

**Application for
The Northwest Academic Computing Consortium
Joanne R. Hugj Excellence Award**

Map Information Tool

**Pacific Northwest National Laboratory
Information Technology Services Division**

Abstract:

A map is a map, right? Wrong. When paired with geographical information system (GIS) technology and detailed location information, the lowly map can become a strategic tool in the safe and efficient management of a large campus. That is what Pacific Northwest National Laboratory (PNNL) accomplished with the development of the Map Information Tool (MIT), a one-stop, GIS-based, web-accessible system that provides facility and space information to PNNL's visitors and staff, including safeguards and security personnel and first responders. The MIT program was created from readily available technologies and is virtually maintenance-free.

Description of the Practice:

Asset management and emergency response are impossible without knowing where things are. The easier location information is to obtain, the better steward an organization can be of its resources, the more efficient its daily operations become, and the more prepared the enterprise is to respond to an emergency.

The scope of the "where is it?" challenge at PNNL is significant:

- approximately two million square feet of facility space billed to 350 different organizations in 8,000 individual spaces in 100 facilities on 200 AutoCAD® drawings
- more than 4,200 occupants from over 30 different companies occupy the spaces
- over 350 acres of PNNL-maintained land, plus "branch" offices and laboratories throughout Washington State
- over 7,500 instances of about 75 various types of hazards
- hundreds of pieces of emergency equipment, including fire alarm pull boxes, extinguishers, and automated electronic defibrillators
- over 300 locations and types of recycle bins
- roughly 70 conference rooms. Each room contains equipment, such as overhead projectors, network drops, and copying white board, plus individual attributes, such as video conferencing design, size, and seating capacity.
- more than 50,000 chemical records in about 150 various work groups and about 35 categories.

PNNL's Information Technology Services Division addressed the challenge by creating MIT, GIS-based technology that provides facility and space information about all of the above items in near real-time, including personnel and property assigned to the spaces.

MIT leverages and centralizes existing facility and space business systems, data, and AutoCAD drawings into a highly usable web-based interface. Users can easily search and browse physical location data ranging from buildings and offices to such items as recycle bins, fire exits, and hazardous materials.

MIT's maps and reports are available to all PNNL staff and authorized users via any modern standards-compliant web browser. MIT also features automated updates, easy extensibility of data sets and almost no maintenance cost.

Responses to Evaluation Criteria:

Innovation

MIT advances the use of information technology by economically adapting the principles of elaborate, costly GIS systems to the daily operation, asset management and emergency response needs of a large campus. MIT employs a variety of technologies and platforms to create an integrated information technology tool capable of displaying and relating facility data from multiple business systems via a map-based graphical user interface.

MIT exemplifies the creative extension of an existing technology. MIT improves on Autodesk MapGuide® in many ways, including:

User Experience. MIT provides a graphics-rich interactive user environment to accommodate novice- to expert-user skill sets. The design places the most frequently executed tasks immediately before the user. For example, most common functions are immediately available without selecting a menu item resulting in a reduced number of mouse clicks. Additionally, the Autodesk MapGuide interface has been modified to automatically change tools based on mouse activity.

Technology. MIT was implemented as a web-based application with cross-browser compatibility that does not require installation of additional client software. Asynchronous JavaScript ® and XML (AJAX) technologies are heavily employed to increase the system performance perceived by users. Data transfer volume was further reduced by exploiting JavaScript Object Notation, rather than XML, as the data transfer protocol between web server and client. Open source software, such as Yahoo!'s User Interface, was used to provide additional features with reduced development effort.

Integration. MIT presents information that relates geography to facilities, operations, and other business data. It allows for the integration of multiple business systems into a single interface for querying and reporting. MIT system architecture also allows for rapid expansion by interfacing with additional data categories and the ability to use web services to supply data for the reports.

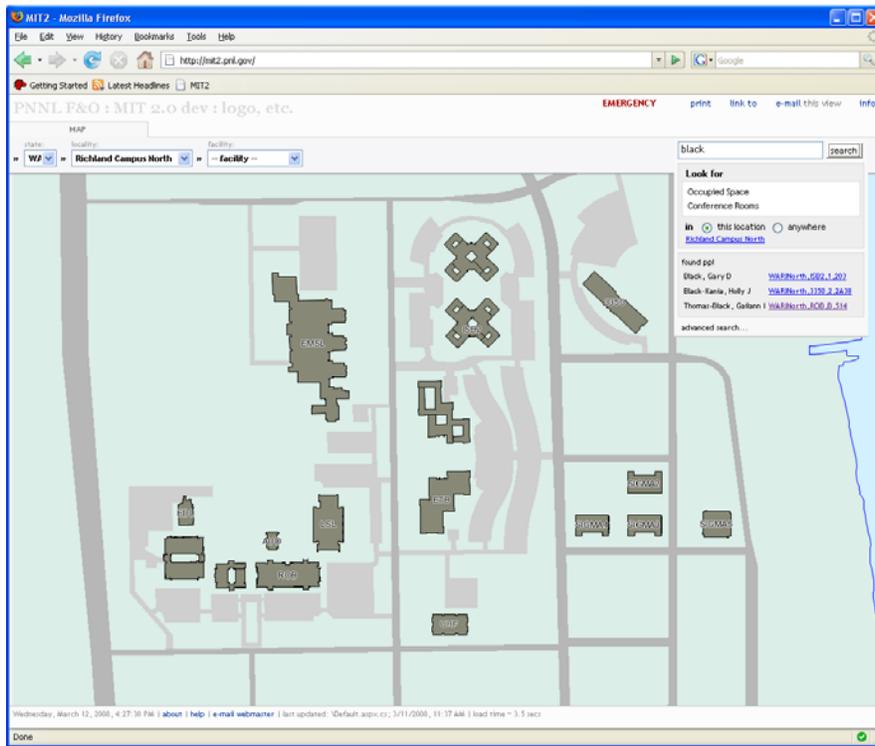
Refresh Process. Automated process completes the data refresh across all facilities in Washington State in about 15 minutes. This enables near real-time map data without manual intervention.

Access Control. MIT provides role-based access control. The user interface adapts to the user's role to ensure authorized data access.

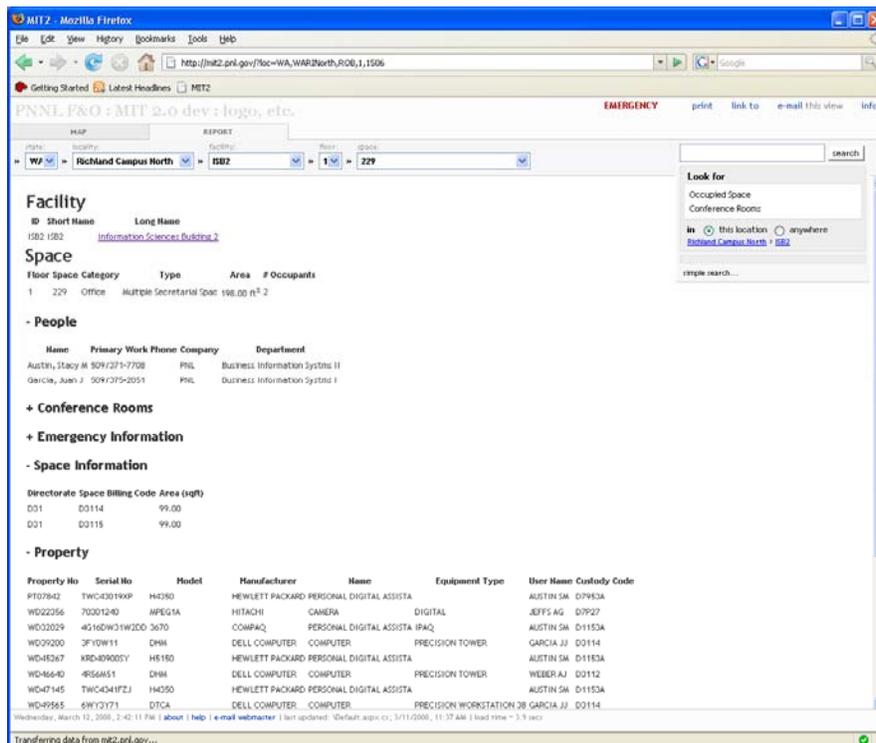
Leveraging and Augmenting Existing Systems. MIT augments existing business systems by leveraging data warehouse and reporting datamart architecture for all of the relational data. AutoCAD drawings are used for the graphical data including the base site map, facility space details, and emergency response information such as exit routes and fire extinguishers. Integrated data comes from eight asset management and inventory systems:

- facility and space
- occupants
- property
- safety and hazards
- fire exit routes and emergency equipment
- recycle locations
- conference rooms
- chemical storage

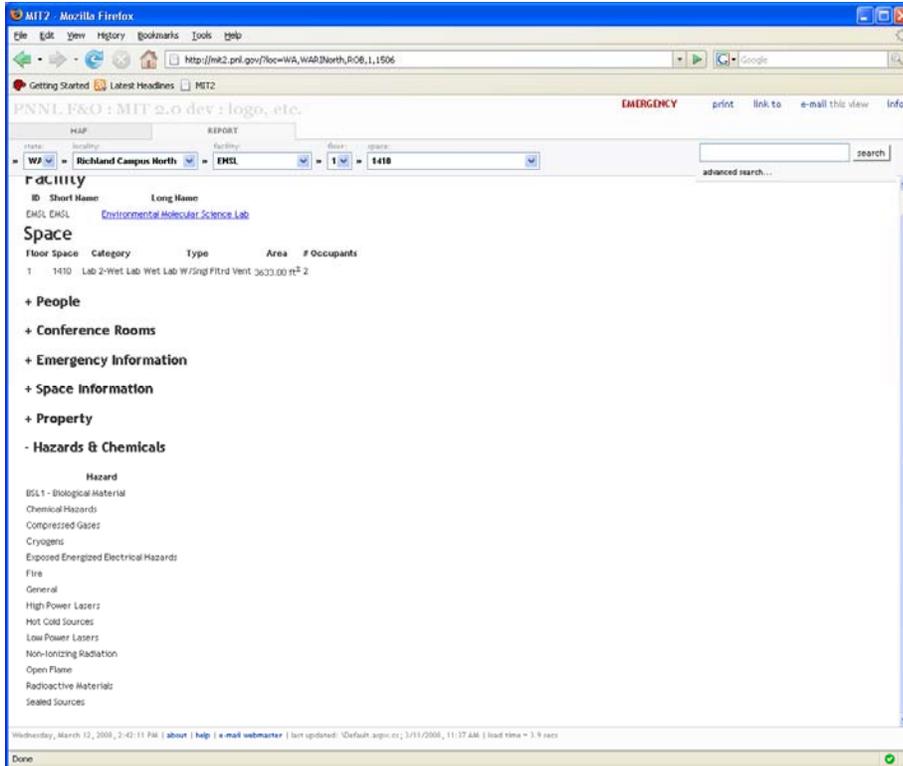
Here are some examples of MIT in action



This view shows facilities in the north part of the Richland campus, plus the location of selected staff. Users can zoom in to find conference rooms, laboratories, individual offices and other data.



Data displayed for this administrative pool space include space category, type, square footage, occupants, space billing information, and property assigned to occupants.



MIT contains over 7500 instances of various types of hazards.

Benefits

MIT directly aligns with PNNL’s institutional strategy—management and operations excellence—and significantly enables achievement of the lab’s strategic goal to “demonstrate cost-effective operational, financial, and organizational management of the lab to enable research.” A key element of that goal is the safety and protection of people, equipment and the environment.

MIT is an unsung hero of lab operations—easy to take for granted and absolutely essential in a crisis. MIT enables personnel and emergency response units to make rapid decisions based its displays of facility and space data, including security information and hazardous materials locations. A second prime benefit of MIT is its contribution to efficient site management.

Collateral benefits include:

- accessible to all employees and other authorized users
- near zero cost of maintenance, compared to \$25,000 annually for the legacy tool
- near real-time data
- easily extensible to display any kind of physical location data
- independent of operating system and browser software
- streamlined user interface.

Replicability

MIT was designed to be implementable across a wide variety of organizations. It can be adapted by any organization that has a desire to make facility and space data available for searching and browsing.

Main replicability attributes include:

- The technology employed is either commercially available or open source.
- MIT is a framework onto which any data tied to a physical location can be displayed.
- Data is abstracted via data warehouse and datamart architecture, enabling a source system's integration without impacting MIT.

Costs

At a development and implementation cost of \$250,000, MIT represents a multi-million-dollar savings over installing, configuring and maintaining a conventional off-the-shelf GIS system.

The automated data acquisition and processing built into MIT will reduce the \$25,000 annual data maintenance required by the legacy tool to almost zero and ensures information provided is the most recently available and most trustworthy. The comprehensive scope of location-specific business data provided by MIT eliminates the burden on users who were previously encumbered with the need to access data from separate source systems. Time savings per individual per annum are estimated to be a minimum of half an hour. Across PNNL's workforce, this is an estimated annual savings of \$150,000.

Easy and immediate availability of business-critical, location-related information has further highly significant potential cost savings, including reduced reliance upon printed documentation, mitigation of the risk of outdated or untimely information in emergency situations, reliable access to property location data, and ease of access to information describing the location of potentially hazardous materials. Furthermore, MIT aids PNNL in its commitment to responsible environmental stewardship by exposing the location of recycling centers across all facilities.

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