Broad Agency Announcement
Spectrum Collaboration Challenge (SC2): Collaborative Intelligent Radio Networks
Microsystems Technology Office
DARPA-BAA-16-47
19 July 2016

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PART I: OVERVIEW INFORMATION

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Microsystems Technology Office (MTO)
- **Funding Opportunity Title** – Spectrum Collaboration Challenge (SC2): Collaborative Radio Networks
- **Announcement Type** – Initial Announcement
- **Funding Opportunity Number** – DARPA-BAA-16-47
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – Not Applicable
- **Dates**
  - Posting Date: 19 July 2016
  - Proposal Due Date: 2 September 2016, 1:00 PM Eastern
  - Estimated period of performance start: 24 January 2017
- **Concise description of the funding opportunity:** DARPA is soliciting innovative research proposals in the area of collaborative and intelligent radio (CIR) networks targeted at creating wireless networks that can autonomously manage and optimize their use of radio frequency (RF) spectrum without pre-planning or prior knowledge of other networks occupying the same spectrum. The networks for all participant teams will be evaluated in a series of competitive, tournament-style events in the DARPA Spectrum Collaboration Challenge.
- **Anticipated individual awards:** Multiple awards of up to $2,000,000 per team over 3 Phases: Up to $500,000 for the first Phase award; Up to $750,000 per Phase for Phases 2 and 3.
- **Anticipated funding type** – 6.2
- **Types of instruments that may be awarded** – FAR-based procurement contract (Firm-Fixed-Price contract)
- **Any cost sharing requirements** – None
- **Agency contact:**
  - Mr. Paul Tilghman, Program Manager
    BAA Coordinator: DARPA-BAA-16-47@darpa.mil
    DARPA/MTO
- **Challenge Website:** www.SpectrumCollaborationChallenge.com

PROPOSERS ARE CAUTIONED THAT EVALUATION RATINGS MAY BE LOWERED AND/OR PROPOSALS REJECTED IF PROPOSAL PREPARATION (PROPOSAL FORMAT, CONTENT, ETC.) AND/OR SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

PART II: FULL TEXT OF ANNOUNCEMENT

I. Funding Opportunity Description

The Defense Advanced Research Projects Agency (DARPA) often selects its research efforts through the Broad Agency Announcement (BAA) process. This BAA is being issued, and any resultant selection will be made, using procedures under Federal Acquisition Regulation (FAR) 35.016. Any negotiations and/or awards will use procedures under FAR 15.4, Contract Pricing, as specified in the BAA. 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 (FedBizOpps) website, http://www.fbo.gov/. The following information is for those wishing to respond to the BAA.

DARPA is soliciting innovative research proposals in the area of collaborative and intelligent radio (CIR) networks targeted at creating wireless networks that can autonomously manage and optimize their use of radio frequency (RF) spectrum without pre-planning or prior knowledge of other networks occupying the same spectrum. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

DARPA encourages all parties interested in submitting proposals to this BAA to visit the official website of the DARPA Spectrum Collaboration Challenge (SC2) (www.SpectrumCollaborationChallenge.com) and to review the SC2 Rules document for a full description of the Challenge.

A. Overview

Under the authority of 10 U.S.C. § 2374a to stimulate innovations using prize competition, the DARPA SC2 will use a series of tournament events to spur development of next-generation wireless networks which make more effective use of the RF spectrum. These networks will be capable of intelligently optimizing the spectrum by collaborating with, and learning from, the other systems that occupy the spectrum with them. In competitive events across three phases, teams will be asked to devise machine learning based strategies that allow their CIR network to autonomously communicate without preplanning or knowledge of the other networks. The winning team will be able to consistently find techniques which optimize not just their own wireless throughput but the total throughput of all radio networks in the spectrum.

B. Motivation for the Spectrum Collaboration Challenge

Across the nation and around the world, the wireless revolution is fueling a voracious demand for access to the RF spectrum. In the civilian sector, consumer devices from smartphones to wearable fitness recorders to smart kitchen appliances are competing for bandwidth. In the military there is growing reliance on unmanned platforms, from underwater sensors to satellites, and a push for broadband connectivity for every member of every Service. All told, some 50 billion wireless devices are projected to be vying for access to mobile communications networks

within the next few years and by 2030, the demand for wireless access could be 250 times what it is today.

Managing this increasing demand, while combating what appears to be a looming scarcity of RF spectrum is a serious problem for our nation, both militarily and economically.

Today's approach, which is nearly a century old, isolates wireless systems by dividing the spectrum into exclusively licensed bands, which are allocated over large, geographically defined regions. This approach rations access to the spectrum in exchange for the guarantee of interference-free communication. However, allocation is human-driven and not adaptive to the dynamics of supply and demand. At any given time, many allocated bands are unused by licensees while other bands are overwhelmed, thus squandering the spectrum's enormous capacity and unnecessarily creating conditions of scarcity. The current situation also poses potential security risks for the military, creating the impression of reliable and unfettered access to the spectrum while in actuality creating a well-defined target for adversaries that may wish to disrupt wireless operations.

Small pockets of unlicensed bands use spectrum freely today, hinting at the viability of a new norm of "shared spectrum." In 2015 close to half of the global internet traffic was carried by WiFi within these unlicensed bands. Unlike licensed bands, these systems avoid interfering with their neighbors using simple sense-and-avoid techniques, however in our dense and diverse spectrum future, these simple strategies won't work. To harvest the full capacity out of the RF spectrum, we need to abandon these simple avoidance and isolation techniques. Future radios will need to lose their isolation safety net and use greater intelligence to avoid interference while maximizing utility. These radios will need to be able to collaborate directly with their peers to derive stable and satisfactory communications for all.

The goal of DARPA SC2 is for competitors to develop a new wireless paradigm of collaborative, local, real-time decision-making. Without strict frequency allocations, radio networks will autonomously collaborate to sense the local RF landscape, reason how to avoid interference, and exploit opportunities to achieve efficient use of the available spectrum. This new breed of collaborative intelligent radio networks could give rise to a rich spectral ecosystem able to accommodate an enormous diversity of communicating devices while operating 100 to 1,000 times more efficiently than today's wireless networks.

By taking advantage of recent advances in artificial intelligence (AI) and machine learning, and the expanding capacities of software-defined radios, SC2 teams will tackle the challenges that stand in the way of realizing truly efficient and adaptive use of the spectrum. Ultimately this competition aims not only to challenge innovators in academia and business to produce breakthroughs in collaborative AI, but to catalyze the creation of a new paradigm that will provide a new era of spectrum abundance.

C. Program Structure

The SC2 program will consist of three 12-month phases, each culminating in a competitive tournament-style event. Phases 1 and 2 will both end with a Preliminary Event (PE1 and PE2,

respectively) and Phase 3 will conclude with the SC2 Championship Event (SCE). The results of each Preliminary Event will be used to determine awards and prizes.

SC2 Championship Event Prizes	
1st Place	$2,000,000
2nd Place	$1,000,000
3rd Place	$750,000

The Challenge provides two tracks for participants: a Proposal Track and an Open Track. Proposal Track teams must submit a proposal in response to this BAA (DARPA-BAA-16-47) and, if selected in accordance with the evaluation criteria in the BAA, will directly enter into a contract with DARPA. Open Track teams must successfully complete entrance hurdles, outlined in the SC2 Rules Document, that demonstrate their ability to develop software defined radios and apply applicable machine learning techniques. Teams from both tracks are treated identically during the competitive events and have the potential to compete with each other in the Preliminary and Championship events.

Up to 30 teams may be selected to participate in the competition. DARPA, at its discretion, may adjust the number of teams accepted to compete due to technical or funding limitations, the number of applications received, or other factors.

The characteristics of the two tracks are summarized in the following table.

Requirement	Proposal Track	Open Track
Respond to this BAA	Yes	No
Contract funding	Yes	No
Submit Application Form	No	Yes
Complete Entrance Hurdles	No	Yes
Cash prizes at PE1, PE2 and SCE	SCE only	Yes

1. Open Track

Teams that choose to participate in the SC2 without DARPA contract funding may apply under the Open Track. Application material and the SC2 Rules Document, which contains Open Track participant information, are available on the Spectrum Collaboration Challenge website (www.SpectrumCollaborationChallenge.com). **Open Track applications should not be submitted in response to this BAA.** Proposal Track teams receiving an award through DARPA-BAA-16-47 may not simultaneously participate in the Open Track, however a team whose proposal is not selected for DARPA funding under the Proposal Track may opt to register under the Open Track.

Teams participating in the Open Track are eligible for all prizes issued in the events they participate in. Top finishers in each of the Preliminary Events will receive $750,000 and the top three teams in the SC2 Championship Event, ranked from the combined group of Open and Proposal Track teams, will receive the prize awards shown above.

2. Proposal Track

Teams that seek to fund their participation in the SC2 via the Proposal Track may submit a proposal in response to this BAA. All proposals will be evaluated in accordance with the evaluation criteria stated in this BAA. Proposal Track teams selected for a contract award under this BAA may not simultaneously participate in the Open Track, however a team whose proposal is not selected for funding under the Proposal Track may opt to register under the Open Track. Any team that is eliminated or otherwise withdraws from the Proposal Track after their initial contract award may be eligible to qualify for participation under the Open Track by successfully completing the applicable Entrance Hurdles (see the SC2 Rules Document available on the SC2 website).

Teams selected for award under this BAA (the Proposal Track) may be funded up to $500,000 in Phase 1. Two additional phases, up to $750,000 each, may be exercised at DARPA's discretion if the team places among the top finishers (tentatively 10 teams) in PE1 and PE2, respectively. If a Proposal Track team fails to place in the Preliminary Events, their funding for follow-on phases may not be exercised, thus ending their Government funding.

In addition to contract funding, Proposal Track teams are also eligible for SCE prizes, in which finishers are ranked from the combined group of Open and Proposal Track teams, subject to the requirements outlined in the Rules Document which can be found on the SC2 website: www.SpectrumCollaborationChallenge.com.

D. Collaborative Intelligent Radio (CIR) Technical Description

To participate in SC2, each team will develop CIR software to run on a Standard Radio Node (SRN), provided by DARPA. The SRN consists of a standard commercial-off-the-shelf (COTS) software programmable radio coupled with a host processing computer. The Government anticipates using Ettus Research X310 software defined radios. Each RN will have programmable logic in the form of a field programmable gate array (FPGA), likely a Xilinx Kintex-7, a multi-core general purpose processor (GPP), likely a Dell R630, and a Nvidia graphical processing unit (GPU).

Proposers should refer to the SC2 Rules Document for more information on the SRN. Details of the configuration of the SRN will be published in the SC2 System Specification Document, which will be made available on the SC2 website at a later date. Proposals should address how their CIR technology addresses these following five key areas: Reconfigurable Radio, RF Environment Understanding, Reasoning, Contextualization, and Collaboration.

1. Reconfigurable Radio

The ability to interact with and accommodate the needs of other radio systems is predicated on a CIR's ability to flexibly adapt to the changing scenarios it finds itself in. Strong CIR designs will implement a reconfigurable communications system, exposing their decision-making engines to a wide variety of tunable radio parameters to be able to operate under these scenarios. Proposers

will need to consider which tunable parameters are of most value to their CIR's and the extent to which their radios are able to freely select among them. Tunable frequency, bandwidth, modulation, coding, medium access, spatial directivity, and networking along with the plethora of options available to radio designer under each of these disciplines should be considered. Proposals should discuss the adaptation envelope and justify design decisions.

2. RF Environment Understanding

In order to inform decision making, the proposed systems must understand the composition and characteristics of the RF environment around them. This potentially includes: understanding large and small-scale wireless channel propagation conditions; the ability to train the CIR network to identify non-collaborative wireless systems, including those that may need to be protected; the ability to learn online how to identify (classify) other CIR and non-collaborative radio (NCR) networks without prior knowledge; the ability to create stateful characterizations of other CIR states; and any other information which the CIR may infer about environment which is useful in their decision-making process.

Proposers should address what level of understanding their CIR network will ultimately have, what algorithms the system will use, and what information feeds those algorithms.

3. Reasoning

A CIR must leverage its current understanding of the RF environment to make the best decision about any changes it may make to its communications strategy. Unlike traditional decision making systems, a CIR is a small piece of a much larger ensemble. For example, changing the type of waveform used by one pair of CIRs may have a ripple effect through the broader collective. As such, a CIR's decision making process must broadly consider the ramifications of how a particular action may affect the overall ensemble and find the best strategy, not solely for a single CIR, or CIR network, but for the entire collective. Proposers should address how their CIRs will make decisions based on information provided by the understanding process. Proposers should also discuss their approaches for making optimal joint decisions with previously unknown CIRs.

4. Contextualization

CIR networks comprising the ensemble are expected to rapidly learn (<5 min.) how to respond to changes in a scenario in order to remain an effective radio system (see the SC2 Rules Document for examples). In order to do this effectively, radio systems must contextualize knowledge they have already acquired (both a-priori and online-learned) and determine how to transfer the relevant information to the current scenario. Classically, contextualization has been achieved through leveraging prior knowledge of both the source and target task in order to build an explicit mapping between them ahead of time.

It's unrealistic to believe that one could give a CIR full knowledge of every scenario it might encounter in the real world. Proposers should describe how their CIRs learn to transfer knowledge from scenario to scenario, enabling the radio system to quickly adapt without

extended disruption to their quality of service. A CIR which must "unlearn" previous and inapplicable knowledge and then "relearn" the new scenario will ultimately react too slowly to be a viable radio system. Proposers should describe the basis for their transfer learning strategies.

5. Collaboration

Collaboration takes place on two fronts: between like CIRs within the same network, and between CIRs of different networks using the collaboration channel. While any two networks will be able to collaborate over a wired channel, the information to be shared, and the resulting decisions, must be distributed throughout the networks wirelessly. This overhead implies a cost to collaboration. Sending all information, to every CIR, all the time, is neither a tenable nor scalable approach to collaborating. A CIR should judiciously find the optimal information sharing strategy, such that throughput is maximized and collaboration excess is minimized. Intra-network collaboration can be optimized as part of the design, however in the inter-network case it can't be known a-priori what information, under what context, will be useful to other networks. Proposers should describe both how their design incorporates intra-network collaboration, as well as their approach for inter-network collaboration. Proposers are also encouraged to detail the information they would hope to exchange over an inter-network collaboration channel. The specific instantiation of the inter-network protocol will be determined by a Government-led working group consisting of all participants prior to PE1.

E. SC2 Competitions

Proposed CIR network solutions will be evaluated by a series of competitive tournaments, i.e. PE1, PE2 and SCE. Tournament structure specifics can be found in the SC2 Rules Document available on the SC2 website.

1. The SC2 Testbed (Government Furnished)

Competitions will take place in a Government-provided testbed called the Colosseum. Proposers will be provided access to the Colosseum as Government Furnished Equipment (GFE) in order to test their solutions during development. A description of the Colosseum can be found in the SC2 Rules Document.

A full specification of the testbed technical details will be contained in the SC2 System Specification Document, which will be made available to all participants on the SC2 website at a later date.

2. Competitive Events and Scrimmages

Information on pre-event scrimmages, qualification testing, tournament play, and scoring may be found in the SC2 Rules Document.

F. Schedule of Events

SC2 will hold three competitive tournament-style events, as described above in Section C, "Program Structure." All events will utilize the Colosseum and will have gameplay monitored by a remote audience. The tentative dates for each of these events are:

Event	Tentative Date
Preliminary Event 1 (PE1)	December 2017
Preliminary Event 2 (PE2)	December 2018
Championship Event (SCE)	December 2019

Scrimmages will be held prior to each event to allow participants practice time in conditions that mimic the upcoming event. Dates for scrimmages will be announced via the SC2 website.

G. Program Phases

Proposals selected for funding will be awarded with firm-fixed-price (FFP) procurement contracts. In all cases, the Government Contracting Officer shall have sole discretion to select award instrument type and to negotiate all instrument terms and conditions with selected performers.

Two additional phases should be proposed to align with the competition calendar, outlined below. Payments will be made based on the milestones/deliverables described below. The percentage indicated represents the portion of the total award to be paid. These milestones/deliverables are to be incorporated into the Statement of Work (see Section IV.B.6.a).

1. Phase 1

Technical Design Document (15%) due 15 Mar 2017 – Performers will deliver a PowerPoint presentation describing their technical approach to achieving the CIR network performance criteria specified by the government and relevant background capability and experience.

Colosseum Integration (15%) due 17 May 2017 – Performers will demonstrate a baseline capability able to be executed on the Colosseum testbed, to include:

- Uploading CIR code to Colosseum.
- Execution of a CIR network of at least 2 nodes.
- Initial results from testing on the SC2 testbed.

CIR Milestone Achievement (15%) due 12 July 2017 – Performers will demonstrate a functioning CIR design which is capable of collaborative decision making to include:

- Execution of a CIR network of 3 nodes.
- Demonstrate successful coexistence with a government provided non-collaborative radio network.
- Demonstrate successful coexistence when collaborating with a government provided CIR network (Challenge Bot).

- Results from testing on the SC2 testbed.

Site Visit & Demo (20%) by 20 Oct 2017 – Performers will host a 1 day site visit and demonstration of their capability.

- Performers will prepare an overview presentation of their system design suitable for public release.
- Performers will demonstrate their CIR design and discuss their testing approaches.

Competition Ready CIR Codebase (25%) due 23 Nov 2017 – Performers will deliver a complete set of software defined radio code for submission into the SC2 Preliminary Event #1 Competition.

- The system must pass all specified qualification tests to be posted on the SC2 website.

Post Competition Final Report (10%) due 17 Jan 2018 – Performers will deliver a Final Report detailing their final technical design and provide an analysis of their system performance in the tournament.

- System functional block diagrams, identifying areas of future work.
- Final results from testing on the SC2 testbed.
- Analysis of competition performance as compared to expected performance.

2. Phase 2

Technical Design Document (15%) due 14 Mar 2018 – Performers will deliver a PowerPoint presentation describing their technical approach to achieving the CIR network performance criteria specified by the government.

Mid-Term Status Report (15%) due 13 Jun 2018 – Performers will deliver a report describing their progress, to include:

- System functional block diagrams, showing current development status of each module.
- Updated results from testing on the SC2 testbed.

CIR Milestone Achievement (15%) due 15 Aug 2018 – Performers will deliver a report describing a functioning subsystem design which is capable of collaborative decision making to include:

- System functional block diagrams, showing current development status of each module.
- Results from testing on the SC2 testbed.

Site Visit & Demo (20%) by 19 Oct 2018 – Performers will host a 1 day site visit and demonstration of their capability.

- Performers will prepare an overview presentation of their system design suitable for public release.
- Performers will demonstrate their CIR design and discuss their testing approaches.

Competition Ready CIR Codebase (25%) due 21 Nov 2018 – Performers will deliver a complete set of software defined radio code for submission into the SC2 Preliminary Event #2 Competition.

- The system must pass all specified qualification tests to be posted on the SC2 website.

Post Competition Final Report (10%) due 17 Jan 2019 – Performers will deliver a Final Report detailing their final technical design and provide an analysis of their system performance in the tournament.

- System functional block diagrams, identifying areas of future work.
- Final results from testing on the SC2 testbed.
- Analysis of competition performance as compared to expected performance.

3. Phase 3

Technical Design Document (15%) due 20 Mar 2019 – Performers will deliver a presentation describing their technical approach to achieving the CIR network performance criteria specified by the government.

Mid-Term Status Report (15%) due 12 Jun 2019 – Performers will deliver a report describing their progress, to include:

- System functional block diagrams, showing current development status of each module.
- Updated results from testing on the SC2 testbed.

CIR Milestone Achievement (15%) due 14 Aug 2019 – Performers will deliver a report describing a functioning subsystem design which is capable of collaborative decision making to include:

- System functional block diagrams, showing current development status of each module.
- Results from testing on the SC2 testbed.

Site Visit & Demo (20%) by 18 Oct 2019 – Performers will host a 1 day site visit and demonstration of their capability.

- Performers will prepare an overview presentation of their system design suitable for public release.
- Performers will demonstrate their CIR design and discuss their testing approaches.

Competition Ready CIR Codebase (25%) due 20 Nov 2019 – Performers will deliver a complete set of software defined radio code for submission into the SC2 Championship Event Competition

- The system must pass all specified qualification tests to be posted on the SC2 website.

Post Competition Final Report (10%) due 17 Jan 2020 – Performers will deliver a Final Report detailing their final technical design and provide an analysis of their system performance in the tournament.

- System functional block diagrams, identifying areas of future work.
- Final results from testing on the SC2 testbed.

- Analysis of competition performance as compared to expected performance

II. Award Information

Multiple awards are anticipated. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation, and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if it is later determined to be necessary. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work at the end of one or more of the phases.

Awards under this BAA will be made to proposers on the basis of the evaluation criteria listed below (see section labeled "Application Review Information," Sec. V.), and program balance to provide overall value to the Government. The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. Such additional information may include but is not limited to Representations and Certifications. The Government reserves the right to remove proposers from award consideration should the parties fail to reach agreement on award terms, conditions and cost/price within a reasonable time or the proposer fails to timely provide requested additional information.

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

Fundamental Research

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

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

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

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

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

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

> There shall be no dissemination or publication, except within and between the contractor and any subawardees, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written approval of DARPA's Public Release Center (DARPA/PRC). All technical reports will be given proper review by appropriate authority to determine which Distribution Statement is to be applied prior to the initial distribution of these reports by the contractor. With regard to subawardee proposals for Fundamental Research, papers resulting from unclassified fundamental research are exempt from prepublication controls and this review requirement, pursuant to DoD Instruction 5230.27 dated October 6, 1987.
>
> When submitting material for written approval for open publication, the contractor/awardee must submit a request for public release to the DARPA/PRC and include the following information: (1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx.

30 words), number of pages (or minutes of video) and document type (e.g., briefing, report, abstract, article, or paper); (2) Event Information: event type (conference, principal investigator meeting, article or paper), event date, desired date for DARPA's approval; (3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and (4) Contractor/Awardee's Information: POC name, email and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests may be sent either via email to public_release_center@darpa.mil or by mail at 675 North Randolph Street, Arlington VA 22203-2114, telephone (571) 218-4235. Refer to the following for link for information about DARPA's public release process: http://www.darpa.mil/work-with-us/contract-management/public-release."

III. Eligibility Information

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

A. Eligible Applicants

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

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

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

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

Without prior approval or a waiver from the DARPA Director, in accordance with FAR 9.503, a contractor cannot simultaneously provide scientific, engineering, technical assistance (SETA) or similar support and also be a technical performer. As part of the proposal submission, all members of the proposed team (prime proposers, proposed subawardees, and consultants) must affirm whether they (their organizations and individual team members) are providing SETA or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the proposer, subawardees, consultant, or individual supports and identify the prime contract number(s). All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure must include a description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict. If in the sole opinion of the Government after full consideration of the circumstances, a proposal fails to fully disclose potential conflicts of interest and/or any identified conflict situation cannot be effectively mitigated, the proposal will be rejected without technical evaluation and withdrawn from further consideration for award.

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

C. Cost Sharing/Teaming

Cost sharing is not required. Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

D. Prize Eligibility

In order for a team to receive a DARPA cash prize for their performance in the SC2 Championship Event (SCE), they must provide a U.S. taxpayer identification number (TIN). Information on how to obtain a TIN is available on the U.S. Internal Revenue Service website at www.IRS.gov.

The following caveats apply to all team members:

- All participants under 18 years of age require authorization to participate by a parent or guardian.

- No individual, organization or sponsor that is named in the Specially Designated Nationals list may apply or participate in the Challenge. Please see the Specially Designated Nationals list at https://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx.
- Federal employees, including DARPA employees and DARPA support contractors and their spouses, dependents, and household members are not eligible to participate in the Challenge. Federal employees and contractors acting outside the scope of their employment should consult their ethics official and appropriate management before participating in the Challenge.
- All individuals and organizations that are funded by DARPA to support the SC2 are not eligible to participate as entrants, team members or sponsors. This includes, but is not limited to, any FFRDC, government, or private-sector personnel whose scope of work includes SC2 technical development, infrastructure development or administrative support.

Collaborative efforts and teaming are encouraged, however teams are to be wholly separate entities that do no share members or financial interests. Individuals cannot be members of multiple teams. For each team, a single individual must be identified as the team leader. This person will serve as the official administrative point of contact for communications with DARPA SC2. Teams may not collaborate or share their technical approaches and solutions with other teams while participating in the SC2, except as directed by DARPA.

IV. Application and Submission Information

A. Address to Request Application Package

This notice, including all attachments, constitutes the total BAA solicitation. No additional information is available, except as provided at FBO, nor will a formal Request for Proposal (RFP) or additional solicitation regarding this announcement be issued. Requests for the same will be disregarded.

B. Content and Form of Application Submission

DARPA policy is to treat all submissions as source selection information (see FAR 2.101 and 3.104), and to disclose their 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.

Submissions will not be returned. The original of each submission received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided the formal request is received at this office within 5 days after notification that a proposal was not selected.

1. 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 with a label such as "Proprietary" or "Company Proprietary." Note, "Confidential" is a classification marking used to control the dissemination of U.S. Government National Security Information as dictated in Executive Order 13526 and should not be used to identify proprietary business information.

2. Security Information

DARPA anticipates that submissions received under this BAA will be unclassified. However, should a proposer wish to submit classified information, an *unclassified* email must be sent to the BAA mailbox requesting submission instructions from the Technical Office PSO.

Security classification guidance and direction via a Security Classification Guide (SCG) and/or DD Form 254, "DoD Contract Security Classification Specification," will not be provided at this time, since DARPA is soliciting ideas only. If a determination is made that the award instrument may result in access to classified information, a SCG and/or DD Form 254 will be issued by DARPA and attached as part of the award.

3. Full Proposal Format

All full proposals must be in the format given below. Nonconforming proposals may be rejected without review. Proposals shall consist of two volumes: Volume I – Technical and Management Proposal, and Volume II – Cost Proposal. Section II of Volume I, Technical and Management Proposal, shall not exceed 15 pages. Maximum page lengths for each section are shown in braces { } below.

All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. Smaller font may be used for figures, tables and charts. The page limitation for full proposals includes all figures, tables, and charts. The submission of other supporting materials along with the proposals is strongly discouraged and will not be considered for review. All full proposals must be written in English.

a. Volume I, Technical and Management Proposal

Section I. Administrative {no page limit}

A. Cover sheet to include
(1) BAA number (DARPA-BAA-16-47);
(2) Lead Organization submitting proposal;
(3) Type of organization, selected among the following categories: "LARGE ORGANIZATION," "SMALL DISADVANTAGED ORGANIZATION," "OTHER SMALL ORGANIZATION," "HBCU," "MI," "OTHER EDUCATIONAL," OR "OTHER NONPROFIT;"

(4) Other team members (if applicable) and type of organization for each;
(5) Proposal title;
(6) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code (+4), telephone, fax (if available), electronic mail;
(7) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code (+4), telephone, fax (if available), electronic mail;
(8) Total funds requested from DARPA, and the amount of cost share (if any);
(9) Date proposal was submitted.

B. Official transmittal letter.

Section II. Detailed Proposal Information {15 pages}

A. Table of Contents

B. Executive Summary/Innovation Claims
Provide an overview of the proposed approach for autonomous collaborative radio network that meets the objectives of the Challenge. Include a brief description of the key technologies and competitive strategies to be employed.

C. Technical Plan
Provide a detailed technical description of the system design approach. This section should demonstrate your understanding of the complex machine learning problems associated with heterogeneous collaborative systems and how these translate to wireless networks that can autonomously optimize their use of spectrum. It should also demonstrate your understanding of how to employ the radio and computing hardware resources of the SRN. See Section I.D, "D. Collaborative Intelligent Radio (CIR) Technical Description," for the desired technical content.

D. Statement of Work (SOW)
In plain English, clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The page length for the SOW will be dependent on the amount of the effort. The SOW must not include proprietary information. For each task/subtask, provide:
1. A general description of the objective (for each defined task/activity);
2. A detailed description of the approach to be taken to accomplish each defined task/activity;
3. Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
4. The completion criteria for each task/activity - a product, event or milestone that defines its completion.
5. Define all deliverables (reporting, data, reports, software, etc.) to be provided to the Government in support of the proposed research tasks/activities; AND
6. Clearly identify any tasks/subtasks (prime or subcontracted) that will be accomplished on-campus at a university.

Note: It is recommended that the SOW should be developed so that each Phase of the program is separately defined and aligned with the competitive events described in Section I, "Funding Opportunity Description," and the SC2 Rules Document. See Section I.G for a list of milestones and deliverables to be included in the SOW. Do not include any proprietary information in the SOW.

E. Ongoing Research
Comparison of the proposed approach with other ongoing research indicating advantages and disadvantages of the proposed effort.

F. Management Plans
Identify the Principal Investigator (PI) and key team members and their roles and staffing levels.

G. Personnel
Discussion of proposer's key personnel, previous accomplishments and work in closely related research areas.

H. Facilities
Description of the facilities that will be used for the proposed effort.

I. Teaming Arrangements
Describe any formal teaming agreements which are required to execute this program.

Section III. Additional Information {no page limit}

Information in this section may include a brief bibliography of relevant technical papers and research notes (published and unpublished) which document the technical ideas upon which the proposal is based. Copies of not more than three (3) relevant papers may be included in the submission.

b. Volume II, Cost Proposal – {No Page Limit}

All proposers, including FFRDCs, must submit the following:

Section I. Administrative

Cover sheet to include:
(1) BAA number (DARPA-BAA-16-47);
(2) Lead Organization submitting proposal;
(3) Type of organization, selected among the following categories: "LARGE ORGANIZATION," "SMALL DISADVANTAGED ORGANIZATION," "OTHER SMALL ORGANIZATION," "HBCU," "MI," "OTHER EDUCATIONAL," OR "OTHER NONPROFIT;"
(4) Other team members (if applicable) and type of organization for each;
(5) Proposal title;

(6) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code (+4), telephone, fax (if available), electronic mail (if available);
(7) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code (+4), telephone, fax (if available), and electronic mail (if available);
(8) Place(s) and period(s) of performance;
(9) Total proposed cost separated by basic award and option(s), if any, by calendar year and by government fiscal year;
(10) Name, address, and telephone number of the proposer's cognizant Defense Contract Management Agency (DCMA) administration office (*if known)*;
(11) Name, address, and telephone number of the proposer's cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
(12) Date proposal was prepared;
(13) DUNS number;
(14) TIN number;
(15) CAGE Code;
(16) Subcontractor Information;
(17) Proposal validity period; AND
(18) Any Forward Pricing Rate Agreement, other such approved rate information, or such documentation that may assist in expediting negotiations (if available).

Attachment 1, the Cost Volume Proposer Checklist, must be included with the coversheet of the Cost Proposal.

Section II. Detailed Cost Information

The proposers,' to include eligible FFRDCs,' cost volume shall provide cost and pricing information (See Note 1), or other than cost or pricing information if the total price is under $700,000, in sufficient detail to substantiate the program price proposed (e.g., realism and reasonableness). In doing so, the proposer shall provide a summary cost breakdown, and a detailed cost breakdown by phase (if multiple phases are proposed), technical task/sub-task, and month. The breakdown/s shall include, at a minimum, the following major cost item along with associated backup documentation:

Total program cost broken down by major cost items:

a. **Direct Labor** – a breakout clearly identifying the individual labor categories with associated labor hours and direct labor rates, as well as a detailed Basis-of-Estimate (BOE) narrative description of the methods used to estimate labor costs;
b. **Indirect Costs** – Including Fringe Benefits, Overhead, General and Administrative Expense, Cost of Money, Fee, etc. (must show base amount and rate);
c. **Travel** – Provide the purpose of the trip, number of trips, number of days per trip, departure and arrival destinations, number of people, etc.;
d. **Other Direct Costs** – Itemized with costs; Back-up documentation is to be submitted to support proposed costs;
e. **Material/Equipment** –

(i) A priced Bill-of-Material (BOM) clearly identifying, for each item proposed, the quantity, unit price, the source of the unit price (i.e., vendor quote, engineering estimate, etc.), the type of property (i.e., material, equipment, special test equipment, information technology, etc.), and a cross-reference to the SOW task(s) that require the item(s). At time of proposal submission, any item that exceeds $1,000 must be supported with basis-of-estimate (BOE) documentation such as a copy of catalog price lists, vendor quotes or a written engineering estimate (additional documentation may be required during negotiations, if selected).

(ii) If seeking a procurement contract and items of Contractor Acquired Property are proposed, exclusive of material, the proposer shall clearly demonstrate that the inclusion of such items as Government Property is in keeping with the requirements of FAR Part 45.102. In accordance with FAR 35.014, "Government property and title," it is the Government's intent that title to all equipment purchased with funds available for research under any resulting contract will vest in the acquiring nonprofit institution (e.g., Nonprofit Institutions of Higher Education and Nonprofit Organizations whose primary purpose is the conduct of scientific research) upon acquisition without further obligation to the Government. Any such equipment shall be used for the conduct of basic and applied scientific research. The above transfer of title to all equipment purchased with funds available for research under any resulting contract is not allowable when the acquiring entity is a for-profit organization; however, such organizations can, in accordance with FAR 52.245-1(j), be given priority to acquire such property at its full acquisition cost.

f. **Consultants** – 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);

g. **Subcontracts** – Itemization of all subcontracts. **Additionally, the prime contractor is responsible for compiling and providing, as part of its proposal submission to the Government, subcontractor proposals prepared at the same level of detail as that required by the prime.** Subcontractor proposals include Interdivisional Work Transfer Agreements (IWTA) or similar arrangements. If seeking a procurement contract, the prime contractor shall provide a cost reasonableness analysis of all proposed subcontractor costs/prices. Such analysis shall indicate the extent to which the prime contractor has negotiated subcontract costs/prices and whether any such subcontracts are to be placed on a sole-source basis. All proprietary subcontractor proposal documentation, prepared at the same level of detail as that required of the prime, which cannot be uploaded to the DARPA BAA website (https://baa.darpa.mil) as part of the proposer's submission, 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 organization. This does not relieve the proposer from the requirement to include, as part of their submission (via the DARPA BAA website), subcontract proposals that do not include proprietary pricing information (rates, factors, etc.). **A Rough Order of Magnitude (ROM),**

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

h. **Cost-sharing -** The source, nature, and amount of any industry cost-sharing;
i. **Fundamental Research** - Written justification required per Part II, "Fundamental Research," pertaining to prime and/or subcontracted effort being considered Contracted Fundamental Research; AND
j. **Small Business Subcontracting Plan -** If applicable. See Section VI(B)(6) "Subcontracting" below.

Proposers are required to provide the aforementioned cost breakdown as an editable MS Excel spreadsheet, inclusive of calculations formulae, with tabs (material, travel, ODC's) provided as necessary. The Government also requests and recommends that the Cost Proposal include MS Excel file(s) that provide traceability between the Bases of Estimate (BOEs) and the proposed costs across all elements and phases. This includes the calculations and adjustments that are utilized to generate the Summary Costs from the source labor hours, labor costs, material costs, etc. input data. It is requested that the costs and Subcontractor proposals be readily traceable to the Prime Cost Proposal in the provided MS Excel file(s) – although this is not a requirement, providing information in this manner will assist the Government in understanding what is being proposed both technically and in terms of cost realism.

The cost proposal should include identification of pricing assumptions of which may require incorporation into the resulting award instrument (i.e., use of Government Furnished Property/Facilities/Information, access to Government Subject Matter Experts, etc.).

The proposer should include supporting cost and pricing information in sufficient detail to substantiate the summary cost estimates and should include a description of the method used to estimate costs and supporting documentation.

Cost proposals submitted by FFRDC's (prime or subcontractor) will be forwarded, if selected for negotiation, to their sponsoring organization contracting officer for review to confirm that all required forward pricing rates and factors have been used.

Note 1:
(a) "Cost or Pricing Data" as defined in FAR 15.403-4 shall be required if the proposer is seeking a procurement contract per the referenced threshold, unless the proposer requests and is granted an exception from the requirement to submit cost or pricing data. Per DFARS 215.408(5), DFARS 252.215-7009, Proposal Adequacy Checklist, applies to all proposers/proposals seeking a FAR-based award (contract).
(b) In accordance with DFARS 15.403-1(4)(D), DoD has waived cost or pricing data requirements for nonprofit organizations (including educational institutions) on cost-reimbursement-no-fee contracts. In such instances where the waiver stipulated at DFARs 15.403-1(4)(D) applies, proposers shall submit information other than cost or pricing data to the extent necessary for the Government to determine price reasonableness and cost realism; and cost or pricing data from subcontractors that are not nonprofit organizations when the subcontractor's proposal exceeds the cost and pricing data threshold at FAR 15.403-4(a)(1).

(c) "Cost or pricing data" are not required if the proposer proposes an award instrument other than a procurement contract (i.e., cooperative agreement, grant, or other transaction agreement).

PLEASE NOTE, PROPOSERS ARE CAUTIONED THAT EVALUATION RATINGS MAY BE LOWERED AND/OR PROPOSALS REJECTED IF PROPOSAL PREPARATION (PROPOSAL FORMAT, CONTENT, ETC.) AND/OR SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

4. Submission Dates and Times

Full proposals must be submitted to DARPA/MTO on or before 1:00 PM, Eastern Time, 2 September 2016, in order to be considered during the single round of selections. Proposals received after this deadline will not be reviewed.

DARPA will post on a regular basis a consolidated Question and Answer (FAQ) document. To access the posting go to: http://www.darpa.mil/work-with-us/opportunities. Under the DARPA-BAA-16-47 summary will be a link to the FAQ. Submit your question/s by E-mail to DARPA-BAA-16-47@darpa.mil. In order to receive a response sufficiently in advance of the proposal due date, send your question/s on or before 1:00 PM, Eastern Time, 22 August 2016.

DARPA will acknowledge receipt of complete submissions via email and assign control numbers that should be used in all further correspondence regarding proposals.

5. Proposal Submission Information

Proposals should express a consolidated effort in support of the Spectrum Collaboration Challenge objectives, including the capability to design, code and deploy software defined radio networks for all competitive events. Proposals that only address parts of the problem space may not be reviewed.

Proposals may not be submitted by fax or e-mail; any so sent will be disregarded. Proposals not meeting the format described in the BAA may not be reviewed.

Proposers must submit proposals via DARPA's BAA Website (https://baa.darpa.mil). Note: If an account has already been created for the DARPA BAA Website, this account may be reused. If no account currently exists for the DARPA BAA Website, visit the website to complete the two-step registration process. Submitters will need to register for an extranet account (via the form at the URL listed above) and wait for two separate e-mails containing a username and temporary password. After accessing the Extranet, submitters may then create an account for the DARPA BAA website (via the "Register your Organization" link along the left side of the homepage), view submission instructions, and upload/finalize the proposal. Proposers using the DARPA BAA Website may encounter heavy traffic on the submission deadline date; it is highly advised that submission process be started as early as possible.

All unclassified full proposals submitted electronically through the DARPA BAA website must be uploaded as zip files (.zip or .zipx extension). The final zip file should not exceed 50 MB in

size. Only one zip file will be accepted per submission and submissions not uploaded as zip files will be rejected by DARPA.

Technical support for DARPA's BAA Website may be reached at BAAT_Support@darpa.mil, and is typically available during regular business hours (9:00 AM - 5:00 PM EST, Monday - Friday).

NOTE: YOU MUST CLICK THE 'FINALIZE FULL PROPOSAL' BUTTON AT THE BOTTOM OF THE CREATE FULL PROPOSAL PAGE. FAILURE TO DO SO WILL RESULT IN YOUR PROPOSAL NOT BEING OFFICIALLY SUBMITTED TO THIS BAA AND THEREFORE NOT BEING REVIEWED.

All administrative correspondence and questions on this solicitation, including requests for information on how to submit a full proposal to this BAA should be directed to DARPA-BAA-16-47@darpa.mil. DARPA intends to use electronic mail for correspondence regarding DARPA-BAA-16-47. Proposals may not be submitted by fax or e-mail; any so sent will be disregarded. DARPA encourages use of the Internet for retrieving the BAA and any other related information that may subsequently be provided.

6. Funding Restrictions

Not applicable.

7. Other Submission Requirements

Not applicable.

V. Application Review Information

A. Evaluation Criteria

Proposals will be evaluated using the following criteria, listed in descending order of importance: (a) Overall Scientific and Technical Merit; (b) Potential Contribution and Relevance to the DARPA Mission; (c) Cost & Schedule Realism; (d) Proposer's Capabilities and/or Related Experience; and (e) Plans and Capability to Accomplish Technology Transition.

(a) Overall Scientific and Technical Merit

The proposed technical approach is feasible, achievable, complete and supported by a proposed technical team that has the expertise and experience to accomplish the proposed tasks.

Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation efforts are clearly defined and feasible.

(b) Potential Contribution and Relevance to the DARPA Mission

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

(c) Cost & Schedule 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).

The proposed schedule aggressively pursues performance metrics in the shortest timeframe and accurately accounts for that timeframe. The proposed schedule identifies and mitigates any potential schedule risk.

It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. For efforts with a likelihood of commercial application, appropriate direct cost sharing may be a positive factor in the evaluation. DARPA recognizes that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies.

In addition, the evaluation will take into consideration the extent to which the proposed intellectual property (IP) rights will potentially impact the Government's ability to transition the technology.

(d) Proposer's Capabilities and/or Related Experience

The proposer's prior experience in similar efforts clearly demonstrates an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule. Similar efforts completed/ongoing by the proposer in this area are fully described including identification of other Government sponsors.

B. Review and Selection Process

DARPA will conduct a scientific/technical review of each conforming proposal. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

Award(s) 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 to the overall research program and the availability of funding for the effort.

It is the policy of DARPA to ensure impartial, equitable, comprehensive proposal evaluations and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals. Pursuant to FAR 35.016, the primary basis for selecting proposals for acceptance shall be technical, importance to agency programs, and fund availability. In order to provide the desired evaluation, qualified Government personnel will conduct reviews and (if necessary) convene panels of experts in the appropriate areas.

For evaluation purposes, a proposal is the document described in "Full Proposal Format," Section IV.3. Other supporting or background materials submitted with the proposal will be considered for the reviewer's convenience only and not considered as part of the proposal.

Restrictive notices notwithstanding, support contractors may handle proposals for administrative purposes. These support contractors are prohibited from competition in DARPA technical research and are bound by appropriate non-disclosure requirements.

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.

VI. Award Administration Information

A. Selection Notices

As soon as the evaluation of a proposal is complete, the proposer will be notified that (1) the proposal has been selected for funding pending contract negotiations, or (2) the proposal has not been selected. These official notifications will be sent via email to the Technical POC identified on the proposal coversheet.

B. Administrative and National Policy Requirements

1. Meeting and Travel Requirements

All key participants are required to attend the program kickoff meeting. Performers should also anticipate regular program-wide PI Meetings and periodic site visits at the Program Manager's discretion. Additionally, at least two representatives from the performer will be expected to attend the three SC2 events, if funded for those phases.

2. Human Subjects Research

All research selected for funding involving human subjects, to include use of human biological specimens and human data, must comply with the federal regulations for human subjects

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

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

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

In addition to a local IRB approval, a headquarters-level human subjects administrative review and approval is required for all research conducted or supported by the DoD. The Army, Navy, or Air Force office responsible for managing the award can provide guidance and information about their component's headquarters-level review process. Note that confirmation of a current Assurance of Compliance with human subjects protection regulations and appropriate human subjects research training is required before headquarters-level approval can be issued.

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

3. Animal Use

Award recipients performing research, experimentation, or testing involving the use of animals shall comply with the rules on animal acquisition, transport, care, handling, and use as outlined in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Animal Welfare Act

of 1966, as amended, (7 U.S.C. § 2131-2159); (ii) National Institutes of Health Publication No. 86-23, "Guide for the Care and Use of Laboratory Animals" (8th Edition); and (iii) DoD Instruction 3216.01, "Use of Animals in DoD Programs."

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

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

4. Export Control

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

5. Subcontracting

Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. § 637(d)), it is the policy of the Government to enable small business and small disadvantaged business concerns to be considered fairly as subcontractors to contractors performing work or rendering services as prime contractors or subcontractors under Government contracts, and to assure that prime contractors and subcontractors carry out this policy. Each proposer who submits a contract proposal and includes subcontractors is required to submit a subcontracting plan in accordance with FAR 19.702(a)(1) should do so with their proposal. The plan format is outlined in FAR 19.704.

6. 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 proposer who submits a proposal involving the creation or inclusion of electronic and information technology must ensure that 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 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.

7. Employment Eligibility Verification

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

8. Reserved

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

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

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

10. Reporting Executive Compensation and First-Tier Subcontract Awards

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

11. Updates of Information Regarding Responsibility Matters

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

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

The following representation will be included in all awards:

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

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

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

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

(b) The Offeror represents that –

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

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

13. Cost Accounting Standards (CAS) Notices and Certification

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

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

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

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

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

15. Safeguarding of Covered Defense Information and Cyber Incident Reporting

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

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

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

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

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

C. Reporting

The number and types of reports will be specified in the award document, but will include as a minimum monthly technical and financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. Reports and briefing material will also be required as appropriate to document progress in accomplishing program metrics. A Final Report that summarizes the project and tasks will be required at the conclusion of the performance period for the award, notwithstanding the fact that the research may be continued under a follow-on vehicle.

D. Electronic Systems

1. Representations and Certifications

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

2. Wide Area Work Flow (WAWF)

Unless using another means of invoicing, performers will be required to submit invoices for payment directly via to http://wawf.eb.mil. Registration in WAWF will be required prior to any award under this BAA.

3. i-Edison

The award document for each proposal selected for funding will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (https://public.era.nih.gov/iedison).

VII. Agency Contacts

Administrative, technical or contractual questions should be sent via e-mail to DARPA-BAA-16-47@darpa.mil. All requests must include the name, email address, and phone number of a point of contact.

The technical POC for this effort is:

Mr. Paul Tilghman
DARPA/MTO
ATTN: DARPA-BAA-16-47
675 North Randolph Street
Arlington, VA 22203-2114

Phone: 703-526-4767
Email: paul.tilghman@darpa.mil

VIII. Other Information

A. Intellectual Property Procurement Contract Proposers

1. Noncommercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all noncommercial technical data and noncommercial computer software that it plans to generate, develop, and/or deliver under any proposed award instrument in which the Government will acquire less than unlimited rights, and to assert specific restrictions on those deliverables. Proposers shall follow the format under DFARS 252.227-7017 for this stated purpose. In the event that proposers do not submit the list, the Government will assume that it automatically has "unlimited rights" to all noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, unless it is substantiated that development of the noncommercial technical data and noncommercial computer software occurred with mixed funding. If mixed funding is anticipated in the development of noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, then proposers should identify the data and software in question, as subject to Government Purpose Rights (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 five (5) years in accordance with the applicable DFARS clauses, at which time the Government will acquire "unlimited rights" unless the parties agree otherwise. Proposers are advised that the Government will 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. If no restrictions are intended, then the proposer should state "NONE." It is noted an assertion of "NONE" indicates that the Government has "unlimited rights" to all noncommercial technical data and noncommercial computer software delivered under the award instrument, in accordance with the DFARS provisions cited above. Failure to provide full information may result in a determination that the proposal is not compliant with the BAA – resulting in nonselectability of the proposal.

A sample list for complying with this request is as follows:

NONCOMMERCIAL				
Technical Data 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)

2. Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all commercial technical data and commercial computer software that may be embedded in any noncommercial deliverables contemplated under the research effort, along with any applicable restrictions on the Government's use of such commercial technical data and/or commercial computer software. In the event that proposers do not submit the list, the Government will assume that 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, as may be necessary, to evaluate the proposer's assertions. If no restrictions are intended, then the proposer should state "NONE." Failure to provide full information may result in a determination that the proposal is not compliant with the BAA – resulting in nonselectability of the proposal.

A sample list for complying with this request is as follows:

COMMERCIAL				
Technical Data 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)

B. All Proposers – Patents

Include documentation proving your ownership of or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) that will be utilized under your proposal for the DARPA program. If a patent application has been filed for an invention that your proposal utilizes, but the application has not yet been made publicly available and contains proprietary information, you may provide only the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and a summary of the patent title, together with either: (1) a representation that you own the invention, or (2) proof of possession of appropriate licensing rights in the invention.

C. All Proposers – Intellectual Property Representations

Provide a good faith representation that you either own or possess appropriate licensing rights to all other intellectual property that will be utilized under your proposal for the DARPA program. Additionally, proposers shall provide a short summary for each item asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research.