SMALL BUSINESS INNOVATION RESEARCH

PHASE II STATEMENT OF OBJECTIVES
FOR
TRACK CORRELATION/DATA DEDUPLICATION FOR SOF MISSION COMMAND

TOPIC SOCOM224 D001

I. **INTERNATIONAL TRAFFIC AND ARMS REGULATION:** The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation. Additionally, Offerors will describe compliance mechanisms offerors have in place or will put in place to address any ITAR issues that arise during the course of agreement administration .

II. **BACKGROUND**:

Real-world objects such as aircraft, ships, vehicles, personnel, etc. affect mission goals within the operations area. Regardless of the type of entity, it is critical for a user and their Command and Control (C2) elements (e.g. Military, Air Traffice Control) to have continuous Situational Awareness (SA) of their location . A combination of various data feeds containing positional data may result in duplicate data. Even objects without positional data may need to be correlated, de-duplicated, and their metadata merged. These tracks may have a host of metadata associated with them captured by various sources or systems.. These objects may have assigned unique identifiers (UID), sensor IDs, and supporting metadata. Often multiple sensors (using various technologies) obtain data, which varies in accuracy, precision, and completeness. Latency, staleness, and other factors present a significant challenge to correlate these objects in real-time. The goal is to merge duplicate datainto a single object to reduce ambiguity and screen clutter. The goal of this effort is to auto correlate/de-duplicate massive data sets in real time from various sources using identifiers, supporting metadata, and location (when sources have varying accuracy and uncertainty) to merge data into a single object to reduce ambiguity and screen clutter. This reduces user overload in terms of data visualized in a user interface, as well as reduces time in trying to deconflict identical data displayed more than a single time.

This Phase II effort requires the firm to pursue the most relevant innovative and developmental efforts with the most advanced technology, whether this is open source frameworks, tools, or algorithms or closed source solutions.

Note: Any products mentioned in this SOO are only examples and are not to be construed as the preferred solution.

III. **OVERALL OBJECTIVE**:

The objective of this Statement of Objectives is to develop a track correlator prototype.

IV. **Requirements**

1. **General:** The Contractor shall deliver source code and binaries as well as a design, Infrastructure as Code (IaC) (as applicable), and supporting documentation for Government follow-on testing and demonstration. The code deliverables will be updated with each sprint cycle in the Government Software Development Environment (GSDE) per CDRL A012. Electronic transmission of data is required inside GSDE as the deliverable.

   a. **Detailed Requirements**: The Contractor shall identify relevant technology, design, develop, test, integrate, demonstrate, and deliver aprototype(s) system that provides correlation and de-duplication of multiple large data sets. The prototype deliver will be to a Cloud Based Software Factory.

2. Track correlation must account for differences in:
   a. Data package latency – time delay in transmission of data
   b. Data content staleness – time difference in real-world event and presentation on UI (e.g., data packet could contain a latitude/longitude when the data pack is 10 seconds old but the location data it contains is 5 minutes old)
   c. Confidence level (not just position, but also Positive Identification [PID] including platform/model and affiliation, as well as other data contained within the data set(s).
   d. Data element uncertainty/errors
      i. Spatial accuracy
      ii. Time accuracy and precision of timestamp
   e. Metadata elements (and possible need to merge metadata sets upon dedupe)
   f. Data type, enumeration, or other mismatch
3. The solution shall gain confidence and possibly reduce false positives (Type I errors) through correlated tracks.
4. The correlation must consider unique identifiers (UID) or sensor IDs as well to improve correlation performance.
5. Allow end user to adjust the following parameters:
   a. Staleness – ability to select a threshold of time whereby tracks older than the threshold would be suppressed (and excluded from the correlation). The allowable values of this threshold would not exceed the ability of the system to reliably correlate the objects.   The control would be different for different object types due to relative velocities (e.g., aircraft vs. person). For the automatic correlations, this would be set by the system administrators.
   b. Reduce false positives – provide user insight by enabling selection of a confidence level threshold (based on entity specifications) for feeds that may contain such data.
      i. Type I error is a "false positive" (i.e., reporting an object that does not exist)
      ii. Type II error is a "false negative" and/or "a miss" since the objects really exists, but the sensor did not report it (i.e., failing to report an object that does exist)
   c. Positional accuracy – the user may want to suppress object plots that exceed some error threshold
   d. Altitude constraints (lowest and highest values) – the user may want to suppress object plots between altitudes or within a 3D polyhedron.
6. Scalability – Solution must be dynamically scalable within milliseconds to handle feed changes and new correlation requests
7. Performance – Solution must correlate multiple feeds simultaneously within seconds to milliseconds. This may change based on the mission requirements.
8. The architecture must support redundancy.
9. Meets a Technology Readiness Level 6 which is defined as "System/subsystem model or prototype demonstration in a relevant environment. Representative model or prototype system, which is well

beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high- fidelity laboratory environment or in a simulated operational environment.

10. Apply the appropriate compute hardware such asCentral Processing Unit [CPU], Graphics Processing Unit [GPU], Field Programmable Gate Array [FPGA], Tensor Processing Unit [TPU] to the various algorithms to achieve operationally relevant performance.

    a. **COMPONENT REQUIREMENTS:** None stated.

    B. **DOCUMENT DELIVERABLES:** The Contractor shall provide the following documents to the respective specified addresses during the Phase II Period of Performance:

Note: The effort will apply Scaled Agile Framework (SAFe) approaches that employ end user feedback events, rather than traditional technical reviews. However, the effort will use the traditional CDRL and Data Item Descriptions (DID) as listed below. They will be tailored to align with agile practices. There will ideally be multiple end user engagements that cultinate in a design/tradespace/risks event. The maturing software prototype(s), associated documentation, and end user feedback along this journey will be the primary artifacts being evaluated at these events. The CDRLs identified below are meant to be lean and not cumbersome.

CDRLs:
1. Monthly Progress Reports: See CDRL A001.
2. Business Plans: See CDRL A002.
3. Final Technical Report: See CDRL A003.
4. Financial Status Report: See CDRL A004. (Not included in Direct to Phase II topics)
5. Contractor Acquired Property: See CDRL A005. (Not included in Direct to Phase II topics)
6. Kick-Off/Epic Hypotheses Review: See CDRL A006.
7. Developmental Test Plan for Performance Validation: See CDRL A007. Note: The artifact must address the approach to achieving evidence of the hypotheses and goals for Human-Machine Teaming (HMT).
8. Developmental Test Report for Performance Validation: See CDRL A008. Note: The artifact must capture evidence addressing the hypotheses and goals for HMT. This includes multiple prototype demos and user engagements.
9. Maturity and End User Engagement Review Design Review Information Package (DRIP): See CDRL A009. This is will be tailored for agile development. See note above.
10. Maturity and End User Engagement Demo DRIP: See CDRL A0010. This is will be tailored for agile development. See note above.
11. Product Backlog: See CDRL A011.
12. Computer Software Product: See CDRL A012.
13. Meeting Minutes: See CDRL A013.
14. Training Materials: See CDRL A014. Note: These will be limited to artifacts required to show end users how to use the prototype(s) to gain user feedback.

V. **TESTS AND DEMONSTRATIONS:** The Contractor shall conduct tests and demonstrations to validate that the Track Correlation prototype(s) meet or exceed all the requirements specified in this Statement of Objectives and achieve the overall goal of reducing human cognitive burden while retaining or improving overall mission performance. (See CDRL A008 and CDRL A009).

A. The Contractor shall demonstrate that the prototype(s) meet or exceed the performance of the identified hypothesis and Features, User Stories, and Acceptance Criteria (AC) elicited from end users and captured in the Product Backolog. (Note: The Product Backlog is a set of entries in an issue tracking tool that have not yet been implemented.) (See CDRL A007, CDRL A008, and CDRL A011).

VI. **ENVIRONMENTAL AND SAFETY:** N/A

VII. **GOVERNMENT FURNISHED PROPERTY (GFP) / GOVERNMENT FURNISHED PROPERTY (GFE) / GOVERNMENT FURNISHED INFORMATION (GFI):** The government will provide the contractor access to the source code and/or binaries for Mission Command System/Common Operational Picture (MCS/COP) as well as data sources, applicable APIs, and access to sensor control interfaces. The government will also make available access to a dedicated vendor integration team and SOF users in which to conduct left seat/right seat sessions to describe the problem set and what a potential solution would look like. The Government does not intend to provide the Contractor any GFP, GFE or GFI. However, the Contractor shall specify by stock number and nomenclature any GFP/GFE/GFI the Contractor believes is needed to successfully complete the requirements specified in this Statement of Objectives.

VIII. **PERIOD OF PERFORMANCE:** The maximum Period of Performance for this Phase II effort is twelve (12) months. The Contractor can propose a lessor Period of Performance if a lessor Period of Performance does not jeapardise the Contractor's successful completion of the requirements specified in this Statement of Objectives.

IX. **MEETINGS AND REVIEWS**: The Contractor shall attend the following meetings and reviews.

A. Phase II Kick-Off meeting shall be conducted not later than thirty (30) calendar days after contract award. The Contractor shall provide the Government:

1. A Phase II Kick-Off Meeting Read-Ahead no less than seven (7) calendar days prior to the Phase II Kick-Off / Epic Hypotheses Review Meeting (See CDRL A006).

2. Conceptual drawings no less than seven (7) calendar days prior to the Phase II Kick-Off / Epic Hypotheses Review Meeting (See CDRL A006).

3. An initial Program Management Plan for accomplishing all objectives specified in this Statement of Objectives. (See CDRLs A001).

B. Prototype demonstrations and end user engagements - These meetings shall be conducted at the Contractor's facility or virtually if the end users are unavailable to travel. The first one will occur no more than ninety (90) calendar days after Phase II contract award. Subsequent events will be arranged based on the availability of end users. They will occur no more than 2 months apart. The expectation is that end users will have additional opportunities to provide feedback via other forums such as email, phone calls, etc. The Contractor shall provide teleconference capability for those participants unable to travel. The Contractor shall provide the Government:

1. Materials and Read-Ahead Briefing will be delivered no less than seven (7) calendar days prior to the event. (See CDRL A009).

2. Trade off considerations for the design/solution. (See CDRL A009 or CDRL A010, as appropriate).

3. Results of any testing to date. (See CDRL A008).

4. Resolution to any Contractor/Government issues, action items, or concerns.

5. An assessment of other potential benefits/impacts of the prototype(s) to be incorporated into the subsequent design/solution that will be provided to the Government at the follow-on events. (See CDRL A009 or CDRL A010, as appropriate).

C. Phase II Close-Out Meeting: The Phase II Close-Out Meeting shall be conducted in no earlier than seven (7) calendar days prior to the conclusion of the Phase II Period of Performance. The Contractor shall provide the Government:

1. A briefing on the test verification and validation. (See CDRL A008).

2. An update of the progress to date. (See CDRL A001 and CDRL A004).

3. Resolution to any Contractor/Government issues, action items, or concerns.

X. **NOTIFICATION:** The Contractor shall notify USSOCOM no less than thirty (30) calendar days prior to tests, demonstrations and reviews at the Contractor's facilities to ensure USSOCOM representatives can attend should they desire to do so.

XI. **TRAVEL REQUIREMENTS:** The Contractor shall comply with the Federal Acquisition Regulation 31.205-46 (http://www.gsa.gov/perdiem) on proposing all travel related costs. The Contractor shall include the costs associated with the following travel requirements in the proposal:

A. Phase II Kick-Off Meeting: Tampa, Florida; one (1) overnight, no more than three (3) Contractor representatives.

B. Phase II Close-Out Meeting: Tampa, Florida; one (1) overnight, no more than three (3) Contractor representatives.

C. Vendor/User Engagements (total of 2 travel events): CONUS travel to a customer site Coronado, CA (NSW), Ft Walton Beach, FL (AFSOC), Ft Bragg, NC (JSOC), Ft Bragg, NC (USASOC), Tampa, FL (SOCOM), Jacksonville, NC (MARSOC); four (4) nights, no more than three Contractor representatives. The engagement locations have not yet been determined. For the purpose of preparing the proposal, the Offeror shall include 2 trips to the location that has the greatest travel expense.