Business Process Re-Engineering for BIM

New Directions in Supporting Workflow Exchanges in IFC

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Precast concrete, structural steel, reinforced concrete
Support and Enhance Workflows with Model Views

Steel Process Model

11 model exchanges
25 non-model exchanges
IFCdocs and MvdXml – a new semi-automatic documentation tool

By Tim Chipman and Thomas Liebich

Semi-automated the MVD documentation generation, using parsing of the IFC schema

Implementation still done by hand

Modules here are different in different workflows, and from those in test platforms
### 133 Concepts for precast, 31 of them are re-used from other MVDs
Overview of NBIMS process

Timeframe for current activities

**Program:** What is the requirement?
- organize domain experts
- scope of coverage
- definition of process model of exchanges
- specification of exchange requirements by domain experts 6-12 Months

**Design:** How to solve the requirements?
- definition of model views as Concepts
- mapping required semantics to schema structures
- define IFC bindings 9-18 months

**Construct:** How to build it?
- thorough unit testing
- verify software implementation
- develop test model views for each exchange 9-15 months

**Deployment:** Use in Industry
- field testing ongoing

Time: 24-45 months

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Current Status of IFC Development

Status of Model View BIM Standards:

MVD too time consuming to develop – 18-36 mos. Multiple man years

Rigid: satisfactory for contractual pass-offs, poor for collaboration

Very much a black-box, not easily understood by most users

The output implementation is all from written specifications, with little help in implementation

Testing is onerous; SW companies will be reluctant to support many MVDs

Lacking some practical aspects: business level non-model exchanges, model annotation, parametrics
Current Status of IFC Development

Completed:
- Coordination View (used in IFC Certification process) (1.0)
- COBie – handover for building operations & maintenance (1.0)
- PCI precast Model View (.97)

Others underway: AISC, ACI, Spie,....

Work relating IFC with ISO15926 (for process industry),
OpenInfra and BRIM for highways and bridges

UK Initiative on BIM: 2018 Phase 3

The reality is that pragmatists think the industry will undertake 4-8, limited to:
- contractual handoffs
- input to applications
Current Status of IFC Development

New Targets:
Support many exchange models, enhancing collaboration from the project down to the subcontractor level

A single domain, such as steel may have a dozen or more exchanges

Develop one or more MVDs in a new area in a month,

Non-programmer can adapt an existing MVD in a few hours w/o knowing IFC
Modularization of IFC

Define modules to provide an intermediate, higher level set of objects to access and store IFC data.

The modules are composable into Model Views.

At a higher level, modules will have intuitive functionality close to building model intentions.
Different Levels of IFC Modularization

- Pieces of MVD spec (current)
- MVD subschema & composeable IFC code
- composeable IFC and native model mapping code
- MVD, between model out and another in
- Test suite to validate module

Modules applied to IFC and native bindings and are implemented once
Modules can be tested once and validated, not requiring internal testing again
Efficiencies of modularization (SEM)

Benefits of Iterated Use of Modules

Each MVD implemented separately
Largest MVD implemented first
Smallest MVD implemented first

Appx. 7700 rules vs. 1360 rules
ICE - Munich

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MVD VIEWER

Select Exchange Model for Model View Definition: EM11
Saved on: 10/20/2012 1:24:19 PM
Model by: shani

EM11: Initial rebar and tendon member layout

Project Stage
31-40 30 21 Concrete Placement & Resource Planning

Exchange Discipline
Rebar Detailer (33-21-31-14)
Reinforcing Contractor (33-41 11 14 17)
Concrete Contractor (33-41 11 14)
Structural Engineer (33-21 31 14)

Description
Purpose
Identifies placement and sizing of rebar, includes plates and embeds

Major Elements
all rebar, mesh and tendons, properly placed within concrete, with preliminary layout of ties, laps and special connections.

Level of Detail
Sufficient for bill of material

SEM Composer
MVD Description
MVD Editor
Simple building model in Tekla
Different type of geometry, material, level of detail
Semantic Exchange Module (SEM)

SEMs can be composed by users into model views

- Architectural intent layout
- Loose detailing hardware
- Full detailing model
- Detailing model of a main piece
- SEMS for Structural Steel
- Tekla and Autodesk

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As the use of Building Models grow, the need for multiple models and exchanges between them increases.

Model Views are the glue that brings different applications together allowing them to be used seamlessly in a single integrated process.

As model views become more common and widely used, they will evaporate into the infrastructure of digital engineering, for example managing consistency management of cloud servers.

Develop one or more MVDs in a new area in a month,

Non-programmer can adapt an existing MVD in a few hours w/o knowing IFC
Workflows consist of model views and non-model engineering information: RFIs, Change Orders, during virtual Design and Construction as well as during the real thing (tolerance tracking)

**BIM Collaboration Format (BCF):**

**Design Review/Assessment:**
- XML dataset:
  - Unique issue ID
  - Screen image with annotation
  - Camera placement in project
  - Description of issue
  - Status
  - Author/time/application

**Design Authoring Platform:**
- Imports XML data:
  - List of action items (can be appended & managed)
  - Resolved with editing capability
  - Maintains original camera placement in project
  - New proposed status
  - Author/time/application

Similar transactions needed & will come about
IFC Parametrics

• An extension to IFC to support parametric rules has been developed and tested. Currently there are five engines able to resolve parametric IFC:
  o Simple command-line demonstration by AEC3 using XSLT
  o EPM Jotne Express Model Server (database) with graphic interface.
  o RDF Parametric Viewer Application.

The scope of parametric behaviour includes generated geometry. The TU Munich bridge design group is working with the buildingSMART parametric group to refine and extend the parametric capability. The IFC-Infra project, starting in July 2011, may support this further.

  o Siemens NX
  o Solidworks
What will Interoperability be like in 2030?

Private cloud server

upon update:
- Clash monitoring
- Synchronization transactions
- Checking for milestone satisfaction
What are the next steps in Model Exchange?

While schema coverage has improved, the base structure of IFC development has not change much

- Modularization of Translators to allow dynamic composability - SEMs

- Non-model collaboration tools, application to application

- Chip away at the parametric model and rule translation

- Incrementally automate model synchronization