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IN REPLY REFER TO: Joint Interoperability Test Command (JTE)

MEMORANDUM FOR DISTRIBUTION **4 Apr 11**

SUBJECT: Special Interoperability Test Certification of the Tellabs Gigabit Passive Optical Network (1134 and 1150 Multi-Service Access Platform Optical Line Terminal with 701, 709 and 729 Optical Network Terminals) Fixed Network Element, software release FP25.3.1

References: (a) Department of Defense Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Chairman, Joint Chiefs of Staff Instruction 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(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 Gigabit Passive Optical Network (GPON) solution consists of a Multi-Service Access Platform (MSAP) Optical line Terminal (OLT) and an Optical Network Terminal (ONT). The Tellabs 1134 or 1150 MSAP OLT, combined with an ONT (701, 709, or 729) with software release FP25.3.1, is hereinafter referred to as the System Under Test (SUT). The JITC certifies the Tellabs SUT for joint use in the Defense Information Systems Network as a Fixed Network Element (F-NE). The Tellabs SUT can be deployed to extend services in high availability Assured Services Local Area Networks or Wide Area Networks. The JITC also assessed the SUT against non-Unified Capabilities Requirements (UCR) GPON requirements. The Defense Information Systems Agency (DISA) adjudicated all open Test Discrepancy Reports (TDR) to have a minor operational impact. The SUT is a layer-2 device that transports Internet Protocol version 4 and Internet Protocol version 6 traffic transparently. The certification status of the SUT will be verified during operational deployment. Any new discrepancy noted in the operational environment will be evaluated for impact on the existing certification. These discrepancies will be adjudicated to the satisfaction of the DISA via a vendor Plan of Action and Milestones that will address all new critical TDRs within 120 days of identification. The JITC conducted testing using Network Element requirements derived from the UCR, Reference (c), and Network Element test procedures, Reference (d). The 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 three years from the date of this memorandum.

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3. This finding is based on interoperability testing conducted by JITC, review of the vendor's Letters of Compliance (LoC), and Defense Information Assurance (IA)/Security Accreditation Working Group (DSAWG) accreditation. The JITC, Indian Head, Maryland, conducted Interoperability testing from April through September 2009 and completed review of the vendor's LoCs on 9 November 2009. The DSAWG granted accreditation based on the security testing completed by DISA-led IA test teams. The JITC published the IA findings in a separate report, Reference (e). The DSAWG granted accreditation of the SUT in January 2010. Enclosure 2 documents the test results and describes the tested network and system configurations. Enclosure 3, System Functional and Capability Requirements, 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 the component status of the SUT.

Table 1. SUT Interface Interoperability Status

Interface	Critical (See note 1.)	UCR Reference	Threshold CR/FR Requirements (See note 2.)	Status	Remarks
Ingress (LAN side)					
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	NA	Not supported by the SUT.
E1	No	5.9.2.3.5	1, 2, 3, and 4	NA	Not supported by the SUT.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	NA	Not supported by the SUT.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	NA	Not supported by the SUT.
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT's OLTs met requirements for 1 Gbps and 10 Gbps interfaces.
Egress (WAN side)					
Serial	No	5.9.2.3.2	1, 2, 3, and 4	NA	Not supported by the SUT.
DS1	No	5.9.2.3.4	1, 2, 3, and 4	NA	Not supported by the SUT.
E1	No	5.9.2.3.6	1, 2, 3, and 4	NA	Not supported by the SUT.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	NA	Not supported by the SUT.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	NA	Not supported by the SUT.
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT met requirements for 1 Gbps and 10 Gbps interfaces.
DLoS	No	5.9.2.3.9	1, 2, 3, 4, and 5	NA	Not supported by the SUT.
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	

Table 1. SUT Interface Interoperability Status (continued)

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.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
10Base-X	10 Mbps Ethernet generic designation	LAN	Local Area Network
BRI	Basic Rate Interface	Mbps	Megabits per second
CR	Capability Requirement	NA	Not Applicable
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)	OLT	Optical line Terminal
E1	European Interface Standard (2.048 Mbps)	SUT	System Under Test
FR	Functional Requirement	UCR	Unified Capabilities Requirements
Gbps	Gigabits per second	WAN	Wide Area Network
IP	Internet Protocol		

Table 2. SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference (See note 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 (See note 3.)	5.9.2.3.7	NA	SUT does not provide TDM interfaces.
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	NA	
	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.

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

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference (See note 2.)	Status	Remarks
6	**D-NE Requirements**				
	D-NE General Requirements	Required (See note 4.)	5.9.3.1	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	D-NE TDM Requirements	Conditional	5.9.3.2	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	D-NE IP Requirements	Conditional	5.9.3.3	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Encapsulated TDM Requirements	Conditional	5.9.3.4	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Carrier Group Alarms	Required (See note 4.)	5.9.3.5	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Long-Local Requirements	Conditional	5.9.3.6	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Proprietary IP Trunk Requirements	Conditional	5.9.3.7	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Secure Call Handling	Required (See note 4.)	5.9.3.8	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Voice Packet Multiplexing	Conditional	5.9.3.9	Not Tested	Sponsor requested to test the SUT as a fixed NE.
7	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a layer-2 device and transports IPv4 and IPv6 traffic transparently.
8	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

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 1.
3. Applies to TDM interfaces only.
4. Only applies if SUT seeking certification as an D-NE.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	IPv4	Internet Protocol version 4
CR	Capabilities Requirement	IPv6	Internet Protocol version 6
DLoS	Direct Line of Sight	NA	Not Applicable
D-NE	Deployed Network Element	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
IP	Internet Protocol	VVoIP	Voice and Video over Internet Protocol

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 Non-secure Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP), which .mil/.gov users can access on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint

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Interoperability Tool at https://jit.fhu.disa.mil (NIPRNet). Information related to Defense Switched Network (DSN) testing is on the Telecommunications Switched Services Interoperability website at http://jitc.fhu.disa.mil/tssi. All associated data is available on the DISA Unified Capability Certification Office website located at https://aplits.disa.mil.

6. The JITC testing point of contact is Mr. Son Pham, commercial (301) 744-2636, or DSN 354-2636. His e-mail address is Son.Pham@disa.mil. The JITC mailing address is 3341 Strauss Avenue, Suite 236, Indian Head, Maryland 20640-5149. The Unified Capabilities Certification Office tracking numbers for the SUT are 0914904 and 0914905.

FOR THE COMMANDER:

3 Enclosures a/s

BRADLEY A. CLARK
Chief
Battlespace Communications Portfolio

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ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense Document, "Department of Defense Unified Capabilities Requirements 2008, Change 1," 22 January 2010
(d) Joint Interoperability Test Command Document, "Unified Capabilities Test Plan," May 2009
(e) Joint Interoperability Test Command Document, "Information Assurance (IA) Assessment of Tellabs Gigabit Passive Optical Network (1134 and 1150 Multi-Service Access Platform Optical Line Terminal with 701, 709 and 729 Optical Network Terminals)," 12 January 2010

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Tellabs Gigabit Passive Optical Network (1134 and 1150 Multi-Service Access Platforms Optical Line Terminal with 701, 709 and 729 Optical Network Terminals) Fixed Network Element, software release FP25.3.1

2. SPONSOR. Headquarters United States Army Information Systems Engineering Command. Mr. Robert Wellborn, address: Commander, HQUSAISEC AMSEL-IE-IS Bldg 53301 Fort Huachuca, AZ 85613-5300, e-mail: robert-wellborn@us.army.mil

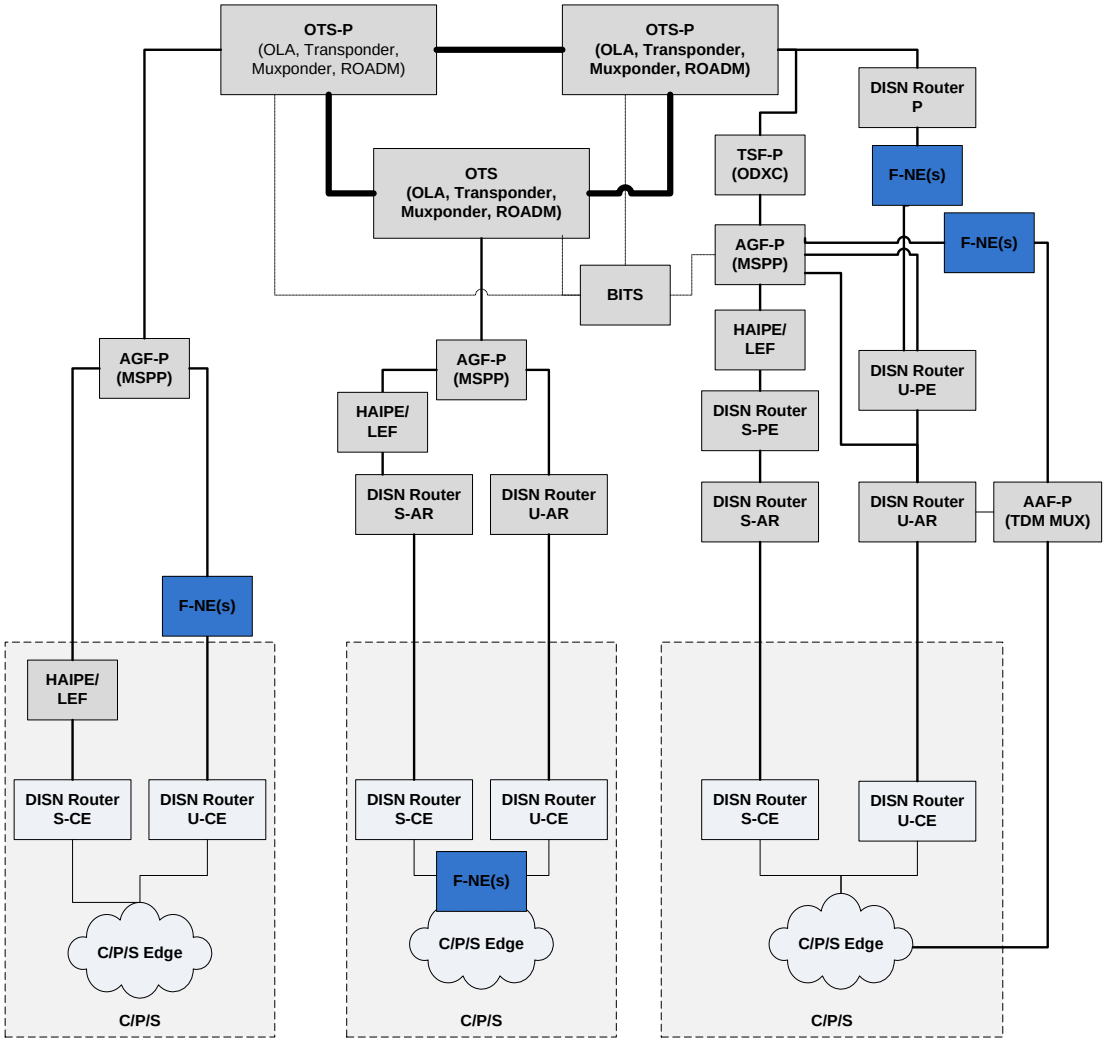
3. SYSTEM POC. Jeff Quinton, Tellabs North America, Inc. 20360 Seneca Meadows Parkway, Germantown, MD, 20876, e-mail: jeffrey.quinton@tellabs.com

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

5. SYSTEM DESCRIPTION. There are three main components in a Gigabit Passive Optical Network (GPON), other than the fiber itself. The GPON Optical Line Terminal (OLT) is the network concentrator, the splitter (or splitters) allows a single fiber to be shared among a number of subscribers, and the Optical Network Terminal (ONT) serves a local site. In terms of Unified Capabilities Requirements (UCR), a GPON falls within the definition and requirements of a Network Element (NE). The Tellabs 1134 Multi-Service Access Platforms (MSAP) offers a medium-density, full-service option ideal for smaller “deep-fiber” (i.e., fiber-to-the desktop) applications. Tellabs designed the system to meet growing demands of high-bandwidth services, including voice, video, and data. The Tellabs 1150 MSAP is a native end-to-end Internet Protocol (IP)/ Ethernet delivery platform that offers the packet-based, high-bandwidth technology required for current telecommunications services. The Tellabs 1150 MSAP is a high-density access platform focused on optimized, scalable, deep-fiber service delivery of voice, video, and data. The Tellabs 1134 and 1150 performs perform the function of the GPON OLT. Tellabs designed the 700 series ONT to deliver narrowband and broadband subscriber services. The Tellabs 701/709/729 ONTs are GPON access devices that provide service termination for the subscriber ports of the 1134/1150 MSAP platforms. The ONTs were tested peripherals to the 1134/1150 MSAP platforms. The Tellabs-1134/1150 MSAPs and 701/709/729 ONTs are components of the GPON system International Telecommunications Union-Telecommunication Standardization Sector G.984 standard.

6. OPERATIONAL ARCHITECTURE. The JITC tested the Tellabs-1134/1150 MSAP OLTs with the accompanying 701/709/729 ONTs under the Fixed Network Element (F-NE) UCR product category. A high-level Defense Information Systems Network (DISN) node architecture, as depicted in Figure 2-1, displays the devices in the DISN architecture. The Tellabs GPON F-NE solution can be deployed to extend DISN services in the Wide Area Network (WAN) and on a camp, post, or station within the Local Area Network (LAN) infrastructure. The Tellabs solution meets the UCR high

availability requirements and can be used to augment high availability WAN or LAN infrastructures.



LEGEND:

AAF-P	Access Aggregation Function Product
AGF-P	Access Grooming Function Product
AR	Aggregation Router
ATM	Asynchronous Transfer Mode
CE	Customer Edge Router
C-PE	Classified Provider Edge Router
C/P/S	Camp, Post, or Station
DISN	Defense Information System Network
F-NE	Fixed Network Element
HAIPE	High Assurance Internet Protocol Encryptor
MSPP	Multi-Service Provisioning Platform
MUX	Multiplexer
P	Provider Router
ODXC	Optical Digital Cross Connect
OLA	Optical Line Amplifier
OTS-P	Optical Transport System Product
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
T-PE	Transport Provider Edge Router
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 NE products are established by Sections 5.4 and 5.9 of the Department of Defense Unified Capabilities UCR 2008, Change 1.

7.1 Interfaces. The NE products use its interfaces to connect to LAN or DISN WAN 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 (See note 1.)	UCR Reference	Threshold CR/FR Requirements (See note 2.)	Criteria	Remarks
Ingress (LAN side)					
Analog	No	5.9.3.2.1	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		
Egress (WAN side)					
Serial	No	5.9.2.3.2	1, 2, 3, and 4	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
DS1	No	5.9.2.3.4	1, 2, 3, and 4		
E1	No	5.9.2.3.6	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		
DLoS	No	5.9.2.3.9	1, 2, 3, 4, and 5		
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. 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.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
10Base-X	10 Mbps Ethernet generic designation	LAN	Local Area Network
BRI	Basic Rate Interface	Mbps	Megabits per second
CR	Capability Requirement	NE	Network Element
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		

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 System Under Test (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 (See note 1.)	UCR Reference (See note 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**				
	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.
	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.	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**				
	D-NE General Requirements	Required (See note 4.)	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 (See note 4.)	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 (See note 4.)	5.9.3.8		
	Voice Packet Multiplexing	Conditional	5.9.3.9		

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

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference (See note 2.)	Criteria	Remarks
7	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Meet UCR IPv6 requirements.	Applies to both F-NE and D-NE
8	**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.	Applies to both F-NE and D-NE.
	General Management Requirements	Required	5.3.2.17.2		

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 1.
3. Requirement applies to TDM interfaces only.
4. Only applies if SUT is seeking certification as an D-NE.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	ID	Identification
CR	Capabilities Requirement	IP	Internet Protocol
DLoS	Direct Line of Sight	IPv6	Internet Protocol version 6
D-NE	Deployed Network Element	NE	Network Element
F-NE	Fixed Network Element	NM	Network Management
FR	Functional Requirement	NMS	Network Management System
G.726	ITU-T speech codec for ADPCM (32 Kbps)	SUT	System Under Test
G.728	ITU-T speech codec for LD-CELP (16 Kbps)	TDM	Time Division Multiplexing
G.729	ITU-T speech codec for CS-ACELP (8 Kbps)	UCR	Unified Capabilities Requirements
		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 Section 5.9, Network Element Requirements, and UCR Section 5.4, IA Requirements.

Table 2-3. NE Products IA Requirements

Requirement	Critical (See Note.)	UCR Reference
General Requirements	Yes	5.4.6.2
Authentication	Yes	5.4.6.2.1
Integrity	Yes	5.4.6.2.2
Confidentiality	Yes	5.4.6.2.3
Non-repudiation	Yes	5.4.6.2.4
Availability	Yes	5.4.6.2.5

NOTE: Not all IA requirements from the referenced UCR section apply. Refer to Table 1 of the System Functional and Capability Requirements for the specific IA requirements.

LEGEND:

IA	Information Assurance	UCR	Unified Capabilities Requirements
NE	Network Element		

7.4 Other. The SUT also supports GPON requirements that the sponsor wanted assessed. Table 2-4 lists the GPON requirements for the SUT. The JITC used ITU-T G.984 series, Request For Comments 2544, and sponsor requirements to establish the GPON requirements.

Table 2-4. GPON Requirements

ID	Requirement	Reference
1	Hardware Design	Sponsor Requirement
2	Initial System Turn-up	Sponsor Requirement
3	Inventory Recording	Sponsor Requirement
4	Network Discovery	Sponsor Requirement
5	GPON Link Throughput Measurement	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
6	GigE Throughput Measurement of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
7	GigE Frame Loss Measurement of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
8	GigE Latency Measurement of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
9	10GigE Throughput of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
10	10GigE Frame Loss of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
11	10GigE Latency of OLT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
12	Ethernet Throughput of ONT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
13	Ethernet Frame Loss of ONT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
14	Ethernet Latency of ONT	ITU-T G.984.1, G.984.2, G.984.3, G.984.4 and RFC 2544
15	OLT Equipment Module Redundancy	ITU-T G.984.1, G.984.2, G.984.3, G.984.4
16	Recovery from Total Electrical Power Failure	Sponsor Requirement
17	Management Application Usability	Sponsor Requirement
18	Remote Device Configuration and Control	Sponsor Requirement
19	Software Upgrade	Sponsor Requirement
20	Node Database Backup and Restore	Sponsor Requirement
21	Alarm Reporting Ability	Sponsor Requirement
22	Operation of the ONT Range Feature	ITU-T G.984.1, G.984.2, G.984.3, G.984.4
23	Place an ONT in ESTOP	ITU-T G.984.1, G.984.2, G.984.3, G.984.4
24	Verify GPON Distances	ITU-T G.984.1, G.984.2, G.984.3, G.984.4
25	1000 Base-X Distribution Port MAC	ITU-T G.984.1, G.984.2, G.984.3, G.984.4
26	10/100/1000 Base-T Auto Negotiation on Copper MACs	IEEE 802.3
27	VLAN Bridging – MAC Address-Based VLAN Classification	IEEE 802.3
28	VLAN Bridging – Lateral Access Port Forwarding	IEEE 802.3
29	VLAN Bridging – Forwarding Database – Dynamic	IEEE 802.3
30	Ingress Access Control – Protocol Filtering	IEEE 802.3
31	Ingress Access Control – Destination Subnet Blocking	Network Infrastructure STIG, Sections 4.4, 4.5, 4.6
32	VLAN Bridging – Access Port to Distribution Port Concentration	IEEE 802.3
33	VLAN Bridging - Trunking	IEEE 802.3
34	Verify ONT Data Transmission During Voice Traffic	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.3.3
35	Stability with Primary Timing Reference Failure	ITU-T G.984; Telcordia, GR-303, TR-57
36	Call Feature Testing	Telcordia GR-303
37	8-hour Bulk- Call Runs GR-303 Call Processing/Call Completion-Long Term	Telcordia GR-303
38	48-hour Bulk- Call Runs GR-303 Call Processing/Call Completion- Long Term	Telcordia GR-303
39	Verify FAX Capability GR-303	Telcordia GR-303, ITU-T V.17

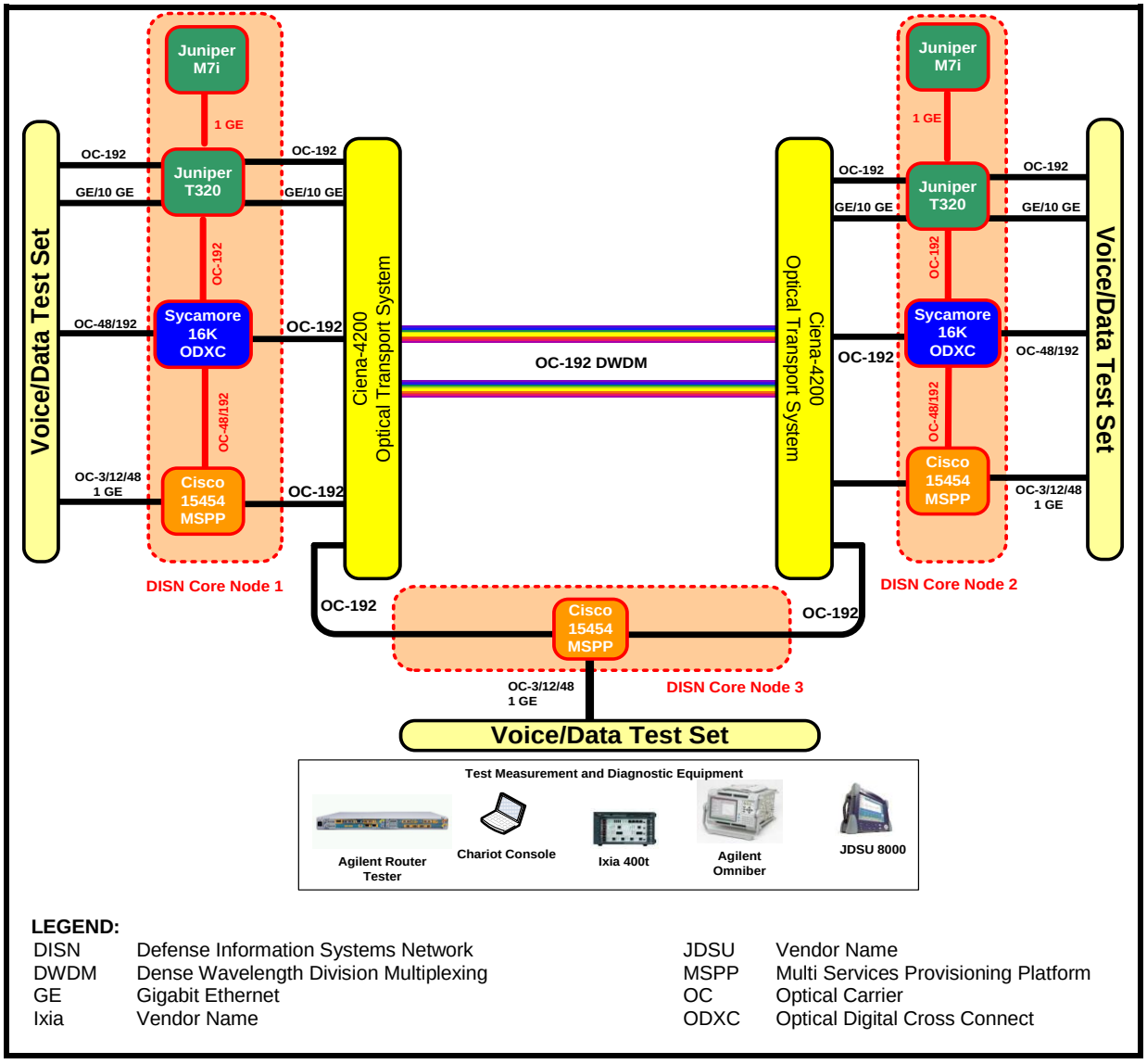
Table 2-4. GPON Requirements (continued)

ID	Requirement	Reference
40	Modem Testing GR-303	Telcordia, GR- 303, ITU-T V.34
41	Call Feature Testing with Interface into the DISN TR-057	Telcordia, TR-57
42	8-hour Overnight Bulk- Call Runs TR- 057 Call Processing/Call Completion	Telcordia, TR-57
43	48-hour Bulk-Call Runs TR-057 Call Processing/Call Completion- Long Term	Telcordia, TR-57
44	Verify FAX Capability with TR-057	Telcordia, TR-57, ITU-T V.17
45	28.8 kbps Voice Band Modem Testing TR-057	Telcordia, GR- 303, ITU-T V.34
46	Call Completion/Data Throughput and IPTV Completion Duration Long-Term TR- 057	Sponsor Requirements
47	DSCP Quality of Service Mapping	Sponsor Requirements
48	Upstream Quality of Service on an oversubscribed PON	Sponsor Requirements
49	Upstream Quality of Service on an oversubscribed ONT with multiple access ports	Sponsor Requirements
50	Upstream Service Level Agreement enforcement	Sponsor Requirements
51	Downstream Quality of Service on an oversubscribed PON	Sponsor Requirements
52	Downstream QoS on Oversubscribed access port	Sponsor Requirements
53	Downstream Service Level Agreement enforcement	Sponsor Requirements
54	VLAN ID Ranges	Sponsor Requirements

LEGEND :

DISN	Defense Information Systems Network	ITU-T	International Telecommunication Union-Telecommunication Standardization
DSCP	Differentiated Services Code Points		
ESTOP	Emergency Stop	MAC	Mandatory Access Control
GigE	Gigabit Ethernet	OLT	Optical Line Terminal
GPON	Gigabit Passive Optical Network	ONT	Optical Network Terminal
GR	Generic Requirement	PON	Passive Optical Network
GR-303	Integrated Digital Loop Carrier System Generic Requirements	QoS	Quality of Service
		RFC	Request For Comments
IEEE	Institute of Electrical and Electronics Engineers	TR-57	Universal or analog interface to a switch
ID	Identification	UCR	Unified Capabilities Requirements
IPTV	Internet Protocol Television	VLAN	Virtual Local Area Network

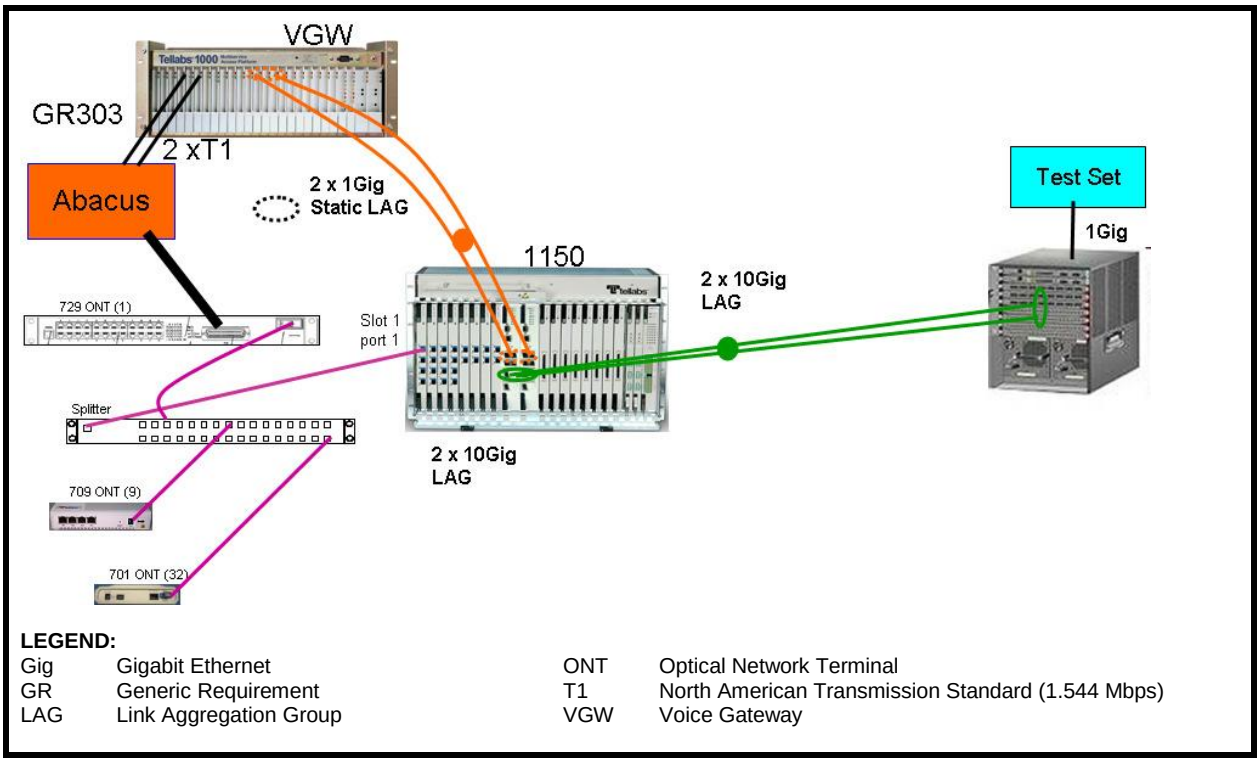
8. TEST NETWORK DESCRIPTION. The JITC tested the SUT at its Indian Head, Maryland Advanced Technology Testing Laboratory using test configurations shown in Figures 2-2 through 2-6. Figure 2-2 shows the Indian Head, Maryland Advanced Technology Test Bed, and Figure 2-3 shows the ONTs and OLT in a standalone configuration for feature testing. Figure 2-4 shows the ONTs and OLT connected via a Cisco 6509 router for feature testing with Cisco. Figure 2-5 shows the ONTs and OLT connected to Video and File Transfer Protocol servers via a Cisco 6509 router for Video and data testing and Figure 2-6 shows the ONTs, OLT, and Cisco 6509 router connected to DISN equipments for testing interoperability with the DISN.



LEGEND:

DISN	Defense Information Systems Network	JDSU	Vendor Name
DWDM	Dense Wavelength Division Multiplexing	MSPP	Multi Services Provisioning Platform
GE	Gigabit Ethernet	OC	Optical Carrier
Ixia	Vendor Name	ODXC	Optical Digital Cross Connect

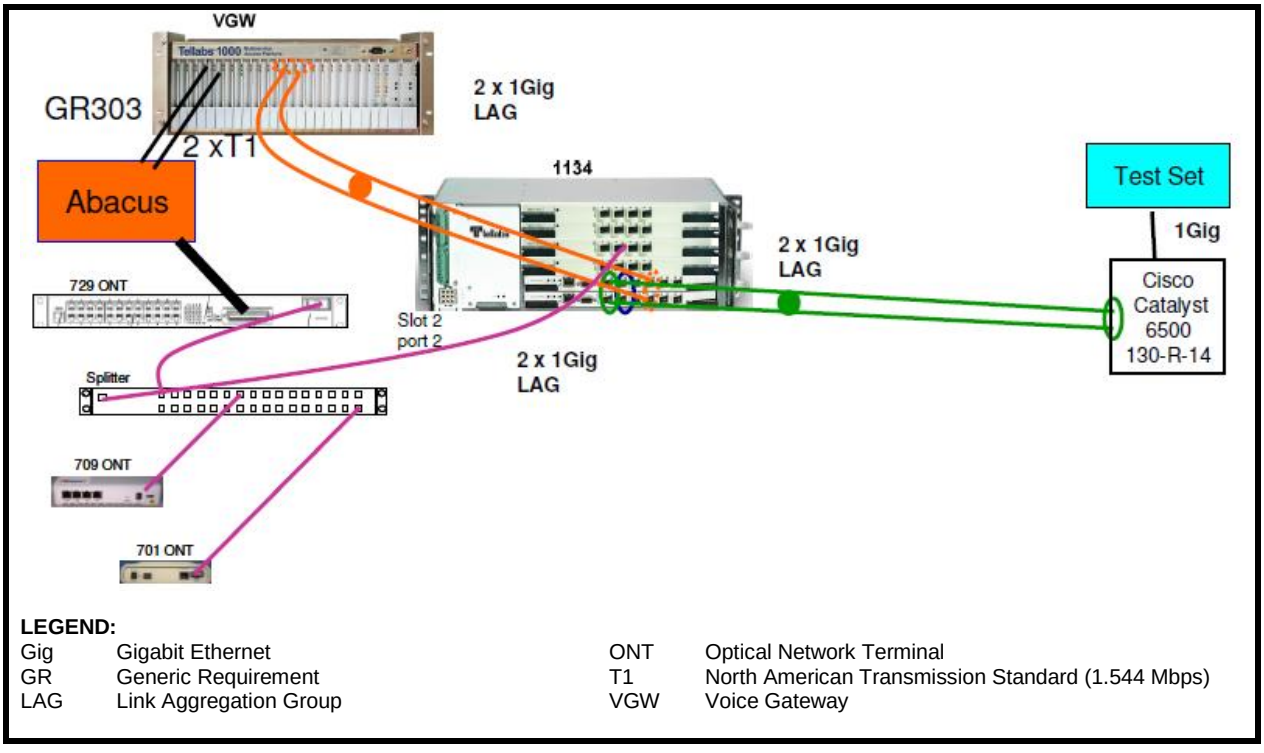
Figure 2-2. Indian Head Advanced Technologies Test Bed



LEGEND:

Gig	Gigabit Ethernet	ONT	Optical Network Terminal
GR	Generic Requirement	T1	North American Transmission Standard (1.544 Mbps)
LAG	Link Aggregation Group	VGW	Voice Gateway

Figure 2-3. Tellabs Configuration 1



LEGEND:

Gig	Gigabit Ethernet	ONT	Optical Network Terminal
GR	Generic Requirement	T1	North American Transmission Standard (1.544 Mbps)
LAG	Link Aggregation Group	VGW	Voice Gateway

Figure 2-4. Tellabs Configuration 2

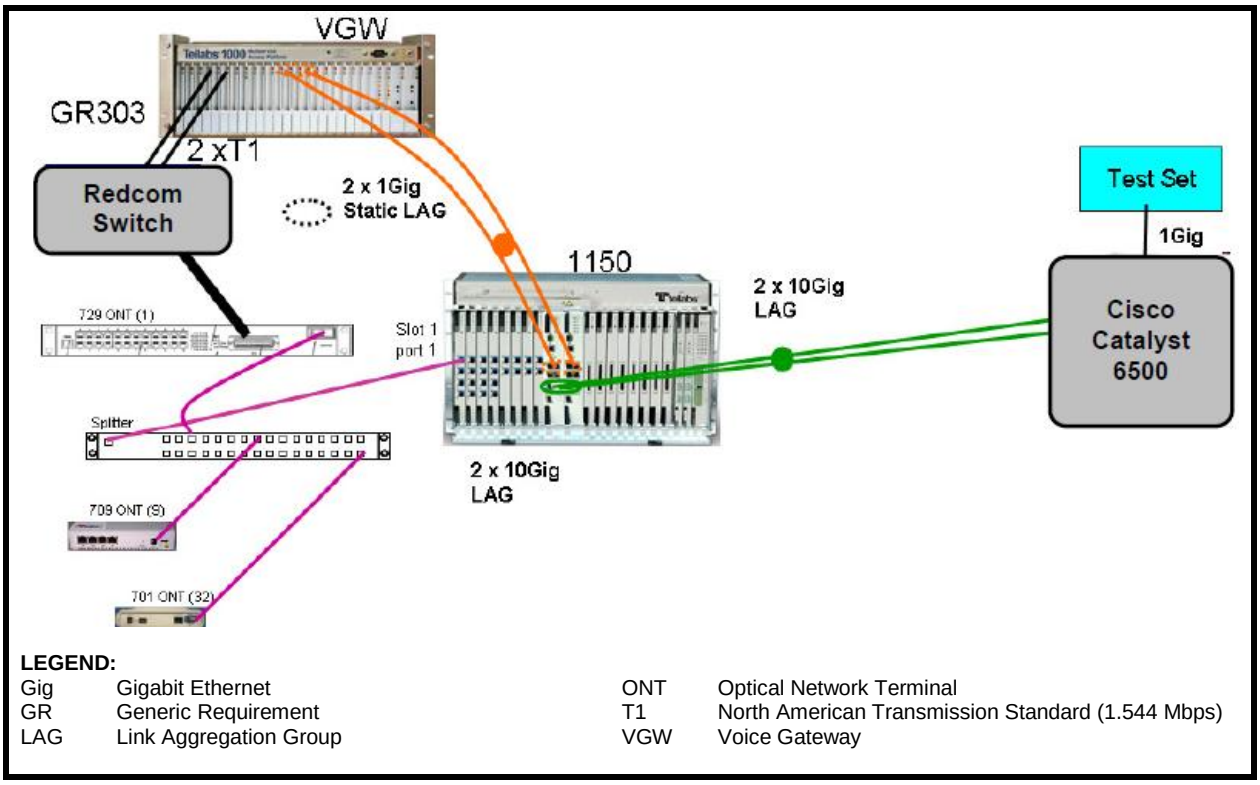


Figure 2-5. Tellabs Configuration 3

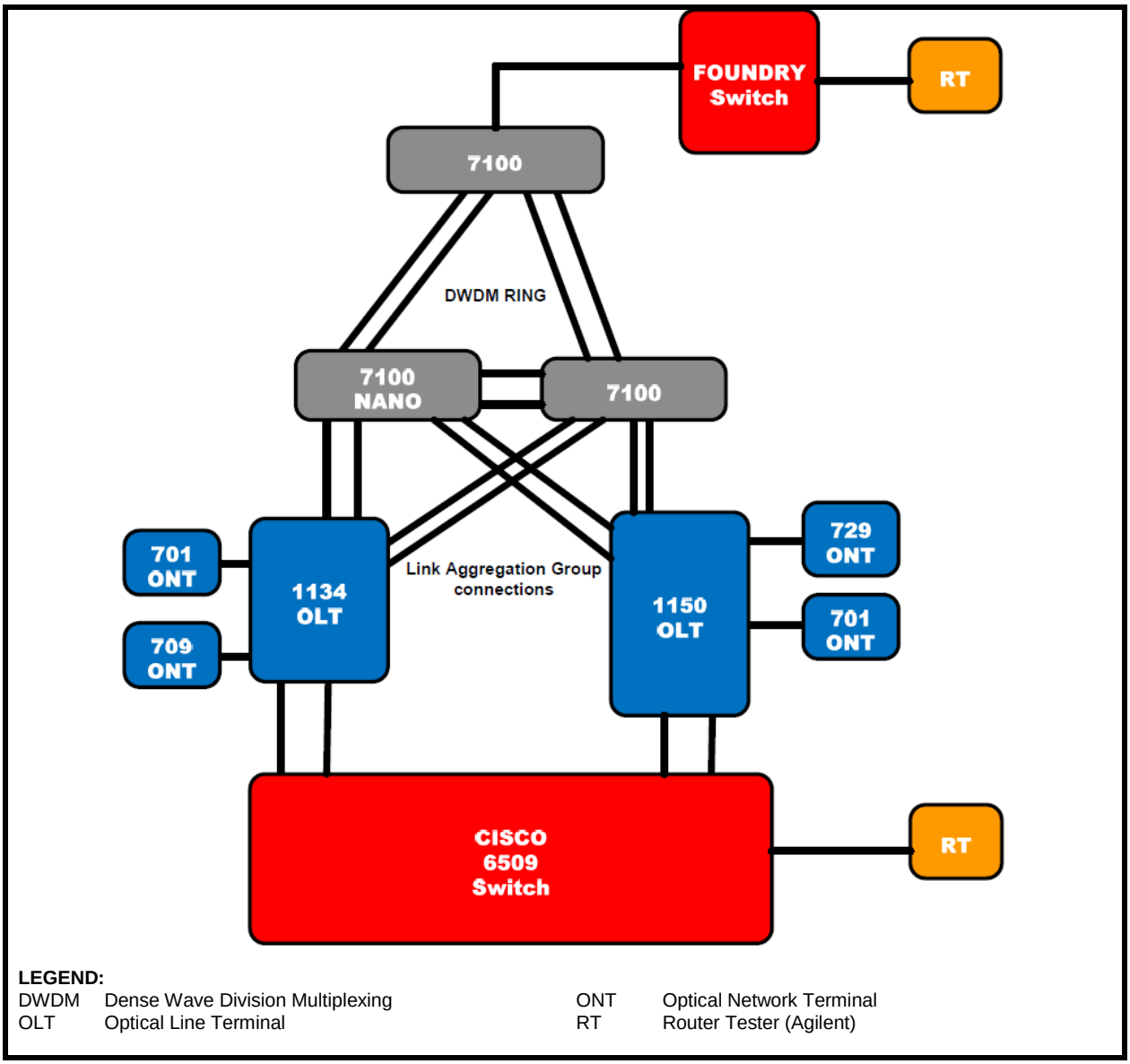


Figure 2-6. Tellabs Configuration 4

9. SYSTEM CONFIGURATION. Table 2-5 lists the tested software configuration shown in Figure 2-1, Table 2-6 lists the DISN Core Equipment used to test the Tellabs GPON F-NE, and Table 2-7 lists the test equipment used to generate voice, Synchronous Optical Network, and IP traffic.

Table 2-5. Tested SUT Equipment

Platform	Software Release	Function
Tellabs 1134 MSAP	FP25.3.1 (MontaVista Linux 4.0 – not user accessible)	GPON OLT
Tellabs 1150 MSAP	FP25.3.1 (MontaVista Linux 4.0 – not user accessible)	GPON OLT
Tellabs 701	FP25.3.1	GPON ONT
Tellabs 709	FP25.3.1	GPON ONT
Tellabs 729	FP25.3.1	GPON ONT
Tellabs 1134/1150 Element Management System	FP8.4	System Management Software
Tellabs Service Layer Manager Server Universal Gateway Server	FP8.4	System Management Software

LEGEND:

MSAP	Multi-Service Access Platform	ONT	Optical Network Terminal
OLT	Optical Line Terminal	SUT	System Under Test

Table 2-6. Non-SUT Equipment

Component	Software Version	Function
Tellabs 7100	FP5.1.1 VxWorks – not user accessible	
Tellabs 7100 Nano	FP5.1.1 VxWorks – not user accessible	
Tellabs 5500 NGX	FP3.2.3.1 OSE – not user accessible	
1000 MSAP VGW	13.4.7 VxWorks – not user accessible	
Cisco 15454	09.00-008I-17.17	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 ODXC	7.6.21 Build 0562.26.27.57.14	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	4 x FE 100 Base Tx, 10 x GigE LAN 1000 Base, 1x OC-192 SM SR2, 1 x 10GigE LAN, XENPAK
Cisco Catalyst 6500	12.1 (13)	48 E ports, 8 ports GigE, 2 port 10GigE
RedCom Switch	6.1	4 Port line card (MA0653-115) 2/ Multi E1/T1 (MET) Interface Board (MA0683-122 3/ Single Slot System Processor (S3P) Board/ line signaling Protocol for trunk lines (GR303 or SS7)(MA0688-101)

LEGEND:

DS	Digital Signal	R	Revision
ETH	Ethernet	SM	Single Mode
GigE	Gigabit Ethernet	SR	Short Reach
LAN	Local Area Network	STM	Synchronous Transport Module
LIM	Line Interface Module	SUT	System Under Test
OC	Optical Carrier	Tx	Transmit
ODXC	Optical Digital Cross Connect	USC	Universal Services Card

Table 2-7. Test 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	
		1000 Base X	
Agilent	Rack Mounted Router Tester 900	10 Gig LAN/WAN	6.11
		10/100/1000 Base-T	
		1000 Base-X	
		OC-48c POS	
		OC-3/12/POS	
Agilent JDSU	T-Berd 8000	OC-192 POS	6.11
		DSU	6.4
		10/100/1000	
		OC-3-12	
		DS-3	
		OC-192	

LEGEND:

DS	Digital Signal	nm	nanometer
DSU	Data Services Unit	OC	Optical Carrier
Gig	Gigabit	POS	Packet Over Synchronous Optical Network
JDSU	Vendor Name	WAN	Wide Area Network
LAN	Local Area Network		

10. TEST LIMITATIONS. The JITC Indian Head testers noted the following test limitations during testing of the system:

a. There were no Department of Defense (DoD) Secure Communication Devices in the test laboratory to test the secure transmission capability. The JITC tested this capability by using simulated information exchanges. This limitation poses a low risk to interoperability because the GPON is a layer 2 optical transport that does not manipulate its transported signals.

b. There are no modem transmission, facsimile transmission, or call control signal transparency test capabilities in the test laboratory to test these capabilities directly. The JITC tested these capabilities by using simulated information exchanges. This limitation poses a low risk to interoperability because the GPON is layer a 2 optical transport that does not manipulate its transported signals.

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for F-NE and the JITC certifies it 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 2-8.

Table 2-8. SUT Interface Requirements Status

Interface	Critical (See note 1.)	UCR Reference	Threshold CR/FR Requirements (See note 2.)	Status	Remarks
Ingress (LAN side)					
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	NA	Not supported by the SUT.
E1	No	5.9.2.3.5	1, 2, 3, and 4	NA	Not supported by the SUT.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	NA	Not supported by the SUT.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	NA	Not supported by the SUT
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT's OLTs met requirements for 1 Gbps and 10 Gbps interfaces.
Egress (WAN side)					
Serial	No	5.9.2.3.2	1, 2, 3, and 4	Not Certified	Not supported by the SUT.
DS1	No	5.9.2.3.4	1, 2, 3, and 4	Not Certified	Not supported by the SUT.
E1	No	5.9.2.3.6	1, 2, 3, and 4	Not Certified	Not supported by the SUT.
DS3	No	5.9.2.3.6	1, 2, 3, and 4	Not Certified	Not supported by the SUT.
OC-X	No	5.9.2.3.8	1, 2, 3, and 4	Not Certified	Not supported by the SUT.
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT met requirements for 1 Gbps and 10 Gbps interfaces.
DLoS	No	5.9.2.3.9	1, 2, 3, 4, and 5	Not Certified	Not supported by the SUT.
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.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	IP	Internet Protocol
10Base-X	10 Mbps Ethernet generic designation	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)	OLT	Optical line Terminal
E1	European Interface Standard (2.048 Mbps)	SUT	System Under Test
FR	Functional Requirement	UCR	Unified Capabilities Requirements
Gbps	Gigabits per second	WAN	Wide Area Network

11.2 Capability Requirements (CR) and Functional Requirements (FR). The SUT's CR/FR statuses are listed in Table 2-9. The detailed CR/FR requirements are provided in Table 3-1 of the System Functional and Capability Requirements (Enclosure 3).

Table 2-9. SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference (See note 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 (See note 3.)	5.9.2.3.7	NA	Requirement applies to TDM interfaces; SUT does not provide TDM interfaces.
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	NA	
	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	**D-NE Requirements**				
	D-NE General Requirements	Required (See note 3.)	5.9.3.1	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	D-NE TDM Requirements	Conditional	5.9.3.2	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	D-NE IP Requirements	Conditional	5.9.3.3	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Encapsulated TDM Requirements	Conditional	5.9.3.4	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Carrier Group Alarms	Required (See note 3.)	5.9.3.5	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Long-Local Requirements	Conditional	5.9.3.6	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Proprietary IP Trunk Requirements	Conditional	5.9.3.7	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Secure Call Handling	Required (See note 3.)	5.9.3.8	Not Tested	Sponsor requested to test the SUT as a fixed NE.
	Voice Packet Multiplexing	Conditional	5.9.3.9	Not Tested	Sponsor requested to test the SUT as a fixed NE.
7	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a layer-2 device and transports IPv4 and IPv6 traffic transparently.
8	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

Table 2-9. SUT Capability Requirements and Functional Requirements Status (continued)

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 1.
3. Only applies if SUT seeking certification as a D-NE.
4. This applies to TDM interfaces only and SUT does not support any TDM interface.

LEGEND:

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

a. General NE Requirements

(1) General Requirements. In Accordance With (IAW) UCR 2008 Change 1 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, Section 5.2.12.6, and DoD Secure Communications Devices. The JITC did not test secure information exchanges by using DoD Secure Communications Devices. Instead, JITC tested this with test equipment and simulated information exchanges with no noted issues. Based on this test limitation, there is a low risk to interoperability.

(d) The NE(s) shall support a minimum modem transmission speed of 9.6 kbps across the associated NE(s). The JITC did not test this information exchanges by using a modem. Instead, JITC tested this with test equipment and simulated information exchanges with no noted issues. Based on this test limitation, there is a low risk to interoperability.

(e) The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s). The JITC did not test this information exchanges by using a facsimile. Instead, JITC tested this with test equipment and simulated information exchanges with no noted issues. Based on this test limitation, there is a low risk to interoperability.

(f) The NE shall transport all call control signals transparently on an E2E basis. The JITC did not test this information exchanges by using an actual call control signals. Instead, JITC tested this with test equipment and simulated information exchanges with no noted issues. Based on this test limitation, there is low risk to interoperability.

(2) Alarms. IAW UCR 2008 Change Section 5.9.2.1.1, the NE shall be able to propagate Carrier Group Alarms (CGA) and IAW UCR 2008, Section 5.2.1.5.7, Carrier Group Alarm, upon physical loss of the Time Division Multiplexing (TDM) interface. 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) the condition of its link state for transporting ingress IP traffic, namely operational or down. The SUT met the alarm requirement for TDM and IP. IP link state information is provided via loss of path indications.

(3) Congestion Control and Latency. IAW UCR 2008 Change 1 Section 5.9.2.1.2, the NE shall ensure that congestion and latency between paired NEs does not affect DSN calls in progress or subsequent calls. Call congestion and latency requirements are as follows:

(a) TDM Transport. The SUT does not provide TDM Transport. Therefore, the following TDM Transport requirements are not applicable to the SUT.

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

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 5-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, Compression) 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, Compression) 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 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. The IP interface parameters subject to ingress/egress requirements shall be met IAW Section 5.9.2.3.9, IP Interface. The SUT supports IP Transport via Differentiated Services Code Points.

(c) Direct Line of Sight (DLoS) Transport. The SUT does not provide 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 SUT does not support Compression. Therefore, the following Compression requirements are not applicable.

(1) G.726.

(2) G.728.

(3) G.729.

c. Interface Requirements.

(1) Timing. IAW UCR 2008 Change 1 Section 5.9.2.3.7, 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, Timing Modes. This requirement applies to TDM interfaces only; IP interfaces need not meet this requirement. The SUT does not provide TDM interfaces, so this requirement is not applicable.

d. Device Management. IAW UCR 2008 Change 1 Section 5.9.2.4, 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 SUT supports only external console control capability. The SUT provides an external console capability.

(b) Remote monitoring and management by the Advanced DSN Integrated Management Support System (ADIMSS) as described in the UCR 2008, Section 5.2.8, Network Management, Section 5.2.8.3, Fault Management, and Section 5.2.8.4, Configuration Management. The 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 not provide TDM 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. Therefore, the following DLoS congestion interface requirements are not applicable.

(a) 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.

(b) 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.

(c) A 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 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. JITC did not verify this capability because the Sponsor requested JITC test the SUT as an F-NE. Therefore, the following conditional D-NE requirements are not applicable.

(1) D-NE General Requirements.

(a) 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.

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

(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) CGAs. IAW UCR 2008 Change 1 Section 5.9.3.5, the D-NE shall be able to propagate CGAs in accordance with UCR 2008, Section 5.2.6, System Interfaces, 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. IAW UCR 2008 Change 1 section 5.9.3.6, 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. IAW UCR 2008 Change 1 Section 5.9.3.7, 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 5.2.2.7, Integrated Services Digital Network Multi-Level Precedence and

Preemption (MLPP) Primary rate Interface (i.e., Precedence, Preemption, MLPP Service Domain, Look Forward for Busy, Network Identifiers, and Coding Standard).

(8) Secure Call Handling. 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 V.150.1 standards implementation IAW National Security Agency SCIP-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 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. 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. Internet Protocol version 6 (IPv6) Requirements.

(1) Product Requirements. The SUT must meet UCR 2008 Change 1 Section 5.3.5.4 IPv6 requirements for Network Appliance /Simple Server (NA/SS). The SUT is a layer-2 device and transports Internet Protocol version 4 and IPv6 traffic transparently so requirements specific relating to layer 3 do not apply.

h. NM Requirements. JITC verified the following NM requirements via a combination of testing and reviewing of the vendor submitted NM Letter of Compliance.

(1) Voice and Video over Internet Protocol (VVoIP) NMS Interface Requirements. IAW UCR 2008 Change 1 Section 5.3.2.4.4 the physical interface between the Defense Information Systems Agency VVoIP EMS and the network components (i.e., LSC, MFSS, EBC, 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. IAW UCR 2008 Change 1 Section 5.3.2.17.2, the SUT must support SNMPv3 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 as specified in Section 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 as specified in, Section 5.3.2.4.4. There shall be a local craftsperson interface (Craft Input Device for OA&M for all VVoIP network components.

11.3 Information Assurance. The IA Assessment Report is published as a separate report.

11.4 Other. The SUT meets all applicable tested GPON requirements. The SUT's GPON requirements status is listed in Table 2-10.

Table 2-10. GPON Requirements Status

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-01	Hardware Design	Warning labels will be plainly visible, optical connectors will avoid the possibility of eye injury, electrical voltage measurements will be within voltage limits, and optical power measurements are within operating range.	Warning labels were plainly visible, optical connectors were positioned to avoid the possibility of eye injury, electrical voltage measurements were within voltage limits, and optical power measurements were within operating range.	ITU-T G.984; UCR 2008 Section 5.3.1	Met
GPON SC-02	Initial System Turn-up	The IP address and other initial settings will be configured during the turn-up phase so that EMS can communicate to the system IPv4 and IPv6.	The IP address and other initial settings were configured during the turn-up phase so that EMS could communicate to the system in IPv4 and IPv6.	ITU-T G.984; UCR 2008 Sections 5.3.1.3.5 and 5.3.5	Met
GPON SC-03	Inventory Recording	It will be possible to record the hardware information for all active cards in the system from a remote location.	It was possible to record the hardware information for all active cards in the system from a remote location.	ITU-T G.984; UCR 2008 Section 5.3.1	Met
GPON SC-04	Network Discovery	The Element Management System and the Network Management System will discover the network configuration of an installed network.	The Element Management System and the NMS discovered the network configuration of the installed network.	UCR 2008 Section 5.3.1.6.5	Met
GPON SC-05	GPON Link Throughput Measurement	It shall be possible to pass 2.2 Gbps downstream and 1.1 Gbps upstream through a single Passive Optical Network (PON) with Forward Error Correction disabled.	It was possible to pass 2.2 Gbps downstream and 1.1 Gbps upstream through a single Passive Optical Network (PON) with Forward Error Correction disabled.	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3 and ITU-T G.984	Met
GPON SC-06	GigE Throughput Measurement of OLT	Greater than 95% throughput for all frame sizes	Throughput was 100%.	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-07	GigE Frame Loss Measurement of OLT	Less than 0.1% frame loss with 100% throughput for all frame sizes.	0 percent frame loss at the throughput rates listed in test case GPON SC-06.	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met
GPON SC-08	GigE Latency Measurement of OLT	Latency measurements will be less than 1 millisecond.	Latency in microseconds for frames sizes tested was: 64 bytes – 56.219 µs 128 bytes – 60.506 µs 256 bytes – 66.355 µs 512 bytes – 69.904 µs 1024 bytes – 85.621 µs 1280 bytes – 95.345 µs 1500 bytes – 101.823 µs	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met
GPON SC-09	10GigE Throughput of OLT	Throughput is greater than 95% for all frame sizes.	Throughput was 100%.	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3, Institute of Electrical and Electronics Engineers (IEEE) 802.3; and RFC 2544	Met
GPON SC-10	10GigE Frame Loss of OLT	Frame loss is less than 0.1% at a load of 100% of line rate for all frame sizes.	Frame loss was 0%.	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met
GPON SC-11	10GigE Latency of OLT	Latency is less than 1 millisecond for all frame sizes.	Latency in microseconds for frames sizes tested was: 64 bytes – 12.45 µs 128 bytes – 12.44 µs 256 bytes – 12.43 µs 512 bytes – 12.38 µs 1024 bytes – 12.35 µs 1280 bytes – 12.33 µs 1518 bytes – 12.31 µs	UCR 2008 Sections 5.3.1.3, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-12	Ethernet Throughput of ONT	Access ports should minimally link at 10 Mbps or 100 Mbps per user. For this test, vendor product should provide 100 Mbps or greater rates with frame loss for all frame sizes and all Ethernet services of no more than 5%.	Packet Size in bytes / Throughput % if line rate 64 16.00 128 22.328 256 32.484 512 41.935 1024 64.359 1280 70.219 1500 74.828 1518 74.984 The GPON ONTs are built with a network processor. In a network processor design, the number of packets per second rather than bit rate performance limits throughput. The 701 ONT uses an older technology part for the network processor than the 709 or 729, and so it is capable of a smaller number of packets per second than the other ONTs. In a network with a random distribution of traffic, the 709 and 729 are capable of achieving 1 Gbps, while the 701 is very near line rate.	UCR 2008 Sections 5.3.1.3, 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and IEEE 802.3	Met
GPON SC-13	Ethernet Frame Loss of ONT	The frame loss at a load of 100% of line rate for all frame sizes and all Ethernet services were not greater than 0.1%.	0% frame loss at the throughput rates listed in test case GPON SC-12.	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; and RFC 2544	Met
GPON SC-14	Ethernet Latency of ONT	The latency at a load of 100% of line rate for all frame sizes and all Ethernet services is not greater than 60 milliseconds.	Latency in microseconds for frames sizes tested was: 64 bytes – 616.618 µs 128 bytes – 624.640 µs 256 bytes – 764.899 µs 512 bytes – 1053.978 µs 1024 bytes – 1367.811 µs 1280 bytes – 3041.100 µs 1500 bytes – 1731.421 µs 1518 byte – 1749.741 µs	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; And RFC 2544	Met
GPON SC-15	OLT Equipment Module Redundancy	Traffic (voice, video, and data) disruption to the test circuits will be less than 5 seconds when redundant modules are added or removed.	Traffic (voice, video, and data) disruption to the test circuits were be less than 5 second when redundant modules were added or removed.	UCR 2008 Sections 5.3.1.7.3, 5.3.1.7.6, 5.3.1.7.7	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-16	Recovery from Total Electrical Power Failure	OLT/ONT system will recover from a total electrical power failure. All services will be restored in 30 minutes.	It took 9 minutes for the traffic to return on the 1134 system and 8.5 minutes for the 1150 system	UCR 2008 Section 5.3.1.7.6	Met
GPON SC-17	Management Application Usability	The device will be functional, easy to use, and provide the proper documentation for management.	The device was functional, easy to use, and provided proper documentation for management.	ITU-T G.697, G.805, G.874, Telcordia GR-228, GR-253, GR-499, GR-2914	Met
GPON SC-18	Remote Device Configuration and Control	It will be possible to remotely configure and control equipment via EMS/NMS. Communication will not be lost when the connection to the primary link is removed.	It was possible to remotely configure and control equipment via EMS/NMS. Communication was not lost when the connection to the primary link was removed.	UCR 2008 Sections 5.3.1.5, 5.3.1.6	Met
GPON SC-19	Hitless Software Upgrade	The switch to new software effects traffic for less than 5 minutes.	The switch to new software effected traffic for 4.5 minutes.	UCR 2008, Section 5.3.1.7.6	Met
GPON SC-20	Node Database Backup and Restore	It will be possible to backup and restore equipment configurations.	It was possible to backup and restore equipment configurations.	UCR 2008 Section 5.3.1.7.6	Met
GPON SC-21	Alarm Reporting Ability	The system will properly register, report, and log alarms.	The system properly registers, reports, and log alarms.	IEEE 803.3, ITU-T G.984; UCR 2008 Section 5.3.1.6.4	Met
GPON SC-22	Operation of the ONT Range Feature	It is possible to range ONTs by knowing the serial number of the ONT or by using a registration identifier. The ONTs that are not assigned an ONT identifier via the registration identifier or a serial number should be viewable in the EMS, but not ranged. No ONT should be permitted to send or receive traffic without being ranged.	It was possible to range ONTs by knowing the serial number of the ONT or by using a registration identifier. ONTs that were not assigned an ONT identifier via the registration identifier or a serial number were viewable in the EMS, but not ranged. No ONT was permitted to send or receive traffic without being ranged.	UCR 2008 Sections 5.3.1.7.6, 5.3.1.7.7; ITU-T G.984	Met
GPON SC-23	Place an ONT in Emergency Stop (ESTOP)	When an ONT is placed in ESTOP, it will not power its optics until told to do so by the OLT.	The ONT optics did not power on its optics until placed out of ESTOP by the OLT.	UCR 2008 Section 5.3.1.7.6; ITU-T G.984	Met
GPON SC-24	Verify GPON Distances	The ONT should operate at BER 10E-9 from 5 feet to 20 km.	The 701, 709, and 729 ONTs operated without any packet loss when a 20-km fiber was placed between the fiber splitter and the 1150 OLT.	UCR 2008 Section 5.3.1.3.1; ITU-T G.984	Met
GPON SC-25	1000 Base-X Distribution Port MAC	The system supports 1000 Base-X MAC operation on uplink distribution ports.	The system supports 1000 Base-X MAC operation on uplink distribution ports.	UCR 2008 Section 5.3.1.3.1 and 5.3.1.2.3; and IEEE 802.3;	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-26	10/100/1000 Base-T Auto Negotiation on Copper MACs	All access ports can link at any speed and duplexity compatible with its link partner.	The 701 and 709 ONT linked up at 10 Mbps half-duplex, 10 Mbps full-duplex, 100 Mbps half-duplex, 100 Mbps full-duplex, and 1000 Mbps full-duplex. The 729 ONT linked up at 10 Mbps half-duplex, 10 Mbps full duplex, 100 Mbps half-duplex, and 100 Mbps full-duplex.	UCR 2008 Sections 5.3.1.3.1, 5.3.1.3.2; and IEEE 802.3	Met
GPON SC-27	VLAN Bridging – MAC Address-Based VLAN Classification	Access ports shall support MAC address-based classification on ranges of MAC addresses on specific ports while other ports support other classification mechanisms.	Access ports support MAC address-based classification on ranges of MAC addresses on specific ports while other ports support other classification mechanisms.	UCR 2008 Sections 5.3.1.3.2, 5.3.1.3.4, 5.3.1.7.3; and IEEE 802.1Q	Met
GPON SC-28	VLAN Bridging – Lateral Access Port Forwarding	Ethernet traffic is switchable from any access port to another access ports and is floodable amongst access ports.	Ethernet traffic was switchable from any access port to another access ports and was floodable amongst access ports of the 701, 709, and 729 ONT.	UCR 2008 Sections 5.3.1.3.2, 5.3.1.3.4; and IEEE 802.1Q	Met
GPON SC-29	VLAN Bridging – Forwarding Database – Dynamic Entries	Verify forwarding rules are built dynamically. Station movement is prevented for some grace period. Forwarding rules are aged out causing flooding. Forwarding rules are dynamically relearned to new ports.	Forwarding rules were built dynamically. Station movement was prevented for some grace period. Forwarding rules were aged out causing flooding. Forwarding rules were dynamically relearned to new ports.	UCR 2008 Section 5.3.1.3.2; IEEE 802.1Q	Met
GPON SC-30	Ingress Access Control – Protocol Filtering	The system shall support ingress access control lists of user selected protocol attributes Layers 2, 3, and 4 on all access ports.	The system supports ingress access control lists of user selected protocol attributes Layers 2, 3, and 4 on all access ports.	UCR 2008 Sections 5.4.6.2.1.7, and 5.3.1.3.9	Met
GPON SC-31	Ingress Access Control – Destination Subnet Blocking	The system shall support ingress access control lists to block destination subnets from a particular access port for all access ports to a particular access port for all access ports.	The system supports ingress access control lists to block destination subnets from a particular access port for all access ports to a particular access port for all access ports.	UCR 2008 5.3.1.3.9 Network Infrastructure STIG, Sections 4.4, 4.5, and 4.6	Met
GPON SC-32	VLAN Bridging – Access Port to Distribution Port Concentration Forwarding	Ethernet traffic is switchable from uplink distribution to access ports and is floodable from uplink to all access ports.	Ethernet traffic was switchable from uplink distribution to access ports and floodable from uplink to all access ports.	UCR 2008 Sections 5.3.1.3.2, 5.3.1.3.4, 5.3.1.6.4; and WT-156	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-33	VLAN Bridging - Trunking	A minimum of 4 VIDs concurrently on every distribution and access port. Only traffic on valid VIDs will be admitted.	Only traffic on valid VIDs was admitted.	UCR 2008 Sections 5.3.1.3.2, 5.3.1.3.4, 5.3.1.7.3; and IEEE 802.1Q	Met
GPON SC-34	Verify ONT Data Transmission During Voice Traffic	Verify the maximum downstream and upstream ONT throughput is not dropped while calls are processed via a Bulk Call Generator. 95.99% calls are completed during process.	The maximum downstream and upstream ONT throughput did not drop while calls were processed via a Bulk Call Generator. 95.99% calls completed during process.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.3.3	Met
GPON SC-35	Stability with Primary Timing Reference Failure	All calls should complete/remain connected with a Secondary Timing Reference source failure. Verify that correct System Alarms post and clear without manual intervention.	All calls completed and remained connected with a Secondary Timing Reference source failure. System Alarms post and clear without manual intervention.	UCR 2008 Section 5.3.1.7.6; ITU-T G.984; Telcordia GR-303, TR-57	Met
GPON SC-36	Call Feature Testing	Call features shall include Call Waiting, Voice Mail and Message Waiting Indicator (MWI), 3-way calling.	Call features were not available on RedCom PBX.	UCR 2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5; and Telcordia GR-303	Not tested
GPON SC-37	8-hour Bulk-Call Runs GR-303 Call Processing/Call Completion-Long Term	Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread. Successfully process and complete 99.95% of all calls.	Successfully processed and completed 99.95% of all calls.	UCR 2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5; and Telcordia GR-303	Met
GPON SC-38	48-hour Bulk-Call Runs GR-303 Call Processing/Call Completion-Long Term	Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread. Successfully process and complete 99.95% of all calls for 48 hours.	Successfully processed and completed 99.95% of all calls for 48 hours.	UCR 2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5, 5.3.1.7.6; Telcordia, GR-303	Met
GPON SC-39	Verify FAX Capability GR-303	Transmission and receiving of faxes shall function normally.	All faxes were received and transmitted normally.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.7.6 Telcordia GR-303, and ITU-T v.17	Met
GPON SC-40	Modem Testing GR-303	Modems should connect to local and long-distance telephone numbers and negotiate data rates of about 28.8 kbps.	Modems connected to local and long-distance telephone numbers and negotiated data rates of 28.8 kbps.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.7.6, Telcordia, GR-303, ITU-T v.34	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-41	Call Feature Testing with Interface into the DISN TR-057	Call features shall include but not limited to Call Waiting, Voice Mail, and Message Waiting Indicator (MWI), etc. TR-057 Interface	Call features were not available on RedCom PBX.	UCR 2008 sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5; Telcordia TR-57	Not tested
GPON SC-42	8-hour Overnight Bulk-Call Runs TR-057 Call Processing/Call Completion-Long Term	Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread. Successfully process and complete 99.95% of all calls.	Successfully processed and completed 99.95% of all calls.	UCR 2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5, 5.3.1.7.6; Telcordia TR-57	Met
GPON SC-43	48-hour Bulk-Call Runs TR-057 Call Processing/Call Completion-Long Term	Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread. Successfully process and complete 99.95% of all calls for 48 hours.	Successfully processed and completed 99.95% of all calls.	UCR 2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5, 5.3.1.7.6; Telcordia TR-57	Met
GPON SC-44	Verify FAX Capability with TR-057	Transmission and receiving of faxes shall function normally.	All faxes were received and transmitted normally.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.7.6, Telcordia, TR-57, ITU-T v.17	Met
GPON SC-45	28.8 kbps Voice Band Modem Testing TR-057	Modems should connect to local and long-distance telephone numbers and negotiate data rates of about 28.8 kbps (assumes only one A/D conversion).	Modems connected to local telephone numbers negotiated data rates of 28.8 kbps.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.7.6; Telcordia, GR-303, ITU-T v.34	Met
GPON SC-46	Call Completion/Data Throughput and IPTV Completion Duration Long-Term TR-057	Stream video while simultaneously completing 99.95% of all calls and no packets dropped.	Streaming video was sent while simultaneously completing 100% of all calls and no packets dropped.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.3.3, and 5.3.1.7.6	Met
GPON SC-47	DSCP Quality of Service Mapping	The SUT shall provide a configurable mapping of DiffServe Code Points to QoS prioritization behavior on all access ports.	The SUT provides a configurable mapping of DiffServe Code Points to QoS prioritization behavior on all access ports.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-48	Upstream Quality of Service on an oversubscribed PON	The system shall support upstream QoS on PON oversubscription with both tagged and untagged services on all access ports.	The system supports upstream QoS on PON oversubscription with both tagged and untagged services on all access ports.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-49	Upstream Quality of Service on an oversubscribed ONT with multiple access ports	The system shall support upstream QoS on ONT oversubscription with both tagged and untagged services.	The system supports upstream QoS on ONT oversubscription with both tagged and untagged services.	UCR 2008 Section 5.3.1.3.3	Met

Table 2-10. GPON Requirements Status (continued)

Requirement Number	Title	Required Results	Actual Results	Reference	Met/ Not Met
GPON SC-50	Upstream Service Level Agreement enforcement	The system shall support unique SLAs on the same VLAN for different access ports.	The system supports unique SLAs on the same VLAN for different access ports.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-51	Downstream Quality of Service on an oversubscribed PON	The system shall support downstream QoS on PON oversubscription.	The system supports downstream QoS on PON.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-52	Downstream QoS on oversubscribed access port	The system shall support downstream QoS on access port oversubscription.	The system supports downstream QoS on access port.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-53	Downstream Service Level Agreement enforcement	The system shall support unique SLAs on the same VLAN for different UNIs.	The system supports unique SLAs on the same VLAN for different UNIs.	UCR 2008 Section 5.3.1.3.3	Met
GPON SC-54	VLAN ID Ranges	The SUT shall provide support for the full range of VLAN IDs from 2 to 4094.	Support for VLAN IDs VLAN IDs 2, 10, 200, 1000, 1001, 2000, 2001, 3000, 4092 and 4094 for VLAN was tested.	UCR 2008 Section 5.3.1.3.3	Met

LEGEND:

BER	Bit Error Rate	ITU-T	International Telecommunication Union-Telecommunication Standardization
DISN	Defense Information Systems Network	MWI	Message Waiting Indicator
DSCP	Differentiated Services Code Points	NMS	Network Management System
DTMF	Dual-Tone Multi-Frequency	OLT	Optical Line Terminal
EMS	Element Management System	ONT	Optical Network Terminal
ESTOP	Emergency Stop	QoS	Quality of Service
Gbps	Gigabits per second	PON	Passive Optical Network
GigE	Gigabit Ethernet	RFC	Request For Comments
GPON	Gigabit Passive Optical Network	SC	Standards Conformance
		SLA	Service Level Agreement
GR	Generic Requirement	TR-57	Universal Or Analog Interface
GR-303	Integrated Digital Loop Carrier System Generic Requirements	UCR	Unified Capabilities Requirements
		UNI	Universal Network Interface
IEEE	Institute of Electrical and Electronics Engineers	VID	Virtual Local Area Network Identifier
ID	Identification	VLAN	Virtual Local Area Network
IP	Internet Protocol	µS	Microsecond
IPTV	Internet Protocol Television		

12. TEST AND ANALYSIS REPORT. In accordance with the Program Manager's request, JITC did not prepare a detailed test report. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Non-secure Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP), which .mil/gov users can access 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 DSN testing is on the Telecommunications Switched Services Interoperability website at http://jitc.fhu.disa.mil/tssi.

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SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Network Elements (NE), Fixed Network Elements, and Deployed Network Elements 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 (e) and are not listed below.

Table 3-1. NE Capability/Functional Requirements Table

ID	Requirement	UCR Ref (UCR 2008 CH 1)	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 1x109 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, Section 5.2.12.6, 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) in accordance with UCR 2008, Section 5.2.1.5.7, Carrier Group Alarm, upon physical loss of the TDM interface.	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 DSN 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 DSN switch in accordance with UCR 2008. 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 CH 1)	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 DSN 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 DSN 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 (2)	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 (3)	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 (4)	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	The NE for an analog 2-wire or 4-wire trunk interface shall be in accordance with UCR 2008, Section 5.2.6.4, Analog Trunk Interface.	5.9.2.3.1	C	C

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

ID	Requirement	UCR Ref (UCR 2008 CH 1)	F-NE	D-NE
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 BRIe interface shall meet the requirements and conditions in accordance with UCR 2008, Section 5.2.1.3.3, National ISDN 1/2 Basic Access.	5.9.2.3.3	C	C
22	The T1 interface shall meet the requirements and conditions in accordance with UCR 2008, Section 5.2.6.1, PCM-24 Digital Trunk Interface.	5.9.2.3.4	C	C
23	The E1 interface shall meet the requirements and conditions in accordance with UCR 2008, Section 5.2.6.2, 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 timing signal from an internal source, an incoming digital signal, or an external source in accordance with UCR 2008, Section 5.2.10.1, Timing Modes.	5.9.2.3.7	R	R
28	OC-X interface shall be in accordance with UCR 2008, Section 5.2.12.2, DSN Switch SONET Digital Trunk 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

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

ID	Requirement	UCR Ref (UCR 2008 CH 1)	F-NE	D-NE
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 ADIMSS as described in the UCR 2008, Section 5.2.8, Network Management, Section 5.2.8.3, Fault Management, and Section 5.2.8.4, Configuration Management.	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
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

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

ID	Requirement	UCR Ref (UCR 2008 CH 1)	F-NE	D-NE
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 Wireless Intrusion Detection System (WIDS) exists for the DLoS transport technology used, the NE DLoS transport link shall be monitored. The system will have the following capabilities: 1. Continuous scanning. The WIDS will scan continuously around-the-clock to detect authorized and unauthorized activity. 2. Deployed systems shall be properly engineered so that the DLAB products achieve the required performance requirements in their specific structural environment. Users shall submit their network design with their request for DSN connection. The UCCO submittal shall include wireless security compliancy FIPS 140 and proposed accessibility as well as WIDS National Information Assurance Partnership (NIAP) Common Criteria validation for basic robustness. Medium robustness will be applied, as determined by the DAA, when the NIAP Common Criteria for that level is approved.	5.9.2.7	C	C
44	The D-NEs shall meet all NE requirements specified in Section 5.9.2, DSN 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
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

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

ID	Requirement	UCR Ref (UCR 2008 CH 1)	F-NE	D-NE
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 any 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 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).	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, DSN 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 in accordance with UCR 2008, Section 5.2.6, System Interfaces, upon physical loss of the ingress TDM interface.	5.9.3.5	NA	R
60	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 CH 1)	F-NE	D-NE
61	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
62	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 5.2.2.7, 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
63	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
64	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
65	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
66	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
DSN	Defense Switched Network
DVX	Deployed Voice Exchange
E1	European 1 (2048 bps, 30-channel PCM)
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
SCIP	Secure Communication Interoperability Protocol
SONET	Synchronous Optical Network
STIG	Security Technical implementation Guide
T1	Trunk 1 (1544 bps, 24-channel PCM)
TDM	Time Division Multiplexing
UCCO	Unified Capabilities Certification Office
UCR	Unified Capabilities Requirements
VVoIP	Voice and Video over Internet Protocol

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