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Guest Column

Slim BIM: Getting Elephants To Dance

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October 19, 2012

In a recent article titled, "Is progress slowing," Rich Karlgaard, publisher of Forbes, writes that the technology process of big physical things has not kept pace with the quantum-scale world of IT. Karlgaard goes on to say that in the next 50, the realm of big things will speed up as it melds with the world of IT. He predicts that this intersection is where big money will be made in the next generation. Of course, I began pondering how this intersection will happen in the big physical things we call buildings.

Engineering information is document-oriented. Large documents, even sheaths of documents, are exchanged, specifying in great detail exactly what to do, and how to do it. Modern information technology (IT) is based on services. Service exchanges are minimal, the smallest exchange able to specify results, and do not specify the means of performance at all.

For the last 50 years, IT has moved far faster than have engineered systems, the things we can touch, inhabit, or ride around in. For the next 50 years, when engineered systems will need to evolve as fast as IT has for the last 50, we will need a middle ground, between document and service call. This is the challenge of configuration as shared configuration will enable big systems to interact as nimbly as IT does today.

Buildings are big systems and are composed of big systems that must begin to interact with the IT-based systems of their occupants. The systems of the occupants will change many times during the life of a building. If we are to meet national and international energy goals, the collection of systems in each building will change frequently as well. These systems will interact through services, simple calls conveying only requests and results. Before they can communicate with each other as services, each must learn about the other. System configuration is when the systems learn the information each needs to request services from the others. This information must be non-specific, to avoid the complexity of details. This information must be specific, cataloguing service entry points and potential performance.

For buildings, designed by architects and engineers, the design and specification uses building information modeling (BIM). These are traditionally very large and cumbersome files. The National BIM Specification (NBIMS) describes documents based on the international foundation classes (IFCs). The IFCs are too cumbersome for exchange, so NBIMS specifies Information delivery models (IDMs) for each structured hand-off of information, and a model view for each IDM. These information exchanges are detailed and overly specific. They rely on document-centric notions of

XML from long ago, seen as a “replacement” for large documents in SGML. The IDM for each stage of a project is different, even if the information is essentially the same.

The problem is, no one outside of the architecture and construction communities uses these approaches, and few seem willing to adopt them.

Recently, members of the National Institute of Building Science (NIBS) have worked on the hand-off of information at the end of a construction project to the maintenance management system (CMMS). They have developed the Construction Operations Building Information Exchange (COBie). COBie lists the spaces and their fittings, the systems, and the spaces they support, and the equipment in each system with its maintenance requirements and spare parts. Each of the market leaders in CMMS already supports COBIE import. Maintenance staffs have reported replacing weeks of error-prone hand entry with 15 minutes of COBIE import and then have had their PM and spare parts management ready to go.

Other systems could benefit by importing COBIE as well. Building owners often run many line-of-business (LOB) systems, often selected by different parts of the company, from different vendors. Asset management, capital renewal, and the registrar’s classroom scheduling each have its view of the core facility information in COBIE. An owner may outsource maintenance to several different businesses that need to share information. The enterprise scheduling software, used to schedule staff and meetings, has its own view of the same data. If the initial configuration of each system is based on the same COBie data set, if each system uses the same identities for spaces and systems, then these systems will be ready to exchange service calls sharing expectations, requests, and schedules.

A report from NREL released last spring defined the building service interface (BSI), a standard for interacting with building systems from non-building applications. The report recommended that each BSI be able to share a light-weight BIM, i.e., to be able to provide, on demand, a description of the space it supports, the systems it controls, and the relationship between systems and space. In the future, this lightweight BIM is likely to be part of minimum commissioning standards to get LEED or other environmental certification.

STEP INTO A SLIM BIM

Mary Ann Piette, staff scientist at Lawrence Berkeley Labs and director of the Demand Response Research Center, has called these light-weight models “Slim BIM.” Today, there are two well-known specifications for Slim BIM: COBIE and GBXML.

Green Building XML (GBXML) is already well known to the building automation community. GBXML was originally developed to prepare energy models. GBXML has an easily used schema that is maintained by the non-profit Open Green Building XML Schema (www.gbxml.org). GBXML has become the de facto standard for exchanging information between engineering analysis tools. GBXML is typically produced by CAD software including applications from Autodesk, Bentley, and Graphisoft. (In each of these, there is a command similar to “Export GBXML”). GBXML is used by energy modelers, HVAC design tools, ductwork CAM tools, and many others. GBXML is so well accepted, in part, because its schema is specified using modern tools that are easy for software developers to use.

COBIE, the other Slim BIM, has found a harder path to wide acceptance. Much of the COBIE produced today is of poor quality and semantically incomplete. Within BIM, information is exchanged using the standard for the exchange of product model data (STEP). STEP is able to convey almost any kind of information, including detailed three dimensional data. The problem is, most users of this information do not want complete specification and wide extensibility; they need terse, validateable information exchanges. Most users do not want detailed purpose-built information exchanges developed slowly in committee; they need ready-to-use exchanges that suit a variety of purposes. COBIE's slow uptake epitomizes the cultural and technical differences between the engineered world and commercial IT.

A better way to think of COBIE is what your building commissioning data should look like. The hand-off from design and construction gives you a good starter set. Today, that set is usually incomplete and must be augmented before use. In retrocommissioning, the set is empty, and the commissioning agent must construct it from scratch. If your maintenance management system could export COBIE, it would provide the retrocommissioner with a head start, producing a more complete report more quickly.

COBIE would face less cultural resistance if it looked more like other inter-domain information exchanges. Some proponents have claimed that there is a COBIE XML format already. COBIE was initially described as "a spreadsheet of the data you need to operate the building."

Accordingly, standard Excel templates for COBIE are available. Today, the XML representation of COBIE is the XML representation of a Microsoft Office [Excel] document. As this format is not very useful, most COBIE is produced as hard to understand, hard to verify CSV files or STEP text. The only COBIE verification tool that I know is offered by Onuma Planning Systems (<http://www.onuma.com/products/OpsAndCobieValidate.php>).

The Army's Construction Engineering Research Lab (CERL) is a pioneer in using construction information to improve building design, acquisition, and operations. To CERL, improved operations are central to sustaining facilities not only during lean budgets, but also to sustain mission support. CERL's PROJNET system, used by thousands of organizations, is the leading producer and user of COBIE. PROJNET maintains an internal XML representation of COBIE, one that is not now part of the specification.

When CERL releases its XML representation of COBIE, I predict it will soon become the dominant form for information exchange. A version of COBIE that is as easy to use, and as clear to understand as the GBXML schema will find rapid acceptance throughout operations. CAD vendors that produce poor or incomplete COBIE today will up their game. Current CAD systems require a few simple early design decisions to be able to produce good COBIE; designers who skip that step will find themselves at a competitive disadvantage.

Even the mash-up approaches to BIM will benefit. A CMMS that can export well-formed COBIE will be able to export information to cloud-based BIM. Mash-ups between 3-D building models and energy management systems will become common and expected. Well-formed, validate-able COBIE will make building information more visible than it has ever been, visible to the right user, at the right time, with the tools of that user's choosing.

As these approaches replace the one-time, hard-to-perform integrations of today, BIM and system integration will become rapid and easy. Cloud-based techniques will reduce the costs of technology

changes within each building at the same time as they expand the owner's awareness of these changes. Shareable configuration is the path to rapid secure service integration.

And if Rich Karlgaard of *Forbes* is correct, Slim BIM, COBIE and GBXML just may be the key to big money in the next generation. **ES**

Considine is co-chair of the OASIS oBIX Technical Committee and has been working with enterprise applications and integration of embedded control systems for 20 years. As a systems specialist in facilities services at the University of North Carolina, he has struggled with the network demands, poor data sharing, and non-scalable security issues posed by last-generation control systems. This led to his focus on open discoverable data standards for control systems. Before coming to UNC, he worked to integrate other silo processes into the enterprise for companies including The Architect's Collaborative, Reebok, and Digital Equipment Corporation.