

## IARPA-RFI-14-05

### SYNOPSIS

Request for Information (RFI): Emerging Events and Participating Entities: Knowledge Representation and Reasoning with Uncertainty and over Time

The Intelligence Advanced Research Projects Activity (IARPA) often selects its research efforts through the Broad Agency Announcement (BAA) process. This request for information (RFI) is intended to provide information relevant to a possible future IARPA program, so that feedback from potential participants can be considered prior to the issuance of a BAA. Respondents are invited to provide comments on the content of this announcement to include suggestions for improving the scope of a possible solicitation to ensure that every effort is made to adequately address the scientific and technical challenges described below. Responses to this request may be used to support development of, and subsequently be incorporated within, a future IARPA Program BAA and therefore must be available for unrestricted public distribution. Neither proprietary nor classified concepts or information should be included in the responses. The following sections of this announcement contain details of the scope of technical efforts of interest, along with instructions for the submission of responses.

### BACKGROUND AND SCOPE

Trying to keep our nation secure involves, in part, trying to identify emerging and evolving events. Given the sea of information that analysts must navigate daily, identifying activities of interest is a huge challenge. Current tools and technologies do a reasonable job of identifying facts of interest in data (e.g., person names, organizations, locations) but cannot reliably identify the events and activities that link these facts together. Some technologies have tried to identify unnamed events in data (i.e., those that represent actions or activities that are unfolding) by identifying all the verbs in a document but relating those “events” to one another and merging “events” across documents have met with little success. Being able to identify and track events over time would provide insight into events that are unfolding and the entities that participate in them.

One challenge to the success of identifying events, however, is that *event* is not clearly defined. Events at the highest level (e.g., a presidential inauguration) have component elements. Precursor events take place long before the major event takes place. Planning takes place; permission is obtained; decisions are made; purchases are made; participants can come and go. Each of these activities is an event. Events can also be linked to other events. Preparatory events can be predecessors of many types of higher level events.

Events also happen over time; they emerge. Activities build on each other, creating a hierarchy of elements and actions. The difficulty with event emergence is that it is characterized by uncertainty because there are rarely explicit references in data to what the end goal of the unfolding process is. Identifying and understanding time and reasoning about the emergence of events and the sequencing of activities are extremely difficult.

### NEW APPROACH AND NEW TECHNOLOGIES NEEDED

This RFI seeks inputs on the feasibility of making significant progress on the challenge of tracking event emergence as reported in unstructured text. First, it is crucially important that *event* be clearly defined and that the concept of *emergence* be specified. Secondly, tracking emerging events will require methods for identifying the events and their participants beginning at a relatively granular level and

moving through stages of event emergence. Techniques must move beyond verb-based event definition and extraction to other, richer characterizations of events and to approaches that find and link events as higher-level events emerge. For example, Communication Events may lead to Planning Events. Planning Events will specify topics or issues to be addressed. A Planning Event may result in a Purchase Event. At any stage along this emergence, it may not be known what the ultimate outcome will be; but reasoning about topics, activities, related or past events and the participating entities will be crucial to understanding emergence.

Automating the process of identifying and tracking emerging events and their participants must address a wide range of challenges, including:

- Defining the concept of *event*, various precursor events and event emergence
- Addressing event co-reference within and across documents as well as entity co-reference (e.g., person, place, equipment)
- Representing and reasoning over time
- Reasoning with uncertainty

This RFI invites discussion of substantive advancements in the development of technologies and architectures that support identifying emerging events, their components and their participants and that can reason about the events over time.

The RFI is **not** interested in building reference lists (e.g., nicknames, place names); in improved processing of phone numbers, dates of birth, etc.; nor in resolving database semantics across existing databases. Also not of interest are “strategic” or “society-level” events or trends that involve populations, e.g., predicting civil unrest, national rebellions, etc.

The responses to this RFI will be used to help in the planning of a 1-day workshop on new approaches to understanding, characterizing and capturing emerging events. An expected result of such a workshop is the identification of promising areas for investment through vehicles such as seedlings, grand challenges, and programs. It is anticipated that this workshop will be held in the Washington, D.C., Metro Area in June, 2014. A separate workshop announcement will be posted with further details.

## **PREPARATION INSTRUCTIONS TO RESPONDENTS**

IARPA is seeking respondents to submit ideas related to this topic for use by the Government in formulating a potential program. IARPA requests that submittals briefly and clearly describe the potential approach or concept, outline critical technical issues, and comment on the expected performance, robustness, and estimated cost of the proposed approach. This announcement contains all of the information required to submit a response. No additional forms, kits, or other materials are needed.

IARPA appreciates responses from all capable and qualified sources from within and outside of the U.S.

Responses have the following formatting requirements:

A one page cover sheet that identifies the title, organization(s), respondent's technical and administrative points of contact - including names, addresses, phone and fax numbers, and email addresses of all co-authors, and clearly indicating its association with IARPA-RFI-14-05:

1. A one page cover sheet that identifies the title, organization(s), respondent's technical and administrative points of contact - including names, addresses, phone and fax numbers, and email addresses of all co-authors, and clearly indicating the association with RFI-14-05;
2. A substantive, focused one-half page executive summary;

3. A description (limited to 5 pages in minimum 12 point Times New Roman font, appropriate for single-sided, single-spaced 8.5 by 11 inch paper, with 1-inch margins) of the technical challenges and suggested approach(es);
4. A list of citations (any significant claims or reports of success must be accompanied by citations, and reference material MUST be attached);
5. Optionally, a single overview briefing chart graphically depicting the key ideas.

### **Submission Instructions to Respondents**

Responses to this RFI are due no later than 4:00 PM Eastern Time on March 28, 2014. All submissions must be electronically submitted to [dni-iarpa-rfi-14-05@iarpa.gov](mailto:dni-iarpa-rfi-14-05@iarpa.gov) as a PDF document. Inquiries to this RFI must be submitted to [dni-iarpa-rfi-14-05@iarpa.gov](mailto:dni-iarpa-rfi-14-05@iarpa.gov). Do not send questions with proprietary content. No telephonic inquiries will be accepted.

### **DISCLAIMERS AND IMPORTANT NOTES**

This is an RFI issued solely for information and new investment planning purposes and does not constitute a solicitation. Respondents are advised that IARPA is under no obligation to acknowledge receipt of the information received, or provide feedback to respondents with respect to any information submitted under this RFI.

Responses to this notice are not offers and cannot be accepted by the Government to form a binding contract. Respondents are solely responsible for all expenses associated with responding to this RFI. It is the respondents' responsibility to ensure that the submitted material has been approved for public release by the organization that funded whatever research is referred to in the response.

The Government does not intend to award a contract on the basis of this RFI or to otherwise pay for the information requested, nor is the Government obligated to issue a solicitation based on responses received. Neither proprietary nor classified concepts or information should be included in the submittal. Input on technical aspects of the responses may be requested by IARPA from non-Government consultants/experts who are bound by appropriate non-disclosure requirements.

### **Contracting Office Address**

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### **Primary Point of Contact**

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