Leif Granholm, BIM Ambassador, SVP

Concept for system integration using data standards

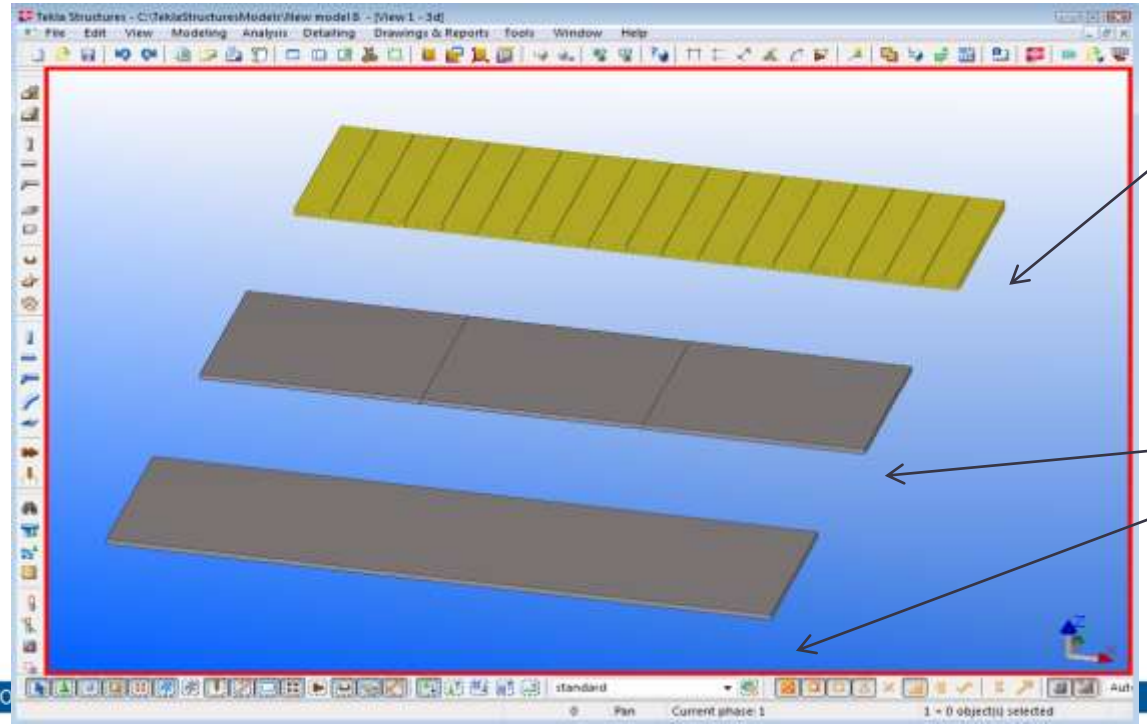
Transforming the way the world works

Paradigm shifts in Information Processing

- Information and Information Technology becoming a utility, everything in the cloud, user does not need to care where it comes from
- Information transforming from human readable documents to structured semantic data that can be processed automatically
- H2H, borders between humans coming down, countries, organizations, projects. Humans as the top of hierarchy, participating in several structures, Enterprise, Public organizations, Projects…

Reference model principle

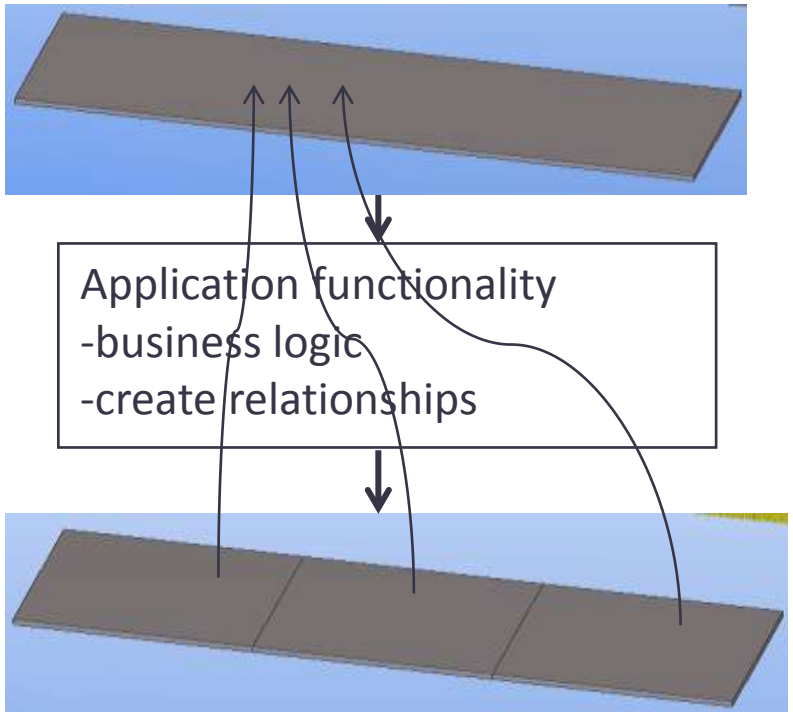
- Application capable of presenting and using native objects and objects in foreign schemas (IFC) simultaneously
- Foreign information not bulk converted to native schema.



Native objects

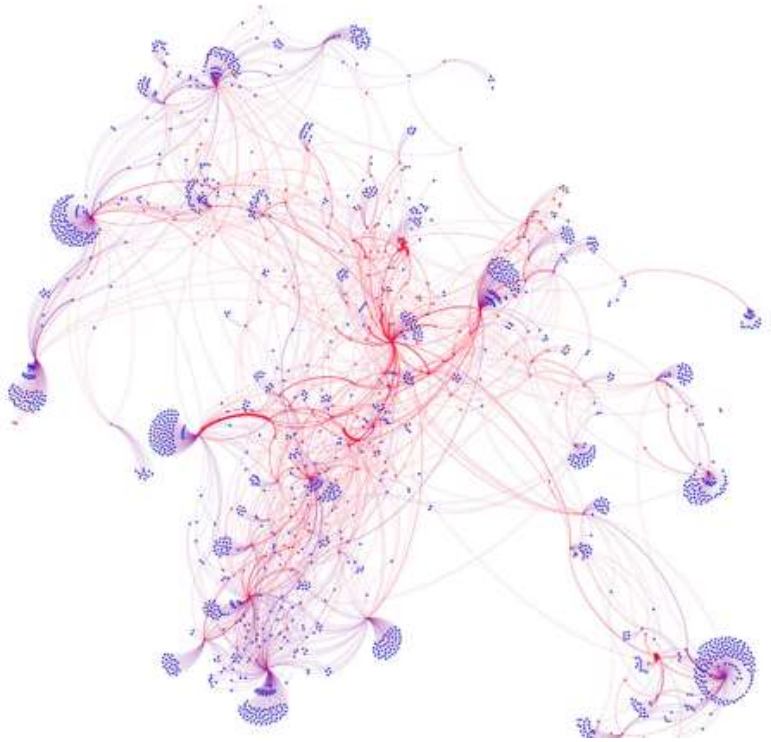
IFC objects
(retained in IFC format)

Intra discipline workflow
Intelligent object converter



Information will reshape built environment

- Falling transaction cost to deliver information and goods will radically transform supply chains
- Industry will consolidate and at the same fragment more
- Industry will become more people and process centric and less organization centric



Industrial Standards history

- The implementation of standards in industry and commerce became highly important with the onset of the Industrial Revolution and the need for high-precision machine tools and interchangeable parts. Henry Maudslay developed the first industrially practical screw-cutting lathe in 1800, which allowed for the standardisation of screw thread sizes for the first time.

- The Engineering Standards Committee was established in London in 1901 as the world's first national standards body. The Deutsches Institut für Normung was set up in Germany in 1917, followed by its counterparts, the American National Standard Institute and the French Commission Permanente de Standardisation, both in 1918.

Three main types of Standards

- Industry standards
  - Typically owned by some company, implementation by reverse engineering
  - Widely adopted and used in industry
  - Examples: DWG, DGN, formerly PDF, office DOC
- Formal licensed standards
  - Owned by neutral organization
  - Specifications publicly available, application requires license to use
  - Examples: Telco standards (GSM, LTE…), GPS, HDMI, USB
- Open standards
  - IPR:s owned by SDO, no licensing fees to implement
  - ¨ISO charges nominal fee for documents, standards still open

Standardization organization types

- "Formal" standardization organizations
  - General national standards bodies, ANSI, DIN, SFS, SIS
    Members of ISO International Organization for Standardization and CEN
  - IEEE Institute of Electrical and Electronics Engineers
    IEEE standards affect a wide range of industries including: power and energy, biomedical and healthcare, Information Technology (IT), telecommunications, transportation, nanotechnology, information assurance, and many more. In 2013, IEEE had over 900 active standards, with over 500 standards under development.
  - IEC International Electrotechnical Commission
  - ITU, ETSI telecomm standards

Standardization organization types

- “Independent” standardization organizations owned by members with no formal position
  - W3C Word Wide Web Consortium, web standards, XML, HTML…
  - OGC Open Geospatial Consortium, GeoSpatial standards, GML…
  - IETF Internet Engineering Task Force, internet Standards, TCP/IP
  - buildingSMART information related standards for construction and built environment

Standardisation vs. Standards

Standardisation

ISO

CEN

National Standards

ISO/TC 211

... is to develop a family of international standards that will

- support the understanding and usage of geographic information
- increase the availability, access, integration, and sharing of geographic information, enable inter-operability of geospatially enabled computer systems
- contribute to a unified approach to addressing global ecological and humanitarian problems
- ease the establishment of geospatial infrastructures on local, regional and global level
- contribute to sustainable development

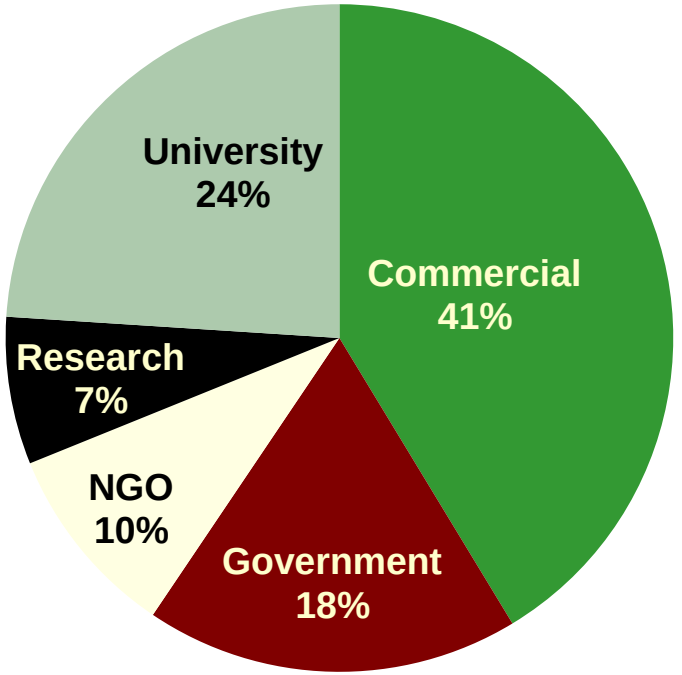



What is the OGC and what is an OGC standard?

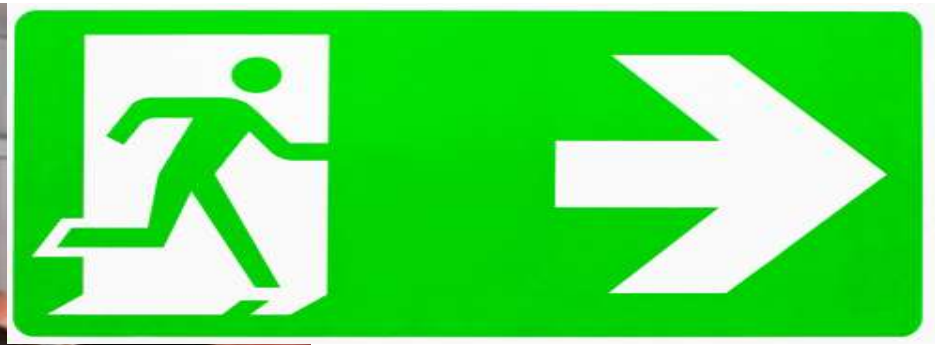
OGC at a Glance

Not-for-profit, international voluntary consensus standards organization; leading development of geospatial standards

- Founded in 1994.
- 480+ members and growing
- 38 standards
- Hundreds of product implementations
- Broad user community implementation worldwide
- Alliances and collaborative activities with ISO and many other SDO's



What most people think about standards work!



Or How Many Others View Standards

Standards Development is not easy!

- Requires collaboration on a global basis
- Requires concensus by many organizations
- Requires give and take
- Requires certified, repeatable process

CityGML

- Application independent Geospatial Information Model for virtual 3D city and landscape models
  - comprises different thematic areas(buildings, vegetation, water, terrain, traffic etc.)
  - data model(UML)acording to ISO 191xxstandard family
  - exchange format results from rule-based mapping of the UML diagrams to a GML3 application schema
  - ongoing standardisation process in OGC

- CityGML represents
  - 3D geometry, 3D topology, semantics and appearance
  - In 5 discrete scales (Levels of Detail, LOD)

InfraGML and IFC buildingSMART and OGC cooperation

- Cooperation around future of LandXML
  - LandXML development nonexistent
  - Autodesk and Bentley approached OGC to “take over” LandXML in 2012, bS openINFRA also interested
  - OGC started first Land Development DWG and then Land Development SWG to take on work
  - First task to create conceptual schema of LandXML in UML by reverse enginering, mostly by Paul Scarponcini from Bentley
  - Results from Frascati OGC meeting:
    -schema is too broken for compatible continuation
    -future with InfraGML and IFC for infrastructure in cooperation with bS,
    -scoping IFC for construction and GML for other purposes
    -name changed to Land and Infrastructure DWG/SWG

ISO/TC 59 Buildings and civil engineering works

Scope:

Standardization in the field of buildings and civil engineering works, of:

general terminology;

organization of information in the processes of design, manufacture and construction;

general geometric requirements for buildings, building elements and components including modular coordination and its basic principles, general rules for joints, tolerances and fits;

general rules for other performance requirements, including functional and user requirements related to service life, sustainability, accessibility and usability;

general rules and guidelines for addressing the economic, environmental and social impacts and aspects related to sustainable development;

geometric and performance requirements for components that are not in the scope of separate ISO technical committees;

procurement processes, methods and procedures.

ISO/TC 59 Buildings and civil engineering works

- Total number of published ISO standards related to the TC and its SCs (number includes updates): 112
- Number of published ISO standards under the direct responsibility of ISO/TC 59: 49
- Participating countries: 29
- Observing countries: 51

Other ISO construction related TC:s

- Documents and Documentation ISO/TC 10
- ISO's globally relevant standards for building include:
- Fire protection and fire safety, see ISO/TC 21 and ISO/TC 92;
- Concrete and binders, see ISO/TC 71 and ISO/TC 74;
- Installations, see ISO/TC 86, ISO/TC 116, ISO/TC 128, ISO/TC 138, ISO/TC 161, ISO/TC 178;
- Building products, see ISO/TC 160 (glass in building), ISO/TC 162 (doors and windows), ISO/TC 77 (fibre reinforced concrete), ISO/TC 89, ISO/TC 179, ISO/TC 189;
- Thermal insulation and internal environment design, see ISO/TC 163 and ISO/TC 205

Introduction: buildingSMART today

Values
- Open
- Neutral
- International
- Non Profit

Goals
- Create openBIM standards
- Host open BIM forums
- Certify software & people
- Become a trusted resource
- Promote active use

Standards Focus
- Data
- Processes
- Dictionaries
- BIM Standards

History
- 1995 Established
- 2000 IFC2 Release
- 2012 IFC4 Release
- 2013 First ISO Standards

A world wide **Alliance**
driving the transformation of
the built environment
through creation & adoption of
open, international standards

Richard Petrie
CEO

Patrick MacLeamy
Chairman

International Network
- Australasia
- Benelux
- Canada
- China
- French
- German
- Hong Kong
- Italia
- Japan
- Korea
- Middle East
- Nordic
- Norway
- Singapore
- United Kingdom
- USA

ISO International Organization for Standardization

bSI Partners

OGC® Open Geospatial Consortium, Inc.

buildingSMART products

- IFC Industry Foundation Classes, IFC by far the most important
  - Official ISO standard, adopted by ISO, ISO 16739
  - Implemented by all major BIM softwares
  - Widely used in certain markets
- buildingSMART Data Dictctionary bSDD
  - It is a reference library intended to support improved interoperability in the building and construction industry ISO 12006-3
- Information Delivery Manual IDM
  - Process modelling to recognize exchanges ISO 29481
- Model View Definitions
  - Machine readable specifications of exchanges
- BIM Collaboration Format
  - How to implement digital collaborative workflow