DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) **1 May 12**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Tellabs 7100E Electrical Interface Node (EIN), Fixed-Network Element (F-NE), with Software Release Feature Pack (FP) 1.1

References: (a) Department of Defense Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Department of Defense Instruction 8100.04, "DoD Unified Capabilities (UC)," 9 December 2010
(c) through (e), see Enclosure 1

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

2. The Tellabs 7100E EIN, with Software Release FP 1.1, is hereinafter referred to as the System Under Test (SUT). The SUT meets all its critical interoperability requirements, and JITC certifies the SUT for joint use in the Defense Information System Network (DISN) as an F-NE. The operational status of the SUT will be verified during deployment. Any new discrepancies that are discovered in the operational environment will be evaluated for impact and adjudicated to the satisfaction of the Defense Information Systems Agency (DISA) in a vendor Plan of Action and Milestones with proper solution to address the concern(s) within 120 days of identification. JITC conducted testing using F-NE requirements within the Unified Capabilities Requirements (UCR) 2008, Change 2, Reference (c), and F-NE test procedures, Reference (d). JITC does not certify any other configurations, features, or functions, except those cited within this memorandum. This certification expires upon changes that affect interoperability, but no later than 3 years from the date of this memorandum.

3. This finding is based on interoperability testing conducted by JITC, review of the Vendor's Letter of Compliance and Information Assurance (IA) Certification Authority (CA) approval of the IA configuration. JITC conducted Interoperability testing at its facility at Indian Head, Maryland, from 16 January through 10 February 2012. The DISA IA CA reviewed the JITC-published IA Assessment Report for the SUT, Reference (e), and provided a positive recommendation of the IA configuration on 14 June 2012. The acquiring agency or site will be responsible for the Department of Defense IA Certification and Accreditation Process accreditation. Enclosure 2 documents the test results and describes the tested network and system configurations. Enclosure 3 lists the F-NE Capability Requirements (CR) and Functional Requirements (FR).

4. Section 5.9 of the UCR establishes the interfaces and threshold CRs/FRs used to evaluate the interoperability of the SUT as an F-NE. Tables 1 and 2 list the interfaces, CRs, FRs, and component status of the SUT.

Table 1. SUT Interface Interoperability Status

Interface	Critical (See note 1.)	Reference (UCR 2008, Change 2)	Threshold CR/FR (See note 2.)	Status	Remarks
NE					
Analog	No	5.9.3.2.1	1, 2, and 4	NA	Not supported by the SUT.
Serial	No	5.9.2.3.2	1, 2, and 4	NA	Not supported by the SUT.
BRI ISDN	No	5.9.2.3.3	1, 2, and 4	NA	Not supported by the SUT.
DS1	No	5.9.2.3.4	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
E1	No	5.9.2.3.5	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	Certified	SUT met requirements for OC-3, OC-12, and OC-48 interfaces. See note 3.
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT met requirements for specified 10/100 interfaces.
NM					
10Base-X	Yes	5.3.2.4.4	8	Certified	SUT met NM requirements for specified interfaces.
100Base-X	Yes	5.3.2.4.4	8	Certified	

NOTES:
1. UCR does not specify any minimum interfaces. The SUT must minimally provide one of the listed ingress and egress interfaces specified.
2. CR/FR requirements are contained in Table 2. CR/FR numbers represent a roll-up of UCR requirements.
3. The SUT provides SDH interfaces, but JITC did not test and certify because it is not required by UCR 2008, Change 2, F-NE section.

LEGEND:

10Base-X	10 Mbps Ethernet generic designation	JITC	Joint Interoperability Test Command
100Base-X	100 Mbps Ethernet generic designation	Mbps	Megabits per second
BRI	Basic Rate Interface	NA	Not Applicable
CR	Capability Requirement	NE	Network Element
DS1	Digital Signal Level 1 (1.544 Mbps)	NM	Network Management
DS3	Digital Signal Level 3 (44.736 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, and OC-48)
E1	European Interface Standard (2.048 Mbps)	SDH	Synchronous Digital Hierarchy
FR	Functional Requirement	SUT	System Under Test
IP	Internet Protocol	UCR	Unified Capabilities Requirements
ISDN	Integrated Services Digital Network		

Table 2. SUT CRs and FRs Status

CR/FR ID	Capability/Function	Applicability (See note.)	Reference (UCR 2008 Change 2)	Status	Remarks
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	
2	**Compression**				
	G.726	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.728	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.729	Conditional	5.9.2.2	NA	Not supported by the SUT.
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	Met	
	Operational Configuration Restoral	Required	5.9.2.4.4	Met	
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	NA	Not supported by the SUT.
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a layer-2 device and transports IPv4 and IPv6 traffic transparently.
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

NOTE: Annotation of 'required' refers to high-level requirement category. Applicability of each sub-requirement is provided in Enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	ITU-T	International Telecommunications Union – Telecommunications Sector
CR	Capabilities Requirement	kbps	kilobits per second
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction	LD-CELP	Low Delay Code Excited Linear Prediction
DLoS	Direct Line of Sight	NA	Not Applicable
FR	Functional Requirement	NE	Network Element
G.726	ITU-T speech codec for ADPCM (32 kbps)	NM	Network Management
G.728	ITU-T speech codec for LD-CELP (16 kbps)	NMS	Network Management System
G.729	ITU-T speech codec for CS-ACELP (8 kbps)	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
IPv4	Internet Protocol version 4	VVoIP	Voice and Video over Internet Protocol
IPv6	Internet Protocol version 6		

5. In accordance with the Program Manager's request, JITC did not develop a detailed test report. JITC distributes interoperability information via the JITC Electronic Report Distribution 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, which .mil/.gov users can access on the NIPRNet at https://stp.fhu.disa.mil.

JITC Memo, JTE, Special Interoperability Test Certification of the Tellabs 7100E Electrical Interface Node (EIN), Fixed-Network Element (F-NE), with Software Release Feature Pack (FP) 1.1

Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at http://jit.fhu.disa.mil (NIPRNet). Information related to Approved Products List (APL) testing is available on the DISA APL Testing and Certification website located at http://www.disa.mil/Services/Network-Services/UCCO. All associated test information is available on the DISA Unified Capability Certification Office (UCCO) APL Integrated Tracking System (APLITS) website located at https://aplits.disa.mil.

6. The JITC testing point of contact is Ms. Jackie Mastin, commercial (301) 743-4320. Her e-mail address is Jackie.Mastin.civ@mail.mil; mailing address: 3341 Strauss Avenue, Suite 236, Indian Head, MD 20640-5149. The UCCO Tracking Number for the SUT is 1115303.

FOR THE COMMANDER:

3 Enclosures a/s

for RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

Distribution (electronic mail):
Joint Staff J-6
Joint Interoperability Test Command, Liaison, TE3/JT1
Office of Chief of Naval Operations, CNO N6F2
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U.S. Joint Forces Command, Net-Centric Integration, Communication, and Capabilities Division, J68
HQUSAISEC, AMSEL-IE-IS

ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense, "Department of Defense Unified Capabilities Requirements 2008, Change 2," December 2010
(d) Joint Interoperability Test Command, "Unified Capabilities Test Plan," 4 February 2010
(e) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Tellabs 7100E with Software Release FP 1.1 (TN 1115303)," 21 February 2012

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Tellabs 7100E Electrical Interface Node (EIN), Fixed-Network Element (F-NE), with Software Release Feature Pack (FP) 1.1

2. SPONSOR. Mr. Jordan Silk, Program Manager, HQUSAISEC, AMSEL-IE-IS, Building 53302, Fort Huachuca, AZ 85613, email: Jordan.R.Silk.civ@mail.mil.

3. SYSTEM POC. Mark Bremner, Tellabs, 1415 West Diehl Road, Naperville, IL 60563, e-mail: Mark.Bremner@tellabs.com.

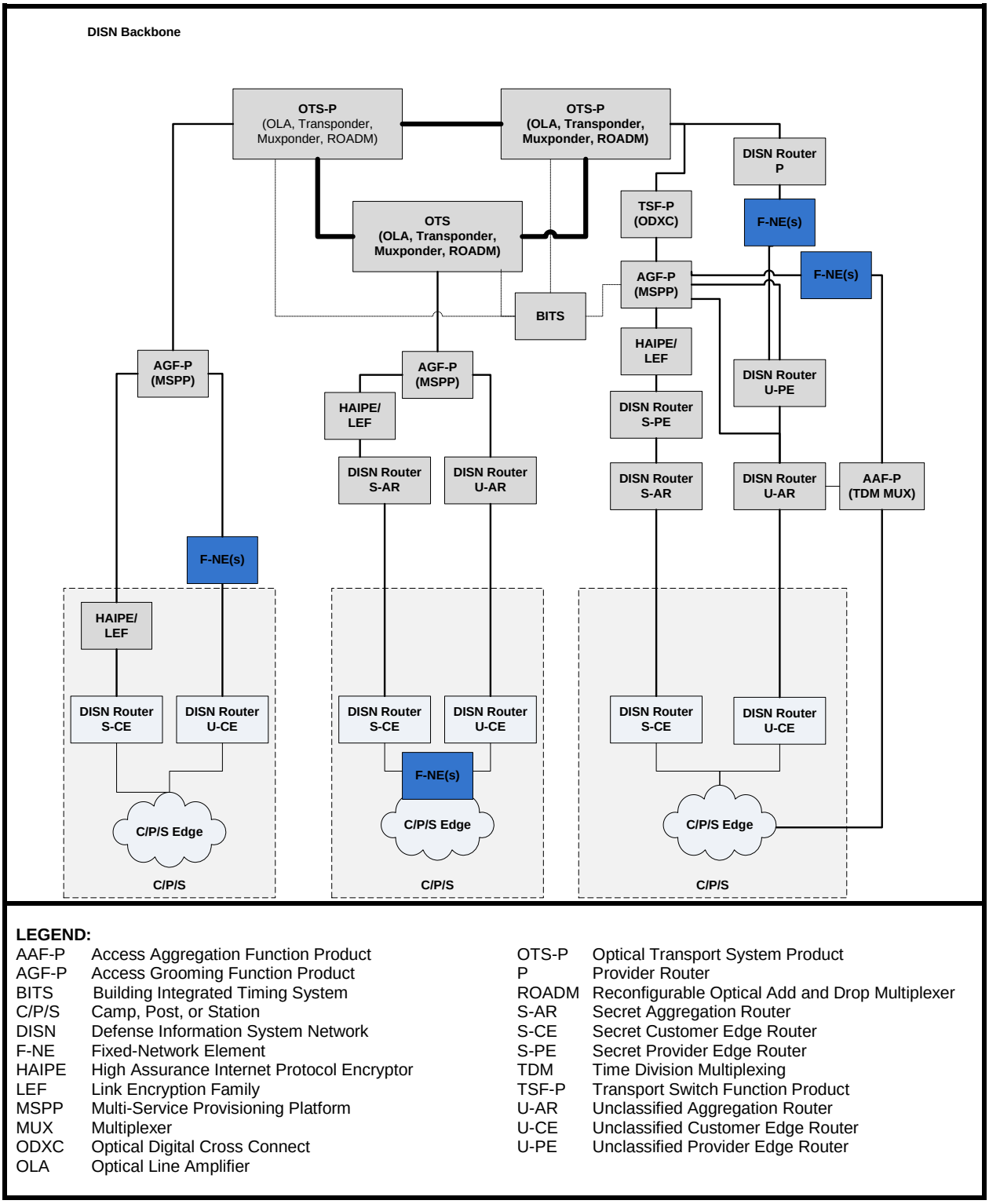
4. TESTER. Joint Interoperability Test Command (JITC), Indian Head, Maryland.

5. SYSTEM DESCRIPTION. The Tellabs 7100E EIN, with FP 1.1, hereinafter referred to as the System Under Test (SUT), is a Multi-Service Provisioning Platform. The SUT is capable of supporting Add/Drop Multiplexer (ADM) or terminal Muxponder (mux) applications with Optical Carrier (OC)-3/Synchronous Transport Module (STM)-1, OC-12/STM-4, or OC-48/STM-16 high-speed interfaces Small Form-Factor (SFP) supporting 1+1 or Unidirectional Path Switched Ring protection. Four high-speed interfaces are available in the system, and two protected ADM or terminal mux nodes can be supported in each shelf. The switch fabric supports Synchronous Transport Signal Level N and VT1.5 switching.

The following types of Tellabs 7100E EIN modules are available:

- 32 x Trunk 1 (1544 Megabits per second (Mbps), 24-channel Pulse Code Modulation) Transmission Carrier 1 (T1)/European Interface Standard (2.048 Mbps) (E1)
- 63 x T1/E1 (34.368 Mbps) (E3)
- 3 x Trunk 3 (44.736 Mbps, 672 voice channels) (T3)/E3 (with optional M13 functions) (E3 features were not tested)
- 8 10/100Base-T (Tested)
- 2 x OC-3/STM-1 or OC-12/STM-4 (SFP) (STM interfaces were not tested)

6. OPERATIONAL ARCHITECTURE. JITC tested the SUT under the F-NE Unified Capabilities Requirements (UCR) product category. A high-level Defense Information System Network (DISN) node architecture, as depicted in Figure 2-1, displays the F-NE devices in the DISN architecture. The SUT as an F-NE can be deployed to transport DISN services in the Wide Area Network (WAN) and on a camp, post, or station within the Local Area Network (LAN) infrastructure. The SUT solution meets the UCR requirements and can be used to augment WAN or LAN infrastructures.



LEGEND:

AAF-P	Access Aggregation Function Product
AGF-P	Access Grooming Function Product
BITS	Building Integrated Timing System
C/P/S	Camp, Post, or Station
DISN	Defense Information System Network
F-NE	Fixed-Network Element
HAIPE	High Assurance Internet Protocol Encryptor
LEF	Link Encryption Family
MSPP	Multi-Service Provisioning Platform
MUX	Multiplexer
ODXC	Optical Digital Cross Connect
OLA	Optical Line Amplifier
OTS-P	Optical Transport System Product
P	Provider Router
ROADM	Reconfigurable Optical Add and Drop Multiplexer
S-AR	Secret Aggregation Router
S-CE	Secret Customer Edge Router
S-PE	Secret Provider Edge Router
TDM	Time Division Multiplexing
TSF-P	Transport Switch Function Product
U-AR	Unclassified Aggregation Router
U-CE	Unclassified Customer Edge Router
U-PE	Unclassified Provider Edge Router

Figure 2-1. DISN Architecture

7. INTEROPERABILITY REQUIREMENTS. The interface, Capability Requirements (CR), Functional Requirements (FR), Information Assurance (IA), and other requirements for F-NE products are established by the Department of Defense (DoD) UCR 2008, Change 2, Sections 5.4 and 5.9.

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

Table 2-1. F-NE Interface Requirements

Interface	Critical (See note 1.)	Reference (UCR 2008 Change 2)	Threshold CR/FR (See note 2.)	Criteria	Remarks
NE					
Analog	No	5.9.2.3.1	1, 2, and 4	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
Serial	No	5.9.2.3.2	1, 2, and 4		
BRI ISDN	No	5.9.2.3.3	1, 2, and 4		
DS1	No	5.9.2.3.4	1, 2, 3, and 4		
E1	No	5.9.2.3.5	1, 2, 3, and 4		
DS3	No	5.9.2.3.6	1, 2, 3, and 4		
OC-X	No	5.9.2.3.8	1, 2, 3, and 4		
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7		
NM					
10Base-X	Yes	5.3.2.4.4	8	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
100Base-X	Yes	5.3.2.4.4	8		

NOTES:
1. UCR does not specify any minimum interfaces.
2. CR/FR requirements are contained in Table 2-2. CR/FR numbers represent a roll-up of UCR requirements.

LEGEND:

10Base-X	10 Mbps Ethernet generic designation	FR	Functional Requirement
100Base-X	100 Mbps Ethernet generic designation	IP	Internet Protocol
BRI	Basic Rate Interface	ISDN	Integrated Services Digital Network
CR	Capability Requirement	Mbps	Megabits per second
DS1	Digital Signal Level 1 (1.544 Mbps)	NE	Network Element
DS3	Digital Signal Level 3 (44.736 Mbps)	NM	Network Management
E1	European Interface Standard (2.048 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.)
F-NE	Fixed-Network Element	UCR	Unified Capabilities Requirements

7.2 CR and FR. The F-NE products have required and conditional features and capabilities that are established by UCR 2008, Change 2, Section 5.9. 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 the SUT products. Table 3-1 of Enclosure 3 provides detailed CR/FR requirements.

Table 2-2. SUT CRs and FRs

CR/FR ID	Capability/Function	Applicability (See note.)	Reference (UCR 2008 Change 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.	.
	Alarms	Required	5.9.2.1.1		
	Congestion Control & Latency	Required	5.9.2.1.2		
2	**Compression**				
	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.	
	G.728	Conditional	5.9.2.2		
	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.	
	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.	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Meet UCR IPv6 requirements.	
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	
	General Management Requirements	Required	5.3.2.17.2		

Table 2-2. SUT CRs and FRs (continued)

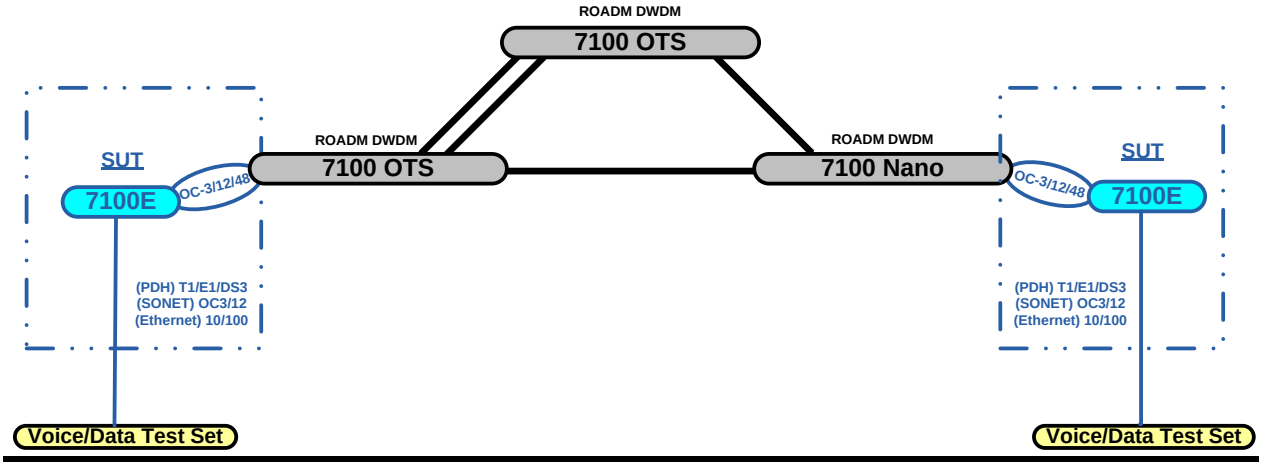
NOTE: Annotation of "required" refers to high-level requirement category. Applicability of each sub-requirement is provided in Enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	ITU-T	International Telecommunication Union - Telecommunication
CR	Capabilities Requirement	kbps	kilobits per second
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction	LD-CELP	Low Delay Code Excited Linear Prediction
DLoS	Direct Line of Sight	NE	Network Element
FR	Functional Requirement	NM	Network Management
G.726	ITU-T speech codec for ADPCM (32 kbps)	NMS	Network Management System
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
IPv6	Internet Protocol version 6	VVoIP	Voice and Video over Internet Protocol

7.3 Other. None.

8. TEST NETWORK DESCRIPTION. JITC tested the SUT at its facility in Indian Head, Maryland. Figure 2-2 shows the Sponsor-requested test configuration and Figure 2-3 shows the DISN test configuration.

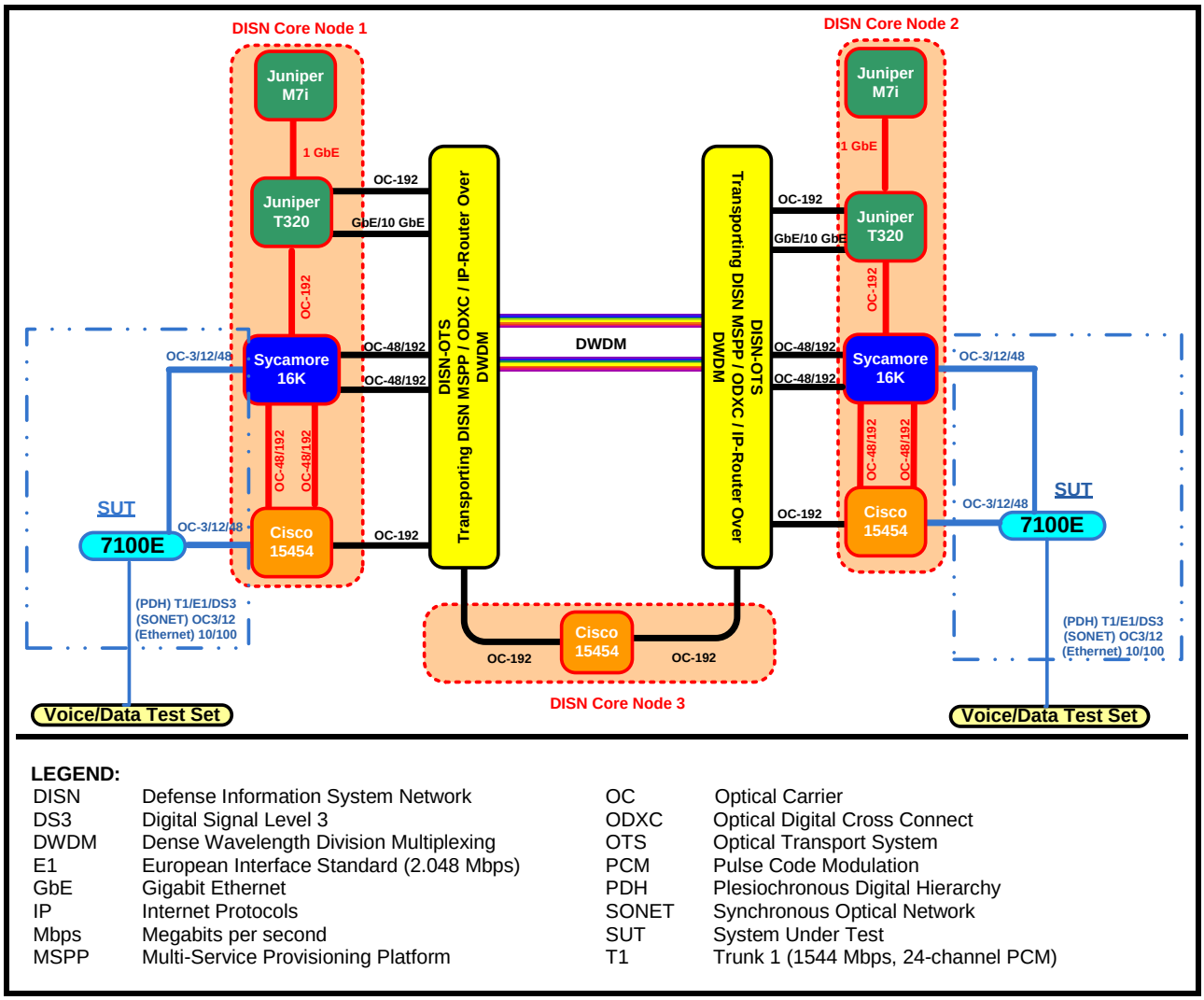


NOTE: Voice/Data Test Set is described in detail in Table 2-5 (Test Measurement and Diagnostic Equipment).

LEGEND:

DS3	Digital Signal Level 3 (44.736 Mbps)	PCM	Pulse Code Modulation
DWDM	Dense Wavelength Division Multiplexing	PDH	Plesiochronous Digital Hierarchy
E1	European Interface Standard (2.048 Mbps)	ROADM	Reconfigurable Optical Add-Drop Multiplexer
Mbps	Megabits per second	SONET	Synchronous Optical Network
OC	Optical Carrier	SUT	System Under Test
OTS	Optical Transport System	T1	Trunk 1 (1544 Mbps, 24-channel PCM)

Figure 2-2. Sponsor-Requested Test Configuration



LEGEND:

DISN	Defense Information System Network	OC	Optical Carrier
DS3	Digital Signal Level 3	ODXC	Optical Digital Cross Connect
DWDM	Dense Wavelength Division Multiplexing	OTS	Optical Transport System
E1	European Interface Standard (2.048 Mbps)	PCM	Pulse Code Modulation
GbE	Gigabit Ethernet	PDH	Plesiochronous Digital Hierarchy
IP	Internet Protocols	SONET	Synchronous Optical Network
Mbps	Megabits per second	SUT	System Under Test
MSPP	Multi-Service Provisioning Platform	T1	Trunk 1 (1544 Mbps, 24-channel PCM)

Figure 2-3. SUT DISN Architecture Test Configuration

9. SYSTEM CONFIGURATION. Table 2-3 lists the SUT equipment shown in Figure 2-2 and Figure 2-3, Table 2-4 lists the DISN Core Equipment used to test the SUT, and Table 2-5 lists the test equipment used to generate voice, Synchronous Optical Network, and Internet Protocol (IP) traffic.

Table 2-3. Hardware/Software Tested SUT Equipment

Platform	Software Release	UC Product Type
Tellabs 7100E EIN	FP 1.1	F-NE

Tellabs 7100E Equipment List		
Quantity	**Description**	**Part Number**
2	7100E Shelf - 6RU	81.71S-ESHELF-R5
4	7100E Cross Connect Unit	81.71C-XCU16-R5
2	7100E Connector Interface Board	81.71C-CBA-R5
2	7100E Fan Tray	81.71F-EFANTRAY-R5
4	7100E Power Supply Unit	81.71P-ACDCPWR-R5
4	7100E 63 port T1/E1 Line Card	81.71L-63TE-R5
4	7100E 32 port T1/E1 Line Card	81.71L-32TE-R5
4	7100E 3 port T3/E3 Line Card	81.71L-3TE3-R5
NA	7100E M13 RTU for T3/E3 Line Card	81.71L-M13RTU-R5
4	7100E 9 Port Ethernet Interface	81.71L-9EoS4NSW-R5
4	7100E 2 Port OC3/OC12 Line Card	81.71L-B16-R5
NA	7100E PSU Blank Filler Module	81.71B-PWRBFM-R5
NA	7100E Line Card Blank Filler Module	81.71B-TRIBBFM-R5
4	7100E Y Box Panel	81.71K-4SCSI4-R5
4	7100E Y-Box SCSI Cable	81.71W-SCSI200-R5
NA	7100E Replacement Filter	81.71F-RFILTER-R5
2	7100E Fan Filter Tray	81.71F-FLTTRAY-R5

LEGEND:

E1	European Interface Standard (2.048 Mbps)	PSU	Power Supply Unit
E3	European Interface Standard (34.368 Mbps)	RTU	Remote Termination Unit
EIN	Electrical Interface Node	RU	Rack Unit
F-NE	Fixed Network Element	SCSI	Small Computer System Interface
FP	Feature Pack	SUT	System Under Test
Mbps	Megabits per second	T1	Trunk 1 (1544 Mbps, 24-channel PCM)
NA	Not Applicable	T3	Trunk 3 (44.736 Mbps, 672 voice channels)
OC	Optical Carrier	UC	Unified Capabilities
PCM	Pulse Code Modulation		

Table 2-4. Non-SUT Equipment

Component	Software Version	Function	Subcomponent
Cisco 15454	09.00-008I-17.17	MSPP	ETH 100T-12-G, OC-3IR-STM-1 SH-1310-8, OC-12IR-STM-4-1310-4, DS-1N-14, G1K-4, OC-192SR/STM-64, OC-48 AS-IR-1310, DS-3N-12E
Sycamore 16K	7.6.21 Build 0562.26.27.57.14	ODXC	GPIC2 2 x OC-192/STM-64, GPIC 24 x OC-3-12/STM-1-4IR, GPIC2 8 x OC-48/STM-16, USC - OC-192 LR 2c LIM 1
Juniper T320 Router	9.2.R2.15	DISN Router	4 x FE 100Base-TX, 10 x GbE LAN 1000Base-T, 1x OC-192 SM SR2, 1 x 10GbE LAN, XENPAK
Cisco Catalyst 6500	12.1 (13)	NA	48 E ports, 8 ports GbE, 2-port 10GbE
REDCOM Switch	6.1	NA	4-port line card (MA0653-115) 2/MET Interface Board (MA0683-122 3/S3P Board/Line Signaling Protocol For Trunk Lines (GR303 or SS7) (MA0688-101)
7100 OTS	FP 6.1	OTS	10 x GbE, 10 x OC3/12/48, 10 x STM-1/4/16, 20 x Ethernet 10/100/100, 4 x 10GbE LAN/WAN, 4 x OC-192, 4 x STM-64, 1 x OC-768, 1 x STM-256
7100 Nano	FP 6.1	OTS	10 x GbE, 10 x OC3/12/48, 10 x STM-1/4/16, 20 x Ethernet 10/100/100, 4 x 10GbE LAN/WAN, 4 x OC-192, 4 x STM-64, 1 x OC-768, 1 x STM-256
Juniper M7i	10.3R4.4	DISN Router	4 x GbE, 2 x 10/100

Table 2-4. Non-SUT Equipment (continued)

LEGEND:

100Base-TX	100 Mbps Ethernet over Category 5 Twisted Pair Copper	MET	Multi E1/T1
		MSPP	Multi-Service Provisioning Platform
1000Base-T	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet	NA	Not Applicable
		OC	Optical Carrier
DISN	Defense Information System Network	ODXC	Optical Digital Cross Connect
DS	Digital Signal	OTS	Optical Transport System
E1	European Interface Standard (2.048 Mbps)	PCM	Pulse Code Modulation
ETH	Ethernet	R	Revision
FE	Fast Ethernet	S3P	Single Slot System Processor
FP	Feature Pack	SH	Static Host
GbE	Gigabit Ethernet	SM	Single Mode
GPIC	Gigabit Port Interface Controller	SR	Short Reach
GR	Generic Requirement	SS7	Signaling System 7
IR	Immediate Range	STM	Synchronous Transport Module
LAN	Local Area Network	SUT	System Under Test
LIM	Line Interface Module	T1	Trunk 1 (1544 Mbps, 24-channel PCM)
LR	Long Reach	USC	Universal Services Card
Mbps	Megabits per second	WAN	Wide Area Network

Table 2-5. Test Measurement and Diagnostic Equipment

Manufacturer	Type	Port Type	Software Version
Agilent	Optical Tester	1550 nm	A.06.01
		1310 nm	
	Router Tester 900	OC-3/OC-12 /POS	6.11
		OC-48 Multilayer	
Agilent	Rack Mounted Router Tester 900	10 Gb LAN/WAN	6.11
		10/100 Base-T	
		OC-48c POS	
		OC-3/12/POS	
Agilent JDSU	T-Berd 8000	OC-192 POS	6.11
		DSU	6.4
		10/100	
		OC-3-12	
		DS-3	
		OC-192	

LEGEND:

10/100Base-T	10/100 Mbps (Baseband Operation, Twisted Pair) Ethernet	LAN	Local Area Network
		Mbps	Megabits per second
DS	Digital Signal	nm	nanometer
DSU	Data Services Unit	OC	Optical Carrier
Gb	Gigabit	POS	Packet Over Synchronous
JDSU	Vendor Name	WAN	Wide Area Network

10. TEST LIMITATIONS. Users, data, secure voice, and facsimile were emulated through the Test Measurement and Diagnostics Equipment.

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

11.1 Interfaces. The SUT's interface status is provided in Table 2-6.

Table 2-6. SUT Interface Requirements Status

Interface	Critical (See note 1.)	Reference (UCR 2008, Change 2)	Threshold CR/FR (See note 2.)	Status	Remarks
NE					
Analog	No	5.9.3.2.1	1, 2, and 4	NA	Not supported by the SUT.
Serial	No	5.9.2.3.2	1, 2, and 4	NA	Not supported by the SUT.
BRI ISDN	No	5.9.2.3.3	1, 2, and 4	NA	Not supported by the SUT.
DS1	No	5.9.2.3.4	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
E1	No	5.9.2.3.5	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	Certified	SUT met requirements for specified interface.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	Certified	SUT met requirements for OC-3, OC-12, and OC-48 interfaces. See note 3.
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT met requirements for specified 10/100 interfaces.
NM					
10Base-X	Yes	5.3.2.4.4	8	Certified	SUT met NM requirements for specified interfaces.
100Base-X	Yes	5.3.2.4.4	8	Certified	

NOTES:
1. UCR does not specify any minimum interfaces. The SUT must minimally provide one of the listed ingress and egress interfaces specified.
2. CR/FR requirements are contained in Table 2-7. CR/FR numbers represent a roll-up of UCR requirements.
3. The SUT provides SDH interfaces, but JITC did not test and certify because it is not required by UCR 2008, Change 2, F-NE section.

LEGEND:

10Base-X	10 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
100Base-X	100 Mbps Ethernet generic designation	JITC	Joint Interoperability Test Command
BRI	Basic Rate Interface	Mbps	Megabits per second
CR	Capability Requirement	NA	Not Applicable
DS1	Digital Signal Level 1 (1.544 Mbps)	NE	Network Element
DS3	Digital Signal Level 3 (44.736 Mbps)	NM	Network Management
E1	European Interface Standard (2.048 Mbps)	OC-X	Optical Carrier-X (OC-3, OC-12, and OC-48)
F-NE	Fixed-Network Element	SDH	Synchronous Digital Hierarchy
FR	Functional Requirement	SUT	System Under Test
IP	Internet Protocol	UCR	Unified Capabilities Requirements

11.2 CR and FR. The SUT's CR/FR statuses are listed in Table 2-7. The detailed CR/FR requirements are provided in Table 3-1 of the System Functional and Capability Requirements (Enclosure 3).

11.3 Other. None.

Table 2-7. SUT CRs and FRs Status

CR/FR ID	Capability/Function	Applicability (See note.)	Reference (UCR 2008 Change 2)	Status	Remarks
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	
2	**Compression**				
	G.726	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.728	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.729	Conditional	5.9.2.2	NA	Not supported by the SUT.
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	Met	
	Operational Configuration Restoral	Required	5.9.2.4.4	Met	
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	NA	Not supported by the SUT.
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a layer-2 device and transports IPv4 and IPv6 traffic transparently.
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

NOTE: Annotation of "required" refers to high-level requirement category. Applicability of each sub-requirement is provided in Enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	ITU-T	International Telecommunication Union - Telecommunication Sector
CR	Capabilities Requirement		
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction	kbps	kilobits per second
		LD-CELP	Low Delay Code Excited Linear Prediction
DLoS	Direct Line of Sight	NA	Not Applicable
FR	Functional Requirement	NE	Network Element
G.726	ITU-T speech codec for ADPCM (32 kbps)	NM	Network Management
G.728	ITU-T speech codec for LD-CELP (16 kbps)	NMS	Network Management System
G.729	ITU-T speech codec for CS-ACELP (8 kbps)	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
IPv4	Internet Protocol version 4	VVoIP	Voice and Video over Internet Protocol
IPv6	Internet Protocol version 6		

a. General Network Element (NE) Requirements

(1) General Requirements. In Accordance With (IAW) UCR 2008, Change 2, Section 5.9.2.1, all NEs shall meet the following general requirements and conditions:

(a) The introduction of an NE(s) shall not cause the End-to-End (E2E) average Mean Opinion Score (MOS) to fall below 4.0 as measured over any 5-minute time interval. The SUT met the MOS requirement as measured using test equipment and simulated voice information exchanges.

(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 using test equipment and simulated information exchanges.

(c) The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by UCR 2008, Change 2, Section 5.2.12.6, and DoD Secure Communications Devices. JITC tested secure information exchanges by using DoD Secure Communications Devices such as Secure Telephone Unit/Secure Terminal Equipment devices with no noted issues.

(d) The NE(s) shall support a minimum modem transmission speed of 9.6 kilobits per second (kbps) across the associated NE(s). JITC tested this information exchange by using a modem and simulated information exchange with no noted issues.

(e) The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s). JITC tested this information exchanges by using a facsimile and simulated information exchanges with no noted issues.

(f) The NE shall transport all call control signals transparently on an E2E basis. JITC tested this information exchanges by using actual call control signals via a Private Branch Exchange T1 call and simulated information exchanges with no noted issues.

(2) Alarms. The NE shall provide the capability of detecting a Carrier Group Alarm (CGA). 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 and Metropolitan Area Network) of the condition of its link state for transporting ingress IP traffic, namely operational or down. The SUT is a layer-2 device, which passes all the routing protocols and IP link states transparently between connecting end equipments (EI). It propagates all CGA with no noted issues. It aso provides loss of signal alarm in case of loss of connectivity events for connecting EIs.

(3) Congestion Control and Latency. IAW UCR 2008, the NE shall ensure that congestion and latency between paired NEs does not affect DISN calls in progress or subsequent calls. Call congestion and latency requirements are as follows:

(a) Time Division Multiplexer/Multiplexing (TDM) Transport. The SUT is a layer-2 device and the SUT provides transparent TDM Transport. Therefore, the following TDM transport requirements are not applicable to the SUT; instead, these are the responsibility of connecting EI.

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

4. TDM Transport Latency. The addition of NEs with TDM transports shall not increase the one-way latency per NE pair when measured from E2E over any 5-minute period specified as follows:

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

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

(b) IP Transport. The NE(s) using 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 and a capability to limit the provisioning of input and output interfaces so that congestion is impossible under the worst transport congestion scenario. The IP interface parameters subject to ingress/egress requirements shall be met. The SUT is a layer-2 device, and it passes all IP traffic transparently; therefore, none of the above IP transport requirements is applicable to the SUT, instead the IP transport requirements are the responsibility of connecting EIs.

(c) Direct Line of Sight (DLoS) Transport. The SUT does not provide DLoS Transport.

b. Compression. The SUT does not support compression.

c. Interface Requirements.

(1) Timing. The NE shall be able to derive timing signal from an internal source, an incoming digital signal, or an external source. This requirement applies to TDM interfaces only; IP interfaces do not need to meet this requirement.

d. Device Management. The SUT shall provide the following device management functions:

(1) Management Options. 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, and the SUT supports only external console control capability. The SUT provides an external console capability.

(b) Remote monitoring and management by the Advanced DISN Integrated Management Support System (ADIMSS). JITC did not verify management of the SUT by ADIMSS.

(2) Fault Management. The SUT may (conditional) report any failure of self-test diagnostic function on non-active and active channels on a noninterference basis to the assigned Network Management System (NMS). JITC verified this conditional capability via Network Management (NM) testing.

(3) Loop-Back Capability. This requirement applies to TDM interfaces only; the SUT does provide loop-back capabilities via its all interfaces.

(4) Operational Configuration Restoral. 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. JITC verified this capability via NM testing.

e. DLoS.

(1) DLoS Transport. The SUT does not provide DLoS Transport.

f. Internet Protocol version 6 (IPv6) Requirements.

(1) Product Requirements. The SUT must meet UCR 2008, Change 2, Section 5.3.5.4 IPv6 requirements for Network Appliance/Simple Server. The SUT is a layer-2 device, and transports IPv4 and IPv6 traffic transparently; therefore, requirements specifically relating to layer-3 do not apply.

g. NM Requirements. JITC verified the following NM requirements by connecting the NMS to the SUT via all required interfaces. JITC also verified via utilization of NMS

for test configurations performance, for alarm monitoring performance, and for fault management performance.

(1) Voice and Video over Internet Protocol (VVoIP) NMS Interface Requirements. The physical interface between the Defense Information Systems Agency VVoIP Element Management System (EMS) and the network components (i.e., Local Session Controller, Multifunction Soft Switch, Edge Boundary Controller, and Customer Edge Router) is a 10/100 Mbps Ethernet interface. The interface will work in either of the two following modes using auto-negotiation: Institute of Electrical and Electronics Engineers (IEEE), Ethernet Standard 802.3, 1993; or IEEE, Fast Ethernet Standard 802.3u, 1995.

(2) General Management Requirements. The SUT must support Secure/Simple Network Management Protocol version 3 format. A network appliance shall have Operations interfaces that provide a standard means by which management systems can directly or indirectly communicate with and, thus, manage the various network appliances in the DISN. The physical interface between the Local EMS and the VVoIP network components shall be an Ethernet connection IAW UCR 2008, Change 2, paragraph 5.3.2.4.4, VoIP NMS Interface Requirements. The physical interface between the VVoIP EMS and the VVoIP network components shall also be an Ethernet connection IAW UCR 2008, Change 2, paragraph 5.3.2.4.4. There shall be a local craftsperson interface (Craft Input Device for Operations Administration & Management) for all VVoIP network components.

11.4 Other. None.

12. TEST AND ANALYSIS REPORT. In accordance with the Program Manager's request, no detailed test report was developed. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Unclassified-But-Secure 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 at http://jit.fhu.disa.mil (NIPRNet). Information related to APL testing is available on the APL Testing and Certification website at http://www.disa.mil/Services/Network-Services/UCCO.

SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Network Elements (NE) and Fixed-Network Elements have required and conditional features and capabilities that are established by the Unified Capabilities Requirements. The System Under Test does not need to meet conditional requirements. If they are provided, they must function according to the specified requirements. The detailed Functional Requirements and Capability Requirements for NEs are listed in Table 3-1.

Table 3-1. NE Capability/Functional Requirements Table

ID	Requirement	Reference (UCR 2008 CH 2)	F-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
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 1x109 bits (averaged over a 9-hour period).	5.9.2.1 (2)	R
3	The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by UCR 2008, Section 5.2.2, DoD Secure Communications Devices.	5.9.2.1 (3)	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
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
6	The NE shall transport all call control signals transparently on an E2E basis.	5.9.2.1 (6)	R
7	[Conditional] The NEs that support a P2N capability shall meet the following additional requirements when deployed in a P2N architectural configuration:	5.9.2.1 (7)	C
7A	The aggregate egress from all NEs in the P2NP architecture must be identical to the aggregate ingress of all NEs in the same P2N architecture. However, if all or part of the P2N is operating in a P2MP mode that is applying multicast from a centrally designated NE to one or more of the associated peripheral NEs, the aggregate of the additional multicast traffic must be accounted for in the egress sum total.	5.9.2.1 (7A)	R
7B	Excluding latency, the P2N AP shall be measured as though it is a P2P architecture at the P2N AP NE endpoints ingress and egress points. As such, the P2N AP must meet all the other stated requirements of a P2P.	5.9.2.1 (7B)	R
7C	For a given P2N AP, the maximum latency allowed E2E, as measured over any 5-minute period at the P2N AP NE ingress and egress points, shall be 5 ms or less, when added in addition to the expected P2P latency. Hence, as an example, if the expected P2P latency requirement for a P2N AP is 50 ms, then P2N AP maximum latency, regardless of the number of NE hops between the ingress and egress NEs, the measured value shall not exceed 55 ms.	5.9.2.1 (7C)	R

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
8	The NE shall be able to propagate CGAs upon physical loss of the TDM interface. The NE shall provide the capability of detecting a CGA. When this alarm is detected, all associated outgoing trunks shall be made busy automatically to subsequent customer call attempts. Call attempts on associated incoming trunks shall not be processed. When possible, the Reverse Make Busy feature shall be exercised on incoming trunks. Voice switching systems using a TDM connection to an 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. The NEs that support IP ingress or 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, so the NE can notify the IP network (e.g., LAN, MAN), using one of these routing protocols, the condition of its link state for transporting ingress IP traffic, namely operational or down.	5.9.2.1.1	R
9	The NE shall assure that congestion between paired 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.	5.9.2.1.2	R
9A	The NE shall implement TDM congestion control via one of the following methods: A. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch per the following requirements: (1) The NE shall provide the capability to handle CGA indications from the carrier systems/equipment using the E-telemetry interface (scan points) for the TDM interfaces provided (e.g., DS0, DS1, and/or OC-X), and, comply to the Telcordia Technologies GR-303-CORE, System Generic Requirements, Objectives, and Interface, December 2000, Issue 4 and Telcordia Technologies TR-NWT-000057 that specifies the use of an COTS-generated DC contact closure alarm to indicate an "all-accessible-channelsbusy" condition.	5.9.2.1.2.1 (1A1)	C
9B	(2) The NE when interfaced to the network that provides an E-telemetry interface type (scan points) for alarm management shall be capable of CGA management that is used to minimize the effects of carrier failures on switching systems and on service. CGA scan point (binary condition, i.e., "closed" contact for active and "opened" for inactive states) when "closed" should busy out the failed circuits, release customers from the failed circuits, and prevent the failed circuits from seizing the DSN trunk equipment and prevent the NE from seizing the failed circuits.	5.9.2.1.2.1 (1A2)	C
9C	(3) The DSN CGA System Operation can be divided into three parts; i.e., detection of the carrier failure, conditioning the failed trunk, and reaction of the switching equipment to the processing of the failure. Requirements for scan point CGA are: (a) Sense Point Interface: The switching system shall provide sense points to which external CGAs can be interfaced to, so that failure of the carrier equipment shall cause the trunks to be removed from service. (b) Call Processing Actions: Receipt of a CGA shall cause call processing to be aborted on associated trunks that are not in the talking state. (c) Trunk Conditioning: Receipt of a CGA shall cause the following actions on the affected trunks: (i) Idle trunks shall be removed from the idle list. Subsequent calls for service must be ignored for the duration of the CGA. Busy-back shall be returned on those incoming trunks, which are optioned for busy-back while in the out-of-service state and proper MLPP treatment shall be applied. (ii) Trunks in the talking state shall be monitored for disconnect, after which they are to be placed in the same state as described above for idle trunks.	5.9.2.1.2.1 (1A3)	C
9D	(4) Restoration of Service: All trunks affected shall be returned to their previous state after the CGA is removed. B. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder). 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.	5.9.2.1.2.1 (1A4, 1B, 1C)	C

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
10	2. 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: a. TDM ingress G.711 (nonsecure calls) to nontranscoding G.711 TDM egress shall not increase delay more than 10 ms per NE pair as measured E2E. b. TDM ingress G.711 (nonsecure 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 E2E. c. TDM ingress G.711 (secure calls) to nontranscoding 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, Compression) shall not increase delay by more than 250 ms per NE pair as measured E2E.	5.9.2.1.2.1 (2A, 2B, 2C, 2D)	C
11	The NE(s) using IP transport shall implement IP congestion control. Congestion may be controlled by using DiffServ, which shall be capable of providing preferential treatment for call congestion over other media types IAW Section 5.3.3, Network Infrastructure E2E Performance Requirements, 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 or egress requirements shall be met IAW paragraph 5.9.2.3.9, IP Interface.	5.9.2.1.2.2	C
12	The NE shall implement DLoS congestion control based on the DISN traffic and signaling type to be transported. (Please see the following:)	5.9.2.1.2.3	C
13	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). b. Congestion is not possible in the NE so the maximum ingress throughput into the NE is configured so 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.	5.9.2.1.2.3 (1A, 1B, 1C)	C
14	The NE transporting only ingress IP traffic, and using a DLoS transport, excluding 802.11, and/or 802.16 series standards, shall implement DLoS IP congestion control per paragraph 5.9.2.1.2.2, For IP Transport. Additionally, IP congestion control may include a standards-based or proprietary protocol between the NEs that will adjust the QoS of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions.	5.9.2.1.2.3 (2)	C
15	The NE transporting both TDM and IP ingress traffic simultaneously over the same DLoS transport link shall meet the following requirements: a. [Required] 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 or egress to the NE. Additionally, the congestion control may include a standards-based or proprietary protocol between the NEs that will adjust the QoS of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions. b. [Conditional] 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 paragraph 5.9.2.1.2.1, For TDM Transport, and paragraph 5.9.2.3.9, IP Interface, respectively.	5.9.2.1.2.3 (3A, 3B)	C
16	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
17	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 per one or more of the following:	5.9.2.3.1	C

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
18A	1. E&M Trunk Circuits: The NE shall interface with exchange carriers using industry standard E&M signaling. The switching system shall interface with Type I and Type II E&M signaling IAW paragraph 9 and subparagraphs of GR-506-CORE. The switching system shall interface with Type V E&M signaling as defined in Paragraphs 6.8.5, 6.8.6, 6.8.7.2, 6.8.8.2, and 6.8.8.3 of Telcordia Technologies Document SR-2275. The DISN switch analog trunk interface shall always originate on the M-lead.	5.9.2.3.1 (1)	C
18B	2. Single Frequency Trunk Circuits: The NE will interface with external SF equipment using a 4-wire E&M trunk circuit, either Type I or II. The DISN in-band signaling equipment utilizing SF will place a 2600 Hz tone on the circuit to indicate the idle state (on-hook) and the tone will be removed from the circuit to indicate the busy state (off-hook). Signaling states will be conveyed via E and M leads (Type I or II) to the telephone equipment terminating the circuit on the equipment side of the interface. The SF trunk interface consists of only the voice path conductors (T, R, T1, R1), but at a point between this transmission facility interface and the switching function the SF signal will be translated back to the two-state DC signals.	5.9.2.3.1 (2)	C
18C	3. Dual Frequency Trunk Circuits: The DFSU equipment used in the DISN operates in much the same way as an SF unit, except that whenever the 2600 Hz tone is removed from the circuit a 2800 Hz tone is applied for a short period (175 ms maximum). The 2800 Hz tone burst will serve as a confirmation tone; the receiving signaling unit will only transition from on-hook to off-hook if the loss of the 2600 Hz tone is followed by the 2800 Hz tone. This prevents false on-hook to off-hook transitions from occurring due to a break in the communications circuit. Like the SF trunk interface, the DF trunk interface will consist of only the voice path conductors (T, R, T1, R1). The NE shall interface an external DFSU using a 4-wire E&M trunk circuit with Type I or II E&M signaling. This connection is on the equipment-side of a DF trunk interface.	5.9.2.3.1 (3)	C
19	The NE used for serial interface connections shall be IAW 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
20	The ISDN BRI interface shall meet the requirements and conditions IAW paragraph 5.3.2.31.2, National ISDN 1/2 Basic Access.	5.9.2.3.3	C
21	If provided, the NE shall meet the following DS1 (T1) interface requirements and conditions of a PCM-24 Digital Trunk Interface: PCM-24 Digital Trunk Interface: An NE shall provide a PCM-24 channel digital interface with a 1.544 Mbps T1 bit stream configured in either the D3/D4 (Superframe) framing format or the D5 ESF framing format. D5 is also referred to as EF. The same framing format shall be used in both directions of transmission. Voice signals shall be encoded in the 8-bit μ (255 quantized values) PCM encoding law. Supervisory and DP signals shall utilize the A and B bits of the D3/D4 format or the A, B, C, and D bits of the D5 format for pre-CCS7 configurations. Voice channel address inband signaling shall be provided on individual channels. The D5 format shall be the preferred and system “goal” digital framing format and shall be provided IAW MIL-STD-187-700. 1. Interface Characteristics: The NE shall use the DS1 24 channel standard interface as specified in ANSI T1.102, “Digital Hierarchy – Electrical Interfaces.” Table 5.9.2.3.4-1, PCM-24 Electrical Interface Characteristics, provides the electrical characteristics at the interface. Table 5.9.2.3.4-2 and Table 5.9.2.3.4-3 provide a listing of the framing characteristics. (Please see UCR 2008, Change 2, Pages 1898 thru 1900)	5.9.2.3.4	C

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
22A	2. Supervisory CAS: On-hook and off-hook status of each channel is transmitted and derived from the coding of the "A" and "B" signaling bits. Trunk seizure, answer supervision, DP digits, preemption signals, and all other trunk supervisory information shall be sent and received on a per-channel basis using this scheme. Per-trunk signaling in the DISN switching system shall control the value of the "A" and "B" bits to indicate an on-hook ("A" = 0, "B" = 0) or an off-hook ("A" = 1, "B" = 1) condition. When receiving supervisory status on digital trunks using the PCM-24 format, the DISN switching system shall interpret the combination of the "A" bit = 0 andthe "B" bit = 0 as on-hook, and the combination bit = 1 and "B" bit = 1 as an off-hook indication. When signaling on VF channels using the PCM-24 format, the least significant bit of each channel, every six frames, shall carry signaling information. Utilizing the four-state signaling option of the Superframe (D3) format, frame 6 shall contain the "A" channel signaling information and frame 12 shall contain the "B" channel signaling information. The switching system shall also interpret the combination of "A" bit = 1, "B" bit = 0, with bit position 2 in all 24 channels in the Superframe (D3) format equal to "0" as a channel alarm indication and shall also interpret the combination of "A" bit = 1, "B" bit = 0 as a remote make busy. In the ESF format ANSI defines a sixteen-state signaling option that labels the signaling bits "A" (frame 6), "B" (frame 12), "C" (frame 18), and "D" (frame 24). Because DISN does not require the "C" and "D" signaling channels the four-state option shall be used to allow changes in "A" and "B" signaling states to be transmitted twice as often. Utilizing Frames 6 and 18 in the 24-frame ESF shall contain the "A" channel signaling information; frames 12 and 24 shall contain the "B" channel signaling information.	5.9.2.3.4 (2)	C
22B	3. Clear Channel Capability: The NE shall be capable of transmitting and receiving B8ZS line coding IAW MIL-STD-187-700.	5.9.2.3.4 (3)	C
22C	4. Alarm and Restoral Requirements: The NE shall provide the alarm and restoral features on the DIU as defined in Table 5.9.2.3.4-4, PCM-24 Alarm and Restoral Requirements. (Please see UCR 2008, Change 2, Page 1901)	5.9.2.3.4 (4)	C
23	If provided, the NE shall meet the following E1 interface requirements and conditions of a PCM-30 Digital Trunk Interface: PCM-30 Digital Trunk Interface: The NE shall provide PCM-30 digital interfaces at a data rate of 2.048 Mbps. The PCM-30 interfaces shall meet the requirements of ITU-T Recommendation G.703 and ITU-T Recommendation G.732. Voice signals in the PCM-30 framing format shall utilize the A-law encoding technique IAW ITU-T Recommendation G.772 (REV), "Protected Monitoring Points on Digital Transmission Systems." The pertinent requirements for the PCM-30 interface are summarized in Table 5.9.2.3.5-1, PCM-30 Electrical Interface Characteristics. (Please see UCR 2008, Change 2, Page 1902)	5.9.2.3.5	C
23A	1. Supervisory CAS: When receiving supervisory status on digital trunks using the PCM-30 format, the DISN switching system shall interpret the combination of the "A" signaling channel bit = 1 and the "B" signaling channel bit = 1 as on-hook, and shall interpret the combination of the "A" signaling channel bit = 0 and the "B" signaling channel bit = 1 as an off-hook indication. The DISN switching system shall also interpret the combination of "A" bit = 1 and "B" bit = 0 as a channel alarm indication and a remote make busy. Bits "C" and "D" are not used in the DISN for signaling or control and therefore shall be set to the values "C" = 0 and "D" =1 IAW ITU-T Recommendation G.704.	5.9.2.3.5 (1)	C
23B	2. Alarm and Restoral Requirements: The NE shall provide the alarm and restoral features on the DIU in order to be compatible with PCM-30 facilities and terminal equipment, as shown in Table 5.9.2.3.5-3, PCM-30 Alarm and Restoral Requirements. (Please see UCR 2008, Change 2, Page 1903)	5.9.2.3.5 (2)	C
24	The DS3 interface shall meet the following requirements and conditions. Frame structure shall include M13 framing IAW ANSI T1.107-2002.	5.9.2.3.6.1 (1)	R
25	Frame structure may include C-bit parity application IAW ANSI T1.107-2002.	5.9.2.3.6.1 (2)	C
26	The line coding shall be bipolar B3ZS IAW ANSI T1.102-1993.	5.9.1.5.3.6.2	R

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
27	The NE shall be able to derive a timing signal from an internal source, an incoming digital signal, or an external source IAW paragraph 5.3.2.12.14.1.1, Timing Modes. (5.3.2.12.14.1.1 Timing Modes): [Required: Media Gateway (MG)] The MGs shall meet the external timing mode requirements specified in the Telcordia Technologies GR-518-CORE, Paragraph 18.1. Most SMEOs and PBX1s will only support line timing. 5.3.2.12.14.1.1.1 External Timing Mode - [Required: MG] The MGs shall support external timing modes as defined in Telcordia Technologies TR-NWT-001244. 5.3.2.12.14.1.1.2 Line Timing Mode - [Required: MG] The MGs shall support line timing modes as defined in Telcordia Technologies TR-NW-001244. 5.3.2.12.14.1.1.2 Internal Clock Requirements: 5.3.2.12.14.1.1.2.1 General - [Required: MG] The MGs shall provide internal clock requirements as described in the Telcordia Technologies GR-518-CORE, Paragraph 18.2. 5.3.2.12.14.1.1.2.2 Stratum 4 Clock - [Required: MG] The MGs shall provide a stratum 4 or better internal clock. 5.3.2.12.14.1.2 Synchronization Performance Monitoring Criteria - [Required: MG] The MGs shall meet the synchronization performance monitoring criteria as described in Telcordia Technologies GR-518-CORE, Paragraph 18.3.	5.9.2.3.7	R
28	The OC-X interface shall be IAW Section 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
29	The NE having an IP interface and using DLoS transport comprised of 802.11 and/or 802.16 series standards shall instead meet the requirements for a WAB contained in Section 5.3.1.7.2, Wireless. All other IP configurations shall meet the following:	5.9.2.3.9	C
29A	a. 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 specified as follows: (1) TDM ingress G.711 (nonsecure calls) to nontranscoding G.711 IP egress shall not increase delay more than 50 ms per NE pair as measured E2E. (2) TDM ingress G.711 (nonsecure 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 E2E. (3) 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 E2E. (4) 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 E2E.	5.9.2.3.9	C
29B	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.	5.9.2.3.9	C
29C	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.	5.9.2.3.9	C
29D	d. [Required: F-NE, D-NE] For VVoIP systems, if the system decrypts the VVoIP traffic and applies a proprietary encryption approach before 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. NOTE: For example, if the NE decrypts the AS-SIP with TLS packets between the NEs and re-encrypts it using NE proprietary encryption methods, then the proprietary method must be one of the cryptographic methods defined in Section 5.4, Information Assurance Requirements, (e.g., IPSec with AES-128 bit encryption, HMAC-SHA1 for integrity, and DoD PKI for authentication). All Section 5.4, Information Assurance Requirements, approved encryption and integrity approaches use FIPS PUB 140-2 cryptographic modules (or have been granted a formal waiver by NIST. Importantly, proprietary only refers to the lack of interoperability with a different vendor's NE and all cryptographic approaches used in Section 5.4, Information Assurance Requirements, are standards-based.	5.9.2.3.9	R

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
29E	e. [Required: F-NE, D-NE] The VVoIP systems that use 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	R
29F	2. [Conditional] 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	C
30	The NE devices are to be managed by at least one of the following: A front or back panel and/or external console control capability shall be provided for local management. Remote monitoring and management by the ADIMSS or similar NM systems developed by DoD Components. The following requirements apply: (1) [Required: Data Interface] The NE shall provide NM data/monitoring via one or more of the following physical interfaces: ** Ethernet/TCP/IP (IEEE 802.3) ** Serial (RS-232)/Asynchronous ** Serial/Synchronous (X.25 and/or BX.25 variant) All data that is collected shall be accessible through these interfaces. For NM purposes, the NE must provide no less than two separate data channels. They may be physically separate (e.g., two distinct physical interface points) or logically separate (e.g., two user sessions through a single Ethernet interface). The data may be sent in ASCII, binary, or hexadecimal data or ASCII text designed for screen/printer display. The data channels shall be used for and, as such, must be capable of providing: ** Alarm/Log Data ** Performance Data (e.g., traffic data) ** NE access (to perform NE data fill administration and network controls) (2) [Required: Fault Management] The DISN telephone switching systems shall detect fault (alarm) conditions and generate alarm notifications. The alarm messages must be sent to the assigned NM Alarm channel in near-real time. No alarm restriction/filtering is necessary. In addition to the data formats in Section 5.3.2.17, Management of Network Appliances, alarms may be sent as SNMP traps. If this channel is also used to output switch administrative log information, the alarm messages must be distinguishable from an administrative log message. (3) [Required: Configuration Management] Requirements for this feature shall be IAW Telcordia Technologies GR-472-CORE, Section 4.	5.9.2.4.1	R
31	The NE shall report any failure of self-test diagnostic function on nonactive and active channels on a noninterference basis to the assigned NMS.	5.9.2.4.2	C
32	The NE shall provide loopback capability on each of the trunk-side interfaces IAW ITU-T Recommendation V.54.	5.9.2.4.3	C
33	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
34	The NEs using DLoS transport shall support the following: a. A minimum MOS score as defined in Section 5.9.2.1, General Requirements, performance requirement or better as measured in any 5-minute interval using ITU-T Recommendation P.862 testing standard. b. [Required] The minimum acceptable 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 a, shall hereby be referred to as the NE DLoS transport MTR. 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. 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. The NEs may be tested with attenuation inserted to simulate the actual NE DLoS transport capability from which the maximum MOS performance range MTR can be extrapolated. The value determined shall be included in the APL report. Refer to paragraph 5.9.2.5.3, Submission of DLoS Transport NEs to UCCO for DISN Connection Request, concerning guidelines on submitting the DLoS transport NE engineering analysis package.	5.9.2.4.5	R

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

ID	Requirement	Reference (UCR 2008 CH 2)	F-NE
35	The DLoS transport NEs shall be engineered properly so that the DLoS transport transmitting or receiving devices achieve the required performance requirements in their specific deployed environment. The user shall submit a network design and engineering performance analysis with supporting calculations to meet minimum MOS performance with the request for DISN connection. Included is the calculation and data required for determining the MDR, as defined in paragraph 5.9.2.5.1, DLoS Transport NE Maximum Deployment Range. For certification procedures, the UCCO submittal shall also include wireless security compliancy as identified in Section 5.9.2.6, Security.	5.9.2.5.3	C
36	All components of the NE shall meet security requirements, for each supported mode, as outlined in DoDI 8510.01 and the applicable STIG(s).	5.9.2.6	R
37	1. If a DoD-approved WIDS exists for the DLoS transport technology used, the NE DLoS transport link(s) shall be monitored IAW the appropriate STIG(s).	5.9.2.7	C

LEGEND:

ADIMSS	Advanced DISN Integrated Management Support System
AES	Advanced Encryption Standard
ANSI	American National Standards Institute
AP	Association Path
APL	Approved Products List
AS-SIP	Assured Services Session Initiation Protocol
ASCII	American Standard Code for Information Interchange
B3ZS	Bipolar 3 zero substitution
BER	Bit Error Rate
BRI	Basic Rate Interface
C	Conditional
CAS	Channel Associated Signaling
CGA	Carrier Group Alarm
CH	Change
COT	Continuity Testing
D-NE	Deployed-Network Element
D3/D4/D5	Specific Interface
DC	Direct Current
DF	Default
DFSU	Dual Frequency Signaling Unit
DISN	Defense Information System Network
DISR	DoD Information Technology Standards and Profile Registry
DIU	Digital Interface Unit
DLoS	Direct Line of Sight
DoD	Department of Defense
DoDI	DoD Instruction
DP	Dial Pulse
DS	Digital Signal
E&M	Ear and Mouth
E1	European 1 (2048 Mbps, 30-channel PCM)
E2E	End to End
EF	Extended Frame
EIA	Electronic Industries Alliance
ESF	Extended Superframe
F-NE	Fixed-Network Element
FIPS	Federal Information Processing Standard
GR	Generic Requirement
HMAC	Hashed Message Authentication Code
Hz	Hertz
IAW	In Accordance With
ID	Identification
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
IPSec	Internet Protocol Security
ISDN	Integrated Services Data Network
ITU-T	International Telecommunication Union - Telecommunication Sector
kbps	kilobits per second
LAN	Local Area Network
MAN	Metropolitan Area Network
Mbps	Megabits per second
MG	Media Gateway
MIL-STD	Military Standard
MLPP	Multi-Level Precedence and Preemption
MOS	Mean Opinion Score
Ms	Millisecond
MTR	Maximum Transmission Range
NE	Network Element
NM	Network Management
NMS	Network Management System
OC	Optical Carrier-X (OC-3, OC-12, etc.,)
P2MP	Point-to Multipoint
P2N	Point-to Network
P2NP	Point-to Network Protocol
P2P	Point-to Point
PBX	Private Branch Exchange
PCM	Pulse Code Modulation
PKI	Public Key Infrastructure
PUB	Publication
QoS	Quality of Service
R	Required
R	Router
REV	Revision
SF	Switching Facility
SHA	Secure Hash Algorithm
SMEO	Small End Office
SONET	Synchronous Optical Network
SRTP	Secure Real-Time Protocol
STIG	Security Technical implementation Guide

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

LEGEND:

T	Ethernet Half-Duplex	UCCO	Unified Capabilities Certification Office
T1	Trunk 1 (1544 Mbps, 24-channel PCM)	UCR	Unified Capabilities Requirements
TCP	Transport Control Protocol	VF	Voice Frequency
TDM	Time Division Multiplexing	VVoIP	Voice and Video over Internet Protocol
TIA	Telecommunications Industry Association	WAB	Wireless Access Bridge
TLS	Transport Layer Security	WIDS	Wireless Intrusion Detection System

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