Motivations for MVD
- Improve the ‘interoperability experience’ in using IFC BIMs
- Dramatically increase confidence in using IFC BIMs
- Integrate partial, complimentary methods and tools to form one framework supported by all stakeholders
- Enable IFC BIM validation in building projects such that contractual requirements can be verified
- Improve implementation testing (certification, regression, etc.)
- Improve reporting of test results (so end users can interpret them)
Background

- Early Model View History
  - Concept introduced by BLIS in 2000
  - Introduced the notion of 'concept blocks'
  - 6 use cases & 4 Model Views implemented/tested in ~60 applications between 2000 and 2003
  - See www.blis-project.org for more information

- MVD History
  - Developed/introduced to IAI in 2005 by Jiri Hietanen
  - Adopted as IAI standard methodology in early 2006
  - See http://www.aii-international.org/software/MVD_060424/IAI-IFCMediaViewDefinitionFormat.pdf
  - Revised for 'IFC Solution Factory' (v2) in late 2007

Overview of MVD Elements

- Concepts
  - MVD
  - Building blocks

- MVD Diagrams & Definitions
  - Collection of generic data concepts
  - Blue Visio Diagrams and MS Word Templates

- IFC Binding Diagrams & Definitions
  - IFC schema specific reps for each generic concept
  - Orange Visio Diagrams
  - MS Word Template for implementer agreements & guidance

Generic MVD - IFC Solutions Factory Process Check

- Where are we in the overall process?

Generic Model Views - Diagrams & Definitions

- Notation

Generic Model Views - View Definition

Example from GSA Concept Design View 2006

Generic Model Views in Visio
IFC Solutions Factory
Model View/ SW Implementation Portion of IFC Technology Session
9-Dec-08 – AEC-ST/EcoBuild Conference – Washington, DC

Generic Model Views – Tools/Templates

- MVD Diagramming Stencil

Generic Model Views – Concept Definition

- Model View Definition (MVD) – AEC-ST/EcoBuild – Washington, DC – 9-Dec-08 – Slide 13

Implementable MVD
- IFC Solutions Factory Process Check

- Where are we in the overall process?

Implementable Model Views - Diagrams

- Notation

Implementable Model Views - View Definition

- Sample from GSA Concept Design View 2006

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Implementable Model Views – Concept Diagrams

Example for GSA Concept Design View 2006

Implementable Model Views – Tools/Templates

Visio Diagramming Stencil – same as for Generic
Visio Stencils for IFC Entities

Implementable Model Views – Tools/Templates

MVD Coordinator

Implementable Model Views – Agmts & Guidance

'Space Areas’ - from GSA Concept Design View 2006

Implementable Model Views – Agmts & Guidance

'Space Occupant’ - from GSA Concept Design View 2006

Implementable Model Views – Agmts & Guidance

'Space Categories’ - from GSA Concept Design View 2006
Implementable Model Views - Agmts & Guidance

'Space Zones' - from GSA Concept Design View 2006

Software Implementation and Testing

Certification Testing & Reporting - IFC Solutions Factory Process Check

Where are we in the overall process?

Certification Testing/Reporting

Each test case is used for testing compliance with one or more concepts

Testing is done on the IFC binding level

- Must comply with the IFC specification
- Must comply with implementation agreements

Reporting of certification results is done on the end user level (IFC independent)

Software users must understand the results

- NOT: Supports IfcSIUnit
- BUT: Supports metric units

Certification Testing/Reporting

Exchange Requirement 1 (ER1)

Exchange Requirement Model 1 (ERM1)

Exchange Requirement 2 (ER2)

Testing Requirements Model p (TRM)

Software A support of ERM A

Certification

Process Map

Certification Test Cases

Example from GSA Concept Design View 2006

Certification Test Cases

Example from GSA Concept Design View 2006

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Certification Testing Process

- MVD is published for Review
- Review comments addressed - Final Published
- Facilitated implementation begins (3-9 mo)
- Certification Test Event – Product ‘A’ certified-1
- Product ‘A’ product pilots begin (6 mo)
- Product ‘A’ user issues addressed
- Certification Test Event – Product ‘A’ certified-2
- Report Product ‘A’ certification test results
- Product ‘A’ – certified version released

Certification Test Reporting

- Hypothetical Example from GSA Concept Design View 2006

Possibilities:
- Auto-generated diagrams
- Differences reporting

Certification Test Reporting – Why is this important?

- Owner wants to use exchange defined in IDM#2
- So the owner can require use of this process/exchange in project agreements
- Certified Product Reports tell him this is possible

Industry Deployment using BIM Data Validation Tools

BIM Data Validation

- BIM Guides for users
- Business Rules captured in IFC constraint model
- BIM Data Validation Tools
- Verification of contract requirements is possible!

SW Certification/BIM Validation

- SW Product Certification --- verifies:
  - It is possible to create BIMs that meet specified data requirements using the product (but not assured!)
- BIM Data Validation --- verifies:
  - BIM data meets ERM requirements
  - BIM author has correctly applied BIM Guide requirements, including the business rules

Possibilities for End User Certification

- Analogous to any professional certification (e.g. LEED design certification in the US)
**How BIM Validation Works**

- **IFC Constraint Model**: Rules for both data structure and data values (IFC)
- **IFC BIM**: Exported from authoring application (IFC view)
- **BIM Validation Product**: Checks Objects in the BIM against constraints (requirements of the Constraint Model)
- **BIM Validation Report**: What does not comply with requirements in the BIM

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**Current Examples - SMARTcodes**

**Constraint Model**

Building Information Model (BIM)

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**Model View Definition (MVD)** – AEC-ST/EcoBuild – Washington, DC – 9-Dec-08 --- Slide 37

**Current Examples - SMARTcodes**

**Model** (BIM)

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**Model View Definition (MVD)** – AEC-ST/EcoBuild – Washington, DC – 9-Dec-08 --- Slide 39

**Existing MVDs & Supporting Products**

- **BUS Views**
  - By: Building Lifecycle Interoperable Software
  - 60 products by 35 vendors – see [www.blis-project.org](http://www.blis-project.org)

- **Coordination View**
  - By: IAI Implementer Support Group (ISG)
  - Many Products by several Vendors – see [www.iai.fhm.edu/](http://www.iai.fhm.edu/)

- **Singapore Code Checking View**
  - By: Singapore Building Construction Authority
  - ADT, ArchiCAD, Revit

- **GSA Concept Design View 2006**
  - By: US Government Services Administration
  - ADT, ArchiCAD, Bentley Arch, Onuma Planning System, Revit

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**Current Examples - SMARTcodes**

**Constraint Model**

Building Information Model (BIM)

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**Model View Definition (MVD)** – AEC-ST/EcoBuild – Washington, DC – 9-Dec-08 --- Slide 40

**Existing MVDs & Supporting Products (2)**

- **ICC Code Checking View 2008**
  - By: International Code Council
  - Planned: Revit, Bentley Arch, ArchiCAD, VectorWorks

- **COBIE**
  - US Army Corps
  - Revit, Bentley Arch, ArchiCAD, Onuma
MVDs in Development (target completion)

- Concept Design View 2009
  - By: GSA, Statsbygg, Senate → early 2009
  - Planned: Autodesk, Bentley, Graphisoft
- Facility Management Inventory Data Take-over
  - By: Regional gov’t agencies in Germany → early 2009
  - Vendors to be announced
- Qty Takeoff and Estimating - Electrical Systems
  - Norwegian buildingSMART Aquarium → early 2009
  - Several regional vendors
- Arch Programming to Early Design
  - By: HOK, buildingSMART International → Mid-2009

Planned Improvements for MVD

- Web site improvements
  - To support many developers
  - Improved MVD Coordination tools
- Integration with Certification Testing
  - Unit tests at the Concept level
  - Visual Studio test packages downloadable by vendors
  - Certification test suite development & mgmt tools
- Product Certification Information
  - Web site for certification test reporting
  - Flexible search tools – e.g. by ‘exchange’