

The NATO Core Geographic Services System

Enterprise GIS for Defense Provides Strong, Centralized Geospatial Capabilities





ArcGIS Explorer Desktop provides an easy way to access local desktop data sources and online NATO Core GIS web services and its analysis capabilities when connected to the NATO LAN.

Peacekeeping and security missions take North Atlantic Treaty Organization (NATO) forces to remote regions of the world, from the rugged mountains in Afghanistan to the choppy seas off the Horn of Africa.

NATO personnel who work in these diverse environments, often under dangerous conditions, need fast and easy access to accurate and up-to-date geographic information for planning missions, evaluating terrain, navigating ships and other vessels, analyzing intelligence, and managing logistics. In short, they require maps, imagery, and other geospatial data, along with geographic information system (GIS) technology, to manage, analyze, and visualize data and create web-based GIS services and applications.

The NATO Communications and Information Agency (NCIA) provides a technical solution for these types of geospatial products, services, and software to NATO's operational commands in Allied Command Operations (ACO), the International Security Assistance Force (ISAF) in Afghanistan, and other missions through the NATO Core Geographic Services system.

The Challenge

NATO needed a next-generation GIS to provide centralized geospatial capabilities throughout the organization. The abundance of disconnected and barely connected legacy systems for collecting, managing, analyzing, and disseminating geospatial information no longer sufficed. The existing systems could not handle the full volume of incoming data. Built on outdated technology, these systems were often incompatible with each other, too.

NATO required a modern, enterprise-level information technology (IT) infrastructure built on IT standards for handling and working with geospatial information. Recognizing GIS as a fundamental technology, NATO wanted the new geospatial solution to provide

- Improved commercial off-the-shelf (COTS) tools and hardware.
- Decentralized geospatial data management at each NATO headquarters, with centralized quality control by Allied Command Operations.
- Standardized GIS production and dissemination tasks.
- An improved interface with NATO Functional Area Services (FAS), which manages logistic and operational information within the common operational picture (COP).



The Solution

In 2006, NATO contracted with Siemens Enterprise Communications to implement the NATO Core Geographic Services system (NATO Core GIS), an enterprise-level geospatial data and services infrastructure. Siemens brought project management, communications, security, site rollout, hardware, and many other assets to the project. Esri joined the team to provide all the geospatial capabilities for the solution. Other team members include Esri Nederland B. V. and Belgium company GIM, brought on for training and technical support, respectively.

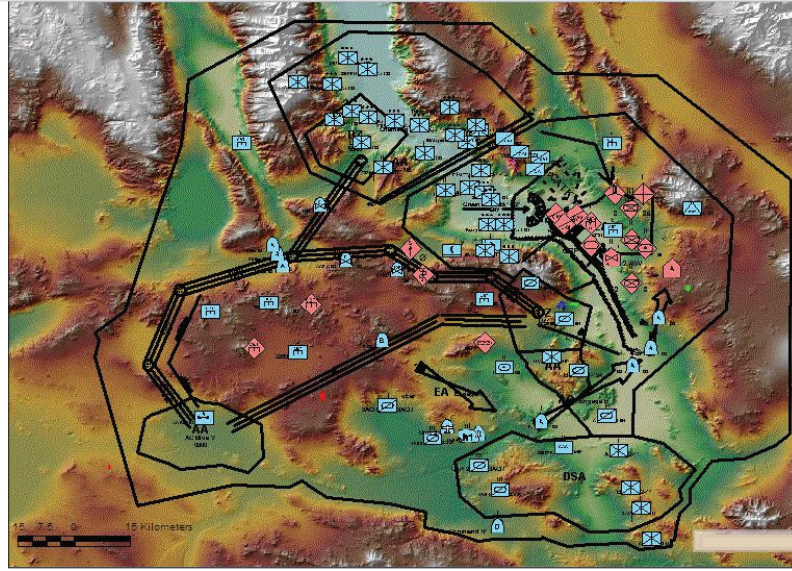
NATO Core GIS provides centralized geospatial services to NATO headquarters staff and command and control (C2) systems. The system delivers the following:

- Cartographic services are available through a high-end GIS desktop and server environment. NATO's geospatial staff will use desktop and server-based applications to acquire, manage, produce, maintain, and publish all geospatial data, products, and web services.



The NATO geospatial staff creates map products and makes them available via web services for NATO Core GIS users and systems.

- Core GIS services, such as web map services and other geospatial capabilities, are centralized in one location at each headquarters and available through a variety of web services. Staff in every NATO headquarters can access these maps and services through the Core Geo Viewer, a



The Core Geo Viewer provides access to NATO geospatial assets, readily available via standards-based web services.

simple GIS viewer. Access is also available using ArcGIS® for Desktop or other applications that can use Open Geospatial Consortium, Inc.® (OGC®)-compliant web services.

- NATO FAS project teams now have access to a GIS developer toolkit called the Component-Based Framework (CBF) to build custom GIS viewers and services for specialized user communities such as intelligence, logistics, and land C2.

These services and the toolkit are deployed on each of the local area networks (LANs) at 18 NATO headquarters in 12 countries. This means that all NATO staff will have access to the same strategic geospatial information and products, whether they are at ACO or ISAF headquarters in Afghanistan, ensuring that everyone in NATO “fights off the same map.”

NATO Core GIS services are available using many OGC and International Organization for Standardization (ISO) standards, integral to promoting interoperability among NATO systems and member states. Any system that can connect to the NATO network and consume OGC services can use the geospatial information. NATO Core GIS will provide this open framework via OGC web services, such as Web Map Service (WMS), Web Coverage Service (WCS), and Web Feature Service (WFS). This enables other systems to ingest and use geospatial data for further analysis, visualization, and planning such as C2 and logistics.

NATO also mandated a solution that uses 80 percent or greater commercial off-the-shelf products, guaranteeing all the benefits of mature, stable, maintained software that will continue to be updated as the project develops.

The Esri® ArcGIS system underpins the solution, which is based on the following products:

- ArcGIS for Desktop plus several extensions for the high-end cartographic workstations
- ArcGIS for Server, with the Spatial Analyst and 3D Analyst™ extensions and ArcGIS Image Extension for Server, which are critical to supporting server-side GIS capabilities within the system
- ArcGIS Workflow Manager to manage all GIS tasks such as map updates and requests for special geospatial analytic products
- ArcGIS Engine and ArcGIS Web Mapping APIs for the developer toolkit
- Core Geo Viewer, a customized 2D web GIS viewer, in addition to Esri's ArcGIS Explorer, an advanced 2D and 3D GIS viewer

NATO Core GIS uses a modern hardware and software infrastructure to support the GIS technology, including

- A multiterabyte and centralized storage environment for imagery and other geospatial products.
- Oracle 11g as the database technology to store geospatial information such as vector geodata.
- Scalable servers capable of supporting a large and distributed user community.

The server, workstation, and networking hardware components come from Dell. Siemens is responsible for configuration management of the Oracle database and all the hardware. Once accepted by NCIA, NATO CIS Agency (NCSA) will take ownership of the systems and be

responsible for life cycle system maintenance.

Training is a key element of any complex system. For NATO Core GIS, Esri Nederland B. V. is responsible for conducting training at NATO CIS School (NCISS). Training courses have been developed and delivered to GIS specialists, IT staff, and database administrators.

The Results

NATO staff around the world can now access geospatial data throughout NATO's command structure, add mission-specific overlays, and use powerful geoprocessing tools.

Commanders, their staff, GIS analysts, and other NATO network users will fuse geospatial content from NATO Core GIS with other forms of information to use in C2, intelligence, logistics, and many other applications.

This was a challenging system development project for everyone involved. It stretched the limits of technology, tested the NATO procurement system, and—like any major project—had its ups and downs. However, all agree that the result is a world-leading defense GIS that will save lives on the battlefield, make NATO planning and operations more efficient, and allow NATO to deliver more geospatial capabilities over the system's life cycle.

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