SPECIAL REPORT

INFORMATION DOMINANCE OF THE BATTLESPACE: EXTREME ANALYTICS FOR GEOINT

How OmniSci's accelerated analytics, intuitive data visualization, and extreme usability help federal defense agencies focus on the mission.

Guiding a unit into dangerous territory. Evaluating images to better identify a place of interest. Monitoring publicly available data — globally and in real time — to fend off attack.

These are just some of the mission-critical, data-intensive tasks that analysts, program managers, and data experts across a wide range of federal defense agencies perform on a daily basis. From scanning Twitter feeds for tactical advantage to supporting troops in the field of battle, speed of analysis is the critical success factor. But one obstacle stands in the way: access to authoritative data for actionable insights.

The story is well known: hundreds of systems exist within the Department of Defense — just for logistics alone. A never-ending stream of data types — from satellite and aircraft images to social media and Internet of Things (IoT) sensor data — are all stored in silos that impede visibility. Meanwhile, publicly available data is growing exponentially.

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All of this clogs the data funnel, putting tremendous pressure on status-quo data analysis. When the adversary is moving quickly, taking hours to analyze data for the needed insights is no longer sufficient to achieve information dominance.

ADVANCES IN ANALYTICS TECHNOLOGY

Today's defense missions increasingly need to analyze terabytes of data in the moment — but mainstream CPU-based solutions are too slow and difficult to scale. Fortunately, technology is changing to help defense agencies better meet the need for real-time data analysis.

On the hardware side, graphics processing units (GPUs) are accelerating analytics and visualization. GPU-based solutions offer massive parallel computing power that is designed for extreme scale and speed. These solutions are suitable for large data volumes and high-velocity, interactive visualization of structured data.

GPUs have a long history of applications involving massive parallel processing, complex image rendering, and data-based visualization for high-end computer gaming and supercomputing. They are also the primary hardware technology behind machine learning and deep learning initiatives. Using a GPU-based approach, agencies can scale to billions of records while still maintaining sub-second query performance.

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OMNISCI: RAPID ANALYSIS OF DATA AT EXTREME SCALE

To overcome the challenges of speed, scale, and real-time responsiveness, many leading defense agencies are choosing GPU-based analytics technology from OmniSci. The OmniSci Extreme Analytics™ Platform offers unique value through four key advances.

1. GPU-Accelerated Analytics

OmniSci harnesses the massive parallel processing and visual rendering power of NVIDIA graphics processing units. Based on technology developed during foundational research at MIT, OmniSci supports data throughput of near 6TB per second on a single server. Adding more servers in a distributed configuration scales throughput linearly.

OmniSci offers the world's fastest open source SQL engine and visual analytics platform. The ability to query and visualize data more efficiently allows users to ask more questions and explore the data as quickly as their curiosity allows. With the ability to render images with zero latency, visualize billions of rows of data in milliseconds, and receive answers to questions in an instant, OmniSci delivers a "speed of thought" experience for analysts across massive-scale data sets.

With the speed and power to support a more interactive, immersive, and engaging user experience, the OmniSci analytics platform changes the way defense agencies conduct operational analytics, data science, and big data exploration by allowing speed-of-thought analysis.

Now analysts can ask and answer streams of questions in the time needed to complete one query on a mainstream CPU-only analytics platform. As a result, teams can monitor and respond to changes in real time. And OmniSci's core open source technology prevents vendor lock-in.

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2. Leading Geospatial Capabilities

Generating maps of the earth based on actual photographs — digital or from film — demands a tremendous amount of raw compute power. Using the processing and visualization power of GPUs, OmniSci helps agencies meet this challenge.

OmniSci technology helps analysts perform large-scale, interactive geospatial analytics on structured data. With native support for geospatial data types such as points, lines, polygons, and multi-polygons, analysts complete SQL queries over billions of rows of location data with zero latency. They can also calculate the distances between billions of objects in milliseconds or identify geospatial locations inside other geographies and query the characteristics of those "contained" objects.

Because the OmniSci analytics database is tightly integrated with a GPU-based rendering engine, OmniSci also enables unparalleled geospatial visualization. Users can interact with millions of polygons and billions of points with unprecedented speed. Interactive visualization features make it easy to instantly cross-filter data by individual polygons or groups and also chart many layers of geo-located data from multiple sources on the same map. By brushing across big geolocation datasets on a time-series graph, analysts can also see how a location changes over days, months, or years — in just seconds. These capabilities can also augment geospatial analysis in ESRI.

With OmniSci, defense analysts can also investigate location-enriched data from always-on mobile devices, IoT-enabled objects, connected vehicles, and location-stamped transactions. Hours of up-front data collection and processing can pay off significantly with the ability to analyze pattern-of-life anomalies. Analysts can visually explore massive amounts of raw data without being forced to down-sample or analyze only a subset of the data. OmniSci also consolidates all relevant data across data sources — giving leaders a single source of truth on which to base their decisions.

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3. Intuitive Data Visualization

Easy pattern recognition makes data analysis far more valuable. OmniSci offers features that allow agencies to create interactive dashboards, display dozens of distinct attributes, and instantly correlate and cross-filter these attributes.

Analysts can create standard visualizations, such as line, bar, and pie charts. They can display these alongside complex data visualizations such as geo point maps, geo heat maps, choropleths, and scatter plots. With the ability to display dozens of distinct datasets in the same dashboard and intuitively interact with this data, users can uncover surprising multi-factor relationships. And all visualizations can be dynamically filtered together for multi-dimensional insight into large datasets.

Click on any dimension in a chart or graph and OmniSci redraws all related visualizations to reflect the new context. Through this connectivity, the solution helps users quickly find correlations and outliers in the data. The flexibility of the visualization tool also allows analysts to see what matters most for the mission, in the locations that are most important.

4. Exceptional Usability

Some analytics solutions are powerful, but using them to gain insight is difficult. Complex, highly technical interfaces demand advanced user training, while certain tools require extensive knowledge of SQL. These products are suitable for skilled data scientists — but with demand for insight and intelligence growing for defense agencies, what's needed is a tool that more analysts can use without years of experience or months of training.

The OmniSci solution is engineered for exceptional usability. An intuitive user interface ensures that analysts can iteratively slice and dice data, exploring questions at the speed of thought. Users can dive deeply into the data, increasing engagement while exposing valuable business insights.

Analysts can also graphically represent data in just a few clicks — and then share their dashboards and insights across the agency. This helps to improve cross-functional collaboration and decision-making.

USE CASE: ACTIONABLE INTELLIGENCE AND ANALYSIS

Analysts preparing their commanders for a deployment often need to identify patterns of life ahead of planned operations. Key to the mission is the identification of anomalies — such as those in traffic patterns and population movements — to better assess conditions on the ground.

Legacy systems have data processing constraints that only allow analysts to process data for a subset of time and locations. But what if the analyst needs to assess not only the broader region but also trends over time — and it all needs to be done by this afternoon?

With powerful visualization capabilities, OmniSci makes information clear and accessible to analysts, commanders, and other decision makers — all of whom can reap benefits from OmniSci almost without training and out of the box.

The geospatial capabilities of OmniSci combine comprehensive data access with the raw processing power needed to get the job done in time. Only OmniSci provides a GPU-accelerated SQL engine capable of exploiting otherwise daunting data volumes — with zero-latency visualization.

In addition, OmniSci gives analysts and non-experts alike an interactive dashboard capable of ingesting and visualizing vast amounts of data from multiple sources. With powerful visualization capabilities, OmniSci makes information clear and accessible to analysts, commanders, and other decision makers — all of whom can reap benefits from OmniSci almost without training and out of the box. In the end, the agency is able to derive the actionable intelligence and insights needed for mission success.

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USE CASE: INFORMATION DOMINANCE IN THE BATTLESPACE

As a commander plans the next mission, analysts and operators need to evaluate the surrounding geography and terrain. They may also need to identify flight patterns for aircraft or the best and safest route for vehicles.

Even during the heat of battle, analysis continues. Depending on the insights needed, analysts may want to combine a wide range of data points such as demographics, real-time terrain conditions, and troop positioning to avoid friendly fire. The goal is to achieve battlefield dominance and troop safety.

Unfortunately, today's information-intensive operating environments overwhelm mainstream geospatial tools, slowing time to analysis and intelligence cycles during mission-critical moments. Not so with OmniSci. What typically takes several hours with other tools, OmniSci helps agencies execute in minutes or seconds.

With zero latency, OmniSci enables analysts to query, visualize, and interact with even the largest geolocation datasets. With instantaneous visual exploration and easy-to-use dashboards powered by the most advanced analytics engine on the market, agencies can speed time to insight, improve decision-making, and dominate the information environment for success in the battlespace.

USE CASE: DEFENSE LOGISTICS AND READINESS

Hurricanes, tornados, flooding, extreme heat, wildfires, and volcanoes. These are just some of the natural disasters for which agencies need to prepare. The readiness mission requires continual planning, such as executing port activities, establishing distribution networks, and initiating military operations.

The greatest determinant of operational readiness is logistics — and the rapid assembly and analysis of massive silos of data in support of logistics is critical.

As these agencies know, the greatest determinant of operational readiness is logistics — and the rapid assembly and analysis of massive silos of data in support of logistics is critical. Agencies need to know when a disaster will hit, who will be affected, how to minimize the impact, and the best ways to rapidly respond to those in need.

One key to success is gaining insight into trends. The objective is to use data for a variety of readiness needs — such as optimizing placement of resources, monitoring conditions and communications, and predicting maintenance needs to ensure the operation of emergency equipment. Yet at the same time, disaster situations are fluid. Preparation is key — but real-time analysis and full situational awareness are always needed. OmniSci helps in both regards.

For driving logistics readiness, OmniSci enables users to ask questions and explore trends that were once too large or difficult to assess. Computation-heavy tasks are now possible at extreme speed. Analysts, for example, can create or select a customized geographic area anywhere in the world and instantly view demographic information in that area. Users can also identify low-level flood plains and then layer in data about entities most in need — such as hospitals or retirement facilities. Flexible capabilities like these make preparation easier and faster.

During a disaster, OmniSci helps agencies analyze and exploit logistics operations data through rapid cross-filtering of large and disparate datasets. Operational analytics are layered over geographic datasets, supporting real-time logistics operations regardless of the mission. This speeds tactical decision-making so that agencies can guide troops and supplies, optimize networks in real time, assess infrastructure, address maintenance needs, and meet strict timelines.

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LEARN MORE

As these three use cases show, federal defense agencies can use the Extreme Analytics Platform from OmniSci to rapidly generate mission-critical insights that improve outcomes across a wide range of activities. From daily logistics to ongoing intelligence-gathering to real-time support of troops on the ground, agencies now have the speed and power to efficiently process and explore the largest volumes of data, manipulate geospatial imagery in real time, and produce the insights that help improve decision-making and performance.

For more information about how OmniSci helps federal defense agencies execute more effectively, visit https://www.omnisci.com/industry/defense/.

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OmniSci is the Extreme Analytics™ Platform. Organizations use OmniSci to rapidly find insights beyond the limits of mainstream analytics tools. Because OmniSci delivers zero-latency querying and visual exploration of big data, analysts and data scientists can dramatically accelerate operational analytics, data science and geospatial analytics. Originating from research at MIT, OmniSci represents a technology breakthrough by harnessing the massive parallel computing of GPUs. OmniSci Technologies Inc. is headquartered in San Francisco, and the platform is available globally via open source, cloud and enterprise license options.

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