

## **NATO Headquarters – The Situation Center GIS experience.**

### **Abstract**

Recently, the dynamic capability of responding to a major world crisis with comprehensive in-depth information has become a crucial aspect of all large organizations. The demand from high-level players for a more complete tool that would fuse various attributes associated with the same event requires the production of an effective result in a timely fashion.

The presentation will illustrate how geospatial information can be combined with the standing NATO Headquarters Situation Centre (SITCEN) services to provide a Web-based environment to monitor global political and military scenarios. This technology will be able to pull or push information and present it with a geographic framework. The GIS, together with the hardened geo Web services can significantly enhance the current methods and practises to guarantee a globally integrated solution that supports key decision makers, task forces, and exercises at a grand strategic-level organization.

### **Introduction**

In the wake of the 1999 Alliance Strategic Concept NATO<sup>1</sup> faces new challenges, missions and organizational requirements. At Prague in November 2002, the Alliance Heads of State and Government agreed on the need for further strengthen NATO to meet the new threats and security challenges of 21st century. They approved the outline of a leaner, more effective and deployable NATO Command Structure (NCS), with military forces able to operate jointly with integrated and coherent geospatial support, across the full spectrum of military operations inside and outside NATO territory.

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<sup>1</sup> *The Alliance's Strategic Concept* (C-M (99) 21), 29th April 1999

In this sense it is crucial for NATO to develop comprehensive tools which fuse various sources and types of information in supporting the decision making process.

NATO Headquarters in Brussels is the center for collective political consultation and decision-making of the Alliance at the Grand Strategic Level, which includes the Capitals, the two Strategic Commands and the staff co-located there<sup>2</sup>.

One of the numerous bodies placed in this Headquarters is the Situation Centre (SITCEN)<sup>3</sup>. It was established by the North Atlantic Council in 1969 to provide, at the highest level of the Alliance, one central focus for Crisis Management. The SITCEN ensures a continuous flow and exchange of information between the NATO Headquarters, the Strategic Commands and the Alliance members; monitors political, military and economic matters of NATO interest; acts as a link between other international organizations with similar facilities; operates the NATO headquarters external communications and provides a Geographic Information Service to the key officials of the building. This wide number of functions allows the SITCEN to count with timely and very diverse information on issues with NATO interest.

During the last six months the geospatial branch of SITCEN, supported by the Research Cell of the Watch Branch<sup>4</sup>, has developed a pilot demonstration to illustrate how geospatial information can be combined with information originated from various sources (media and field theatres, in this case), to support the decision-making process and to meet the NATO need of responding to major crisis with comprehensive in-depth information.

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<sup>2</sup> The Capitals enclose the Ministries, cabinets, agencies and Commands, Chiefs of Defense and Embassies; the two Strategic Commands are Allied Command Operations (ACO) in Mons, Belgium and Allied Command Transformation (ACT) in Norfolk, VA-USA.

<sup>3</sup> C-M (69) 31 SITCEN TORs.

<sup>4</sup> The Watch Office (CWB) monitors, on a 24-hour basis, the international political, military, economic and terrorism situation, in particular those developments which might affect the Alliance; processes and distributes political, economic, military and intelligence information and notifies appropriate civil and military authority inside/outside of the NATO Headquarters. The Research Cell is subordinated to CWB and provides the NATO HQ staff with products that need more in-depth research and analysis than the Watch Office normally can provide.

More comprehensive information provides better discrimination between available hypotheses or decisions, reducing ambiguity and increasing the dimensionality and the quality of the data space.

The scenario chosen reflects the evolution of the bird flu epidemic in the world with specific information of each country outbreak. Within a Web-based environment accessible through intranet, SITCEN has provided dynamic maps to all NATO Headquarters staff. A server-based product, ArcIMS, has been the solution for delivering and sharing maps with open sources information. A world wide project, task-focused on the knowledge and capabilities of NATO staff, was created and linked to an Access database with particular information on each country outbreak.

## **Discussion**

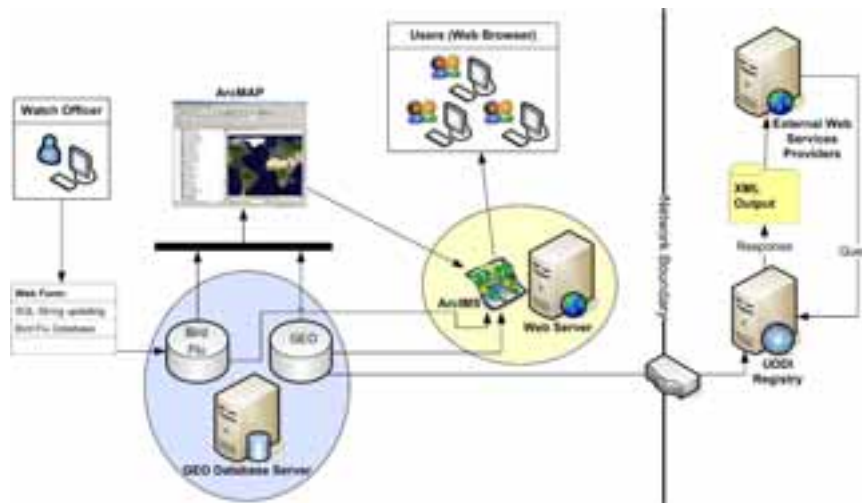
### *Project Concept*

The theory of knowledge management has constantly driven the SITCEN of NATO Headquarters in Brussels. The application of this concept has always been a fundamental element of its mission, reinforcing the term itself through the implementation of processes to help achieving organizational learning. One way to achieve such an essential knowledge management certification was to enable push-pull strategies within the headquarters. Information was pulled from operational and from crisis areas and pushed to the right group of decision-making managers of the Alliance.

Today, we know that we can count on the support of UDDI Web services (Universal Description, Discovery, and Integration) as a well known XML-based design, which allows companies and organizations to publish and discover information about their business functions and Web services offerings. Thanks to the XML format, which is platform and language neutral, information can be described, published, discovered, and invoked dynamically in a distributed computing environment such as the NATO network.

As for the bird flu project, information is grabbed, managed, and shared by three different sections to ensure promptness, certification, representation superiority and satisfactory validation.

According to the solution adopted by the SITCEN, two joint databases had been created, a geo DB and a data DB (Figure 1), which are constantly kept updated with relevant information through a web interface by the staff of the research cell and the watch office. Both DBs provide the required information to the GIS application which elaborates the information and passes it to the ArcIMS web server. In this way, information retrieved from the two DBs flows through ArcGIS and ArcIMS to finally reach all the end users equipped with just a standard web browser.



(Figure 1)

Additionally, all the resources contained in the two databases can also serve other web sites through an UDDI server to ensure information sharing in standard XML mode when the graphical interface of ArcIMS would not be required.

This project enabled the geospatial branch of SITCEN to play an active role during the analysis, design, and implementation of the bird flu task to support decision-making processes for NATO management. Again, information is pulled from the real world context and pushed in the shortest time possible to the staff of the organization enhanced with the fundamental value that a geographic representation can normally provide.

## Project Description

### Architecture

The 'Bird-flu outbreaks around the world' website uses the resources of one computer where ArcMap and ArcIMS administration software are installed. The Web server software and ArcIMS applications were installed on the same Windows Server 2003 computer. During the installation, an ArcMap Server was also added. This optional component allows an ArcGIS user to create maps in ArcMap, rather than in ArcIMS Author, and to publish the content of the map document over the Internet.

There are two main reasons why an ArcMap Image Server was chosen. First, the enhanced symbology and labeling capability of ArcMap allows users to design maps with high cartographic quality. On top of that, ArcMap Image Services, allows users not only to access the data views stored within data frames, but also to publish the map layout, the printable or displayable map, containing geographic data from data frames and cartographic elements (Figure 2 shows a screenshot of the project while running from the user side).

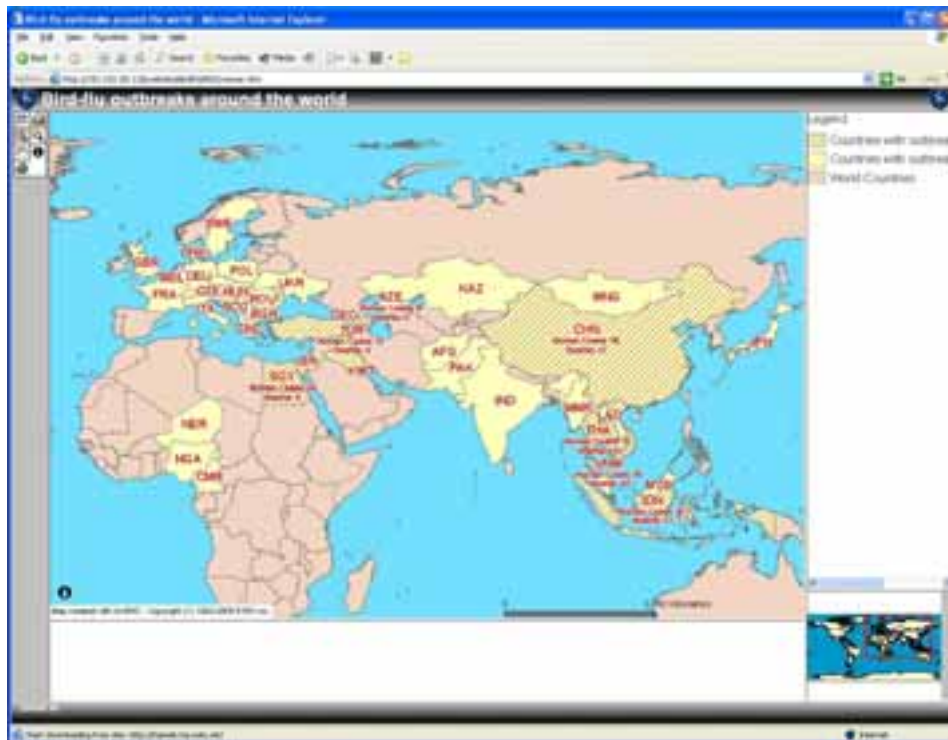


Figure 2

## Website

The interface of the website is kept very simple and straightforward by reducing the options to control the map, in order to facilitate the use of the site, since this service is being provided to a non-technical audience. Each user can zoom in, zoom out, pan to the desired map extend using the interactive map tools or returning to the full extend of the map via the full extend button.



The screenshot shows a web browser window titled "Bird Flu Database" with a sub-header "NCEM Watch Branch, Research Cell, and Geo Branch". The main heading is "Egypt" and it says "Last updated on: 6/June/2006". Below this is a table with the following data:

First Case Reported in Wild Birds		N/A
First Case Reported in Poultry	17 Feb 06	The virus has been found in 4 chickens in Giza, 2 in Giza and 3 in Minya, south of the capital.
First Case Reported in Mammals		N/A
First Case Reported in Humans	25 Mar 06	The death of a young woman was reported as the first death caused by the virus in Egypt.
Number of Humans Infected by Influenza	14	
Number of Human Deaths by Influenza	5	

At the bottom of the table area, there is a button labeled "Close this window".

Figure 3

Additionally, by selecting the identify tool and clicking on an affected country with it, a new window will pop up (Figure 3) containing all relevant and updated country information related to the avian flu. Other options on this website include a print button and a legend button. The first allows the user to create a map within a predefined layout and to export it towards a .PDF or .JPEG file while the second enables legend manipulation features.

## Service

ArcMap is mainly used to create a map document (.mxd) to author the data content. This map document was registered to the ArcIMS Spatial Server as being the source file for the map configuration of an ArcMap Image Service.

## Map document

In the map document the same polygon shape file representing the world countries is used three times. Once as a background layer, and twice joined to an Access table containing all relevant attribute information. By using two different definition queries, based on the joined attributes, these layers display the countries with outbreaks, as well as the countries with outbreaks and human cases. The combination of these three layers and data contained in the two databases, results in the current global avian influenza situation.

Furthermore, the map also shows labels containing the number of human cases and the number of deaths in the affected countries. These labels are based upon VB script code.



Figure 4

Figure 4 depicts a screenshot of the project from the user side. As we can see, geographic information and world events data can be combined to provide dynamic capabilities in a very reduced time.

## **Conclusions**

The SITCEN, with its access to defence-intelligence related channels, continues to provide NATO Headquarters in Brussels with constantly rationalized information thanks to the dynamic models applied to its system models.

The SITCEN has the requirement of monitoring NATO operations and major world crisis and, at the same time, gathering as much information as possible –from either open sources or intelligence channels – and binding all the relevant parts and present it to the key decision players.

It is in this specific task of information management and data manipulation that SITCEN plays a central role at the top of the NATO organization.

SITCEN accepted the challenge of the GIS business in fall 2002 and gained a more perceptible role in the process of information handling, representation, and supervision. Today, the Geospatial Branch is present at the 26<sup>th</sup> ESRI International User Conference to bear out the weight that GIS tools have on the success of organizations committed to the support of key decision managers.

It is certain that this technology will continue to significantly enhance the current methods and practises put into play by a vast number of organizations around the world, to ensure a more scalable integrated solution, particularly in support of security and defence-intelligence organizations.

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