DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY
REFER TO: Joint Interoperability Test Command (JTE) **2 Feb 10**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of Tellabs 1000 Voice Gateway, 1134 and 1150 Multi-Service Access Platforms, and 700 Series Optical Network Terminals within the Defense Information Systems Network

References: (a) Department of Defense Directive 4630.5, "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 Certification.

2. The following Tellabs hardware and software shall hereinafter be referred to as the System Under Test (SUT).

a. Tellabs 1000 Voice Gateway (VGW) will be configured as a VGW to provide telephony services for the Gigabit Passive Optical Network (GPON), Software Release Panorama INM 1000 RTU.
b. Tellabs 1134 and 1150 Multi Service Access Platforms, 701, 709, and 729 Optical Network Terminal equipment provide GPON services for core and edge networks, Software Release Panorama INM 1134 RTU and Panorama INM 1150 RTU.

The SUT met all tested critical interoperability requirements as set forth by the Unified Capabilities Requirement (UCR) 2008 (reference (c)) and is certified interoperable for use within the Defense Information Systems Network (DISN) in accordance with UCR, Section 5.3 for Assured Services Local Area Network Infrastructure and Section 5.5 for Network Infrastructure Product Requirement. The JITC certifies all configurations, features, and functions cited in this document for use within the DISN. The JITC accept the Tellabs Letter of Compliance as "Like Function" with functionality and capability identical to the hardware components tested at JITC laboratory and capable for certification (mentioned in additional reference (e)). This certification expires upon changes that affect interoperability but no later than three years from the date of this memorandum.

3. The JITC based these findings on the results of testing conducted at the JITC Indian Head, Maryland test facility and review of Tellabs Letters of Compliance. Testing originally consisted

of assessment testing from April through September 2009 against vendor-defined functional and capability requirements. The JITC validated existing test artifacts to determine the interoperability status of the SUT against the UCR 2008 Optical Transport System requirements. The Interoperability Certification Summary (enclosure 2) documents all certified requirements for the SUT. Further details are available in the JITC Assessment Report.

4. Tables 1 through 4 show the Tellabs equipment overall status for Interface Requirements and Requirements Summaries used to evaluate functionality and interoperability.

Table 1. Tellabs 1000 VGW Interface Summary

INTERFACE	UCR 2008 REQUIRED	STATUS	REMARKS
DS-1	Yes	Met	Met UCR 2008 required requirements
LEGEND: DS Digital Signal; UCR Unified Capabilities Requirement; VGW Voice Gateway			

Table 2. Tellabs 1000 VGW Requirements Summary

REQUIREMENT	UCR 2008 REFERENCE	STATUS	REMARKS
Voice Services	5.3.1.4.1	Certified	Certified based on combination of Special Interoperability Certification testing and Tellabs LOCs
LEGEND: LOC Letter of Compliance; UCR Unified Capabilities Requirement; VGW Voice Gateway			

Table 3. Tellabs 1134 and 1150 Multi Service Access Platforms Interface Summary

INTERFACE	UCR 2008 REQUIRED	STATUS	REMARKS
GPON	No	Met	Met UCR 2008 required requirements
GigE	Yes	Met	Met UCR 2008 required requirements
10GigE	Yes	Met	Met UCR 2008 required requirements
LEGEND: GigE Gigabit Ethernet; GPON Generic Passive Optical Network; UCR Unified Capabilities Requirement			

Table 4. Tellabs 1134 and 1150 Multi Service Access Platforms Requirements Summary

REQUIREMENT	UCR 2008 REFERENCE	STATUS	REMARKS
General Performance Parameters	5.3.1.3	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Port Interface Rates	5.3.1.3.1	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Port Parameter Requirements	5.3.1.3.2	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Class of Service Markings	5.3.1.3.3	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Virtual LAN Capabilities	5.3.1.3.4	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Protocols	5.3.1.3.5	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Quality of Service Features	5.3.1.3.6	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Network Monitoring	5.3.1.3.7	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Security	5.3.1.3.8	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
End-to-End Performance Requirements	5.3.1.4	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Voice Services	5.3.1.4.1	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Video Services	5.3.1.4.2	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance
Data Services	5.3.1.4.3	Certified	Certified based on Special Interoperability Certification testing and review of Tellabs Letters of Compliance

LEGEND:
UCR Unified Capabilities Requirement

5. The 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, which .mil/.gov users can access at https://stp.fhu.disa.mil/ (NIPRNet). Assessment reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at http://jit.fhu.disa.mil/ (NIPRNet) or http://199.208.204.125/ (Secure Internet Protocol Router Network).

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 tracking numbers for the SUT are 0914905, 0914904, and 0914906.

JITC Memo, JTE, Special Interoperability Test Certification of Tellabs 1000 Voice Gateway, 1134 and 1150 Multi-Service Access Platforms, and 700 Series Optical Network Terminals within the Defense Information Systems Network

FOR THE COMMANDER:

Germaine M. Forbes

2 Enclosures a/s

for RICHARD A. MEADOR
Chief, Battlespace Communications
Portfolio

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ADDITIONAL REFERENCES

(c) Office of Assistant Secretary of Defense for Networks and Information Integration/ Department of Defense Chief Information Officer Document, "Department of Defense Unified Capabilities Requirements 2008," 22 January 2009
(d) Joint Interoperability Test Command Document, "Tellabs 7100 and 7100-Nano Optical Transport Systems, 5500 Next Generation Cross-Connect Switch, 1134 and 1150 Multi-Service Access Platforms, and 1000 Voice Gateway Special Interoperability Certification Test Report" November 2009
(e) Tellabs Document, "Letters of Compliance," 9 November 2009

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Tellabs 1000 Voice Gateway and 1134 and 1150 Multi-Service Access Platforms

2. PROPONENTS. United States Army Information Systems Engineering Command

3. PROGRAM MANAGER. Mr. Robert Wellborn, address: Commander, HQUSAISEC AMSEL-IE-IS Bldg 53301 Fort Huachuca, AZ 85613-5300
e-mail: robert-wellborn@us.army.mil

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

5. SYSTEM UNDER TEST (SUT) DESCRIPTION. The Tellabs 1000 Voice Gateway (VGW), configured as a VGW, provides Internet Protocol (IP)/Time Division Multiplexing Multi-Service Provisioning Platform (MSPP) interworking of Voice over IP calls traversing the Tellabs 1134 and 1150 Multi Service Access Platforms (MSAP) that are destined to a legacy Class 5 switch using existing switch interfaces, Generic Requirement-303, and Technical Requirement-057. The Tellabs 1000 VGW, configured as a VGW, provided telephony services for the Gigabit Passive Optical Network (GPON) during the certification test. The 1000 VGW eliminates box-on-box, non-carrier-class solutions.

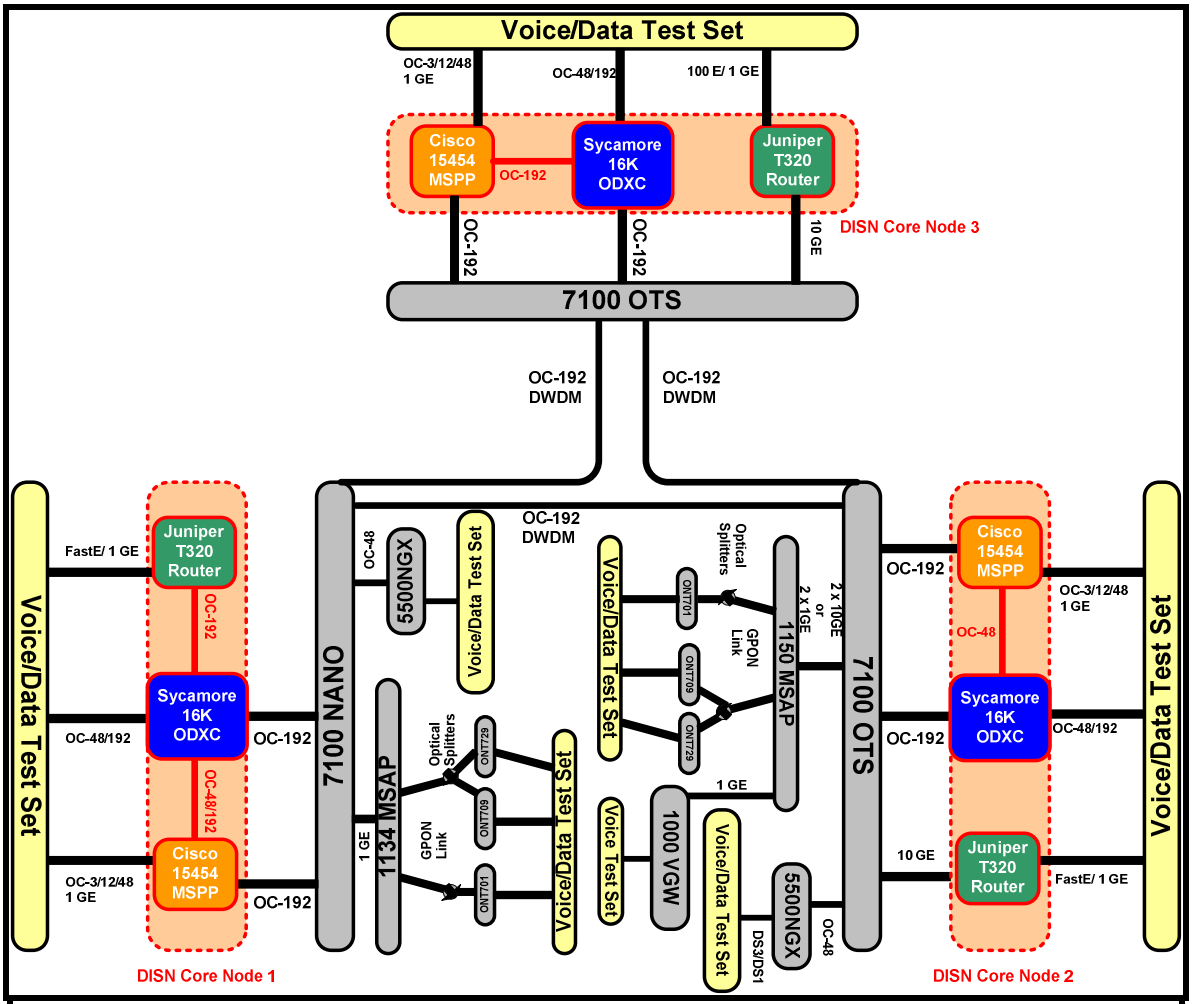
The Tellabs 1134 MSAP offers a medium-density, full-service option ideal for smaller “deep-fiber” (i.e., fiber-to-the desktop) applications. The compact 1134 MSAP enables small-sized and medium-sized operators to address their entire network without bandwidth constraints imposed by prior networks. Tellabs designed the system to meet growing demands of high-bandwidth services, including voice, video, and data.

Tellabs 1150 MSAP is a native end-to-end IP/Ethernet delivery platform that offers the packet-based, high-bandwidth technology required for current telecommunications services. Designed to help service providers support competitive offerings to consumer and business customers, the Tellabs 1150 MSAP enables flexible, high-capacity applications. The Tellabs 1150 MSAP is a high-density access platform focused on optimized, scalable, deep-fiber service delivery of voice, video, and data.

Tellabs designed the Optical Network Terminals (ONT) to deliver narrowband and broadband subscriber services. This means that the ONT supports all services, including voice, T1, Ethernet, and cable television, natively over a single optical fiber from a single ONT unit. 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 1134 and 1150 Multi-Service Access Platforms (MSAP), with the accompanying 701/709/729 ONTs, peripherals, and the 1000 VGW were tested as Assured Services Local Area Network devices to demonstrate Tellabs GPON technology. The 1134 and 1150 MSAPs are also called Optical Line Terminals (OLT). A high-level Defense Information Systems Network (DISN) node architecture, as depicted in Figure 2-1, displays the role of the Optical Transport Systems (OTS) and MSPP devices in the DISN architecture. The Tellabs OLTs connect directly to the 7100 OTS using the 7100 Layer-2 support services for Link Aggregation Groups (LAG) shown in Figure 2-2. The Tellabs 7100 and 7100 Nano are OTSs as defined in the Unified Capabilities Requirements (UCR) provided core transport, Layer-2 switching, and link aggregation for the GPON equipment. The 5500 Next Generation Cross-Connect Switch is a MSPP as defined in the UCR 2008 and provided access switching for the GPON equipment.



LEGEND:

DISN	Defense Information Systems Network	Nano	Small Form 7100 OTS
DWDM	Dense Wavelength Division Multiplexing	NGX	Nest Generation Cross-Connect
FastE	Fast Ethernet	OC	Optical Carrier
GE	Gigabit Ethernet	ODXC	Optical Digital Cross-Connect
GPON	Generic Passive Optical Network	ONT	Optical Network Terminal
MSAP	Multi-Service Access Platform	OTS	Optical Transport System
MSPP	Multi-Service Provisioning Platform	VGW	Voice Gateway

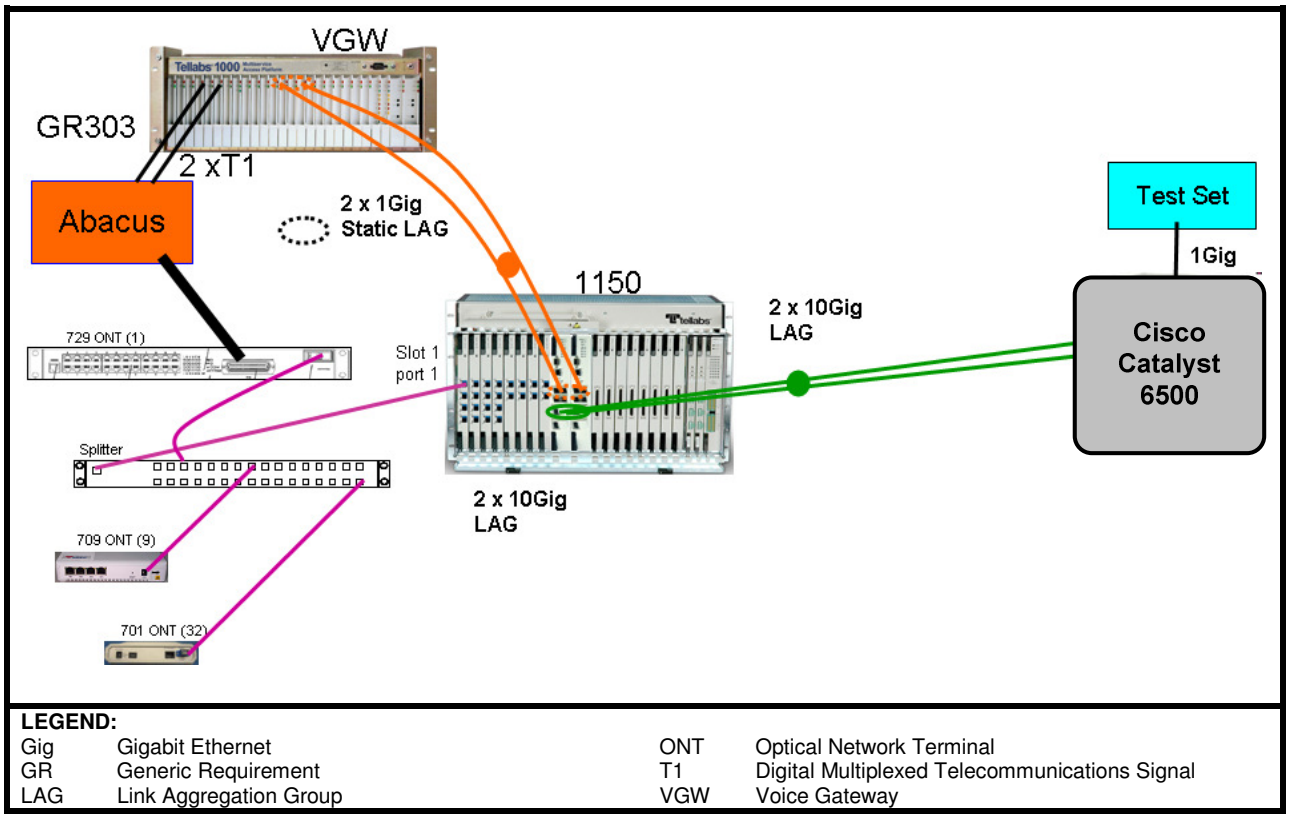
Figure 2-1. Tellabs Test Bed Architecture

7. REQUIRED SYSTEMS INTERFACES. For SUT testing, the JITC used requirements from the UCR 2008, dated January 2009 and industry best practices. Appendix A to Enclosure 2 lists all test cases and requirement references. Table 1, Tellabs 1000 VGW Interface Summary, and Table 2, Tellabs 1000 VGW Requirements Summary, list the interfaces tested.

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, 2-3, 2-4, and 2-5. Figure 2-1 shows the Tellabs 7100 used as an OTS

providing transport for the Cisco 15454 MSPP, Sycamore 16000 Optical Digital Cross-Connect (ODXC), Tellabs 5500 NGX, 1134 MSAP, and 1150 MSAP. Voice, video, and data traffic is enters the network as depicted by “Voice/Data Test Set” in the diagram.

In Figure 2-2, the Abacus bulk call generator was able to originate voice calls on the 729 ONT and terminate voice calls on the 1000 VGW. Simultaneously data and video traffic originated and terminated on the 701/709 ONTs.



LEGEND:

Gig	Gigabit Ethernet	ONT	Optical Network Terminal
GR	Generic Requirement	T1	Digital Multiplexed Telecommunications Signal
LAG	Link Aggregation Group	VGW	Voice Gateway

Figure 2-2. Tellabs Configuration 1

In Figure 2-3, the Abacus bulk call generator originated voice calls on the 729 ONT and terminated voice calls on the 1000 VGW. Simultaneously data and video traffic originated and terminated on the 701/709 ONTs. The difference in this diagram is the use of the 1134 OLT.

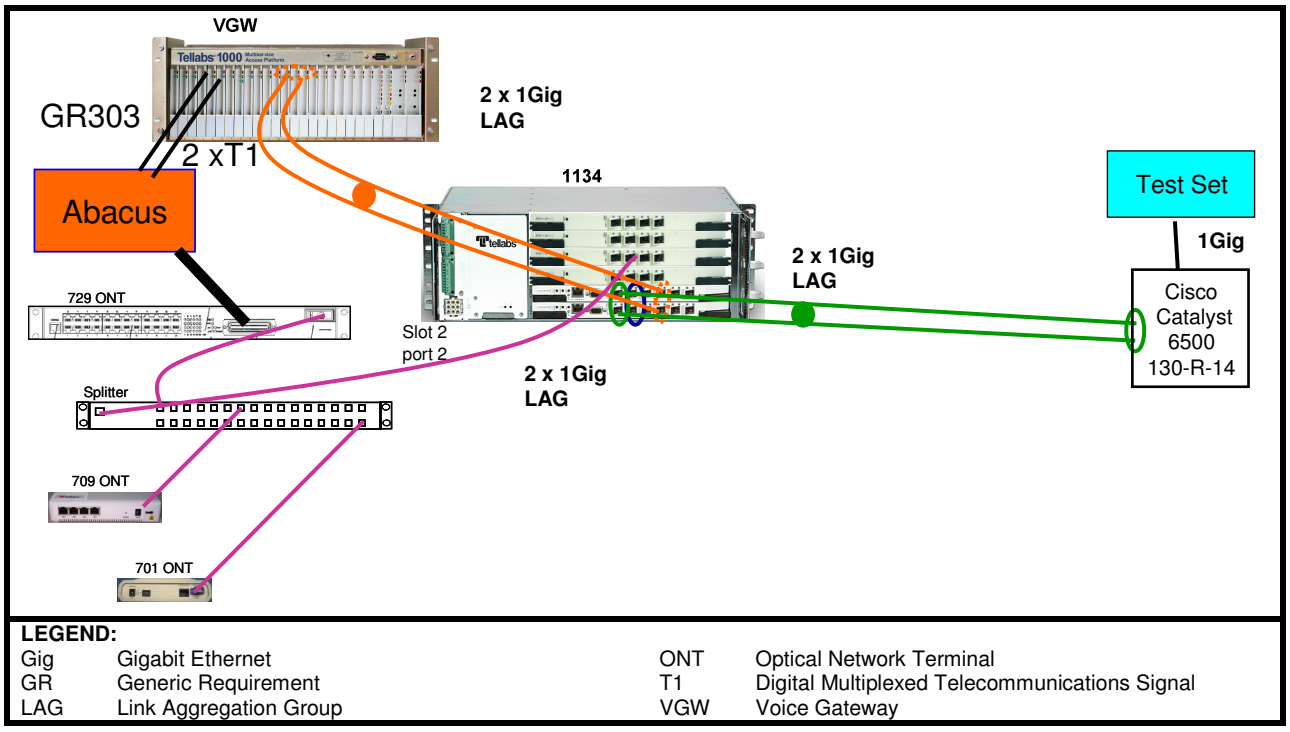
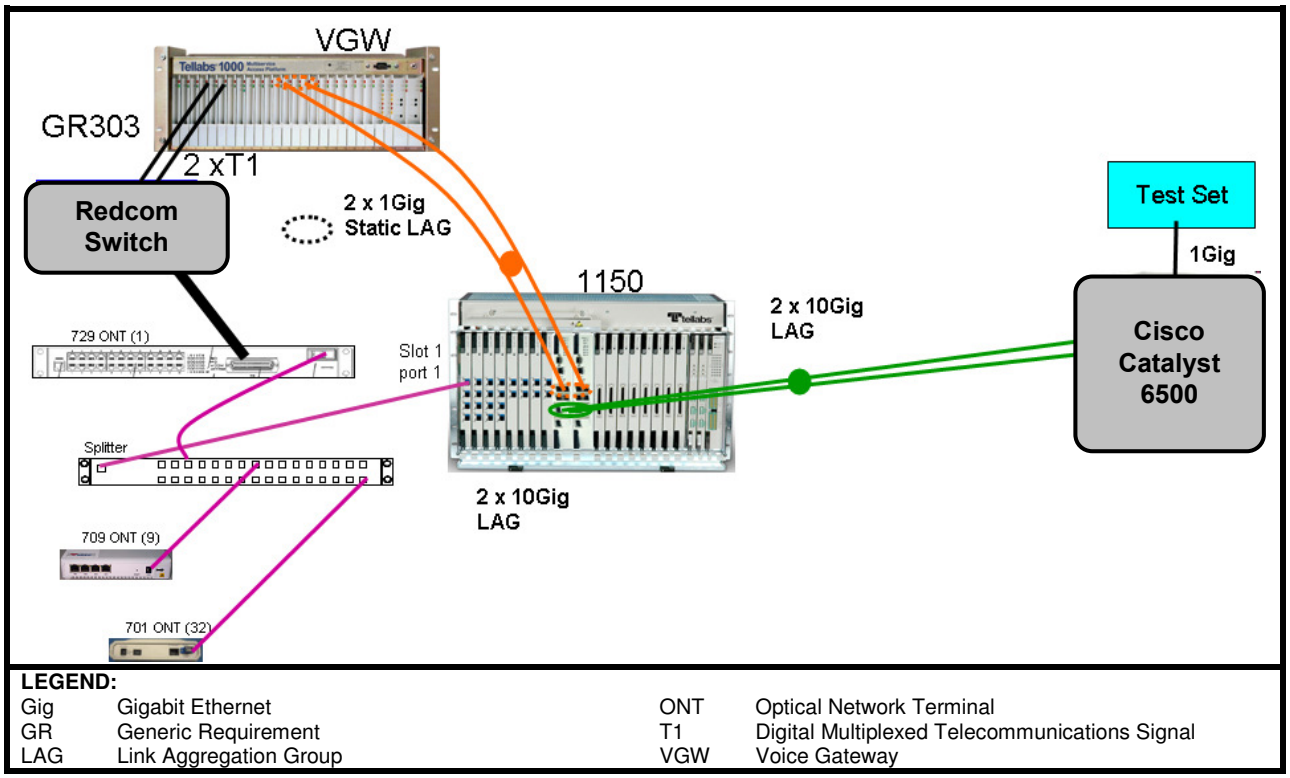


Figure 2-3. Tellabs Configuration 2

In Figure 2-4, the Abacus bulk call generator originated voice calls on the 729 ONT and terminated voice calls from the Redcom Switch. In this scenario, the Redcom Switch interfaced with the 1000 VGW. Simultaneously data and video traffic originated and terminated on the 701/709 ONTs. The difference in this diagram is the use of the 1134 OLT



LEGEND:

Gig	Gigabit Ethernet	ONT	Optical Network Terminal
GR	Generic Requirement	T1	Digital Multiplexed Telecommunications Signal
LAG	Link Aggregation Group	VGW	Voice Gateway

Figure 2-4. Tellabs Configuration 3

In Figure 2-5, the 1134 and 1150 MSAPs expects a northbound router or switch to connect to the backbone of a network via a LAG. The testing of voice, video, and data was preformed using Figure 2-6. In addition, dual connections were used in the LAG to provide load balancing and protection.

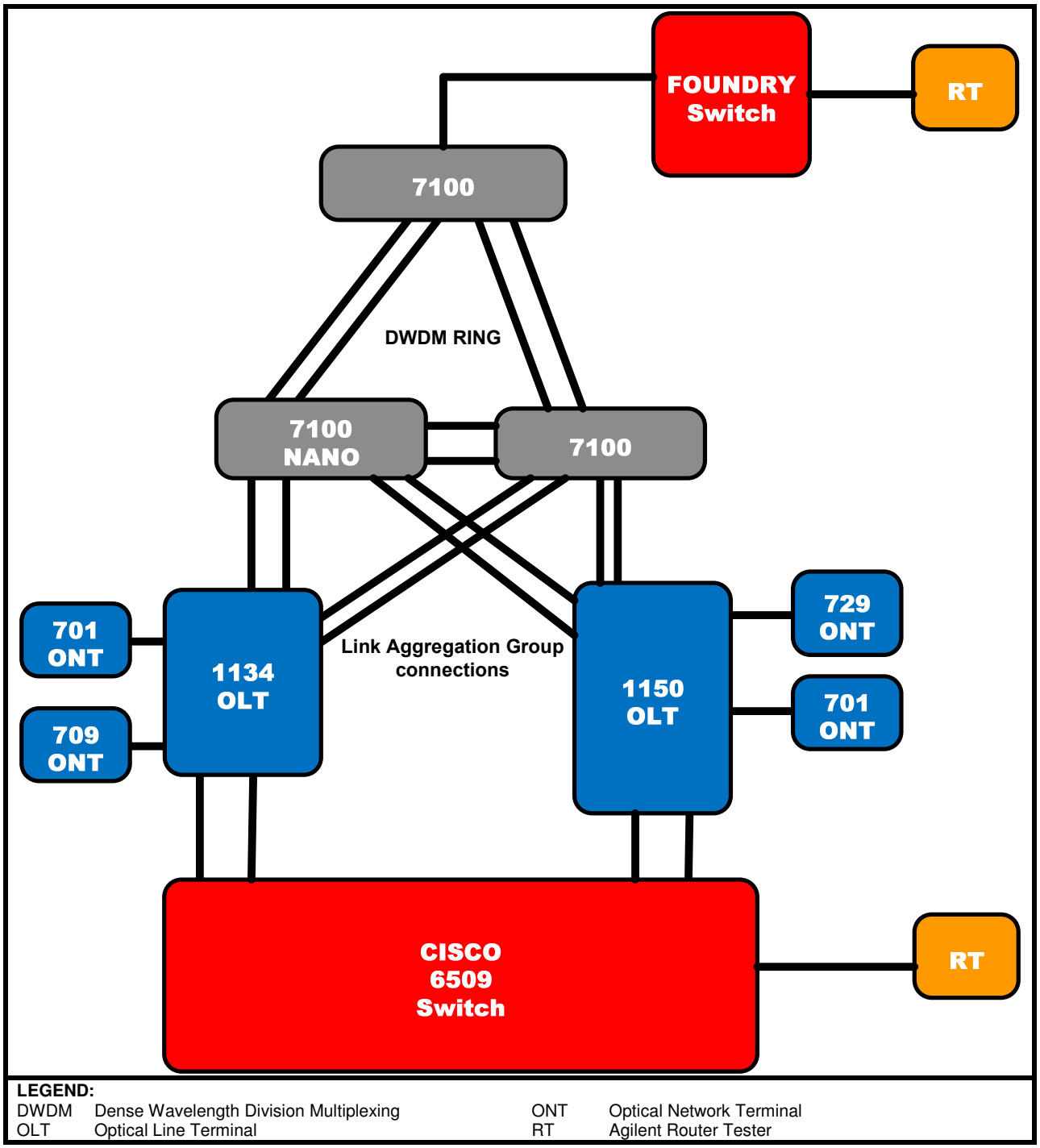


Figure 2-5. Tellabs Configuration 4

9. SYSTEM CONFIGURATIONS. Table 2-1 lists the tested software configuration shown in Figure 2-1, Table 2-2 lists the DISN Core Equipment used to test the Tellabs GPON, and Table 2-3 lists the test equipment used to generate voice, Synchronous Optical Network, and IP traffic.

Table 2.1. Tested Tellabs Equipment

PLATFORM	SOFTWARE RELEASE	APPLICATION
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
1134 MSAP	FP25.3.1	MontaVista Linux 4.0 – not user accessible
1150 MSAP	FP25.3.1	MontaVista Linux 4.0 – not user accessible
1000 VGW	13.4.7	VxWorks – not user accessible
Tellabs 7100 Tellabs Manager Server Tellabs 719x NMS	FP6.0	Node Management Software
Tellabs 5500 NGX Tellabs Manager	FP6.0	Node Management Software
1134/1150 MSAP Element Management System	FP8.4	Node Management Software
Tellabs Service Layer Manager Server Universal Gateway Server	FP8.4	System Management Software

LEGEND:

MSAP	Multi-Service Access Platform	NMS	Network Management System
Nano	Small Form 7100 Chassis	VGW	Voice Gateway
NGX	Next Generation		

Table 2-2. Non-SUT Equipment

VOICE AND DATA TEST SET	SOFTWARE VERSION	INTERFACE CARDS
Cisco 15454	09.00-008I-17.17	ETH 100T-12-G, OC-3IR-STM1 SH-1310-8, OC-12IR-STM4-1310-4, 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/STM1-4IR, GPIC2 8 x OC-48/STM16, 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
Cicso Catalyst 6500	12.1 (13)	48 E ports, 8 ports GigE, 2 port 10GigE
RedCom Switch	6.1	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	ODXC	Optical Digital Cross-Connect
ETH	Ethernet	R	Revision
GigE	Gigabit Ethernet	SM	Single Mode
LAN	Local Area Network	SR	Short Reach
LIM	Line Interface Module	Tx	Transmit
OC	Optical Carrier	USC	Universal Services Card

Table 2-3. 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	
Ixia	Traffic generator	10 Gig	5
		LM1000STX	
Digital Lightwave	Optical Wavelength Manager	Monitor Ports	2.4.0
Spirent Abacus	Bulk Call Generator	T1-RJ45/RJ11	6.0.r20
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
LAN	Local Area Network	WAN	Wide Area Network

10. TEST LIMITATIONS. The JITC tested the Tellabs devices using the configuration illustrated in Figures 2-2, 2-3, 2-4, and 2-5. Testing covered a wide variety of configurations using multiple traffic paths. It was not possible to test every implementation scenario. Table 2-1 lists the tested software configuration.

11. TEST RESULTS. In accordance with the UCR 2008 requirements, the Tellabs GPON equipment transport and restore traffic in a reliable, timely, and secure manner. The Tellabs GPON equipment interoperates with transport switches and access equipment comprising the Department of Defense (DoD) Global Information Grid (GIG). The detailed report is summarized in appendix A.

12. TEST AND ANALYSIS REPORT. The JITC prepared a detailed report, titled "Tellabs 7100 and 7100-Nano OTSs, 5500 Next Generation Cross-Connect Switch, 1134 and 1150 MSAPs, and 1000 VGW Special Interoperability Certification Test Report" during November 2009. The 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, which .mil/.gov users can access at https://stp.fhu.disa.mil/ (NIPRNet). Assessment reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at http://jitc.fhu.disa.mil (NIPRNet) or http://199.208.204.125/ (Secure Internet Protocol Router Network).

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APPENDIX A TO ENCLOSURE 2

TEST RESULTS

Table A-1. GPON Test Results

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-G.984; UCR 2008, Sections 5.3.1.3.5, 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 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; RFC 2544	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; RFC 2544	MET

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT 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; 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; 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; 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; RFC 2544	MET

Table A-1. GPON Test Results (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; 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; 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; RFC 2544	MET

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT 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
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

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON SC-24	Verify GPON Distances	The ONT should operate at BER 10^{E-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; IEEE 802.3 2008-5.3.1.2.3	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; 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; 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; 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, 5.3.1.3.9	MET

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT 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, 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; IEEE 802.1Q; WT-156	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; 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 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5; 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 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5; 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

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT 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, 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
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, 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

Table A-1. GPON Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT 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
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 2008-5.3.1.3.3	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	Kbps	Kilobits per second
DISN	Defense Information Systems Network	km	kilometer
CJCSI	Chairman of the Joint Chiefs of Staff Instruction	MAC	Mandatory Access Control
DTMF	Dual-tone multi-frequency	MOS	Mean Opinion Score
EMS	Element Management System	MWI	Message Waiting Indicator
ESTOP	Emergency Stop	NMS	Network Management System
Gbps	Gigabits per second	OLT	Optical Line Termination
GigE	Gigabit Ethernet	ONT	Optical Network Terminal
GPON	Gigabit Passive Optical Network	PON	Passive Optical Network
GR	Generic Requirement	RFC	Request For Comments
GR-303	Integrated Digital Loop Carrier System Generic Requirements	SC	Standards Conformance
IEEE	Institute of Electrical and Electronics Engineers	TR-57	Universal or analog interface to a switch
ID	Identification	UCR	Unified Capabilities Requirements
IP	Internet Protocol	VID	Virtual Local Area Network Identifier
IPTV	Internet Protocol Television	VLAN	Virtual Local Area Network
ITU-T	International Telecommunication Union-Telecommunication Standardization	µs	Microsecond

Table A-2. GPON Interoperability Test Results

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-01	Provisioning the Tellabs System to Transport DISN Services	The interoperability configuration for transport of DISN services will be provisionable and operational.	The interoperability configuration for transport of DISN services was provisioned and operational.	UCR 2008 Sections 5.3.1.3.2, 5.3.1.7.7, 5.3.1.7.9; Institute of Electrical and Electronics Engineers (IEEE) 802.1ax, IEEE 802.1w; ITU-T G.984; Chairman, Joint Chiefs of Staff Instruction (CJCSI) 3170E, CJCSI 6212.01D, CJCSI 6510.01	MET
GPON IOP-02	Tellabs System Transport of DISN GigE Circuit	Less than 0.1% frame loss with 95% throughput for frame sizes greater than 512 bytes. Minimum throughput with 64-byte packets should be 350 Mbps symmetrical.	0% frame loss.	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; ITU-T G.984	MET
GPON IOP-03	Tellabs System Protection of Transported DISN Ethernet Services	Link removal and restoral time measurements for all circuits will be less than or equal to 250 milliseconds.	Link removal and restoral time measurements for all circuits were less than 250 milliseconds. With two LAG links, traffic was not affect by losing a single link.	UCR 2008 Section 5.3.1.3.2; IEEE 802.1ax, 802.1w	MET
GPON IOP-04	Transport of DISN GigE Frame Loss Measurement of Tellabs System	Less than 0.1% frame loss with 95% throughput for frame sizes greater than 512 bytes. Minimum throughput with 64-byte packets should be 350 Mbps symmetrical (upstream and downstream).	0% frame loss.	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; ITU-T G.984, IEEE 802.3z, RFC 1242, and RFC 2544	MET
GPON IOP-05	Transport of DISN GigE Latency Measurement of Tellabs System	Latency measurements will be less than 5 milliseconds for all frame sizes.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; ITU-T G.984, IEEE 802.3z, RFC 1242, and RFC 2544	MET
GPON IOP-06	Transport of DISN GigE Throughput of Tellabs System	Throughput with no frames lost for all frame sizes and all Ethernet services are not less than 95%.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; RFC 2544	MET

Table A-2. GPON Interoperability Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-07	Transport of DISN 10GigE Frame Loss Measurement of Tellabs System	Less than 0.1% frame loss with 100% throughput for all frame sizes.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; RC 2544	MET
GPON IOP-08	Transport of DISN 10 Gig Latency Measurement of Tellabs System	Latency measurements will be less than 5 milliseconds for all frame sizes.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; RFC 2544	MET
GPON IOP-09	Transport of DISN 10 Gig Throughput of Tellabs System	Greater than 95% throughput for all frame sizes	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3; RFC 2544	MET
GPON IOP-10	Ethernet Throughput of DISN Core Traffic Transported Across the Tellabs System	Throughput with no frames lost for all frame sizes and all Ethernet services is not less than 95%.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.3.1, 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3	MET
GPON IOP-11	Ethernet Frame Loss of DISN Core Traffic Transported Across the Tellabs System	The frame loss at a load of 100% of line rate for all frame sizes and all Ethernet services are not greater than 0.1%.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4	MET
GPON IOP-12	Ethernet Latency of DISN Core Traffic Transported Across the Tellabs System	The latency at a load of 100% of line rate for all frame sizes and all Ethernet services is not greater than 60 milliseconds.	Covered in GPON SC testing	UCR 2008 Sections 5.3.1.4.1, 5.3.1.4.2, 5.3.1.4.3	MET
GPON IOP-13	Performance Monitoring on OLT Distribution and ONT Access Ports Interface with the DISN	The system shall report current and previous 15-minute counters.	The system reports current and previous 15-minute counters.	UCR 2008 Sections 5.3.1.3.7, 5.3.1.6.3; CJCSI 3170.01E	MET
GPON IOP-14	Ingress Access Control – Denial of Service Protection – Flood Rate Limiting Interface with the DISN	The system supports ingress broadcast and flood rate limiting on all access ports. The system supports egress broadcast and flood rate limiting on the PON downlink.	The system supported ingress broadcast and flood rate limiting on all access ports. The system supported egress broadcast and flood rate limiting on the PON downlink.	UCR 2008 Section 5.4.6.2.1.7	MET

Table A-2. GPON Interoperability Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-15	Ingress Access Control – Denial of Service Protection – Protocol Rate Limiting Interface with the DISN	The system supports ingress rate limiting of arbitrary protocols on all access ports.	The system supported ingress rate limiting of arbitrary protocols on all access ports.	UCR 2008 Sections 5.3.1.3.9, 5.4.6.2.1.7	MET
GPON IOP-16	Ingress Access Control – Protocol Filtering Interface with the DISN	The system supports ingress access control lists of user selected protocol attributes Layers 2, 3, and 4 on all access ports.	The system supported ingress access control lists of user selected protocol attributes Layers 2, 3, and 4 on all access ports.	UCR 2008 Sections 5.3.1.3.9 5.4.6.2.1.7	MET
GPON IOP-17	Ingress Access Control – Static Host Binding Interface with the DISN	The system supports ingress access control lists to bind a static host to a particular access port for all access ports.	The system supported ingress access control lists to bind a static host to a particular access port for all access ports.	UCR 2008 Sections 5.3.1.3.9, 5.3.1.3.2, 9.5.1, 9.5.1.1, 5.4.1.3.2	MET
GPON IOP-18	Verify GPON Distances Interface with the DISN	The ONT should operate at BER 10^{E-9} from 5 feet to 20 km.	The ONT should operate with 0% frame loss with a 20-km connection to the OLT.	UCR 2008 Section 5.3.1.3.1 ITU-T G.984	MET
GPON IOP-19	1000 Base-X Distribution Port MAC	The system shall support 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, 5.3.1.2.3, IEEE 802.3ae	MET
GPON IOP-20	10/100/1000 Base-T Auto Negotiation on Copper MACs Interface with the DISN	All access ports can link at any speed and duplexity compatible with its link partner.	All UTP ports can link at the highest common speed and duplexity with its link partner.	UCR 2008 Sections 5.3.1.3.1, 5.3.1.3.2, 5.3.1.2.3, IEEE 802.3ae	MET
GPON IOP-21	VLAN Bridging – PCP Mapping Interface with the DISN	Ports shall support PCP preservation on tagged services. Ports support PCP remarking on tagged services.	Ports support PCP preservation on tagged services. Ports support PCP remarking on tagged services.	UCR 2008 Section 5.3.1.2.3, 5.3.1.4, IEEE 802.3ae	MET
GPON IOP-22	VLAN Bridging Forwarding Database with the DISN	Access ports shall support user-defined-based classification on fields up to and including transport layer protocol data units on specific ports while other ports support other classification mechanisms.	Access ports supported user-defined-based classification on fields up to and including transport layer protocol data units on specific ports while other ports support other classification mechanisms.	IEEE 802.1Q; WT-156; UCR 2008-5.3.1.2, 5.3.1.3.4	MET
GPON IOP-23	Transparent Bridging – IPv6/NDP IPv4/ARP Service Data Unit Interface with the DISN	Core initiated and access imitated IPv4/IPv6 conversations can be completed.	Core initiated and access imitated IPv4/IPv6 conversations were completed.	UCR 2008 5.3.1.3.5	MET

Table A-2. GPON Interoperability Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-24	802.1x – Access Port Authenticator Interface with the DISN	All access ports shall support port authentication of attached 802.1x supplicants.	All access ports supported port authentication of attached 802.1x supplicants.	UCR 2008 Section 5.3.1.3.2; Network Infrastructure STIG, Sections 9.5, 9.5.2; IEEE 802.1X	MET
GPON IOP-25	Link Aggregation – LACP Active Mode Convergence interface with the DISN	All uplink distribution ports support LACP in Active Mode.	All uplink distribution ports support LACP in Active Mode.	UCR 2008 Section 5.3.1.3.9, IEEE 802.3ad, 802.1ax	MET
GPON IOP-26	Link Aggregation – Load Balancing interface with the DISN	All uplink distribution ports support load balancing traffic issued from the distribution function of the aggregator to operational links attached to the aggregator in an efficient manner that deviates by no more than 5%.	All uplink distribution ports did not deviate by no more than 5%.	UCR 2008 Section 5.3.1.3.9, IEEE 802.3ad, 802.1ax	MET
GPON IOP-27	ONT Data Transmission during Voice Traffic Interface with the DISN	99.95% of calls are completed during process with a GR 303 interface.	99.95% calls were completed during process with a GR 303 interface.	UCR 2008 5.2.12.5.5.1.1, 5.3.1.3.3; GR-303	MET
GPON IOP-28	Stability with Primary Timing Reference Failure Interface with DISN	All calls should complete/remain connected with a Secondary Timing Reference source failure.	All calls completed and remained connected with a Secondary Timing Reference source failure.	UCR 2008 Section 5.5.4.1, 5.3.1.7.6; Telcordia GR-303	MET
GPON IOP-29	Call Feature Testing with interface into DISN	Call features shall include but not limited to Call Waiting, Voice Mail and Message Waiting Indicator (MWI), 3-way calling using a GR-303 interface.	Call features were not available on Redcom PBX.	UCR 2008 Section 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, Telcordia GR-303, GR 8	NOT TESTED
GPON IOP-30	Overnight Bulk-Call Runs GR-303 Call Processing/Call Completion-Long Term	Successfully process and complete 99.95% of all calls during overnight bulk calling test runs for 8 hours.	Successfully processed and completed 99.95% of all calls during overnight bulk calling test runs for 8 hours.	UCR 2008 Section 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, Telcordia GR-303, GR 8	MET
GPON IOP-31	48-hour Bulk-Call Runs GR-303 Call Processing/Call Completion-Long Term	Successfully process and complete 99.95% of all calls during overnight bulk calling test runs for 48 hours.	Successfully processed and completed 99.95% of all calls during overnight bulk calling test runs for 48 hours.	UCR-2008 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, GR 303, GR 8	MET
GPON IOP-32	Verify FAX capability Interface into the DISN	Transmission and receiving of faxes shall function normally using GR-303.	Transmission and receiving of faxes functioned normally using GR-303.	UCR 2008 Section 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, GR 303, GR 8	MET

Table A-2. GPON Interoperability Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-33	Modem Testing with Interface into the DISN	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 and long-distance telephone numbers and negotiate data rates of about 28.8 kbps.	UCR 2008 Section 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, GR 303, GR 8	MET
GPON IOP-34	Call completion/Data Throughput and IPTV Completion duration short-term GR-303	The Tellabs System shall successfully process and complete 99.95% of all calls using the GR-303 interface while streaming video and sending RFC-2544 data traffic simultaneous.	The Tellabs System successfully processed and completed 99.95% of all calls using the GR-303 interface while streaming video and sending RFC-2544 data traffic simultaneous.	UCR 2008 Section 5.2.12.5.5.1.1 CJCSI 3170.01	MET
GPON IOP-35	OLT Equipment Module Redundancy	Traffic disruption to the test circuits will be less than 5 seconds when redundant modules are added or removed.	No traffic disruption to the test circuits when redundant modules are added or removed.	UCR 2008 Section 5.3.1.7.6	MET
GPON IOP-36	ONT Data transmission interface Into DISN TR-057	95.99% calls are completed during process	Downstream and upstream ONT throughput on the 729 ONT did not drop, while 95.99% of calls were completed simultaneously.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.3.3; Telcordia TR-57	MET
GPON IOP-37	Stability with Primary Timing Reference Failure	All calls should complete/remain connected with a Secondary Timing Reference source failure.	All calls completed and remained connected with a Secondary Timing Reference source failure.	UCR 2008, Section 5.3.1.7.6; Telcordia TR-57	MET
GPON IOP-38	Call Feature Testing with interface into DISN TR-057	Call features must function normally on the system under test. Call features shall include but not limited to Call Waiting, Voice Mail, and Message Waiting Indicator (MWI), 3-way calling, etc.	Call features were not available on Redcom PBX.	UCR-2008 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 IOP-39	Bulk-Call Runs TR-057 Call Processing/Call Completion-Long Term	Successfully process and complete 99.95% of all calls during overnight bulk calling test runs 8 hours. Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread.	Successfully processed and completed 99.95% of all calls during overnight bulk calling test for 14 hours.	UCR-2008 Sections 5.2.1.1.5, 5.2.1.1.6, 5.2.1.1.8, 5.2.6.5, Telcordia TR-057	MET
GPON IOP-40	48-hour Bulk-Call Runs TR-057 Call Processing/Call Completion-Long Term	Successfully process and complete 99.95% of all calls during overnight bulk calling test runs for 48 hours. Mix of DTMF and Dial Pulse Supervision is required for lines under test. DTMF and Dial Pulse lines shall be evenly spread.	Successfully processed and completed 99.95% of all calls during overnight bulk calling test runs 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 TR-57	MET
GPON IOP-41	Verify FAX Capability	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

Table A-2. GPON Interoperability Test Results (continued)

REQUIREMENT NUMBER	TITLE	REQUIRED RESULTS	ACTUAL RESULTS	REFERENCE	MET/NOT MET
GPON IOP-42	Voice Band Modem Testing	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 and negotiated data rates of 28.8 kbps.	UCR 2008, Sections 5.2.12.5.5.1.1, 5.3.1.7.6; Telcordia TR-303; ITU-T V.34	MET
GPON IOP-43	Call Completion Data Throughput and IPTV Completion Duration Short-Term	The Tellabs System shall successfully process and complete 99.95% of all calls using the TR-057 interface while sending RFC-2544 data traffic, and streaming Multicast Video on the 729 ONT.	The Tellabs System successfully processed and completed 99.95% of all calls using the TR-057 interface while sending RFC-2544 data traffic, and streaming Multicast Video on the 729 ONT.	UCR 2008 Sections 5.2.12.5.5.1.1, 5.3.1.3.3; Telcordia TR-57; CJCSI 3170.01E	MET
GPON IOP-44	Rapid Spanning Tree Protocol Convergence	The system participates in a RSTP. The system can also break a cycle by selecting a port as blocking.	The system participated in RSTP. The system broke cycles by selecting a port as blocking.	IEEE 802.1w, UCR 2008 Section 5.3.1.3.2, UCR 2008-5.3.1.7.9	MET
GPON IOP-45	Rapid Spanning Tree – Failure Recovery	The system can recover from faults in the RSTP tree within 5 seconds.	Recovered all 3 NETs of 1150 one at a time. Frame loss accumulates for a total of ~15 seconds. This is attributable to 3 sec LAG recovery + 5 seconds STP recovery on each link as the network re-converges. Executed fiber breaks on 1134. 2 seconds LAG recovery + 5 seconds STP recovery on each link as the network re-converges. LAG fault recovery was approximately 2 seconds due to local topological convergence.	IEEE 802.1w, UCR 2008 Section 5.3.1.3.2, 5.3.1.7.9	MET

LEGEND:

ARP	Address Resolution Protocol	Kbps	Kilobits per second
BER	Bit Error Rate	Km	kilometer
DISN	Defense Information Systems Network	LACP	Link Aggregation Control Protocol
CJCSI	Chairman of the Joint Chiefs of Staff Instruction	MAC	Mandatory Access Control
DTMF	Dual-tone multi-frequency	Mbps	Megabits per second
GigE	Gigabit Ethernet	MOS	Mean Opinion Score
GPON	Gigabit Passive Optical Network	MWI	Message Waiting Indicator
GR	Generic Requirement	NDP	Neighbor Discovery Protocol
GUI	Graphical User Interface	OLT	Optical Line Termination
IOP	Interoperability	ONT	Optical Network Terminal
IPTV	Internet Protocol Television	PCP	Priority Code Point
IPv4	Internet Protocol version 4	PON	Passive Optical Network
IPv6	Internet Protocol version 6	RFC	Request For Comment
ITU-T	International Telecommunication Union-Telecommunication Standardization	UCR	Unified Capabilities Requirements
		VLAN	Virtual Local Area Network