# Broad Agency Announcement

Fast Network Interface Cards (FastNICs)

HR001119S0082

August 20, 2019


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

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# PART I: OVERVIEW INFORMATION

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

- **Funding Opportunity Title:** Fast Network Interface Cards (FastNICs)

- **Announcement Type:** Initial Announcement

- **Funding Opportunity Number:** HR001119S0082

- **Catalog of Federal Domestic Assistance Numbers (CFDA):** Not Applicable

- **Dates**
  - Posting Date: August 20, 2019
  - Proposers Day: July 10, 2019
  - Proposal Due Date: October 8, 2019, 12:00 noon (ET)

- **Anticipated Individual Awards:** DARPA anticipates one or more awards for technical area 1, one or more awards for technical area 2, and a single award for technical area 3.

- **Types of Instruments that May be Awarded:** Procurement contracts or Other Transactions (OT)

- **Agency Contacts**

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  - **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 for improving network stack performance to realize 100x or more throughput gains, in order to accelerate highly distributed applications, such as training of deep neural networks. 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/).

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

### A. Introduction/Background

Current network subsystems are a bottleneck between multiprocessor servers and the network links that interconnect them. This bottleneck has dramatically worsened over time, stemming in large part from the increasing use of parallelism in processor design to increase central processing unit (CPU) performance. This design strategy is effective for CPUs; however, from the system level, since network link performance has not matched processor gains, increases in integrated computer system performance has been limited. Fundamentally, there is a performance imbalance between network links and other computer system components. This issue remains unaddressed due to strong commercial incentives focus on incremental technology advances across multiple independent market siloes. The separate evolutions of network technology and server technology have made network interface cards (NICs), which bridge the network/server boundary, an afterthought in both technology marketplaces.

At the physical layer, the upper bound for server throughput is imposed by the network interface hardware that connects a machine to a communications network, limiting a processor's data ingest capability. Other issues, such as limitations in server memory technologies, software that exhibits excessive memory copying, and poor application design also contribute to throttling application throughput.

The differences in data rates at different points in the path from a remote server to a local server illustrate the need for breakthrough approaches in FastNICs. A single optical fiber can (in aggregate) carry about 100 terabits per second of data traffic. Today's multicore multiprocessors, graphic processing unit (GPU)-equipped servers, and similar computing nodes can (in aggregate) process data at a roughly similar rate. Both are severely limited by the network interface, which typically operate at rates that are 100x – 1000x slower.

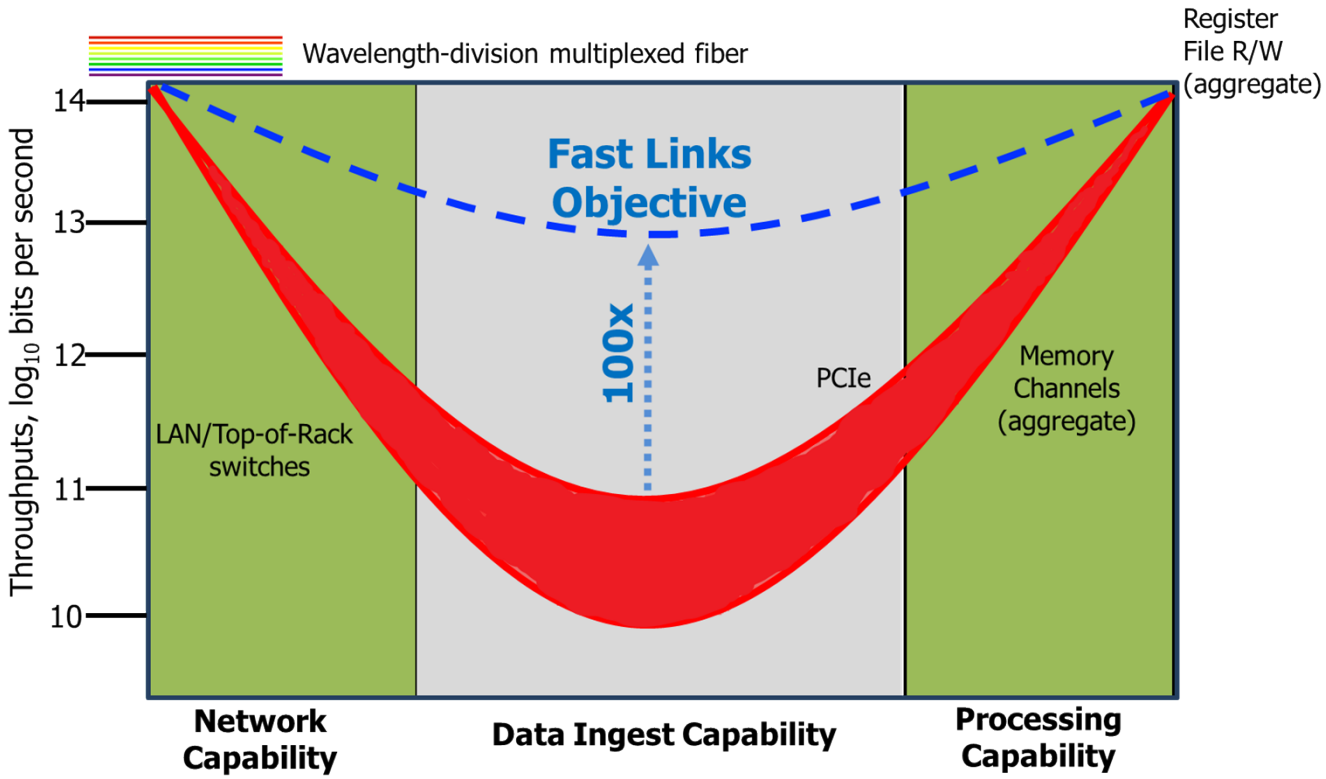


Figure 1: FastNICs Objectives

Figure 1 represents data rates on a vertical log scale, with an optical fiber on the left and a server on the right. Movement from left to right traces the path data must take through the components from a fiber to a server. As indicated by the multiple colors, the fiber is expected to be wave-length division multiplexed (WDM), as is common in wide-area networks (WANs).

The local area network (LAN) data rates are a function of coding and cabling, and while in principle network striping could be used to achieve multiples of the LAN data rate, e.g., by constructing multiple parallel paths through a "Top of Rack (ToR)" switch associated with each server, this is uncommon in practice.

Network stacks are limited both by network interface cards and system software to 10-100 gigabits per second. This bottleneck is especially important for distributed computation that requires significant communication between the computation nodes. Training of deep neural networks is an exemplar of this class of computation; a significant fraction of machine learning research investigates ways in which the network interface bottleneck can be minimized.

### B. Program Description/Scope

FastNICs will speed up applications such as the distributed training of machine learning classifiers by 100x through the development, implementation, integration, and validation of novel, clean-slate network subsystems. The program will focus on overcoming the gross mismatches in computing and network subsystem performance. Specifically, computer network interface performance lags the performance of other computer subsystems (RAM, CPU, etc.) by 3 to 4 orders of magnitude.

### C. Program Structure

FastNICs is a four-year program organized into three phases:

- Phase 1 (24 months): During this phase, FastNICs will develop an initial, small-scale proof-of-concept that integrates hardware, system software, and application software. The goal of this initial capability is to produce a 5x application speedup over current state-of-the-art hardware and software.
- Phase 2 (12 months): This phase will focus on scaling up the Phase 1 proof-of-concept while also achieving a 5x application speedup.
- Phase 3 (12 months): The final phase will aim to yield a 4x application speedup over Phase 2.

Specific metrics are shown in Table 1.

Proposals should reflect a four-year base program effort and a nominal start date of May 1, 2020.

### D. Technical Areas (TAs)

FastNICs is structured into three technical areas:

(1) TA1 Network Subsystem Hardware and Software,
(2) TA2 Applications
(3) TA3 Independent Test and Evaluation.

Layers serve to divide a system into components with logically distinct roles, with interactions between layers via well-defined interfaces. As shown in Figure 2, TA1 and TA2 comprise the layers of the FastNICs network stack. The network subsystem technical area, TA1, is further divided into network interface hardware (TA1.1) and system software support (TA1.2).

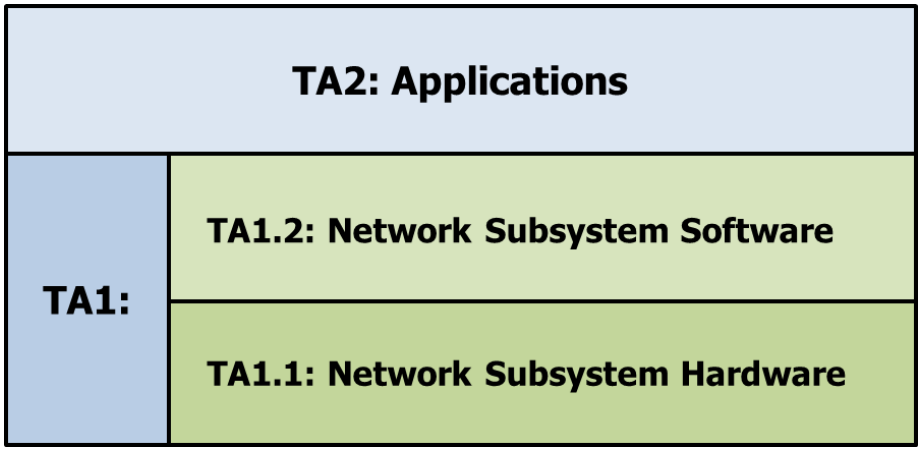


Figure 2: FastNICs program Technical Areas TA1 and TA2 as a stack

Proposals to TA1 must address both TA1.1 and TA1.2. A strong TA1 proposal will likely require multiple areas of expertise to support both TA1.1 and TA1.2. TA1 proposers are therefore strongly encouraged to consider an appropriate teaming strategy.

Proposers may submit proposals for any or all technical areas without restriction. However, each technical area must be proposed separately (i.e., each proposal should only address one TA). Proposers selected for TA3 cannot be selected for any portion of the other two technical areas,

whether as a prime, subcontractor, or in any other capacity from an organizational to individual level. This is to avoid organizational conflict of interest (OCI) situations between the technical areas and to ensure objective test and evaluation results. If the submission of potentially selectable proposals creates an OCI, the Government will make the final TA selection determination to avoid the conflict.

To support collaboration and the development of technology and systems in the FastNICs program, performers will have an Associate Contractor Agreement (ACA) clause included in their awarded contract or agreement (see Section VIII.E). This clause is intended to ensure appropriate coordination and potential integration of work done by program performers.

**TA1.1 Network Subsystem Hardware**

FastNICs TA1.1 will focus on developing hardware systems to significantly improve aggregate raw server datapath speed. This TA will design, implement, and demonstrate 10Tbps network interface hardware using existing or road-mapped hardware interfaces. TA1.1 computing nodes should reflect the architecture and performance of commercially-available multiprocessor servers. Such servers comprise a set of multicore CPU chips linked by a non-uniform memory access (NUMA) interconnect. Compute nodes may also include many core or GPU computing elements, typically attached via a bus intended for peripherals. TA 1.1 solutions must attach to servers via one or more industry-standard interface points such as I/O buses, multiprocessor interconnection networks, and memory slots. Use of industry-standard interface points is essential for rapid technology transition and industry adoption of FastNICs TA1.1 research results. Further, this requirement ensures that the results of FastNICs TA 1.1 research will persist across multiple generations of network and server technology.

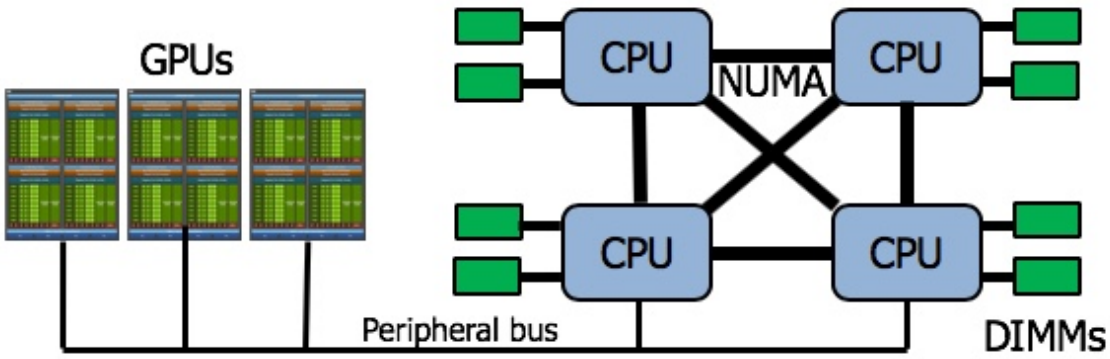


Figure 3: Simplified model of a multiprocessor server

A wide variety of creative approaches exist for TA1.1, with various implications for throughputs, latencies, and consequences for research in TA1.2 and TA2. Proposers should be familiar with and cite prior technical work in this area.

TA1 proposers must provide a scientific and technical argument for their choice of data pathways versus design alternatives, describing the quantitative trade-offs motivating the proposed research plan. The analysis should be sufficiently detailed to demonstrate the proposer's understanding of the technical challenges that must be overcome.

A proposer's research plan may include pursuing several approaches in sequence or concurrently, e.g., a conservative design for the short-term to get TA1.2 work under way, and a

more radical, longer-term "stretch" design that requires much more research and thus more time to reach a functional state. The proposer's scientific and technical argument supporting the chosen strategy should follow naturally from the tradespace analysis.

Proposers should explicitly and clearly "connect the dots" from the challenges inherent in their choice of host attachment to how the approaches proposed will address them. For one example in the large space of possible options, in the case of a peripheral bus (see Figure 3), the bus's intended role in sharing access to server peripherals inhibits scaling throughput by increasing the number of attached data transfer points, as it is a resource shared amongst the peripherals (such as the GPUs illustrated) and the server's sockets. Bus contention or overload may thus become an issue when multiple cards are attached to the server.

On the other hand, a potential advantage accruing from such a strategy could be reduced time to achieve an initial TA1 capability, in the form of device driver software (written assuming that network interfaces resemble input/output devices). To illustrate the interplay of network hardware with low-level software such as device drivers, consider the common case of a commercial NIC that connects to servers via a peripheral bus, e.g., Peripheral Component Interconnect Express (PCIe). This plan may offer a quick start for TA 1.2 research, as such an attachment is similar to existing systems, except in the number of attachment points. However, meeting the performance goals of the program may require that this number be large enough to challenge assumptions embedded in current systems software (regarding, for instance, serialization, interrupt service, or scheduling) or simply attachment feasibility.

Overcoming the limitations of an inadequate maximum throughput on a shared peripheral attachment bus might necessitate disconnecting lanes of the bus from CPU sockets and replacing the electrical paths with a connection directly to lanes at the socket. For example, the PCIe connects directly to a socketed processor on the motherboard. Data exchange would then be via a non-shared parallel per-socket approach.

Another approach, broadly similar, would be to connect to the server's memory, comprised of Dual Inline Memory Modules (DIMMs). In a multiprocessor server, memory is processor-local and memory channels connect directly to processor sockets. DIMMs populate slots associated with particular CPU sockets.

This approach would be a major departure from today's network attachment schemes and may, therefore, demand substantial creativity and a collection of novel software strategies to extract full performance, which is the focus of TA1.2 research.

TA1 proposers should clearly describe any and all assumptions regarding the external network that interconnects the FastNICs TA1.1 servers. For example, under the assumption that wavelength division multiplexing (WDM) is used over single-mode fiber pairs to create a parallelized data path, are optical add/drop multiplexors and/or packet switches presumed to be available on the network side of the proposed FastNICs approach? If so, are these devices necessary for your proposed TA1.1 solution (e.g., in-network packet manipulation as a preprocessing step to prepare packets for traversing in-server paths more efficiently)?

TA1 proposers must include an estimate of the size, weight and power anticipated for sustained operation of their proposed TA1.1 systems. TA1.1 hardware deliverables will include network hardware sufficient to interconnect eight (8) servers. TA1 proposals should include an equipment

purchase plan for servers necessary for experimentation and evaluation. As the TA3 Independent Test and Evaluations are expected to be performed at the TA1 performer site, the TA1 equipment purchase plan should anticipate, and be adequate for, concurrent use of equipment for TA1, TA2, and TA3.

**TA1.2 Network Subsystem Software**

FastNICs TA 1.2 will develop the system software required to manage TA1.1 hardware, as well as enable the efficient transit of data to and from processing resources in support of TA 2 applications research. Responsive TA1.2 research proposals will incorporate both novel resource management approaches and novel programming models and interfaces.

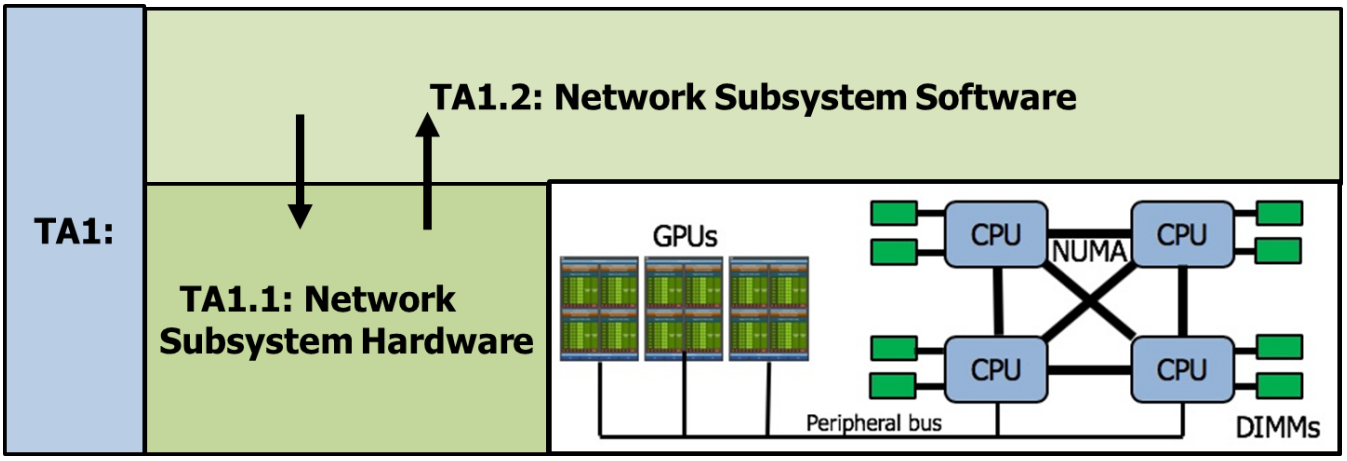


Figure 4: TA 1.2 must manage both the TA 1.1 network hardware and the attached server

As illustrated in Figure 4, TA 1.2 must enable the full potential of the proposed TA 1.1 hardware in the context of a server platform, resulting in a working prototype suitable for TA 2 research and experimental validation. TA1.2 must also provide programming interfaces enabling TA 2 to unleash the system's potential performance. TA 1.2 will collaborate closely with TA 2 while developing the interfaces, APIs, and programming tools (see Figure 5).

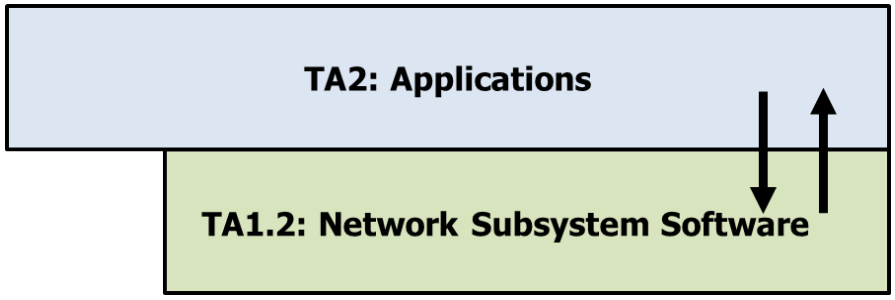


Figure 5: FastNICs program Technical Areas TA 1.2 and TA 2

TA 1 proposals should propose novel general programming primitives for connecting multiprocessor systems into a distributed computation in TA 1.2. Here, general means that the proposed primitive can support the range of conditions that multiple TA 2 performers would require.

```
Surface Tile[2][2];

Surface_Read(Tile,
     Remote_Tile,
     THROUGHPUT);

Surface_Process(Tile,
     LATENCY|DYNAMIC);
```

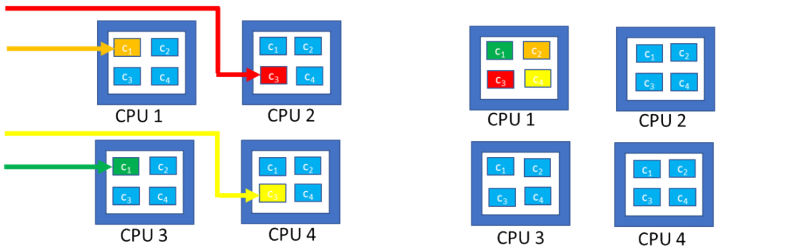


Figure 6: An example interface primitive, the "Computing Surface"

As an illustrative conceptual example, consider the "Computing Surface," a collection of cores associated with an application, as sketched in Figure 6. It might have sizes and attributes that distributed computations can exploit to reduce software overheads, as well as identify optimal per-application or per-execution stage resource management objectives on the server. Figure 6 declares a 2x2 computing surface, "Tile", comprising 4 cores; declaration as 2x2 rather than 1x4 might be indicative of the communications pattern amongst its constituent cores. In the Surface_Read invocation, on the left, data ingest needs maximum throughput for the surface, so the component cores are placed on separate CPUs in a notional 4-processor server. For the Surface_Process invocation, on the right, the cores of Tile are placed together on a single CPU to minimize latencies and maximize use of caches.

Libraries for programming languages are used to raise the level of abstraction to that needed by the TA 2 application. TA 1.2 software deliverables must be open source, and compatible with one or more open source operating systems, e.g., a Linux or BSD variant.

In order to realize 100x at the application level, the system software must enable efficient and parallel transfer of data between the TA 1.1 network hardware and the other elements of the system shown in Figure 3.

Strong proposals will address many of the following issues:

- Memory: Reducing copies, cache-awareness, NUMA-awareness, maximizing concurrent access, memory protection, sharing, address translation, coherence guarantees, etc.
- Computing: scheduling, event-signaling, efficient inter-process communication, cache-aware thread placement, throughput aware scheduling, latency aware scheduling, co-scheduling sets of cores, maximizing concurrency of processing and communication, novel data locking and serialization algorithms, etc.
- Device management: GPUs, NICs, interrupts, polling/interrupt hybrids, clocked interrupts, use of programmability, reconfigurable devices, etc.
- Networking: Protocol data units, network striping algorithms and units, novel protocols, support for IP, UDP/IP and TCP, etc.

For FastNICs, system software is defined broadly, to be any or all of device firmware, virtualization support, operating systems functions, and libraries to provide efficient application

programming interfaces (APIs). It is expected that TA 1.2 efforts will generate software libraries usable by TA 2.

Proposers should distinguish between TA 1.2 approaches that are independent of their TA 1.1 approach and those that are necessitated by it. Examples of the former might include cache-aware or memory hierarchy aware thread and page placement, novel scheduling and event management schemes, and libraries that adapt dynamically to changes in machine resources and user intent. For examples of the latter, consider the case of a TA 1.1 attachment scheme using Dual Inline Memory Module (DIMM) slots as a means to access memory channels associated with each CPU socket.

The data rates and number of these channels offer the raw potential for a fast, highly parallel hardware attachment solution, at the (substantial) cost of losing the coherence support built into NUMA interconnects. System approaches to reestablishing coherence might include the addition of one or more status registers accessible through a more conventional interface such as the peripheral bus. Use of busy-waiting approaches such as polling or more nuanced event-signaling techniques such as clocked interrupts can be used to determine when data has arrived or has been sent. Steps can then be taken, such as invoking specialized code to populate or repopulate entries in flushed data caches towards the goal of consistent views of memory shared amongst elements of a grouping such as the surface sketched in Figure 6. If an approach requires unusual control paths and corresponding software support, proposers should describe both their hardware control path strategies and what other resources are assumed for efficiently performing such tasks, e.g., by use of a plenitude of available cores or use of hyperthreading hardware.

Strategies for maximizing the likelihood of technology transition (e.g., open-source licensing of any modifications necessary to support FastNICs, choice of open-source license, etc.) should be described explicitly and succinctly.

TA1 proposals should provide plans for iteratively developing, testing, and refining their technologies throughout the entire four-year program. TA1 metrics and phase goals are shown below in Table 1.

**TA2 Applications**

TA2, the applications technical area, will explore new applications enabled by the multiple order of magnitude performance increases provided by TA1, and validate the FastNICs objective of increasing application performance. Each TA2 team will design and implement at least one application that demonstrates a 100x speedup when executed on the TA1 hardware/software stack. This technical area will be an important driver for TA1.2 interface/API design.

Strong TA2 proposals will include models of the impacts of throughput increases on the application research proposed for FastNICs. Algorithmic and distributed processing advances should assume the success of FastNICs TA1.

For purposes of modeling the impacts of FastNICs on their proposed application research, TA2 proposers should presume a constant cluster setup of four computing nodes, each with 12TB of 2666 MHz memory, 224 physical cores and a 1-microsecond node-node latency. Estimates for throughput values of 2, 5, 10, 20, 50, 100, 200, 500 and 1000 gigabits per second, as well as the three values for end of Phase metrics for throughputs expected from TA1.1 (2, 5 and 10 terabits per second) should be modeled to estimate the benefit of greatly improved network throughputs

on the proposed application or applications. Proposers should provide the scientific basis for these estimates, such as mathematical models based on published research, proposer-developed simulations, traces from measurements, etc. The sole purpose of these estimates is for the TA2 proposers to convincingly demonstrate their depth of understanding of the impact of throughput on their application to DARPA.

Applications proposed for TA2 research should be relevant to DoD and should fit broadly into either machine learning training or image processing or both. An example of relevant training is using tagged images to train a deep learning system to recognize anomalies in a time series of image captures, such as the presence of a strange structure, or a sudden spurt in activity at facilities in an inexplicable location.

Algorithmic advances in distributed machine learning training have been achieved under the assumption that the performance limitations inherent in today's network stacks will persist indefinitely. The scale of computational challenges facing the DoD requires multiple servers, forcing training of machine learning to become a distributed computation to achieve the required performance. As these computations are often very data-intensive, restructuring distributed training to reduce network use, e.g., by data compression or use of more iterations to avoid passing data, is common. Distributed training is thus an exemplary application of FastNICs. Applications of the results of such training, such as the analysis of multiple large-scale data streams, provide compelling cases for transition partners.

Many other large-scale applications of interest exist, examples of which include pattern recognition using multiple concurrent streams of data, data generated from arrays of sensors that must be cohered for situational awareness, and real-time fusion with joint analysis of sensor feeds and stored data retrieved from multiple remote repositories.

To reach performance goals, TA2 performers will initially research and model distributed algorithms that require substantial network communication. These models will be used to identify system bottlenecks, which will be used to further focus TA1. The models will also be used to determine the effect of network latency and throughput on application speed.

TA2 will collaborate closely with TA1.2. TA2 proposers should, if an existing version of the application exists, propose an ideal interface for their application or applications. For example, an application might be rewritten with a shared memory model to replace a legacy remote procedure call scheme. These ideal interfaces will enable TA1.2 performers to generate appropriate interfaces, APIs, and programming tools. TA2 will implement their algorithms using TA1.2's evolving set of programming interfaces, tools, and libraries. Improving application performance to meet FastNICs program goals will require the entire hardware/software stack (TA1.1, TA1.2, and TA2) to operate in an effective, integrated fashion. Workshops for specifying and working through details of these interfaces are included in the program's schedule.

TA2 proposals should provide plans for iteratively developing, testing, and refining their technologies throughout the entire four-year program. TA2 metrics and phase goals are shown in Table 1.

| TA | Metric | Phase 1 (24 months) | Phase 2 (12 months) | Phase 3 (12 months) |
|---|---|---|---|---|
| 1.1 | Datapath, link to cores | >2 Tbps | >5 Tbps | 10+ Tbps |
| | Latency, link to cores | 100 nsec max, 4 cores in 1 CPU | 40 nsec max, 8 cores on 2 CPUs | 20 nsec max, 16 cores on 4+ CPUs |
| 1.2 | Sustained software throughput | 12TB in 100 sec | 12TB in 30 sec | 12TB in 16 sec |
| | Software Round Trip Time (3m fiber) | 1000 nanoseconds | 400 nanoseconds | 200 nanoseconds |
| 2 | Training time, ImageNet (50 minute baseline) | 600 seconds | 120 seconds | 30 seconds |
| | Training time, labelled 5GB Earth Observing System (EOS) images (90 minute baseline) | 1200 seconds | 180 seconds | 40 seconds |
| | Image processing throughput, 95% accuracy classifier, single FastNICs-equipped server, EOS-sized images | 25 images/sec | 75 images/sec | 150 images/sec |

Table 1: FastNICs Metrics

**TA3 Independent Test and Evaluation**

Finally, the Independent Test and Evaluation technical area (TA3) will measure the scientific progress of the program and technical area performance against the metrics in Table 1, and independently provide an objective and convincing evidence base for the impact of FastNICs.

The TA3 performer is responsible for:

- Refining TA1.1, TA1.2, and TA2 metrics and devising measurement methodologies, including selection, configuration, and operation of measurement equipment and software tools. These methodologies should enable TA3 to definitively measure performance gains accruing from TA1.1, TA1.2, and TA2 technologies.
- Finding and/or generating data required by TA2 (i.e., labeled training data)
- Facilitating project-level experimentation, data collection, and data analysis
- Conducting project and program-level evaluations at each Phase and as needed by DARPA

Of particular interest are evaluation strategies that:

- Analyze data movement, data routing, and impacts of statistical phenomena such as locality on the metrics
- Analyze performance as the number of cores and CPUs in a chassis increases
- Analyze node and application performance as a function of link throughput and latency
- Analyze application performance as a function of scale
- Are lightweight and minimize interference with the system under test
- Provide concurrent measurement of hardware, software and application performance

TA3 proposers should assume that one TA1 and two TA2 proposals will be funded by DARPA, and must include options for an additional performer in each TA1 and TA2. These options should be separate. Cost estimates should reflect the savings from sharing costs, such as proposed measurement apparatus and software tools, while accounting for the additional TA3 effort required to evaluate multiple systems that might be very similar or very unlike in design. To provide an additional degree of flexibility, multiple options for evaluating an additional TA1 performer may be proposed at different levels of effort.

### E. Schedule/Milestones

DARPA will conduct quarterly technical reviews, comprising biannual Principal Investigator (PI) meetings and biannual development workshops, during which the program management team will assess progress towards a solution via performer briefings and technical exchanges. For cost estimation purposes, assume that the locations for PI meetings will alternate between Los Angeles, CA, and Washington, DC, and each meeting will be 2-1/2 days. Program evaluation will be conducted by the Government team throughout program execution. The program schedule and milestones are shown in Figure 6 below.

| | Phase 1 | | | | | | | | Phase 2 | | | | Phase 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Government Fiscal Year | 2020 | | 2021 | | | | 2022 | | | | 2023 | | | | 2024 | |
| GFY Quarter | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 |
| Kickoff and PI Meetings | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | |
| Development Workshops | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | ♦ | | |
| T&E Activities | | | | | | | | ♦ | | | | ♦ | | | | ♦ |
| Transition Demonstrations | | | | | | | ♦ | | | | ♦ | | | | ♦ | |
| Integrated System Demos | | | | | | | | ♦ | | | | ♦ | | | | ♦ |

Figure 6: FastNICs Schedule

### F. Deliverables

All performers will be required to provide, at a minimum, the following deliverables:

- Any technical documents and products derived from work funded by this program
- Hardware instances produced by TA1.1 with documentation, including electrical requirements, mechanical details, and other details as needed for installation, reliable operation, and diagnosis
- Commented source code, any other necessary data, build scripts, and documentation (including at minimum user manuals and a detailed software design document) for all software developed under this program
- Annotated slide presentations, delivered within one (1) month after each PI meeting, development workshop, or other program events
- Quarterly technical status reports detailing progress made, tasks accomplished, major risks, planned activities, trip summaries, changes to key personnel, and any potential issues or problem areas that require the attention of the Government Team must be provided within fifteen (15) calendar days of the end of each quarter
- Monthly financial status reports, provided within fifteen (15) calendar days of the end of each month
- A final phase report for each program phase that concisely summarizes the effort conducted, technical achievements, and remaining technical challenges will be due 30 calendar days after the end of each phase

- A final report at the end of the overall period of performance that summarizes the project

### G. Intellectual Property

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

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

## II. Award Information

### A. Awards

DARPA anticipates a single award for TA1, multiple awards for TA2, and a single award for TA3. The level of funding for individual awards made under this solicitation has not been predetermined and will depend on the quality of the proposals received and the availability of funds. Awards will be made to proposers whose proposals are determined to be the most advantageous to the Government, all factors considered, including the potential contributions of the proposed work, overall funding strategy, and availability of funding. See Section V for further information.

The Government reserves the right to:

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

Proposals selected for award negotiation may result in a procurement contract 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).

### D. Other Eligibility Requirements

#### 1. Ability to Receive Awards in Multiple Technical Areas - Conflicts of Interest

While proposers may submit proposals for all three Technical Areas, proposers selected for Technical Area 3 cannot be selected for any portion of the other two Technical Areas, whether as a prime, subcontractor, or in any other capacity from an organizational to individual level. This is to avoid OCI situations between the Technical Areas and to ensure objective test and evaluation results. The decision as to which proposal to consider for award is at the discretion of the Government.

## IV. Application and Submission Information

### A. Address to Request Application Package

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

### B. Content and Form of Application Submission

#### 1. 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 font size no 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, and they may propose to multiple TAs.

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 40 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 (HR001119S0082)
- Technical Area
- 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 contracts or OT.[1]
- Total amount of the proposed effort
- Place(s) and period(s) of performance
- Other team member (subcontractors and consultants) information (for each, include Technical POC name, organization, type of organization, mailing address, telephone number, and email address)
- Proposal validity period (minimum 120 days)
- Data Universal Numbering System (DUNS) number[2]
- Taxpayer Identification Number (TIN)[3]
- Commercial and Government Entity (CAGE) code[4]
- Proposer's reference number (if any)

[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.

**ii. Table of Contents**

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

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

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

**iv. Innovative Claims and Deliverables:** Describe the innovative aspects of the project in the context of existing capabilities and approaches, clearly delineating the uniqueness and benefits of this project in the context of the state of the art, alternative approaches, and other projects from the past and present. Describe how the proposed project is 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 | A description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate |
|---|---|---|

| | supported | 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, but with the label "Proposal: Volume 2."

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

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

**(1) Direct Labor:** Provide labor categories, rates and hours. Justify rates by providing examples of equivalent rates for equivalent talent, past commercial or Government rates 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.). For proposed equipment/information technology (as defined in FAR 2.101) purchases equal to or greater than $50,000, include a letter justifying the purchase. Include any requests for Government-furnished equipment or information with cost estimates (if applicable) and delivery dates.

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

**(5) Subcontractor/Consultant Costs:** Provide above 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/consultant cost proposals. At a minimum, the submitted cost volume must contain a copy of each subcontractor or consultant non-proprietary cost proposal (i.e., cost proposals that do not contain proprietary pricing information such as rates, factors, etc.). Proprietary subcontractor/consultant cost proposals may be included as part of Volume 2. Proposal submissions will not be considered complete unless the Government has received all subcontractor/consultant cost proposals.

If proprietary subcontractor/consultant cost proposals are not included as part of Volume 2, they may be emailed separately to FASTNICS@darpa.mil. Email messages must include “Subcontractor Cost Proposal” in the subject line and identify the principal investigator, prime proposer organization, and proposal title in the body of the message. Any proprietary subcontractor or consultant proposal documentation which is not uploaded to 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.

**(6) 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 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 for Prototypes:** Proposers must indicate whether they qualify as a nontraditional Defense contractor[5], have teamed with a nontraditional Defense contractor, or are providing a one-third cost share for this effort. Provide information to support the claims.

Provide a detailed list of milestones including: description, completion criteria, due date, and payment/funding schedule (to include, if cost share is proposed, contractor and Government share amounts). Milestones must relate directly to accomplishment of technical metrics as defined in the solicitation and/or the proposal. While agreement type (fixed price or expenditure based) will be subject to negotiation, the use of fixed price

[5] For definitions and information on an OT agreements see https://www.darpa.mil/work-with-us/contract-management.

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 7. 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.

| | | | | Labor Hours for Prime | | | | | | | Labor Hours for Subcontractor/Consultants | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SOW Task | Duration (months) | Intensity (hrs/mo) | 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) | Conslt | Total |
| 1.1.0 | <Phase 1 Task 1 name> | 7 | 135 | 240 | | 680 | | 24 | | 944 | - | | | | | | 200 | 1,144 |
| 1.1.1 | <Subtask 1.1.1 name> | 4 | 90 | 80 | | 280 | | - | | 360 | - | | | | | | 200 | 560 |
| 1.1.2 | <Subtask 1.1.2 name> | 3 | 195 | 160 | | 400 | | 24 | | 584 | - | | | | | | - | 584 |
| 1.2.0 | <Phase 1 Task 2 name> | 6 | 385 | 108 | | 400 | | 1,800 | | 2,308 | 1,400 | | | | | | - | 3,708 |
| 1.2.1 | <Subtask 1.2.1 name> | 3 | 656 | 48 | | 320 | | 1,600 | | 1,968 | 600 | | | | | | - | 2,568 |
| 1.2.2 | <Subtask 1.2.2 name> | 3 | 113 | 60 | | 80 | | 200 | | 340 | 800 | | | | | | - | 1,140 |
| : | : | : | : | : | | : | | : | | : | : | | | | | | : | : |
| | | Phase 1 Total Hours | | 348 | | 1,080 | | 1,824 | | 3,252 | 1,400 | | | | | | 200 | 4,652 |
| | Phase 1 Costs *First column is prime, second is* | | | | | | | Travel | | $ 44,000 | $ 12,000 | | | | | | $ 2,000 | $ 58,000 |
| | *total subcontractor, third is total consultant, fourth is total* | | | | | | | Materials & Equipment | | $ 8,000 | $ - | | | | | | $ - | $ 8,000 |
| 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 *First column is prime, second is* | | | | | | | Travel | | $ 47,000 | $ 12,000 | | | | | | $ 2,000 | $ 61,000 |
| | *total subcontractor, third is total consultant, fourth is total* | | | | | | | Materials & Equipment | | $ 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 *First column is prime, second is* | | | | | | | Travel | | $ 48,000 | $ 12,000 | | | | | | $ 2,000 | $ 62,000 |
| | *total subcontractor, third is total consultant, fourth is total* | | | | | | | Materials & Equipment | | $ - | $ - | | | | | | $ - | $ - |
| | | Project Total Hours | | 984 | | 3,360 | | 5,608 | | 9,952 | 4,040 | | | | | | 400 | 14,092 |
| | Total Project Costs *First column is prime, second is* | | | | | | | Travel | | $ 139,000 | $ 36,000 | | | | | | $ 6,000 | $ 181,000 |
| | *total subcontractor, third is total consultant, fourth is total* | | | | | | | Materials & Equipment | | $ 12,000 | $ - | | | | | | $ - | $ 12,000 |

**Figure 7: Example level-of-effort summary table. Numbers illustrate roll-ups and subtotals. The SubC column captures all subcontractor hours and the Conslt column captures all consultant hours. 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.

## 2. 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

DARPA anticipates that most submissions received under this solicitation will be unclassified; however, classified submissions will be accepted. Classified submissions must be appropriately and conspicuously marked with the proposed classification level and declassification date. Use classification and marking guidance provided by the DoD Information Security Manual (DoDM 5200.1, Volumes 1-4) and the National Industrial Security Program Operating Manual (DoD 5220.22-M). When marking information previously classified by another Original Classification Authority (OCA), also use the applicable security classification guides. Classified submissions must indicate the classification level of not only the submitted materials but also the anticipated classification level of the award document. Please contact (FastNICs) staff at FASTNICS@darpa.mil if you have any questions.

If a proposer believes a submission contains classified information (as defined by Executive Order 13526) but requires DARPA to make a final classification determination, the information must be marked and protected as though classified at the appropriate classification level (as defined by Executive Order 13526). Submissions requesting DARPA to make a final classification determination shall be marked as follows:

> "CLASSIFICATION DETERMINATION PENDING. Protect as though classified _____ *[insert the recommended classification level, e.g., Confidential, Secret, or Top Secret]*."

Proposers submitting classified proposals or requiring access to classified information during the lifecycle of the project shall ensure all industrial, personnel, and information system processing security requirements (e.g., facility clearance, personnel security clearance, certification, and accreditation) are in place and at the appropriate level, and any foreign ownership control and influence issues are mitigated prior to submission or access. Proposers must have existing, approved capabilities (personnel and facilities) prior to award to perform research and development at the classification level proposed. Additional information on these subjects is at http://www.dss.mil.

Classified submissions will not be returned. The original of each classified submission received will be retained at DARPA, and all other copies destroyed. A destruction certificate will be provided if a formal request is received by DARPA within 5 days of

notification of non-selection.

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

### C. Submission Date and Time

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

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

**Proposals**

The proposal package -- full proposal (Volume 1 and 2) and, as applicable, proprietary subcontractor cost proposals, classified appendices to unclassified proposals -- must be submitted per the instructions outlined herein and received by DARPA no later than **October 8, 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 full proposals will not be accepted.

##### a. 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 FASTNICS@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.*

**2. Classified Submission Instructions**

Classified materials must be submitted in accordance with the guidelines outlined herein and must not be submitted electronically by any means, including the electronic web-based system as described above. Use transmission, classification, handling, and marking guidance provided by previously issued SCGs, the DoD Information Security Manual (DoDM 5200.01, Volumes 1 - 4), and the National Industrial Security Program Operating Manual, including the Supplement Revision 1, (DoD 5220.22-M and DoD 5200.22-M Sup. 1) when submitting Confidential, Secret, and/or Top Secret classified information.

If submissions contain information previously classified by another OCA, proposers must also follow any applicable SCGs when transmitting their documents. Applicable classification guide(s) must be included to ensure the submission is protected at the appropriate classification level.

**a. Confidential and Collateral Secret Information**

Classified information at the Confidential or Secret level must be submitted by one of the following methods:

- Hand-carried by an appropriately cleared and authorized courier to DARPA. Prior to traveling, the courier must contact the DARPA Classified Document Registry (CDR) at 703-526-4052 to coordinate arrival and delivery.

or

- Mailed by U.S. Postal Service Registered Mail or Express Mail.

All classified information will be enclosed in opaque inner and outer covers and double wrapped. The inner envelope must be sealed and plainly marked with the assigned classification and addresses of both sender and addressee. The inner envelope must be addressed to:

Defense Advanced Research Projects Agency
ATTN: I2O BAA Coordinator
Reference: HR001119S0082
675 North Randolph Street
Arlington, VA 22203-2114

The outer envelope must be sealed without identification as to the classification of its contents and addressed to:

Defense Advanced Research Projects Agency
Security and Intelligence Directorate, Attn: CDR
675 North Randolph Street
Arlington, VA 22203-2114

**b. Top Secret (TS) Information**

TS information must be hand-carried, by appropriately cleared and authorized courier(s), to DARPA. Prior to traveling, the courier(s) must contact the DARPA CDR at 703-526-4052 for instructions.

**c. Special Access Program (SAP) Information**

SAP information must be marked in accordance with DoDM 5205.07 Volume 4 and transmitted by specifically approved methods which will be provided by the Technical Office PSO or their staff. Proposers choosing to submit SAP information from an agency other than DARPA are required to provide the DARPA Technical Office PSO written permission from the source material's cognizant Special Access Program Control Officer

(SAPCO) or designated representative. For clarification regarding this process, contact the DARPA Technical Office PSO via the BAA mailbox or the DARPA SAPCO at 703-526-4102. Additional SAP security requirements regarding facility accreditations, information security, personnel security, physical security, operations security, test security, classified transportation plans, and program protection planning may be specified in the DD Form 254.

*NOTE: Prior to drafting the submission, if use of SAP Information Systems is to be proposed, proposers must first obtain an Authorization-to-Operate from the DARPA Technical Office PSO (or other applicable DARPA Authorization Official) using the Risk Management Framework (RMF) process outlined in the Joint Special Access Program (SAP) Implementation Guide (JSIG), Revision 3, dated October 9, 2013 (or successor document).*

**d. Sensitive Compartmented Information (SCI)**

SCI must be marked, managed and transmitted in accordance with DoDM 5105.21 Volumes 1 - 3. Questions regarding the transmission of SCI may be sent to the DARPA Technical Office Program Security Officer (PSO) via the BAA mailbox or by contacting the DARPA Special Security Officer (SSO) at 703-812-1970.

Successful proposers may be sponsored by DARPA for access to SCI. Sponsorship must be aligned to an existing DD Form 254 where SCI has been authorized. Questions regarding SCI sponsorship should be directed to the DARPA Personnel Security Office at 703-526-4543.

## 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. 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.1.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.1.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.1.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. 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).

### 5. 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.

### 6. 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:** Jonathan Smith, Program Manager, DARPA/I2O
- **Email:** FASTNICS@darpa.mil
- **Mailing address**:
  DARPA/I2O
  ATTN: HR001119S0082
  675 North Randolph Street
  Arlington, VA 22203-2114
- **I2O Solicitation Website:** http://www.darpa.mil/work-with-us/opportunities

## VIII. Other Information

### A. Frequently Asked Questions (FAQs)

Administrative, technical, and contractual questions should be sent via email to FASTNICS@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/work-with-us/opportunities

### B. Proposers Day

The FastNICs Proposers Day was held on July 10, 2019, in Arlington, VA. The special notice regarding the FastNICs Proposers Day, DARPA-SN-19-62, can be found at https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-19-62/listing.html

For further information regarding the FastNICs Proposers Day, including slides from the event, please see http://www.darpa.mil/work-with-us/opportunities under HR001119S0082.

### 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 |
|---|---|---|---|---|
| | Obtain DUNS number | IV.B.1.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.1.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/individuals/international-taxpayers/taxpayer-identification-numbers-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://www.sam.gov/SAM/ for information and registration. Note: new registrations can take an average of 7-10 business days. SAM registration requires the following information:<br>-DUNS number<br>-TIN<br>-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.<br>-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.1 | Required of all proposers | Conform to stated page limits and formatting requirements. Include all requested information. |
| | Appendix A | IV.B.1.a.xi | Required of all proposers | -Team member identification<br>- Government/FFRDC team member proof of eligibility<br>- Organizational conflict of interest affirmations<br>- Intellectual property assertions<br>- Human subjects research<br>- Animal use<br>- Unpaid delinquent tax liability/felony conviction representations<br>-CASB disclosure, if applicable |
| | Appendix B | IV.B.1.a.xii | Optional of all proposers | - Appendix B does not count against the page limit<br>- A brief bibliography to relevant papers, reports, or resumes<br>- Do not include technical papers<br>- The materials in Appendix B will not be evaluated as part of the proposal review |
| | Volume 2 (Cost Proposal) | IV.B.1.b | Required of all proposers | - Cover Sheet<br>- Cost summary<br>- Detailed cost information including justifications for direct labor, indirect costs/rates, materials/equipment, subcontractors/consultants, travel, ODCs<br>- Cost spreadsheet file (.xls or equivalent format)<br>- If applicable, list of milestones for Other Transactions<br>- Subcontractor plan, if applicable Subcontractor cost proposals<br>- Itemized list of material and equipment items to be purchased with vendor quotes or engineering estimates for material and equipment more than $50,000<br>- Travel purpose, departure/arrival destinations, and sample airfare |
| | Level of Effort Summary by Task Excel spreadsheet | IV.1.2.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.1.2.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 HR001119S0082. Awards other than FAR based contracts will contain similar agreement language:

(a) It is recognized that success of the FastNICs 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 FastNICs 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 FastNICs 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 FastNICs research effort include:

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

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