Who is Wolfgang Wilkes?

- Researcher at the University of Hagen
- Active in various standardization committees
  - Related to property dictionaries (e.g. PLIB, ISO 13584)
  - Related to BIM standards
    - Convener ISO TC 59/SC 13/WG 11
      - VDI 3805 to ISO 16757
    - Member CEN TC 442/WGs 2+4
    - Member in various DIN committees about BIM
- Deputy chair of eCl@ss scientific advisory board (SAB)

- Managing Director of Semaino Technologies GmbH
- Exchange of product data in electronic catalogues
- Support of various exchange formats
  - BMEcat, GS1/XML
- Support of various classification systems
  - eCl@ss, ETIM, Proficlass, UNSPSC
eCl@ss and BIM - Outline

- BIM and buildingSMART
- Why should eCl@ss care?
- Current activities in eCl@ss
BIM

- Building information modelling (BIM) is a process supported by various tools and technologies involving the generation and management of digital representations of physical and functional characteristics of places.
- Many design systems (e.g. Revit) claim that they support BIM.
- Missing: interoperability between the BIM isles
- buildingSMART: an international organisation which aims to improve the exchange of information between software applications used in the construction industry.
  - → open BIM
  - → standards
- Truely international organisation

- 19 chapters representing 22 countries
  - Including the eCl@ss focus countries Germany, France, US, China and Japan

- Rooms
  - Topic related committees

- www.buildingsmart.org
ICF (ISO 16739):
International Foundation Classes

- Object oriented model for the representation of a built asset, including its subobjects, their properties and their relationships

- Format for the exchange of model information between different phases of the building life cycle and between different actors
  - STEP File Format
  - ifcXML
IFC – Industry Foundation Classes

- Really big model
- Two effects
  - Too big for applications
    - MVDs (model view applications) extract subsets for specific purposes
  - Never complete
    - Gaps – missing objects and properties for a specific application
    - Extensions – project specific property-sets to fill these gaps
Parallel development: bSDD (buildingSMART Data Dictionary)

- Platform to „host“ several dictionaries
- Data Model defined in ISO 12006-3
- Network of concepts
  - Various concept types
  - Various relationship types
- Accessible via a REST API (Web Services)
- Only incomplete online access via web browser
- Contexts: means for sharing concepts among different dictionaries
bSDD as a semantic net of concepts

from: dev.ifd.library.org
bSDD Contexts

1 - 4
3 - 6
7

8 - 13
9
10 - 15
11
New structure of bSDD
How do IFC and bSDD fit together?

- For long time: independent developments
- Closer cooperation during the last years:
  - IFC „classification“ has become part of bSDD
  - Reference mechanism from IFC to bSDD GUIDs
  - Data templates
    - Dictionary-based data structures for exchange processes
    - MVDs to exchange template definition and „Filled-in templates“
- Vision
  - bSDD defines semantics of objects
  - IFC refers to the semantics in its instance model and exchange structure
  \[\rightarrow\] bSDD is the entry point to bring semantics into the BIM world
Landscape of BIM standards and standardization organisations

ISO 16739
IFC
JWG 12

ISO TC 59/SC 13

ISO12006-3 bSDD / IFD

buildingSMART

ISO 16757
WG 11

ISO 12006-3 bSDD / IFD

WG 6

CEN TC 442

Templates
WG4 / TG2
EN-ISO 13387

Property Def. & Maintenance Processes
WG4 / TG1
EN-ISO 13386

Template Data Exchange
WG2/ TG3

Dr. Wolfgang Wilkes
Why should eCl@ss care?
Why should eCl@ss care?

- Building area only rarely covered in eCl@ss
- Focus in buildingSMART moves to product data exchange and the supply chain
- buildingSMART is a truely international organisation
Why should eCl@ss care?

- Building area only rarely covered in eCl@ss
- Focus in buildingSMART moves to product data exchange and the supply chain
- buildingSMART is a truely international organisation
- ETIM has provided ist content on the buildingSMART Data Dictionary
Why should eCl@ss care?

– Building area only rarely covered in eCl@ss
– Focus in buildingSMART moves to product data exchange and the supply chain
– buildingSMART is a truly international organisation

– ETIM has provided content on the buildingSMART Data Dictionary

– Don’t spend money twice
  – Building automation products are described by the CAx group in eCl@ss
  – Companies like Siemens, Schneider electrics, Hager, etc. have spent considerable efforts
  – Need for doing that again for BIM standards?
<table>
<thead>
<tr>
<th>Simple building automation device: Motor circuit breaker</th>
</tr>
</thead>
</table>

### Information

- **CAx connector and function**
  - **number of connectors**: 12

### Connection

- **(1) Connection**
- **(2) Connection**
- **(3) Connection**
- **(4) Connection**
- **(5) Connection**
- **(6) Connection**
- **(7) Connection**
- **(8) Connection**
- **(9) Connection**
- **(10) Connection**
- **(11) Connection**
- **(12) Connection**

### Function group

- **CAx basic**
- **Commercial**
- **Add on Documentation**

### Identification

- **Application standards**: IEC 60947-2, IEC 60947-4-1
- **Connection type**: Screw connection
- **Device type**: Assembly
- **certificate/approval**: CE
- **Greatest value of overload release adjustment range**: A 1.6
- **Greatest value of tuning range short circuit tripper, undelayed**: A 19.2
- **Lowest value of setting range for overload tripper**: A 1
- **Integrated undercurrent tripper present**: No
### Motor protection circuit-breaker

<table>
<thead>
<tr>
<th>Title</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECLASS-1.0 27-37-04-01 Motor protection circuit-breaker</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(1) Connection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(1) Connection</strong></td>
<td></td>
<td>Single connector electrical</td>
</tr>
<tr>
<td><strong>Number of connectors</strong></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>Type of connection</strong></td>
<td></td>
<td>Single connector electrical</td>
</tr>
<tr>
<td><strong>Number of executions of the electric connector</strong></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Execution of the electric connector</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulation stripped length</strong></td>
<td>mm</td>
<td>10</td>
</tr>
<tr>
<td><strong>Allowed types of conductors</strong></td>
<td></td>
<td>Einfadungskabel, Einfadungskabel mit Schutz</td>
</tr>
<tr>
<td><strong>Cable size</strong></td>
<td></td>
<td>PZ 2</td>
</tr>
<tr>
<td><strong>Conductor section (mm²)</strong></td>
<td></td>
<td>Screw connection</td>
</tr>
<tr>
<td><strong>type of electrical terminal</strong></td>
<td></td>
<td>Round</td>
</tr>
<tr>
<td><strong>Conductor parameters (AWG/KCMIL)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Form of conductor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conductor section (mm²)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>number of rated values of device functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of parts relations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>connector group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>connector removable</strong></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td><strong>Connector identification</strong></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>direction of connection</strong></td>
<td></td>
<td>From above</td>
</tr>
<tr>
<td><strong>Position (in mm)</strong></td>
<td></td>
<td>x=0, y=50, z=34,5 (Orientierung: x=0 y=1 z=0)</td>
</tr>
<tr>
<td><strong>(2) Connection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(2) Connection</strong></td>
<td></td>
<td>Single connector electrical</td>
</tr>
<tr>
<td><strong>Connector identification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Position (in mm)</strong></td>
<td></td>
<td>x=11,5, y=75,5, z=34,5 (Orientierung: x=0 y=1 z=0)</td>
</tr>
</tbody>
</table>

**Electrical terminal material**
- Bridge circuit connector: No
- Color of electrical terminal: No

**Number of execution of the electric connector**
- 1 execution

**Execution of the electric connector**
- Insulation stripped length: 10 mm
- Allowed types of conductors: Einfadungskabel, Einfadungskabel mit Schutz
- Cable size: PZ 2
- Conductor section (mm²)
  - Screw connection
  - Round

**Conductor parameters (AWG/KCMIL)**
- Form of conductor
- Conductor section (mm²)

**Number of rated values of device functions**
- Number of parts relations

**Connector group**
- Connector removable: No
- Connector identification: 1
- Direction of connection: From above
- Position (in mm): x=0, y=50, z=34,5 (Orientierung: x=0 y=1 z=0)
Why should eCl@ss care?

- Building area only rarely covered in eCl@ss
- Focus in buildingSMART moves to product data exchange and the supply chain
- buildingSMART is a truly international organisation

- ETIM has provided content on the buildingSMART Data Dictionary

- Don’t spend money twice
  - Building automation products are described by the CAx group in eCl@ss
  - Companies like Siemens, Schneider electrics, Hager, etc. have spent considerable efforts
  - Need for doing that again for BIM standards?

- bSDD is in a transition to a professional organisation
  - eCl@ss could offer advice, support, ... based on its experience
eCl@ss to BIM
Cooperation eCl@ss - buildingSMART

- eCl@ss task force BIM, founded in 2017
  - Chair: Ashley McNeil (Hager)
  - eCl@ss representative: André Lindner
- MoU between eCl@ss and buildingSMART
  - Goal: bring relevant parts of eCl@ss into bSDD
- eClass is listed as one of the partners of buildingSMART
Started Project: Bring eCl@ss content to bSDD

– Step 1: Pilot projects (2019)
  – Mapping of basic structures
    – asphalt
  – Mapping of advanced structures
    – electrical cabinet
  – Tool support by University of Hagen and Semaino

– Step 2: complete transfer of relevant classes (2020, ...)
Two kinds of mappings

- Structural mapping
  - Representing eCl@ss data structures by bSDD data structures
- Content mapping
  - Map eCl@ss classes and properties on existing bSDD subjects and properties
bSDD tool project at FernUni Hagen

- **eClass XML file**
- **Dict Im- + Exporter**
- **bSDD XML file**

**Data flow**
- Uses module

**Local Dictionary Repository (LDR)**

- **eClass2bSDD Mapper**
- **VDI 3805 / ISO 16757 Mapper**
- **bSDD Integrator**

**LDR API**

- **LDR2bSDD API**
- **global bSDD API**

**Global bSDD Database**

**VDI 3805 / ISO 16757 Excel File**

**Global bSDD Database**
# Structural Mapping (eCl@s basic)

<table>
<thead>
<tr>
<th>eCl@s element</th>
<th>bSDD concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification Class</td>
<td>Classification</td>
</tr>
<tr>
<td>Application Class</td>
<td>Subject</td>
</tr>
<tr>
<td>Property</td>
<td>Property</td>
</tr>
<tr>
<td>Unit</td>
<td>Unit</td>
</tr>
<tr>
<td>Quantity</td>
<td>Measure</td>
</tr>
<tr>
<td>Value</td>
<td>Value</td>
</tr>
</tbody>
</table>
Structural Mapping (eCl@ss advanced)

- eCl@ss:
  - Additional structures in eCl@ss like
    - Blocks
    - Aspects
    - Hierarchies of blocks with property inheritance

- bSDD:
  - Several possibilities for mapping blocks
    - Properties composed of properties
    - Collection of properties
    - subjects
  - Less strict semantics in bSDD structural elements
  - Specialization relationship without property inheritance
Quality rules of bSDD

- Most important rule:
  - Map to existing concepts wherever possible
- Requires:
  - Search for similar objects (subjects, properties)
  - Expert decision:
    - eCl@ss class/property can be mapped to one of the search results or
    - eCl@ss class/property can be related to one of the search results or
    - Create new element in bSDD
- Probably the most expensive part of the mapping
Discussion Points

- More attributes for describing concepts
  - Preserving eClass Ids
  - No complete matching of attributes
- General modelling guidelines of bSDD
  - Discussions in the bSDD agent team
  - Following the ETIM mapping required?

- Merging vs. Equivalence relationship

- Mapping approach to be aligned with new version of ISO 12006-3
Summary

- BIM is getting attention worldwide
- Construction area is entering the digital world
- buildingSMART is defining standards for openBIM
- eCl@ss has to offer much content in various product areas
- Connecting eCl@ss to BIM standards will ease the use of eCl@ss content in BIM applications
  - eCl@ss investment is saved
- Current project: Map eCl@ss to buildingSMART Data Dictionary
Thank you

wolfgang.wilkes@fernuni-hagen.de
wilkes@semaino.de
+49 2333-30680-22
Current organisation of eCl@ss

Application classes

Classification classes

Blocks
How to relate classification elements?

- has parts (as done in case of ETIM)?
  - xtdRelComposes
- xtdRelSpecializes?
- xtdRelGroups?

Properties and values as classifications (as done in ETIM)?

- Also related by has-parts?
- Is that modelling style a standard?
Classes and properties

Application Class = subject
Property = Property
Relationship Classification – ApplClass: classifies
Relationship ApplClass – Property: assignsProperty

→ Similar to ETIM
eCl@ss advanced

eClass distinguishes between
- ApplClass (AC) and
- Block (can only live inside an AC)

Blocks are used
- For grouping of properties
- For defining sub-components

Real composition
- Reference to another AC
Representing property grouping blocks as property
Representing property grouping blocks as grouping of property
Blocks as subcomponents

relAssignProp

<<subject>>
Motor protection BC

<<property>>
Length

relComposes

<<subject>>
Connection

relAssignProp

<<subject>>
ConnectionID

relAssignProp

<<subject>>
Position
Polymorphism

- Motor protection BC relComposes Connection
- Connection relAssignProp Type
- Connection-1 relSpecializes Connection
- Connection-2 relSpecializes Connection
- Connection-1 relAssignProp ConnectionID
- Connection-2 relAssignProp Position