

Special Notice 12-SN-0006
Special Program Announcement for 2012 Office of Naval Research
Research Opportunity:
Basic Research Challenge: Decentralized Online Optimization

I. INTRODUCTION:

This announcement describes a research thrust, entitled “Decentralized Online Optimization” to be launched under the ONRBAA12-001, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology which can be found at <http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Broad-Agency-Announcements.aspx>. The research opportunity described in this announcement specifically falls under numbered paragraph 1 of the “Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (Code 31)” sub-section, numbered paragraph 1 of the “Ocean Battlespace Sensing (Code 32)” sub-section, and numbered paragraph 1 of the “Naval Air Warfare and Weapons (Code 35)” sub-section. The submission of proposals, their evaluation and the placement of research grants will be carried out as described in that Broad Agency Announcement.

The purpose of this announcement is to focus attention of the scientific community on (1) the area to be studied, and (2) the planned timetable for the submission of white papers and proposals.

II. TOPIC DESCRIPTION:

Background:

The Navy is moving towards deploying large, complex systems that are beyond centralized control. A canonical example of such a system is a fleet of unmanned vehicles with limited communications operating in a dynamic environment. Important characteristics of these systems are that 1) they are decentralized (i.e., system components can take independent actions), and 2) the environment in which the system operates is not necessarily known a priori, and is revealed over time; that is, the data defining the system and its environment is *online* (in the sense of online algorithms).

Objective:

The objective of this topic is to develop scientific principles and algorithms for solving decentralized, online optimization problems. To achieve this, first, solid mathematical frameworks need to be proposed and put into place so that various algorithmic strategies can be developed, analyzed, and compared. Second, canonical models need to be defined. These models should capture the fundamental difficulties associated with decentralized, online optimization. The aim in defining a few, simple canonical models is not to include all possible real-world complexities, but rather create a set of models whose rigorous treatment will drive design and analysis principles. Third, promising algorithmic strategies need to be identified and developed.

The Office of Naval Research (ONR) is interested in receiving proposals for this Basic Research Challenge Program. This program supports basic science and/or engineering research within academia and industry. The program focuses on stimulating new, high-risk basic research projects. ONR will consider awards to single investigators, but preference is for collaborative groups that have a history of innovative research in the mathematical and computational sciences.

Specifically, this Basic Research Challenge (BRC) topic seeks proposals that scientifically address efficient, robust computational techniques having the following characteristics:

- 1) The techniques can be applied to problems possessing a high degree of decentralization, and in which there is limited communication between system components,
- 2) The techniques can be applied to problems in which not all relevant information of the environment is known a priori, and is revealed incrementally to individual system components; information spreads through the system as communications become available and with potentially substantial time delays, and
- 3) The techniques are capable of producing high-quality solutions in a reasonable amount of time. Solution quality is measured against optimality, and solution time is measured against the time scale of changes in the environment. Analysis of these measures is expected to be mathematically rigorous.

Only proposals that meet all three criteria will be considered within the scope of this BRC topic.

Other potential research issues include, but are not limited to:

- The development of rigorous algorithmic-analysis techniques for decentralized online optimization that provides performance predictions through sound estimates of the closeness a decentralized online solution to a centralized, global offline optimal solution; such performance guarantees contribute tremendously to trust in these systems, which is critical for their deployment.
- The development of hybrid methods that seamlessly move between centralized and decentralized modes.
- The development of robustness techniques for decentralized online optimization, which leads to the development of algorithms that produce high-quality solutions under small variations in the input.
- Identification of important subclasses of problems, and the development of efficient algorithms that exploit the underlying structure.
- The development of unifying principles for decentralization/distributed optimization; current research is to a large degree disparate.
- The extension from online optimization for modeling changes in the environment to more general network dynamics.

III. WHITE PAPER SUBMISSION

White papers should not exceed four (4) single-sided pages, exclusive of cover page and resume of principal investigator, and should be in 12-point Times New Roman font with margins not less than one inch. The cover page should be labeled “White Paper for 2012 Research Opportunity: “Decentralized Online Optimization” and include the following information: title of the proposed effort, technical point of contact, telephone number, fax numbers, and e-mail address. The four (4) page body of the white paper should include the following information: (1) Principal Investigator; (2) Relevance of the proposed effort to the research areas described in Section II; (3) Technical objective of the proposed effort; (4) Technical approach that will be pursued to meet the objective; (5) A summary of recent relevant technical breakthroughs; and (6) A funding plan showing requested funding per fiscal year. A resume of the principal investigator, not to exceed one (1) page, should also be included after the four (4) page body of the white paper.

Although not required, white papers are strongly encouraged for all offerors seeking funding. Each white paper will be evaluated by the Government to determine whether the technology advancement proposed appears to be of particular value to the Department of the Navy. Initial Government evaluations and feedback will be issued via e-mail notification from the Technical Point of Contact. The initial white paper appraisal is intended to give entities a sense of whether their concepts are likely to be funded.

Detailed Full Proposal (Technical and Cost volumes) will be subsequently encouraged from those Offerors whose proposed technologies have been identified through the above referenced e-mail as being of “particular value” to the Government. However, any such encouragement does not assure a subsequent award. Full Proposals may also be submitted by any offeror whose white paper was not identified as being of particular value to the Government or any offeror who did not submit a white paper.

For white papers that propose efforts that are considered of particular value to the Navy but either exceed available budgets or contain certain tasks or applications that are not desired by the Navy, ONR may suggest a full proposal with reduced effort to fit within expected available budgets or an effort that refocuses the tasks or application of the technology to maximize the benefit to the Navy.

White papers should be submitted electronically to the program technical points of contact, Dr. Donald Wagner, don.wagner@navy.mil. These white papers shall be in Microsoft Word or Adobe PDF format.

To ensure full, timely consideration for funding, white papers should be submitted **no later than 29 March 2012**. White papers received after that date will be considered as time and availability of funding permit.

The planned date for completing the review of white papers is **13 April 2012**.

IV. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals (including one technical volume and one cost volume) should be submitted under **ONRBAA12-001** by **15 May 2012**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates only **grants** will be issued for this effort. All full proposals must be submitted through www.grants.gov. The following information must be completed as follows in the SF 424 to ensure that the application is directed to the correct individual for review: Block 4a, Federal Identifier: Enter N00014; Block 4b, Agency Routing Number, Enter the three (3) digit Program Office Code (“311”) and the Program Officer’s name, last name first, in brackets (“[Wagner, Donald]”). All attachments to the application should also include this identifier to ensure the proposal and its attachments are received by the appropriate Program Office.

ONR plans to fund eight (8) to ten (10) individual awards with a value of \$100,000 to \$150,000 per year, using Research funds. However, lower and higher cost proposals will be considered. The period of performance for projects may be from one (1) to five (5) years.

Although ONR expects the above described program plan to be executed, ONR reserve the right to make changes.

Funding decisions should be made by **4 June 2012**. Projects will have an estimated award date of **15 July 2012**.

V. SIGNIFICANT DATES *

Event	Date
Recommended White Paper Submission Date	29 March 2012
Notification of White Paper Evaluation	13 April 2012
Recommended Full Proposal Submission Date	15 May 2012
Notification of Selection: Full Proposals	4 June 2012
Awards	15 July 2012

Note: * These are approximate dates.

VI. POINTS OF CONTACT

In addition to the points of contact listed in ONRBAA12-001, the specific points of contact for this announcement are listed below:

Technical Points of Contact:

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Dr. Donald Wagner, Program Officer, don.wagner@navy.mil

Dr. Behzad Kamgar-Parsi, Program Officer, behzad.kamgarpari@navy.mil

Dr. Jason Stack, Program Officer, jason.stack@navy.mil

Dr. Marc Steinberg, Program Officer, marc.steinberg@navy.mil

Business Point of Contact:

Mr. Gordon Jaquith, Contract Specialist, gordon.jaquith@navy.mil

VII. Submission of Questions

Any questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Answers to questions submitted in response to this Special Notice will be addressed in the form of an Amendment and will be posted to the following web page:

- Federal Business Opportunities (FEDBIZOPPS) Webpage – <https://www.fbo.gov/>
- Grants.gov Webpage – <http://www.grants.gov/>
- ONR Broad Agency Announcement (BAA) Webpage - <http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Special-Notices.aspx>

Questions regarding **White Papers or Full Proposals** should be submitted NLT two weeks before the recommended date for receipt of White Papers or Full Proposals. Questions after this date may not be answered.