buildingSMART International

Activity Proposal

Project Name:

Open, Standardized Application Programming Interfaces (APIs) for Common Data Environments (CDEs) to Lower Threshold of Data Exchange and Sharing on BIM-based Projects

AKA "Open CDE APIs"

General Information

Room Governance:

Technical Room (TR)

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1 GLOSSARY

Body	Abbreviation	Short summary
buildingSMART International	bSI	
Expert Panel*	EP	Brings in expert advice during the project, on a voluntary basis, during on average four meetings per year.
International Standardization Organization	ISO	Please follow this link for more information: http://www.iso.org/iso/home.html
Open Geospatial Consortium	OGC	Please follow this link for more information: http://www.opengeospatial.org/
Project Leader	PL	Responsible for managing the project and ensures the project is delivered within budget and on time.
Project Team*	PT	Executes a project based on a project plan and delivers the results according to plan.
Standards Committee Executive**	SCE	Establishes and manages the bSI standards process and addresses procedural and programmatic issues.
Standards Committee Technical Executive**	SCTE	Provides technical advice to the SC and SCE the bSI standards process and addresses project technical issues.
Standards Committee**	SC	The senior governance body within bSI overseeing the standards process. It will comprise representatives from members and chapters.
Technical Room Project Steering Committee*	TRPSC	Body within the Technical Room responsible for managing the Technical Room projects, meets once a month and Project Lead presents the Project Dashboard during this meeting.
Technical Room Steering Committee*	TRSC	Steers the Technical Room and is responsible for setting out strategy, managing initiatives and liaison with other Rooms and bodies.
Technical Room*	TR	Open forum within bSI responsible for the Technical domain and all developments on IFC within this domain.

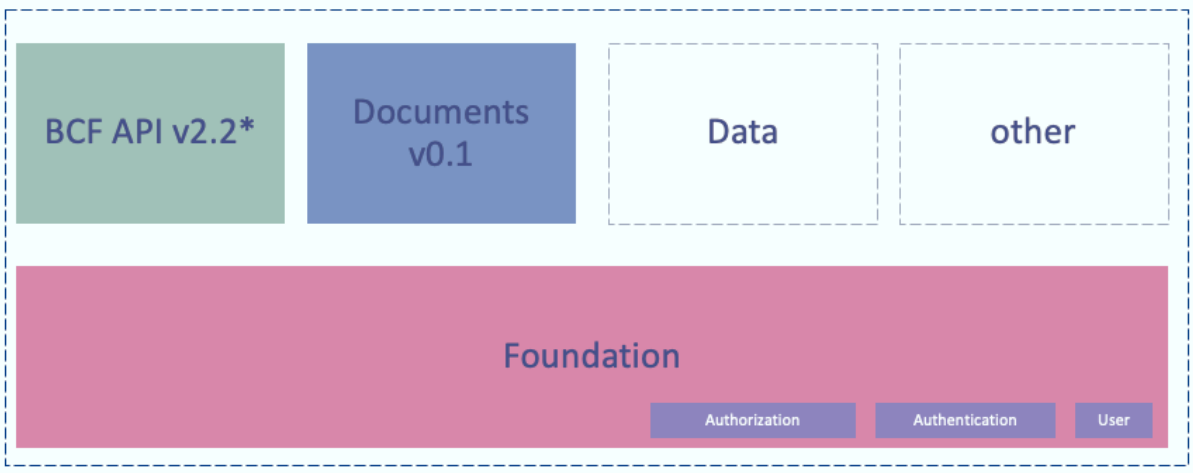
*** For more information please see the buildingSMART International Standards Process. This process describes the manner in which standards and other technical work is created and governed within buildingSMART International. It is available online: http://buildingsmart.org/standards/standards-process/*

2 EXECUTIVE SUMMARY

The proposed activity, “Open CDE APIs”, addresses opportunities to improve interoperability within the AEC software ecosystem. An ‘Application Programming Interface’ (API) allows third parties to interact with the data inside a system. The APIs are easy to implement and address the pain and burden of point to point integrations between an ever-growing number of software vendors. The opportunity is best articulated by a user: Brian Tighe, National Director of Project Controls at Skanska USA who said that “Vendors are often unwilling to build integrations between tools, especially the project management solutions used by owners, designers, and contractors. It is a critical need in our industry, and we have needed to engage third parties and spend significant resources to get this done.”

Having standardised entry points for isolated software tools to send and receive data, makes the user processes more efficient and collaboration workflows more effective. The group’s mission is to connect data silos, transcending the gaps between tools built by different software vendors.

The approach chosen by the group is to develop interoperable, domain-specific APIs. These domain specific APIs share a common “Foundation API” standardising authentication and identity. The diagram below illustrates at a very high level the current roadmap.



The group’s current focus is improvements to BCF API and exchanging datasets (i.e. ‘documents’). An object level, ‘Data API’, which allows object level data exchange is also on the roadmap. The forward-looking strategy is to move towards an object level data exchange eliminating the current file-based data silos.

3 BACKGROUND

3.1 HISTORY

Please add a short description of the history of the activity's subject leading up to this proposal. This includes current regional developments and existing national work that may have led to this proposed activity.

The BCF/OpenCDE group consists of people motivated by solving real world challenges related to interoperability between various software systems. The group has developed BCF-XML and BCF-API standards that are endorsed by buildingSMART and are already implemented by many software applications and are used by customers in real projects.

The OpenCDE APIs initiative started in the BCF group after the successful release of BCF 2.1. BCF 2.1 solves round-tripping design issues. BCF 2.1 doesn't address other, related, user flows. One missing piece is an API for a streamlined exchange of models and documents. Also missing, is the ability to exchange metadata and geometry at the object-level.

BCF 2.1 has placeholders for model and object exchange (see the "Files" header section and "BIM Snippet"). These placeholders can hardly be used to support the required flows because they leave out key parts of the exchange. The group discussed enhancing and developing these placeholders in the BCF 3.0 release but there were major drawbacks. For one, growing the BCF specification with side flows might risk adoption. While document and object APIs are important, they're not necessary for design-issue management. The other drawback is that there are valid use-cases for both document and object APIs that are unrelated to design issues.

Our conclusion was that rather than extending BCF we would create a family of Open API standards. These APIs would share a common foundation in the form of a shared authentication and authorisation API. Each of the APIs would solve a problem in a comprehensive but minimal manner. Finally, the APIs could be used together to provide users with a streamlined and integrated experience, where possible.

IFC files are becoming larger and larger and any time you want to create even the slightest modification, a full IFC file needs to be generated. Another subject that the group is dealing with is to generate a way to produce incremental updates using IFC. After creating an initial version of an IFC file, the subsequent IFCs can just contain information about modified and deleted components, and info about which IFC version the update applies to. This will greatly increase the efficiency of handling IFC files, since the incremental files will be typically tiny compared with the original model.

3.2 OPPORTUNITY & INDUSTRY NEED

Typically, BIM projects use a system, Common Data Environment (CDE), to share documents: IFC files, drawings, etc. All these CDEs have their proprietary API's (Application Programming Interfaces) that can be used to, for example, upload and download documents. Since there are a lot of CDEs, implementing point-to-point integration to them from various BIM tools is a major task, which often remains undone. Therefore, the common way of working involves downloading and uploading files from/to the CDEs using the web interface or some other means provided by the CDE in use. This manual way of working is cumbersome, and users need to be proactive, for example, to check if there are updated version of documents.

The aim of this proposal is to identify and standardize various use cases related to exchanging data between CDEs and various client software. Also, communication between CDEs is analyzed to see if there's a way to, for example, create a standardized way to synchronize content, including meta data, between CDEs. Additionally, having a possibility to update IFC files incrementally will lower the threshold to deliver IFC in small increments and keep the shared project data more current than it is at the moment.

The proposed standards will reduce cycle times, allow for seamless transfer of information, reduce errors, and ultimately, reduce the risk of project delays and failures.

When these standards are put into practice, the users will have easy access to up-to-date data directly from the software where they need the data. For the software industry the standards will be easy and fast to implement, and they don't dictate any particular business model.

3.3 PROJECT GOVERNANCE

The proposed project will be executed and governed as a buildingSMART International project within the Technical Room.

3.4 RELATIONSHIP TO BSI STANDARDS, TECHNICAL WORK, AND TECHNICAL ROADMAP

The project builds on the foundation of previous BCF-XML and BCF-API development by generalizing some parts of BCF-API. The file content accessed in CDEs can be in any format including standards, like IFC and PDF, but also in proprietary formats.

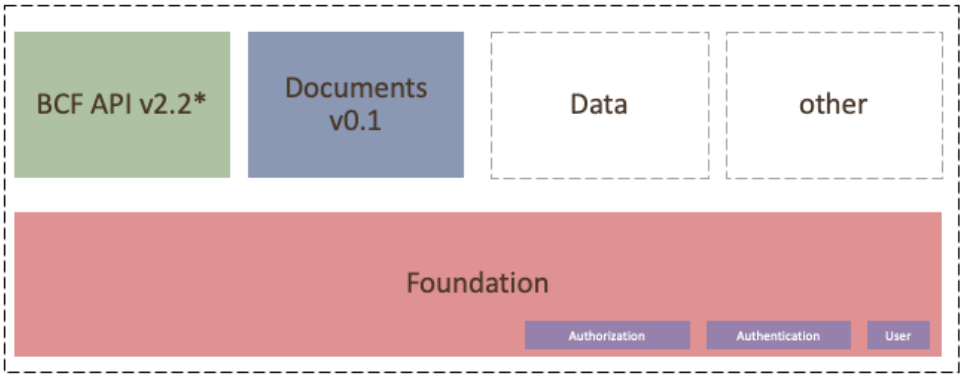
3.5 RELATIONSHIP TO OTHER STANDARDS AND TECHNICAL WORK

When the group starts developing a specification towards accessing individual objects at CDEs then existing specifications such as *BIMsie*, *BIMql* and the linked data initiative will be evaluated.

4 SCOPE & OBJECTIVES

4.1 SCOPE STATEMENT

The project group will identify key, cross-industry, user flows and develop a set of Open APIs to support them. The image below illustrated the high-level plan.



This proposal does NOT address how to apply the products/results to the ISO standardization process.

4.2 OBJECTIVES

The project group has the following roadmap:

1. **Foundations**: Release first version of the Foundation API[1]
2. **BCF (XML and API)[2]**:
    a. Publish BCF-API, BCF-XML 2.2 specification[3]
    b. Publish BCF-API and BCF-XML 2.x specifications (minor patches and fixes)
    c. Publish BCF-API and BCF-XML 3.0 specification (major, potentially breaking changes)
3. **Documents**: Develop and publish version 0.1 - First draft addressing all use-case currently in scope
4. **Data**: Develop and publish a Data-driven object exchange API specification.
5. Develop a proposal for **incremental update** of IFC file.
6. Other objectives may arise as the group continues to operate

This roadmap will be continually re-evaluated in light of the overarching goal of developing a suite of closely-knit APIs to support cross-industry user flows.

[1] By separating Foundations from the BCF 2.1 specification
[2] The scope of BCF-XML will be kept consistent with BCF-API where applicable
[3] By separating BCF 2.2 from the current BCF 2.1 specification

4.3 APPROACH

Focused APIs – each addressing a specific domain or workflow

Each API addresses a specific domain for example – *BCF-XML* and *BCF-API* address the design issues domain, *Documents* addresses exchanging models, documents and other files, *Data* addresses exchanging object geometry and metadata and so on.

APIs work in conjunction and share a similar "Look & Feel"

The Foundation allows applications to authenticate once and share user identity. Principles of communicating and enforcing user authorisation would be consistent across the different APIs

Prototype first, specify later (a software-first approach)

The group believes that there's no possibility to specify a standard without iterating over draft implementations to test the initial specifications. This belief stems from years of experience with BCF where it was proven time and again that mistakes and oversights will happen and the only way to avoid them is to implement before releasing a specification.

Put in front of users and get feedback

This serves multiple goals: it's an extension of the "prototype first" principle allowing for users to test and confirm that the proposed solution solves the problem. The other goal is a litmus test – if no user is willing to test the solution it may indicate that the group is not solving the right problem.

Reduce barriers to adoption

The specifications created by the group will aim to be minimal and as business domain agnostic as possible. Software vendors resist taking efforts that require a period longer than a small number of weeks (at most months) to achieve an outcome. And also, if the standard specifies workflows or other rules that take away different vendors' competitive edge – they will not implement it.

Open for all industries in all markets to join and influence

We encourage all users and vendors to join the group and influence.

4.4 CHALLENGES

N/A

5 DELIVERABLES

The group delivers its output under the BuildingSMART GitHub group:

- https://github.com/buildingSMART/OpenCDE-API.
- https://github.com/buildingSMART/BCF-API
- https://github.com/buildingSMART/BCF-XML
- And others as needed.

The deliverables include:

- REST-API specifications in YAML and/or another standard format
- Documentation how to implement the developed standards
- Testing material to help in testing implementations (optional).

6 RESOURCES & PROJECT EXECUTION

6.1 RESOURCES & SKILLS

Much of this group has already been involved in developing the BCF previously and has the necessary skills to continue developing it and the new Open CDE API standards.

More expertise and resources are needed to develop and maintain test suites and certifications.

6.2 PROJECT EXECUTION & MANAGEMENT

In general, the work is done iteratively: develop a concept, create initial REST-API specification and implementation, then test the implementation among the participating companies. When a part of a standard is deemed good enough, it is given to users to do pilot testing.

There are already a number of participating vendors, cooperating on development, including:

- Oracle/Aconex - https://www.oracle.com/industries/construction-engineering/aconex-project-controls/
- GRAPHISOFT - https://www.graphisoft.com/
- SOLIBRI - https://www.solibri.com/
- thinkproject - https://group.thinkproject.com/
- Trimble - https://www.trimble.com/
- ACCA Software - https://www.accasoftware.com/
- OpenProject - https://www.openproject.org/
- ALLPLAN - https://www.allplan.com/
- Catenda - https://catenda.no/
- Iabi - http://iabi.eu/

Besides development work iabi has been providing project coordination/management.

Meetings (listed below) are open to everyone and end users are encouraged to attend and contribute.

Biweekly telecons

Every Second Monday at 11am CET. The group meets over zoom (link below). Klaus Linhard linhard@iabi.eu and Georg Dangl dangl@iabi.eu from IABI are the group moderators.

https://oracle.zoom.us/j/186149884?pwd=dFNGTGRXbjF4MW84bkNTeExFdldDZz09

Meeting notes and recordings can be found on Sharefile.

Biyearly hackathons

The group meets twice a year to test implementation and have focused discussions.

GitHub – code and documentation repository

Standard development happens in GitHub in public repositories under the buildingSMART organization at https://github.com/buildingSMART.

Mailbox

The group can be reached at opencde@buildingsmart.org.

6.3 LIAISONS

N/A

7 WORK & TIME SCHEDULE

6-12 Month Goal (Q1-Q4 2020)

- Foundations: Version 1.0* released
- BCF
    - Release BCF API 2.2 (BCF 2.1 minus Foundations)
    - Finalize scope for BCF 3.0
- Documents:
    - First draft addressing all use-case currently in scope
    - At least one – live project providing feedback

8 BUDGET & FUNDING

To date, all of the development work on BCF and this project have been funded by in-kind contributions of labor by the participating companies.

Another EUR €25,000.00 is annually contributed by the participants to pay for iabi's administration of the project.

More budget is necessary, though, to properly develop and maintain test suites and a certification regime, but funding for such activities has not been secured.