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The BIM Balancing Act: Tilt the Scales in Your Favor

Feature

Creating a BIM for Emergency Management

By Bob Cox and Fred Terry

WHAT THE INDUSTRY THINKS BUILDING INFORMATION MODEL (BIM) IS

The industry (software vendors, architects, builders) tends to think of a BIM as the 3D representation created from 2D Computer Assisted Drawings (CADD) files or by a specialized BIM application. Facility owners and operators, however, are beginning to realize a BIM only begins with that 3D representation; it reaches far beyond that to incorporate all of the facility-associated data including (but certainly not limited to) as-builts, equipment specifications and operations manuals, parts lists, data from the building automation and control systems, and fire response plans. Those owners and operators realize that having all of this information in electronic format that can be integrated and correlated would provide the basis for their lifecycle BIM and provide the basis for real time data for a decision support system that can be used for a wide variety of scenarios and applications.

The industry is concentrating on representation because today's BIM products solve problems that have long existed in the construction industry. They allow for early clash detection and analysis of the building, and these mean fewer changes in the field leading to more efficient and cost effective construction. The new BIM products are also a starting point for interoperability. As a result, Industry Foundation Classes (IFCs) are primarily concerned with ensuring the ability to share data between the different disciplines of construction. A longer term view is being able to share in real time between systems without any manual processes for exporting or importing data. This allows for the creation of a lifecycle BIM: building data—from its inception to the current operating state—can be shared in near real time between systems.

EMERGENCY MANAGEMENT BASED ON A LIFECYCLE BIM

The Pentagon Integrated Campus Pilot Project focused on a different role for BIM. The creation of an integrated BIM that could be used to enhance survivability of facilities and improve the health, safety and welfare of building occupants by securely integrating certain building design, automation and control systems and select force protection systems, thereby creating an integrated campus.

In taking this approach the project demonstrated that the BIM must go beyond conventional BIM definitions and into a model that integrated a wide range of data sources into a single operational awareness tool that could be used to facilitate the implementation of the National Incident Management System (NIMS) to include local incident command, giving an unprecedented ability to access building data, security data, and emergency information for an incident commander.

This new way of looking at what the BIM could do for a facility resulted in a much more robust and comprehensive BIM than currently defined. The diverse nature of where all the data resided dictated the BIM needed to be something that could access this information without having to purchase new software. Each software system currently being used has a specific purpose and was chosen because it met that purpose. The cost of developing and implementing a single software system containing all of the functionality currently residing in this diverse group of software applications was cost prohibitive. Such a monolithic system also creates an inherent vulnerability by creating a single point of failure. By using the current COTs applications, not only was this vulnerability eliminated through distributed control, the cost associated with development and implementation was avoided.

It is critical that access issues to the BIM be addressed early. These concerns include the need to ensure the information contained within the BIM is secure and available to those who need it, while denying access to others. Since 9/11 the need to secure critical and sensitive facility information has become a driven in the development of BIM information for the Federal Government.

This enterprise-centric decision support system solution demonstrated an integrated BIM capable of supporting building operations and maintenance activities as well as incident command operations is the type of model building owners and operators will need in the future.

CREATING A VIRTUAL DATA BIM

While most operations and command centers have video walls with CCTV and other systems displayed, those systems are not integrated in any way. To create a decision support system for the integrated command center, the Pentagon' s Washington Headquarters Services and Pentagon Force Protection Agency worked together to incorporate data from normally disparate systems into a BIM that was the foundation for real-time information for emergency response.

The integrated system was based on building automation and control and fire protection systems to provide real time information about the state of the building. This dynamic information was augmented with data from the Computerized Maintenance Management Systems (CMMS), Computerized Facility Asset Management (CAFM) systems, as well as the commissioning database and displayed for the incident commander in a heads up display. Additional emergency-oriented static data sets—like evacuation routes, standpipe locations and sprinkler zones, and hazardous material locations—could be layered on this foundation of dynamic building data. The data mined from these combined sources could provide an incident commander with a single comprehensive view of the facility.

The resulting system gave the incident commander access to a large set of building data to respond to any threat with a complete picture of the situation. Integrating the various databases made it possible for immediate answers to questions by using a query tool to drill down from the comprehensive view into the BIM data. With a single click, the incident commander could overlay a dataset and answer the questions "What organizations will be affected by this emergency?" or "Are

there any hazardous materials near the fire?" Integrating the databases also meant that the answers to the questions could be quickly located on floorplans or related to other datasets. In the event of a fire, the incident commander would be able to search mechanical drawings of the fire's location to find and display the gas cut-off valve.

This integrated emergency system was based on what could best be thought of as a virtual data BIM. It contained a visual representation of the building with all of the CADD files associated with the facility and a 3D representation. It was not, however, based on one of the current BIM tools because integrating the data would not have been as easy. Instead, it was an interface to the facility data that allowed easy access to any particular slice of the data and continued to use the best of breed CMMS and building automation applications that were already in use.

THE BENEFITS OF A LIFECYCLE BIM

Though this integrated system was only a proof of concept application, it demonstrated the possibility of creating a single, comprehensive view of a facility based on automation and control data that could be used for emergency response. It also demonstrated that it is possible to use existing data and Commercial off the Shelf (COTS) software to create single-click access to disparate data and allow for the creation of information from various datasets by feeding or pulling data into a common interface. This would provide emergency responders with a more directed and timely approach to response and recovery actions.

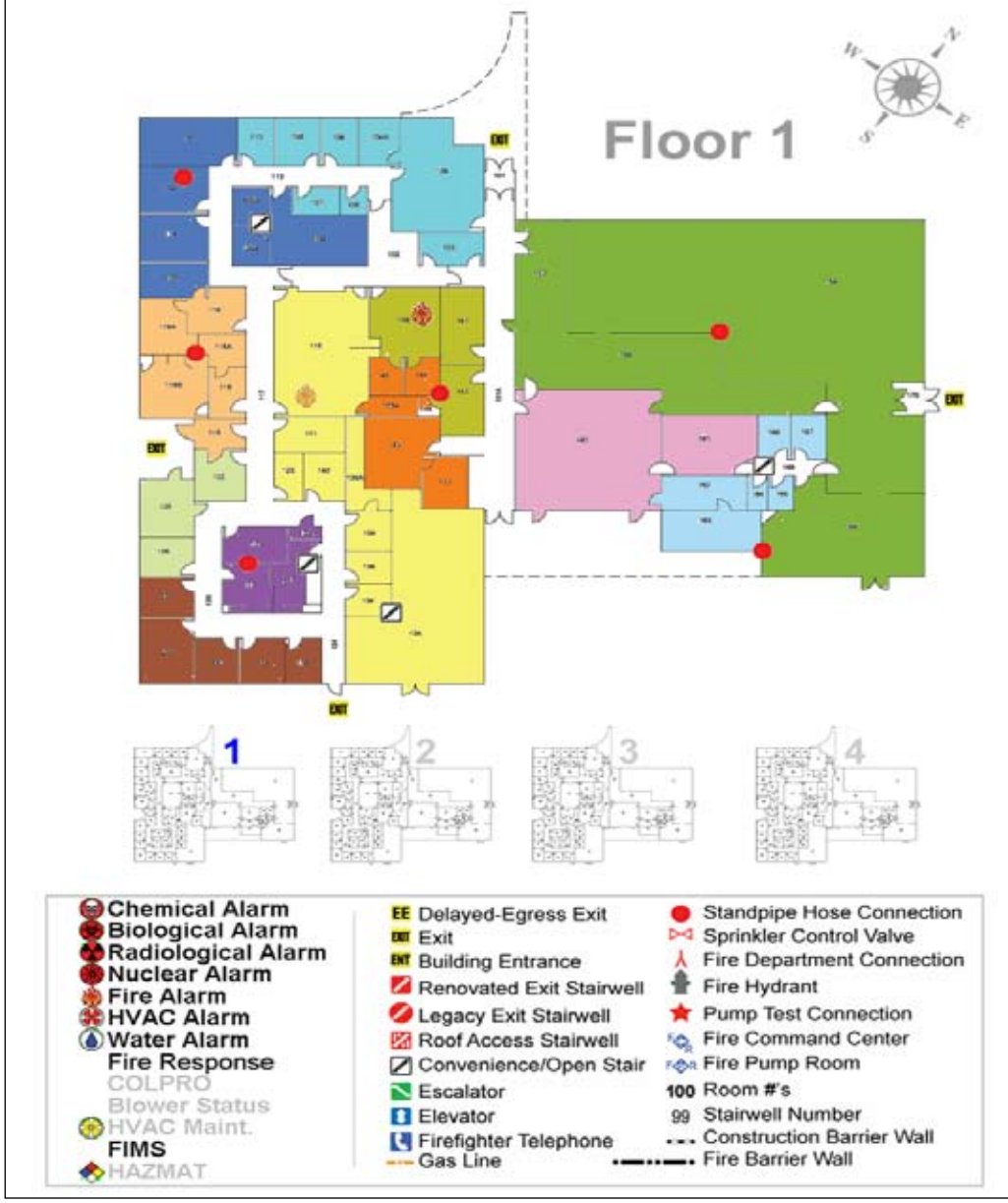
Moreover, the integrated system created for emergency management can be the foundation for operational efficiency. During routine operations, building operators and force protection personnel can address daily tasks in a more efficient manner because they have ready access to a more complete picture of the facility's condition and the status of the various systems that monitor and control facility assets and occupants. The integration of data also makes it possible to mine data from the building automation and control systems for trending, predictive maintenance, and to better manage energy in a large facility.

CONCLUSIONS

Current BIM approaches tend to focus on the initial planning, design and construction. Capturing the data generated in these phases of life cycle are important, but they ultimate serve a more important master, operation and maintenance. The BIM of the future must integrate all aspects of a facility's life, to include security, emergency response, operation, maintenance, and focus on optimization of not only the planning, design and construction, but all aspects of the buildings operation.

Anything less than this will not meet the owners needs. If the BIM is not useful after project delivery, the owner will not be willing to pay for the BIM, even if BIM becomes the standard practice for project deliverables. The BIM becomes useful only if we understand the owners' needs for operating, maintenance and security.

The industry is struggling to decide the appropriate method to create the interoperability necessary to achieve a viable BIM. National Institute of Building Sciences (NIBS) has attempted to address the issue through the use of a National BIM standard and the use of IFCs. Industry software vendors are also attempting to make their products more interoperable as well. Both of these solutions and others must be considered as we move to a day in which we can duplicate the IT industry's "plug and play" approach.



Bob Cox is the Director of Engineering and Technical Services Division at the Pentagon. This Division is responsible for the engineering, energy management, environmental management, safety, building commissioning, CADD resources, building services contracting and several other types of services for the Defense Facilities Directorate (DFD) which manages the Pentagon and other facilities in the National Capital Region. Bob has been recognized as a leader in sustainable design, energy management and emerging technologies for facility management.

Fred Terry is a project manager at Burns & McDonnell, a Kansas City, MO based engineering company. Fred was the project manager for the PICPP, and he has more than twenty years experience in the IT industry managing network, system integration, and data integration and management projects.