# The Defense Logistics Agency
# Map Catalog Program

# Eye on the Future – Building a GIS for DLA

## Introduction

The Defense Logistics Agency (DLA) catalogs, stocks and distributes over 7 million active items to provide the U.S warfighter supplies they need to complete their mission. DLA procures stocks and issues uniforms, weapons, tools, food and medicine as supply items to support the many missions of the U.S. military. Maps, charts and other geospatial items of supply produced by the National Geospatial-Intelligence Agency (NGA) are among the 7 million items managed by DLA. The Richmond Map Facility (located at the Defense Supply Center – Richmond) manages and distributes almost 90,000 geospatial items. In addition to the main map warehouse, strategic map stockpiles are maintained at several forward locations as well. To find and obtain required maps and charts, the war fighter uses the DLA Map Catalog.



**Figure 1 (DoD/DVIC, SSGT Quinton T. Burris, USAF)**

The Defense Logistics Agency (DLA) assumed the map supply mission from the former National Imagery and Mapping Agency (NIMA), currently known as NGA, in 1996 as a result of difficulties encountered distributing these products during the first Gulf War. Getting the maps into the theater and to the forward deployed units proved difficult "because the distribution system was jammed."[1] NIMA and DLA signed a Memorandum of Agreement to hand over responsibility for cataloging, catalog production, item management, and distribution of these vital items to DLA. As part of this agreement, stockpiles of maps were moved to Richmond, and DLIS inherited the NIMA map catalogs; a series of hardcopy volumes of all maps, charts and digital products that were available.

Maps, charts and geospatial items are assigned to Federal Stock Classes (FSC) according to map type and usage. When the catalogs were transitioned to DLA, there was a hardcopy catalog for each of these stock classes:

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[1] McDonnell, Janet A. "Supporting the Troops: The U.S. Army Corps of Engineers in the Persian Gulf War", October 1, 1996, http://www.usace.army.mil/publications/eng-pamphlets/ep870-1-50/

- Aeronautical Charts and Publications (FSC 7641)
- Hydrographic Charts and Publications (FSC 7642)
- Topographic Maps  (FSC 7643)
- Digital products (FSC 7644)

These catalogs were maintained with regularly produced hardcopy chart bulletins and supplemented by special area and crisis catalogs. DLA assigned production of these catalogs to the Defense Logistics Information Services (DLIS) in Battle Creek, MI. Catalog production and maintenance at DLIS was performed by three full time cartographers. The cartographers worked with DLIS publishing experts to produce these catalogs on an annual cycle. Because NGA produces new maps on a daily basis, it was impossible to keep the catalogs current to reflect new or deleted products. As a result, the hardcopy catalog system was cumbersome for the end user as they had to make constant pen and ink changes to maintain currency. Producing and maintaining the paper volumes was resource intensive for DLIS and it was expensive to print, store and distribute the catalogs. The hardcopy replication and distribution alone accounted for more than half the budget (approx. $500,000.00) of the map catalog program.  In order to comply with the agency mission statement, *"To Provide Best Value Integrated Logistics Solutions to America's Armed Forces and Other Designated Customers. . .in Peace and in War . . . Around the Clock, Around the World."*[2]; DLIS began a journey to exploit GIS technology to produce an electronic version of the map catalog.

## *Development History*

In the early 90's,  NGA had attempted to implement a "softcopy catalog." They were, however, unsuccessful. In June 2000, the DLA Map Catalog team met with a representative from the former Defense Mapping School (now National Geospatial-Intelligence School), to discuss a better way to produce a catalog of NGA maps. Since DLIS was already using Environmental System Research Institute (ESRI) ArcView 3.2 Geographic Information System (GIS) software to create graphics used in the hardcopy catalogs, it became clear that this software application would facilitate distribution of the data in a softcopy/CD-ROM format. The initial CD-ROM catalog was produced using the ESRI GIS data viewer ArcExplorer. DLIS obtained a license to distribute this software and bundled it on a CD with preprogrammed ArcExplorer projects (.aep files) and catalog data for each map and chart series. In addition to providing a new venue for the catalog data, this process also combined all volumes of the catalog into a single CD-ROM. Shapefile data to support this GIS was obtained from a DB2 database using standard Structured Query Language (SQL) queries. After three months of development, the prototype CD-ROM catalog was distributed to all map catalog customers in September 2000. The new catalog format was revolutionary and demonstrated to the map catalog community that these catalogs and their supporting data could be portrayed and distributed in a much more effective manner. Customers provided feedback and suggestions on how to improve the catalog system. These suggestions formed the basis for functional improvements (enhancements) to the map catalog.

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[2] Defense Logistics Agency Strategic Plan, FY2006 – FY2013, Pg.4
http://www.dla.mil/library/StratPlaFY06to13.pdf

DLIS continued its partnership with ESRI to develop a catalog application based on MapObjects (MO) Java, another new technology that ESRI had just released. While the ArcExplorer catalog offered some solutions to the basic catalog production problem, it still required the user to have a fundamental knowledge of GIS to make the catalog work effectively. Also, at this stage in development, there was no ordering capability in the catalog. The user still had to prepare a Military Standard Requisitioning and Issue Procedures (MILSTRIP) map order and submit it via proper channels to obtain desired maps. The new MO Java catalog would be more intuitive, and would automatically produce a map order. To meet these objectives, ESRI developed a graphic user interface (GUI) specifically designed to query the product databases stored within the new CD version of the catalog. It also allowed the user to select maps and charts to add to a shopping cart that would then automatically build a MILSTRIP map order that could be sent to the map distribution center via online DLA ordering systems.

The 11,000 DLA Map Catalog customers of today employ a user-friendly application that empowers its military and civilian customers to locate, identify and order maps and related geospatial products very efficiently. (See Figure 2, below)
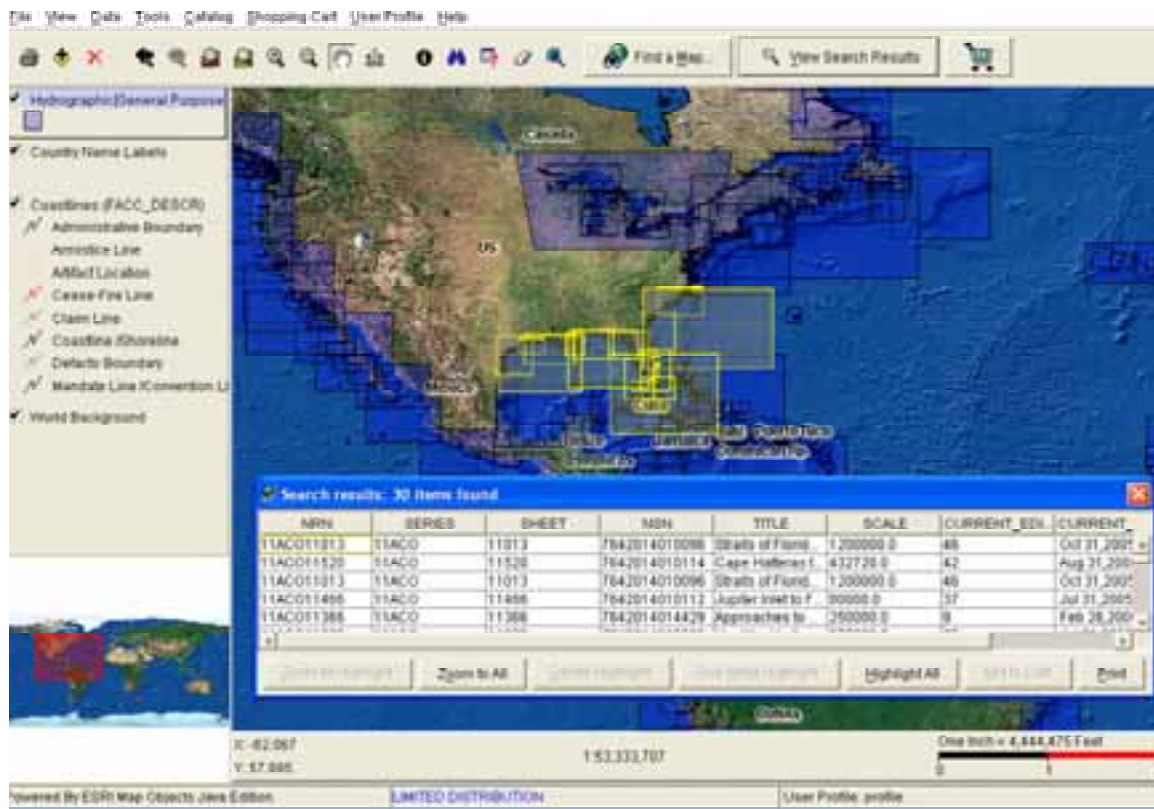


**Figure 2 (DLIS / DLA Map Catalog Screen Shot)**

## *GIS Technology – Powering the Map Catalog*

DLIS and the DLA Map Catalog Program have sought to use the best technology tools to bring the power of GIS into the hands of military, government and civilian map customers. In doing so, DLIS and the Map Catalog Program have developed a solid and ongoing partnership with ESRI, centered on the development of efficient and user

friendly GIS solutions to meet the needs of geospatial data acquisition requirements for civilian and military customers.

To meet the needs of map customers, the DLA Map Catalog program uses a robust enterprise GIS architecture integrating ArcGIS, Arc SDE, Arc IMS and an Oracle-driven server. The hardware to make the Map Catalog is comprised of various SunFire servers arranged in a configuration that provides security, flexibility and survivability. (See Figure 3)
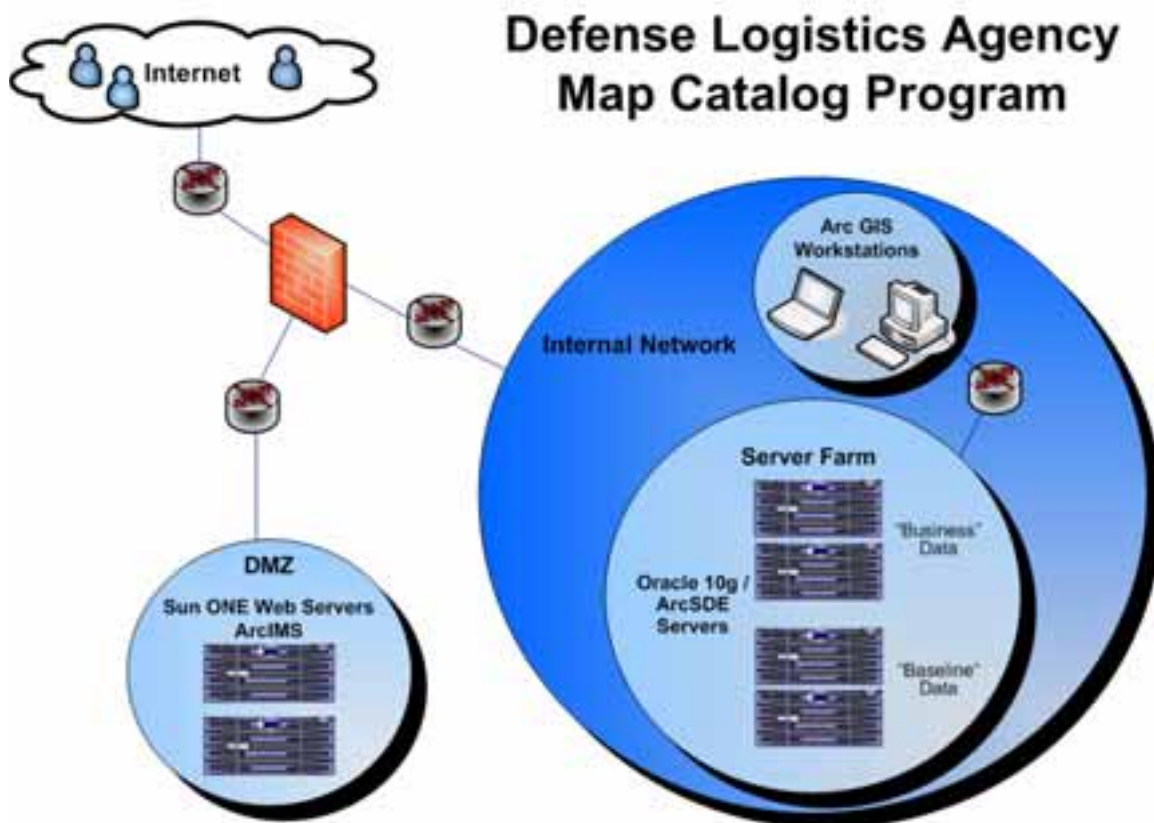


**Figure 3 (NGIT, Wendy Wassa)**

The DLA Map Catalog team has constructed a secure enclave by implementing a "Defense-In-Depth" approach, which is a strategy that emphasizes security system diversification as a way to ensure effectiveness. In simple terms, it means that using multiple security components in various locations of the network, each performing different roles, will likely provide better protection than relying on a single component to provide all security functions. All critical assets (servers, databases, workstations, etc), are situated inside the internal local area network. Only users with proper authorization will be able to reach these protected resources. These resources include ArcGIS Workstation, ArcSDE, and Oracle 10G. Web servers featuring SunOne Web Server (formerly Iplanet), and ArcIMS are located in the "demilitarized zone (DMZ)". This two-tiered arrangement affords a sufficient level of protection. All assets are "hardened"[3] to the fullest extent possible. Any identified security vulnerabilities are normally addressed within hours of announcement. Upgrades and patches are applied using the DLA

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[3] "Hardening" refers to the system administration practice of locking down system processes and privileges, allowing appropriate user access to those processes and resources required by the user.

Computer Emergency Response Team (CERT) process.

The DLA Map Catalog enterprise arrangement is also flexible. Databases and ArcSDE instances have been created based on function and audience. For instance, baseline data has been warehoused in an Oracle instance as a read-only resource. Since this data is not sensitive and requires no change, it is separated from more volatile data. This is a good idea for two reasons: first, this "read only" data needs to be backed up only once; second, since the resource is read-only, different tactics can be employed with archive logging and tablespace specifications. The baseline geodatabase instance is used as a shared resource for other DLA projects. The DLA Map Catalog product feature classes contain the business content of the DLA Map Catalog. As such, these feature classes exist in a development geodatabase and are ported to production after a rigorous set of Quality Assurance checks are performed.

In the event of a catastrophic occurrence, the enterprise architecture is also survivable. Redundancy has been built into the configuration. The function of every server is duplicated with a server of equal specifications. Applications and operating systems require upgrades; hardware malfunctions; software requires patching. All of these issues will result in a loss of service if not addressed. For that reason, the entire system is backed up by a redundant second system. This situation affords the ability to maintain a true 24x7 presence. Equally as important as redundancy in the number of servers, hardware was selected with maximum survivability with RAID arrays, hot-swappable components, and dual power supplies. The enterprise was designed to sustain operations as it serves the needs of the program as we provide information to the warfighter.

With little change in personnel, DLIS has expanded its role in DLA from providing simple map inventory shape files to providing multiple GIS services including an enterprise-wide GIS application. The current GIS initiatives involve integrating GIS into current DLIS logistics applications. By introducing the rest of the agency to the power of GIS, the team hopes to expand the role of GIS in the agency. There are many other areas in the logistics arena besides maps and geospatial items of supply that can benefit from the use of GIS. Contractor and Government Entity (CAGE) Codes contain location data that can be portrayed and analyzed with GIS. True asset visibility can be achieved by geocoding items and sources of supply and integrating location intelligence into the supply chain. By broadening our scope we can insure that other tasks performed by the warfighter on a daily basis can be made as efficient as ordering maps and charts.

The Map Catalog Team is also working diligently to leverage its collective GIS expertise in support of the entire DLA logistics operation. By exploiting the combined knowledge inherently gained by working with GIS and in a logistics organization the team is building a solid foundation to continue to support the Map Catalog while developing supply chain analysis capabilities. Such a program provides a maximum benefit to the main customer, the warfighter, and also is an important benefit to the taxpayer. As a leader in the field of logistics information, DLIS can enhance its existing applications with location intelligence. GIS can add value to existing DLIS programs and applications by adding the power of place, and linking these systems to provide complete logistical support; search, locate, order and track.  An address database record of an item of supply is useful, but a map showing the actual location of that item in relation to the manufacturer, inventory control point and customer…that is unleashing the true power of GIS.

## Customer Support

The key to the program has been and remains customer support. All members of the team interact with customers, provide assistance and listen to feedback. Without this customer interaction, the map catalog would not have evolved into the extremely successful product it is today. Moreover, as an example of customer support, the program has partnered with NGA on  routine fleet visits to Navy installations, visited Marine Corps camps, and Army and Air Force bases to demonstrate the Map Catalog, and field questions on site. Such activity has spawned dialogues with customers leading to a greatly improved catalog with several key enhancements. These enhancements have come primarily from the user feedback that the team uses to fuel the improvement of all versions of the catalog. Some of the highlights of the newest version of the catalog include the ability for navigators to enter waypoints into the catalog and select all the charts along their route, the ability to save searches that are frequently performed, as well as the ability to add their own shapefiles to the catalog that they can then use to select products. Without the feedback from the users, the catalog would not be the product that it is today.

The program has instituted a customer relationship program highlighted by an annual DLA Map Catalog User's Conference. The conference has been held in San Diego, California, Aberdeen, Maryland and will be held next month at Fort Lewis, Washington. Customer feedback from the conferences has been very favorable. The conferences provide a platform where users can attend presentations by the team demonstrating a range of instruction from basic user functionality to advanced catalog capabilities. In addition to the instruction, the team opens up a "Doctor's Office" where users requiring individualized attention can discuss map catalog issues one on one with members of the production team.

The DLA Map Catalog team also resolves customer issues and assists catalog users over the phone and through E-mail. With a 24x7 Customer Interaction Center (CIC), any request for assistance, either technical or training, is issued a service ticket that is created using SAP/CRM (Customer Relation Management) software and assigned to the team for callback and resolution.

In addition to its support of the warfighter and government agencies, DLIS, in partnership with the Federal Aviation Administration (FAA), has released a Public Sale Map Catalog of hydrographic products for all civil mariners. The Public Sale Map Catalog contains all Unlimited Distribution products produced by NGA and distributed by the FAA. In January 2006, DLIS released its second version of the Public Sale Map Catalog. It is popular with the civilian mariner and authorized chart agents, reflected by the 800 map catalogs ordered from DLIS. For the 3$^{rd}$ Edition of the Public Sale Map Catalog, DLIS plans to add aeronautical charts and collaborate with other Federal map agencies to portray other public sale map items in the Public Sale Map Catalog. The 3$^{rd}$ Edition of the Public Sale Map Catalog is scheduled to be released in January 2007.

## Future Initiatives

As the DLA Map Catalog program has evolved from hardcopy to CD, requirements from military service system administrators necessitated a movement toward an online Map Catalog implementation. In July 2005, the program launched the Secret Internet Protocol Router Network (SIPRNet) version of the online catalog. This iteration of the map

catalog avoids issues associated with client side software installations and network/system security issues addressed by initiatives such as the Navy-Marine Corps Intranet (NMCI). In December 2006, the program will launch its Non-Classified Internet Protocol Router Network (NIPRNet) catalog application. While the Map Catalog is in the process of gaining NMCI Certification, the online catalog will provide an alternative source for map catalog information.

The online map catalogs will be utilizing a 1 terabyte imagery backdrop called NaturalVue for both online versions. NaturalVue will give the customer a 15-meter resolution imagery backdrop of the world. This should prove to be especially useful to the customer interested in the "pitches and ditches" view of specific geographic areas. NaturalVue will add a new and unique dimension to the catalog where relief portrayal will aid in the selection of maps, especially in areas of troop supply movement, reconnaissance/intelligence efforts, battlefield preparation and situational awareness.



**Figure 4 (DoD/DVIC, LCPL Kevin C. Quihuis Jr., USMC)**

## *Conclusion*

In the past few years the Map Catalog Team has been advancing the GIS mission throughout the agency through our partnership with the item managers at the Defense Supply Center – Richmond (DSCR) and the distributors at the Defense Distribution Mapping Activity (DDMA). Whether it be by presenting a "Proof of Concept" to other branches at DLIS or by just keeping up with the latest GIS happenings, the Map Catalog Team has made it a priority to keep the program growing. As the various catalogs become less labor intensive to maintain, the team will focus its resources on bettering existing products at DLIS through the use of GIS technology and partnering with DSCR and DDMA to better manage the supply chain through GIS. As these future initiatives grow, however, the team will never lose sight of their main focus, which is and always will be providing superior support to the warfighter. With the DLIS mission focused on logistics, it makes logical sense that the agency moves toward a world where logistics is integrated with and exploited by GIS.

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## Image Credits

1. US Army (USA) First Lieutenant (1LT) Tamara Montgomery (foreground), Public Health Civil Affairs Specialist, 358th Civil Affairs Brigade, and US Marine Corps (USMC) Marines assigned to the 21st Weapons Company Combined Anti-Armor Team, 2nd Battalion, 1st Marines Division, Corporal (CPL) Jeff Duarte (center), and Sergeant (SGT) Joshua Guffey, view a MAP to find a grid coordinate in the town of An Nasariyah, Iraq, during Operation IRAQI FREEDOM. Camera Operator: SSGT QUINTON T. BURRIS, USAF  Date Shot: 14 Apr 2003, Department of Defense, Defense Visual Information Center, Riverside, CA
2. DLIS GIS System Architecture Diagram (Northrop Grumman Information Technology / Wendy Wassa)
3. Marines, 7th Marines Fire Support Command Center (FSCC), study a MAP of an area of Kuwait. They will use this as a guide to build a topographical model simulating the terrain, aiding the troops to visualize the battlefield as a whole as they plan their maneuvers during Operation ENDURING FREEDOM at Camp Coyote, Kuwait. Camera Operator: LCPL KEVIN C. QUIHUIS JR, USMC  Date Shot: 1 Feb 2003, Department of Defense, Defense Visual Information Center, Riverside, CA
4.  DLA Map Catalog application screen image (DLIS)