International Alliance for Interoperability

IFC As A State of the Art Solution
Tokyo - 6th July 1999

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AGENDA

IAI Objectives
Business Context
Software Technology
Modeling History and Technology
Process, Information and Object Models
Relationships and Needs
STEP, Projects, Academic
International Alliance for Interoperability

Vision
To enable software interoperability in the AEC/FM industries

Mission
To provide a universal basis for process improvement and information sharing in the construction and facilities management industries.

Goal
To Define Industry Foundation Classes

IFC

The IAI Objective

from this...

...to this
The IAI Objective

...to global working

Project Lifecycle

from Kjell Svensson, KTH
Information in Drawings from Kjell Svensson, KTH

- A medium-sized (about 5000 sq. m.) office building requires 500-600 drawings to be completed.
- + geographical maps and surveys.
- During the life-time of a building, smaller refurbishments generate about fifty new drawings every ten years.
- At least twice a century, major conversions are required which add about another 250 drawings.

<table>
<thead>
<tr>
<th>Drawing type (discipline)</th>
<th>Total No.</th>
<th>No. to archives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Construction</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Mechanical Services (HVAC)</td>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>Electrical and control systems</td>
<td>200</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total number</strong></td>
<td><strong>550</strong></td>
<td><strong>270</strong></td>
</tr>
</tbody>
</table>
"A common complaint heard from academics and software vendors is that those involved in the construction industry are resistant to change. I feel that this is wrong. Many professional people are realists. They will not take on technology because it is new, but because it is beneficial."

Comment to the ISFAA Email Conference 1997 by Andrew Crowley
(Steel Construction Institute. CIMsteel model developer)
Business Benefit

Class = CentrifugalFan

- Attributes:
  - Length
  - Width
  - Height
  - Location
  - Cost
  - BaseDate
  - InletRadius
  - OutletWidth
  - OutletDepth
  - SupplyVolume
  - Resistance

Centrifugal Fan
Starter

Started_by
Stops
Stopped_by

Classes and Relationships

6th July 1999
Views on a Class

Architect

Structural Engineer

Quantity Surveyor

Services Interface

Structural Interface

Quantity Surveying (or Cost) Interface

shape
location

Architectural Interface

weight
location

location

inlet connection size

outlet connection sizes

distribution characteristics

Decomposing Classes

Class = CentrifugalFan

Attributes

Length = 2.000m
Width = 1.500m
Height = 1.500m
Location = Plant Room 1
InletRadius = 600mm
OutletWidth = 1450mm
OutletDepth = 750mm
SupplyVolume = 9cu.m/s
Resistance = 10kPa

Object

Centrifugal Fan Artefact

Class = Process

Identity = abcd123xyz44

Attributes

StartDate = 20-10-98
EndDate = 24-10-98
Duration = 4 days

Behaviours

ChangeStart ()

ChangeEnd ()

Class = Cost

Identity = abcd123xyz44

Attributes

Amount = 3842.65
Currency = GBP
BaseDate = 14-09-98

Behaviours

NewAmount ()

NewCurrency()
Class Behaviors

Object

Behaviours

Attributes

General AEC Reference Model (1986)

Functional Unit

solves

requires

Technical Solution

GARM Basic Model

FU/TS Decomposition
Building Systems Model (1988)

Application Protocols (1993)
Property Set Model (Lifts)

Elevator Car Property Set

<table>
<thead>
<tr>
<th>Property Name</th>
<th>Definition</th>
<th>Property Type</th>
<th>Data or Rel. Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpecialPurposes</td>
<td>Additional purposes for which the elevator car may be used including firefighting, evacuation etc.</td>
<td>IfcSimpleProperty</td>
<td>IfcString</td>
</tr>
<tr>
<td>CarWidth</td>
<td>The horizontal dimensions between the inner surfaces of the car walls measured parallel to the front entrance and at 1m above the car floor.</td>
<td>IfcSimplePropertyWithUnit</td>
<td>IfcPositiveLengthMeasure</td>
</tr>
<tr>
<td>CarHeight</td>
<td>The inside vertical distance between the entrance threshold and the constructional roof of the car. Light fittings and false ceilings are accommodated within this dimension.</td>
<td>IfcSimplePropertyWithUnit</td>
<td>IfcPositiveLengthMeasure</td>
</tr>
<tr>
<td>CarDepth</td>
<td>The horizontal dimensions between the inner surfaces of the car walls measured at right angles to the car width and at 1m above the car floor.</td>
<td>IfcSimplePropertyWithUnit</td>
<td>IfcPositiveLengthMeasure</td>
</tr>
<tr>
<td>ElevatorCarOperatingStation</td>
<td>See ElevatorCarOperatingStation property list definition</td>
<td>IfcPropertyList</td>
<td></td>
</tr>
<tr>
<td>ElevatorCarFinish</td>
<td>See ElevatorCarFinish property list definition</td>
<td>IfcPropertyList</td>
<td></td>
</tr>
<tr>
<td>ElevatorCarHandrail</td>
<td>See ElevatorCarHandrail property list definition</td>
<td>IfcPropertyList</td>
<td></td>
</tr>
<tr>
<td>ElevatorCarMirror</td>
<td>See ElevatorCarMirror property list definition</td>
<td>IfcPropertyList</td>
<td></td>
</tr>
</tbody>
</table>
**Release Strategy**

- **IFC Release 2.X Platform**
- **IFC Release 4 Platform**

**R4 Extension Releases**

- **2000**
- **2001**
- **2002**
- **2003**
- **2004**

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**Relationship with STEP**

- **IFC uses a lot of STEP technology**
- **BUT** it must be used carefully
- **We have to find ways of working more closely with ISO**
  - We have A-liaison status
  - We have good contact with ISO TC59 and we must build on this
- **Conversations have been held between IAI and STEP people of the STEP Technical Architecture**
- **We must participate**
  - Model from the Process Industry (EPISTLE/PIEBASE)
  - Model from the Petrochemical Industry (POSC)
- **We need resources to do this**
Needs

- Tools and approaches that enable people in projects to work together more effectively
- Development of abilities to reference static information stores
- Extend and refine property set capability to handle differences in ‘flavor’ of a common concept.

Use and reference current work

- Deliver capability to industry
- Market what we do to industry
- Extend collaboration
- Extend technology

IFC As State of the Art Technology

- IFC is State of the Art for the Building Construction Industry
- It is a Leading Edge, not ‘Bleeding Edge’
- Technology is only one part of the problem
- It may be the easiest part of the problem to solve
- There are also
  - People Issues
  - Business Issues
  - Cultural Issues
  - Legal Issues
  - …. and others
Lexicon of Terminology

The information modeling world

A Lexicon to link worlds

The classification world

The provided information world

Future Services

Knowledge Based Design Assistance Services
Model Access Services
Knowledge Based Code Checking Services
Remote User Specialised Engineering Services
Training and Online Human Support Services
Technology Support Tools for eCommerce Services

USER