

Total Facilities Management With GIS, MAXIMO® and CAD

Jason Thacker – TAIC

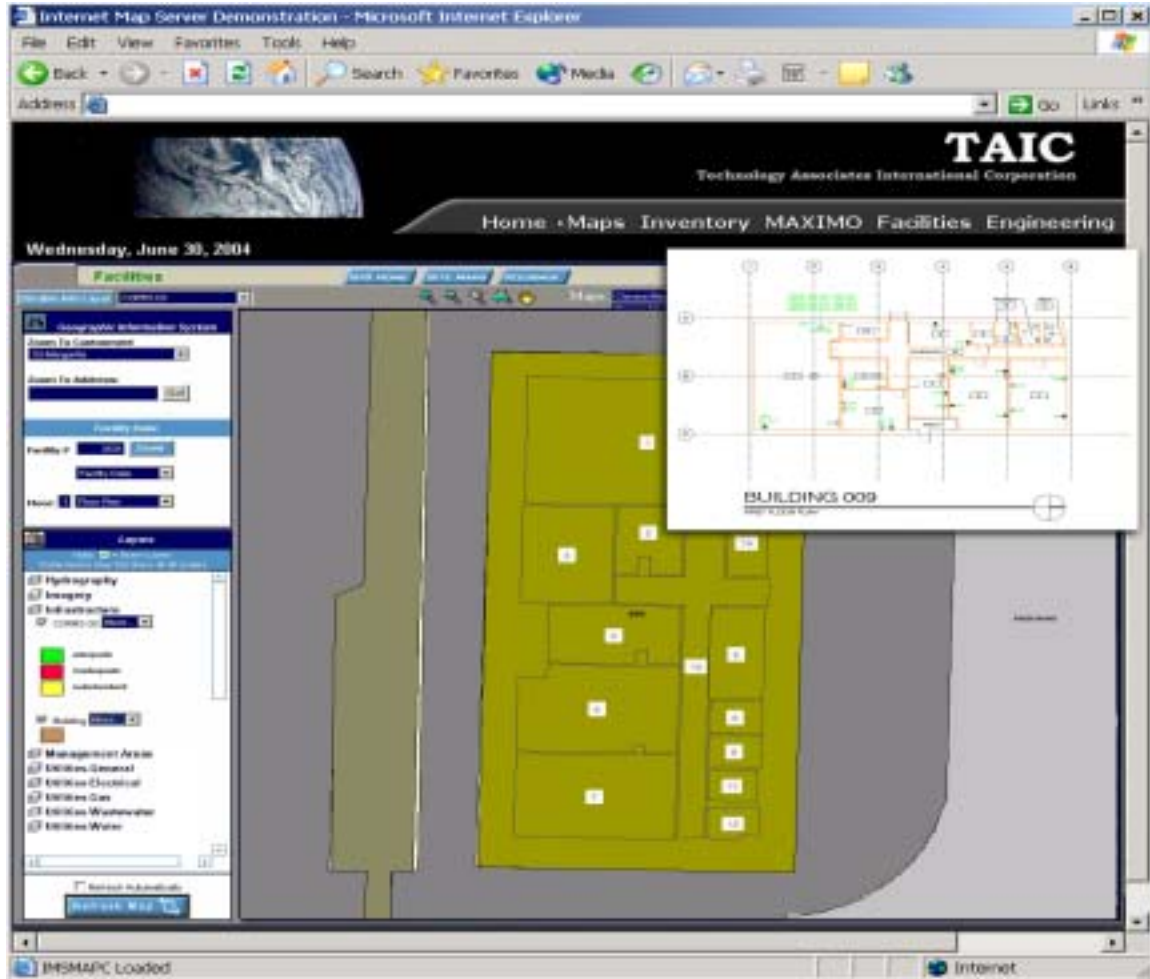
Abstract

Facilities management has multiple definitions for people in an organization. Some might be interested in the cost to perform a major building renovation, others might be interested in its location and proximity to other things, and others might be interested in the square footage of the rooms within the building for cleaning purposes or furnishing. Historically, facility managers have gone to multiple applications to get the answers to such questions. These answers however, are easy to come by through seamlessly integrating GIS with an asset management system such as MAXIMO® and using scheduled ArcObjects routines to convert frequently edited CAD data, that has historically been used to manage building footprints, into a geodatabase to answer questions such as “how much square footage is in this room.” TAIC will present our “one-stop” solution for facility managers to make informed decisions from a single application.

Body

Facilities management data come from many sources and in many formats. Floor plans and utility drawings are often maintained in CAD. Building and equipment pictures are often stored in a shared directory as digital photographs. Historical records may be stored as TIFF images in a document management system. Facilities management-related databases such as telephone directories, property records, equipment and IT inventories, and facilities maintenance applications such as MAXIMO® are often housed in and administered by different departments within an organization. How to best integrate these various data formats while fostering cooperation among the many departments and individuals responsible for the maintenance of those data sources is a question many organizations struggle with. Through GIS, integration of these diverse data sources can be a seamless process that provides facility managers with a single-source solution to meet their management needs.

CAD - GIS Synchronization



Since surveyors, construction and utility contractors, and facilities engineers typically maintain their plans in CAD format and are generally comfortable with their particular CAD software, any solution to integrate this data should allow them to continue their existing processes **without the need to maintain separate copies, add additional procedures or provide additional training**. TAIC has implemented a GIS-based solution that accommodates these requirements.

Through ArcObjects programming, asset and space-level geometric and attribute information is extracted directly from CAD floor plan files, input into the GIS, and linked to an asset management database. Additionally, the ArcObjects procedures are scheduled to automatically detect and run the extraction and update process when a CAD file has been edited. This solution allows the existing CAD operators to continue utilizing and maintaining their same CAD files, in the same directory they always have, at the same architectural scale they are familiar with. The GIS simply reads and extracts the information required to support the asset management system. Structure floor plans generally provide geometric and attribute information at the asset (building) level. When floor plans also contain individual room-level polygons, facilities can be managed at the

space (room) level. Examples of information extracted from CAD floor plan files and available to facility managers through the GIS include, but are not limited to:

- Asset and Space geographic foot print (geo-referenced)
- Asset and Space gross square footage
- Asset and Space net square footage
- Asset and Space name
- Space floor level (1st, 2nd, 3rd)
- Asset-space association

This same concept can be applied to other types of information typically maintained in CAD format such as utilities, property boundaries, and transportation routes.

Leverage External Facilities-Related Databases

The screenshot shows a web-based application titled "GIS Facility Data Viewer - Phoenix2 Internet Explorer". At the top, there is a search bar with the following fields: Activity (DL), Special Area, Facility No. (205462), PR No. (295462), Facility Name (Research Laboratory), and Category Code (31823). Below the search bar are several tabs: ALL RESULTS, FACILITY DATA, OCCUPANCY, ROOM DATA, ORGANIZATIONAL, PHOTO, and FLOORPLAN. The "ROOM DATA" tab is currently selected, displaying a table with the following columns: Room No, Floor, Room Description, User IUC, Category Code, User Code, Organization Level 1, Organization Level 2, Organization Level 3, and Organization L.

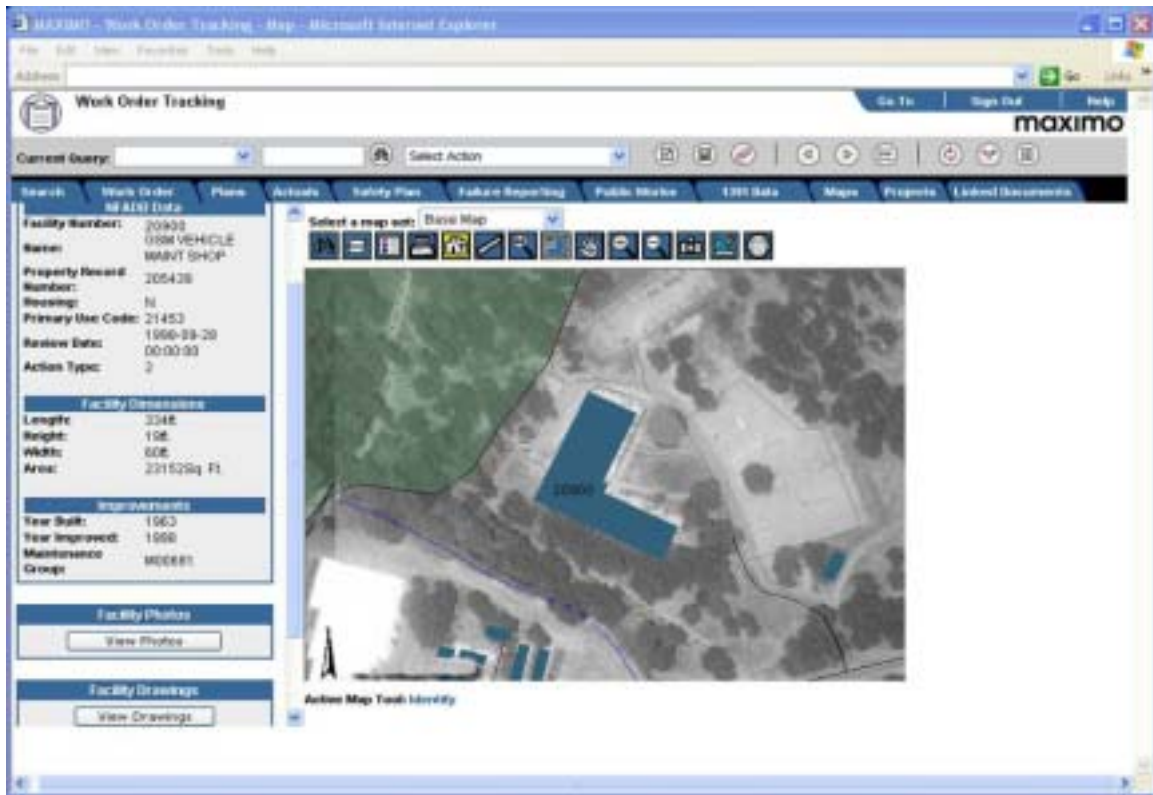
Room No	Floor	Room Description	User IUC	Category Code	User Code	Organization Level 1	Organization Level 2	Organization Level 3	Organization L
100	1	STORAGE	169530	31218	472000D	RESEARCH & ENGINEERING	WEAPONS/TARGETS DEPARTMENT	ELECTRO-OPTICAL/INFRARED GUIDANCE DIVISION	ELECTRO-OPTICAL/INFRARED GUIDANCE DIV
1000A	1	ADMINISTRATIVE	169530	31823	47AFOOD				
1000B	1	COFFEE MESS	169537	31823	726100D				
1000C	1	CONFERENCE ROOM	169537	31823	880000D				
1000D	1	AUDITORIUM	169537	31823	980000D				
1000E	1	ADMINISTRATIVE OFFICE	169537	21918	040000D				
1000I	1	FOTS HUB	169530	13117	724000D	CORPORATE OPERATIONS	IT/IM DEPARTMENT	IT/IM CUST SERVICES & OPERATIONS DIVISION	IT/IM CUST SERVICES & OPERATIONS C
1000J	1	ADMINISTRATIVE OFFICE	169530	31823	724000D	CORPORATE OPERATIONS	IT/IM DEPARTMENT	IT/IM CUST SERVICES & OPERATIONS DIVISION	IT/IM CUST SERVICES & OPERATIONS C
1000K	1	STORAGE	169530	31823	724000D	CORPORATE OPERATIONS	IT/IM DEPARTMENT	IT/IM CUST SERVICES & OPERATIONS	IT/IM CUST SERVICES & OPERATIONS C

GIS can serve as the common thread amongst the many asset and space management-related databases such as property record cards, telephone directories, and equipment inventories typically found within an organization. Since these data sources are often managed by different departments and may be physically stored in different buildings or geographic areas, the question is how to best integrate this data **without requiring additional business processes from the departments or individuals updating and utilizing those systems**. TAIC has implemented a GIS/database solution that accommodates these requirements.

Once the asset management foundation has been established by importing the asset and space-level geometry and basic attribute information from CAD, supplementary data is incorporated through customized database programming procedures that connect to the remote databases, extract the asset and/or space-level data, and link that data to the corresponding asset or space in the GIS. The database procedures are scheduled to run automatically at various intervals as determined by the frequency at which the original data sources are updated. Examples of information extracted from other database sources include, but are not limited to:

- Organization by building or room (Engineering Div, Public Works dept.)
- Personnel by building or room (John Doe – Bldg.10, Room 220)
- Type of building or room (warehouse, admin, bathroom, hallway, lab)
- IT inventory by building or room (computers, printers, live outlet numbers)
- Facilities equipment inventory by building or room (boilers, a/c units)
- Janitorial services (days per week, level of service, shift number)
- Property record cards (financial value, use code, built date)
- Planning/construction (proposed for demolition or repair)

GIS - MAXIMO® Integration



As a leading facilities maintenance management system, MAXIMO® provides a broad spectrum of asset management-related data. MAXIMO® is a total work order management system that is used to report asset problems (such as a broken air conditioner) and create a corresponding work order, develop preventative maintenance

schedules to avoid asset failures, assign and schedule labor to work orders, track inventory used to complete work orders, and update MAXIMO®'s automated purchasing system to replace that inventory. Maximo runs on an Oracle database and its more recent application release provides a Web-based interface. Asset management information provided by MAXIMO® includes, but is not limited to:

- Preventive maintenance schedules
- Equipment inventories
- Job plans
- Inspection reports
- Work orders

TAIC has enhanced MAXIMO® by including a GIS module that is available once a user logs into MAXIMO®. Multiple methods can be utilized to relate MAXIMO® asset numbers and location table data to their corresponding GIS facilities and can be a daunting task depending on the condition of both the GIS and MAXIMO® data. The result of the effort however is **full enterprise GIS functionality within MAXIMO®** including:

- View GIS map data sets or layers
- View photos, CAD floor plans
- Enterprise data access to not just Maximo and GIS data, but other data sources such as those outlined above
- Facility evaluations
- Print custom maps; 'Maps on Demand'
- View asset information by map click, asset number, address, or area
- Project tracking
- Zoom to map location from work order, equipment and location modules
- View space level data that has been imported to the GIS and their corresponding equipment records from MAXIMO®

Including a GIS interface with MAXIMO® greatly enhances its functionality. To the Asset or Facility Manager who may not be an everyday user of MAXIMO® but still requires data contained in MAXIMO® to make important decisions, GIS provides an easy, intuitive interface to access that data by creating a selection set in GIS from which to read and create reports from the MAXIMO® database. Work order scheduling can be more efficient by determining the best geographic route between work orders and the time to travel to each. Assets that are in close proximity to one another that might not have been scheduled for preventative maintenance on the same day in MAXIMO® might be rescheduled after viewing them in GIS. By visually displaying GIS data based on the amount or priority of work orders, trends that might not be realized through analyzing tabular data alone can be realized.

GIS can also be used prior to issuance/funding of large work orders (reconstruction or new construction projects). GIS can be used to analyze constraints to development such as environmental restrictions. GIS can also be used to calculate the distance between a proposed construction site and the nearest water or electric line to determine amount of line required, from which cost can be calculated and the necessary inventory purchased.

GIS Portal: the Single-Source Solution



A Server-side processing, GIS Web portal application provides a centralized map and facilities management database search, editing and reporting tool to facility managers as well as many other individuals within an organization. TAIC's GIS Web portal allows portal administrators to perform such functions as control and define user-specific access, edit portal content, add new maps, and customize map functionality and layout all from within the portal itself. The Web-based GIS asset management portal application allows facility managers to:

- View map within a facilities-oriented Web portal environment
- **Overlay CAD floor plans** within the map
- View CAD files without the use of a Web plug-in
- View asset-level information by selecting an asset/building
 - Square footage
 - Occupancy
 - Property record card
 - Digital photo
 - Floor plan
 - Equipment
 - MAXIMO®
- View space-level information by selecting an asset or space
 - Square footage
 - Occupancy
 - Service
- **Search and create reports**
 - Square footage by organization
 - Square footage by use type
 - Total equipment value per building
 - Total asset value per area or organization
 - Total work orders per building
 - Total maintenance costs by organization or building
- **Edit/Update** map and selected asset and space management information through the map and Web portal
 - Inspection status
 - Maintenance responsibility code
 - Asset manager designation
 - Occupancy and contact information
 - **On-line mark-up** of geographic features on map (server-side processing)
 - Create points, lines and polygons
 - Add attribute information

Facility managers no longer have to go to multiple applications to get the answers they need. By using scheduled ArcObjects routines to synchronize frequently edited CAD data, automating database procedures to tie-in external data sources, and integrating a facilities maintenance management system such as MAXIMO®, TAIC's GIS Web portal provides a "one-stop" solution for **total facilities management**.

Acknowledgements

All pictures provided by Technology Associates International Corporation (TAIC)

Author Information

Jason Thacker

GIS Consultant

TAIC

(Technology Associates International Corporation)

5962 La Place Court, Suite 225

Carlsbad, CA 92008

Office: 760 603 1195 x103

Fax: 760 603 1164

jthacker@taic.net