



## Open Floor Plan Display

### Project Prospectus

Presented by

SFC MapLab Project

Golden Gate Safety Network

and

Building Service Performance Project

Ontolog Forum

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# **Open Floor Plan Display Project Program Development Planning Outline**

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# Golden Gate Safety Network

## Strategic Outlook

This brief statement outlines a strategy for the **Golden Gate Safety Network** development activities for the next few years.

Over the last six years, the **GGSN** has conducted or participated in a large number of exercises, demonstrations, and workshops related to information exchange to assist in emergency response. Many of these events were oriented to the coordination of efforts from multiple agencies to respond to major incidents. Originally the focus was on terrorism after the events of 9/11. Since then however, the emphasis has shifted to a Multi-Hazard framework with more attention to natural disasters such as earthquakes, hurricanes, floods, wild fires, tornados, climate change and other related threats.

Throughout the **GGSN** experience, the value of multi agency exercises has become quite apparent. This ability to coordinate emergency response will be fundamental to surviving future disasters. In order to provide the most possible value to the public safety community, the **GGSN** will focus on development of training and exercise tools that provide an opportunity for many different agencies, disciplines, and jurisdictions to practice the concept of Unified Command through a working requirements prototype of a **Common Operating Picture**.

In addition, the **GGSN** will undertake a focused project on developing Interactive Floor Plans for Emergency Response. This project will be joined by the National Institute of Standards and Technology (**NIST**) by both the Modeling and Simulation group and the Building Fire Research Laboratory (**BFRL**). A project partnership has been formed with the Building Service Performance Project (**BSP**) and discussions are underway with various industry groups and private organizations to formalize funding for this important public benefit project.

The Program Development Planning Outline presented above is intended to stimulate project planning discussions among the principal stakeholders. The first four sections are presented in preliminary draft form. Sections 5 through 12 are being outlined in detail by the project startup team. These sections will be completed in full as part of the detailed project planning.

Seed capital contributions are being sought from potential sponsoring organizations to undertake a full project plan and to pursue the first year funding from government granting agencies and industry partners.

# Building Service Performance (BSP) Project

## Open Development Process

Conversations between industry specialists often break down in semantic frustration for many reasons. A primary reason is the lack of a common framework and strategic planning to evolve this framework. Secondly, documentation of building elements and building service performance requirements has exploded. Which parts of the living documents need to comply with long term exchange requirements for wide spread re-use?

The mission of the Building Service Performance Project is to formalize how we describe the purpose(s) of a facility and the associated services expected from building systems. The aim is to develop an open compliance framework to understand and capture whether building services are being provided in accordance with required performance metrics. The Open Floor Plan Display Project and subsequent Data Exchange Project are the first working groups from **BSP**, chartered April 2008. Going forward, BSP will function as both an advisory council, and contribute to specific project tasks.

**BSP** evolved out of **Ontolog** Forum, which evolved out of the Organization for the Advancement of Structured Information Standards (**OASIS**) Universal Business Language (**UBL**) project in 2002. The founders saw the use of ontologies as both a critical success factor for eBusiness standardization and an emerging model of best practice for semantic technologies to be integrated into mainstream information systems applications. Our explicit assumptions involve at least the following dependencies and relationships:

The buildingSMART alliance to mainstream Building Information Modeling (**BIM**), and Open Geospatial Consortium to mainstream Geographic Information Systems (**GIS**) data, Open Standards Consortium for Real Estate (**OSCRE**) space definition rules and related standards development activities to reduce tensions between different kinds of building stakeholders by allowing rapid simulation of building configurations, costs, and services;

Onuma Planning System (**OPS**) as a BIM / GIS Model Server allowing hundreds of stakeholders to participate in a global virtual charrette using many types of building services assessment tools and taxonomies such as Smart GRID and **cityGML**.

Ontolog and BSP function as virtual Communities of Practice by providing an open forum for ideas to be gathered and distributed. Accordingly, BSP working groups are obligated to keep their activities open and publicly accessible. Funded activities are handled under different organizational umbrellas and proprietary communications should not be posted on the BSP Forum in accordance with the Ontolog Intellectual Property Rights (IPR) Policy.

## Seeking a Common Operating Picture for Emergency Response



*A collaboration between the SFC MapLab, the Building Service Performance Project at Ontolog, and NIST National Institute of Standards and Technology Building Fire Research Lab.*

Today, when there is an emergency requiring response from the fire department, police, or other public safety network, initial reports are typically received by phone. Responders go to a building they don't know anything about. Each building, emergency, and public safety service is different. Security systems are proprietary and conform to very few standards.

The work proposed envisions a next generation 9-1-1 using modern devices and open exchange languages to depict buildings and alerts in simple, interoperable formats via lightweight web services. One objective is the ability to read and pass along sensor alerts before emergencies such as fires are large enough to be observed by a by-stander phoning in.

Data identities center around building addresses, standard building data representations, and alert classifications. The aim is for software and servers to be certified by NIST to foster speaking the right languages (ex: XML, BACnet, CAP) between each building, jurisdiction, and security system (open or private) based on emergency communication needs. EDXL-DE Emergency Data Exchange Language Distribution Element is one routing mechanism that could be used. CAP Common Alerting Protocol is one kind of protocol for encapsulating alert message content.

Standard Access Points (SAP) allow security vendors and responders with proper authorization at any point in the communication loop to plug into live building data, such as fire alarms, to enable strategic response and planning ahead of time. Building Owners submit drawings on a regular basis according to local regulations, for example New York City Local Law 26, or special requirements based on building type or occupancy. Existing buildings may be submitted as CAD files, BIM files, paper plans, or .jpg, .png, .gif or similar images.

Owner images are cleaned and converted into SVG Scalable Vector Graphics to include only necessary and sufficient content. Clean drawings, terminology, and the actual buildings may be measured and inspected by many response levels ahead of time. Approved static drawings and models are converted to compact interoperable files, able to automatically connect to data fields generated and maintained by diverse organizations. Previously established relationships and permissions between data fields enable security vendors and emergency responders to overlay dynamic live building data onto static drawings in real time.

To work, the system needs to accommodate buildings and emergencies of every conceivable shape, size and style. Many supporting elements such as the Industry Foundation Classes (IFC) are works in progress. Semantic maps to similar classifications such as National Incident Management System (NIMS), are missing or incomplete. Fortunately, only the access points and exchange languages need to be standardized while supporting work continues to be developed.

Common Operating Pictures enabled by new communication chains work backwards in time to register existing buildings, and forwards in time using Building Information Models (BIM) and Geospatial Information Systems (GIS). A key objective sooner rather than later is the creation of a National Building Information Modeling Standard (NBIMS) Model View Definition (MVD), with technical review by open standards organizations.

*DMacP, WDG Architecture, Accuracy&Aesthetics 12 08 08*

### **Works in Progress**

Dictionary <http://ontolog.cim3.net/cgi-bin/wiki.pl?FloorplanMarkupLanguage>

Slides [http://ontolog.cim3.net/file/work/BSP/ConferenceCall\\_2008-11-28/DigitalKeybox5](http://ontolog.cim3.net/file/work/BSP/ConferenceCall_2008-11-28/DigitalKeybox5)

Discussion <http://ontolog.cim3.net/forum/bsp-forum/2008-12/threads.html>



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Institute of Standards and Technology**  
Gaithersburg, Maryland 20899-0001

January 26, 2009

To whom this may concern:

The purpose of this letter is to describe the "Floorplan Display Problem" that was developed at the October, 2008 NIST workshop for the Building Information Exchange with First Responders project. The Floorplan Display Problem is one of many research topics that requires investigation and cooperation between NIST and industry in order to develop an appropriate solution.

NIST is working with industry to develop a standardized mechanism for representing building floorplans for any building's shape and size for two dimensional display purposes; and to map entities such as standpipes and sensor locations onto those floorplans in real time; e.g., a sensor object must contain location information that can be used to map the sensor onto the floorplan. The location information must be able to be represented in a building alert message such as a Common Alerting Protocol (CAP) message.

The representation of these floorplans must be small (lightweight) and be usable given the limited resources typical of a first responder's mobile data computer (MDC) in a quick and efficient manner. If a network connection to the building server is available, the small sizes of these floorplans will speed retrieval from the building server onto the MDC, as well as conserve bandwidth to be used by other critical applications.

By having a standardized mechanism to represent floorplans, software vendors that are compliant with the representations of these floorplans can use any software techniques or graphics engines to interpret and correctly display the floorplans on the user's screen. Implicitly, the floorplan must have a coordinate system so that when given the location of an object such as a sensor, that object can then be displayed in the correct position on the floorplan.

The following list defines some of the requirements that need to be resolved by the Floorplan Display Problem research:

1. Requirements analysis to understand the components required on a floorplan for an emergency fire scenario such as standpipes, sensors, etc.; reference the NFPA 72, annex F, 2007 edition.
2. Develop a standardized mechanism for representing any building's floorplan (a.k.a., a standardized floorplan).
3. Develop a mechanism for converting printed drawings, or electronic files into the standardized floorplan.
4. Develop a standard means of mapping building objects such as standpipes and sensors to the standardized floorplan.
5. The standardized floorplan must be lightweight and can stand alone (i.e., on low power notebooks and computers without network connections).
6. Evaluate and demonstrate using various software techniques and graphical engines such as Scalable Vector Graphics (SVG) and Flash to present the standardized floorplan.
7. Demonstrate by displaying multiple "real-time" sensor locations on a standardized floorplan.

Sincerely,

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Disclaimer: Certain documents, organizations, protocols and technologies are referenced in this letter. Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that these entities are necessarily the best available for the purpose.



# buildingSMARTalliance™

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January 27, 2009

To whom this may concern,

The purpose of this letter is to express the support of the National Institute of Building Sciences and the buildingSMART alliance, a council of the Institute for the “Open Floor Plan Display” project.

This project, which has the goal of seeking a common operating picture for emergency response, is an important, some would say critical opportunity to use information collected and sustained in a building information model for first responders.

The buildingSMART alliance, based on its enabling legislation serves to bring together various stakeholders to share open standard information through various forms of interoperability throughout the facilities and related industries.

This project represents, in terms based on ISO/PAS 16739, a model view of the building information model. Many stakeholders deal with facilities and an essential part of any effort is to provide accurate specific information as defined by the appropriate stakeholders. In addition, as stakeholders change a facility over time business processes should be in place to ensure that the information is sustained. Otherwise, the first responder will not have accurate information when needed. It should be noted however, that information from a building information model that is accurate at handover and not sustained is still far better than most of the information available today to first responders.

In order to be successful on this project information exchanges need to be defined and the model views be developed and standardized so that a true open standard common operating picture can be developed. It is essential that the National BIM Standard be used for this effort to ensure eventual interoperability and our best chance for information sustainability.

Sincerely,



Dana K. Smith, FAIA  
Executive Director

*An Authoritative Source of Innovative Solutions for the Built Environment*



# **Open Floor Plan Display Project**

## **Functional Requirements Abstract**

This project seeks to develop and test a lightweight standalone floor plan format, based on open web standards, to quickly and effectively exchange building information that will enhance emergency response. The project will not develop emergency procedures per se, rather, it is a simplified mechanism for storing and displaying building elements relevant to incident response. Technical goals and objectives are organized into four general categories:

- 1. Format Composition, Functionality and Interfaces**
- 2. Format Preparation Guidelines**
- 3. Integration with Fire Service Building Record Systems**
- 4. Operational Effectiveness Field Testing**

During the project planning period (Phase Zero), these areas will be detailed based on a review of current industry practices, interviews with Subject Matter Experts, and an assessment of emerging technologies such as handheld devices, wireless communications, and web services. This document presents preliminary thoughts in each area to initiate the planning activity.

### **1. Format Composition, Functionality, and Interfaces**

Scalable Vector Graphics (SVG) is the XML web standard for 2D vector graphics including raster images, animation, and scripted interactivity. SVG is currently being incorporated into all major browsers and most cell phones. As an open text based format, SVG can be produced by a number of different methods without requiring proprietary software applications.

#### **A. Composition**

- 1) Background** raster graphic layer (png or gif) derived by flattening a simplified plan similar to elevator lobby evacuation diagrams.
- 2) Foreground** vector objects to represent building spaces, and safety elements (see Dictionary in progress – FloorPlanMarkupLanguage).
- 3) JavaScript** functions for controlling navigation, element visibility and display parameters, data readouts, and interface to other web application components.

## B. Functionality

The first level of implementation will be “Read Only” and operate as an “Interactive Reference Document”. Future levels may include the ability to create and edit persistent data, and incorporate data fields maintained by others.

- 1) **Pan & Zoom:** The ability to display and navigate the floor plan at both an overview and detail level.
- 2) **Find:** Building spaces and safety elements - through rollover hot readouts, identifier input (such as room number or name), or group selection criteria (such as ‘all laboratories’).
- 3) **Display:** Building spaces and safety elements – through visibility toggling, color coding, and edge highlighting – to support ‘Find’ and other functions.
- 4) **Report:** To generate companion text lists of elements satisfying group selection criteria.
- 5) **Calculate:** Total number of rooms and areas selected by user

## C. Interfaces

The Floor Plan format is a modular component to be incorporated into larger applications through an Application Programmer Interface. This API provides a simple set of commands that can be used by other modules to control the display and readout of relevant information. This will be particularly important when mapping sensor alerts to floor plan locations or showing sprinkler zones controlled by cutoff valves.

Additional consideration will be given to a data mapping capability to retrieve additional information about occupants, hazardous materials, and other room content. This type of information could be provided in a companion stand alone data file, or be queried in real time through AJAX enabled web services.

User interface considerations vary depending on the delivery hardware. Desktop computers can utilize large screens and small mouse activated controls. Hand held smart phones have small screens and require fat buttons for fingertip control. This means that the same content may need to be reformatted appropriately. A major innovation will be voice activated “phrase recognition” which is already beginning to appear in map navigation and search applications. This is especially relevant to first responder field personnel who will generally need their hands free for other pressing activities.

## 2. Format Preparation Guidelines

The proposed floor plan data exchange format is meant to be general purpose irrespective of the size, shape, or age of the building. Therefore it is important to recognize the starting point for deriving this format may vary greatly from one building to the next. Several examples, from old to new, are as follows:

- A. Old Building, No Floor Plans:** This is the worst case condition and will require some level of “As-Built” drawing generation. This could be a simple “single-line” drawing with rough dimensions. Many architecture, contracting, and other firms provide services to produce as built drawings utilizing laser measuring devices and quick drawing software tools. Considering other possible uses for these types of simple plans, owners should be encouraged to undertake this level of documentation at minimum.
- B. Old Building, Paper Plans:** These may be hand drawn plans or CAD originated plans where the disk files are not available or useable. In either case the paper version can be scanned and scaled appropriately. The target format should be rendered in a raster format of shallow bit-depth (such as .gif or .png) to keep the background image lightweight.
- C. Recent Building, Un-conformed CAD:** These are buildings drawn on CAD before layering and object grouping conventions were established or enforced. Current layer visibility can be set up to provide an appropriately simplified background, and new layers can be initiated to contain minimum required polygons (to be drawn).
- D. Recent Building, Good CAD Practices:** More recent buildings that have followed good CAD practices should be easy to configure for both the raster background and the required foreground vectors. Standardized layers for room spaces and safety elements may need to be added.
- E. Current and Future Buildings, Advanced CAD Practices:** These are buildings that have been designed and drawn with modern best practices, already in good condition for providing the necessary elements such as Industry Foundation Classes (IFC), and other aspects of the National Building Information Modeling Standard (NBIMS) as these standards are developed and adopted.

A generalized workflow diagram will be developed to accommodate any starting point. Once the building backgrounds have been derived, only a few layers of foreground vectors will be required (building spaces and safety elements). This will represent the “format construction” model to be maintained by the owner in order to provide ongoing revisions over time.

The “format construction” model will be capable of exporting the light weight, standalone version of the floor plan as described above. Changes to either the floor plan content or the format functionality will be maintained in this model. Similar to BIMStorm, the building itself is the Spatial Interface in the Geographic Context. Several alternative methods for implementing this model will be explored as part of this project.

### **3. Integration with Fire Service Building Record Systems**

Recently Fire Services such as FDNY have begun to realize the need to have building floor plans in electronically readable format. There are many different candidate formats such as PDF, JPEG, DWG/DXF, etc. For these drawings to be useful to the Fire Service, there needs to be a standardized method to incorporate the drawings into actual fire response procedures. Such methods have not yet been mandated by any regulatory agency and implementation will vary from one agency to the next.

This project recognizes the many variations between Fire Department procedures and strives to provide an easy, cost effective, efficient way to integrate the proposed format into existing activities. Current Fire Codes require building owners to provide adequate information for the Fire Service to periodically inspect the building for safety element compliance. The new proposed format will have the best chance of success if it supports and simplifies this inspection activity,

It is anticipated that there will be a number of pilot case study sites selected to test the new format and attendant procedures. In each case, the respective Fire Department should be major stakeholders in project activities to ensure the proposed system will integrate well with existing and anticipated Fire Fighter systems.

### **4. Operational Effectiveness Field Testing**

Based upon the selection of a number of pilot case study sites, work will be undertaken to prepare floor plans in the new format. Then, the formats will be applied to inspection and response activities in a variety of jurisdictions. Close attention will be paid to the usability and effectiveness from a Fire Fighter point of view.

One method to establish the effectiveness of this approach is through Emergency Response Exercises. Scenarios can be developed which will test various aspects of the proposed format. After Action Reviews can critique performance and recommend improvements..

# **Open Floor Plan Display Project**

## **Naming Conventions and Open Framework**

The Open Floor Plan Display project team does not claim to understand all of the intricacies of the Industry Foundation Classes (**IFC**), the International Framework for Dictionaries (**IFD**), and the full range of applicable standards, guidelines, and recommendations relevant to the work of this project. Fortunately, unlike this supporting work, we are not tackling the entire building or public safety industries. The intended results are limited to only the logical descriptions and interconnectivity needed between essential building elements, geospatial information, and fire service features. And then, only as this data is necessary and sufficient to the pre-plan communication process between Owners and Inspectors across a wide spectrum of building types, local jurisdictions, and networking capabilities.

Starting with a foundation (background-static) layer, each floor plan layer, (a section/row in the framework) comprises a class of objects that are displayed and positioned relative to the building. Once stabilized conceptually (attaining agreement on a method for resolving different names for the same thing, and the same or similar names for different things; e.g. semantic harmonization or disambiguation) collection and presentation of this data can be “automated” to deliver only the information that First Responders understand immediately. Knowing what static data is available, what dynamic data can be available, and that this data can be effectively integrated with the display are parallel parts of the project plan.

The polygons previously explained in the Functional Requirements will be initially classified using OmniClass Table 13, Spaces by Functions. Then, special relationships between OmniClass tables and other classification systems will be created to describe and pre-establish relationships between the particular items needed for effective pre-incident planning. Early discussions have begun with the OmniClass Facility and Spaces working group to include special designators for currently unsupported fire safety features.

The results of the Open Floor Plan Display project will be modular using concepts that belong to everyone, thus laying a foundation for adding multiple layers to reflect diverse interests in the future. For example, regional planning efforts, energy efficiency studies, real estate and insurance matters - any discussion topic that can benefit from the exchange of simplified, non-technical building information. Open floor plans and supporting work are a new use for BIM and GIS, a new way to use technology to meet on a common ground.



Created on Many Eyes (<http://many-eyes.com>) © IBM

## Open Floorplan Display Project

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