

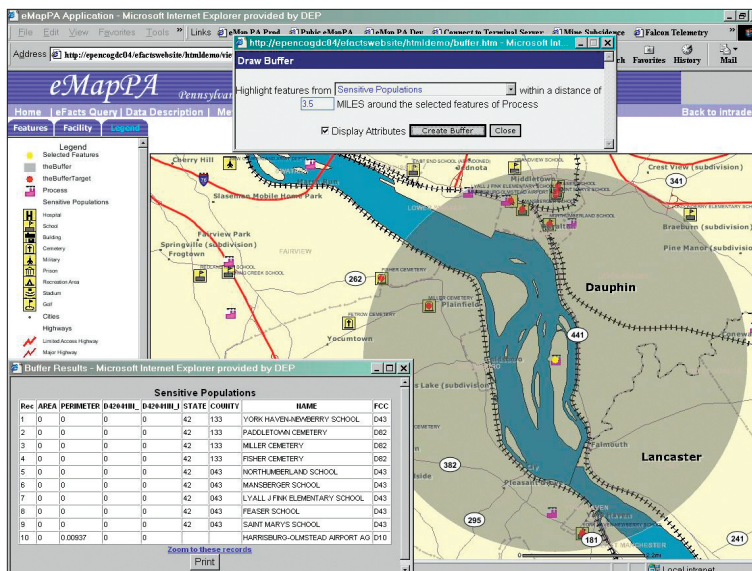
Pennsylvania Department of Environmental Protection

Goals

- Provide the public with a single, reliable resource for environmental information (e.g., safe drinking water, compliance with environmental laws, location of factories in relation to schools).
- Develop an effective method for planning and managing an enterprise network environment in which environmentally permitted locations have to be analyzed in depth with a rapid response.
- Make the resource easy to use.
- Make the resource highly accessible.

Results

- Users have the capability to analyze vast amounts of data with a variety of tools ranging from simple queries to advanced, user-built queries.
- Extensive environmental data and functionality are combined to suit every user in an easy-to-use mapping tool.
- DEP staff members gain significant time savings doing environmental assessments.
- The public is able to get an accurate response to their environmental concerns within seconds rather than days.



Introduction

The Pennsylvania Department of Environmental Protection (DEP) has a mission to protect Pennsylvania's air, land, and water from pollution and provide for the health and safety of its citizens through a cleaner environment. DEP values two-way communication with all its constituents and proves this by involving the public in decision making opportunities and disseminating information through all means possible.

Whether a citizen is questioning a noxious odor from the tap water, the hazards of an abandoned mine, or a neighborhood company's compliance with environmental law, location is the critical element to answering the public's questions and concerns. In the past, environmental information was transmitted over the phone, through an existing Web site with limited functionality and data, or by knowing who was holding the needed data. Missing was a single reliable resource with the data, functionality, accessibility, and ease of use that everyone needed to locate and address areas of concern in the environment.

The Solution

Environmental permit applicants, concerned citizens, government agencies, and DEP employees all have an interest in environmental information. To address the needs of both DEP employees and the public, DEP investigated its options and chose ESRI's spatial data server ArcSDE®, Oracle®, and ArcIMS®.

DEP chose ArcIMS because it wanted a strong foundation for distributing high-end geographic information system (GIS) and mapping services over the Internet. DEP also wanted to give users an easy, reliable way to interact with maps and their local data. ArcIMS was the clear choice because of the software's ability to enable users to integrate local data sources with Internet data sources for display, query, and analysis in an easy-to-use Web browser.

DEP was also looking for the most effective method for planning and managing an enterprise network environment in which environmentally permitted locations have to be analyzed in depth with a rapid response. Deploying ArcIMS was once again a logical choice to make the site a success.

ArcSDE was chosen because it provided the best solution for retrieval of geographic data from Oracle. In addition, ArcSDE offered advanced spatial search functions, spatial geometry verification, projection functions, fast loading databases, and a host of

Continued on page 2



ESRI

380 New York Street
Redlands, CA 92373-8100, USA

Phone: 909-793-2853

Fax: 909-793-5953

Web: www.esri.com

E-mail: info@esri.com

Pennsylvania Department of Environmental Protection

ESRI Software and Extensions

ArcIMS 4.0.1

ArcSDE 8.2

DBMS: Oracle9TM

Operating System: Windows[®] 2000

ArcIMS Web Server

- Compaq[®] ProLiant ML370 G2
- Two processors (Intel 1258 MHz)
- 3.93 GB RAM

Spatial Servers

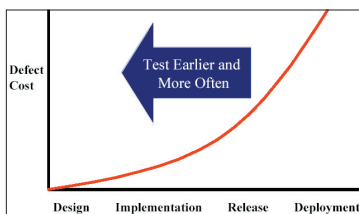
- Two processors (Intel 864 MHz)
- 2.01 GB RAM

Database Servers

- Four Processors (450 MHz)

Type of Data: More than 140 environmental data layers including water, air, mining, brownfields, facilities, etc.

In addition, DEP used Java 2 SDK version 1.3.1_01 as well as JRE version 1.4.0_01.



Performance of eMap PA does not degrade with millions of users on the site—a preliminary analysis during the design state resulted in some valuable information.

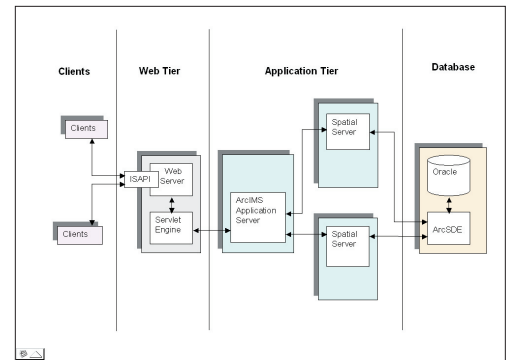
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administrative tools. The ability to perform ArcSDE administration through a system of cooperative client/server processing and a clientside task frees the database management system server to concentrate on efficient querying of the database. Three reasons why DEP chose ArcSDE software are that it provides new functionality (including versioning), direct editing of spatial data, and support for new data types (including raster files and locators [addresses]). DEP was looking for a solution that supports a variety of elements—points, lines, and polygons. In addition, the product had to have the ability to handle both raster and vector data. Thus, the logical choice for the department was ArcSDE.

The resulting location-based service was called eMap PA (www.emappa.dep.state.pa.us).

Through iterative performance testing of various design options, DEP determined the best combinations of Oracle database design options; spatial tools such as ArcSDE; Internet mapping tools such as ArcIMS; and languages such as Java[™], JavaServer Pages[™] (JSP), JavaScript[™], and HTML. Using Rational Test Manager, DEP was also able to gauge changes in performance brought about by hardware enhancements. The DEP team was able to determine where best to apply hardware upgrades and what those upgrades would do to total application performance, thus avoiding needless expenditures on hardware.

eMap PA is now DEP's Web-based mapping and locational service tool for all Pennsylvanians. This Internet and Intranet site combines a collection of layers or themes of map features such as keystone opportunity zones, conservancies, private landholdings set aside for environmental reasons, landslide areas, sinkholes, lands unsuitable for mining, abandoned mines, Environmental Protection Agency Toxic Release Inventory sites, and more. There are also 140 data layers representing DEP's corporate database of environmental information that is available for analysis. To analyze all this data, a variety of tools with capabilities of running simple queries as well as advanced user-built queries is available. Users can also use the predefined tools or just point and click on the map to obtain database readouts. All the data on the map can now be accessed and analyzed in a variety of ways. This innovative new tool is the state's central resource for combining extensive environmental data and functionality to suit every user in an easy-to-use mapping application.



Architecture Diagram of eMap PA

The Outcome

eMap PA, with its ability to accurately determine distances between any two or more features on a map, can tell a parent how far away a factory is from a child's school and whether or not that factory complies with Pennsylvania's environmental laws. Do I live in a floodplain? What is the health of the nearby river or stream that I swim and fish in? These questions can be answered today because eMap PA is available to the public.

For DEP employees, what once took hours and days to do can now be performed in a matter of seconds. eMap PA is now the place where staff go to perform environmental assessments of everything from abandoned mine sites to public water supply areas. For example, if DEP sees a segment of a stream that is impaired, it can pull up eMap PA and see all the facilities the department regulates that are upstream or downstream within any set distance of this point. This enables DEP to see the source of the pollution—whether it is an effluent being discharged or drainage from a mine.

DEP's business processes are now forever altered. Instead of permit applicants not knowing what environmental factors may affect approval, applicants can check eMap PA and see factors that affect their environmental permit before submitting the application. DEP employees do not have to go on a data hunt to get an answer. The public will not be placed "on hold" while a DEP employee looks for a map or determines what permitted facilities are in the caller's neighborhood.

By using state-of-the-art ESRI[®] GIS tools such as ArcIMS and ArcSDE, combining the software engineering practices to capture user requirements, and developing and testing design options, DEP was able to exceed its goals within a six-month time frame. Money and time have been saved while making DEP more responsive and thereby fulfilling its mission to protect the environment.