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Net-Centric Test & Evaluation

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ABSTRACT

This paper and associated presentation describes an approach for test and evaluation in a net-centric environment. A short term effort is planned in February to September 2004 to develop and apply appropriate measures of effectiveness (MOEs), metrics, and methods of data collection, analysis and evaluation for a representative test item's performance within a networked system of systems environment. A net-centric T&E approach is prepared for the Rosetta STONE Single Integrated Picture Enabling Technology Demonstration (ETD). The Department of Defense has issued guidance and criteria in the form of joint concepts, net-centric checklists, and interoperability and supportability instructions for use in program assessments, capability analyses, and experimentation. The finding of this research so far are that these criteria, comprised of attributes derived largely from network-centric warfare concepts and commercial standards, are not yet in a form suitable for immediate and widespread use for test and evaluation (T&E). However, progress is being made. Status of the effort will be reported at the Symposium to include lessons learned for planning future net-centric T&E.

Introduction

Military operations are increasingly showing the benefits of netting system of systems together to achieve joint missions. Although not purchased originally to function in an interconnected way, C3ISR and weapon systems were lashed together in Afghanistan and Iraq to achieve incredible flexibility, precision and speed in prosecution of time sensitive targets. New systems in the acquisition pipeline are increasing expected to be delivered ready to plug and play within the network environment. The Office of the Secretary of Defense and the Joint Staff are developing assessment guidance and criteria for use in program assessments, capability analyses, and experimentation.

This paper describes and reports the status of a net-centric T&E approach planned to evaluate the military utility of the Rosetta STONE Single Integrated Picture Enabling Technology Demonstration (ETD). Included are a statement of the problem, the concept of operations, net-centric requirements and measurements, traditional T&E approach, net-centric approach for the Joint Military Utility Evaluation (JMUA), future applications, and lessons learned. Current status of the effort will be reported at the Symposium.

Problem

Warfighter Problem. Multiple after-action reports, lessons learned, and Joint Combat Identification Evaluation Team reports have consistently identified the necessity to reduce the time sensitive targeting decision time-line. This technology effort will address these shortfalls by fielding a hardware/software solution that the Warfighter can use to resolve correlation, fusion, sensor registration and conduct of time sensitive targeting. Warfighters are inundated with large amounts of disparate data and information from many sensors displayed on many different displays which they do not have the time to interpret and absorb. The diversity of sensors and data link information makes it difficult

to arrive at targeting decisions in a timely manner. "Death by ones and zeros" is preventing effective operational use of sensor advances. Unfortunately, existing correlation systems are often limited to one sensor type. In addition, algorithms in current systems exclude data to simplify the correlation and registration processes in order to use digital correlation engines. As a result, warfighters are unable to effectively leverage the huge amount of available data to provide the accuracy and identification that they need. This issue reaches across all services and combatant commands. The warfighter need is to correlate, fuse, and make available all sources of data to battle commanders and edge users alike, in a timely manner and provide that data to in a "machine-to-machine" format that reduces fratricide and enhances overall combat capability.

Test & Evaluation (T&E) Problem. The Rosetta STONE solution to address these warfighter problems is end-to-end data integration that cuts across mission areas, platforms, and communication lines. In other words, it is a networked solution. The question to be addressed in this paper is how to verify that solution is net-centric and that it solves the problem. Since the traditional T&E approach is optimized to verify performance and effectiveness of point solutions, new criteria is needed to reflect the realities of systems operating within networked environments. Such criteria, comprised of attributes derived largely from network-centric warfare concepts, are just beginning to emerge and not yet matured into in a form suitable for immediate and widespread use for T&E.

Operational Overview

Operational View. Joint tactical operations are the venues for applications of Rosetta STONE. As depicted in Figure 1, this is an environment where elements from Army, Navy, Air Force, and Marines Corps all interact with one another as a team to accomplish campaigns, missions, and tasks. Rosetta is software that provides interoperability at the data level among these forces. This means that any individual or unit can communicate digitally with Army, Air Force, Navy, and Marines to share information, coordinate movements, request fire support, confirm identification, execute ordinance deliveries, etc. Rosetta provides the translation service among various data links so that close air support aircraft can, for example, "see" and avoid hitting friendly ground units when attacking targets in response to a call for air support in a battle area. Over 80 Rosetta-Tactical Air Control Party Modernization (TACP-M) systems were deployed in Operation Iraqi Freedom, including dismounted systems, Air Support Operations Center (ASOC), and Tactical Operations Center (TOC) systems. Soldiers use small ruggedized laptop that runs Rosetta. The Rosetta in TACP acts as a gateway and supports Air Force Application Development Program (AFAPD) in the F-16, B-52; Joint Variable Message Format (JVMF) in the F/A-18 & Army Tactical Internet; and Link-16. Likewise, each Rosetta application interfacing the other sensors, data links, and systems replicate or "mirror" data with all other Rosetta applications so that all data is available to all users all the time. In this way the individual on the ground, for example, can receive user specified threat and C2 information from ISR platforms, C2 nodes, radars, and ships while simultaneously sending target information from laser range finder, camera, etc, directly to fighter aircraft for bomb delivery. The Rosetta gateway enables a true machine-to-

machine, sensor-to-shooter operation. All data resident on Rosetta is correlated to achieve a single integrated picture and to determine identification of targets by the STONE optical correlator. Sensor data registration corrections are also performed to improve target location accuracy to weapons release grade levels. STONE returns the composite data to Rosetta so network users can access the integrated data and picture.

Figure 1. Operational View

Capabilities to be demonstrated. The intent of the Rosetta STONE ETD is to improve the decision making capability of the Warfighter. Priorities are: 1) improve targeting accuracy and reduction of Time-Sensitive Target (TST) decision timelines; 2) integrate of data from disparate sensors and data links; 3) register multi-sensor, multi-platform integration/sensors in an open architecture; 4) enhance coordination among shooters and associated C2 nodes; 5) integrate horizontal information/data across platforms; 6) share accurate, and relevant situational awareness for warfighters; 7) enhance combat identification of detected airborne/ground objects; 8) employ integrated fire-control concepts in a Joint Fires Network environment using existing data networks; 9) evaluate current gateway, correlation, and sensor registration technologies used in Advanced Concept Technology Demonstrations (ACTDs), JTFWARNET, FORCENet, ROBE, CAOC-X, JTRS, SJFHQ, DJC2, and other Programs of Records.

Critical Operational Issues (COI). Overall critical operational issues include how much Rosetta STONE applications demonstrate: 1) the ability to decrease engagement decision time by enhancing the accuracy of sensor data; 2) the ability to enhance TST and other missions' accuracy and precision by combining data from disparate sensors; 3) the migration and scalability of horizontal integration of networks; 4) the ability to get correlated track information to the shooter; 5) the ability to increase the quality and speed of distributed situational awareness; and 6) the ability to perform gateway functionalities including correlation, fusion, translation, forwarding, and dissemination.

System Description

The operational overview touched on what Rosetta STONE can do. This section will describe the system in more detail in terms of its application in the Navy's AEGIS weapon system (Figure 2). Rosetta STONE is data translation, fusion and forwarding software that can be accessed by network users (network service) or directly integrated with existing sensors, data links, and C2 and weapon systems as a dedicated interface. As such, it is neither a platform nor a force level capability. Rather, it is an integrating mechanism for interoperability, which is difficult to measure using traditional approaches. The Rosetta communication link gateway software has enabled data interoperability among military forces that use different military and commercial data links, radios, sensors, C2 systems, and weapons. The addition of the STONE optical correlator offers to extract knowledge out of a large variety of disparate data sources currently managed by Rosetta, plus several of the major AEGIS shipboard sensors. This combination will make a single integrated picture available to the crew on laptop or PC anywhere on the ship's local area network, and to off board users via data links or TCP/IP network connections. The object under test is a prototype configuration of the STONE optical correlator. Rosetta prepares the sensor data and translates link data for processing, performing data normalization and pedigree management for the STONE optical correlation engine. Rosetta processes data inputs and outputs using military and commercial protocols, and message formats. The STONE correlator uses this variety of processed sensor and link data to rapidly determine association among targets, provide combat identification, and improve target location accuracy. Rosetta distributes the data using existing tactical communication links, or instantly accessed by users on shipboard local area or wide area networks as a network service.

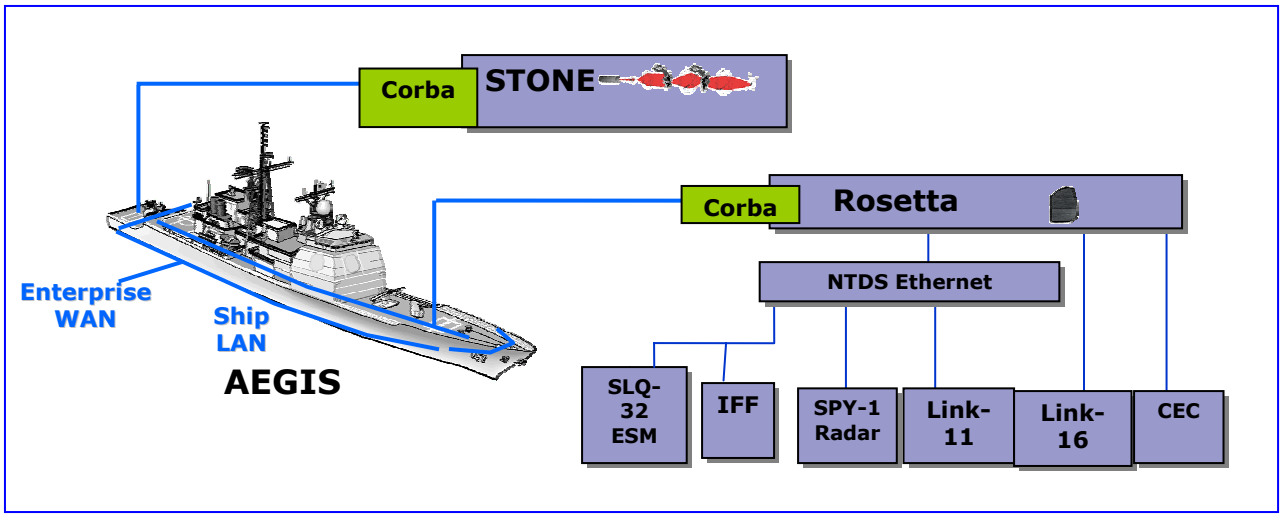

Figure 2

Joint Military Utility Assessment

ACTD Guidelines. Rosetta STONE ETD is sponsored by the ACTD program in the Department of Defense's Office of the Secretary of Defense. Therefore, a joint Military Utility Assessment (JMUA) is planned in accordance with guidance provided for ACTDs. This guidance provides for a traditional T&E approach but allows more flexibility. Typically, ACTDs are judged on their ability to meet specified performance requirements and on how useful it is in the conduct of military operations. Since the CJCSI now requires ACTDs to include Net-Ready requirements, the JMUA approach must be modified to be more net-centric.

Overall Measures. The JMUA will address the critical operational issues using measures of performance (MOPs) and measures of effectiveness (MOEs) to address effectiveness and suitability. MOPs, technical characteristics that determine a particular aspect of effectiveness or suitability, will be used primarily to assess how well the correlator performs. Measures of Effectiveness (MoEs), high level indicators of operational effectiveness or suitability, will be used to assess operational utility within a net-centric environment. Many of the critical operational issues will require assessments of mission threads (e.g., time sensitive targeting, air and missile defense, close air support request, etc.) to determine the level and extent of horizontal integration achieved across platforms and nodes. For the Aegis application, for example, the JMUA will consider use of common performance parameters derived from the plethora of single integrated air, ground, and maritime pictures. MOPs include quality of information (e.g., completeness, continuity, timeliness, accuracy, commonality), level of understanding, degree of end-to-end effectiveness, target location accuracy, time to achieve target location accuracy, degree of combat identification achieved, sensor registration accuracy, degree of machine to machine connectivity, end-to-end timeliness, degree of smart pull achieved for low bandwidth users, and number of targets successfully serviced.

JMUA Approach. United States Joint Forces Command (USJFCOM) has designated JITC as the independent T&E lead for the Rosetta STONE ETD. The JMUA will include an assessment of the potential for Rosetta STONE to become both an accessible network

service and an embedded application to provide Joint Translator/Forwarder (JxF) gateway functionality and replace multiple legacy functions performing correlation, fusion, translation, forwarding, and dissemination throughout DoD. JITC, in conjunction with participants, will plan and conduct interoperability assessments of demonstrated Rosetta STONE capabilities in accordance with prescribed methods to provide certified capability for technology transition into programs and systems of record for immediate warfighter use. Demonstrated capabilities without a Joint Staff validated requirement will be published as an interoperability performance assessment report.

General Test and Evaluation Approach

Joint Interoperability Test Command's (JITC) Role. Within the DoD, JITC has the sole responsibility for certifying the Information Technology (IT) systems & National Security Systems (NSS) for interoperability purposes. NSS is a legal term from the Clinger-Cohen Act that includes DoD warfighting military and intelligence systems. The Chairman of the Joint Chief of Staff Instruction (CJCSI) 6212.01C establishes polices and procedures for interoperability certifications of systems developed and delivered from major programs in acquisition category (ACAT) I and the smaller programs in ACAT II through IV. The new CJCSI 6212.01C instruction addresses, however, Net Ready Key Performance Parameters as well as expansion of testing and certification to include non-ACAT systems and fielded systems.

Test Requirements. For the ACAT programs, the instructions state that the interoperability test should be guided by the Joint Staff validated requirements. This could come through formal approval of the requirement documents such as the Initial Capabilities Document (ICD), Capability Development Document (CDD), or Capability Production Document (CPD). However, for non-ACAT programs such as an Advanced Concept Technology Demonstrations (ACTD), an approved Information Support Plan (ISP) would be sufficient. The Rosetta STONE ETD is treated as an ACTD in terms of T&E planning.

Acquisition Phase. The majority of all ACTDs are considered pre-acquisition, non-ACAT programs. As such, in order to certify these systems, JITC will guide the Program Managers, Technical Managers, and Operational Managers to develop an ISP. This ISP has to be approved by the sponsoring organization, USJFCOM. For ACTD systems transitioning to ACAT I-IV programs, the joint interoperability certifications will be issued before system fielding but not before Milestone C. The ACTD residuals or "leave-behinds" in the field must successfully pass an interoperability performance assessment conducted by JITC.

Net-Centric T&E Approach vs. Traditional T&E Approach. The traditional T&E approach differs in many ways with the emerging net-centric approach. For starters, in a net-centric approach the testers have to be concerned with net–enabled requirements in addition to previous system or systems of systems requirements. Although some of the new attributes (such as Information Needs, Information Timeliness, and Information Assurance) were part of the traditional assessment, these attributes have taken on a new definition. Take information assurance as an example. In the past, testers were

concerned with the information assurance attribute of the system and its immediate interfaces. However, in a net-centric environment, the information assurance attribute depends on several external parameters, which are beyond the control and responsibility of the system under test and its connectivity.

Net-Centric Requirements and Measurements

Approach to a Network Centric T&E Environment. This project deviates from the traditional T&E approach by introducing net-centric elements into the criteria. The conceptual framework for network-centric warfare[1] was used to set the stage, which is based on the following principal tenets:[2]

- A robustly networked force improves information sharing
- Information sharing and collaboration enhance quality of information and shared situation awareness
- Shared situation awareness enables collaboration and self-synchronization, and enhances sustainability and speed of command
- These, in turn, dramatically increase mission effectiveness

The question is how to know when we are being successful in implementing net-centric capabilities and to what degree. The types of measurements needed are not new but certainly have a different context, of which the NCW conceptual framework certainly is one. Regardless of the framework used, the desirable metrics should be operational in character. That is, they should relate to capabilities but will be quantified to reflect degrees of success in specific systems. The metrics should also address the critical environmental and operating conditions that affect product performance and operational utility. Both performance and operational utility will vary according to specific operating and stress conditions and these must be carefully considered and incorporated in the results. Metrics will consider environmental conditions and legacy system performance. While every system-of-systems situation is dominated by numerous interactions, it is important to focus on the object under test and address that subject directly and its critical interfaces and interactions. This can be accomplished by creating overviews, both operational and technical, of the system and the network within which the system is operating. These overviews are built using the parameters described in the Joint Technical Architecture 2.0. Ultimately, these steps would lead to documenting a set of requirements that can be validated using the joint staff approved process and also used for testing and certification. This is a challenging but viable approach to this problem and it recognizes the dimensions, complexity and structure of the environment and the contributions that many components must make to achieve an operational capability. The Office of the Secretary of Defense (OSD) and the Office of the Chairman of the Joint Chiefs of Staff (Joint Staff) have been thinking a lot about net-centric attributes, criteria, and capabilities and recently published guidance and instructions. A tailored T&E

[1] Signori, David, Network-Centric Warfare Conceptual Framework, http://www.dodccrp.org/events/2002/ncw_workshop/NCWDecWork.htm
[2] http://www.dodccrp.org/research/ncw/ncw.htm

construct must consider these emerging set of universal net-centric guidelines that are affecting program management and systems design for net-readiness.

Net-Centric Attributes and Criteria Checklist. The DoD Chief Information Officer issued net-centric guidance on February 24, 2004, in the form of Net-Centric Checklist. The purpose of the checklist is to assist program managers in understanding the net-centric attribute that their programs need to implement to move into the net-centric environment in the Global Information Grid. The checklist is organized into four sections: Data, Services, Information Assurance/Security, and Transport. Although the majority of the checklist asks for specific technical descriptions or explanations of how data, data services, data security, and data transport are handled, there are standards oriented design tenets that can form the basis for T&E. Examples include the provision of meta data IAW the DoD Discovery Metadata Standard to make data visible; mechanisms for accessibility of data by all potential consumers; data pedigree, security level, and access control determination; interoperability of data for mediation and translation across interfaces; open architecture including web standards, XML standards, representational state transfer (REST) style; simple object access protocols (SOAP); web services description language (WSDL); universal description, discovery, and integration (UDDI) standard; web services security (WS-Security) and interoperability (WS-I); bandwidth heterogeneity; security authentication and protection; provision of Internet Protocol Version 6 (IPv6); layering; network redundancy; and network quality of service.

Net-Ready Key Performance Parameter Requirements. The requirement for the Net-Ready Key Performance Parameter (NR-KPP), in lieu of the previous Interoperability KPP discussed in Joint Staff documents CJCSI 3170.01C and CJCSM 3170.01, is contained in recently released CJCSI 6212.01C.[3] In comparison to the DoD CIO Net-Centric Checklist which is focused on technical aspects of data, services, security, and transport, CJCSI 6212.01C focuses on the capability for systems to exchange information. Furthermore, the DoD CIO checklist appears to be consistent with the net-centric assessment criteria in Table F3 of the CJCSI 6212.01C. Ultimately, the NR-KPP defines the interoperability requirements of the proposed system. The NR-KPP assesses net-readiness; information assurance requirements; and both the technical exchange of information and the end-to-end operational effectiveness of that exchange. Because the Rosetta STONE ETD is a pre-acquisition project, a preliminary NR-KPP will be prepared for the Rosetta STONE ETD based on the operational concept, critical operational issues that identify deficiencies or gaps, and architectural views. This "draft" NR-KPP will be updated as the capability is characterized though demonstrated performance. The instruction also establishes policies and procedures for Joint Interoperability Test Command (JITC) system interoperability test certification. The next section will consider these elements in the context of a DoD-wide assessment process of interoperability and supportability which affects the T&E and JMUA approach for the Rosetta STONE ETD

[3] Chairman of the Joint Chiefs of Staff Instruction 6212.01C, Interoperability and Supportability of Information Technology and National Security Systems, 20 November 2003

DoD Interoperability and Supportability Guidance

DoD provides guidelines for systems produced from small projects including ACTDs, Advanced Technology Demonstrations (ATDs), Combatant Commander Command and Control Initiative Program, and Combatant Commander Field Assessments program. As mentioned previously, these smaller scale program activities are considered "Non-ACAT" programs. As such, these programs are required to follow the Non-ACAT IT and NSS Acquisitions and Procurements Process. DoD Instruction 4630.8[4] outlines the process and names the responsible DoD components that must participate in the acquisition cycle of the above programs. Figure 3 depicts the capability-related, outcome-based, interoperability and supportability process for non-ACAT IT and NSS acquisitions and procurements.

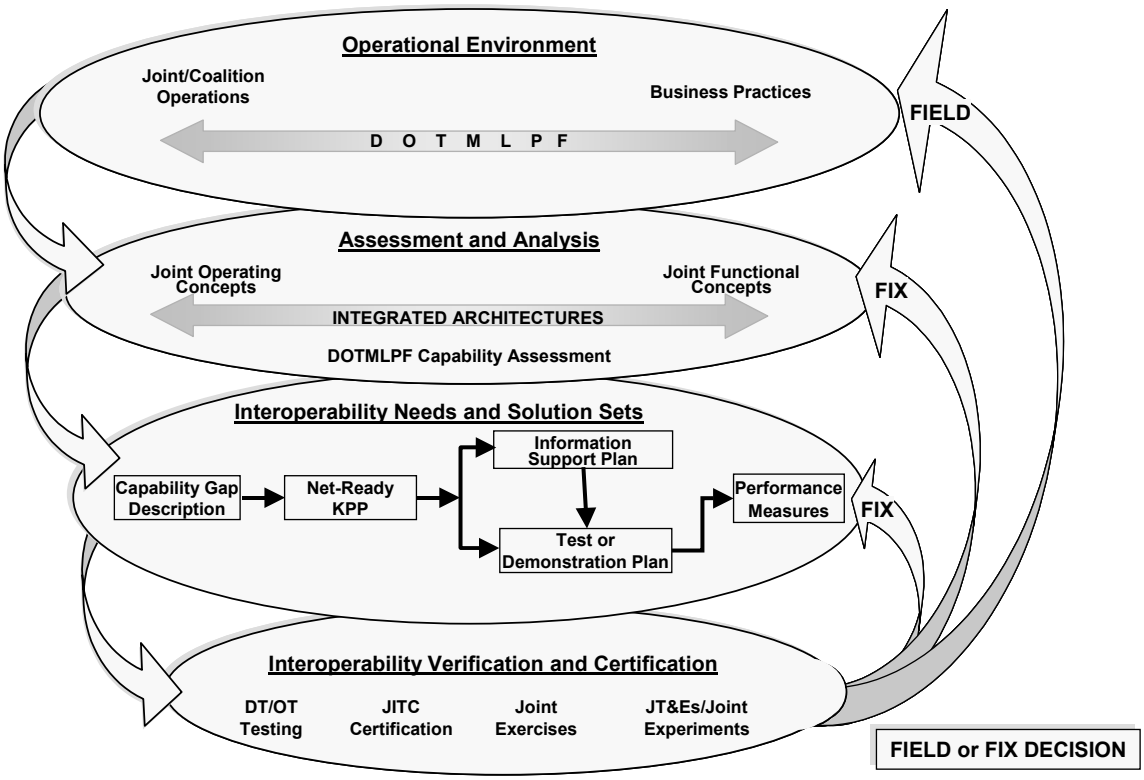

Figure 3. Non-ACAT IT and NSS Acquisition and Procurement Process[5]

[4] DoD Instruction 4630.8, Procedures for Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS), ASD(NII), May 2, 2002

[5]DoD Instruction 4630.8, Procedures for Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS), ASD(NII), draft revision, Figure F

Information Support Plan. In order to assess the non-ACAT program, such as the Rosetta STONE ETD, an Information Support Plan (ISP) must be developed. Among other aspects, an ISP must document the program needs, dependencies, interface requirements, and incorporate the NR-KPP. The plan would describe system dependencies and interface requirements in sufficient detail to enable testing and verification of the requirements. The ISP would also include the systems interface descriptions, infrastructure and support requirements, standards profiles, measures of performance, and interoperability shortfalls. The scope of the ISP would be scaled to the relative size and funding profile for the program. Once an ISP has been developed, it must be reviewed and approved by the sponsoring organization, USJFCOM. Any unresolved issues must be reported to the DoD Chief Information Officer.

Test Guidance. There are several documents that guide the testing community in analyzing the NR-KPP portion of the ISP. All four pillars of the NR-KPP, such as the Net-Centric Operations and Warfare (NCOW) Reference Model, Integrated Architecture, Key Interface Profiles (KIPs), and Information Assurance, must be addressed. NCOW provides a common language and understanding of net-centricity and specifies the core capabilities of a net-centric DoD architecture. Integrated Architecture defines the Operational Nodes, Organizational Relationships, Operational Activity, Systems Functionality Description, Systems Data Exchange, and Technical Architecture Profile. KIPs define organizational boundaries, mission criticality, capability, interoperability, or efficiency issues. A KIP may affect multiple acquisition programs.

Key Interface Profiles (KIPs). The following is a list of 17 KIPs that are to be developed. The Teleport KIP is the only one that has been completed so far.[6]

1. JTF to Coalition
2. Logical Networks to DISN Transport Backbone
3. Space to Terrestrial
4. TELEPORT
5. Client to Server
6. Application Server to Shared Data
7. DISN Service Delivery Node
8. Secure Enclave Service Delivery Node
9. JTF Component to JTF Headquarters
10. Application Server to Database Server
11. Joint Interconnection Service
12. Management System to Managed Systems
13. Application to COE/CCP (NCES/GES)
14. End System to PKI
15. Information Servers to IDM Infrastructure
16. IDM to Distribution Infrastructure
17. Management System to (integrated) Management Systems

[6] Gaetjen, Tom. "Interoperability Process and Net-Ready Key Performance Parameter (v1.0)", 14th annual Interoperability Conference, Joint Interoperability Test Command, Ft. Huachuca, 18 March 2004.

One of the objectives of developing the KIPs is to define more specifically issues related to the interface and then resolve those issues. Once a tester has identified which of the KIPs is related to the system under testing, the specific parameters of that KIP are used to derive the requirements of the NR-KPP. If the KIPs were available, those most applicable to Rosetta STONE ETD are: Client to Server, Application Data to Shared Data, Secure Enclave Service Delivery Node, Application Server to Database Server, and Application to COE/CPP (NCES/GES).

Information Assurance. Another part of the NR-KPP is the Information Assurance that must address availability, integrity, authentication, confidentiality and non-repudiation of the services that are provided by the systems.

Since the KIPs are not yet completed, other guidelines such as the NCOW, integrated architectures, CONOPS, Net-Centric Attributes and Criteria Checklist, critical operational issues will be used to complete the ISP and to specify detailed elements of the NR-KPP.

Preliminary Net-Ready Key Performance Parameter. As stated above, the ISP will incorporate the Net-Ready Key Performance Parameter (NR-KPP) of the systems. NR-KPPs will be used to assess information needs, information timeliness, information assurance, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange for a given system. The NR-KPP would consist of verifiable performance measures and associated metrics required to evaluate the timely, accurate, and complete exchange and use of information to satisfy the information needs for a given capability. The draft NR-KPP for the Rosetta STONE ETD would contain metrics for the STONE correlator performance, Rosetta translator/forwarder performance, AEGIS shipboard and off-board interfaces, and mission threads representative of end-to-end integration to measure military utility.

Correlator Measures of Performance. STONE correlator measures of performance would include, for example, completeness (amount of truth targets included in correlator output), timeliness (data is available when it is needed), accuracy (plots, track and radar locations as reported or correlated), loading under a range of scenarios and levels of data, intake (all information used efficiently), receiver operating characteristic curve (probability of correctly associating two track pairs vs. probability of mis-associating two track pairs), and number of different types of phenomenology processed from sensor and data links. As a network service, the STONE correlator will be evaluated as a discovery service, the measures of which are still being developed.

Translator/Forwarder Measures of Performance. Rosetta will be evaluated in terms of it ability to correctly and completely translate tactical data link message sets in accordance with approved military standards, standardization agreements, and forwarding rules. Some of the translator/forwarder applications have been previously tested (Link 16/Link 11, L16/JVMF); others have not (Link 16/CEC, Link 11/CEC).

***Interfaces*.** The interfaces between the sensors (SLQ-32 EW system, SPY-1 radar, and identification friend or foe (IFF) systems) and data links (Link 16, Link 11, and Cooperative Engagement Capability (CEC)) will be measured in terms of the correctness and completeness of the input and output data. Rosetta is evolving as a network service and will be evaluated for net-centric value-added features and standards compliance based on the attributes and criteria of the DoD CIO checklist, net-centric assessment criteria in Table F3 of the CJCSI 6212.01C , NCOW, available KIPs, Joint Technical Architecture, and any other network-centric enterprise service (NCES) criteria What does not exist at the moment is a comprehensive list of network service interface and functional requirements needed for all network services. These interfaces and associated parameters will be analyzed in the Rosetta STONE ISP.

Measures of effectiveness. Based on the network-centric warfare conceptual framework and critical operational issues of the Rosetta STONE CONOPs, several parameters appear important to quantify military utility, including AEGIS support of time sensitive targeting missions against airborne, surface, and ground targets:

General quality of information (e.g., completeness, continuity, timeliness, accuracy, commonality)

Degree of shared situation awareness (consistency of picture among variety of users)

Degree of M2M connectivity, AKA scale of collaboration or extent of reach (% of total message types/versions, % platforms, % C2 nodes)

Time sensitive target location accuracy

Time sensitive target - time to achieve target location accuracy

Time sensitive target - % successful targeting delivery to shooter

Degree of target identification achieved

Sensor registration accuracy

Degree of smart pull achieved for low bandwidth users

These and other parameters will be analyzed in the information support plan for use in detailing the elements of the draft net-ready key performance parameter.

Conclusion

This paper attempted to walk through an example using a realistic case to develop an approach for net-centric test & evaluation. The general issue is how to verify that a proposed solution is net-centric and that it solves the problem. The Department of Defense has issued guidance and criteria in the form of joint concepts, net-centric checklists, and interoperability and supportability instructions for use in program assessments, capability analyses, experimentation, and interoperability testing. The finding of this research so far are that these criteria, comprised of attributes derived largely from network-centric warfare concepts and commercial standards, are not yet in a form suitable for immediate and widespread use for test and evaluation. Specifically, the detailed interface and environmental requirements for systems to successfully function with and within the global information grid are not compiled in a comprehensive form.

Requirements, the cornerstone of any net-centric test and evaluation activity, are still needed. While progress is being made to define these universal net-ready requirements, sufficient criteria are available to formulate initial testing requirements for the Rosetta STONE enabling technology demonstration both as a hard-wired system and as a network service. Such requirements will be sufficient to conduct an assessment which can serve to characterize the capability and inform future requirements analyses and choices. The next step in the process is to develop an Information Support Plan to document the architectures, interfaces, and preliminary net-ready key performance parameter.

Lessons Learned for Net-Centric T&E Planning

Universal net-centric requirements in the form of net-ready key performance parameters and key interface profiles are in development but not yet mature.

Until such time as net-ready requirements are available for widespread use, the T&E planners must tailor their approach based on accepted precedence and emerging criteria.

Specific net-centric requirements needed for Rosetta STONE Enabling Technology Demonstration can be developed by use of an Information Support Plan, which can further assess and determine the details of net-ready key performance parameter.

The Net-Centric T&E approach needs a lot more definition and will certainly create a lot more challenges for the testing communities.

The immediate demand for Net-Centric testing will require an increased emphasis on conformance to standards.

There will be more reliance on a distributed net-centric test-bed infrastructure

Future Net-Centric test and evaluation will be more concern with services rather than systems.

There will be occasions when the interoperability assessment will deal with new Net-Centric principles such as data posted on the network for immediate use before it has been processed, and only handling information once.