Broad Agency Announcement

Modeling Adversarial Activity (MAA)

DARPA-BAA-16-61

September 30, 2016

Defense Advanced Research Projects Agency
Information Innovation Office
675 North Randolph Street
Arlington, VA 22203-2114

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PART I: OVERVIEW INFORMATION

- **Federal Agency Name:** Defense Advanced Research Projects Agency (DARPA), Information Innovation Office (I2O)

- **Funding Opportunity Title:** Modeling Adversarial Activity (MAA)

- **Announcement Type:** Initial Announcement

- **Funding Opportunity Number:** DARPA-BAA-16-61

- **Catalog of Federal Domestic Assistance Numbers (CFDA):** 12.910 Research and Technology Development

- **Dates**
  - Posting Date: September 30, 2016
  - Proposers Day: September 27, 2016
  - Abstract Due Date: October 28, 2016, 12:00 noon (ET)
  - Proposal Due Date: December 15, 2016, 12:00 noon (ET)
  - BAA Closing Date: December 15, 2016, 12:00 noon (ET)

- **Anticipated Individual Awards:** Multiple awards are anticipated.

- **Types of Instruments that May be Awarded:** Procurement contracts, Cooperative Agreements, or Other Transactions (OTs). No grants will be awarded under this solicitation.

- **Agency Contacts**

  - **Technical POC**: Carey Schwartz, Program Manager, DARPA/I2O

  - **BAA Email**: MAA@darpa.mil

  - **BAA Mailing Address**:
    DARPA/I2O
    ATTN: DARPA-BAA-16-61
    675 North Randolph Street
    Arlington, VA 22203-2114

  - **I2O Solicitation Website:** http://www.darpa.mil/work-with-us/opportunities

PART II: FULL TEXT OF ANNOUNCEMENT

I.   Funding Opportunity Description

DARPA is soliciting innovative research proposals in the area of modeling adversarial activity for the purpose of producing high-confidence indications and warnings of efforts to acquire, fabricate, proliferate, and/or deploy weapons of mass terrorism (WMT). This solicitation is focused upon the development of mathematical and computational methods that integrate multiple data sources to detect relevant activities and events with high probability of detection and low rates of false alarms. Proposed research should investigate innovative approaches that enable revolutionary advances in science and technology. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of the art.

This Broad Agency Announcement (BAA) is being issued, and any resultant selection will be made, using procedures under Federal Acquisition Regulation (FAR) 35.016. Any negotiations and/or FAR based contract awards will use procedures under FAR 15.4 (or 32 CFR 22 for cooperative agreements). Proposals received as a result of this BAA shall be evaluated in accordance with evaluation criteria specified herein through a scientific review process.

DARPA BAAs are posted on the Federal Business Opportunities (FBO) website (https://www.fbo.gov/) and the Grants.gov website (http://www.grants.gov/).

The following information is for those wishing to respond to this BAA.

Introduction/Background

The goal of the Modeling Adversarial Activity (MAA) program is to develop mathematical and computational techniques for modeling adversarial activity for the purpose of producing high-confidence indications and warnings of efforts to acquire, fabricate, proliferate, and/or deploy WMTs. The program is structured in two phases, each with its own BAA. This BAA is for MAA Phase 1. Upon the successful completion of MAA Phase 1, DARPA plans to release a BAA for MAA Phase 2. MAA Phase 2 will focus on continued development of Phase 1 methods and integration of methods into a proof-of-concept prototype system.

Relying solely on synthetic data, MAA Phase 1 is focused on developing the mathematical and computational methods to enable large-scale graph analytics including graph alignment and merging, sub-graph detection, and sub-graph matching. The methods must operate in noisy, complex, and time-dependent environments. Synthetic data sets will be created for the program to support the development of tools that can perform on real world data that is uncertain, incomplete, imprecise, and contradictory. The program will pursue a variety of approaches to the challenges of graph alignment and merging, sub-graph detection and sub-graph matching. The methods developed in MAA Phase 1 will be the foundation of the MAA Phase 2 system.

The MAA program requires realistic data to drive technology development. However, out of respect to the issues of privacy and classification, the MAA program will not use real-world data and MAA performers will, at no time, have access to or use real-world data.

Program Description

The goal of the MAA program is to develop mathematical and computational techniques for the integration and analysis of multiple sources of transaction data including graph alignment and merging, sub-graph detection, and sub-graph matching for the purpose of modeling and detecting adversarial activity. Currently, transaction data is used as a means to validate leads developed from traditional sources such as Signals Intelligence (SIGINT). MAA assumes that an adversary's WMT activities will result in observable transactions. MAA will develop techniques to generate alerts directly from diverse synthetic transaction data for the purpose of producing high confidence indications and warnings of efforts to acquire, fabricate, proliferate, and/or deploy WMTs.

MAA's technical approach involves the integration of multiple channels of synthetic transaction data in order to detect activity of interest. While the probability that any one of these channels will reveal that a WMT threat is low, taken together the probability of detecting a WMT threat will be increased. MAA will create synthetic transaction data sets of sufficient realism to drive the development of techniques that can perform on real world data. A number of problems share the underlying structure of the WMT activity detection problem in that (1) adversary activities can be represented as a series of actions that must be completed in sequence for the adversary to achieve success, i.e. as a pathway; and (2) many of the actions in the pathway result in observable transactions and the observations themselves may lead to either structured or unstructured data. MAA may draw on related domains, including human trafficking, smuggling of drugs, antiquities or rare wildlife species, and illegal arms dealing, during the creation of synthetic data sets to meet the need for a large amount and diverse types of synthetic data..

In order to detect WMT pathways, MAA performers may need to create (1) a unified transaction-oriented synthetic worldview of entities and actions; and (2) pathway models for WMT activities of interest. When a sequence of actions within the synthetic worldview closely matches a modelled pathway, MAA techniques should generate a lead for follow-up analysis. As noted previously, there are actions in a WMT pathway that will result in observable transactions. Examples of actions of particular interest include purchasing of pathway-related items, shipment of these items to a common location, etc. Detecting a particular pathway will require that these synthetic sources be integrated in a unified synthetic worldview. Creating such a unified synthetic transaction-oriented worldview of entities and actions will require significant advances in graph analysis methods for graph alignment and merging.

A unified transaction-oriented worldview of entities and actions enables the search for pathways using pathway templates that describe methods for acquiring, fabricating, proliferating, and/or deploying WMTs. A pathway template could be a complete cycle for WMT acquisition or a segment of the acquisition. A pathway template provides a mechanism for determining the relevancy of available data. Finding graph structures within the unified worldview that exhibit sufficiently high similarity to WMT pathway templates will require significant advances in graph analysis methods for sub-graph detection and sub-graph matching.

Program Structure

The MAA program is structured as two 24-month phases, each with separate BAAs. This BAA is for MAA Phase 1. Upon the successful completion of MAA Phase 1 (i.e., assuming adequate technical progress in Phase 1), TA1, TA2, and TA3 performers would have an option exercised

allowing them to continue to Phase 2. Proposals to this Phase 1 BAA should include both a 24-month MAA Phase 1 base effort and a 24-month option for work under MAA Phase 2 - this will preclude the need to negotiate new contracts with successful Phase 1 performers. DARPA plans to release a BAA for MAA Phase 2 to add TA4 (the integration of methods into a proof-of-concept prototype system) and TA5 (the evaluation of the prototype system).

The MAA Phase 1 effort is structured in three TAs as depicted in Figure 1, and is described in detail below.
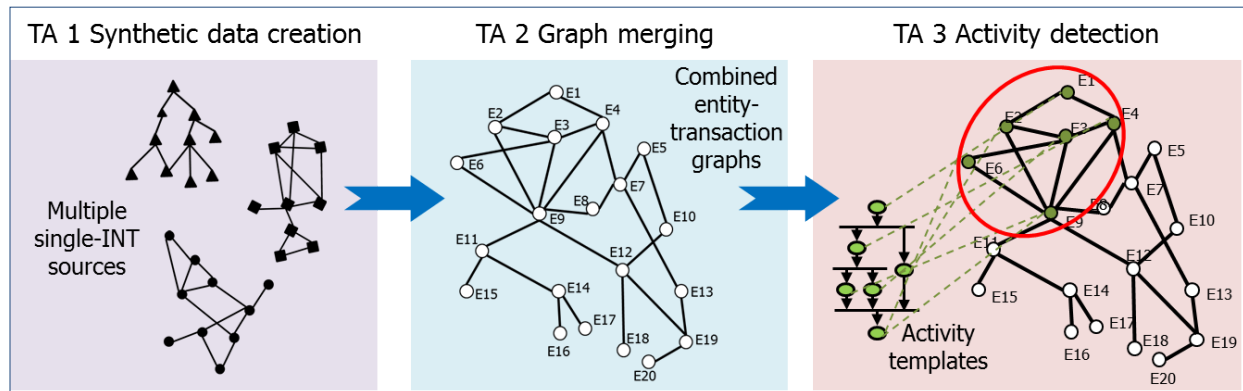
Figure 1: Program Technical Areas

- TA1 Synthetic data creation: Develop methods for creating synthetic data representative of general background transactions and of activities of interest, and methods to embed the activity-related data into the background.

- TA2 Graph merging: Develop techniques for merging synthetic data from a variety of sources to create a unified transaction-oriented synthetic worldview of entities and actions in the form of a single aligned graph.

- TA3 Activity detection: Develop techniques for detecting activities of interest modelled using activity templates in a unified synthetic worldview graph.

The Government will provide pathways/templates for adversary activity. These pathways/templates will be generic representations of classes of data and will not include any actual data collected from actual sources. Proposers, particularly those proposing against TA1, should describe how they anticipate interacting with Government subject matter experts supporting the program. All proposals should include any assumptions being made about available resources such as models, templates, and knowledge bases.

Proposers should note the following restrictions:

- A TA1 performer cannot also be a performer on TA2 nor on TA3, and conversely, performers on TA2 and TA3 cannot also be a performer on TA1.

- TA2 and TA3 proposers may choose to submit proposals for either TA2, TA3, or both. If the proposal contains responses to multiple technical areas, the page limit for the technical section is increased in accordance with Section IV.B.2.a.

There is an interest in techniques that will enable decision aids for a human in the loop and that are well-suited to evolve into an autonomous system to achieve high-quality indications and

warnings associated with WMT entities, activities, and events. Proposals with research focused on the development of new sensors, methods for low-level processing including those that seek to improve the identification of objects or tracks, automated vision processing, generic optimization methods, linear and non-linear control, or the generation of knowledge bases and ontologies will be deemed non-responsive.

Technical Areas

Technical Area 1 – Synthetic Data Creation

TA1 performers will create the means to generate synthetic transaction data sets that provide a realistic surrogate for real-world transaction data. The synthetic data sets will include transactions arising from activities consistent with existing models for WMT development or other transaction-oriented domain within a vast background of benign transaction data that is similar to real-world transaction data. Provision will also be made to insert synthetic transactions arising from activities associated with evolving and novel WMT development pathways. The synthetic data sets will be based upon the observed characteristics of transaction data. The synthetic data sets created will contain no personally identifiable information nor carry any restrictions with respect to classification. All data sets must be fully releasable to the scientific community.

These synthetic data sets will be provided to the TA2 and TA3 performers to drive their research and development. The synthetic data generated by the techniques and tools developed under TA1 will be processed by TA2 performers in the form of graphs in which the nodes represent entities and the edges relationships between the entities. TA1 performers will work closely with the Government to ensure synthetic data sets are of sufficient realism.

The synthetic data sets generated will contain two components: realistic background activity and observations associated with adversary activities of interest.

- Synthetic background activities and associated transactions will be constructed in a manner that is realistic and does not simplify the activity detection problem. For example, benign background activities might include synthetic routine international fund transfers by individuals and organizations.

- Activity models and associated WMT activity-related transaction data will be constructed based on subject matter expert input. This synthetic "signal" data of pathway-related transactions will be embedded within the totality of synthetic benign "clutter" transaction data.

Metrics for the signal-to-clutter ratio of the synthetic data sets will be developed to characterize the difficulty of the activity detection problem. The metrics should include a characterization of uncertainty, incompleteness, and imprecision in the data that enables and supports control of these quantities and eventually the understanding of the impact of these effects on downstream processing.

Technical challenges for TA1 include:
   a) Scalability: Large data sets will be required to adequately test algorithms, and so techniques for generating synthetic data must be scalable. By the end of MAA Phase 1

(year 2), data sets should strive to be capable of generating background graphs with 1 million nodes and 1 billion connections; and by end of Phase 2 (year 4), 10 billion nodes and 1 trillion connections. Proposers must describe scalable techniques for generating large volumes of synthetic background data, i.e. all benign transactions of a various types.

b) Embedding: Proposers must provide a complete description of how they will embed the activities of interest into the background in a manner that does not draw attention to the embedded activities of interest.

c) Realism: Both the background data and data arising from modeled WMT activities of interest must provide suitable surrogates for real-world data. Proposers must describe how they will generate realistic synthetic backgrounds in which the activities of interest could be embedded. The Government will provide activity/pathway models. Proposers must describe how they will use these models to generate observable synthetic transaction data.

d) Temporal characteristics: Temporal aspects of the synthetic data must be handled realistically. This includes not only aspects related to when data is generated (i.e., when event/actions occur) but also latencies associated with the collection, transmission, centralization, ingest, and processing of data.

e) Assessment: Proposers should describe metrics for assessing the fidelity between synthetic data modeling the background activities and real world background activities, as well as metrics that describe the quality of the embedding of activity data into the background, such as signal to clutter for a graph. Linkage of synthetic transaction data to underlying actions for both background data and WMT pathway-related data must be readily available in order that it is straightforward to compare simulated WMT activities detected by MAA algorithms with the synthetic "ground truth".

f) Data structure: Proposers will need to create efficient graphical/relational data structures for multi-channel transaction data and associated entities, actions, and activities. In particular, proposers should describe their approach for representing (raw) data in the form of a graph or set of resource description framework (RDF) triples that can be represented as a graph for hand-off to TA2 and TA3 performers.

TA1 proposers must describe a plan and budget for interactions with TA2 and TA3 performers to improve the realism of the synthetic data.

(Please note that TA1 performers will be working closely with TA2 and TA3 performers regarding initial data format design.)

Technical Area 2 – Graph Merging

The objective of TA2 is to develop techniques that merge the synthetic raw data produced by various sources into one integrated graph that we have termed an (activity) worldview. The synthetic raw data is assumed to be in the form of a graph or set of resource description framework (RDF) triples that can be represented as a graph. Each input graph represents a filtered view of the entities, activities, and events associated with an underlying process in a time varying background. These individual graphs will often contain multiple errors including mislabeled and missing nodes (entities) and edges (associations) or fallacious nodes and edges.

Taking the individual graphs as input, the desired output is a single merged graph (or the adjacency matrix associated with the graph) that aligns as correctly as possible the nodes and edges of the individual graphs in an integrated synthetic worldview of all of the available data that enables a comprehensive analysis of underlying activity process(es) and the background.

TA2 proposers should put forward scalable algorithms and software for automated alignment of graph data sets produced from a variety of synthetic sources, some with temporal aspects, into an integrated worldview. Proposers must show how their methods address uncertain, incomplete, imprecise, and contradiction in the data. As misalignment of data is suspected of being a major contributor to increases in the false alarm rate for detecting entities, activities, and events associated with WMT, proposed approaches must lead to high probability of detection and low probability of false alarm while allowing for controlling the effect of alignment errors on downstream processing.

Of particular interest to the MAA program are methods that predominantly rely on the structure of the input graphs themselves, and not the semantic node/edge labeling of the graphs. Methods that exploit the semantic labeling or template for a given process in conjunction with structural, topological, or geometric techniques will also be considered. In exploiting the physical structure of the graphs themselves, the Government anticipates proposals that employ graph matching, sub-graph-detection, graph isomorphism, geometric or topological alignment, as well as segmentation and community/clique detection based methods. The Government further anticipates that effective strategies will employ a coarse to fine (multiresolution) strategy to minimize computational resources and time, as well as controlling accuracy of the alignment. DARPA strongly discourages alignment methods that solely focus on exploiting the label associated with a set of edges or nodes in the graph, nor is the Government interested in pursuing methods to address so-called (named) entity resolution.

TA2 proposals should describe methods that would allow an automated system to align graphs input from at least three different sources, with a typical graph consisting initially (year 1) of up to 1000 nodes and then (year 2) scaling to accommodate large graphs as described in TA1. The Government will supply TA2 performers with TA1 synthetic data in the form of graphs and meta-data, as well as partial semantic labeling. It is planned that initially (year 1) input data will be error-free, but that as the program progresses (year 2) errors in input data (missing nodes/edges that should be present, containing extraneous nodes/edges that should not be present, or mislabeled) will be introduced to increase the realism of the data. The Government's plan is to examine alignment performance across input data error rates that range from 5% to 25%.

Proposers should be aware that the templates and models will lead to synthetic data for which the underlying graph representation is sparse and may appear to be random. It is well known that large sparse matrices have large condition number and many algorithms, such as community or clique detection using spectral methods, will be numerically unstable. Proposers are encouraged to develop methods that are numerically stable, or demonstrate that their proposed methodologies will lead to stable numerical results when the underlying adjacency matrices have large condition numbers.

TA2 proposers must analyze the scaling properties of their algorithms, and define metrics by which their algorithms can be evaluated. This could include, for example, estimating the numerical stability of the underlying method and techniques for identifying nodes/edges that are

potentially mislabeled, missing, unidentified, or extraneous. Proposers should define additional metrics and provide a rationale for these metrics.

TA2 performers will work only with program supplied data provided by the Government and TA1 performers. TA2 proposers must describe a plan and budget for interactions with TA1 and TA3 performers.

Technical Area 3 – Activity Detection

MAA seeks to develop the ability to detect evidence of WMT activities by developing advanced pattern matching capabilities. TA3 performers will develop mathematical and computational techniques for sub-graph detection and sub-graph matching in order to find activities of interest within the merged synthetic worldview graph created from synthetic data in TA 2. The algorithms developed under TA3 must scale to very large worldview graphs and must also be numerically stable and robust to errors in the worldview graph. It is anticipated that the adjacency matrix of a typical worldview graph will have a large condition number and so it is desirable that algorithms provide robust answers with ill-conditioned data or that methods are developed to precondition graph data leading to numerically stable results.

TA3 proposers must provide a technical approach to identify graph structures in the synthetic worldview graph produced in TA2 that strongly resemble activity templates based on pathway models, and if they occur, determine if they occur in a specific temporal sequence or are merely present. TA3 performers will be provided with synthetic worldview graphs in vertex-edge format or as an equivalent adjacency matrix. If a TA3 proposer prefers another data structure for the worldview graph, it is incumbent upon the proposer to define and describe the desired format in their proposal.

TA3 proposers must explain how their approaches will provide robustness to errors in the synthetic worldview graph that may impact the detection of WMT activity template sub-graphs. It is also desirable that TA3 proposers provide a strategy and capability for identifying nodes/edges that might be incorrectly labeled, extraneous, or missing.

As noted earlier, the Government anticipates increasing the size of the synthetic worldview graph and increasing the complexity of identifying the pathway activities of interest over the course of the program. To deal with these challenges TA3 proposers should describe how they will extend or apply various forms of pattern matching, including but not limited to plan/activity/goal recognition, graph cycle detection, subgraph detection, graph isomorphism, community/clique detection, and graph visualization.

TA3 proposers must define metrics by which their algorithms can be evaluated. TA3 proposers must provide a rationale for these metrics with regard to evaluation of performance at both the algorithmic level and in terms of the overall program goals of high probability of detection and low false alarm rate. Metrics are also desired to quantify robustness of sub-graph detection techniques to errors including missing node/edge, mislabeled node/edge, extraneous node/edge, etc.

TA3 performers will work only with program supplied data provided by the Government and TA1 and TA2 performers. TA3 proposers must describe a plan and budget for interactions with TA1 and TA2 performers.

Schedule/Milestones

The MAA program is being structured in two 24-month phases. The initial phase of MAA will last 24 months and will establish the feasibility of the detection strategy, synthetic data, and necessary tools. The subsequent 24-month phase, the subject of a possible combination of exercised option and a second BAA, will address expansion of the baseline capabilities, provide a new set of tools to reason about the results of the analysis; integrate, test, and validate a system.
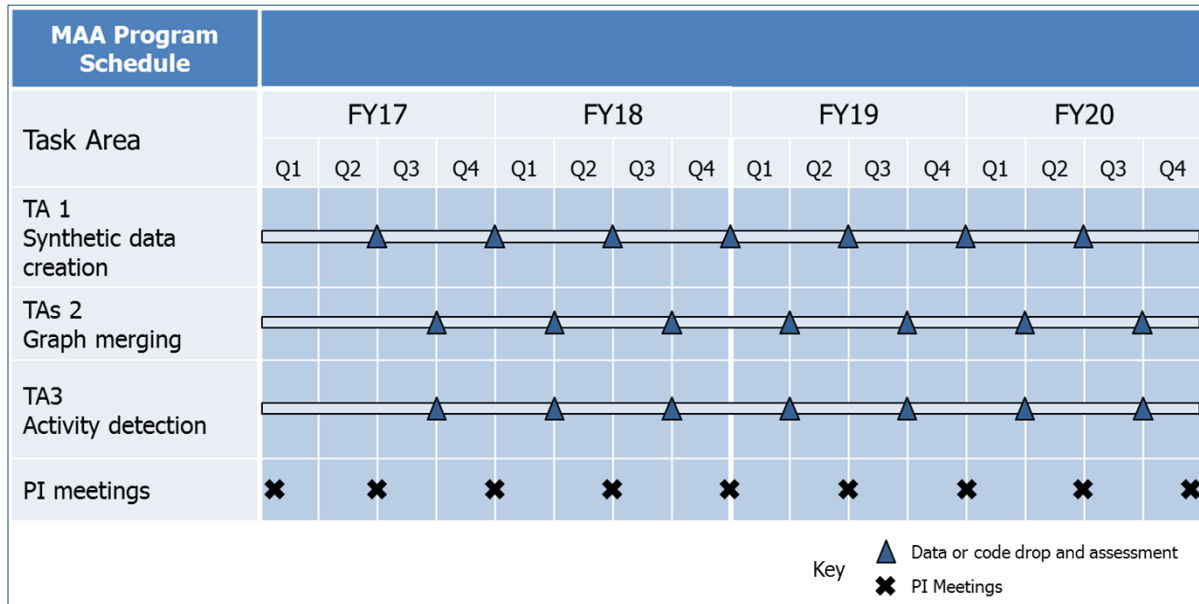
Figure 2: MAA Schedule
(Please note that the above schedule is tentative, and will be revised by amendment at a future date.)

Synthetic data sets are to be delivered every six months, with the first delivery occurring six months after the program starts. Evaluations of algorithms developed under Phase 1 will take place as indicated in the MAA schedule, at 9 and 15 months after program initiation, and then every six months following using both synthetic and potentially real world data.

PI meetings are scheduled for every six months, beginning with the program start. Site visits, demos and additional travel will take place as needed.

Deliverables

The following table summarizes the deliverables expected of performers in each TA, with additional details provided below.

Technical Area	Techniques	Data
1	i) Techniques for generating synthetic transaction data for background activity ii) Techniques for generating synthetic transaction data for WMT activities iii) Techniques for embedding synthetic WMT activity-related transactions in the background activity iv) Metrics for the embedding of synthetic activity data into the background such as signal-to-clutter ratio	i) Synthetic background activity and transaction data for background activity ii) Synthetic WMT activities and transaction data for WMT activities iii) Synthetic graphs for background and WMT activity data
2	i) Techniques for automated alignment of graphs ii) Techniques for preconditioning / conditioning graphs that may not be well-conditioned iii) Analysis of the scaling properties of graph alignment algorithms iv) Metrics for the quality of merged graphs produced by graph alignment techniques	i) Merged transaction graph, i.e., the synthetic worldview graph ii) Analysis of merged graph quality including accuracy iii) Measure of the expected accuracy of the merged graph
3	i) Techniques that detect sub-graph structures in a larger graph ii) Analysis of the scaling and robustness of properties of sub-graph detection techniques iii) Metrics for the accuracy of sub-graph detection techniques including probability of detection and false alarm rates	i) Detected synthetic WMT pathways ii) Probabilities of detection and false alarm rate for a specific WMT activity template when provided with synthetic ground truth iii) Measure of the level of confidence in detection results

TA1 performers will deliver synthetic data sets as shown on the MAA schedule. Synthetic data sets are understood to include background activities, activities of interest, a merged graph that establishes and plays the role of ground truth, filtered versions of the merged graph that have been separated into individual data types, and a report on current performance as measured by the agreed upon metrics.

TA2 and TA3 performers will deliver algorithms prior to evaluations as shown on the MAA schedule. An algorithm delivery will include: (1) a complete description of the algorithm

sufficient to enable a qualified third party to independently implement the algorithm; (2) source code implementing the algorithm in a higher order language such as C, C++, or MATLAB; (3) the executable version of the algorithm as well as a complete description of the target hardware for the executable documentation associated with the code; (4) test data used for evaluation of code; (5) results obtained from the code when using the test data is input; (6) performance results of testing associated with community-wide metrics and any performer-specific metrics; (7) any custom data sets developed for background or activities of interest; and (8) any custom activity templates developed. The software that instantiates the algorithms developed by the performers must be delivered to the Government in a format that supports independent testing. There is no required coding language specified for this program.

In addition to scheduled algorithm deliveries, TA1, TA2 and TA3 performers are expected to submit required monthly reports on financial and technical matters, and to attend all meetings and phone calls as directed by the contracting agent. There will be a two-day kick-off meeting held as soon as all performers are under contract. The location will most likely be the Washington DC area. In addition, Principal Investigator meetings held every six months with locations to be determined based on the performer community and available Government partner facilities. For budgeting purposes, performers should budget in accordance with meetings alternating between the east and west coasts of the United States. Attendance is expected at all meetings. Regular phone calls will be set up to track performance. Site visits and other meetings will take place as needed.

Government-furnished Property/Equipment/Information

The Government will supply performers (TA1, TA2, and TA3) with templates for activities of interest in the form of reports, as well as sample, synthetic data schemas in the early months of the program. The Government will also provide feedback on the performance to performers during evaluations.

Intellectual Property

The MAA program will emphasize creating and leveraging open source technology and architecture. Intellectual property rights asserted by proposers are strongly encouraged to be aligned with open source regimes.

A key goal of the program is to establish an open, standards-based, multi-source, plug-and-play architecture that allows for interoperability and integration. This includes the ability to easily add, remove, substitute, and modify software and hardware components. This will facilitate rapid innovation by providing a base for future users or developers of program technologies and deliverables. Therefore, it is desired that all noncommercial software (including source code), software documentation, hardware designs and documentation, and technical data generated by the program be provided as deliverables to the Government, with a minimum of Government Purpose Rights (GPR), as lesser rights may adversely impact the lifecycle costs of affected items, components, or processes. See Section VI.B.1 for more details on intellectual property.

For synthetic data sets, in order to facilitate reuse, there is interest in being able to provide these data sets to other Government partners and research efforts. Therefore, it is desired that all data sets generated by the program be provided as deliverables to the Government, with a minimum of Government Purpose Rights (GPR).

Security Clearance Requirements

As this program will not use any real-world data or reveal specific methods or modes of data collection used by Government agencies, there is no requirement for security clearance associated with this program.

Potential Conflicts of Interest

As stated above, TA1 performers are not allowed to propose against TA2 and TA3. TA2 proposers may also propose to TA3, and TA3 proposers may also propose to TA2. DARPA reserves the right to select only part of the work proposed based on DARPA's needs. See Section III.D for more information.

II. Award Information

A. Awards

Multiple awards are anticipated. The level of funding for individual awards made under this solicitation has not been predetermined and will depend on the quality of the proposals received and the availability of funds. Awards will be made to proposers whose proposals are determined to be the most advantageous and provide the best value to the Government, all factors considered, including the potential contributions of the proposed work, overall funding strategy, and availability of funding. See Section V for further information.

The Government reserves the right to:
- select for negotiation all, some, one, or none of the proposals received in response to this solicitation;
- make awards without discussions with proposers;
- conduct discussions with proposers if it is later determined to be necessary;
- segregate portions of resulting awards into pre-priced options;
- accept proposals in their entirety or to select only portions of proposals for award;
- fund proposals in increments and/or with options for continued work at the end of one or more phases;
- request additional documentation once the award instrument has been determined (e.g., representations and certifications); and
- remove proposers from award consideration should the parties fail to reach agreement on award terms within a reasonable time or the proposer fails to provide requested additional information in a timely manner.

Proposals selected for award negotiation may result in a procurement contract, cooperative agreement or Other Transaction, depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors.

In all cases, the Government contracting officer shall have sole discretion to select award instrument type and to negotiate all instrument terms and conditions with selectees. Proposers are advised that regardless of the instrument type proposed, DARPA personnel, in consultation with the Government contracting officer, may select other award instruments, as they deem appropriate. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before publishing any information or results on the program. For more information on publication restrictions, see the section below on Fundamental Research.

B. Fundamental Research

It is DoD policy that the publication of products of fundamental research will remain unrestricted to the maximum extent possible. National Security Decision Directive (NSDD) 189 established the national policy for controlling the flow of scientific, technical, and engineering information produced in federally funded fundamental research at colleges, universities, and laboratories. The Directive defines fundamental research as follows:

'Fundamental research' means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

As of the date of publication of this BAA, the Government expects that program goals as described herein may be met by proposers intending to perform fundamental research. The Government does not anticipate applying publication restrictions of any kind to individual awards for fundamental research that may result from this BAA. Notwithstanding this statement of expectation, the Government is not prohibited from considering and selecting research proposals that, while perhaps not qualifying as fundamental research under the foregoing definition, still meet the BAA criteria for submissions. If proposals are selected for award that offer other than a fundamental research solution, the Government will either work with the proposer to modify the proposed statement of work to bring the research back into line with fundamental research or else the proposer will agree to restrictions in order to receive an award.

Proposers should indicate in their proposal whether they believe the scope of the research included in their proposal is fundamental or not. While proposers should clearly explain the intended results of their research, the Government shall have sole discretion to select award instrument type and to negotiate all instrument terms and conditions with selectees. Appropriate clauses will be included in resultant awards for non-fundamental research to prescribe publication requirements and other restrictions, as appropriate.

For certain research projects, it may be possible that although the research being performed by the prime contractor is restricted research, a subawardee may be conducting fundamental research. In those cases, it is the prime contractor's responsibility to explain in its proposal why its subawardee's effort is fundamental research.

The following statement or similar provision will be incorporated into any resultant non-fundamental research procurement contract or other transaction:

> There shall be no dissemination or publication, except within and between the contractor and any subawardees, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written approval of DARPA's Public Release Center (DARPA/PRC). All technical reports will be given proper review by appropriate authority to determine which Distribution Statement is to be applied prior to the initial distribution of these reports by the contractor. With regard to subawardee proposals for Fundamental Research, papers resulting from unclassified fundamental research are exempt from prepublication controls and this review requirement, pursuant to DoD Instruction 5230.27 dated October 6, 1987.

> When submitting material for written approval for open publication, the contractor/awardee must submit a request for public release to the DARPA/PRC and include the following information: (1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx. 30 words), number of pages (or minutes of video) and document type (e.g., briefing, report, abstract, article, or paper); (2) Event Information: event type (conference,

principal investigator meeting, article or paper), event date, desired date for DARPA's approval; (3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and (4) Contractor/Awardee's Information: POC name, email and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests may be sent either via email to public_release_center@darpa.mil or by mail at 675 North Randolph Street, Arlington VA 22203-2114, telephone (571) 218-4235. Refer to the following for link for information about DARPA's public release process: http://www.darpa.mil/work-with-us/contract-management/public-release."

III. Eligibility Information

A. Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA.

1. Federally Funded Research and Development Centers (FFRDCs) and Government Entities

Federally Funded Research and Development Centers (FFRDCs) and Government entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to this BAA in any capacity unless they meet the following conditions: (1) FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector; and (2) FFRDCs must provide a letter on official letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and their compliance with the associated FFRDC sponsor agreement's terms and conditions. This information is required for FFRDCs proposing to be prime contractors or subawardees. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations. At the present time, DARPA does not consider 15 U.S.C. § 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C.§ 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider FFRDC and Government entity eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the proposer.

2. Foreign Participation

Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances.

B. Procurement Integrity, Standards of Conduct, Ethical Considerations, and Organizational Conflicts of Interest

Current federal employees are prohibited from participating in particular matters involving conflicting financial, employment, and representational interests (18 U.S.C. §§ 203, 205, and 208). Once the proposals have been received, and prior to the start of proposal evaluations, the Government will assess potential conflicts of interest and will promptly notify the proposer if any appear to exist. The Government assessment does NOT affect, offset, or mitigate the proposer's responsibility to give full notice and planned mitigation for all potential organizational conflicts, as discussed below.

Without prior approval or a waiver from the DARPA Director, in accordance with FAR 9.503, a contractor cannot simultaneously provide scientific, engineering, technical assistance (SETA) or similar support and also be a technical performer. As part of the proposal submission, all

members of the proposed team (prime proposers, proposed subawardees, and consultants) must affirm whether they (their organizations and individual team members) are providing SETA or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the proposer, subawardees, consultant, or individual supports and identify the prime contract number(s). All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure must include a description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict. If in the sole opinion of the Government after full consideration of the circumstances, a proposal fails to fully disclose potential conflicts of interest and/or any identified conflict situation cannot be effectively mitigated, the proposal will be rejected without technical evaluation and withdrawn from further consideration for award.

If a prospective proposer believes a conflict of interest exists or may exist (whether organizational or otherwise) or has questions on what constitutes a conflict of interest, the proposer should send his/her contact information and a summary of the potential conflict via email to the BAA email address before time and effort are expended in preparing a proposal and mitigation plan.

C. Cost Sharing/Matching

Cost sharing is not required; however, it will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument (e.g., OTs under the authority of 10 U.S.C. § 2371).

D. Other Eligibility Requirements

1. Ability to Receive Awards in Multiple Technical Areas - Organizational Conflicts of Interest (OCI)

While proposers may submit proposals for all three technical areas, proposers selected for Technical Area 1 cannot be selected for any portion of the other two technical areas, whether as a prime, subcontractor, or in any other capacity from an organizational to individual level. This is to avoid OCI situations between the technical areas and to ensure objective test and evaluation results. The decision as to which proposal to consider for award is at the discretion of the Government.

Proposers may submit one proposal for both TA2 and TA3 efforts jointly.

2. Ability to Support Classified Development

There is no requirement to hold or obtain security clearances in order to participate in this program.

IV. Application and Submission Information

A. Address to Request Application Package

This document contains all information required to submit a response to this solicitation. No additional forms, kits, or other materials are needed except as referenced herein. No request for proposal (RFP) or additional solicitation regarding this opportunity will be issued, nor is additional information available except as provided at the Federal Business Opportunities website (https://www.fbo.gov), the Grants.gov website (http://www.grants.gov/), or referenced herein.

B. Content and Form of Application Submission

1. Abstracts

Proposers are highly encouraged to submit an abstract in advance of a proposal to minimize effort and reduce the potential expense of preparing an out of scope proposal. The abstract provides a synopsis of the proposed project, including brief answers to the following:

- What is the proposed work attempting to accomplish or do?
- How is it done today, and what are the limitations?
- What are the potential risks associated with the approach and what are the mitigation strategies?
- Who will care and what will the impact be if the work is successful?
- How much will it cost, and how long will it take?

Abstract Format: Abstracts shall not exceed a maximum of 6 pages. If you are submitting an abstract that contains both TA2 and TA3, you are allowed 11 pages. The page limit includes the cover sheet and all figures, tables, and charts. The page limit does not include a submission letter (optional).

All pages shall be formatted for printing on 8-1/2 by 11 inch paper with 1-inch margins and font size not smaller than 11 point. Font sizes of 8 or 10 point may be used for figures, tables, and charts. Document files must be in .pdf, .odx, .doc, .docx, .xls, or .xlsx formats. Submissions must be written in English.

Abstracts must include the following components:

- **Cover Sheet**: Provide the administrative and technical points of contact (name, address, phone, email, lead organization). Include the BAA number, title of the proposed project, primary subcontractors, estimated cost, duration of the project, and the label "Abstract."

- **Goals and Impact:** Describe what is being proposed and what difference it will make (qualitatively and quantitatively) if successful. Describe the innovative aspects of the project in the context of existing capabilities and approaches, clearly delineating the relationship of this work to any other projects from the past and present.

- **Technical Plan:** Outline and address all technical challenges inherent in the approach and possible solutions for overcoming potential problems. Provide appropriate specific milestones (quantitative, if possible) at intermediate stages of the project to demonstrate

progress.

- **Capabilities/Management Plan:** Provide a brief summary of expertise of the team, including subcontractors and key personnel. Identify a principal investigator for the project and include a description of the team's organization including roles and responsibilities. Describe the organizational experience in this area, existing intellectual property required to complete the project, and any specialized facilities to be used as part of the project. List Government-furnished property, facilities, or data assumed to be available. If desired, include a brief bibliography with links to relevant papers, reports, or resumes of key performers. Do not include more than two resumes as part of the abstract. Resumes count against the abstract page limit.

- **Statement of Work, Cost and Schedule:** Provide a cost estimate for resources over the proposed timeline of the project, broken down by year. Include labor, materials, a list of deliverables and delivery schedule. Provide cost estimates for each subcontractor (may be a rough order of magnitude or ROM).

2. Proposals

Proposals consist of Volume 1: Technical and Management Proposal (including mandatory Appendix A and optional Appendix B) and Volume 2: Cost Proposal.

All pages shall be formatted for printing on 8-1/2 by 11-inch paper with 1-inch margins, single-line spacing, and a font size not smaller than 12 point. Font sizes of 8 or 10 point may be used for figures, tables, and charts. Document files must be in .pdf, .odx, .doc, .docx, .xls, or .xlsx formats. Submissions must be written in English.

Proposals not meeting the format prescribed herein may not be reviewed.

a. Volume 1: Technical and Management Proposal

The maximum page count for Volume 1 is <u>15 pages</u> if responding to a single TA. For each additional TA (TA2 and TA3 combined) an additional 10 pages are allowed, including all figures, tables and charts, but not including the cover sheet, table of contents or appendices. A submission letter is optional and is not included in the page count. Appendix A does not count against the page limit and is mandatory. Appendix B does not count against the page limit and is optional. Additional information not explicitly called for here must not be submitted with the proposal, but may be included in the bibliography in Appendix B. Such materials will be considered for the reviewers' convenience only and not evaluated as part of the proposal.

Volume 1 must include the following components:

i. Cover Sheet: Include the following information.

- Label: "Proposal: Volume 1"
- BAA number (DARPA-BAA-16-61)
- Technical Area(s)
- Proposal title
- Lead organization (prime contractor) name

- Type of organization, selected from the following categories: Large Business, Small Disadvantaged Business, Other Small Business, HBCU, MI, Other Educational, or Other Nonprofit
- Technical point of contact (POC) including name, mailing address, telephone, and email
- Administrative POC including name, mailing address, telephone number, and email address
- Award instrument requested: procurement contract (specify type), cooperative agreement, or OT.[1]
- Total amount of the proposed effort.
- Place(s) and period(s) of performance
- Other team member (subcontractors and consultants) information (for each, include Technical POC name, organization, type of organization, mailing address, telephone number, and email address)
- Proposal validity period (minimum 120 days)
- Data Universal Numbering System (DUNS) number[2]
- Taxpayer identification number[3]
- Commercial and Government Entity (CAGE) code[4]
- Proposer's reference number (if any)

ii. Table of Contents

iii. Executive Summary:
Provide a synopsis of the proposed project, including answers to the following questions:

- What is the proposed work attempting to accomplish or do?
- How is it done today, and what are the limitations?
- Who or what will be affected and what will be the impact if the work is successful?
- How much will it cost, and how long will it take?

The executive summary should include a description of the key technical challenges, a concise review of the technologies proposed to overcome these challenges and achieve the project's goal, and a clear statement of the novelty and uniqueness of the proposed work.

iv. Innovative Claims and Deliverables: Describe the innovative aspects of the project in the context of existing capabilities and approaches, clearly delineating the uniqueness and benefits of this project in the context of the state of the art, alternative approaches, and other projects from the past and present. Describe how the proposed project is

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[1] Information on award instruments can be found at http://www.darpa.mil/work-with-us/contract-management.
[2] The DUNS number is used as the Government's contractor identification code for all procurement-related activities. Go to http://fedgov.dnb.com/webform/index.jsp to request a DUNS number (may take at least one business day). See Section VI.B.8 for further information.
[3] See http://www.irs.gov/businesses/small/international/article/0,,id=96696,00.html for information on requesting a TIN. Note, requests may take from 1 business day to 1 month depending on the method (online, fax, mail).
[4] A CAGE Code identifies companies doing or wishing to do business with the Federal Government. See Section VI.B.8 for further information.

revolutionary and how it significantly rises above the current state of the art.

Describe the deliverables associated with the proposed project and any plans to commercialize the technology, transition it to a customer, or further the work. Discuss the mitigation of any issues related to sustainment of the technology over its entire lifecycle, assuming the technology transition plan is successful.

v. Technical Plan: Outline and address technical challenges inherent in the approach and possible solutions for overcoming potential problems. Demonstrate a deep understanding of the technical challenges and present a credible (even if risky) plan to achieve the project's goal. Discuss mitigation of technical risk. Provide appropriate measurable milestones (quantitative if possible) at intermediate stages of the project to demonstrate progress, and a plan for achieving the milestones.

vi. Management Plan: Provide a summary of expertise of the proposed team, including any subcontractors/consultants and key personnel who will be executing the work. Resumes count against the proposal page limit so proposers may wish to include them in Appendix B below. Identify a principal investigator (PI) for the project. Provide a clear description of the team's organization including an organization chart that includes, as applicable, the relationship of team members; unique capabilities of team members; task responsibilities of team members; teaming strategy among the team members; and key personnel with the amount of effort to be expended by each person during the project. Provide a detailed plan for coordination including explicit guidelines for interaction among collaborators/subcontractors of the proposed project. Include risk management approaches. Describe any formal teaming agreements that are required to execute this project. List Government-furnished materials or data assumed to be available.

vii. Personnel, Qualifications, and Commitments: List key personnel (no more than one page per person), showing a concise summary of their qualifications, discussion of previous accomplishments, and work in this or closely related research areas. Indicate the level of effort in terms of hours to be expended by each person during each contract year and other (current and proposed) major sources of support for them and/or commitments of their efforts. DARPA expects all key personnel associated with a proposal to make a substantial time commitment to the proposed activity and the proposal will be evaluated accordingly. It is DARPA's intention to put key personnel conditions into the awards, so proposers should not propose personnel that are not anticipated to execute the award.

Include a table of key individual time commitments as follows:

Key Individual	Project	Status (Current, Pending, Proposed)	Hours on Project			
			2017	2018	2019	2020
Name 1	**MAA**	Proposed	x	x	x	x
	Project Name 1	Current	x	x	x	n/a
	Project Name 2	Pending	n/a	x	x	x
Name 2	**MAA**	Proposed	x	x	x	x
	Project Name 3	Proposed	x	x	x	x

viii. Capabilities: Describe organizational experience in relevant subject area(s), existing intellectual property, or specialized facilities. Discuss any work in closely related research areas and previous accomplishments.

ix. Statement of Work (SOW): The SOW must provide a detailed task breakdown, citing specific tasks and their connection to the interim milestones and metrics, as applicable. Each year of the project should be separately defined. The SOW must not include proprietary information. For each defined task/subtask, provide:

- A general description of the objective.
- A detailed description of the approach to be taken to accomplish each defined task/subtask.
- Identification of the primary organization responsible for task execution (prime contractor, subcontractor(s), consultant(s)), by name.
- A measurable milestone, (e.g., a deliverable, demonstration, or other event/activity that marks task completion).
- A definition of all deliverables (e.g., data, reports, software) to be provided to the Government in support of the proposed tasks/subtasks.
- Identify any tasks/subtasks (by the prime or subcontractor) that will be accomplished at a university and believed to be fundamental research.

x. Schedule and Milestones: Provide a detailed schedule showing tasks (task name, duration, work breakdown structure element as applicable, performing organization), milestones, and the interrelationships among tasks. The task structure must be consistent with that in the SOW. Measurable milestones should be clearly articulated and defined in time relative to the start of the project.

xi. Level of Effort Summary by Task: Provide a one-page table summarizing estimated level of effort per task (in hours) broken out by senior, mid-level and junior personnel, in the format shown below in Figure 3. Also include dollar-denominated estimates of travel, materials and equipment. For this table, consider materials to include the cost of any data sets or software licenses proposed. For convenience, an Excel template is available for download along with the BAA.

SOW Task	Duration (months)	Intensity (hrs/mo)	Sr	Mid	Jr	Total	SubC	Conslt	Total
					Labor Hours				
1.1.0 <Phase 1 Task 1 name>	7	135	240	680	24	944	-	200	1,144
1.1.1 <Subtask 1.1.1 name>	4	90	80	280	-	360	-	200	560
1.1.2 <Subtask 1.1.2 name>	3	195	160	400	24	584	-	-	584
1.2.0 <Phase 1 Task 2 name>	6	385	108	400	1,800	2,308	1,400	-	3,708
1.2.1 <Subtask 1.2.1 name>	3	656	48	320	1,600	1,968	600	-	2,568
1.2.2 <Subtask 1.2.2 name>	3	113	60	80	200	340	800	-	1,140
:	:	:	:	:	:	:	:	:	:
Phase 1 Total Hours			348	1,080	1,824	3,252	1,400	200	4,652
Phase 1 Costs *First column is prime, second is*					Travel	$ 44,000	$ 12,000	$ 2,000	$ 58,000
total subcontractor, third is total consultant, fourth is total					Materials & Equipment	$ 8,000	$ -	$ -	$ 8,000

Figure 3: Example level-of-effort summary table. Numbers illustrate roll-ups and subtotals. The "SubC" column captures all subcontractor hours and the "Conslt" column captures all consultant hours.

xii. Appendix A: This section is mandatory and must include all of the following components. If a particular subsection is not applicable, state "NONE".

(1). Team Member Identification: Provide a list of all team members including the prime, subcontractor(s), and consultant(s), as applicable. Identify specifically whether any are a non-US organization or individual, FFRDC and/or Government entity. Use the following format for this list:

Individual Name	Role (Prime, Subcontractor or Consultant)	Organization	Non-US?		FFRDC or Govt?
			Org	Ind.	

(2). Government or FFRDC Team Member Proof of Eligibility to Propose: If none of the team member organizations (prime or subcontractor) are a Government entity or FFRDC, state "NONE".

If any of the team member organizations are a Government entity or FFRDC, provide documentation (per Section III.A.1) citing the specific authority that establishes the applicable team member's eligibility to propose to Government solicitations to include: 1) statutory authority; 2) contractual authority; 3) supporting regulatory guidance; and 4) evidence of agency approval for applicable team member participation.

(3). Government or FFRDC Team Member Statement of Unique Capability: If none of the team member organizations (prime or subcontractor) are a Government entity or FFRDC, state "NONE".

If any of the team member organizations are a Government entity or FFRDC, provide a statement (per Section III.A.1) that demonstrates the work to be performed by the Government entity or FFRDC team member is not otherwise available from the private sector.

(4). Organizational Conflict of Interest Affirmations and Disclosure: If none of the proposed team members is currently providing SETA or similar support as described in Section III.B, state "NONE".

If any of the proposed team members (individual or organization) is currently performing SETA or similar support, furnish the following information:

Prime Contract Number	DARPA Technical Office supported	A description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate the conflict

(5). Intellectual Property (IP): If no IP restrictions are intended, state "NONE". The Government will assume unlimited rights to all IP not explicitly identified as having less than unlimited rights in the proposal.

For all technical data or computer software that will be furnished to the Government with other than unlimited rights, provide (per Section VI.B.1) a list describing all proprietary claims to results, prototypes, deliverables or systems supporting and/or necessary for the use of the research, results, prototypes and/or deliverables. Provide documentation proving ownership or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) to be used for the proposed project. Use the following format for these lists:

NONCOMMERCIAL				
Technical Data and/or Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(List)	(Narrative)	(List)	(List)	(List)
(List)	(Narrative)	(List)	(List)	(List)

COMMERCIAL				
Technical Data and/or Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(List)	(Narrative)	(List)	(List)	(List)
(List)	(Narrative)	(List)	(List)	(List)

(6). Human Subjects Research (HSR): If HSR is not a factor in the proposal, state "NONE".

If the proposed work will involve human subjects, provide evidence of or a plan for review by an institutional review board (IRB). For further information on this subject, see Section VI.B.2.

(7). Animal Use: If animal use is not a factor in the proposal, state "NONE".

If the proposed research will involve animal use, provide a brief description of the plan for Institutional Animal Care and Use Committee (IACUC) review and approval. For further information on this subject, see Section VI.B.3.

(8). Representations Regarding Unpaid Delinquent Tax Liability or a Felony Conviction under Any Federal Law: Per Section VI.B.10, complete the following statements.

(1) The proposer is [ ] is not [ ] a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner

pursuant to an agreement with the authority responsible for collecting the tax liability,

(2) The proposer is [ ] is not [ ] a corporation that was convicted of a felony criminal violation under a Federal law within the preceding 24 months.

(9). Cost Accounting Standards (CAS) Notices and Certification: Per Section VI.B.11, any proposer who submits a proposal which, if accepted, will result in a CAS-compliant contract, must include a Disclosure Statement as required by 48 CFR 9903.202. The disclosure forms may be found at http://www.whitehouse.gov/omb/procurement_casb.

If this section is not applicable, state "NONE".

xiii. Appendix B: Include a brief bibliography to relevant papers, and public reports. Do not include technical papers. This section is optional, and the materials will not be evaluated as part of the proposal review.

b. Volume 2 - Cost Proposal

This volume is mandatory and must include all the listed components. No page limit is specified for this volume.

The cost proposal should include a working spreadsheet file (.xls or equivalent format) that provides formula traceability among all components of the cost proposal. The spreadsheet file should be included as a separate component of the full proposal package. Costs must be traceable between the prime and subcontractors/consultants, as well as between the cost proposal and the SOW.

Pre-award costs will not be reimbursed unless a pre-award cost agreement is negotiated prior to award.

i. Cover Sheet: Include the same information as the cover sheet for Volume 1, but with the label "Proposal: Volume 2."

ii. Cost Summary Tables: Provide a single-page summary table broken down by fiscal year listing cost totals for labor, materials, other direct charges (ODCs), indirect costs (overhead, fringe, general and administrative (G&A)), and any proposed fee for the project. Include costs for each task in each fiscal year of the project by prime and major subcontractors, total cost and proposed cost share, if applicable. Provide a second table containing the same information broken down by project phase.

iii. Cost Details: For each task, provide the following cost details by month. Include supporting documentation describing the method used to estimate costs. Identify any cost sharing.

(1) Direct Labor: Provide labor categories, rates and hours. Justify rates by providing examples of equivalent rates for equivalent talent, past commercial or Government rates or approved rates from a Government audit agency such as the Defense Contract Audit Agency (DCAA), the Office of Naval Research

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(ONR), the Department of Health and Human Services (DHHS), etc.

(2) Indirect Costs: Identify all indirect cost rates (such as fringe benefits, labor overhead, material overhead, G&A or F&A, etc.) and the basis for each.

(3) Materials: Provide an itemized list of all proposed materials, equipment, and supplies for each year including quantities, unit prices, proposed vendors (if known), and the basis of estimate (e.g., quotes, prior purchases, catalog price lists, etc.). For proposed equipment/information technology (as defined in FAR 2.101) purchases equal to or greater than $50,000, include a letter justifying the purchase. Include any requests for Government-furnished equipment or information with cost estimates (if applicable) and delivery dates.

(4) Travel: Provide a breakout of travel costs including the purpose and number of trips, origin and destination(s), duration, and travelers per trip.

(5) Subcontractor/Consultant Costs: Provide above info for each proposed subcontractor/consultant.
If the proposer has conducted a cost or price analysis to determine reasonableness, submit a copy of this along with the subcontractor proposal.

The proposer is responsible for the compilation and submission of all subcontractor/consultant cost proposals. At a minimum, the submitted cost volume must contain a copy of each subcontractor or consultant non-proprietary cost proposal (i.e. cost proposals that do not contain proprietary pricing information such as rates, factors, etc.) Proprietary subcontractor/consultant cost proposals may be included as part of Volume 2. Proposal submissions will not be considered complete unless the Government has received all subcontractor/consultant cost proposals.

If proprietary subcontractor/consultant cost proposals are not included as part of Volume 2, they may be emailed separately to MAA@darpa.mil. Email messages must include "Subcontractor Cost Proposal" in the subject line and identify the principal investigator, prime proposer organization and proposal title in the body of the message. Any proprietary subcontractor or consultant proposal documentation which is not uploaded to BAAT as part of the proposer's submission or provided by separate email shall be made immediately available to the Government, upon request, under separate cover (i.e., mail, electronic/email, etc.), either by the proposer or by the subcontractor/consultant organization.

Please note that a ROM or similar budgetary estimate is not considered a fully qualified subcontract cost proposal submission. Inclusion of a ROM or similar budgetary estimate, or failure to provide a subcontract proposal, will result in the full proposal being deemed non-compliant.

(6) ODCs: Provide an itemized breakout and explanation of all other anticipated direct costs.

iv. Proposals Requesting a Procurement Contract: Provide the following information where applicable.

> **(1) Proposals for $750,000 or more**: Provide "certified cost or pricing data" (as defined in FAR 2.101) or a request for exception in accordance with FAR 15.403.

> **(2) Proposals for $700,000 or more:** Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. § 637(d)), it is Government policy to enable small business and small disadvantaged business concerns to be considered fairly as subcontractors to organizations performing work as prime contractors or subcontractors under Government contracts, and to ensure that prime contractors and subcontractors carry out this policy. In accordance with FAR 19.702(a)(1) and 19.702(b), prepare a subcontractor plan, if applicable. The plan format is outlined in FAR 19.704.

> **(2) Proposers without an adequate cost accounting system:** If requesting a cost-type contract, provide the DCAA Pre-award Accounting System Adequacy Checklist to facilitate DCAA's completion of an SF 1408. Proposers without an accounting system considered adequate for determining accurate costs must complete an SF 1408 if a cost type contract is to be negotiated. To facilitate this process, proposers should complete the SF 1408 found at http://www.gsa.gov/portal/forms/download/115778 and submit the completed form with the proposal. To complete the form, check the boxes on the second page, then provide a narrative explanation of your accounting system to supplement the checklist on page one.

v. Proposals Requesting an Other Transaction for Prototypes Agreement: Proposers must indicate whether they qualify as a nontraditional Defense contractor[5,] have teamed with a nontraditional Defense contractor, or are providing a one-third cost share for this effort. Provide information to support the claims. See 10 U.S.C. 2371b.

Provide a detailed list of milestones including: description, completion criteria, due date, and payment/funding schedule (to include, if cost share is proposed, contractor and Government share amounts). Milestones must relate directly to accomplishment of technical metrics as defined in the solicitation and/or the proposal. While agreement type (fixed price or expenditure based) will be subject to negotiation, the use of fixed price milestones with a payment/funding schedule is preferred. Proprietary information must not be included as part of the milestones.

3. Proprietary and Classified Information

DARPA policy is to treat all submissions as source selection information (see FAR 2.101 and 3.104) and to disclose the contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA

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[5] For definitions and information on an OTs for Prototypes agreement see http://www.darpa.mil/work-with-us/contract-management.

support contractors performing this role are expressly prohibited from performing DARPA-sponsored technical research and are bound by appropriate nondisclosure agreements.

a. Proprietary Information

Proposers are responsible for clearly identifying proprietary information. Submissions containing proprietary information must have the cover page and each page containing such information clearly marked.

b. Classified Information

Classified submissions (classified technical proposals or classified appendices to unclassified proposals) WILL NOT be accepted under this solicitation.

If a determination is made that the award instrument may result in access to classified information, a DD Form 254, "DoD Contract Security Classification Specification," will be issued by DARPA and attached as part of the award. A DD Form 254 will not be provided to proposers at the time of submission. For reference, the DD Form 254 template is available at http://www.dtic.mil/dtic/pdf/formsNguides/dd0254.pdf.

C. Submission Dates and Times

Proposers are warned that submission deadlines as outlined herein are strictly enforced. Note: some proposal requirements may take from 1 business day to 1 month to complete. See the proposal checklist in Section VIII.D for further information.

When utilizing the DARPA BAA Submission Website, as described below in Section IV.E.1.b below, a control number will be provided at the conclusion of the submission process. This control number should be used in all further correspondence regarding your abstract/proposal submission.

Because cooperative agreement proposal submissions (Section IV.E.1.c) will be utilizing the Grants.gov website, a control number will be created by DARPA following the proposal due date. To request this control number, which will be used in all further correspondence regarding your proposal submission, please send an email to MAA@darpa.mil after the proposal due date.

Failure to comply with the submission procedures outlined herein may result in the submission not being evaluated.

1. Abstracts

Abstracts must be submitted per the instructions outlined herein and received by DARPA no later than October 28, 2016, at 12:00 noon (ET). Abstracts received after this date and time will not be reviewed.

2. Proposals

The proposal package -- full proposal (Volume 1 and 2) and, as applicable, proprietary subcontractor cost proposals -- must be submitted per the instructions outlined herein and received by DARPA no later than December 15, 2016, at 12:00 noon (ET).

Submissions received after this date and time will not be reviewed. Proposers are warned that submission deadlines as outlined herein are strictly enforced. DO NOT WAIT UNTIL THE LAST MINUTE TO FINALIZE AND COMPLETE YOUR SUBMISSION.

D. Funding Restrictions

Not applicable.

E. Other Submission Requirements

1. Unclassified Submission Instructions

Proposers must submit all parts of their submission package using the same method; submissions cannot be sent in part by one method and in part by another method nor should duplicate submissions be sent by multiple methods. Email submissions will not be accepted.

a. Abstracts

DARPA/I2O will employ an electronic upload submission system (https://baa.darpa.mil/) for all UNCLASSIFIED abstract responses under this solicitation. *Abstracts should not be submitted via Grants.gov.*

First time users of the DARPA BAA Submission Website must complete a two-step account creation process at https://baa.darpa.mil/. The first step consists of registering for an Extranet account by going to the above URL and selecting the "Account Request" link. Upon completion of the online form, proposers will receive two separate emails; one will contain a user name and the second will provide a temporary password. Once both emails have been received, proposers must go back to the submission website and log in using that user name and password. After accessing the Extranet, proposers must create a user account for the DARPA BAA Submission Website by selecting the "Register Your Organization" link at the top of the page. The DARPA BAA Submission Website will display a list of solicitations open for submissions. Once a proposer's user account is created, they may view instructions on uploading their abstract.

Proposers who already have an account on the DARPA BAA Submission Website may simply log in at https://baa.darpa.mil/, select this solicitation from the list of open DARPA solicitations and proceed with their abstract submission. Note: Proposers who have created a DARPA BAA Submission Website account to submit to another DARPA Technical Office's solicitations do not need to create a new account to submit to this solicitation.

All submissions submitted electronically through DARPA's BAA website must be uploaded as zip files (.zip or .zipx extension). The final zip file should contain only the files requested herein and must not exceed 50 MB in size. Only one zip file will be accepted per submission. Note: Submissions not uploaded as zip files will be rejected by DARPA.

Please note that all submissions MUST be finalized, meaning that no further editing will be possible, when submitting through the DARPA BAA Submission Website in order for DARPA to be able to review your submission. If a submission is not finalized, the submission will not be deemed acceptable and will not be reviewed.

Website technical support may be reached at Action@darpa.mil and is typically available during regular business hours (9:00 AM – 5:00 PM ET, Monday-Friday). Questions regarding submission contents, format, deadlines, etc. should be emailed to MAA@darpa.mil.

Since abstract submitters may encounter heavy traffic on the web server, they should not wait until the day abstracts are due to request an account and/or upload the submission.

b. Proposals Requesting a Procurement Contract or Other Transaction

DARPA/I2O will employ an electronic upload submission system (https://baa.darpa.mil/) for UNCLASSIFIED proposals requesting award of a procurement contract or Other Transaction under this solicitation.

First time users of the DARPA BAA Submission Website must complete a two-step account creation process at https://baa.darpa.mil/. The first step consists of registering for an Extranet account by going to the above URL and selecting the "Account Request" link. Upon completion of the online form, proposers will receive two separate emails; one will contain a user name and the second will provide a temporary password. Once both emails have been received, proposers must go back to the submission website and log in using that user name and password. After accessing the Extranet, proposers must create a user account for the DARPA BAA Submission Website by selecting the "Register Your Organization" link at the top of the page. The DARPA BAA Submission Website will display a list of solicitations open for submissions. Once a proposer's user account is created, they may view instructions on uploading their proposal.

Proposers who already have an account on the DARPA BAA Submission Website may simply log in at https://baa.darpa.mil/, select this solicitation from the list of open DARPA solicitations and proceed with their proposal submission. Note: Proposers who have created a DARPA BAA Submission Website account to submit to another DARPA Technical Office's solicitations do not need to create a new account to submit to this solicitation.

All submissions submitted electronically through DARPA's BAA website must be uploaded as zip files (.zip or .zipx extension). The final zip file should contain only the files requested herein and must not exceed 50 MB in size. Only one zip file will be accepted per submission. Note: Submissions not uploaded as zip files will be rejected by DARPA.

Please note that all submissions MUST be finalized, meaning that no further editing will be possible, when submitting through the DARPA BAA Submission Website in order for DARPA to be able to review your submission. If a submission is not finalized, the submission will not be deemed acceptable and will not be reviewed.

Website technical support may be reached at Action@darpa.mil and is typically available during regular business hours (9:00 AM – 5:00 PM ET, Monday-Friday). Questions regarding submission contents, format, deadlines, etc. should be emailed to MAA@darpa.mil.

Since proposers may encounter heavy traffic on the web server, they should not wait until the day proposals are due to request an account and/or upload the submission.

c. Proposals Requesting a Cooperative Agreement

Proposers requesting cooperative agreements may submit proposals through one of the following methods: (1) hard copy mailed directly to DARPA; or (2) electronic upload per the instructions at http://www.grants.gov/applicants/apply-for-grants.html. Cooperative agreement proposals may not be submitted through any other means. If proposers intend to use Grants.gov as their means of submission, then they must submit their entire proposal through Grants.gov; applications cannot be submitted in part to Grants.gov and in part as a hard-copy. Proposers using the Grants.gov do not submit paper proposals in addition to the Grants.gov electronic submission.

Proposers choosing to mail hard copy proposals to DARPA must include one paper copy and one electronic copy (e.g., CD/DVD) of the full proposal package.

Grants.gov requires proposers to complete a one-time registration process before a proposal can be electronically submitted. If proposers have not previously registered, this process can take between three business days and four weeks if all steps are not completed in a timely manner. See the Grants.gov registration checklist at http://www.grants.gov/web/grants/register.html for registration requirements and instruction.

Once Grants.gov has received an uploaded proposal submission, Grants.gov will send two email messages to notify proposers that: (1) their submission has been received by Grants.gov; and (2) the submission has been either validated or rejected by the system. It may take up to two business days to receive these emails. If the proposal is rejected by Grants.gov, it must be corrected and re-submitted before DARPA can retrieve it (assuming the solicitation has not expired). If the proposal is validated, then the proposer has successfully submitted their proposal and Grants.gov will notify DARPA. Once the proposal is retrieved by DARPA, Grants.gov will send a third email to notify the proposer. The proposer will then receive an email from DARPA acknowledging receipt and providing a control number.

To avoid missing deadlines, proposers should submit their proposals to Grants.gov in advance of the proposal due date, with sufficient time to complete the registration and submission processes, receive email notifications and correct errors, as applicable. For more information on submitting proposals to Grants.gov, visit the Grants.gov submissions page at: http://www.grants.gov/web/grants/applicants/apply-for-grants.html.

Proposers electing to submit cooperative agreement proposals as hard copies must complete the SF 424 R&R form (Application for Federal Assistance, Research and Related) available on the Grants.gov website http://apply07.grants.gov/apply/forms/sample/RR_SF424_2_0-V2.0.pdf.

Proposers are warned that submission deadlines as outlined herein are strictly enforced. DO NOT WAIT UNTIL THE LAST MINUTE TO FINALIZE AND COMPLETE YOUR SUBMISSION.

Technical support for the Grants.gov website may be reached at 1-800-518-4726 and

support@grants.gov. Questions regarding submission contents, format, deadlines, etc. should be emailed to MAA@darpa.mil.

V.   Application Review Information

A. Evaluation Criteria

Proposals will be evaluated using the following criteria listed in descending order of importance: Overall Scientific and Technical Merit; Potential Contribution and Relevance to the DARPA Mission; and Cost Realism.

– *Overall Scientific and Technical Merit*:
  The proposed technical approach is feasible, achievable, complete and supported by a proposed technical team that has the expertise and experience to accomplish the proposed tasks.

  The task descriptions and associated technical elements are complete and in a logical sequence, with all proposed deliverables clearly defined such that a viable attempt to achieve project goals is likely as a result of award. The proposal identifies major technical risks and clearly defines feasible mitigation efforts.

– *Potential Contribution and Relevance to the DARPA Mission:*
  The potential contributions of the proposed effort are relevant to the national technology base. Specifically, DARPA's mission is to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their application.

  This includes considering the extent to which any proposed intellectual property restrictions will potentially impact the Government's ability to transition the technology.

– *Cost Realism:*
  The proposed costs are realistic for the technical and management approach and accurately reflect the technical goals and objectives of the solicitation. The proposed costs are consistent with the proposer's Statement of Work and reflect a sufficient understanding of the costs and level of effort needed to successfully accomplish the proposed technical approach. The costs for the prime proposer and proposed subawardees are substantiated by the details provided in the proposal (e.g., the type and number of labor hours proposed per task, the types and quantities of materials, equipment and fabrication costs, travel and any other applicable costs).

B. Review and Selection Process

The review process identifies proposals that meet the evaluation criteria described above and are, therefore, selectable for negotiation of awards by the Government. DARPA policy is to ensure impartial, equitable, comprehensive proposal evaluations and to select proposals that meet DARPA technical, policy, and programmatic goals. If necessary, panels of experts in the appropriate areas will be convened. As described in Section IV, proposals must be deemed conforming to the solicitation to receive a full technical review against the evaluation criteria; proposals deemed non-conforming will be removed from consideration.

DARPA will conduct a scientific/technical review of each conforming proposal. Proposals will not be evaluated against each other since they are not submitted in accordance with a common

work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

Selections may be made at any time during the period of solicitation. Pursuant to FAR 35.016, the primary basis for selecting proposals for award negotiation shall be technical, importance to agency programs, and fund availability. Conforming proposals based on a previously submitted abstract will be reviewed without regard to feedback resulting from review of that abstract. Furthermore, a favorable response to an abstract is not a guarantee that a proposal based on the abstract will ultimately be selected for award negotiation. Proposals that are determined selectable will not necessarily receive awards.

For evaluation purposes, a proposal is defined to be the document and supporting materials as described in Section IV.B.2. Subject to the restrictions set forth in FAR 37.203(d), input on technical aspects of the proposals may be solicited by DARPA from non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements. No submissions, abstract or proposal, will be returned.

VI. Award Administration Information

A. Selection Notices

After proposal evaluations are complete, proposers will be notified as to whether their proposal was selected for award negotiation as a result of the review process. Notification will be sent by email to the technical and administrative POCs identified on the proposal cover sheet. If a proposal has been selected for award negotiation, the Government will initiate those negotiations following the notification.

B. Administrative and National Policy Requirements

1. Intellectual Property

Proposers should note that the Government does not own the intellectual property of technical data/computer software developed under Government contracts; it acquires the right to use the technical data/computer software. Regardless of the scope of the Government's rights, performers may freely use their same data/software for their own commercial purposes (unless restricted by U.S. export control laws or security classification). Therefore, technical data and computer software developed under this solicitation will remain the property of the performers, though DARPA desires to have a minimum of Government Purpose Rights (GPR) to technical data/computer software developed through DARPA sponsorship.

The program will emphasize creating and leveraging open source technology and architecture. Intellectual property rights asserted by proposers are strongly encouraged to be aligned with open source regimes. Exceptions to proprietary technology will be considered only in compelling cases.

Proposers expecting to use, but not to deliver, commercial open source tools or other materials in implementing their approach may be required to indemnify the Government against legal liability arising from such use.

All references to "Unlimited Rights" or "Government Purpose Rights" are intended to refer to the definitions of those terms as set forth in the Defense Federal Acquisition Regulation Supplement (DFARS) Part 227.

a. Intellectual Property Representations

All proposers must provide a good faith representation of either ownership or possession of appropriate licensing rights to all other intellectual property to be used for the proposed project. Proposers must provide a short summary for each item asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research. If proposers desire to use proprietary software or technical data or both as the basis of their proposed approach, in whole or in part, they should: (1) clearly identify such software/data and its proposed particular use(s); (2) explain how the Government will be able to reach its program goals (including transition) within the proprietary model offered; and (3) provide possible nonproprietary alternatives in any area that might present transition difficulties or increased risk or cost to the Government under the proposed proprietary solution.

b. Patents

All proposers must include documentation proving ownership or possession of appropriate licensing rights to all patented inventions to be used for the proposed project. If a patent application has been filed for an invention, but it includes proprietary information and is not publicly available, a proposer must provide documentation that includes: the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and summary of the patent title, with either: (1) a representation of invention ownership, or (2) proof of possession of appropriate licensing rights in the invention (i.e., an agreement from the owner of the patent granting license to the proposer).

c. Procurement Contracts

  – **Noncommercial Items (Technical Data and Computer Software):** Proposers requesting a procurement contract must list all noncommercial technical data and computer software that it plans to generate, develop, and/or deliver, in which the Government will acquire less than unlimited rights and to assert specific restrictions on those deliverables. In the event a proposer does not submit the list, the Government will assume that it has unlimited rights to all noncommercial technical data and computer software generated, developed, and/or delivered, unless it is substantiated that development of the noncommercial technical data and computer software occurred with mixed funding. If mixed funding is anticipated in the development of noncommercial technical data and computer software generated, developed, and/or delivered, proposers should identify the data and software in question as subject to GPR. In accordance with DFARS 252.227-7013, "Rights in Technical Data - Noncommercial Items," and DFARS 252.227-7014, "Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation," the Government will automatically assume that any such GPR restriction is limited to a period of 5 years, at which time the Government will acquire unlimited rights unless the parties agree otherwise. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is not compliant with the solicitation. A template for complying with this request is provided in Section IV.B.2.a.xii.(5).

  – **Commercial Items (Technical Data and Computer Software):** Proposers requesting a procurement contract must list all commercial technical data and commercial computer software that may be included in any noncommercial deliverables contemplated under the research project, and assert any applicable restrictions on the Government's use of such commercial technical data and/or computer software. In the event a proposer does not submit the list, the Government will assume there are no restrictions on the Government's use of such commercial items. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is not compliant with the solicitation. A template for complying with this request

is provided in Section IV.B.2.a.xii.(5).

d. Other Types of Awards

Proposers responding to this solicitation requesting an award instrument other than a procurement contract shall follow the applicable rules and regulations governing those award instruments, but in all cases should appropriately identify any potential restrictions on the Government's use of any intellectual property contemplated under those award instruments in question. This includes both noncommercial items and commercial items. The Government may use the list as part of the evaluation process to assess the impact of any identified restrictions, and may request additional information from the proposer, to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is not compliant with the solicitation. A template for complying with this request is provided in Section IV.B.2.a.xii.(5).

2. Human Subjects Research

All research selected for funding involving human subjects, to include use of human biological specimens and human data, must comply with the federal regulations for human subjects protection. Further, research involving human subjects that is conducted or supported by the DoD must comply with 32 CFR 219, Protection of Human Subjects (and DoD Instruction 3216.02, Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research (http://www.dtic.mil/whs/directives/corres/pdf/321602p.pdf).

Institutions awarded funding for research involving human subjects must provide documentation of a current Assurance of Compliance with Federal regulations for human subjects protection, such as a Department of Health and Human Services, Office of Human Research Protection Federal Wide Assurance (http://www.hhs.gov/ohrp). All institutions engaged in human subjects research, to include subawardees, must also hold a valid Assurance. In addition, all personnel involved in human subjects research must provide documentation of completion of human subjects research training.

For all proposed research that will involve human subjects in the first year or phase of the project, the institution must provide evidence of or a plan for review by an Institutional Review Board (IRB) upon final proposal submission to DARPA as part of their proposal, prior to being selected for funding. The IRB conducting the review must be the IRB identified on the institution's Assurance of Compliance with human subjects protection regulations. The protocol, separate from the proposal, must include a detailed description of the research plan, study population, risks and benefits of study participation, recruitment and consent process, data collection, and data analysis. It is recommended that you consult the designated IRB for guidance on writing the protocol. The informed consent document must comply with federal regulations (32 CFR 219.116). A valid Assurance of Compliance with human subjects protection regulations along with evidence of completion of appropriate human subjects research training by all investigators and personnel involved with human subjects research should accompany the protocol for review by the IRB.

In addition to a local IRB approval, a headquarters-level human subjects administrative review and approval is required for all research conducted or supported by the DoD. The Army, Navy, or Air Force office responsible for managing the award can provide guidance and information about their component's headquarters-level review process. Note that

confirmation of a current Assurance of Compliance with human subjects protection regulations and appropriate human subjects research training is required before headquarters-level approval can be issued.

The time required to complete the IRB review/approval process varies depending on the complexity of the research and the level of risk involved with the study. The IRB approval process can last between one and three months, followed by a DoD review that could last between three and six months. Ample time should be allotted to complete the approval process. DoD/DARPA funding cannot be used towards human subjects research until ALL approvals are granted.

3. Animal Use

Award recipients performing research, experimentation, or testing involving the use of animals shall comply with the rules on animal acquisition, transport, care, handling, and use as outlined in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Animal Welfare Act of 1966, as amended, (7 U.S.C. § 2131-2159); (ii) National Institutes of Health Publication No. 86-23, "Guide for the Care and Use of Laboratory Animals" (8th Edition); and (iii) DoD Instruction 3216.01, "Use of Animals in DoD Programs."

For projects anticipating animal use, proposals should briefly describe plans for Institutional Animal Care and Use Committee (IACUC) review and approval. Animal studies in the program will be expected to comply with the Public Health Service (PHS) Policy on Humane Care and Use of Laboratory Animals, available at http://grants.nih.gov/grants/olaw/olaw.htm.

All award recipients must receive approval by a DoD-certified veterinarian, in addition to an IACUC approval. No animal studies may be conducted using DoD/DARPA funding until the United States Army Medical Research and Materiel Command (USAMRMC) Animal Care and Use Review Office (ACURO) or other appropriate DoD veterinary office(s) grant approval. As a part of this secondary review process, the award recipient will be required to complete and submit an ACURO Animal Use Appendix, which may be found at https://mrmc-www.army.mil/index.cfm?pageid=Research_Protections.acuro&rn=1.

4. Export Control

Per DFARS 225.7901-4, all procurement contracts, other transactions and other awards, as deemed appropriate, resultant from this solicitation will include the DFARS Export Control clause (252.225-7048).

5. Electronic and Information Technology

All electronic and information technology acquired through this solicitation must satisfy the accessibility requirements of Section 508 of the Rehabilitation Act (29 U.S.C. § 794d) and FAR 39.2. Each project involving the creation or inclusion of electronic and information technology must ensure that: (1) Federal employees with disabilities will have access to and use of information that is comparable to the access and use by Federal employees who are not individuals with disabilities; and (2) members of the public with disabilities seeking information or services from DARPA will have access to and use of information and data that is comparable to the access and use of information and data by members of the public who are not individuals with disabilities.

6. Employment Eligibility Verification

As per FAR 22.1802, recipients of FAR-based procurement contracts must enroll as federal contractors in E-verify and use the system to verify employment eligibility of all employees assigned to the award. All resultant contracts from this solicitation will include FAR 52.222-54, "Employment Eligibility Verification." This clause will not be included in grants, cooperative agreements, or Other Transactions.

7. System for Award Management (SAM) and Universal Identifier Requirements

Unless the proposer is exempt from this requirement, as per FAR 4.1102 or 2 CFR 25.110 as applicable, all proposers must be registered in the System for Award Management (SAM) and have a valid Data Universal Numbering System (DUNS) number prior to submitting a proposal. All proposers must maintain an active registration in SAM with current information at all times during which they have an active Federal award or proposal under consideration by DARPA. All proposers must provide the DUNS number in each proposal they submit.

Information on SAM registration is available at www.sam.gov.

Note that new registrations can take an average of 7-10 business days to process in SAM. SAM registration requires the following information:

- DUNS number
- TIN
- CAGE Code. If a proposer does not already have a CAGE code, one will be assigned during SAM registration.
- Electronic Funds Transfer information (e.g., proposer's bank account number, routing number, and bank phone or fax number).

8. Reporting Executive Compensation and First-Tier Subcontract Awards

FAR clause 52.204-10, "Reporting Executive Compensation and First-Tier Subcontract Awards," will be used in all procurement contracts valued at $25,000 or more. A similar award term will be used in all grants and cooperative agreements.

9. Updates of Information Regarding Responsibility Matters

Per FAR 9.104-7(c), FAR clause 52.209-9, Updates of Publicly Available Information Regarding Responsibility Matters, will be included in all contracts valued at $500,000 or more where the contractor has current active Federal contracts and grants with total value greater than $10,000,000.

10. Representations by Corporations Regarding an Unpaid Delinquent Tax Liability or a Felony Conviction under any Federal Law

The following representation will be included in all awards:

(a) In accordance with section 101(a) of the Continuing Appropriations Act, 2016 (Pub. L. 114-53) and any subsequent FY 2016 appropriations act that extends to FY 2016 funds the same restrictions as are contained in sections 744 and 745 of division E, title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235), none of

the funds made available by this or any other Act may be used to enter into a contract with any corporation that —

(1) Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, where the awarding agency is aware of the unpaid tax liability, unless the agency has considered suspension or debarment of the corporation and made a determination that this further action is not necessary to protect the interests of the Government; or

(2) Was convicted of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless the agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government.

(b) The Offeror represents that –

(1) It is [　] is not [　] a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability,

(2) It is [　]　is not [　] a corporation that was convicted of a felony criminal violation under a Federal law within the preceding 24 months.

Each proposer must complete and return the representations outlined in Section IV.B.2.a.xii.(8) with their proposal submission.

11. Cost Accounting Standards (CAS) Notices and Certification

As per FAR 52.230-2, any procurement contract in excess of the referenced threshold resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR 99), except those contracts which are exempt as specified in 48 CFR 9903.201-1. Any proposer submitting a proposal which, if accepted, will result in a CAS compliant contract, must submit representations and a Disclosure Statement as required by 48 CFR 9903.202 detailed in FAR 52.230-2. The disclosure forms may be found at http://www.whitehouse.gov/omb/procurement_casb.

12. Controlled Unclassified Information (CUI) on Non-DoD Information Systems

Controlled Unclassified Information (CUI) refers to unclassified information that does not meet the standards for National Security Classification but is pertinent to the national interests of the United States or to the important interests of entities outside the Federal Government and under law or policy requires protection from unauthorized disclosure, special handling safeguards, or prescribed limits on exchange or dissemination. All non-DoD entities doing business with DARPA are expected to adhere to the following procedural safeguards, in addition to any other

relevant Federal or DoD specific procedures, for submission of any proposals to DARPA and any potential business with DARPA:

- Do not process DARPA CUI on publicly available computers or post DARPA CUI to publicly available webpages or websites that have access limited only by domain or Internet protocol restriction.
- Ensure that all DARPA CUI is protected by a physical or electronic barrier when not under direct individual control of an authorized user and limit the transfer of DARPA CUI to subawardees or teaming partners with a need to know and commitment to this level of protection.
- Ensure that DARPA CUI on mobile computing devices is identified and encrypted and all communications on mobile devices or through wireless connections are protected and encrypted.
- Overwrite media that has been used to process DARPA CUI before external release or disposal.

13. Safeguarding of Covered Defense Information and Cyber Incident Reporting

Per DFARS 204.7304, DFARS 252.204-7012, "Safeguarding of Covered Defense Information and Cyber Incident Reporting," applies to this solicitation and all FAR-based awards resulting from this solicitation.

14. Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements

(a) In accordance with section 101(a) of the Continuing Appropriations Act, 2016 (Pub. L. 114-53) and any subsequent FY 2016 appropriations act that extends to FY 2016 funds the same restrictions as are contained in section 743 of division E, title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235), none of the funds appropriated (or otherwise made available) by this or any other Act may be used for a contract with an entity that requires employees or subcontractors of such entity seeking to report fraud, waste, or abuse to sign internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or contactors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The prohibition in paragraph (a) of this provision does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(c) *Representation*. By submission of its offer, the Offeror represents that it does not require employees or subcontractors of such entity seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or contactors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

C. Reporting

1. Technical and Financial Reports

The number and types of technical and financial reports required under the contracted project will be specified in the award document, and will include, as a minimum, monthly financial status reports and a yearly status summary. A final report that summarizes the project and tasks will be required at the conclusion of the performance period for the award. The reports shall be prepared and submitted in accordance with the procedures contained in the award document.

2. Representations and Certifications

In accordance with FAR 4.1201, prospective proposers shall complete electronic annual representations and certifications at http://www.sam.gov.

3. Wide Area Work Flow (WAWF)

Unless using another means of invoicing, performers will be required to submit invoices for payment directly at https://wawf.eb.mil. If applicable, WAWF registration is required prior to any award under this solicitation.

4. i-Edison

Award documents will contain a requirement for patent reports and notifications to be submitted electronically through the i-Edison Federal patent reporting system at http://s-edison.info.nih.gov/iEdison.

VII. Agency Contacts

DARPA will use email for all technical and administrative correspondence regarding this solicitation.

‒ **Technical POC:** Carey Schwartz, Program Manager, DARPA/I2O

‒ **Email:** MAA@darpa.mil

‒ **Mailing address**:
DARPA/I2O
ATTN: DARPA-BAA-16-61
675 North Randolph Street
Arlington, VA 22203-2114

‒ **I2O Solicitation Website:**
http://www.darpa.mil/Opportunities/Solicitations/I2O_Solicitations.aspx

VIII. Other Information

A. Frequently Asked Questions (FAQs)

Administrative, technical, and contractual questions should be sent via email to
MAA@darpa.mil. All questions must be in English and must include the name, email address,
and the telephone number of a point of contact.

DARPA will attempt to answer questions in a timely manner; however, questions submitted
within 7 days of closing may not be answered. If applicable, DARPA will post FAQs to
http://www.darpa.mil/Opportunities/Solicitations/I2O_Solicitations.aspx.

B. Collaborative Efforts/Teaming

It is DARPA's desire to receive comprehensive, quality responses to this solicitation. To
facilitate strong, collaborative teaming efforts and business relationships, a website
(https://www.schafertmd.com/darpa/i2o/MAA/teaming) has been established. Specific content,
communications, networking, and team formation are the sole responsibility of the participants.
Neither DARPA nor the DoD endorses the destination web site or the information and
organizations contained therein, nor does DARPA or the DoD exercise any responsibility at the
destination. This website is provided consistent with the stated purpose of this solicitation.

C. Proposers Day

The Proposers Day was held on September 27, 2016, in Arlington, VA.

For further information regarding the MAA Proposers Day, including slides from the event,
please see http://www.darpa.mil/work-with-us/opportunities under DARPA-BAA-16-61.

D. Submission Checklist

The following items apply prior to proposal submission. Note that some items may take up to 1
month to complete.

✔	Item	BAA Section	Applicability	Comment
	Abstract	IV.B.1	Optional, but recommended	Conform to stated page limit.
	Obtain DUNS number	IV.B.2.a.i	Required of all proposers	The DUNS Number is the Federal Government's contractor identification code for all procurement-related activities. See http://fedgov.dnb.com/webform/index.jsp to request a DUNS number. Note: requests may take at least one business day.
	Obtain Taxpayer Identification Number (TIN)	IV.B.2.a.i	Required of all proposers	A TIN is used by the Internal Revenue Service in the administration of tax laws. See http://www.irs.gov/businesses/small/international/article/0,,id=96696,00.html for information on requesting a TIN. Note: requests may take from 1 business day to 1 month depending on the method (online, fax, mail).
	Register in the System for Award Management (SAM)	VI.B.7	Required of all proposers	The SAM combines Federal procurement systems and the Catalog of Federal Domestic Assistance into one system. See www.sam.gov for information and registration. Note: new registrations can take an average of 7-10 business days. SAM registration requires the following information: -DUNS number

✔	Item	BAA Section	Applicability	Comment
				-TIN -CAGE Code. A CAGE Code identifies companies doing or wishing to do business with the Federal Government. If a proposer does not already have a CAGE code, one will be assigned during SAM registration. -Electronic Funds Transfer information (e.g., proposer's bank account number, routing number, and bank phone or fax number).
	Register in E-Verify	VI.B.6	Required for proposers requesting procurement contracts	E-Verify is a web-based system that allows businesses to determine the eligibility of their employees to work in the United States. See http://www.uscis.gov/e-verify for information and registration.
	Ensure representations and certifications are up to date	VI.C.2	Required of all proposers	Federal provisions require entities to represent/certify to a variety of statements ranging from environmental rules compliance to entity size representation. See http://www.sam.gov for information.
	Ensure eligibility of all team members	III	Required of all proposers	Verify eligibility, as applicable, for in accordance with requirements outlined in Section 3.
	Register at Grants.gov	IV.E.1.c	Required for proposers requesting cooperative agreements	Grants.gov requires proposers to complete a one-time registration process before a proposal can be electronically submitted. If proposers have not previously registered, this process can take between three business days and four weeks if all steps are not completed in a timely manner. See the Grants.gov user guides and checklists at http://www.grants.gov/web/grants/applicants/applicant-resources.html for further information.

The following items apply as part of the submission package:

✔	Item	BAA Section	Applicability	Comment
	Volume 1 (Tech/Management Proposal)	IV.B.2.a	Required of all proposers	Conform to stated page limits and formatting requirements. Include all requested information.
	Appendix A	IV.B.2.a.xii	Required of all proposers	-Team member identification - Government/FFRDC team member proof of eligibility - Organizational conflict of interest affirmations - Intellectual property assertions - Human subjects research - Animal use - Unpaid delinquent tax liability/felony conviction representations -CASB disclosure, if applicable
	Volume 2 (Cost Proposal)	IV.B.2.b	Required of all proposers	- Cover Sheet - Cost summary - Detailed cost information including justifications for direct labor, indirect costs/rates, materials/equipment, subcontractors/consultants, travel, ODCs - Cost spreadsheet file (.xls or equivalent format) - If applicable, list of milestones for 845 OTs - Subcontractor plan, if applicable Subcontractor cost proposals - Itemized list of material and equipment items to be purchased with vendor quotes or engineering estimates for material and equipment more than $50,000 - Travel purpose, departure/arrival destinations, and sample airfare

Dr. Carey D. Schwartz
Program Officer
I2O
DARPA
703 696 2258
carey.schwartz@darpa.mil

Biosketch:
Prior to joining DARPA, Dr. Schwartz served as a program officer at the Office of Naval Research (ONR) where he developed and managed programs in information science and technology, advanced analytics and computational methods for decision making. From 2002-2008 Dr. Schwartz was a DARPA Program Manager in the Defense Science Office where he created and managed programs in applied and computational mathematics.

Earlier in his government career Dr. Schwartz was employed by the Naval Air Warfare Center Weapons Division (NAWC-WD), serving in a sequence of positions of increasing responsibility including division head of the Sensors and Signal Sciences Division and division head of the Computational Sciences Division.

He has 38 peer-reviewed publications, one patent and has received awards from both DARPA and NAWC-

Feb 2015 – present	Program Officer, DARPA I2O
July 2011 – Jan 2015	Program Officer, Office of Naval Research
Jan 2011 – Present	Senior Research Associate, Applied Research Laboratory PSU
2002 – 2008	Program Manager, DARPA DSO

Physics Division, Research Department, Naval Weapon Center, China Lake

Education
PhD, Physics from Penn State University in 1980
MS, Physics from Penn State University in 1977
BS, Physics from The Cooper Union for the Advancement of Science and Art in 1975

Program:
At DARPA I2O his principal research interests include analytic methods for distinguishing causality from correlation, data to decisions and quantum information sciences.

Current projects
    Modeling Adversarial Activity   DARPA BAA-16-61
        DARPA is soliciting innovative research proposals in the area of modeling adversarial activity for the purpose of producing high-confidence indications and warnings of efforts to acquire, fabricate, proliferate, and/or deploy weapons of mass terrorism (WMT). This solicitation is focused upon the development of mathematical and computational methods that integrate multiple data sources to detect relevant activities and events with high

probability of detection and low rates of false alarms. Proposed research should investigate innovative approaches that enable revolutionary advances in science and technology.

Reconfigurable Imaging (ReImagine) Proposers Day DARPA-SN-16-68

The objectives of the ReImagine program are to demonstrate that a software-reconfigurable imaging system can enable revolutionary capabilities, present a new approach to application development that is more similar to a field programmable gate array (FPGA) programming than to ASIC design, and develop the underlying theory and algorithms that learn to predict and configure the sensor to make the measurements that provide the most value. The ReImagine program aims to demonstrate that a single ROIC architecture can be configured to accommodate multiple modes of imaging operations that may be defined after the chip has been designed. It is anticipated that with the use of 3-D integration, it will be possible to customize the sensor to interface with virtually any type of imaging sensor (e.g., photodiode, photoconductor, avalanche photodiode, or bolometer) and to optimize for any spectral band (e.g. ultraviolet (UV) through long-wave infrared (LWIR)). ReImagine ROICs will also aim to demonstrate that efficient computation within an ROI can enable real-time analysis on much more complex scenes than traditional systems. ReImagine will build on this architecture in an effort to develop and demonstrate the concept of operation, the application requirements, the modes of operation, and the algorithms that will be used.

Old program at ONR
Computational Methods for Decision Making
http://www.onr.navy.mil/Science-Technology/Departments/Code-31/All-Programs/311-Mathematics-Computers-Research/Computational-Methods-Decision-Making.aspx
Information Integration Thrust:
The objectives of the Information Integration thrust is to develop efficient, theoretically sound, and consistent algorithms for organizing, fusing high-dimensional data sources, interpretation of the fused product, determination of the value of data and information, and to investigate their application and potential to support naval applications. Of particular interest to the thrust is the development, maturation and assessment of algorithms that organize high-dimensional datasets of interest to Naval Operations.   ONR is interested in applied research focused on the analysis of image, video, structured database, social or complex networks, hyper-spectral, multispectral, acoustic, sensor array, and other structured datasets as well as assessing the potential value of missing information. Issues that are to be addressed under this thrust include:
   a) methods that lead to structuring unstructured datasets in an organized and meaningful way are desirable and should facilitate more efficient and accurate processing tasks including data matching or alignment, data merging, data search, outlier detection, learning and classification, query response, reasoning and decision making;
   b) automated algorithms that fuse high-dimensional datasets that are comprised of uncertain, incomplete, imprecise, and contradictory data for the purpose of

recognizing and classifying features, objects, entities, activities, patterns of interest, and relationships;

c) assess and understand the quality of the resulting fused battle space picture and its impact on decision making.

Quantum Information Science Program
http://www.onr.navy.mil/Science-Technology/Departments/Code-31/All-Programs/311-Mathematics-Computers-Research/Quantum-Information-Science.aspx
The Quantum Information Science Program supports basic and applied research. The primary focus of the basic research element is the development and understanding of the security implications of quantum key distribution (QKD) protocols and implementations. The applied research program has two primary thrusts. The first is to understand the achievable performance, benefits, and limitations of algorithms for quantum key distribution in a maritime environment that is characterized by the presence of aerosol particles resulting in scattering and potential leakage of information to the environment. While QKD is often regarded as unconditionally secure, it is known that imperfect implementations of the mathematics associated with QKD leads to vulnerable systems. Of particular interest to the Navy for both the basic and applied programs is to develop an understanding of the security implications for QKD in the maritime environment, the development of protocols that simultaneously minimize leakage of information to the environment and the creation of secure networks, as well as schemes to maximize the information carried by a continuous or discrete variable.

The second Quantum Information Science concentration area is the development of algorithms that are interesting, in that they accomplish a useful calculation, and if implemented on a computer would offer exponential speedup relative to a classical algorithm that accomplishes the same function executed on a classical computer. Here, interesting is to be understood as directly supporting a naval function such as routing, weapon-target pairing, etc…, a key application such as radar cross section calculation, or a commonly occurring computational primitive from linear algebra such as eigenvalue/eigenvectors of a sparse matrix with an unfavorable condition number.

ONR BAA 14-010
This 6.2 program is partitioned into four thrusts – resource optimization, automated image understanding, information integration and cyber security.

Recent Special Programs:
FY13 Text Analytics for Data to Decision, 13-SN-0002
FY13 Free Space Optical Quantum Key Distribution, 13-SN-0004
FY13 Computational Methods for Decision Making, 13-SN-0009

Recent MURIs:
FY13 Free Space Optical Quantum Key Distribution (QKD)

Illustrative Publications Reflecting Personal Research Interests:
Multiple quantum well device

Schwartz, Carey
Patent 5036371   1991

Band-Structure and Thermodynamic Properties of He Atoms Near a MgO Surface
Schwartz C; Karimi M; Vidali G
Surface Science 216(1-2), L342-L346   JUN 1989

An efficient algorithm for calculating bound- and resonant -energy spectra
Carey Schwartz
SPIE Vol 792 Quantum Well and Superlattice Physics, 257-263   1987

Asymptotic Potential Coefficients for Rare-Gas and Alkali Atoms and Simple Molecules
Interacting with Metallic Surfaces
Schwartz C; Leroy RJ
Surface Science 166(1), L141-L147   FEB 1986

Multipole Surface-Plasmons and Photoemission Yield Spectra
Schwartz C; Schaich WL
Physical Review B 30(2), 1059-1061   1984

Photostimulated Field-Emission - Image Rounded Barrier Model
Schwartz C; Cole MW
Surface Science 115(2), 290-300   1982

Asymptotic Interaction Between He, H, H2 and a Graphite Surface
Vidali G; Cole MW; Schwartz C
Surface Science 87(1), L273-L277   1979

Semi-Empirical Determination of Atom-Surface Interaction
Schwartz C; Cole MW; Pliva J
Surface Science 75(1), 1-16   1978

Theory of Photostimulated Field Emission
Schwartz, Carey
PhD Thesis, The Pennsylvania State University, 1980.