

IFC FOR INFRASTRUCTURE

Separation between BIM and GIS requirements

Technical Scope Definition

Proposed First Steps

Infrastructure Scope between GIS and BIM Standards – 1

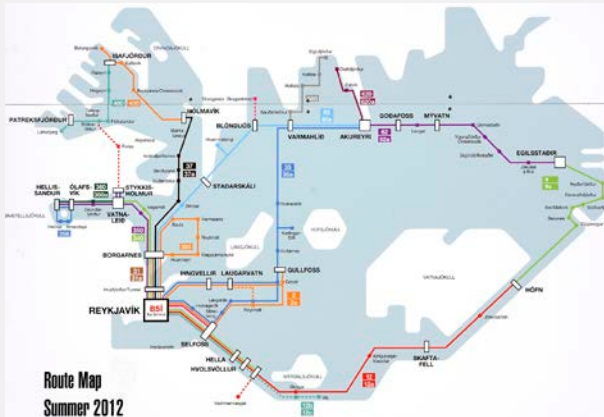
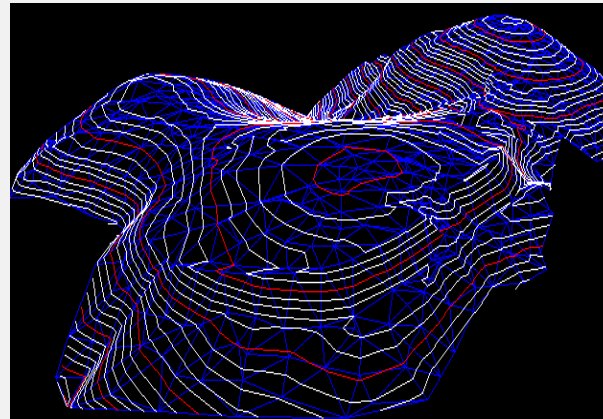


Photo: Thomas Liebich

Traffic network



Digital Terrain Model (of area)

Source <http://de.wikipedia.org>
http://de.wikipedia.org/w/index.php?title=Image%3ADigitales_Gel%C3%A4ndemodell.png



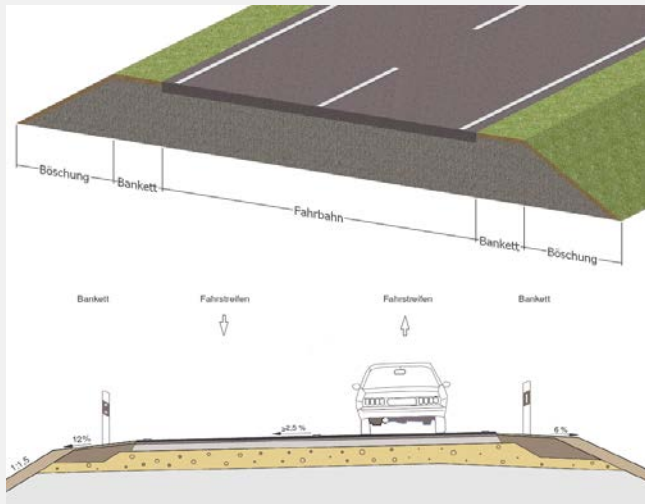
Source <http://de.wikipedia.org>
http://de.wikipedia.org/w/index.php?title=Datei:Strassenmetz_nuernberg.png

Road network

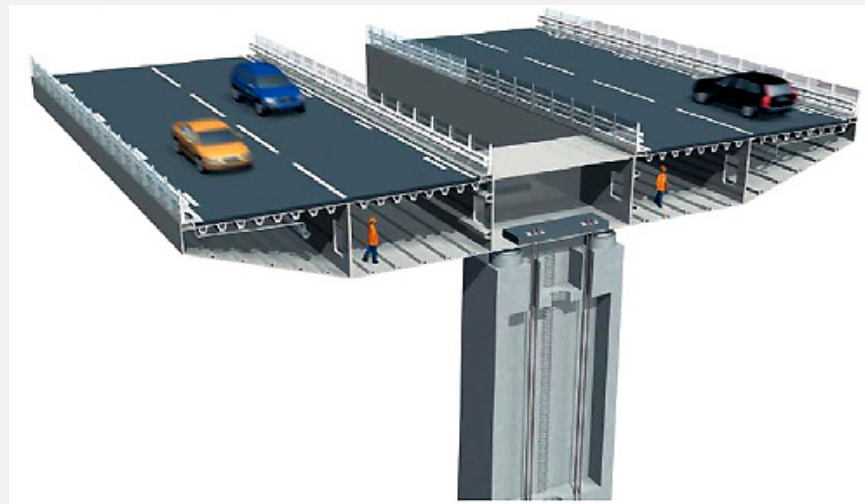
clearly GIS scope

- small scale
 - geospatial CRS
 - mainly surfacic
 - topological network
 - surveying as source
-
- OGC / TC211
 - gml / transXML / ...

Infrastructure Scope between GIS and BIM Standards – 2



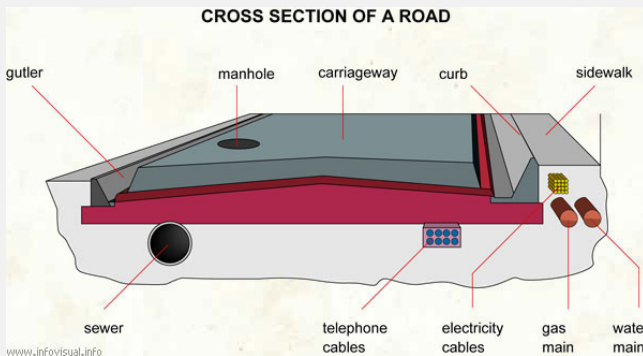
source: <http://de.wikipedia.org/wiki/Stra%C3%9Fenquerschnitt>



<http://www.roadtraffic-technology.com/projects/svinesund/svinesund3.html>

Road Construction Sectioning

Road Construction - Bridges



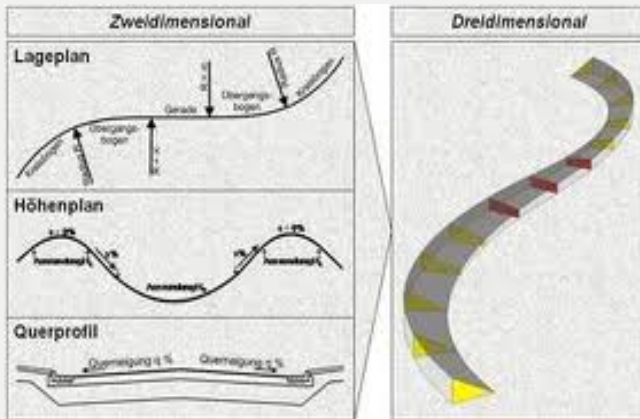
http://www.infovisual.info/05/025_en.html
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Road Construction Detailing

clearly BIM scope

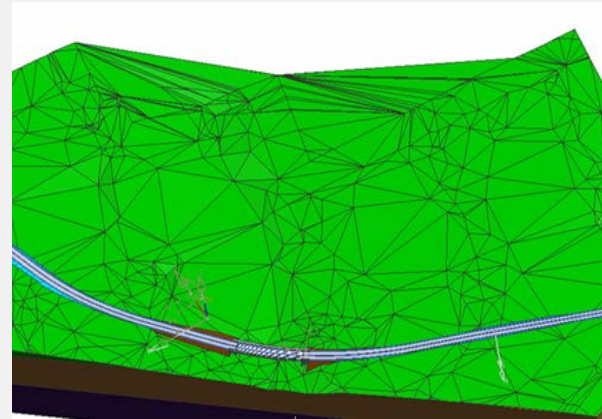
- big scale
 - engineering CRS
 - mainly volumetric
 - longitudinal structure
 - element composition
-
- open – bSI / TC59 ?
 - open – IFC ?

Infrastructure Scope between GIS and BIM Standards – 3



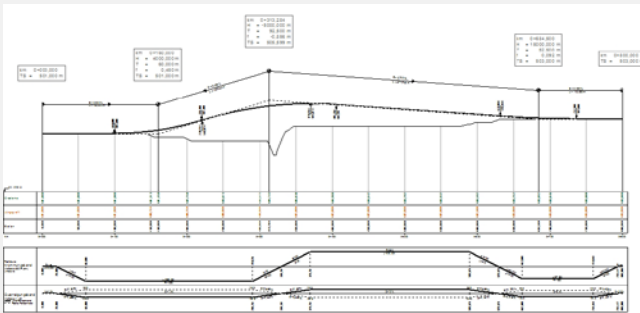
Road Alignment (traditional 2D and 3D)

source: Universität Stuttgart, VALIDATE
<http://www.validate-stuttgart.de/projekte/fahrbahn/>



Digital Terrain Model for a section (cut & fill)

source: André Bormann, Yang Ji,
 TU München / ForBAU Project



Road Sections at Stations along Alignment

source: <http://de.wikipedia.org>
<http://de.wikipedia.org/wiki/Gradiente#Stra.C3.9Fentrassierung>

overlapping scope

- medium scale
 - geospatial, projected
 - surfacic & volumetric
 - alignment
 - element structure
-
- bSI (59) & OGC (211)
 - IFC and LandGML?

MAIN AREAS FOR IFC FOR INFRASTRUCTURE

Road and Rail Construction

Bridges, Tunnels

Utilities

Business Cases for IFC for Infrastructure

for Construction Companies

earth work (cut and fill)

bill of quantities

bill of material

construction scheduling (4D)

progress reporting

...

others ?

for (Governmental) Owners

project management

progress reporting

commissioning

maintenance

...

others ?

Business Case of Construction Company



Univ-Nebraska_Omaha-Mammel-Hall

Buildings



Dallas-Fort_Worth_Connector

Roads and other Infrastructure



High-Dessert-Power-Plant Victorville

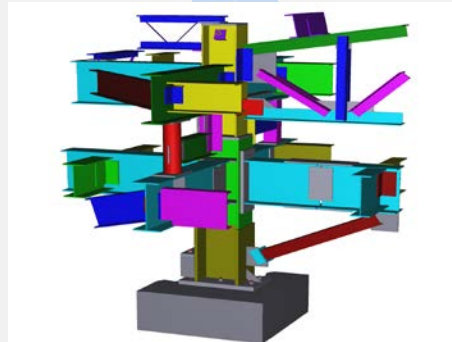
Industrial (plans, power, oil & gas)

works within many vertical sectors – but main business cases are equal bill of quantities / bill of materials for all three main verticals



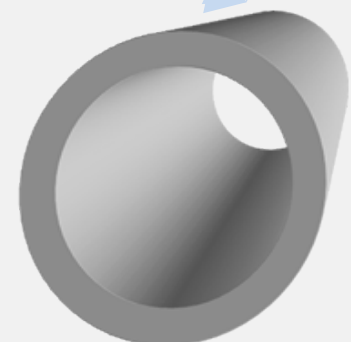
Source: Atika Betonmischer:

Concrete works



Source: AISC Steel Sculpture

Steel works



source: <http://de.wikipedia.org>
http://de.wikipedia.org/w/index.php?title=Datei:Pipe_shape.png

Pipe and Duct works

Business Target for Open Standard Solutions



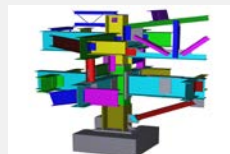
VDC Software

from Strategic Vendors : Autodesk / Bentley / Trimble / Intergraph (and others)

open standard solution to obtain correct quantities,
material information and other VDC information in a
unique way across the different
construction verticals



Concrete works



Steel works



Pipe and Duct works

ERP Solution

Strategic Implementation SAP (with others: EPM / Hard Dollar / ...)

Ordering, Purchasing, Billing, etc.

Open Standards for all Verticals



Buildings

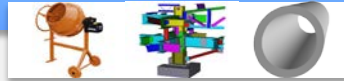


Infrastructure



Industrial

VDC Software : Autodesk / Bentley / Trimble / Intergraph (and others)



IFC



LanXML



ISO15926



obtain, visualize and interpret quantities, material and other construction data (EDM)

ERP Solution SAP

Open Standard for Infrastructure



Infrastructure

VDC Software : Autodesk / Bentley / Trimble / Intergraph (and others)



for now?

proxy IFC

right solution

IFC for Infra

obtain, visualize and interpret quantities, material and other construction data (EDM)

ERP Solution SAP

Open Standard for Infrastructure



Roads, Bridges, Tunnels, etc.

right solution

IFC for Infra

Requirements to be met

road construction

- linear spatial structure (segments, stations, ...)
- element breakdown (substructure, pavement, curb, ...)
- volumetric geometry representation
- reference to alignment and cross sections
- volume, surface, and other quantities
- detailed material information
- classification (by function, by work method)

earth work

- digital terrain model
- embankment (fill) and excavation (cut)
- geological volumes (soil layers)

► Kiewit's KieCore VDC team would be eager to collaborate with other in achieving these goals

EXISTING WORKS AND PROTOTYPES

IFC for Bridges and Tunnels

pre-integrated IFC extensions to satisfy business requirements

prototype developments to validate the approach

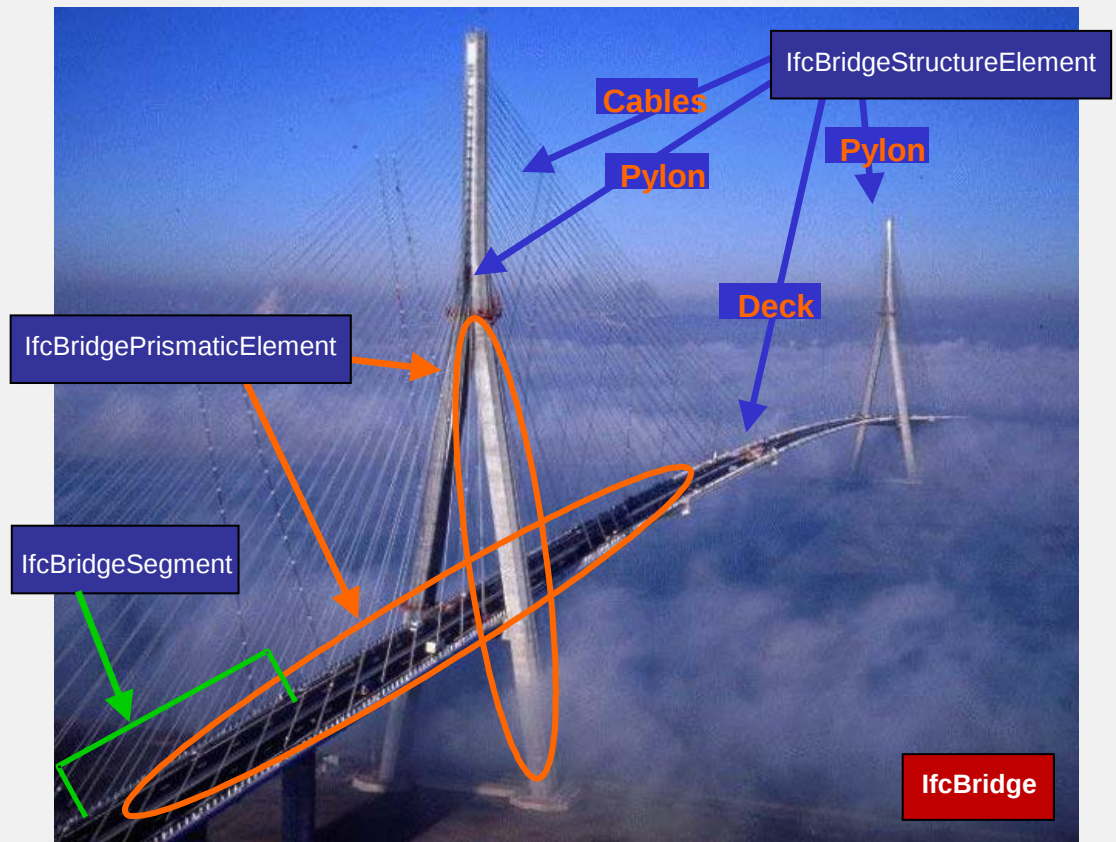
IFC for Bridges



short history of the project

- first proposal to bSI 2002 !!!
- user requirements 2003
- pre-integrated model v1 2004
- pre-integrated model v2 2006
- prototyping work 2008-10
- parametric bridge ext. 2010-11
- pre-integrated model v3 2012

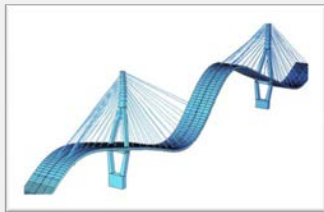
- official status with bSI in 2012
 - new proposal ???
 - re-inventing IDM / +++ ???
- how to resolve ?
 - fast-track project ?



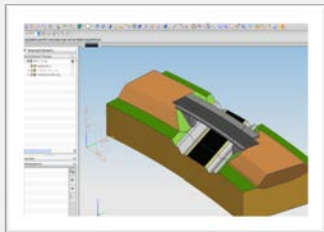
IFC for Bridge – validating prototypes



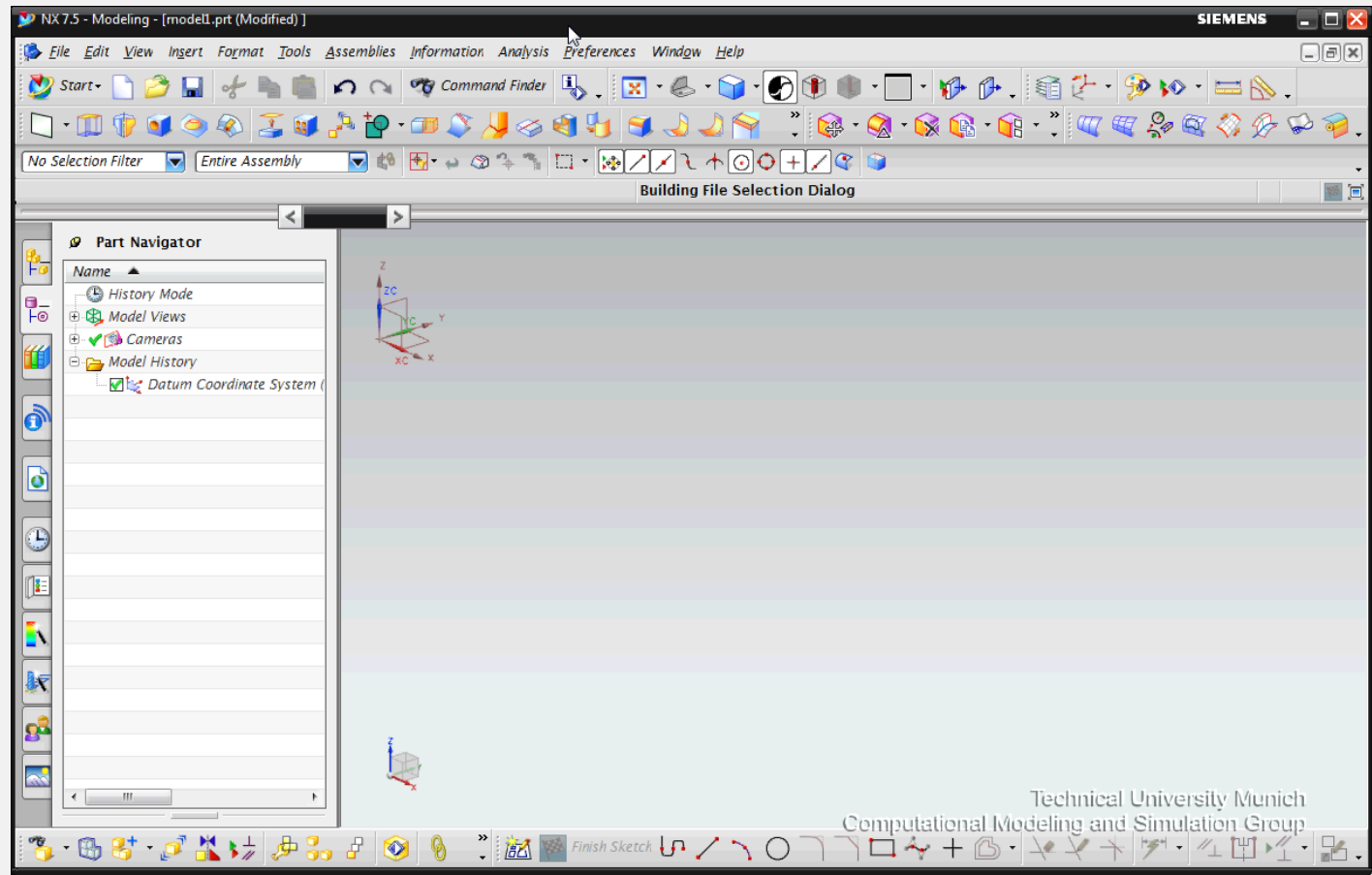
Design



Analysis



Production

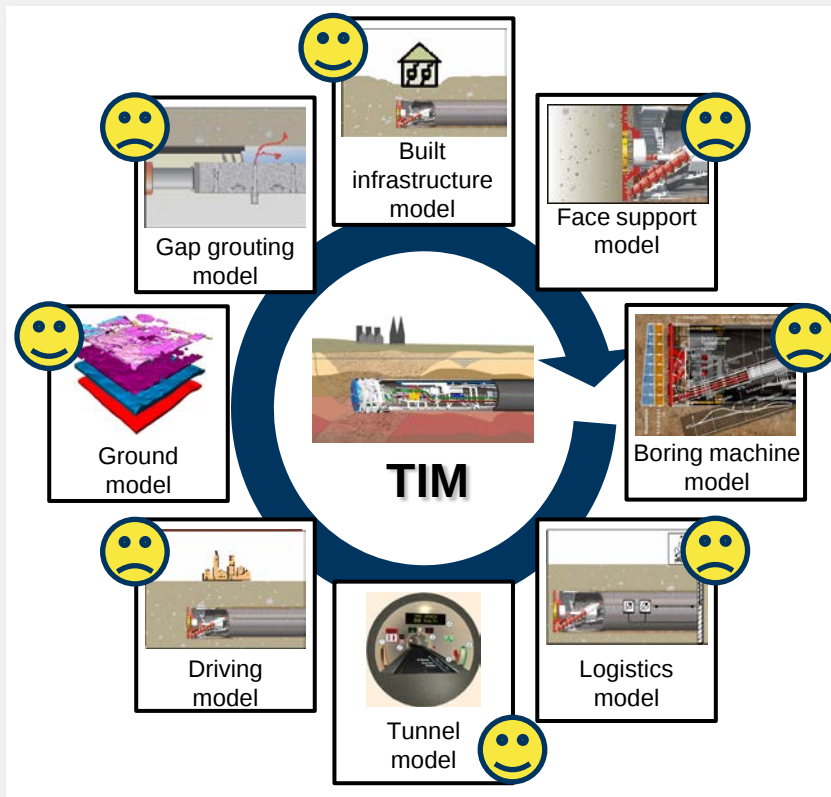


source: André Borrmann, Yang Ji „TU München / ForBAU Project/

IFC for Tunneling – Feasibility Studies

German IFC Tunneling Project

Work at University of Bochum



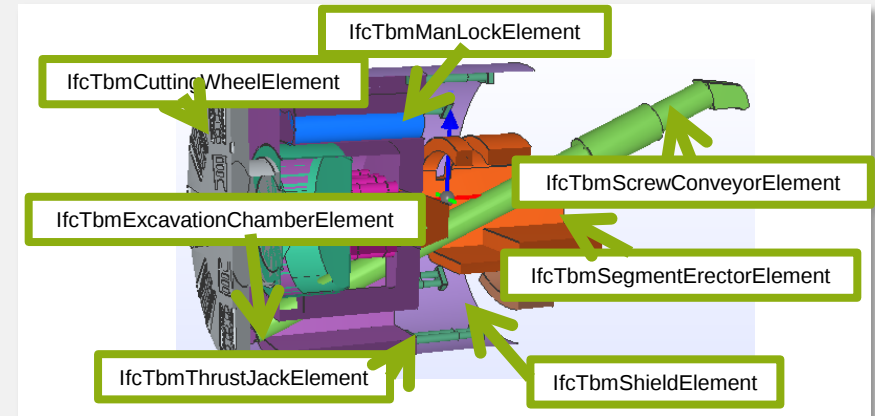
based on Japanese Shield-Tunnel Project

Work at OSAKA university

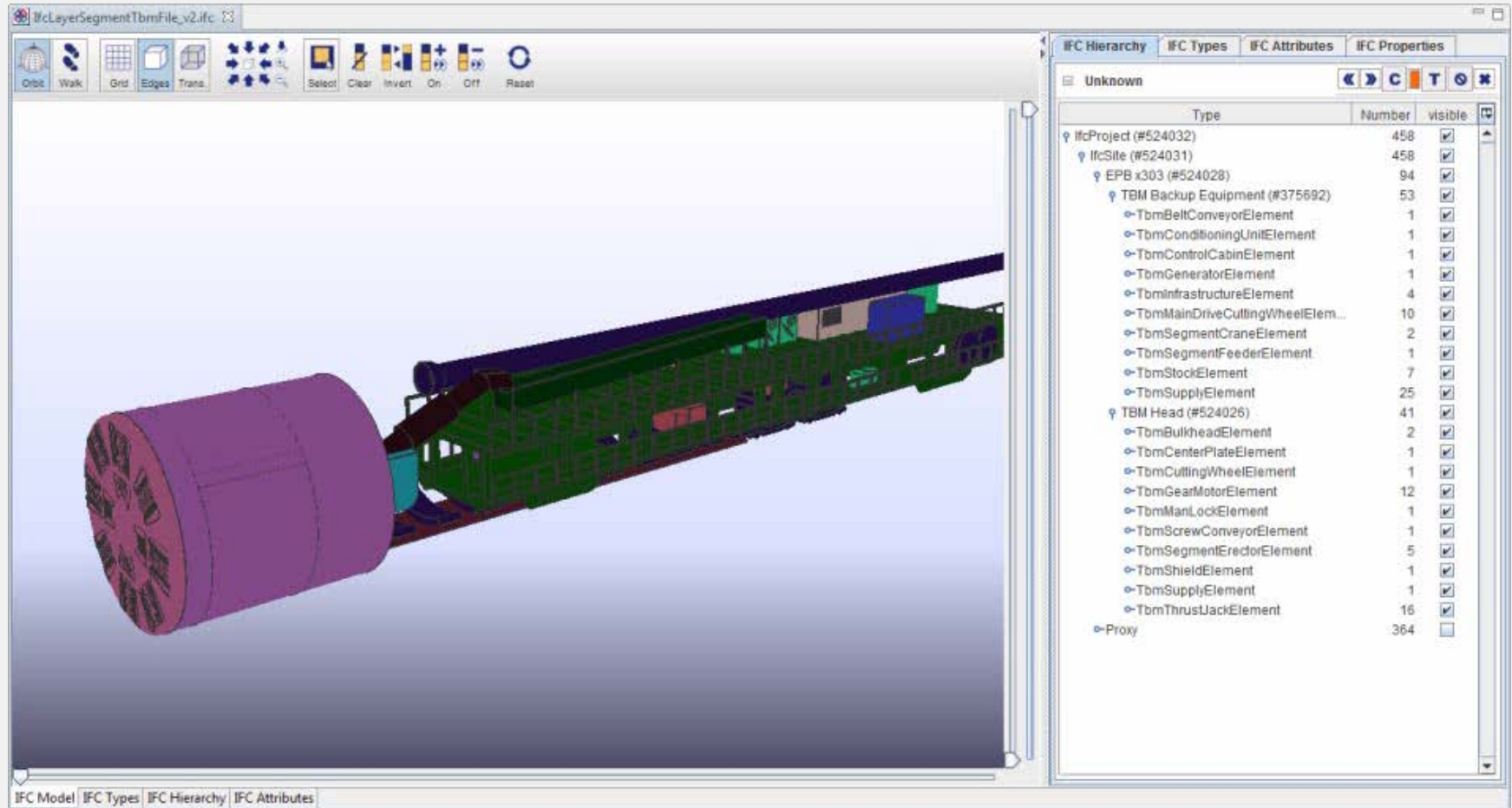
- presented separately

source:

Felix Hegemann, Karlheinz Lehner, Markus König, Ruhr-Universität Bochum



IFC for Tunneling – early prototypes



POTENTIALS FOR NEXT STEPS

make Infrastructure clear part of buildingSMART mission

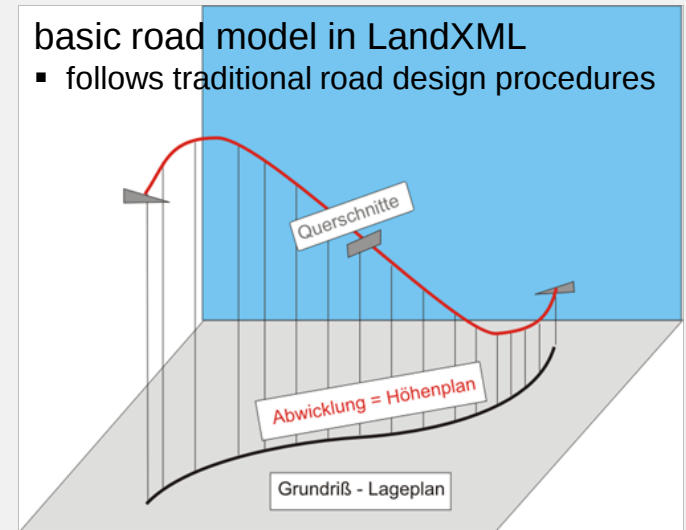
openINFRA umbrella (coordinate between verticals)

clear (also organizational) separation of BIM(only), GIS(only), and BIM&GIS

practical first IFC4 extension projects to kick-off

Handling of LandXML

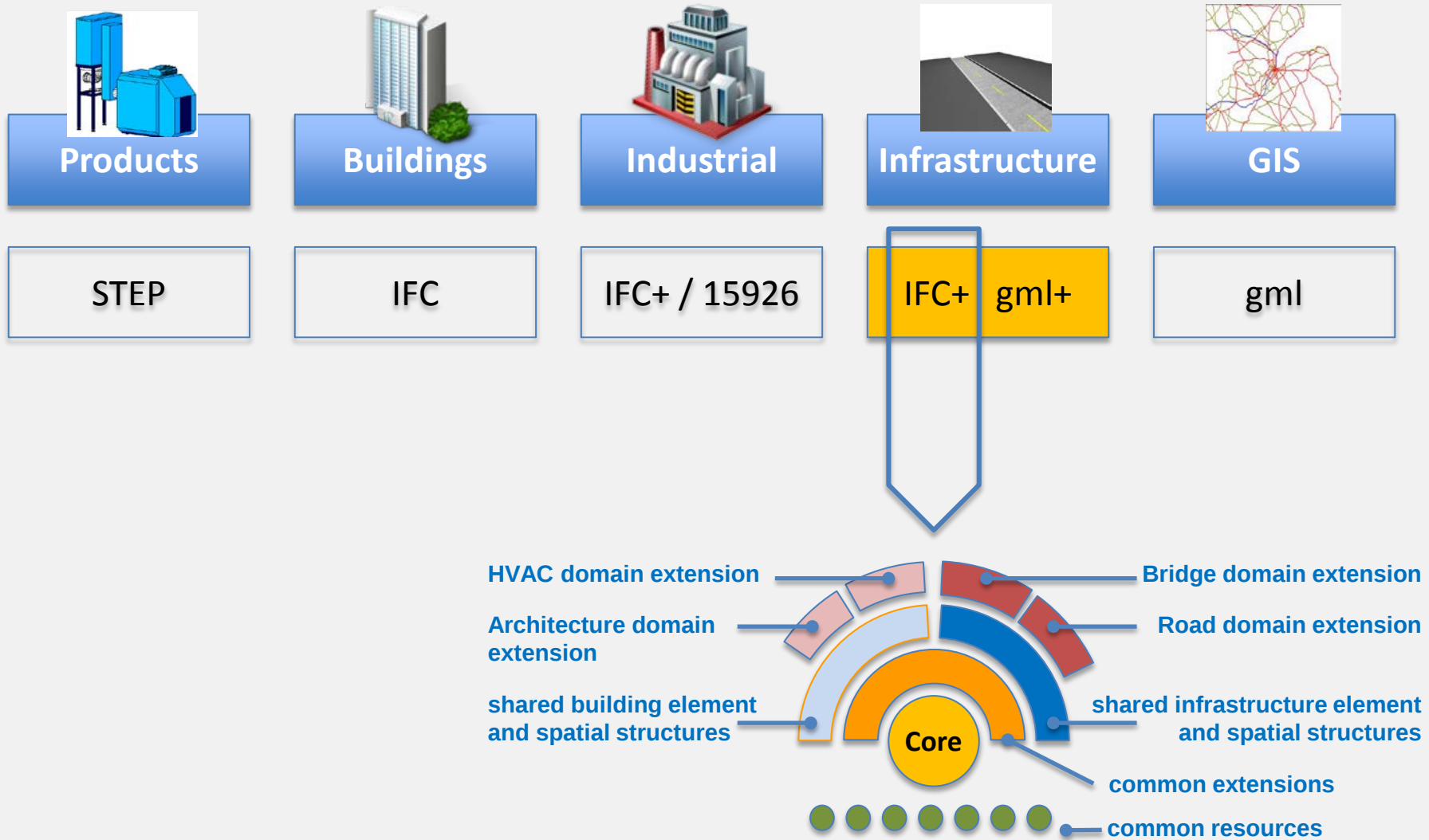
- LandXML is not an model-based road construction standard
- LandXML is a standard coming from (a) surveying and (b) road design
- LandXML has following main parts:
 - (a) digital terrain model
 - (b) road alignment curve, set of stations along the curve and high plus set of cross sections along the curve
 - (c) features (ako property set definitions)



main shortcomings for road construction use cases:

- no volumetric geometry and quantities for the road components
- no object model - no standardised way to identify parts of the road structure
- no feature catalogues defined within the LandXML standard
- many details, like meaning of road profile edges, orientation of cross sections, transition between cross sections, are not defined and left open to interpretation

IFC for Infrastructure Related to Other Standards



What to do next



"The debate has gone on long enough, now is the time for action."

"der Worte sind genug gewechselt, lasst mich nun endlich Taten sehen"

Johann Wolfgang von Goethe, Faust