

Increasing Combat Effectiveness Through Interoperability

Information Interoperability—The Key to Information Superiority

PHUONG TRAN • GORDON DOUGLAS

Information Superiority—a powerful tool for the warfighter in the international battlespace of today ... and one of the greatest challenges facing the test and evaluation community. Information interoperability is arguably the key ingredient of information superiority.

Consequences of Not Sharing Information

Every time the wrong helicopter is shot down or the wrong target is bombed critics say, “They should have known.” In some cases the critics are right. Some people did know, but the right information did not get to the right people at the right time. That often happens when systems do not exchange information efficiently and effectively and are not interoperable across Service, Agency, or even National boundaries.

The Chairman of the Joint Chiefs of Staff has attacked this problem directly with a joint interoperability test certification process that applies to every Department of Defense National Security System (NSS) and Information Technology (IT) system. Systems that have interoperability integrated into their development and testing plans have a shorter, smoother path to deployment and provide the best support to the warfighter. Programs where interoperability issues have been sidestepped may later suffer delays, cost overruns, or worst of all, contribute to deadly mistakes.

The Joint Interoperability Test Command helps to ensure continuing effective interoperability by participating in joint exercises and real contingencies. Results from these events confirm a system’s interoperability status, or trigger a reassessment if serious anomalies are uncovered.



Program managers need to understand the interoperability testing and evaluation process and use it to their advantage. To understand the process, a few basic questions need to be answered.

Q What is information interoperability?

A Simply put, information interoperability is systems working effectively together. Joint Publication (JP) 1-02, *DoD Dictionary of Military and Associated Terms*, dated March 23, 1994, uses a slightly more elaborate definition:

“The ability of systems to provide services to and accept services from other systems, and to use the services exchanged to enable them to operate effectively together.”

Q How interoperable must a system be?

A For years, this has always been a challenging question to answer. The interoperability status of systems, especially families or systems of systems, cannot be simply dichotomized into “yes, it works” or “no, it doesn’t.” Commercial

Tran is Chief of the Plans and Policies Branch, Plans, Policies, and Warfighter Support Division, at the Joint Interoperability Test Command (JITC), Fort Huachuca, Ariz. She is a graduate of the University of Arizona and has 15 years of government service in the Test and Evaluation arena. Douglas is an operations research analyst with JITC, also at Fort Huachuca. He is a graduate of the University of Arizona, with more than 20 years of military, government, and private industry experience in research, engineering, and test and evaluation.

software, whether used directly in systems or in the tools used to develop custom systems, is ubiquitous. Unfortunately, the complexity of this software guarantees that any moderately large system will never be error free.

Interoperability evaluation acknowledges this situation by factoring in the criticality of requirements (i.e., will failure to meet a requirement affect critical mission functions?) and by assessing the severity of any deficiencies. The expected operational impact of anomalies is categorized as minor, moderate, or major—major being sufficiently severe to preclude certification of the capability or to justify de-certification of a previously certified requirement.

The operational environment is dynamic in ways beyond the flexibility of tactical networks. Individual system components are upgraded—frequently with hardware, constantly with software. Anyone with a personal computer, who has tried to maintain current versions of operating systems, applications, virus definition files, etc., is painfully aware of the implications of this situation.

With few exceptions, no static configuration exists for the components of a family of systems or tactical network infrastructure. In this environment, it becomes a practical necessity to focus on critical high-level Information Exchange Requirements (IERs, in the new terminology) and other critical system performance parameters (for example, information assurance). At the same time, the low-level technical interoperability must be verified as capable of supplying the “wire” between systems.

With technology, systems, architectures, and operational configurations in a constant state of flux, periodic verification of interoperability is an important element of the interoperability test methodology. JITC helps to ensure continuing effective interoperability by participating in joint exercises and real contingencies. Results from these events confirm a system’s interoperability status, or trigger a reassessment if serious anomalies are uncovered.

Q
What is interoperability test certification?

A
Interoperability test certification is the process of ensuring that a system meets the joint information interoperability requirements of its users. It includes the collection of the data necessary to determine whether or not the system conforms to applicable interoperability standards and can effectively exchange all required information with all other required systems.

Q
Why certify for interoperability?

A
Certification is confirmation from an independent evaluator that assures the warfighter that the Commanders-in-Chief (CINCs), Service, and Agency systems can interoperate in a joint team.

Q
Who certifies that a system is interoperable in a joint environment?

A
The Joint Interoperability Test Command, an element of the Defense Information Systems Agency, has responsibility for certifying joint interoperability of all DoD systems. The Joint Staff certifies the actual requirements; JITC certifies that the system meets those interoperability requirements.

Q
What systems need to be certified?

A
All NSS and IT systems, regardless of acquisition category (ACAT), that produce, use, or exchange information between Services, Agencies, or countries, must be evaluated and certified by JITC.

Q
When should systems be certified?

A
All systems must be certified before they are fielded, usually before Milestone C or Initial Operational Capability (IOC). Fielded systems must be re-certified

every three years or upon changes affecting interoperability or supportability. The system proponent should contact JITC early in the acquisition process to ensure that certification is both timely and cost effective by leveraging off other testing wherever possible.

Q
What is involved in the interoperability test certification process?

A
JITC follows the processes outlined in the May 8, 2000, Chairman Joint Chiefs of Staff Instruction (CJCSI) 6212.01B, *Interoperability and Supportability of National Security Systems and Information Technology Systems*, to perform its joint interoperability test and certification mission. This Joint Staff instruction has recently been updated to mesh with changes to the requirements generation process and to ensure that interoperability certification is addressed during the acquisition of all NSS and IT systems, regardless of ACAT. JITC implements joint test certification in a four-step process that is depicted in Figure 1.

Identification of All Joint Interoperability Requirements
Interoperability testing begins with identifying requirements from traditional sources such as Mission Need Statements (MNSs) and Operational Requirements Documents (ORDs). But MNSs and ORDs are sometimes outdated and incomplete.

On April 15, 2001, the requirements generation process was strengthened with publication of a revised CJCSI 3170.01B, *Requirements Generation System*, which serves to improve the identification of interoperability requirements. This updated instruction mandates identification of interoperability Key Performance Parameters (KPPs) for Capstone Requirements Documents and ORDs and defines time-phased requirements in support of incremental acquisitions. To complete the requirements picture, we examine how the system will fit into the present and future joint operational networks and archi-

FIGURE 1. Joint Interoperability Certification Process



tures—a process aided by JITC’s active participation in exercises and contingencies.

User Requirements Confirmation
Once requirements are identified, JITC extracts interoperability requirements from system documents and develops a joint interoperability requirements matrix. JITC coordinates this matrix with the program manager and the user community to verify requirements and determine criticality.

Interoperability Data Collection
Interoperability data to support evaluation efforts is then obtained from appropriate test events, to include JITC- or Service-conducted tests. While each NSS or IT system presents unique challenges, JITC divides interoperability assessments into two basic categories: information transport and information processing. The interoperability issue with information transport is the complete, accurate, and timely transfer of information from one system to another. The objective of this assessment is to determine the ability of the system to send and receive information in its intended operational environment.

As an example, JITC assesses tactical communications equipment in terms of supporting a notional Joint Task Force (JTF). While the Services acquire tactical communications equipment focusing on Service requirements, JITC’s wider viewpoint determines the degree that this equipment interoperates within the overall requirements of the JTF—the capability of the system to transfer data, voice, imagery, and the system management functions required for JTF operations.

Interoperability assessment of information processing requires more than the bits, bytes, and protocol testing of the transport mechanism. JITC assesses sys-

tems from end-user to end-user to determine how one system interacts with other systems in order to evaluate whether they can exchange information and services in a joint environment. The objective of this testing is to assess the ability of the system to process and present information to and from other systems in the joint architecture.

As an example, during joint theater air and missile defense evaluations, JITC’s data collection/analysis efforts often extend to three levels of interoperability. The first level is standards conformance certification to verify the exchange of information is in accordance with applicable military and commercial standards and standards profiles, as required by operational and technical architectures. System capability is the next level examined. Interoperability with respect to defined system performance parameters is verified, using a variety of tools. Finally, the assessment of operational levels of interoperability ensures that components satisfy the user’s needs in a realistic environment.

JITC’s Joint Operational C4I Assessment Team (JOCAT) capability is one means

of obtaining operational interoperability data. JOCAT is a worldwide deployable team consisting of equipment and personnel with the capability and expertise to provide on-site interoperability analysis and support during field exercises and real-world contingencies. The JOCAT monitors the Joint Data Network (JDN); selected voice networks; Tactical Information Broadcast Service (TIBS); Tactical Receive Equipment and Related Applications (TRAP) Data Dissemination System (TDDS) network; the Joint Planning Network (JPN); and exercise Distributed Interactive Simulation (DIS) networks. JOCAT provides automated methods to identify items of interest and interoperability anomalies for immediate analysis. The automated methods of JOCAT process the data collected at various interfaces to provide valuable and timely feedback.

Determining the Status of Interoperability

All relevant data are used to determine the interoperability of a system and all its interfaces. JITC publishes the determination in a letter of certification sent to the program office; the Services; the Joint Staff; and acquisition executives such as Director, Operational Test and Evaluation (DOT&E); U.S. Joint Forces Command; Under Secretary of Defense for Acquisition, Technology and Logistics; and Assistant Secretary of Defense for Command, Control, Communications and Intelligence (C3I).

FIGURE 2. JITC’s Areas of Expertise

- | | |
|--|---|
| Asynchronous Transfer Mode (ATM) | High Frequency Test Facility (HFTF) |
| Combined Interoperability Command and Control (C2) | Information Assurance (IA) |
| Defense Information System Network (DISN) | Joint Theater Air & Missile Defense (JTAMD) |
| Defense Message System (DMS) | National Imagery Transmission Format Standard (NITFS) |
| Defense Red Switch Network (DRSN) | National Missile Defense (NMD) |
| Defense Travel System (DTS) | Satellite Communications |
| Department of Defense Intelligence Information System (DODIIS) | Security Management Infrastructure (PKI and EKMS) |
| DFAS Corporate Information Infrastructure (DCII) | Tactical Communications |
| Electronic Business / Electronic Commerce (EB / EC) | Tactical Digital Information Link (TADIL) |
| Global Command and Control System (GCCS) | Telemedicine |
| Global Combat Support System (GCSS) | US Message Text Format (USMTF) |
| | Unmanned Aerial Vehicle (UAV) |
| | Logistics Systems |

Q
How do you get and keep your system certified?

- A**
- Contact the JITC as early in system development as possible. This allows JITC to piggyback on planned system testing.
 - Coordinate all testing with JITC, so joint interoperability can be integrated into the test program schedule.
 - Consult JITC on changes in requirements or capabilities in order to keep certification status current.

Q
What will JITC do to help get your system certified?

A
When a program manager contacts JITC early in the acquisition program, JITC will:

- Assist in identifying joint interoperability requirements during the concept/design phase of the program.
- Provide advice so that interoperability is built into the system from the start.
- Plan for the most efficient use of testing resources.
- Assist the program manager in identifying solutions to interoperability problems necessary to get the system certified.

About JITC's Test Program

JITC's philosophy is to test for success; thus, the objectives are to characterize and certify systems using affordable levels of confidence to ensure an operational interoperability capability. JITC also has a range of tools available for system assessments, and laboratories and networks for testing virtually all types of NSS and IT systems. Figure 2 displays some of JITC's areas of expertise.

Q
How does JITC track the certification process?

A
One difficulty in achieving joint interoperability is identifying systems with external interface requirements and tracking the interoperability status of these systems throughout the life cycle. JITC is attacking this problem by developing the System Tracking Program (STP) to better manage interoperability. The STP itself is an evolutionary development based on a simpler test scheduling application. Responding to new

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policy, the STP has evolved to a Web database that includes system information from the concept phase, as requirements documents are initially staffed, to re-certification requirements for mature systems.

Test scheduling and current interoperability status of systems are still core capabilities of the new database; however, this has been augmented with Interim Authority To Operate (IATO)—a temporary “waiver” of certification requirements—and automated notification of expiring certifications. The mature STP will provide a single source to determine NSS/IT system interoperability status (i.e., overall system and individual interface results), system and test event information, results of any standards conformance testing/certification, and online links to certification letters and

detailed test reports. Populating the STP with “heads up” information when requirements are first approved allows identification of systems not tested. By tracking the life cycle progress of interoperability, STP helps paint the big picture of DoD interoperability.

Q
What does the future portend?

A
Too frequently, interoperability has been force fitted and tested into systems. The new direction strives to achieve the rhetoric of having systems “born joint.” DoD policy now calls for system interoperability requirements themselves to be certified. In addition, supportability—including the expected support from infrastructure networks—must be documented in a C4I [Command, Control, Communications, Computers, and Intelligence] Support Plan. Supportability itself, another essential ingredient of interoperability too often ignored, must be certified by the Joint Staff.

These steps will ensure that interoperability requirements are addressed in the system requirements documents and that the existing and planned infrastructure can support the exchange requirements of new and modified systems.

Far from being the end game, joint interoperability is only a step up the ladder to satisfying international interoperability issues. Combined and coalition interoperability will remain suitably challenging. The variables in equipment, versions, basic technology, and configurations that could possibly be encountered in combined and coalition environments will continue to “test the testers” far into the 21st century.

Joint Certification No Longer a “Nice to Have”

Our nation's forces deploy and execute their assigned missions as members of Joint Task Forces. Operational networks

clearly reflect this Joint Force composition and carry with them the requirement to exchange information across Service, Agency, and national boundaries. The Service-sponsored process through which systems have been procured, and the rapid acquisition of readily available and low-cost C4I technologies, have posed challenges to ensuring that all systems are capable of operating when placed in a joint environment.

C4I capabilities have been fielded that enhance the capabilities of the specific user but may degrade overall system

performance when viewed from an integrated, joint perspective. Such non-certified NSS and IT system procurements did not participate in the joint certification process. Recent updates to the requirements generation and interoperability certification processes will establish a means to overcome these challenges and better enforce the requirement for NSS and IT systems to participate in the joint certification process.

JITC, as the sole certifier of DoD systems, will continue to play an active role in the interoperability test certification

process. The ultimate beneficiaries will be the warfighters, who will be provided with higher levels of assurance that the systems procured for their use will interoperate and provide the information superiority needed to achieve the Joint Vision.

Editor's Note: To obtain more information about the joint interoperability certification process, please contact 1-800-LET-JITC or visit the HITC Home Page at <http://jitc.fhu.disa.mil>. The authors welcome questions or comments on this article. Contact Tran at tranp@fhu.disa.mil; contact Douglas at douglasg@fhu.disa.mil.

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