Common starting point for phased array programs may save billions, years off development

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Phased radio frequency (RF) arrays use numerous small antennas to steer RF beams without mechanical movement (think radar without a spinning dish). These electronics are invaluable for critical DoD applications such as radar, communications and electronic warfare. Their lack of moving parts reduces maintenance requirements and their advanced electromagnetic capabilities, such as the ability to look in multiple directions at once, are extremely useful in the field. These benefits, though, come with a high price tag. Current phased arrays are extremely expensive and can take many years to engineer and build.

One of the main factors driving the dollar and time costs of current phased array programs is the need to start engineering from scratch, to customize the array to a specific defense application every time a new system is needed. Because the resulting arrays are so specialized, even upgrading them is often prohibitively expensive. The drawn-out process for designing and building custom arrays also means that actual gains in performance have slowed to the point that commercial-off-the-shelf electronics are catching up rapidly in their ability to counter phased arrays. This emerging parity threatens to diminish the technological advantage DoD has traditionally enjoyed in military electronics. A technical solution is needed to bring military array programs to more manageable cost levels and timescales.

DARPA created the Arrays at Commercial Timescales (ACT) program to seek new technologies to form a shared hardware basis for many future DoD phased array development programs. If ACT is successful, the resulting technologies may save DoD billions of dollars and require years less research and development time for new systems. ACT will oversee technology research into three technical areas: 1) a common building block for RF arrays, 2) a reconfigurable electromagnetic interface (the antenna interface from the electronics to the waves in the air) and 3) over-the-air coherent array aggregation.

"What DARPA is looking for is essentially three tiers of technology that together form a configurable system that would serve as a starting point for any new array program," said Bill Chappell, DARPA program manager for this effort. "Current DoD array development programs can take more than a decade and cost tens of billions of dollars. That's because these programs start from zero, from a clean slate, every time and work toward an endpoint as specific as a radar system for a single class of warship. We want to give those efforts a common foundation. Success with technical areas one and two would lead to a significant reduction in program costs, namely the 30-40 percent nonrecurring engineering costs these programs average. We'll also save time, allowing DoD to field the effective new systems and readily refresh systems already in the field. Because of the rapid evolution of electronics, cost and time translate directly to performance. So not only do we hope to make arrays significantly cheaper at a faster time scale, we believe that this will in turn allow for much greater performance."

The third technological area of ACT aims to reduce the space requirements for defense electronics by developing distributed phased arrays that can communicate with each other to function as a single larger array. For example, there is very limited space available in the tower of an aircraft carrier, so large systems for applications like radar do not always fit. ACT could enable just a piece of a radar system to be hosted in one location, with other pieces hosted elsewhere in the carrier group, and with all the pieces communicating to act as a whole. This portion of ACT expands on the work done under DARPA's Precision Electronic Warfare (PREW) program, applying the basic capability of time and localization transfer to next generation arrays. The time and localization work done under PREW helps precisely put energy on target from disparate origin points.

More information: Potential performers in the electronics community are encouraged to attend a March 18, 2013 Proposers' Day at DARPA.

Information on the event is available at: go.usa.gov/2cYA

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