Deploying Maryland Data to The National Map

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Deploying Maryland Data to The National Map

Executive Summary

The USGS project *The National Map* is intended to give the Nation access to current, accurate, consistent digital data and topographic maps derived from those data. Through a nationwide network of data partnerships, *The National Map* will be a regularly updated, seamless set of public domain geographic base data. Partnerships must take responsibility to provide an assortment of data sources, production, and operating environments for the common good.

Through National Spatial Data Infrastructure (NSDI) Cooperative Agreement Program (CAP) grants, the Towson University Center for Geographic Information Sciences (TU-CGIS) has become Maryland's portal to *The National Map* and is charged with helping organizations in Maryland publish framework data for the common good. The procedures discussed in this document are designed to help Maryland organizations and agencies overcome policy and technological barriers that hinder their contributions to *The National Map*.

Accurate, accessible digital data can be critical to national homeland security and emergency management. Contributed data must conform to Open Interoperability Standards. Data that are created at the local level are generally more accurate and up-to-date. TU-CGIS provides technological resources that can overcome policy and technical barriers to data sharing. Once policy issues are resolved, the Open Interoperability Standards program allows communication and data sharing among multiple levels of government.

The National Map is a data resource. As partnerships and contributions increase, the value of *The National Map* increases.

Deploying Maryland Data to The National Map

Introduction

The National Map is an effort led by the United States Geological Survey (USGS) to ensure that the Nation has access to current, accurate, nationally consistent digital data, as well as topographic maps that are derived from those data. The result of *The National Map* initiative is a seamless, continuously maintained set of public domain geographic base information that will serve as a foundation for integrating, sharing, and using other data easily and consistently. *The National Map* project organizes and manages access to data sources by building a nationwide network of data partnerships. The partners store, maintain, and serve their own data. *The National Map* depends on local level government contributions of current data.

Information about the nature and the responsibilities of the partnerships is available at <u>http://nationalmap.gov/partnerships.html</u>.

Through National Spatial Data Infrastructure (NSDI) Cooperative Agreement Program (CAP) grants, the Towson University Center for Geographic Information Sciences (TU-CGIS) has become Maryland's portal to *The National Map*. The TU-CGIS role is to help organizations in Maryland publish data to *The National Map* and to provide assistance with two main concerns that organizations may have. The first issue is *political*, relating to policies at various levels of government that impede contributions to *The National Map*. The second issue is *technical*, where hardware, software, and other technical requirements may hinder contributions to *The National Map*.



Figure 1

The National Map Viewer

Framework Data

The National Map focuses on the following eight base map themes.

- 1) Boundaries
- 2) Elevation
- 3) Names
- 4) Hydrology
- 5) Land Use/Land Cover
- 6) Orthoimagery
- 7) Structures
- 8) Transportation

Components

Primary components of The National Map include the following.

1. Viewer Application (http://nmviewogc.cr.usgs.gov/)

The viewer application provides an interface through which partnering agency data can be accessed. The viewer is hosted by USGS and serves as a national resource for the entire United States. The underlying map services can be accessed through a variety of other means as long as client software complies with appropriate Open GIS Consortium standards.

2. Catalog Service

The National Map's catalog service provides an application programming interface that allows http requests to be made to the service. This service responds with XML and DTD responses that allow for metadata information to be returned to the client application, as well as the ability to retrieve minimum bounding rectangles (MBRs) and queries.

3. Catalog Database

In order to maintain a proper inventory of data accessible via *The National Map*, a catalog database maintains information about data content and its URL or Web service location. The database contains a list of thematic layers along with their classifications and relationships to one another. Searching the database provides users (or programmers) with information such as the layers that are included in each service and the geographic extent of individual layers.

4. Web Map Services

Data publishers are required to have a standard Open GIS Consortium (OGC) Web Map Service (WMS) interface to access geospatial data; however, they may employ various methods to store, organize, and serve their data.

Data stewards share data to *The National Map* through the use of Web-based mapping technology. The technology is known as a "map service." Map services allow .geospatial data to be shared across the Internet. Publishing to *The National Map* requires that OGC standards are employed—specifically, the WMS standard. Because *The National Map* employs locally rich data to provide a consistent framework of data for the entire nation, the data resources are available to anyone to incorporate into their own mapping applications.

These components interact with one another in the following way:

The user creates a request from *The National Map* viewer. The request includes the geographic area of interest, scale, and themes. Based on the search criteria set by the user, the viewer sends a request to find Web services that meet the criteria. The Catalog Service then queries the Catalog Database, formulates a response, and sends it to the viewer. The viewer sends a request to each of the Web map services requested by the user and listed in the response, and then the results are displayed to the user. This processes is repeated each time the user takes any action that changes the viewer, such as pan, zoom, refresh, etc.

Maryland's Participation

Through a series of NSDI Cooperative Agreement Grants, TU-CGIS is serving as Maryland's gateway to *The National Map*. Components of this gateway include the following.

Maryland's FGDC Clearinghouse node

FGDC's main Web site and clearinghouse now contains links to the Maryland metadata server, which provides access to all metadata produced by state and local government agencies in Maryland. In addition, interested parties can find metadata for the Chesapeake Bay Program, whose territory incorporates the entire Chesapeake Bay watershed, including parts of Maryland, Virginia, West Virginia, Delaware, Pennsylvania, and New York.

Maryland Mapping Resource Guide

The Maryland Mapping Resource Guide (MMRG) is Maryland's one-stop portal for GIS resources in across the state. Users of the MMRG can search for information on Maryland data, projects, MSGIC contacts, and other GIS related tools and resources using a customized search engine. Search results offer users the option to preview OGC map service-enabled data in an OGC WMS interactive viewer and then link to

data download sites. A special map viewer is available to explore selected Maryland Government Agency datasets. A set of tools allows users to create and post, or import their metadata to Maryland's NSDI node, which is harvested by the Geospatial One Stop (GOS).

Serving Data to the National Map

⇒ During 2004-2005, TU-CGIS partnered with the Maryland State Highway Administration (SHA) to serve county level centerline data to *The National Map*. Maryland SHA is actively involved in a Statewide Cooperative Centerline project to vertically integrate road centerlines between counties and the state. The Shared Centerline Program began in 2001 and has resulted in methodology that allows local governments to provide centerline and address information, while SHA provides roadway distance measurements, linear referencing, quality control, and data validation. Although neither entity actually edits the other's data, the project allows better exchange of information about the roadway system, gives each entity a common model when referring to the system, and provides opportunities for more efficient collection of information about roadway assets.

The following activities occurred as part of the FGDC/NSDI 2004-2005 CAP project effort.

- Assisted Maryland SHA with creating a Statewide Centerline dataset and subsequently publishing it to *The National Map* as a Web Map Service.
- Assured compliance with applicable International for Organization Standardization (ISO), Federal Geographic Data Committee (FGDC), and Open GIS Consortium (OGC) standards.
- Cataloged the Web Map Server (WMS) in the Maryland Mapping Resource Guide (MMRG), which is harvested by the Federal GOS.
- Created a "Deploying Maryland Data to *The National Map*" white paper to further such efforts in the State of Maryland

TU-CGIS and SHA developed a methodology in which the centerline data remain current. The data are hosted on servers at TU-CGIS but are maintained at SHA. An innovative system of secure Web folders that can be accessed by SHA and TU-CGIS and used to move large datasets was developed. The Webdav protocol was implemented to allow efficient transfer of large files in a secure environment.

The success of this project depends on its sustainability. Technical work included researching, prototyping, and documenting the use of different tools for publishing a WMS. These include ESRI's "out of the box" WMS connector, ESRI's downloadable WMS connector, and the Minnesota Map Server. We currently have deployed and cataloged a Web Map Service of publicly available statewide data in the MMRG. TU-CGIS also developed a custom Web client for WMS map services.

⇒ During 2005-2006, TU-CGIS worked with MSGIC, the Maryland Department of Natural Resources (DNR), Howard County, and the Eastern Shore Regional GIS Cooperative (ESRGC) to strengthen Maryland's orthoimagery contribution to *The National Map*.

The following are the FGDC/NSDI 2005-2006 CAP project objectives.

- Inventory the readiness and completeness of Maryland counties' large-scale digital orthophotography data throughout the state for incorporation into *The National Map*.
- Work with local governments to determine specific data distribution policies and data sharing concerns to determine a satisfactory method for contributing data to *The National Map*.
- Assist DNR and ESRGC with database development and documentation to prepare the data for *The National Map*.
- Create Web Map Server (WMS) for Maryland imagery and catalog the imagery in the Maryland Mapping Resource Guide (MMRG) at <u>www.marylandgis.net</u>, which is harvested by the Federal GOS.
- Update the white paper resource for Maryland state and local government agencies called "Deploying Maryland Data to *The National Map.*"
- Participate in current MSGIC efforts toward data and technology interoperability.

TU-CGIS developed a survey to inventory the data available in Maryland counties and to identify the data sharing policies within each county. Follow-up phone calls were made to all counties after the allotted amount of time to complete the survey had passed. Work with counties to identify and overcome their impediments to sharing data began in earnest. A Memorandum of Understanding (MOU) was developed to establish an agreement between TU-CGIS/MSGIC and the counties that will allow TU-CGIS to serve their data to *The National Map*. All of the county GIS offices have received a copy of the MOU.

Overcoming Fundamental Problems with Data Sharing

Two primary obstacles limit the ability of Maryland jurisdictions to serve data to *The National Map* In some cases, jurisdictions lack the requisite hardware, software, and technical skills that are critical to data sharing. Even where this technology exists, however, jurisdictional and political policies frequently act as barriers to data sharing.

Technical Barriers

Local government IT budgets often do not support the cost of hardware, software, and personnel required to share data geospatial data outside of their organizations. For certain datasets, such as aerial imagery, the storage requirements and technical skillset to deploy functional solutions are difficult to maintain. This lack of technical resources hinder an agency's ability to share their data to *The National Map*. While the expense of software can be mitigated through the use of open source software packages for data

serving, organizations might not have the requisite technical expertise with Internet based mapping applications.

Political Barriers

While adequate technology might be available in Maryland for data sharing, there are often policy barriers at various levels of government. These barriers include data licensing, security, liability, and cost recovery policies. Addressing policy barriers necessitates examining one of *The National Map*'s underlying principles: Local level datasets are critical. Many government agencies have a stake in the development and management of spatial data resources, but local level data are generally the most accurate and complete with regard to the framework layers required for *The National Map*. This increased accuracy and completeness, however, is often the result of a large commitment of financial and staffing resources allocated to developing and maintaining the data. In order to protect these investments and provide sustainable funding to maintain them, data licensing agreements, security, and fees are often implemented.

These protection measures, however, run counter to the fundamental tenets of *The National Map.* Specifically, agency policy that requires a data licensing agreement to be signed before releasing data impedes the ability to share framework layers to the public. Data security, if too restrictive, threatens the ease of access to the data. Liability issues may also occur if not addressed properly. Once distributed, if the data are modified, data creators should not be held responsible for the integrity and quality of the data if a poor decision is made as a result of data misuse. Cost Recovery practices are common, since creating or obtaining and maintaining spatial data can represent a large portion of a local government's budget. Resulting fees for data, however, work against efforts to seamlessly share data across governmental boundaries.

Maryland's Approach to Sharing Data to The National Map

Establishing a Repeatable Process

Through effective partnerships, *The National Map* gives users access to data nationally. The issues summarized above must be resolved before agencies will be confident about participating in any data-sharing effort. Since 2000, TU-CGIS has been partnering with MSGIC through USGS CAP grant funding to develop a functional process that is dynamic enough to overcome the policy and technical barriers to data sharing.

Maryland Cooperative Centerline Project

The Maryland GIS community has a strong record of partnerships among state, local, and federal partners. This effort is perhaps best demonstrated through Maryland's Cooperative Centerline project, which encompasses data-sharing relationships among Maryland's 23 counties, Baltimore City, and the Federal Government, via *The National Map*. As it relates to the policy challenges described above, this project has laid a foundation for data-sharing that respects data licensing, cost recovery practices, and

liability concerns of all partners. In particular, because *The National Map* requires only framework information, many of the rich attributes of road centerlines that local jurisdictions maintain are not necessary for a seamless statewide map and have thus been removed prior to publishing to *The National Map*. Aggregated by the Maryland State Highway Administration, the framework data are published by TU-CGIS with appropriate metadata that limits the liability of data owners and the potential misuse of their data. Because the published dataset is a simplified version of local county data, it does not conflict with the cost recovery fees that may be in place for the fully attributed source data.

Maryland Imagery Acquisition Partnership

Another ongoing effort to overcome policy barriers in the state is Maryland's Imagery Acquisition Partnership (MIAP). This effort is striving to consolidate otherwise separate financial resources into a single, unified purchase of statewide orthophotography. The effort has already resulted in a level of collaboration that is unprecedented in the Maryland GIS community. Perhaps the most significant benefit to *The National Map* effort is the fact that the resulting data will be available in the public domain. Because of the large number of partners, including the U.S. Geological Survey, there is an understanding that the data best serves the community by being available without restriction. This runs contrary to some data distribution practices within Maryland. When complete, the project will establish a precedent for collaborative purchase of a shared framework layer.

In the meantime, TU-CGIS has been working with local jurisdictions to secure partnerships for sharing orthophotography to *The National Map*. Many counties do not have data licensing restrictions on their data. Licensing concerns that do exist are being overcome by an approach that allows data owners to share either resampled (lower resolution) data or watermarked data. Another alternative has been to release orthoimagery that pre-dates the county's most current version of the data. To allay any fears of liability from sharing and from potential misuse of the data, counties have been encouraged to sign a Memorandum of Understanding (MOU) that limits their liability when sharing. In addition, data posted to *The National Map* include metadata that expressly limits liability.

Improving Statewide Coordination

Both of the efforts described above have succeeded in a climate where there is no formal GIS coordination in the state. Although progress has been made without formal coordination, there have been many missed opportunities and slower-than-expected timelines. As of the writing of this white paper, efforts are underway to establish a formalized coordinating body to include a GIS council with a Geographic Information and a technical services arm to implement solutions. As these efforts mature, Maryland's ability to overcome policy challenges to contribute to *The National Map* will continue to diminish.

Overcoming Technical Barriers

As described above, one of the limiting factors of data sharing for many local jurisdictions is a lack of technology resources—whether related to hardware and software or to personnel. To overcome these challenges, Maryland has taken a two pronged approach to 1) provide a hosted solution for those counties unable or unwilling to implement the required technology for sharing, and 2) conduct technology knowledge transfer to those counties that currently do not possess the skill set required to share data.

Hosting Data at Towson University Center for GIS

As a longtime participant in Maryland's GIS and data sharing activities, TU-CGIS is well positioned to host data on behalf of local entities who are unable and/or unwilling to share data from their own local resources. TU-CGIS maintains state-of-the-market technology that partners can leverage, along with a large number of highly trained GIS staff. In this scenario, counties transfer their data to TU-CGIS via DVD, external hard-drive, or some other method. TU-CGIS staff then loads the data onto a cluster of servers that are dedicated to sharing data to the National Spatial Data Infrastructure (NSDI). Serving much like an application service provider (ASP), TU-CGIS provides a consistent, reliable infrastructure to share framework layers to *The National Map*.

Hosting Data at Local Government

For those that wish to host the data locally, TU-CGIS has established guidelines for installing, configuring, and publishing data to *The National Map*. If desired, partners can build the technological knowledge required for publishing open source GIS map services. An example of this technology transfer occurred during Maryland's 2005-2006 USGS CAP Grant effort, whereby TU-CGIS worked with the Eastern Shore Regional GIS Cooperative (ESRGC) at Salisbury University. ESRGC serves as a local resource for Maryland's Eastern Shore counties and maintains much of those counties' data resources. The partnership between TU-CGIS and ESRGC has resulted in increased technology capabilities for Maryland's Eastern Shore and an increased capacity to share framework layers to *The National Map*

Technical Specifications for Sharing Data to *The National Map*

Hardware and Software Requirements

Although there is no definitive specification of servers to publish to *The National Map*, at a minimum, publishers must possess Web server technology that adheres to the Open GIS Consortium Web Map Service (WMS) standard. This is a software neutral standard that allows for data interoperability across platforms. Consideration should be given to the performance capacity of the server and software to ensure that the map service is

available and capable of serving multiple users. Thought should also be given toward the scalability of the server and software components in order to meet additional demands that may occur over time.

Deploying an OGC-compliant WMS

Although there are multiple software packages that can be utilized to deploy a WMS, TU-CGIS used the newest ESRI ArcIMS WMS connector released with Service Pack 2 of ArcIMS 9.0. (*Note*: ESRI also provides an "out of the box" WMS connector.) The following Web pages offer useful information about OGC-compliant WMS.

http://www.ogcnetwork.org/docs/03-050.pdf Link to the "OpenGIS Web Map Server Cookbook, version 1.0.0.

http://helios.er.usgs.gov/catalog/index.html This site offers OGC specification documents.

http://support.esri.com/index.cfm?fa=knowledgebase.whitepapers.viewPaper&Pl D=16&MetaID=906

This site offers a document that explains the configuration of ESRI's SP2 WMS connector.

For guidelines relative to posting imagery to *The National Map*, please see Appendix A, "Lessons Learned using ArcSDE for Orthoimagery."

Coordinate System

The National Map viewer requires Map services to serve up a map in an unprojected (geographic) coordinate system. The units must be decimal degrees and the datum must be WGS84. If the source data are in a different coordinate system, then appropriate coordinate system conversion parameters must be added to the service code. Please review the attached AXL file example (Appendix B) for more information.

Configure the USGS National Map Connector

In addition to the WMS connector, a separate connector has been written by USGS. The advantage of the USGS connector is that it supports Style Layer Descriptors (SLDs). SLDs are used by *The National Map* as a method for providing consistent symbology across multiple datasets. This connector is available to all *The National Map* partners. Please review the attached document with instructions for configuring the connector (Appendix C.

Register WMS with The National Map Catalog

To register the service with *The National Map* Catalog, descriptive information must be provided to the Catalog Support Team (CST). This information can be conveyed via email. The following information must be provided:

Partner Name – The name as it will appear along the bottom of the viewer when data that have been supplied by a partner are displayed in the viewer.

General Information URL – A URL for general information that is hot-linked to the partner name.

Footprints – Approximate footprint of any data layers that are NOT statewide (shapefile, or description from which a shape file can be built). This includes:

- (a) Layer Information List of data layers to be registered. For each layer in this list, the following information is needed:
 - (i) Service URL The URL to the OGC service. This is the most technically important piece of information.
 - (ii) Technical Contacts for the Service Name, phone number, email of the person who is called if the service is not working correctly. Identifying a backup person is also recommended.
 - (iii) Is the layer queryable? (Yes or No)
 - (iv) Legend URL This applies only to layers that need a legend. The legend file must be in .png format and have a white background.
 (iv) Matadata URL
 - (v) Metadata URL.
 - (vi) Maximum and Minimum Display Scales as defined in the WMS.
 - (vii) Data Downloads Have data extract been enabled? If applicable, provide URL for data download site.
 - (viii) Viewing Restrictions Indicate if you would prefer that a layer not appear in *The National Map.* It is important to note that the Catalog does not provide security against viewing the data with a different application.

Contact Information

For answers to questions, or for more information, please contact::

Jeff Roberts, PMP jaroberts@towson.edu 410-704-5289

Appendix A

Lessons Learned Using ArcSDE for Orthoimagery

Note: The following documentation is intended to assist GIS specialists who have little or no experience loading data into ArcSDE.

Our goal is to load orthoimagery for two Maryland counties (Harford and St. Mary's) into ArcSDE as one seamless image. This data will then be posted to *The National Map*. The original imagery is 24-bit color with one-foot pixel resolution. Harford County consists of 500 tiles, and St Mary's County consists of 385 tiles. The original projection was Maryland State plane feet. All of the imagery had to be reprojected into geographic coordinate system using the WGS 84 datum, to meet *The National Map* standard.

There are four main steps to get the imagery loaded into ArcSDE. Each step can be completed through command line or ArcCatalog. The text below outlines all three steps, the different methods, and the approach that worked best for this data.

Step 1: Creating New Raster Dataset

The first step is to create a new raster dataset in the ArcSDE database. This dataset will hold all of the imagery.

Methods:

Command Line

sderaster –o import –f M:\HarfGeographic\106.tif –I TMN_Ortho_Harford,image –g –a 255 –t 128,128 –c JPEG –I nearest –N –G 4326 –L 0 –i 5151 –p <type password> –q 95 –s <type server host name> –u <type user name>

ArcCatalog

First, make a connection to the SDE database. Then right-click the SDE database, click 'New' then click 'Raster Dataset'. A window will open for you to select the appropriate parameters, including the output location, the name of the final dataset, the cell size, the pixel type, the number of bands and the Spatial reference. It is important that if you have imagery with three bands to specify **3** bands when creating the dataset.

🎢 Create Raster Dataset	
Output Location Database Connections\MD_Ortho v-cgis-Southern.sde Raster dataset name with extension	
Cellsize (optional) Pixel Type (optional)	
8_BIT_UNSIGNED Coordinate system for the raster (optional) GCS_WGS_1984 Number of bands	
3	
* ArcSDE geodatabase parameters (optional)	
Create pyramids (optional)	
Pyramid levels	
Pyramid resampling technique for ArcSDE geodatabase	
Tile size for ArcSDE geodatabase (optional) Tile size for ArcSDE geodatabase Width Height 128 128	
Compression for ArcSDE geodatabase (optional) Compression type for ArcSDE geodatabase JPEG	
Compression quality 95	
Pyramid Reference Point (optional) X Coordinate Y Coordinate	
OK Cancel Environments	Show Help >>

Approach

Either method of creating a new raster dataset was suitable for our data. The main difference between using command line and ArcCatalog is that command line uses one image to create the new dataset, while ArcCatalog creates an empty raster dataset based on the parameters supplied by the user. We choose JPEG compression, a lossy

compression, with a 95-compression quality. The 95-compression quality minimizes the amount of loss.

Step 2: Mosaicing Raster Datasets

The second step is to mosaic the imagery together into ArcSDE to create one seamless image.

<u>Methods</u>

Command Line

Sderaster –o mosaic –f D:\GISData\306.tif –l Ortho_mosaic2,image –v 1 –N –L 0 –u <type user name> – p <type password> –i 5151 –s <type server host name>

ArcCatalog

Right-click the raster dataset, select 'Load' then click 'Load Data'. A window appears prompting you to enter the parameters of the mosaic. Select the images you want to import. Make sure to click the 'Environments' button to set all other properties before executing the mosaic.

🎢 Mosaic	
Toput Destars	<u> </u>
	2
M:\HarfGeographic\1001.tif M:\HarfGeographic\1002.tif	+ × ↑
Target Raster Database Connections\MD_Ontho v-cgis-Southern.sde\SDE. Mosaic Method (optional)	B
Mosaic Colormap Mode (optional)	
Ignore Background Value (optional)	
Nodata Value (optional) 255	
Convert 1 bit data to 8 bit (optional) Mosaicking Tolerance (optional)	
OKCano	el Environments Show Help >>

🎕 Environment Settings	
X General Gellines	<u> </u>
♦ General Settings X Courses Settings	_
V Coverage Settings	_
X Raster Analysis Settings	_
* Raster Geodatabase Settings	
Pyramid	
Build ovramids	
Puramid levels	
Pursuid consulting to AveCDE good states	
Raster Statistics	
Calculate statistics	
Statistics skip factor for personal geodatabase	
X skip factor Y skip factor	
Statistics ignore value for personal geodatabase	
Compression	
Compression	
Compression quality	
Tile Size	
Tile size for ArcSDE geodatabase	
Width Height	
128 128	
OK Cancel	Show Help >>

Approach

Command line successfully mosaiced the original images. Once the images were reprojected, they rotated due to the coordinate system transformation. This shift formed a black border around the outside of the image preventing the images from being mosaiced in command line. We tried using the –R operation (removes pixels with background color in a rotated image) and the –a operation (sets pixels with specified value as no data pixels) with no success. It is important to note that you cannot use both of these operations together. However, the images could be mosaiced in ArcCatalog.

Because our images were rotated during reprojection we specified a value of 0 for No data (black border) and 255 (white background) for background values.

The process took between 1 and 2 hours to mosaic 250 tiles through ArcCatalog, depending on the time of day and the server load.

Step 3: Building Pyramids

The final mosaiced image is very large and draws slowly. Building pyramids enhances the performance of the final dataset. The entire dataset shows at a decreased resolution, but as you zoom in the resolution increases. The time to draw remains the same as you zoom in because fewer pixels are visible, taking less time to draw.

Methods

Command Line

sderaster -o pyramid -I TNM_ORTHO_HARFSOUTH,RASTER -v 1 -L 9 -I nearest -q 95 -D MD_Ortho -u MDOrthoSDEOwner -p Ar1alImagesMD10242006! -i 5151 -s <type server host name>

ArcCatalog

Connect to database supplied by IT. Right-click the raster dataset, select 'Build Pyramids'. Make sure to click the 'Environments' button to set all other properties before running.

🎤 Build Pyramids	
Input raster dataset Database Connections\MD_Ortho v-cgis-Southern.sde\SDE.	
OK Cancel	Environments Show Help >>

Approach

ArcCatalog worked great for building pyramids on smaller datasets, however when building pyramids for the larger dataset we received an error. Command line built the pyramids successfully on larger datasets. We specified a value of 9 for the reduced resolution dataset layers; this builds nine levels of pyramids for the dataset. It is important to wait to build pyramids until all of the images have been successfully mosaiced together.

Valuable Documents

<u>Title</u>: Load Rasters in ArcSDE Using sderaster <u>Author</u>: Michael Mannion <u>Source</u>: ArcUser <u>Date</u>: July-September 2002 <u>Internet</u> location: <u>Use</u>: Learning command line to import data into SDE and command line SDE object definitions

<u>Title</u>: ArcSDE Configuration and Tuning Guide for Microsoft SQL Server <u>Author</u>: ESRI <u>Source</u>: ESRI <u>Date</u>: 1986-2004 <u>Use</u>: Basic ArcSDE information and guidance.

<u>Title</u>: ArcSDE Administration Command Reference <u>Author</u>: ESRI <u>Source</u>: ESRI <u>Date</u>: None <u>Use</u>: sderaster command line reference. <u>Internet</u>: http://edndoc.esri.com/arcsde/9.1/admin_cmd_refs/sderaster.htm

<u>Title</u>: Raster Data in ArcSDE 9.1 <u>Author:</u> ESRI <u>Source:</u> An ESRI White Paper <u>Date:</u> September_2005 <u>Use</u>: Basic raster concepts, loading data into SDE and tips and tricks. <u>Internet</u>: www.esri.com/library/whitepapers/pdfs/arcsde91-raster.pdf

<u>Title</u>: Managing a Raster Database <u>Author</u>: ESRI <u>Source</u>: An ESRI Technical Paper <u>Date May</u>: 2005 <u>Use</u>: Case studies on managing a raster database.. <u>Internet</u>: http://www.systematics.co.il/GIS/Resources/July2005/Managing_Raster_Databa se.pdf

Appendix B

AXL File Example

```
<?xml version="1.0" encoding="UTF-8" ?>
- <ARCXML version="1.1">
- <CONFIG>
- <ENVIRONMENT>
 <LOCALE country="US" language="en" variant="" />
 <UIFONT color="0,0,0" name="SansSerif" size="12" style="regular" />
 <SCREEN dpi="96" />
   </ENVIRONMENT>
<u>-</u> <MAP>
- < PROPERTIES>
 <ENVELOPE minx="-79.5738985257" miny="37.8616573333" maxx="-75.0135338092"</pre>
    maxy="39.7554532079" name="Initial_Extent" />
 <MAPUNITS units="decimal_degrees" />
 <FILTERCOORDSYS id="4326" />
 <FEATURECOORDSYS id="4326" />
   </PROPERTIES>
- < WORKSPACES>
 <SDEWORKSPACE name="sde_ws-0" server="map4" instance="port:5151"</pre>
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    password="YIONFKKMARDRLMYKUXQCWEGVLBHCJX"
    geoindexdir="C:\DOCUME~1\cbizzell\LOCALS~1\Temp\2\" />
   </WORKSPACES>
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    id="SHA MD STATE">
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    visible="false" id="SHA_MD_COUNTIES_C">
```

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	Deploying Maryland Data to The National Map

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    id="SHA_CLINE" maxscale="1:152587">
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    workspace="sde_ws-0" />
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   </MAP>
   </CONFIG>
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Appendix C

OGC Connector Installation Instructions

This documentation will outline the installation procedure of the OGCConnector. This connector was built by a team of developers at MCMC. This connector enables the use of SLDs with map services. This documentation is written specifically for Apache/Tomcat and IIS/Tomcat server setups but some information may generally apply to ESRI WMS connectors and the OGCConnector.

Background Information

Several WMS/OGC compliant connectors are available from ESRI, so where and how does the OGCConnector fit in with these other connectors? This question can be answered by taking a look at each connector and then the OGCConnector.

"Out-of-the-box Connector"

This connector is included in the installation of ArcIMS. This is true for versions 4.x and 9.x. This connector is enabled by editing the WMSEsrimap_prop file that is located in the Tomcat installation directory with the other ArcIMS configuration files. Editing the file allows the connector to be enabled, select working directories, and other options. There is an extensive set of documentation for this connector in the ArcIMS help. This documentation is located under the "Advanced Topics" section.

In the version 4.x of the connector services could still be accessed despite the connector being disabled in the WMSEsrimap_prop file. Also, any login/password authentication that was established to protect services is bypassed by this connector. A second issue for this version of the connector was that the output directory of ArcIMS images had to be on the same server as the connector.

Version 9.0 SP1 of this connector finally secured services by allowing them to be excluded in the WMSEsrimap_prop file. This connector has a quirk regarding GetCapabilities requests, the request URL must contain &service=wms at the end of the request. If this is not included an error message will appear warning about a service not being available.

Below are URL examples of WMS requests to this connector:

A connector ping command will show if the connector is installed and working:

http://machinename:portnumber/servlet/com.esri.wms.Esrimap?cmd=connectorping&

ArcIMS 9.0 SP2 WMS Connector

ESRI included a new WMS connector to the mix when they released SP2 for ArcIMS 9.0. This connector features web interface for administering the connector. This connector does not support SLD implementation. The SP2 connector can run simultaneously with the "out-of-the-box" connector. The following URL is to an ESRI support page which has a pdf that can be downloaded. This pdf file contains a significant amount of information and should be consulted prior to installation.

http://support.esri.com/index.cfm?fa=knowledgebase.whitepapers.viewPaper&PID=16& MetaID=906

OGCConnector Installation instructions (Tomcat & IIS w/ ArcIMS 9.x)

First unzip the zip file into the webapps folder of your tomcat installation (ours for example is D:\Tomcat5\webapps).

🗁 D:\Tomcat5\webapps\OGCConnector\WEB-INF 📃 🗖 🗙							
<u>File E</u> dit <u>V</u> iew F <u>a</u> vorites <u>T</u>	ools <u>H</u> elp			2			
🔆 Back 🗸 🕥 - 🏂 🔎 Search 💫 Folders 🛛 🕼 🎲 🗙 🏹 🎹 -							
Address 🗁 D:\Tomcat5\webapps\	OGCConnector\WEB	INF		💌 🄁 Go			
Name 🔺	Size	Туре	Date Modified	Attributes			
Classes		File Folder	5/5/2005 7:05 AM				
lib		File Folder	5/5/2005 7:05 AM				
web.xml	2 KB	XML Document	5/5/2005 7:23 AM				
				C 1			
3 objects			1.81 KB 🚼 My	Computer //			

Then you will need to edit the web.xml file that is inside of the \webapps\OGCConnector\WEB-INF\ folder.

The things you will need to change are:

ServiceURL: you will need to remove the mcmcwebmap.usgs.gov with the hostname of your ArcIMS URL.

```
- <init-param>
```

```
<param-name>ServiceURL</param-name>
<param-
value>http://<yourwebservername>/servlet/com.esri.esrimap.Esrimap</param-
value>
</init-param>
```

- <!--Host and port for a direct connection to Arc

Host: you will need to put in the DNS/host name of your ArcIMS server...and make sure those are the port number is correct. 5300 is the default number...

```
- <init-param>
  <param-name>Host</param-name>
  <param-value>DNS/Hostname</param-value>
    </init-param>
- <init-param>
  <param-name>Port</param-name>
  <param-value>5300</param-value>
    </init-param>
    - <!--
    The default service name (used when servicename is unspecified)
    -->
= <init-param>
```

<param-name>DefaultServiceName</param-name>
<param-value>NTAD</param-value>

This DefaultServiceName will answer requests that don't specify a service by using the service set as DefaultServiceName. This is helpful if one service receives a large percentage of the total requests.

##########

As a part of installing ArcIMS with Tomcat & IIS you had to download a zip file that had an isapi_redirector.dll, registry entry file(s), and 2 properties files.

The uriworkermap.properties file needs to be edited. This file should be in the \conf directory of your Tomcat installation (i.e. D:\Tomcat5\conf). You will need to add the OGCConnector context to this file:

#OGCConnector /OGCConnector/*=ajp13 # #*****End uriworkermap.properties*****

It should look similar to the other entries in that file.

##############

Once those lines have been added, you should restart the Tomcat service and the OGCConnector should be added. You can test to see if the connector installed correctly by typing the following into a web browser:

http://<yourwebserver>/OGCConnector (ours is http://mcmcwebmap.usgs.gov/OGCConnector)

If installed correctly the following message should be returned: OGCConnector v1.2 IMS v9.0.0 Build_Number=871.1714 Version=9.0.0 Test successful

If you get a page not found error double check the uriworkermap.properties file....