

APPENDIX E

CONFIGURATIONS AND DETAILED TEST PROCEDURES

E-5 VOICE OVER INTERNET PROTOCOL (VoIP). VoIP is a conditional requirement in that vendors need not provide a capability for IP telephony. However, if provided all the requirements listed in tables D-5.1 and D-5.2 must be met to be certified for VoIP to be certified as being interoperable in the Defense switched Network (DSN). VoIP requirements are contained in Appendix to the Generic Switching Center Requirements document.

Table E-5. VoIP System Information

Switch Category (MFS, EOS, SMEO, PBX1, PBX2):	
LAN Category (C2 Voice Grade, Voice Grade):	
Converged or non-converged:	
VoIP Switch Type (enabled, centric):	

Table E-5.1. VoIP Systems Test Procedures

Ref #	Configuration and/or Diagram	Test Procedure(s)	Expected Result(s)
A	System Design:	a. VoIP system supports G.711 PCM codec. b. VoIP system components support IPv6. c. Review VoIP Design.	a. G.711 codec. Y/N
	Requirement: Conditional GSCR Reference: App. 3		b. IPv6 compliant. Y/N c. More than 64 users served at any single point of failure.
			10 Mbps links, serve no more than: <u>Non-Converged:</u> (C2VGLAN) - 64 users. Y/N (VGLAN) – 100 users. Y/N
			10 Mbps Link Pairs, serve no more than: <u>Non-Converged:</u> (C2VGLAN) – 1024 users. Y/N (VGLAN) – 1024 users. Y/N
			100 Mbps links, serve no more than: <u>Non-Converged & Converged:</u> (C2VGLAN) - 64 users. Y/N (VGLAN) - 1024 users. Y/N
			100 Mbps Link Pairs, serve no more than: <u>Non-Converged:</u> (C2VGLAN) – 1024 users. Y/N (VGLAN) – 1024 users. Y/N <u>Converged:</u> (C2VGLAN) – 256 users. Y/N (VGLAN) – 1024 users. Y/N

Table E-5.1. VoIP Systems Test Procedures (continued)

Ref #	Configuration and/or Diagram		Test Procedure(s)	Expected Result(s)
A c o n t i n u e d	System Design (continued):			1 Gbps serve no more than: <u>Non-Converged:</u> (C2VGLAN) – 64 users. Y/N (VGLAN) – 1024 users. Y/N <u>Converged:</u> (C2VGLAN) – 64 users. Y/N (VGLAN) – 1024 users. Y/N 1Gbps Link Pairs, serve no more than: <u>Non-Converged & Converged:</u> (C2VGLAN) - 1024 users. Y/N (VGLAN) – 1024 users. Y/N Does the C2 LAN have redundant power supplies for equipment that serves more than 64 users, which will prevent any loss of ongoing functions within the chassis? (Excludes PBX2) Y/N Does the C2 LAN have Dual Processors for equipment that serves more than 64 users (excludes PBX2). Y/N Is a Security Technical Implementation Guide (STIG) defined for LAN configuration under test? Y/N Has applicable STIG requirements been applied to systems under test? Y/N
	Requirement: Conditional	GSCR Reference: App. 3		

Table E-5.1. VoIP Systems Test Procedures (continued)

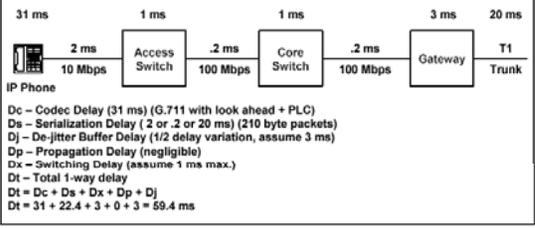
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B	<p>VoIP System Line Timing:</p> <p>Requirement: Conditional GSCR Reference: App. 3</p> <p>Configure SUT to draw timing off of incoming line for all line types appropriate to the switch type</p>	<p>a. SUT shall have the capability to directly derive timing from a terminating synchronous signal. This source of timing shall be used to time all transmitted synchronous signals.</p> <p>b. SUT shall provide the user the capability to provision any of its synchronous interfaces as a synchronization source.</p> <p>c. With the exception of those containing stratum 4 clocks (SMEO and PBX1), SUTs that support line timing shall provide the capability for the user to provision more than one synchronous interface (if present) as a synchronization reference (e.g., one DS1 interface as "reference A" and another as "reference B").</p> <p>d. Conduct a 1 hour BERT test between ON and DN.</p> <p>Notes:</p>	<p>a.</p> <table border="1" data-bbox="1417 267 1963 397"> <tr> <td></td> <td>T1 SS7</td> <td>E1 SS7</td> <td>T1 CAS</td> <td>E1 CAS</td> <td>T1 PRI</td> <td>E1 PRI</td> </tr> <tr> <td>Line Timing</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>BER</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </table> <p>b. SUT can draw timing from any synchronous Interface. Y/N</p> <p>c. SUT supports multiple timing reference. Y/N</p> <p>d. Less than 1 error in 10⁹ bits Y/N</p>		T1 SS7	E1 SS7	T1 CAS	E1 CAS	T1 PRI	E1 PRI	Line Timing	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	BER	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N												
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C	<p>End-to-end Latency:</p> <p>Requirement: Conditional GSCR Reference: App. 3</p>	<p>a. Conduct end-to-end latency measurement.</p> <p>Notes:</p>	<p>a. Less than 60 ms Y/N</p>																																	
																																				
<p>Legend:</p> <table border="0"> <tr> <td>App. – Appendix</td> <td>IPv6 – Internet Protocol Version 6</td> <td>PRI – Primary Rate Interface</td> </tr> <tr> <td>BER – Bit Error Rate</td> <td>LAN – Local Area Network</td> <td>SMEO – Small End Office</td> </tr> <tr> <td>BERT – Bit Error Rate Test</td> <td>Mbps – Megabits per second</td> <td>SS7 – Signaling System 7</td> </tr> <tr> <td>C2 – Command and Control</td> <td>MLPP – Multi-Level Precedence and Preemption</td> <td>STIG – Security Technical Implementation Guide</td> </tr> <tr> <td>C2VGLAN – Command and Control Voice Grade LAN</td> <td>ms – Milliseconds</td> <td>SUT – System Under Test</td> </tr> <tr> <td>CAS – Channel Associated signaling</td> <td>N – No</td> <td>T1 – North American Transmission Standard (1.544 Mbps)</td> </tr> <tr> <td>DN – Destination Node</td> <td>ON – Origination Node</td> <td>TP – Test Procedure</td> </tr> <tr> <td>DS1 – Digital System Level 1 (1.544 Mbps)</td> <td>PBX – Private Branch Exchange</td> <td>VGLAN – Voice Grade LAN</td> </tr> <tr> <td>E1 – European Transmission Standard (2.048 Mbps)</td> <td>PBX1 – Private Branch Exchange Type 1 (MLPP)</td> <td>VoIP – Voice over Internet Protocol</td> </tr> <tr> <td>Gbps – Gigabits per second</td> <td>PBX2 – Private Branch Exchange Type 2 (non-MLPP)</td> <td>Y – Yes</td> </tr> <tr> <td>GSCR – Generic Switching Center Requirements</td> <td>PCM – Pulse Code Modulation</td> <td></td> </tr> </table>				App. – Appendix	IPv6 – Internet Protocol Version 6	PRI – Primary Rate Interface	BER – Bit Error Rate	LAN – Local Area Network	SMEO – Small End Office	BERT – Bit Error Rate Test	Mbps – Megabits per second	SS7 – Signaling System 7	C2 – Command and Control	MLPP – Multi-Level Precedence and Preemption	STIG – Security Technical Implementation Guide	C2VGLAN – Command and Control Voice Grade LAN	ms – Milliseconds	SUT – System Under Test	CAS – Channel Associated signaling	N – No	T1 – North American Transmission Standard (1.544 Mbps)	DN – Destination Node	ON – Origination Node	TP – Test Procedure	DS1 – Digital System Level 1 (1.544 Mbps)	PBX – Private Branch Exchange	VGLAN – Voice Grade LAN	E1 – European Transmission Standard (2.048 Mbps)	PBX1 – Private Branch Exchange Type 1 (MLPP)	VoIP – Voice over Internet Protocol	Gbps – Gigabits per second	PBX2 – Private Branch Exchange Type 2 (non-MLPP)	Y – Yes	GSCR – Generic Switching Center Requirements	PCM – Pulse Code Modulation	
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Table E-5.2. LAN Test Procedures

Ref #	Configuration and/or Diagram		Test Procedure(s)	Expected Result(s)
A	LAN Parameters:		a. Using the RADCOM Prism lite, perform a jitter test on the C2 LAN.	a. Average Jitter on the C2 LAN 3 ms or less Y/N
	Requirement: Conditional	GSCR Reference: App. 3	b. Using the Smart Bits, perform a Packet Delay test on the LAN, but sending packets from the core switch to an access device.	b. Average delay on the C2 LAN 5 ms or less Y/N
			c. Using the Smart bits, perform a Packet Loss test across the LAN. (run test for 5 mins)	c. C2 LAN have packet loss 0.05% or less (voice packets only) Y/N One way delay: _____ Packet loss _____%
			Notes:	
B	CoS:		a. CoS implemented in network.	a. 802.1p/Q Y/N
	Requirement: Conditional	GSCR Reference: App.3		DSCP Y/N 802.1p to DSCP mapping Y/N IP TOS Y/N
			Notes:	
C	QoS:		QoS implemented in the network.	a. Queuing: Y/N
	Requirement: Conditional	GSCR Reference: App.3	a. Queuing. b. Policing.	Priority Queuing (PQ). Y/N Custom Queuing (CQ). Y/N Weighted Fair Queuing (WFQ). Y/N Class-Based Weighted Fair Queuing (CBWFQ). Y/N
			b. Policing: DiffServ Per-Hop Behavior (PHB). Y/N Generic Traffic Shaping (GTS). Y/N Policy-Based Routing (PBR). Y/N Class-Based Shaping (CBS). Y/N	
			Notes:	

Table E-5.2. LAN Test Procedures (continued)

Ref #	Configuration and/or Diagram		Test Procedure(s)	Expected Result(s)																								
D	VLANS:		VLANS: Network Management and Voice traffic (signaling & media) shall be placed in a separate VLAN from data and video traffic. CoS and QoS measures shall be applied to the network management and the voice VLAN to guarantee bandwidth. Notes:	For converged LANs, support either Implicit or Explicit VLAN membership for: a. Port-based VLANs. Y/N b. MAC address-based VLANs. Y/N c. Layer 3 (or protocol)-based VLANs. Y/N																								
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E	IEEE Conformance:		<table border="1"> <thead> <tr> <th>IEEE Std.</th> <th>Description</th> <th>Supported</th> </tr> </thead> <tbody> <tr> <td>802.1d</td> <td>Bridging</td> <td>Y/N</td> </tr> <tr> <td>802.1p/Q</td> <td>VLAN tagging</td> <td>Y/N</td> </tr> <tr> <td>802.1s</td> <td>Per-VLAN Group Spanning Tree</td> <td>Y/N</td> </tr> <tr> <td>802.1v</td> <td>VLAN classification by protocol or port</td> <td>Y/N</td> </tr> <tr> <td>802.1w</td> <td>Rapid Reconfig of spanning Tree</td> <td>Y/N</td> </tr> <tr> <td>802.1x</td> <td>Port based access control</td> <td>Y/N</td> </tr> <tr> <td>802.3ad</td> <td>Link aggregation protocol</td> <td>Y/N</td> </tr> </tbody> </table> Notes:	IEEE Std.	Description	Supported	802.1d	Bridging	Y/N	802.1p/Q	VLAN tagging	Y/N	802.1s	Per-VLAN Group Spanning Tree	Y/N	802.1v	VLAN classification by protocol or port	Y/N	802.1w	Rapid Reconfig of spanning Tree	Y/N	802.1x	Port based access control	Y/N	802.3ad	Link aggregation protocol	Y/N	
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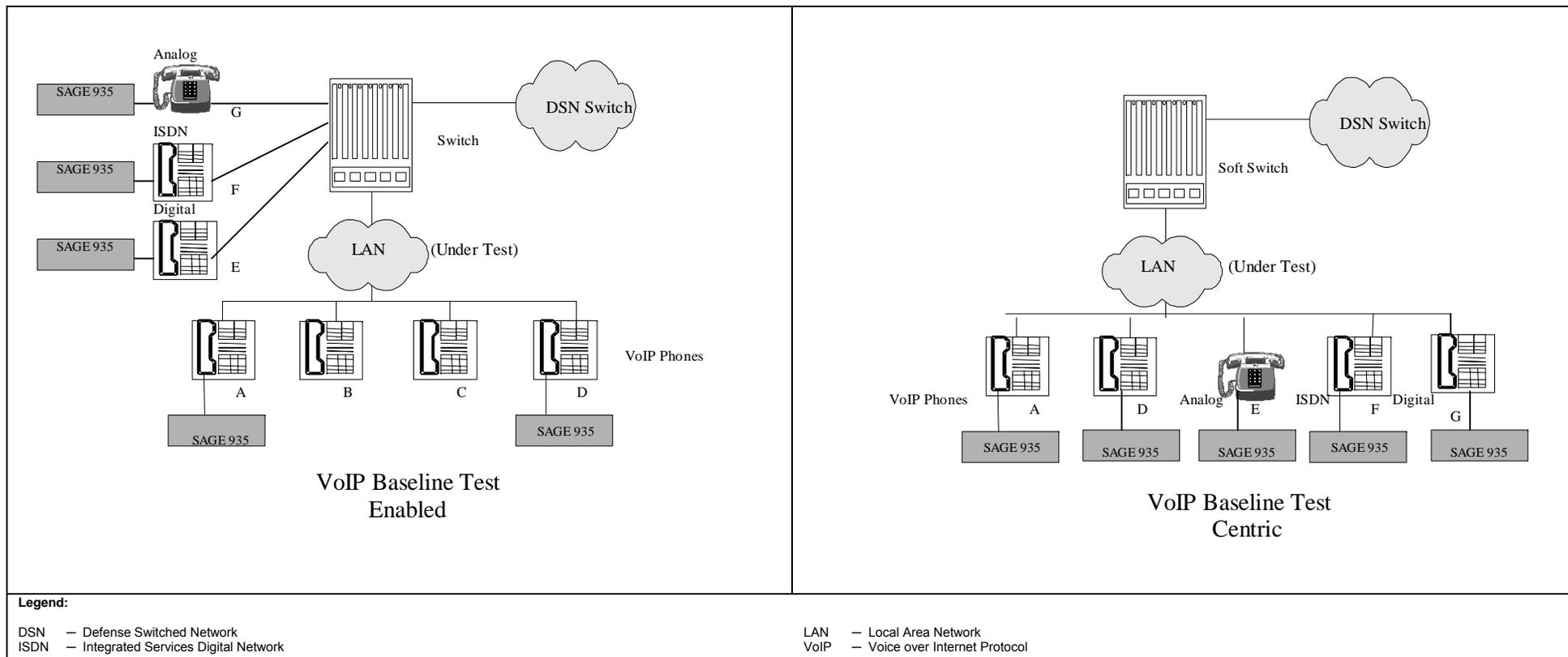


Figure E-5.1. VoIP Intra-switch Test Configuration

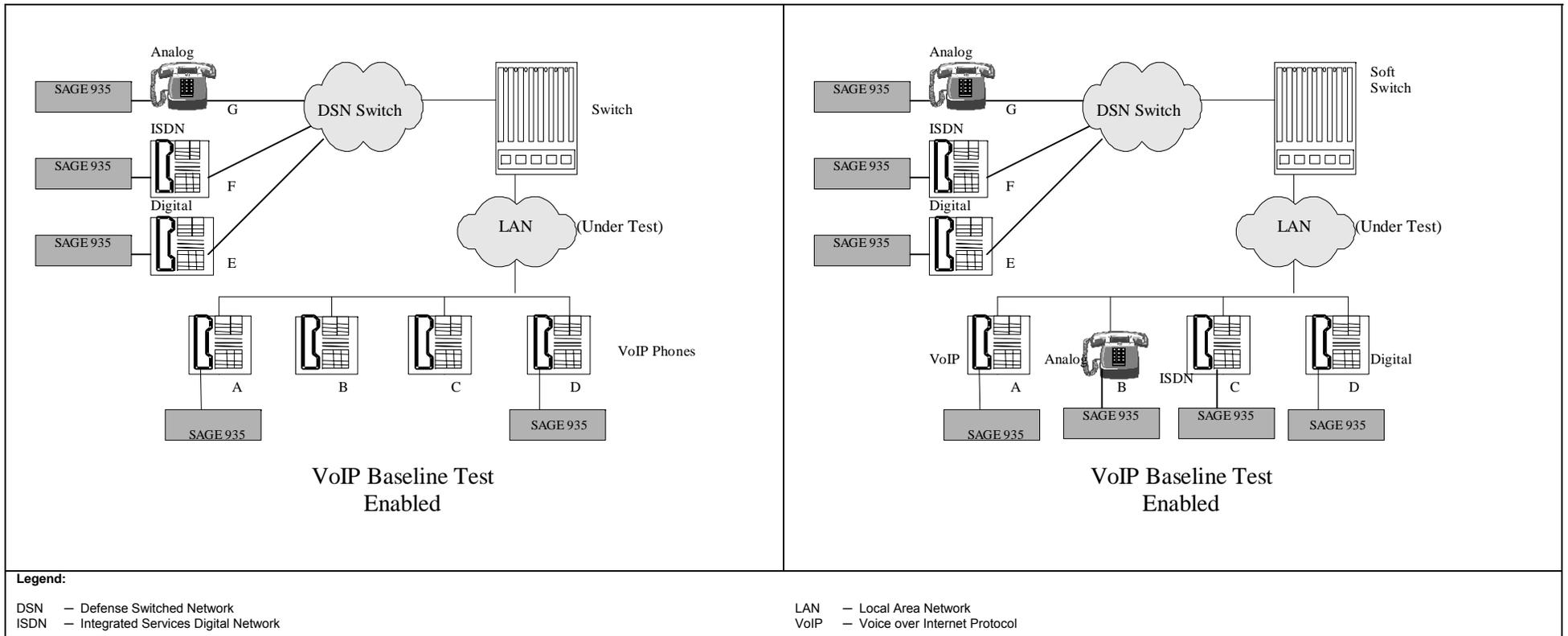


Figure E-5.2. VoIP Inter-switch Test Configuration

Table E-5.2. LAN Test Procedures (continued)

Ref #	Configuration and/or Diagram	Test Procedure(s)	Expected Result(s)																																																																																																																																																																																				
H	<p>Inter-switch Baseline:</p> <p>Requirement: Conditional GSCR Reference: App. 3</p> <p>Configure the network as shown in Figure D5-2. Activate 2 VoIP phones, 1 Analog phone, 1 ISDN phone and 1 Digital phone off of the LAN under test. The Sage 935AT will be used for this test.</p> <p>Configure the VoIP system with hair pinning off, (call will go from IP phone to: IP phone, Analog phone, ISDN phone, and Digital phone.</p>	<p>Using the SAGE 935AT, perform a SMOS test between A and D, A and E, A and F, and A and G.</p> <p>For Centric Switches, also place calls between E to F, E to G, and F to G (complete charts).</p> <p>Using the SAGE 935AT, perform a PVIT test, send -16dB for 15 minutes.</p> <p>Notes:</p>	<table border="1"> <thead> <tr> <th>IP to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>MOS N-F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F-N</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Delay</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Analog to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>MOS N-F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F-N</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Delay</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>ISDN to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>MOS N-F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F-N</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Delay</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Digital to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>MOS N-F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F-N</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Delay</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>IP to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>Frame Loss</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Frame slips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Voice Clips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Noise Hits</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Analog to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>Frame Loss</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Frame slips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Voice Clips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Noise Hits</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>ISDN to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>Frame Loss</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Frame slips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Voice Clips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Noise Hits</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Digital to:</th> <th>IP</th> <th>Analog</th> <th>ISDN</th> <th>Digital</th> </tr> </thead> <tbody> <tr> <td>Frame Loss</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Frame slips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Voice Clips</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Noise Hits</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	IP to:	IP	Analog	ISDN	Digital	MOS N-F					F-N					Delay					Analog to:	IP	Analog	ISDN	Digital	MOS N-F					F-N					Delay					ISDN to:	IP	Analog	ISDN	Digital	MOS N-F					F-N					Delay					Digital to:	IP	Analog	ISDN	Digital	MOS N-F					F-N					Delay					IP to:	IP	Analog	ISDN	Digital	Frame Loss					Frame slips					Voice Clips					Noise Hits					Analog to:	IP	Analog	ISDN	Digital	Frame Loss					Frame slips					Voice Clips					Noise Hits					ISDN to:	IP	Analog	ISDN	Digital	Frame Loss					Frame slips					Voice Clips					Noise Hits					Digital to:	IP	Analog	ISDN	Digital	Frame Loss					Frame slips					Voice Clips					Noise Hits				
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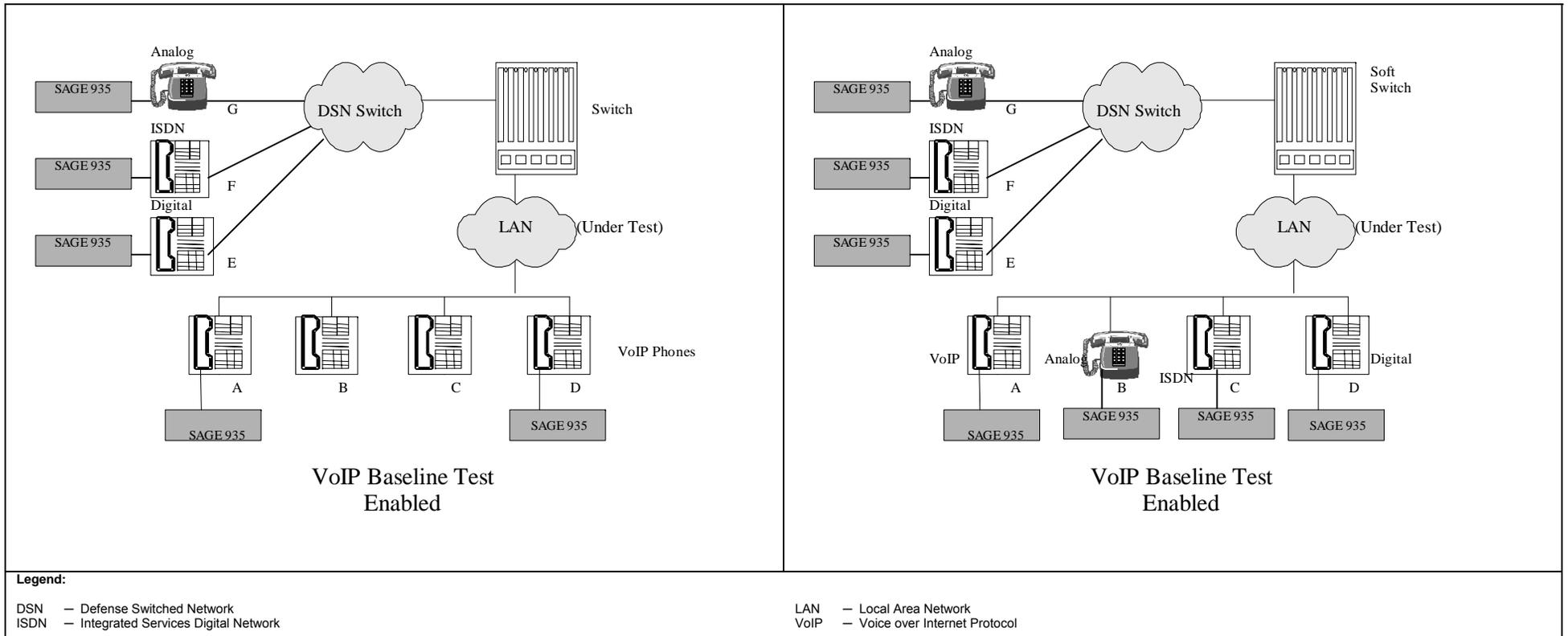


Figure E-5.3. VoIP Inter-switch LAN Load Test Configuration

Table E-5.2. LAN Test Procedures (continued)

Ref #	Configuration and/or Diagram	Test Procedure(s)	Expected Result(s)																																																																				
1	<p>Inter-switch LAN Load:</p> <p>Requirement: Conditional GSCR Reference: App. 3</p>	<p>With LAN bandwidth utilized at 60%, 80%, and 100% (call will go from IP phone to: IP phone, Analog phone, ISDN phone, and Digital phone.</p>	<p>See tables below.</p>																																																																				
	<p>Configure the network as shown in Figure D5-3. Activate 2 VoIP phones, 1 Analog phone, 1 ISDN phone and 1 Digital phone off of the LAN under test. The Sage 935AT will be used for this test.</p>	<p>Using the SAGE 935AT, perform a SMOS test between A and D, A and E, A and F, and A and G.</p>																																																																					
	<p>Expected Results:</p>																																																																						
	<table border="1"> <thead> <tr> <th colspan="2">IP phone to:</th> <th colspan="3">IP</th> <th colspan="3">Analog</th> <th colspan="3">ISDN</th> <th colspan="3">Digital</th> </tr> </thead> <tbody> <tr> <td rowspan="3">M O S</td> <td>% of BW</td> <td>60</td> <td>80</td> <td>100</td> <td>60</td> <td>80</td> <td>100</td> <td>60</td> <td>80</td> <td>100</td> <td>60</td> <td>80</td> <td>100</td> </tr> <tr> <td>Near-Far</td> <td></td> </tr> <tr> <td>Far-Near</td> <td></td> </tr> <tr> <td colspan="2">One-Way Delay(ms)</td> <td></td> </tr> </tbody> </table>			IP phone to:		IP			Analog			ISDN			Digital			M O S	% of BW	60	80	100	60	80	100	60	80	100	60	80	100	Near-Far													Far-Near													One-Way Delay(ms)													
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I c o n t i n u e d	Inter-switch LAN Load:	Using the SAGE 935AT, perform a PVIT test, send -16dB for 15 minutes.	See tables below.																																																																																																																																																																																																																																																																																																																								
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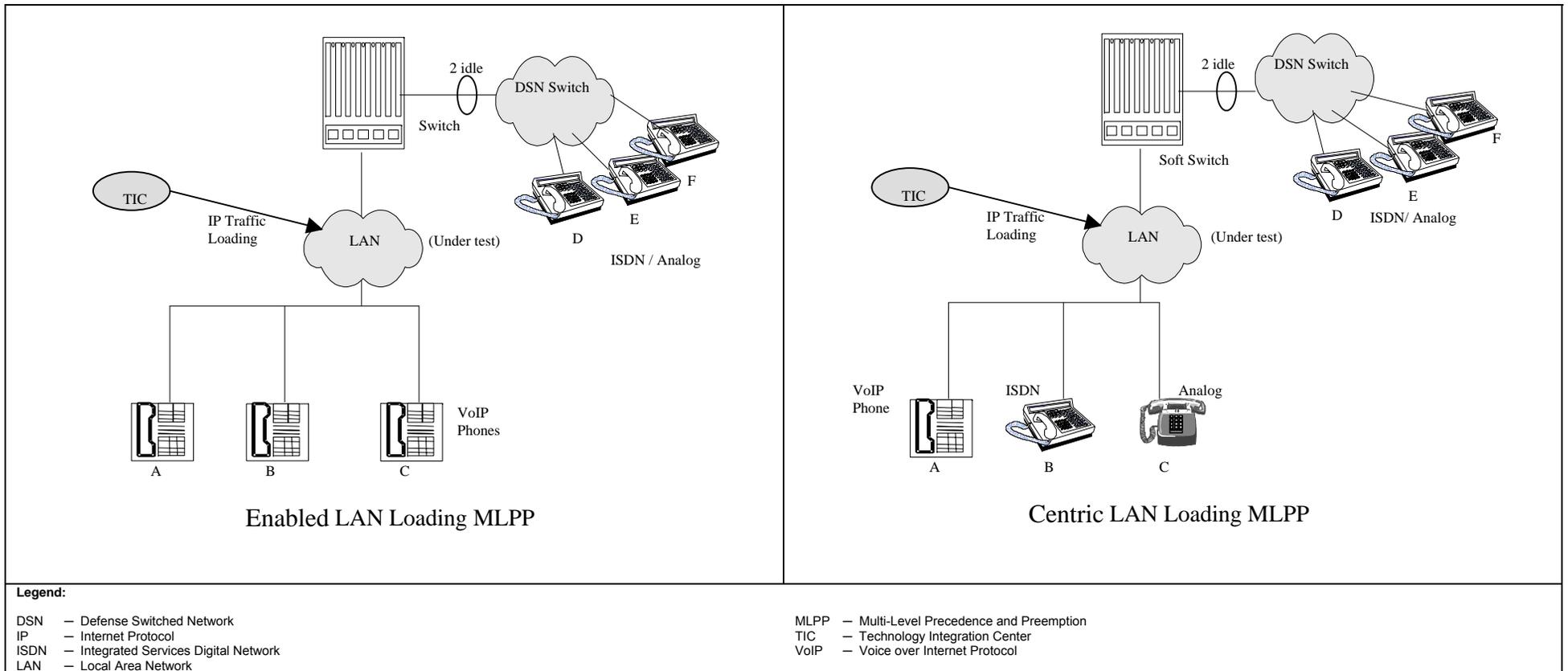


Figure E-5.4. VoIP Inter-switch LAN Loading MLPP Configurations

Table E-5.2. LAN Test Procedures (continued)

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	Requirement: Conditional GSCR Reference: App.3 To perform this test, setup the Network as shown in figure D5-4, for the Enabled or Centric solution. For the Centric solution, if all 3 interfaces are not supported, replace with one that is supported. Using LAN loading, load the LAN to 80% and 100%.	Notes:																																																																																																																																																																																					

Table E-5.2. LAN Test Procedures (continued)

Ref #	Configuration and/or Diagram	Test Procedure(s)	Expected Result(s)																																																																																																																																																						
J c o n t i n u e d	Interswitch LAN loading MLPP:	<p>7. Preempt Not For Reuse Answered (Intra-Switch)</p> <p>a. A Calls C @ Routine: Answer</p> <p>b. B Calls A @ Priority</p> <p>8. Preempt Not For Reuse Unanswered (Intra-Switch)</p> <p>a. A Calls C @ Routine: Don't Answer</p> <p>b. B Calls C @ Priority</p> <p>9. Preempt For Reuse Unanswered (Trunk only)</p> <p>a. D Calls A @ Routine: Don't Answer</p> <p>b. E Calls B @ Priority: Answer</p> <p>c. F Calls C @ Priority</p> <p>10. Preempt For Reuse Unanswered (Line & Trunk)</p> <p>a. D Calls A @ Routine: Don't Answer</p> <p>b. E Calls B @ Priority: Answer</p> <p>c. F Calls A @ Priority</p> <p>11. Blocked Precedence Announcements</p> <p>a. A Calls D @ Priority: Answer</p> <p>b. B Calls D @ Priority</p> <p>12. Blocked Precedence Announcements</p> <p>a. A Calls C @ Priority: Answer</p> <p>b. B Calls A @ Priority</p> <p>Notes:</p>	<p>7.</p> <table border="1" data-bbox="1365 259 1974 414"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>A & C rec PNT</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>Call Completes</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>A rings @ Prec</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>B rec Prec ringback</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table> <p>8.</p> <table border="1" data-bbox="1365 446 1974 600"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>A rec PNT</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>Call Completes</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>C rings @ Prec</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>B rec Prec ringback</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table> <p>9.</p> <table border="1" data-bbox="1365 633 1974 787"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>D rec PNT</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>Call Completes</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>C rings @ Prec</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>F rec Prec ringback</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table> <p>10.</p> <table border="1" data-bbox="1365 820 1974 974"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>D rec PNT</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>Call Completes</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>A rings @ Prec</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> <tr> <td>F rec Prec ringback</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table> <p>11.</p> <table border="1" data-bbox="1365 1006 1974 1079"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>B receives BPA</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table> <p>12.</p> <table border="1" data-bbox="1365 1112 1974 1185"> <thead> <tr> <th></th> <th colspan="2">Hairpinning On</th> <th colspan="2">Hairpinning Off</th> </tr> <tr> <th></th> <th>80</th> <th>100</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>B receives BPA</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> <td>Y/N</td> </tr> </tbody> </table>		Hairpinning On		Hairpinning Off			80	100	80	100	A & C rec PNT	Y/N	Y/N	Y/N	Y/N	Call Completes	Y/N	Y/N	Y/N	Y/N	A rings @ Prec	Y/N	Y/N	Y/N	Y/N	B rec Prec ringback	Y/N	Y/N	Y/N	Y/N		Hairpinning On		Hairpinning Off			80	100	80	100	A rec PNT	Y/N	Y/N	Y/N	Y/N	Call Completes	Y/N	Y/N	Y/N	Y/N	C rings @ Prec	Y/N	Y/N	Y/N	Y/N	B rec Prec ringback	Y/N	Y/N	Y/N	Y/N		Hairpinning On		Hairpinning Off			80	100	80	100	D rec PNT	Y/N	Y/N	Y/N	Y/N	Call Completes	Y/N	Y/N	Y/N	Y/N	C rings @ Prec	Y/N	Y/N	Y/N	Y/N	F rec Prec ringback	Y/N	Y/N	Y/N	Y/N		Hairpinning On		Hairpinning Off			80	100	80	100	D rec PNT	Y/N	Y/N	Y/N	Y/N	Call Completes	Y/N	Y/N	Y/N	Y/N	A rings @ Prec	Y/N	Y/N	Y/N	Y/N	F rec Prec ringback	Y/N	Y/N	Y/N	Y/N		Hairpinning On		Hairpinning Off			80	100	80	100	B receives BPA	Y/N	Y/N	Y/N	Y/N		Hairpinning On		Hairpinning Off			80	100	80	100	B receives BPA	Y/N	Y/N	Y/N	Y/N
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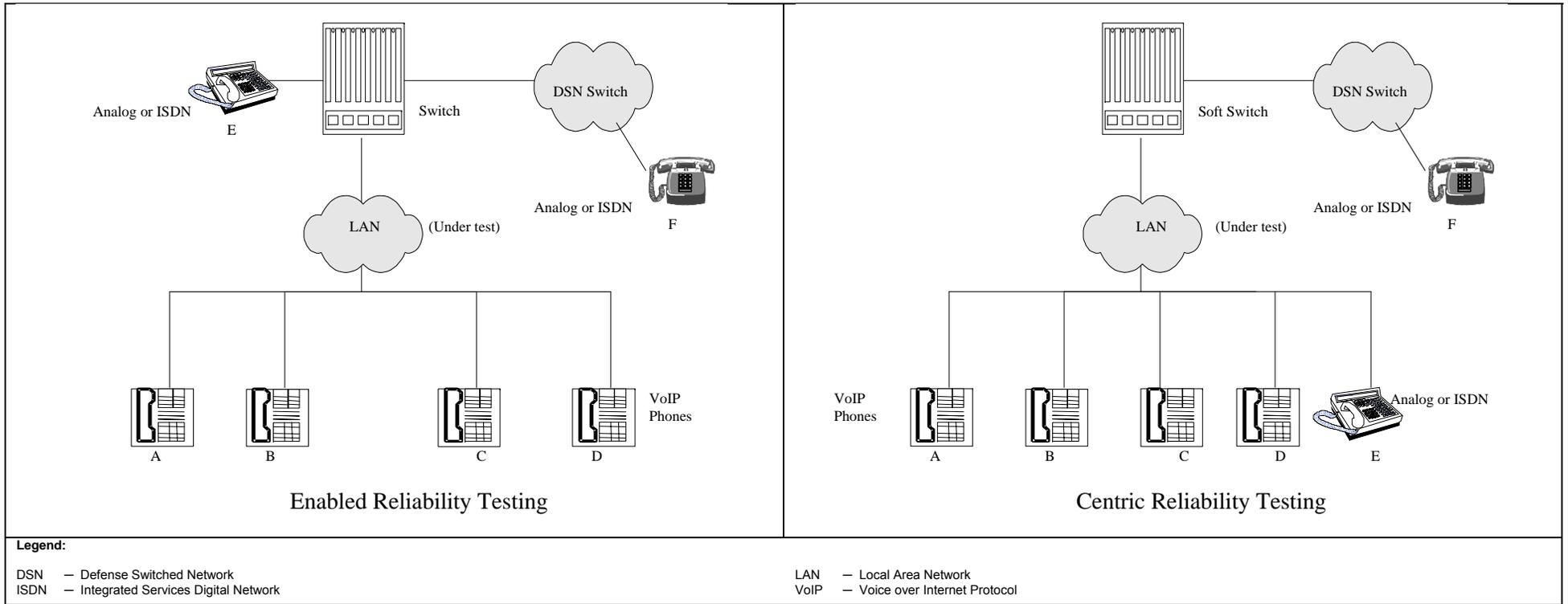


Figure E-5.5. VoIP Reliability Configuration

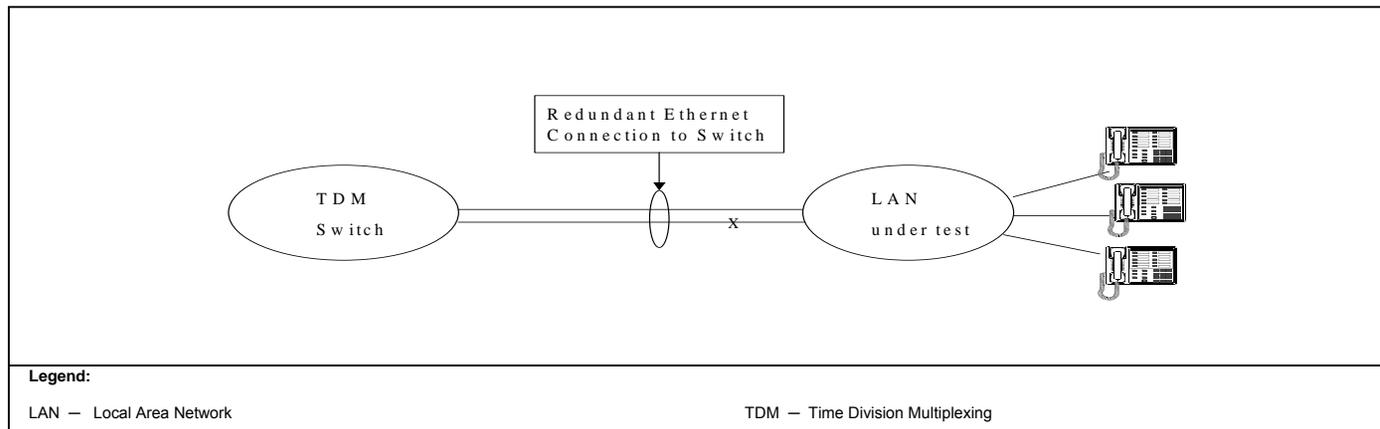


Figure E-5.6. VoIP Trunk Reliability Configuration

Table E-5.2. LAN Test Procedures (continued)

TP #	Configuration and/or Diagram		Test Procedure(s)	Expected Result(s)
11	Reliability:			
	Requirement: Conditional	GSCR Reference: App.3	a. Place calls between Phones A to E and B to C remain off hook. b. With calls A to E and B to C active, disconnect HW of the active Processor in or to the Core LAN Switch.	a. Calls complete. Y/N b. All calls remain active. Y/N
	To perform this test, setup the Network as shown in figure D-5.5. Activate 1 VoIP Phone off of the LAN under test and 1 ISDN Phone off same switch. (Excludes PBX2).		c. Place call from D to F. d. Restore link. e. Hang up call D to F f. With calls A to E and B to C active, disconnect HW of the main power supply all LAN switches with redundant power. g. Place call from D to F h. Hang up call D to F	c. Does call complete. Y/N d. Network Path restores within 1 second. Y/N e. Calls end. Y/N f. All calls remain active. Y/N
	Using configuration in figure D5.6.		a. With calls A to E and B to C active, break one of the active Media Gateway links to the TDM Switch. b. Place call from D to F. c. Hang up call D to F and restore link. d. With calls A to E and B to C active, break one of the Active links to the Signaling Processor e. Place call from D to F then restore link.	a. Do voice packets use alternate route. Y/N All calls remain active. Y/N b. Does call complete. Y/N c. Network Path restores within 1 second. Y/N d. Do voice packets use alternate route. Y/N All calls remain active. Y/N e. Does call complete. Y/N Network Path restores within 1 second. Y/N f. All calls remain active. Y/N
			f. With calls A to E and B to C active, disconnect active link to Core switches. g. Place call from D to F; restore link.	g. Does call complete. Y/N Network Path restores within 1 second. Y/N h. All calls remain active. Y/N
			h. With calls A to E and B to C active, disconnect active link to Distribution switch. i. Place call from D to F then restore link.	i. Does call complete. Y/N Network Path restores within 1 second. Y/N j. All calls remain active. Y/N
			j. With calls A to E and B to C active, disconnect active link to Firewall (if any). k. Place call from D to F then restore link.	j. All calls remain active. Y/N k. Does call complete. Y/N Network Path restores within 1 second. Y/N l. All calls remain active. Y/N
			l. With calls A to E and B to C active, disconnect active link between Distribution switches. m. Place call from D to F then restore link.	m. Does call complete. Y/N Network Path restores within 1 second. Y/N n. All calls remain active. Y/N
			n. With calls A to E and B to C active, disconnect active link between Core switches. o. Place call from D to F then restore link.	o. Does call complete. Y/N Network Path restores within 1 second. Y/N
	p. Hang up all calls.			p. Calls end. Y/N
			Notes:	

Legend:					
App.	- Appendix	HW	- Hardware	PRI	- Primary Rate Interface
BER	- Bit Error Rate	IP	- Internet Protocol	PVIT	- Packet Voice Impairment Test
BERT	- Bit Error Rate Test	IPv6	- Internet Protocol Version 6	QoS	- Quality of Service
BPA	- Blocked Precedence Announcement	ISDN	- Integrated Services Digital Network	Rec	- Receives
BW	- Bandwidth	LAN	- Local Area Network	SMEO	- Small End Office
C2	- Command and Control	MAC	- Media Access Control	SMOS	- Sage Mean Opinion Score
C2VGLAN	- Command and Control Voice Grade LAN	Mbps	- Megabits per second	SNMP	- Simple Network Management Protocol
CAS	- Channel Associated Signaling	Mins	- Minutes	SS7	- Signaling System 7
CBS	- Class-Based Shaping	MLPP	- Multi-Level Precedence and Preemption	SSH	- Secure Shell
CBWFQ	- Class-Based WFQ	MOS	- Mean Opinion Score	STIG	- Security Technical Implementation Guide
CQ	- Custom Queuing	ms	- Milliseconds	SUT	- System Under Test
CoS	- Class of Service	N	- No	T1	- North American Transmission Standard (1.544 Mbps)
dB	- Decibel	N-F	- Near-to-far	TDM	- Time Division Multiplexing
DN	- Destination Node	ON	- Origination Node	TIC	- Technology Integration Center
DS1	- Digital System Level 1 (1.544 Mbps)	PBX	- Private Branch Exchange	TOS	- Type of Service
DSCP	- Differentiated Services Code Point	PBX1	- Private Branch Exchange Type 1 (MLPP)	TP	- Test Procedure
DSN	- Defense Switched Network	PBR	- Policy Based Routing	VGLAN	- Voice Grade LAN
E1	- European Transmission Standard (2.048 Mbps)	PBX2	- Private Branch Exchange Type 2 (non-MLPP)	VLAN	- Virtual LAN
F-N	- Far-to-near	PCM	- Pulse Code Modulation	VoIP	- Voice over Internet Protocol
Gbps	- Gigabits per second	PHB	- Per Hop Behavior	WFQ	- Weighted Fair Queuing
GSCR	- Generic Switching Center Requirements	PQ	- Priority Queuing	Y	- Yes
GTS	- Generic Traffic Shaping	PNT	- Preempt Notification Tone		
HTTPS	- Hypertext Transfer Protocol Secure	Prec	- Precedence		