DEFENSE INFORMATION SYSTEMS AGENCY

JOINT INTEROPERABILITY TEST COMMAND
FORT HUACHUCA, ARIZONA

THE DEPARTMENT OF DEFENSE (DOD) INTEROPERABILITY COMMUNICATIONS EXERCISE (DICE) 2004 SUMMARY

AUGUST 2004

EXECUTIVE SUMMARY

The Department of Defense (DOD) Interoperability Communications Exercise (DICE) is an annual exercise that is sponsored by the Joint Forces Command and conducted by the Joint Interoperability Test Command (JITC). DICE is the only exercise dedicated to testing interoperability between systems from each Service, DOD agencies, coalition members, and commercial vendors.

Networks are developed during DICE that replicate, as closely as possible, the "typical" Joint Task Force (JTF) networks that are in use by operational units on real-world missions. DICE brings together warfighting units to reuse the experiences gained from past missions and evaluate new systems in new environments. JITC uses DICE as the means to mitigate risk to the warfighters by rigorously testing equipment and systems intended for use in a JTF network.

The primary objectives for DICE 2004 were interoperability testing, systems' certifications, assessments, and training. With the exception of the Secure Telephone Equipment, all systems met their individual objectives and 18 certifications, assessments, and demonstrations were completed. Some of the systems that successfully met their testing objectives included:

- US Air Force Ground Mobile Terminal
- US Army Combat Support System Automated Information Systems Interface
- US Marine Corps AN/MSQ-126(V)3 Tactical Command System
- Joint Communications Support Element Tactical Local Area Network
- Canadian Deployed Operations Gateway using the DTX-600 Digital Compression Multiplex Equipment

Since the DICE network replicated a "typical" JTF network, the participants, testers, decisions makers, and, most importantly, the warfighter, can have a high degree of confidence that system requirements met in DICE will also be met in a deployed environment.

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DICE 2004 Summary Report

Introduction

The Department of Defense (DOD) Interoperability Communications Exercise (DICE) is an annual exercise that is conducted by the Joint Interoperability Test Command (JITC).

DICE is the only DOD exercise whose primary purpose is to generate joint interoperability certifications. DICE builds upon the successes discovered during other DOD technology demonstration and risk mitigation events. Since JITC is DOD's sole interoperability certification authority, JITC conducts DICE in support of DOD joint interoperability testing, training, and exercise transformation initiatives. Participation includes communications equipment and personnel from each of the Services as well as the Joint Communications Support Element (JCSE), Special Operations signal units, and the Department of Homeland Security Federal Emergency Management Agency (FEMA).

Inviting FEMA to participate and using Guard and Reserves in non-traditional roles has supplemented the operational unit participation level. Commercial vendors with DOD sponsorship are welcomed as DICE participants and, in this way, introduce the latest, state-of-the-art technologies to the warfighters and testing community.

DICE employs a robust joint architecture that provides the necessary opportunities to vigorously exercise and evaluate tactical interfaces and strategic and commercial interfaces, which are critical to split-base operations.

Actual operational units install, operate, and maintain the equipment and systems used during DICE. These exercise configurations are representative of those that the warfighting community uses in real-world combat and contingency operations.

DICE reduces the warfighters' risk of operational failure by aggressively testing new versions of software, equipment, and employment techniques in a "typical" Joint Task Force (JTF) communications network. DICE also creates a dynamic training environment that enables participating Service personnel to enhance their skills in tactical network planning, management, and switch operations. It allows participants to gain familiarity with new upgrades and apply network management disciplines while exercising tactical scenarios consistent with their mission areas.

DICE 2004

Participants included Army, Air Force, and Marine Corps systems, several DOD programs and a Canadian initiative. Additionally, three commercial vendors brought their products for evaluation and had favorable results.

The objectives of DICE 04 were:

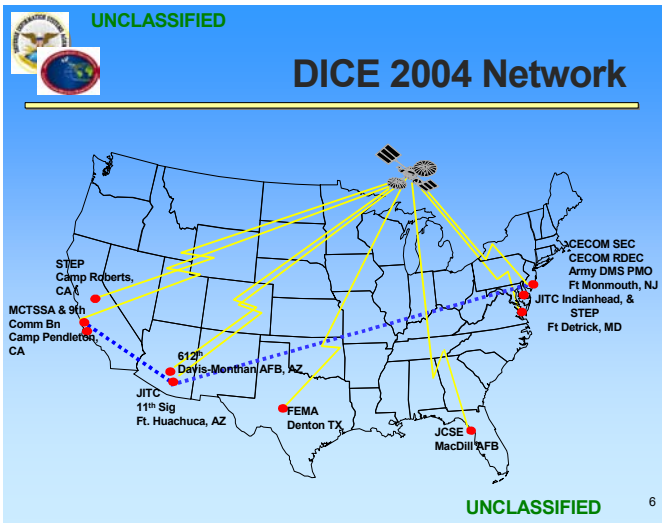
Interoperability Certification—Determine the degree of interoperability of new hardware and software versions employed in joint transmission, switching, and information systems.

Assessments—Assess the capabilities of systems still in development and provide insights into their interoperability posture.

Training—Replicate joint tactical communications architectures and operational or organizational structures that will allow the participating units to:

- Develop Command, Control, Communications, Computers, and Intelligence (C4I)-oriented training
- Develop interoperability skills with current and legacy communications equipment and systems in an operationally representative joint environment.

Network System Control—Establish a Joint Communications Control Center (JCCC) to provide operational direction and management of all joint Command, Control, Communications, and Computers (C4) resources. The JCCC exercised management and control over the deployed equipment via the various system controls or equivalent functions.



DICE 2004 Network

Descriptions and Demonstrated Capabilities

The following synopsis describes the capabilities that were demonstrated for each system during DICE 04. Systems' descriptions and evaluation results are grouped by sponsoring Service or organization. For specific details, refer to the individual system test or assessment report by accessing the System Tracking Program (STP) at https://stp.fhu.disa.mil/ or the Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil.

Air Force-Sponsored Efforts:

- Ground Multi-Band Terminal (GMT) is projected by the Air Force to replace the Lightweight Mobile Satellite Terminal (LMST). The GMT, pictured below, is a multi-band Super High Frequency (SHF) Satellite Communications (SATCOM) terminal that provides connectivity between deployed elements and centralized Command and Control (C2) facilities.
Results: GMT supported user services in the networks tested. GMT is interoperable with the following SATCOM terminals on X-Band and Ku-Band satellites:

- Defense Satellite Communications System (DSCS) AN/GSC-52
- Standardized Tactical Entry Point (STEP) and Teleport
- AN/USC-60, AN/TSC-85B, and AN/TSC-93C
- LMST-Block IV and V
- TCS-3000 (part of AN/MSQ-126)
- Quad-Band Dual-Hub Terminal (QDHT)

Army-Sponsored Efforts:

- Combat Support System (CSS) Automated Information Systems Interface (CAISI) is a collection of modules that provides an infrastructure for network-capable Army CSS systems. The modules include wireless Local Area Network (LAN) components and Inline Network Encryption (INE) devices. CAISI may be set up in a number of different configurations to meet the needs of the particular unit it supports. The INE devices allow tunneling Sensitive But Unclassified data through secret-high networks, which in turn enables CAISI users to communicate with Army and other JTF users.
Results: CAISI is capable of passing e-mail, File Transfer Protocol files, and World Wide Web pages among all Service components of a deployed JTF and the strategic sustaining base across a joint network. Additionally, CAISI logistics/maintenance terminals can exchange files containing logistics/maintenance information with four other CAISI terminals set up as the Army sustaining base. The CAISI LAN and Wide Area Network components are interoperable with a deployed JTF and are capable of connecting with the Army sustaining base through a joint network and the Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) gateway.

- Common Baseline Circuit Switch (CBCS) Circuit Switch On-Line Operational Program (CSOLOP), Software Version RD30219C, is the operating system for Tri-Service Tactical Communications (TRI-TAC) and Mobile Subscriber Equipment (MSE) tactical voice switching platforms. This software provides the facilities and management for all subscriber services and functions, as well as network management. The CBCS software is upgraded annually by the United States Army Communications and Electronics Command and submitted to JITC for interoperability testing and certification.

Results: Overall, CBCS, with Software Version RD30219C, effectively provided quality voice communications and was interoperable with other switching systems. The overall call completion rate was 98 percent.

- Enhanced -Tactical High Speed Data Network (E-THSDN) is designed to provide a high-speed digital communications path over MSE switching and TRI-TAC switching and transmission systems, except for the AN/TTC-42, SB-3865, and SB-3614. E-THSDN is an Army project intended for use in TRI-TAC and MSE equipment. E-THSDN will increase the data and Video Teleconferencing (VTC) throughput capability of the warfighter's tactical switching systems. E-THSDN enhances the capability of current systems to provide nonsecure and secure data and VTC services to deployed forces.

Results: The E-THSDN circuit cards were able to successfully send and receive data files and VTC in a joint tactical network. The system is interoperable in a JTF network.

- Secure Telephone Devices (STD) are the next generation of secure voice and data terminals providing enhanced secure digital communications. The STD suite includes but is not limited to a host of secure telephone systems as well as cellular technology. STDs were designed to be interoperable with the currently fielded telephone devices; however, there are issues requiring continued research. This year, testing focused on the Secure Terminal Unit-Third Generation (STU-III) and Secure Terminal Equipment (STE), Versions 1C, 2.2, and 2.3. Although the STU-III is no longer manufactured or supported, it is still widely used throughout the DOD.

Results: Overall, secure voice calls do not meet the interoperability criteria defined by the Executive Agent for Theater Joint Tactical Networks. STEs operating in the STU-III mode had excellent secure call completion rates. Also, STE Version 2.3 was shown to perform better than previous versions. On the other hand, when the STEs were operating in Future Narrow-Band Digital Terminal (FNBDT) mode over legacy tactical switching systems, secure call completion rates were significantly degraded. FNBDT is not interoperable with tactical systems such as the TRI-TAC suite.

Marine Corps-Sponsored Efforts:

- AN/MSQ-126(V)3 Tactical Command System is a self-contained command post capable of rapid mobilization. It possesses all the necessary C4 systems to provide the initial link between Marine Forces Pacific (MARFORPAC), the designated Commander, and the JTF. The functional capabilities provided by the AN/MSQ-126(V)3 include a multi-band satellite terminal (TCS-3000), secure and nonsecure tactical telephone services via the Switch Multiplex Unit (SMU)-96, Secret Internet Protocol Router Network (SIPRNet), NIPRNet, and secure and nonsecure VTC via a Tandberg 2500.
Results: An interoperability assessment of the AN/MSQ-126 was conducted in lieu of Joint Staff validated system requirements. The AN/MSQ-126(V)3 Tactical Command System meets some of its user-defined interoperability requirements. The system as configured and tested during DICE 04 successfully provided voice, data, and video services. Some of the critical interfaces were not available for testing during DICE 04, and therefore could not be assessed during this year's event.

- Lightweight Mobile Satellite Terminal-Block V (LMST V) will replace the Marine Corps' Ground Mobile Forces satellite terminals. The LMST V is a multi-band SHF SATCOM terminal that provides connectivity between deployed elements and centralized C2 facilities operating over C, X, Ku, and Ka SHF frequency bands.
Results: LMST supported user services in the networks tested. LMST is interoperable with the following SATCOM terminals on X-Band and Ku-Band satellites:

- Teleport
- AN/TSC-85C
- AN/TSC-93C
- GMT
- TCS-3000 (part of AN/MSQ-126)
- QDHT

DOD-Sponsored Efforts:

- Automated Network Information Flow (ANIF) project is an integration of several emerging technologies that can enable the warfighters to take advantage of the data transfer capabilities of new internetworking technologies while at the same time retain the information prioritization feature of older legacy technologies. The ANIF project will concentrate on identifying selected technologies that can provide the JTF with the ability to install networks that are capable of providing the users with end-to-end prioritized Quality of Service (QoS) and give the Commanders' information

managers the ability to dynamically reapportion bandwidth.

During this third ANIF event JITC assessed the current ANIF net-centric capabilities over converged SATCOM networks. The first event was a Joint Forces Command (JFCOM) ANIF demonstration that took place in October 2003 to assess the Linkway™ Demand Assigned Multiple Access (DAMA) network over a Ku-Band constellation. A similar follow-on demonstration to assess DAMA over X-Band DSCS took place in December 2003. During DICE, the test team continued to assess the capabilities of network-centric communications to deliver a seamless integration of voice, data, and video over a mixed satellite network.

Results: The convergence of voice, video, and data over the net-centric and transformational communications framework for deployed warfighter using the Everything-over-Internet-Protocol (EoIP) concept was successfully demonstrated. It was a successful attempt to integrate a number of users and multiple organizations in the EoIP test environment. The experiences gained and lessons learned have helped the team to be well positioned for future similar demonstrations.

- Multiplexer Integration and Defense and Communication System (MIDAS) AN/USC-63, Software Version 4.09.11, is an automated approach to accomplish the multiplexing and patching functions of the Defense Communications Satellite Subsystem (DCSS) within STEP and Teleport sites. MIDAS replaces multiplexer equipment and patching panels within the DCSS with circuit card assemblies in a chassis assembly. It is intended to be the intermediary device between joint deployed SATCOM users' traffic and the terrestrial transmission equipment at the STEP and Teleport sites providing connectivity to Defense Information System Network (DISN) services. MIDAS has been installed in Teleport sites and is being installed in selected STEP site facilities. This software version is currently in use in the selected STEPs and Teleports worldwide.

Results: MIDAS is interoperable in a JTF network. Any problems encountered during testing had minor operational impact and were isolated to legacy equipment in the network.

- Moonv6 Internet Protocol Version 6 (IPv6) Assessment Demonstration was co-sponsored by the North American IPv6 Task Force, in collaboration with JITC, the University of New Hampshire Interoperability Lab, and DOD.

Moonv6 Phase II was a two-month interoperability assessment during which the test team learned valuable lessons in conducting "End-to-End" network testing in a non-operational but realistic production environment. A high-capacity backbone leveraged the Defense Research and Engineering Network (DREN) and the DISN Leading Edge Services to connect nine test sites distributed across the continental United States and one test site in Europe. This distributed test environment was the result of a unique

alliance between DOD, academia, commercial consortiums, and a large number of commercial vendors.
Results: IPv6 technologies, as currently implemented by vendors, are sufficiently reliable for large-scale deployments provided they are used with Internet Protocol Version 4 (IPv4)/IPv6 transition mechanisms. Native IPv6 (IPv6 with no IPv4 functionality) is not ready for large-scale operational deployments. IPv6 is ready for deployment in network research and development environments; however, significant development work must be done in the key areas of routing protocols, mobility, Internet Protocol (IP) security, Domain Name Server (DNS), and e-mail.

- Joint Communications Support Element (JCSE) Tactical Local Area Network (TACLAN) is composed of commercial hardware and software that can provide C2 communications services to a deployed commander's JTF or Joint Special Operations Task Force (JSOTF) headquarters.
Results: All equipment strings were able to support error-free file exchanges. The released versions of the newly acquired equipment can interoperate with the NIPRNet and the SIPRNet.

- JCSE Quadband Dual Hub Terminals (QDHT) was designed as a replacement for the canceled SHF Triband Advanced Range Extension Terminal (STAR-T). The QDHT is a multi-band SHF SATCOM terminal that provides connectivity between deployed elements and centralized C2 facilities.
Results: QDHT supported user services in the networks tested. QDHT is interoperable with Teleport, AN/USC-60, AN/TSC-85B, AN/TSC-85C, and GMT on both X-Band and Ku-Band satellites.

-Video Teleconferencing (VTC) is used more and more by the DOD and the warfighting community to engage in face-to-face audio and visual communications.

During DICE, a variety of currently employed tactical VTC systems were tested to determine the extent these VTC systems interoperate within a joint communications network and how each system is interoperable within the DISN Video Services (DVS) network.
Results: Each suite under test, the JCSE View Case, Polycom V.35, and the AN/MSQ-126(V)3 Tandberg 2500 provided users the ability to effectively support VTC in point-to-point and multipoint configurations within a joint communications network and within the DVS network. The only exception is the AN/MSQ-126(V)3 Tandberg 2500 configured with B 4.3 software, which cannot complete a session to a suite using newer VTC technology.

Combined-Sponsored Efforts:

- Canadian Deployed Operations Gateway (DOG) using the DTX-600 Digital Compression Multiplex Equipment (DCME), a device that can simultaneously compress voice, facsimile (fax), voice band data (VBD), native data, and signaling. Nonsecure voice channels can be compressed up to 20:1, secure voice 6:1, fax 6:1, and VBD 2:1. The Canadian DOG at Tunney's Pasture in Ottawa, Canada, along with ECI Telecom-Veraz Networks, requested that JITC assess the DTX-600 compression capabilities at the JCSE at MacDill Air Force Base, FL.
Results: The ECI-Veraz DTX-600 successfully provided quality voice, data, and VTC services within a JTF network.

Commercially-Sponsored Efforts:

- Intelligent Tactical Network (ITN) is a wireless and wired network concept supported by REDCOM Labs, Tekelec, Cell-Tel Government Systems, L3 Communications, Diversified Products, and General Dynamics.

The ITN node is designed to rapidly deploy and be made operational, affiliating ITN wired or wireless voice devices with network-wide mobility. ITN provides secure interoperability between wired and wireless devices and TRI-TAC radios. ITN supports Single Stage Dialing for KY-68 users to STEs, STU-IIIs, and FNBDTs as well as other modern and legacy network protocols.

Results: The ITN successfully demonstrated its advertised capabilities and met its 11 objectives.

- REDCOM Integrated Services Digital Network (ISDN) Gateway Exchange (IGX) with Software Version 6.1.3 is a modular and scalable Commercial Deployable Exchange capable of military-unique features such as Multi-Level Precedence and Preemption. The REDCOM IGX is an ISDN digital telecommunications switching system that supports both analog and digital ISDN Basic Rate lines, and analog and digital trunks. It also provides secure and nonsecure voice. The REDCOM IGX can be employed as an end switch or a gateway switch between the tactical networks, the Defense Switched Network, and the Defense Red Switch Network. Access nodes are distributed to user locations and interconnected via terrestrial or satellite links or a wired network.

REDCOM developed a new version of software for release to the joint forces that was certified by JITC on 23 September 2003. Further testing was required to determine the interoperability of this latest version of the REDCOM IGX into the tactical network.
Results: REDCOM IGX with Software Version 6.1.3 successfully met its interoperability requirements. A total of

270 telephone calls were attempted to and from the REDCOM IGX and all completed successfully. The REDCOM IGX, Software Version 6.1.3, as configured and tested, is interoperable with currently fielded tactical switching systems within a JTF network.

- Vantage, manufactured by General Dynamics, is a network control and service delivery vehicle for networks primarily composed of commercial off-the-shelf (COTS) elements. It integrates and unifies controlling network services from disparate communications elements such as Public Branch Exchanges, routers, switches, and legacy systems through management and control system. This control addresses admission, service requests, and delivery, security, and Bandwidth Management/QoS.

The JCSE plans to use the Vantage with the REDCOM IGX to further enhance its ability to provide communications. The network environment included both terrestrial and satellite radio systems, active military units, and traffic loading devices to provide operational realism. Results: There were 1,007 telephone calls attempted from, to, and through the Vantage, and 907 calls were successful which meets the requirement.

Conclusions

JITC's DICE network successfully supported 18 tests, assessments, and demonstrations. Since the DICE network replicated a "typical" JTF network, the participants, testers, decisions makers, and most importantly, the warfighter, can have a high degree of confidence that system requirements met in DICE will also be met in an deployed environment. DICE 04 achieved all of its objectives:

- Demonstrated a high degree of interoperability of assessed systems
- Successfully conducted joint interoperability assessments and certifications
- Allowed participating units valuable training in a joint operational environment

The majority of the systems tested met their requirements and successfully achieved their test objectives. DICE reduced the warfighters' risk of operational failure by aggressively testing new versions of software, equipment, and employment techniques in a typical communications network.

DICE also created a dynamic training environment that enabled participating service personnel to enhance their skills in tactical network planning, management, and switch operations. It allowed participants to gain familiarity with new upgrades and apply network management disciplines while exercising tactical scenarios consistent with their mission areas.

Points of Contact:

ANIF: Don Hann,
(520) 538-5130
DSN 879-5130
hannd@fhu.disa.mil

CAISI: Don Hann,
(520) 538-5130
DSN 879-5130
hannd@fhu.disa.mil

CBCS: Martin E. Mendoza,
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

DICE: Capt Paul Dunbar,
(520) 533-0154
DSN 821-0154
dunbarp@fhu.disa.mil
Martin E. Mendoza,
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

DMS: Capt Paul Dunbar,
(520) 533-0154
DSN 821-0154
dunbarp@fhu.disa.mil

DOG: Marty Mendoza,
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

DTX-600: Marty Mendoza,
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

E-THSDN: Don Hann,
(520) 538-5130
DSN 879-5130
hannd@fhu.disa.mil

GMT: Bill Johnson,
(520) 533-0150
DSN 821-0150
johnsonw@fhu.disa.mil

ITN: Marty Mendoza,
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

JNMS: Elester Jackson,
(520) 538-5109
DSN 879-5109
jacksone@fhu.disa.mil

LMST: Bill Johnson,
(520) 533-0150
DSN 821-0150
johnsonw@fhu.disa.mil

MIDAS: Elester Jackson,
(520) 538-5109
DSN 879-5109
jacksone@fhu.disa.mil

Moonv6: Capt Dan Millane,
(520) 538-4393
DSN 879-4393
millaned@fhu.disa.mil

MSQ-126: Jim Bennett,
(520) 533-0151
DSN 821-0151
bennettj@fhu.disa.mil

QDHT: Bill Johnson,
(520) 533-0150
DSN 821-0150
johnsonw@fhu.disa.mil

REDCOM IGX: Martin E. Mendoza
(520) 538-5552
DSN 879-5552
mendozam@fhu.disa.mil

STD: Lt Jared Harris,
(520) 538-5193
DSN 879-5193
harrisj@fhu.disa.mil

TACLAN: Don Hann,
(520) 538-5130
DSN 879-5130
hannd@fhu.disa.mil

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