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THOUGHT PIECE

REMAKING INTELLIGENCE PROCESSING, EXPLOITATION AND DISSEMINATION

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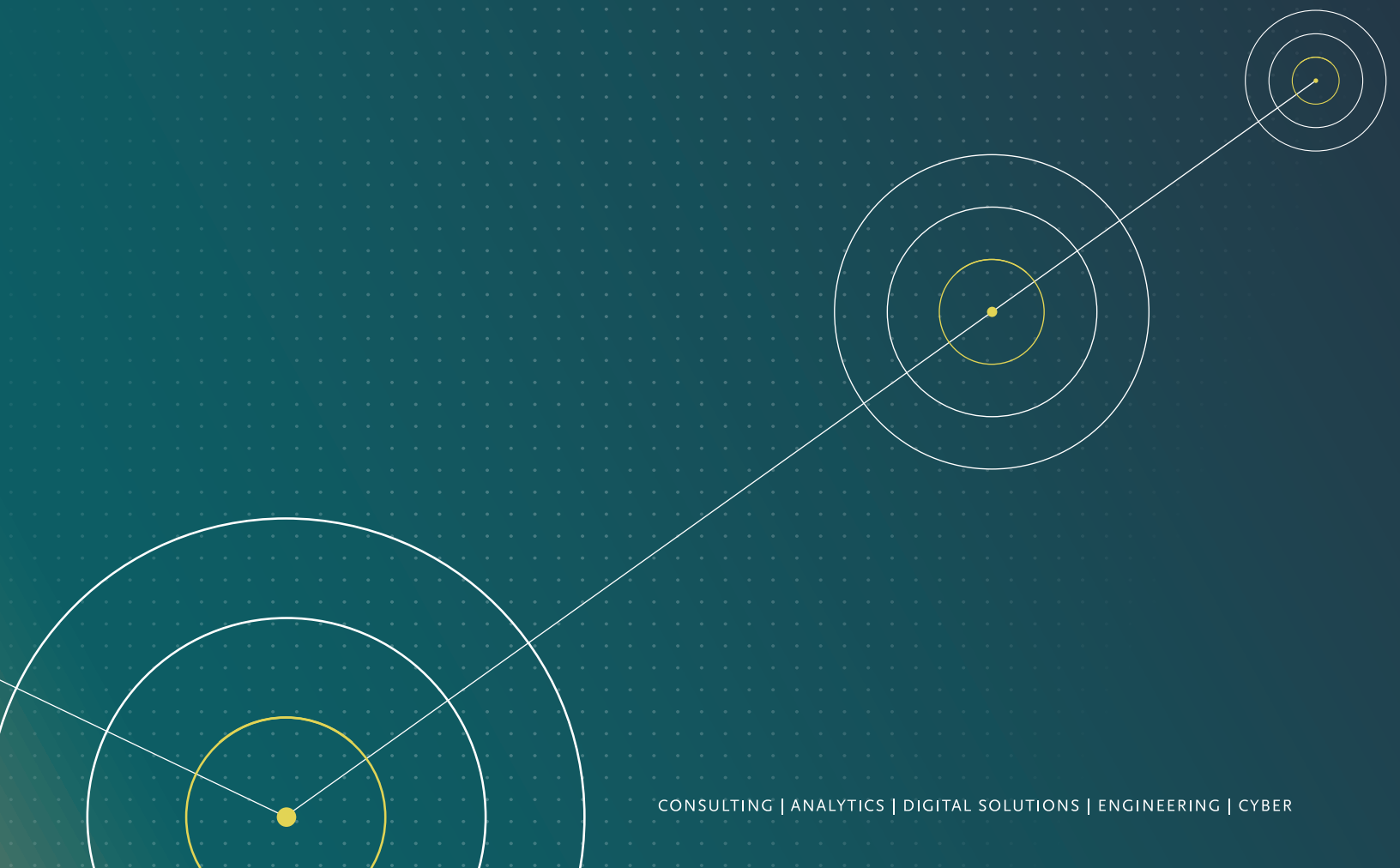

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MAINTAINING ADVANTAGE: REMAKING PED FOR TODAY'S INTELLIGENCE NEEDS

Awash In A Sea Of Data, Looking For Insights

The Pentagon releases thousands of memos a year and only a few of them could be characterized as blockbuster. But a relatively unassuming, page-and-a-quarter directive issued in April 2017 has the potential to be one of the most consequential Department of Defense (DoD) policy initiatives in years.

This announcement, an edict from then-Deputy Secretary of Defense Robert Work, created a task force dubbed the Algorithmic Warfare Cross-Functional Team (AWCFT) and placed it on a fast track to develop more effective methods of sorting through the DoD's vast amounts of archived and new signals and human intelligence as well as the military's teeming databases and public sources. The current method depends almost exclusively on the cognitive abilities of military analysts to sort through the data. The result is a very large and cumbersome process depending very little on automation to glean insight from a wide variety of critical data sources.

Simply put, the goal of AWCFT is to modernize military processing, exploitation, and dissemination (PED) capabilities so that the vast reams of video, audio, and other data continuously gathered by the military can be made available to support real-time operational choices.

The program's architects believe the initiative can overcome the array of challenges the military faces in the use of advanced intelligence equipment (particularly video sensors) and has the potential to dramatically improve PED outcomes for modern military purposes and warfare. The original memo touched on this: "*Numerous studies have made clear, the Department of Defense must integrate artificial intelligence and machine learning more effectively across operations to maintain advantages over increasingly capable adversaries and competitors... We need to do much more, and move much faster, across DoD, to take advantage of recent and future advances in these critical areas.*"

The initial phase of the effort to transform the PED practice – code-named Project Maven – is focusing on developing computer vision algorithms for the fight against ISIS. These artificial intelligence (AI)-based programs are intended to detect and classify objects in full-motion video collected by surveillance drones and alert analysts when potentially interesting items or patterns are found.

In essence, the efforts of the AWCFT will transform PED by putting into practice, on a grand scale, a central tenet of data science: machines should do analytics, people should do analysis.

Why Processing, Exploitation And Dissemination Needs Fixing

To a large degree, many of the shortcomings in PED capabilities today were unavoidable, the result of huge improvements in intelligence technology and sources over the past few years. Indeed, data has become an embarrassment of riches. The military gathers untold terabytes of information every day from sensors arrayed in intelligence, surveillance and reconnaissance (ISR) equipment through land, sea, air, and space platforms – everything from satellites, manned aircraft, and drones, to ground- and water-based equipment and human intelligence teams.

Unfortunately, the availability of so many new sources of data and the continuing rapid proliferation of them has made integration of these sources in a timely fashion a significant challenge. Since much of this technology was acquired by the services in separate procurement programs, the data is stored in numerous individual repositories, each with its own set of cataloging procedures and proprietary technologies that effectively place this intelligence in silos. As a result, potentially advantageous communications among databases – for example, a fundamental but critical exercise like immediately identifying a new building (a potential enemy redoubt) at a site by comparing the current video view with other flyovers in the past decade – are limited and, when these communications are possible, they are often not timely enough.

Moreover, as field sensor technology has evolved, the number of military analysts earmarked for monitoring the incoming data has failed to keep pace. Hence, some subsets of video intel are neglected while high walls of the data silos raise the risk that less vital material may be pored over by three different analysts in separate locations. Prioritization of data input is wanting primarily because of the lack of usable machine-based algorithms that could sift through video in real time, raising red flags for humans to pay immediate attention to what's on the screen when anomalies are found.

The need to modernize and integrate PED capabilities into a holistic, efficient intelligence-gathering system can be summed up by this challenge confronting the community: ISR analysts of the future must be capable of integrating the increasing amounts of raw signals, human, geospatial, dynamic, and open source intelligence with critical thinking to provide tailored intelligence support to operational and higher-level decision makers. Addressing these hurdles offers the military an opportunity to critically assess the way PED is done in the Department, and incorporate new thinking that will transform a critical part of its arsenal.

On a practical level, PED technology development must be targeted to improve analysts' ability to rapidly search across near real-time sensors, leverage historical data, and identify valuable intelligence. This includes enhancing weapons systems to facilitate the needs of updated intelligence gathering technologies; integrating quick-reaction networks, tools, and equipment; and advancing the science of analysis to shorten the time it takes to translate collections into actionable intelligence.

Keys To A Transformation

Operationalizing the tenet that machines should do analytics, and people should do analysis is at the core of PED modernization. Data science – in the form of advanced analytics and machine intelligence – provides the basis to automate the time-consuming analytics associated with PED activities. Thanks to ongoing advances in technology, advanced analytic capabilities are now much more viable – and affordable – for the wider defense and national security community. These capabilities streamline the collection of data from an expanding variety of sources, including signals intelligence, full-motion video, photos, unstructured text, and social media. In addition, defense program owners can access greater computing power for a lower cost, thereby making new pilot projects less risky. They can adopt open source solutions that make data storage and access more attainable for a wider range of end users – without building new infrastructure or being locked in to specific vendors. They can implement automated solutions that reduce the amount of time analysts spend cleaning, tagging, and structuring data. With this foundation, they can then leverage the breakthroughs of leading edge data scientists using machine learning to search for patterns and relationships.

Central to these new approaches is the implementation of a data abstraction layer. One of its key breakthroughs is that instead of storing data in silos – the traditional method – it liberates the data, bringing together and integrating all the data available to an organization, including from outside sources. Just as important, the entirety of the data is available, all at once, for any inquiry.

"Democratizing" the data this way empowers analysts to address a much broader range of emergent problems. Analysts can view the larger context, see complex patterns and connections in the data, and understand how various forces impact each other. Tagging this data as it is collected provides access from a number of different starting points. Third-party data visualization tools enable analysts to present data and analysis in clear, compelling formats. The result: high quality analytics that capture and synthesize vast amounts of data more efficiently than humans can, thus providing a basis for much better analysis and improved decision making.

While data science and advanced analytic capabilities clearly address many of the technical challenges associated with PED modernization, sustained success requires a broader view. In other words, the community's ability to thrive must recognize that these improved capabilities will result in operational changes in activity and those changes require an understanding of and planning for the associated cultural challenges that come with them. This may mean reevaluating the way the military views ISR goals, outcomes, and processes. It should include new perspectives on technology acquisition and adoption that will enable Project Maven to have a significant impact. In addition, organizational management and accountability precepts will need a refresh to benefit from these gains. This holistic perspective is best understood through the lens of several key transformational concepts: heightened situational understanding, agile technology management, and an improved analyst value proposition.

SITUATIONAL UNDERSTANDING

Situational awareness is too often accepted as a proxy for situational understanding. Awareness is certainly essential, but often it is *uni*-dimensional, the result of reliance on a single source for information, such as a single sensor on a drone. Situational understanding, in contrast, applies data analytics, analysis, judgment, historical perspective, archived knowledge, and other sources of current data and relationship assessment to determine threats and opportunities during a mission. Without situational understanding, a commercial Iranian flight, for example, could be mistaken for a warplane, or a wedding party in the far reaches of Afghanistan could be erroneously identified as terrorists on the move. DoD decision makers put a premium on moving toward situational understanding as the bedrock for developing effective PED capabilities and measures of success.

TECHNOLOGY MANAGEMENT

Much of the PED technology that has been employed over the past decade or so has become deeply rooted, making it difficult for DoD to modernize these legacy systems and fleets of programs and applications devoted to intelligence gathering. Moving to situational understanding and real-time networked ISR input and analysis will require a fresh and, in some quarters, radical reworking of the criteria for technology procurement decisions and implementation plans. For one thing, purchased hardware and software must run on open operating systems and be written in open architecture languages to avoid technology silos that inhibit network communications and big data analysis.

In addition, agile software development techniques must be embraced, replacing entrenched, more linear approaches. Agile methodologies are perhaps more time-consuming and require more engagement from development teams than traditional approaches. But software design for still evolving PED machine learning programs and AI-based analysis algorithms must be malleable and able to change direction as conditions in the field shift. They must also respond quickly to real-time human user needs (filling in the information gaps left by people unable to keep up with the rich streams of data pouring in). In addition, they need to be multi-lingual (in the computer sense), fluent in incoming and archived data no matter the hardware or software source or storage media.

ANALYST VALUE PROPOSITION

Military leadership needs to publicly champion the importance of the necessary transformation in the human/machine interface by effectively communicating how unleashing the power of analytics can drive analysts to higher value work. They must tamp down the natural, but erroneous, reaction that modernizing PED, through efforts like Project Maven, is little more than a cost-cutting effort to eliminate analysts.

Quite the contrary, the improvements to PED are designed to maximize the value of the analysts by minimizing the amount of time they spend on mundane and low value-add activities, like staring at full-motion video waiting for some pattern to emerge. This is not a situation where technology is simply replacing humans, as one might expect in an effort to automate a call center, for example. Instead, this is much closer to the way technology enhances the ability of surgeons to perform operations in a more detailed and expansive manner, at increasingly lower risk levels. The number of surgeons does not drop as technology improves, but rather we see more surgical options and specializations emerging. This is the promise of a modernized PED capability.

Going Forward, Think Holistically

Given the diverse and consequential categories of activities involved in PED modernization, the implementation program, virtually by definition, must be wide-ranging and ambitious. It must be a broad-based effort that seeks to identify and collect the types of intelligence required to succeed in a world of asymmetric warfare and embrace the latest integrated technologies as well as an agile military culture. Only through such a holistic approach to updating PED can efforts like Project Maven energize and engage many in the DoD who want to improve current systems. To be sure, PED modernization has been tried before and died aborning; but approached the right way, with a fresh far-sighted perspective, it is indeed likely that this time will be different.

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