

BIOGRAPHICAL INFORMATION

Dave Murray
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Specific Responsibilities

Dave Murray is GIS Coordinator for the City of Westminster, Colorado.

Past Experience

Mr. Murray has been an adjunct instructor in the Civil Engineering Department, teaching Introduction to GIS and GIS Lab courses.

Educational Information

He holds Masters Degrees in GIS and Urban and Regional Planning from the University of Colorado at Denver and a Bachelors Degree in Mechanical Engineering from Northern Arizona University.

Professional Memberships

He has been active in the GIS community in the Denver area, serving on the Boards of the Rocky Mountain Urban and Regional Information Systems Association as well as the GIS in the Rockies conference.

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Enabling the Flow of Data Across Municipal and County Governments: The City of Westminster's Enterprise Application Story

Paper Presentation

Audience Rank: Intermediate

Learning Objectives:

1. Learn how data is shared (or isn't shared) across government entities at the municipal and county level
2. Learn how the City of Westminster overcame their data integration problems by approaching GIS as an enterprise problem across different jurisdictions
3. Understand how the City of Westminster and third party government partners are using the new GIS as a way to reduce data overlap and inconsistencies

Topic: Municipal Applications

Industry: Municipal Governments

Abstract:

The City of Westminster, Colorado has long struggled to integrate and share its CAD and GIS data with the two counties it spans and the constituents it serves. The city's GIS department uses shapefiles, coverages, and ArcSDE. The Public Works and Parks departments use AutoCAD and GIS.

As a rapidly expanding suburb of Denver, the city's GIS department spends significant amounts of time entering new data and translating the data between four file formats. In addition there is considerable time spend trying to integrate the municipal data with the two county data sets that underlie the City.

With seamless real-time access to these three datasets (one city, two counties), the city has the opportunity to provide more accurate maps to its citizens while improving data management workflows with internal users and external contractors.

This paper will discuss the difficulties of integrating and sharing data between municipal governments, their county counterparts, and their constituents. The application of a web-enabled enterprise GIS solution at the City of Westminster has lessened many of those difficulties and will be highlighted as an innovative case study for other municipal governments with similar data integration and sharing issues.

Enabling the Flow of Data Across Municipal and County Governments: The City of Westminster's Enterprise Application Story

Dave Murray, GIS Coordinator, City of Westminster, Colorado

Background:

The City of Westminster, a fast growing suburb of Denver, is responsible for maintaining its own GIS. In doing so, it must first satisfy the needs of its own users, such as employees, City Council members, internal departments, and contractors. Secondly, the city depends on relevant data sets from Adams and Jefferson counties in order to provide a complete and accurate spatial description of its natural features, commercial activities, municipal boundaries, property parcels, and other associated data layers. And finally, it would like to provide municipal data back to the two counties that underlie the city: Adams and Jefferson counties.

Like many municipal organizations, in early 2004, the City of Westminster faced the need to streamline its own data flow internally while satisfying increasing demands to share data with outside partners. In the past, the exchange of data between internal and external organizations had typically been in the form of a file transfer from one entity to another. This process of replicating data sets and sending them on disk created duplicate data sets and significant delays in data updating and maintenance processes.

Adding to the problem, the city did not have significant financial or technical resources to devote to standardizing data formats and synching data sets. It needed to overhaul the data maintenance and sharing processes while utilizing established GIS and CAD systems, existing hardware, and limited technical personnel resources.

This paper will discuss how data is shared (or isn't shared) across government entities at the municipal and county level, how the City of Westminster overcame data integration problems by approaching GIS as an enterprise problem across different jurisdictions, and how the City of Westminster and its partners are reducing data overlap and inconsistencies.

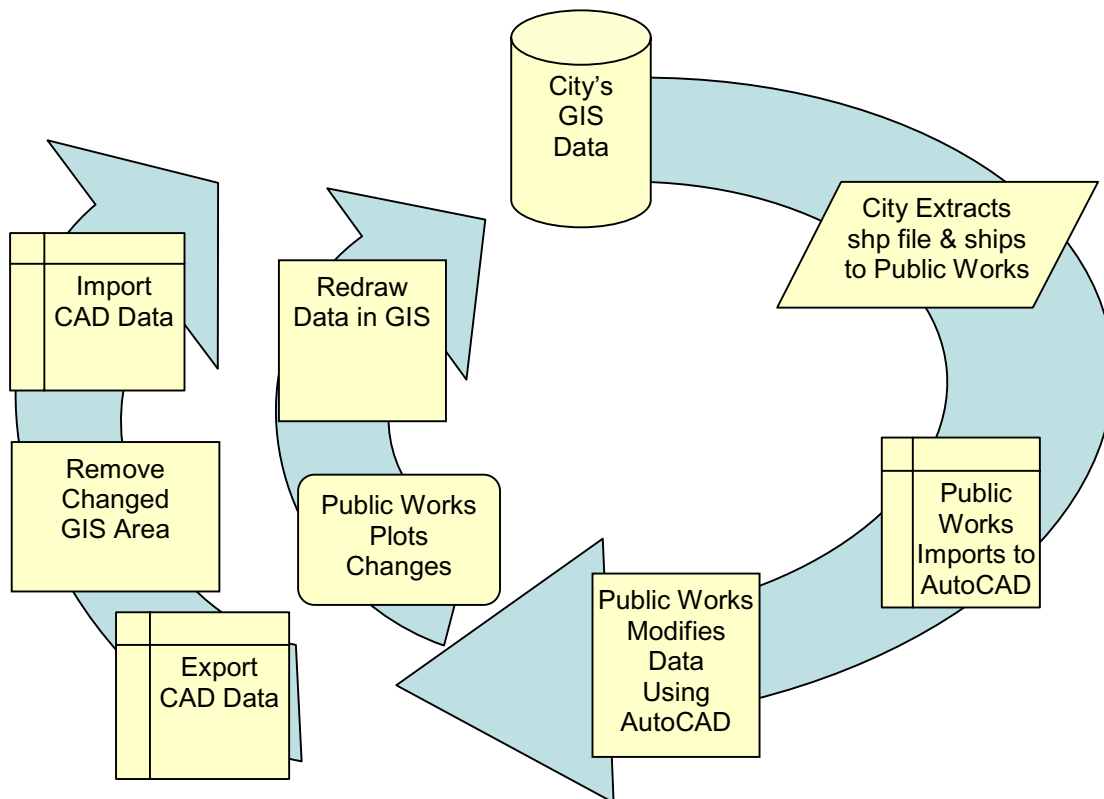
The application of a web-enabled enterprise GIS solution at the City of Westminster has lessened many of those difficulties and will be highlighted as an innovative case study for other municipal governments with similar data integration and sharing issues.

Problems With Internal Data Sharing:

The problems with data sharing arose primarily where the city's GIS group was maintaining GIS data in ArcSDE and the external contractors and Public Work Department use AutoCAD for design. To design new utilities and manage infrastructure expansion, both the city's Public Works Department and external engineering contractors rely on data transfer from the city GIS group. A contractor would go into the field, collect landbase data using a combination of GPS and survey methods then import the new data into AutoCAD for the design. When the design was completed, it would be submitted in AutoCAD .dxf format to the city. The city's GIS group would then spend time verifying the data by importing it into ArcSDE and comparing it with existing GIS data. The whole process was very time-consuming and labor intensive.

Utilizing existing geo-referenced landbase data from the GIS would not only streamline the workflow and reduce backlogs, but also eliminate errors in registration of the designs.

The original internal data flow between the City of Westminster's GIS Department and the Public Works Department was as follows:



Problems with External Data Sharing:

City of Westminster also faced the need to update the parcel layer, which was maintained at the county level. In order to perform this task, the City regularly requested updated layers from Adams and Jefferson counties. The process is time consuming and has inherent inaccuracies built in. Since the City maintains its own parcel layer from the approval stage, it can take many weeks before the counties enter in the data into their GIS's. This lag time can be shortened with the use of a common base map as well as tools for viewing and updating data that are convenient.

Using an Enterprise Approach

Since the city faced both internal and external data sharing difficulties, it decided to solve both problems using an enterprise approach. With an expanding need to deliver accurate data to a broad audience the GIS Section looked around for a solution that would solve these problems. Fortunately we didn't have to look too far since the vendor; Hitachi Software Global Technologies was right in our own backyard. We contacted them and after several technical presentations with the GIS Section and Public Works personnel, the decision was made to move ahead with a pilot project to test the capabilities of the Any*GIS software as well as determine where it fit into the software mix.

One of the main selling points for implementing the Any*GIS product is its flexibility in viewing and translating various sources of data. The City has several users of AutoCad as well as approximately 35 ESRI GIS users. Each have their own methods of data maintenance and many times bringing CAD and GIS together can take time and determination. The Any*GIS product provides an environment where open source compliant data can be viewed and updated through several methods. There is the full featured Pro Client that requires a desktop installation, the CAD client that plugs into AutoCad and the web client. Each has advantages based on the user's requirements and security settings. The ability to have an out-of-the-box GIS web site up and running in a very short period of time has given the organization a jump start on data integration and maintenance.

Technical Challenges

In tackling issues of internal data sharing, the city needed a new GIS system that would address several of existing technical issues, among them:

- Accessing multiple ArcSDE systems for spatial data
- Multi-platform environments (OS, RDBMS, data storage)
- Translation vs. exchange mindset; coordinate transformation between data sets
- Vendor neutrality; lessen impact of future version updates, etc.
- OpenGIS: need to incorporate new technical specs (WFS, WMS, etc.)

In the first phase of the project, the city tackled the internal data sharing challenges. The project involved implementation of a web-enabled enterprise GIS system to provide direct access to GIS data in ArcSDE and distribute that data over the Internet via a web browser. The internal users at the City of Westminster GIS Department are now able to view, query GIS data via a lightweight Java client. In addition, the new GIS, which implements Open GIS based standards, integrates data from both ArcSDE and DXF, so users can view all data layers in a single environment.

In phase two of the project (scheduled for completion by the end of 2004); the city will implement a CAD client interface allowing external contractors to access GIS data over the internet from AutoCAD Map. This provides external contractors real-time access the GIS data from ArcSDE in their AutoCAD Map session. Given the permission from the city, the contractor can update the GIS data from their CAD desktop.

Overall Architecture

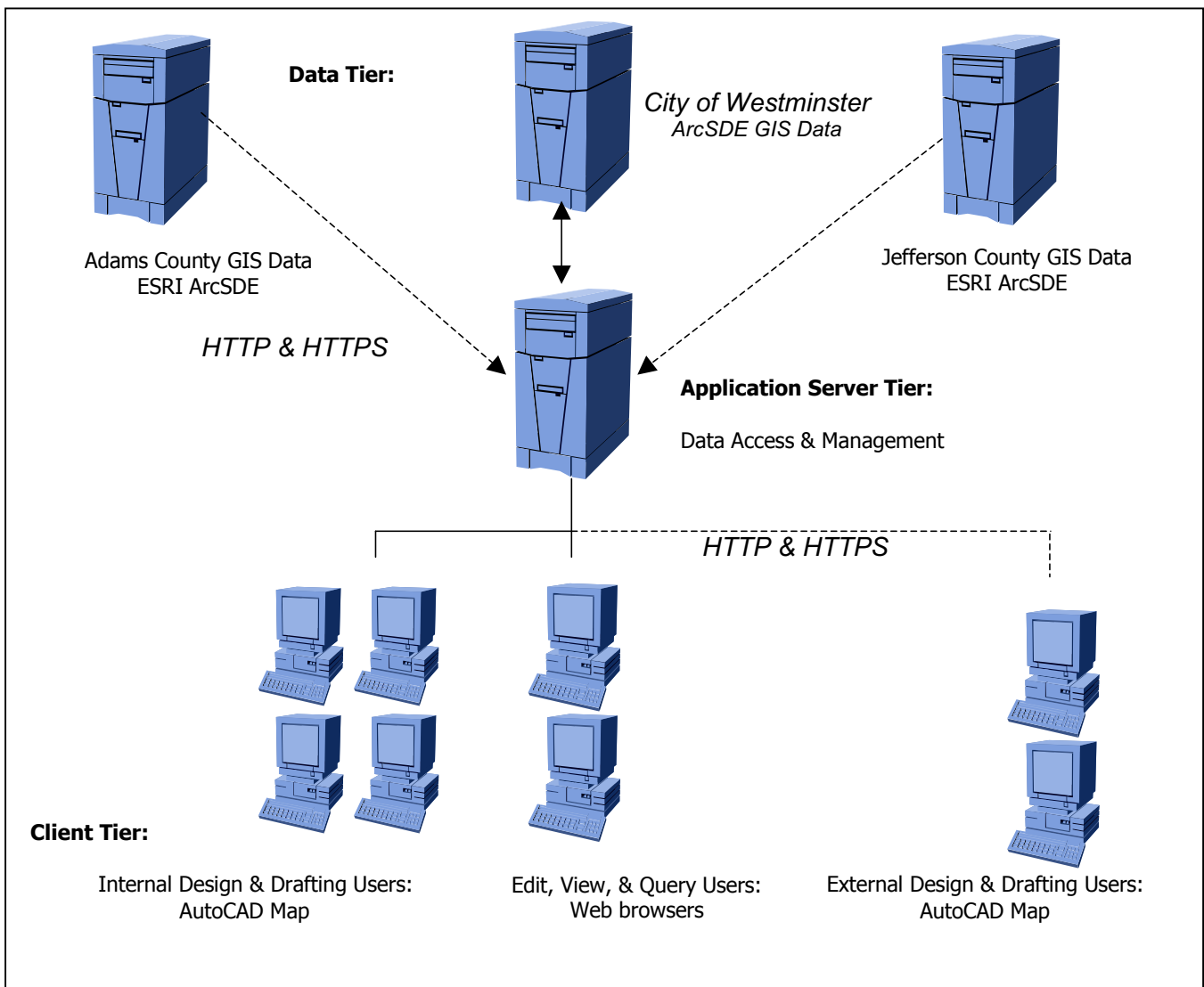
The GIS consists of multiple layers of functionality. Each layer serves a primary purpose in the system, either for maintaining a continuous database or distributing data to disbursed users.

The layers that will be discussed are as follows:

- **Client Tier:** The user interface layer consists of two distinct sub-components:
 1. a web-browser, and
 2. a CAD client-server desktop application.
- **Business Logic Tier:** The business layer is comprised of four sub-components:
 1. a GIS web application server,

2. a GIS spatial server,
 3. a web server, and
 4. integration/security components.
- **Data Tier:** The data layer consists of three sub-components:
 1. a data access component,
 2. a relational database management system (RDBMS), and
 3. external data sources.

A generalized functional overview of these component interactions is shown below.



Summary

Like many local governments, in 2004 the City of Westminster, Colorado sought to simplify data maintenance processes and more efficiently distribute its data among its internal users and external partners.

Using an innovative enterprise approach across several governmental jurisdictions, it was able to meet growing demands for increased accuracy and efficiency while maximizing existing investment in GIS and CAD software and personnel resources. The application of a web-enabled enterprise GIS solution has lessened many of the workflow redundancies and can serve as an innovative case study for other municipal governments with similar data integration and sharing issues.