NET SENTRIC SURVEILLANCE
BAA 07-017

Questions and Answers
2 April 2007

Question #1: Should we consider only active RF sensing (radar) or also passive (for detection/localization of RF sources, or using transmitters of opportunity)?

Answer #1: Consider both coordinated RF sources, like radar, and un-coordinated RF, such as, transmitters of opportunity.

Question #2: Are the targets passive or could they also be active RF emitters?

Answer #2: Targets should be assumed to be passive.

Question #3: Should we only consider traditional RF sensing architecture, or also consider novel architectures that enable sub ns synchronization by exchanging RF between cooperating platforms?

Answer #3: Traditional RF sensing architectures use sub ns synchronization. Exchange of RF between platforms may or may not be required, but one should consider it.

Question #4: Is the time coordination provided by GPS (jitter ~tens of ns)?

Answer #4: Assume GPS jitter is 10s to 100s of ns.

Question #5: What is a reasonable assumption for integrated GPS/INS accuracy, particularly compared to the emitted wavelengths?

Answer #5: Assume GPS position relative to the wavelength it is poor.

Question #6: What are typical frequencies, bandwidths, and power levels of active RF sensors we should consider? Are algorithms for Ultra Wide Band of interest?

Answer #6: (Part 1) They are too varied to list here and there is no inclusive list. (Part 2) I know of no compelling reason to pursue UWB radar in this context; however that is not to say you can't make the argument.

Question #7: What scenarios (target characteristic, number of targets, stand off distance, numbers of sensors) are of particular interest?

Answer #7: Generally small air targets, ground targets and maritime targets, stand off distance 5km to 600km, number of targets hundreds and number of sensors 1 to N.

Question #8: Should we consider algorithms that are feed and are informed by the platform control? By that I mean that the output of our algorithms determine where the platform moves next.

Answer #8: I assume you mean the platform moves to optimize its surveillance performance of a given battle space, in which case yes.

Question #9: Should we consider distributed algorithms that lead to surveillance as an emergent behavior of the network?

Answer #9: The concept distributed or not, should primarily improve surveillance. That is not necessarily an emergent behavior; your statement of "leading to surveillance" rather than "providing improved surveillance" makes me think you are interested in automating network processes rather than improving overall surveillance. I would argue that one's concept should focus on the surveillance benefits, and if the Network needs additional functionality then it would follow as a second priority.

Question #10: What are the key differences in emphasis between your solicitation, and Sensors as Robots: http://www.fbo.gov/spg/USAF/AFMC/AFRLRRS/Reference-Number-BAA-07-02-IFKA/SynopsisP.html ?

Answer #10: While the BAA listed several enabling technologies you should consider, we are not focused on mobility, self awareness, autonomous reconfiguration or emergent behaviors but rather how surveillance can benefit from exploiting the network. ONR focus is on technologies that can transition to the current/planned family of Navy UAV's and manned platforms to provide significant enhancement to RF sensing by exploiting the network backbone and not necessarily the automation of that concept, yet.

Question #11: We are interested in the recently released BAA on NET-SENTRIC Surveillance. We wonder whether you have more details on the technical scope, target architecture, applications, etc. Also, we gathered from the brief description that it is desired to use the change in the signal propagation pattern from some nodes as indication of the presence of an intruder. That effectively converts contemporary wireless networks such as WLAN into a surveillance tool. Is this the right interpretation?

Answer #11: That would be incorrect. We are interested in improving conventional, and/or creating new methods of surveillance, using current or proposed hardware and platforms. For example, is it possible to exploit wireless as signal sources for surveillance? Yes at ranges greater than traditional sensors? Not likely.

Questions/Answers #12: Do you have any specific types of targets and radar modes in mind here? Yes, traditional military targets
Stationary or moving targets? Primarily moving targets.
Moving Air or surface? Yes, both are acceptable.
Large or small? Small

On water or ground? Water, ground and air.
One or multiple measurements from one target? Yes, either can be assumed.
What type of clutter? Land, Sea, RFI and environmental.
Urban or any other type obscuration? Masking is possible in all environments.
Any Doppler / MTI? Yes, either can be assumed.
Mono-static or bi/multi-static radar? Yes, either can be assumed.
Is work related to GMTI (JSTARS Or Global Hawk) or Aegis/DDX type radar relevant? GMTI and Surface radars primarily, not necessarily JSTARS or Global Hawk (Those are primarily Air Force sensors).
We are currently working on non-combinatorial detection of weak targets in GMTI clutter (using coordinates, Doppler and RCS measurements). We can expand the approach to detailed modeling of RCS as a function of angle. Is this of interest? Modeling should not be your focus, except to prove your solution.

Question #13:

What are the applications that are being targeted for this study?

Answer #13

Improved detection, tracking and system cost of military targets at range.

Question 14:

Are there existing sensors in mind or is this targeted toward future sensors, or both?

Answer #14

Have a future concept in mind that shows a direct war fighter improvement, with a way to implement it via spiral development of existing sensors, platforms, and systems.

Question 15:

Is there a preferred set of sensor platforms to be considered among the myriad of ground, sea, air, and space types?

Answer #15

Target those Navy sensors that best show a performance increase with your proposed technique.

Question 16:

Are there a preferred set of targets such as air, ships, ground vehicles, troop dismounts, and so forth?

Answer #16

Air, maritime and ground moving and stationary vehicles.

Question 17:

On the one hand the synopsis says that the focus of the effort is “not fusion of disparate sensors.” This led us to believe that a network of one kind of sensor is envisioned. But later the synopsis refers to a network of “heterogeneous sensors.” One interpretation could be that combinations of passive and active radars are envisioned. If this is not correct, is it possible to be more specific about what kinds of sensor networks and sensor modalities that are envisioned, perhaps with examples?

Answer #17

What was meant is: Combining sensors data is desirable, but I mean to exclude track and post detection fusion.

Question 18:

Is it desired to minimize “the ability of the enemy to exploit and deny sensors” by “minimizing sensor and network resource utilization,” or are there other reasons for minimizing resource utilization, like reduced power consumption?

Answer #18

Yes, but that would be a secondary benefit. Primary benefits would be things like, improved performance, identification, more accurate track and reduced cost.

Question #19:

Apparently algorithms of interest include those that coherently combine received signals from multiple radars to enhance detection. Do these, for example, include innovative algorithms for coherently combining signals from several airborne sensors in a manner that reduces the minimum detectable velocity over that achieved with one sensor alone, or would this function be too "low-level" for this effort? In other words, are the networking algorithms of interest at a “low-level,” similar to what was just described, or at a "high-level," i.e. at the detection level?

Answer #19

Low level algorithms are of interest.

Question #20:

Are you interested in the development of algorithms that address only part of the overall problem, such as those that pertain only to the combining of data of a specific sensor type, for example, airborne radars flying in reasonable proximity to each other?

Answer #20

We are interested in addressing all aspects of the problem.

Question #21:

Should effort be directed solely at the development of algorithms, or is demonstration of concepts on existing hardware platforms of interest?

Answer #21:

Existing hardware platforms are a good way to demonstrate concepts and algorithms.

Question #22:

Is US citizenship required for ITAR on this BAA or are permanent resident US institutional faculty members also allowed as with most ITAR programs?

Answer #22:

This question is answered under Section III Eligibility where it states “Only U.S. owned firms, U.S. based firms and American universities will be considered for awards under this BAA. Only United States citizens are permitted to work on this effort due to export control restrictions.”

Question #23:

What type of heterogeneous sensors and sensor platforms are anticipated (airborne and/ or ground and water-based surface systems)?

Answer #23:

Any current air or ground based platform or systems, with expansion to future.

Question #24:

Are there specific RF sensors of interest such as radar, ESM, IFF, off board inputs? If so what are they?

Answer #24:

There are no specific RF sensors of interest.

Question #25:

Are satellite systems under consideration?

Answer #25:

Have not considered it, but yes.

Question #26:

Is there a specific goal of interest such as enhanced targeting, Combat ID?

Answer #26:

Enhanced detection and identification

Question #27:

Is there a specific mission such as AEW, precision AG targeting?

Answer #27:

AEW would be primary, secondary targeting.

Question #28:

What typical threat/CONOPS scenerios are to be considered?

Answer #28:

Please read through the other answers to similar questions posed in this amendment.

Question #29:

Or are we free to postulate the threat(s)?

Answer #29:

Yes

Question #30:

Does coherent RF sensing imply beam forming among network nodes or bi-static multi-static sensing?

Answer #30:

It could imply either one.

Question #31:

If not fusing from disparate sources, what is implied by "fused sensing"? Does "fused sensing" imply centralized and/or distributed non-coherent fusion, and/or as stated, additional coherent cross-platform beam forming and fusion modalities?

Answer #31:

See question #17, however we are not looking for “post detection” fusing.

Question #32:

Since sensor can arbitrarily leave or enter network does this statement rule out surface-based ad-hoc network sensing (say with UGS or mobile UGS)?

Answer #32:

No.

Question #33:

Minimizing network resource utilization has many meanings depending on the type sensors/platforms utilized and deployed. Does it imply utilization (scheduling) or Energy resource?

Answer #33:

Assume that it could imply either.

Question #34:

Are we to assume SOA GPS/INU systems are sufficiently accurate or should advance systems be considered?

Answer #34:

That may be a requirement for your particular concept, therefore, it will depend on what your firm proposes.

Question #35:

Can Federally Funded R&D Centers (Gov't Labs) be considered as team members?

Answer #35:

Yes, however, see paragraph III. Eligibility Information that states “Government Entities and FFRDCs are ineligible to apply to this BAA as prime contractors.”

Question #36:

What LOE or other exercises should be planned in?

Answer #36:

That would be at the discretion of your firm.

Question #37:

Could you please comment on the intended RF sensor base to which the algorithms would apply? For example, would they be ship-based radars, members of a constellation of UAVs, manned airborne platforms, all of the above?

Answer #37:

Both existing and future, air and surface platforms and sensors.

Question #38:

If algorithms accommodate sensors which may not be currently deployed, such as a HALE illuminator, are these sensor/algorithm concepts also of interest?

Answer #38:

Yes.

Question #39:

Could you comment on the desired field of regard over which the algorithms would support a persistent surveillance capability (e.g. 10,000 km^2) ? Should the field of regard focus on sea surface or include a hemispherical volume?

Answer #39:

In answer to the first part of the question, the maximum field of regard is desired (given your concepts limitations). In answer to the second part of the question, the field of regard should focus on a hemispherical goal.

Question #40:

To what level would the algorithms be permitted to impact the current CONOPs of the available network of RF sensors?

Answer #40:

Some CONOPS modification or synchronization of multi-ship or multi-airborne surveillance radars might enhance algorithm performance.

Question #41:

What readiness level and throughput is desired for the subject algorithms at the end of year One? Is Matlab code suitable or would platform-portable vectorized code be the objective?

Answer #41:

That would depends on your proposal, if you can provide a real time solution for a low first year cost which does something new and novel, it would be considered. We will not evaluate a software development environment, that's a third tier issue.

Question #42:

Can we assume the existence of a suitable wideband data link or equivalent between each RF sensor and a common processing site?

Answer #42:

Yes you can assume this, however, it is suggested that such assumptions be limited to practicality.

Question #43:

At what phase in a multi-year program would the processing of real field data be required?

Answer #43:

This would depend on your proposal; that is, based on your proposed concept between year 1 and year 15.

Question #44:

Some expansion of existing sensors/ platforms may offer significant improvement over current detection, ID, and tracking of platforms. If added sensors and/or platforms do not require evolutionary development, are they within the scope of the BAA?

Answer #44:

Yes

Question #45

Do the technologies we describe fit within the scope of the published BAA?

Answer #45

Yes, we will review all technologies and concepts, however, there is no guarantee of acceptance of concepts as described in the BAA.

Question #46

Is there more information available regarding the target sensor system? if indeed there is a targeted platform

Answer #46

See answers to #14, #23 and #24

Question #47

What are the power consumption constraints? Are the sensors unmanned ground sensors? or are they installed in aircraft/vehicles?

Answer #47

These are not specified, we are looking for a concept coupled with a plan to implement.

Question #48

How large is the expected area of coverage?

Answer #48

See #7

Question #49

What the sensor baseline/distance among sensors?

Answer #49

This depends on your concept, e.g. this should be part of your proposal.

Question #50

Is there an expected/desired Technology Readiness Level for this effort?

Answer #50

No, but above 6 is unlikely to be considered for S&T funding.

Question #51

Is there a schedule for deployment?

Answer #51

It would depend on your concept, available sensors and platforms.

Question #52

Is there an existing data dissemination network and/or user display station/software?

Answer #52

It would depend on the requirement you propose. Yes for some concepts and no for other concepts.

Question #53

Can AFRL participate in this project as a subcontractor?
University will be the prime contractor.

Answer #53

Please see the BAA Section III Eligibility Requirements.

Question #54

Can the white paper cover page be signed by the principal investigator (PI) as an authorized officer?

Answer #54

It is the firm's responsibility to establish and identify who is an authorized officer.

Question #55

Can the white paper be emailed by PI directly to the appropriate ONR Program Officer/Program Manager? If yes, should it be emailed to Dr. Michael Pollock?

Answer #55

See Section IV, Application and Submission Information. Paragraph #6 of this section identifies the address for hard copy submission of white papers.

Question #56

Is this Broad Agency Announcement a follow-on to a previous BAA or other requirement? If so, can you provide the BAA number, or incumbent contract # / contractor name?

Answer #56

This is not a follow-on BAA

Question #57

What is the place of performance expected to be? (Contractor's facility? If not, where?)

Answer #57

The Contractor's facility.

Question #58

Can you confirm that this is being competed on a full and open basis?

Answer #58

Yes, this is a competitive procurement per FAR 6.102(d)(2) as described in the first paragraph of the BAA.