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I. OVERVIEW OF THE FUNDING OPPORTUNITY

A. REQUIRED OVERVIEW CONTENT

1. **Federal Agency Name:** US Army Research Laboratory (ARL), 2800 Powder Mill Road, Adelphi, MD 20783-1138 on behalf of ARL and United Kingdom Defence Science and Technology Laboratory (Dstl)
2. **Issuing Acquisition Office:** US Army Contracting Command – Aberdeen Proving Ground, Research Triangle Park Division (ACC-APG RTP), 4300 S. Miami Blvd., Durham, NC 27703 on behalf of ACC-APG RTP and the United Kingdom Ministry of Defence (MOD)
3. **Funding Opportunity Title:** International Technology Alliance (ITA)
4. **Announcement Type:** Initial
5. **Funding Opportunity Number:** **AMENDMENT 0003 TO W911NF-15-R-0003 – SEE SECTION II.D.3 BELOW FOR CHANGES INCLUDING A NEW EMAIL ADDRESS FOR SUBMISSION OF WHITEPAPERS!**
6. **Catalog of Federal Domestic Assistance (CFDA) Number(s):** 12.630 - "Basic, Applied, and Advanced Research in Science and Engineering"
7. **Dates:** The following is a summary of the events and dates associated with the ITA Program Announcement (PA):

<u>EVENT</u>	<u>ESTIMATED DATE/TIMEFRAME</u>
PA released	November 2014
Whitepapers due	27 April 2015
<u>EVEN IF AN OFFEROR SUBMITTED THEIR WHITEPAPER ON OR BEFORE THE PREVIOUS DUE DATES, ALL OFFERORS MUST RESUBMIT THEIR WHITEPAPERS TO A NEW EMAIL ADDRESS ON OR BEFORE 4:00AM (LOCAL TIME IN NORTH CAROLINA, USA) ON 27 APRIL 2015 TO BE CONSIDERED IN CONNECTION WITH THIS PA.</u>	
Whitepaper Feedback/Invitation to Submit Full Proposal	June 2015
Full Proposals due	31 August 2015
Award	May 2016

B. PROGRAM OVERVIEW

Purpose. The purpose of this United States Army Research Laboratory (ARL) and United Kingdom Defence Science and Technology Laboratory (Dstl) **International Technology Alliance (ITA) Program Announcement (PA)** is to solicit offers that will help to fulfill the research and development goals of the US Department of Army and UK Ministry of Defence. This document announces a new and innovative opportunity for cooperation between the US and the UK in the area of Distributed Analytics and Information Science (DAIS). The DAIS ITA Program is comprised of two components: (1) the Basic Research Component and (2) the Technology Transition Component. The Basic Research Component will provide for fundamental research, the results of which will be in the public domain, while the Technology Transition Component will provide for the application of the fundamental research results to military, security and commercial applications to foster the best technologies for future defense and security needs.

International Considerations. The ITA Program is being initiated under the authority provided those countries through the Memorandum of Understanding (MOU) between the US and UK Concerning Cooperative Participation in Research and Development Projects, dated 26 April 2000. Execution of the DAIS ITA Program, to include the award of any agreements resulting from this PA, is dependent upon prior approval by both countries of a Project Arrangement to the aforementioned MOU, which will recognize the specifics of the DAIS ITA Program.

Consortium Requirements. IN ORDER TO RESPOND TO THIS PA, OFFERORS ARE REQUIRED TO FORM AN INTEGRATED US-UK CONSORTIUM OF INDUSTRY AND ACADEMIA WITH AN EQUITABLE WORK-SHARE BETWEEN US AND UK PARTICIPANTS. While the Consortium can be incorporated as a legal entity, there is no requirement for the Consortium to do so for the purposes of participating in the DAIS ITA Program. Minimum membership requirements for the Consortium are detailed in this PA. Each Consortium shall draft Articles of Collaboration that will address various operational aspects of the Consortium. A model Articles of Collaboration will be provided to Offerors who are invited to submit proposals under this PA. An Offer that does not include Articles of Collaboration **signed** by a duly authorized representative of each Consortium member in their proposal submission will be considered non-responsive and their proposal will receive no further consideration for award. The Consortium Lead, referred to as the Lead Industrial Partner (LIP), is defined as a US or UK industrial organization with existing operations in both the US and UK sufficient to support research and transition in both countries.

Award Instruments. The result of this PA/Solicitation will be the award of three award instruments for the ITA Program. The first two instruments will be issued by ARL and the third instrument will be issued by Dstl. The first instrument will be a Technology Investment Agreement (referred to as TIA-1) for the Basic Research Component of the ITA Program. TIA-1 will be issued under the authority of 10 United States Code (USC) 2371 in accordance with 32 CFR PART 37. The second instrument will be a Technology Investment Agreement (referred to as (TIA-2) for the Technology Transition Component of the ITA Program, specifically for US only transitions and US led joint US/UK transition opportunities. TIA-2 will also be issued under the authority of 10 USC 2371 and in accordance with 32 CFR PART 37. The third instrument, known as the “UK DAIS ITA Transition Contract”, is also for the Technology Transition Component, specifically for UK only and UK led joint US/UK transition opportunities. Individual task efforts will be issued under TIA-2 and the UK ITA Transition Contract dependent on ability to transition the basic research efforts under TIA-1. Both TIA-1 and TIA-2 agreements will be awarded by the US Army to a single Consortium selected for the awards. The UK DAIS ITA

Transition Contract will be awarded by the Ministry of Defence (MOD)/Dstl to the UK arm of the LIP of the Consortium selected for the awards.

US Export Control Considerations. The effort to be performed under TIA-1 is limited to basic research in the public domain and as such should not be subject to the International Traffic In Arms Regulations (ITAR)[22 Code of Federal Regulations (CFR) 120, et. seq.] “Public Domain” is defined in Section 120.11 of the ITAR. The corresponding section of the Export Administration Regulations (EAR)(15 CFR 730, et. seq.) is Section 734.8. The nature of the effort to be performed under TIA-2 and the UK DAIS ITA Transition Contract is dependent upon the results of the research to be accomplished under TIA-1, and may involve ITAR and/or EAR considerations. These considerations will have to be addressed prior to the issuance of any technology transition task under TIA-2 or the UK DAIS ITA Transition Contract. Depending on the specifics of the task, it may be necessary for the performing Consortium members to request and obtain an export license or Technical Assistance Agreement (TAA) from the Department of State in accordance with the provisions of the ITAR, or, if the subject matter is subject to the EAR, to obtain an export license from the Department of Commerce.

UK Export Control Considerations. The effort to be performed under TIA-1 is considered basic research in the public domain and as such the information involved should not be subject to the Orders introduced under the Export Control Act 2002. The nature of the effort to be performed under TIA-2 and the UK DAIS ITA Transition Contract is dependent upon the results of the research to be accomplished under TIA-1, and may involve strategic export controls and other considerations. These considerations will have to be addressed prior to the issue of any technology transition task under TIA-2 or the UK DAIS ITA Transition Contract. Depending on the specifics of the task, it may be necessary for the performing Consortium members to request and obtain an export license from the Department of Trade and Industry in accordance with the provisions of the Export Control Act.

Period of Performance. Awards made as a result of this PA are expected to provide for a basic period of performance of five years with an optional five-year extension period.

Place of Performance: In response to this PA, all proposed work must be performed within the US or UK. A Whitepaper or Proposal that includes work to be performed outside of the US or UK, in whole or in any part, will not be considered.

Funding. This PA is issued subject to the availability of funds. The ARL and Dstl are jointly funding the Basic Research Component under TIA-1. Funding distribution requirements are set forth in this PA. Funding for the Basic Research Component is the 6.1 (basic research) budget category. The definition of “6.1” is contained in this PA, as well as the anticipated funding level of 6.1 funding under the ITA Program. The ARL and Dstl have submitted the requisite documents to request continued funding for the ten-year period. However, Offerors are reminded that this request is subject to Presidential, Congressional, Ministerial, Parliamentary and Departmental approval. Funding for the Technology Transition Component under both TIA-2 and the UK DAIS ITA Transition Contract are expected to be received from US and UK Government organizations (as appropriate) as opportunities for transition of technology from the Basic Research Component are identified for specific applications.

Profit/Fee. In accordance with 32 CFR 37.230, profit/fee will not be permitted under TIA-1 and TIA-2. Profit/fee may be permitted for the UK DAIS ITA Transition Contract. The rate of profit/fee to be paid is expected to be at a level that is appropriate for the risk associated with the effort to be performed. For the UK DAIS ITA Transition Contract, the Dstl seeks to minimize any

profit/fee payable as part of the competitive contract assessment process by negotiating such rates prior to award of the contract to determine the best value to the UK Government.

Cost Sharing. Cost sharing is not required in the response to this PA as cost sharing requirements have been determined to be impracticable for this Program. However, any proposed cost sharing will be evaluated as it relates to the evaluation factors set forth in the PA, based on the degree to which the proposed cost sharing enhances the proposal to result in added benefits to the Program. In order for the proposed cost sharing to receive appropriate credit during the evaluation process, the proposal must evidence a firm commitment to cost sharing and evidence a process for integrating the cost sharing into the Biennial Program Plan for the research component.

Opportunity Days. Two Opportunity Day meetings will be held to discuss this PA and to encourage dialogue, interchange and teaming related to responding to the PA. The first meeting will be held at US Army Research Laboratory, Adelphi, MD on Thursday, 29 January 2015. The second meeting will be held in central London in the UK on Tuesday, 3 February 2015. While attendance is strongly encouraged, attendance at these meetings is not a requirement for submission of a Whitepaper or Proposal in connection with the ITA Program. Registration details can be found on the DAIS ITA Program website at <http://www.arl.army.mil/ngita>. The presentations from those meetings, the list of attendees at both meetings, and the non-proprietary questions posed and answers provided at both meetings will be made available on the above mentioned website. Nothing said during the Opportunity Day meetings will change this PA. Any changes to this PA will be issued via an amended PA being posted in grants.gov.

Proposal Submission: The application process consists of a Whitepaper stage and a Proposal stage. The purpose of requesting a Whitepaper is to minimize the effort associated with the production of a detailed Proposal for an Offeror that has little chance of being selected for funding. The Governments' decision to invite a Proposal will be based upon the evaluation results of a timely and compliant Whitepaper submission. Only the most highly rated Whitepapers will receive an invitation from the Governments to submit a Proposal. **An Offeror that does NOT receive an invitation from the Governments to submit a Proposal is NOT eligible to submit a Proposal and will NOT receive any feedback or a "debriefing" on their Whitepaper.** An Offeror invited to submit a Proposal will receive feedback on their Whitepaper that is expected to substantially improve their Proposal submissions. **If an Offeror does NOT submit a timely and compliant Whitepaper, they may NOT submit a Proposal for consideration for funding.**

Evaluation and Award: Whitepapers and Proposals that are in compliance with the requirements of the PA will be evaluated in accordance with merit based, competitive procedures. These procedures will include evaluation factors and an adjectival and color rating system. A Review Team, consisting of a qualified group of scientists, managers and business specialists from both the US and UK Governments, will evaluate the Whitepapers and Proposals and provide the results of that evaluation to the decision makers of both Governments. Those decision makers will make both the decisions concerning the Whitepaper downselection and award selection.

Contact Information. Outside of questions posed at the Opportunity Days, all questions or comments concerning this PA shall be submitted to the Governments through the DAIS ITA Program website identified above. Comments or questions submitted should be concise and to the point, eliminating any unnecessary verbiage. In addition, the relevant part and paragraph of the PA to which a question pertains should be referenced. Responses to non-proprietary questions received will be posted to the DAIS ITA Program website under the "General Information/Questions & Answers" section for the benefit of all interested parties. All clearly identified proprietary questions posed will be responded to via an individual email response. Offerors are encouraged to submit any questions as

early as possible. The deadline for submission of questions which will be answered under this PA is 1 March 2015. Any answers provided to questions do not change the requirements of this PA. Any changes to this PA will be issued via an amended PA being posted in grants.gov.

II. DETAILED INFORMATION ABOUT THE FUNDING OPPORTUNITY

A. FUNDING OPPORTUNITY DESCRIPTION

1. Program Background

a. Introduction

History of ITA - A landmark collaboration known as the International Technology Alliance in Network and Information Sciences was initiated by the US Army Research Laboratory (ARL) and the UK Ministry of Defence (MoD). Awards were made in 2006 to a Consortium of industrial and academic organizations from the United States and the United Kingdom, which along with the US ARL and the UK Dstl, formed an international research Alliance that is jointly conducting collaborative research focused on enhancing coalition operations. The key factors contributing to the success of this unique collaborative venture are: joint technical leadership and management by the Alliance (academia, industry, Government in both countries); an arrangement fostering an open collaborative research environment to support deep collaboration among researchers; multidisciplinary research approach applied to key coalition technical challenges; and an innovative transition model that is facilitating the rapid transition of research results to both commercial and military domains.

Coalition Need - Coalition operations are becoming increasingly prevalent and increasingly complex. Recent coalition operations are placing significantly greater burdens on the people and technologies that are deployed and coalitions are forced to counter adversaries that increasingly have access to advanced communications, information, and analytics technologies, necessitating coalition information superiority.

The need for technologies that support dynamic coalitions which bring together a number of different partners into a single operation or mission has never been greater. These coalitions imply a degree of transience of existence and membership, distinct from persistent alliances with permanent infrastructure, such as North Atlantic Treaty Organization (NATO). Each partner brings different cultures, different policies and procedures, and different systems and networks, all supported by a variety of technologies and all which must be brought into harmony to achieve common goals.

Future conflicts will occur in congested, cluttered, contested, connected, and constrained battlespace, and adversaries will use a mix of high-end and low-end asymmetric techniques to exploit coalition weaknesses. Coalitions need to develop an understanding of complex situations and problems involving sets of interacting entities or actors with many dimensions (military, economic, political, social, legal, etc.). The ability to understand, predict, and adapt to the behaviors of these complex adaptive systems is critical to enhancing the ability to conduct coalition operations.

Belief in Collaboration - The Governments strongly believe that a joint collaborative approach by a diverse set of multidisciplinary researchers is required to make fundamental advances towards meeting DAIS ITA goals of developing a fundamental understanding of distributed analytics in coalitions. Two Technical Areas (set forth below) have been identified that address interrelated aspects of secure information infrastructures and distributed analytics for situational understanding, including elements of networking, security, analytics, and the human element, which when jointly studied will advance the theoretical foundations of coalition operations. It is expected that jointly addressing challenges associated with coalition operations will enable superior technologies for future operations.

Collaborative Environment - The DAIS ITA is intended to create a collaborative environment that enables participants from the Consortium and Governments to advance the state of the art and assist with the transition of research to enhance the performance of coalition technologies of interest to the US and UK Governments. The Consortium will work collaboratively with the internal research programs of both ARL and Dstl to identify areas where joint, multidisciplinary, collaborative research can advance each organization's long-term vision. The Consortium will also work collaboratively with Dstl and ARL to identify where joint collaborative research with researchers from ARL- and Dstl-led collaborative ventures can advance the state of the art to support distributed analytics and information infrastructures for coalition operations. Collaborative research, collaboration links, and transition opportunities will be pursued and defined through continuous collaboration, technical exchanges, site visits, staff rotations, and mutual participation in formulating the program, performing the research, and in technical reviews during the period of performance. The collaborative environment will strengthen the research program, build and strengthen relationships and mutual understanding of coalition challenges, improve the relevance of ITA research, and enable the transition of research results.

b. **Programmatic Strategy**

Award Structure - This PA describes the award of three instruments for the DAIS ITA Program that will enable a Basic Research Component and Technology Transition Component.

Collaborative Alliance - The Basic Research Component of the DAIS ITA is intended to foster collaborative basic research (Budget Activity 1 - see definition below) involving the Consortium and the Governments. The strategy is to exploit research and expertise, where it exists, through the issuance of a single award to a Consortium of academic and industrial partners. Dstl, ARL, and the Consortium selected for award will establish an Alliance to address research topics critical to coalition operations. This Consortium will work in collaboration with ARL and Dstl to advance the theoretical foundations of distributed analytics and information infrastructures for coalition operations. The Alliance will engage in joint Consortium/Governments planning and research collaboration, staff rotation/exchange, and transition efforts. Additionally, other Government agencies may participate in the DAIS ITA and contribute their technical expertise, personnel, and facilities. A significant goal of this effort will be to

create a critical mass of collaborating academic, industrial, and Government scientists and engineers focused on solving the research challenges outlined within the scope of the DAIS ITA. This intellectual synergy is also expected to include sharing of equipment, software, personnel, and facilities to promote efficiency and collaboration.

The Basic Research Component will be funded under Budget Activity 1 (basic research) and the research proposed and performed must comply with the definition for Budget Activity 1 as summarized below and outlined in the US DoD Financial Management Regulation (FMR), Volume 2B, Chapter 5 (September 2012) as:

Budget Activity 1: Basic Research. Basic research is systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs. It is farsighted high payoff research that provides the basis for technological progress. Basic research may lead to (a) subsequent applied research and advanced technology developments in Defense-related technologies, and (b) new and improved military functional capabilities in areas such as communications, detection, tracking, surveillance, propulsion, mobility, guidance and control, navigation, energy conversion, materials and structures, and personnel support.

Intent of PA - It is the intent of this PA to solicit the most creative, innovative, and flexible approaches in support of the ultimate goal of generating and exploiting research to solve pressing research gaps in distributed analytics and information infrastructures for coalition operations. It is expected that the basic research in this DAIS ITA will be highly innovative, advance the state of the art, and lead to disruptive innovations that will impact both the military and commercial sectors. While it is expected that commercial technologies will be exploited and used by coalitions, they must be adapted for military use and it is not expected that the DAIS ITA will make incremental progress to the current state of the art. This PA seeks a Whitepaper (and Proposal from those who are invited to submit a Proposal based on their Whitepaper submission) from a self-formed consortium, led by an industrial organization (see Section PART.II.C for eligibility). In response to this PA, an Offeror is required to:

- (i) Define a strategy for implementing a collaborative approach that synergistically integrates the two Technical Areas, is flexible and adaptive to changes in the research environment, and identifies the metrics by which success of the Consortium is expected to be measured.
- (ii) Formulate a basic research program that clearly demonstrates innovation with detailed and substantive scientific plans to address the Technical Areas of the Basic Research Component. The Whitepaper and any subsequent Proposal must clearly articulate the Offeror's vision for these Technical Areas and the Offeror's research goals for the program (two-

five- and ten-year goals). An Offeror must identify and justify the most critical research issues and describe how their proposed research efforts meet the goals of this program.

- (iii) Scope the research, appropriate to the overall funding of the DAIS ITA, ensuring all elements of the proposed research are tightly integrated in a way that results of research in one Technical Area support and enhance the results in the other Technical area. Sufficient resources must be allocated and justified to ensure enough critical mass to make fundamental progress.
- (iv) Present the experience, qualification, and availability of technical leadership and technical staff in both the US and UK. Describe the quality, relevance, and availability of research facilities.
- (v) Identify approaches to building and fostering collaborations within the Consortium and with ARL/Dstl, which are essential to the success of the DAIS ITA.
- (vi) Describe technology transition approaches and capabilities that are broad (covering the full breadth of DAIS ITA Technical Areas), involve a broad set of supply networks, and impact both the commercial and defense sectors in both countries.
- (vii) Identify the overall management (business plan) and programmatic and administrative team with the expertise to achieve the stated research goals and to oversee and manage finances, reporting, data, meetings, reviews, and intellectual property.

Expectations - The DAIS ITA is expected to achieve basic research results that would not be possible without the synergies gained from robust UK/US collaborations among academic, industrial, and Government researchers. The DAIS ITA is also expected to facilitate the rapid transition of a broad set of technologies that enhance coalition operations to both the commercial and military sectors in both countries.

2. ARL and Dstl Mission and Related Programs

- a. **ARL Mission and Related Programs.** The International Technology Alliance will become an integral part of ARL's Enterprise in Information Sciences and Human Sciences. Collaboration with the internal information sciences research program is critical to its success, and interactions with other related ARL research programs may bring different insights to bear on the DAIS ITA's research problems. Moreover, these interactions may increase relevance of DAIS ITA research and eventually lead to transition of research results.

The US Army Research Laboratory (ARL) – the Army's corporate research laboratory – is pursuing discoveries, innovations, and transition of technological developments that are geared towards acting upon opportunities in power projection, information, lethality and protection, and Soldier performance. As a guide towards the technological possibilities in these areas, ARL has developed eight S&T campaigns: Extramural Basic Research, Computational Sciences,

Materials Research, Sciences-for-Maneuver, Information Sciences, Sciences-for-Lethality and Protection, Human Sciences, and Assessment and Analysis. The research program envisioned for the ITA crosses two of these Campaigns: Information Sciences and Human Sciences.

- **Information Sciences** is focused on gaining a greater understanding of emerging technology opportunities that support intelligent information systems that perform acquisition, analysis, reasoning, decision-making, collaborative communication, and assurance of information and knowledge through Sensing and Effecting, System Intelligence and Intelligent Systems, Human and Information Interaction, Networks and Communications, and Cyber Security.
- **Human Sciences** is focused on gaining a greater understanding of individual physical, perceptual, and cognitive performance through Human-Physical Interface, Human-Human Interface, and Human-Technology Interface.
- **Extramural Basic Research** is focused on steering and oversight of systematic studies to increase fundamental knowledge and understanding in the Physical Sciences, Information Sciences, Life Sciences, and Engineering Sciences related to long-term national security needs.
- **Computational Sciences** is focused on advancing the fundamentals of Predictive Simulation Sciences, Data Intensive Sciences, Computing Sciences, and emerging Computing Architectures to transform the future of complex Army applications.

Related Programs at ARL:

- **Network Science (NS) Collaborative Technology Alliance (CTA).** The objective of the NS CTA is to perform foundational research leading to a fundamental understanding of the interplay among the Social/Cognitive, Information, and Communication Networks (multi-genre) that are key components of a tactical network. This research will lead to insights on how processes and parameters in one network affect and are affected by those in other networks; these in turn should enable us to predict and control the composite behavior of these complex interacting networks. Research in the NS CTA is organized along four basic themes: (1) How - multi-genre networks behave over time (optimal design, group phenomena, large dynamic networks, prediction of network properties and structure, controllability of complex networks); (2) How information representation, discovery, and analytics contribute to distributed understanding and social influence; (3) Control of semantically-adaptive network behaviors so that the capacity of the composite network to deliver relevant information can be maximized using intrinsic, contextual, and semantic properties; and (4) The impact of trust on distributed decision-making in the presence of human cognitive limitations and conflicting, incomplete, or malicious information. Collaborations between researchers in the ITA and the NS CTA may be beneficial.

- **Cognition and Neuroergonomics CTA (CAN CTA).** This CTA focuses on cognitive performance, which is generally considered the act of executing mental operations and is intrinsically dependent on task and environmental factors, in addition to the characteristics of the individual soldier. Specific objectives are to optimize information transfer between the system and the soldier, identify mental processes and individual differences that impact mission-relevant decision making, and develop technologies for individualized analyses of neurally based processing in operational environments. To achieve this objective, the CAN CTA is working to implement computational modeling and execute and link neuroscience-based research from multiple levels to produce advances in fundamental science and technology, demonstrate, and transition technology, and develop research demonstrators for warfighter experimentation. Collaborations between researchers in the ITA and the CAN-CTA may be beneficial.
- **Cyber Security Collaborative Research Alliance (Cyber CRA).** This CRA focuses on developing a fundamental understanding of cyber phenomena, including aspects of human attackers, cyber defenders, and end users, so that fundamental laws, theories, and theoretically grounded and empirically validated models can be applied to a broad range of Army domains, applications, and environments. Specifically, this basic research program is developing and advancing the state of the art of Cyber Security in three research areas: risk, detection, and agility. Intersecting with each of the three research areas is a fourth research area that looks psychosocial effects. Collaborations between researchers in the ITA and the Cyber CRA may be beneficial.

b. Dstl Mission and Related Programs.

The purpose of the UK Defence and Science Technology Laboratory (Dstl) is to maximize the impact of science and technology (S&T) for the defense and security of the UK. As such Dstl delivers S&T across the full breadth of UK defense priorities and national security challenges as set out in the National Security Strategy, the Strategic Defence and Security Review (SDSR) and 'National Security Through Technology'. In doing so, Dstl partners with industry, academia, wider UK Government and our international allies as such collaborative research will add value to all parties, and facilitate exploration and exploitation to deliver integrated solutions. As part of this approach, Dstl places work externally wherever possible, which supports the UK Government's growth agenda.

In support of Dstl's mission, the main role of Dstl is to lead the formulation, design and delivery of a coherent and integrated UK Ministry of Defence (MOD) science and technology portfolio in a number of key areas, including C4ISR. Within C4ISR there is consideration of the centrality and ubiquity of information, 'Big Data', autonomy and the changing role of the Human.

The DAIS ITA falls within Dstl's C4ISR S&T enterprise, currently comprising the following research programs:

- Assured information infrastructure (Ai2) Programme;

- C4ISR Decision Support and Experimentation (DSE) Programme;
- Countering Terrorist Networks Programme;
- Cyber Programme;
- Knowledge, innovation and futures enterprise (KnIFE) Programme.

The Ai2 Programme covers the S&T required to enable the MOD to realize its vision of a continuously evolving single, logical, reconfigurable, resilient infrastructure; including the impact of efficient, effective, and economic provision of C2 on that infrastructure. It ensures that the UK's C2 capability is sufficiently sustainable, scalable, and interoperable.

The C4ISR DSE Programme provides evidence based decision support to MOD underpinned by analysis and experimentation.

The Countering Terrorist Networks Programme develops the ability for defence to find and understand terrorist networks and associated activities.

The Cyber Programme aims to develop the knowledge and tools the MOD needs to support the National Security Strategy by defending itself in cyberspace to meet UK military, diplomatic, and economic objectives. It is an integral part of a cross-Government transformative Programme intended to deliver highly effective revolutionary and evolutionary UK cyber capabilities, ensuring that the UK is more resilient to cyber attacks and can exploit the opportunities of cyberspace.

The KnIFE project portfolio engages with wider UK Government, academia, industry and international partners through a challenge-driven approach for emerging technologies that are likely to prove most disruptive and surprising, and could result in the greatest impact on the defence and security of the UK.

Further details of the Dstl research portfolio can be found at; <https://www.gov.uk/Government/collections/dstls-areas-of-work-Programmes-and-project-portfolios>.

Related Programs at Dstl:

- **Defence and Security Data Science Centre for Doctoral Training (CDT).** The Defence and Security Data Science CDT will be funded by Dstl and its UK Government partners. The CDT will operate in partnership with UK Turing Institute; the Turing Institute is due to be established on 1st April 2015. The CDT's mission is to undertake advanced research and translational work in the application of large scale data science and the associated computational algorithms to address challenges associated with UK Defence and Security. It is expected that the CDT will be established during 2015. Collaborations between researchers in the ITA and the CDT may be beneficial.
- **University Defence Research Centre (UDRC) in Signal Processing.** The current phase of the UDRC focuses on research into sensor processing in a networked battlespace. Specific objectives are improving the performance of integrated multi-sensor systems as well as limiting

data overload and maximizing data relevance within the network, through novel acquisition, processing, and sensor management. The scope of the research is:

- Signal Detection in Multi-input Networks
- Time-series/High-volume Signal Detection
- Signal Processing in Novel Computation Architectures

Collaborations between researchers in the ITA and the UDRC may be beneficial.

Other basic research programs, with which collaboration may be beneficial, may arise during the lifetime of the DAIS ITA.

3. Basic Research Component

a. Introduction

The Basic Research Component of the DAIS ITA is intended to foster collaborative basic research to advance the theoretical foundations of coalition operations. The resulting Alliance (Consortium and Governments) will engage in joint collaborative research, planning, staff rotation/exchange, and transition efforts to address research topics critical to coalition operations. Success of the ITA Program is dependent on generating, disseminating, and improving upon program intellectual property for both military and commercial applications and must consider the US and UK export controls that apply to this program.

Intellectual Property - Success of the ITA Program is dependent on the transition of intellectual property generated under TIA-1 to specific military or commercial applications. Intellectual property is defined to include, but is not limited to, inventions, reports, technical data, software, computer codes and trade secrets. Data resulting from basic research shall be unrestricted. All intellectual property, including patentable inventions, made while performing under TIA-1 will be provided to both ARL and Dstl with Government Purpose Rights. Government Purpose Rights will allow both Governments the right to practice, obtain, reproduce, publish, or otherwise use in any part of the world for purposes of either Government, and to authorize others to do so solely for Government purposes. Government purposes do not include commercial applications. Similarly, software developed while performing under TIA-1 will be provided to both ARL and Dstl with Government Purpose Rights.

Scope and Rationale - Coalition operations are becoming increasingly prevalent and increasingly complex. Consequently, the need for information technologies that support dynamic coalitions which bring together a number of different partners into a single operation or mission has never been greater. Future conflicts will take place in congested, cluttered, contested, connected, and constrained battlespaces, and adversaries will use a mix of high-end and low-end asymmetric techniques to exploit coalition weaknesses.

The DAIS ITA program seeks to develop the fundamental underpinning research required to enable secure, dynamic, semantically-aware, distributed analytics for deriving situational understanding in coalition operations. A key focus is enabling the rapid and secure formation of ad hoc teams with an emphasis on dynamic coalitions which bring together a number of different partners into a single operation or

mission. The ability to flexibly and securely share and process data and information distributed amongst multiple disparate ad hoc teams, perform distributed analytics, and derive situational understanding to provide insight and foresight are critical to future coalition operations. Some key challenges include:

- **Ad Hoc Coalition Teams.** Ad hoc coalition teams must be formed rapidly and adapt under dynamics caused by changing missions, tempo, mobility, environment and membership.
- **Distributed Operations.** Data, context, processing, analytics, and situational understanding must be accomplished in distributed and dynamic environments and be effective, efficient, robust, secure, and resilient while supporting collaborative decision making.
- **Resource-constrained.** The operational environment, especially at the edge of the network, is highly resource-constrained including military personnel, bandwidth, energy, processing power, and data storage capacity and cannot rely on centralized network or security services nor overload users.
- **Data Complexity.** The data is highly dynamic, varied (including structured/unstructured data), complex, context-driven, and uncertain (noisy, volatile, incomplete, untrustworthy, hidden, adversarial).
- **Heterogeneity.** Coalitions will utilize a heterogeneous mixture of technologies, policies, levels of trust, data schemas, security mechanisms, and data services. Coalition information infrastructures are derived from the composition of disparate security, networking, and information systems.
- **Dynamics.** The operational environment is highly dynamic as coalition ad hoc teams change, information is transformed, assets move, situational understanding evolves, and time-sensitive missions are adjusted.
- **Understanding Complex Situations.** Coalitions will need to understand, predict and adapt to the behaviors of complex situations and problems involving sets of interacting entities or actors with many dimensions (military, economic, political, social, legal, etc).

Research is needed that meets these challenges and supports: (1) the dynamic adaptation of secure, resilient infrastructures to support context and semantically-aware distributed analytics; (2) the ability to integrate and exploit data and information distributed across the coalition information infrastructure; and (3) the derivation of situational understanding of complex situations by human users synergistically supported by machines.

To achieve the DAIS ITA's vision, it is imperative that a multidisciplinary approach to basic research is used to advance the fundamental knowledge of secure, context and semantically-aware distributed analytics so that generalizable theories and methods can enable dynamic and distributed situational understanding in coalition operations. Two interrelated Technical Areas (TAs) have been identified that when jointly studied will advance the theoretical foundations of distributed analytics and information science in the context of coalition operations. These TAs are

(1) Dynamic, Secure Coalition Information Infrastructures (DSCII) and (2) Coalition Distributed Analytics and Situational Understanding (CDASU).

A successful collaborative research program lays the scientific foundations for a theory of distributed analytics and information science that combines new and emerging developments in theory with innovative extensions of existing theory, computationally efficient modeling and simulation techniques, and theoretically principled experimental scientific verification and validation. Research proposed to meet these goals should be substantially different from classical approaches and must fit coherently together. Research should not be stove-piped as there are significant inter-dependencies between the networking, security, analytics, and human aspects of these TAs. The proposed research must be supported by a principled and ethical experimentation validation plan subject to the Governments statutes and policies. Scientific experimentation is a crucial element of multidisciplinary research as it validates research results and findings under realistic conditions and often provides additional research insights. While elements of such a plan may be specific to a TA, it is expected that a cohesive verification and validation plan would span all research.

The research goals to be addressed by the Offeror in each of the Technical Areas are discussed in the following sections. The inherent nature of coalition problems call for a multidisciplinary approach. Research must be performed in the context and constraints of complementary research in the other areas and should lead to insights into the interrelationships and interdependencies between the networking, security, analytics, and human element. The proposed research should lead to deep, persistent, and meaningful collaboration among researchers throughout the Alliance, and should harmonize vocabularies, ontologies, metrics, and processes to build understanding across all of the research efforts in the DAIS ITA.

The following paragraphs contain required topics to be addressed and some suggested topics and issues for consideration. Based on available resources it is not expected that Offerors address all suggested topics. The research component shall be balanced with appropriate depth and breadth across the two TAs to address the Offeror's 2-, 5-, and 10-year goals. Except for the required topics, the information presented, rather than being definitive or exhaustive, should be understood as suggested topics and issues for consideration in formulating a research program to fill some of the above-identified challenges. Indeed, it is expected that competitive Whitepapers and Proposals will contain other innovative topics and approaches, and may identify other gaps. However, all proposed research must fit together coherently and it is expected that competitive Whitepapers and Proposals must clearly identify linkages and joint collaborative efforts between research tasks. Offerors must carefully choose research topics to ensure a critical mass of researchers addressing the challenges proposed. Offerors are expected to apply relatively equal resources to each of the two TA.

b. Technical Area 1: Dynamic, Secure Coalition Information Infrastructures (DSCII)

Research is needed to provide the fundamental underpinning research for enabling distributed, dynamic, secure coalition communication/information infrastructures that support distributed analytics to derive situational understanding. Assets at the tactical

edge are disadvantaged by resource constraints (communications bandwidth, constrained and dynamic connectivity, finite energy, computing and storage, and the human's ability to process information). It is likely that nodes may change roles and hence the changes in services they offer or consume in response to changes in the environment leads to dynamic resource (re-)allocation problems. Tactical coalition operations are often very dynamic and assets (sensing and communications, policies, goals, rapidly shifting traffic patterns and demands) will be heterogeneous. With the growing proliferation of sensors, as well as access to structured and unstructured data, the Warfighter at the tactical edge could be deluged in data. Appropriate data analytics and delivery mechanisms must cope with this potential overload, both at the physical as well as the cognitive levels.

Hence, to address the challenges of dynamic environments and disadvantaged users, it is necessary to develop techniques for dynamic, self-configuring services that build services "on-demand," taking into account changing mission needs, context and resource constraints. The importance of protecting information and assets remains a priority. Information assurance across heterogeneous networks with varying degrees of trust remains an issue, while operations at the tactical edge require effective protection and management of integrity and availability. Required topics to be addressed and suggested topics for consideration are as follows:

- A. **Content-based Software Defined Networking.** Software-defined networking (SDN) offers a separation of control and data planes, thus potentially easing complexity of dynamic network management. Content-based networking has the potential to allow distributed information sources to be discovered, assessed, and processed so that networks are context and content-aware and not independent, data-agnostic bit pipes.

SDN has the potential to be an enabler for establishing, controlling, and securing complex disparate coalition information infrastructure arrangements. However, to realize these benefits, many challenges need to be addressed including coping with limited knowledge of topology, heterogeneity of protocols and policies, differing time-scales, security concerns, decentralized distributed operations, and latency between the controller and the controlled assets.

While the conventional SDN paradigm of centralized control offers optimality, decentralized control may offer advantages in disrupted networks. It is therefore necessary to develop the requisite underpinning knowledge leading to principled methods that enable the trade between centralized and distributed control planes, and optimal policies for creation, management, and communication between control plane fragments, whether as peer to peer or through a hierarchy of supervisory planes.

Important research issues include:

- **A.1: Control Plane Configuration Across Coalition Networks [REQUIRED]:** Software-defined information-centric networking that supports secure coalition operations via logically distributed and decentralized control plane architectures across heterogeneous networks. Models and tools for the formal study, verification, and analysis of

algorithms and protocols that support inter-operability, adaptability, and resilience of heterogeneous coalition networks and network components. Establishment of performance bounds and complexity tradeoffs. Optimal policies for creation, management, and communication between control plane fragments. It is expected that networks at the tactical edge will be essentially mobile ad hoc networks (MANETs), but infrastructure and cellular networks must be exploited where available and when feasible.

- **A.2: CBN-enabled Network Management [SUGGESTED]:** Abstractions, models, mathematical frameworks, and tools for content-based networking (CBN) that enable discovery of, access to, and processing of information sources in environments with highly variable tempo. Development of appropriate performance metrics and establishment of fundamental limits and tradeoffs. Innovative paradigms in network protocols enabled by SDN to better support mission and context awareness, and to create coherence between management functions (such as network, services, security, spectrum). Routing and (de-) prioritization of data flows in CBN may require an understanding of the data content and should be integral to SDN. CBN is key to supporting semantic interoperability for shared coalition situational understanding.
- **A.3: Measurement and Control [SUGGESTED]:** Appropriate definitions of network state and approaches, algorithms and tools to infer network state and topology/connectivity, and development of appropriate (state) consistency models and trust models. Distributed dynamic control of the heterogeneous networks to maximize security, resilience, and performance. Develop the principles of distributed processing of monitor data and related distributed analytics to facilitate provision of situational awareness (SA) across the contextual layers, reporting at the appropriate level to support decision making and ensure a consistent SA picture. Predict future demand as an input to network management and provisioning, and therefore anticipate overload or resource limitations to enable an optimal response.

B. Policy-Based Secure Coalition Information Infrastructures. The Warfighter at the tactical edge will have access to information from varying sources, with varying provenance and credibility, and subject to diverse policy requirements. Information processing in support of collaborative coalition decision making requires methods to provably show that content information and services are only used as agreed by coalition policies. These policy mechanisms must ensure that the required level of security is achieved without reliance on centralized security services and under significant risk of compromise. It is expected that security concerns will be jointly addressed with networking, analytics, and situational understanding research. Particular emphasis should be placed on developing analytical frameworks, simulation techniques, and experimental methods that can assess the effectiveness of the security mechanisms, together with its impact on decision making in a complex dynamic hostile environment. This security analysis should cover

scalability issues, security proofs, and security tradeoffs under a variety of network and user constraints.

Important research issues include:

- **B.1: Dynamic Policy-Based Autonomous Management [REQUIRED]** of both coalition information and infrastructural services that dynamically adjust to mission changes, network dynamics and policy changes. Techniques for rapidly negotiating, establishing and executing composite coalition policies from ad hoc teams with different assets, roles, security mechanisms, trust, and policies. This includes policies for the use of data/fusion services, analytics, and information infrastructures as well as the security policies to protect them.
- **B.2: Policy Analytics [SUGGESTED]:** Foundational techniques to model, analyze and formally verify policy managed secure adaptive coalition information infrastructures. Assurance of dynamic policies, identification of policy conflict, conflict mitigation strategies, and decision support for policy negotiation. Such policy analytics must consider the human-in-the-loop so that processing by both humans and machines is supported.
- **B.3: Security for Distributed Information Services [SUGGESTED]:** Develop fundamental models and mathematics to describe key aspects of Information Assurance, and their impact on each other. Develop foundational techniques for balancing and integrating security features. This basic research should lead to mechanisms that enable users of security services to make complex cost-benefit judgments, balancing multiple objectives such as operational impact, time, and effort required to comply against their ability to achieve their mission goals. Examples of security services include fine-grained data protections, distributed access control, discovery, processing, replication, and concurrency control that can be distributively applied with heterogeneous coalition policies.
- **B.4: Security Metrics [SUGGESTED]:** Lack of a set of adequate, sound and underpinning set of security metrics hampers effective quantification of security, understanding of fundamental limits and tradeoffs in the design of security countermeasures, choice of security architectures, and optimization of security in the design and operation of information technology infrastructures. Security metrics must be quantifiable, realizable, and traceable. Security metrics should be identified and investigated to support:
 - Effectiveness, comparison and reasoning about security functionality
 - Security composability and security in composed systems and services
 - As a component of risk management

- C. **Composability, Positioning, and Adaptive Distributed Data Services.** In a dynamic coalition scenario, it is likely that a subset of nodes might be able to dynamically change roles. The ability to fight through in a degraded dynamic networking environment calls for basic research in composability and positioning of distributed coalition data and information services for and on disadvantaged nodes at the tactical edge. Data and information services of interest include aggregation, summarization, fusion, computing, and other services as envisaged in TA2.B (Dynamic Context-Aware Gathering and Information Processing Services). Composition of services will be goal-driven, based on the (dynamic) mission. The distributed composition and federation of services across the coalition will be constrained by policies, security issues and network state, and these constraints will impact the functionality of the composed service.

Research must address the ability to predict the feasibility of achieving the desired composed functionality as well as the cost of achieving and maintaining this composition. The problem of composability of services is a joint information processing and networking problem. An important challenge is in understanding how selection and positioning of the distributed processing services affects the higher layer task performance. There is a strong temporal component due to the network dynamics and changing nature of the tasks as well as with underlying information in the network which requires any solution to be dynamic and evolve over time.

Important research topics include:

- **C.1: Composability of Distributed Coalition Services [REQUIRED]:** Fundamental understanding of the composability of distributed services to support coalition information processing in dynamic environments with principled approaches for building composite information infrastructures. Emphasis is on the basic science leading to understanding the composition of services and the resulting performance of the composite system of services. Appropriate metrics for such composition must be defined and bounds on performance established. Research must enable the ability to predict the feasibility of achieving the desired functional composition, as well as the cost of achieving and maintaining this.
- **C.2: Positioning of Services [SUGGESTED]:** Distributed methods to position, manage, and secure information services across dynamic heterogeneous coalition networks to support efficient, resilient, and distributed/collaborative decision making. Positioning and repositioning must consider the location of information sources, context and state of the users, capabilities of information processing assets, and coalition policies, all of which may dynamically vary (and at different time scales).
- **C.3: Adaptive Data Service Negotiation [SUGGESTED]:** to provably maintain, and provide assurance of, coalition security policies in resource-constrained and distributed environments for both the services to be shared and the data to be exchanged or processed. This basic

research will require common architectures, components, and information exchange mechanisms.

c. **Technical Area 2: Coalition Distributed Analytics and Situational Understanding (CDASU)**

Multidisciplinary research is needed to provide the fundamental underpinnings for Coalition Distributed Analytics and Situational Understanding (CDASU). The context of future ad-hoc coalition operations at the tactical-edge has four important considerations: each has significant impact on the research required to underpin the distributed analytics and derived situational understanding. The four considerations are:

- The complex multi-actor situations which require resolution, and which requires understanding of the mutability of the actors involved, the environment they exist within, and rapid dynamic adaption of information and analytics as understanding changes.
- Coping with the volume and complexity (variety, velocity, value, viscosity and veracity) of information distributed across the Coalition's dynamic resource constrained information infrastructure will require distributed data processing and analytics to be undertaken by machines (supporting humans).
- The high tempo and time sensitivity in the tactical environment demands the ability to rapidly, and in a distributive manner, reconfigure/adapt the Coalition information system to address the rapidly fluctuating set of Coalition tasks with the rapidly fluctuating set of Coalition assets.
- Finally, technical systems must be aligned with human needs and capabilities, and support human understanding.

Required topics to be addressed and suggested topics for consideration are as follows:

A. **Modeling and Interaction for Situation Understanding.** The socio-technical information system must be driven by the needs of the Coalition users and support them in understanding the diverse and dynamic range of situations presented to the Coalition at the tactical edge. A primary challenge is how to represent and model such complex adaptive multi-actor human systems. A second challenge is how to make best use of Coalition human capabilities, via use of appropriate interaction and visualization techniques. Such techniques need to be appropriate for deployed military operations: in such operations the vast majority of users are generalists as opposed to highly trained data scientists. Also such operations are highly dynamic, temporally challenging, and in an unfamiliar socio-cultural environment.

Important research topics include:

- **A.1: Modeling Mutability of Complex Adaptive Human Systems [REQUIRED].** Research is needed into formal theories, representations, and models of the underlying mechanisms of how human groups and organizations (sub-classes of complex adaptive systems) evolve. The research must address, (a) group and sub-group path-dependent reactions

to external and internal stimuli (including probes), (b) resilience/mutability of these systems and their closeness to a catastrophe (c.f. chaos theory), tipping point or phase change, and (c) recognition and discrimination of particular behaviors of interest. The research must address a range of group types such as (a) transient and localized groups such as crowds and mobs, (b) regionally centered/focused groups with a shared value system and goals, and (c) dispersed, loosely connected groups.

A key goal of this research is to develop effective fundamental mechanism models (or sub-models which can be composed) which can be customized (and subsequently calibrated) to represent the set of interacting groups of interest (utilizing information and understanding distributed across the Coalition).

Research is also needed to develop a framework to represent the relationships between the analytic goal (i.e., desired understanding), the fidelity of the mechanism model, the quality/velocity of information about the group and the uncertainty of the resulting understanding. The research's purpose is to characterize the trade-space for the coalition tactical-edge environment and enable the creation of a prioritized set of relevant information goals.

- **A.2: Problem and Goal-driven Coalition Information Processing [SUGGESTED]:** Research is needed into formal theories, representations and models to underpin the analytic process and ensure it is driven by user need. Research is needed to develop effective and efficient methods to: (a) recognize the style of understanding needed (e.g. novel ('unknown unknowns') versus routine ('known unknowns'), open versus closed questions, complex versus simple) and the required tempo; (b) choose the appropriate set of analytic methods for the problem type, determining the information goals for these methods (including concepts such as precision and appropriate evidential requirement) and selecting appropriate interaction approaches (e.g. split of roles between human and machine); and (c) decompose the analytic and information goal into a set of prioritized and atomized queries (to be executed within the information system). The research will need to take account of the need to avoid surprise, the granularity of understanding required at different levels of command and how to mitigate well-known human cognitive biases.
- **A.3: User Context, Interaction and Visualization [SUGGESTED]:** Enabling the users at the tactical-edge operating in very dynamic situations to utilize information more effectively requires an understanding of their context and intuitive ways of (collaboratively when needed) interacting with and visualizing information. Therefore, research is needed to (a) model the tactical-edge users context (including mission goals, tempo of operation, cognitive skills and loading) in a manner which can be utilized within the information system to tailor the processing and delivery of information, (b) develop mechanisms and frameworks to enable intuitive iterative interaction between the tactical-

edge user and the information system (including visualization, alerting and challenge), (c) develop frameworks and mechanisms to enable tactical-edge coalition users to collaboratively undertake visual analysis of information, and (d) develop models which enable selection of mechanisms without the need for exhaustive trials. The research must be multidisciplinary taking due account of cognitive design and perceptual principles and interaction with the distributed information system, and the generalist (as opposed to data analytic specialist) nature of the tactical-edge user.

B. Dynamic Context-aware Gathering and Information Processing Services.

Given the dynamic, resource-constrained and distributed nature of operations, a continuous set of distributed choices will need to be made about how the coalition information system resources should be employed to satisfy the needs of the dynamically varying set of coalition tasks. The problem is further complicated as a single resource could potentially contribute to multiple tasks (frequently concurrently), and a single task will require multiple resources (in a temporally and/or spatially distributed manner). Solving this problem requires addressing issues associated with the impact and priority of tasks in a distributed manner. In addition, the dynamic composition of content based information services requires the ability to contextualize the set of distributed data and services. Further, maximal information exploitation whilst supporting the human component within highly dynamic coalition tactical environments without increasing their cognitive loading (including skill requirements) is aided if the machine component can directly process human provided representations.

- **B.1: Optimizing the Matching of Coalition Resources to Tasks [REQUIRED].** Given a dynamically varying set of operational tasks and available information system resources, where a single resource can potentially contribute to multiple tasks, the selection of which tasks to attempt to satisfy requires the ability to effectively and efficiently match resources to tasks in a branching many-many temporally and spatially complicated or complex manner. Thus basic research is required into theorems, frameworks, and mechanisms required to dynamically match tasks to resources. The research should enable the development of a distributed matching service, supported by a quantified understanding of the trade-space and assessment of the robustness of solutions. Further it should illuminate the higher-level trade-space between the scope of the asset to task matching system, the matching problem type (e.g. complicated or complex) and performance of the distributed matching services. If auction based approaches are proposed, these need to focus on empirically validated mechanisms to assign ‘money’ to ‘consumers’ in hierarchical coalition organizations dealing with a mixture of important and urgent tasks.

The research should develop empirically validated theorems, frameworks and mechanisms to assign relevance, significance and/or value to (categories of) information based upon the information’s expected

impact upon situational understanding. Non-auction based mechanism to assign significance or value are of interest.

- **B.2: Contextualization of Disparate Coalition Data Sources and Services [SUGGESTED]:** Research is needed to develop the information service frameworks, mechanisms and schema required to enable the characterization and contextualization of data sources (gathering and storing both structured and non-structured data) and the available information services distributed across coalition networks. Given the situation understanding information goal in dynamic resource-constrained coalition environments, characterization and contextualization are needed at the data source layer to enable relevant distributed data sources to be discovered and, at the service layer to match available relevant information services to the relevant data sources and coalition information goal. The resulting frameworks, mechanisms, and schema must be flexible and configurable to account for the varied computing resources and platforms and be extendable for new types of coalition data sources and services. Finally, it is desirable to have rich contextualized representations that are human understandable in order to enable intuitive user interaction with them.
- **B.3: Intuitive Machine Processable Representations [SUGGESTED]:** Research is needed into intuitive symbolic representations that are directly machine-processable. This means that value-loaded symbolic representations obtained from a user do not need to be transformed into a different representation (c.f. computer language) before being processed. The research should focus on both text and diagrammatic representations. The research should focus more on the feasibility of the representation dealing with the richness and variability of encoded meaning within ad-hoc coalition teams (including scalability, processing power) than the ease of human externalization and assimilation. The research will enable more effective interaction between ad-hoc coalition teams and machines, as it will enable the machine to adapt, and contribute, to user externalized information and cognitive frames without the user needing to be skilled in computer programming.

C. **Distributed Processing and Analytics.** Exploiting the opportunity provided for situational understanding by the increasing volume, velocity, and variety of data and information available across the resource constrained dynamic coalition information infrastructure requires the seamless task-based integration, modification, and extension of low-level and high-level information fusion mechanisms. Also, research is needed to modify and extend the current state of the art in standard data analytic techniques and paradigms (as they are designed for operation in static and high performance computing environments) for tactical-edge users.

1. **C.1: Distributed and Integrated Fusion for Situation Understanding [REQUIRED].** A key coalition goal is to improve the entire information process from signal processing through to situational understanding. Basic research is required into formal theories and techniques to enable

the linking and integration of low-level information fusion with high-level information fusion across a distributed enterprise involving a mixture of human and machine information processing agents to achieve situational understanding. Thus, research into formal theories and techniques will need to address, in an integrated manner, both the disparate coalition sources and decision support objectives: (a) the fusion of disparate data and information that is hard and soft, structured and unstructured and; (b) selection and tailoring of knowledge-based reasoning components.

2. **C.2: Distributed Data Analytics in Coalition Environment**

[SUGGESTED]: Given the data rich edge, basic research is needed to enable analytics of the variety, velocity, volume, veracity, value, and viscosity distributed coalition data. The research into distributed data analytics should address analytic services providing (a) distributed learning (including data mining) of distributed coalition data (structured and unstructured) in near real time, (b) aggregation, integration and summarization of large distributed volumes of heterogeneous information into more compact representations whilst also retaining the characteristics most important for situational understanding (e.g. uncertainty, discord and novelty), and (c) assurance and assessment of the risk and uncertainty associated with distributed learning systems. The research should also address how to model performance trade-offs to enable autonomic in-system decision-making about combined analytic and data resource management.

3. **C.3: Enabling Analytics of Distributed Coalition Data**

[SUGGESTED]: Given the data rich edge, basic research is needed to enable analytics of the variety, velocity volume, veracity, value, and viscosity of coalition data distributed across dynamic resource-constrained coalition networks. In particular, basic research is needed to enable adaption of enterprise-based approaches or the development of novel extendable mechanisms for distributed processing job and data handling which can be utilized on such distributed, dynamic, and resource-constrained coalition networks. This basic research should address both distributing the analytics to the data sources and distributing data to analytic services with dynamic resource constrained coalition networks. The research should also address how to model performance trade-offs to enable autonomic in-system decision making about combined analytic and data resource management.

- d. **Research Linkages.** Research in each of the TAs must be performed in the context and constraints of complementary research in other areas. TA1 and TA2 research must fit coherently together via joint and integrated research and experimentation where networking, security, analytics, and human research challenges are jointly addressed. There are many possible joint research opportunities, and there are clear research linkages between the two TAs that need to be exploited to enable distributed data analytics supporting distributed end users at the tactical edge in dynamic coalition networks. For example, dynamic policy-based management affects how the distributed coalition services

are dynamically composed based on the coalition resources available that best match the mission tasks. In order to optimize the matching of available distributed sensor, data, and information resources based on user's task needs, the underlying coalition network infrastructures must adapt and provide context-aware composition of coalition services. To effectively perform distributed data and information fusion from disparate coalition sources for situation understanding, it is necessary to compose and position the needed network services (e.g., policies, processing algorithms, computing resources) at the right network nodes at the right time.

It is expected that research linkages and interaction effects between technical areas and research outputs will be explored and verified through use of principled and ethical experimentation subject to the Governments statutes and policies. As noted above, experimentation is a crucial element of multidisciplinary research as it scientifically verifies and validates research results and findings under realistic conditions and often provides additional research insights.

4. Technology Transition Component

- a. **Introduction.** This PA contains a requirement for a Technology Transition Component to augment the Basic Research Component. The success of the DAIS ITA program is predicated on its ability to advance the state of the art in distributed analytics and information science and to transition the resulting research results to significantly improve the effectiveness and efficiency of coalition forces. The ability for the Alliance to rapidly exploit and transition research results from the basic research is of paramount importance. These transitions are expected to be broad (covering the full breadth of DAIS ITA technical areas), involve (and, when required, grow) a broad set of supply networks, start with the transition of results to applied research and impact both the commercial and defense sectors in both countries. It is expected that the Alliance will aggressively seek out transition opportunities for work ongoing in the Basic Research Component.

As stated previously in this PA, the ARL and Dstl anticipate awarding two separate instruments under which tasks will be issued for technology transition efforts. The first, TIA-2, will be awarded by ARL to the Lead Industrial Partner of the selected Consortium and will cover US only and US led joint US/UK transition opportunities. The second, the UK DAIS ITA Transition Contract, will be awarded to the UK arm of the Lead Industrial Partner of the selected Consortium by Dstl and will cover UK only and UK led joint US/UK transition opportunities. The Consortium may augment their capabilities through the issuance of subawards or subagreements as necessary under both TIA-2 and the UK DAIS ITA Transition Contract. TIA-2 and the UK DAIS ITA Transition Contract will be used to further mature and exploit the TIA-1 basic research results of the DAIS ITA. Products generated under TIA-2 and the UK DAIS ITA Transition Contract may be subject to export controls and security concerns.

The following represents a discussion of the scope of the Technology Transition Component that will be incorporated into TIA-2 and the UK ITA Transition Contract as the umbrella under which taskings will be issued.

- b. **Objective and Scope.** The goal of the Technology Transition Component is to facilitate movement of the research further along the acquisition cycle toward specific applications. The objectives of TIA-2 and the UK DAIS ITA Transition Contract are for the Consortium to support the ITA Program in identifying, pursuing, and performing technology transition efforts. Specifically, there are several objectives for TIA-2 and the UK DAIS ITA Transition Contract:
- To respond to ARL, Dstl, or other Government customers who wish the Consortium to alter, modify, augment, accelerate, mature, integrate, and/or expand specific results of the Basic Research Component in order to fulfill a specific developmental requirement;
 - To join with ARL, Dstl, or other appropriate Government customers in bringing technology from the Basic Research Component to experiments or exercises;
 - To join with ARL, Dstl, or other appropriate Government customers in providing analytical and other support to the exploitation of the research outputs from the Basic Research Component; and
 - As a vehicle to respond to ARL, Dstl, or other Government customers who have requirements for the expertise and/or results emerging from the Basic Research Component, and the integration of those results on the customer's applications.

The following describes the Technology Transition requirements: The Consortium shall identify technology transition opportunities. In coordination with the Governments the Consortium shall (a) familiarize itself with potential military applications for the technology through participation in workshops, seminars and meetings and other appropriate venues; review and analyze appropriate reports, studies and findings to determine applicability of the DAIS ITA research to address military requirements, (b) conduct specialized analyses, studies, and experimentation necessary to assess the applicability of technology, and (c) develop specific plans for the transfer of technology to targeted applications.

The mechanism for these transition activities will be defined by the statement of work for each specific tasking. The following describes a sample of the types of technology transition tasks envisioned to support the objectives above:

- The recipient will (a) conduct specialized analyses, studies, simulations, and experimentation necessary to assess the applicability of technology; and (b) develop specific plans for the transfer of technology to targeted applications.
- The recipient will (a) prepare descriptive material that clearly details the scope, limitations, and requirements for implementing the specific technology; (b) provide an exemplar of the technology for incorporation into the target system for demonstration and/or experimentation as appropriate; and (c) assist in the integration of the technology into the test bed for demonstration and/or experimentation as appropriate.

- The recipient will perform demonstrations and field experiments as required to promote transitioning of the technologies developed under the Basic Research Component. The statement of work for the tasks will be expected to define the mechanism for the demonstration or experiments as appropriate.

- c. **Intellectual Property** - Intellectual property is defined to include, but is not limited to, inventions, reports, technical data, software, computer codes, and trade secrets. Due to the variety of efforts which might be undertaken in the technology transition component of the DAIS ITA Program, there is no single approach to intellectual property rights. Intellectual property rights will be negotiated separately with each undertaking, consistent with the technology transition goals of the DAIS ITA Program.

The goal of the US Government relative to intellectual property generated under TIA-2 will be to secure Government Purpose Rights. Government Purpose Rights will provide the sponsoring Government(s) the right to practice, obtain, reproduce, publish, or otherwise use in any part of the world for purposes of either Government, and to authorize others to do so solely for Government purposes. Government purposes do not include commercial applications.

As far as the UK DAIS ITA Transition Contract is concerned, it is expected that normal UK MOD Intellectual Property Rights (e.g. Defcon 705) shall apply for efforts with UK organizations. Intellectual Property Rights for transitions under the UK DAIS ITA Transition Contract involving US organizations may require a variation to the normal UK MOD Intellectual Property Rights.

- d. **Export Controls and Security Concerns.** Each technology transition effort shall be examined on a case-by-case basis for export control and security concerns, as these requirements may vary based on the specific transition effort contemplated. The Consortium is required to ensure compliance with all export control and security requirements for each technology transition effort awarded under TIA-2 and the UK DAIS ITA Transition Contract.
- e. **Reports.** All reports shall have been reviewed to ensure they meet normal professional quality standards. The following are examples of reports which may be required for a task: Technical Study Reports, Software Design Documentation, Software Systems Manuals, Interface Design Documentation, Interface Requirements, Database Design Documentation, Engineering Drawings, Engineering Specifications, Engineering Change Documentation, Workshop and Conference Reports, Instructor/Lesson Guides, etc. The Consortium shall submit performance and cost reports, if required by the particular task that reflects the number of labor hours and labor costs charged against the task, cost of materials, travel, per diem, and total cost accumulated under the task. Performance reports shall include the current status of the work, problem areas encountered, current projections of completion dates and estimated total cost to complete the order. Any changes to previous projections shall be explained. Reports produced under the UK DAIS ITA Transition Contract shall be compliant with the standard Dstl report template; which will be provided to Offerors with their invitation to submit proposals under this PA.

- f. **Funding.** It is expected that tasks submitted by ARL, Dstl, and appropriate Other Government Agencies/Departments (OGA/OGD), will provide funding to the Consortium for transitioning technology to specific applications under TIA-2 and the UK DAIS ITA Transition Contract. No specific funding has been budgeted by either country at this time for TIA-2 or the UK DAIS ITA Transition Contract, and future budgetary efforts will be dependent on the success of the research efforts under TIA-1, as well as other events which may dictate the budgetary process. No funding from the TIA-1, Basic Research Component, shall be used for transitioning technology. The ceiling amount for the potential ten-year period of performance for the Consortium in connection with the TIA-2 agreement to be awarded is \$50 million. . It is anticipated that the UK DAIS ITA Transition Contract will have a ceiling of £30 million over the potential 10-year period. It should be noted that these values are provided as a guideline only and no guarantee can be given to the actual amount of spend.

5. Collaboration

- a. **Background.** This program continues the ARL and Dstl concept of creating an Alliance to facilitate a close collaborative relationship between the Governments and their partners. Experience has shown that deep and persistent collaboration between Government, academia, and industry enhances innovation and has a high return on investment. Therefore, collaboration between Alliance (Consortium and Government) researchers is integral to the execution and success of the DAIS ITA. It is ARL/Dstl's strong belief that work conducted by the Alliance cannot be successful either in whole or in part without collaboration. The DAIS ITA must be structured and managed to foster an open collaborative research environment to support deep collaboration among researchers in the Alliance, including between Government and industry sector researchers. Creation of this environment is therefore a critical element in establishing the Alliance. This section describes collaborative opportunities and potential avenues for the Alliance to collaborate. Collaborations with ARL/Dstl will be documented in the Initial Program Plan (IPP) and the subsequent Biennial Program Plans (BPPs). Offerors are invited to suggest additional new and innovative avenues for fostering collaboration among Alliance researchers.
- b. **Collaboration Environment.** The Lead Industrial Partner (LIP) must provide an environment that promotes collaborative research and management of the Alliance. Such an environment might include web-based, password-protected systems or audio-visual collaboration tools. The LIP must provide an Internet secure environment for information sharing and interactive collaboration. An information repository must be maintained where ongoing research results, published papers and reports, biennial research plans, interactive file sharing, discussion groups, interactive calendars of events, and other information can be accessed to enhance communication. This environment must support collaboration among Consortium members and between the Consortium and the Government and must support multi-level access control to protect sensitive information and intellectual property. The Consortium is expected to facilitate the experimentation and demonstration of integrated Alliance research results through this collaboration environment.

- c. **Collaborative Opportunities.** During the period of performance, there will be substantial opportunities to collaborate with researchers in both the US and UK Governments. ARL and Dstl will specifically fund in-house staff to foster direct highly collaborative partnerships between Consortium and Government(s) researchers in both Technical Areas. Methods of collaboration are expected to be diverse and could include remote conferencing, workshops, workshop series or staff exchange as described below. Moreover, ARL and Dstl will shape their mission programs for synergies with the DIAS ITA research strategy, the DAIS ITA Initial Program Plan (IPP) and subsequent Biennial Program Plans (BPPs), thus ensuring a direct and continuing collaboration across the Alliance. The BPP will be the basis for the Alliance to optimize the collaboration, information, research and technology transfer between the Consortium and ARL/Dstl subject matter experts.

- d. **Staff Rotation and Exchange.** An important element of DAIS ITA collaboration is rotation of research staff through short-term and long-term temporary assignments among the Alliance members, and particularly rotations between the Government and industry sector members. The scope of these rotations may range from regular, periodic short term visits to sabbaticals lasting as long as a year. Staff rotations must be undertaken to foster and facilitate collaborative research where face-to-face interaction is advantageous, to enable a researcher to utilize unique facilities, to enable Alliance personnel to obtain specialized training or experience and to facilitate the exchange of research results. In addition, this exchange, or cross fertilization, of personnel will provide Consortium personnel with insight into Defense unique requirements and will provide Government personnel with insight into state-of-the-art research and commercial practices and/or the opportunity to pursue basic research with noted researchers. The success of these interactive and collaborative exchanges will be assessed by the quality of the collaboration as demonstrated by joint efforts such as basic research transitions to applied research programs, archival journal papers, patents, and refereed presentations.

Offerors should outline the range of opportunities foreseen for collaboration and the mechanisms that will be put into place to foster staff rotations and other collaborative activities. An enabler for collaborating with ARL researchers is ARL's Open Campus Initiative which seeks to build a science and technology ecosystem where visiting scientists work side-by-side with ARL researchers (see <http://www.arl.army.mil/www/default.cfm?page=2357>).

All salary and travel costs associated with the rotation of Government personnel will be borne by the Governments. All salary and travel costs associated with staff rotations of Consortium members will be funded under the TIA-1 or may be provided by the Consortium member as cost-share. There should be a balance of staff rotations across all the partners in the Consortium and across all the research areas. It is anticipated that some portion of the Consortium's scientific labor-years will be in staff rotations.

- e. **Research Reviews, Workshops, and Lectures.** The Alliance must conduct research reviews and collaboration meetings annually, and workshops and lectures periodically. The Alliance research efforts will undergo independent scientific peer review by independent technical experts from industry, academia,

and Government in both countries with expertise in DAIS ITA science and technologies. The peer review panel will provide independent assessment and evaluation of each DAIS ITA project.

The Alliance will be encouraged to hold, from time to time, scientific lectures, short courses, and workshops on mutually agreed upon topics. These lectures and workshops will serve as both educational and research outreach opportunities and should involve participants outside the Alliance when appropriate. Additionally, the Alliance is expected to hold regular, periodic research reviews that will permit the free exchange of ideas and research results. The Alliance must conduct two meetings each year (technical review and collaboration meeting). The costs associated with the Consortium's efforts for these lectures, short courses, workshops and reviews will be funded under the DAIS ITA.

6. Management

- a. **Background.** This DAIS ITA is being formed to leverage and enhance individual expertise and viewpoints in both the US and UK. It is critical that the Consortium be structured and managed to create and foster an open, collaborative research environment. Both Governments recognize the hurdles that may arise in managing an international effort of this magnitude. While creation of a fully collaborative research environment that engages the Alliance is of paramount importance, consideration of international issues is also important. This section describes a framework for management of the DAIS ITA. This framework is intended to be flexible to minimize overhead, yet ensure research relevance and proper oversight. Offerors may suggest additional management tools and mechanisms as part of the Whitepaper and Proposal, but in doing so they must also justify and demonstrate the benefit and cost effectiveness of these additional management activities.
- b. **Overall Management Concept.** ARL, Dstl and the Consortium will establish a International Technology Alliance. Additionally, other Government agencies may be invited to join this Alliance and to contribute, as appropriate, their technical expertise, personnel, access to research facilities and funding. The Alliance will strive for a focused, yet flexible research environment. To accomplish this, the Consortium should consist of a relatively small number of academic and industrial organizations, optimally sized with no more than sixteen members (including the LIP counted as two organizations, one in each country.). These members must possess significant expertise in one or more of the technical areas covered by the ITA with the ability to integrate the broad palette of research required to realize the goals of the ITA Program. Each of these members will be a full Member of the Consortium and possess equal voting rights in accord with the Articles of Collaboration.

It is expected that new and emerging ideas will arise as distributed analytics and information science advances and as the US and UK needs for coalition operations evolve. Therefore, the Consortium should be prepared for significant adjustment to the basic research program throughout the period of performance of the ITA as research insights are gained, state of the art is advanced, and collaboration opportunities arise. Technical leadership and management methods

and procedures must be considered to identify and include new research directions and advances.

In addition to research conducted by members of the Consortium, the research program may be enhanced by research undertaken by other organizations selected jointly by the Alliance as part of its planning process. Any such research efforts are expected to be conducted by subawardees to the LIP.

c. **Technical Guidance and Oversight.** The following framework is required for the management and oversight of the Alliance. It consists of parallel managers from the Governments of both countries and the Consortium who will provide day-to-day coordination, as well as a small managing board representing the interests of the Consortium members and a consultative group of interested parties from the Governments. An Offeror may propose additional plans or mechanisms for management, however Offerors are cautioned to ensure that any such plans or mechanisms are: (1) not duplicative of the requirements in this PA, and (2) not overly burdensome to the Alliance. A description of each component of the Alliance Management follows:

1. **The Lead Industrial Partner (LIP)** is expected to provide research leadership; create and foster deep and persistent, collaborative, multidisciplinary research; perform lightweight administrative duties; and conduct basic research in both Technical Areas. Their involvement includes participating in the research, promoting research to technology, distributing Government(s) funding to Consortium Members in accordance with the approved IPP/BPP, and maintaining proper research invoicing.
2. **Collaborative Alliance Managers (CAMs).** The research executed under the ITA Program will be considered an extension and integral part of the ARL and Dstl research programs. As such, the DAIS ITA Program will be planned, defended, executed, and reviewed as part of ARL/Dstl's mission programs. Overall scientific management and fiscal responsibility for the DAIS ITA will reside with senior ARL/Dstl scientific managers, who will be designated the CAMs, (one in the US and one in the UK.) The ARL Agreements Officer will receive recommendations from the CAMs and will be the ultimate legal authority empowered to make formal adjustments to the TIA-1.
3. **Program Managers (PMs).** The DAIS ITA Program Managers are the Consortium's scientific representatives charged with the Consortium's overall management and guidance of TIA-1. The LIP will identify a PM in the US and one in the UK. The PMs will be designated by the Lead Industrial Partner and be a member of that organization. Management of the DAIS ITA Program is expected to be a primary responsibility of the individual assigned as PM and a commitment of time commensurate with this responsibility is also expected. The PMs are required to have scientific stature, research and leadership experience and skills sufficient to successfully execute the DAIS ITA program. It is also recognized that the PM may require staff support to manage and execute their duties, and this requirement should be included in the DAIS ITA submission.

4. **An Executive Steering Board (ESB)** will be established to identify and develop collaborative opportunities, advise, and assist the CAMs in setting research goals, and facilitate technology transitions. The ESB will be chaired by senior leadership in ARL and Dstl, may include representatives from other Government organizations with interest and expertise in the technologies related to the DAIS ITA and will typically meet on an annual basis. The ESB may be invited to DAIS ITA meetings, and will be informed about the BPP approval process. The Consortium may be requested to participate in ESB meetings.
5. **Consortium Management Committee (CMC).** The DAIS ITA will have a Consortium Management Committee (CMC) that consists of one representative from each member of the Consortium. The CAMs participate as ex officio members in all discussions except those that deal with purely internal Consortium matters. The CMC will be chaired by the PMs. Each Consortium Member will have one vote on the CMC to support programmatic and management-related activities and decisions. In the event of a tie, the LIP will cast the deciding vote. The CMC will be responsible for the management and integration of the Consortium's efforts under the DAIS ITA including programmatic, technical, reporting, financial, and administrative matters. The CMC makes recommendations that concern the membership of the Consortium, the definition of the tasks and goals of the program, and the distribution of funding to the Members and any subawardees. Quarterly meetings will be conducted by the CMC.
6. **Peer Review Panel.** The Peer Review Panel will consist of independent technical experts from industry, academia, and Government in both countries with expertise in DAIS ITA science and technologies. The peer review panel will provide independent assessment and evaluation of each DAIS ITA project with respect to:
 - The technical merit of the approaches adopted
 - The operational relevance of the problems addressed
 - The synergistic value of collaboration
 - The likelihood of exploitation (technology transition)
 - Whether the science is innovative and advances the state of the art

The Consortium will support the Peer Review Panel annually. Starting in the second year and every two years thereafter, a formal Peer Review will take place. Prior to this Peer Review, the Consortium will provide a report delineating the scientific results of the research tasks. During the Peer Review researchers will present these results to the Peer Review Panel. An informal Peer Review will be held in alternate years starting in year 3 where the Peer Review Panel will interact with researchers without formal presentations at other DAIS ITA meetings. The Peer Review Panel will provide their independent assessment to the CAMs based upon these interactions.

- d. **Articles of Collaboration (AoC)** - In accordance with 32 CFR 37.515(b), the articles of collaboration is the document that sets out the rights and responsibilities of each consortium member. It binds the individual consortium members together, whereas a TIA binds the Government and the consortium as a group (or the Government and a consortium member on behalf of the consortium, as explained in 32 CFR 37.1015). The articles of collaboration should discuss, among other things, the consortium's:
- (1) Membership and Management structure
 - (2) Changes to the consortium membership
 - (3) Method of making payments to consortium members
 - (4) Financial, personnel, facilities and reporting requirements
 - (5) Means of ensuring and overseeing member' efforts on the project
 - (6) Provisions for members' cost sharing contributions (if applicable)
 - (7) Intellectual property, to include establishment and maintenance of a collaborative research environment that encourages and facilitates the sharing of intellectual property, as appropriate, between participants under TIA-1
 - (8) Information exchange guidelines, to include establishment and maintenance of a collaborative research environment that encourages and facilitates the sharing of proprietary information, as appropriate, between participants under TIA-1
 - (9) Modifications to the AoC

An Offeror invited to submit a Proposal will be provided a model Articles of Collaboration with their invitation to submit a Proposal. The model AoC represents appropriate and necessary terms and conditions the Government finds acceptable. An Offeror must submit the AoC with the Proposal signed by a duly authorized representative of each Member of the Consortium. The model AoC is to be executed by the proposed Members of the Consortium "as is" or changes may be proposed by the Offeror. If changes to the model AoC are proposed, an Offeror is hereby informed that such changes must be acceptable to the Government for the Offeror to be eligible for award.

- e. **Initial Program Plan (IPP) and Biennial Program Plans (BPP).** Within 30 calendar days after award, the Alliance will jointly prepare an IPP to cover the first 7 months of performance under TIA-1. The IPP will be based substantially on the Proposal received from the selected Consortium. The IPP will be accompanied by a five-year roadmap that describes the overall plan to be accomplished by the Consortium within the Alliance structure. This roadmap must provide the vision for goals to be addressed during the first five years of the Alliance. The roadmap must provide a detailed description of the IPP for execution of the basic research during the first 7 months and must include approximate timelines for research activities to facilitate potential future basic research transitions.

Four months after award, the Alliance will begin to jointly prepare a proposed BPP for the next 2 years of performance under TIA-1. Through discussion among the Alliance members, a BPP will result that enables integration and execution of multidisciplinary, collaborative research that strives to achieve DAIS ITA objectives. The CAMs will approve the BPP and formally submit the approved BPP to the Agreements Officer for incorporation into TIA-1. This process will continue through the life of TIA-1.

Each BPP will cover a two-year timeframe, but may be altered, with the approval of the CAMs and the Agreements Officer, if research work requirements change. The BPP will provide a detailed plan of research activities (including research goals, key personnel, staff rotation, facilities, experiments, and budget) that commits the Consortium to use their best efforts to meet specific research objectives. The BPP will also describe the collaborative efforts with the Governments.

During the course of TIA-1 performance, if it appears that research goals will not be met, the CMC will provide a proposed adjustment to the BPP for approval by the CAMs. In addition, the CAMs may from time to time request that additional research be added to the BPP within the scope of TIA-1. The Consortium, as an entity, will not solicit or accept funding from outside sources other than the ARL/Dstl without the approval of the CAMs and the Agreements Officer.

During the course of performance of TIA-1, the Agreements Officer, in coordination with the CAMs, will have approval authority for certain specific changes to the IPP/BPP including but not limited to:

4. Changes in the scope or the objective of the DAIS ITA Program, IPP/BPP, or research milestones
5. Change in the key personnel specified in the IPP/BPP
6. The absence for more than three months, or a 25% reduction in time devoted to the ITA Program, by either of the PMs
7. The need for additional Federal funding
8. Any subaward, transfer, or contracting out of substantive program performance under an award, unless described in the IPP/BPP
9. Changes to the Articles of Collaboration if such changes substantially alter the relationship of the parties as originally agreed upon
10. Solicitation or acceptance of funding under the DAIS ITA Program from sources other than ARL/Dstl
11. Changes in Consortium membership. It is expected membership will change as technical efforts progress and resource levels change.

The CAMs, in coordination with the CMC, will be responsible for integrating the IPP/BPP into their overall respective Government research and technology programs.

- f. **Collaboration and Technical Review Meetings.** Each year, the Alliance must organize an DAIS ITA Collaboration Meeting and an DAIS ITA Technical Review Meeting where Alliance researchers engage in face-to-face technical discussions. The overall goals of these meetings are to foster interactions and collaborations among researchers and stakeholders, allow Alliance research leadership to assess research progress, and support independent scientific peer review.

The focus of the DAIS ITA Collaboration Meeting is on face-to-face interactions and technical discourse to enhance collaborations (especially multidisciplinary, cross-Technical Area collaborations). It is expected that these scientific discussions will lead to new ideas and insights, strengthen existing and establish new collaborative arrangements, engage stakeholders, and evolve the DAIS ITA scientific program. This meeting may also emphasize experimentation/validation efforts and possible transition opportunities. Ad hoc discussions should be expected and encouraged. The Peer Review Panel will attend this meeting, informally participate in discussions, and provide feedback to the Alliance.

The focus of the Technical Review Meeting is to present ongoing research efforts and scientific results. The Peer Review Panel process is included as part of the annual Technical Review Meeting. For the broader community and stakeholders (both Government and non-Government , by invitation only), this meeting may consist of scientific talks, workshops, demonstrations, and tutorials.

These meetings will each be held annually and rotate between the US and UK. Planning for these meetings will be executed through the PMs and the CAMs. Additionally, it is anticipated that the Alliance may participate in other Government(s) program reviews on an ad hoc basis.

- g. **Evaluation for Five-Year Extension.** The DAIS ITA awards (i.e. TIA-1, TIA-2 and the UK DAIS ITA Transition Contract) will be awarded for a five-year period. These awards will each contain an option to extend these awards for an additional five years. At the end of the fourth year, a comprehensive program review will be conducted that will consider cumulative performance metrics, the Consortium's vision for the additional five-year period of performance (to be submitted by the Consortium at the end of the fourth year), funding availability, and the current research needs and goals of the ARL and Dstl. Performance metrics are expected to include items that provide an indication of the DAIS ITA's accomplishments, its transitions, the number of refereed journal and conference articles, invited presentations, patents, relevance of the work to ARL/Dstl, and collaboration. The essential elements of this evaluation will be impact on the scientific community and ability of the Governments to conduct coalition operations through transitions of research results. The decision as to whether to exercise any option is expected to be based on the results of the review and evaluation described above.

7. Funding

The estimated funding levels for the DAIS ITA Program (under TIA-1) over the projected period of performance, including option years, is shown in the top part of Table

1. The funding includes all known costs associated with TIA-1, i.e. the costs for research, program management, experimentation, travel, etc.

Award will be made to the Consortium that offers the best value to the Governments. Consortium Members must recognize and understand there are no guarantees associated with the levels of funding for each Member during the period of performance. All Members may be expected to compromise and sacrifice anticipated funding as necessary and appropriate to meet the goals and objectives of the DAIS ITA Program as established through the collaborative planning process.

- a. **Enhanced Funding.** As stated above, other Government agencies (both US and UK) may participate in the DAIS ITA and contribute their technical expertise, personnel and facilities. Should additional funding for the DAIS ITA become available from those other Government agencies, an Enhanced Funding provision is included in this PA. This provides a mechanism for growth and enhancement within the DAIS ITA under TIA-1. Other Government agencies in the US and UK may chose to support the program with basic research dollars in areas of specific interest to their mission programs. The Enhanced Funding (should it become available) is expected to be used to leverage the research, technology and capabilities from what is being accomplished with the Program Funding under TIA-1. **In response to this PA, Offerors are not to propose any work related to the Enhanced Funding in the Whitepaper. Offerors invited to submit a Proposal are required to provide a detailed proposal to address the requirements of this PA within the outlined Program Funding. In addition, Offerors are required to include a general discussion of possible additional research that could be pursued should Enhanced Funding be received. The discussion of Enhanced Funding is required for the Proposal only.**

Table 1. Anticipated DAIS ITA Funding (Both US and UK combined funding expressed in US Dollars - \$)

PROGRAM FUNDING

Funding Category	TIA-1 Research Program (\$M)										
	Fiscal Year										
	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	Total (10 yr)
Basic Research (6.1)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	80.0

ENHANCED FUNDING

Funding Category	TIA-1 Research Program (\$M)										
	Fiscal Year										
	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	Total (10 yr)
Basic Research (6.1)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	20.0

B. AWARD INFORMATION

One proposal will be selected for award as a result of this PA. The Offeror selected for award will be notified by the Agreements Officer or his/her designee telephonically or via email. Upon notification, the selected Offeror will be required to sign the TIA-1, TIA-2 and the UK DAIS ITA Transition Contract. The award is not official until each Member of the successful Consortium on the selected Offeror's proposal has signed the TIA-1, TIA-2 and the UK DAIS ITA Transition Contract and the Agreements Officer has signed TIA-1 and TIA-2 and the appropriate UK Official has signed the UK DAIS ITA Transition Contract. If for any reason an Offeror is not willing to sign all three instruments (TIA-1, TIA-2 and the UK DAIS ITA Transition Contract) that Offeror will no longer be eligible for award.

C. ELIGIBILITY INFORMATION

1. **Eligible Applicants.** An Offeror is reminded that formation of a Consortium is a requirement in order to be responsive to this PA. The Lead Industrial Partner has specific leadership and management responsibilities and roles as outlined below. All Consortium Members are expected to have significant involvement and input into the program. It is anticipated that an optimally sized Consortium would include no more than sixteen members (including the LIP counted as two of the sixteen organizations (one in the US and one in the UK). This recommended Consortium size is not a hard limit, but having more than sixteen organizations in the Consortium may dilute the funding levels to the point that it renders the program goals unattainable.

A proposal that includes more than sixteen members must provide a rationale for the additional members.

To be qualified, potential Consortium members must:

- Have the management capability and adequate financial and technical resources, given those that would be made available through TIA-1 and TIA-2 and the UK DAIS ITA Transition Contract, to execute the program.
- Have a satisfactory record of executing such programs or activities (if a prior recipient of an award).
- Have a satisfactory record of integrity and business ethics.
- Be otherwise qualified and eligible to receive a TIA under applicable laws and regulations.
- For UK participants a Letter of Good Standing must be completed

NOTE: Upon implementation of the OMB guidance in 2 CFR part 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards," by DoD, prior to making an award, the DoD is required to review information available through any OMB designated repositories of Government-wide eligibility qualification of financial integrity information, such as the Federal Awardee Performance and Integrity Information System (FAPIIS). Note, however,

that FAPIIS is cited only as an example in 2 CFR 200.205. The US Government-wide policy regarding use of FAPIIS in the award of grants, cooperative agreements, and TIAs is still pending. Once issued in final form, the FAPIIS policy may affect DoD's process for judging proposed recipients to be qualified to receive financial assistance awards (note that the current process and standards for a Agreements Officer's determination of a recipient's qualification are described in the DoD Grant and Agreement Regulations, in subpart D of 32 CFR Part 22). For additional background information, see the Supplementary Information section in Office of Management and Budget's (OMB) proposal of the policy for comment, which appeared in the *Federal Register* on February 18, 2010 [75 FR 7316]. Note that the particulars of the proposed guidance may change when OMB issues the final guidance.

Discussion of Consortium Member's Eligibility:

- **Lead Industrial Partner (LIP).** A LIP is defined as a US or UK industrial organization with existing operations in both the US and UK sufficient to support research and transition in both countries. Sufficient operations are defined as having the ability to perform research and support activities in both countries, utilizing in-house engineers and scientists. This partner is required to take the lead in the organization and management of the Consortium, substantially participate in the research, and promote the transition of technologies resulting from the Basic Research Component of the DAIS ITA Program. Industry leadership will enhance the potential for transition of the resultant technology into both the commercial and military marketplaces and ensure compliance with US/UK export control and security requirements when applicable under TIA-2 and the UK DAIS ITA Transition Contract.
 - **Consortium Members.** Consortium members are required to have operations in either the US or the UK, or both nations and are expected to substantially participate in the research of the Basic Research Component. At least one advanced degree-granting educational institution from both the UK and the US must be included in the Consortium. Each Consortium Member may be an industrial or academic institution, but must possess substantial experience and expertise in the research areas contained within the scope of the DAIS ITA Program. US Academic members are expected to be institutions of higher education as defined by 20 USC 1001 which offer programs leading to an advanced degree. UK Academic members are expected to be advanced degree-granting educational institutions and listed as a Recognised Body within the Education (Recognised Bodies) (England) Order 2013, as per the Education Reform Act 1988. Academic Members are also required to have doctoral level courses of study in scientific and research areas related to the DAIS ITA Program that can result in the granting of a doctoral degree. Industrial members are required to have the ability to conduct appropriate research activities utilizing in-house engineers, scientists, and facilities. All Consortium Members are required to demonstrate opportunities for substantive collaboration with ARL/Dstl, including appropriate opportunities for staff rotations and research collaboration.
2. **Cost Sharing or Matching.** Cost sharing is not required in the response to this PA as cost sharing requirements have been determined to be impracticable for this

Program. However, any proposed cost sharing will be evaluated as it relates to the evaluation factors set forth in the PA, based on the degree to which the proposed cost sharing enhances the proposal to result in added benefits to the Program. In order for the proposed cost sharing to receive appropriate credit during the evaluation process, the proposal must evidence a firm commitment to cost sharing and evidence a process for integrating the cost sharing into the Biennial Program Plan for the research component.

3. **Dun and Bradstreet Universal Numbering System (DUNS) Number and Central Contractor Registration (CCR)**

Central Contractor Registration (CCR) and Universal Identifier Requirements.

- A. **Requirement for Consortium Members.** Unless you are excepted from this requirement under 2 CFR 25.110, in order to receive payment, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under TIA-1 and TIA-2, whichever is later.
- B. **Requirement for subrecipients.** If a Consortium Member is authorized to make subawards under TIA-1 and TIA-2 that member:
 - 1. Must notify potential subrecipients that no entity may receive a subaward from you unless the entity has provided its Data Universal Numbering System (DUNS) number to you and is registered in the CCR.
 - 2. May not make a subaward to an entity unless the entity has provided its DUNS number to you and is registered in the Central Contractor Registration.
- C. **Definitions.** For purposes of this award term:
 - 1. **Central Contractor Registration (CCR)** means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the CCR Internet site (currently at <http://www.ccr.gov>).
 - 2. **Data Universal Numbering System (DUNS) number** means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at <http://fedgov.dnb.com/webform>).
 - 3. **Entity** means all of the following, as defined at 2 CFR Part 25, Subpart C:
 - a. A Governmental organization, which is a State, local Government, or Indian tribe
 - b. A foreign public entity

- c. A domestic or foreign nonprofit organization
- d. A domestic or foreign for-profit organization
- e. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity

4. **Subaward:**

- a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
- b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. __.210 of the attachment to OMB Circular A-133, “Audits of States, Local Governments, and Non-Profit Organizations”).
- c. A subaward may be provided through any legal agreement, including an agreement that you consider a contract.

5. **Subrecipient** means an entity that:

- a. Receives a subaward from you under this award; and
- b. Is accountable to you for the use of the Federal funds provided by the subaward.

4. Other – Not Applicable.

D. APPLICATION AND SUBMISSION INFORMATION

The application process consists of a Whitepaper stage and a Proposal stage. The purpose of requesting a Whitepaper is to minimize the effort associated with the production of a detailed Proposal for an Offeror that has little chance of being selected for funding. The Governments’ decision to invite a Proposal will be based upon the evaluation results of a timely and compliant Whitepaper submission. Only the most highly rated Whitepapers will receive an invitation from the Governments to submit a Proposal. **An Offeror that does NOT receive an invitation from the Governments to submit a Proposal is NOT eligible to submit a Proposal and will NOT receive any feedback or a “debriefing” on their Whitepaper.** An Offeror invited to submit a Proposal will receive feedback on their Whitepaper. **If an Offeror does NOT submit a timely and compliant Whitepaper, they may NOT submit a Proposal for consideration for funding.**

1. Address to Request Application Package

Whitepaper. An Offeror is responsible for submitting an electronic Whitepaper so as to be received at the Government site indicated in this PA no later than the date and time specified in PART II.D.3. Whitepapers must be emailed to kelly.s.foster11.civ@mail.mil and must include a subject line of “WHITEPAPER – INTERNATIONAL TECHNOLOGY ALLIANCE – W911NF-15-R-0003” in order for the Whitepaper to be properly received. When sending electronic files, an Offeror is to account for potential

delays in file transfer from the originator's computer server to the Government website/computer server. An Offeror is encouraged to submit their response early to avoid potential file transfer delays due to high demand or problems encountered in the course of the submission.

An Offeror will receive confirmation of delivery at the Government site, not just successful relay from the Offeror's system. Acceptable evidence to establish the time of receipt of the Whitepaper at the Government site includes documentary and electronic evidence of receipt maintained by the Government site. All submissions must be emailed before the cutoff time/date in order to be considered – NO exceptions.

If an emergency or unanticipated event interrupts normal Government processes so that a Whitepaper cannot be received at the site designated for receipt by the date and time specified, then the date and time specified for receipt will be deemed to be extended to the same time of day specified in this PA on the first work day on which normal Government processes resume.

A Whitepaper sent by any other means (e.g., submitted to other email addresses, hand-carried, postal service mail, commercial carrier or fax) will not be considered. An Offeror will receive an email confirmation that their Whitepaper has been received.

Proposal. UPON WRITTEN INVITATION ONLY by the Governments, a Proposal must be submitted electronically through the www.grants.gov portal. A Proposal sent by fax or email will not be considered. A Proposal sent by an Offeror that has NOT been provided a written invitation to do so will NOT be considered. An Offeror is responsible for submitting electronic Proposals so as to be received at the Government site indicated in this PA no later than the date and time specified in PART II.D.3.

Registration Requirements for www.grants.gov: There are several one-time actions that an Offeror (represented by the LIP) must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the System for Award Management (SAM), register with the credential provider, and register with Grants.gov). See www.grants.gov/GetRegistered to begin this process. Use the Grants.gov Organization Registration Checklist at www.grants.gov/Applicants/get-registered.jsp to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 calendar days to complete these requirements. It is suggested that the process be started as soon as possible.

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

2. Content and Form of Application Submission

Whitepaper. A Whitepaper must be submitted in Adobe Portable Document Form (PDF) with the following Formatting:

- Page size when printed: 8 ½ x 11 inches
- Margins: 1 inch minimum
- Spacing and Page Numbers: At least single-spaced with numbered pages utilizing one side per page.
- Font: Times New Roman, no smaller than 10 point. Graphic presentations, including tables, while not subject to the same font size and spacing requirements, must have spacing and text that is easily readable.
- Page Limits. Whitepapers are not to exceed the stipulated page limits. Pages in excess of the page limits will be removed and not evaluated.

A Whitepaper must consist of:

- **Cover Page (limit 1 page)** to include the following:

1. Information concerning the LIP (points of contact (POCs)):

US PM: _____
 Phone No.: _____
 Email Address _____

UK PM: _____
 Phone No.: _____
 Email Address _____

Business POC: _____
 Phone No.: _____
 Email Address: _____

2. List the names and relationships of all organizations included in the Proposal:

Lead Industrial Partner: _____
 Consortium Member(s): _____
 Subawardee(s): _____

- **Project Summary/Abstract (limit 2 pages).** A summary of the Consortium team, research program, collaboration plans, program management, and technology transition approaches.
- **Research Program (limit 25 pages).** The Whitepaper must include an overview of the research strategy to be employed to advance the state of the art in distributed analytics and information science; a description and justification for the Offeror’s 2-, 5-, and 10-year research goals of the proposed effort; and a technical discussion stating the background and objectives of the proposed research, the overall technical approaches to be pursued, and the potential techniques to be used to validate the models and theories developed in this DAIS

ITA. Where the Whitepaper proposes research topics outside the scope described in this PA, justification for such variance is required. The Whitepaper must clearly identify specific scientific challenges and research barriers that relate to fundamental understanding of the root cause of difficult problems in distributed analytics and information science for coalitions, and their linkage to the required and suggested technical topics. The Whitepaper must clearly highlight the innovations proposed and how they may lead to substantial advances in foundational understanding and also highlight how the proposed research is expected to feed, be fed by, or in some other way link with, research being performed elsewhere within the Consortium.

- **Collaboration, Program Management and Technology Transition (limit 5 pages).** The Whitepaper must include general information on previous successful relevant collaborations and general plans for how researchers will collaborate within each Technical Area and between Technical Areas and how this collaboration will result in outcomes and further the goals of the program. The Whitepaper must include a summary of collaboration plans (processes and supporting toolsets), synergies gained from these collaborations, and examples of how researchers have successfully collaborated in the past and the outcomes. The Whitepaper must include a summary of the overall plan for leadership and management of the Consortium. The Whitepaper must include the identification of the Program Managers, key leadership personnel and an overall plan for leadership, efficient management of the DAIS ITA Program and creation of an effective collaborative environment. The Whitepaper must describe an overall strategy for adjusting the research plans in response to research insights gained, advances in the state of the art, and new collaboration opportunities. The Whitepaper must include a summary of the overall approach and history for technology transition including a description of past performance of transition across the breadth of the research program and supply networks.
- **Biographical Sketches.** Biographical sketches are to be limited to 1 page per individual, with no limit on the number of individuals submitted. The Whitepaper must include the names, brief biographies, and general availability of the key personnel who will be involved in the research. Such credentials, as documented on the biographical sketches, must include, among others, a record of seminal publications in the scientific literature with a citation index and a record of successful research in the relevant technical area of ITA. For Program Managers it must provide evidence the proposed PMs have scientific stature, research and leadership experience and skills sufficient to successfully execute the DAIS ITA program. .
- **Cost Summary Tables.** For the Whitepaper only, two cost estimate tables must be provided to provide a broad idea of each Consortium Member's relative level-of-effort. This information will be used in the evaluation of the research program. One table must list the estimated first year funding by Consortium Member for each TA (see Table 2). A column for "Other" can be used for management or other costs. Another table must list the estimated funding per Consortium Member for each of the five years (see Table 2). **For evaluation purposes only, proposed budgets in British Pound (GBP) will be converted to US Dollars (USD) at the rate of 1 GBP = 1.6 USD.**

Table 1. Year 1 Budget Estimates by Technical Area (\$K)

	Technical Area 1	Technical Area 2	Other	Total
Lead Industrial Partner				
Organization A				
Organization B				
...				
Organization Z				
Total				

Table 2. 5-Year Budget Estimates (\$K)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Lead Industrial Partner						
Organization A						
Organization B						
...						
Organization Z						
Total						

NOTE: Compatible versions of Adobe Reader are currently 8.1.1 and 8.1.2. You will be asked to specify your Operating System (examples: Windows, Mac) and Version (examples: XP, Vista, 10.4.9). Be sure to specify Adobe Reader Version 8.1.2 to get the compatible version to apply for grants on Grants.gov.

Proposal. REMINDER: ONLY PROPOSALS SUBMITTED BY OFFERORS GIVEN A WRITTEN INVITATION TO SUBMIT A PROPOSAL WILL BE CONSIDERED! Application forms and instructions will be available at Grants.gov. To access these materials, go to <http://www.grants.gov>, select "Apply for Grants", and then select "Download an Application Package." Enter the funding opportunity number, W911NF-15-R-0003.

An Offeror must complete the mandatory forms and any optional forms (e.g., SF-LLL Disclosure of Lobbying Activities) in accordance with the instructions on the forms and the additional instructions below. The required fields should be completed in accordance with the “pop-up” instructions on the forms. To activate the instructions, turn on the “Help Mode” (icon with the pointer and question mark at the top of the form). Files that are attached to the forms must be in Adobe Portable Document Form (PDF) unless otherwise specified in this announcement.

The following formatting applies to the Proposal:

- Page size when printed: 8½ x 11 inches
- Margins: 1 inch minimum
- Spacing and Page Numbers: At least single-spaced with numbered pages utilizing one side per page.
- Font: Times New Roman, no smaller than 10 point. Graphic presentations, including tables, while not subject to the same font size and spacing requirements, must have spacing and text that is easily readable.
- Page Limits. Proposals are not to exceed the stipulated page limits. Pages in excess of the page limits will be removed and not evaluated.

Form: SF 424 (R&R) (Mandatory). Complete this form first to populate data in other forms. Authorized Organization Representative (AOR) usernames and passwords serve as “electronic signatures” when your organization submits applications through Grants.gov. By using the SF 424 (R&R), an Offeror is providing the certification required by 32 CFR Part 28 regarding lobbying.

Form: Research and Related Other Project Information. Complete questions 1 through 6 and attach files.

- **Project Summary/Abstract** (Field 7 on the form) - The Project Summary should be a brief abstract that summarizes the content of the Basic research of the Proposal. **The project summary must not exceed 5 pages.** Pages in excess of the page limit will be removed for the evaluation of the Proposal.
- **Project Narrative** (Field 8 on the form) - Chapters and Numbers of pages – Field 8 is to contain the chapters set forth below and each chapter is not to exceed the stipulated page count as noted. Pages in excess of the page limits will be removed for the evaluation of the Proposal.
- **Chapter 1: Research Program.** The pages included in Chapter 1 are to be numbered. Offerors are advised that Chapter 1 **must not exceed 50 pages**, utilizing one side of the page. The Proposal must include a discussion of the research strategy to be employed to advance the state of the art in distributed analytics and information science; a detailed description and justification for 2-, 5-, and 10-year research goals of the proposed effort; and a detailed technical discussion. The technical discussion must include the background and objectives of the proposed research, the technical approaches to be pursued, the techniques and metrics to be used to validate the models and theories developed in this ITA, and the parties involved and the level of effort to be employed (demonstrating that

researchers are collaborating and substantially and meaningfully engaged in the research efforts, spanning both industry and academia, and in the US and the UK, as appropriate). Where the proposal includes research topics not listed in this PA, a rationale must be provided. The Proposal must also clearly:

- Identify specific scientific challenges and research barriers that relate to fundamental understanding of the root cause of difficult problems in the ITA space and provide evidence that the proposed technical approaches can address these challenges in a measured approach across the near- and far-term.
 - Explain in substantial detail the specific scientific plans that will be employed, and provide evidence that the approaches are likely to substantially advance the underlying science.
 - Describe cross-cutting research activities between the two TAs how they link the TAs, link to the required and suggested technical topics, and the benefits from such collaboration
 - Highlight the innovations proposed, describing how they would substantially advance the state of the art , and impact understanding of distributed analytics and information science phenomena particularly fundamental laws, theories, and validated models.
 - Include specific examples of how the proposed research is expected to feed, be fed by, or in some other way link with, research being performed elsewhere within the Consortium and within the US ARL or the UK Dstl.
- **Chapter 2: Collaboration Plan and Program Management.** The pages included in Chapter 2 must be numbered. Offerors are advised that Chapter 2 of the Proposal **must not exceed 20 pages**, utilizing one side of the page. The Proposal must include a detailed plan for leadership and efficient management of the ITA Program, creation of a collaborative environment, and organizational structures. The Proposal must identify metrics for success, how they will be used, and how they will further the goals of the program. Where available, evidence for the success of these strategies is to be described. The Proposal must include plans for how researchers will collaborate within each Technical Area and across the two Technical Areas and describe how this collaboration will further the goals of the program. The Proposal must describe the processes and toolsets to facilitate collaboration and the document/information controls to be employed. The Proposal must describe the strategy for collaborating with ARL and Dstl and propose collaborative opportunities with ARL and Dstl. The Proposal must describe approaches to adjusting the research plans in response to research insights gained, advances in the state of the art, and new collaboration opportunities. The Proposal must include examples of how researchers have successfully collaborated previously in similar programs. The Proposal must include a strategy for identifying, establishing, and exploiting collaborations with other related ARL and Dstl research programs. The Proposal must describe processes for external communication of research outputs.
 - **Chapter 3: Technology Transition.** The pages included in Chapter 3 must be numbered. Offerors are advised that Chapter 3 of the Proposal **must not exceed 25 pages**, utilizing one side of the page. The Proposal must provide evidence of the Offeror's extant ability and past performance in transitioning of basic research into successful world leading

solutions across the breadth of the research program. The Proposal must describe the link between the breadth of the basic research program and the extant strategic aims of the institutions forming the Consortium to transition basic research across the breadth of the research program. The Proposal must include a description of the Offeror's plans, approaches, mechanisms (including intellectual property management) and facilities to support transition from basic research into development programs and products/solutions. The Proposal must include a description of the plan, approaches and mechanisms identifying research ready for transition to meet technology gaps for coalition operations; identifying and engaging transition partners; rapidly maturing research results into technologies to meet development requirements or supporting demonstrations or exercises; and addressing US and UK security and export controls.

- **Chapter 4: Biographical Sketches.** Biographical sketches are to be limited to two (2) pages per individual, with no limitation on the number of individuals submitted. The Proposal must include the names, biographies, and availability of the key personnel who will be involved in the research and management of the program. Such credentials, as documented on the biographical sketches, must include, among others, a record of seminal publications in the scientific literature with a citation index and a record of successful research in areas relevant to the DAIS ITA.. For Program Managers it must provide evidence the proposed PMs have scientific stature, research and leadership experience and skills sufficient to successfully execute the DAIS ITA program. The proposal is to demonstrate how the aggregate of skills/expertise across the Consortium provides the required breadth and depth to effectively carry out the proposed program of research.
- **Bibliography and References Cited** (Field 9 on the form) - Attach a listing of applicable publications cited in above sections. References may be checked for validity. Only archival (reviewed) sources can be referenced and may be checked.
- **Facilities and Other Resources** (Field 10 on the form) - The Offeror is to include a listing of facilities and other resources available to support the Proposal. Attach this information at Field 10. The Proposal must include a description of the facilities to be used for the research and experiments, a description of who will have access to these facilities, and how these facilities will enhance the research efforts proposed. Where new research facilities are to be created for the purposes of the DAIS ITA, the development and verification plans are to be described.
- **Equipment** (Field 11 on the form) - The Offeror is to include a listing of equipment available to support the Proposal. Any Government equipment necessary for performance is to be clearly identified. Attach this information at Field 11.
- **Other Attachments** (Field 12 on the form) are as follows:
 1. Attached the completed Proposal Cover Sheet. (See PART II.D.6 below)
 2. Attached the completed certifications. (See PART F.2 below)
 3. Attach any exceptions or conditions to the Model TIA-1, TIA-2 and UK ITA Transition Contract. (NOTE: These model documents will be provided to Offerors with their invitation to submit a proposal.). Attach the signed Articles of Collaboration for all Members. (A model AoC will be provided to Offerors with their invitation to submit a proposal.)

4. Attach the Cost Proposal. The Cost Proposal must include a budget for the first five years of performance. The Cost Proposal MUST address all requirements for the Basic Research Component. (The Consortium will be requested to provide a complete Cost Proposal for the optional five-year period of performance as part of the evaluation to be completed prior to making the decision concerning this optional period) The cost portion of the Proposal must contain cost estimates sufficiently detailed for meaningful evaluation. For budget purposes, assume a performance start date of 1 May 2016. The proposed amounts shall not exceed the funding ceilings identified for the Basic Research Component of this PA. **For evaluation purposes only, proposed budgets in British Pound (GBP) will be converted to US Dollars (USD) at the rate of 1 GBP = 1.6 USD.** For a Proposal, the elements of the budget must include:

- **Direct Labor.** Individual labor category or person, with associated labor hours and unburdened direct labor rates.
- **Indirect Costs.** Fringe benefits, overhead, G&A, etc. (must show base amount and rate). Justify.
- **Travel.** Number of trips, destination, duration, etc. Justify and include basis for costs.
- **Subaward.** A Cost Proposal, as detailed as the Offeror's Cost Proposal, will be required to be submitted by each proposed subrecipient.
- **Consultant.** Provide consultant agreement or other documentation that verifies the proposed loaded daily/hourly rate. Include a description of the nature of, and the need for, any consultant's participation. Provide budget justification.
- **Materials.** Specifically itemized with costs or estimated costs. An explanation of any estimating factors, including their derivation and application, must be provided. Include a brief description of the Offeror's procurement method to be used (competition, engineering estimate, market survey, etc.). Justify.
- **Other Directs Costs.** Particularly any proposed items of equipment or facilities. Equipment and facilities generally must be furnished by the recipient (justifications must be provided when Government funding for such items is sought). Include a brief description of the Offeror's procurement method to be used (competition, engineering estimate, market survey, etc.). Justify.

All Consortium Members included in the Cost Proposal are to provide detailed information on all cost elements included in their proposed budgets to the LIP as part of the Proposal submission process. However, it is recognized that some entities may choose to submit their proprietary rate information directly to the Government in lieu of providing such information to the LIP for inclusion in the cost Proposal submitted through grants.gov. In such a case, a separate proprietary cost submission may be made directly to the Government. Instructions for any such submission will be provided to Offerors with the invitation to submit a proposal under this PA.

NOTE: All such separate proprietary cost submissions must arrive NLT than

the due date and time specified in PART II.D.3 for the Proposal submission through grants.gov to be considered. Further, for all such submissions summary cost information must be provided to the LIP for the grants.gov submission that is sufficient in detail for the Governments to use in the evaluation of the cost Proposal for cost realism, and can be clearly mapped to the proprietary rate information submitted directly to the Governments.

- **SF-LLL: Disclosure of Lobbying Activities.** If applicable, attach a complete SF- LLL at Field 11 of the R&R Other Project Information form. Applicability: If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the grant/collaborative agreement, you must complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying."

3. Submission Dates and Times

WITH AMENDMENT 0003, WHITEPAPERS ARE NOW DUE BY 4:00AM (LOCAL TIME IN NORTH CAROLINA, USA) ON 27 APRIL 2015. AN EMAIL RECEIPT WILL BE PROVIDED TO EACH OFFEROR FOR EACH WHITEPAPER SUBMISSION RECEIVED FROM A REPRESENTATIVE OF THE AGREEMENTS OFFICER WITHIN 24 HOURS OF WHITEPAPER SUBMISSION. DUE TO CONTINUED TECHNICAL ISSUES WITH ARMY RECEIPT, ANY WHITEPAPER SUBMISSIONS MADE TO THE PREVIOUSLY PROVIDED EMAIL ADDRESS HAVE NOT BEEN RECEIVED. ALL OFFERORS MUST RESUBMIT THEIR WHITEPAPERS BY 4:00AM (LOCAL TIME IN NORTH CAROLINA, USA) BY 27 APRIL 2015 TO KELLY.S.FOSTER11.CIV@MAIL.MIL AND MUST INCLUDE A SUBJECT LINE OF "WHITEPAPER – INTERNATIONAL TECHNOLOGY ALLIANCE – W911NF-15-R-0003" IN ORDER FOR THE WHITEPAPER TO BE PROPERLY RECEIVED.

Proposals are due by 4:00am (local time in North Carolina, USA) on 31 August 2015. After a Proposal is submitted through Grants.gov, the Authorized Organization Representative (AOR) will receive a series of three emails. It is extremely important that the AOR watch for and save each of these e-mails. An Offeror will have evidence that their Proposal has been properly received when the AOR receives e-mail Number 3. The three emails are:

- Number 1. The AOR will receive a confirmation page upon completing the submission to Grants.gov. This confirmation page is a record of the time and date stamp for the submission.
- Number 2. The AOR will receive an email indicating that the Proposal has been validated by Grants.gov within a few hours of submission. (Validation means that all of the required fields have been completed.)
- Number 3. The third notice is an acknowledgment of receipt in email from Grants.gov. The email is sent to the AOR for the institution. The email notes that the Proposal has been received and provides the assigned tracking number. THE

PROPOSAL IS NOT CONSIDERED PROPERLY RECEIVED UNTIL THE AOR RECEIVES EMAIL #3.

4. Intergovernmental Review - Not applicable

5. Funding Restrictions - Funding levels for TIA-1 have been estimated and are provided in this PA. No award will be made in excess of these amounts. The LIP will distribute the funding to all Members of the Consortium in accordance with the IPP/BPP included as part of TIA-1. The distribution of the funding shall be such that 50% of the funds shall be allocated to the efforts in each country. This includes both funding for program administration and research. Program Administration expenses are those expenses associated with the budgeting, payments, communications, reporting, etc., but are not expected to include Technical Oversight and Program Management efforts. At least 40% of the funding for research (not including the funding for program administration) allocated to each country must be provided to academic members. **See also PART II.A above.**

6. Other Submission Requirements

The following Proposal Cover Sheet must be submitted by each Offeror:

PROPOSAL COVER SHEET

1. Information concerning the LIP (points of contact (POC)):

US PM: _____
Phone No.: _____
Email Address _____

UK PM: _____
Phone No.: _____
Email Address _____

Business POC _____
Phone No.: _____
Email Address: _____

2. List the names and relationships of all organizations included in the Proposal:

Lead Industrial Partner _____
Consortium Member(s) _____
Subawardee(s) _____

3. Provide a point of contact for each organization included in the Cost Proposal. These individuals may be contacted for questions concerning the Cost Proposal:

Organization: _____
POC: _____
Phone No.: _____
Email Address _____

4. **Signature of one person for the proposed Lead Industrial Partner, and one person from each proposed Consortium Members, authorized to submit a Proposal and bind that organization:** (These signatures may be provided on separate sheets, but all must be included in the Proposal Cover Sheet.)

Organization Name: _____
Signature: _____
Type Name/Title: _____
Date (Proposal): _____

E. APPLICATION REVIEW INFORMATION

1. Criteria

Whitepaper Evaluation Criteria. Each Whitepaper will be evaluated against the stated requirements in the PA using the following criteria:

Factors 1.a and 1.b: Scientific Merit and Relevance: (This includes Factor 1.a for Technical Area 1 and Factor 1.b for Technical Area 2.) Evaluation of this factor will concentrate on the overall scientific and technical merit, military relevance, and innovation of the proposed research in light of the state of the art in the relevant Technical Areas in distributed analytics and information science. The research component will be evaluated for its balance and its appropriate breadth and depth across the two Technical Areas. The scientific merit will be evaluated with regard to each of the Technical Areas of the DAIS ITA and each Technical Area will be assessed with regard to its overall scientific merit, innovation, potential degree of generality of the models/ techniques, and strategy for validation. Evaluation of this factor will concentrate on the long term relevance of the proposed research and the likelihood that the proposed research will address scientific challenges and research barriers. Evaluation of this factor will also focus on how well the proposed research responds to the US Army's and the UK MoD's Vision and the Army and MoD's requirements to achieve these Visions. The US Army's Vision may be found at the US Army's homepage: www.army.mil. The UK MOD vision for future operations is set out in documents such as the UK Joint High Level Operational Concept, Future Land Operating Concept, Future Character of Conflict and JDP-04 Understanding.

Factors 2.a and 2.b: Experience and Qualifications of Technical Staff: (This includes Factor 2.a for Technical Area 1 and Factor 2.b for Technical Area 2.) Evaluation of this factor will concentrate on the relevant qualifications, capabilities, availability, accomplishments, and experience of the Offeror's proposed research personnel as an indication of their ability to achieve the

proposed technical objectives related to the proposed efforts for each of the Technical Areas.

Factor 3: Collaboration, Program Management and Technology Transition:

Evaluation of this factor will concentrate on the Offeror's strategies, plans and experience in fostering collaborative research, managing collaborative research programs, and technology transition. Evaluation of this factor will be based on evidence of previous successful relevant collaborative efforts and the Offeror's commitment and plans for collaboration. Evaluation of this factor will focus on the Program Managers' scientific leadership and experience in managing large collaborative research programs and the Offeror's plans to meet the requirements of the overall management concept. This factor includes plans for an environment to foster collaboration and efforts to bring about a unity of vision for the Consortium and drive for results and benefits. Evaluation of this factor will focus on demonstration of the extant capability to rapidly transition research results into US Army and UK MoD development programs and commercial solutions.

Relative Importance of the Evaluation Factors: The evaluation factors are listed in descending order of importance with Factor 1 approximately equal to Factors 2 and 3 combined, and Factor 2 being approximately 50% more important than Factor 3.

Proposal Evaluation Criteria. Each Proposal will be evaluated against the stated requirements in the PA using the following criteria:

Factors 1.a and 1.b: Scientific Merit and Relevance: (This includes Factor 1.a for Technical Area 1 and Factor 1.b for Technical Area 2.) Evaluation of this factor will concentrate on the overall scientific and technical merit, creativity, military relevance, and innovation of the proposed research in light of the state of the art related to distributed analytics and information science. The research component will be evaluated for its balance and its appropriate breadth and depth across the two technical areas. The scientific merit will be evaluated with regard to each of the Technical Areas of the DAIS ITA and each Technical Area will be assessed with regard to its overall scientific merit, creativity, innovation, degree of generality of the models/techniques, validation techniques, and likelihood of substantially advancing the current state of the art. Evaluation of this factor will also concentrate on the long term relevance of the proposed research and the likelihood that the proposed research will address scientific challenges and research barriers facing the US Army and the UK MoD.

Factors 2.a and 2.b: Experience and Qualifications of Scientific Staff and Quality of Research Facilities: (This includes Factor 2.a for Technical Area 1 and Factor 2.b for Technical Area 2.) Evaluation of this factor will concentrate on the qualifications, capabilities, availability, and experience of the Offeror's proposed research personnel (individually and as a whole) including their relevant past accomplishments and their ability to achieve the proposed technical objectives. The research staff will be evaluated as to whether their time commitment is meaningful and substantial to the DAIS ITA. The extent to which the Offeror's proposed facilities and equipment will contribute to the accomplishment of the proposed research will be evaluated including the nature,

quality, scientific validation and verification methods, relevance, availability, and access to state-of-the-art research facilities and equipment.

Factor 3: Collaboration and Program Management: Evaluation of this factor will concentrate on the Offeror's strategies, plans and experience in fostering collaborative research and managing collaborative research programs as set forth in this PA. Evaluation of this factor will include a focus on the Program Managers' technical leadership and experience in managing large collaborative research programs and the Offeror's plans to meet the requirements of the overall management concept included in the PA. These approaches should be lightweight and will be evaluated for their flexibility to minimize overhead, yet ensure research relevance and proper oversight. Evaluation of this factor will also include the Offeror's general proposed plans should Enhanced Funding become available. Where available, evidence for the success of these strategies is to be described. Evaluation of this factor will include evidence of previous successful collaborative efforts, the Offeror's commitment and plans for collaboration within the Alliance, and the synergistic value of the collaborations among researchers. Technical leadership and management methods and procedures must be considered to identify and include new research directions and advances. Evaluation of this factor will include the adequacy of the overall management plan, internal team structures, and composition with respect to achieving the research goals of the program. Evaluation of this factor will focus on the Program Managers' scientific leadership experience, experience in managing large collaborative research programs and experience in successfully transitioning research.

Factor 4: Technology Transition: Evaluation of this factor will focus on demonstrated extant intent and capability to rapidly transition basic research results into US Army and UK MoD development program and commercial solutions across the full breadth of the basic research program. Evaluation of this factor will include, in the case of US Army and UK MoD development program, evidence of extant capability to transition across the breadth of supply networks. Evaluation of this factor will also include demonstration of the extant capability to address both US and UK security and export controls.

Factor 5: Cost. While this area will not be weighted, evaluation of this area will consider cost realism, cost reasonableness, and affordability within funding constraints. The Governments may make adjustments to the cost of the total proposed effort as deemed necessary to reflect what the effort should cost. These adjustments will consider the task undertaken and approach proposed. These adjustments may include upward or downward adjustments to proposed labor hours, labor rates, quantity of materials, price of materials, overhead rates and G&A, etc.

Relative Importance of the Evaluation Factors: The evaluation factors are listed in descending order of importance with Factor 5 not being weighted. Factor 1 is approximately equal importance with Factor 2 and Factor 3 combined. Factor 3 is approximately as important as Factor 4.

2. **Review and Selection Process.** Whitepapers and Proposals that are in compliance with the requirements of the PA will be evaluated in accordance with merit based,

competitive procedures. These procedures will include evaluation factors that will be evaluated using an adjectival and color rating system as follows:

OUTSTANDING (blue): The proposal is evaluated as outstanding for this factor. The proposal includes **one or more significant strengths that are not offset by weaknesses.**

GOOD (purple): The proposal is evaluated as good for this factor. The proposal includes **some strengths that are not offset by weaknesses.**

ACCEPTABLE (green): The proposal is evaluated as acceptable for this factor. **Any strengths and weaknesses in the proposal balance out.**

MARGINAL (yellow): The proposal is evaluated as marginal for this factor. While the proposal **may or may not contain some strengths, and strengths are more than offset by any weakness or weaknesses.**

UNACCEPTABLE (red): The proposal is evaluated as unacceptable for this factor. While the proposal **may or may not contain some strengths, and strengths are offset by any significant weakness or weaknesses.**

A Review Team, consisting of a qualified group of scientists, managers and business specialists from both the US and UK Governments, will evaluate the Whitepapers and Proposals and provide the results of that evaluation to the decision makers of both Governments. Those decision makers will make both the decisions concerning the Whitepaper downselection and award selection.

Only the most highly rated Whitepapers will receive an invitation to submit a Proposal as well as feedback on the Whitepaper. **An Offeror that does NOT receive a written invitation from the Governments to submit a Proposal is NOT eligible to submit a Proposal and will NOT receive any feedback or "debriefing" on their Whitepaper.** An Offeror not receiving a written invitation to submit a Proposal will be informed of such via email following the Whitepaper evaluations.

All information necessary for the review and evaluation of a Whitepaper/Proposal must be contained within the Whitepaper/Proposal. No other material will be provided to those evaluating Whitepapers/Proposals. An initial review of the Whitepapers/Proposals will be conducted to ensure compliance with the requirements of this PA. Failure to comply with the requirements of the PA may result in a Whitepaper/Proposal receiving no further consideration for award.

After Proposals are evaluated, the Governments reserve the right to establish a competitive range and enter into negotiation discussions or award without discussions. Negotiation discussions may be conducted telephonically or face-to-face at the Offeror's facility. Any such meeting will be coordinated with the Offeror at the appropriate time. If a competitive range is established for negotiation purposes, then all Offerors in the competitive range will be invited to submit Final Proposal Revisions (FPRs). If FPRs are received, they will be evaluated using the same evaluation criteria as was used to evaluate the initial Proposals.

Award will be based on an integrated assessment of each Offeror's ability to satisfy the PA requirements. The Governments will make award to the Offeror, whose proposal conforms to the PA that offers the best value to the Governments, cost and other factors considered. Further, award may be made to other than the Offeror who offers the lowest cost Proposal. US ARL and UK Dstl reserve the right not to make an award should no acceptable offer be submitted.

3. **Recipient Qualifications – see PART II.C.1 above.**

4. **Anticipated Announcement and Award Dates – See PART I.A.7 above.**

F. AWARD ADMINISTRATION INFORMATION

1. **Award Notices – see PART II.B above.**

2. **Administrative and National Policy Requirements**

Offerors must comply with National Policy Requirements Matrix Appendix "C" found at <http://www.nsf.gov/bfa/dias/policy/rtc/appc.pdf>.

3. **Reporting**

Reporting requirements for TIA-1, TIA-2 and the UK ITA Transition Contract will be provided to Offerors invited to submit Proposals under this PA.

G. AGENCY CONTACTS – see PART I.A above.