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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) 21 April 2021

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Joint Interoperability Certification of the Thinklogical TLX Video Matrix Switching Solution with Software Release 5

References: (a) Department of Defense Instruction 8100.04, "DoD Unified Capabilities (UC)," 9 December 2010
(b) Office of the Department of Defense Chief Information Officer, "Department of Defense Unified Capabilities Requirements 2013 (UCR 2013) Change 2," September 2017
(c) through (e), see Enclosure 1

1. Certification Authority. Reference (a) establishes the Joint Interoperability Test Command (JITC) as the Joint Interoperability Certification Authority for the Department of Defense Information Network (DoDIN) products, Reference (b).

2. Conditions of Certification. The Thinklogical TLX Video Matrix Switching Solution with Software Release 5, hereinafter referred to as the System Under Test (SUT), meets the critical requirements of the Unified Capabilities Requirements, Reference (b), and is certified for joint use as a Closed Video Distribution System (VDS) with no conditions, see Table 1. This certification expires upon changes that affect interoperability, but no later than the expiration date specified in the DoDIN Approved Products List (APL) memorandum.

Table 1. Conditions

Condition	Operational Impact	Remarks
Not applicable; the Thinklogical TLX Video Matrix Switching Solution with Software Release 5 meets all applicable of the critical joint interoperability requirements in accordance with the Unified Capabilities Requirements (UCR), Reference (b).		

3. Interoperability Status. Table 2 provides the SUT interface interoperability status, Table 3 provides the Capability Requirements and Functional Requirements status and Table 4 provides a DoDIN APL product summary, to include all subsequent Desktop Review (DTR) updates.

Table 2. Interface Status

Interface	Applicability: (R), (O), (C)	Status	Remarks
Closed VDS (See note 1.)			
RS-232	R	Met	(See note 2.)
RS-422	R	Met	(See note 2.)
RS-485	O	Not Met	(See notes 2 and 3.)
USB	R	Met	
Ethernet – IEEE 802.3i (10BaseT UTP)	O	Met	(See note 4.)
Ethernet - IEEE 802.3u (100BaseT UTP)	O	Met	
Ethernet - IEEE 802.3u (100BaseFX)	O	Met	
Ethernet - IEEE 802.3ab (1000BaseT UTP)	O	Met	
Ethernet - IEEE 802.3z (1000BaseX Fiber)	O	Not Met	(See note 3).
Network Management Interfaces for VDS Products (See notes 1 and 5.)			
IEEE 802.3i (10BaseT UTP)	C	Met	
IEEE 802.3u (100BaseT UTP)	C	Met	
IEEE 802.3ab (1000BaseT UTP)	C	Met	
IEEE 802.3ab (1000BaseT UTP)	C	Met	
IEEE 802.3z (1000BaseX Fiber)	C	Not Met	(See note 3).
VDS Subcomponents (See notes 1 and 6.)			
VDS Signal Extenders (See note 7.)			
Coaxial	R	Met	
Twisted Pair	R	Met	
Fiber Optical	R	Met	
VDS Peripheral Connectors (See note 8.)			
BNC	R	Met	
DVI	R	Met	
VGA	R	Met	
HDMI	R	Met	
RCA	R	Met	
Fiber	R	Met	
Modular Connectors	R	Met	
VDS Peripheral Connector Conversion Devices (See note 8.)			
BNC	R	Met	
DVI	R	Met	
VGA	R	Met	
HDMI	R	Met	
RCA	R	Met	
Fiber	R	Met	
Modular Connectors	R	Met	

NOTE(S):
1. The SUT is a Closed VDS only and therefore did not require interoperability testing; all applicable "Met" results were based on analysis of the vendor's LoC.
2. The UCR requires that a Closed VDS support RS-232, RS-422, or RS-485.
3. The SUT does not support this optional (or conditional) interface; therefore, it was not included in this certification.
4. The UCR specifies that that a Closed VDS may support an Ethernet interface but does not specify media or data rate. The SUT may support one or more of the specified interfaces.
5. The UCR specifies that all network appliances must be manages via an Ethernet interface but does not specify media or data rate. The SUT must support at least one of the specified interfaces.
6. A Closed VDS may support VDS Signal Extenders, Peripheral Connectors, or Peripheral Connector Conversion devices. If supported, these subcomponents must meet the applicable UCR requirements specified in Section 9.
7. If the SUT supports VDS Signal Extenders, the SUT must provide one of the specified interfaces.
8. If the SUT supports peripheral connectors it must support at least one of the specified interfaces.

(Table continues on next page.)

Table 2. Interface Status (contined)

LEGEND:			
802.3ab	1000 Base T Gbps Ethernet over Twisted pair	ID	Identification
802.3i	10BaseT Mbps over Twisted pair	IEEE	Institute of Electrical and Electronics Engineers
802.3u	Fast Ethernet at 100 Mbps, copper and fiber	IP	Internet Protocol
802.3z	Gigabit Ethernet over Fiber	LoC	Letter of Compliance
BaseFX	1000 Mbps Ethernet over fiber	O	Optional
BaseT	10 Mbps (Baseband Operation, Twisted Pair) Ethernet	R	Required
BaseX	1000 Mbps Ethernet over Fiber or Copper	SUT	System Under Test
BNC	Bayonet Neill-Concelman	UCR	Unified Capabilities Requirements
C	Conditional	UTP	Unshielded Twisted Pair
DVI	Digital Visual Interface	USB	Universal Serial Board
FX	Fast Ethernet over Optical Fiber	VDS	Video Distribution System
HDMI	High-Definition Multimedia Interface	VGA	Video Graphics Array

Table 3. Capability Requirements and Functional Requirements Status

CR/FR ID	UCR Requirement (See note 1.)	UCR 2013 Change 2 Reference	Status
1	General VDS	9.1	Met (See notes 1, 2 and 3.)
2	Closed VDS	9.2	Met (See note 2.)
3	VDS over IP (VDS-IP)	9.3	Not Met (See note 4)
4	VDS Recording	9.4	Not Met (See note 4.)

NOTE(S):
1. The annotation of "required" refers to a high-level requirement category. Table 3-1 in Enclosure 3 addresses the applicability of each sub-requirement.
2. The SUT is a Closed VDS only and therefore did not require interoperability testing; the SUT CR/FR status is based on analysis of the vendor's LoC.
3. A NIWC led Cybersecurity test team conducted Security testing and published the results in a separate report, Reference (c).
4. The SUT is a Closed VDS only; therefore, these requirements are not applicable to the SUT.

LEGEND:

CR	Capability Requirement	NIWC	Naval Information Warfare Center
FR	Functional Requirement	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
IP	Internet Protocol	VDS	Video Distribution System

Table 4. DoDIN APL Product Summary

Product Identification			
Product Name	TLX Video Matrix Switching Solution		
Software Release	Software Release 5		
UCR Product Type(s)	Closed VDS		
Product Description	The SUT (System Under Test) is a closed video matrix extension and distribution system. As a closed system, the SUT includes video distribution as well as other computer interfaces such as keyboard and mouse. The certified interfaces are all internal to the system and the SUT will not connect to the Defense Information Systems Network (DISN).		
Product Components (See note 1.)	**Component Name** (See note 2.)	**Version**	**Remarks**
TLX Video Matrix Switching Solution	**VDS Matrix Switch**		
	TLX-MSC-000080	5.07	
	Peripherals to the Matrix		
	SMP-AX00080	1.03	
	CHS-HP0004	N/A	
	CHS-HP0004, ICT-XMF-C01A22	1.0	
	CHS-000004	23.26	
	CHS-000004, TLX-TMM-U00E40	23.29	
	CHS-000004, TLX-TMM-U00001	23.20	
	CHS-000004, SMP-CX00001	6.0	
	CHS-000004, TLX-RMM-U00E40	23.18	
	CHS-000004, TLX-RMM-K0SE20	23.31	
	CHS-000004, TLX-RMM-U00001	23.19	
	CHS-000004, VQM-0HVK03-LCTX	69.19	
	CHS-000004, VQM-U00002-LCTX	00.02	
	CHS-000004, VQM-HA0006-LCTX	68.08	
	VEL-AV0M12-LCTX	20.04	
	SDC-000001-LC	NA	
	HDC-000001-LC	52.11	
	CHS-000004, VQM-AHV003-LCRX	18	
	CHS-000004, VQM-U00002-LCRX	00.02	
	CHS-000004, VQM-HA0006-LCRX	68.10	
	SDI-C100X1-LCRX	NA	

NOTE(S):
1. The detailed component and subcomponent list is provided in Table 3-3 in Enclosure 3.
2. The SUT is a Closed VDS and did not require interoperability testing; the SUT met all applicable interoperability requirements based on analysis of the vendor's LoC.

LEGEND:

APL	Approved Products List	SUT	System Under Test
DoDIN	Department of Defense Information Network	UCR	Unified Capabilities Requirements
LoC	Letter of Compliance	VDS	Video Distribution System

4. Test Details. This certification is based on review of the Vendor's Letters of Compliance (LoC), DISA adjudication of open test discrepancy reports (TDRs), and DISA Certifying Authority Recommendation for inclusion on the DoDIN APL. Review of the Vendor's LoC was completed on 26 July 2018 with no interoperability test discrepancies. A Naval Information Warfare Center (NIWC)-led Cybersecurity (CS) test team conducted CS testing from 2 April through 5 April 2019, and conducted a follow-on CS Verification and Validation (V&V) test from 7 May through 17 May 2019. NIWC conducted an additional follow-on CS V&V test from 31 March through 1 April 2021, and published the results in a separate report, Reference (c).

Enclosure 2 documents the test results and describes the network and system configurations. Enclosure 3 provides the detailed interface, capability, and functional requirements and LoC analysis results.

5. Additional Information. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Sensitive but Unclassified Internet Protocol Data (formerly known as NIPRNet) e-mail. Interoperability status information is available via the JITC System Tracking Program (STP). STP is accessible by .mil/.gov users at https://stp.fhu.disa.mil/. Test reports, lessons learned, and related testing documents and references are on the JITC Industry Toolkit (JIT) at https://jit.fhu.disa.mil/. Due to the sensitivity of the information, the CS Assessment Package containing the approved configuration and deployment guide must be requested directly from the Approved Products Certification Office (APCO) via e-mail: disa.meade.ie.list.approved-products-certification-office@mail.mil. All associated information is available on the DISA APCO website located at http://www.disa.mil/Network-Services/UCCO.

6. Point of Contact (POC). NIWC testing POC: Lalanti Antolin; 757-618-0224; Lalanti.antolin@navy.mil. JITC certification POC: Lisa Esquivel; commercial telephone 520-538-5531; e-mail address: lisa.r.esquivel.civ@mail.mil; mailing address: Joint Interoperability Test Command, ATTN: JTE (Lisa Esquivel), P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The APCO tracking number for the SUT is 1823401.

FOR THE COMMANDER:

CLARK.BRADLEY.ALAN.1231466564 Digitally signed by CLARK.BRADLEY.ALAN.1231466564 Date: 2021.04.21 09:03:47 -07'00'

3 Enclosures a/s

for JEFFREY P. O'DONNELL
LTC, USA
Acting Chief
Networks/Communications &
DoDIN Capabilities Division

Distribution (electronic mail):
DoD CIO
Joint Staff J-6, JCS
ISG Secretariat, DISA, JT
U.S. Strategic Command, J66
USSOCOM J65
USTRANSCOM J6
US Navy, OPNAV N2/N6FP12
US Army, DA-OSA, CIO/G-6, SAIS-CBC
US Air Force, SAF/A6SA
US Marine Corps, MARCORSYSCOM, SEAL, CERT Division
US Coast Guard, CG-64
DISA/ISG REP
OUSD Intel, IS&A/Enterprise Programs of Record
DLA, Test Directorate, J621C
NSA/DT
NGA, Compliance and Assessment Team
DOT&E
Medical Health Systems, JMIS PEO T&IVV
HQUSAISEC, AMSEL-IE-IS
APCO

ADDITIONAL REFERENCES

(c) Joint Interoperability Test Command, "Cybersecurity Assessment Report for Thinklogical, LLC TLX Video Matrix Switching Solution Software Release 5 Tracking Number 1823401", December 2019
(d) Joint Interoperability Test Command, "Video Distribution System (VDS) Test Procedures Version 1.0 For Unified Capabilities Requirements (UCR) 2013 Change 2," November 2018
(e) Joint Interoperability Test Command, JTE, Memo, "Joint Interoperability Certification of the Thinklogical, Velocity Closed Video Matrix Switching Solution, Software Revision 4," 2 February 2015 (TN 1324203)

CERTIFICATION SUMMARY

1. SYSTEM AND REQUIREMENTS IDENTIFICATION. SYSTEM AND REQUIREMENTS IDENTIFICATION. The Thinklogical TLX Video Matrix Switching Solution with Software Release 5 is hereinafter referred to as the System Under Test (SUT). Table 2-1 depicts the SUT identifying information and requirements source.

Table 2-1. System and Requirements Identification

System Identification	
Sponsor	United States Navy
Sponsor Point of Contact	Scott Houghton, scott.houghton@navy.mil, 843-218-5380
Vendor Point of Contact	Larry Wachter, larryw@thinklogical.com, 203-647-8720
System Name	Thinklogical TLX Video Matrix Switching Solution
Increment and/or Version	Software Release 5
Product Category	Video Distribution System (VDS)
System Background	
Previous certifications	TN 1324203 - TL Velocity Closed Video Matrix Switching Solution, Version 4, Reference (e).
Tracking	
APCO ID	1823401
System Tracking Program ID	8400
Requirements Source	
Unified Capabilities Requirements	Unified Capabilities Requirements 2013, Change 2, Section 9.2, 5.2.1,
Remarks	None
Test Organization(s)	Naval Information Warfare Center (NIWC)

LEGEND:

APCO	Approved Products Certification Office	NIWC	Naval Information Warfare Center
etc.	et cetera (and so on)	OS	Operating System
ID	Identification	POC	Point of Contact
i.e.	id est (in essence)	SUT	System Under Test
JITC	Joint Interoperability Test Command	SW	Software

2. SYSTEM DESCRIPTION. A Video Distribution System (VDS) is a complement of audio and video equipment designed for interfacing, switching/bridging, and distributing digital and/or analog audio and video signals sourced from multiple devices and destined to multiple devices. Unlike a Video Teleconferencing (VTC) Multipoint Conferencing Unit (MCU), which performs solely many-to-one audio and video signal bridging, the VDS can perform many-to-one, one-to-many, and many-to-many bridging. The VDS can distribute signal feeds to geographically dispersed locations and may include types of "METADATA" that might include intelligence about the feed (e.g., signal feed coordinates, Predator target) or industry standard information such as Extended Display Identification Data (EDID), which is a data structure that provides additional information about the intended display devices. The VDS is fielded in one of two categories: Closed VDS or VDS Over Internet Protocol (VDS-IP).

Closed VDS: Closed VDSs do not interface with the Defense Information Systems Network (DISN) core. A Closed VDS is considered to be a traditional VDS that enables video distribution over a Time Division Multiplexing (TDM)-based network that can occasionally support IP capabilities in a closed environment, and is capable of enabling Society of Motion

Picture and TV Engineers (SMPTE) signals to be transmitted over a digital infrastructure. Closed VDSs can leverage legacy standards and traditional TDM VDS, and are inaccessible from DoD IP-routed networks. However, a Closed VDS may use a peripheral device to extract video from an IP transport and convert it to an SMTP digital data stream, and pass it through the VDS.

The SUT is a Closed Video Distribution System.

a. General Description. The TLX Video Matrix Switching Solution is a closed video matrix extension and distribution system. As a closed system, the SUT includes video distribution as well as other computer interfaces such as keyboard and mouse. The certified interfaces are all internal to the system and the SUT will not connect to the Defense Information Systems Network (DISN). Components 10 through 19 listed below were tested with similar functionality as part of the previous certification process for TL Velocity Closed Video Matrix Switching Solution, Version 4, TN 1324203, Reference (e). These components are used to demonstrate compatibility with TLX Matrix Switching Solution, Revision 5.

b. Management Description. Thinklogical Matrix Switches are configured by an external control system (make connections). This allows for customization as well as ease of control and administration with access provided via a LAN connection port, or a serial port for 3rd party controller integration (such as Crestron, AMX or home-spun interfaces). Thinklogical's SMP Appliance (Component #6) with System Management Portfolio Software creates an advanced, configurable GUI which provides convenient user interface to the TLX Matrix Switching Solution. Enhanced diagnostics and alarms- Thinklogical switching solutions provide extensive real-time monitoring and diagnostics of the internal product operating temperature, power supply voltages, I/O fiber links, fans, and control functions of the matrix switch. Redundant controllers have LED indicators to provide active and fault monitoring, while TL Certification SUT Rev A Page 10 of 23 the system alarms can be configured to trigger an external control system, SNMP notifications, or generate email notifications. Third Party Controllers- Thinklogical matrix switches are controlled via an ASCII interface. This interface is accessible via a serial RS-232 port or over the LAN interface on port 17567. Both ports use the same syntax. The commands are all ASCII based and are terminated with either a linefeed character or a carriage-return / linefeed pair.

c. Components Descriptions.

Component 1. TLX-MSC-000080 Fiber Optic Non-Blocking Matrix Switch - Thinklogical TLX Matrix switches are true non-blocking and leverage bidirectional signal capability. The TLX80 are part of the TLX Matrix Switch family which ranges in size from 12 x 12 up to 1280 x 1280. Our non-blocking matrix switches allow multiple input signals to be available at one output. 10 Gbps. of bandwidth allows for uncompressed video, with no frame dropping. It supports both multi-mode and single-mode fiber connections using industry standard SFP+ optics. Thinklogical matrix switches allows for all critical system components including power supplies, cooling fans and pluggable optics (SFP+) to be hot-swappable. The hotswappable I/O boards allow the matrix switch to be reconfigured without interrupting signal processing by

powering down the matrix switch. In addition, the dual redundant power supplies ensure continuous, uninterrupted power.

Component 2. SMP-AX00080 - The SMP Appliance provides access and a local OSD (On-Screen Display) for system users and administrators to make, modify and monitor all Matrix Switch connections on a 6G (VX) or 10G (TLX) fiber port. Thinklogical' s System Management Portfolio Software includes a specialized software package that provides powerful management and maintenance capabilities, making it easier for users to configure, operate and update Thinklogical signal extension and switching systems of any size. The intuitive graphical user interface enables fast set-up and control of each Matrix Switch in the system. Tabs along the bottom of the screen allow users to navigate effortlessly through the Drag N Drop, Connection and Macros pages. The Drag N Drop Graphical User Interface makes it easy for users to visualize their work stations onscreen and switch Sources and Destinations by simply moving an icon. As room configurations evolve over time, icons representing Sources and Destinations can be added or removed from the layout as required, making it simple to adapt to changing requirements without moving a single cable or wire.

Component 3. CHS-HP0004, ICT-XMF-C01A22 - The integrated client machine can host any standard VDI client software, including those produced by VMware®, Citrix®, Microsoft®, etc. It is also compatible/agnostic to third party accredited software images. With Thinklogical' s integrated client machine, the customer no longer requires separate VDI client machines; rather, they connect the VDI servers directly to the Thinklogical transmitters (where the client machines now reside), saving as much as 50% of the space previously required for the client machines and transmitters in the rack room. Thinklogical' s integrated approach dramatically increase the security of a VDI infrastructure, by removing network cables. The system is modular, hot-swappable and high density, with up to four client machines per rack unit. Configurations support singlehead or dual-head systems up to uncompressed 4K resolution at 30Hz frame rate.

Component 4. CHS-000004, TLX-TMM-U00E40 - The TLX CHS4 Modular Chassis (CHS-000004) and Modules (TLX-TMM-U00E40) are used to extend video over fiber optic cable. - The Thinklogical CHS4 chassis allows users to locate HDMI monitors (via fiber) from just a few meters up to 80 kilometers away from the controlling computer, securely and without the loss of resolution. The rack mountable Module Chassis 4 is ideal for high density applications, where space may be limited. The 1RU, modular design is configurable with up to two TLX KVM or up to four TLX Video transmitter or receiver modules. Chassis may also be configured with a single TLX KVM and up to two TLX Video transmitter or receiver modules and offers redundant and hot-swappable internal power supplies. The TLX-TMM-U00E40 Module is a transmitter extender that requires four cables, three simplex and one duplex fiber for the standard configuration. The forward channels are dedicated to transmitting video, audio and peripheral data from the source to the destination. The return channel is dedicated to transmitting DDC/ EDID and peripheral data from the destination to the source. All Thinklogical TLX systems are available with multi-mode fiber or single mode fiber. The TLX extension systems are designed to support dual DisplayPort 1.2 displays or dual HDMI 2.0 displays up to the maximum specification (4096x2160 at 60Hz), including support for HDCP content. An additional video output is provided, per input, for a local display. Extenders also support full duplex stereo audio, embedded audio (with the ability to de-embed audio at the receiver), Serial RS232, USB HID

and are custom configurable to support USB 2.0 (480Mbps). Additionally, an Ethernet (10/100 Network) port is provided to easily set-up and manage the extender. The Management port provides status for video parameters, DDC configuration, connection status, optical power levels and SFP parameters. The Management port also enables users to load custom EDID files and update firmware.

Component 5. CHS-000004, TLX-TMM-U00001 - TLX Audio & Peripheral systems have a simple transmit and receive design. The TLX Audio & Peripheral Transmitter connects to the source to receive audio and peripheral data. The data is multiplexed with Thinklogical's patented MRTS Technology, and transmitted over 10Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. A TLX Audio & Peripheral system requires one or two fibers, depending on the configuration. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical TLX Audio & Peripheral systems are configurable with multi-mode or single mode fiber.

Component 6. CHS-000004, SMP-CX00001 - The SMP Client is an extension of the SMP Appliance, which includes On Screen Display (OSD) as part of its standard features. The SMP Client browses to the Hot Key Manager of the SMP Appliance and provides the OSD. SMP Modules can be used for setting up the initial configuration in multiple source systems. SMP Clients are available in both 6G and 10G models and fits into a single slot of an extender chassis and provides an on-screen display via a browser connection to the SMP Appliance. The SMP Client can be accessed locally via two USB 2.0 ports (keyboard and mouse) and an HDMI 1.2 video port. The SMP Module/SMP Client uses a fiber-optic output via an SFP Module (Small Formfactor Pluggable Module, pg. 5) that can be routed to any KVM extender. The SMP Module/SMP Client incorporates an i.MX6 Quad ARM 9 core processor that uses a Debian Operating System.

Component 7. CHS-000004, TLX-RMM-U00E40 - The TLX CHS4 Modular Chassis (CHS-000004) and Modules (TLX-RMM-U00E40) are used to extend video over fiber optic cable. - The Thinklogical CHS4 chassis allows users to locate HDMI monitors (via fiber) from just a few meters up to 80 kilometers away from the controlling computer, securely and without the loss of resolution. The rack mountable Module Chassis 4 is ideal for high density applications, where space may be limited. The 1RU, modular design is configurable with up to two TLX KVM or up to four TLX Video transmitter or receiver modules. Chassis may also be configured with a single TLX KVM and up to two TLX Video transmitter or receiver modules and offers redundant and hot-swappable internal power supplies.

A TLX-RMM-U00E40 Module is a receiver extender that requires four cables, three simplex and one duplex fiber for the standard configuration. The forward channels are dedicated to transmitting video, audio and peripheral data from the source to the destination. The return channel is dedicated to transmitting DDC/ EDID and peripheral data from the destination to the source. All Thinklogical TLX systems are available with multi-mode fiber or single mode fiber. The TLX extension systems are designed to support dual DisplayPort 1.2 displays up to

4096x2160 at 60Hz or dual HDMI 2.0 displays up to the maximum specification (3840x2160 at 30Hz), including support for HDCP content. An additional video output is provided, per input, for a local display. Extenders also support full duplex stereo audio, embedded audio (with the ability to de-embed audio at the receiver), Serial RS232, USB HID and are custom configurable to support USB 2.0 (480Mbps). Additionally, an Ethernet (10/100 Network) port is provided to easily set-up and manage the extender. The Management port provides status for video parameters, DDC configuration, connection status, optical power levels and SFP parameters. The Management port also enables users to load custom EDID files and update firmware.

Component 8. CHS-000004, TLX-RMM-K0SE20 - A TLX-RMM-K0SE20 receiver uses three duplex fibers for the standard configuration. The forward channels are dedicated to transmitting video, audio and peripheral data from the source to the destination. The return channel is dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. This specific model utilizes a separate fiber path for analog audio and USB HID. All Thinklogical TLX systems are available with multi-mode fiber or single mode fiber. The TLX extension systems are designed to support a DisplayPort 1.2 display or HDMI 2.0 display up to the maximum specification (4096x2160 at 60Hz), including support for HDCP content. An additional video output is provided for a local HDMI display. Extenders are custom configurable to also support full duplex stereo audio and embedded audio, with the ability to de-embed audio at the receiver. Additionally, an Ethernet (10/100 Network) port is provided to easily set-up and manage the extender. The Management port provides status for video parameters, DDC configuration, connection status, optical power levels and SFP parameters. The Management port also enables users to load custom EDID files and update firmware.

Component 9. CHS-000004, TLX-RMM-U00001 - - TLX Audio & Peripheral systems have a simple transmit and receive design. The TLX Audio & Peripheral Transmitter connects to the source to receive audio and peripheral data. The data is multiplexed with Thinklogical' s patented MRTS Technology, and transmitted over 10Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. A TLX Audio & Peripheral system requires one or two fibers, depending on the configuration. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical TLX Audio & Peripheral systems are configurable with multi-mode or single mode fiber. The TLX-RMM-U000001 is the Audio & Peripheral data Receiver module.

Component 10. CHS-000004, VQM-0HVK03-LCTX - VQM Video Modules (VQM-0HVK03-LCTX) are used to extend video and HID signals over fiber optic cable. The Thinklogical CHS4 allows users to locate DVI monitors (via fiber) from just a few meters up to 80 kilometers away from the controlling computer, securely and without the loss of resolution. The CHS4 is a rack space saving, high reliability solution providing a rack mount for up to 4 modules of DVI, dual USB HID and audio, single USB 2.0 and PS/2 interfaces or single USB 2.0 only, in a compact 1U chassis. The VQM-0HVK03-LCTX module allows users to transmit two separate single link DVI or HDMI video paths that are HDCP compliant and transmits HID signals.

Component 11. CHS-000004, VQM-U00002-LCTX - Velocity Peripheral systems have a simple transmit and receive design. The Transmitter connects to the source to receive peripheral data. The data is multiplexed with Thinklogical' s patented MRTS Technology, and transmitted over 6.25Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical Velocity Peripheral systems are configurable with multi-mode or single mode fiber. The VQM-U00002-LCTX Peripheral Extension Module supports two separate USB 2.0 inputs. It works with all extenders and matrix switches in the Velocity family.

Component 12. CHS-000004, VQM-HA0006-LCTX - Velocity Peripheral systems have a simple transmit and receive design. The Transmitter connects to the source to receive peripheral data. The data is multiplexed with Thinklogical' s patented MRTS Technology, and transmitted over 6.25Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical Velocity Peripheral systems are configurable with multi-mode or single mode fiber. The Q-Series Dual Peripheral Extension Module supports dual USB HID and unbalanced audio connections on two separate streams (each one containing USB HID and Audio, for a total of 2 HID and 2 Audio). It works with all extenders and matrix switchs in the Velocity family.

Component 13. VEL-AV0M12-LCTX - Thinklogical Velocity DVI/RGB Extenders- Thinklogical' s DVI extenders extend DVI and analog video signals up to 40 kilometers (24 miles) with standard video formats up to 1920 x 1200 to extend DVI and analog video. Options include balanced CD quality audio extension, and Neutrik® connection for rugged applications. These extenders are fully compatible with Velocity line. Velocity AV 12-The Velocityrgb System-12 supports one RGB display, full duplex stereo audio, and serial (RS-232) and it supports 480p, 720p, and 1080i component video. This product was previously tested under TN 1324203, Reference (e).

Component 14. SDC-000001-LC - SDI to HDMI Converter/Extender- The Thinklogical SDI to HDMI converter allows you to seamlessly convert a broadcast quality SDI signal to HDMI. The SDI to HDMI converter is fully SMPTE compliant, including the active loop out port. System features include user SDI embedded audio conversion to HDMI output and remote control of the user interface via serial port (RS-232) and Ethernet port. The SDI to HDMI converter also has a fiber output option that is fully compatible with our Velocity line of receivers for a comprehensive conversion and extension solution. This product was previously tested under TN 1324203, Reference (e).

Component 15. HDC-000001-LC - HDMI to SDI Converter/Extender- The Thinklogical HDMI to SDI converter allows you to seamlessly convert an HDMI or DVI signal to a broadcast quality SDI signal. The HDMI to SDI Converter is fully SMPTE compliant, and includes a genlock input. User interface options include a front panel LCD and encoder, and remote control via the serial port (RS-232) and Ethernet port. Audio inputs include HDMI embedded (up to eight channels), digital AES (single stereo pair) and balanced analog (single stereo pair). Audio outputs include SDI embedded (up to 8 channels). The HDMI to SDI converter also has a fiber output option that is fully compatible with our SDIXtreme 3G+ line of receivers for a comprehensive conversion and extension solution. This product was previously tested under TN 1324203, Reference (e).

Component 16. CHS-000004, VQM-AHV003-LCRX - VQM Video Modules (VQM-AHV003-LCRX) are used to extend video, audio and HID signals over fiber optic cable. The Thinklogical CHS4 allows users to locate DVI monitors (via fiber) from just a few meters up to 80 kilometers away from the controlling computer, securely and without the loss of resolution. The CHS4 is a rack space saving, high reliability solution providing a rack mount for up to 4 modules of DVI, dual USB HID and audio, single USB 2.0 and PS/2 interfaces or single USB 2.0 only, in a compact 1U chassis. The VQM-AHV003-LCRX module allows users to receive two separate single link DVI or HDMI video paths that are HDCP compliant as well as audio and serial signals.

Component 17. CHS-000004, VQM-U00002-LCRX - Velocity Peripheral systems have a simple transmit and receive design. The Transmitter connects to the source to receive peripheral data. The data is multiplexed with Thinklogical' s patented MRTS Technology, and transmitted over 6.25Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical Velocity Peripheral systems are configurable with multi-mode or single mode fiber. The VQM-U00002-LCRX Peripheral Extension Module supports two separate USB 2.0 outputs. It works with all extenders and matrix switchs in the Velocity family.

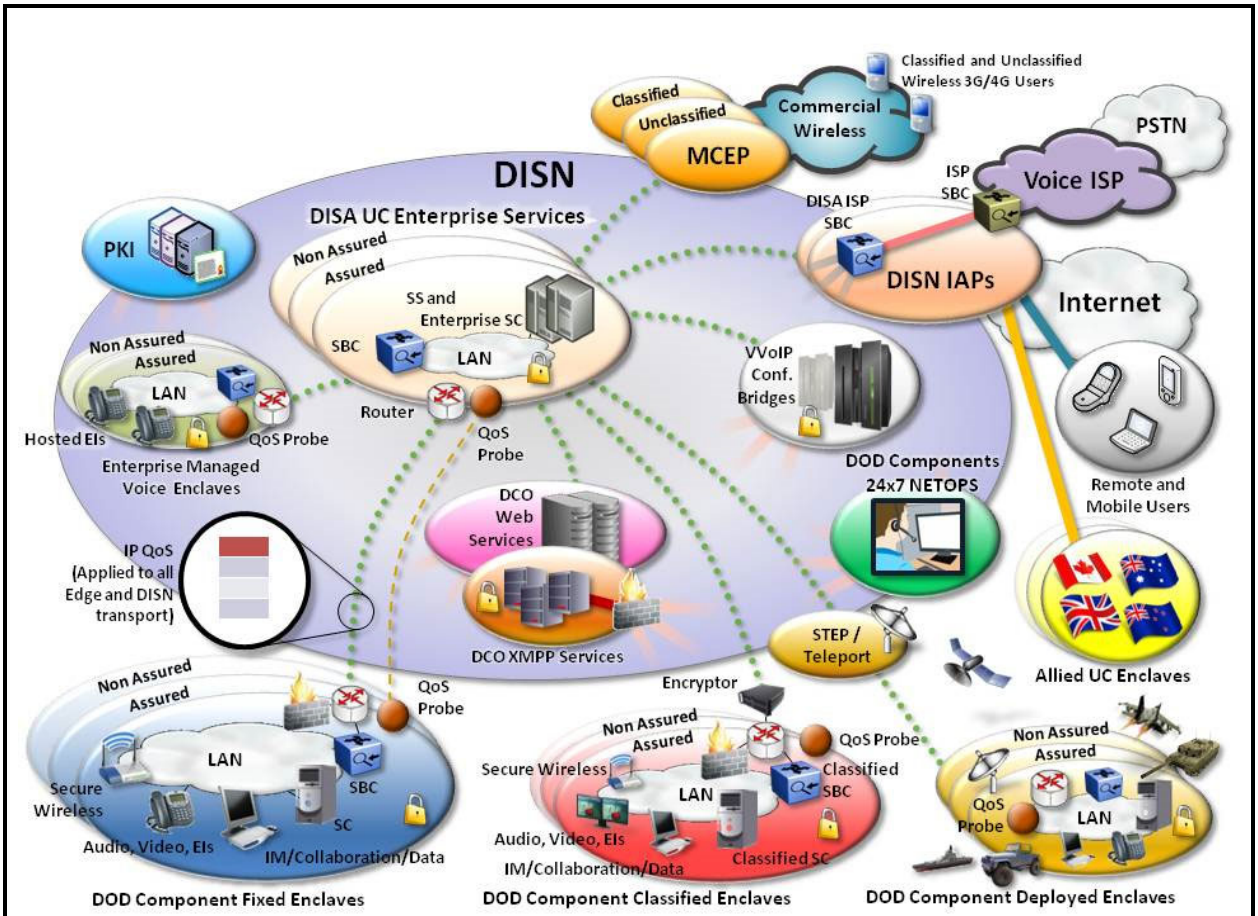
Component 18. CHS-000004, VQM-HA0006-LCRX - Velocity Peripheral systems have a simple transmit and receive design. The Transmitter connects to the source to receive peripheral data. The data is multiplexed with Thinklogical' s patented MRTS Technology, and transmitted over 6.25Gbps SFP+ technology for up to 80 kilometers. Fiber provides a secure connection from the transmitter to the receiver, where MRTS Technology demultiplexes the data stream to deliver uncompromised audio and peripheral data to the destination. The forward channels are dedicated to transmitting audio and peripheral data from the source to the destination. The return channels are dedicated to transmitting DDC/EDID and peripheral data from the destination to the source. All Thinklogical Velocity Peripheral systems are configurable with multi-mode or single mode fiber. The Q-Series Dual Peripheral Extension Module supports dual USB HID and unbalanced audio connections on two separate streams (each one containing USB HID and Audio, for a total of 2 HID and 2 Audio). It works with all extenders and matrix switchs in the Velocity family. This product was previously tested under TN 1324203, Reference (e).

Component 19. SDI-C100X1-LCRX - SDI Xtreme 3G+ Extenders- The SDI Xtreme 3G product series is a compact, broadcast quality, SDI over fiber extension system. The system is designed to transmit up to two SD/HD signals or one 3G SDI signal with or without embedded audio and data, and is SMPTE 424M, 292M, 259M, 372M and 425 level A and B compliant. In addition, this fiber based transport system gives users the assurance that each signal is immune to video pathological signals over the entire length of the fiber interconnect, while supporting all pathological patterns at all rates. The system also supports either single or multimode fiber, and is fully compatible with Thinklogical' s Velocity line of products. This product was previously tested under TN 1324203, Reference (e).

3. OPERATIONAL ARCHITECTURE. The Unified Capabilities (UC) architecture is a two-level network hierarchy consisting of DISN backbone switches and Service/Agency installation switches. The Department of Defense (DoD) Chief Information Officer (CIO) and Joint Staff policy and subscriber mission requirements determine which type of switch can be used at a particular location. The UC architecture, therefore, consists of several categories of switches. Figure 2-1 depicts the notional operational UC architecture that the SUT may be used.

4. TEST CONFIGURATION. The certification is based on the review of the vendor's Letter of Compliance (LoC) and the review of vendor's system description. Figure 2-2 depicts the SUT Functional Test Configuration for the SUT.

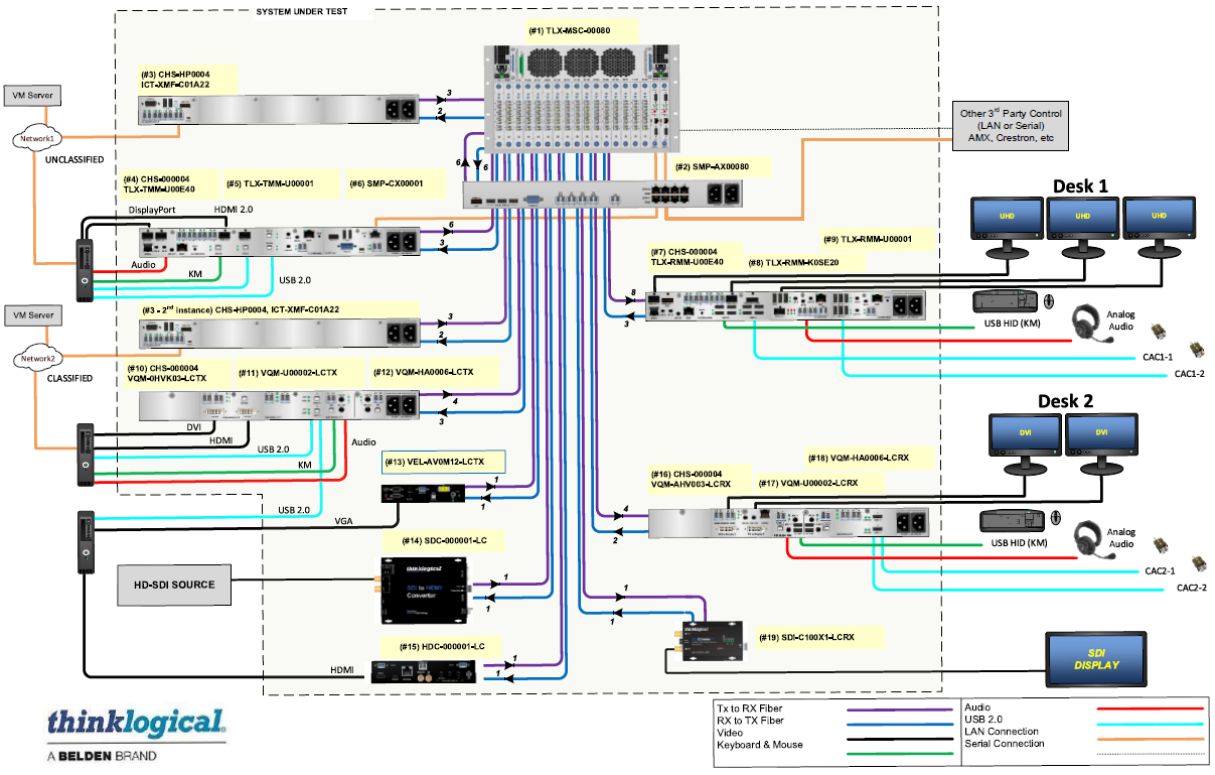
5. METHODOLOGY. The Naval Information Warfare Center (NIWC) conducted a review of the Vendor's LoC using LAN requirements derived from the UCR 2013, Change 2, Reference (b), and the VDS test procedures, Reference (d). No interoperabitity testing was conducted on the SUT; however, functional testing was conducted during the Cybersecurity (CS) testing. Analysis of the vendor's Letters of Compliance (LoC) verified that letter "R" requirements have been met with no discrepancies. DISA will evaluate any new discrepancy noted in the operational environment for impact on the existing certification. DISA will adjudicate these discrepancies via a vendor POA&M, which must address all new critical TDRs within 120 days of identification.



LEGEND:

DCO	Defense Connection Online	NETOPS	Network Operations
DISA	Defense Information Systems Agency	PKI	Public Key Infrastructure
DISN	Defense Information Systems Network	PSTN	Public Switched Telephone Network
DoDIN	Department of Defense Information Network	QoS	Quality of Service
EI	End Instrument	SBC	Session Border Controller
IAP	Internet Access Point	SC	Session Controller
IM	Instant Messaging	SS	Soft-switch
IP	Internet Protocol	STEP	Standardized Tactical Entry Point
ISP	Internet Service Provider	UC	Unified Capabilities
LAN	Local Area Network	VVoIP	Voice and Video over IP
MCEP	Multi Carrier Entry Point	XMPP	Extensible Messaging and Presence Protocol

Figure 2-1. Notional DoDIN Network Architecture



LEGEND:

CAC	Common Access Card	RX	Receive
DVI	Digital Visual Interface	SDI	Serial Digital Interface
HDMI	High Definition Multimedia Interface	TX	Transmit
HD-SDI	High Definition-Seria Digital Interface	USB	Universal Serial Bus
HID	Human Interface Device	VDS	Video Distribution System
KM	Keyboard Monitor	VGA	Video Graphics Array
LAN	Local Area Network	VM	Virtual Machine

Figure 2-2. SUT Functional Test Configuration

6. INTEROPERABILITY REQUIREMENTS, RESULTS, AND ANALYSIS. The interface, Capability Requirements (CR) and Functional Requirements (FR), and other requirements for a DoDIN VDS are established by UCR 2013, Change 2, Sections 5.2.1 and 9.2. Table 3-1 provides the SUT interface interoperability status, and Table 3-2 provides the Capability Requirements (CR) and Functional Requirements (FR) status. Testing details and results are provided in the following sub-paragraphs.

a. The UCR 2013, Change 2, Section 9 includes the Video Distribution Service (VDS) Product Requirements.

1) **Section 9.1, General VDS.** General VDS configuration requirements apply to all VDS devices in both the Closed VDS configuration as described in Section 9.2, Closed VDS, and VDS over Internet Protocol (IP) configurations as described in Section 9.3, VDS over IP (VDS-IP).

a) The VDS shall fall into one of two categories:

- Closed VDS. These VDSs are inaccessible from Department of Defense (DoD) IP-routed networks. Closed VDSs shall follow the requirements as specified in Section 9.2, Closed VDS. The SUT is a Closed VDS only. The SUT did not require interoperability testing as a Closed VDS; however, the SUT met applicable interoperability requirements based on analysis of the vendor's LoC. The LoC analysis results for all components are included in the following interoperabitlity sections and listed in Enclosure 3, Table 3-2.

- VDS over IP (VDS-IP) System. These are VDSs that are accessible and interface with DoD IP-routed networks. VDS-IP systems shall follow the requirements as specified in Section 9.3, VDS over IP (VDS-IP). The SUT is a Closed VDS only; therefore, these requirements were not applicable and the SUT is not certified for VDS over IP.

NOTE: This section leverages the DoD Architecture Framework (DoDAF) baseline for a Closed System; therefore, the VDS shall be Closed if the system is inaccessible from external networks such as Non-Secure Internet Protocol Router (NIPR) or Secure Internet Protocol Router (SIPR).

b) If the Closed VDS requires IP-routed control of its Matrix Switch, then the system shall utilize Out-of-Band Management (OBM) in accordance with the Security Technical Implementation Guidelines (STIGs). A NIWC-led CS test team conducted Security testing and published the results in a separate report, Reference (c).

c) The VDS shall have the ability to be controlled from an external master control system. The SUT is a Closed VDS only; therefore, these requirements were not applicable to the SUT.

d) The VDS shall provide at least one sub-control position with System Administrator permission access control. The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

1. **Section 9.1.1, IP Requirements for VDSs**

a. If the VDS is inaccessible from DoD IP-routed networks, then the VDS is considered a Closed VDS and support of the IPv4 profile as defined in UCR 2013, Section 7.2.1.5, Protocols, and of the IPv6 profile as described in the UCR 2013, Section 5, IPv6, is optional. Otherwise, if the VDSs connect to IP-routed networks, then the VDS is considered a VDS over IP system, and support of the IPv4 profile as defined in the UCR 2013, Section 5, IPv6, and of the IPv6 profile as described in the UCR 2013, Section 5, IPv6, is required. The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

2. **Section 9.1.2, VDS Signal**

a. The VDS shall provide the ability to transfer audio and video signals in a variety of configurations, including, but not limited to, seat console to seat console, seat console to destination display device, seat console to video conversion device, seat console to VTC, and source devices to seat console. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. The VDS shall be scalable for distributing incoming signal feeds from multiple video sources and shall route to multiple video display receivers as needed by operational requirements. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

c. The VDS shall be dynamic, transparent, and capable of understanding the capabilities of the display based on the input source, to provide the necessary equipment resolutions and information required by the peripheral equipment connected. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

d. The VDS shall support both analog and digital input signals. This provides the flexibility to support both legacy analog sources and digital displays. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

e. The VDS shall provide the ability to display signals from any source device to any compatible destination device, including intermediate display aggregators (e.g., Wall Controllers, Multi-View display processors). The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

f. The VDS shall maintain native audio and video signals from input interface to output interface without signal degradation, loss of data compression, color sub-sampling, frame rate conversion, auxiliary data loss or signal resolution formatting. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

g. Any type of signal processing to modify the original audio or video signal information shall be documented and verified by maintenance and/or operator inquiry. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

h. The VDS shall be capable of processing and maintaining a minimum of 4:2:2 chroma subsampling in color space, preserving single pixel detail through the encoding, streaming, and decoding processes. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

i. The VDS shall support internal scaling to allow the end user to specify different input or output resolutions as required, matching the configuration of installed equipment. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

j. The VDS shall utilize VDS Peripheral Connector Conversion (VPCC) devices (Section 9.1.3, VDS Peripheral) to modify audio and video signals to a single common interface standard for use in the VDS. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

NOTE: Possible applications of this method would convert hig-resolution computer graphics DVI interfaces to production television HD-SDI interface formats for switching and distribution. These HD-SDI signaling interface formats are then typically converted back to DVI or HDMI interfaces for use with common display devices.

k. The VDS shall provide methods to modify or customize EDID information reported to source devices in order to allow proper configuration of video source devices to match the overall capabilities of the VDS core switching, VDS destination devices, and display devices connected to the VDS. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

l. The VDS shall provide EDID signaling standard in accordance with the Video Electronics Standards Association (VESA) Enhanced Extended Display Identification, Version 1.3. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

3. **Section 9.1.3, VDS Peripheral**

a. The VDS Peripherals shall fall into one of two categories:

- Source Devices. Signal generators that output video, audio and other waveforms which are used in the communication and synchronization of VDS subcomponents, using a signal type that is processed by the VDS Switch system. Examples include computer workstations, laptop computers, VTC codecs, video playback devices (DVD, Blu-ray, and media players), cable television tuners, and live video camera feeds.

- Destination Devices. Signal receivers that accept the signal from the VDS Switching system; process the video, audio, and other waveforms; and provide the necessary feedback that enables VDS. Examples include Desktop monitors, television monitors, video projectors, video signal processors, video recording devices, and video wall signal processor systems.

NOTE: Some devices such as VTC codecs and recording devices may serve as a source and/or destination device.

b. Destination devices shall support scan rates between 23.95 and 85Hz. The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

c. Destination devices shall support video input resolutions of: 480i, 525i, 625i, 1080i, 480p, 720p, and 1080p for 50Hz and 60Hz progressive and interlaced scan formats. The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

d. Section 9.1.3 states that the Destination devices shall support video and picture graphics in their native resolution (without any visual artifacts), without additional processing and decoding, to maintain the original native resolution without use of image processing to resize or scale the original signal feed. The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

4. **Section 9.1.4, VDS Signal Extenders**

a. VDS Signal Extenders shall condition, amplify, and provide physical media conversion (i.e., copper to fiber optic or coaxial video to video over twisted pair) for audio and video signals to extend the maximum cabling distances from source devices to destination device. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. Section 9.1.4 states that the VDS Signal Extenders shall support, at a minimum, one of the following interconnects: coaxial, twisted pair, or fiber optical. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

5. **Section 9.1.5, VDS Peripheral Connectors**

a. VDS Subcomponents interface with one another using peripheral connectors, which are simply modular components that provide different options for interfacing audio and audio interface formats and VDS components. Table 9.1-1, Summary of Connector Types, lists the various connector types. Summary of Connector Types, lists the various connector types. Summary of connector types include: BNC, DVI, VGA, HDMI, RCA, Fiber (LC, SC, etc.), Modular Connectors (RJ11, RJ45, 8P8C, etc.). If the VDS supports analog VGA and DVI computer connectors, then the following formats shall be supported: The SUT is a Closed VDS only; therefore, these requirements were not applicable to the SUT.

- High Resolution [up to 1920x1200 pixels Wide Ultra eXtended Graphics Array (WUXGA)] computer video resolutions operating at up to 60Hz vertical refresh rate, or up to165 MHz total un-compressed pixel clock bandwidth.
- Analog VGA connectors with RGBHV, RGBS, or RGsB coaxial high definition video formats through use of RGBHV to VGA cabling adaptors.
- DVI connectors compatible with the Digital Display Working Group (DDWG) DVI 1.0 Specification, April 2, 1999.

b. If the VDS supports Multi-Rate SDI connectors, then the following Society of Motion Picture and Television Engineers (SMPTE) formats shall be supported: The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT .

- SMPTE 259M: Standard Definition SDI (SD-SDI)
- SMPTE 344M: Enhanced Definition SDI (ED-SDI)
- SMPTE 292M: High Definition SDI (HD-SDI)
- SMPTE 424M: 3-Gbps SDI (3G-SDI)
- SMPTE 291M: Ancillary Data Packet and Space Formatting

c. If the VDS supports HDMI video connectors and provides support for digital video sources with and without High-Bandwidth Digital Content Protection (HDCP) copy protection, then the following HDMI features shall be supported: The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT .

- High-resolution (up to 1920x1200 pixels WUXGA) computer video resolutions operating at up to 60Hz vertical refresh rate, or up to165MHz total un-compressed pixel clock bandwidth.
- 24-bit color pixel depth and RGB and YCbCr color space.
- Embedded 2 CH Stereo Uncompressed Pulse Code Modulation (PCM) audio signaling over HDMI interface connections.

d. The VDS shall support Extended Display Identification Data (EDID) for VGA, DVI, and HDMI connectors. EDID support shall be provided by a VDS connector to describe the capabilities of the VDS interface to a connected video source device. EDID interface signaling provided by the VDS to the source video device shall include the following: The SUT is a Closed VDS; therefore, these requirements were not applicable to the SUT.

- VDS Manufacture ID
- VDS Product Identification
- Digital or analog capability of VDS Interface
- Supported video resolution and video timing modes of the VDS
- Preferred video resolution and video timing mode of the VDS

6. **Section 9.1.6, VDS Peripheral Connectors Conversion Devices**

a. VPCC devices are system appliances that operate and provide gateway like capabilities and allow for different types of VDS subcomponents to interoperate by coupling like peripherals. VPCCs shall accept, couple, and convert from input to output for connector peripherals as described in Table 9.1-1, Summary of Connector Types. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. VPCCs shall accept high-resolution, up to 1920x1200 pixels WUXGA computer video resolutions, operating at up to 60Hz vertical refresh rate, or up to165MHz total un-compressed pixel clock bandwidth. The SUT met the requirements for a Closed VDS with the vendor's LoC. The VDS results for all components are listed in Enclosure 3, Table 3-2.

c. VPCCs shall support upwards and downwards video resolution and frame rate signal processing. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

d. VPCCs shall use video scaling or signal processing to convert between different connector peripherals as described in Table 9.1-1, Summary of Connector Types. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

e. VPCCs shall allow for dynamic conversion or for user defined conversions to support display resolution formats with varying aspect ratios (4:3, 16:9, and 16:10). The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

f. If the VPCCs require local monitoring, then VPCCs shall support local HD-SDI/VGA/DVI/HDMI loop-through outputs (as needed for the video source format) for local monitoring. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

g. VPCCs shall auto-detect the type of peripheral present and provide video peripheral conversion and processing as needed to match the selected video peripheral of the attached video display or VDS subcomponent. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

h. VPCCs shall support Ethernet management interfaces for diagnostic information and control, including the following: The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

- Complete information about the device
- Physical identification of hardware and system error log

7. **Section 9.1.7, VDS Master Control Switch**

a. The VDS Master Control switch shall allow the end user to select and verify the processing of any signal displayed. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. The VDS Master Control switch shall be able to perform the following functions on the VDS Matrix Switch: The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

- Switch Single Input to Single Output
- Switch Single Input to Multiple Outputs
- Allow the user to "record" and "recall" presets of crosspoint routings over both the entire switch matrix and selected groupings of inputs and outputs.

c. The VDS Master Control shall be able to perform the following functions on the VDS Matrix Switch: The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in the Enclosure 3, Table 3-2.

- Switch Single Input to Single Output
- Switch Single Input to Multiple Outputs
- Enquire the status of any current configuration, by individual output, resulting in the current routed input information; by individual input, resulting in a listing of all current outputs; a master listing of all input names (if stored within the device); and a master listing of all current output assignments.
- Clear the switching or crosspoint (route "0") based on input, where any output with the selected input will be automatically cleared, or based on output, where only the selected output crosspoints are cleared.

Clearing must result in NO INPUT selected rather than using a "blank" or "un-assigned" input.

8. **Section 9.1.8, VDS Matrix Switch**

a. VDSs connect via a VDS Matrix Switch, which is a device capable of accepting multiple inputs from source devices and selectively distributing any one of these inputs to one or many destination devices. The VDS Matrix Switch shall accept original audio and video signals, as defined in Section 9.1.2, VDS Signal, and shall accept multiple connectors as defined in Section 9.1.4, VDS Signal Extenders, to interface to other VDS Matrix Switching Devices, VDS Distribution Devices, VDS Switching Devices, VDS Conversion Devices, and other VDS subcomponents. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. The VDS Matrix Switch shall support hot-swappable expansion modules. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

c. The VDS Matrix Switch shall support local and remote control management and control. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

d. The VDS Matrix Switch shall include a local primary control mode that supports a secondary external control mode as needed for redundancy. NOTE: Best practices indicate a need for backup distributed control systems (dual processors) in any large scale VDS installation. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

e. If the VDS Matrix Switch is slated for specialized missions, the VDS Matrix Switch shall use custom rack mounts (e.g., Ship board operations). Otherwise, the VDS Matrix Switch shall support the industry standard 19-inch wide equipment racks. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

f. If the VDS Matrix Switch is slated for mission-critical C2 operations, then the VDS Matrix Switch shall include two or more hot-swappable power supplies with two independent power cords for redundancy. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

g. The VDS Matrix Switch shall provide at least one sub-control position with System Administrator permission access control. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

9. **Section 9.1.9, VDS Cybersecurity**

a. All VDS components shall adhere to the appropriate STIGs. A NIWC-led CS test team conducted Security testing and published the results in a separate report, Reference (c).

b. All VDS components shall meet all appropriate Ports, Protocols, and Services Management (PPSM) guidelines and vulnerability and risk assessments to achieve compliance for all information systems, applications, and services connected to the Global Information Grid (GIG). A NIWC-led CS test team conducted Security testing and published the results in a separate report, Reference (c).

c. The VDS shall comply with appropriate National Institute of Standards and Technology (NIST)/National Information Assurance Partnership (NIAP) standards. A NIWC-led CS test team conducted Security testing and published the results in a separate report, Reference (c).

10. **Section 9.1.10, VDS Availability**

a. Section 9.1.10 states that the number of UI events shall be no more than 4.38 events per year. Note: UI events are critical service affecting events impairing critical components (i.e., a Matrix Switch as opposed to a Peripheral Device). A UI is any condition identified by a user making the system not operational. Table 9.1-2, Unscheduled Interruption Event Counts, depicts the number of events per system uptime. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. Section 9.1.10 states that the duration of unscheduled interruption (DUI) events shall be no more than 2 hours per event. Table 9.1-3, Duration of Unscheduled Interruption Events, depicts the number of hours per event per year. Note: An entire system integrity check must be performed for outages lasting longer than 2 hours. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

c. Section 9.1.10 states that the duration of scheduled outages shall be no longer than 0.5 hours per month and 6 hours per year. Table 9.1-4, Scheduled Maintenance Event Durations, depicts the allowable hourly/yearly durations for scheduled outages. Note 1: Scheduled maintenance is the duration of performing planned maintenance operations in which the system is not available to the user. Note 2: An entire system integrity check must be performed for outages lasting longer than 0.5 hours. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

d. Section 9.1.10 states that all outages or service disruptions to the system shall be correctable within 2 hours using normal maintenance procedures. The SUT met the

requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

11. **Section 9.1.11, VDS Diagnostics**

a. Section 9.1.11 states that the VDS Matrix Switch, VPCCs, and VDS signal Extenders shall provide system diagnostics to verify and validate proper system operation and status. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b. Section 9.1.11 states that the VDS Matrix Switch shall provide complete information about the device, including all software and firmware revisions; type of device; model number; IP address; serial number; MAC address; input signal resolution; original signal resolution; physical location of the unit (based on customer input at time of installation); internal temperatures of the unit; fan speed and status of each fan associated with the unit; and an error log pertaining to the unit. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

c. Section 9.1.11 states that the VPCCs and VDS signal Extenders shall be able to output an internally generated video signal in place of the input signal and an audio tone in place of the incoming audio. Per the vendor's LoC, the SUT does not support this Optional VDS requirement.

d. Section 9.1.11 states that the VDS Matrix Switch, VPCCs, and VDS signal Extenders shall provide an interface capability to be monitored from a centralized monitoring and diagnostic VDS control location. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

e. Section 9.1.11 states that the VDS Matrix Switch, VPCCs, and VDS signal Extenders shall support local and remote control monitoring. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

2) **Section 9.2, Closed VDS**

a) Closed VDSs shall comply with the General VDS Requirements as outlined in Section 9.1, General VDS. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

b) Closed VDSs shall support the IPv4 profile as defined in Section 7.2.1.5, Protocols, and the IPv6 profile as described in Section 5, IPv6. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

c) Closed VDSs shall interface with a VDS Matrix Switch controller. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

d) Closed VDSs shall support serial RS-232, RS-422, or RS-485 interfaces as required by the system. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

e) Closed VDSs shall support USB and Ethernet interfaces. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

f) Closed VDSs shall support a web-based configuration and control. The SUT met the requirements for a Closed VDS with the vendor's LoC. The LoC analysis results for all components are listed in Enclosure 3, Table 3-2.

3) **Section 9.3, VDS Over IP (VDS-IP)**

a) VDS-IP Systems shall comply with the General VDS Requirements as outlined in Section 9.1, General VDS. Note: See LoC for UCR Section 9.1. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

b) VDS-IP Systems shall support the IPv4 profile as defined in Section 7.2.1.5, Protocols, and the IPv6 profile as described in Section 5, IPv6. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

c) If the VDS-IP system uses standards-based video or picture conversion, compression, and encoding methods, then the VDS shall be categorized as an Open Distribution VDS. Otherwise, the system is a Proprietary Distribution VDS. The SUT is a Closed VDS; therefore, therefore, these requirements were not applicable for the SUT.

d) Open Distribution VDS-IP systems shall comply with all Unified Capabilities (UC) Audio and Video Conference System Requirements as defined in Section 3.4, UC Audio and Video Conference System. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

e) Proprietary Distribution VDS-IP system shall use STIG and PPSM-approved IP transport mechanisms, but is not required to use standards based video or picture conversion, compression and encoding methods. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

f) VDS-IP Systems shall comply with the following PCA formats: The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

- JPEG, JPEG2000, VC-1, Dirac, VP8 or other compression codecs based on Discrete Cosine Transform (DCT) or Discrete Wavelet Transform (DWT).
- PNG

g) VDS-IP subcomponents shall support serial RS-232, USB, or Ethernet. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

h) VDS-IP systems shall support a web-based configuration and control. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

i) VDS-IP systems shall interface with a VDS Matrix Switch controller. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

1. **Section 9.3.1, VDS–IP Codec**

a. VDS-IP shall fall into one of two categories: VDS-IP Hardware Codec or VDS-IP Software Codec. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

b. VDS-IP Hardware Codecs shall accept computer graphic input resolutions to include VGA, SVGA, XGA, SXGA, SXGA+, UXGA, WUXGA, 1920x1080, and custom computer graphic resolutions and input modes. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

c. The VDS-IP Hardware Codecs shall provide reliable decoding during live configuration changes or selection of new active audio and video data streams (e.g., decoding device does not require restart, resync, or reboot to acquire newly selected data stream). The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

4) **Section 9.4, VDS Recording**

a) VDS Recording Devices shall fall into one of two categories: The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

- Video Tape Recorder (VTR). A device that captures and archives video and/or audio material on a magnetic tape (e.g., video tape, compact cassette).
- Digital Video Recorder (DVR). A device or application software that captures and archives video and/or audio in a digital format to a disk drive, USB flash drive, Standard Definition (SD) memory card, or other local or networked mass storage device.

b) VTR Recording Devices shall adhere to the requirements specified in Section 9.4.1, VDS Video Tape Recording (VTR). The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

c) DVR Recording Devices shall adhere to the requirements specified in Section 9.4.2, VDS Digital Video Recording (DVR). The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

1. **Section 9.4.1, VDS Video Tape Recording (VTR)**

a. VTR devices shall accept standard and high-definition video using the following SMPTE formats: The SUT is a Closed VDS; these requirements were not applicable for the SUT.

- SMPTE 259M: SD-SDI
- SMPTE 344M: ED-SDI
- SMPTE 292M: HD-SDI
- SMPTE 424M: 3G-SDI
- SMPTE 291M: Ancillary Data Packet and Space Formatting

b. VTR devices shall accept standard and high-definition video using the following SMPTE formats: The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

- SMPTE 372M: Dual-Link (DL) HD-SDI
- Digital Picture Exchange
- NOTE: the SMPTE defines the standard for many video tape recording (VTR) protocols.

2. **Section 9.4.2, VDS Digital Video Recording (DVR)**

a. DVR devices shall be capable of recording and replaying video and audio using MPCA and Audio Compression Algorithms (ACAs) as defined in Section 3.4, UC Audio and Video Conference System, and shall be able to capture Picture Compression Algorithms (JPEG and PNG). The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

b. DVR devices shall be capable of recording and replaying video using MPEG-4 Part 2, MPEG-2 .mpg, MPEG-2 .TS, VOB, and International Organization for Standardization (ISO) video. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

c. DVR devices shall be capable of recording and replaying audio using MP3, AC3, and Ogg. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

d. DVR devices shall integrate with the monitor and/or TV set. The SUT did not test this requirement, as it is a Closed VDS. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

e. DVR devices shall be VESA compatible. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

f. DVR devices shall be able to interface with PC-based compatible devices running Microsoft Windows, Linux, or Mac OS. The SUT is a Closed VDS; therefore, these requirements were not applicable for the SUT.

b. Hardware/Software/Firmware Version Identification. Table 3-3 provides the SUT components' hardware, software, and firmware. Table 3-4 provides the hardware, software, and firmware of the components included the SUT infrastructure.

7. TESTING LIMITATIONS. There was no interoperability testing conducted because this is a Closed VDS, and there were no testing limitations. Compliance to applicable UCR Change 2 requirements for a VDS was based on the Vendor's LoC.

8. CONCLUSION(S). The Thinklogical TLX Video Matrix Switching Solution with Software Release 5 meets the critical interoperability requirements for a DoDIN Closed VDS in accordance with the UCR and is certified for joint use with other DoDIN Products listed on the Approved Products List (APL).

DATA TABLES

Table 3-1. Interface Status

Interface	Applicability: (R), (O), (C)	Status	Remarks
Closed VDS (See note 1.)			
RS-232	R	Met	(See note 2.)
RS-422	R	Met	(See note 2.)
RS-485	O	Not Met	(See notes 2 and 3.)
USB	R	Met	
Ethernet – IEEE 802.3i (10BaseT UTP)	O	Met	(See note 4.)
Ethernet - IEEE 802.3u (100BaseT UTP)	O	Met	(See note 4.)
Ethernet - IEEE 802.3u (100BaseFX)	O	Met	(See note 4.)
Ethernet - IEEE 802.3ab (1000BaseT UTP)	O	Met	(See note 4.)
Ethernet - IEEE 802.3z (1000BaseX Fiber)	O	Not Met	(See note 3).
Network Management Interfaces for VDS Products (See notes 1 and 5.)			
IEEE 802.3i (10BaseT UTP)	C	Met	
IEEE 802.3u (100BaseT UTP)	C	Met	
IEEE 802.3ab (1000BaseT UTP)	C	Met	
IEEE 802.3ab (1000BaseT UTP)	C	Met	
IEEE 802.3z (1000BaseX Fiber)	C	Not Met	(See note 3).
VDS Subcomponents (See notes 1 and 6.)			
VDS Signal Extenders (See note 7.)			
Coaxial	R	Met	
Twisted Pair	R	Met	
Fiber Optical	R	Met	
VDS Peripheral Connectors (See note 8.)			
BNC	R	Met	
DVI	R	Met	
VGA	R	Met	
HDMI	R	Met	
RCA	R	Met	
Fiber	R	Met	
Modular Connectors	R	Met	
VDS Peripheral Connector Conversion Devices (See note 8.)			
BNC	R	Met	
DVI	R	Met	
VGA	R	Met	
HDMI	R	Met	
RCA	R	Met	
Fiber	R	Met	
Modular Connectors	R	Met	

NOTE(S):
1. The SUT is a Closed VDS only and did not require interoperability testing; all applicable "Met" results were based on analysis of the vendor's LoC.
2. The UCR requires that a Closed VDS support RS-232, RS-422, or RS-485.
3. The SUT does not support this optional (or conditional) interface; therefore, it was not included in this certification.
4. The UCR specifies that that a Closed VDS may support an Ethernet interface but does not specify media or data rate. The SUT may support one or more of the specified interfaces.
5. The UCR specifies that all network appliances must be manages via an Ethernet interface but does not specify media or data rate. The SUT must support at least one of the specified interfaces.
6. A Closed VDS may support VDS Signal Extenders, Peripheral Connectors, or Peripheral Connector Conversion devices. If supported, these subcomponents must meet the applicable UCR requirements specified in Section 9.

(Table continues on next page.)

Table 3-1. Interface Status (contined)

NOTE(S): (continued)
7. If the SUT supports VDS Signal Extenders, the SUT must provide one of the specified interfaces.
8. If the SUT supports peripheral connectors it must support at least one of the specified interfaces.

LEGEND:

802.3ab	1000 Base T Gbps Ethernet over Twisted pair	ID	Identification
802.3i	10BaseT Mbps over Twisted pair	IEEE	Institute of Electrical and Electronics Engineers
802.3u	Fast Ethernet at 100 Mbps, copper and fiber	IP	Internet Protocol
802.3z	Gigabit Ethernet over Fiber	LoC	Letter of Compliance
BaseFX	1000 Mbps Ethernet over fiber	O	Optional
BaseT	10 Mbps (Baseband Operation, Twisted Pair) Ethernet	R	Required
BaseX	1000 Mbps Ethernet over Fiber or Copper	SUT	System Under Test
BNC	Bayonet Neill-Concelman	UCR	Unified Capabilities Requirements
C	Conditional	UTP	Unshielded Twisted Pair
DVI	Digital Visual Interface	USB	Universal Serial Board
FX	Fast Ethernet over Optical Fiber	VDS	Video Distribution System
HDMI	High-Definition Multimedia Interface	VGA	Video Graphics Array

Table 3-2. Capability and Functional Requirements and Status

CR/FR ID	Capability/Function	Applicability	UCR Reference	Status
1	**General VDS** (See note 1.)			
	IP Requirements for VDSs	Optional	9.1.1	Not Met (See note 2.)
	VDS Signal	Required	9.1.2	Met
	VDS Peripheral	Optional	9.1.3	Met
	VDS Signal Extenders	Required	9.1.4	Met
	VDS Peripheral Connectors	Conditional	9.1.5	Not Met (See note 2.)
	VDS Peripheral Connector Conversion Devices	Required	9.1.6	Met
	VDS Master Control Switch	Required	9.1.7	Met
	VDS Matrix Switch	Required	9.1.8	Met
	VDS Cybersecurity (See note 3.)	Required	9.1.9	Met (See note 3.)
	VDS Availability	Required	9.1.10	Met
	VDS Diagnostics	Optional	9.1.11	Not Met (See note 4.)
2	**Closed VDS** (See note 1.)	Required	9.2	Met
3	**VDS over IP (VDS-IP)** (See note 2.)			
	VDS-IP Codec	Required	9.3.1	Not Met (See note 2.)
4	**VDS Recording** (See note 2.)			
	VDS Video Tape Recording (VTR)	Required	9.4.1	Not Met (See note 2.)
	VDS Digital Video Recording (DVR)	Required	9.4.2	Not Met (See note 2.)

NOTE(S):
1. The SUT is a Closed VDS only and therefore did not require interoperability testing; the SUT CR/FR status is based on analysis of the vendor's LoC.
2. The SUT is a Closed VDS only; therefore, these requirements were not applicable to the SUT
3. A NIWC-led Cybersecurity test team conducted Security testing and published the results in a separate report, Reference (c).
4. Per the vendor's LoC, this SUT does not support this Optional VDS requirement.

LEGEND:

CR	Capability Requirement	IP	Internet Protocol
DISA	Defense Information Systems Agency	NIWC	Naval Information Center Warfare
DVR	Digital Video Recording	UCR	Unified Capabilities Requirements
FR	Functional Requirement	VDS	Video Distribution System
ID	Identification	VTR	Video Tape Recording

Table 3-3. Test Infrastructure Hardware/Software/Firmware Version Identification

Component (See note.)	Tested Version	Sub-component	Description
TLX-MSC-000080	5.07	N/A	VDS Matrix Switch
Peripherals to Matrix			
SMP-AX00080	1.03	N/A	SMP Appliance
CHS-HP0004	N/A	N/A	Chassis
CHS-HP0004, ICT-XMF-C01A22	1.0	N/A	Integrated Client Machine
CHS-000004	23.26	N/A	Chassis
CHS-000004, TLX-TMM-U00E40	23.29	N/A	Transmitter Extender Module
CHS-000004, TLX-TMM-U00001	23.20	N/A	Audio and Peripheral Transmitter Module
CHS-000004, SMP-CX00001	6.0	N/A	SMP Client
CHS-000004, TLX-RMM-U00E40	23.18	N/A	Receiver Extender Module
CHS-000004, TLX-RMM-K0SE20	23.31	N/A	Receiver Module
CHS-000004, TLX-TMM-U00001	23.19	N/A	Audio and Peripheral Transmitter Module
CHS-000004, VQM-0HVK03-LCTX	69.19	N/A	Video Extender Module
CHS-000004, VQM-U00002-LCTX	00.02	N/A	Velocity Peripheral Module
CHS-000004, VQM-HA0006-LCTX	68.08	N/A	Velocity Peripheral Module
VEL-AV0M12-LCTX	20.04	N/A	Velocity DVI/RGB Extender
SDC-000001-LC	NA	N/A	SDI to HDMI Converter/Extender
HDC-000001-LC	52.11	N/A	HDMI to SDI Converter/Extender
CHS-000004, VQM-AHV003-LCRX	18	N/A	Video Extender Module
CHS-000004, VQM-U00002-LCRX	00.02	N/A	Velocity Peripheral Module
CHS-000004, VQM-HA0006-LCRX	68.10	N/A	Velocity Peripheral Module
SDI-C100X1-LCRX	NA	N/A	SDI Xtreme 3G+ Extender

NOTE(S): The SUT is a Closed VDS and did not require interoperability testing; the SUT met all applicable interoperability requirements based on analysis of the vendor's LoC.

LEGEND:

N/A	Not Applicable	SDI	Serial Digital Interface
HDMI	High Definition Multimedia Interface	VDS	Video Distribution System
JITC	Joint Interoperability Test Command		