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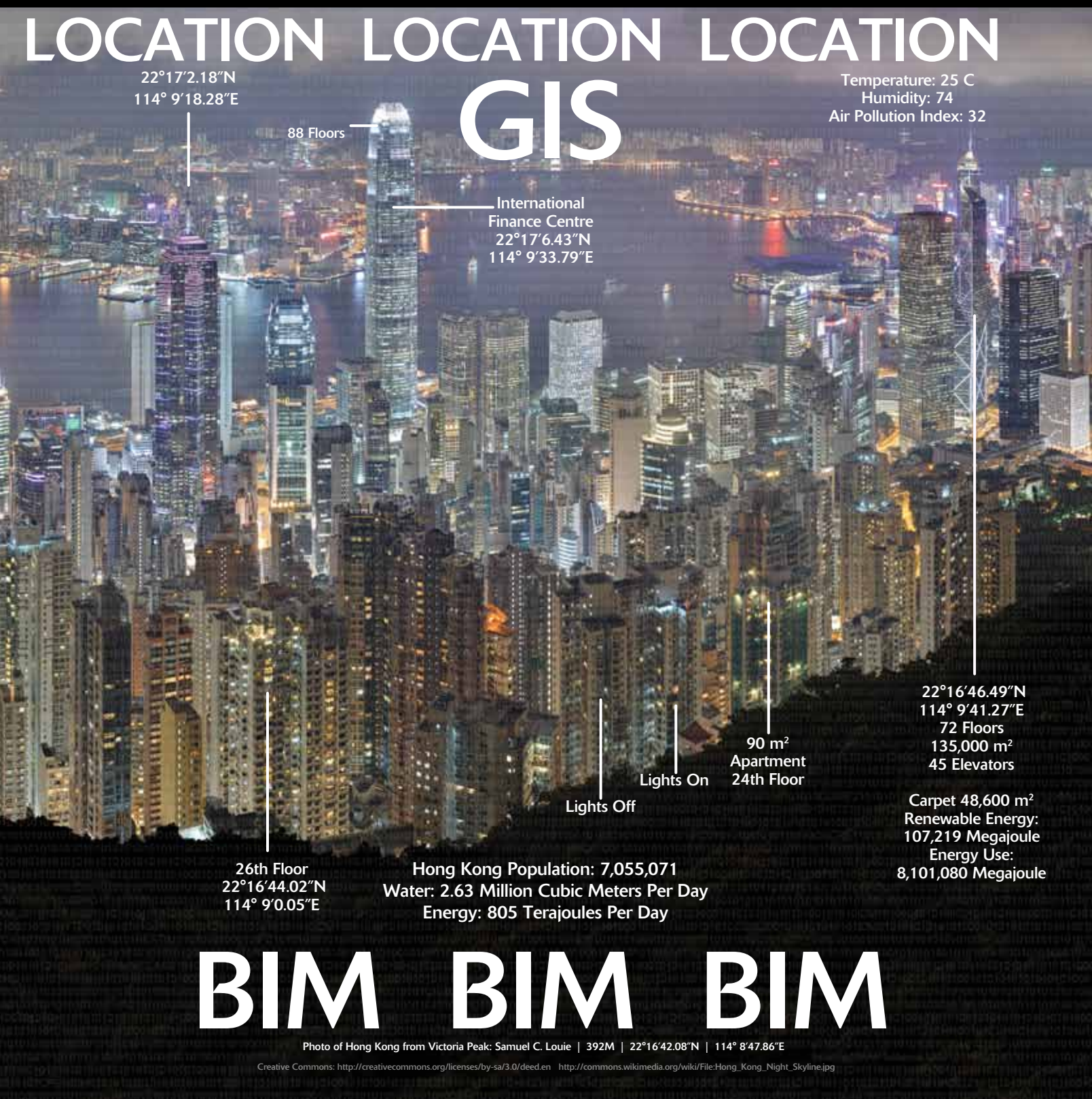

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Photo of Hong Kong from Victoria Peak: Samuel C. Louie | 392M | 22°16′42.08″N | 114° 8′47.86″E

Building Interior Space Data Model:
The Link from BIM to GIS and the Foundation for an Existing-Structure BIM

By Ken Casazza

THE VALUE OF ANY STANDARD IS IN its utility. The utility of a data modeling standard is determined by its value to the applications that access the data. Ultimately, the value of those applications, especially of their potential interaction, is the reason we establish data modeling standards at all. As the applications that access in-building data models become more common, they also become more important. And, the more important these applications become, the more important it becomes to link or share their data models.

Growth in the adoption of the *National BIM Standard*™ (NBIMS) has generally been driven by the advanced applications that access it. These applications, usually supporting the design and construction of facilities, require a vast range of data relating to many diverse aspects of a building, from materials to mechanicals, from measurements to suppliers. The value of construction management applications is undeniable. Their voracious appetites for more and more detailed data have helped to steer the NBIMS toward the inclusion of greater amounts and types of data. When the BIM is first established, this data is available, accurate and organized, usually remaining so prior to and during construction. Its utilization by mutually complementary planning and construction phase applications saves time, money and energy.

After construction, relatively few applications access BIM. Thus, with less value to the data, the data is commonly allowed to deteriorate. Given this, it is in the best interest of the software community to develop not just the facilities automation applications, particularly those supporting operations and maintenance that make valuable use of BIMs, but, because of the value of these applications, to look at the particular classes or subsets of BIM data that are worth evergreen maintenance and update. If neither these application types nor their data requirements are known, justified and planned-for by the end of the construction phase, the data will not be adequately maintained, often rendering the data update costs prohibitive to future application start up.

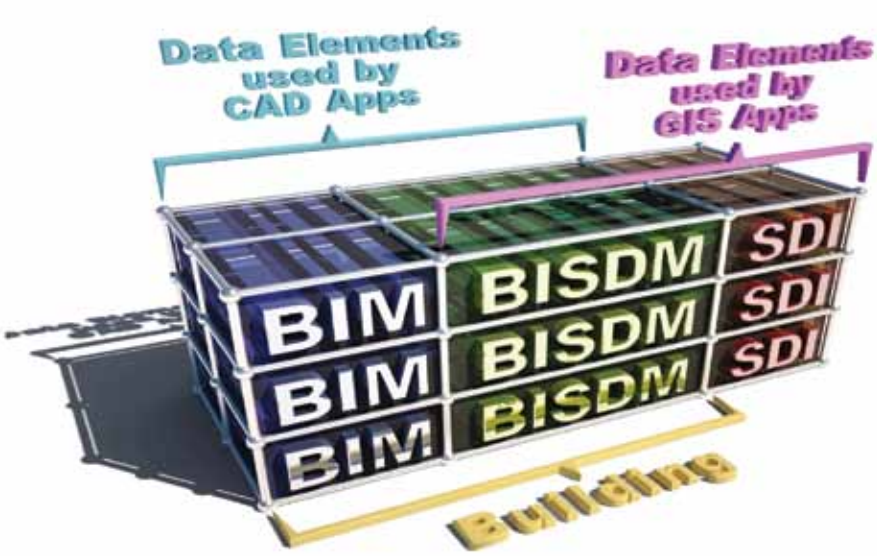

Figure 1. The relationships between data elements of an SDI, a BISDM and a BIM.

With few exceptions, the GIS community has, until the last few years, shown little interest in, and offered little value to, applications inside buildings. The reasons for this are evident. Data that includes relative and geographic positioning of its elements (spatial data) just wasn't available. In fact, common definitions of Spatial Data Infrastructure (SDI) have no explicit references to building interiors. As a result, the integration of GIS applications with BIM and with other CAD-based planning, design and construction applications, was usually more likely a hand-off than an integration, with the hand-off taking place at the building boundary, with CAD or BIM inside and GIS outside.

Recent technological advances have begun to blur and, in some cases, erase this building border dividing line. As noted above, there are a number of reasons for this, but the primary driver is the value of a wide range of new software applications. The value of traditional GIS empowered applications such as those in urban and environmental planning, emergency response services, space management, routine maintenance scheduling and way finding can be radically higher if they don't stop at the door. However, until a few recent technological and conceptual developments, the spatially referenced data was simply not available indoors.

Driven by application value, ready availability of spatially referenced in-building data is now a reality. In existing buildings, data providers now employ a variety of spatially aware data collection technologies and procedures. In new buildings, BIM data can be accessed and necessary geo-referenceable data extracted, using a number of commonly available software tools from the CAD and GIS communities. In existing buildings, companies employ advanced techniques and technologies to quickly

and inexpensively capture a wide range of spatially referenced interior data. The demand for "holistic" (inside/outside) applications has led not only to better techniques and technologies to provide the data but also to the establishment of an in-building best practices data model for GIS applications.

This model, a GIS database-ready template called the Building Interior Spatial Data Model (BISDM[1]), has two very important attributes. First, it was created to satisfy the needs of known in-building GIS applications. Second, all data modeling derived from its use can yield applications that can be readily and completely integrated with existing "outside" GIS applications. This means that the SDI mentioned above can now include what we call a Facilities Information Infrastructure (FII). An FII is an extension of the SDI, opening the door to a whole array of new and valuable applications for managing facilities both indoors and outdoors.

FIGURE 1 illustrates the relationships between data elements of an SDI, a BISDM and a BIM. Since BIM-based CAD applications and/or GIS applications can include BISDM data elements in their models and applications, the data in the BISDM becomes significantly more valuable as it is feeding and being fed by somewhat disparate application families. Effective use of the shared data elements also offers interesting and unique possibilities for integrating the applications.

As an in-building extension of an SDI, a BISDM-based FII has clear value, enabling existing GIS applications to be extended indoors and new applications of GIS technologies to be developed for use indoors. Using this model for in-building application of GIS technologies enables their logic and results to be easily integrated with the wide range of existing GIS applications. A key value here is that since the data necessary to populate a BISDM data model may be extracted or derived from an accurate BIM model, eventually mapped directly from Industry Foundation Class (IFC) data elements, the same data elements may be used in CAD/BIM applications as well. Furthermore, since we know that these data elements can be quickly and easily gathered for existing buildings (as well as derived from BIMs), BISDM is an excellent candidate for the core of "BIM for Existing Buildings". The value of this is clear from the utility of the models to real proven applications.

As we consider the potential uses of this shared or overlapping data modeling standard, we will undoubtedly enhance the value of the GIS and BIM database, making it not just feasible but also valuable to keep modeling data up-to-date. When users begin to see the value of this up-to-date sharable data, they will begin to demand more and better CAD, GIS and hybrid software applications to effectively manage the most costly environment in the world, building interiors.

These new and improved applications emerging from the worlds of Integrated Workstation Management Systems, Computer Aided Facilities Management, Emergency Response Systems, etc., will look at GIS applications and CAD/BIM not as alternatives but as critical contributors to efficiency, each becoming more valuable by leveraging the strengths of the other.

The most obvious way to ensure that this leveraging is enabled is to adopt a single CAD/GIS unified data modeling standard, based on or similar to BISDM, to satisfy the needs of users for an "existing structure BIM." ■

Ken Casazza, Director of Partnership Development, joined PenBay with senior executive experience in sales management, corporate development and product marketing, as well as with extensive knowledge of government industry. Prior to PenBay he was a senior executive with Centel Corporation and then Tracor.

REFERENCE:

1. BISDM: A committee was formed in late 2007 as a community of interest focused on creating a GIS data model for buildings. BISDM is a volunteer organization dedicated to providing a collection of best practices, case studies and templates that individuals can adopt or adapt to their specific project needs (Building Information Spatial Data Model: http://bisdm.org).