



## **NAVAL AIR WARFARE CENTER TRAINING SYSTEMS DIVISION (NAWCTSD) ORLANDO**

### **TECHNOLOGY TRANSFER OPPORTUNITIES**

**7 June 2016**

**The technologies/products/services described in this document offer opportunities for partnerships with NAWCTSD through CRADAs or licensing agreements.**

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## **TECHNOLOGY TRANSFER**

Federal Technology Transfer (T2) legislation has been in place since 1980 to facilitate the transfer of federally developed technologies to the private sector as well as academic institutions and state & local governments. Federal and non-federal partners have the opportunity to work together on mutually beneficial research using instruments called “cooperative research and development agreements” (CRADAs). T2 legislation also promotes the licensing of patented technologies developed in the federal laboratories for commercial applications.

NAWCTSD predominantly uses CRADAs in transferring technologies to non-Federal organizations. Licensing Agreements and Commercial Services Agreements are also vehicles for T2. Sometimes, partnerships with Federal organizations and other Department of Defense (DOD) entities facilitate dual-use and transfer of NAWCTSD developed technologies.

- **Cooperative Research and Development Agreement (CRADA)**

A CRADA is a legal instrument that allows NAWCTSD, a federal laboratory, to engage in collaborative efforts with a non-federal partner. Research and development performed under a CRADA must be collaborative and consistent with the mission of the federal laboratory. CRADA partners may contribute personnel, services, and property. The federal partner cannot contribute funds to the non-federal partner, but the non-federal partner may contribute funds. The non-federal partner may receive a non-exclusive license to inventions made during the performance of the CRADA effort. The non-federal partner may obtain an exclusive license to any inventions made during the performance of the CRADA effort; license should be for reasonable consideration. Data generated under a CRADA may be protected from public disclosure for up to five years.

- **Patent Licensing Agreement (PLA)**

Research performed at NAWCTSD may produce patented, innovative discoveries of commercial value. These patents are available for licensing to the private sector. PLAs can be non-exclusive, exclusive or partially exclusive. Navy and Marine Corps licenses are subject to an irrevocable, royalty-free right of government to practice the licensed invention. The licensee must have a plan for commercializing the invention.

- **Commercial Services Agreement (CSA)**

Through a CSA industry can leverage NAWCTSD’s research, development, test & evaluation capabilities. This Agreement is a type of contract (non-FAR based) whereby NAWCTSD can be directly paid by industry to perform services that are unique to the laboratory and not commercially available elsewhere. NAWCTSD can provide facilities and technical expertise to allow industry to capitalize on public investments of unique capabilities.

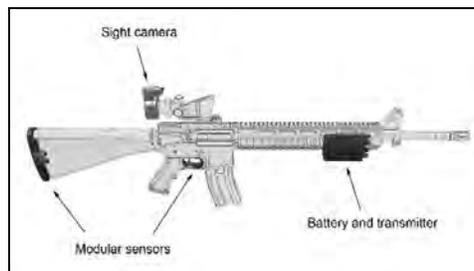
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## MODULAR ADVANCED TECHNOLOGIES - MARKSMANSHIP PROFICIENCY (MAT-MP) TOOLKIT

The MAT-MP toolkit is a reconfigurable small arms instrumentation kit of patent-pending assessment and diagnostic tools for use on the live-fire range by marksmanship instructors/coaches.



- The toolkit provides instructors with additional direct measures to assess problem shooter performance.
- Toolkit sensors are temporarily attached to a live-fire weapon in less than five minutes.
- A miniature camera and beam splitting assembly are attached to the rear of the rifle's combat optic.
- Data and video are wirelessly transmitted to the instructor's portable computer.
- The instructor assistant software displays through optic video and sensor data for each shot or series of shots.
- Performance summary data is displayed for key fundamental metrics.
- Data is stored for each shooter for replay as necessary.
- One instructor can simultaneously monitor up to four shooters.
- MAT-MP sensors are currently compatible with the M16/M4/M27 platforms.
- These sensors provide data on basic weapon handling including trigger squeeze, trigger follow through, cant angle, buttstock pressure and steadiness.



## SCENARIO PLANNING AND EFFECTS CONTROL SYSTEM (SPECS) WITH AFTER ACTION REVIEW CAPABILITIES

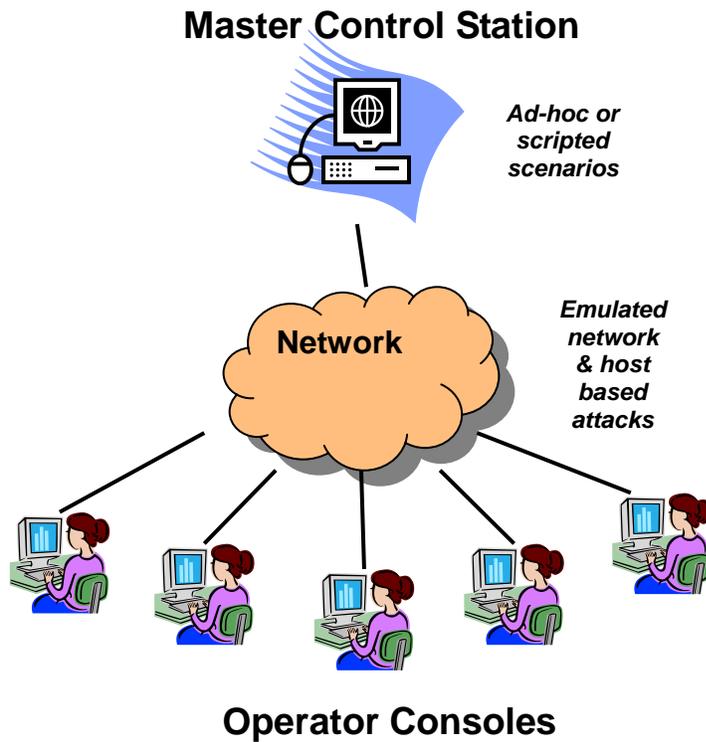


The NAWCTSD Scenario Planning and Effects Control System enables instructor/operators to provide highly detailed and repeatable immersive training scenarios by defining combinations of cause/effect, time, and manual trigger actions between various types of sensor and environmental stimuli for increased training effectiveness, trainee immersion, and reduced instructor/operator workload.

- The system's audio distribution engine is capable of simultaneous streaming of sound effects to any user defined speaker location or time synchronized group of speaker locations within the training environment utilizing real-time mixing of source files.
- The RaidFX special effects device and training stimuli control architecture is fully extensible and capable of integrating numerous devices and training aids based on common control and communication standards.
- The client Graphical User Interface (GUI) is designed around the concept of the instructor as the operator, and provides for the authoring and control of scenarios within the distributed system architecture.
- The architecture utilizes a combination of Government and Commercial-Off-the-Shelf components providing for a high degree of flexibility and sustainability.
- Data integration with commercially available digital video management and debriefing systems enables event-based navigation and remediation support during after-action-review.
- The SPECS architecture has been successfully installed and is operational within a number of immersive and mixed-reality training environments.
- SPECS is installed within a number of US Navy and US Marine Corps training facilities, at the Federal Law Enforcement Training Center, and at the Northeast Counterdrug Training Center.

## **NETWORK EFFECTS EMULATION SYSTEM (CYBERSPACE ATTACK EMULATION)**

The Network Effects Emulation System (NE2S) provides realistic emulation of network and host based Cyberspace attacks. NE2S integrates traditional test and training environments with Cyber attack scenarios. A Master Control Station provides centralized control of real-time Instructor/Operator initiated effects or scripted scheduled scenarios. NE2S employs a network centric architecture and is operating system and application agnostic. The system uses encrypted communications using standard network protocols. Authentication credentials are encrypted at rest. NE2S was demonstrated at Ulchi Freedom Guardian (UFG) 2015 and Operation Blended Warrior (OBW) 2015.



## LIVE – VIRTUAL COMMUNICATIONS TECHNOLOGIES

The Concept Development and Integration Laboratory of NAWCTSD provides live and virtual communications technologies compliant with standard Modeling and Simulation (M&S) protocols. These technologies can bridge the gap between live and virtual training environments.

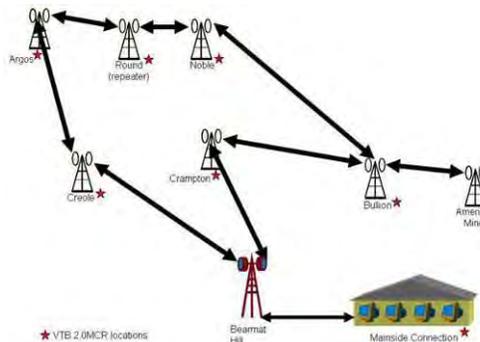
- **Joint Virtual Tactical Radio (JVTR)**

Functionally accurate graphical faceplates of operational radios can be developed using this application. Similar faceplates can be created for a variety of communications devices (e.g., military radios, ICOM radios, other service specific radios, telephones, etc.). These faceplates can be used in distributed training or live tactical operations (e.g., a PC-based, photo-realistic, functionally accurate radio faceplate can be utilized to train a newly deployed first-responder how to operate the radio, while in the field). When multiple units are connected via a computer network they can provide radio protocol training.



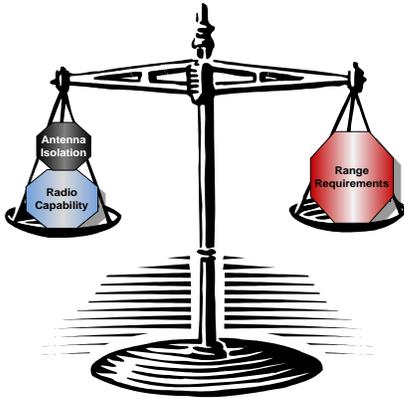
- **Live To Virtual Communications (LVC) Bridge**

The LVC Bridge provides distributed control of operational communications equipment (i.e., service radios) and relays the communications between different networks (e.g., communications between a simulation/training network to/from a live communications network). This allows for adjustments of radio settings (i.e., frequency, presets, power, etc.), to be changed on a remote live radio from a local virtual radio interface. An example of this technology, is utilizing the JVTR radio faceplate or trainer, as described above, during an emergency operations scenario. The PC-based virtual radio can be operated from a laptop or portable device, and connected via the LVC Bridge to an operational communications network. The virtual radio could then communicate seamlessly with live operational RF radios (i.e., ICOM) in the field.



This technology also connects virtual radios to operational radios and switching systems (i.e., line-of-sight equipment, satellite communications equipment) to allow for seamless live and virtual training and tactical operations. For example, virtual and live RF radios can be utilized in communications training exercises. Similarly, this technology can provide the interface between operational satellite communications systems with encryption, and other live RF radios in the field. A “make-shift” command center can utilize this technology to “link” multiple services (i.e., Fire, Police, EMT) during an emergency operations scenario.

## SMART ANTENNA ALGORITHM



Developed by the Navy, patent-pending Smart Antenna Algorithm (SAA) provides frequency management capabilities across a spectrum of networked Radio Frequency communication devices. The tool determines susceptibility of multiple radios to interference by mathematically modeling radio noise and nonlinearities. SAA uses antenna isolation to map problem frequency nets to antenna pairs having greater isolation. The overall result is a boost to radio performance in order to balance and meet range coverage requirements. Even though the number of possible combinations for assigning frequency nets to antenna elements may be exhaustive, the algorithm finds an accurate solution for the nonlinear optimization problem in real-time. SAA can be used as a communications planner tool, for dynamic frequency trunking, and for rapid, ad-hoc communications set-up for emergency response units.

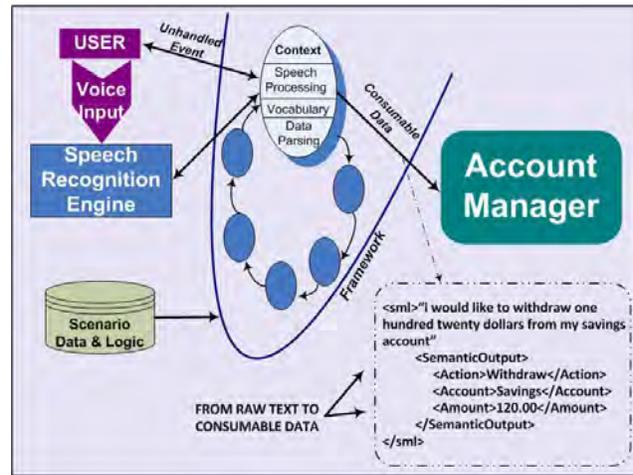
## VIRTUAL INTERACTIVE SHIPBOARD INSTRUCTIONAL TOUR

The virtual interactive shipboard instructional tour (VISIT) allows a trainee/user to “wander” through a photo-realistic interactive tour of a real world environment by providing virtual access to environments or facilities that are unfamiliar, unavailable, or dangerous. While moving around the environment, a user can click on items of interest to access descriptive or instructional media (interactive courseware, workstation simulations, reference documents or almost any common media file). The integrated 360-degree spherical photographic panoramas allow a user to look in any direction. In addition to unstructured exploration of an environment, the instructor can develop structured tours of the environment via a game-like scavenger hunt feature which also provides students with performance feedback. Integrated quizzes can also be authored by instructors. Current platforms are Navy ships, submarines, and aircraft; but buildings, cities, or other critical environments can be created. A recent upgrade of the software enables the product to run in a browser, negating the need to install software to tour the selected platform. A new effort is underway to optimize the software to operate on mobile devices, which will enable its use on a much wider basis. Important selling points for VISIT are that it is extremely affordable compared to 3-D based tours and that it runs on a wide variety of hardware - making it attractive for mass distribution.



## CONTEXT-DRIVEN SPEECH RECOGNITION SOFTWARE

The Context-Driven Speech Recognition Software is a patent-pending software application designed to handle very large complex vocabularies in smaller subsets by logically dividing the vocabulary according appropriate contexts. The divided vocabulary reduces the potential paths in the language model for any given recognition event, thereby reducing the recognition errors produced in the recognition engine. The framework for this software minimizes the size of the vocabulary loaded at any point when it is executing a recognition task against an audio stream. This basic principle alleviates many of the shortcomings related to off-the-shelf speech recognition engines' handling of very large vocabularies. The approach manages speech recognition grammar outside of the compiled software. This application can be used for customer interface systems with large vocabularies, voice command & control applications, mobile applications (such as banking applications), computer gaming, and others.



## TEAM DIMENSIONAL TRAINING™ (TDT™)



Team Dimensional Training™ (TDT™) is an empirically-based team strategy that facilitates team self-correction and effective team processes to improve team performance. TDT™ provides instructors with a structured method of evaluating teamwork and guides instructors on effective briefing skills. The TDT™ process has been found to increase team performance by enhancing communication, teammate mentoring and the ability to diagnose performance problems.

NAWCTSD offers a number of TDT™-related products and services to assist in the transition and sustainment of the program. Traditionally, TDT™ has been introduced to organizations through the TDT™ Workshop. The TDT™ workshop is conducted by a NAWCTSD team and a workshop consists of a classroom section and a role-play section. The classroom section is focused on the research and history associated with TDT™, introducing the four teamwork dimensions, as well as training cycle management and facilitation skills. The skills learned and practiced during the classroom are applied and evaluated in high-fidelity role-play scenarios with actual teams-in-training.

Specific aspects of TDT™, such as performance measurement and facilitation skills, can be incorporated into existing training programs. In addition, TDT™ can be integrated into an organization's own leadership development curriculum. Currently TDT™ is being used in the Squad Overmatch - Tactical Combat Casualty Care effort at Fort Benning, to develop Army and Marine Corps infantry squad team skills, which are then put into practice in virtual and live environment tactical scenarios as part of an integrated curriculum. TDT™ was also successfully integrated into the Naval Air System Command's Executive Leadership Development Training Programs.

Outside of the Department of the Navy, TDT™ workshops have been conducted for the Federal Law Enforcement Training Center, Volusia County (FL) Fire Services, and both State and Federal Corrections communities. In addition, NAWCTSD's TDT™ team has consulted with NASA's Johnson Space Center on incorporating TDT's performance measurement and facilitation skills as instructor support tools.



## MARINER SKILLS SIMULATOR (MSS)



Naval Reserve Officer Training Corps (NROTC) midshipmen at universities across the U.S. learn electronic navigation, ship handling and seamanship skills through a simulated environment made possible by the MSS. The low cost PC-based family of networked workstation emulations enables the selection of any location, the scripting of scenarios, instructor setup and control of training sessions, and the display of post-training feedback. This product line also supports the Surface community to provide training on electronic charting and ARPA radar employment. Both versions of MSS heavily leverage SubSkillsNet (Submarine Skills-training Network) software developed by NAWCTSD for the Submarine community. The NROTC version of MSS is used in over 40 NROTC host universities.

## **ADVANCED USE OF FORCE TRAINING SYSTEM (AUFTS)**



In partnership with the National Institute of Justice and the Federal Law Enforcement Training Center, the Naval Air Warfare Center Training Systems Division developed a use of force training system that supports improved situation awareness and cognitive decision making in use of force scenarios. The system incorporates computer generated imagery with expressive face technology, speech recognition, multiple wireless force options, scenario generation tools and an after action review capability. Computer generated characters react to speech inputs, weapon position and trigger pull. The AUFTS has direct application to law enforcement, force protection and tactical training simulations.