



DEFENSE INFORMATION SYSTEMS AGENCY

JOINT INTEROPERABILITY TEST COMMAND
2001 BRAINARD ROAD
FORT HUACHUCA, ARIZONA 85613-7051

IN REPLY
REFER TO: Networks and Transport Division (JTE)

23 June 2004

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of Avaya S8700 with Software Release Call Manager (CM) 2.01 (R012x.00.1.221.1) and G3SI with Software Release CM 2.01 (R012i.00.1.221.1) Digital Switching Systems (Includes Voice over Internet Protocol)

References: (a) DOD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01C, "Interoperability and Supportability of Information Technology and National Security Systems," 20 November 2003

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 Avaya S8700 with Software Release CM 2.01 (R012x.00.1.221.1), including Voice over Internet Protocol (VoIP), hereinafter referred to as the system under test (SUT), meets all of its critical interoperability requirements, and is certified as interoperable for joint use within the Defense Switched Network (DSN). The identified test discrepancies shown in the Certification Testing Summary (enclosure 2), which remained open after software patches were applied and regression testing was completed, have an overall minor operational impact. The Avaya G3SI digital switching system employs the same software and trunk/line card hardware as the SUT. JITC analysis determined the G3SI to be functionally identical for interoperability certification purposes and the G3SI, with CM 2.01 (Software Release R012i.00.1.221.1) including VoIP is also certified as interoperable for joint use within the DSN. The switching systems and their respective software releases covered under this certification are listed in table 1. The SUT was tested and met the critical interoperability requirements for the following DSN switch types: Small End Office, Private Branch Exchange (PBX) 1 and PBX 2. This certification expires upon changes that could affect interoperability, but no later than three years from the date of this memorandum.

3. This finding is based on interoperability testing conducted by the JITC. Testing was conducted at the JITC facility at Ft. Huachuca, AZ, from 11 August through 20 December 2003. Enclosure 2 documents the test results and describes the tested network and systems configurations. System interoperability should be verified before deployment in an operational environment that varies significantly from the test environment.

JITC Memo, JTE, Special Interoperability Test Certification of Avaya S8700 with Software Release Call Manager (CM) 2.01 (R012x.00.1.221.1) and G3SI with Software Release CM 2.01 (R012i.00.1.221.1) Digital Switching Systems (Includes Voice over Internet Protocol)

4. The Command and Control (C2) Voice Grade (VG) Local Area Network (LAN) certified hardware and software components are listed in table 2. The interoperability summary of the SUT is indicated in table 3. The interoperability status and criticality are listed in table 4, and the Exchange Requirements (ERs) and Functional Requirements (FRs) for the DSN are listed in table 5. The Avaya switch product line offers a Remote Switch Unit (RSU) capability referred to as the Survivable Remote Processor Expansion Port Network. Preliminary testing was completed on the RSU but it is not covered by this certification. This product line also offers a Voice over Internet Protocol capability. Testing was performed on this capability and is covered by this certification. Network Management (NM) capabilities of the SUT platform were tested in accordance with the DISA NS53 requirements as set forth in references (c) and (d). This reference requires that a switch provide NM capabilities via either Ethernet, serial (EIA-232), or serial (X.25 or BX.25 variant). The SUT meets the NM requirements through the use of either serial (EIA-232) or Ethernet connections. The serial interface does not support alarm data. This interoperability test status is based upon evaluation of:

a. The following network interfaces as specified in reference (e): DSN, Defense Red Switch Network Gateway, Tactical Network Gateway, North Atlantic Treaty Organization Gateway, and Public Switched Telecommunications Network or Commercial Network Gateway.

b. The interface and signaling requirements for trunk/line interfaces, and interoperability ERs and FRs derived from references (f) and (g).

c. The overall system interoperability performance derived from test procedures listed in reference (h).

d. Review of Letters of Compliance submitted by Avaya.

e. The C2 VG LAN interoperability ERs and FRs derived from reference (i).

Table 1. Certified Avaya Systems Software Releases

Software Release	Software Medium	Switch Platform
R012x.0.0.221.1 (See note)	Optical Disk	Avaya S8700
R012i.0.0.221.1 (See note)	PCMCIA	Avaya G3SI
Legend: PCMCIA – Personal Computer Memory Card International Association Note: The software is the same; however, Avaya distinguishes the different mediums and platforms by the 5 th character of the Software Release (e.g., “x” or “i”).		

Table 2. C2 VG LAN Hardware and Software Components

Hardware	Software Release
Extreme Summit 48si	6.2.2B134
Extreme Summit 200-24	6.2E2B16
Extreme Alpine 3808	6.2.2B134
Extreme Alpine 3804	6.2.2B134
Card SMMi (45014)	See Note.

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Table 2. C2 VG LAN Hardware and Software Components (continued)

Hardware	Software Release
Card GM – 4X (45112)	See Note.
Card GM – 4S (45110)	See Note.
Extreme Black Diamond 6804	6.2.2B134
Extreme Black Diamond 6808	6.2.2B134
Card MSM64 (50015)	See Note.
Card G8X (51032)	See Note.
Card F48T (52011)	See Note.
Phone – 4620IP	DEF 20R2_0
Legend: C2 - Command and Control F - Fast Ethernet G - Gigabit GM - Gigabit Module i - Inferno Chip Set IP - Internet Protocol LAN - Local Area Network MSM - Management Switch Module SMM - Switch Management Module s - Small Profile T - Twisted pair copper VG - Voice Grade X - Gigabit interface converter based	
Note: There is no software version.	

Table 3. The SUT System Interoperability Summary

Network	Critical	Status	Remarks
DSN	Yes	Certified	- Certified for VoIP with C2 Voice Grade Local Area Network. ¹ - Certified as SMEO & PBX1. - RSU not certified. - E1 CAS and CDC certified (DISN-E only). - The identified test discrepancies shown in enclosure (2) that remained open have an overall minor operational impact.
DRSN Gateway	Yes	Certified	- All requirements met.
Tactical Gateway	No	Certified	- All requirements met.
NATO Gateway	No	Not Tested	
Commercial Gateway	Yes	Certified	- All requirements met.
Legend: C2 - Command and Control CAS - Channel Associated Signaling CDC - Common Data Channel DISN-E - Defense Information System Network Europe DRSN - Defense Red Switch Network DSN - Defense Switched Network E1 - European Basic Rate (2.048 Mbps) Mbps - Megabits per second NATO - North Atlantic Treaty Organization PBX1 - Private Branch Exchange 1 RSU - Remote Switching Unit SMEO - Small End Office SUT - System Under Test VoIP - Voice over Internet Protocol			
Note: ¹ Refer to enclosure 2, table 2-4 for the C2 VG LAN certified components.			

Table 4. Interoperability Status

	Trunk Interfaces				
	Interface & Signaling	Critical	Status	Remarks	
Defense Switched Network	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DTMF	Yes	Certified	Met all critical ERs and FRs.	
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	Yes	Certified	Met all critical ERs and FRs.	
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DP	Yes	Certified	Met all critical ERs and FRs.	
	PCM-30 E1 CAS HDB3 MFR1	No	Certified	Met all ERs and FRs.	
	PCM-24 T1 (B8ZS/ESF) ISDN PRI	Yes	Certified	Met all critical ERs and FRs.	
	Analog E&M Signaling Type I	No	Certified	Met all ERs and FRs.	
	Line Interfaces				
	Interface & Signaling	Critical	Status	Remarks	
	TPC ISDN BRI ST and U Interface Q.931	Yes	Certified	Met all critical ERs and FRs. ISDN supplemental services ¹ and full compliance of DSN Announcements ³ not met. Operational impact is minor.	
	TPC 2-Wire analog	Yes	Certified	Met all critical ERs and FRs. Full compliance of DSN Announcements ² not met. Operational impact is minor.	
	TPC 2-Wire Digital (Proprietary)	No	Certified	Met all ERs and FRs except for full compliance of DSN Announcements. ² Operational impact is minor.	
	Voice over Internet Protocol IEEE 802.3, H.323	No	Certified	Met all ERs and FRs except for IPv6 capability. ³	
	Network Management Interfaces				
	Interface & Signaling	Critical	Status	Remarks	
CAT 5 TPC IEEE 802.3 10BaseT Ethernet, TCP/IP	No	Certified	Met all ERs and FRs.		
TPC EIA-232 Asynchronous @ 9.6 kbps	No	Certified	Met all ERs and FRs.		
TPC X.25 or BX.25 Synchronous	No	Not Tested			
Defense Red Switch Network Gateway	Trunk Interfaces				
	Interface & Signaling	Critical	Status	Remarks	
	2-Wire Analog Loop	Yes	Certified	Met all critical ERs and FRs.	
Tactical Network Gateway	Trunk Interfaces				
	Interface & Signaling	Critical	Status	Remarks	
		PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	No	Certified	Met all ERs and FRs.
		PCM-30 E1 HDB3 CAS MFR1	No	Certified	Met all ERs and FRs.
	Analog E&M Signaling Type I	No	Certified	Met all ERs and FRs.	

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Table 4. Interoperability Status (continued)

NATO Gateway	Trunk Interfaces																																															
	Interface & Signaling	Critical	Status	Remarks																																												
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Commercial Network Gateway	Trunk Interfaces																																															
	Interface & Signaling	Critical	Status	Remarks																																												
	Same Interfaces and Signaling as DSN	Yes	Certified	See note 4.																																												
<p>Legend:</p> <table border="0"> <tr> <td>10BaseT - Ethernet Based Operation, Twisted Pair</td> <td>IEEE 802.3 - IEEE Ethernet protocol</td> </tr> <tr> <td>AMI - Alternate Mark Inversion</td> <td>IPv4 - Internet Protocol version 4</td> </tr> <tr> <td>ANSI - American National Standards Institute</td> <td>IPv6 - Internet Protocol version 6</td> </tr> <tr> <td>B8ZS - Bipolar Eight Zero Substitution</td> <td>ISDN - Integrated Services Digital Network</td> </tr> <tr> <td>BRI - Basic Rate Interface</td> <td>ITU - International Telecommunications Union</td> </tr> <tr> <td>CAS - Channel Associated Signaling</td> <td>kbps - kilobits per second</td> </tr> <tr> <td>CAT - Category</td> <td>Mbps - Megabits per second</td> </tr> <tr> <td>DISN - Defense Information Systems Network</td> <td>MFR1 - Multi-Frequency R1</td> </tr> <tr> <td>DP - Dial Pulse</td> <td>NATO - North Atlantic Treaty Organization</td> </tr> <tr> <td>DSN - Defense Switched Network</td> <td>PCM-24 - Pulse Code Modulation 24 Channels</td> </tr> <tr> <td>DTMF - Dual Tone Multi-Frequency</td> <td>PCM-30 - Pulse Code Modulation 30 Channels</td> </tr> <tr> <td>E1 - European Basic Rate (2.048 Mbps)</td> <td>PRI - Primary Rate Interface</td> </tr> <tr> <td>E&M - Ear and Mouth</td> <td>Q.931 - ITU Signaling Standard for ISDN</td> </tr> <tr> <td>EIA - Electronic Industries Alliance</td> <td>SF - Superframe</td> </tr> <tr> <td>ERs - Exchange Requirements</td> <td>SS7 - Signaling System 7</td> </tr> <tr> <td>ESF - Extended Superframe</td> <td>ST - ISDN BRI Four-Wire Interface</td> </tr> <tr> <td>FRs - Functional Requirements</td> <td>SUT - System Under Test</td> </tr> <tr> <td>GSCR - Generic Switching Center Requirements</td> <td>T1 - Digital Transmission Link level 1 (1.544 Mbps)</td> </tr> <tr> <td>GSTP - Generic Switch Test Plan</td> <td>T1.619a - SS7 and ISDN Signaling Standard for T1</td> </tr> <tr> <td>H.323 - Standard for multi-media communications on packet-based networks</td> <td>TCP/IP - Transmission Control Protocol/Internet Protocol</td> </tr> <tr> <td>HDB3 - High Density Bi-Polar Three</td> <td>TPC - Twisted Pair Copper</td> </tr> <tr> <td>IEEE - Institute of Electrical and Electronic Engineers, Inc.</td> <td>U - ISDN BRI Two-Wire Interface</td> </tr> </table> <p>Notes:</p> <ol style="list-style-type: none"> 1 ISDN supplemental services currently not used in the DISN. The operational impact is none. 2 Met all DSN Announcement requirements except for Isolation Code Announcement. The SUT provides this announcement only for precedence calls above ROUTINE. ROUTINE precedence calls receive a fast busy signal. 3 The SUT met all ER and FR requirements with the exception of IPv6 capability. The operational impact is minor. IPv6 is currently not used in the DSN and the DISN is scheduled to be completely converted from IPv4 to IPv6 in 2008. 4 The certification of interoperability with commercial networks was verified based on the review of the vendor's letter of compliance to requirements identified as the "Letter" and "Verify" items listed in appendix E of the GSTP and specified in tables 2-1 through 2-15 of the GSCR. 					10BaseT - Ethernet Based Operation, Twisted Pair	IEEE 802.3 - IEEE Ethernet protocol	AMI - Alternate Mark Inversion	IPv4 - Internet Protocol version 4	ANSI - American National Standards Institute	IPv6 - Internet Protocol version 6	B8ZS - Bipolar Eight Zero Substitution	ISDN - Integrated Services Digital Network	BRI - Basic Rate Interface	ITU - International Telecommunications Union	CAS - Channel Associated Signaling	kbps - kilobits per second	CAT - Category	Mbps - Megabits per second	DISN - Defense Information Systems Network	MFR1 - Multi-Frequency R1	DP - Dial Pulse	NATO - North Atlantic Treaty Organization	DSN - Defense Switched Network	PCM-24 - Pulse Code Modulation 24 Channels	DTMF - Dual Tone Multi-Frequency	PCM-30 - Pulse Code Modulation 30 Channels	E1 - European Basic Rate (2.048 Mbps)	PRI - Primary Rate Interface	E&M - Ear and Mouth	Q.931 - ITU Signaling Standard for ISDN	EIA - Electronic Industries Alliance	SF - Superframe	ERs - Exchange Requirements	SS7 - Signaling System 7	ESF - Extended Superframe	ST - ISDN BRI Four-Wire Interface	FRs - Functional Requirements	SUT - System Under Test	GSCR - Generic Switching Center Requirements	T1 - Digital Transmission Link level 1 (1.544 Mbps)	GSTP - Generic Switch Test Plan	T1.619a - SS7 and ISDN Signaling Standard for T1	H.323 - Standard for multi-media communications on packet-based networks	TCP/IP - Transmission Control Protocol/Internet Protocol	HDB3 - High Density Bi-Polar Three	TPC - Twisted Pair Copper	IEEE - Institute of Electrical and Electronic Engineers, Inc.	U - ISDN BRI Two-Wire Interface
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Table 5. Exchange and Functional Requirements

	Trunk Interfaces	
	Interface & Signaling	Exchange & Functional Requirements
Defense Switched Network	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DTMF	<ul style="list-style-type: none"> - MLPP - Hotline services - System Interface <ul style="list-style-type: none"> • Non-secure Voice and Data • Secure Voice and Data (STU-III and STE) • NX56 and NX64 Synchronous Data • Non-secure and Secure FAX • VTC • Alarms - Integrated Services Digital Network (<i>ISDN PRI only</i>) - Attendant services¹ - System Administration, Measurements, and Service Standards - Y2K (Rollover, Valid, and Invalid Dates) - Screening, Zone Restriction, and DSN Access Restriction - Automated Message Accounting - Network Integration - Common Data Channel (<i>TI and EI CAS only</i>) - ANSI T1.619a (<i>TI ISDN PRI</i>)
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DP	
	PCM-30 E1 CAS HDB3 MFR1	
	PCM-24 T1 B8ZS/ESF ISDN PRI	
	Analog E&M Signaling Type I	
	Line Interfaces	
	Interface & Signaling	Exchange & Functional Requirements
	TPC ISDN BRI ST and U Interface Q.931	<ul style="list-style-type: none"> - MLPP - Hotline services - ANSI T1.619a - ISDN supplemental services - Call Treatments - DSN Announcements - Attendant services¹ - EKTS - VTC - NX56 and NX64 Synchronous Data - Non-secure Voice and Data - Secure Voice and Data (STE)
TPC 2-Wire analog	<ul style="list-style-type: none"> - MLPP - Hotline services - DSN Announcements - Traffic Measurements - Attendant services¹ - Call Treatments - Non-secure Voice and Data - Non-secure and Secure FAX - Secure Voice and Data (STU-III and STE) 	
TPC 2-Wire Digital and Analog (Proprietary)	<ul style="list-style-type: none"> - MLPP - Hotline services - DSN Announcements - Traffic Measurements - Attendant services¹ - Call Treatments - Non-secure Voice 	
Voice over Internet Protocol IEEE 802.3 H.323	<ul style="list-style-type: none"> - MLPP - Hotline services - DSN Announcements - Traffic Measurements - Attendant services² - Call Treatments - Non-secure Voice - C2 Voice Grade Local Area Network² 	

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Table 5. Exchange and Functional Requirements (continued)

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	CAT 5 TPC IEEE 802.3 10BaseT Ethernet, TCP/IP	- Automated Message Accounting - Traffic Measurements																																																																																																
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Defense Red Switch Network Gateway	Trunk Interfaces																																																																																																	
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DTMF	- Dual Tone Multi-Frequency	PRI	- Primary Rate Interface																																																																																															
E1	- European Basic Multiplex Rate (2.048 Mbps)	Q.931	- ITU Signaling Standard for ISDN																																																																																															
E&M	- Ear and Mouth	SF	- Superframe																																																																																															
EIA	- Electronic Industries Alliance	SS7	- Signaling System 7																																																																																															
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5. 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),

JITC Memo, JTE, Special Interoperability Test Certification of Avaya S8700 with Software Release Call Manager (CM) 2.01 (R012x.00.1.221.1) and G3SI with Software Release CM 2.01 (R012i.00.1.221.1) Digital Switching Systems (Includes Voice over Internet Protocol)

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 Capt. Michel Roy, DSN 821-8575, commercial (520) 533-8575, FAX DSN 879-4347, or e-mail to roym@fhu.disa.mil.

FOR THE COMMANDER:

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Commander, 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) NS53, Memorandum, "DSN Switch Network Management Interface," 26 July 2001
- (d) DISA NS53, Memorandum, "DSN Network Management Requirements for End Offices," 2 August 2001
- (e) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01B, "Policy for Department of Defense Voice Services," 23 September 2001
- (f) DISA, Joint Interoperability and Engineering Organization (JIEO), Technical Report 8249, "Defense Information Systems Network (DISN) Circuit Switched Subsystem, Defense Switched Network (DSN) Generic Switching Center Requirements (GSCR)," March 1997
- (g) DISA NS53, Memorandum, "DSN Global Network Requirements for Tandem (Standalone), Multifunction, End Office, and Small End Office Switches," 30 January 2003
- (h) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP)," 17 June 1999
- (i) DISA, "GSCR, Appendix 3, DSN Voice over Internet Protocol (VoIP Requirements)," 08 September 2003

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Avaya S8700 Digital Switching System with Software Release R012x.00.1.221.1 (hereinafter referred to as the system under test [SUT]).

2. PROPONENT. Defense Information Systems Agency (DISA).

3. PROGRAM MANAGER. Mr. Howard Osman, GS23, Room 5W23, 5275 Leesburg Pike, Falls Church, VA 22041, E-mail: Osmanh@ncr.disa.mil.

4. TESTERS. Joint Interoperability Test Command (JITC), Fort Huachuca, AZ.

5. SYSTEM UNDER TEST DESCRIPTION. The Avaya Digital Switching System product line, in addition to the S8700, includes the G3SI. The Avaya G3SI digital switching system employs the same software and trunk/line card hardware as the SUT. JITC analysis determined the G3SI to be functionally identical for interoperability certification purposes and the G3SI with Software Release R012i.00.1.221.1 is also certified as interoperable for joint use within the Defense Switched Network (DSN). The switching systems and their respective software releases covered under this certification are listed in table 2-1. These two platforms utilize the same software and trunk/line card hardware and were developed to satisfy scalability requirements. The Avaya switch product line offers a Remote Switch Unit (RSU) capability referred to as the Survivable Remote Processor Expansion Port Network. Preliminary testing was performed on this capability but is not covered by this certification. This product line also offers a Voice over Internet Protocol (VoIP) capability. Testing was performed on VoIP and is covered by this certification. Avaya's G3SI digital switching systems are currently in use within the Defense Information Systems Network (DISN) providing Small End Office (SMEO) Switch and Private Branch Exchange (PBX) functionality. If a switch satisfies SMEO criteria, it will satisfy the lesser standards of a PBX.

6. OPERATIONAL ARCHITECTURE. The Generic Switching Center Requirements (GSCR) operational DSN Architecture is depicted in figure 2-1.

Table 2-1. Certified Avaya DEFINITY Software Releases

Software Release	Software Medium	Switch Platform
R012x.00.1.221.1 (See note)	Optical Disk	Avaya S8700
R012i.00.1.221.1 (See note)	PCMCIA	Avaya G3SI

Legend:
PCMCIA – Personal Computer Memory Card International Association

Note: The software is the same; however, Avaya distinguishes the different mediums and platforms by the 5th character of the Software Release (e.g., "x" or "i").

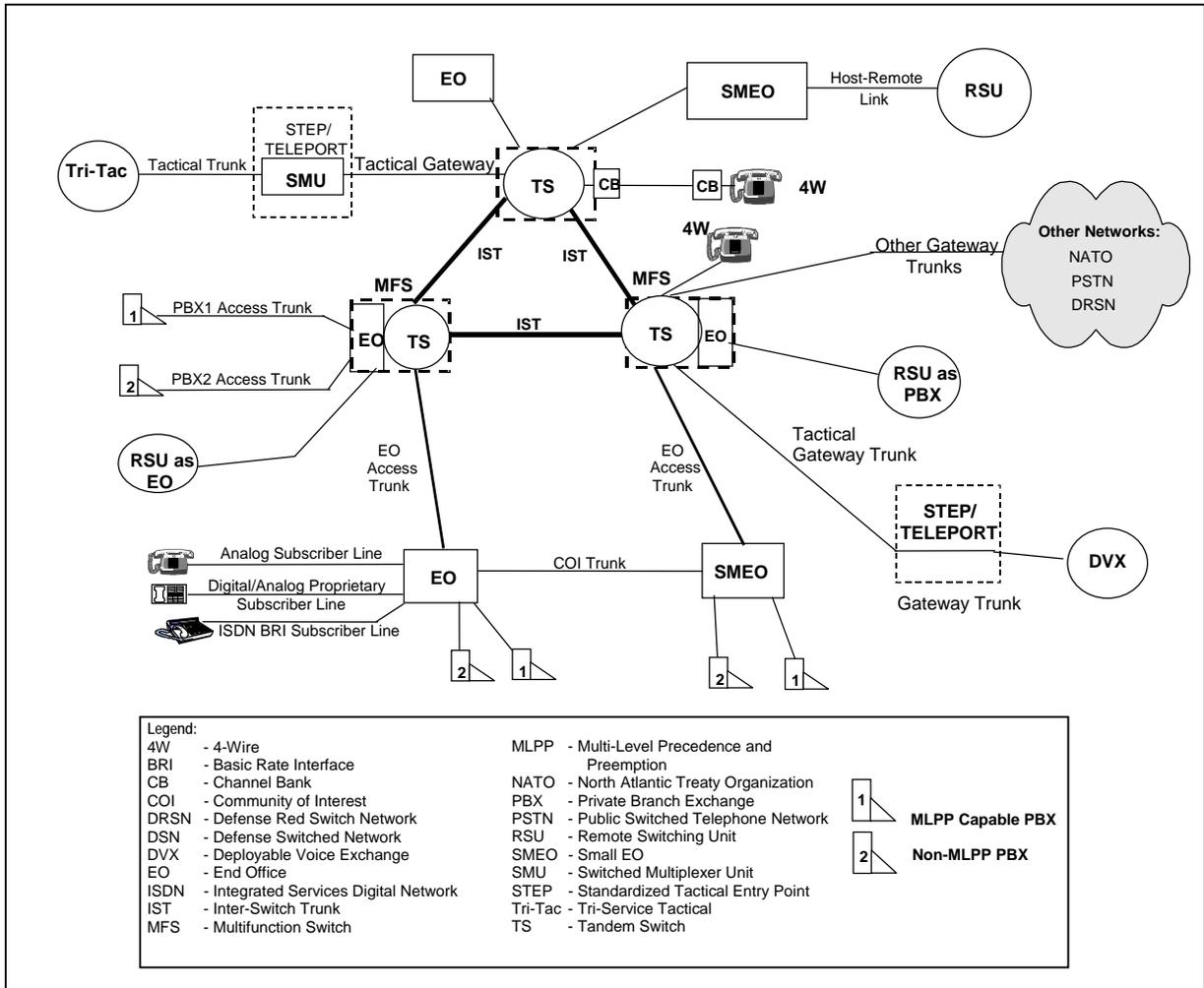


Figure 2-1. DSN Architecture

7. REQUIRED SYSTEM INTERFACES. This interoperability test status is based upon evaluation of the network interfaces as specified in:

- a. The Chairman of the Joint Chiefs of Staff (CJCS) policy for Department of Defense voice services: DSN, Defense Red Switch Network (DRSN) Gateway, Tactical Network Gateway, North Atlantic Treaty Organization (NATO) Gateway, and Commercial Network Gateway.
- b. Interface and signaling requirements for trunk, line, and network management derived from the GSCR document.
- c. Interoperability Exchange Requirements (ERs) and Functional Requirements (FRs) derived from the GSCR.
- d. The overall system interoperability performance.

The ERs and FRs for the CJCS network interfaces are indicated in table 2-2. The criticality and certification status of these interfaces can be found in paragraph 11. The test summary can be found in paragraph 11b.

Table 2-2. Exchange and Functional Requirements

Defense Switched Network	Trunk Interfaces		
	Interface & Signaling	Critical	Exchange and Functional Requirements
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DTMF	Yes	<ul style="list-style-type: none"> - MLPP - Hotline services - System Interface <ul style="list-style-type: none"> • Non-secure Voice and Data • Secure Voice and Data (STU-III and STE) • NX56 and NX64 Synchronous Data • Non-secure and Secure FAX • VTC • Alarms - Integrated Services Digital Network (<i>ISDN PRI only</i>) - Attendant services¹ - System Administration, Measurements, and Service Standards - Y2K (Rollover, Valid, and Invalid Dates) - Screening, Zone Restriction, and DSN Access Restriction - Automated Message Accounting - Network Integration - Common Data Channel (<i>T1 and E1 CAS only</i>) - ANSI T1.619a (<i>T1 ISDN PRI only</i>)
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	Yes	
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DP	Yes	
	PCM-30 E1 CAS HDB3 MFR1	No	
	PCM-24 T1 B8ZS/ESF ISDN PRI	Yes	
	Analog E&M Signaling Type I	No	
	Line Interfaces		
	Interface & Signaling	Critical	Exchange and Functional Requirements
TPC ISDN BRI ST and U Interface Q.931	Yes	<ul style="list-style-type: none"> - MLPP - Hotline services - ANSI T1.619a - ISDN supplemental services - Call Treatments - DSN Announcements - Attendant services¹ - EKTS - VTC - NX56 and NX64 Synchronous Data - Non-secure Voice and Data - Secure Voice and Data (STE) 	
TPC 2-Wire analog	Yes		
TPC 2-Wire Digital and Analog (Proprietary)	No		

Table 2-2. Exchange and Functional Requirements (continued)

Defense Switched Network (continued)	Line Interfaces (continued)		
	Interface & Signaling	Critical	Exchange and Functional Requirements
	Voice over Internet Protocol IEEE 802.3, H.323	No	<ul style="list-style-type: none"> - MLPP - Hotline services - DSN Announcements - Traffic Measurements - Attendant services¹ - Call Treatments - Non-secure Voice - C2 Voice Grade Local Area Network²
Network Management Interfaces			
Interface & Signaling	Critical	Exchange and Functional Requirements	
CAT 5 TPC IEEE 802.3 10BaseT Ethernet, TCP/IP	No	<ul style="list-style-type: none"> - Automated Message Accounting - Traffic Measurements - Alarms (<i>TCP/IP interface only</i>) - Man Machine Language 	
TPC EIA-232 Asynchronous @ 9.6 kbps	No		
Defense Red Switch Network Gateway	Trunk Interfaces		
	Interface & Signaling	Critical	Exchange and Functional Requirements
	2-Wire Analog Loop	Yes	<ul style="list-style-type: none"> - MLPP - Secure Voice
Tactical Network Gateway	Trunk Interfaces		
	Interface & Signaling	Critical	Exchange and Functional Requirements
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	No	<ul style="list-style-type: none"> - MLPP - Non-secure Voice
	PCM-30 E1 HDB3 CAS MFR1	No	
Analog E&M Signaling Type I	No		
NATO Gateway	Interface & Signaling	Critical	Exchange and Functional Requirements
	Not tested	No	See note 3.

Table 2-2. Exchange and Functional Requirements (continued)

Commercial Network Gateway	Interface & Signaling	Critical	Exchange and Functional Requirements																																																																																																				
		Same Interfaces and Signaling as DSN	Yes	See note 4.																																																																																																			
<p>Legend:</p> <table border="0"> <tr> <td>10BaseT</td> <td>- Ethernet Based Operation, Twisted Pair</td> <td>kbps</td> <td>- kilobits per second</td> </tr> <tr> <td>AMI</td> <td>- Alternate Mark Inversion</td> <td>Mbps</td> <td>- Megabits per second</td> </tr> <tr> <td>ANSI</td> <td>- American National Standards Institute</td> <td>MFR1</td> <td>- Multi-Frequency R1</td> </tr> <tr> <td>B8ZS</td> <td>- Bipolar Eight Zero Substitution</td> <td>MLPP</td> <td>- Multi-Level Precedence and Preemption</td> </tr> <tr> <td>BRI</td> <td>- Basic Rate Interface</td> <td>NATO</td> <td>- North Atlantic Treaty Organization</td> </tr> <tr> <td>C2</td> <td>- Command and Control</td> <td>NX56</td> <td>- Data format restricted to multiples of 56 kbps</td> </tr> <tr> <td>CAS</td> <td>- Channel Associated Signaling</td> <td>NX64</td> <td>- Data format restricted to multiples of 64 kbps</td> </tr> <tr> <td>CAT</td> <td>- Category</td> <td>PCM-24</td> <td>- Pulse Code Modulation 24 Channels</td> </tr> <tr> <td>DP</td> <td>- Dial Pulse</td> <td>PCM-30</td> <td>- Pulse Code Modulation 30 Channels</td> </tr> <tr> <td>DSN</td> <td>- Defense Switched Network</td> <td>PRI</td> <td>- Primary Rate Interface</td> </tr> <tr> <td>DTMF</td> <td>- Dual Tone Multi-Frequency</td> <td>Q.931</td> <td>- ITU Signaling Standard for ISDN</td> </tr> <tr> <td>E1</td> <td>- European Basic Rate (2.048 Mbps)</td> <td>SF</td> <td>- Superframe</td> </tr> <tr> <td>E&M</td> <td>- Ear and Mouth</td> <td>SS7</td> <td>- Signaling System 7</td> </tr> <tr> <td>EIA</td> <td>- Electronic Industries Alliance</td> <td>ST</td> <td>- ISDN BRI Four-Wire Interface</td> </tr> <tr> <td>EKTS</td> <td>- Electronic Key Telephone System</td> <td>STE</td> <td>- Secure Terminal Equipment</td> </tr> <tr> <td>ESF</td> <td>- Extended Superframe</td> <td>STU-III</td> <td>- Secure Telephone Unit-III</td> </tr> <tr> <td>FAX</td> <td>- Facsimile</td> <td>SUT</td> <td>- System Under Test</td> </tr> <tr> <td>GSCR</td> <td>- Generic Switching Center Requirements</td> <td>T1</td> <td>- Digital Transmission Link level 1 (1.544 Mbps)</td> </tr> <tr> <td>GSTP</td> <td>- Generic Switch Test Plan</td> <td>T1.619a</td> <td>- SS7 and ISDN Signaling Standard for T1</td> </tr> <tr> <td>H.323</td> <td>- Standard for multi-media communications on packet-based networks</td> <td>TCP/IP</td> <td>- Transmission Control Protocol/Internet Protocol</td> </tr> <tr> <td>HDB3</td> <td>- High Density Bipolar Three</td> <td>TPC</td> <td>- Twisted Pair Copper</td> </tr> <tr> <td>IEEE</td> <td>- Institute of Electrical and Electronics Engineers, Inc.</td> <td>U</td> <td>- ISDN BRI Two-Wire Interface</td> </tr> <tr> <td>IEEE 802.3</td> <td>- IEEE Ethernet protocol</td> <td>VTC</td> <td>- Video Teleconferencing</td> </tr> <tr> <td>ISDN</td> <td>- Integrated Services Digital Network</td> <td>Y2K</td> <td>- Year 2000</td> </tr> <tr> <td>ITU</td> <td>- International Telecommunications Union</td> <td></td> <td></td> </tr> </table> <p>Notes:</p> <ol style="list-style-type: none"> 1 The SUT meets all the GSCR exchange requirements for attendant services with the following console: Lucent Attendant Console Model 302C. 2 Refer to table 2-4 for the C2 VG LAN certified components. 3 NATO interface requirements are in accordance with the GSCR, paragraph 10.8. Not all switches are required to perform this function. 4 The certification of interoperability with commercial networks was verified based on the review of the vendor's letter of compliance to requirements identified as the "Letter" and "Verify" items listed in appendix E of the GSTP and specified in tables 2-1 through 2-15 of the GSCR. 				10BaseT	- Ethernet Based Operation, Twisted Pair	kbps	- kilobits per second	AMI	- Alternate Mark Inversion	Mbps	- Megabits per second	ANSI	- American National Standards Institute	MFR1	- Multi-Frequency R1	B8ZS	- Bipolar Eight Zero Substitution	MLPP	- Multi-Level Precedence and Preemption	BRI	- Basic Rate Interface	NATO	- North Atlantic Treaty Organization	C2	- Command and Control	NX56	- Data format restricted to multiples of 56 kbps	CAS	- Channel Associated Signaling	NX64	- Data format restricted to multiples of 64 kbps	CAT	- Category	PCM-24	- Pulse Code Modulation 24 Channels	DP	- Dial Pulse	PCM-30	- Pulse Code Modulation 30 Channels	DSN	- Defense Switched Network	PRI	- Primary Rate Interface	DTMF	- Dual Tone Multi-Frequency	Q.931	- ITU Signaling Standard for ISDN	E1	- European Basic Rate (2.048 Mbps)	SF	- Superframe	E&M	- Ear and Mouth	SS7	- Signaling System 7	EIA	- Electronic Industries Alliance	ST	- ISDN BRI Four-Wire Interface	EKTS	- Electronic Key Telephone System	STE	- Secure Terminal Equipment	ESF	- Extended Superframe	STU-III	- Secure Telephone Unit-III	FAX	- Facsimile	SUT	- System Under Test	GSCR	- Generic Switching Center Requirements	T1	- Digital Transmission Link level 1 (1.544 Mbps)	GSTP	- Generic Switch Test Plan	T1.619a	- SS7 and ISDN Signaling Standard for T1	H.323	- Standard for multi-media communications on packet-based networks	TCP/IP	- Transmission Control Protocol/Internet Protocol	HDB3	- High Density Bipolar Three	TPC	- Twisted Pair Copper	IEEE	- Institute of Electrical and Electronics Engineers, Inc.	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8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC's facility in a manner and configuration similar to that of the DSN operational environment. This test was conducted using four test configurations shown in figures 2-2 through 2-5. Testing of the system's required functions and features was conducted using the test configuration depicted in figure 2-2. Network integration testing was conducted using the test configuration depicted in figure 2-3. These figures accurately emulate the DSN operational environment. Figure 2-4 depicts the test configuration used to test the Advanced Defense Switched Network Integrated Management Support System network management required functions and features. Testing of the system's Command and Control (C2) Voice Grade (VG) Local Area Network (LAN) was conducted using the test configuration depicted in figure 2-5.

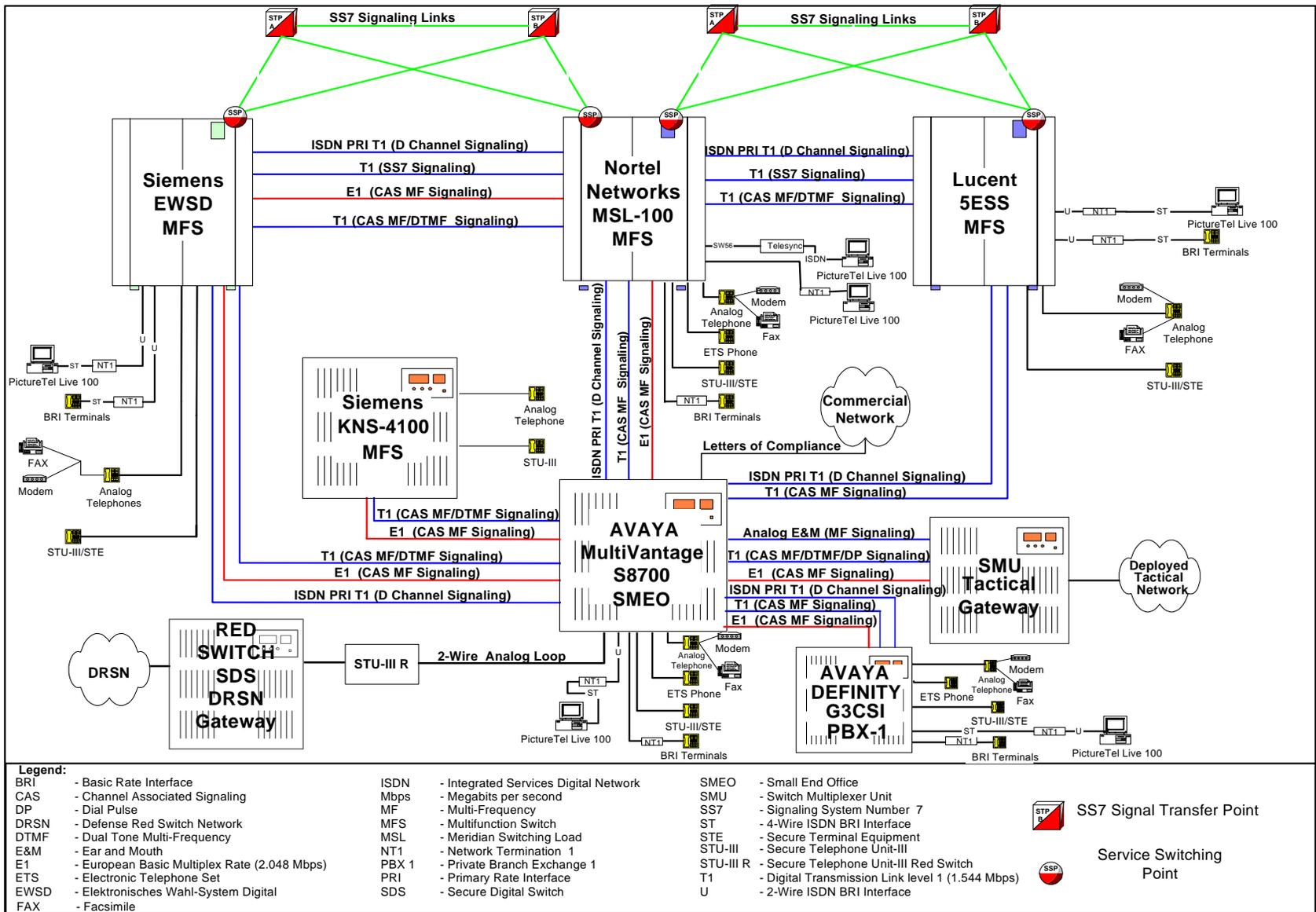


Figure 2-2. Test Configuration

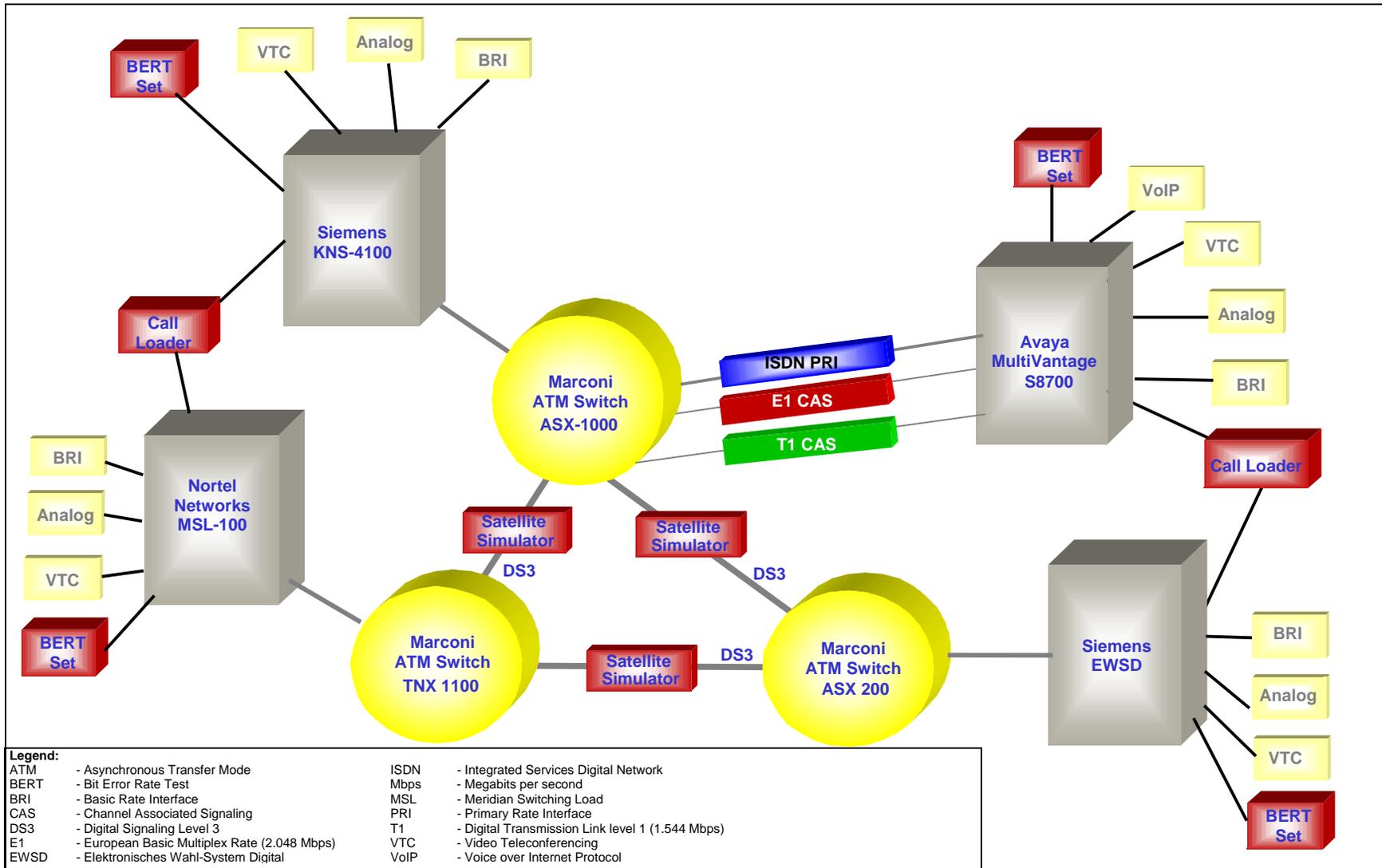


Figure 2-3. Network Integration Test Configuration

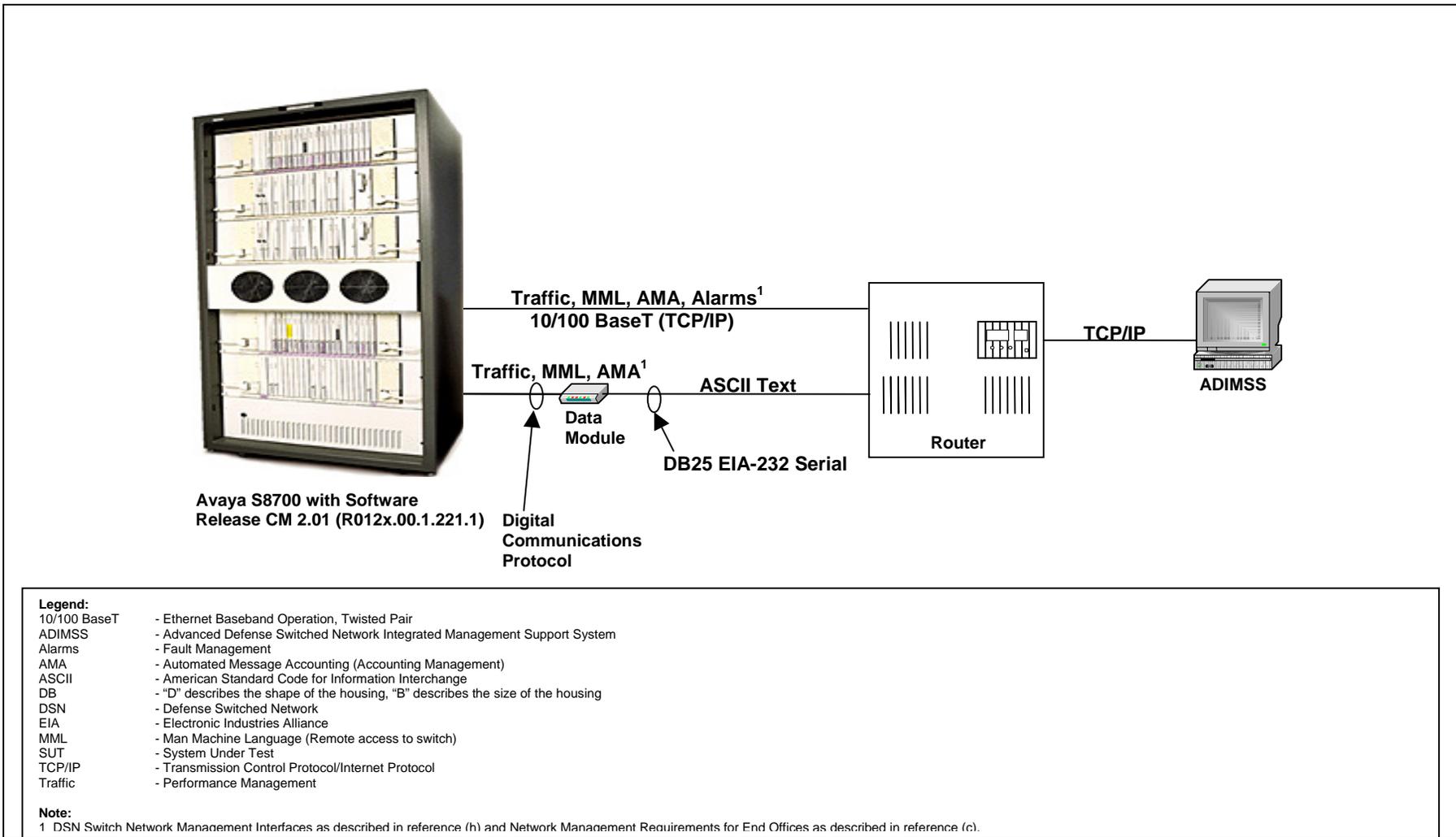


Figure 2-4. The SUT ADIMSS Network Management System Interface

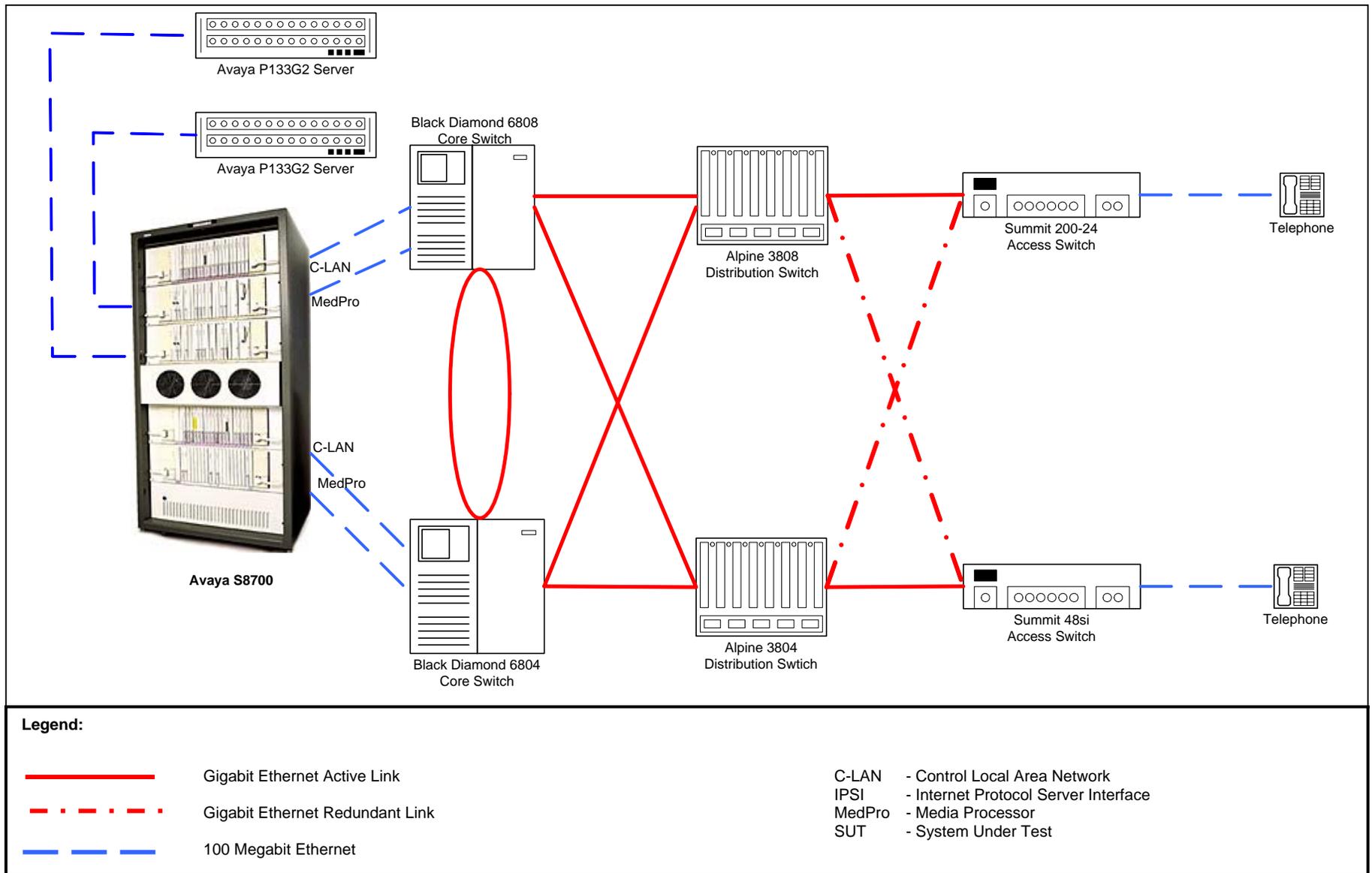


Figure 2-5. The SUT Command and Control Voice Grade Local Area Network

9. SYSTEM CONFIGURATIONS. Table 2-2 provides the system configurations used in the test. Table 2-3 provides the C2 VG LAN certified hardware and software components.

Table 2-3. Tested System Configurations

System Name	Software Release		
Nortel Networks MSL-100	MSL-17		
Avaya S8700	Vintage	Software Release	
Expansion Interface Card TN570D	000005	CM 2.01 (R012x.00.1.221.1)	
Expansion Interface Card TN570C	000003		
Internet Protocol Server Interface Card TN2312AP	HW02 FW006		
Tone Detector Card TN748D	000007		
Tone Clock Card TN2182C	000002		
Media Processor Board TN2302AP	HW03 FW071 HW15 FW072 HW13 FW051		
Announcement Card TN2501AP	HW01 FW007		
Control LAN Card TN799DP	HW01 FW009 HW00 FW010 HW01 FW010		
Analog Card TN793B	000006 000002 000007		
DS1 Interface Card TN464GP	HW06 FW120 HW02 FW120		
Call Classifier Card TN744E	000002		
BRI Line Card TN2198	000003		
Tie Trunk Card TN760E	000002		
Digital Line Card TN754B	000002		
Digital Line Card TN2224B	000011 000018		
Avaya G3CSI, ProLogix (see note)	CM 2.01 (R012i.00.1.221.1)		
Avaya G3SI (see note)	CM 2.01 (R012i.00.1.221.1)		
Siemens EWSD	19d with Patch Set 32		
Siemens KNS-4100	APS4V2.3		
Lucent 5ESS	5E15		
SMU 96 Tactical Gateway	RD302185		
Tekelec STP	23.1		
Nortel Networks Broad Band STP	3.0.3.18d		
DSS Red Switch	8.03		
MARCONI ATM switches	Versions 6.2 and 7.1		
Legend: ATM - Asynchronous Transfer Mode BRI - Basic Rate Interface CM - Communication Manager DS1 - Digital Signal Level 1 DSS - Digital Small Switch EWSD - Elektronisches Wahl-System Digital FW - Firmware HW - Hardware LAN - Local Area Network MSL - Meridian Switching Load SMU - Switch Multiplexer Unit STP - Signal Transfer Point			
Note: All cards listed under the Multivantage S8700 switch are applicable with the exception of the Internet Protocol Server Interface Card TN2312AP.			

Table 2-4. Command and Control Voice Grade Local Area Network Component Hardware and Software

Hardware	Software Release
Extreme Summit 48si	6.2.2B134
Extreme Summit 200-24	6.2E2B16
Extreme Alpine 3804	6.2.2B134
Extreme Alpine 3808	6.2.2B134
Card SMMi (45014)	See Note.
Card GM – 4X (45112)	See Note.
Card GM – 4S (45110)	See Note.
Extreme Black Diamond 6804	6.2.2B134
Extreme Black Diamond 6808	6.2.2B134
Card MSM64 (50015)	See Note.
Card G8X (51032)	See Note.
Card F48T (52011)	See Note.
Phone – 4620IP	DEF 20R2_0
Legend: F - Fast Ethernet G - Gigabit GM - Gigabit Module i - Inferno Chip Set IP - Internet Protocol MSM - Management Switch Module PWR - Power-over-Ethernet SMM - Switch Management Module s - Small Profile T - Twisted pair copper X - Gigabit interface converter based	
Note: There is no software version.	

10. TESTING LIMITATIONS. None

11. TEST RESULTS. Tables 2-5 through 2-10 synopsise the SUT interface ER and FR status and criticality. The identified test discrepancies shown below denote only those test discrepancies that remained open after software patches were applied and regression testing was completed. A detailed description of these discrepancies can be found in paragraph 11a.

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-24 T1 CAS (B8ZS/ESF) (AMI/SF) DTMF	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met
		AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
		CDC	No	II-24.2	See Note	No	Met ²

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-24 T1 CAS (B8ZS/ESF) (AMI/SF) MFR1	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met
		AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
		CDC	No	II-24.2	See note	No	Met ²

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-24 T1 CAS (B8ZS/ESF) (AMI/SF) DP	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met
		AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
		CDC	No	II-24.2	See Note	No	Met ²

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-30 E1 CAS HDB3 MFR1	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met
		AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
		CDC	No	II-24.2	See Note	No	Met ²

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-24 T1 (B8ZS/ESF) ISDN PRI	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		ISDN	No	II-6.2	6.6, 21.1, 21.2, 21.3	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met
		AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
		ANSI T1.619a	Yes	II-6.2	21.3.1	Yes	Met ³

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
Analog E&M Signaling Type I	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4.3 through 4.9	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		System Interface (Alarms, non-secure voice and data, secure voice and data, FAX, VTC)	No	II-4.2	10.1 through 10.12	Yes	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ¹
		System Administration, Measurements, and Service Standards	No	II-8.2	9.1 through 9.5	Yes	Met
		Y2K (Rollover, Valid, Invalid) Dates	No	II-9.2, II-10.2, II-11.2	9.1	Yes	Met
		Screening, Zone Restriction, and DSN Access Restriction	No	II-12.2	5.3.4	Yes	Met

Table 2-5. Defense Switched Network Trunk Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
Analog E&M Signaling Type I (continued)	Certified	AMA	No	II-14.2	8.1	Yes	Met
		Network Integration	No	II-20.2	10	Yes	Met
Legend: AMA - Automated Message Accounting AMI - Alternate Mark Inversion ANSI - American National Standards Institute B8ZS - Bipolar Eight Zero Substitution CAS - Channel Associated Signaling CDC - Common Data Channel DISN - Defense Information Systems Network DP - Dial Pulse DSN - Defense Switched Network DTMF - Dual Tone Multiple-Frequency E1 - European Basic Multiplex Rate (2.048 Mbps) E&M - Ear and Mouth ER - Exchange Requirement ESF - Extended Superframe FAX - Facsimile FR - Functional Requirement GSCR - Generic Switching Center Requirements GSTP - Generic Switch Test Plan HDB3 - High Density Bi-Polar Three ISDN - Integrated Services Digital Network Mbps - Megabits per second MFR1 - Multi-Frequency R1 MLPP - Multi-Level Precedence and Preemption Para - Paragraph PCM - Pulse Code Modulation SF - Superframe SS7 - Signaling System 7 SUT - System Under Test T1 - Digital Transmission Link level 1 (1.544 Mbps) T1.619a - SS7 and ISDN Signaling Standard for T1 VTC - Video Teleconferencing Y2K - Year 2000							
Notes: 1 SUT meets all the GSCR exchange requirements for attendant services with the following console: Lucent Attendant Console Model 302C. 2 CDC is a requirement only for DISN-Europe. Switches that have a requirement to interface to the DSN European KNS-4100 switches must be capable of passing CDC traffic transparently. 3 The SUT will not allow calls between unlike DSN service domains when resources are available. The SUT meets the minimum requirements defined in reference (g). The operational impact is minor.							

Table 2-6. Defense Switched Network Line Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
TPC, ISDN BRI ST and U, Q.931	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		ANSI T1.619a	Yes	II-6.2	21.3.1	Yes	Met ¹
		ISDN supplemental services	Yes	II-6.2	21.3	No	Not Met ²
		Attendant services	No	II-7.2	2.1.3	No	Met ³
		Call Treatments	No	II-15.2	5.2.1.1, 5.2.2.1	Yes	Met
		DSN Announcements	Yes	II-19.2	5.6	Yes	Met ⁴
		Electronic Key Telephone Service	Yes	II-25.5	21.2	No	Met
2-Wire Analog, TPC	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	Yes	Met
		Hotline services	No	II-3.2	21.3.10	No	Met
		Attendant services	No	II-7.2	2.1.3	No	Met ³
		Call Treatments	No	II-15.2	5.2.1.1, 5.2.2.1	Yes	Met
		DSN Announcements	Yes	II-19.2	5.6	Yes	Met ⁴

Table 2-6. Defense Switched Network Line Interface and Exchange Requirements (continued)

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status																																																
2-Wire Proprietary Digital	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	Yes	Met																																																
		Hotline services	No	II-3.2	21.3.10	No	Met																																																
		Attendant services	No	II-7.2	2.1.3	No	Met ³																																																
		Call Treatments	No	II-15.2	5.2.1.1, 5.2.2.1	Yes	Met																																																
		DSN Announcements	Yes	II-19.2	5.6	Yes	Met ⁴																																																
Voice over Internet Protocol IEEE 802.3 H.323	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	No	Met																																																
		Attendant services	Yes	II-7.2	2.1.3	No	Met ¹																																																
		Call Treatments	No	II-15.2	5.2.1.1, 5.2.2.1	No	Met																																																
		DSN Announcements	No	II-19.2	5.6	No	Met																																																
		Command and Control Voice Grade Local Area Network	Yes	D-26	Appendix 3	No	Met ⁵																																																
<p>Legend:</p> <table border="0"> <tr> <td>ANSI</td> <td>- American National Standards Institute</td> <td>ISDN</td> <td>- Integrated Services Digital Network</td> </tr> <tr> <td>BRI</td> <td>- Basic Rate Interface</td> <td>ITU</td> <td>- International Telecommunications Union</td> </tr> <tr> <td>DSN</td> <td>- Defense Switched Network</td> <td>MLPP</td> <td>- Multi-Level Precedence and Preemption</td> </tr> <tr> <td>ER</td> <td>- Exchange Requirement</td> <td>Para</td> <td>- Paragraph</td> </tr> <tr> <td>FR</td> <td>- Functional Requirement</td> <td>Q.931</td> <td>- ITU Signaling Standard for ISDN</td> </tr> <tr> <td>GSCR</td> <td>- Generic Switching Center Requirements</td> <td>SS7</td> <td>- Signaling System 7</td> </tr> <tr> <td>GSTP</td> <td>- Generic Switch Test Plan</td> <td>ST</td> <td>- ISDN BRI Four-wire interface</td> </tr> <tr> <td>H.323</td> <td>- Standard for multi-media communications on packet-based networks</td> <td>SUT</td> <td>- System Under Test</td> </tr> <tr> <td>IEEE</td> <td>- Institute of Electrical and Electronics Engineers, Inc.</td> <td>T1</td> <td>- Digital Transmission Link level 1 (1.544 Mbps)</td> </tr> <tr> <td>IEEE 802.3</td> <td>- IEEE Ethernet protocol</td> <td>T1,619a</td> <td>- SS7 and ISDN Signaling Standard for T1</td> </tr> <tr> <td>IPv4</td> <td>- Internet Protocol version 4</td> <td>TPC</td> <td>- Twisted Pair Copper</td> </tr> <tr> <td>IPv6</td> <td>- Internet Protocol version 6</td> <td>U</td> <td>- ISDN BRI Two-wire interface</td> </tr> </table> <p>Notes:</p> <ol style="list-style-type: none"> SUT will not allow calls between unlike DSN service domains when resources are available. The SUT meets the minimum requirements defined in reference (g). The operational impact is minor. ISDN supplemental services currently not used in the DSN. The operational impact is none. SUT meets all the GSCR exchange requirements for attendant services with the following console: Lucent Attendant Console Model 302C. Met all critical DSN Announcement requirements except for Isolation Code Announcement. The SUT provides this announcement only for precedence calls above ROUTINE. ROUTINE precedence calls receive a fast busy signal. The operational impact is minor. The SUT met all ER and FR requirements with the exception of IPv6 capability. The operational impact is minor. IPv6 is currently not used in the DSN and the DISN is scheduled to be completely converted from IPv4 to IPv6 in 2008. 								ANSI	- American National Standards Institute	ISDN	- Integrated Services Digital Network	BRI	- Basic Rate Interface	ITU	- International Telecommunications Union	DSN	- Defense Switched Network	MLPP	- Multi-Level Precedence and Preemption	ER	- Exchange Requirement	Para	- Paragraph	FR	- Functional Requirement	Q.931	- ITU Signaling Standard for ISDN	GSCR	- Generic Switching Center Requirements	SS7	- Signaling System 7	GSTP	- Generic Switch Test Plan	ST	- ISDN BRI Four-wire interface	H.323	- Standard for multi-media communications on packet-based networks	SUT	- System Under Test	IEEE	- Institute of Electrical and Electronics Engineers, Inc.	T1	- Digital Transmission Link level 1 (1.544 Mbps)	IEEE 802.3	- IEEE Ethernet protocol	T1,619a	- SS7 and ISDN Signaling Standard for T1	IPv4	- Internet Protocol version 4	TPC	- Twisted Pair Copper	IPv6	- Internet Protocol version 6	U	- ISDN BRI Two-wire interface
ANSI	- American National Standards Institute	ISDN	- Integrated Services Digital Network																																																				
BRI	- Basic Rate Interface	ITU	- International Telecommunications Union																																																				
DSN	- Defense Switched Network	MLPP	- Multi-Level Precedence and Preemption																																																				
ER	- Exchange Requirement	Para	- Paragraph																																																				
FR	- Functional Requirement	Q.931	- ITU Signaling Standard for ISDN																																																				
GSCR	- Generic Switching Center Requirements	SS7	- Signaling System 7																																																				
GSTP	- Generic Switch Test Plan	ST	- ISDN BRI Four-wire interface																																																				
H.323	- Standard for multi-media communications on packet-based networks	SUT	- System Under Test																																																				
IEEE	- Institute of Electrical and Electronics Engineers, Inc.	T1	- Digital Transmission Link level 1 (1.544 Mbps)																																																				
IEEE 802.3	- IEEE Ethernet protocol	T1,619a	- SS7 and ISDN Signaling Standard for T1																																																				
IPv4	- Internet Protocol version 4	TPC	- Twisted Pair Copper																																																				
IPv6	- Internet Protocol version 6	U	- ISDN BRI Two-wire interface																																																				

Table 2-7. Defense Switched Network Network Management Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
CAT 5 TPC, IEEE 802.3 10BaseT Ethernet, TCP/IP	Certified	AMA	No	II-23.2	2.1.10, 16.1	Yes	Met
		Alarms	No	II-23.2	2.1.10, 16.1	Yes	Met
		Traffic Measurements	No	II-23.2	2.1.10, 16.1	Yes	Met
		MML	No	II-23.2	2.1.10, 16.1	Yes	Met
TPC EIA-232 Asynchronous @ 9.6 kpbs	Certified	AMA	No	II-23.2	2.1.10, 16.1	Yes	Met
		Traffic Measurements	No	II-23.2	2.1.10, 16.1	Yes	Met
		MML	No	II-23.2	2.1.10, 16.1	Yes	Met
X.25/BX.25		AMA	No	II-23.2	2.1.10, 16.1	No	Not Tested
		Alarms	No	II-23.2	2.1.10, 16.1	No	Not Tested
		Traffic Measurements	No	II-23.2	2.1.10, 16.1	No	Not Tested
		MML	No	II-23.2	2.1.10, 16.1	No	Not Tested

Legend:
10BaseT - 10 megabits per second Ethernet twisted pair
AMA - Automated Message Accounting
CAT - Category 5 cable (rated @ 100 megahertz of bandwidth)
EIA - Electronic Industries Alliance
ER - Exchange Requirement
FR - Functional Requirement
GSCR - Generic Switching Center Requirements
GSTP - Generic Switch Test Plan
IEEE - Institute of Electrical and Electronic Engineers, Inc.
IEEE 802.3 - IEEE Ethernet protocol
kbps - kilobits per second
MML - Man Machine Language
Para - Paragraph
TPC - Twisted Pair Copper
TCP/IP - Transmission Control Protocol/Internet Protocol

Table 2-8. Defense Red Switch Network Gateway Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
TPC 2-Wire analog	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	Yes	Met
		Secure Voice (STU-III, STE)	No	NA	2.2.1, 5.3.4	Yes	Met
Legend: ER - Exchange Requirement FR - Functional Requirement GSCR - Generic Switching Center Requirements GSTP - Generic Switch Test Plan MLPP - Multi-Level Precedence and Preemption Para - Paragraph STE - Secure Terminal Equipment STU-III - Secure Telephone Unit-III TPC - Twisted Pair Copper							

Table 2-9. Tactical Network Gateway Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
PCM-24 T1 (B8ZS/ESF) (AMI/SF) MFR1, DTMF	Certified	MLPP	No	II-2.2	2.2.1, 5.3.4	Yes	Met
PCM-30 E1 HDB3 CAS		Non-secure Voice	No	NA	2.2.1, 5.3.4	Yes	Met
Analog E&M Type I							
Legend: AMI - Alternate Mark Inversion B8ZS - Bipolar Eight Zero Substitution CAS - Channel Associated Signaling DTMF - Dual Tone Multi-Frequency E1 - European Basic Multiplex Rate (2.048 Mbps) E&M - Ear and Mouth ER - Exchange Requirement ESF - Extended Superframe FR - Functional Requirement GSCR - Generic Switching Center Requirements GSTP - Generic Switch Test Plan HDB3 - High Density Bi-Polar Three Mbps - Megabits per second MFR1 - Multi-Frequency R1 MLPP - Multi-Level Precedence and Preemption Para - Paragraph PCM-24 - Pulse Code Modulation Twenty-Four channels PCM-30 - Pulse Code Modulation Thirty Channels SF - Superframe T1 - Digital Transmission Link level 1 (1.544 Mbps)							

Table 2-10. Commercial Network Gateway Interface and Exchange Requirements

Interface & Signaling	Interface Status	Exchange and Functional Requirements	Test Discrepancies	GSTP Para(s)	GSCR Para(s)	Critical Yes/No	ER/FR Status
Same Interfaces Signaling as DSN	Certified	See Note	No	See Note	See Note	Yes	Met
<p>Legend: DSN - Defense Switched Network ER - Exchange Requirement FR - Functional Requirement GSCR - Generic Switching Center Requirements GSTP - Generic Switch Test Plan Para - Paragraph</p> <p>Note: The certification of interoperability with commercial networks was verified based on the review of the vendor's letter of compliance to requirements identified as the "Letter" and "Verify" items listed in appendix E of the GSTP and specified in tables 2-1 through 2-15 of the GSCR.</p>							

a. Discussion

(1) **DSN.** The SUT meets all the exchange requirements for Network Management (NM) over Institute of Electrical and Electronic Engineers, Inc. (IEEE) 802.3 (10BaseT Ethernet) Transmission Control Protocol/Internet Protocol (TCP/IP) and EIA-232 asynchronous serial interfaces. It was verified that these interfaces pass required NM data elements per reference (c). All critical interface ERs and FRs for DSN were met. The following minor exceptions are noted:

(a) The SUT does not support the following unique Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) supplemental services as specified in the respective GSCR paragraphs listed below. There are currently no switches in the DISN that support ISDN BRI supplemental services. The operational impact is none.

1. Conference Calling. GSCR Para. 21.3.2
2. User-to-User Signaling. GSCR Para. 21.3.3
3. Call Hold. GSCR Para. 21.3.4
4. Call Waiting. GSCR Para. 21.3.5
5. Normal Call Transfer. GSCR Para. 21.3.6
6. Explicit Call Transfer. GSCR Para. 21.3.7
7. ISDN Call Deflection. GSCR Para. 21.3.8
8. Preset Conference Calling. GSCR Para. 21.3.11

(b) The SUT does not support the Isolation Code Announcement (ICA) for ROUTINE precedence calls. ROUTINE precedence calls receive a fast busy tone rather than the required ICA. The ICA is received by calls above ROUTINE precedence. The operational impact is minor.

(c) The SUT does not support precedence ring cadence on a call transfer. When a routine call is transferred at a precedence level, the far-end instrument will not receive a precedence ring although the call still connects at the correct precedence level. The operational impact is minor.

(d) The SUT does not support correct preemption of a three-way call. After establishing a three-way call at a routine precedence level, when one of the three legs is preempted, all three legs receive precedence notification tone and are dropped. The operational impact is minor.

(e) The SUT does not support ten-digit interswitch dialing without dialing the "94" access code. When a user dials a ten-digit number, the access code "94" must prefix the number. The operational impact is minor.

(f) When the connection is broken to the active, internet protocol server interface, all active calls (e.g., VoIP, analog, digital, and ISDN) remain connected; however, any new attempted calls placed immediately after the link is restored fail to receive dial tone for a period of 5-15 seconds. The operational impact is minor.

(g) The SUT sends “Restart” messages when busying out American National Standards Institute T.619a PRI. The SUT should only send out a “Restart” message on an idle request or reestablishment of the T1 span. The operational impact is minor.

(2) DRSN Gateway. All critical interface ERs and FRs for the DRSN gateway were met.

(3) Tactical Gateway. All critical interface ERs and FRs for the tactical gateway were met.

(4) NATO Gateway. The NATO Gateway interfaces were not tested.

(5) Commercial Gateway. The certification of interoperability with commercial networks was verified based on the review of the vendor’s letter of compliance to requirements identified as the “Letter” and “Verify” items listed in appendix E of the Generic Switch Test Plan and specified in tables 2-1 through 2-15 of the GSCR, with minor exceptions. Exceptions were reviewed and assessed by the DISA, Gig Combat Support Services (GS) 23, the Development and Operational Engineering Department, and determined to have a minor operational impact.

(6) VoIP. The SUT VoIP solution comprises of the S8700 Time Division Multiplexing (TDM) circuit switch and the LAN as shown in figure 2-5. The LAN infrastructure was made up of the Extreme Networks equipment listed in table 2-4. The results for the overall VoIP system and LAN, as defined by the GSCR, appendix 3, are presented below.

(a) **VoIP System.** GSCR, appendix 3, section A3.2, outlines the requirements for the VoIP system. The VoIP system requirements encompass end-to-end VoIP requirements (i.e., encompasses both the circuit switch and LAN). The following paragraphs detail the results of the SUT VoIP solution.

1. **Voice Quality.** In accordance with the GSCR, appendix 3, VoIP calls shall have an average Mean Opinion Score (MOS) score of at least 4.0 as measured over a 5-minute period. For intra-switch calls, the SUT VoIP solution had a MOS of 4.28. Inter-switch calls had a MOS of 4.29. This average was based a total of 50 intra-switch and inter-switch calls.

2. **Codec.** Per the GSCR, appendix 3, section A3.2.2, the G.711 Pulse-Code Modulation (PCM) codec was required and was met by the SUT VoIP solution.

3. **Multi-Level Precedence and Preemption (MLPP).** The GSCR, section 3, details the requirements for MLPP. All critical MLPP features and functions were met by the SUT VoIP system. There currently there are no mature standards for MLPP over Internet Protocol (IP), requiring the vendor to implement proprietary IP signaling.

4. Security. Security requirements per the GSCR, appendix 3, were verified using the Information Assurance Test Plan (IATP). Results of the security testing are reported in a separate test report generated by the DISA Information Assurance test personnel.

5. NM. The GSCR, appendix 3, defines the overall NM requirements that VoIP systems must meet. The SUT VoIP system met these NM requirements. The switching system NM requirements per the GSCR, section 9, were also met by the SUT.

6. Synchronization. Synchronization is required for overall voice platforms to include VoIP systems. For the SUT solution, synchronization per the GSCR, section 11, was met. The SUT derived synchronization with line timing mode via traditional TDM based interfaces (i.e., T1 or E1 digital).

7. Latency. The requirement for one-way system latency for the VoIP system is 60 milliseconds (msec) or less as averaged over any 5-minute period. The latency requirement is measured from IP handset to the egress trunk. The SUT average latency over 60 calls was measured to be 50.15 msec.

8. Internet Protocol version 6 (IPv6). The GSCR, appendix 3, states that the C2 LAN components must be IPv6 capable. The VoIP components provided did not support this requirement. The operational impact is minor due to the fact that IPv6 is not currently implemented within the DSN and is not scheduled to be fully implemented until 2008.

(b) **Local Area Network.** The SUT/Extreme LAN solution as shown in figure 2-5 and table 2-4 met the minimum interoperability requirements of the GSCR, appendix 3. The network consisted of three main components: the core switches, distribution switches and access switches. The Extreme networks LAN solution used several industry standards to provide resiliency and quality of service.

1. Design

a. Delay. Per the GSCR, appendix 3, section A3.3.1.1, the one-way packet delay, the amount of time a packet takes to traverse the network, will be 5 msec or less, as measured over a 5-minute period. The averaged one-way delay measured in the SUT VoIP solution was 2.5 msec.

b. Jitter. The SUT utilizes a dynamic jitter buffer in both the 4620IP phones and its IP Media Processor (MedPro) boards. These buffers automatically adjust depending on the amount of jitter within the network. With a 40% bandwidth load, no jitter was measured.

c. Packet Loss. Network packet loss occurs when packets are sent, but not received at the final destination. The GSCR, appendix 3, states that LANs shall be engineered so the measured voice packet loss within the LAN shall not exceed

0.05% averaged over any 5-minute period. With 40% bandwidth load, the measured packet loss was 0.00% for the Extreme Networks LAN infrastructure utilized.

d. Class of Service (CoS) and Quality of Service (QoS). The GSCR, appendix 3, outlines several methodologies to implement CoS and QoS. 802.1p/Q at the Data Link Layer (L2) and Differentiated Services Code Point (DSCP) at the Network Layer (L3) were two CoS mechanisms that the Extreme Networks products employed. The SUT/Extreme solution provides CoS by assignment of an 802.1p/Q tag. Switches within the topology were configured with multiple Virtual LANs (VLANs) to separate data from voice traffic. 802.1Q tags were used to uniquely identify and separate traffic as it passed through network connections. Voice VLAN traffic was assigned to a high priority queue, ensuring voice traffic took precedence over data traffic. For DSCP, L2 audio/signaling was set for 6 and L3 audio/signaling was set for 46 in the tested configuration.

2. Traffic Engineering

a. SUT's IP MedPro cards have a limitation in that they can only support 64 IP subscribers and still meet DSN assured connectivity requirements. To determine the number of MedPro cards per switch, the following formula must be used:

$$\text{Total number of MedPro cards} = \text{total VoIP users} / 64.$$

For redundancy purposes, the number of MedPro cards shall be implemented on an n+1 basis (i.e., for 64 users require 2 MedPro cards).

b. To determine the number of C-LAN cards needed to support IP subscribers use:

$$\text{Total number of C-LAN cards} = \text{number of VoIP users} / 250.$$

This based on the manufacturer recommendation that no more than 250 users per C-LAN Card be assigned. C-LAN cards shall also be implemented on an n+1 basis to meet redundancy requirements.

c. Core to Core. Ethernet Automatic Protection Switching (EAPS) RFC 3619, was implemented between the two core routers allowing the redundant transport of layer 2 VLAN traffic while providing sub-second fail over. EAPS is a ring technology that is designed to minimize network re-convergence time. EAPS utilizes master and transit nodes that are physically connected into a ring configuration. The master sends a hello packet out the primary port and blocks the secondary port upon receiving the packet, thus ensuring the ring is complete. If a transit node detects a failed link, a packet is sent to the master, which in turns unblocks the master port and sends a signal for all nodes to flush their forwarding databases.

d. Core to Distribution. The Extreme Networks LAN used Open Shortest Path First, Equal Cost Multi-Path (OSPF ECMP). This protocol allowed all routers to share traffic loads, while having active paths to all routers in the core. This protocol played a key role under the failed conditions testing because the routing tables were pre-populated alleviating the time needed to learn alternate paths.

e. Distribution to Access. Access switches require layer 2 and 3 redundancy to ensure traffic integrity. The GSCR, appendix 3, requires that LAN devices provide a redundancy protocol for the distribution and core devices. Extreme Stand by Router Protocol ESRP, layer 2 traffic is blocked, preventing loops within the network. The technology exists between the two distribution switches, so any edge switch will be compatible with the topology.

3. Management. The GSCR, appendix 3, requires that the vendor provide a management system to monitor the performance of the LAN portion of the VoIP system. This requirement was verified via a letter of compliance because of the numerous third party systems and applications capable of performing this function.

4. Phones. The only SUT phone, which met all requirements for certification, was the 4620IP phone. Although the phones are capable of shared access (i.e., same switch port is shared by Personal Computer (PC) and IP phone), the dedicated access was tested (separate ports for phones and PCs).

5. Scalability. The SUT can support 200 MedPro cards, which limits the maximum IP subscribers to 12,800. However, the manufacturer recommendation is not to exceed 12,000 users. The SUT C2 VG LAN solution tested consisted of one Black Diamond 6808, one Black Diamond 6804, one Alpine 3808, one Alpine 3804, one Summit 48si, and one Summit 200-24, as shown in figure 2-5. For implementation purposes, the C2 VG LAN can be scaled to meet the 12,800 IP phone subscribers as long as it is comprised of the equipment and software listed, and meets the traffic engineering constraints contained in the GSCR, appendix 3.

b. Test Summary. The Avaya S8700 and G3SI Digital Switching Systems with their associated software releases listed in table 2-1, are certified for joint use in the DSN, in accordance with the requirements set forth in the GSCR. Minor discrepancies identified during testing and the GSCR requirements not tested will have no adverse operational impact. The interoperability summary and status to include criticality for each interface is shown in tables 2-11 and 2-12.

12. TEST AND ANALYSIS REPORT. No detailed test report was developed per 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>.

Table 2-11. The SUT Interoperability Summary

Network	Status	Remarks
DSN	Certified	- Certified for VoIP with C2 Voice Grade Local Area Network (See note). - Certified as SMEO & PBX1. - RSU not certified. - E1 CAS and CDC certified (DISN-E only). - The identified test discrepancies listed in enclosure 2 that remained opened have an overall operational impact of minor.
DRSN Gateway	Certified	
Tactical Gateway	Certified	
NATO Gateway	Not Tested	
Commercial Gateway	Certified	
Legend: C2 - Command and Control CAS - Channel Associated Signaling CDC - Common Data Channel DRSN - Defense Red Switch Network DISN-E - Defense Information System Network Europe DSN - Defense Switched Network E1 - European Basic Rate (2.048 Mbps) LAN - Local Area Network Mbps - Megabits per second NATO - North Atlantic Treaty Organization PBX1 - Private Branch Exchange 1 RSU - Remote Switching Unit SMEO - Small End Office SUT - System Under Test T1 - Digital Transmission Link level 1 (1.544 Mbps) VG - Voice Grade VoIP - Voice over Internet Protocol		
Note: Refer to table 2-4 for the C2 VG LAN certified components.		

Table 2-12. Interoperability Status

Defense Switched Network	Trunk Interfaces			
	Interface & Signaling	Critical	Status	Remarks
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DTMF	Yes	Certified	Met all critical ERs and FRs.
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	Yes	Certified	Met all critical ERs and FRs.
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS DP	Yes	Certified	Met all critical ERs and FRs.
	PCM-30 E1 CAS HDB3 MFR1	Yes	Certified	Met all critical ERs and FRs.
	PCM-24 T1 (B8ZS/ESF) ISDN PRI	Yes	Certified	Met all critical ERs and FRs.
	Analog E&M Signaling Type I	No	Certified	Met all critical ERs and FRs.
	Line Interfaces			
	Interface & Signaling	Critical	Status	Remarks
TPC ISDN BRI ST and U Interface Q.931	Yes	Certified	Met all critical ERs and FRs. ISDN supplemental services ¹ and full compliance of DSN Announcements ² not met. Operational impact is minor.	
TPC 2-Wire analog	Yes	Certified	Met all critical ERs and FRs. Full compliance of DSN Announcements ² not met. Operational impact is minor.	
TPC 2-Wire Digital (Proprietary)	No	Certified	Met all critical ERs and FRs. Full compliance of DSN Announcements ² not met. Operational impact is minor.	
Voice over Internet Protocol IEEE 802.3, H.323	No	Certified	Met all critical ERs and FRs except for IPv6 capability. ³	

Table 2-12. Interoperability Status (continued)

Defense Switched Network (continued)	Network Management Interfaces			
	Interface & Signaling	Critical	Status	Remarks
	CAT 5 TPC IEEE 802.3 10BaseT Ethernet, TCP/IP	Yes	Certified	Met all critical ERs and FRs.
	TPC EIA-232 Asynchronous @ 9.6 kbps	Yes	Certified	Met all critical ERs and FRs.
Defense Red Switch Network Gateway	Trunk Interfaces			
	Interface & Signaling	Critical	Status	Remarks
	2-Wire Analog Loop	Yes	Certified	Met all critical ERs and FRs.
Tactical Network Gateway	Trunk Interfaces			
	Interface & Signaling	Critical	Status	Remarks
	PCM-24 T1 (B8ZS/ESF) (AMI/SF) CAS MFR1	No	Certified	Met all critical ERs and FRs.
	PCM-30 E1 HDB3 CAS MFR1	No	Certified	Met all critical ERs and FRs.
Analog E&M Signaling Type I	No	Certified	Met all critical ERs and FRs.	
NATO Gateway	Trunk Interfaces			
	Interface & Signaling	Critical	Status	Remarks
		No	Not Tested	Operational impact is minor.
Commercial Network Gateway	Trunk Interfaces			
	Interface & Signaling	Critical	Status	Remarks
	Same Interfaces and Signaling as DSN	Yes	Certified	See note 4.

Legend:

10BaseT - Ethernet Based Operation, Twisted Pair	IEEE 802.3 - IEEE Ethernet protocol
AMI - Alternate Mark Inversion	IPv4 - Internet Protocol version 4
ANSI - American National Standards Institute	IPv6 - Internet Protocol version 6
B8ZS - Bipolar Eight Zero Substitution	ISDN - Integrated Services Digital Network
BRI - Basic Rate Interface	ITU - International Telecommunications Union
CAS - Channel Associated Signaling	kbps - kilobits per second
CAT - Category	Mbps - Megabits per second
DP - Dial Pulse	MFR1 - Multi-Frequency R1
DISN - Defense Information Systems Network	NATO - North Atlantic Treaty Organization
DSN - Defense Switched Network	PCM-24 - Pulse Code Modulation 24 Channels
DTMF - Dual Tone Multi-Frequency	PCM-30 - Pulse Code Modulation 30 Channels
E1 - European Basic Multiplex Rate (2.048 Mbps)	PRI - Primary Rate Interface
E&M - Ear and Mouth	Q.931 - ITU Signaling Standard for ISDN
EIA - Electronic Industries Alliance	SF - Superframe
ERs - Exchange Requirements	SS7 - Signaling System 7
ESF - Extended Superframe	ST - ISDN BRI Four-Wire Interface
FRs - Functional Requirements	SUT - System Under Test
GSCR - Generic Switching Center Requirements	T1 - Digital Transmission Link level 1 (1.544 Mbps)
GSTP - Generic Switch Test Plan	T1.619a - SS7 and ISDN Signaling Standard for T1
H.323 - Standard for multi-media communications on packet-based networks	TPC - Twisted Pair Copper
HDB3 - High Density Bi-Polar Three	TCP/IP - Transmission Control Protocol/Internet Protocol
IEEE - Institute of Electrical and Electronic Engineers, Inc.	U - ISDN BRI Two-Wire Interface

Notes:

- 1 ISDN supplemental services currently not used in the DISN. The operational impact is minor.
- 2 Met all DSN Announcement requirements except for Isolation Code Announcement. The SUT provides this announcement only for precedence calls above ROUTINE. ROUTINE precedence calls receive a fast busy signal.
- 3 The SUT met all ER and FR requirements with the exception of IPv6 capability. The operational impact is minor. IPv6 is currently not used in the DSN and the DISN is scheduled to be completely converted from IPv4 to IPv6 in 2008.
- 4 The certification of interoperability with commercial networks was verified based on the review of the vendor's letter of compliance to requirements identified as the "Letter" and "Verify" items listed in appendix E of the GSTP specified in tables 2-1 through 2-15 of the GSCR.