Building a composable, open, service-oriented maritime and port security system

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In 2007, the SRI Center for Maritime and Port Security, funded by the US Navy Air Systems Command, began developing a replicable, maritime domain awareness system prototype for Tampa Bay, Florida (Port Technology International, Edition 37). The Center focused on employing and improving current technology as well as developing new, cutting-edge technologies where security gaps existed. Two years into the project, the foundations for land, surface, and subsurface sensor placement are solidly in place.

Tampa Bay maritime domain awareness sensors – today and tomorrow

The SRI team is deploying technology to fill security gaps identified by the community's maritime stakeholders. Through cooperation with government agencies, private companies, and public organisations, three radar installations now provide coverage of the upper, middle, and lower Tampa Bay. A fourth, long-range radar on the Fort DeSoto Coast Guard Aid to Navigation Station, tracks vessels approaching the channel entrance from as far as 25 miles. Cameras augment the radars and assist with vessel detection and identification. In the spirit of maritime community cooperation, some cameras are specific to the Tampa Bay Maritime Domain Awareness System, while others are feeds received from legacy cameras in the three ports of the Tampa Bay complex.

The Physical Oceanographic Real Time System, developed by the University of Florida and the National Oceanographic and Atmospheric Administration (NOAA), is scheduled for incorporation into a three-dimensional display for low-latency information on water levels, temperature, currents, and meteorological data for use in economic, safety, and security matters.

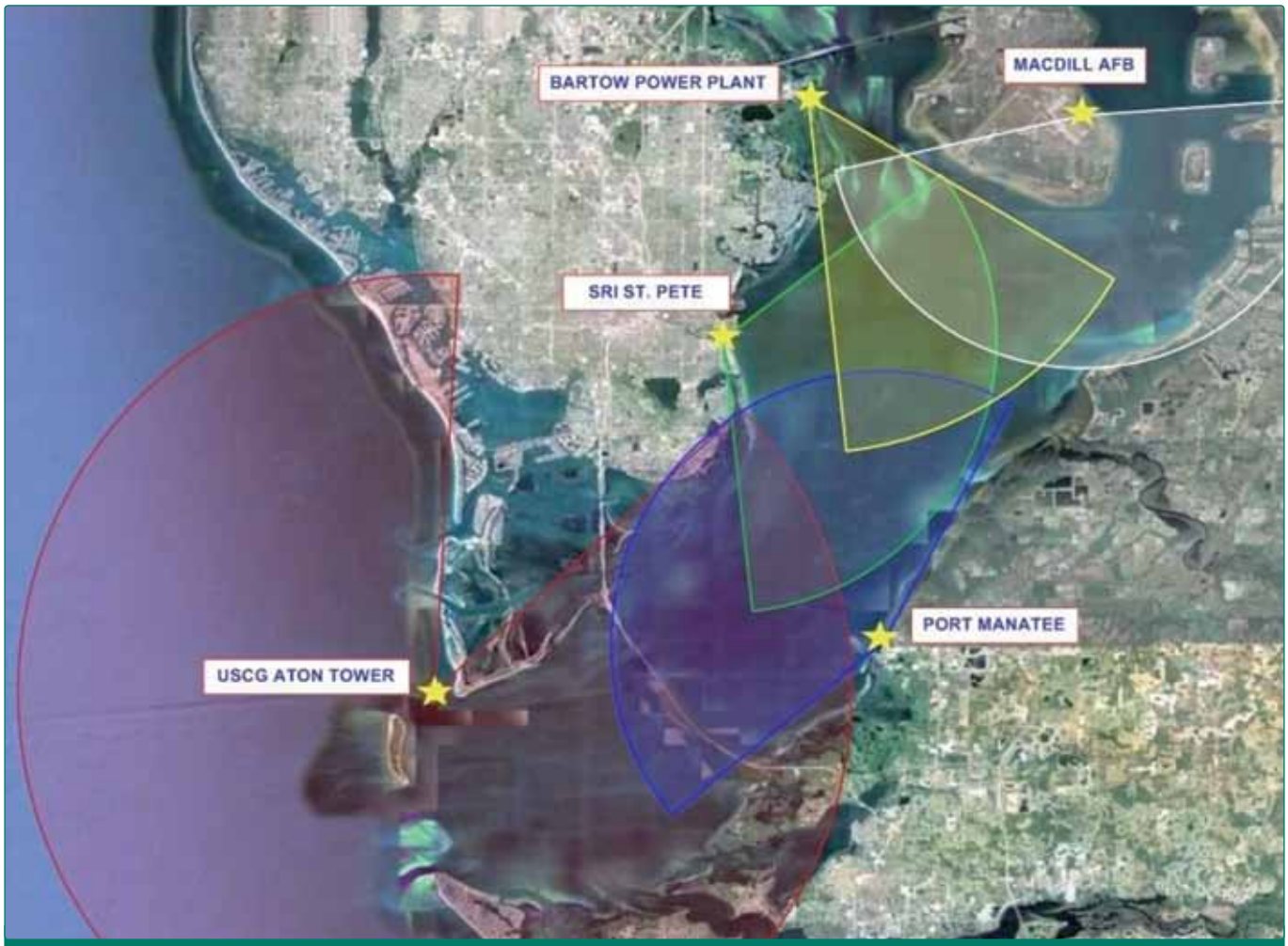

Figure 1. Maritime domain awareness system radar/AIS coverage.

Testing and evaluation activities are ongoing for selection of an underwater sonar diver-detection system. This system would be used during increased maritime security conditions as declared by the US Coast Guard Captain of the Port. This generally occurs when a vessel is either carrying certain dangerous cargo or is a high-value asset that warrants heightened security measures. The system also would be used to protect land-based maritime critical infrastructure and key resources (CIKR).

In-water sensors for examining hulls of vessels entering the channel to detect attached explosive or contamination devices are being investigated for inclusion in the Tampa Bay system. On the landward side, development continues on a man-portable explosive detection system that uses laser technology to identify elements in many types of explosives. A positive reading is displayed to the operator when the right combinations are present. This, primarily landward system can be used by ship-boarding parties and other law enforcement agencies, when checking for explosive devices.

Anomaly alerting is another capability in development. Using system radar and camera data, algorithms in conjunction with rule sets will provide audio or visual geographic user display alerts that a vessel has penetrated a waterside security zone. Kinematic alerting will also be possible. A floating security zone can be deployed around a vessel, such as a cruise ship or a tanker carrying chlorine gas. In this instance, the floating security zone maintains its established circumference around the ship for the entire transit, providing an alert to the operator when a vessel enters its perimeter.

Innovative system is open, service oriented and non-proprietary

The Smart Integration Manager Ontologically Networked (SIMON) system is a service-oriented architecture (SOA) platform based on non-proprietary, open standards. The platform creates an open, independent marketplace for value-added service components composing the broader system event of interest (EOI) collection, fusion, analysis, and dissemination to support common operating picture and command and control (C2) actions. SIMON is modular, scalable, and evolvable, with a long technology life cycle and extensible utility.

For maritime and port security stakeholders, SIMON enables selecting the best service available for the required function instead of a single proprietary suite of equipment. SIMON promotes best-of-breed component use without regard to manufacturer. SIMON also fosters inclusion of legacy security equipment, connecting existing camera, radar, and other sensors with the overall system.

In addition, an innovative achievement is the adaptive graphical user interface (GUI). Instead of multiple security systems feeding separate displays, the adaptive GUI melds various user displays into a single operational picture of fused sensor and non-sensor information.

Test bed activities

Testing and evaluation have been integral to the success and innovative progress of this project. The test bed facility with the SIMON platform is building a robust maritime domain awareness system integrating the best-of-breed components.

Other test bed activities include experimentation and research in underwater swimmer detection systems. In the summer of 2008, the US Navy, US Coast Guard, Office of Naval Research, and other organisations conducted a 'Tampa Bay Mine/Underwater Improvised Explosive Device Homeland Security Experiment.' US Navy mine-hunting equipment and SRI's sonar-equipped, remotely operated vehicle were deployed to detect inert mines and underwater improvised explosives. The experiment was a terrorist scenario that included the US Coast Guard, forensic underwater divers from Florida State University, and remote forensic analysis provided by the National Forensic Science Technology Center.

SRI is currently engaged in a US Navy program to evaluate land-water interface (LWI) sensors to detect underwater threats in extremely shallow water. Future programs will expand from current LWI in-water sensors to those that can be used in the full range of coastal and port environments to include swimmer detection in deeper water, swimmer and small boat detection and classification in the littorals and harbour approaches, and personnel and personal watercraft detection in swamps, marshes, and other coastal areas.

At project completion, the SRI team will have an innovative, comprehensive, prototype maritime domain awareness system providing increased situational awareness for Tampa Bay maritime stakeholders, replicable in other ports and harbours. New and capable sensors for security will be fielded, and test bed activities will continue to research, develop, test, and evaluate new and existing technologies. All of these efforts contribute to making the ports of the world safer and more secure for the public, the maritime industry, and commerce.

ABOUT THE ORGANISATION

Silicon Valley-based **SRI International** is one of the world's leading independent research and technology development organisations. Founded as Stanford Research Institute in 1946, SRI has been meeting the strategic needs of clients for more than 60 years. The non-profit research institute performs client-sponsored research and development for government agencies, commercial businesses, and private foundations. In addition to conducting client-sponsored R&D, SRI licenses its technologies, forms strategic partnerships, and creates spin-off companies. SRI St. Petersburg is focused on research, development, deployment, and commercialization of technologies related to ocean science, the maritime industry, and port security.

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