Objective: Develop an innovative, rapid, iterative capability to monitor, visualize, and assess combat system interface traffic in real-time during integration and testing of combat systems.

Description: Surface ship combat systems represent complex systems of systems, such as the SSQ-89 Anti-Submarine Warfare (ASW) combat system element [Ref. 1], that must adapt to rapidly evolving threats. Integration, testing, and certification of the SSQ-89 are required prior to fielding production systems. These activities are time consuming and costly, throttling the rate of improvement to warfighting capability. Migration to automated testing [Ref. 2] alone for external interfaces has been insufficient to eliminate this throttling effect. The Navy desires to adopt rapid, iterative approaches to capability development and reduce costs, technological obsolescence, and acquisition risk.

A key challenge to the time and cost associated with integration is the testing time spent by engineers and coders during integration and test events trying to gain insight into the cause of errors related to internal interfaces between systems or modules of systems. An ability to monitor, visualize and assess combat system interface traffic in real-time during integration and test events would allow real-time root cause analysis and reaction in place of the current time lag, duplicative, and labor-intensive processes.

Development, integration, and element testing is performed at the AN/SQQ-89 prime integrator site. Combat system integration testing of the AN/SQQ-89 with associated combat system elements is performed in conjunction with the appropriate Combat System Engineering Development Site (CSEDS), such as the AEGIS CSEDS at Moorestown, NJ. Real-time insight during integration and testing of combat system elements - both stand-alone and when connected via Ethernet and legacy Naval Tactical Data Systems (NTDS) - facilitates Navy migration to a DEVOPS approach to modular capability fielding. To serve as this enabler for DEVOPS, the real-time analysis must be able to support automated development and test environments with rigorous datagram packet inspection for root cause analysis [Refs. 3, 4].

This capability will have utility for a range of complex interconnected systems that are safety critical, such as military systems, utility systems, and information technology systems.

A real-time integration analysis tool must be developed to test the specific combat system applications and their interactions through the interface. It must conduct deep packet datagram inspection to assess the specific data fields for the application messages sent between the systems. The system must compare the data to government-furnished information (GFI) interface design specifications in order to determine if the message is in error. It must assess specific data fields within the datagram to find these potential problems; and must assess if the data is out of bounds; and must determine if an older incorrect weapon specification is being used. Testing of the technology sought will take place either at Navy facilities (e.g., Naval Undersea Warfare Center, Newport, RI) or at Navy Prime Integrator sites (e.g., LM RMS at Manassas, VA or LM RMS at Moorestown, NJ).
Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. Owned and Operated with no Foreign Influence as defined by DOD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been be implemented and approved by the Defense Security Service (DSS). The selected contractor and/or subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances, in order to perform on advanced phases of this contract as set forth by DSS and NAVSEA in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advance phases of this contract.

PHASE I: Develop a concept for a software tool that provides the test team the ability to conduct real-time monitoring, visualization, and assessment of combat system interface traffic. Demonstrate the concept can feasibly support interface traffic in development, integration, and test environments, including automated testing described in the Description. Establish feasibility through modeling and analysis of the tool. The Phase I Option, if exercised, will involve initial system specification of the performer’s solution with associated capabilities description to build a prototype solution in Phase II.

PHASE II: Develop and deliver a prototype of the software tool that will focus on supporting SSQ-89 development, integration, and testing. Validate the prototype through testing to demonstrate it achieves the metrics defined in the Description. (Note: The Government will provide access to the facility at LMCO, Manassas, for testing using the prototype software and run-time environment on the interface between the SQQ-89 and the AEGIS VTWIN. The A Government representative will witness a system performance test to verify that it satisfactorily meets the requirements. The test will utilize the Automated Combat System of System Integration Test for Certification tool to run automated operator kill chain actions to fully vet the IDSs.) It is probable that the work under this effort will be classified under Phase II (see Description section for details).

PHASE III DUAL-USE APPLICATIONS: Support the Navy in transitioning the technology for Navy use through the prototype's successful ability to produce a real-time monitoring and assessment capability to support system of systems development, integration, and testing for modular capability improvements using DEVOPS in the SSQ-89 Advanced Capability Build development process.

Commercial applications are possible for software developers, where complex code integration and testing can currently only be assessed after testing or which requires duplicative re-testing to validate fixes could benefit from an approach to achieve real-time insights into integration and testing of information technology infrastructure.

REFERENCES:

KEYWORDS: AN/SSQ-89; Errors Related to Internal Interfaces; Assess Combat System Interface Traffic in Real-time; DEVOPS Approach to Modular Capability Fielding; Integration and Test Events; Rigorous Datagram Packet Inspection for Root Cause Analysis