

Web Based Components for a Successful ArcIMS Implementation

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Overview

A common problem with providing data to the public is creating an easy to use and understandable user interface for a non-GIS user. At times, when the data and other inputs change, the user interface may change, causing confusion and a new learning curve for your end-user. This paper presents Web-based GIS components as a way to deliver GIS to the public using ArcIMS and the ActiveX connector with a multiple "Map Service" approach.

Background

When I came on board to work for ACS at Adams County, there was a Map Objects Web based application in place. There were problems with the system and we were tasked to find a solution to overcome the problems we had with Map Objects and the design of the Web site. One of the greatest problems to overcome was to create a user interface that is easy to use for the "non-gis" user. The general audience of the county based Web site is the general public, most of which are real estate and brokerage companies finding property data within the county.

Something that we all had noticed on many of the mapping Web sites was the inclusion of every layer available. We felt that was too confusing for the general public. Most people do not know what half of the data layers are. Secondly, there were too many tools to use. When you zoom, do you click and drag or do you just click? Most of the tools did not have any clear message as what they were used for.

The next major task was maintainability. The current Web site was very difficult to fix and update data. Most updates took half a day because we had to make sure the files had the proper fields used for data lookup in the application and updates to the new or changed features had to have previous information propagated to the new files.

Another needed request was the ability to link to different sites to obtain data. This included a local Document Management System and a link to the Federal Census data.

Finally, a way to quickly create new reports needed to be implemented. Currently, there was only one report available and the report included all information available for the property. You did not have the ability to print only the sections of the report that pertained to the information you needed.

Web Map Service

Here at Adams County, we came up with the idea of a Web Map Service. This service is defined by either a department's needs or a common grouping of data. One of the problems with many Web sites is that all of the data that the application delivers is displayed all at once. There is no grouping except for maybe data types. This can be an overload of information to any user of the application.

To alleviate some of the confusion to a user, we created a Web Map Services approach. Each Web Map Service may have common data in each of the services, but may contain specific data to each service that would be relevant to that service. For example, we add zoning and zoning map information to a "Zoning Map Service". Because we broke down the data into groups, it diffused the confusion some people had with all of the data in one large Web application.

Technical Components

To implement the concept of Web Map Services, we decided to use ArcIMS, version 4.0.1, because of the customizability of the User Interface, ease of implementation and maintainability of the server and data. Here at Adams County, the vast majority of servers are Windows based, thus an IIS platform was the choice of web server type. We were planning on having an Intranet and Internet implementation, so support from the technical staff with regards to the Windows operating system was a major consideration for the proper web server selection.

We decided to go with Tomcat Jakarta as the servlet engine for ArcIMS due to the price (free) and from talking to other people who have used it. The install and implementation of Jakarta was extremely easy and well documented by ESRI's support Web site.

We installed all of the connectors and played with the HTML Viewer to implement a proof of concept application for the layers of a particular Web Map Service. It was very easy to create the initial axl file using the ArcIMS Author tool. Configuration of the ArcIMS server was easy and well documented.

Now, the decision had to be made for what connector to use. In looking at all of the pros and cons of each of the connectors, we decided to use the Active X connector because of its flexibility to program with and its multi-browser functionality. There were multiple down sides, some of which we learned later on, but we felt the up sides outweighed them. One of the downsides we had to deal with was the fact that we could not place an overview map on top of the full map, so now we had to use two image services for each Web Map Service, one for the main map and one to show the overview.

Most of our data here at Adams County was in shape files. We do have a library coverage for Parcels and Subdivisions, which need to be converted to shape files to update the data available on the Web site. We also had MrSid images for our 1999 Aerial photography which was in black and white. Now a big challenge was introduced. The 2002 Aerial photography was full color and the tiff images comprised over 60 gigabits of data. With MrSid, we would lose too much image quality so we imported the data into ArcSDE 8.3. We added the indexes and built the pyramids. We added the like from the AXL files to the ArcSDE database and was extremely surprised and pleased at the performance and quality of this large data set.

For quality reasons, we left the display of the map to JPEG image format. Since we were displaying imagery, we wanted to keep near to that same quality available of the original TIFF files. For the Overview Map, described later, we decided to go with a GIF format since it was just vector data and it reduced the image size significantly.

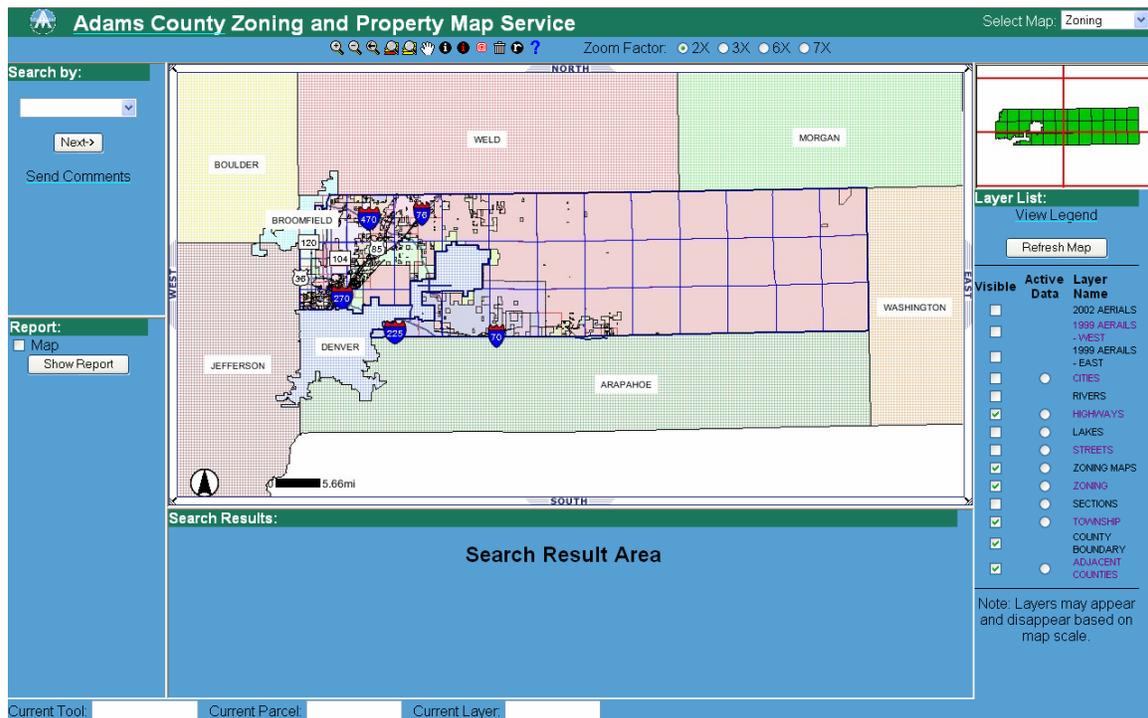
The non-graphical data was stored on Oracle databases behind a firewall, so we could not get to that data directly from the Internet web server box. So, we decided to use a Microsoft Access database to be the repository for a “small” copy of the data that is stored on the internal servers. We created update routines that would export the data we needed from the Oracle servers to text files and then import them into the Access database. Then we would shut down the Internet Information Server (IIS) and copy the data

over. The reason we had to shut the IIS down was we created the database connection as a Application variable to reduce the number of open and closes to the Access Database. All of the data updating is automatic and run nightly.

We also created a Microsoft Access database that is being used as an installation and performance mechanism. Within this database, we have tables that describe all of the data layers for every service and contain lookup tables that may be needed for reports. Also, for performance issues, we have tables that contain bounding box and center coordinate information for certain data layers. This improves the performance of the Web site immensely.

Layout of the UI

Now came the most difficult task to us, creating a user interface that both is easy to use and also provides the information needed for the consumer of the Web site. We came up with a frames based HTML page that allows for parts of the screen to change based on what type of Web Map Service that the user was in. The reason for the changes in the different parts of the web application pages was because searches, available data layers and available reports could be different because of the specific Web Map Service that is selected. The current page layout looks like this:



Sections of the UI:

A. Title and Web Map Service



Adams County Zoning and Property Map Service

This section of the page contains the Adams County Seal and links back to Adam County's main web site page. The most important part of this section is the name of the Web Map Service. When a user changes from service to service, this is the main location to find out what map service you are in.

B. Map Service Change

Select Map: Zoning

This section of the page contains a list of the all available map Services. This is the "meat" of the application. This is why we build the Web Map Services approach. After a consumer of the web application uses one of the Web Map Services to complete searches, changed visible map location, queried available layer information or displayed available reports, the consumer may change Web Map Services to another service to display different search, layer or report information. The big key is that we keep the same, current visible extent of the map when we change Web Map Services. This way, we can find Zoning information on a certain property from the Zoning Web Map Service, then, keeping the same map extent, change Web Map Services to the Subdivision Web Map Service and instantly find new information on the same property, keeping the same look and feel of the User Interface.

C. Tools

Zoom Factor: 2X 3X 6X 7X

The tools area of the page contains the current tool set for all Web Map Services. The tools are the same for all services. They contain the standard zoom in and zoom out and identify tools. Zoom factors are currently used for a single point click zoom on the map. Each tool is described with a simple mouse over to explain to the consumer what each tool is.

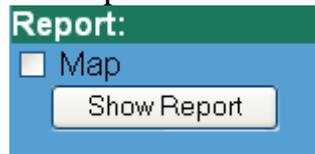
D. Search



The screenshot shows a blue header with the text "Search by:" in white. Below the header is a white dropdown menu with a blue arrow pointing down. Underneath the dropdown is a button labeled "Next->". At the bottom of the section is a link labeled "Send Comments".

This section of the page contains all search methods for the currently select Web Map Service. There is a set of “standard” searches for all services. They are: Owner, Parcel, Street Number, Section-Township-Range, Intersection and Advanced Street. Searches may be added based on certain Web Map Services, like Subdivision, Election and Parks. They are added to the end of the standard search list, so the consumer is not confused by any change to the list of common searches.

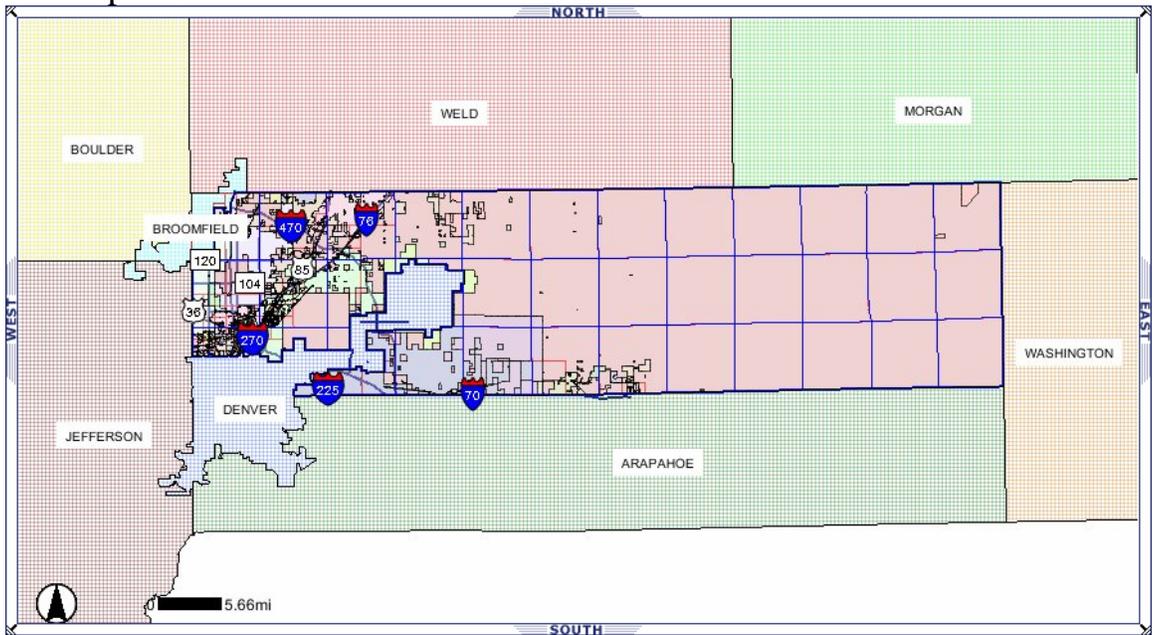
E. Report



The screenshot shows a blue header with the text "Report:" in white. Below the header is a checkbox labeled "Map". Underneath the checkbox is a button labeled "Show Report".

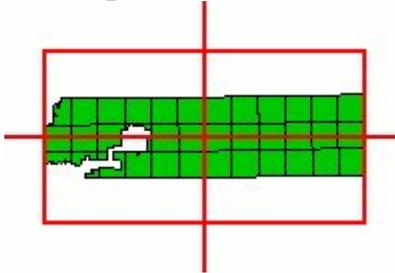
The report section also changes based on selected service. It also changes based on what type of search or layer identify is being preformed. At all times, a map report is available. This report just displays, in a nice printed format, the contents of the visible map. When parcels are active or search results are displayed, the Adams County standard property report sections are available for output. Other reports are also available, like Subdivision and Zoning, when the appropriate Web Map Service is selected.

F. Map View



This section of the user interface is the graphical entry into the application. This is where the map of Adams County is displayed and interacted with. Any selected tool that needs an action is implemented on this map, i.e. a zoom or identify tool. There are panning points located around the map.

G. Map Overview



The Map Overview gives the consumer a general location of what part of Adams County they see displayed in the Map View section. As the consumer zooms in, the bounding box will shrink until it is just a cross hair of the area that is displayed in the larger map.

H. Layer List\Legend

Layer List:

[View Legend](#)

Visible	Active Data	Layer Name
<input type="checkbox"/>		2002 AERIALS
<input type="checkbox"/>		1999 AERIALS - WEST
<input type="checkbox"/>		1999 AERIALS - EAST
<input type="checkbox"/>	<input type="radio"/>	CITIES
<input type="checkbox"/>		RIVERS
<input checked="" type="checkbox"/>	<input type="radio"/>	HIGHWAYS
<input type="checkbox"/>	<input type="radio"/>	LAKES
<input type="checkbox"/>	<input type="radio"/>	STREETS
<input checked="" type="checkbox"/>	<input type="radio"/>	ZONING MAPS
<input checked="" type="checkbox"/>	<input type="radio"/>	ZONING
<input type="checkbox"/>	<input type="radio"/>	SECTIONS
<input checked="" type="checkbox"/>	<input type="radio"/>	TOWNSHIP
<input checked="" type="checkbox"/>		COUNTY BOUNDARY
<input checked="" type="checkbox"/>	<input type="radio"/>	ADJACENT COUNTRIES

Note: Layers may appear and disappear based on map scale.

Legend:

[View Layer List](#)

Adjacent Counties

-  Arapahoe County, Colorado
-  Boulder County, Colorado
-  Broomfield County, Colorado
-  Denver County, Colorado
-  Jefferson County, Colorado
-  Morgan County, Colorado
-  Washington County, Colorado
-  Weld County, Colorado
-  County Boundary

This section of the user interface is two-fold. It displays the current layer list of visible data layers for the selected Web Map Service and it also will display the legend of the currently visible layers. There are three columns that define the Layer List: the Visible, Active Data and Layer Name. The visible checkbox will turn on or off layers, based on the value of the check. Once any change is made to the visibility of a layer, the Refresh Map button must be pushed for the changes to take affect. The Active Data layer selection works in conjunction with the Identify button on the Tools section of the UI. This is a mutually exclusive selection so only one available data layer may be selected to do an Identify at a time. This is one of the hardest concepts for the consumer to grasp and may be changed at a later time. The last

column is the actual data layer name. Layers can appear and disappear based on the map scale.

The Legend is just a graphical display of the visible Web Map Service layers available at that time.

I. Application Status Bar

Current Tool: Current Parcel: Current Layer:

This section of the page is just an information area that is used to notify the consumer what state the application is in. It displays what the current tool is, the current parcel, if one is selected and what the current Active Data layer is.

Intranet vs. Internet

Due to data sensitivity issues and internally supported applications, we had to create an Intranet version of the same application that is available to the public. There were certain data layers that the Adams County employees needed but did not want to make available to the public. Also, there are internal applications that this application can make links to that would only be used for internal users. Therefore, we had to set up an Intranet version of the same application but with different parameters. Since we are using IIS as our web server, we were able to create a global.asa file, which allows us to configure each installation appropriately for the server that it is running. There was one difference between the AXL files that are used in the Image Service for the Internet and Intranet and that was because of data sensitivity issues.

Conclusion

In conclusion, we wanted to present an approach to a common web based interface that is easily learned by the user of the Web site and an application that is easily maintainable.

Since we use global.asa files for each Web Map Service, a separate directory is needed for each service. All of the ASP and HTML pages are the same in each folder. The only different file within each folder that represent each Web Map Service is the global.asa file. The global.asa file contains the Web Map Service specific data that is needed for the application to perform properly.

Maintenance is easy in the regards to updates. With any code change, the code is propagated to each directory by just copying the file to each directory and overwriting what is contained there. Since each frame is its own code segment, it is easy to update and add functionality in regards to Searches and Reports. Due to the nature of this application, we do not want to add too many tools because we want to keep the complexity of the application to a minimum.

A new Web Map Service, depending on the type of data, can take as little as an hour to add to the system. That includes creation of the initial AXL file using the ArcIMS Author tool.

The current website, with all of the available Web Map Services, can be found at Adams County's Website at <http://www.co.adams.co.us> and look for the Public Records Search link to reach all county web applications.

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References

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ESRI: Technical Articles, [Install: Install IIS 4.0/5.0 with Tomcat 4.1.12 using J2SDK 1.4.0 for ArcIMS 4.0.1 on Windows](#)

ESRI: Technical Articles, [HowTo: Enable GIF as output for an Image Server](#)

ESRI: Technical Articles, [HowTo: Enable ArcIMS authentication with a file-based Access Control List](#)

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