railML and ÖBB asset-database applications
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IQSOFT ...

- Established 1999
- Staff: 35
- Independent IT Service Provider
- 150 person years project experience in railway solutions
- Areas of railway expertise
  - Asset databases
    - permanent way, track geometry, platforms, avalanche barriers, noise barriers, culverts, drainage lines ...
    - Telecom (cables, equipment, locations ...)
  - Data acquisition processes with measurement and survey equipment
  - Data analysis (Laserscan, object recognition, ......)
  - Railway geocoding
  - Reference systems
  - Line description (IM → RU)
Context – business processes with railML potential

**ÖBB ASSET-DB**

- **Track layout**
- **Switch Inspection**
- **Acceptance of tamping work**
- **Reference data tamping machine**
- **Cable Documentation**
- **Track/Measurement**
- **Track Measurement**

eg. permanent way track geometry
Context – R & D Project

- R & D Project (finished 2012)
  - Process-development
  - System-integration
  - System-evaluation
  - procurement

Track/Switch Measurement
Work-packages systemintegration

- Support system verification and testing

- Dataexchange interface LandXML
  - operational today

- Evaluation of railML
  - potential interfaces to „Track layout Software"
Evaluation of railML

- Analysis of prior work
  - railML Schema Version 2.1
  - „Verifizierung von railML-Daten mithilfe von Schematron“ (Susanne Wunsch 2010)
  - railML-Wiki

- Definition of research topics

railML specific topics

- Can we produce a valid railML document from real world geometry data?

- Required extensions of the existing railML standard to exchange real world track geometry layout information?

- Which extensions have to be applied to the structure of the existing asset database?

- Necessary adaptations of processes related to the existing asset database?
railML related questions and answers

Q: does railML provide a potential base for exchange of infrastructure data?
A: basically yes

Q: has railML to be extended for the exchange of trackgeometry data
A: yes

Q: may railML schema extensions be applied using xs:any?
A: no

Q: should ÖBB-specific railML schema extensions be applied
A: at first some fundamental issues have to be addressed
Some combinations of tracks and switches cannot be modelled

see also:
http://www.railml.org/forum/ro/?group=1&offset=0&thread=56&id=296
discussion of workarounds using „fictive“ elements
Assumptions versus real world

railML assumption: the processed dataset is complete and consistent

real world: datasets are portions of the full dataset

Infrastructure processes DO NOT operate on the complete network
Assumptions versus real world

railML assumption: positioning is straightforward
real world: positioning is full of hidden pitfalls and misunderstandings

- 44 different registered line designations
- 4 different registered track designations
- Mile post has 3 different accuracy levels
- Mile post may have 2 different stations within one accuracy level (station change)
- Coordinates:
  - at least six different application areas
  - accuracy ranging from meter to millimeter
Assumptions versus real world

railML assumption: tracks and switches come as twins
real world: there is no such thing in rail infrastructure 😊

Tamping machines:
switches are an obstacle

Telecom cables:
they do not take notice of a switch

Switch inspection:
is already done in the factory before delivery
Assumptions versus real world

railML assumption: data basis is complete and without errors

real world: there are missing parts and there are wrong parts
Assumptions versus real world

railML assumption: structural dependence between asset and track

real world: many assets exist without any track information

• Lifecycle considerations
  • Asset basically possesses a relation to a track, but not in all phases of the lifecycle

• No structural dependence at all

• Structural dependence to a line
  • asset relates to ONE line but to one or MORE tracks
Assets without relation to tracks - examples

Bridge is in the early planning stage

Track data will be available in 2 months

Track was abandoned 20 years ago

Bridge still has to be maintained
Assets without relation to tracks - examples

Switch is measured in the factory

Measurement results are documented in asset database without related tracks
Assets with relation to two or more tracks - examples

Railway crossing intersecting one street and two tracks

Bridge with three tracks
Assets without any structural dependence to tracks

Noise barriers

Avalanche barriers

Telecommunication equipment
Conclusions 2013

- railML is still not ready for our usecases

- Further development of railML is definitely worth watching

- Minor changes (version 2.3 ??) may allow railML based interface definitions for track geometry

- Majority of considered usecases require a major, even radical redesign (version 3.0 ??)
Development of railML 3.0 – some deliberations

What is covered?

Define the context!