U.S. ARMY CORPS OF ENGINEERS (USACE) ENGINEER RESEARCH AND DEVELOPMENT CENTER (ERDC)



BROAD OTHER TRANSACTION AUTHORITY ANNOUNCEMENT (BOTAA)

ERDC BOTAA 27-01
October 2026

1. INTRODUCTION:

The U.S. Army Corps of Engineer (USACE) Engineer Research and Development Center (ERDC) is an integral component of the Office of the Assistant Secretary of Defense for Research and Engineering and helps solve our Nation's most challenging problems in civil and military engineering. ERDC strives to be the world's premier public engineering and environmental sciences research and development organization.

General information on can be obtained from the ERDC website at https://www.erdc.usace.army.mil/

This **Broad Other Transaction Authority Announcement (BOTAA)** provides information, submission instructions, and evaluation and selection criteria.

Under the authority of 10 U.S.C. 4022, ERDC seeks to award Other Transaction (OTs) to nontraditional defense contractors (NDCs), traditional defense contractors and nonprofit research institutions for ***prototype projects*** within ERDC's identified focus areas:

Military Engineering (ME)

- Protective Structures and Systems
- Protection and Survivability
- Geophysical Sensors and Data Fusion
- Vulnerability Assessment, Detection and Analytics
- Geoscience, Environmental, Geospatial and Material Modeling and Simulation
- Enhance and Assess Mobility of Manned and Unmanned Systems
- Engineering and Engineering Enabling Technologies
- Global Access Engineering
- Infrastructure Maintenance, Repair and Reconstruction Technologies
- Engineering Analysis Tools and Decision Aid Prototype Software

Engineered Resilient Systems (ERS)

- Cybersecurity
- High Performance Computing (HPC) Enabled Advanced Manufacturing (AdM)
- High Performance Data Analytics
- System Engineering Techniques
- High Performance Computing (HPC) Enabled Development of Surrogate Models and Data Analytics
- Leveraging HPC capabilities for On-the-Edge Computing
- Computational Material Testing and Validation

Each focus area is defined in Section 4.

This announcement is continuously open; white papers may be submitted and will be evaluated for the general requirements of this BOTAA at any time. The availability of funds may limit the ability of the U.S. Government to make awards in specific areas, nevertheless, white papers are sought under this BOTAA for the focus areas referenced above.

This BOTAA is considered a competitive process. White papers and subsequent proposals will be evaluated against the criteria in this announcement without regard to other submissions under this announcement.

1.1 HOW THE PROCESS WORKS:

- Offerors may submit white papers against any focus area in accordance with the guidelines at Section 3.3.1. White papers shall be submitted through ERDCWERX at https://www.erdcwerx.org/military-engineering-request-for-white-papers/
- White papers are reviewed by the Government in accordance with the evaluation criteria at Section 3.3.2.
- White papers that are determined advantageous may be selected for further consideration.
- If a white paper is selected and funding is available, the Government may request a solution pitch, technical demonstration or issue a Request for Prototype Proposal (RFPP).
- If a white paper is selected and funding is not available, the Government may request the selected white paper be maintained in the electronic library for consideration and subsequent funding up to three years after submission.
- The offeror will be notified of selection/non selection typically within 60-90 days of white paper submission and be provided further instructions as appropriate.
- Once the government issues the RFPP, collaboration will occur between the offeror and the government as necessary to develop the Scope of Work (SOW).
- The offeror will prepare and submit the proposal in accordance with the proposal requirements at Section 3.4.1 within the period of time stated in the RFPP.
- Proposals are reviewed by the government in accordance with the evaluation criteria at Section 3.4.2 and negotiations will occur if necessary.
- Award will be made once terms and conditions are agreed upon.

2. DEFINITIONS:

"Agreements Officer (AO)" is the ERDC Contracting Office (ECO) warranted individual authorized to enter into, administer, modify, or terminate agreements, as well as, execute bilateral modifications authorizing Projects on behalf of the Government.

"Agreements Officer Representative (AOR)" is the individual designated by the AO on a per-project basis to manage all technical aspects and assist in administration of the specific project.

"Cash Contribution" means one of the two (2) accepted forms of "Cost Share" where an offeror's financial resources are expended to conduct a prototype project. The cash contribution can be derived from the offeror's funds, outside sources, non-Federal contract or grant revenues, or from profit or fee on a federal procurement contract.

"Cost Share" means resources expended by the offeror on the proposed prototype. There are two kinds of cost share: cash contribution and in-kind contribution.

"Data" means recorded information, regardless of form or media on which may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Development" means the systematic use, under whatever name, of scientific and technical knowledge in the design, development, test, or evaluation of an existing or potential new technology, product or service (or of an improvement in an existing technology, product or service) for the purpose of meeting specific performance requirements or objectives. Development includes the research functions of design engineering, prototyping, and engineering testing.

"Electronic Library" is an electronic file containing White Papers that have been submitted by offerors in response to this BOTAA, reviewed by the Government and selected in accordance with the procedures outlined herein which may be funded up to three years after submission.

"Focus Area" means a broad technology area identified by the Government with regard to capabilities sought within specific domains.

"Follow-on Production" means an award of a production contract or transaction to an offeror. Follow- on production authority requires two criteria to be satisfied: 1) competitive procedures were used to select the parties to participate in the transaction (for a prototype project); and 2) the participants in the transaction successfully completed the prototype project provided for in the transaction.

"In-Kind Contribution" means one of the two (2) forms of accepted "Cost Share" where the offeror's non-financial resources expended offeror to perform a Prototype Project, such as wear and tear on in-place capital assets like machinery, the prorated value of space used for the execution of a Project, or the reasonable fair market value (appropriately prorated) of equipment, materials, and other property used in the performance of the Project.

"Nonprofit Research Institution" means an organization that conducts research as its primary function and files as a nonprofit organization under the tax code of 26 United States Code 501(c)(3).

"Nontraditional Defense Contractor" means an entity that is not currently performing and has not performed, for at least the one-year period preceding the issuance of the Request for White Papers by the DoD, any contract or subcontract for the DoD that is subject to full coverage under the cost accounting standards prescribed pursuant to section 1502 of title 41 of the U.S. Code and the regulations implementing such section.

Note: Nontraditional Defense Contractors can be at the prime level, team members, subcontractors, lower- tier vendors, or "intra-company" business units; provided the business is participating to a significant extent (i.e., is a key participant). Examples of what might be considered significant may include, but are not limited to, supplying a new key technology or product(s), accomplishing a significant amount of the effort, or in some other way causing a material reduction in the cost or schedule or increase in performance. Significance is determined by the AO with input from technical advisors for each prototype project.

"Other Transactions for Prototypes" is the authority provided under the Department of Defense under 10 U.S.C. 4022 to award "other transactions" (OTs) to carry out prototype projects that are directly relevant to enhancing the mission effectiveness of personnel of the DoD or improving platforms, systems, components, or materials proposed to be acquired or developed by the DoD, or to improvement of platforms, systems, components, or materials in use by the armed forces. The use of this authority under this acquisition instrument are not generally subject to the federal laws and regulations governing procurement contracts. As such, they are not required to comply with the Federal Acquisition Regulation (FAR), its supplements, or laws limited in their applicability to procurement contracts.

"Prototype Project(s)" includes a project that addresses-

- A proof of concept, model, or process, including a business process;
- Reverse engineering to address obsolescence;
- A pilot or novel application of commercial technologies for defense purposes;
- Agile development activity;
- The creation, design, development, or demonstration of operational utility; or
- Any combination of the above

"Request for Prototype Proposal (RFPP)" means the announcement by the Government to an Offeror requesting proposals for a prototype project to be performed by the Offeror to meet Government requirements.

"Small Business" means a small business concern as defined under Section 3 of the

Small Business Act (15 U.S.C. 632).

“Successfully Completed” means A transaction for a prototype project is complete upon the written determination of the appropriate approving official for the matter in question that efforts conducted under a Prototype OT: 1) met the key technical goals of a project; 2) satisfied success metrics incorporated in the Prototype OT; or 3) accomplished a particularly favorable or unexpected result that justifies the transition to production. Furthermore, successful completion can occur prior to the conclusion of a prototype project to allow the Government to transition any aspect of the prototype project determined to provide utility into production while other aspects of the prototype project have yet to be completed.

“White Paper” means the document submitted by an Offeror that describes their proposed solution.

3. OTHER TRANSACTIONS FOR PROTOTYPES:

3.1 GENERAL INFORMATION

The award of Prototype OTs shall be for the development of prototypes in accordance with 10 U.S.C. 4022 for projects that are ***directly relevant to enhancing the mission effectiveness of personnel of the DoD and the supporting platforms, systems, components, or materials proposed to be acquired or developed by the DoD, or to improvement of platforms, systems, components, or materials in use by the Armed Forces***.

To receive an award, one of the following must be present:

- There must be at least one NDC or nonprofit research institution participating to a significant extent in the prototype project; or
- All significant participants in the transaction other than the Federal Government are small businesses or NDCs; or
- At least one-third of the total cost of the prototype project is to be paid out of funds provided by parties other than the Federal Government.

The work performed under the resulting agreement is subject to the International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR). Each offeror is responsible for ensuring compliance. For questions regarding how to comply with the ITAR, the Department of State publishes compliance guidance at http://www.pmddtc.state.gov/compliance/index.html . For questions regarding how to comply with the EAR, the Department of Commerce publishes compliance guidance at http://www.bis.doc.gov/ .

The resultant award of any OT using the procedures of this BOTAA are NOT made or issued under the provisions of the Competition in Contracting Act of 1984 (P.L. 98-369), FAR Part 6 or any other FAR based regulation. However, the information provided in this BOTAA is intended to ensure competitive procedures are used to the maximum extent practicable when entering into agreements to carry out these prototype projects.

Only a warranted Agreements Officer may obligate the U.S. Government to the expenditure of funds for awards under this Announcement.

The U.S. Government does not fund preparation of proposals or support work efforts or tasks that are inferred from discussions with Government employees. The Offeror will not be reimbursed for any costs incurred prior to the effective date of the agreement.

There are certain post-employment restrictions on former Federal officers and employees as defined in 18 USC 207 and FAR 3.104-4(c). If an offeror believes a post-employment restriction or conflict of interest exists, notification shall be sent to the Agreements Officer prior to initiating efforts on a full proposal.

Proposals may be disclosed outside of the U.S. Government to subject matter experts for the sole purpose of technical and programmatic evaluation. The ERDC obtains a written agreement from the evaluators that information in the proposal will only be used for evaluation purposes and will not be further disclosed. Offerors are advised that proposals for funded projects may be subject to public release under the Freedom of Information Act. Therefore, Offerors should mark business plans and technical information that they reasonably believe may be withheld from FOIA disclosure with a legend identifying the documents as being submitted on a confidential basis.

The Government is prohibited from soliciting and awarding actions to contractors that have engaged or are suspected to have engaged in criminal, fraudulent, or seriously improper conduct.

By submission of a white paper, the Offeror acknowledges the requirement that prospective awardees MUST be registered in the System for Award Management (SAM) database prior to award of any agreement resulting from this BOTAA. Offerors who are not registered in SAM should consider applying for registration immediately. To remain registered in the SAM database after the initial registration, the Offeror is required to review and update on an annual basis from the date of initial registration (or subsequent updates) its information in the SAM database to ensure it is current, accurate and complete. All agreements resulting from this BOTAA will contain a requirement that a prospective awardee will have an active registration in SAM at time of award, during performance, and through final payment.

NOTICE: IAW 10 U.S.C. 4022(f), a follow-on, noncompetitive, Production OT may be awarded following the successful completion of a Prototype OT.

3.2 SUBMISSION PROCEDURES:

DO NOT INCLUDE CLASSIFIED INFORMATION

White papers shall be submitted through ERDCWERX at:
https://www.erdcwerx.org/military-engineering-request-for-white-papers/

If any of the information required in this section is missing, the white paper may not be considered. Brochures or other descriptions of general organizational or individual capabilities will not be accepted as a white paper.

All white papers will be assigned an identification number.

GENERAL FORMATTING REQUIREMENTS: White papers and proposals for all awards under this BOTAA shall be submitted electronically. All submissions must be clear, legible, and conform to the following general formatting guidelines:

- Pages shall be 8.5 x 11 inches with each page numbered “X of Y pages.”
- Margins: Minimum of 1 inch on all sides.
- Type Font: 12 point Times New Roman, single spaced.

- Acronyms: Spell out all acronyms the first time they are used.
- Language: English.
- Electronic file format: PDF, compatible with Adobe Acrobat Reader v. 11.0. File size less than 20 MB.

3.3 WHITE PAPER

3.3.1 CONTENT: White papers (technical requirements and rough order magnitude) shall be no longer than three pages and include the following:

3.2.1.2 **Cover Page (not included in page count) -** This page will be generated as the offeror provides the information requested on the White Paper Submission Form. Requested information includes:

- Primary point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), and electronic mail address (if available)
- Name of Primary Business submitting proposal including Commercial and Government Entity (CAGE) code.
- Primary Business Status: NDC, Traditional or Nonprofit Research Institution
- Focus area(s) this solution represents
- Prototype Project Title
- Prototype Description
- DoD Purpose
- Rough Order of Magnitude (ROM) price

3.2.1.3 **Technical Requirements**

- Background and benefits of proposed solution
- Technical approach, including clearly defined prototype solution
- Anticipated Data Rights Assertions, if applicable.

3.2.1.4 **Rough Order of Magnitude (ROM) –** Estimated price (including anticipated cost share, if applicable) and any supporting documentation

3.3.2 EVALUATIONS: White papers will be evaluated based on an integrated assessment of the following:

- The degree to which the solution meets a government problem, area of need or capability gap within an identified focus area.
- The evaluation of the ROM price and whether it is commensurate with the identified solution.
- Government funding availability.
- The evaluation of whether the white paper sufficiently demonstrates 1)

significant participation by NDCs, 2) significant participation by nonprofit research institutions, 3) all significant participants in the transaction other than the Federal Government are small businesses or NDCs, or 4) at least one-third of the total cost of the prototype project is to be paid out of funds provided by parties other than the Federal Government.

3.3.3 NOTIFICATION: The Offeror will receive an email regarding the white paper usually within 60-90 days of submission with ERDC's determination whether to select/non select all or some portion of the white paper.

3.4 PROPOSALS:

If a white paper is selected by the government and funding is available, an RFPP will be issued to the Offeror. (Note: Solution pitch and/or demonstration may be requested in advance of RFPP). Submission instructions will be included in the RFPP.

3.4.1 CONTENT

3.4.1.1 Cover Page

- White paper ID# (issued at white paper submission)
- Prototype Project Title
- Name of Primary Business submitting proposal. Including Commercial and Government Entity code (CAGE) and Unique Entity Identifier (UEI).
- Date proposal was submitted

3.4.1.2 Statement of Work Requirements: The Offeror shall submit a statement of work that formally captures and defines the work activities, deliverables, and timeline, for the prime contractor and any subcontractors, necessary to execute development of the prototype. Include the following:

- Background
- General Requirements to include safety, environmental and security
- Technical Requirements/Objectives
- Define successful completion (See definitions)
- Reporting and Delivery Requirements
- Period/Place of Performance
- Government Furnished Property/Equipment/Materials/Data
- Access to any Government Systems, if necessary

3.4.1.3 Milestone Payment Schedule: The milestone payment schedule shall include the firm fixed priced payable events for the prototype project. Each event shall include a description, proposed price, and target timeframe to complete the event.

3.4.1.4 Security Requirements. Although not to be evaluated, the Offeror shall identify existing or describe capability of obtaining personnel/facilities security clearances if necessary. DoD security management and handling requirements outlined in regulations such as DoD 5200.1-R and DoD 5400.07 apply to prototype other transactions.

3.4.1.5 Data Rights - All agreements that require data to be produced, furnished, acquired or used in meeting performance requirements, must contain terms that delineate the respective rights and obligations of the Government and the contractor regarding the use, reproduction and disclosure of that data. The offeror shall identify any data rights assertions.

3.4.1.6 Key personnel qualifications. The proposal shall include resumes of the Program Manager and other Key Personnel who will be assigned to and work on the proposed project. If the Offeror does not presently employ personnel in the positions identified as Key, the Offeror must present a description of the terms of the commitment(s). The Offeror shall describe the proposed labor hours and labor categories relating to the performance of the SOW of Key Personnel.

3.4.1.7 Significant Participation: If the prime offeror is a traditional defense contractor and not proposing a cost share, the proposal shall include at least one nontraditional defense contractor or nonprofit research institution participating to a significant extent. Rational of the significant participation shall be included.

3.4.1.8 Pricing: The Offeror shall provide sufficient detail to substantiate that the overall proposed price is realistic, reasonable, and complete for the work proposed and reflects the best price for the prototype project. The Offeror shall also include a narrative explanation of the proposed prices. The AO may request additional information to determine pricing is fair and reasonable.

- Price proposals shall be submitted on a firm fixed price basis.
- The depth and breadth of the price proposal shall be determined based on the complexity of the requirement. At a minimum, include:
    - Labor Rates. Provide bases for which the estimated total labor hours were calculated.
    - Material/Equipment. Provide a list of the materials/equipment required to meet the technical solution proposed.
    - Indirect Costs. Provide estimate of the total indirect costs and supporting data on how this estimated was calculated (i.e. overhead, G&A, etc.)

3.4.1.9 Miscellaneous: Any other documentation that may be requested by the Government in a RFPP.

3.4.2 EVALUATIONS: Proposals will be evaluated by ERDC scientists, other Federal Agency Representatives, and/or outside experts. At a minimum, the following will be considerations during the evaluation (in no particular order):

3.4.2.1 Scientific/Technical Merit: The proposed plans, methods, techniques, and procedures must be feasible, clear, valid, adequately referenced, and state-of-the- art. stated objectives must be clear, valid and logical. Projects that demonstrate an innovative approach are desired. The proposed milestone schedule, security requirements and data rights asserted must be reasonable.

3.4.2.2 Key Personnel Qualifications: The qualifications, capabilities and experience of the proposed Project Manager and other key personnel in sufficient details to demonstrate that the proposed staff has the knowledge and skills to achieve the proposed objectives.

3.4.2.3 Significant Participation: The AO will determine if the partner(s) identified are participating to a significant extent by considering whether the NDC/nonprofit research institution will supply a new key technology, product or process; supply a novel application or approach to an existing technology, product or process; provide a material increase in the performance, efficiency, quality or versatility of a key technology, product or process; accomplish a significant amount of the prototype project; cause a material reduction in the cost or schedule of the prototype project; or, provide for a material increase in performance of the prototype project.

3.4.2.4 Budget/Price: The budget must reflect the actual needs of the proposed work ***and be fully justified*** so that Government can evaluate and determine the cost to be fair and reasonable and commensurate with the complexity and nature of the work proposed.

4. ERDC FOCUS AREAS OF INTEREST:

4.1 MILITARY ENGINEERING (ME):

4.1.1 Protective Structures and Systems: Technologies, components, systems, materials that reduce manpower, logistical requirements or equipment hours and improve survivability of individuals and small units, individual or crew-served fighting positions, platform fighting positions, semi-fixed assets, observation/combat outposts or contingency bases. Prototype processes including planning tools and Tactics, Techniques and Procedures (TTPs) integrating force protection needs for quicker more effective setup and reuse / retrograde of materials. Technologies to enable or improve overwatch, security, perimeter security, port security, border security, de-escalation/turnover, surveillance and warning.

4.1.2 Protection and Survivability: Technologies, components, systems and materials at the Unit and System level that provide the ability to detect, disable, survive, and/or defeat, and to determine the threat that enemy weapon systems pose. Survivability efforts include research and prototype activities to improve and enhance the capability and effectiveness in areas of key infrastructure hardening/retrofit, camouflage, detectability, susceptibility, vulnerability, and recoverability. Technologies include protection of personnel, critical assets and facilities from a range of threats, including unconventional, conventional and advanced threats.

4.1.3 Geophysical Sensors and data fusion: Technologies, components, systems, and materials to detect, assess and persistently monitor threats and critical infrastructure in all environments including urban, subterranean and complex terrain to increase awareness and enable faster decisions. Integrate geophysical sensors, sensor systems and unmanned systems with natural terrain to obtain automated fusion creating an in-depth Common Operating Picture for super and sub-surface movement, maneuver and force protection planning. Integrates sensors, sensor systems, and unmanned systems with automated fusion creating a Common Operating Picture for integrated force protection, maneuver and defense planning.

4.1.4 Vulnerability assessment, detection, and analytics: Technology and processes that are relevant to strategic, operational and tactical analytical framework for understanding anti- terrorism/force protection posture, population and infrastructure disruption from combat, humanitarian, and other disaster situations. Prototype framework supports military assessment of mission assurance, population vulnerability and resilience disruptors, such as combat, disaster, disease, etc., for various environments.

4.1.5 Geoscience, Environmental, Geospatial, and Material Modeling and simulation: Technologies to enable and integrate materials-by-design capability as well as new materials and components for advanced force protection for domestic and foreign protective construction. Computational methods to

simulate technologies that detect activities in above/below ground and maritime avenues of approach. Technologies will enable virtual material synthesis and optimization to predict system performance, environmental impact/scene clutter on sensor performance, structural response to weapons effects, level of protection and scalability. Technologies and system includes models, surveillance, countermeasures and targeting in dynamic multi- domain environments.

4.1.6 Enhance and Assess Mobility of Manned and Unmanned Systems: Technologies, systems and materials to accelerate manned and unmanned platform development, integrate autonomous systems at all levels of operation, execute tactical reconnaissance and real-time mobility predictions to increase mobility and optempo of manned and unmanned ground and watercraft systems in complex environments and through challenging terrain. Technologies to clear or breach obstacles, cross gaps and rivers, improve combat roads/trails, improve vehicle/soil interaction and traction, and detect dynamic mobility hazards in complex environments. M&S enabled analytical tools for predicting the mobility performance of ground vehicles and watercraft in a wide variety of weather and terrain conditions. Technologies to enable autonomous systems assured mobility and situational awareness in various dynamic terrain and environment.

4.1.7 Engineering and engineering enabling technologies: Technologies that are relevant, enable support or compliment systems or weapon systems for the DoD and Joint Force. This includes but is not limited to: Combat Engineering; Mobility Obstacles; Explosive Effects; Breaching; Materials; Manufacturing and Process Technologies; Engineering Services, Modeling and Simulation and Virtual Prototyping; Operational Energy; Autonomous Systems; Prime Power; Engineer-related Environmental Technologies; and Engineer mobility, counter mobility, and survivability technologies, other Engineer Technology Enablers.

4.1.8 Global Access Engineering: Technologies, systems, materials and planning tools to conduct technical reconnaissance, assessment, construction, maintenance, repair, restoration and upgrade of infrastructure critical to Force Projection, transportation and global theater access. Prototypes include remote sensing, on- site tactical, derived and experimental methods for estimating engineering attributes and properties of soils, ice and snow, pavements, matting, natural terrain, bathymetry, river currents, port depths, coastal regions, airfields, road/rail networks, bridges and other infrastructure.

4.1.9 Infrastructure Maintenance, Repair and Reconstruction Technologies: Materials and equipment solutions to rapidly assess the condition of existing infrastructure, rapidly repair damaged infrastructure, and rapidly construct new infrastructure such as pavements, bridges, railways, ports, and airfields. Prototypes include advanced physics- based technologies for measuring layer thicknesses, layer strength parameters, rail capacity, pier capacity, bridge structural capacity, and critical engineering properties for engineering analyses.

Prototypes also include new advancements in repair equipment solutions and packaging of technologies into prototype kits for technology transition.

4.1.10 Engineering Analysis Tools and Decision Aid Prototype Software: Prototypes include software development solutions to integrate advanced engineering algorithms for the evaluation, design, repair and operation of critical infrastructure systems to support force projection and maneuver support planning. Prototype software systems will be used to demonstrate the research results through integration of new analytical methods into practical maneuver solutions using prototype software tools and decision aids.

4.2 ENGINEERED RESILIENT SYSTEMS (ERS)

4.2.1 Cybersecurity: Techniques, components, software, hardware, systems, and enhanced tools that provide the ability to protect critical infrastructure and advanced manufacturing industrial control systems (ICS), supervisory control and data acquisition (SCADA) systems, programable logic controllers (PLC), and networks against increasingly adaptive cyberspace adversaries. New and innovative capabilities are needed that leverage networked-, host-, and behavior-based concepts to provide a holistic cybersecurity defense approach and provide cyber situational awareness.

4.2.2 High Performance Computing Enabled Advanced Manufacturing: Techniques, components, software, hardware, systems, and enhanced tools that support AdM concepts and technologies, to include but not limited to 3-D printing used to rapidly fabricate complex and innovative systems and components. Techniques, components, software, hardware, and systems to provide HPC resources at the edge or point of manufacture that allow the use of (a) high-fidelity, multi-physics, multi-scale computational AdM approaches; (b) optimization; (c) trade-space analytics; (d) integration of AdM with deployable HPC; (e) uncertainty quantification and validation; (f) data driven approaches; (g) machine learning based simulation approaches to assist designers; (h) virtual testing; (i) artificial intelligence enabled certification; G) HPC enabled optimized process control; and (k) innovative AdM technologies. Techniques, components, software, hardware, systems, and enhanced tools that advance the ability to design, fabricate, and test large-scale components and systems (i.e. the longest dimension exceeds a meter in length). A necessary product of this is testable components that could be used for a variety of defense needs, such as: armor; aerospace, ground, and marine sub-structures; specialized facilities for blast and ballistic protection; marine ship hulls; and rotorcraft components.

4.2.3 High Performance Data Analytics: Techniques, components, software, hardware, systems, and enhanced tools that allow the examination data sets that are too large or too complex for traditional data processing applications to uncover hidden patterns, unknown correlations, multidimensional trends, and other useful information. Techniques, components, software, hardware, systems, and enhanced tools that leverage High Performance Computing, emerging heterogeneous computing resources, next generation computational algorithms, and software tools to create an ecosystem approach to manage and conduct high performance data analytics with complex data sets.

4.2.4 System Engineering Techniques: Techniques, components, software, hardware, systems, and enhanced tools that allows the development and application of advanced system engineering techniques to address system acquisition and readiness challenges. System acquisition is addressed through design trade space development; analysis and reporting of many designs and system readiness via Condition Based Maintenance based primarily on sensor and maintenance data from the many systems. Both challenges are characterized by the massive data volume involved and require that the techniques of acquisition, mining, storage, transfer, cleaning, retrieval and analytical processes; artificial intelligence and machine learning (AL/ML) algorithms; systems modeling; consisting of either classical methods, scaled to enable processing of the data, or new, innovative methods developed with the ability to process the massive volume of data from the beginning.

4.2.5 High Performance Computing (HPC) Enabled Development of Surrogate Models and Data Analytics: Techniques, components, software, hardware, systems, and enhanced tools that provide for computationally efficient and accurate surrogate models for full-order, algebraic systems. The primary interest is in application of novel techniques using HPC to develop surrogate models and data analytics for complex applications. Application areas of interest include but are not limited to modeling of blast effects, flight envelop simulations, turbulent rotor dynamics, vehicle vibration effects on humans. Topics of interest include: (a) multi-physics interactions, (b) fluid-structure-thermal interaction models, (c) aero thermoelastic models, (d) thermo-mechanical processes, (e) applications to CFD and FEA, (f) anomaly detection, (g) analysis of robustness of models, (h) physics-informed machine learning.

4.2.6 Leveraging HPC capabilities for On-the-Edge Computing: Techniques, components, software, hardware, systems, and enhanced tools that provide high performance computing capabilities and resources at the point of need. On-the-edge computing has the potential to provide soldiers with access to data and sensors leading to improved situation awareness. However, these applications require highly functional, understandable, and secure systems that can provide accurate and actionable data under uncertainty in the field. Techniques, components, software, hardware, systems, and enhanced tools to develop HPC-enabled computational approaches that leverage on-the-edge capabilities are needed. Topics of interest for HPC-enabled on-the-edge

computing include: (a) electro-optical sensor data processing, (c) thermal/IR sensor data processing, (d) radar sensor data processing, (e) acoustic sensor data processing, (f) terrain and environment characterization, (g) terrain and environment mapping, (h) sensor fusion, (i) anomaly detection and characterization, (j) multi-factor optimization of local maneuver planning.

4.2.7 Computational Material Testing and Validation: Techniques, components, software, hardware, systems, and enhanced tools to computational processes for material testing and validation of components and sub-components that are produced through advanced manufacturing technologies. Capabilities will enable the direct connection between the standard procedures for advanced manufacturing techniques and numerical tools, techniques and systems for engineering mechanics simulations and will contribute to reducing the uncertainty of advanced manufactured components.

5. POINTS OF CONTACT

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