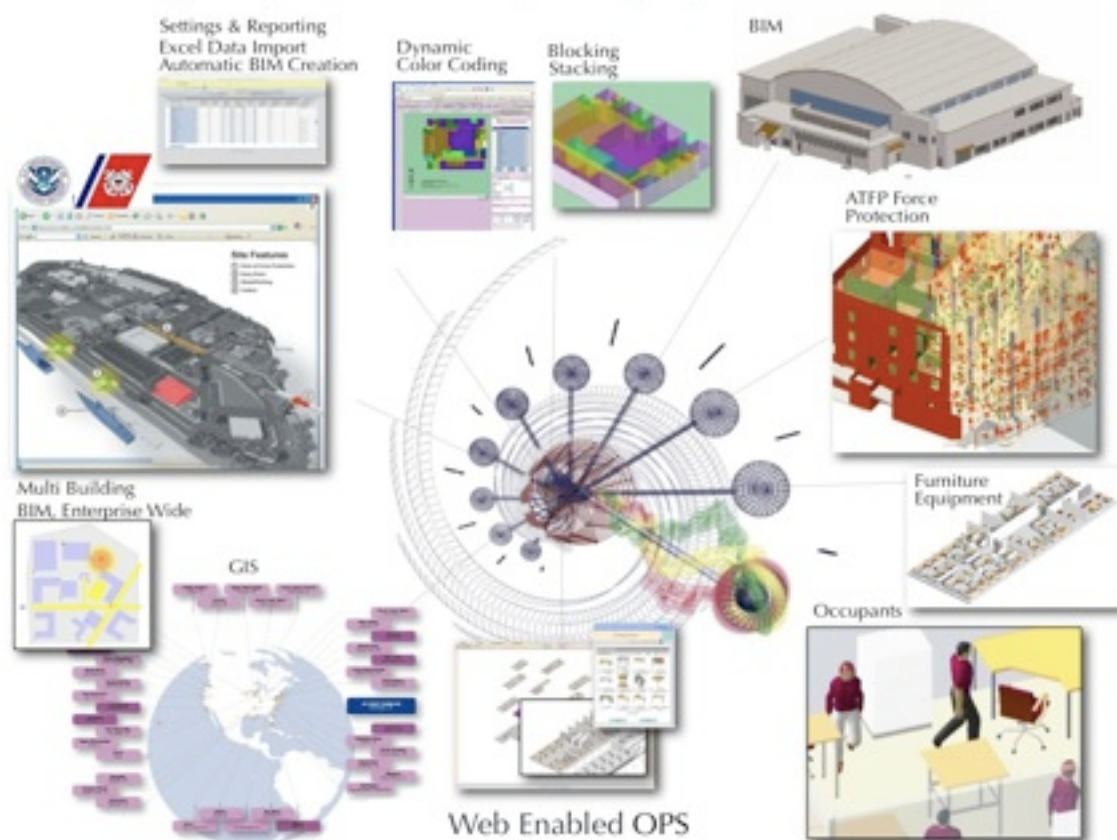


Integrated Facility Planning using BIM Web Portals

Author: Kimon G. Onuma, AIA, Onuma, Inc., KG@onuma.com

Co-author: Dianne Davis, AEC Infosystems, Inc., d.davis@aecinfosystems.com

October 9, 2006 for The Federal Facilities Council of the National Academies, Washington D.C.



Making BIM Simple

Making a meaningful Building Information Model (BIM) can be as easy as making reservations for a plane ticket, hotel, rental car and dinner on the Expedia.com web portal. On Expedia.com you don't have to know XML or HTML programming. You don't have to know what software programs are working together to optimize your search for a hotel and restaurant near the convention center. With an "Expedia™" type web portal you can make a Building Information Model without even knowing what "BIM" means. The complexity of integrating relevant information happens in the background and the user is presented with a customized decision making tool in a interface that is familiar to that particular user's expertise.

Web portal technology has increased productivity and launched efficient business processes in many industries. Similarly, advanced BIM web portals offer the ability to significantly improve productivity in building design, construction and management. Through involvement of more people using powerful tools, many organizations have already achieved significant improvements using BIM web portals. Federal agencies, institutions, medical facility planners, building products manufacturers and others have already improved performance quality on many levels. For example, the United States Coast Guard has been able to dramatically increase efficiency by a factor of 10 on facility projects.

BIM is just one tool in the building design, construction and management process. While many efforts are being made to make information from all BIM applications interchangeable, some BIM web portals make it possible to use information from many programs at one time. Observing some of the rewards already achieved with BIM portals can help people understand the types of process changes they can support with the right tools.

Integrated Facility Planning using BIM Web Portals

An example of a web enabled BIM web portal is The Onuma Planning System™(OPS™) which is being used by government agencies, institutional and commercial clients as well as building product manufacturers, designers and others to gain full advantage of BIM technology. OPS™ extends the capabilities of stand-alone desktop BIMs to fully web-enabled data and moves organizations in the direction of integrated decision making.

United States Coast Guard Case Study

The US Coast Guard is an early adopter of BIM technology and has used OPS™ in conjunction with other tools to achieve dramatic improvements to productivity. They knew processes and tools were needed in order to meet goals and from the very beginning had strong support from high levels to implement BIM. But first, they prepared a Shore Facility Capital Asset Management “Road Map” to define the overarching goals and organizing principals. As with any change management exercise, clear goals and leadership were required elements. Adopting BIM and its supporting technologies were no different.

In another paper submitted to this conference, Commander James J. Dempsey, PE,USCG, lists four keys to successful Facility Asset Management (FAM). For our purposes, the keys can be summed up as:

- 1) Goals – clearly stated
- 2) Inventory – accurately listed
- 3) Outcome – linked to measurements
- 4) Performance – defined

In this approach to facilities, BIM only involves the word “linked.” In order to maximize the use of BIM, it is important to realize its specific role in an entire building design, construction and operation process. Expedia.com does not require information to reside on one server. The value lies in its ability to link different applications and servers. The US Coast Guard uses OPS™ to help link goals with measurable performance delivery. After establishing its “Road Map,” the US Coast Guard was able to evaluate and implement new processes and tools to achieve the results they sought.

Among the US Coast Guard accomplishments are:

- An integrated decision making process used to organize mission objectives, which were input to OPS™ to verify that processes were analyzed and re-engineered properly.

- The US Coast Guard’s entire 33 million square feet of facility portfolio were created using OPS™ to automate the creation of low level of detail BIMs.

- 3 million square feet of facilities was rendered in high detail using Archicad™. Ongoing, linked management of data to BIM for these facilities is assisted by OPS™.

- A “Rapid Space Calculator” was created to quickly understand space needs for personnel and equipment based on existing US Coast Guard facility management data to generate early planning documents.

- After a single day of training, planners guided 38 local teams of up to 20 people in finalizing conception stage design for 38 new Sector Command Centers across the country in three months instead of the 380 months of combined time it would have taken with traditional processes. Planners were guided through the complexities and logistics of this new space type and maintained critical established standards.

- BIM Bombs™ were integrated with the tool and used to determine the effect of blast threats on building design and siting and to link operational planning requirements and missions to facilities.

- Design Development Documentation for the Sector Command Center at Yerba Buena Island in San Francisco. This complex project included developing a 1,200 SF Sector Command Center, renovating 6,000 SF of existing office space and converting 11,000 SF of barracks into new office space. A process strategy was developed early on to implement BIM and web based collaborations to expedite the design process. Typically, a project of this scope could take ten months to complete design development

Integrated Facility Planning using BIM Web Portals

documents. The team finished in one month. The team was able to communicate the final design solution to the customer clearly and succinctly and received acceptance of the plans on the first presentation.

- The design of shore facilities to support new security cutters being launched in 2007 is being facilitated with the tool. Even though the final cutter staffing and operational decisions have not been made, OPS™ is providing BIMs that help US Coast Guard stake holders make decisions about the best and most cost effective ways to staff the cutters. This ship type introduced a new concept for off crew cycling that is being explored with a customized version of OPS™.

While there are other examples of how BIM web portals have enhanced building design, construction and management processes, the US Coast Guard's overarching success and its willingness to share its findings make it an excellent case study. See the related story at the end of this paper.

BIM at Warp Speed

While Building Information Modeling (BIM) is getting the attention it deserves, BIM alone is not relevant unless it is integrated with other business processes. The Industry has already accepted BIM. Now how do we move BIM into warp speed? The common understanding of BIM focuses on it as a single model and application, a more intelligent 3D CAD system to do construction documents. The "I" in BIM (Building Information Model) is the most important initial in the acronym. Using information wisely through the life of a building is what will allow our industry to experience increased productivity gains and get the real payback of true integration.

Achieving a high level of integration requires a technological process change or shift and the perfect vehicle for this is using a medium that already exists. The Internet is the conduit and web enabling BIM explodes the value of BIM beyond the island of the desktop. Although storing stand alone BIM files on the Internet is valuable, drilling down to component level of BIM data from multiple files in real time requires accessing the data via the Internet and presenting the user with a simple enough user interface to view and interact with complex data. Web enabling BIM creates better decision support for better decisions and eliminates the iterations caused by miscommunication of need.

The Need for Standards

The Internet is built on open standards. The explosion of linked information on the web happened at an astounding speed. Web enabled applications and standards such as Simple Object Access Protocol (SOAP) are built on open published protocols to exchange information and data over standard HTTP. The Industry Foundation Classes (IFC) have established standards and logic for exchanging facility data. Without standards nothing will be possible. Proprietary applications have been built on a business model of trapping data in specific formats and making the cost of shifting to another format very expensive and painful. Proprietary formats are not based on open standards. The cost of managing proprietary formats exponentially grows. Forward looking facility owners such as the US Coast Guard state: "The US Coast Guard owns their data," said David Hammond, Chief, SFCAM Division USCG. "The US Coast Guard will not accept proprietary data or solutions," said Paul Herold, Director of LoGIC USCG. Establishing BIM standards, utilizing and supporting IFCs that allow easier data sharing, defining deliverables for government projects and other initiatives are well underway. The National BIM Standards (NBIMS) is preparing to publish version 1 of BIM standards at the end of 2006. While many think that initiatives need to be finalized before major benefits can be derived from BIM, first adopters are already using what is in place, gaining dramatic improvements in productivity.

Features of BIM Web Portal

It is important to have a multi-featured BIM Web Portal. You can find the following features in OPS™ and other BIM Web Portals.

- Manages BIMs on interoperable standards and protocols that allows queries into multiple or individual models.
- Web services are used to connect available data on multiple servers and databases.
- Allows viewing models from the level of an entire campus or base, to individual buildings, to specific rooms, down to furniture and equipment inventory.

Integrated Facility Planning using BIM Web Portals

- In a multiple-user, real-time environment, users can combine partial BIMs or export IFCs or GML of the queried results to desktop BIM applications.
- It can be used in planning and design workflows which include applications such as Archicad™, Revit™, Bentley Architecture™, Google Earth™, Solibri™, and even Excel™ or Google Spreadsheets™.
- It links BIM data to Geospatial (GIS) programs. In the Open Geospatial Consortium (OGC) project, the web feature of OPS™ as WFS serves 3D multi building city models and data as CityGML files and link BIM with the world around us using GIS.
- Through a system of templates and shared projects, users can reclaim past work effort and maintain a level of consistency for projects.
- A simple user interface developed with the user in mind. Anyone with Internet navigating skills, and spreadsheet capabilities, can make BIM part of their integrated practice. OPS™ can automate and accelerate BIM creation and management. The team can expeditiously analyze design alternatives before undergoing detailed modeling efforts, greatly enriching the process.
- Simplicity does not imply shallow information. The depth and integration with other relevant data is maintained and presented to the user only as needed. Therefore, the learning curve is very low.
- Generating automated reports (including 1391 Reports), creating schematic 3D drawings, designing development drawings, constructing document sets and completing other critical tasks.
- Building on open standards including the internet, IFC's, and web services using SOAP. Published schema for using web services. Eliminates the need to install and maintain desktop applications to interact with BIM data. With these and other features, a BIM web portal can be used to maximize the power of BIM today.

In this way making coherent, interdisciplinary, fact-based decisions and rapidly evaluating alternatives while linking operational requirements to missions are possible. A common operational picture is formed which increases corporate knowledge over time in a self-documenting process. A focus on automating the design process supports the capture of established space standards for an organization. This in turn provides design direction towards feasible solutions which are in alignment with the approved standards. This may contribute to the design of a classroom, school wing, entire school, campus or any type of facility.

BIM Productivity

It is possible to gain BIM productivity now just as you can gain productivity with the Internet even though not every company in the world has a web site yet. And just as you didn't wait for every company in the world to have a web site before you started using the web, no one has to wait one more day before they start exploring the productivity gains enabled by BIM. BIM can be a critical part of any facility design, construction and management operation. The issue is not the technology, the key is understanding the new goals possible so you can define the performance levels you want to measure up to. Don't wait to raise your standards or your standards may be obsolete.

The sources of information will come from various databases. It will not all reside in one BIM or one database but in system of interconnected servers that allow for users to maintain the data that they are "stewards" of. The Internet is integral to business processes and BIM is a tool to manage complex data. Web enabled systems are the foundation of being able to link the complex logic together and the standards and interoperability are the glue that will hold it all together. The vision is to constantly expand the linking of data and to constantly increase the value as we as an industry help to reduce the inefficiencies in the facility life cycle process.

Integrated Facility Planning using BIM Web Portals

Effectively Applying BIM

As more options in BIM applications become available, it is difficult to determine which product is the right solution for a company or organization. An organization needs to balance issues such as the team's skill sets as well as the variations that occur among different projects. Effectively applying BIM as a tool is not always straightforward. Often times the key question is determining what should and what should not be included "in the BIM". The key is to avoid modeling in such detail that the model does not correspond to the level of data the organization wishes to ultimately leverage. In fact, this could lead to a cumbersome model with extraneous information that is burdensome to manage over the lifecycle of the building.

The short delivery time frame for the renovation for the US Coast Guard's Sector Command Center at Yerba Buena Island in San Francisco made it important to determine how best to use BIM to fulfill the project's objective. The key was to not get trapped in over-detailing and to focus on identifying the critical parts of the project. The team set goals to produce a BIM that described the "big picture" of this multi-faceted project. A concise construction package was created which was sufficient for bidding, with the understanding that all the final details and specifications would have to be resolved during construction. This "Performance Specification" concept of construction documents was used as an avenue for streamlining the current Planning/ Design/ Construction Documentation/ Bidding/ Construction process and the BIM reflected the appropriate level of information.

The month long process of developing this project presented another interesting challenge. Civil Engineering Unit Oakland architects and engineers were coordinating the ongoing design development with BIM consultants in Los Angeles. An online collaboration website was created so that the latest versions of the model were available for the entire team to review. This underscores the importance of developing a protocol that enables version control and easy access to the latest BIM if it is to be adopted as an enterprise-wide tool.

