IFC FOR INFRASTRUCTURE

Separation between BIM and GIS requirements
Technical Scope Definition
Proposed First Steps
Infrastructure Scope between GIS and BIM Standards – 1

- Traffic network
- Road network
- Digital Terrain Model (of area)

- small scale
- geospatial CRS
- mainly surfacic
- topological network
- surveying as source

- OGC / TC211
- gml / transXML / …

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Infrastructure Scope between GIS and BIM Standards – 2

Road Construction Sectioning

Road Construction - Bridges

- big scale
- engineering CRS
- mainly volumetric
- longitudinal structure
- element composition

Road Construction Detailing

clearly BIM scope

- open – bSI / TC59 ?
- open – IFC ?
Infrastructure Scope between GIS and BIM Standards – 3

- medium scale
- geospatial, projected
- surfacic & volumetric
- alignment
- element structure

- bSI (59) & OGC (211)
- IFC and LandGML?

Road Alignment (traditional 2D and 3D)

Digital Terrain Model for a section (cut & fill)

Road Sections at Stations along Alignment

overlapping scope
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

- Buildings
- Roads and other Infrastructure
- 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

Concrete works
Steel works
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.

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Open Standards for all Verticals

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

- IFC
- LandXML
- ISO 15926

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

ERP Solution SAP

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Open Standard for Infrastructure

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

proxy IFC for now?

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

right solution IFC for Infra

ERP Solution SAP
Open Standard for Infrastructure

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
ICF 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 ?

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IFC for Bridge – validating prototypes

Design

Analysis

Production

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

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IFC fur 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

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buildingSMART International home of openBIM
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

Quelle: Online-Kompendium Straßenentwurf
IFC for Infrastructure Related to Other Standards

Products
- STEP

Buildings
- IFC

Industrial
- IFC+ / 15926

Infrastructure
- IFC+ gml+

GIS
- gml

Core
- HVAC domain extension
- Bridge domain extension
- Architecture domain extension
- Road domain extension
- shared building element and spatial structures
- shared infrastructure element and spatial structures
- common extensions
- common resources

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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