

Markets – Command, Control & Intelligence (C2I)

Case Study – Common Operating Environment (COE)

Reinventing Geospatial is working with the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) to recommend the geospatial standards, applications, and best/good implementation practices that should be considered as part of the COE. Our efforts focus on enabling the Army's C2I Programs of Record (PORs) to standardize on a set of open geospatial interfaces leading to the exchange of geospatial data and information across the battlespace.

We are supporting Operations/Intelligence Convergence through the definition and development of COE V1, V2, and V3. We are working alongside PM Mission Command (MC), PM Distributed Common Ground System – Army (DCGGS-A), and the Systems of Systems Engineering and Integration (SoSE&I) to define the geospatial solution for the COE Common Overlay Cross Cutting Capability (CCC).

Our efforts include working with multiple working groups (WGs) throughout ASA(ALT), the Army Project Managers (PMs), and Product Managers (PdMs) developing technical recommendations for inclusion in the COE Proposals (COEPs).

Our goal is to ensure intelligence drives operations and operations prioritize intelligence by developing capabilities to easily exchange geospatial and temporal information between computing environments (CEs) and PORs.

Related Case Studies:

Command Post (CP) Computing Environment (CE)

Mounted Computing Environment (MCE)

Systems Acquisition Support Directorate (SASD)

Quick Links:

Command, Control, & Intelligence (C2I)

Geospatial & Temporal

Geospatial Data & Information Interoperability

Intelligence, Surveillance & Reconnaissance

Operations/Intelligence Convergence

Case Study – Network Integration Evaluation (NIE) & Army Warfighting Assessment (AWA)

Reinventing Geospatial provides geospatial subject matter expertise (SME) to the Army's Network Integration Events (NIEs) and Army Warfighting Assessments (AWAs).

We supported PM Distributed Common Ground System – Army (DCGS-A), PM Mission Command (MC), and Nett Warrior's objectives at NIE 13.1, 13.2, 14.1, 14.2, 15.1 and 15.2. SME support we provided covered a variety of capabilities, such as ArcGIS Server, Google Earth Enterprise Server, Maps formatted for ESRI, Google Earth Globes, user guides, training materials, and over-the-shoulder technical support for the various Command, Control, and Intelligence (C2I) systems, to include select multi-INT and Warfighting Functional Areas (WFAs). We provided on-the-ground support deploying ArcGIS and Google Earth Enterprise Server technologies at the Tactical Operations Center (TOC) deployed at Division, Brigade, and Battalion.

We supported DCGS-A during their Follow-On Operational Test & Evaluation (FOT&E) at NIE 15.2, addressing geospatial issues encountered. Our SMEs, when a trouble ticket was created, were deployed to resolve issues by working directly with local Field Support Representatives (FSR) and representatives from the Army Test and Evaluation Command (ATEC).

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Markets – Geospatial & Temporal

Case Study – ERDC Geospatial Research Lab (GRL)

Reinventing Geospatial is working with the U.S. Army's Corps of Engineers (USACE) Engineer Research and Development Center (ERDC) conducting geospatial and temporal Research and Development (R&D) focused on multidisciplinary geospatial and temporal topics, such as:

- Algorithms optimized for CPUs and GPUs
- Anomaly Detection
- Geospatial Interoperability, to include, web service interfaces and standard file based exchanges, such as GeoPackage
- Link Analysis
- Multi-Criteria Decision Analysis (MCDA)
- Natural Language Processing (NLP)
- Open Source Intelligence
- Stream Processing
- Unstructured/Semi-Structured Data Storage and Analysis

Our R&D teams generally focus on Technology Readiness Levels (TRL) 1 – 5 with demonstrations built using the Army's Programs of Record (TRLs 6 & 7).

Research and Development Examples

We developed a web application using common JavaScript libraries, such as Leaflet, Knockout, D3, and Backbone, to create MCDA products enabling informed decision making. We developed various use cases, such as first-responders and disaster recovery experts, demonstrating how MCDA helps decision makers more effectively make the right decision in time critical/high impact situations.

Reinventing Geospatial designed, developed, and open sourced an extension to the Open Geospatial Consortiums' (OGC's) GeoPackage specification allowing for the storage of network data. This extension to GeoPackage allows the development of routing algorithms, such as how to get from Point A to Point B on foot, using non-proprietary formatted data.

Related Case Study

Ebola Outbreak Scenario

GitHub Repositories:

[Reinventing Geospatial](#)

[GeoPackage \(Python\)](#)

[GeoPackage Validator](#)

[SWAG-D](#)

Quick Links:

Geospatial & Temporal

Geospatial Data & Information Interoperability

Case Study – PM Distributed Common Ground System - Army (DCGS-A)

Reinventing Geospatial is leading Project Manager (PM) Distributed Common Ground System – Army’s (DCGS-A’s) and the Intelligence and Information Warfare Directorate’s (I2WD’s) efforts to simplify the Army’s geospatial architecture by designing, constructing, and deploying open source and commercial geospatial solutions to Echelons above Corps (EAC) Combined Operations Intelligence Centers (COICs) and Divisions, Brigades/Brigade Combat Teams (BCTs), and Battalion Command Posts (CPs).

We are optimizing network communications, leading to the effective dissemination of the Standard and Shareable Geospatial Foundation (SSGF) across the Common Operating Environment (COE). We optimized DCGS-A’s geospatial implementation, through the use of a load-balanced architecture, by drawing on our extensive experience with architecture, engineering, development, and deployment of geospatial services, allowing the program to meet the previously unmet geospatial requirements of DCGS-A V3.1.7 and DCGS-A V3.2.

We are developing technologies and an Operations/Intelligence Convergence focused roadmap outlining how network communications are optimized through the deployment of geospatial edge node technologies. Our prototype demonstrates the ability to effectively disseminate the SSGF and Geospatial-Intelligence (GEOINT) to Forward Operating Bases (FOBs).

Our team is heavily focused on supporting the implementation of Open Geospatial Consortium’s (OGC’s) OpenGIS® web service interfaces, such Web Map Service (WMS), Web Feature Service (WFS), and GeoPackage, supporting geospatial data and information interoperability between computing environments (CEs) and Command, Control, & Intelligence (C2I) Programs of Record (PORs).

We are developing a prototype using ArcGIS Portal within the tactical cloud, supporting the Soldier’s ability to generate, collaborate, disseminate, and discover fused intelligence products.

Reinventing Geospatial has conducted extensive research and development ensuring the scalability of ArcGIS and Boundless based geospatial infrastructure deployed at multiple echelons. We have demonstrated how the existing DCGS-A solutions can be scaled to meet requirements, such as 16,000 concurrent requests a second.

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Markets – Intelligence, Surveillance & Reconnaissance

Case Study – PM Distributed Common Ground System - Army (DCGS-A)

Same as 'Markets – Geospatial & Temporal'

Markets – Operations/Intelligence Convergence

Case Study – Army Geospatial Enterprise (AGE) Node

The Army Geospatial Enterprise (AGE) Node provides an environment for government, industry and commercial vendors to assess current and future geospatial and temporal capabilities within the tactical operational environment using key Programs of Record (PORs) and Common Operating Environment (COE) Computing Environments (CEs). Reinventing Geospatial's primary objective is to enable Operations/Intelligence convergence by identifying opportunities to align the existing technologies with improved workflows enabling the Army Geospatial Enterprise (AGE) vision.

We provide geospatial, technical, and U.S. Army Command, Control, & Intelligence (C2I) experience identifying and addressing key geospatial gaps focusing on improving data interoperability, optimizing processes & workflows, and maximizing the Army's existing investments.

Geospatial Data & Information Interoperability

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Same as 'Markets – C2I'

Case Study – PM DCGS-A

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Case Study – Systems Acquisition Support Directorate (SASD)

Reinventing Geospatial is exploring how geospatially referenced data and information can be effectively employed in enterprise, segment, and solution architectures across the Common Operating Environment (COE). We provide key Army Programs of Record (PORs) with access to geospatial segment and solution architects facilitating the definition and adoption of the Army Geospatial Enterprise (AGE).

We are exploring how the AGE Architecture and Ground Geospatial Data Model (GGDM) improves the Army's deployment of standalone, system, network centric, and cloud capabilities. We are supporting the Army in the development of software which demonstrates the applicability of the AGE to various Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) PORs.

Reinventing Geospatial is designing, developing, supporting, and testing the AGE within the COE Command Post (CP), Mounted (M), and Mobile/Handheld (M/HH) Computing Environment (CEs).

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Products – Gears™

Case Study – Ebola Outbreak Scenario

Gears decision analytics represents a practical application of open geospatial analytical tools to support complex decisions, allocation problems, and planning processes. The Gears multi-criteria decision analysis (MCDA) toolset provides our users with a robust capability to efficiently and intuitively assess, analyze and compare alternative outcomes, and to use these results to generate actionable end products.

Recently, communicable disease outbreaks, such as those linked to the Ebola and Zika viruses, have made global news due to their wide-ranging effects on public health and nation-state stability. Our MCDA tools have been used in a hypothetical scenario where an Ebola outbreak threatens Dhaka, Bangladesh.

In this scenario, the stated goal is to prioritize local schools for temporary medical triage facilities. Under normal conditions, this decision process is difficult and subjective, since multiple criteria for optimizing facility selection requires tradeoff consideration of many (sometimes competing) criteria.

For school selection, the scenario assumes that locations are central to vulnerable population and population centers, near public transportation, and sufficiently far from other emergency services. Geocentric Environment for Analysis and Reasoning (GEAR) is able to both aggregate the necessary data for and encode the logic of this decision process using six criteria to measure these four main objectives. The result of this analysis is an annotated geovisualization of school facilities in Dhaka that are optimal for serving as temporary medical triage facilities.

This scenario highlights the transparency, flexibility, and repeatability between decision makers, as well as responsiveness to multiple planning scenarios to which GEAR users have access. This accessible platform represents a powerful innovation in data-driven decision making, and will result in a more efficient allocation of government resources to solve critical problems.

Related Case Studies:

Geospatial Research Lab (GRL)

Quick Links:

Command, Control, & Intelligence (C2I)

Geospatial & Temporal

Intelligence, Surveillance & Reconnaissance

Technology – Data Science

Case Study – Geospatial Research Lab (GRL)

Same as 'Markets – GRL'

Technology – Geospatial Data & Information Interoperability

Case Study – Army Geospatial Enterprise (AGE) Node

Same as 'Markets – Operations/Intelligence Convergence'

Case Study – Common Operating Environment (COE) Command Post (CP) Computing Environment (CE)

Reinventing Geospatial supports Common Operating Environment (COE) Command Post (CP) Computing Environment (CE) with systems architecture, systems engineering, software testing and system of systems testing services.

We conduct testing and evaluation for CPCE systems' use of geospatial data and services for CPCE V2 systems, to include Distributed Common Ground System – Army (DCGS-A), Advanced Field Artillery Tactical Data Systems (AFATDS), Command Post of the Future (CPOF), Joint Battle Command – Platform (JBC-P), Air and Missile Defense Planning and Control System (AMDPCS), and Aviation Mission Planning System (AMPS). Working alongside system testers and engineers, we serve as the geospatial subject matter expert (SME) on the resolution of geospatial issues encountered during CP CE test events.

We support the Army's evaluation of geospatial performance on the newest hardware for CP CE, Tactical Server Infrastructure (TSI) by providing detailed test reports and recommendations for improving the performance of our geospatial solutions. We help engineer the integration of the open source Extensible Mapping Platform (EMP), NASA's World Wind for Android, NASA's World Wind for the web for the CP CE, and the Mounted Computed Environment (MCE). We assist in the creation of new training material supporting the Army's Geospatial Planning Cells (GPCs) support for the dissemination of the Standard and Shareable Geospatial Foundation (SSGF).

Case Study – Distributed Common Ground System - Army (DCGS-A)

Same as 'Markets – Geospatial & Temporal'

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Mounted Computing Environment (MCE)

Systems Acquisition Support Directorate (SASD)

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Technology – Mobile/Handheld

Case Study – Mounted Computing Environment (MCE)

Due to the unique set of limitations (varying bandwidth, less robust hardware, etc.), the Mounted Computing Environment (MCE) is a very challenging space to engineer eloquent geospatial solutions.

Reinventing Geospatial is supporting MCE's efforts to integrate and develop the NASA World Wind Android 3D globe engine. We are instrumental in the integration of the open source Extensible Mapping Platform (EMP) for the MCE. We are working with the Army Corps of Engineers Engineering Research and Development Center to find open source solutions for vehicle route planning and turn-by-turn navigation. Our research and development has focused on ways to improve and align Joint Variable Message Format (JVMF) messages and the Sematic Extensible Attribute Model (SEAM), with the Army Geospatial Enterprise (AGE).

Related Case Studies:

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Mobile/Handheld Computing Environment (CE)

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Case Study – Instrument Set, Reconnaissance and Surveying (ENFIRE)

The Instrument Set Reconnaissance, Surveying and Construction (ENFIRE), an Army Program of Record (POR), provides capabilities to Army Engineer units to enable faster, safer, and more accurate execution of mission objectives. Through the use of a highly-tailored custom application and a best-of-breed suite of commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) hardware and software, ENFIRE supports a broad range of engineering capabilities that span across reconnaissance, combat and construction engineering, and surveying domains. A robust set of interoperability capabilities allows the rapid dissemination of ENFIRE data to allow analysts and decision makers to have an up-to-date and comprehensive view of the operational picture.

We are leading the software development effort on ENFIRE for the Combat Terrain Information Systems (CTIS) Program, providing software engineering services through the use of industry-proven best practices in the design and implementation of the software components. Reinventing Geospatial ensures quality in all its deliverables using mature, continuous integration and automated testing processes in combination with metrics-driven code analytics. We add value through:

- The use of continuous integration and automated tools to strategically increase code quality
- Our end-user focus with heavy emphasis on user interface and user experience design
- Our unique understanding of customer objectives and end-user needs

Related Case Studies:

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Mobile/Handheld Computing Environment (CE)

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Case Studies – M/HHCE

With increased adoption of the mobile/handheld (M/HH) computing environment (CE), the Army equips our soldiers with M/HH devices to assist with their mission on the ground. However, the M/HH CE is experiencing challenges in the areas of obtaining a common operating picture and geospatial capabilities optimized for the M/HH CE.

Reinventing Geospatial is helping the M/HH systems, such as Nett Warrior, to identify and develop solutions improving the operational workflow to provision maps, optimizing geospatial content management and usage, and delivering new capabilities to support the Soldier. Reinventing Geospatial is working with the US Army Corp of Engineers - Engineer Research and Development Center (ERDC) to deliver an open source dismounted routing solution enabling Soldiers to plan routes based on key factors (e.g., caloric burn, shortest path, exclusion areas, etc.), and OGC GeoPackage solutions improving the delivery and usage of maps and geospatial data from Enterprise to the end user device operating within a disconnected, intermittent, limited-bandwidth (DIL) environment.

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Mounted Computing Environment (MCE)

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Technology – Network Optimized Communications

Case Study – DCGS-A

Same as 'Markets – Geospatial & Temporal'

Technology – Scalable Infrastructure

Case Study – Command Post Computing Environment

Same as 'Technology – Geospatial Data & Information Interoperability'

Case Study – Distributed Common Ground System - Army (DCGS-A)

Same as 'Markets – Geospatial & Temporal'