

BuildingSMART International Infrastructure Room

Work Plan 2015 – Summary

Background

There is a critical need for a comprehensive neutral data model capable of representing both semantic and geometric aspects of major infrastructure works. This facilitates data exchange and open data access in the context of the planning, realization and maintenance of road and rail infrastructure.

Standards for modelling buildings are relatively mature, but the functionality of a neutral data model and exchange standards for Infrastructure is not available among the current open BIM standards. The buildingSMART InfraRoom takes initiatives to fill this gap.

One of the most crucial parts of infrastructure projects is the alignment. The construction of roads, tunnels, rail tracks and eventually bridges depends very largely on the alignment. In 2014, the InfraRoom started a project to develop an extension to IFC for alignment. This project will deliver according to plan in early 2015.

Now that alignment is available, this paves the way for development of the required exchange standards for these major elements of transport infrastructure in the short term, while developing an architecture and roadmap for integrating those standards across the broader aspects of the built environment. This document summarizes the development work that is needed in the period 2015-2017 to cover these needs and provide the drivers for the evolving open BIM standards for Infra.

Objectives

- Enable data exchange based on open standards for the planning, realization and maintenance of road and rail infrastructure, and ultimately all aspects of the built environment
- Enable the exchange and open data access from asset management databases
- Enable enduring archives of asset information based on open standards
- Enable life cycle information management based on open standards
- Enable the merging of project related information e.g. requirements and risks, with asset information

Results

- A set of open BIM standards covering data exchange in Infrastructure between Consultant, Contractor, Client project organization and Client asset manager
- A comprehensive neutral data model covering semantic and geometric aspects for road and rail infrastructure, mainly delivered as an object type library
- A comprehensive process model covering the cooperation and interaction between Consultant, Contractor, Client project organization and Client asset manager
- Information delivery manuals for interfaces between Consultant, Contractor, Client project organization and Client asset manager
- A roadmap and architecture for the integration of standards for neutral data sharing in support of urban planning and management of the built environment.
- Support from clients and expert panel
- Support from IT-vendor panel
- coordination with OGC and ISO

Approach

The **overall goal** of the InfraRoom as established in 2013:

- Enabling process integration for infrastructure through open BIM standards
- Contribute to the development of standards
- Provide a platform where stakeholders meet and join forces to take initiatives

These are the identified **key principles** that guide the efforts of InfraRoom:

- Since InfraRoom is part of buildingSMART International, emphasis is on the use of existing bSI standards, technologies and knowledge as a valuable basis, complemented by integrating with other relevant standards such as developed by OGC and ISO
- Look five years ahead, which is a practical limit
- Focus energy on a limited number of topics
- A precondition for the introduction of standards is where there exists a well-defined and stable interface between roles within a process, requiring high volume information exchange
- This leads to a focus on the interface between clients and market

Priorities were identified in Stockholm in March 2014, identifying two priority projects: P6 IFC alignment as an extension of IFC to include Alignment for road, bridges, tunnel, power network and other transport networks; P5 IFC Bridge as an extension of IFC for structures, including features and properties set. Those projects have progressed well and are appropriately funded. The second level priority projects identified at the start of 2014 have made little progress due to lack of resources.

Work schedule

A **Work Plan** was developed in Toronto in October 2014. A set of five Work Items were identified for 2015, with each assigned a Working Group in order to progress efforts and engage a wider group of contributors within InfraRoom:

- **IFC Alignment – Deployment:** once the schema is delivered, the functionality should be built in to software and tested in practice within selected pilot projects
- **Integrated Built Environment Life Cycle Model:** reviewing how we can represent the built environment as a whole across several aspects
- **International IFC-Roads:** to coordinate and harmonize several efforts world-wide to provide IFC extensions that would be a truly International and universally accepted
- **Infra Asset Management:** an effort to enhance, improve and strengthen existing standards and develop new open BIM-standards to answer the needs of infrastructure asset management
- **IFC Bridge:** based on P6 alignment and other existing bridge-relevant models (schemas), identify needed extensions to IFC4 by merging and extending existing schemas.

Summaries of the Work Items are included in the annex of this document.

Time schedule

- Lead time three year, end results available end 2017

Governance

In order to progress these Work Items and assist the Working Groups to maintain momentum, InfraRoom wishes to form a part-time secretariat with responsibility to establish a project structure for the working groups to track progress and provide organisational support with a web-based communication resource and the establishment a reporting cycle. Other principles are:

- The work plan is executed as a project by buildingSMART International
- Project has a project leader and a project team
- For each work item, a working group is formed
- Project leader reports to steering committee
- Stakeholders are represented in steering committee
- The Standards Process is followed

Funding

- The project is funded by contributions from stakeholders
- The total budget is estimated at EUR 1,5 million.

Annex to Work Plan 2015 – Summary

- IFC Alignment – Deployment
- Integrated Built Environment Life Cycle Model
- International IFC-Roads
- Infra Asset Management
- IFC Bridge

IFC Alignment – Deployment

Work Item Plan

Summary

The current Alignment project result are expected in Q1 2015. Before the standard can be used the functionality should be built in to software and the functionality should be tested in practice.

This project should lead to a number of implementations and will be tested in different pilot situations.

The result can be used to improve the IFC-standards and also to ensure user community to deploy the standard.

Required results

The IFC Alignment - Deployment project will take about a year to execute, and can start right after the ending of the P6 Alignment project.

After one year:

1. Experimental implementation
2. Correct implementation
3. Testing in practice

After three years:

1. Extension of IFC5
2. Implementation plan

Added Value to InfraRoom

- IFC can be used for Infra
- Trust in the implementation of Alignment functionality

List of activities

- Create a broad working group 60 man-hours
- Recruit software vendors 40 man-hours
- Find and create a test environment 40 man-hours
- Support software implementations 40 man-hours
- Execute tests 120 man-hours
- Evaluate results 120 man-hours
- Write a implementation plan 80 man-hours
- Execute the implementation plan 200 man-hours

Budget and resources

700 man-hours

Potential stakeholders

- Software vendors
- Client organizations

Integrated Built Environment Life Cycle Model

Summary

This work item will consider the built environment as a whole, examining the ways to capture and standardise the following aspects of the built environment:

- Life cycle
- Identify and integrate across all levels of granularity (detail, description, design view, definition, etc.)
- Built environment objects, including their semantic structure
- Relationship between built environment objects
- Managing object type classifications and hierarchy
- Managing requirements information
- Managing diverse stakeholder viewpoints

Required Results

- After 1 Year: report that maps the issues and defines the scope of the task
- After 2 Years: develop an agreed outline conceptual model and plan for development
- After 3 Years: finalise a prototype schema

Added Value to InfraRoom

This project will lead to an initial definition of an integrated urban data model that encompasses other work that focusses on building and civil infrastructure works, and provides an appropriate link to geospatial representations, web services and data sources. For the wider built environment community, this works will support a range of activities including, but not limited to:

- Urban planning and analysis
- Management of planning-related business processes
- End-user engagement and interaction with the built environment
- New opportunities for innovative digital tools in the built environment

List of Activities

- Identifying stakeholders
- Development of use cases and demonstrators (drawing on existing work)
- Identify and critique alternate strategies
- Identify where the work can add value and establish priorities
- Scoping on-going work

Required Budget and Resources

There is some substantial effort being applied in this domain, so our goal is to identify and harness, where possible, that work. In the initial stages, the best resource is our own time and commitment. Going forward, we aim to build credibility to attract further support.

Potential Stakeholders

These are legion, but the first that spring to mind are city and land management authorities and infrastructure administrators.

International IFC-Roads

Summary

Currently there is a unique opportunity to coordinate and harmonize several efforts world-wide to provide IFC extensions that would be a truly International and universally accepted. Significant work in this area has been done by several chapters, especially by KICT in Korea, and several other chapters and entities (including OGC) have expressed strong interest in collaborating on a bSI IfcRoads standard. By coordinating existing works and collaboration a full-fledged bSI standard for roads could be rapidly developed. The proposed project will allow these interest holders to define a common set of requirements and compare it against what is already available in the KICT IfcRoads model to create a common model and bSI IfcRoads standard.

The scope of the proposed project covers the design and construction phase, and include the data requirements for design, costing, scheduling and construction.

Required Results

After start of work, the following schedule is expected:

- Month 9 – Agreement on IDM, including processes, exchange requirements, constraints etc. This effort is expedited by the fact that the KICT model is available and team members could rapidly identify their own requirements in comparison to the KICT model.
- Month 18 – Agreement on definitions, terminology and completion of a common conceptual model for IFCRoads.
- Month 24 – Complete the IfcRoads standard and implementation model, with all required documentation.

Added Value to InfraRoom

BIM-based working with roads data is widely sought and a high priority for many chapters and authorities.

List of Activities

To be developed based on the above required results.

Required Budget and Resources

800.000 – 1 M Euro. Estimates are based on resources that was needed for P6 Alignment projects, considering this effort will be approximately four times the effort for P6. This is beyond what KICT has provide.

Potential Stakeholders

All authorities and interest holders in road design, construction and management.

Infra Asset Management

Summary

We propose to start an effort to enhance, improve and strengthen existing standards and develop new open BIM-standards to answer the needs of infrastructure asset management. First step in this effort is a requirement definition phase which will be executed as a project.

Required Results

- IDM's
- Process modelling leading to use cases
- Other requirements
- Open standards Development plan

Added Value to InfraRoom

- Provides the Construction-to-Operations and Maintenance use case, which is one of the main drivers for infra
- Brings designers and Asset Managers together

List of Activities

- Prepare Work Plan and organization
- Survey (ISO standards and related, asset management software, Asset Managers/road authorities/municipalities, etc., other standards)
- Prepare report and development plan

Issues to address:

- What "subset" of Infra project models need to feed into asset management?
- Asset Managers view some information differently from other views: different names for things, different ways of grouping things, etc. (i.e. need new modelling that covers essentially the same information).
- New data that is specific to AM: Condition, replacement values, etc., etc.

Required Budget and Resources

- Needs a Working Groups, a few people with some dedicated time, potentially some Research students
- Maybe several people at \$25 to \$50 k each (one month of professional researcher)
- Road Authorities, e.g., CEDR group
- City Asset Managers.
- Total estimated budget: \$ 125.000

Potential Stakeholders

Recent meeting of CEDR group of European road authorities very interested in Asset Mgt. Also city and land management authorities and infrastructure administrators.

IFC Bridge

Summary

Objective: world open BIM standards dedicated for bridges via extension of IFC product model

Scope: based on P6 alignment and other existing bridge – relevant models (schemas), identify needed extensions to IFC4 (spec how it works), merge and extend existing models (schemas)

Based on: Related projects ongoing in Japan, Korea, Finland, France, Germany, USA etc

Required Results

- After 1 yr
 - DD (from French minD & other efforts)
 - IDM
 - MOU with buildingSMART to develop extension
 - Survey of state-of-the art efforts relevant to bridge data interoperability
- After 3 yrs
 - Extensions of IFC product model for project delivery of typical bridges
 - Accompanying Viewer (software) for these extensions

Added Value to InfraRoom

- Important leveraging of P6 alignment work

List of Activities

- Survey and comparison of state-of-the-art efforts relevant to bridge data interoperability
- Synthesize results of these efforts
- ID gaps
- Fill in high-priority gaps
- Software (ifcBridge) Refinement/Implementation & Testing / Demo
- Recommended Further Developments

Required Budget and Resources

- Ref: \$200 k euros for DD & IDM & Extension in France = 250 man-days over 1.5 yrs
- In-kind contributions from commercial software implementer (e.g., Innova in France)
- Assume comparable amounts in existing ongoing projects (e.g., Korea, Germany, USA)
- 10 people currently in bridge model group bSI Japan chapter ; can increase # if this project is selected
- Live Meetings of Expert Panel 2+ per year
- Administration & Coordination

Potential Stakeholders

- Ea client (country/owners) with related work already ongoing
- Software solution providers
- Construction industry stakeholders