



The Computerworld Honors Program

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Laureate

Organization:
U.S. Army Material Command

Organization URL:
www.army.mil

Project Name:
Defense Common Ground System Army (DCGS-A) Standard Cloud (DSC)

What social/humanitarian issue was the project designed to address? What specific metrics did you use to measure the project's success?

To come together as a nation, Afghanistan's people must feel safe, not only from enemy threats, but also from collateral damage resulting from the fog of war. They need to be convinced that America's military power is focused on their enemies, as well as ours. Improved intelligence is imperative. The right intelligence at the right time improves both war-fighting and humanitarian missions. But improved intelligence requires changes to developing, analyzing, and disseminating information. And while the Army's Intelligence, Surveillance, and Reconnaissance (ISR) efforts in support of Operation Enduring Freedom (OEF) proved highly successful at gathering raw data, the ever-increasing flood of intelligence far outstripped the ability of intelligence analysts to manually review it. Even for the data that could be processed, only stove-piped systems were available, meaning that analysts had to shift from system to system to find the answers they needed. Even those systems were approaching capacity; a single query could churn for minutes before producing a response. DSC solves these problems by providing the means to automatically process all incoming intelligence data to storage in a single location, and making the data available to analysts in a timely manner. To achieve these goals, DSC had three key performance metrics: a bulk ingest rate of 10GB of raw data per hour, a data storage capacity of 10 terabytes, and an average query response time of 1.3 seconds. All three metrics had been exceeded when the Army delivered DSC to U.S. and Coalition Forces in Afghanistan in April 2011, the first forward-deployed, big data cloud instance in the Department of Defense. DSC is bringing the promise of improved intelligence to OEF, sparing U.S. soldiers' lives and promising a better future for the Afghan people.

Please describe the technologies used and how those technologies were deployed in an innovative way. Also, please include any technical or other challenges that were overcome for the successful implementation of the project.

DSC was designed to make reliable intelligence available to the warfighter all the way out to the tactical edge. To accomplish this, DSC integrates three computing technologies: cloud computing, a specialized data ingestion system, and the Ozone Widget Framework/Synapse. The cloud computing approach provides the massive storage capacity needed to accommodate the vast quantities of raw intelligence data currently available to U.S. forces. In addition, cloud computing provides the computing power needed to ingest, index, and analyze the incoming data, making it searchable and retrievable by analysts. DSC relies heavily on open source and government open source software, thus avoiding the considerable cost of licensing fees. The primary technologies associated with the cloud solution are: Hadoop Distributed File System (HDFS), an open source version of Google File System (GFS), capable of scaling to the exabyte level, for structured and unstructured data; Hadoop Core parallelization infrastructure, an open source version of the Map/Reduce programming model capable of parallelizing tasks across a large number of compute nodes; Accumulo, an open source tool for storing structured data at the petabyte level; Condor, an open source management infrastructure for cloud environments that supports the elasticity required of such clouds; SolrCloud, a distributed index management capability capable of support for very high-speed searching. DSC developers created a specialized ingestion system, capable of loading and indexing multiple data formats to the cloud at a rate sufficient to keep pace with the flood of incoming data. The system had to automatically extract and identify entities and relationships from ingested artifacts to meet soldiers' needs. The result is a stunningly fast intelligence fusion tool that plays a critical role in saving the lives of Afghans and U.S. soldiers alike.

Please list the specific humanitarian benefits the project has yielded so far.

Improvised Explosive Devices (IEDs) wreak havoc in Afghanistan, causing three times as many deaths and injuries to Afghan civilians as to American soldiers. On the simplest level, the Army's ability to find those who are responsible for supplying, warehousing, creating, planting, and triggering the IEDs depends on intelligence systems through which analysts can identify patterns of behavior and complex social links. DSC better enables analysts to expose those who threaten our soldiers and terrorize the Afghan people. As data is ingested into the DSC system, analysts can provide military commanders with responses to a host of questions such as finding the safest route for a patrol to follow; assessing possible collateral damage from military operations; establishing the likely identity and location of individuals; calculating the safety and security of supply routes; mapping high-risk areas; and demonstrating the cost-effectiveness of support operations undertaken to restore essential infrastructure and improve Afghan civilians' quality of life. DSC's capabilities make it possible for analysts to detect relationship links and subtle patterns of behavior that the enemy himself may not be aware of, thereby enabling U.S. warfighters to fight when they must, but also deter hostile activity before it has begun. While DSC was created to meet the needs of military intelligence, the system has also demonstrated the feasibility of a mobile, rapidly deployable, self-contained cloud computing solution capable of massive, real-time, multi-format data ingestion. DSC proves that cloud computing can be deployed wherever and whenever needed. Thanks to DSC, we can envision a cloud computing solution deployed within the zone of devastation of an earthquake to assist in structural analyses of damaged buildings, roads, and bridges, or within a primitive area to support epidemiological studies in the midst of a plague.

Please provide the best example of how the project has benefited a specific individual, enterprise or organization. Feel free to include personal quotes from individuals who have directly benefited from the work.

DSC has done its job best when bad things don't happen. A squad returns safely from patrol without casualties because it followed a safe route; a team finds and disarms an IED with no injuries to civilians or soldiers; or a terrorist is apprehended without incidental I because intelligence analysts, with access to the latest intelligence data, accurately predicted how best to accomplish these missions. And DSC does its job well when it helps to find the right place to concentrate America's resources, for example, rebuilding a bridge to bring security to an isolated village. Analysts can find these answers when they have access to data in real time; when they have a complex suite of tools that allow them to query, refine, visualize, collaborate, analyze, document, and report their conclusions almost as quickly as they can read; and when patterns, links, trends, and probabilities are all available. Instead of guessing how the enemy will act, field commanders will know, with a high degree of certainty, what he will do. Instead of guessing which project to undertake, commanders will know where and how they can do meaningful things. America must send its war-fighters into harm's way, but DSC will mean that fewer of them come home in flag-draped coffins, and more will come home safely, without missing limbs, scars, or other reminders of the horrors of battle. For Afghans, DSC will help identify areas that need our attention, so that, to the Afghan people, the sight of an American soldier will ultimately signal that medicine, food, infrastructure, safety, and a resolution of conflict are on the way.