

Broad Agency Announcement

Assured Micropatching (AMP)

HR001119S0089

September 23, 2019



Defense Advanced Research Projects Agency

Information Innovation Office

675 North Randolph Street

Arlington, VA 22203-2114

Table of Contents

Part I: Overview Information.....	3
Part II: Full Text of Announcement.....	4
I. Funding Opportunity Description.....	4
II. Award Information	17
A. Awards	17
B. Fundamental Research.....	18
C. Disclosure of Information and Compliance with Safeguarding Covered Defense Information Controls.....	18
III. Eligibility Information.....	19
A. Eligible Applicants.....	19
B. Organizational Conflicts of Interest.....	20
C. Cost Sharing/Matching	21
IV. Application and Submission Information	21
A. Address to Request Application Package	21
B. Content and Form of Application Submission.....	21
C. Submission Dates and Times	34
D. Funding Restrictions	34
E. Other Submission Requirements.....	34
V. Application Review Information	37
A. Evaluation Criteria	37
B. Review and Selection Process	38
VI. Award Administration Information	39
A. Selection Notices	39
B. Administrative and National Policy Requirements.....	39
C. Reporting.....	42
VII. Agency Contacts	43
VIII. Other Information	43
A. Frequently Asked Questions (FAQs).....	43
B. Proposers Day	43
C. Submission Checklist.....	44
D. Associate Contractor Agreement (ACA).....	45

PART I: OVERVIEW INFORMATION

- **Federal Agency Name:** Defense Advanced Research Projects Agency (DARPA), Information Innovation Office (I2O)
- **Funding Opportunity Title:** Assured Micropatching (AMP)
- **Announcement Type:** Initial Announcement
- **Funding Opportunity Number:** HR001119S0089
- **Catalog of Federal Domestic Assistance Numbers (CFDA):** 12.910 Research and Technology Development
- **Dates**
 - Posting Date: September 23, 2019
 - Abstract Due Date: October 8, 2019, 12:00 noon (ET)
 - Proposal Due Date: November 20, 2019, 12:00 noon (ET)
 - Proposers Day: September 26, 2019

Anticipated Individual Awards: There are multiple technical areas for this solicitation. Currently, DARPA anticipates multiple awards in Technical Area 1 and Technical Area 2; and a single award for Technical Area 3. DARPA anticipates making multiple awards under this BAA, which has a total anticipated funding amount of approximately \$50 million.

Types of Instruments that May be Awarded: Procurement contracts, cooperative agreements or Other Transactions (grants will not be awarded)

- **Agency Contacts**
 - **Technical POC:** Dr. Sergey Bratus, Program Manager, DARPA/I2O
 - **BAA Email:** AMP@darpa.mil
 - **BAA Mailing Address:**
DARPA/I2O
ATTN: HR001119S0089
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 creating targeted security binary patches (micropatches) to repair legacy binaries of mission-critical systems, with strong guarantees that the patch will not impact the functions of the system. Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

This Broad Agency Announcement (BAA) is being issued, and any resultant selection will be made, using procedures under Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016. Any negotiations and/or awards will use procedures under FAR 15.4. 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 (<https://www.grants.gov/>).

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

Introduction

Our society's infrastructure is increasingly dependent on software deployed on a wide variety of computing devices other than commodity personal computers, such as industrial equipment, automobiles, and airplanes. Unlike commodity computers that have short upgrade cycles and are easily replaceable in case of failure, these computing devices are intended for longer service, and are hard to replace. Thus, the amount of deployed software that needs to be maintained is continually increasing, while the growing use of telemetry on such devices potentially exposes their software to cyber-attacks.

To fix cybersecurity flaws in software, vendors distribute patched versions of the software. Unfortunately, even after a particular flaw has been fully understood, and a remediation approach has been developed and expressed as a source code change in the current version of the software, the ability of vendors to produce patches for all of their deployed devices in a *timely, assuredly safe, and scalable* manner is limited. Additional challenges arise when the exact source code version has been lost, the process for building the software from source code was not documented, and/or the original software development environment is not available. These limitations and challenges result in mission-critical software going unpatched for months to years, increasing the opportunity for attackers.

The goal of AMP is to create the capability for rapid patching of legacy binaries in mission-critical systems, including the cases where the original source code version and/or build process is not available. AMP will create new capabilities to analyze, modify, and fix legacy software in binary form, to produce *assured targeted micropatches* for known security flaws in existing binaries. Micropatches change the fewest possible bytes to achieve their

objective, which minimizes potential side effects, and should enable proofs that the patches will preserve the original baseline functionality of the system. With these proofs, the time to test and deploy the patched system will be reduced from months to days.

Insufficiency of Current Approaches

Today's software methodologies and tools do not support systematic assured modification of binaries, such as synthesizing a change for an existing binary from a source-code level description and safely applying and analyzing the change. Instead, the binary is regarded as an opaque end-point of the build process, to be discarded and re-created from scratch when any changes need to be applied to it. This approach disregards the growing footprint of deployed legacy binaries and the difficulties of preserving build processes for binaries meant to be deployed in long-serving mission-critical infrastructure assets. The challenges of security patching at scale are illustrated by (but are not limited to) the following typical concerns. In these examples, the terms software and firmware are used interchangeably.

A. Re-building binaries from changed source code risks breaking tested baseline functionality.

Although software flaws are commonly understood and fixed at the source code level, the actual operation of a device is controlled by the binary executable image of the software, obtained from the source via the *build process*. The build process produces executable binary units from the source code units via *compilation* and then unifies these units via *linking* into a single executable binary image to be loaded onto the device. The culmination of the software development process for a platform is the *integration* stage, wherein all the binary software modules obtained via their separate build processes are functionally tested as a whole.

Functional testing at the integration stage tests the properties of the binary image as created by the build process rather than those of the source code. The actual accepted or certified baseline of the device's mission-critical functionality is thus as much a product of the compilation, linking, and other build process artifacts as it is of the source code. In particular, testing cannot distinguish whether an intended behavior of the binary code is due to its correct representation in the source code that was correctly translated into the binary executable code, or whether it is actually due to a serendipitous compiler decision that won't be reliably reproduced in another compilation. A small change in the source code, the compiler configuration, or the compiler's internal algorithms could cause the compiler to emit binary code that fails to perform as intended. Since such decisions depend on an exponential number of configuration options, as well as on the particular version of the build tool chain, any recompilation of mission-critical code is fraught with danger, even when the original build environment is exactly reproduced. However, the particulars of the build process are the least likely to be documented, even under otherwise aggressive source control approaches.

Uncertainties of recompiling source code are exacerbated when the exact version of the source code or the build process configuration are not known. Under such circumstances, preserving as much of the known-good binary executable code that has successfully passed integration and testing is advisable. However, this mode of operation is not supported by any existing build chain, as any compilation is undertaken from scratch without regard for the previous binary.

B. Manual micropatching changes to existing binaries are not scalable or assured.

An empirically viable alternative method of fixing known flaws is the so-called manual binary micropatching process. In this process, experts manually decompile and reverse engineer the binary, then analyze the results to find the locus of the desired source code change. They then translate the source code change into a change in the binary executable code that respects the structure of the existing binary, including the original compiler's conventions and artifacts. Further manual analysis ensures that the changes will not disrupt the code paths inherent in the binary's baseline functionality.

However, there is no automated methodology for reasoning about the effects of a binary micropatch on the rest of the system. The changed binary code must undergo the same extensive testing accomplished during the original software's integration stage. In the end, the data flow and control flow properties of a manual binary micropatch are subject to the manual analysis by the expert, unaided by any kind of potentially relevant sophisticated analyses typically performed by the compiler when optimizing code for efficiency. While side-stepping the risks of from-scratch recompilation, manual binary micropatching remains an unscalable approach.

C. Decompilation tools aren't suited to situating patches and do not utilize relevant information.

Decompiling binaries produces source-level code that looks nothing like the original source, and lacks the landmarks to situate the patch, requiring experts to conduct painstaking manual analysis to identify the loci of the needed change. Current binary decompilation and analysis tools that could help situate a source-level security patch into a binary component or highlight deviations of the binary component from an available source code version cannot take advantage of available source code samples, desired code style information, or other available information about the source code or the build process. In a similar vein, there are no tools today for reconstructing an undocumented, lost, or incomplete build process for a binary from available information.

Current decompilers produce source code-level representations that target vague concepts of readability by human reverse engineers. These tools do not support analysis on the resulting decompiled form, recompilation, nor situating of patches. They cannot provide any assurance of non-interference with the intended baseline functionality of the code to be patched.

Current decompilation approaches encompass complex stacks of multi-level heuristics and logics representing the collective experience of many binary analysis experts. These heuristics select particular representations of the binary code semantics from among a wide range of semantically equivalent representations. A state-of-the-art decompiler produces one of many semantically equivalent representations of the code, but lacks the ability to explore the space of such semantically equivalent representations with respect to a particular goal. The lack of clear goals and metrics for the decompilation process stymies the progress of automation techniques. No frameworks exist for searching the space of semantically equivalent representations to select those fit to a purpose.

Compiler research has benefited from the establishment of open, modular architectures and frameworks that enable composable transformations to act on source code and intermediate representations thereof in order to produce performant executable binaries. These frameworks support sophisticated control and data flow analyses of source code for the purposes of performance optimization, parallelization, and security. They take advantage of many purpose-built intermediate representations to facilitate these analyses. No such open infrastructure has appeared to support decompilation.

D. Embedded software faces additional challenges from aging development environments.

For embedded software, the situation is further exacerbated by restrictive licensing and customization of build tools chains, which may be constrained to run on a single computer with an outdated operating system and programming environment. In a typical scenario, a flawed version of a component library is included in an embedded software development kit (SDK) and becomes part of many different firmware images. The version of the library included in the SDK may be modified to integrate with other components of the SDK or to address the embedded platform's features and constraints. When flaws are fixed in the stock version of the library, the SDK version may be left behind—especially in the case when it has been modified. As a result, the availability of a well-understood patch for a stock version does not automatically entail the availability of patches for a multitude of SDK-derived binary firmwares. In such cases, there is no viable automated path for rebuilding these firmwares, and no scalable way of micropatching them.

The AMP program seeks to address these gaps in the current software development paradigm, elevating the tasks of assured manipulation of existing binaries to the first-class status currently enjoyed by the compiler analysis for performance optimization and software verification.

The program seeks breakthroughs in and novel approaches to the following technical challenges including but not limited to:

- Identifying modular units in executable binary images, identifying modules' interfaces, interactions, and linking artifacts to enable subsequent assured re-linking and re-integration of patched binary modules;
- Decompiling the executable binary code into forms suitable for automatically situating a patch for a known security flaw existing in the binary;
- Generating minimal-change binary micropatches for existing binary images and for rigorous reasoning about their effects and testing these effects to verify non-interference of the changes with the binary's baseline functionality; and
- Using available sources of information, such as source code and binary samples, to recover missing relevant parts of the source code and the build process.

Program Scope

The AMP program will address rapid patching of software in mission-critical systems by combining techniques from compiler research, binary decompilation and analysis, and program verification. Compiler research to date treats creating executable code as a clean-slate task for every compilation unit, without regard for restrictions imposed by the binary environment into

which the resulting compiled code must be re-integrated. Decompilation has not made effective use of composable semantically-equivalent transformations, which drive state-of-the-art compilation research. And finally, program verification focuses on proving behaviors of programs with respect to their specifications, rather than proving intended behavior equivalence between patched and unpatched binary versions. AMP will create challenges to spur collaborations among experts in these areas, to enable assured modification of binaries via automated micropatching.

Program Structure

The program will produce theories, technologies, and formal proof techniques leading to experimental prototype(s) that will demonstrate the use of targeted micropatches for repairing legacy mission-critical binaries with strong guarantees that the patch will not impact the baseline functions of the system. It is expected that these prototypes will provide a starting point for technology transition to mission-critical software for cyber physical system domains.

The AMP is a 48 month program divided into three Technical Areas (TAs), TA1 Goal-driven decompilation, TA2 Assured recompilation and TA3 Evaluation, organized into three (3) phases; Phase I will be 18 months, followed by an 18-month Phase 2, and then concluded with Phase 3 at 12 months, with milestones as described in Table 1. DARPA anticipates funding multiple technical approaches and performers across the AMP technical areas. It is desired that selected performers be funded through Phase 1, 2, and 3 of the program. Beyond Phase 1, subsequent phases will be considered options, and may or may not be exercised at the sole discretion of the government. Funding of option phases will be based on demonstrated technical progress towards the goals of the AMP program and the availability of funds.

TA1 and TA2 performers should be prepared to work closely with each other in order to support integration of the TA1-goal-driven decompilation results with the TA2-automated, proof-guided relinking of the targeted patch. To facilitate the open exchange of information, performers will have Associate Contractor Agreement (ACA) language included in their award. See Section VIII.D for more information regarding an ACA. While TA3 performers will be a party to the ACA, it is expected that TA3 outputs will be largely independent of TA1 and TA2 work.

Each abstract and proposal may only address one TA. Proposers may submit multiple proposals to any one TA, and they may propose to multiple TAs. In the case of submissions to multiple TAs, the Government reserves the right to decide which, if any, to select for award. A proposer submitting a proposal to TA1 and another to TA2 may be selected to perform on both TAs. However, TA3 performers cannot perform on any other TA.

DARPA encourages proposers to consider the investigation of techniques and strongly prefers proposals that will provide an overall AMP framework that will result in an open, modular architecture for decompilation, analysis, and manipulation of binaries and that embraces free software principles and experimental reproducibility. Proposals restricting technology transition of the AMP technology may be considered a weakness.

The Government will assess performer progress against target goals set for each phase, using a progression of technical challenges as outlined below in the Technical Areas. In addition, an advisory panel composed of participants from interested Government partners may participate in the meetings and in the informal challenges to provide feedback to the PM.

Technical Areas (TAs)

The program will address rapid patching of software in mission-critical systems by combining techniques from compiler research, binary decompilation and analysis, and program verification, through progress in three key technical areas of

- Goal-driven decompilation (TA1)
- Assured recompilation (TA2)
- Evaluation (TA3)

as shown in Figure 1. The first two technical areas are focused on the program’s technical challenges: automatic component and interface discovery, goal-driven decompilation to isolate and analyze the known flawed components, and assured recompilation to rebuild the affected binaries with assured minimal changes and guarantees of non-interference with baseline functionality—in timelines of hours to days instead of the current timelines of months to years. The third technical area provides the program challenge tests to evaluate the results using, but not limited to, a cyber physical mission-critical systems domain use case such as the heavy vehicle domain.

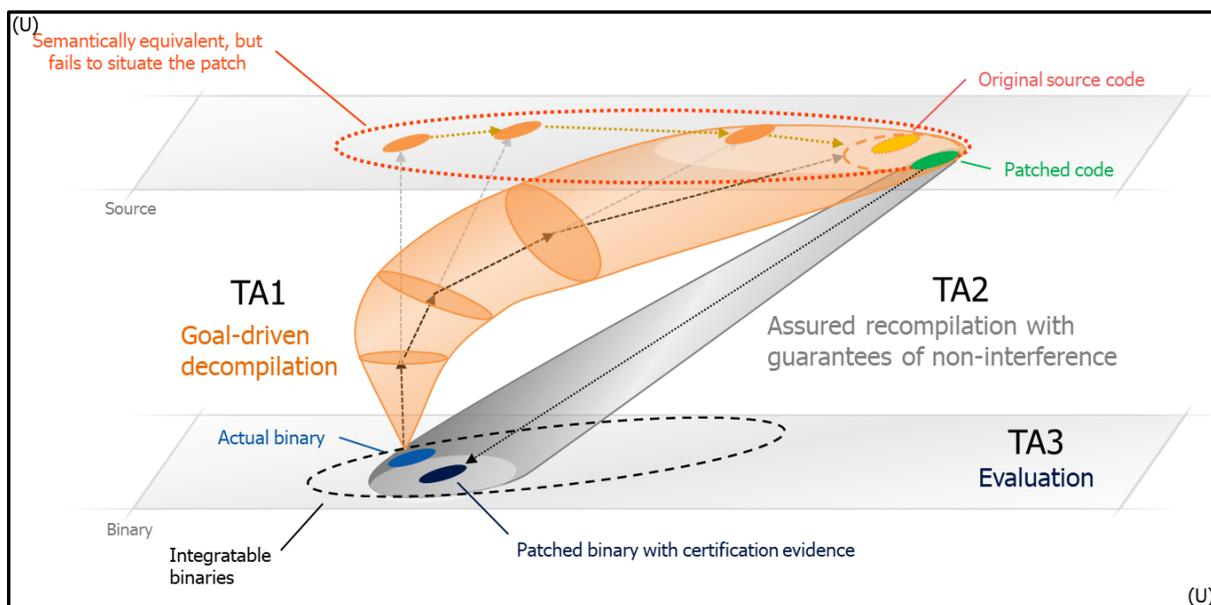


Figure 1 – AMP Technical Areas (TAs)

TA1: Goal-driven decompilation

TA1 performers will develop novel approaches to identify modular units in executable binary images; identify modules’ interfaces, interactions, and linking artifacts to enable subsequent assured re-linking and re-integration of patched binary modules; and, to decompile the executable binary code into forms suitable for automatically situating a patch for a known security flaw existing in the binary.

An AMP TA1 decompiler tools should take advantage of existing source code samples, binary code samples, available parts of the build process, or any other available information and suitable

analysis methods. The decompiler will use this information to direct decompilation towards a goal such as alignment with existing source code, a particular desired pattern or style of the decompiled code, or a fitness function for an analysis task. The resulting goal-driven decompilation prototype will demonstrate feasibility of guiding decompilation towards the goal of automatically situating and analyzing patches for repairing binary flaws.

Strong TA1 proposals will develop new open architectures for decompilers, in which decompiler operations are decoupled from the current stacks of heuristics, are made composable, and enable modular approaches to analysis. Strong TA1 proposals will support interoperability with intermediate representations and specification languages used by leading industry standard tools, and will support creation of and translations between novel intermediate representations required for goal-driven decompilation tasks.

Strong TA1 proposals will present a review of the existing approaches, techniques, and challenges in academia and industry, supported by appropriate literature citations. Strong proposals will offer metrics and benchmarks for evaluating the success of the existing and newly developed technologies, in open reproducible settings.

TA2: Assured recompilation

TA2 performers will focus on the research and development of novel techniques for generating minimal-change binary micropatches for existing binary images and for reasoning about their effects. Proposals should describe approaches to precisely track the effects of patches from their source or source-equivalent high-level abstraction representations to the binary executable code throughout compilation, to identify the footprint of changes on requirements tests, and to rigorously verify non-interference of the changes with the binary's baseline functionality. For cases where the original build process is not available, proposals should describe approaches to use available sources of information, such as source code and binary samples, to recover the build process sufficiently to translate a source-level patch to the executable binary form. TA2 systems should use a suitable representation of the pre-existing binary code, aided by the decompiler analysis from TA1.

The TA2 recompiler tools will reason about a source-level change to produce a targeted binary patch that results in a minimal change of the binary's behaviors with respect to the functional baseline of the pre-existing binary. In addition to the binary patch, the re-compiler will produce a formal representation of the effects of the change, to be used in isolation proofs and for generating tests for guided, limited re-testing of the patched binary image if necessary. Checking isolation proofs and testing and will be performed automatically.

TA2 performers will develop theories to identify and distinguish between the classes of security patches that can be effectively translated into binary micropatches, and the levels of assurance that can be achieved with various analyses of these patches.

Strong TA2 proposals will present a review of the existing approaches, techniques, and challenges in academia and industry, supported by appropriate literature citations. Strong proposals will offer metrics and benchmarks for evaluating the success of the existing and newly developed technologies, in open reproducible settings.

Essential Interactions between TA1 and TA2

TA1 analysis tools are required to provide binary analysis results to assist TA2's reasoning about changes to the binary and the construction of isolation proofs. For example, TA1 tools should produce useful representations of the modules, interfaces, linking artifacts, application binary interfaces (ABI) artifacts, and other relevant artifacts for TA2's use.

Robust interaction is expected and should be planned for between TA1 and TA2 in identifying the goals of automated analyses and in representation of the analysis results such as intermediate representations.

TA3: Evaluation

The TA3 performer will assist the Government team in the development of evaluations for the technological capabilities developed by the TA1 and TA2 performers and to provide feedback to the TA1 and TA2 performers. The TA3 performer will be responsible for defining and executing a testing approach that enables the incremental development and demonstration of AMP capabilities.

The TA3 performer will produce the testbed for evaluating the AMP technological capabilities developed by TA1 and TA2 performers, and will evaluate these capabilities. Evaluation will include both security testing of the AMP micropatching technologies and rigorous testing of the baseline functionality preservation by these technologies, via a series of challenge tests of increasing complexity and difficulty, as described below.

Security Testing Activities

Proposals should describe methods for developing tactics, techniques and procedures capable of demonstrating specific weaknesses in the TA1 and TA2 performers' technologies. Strong TA3 proposals should address TA1 and TA2 performer technologies, integrated system software security proofs/analysis, and AMP system traffic instrumentation.

Evaluation Testbed Development

The series of the challenge tests will progress from *commodity* connected software and firmware in Phase 1, to *real-time* controller units for a cyberphysical system in Phase 2, to a *networked system* of controllers for a cyberphysical system in Phase 3, increasing the technical complexity of the challenges and the assurance guarantees that TA1 and TA2 technologies must meet.

In each challenge test, TA1 and TA2 performers will receive binary software/firmware images alongside with source-level or equivalent high-level representations of the patches that need to be applied to the binary images to fix a known vulnerability. The performers will also be provided with additional information such as relevant source code samples, compiled binary code samples, or elements of the build process. After the performers formulate and apply binary micropatches, the patched images will be tested for robustness, preservation of the baseline functionality, and security.

In addition, TA3 will produce tests to evaluate progress on mechanized TA1 and TA2 analysis tasks against the ground truth, such as precision of decompilation and of relevant binary

analyses. TA3 will ensure that the evaluated technological capabilities are reproducible and at least comparable to those of the state-of-the-art tools.

Strong TA3 proposals shall provide detailed plans, descriptions, and test protocols for creating challenge problems of increasing difficulty culminating in a networked system that are representative of actual mission-critical software and firmware targets, flaws, and fixes in the chosen domain use cases. These challenges will guide the TA1 and TA2 performers in the development of their tools and theories.

The TA3 performer should form strong collaborative relationships with vendors and industry subject-matter experts (SMEs) in the chosen systems domain to formulate the representative challenges, and should collaborate with the Government SMEs to ensure relevance of the developed tests and technologies, and consistency with Government standards for acceptance testing and certification.

Strong proposals shall focus on realistic and industry-relevant patching and testing scenarios, including testing protocols that should be at least as strong as the accepted industry practice. The TA3 performer will submit plans for the challenge problem events to the Government team at least two months prior to each event. Evaluation approaches for maximizing test coverage of unclassified target platforms are highly encouraged.

Program challenge events will be conducted at the performer's site over the course of the program. The events will determine whether TA1 and TA2 technologies are meeting program metrics, thereby aiding the Government in determining the value added for additional AMP program phases. Specific AMP end-of-program goals will be used during the Phase 3 evaluation assessment events. Strong proposals will present detailed plans for organizing the evaluations, demonstrations, and hackathons for the TA1 and TA2 performers using the testbed, as well as plans for allowing the performers suitable access to the testbed to prepare for these events.

Challenges should be drawn from, but not limited to, a cyber physical mission-critical software domain such as heavy vehicle firmware or a similar domain of mission-critical systems combining commodity and real-time components. **The challenges should be suitable for fundamental research, will be shared without limitations with the TA1 and TA2 fundamental research teams, and should not contain Controlled Technical Information (CTI).**

To aid the TA3 proposers, the following discussion of an exemplary evaluation testbed from the heavy vehicle domain is provided below. Proposers are encouraged to enhance it with other relevant challenges, systems, and domains as needed to demonstrate robust assured micropatching capabilities.

Exemplary Evaluation Testbed for a Heavy Vehicle Use Case

- **Phase 1:** A potential evaluation challenge test platform for this phase is a heavy vehicle telematics unit. These units, mandated by the US Department of Transportation for heavy vehicles since December 2017, combine commodity cellular modems with access to the vehicle's systems, as well as management and reporting interfaces. These devices present

security concerns typical for networked embedded commodity systems, yet interact with mission-critical control systems.

- **Phase 2:** Potential evaluation challenges are heavy vehicle brakes, transmission, or engine Electronic Control Units (ECUs). Typically under one million lines of code, these units present a realistic and highly performance-sensitive mission-critical target.
- **Phase 3:** A potential evaluation challenge in this phase is a networked system of multiple ECUs interoperating over the J1939 bus used in heavy commercial vehicles, with appropriate test cases for the whole-system evaluation.

The AMP program metrics are delineated in Table 1, with the respective exemplary test platforms for a heavy vehicle use case noted in the first row.

	Phase 1 (18 months) Commodity	Phase 2 (18 months) Real-time	Phase 3 (12 months) Networked system
<i>Exemplary platform for a heavy vehicle use case</i>	<i>Telematics/ELD unit (commodity OS router/IoT device firmware)</i>	<i>Single ECU firmware (engine, brakes control modules)</i>	<i>Heavy vehicle ECUs as a system (truck-on-a-board)</i>
Testbed platform challenge, size and complexity	Commodity connected device, 100k LOCs, 5-10 components	Real-time control device, 1M LOCs, 10-50 components	Multiple connected devices of 1M+ LOCs
TA1: Goal-driven decompilation	Human-in-the-loop decompilation of individual functions at 60% accuracy relative to ground truth	Automated decompilation of modules at 80% accuracy relative to ground truth	Automated decompilation integrated with industry tools, of realistic binaries at 95% accuracy
TA2: Assured recompilation	Unoptimized compilation of patched code for a single library CVE, statically linked, with no loss of functionality vs ground truth; Semi-manual proofs in 1-2 weeks	Optimizing compilation of patches with dynamic linking and multi-procedure analysis, with no loss of functionality vs ground truth; Automated proofs 1-2 days	Full build chain recovery, integration with industry tools Fully automatic proofs Hours

Legend:	
CVE: Common Vulnerabilities and Exposures	IoT: Internet of Things
ECU: Electronic Control Unit	LOCs: Lines of Code
ELD: Electronic Logging Device	OS: Operating System

Table 1 – AMP Metrics

Program Phases and Metrics

The AMP program is a 48 month effort, divided into three phases: an initial 18-month commodity systems phase, followed by an 18-month real-time systems phase. A final 12-month phase will focus on scaling the technology to a networked system. The schedule is summarized in Figure 2.

Proposers should describe specific devices that they will use for test and evaluation purposes during each of the program phases. To ensure maximum relevance to the government, DARPA will select specific devices to be used in evaluation, at each phase. The specific metrics provided in the remainder of this section are indicative of the expected progress.

- **Phase 1:** The first phase will create the frameworks and the prototypes of the recompiler and the goal-driven decompiler, and apply them to a series of challenges in micropatching commodity embedded software with known flaws. The software is assumed to be connected to the Internet while being a part of a cyberphysical system.
- **Phase 2:** The second phase continues development and successfully applies micropatches to embedded real-time control system software components. The program's midterm exam is the ability to generate micropatches for such performance-sensitive control system components, wherein naively rebuilding a flawed component would result in a non-functional system.
- **Phase 3:** The third and final phase scales the program's success to a networked system of multiple control devices that interoperate over a standard bus to control a cyberphysical system. The units of the system must be patched in concert. Patching of separate components without regard for their interactions would result in a non-functional system.

The AMP program metrics are delineated in Table 1. The first row of the table references the respective exemplary platforms for a heavy vehicle use case.

The Government will assess individual performer efforts in terms of the viability of their technical approaches, the trend in the performance of their systems over time, and their overall progress toward AMP program objectives.

Schedule and Milestones

For each year of the effort, there will be quarterly meetings with the Program Manager (PM), consisting of two site visits and two Principal Investigator (PI) meetings. During these reviews, the PM will assess progress toward solution via performer briefings, technical discussions, demonstrations, and informal end-of-phase evaluations/challenges based on the target goals of each phase.

PI meetings will focus on open technical exchange. Difficulties encountered and possible solutions will also be discussed. The goals of the PI meetings will be to: (a) review and share innovations/accomplishments of the AMP program; (b) review and discuss plans and options for technology demonstrations and prototypes and AMP challenge events (c) review and discuss results from meetings and events conducted prior to the tests and evaluation challenge events; (d) demonstrate prototypes; and (e) plan for the next six-month period.

The Government will specify the locations for the technical interchanges and PI meetings. Challenge events will be held at the TA3 performer's site. For budgeting purposes, assume the locations of the two PI meetings held each year will alternate between Washington, D.C., and at a location on the west coast. Actual locations will be determined on performer locations and relative cost to the Government. In addition to site visits, regular teleconference meetings are encouraged to enhance communications and collaborations, as required, among the performers. Should important issues arise between program reviews, the Government team will be available to support informal interim meetings.

The schedule listed in Figure 2 contains notional estimates. Proposers should propose a detailed schedule that is consistent with the maturity of their approaches and the risk reduction required for their concepts, and their program plan. These schedules will be synchronized across performers, as required, and monitored and revised as necessary, throughout the AMP program’s period of performance. A start date of April 1, 2020, should be assumed for budgeting purposes. Subject to the availability of funding, the program is intended to last for four years.



Figure 2 – AMP Program Schedule

Deliverables

Performers are responsible for providing the following deliverables, as applicable:

- Slide Presentations – Annotated slide presentations will be submitted within two weeks after program kick-off meeting and after each review.
- Quarterly Coordination Reports – A quarterly technical coordination report describing progress made, resources expended, and any issues requiring the attention of the Government team will be provided within 10 calendar days after the end of each quarter. Monthly expenditure reports and uploading of required deliverables to the DARPA Technology Financial Information Management System (TFIMS) reporting system are required by all AMP program performers.
- System Development Plan (SDP) – An SDP will be provided within one month after the kickoff meeting for each phase, and shared with other performers for synchronization. The SDPs for each phase will be based on the performers’ proposal and will be presented at the kickoff meeting for each phase. The SDP will describe the scope of the design and development effort, describe the hardware and software architecture in sufficient detail for review and planning, reference any applicable documents, and provide a program schedule.
- Software – All computer software developed or delivered under the AMP program must be delivered as source and as object (executable) code. Include the source listings and source code for the target computer systems, as well as any build scripts or other

technical information required for DARPA to compile all delivered source code. Delivered software under this effort is to be completely maintainable and modifiable with no reliance on any non-delivered computer programs or documentation.

- Software Documentation – Software documentation shall be provided within one month after the end of each phase documenting source code, hardware description language specifications, system diagrams, part numbers and other data necessary to maintain and to produce copies of the software.
- Hardware - At the conclusion of the last Phase, all custom hardware procured or developed under the AMP program shall be delivered. The delivered components shall be the same as those used to perform the last Phase final performance tests and evaluations. The delivery is to include sufficient documentation so as to be completely operable, maintainable and modifiable with no reliance on any non-delivered hardware or hardware documentation developed or procured under the AMP program.
- Final Technical Report – The final report, due at contract completion, will concisely summarize the effort conducted and provide any lessons learned during the development of the AMP technology.

All reporting must be delivered as required in Section VI.C.

Government-furnished Property/Equipment/Information

Proposals should clearly state any assumptions regarding the use of proposed Government test facilities and capabilities, as well as any proposed Government Furnished Equipment (GFE) used as part of their development, test, and evaluation approach. Proposers should not assume that the Government will provide them with any tools, hardware-in-the-loop testing tools, or ready-to-use threats needed to perform their tasks.

Intellectual Property

A key goal of the AMP program is to facilitate rapid innovation by providing a base for future users or developers of program technologies and deliverables. In particular, the AMP program aims to establish an open, standards-based, multi-source, modular plug-and-play architectures that allow for interoperability and integration. This includes the ability to easily add, remove, substitute, and modify software and hardware components, to facilitate rapid innovation by providing a base for future users or developers of program technologies and deliverables. Therefore, it is desired that all non-commercial 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.

The program will emphasize creating and leveraging open source technology and an open source architecture. Intellectual property rights asserted by proposers are strongly encouraged to be aligned with open source regimes. See Section VI.B.1 for more details on intellectual property.

II. Award Information

A. Awards

DARPA anticipates multiple awards in Technical Area 1 and Technical Area 2; and a single award for Technical Area 3. The level of funding for individual awards made under this solicitation has not been predetermined. Awards will be made to proposers whose proposals are determined to be the most advantageous 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 phases with options for continued work at the end of one or more of the phases, as applicable;
- 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 (OT) depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. Grants will NOT be awarded under this program.

Proposers looking for innovative, commercial-like contractual arrangements are encouraged to consider requesting Other Transactions. To understand the flexibility and options associated with Other Transactions, consult <http://www.darpa.mil/work-with-us/contract-management#OtherTransactions>.

In accordance with 10 U.S.C. § 2371b(f), the Government may award a follow-on production contract or Other Transaction (OT) for any OT awarded under this BAA if: (1) that participant in the OT, or a recognized successor in interest to the OT, successfully completed the entire prototype project provided for in the OT, as modified; and (2) the OT provides for the award of a follow-on production contract or OT to the participant, or a recognized successor in interest to the OT.

In all cases, the Government contracting officer shall have sole discretion to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. 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 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 proposed efforts for fundamental research and non-fundamental research. Some proposed research may present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Based on the anticipated type of proposer (e.g., university or industry) and the nature of the solicited work, the Government expects that some awards will include restrictions on the resultant research that will require the awardee to seek DARPA permission before publishing any information or results relative to the program.

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 determine whether the proposed research shall be considered fundamental and to select the award instrument type. Appropriate language will be included in resultant awards for non-fundamental research to prescribe publication requirements and other restrictions, as appropriate. This language can be found at <http://www.darpa.mil/work-with-us/additional-baa>.

For certain research projects, it may be possible that although the research to be performed by a potential awardee is non-fundamental research, its proposed subawardee’s effort may be fundamental research. It is also possible that the research performed by a potential awardee is fundamental research while its proposed subawardee’s effort may be non-fundamental research. In all cases, it is the potential awardee’s responsibility to explain in its proposal which proposed efforts are fundamental research and why the proposed efforts should be considered fundamental research.

C. Disclosure of Information and Compliance with Safeguarding Covered Defense Information Controls

The following provisions and clause apply to all solicitations and contracts; however, the definition of “controlled technical information” clearly exempts work considered fundamental research and therefore, even though included in the contract, will not apply if the work is fundamental research.

DFARS 252.204-7000, “Disclosure of Information”
DFARS 252.204-7008, “Compliance with Safeguarding Covered Defense Information Controls”
DFARS 252.204-7012, “Safeguarding Covered Defense Information and Cyber Incident Reporting”

The full text of the above solicitation provision and contract clauses can be found at <http://www.darpa.mil/work-with-us/additional-baa#NPRPAC>.

Compliance with the above requirements includes the mandate for proposers to implement the security requirements specified by National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, “Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations” (see <https://doi.org/10.6028/NIST.SP.800-171r1>) that are in effect at the time the BAA is issued.

For awards where the work is considered fundamental research, the contractor will not have to implement the aforementioned requirements and safeguards. However, should the nature of the work change during performance of the award, work not considered fundamental research will be subject to these requirements.

III. Eligibility Information

A. Eligible Applicants

DARPA welcomes engagement from all responsible sources capable of satisfying the Government's needs, including academia (colleges and universities); businesses (large, small, small disadvantaged, etc.); other organizations (including non-profit); other entities (foreign, domestic, and Government); FFRDCs; minority institutions; and others.

DARPA welcomes engagement from non-traditional sources in addition to current DARPA performers.

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

a. FFRDCs

FFRDCs 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. (2) FFRDCs must provide a letter, on official letterhead from their sponsoring organization, that (a) cites the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and (b) certifies the FFRDC's compliance with the associated FFRDC sponsor agreement's terms and conditions. These conditions are a requirement for FFRDCs proposing to be awardees or subawardees.

b. Government Entities

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. 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 and compete with industry. This information is required for Government Entities proposing to be awardees or subawardees.

c. Authority and Eligibility

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. Organizational Conflicts of Interest

FAR 9.5 Requirements

In accordance with FAR 9.5, proposers are required to identify and disclose all facts relevant to potential OCIs involving the proposer's organization and *any* proposed team member (subawardee, consultant). Under this Section, the proposer is responsible for providing this disclosure with each proposal submitted to the BAA. The disclosure must include the proposer's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposer has taken, or intends to take, to prevent the existence of conflicting roles that might bias the proposer's judgment and to prevent the proposer from having unfair competitive advantage. The OCI mitigation plan will specifically discuss the disclosed OCI in the context of each of the OCI limitations outlined in FAR 9.505-1 through FAR 9.505-4.

Agency Supplemental OCI Policy

In addition, DARPA has a supplemental OCI policy that prohibits contractors/performers from concurrently providing Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services and being a technical performer. Therefore, as part of the FAR 9.5 disclosure requirement above, a proposer must affirm whether the proposer or *any* proposed team member (subawardee, consultant) is providing SETA, A&AS, or similar support to any DARPA office(s) under: (a) a current award or subaward; or (b) a past award or subaward that ended within one calendar year prior to the proposal's submission date.

If SETA, A&AS, or similar support is being or was provided to any DARPA office(s), the proposal must include:

- The name of the DARPA office receiving the support;
- The prime contract number;

- Identification of proposed team member (subawardee, consultant) providing the support; and
- An OCI mitigation plan in accordance with FAR 9.5.

Government Procedures

In accordance with FAR 9.503, 9.504 and 9.506, the Government will evaluate OCI mitigation plans to avoid, neutralize or mitigate potential OCI issues before award and to determine whether it is in the Government's interest to grant a waiver. The Government will only evaluate OCI mitigation plans for proposals that are determined selectable under the BAA evaluation criteria and funding availability.

The Government may require proposers to provide additional information to assist the Government in evaluating the proposer's OCI mitigation plan.

If the Government determines that a proposer failed to fully disclose an OCI; or failed to provide the affirmation of DARPA support as described above; or failed to reasonably provide additional information requested by the Government to assist in evaluating the proposer's OCI mitigation plan, the Government may reject the proposal and withdraw it from consideration for award.

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).

For more information on potential cost sharing requirements for Other Transactions, see <http://www.darpa.mil/work-with-us/contract-management#OtherTransactions>.

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 required 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 (<https://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 questions:

- What is the proposed work attempting to accomplish or do?
- How is it done today, and what are the limitations?
- 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?

DARPA will respond to abstracts with a statement as to whether DARPA is interested in the idea. If DARPA does not recommend the proposer submit a full proposal, DARPA will provide feedback to the proposer regarding the rationale for this decision. Regardless of DARPA's response to an abstract, proposers may submit a full proposal. DARPA will review all conforming full proposals using the published evaluation criteria and without regard to any comments resulting from the review of an abstract.

Abstract Format: Abstracts shall not exceed a maximum of 5 pages including the cover sheet and all figures, tables, and charts. The page limit does not include a submission letter (optional).

Reminder – Each abstract submitted in response to this BAA shall address only one TA. Organizations may submit multiple abstracts to any one TA, or they may submit abstracts to multiple TAs.

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 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. All pages should be numbered.

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).

2. Proposals

Proposals consist of Volume 1: Technical and Management Proposal (including mandatory Appendix A and optional Appendix B); Volume 2: Cost Proposal; the Level of Effort Summary by Task Excel spreadsheet; and the PowerPoint summary slide.

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. All pages of Volume 1 should be numbered.

A summary slide of the proposed effort, in PowerPoint format, should be submitted with the proposal. A template slide is provided as an attachment to the BAA. Submit this PowerPoint file in addition to Volumes 1 and 2 of your full proposal, and the Level of Effort Summary by Task Excel spreadsheet. This summary slide does not count towards the total page count.

Reminder – Each proposal submitted in response to this BAA shall address only one TA. Organizations may submit multiple proposals to any one TA, or they may propose to multiple TAs. However, a TA3 submission and award excludes a TA1 and TA2 award.

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 30 pages, 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 (HR001119S0089)
- 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 number, and email address
- Administrative POC including name, mailing address, telephone number, and email address
- Award instrument requested: procurement contract (specify type) and cooperative agreement or OT.¹
- Total proposed cost separated by basic award and option(s), if any, by calendar year and by government fiscal year;
- 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)
- Date proposal was prepared;
- Proposal validity period (minimum 120 calendar days)
- Data Universal Numbering System (DUNS) number²
- Taxpayer Identification Number (TIN)³
- Commercial and Government Entity (CAGE) code⁴
- 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.

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). For further information regarding this subject, please see www.darpa.mil/work-with-us/additional-baa 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. For further information regarding this subject, please see www.darpa.mil/work-with-us/additional-baa.

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 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		
			Phase 1	Phase 2	Phase 3
Name 1	Program name	Proposed	x	x	x
	Project Name 1	Current	x	x	n/a
	Project Name 2	Pending	n/a	x	x
Name 2	Program Name	Proposed	x	x	x
	Project Name 3	Proposed	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. Appendix A: This section is mandatory and must include all of the following components. If a particular subsection is not applicable, state “NONE”. There is no page limit on Appendix A.

- (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 noncommercial 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.2.

- (8). Representations Regarding Unpaid Delinquent Tax Liability or a Felony Conviction under Any Federal Law:** For further information regarding this subject, please see www.darpa.mil/work-with-us/additional-baa.

Please also 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:** For 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 https://www.whitehouse.gov/wp-content/uploads/2017/11/CASB_DS-1.pdf.

If this section is not applicable, state “NONE”. For further information regarding this subject, please see www.darpa.mil/work-with-us/additional-baa.

xii. Appendix B: If desired, include a brief bibliography to relevant papers, reports, or resumes. 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, .xlsx 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, with the addition of the following:

- Label: “Proposal: Volume 1”
- Name, address, and telephone number of the proposer’s cognizant Defense Contract Management Agency (DCMA) administration office (*if known*);
- Name, address, and telephone number of the proposer’s cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
- Any Forward Pricing Rate Agreement, other such approved rate information, or such documentation that may assist in expediting negotiations (if available).

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 from a Government audit agency such as the Defense Contract Audit Agency (DCAA), the Office of Naval Research (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.), and a cross reference to the Statement of Work (SOW) task/s that require the item/s. 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) Consultant Costs:

If consultants are to be used, proposer must provide a copy of the consultant's proposed SOW as well as a signed consultant agreement or other document which verifies the proposed loaded daily / hourly rate and any other proposed consultant costs (e.g. travel).

(6) Subcontractor: Provide above information for each proposed subcontractor/consultant. Subcontractor cost proposals must include interdivisional work transfer agreements or similar arrangements. 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 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 cost proposals are not included as part of Volume 2, they may be emailed separately to AMP@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 proposal documentation which is not uploaded to the DARPA BAA Submission Website 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.

(7) Other Direct Costs (ODCs): Provide an itemized breakout and explanation of all anticipated ODCs.

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

(1) Proposals exceeding the Certification of Cost or Pricing Threshold: 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 (total contract amount including options) 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.

(3) 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: Proposers must indicate whether they qualify as a nontraditional Defense contractor⁵, have teamed with a nontraditional Defense contractor, or are providing a one-third cost share for this effort. Provide information to support the claims.

Provide a detailed list of milestones including: description, completion/exit criteria, due date, and payment/funding schedule (to include, if cost share is proposed, contractor and Government share amounts). For each data deliverable, identify the proposed Government IP rights (keep in mind how each data/software deliverable will be used by the Government given the goals and objectives of the proposed project.) 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.

c. Level of Effort Summary by Task Spreadsheet

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. Submit the Level of Effort Summary Excel file (do not convert the Excel file to pdf format) in addition to Volume 1 and Volume 2 of your full proposal. This Excel file does not count towards the total page count.

⁵ For definitions and information on an OT agreement see <http://www.darpa.mil/work-with-us/contract-management>.

SOW Task	Duration (months)	Intensity (hrs/mo)	Labor Hours for Prime						Labor Hours for Subcontractor/Consultants						Total	
			Sr	Skill set(s)	Mid	Skill set(s)	Jr	Skill set(s)	Total	SubC-Sr	Skill set(s)	SubC-Mid	Skill set(s)	SubC-Jr		Skill set(s)
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 <i>First column is prime, second is total subcontractor, third is total consultant, fourth is total</i>									\$ 44,000	\$ 12,000					\$ 2,000	\$ 58,000
									\$ 8,000	\$ -					\$ -	\$ 8,000
2.1.0 <Phase 2 Task 1 name>	8	100	176		560		64		800	100					100	1,000
2.1.1 <Subtask 2.1.1 name>	7	51	96		240		24		360	100					100	560
2.1.2 <Subtask 2.1.2 name>	4	110	80		320		40		440	-					-	440
2.2.0 <Phase 2 Task 2 name>	6	417	180		520		1,800		2,500	1,240					-	3,740
2.2.1 <Subtask 2.2.1 name>	4	435	140		400		1,200		1,740	400					-	2,140
2.2.2 <Subtask 2.2.2 name>	4	190	40		120		600		760	840					-	1,600
:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Phase 2 Total Hours			356		1,080		1,864		3,300	1,340					100	4,640
Phase 2 Costs <i>First column is prime, second is total subcontractor, third is total consultant, fourth is total</i>									\$ 47,000	\$ 12,000					\$ 2,000	\$ 61,000
									\$ 4,000	\$ -					\$ -	\$ 4,000
3.1.0 <Phase 3 Task 1 name>	9	71	120		400		120		640	100					100	840
3.1.1 <Subtask 3.1.1 name>	3	93	40		200		40		280	100					100	480
3.1.2 <Subtask 3.1.2 name>	6	60	80		200		80		360	-					-	360
3.2.0 <Phase 3 Task 2 name>	6	460	160		800		1,800		2,760	1,200					-	3,960
3.2.1 <Subtask 3.2.1 name>	4	370	80		400		1,000		1,480	600					-	2,080
3.2.2 <Subtask 3.2.2 name>	3	427	80		400		800		1,280	600					-	1,880
:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Phase 3 Total Hours			280		1,200		1,920		3,400	1,300					100	4,800
Phase 3 Costs <i>First column is prime, second is total subcontractor, third is total consultant, fourth is total</i>									\$ 48,000	\$ 12,000					\$ 2,000	\$ 62,000
									\$ -	\$ -					\$ -	\$ -
Project Total Hours			984		3,360		5,608		9,952	4,040					400	14,092
Total Project Costs <i>First column is prime, second is total subcontractor, third is total consultant, fourth is total</i>									\$ 139,000	\$ 36,000					\$ 6,000	\$ 181,000
									\$ 12,000	\$ -					\$ -	\$ 12,000

Figure 3: Example level-of-effort summary table. Numbers illustrate roll-ups and subtotals. The SubC column captures all subcontractor hours and the Consult column captures all consultant hours. The Skill set(s) columns should indicate an area of expertise (e.g., engineer, software developer, data scientist, subject matter expert).

d. Summary Slide

The submission of a PowerPoint slide summarizing the proposed effort is mandatory. A template PowerPoint slide will be provided on the Federal Business Opportunities (FedBizOpps) website, as well as on the Grants.gov website, as an attachment. Submit the PowerPoint file (do not convert PowerPoint file to pdf format) in addition to Volume 1 and Volume 2 of your full proposal. This summary slide does not count towards the total page count.

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 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.

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.C for further information.

When utilizing the DARPA BAA Submission Website, as described below in Section IV.E.1 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.

For proposal submissions requesting cooperative agreements, Section IV.E.1.c, you must request your control number via email at AMP@darpa.mil. Please note that the control number will not be issued until after the proposal due date and time.

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 8, 2019 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, appendices to unclassified proposals -- must be submitted per the instructions outlined herein and received by DARPA no later than **November 20, 2019 at 12:00 noon (ET)**. Proposal submissions received after this date and time will not be reviewed.

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. Emailed submissions of abstracts or full proposals 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 Email or 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 on the right side of the page, using the Chrome browser. 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 AMP@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.

Abstracts should not be submitted via Email or Grants.gov. Any abstracts submitted by Email or Grants.gov will not be accepted or reviewed.

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 on the right side of the page, using the Chrome browser. 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 AMP@darpa.mil.

Since proposers may encounter heavy traffic on the web server, it is highly recommended that proposers not wait until the day proposals are due to request an account and/or upload the submission. Full proposals should not be submitted via Email. Any full proposals submitted by Email will not be accepted or evaluated.

c. Proposals Requesting a Cooperative Agreement

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

<https://www.grants.gov/web/grants/applicants.html> for further information.

Proposers requesting cooperative agreements must submit proposals through one of the following methods: (1) electronic upload per the instructions at <https://www.grants.gov/applicants/apply-for-grants.html>; or (2) hard-copy mailed directly to DARPA. 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 Grants.gov do not submit hard-copy proposals in addition to the Grants.gov electronic submission.

Submissions: Proposers must submit the three forms listed below.

SF 424 Research and Related (R&R) Application for Federal Assistance, available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_SF424_2_0-V2.0.pdf. *This form must be completed and submitted.*

To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C. A§ 1681 Et. Seq.), the Department of Defense is using the two forms below to collect certain demographic and career information to be able to assess the success rates of women who are proposed for key roles in applications in science, technology, engineering, or mathematics disciplines. Detailed instructions for each form are available on Grants.gov.

Research and Related Senior/Key Person Profile (Expanded), available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_KeyPersonExpanded_2_0-V2.0.pdf. *This form must be completed and submitted.*

Research and Related Personal Data, available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_PersonalData_1_2-V1.2.pdf. *Each applicant must complete the name field of this form, however, provision of the demographic information is voluntary. Regardless of whether the demographic fields are completed or not, this form must be submitted with at least the applicant's name completed.*

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 innovative, feasible, achievable, and complete.
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.

Proposer should also take note to the information provided in Section I, as DARPA will also look at how a proposer addresses the technical challenges relevant to each TA, as well as view how key personnel will work on those challenges.

– *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 make pivotal early technology investments that create or prevent strategic surprise for U.S. National Security.

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 and the basis for the estimates).

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. Conforming proposals comply with all requirements detailed in this BAA; proposals that fail to do so may be deemed non-conforming and may be removed from consideration. 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 noncommercial 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/open architecture regimes.

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 IP 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 IP 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 in Appendix A 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.xi.(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 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.xi.(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.xi.(5).

2. Human Subjects Research (HSR)/Animal Use

Proposers that anticipate involving human subjects or animals in the proposed research must comply with the approval procedures detailed at <http://www.darpa.mil/work-with-us/additional-baa>, to include providing the information specified therein as required for proposal submission.

3. 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.

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

All proposers must be registered in SAM unless exempt per FAR 4.1102. FAR 52.204-7, "System for Award Management" and FAR 52.204-13, "System for Award Management Maintenance" are incorporated into this BAA. See <http://www.darpa.mil/work-with-us/additional-baa> for further information.

International entities can register in SAM by following the instructions in this link: https://www.fsd.gov/fsd-gov/answer.do?sysparm_kbid=dbf8053adb119344d71272131f961946&sysparm_search=KB0013221.

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).

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, at a minimum, monthly financial status reports and a quarterly 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 4.1102 and 4.1201, proposers requesting a procurement contract must complete electronic annual representations and certifications at <https://www.sam.gov/>. In addition, resultant procurement contracts will require supplementary DARPA-specific representations and certifications. See <http://www.darpa.mil/work-with-us/additional-baa> for further information.

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. Terms and Conditions

For terms and conditions specific to grants and/or cooperative agreements, see the DoD General Research Terms and Conditions (latest version) at <http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions> and the supplemental DARPA-specific terms and conditions at <http://www.darpa.mil/work-with-us/contract-management#GrantsCooperativeAgreements>.

5. FAR and DFARS Clauses

Solicitation clauses in the FAR and DFARS relevant to procurement contracts and FAR and DFARS clauses that may be included in any resultant procurement contracts are incorporated herein and can be found at www.darpa.mil/work-with-us/additional-baa.

See also Section II.C regarding the disclosure of information and compliance with safeguarding covered defense information controls (for FAR-based procurement contracts only).

6. 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>.

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

Further information on Controlled Unclassified Information on Non-DoD Information Systems is incorporated herein can be found at www.darpa.mil/work-with-us/additional-baa.

VII. Agency Contacts

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

- **Technical POC:** Dr. Sergey Bratus, Program Manager, DARPA/I2O
- **Email:** AMP@darpa.mil
- **Mailing address:**
DARPA/I2O
ATTN: HR001119S0089
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 AMP@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. Proposers Day

The AMP Proposers Day will be held on September 26, 2019, in Arlington, VA. The special notice regarding the AMP Proposers Day, DARPA-SN-19-76, can be found at <https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-19-76/listing.html>.

For further information regarding the AMP Proposers Day, including slides from the event, please see <http://www.darpa.mil/work-with-us/opportunities> under HR001119S0089.

C. Submission Checklist

The following items apply prior to proposal submission. Note: 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.4	Required of all proposers	The SAM combines Federal procurement systems and the Catalog of Federal Domestic Assistance into one system. See https://sam.gov/portal/SAM/##11#1 for information and registration. Note: new registrations can take an average of 7-10 business days. SAM registration requires the following information: -DUNS number -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).
	Ensure eligibility of all team members	III	Required of all proposers	Verify eligibility, as applicable, for in accordance with requirements outlined in Section 3.

The following items apply as part of the submission package:

✓	Item	BAA Section	Applicability	Comment
	Volume 1 (Technical and Management Proposal)	IV.B.2	Required of all proposers	Conform to stated page limits and formatting requirements. Include all requested information.
	Appendix A	IV.B.2.a.xi	Required of all proposers	-Team member identification - Government/FFRDC team member proof of eligibility - Organizational conflict of interest affirmations

				<ul style="list-style-type: none"> - Intellectual property assertions - Human subjects research - Animal use - Unpaid delinquent tax liability/felony conviction representations -CASB disclosure, if applicable
	Appendix B	IV.B.2.a.xii	Optional of all proposers	<ul style="list-style-type: none"> - Appendix B does not count against the page limit - A brief bibliography to relevant papers, reports, or resumes - Do not include technical papers - The materials in Appendix B will not be evaluated as part of the proposal review
	Volume 2 (Cost Proposal)	IV.B.2.b	Required of all proposers	<ul style="list-style-type: none"> - 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 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
	Level of Effort Summary by Task Excel spreadsheet	IV.B.2.c	Required of all proposers	A template LoE Excel file will be provided on the FedBizOpps website as an attachment. Submit the LoE Excel file (do not convert Excel file to pdf format).
	PowerPoint Summary Slide	IV.B.2.d	Required of all proposers	A template PowerPoint slide will be provided on the FedBizOpps website as an attachment. Submit the PowerPoint file (do not convert PowerPoint file to pdf format).

D. Associate Contractor Agreement (ACA)

This same or similar language will be included in contract awards against HR001119S0089. Awards other than FAR based contracts will contain similar agreement language:

(a) It is recognized that success of the AMP research effort depends in part upon the open exchange of information between the various Associate Contractors involved in the effort. This language is intended to insure that there will be appropriate coordination and integration of work by the Associate Contractors to achieve complete compatibility and to prevent unnecessary duplication of effort. By executing this contract, the Contractor assumes the responsibilities of an Associate Contractor. For the purpose of this ACA, the term Contractor includes subsidiaries, affiliates, and organizations under the control of the contractor (e.g. subcontractors).

(b) Work under this contract may involve access to proprietary or confidential data from an Associate Contractor. To the extent that such data is received by the Contractor from any Associate Contractor for the performance of this contract, the Contractor hereby agrees that any proprietary information received shall remain the property of the Associate Contractor and shall be used solely for the purpose of the AMP research effort. Only that information which is

received from another contractor in writing and which is clearly identified as proprietary or confidential shall be protected in accordance with this provision. The obligation to retain such information in confidence will be satisfied if the Contractor receiving such information utilizes the same controls as it employs to avoid disclosure, publication, or dissemination of its own proprietary information. The receiving Contractor agrees to hold such information in confidence as provided herein so long as such information is of a proprietary/confidential or limited rights nature.

(c) The Contractor hereby agrees to closely cooperate as an Associate Contractor with the other Associate Contractors on this research effort. This involves as a minimum:

- (1) maintenance of a close liaison and working relationship;
- (2) maintenance of a free and open information network with all Government-identified associate Contractors;
- (3) delineation of detailed interface responsibilities;
- (4) entering into a written agreement with the other Associate Contractors setting forth the substance and procedures relating to the foregoing, and promptly providing the Agreements Officer/Procuring Contracting Officer with a copy of same; and,
- (5) receipt of proprietary information from the Associate Contractor and transmittal of Contractor proprietary information to the Associate Contractors subject to any applicable proprietary information exchange agreements between associate contractors when, in either case, those actions are necessary for the performance of either.

(d) In the event that the Contractor and the Associate Contractor are unable to agree upon any such interface matter of substance, or if the technical data identified is not provided as scheduled, the Contractor shall promptly notify the DARPA AMP Program Manager. The Government will determine the appropriate corrective action and will issue guidance to the affected Contractor.

(e) The Contractor agrees to insert in all subcontracts hereunder which require access to proprietary information belonging to the Associate Contractor, a provision which shall conform substantially to the language of this ACA, including this paragraph (e).

(f) Associate Contractors for the AMP research effort include:

Contractor	Technical Area
------------	----------------

(end of ACA)

For information concerning agency level protests see <http://www.darpa.mil/work-with-us/additional-baa#NPRPAC>.