DEFENSE INFORMATION SYSTEMS AGENCY
JOINT INTEROPERABILITY TEST COMMAND
P.O. BOX 12798
FORT HUACHUCA, ARIZONA 85670-2798

IN REPLY REFER TO: Battlespace Communications Portfolio (JTE) **5 July 2007**

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Alcatel-Lucent Metropolis® Digital Multiplexer (DMX) Access Multiplexer with Software Release 7.0.0 and Metropolis® DMXtend Access Multiplexer with Software Release 5.0.0

References: (a) DoD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01D, "Interoperability and Supportability of Information Technology and National Security Systems," 08 March 2006

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

2. The Alcatel-Lucent Metropolis® DMX Access Multiplexer with Software Release 7.0.0 and Metropolis® DMXtend Access Multiplexer with Software Release 5.0.0 are hereinafter referred to as the System Under Test (SUT). The SUT meets all of the critical interoperability requirements for a Defense Switched Network (DSN) Strategic Network Element and is certified for joint use within the DSN. The SUT met the critical interoperability requirements for a DSN Strategic Network Element set forth in appendices 5 and 9 of reference (c) using test procedures derived from reference (d). The SUT offers an Internet Protocol (IP) interface; however, this interface was not tested and is not covered under this certification. The SUT offers an Optical Carrier Level 12 (OC-12) interface; however, this interface was not tested and is therefore not covered under this certification. The SUT IP and OC-12 interfaces are not authorized or approved for joint use within the DSN. This certification expires upon changes that affect interoperability, but no later than three years from the date of this memorandum.

3. This certification is based on interoperability testing and review of vendor's Letters of Compliance (LoC). Interoperability testing was conducted by JITC at the Global Information Grid Network Test Facility, Fort Huachuca, Arizona, from 16 April through 4 May 2007. Review of vendor's LoC was completed on 30 May 2007. The Certification Testing Summary (enclosure 2) documents the test results and describes the test network. Users should verify interoperability before deploying the SUT in an environment that varies significantly from that described.

4. The SUT Interoperability Test Summary is shown in table 1 and the Capability and Feature Requirements used to evaluate the interoperability of the SUT are indicated in table 2.

Table 1. SUT Interoperability Test Summary

DSN Access Interfaces			
Interface & Signaling	**Critical**	**Status**	**Remarks**
T1 CAS (AMI/SF) DTMF, DP, MFR1	No[1]	Certified	Met all CRs and FRs.
T1 CAS (B8ZS/ESF) DTMF, DP, MFR1	No[1]	Certified	Met all CRs and FRs.
T1 PRI (ANSI T1.619a)	No[1]	Certified	Met all CRs and FRs.
T1 SS7 (ANSI T1.619a)	No[1]	Certified	Met all CRs and FRs.
DS3	No[1]	Certified	Met all CRs and FRs.

DSN Transport Interfaces				
Optical Carrier Level	**Transport Level**	**Critical**	**Status**	**Remarks**
OC-3	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.
OC-48	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.
OC-192	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.

Features And Capabilities			
Features and Capabilities	**Critical**	**Status**	**Remarks**
Synchronization	Yes	Certified	Met all CRs and FRs.
Network Management	Yes	Certified	Met all CRs and FRs.
Security	Yes	See note 3.	See note 3.

LEGEND:

AMI	- Alternate Mark Inversion
ANSI	- American National Standards Institute
B8ZS	- Bipolar Eight Zero Substitution
BRI	- Basic Rate Interface
CAS	- Channel Associated Signaling
CRs	- Capability Requirements
DISA	- Defense Information Systems Agency
DP	- Dial Pulse
DS1	- Digital Signal Level 1
DS3	- Digital Signal Level 3 (44.736 Mbps)
DTMF	- Dual Tone Multi-Frequency
DSN	- Defense Switched Network
E1	- European Basic Multiplex Rate (2.048 Mbps)
ESF	- Extended Super Frame
FRs	- Feature Requirements
Gbps	- Gigabits per second
IP	- Internet Protocol
ISDN	- Integrated Services Digital Network
Mbps	- Megabits per second
MFR1	- Multi-Frequency Recommendation 1
MLPP	- Multi-Level Precedence and Preemption
NE	- Network Element
OC-3	- Optical Carrier Level 3 (155 Mbps)
OC-12	- Optical Carrier Level 12 (622 Mbps)
OC-48	- Optical Carrier Level 48 (2.448 Gbps)
OC-192	- Optical Carrier Level 192 (10 Gbps)
OC-X	- Optical Carrier Level - X stands for capacity (3, 48, 192)
PRI	- Primary Rate Interface
SF	- Super Frame
SS7	- Signaling System 7
SUT	- System Under Test
STS-1	- Synchronous Transport Signal-1
T1	- Digital Transmission Link Level 1 (1.544 Mbps)
T1.619a	- SS7 and ISDN MLPP Signaling Standard for T1
VT1.5	- Virtual Tributary 1.5

NOTES:

1 The DSN Strategic NE Access Interface can be met with any one of the following interfaces: Analog, Serial, ISDN BRI, T1 (DS1), E1, DS3, OC-X, or IP.
2 The DSN Strategic NE Transport Interface can be met with any one of the following interfaces: T1, E1, DS3, OC-3, OC-12, OC-48, or OC-192.
3 Information assurance testing is accomplished via DISA-led Information Assurance test teams and published in a separate report.

Table 2. SUT Capability and Feature Interoperability Requirements

DSN Access Interfaces			
Interface	**Critical**	**Requirements Required or Conditional**	**References**
T1 CAS	No[1]	• DS1 Interface Characteristics (R) • DS1 Supervisory Channel Associated Signaling (R) • DS1 Clear Channel Capability (R) • DS1 Alarm and Restoral Requirements (R)	• GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4
T1 SS7 (ANSI T1.619a)	No[1]	• E1 Interface Characteristics (R) • E1 Supervisory Channel Associated Signaling (R) • E1 Clear Channel Capability (R) • E1 Alarm and Restoral Requirements (R)	• GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5
T1 ISDN PRI (ANSI T1.619a)	No[1]	• MOS (R) • BERT (R) • Secure Transmission (Voice and Data) (R) • Modem (R) • Facsimile (R)	• GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1
DS3	No[1]	• Call Control Signals (R) • Call Congestion (R) • Voice Compression (C) • DS3 Interface Requirements (R)	• GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1.3 • GSCR App. A9.5.1.1.4 • GSCR App. A9.5.1.2.6
DSN Transport Interfaces			
Interface	**Critical**	**Requirements Required or Conditional**	**References**
OC-3	No[2]	• MLPP (R) • GR-303-CORE (R) • GR-253-CORE (R) • GR-782-CORE (R) • ANSI T1.105-2001 (R) • DS1 Rate Transport via VT1.5 (R) • DS1 Rate Provisioning (R) • DS0 Call Processing (R) • DS0 to OC-3 Route Assignment (R) • Facility Alarms (R)	• GSCR App. A5.5.1 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.3 • GSCR App. A5.5.4
OC-48	No[2]	• DS1 AIS/Yellow (R) • DS0 AIS/DS0 RAI (R) • Synchronization in accordance with GR-518-CORE (R) • Synchronization in accordance with GR-253-CORE (R) • Synchronization in accordance with GR-436-CORE (R) • Reliability in accordance with GR-874-CORE (R) • Security (R) • MOS (R) • BERT (R)	• GSCR App. A5.5.4 • GSCR App. A5.5.4 • GSCR App. A5.5.5 • GSCR App. A5.5.5 • GSCR App. A5.5.5 • GSCR App. A5.5.6 • GSCR App. A5.5.7 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1
OC-192	No[2]	• Secure Transmission (Voice and Data) (R) • Modem (R) • Facsimile (R) • Call Control Signals (R) • Call Congestion (R) • Voice Compression (C)	• GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1.3 • GSCR App. A9.5.1.1.4

Table 2. SUT Capability and Feature Interoperability Requirements (continued)

SUT Features And Capabilities			
Feature/Capability	**Critical**	**Requirements Required or Conditional**	**References**
Synchronization	Yes	• Timing (R)	• GSCR App. A9.5.1.7
Network Management	Yes	• Management Option (R) - Local Management (Front Panel and/or External Console) (C) - ADMISS (C) • Fault Management (C) • Loop Back Capability (C) • Operational Configuration Restoral (R)	• GSCR App. A9.5.2.1 • GSCR App. A9.5.2.2 • GSCR App. A9.5.2.3 • GSCR App. A9.5.3
Security	Yes	• GR-815, STIGs, and DIACAP (replacement for DITSCAP) (R)	• GSCR App. A9.6

LEGEND:

ADMISS	- Advanced DSN Integrated Management Support System
ANSI	- American National Standards Institute
App.	- Appendix
AIS	- Alarm Indication Signal
BERT	- Bit Error Rate Test
BRI	- Basic Rate Interface
C	- Conditional
CAS	- Channel Associated Signaling
DIACAP	- DoD Information Assurance Certification and Accreditation Process
DITSCAP	- DoD Information Technology Security Certification and Accreditation Process
DoD	- Department of Defense
DS0	- Digital Signal Level 0
DS1	- Digital Signal Level 1
DS3	- Digital Signal Level 3
DSN	- Defense Switched Network
E1	- European Basic Multiplex Rate (2.048 Mbps)
Gbps	- Gigabits per second
GR	- Generic Requirement
GR-253-CORE	- SONET Transport Systems: Common Generic Criteria
GR-303-CORE	- Integrated Digital Loop Carrier System Generic Requirements, Objectives, and Interface
GR-436-CORE	- Digital Network Synchronization Plan
GR-518-CORE	- LSSGR: Synchronization, Section 18
GR-782-CORE	- SONET Digital Switch Trunk Interface Criteria
GR-815	- Generic Requirement for Network Element/Network System (NE/NS) Security
GR-874-CORE	- An Introduction to the Reliability and Quality Generic Requirements (RQGR)
GSCR	- Generic Switching Center Requirement
IP	- Internet Protocol
ISDN	- Integrated Services Digital Network
LSSGR	- Local Access and Transport Area (LATA) Switching Systems Generic Requirements
Mbps	- Megabits per second
MLPP	- Multi-Level Precedence and Preemption
MOS	- Mean Opinion Score
NE	- Network Element
OC-3	- Optical Carrier Level 3 (155 Mbps)
OC-12	- Optical Carrier Level 12 (622 Mbps)
OC-48	- Optical Carrier Level 48 (2.448 Gbps)
OC-192	- Optical Carrier Level 192 (10 Gbps)
OC-X	- Optical Carrier Level - X stands for capacity (3, 48, 192)
PRI	- Primary Rate Interface
R	- Required
RAI	- Remote Alarm Indication
SONET	- Synchronous Optical Network
SS7	- Signaling System 7
STIGs	- Security Technical Implementation Guides
SUT	- System Under Test
T1	- Digital Transmission Link Level 1 (1.544 Mbps)
T1.105-2001	- SONET - Basic Description include Multiplexer structure, rates, formats
T1.619a	- SS7 and ISDN MLPP Signaling Standard for T1
VT1.5	- Virtual Tributary 1.5

NOTES:
1 The DSN Strategic NE Access Interface can be met with any one of the following interfaces: Analog, Serial, ISDN BRI, T1 (DS1), E1, DS3, OC-X, or IP.
2 The DSN Strategic NE Transport Interface can be met with any one of the following interfaces: T1, E1, DS3, OC-3, OC-12, OC-48, or OC-192.

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

6. The JITC point of contact is Mr. Joseph Schulte, DSN 879-5164, commercial (520) 538-5164, FAX DSN 879-4347, or e-mail to joseph.schulte@disa.mil. The tracking number for the SUT is 0628401.

FOR THE COMMANDER:

2 Enclosures a/s

MANUEL H. GARCIA, JR.
Chief
Battlespace Communications Portfolio

JITC Memo, JTE, Special Interoperability Test Certification of the Alcatel-Lucent Metropolis® Digital Multiplexer (DMX) Access Multiplexer with Software Release 7.0.0 and Metropolis® DMXtend Access Multiplexer with Software Release 5.0.0

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Defense Information Systems Agency (DISA), ATTN: GS23 (Mr. Osman), Room 5w23, 5275 Leesburg Pike (RTE 7), Falls Church, VA 22041

ADDITIONAL REFERENCES

(c) Defense Information Systems Agency (DISA), "Defense Switched Network (DSN) Generic Switching Center Requirements (GSCR), Errata Change 2," 14 December 2006

(d) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP), Change 2," 2 October 2006

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. The Alcatel-Lucent Metropolis® Digital Multiplexer (DMX) Access Multiplexer with Software Release 7.0.0 and Metropolis® DMXtend Access Multiplexer with Software Release 5.0.0 are hereinafter referred to as the System Under Test (SUT).

2. PROPONENTS. US Army, Directorate of Information Management (DOIM), Fort Campbell, Kentucky.

3. PROGRAM MANAGER. Mr. Alfred Henderson, Chief, DOIM, Operations Division, Building 907, Bastogne Avenue, Fort Campbell, Kentucky, 42223, e-mail: alfred.b.henderson@us.army.mil.

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

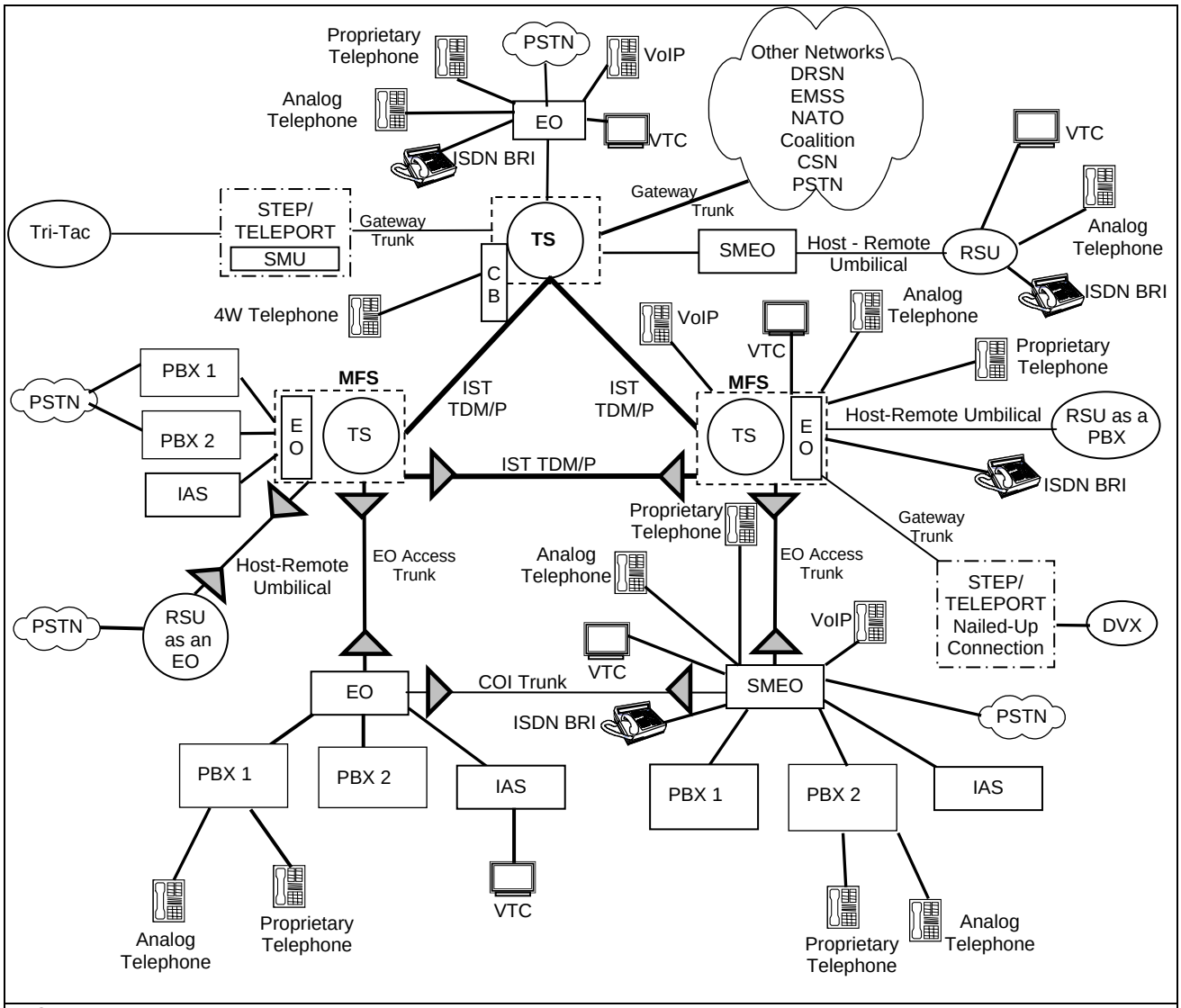
5. SYSTEM UNDER TEST DESCRIPTION. The SUT is a compact, highly scalable Synchronous Optical Network (SONET) multiplexing system that can be deployed as a Network Element (NE) device. The SUT is configured with expansion slots for adding Digital Signal Level 1 (DS1), Digital Signal Level 3 (DS3), Synchronous Transport Signal –1 (STS-1), Optical Carrier Level 3 (OC-3), Optical Carrier Level 12 (OC-12), Optical Carrier Level 48 (OC-48), and Optical Carrier Level 192 (OC-192). The SUT offers an Internet Protocol (IP) interface; however, this interface was not tested and is therefore not covered under this certification. The SUT offers an OC-12 interface; however, this interface was not tested and is therefore not covered under this certification. The SUT is managed from a remote client, which can be used to manage multiple units. The management system is a Personal Computer (PC)-based system running WaveStar Craft Interface Terminal (CIT). The WaveStar CIT is the client Graphical User Interface (GUI) used to monitor and control the SUT. All management and real-time visibility functions are available via this GUI client. The GUI client includes a visual representation of all SUT system hardware and each monitored circuit. The SUT includes two platforms; the Metropolis® DMX and the Metropolis® DMXtend with their respective software releases. Their respective details are listed in the following paragraphs:

(a) The Metropolis® DMX is a compact, single-shelf, optical multiplexer designed to transport voice and data for metro access, business access, and regional interoffice applications. The DMX can be configured to carry SONET or Synchronous Digital (SDH) payloads at the OC-192, OC-48, OC-12, OC-3, DS3, or DS1 rates. Cross connections can be created at any rate, from the highest rate of OC-192 to the lowest rate of Virtual Tributary (VT)1.5. The DMX can be used in a Bidirectional Line Switched Ring (BLSR), Unidirectional Path Switched Rings (UPSR) ring, or in a 1+1 protection configuration.

(b) The Metropolis® DMXtend is a single-shelf network multiplexer designed to transport voice and data for the access transport, business access, and regional

interoffice applications. The DMXtend can be configured to carry SONET payloads at the OC-48, OC-12, OC-3, DS3, or DS1 rates. Cross connections can be created at any rate, from the highest rate of OC-48 to the lowest rate of VT1.5. The DMXtend can be used in a UPSR ring or in a 1+1 protection configuration.

6. OPERATIONAL ARCHITECTURE. The Generic Switching Center Requirements (GSCR) Defense Switched Network (DSN) operational architecture in figure 2-1 depicts the relationship of the SUT to the DSN switches.



LEGEND:

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

Figure 2-1. DSN Architecture

7. REQUIRED SYSTEM INTERFACES. The SUT interoperability test summary is shown in table 2-1 and the Capability and Feature Requirements used to evaluate the interoperability of the SUT are indicated in table 2-2. These requirements are derived from the GSCR and verified through JITC testing and review of vendor Letters of Compliance (LoC).

Table 2-1. SUT Interoperability Test Summary

DSN Access Interfaces				
Interface & Signaling		**Critical**	**Status**	**Remarks**
T1 CAS (AMI/SF) DTMF, DP, MFR1		No[1]	Certified	Met all CRs and FRs.
T1 CAS (B8ZS/ESF) DTMF, DP, MFR1		No[1]	Certified	Met all CRs and FRs.
T1 PRI (ANSI T1.619a)		No[1]	Certified	Met all CRs and FRs.
T1 SS7 (ANSI T1.619a)		No[1]	Certified	Met all CRs and FRs.
DS3		No[1]	Certified	Met all CRs and FRs.
DSN Transport Interfaces				
Optical Carrier Level	**Transport Level**	**Critical**	**Status**	**Remarks**
OC-3	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.
OC-48	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.
OC-192	VT1.5	No[2]	Certified	Met all CRs and FRs.
	STS-1	No[2]	Certified	Met all CRs and FRs.
Features And Capabilities				
Features and Capabilities		**Critical**	**Status**	**Remarks**
Synchronization		Yes	Certified	Met all CRs and FRs.
Network Management		Yes	Certified	Met all CRs and FRs.
Security		Yes	See note 3.	See note 3.

LEGEND:

AMI - Alternate Mark Inversion
ANSI - American National Standards Institute
B8ZS - Bipolar Eight Zero Substitution
BRI - Basic Rate Interface
CAS - Channel Associated Signaling
CRs - Capability Requirements
DISA - Defense Information Systems Agency
DP - Dial Pulse
DS1 - Digital Signal Level 1
DS3 - Digital Signal Level 3 (44.736 Mbps)
DTMF - Dual Tone Multi-Frequency
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FRs - Feature Requirements
Gbps - Gigabits per second
IP - Internet Protocol
ISDN - Integrated Services Digital Network
Mbps - Megabits per second
MFR1 - Multi-Frequency Recommendation 1
MLPP - Multi-Level Precedence and Preemption
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OC-3 - Optical Carrier Level 3 (155 Mbps)
OC-12 - Optical Carrier Level 12 (622 Mbps)
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OC-192 - Optical Carrier Level 192 (10 Gbps)
OC-X - Optical Carrier Level - X stands for capacity (3, 48, 192)
PRI - Primary Rate Interface
SF - Super Frame
SS7 - Signaling System 7
SUT - System Under Test
STS-1 - Synchronous Transport Signal-1
T1 - Digital Transmission Link Level 1 (1.544 Mbps)
T1.619a - SS7 and ISDN MLPP Signaling Standard for T1
VT1.5 - Virtual Tributary 1.5

NOTES:

1 The DSN Strategic NE Access Interface can be met with any one of the following interfaces: Analog, Serial, ISDN BRI, T1 (DS1), E1, DS3, OC-X, or IP.
2 The DSN Strategic NE Transport Interface can be met with any one of the following interfaces: T1, E1, DS3, OC-3, OC-12, OC-48, or OC-192.
3 Information assurance testing is accomplished via DISA-led Information Assurance test teams and published in a separate report.

Table 2-2. SUT Capability and Feature Interoperability Requirements

DSN Access Interfaces			
Interface	**Critical**	**Requirements Required or Conditional**	**References**
T1 CAS T1 SS7 (ANSI T1.619a) T1 ISDN PRI (ANSI T1.619a) DS3	No[1] No[1] No[1] No[1]	• DS1 Interface Characteristics (R) • DS1 Supervisory Channel Associated Signaling (R) • DS1 Clear Channel Capability (R) • DS1 Alarm and Restoral Requirements (R) • E1 Interface Characteristics (R) • E1 Supervisory Channel Associated Signaling (R) • E1 Clear Channel Capability (R) • E1 Alarm and Restoral Requirements (R) • MOS (R) • BERT (R) • Secure Transmission (Voice and Data) (R) • Modem (R) • Facsimile (R) • Call Control Signals (R) • Call Congestion (R) • Voice Compression (C) • DS3 Interface Requirements (R)	• GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.4 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.2.5 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1.3 • GSCR App. A9.5.1.1.4 • GSCR App. A9.5.1.2.6
DSN Transport Interfaces			
Interface	**Critical**	**Requirements Required or Conditional**	**References**
OC-3 OC-48 OC-192	No[2] No[2] No[2]	• MLPP (R) • GR-303-CORE (R) • GR-253-CORE (R) • GR-782-CORE (R) • ANSI T1.105-2001 (R) • DS1 Rate Transport via VT1.5 (R) • DS1 Rate Provisioning (R) • DS0 Call Processing (R) • DS0 to OC-3 Route Assignment (R) • Facility Alarms (R) • DS1 AIS/Yellow (R) • DS0 AIS/DS0 RAI (R) • Synchronization in accordance with GR-518-CORE (R) • Synchronization in accordance with GR-253-CORE (R) • Synchronization in accordance with GR-436-CORE (R) • Reliability in accordance with GR-874-CORE (R) • Security (R) • MOS (R) • BERT (R) • Secure Transmission (Voice and Data) (R) • Modem (R) • Facsimile (R) • Call Control Signals (R) • Call Congestion (R) • Voice Compression (C)	• GSCR App. A5.5.1 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.2 • GSCR App. A5.5.3 • GSCR App. A5.5.4 • GSCR App. A5.5.4 • GSCR App. A5.5.4 • GSCR App. A5.5.5 • GSCR App. A5.5.5 • GSCR App. A5.5.5 • GSCR App. A5.5.6 • GSCR App. A5.5.7 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1 • GSCR App. A9.5.1.1.3 • GSCR App. A9.5.1.1.4

Table 2-2. SUT Capability and Feature Interoperability Requirements (continued)

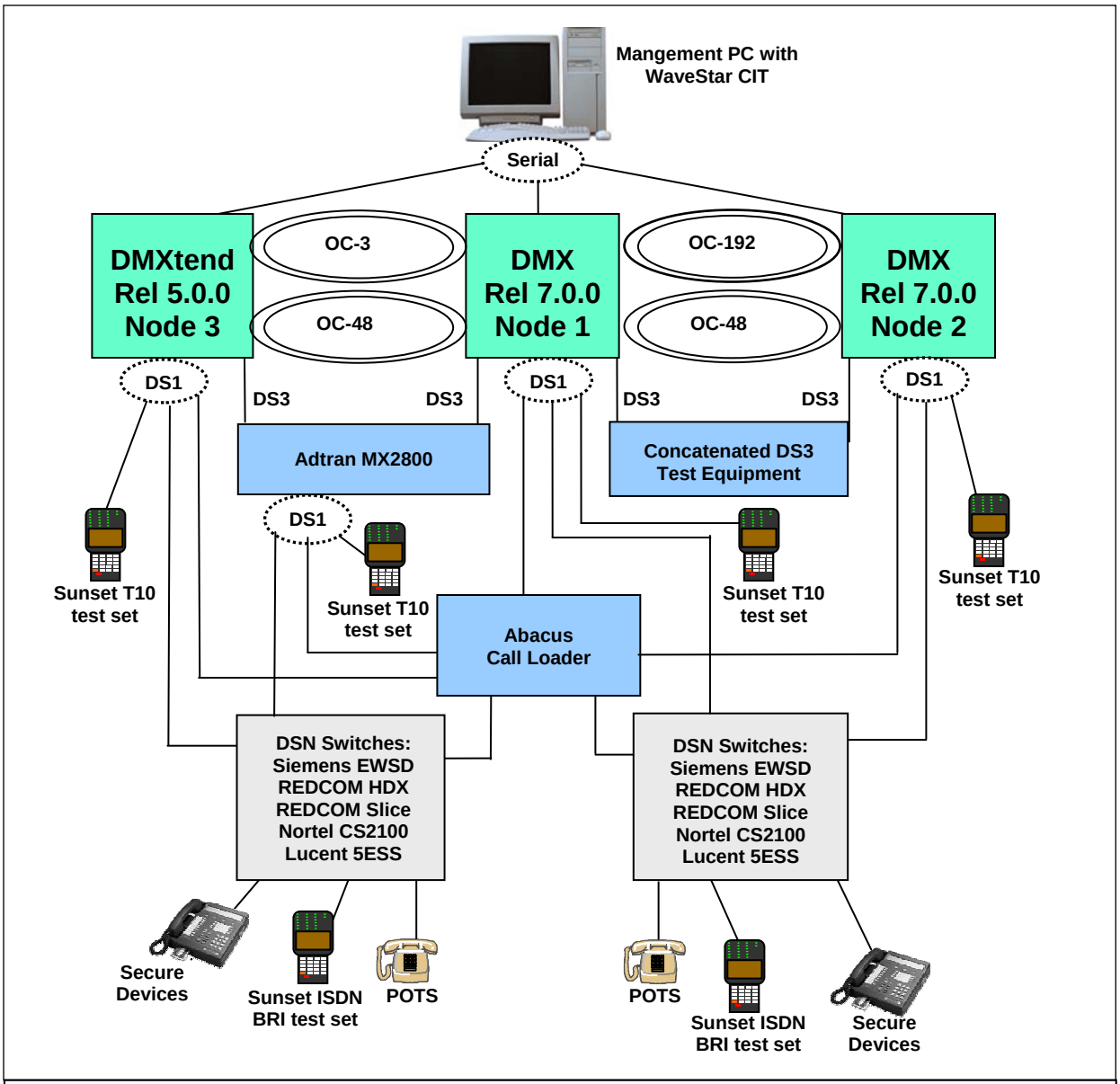
SUT Features And Capabilities			
Feature/ Capability	**Critical**	**Requirements Required or Conditional**	**References**
Synchronization	Yes	• Timing (R)	• GSCR App. A9.5.1.7
Network Management	Yes	• Management Option (R) - Local Management (Front Panel and/or External Console) (C) - ADMISS (C) • Fault Management (C) • Loop Back Capability (C) • Operational Configuration Restoral (R)	• GSCR App. A9.5.2.1 • GSCR App. A9.5.2.2 • GSCR App. A9.5.2.3 • GSCR App. A9.5.3
Security	Yes	• GR-815, STIGs, and DIACAP (replacement for DITSCAP) (R)	• GSCR App. A9.6

LEGEND:

ADMISS	- Advanced DSN Integrated Management Support System
ANSI	- American National Standards Institute
App.	- Appendix
AIS	- Alarm Indication Signal
BERT	- Bit Error Rate Test
BRI	- Basic Rate Interface
C	- Conditional
CAS	- Channel Associated Signaling
DIACAP	- DoD Information Assurance Certification and Accreditation Process
DITSCAP	- DoD Information Technology Security Certification and Accreditation Process
DoD	- Department of Defense
DS0	- Digital Signal Level 0
DS1	- Digital Signal Level 1
DS3	- Digital Signal Level 3
DSN	- Defense Switched Network
E1	- European Basic Multiplex Rate (2.048 Mbps)
Gbps	- Gigabits per second
GR	- Generic Requirement
GR-253-CORE	- SONET Transport Systems: Common Generic Criteria
GR-303-CORE	- Integrated Digital Loop Carrier System Generic Requirements, Objectives, and Interface
GR-436-CORE	- Digital Network Synchronization Plan
GR-518-CORE	- LSSGR: Synchronization, Section 18
GR-782-CORE	- SONET Digital Switch Trunk Interface Criteria
GR-815	- Generic Requirement for Network Element/Network System (NE/NS) Security
GR-874-CORE	- An Introduction to the Reliability and Quality Generic Requirements (RQGR)
GSCR	- Generic Switching Center Requirement
IP	- Internet Protocol
ISDN	- Integrated Services Digital Network
LSSGR	- Local Access and Transport Area (LATA) Switching Systems Generic Requirements
Mbps	- Megabits per second
MLPP	- Multi-Level Precedence and Preemption
MOS	- Mean Opinion Score
NE	- Network Element
OC-3	- Optical Carrier Level 3 (155 Mbps)
OC-12	- Optical Carrier Level 12 (622 Mbps)
OC-48	- Optical Carrier Level 48 (2.448 Gbps)
OC-192	- Optical Carrier Level 192 (10 Gbps)
OC-X	- Optical Carrier Level - X stands for capacity (3, 48, 192)
PRI	- Primary Rate Interface
R	- Required
RAI	- Remote Alarm Indication
SONET	- Synchronous Optical Network
SS7	- Signaling System 7
STIGs	- Security Technical Implementation Guides
SUT	- System Under Test
T1	- Digital Transmission Link Level 1 (1.544 Mbps)
T1.105-2001	- SONET - Basic Description include Multiplexer structure, rates, formats
T1.619a	- SS7 and ISDN MLPP Signaling Standard for T1
VT1.5	- Virtual Tributary 1.5

NOTES:
1 The DSN Strategic NE Access Interface can be met with any one of the following interfaces: Analog, Serial, ISDN BRI, T1 (DS1), E1, DS3, OC-X, or IP.
2 The DSN Strategic NE Transport Interface can be met with any one of the following interfaces: T1, E1, DS3, OC-3, OC-12, OC-48, or OC-192.

8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC's Global Information Grid Network Test Facility in a manner and configuration similar to that of the DSN operational environment. This test was conducted using the test configuration shown in figure 2-2.



LEGEND:

5ESS	- Class 5 Electronic Switching System	DSN	- Defense Switched Network	OC-3	- Optical Carrier Level 3 (155 Mbps)
BRI	- Basic Rate Interface	EWSD	- Elektronisches Wählsystem Digital	OC-48	- Optical Carrier Level 48 (2.488 Gbps)
CIT	- Craft Interface Terminal	Gbps	- Gigabits per second	OC-192	- Optical Carrier Level 192 (10 Gbps)
CS	- Communication Server	HDX	- High Density Exchange	PC	- Personal Computer
DMX	- Digital Multiplexer	ISDN	- Integrated Services Digital Network	POTS	- Plain Old Telephone Service
DS1	- Digital Signal Level 1 (1.544 Mbps)	Mbps	- Megabits per second	Rel	- Release
DS3	- Digital Signal Level 3 (44.736 Mbps)	MX	- Multiplexer	SUT	- System Under Test

Figure 2-2. SUT Test Configuration

9. SYSTEM CONFIGURATIONS. Table 2-3 lists the system configurations used in the test.

Table 2-3. Tested System Configurations

System	Release
Nortel CS2100	Succession Enterprise 08 (SE08)
Siemens EWSD	19d with Patch Set 46
Lucent 5ESS	5E16.2 with Software Update (SU) 06-0002
REDCOM HDX	2.0A R3P0
REDCOM Slice	2.0A R3P0
Adtran MX2800	code version 3.20A / boot version 2.20A

System Name		Circuit Pack Type	Apparatus Code	Series Number	Firmware Release
SUT	DMX with Software Release 7.0.0	28DS1PM	LNW7	S1-1	18.0.1
		12TMUX	LNW18	S1-1	252.5.24.13
		OC-192	LNW56	S1-3A	N/A
		4-OC-3	LNW37	S1-2	N/A
		OC-48	LNW31	S1-3	N/A
		12DS3	LNW16	S1-6	58.4.2.0
		SYSCTL	LNW2	S1-1	7.0.0
	DMXtend with Software Release 5.0.0	16DS1PM	LNW39	S1-5	18.0.1
		3DS3	LNW39	S1-5	N/A
		OC-3	LNW40	S1-2	N/A
		4OC-3	LNW37	S1-2	N/A
		OC-48	LNW41	S1-2	N/A
		SYSCTL	LNW2	S1-1	5.0.0
		Management Application	**Management PC**		
		WaveStar CIT Release 16.03.00	RAM=768 MB, Hard Drive Size=37 GB, Processor Type=Intel PIII, Processor Speed=1 GHz; Microsoft Windows XP with Service Pack 2		

LEGEND:

5ESS	- Class 5 Electronic Switching System	Mbps	- Megabits per second
CIT	- Craft Interface Terminal	MX	- Multiplexer
CS	- Communication Server	N/A	- Not Applicable
DMX	- Digital Multiplexer	OC-3	- Optical Carrier Level 3 (155 Mbps)
DS1	- Digital Signal Level 1	OC-48	- Optical Carrier Level 48 (2.488 Gbps)
DS3	- Digital Signal Level 3 (44.736 Mbps)	OC-192	- Optical Carrier Level 192 (10 Gbps)
EWSD	- Elektronisches Wählsystem Digital	PM	- Performance Monitoring
GB	- Gigabytes	RAM	- Random Access Memory
Gbps	- Gigabits per second	SUT	- System Under Test
GHz	- Gigahertz	SYSCTL	- System Controller
HDX	- High Density Exchange	TMUX	- Trans Multiplexer
MB	- Megabytes		

10. TEST LIMITATIONS. None.

11. TEST RESULTS

a. Discussion

(1) DSN Access Interfaces. Channel Associated Signaling (CAS) and Common Channel Signaling trunks were provisioned and tested. All trunk types were provisioned and tested on the internal DS1 card and through the DS3 card connected to an Adtran MX2800 that was configured to provide DS1 interfaces to the DSN network. All of the DS1 trunk types were mapped through the test network via Virtual Tributary (VT)1.5 and STS-1 transport levels over all of the supported SONET interfaces

described in paragraph (2). The specific requirements and test results of the DSN Access Interface testing are described below.

(a) Interface Characteristics. The DS1 interface characteristics were verified using a Sunset T10 test set. The SUT met all DS1 interface characteristics as required by the GSCR, appendix 9.

(b) Supervisory Channel Associated Signaling. Trunk seizure, answer supervision, preemption signals, and all other trunk supervisory information sent and received on a per channel basis was passed transparently through the SUT as required in the GSCR, appendix 9.

(c) Clear Channel Capability. The SUT is capable of transmitting and receiving Bipolar Eight Zero Substitution (B8ZS) line coding in accordance with GSCR, appendix 9.

(d) Alarm and Restoral Requirements. The SUT is capable of transparently passing the alarm and restoral features of the DSN switch's digital interface unit as required in the GSCR, appendix 9.

(e) Mean Opinion Score (MOS). The Abacus call loader was used to generate voice traffic across the DS1 links mapped through the SONET test network as depicted in figure 2-2. There were 350,280 calls placed over the T1 interfaces. The GSCR, appendix 9 states that a Network Element shall have a MOS of 4.0 or better for 95 percent of all calls placed. The SUT met this requirement with 99.99 percent of all calls placed via the SUT having an MOS of at least 4.0.

(f) Bit Error Rate Test (BERT). BERTs were conducted across DS1 interfaces, which were mapped through the SONET test network. The GSCR, appendix 9, requires that the SUT, when inserted in to the test network, will not exceed an end-to-end bit error rate of less than one error in $1x10^{9}$ (averaged over a nine hour period). The SUT met this requirement for all interfaces with a recorded bit error ratio of $1x10^{-10}$.

(g) Secure Transmission (Voice and Data). There were 60 secure calls placed between Secure Terminal Equipment (STEs) and Secure Wireline Terminals (SWTs) without degrading transmissions between end devices. This satisfies the GSCR, appendix 9, requirement.

(h) Modem. There were 3,627 modem calls placed through the SUT using the Abacus call loader. All modem calls had a transmission rate of 32.5 kilobits per second (kbps). The SUT supports the minimum modem transmission speed of 9.6 kbps as required in the GSCR, appendix 9.

(i) Facsimile. There were 6,136 facsimile calls placed through the SUT using the Abacus call loader. All facsimile calls had a transmission rate of 14.4 kbps.

The SUT supports the minimum modem transmission speed of 9.6 kbps as required in the GSCR, appendix 9.

(j) Call Control Signals. The SUT transparently transported all Multi-Level Precedence and Preemption (MLPP) call control signals as required in the GSCR, appendix 9.

(k) Call Congestion. In accordance with the GSCR, appendix 9, call congestion handling can be met one of the following three ways: dynamic load control signal; software capability which makes congestion impossible; or congestion is not possible in the SUT. Call congestion in the SUT is not possible.

(l) Voice Compression. Voice compression is not a feature provided by the SUT. This requirement is conditional and has no major operational impact on network interoperability.

(2) DSN Transport Interfaces. The SUT supports SONET standard optical carrier link levels of OC-3, OC-48, and OC-192. The optical carrier links were tested in a direct-connect configuration and a fully redundant ring configuration. The SUT's SONET interfaces supported switching at the VT1.5 and STS-1 transport levels. The specific requirements and results of the DSN Transport Interface testing are described below.

(a) Military Unique Features. The SUT supports the full complement of Military Unique Features as required in the GSCR, appendix 5. The following types of MLPP calls were placed over all the SUT transport and access interfaces between the switching systems listed in table 2-3. All calls were completed successfully and met the following MLPP interactions as required by the GSCR, appendix 5.

1. Circuit for Reuse; Answered Call
2. Circuit for Reuse; Unanswered Call
3. Circuit not for Reuse; Answered Call
4. Circuit not for Reuse; Unanswered Call
5. Resources not Available (Intra- and inter-switch)
6. Circuit for Reuse; Answered Call (simultaneous preemption of line and trunk)
7. Circuit for Reuse; Unanswered Call (simultaneous preemption of line and trunk)

(b) Generic Requirement (GR)-303-CORE. The SUT was compliant with GR-303-CORE. This requirement was verified via the vendor's LoC.

(c) GR-253-CORE. The SUT was compliant with GR-253-CORE. This requirement was verified via the vendor's LoC.

(d) GR-782-CORE. The SUT was compliant with GR-782-CORE. This requirement was verified via the vendor's LoC.

(e) American National Standards Institute (ANSI) T1.105-2001. The SUT was compliant with ANSI T1.105-2001. This requirement was verified via the vendor's LoC.

(f) DS1 Rate Transport via VT1.5. As required in the GSCR, appendix 5, all features and functions defined to operate at the DS1 rate worked transparently at the VT1.5 rate over the SUT's SONET interfaces.

(g) DS1 Rate Provisioning. The SUT supports the provisioning of transport levels as low as the DS1 rate as required in the GSCR, appendix 5.

(h) DS0 to OC-3 Route Assignment. The SUT supported this requirement by transparently passing all trunk group(s) mapped through the test network as required in the GSCR, appendix 5.

(i) DS3 M13 and C-bit Parity Framing. The SUT met both DS3 M13 and C-bit Parity Framing as required in the GSCR appendix 9. This requirement was verified with both testing and via the vendor's LoC.

(j) DS3 Line Coding. The SUT was compliant with ANSI T1.102-1993. This requirement was verified with both testing and via the vendor's LoC.

(k) Facility Alarms. The SUT supported all facility alarms as required in the GSCR, appendix 5.

(l) DS1 Alarm Indication Signal (AIS: Blue Alarm) and DS1 Remote Alarm Indication (RAI:Yellow Alarm). The SUT transparently transported all DS1 Alarm Indication Signals and Yellow alarms as required in the GSCR, appendix 5.

(m) DS0 AIS/DS0 RAI/Yellow. The SUT transparently passed all DS0 level alarms required in the GSCR, appendix 5.

(n) Synchronization. The SUT was compliant with GR-253-CORE, GR-436-CORE, and GR-518-CORE as required in the GSCR, appendix 5. This requirement was verified via the vendor's LoC.

(o) Reliability. The SUT was compliant with GR-874-CORE as required in the GSCR, appendix 5. This requirement was verified via the vendor's LoC.

(p) Security. Security is tested as part of the Information Assurance testing and is covered under a separate report.

(q) MOS. The Abacus call loader was used to generate voice traffic across the DS1 links mapped through the SONET test network as depicted in figure 2-2. There were 350,280 calls placed over the T1 interfaces. The GSCR, appendix 9 states that a Network Element shall have a MOS of 4.0 or better for 95 percent of all calls placed. The SUT met this requirement with 99.99 percent of all calls placed via the SUT having an MOS of at least 4.0.

(r) BERT. BERTs were conducted across DS1 interfaces, which were mapped through the SONET test network. The GSCR, appendix 9, requires that the SUT, when inserted in to the test network, will not exceed an end-to-end bit error rate of less than one error in $1x10^9$ (averaged over a nine hour period). The SUT met this requirement for all interfaces with a recorded bit error ratio of $1x10^{-10}$.

(s) Secure Transmission (Voice and Data). There were 60 secure calls placed between STEs and SWTs without degrading transmissions between end devices. This satisfies the GSCR, appendix 9, requirement.

(t) Modem. There were 3,627 modem calls placed through the SUT using the Abacus call loader. All modem calls had a transmission rate of 32.5 kbps. The SUT supports the minimum modem transmission speed of 9.6 kbps as required in the GSCR, appendix 9.

(u) Facsimile. There were 6,136 facsimile calls were placed through the SUT using the Abacus call loader. All facsimile calls had a transmission rate of 14.4 kbps. The SUT supports the minimum modem transmission speed of 9.6 kbps as required in the GSCR, appendix 9.

(v) Call Control Signals. The SUT transparently transported all MLPP call control signals as required in the GSCR, appendix 9.

(w) Call Congestion. In accordance with the GSCR, appendix 9, call congestion handling can be met one of the following three ways: dynamic load control signal; software capability which makes congestion impossible; or congestion is not possible in the SUT. Call congestion in the SUT is not possible.

(x) Voice Compression. Voice compression is not a feature provided by the SUT. This requirement is conditional and has no major operational impact on network interoperability.

(3) Synchronization. The SUT can derive timing from any access or transport interface with the exception of DS3, or from a Building Integrated Timing Source (BITS). During this test the timing for node 1 was derived from a BITS located in the test lab with Stratum level 1 timing reference. The additional nodes derived their timing from node 1 via optical transport links.

(4) Device Management

(a) Management Option. The SUT is managed via the WaveStar CIT Release 16.03.00 application running on a Windows XP-based PC. The management PC was connected to the gateway node via an Electronic Industries Alliance (EIA)-232 serial cable. The management PC, via in-band management, managed all other nodes in the test network.

(b) Fault Management. The SUT does not support fault management as defined in the GSCR, appendix 9. This requirement is conditional and has no major operational impact on network interoperability.

(c) Loop Back Capability. The SUT does not support International Telecommunication Unit (ITU) Recommendation V.54 "Loop Test Devices For Modems" as defined in the GSCR, appendix 9. This requirement is conditional and has no major operational impact on network interoperability.

(d) Operational Configuration Restoral. The SUT was placed into a power failure condition. The SUT returned to the last customer configured state prior to the power failure as required in the GSCR, appendix 9.

(5) Security. Security is tested as part of the Information Assurance testing and is covered under a separate report.

b. Summary. The SUT is certified for joint use within the DSN as a DSN Strategic Network Element Device in accordance with the requirements set forth in reference (c). When connected to the interfaces certified in this letter, the SUT and its associated applications were transparent to the switching systems interfaced causing no degradation of service or negative impact.

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