ATC-75

Development of IFCs for the Structural Domain

Strategic Work Plan

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Revision 1.0

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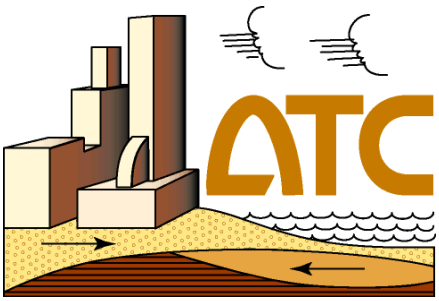

Strategic Work Plan

The Applied Technology Council (ATC) is developing an extended set of IFCs for structural components for inclusion in the International Alliance for Interoperability (IAI) as a part of the buildingSmart Alliance, National Building Information Modeling Standard (NBIMS). This project seeks to improve productivity in the design and construction industry by taking the lead in developing a basis for incorporating and integrating structural design, codes, analysis tools and methods into IFCs. The ATC consensus process will be used to bring together structural practitioners with industry and software developers under a Project Management Committee (PMC) in order to define pertinent IFCs for the structural domain. This effort will be conducted under the oversight of a distinguished Project Advisory Panel (PAP).

Vision

Create a robust process for seamless, efficient, reproducible exchange of accurate and reliable structural information that is widely and routinely utilized among all tools and stakeholders. Generate it once; use it many times - interoperability.

Task 1: Strategic Work Plan

A strategic planning session, the subject of this report, was held on November 30, 2007 in Los Angeles, California[1]. Participants in that session were:

Chris Rojahn, ATC
Tom McLane, ATC
Francois Grobler, CERL
Ed Dean, Nishkian Dean
Michelle Anderson, Nishkian Dean
Dan Frangopol, Lehigh University
Deke Smith, buildingSmart
Jim Jacobi, Walter P. Moore
Paul Mlakar, US Army Corps
Steve Jones, McGraw Hill
Aaron White, Walter P. Moore
Bob Lipman, NIST
Erleen Hatfield, Thornton-Tomasetti
Luke Faulkner, AISC
Frank Wang, Tekla
Raoul Karp, Bentley Systems
Rob Tovani, CSI
Robert Tener, Charles Pankow Foundation
(Not in attendance, Chuck Eastman, GA Tech)

The participants discussed the project scope and objectives. The morning sessions focused on an overview of the project proposal and the thought used in its development. Francois Grobler provided an overview of the IFC development process and outlined the concurrent efforts underway by other US and international groups.

The afternoon session focused on identifying the IFC pathways for the structural domain and prioritizing those that are most important for this effort and would lead to the greatest benefit, within the budget and schedule constraints of the project. The diagram in Figure 1 conceptually illustrates the IFC exchange pathways that traverse the structural domain.

[1] Reference meeting minutes for details of the meeting discussion.

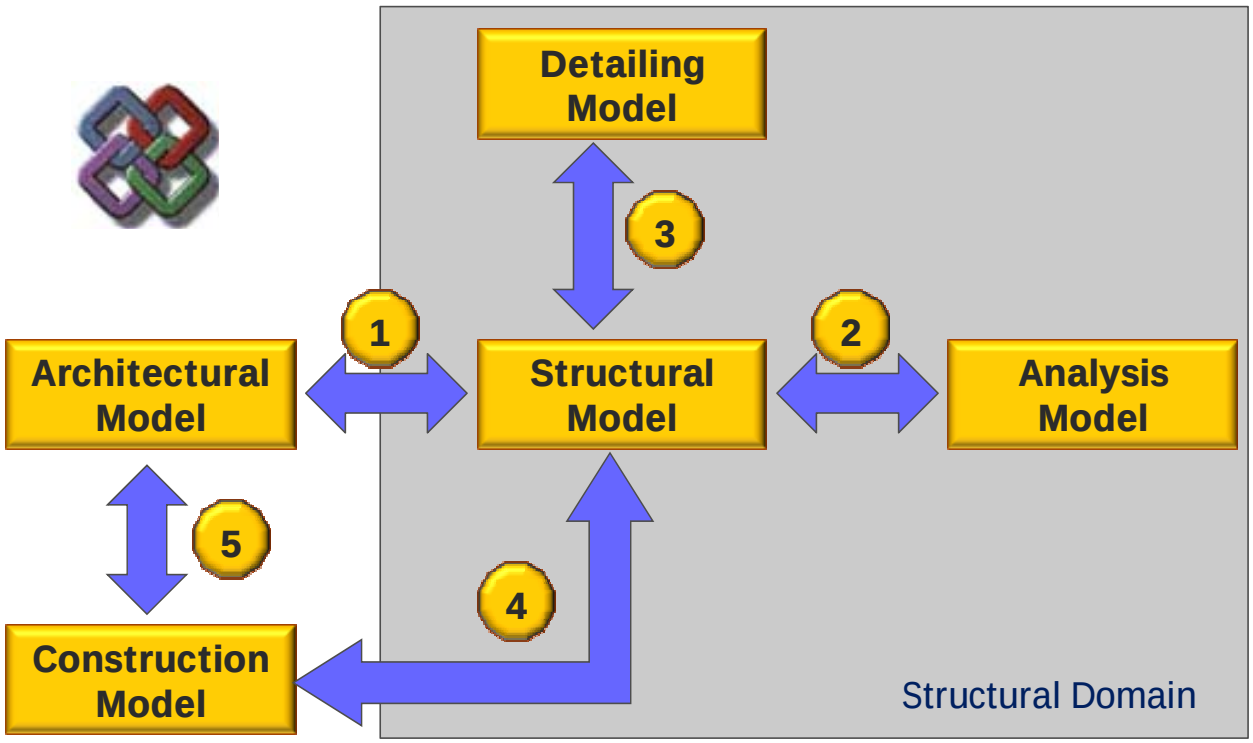

Figure 1: IFC Exchange Pathways

Much discussion ensued about the importance of each of the potential pathways and their relative importance to each other as well as their collective value to interoperability with other domains. The consensus of the group was that ultimately all of these pathways are important to the seamless interoperability across the myriad of platforms potentially involved in a project. However, the most important parameter by far and the one that transcends all of these pathways is basic geometry. A summary of the generalized exchange priorities as determined in the strategic planning session was as follows:

First Priority - all paths
a) Geometry: basic dimensional data
b) Properties: material, etc.

Second Priority - paths #3, #4, #5
a) Construction data, such as cost information, materials and quantities, procurement status, supply chain information, etc.

Third Priority - path #2
a) "Geometry plus": details such as gusset plates, rebar, pre-stressing tendons, etc.
b) Loads

Task Product: Strategic Work Plan

Task 2: User Requirements and Business Process Report

Describing the framework around which the structural engineering practice exchanges interoperable data will be done through the development of the User Requirements and Business Process (URBP) report. The URBP report delineates attributes that are important in defining characteristics specific to the structural components and is important for building a framework for describing the structural engineering practice and how that information is used within and outside the structural domain. The preparation of the URBP report will be formed around two carefully planned work sessions. The work sessions will bring together the project team augmented by industry representatives of stakeholders in structural engineering and related disciplines. The process will begin with the identification of the business process models (PM) for structural engineering and to determine from these what data must be exchanged to serve these processes. The delineated business processes will be identified according to their exchange requirements (ER's), which be defined in a process and format prescribed by NBIMS. These ER's will then be tied to associated business rules (BR's) which define the constraints for their use. These attributes will be captured into a series of interim reports to clearly define the considered business processes, data exchange requirements and business rules. The project team will also provide guidance to explain how the exchange capabilities should be best used, and validation of the resulting interoperable software will be tested against these processes and data exchange requirements, contained in the Information Delivery Manual (IDM). This work phase will follow the NBIMS process to ensure wide industry participation and to create accepted industry processes.

- Two Interim Reports. Interim reports will be presented at incremental junctions consisting of Process Models, Exchange Requirements and Business Rules. Meeting notes for each of the work sessions will be prepared to summarize the relevant discussion and resulting outcomes and conclusions.
- Draft Final Report. Will build on the two interim reports with appropriate introductory material and conclusions. A "draft" final report at 95% completion.
- Final Report.

The PMC will follow NBIMS procedures to execute this research and development and the results will be available for incorporation into the evolving NBIMS. The PAP will oversee the development of the URBP report.

Task Product: User Requirements and Business Process Report

Task 3: Model View Definition

The User Requirements and Business Processes defined in the URBP report will be mapped into IFCs by our IFC Consultant, Thomas Liebich. Some iteration in the software mapping process will require consultation with the project team and collaboration with industry representatives. The mapping process results in the identification of new and modified IFC structural elements, which will be created and integrated into the IFC data model to ensure interoperability across the diverse domain areas in the scope of IFC. A Model View Definition is a complete set of data elements for enabling the data exchanges in the structural engineering, is then compiled in collaboration with software vendors and published for implementation in structural engineering software. Software implementing these capabilities provides the interoperability gateway between the structural domain and other industry processes across the exchange pathways.

Task Product: Model View Definitions

Task 4: Validation Test Report

Collaborating software vendors will modify their software to enable the exchange of structural data elements as previously defined by the domain experts and documented in the Model View Definitions. In this activity the project team will interact with vendors to ensure that the structural data exchange requirements are correctly understood and implemented in a two-tiered testing program. First, the IFC Structural Model View is implemented in software, an IAI testing program will be conducted against it to certify that Structural Model View data is correctly implemented in accordance with NBIMS and IAI guidelines. Secondly, the project team and members of the engineering community will validate the effective exchange of structural data elements in the defined processes from a user/structural perspective. The first tier of this testing will be completed within the scope of the project, while the second tier will extend beyond given its extensive nature and time requirement (6 months).

Task Product: Validation Test Report

Task 5: Dissemination Work Plan

Dissemination, both of the IFCs themselves and of the message of the opportunities and benefits of interoperability they provide, will be an important product of this endeavor. A pending strategic planning effort by the project team will lay out a dissemination scheme that will demonstrate the value this technology brings to our industry, thereby creating a need for the technology in the broad group of stakeholders. A Dissemination Work Plan will be developed, defining the strategies to be implemented to market and distribute the development of the IFC to stakeholders – engineering practitioners, industry and software creators. The strategy will also address the "human factors" of implementation of new technology to the user group to allow them to be accepting and accommodating of the technology. The strategy, when developed, will necessarily need to be multifaceted – reaching a wide variety of avenues, including:

- www platforms
- professional associations
- engineering journals
- engineering periodicals
- industry seminars/conferences.

Additionally, a Diffusion Summary Report will be developed. This report will capture the effectiveness of the dissemination process by summarizing the diffusion success, documenting the implementation of the dissemination strategy and seeking out measures to quantify the effectiveness of the plan.

The dissemination work plan defines the strategies to be implemented to market and distribute the development of the IFC to stakeholders – engineering practitioners, industry and software creators.

Task Product: Dissemination Work Plan, Diffusion Summary Report

Personnel:

Principal Investigator:	Christopher Rojahn, ATC
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Project Administrator:	Michelle Andersen, Nishkian Dean
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Project Advisory Panel (PAP)

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Steve Jones, McGraw-Hill
Chuck Eastman, Georgia Tech
Dan Frangopol, Lehigh University
Paul Mlakar, US Army Corp R&D Center
David Hutchinson, Buehler & Buehler Structural Engineers

Task Product Summary	Deliverable Date	
1. Strategic Work Plan	12/21/07	Complete
2. Dissemination Work Plan	6/6/08	Complete
3. Work Session 1 Report	6/6/08	Complete
4. Work Session 2 Report	10/30/08	
5. Final Draft URPB Report	3/13/09	
6. Final URBP Report	4/10/09	
7. Model View Definitions	4/17/09	
8. Diffusion Report	9/24/09	
9. Validation Test Report	10/23/09	