

Topic: N161-043

## Innovative Defense Technologies

### Automated Verification and Validation for Distributed Testing

Innovative Defense Technologies' (IDT) Automated Verification & Validation (V&V) for Distributed Testing (ADT) supports the definition and testing of complex system of system (SoS) interface requirements with a focus on leveraging existing infrastructure, resources, and subject matter expertise from distributed test environments. IDT has developed Automated Test and Re-Test (ATRT), which is an enabling technology for ADT, founded on the patented model based systems engineering approach that accelerates the deployment of software capability to the fleet. ADT is initially supporting testing of SQQ-89 to Aegis baseline 9, however the tool suite was built to be used by any complex system that requires V&V of system of system interfaces. IDT seeks collaboration with government programs with complex, software/data intensive SoS that require distributed test and analysis capability.

### Technology Category Alignment:

Test, Evaluation, Validation, and Verification

Advanced Computing/Software Development

Synthesis/Analytics/Decision Tools

Distributed/Coordinated/Net-Enabled Systems

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**SYSCOM:** NAVSEA

**Contract:** N00178-18-C-7001

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N00178-18-C-7001](https://navystp.com/vtm/open_file?type=brochure&id=N00178-18-C-7001)

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2018-0526

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WHO

**SYSCOM:** NAVSEA

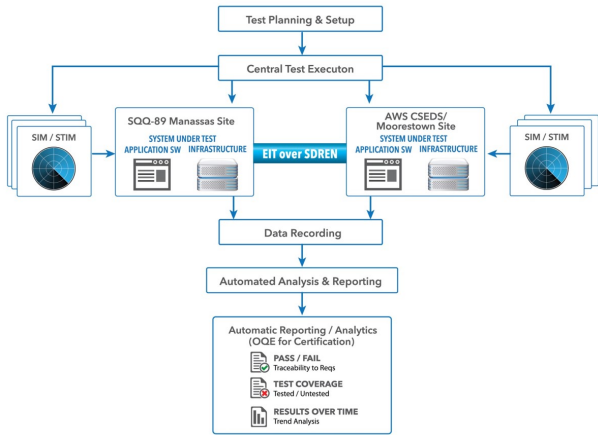
**Sponsoring Program:** IWS 5.0 - SQQ-89

**Transition Target:** SQQ-89 / Aegis

**TPOC:**  
(202)781-5298

**Other transition opportunities:** Aegis Ballistic Missile Defense (BMD), Ground-Based Midcourse Defense (GMD), Terminal High Altitude Area Defense (THAAD), Command and Control, Battle Management, and Communications (C2BMC), Patriot, Cooperative Engagement Capability (CEC), Ship Self Defense System (SSDS), Littoral Combat Ship (LCS) / Frigate (FFG) Combat Management System (CMS), Air Force Nuclear, Command, Control & Communications (NC3)

**Notes:** Any systems of systems platform with interfaces, an a distributed test environment with heavy reliance on limited infrastructure or SME participation.



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WHAT

**Operational Need and Improvement:** The Navy needs to implement Automated Verification and Validation (V&V) to support distributed testing between AN/SQQ-89 Undersea Warfare Combat System, Aegis Weapons System (AWS), and other Combat System (C/S) elements. Current capabilities do not support distributed testing with stand-alone or wrap-around simulation and stimulation (SIM/STIM) tools. This topic will increase V&V coverage and reduce the 18-month average lag time between software baseline freeze and combat systems certification to 12 months.

**Specifications Required:** For the SQQ-89 Test program, this solution will reduce the 18-month lag time from software freeze to actual fielding to 12 months, and simultaneously increase V&V coverage with significantly less resources than traditional methods for system test. This capability will reduce overall resources applied to integration and test by 75%, and meet the minimum interface requirements for SQQ-89 and Aegis. Improvements include subject matter expert (SME) hours per test / analysis event, software requirements coverage, software requirements test frequency, hardware-in-the-loop / simulation-stimulation infrastructure utilization, and overall man-hours per test.

**Technology Developed:** Delivery of complex system of system capability often bottlenecks at Verification and Validation (V&V), where a representative test environment, test data, and Subject Matter Expert (SME) personnel are required to investigate tough cognitive issues during integration. IDT seeks to remove this bottleneck by enabling system of system developers to define and test their interface requirements upfront and with increasing fidelity throughout each stage of development, supporting a pipeline for system of systems to deploy changes more efficiently. Automated V&V for Distributed Testing, IDT's system of system pipeline support solution, supports local and cross-network SIM/STIM, data recording, and analysis capability at each stage of the development life cycle.

**Warfighter Value:** Automated V&V for Distributed Testing (ADT) allows for the rapid certification of complex systems of systems enabling the more rapid delivery of capability to the fleet and war fighter.

WHEN

**Contract Number:** N00178-18-C-7001 **Ending on:** November 19, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Local Lab Navigation SIM/STIM	Low	Achieve ~50Hz navigation messaging in local lab environment	5	September 2018
Local Lab Time SIM/STIM	Low	Keep automation elements and SIM/STIM synchronized within ~10ms in local lab	5	September 2018
Distributed Navigation SIM/STIM	Low	Achieve ~50Hz navigation messaging in distributed environment over SDREN	6	October 2020
Distributed Time SIM/STIM	Low	Distributed automation elements & SIM/STIM stay synchronized within ~10ms over SDREN	6	October 2020
ADT automatically generating Objective Quality Evidence (OQE) for test events in Government test site with SQQ-89 & Aegis	Low	Reduce External Interface Testing (EIT) efforts by 75%	6	October 2020

HOW

**Projected Business Model:** IDT plans for a services based model in order to implement a tailored solution for Automated V&V for Distributed Testing for additional DoD / Commercial Programs. Each program has it's own unique set of circumstances in regards to the current state of test and assessment. IDT will need to tailor the offering based on the current state of a program's requirements, hardware-in-the-loop (HWIL) test infrastructure and accessible networks, subject matter expert (SME) participation, manual/automated test, prime/sub/government relationship, and behavioral model. Collaboration with all entities involved will allow increase the probability of adoption across entity cultures by including program stakeholders, and leveraging investments made to date.

**Company Objectives:** IDT's objective for participation in the Navy SBIR Transition Program for N161-043 is to create materials and then network to raise the level of awareness among applicable DoD programs for Automated V&V for Distributed Testing. IDT would also like to interface with prime contractors currently executing on complex systems of systems programs that can benefit from this level of automation. Finally, IDT would like to identify additional areas of commercialization outside of the DoD to approach with this innovation.

**Potential Commercial Applications:** Similar to the DoD, Automated V&V for Distributed Testing with ATRT can be applied to any systems of systems platform with a distributed test environment with heavy reliance on limited infrastructure and/or SME participation. In addition, these systems of systems, must have stringent requirements that require a high level of test and objective quality evidence to certify performance. Oil & Gas infrastructure, power generation & distribution, commercial aviation (manned & unmanned) and transportation, as well as automotive applications may be additional applications for Automated V&V for Distributed Testing.

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