

**CHIEF DIGITAL AND ARTIFICIAL INTELLIGENCE OFFICE (CDAO)
DoD 24.4 Small Business Innovation Research (SBIR) Annual BAA
Proposal Submission Instructions**

March 28, 2024: Topic issued for pre-release

April 10, 2024: Topic opens; CDAO begins accepting proposals via DSIP

May 15, 2024: Deadline for receipt of proposals no later than **12:00 p.m. ET**

INTRODUCTION

The Department of Defense’s Chief Digital and Artificial Intelligence Office (CDAO) is the senior official responsible for the acceleration of the DoD’s adoption of data, analytics, and AI to generate decision advantage from the boardroom to the battlefield. Stood up in February 2022 by integrating the Joint Artificial Intelligence Center (JAIC), Defense Digital Services (DDS), the Chief Data Officer, and the enterprise platform Advana into one organization, the CDAO is building a strong foundation for data, analytic, and AI-enabled capabilities to be developed and fielded at scale. Part of this foundation is ensuring the Department has the necessary people, platforms, and processes needed to continuously provide business leaders and warfighters with agile solutions. CDAO recognizes that creating an ecosystem that fosters competition and collaboration is essential for the development and deployment of competitive and encourages domestic small businesses to engage in R/R&D that has both DoD-mission applicability and the potential for commercialization. Additional information on the CDAO is available at www.ai.mil.

Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. CDAO requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.

- The DoD Program BAA is located at: <https://www.defensesbirstr.mil/SBIR-STTR/Opportunities/#announcements>. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: <https://www.dodsbirstr.mil/submissions/login>.

Specific questions pertaining to the administration of the CDAO SBIR Program, and these proposal preparation instructions should be directed to:

CDAO, Office of the Chief Technology Officer
osd.pentagon.dod-cio.mbx.cdao-assist@mail.mil

PHASE I PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (DSIP) is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA.

Technical Volume (Volume 2)

The technical volume is not to exceed 15 pages and must follow the formatting requirements provided in the DoD SBIR Program BAA.

Content of the Technical Volume

The content of the technical volume must follow the requirements provided in the DoD SBIR Program BAA.

Cost Volume (Volume 3)

The Phase I Base amount must not exceed 6 months, \$150,000 and the Phase I Option amount must not exceed 6 months, \$100,000. Costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. CDAO will not accept any deviation to the POW requirements.

Company Commercialization Report (CCR) (Volume 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by CDAO during proposal evaluations.

Supporting Documents (Volume 5)

All proposing small business concerns are REQUIRED to submit the following documents to Volume 5:

1. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries
3. Disclosure of Funding Sources

Please refer to the DoD Program BAA for more information.

Additional information:

Proposing small business concerns may include the following administrative materials in Supporting Documents (Volume 5). Templates and guidance on optional material the proposing small business concern may want to include in Volume 5 is available via the Navy at:

https://navysbir.com/links_forms.htm.

- SBIR/STTR Funding Agreement Certification
- Data Rights Assertion
- Allocation of Rights between Prime and Subcontractor
- Disclosure of Information (DFARS 252.204-7000)
- Prior, Current, or Pending Support of Similar Proposals or Awards
- Foreign Citizens

Do not include documents or information to substantiate the Technical Volume (Volume 2) in Volume 5 (e.g., resumes, test data, technical reports, or publications). Such documents or information will not be considered.

DIRECT TO PHASE II PROPOSAL GUIDELINES

CDAO is not accepting Direct to Phase II Proposals under this BAA.

PHASE II PROPOSAL GUIDELINES

Phase II proposals may only be submitted by Phase I awardees.

All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II are the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to progress to a workable prototype in Phase II and transition the technology to Phase III. Details on the due date, content, maximum cost, and submission requirements of the Initial Phase II Proposal will be provided by CDAO either in the Phase I contract or by subsequent notification.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

CDAO does not offer TABA funding.

EVALUATION AND SELECTION

All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR Program BAA. CDAO will conduct an evaluation of each conforming proposal. Proposals that do not comply with the requirements detailed in this BAA and the research objective(s) of the corresponding topic are considered non-conforming and therefore are not evaluated nor considered for award. Please note the following sections that will be evaluated:

- Proposal Cover Sheet (Volume 1). The Proposal Cover Sheet (Volume 1) will undergo a compliance review to verify the proposing small business concern has met eligibility requirements and followed the instructions for the Proposal Cover Sheet as specified in the DoD SBIR Program BAA.
- Technical Volume (Volume 2). CDAO will evaluate and select Phase I proposals using the evaluation criteria specified in the Phase I Proposal Evaluation Criteria section of the DoD SBIR Program BAA, with technical merit being most important, followed by qualifications of key personnel and commercialization potential of equal importance. The Technical Volume (Volume 2) will undergo a conformance review (prior to evaluation) to verify the proposing small business concern has met the submission requirements of the BAA detailed in the DoD SBIR instructions.
- Cost Volume (Volume 3). The Cost Volume (Volume 3) will not be considered in the selection process and will only undergo a conformance review to verify the proposing small business concern has followed the BAA instructions.
- Company Commercialization Report (CCR) (Volume 4). The CCR (Volume 4) will not be evaluated by the CDAO nor will it be considered in the CDAO's award decision. However, all proposing small business concerns must refer to the DoD SBIR Program BAA to ensure compliance with DSIP Volume 4 requirements.
- Supporting Documents (Volume 5). Supporting Documents (Volume 5) will not be considered in the selection process and will only undergo a conformance review to ensure the proposing small business concern has included items in accordance with the PHASE I SUBMISSION INSTRUCTIONS section above.
- Fraud, Waste, and Abuse Training Certificate (Volume 6). Not evaluated.

Using the evaluation criteria, the Government will evaluate each proposal in its entirety, documenting the strengths and weaknesses relative to each evaluation criterion, and based on these identified strengths and weaknesses, determine the proposal's overall selectability. Proposals will not be evaluated against each other during the evaluation process, but rather evaluated on their own individual merit to determine how well the proposal meets the criteria stated in this BAA and the corresponding CDAO topic. Awards will be made to proposers whose proposals are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in the DoD SBIR BAA and availability of funding.

Given the limited funding available for each topic released, not all proposals considered selectable will be selected for funding. For the purposes of this proposal evaluation process, a selectable proposal is defined as follows: Selectable: A selectable proposal is a proposal that has been evaluated by the Government against the evaluation criteria listed in the DoD SBIR BAA and CDAO topic, and the strength of the overall proposal outweighs its weaknesses. Additionally, there are no accumulated weaknesses that would require extensive negotiations and/or a resubmitted proposal. For the purposes of this proposal evaluation process, a non-selectable proposal is defined as follows: Non-Selectable: A proposal is considered non-selectable when the proposal has been evaluated by the Government against the evaluation criteria listed in the DoD SBIR BAA and CDAO topic, and the strengths of the overall proposal do not outweigh its weaknesses.

Proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date of the DoD SBIR BAA. It is the policy of CDAO to treat all proposals as source selection information and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All CDAO support contractors are expressly prohibited from performing CDAO-sponsored technical research and are bound by appropriate nondisclosure agreements. Input on technical aspects of the proposals may be solicited by CDAO from other Government and/or non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements. No submissions will be returned. Upon completion of the evaluation and selection process, an electronic copy of each proposal received will be retained at CDAO. Proposal titles, abstracts, anticipated benefits, and keywords of proposals that are selected for contract award will undergo a CDAO Policy and Security Review. Proposal titles, abstracts, anticipated benefits, and keywords are subject to revision and/or redaction by CDAO. Final approved versions of proposal titles, abstracts, anticipated benefits, and keywords may appear on the DoD SBIR/STTR awards website and/or the SBA's SBIR/STTR award website (<https://www.sbir.gov/sbirsearch/award/all>).

Refer to the DoD Program BAA for procedures to protest the Announcement. As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to: osd.ncr.ousd-r-e.mbx.sbir-sttr-protest@mail.mil.

AWARD AND CONTRACT INFORMATION

Funding Limitations. In accordance with the SBIR and STTR Policy Directive section 4(b)(5), there is a limit of one sequential Phase II award per small business concern per topic. The maximum Phase I proposal/award amount including all options is \$306,872 over a period of 12 month. The maximum Phase II proposal/award amount including all options is \$2,045,816 (unless non-SBIR funding is being added). CDAO may award amounts, including Base and all Options, of less than \$306,872 for Phase I and \$2,045,816 for Phase II based on available funding, and the BAA instructions provided. The structure of the Phase II proposal/award, including maximum amounts as well as breakdown between Base and Option amounts will be provided to all Phase I awardees either in their Phase I award or a minimum of 30 days prior to the due date for submission of their Initial Phase II proposal.

Contract Deliverables. Contract deliverables for Phase I are typically a kick-off brief, progress reports, and a final report.

Multiple awards are anticipated. CDAO will award FAR-based government contracts (Firm- Fixed Price or Cost-Plus Reimbursement) subject to approval of the Contracting Officer. The amount of resources made available for each topic issued under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this announcement and to make awards with or without communications with proposers. Additionally, the Government reserves the right to award all, some, one, or none of the options on the contract(s)/agreement(s) of the performers based on available funding and technical performance. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, CDAO reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that CDAO desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work, as applicable. The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. The Government reserves the right to remove a proposal from award consideration should the parties fail to reach agreement on award terms, conditions, and price within a reasonable time, and/or the proposer fails to provide requested additional information within three business days. In all cases, the Government Contracting Officer reserves the right to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. CDAO 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 CDAO permission before publishing any information or results on the program.

System for Award Management (SAM). It is strongly encouraged that proposing small business concerns register in SAM, <https://sam.gov>, by the Close date of this BAA, or verify their registrations are still active and will not expire within 60 days of BAA Close. Additionally, proposing small business concerns should confirm that they are registered to receive contracts (not just grants) and the address in SAM matches the address on the proposal. A small business concern selected for an award **MUST** have an active SAM registration at the time of award or they will be considered ineligible.

OUSD(R&E)
CDAO SBIR 24.4 Topic Index
Release 1

OSD244-001 Chief Digital and Artificial Intelligence Office (CDAO) Data Mesh Reference Design (REFDES)

OSD244-001

TITLE: Chief Digital and Artificial Intelligence Office (CDAO) Data Mesh Reference Design (REFDES)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Network Systems-of-Systems

OBJECTIVE: To break the Department of Defense (DoD) enterprise data out of stovepipes created for single use cases, and to make all data seamlessly interoperable across the department, while retaining federated control, hosting, and ownership.

DESCRIPTION:

The Department aims to establish a set of software services to allow data users across the Department of Defense (DoD) enterprise to discover DoD data products, understand their structure and meaning, seamlessly negotiate access, and consume them via self-service API. Per DoD rulemaking, data access must support attribute-based access control (ABAC) and operate in a zero-trust environment.

The Department has determined that data sharing models with a unified schema and single system of record (sometimes called a “Data Warehouse”) or even semi-unstructured data in a single system of record (“Data Lake”) are not good operational fits for the Department’s requirements. A closer analogue is a “Data Mesh” as described in Dehghani (2022).¹

This program consists of three phases, described in the sections below. First, however, a few descriptions.

Peer-Cooperative Microservices

Each unique microservice is able to communicate with all other similar/identical microservices to form a specific community.

Services vs. Microservices

The rest of this document will reference services and microservices as “services”, however it recognizes the distinction between them. Larger applications, built on a single code base, typically consist of a client-side UI, a database, and a server-side application. These are Services. On the other hand microservices are built for a fully distributed system to accomplish a single feature or business logic. Instead of exchanging data within the same code base, microservices communicate with an API.

The DoD has identified 15 core functional capabilities that an enterprise data mesh at the Department must have:

1. **UIDs:** Tools to describe how data transforms and flows as it is transported from source to destination across the entire data lifecycle. Data versioning for tracking data and models as they change. *[A prototype of this is available, accompanied by a whitepaper describing its recommended structure]*
2. **Semantic Services:** Tools to promote sharing, collaboration, and reuse of data models and ontologies; alias re-referencing to build a canonical controlled vocabulary. *[A prototype of this is available, accompanied by a whitepaper describing its recommended structure]*
3. **Federated Data Catalog:** Virtually federated catalog enabling defense-wide visibility of data and interfaces through pointers to DOD assets and services. *[Multiple instantiations exist]*
4. **Data and Metadata Profiles (xBOMs):** Managed service providing attribution and characteristics that describe the meaning and intended use for data, metadata, algorithms, hardware, software, and data objects. *[A whitepaper describing its structure and the recommended schema are available]*

5. **Policy Access Control:** Tools for ensuring proper access restrictions and identity verification for all consumers and producers in the data mesh.
6. **Digital Policy Administration:** Policy administration points feeding enforcement points enabling managed data access across environments.
7. **Data Exchange Management:** Handles and routes requests via any exchange method (e.g., API, cloud storage location, access-denied environments) to appropriate services.
8. **Data Product Search:** Tool for fast, relatable, and semantically congruent searching of all data products. Provides intuitive result finding for ingenuity and novel discovery of data products.
9. **Data Mesh Pub/Sub:** Systems of producers and consumers given by asynchronous service-to-service communication.
10. **Mesh Performance Analytics:** Track the flow and usage of data across the mesh. Flow monitoring and alerting.
11. **Data Product Lifecycle Management:** Submits data products for registration to the domain and enterprise catalogs. Updates/maintains/revokes registration as necessary. Manage recalled data products. Provide recall and other data product-associated notifications to data product consumers.
12. **Data Security Classification:** Tools and policy for proper marking of all types of sensitive data across the DoD. Includes an approach to handling escalation of classification due to data aggregation.
13. **Quality Management Services:** Tools for properly computing quality metrics on data and marking the data appropriately with its quality level.
14. **Mediation Hub Services:** Managed service for coordinating automated translation capabilities from data producer schemas and contexts to those of consumers, for immediate use without further transformation. The managed service consumes structured metadata about the schema and content of the producer data, available on the Mesh (e.g. from its xBOMs), and the target information about the consumer's schema and context, and then sends the producer provided data to one or more translation services as required to return the translated data to the consumer. Implementation of specific translation services is outside the scope of this proposal; the Mediation Hub only coordinates their use and manages the mapping of producer to consumer and the required metadata.
15. **Mesh Instrumentation Tools:** Behavior analytic data stream analytics to allow performance optimization and asset value determination.

Multiple of these services are thought to be available by off the shelf (COTS) software products. In all cases, the Department is interested in keeping the resulting mesh services modular, with clear interfaces and clear separation of concerns.

PHASE I: The output of Phase I is a formal REFDES consisting of a composition of textual documentation and visual images as is appropriate to convey all concepts and their interoperability. It is required to use DoD-approved architecture tool and document creation software (e.g., Cameo). For any hybrid COTS/GOTS (Commercial Off-the-Shelf, Government Off-the-Shelf) or COTS service the REFDES must include the interoperability approach with all other services. Describe the enterprise interoperability services to promote a uniform pattern-based communication among all services and data. It is required to use DoD-approved architecture tool and document creation software and to be in accordance with (IAW) the DoD CIO Reference Design guidance^[2]. A separate output, for Phase I performers that proposed an option, is a program plan that includes a detailed Phase I option plan that bridges to your level 3 breakdown structure for the Phase II effort.

The required REFDES must address the key concepts identified in the provided outline. Any deviations from this outline must be approved by the federal government lead. The complete REFDES must clearly articulate how all services will achieve both service-level communication interoperability and data

interoperability. The end product shall enable any developer to design, develop, and implement any or all of the services independent of any other developer while ensuring full interoperability among all delivered capability. It should be accompanied by a time phased roadmap for service evolution.

The REFDES outline is below.

- Reference Design Outline
 - Introduction
 - Background
 - Purpose
 - Scope
 - Document Overview
- Assumptions and Principles
 - Assumptions
 - Principles
- Capability Concepts
 - Key Terms and Conceptual Model
 - Lifecycle Management
 - Management Environment
 - Organization
 - Process
 - Technology
 - Governance
 - Ecosystem
 - Planning
 - Production Services
 - Operations
 - External Systems
- Tools and Activities
 - Planning Tools and Activities
 - Develop
 - Build
 - Test
 - Release and Deliver
- Production Operation Tools and Activities
 - Deploy
 - Operate
 - Monitor
 - Sustain
- Support
 - Security
 - Deployment
 - Operation
 - Monitoring
- Acronym Table
- Glossary
- References

Key concepts for Data Mesh componentry shall at a minimum include:

- Visible, Accessible, Understandable, Linked, Trustworthy, Interoperable, and Secure (VAULTIS) compliance
- Services communication model and framework
- Data Templating
 - Machine-readability
 - Machine-comprehensibility
- Dynamic Attribution association
- Automated notification services
- Cybersecurity and Zero Trust support

The REFDES concept of operations (CONOPS) should consider the provided information describing service, COTS, GOTS, and the implementation model. (Figure 3)

The DoD-supplied information papers found in the References section provide the minimally-acceptable architecture and REFDES concepts. The strong default is for these to be individual services. Any deviation from the specified approaches shall be approved by the Government.

	Service	COTS/GOTS	Progress to Date	Implementation Model
1	UID	GOTS	In Process	Centrally Governed, Fully Distributed
2	Semantic Services	GOTS	In Process	Centralized
3	Data Catalog	COTS/GOTS	In Process	Centrally Governed, Fully Distributed
4	Data and Metadata Profiles ([x]BOMs)	GOTS	In Process	Centrally Governed, Fully Distributed
5	Policy Access Control	COTS/GOTS	TBD	Centrally Governed, Fully Distributed
6	Digital Policy Administration	COTS	TBD	Centrally Governed, Fully Distributed
7	Data Exchange Management	COTS	In Process	Fully Distributed
8	Data Product Search	COTS	TBD	Centrally Governed, Fully Distributed
9	Data Pub/Sub	COTS	TBD	Central Service, Distributed Content
10	Mesh Performance Analytics	COTS/GOTS	TBD	Centralized
11	Data Product Life Cycle Management	COTS/GOTS	TBD	Centrally Governed, Fully Distributed
12	Data Security Classification	COTS	In Process	Centrally Governed, Fully Distributed
13	Quality Management Services	COTS	TBD	Fully Distributed
14	Mediation Hub Services	COTS/GOTS	TBD	Fully Distributed
15	Mesh Instrumentation Tools	GOTS	TBD	Centrally Governed, Fully Distributed

Figure 3

PHASE II: In Phase II, participants will create a Minimum Viable Product (MVP) version of the chosen design, building complete enough versions of the systems in the selected Reference Design(s) to demonstrate that they can achieve the DoD’s final objective. The Phase II deliverables provide foundational understanding or capability basis for Phase III. Phase II should include viable proof of concept (POC) matured to MVP 1 for each of the 15 services demonstrably, independently, and cooperatively as a mesh component.

PHASE III DUAL USE APPLICATIONS: In Phase III, participants will create the balance of the required services and deliver a full production capability that meets all requirements for infrastructure compliance while delivering the end-using community the advantages outlined in VAULTIS. The fully operating data mesh that achieves full data interoperability with minimal to no human intervention for specific data exchange. The resulting mesh will support interoperability for applications both in the battlefield (e.g., Coalition Joint All Domain Command and Control (CJADC2), military exercises) and the boardroom (e.g., dashboarding, regular reporting).

REFERENCES:

1. <https://www.oreilly.com/library/view/data-mesh/9781492092384/>
2. https://dodcio.defense.gov/Portals/0/Documents/Library/DoD%20Enterprise%20DevSecOps-Pathway%20to%20a%20Reference%20Design_DoD-CIO_20211018.pdf
3. <https://aws.amazon.com/compare/the-difference-between-monolithic-and-microservices-architecture/>
4. Data Mesh Reference Architecture (DMRA) paper: https://media.defense.gov/2024/Mar/15/2003414274/-1/-1/1/dmra_paper.PDF
5. Unique Identifier (UID) Whitepaper: https://media.defense.gov/2024/Mar/15/2003414275/-1/-1/1/unique_identifier_wp.PDF
6. Canonical Controlled Vocabulary (CCV) Whitepaper: https://media.defense.gov/2024/Mar/15/2003414273/-1/-1/1/canonical_controlled_VOC_wp.PDF
7. eXtensible Bill of Material ([x]BOM) paper: https://media.defense.gov/2024/Mar/15/2003414075/-1/-1/1/xBOM_paper.PDF

KEYWORDS: Microservices; Data Mesh; Data Interoperability; Data Sharing Capability; VAULTIS