

Seven Layers of Wisdom

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(Editor's note: Excerpted from an article by the author entitled "GeoGlobe and the Seven Layers of Analysis.")

The difference between data and information is context. Without background or basis for comparison, the value of the data is limited to a single scope. The goal of the "seven layers of analysis" is to consolidate a vast array of both current and historical data into a single user-friendly platform to create a common operating picture for the Afghanistan operational environment, removing the need for multiple systems or software applications. The seven layers builds its data from the most fundamental geospatial layers up to the active threats operating throughout the country, providing the user the ability to visualize a comprehensive, tailored view of the current condition of the operational environment.

The seven layers of analysis has already impacted an extraordinary amount of users within Regional Command-East (RC-East) through it remains at a relatively early stage. Users of the seven layers structure for analysis span the gamut from decision makers at the regional command headquarters to the company intelligence support teams in the most austere areas of the battle space.

Paired together with the Army Geospatial Center's (AGC) GeoGlobe, the seven layers have given an unprecedented ability to users throughout Afghanistan for on-demand access to a wealth of information, which in the past would have required extensive preparation and multiple systems to visualize. The structure also provides endless possibilities to how the data can be visualized, analyzed and used to create fuller understanding of complex problem sets, all contextualized and customized by the user.

The inspiration and planning of the seven layers of analysis began well before GeoGlobe was selected as the geospatial visualization service of choice for the project. Lieutenant Colonel David Pendall, the First Cavalry Division G-2, envisioned creating a structured analytical process spanning the entire operational environment. The goal was to form a method of analysis incorporating multiple information and intelligence sources into a single platform. Almost as important as the data, however, would be the way it was structured. The data needed to be structured in a manner that was conducive to an analytical mindset. Information needed to be categorized according to its type, but placed in a user-friendly environment that allowed the different layers to be integrated on demand for a variety of analytical assessments.

Contextual Relationships

The core of the seven layers process revolves around creating contextual relationships between differing categories of information. The critical requirement is the capability to easily display and compare the selected data sets by the analyst or staff user. Each of the seven layers are overarching categories (meta layers) to catalog information. When a particular layer is opened, a wide range of data sets (micro layers) become available that can be individually turned on and off (visualized) at the analyst's discretion. This feature provides the user the ability to evaluate and relate information that at first look may have not appeared to correlate. Compiling a vast data set and including it within a 3-D environment removes the data mining and organizational process for the user and allows immediate comparison, analysis, presentation and most importantly understanding.

The seven layers concept begins with the geospatial foundation. Annotated natural features such as valleys, mountain passes and rivers provide the foundational datasets within the geospatial layer. Also included are slope maps based off of terrain, display areas that can be traversed by vehicle or foot traffic, and areas that are level enough to be used as a helicopter landing zone. Weather data also plays a role in the geospatial layer. Within the first layer, the user can view a variety of dynamic information on the weather, not just in Afghanistan but in the entire region including air transit corridors.

The second layer centers on the social framework of the country. The data focuses not just on where people live, but also their organization. Basic social data such as city and village locations are supplemented with population density and annotated areas of specific tribal, ethnic and religious groups. This layer also contains atmospheric measurements measuring the populace's support for the Afghan government, Afghan national security forces and coalition forces.

Infrastructure comprises the third layer, which ties in heavily with the social aspect. Infrastructure consists of anything man-made that causes or supports human interaction. Lines of communications as well as essential structures such as dams, bridges and karez systems (or underground irrigation channels) are included within the third layer. Infrastructure also includes cell phone tower data with detailed information on specific nodal locations and signal propagation coverage.

The fourth layer consists of both formal and informal political information at all levels of the Afghan government and society, including local powerbrokers, tribal elders and village councils. International boundaries as well as provincial and district boundaries for both Afghanistan and Pakistan are annotated. The political layer also contains detailed information about the primary members of the provincial and district government with an included assessment for each of them, providing the user an immediate review of the governance structures in the selected province, district or village.

Development and infrastructure construction for the country is the focus of the fifth layer. The data within this layer displays information regarding public works projects that benefit the people at the district and provincial level, as well as changes in the community brought about by development which impact the way people will interact, such as new roads, electrification or schools. The layer not only contains current projects, but also historical locations and information about past works. Each category is based on the status of the project and is color coded allowing a quick look of the stages of projects in an area. Selecting a point provides detailed information on the project type, goals, priority and cost. The development layer also allows the user to view where commander's emergency relief program funds are being utilized and how these relate to the situation and populous of the area.

The subject of the sixth layer is security. The most important and necessary components to the security layer are Afghan national security forces and coalition force mentorship locations throughout the country. The layer also contains boundaries for major task forces, minor task forces and the Afghan national security forces. To accompany the task force boundaries, there are also named areas of interest for each of the battle space owners. Operational graphics for named operations of concern to the division and campaign plans have also been added to the layer to allow interaction with other datasets in order to enhance what has traditionally been a static product.

Threat Visualization

The seventh layer contains the current enemy situation (confirmed and templated) for the region, developed by CJ2 analysts and vetted with each battlespace owner. The seventh meta-layer of the seven layers is intentionally the last. The seventh layer visualizes the threat throughout the battlespace and is best understood when viewed in context of the previous six meta-layer relational analysis. To further enhance the enemy visualization, both current and historic densities of kinetic events are provided, available by month, season and year. Gaining understanding of the threat necessitates the use of the other six layers in order to gain perspective on why and where events occur. Without integrating the threat with supplementary data, the relevance and significance diminishes as the context is lost.

The seven layers process was initially tested during the First Cavalry Division headquarters military readiness exercise in preparation for deployment to Afghanistan as the RC-East Headquarters. During the exercise, six paper maps were created, each representing one of the first six layers. The seventh layer, threat, was a transparency that could be overlaid on any of the other layer maps.

By overlaying the threat on any of the other maps, the benefit of the concept was immediately evident. An example of its effectiveness was when the threat layer was overlaid to the security layer. Instantly there was a visible correlation between the gaps in coalition force presence and their effectiveness, where governance was strong or weak, and where demographics trended in support or opposition to the government or the insurgency, viewed in relation to where the insurgency was actually operating.

At that point it became clear to the staff that this tool would be crucial in providing a greater understanding of not just the enemy situation, but also how it relates to every other dataset that was displayed in this manner. The concept was proven to be successful, though a highly manually intensive effort, but the actual system in which it would be employed was still undetermined. The solution wasn't clear until the division arrived in Afghanistan.

The first time the GeoGlobe software and servers were used by First Cavalry Division was upon arrival in theater. The outgoing unit's geospatial intelligence cell was using the software heavily for 3-D geospatial visualization. The 101st Airborne Division was relying on the GeoGlobe platform more than the established Google Earth servers already available. The capabilities of the tools within GeoGlobe were explained and its impact was evident by the extensive use of the software in daily imagery production. The division G-2 and the GEOINT team critically examined the software and server infrastructure already in place. The power and utility was clearly apparent; GeoGlobe was the ideal software for visualization of the seven layers.

The primary interface for the user is the software TerraExplorer. TerraExplorer contains an abundance of unique features that made it the leading candidate program to incorporate and visualize the seven layers. ♦

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