DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY
REFER TO: Joint Interoperability Test Command (JTE) **07 Sept 12**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the SecureLogix Enterprise Telephony Management (ETM)® System with Software Version 6.3.0, Build 38 and Telecommunications Appliances ETM® 1012, 1024, 1060, 2100, and 3200 with Software Package 6.3.5

References: (a) Department of Defense Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Chairman, Joint Chiefs of Staff Instruction 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c) through (f), see Enclosure 1

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

2. The SecureLogix ETM® System with Software Package 6.3.0, Build 38 and Telecommunications Appliances ETM® 1012, 1060, and 2100 with Software Version 6.3.5, are hereinafter referred to as the System Under Test (SUT). The SUT meets all of the critical interoperability requirements IAW Reference (c) using test procedures from Reference (d) and is certified for joint use as Fixed Network Element (F-NE) on the Defense Information Systems Network (DISN). The ETM® 3200 and 1024 appliances have similar hardware and the same software as the ETM® 2100 and 1012 respectively. JITC analysis determined the ETM® 3200 and 1024 to be functionally identical for interoperability certification purposes, and they are also certified for joint use within the DISN. The SUT appliances, with their associated application suites, were tested in each mode of operation to insure that they had no adverse effect on interoperability within the DISN. The SUT includes a Telecom Firewall application that has the capability to terminate DISN calls based on "policies" regardless of the precedence level of the call. As a result, assured services mandated by Reference (e) cannot be guaranteed. Therefore the SUT is certified for joint use within the DISN only in the following configurations: Non-intrusive mode (monitor only), and in the intrusive mode (inserted in-line with the circuit) with the terminate policy "Allow Call Terminations" block unchecked, which is optioned under the edit spans/firewall tab. The SUT is certified for use with terminate policies authorized only when it is inserted in the Public Switched Telephone Network (PSTN). This certification expires upon changes that affect interoperability, but no later than three years from the date of the UC Approved Products List (APL) memorandum.

3. This finding is based on interoperability testing, review of the vendor's Letters of Compliance (LoC), and DISA Certifying Authority (CA) Recommendation. Interoperability testing was conducted at JITC's Global Information Grid Network Test Facility at Fort Huachuca, Arizona, from 6 through 19 June 2012. Review of vendor's LoC was completed on 21 November 2011. The DISA CA provided a positive Recommendation on 25 July 2012 based on the security testing completed by DISA-led IA test teams and published in a separate report, Reference (f). Enclosure 2 documents the test results and describes the tested network and system configurations.

4. Section 5.9 of Reference (c) establishes the interfaces and Capability Requirements (CRs), Functional Requirements (FRs) used to evaluate the interoperability of the SUT. Tables 1 and 2 list the interface, CRs/FRs, and component status of the SUT. Enclosure 3 provides a detailed list of the interface, capability, and functional requirements.

Table 1. SUT Interface Interoperability Status

Interface	Critical	UCR Reference	Threshold CR/FR Requirements[1]	Status	Remarks
Access Interfaces					
Analog	No[2]	5.9.2.3.1	1, 2	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
Serial	No[2]	5.9.2.3.2	1, 2	Not Tested	The SUT does not support this interface.
BRI ISDN	No[2]	5.9.2.3.3	1, 2	Not Tested	The SUT does not support this interface.
DS1	No[2]	5.9.2.3.4	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
E1	No[2]	5.9.2.3.5	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
DS3	No[2]	5.9.2.3.6	1, 2, 3	Not Tested	The SUT does not support this interface.
OC-X	No[2]	5.9.2.3.8	1, 2, 3	Not Tested	The SUT does not support this interface.
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	Not Tested	The SUT does not support this interface.
Transport Interfaces					
Analog	No[2]	5.9.2.3.1	1, 2	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
Serial	No[2]	5.9.2.3.2	1, 2	Not Tested	The SUT does not support this interface.
BRI ISDN	No[2]	5.9.2.3.3	1, 2	Not Tested	The SUT does not support this interface.
DS1	No[2]	5.9.2.3.4	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
E1	No[2]	5.9.2.3.5	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
DS3	No[2]	5.9.2.3.6	1, 2, 3	Not Tested	The SUT does not support this interface.
OC-X	No[2]	5.9.2.3.8	1, 2, 3	Not Tested	The SUT does not support this interface.
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	Not Tested	The SUT does not support this interface.
DLoS	No[2]	5.9.2.3.9	1, 2, 5	Not Tested	The SUT does not support this interface.

Table 1. SUT Interface Interoperability Status (continued)

Interface	Critical	UCR Reference	Threshold CR/FR Requirements[1]	Status	Remarks
Device Management Interfaces					
10/100-Mbps Ethernet	No[2]	5.9.2.4.1	4	Certified	Met all Critical CRs and FRs via this interface.
Serial	No[2]	5.9.2.4.1	4	Not Tested	The SUT does not support this interface.

NOTES:
1. The SUT's specific capability and functional requirement ID numbers depicted in the CRs/FRs column can be cross-referenced in Table 2.
2. The UCR does not specify minimum required interfaces for access, transport, or management interfaces; however, the SUT must provide at least one for connectivity.

LEGEND:

BRI	Basic Rate Interface	ISDN	Integrated Services Digital Network
CR	Capability Requirement	LAN	Local Area Network
DLoS	Direct Line of Sight	Mbps	Megabits per second
DS1	Digital System Level 1 (1.544 Mbps)	NM	Network Management
DS3	Digital System Level 3 (44.736 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
E1	European Interface Standard (2.048 Mbps)	SUT	System Under Test
FR	Functional Requirement	UCR	Unified Capabilities Requirements
IP	Internet Protocol	WAN	Wide Area Network

Table 2. SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability[1]	UCR Reference[2]	Status
1	**General NE Requirements**			
	General Requirements	Required	5.9.2.1	Met
	Alarms	Required	5.9.2.1.1	Met
	Congestion Control & Latency	Required	5.9.2.1.2	Met[3]
2	**Compression**			
	ITU-T G.726	Conditional	5.9.2.2	Not Tested[4]
	ITU-T G.728	Conditional	5.9.2.2	Not Tested[4]
	ITU-T G.729	Conditional	5.9.2.2	Not Tested[4]
3	**Interface Requirements**			
	Timing	Required	5.9.2.3.7	Met
4	**Device Management**			
	Management Options	Required	5.9.2.4.1	Met
	Fault Management	Conditional	5.9.2.4.2	Met
	Loop-Back Capability	Conditional	5.9.2.4.3	Not Tested[4]
	Operational Configuration Restoral	Required	5.9.2.4.4	Met
5	**DLoS**			
	DLoS Transport	Conditional	5.9.2.4.5	Not Tested[4]
6	**D-NE Requirements**			
	D-NE General Requirements	Required	5.9.3.1	Not Tested[5]
	D-NE TDM Requirements	Conditional	5.9.3.2	Not Tested[5]
	D-NE IP Requirements	Conditional	5.9.3.3	Not Tested[5]
	Encapsulated TDM Requirements	Conditional	5.9.3.4	Not Tested[5]
	Carrier Group Alarms	Required	5.9.3.5	Not Tested[5]
	Long-Local Requirements	Conditional	5.9.3.6	Not Tested[5]
	Proprietary IP Trunk Requirements	Conditional	5.9.3.7	Not Tested[5]
	Secure Call Handling	Required	5.9.3.8	Not Tested[5]
	Voice Packet Multiplexing	Conditional	5.9.3.9	Not Tested[5]

Table 2. SUT Capability Requirements and Functional Requirements Status (continued)

CR/FR ID	Capability/ Function	Applicability[1]	UCR Reference[2]	Status
7	**IPv6 Requirements**			
	Product Requirements	Required	5.3.5.4	Not Tested[6]

NOTES:
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3.
2. The reference document is the UCR 2008, Change 3.
3. The SUT interfaces are TDM only and therefore congestion is not possible.
4. This conditional feature is not supported by the SUT.
5. The SUT was tested and certified for joint use as Fixed Network Element only. The UCR D-NE requirements are conditional and were not tested.
6. The SUT only supports IP with its Network Management Interface. Per reference (c), Network Management may be deployed IPv4 only.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	IP	Internet Protocol
CR	Capabilities Requirement	IPv4	Internet Protocol version 4
CS-ACELP	Conjugate Structure Algebraic Code-Excited linear Prediction	IPv6	Internet Protocol version 6
		ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
DLoS	Direct Line of Sight		
D-NE	Deployed Network Element	kbps	kilobits per second
FR	Functional Requirement	LD-CELP	Low Delay Code Excited Linear Prediction
G.726	ITU-T speech codec for ADPCM (32 kbps)	NE	Network Element
G.728	ITU-T speech codec for LD-CELP (16 kbps)	SUT	System Under Test
G.729	ITU-T speech codec for CS-ACELP (8 kbps)	TDM	Time Division Multiplexing
ID	Identification	UCR	Unified Capabilities Requirements

5. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly through government civilian or uniformed military personnel from the Unified Capabilities Certification Office (UCCO). All associated data is available on the DISA UCCO website located at http://www.disa.mil/Services/Network-Services/UCCO.

6. The JITC point of contact is Capt Stéphane Arsenault, DSN 879-5269, commercial (520) 538-5269, FAX DSN 879-4347, or e-mail to Stephane.P.Arsenault.fm@mail.mil. JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Unified Capabilities Certification Office tracking number for the SUT is 1130801.

FOR THE COMMANDER:

3 Enclosures a/s

for RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

Distribution (electronic mail):
DoD CIO
Joint Staff J-6, JCS
USD(AT&L)
ISG Secretariat, DISA, JTA
U.S. Strategic Command, J665
US Navy, OPNAV N2/N6FP12
US Army, DA-OSA, CIO/G-6 ASA(ALT), SAIS-IOQ
US Air Force, A3CNN/A6CNN
US Marine Corps, MARCORSYSCOM, SIAT, A&CE Division
US Coast Guard, CG-64
DISA/TEMC
DIA, Office of the Acquisition Executive
NSG Interoperability Assessment Team
DOT&E, Netcentric Systems and Naval Warfare
Medical Health Systems, JMIS IV&V
HQUSAISEC, AMSEL-IE-IS
UCCO

ADDITIONAL REFERENCES

(c) Office of the Department of Defense Chief Information Officer, "Department of Defense Unified Capabilities Requirements 2008, Change 3," September 2011
(d) Joint Interoperability Test Command Document, "Unified Capabilities Test Plan," May 2009
(e) 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
(f) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of SecureLogix Enterprise Telephony Management (ETM) System Release (Rel.) 6.3.0 (Tracking Number 1130801)," Draft

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. SecureLogix Enterprise Telephony Management (ETM)® System with Software Version 6.3.0, Build 38 and Telecommunications Appliances ETM® 1012, 1024, 1060, 2100, and 3200 with Software Package 6.3.5; hereinafter referred to as the System Under Test (SUT).

2. SPONSOR. Ms. Jenny Dolak, NETC-SFD, 2nd Signal Center/CONUS Theater Network Operations & Security Center (C-TNOSC), 2133 Cushing Street, Fort Huachuca, Arizona 85613, email: jenny.c.dolak.civ@mail.mil.

3. SYSTEM POC. Mr. Tim Spiegel, SecureLogix Corporation, 13750 San Pedro, Suite 820, San Antonio, Texas 78232, email: tspiegel@securelogix.com.

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

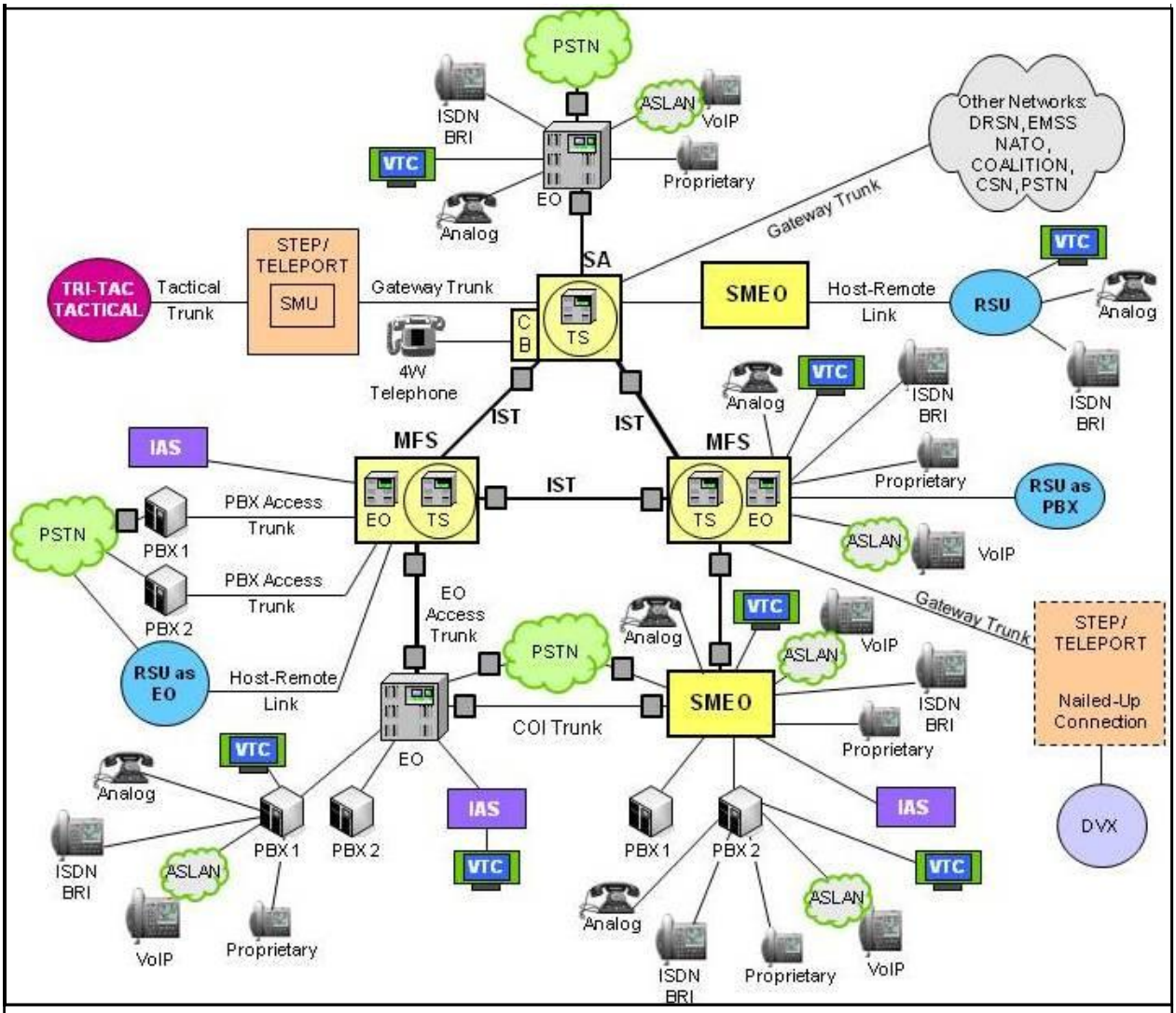
5. SYSTEM UNDER TEST (SUT) DESCRIPTION. The SUT is certified for joint use in the Defense Information Systems Network (DISN) in accordance with the requirements set forth in reference (c). The SUT and its associated applications and appliances met all the critical interoperability requirements as a Fixed Network Element (F-NE) and were transparent to the switching systems interfaced, causing no degradation of service or negative impact when connected to the interfaces certified in this letter. The SUT includes a Telecom Firewall application, which has the capability to terminate DISN calls based on "policies" regardless of the precedence level of the call. As a result, assured services mandated by reference (e) cannot be guaranteed. Therefore the SUT is certified for joint use within the DISN only in the following configurations: Non-intrusive mode (monitor only), and in the intrusive mode (inserted in-line with the circuit) with the terminate policy "Allow Call Terminations" block unchecked, which is optioned under the edit spans/firewall tab. The SUT is certified with terminate policies authorized only when it is inserted in the Public Switched Telephone Network (PSTN). The SUT includes expandable, managed appliances, which are deployed as F-NE devices on trunks and lines. These appliances are controlled by remote servers and support a number of existing security and management applications. The SUT is managed from a remote client, which can be used to manage multiple servers and appliances.

- **ETM® Telecommunications Appliances -** The ETM® 1012, 1024, 2100 and 3200 Telecommunications Appliances are rack-mountable in-line devices, which are deployed on trunks between two digital switching systems. These ETM® Telecommunications Appliances continuously monitor all signaling and bearer traffic, and use an expandable policy engine to examine calls and take actions based upon user-defined rules. The ETM® 1060 Telecommunication Appliance is a call recorder that records audio calls and automatically uploads the recorded calls to the ETM Collection Server. All ETM® Telecommunications Appliances are remotely managed and can be remotely upgraded with new software and applications. There are several versions of the ETM® Telecommunications Appliance to suit a variety of different

telephone signaling types (e.g. Channel Associated Signaling (CAS), Primary Rate Interface (PRI), Signaling System Number 7 (SS7), and Analog).

- **ETM® Applications -** The ETM® SUT includes the ETM® Management Server, the Database Server, the ETM® System Console, and the ETM® Collection Server. The ETM® Management Server consists of applications that collect data from ETM® Telecommunications Appliances, maintain system configuration and policy data, store all call data in a database, generate reports, and provide an anchor point for the Graphical User Interface (GUI) client. These applications can run on one or multiple physical servers to allow the system to be configured to meet customer requirements. The Database Server provides back-end data storage duties for the ETM® Management Server. The ETM® System Console is the client GUI used to monitor and control the SUT. Individual client applications available from the console include the Performance Manager, Directory Manager, and the Usage Manager. All security, management, and real-time visibility functions are available via these tools. The client applications include a visual representation of all SUT hardware and each monitored circuit. The client also includes tools for appliance and server administration, log review, call monitoring, viewing of real-time alerts, and user configuration. The ETM® Collection Server is an application to which one or more Call Recording Caches transmit the stored call recordings at user-defined intervals for permanent storage, playback, and analysis.

6. OPERATIONAL ARCHITECTURE. JITC tested the SUT under the F-NE Unified Capabilities Requirements (UCR) product category. A high-level DISN node architecture, as depicted in Figure 2-1. The SUT is currently deployed at various camps, posts, or stations.



LEGEND:

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

Figure 2-1. DISN Architecture

7. INTEROPERABILITY REQUIREMENTS. The interface, Capability Requirements (CR), Functional Requirements (FR), Information Assurance (IA), and other requirements for NE products are established by sections 5.4 and 5.9 of the Department of Defense UCR 2008, Change 3.

7.1 Interfaces. The NE products use its interfaces to connect to the DISN or PSTN infrastructure. The threshold requirements for interfaces specific to the NE products are listed in Table 2-1.

Table 2-1. NE Interface Requirements

Interface	Critical	UCR Reference	Threshold CR/FR Requirements[1]	Criteria
Access Interfaces				
Analog	No[2]	5.9.2.3.1	1, 2	Meet minimum CR/FRs and interface standards. .
Serial	No[2]	5.9.2.3.2	1, 2	
BRI ISDN	No[2]	5.9.2.3.3	1, 2	
DS1	No[2]	5.9.2.3.4	1, 2, 3	
E1	No[2]	5.9.2.3.5	1, 2, 3	
DS3	No[2]	5.9.2.3.6	1, 2, 3	
OC-X	No[2]	5.9.2.3.8	1, 2, 3	
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	
Transport Interfaces				
Analog	No[2]	5.9.2.3.1	1, 2	Meet minimum CR/FRs and interface standards.
Serial	No[2]	5.9.2.3.2	1, 2	
BRI ISDN	No[2]	5.9.2.3.3	1, 2	
DS1	No[2]	5.9.2.3.4	1, 2, 3	
E1	No[2]	5.9.2.3.5	1, 2, 3	
DS3	No[2]	5.9.2.3.6	1, 2, 3	
OC-X	No[2]	5.9.2.3.8	1, 2, 3	
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	
DLoS	No[2]	5.9.2.3.9	1, 2, 5, 7	
Device Management Interfaces				
10/100-Mbps Ethernet	No[2]	5.3.2.4.1	4	Meet minimum CR/FRs and interface standards.
Serial	No[2]	5.9.2.4.1	4	Meet minimum CR/FRs and interface standards.

NOTES:
1. The CR/FR requirements are contained in Table 2-2. The CR/FR numbers represent a roll-up of UCR requirements.
2. The UCR does not specify a minimum interfaces for access, transport, or device management interfaces.

LEGEND:

BRI	Basic Rate Interface	ISDN	Integrated Services Digital Network
CR	Capability Requirement	LAN	Local Area Network
DLoS	Direct Line of Sight	Mbps	Megabits per second
DS1	Digital System Level 1 (1.544 Mbps)	NM	Network Management
DS3	Digital System Level 3 (44.736 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
E1	European Interface Standard (2.048 Mbps)	SUT	System Under Test
FR	Functional Requirement	UCR	Unified Capabilities Requirements
IP	Internet Protocol	WAN	Wide Area Network

7.2 Capability Requirements (CR) and Functional Requirements (FR). The NE products have required and conditional features and capabilities that are established by section 5.9 of the UCR. The SUT does not need to provide non-critical (conditional) features and capabilities. If they are present, however, they must function according to the specified requirements. Table 2-2 lists the features and capabilities and their

associated requirements for wireless products. Table 3-1 of Enclosure 3 provides detailed CR/FR requirements.

Table 2-2. NE Capability Requirements and Functional Requirements

CR/FR ID	Capability/Function	Applicability[1]	UCR Reference[2]	Criteria	Remarks
1	**General NE Requirements**				
	General Requirements	Required	5.9.2.1	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	Applies to both F-NE and D-NE.
	Alarms	Required	5.9.2.1.1		
	Congestion Control & Latency	Required	5.9.2.1.2		
2	**Compression**				
	ITU-T G.726	Conditional	5.9.2.2	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	Applies to both F-NE and D-NE.
	ITU-T G.728	Conditional	5.9.2.2		
	ITU-T G.729	Conditional	5.9.2.2		
3	**Interface Requirements**				
	Timing	Required	5.9.2.3.7	Meet UCR requirements.	Applicable to TDM interfaces.
4	**Device Management**				
	Management Options	Required	5.9.2.4.1	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	Applies to both F-NE and D-NE.
	Fault Management	Conditional	5.9.2.4.2		
	Loop-Back Capability	Conditional	5.9.2.4.3		
	Operational Configuration Restoral	Required	5.9.2.4.4		
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	Meet UCR DLoS requirements.	Applies to both F-NE and D-NE.
6	**D-NE Requirements[3]**				
	D-NE General Requirements	Required	5.9.3.1	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	Applies to D-NE.
	D-NE TDM Requirements	Conditional	5.9.3.2		
	D-NE IP Requirements	Conditional	5.9.3.3		
	Encapsulated TDM Requirements	Conditional	5.9.3.4		
	Carrier Group Alarms	Required	5.9.3.5		
	Long-Local Requirements	Conditional	5.9.3.6		
	Proprietary IP Trunk Requirements	Conditional	5.9.3.7		
	Secure Call Handling	Required	5.9.3.8		
	Voice Packet Multiplexing	Conditional	5.9.3.9		
7	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Meet UCR IPv6 requirements.	Applies to both F-NE and D-NE

NOTES:
1. Annotation of 'required' refers to high-level requirement category. Applicability of each sub-requirement is provided in enclosure 3.
2. Reference document is UCR 2008 Change 3.
3. The D-NE requirements only apply if the SUT is being considered for certification as a D-NE.

Table 2-2. NE Capability Requirements and Functional Requirements (continued)

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	IP	Internet Protocol
CoS	Class of Service	IPv4	Internet Protocol version 4
CR	Capabilities Requirement	IPv6	Internet Protocol version 6
DLoS	Direct Line of Sight	kbps	kilobits per second
D-NE	Deployed Network Element	NE	Network Element
F-NE	Fixed Network Element	NM	Network Management
FR	Functional Requirement	SUT	System Under Test
G.726	ITU-T speech codec for ADPCM (32 kbps)	TDM	Time Division Multiplexing
G.728	ITU-T speech codec for LD-CELP (16 kbps)	UCR	Unified Capabilities Requirements
G.729	ITU-T speech codec for CS-ACELP (8 kbps)	VLAN	Virtual Local Area Network
ID	Identification	VVoIP	Voice and Video over Internet Protocol

7.3 Information Assurance. The IA requirements for NE products are listed in Table 2-3. The IA requirements were derived from the UCR 2008, Change 3, section 5.9, Network Element Requirements, and UCR 2008, Change 3, section 5.4, IA Requirements.

Table 2-3. NE Products IA Requirements

Requirement	Applicability (See note.)	UCR Reference	Criteria
General Requirements	Required	5.4.6.2	Detailed requirements and associated criteria for CER are listed in Reference (f).
Authentication	Required	5.4.6.2.1	
Integrity	Required	5.4.6.2.2	
Confidentiality	Required	5.4.6.2.3	
Non-Repudiation	Required	5.4.6.2.4	
Availability	Required	5.4.6.2.5	

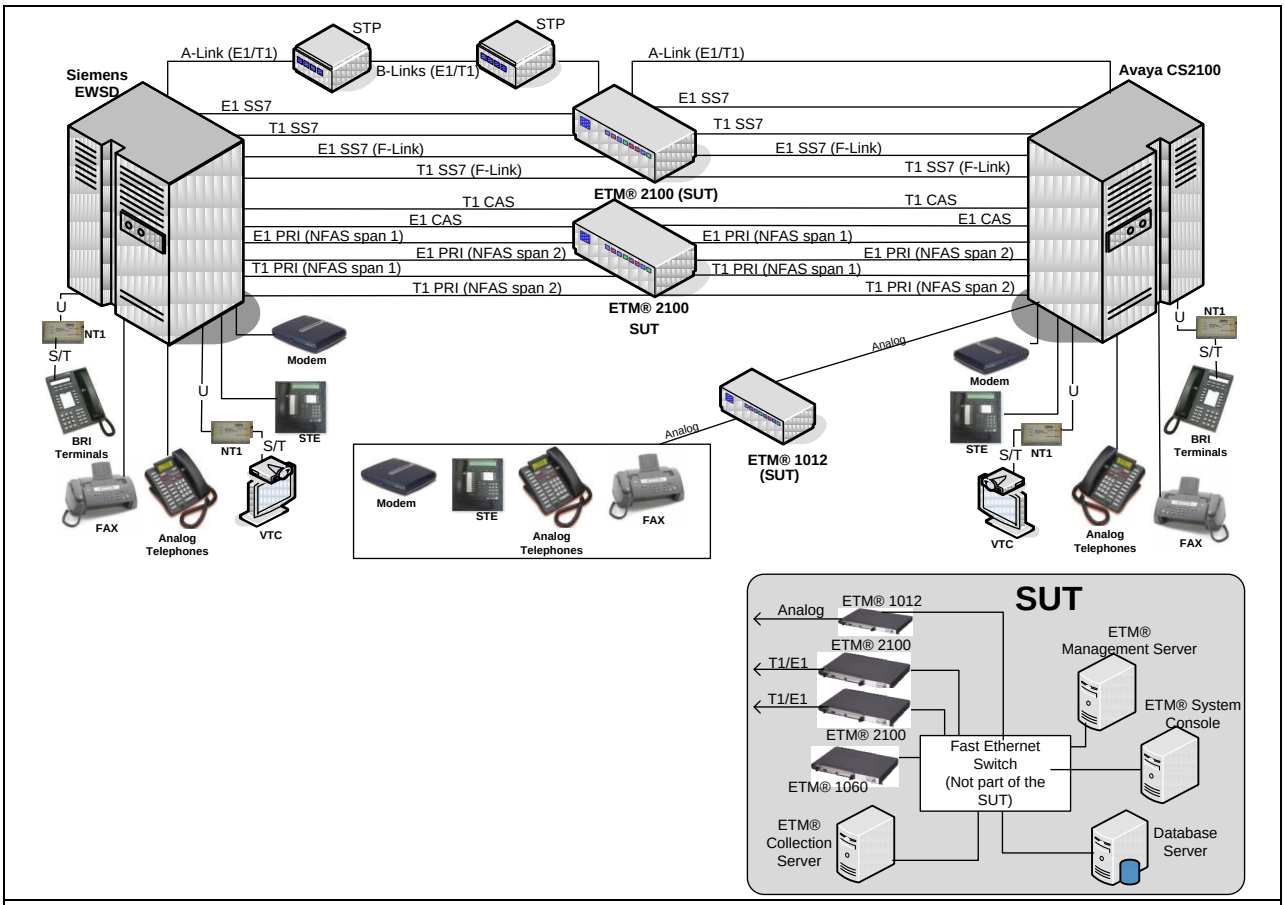
NOTE: The annotation of 'required' refers to a high-level requirement category of IA requirements from the UCR 2008, Change 3, section 5.4. The detailed IA requirements are included in Reference (f).

LEGEND:

CER	Customer Edge Router	UCR	Unified Capabilities Requirements
IA	Information Assurance		

7.4 Other.

8. TEST NETWORK DESCRIPTION. JITC tested the SUT at its Fort Huachuca, Arizona Global Information Grid Network Test Facility using test configurations shown in Figures 2-2 and 2-3. Figure 2-2 denotes the SUT test configuration in the intrusive mode, and Figure 2-3 denotes the SUT test configuration in the non-intrusive mode.

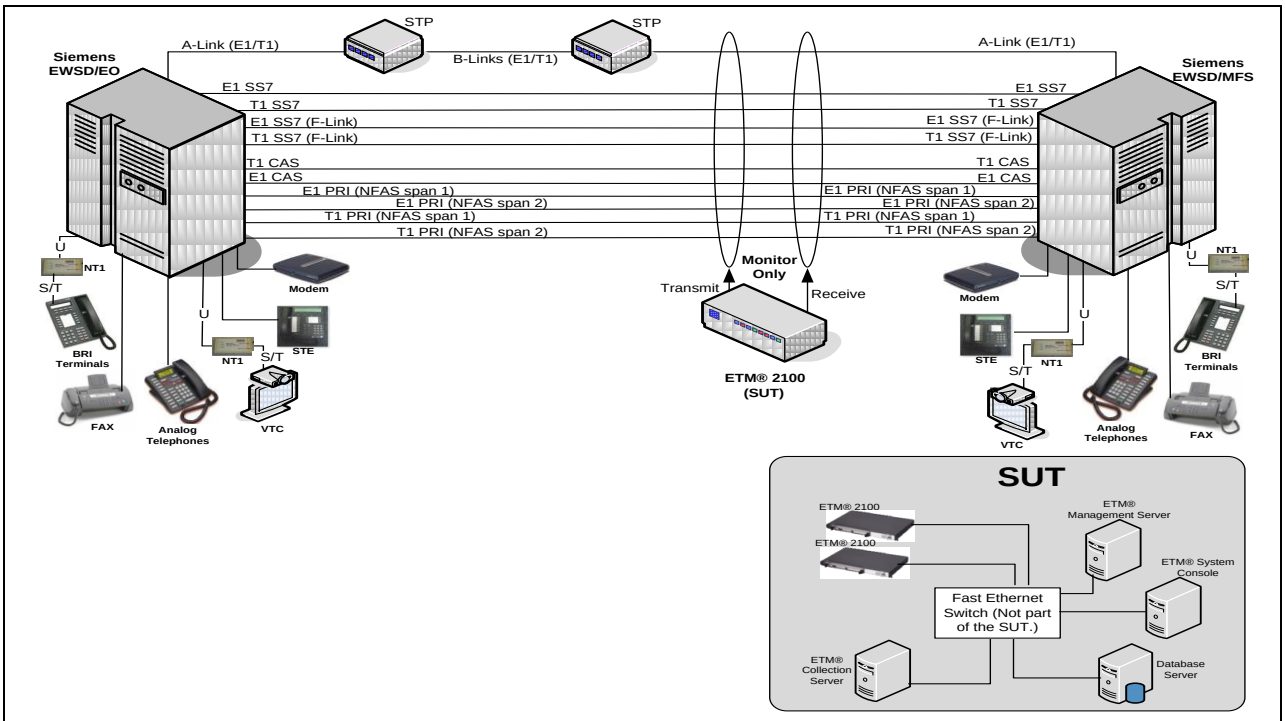


NOTE: Testing was not concurrent. The ETM 2100 is capable of only 4 E1 or 4 T1 spans at a time.

LEGEND:

A-Link	Access Link
B-Link	Bridge Link
BRI	Basic Rate Interface
CAS	Channel Associated Signaling
CR	Call Recorder
CS	Communication Server
E1	European Basic Multiplex Rate (2.048 Mbps)
ETM®	Enterprise Telephony Management®
EWSD	Elektronisches Wählsystem Digital
F-Link	Facility Link
FAX	Facsimile
ISDN	Integrated Services Digital Network
Mbps	Megabits per second
NFAS	Non Facility Associated Signaling
NT1	Network Termination 1
PRI	Primary Rate Interface
SS7	Signaling System 7
S/T	ISDN BRI four-wire interface
STE	Secure Terminal Equipment
STP	Signal Transfer Point
T1	Digital Transmission Link Level 1 (1.544 Mbps)
U	ISDN BRI two-wire interface
VTC	Video Teleconferencing

Figure 2-2. Test Network Configuration (Intrusive Mode)



NOTE: Testing was not concurrent. The ETM 2100 is capable of only 4 E1 or 4 T1 spans at a time.

LEGEND:

A-Link	Access Link
B-Link	Bridge Link
BRI	Basic Rate Interface
CAS	Channel Associated Signaling
CR	Call Recorder
E1	European Basic Multiplex Rate (2.048 Mbps)
ETM®	Enterprise Telephony Management ®
EWSD	Elektronisches Wählsystem Digital
F-Link	Facility Link
FAX	Facsimile
ISDN	Integrated Services Digital Network
Mbps	Megabits per second
MSL	Meridian Switching Load
NFAS	Non Facility Associated Signaling
NT1	Network Termination 1
PRI	Primary Rate Interface
SS7	Signaling System 7
S/T	ISDN BRI four-wire interface
STE	Secure Terminal Equipment
STP	Signal Transfer Point
T1	Digital Transmission Link Level 1 (1.544 Mbps)
U	ISDN BRI two-wire interface
VTC	Video Teleconferencing

Figure 2-3. Test Network Configuration (non-Intrusive Mode)

9. SYSTEM CONFIGURATION. Table 2-4 lists the tested software configuration shown in Figure 2-1, Table 2-4 provides the system 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 offer the same certified interfaces.

Table 2-4. Tested SUT Configuration

System Name		Software
Avaya CS2100		Succession Enterprise (SE)09.1
Siemens EWSD		Release 19d with Patch Set 46
SUT		
Hardware	**Software Release**	**Application**
ETM 1012/1024(See note.)	Version 6.3.5, Linux v2.6.14-7-SLC	Monitor Call Activity Analog PSTN
ETM 1060	Version 6.3.5, Linux v2.6.14-7-SLC	Call Recording Cache
ETM 2100/3200(See note.)	Version 6.3.5, Linux v2.6.14-7-SLC	Monitor Call Activity PSTN/DSN
ETM® Management Server	Windows Server 2008 ETM System Software v6.3 Build 38, JRE 1.6.0_31	Management Server Applications Host
Database Server	Windows Server 2008 Oracle Database Enterprise Edition 11gR2	ETM MS Applications Database
ETM® Collection Server	ETM System Collection Server v6.3.0.1	Software Applications Host
ETM® System Console	Windows 7, ETM System Software 6.3.5 Build 38, JRE 1.6.0_31	User/Administration Applications

NOTE: The ETM® 3200 and 1024 appliances have similar hardware and the same software as the ETM® 2100 and 1012 respectively. JITC analysis determined the ETM® 3200 and 1024 to be functionally identical for interoperability certification purposes, and they are also certified for joint use within the DISN.

LEGEND:

CS	Communication Server	MS	Management Server
ETM	Enterprise Telephony Management	PSTN	Public Switched Telephone Network
EWSD	Elektronisches Wählsystem Digital	R	Revision
DSN	Defense Switched Network	SLC	Scientific Linux CERN
JRE	Java Runtime Environment	V	Version

10. TEST LIMITATIONS. None.

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for F-NE and is certified for joint use within the DISN. Additional discussion regarding specific testing results is contained in subsequent paragraphs.

11.1 Interfaces. The interface status of the SUT is provided in Table 2-5.

Table 2-5. SUT Interface Interoperability Status

Interface	Critical	UCR Reference	Threshold CR/FR Requirements[1]	Status	Remarks
Access Interfaces					
Analog	No[2]	5.9.2.3.1	1, 2	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
Serial	No[2]	5.9.2.3.2	1, 2	Not Tested	The SUT does not support this interface.
BRI ISDN	No[2]	5.9.2.3.3	1, 2	Not Tested	The SUT does not support this interface.
DS1	No[2]	5.9.2.3.4	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
E1	No[2]	5.9.2.3.5	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
DS3	No[2]	5.9.2.3.6	1, 2, 3	Not Tested	The SUT does not support this interface.
OC-X	No[2]	5.9.2.3.8	1, 2, 3	Not Tested	The SUT does not support this interface.
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	Not Tested	The SUT does not support this interface.

Table 2-5. SUT Interface Interoperability Status (continued)

Interface	Critical	UCR Reference	Threshold CR/FR Requirements[1]	Status	Remarks
Transport Interfaces					
Analog	No[2]	5.9.2.3.1	1, 2	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
Serial	No[2]	5.9.2.3.2	1, 2	Not Tested	The SUT does not support this interface.
BRI ISDN	No[2]	5.9.2.3.3	1, 2	Not Tested	The SUT does not support this interface.
DS1	No[2]	5.9.2.3.4	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
E1	No[2]	5.9.2.3.5	1, 2, 3	Certified	Met all Critical CRs and FRs when intrusively inserted or non-intrusively inserted (monitor-only) via this interface.
DS3	No[2]	5.9.2.3.6	1, 2, 3	Not Tested	The SUT does not support this interface.
OC-X	No[2]	5.9.2.3.8	1, 2, 3	Not Tested	The SUT does not support this interface.
IP (Ethernet)	No[2]	5.9.2.3.9	1, 2, 7	Not Tested	The SUT does not support this interface.
DLoS	No[2]	5.9.2.3.9	1, 2, 5	Not Tested	The SUT does not support this interface.
Device Management Interfaces					
10/100 Mbps Ethernet	No[2]	5.9.2.4.1	4	Certified	Met all Critical CRs and FRs via this interface.
Serial	No[2]	5.9.2.4.1	4	Not Tested	The SUT does not support this interface.

NOTES:
1. The SUT's specific capability and functional requirement ID numbers depicted in the CRs/FRs column can be cross-referenced in Table 2-6.
2. The UCR does not specify minimum required interfaces for access, transport, or management interfaces; however, the SUT must provide at least one for connectivity.

LEGEND:

10/100	10/100 Mbps Ethernet	ISDN	Integrated Services Digital Network
BRI	Basic Rate Interface	LAN	Local Area Network
CR	Capability Requirement	Mbps	Megabits per second
DLoS	Direct Line of Sight	NM	Network Management
DS1	Digital System Level 1 (1.544 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
DS3	Digital System Level 3 (44.736 Mbps)	SUT	System Under Test
E1	European Interface Standard (2.048 Mbps)	UCR	Unified Capabilities Requirements
FR	Functional Requirement	WAN	Wide Area Network
IP	Internet Protocol		

11.2 CR and FR. The SUT CR and FR status is depicted in Table 2-6. Detailed CR/FR requirements are provided in Enclosure 3, Table 3-1.

Table 2-6. SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability[1]	UCR Reference[2]	Status
1	**General NE Requirements**			
	General Requirements	Required	5.9.2.1	Met
	Alarms	Required	5.9.2.1.1	Met
	Congestion Control & Latency	Required	5.9.2.1.2	Met[3]
2	**Compression**			
	ITU-T G.726	Conditional	5.9.2.2	Not Tested[4]
	ITU-T G.728	Conditional	5.9.2.2	Not Tested[4]
	ITU-T G.729	Conditional	5.9.2.2	Not Tested[4]

Table 2-6. SUT Capability Requirements and Functional Requirements Status (continued)

CR/FR ID	Capability/ Function	Applicability[1]	UCR Reference[2]	Status
3	**Interface Requirements**			
	Timing	Required	5.9.2.3.7	Met
4	**Device Management**			
	Management Options	Required	5.9.2.4.1	Met
	Fault Management	Conditional	5.9.2.4.2	Met
	Loop-Back Capability	Conditional	5.9.2.4.3	Not Tested[4]
	Operational Configuration Restoral	Required	5.9.2.4.4	Met
5	**DLoS**			
	DLoS Transport	Conditional	5.9.2.4.5	Not Tested[4]
6	**D-NE Requirements**			
	D-NE General Requirements	Required	5.9.3.1	Not Tested[5]
	D-NE TDM Requirements	Conditional	5.9.3.2	Not Tested[5]
	D-NE IP Requirements	Conditional	5.9.3.3	Not Tested[5]
	Encapsulated TDM Requirements	Conditional	5.9.3.4	Not Tested[5]
	Carrier Group Alarms	Required	5.9.3.5	Not Tested[5]
	Long-Local Requirements	Conditional	5.9.3.6	Not Tested[5]
	Proprietary IP Trunk Requirements	Conditional	5.9.3.7	Not Tested[5]
	Secure Call Handling	Required	5.9.3.8	Not Tested[5]
	Voice Packet Multiplexing	Conditional	5.9.3.9	Not Tested[5]
7	**IPv6 Requirements**			
	Product Requirements	Required	5.3.5.4	Not Tested[6]

NOTES:
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3.
2. The reference document is the UCR 2008, Change 3.
3. The SUT interfaces are TDM only and therefore congestion is not possible.
4. This conditional feature is not supported by the SUT.
5. The SUT was tested and certified for joint use as Fixed Network Element only. The UCR D-NE requirements are conditional and were not tested.
6. The SUT only supports IP with its Network Management Interface. Per reference (c), Network Management may be deployed IPv4 only.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	IP	Internet Protocol
CR	Capabilities Requirement	IPv4	Internet Protocol version 4
CS-ACELP	Conjugate Structure Algebraic Code-Excited linear Prediction	IPv6	Internet Protocol version 6
		ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
DLoS	Direct Line of Sight		
D-NE	Deployed Network Element	kbps	kilobits per second
FR	Functional Requirement	LD-CELP	Low Delay Code Excited Linear Prediction
G.726	ITU-T speech codec for ADPCM (32 kbps)	NE	Network Element
G.728	ITU-T speech codec for LD-CELP (16 kbps)	SUT	System Under Test
G.729	ITU-T speech codec for CS-ACELP (8 kbps)	TDM	Time Division Multiplexing
ID	Identification	UCR	Unified Capabilities Requirements

a. General NE Requirements

(1) General Requirements. The SUT has the ability to automatically or manually enter a metallic bypass mode. In this mode, the input and output connections of the circuits are electronically connected, bypassing the monitoring functionality of the SUT. The call loader was used to generate calls over each of the respective digital interfaces through the SUT. Call load scenarios included simulated 56 kilobits per second (kbps) data, facsimile, modem, and 3-tone voice over each interface. A total

number of 338,249 calls (includes fax, modem, 3-tone, and synchronous data) were placed using the call loader with a recorded 100 percent call completion rate. During call loading, the power was disconnected during a call loading scenario and the SUT automatically entered the bypass mode without affecting call processing. The SUT was also placed in the manual bypass mode during call loading producing the same results as recorded during the automatic mode. There were no noted negative effects with the SUT inserted in the circuit. The UCR 2008, Change 3, section 5.9.2.1, includes the general requirements in the following paragraphs.

(a) The introduction of an NE(s) shall not cause the End-to-End (E2E) average MOS to fall below 4.0 as measured over any five-minute time interval. Voice calls were placed over the interfaces through the SUT and measured a Mean Opinion Score of 4.0 or better with an average of 4.2 as required by the UCR. The SUT had no adverse effects in either the intrusive or non-intrusive mode.

(b) The introduction of an NE(s) shall not degrade the E2E measured bit error rate (BER) to no more than .03 percent from the baseline minimum E2E digital BER requirement which is not more than one error in $1x10^{9}$ bits (averaged over a 9-hour period). The SUT met the requirement as measured through testing. The introduction of the NE did not cause a measureable degradation from the baseline, 0.0 percent. The SUT had a measured baseline of $0x10^{-10}$ during 23 hours of a 64 kbps data BERT. The SUT had a measured baseline of $0x10^{-11}$ during 66 hours of a 56 kbps data BERT.

(c) The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by section 5.2.2. The SUT met the requirement through testing. Over 175 secure calls were placed over the different interfaces using like and unlike devices with no failures.

1. Secure Terminal Equipment (STE) Secure Voice Calls. Secure voice call scenarios (STE to STE calls @ 6.4 & 32 kbps) were conducted over the interfaces through the SUT with a 100-percent success rate with no adverse effects in either the intrusive or non-intrusive mode. Secure calls were also successfully completed using various other Defense Communications Secure Device (DSCD) units for call scenarios.

2. STE Secure Data Calls. The Fireberd 8000 test set was used to conduct an asynchronous Bit Error Rate Test (BERT) using a 511 test pattern in the secure data mode for periods of at least 30 minutes per call over the interfaces through the SUT with no adverse effects in either the intrusive or non-intrusive mode. Secure data calls scenarios (STE to STE calls @ 19.2, 64, and 128 kbps) were conducted with no bit errors. Secure data calls were conducted from 30 minutes to 60 hours.

3. Secure FAX. Manually placed secure FAX calls were placed over each of the digital interfaces through the SUT with a 100-percent success rate with no adverse effects in either the intrusive or non-intrusive mode.

(d) The NE(s) shall support a minimum modem transmission speed of 9.6 kbps across the associated NE(s). The SUT met this requirement with testing. The minimum modem transmission speed tested was 31.2 kbps. All asynchronous modem calls were placed over the interfaces through the SUT with a 100-percent success rate with no adverse effects in either the intrusive or non-intrusive mode.

(e) The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s). The SUT met this requirement with testing. The minimum facsimile transmission speed tested was 14.4 kbps. Manual non-secure FAX calls were placed over the interfaces through the SUT with a 100-percent success rate with no adverse effects in either the intrusive or non-intrusive mode.

(f) The NE shall transport all call control signals transparently on an E2E basis. The SUT met this requirement through testing for supervisory, Assured Services and Multi-Level Precedence and Preemption (MLPP) signaling. The four types of MLPP call scenarios listed below were tested over each interface. Each preemption scenario met the UCR MLPP requirements with no adverse effects.

1. Answered Call; Circuit to be Reused

2. Unanswered Call; Circuit to be Reused

3. Answered Call; Circuit not to be Reused

4. Unanswered Call; Circuit not to be Reused

(2) Alarms. The UCR 2008, Change 3, section 5.9.2.1.1, states the NE shall be able to propagate Carrier Group Alarms (CGAs) upon physical loss of the TDM interface. The NE shall provide the capability of detecting a CGA. When the CGA is detected, all outgoing trunks shall be made busy automatically and call attempts on associated incoming trunks shall not be processed. NEs that support Internet Protocol (IP) ingress/egress traffic either as inbound or outbound NE traffic and/or transport between NE(s) shall support one or more of the following routing protocols: Link-State and/or Distance-Vector, such that the NE can notify the IP network (e.g., LAN, MAN) the condition of its link state for transporting ingress IP traffic, namely operational or down. The SUT met the requirements for Red (Loss of Signal) and yellow (Remote Alarm Indication) CGAs on the TDM interfaces. The alarms were propagated through the SUT transparently in both the intrusive and non-intrusive modes. The SUT does not support an IP interface, which is not required.

(3) Congestion Control and Latency. The UCR 2008, Change 3, section 5.9.2.1.2, states the NE shall assure that congestion between paired NEs does not affect DISN calls in progress or subsequent calls. Call congestion handling shall be met in one or more of the following ways:

(a) TDM Transport. The UCR 2008, Change 3, section 5.9.2.1.2.1 states the NE shall implement TDM congestion control via one of the methods below. The SUT met this requirement because congestion is not possible in the SUT. Because the SUT has TDM interfaces, transport cannot be oversubscribed regardless of how the network is engineered. The SUT is a passive monitoring device.

1. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch.

2. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder).

3. A software capability in limiting the provisioning the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.

4. TDM Transport Latency. The addition of NEs with TDM transports shall not increase the one-way latency per NE pair when measured from end to end over any five-minute period specified as follows:

a. TDM ingress G.711 (non-secure calls) to non-transcoding G.711 TDM egress shall not increase delay more than 10 ms per NE pair as measured E2E.

b. TDM ingress G.711 (non-secure calls) to transcoding TDM egress with compression codecs (section 5.9.2.2) shall not increase delay by more than 100 ms per NE pair as measured E2E.

c. TDM ingress G.711 (secure calls) to non-transcoding TDM egress G.711 shall not increase delay by more than 50 ms per NE pair as measured E2E.

d. TDM ingress G.711 (secure calls) to transcoding TDM egress with compression codecs (section 5.9.2.2) shall not increase delay by more than 250 ms per NE pair as measured E2E.

(b) IP Transport. The UCR 2008, Change 3, section 5.9.2.1.2.2, states the NE(s) utilizing IP transport shall implement IP congestion control. Congestion may be controlled by using Differentiated Services, which shall be capable of providing preferential treatment for call congestion over other media types in accordance with section 5.3.3, and a capability to limit the provisioning of input, and output interfaces so congestion is impossible under the worst transport congestion scenario. The IP interface parameters subject to ingress/egress requirements shall be met IAW section 5.9.2.3.9. The SUT does not support IP transport and therefore, this requirement does not apply.

(c) Direct Line of Sight (DLoS) Transport. The UCR 2008, Change 3, section 5.9.2.1.2.3, states the NE shall implement DLoS congestion control based on the DSN traffic and signaling type to be transported. The SUT does not support DLOS Transport. Therefore, the following DLoS congestion control requirements are not applicable.

1. The NE transporting only TDM bearer and signaling traffic shall implement DLoS congestion control via one or more of the following methods:

a. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch in accordance with UCR 2008.

b. Congestion is not possible in the NE such that the maximum ingress throughput into the NE is configured such that it does not exceed the DLoS link maximum egress transport capability to include all DLoS overhead control traffic between the transport devices.

c. A software capability in limiting the provisioning of the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.

2. The NE transporting only ingress IP traffic, and not using DLoS transport comprised of 802.11 a/b/g, 802.16-2004 (formerly 802.16d), or 802.16e-2005, shall implement DLoS IP congestion control per section 5.9.2.1.2.2. Additionally, IP congestion control may include a standards based or proprietary protocol between the NEs that will adjust the Quality of Service of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions.

3. The NE transporting both TDM and IP ingress traffic simultaneously over the same DLoS transport link shall meet the following requirements:

a. The NE shall provide congestion control so it provides the same level of capability, respectively, for the appropriate traffic type, TDM and IP, per the requirements for single traffic type ingress/egress to the NE. Additionally, the congestion control may include a standards based or proprietary protocol between the NEs that will adjust the Quality of Service of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions.

b. The use of DLoS transport shall not increase the one-way latency or packet delay per the requirements for TDM ingress and TDM or IP egress interfaces per the appropriate section 5.9.2.1.2.1, For TDM Transport, and section 5.9.2.3.9, IP Interface, respectively.

b. Compression. The UCR 2008, Change 3, section 5.9.2.2, states the NE used for voice compression shall support at least one of the following standards: ITU-T G.726, ITU-T G.728, or ITU-T G.729. The SUT does not support Compression. This is a conditional requirement for an NE.

c. Interface Requirements. The UCR 2008, Change 3, section 5.9.2.3, details the interface requirements for a NE. The UCR does not specify minimum required interfaces for access, transport, or management interfaces; however, the SUT must provide at least one for connectivity.

(1) Analog. The UCR 2008, Change 3, section 5.9.2.3.1, states that if an analog interface is provided, the NE shall provide for a 2-wire and/or 4-wire analog trunk circuit interface that interfaces using industry standard signaling and facility arrangements per one or more of the following trunk circuits: E&M, Single Frequency, or Dual Frequency. The ETM® 1012 met all critical CRs and FRs for the 2-wire analog interface when inserted intrusively or non-intrusively (monitor only).

(2) Serial. The UCR 2008, Change 3, section 5.9.2.3.2, states that if a serial interface is provided, the NE shall use one of the following standards: ITU-T V.35, TIA-232, EIA-449, or EIA-530. The SUT does not support a serial interface.

(3) BRI Integrated Services Digital Network (ISDN). The UCR 2008, Change 3, section 5.9.2.3.3, states that if an ISDN BRI interface is provided, the NE shall meet the requirements and conditions IAW section 5.3.2.31.2. The SUT does not support a BRI interface.

(4) Digital Transmission Link Level 1 (T1). The UCR 2008, Change 3, section 5.9.2.3.4, states that if a T1 interface is provided, the NE shall meet the requirements and conditions of a PCM-24 digital trunk interface. The ETM® 2100 met all critical CRs and FRs for the following T1 interfaces: CAS Multi-Frequency Recommendation 1 (MFR1), Dual Tone Multi-Frequency (DTMF), Dial Pulse (DP), ISDN PRI, and SS7. When the SUT is interfaced with ISDN PRI T1/E1 circuits configured between the switching systems as Non Facility Associated Signaling, it must be configured as follows: At the Management Server under the PRI tab for the span configuration there is an option labeled “layer 2 crossover”, which must be set to “Auto”. This option prevents interoperability anomalies noted during testing when the primary or backup D-channels are busied at the switch maintenance terminal. If the “layer 2 crossover” option is set to “Off”, the switches may fail to transfer control to the back-up D-channel when the primary D-channel is busied, which could result in a loss of up to 20 T1s. The SUT Telecom Firewall application was tested with each interface in the following configurations: Non-intrusive mode (monitor-only), and in the intrusive mode with the terminate policy “Allow Call Terminations” block unchecked, which is optioned under the edit spans/firewall tab. In addition, a pulse mask analysis was conducted on the T1 interfaces to verify the SUT met the required T1 electrical interface characteristics. The pulse mask analysis met the UCR requirement.

(5) E1. The UCR 2008, Change 3, section 5.9.2.3.5, states that if an E1 interface is provided, the NE shall meet the requirements and conditions of a PCM-30 digital trunk interface. The ETM® 2100 met all critical CRs and FRs for the following E1 interfaces: CAS (MFR1, DTMF, DP), ISDN PRI, and SS7. When the SUT is interfaced with ISDN PRI T1/E1 circuits configured between the switching systems as Non Facility Associated Signaling, it must be configured as follows: At the Management Server under the PRI tab for the span configuration there is an option labeled "layer 2 crossover", which must be set to "Auto". This option prevents interoperability anomalies noted during testing when the primary or backup D-channels are busied at the switch maintenance terminal. If the "layer 2 crossover" option is set to "Off", the switches may fail to transfer control to the back-up D-channel when the primary D-channel is busied, which could result in a loss of up to 20 T1s. The SUT Telecom Firewall application was tested with each interface in the following configurations: Non-intrusive mode (monitor-only), and in the intrusive mode with the terminate policy "Allow Call Terminations" block unchecked, which is optioned under the edit spans/firewall tab.

(6) DS3. The UCR 2008, Change 3, section 5.9.2.3.6, states that if a DS3 interface is provided, the NE shall meet the requirements and conditions for framing and line coding. The SUT does not support a DS3 interface.

(7) Timing. The UCR 2008, Change 3, section 5.9.2.3.7, states the NE shall be able to derive timing signal from an internal source, an incoming digital signal, or an external source in accordance with UCR 2008, section 5.2.10.1. This requirement applies to TDM interfaces only, IP interfaces need not meet this requirement. The SUT met this requirement by deriving timing from an incoming digital signal.

(8) OC-X. The UCR 2008, Change 3, section 5.9.2.3.8, states that if an OC-X interface is provided, the interface shall be IAW section 5.5.3.2 and/or appropriate SONET commercial standards. The SUT does not support an OC-X interface.

(9) IP. The UCR 2008, Change 3, section 5.9.2.3.9, states that if an IP interface is provided using DLoS transport comprised of IEEE 802.11 and/or IEEE 802.16 series standards the interface shall instead meet the requirements for a WAB contained in section 5.3.1.7.2. All other IP configurations shall meet the following requirements. The SUT does not support this interface; therefore, this requirement does not apply.

(a) Delay.

1. TDM ingress of ITU-T G.711 (nonsecure calls) to non-transcoding ITU-T G.711 IP egress shall not increase delay more than 50 ms per NE pair as measured end-to-end.

2. TDM ingress of ITU-T G.711 (nonsecure calls) to transcoding IP egress with compression codecs shall not increase delay more than 100 ms per NE pair as measured end-to-end.

3. TDM ingress of ITU-T G.711 (secure calls) to non-transcoding ITU-T G.711 IP egress shall not increase delay more than 50 ms per NE pair as measured end-to-end.

4. TDM ingress of ITU-T G.711 (secure calls) to transcoding IP egress with compression codecs shall not increase delay more than 250 ms per NE pair as measured end-to-end.

(b) Jitter. The addition of an NE shall not cause jitter measured from ingress to egress to increase by more than 5 ms averaged over any 5-minute period.

(c) Packet Loss. The addition of an NE shall not cause packet loss measured from ingress to egress to increase by more than 0.05 percent averaged over any 5-minute period.

d. Device Management.

(1) Management Options. The UCR 2008, Change 3, section 5.9.2.4.1, states the NE devices are to be managed by at least one of the following:

(a) A front or back panel and/or external console control capability shall be provided for local management. The SUT provides an external console capability.

(b) Remote monitoring and management by the ADIMSS or similar Network Management (NM) system developed by DoD components. The SUT does not support this conditional requirement.

(2) Fault Management. The UCR 2008, Change 3, section 5.9.2.4.2, states the NE shall report any failure of self-test diagnostic function on non-active and active channels on a noninterference basis to the assigned NMS. The SUT met this requirement through testing, reporting back to the external console.

(3) Loop-Back Capability. The UCR 2008, Change 3, section 5.9.2.4.3, states the NE shall provide loopback capability on each of the trunk-side interfaces IAW ITU-T V.54. The SUT does not support this conditional requirement.

(4) Operational Configuration Restoral. The UCR 2008, Change 3, section 5.9.2.4.4, states loss of power should not remove configuration settings. The SUT shall restore to the last customer-configured state before the power loss, without intervention when power is restored. The SUT met this requirement through testing.

e. DLoS. The UCR 2008, Change 3, section 5.9.2.4.5, includes the DLoS requirements. An NE using DLos transport shall support the requirements in the paragraphs below. The SUT does not provide DLoS Transport. Therefore, the following DLoS congestion interface requirements are not applicable.

(1) The minimum MOS scores shall be as defined in UCR 2008, Change 3, section 5.9.2.1, which is 4.0 or better as measured in any 5-minute interval using P.862 testing standard.

(2) The minimum acceptable Maximum Transmission Range (MTR) shall be 300 feet based on operating in an open air-minimal obstruction, clear line-of-sight environment with the DLoS transport device operating at or near full power mode. Based on the testing results, the estimated maximum performance range while still maintaining MOS requirements shall be referred to as the NE DLoS transport MTR.

(3) An NE with only TDM interfaces that uses a DLoS transport link can be used to transport TDM only or IP over TDM access traffic.

f. Deployed Network Element (D-NE) Requirements. The UCR 2008, Change 3, section 5.9.3, states that the D-NEs shall meet all NE requirements specified in section 5.9.2, DSN F-NE Generic Requirements, except as modified by the following paragraphs. The SUT was not tested as a D-NE.

(1) D-NE General Requirements.

(a) The D-NEs may include voice compression, as specified in section 5.9.2.2, to include the following additional compression standard: ITU-T Recommendation G.723.

(b) Network element latency requirements for various codecs are defined in section 5.9.2. The D-NE allows for one additional codec, ITU-T G.723.1. The latency introduced by a single D-NE using the ITU-T G.723.1 codec shall be less than 90 ms. The latency introduced by a pair of D-NEs using the ITU-T G.723.1 codec shall be less than 180 ms.

(c) Voice calls placed through a set of D-NEs shall support a minimum MOS of 3.6 or better as measured in any 5-minute interval using the Perceptual Speech Quality Measure testing standard.

(d) The introduction of a D-NE shall not cause the E2E digital BER to degrade the Tactical BER below $1x10^{-5}$ by more than 0.03 percent as measured over a 9-hour period. This value does not include the application of Forward Error Correction (FEC) but is the minimum acceptable value for Tactical transmission before FEC is applied.

(e) The D-NE (when implemented in pairs) shall apply error correction to correct the errors interjected by the transport network between the two D-NEs such that the resulting BER of the external facing D-NE interface shall be better than $1x10^{-5}$ as measured over a 9-hour period.

(f) The NE shall assure congestion within NEs does not affect DSN calls in progress or subsequent calls. Call congestion handling shall be met in one or more of the following ways:

1. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch in accordance with section 5.9.2.1.2, Congestion Control.

2. A software capability in limiting the provisioning the input and/or output interfaces such that makes congestion impossible even under the worst congestion scenario.

3. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder).

(2) D-NE TDM Requirements. IAW UCR 2008 Change 1 section 5.9.3.2, the D-NE shall support at least one of the interfaces listed in section 5.9.2, DSN F-NE Generic Requirements. To be certified for use, TDM interfaces shall meet the interface requirements for that specified interface. For interfaces provided, congestion control shall be provided as specified in section 5.9.2.1.2, Congestion Control.

(3) D-NE IP Requirements. The D-NEs may use IP as a means to transport voice communications between D-NEs. The IP transport of voice services shall be one or more of the following methods: encapsulated TDM, long local, or Proprietary IP Trunks (PIPT). For any IP transport methods used, D-NEs using IP interfaces shall meet the following parameters: 1) The addition of D-NEs shall meet the latency criteria specified in section 5.9.3.1. 2) The addition of a D-NE shall not cause jitter measured from ingress to egress to increase by more than 5 ms averaged over any 5-minute period. 3) The addition of a D-NE shall not cause packet loss measured from ingress to egress to increase by more than 0.05 percent averaged over any 5-minute period.

(4) Encapsulated TDM Requirements. The D-NEs that use encapsulated TDM shall meet all the following requirements: 1) The D-NE shall use either differentiated services or integrated services to provide preferential treatment over IP transport. 2) The D-NE shall provide an IP bandwidth reservation/allocation mechanism to allow for the user-specified allocation of bandwidth to support the full non- blocking voice services requirement. 3) The D-NE shall implement IP congestion control. Congestion may be controlled by using differentiated services that shall be capable of providing preferential treatment for call congestion over other media types in accordance with section 5.3.3, Network Infrastructure E2E Requirements, and a capability to limit the provisioning of input and output interfaces, so congestion is impossible under the worst transport congestion scenario.

(5) Carrier Group Alarms. The UCR 2008, Change 3, section 5.9.3.5, states the D-NE shall be able to propagate CGAs IAW section 5.9.2.1.1, upon physical loss of the ingress TDM interface. Voice switching systems, DSN or Deployed Voice Exchange

(DVX), shall receive the proper CGAs from the D-NE upon loss of the IP transport link between D-NEs.

(6) Long-Local Requirements. The UCR 2008, Change 3, section 5.9.3.6, states the D-NEs that provide a long local shall meet all the following requirements: 1) The D-NE shall provision features and functions to support the long-local device. 2) The D-NE shall allocate enough bandwidth to support the long-local device to ensure assured services and non-blocking requirements are met.

(7) Proprietary IP Trunk Requirements. The UCR 2008, Change 3, section 5.9.3.7, states the DVX VD-NE may use Proprietary IP signaling for this solution, and this interface shall support E2E ANSI T1.619a features and functions IAW UCR 2008, Change 3, section 5.3.2.31.3.7.

(8) Secure Call Handling. The UCR 2008, Change 3, section 5.9.3.8, states that in processing Secure Communication Interoperability Protocol (SCIP) across conversion boundaries such as TDM to IP and/or IP to TDM, the D-NE shall utilize the ITU-T V.150.1 standards implementation IAW NSA SCIP-215 and SCIP 216 for said ingress and egress conversions respectively. The secure call shall complete successfully as a minimum equal to or better than 85 percent of the time when used in the Deployed environment

(9) Voice Packet Multiplexing. The UCR 2008, Change 3, section 5.9.3.9, states that a D-NE that is equipped with voice packet multiplexing, where individual small IP voice packets (from either the same or multiple sources) may be combined into a single larger IP packet. The D-NE shall be configurable to allow the operator to specify the maximum latency and/or packet size to provide flexibility in the actual implementation. The intent is to allow the system to trade off additional latency incurred by this process for the gain in packet processing efficiency.

g. IPv6 Requirements. The UCR 2008, Change 3, section 5.3.5.4 states that an NE must be IPv6 capable using the guidance in Table 5.3.5-4 for Network Appliance /Simple Server (NA/SS). The SUT does not support IP access or transport interfaces. The SUT only supports IP with its NM interface and therefore, the IPv6 requirements do not apply.

11.3 Information Assurance. Security is tested by DISA-led Information Assurance test teams and published in a separate report, Reference (f).

11.4 Other. PSTN test conduct. The same tests conducted over DSN interfaces were also conducted over PSTN interfaces, with the exception of MLPP, producing the same results. In addition, a blocked number policy was invoked on both a designated calling and called directory number. All other calling and called DNs were successfully completed without any failures. The calling and called numbers were terminated over each interface and the respective calls were properly cleared and the associated

resources were returned to an idle state. The following actions over each interface were taken by the SUT when a policy was invoked:

a. Analog Interface. Calls placed through the SUT that invoke a policy are terminated on analog interfaces by opening a relay for a configurable number of seconds (default is 15 seconds). This opens the circuit and sends a disconnect towards the switch.

b. T1/E1 CAS interfaces. Calls placed through the SUT that invoke a policy are terminated by changing the off hook status (ABCD bits high) to an on hook status (ABCD bits low) towards both the Central Office (CO) and the PBX.

c. T1/E1 PRI Interfaces. Calls placed through the SUT that invoke a policy are terminated by generating a Disconnect Message via the D-channel with a normal call clearing cause value towards both the CO and the PBX.

d. T1/E1 SS7 Interfaces. Calls placed through the SUT that invoke a policy are disconnected by terminating the speech path and simultaneously generating a T-120 fast busy tone towards both the CO and to the PBX.

12. TEST AND ANALYSIS REPORT. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly through government civilian or uniformed military personnel from the Unified Capabilities Certification Office (UCCO). All associated data is available on the DISA UCCO website located at http://www.disa.mil/Services/Network-Services/UCCO.

SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Network Elements (NEs), fixed (F-NE) and deployed (D-NE), have required and conditional features and capabilities that are established by the Unified Capabilities Requirements (UCR). The System Under Test (SUT) need not provide conditional requirements. If they are provided, they must function according to the specified requirements. The detailed Functional requirements (FR) and Capability Requirements for NEs are listed in Table 3-1. Detailed Information Assurance (IA) requirements are included in Reference (f) and are not listed below.

Table 3-1. NE Capability/Functional Requirements Table

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
1	The introduction of an NE(s) shall not cause the E2E average MOS to fall below 4.0 as measured over any 5-minute time interval.	5.9.2.1 (1)	R	R
2	The introduction of an NE(s) shall not degrade the E2E measured BER to no more than .03 percent from the baseline minimum E2E digital BER requirement which is not more than one error in $1x10^9$ bits (averaged over a 9-hour period).	5.9.2.1 (2)	R	R
3	The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by UCR 2008, Change 3, section 5.2.2, DoD Secure Communications Devices.	5.9.2.1 (3)	R	R
4	The NE(s) shall support a minimum modem transmission speed of 9.6 kbps across the associated NE(s).	5.9.2.1 (4)	R	R
5	The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s).	5.9.2.1 (5)	R	R
6	The NE shall transport all call control signals transparently on an E2E basis.	5.9.2.1 (6)	R	R
7	The NE shall be able to propagate Carrier Group Alarms (CGAs) upon physical loss of the TDM interface. The NE shall provide the capability of detecting a CGA.	5.9.2.1.1	R	R
8	Voice switching systems utilizing a TDM connection to a NE shall receive the proper CGAs from the NE upon loss of the transport link between NEs, regardless of whether the transport link is TDM, IP, or DLoS between the NEs.	5.9.2.1.1	R	R
9	NEs that support IP ingress/egress traffic either as inbound or outbound NE traffic and/or transport between NE(s) shall support one or more of the following routing protocols: Link-State and/or Distance-Vector, such that the NE can notify the IP network (e.g., LAN, MAN), using one of the above routing protocols, the condition of its link state for transporting ingress IP traffic, namely operational or down.	5.9.2.1.1	R	R
10	The NE shall assure that congestion between paired NEs does not affect DISN calls in progress or subsequent calls.	5.9.2.1.2	R	R
11	The NE shall implement TDM congestion control via one of the following methods: 1. A dynamic load control signal (e.g., contact closure) shall be provided to the DISN switch in accordance with UCR 2008, Change 3. 2. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder). 3. A software capability in limiting the provisioning the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.	5.9.2.1.2.1 (1)	C	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
12	The addition of NEs with TDM transports shall not increase the one-way latency per NE pair when measured from end to end over any 5-minute period specified as follows: 1. TDM ingress G.711 (non-secure calls) to non-transcoding G.711 TDM egress shall not increase delay more than 10 ms per NE pair as measured end-to-end. 2. TDM ingress G.711 (non-secure calls) to transcoding TDM egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 100 ms per NE pair as measured end-to-end. 3. TDM ingress G.711 (secure calls) to non-transcoding TDM egress G.711 shall not increase delay by more than 50 ms per NE pair as measured end-to-end. 4. TDM ingress G.711 (secure calls) to transcoding TDM egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 250 ms per NE pair as measured end-to-end.	5.9.2.1.2.1 (2)	C	C
13	The NE(s) utilizing IP transport shall implement IP congestion control.	5.9.2.1.2.2	C	C
14	The NE shall implement DLoS congestion control based on the DISN Traffic and signaling type to be transported.	5.9.2.1.2.3	R	R
15	The NE transporting only TDM bearer and signaling traffic shall implement DLoS congestion control via one or more of the following methods: 1. A dynamic load control signal (e.g., contact closure) shall be provided to the DISN switch in accordance with UCR 2008. 2. Congestion is not possible in the NE such that the maximum ingress throughput into the NE is configured such that it does not exceed the DLoS link maximum egress transport capability to include all DLoS overhead control traffic between the transport devices. 3. A software capability in limiting the provisioning of the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.	5.9.2.1.2.3 (1)	C	C
16	The NE transporting only ingress IP traffic, and not using DLoS transport comprised of 802.11 a/b/g, 802.16-2004 (formerly 802.16d), or 802.16e-2005, shall implement DLoS IP congestion control per Section 5.9.2.1.2.2, For IP Transport.	5.9.2.1.2.3 (2)	C	C
17	The NE transporting both TDM and IP ingress traffic simultaneously over the same DLoS transport link shall meet the following requirements: 1. The NE shall provide congestion control so it provides the same level of capability, respectively, for the appropriate traffic type, TDM and IP, per the requirements for single traffic type ingress/egress to the NE. Additionally, the congestion control may include a standards based or proprietary protocol between the NEs that will adjust the Quality of Service of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions. 2. The use of DLoS transport shall not increase the one-way latency or packet delay per the requirements for TDM ingress and TDM or IP egress interfaces per the appropriate Section 5.9.2.1.2.1, For TDM Transport, and Section 5.9.2.3.9, IP Interface, respectively.	5.9.2.1.2.3 (3)	C	C
18	The NE used for voice compression shall support at least one of the following standards: • ITU-T Recommendation G.726 • ITU-T Recommendation G.728 • ITU-T Recommendation G.729	5.9.2.2	C	C
19	If provided, the NE shall provide for a 2-wire and/or 4-wire analog trunk circuit(s) interface that interfaces using industry standard signaling and facility arrangements.	5.9.2.3.1	C	C
20	The NE used for serial interface connections shall be in accordance with one of the following standards: • ITU-T Recommendation V.35 • TIA-232-F • EIA-449-1 • TIA-530-A	5.9.2.3.2	C	C
21	The ISDN BRI interface shall meet the requirements and conditions IAW UCR 2008, Change 3, section 5.3.2.31.2, National ISDN 1/2 Basic Access.	5.9.2.3.3	C	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
22	If provided, the NE shall meet the following DS1 (T1) interface requirements and conditions of a PCM-24 Digital Trunk Interface.	5.9.2.3.4	C	C
23	If provided, the NE shall meet the following E1 interface requirements and conditions of a PCM-30 Digital Trunk Interface.	5.9.2.3.5	C	C
24	Frame structure shall include M13 framing in accordance with ANSI T1.107-2002.	5.9.2.3.6.1 (1)	R	R
25	Frame structure may include C-bit parity application in accordance with ANSI T1.107-2002.	5.9.2.3.6.1 (2)	C	C
26	The line coding shall be bipolar 3 zero substitution (B3ZS) in accordance with ANSI T1.102-1993.	5.9.1.5.3.6.2	R	R
27	The NE shall be able to derive a timing signal from an internal source, an incoming digital signal, or an external source IAW UCR 2008, Change 3, 5.3.2.12.14.1.1, Timing Modes.	5.9.2.3.7	R	R
28	The OC-X interface shall be IAW UCR 2008, Change 3, 5.5.3.2, Optical Transport System Interface, and/or appropriate SONET commercial standards. (NOTE: X stands for the capacity (e.g., 3, 48, 192 and higher).	5.9.2.3.8	C	C
29	The NE having an IP interface and using DLoS transport comprised of 802.11 a/b/g, 802.16-2004 (formerly 802.16d), and/or 802.16e-2005 instead shall meet the requirements for a Wireless Access Bridge in Section 5.3.1.7.2, Wireless. All other IP configurations shall meet the following: 1. Delay. The addition of NEs with IP transports shall not increase the one-way latency per NE pair when measured from end to end over any 5-minute period as specified below: a. TDM ingress G.711 (non-secure calls) to non-transcoding G.711 IP Egress shall not increase delay more than 50 ms per NE pair as measured end-to-end. b. TDM ingress G.711 (non-secure calls) to transcoding IP egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 100 ms per NE pair as measured end-to-end. c. TDM ingress G.711 (secure calls) to non-transcoding G.711 IP egress shall not increase delay by more than 50 ms per NE pair as measured end-to-end. d. TDM ingress G.711 (secure calls) to transcoding IP egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 250 ms per NE pair as measured end-to-end. 2. Jitter. The addition of an NE shall not cause jitter measured from ingress to egress to increase by more than 5 ms averaged over any 5-minute period. 3. Packet Loss. The addition of an NE shall not cause packet loss measured from ingress to egress to increase by more than 0.05 percent averaged over any 5-minute period.	5.9.2.3.9	C	C
30	For VVoIP systems, if the system decrypts the VVoIP traffic and applies a proprietary encryption approach prior to transmittal between the two components of the single vendor system, then the system proprietary encryption approach shall be one of the encryption and integrity approved approaches defined in Section 5.4, Information Assurance Requirements.	5.9.2.3.9 (4)	R	R
31	VVoIP systems that utilize proprietary encryption approaches within the system shall restore the VVoIP packets to their original format (e.g., AS-SIP with TLS and SRTP) upon exiting from the system to ensure the VVoIP session can complete successfully.	5.9.2.3.9 (5)	R	R
32	The IP interface shall meet the IP requirements detailed in the DISR and Section 5.3, IP-Based Capabilities and Features, inclusive.	5.9.2.3.9 (6)	C	C
33	The NE devices are to be managed by at least one of the following: 1. A front or back panel and/or external console control capability shall be provided for local management. 2. Remote monitoring and management by the Advanced DSN Integrated Management Support System (ADIMSS) or similar Network Management (NM) systems developed by DoD Components.	5.9.2.4.1	R	R
34	Shall report any failure of self-test diagnostic function on non-active and active channels on a noninterference basis to the assigned NMS.	5.9.2.4.2	C	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
35	The NE shall provide loop-back capability on each of the trunk side interfaces in accordance with ITU-T Recommendation V.54.	5.9.2.4.3	C	C
36	Loss of power should not remove configuration settings. Unit should be restored to the last customer-configured state before the power loss, without intervention when power is restored.	5.9.2.4.4	R	R
37	The NEs using DLoS transport shall support the following: 1. Minimum MOS scores as defined in Section 5.9.2.1, General Requirements, performance requirement or better as measured in any 5-minute interval using P.862 testing standard. 2. [Required] The minimum acceptable Maximum Transmission Range (MTR) shall be 300 feet based on operating in an open air-minimal obstruction, clear line-of-sight environment with the DLoS transport device operating at or near full power mode. Based on the testing results, the estimated maximum performance range while still maintaining MOS requirements, as required in item 1, shall hereby be referred to as the NE DLoS transport MTR.	5.9.2.4.5	R	R
38	The MTR baseline-testing environment shall be while operating in an open air-minimal obstruction, clear line-of-sight environment with the DLoS transport device operating at or near full power mode.	5.9.2.4.5 (3)	R	R
39	The NE shall be tested at a minimum operating height of 25 feet with a clear unobstructed line of sight between NEs at a minimum range of 150 feet.	5.9.2.4.5 (3)	R	R
40	The NE TDM only or IP over TDM Access interfaces can transport IP traffic provided it is deployed per the following conditions: 1. The IP device is listed on the APL either as a component of an ASLAN and/or CE Router. 2. The IP device meets the appropriate IP congestion controls for that IP device. 3. The connection from the IP device to the NE meets one or more of the NE interface requirements, other than IP, as described in Section 5.9.2.3, Interface Requirements. 4. The physical or configured capacity of the interface link (e.g., Section 5.9.2.3, Interface Requirements) from the IP device to the NE shall not exceed the transport capacity of the NE DLoS transport link, as determined in and modified per, or the portion thereof the transport link allocated to transport the IP traffic. The DLoS transport control traffic overhead will be included in traffic capacity determination. 5. Upon DLoS transport link loss in either direction between the NEs for IP over TDM connections, either the generated alarm from the NE shall be interpreted by the IP device as link failure and/or signaling packets, such as keep-alive packets or other standard routing protocol/proprietary control means between the IP devices fails, will also be interpreted by the IP device as failure of the link connected to the NE.	5.9.2.5.2 (2)	R	R
41	The DLoS transport NEs shall be engineered properly so that the DLoS transport transmitting/receiving devices achieve the required performance requirements in their specific deployed environment.	5.9.2.5.3	C	C
42	All components of the NE shall meet security requirements, for each supported mode, as outlined in DoDI 8510.01 and the applicable STIG.	5.9.2.6	R	R
43	If a DoD-approved WIDS exists for the DLoS transport technology used, the NE DLoS transport link(s) shall be monitored in according with the appropriate STIG(s).	5.9.2.7	C	C
44	The D-NEs shall meet all NE requirements specified in Section 5.9.2, DISN F-NE Generic Requirements	5.9.3	NA	R
45	The D-NE being tested shall continue to function as specified in Section 5.9.2.1, General Requirements, and Section 5.9.3.1, D-NE General Requirements, during such testing: • Error Burst Density: The D-NE measured error burst density shall be $1x10^{-6}$. • Error Burst Gap (gap between error bursts in ms): The measured D-NE error burst gap shall be 600 ms. • Error Burst Length (length of error burst in ms): The measure D-NE error burst length shall be 500 ms.	5.9.3	NA	R

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
46	The D-NEs may include voice compression, as specified in Section 5.9.2.2, Compression, to include the following additional compression standard: ITU-T Recommendation G.723.	5.9.3.1 (1)	NA	C
47	The latency introduced by a single D-NE using the G.723.1 codec shall be less than 90 ms.	5.9.3.1 (2)	NA	R
48	The latency introduced by a pair of D-NEs using the G.723.1 codec shall be less than 180 ms.	5.9.3.1 (2)	NA	R
49	Voice calls placed through a set of D-NEs shall support a minimum MOS of 3.6 or better as measured in an**y** 5-minute interval using the Perceptual Speech Quality Measure (PSQM) testing standard.	5.9.3.1 (3)	NA	R
50	The introduction of a D-NE shall not cause the E2E digital BER to degrade the Tactical BER below $1x10^{-5}$ by more than 0.03 percent as measured over a 9-hour period.	5.9.3.1 (4)	NA	R
51	The D-NE (when implemented in pairs) shall apply error correction to correct the errors interjected by the transport network between the two D-NEs such that the resulting BER of the external facing D-NE interface shall be better than $1x10^{-5}$ as measured over a 9-hour period.	5.9.3.1 (5)	NA	R
52	The NE shall assure congestion within NEs does not affect DISN calls in progress or subsequent calls. Call congestion handling shall be met in one or more of the following ways: 1. A dynamic load control signal (e.g., contact closure) shall be provided to the DISN switch in accordance with Section 5.9.2.1.2, Congestion Control. 2. A software capability in limiting the provisioning the input and/or output interfaces such that makes congestion impossible even under the worst congestion scenario. 3. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder).	5.9.3.1 (6)	NA	R
53	The D-NE shall support at least one of the interfaces listed in Section 5.9.2, DISN F-NE Generic Requirements.	5.9.3.2	NA	C
54	The D-NEs may use IP as a means to transport voice communications between D-NEs.	5.9.3.3 (2)	NA	C
55	For any IP transport methods used, D-NEs using IP interfaces shall meet the following parameters: 1. The addition of D-NEs shall meet the latency criteria specified in Section 5.9.3, D-NE General Requirements. 2. The addition of a D-NE shall not cause jitter measured from ingress to egress to increase by more than 5 ms averaged over any 5-minute period. 3. The addition of a D-NE shall not cause packet loss measured from ingress to egress to increase by more than 0.05 percent averaged over any 5-minute period.	5.9.3.3 (3)	NA	R
56	The D-NE shall use either differentiated services or integrated services to provide preferential treatment over IP transport.	5.9.3.4 (1)	NA	R
57	The D-NE shall provide an IP bandwidth reservation/allocation mechanism to allow for the user-specified allocation of bandwidth to support the full nonblocking voice services requirement.	5.9.3.4 (2)	NA	R
58	The D-NE shall implement IP congestion control. Congestion may be controlled by using differentiated services that shall be capable of providing preferential treatment for call congestion over other media types in accordance with Section 5.3.3, Network Infrastructure E2E Requirements, and a capability to limit the provisioning of input and output interfaces, so congestion is impossible under the worst transport congestion scenario.	5.9.3.4 (3)	NA	R
59	The D-NE shall be able to propagate CGAs IAW Section 5.9.2.1.1, Alarms, upon physical loss of the ingress TDM interface. Voice switching systems, DSN or DVX, shall receive the proper CGAs from the D-NE upon loss of the IP transport link between D-NEs.	5.9.3.5	NA	R

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH3)	F-NE	D-NE
60	The D-NEs that provide a long local shall meet all the following requirements: 1. The D-NE shall provision features and functions to support the long local device. 2. The D-NE shall allocate enough bandwidth to support the long-local device to ensure assured services and nonblocking requirements are met.	5.9.3.6	NA	R
61	The DVX VD-NE may use Proprietary IP signaling for this solution, and this interface shall support E2E ANSI T1.619a features and functions IAW UCR 2008, Section 5.3.2.31.3.7, ISDN MLPP PRI (i.e., Precedence, Preemption, MLPP Service Domain, Look Forward for Busy, Network Identifiers, and Coding Standard).	5.9.3.7 (1)	NA	C
62	For DVX VD-NE switches that do not support MLPP, this interface shall support end-to-end ISDN PRI NI 1/2 features and functions (i.e., Bearer, Calling Number Delivery)	5.9.3.7 (2)	NA	C
63	In processing secure calls (SCIP) across conversion boundaries such as TDM to IP and/or IP to TDM, the D-NE shall utilize the V.150.1 standards implementation IAW NSASCIP-215 "U.S. Secure Communication Interoperability Protocol (SCIP) over IP Implementation Standard and Minimum Essential Requirements (MER) Publication" and SCIP 216 "Minimum Essential Requirements (MER) for V.150.1 Gateways Publication" for said ingress and egress conversions respectively. The D-NE shall support this NSA V.150.1 implementation capability on all D-NE interface ports where secure call conversion can occur. The secure call handling implementation on the D-NE shall also meet the requirements of Section 5.9.2.1, Sub-Requirement 3.	5.9.3.8 (1)	NA	R
64	The secure call shall complete successfully as a minimum equal to or better than 85-percent of the time when used in the Deployed environment.	5.9.3.8 (2)	NA	R
65	A D-NE that is equipped with voice packet multiplexing, where individual small IP voice packets (from either the same or multiple sources) may be combined into a single larger IP packet. The D-NE shall be configurable to allow the operator to specify the maximum latency and/or packet size to provide flexibility in the actual implementation.	5.9.3.9	NA	C

LEGEND:

ADIMSS	Advanced DSN Integrated Management Support System
ANSI	American National Standards Institute
APL	Approved Product List
ASLAN	Assured Services LAN
BER	Bit Error Rate
BRI	Basic rate Interface
C	Conditional
CE	Customer Edge
CGA	Carrier Group Alarm
CH	Change
D-NE	Deployed-Network Element
DAA	Designated Approving Authority
DISR	DoD Information technology Standards and Profile Registry
DoD	Department of Defense
DODI	DoD Instruction
DISN	Defense Information Systems Network
DSN	Defense Switched Network
DVX	Deployed Voice Exchange
E1	European Basic Multiplex Rate (2.048 Mbps)
E2E	End to End
F-NE	Fixed-Network Element
FIPS	Federal Information Processing Standard
IAW	In Accordance With
IP	Internet Protocol
ISDN	Integrated Services Data Network
ITU	International Telecommunications Union
ITU-T	ITU Telecommunications Union - Telecommunications Sector
LAN	Local Area Network
MAN	Metropolitan Area Networks
MLPP	Multi-Level Precedence and Preemption
MOS	Mean Opinion Score
Ms	Millisecond
NMS	Network Management System
NSA	National Security Agency
PCM	Pulse Code Modulation
PRI	Primary rate Interface
R	Required
SONET	Synchronous Optical Network
STIG	Security Technical implementation Guide
T1	Digital Transmission Link Level 1 (1.544 Mbps)
TDM	Time Division Multiplexing
UCCO	Unified Capabilities Certification Office
UCR	Unified Capabilities Requirements
VVoIP	Voice and Video over Internet Protocol