


IFC Solutions Factory

Model View/SW Implementation Portion of IFC Technology Session

9-Dec-08 – AEC-ST/EcoBuild Conference – Washington, DC



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Model View Definition (MVD)

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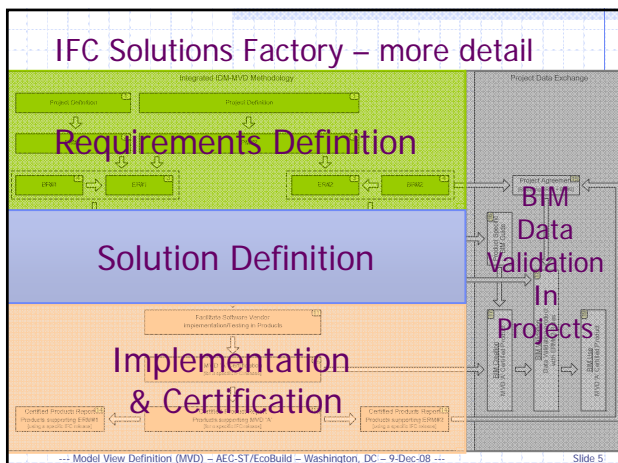
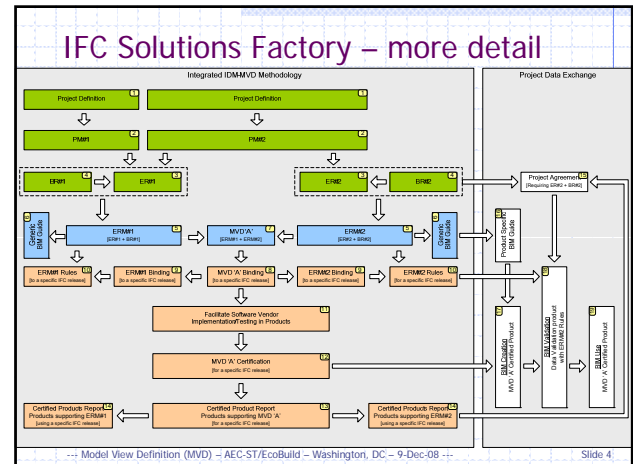
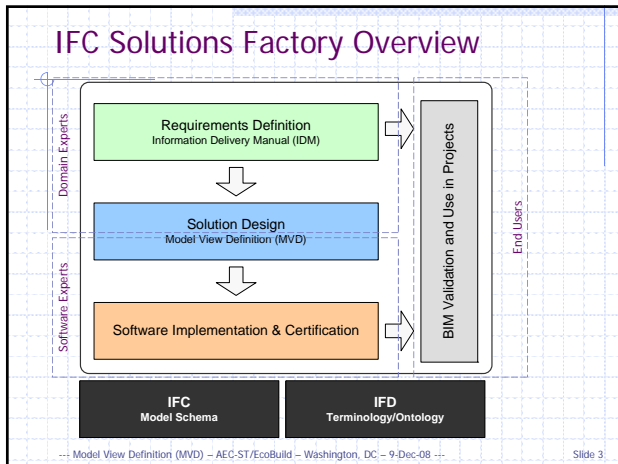
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Outline

- ◆ Motivations for MVD
- ◆ Background/Overview
- ◆ Generic Model Views – Format, Tools, and Templates
- ◆ Implementable Model Views – Format, Tools, Templates
- ◆ Certification Test Reporting
- ◆ MVDs Developed & Implemented to Date
- ◆ Future Plans

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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)

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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 much more information
- ◆ MVD History
 - Developed/introduced to IAI in 2005 by Jiri Hietanen
 - Adopted as IAI standard methodology in early 2006
 - see http://www.iai-international.org/software/MVD_060424/IAI_IFCModelViewDefinitionFormat.pdf
 - Revised for 'IFC Solution Factory' (v2) in late 2007



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Overview of MVD Elements

- ◆ Concepts
 - MVD Building blocks
- ◆ Generic 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 agmts & guidance

Reference	Name
1 VBL-359	1st Level Space Boundary
2 VBL-370	2nd Level Space Boundary
3 VBL-324	Applied Load
4 VBL-355	Arbitrary Curved Edge Profile Cross Section and Name
5 VBL-347	Arbitrary Straight Edge Profile Cross Section and Name
6 VBL-344	Assigned Action
7 VBL-328	Connections
8 VBL-324	Curved Edge Representation
9 VBL-148	Curved Edge Representation
10 VBL-143	Eccentric Curve Connection

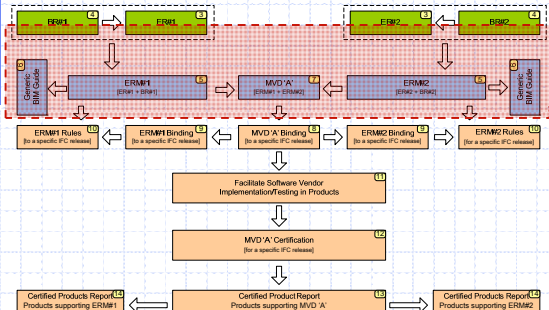


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Generic MVD – IFC Solutions Factory Process Check

- ◆ Where are we in the overall process?



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Generic Model Views - Diagrams

- ◆ Notation

IFC Release Independent Concepts	
Variable Concept	The same variable concepts can be used in different MVDs, but their content may vary. Hence the variable concept must be configured separately for each MVD. This configuration is done by creating a diagram in which other concepts (group and static) are attached to the variable concept. Examples: space in quantity take-off, wall in HVAC design
Group Concept	Group concepts provide structure for the concept diagrams by grouping together static concepts and/or other group concepts. Examples: space properties, wall geometry
Static Concept	Static concepts remain the same in all scenarios in which they are used. They can be re-used without modification because they don't contain any options. Examples: space number, bounding box geometry



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Generic Model Views – View Definition

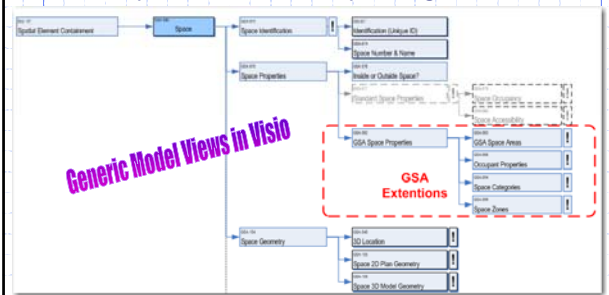
Generic AEC/FM BIM View Specification			
GSA Concept Design View (2006)			
Reference	000	Version	1.0
Status	Final		
History	Document created 1-Mar-06; v0.5 – 1-Jun-06; v0.9 – 1-Sep-06; v1.0 – 1-Nov-06		
Authors	Richard See (Digital Alchemy)		
Document Owner	GSA Public Building Service		
Description	<p>Only part of information which is created by architects is needed for GSA's internal analyses of Conceptual Design Submissions. This Building Information Model (BIM) View Definition specifies the subset of the architect's BIM that must be submitted to GSA at Concept Design Submission milestones. This primary audience for this specification is software vendors creating BIM authoring applications that will be used to create such BIMs. Architects and Engineers (A-Es) creating such models are encouraged to review the GSA BIM Guide for end user instructions on how to create such models and what objects and information is expected.</p> <p>BIM models conforming to this view will generally be created by design architects using architectural BIM authoring applications. Models will be submitted as IFC model files structured according to the industry standard IFC 2x or 2x2 schema (see www.iai-international.org). These models will be uploaded to the GSA Project Information Portal at http://BIM-Submission.GSA.gov. GSA project managers will then load the models into various internal software applications to perform design analyses.</p>		
CAD Documents		Current Process	
GSA Documents		GSA Doc Review	

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Generic Model Views - Diagrams

- ◆ Example from GSA Concept Design View 2006



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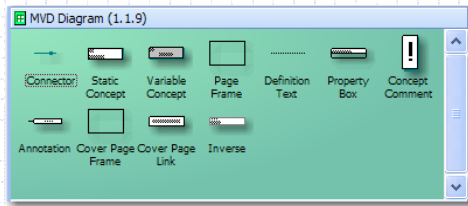
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Generic Model Views – Tools/Templates

MVD Diagramming Stencil

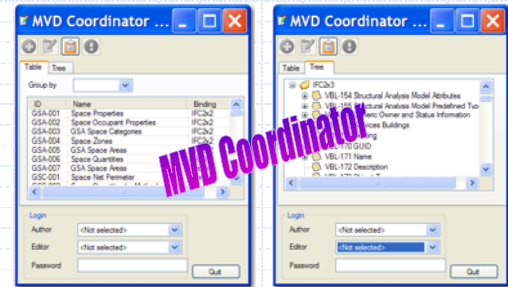


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Generic Model Views – Tools/Templates

MVD Coordinator



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Generic Model Views – Concept Definition

Generic AEC/FM Concept Description GSA Space Properties

Reference	GSA-082	Version	1.0	Status	Final
Relationships	None				
History	Document created 1-Mar-06; v0.5 – 1-Jun-06; v0.9 – 1-Sep-06; v1.0 – 1-Nov-06				
Authors	Richard See (Digital Alchemy)				
Document Owner	GSA-PBS				
Usage in view definition diagram					
Definition	<p>A collection of properties used by GSA to describe space usage, occupants, classification, and areas, all of which are used in planning and management of spaces in GSA facilities.</p> <p>Space Categories – 3 properties are used by GSA to categorize spaces in various systems are:</p> <ul style="list-style-type: none"> GSA STAR Space Type – a 3 character descriptor, selected from a reference list. GSA STAR Space Category – a 2 digit numeric ID, selected from a reference list. ANSI/BOMA Space Category – a 2 digit numeric ID, selected from a reference list published by BOMA. <p>Occupant Properties – 5 properties are used by GSA to describe space occupants. These are:</p> <ul style="list-style-type: none"> Occupant Organization Code – a 4 digit numeric ID, selected from a reference list. 				

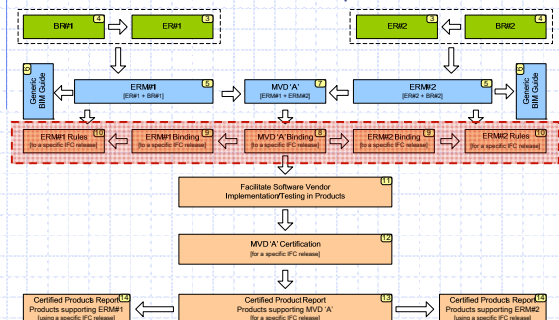
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Implementable MVD

– IFC Solutions Factory Process Check

Where are we in the overall process?



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Implementable Model Views - Diagrams

Notation

IFC Release Specific Concepts	
Variable Concept	The IFC binding of a variable concept implements a generic variable concept with the same name. Example: the IFC Binding of the variable concept "Wall" is "Wall", not "Wall standard case".
Adapter Concept	Adapter concepts are reusable parts of the IFC model specification that connect static concepts to a variable concept. There is no correspondence between adapter concept and IFC release independent group concept. Instead, adapter concepts provide a proposal how to structure software code in IFC implementations for reaching maximal code reuse. Examples: classification assignment, property set assignment.
Static Concept	The IFC binding of a static concept implements one or more generic static concepts. The names of generic and IFC binding static concepts don't have to match. The documentation of the IFC binding contains a detailed definition how to apply the IFC Model Specification. Example: "GUID" implements the IFC release independent concept "Software Internal ID".

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Implementable Model Views – View Definition

Sample from GSA Concept Design View 2006

IFC Release Specific AEC/FM View Description (IFC 2x2) GSA Concept Design View for IFC 2x2

Reference	GSA-000	Version	1.0	Status	Final
History	Document created 1-Mar-06; v0.5 – 1-Jun-06; v0.9 – 1-Sep-06; v1.0 – 1-Nov-06				
Authors	Richard See (Digital Alchemy)				
Document Owner	GSA-PBS				
Description	<p>This document describes the high level principles applied in mapping v1.0 of the generic view definition for "GSA Concept Design View (2006)".</p> <p>This view is based on the Coordination View for IFC 2x2, developed and published by the IA's Implementer Support Group (ISG). This view only adds 3 property sets and 1 to 3 element quantities to all space objects in such a model. All other requirements are defined in the Coordination View.</p> <p>There are no known limitations in this binding, relative to the generic view definition.</p> <p>This document uses the official IA View Definition Format version 1.0.11. The content of this document has to be certified by the IA before becoming part of an Official IA View Definition.</p>				

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Implementable Model Views – Concept Diagrams

- Example for GSA Concept Design View 2006

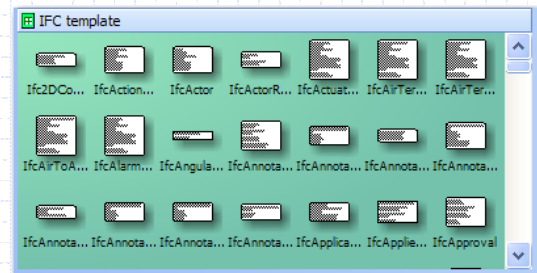


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Implementable Model Views – Tools/Templates

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

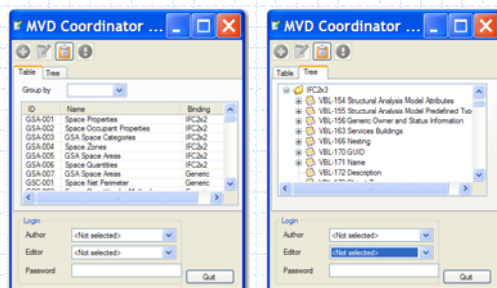


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Implementable Model Views – Tools/Templates

-
- MVD Coordinator



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Implementable Model Views – Agmts & Guidance

- 'Space Areas' - from GSA Concept Design View 2006

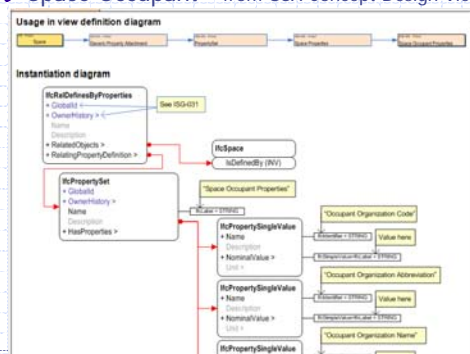


default unit for Area Measure.

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Implementable Model Views – Agmts & Guidance

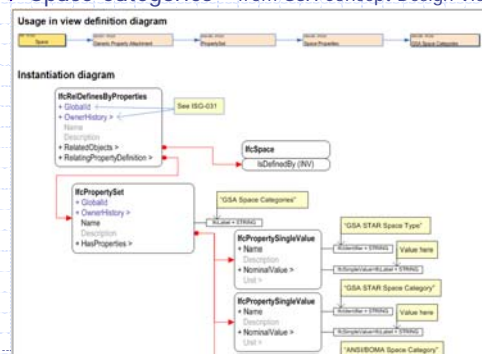
- ◆ 'Space Occupant' - from GSA Concept Design View 2006



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Implementable Model Views – Agmts & Guidance

- 'Space Categories' - from GSA Concept Design View 2006



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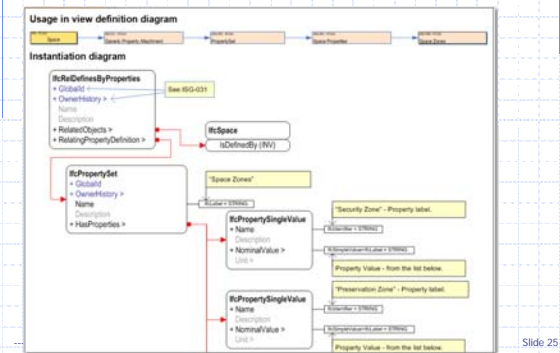
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Implementable Model Views – Agmts & Guidance

◆ 'Space Zones' - from GSA Concept Design View 2006



Software Implementation and Testing

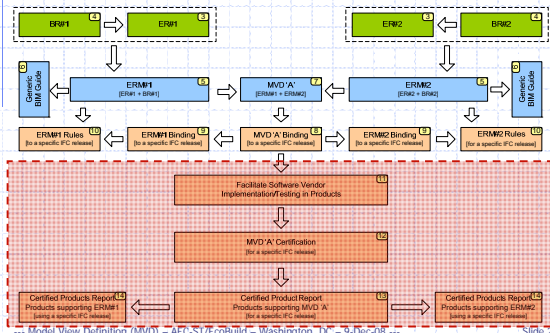
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Certification Testing & Reporting

– IFC Solutions Factory Process Check

◆ Where are we in the overall process?



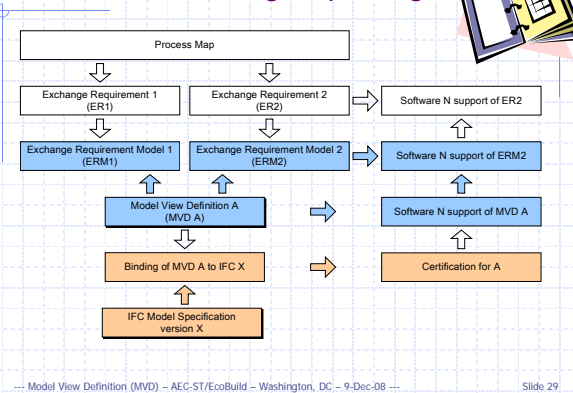
Certification Testing/Reporting

- ◆ 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

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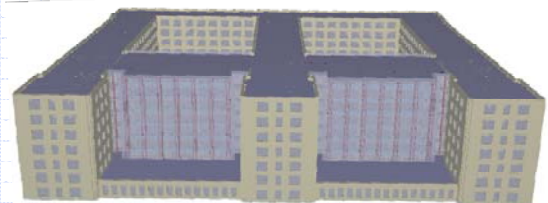
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Certification Testing/Reporting



Certification Test Cases

◆ Example from GSA Concept Design View 2006



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Certification Testing Process



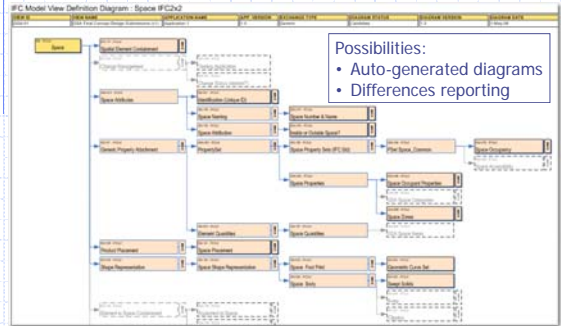
- ◆ MVD is published for Review
- ◆ Review comments addressed – Final Published
- ◆ Facilitated implementation begins (3-9 mo)
- ◆ Certification Test Event – Product 'A' certified-1
- ◆ Product 'A' product pilots begin (6 mo)
- ◆ Product 'A' user issues addressed
- ◆ Certification Test Event – Product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

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Certification Test Reporting

- ◆ Hypothetical Example from GSA Concept Design View 2006



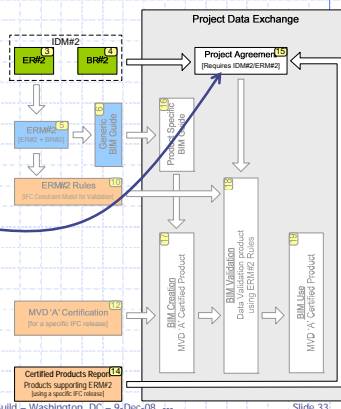
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Certification Test Reporting

– 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



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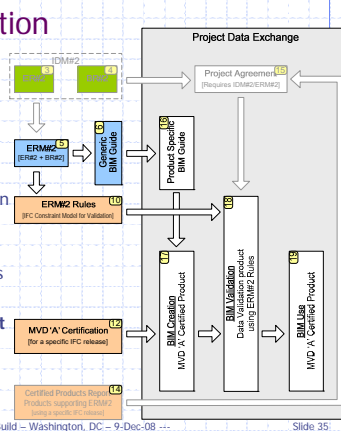
Industry Deployment using BIM Data Validation Tools

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BIM Data Validation

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



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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)

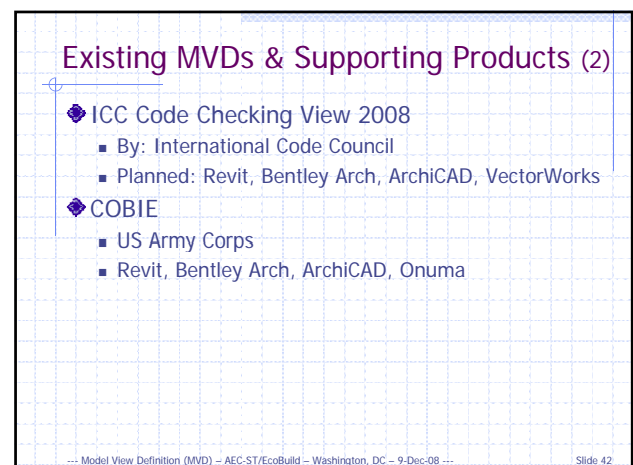
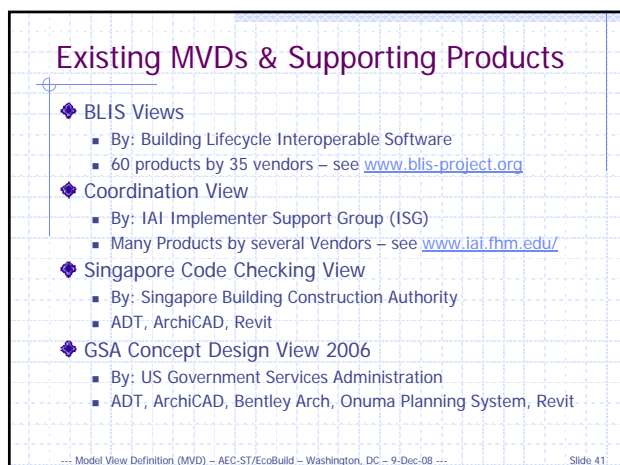
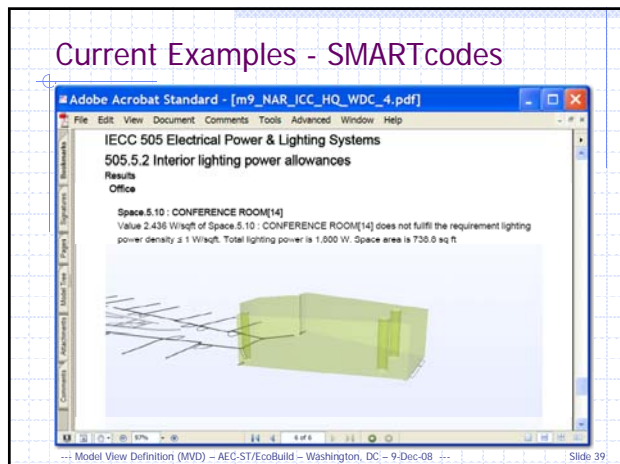
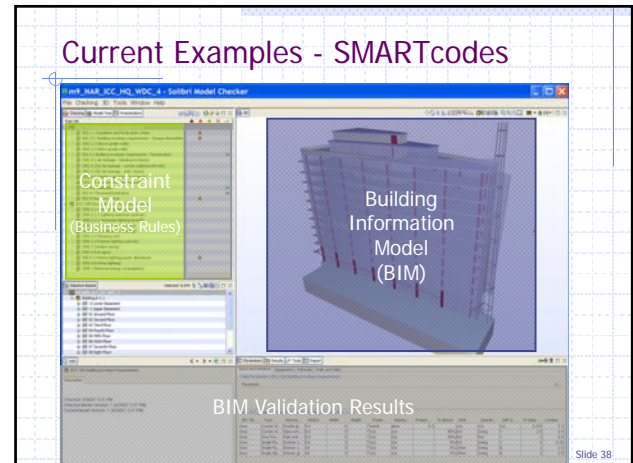
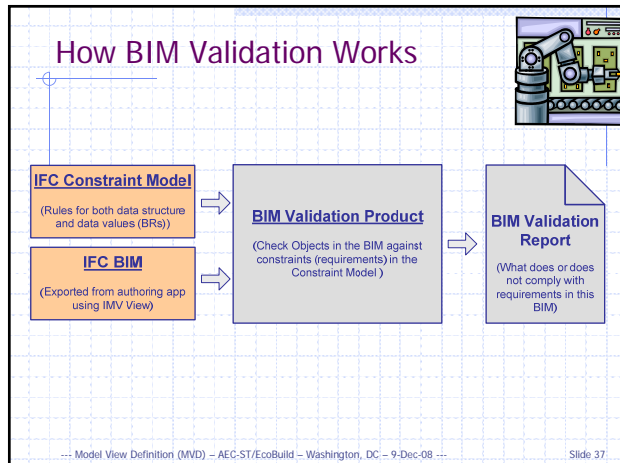
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MVDs in Development (→target completion)



- ◆ 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

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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'

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Model View Definition (MVD)



Questions?

Richard See

Leader – NBIMS Models and Implementation Guidance Committee

MVD Lead – buildingSMART Alliance Technical Committee

Managing Director – Digital Alchemy

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