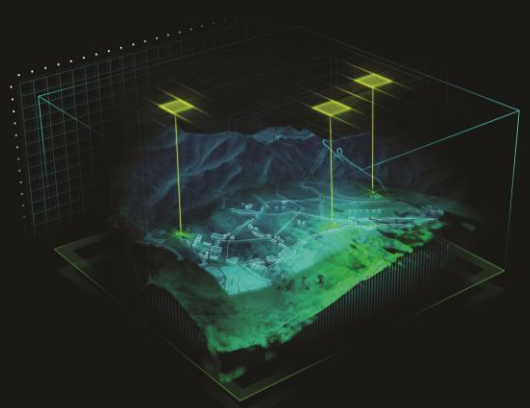


# GEO INTELLIGENCE CASE STUDY



## GIS FEDERAL REVOLUTIONIZES ACCESS TO GEOSPATIAL DATA *GPU-Accelerated GAIA Database Delivers Real-Time Analytics and Data Visualization*

### CUSTOMER PROFILE

- GIS Federal focuses on enterprise system architecture, cloud computing, and handling big data

### PROJECT CHALLENGE

- Create a system to provide the Army with near real-time access to varied geospatial data in remote locations

### NVIDIA SOLUTION

- NVIDIA® GPU Acceleration with CUDA enabled new level of query capability



*Air tracks photo shows the geospatial rasterization capability of big data using GPUs. Instead of providing limited data on the web browser, GIS Federal has the ability to show all the data to the user by creating an on-the-fly raster or 4kb PNG image.*

“By harnessing the power of GPUs, we were able to deliver data for one billion geospatial points in a defined area of interest in less than 2 seconds from a laptop - and that was in 2010. The combination of our patented GAIA database and a GPU-enabled system changes the game for access to geospatial intelligence.”

*Amit Vij, Chief Executive Officer  
GIS Federal*

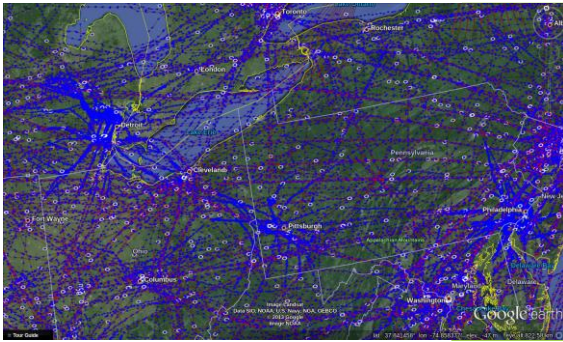
### GIS Federal Delivers Unprecedented Access to GIS Data

In 2009, the notion of real-time, cloud-based access to detailed geospatial data was beyond scope of even the most advanced computational engines. At that time, GIS Federal began a research project for the Army with a challenge of filtering 10 million points in a defined area of interest. They were able to achieve the goal, creating a CPU-based system that filtered the points in 92 minutes. GIS Federal recognized the drawbacks associated with heavy duty analytical computing tasks using traditional CPUs. GPU-based supercomputing enables tremendous gains in computing power while reducing costs associated with power consumption hardware. GPUs reduce the computing time for heavy-duty GIS operations from hours to minutes, and minutes to seconds. This allows users to run complex GIS tasks in a web-based environment, bringing more computing power to remote locations.

In a hostile or remote environment access to timely intelligence data is essential, so reducing the time from capture to delivery is critical. “By harnessing the power of GPUs, we can deliver data for one billion geospatial points in a defined area of interest in less than 2 seconds from a laptop 0 and that was in 2010,” said Amit Vij, CEO of GIS Federal. “The combination of our patented GAIA database and a GPU-enabled system changes the game for access to geospatial intelligence.”

### Patented Database Design Leverages GPU Acceleration

GAIA is a distributed database that has been built specifically for a multi-core engine. “The difference with GAIA is that because we’re tying the threads that the GPU provides to the data, it can give a whole new level of query capability that developers don’t traditionally have with large data sets,” said Nima Negahban, Chief Technology Officer at GIS Federal. “With GAIA you can include things like ‘join’ and ‘group by’ and this opens up a whole new capability in analytics. The developer doesn’t have to try to make an index or precompute every possible combination of absolutes and variables. Most ‘big data’ systems are just able to give you a pointer to a very long list, ask how many items are in that list and you’ll be waiting quite a while for a response, but because GAIA is tying the GPU threads to the data, it can do these complicated aggregate calculations extremely quickly.”



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GIS Federal*

“One of our core beliefs when we started working on GAIA is that we wanted it so not everyone needed to know CUDA or know how to synchronize data across multiple cores or machines,” continued Negahban. “We abstracted it all away, so GAIA acts a lot like a traditional database where you can put in data, you’re given a query API and then you can go ahead and dream up what you want without having to know the nitty gritty about your card or your cluster.”

### **Near Real-time Access to Predictive Analytics in Remote Locations**

A developer using GAIA can add objects from a wide variety of sources and schemas, and has instant access to perform complicated queries of any design or combination of data, without experiencing a delay for indexing, even remotely. “Before, they just cared about what’s inside my area of interest, and they might run predictive analytics that would be for the last one or three days,” said Vij. “It would take minutes or hours depending on how much data they were dealing with. Intelligence analysts in the field now have all the control at their fingertips. They can toggle, tune, and change multiple variables in their calculations to get to the data they’re looking for very quickly. Jobs that would take hours or days can now run in near real time.”

As an example, GAIA allows users to perform trend analysis and predictive analytics for IED detection using past history of IEDs that have exploded on certain routes. Primary and secondary mission supply routes can use this. There is also an alert system that can show best routes in near real time based on recent events. “Vehicles create a point every second,” said Vij. “This results in millions of tracks with billions of points. GAIA with GPU acceleration can do in memory calculations what would take years on a CPU-based system. With a UV 2000 from SGI and NVIDIA’s K20X GPU cards, we have 43,000 physical cores and 10 terabytes of RAM. This enables an incredible number of floating point operations per second that would not be possible in a CPU-based system.”

### **Data Fusion and other Breakthroughs on the Horizon for GAIA**

There will be more analytics and algorithms that will be possible moving forward. “So many new doors are opening,” said Vij. “We can see what points are connected to other points. We can create heat map time referenced movies. We can rasterize complex results as an image or movie on a map within a second. This type of visualization was not previously possible. GAIA’s advanced typing capability also creates a lot of Data fusion opportunities which is also really exciting. A single query can run against multiple data types with multiple schemas and GAIA’s type system will understand how to fuse these seemingly isolated types into one concise and fused result set.”