

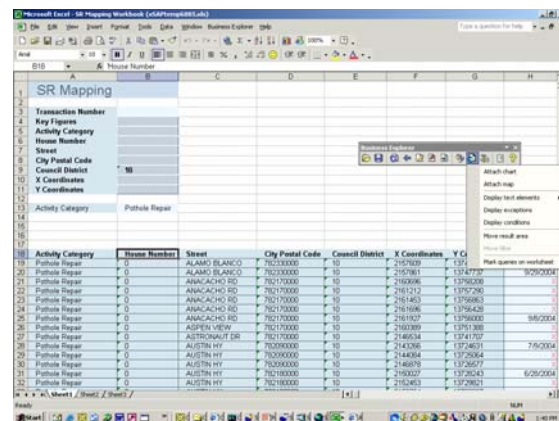
Mapping Data in SAP-Business Warehouse

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San Antonio, Texas is the eighth largest city in the United States, with a population of about 1.2 million people. The City of San Antonio is completing an installation of SAP data warehousing software as part of the Enterprise Resource Management (ERM) project. The SAP Business Warehouse team is the reporting arm of the project, and needed to develop a way to display the city's data on maps. The project has a large budget but mapping capability was not in the initial scope of the project and consequently there was no budget for completing this task. The team looked at two different methods for accomplishing this goal. This paper explores the SAP Business Explorer map tool, which is packaged with the software, and a second method the team developed using VBA, SQL, and ArcGIS/ArcIMS, and compares and contrasts the two methods.

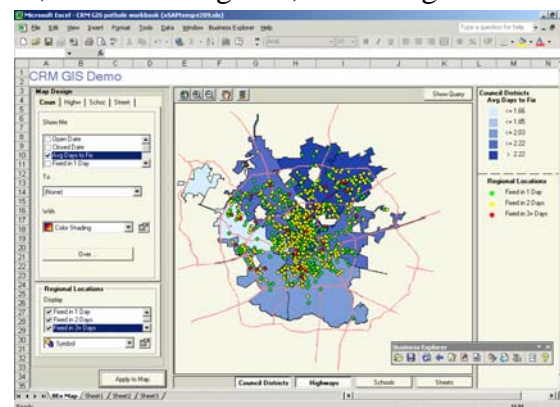
SAP is a German software company that specializes in data warehousing solutions, and an ESRI business partner. The SAP reporting tool is called Business Warehouse, or BW for short. BW includes Business Explorer Analyzer (BEx), which is an instance of Microsoft Excel with a set of macros for reading data from BW. Microsoft is also an ESRI business partner.

The Business Explorer toolbar includes a command for attaching a map. There are several steps that must occur before a map can be produced. The map uses shapefiles, and these must be loaded into the BW server. The shapefile's .dbf file must contain a key field, called the SAPBWKEY, with a pointer to the dataset that will be used to produce the map. Obviously the dataset has to have X,Y coordinates. Once these steps are accomplished, the map can be displayed.



SAP Business Explorer. The toolbar contains the Attach Map command.

The user can bring up the map in Business Explorer's integrated map viewer. The map viewer was developed using ESRI's ArcObjects, and it has a limited set of tools for configuring the map. The user can display layers, charts and legends, and change colors. The tool allows color shading of polygons, and color-coding of points. All of the colors can be set according to the values in the dataset. Users can also display bar charts and pie charts, and zoom and pan.



This map shows city council districts color shaded by average time to fix potholes, and the potholes as points, color coded by the number of days to fix.

The map tool does not allow labeling of features. It includes a legend, but not a north arrow or title. There is no capability

to measure distance. Maps can be viewed from within Business Explorer, but cannot be exported or viewed on a web page. The underlying shapefiles must also be maintained. For example, if the city council districts change, then the shapefile must be deleted and reloaded.

The Business Explorer amp tool is available to all users, but the report must be configured in advance, a task that requires significant expertise and time. The average user is not expected to perform this function.

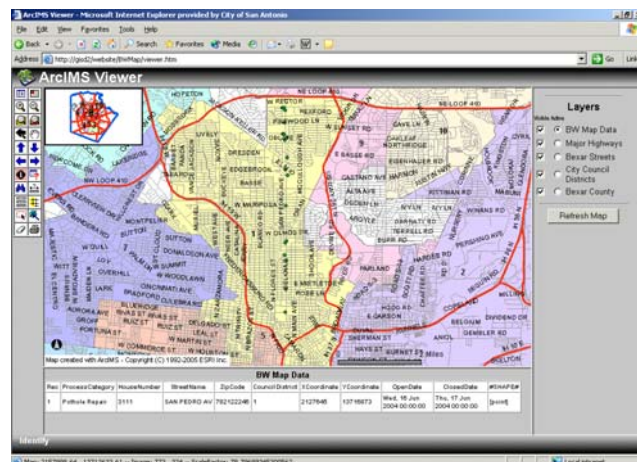
The BW team wanted to give users a more powerful tool, that they would be able to use from within Business Explorer, and enable displaying maps on the web. Realizing that Business Explorer uses Microsoft Excel, the teams decided to attempt exporting the data using VBA, and store it in a SQL database. An ESRI ArcIMS web page could then use the database to display the data on a map. After some experimenting, this solution worked.

The VBA code is the driver for the system. The city's Information Technology Services Department Applications team was brought in to write the code. The VBA code is stored as a module in a Business Explorer workbook. The code performs several steps, which are summarized as follows.

The code first truncates, or deletes data from, the SQL database, to ensure a clean dataset is displayed for each user. Then a connection to the Business Explorer workbook is established, and the code loops through each row in the workbook, looking for X,Y coordinates in the appropriate columns. Once an X,Y coordinate is recognized, the code begins building a SQL string. Each column is evaluated separately, and the code processes each cell in a row according to that column's data type. If a cell is empty, that value is written as a "0" or "null". The X,Y coordinates are treated specially, since they are stored on the city's mainframe computer in a shortened form to save space. The VBA code converts the X,Y values so they can be displayed on the map. When the code finishes with a row, it completes the SQL string and writes that row to the database.

When the code reaches a row with no values in the X,Y fields, it exits the loop and opens the ArcIMS web page. The GIS section within the city's IT department set up the map service. ArcIMS 9 cannot connect to a database on its own, so the GIS team created an ArcMap .mxd file with a connection to the SQL database, and then connected ArcIMS to this .mxd file.

When the ArcIMS web page opens, it reads the ArcMap file and displays the data as points on the map. The map viewer enables the user to perform all the functions available in ArcIMS, and combined with the querying capability in Business Explorer, gives the user a powerful



The ArcIMS map viewer, showing potholes on a city street.

tool to analyze and display the city's data. As an example, city staff can use Business Explorer to drill down on a set of potholes on a particular street in one council district, and display just those potholes on a map. The potholes can be in a specified date range, and the user can specify whether the work orders to fill the potholes have been closed or are still open.

This solution does have certain limitations over the Business Explorer internal map tool. Users cannot change colors of features, or display charts. There is currently one map service for all users, and if one user displays data, and then another user loads the database, the potential exists for the first user to see the second users data upon refreshing the map. The BW team is researching the possibility of passing the userID to the SQL database and selecting on the userID to eliminate this crossing of data among users. The VBA code may be used to pass a title to the map. Further customization of the map viewer will enable more tools and functions available to the user.

Both of the mapping tools have desirable tools and functions. Demonstrations to city staff have brought uniformly positive reactions, and every department that has seen the ability to map data has expressed their desire to use it in their duties. Potential users have been quick to recognize the benefits of mapping their data, including better visualization of trends and relationships, quicker decision-making, and reduced cost.

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