

NATO Peace Time/Field Head Quarters and GIS: a Kosovo Experience

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Abstract:

The purpose of this presentation is to describe the interim GIS (IGIS) Cartographic Workshop (CWS), which is the current NATO standard for geo-analysis and map production. Depending on the scope of field theatres and commands, a small CWS or a full CWS is used. During the presentation both hardware (server, workstations, network, peripherals) and software (GIS applications, graphics applications, etc.) are covered. In addition, problems and lessons learned from the KOSOVO Field HQs are discussed and an outlook is provided on NATO's plans for future, service orientated, NATO-wide GIS solutions addressing NATO GIS interoperability and standardization issues.

Paper body:

Introduction: What is NC3A?

NC3A is the NATO Command, Control and Consultancy Agency. It provides scientific, technical and analytical support to all NATO organizations, for instance to SHAPE in Belgium, KFOR in Kosovo, SFOR in Bosnia, and ISAF in Afghanistan. The scientific portion of NC3A is based in The Hague, Netherlands. One of the elements within NC3A is the Geo-Team. This knowledge center supports the different NATO headquarters and theatres on GIS and geo-related issues.

The main support for theatres and headquarters is focused on the so-called Cartographic Workshop (CWS) and on the interim GeoSpatial Intelligence tool (iGeoSIT). These two topics are discussed first.

CWS concept

Historical NATO missions have shown that the deployed Geo-Teams have had problems capturing geo-data and creating uniform map-products. The most important reasons for these problems have been:

- Inconsistent hardware and software. Each and every mission has had access to a different set of hardware and software, making it hard to relate to previous experiences. Furthermore, the resulting data sets could not be used in other applications.

- Team member experience has not always matched the available hardware and software. Team members might be trained in software product X, but have had to use product Y in the field.

To overcome these problems, the so-called Cartographic Workshop (CWS) has been established by NC3A. This CWS contains of a set of specified hardware (server, workstations, network and peripherals) and specified software (GIS software, graphics applications, office software etc.). This integrated set of software and hardware can be deployed easily during missions, and, since all components are COTS-based, team members can be trained easily to use the CWS. Since the set is unified, it is much easier and much more valuable to provide support to theatres and headquarters using this CWS environment.

This CWS project first started as IGIS, which stands for 'Interim GIS standard'. Initially, the CWS system had a first rollout in Kosovo, about four years ago. Based on user experiences, some changes were proposed to the CWS structure. The 'interim' part of IGIS is currently migrating into a mid-term solution with the rollout of the new CWS, again in Kosovo.

The CWS concept exists in two variants: a full CWS and a small CWS. The full CWS consists of a full set of hardware and software, which can be deployed easily as a full-scale mobile mapping agency. The small CWS is designed for combining pre-generated mapping products and data sets, and minor mapping tasks.

The full CWS consists of the following:

[image: p22061.gif]

For the hardware part:

- a CWS server with working database
- a Geo server for exporting the finalized map-products to different parts of the organization
- two or three workstations for the GIS operators
- a PC for the geo-data manager
- a production facility for generating CDs and DVDs in batch
- two large scale PostScript plotters
- one 36" scanner
- one or two small laser printers
- DVD writers and a CD robot

And as software:

- at least one ArcGIS ArcInfo 8.3 license per CWS, and added ArcGIS ArcView 8.3 licenses for the other machines
- MapInfo Professional 7.0
- Erdas Imagine 8.7
- PaintShop Pro and Photoshop
- MrSID compressor, ECW compressor

The small CWS is a bit less complicated:

[image: p22062.gif]

The hardware:

- one or two CWS workstations
- one geo server
- one large scale printer
- CD and DVD burners
- One small laser scanner

The software for a small CWS is basically the same as for a full CWS, depending somewhat on what the HQ actually needs.

The CWS working database

The CWS users explore, create and manage geographic data on the CWS server in their database. Once a map product is finalized, it is plotted and copied to the geo server for use in other parts of the organization, as needed. The latest versions of map products are always available on the geo server, but the original data, outdated versions, versions that are not available to the general public and working files remain on the CWS server.

The database on the CWS server is currently not a database as in 'RDBMS'. For now, it consists of a directory structure with files and personal geo-databases. A true RDBMS is currently not relevant (costs of setting up and deploying an RDBMS, heavy burdens on the Geo-Teams to address database administration issues, etc).

The CWS working database consists of three conceptual layers:

[image: p22063.gif]

- a reference GIS database
- a geo-data warehouse
- a project database

In this structure the reference GIS database contains source data and base information. This data should not be related to one specific map product, but it contains widely used, mostly topographic information. Information that one normally finds in the reference GIS database includes:

Raster: ADRG ,CADRG, local maps
GeoTIFF, MrSID, ECW
Matrix: DTED 1, DTED 2, SRTM
Imagery: Landsat, Ikonos, aerial photos, SPOT
Vector: VMAP 1, UVMAP

Shapefiles, Map Info TAB

The sources for these datasets are always external; NIMA/NGA is a big supplier of this part of the database.

The second part is the geo-data warehouse. It also contains widely used, mostly topographical information. The difference with the reference database is that the Geo-Team has to create this database themselves, and they are responsible for maintaining this database. Data that one normally finds in this warehouse includes:

- Road networks, power supply and mobile telephony infrastructures
- Borders, on any level:
 - International
 - Conflict lines
 - Administrative
- Landmine areas
- Smuggling routes
- Census information

The third and last part is the reference GIS database. It contains all the symbology, templates and predefined map documents (MXD's for ArcGIS, APR's, SXD's and WOR's in other software) that describe the published map products. If a specific map product uses one specific dataset that doesn't fit in the normal structure, it is also stored here (along with the MXD describing the map product).

This structure aids the Geo-Teams in generating consistent and correct map products, and it makes the Geo-Teams effective when a new map product has to be created under great time pressure.

iGeoSIT

iGeoSIT is the Interim GeoSpatial Intelligence Tool of NATO. It is a web-services mapping tool, developed in Java, which combines and distributes all brands of geo-information through a simple web-browser interface. To guard the security of the information displayed, this iGeoSIT tool is only available on the intranet of selected theatres, through a secure network.

The iGeoSIT system is now installed in the SFOR and KFOR intranets, and ISAF is currently rolling out.

Data for iGeoSIT comes from a number of sources:

- J2 GEO (geographic backgrounds and most of the other data common data)
- J3 JOC (Incidents (last 24 hours), Border Crossing Points)
- JENGR (mines information, roads information)
- J9 CIMIC (Reconstruction, Humanitarian Aid, Multi Ethnic Affairs, etc)

Of course iGeoSIT is a true military tool, and as such it supports MGRS coordinates, and normal military file formats.

[image: p22064.gif]

The Kosovo experience

The KFOR team in Kosovo was more or less the initial testbed for CWS, and it is also one of the first theatres to use iGeoSIT. The newest CWS has also been installed recently at KFOR, which makes KFOR a good example from a GIS point of view.

Lessons learned:

- The team showed that it is hard to maintain the initial data structure; time pressure and lack of education compromise the procedures to describe, store and retrieve data properly. As a result, repetitive support from NC3A was necessary to keep the database in good shape.
- The annotation part of map products turned out to be much more labor intensive, and therefore expensive, than expected. NC3A had to construct additional workflows and procedures to make the re-usability of map annotation better, and to retrieve corrupt map annotation stores. More than for the rest of the data, map annotation needed a truly separate approach.
- CWS workstations were originally equipped with administrative rights to all Geo-Team members, as they had to take care of maintaining the system for themselves (due to lack of fast support out in the field). This turned out to be a bad idea. The workstations deteriorated relatively quickly with installed gadgets and applications, and the price for that proved to be higher than to arrange for technical support in the field.
- The iGeoSIT system needs a full set of background maps. Where map products produced in CWS very often stick to default scales (1:250,000 is the most common one), a web-mapping tool has many zooming capabilities. To keep maps readable at any scale, it is very important to have a decent set of background maps at many scales, retrievable in a fast way. This implied that NC3A had to create accurate and recent background maps at about 8 scales in MrSID or ECW format for iGeoSIT to be successful.

NATOs future Core GIS capabilities

GIS has been identified as a Core Service to be available to all NATO users within NATO networks. GeoSpatial information is critical for most NATO C3 systems and needs to be provided centrally. In order to meet this challenge, NATO will implement a long-term network-centric GIS enterprise solution in 2006. This new architecture will provide all required GIS services in a strictly service oriented way, based on OGC and ISO standards, allowing the widest possible degree of interoperability. Centralized DBMSs will hold all geo-data resources, allowing access and version control. Furthermore, dynamic environmental information, such as meteorological data, will be provided in real time by NATO nations and will be ingested through Diodes directly into the NATO Secret networks and instantaneously available to all relevant NATO systems.

This new GEI Core Service will provide all future GIS services including the functions of the current CWS and iGeoSit.

Acknowledgements:

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Appendixes:

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End notes:

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References:

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