



Homeland Security

Automated Scene Understanding (ASU) Technology and Prototypes

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1 BACKGROUND

The Homeland Security Advanced Research Projects Agency (HSARPA) invests in programs offering the potential for revolutionary changes in technologies that promote homeland security and accelerates the prototyping and deployment of technologies that reduce homeland vulnerabilities. HSARPA performs these functions in part by awarding procurement contracts, grants, cooperative agreements, or other transactions for research or prototypes to public or private entities, businesses, federally funded research and development centers and universities.

This BAA addresses a general class of problem that is becoming more acute as the nation deploys sensors and security networks in response to the global war on terrorism. Multiple governmental organizations are deploying sensors, such as closed circuit television (CCTV), specialized video and infrared cameras, radars, and other sensors to provide physical security and general awareness at critical infrastructure, transportation hubs, borders and border entry points and our ports and harbors. In parallel, private industry, more acutely aware of the threats to physical security, is installing large numbers of security networks, many based on CCTV systems, at buildings, industrial sites and other key locations. With the introduction of these sensors, the volume of data (in terms of video screens, alarms, tracks, etc.) is far outstripping the number of operators available to monitor the data. In addition, combinations of different types of sensors, such as CCTV, thermal imaging, beacons, and radars are also appearing at such locations. Today, the fusion of data and information from these different modalities must be done by the operator, further expanding his or her workload, and increasing the chances of the systems being ignored or being ineffective. The problem will get dramatically worse in the coming years as governmental agencies and industries continue to invest in security monitoring sensors through the wide application of various security grants.

Fortunately, there is a considerable base of technology from which to begin. A number of commercial vendors, responding to the marketplace for security systems, have begun to provide increasing sophisticated interpretation algorithms with their CCTV systems. Over more than a decade, the Department of Defense has had a major development emphasis on developing the capability for total battlespace awareness. This BAA intends to leverage those capabilities to adapt the technologies to homeland security concerns and continue to push the state of the art to meet our domestic needs.

2 PROGRAM OBJECTIVES AND APPROACH

The Department of Homeland Security (DHS) seeks proposals for innovative architectures and solutions to meet this growing need. These solutions can consist of new architectures or components or algorithms for new or existing systems that will provide automation for the purpose of scene understanding. Systems based on these architectures provide greatly improved capabilities to fuse, correlate and interpret fragments of information derived from various sources including, but not limited to, video, radar,

seismic, acoustic, and other sources by the use of mathematical, algorithmic or knowledge-based computational reasoning. The analysis will yield objects, tracks, events, situations, behaviors and scenarios and be able to identify anomalous or explicitly specified scenarios, behaviors, events, patterns, tracks or objects. The intent is to reduce potentially thousands of objects, tracks, events, etc. into a manageable, significant / interesting few and raise an alarm (if appropriate) based on the identification of a specific scenario, behavior, event, situation, pattern, track or object. These systems must integrate automated operator decision support that allow a minimum number of people to manage the entire system. The proposed solutions will be demonstrated in a real-world environment such as maritime surveillance, airport security, port protection, and traffic in and near secure areas and critical infrastructure.

2.1 Objectives of the Program

This program seeks to develop technologies and systems that will:

- Enhance the ability of Federal, State and Local Law Enforcement and other homeland security functions to use increasingly extensive arrays of sensors (CCTV, radars, seismic, etc.) to be alerted to, recognize and correlate indications of unusual, criminal or terrorist activities or intent in order to allow timely response.
- Improve the efficiency and reduce the operating cost of security infrastructure networks for critical infrastructure protection, transportation hubs, ports and maritime operations by automating the sensor monitoring process.
- Create one or more demonstration prototypes that will act as a testbed for integrating COTS (commercial off the shelf)-based monitoring systems and new systems developed using innovative architectural approaches, and new components or algorithms to achieve revolutionary advances in capabilities.

2.2 Desired Outcomes

The desired outcomes of this research effort include:

- Innovative architectural approaches that can be the basis for systems that will achieve revolutionary advances in automated scene understanding.
- New components and algorithms that can be part of new systems or can augment existing systems and provide significantly improved capabilities.
- Projections of explicit capabilities and performance characteristics of systems based on these architectures, components or algorithms.
- Technology roadmaps and development plans (including timetables) for realizing these systems.
- Projections of costs, both short term, medium term and long term for deployment and operation of these systems.
- Plans for integration of developed technologies into real-world, DHS-relevant testbed environments.

- Information for potential end users.

2.3 Additional Desired Outcomes

This research effort is designed to create the foundation for new systems or provide augmentations and improvements in existing systems. These include:

- Bringing analytical tools to bear on real-time and warehoused video data to extract specific information and to discover “abnormal” events that can be used to preempt criminal or terrorist behavior.
- Moving video data from the role of evidence collection into its use as an integral tool to prevent crime and terrorist activity.
- Integrating new and improved scene awareness capabilities into the DHS Hawkeye testbed in South Florida for evaluation and operations concept development.

2.4 Architecture Requirements

The solution should incorporate several features. A key requirement of any proposed architecture is that the architecture should be open and allow other entities to insert components or algorithms into the system for improved capabilities and performance. Specifically,

- An architecture must be *open* in the sense that each layer of the architecture must be documented via explicitly published APIs (Application Programming Interfaces) or standardized XML (extensible markup language)-based information transfers.
- An architecture must be *modular* in the sense that each specific layer of the architecture must be isolatable to a specific set of modules.
- An architecture must be *scalable* and allow for one or more levels of analysis to be off-loaded / distributed to other computer systems.
- An architecture must be *evolutionary* to allow improvements in or changes to an analysis algorithm or component to be deployable entirely within the appropriate analysis layer(s) and module(s) without requiring modification of the entire system.

2.5 End Users

HSARPA has requirements to meet the needs of a variety of users, including:

- State and Local Governments, who through grants and other funding are increasing their monitoring capabilities,

- Borders and Transportation Security, who have the responsibility of monitoring border entry points, transportation hubs, shipping facilities, and borders themselves,
- Critical Infrastructure Protection, which has the need to enhance the security of key infrastructure elements,
- United States Coast Guard, which has the requirement to ensure security and safety of the nations coastal approaches, ports and waterways,
- United States Secret Service, which has the requirement for protection of key officials.

2.6 Technology Interests

This BAA addresses both immediate and long term interests. DHS S&T (Science and Technology) has immediate needs to apply technology to a number of testbeds for early implementation of homeland security capabilities, one example being the HAWKEYE testbed for coastal and port surveillance in South Florida. State and local governments are rapidly enhancing their security capabilities and have immediate needs for information on the capabilities and limitations of various approaches. DHS S&T also understands that as sensors become more sophisticated, less costly and proliferate, scene understanding will be a problem that will endure and become more widely needed over the decades ahead. In addition to meeting immediate needs, a coordinated research and development program to significantly enhance our scene awareness capabilities is called for.

2.7 Topic Areas

This specific BAA has three specific Technical Topic Areas (TTAs):

- TTA-1 : CCTV-based scene understanding – system architecture
- TTA-2 : CCTV-based scene understanding – components and algorithms
- TTA-3 : DHS Hawkeye Testbed

3 OVERALL CONCEPT

The overall concept that a new architecture or an augmented system must support is one of integrated security and monitoring systems that use a variety of multiple heterogeneous and homogeneous sensors and information and knowledge sources. Sensors include but are not limited to CCTV, long range video cameras, radars, transponders, beacons or other sensors yet to be developed. Knowledge sources can include weather data, shipping data, AIS (automatic identification system) data, and structured and unstructured intelligence information among many others. Final scene awareness and alertable conditions should be able to be passed to proper authorities via networks.

- Topic Area 1 (CCTV-Based Scene Understanding) develops an architecture for a prototype system that supports the advanced CCTV-based scene understanding

and data fusion requirements stated herein. Architectural studies are intended to take 8-12 months and should be bid as a whole.

- Topic Area 2 (CCTV-Based Scene Understanding) will develop advanced scene awareness and data fusion components and/or algorithms for new or existing systems incorporating CCTV. The initial performance period for components and/or algorithms is 6 months with no more than two one-year options.
- Topic Area 3 (Prototyping and Demonstration System: Hawkeye Testbed) will adapt existing or a collection of existing scene awareness capabilities into an operational rapid prototype as a part of Project Hawkeye. The anticipated period of performance is 12 months including integration with an option for an additional year of hardware and software support.

The architecture should allow for the additional of new types of sensors as they become available.

4 TECHNICAL TOPIC AREAS 1 & 2 – CCTV-BASED SCENE UNDERSTANDING

4.1 Application Description

An automated CCTV monitoring system consists of one or more fixed and/or (possibly) movable CCTV cameras, which are used to monitor a physical space such as a fence outside a factory, a plant floor, a port, a marine waterway, a subway station, a roadway approach to a building or an airport concourse. The output of the cameras is fed into television monitors and into a computer analysis system. The computer system acts as an automated monitor in that it can analyze scenes, recognize objects, tracks, situations, events, behaviors and scenarios (ranging from simple to complex) and raise alerts for a class of events that range from detection of motion, scene changes, to environmental changes and behavioral scenarios. The principal application is to aid individuals who are tasked to monitor the output of these CCTV systems and alert them to situations or scenarios that require specific attention. Additional applications include post incident analysis, scene/scenario reconstruction, panoramic image generation, and archival and management of video images for investigation and evidentiary chain-of-custody.

4.2 CCTV-based scene understanding requirements

The following requirements must be supported by any proposed architecture. However, implementations of systems based on these architectures may sequence the delivery of capabilities that support these requirements over time. Components or algorithms that augment and improve the performance of existing systems must demonstrate capabilities that support subsets of these requirements.

4.2.1 Environmental invariance

- Operate over a wide range of general environmental conditions such as lighting, weather, and sea state among others. However, in any specific installation, the expected environmental variation must be reasonable.
- Operate over a wide range of environmental variations such as fixed scene changes and mutations (e.g. addition of a sign to a background or adding new paint to a wall).
- Should be unaffected by image instability caused by camera jitter (e.g. wind-induced) and motion (e.g. sensor onboard an underway patrol craft).

4.2.2 Motion detection

- Detect the motion of objects in a scene including objects entering or leaving a scene or moving within a scene.
- Detect motion of a wide range of object types, sizes and degrees of motion including people walking, running or moving very slowly, vehicles of varying sizes and animals.

4.2.3 Spatial and temporal programming & end-user programmability

- Should be programmable to divide a scene into a collection of regions and region borders each with possibly different alert criteria.
- Should be able to “glue together” scenes that arise from different cameras (from scanning/dwelling as well as staring), handle transitions between them and treat a collection of camera scenes as a single unit.
- Should be programmable to recognize different alert criteria depending on time of day, day of week and specific date.
- Trained end-users should be able to program the system in all of its aspects.

4.2.4 Object class recognition

- Should be able to recognize an instance of an object class (e.g., a truck, a car, a particular type of car, a person, a vessel, or a package).

4.2.5 Individual object recognition

- Should be able to recognize a specific instance of an object class (e.g. a specific person or vehicle or class of vessel).
- Should be able to distinguish multiple specific instances of multiple object classes in a scene.

4.2.6 Anomalous object instance recognition

- Should be able to specify a set of templates consisting of features that define a 'normal' instance of an object class (e.g., should be wearing appropriate clothing).
- Should be able to recognize anomalous instances of an object class – i.e. an instance that does not match one of the normal templates (e.g., wearing a coat in warm weather, flat or exaggerated effect relative to a crowd, etc.).
- Should be able to recognize behavior anomalous for the class of object (e.g., moving in an unusual way, unusual aspect or unusual configuration).

4.2.7 Object decomposition

- A single object should be decomposable into a set of sub-objects (e.g. a person consists of a torso, a head, arms and legs).

4.2.8 Object compositing

- A set of objects can be treated as a single composite object (e.g. a person carrying a package).
- A set of objects can merge into a composite object (e.g., a person can pick up a package), which can then be treated as a single object.
- A composite object can be split (e.g., a person can leave a package), which is then treated as multiple (but related) objects.

4.2.9 Camera control

- Intermediate results at any level of the analysis should be able to control the parameters of the camera(s) include activation, panning, skewing, zooming, etc.

4.2.10 Object / sub-object tracking

- Should be able to tag and track any object instance through its range of motion in a scene.
- Should be able to track any sub-object of an object through its range of motion in a scene (e.g., the motions of a person's arms).
- Should be able to track object merging and splitting through the entire range of motion.
- Should be able to track multiple object instances simultaneously without ambiguity.

4.2.11 Scene feature extraction

- Extract text from license plates, trucks, and vessels for real-time analysis.
- Extract a number of operating states for vessels (e.g.: underway, planning, adrift, at anchor, under sail, fishing, etc.)
- Recognize prohibited behavior such as dumping from a vessel or tailgating through a secure door.
- Extract salient vessel characteristics (width, length, height, freeboard, structural outline, IR [infrared] signature) at tactically useful ranges and independent of vessel aspect.

4.2.12 Scenario programming and matching

- Scenarios that include collections of object classes, object instances, paths, regions, events, temporal and spatial relationships and behaviors should be programmable.
- The programming system for specifying scenarios must support multiple levels of abstraction and expressivity in order to support complex programming tasks normally performed by professional programmers and less complex programming tasks that could be performed by sufficiently trained end-users.
- Observed objects, events and behaviors can be aggregated into scenarios and matched against a database of pre-programmed scenarios. The aggregation process should also be programmable.
- Matching a scenario should be able to cause an alert. Not matching a (normal) scenario should also be able to cause an alert. Alerts should be customizable.

4.2.13 Training by example

- Should be able to train the system to establish baseline situations, behaviors and scenarios through processing steady-state / normal real-time video data or by processing corpuses of examples.
- Training should include automated or system-aided synthesis of normal scenarios.
- Training can be augmented by user-directed programming.

4.2.14 Real-time / near real-time operation

- The system should operate in real-time or near real-time.

4.2.15 Non real-time operation

- In non real-time mode, the system should be able to operate on and analyze recorded digital video stored in an archival warehouse.

4.2.16 Scene tagging and description

- Provide a method for attaching descriptive metadata to scenes.
- Add metadata to scenes automatically or manually.
- Search archival databases using metadata queries.

4.2.17 Data transformation, association, correlation and fusion

- The output of the analysis system must be in such a form that it can easily be transformed as necessary to provide input to a data fusion system that merges different real-time and/or non-real time data.
- The derived data stream consisting of the summary of the scene analysis should either be in a recognized standard form or be easily transformable into such a form.
- Should have the ability to combine data from multiple and possibly different sensors and use the results to make inferences about a physical entity or situation that may not be possible or accurate with a single sensor.
- Should have the ability to combine data from sensors and databases and use the results to reduce uncertainty in the inferences made about physical entities or situations and to detect anomalies between combined sensor outputs and databases.

4.2.18 False alarm rate

- The false alarm rate and alerting thresholds should be adjustable and determined by the environment, application and system sensitivity settings.

4.3 Deliverables

Contractors may propose solutions in the form of system architectural studies for new systems (TTA-1) or components or algorithms for new or existing systems (TTA-2).

4.3.1 Architectural studies

Each contractor responding to TTA-1 will be responsible for delivering an architectural study that contains the following elements:

- A review of the current state of research in automated scene awareness (including data fusion) and a gap analysis with respect to the capabilities of the proposed architecture.
- A detailed architectural specification of the scene awareness system that meets or exceeds the requirements described above. The specification should include:
 - Diagrams and functional specifications for each level of the architecture
 - Interface descriptions for each level of the architecture
 - Modular decomposition of each level of the architecture
 - Component-level functional descriptions
 - Concept of operations for systems built using the architecture
- A proposed demonstration prototype system based on the proposed architecture and a plan for implementing the demonstration prototype system including timing for delivery of different functional components and requirements for system integration.
- A strategy and architecture for multi-sensor, multi-level data / information / knowledge fusion.
- A plan / proposal for integrating the demonstration prototype system into a real-world, DHS-relevant testbed environment.

4.3.2 Components and algorithms

Each contractor responding to TTA-2 will provide a detailed description of the particular component or algorithm including principles of operation, mathematical background, functional description, interfaces and current state of development. In addition, the description should include information about estimated performance characteristics and systems integration strategy.

At a later stage in this program, contractors who have developed novel components or algorithms that demonstrate superior capabilities, performance or reliability will be teamed with providers of existing systems or creators of new systems. In addition, HSARPA intends to make available for system demonstration projects, components and algorithms developed by other entities in the earlier phases.

4.4 Architectures and components

It is anticipated that a contractor may propose both an architecture under TTA-1 and one or more components or algorithms under TTA-2 that are intended to fit within the architecture. In this case, the contractor will follow the guidelines above, but in addition will provide information that links the architecture to the component(s) and/or algorithm(s).

5 TECHNICAL TOPIC AREA 3 - PROTOTYPING AND DEMONSTRATION SYSTEM : HAWKEYE TESTBED

5.1 Background

The Department of Homeland Security (DHS) is initiating a program for the development of and deployment of scene-awareness software that will integrate radar data, radar track data, optical (video) and infrared image streams, positioning information from an Automatic Identification System (AIS), and other data inputs, to provide machine understanding of the coastal and port security scene and enhance vessel detection, evaluation, and tracking in support of tactical analysis and intercept decisions. The projected systems will be installed in Coast Guard Sector Command Centers (SCC) to be located in major ports and coastal surveillance areas.

This software will become part of the ongoing Coast Guard program of coastal surveillance in southern Florida called Project Hawkeye, begun in 2003. Project Hawkeye is part of the DHS Port and Coastal Surveillance initiative in the Southeast Florida area (Port Everglades, Miami and Key West). In 2004, Coast Guard centers in this region will be equipped with new sensor systems (radar, optical, infrared, AIS and Blue force tracking). The goal of Hawkeye is to furnish the SCC with increased maritime domain awareness (MDA), improved tactical picture, improved reaction windows to threats, fewer re-evaluations of non-threats, and improved command/control and utilization of assets.

As a result, on the watch-floor, there will be many screens of camera scenes and numerous radar tracks to monitor and evaluate, in addition to AIS and Blue force information, maritime and government databases, and reports from USCG (United States Coast Guard) patrol reports, USCG boarding parties, and the Port Partner organizations (e.g. Marine Wildlife and Fisheries, ICE [Immigration and Customs Enforcement], and law enforcement). The Hawkeye radar processor will provide simple rule-based track acquisition and alarm generation capabilities based on operator inputs.

The SCCs will have limited staffing resources with which to track and evaluate hundreds of vessels. This volume of data is too great for the SCC staffing complement to utilize completely. The resultant impacts may include operator overload, under-utilization of the available data, delayed responses, unacceptable false alert rate, ineffective CONOPS (concepts of operations), redundant evaluations of non-threats tying up patrol assets, and critical inaccuracies and uncertainties. Thus correlation of multiple sensor inputs into one presentation and automatic recognition of suspicious, unusual, dangerous, prohibited or other actionable behavior is mandatory.

5.2 Objective

HSARPA is interested in software solutions focused on accurately identifying suspicious, dangerous and prohibited behavior by vessels; fusing data and information from more than one sensor system (e.g., optical and radar) and information from other information

sources (e.g., AIS, maritime and security databases, Blue Forces position data); allocating sensor assets to evaluate vessels of interest; flexibly and automatically adapting to changing situations and conditions, both through machine learning and operator input; providing a very high acceptable probability of correctly alerting to suspicious, dangerous and prohibited behavior by vessels being surveilled in the port and coastal environments; and maintaining a very low false alarm rate.

5.3 Strategy

The Department of Homeland Security seeks to adapt an existing or collection of existing scene awareness capabilities into a operational rapid prototype as a part of Project Hawkeye. One or more contracts will be awarded for rapid prototype development and demonstration. The prototypes will be developed and tested using data collected from Hawkeye radars, optical and infrared sensors and processor data, furnished by DHS, as much as is practicable. Other types of data may be provided by DHS or simulated by the developer, as required.

The developer will deliver a prototype system solution that will be integrated into the HAWKEYE SCC in Miami, FL and operated in actual operations to assess the technology's operational utility and develop operational procedures. The developer may be required to deliver the software and algorithm descriptions to a systems integrator designated by DHS to integrate multiple prototypes. It is desired that the software resulting from this BAA is the beginning of a continual improvement in target-identification and anomaly detection sophistication and as such it must meet the architecture criteria listed in Section 2.4.

5.4 Deliverables

Each contractor will be required to design, develop, demonstrate, and deliver software and hardware for demonstrating system performance (with emphasis on operational suitability) within approximately twelve months. Integration into one Coast Guard Sector Command Center (SCC) will be required. The prototype must be open-architected and employ high-level software languages as much as practicable

The contractor will be required to provide hardware and software maintenance (to include on-scene repair and software troubleshooting and patches) support for their fielded system at the SCC Miami for six months following delivery and, as a option, for another year on a time and material basis.

The prototype will initially use commercial off the shelf (COTS) hardware and software tools. The prototype should be compatible with (although not necessarily integrated into) the Hawkeye software (which is based on the Department of Defense (DOD) Defense Information Infrastructure / Common Operating Environment (DII/COE)).

5.5 Requirements

5.5.1 Concept of Operations

DHS envisions such a system having the following concept of operations:

5.5.1.1 Genera

- The system will normally operate in the background, only alerting operators when anomalous, suspicious or prohibited behavior is detected,
- When fully implemented, the system will be a software and COTS hardware capability integrated with the SCC software,
- The outputs from the system will be monitored by one or more operators
- The system will simultaneously monitor radar tracks, video information, and position reports to generate, classify, correlate, track, identify, and assess the threat level of vessels within the sensors fields of view.

5.5.1.2 Sensor Level Detection

- The system will monitor radar tracks from multiple radars (the tracks may be already fused when the system receives them) and analyze them for
 - Anomalous behavior - behavior that is not normally seen in a particular context and therefore is worthy of further surveillance and evaluation.
 - Suspicious behavior – behavior that may fit, to some degree of correlation, to one or more predetermined threat scenarios.
 - Prohibited behavior – behavior that violates one or more “rules” preset by the operators.
 - Upon determination of any of the above, the system will generate an alert..
- The system will monitor the image stream from multiple optical and infrared cameras and analyze them for:
 - Objects (particularly vessels in view of the camera, to include a classification of object type and size (including vessel classification)
 - Object position, velocity and velocity characteristics (vessel planning, sea keeping, etc),
 - Anomalous behavior - behavior that is not normally seen in a particular context and therefore is worthy of further surveillance and evaluation
 - Suspicious behavior – behavior that may fit, to some degree of correlation, to one or more predetermined threat scenarios.
 - Prohibited behavior – behavior that violates one or more “rules” preset by the operators.
 - Upon detection of any of the above, the system will generate an alert

5.5.1.3 Correlation, Identification and Target Package

- The system will correlate radar tracks and optical objects, and initiate a Target Package that includes radar position, track, optical information and results of radar and optical analysis.
- The system will initially classify each target (e.g., unknown high speed, sailing vessel, cruise ship, etc) based on track analysis, visual imagery and other information.
- The system will also correlate targets with automatic identification data streams, such as the AIS system and Blue Force locators to provide, where available, target identification.

5.5.1.4 Target Analysis

- The system continues further analysis to classify and identify the vessel, its behavior, degree of interest, threat or actionable behavior . Such analysis may consist of: correlation of radar tracks with other sensor information, retrieval of similar historical events, and database searches for correlating and relevant information in order to conduct automated assessment of suspicious behavior.
- Operator input of specific suspicious behaviors should be ingested and acted upon but should not be required for system performance.
- The system shall maintain and display a continuous assessment of target interest level and priority.

5.5.1.5 Alerting

- Upon achieving a threshold in interest or priority, the system will alert the operator and provide her or him the Target Package and basis of the alert.
- The operator will be able to modify the target classification, interest level, identification, analyzed behavior and status.
- Based on alerts the system provides or other information, the operator shall be able to designate a target as a Flash Target which will then be continuously monitored using all available sensors and data systems. Examples of a Flash Target may include a potential vessel out of control, vessel in distress, terrorist attack, indications of an illegal landing, etc.
- The system will initiate recommendation of courses of action for a Flash Target.

5.5.1.6 Post Analysis

- The system will track recording and analysis sufficient to reveal patterns and behaviors and changes to patterns, behaviors and routes used by vessel traffic. This capability will be integrated with a graphical information systems (GIS) and results provided in GIS-compatible coordinates.
- The system will archive the Target Package for forensic analysis and later comparison with subsequent detection of the same target.

- The system will provide automatic, time-stamped logging of internal messages and system states to support real-time and post analysis of system operation and comparison of system states and activities to actual system inputs.

5.5.1.7 Concept of Operations Example

A set of cameras and radars are installed along the coast, along the channels into ports and harbors and on inland waterways to aid in the tracking and identification of large and small vessels in the area. The cameras include visual and infrared, long and short range optics and are remotely controllable in pan, zoom and tilt (PZT). The camera feeds from, say, ten cameras are piped to a port command center along with the tracks from the multiple radars and position reports from identification and localizing beacons on certain cooperating vessels (e.g. Automated Identification System (AIS)). The system must perform the following actions for the operator, a watchstander at the Sector Command Center:

The system will monitor radar tracks, visual scene, AIS reports and other sensors. If the radar tracks indicate that the target is in visual range, the appropriate cameras will be slewed to the target and a visual identification attempted and a determination of vessel operating state will be made. Position reports and other intelligence will be correlated with the track. If the AIS or other position report identifies the vessel, previous histories of that vessel will be recalled and compared.

The system will assign an interest level based on the classification or identification. The target's behavior (track, course, speed) will be monitored, and an operator may be alerted depending on pre-set doctrine. Any anomalous behavior or change in operation will cause a re-evaluation of the target interest level. Anomalous behavior that matches a preset scenario or highly unusual actions should cause an operator alert and more thorough coverage with other sensors. Preset scenarios may include: indications of dumping, diving operations, vessel in distress, unsafe operation, anchoring, or beaching. As the vessel enters a harbor, a positive visual identification is attempted using registration numbers.

During the entire operation a target history file complete with tracks, visual images, and identifications, is generated and archived both for forensic purposes and later comparisons.

At any time the operator can call up (or be automatically presented with) a complete target package with radar tracks, position reports, visual images, classification, identification, degree of anomalous behavior and any alert events. In addition any histories for the same vessel are brought up and normal behavior for that class of vessel displayed.

5.5.2 Functions

The system will be used to provide expert assistance to the operator in performing the following functions:

- Alerting to potential terrorist threats or behavior
- Alerting to potentially unsafe or dangerous behavior
- Monitoring vessels designated to be of interest
- Alerting to unsafe boating or operation of vessels in a hazardous manner
- Alerting to violation of environmental laws and regulations including fishing regulations
- Alerting to potential illegal immigration operations
- Alerting to potential smuggling operations
- Alerting to vessels potentially in distress

5.5.3 Additional Requirements

5.5.3.1 Scenarios and Rules

- The system should be capable of allowing operators to easily insert new behavior rules, such as “watch and alert if vessel turns south”.
- The system should permit input of separate sets of behavior rules corresponding to Maritime Security (MARSEC) levels 1, 2 or 3, that can be recalled and put into operation by the operator.

5.5.3.2 Alerting Rates

- The system should be capable of adjusting the priority of alerts to produce a desired false alarm rate.
- The system should provide a straightforward methodology for adjusting false alarm rates.
- The false alarm rate and alerting thresholds should be adjustable and determined by the environment, application and system sensitivity settings.

5.5.3.3 Operator Interface

- Time and latitude/longitude of suspicious radar tracks and radar tracks exhibiting prohibited behavior will be automatically ingested into, and displayed in, a GIS at one-minute intervals
- Time, latitude/longitude, velocity vector, and velocity characteristic of optically-detected suspicious objects and objects exhibiting prohibited behavior will be ingested into, and displayed in, a GIS at one-minute intervals

5.6 Modes

- The system will have a real-time operational mode (normal)
- The system should have an offline test and evaluation and training mode.

- The system should have a forensic mode, i.e.: be able to play back information and events following an event of interest.

6 INFORMATION FOR OFFERORS

This BAA will remain open for one year following its issue. White papers will be required for the three additional quarterly reviews of new submissions. However, teams considering a submission should note that most of the anticipated funding will have been awarded before the three additional quarterly reviews.

6.1 Eligible Applicants

Any entity or team of entities, other than the specific Department of Energy Laboratories listed in Appendix A, may submit a white paper and/or proposal in accordance with the requirements and procedures identified in this Broad Agency Announcement (BAA).

Historically Black Colleges and Universities (HBCU), Minority Institutions (MI), small and disadvantaged businesses (SDB), women-owned businesses (WB), and HUB-zone enterprises are encouraged to submit proposals, and to join others in submitting proposals; however, no portion of the BAA will be set-aside for these special entities because of the impracticality of reserving discrete or severable areas of research and development under this topic.

6.2 Anticipated Funding Level

HSARPA anticipates that up to \$5M in funding will be available in FY'04 for award to multiple teams under the ASU solicitation. Of the FY'04 funding, approximately \$3M will apply to TTA-1 and TTA-2 and \$2M to TTA-3.

6.3 Types of Awards Including Other Transactions for Prototypes

Awards may be executed as contracts, cooperative agreements or other transactions. Section 831(a)(2) of the Homeland Security Act of 2002 (Public Law 107- 296) gives the Department of Homeland Security (DHS) the same “Other Transactions for Prototypes” authority exercised by the Department of Defense (DoD) under 10 U.S.C. (United States Code) §2371 note. Section 831(a)(2) also imposes the same criteria for award of an “Other Transactions for Prototypes” agreement on DHS as was given to DoD.

6.4 Application and Submission Information

Copies of this BAA may be downloaded from the Federal Business Opportunities (FedBizOpps) web site at www.FedBizOpps.gov or at www.hsarpabaa.com. Paper copies of the BAA may be obtained by contacting:

Booz Allen Hamilton,
4001 Fairfax Drive, Suite 750
Arlington, VA 22203
POC: Steve Svensson 703 465-2628

6.5 Registration and Submission Instructions

This BAA will remain open for one year from the date of issuance with one initial round of evaluations and quarterly reviews following the initial round. Table 1 - Procurement Schedule gives the anticipated schedule of events.

Table 1 - Procurement Schedule

DATE	EVENT
12 April 2004	FedBizOpps announcement published
26 April 2004	Briefing to Industry
3 May 2004	White Paper Registration
17 May 2004	White Papers due @ 4PM EDT (Eastern Daylight Time)
7 June 2004	White Paper Review completed
21 June 2004	Proposal Registration
12 July 2004	Proposals due @ 4:00PM EDT
30 August 2004	Source selection completed. Start contract negotiations.
27 September 2004	Kickoff meetings
22 November 2004	Quarterly Review of Additional White Papers
28 February 2005	Quarterly Review of Additional White Papers
30 May 2005	Quarterly Review of Additional White Papers

6.5.1 Registration

To aid in the management of the anticipated response to this solicitation, bidders are required to register at least one week in advance to submit either a white paper or a full proposal. Bidders will not be permitted to submit white papers or proposals unless registered. Submissions will not be accepted from organizations who have not registered.

6.5.2 Submission

Any organization that wishes to participate in this BAA must register at www.hsarpabaa.com. Upon acquiring a username and password to access the site, select BAA 04-05 from the list on the left side of the screen and further select either TTA-1, TTA-2, TTA-3 or any subset. Upon proper selection, buttons for registration and submission will appear. Fill in the requisite fields, and submit your registration or

proposal. Upon registration or submission, a file will be sent to the registered email address. Receipt of a file confirms your registration for the set of TTAs selected. In the case of a white paper or proposal submission, please check the contents of the file. If they are incorrect, return to the website and make corrections.

6.6 Multiple Submissions

Organizations are permitted to submit more than one proposal or white paper to this solicitation. In the case where a single concept applies to TTA-1 and TTA-2, bidders may submit a single white paper or proposal. The presence of a multiple TTA proposal must be clearly marked on the cover page (generated by registration). Restrictions on page limits for both white papers and proposals specified in sections 6.10 and 6.11 must still be followed. However, if there are additional cost savings or other benefits to be gained by selecting a multiple TTA proposal, an annex of up to 3 pages may be added specifying these benefits.

6.7 Bidders Conference

HSARPA will hold a Bidders Conference for the ASU BAA on or about the date listed in Table 1 at the Marriott Wardman Park in Washington, D.C. All interested attendees must register on line at <http://www.hsarpabaa.com>. The site includes directions to the Marriott Wardman Park from local airports and names and contact information for area hotels. An \$120.00 registration fee will be collected at sign in. The point of contact for the Bidders Conference is:

Donna Blanger - 703-465-5717
Booz-Allen Hamilton
4001 Fairfax Drive, Suite 750, Arlington, VA 22203
blanger_donna@bah.com

Viewgraphs from the presentation will be made available on-line after the bidders conference.

6.8 Submitting a Classified Response to this BAA

HSARPA does not anticipate that proposals submitted in response to this BAA will be classified. If an offeror intends to submit a proposal containing classified information, it must be submitted via proper classified courier or proper classified mailing procedures as described in the National Industrial Security Program Operating Manual (NISPOM). Classified submittals must include ten printed proposals and one electronic copy on CD-R media. Classified documents MUST be received by the applicable due date and time.

Classification does not eliminate the requirement for offerors to comply with all

instructions and deadlines in this BAA.

For additional instructions with regards to the submission of classified proposals, contact: Rob Sullivan, Special Security Officer (contractor support)

robert.c.sullivan@dhs.gov
202-772-9889

Participants should register on-line and print out a cover sheet for the classified proposal.

6.9 Solicitation and Awards Schedule

The planned solicitation and awards schedule is listed in Table 1.

After the white paper review, HSARPA, at its discretion, will notify offerors, electronically or in writing, either encouraging or discouraging submission of full proposals based on the white paper. While highly recommended, neither encouraging comments nor white papers are required to submit a proposal. Full proposals will be accepted only after the white paper deadline. Proposals will be evaluated by a review panel using the criteria specified under Evaluation Criteria in Section 7.0. Following this review offerors will be notified if their proposal has been selected for negotiation.

Registration for white papers will open shortly after the solicitation is posted. Registration for proposals will open after white paper feedback has been provided.

Submission of white papers and proposals opens immediately upon proper registration. This BAA will remain open for one year from date of issuance. The evaluation will provide a coordinated evaluation of all submissions.

6.10 White Paper Guidance and Content

Offerors are encouraged, but not required, to submit short white papers in advance of full proposals.

White papers should capture the essence of a proposal and are designed to permit offerors to obtain feedback from HSARPA on their planned technology development without having to go to the expense and effort of writing a complete proposal. If received by the white paper submission deadline, the white paper will be evaluated by a review panel comprised of government employees and government contractors specially selected to eliminate potential conflicts of interest. After this review, offerors will be promptly notified either encouraging submission of a full proposal or discouraging submission of a complete proposal. For those white papers encouraged to submit full proposals, HSARPA will provide a summary of specific strengths and weaknesses. No further debriefing will be offered to discouraged white papers due to the large amount of time this would entail.

The Government intends to use employees and subcontractors of a support contractor to assist in administering the evaluation of white papers and proposals. These personnel will have signed, and will be subject to, the terms and conditions of non-disclosure agreements. Bidders may request a government only review, notwithstanding a contractor may handle the white paper for administrative purposes, but must indicate so when submitting on the website.

6.10.1 Format and size limitations

A white paper is an electronic file in PDF (portable document format) format, readable by IBM-compatible PCs. The individual file size must be no more than 5 MB. A white paper may consist of not more than five pages including a one page quad chart, with all pictures, figures, tables, and charts in a legible size.

6.10.2 White Paper Organization

The White Paper should contain the following information in the following order:

- Quad Chart
- Program Summary

6.10.2.1 Quad Chart:

One page. For instructions and sample of a Quad Chart, please go to Appendix D or to www.hsarpabaa.com.

6.10.2.2 Program Summary

Provide a concise description of the scientific, technical, engineering and management approach you propose to address. For TTA-1 (architectural studies), also briefly describe the various components of the architecture and proposed and relevant details about how they will function together. For TTA-2 (components or algorithms), briefly describe the function of the component or algorithm and its role in a new or existing system. For both TTA-1 and TTA-2, point out what is unique about your proposed solution.

For TTA-3, which is intended as a rapid prototype, briefly describe the following:

- Any existing scene understanding or battlefield awareness system(s) upon which the proposed solution is based, include customer identification
- The state of development or deployment of the system, include user identification
- The software architecture to be used, in particular whether it is DII/COE compliant
- The proposed system's major software segments and hardware

- The visual understanding techniques to be used
- The radar scene understanding techniques to be used
- The fusion techniques to be used
- The number of targets and sensors successfully handled in real time

For all TTA's briefly describe your team and what has been the extent of your team's past experience in working with or developing the technologies comprising your system or related technologies. Finally, provide a brief summary of the estimated costs and delivery time.

6.11 Proposal Guidance and Content

Following proposal registration, bidders may begin submitting proposals which must be submitted prior to the proposal deadline. Although white papers are strongly encouraged, bidders may submit a proposal without a preceding white paper.

Proposers can choose to alter their ideas, concepts, technical approaches, etc. or expand on their original ideas between submission of a white paper and submission of the full proposal. Discussion, suggestions, or advice between the Government and offerors on white paper topics is not binding. Proposers are free to submit a full proposal without regard to any feedback or advice about white papers that they may have received.

Note that proposals should not be written as complete specifications. Instead, they should provide a sufficient level of depth and detail for evaluation. Proposals consist of the following components.

6.11.1.1 Cover Page

Each volume will include a cover page which will be generated automatically from your online registration. If you are submitting a classified proposal, the cover page must be printed and attached to your submission.

6.11.2 Volume 1 For TTA-1 - Architecture Studies

Volume 1 for TTA-1 – Architectural Studies will be limited to 35 pages and should cover the following:

- Overview of the proposed architecture and significance to DHS missions
- Technical approach with emphasis on uniqueness of approach.
- Diagrams illustrating the components and relationships
- For each significant component, a functional description and choice of algorithm(s)
- Managerial approach
- A description of the members of the team and their relevant experience.
- Statement of work

- An estimate of the costs to produce a full architectural study that meets the deliverables specified in Section 4.4
- One page cost summary

A description of the tasks and schedule to produce a full architectural study that meets the deliverables specified in Section 4.4. The costs in Volume II should be to cover this described effort.

6.11.3 Volume 1 For TTA-2 - Components and Algorithms

Volume 1 for TTA-2 – Components and Algorithms will be limited to 35 pages and should cover the following:

- Overview of the proposed component or algorithm and significance to DHS missions
- Technical approach with emphasis on uniqueness of approach
- Functional and/or algorithm description
- Managerial approach
- A description of the members of the team and their relevant experience
- Statement of work
- An estimate of the costs to produce the component or algorithm
- An estimate of the effort to integrate the component or algorithm into new or existing systems
- One page cost summary

6.11.4 Volume 1 For TTA-3 Prototyping and Demonstration System – Hawkeye Testbed

Since the TTA-3 effort is to develop a rapid prototype and integrate it into an operational testbed system, the technical proposal requirements are more proscribed. Responsiveness to the order and content of sections listed in the Volume 1 TTA-3 description is important to assure thorough and fair evaluation of proposals. Table 2 summarizes the proposal outline and page counts. Nonconforming proposals may be rejected without review.

TTA-3 PROPOSAL OUTLINE				
Volume	Section	Description	Max Page Count	Sep-arable
I	i	Cover Sheet	1	
	ii	Letter of Transmittal	1	
	1	Executive Summary	1	X
	2	Technical Approach	15	
	3	Task Description Document	4	X
	4	Schedule	2	X
	5	Management	1	
	6	Key Personnel	1	
	7	Past Experience	3	
	8	Facilities	1	
	9	Government Furnished Resources	1	
	10	Deliverables	2	X
	A	Resumes	5	
	Total Volume I			38
II	I	Cover Sheet	1	
	1	Cost Response	n/a	

Table 2 - Proposal Outline

6.11.4.1 Official Transmittal Letter

Official transmittal letter with authorizing official signature. For an electronic submission, the letter can be scanned into the electronic proposal. The letter of transmittal shall state whether this proposal has been submitted to another government agency, other than HSARPA, and if so, which one and when.

6.11.4.2 Executive Summary

A one page synopsis of the entire proposal including costs. This page should include the proposal title and company name. This section should describe the overall concept and technical approach. In addition this section should provide a summary of the following:

- Any previous or existing system the proposed system is based upon
- The experience of that system in test and evaluation and in the field
- The technology and approach used for visual scene awareness
- The technology and approach used for radar anomaly detection
- The technology and approach used for multi-sensor fusion
- The technology approach used for alerting
- The software architecture to be used

This section shall be separable, i.e., it will begin on a new page and the following section shall begin on a new page. If an OTA (other transaction authority) is chosen at the time of negotiation, this section will be appended to the OTA.

6.11.4.3 Technical Approach

This section describes the proposed design and technical issues. This section should identify the critical technical issues in the design and concept. The discussion of the technical approach should include the following factors:

- Concept of Operations. Describe the overall concept of operations from sensor detection, through classification, sensor fusion, identification, assessment of risk or anomalous behavior, alerting and course of action recommendation.
- Overall architecture. Describe the major segments and hardware and software components, their functions and interfaces.
- Sensor scene understanding. Describe the scene understanding techniques to be used for radar and visual sensor systems. Describe the number and type of sensors that can be accommodated.
- Visual recognition. Describe the types of vessels and attributes the proposed visual recognition system can identify. Discuss the effectiveness and experience of the visual recognition systems in the marine environment with waves, whitecaps and vessel motion.
- Alerts. Describe how sensor alerts are generated and the information contained therein.
- User interface. Describe the proposed user interface. Discuss any standards to which it might adhere.
- Open Architecture. State whether and describe how your proposed system meets the open architecture requirements of section 2.4.
- Fusion. Describe the techniques used for multi-sensor data fusion. Discuss your experience with using this technique with similar systems.
- DII / COE interface. Describe how you will interface your system with the HAWKEYE software system (which is DII/COE compliant).
- Hardware. Describe the hardware proposed. Discuss the sizing required for full real-time operations. Discuss your calculations and the assumptions, including the number of radar, visual and AIS targets being tracked and fused simultaneously.

6.11.4.4 Task Description Document

The offeror shall prepare a Task Description Document (TDD) that describes in hierarchical fashion the work tasks required to accomplish the effort. The TDD shall be in a Work Breakdown Structure (WBS) format. Each task in the TDD shall describe the work to be carried out, end result of the task, the time allocated, the organization performing the task, the predecessor tasks, and the resources (labor, material and services) required. The resources shall be costed to provide a baseline budgeted cost for the task. In the case of software development, the estimated lines of code will be included. The TDD shall be at a level sufficient to define the nature of the work to be carried out, measure progress, and understand the relationship of the tasks to one another.

6.11.4.5 Schedule

The offeror shall develop an overall program schedule. By using resource loaded tasks, the Integrated Master Schedule (IMS) will become the budgeted cost of work scheduled (BCWS) baseline for the program. The costs will be broken out by top level WBS and month. The critical path, slack, and schedule reserves will be identified. The IMS shall be illustrated in a Gantt Chart format.

6.11.4.6 Management

The offeror shall describe, in contractor format, the roles and responsibilities of the contractor team, reporting structures and mechanisms, risk assessment and mitigation, cost and progress allocation and reporting, earned value monitoring, the baseline change process, progress monitoring and the corporate oversight.

6.11.4.7 Key Personnel

List, including contact information and title, the accountable corporate officer to whom the project will report. This section should also list and describe the roles and responsibilities of the key project personnel (not more than 5), including:

- Project Manager
- Chief Engineer
- Specialty Engineering

If the proposal is bid as a team, the teaming partners should be listed with their roles and rationale for selection. Resumes will be included in an appendix.

6.11.4.8 Past Experience

In this section, describe three contracts that the team has performed that are relevant to the proposed effort. For each, describe:

- Contract or effort name
- Customer and customer contact information
- Dates of performance
- What the company performed, what was delivered by the company, technical performance achieved and cost and schedule performance
- The overall contract value and its present status

6.11.4.9 Government Furnished Resources

Any government furnished resources including information, testing equipment, support equipment, etc., the offeror assumes will be available in order to carry out the planned work. Be specific, including a complete description, including location, applicable agency, services to be performed, information or facilities to be used. List the date on which such resources are required. Describe the impact if the resources may not be available or available on time. Be complete.

6.11.4.10 Deliverables

This section should list all deliverables the offeror proposes to provide the government, the schedule for delivery and acceptance criteria.

6.11.4.11 Resumes

Up to five resumes may be included, but must include the project manager and the chief engineer. Each resume should be no more than 3 pages long.

6.11.5 Volume II - Cost Proposal (All TTA's)

The Cost Proposal volume will include a cover sheet and cost response.

6.11.5.1 Cover Sheet

The cover sheet will be generated as part of the online registration.

6.11.5.2 Cost Response

The cost response should be in the offeror's format. There is no restriction on page count. Detailed Bases of Estimates are not required. Certified cost or pricing data are not required. However, in order for the government to determine the reasonableness, realism and completeness of the cost proposal, the following data must be provided for each team member and broken out for the base period and any additional periods of performance:

- **Labor:** Total labor includes direct labor and all indirect expenses associated with labor, to be used. Labor hours shall be allocated to each work outline element and segmented by team member. A labor summary by work outline is required. Provide a breakdown of labor and rates for each category of personnel to be used on this project.
- **Direct Materials:** Total direct material that will be acquired and/or consumed. Limit this information to only major items of material and how the estimated expense was derived. For this agreement, a major item exceeds \$25,000. Material costs shall be assigned to specific work outline elements.
- **Subcontracts:** Describe major efforts to be subcontracted, the source, estimated cost and the basis for this estimate. For this agreement a major effort exceeds \$250,000. Subcontract labor and material shall be accounted for per the two paragraphs above. A summary chart showing each major subcontractor labor and material effort by work outline is required.
- **Travel:** Total proposed travel expenditures. Limit this information to the number of trips, location, duration, and purpose of each trip.
- **Other Costs:** Any direct costs not included above. List the item, the estimated cost, and basis for the estimate.

Remember the cost proposal should tell the story of how and why you are planning to complete your proposed effort. Activities such as demonstrations required to reduce the various technical risks should be identified in the TDD and reflected in the cost proposal.

The offeror should provide a total estimated price for the major IR&D (independent research and development) activities associated with the program. The offeror should state whether each program is a dedicated IR&D or if it is being pursued to benefit other programs as well.

6.12 Contact Information for Questions Regarding this Solicitation

The applicable electronic address for all correspondence for this BAA is:
BAA04-05@dhs.gov

Program Manager:
Peter Miller
Homeland Security Advanced Research Projects Agency
Department of Homeland Security
Washington, D.C. 20528

Contracting Office Address:
Mickey Jones
Director of Procurement Operations
Administrative Services
Department of Homeland Security
Washington, D.C. 20528

7 EVALUATION CRITERIA AND SELECTION PROCESS

The evaluation criteria for each TTA is described below. For TTA-1 and TTA-2 it is intended to select multiple performers. Final funding decisions will be based on the evaluations, funds available, and other programmatic considerations.

7.1 White Papers

The evaluation of white papers under all TTAs will be accomplished through an independent technical review of each using the following criteria, which are listed in descending order of relative importance:

- Potential for satisfying the desired requirements including future fieldability in future real-world DHS-relevant testbeds;
- Sound technical and managerial approach to the proposed work;
- Capability to perform proposed work and history of performance of the team and team members in developing related technologies and systems.

7.2 Proposals

7.2.1 TTA 1 and 2 - Architecture and Components

The evaluation of proposals will be accomplished through an independent technical review of each using the following criteria, which are listed in descending order of relative importance:

- Potential for satisfying the desired requirements including future fieldability in future real-world DHS-relevant testbeds;
- Sound technical and managerial approach to the proposed work, including a demonstrated understanding of the critical technology issues and a strategy to address those issues including risk mitigation strategies;
- Capability to perform proposed work and history of performance of the team and team members in developing related technologies and systems; and
- Cost realism.

The final evaluation will be based upon an assessment of the overall best value to the government based upon these criteria.

7.2.2 TTA-3 - Hawkeye Prototype

The evaluation of proposals will be accomplished through an independent technical review of each using the following criteria:

7.2.2.1 *Technical*

- **Technical Maturity.** Is the offeror's solution based on an existing technically mature, but extensible and upgradeable, system? What is the level and type of risk in the offeror's proposed solutions?
- **Concept of Operations.** How well does the offeror's concept of operations match the Coast Guard's Sector Command Center mission and needs?
- **Overall architecture.** Does the offeror's overall system architecture provide the capability to be readily integrated with the Hawkeye testbed? Has the offeror used this architecture in the past in successful and relevant systems? Is the proposed system based on an existing working relevant capability?
- **Radar scene understanding.** Will the radar scene understanding techniques detect anomalies? Is there a training and learning mechanism? Are there techniques to insert scenario-based or rule-based understanding and assessment? What is the number and variety of the radar sensors supported? What is the offeror's tested experience with radar scene understanding in similar relevant systems? Is the proposed system based on an existing working relevant capability?
- **Visual recognition.** What are the proposed types of vessels and attributes the proposed visual recognition system can identify and the offeror's experience?. What is the offeror's experience for the visual recognition systems in the marine environment with waves, whitecaps and vessel motion? Is the proposed system based on an existing working relevant capability?

- Alerts. What is the discrimination and robustness or the alerting mechanism proposed? Can the alerting threshold be either manually or automatically varied according to load, threat condition or other input? What is the format and content of the alerts? Is the proposed system based on an existing working relevant capability?
- User interface. To what standards does the GUI (graphical user interface) adhere? Does the offeror have a GUI developed which can be integrated into the Hawkeye Testbed?
- Open Architecture. Does the architecture meet the standards of section 2.4.
- Fusion. How well will the multi-sensor fusion capability work? What is the technique and algorithms for achieving multi-sensor fusion? What experience does the offeror have with similar relevant fusion systems? Is the proposed system based on an existing working relevant capability?
- DII / COE interface. How will the offeror's system interface with the HAWKEYE software system (which is DII/COE compliant)?
- Hardware. Is the proposed hardware COTS? Is the hardware suite proposed sufficient for the size of the problem at hand? How credible are the loading and processing calculations, including CPU sizing, network bandwidths and storage and access? What is the number of radar, visual and AIS targets that can be tracked and fused simultaneously?

7.2.2.2 Management

- Task Planning and Organization. Does the Task Description Document (TDD) show a logical and complete work package to achieve the goals of the program? Do the tasks have appropriate resources? Are the tasks phased realistically? Are the estimated lines of code realistic and appropriate? Does the TDD give a level of detail and structure sufficient to measure progress and risk? Is the TDD complete, does it cover all the phases of work required to deliver a system?
- Schedule. Is the schedule based on the TDD? Is it linked in a form to assess schedule risk and progress? Is the schedule realistic? Does it include slack or contingency? Are which give a clear indication of progress clearly visible?
- Team Composition. Is the team well constructed to provide strength in critical technical areas? Are the responsible and accountable program manager and chief engineer clearly identified? What is the assessment for team communications and integration? What reporting mechanisms are proposed and are they likely to provide early warning of technical, schedule or cost issues?
- Resumes. What is the relevant experience of the key team members?

7.2.2.3 Prior Experience

What is the offeror's prior experience for similar undertakings? Is the proposed system based on a development or product in the offeror's recent experience? Based on inputs from customers of government program offices, what has been the offeror's performance on similar development activities?

7.2.2.4 Cost and Cost Realism

- The offeror's proposed costs will be adjusted for the cost of providing all proposed Government Furnished Equipment or Information.
- The offeror's proposed costs will be evaluated based on the level of effort proposed, the completeness of the cost elements, and evaluation of the bases of estimate. The estimated lines of code and cost per line of code will be evaluated. The government will then assign an evaluated cost range for the proposed effort.
- The cost range may then be extended based on the level of risk evaluated in the technical and management factors.

7.3 Review and Selection Process

Multiple awards are anticipated. Awards will be made based on the evaluation, funds availability, and other programmatic considerations. The Government reserves the right to fund none, some, parts, or all of the proposals received. Portions of resulting awards are likely to be segregated into optional tasks. It is the intention upon completion of proposal evaluation to notify bidders of an initiation of negotiation for awards or rejection of their proposal. In a limited number of cases, proposals will be put on hold pending the outcome of other negotiations and the availability of funds. HSARPA requests that those proposals put on hold remain valid for twelve months after the proposal closing date.

It is the policy of HSARPA to ensure an impartial, equitable, and comprehensive evaluation of all proposals and to select the source (or combination of sources) whose offer is most advantageous for the Government. In order to provide the desired evaluation, Government evaluators and employees and subcontractors of a support contractor will review and rate each submission. These personnel will have signed, and will be subject to, the terms and conditions of non-disclosure agreements. Bidders may request a government only review, notwithstanding a contractor may handle the white paper for administrative purposes, but must indicate so during the white paper and/or proposal registration.

7.4 Objections to Solicitation and Award

Any objections to the terms of this solicitation or to the conduct of receipt, evaluation or award of agreements must be presented in writing within ten calendar days of (1) the release of this solicitation or (2) the date the objector knows or should have known the basis for its objection. Objections should be provided in letter format, clearly stating that it is an objection to this solicitation or to the conduct of the evaluation or award of an agreement, and providing a clearly detailed factual statement of the basis for objection. Failure to comply with these directions is a basis for summary dismissal of the objection. Mail objections to the address listed in the Proposal delivery information

LIST OF ATTACHMENTS

Appendix A	List of Excluded Bidders
Appendix B	List of Acronyms
Appendix C	OTA Rules
Appendix D	Quad Chart Format

Appendix A

List of Excluded Bidders

This solicitation is a Broad Agency Announcement (BAA) considered to be full and open competition. Therefore any entity other than the following DoE National Laboratories:

- 1) Lawrence Livermore National Laboratory
- 2) Los Alamos National Laboratory
- 3) Oak Ridge National Laboratory
- 4) Pacific Northwest National Laboratory
- 5) Sandia National Laboratory
- 6) Brookhaven National Laboratory
- 7) Argonne National Laboratory
- 8) Idaho National Environmental and Engineering Laboratory
- 9) Remote Sensing Laboratory

may propose. The DoE National Laboratories listed above, termed DHS strategic partner laboratories, are prohibited because of their direct participation in DHS programs through the Office of Research and Development. These DHS strategic partner laboratories, are not permitted to propose as the lead or prime contractor under this solicitation, nor may they be included on any team except under the very limited circumstances of providing transition ready technologies as described in detail below. The nine DHS strategic partner laboratories are only permitted to participate in HSARPA BAA 04-05 under the very limited circumstances described in this in this Appendix. The principles which guide this participation are:

- Due to the potential for access to internal DHS data and the provision of stewardship funding, DHS strategic partner laboratories may not participate in HSARPA solicitations except under the very limited circumstances described below.
- DHS strategic partner laboratories may not propose directly to this solicitation or participate in any manner in the development of responses to this solicitation outside of the process here defined.
- DHS strategic partner laboratories may collaborate with HSARPA bidders by providing explicitly identified transition ready technologies subject to DoE and DHS approval. It is on the initiative of the providing laboratory to identify which technologies are transition ready.
- DHS strategic partner laboratories may collaborate with HSARPA bidders by providing explicitly identified and unique supporting capabilities subject to DoE and DHS approval. It is on the initiative of the providing laboratory to identify which supporting capabilities are available to HSARPA bidders.
- HSARPA will neither encourage nor discourage bidders from incorporating DHS strategic partner laboratory technologies. This inclusion of these technologies is

at the sole discretion of bidders in their evaluation of best value and best technical response to the government under this solicitation.

- All collaborations between HSARPA performers and DHS strategic partner laboratories are subject to any additional restrictions imposed by either the collaborating laboratory or the DoE.
- Laboratories other than those identified as DHS strategic partners may participate directly in this solicitation, similar to any other FFRDC, subject to any restrictions imposed by the policies of the individual laboratory and the DoE.

The process for DHS strategic partner participation in this HSARPA solicitation is defined below:

- 1) The nine DHS strategic partner laboratories, at their initiative, will propose a list of transition ready technologies or unique supporting capabilities. This list is subject to the approval of DHS (ORD & HSARPA). Once approved, this list is published at www.hsarpabaa.com with supporting technical documentation.
- 2) Bidders may request the addition of technologies not listed as part of this BAA. This request must be submitted to HSARPA and is subject to the approvals identified in 1).
- 3) Bidders may NOT directly contact the DHS strategic partner laboratories with regard to this solicitation. Bids which include DHS strategic partner laboratory participation outside of this process will be rejected without review.
- 4) For the purposes of the white paper submission, bidders may identify as part of their technical solution any of the listed transition ready technologies or unique supporting technologies without laboratory, DHS or DoE consultation or approval. This consultation and approval will be required prior to submission of a full proposal.
- 5) Bidders may request from HSARPA a technical POC for any of the listed technologies. Based upon the number of inquiries and other factors, individual DHS strategic partner laboratories may elect not to provide additional technical data beyond the public technical disclosures at the white paper stage.
- 6) White papers will be evaluated assuming the requested technologies will be made available to the proposer.
- 7) White papers bidders which are encouraged to submit a full proposal which include DHS strategic partner participation will be provided a DHS strategic partner laboratory POC for the identified technologies.
- 8) Bidders who wish to submit a full proposal without an encouraged white paper may directly request, and will be provided a DHS strategic partner laboratory POC for the identified technologies from HSARPA.

- 9) HSARPA will provide a single DHS strategic partner laboratory POC for each laboratory to all requestors. This POC is responsible to ensure that technical discussion with the bidders are limited to the technologies and capabilities listed and must explicitly ensure that no discussions involve any internal DHS data provided to the lab.
- 10) Prior to submission of a full proposal, bidders must negotiate a statement of work including costs with the appropriate lab partner which must be submitted as part of the full proposal. This negotiation is subject to all normal laboratory and DoE policies with regard to collaboration and technology transition.
- 11) Selected proposals which include DHS strategic partner laboratory participation are subject to final approval of either the SSA or the HSARPA Director with regards to the level of effort and scope of the DHS strategic partner's participation.
- 12) Selected proposals may be subject to final negotiation of any technology transfer or collaborative agreements needed to implement the proposed work.

Appendix B

List of Acronyms

AIS	Automatic Identification System
API	Application Programming Interface
ASU	Automated Scene Understanding
BAA	Broad Agency Announcement
BCWS	Budget Cost of Work Scheduled
Blue Forces	Friendly forces to include DHS & law enforcement units
CCTV	Closed Circuit Television
CONOPS	Concept of Operations
COTS	Commercial Off The Shelf
DHS	Department of Homeland Security
DII/COE	Defense Information Infrastructure/Common Operating Environment
DoD	Department of Defense
DOE	Department of Energy
EDT	Eastern Daylight Time
FAR	Federal Acquisition Regulations
FedBizOpps	Federal Business Opportunities (www.FedBizOpps.gov)
FFRDC	Federally Funded Research and Development Centers
G&A	General and Administrative
GIS	Geographical Information System
GUI	Graphical User Interface
HBCU	Historically Black Colleges and Universities
HSARPA	Homeland Security Advanced Research Projects Agency
HUB	Historically Underutilized Business
ICE	Immigration and Customs Enforcement
IMS	Integrated Master Schedule
IR	Infrared
IR&D	Independent Research and Development
MARSEC	Marine Security Level
MDA	Maritime Domain Awareness
MI	Minority Institutions
NISPOM	National Industrial Security Program Operating Manual
OTA	Other Transaction Authority
PDF	Portable Document Format
PIP	Proposer Information Pamphlet
PZT	Pan, Zoom and Tilt
R&D	Research and Development
S&T	Science and Technology
SCC	Sector Command Center
SDB	Small Disadvantaged Business
SOW	Statement of Work
TTA	Technical Topic Area
TDD	Task Description Document
USC	United States Code
USCG	United States Coast Guard
WB	Women-owned Business
WBS	Work Breakdown Structure
XML	Extensible Markup Language

Section 831(a)(2) of the Homeland Security Act of 2002 (Public Law 107-296) gives the Department of Homeland Security (DHS) the same “Other Transactions for Prototypes” authority exercised by the Department of Defense (DoD) under 10 U.S.C. §2371 note. Section 831(a)(2) also imposes the same criteria for award of an “Other Transactions for Prototypes” agreement on DHS as was given to DoD.

In summary, these criteria require that:

- 1) there must be either at least one nontraditional government contractor participating to a significant extent in the prototype project; or,
- 2) if there is no nontraditional government contractor participating to a significant extent, at least one of the following circumstances exists:
 - a. at least one third of the total cost of the prototype project is to be paid with funds provided by parties to the transaction other than the Federal Government; or,
 - b. the senior procurement executive determines that exceptional circumstances justify the use of a transaction that provides for innovative business arrangements or structures that would not be feasible or appropriate under a contract.

In this context, a “nontraditional contractor” is defined as:

- 1) an entity that has not, for a period of at least one year prior to the date that a transaction (other than a contract, grant, or cooperative agreement) for a prototype project under the authority of this section is entered into, entered into or performed with respect to –
 - i) any contract that is subject to full coverage under the cost accounting standards prescribed pursuant to section 26 of the Office of Federal Procurement Policy Act (41 U.S.C. 422) and the regulations implementing such section; or
 - ii) any other contract in excess of \$500,000 to carry out prototype projects or to perform basic, applied, or advanced research projects for a Federal agency, that is subject to the Federal Acquisition Regulation.

The Government has discretion in determining the level of “significant extent.” Some factors may include:

- 1) criticality of the technology being contributed
- 2) role of the non-traditional government contractor(s) in the design process
- 3) value of the effort being proposed

Contributions for items such as IR&D reimbursement, G&A (general and administrative), cost of money, and fee identified separately will meet the statutory cost-share requirement and are preferred to in-kind contributions. It is not the Government's intention to encourage or require use of the cost share criteria. The Government prefers that the teams attempt to locate appropriate non-traditional team members before offering cost share. If the team cannot or chooses not to find nontraditional team members or provide cost share, the team may request a waiver of these requirements. The team should describe the innovative business arrangements or structures that would justify the exercise of such a waiver. The Government will consider all waiver requests but reserves the right to grant any, all or none of the requests at its discretion.

Appendix D

Quad Chart Format

This template will be available in Microsoft PowerPoint Format at www.hsarpabaa.com.

**Quad Chart
– Format**

BAA Number: *(Number of the BAA Announcement)*
TTA: *(insert TTA Number)* **Part:** *(Insert Part Number)*
Title: *(Brief/short Title to describe offeror's proposed effort)*

Offeror Name
Date

Photograph or artist's concept

Provide a simple but sufficiently detailed graphic that will convey the main idea of the final capability/use of the prototype, and its technological methodology. It should further give an idea of the size and weight of the end item.

Operational Capability:

Provide information on how the system or system component would meet the goals listed in Section 3:

- 1) Performance Targets
- 2) Cost of Ownership
- 3) System Characteristics

Proposed Technical Approach:

Specifically, how will the problem be approached.
Describe tasks to be performed.
Describe any actions done to date.
Describe any related on-going effort by the offeror.
Describe the technology involved and how it will be used to solve the problem.
Describe the key technical challenges.

Cost and Schedule:

Provide any milestone decision points that will be required. Describe period of performance and total costs. Include the Phase I cost and length, and estimates of cost and lengths of subsequent phases.

Deliverables:

Include all hardware and the following data deliverables: monthly status report, final report, test plans, test reports, specifications, computer program end items, user's manual, drawings, transition plan, etc.

Corporate Information:

You must include Offeror Name, POC full name, address, phone numbers and email.