

NSS/IT Information Interoperability

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Background. The Department of Defense (DoD) has encountered numerous deficiencies and shortcomings in the information interoperability arena. As a result of joint and combined information interoperability problems that reduced the mission capabilities of the Coalition Forces during Desert Shield/Desert Storm, the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C3I)) reissued DoDD 4630.5, reinforcing the need to consider joint, combined, and coalition interoperability for all National Security Systems (NSS) and Information Technology (IT) systems. Since then, the DoD 5000 acquisition series and the Joint Staff CJCSI 3170.01 and 6212.01 have been updated to reflect the criticality of interoperability in achieving information superiority. DoDD 4630.5 and CJCSI 6212.01 mandate JITC Interoperability Test Certification for all NSS and IT systems deployed for use by U.S. forces. JITC's role as DoD's sole agent for system test certification is to ensure that the Warfighter's toolkit includes superior interoperability.



JITC follows the processes outlined in CJCSI 6212.01 with respect to accomplishing the joint interoperability test and certification mission. This mission includes the following efforts:

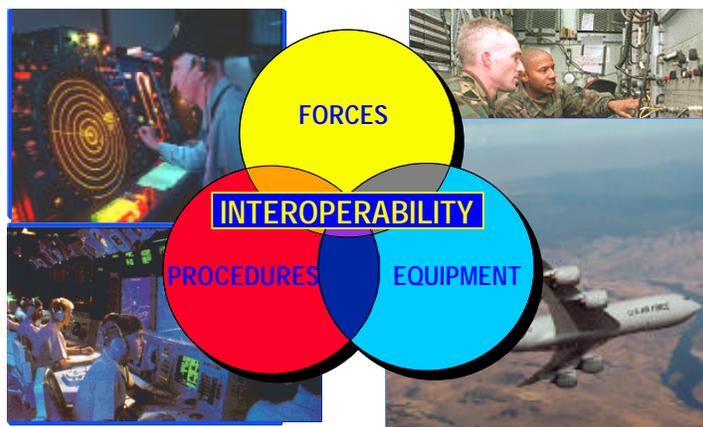
- C Review of Mission Need Statements (MNSs), Capstone Requirements Documents (CRDs), Operational Requirements Documents (ORDs), and C4I Support Plans (C4ISPs).
- C Review of program managers' test plans (including Test & Evaluation Master Plans (TEMPs)).
- C Evaluation of information interoperability and standards conformance.
- C Certification of joint interoperability and standards conformance.
- C Life-cycle support.

Aspects of Interoperability. The directives and instructions above address requirements, interoperability, supportability, compatibility, and compliance with joint architectures for achieving a seamless information flow throughout the battlespace. While information interoperability is our primary focus here, we will discuss other issues as appropriate.

Compatibility is best assessed during standards conformance testing. Along with the more common aspects of compatibility such as radiated emissions, we also examine the adherence to standards that frame such items as data elements. That is, during the examination of the compatibility of information transfer, we look at the data fields from source to target for compatibility as well as examine the standard units of measure.

With respect to interoperability, there are many thoughts on what the true meaning of interoperability might be. Prior to engaging in the interoperability certification mission, we must have a common reference point as to the definition of interoperability. As a means of a common focus, we have adopted the following definition which captures the basic essence of interoperability:

*Interoperability is the ability of **people, procedures, and equipment** to operate together effectively and efficiently under all conditions of battle.*



Some people will discuss the ever-elusive interoperability solution in terms of creating the perfect standard or comprehensive requirement. As those familiar with real acquisitions know all too well, the pursuit of requirements perfection is a futile and frustrating effort. Interoperability is not a static state that can be achieved simply by the satisfaction of technical requirements.

Interoperability is an ideal condition which can be approached but never totally achieved because of the dynamic nature of military operations, system acquisitions, and technology improvements. While the focus towards achieving technical requirements is absolutely essential in the early stages of an acquisition, the people and procedures aspects of interoperability are vital, and must be addressed throughout the acquisition life-cycle.

Requirements. Historically, interoperability requirements have been as elusive and complex as the various interoperability definitions, although the current policy to identify Interoperability Key Performance Parameters (I-KPPs) and Information Exchange Requirements (IERs) serves to mitigate this situation. While other documents exist, the following sources of requirements form the basis of interoperability evaluations:

- C Joint Technical Architecture (JTA). The JTA identifies the set of standards that are required to be implemented within DoD acquisitions. The objective of the JTA is to provide a technical framework for systems interoperability.
- C MNSs/CRDs/ORDs/C4ISPs. These documents outline the users' requirements and system supportability as validated by senior DoD management and certified by the Joint Staff.
- C Operational Employments. As operational organizations continually adjust their assets to address changing threats, the acquisition community experiences great difficulty in adapting ongoing acquisitions to incorporate the CINC's continuous adjustments. Hence, the MNSs/CRDs/ORDs of yesterday are often outdated and incomplete. To bridge the gap between the acquisition and operational worlds, JITC conducts field assessments of NSS during CINC exercises and contingencies. In addition to verifying any previous NSS interoperability certifications, JITC documents the differences between the MNSs/CRDs/ORDs and the operational employments of NSS in the CINC exercises and contingencies. This information is used by: (1) the JITC test divisions to tailor related interoperability evaluations to address the NSS field operations and (2) the Joint Staff to update NSS MNSs/CRDs/ORDs.

Scope of Interoperability Evaluations. While each NSS or IT system presents unique challenges, interoperability assessment can be divided into two basic elements: information transport and information processing. In a very generic sense, we define information to be voice, text, data, and imagery.



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 described in the MNS, CRD (if available), ORD, C4ISP, and TEMP for that system, and as observed in JITC field assessments.



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

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that this equipment interoperates within the overall requirements of the JTF -- the capability of the system to transfer voice, text, data, and 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 systems 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, the command and control systems that support the theater air and missile defense are assessed in terms of: detection, message transfer, combat identification, reporting responsibility, system queuing from organic and remote sources, coordination of engagements, multiple simultaneous engagements, accuracy and timeliness of information, common tactical picture, and track correlation. It is imperative that this information be accurate and timely for the warfighter to effectively identify and neutralize enemy forces without incurring loss of friendly elements due to inaccurate or untimely information.

Test and Evaluation, and Certification. It is impossible to analyze overall information interoperability with a single system entity, so JITC employs a system assessment methodology with the end objective of evaluating the capabilities of the system to function in an operationally realistic environment. As each NSS and IT system is tested, evaluated, and certified, the total picture of operational capabilities and weaknesses is better understood.

JITC addresses the interoperability mission via a three phased approach. The first phase is the standards conformance testing of NSS and IT systems with the objective of assessing the degree of compatibility with the technical framework established by the appropriate JTA standards. The second phase is the testing of systems to assess the degree of interoperability among systems, and the degree to which the system meets other stated interoperability related requirements (e.g., supportability, Information Assurance (IA)). The third phase is the verification of the interoperability status in an operational environment with the objective of assessing the degree of integration of systems within the joint operational networks.

Standards Conformance Testing and Certification. As a precursor to interoperability test and evaluation, information systems may undergo standards conformance testing. The objective of

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this testing is to ascertain the degree of compliance to the appropriate standards and standards profiles of the JTA with respect to electrical interfaces, messaging protocols, data formats, etc. JITC issues a standards conformance certification letter for systems that meet the applicable standards.

Interoperability Testing. While standards conformance is a necessary first step towards meeting interoperability goals, system interoperability test certification is a further step required to ensure that systems meet the user's interoperability needs. For interoperability testing, JITC tests against the user-validated requirements in the MNS, CRD (if available), ORD, C4ISP, and TEMP to ensure that a system meets the information interoperability requirements of its users. All relevant data are used to determine the interoperability of a system and all its interfaces. Based upon the results of testing, the criticality of interoperability requirements, and expected operational impact of any discrepancies, JITC prepares a memorandum of certification which identifies the degree of interoperability of that system within its intended operational environment. Certification is JITC's assurance to the Warfighter that the I-KPPs and top-level IERs (or equivalent interoperability interface requirements) have been met and that the system is ready for joint/combined/coalition use. Certification letters are distributed to the Joint Staff, members of the Military Communications-Electronics Board's (MCEB's) Interoperability Policy and Test Panel (IPTP), the program manager, and other interested parties. Certification letters are then posted on the Joint Interoperability Tool (JIT) website and the system and interface status is entered into the System Tracking Program (STP). Verification of interoperability continues after initial certification and deployment – periodically every three (3) years, or upon events that affect interoperability. Events that trigger recertification include changes in requirements, hardware, software, or procedures having an impact on interoperability, potential interoperability problems reported from the field, or significant changes to interfacing systems.

Operational Verification of Interoperability Certifications. JITC verifies interoperability certifications through field assessments of systems during exercises and contingencies. This effort is a vital step in the life-cycle interoperability process as JITC assesses the continuing interoperability of NSS in the operational environment. Deficiencies are reported to the IPTP for appropriate action.



Additionally, JITC documents the employment of NSS that deviate from the MNSs, CRDs, ORDs, and C4ISPs of those systems. This information is essential to ensure that system requirements are current and that the systems remain supportable.

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Any deviations from the documentation are also reported to the IPTP for consideration.

Scheduling and Funding of Interoperability Tests. JITC continually receives interoperability testing and evaluation, and certification requests. These requests are entered into the STP for tracking and resource management purposes. Tests are scheduled with a balance between the program manager's schedule, JITC's available test resources, and organizational and functional priorities. Funding for standards conformance and interoperability testing are the responsibilities of the program manager within his/her total test responsibility for the system acquisition.

JITC reserves the top organizational priority for testing, evaluating, and certifying interoperability to the joint systems that support the warfighting CINC. The second priority is assigned to joint systems that are acquired by the Services, while the third priority is for systems that are acquired by the Defense Agencies.

JITC assigns the top functional priority to the tactical and strategic warning and communications that support the warfighting CINCs and the National Command Authority (NCA). The second functional priority is assigned to NSS that support the warfighting CINCs. The third priority is assigned to intelligence systems that support the warfighting CINCs. The fourth priority is assigned to the combat service support systems that support the warfighting CINCs.

Correction of Interoperability Deficiencies. JITC does not have the mission to enforce the correction of interoperability deficiencies. Our interoperability certifications are provided to the Joint Staff, the Director of Operational Test and Evaluation (DOT&E), IPTP members, the appropriate Service, and the Program Manager. It is the responsibility of the Services and Agencies to correct the joint interoperability deficiencies and shortfalls noted in the certifications. If possible, JITC provides a short-term work-around solution and a recommendation for corrective action. In follow-on certifications and field assessments, JITC tracks the corrective actions to the previously identified deficiencies and shortfalls. This information is provided to the Services and Joint Staff for consideration and action.



Interoperability Inhibitors. The factors below are the major inhibitors to the achievement of interoperability. While no solution will mitigate all of the negative effects, we are making every

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attempt to minimize the impact of these factors with respect to interoperability.

Fast Track Acquisitions. Recent efforts in streamlining acquisitions have resulted in quick injection of technology into the joint battlespace. The increased pressure on program managers for rapid fielding has resulted in an increased emphasis on functional requirements and a decreased emphasis on conformance and interoperability. The end state is an increased number of fielded systems which are not fully interoperable.

Emphasis on Service vice Joint Requirements. Because of decreasing resources (time and funding), program managers are placing the greatest emphasis on Service requirements and less emphasis on joint requirements. This also results an increased number of fielded systems which are not interoperable.

Complexity of the Joint Operational Environment. In recent years, the thirst for information has dramatically increased. As a means of quenching this thirst, systems are being connected in a complex and oftentimes unstructured fashion. The result is that the fidelity and timeliness of the information is frequently unknown to the users of the information. Even with well designed and implemented joint architectures, it is neither feasible nor cost effective to test all conceivable network paths and system configurations. As a result, interoperability testing is focused on providing a reasonable and affordable confidence vice an absolute guarantee of interoperability.

Summary. JITC has established a sound information interoperability test and evaluation program which addresses the full life-cycle of system acquisitions. We need to work closely with the various acquisition and operational elements to ensure that the warfighters have full knowledge and confidence in the systems that they take to war. 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. We do not want the battleground of tomorrow to become the testing ground for acquisitions.

