) Virtual LAN (VLAN). The UCR, appendix 3, paragraph A3.3.5, outlines that the ASLAN shall support either implicit or explicit VLAN membership for: Port-based VLANs, Media Access Control (MAC) address-based VLANs, or L3 protocol-based VLANs. The SUT supports port-based VLANs which meets the requirement. Switches within the topology were configured with multiple VLANs using the IEEE 802.1Q tag to

separate data from voice traffic. MAC address and Protocol-based VLANs were verified through the LoC as well as packet captures.

(6) IEEE Conformance. All aspects of IEEE conformance were met through the LoC or testing. All test results are discussed under their respective topics.

(7) Reliability. The UCR, appendix 3, section A3.3.9.3, requires that there be no single point of failure within the ASLAN that can cause an outage of more than 64 telephony subscribers. If an access device has a single point of failure and offers more than 64 ports (e.g. 96), the end users shall not use more than 64 of these connections for IP telephony. The remaining 32 ports shall only be utilized for data connections. In order to meet the availability requirement of an ASLAN, all switching/routing platforms that offer more than 64 telephony subscribers shall have a switch design or configuration that provides at a minimum dual power supplies, dual processors, redundancy protocol, and switch fabric redundancy. To meet the reliability requirements, dual Gigabit and/or 10 Gigabit Link Aggregation was configured between the core and distribution switches, and dual Gigabit and/or 10 Gigabit L2 rapid spanning tree links connected the distribution and access switches, as shown in Figure 2-5. The link aggregation from the distribution to the core must be terminated onto separate fiber cards at the core switch. Reliability is a conditional requirement for a non-ASLAN.

(8) Network Management. The UCR, appendix 3, paragraph A3.3.7, requires that the vendor provide a management system to monitor the performance of the ASLAN portion of the VoIP system. Due to numerous third party systems and applications capable of performing this function, this requirement was verified via LoC.

(9) Security. Security requirements in accordance with the UCR, appendix 3, paragraph A3.3.8, were verified using the Information Assurance Test Plan. Results of the security testing are reported in a separate test report generated by the Defense Information Systems Agency (DISA) Information Assurance test personnel.

(10) LAN Availability. The UCR, appendix 3, paragraph A3.3.9.2, requires that the ASLAN must have a hardware availability designed to meet the needs of the following subscribers: Special C2 ASLAN supports Special C2 users and are classified as a High Availability ASLAN and must meet 99.999 percent availability. A C2 ASLAN supports C2 users is classified as a Medium Availability ASLAN must have 99.997 percent availability. LAN Availability was satisfied by a vendor LoC.

(11) IPv6. The UCR, appendix 3, section A3.2.8, requires that VoIP systems must meet the IPv6 capability requirements as defined in the UCR, appendix 11. An IPv6 capable system or product, as defined in the UCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is now satisfied with ASLAN certification testing and a vendor LoC signed by the Vice President of the company. The UCR, Appendix 11, A11.3.15, requires the system to support the Open Shortest Path First (OSPF) for IPv6. OSPF version three (OSPF v3)

was used during the tests. IPv6 capabilities were tested and all requirements were met. The vendor stated, in writing, compliance to the following criteria:

(a) Conformant with IPv6 standards profile contained in the Department of Defense (DoD) Information Technology Standards Registry (DISR).

(b) Maintaining interoperability in heterogeneous environments and with IPv4.

(c) Commitment to upgrade as the IPv6 standard evolves.

(d) Availability of contractor/vendor IPv6 technical support.

Cisco's ASLAN IPv6 LoC submission indicates that they meet all of the respective Request for Comment (RFC)s for a Layer 3 (L3) Switch with the exception of the four listed below.

- . 3041 Privacy Extensions of Stateless Address AutoConfiguration.
- . 4022 Management Information Base the transmission control protocol.
- . 4191 Default Router Preferences and More-Specific routes.
- . 4113 User Datagram Protocol for Management Information Base.

DISA reviewed these exceptions and adjudicated them as minor for an L3 switch.

(12) Traffic Engineering

(a) Links. To meet the ASLAN requirements for failover, all links connected between the core and distribution switches and between the distribution switches were configured as Link Aggregation. The link aggregation between the core and distribution must be terminated on separate fiber cards at each switch.

(b) Scalability. The SUT can be scaled to meet any number of IP phone subscribers as long as the SUT is composed of the equipment and software listed in Table 2-3, and are consistent with traffic engineering constraints contained in the UCR, appendix 3. Table 2-4, which was approved by the DSN Configuration Control Board (DSN CCB) on Dec 2004, outlines the maximum number of subscribers that can be supported per each link capacity.

Table 2-4. IP Subscriber Supportability by Link Capacity

Link Type	LAN BW	Users
Non-Converged	10 Mbps	64 (See note 1.)
	100 Mbps	64 (See note 1.)
	1 Gbps	64 (See note 1.)
	10 Gbps	64 (See note 1.)
	10 Mbps LP	100 (See note 2.)
	100 Mbps LP	1000 (See note 2.)
	1 Gbps LP	10000 (See note 2.)
	10 Gbps LP	100000 (See note 2.)
Converged	10 Mbps	25 (See note 3.)
	100 Mbps	64 (See note 1.)
	1 Gbps	64 (See note 1.)
	10 Gbps	64 (See note 1.)
	10 Mbps LP	25 (See note 3.)
	100 Mbps LP	250 (See note 4.)
	1 Gbps LP	2500 (See note 4.)
	10 Gbps LP	25000 (See note 4.)

NOTES:

- 1 For single links, number of telephony subscribers is limited to a maximum of 64 because of single point of failure. This limit applies specifically to ASLANs.
- 2 The number of users is calculated as bandwidth (BW) divided by 100 kbps per user.
- 3 The number of users was limited to 64 telephony subscribers per note 1 or 25% of total users per note 1, whichever was less.
- 4 For the converged network, voice traffic was engineered not to exceed 25 % of total utilization using an estimated 100 kbps per voice call.

LEGEND:

ASLAN	Assured Services LAN	kbps	kilobits per second
BW	Bandwidth	LAN	Local Area Network
Gbps	Gigabits per second	LP	Link Pair
IP	Internet Protocol	Mbps	Megabits per second

(13) LAN Architectures. The Catalyst 7600 and 6500 series are certified in the core, distribution, and access layers under the guidelines of the UCR 2007. The Catalyst 4500 and 4500-E series are certified as access layer only. The Catalyst 3750-E series is certified in the access layer. The Catalyst 3560E-12 series is certified in the distribution layer and the 3560E-48 series is certified in the access layer.

The core switches are connected in a fully redundant mode, using the port-channel architecture. These switches are also connected to the distribution switches in a full mesh.

The distribution layer switches are connected in a fully redundant mode to the core switches and to each other using the port-channel architecture. These switches also provide redundant connectivity to the access switches wherever possible. If there are less than 64 users, redundancy is not required.

The access layer provides access to telephony users. All SUT access layer switches can be configured and are certified for Power over Ethernet (PoE). Components supporting the IEEE 802.3af standard are depicted with AF in the component title or function and they will provide PoE to any certified IP phone on the UC APL that

supports IEEE 802.3af. Other components that provide PoE but do not comply with the IEEE 802.3af standard will support any Cisco IP phone on the UC APL. Other IP phones on the UC APL will have to be powered by an external power supply if they are connected to a component that provides PoE but does not support the IEEE 802.3af standard.

The UCR, appendix 3, section A3.3.9.4, requires that OSPF or Intermediate System-Intermediate System (IS-IS) will be used for intradomain routing and shall use routing protocols in accordance with the DISR to provide survivability. To meet the ASLAN failover requirements, OSPF was implemented in the ASLAN and met the requirement. OSPF utilizes link-state protocols to identify lowest cost paths within the LAN. Additionally, OSPF is an open standard, and is a common protocol between different vendors' equipment. The 4507 series with SUP 6E incorrectly assigned the DSCP value in OSPF IPv4 packets. This finding was adjudicated by DISA as a minor discrepancy. The vendor ensures OSPF through out-of-band prioritization. The vendor enabled Multiprotocol Label Switching (MPLS) between the core and distribution elements and there was no negative impact found.

(a) Delay. The UCR, appendix 3, section A3.3.2.1, states the one-way packet delay shall be five milliseconds (ms) or less, as measured over a five-minute period. The average one-way delay for each of the sampled five-minute periods, measured between the access and core devices, was 0.0 ms, which met the requirement.

(b) Jitter. The UCR, appendix 3, section A3.3.2.2 states jitter for voice media packets will be 5 ms or less as averaged over any five-minute period. With a 100 percent bandwidth load, jitter was measured to be 0.0 ms or less over a five-minute period, which met the requirement.

(c) Packet Loss. Network packet loss occurs when packets are sent, but not received at the final destination. The UCR, appendix 3, section A3.3.2.3, states that LANs shall be engineered so the measured voice packet loss within the LAN shall not exceed 0.05 percent averaged over any five-minute period. With 100 percent bandwidth load, the measured packet loss was 0.00 percent, which met the requirement.

b. System Interoperability Results. The SUT is certified for joint use within the DSN with a digital switching systems listed on the UC APL which are certified for use with an ASLAN or non-ASLAN. The SUT is certified to support DSN Assured Services over IP as an ASLAN in accordance with the requirements set forth in the UCR, appendix 3. If a system meets the minimum requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. The SUT is certified for joint use as a non-ASLAN for C2R and non-C2 traffic. Non-ASLANs may provide MLPP to users authorized to originate only ROUTINE precedence calls but terminate all precedence levels. Non-ASLANs do not

need to meet the availability or redundancy requirements of the Special C2 users or the C2 users capable of originating precedence calls above ROUTINE. Since non-ASLANs are not required to support the reliability requirements detailed in the UCR for ASLANs, C2 users and Special C2 users are not authorized to be served by a non-ASLAN. The system interoperability test summary is shown in Table 2-5 and the detailed component interoperability test status is shown Table 2-6.

Table 2-5. SUT System Interoperability Test Summary

Device Requirement ¹	Reference	Test Results	Remarks
Delay measured at 5 ms or less	UCR, Appendix 3, A3.3.2.1	Met	The average was 0.0 ms.
Jitter measured at less than 5 ms	UCR, Appendix 3, A3.3.2.2	Met	Measured to be 0.0 ms or less.
Packet Loss less than 0.05%	UCR, Appendix 3, A3.3.2.3	Met	Measured to be 0.00%.
Reliability	UCR, Appendix 3, Section A.3.3.9.3	Met	See note 2.
Availability	UCR, Appendix 3, Section A3.3.9.2	Met	See note 3.
IPv6	UCR, Appendix 3, Section A3.2.8	Met	See note 4.
Security	UCR, Appendix 3, A3.3.8	Met	See note 5.

NOTES:

- 1 If a system meets the minimum requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN.
- 2 Reliability is a conditional requirement for a non-ASLAN.
- 3 Availability must meet the requirement of 99.999% for Special C2 users and 99.997% for C2 users. LAN Availability was satisfied by vendor Letter of Compliance.
- 4 An IPv6 capable system or product, as defined in the UCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability was satisfied by JITC Interoperability testing and vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria:
 - a. Conformant with IPv6 standards profile contained in the DISR.
 - b. Maintaining interoperability in heterogeneous environments and with IPv4.
 - c. Commitment to upgrade as the IPv6 standard evolves.
 - d. Availability of contractor/vendor IPv6 technical support.
- 5 Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (c).

LEGEND:

A	Appendix	IPv6	Internet Protocol version 6
ASLAN	Assured Services Local Area Network	JITC	Joint Interoperability Test Command
C2	Command and Control	LAN	Local Area Network
DISA	Defense Information Systems Agency	ms	millisecond
DISR	DoD Information Technology Standards Registry	SUT	System Under Test
DoD	Department of Defense	UCR	Unified Capabilities Requirements
IPv4	Internet Protocol version 4		

Table 2-6. Component Interoperability Test Summary

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
10000/1000 Base SX/LX 100BaseFX 10/100/1000 BaseT	CISCO7613, CISCO7609, <u>CISCO7609-S</u> , CISCO7606, CISCO7606-S, CISCO7604, CISCO7603, CISCO7603-S	Certified as: Core Distribution Access	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
			TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²
1000Base SX/LX 10/100/1000 BaseT	<u>ME-C6524GS-8S</u> ME-C6524GT-8S	Certified as: Core Distribution	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
			TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²

Table 2-6. Component Interoperability Test Summary (continued)

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
10000/1000 Base SX/LX 10/100/1000 BaseT	WS-C6503-E, WS-C6504-E, WS-C6506-E, <u>WS-C6509-E</u> , WS-C6509-NEB-A, WS-C6513, WS-C6503, WS-C6504, WS-C6506, <u>WS-C6509</u> , WS-C6509-NEB	Certified as: Core Distribution Access	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
			TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²
10000/1000 Base SX/LX 10/100/1000 BaseT	WS-C4510R, <u>WS-C4507</u> , WS-C4506, WS-C4503, WS-C4503-E, WS-C4506-E, <u>WS-C4507R-E</u>	Certified as: Core Distribution Access	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
			TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²

Table 2-6. Component Interoperability Test Summary (continued)

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
10000/1000 Base SX/LX 10/100/1000 BaseT	WS-C3750E-24TD, <u>WS-C3750E-24PD</u> , WS-C3750E-48TD, <u>WS-C3750E-48PD</u> , <u>WS-C3750E-48PD-F</u>	Certified as: Access	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²			
10000/1000 Base SX/LX 10/100/1000 BaseT	<u>WS-C3560E-12D</u> , <u>WS-C3560E-12SD</u>	Certified as: Distribution	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²			

Table 2-6. Component Interoperability Test Summary (continued)

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
10000/1000 Base SX/LX 10/100/1000 BaseT	WS-C3560E-24TD, WS-C3560E-48TD, WS-C3560E-24PD, <u>WS-C3560E-48PD</u>	Certified as: Access	LAN Traffic Prioritization	Met	UCR, Appendix 3, A3.3.3	
			LAN Traffic Priority Methods	Met	UCR, Appendix 3, A3.3.3.1	
			LAN Queuing	Met	UCR, Appendix 3, A3.3.4.1	
			LAN Behaviors	Met	UCR, Appendix 3, A3.3.4.2	
			VLANs	Met	UCR, Appendix 3, A3.3.5	
			IEEE Conformance	Met	UCR, Appendix 3, A3.3.9.1	
			LAN Availability	Met	UCR, Appendix 3, A3.3.9.2	This is met by a vendor LoC.
			LAN Redundancy	Met	UCR, Appendix 3, A3.3.9.3	Redundancy is a conditional requirement for a non-ASLAN. ²
			LAN Network Management	Met	UCR, Appendix 3, A3.3.7	This is met by a vendor LoC.
			LAN Security	Met	UCR, Appendix 3, A.3.3.8	See note 3.
			LAN IPv6 Requirements	Met	UCR, Paragraph 1.7, Appendix 3, A3.2.8 and Appendix 11	See note 4.
TE	Met	UCR, Appendix 3, A.3.3.9.6	Redundant links are not required for a non-ASLAN. ²			

NOTES:

- 1 Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.
- 2 If a system meets the requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN.
- 3 Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (c).
- 4 The UCR, appendix 3, section A3.2.8, requires that VoIP systems must meet the IPv6 capability requirements as defined in the UCR, appendix 11. An IPv6 capable system or product, as defined in the UCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is satisfied with ASLAN certification testing and a vendor LoC signed by the Vice President of the company. Open Shortest Path First version three (OSPF V.3) was used during the tests. IPv6 capabilities were tested and requirements were met. The vendor stated, in writing, compliance to the following criteria:
 - a. Conformant with IPv6 standards profile contained in the DISR.
 - b. Maintaining interoperability in heterogeneous environments and with IPv4.
 - c. Commitment to upgrade as the IPv6 standard evolves.
 - d. Availability of contractor/vendor IPv6 technical support.

Table 2-6. Component Interoperability Test Summary (continued)

LEGEND:			
10/100/1000BaseT	10/100/1000 Mbps (Baseband Operation, Twisted Pair)	IPv6	Internet Protocol version 6
Ethernet		JITC	Joint Interoperability Test Command
ASLAN	Assured Services Local Area Network	LAN	Local Area Network
DISA	Defense Information Systems Agency	Mbps	Megabits per second
DISR	DoD Information Technology Standards Registry	NEB	Network Equipment Building
DoD	Department of Defense	S	Standard
DSN	Defense Switch Network	TE	Traffic Engineering
E	Enhanced	UCR	Unified Capabilities Requirements
IEEE	Institute of Electrical and Electronics Engineers	VLAN	Virtual Local Area Network
IPv4	Internet Protocol version 4	WS	Workgroup Station

12. TEST AND ANALYSIS REPORT. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <https://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (SIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.