Using railML® for Exchanging Timetable Data
Experiences from the PAIP Project

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Paris, May 3, 2017
Architecture Principles at SBB.

- Reuse, Rent, Buy or Make for new applications
- We share and use data across the entire SBB enterprise
- «Rent» or «Buy» is to be preferred in comparison to in-house/proprietary development
- Requirements on integration are increasing
Defined Goal of SBB Infrastructure’s IT.

- SBB IT aims at actively driving standardisation of its application integration.
- railML® / RailTopoModel is considered of having the potential – both from a business as well as from an IT perspective – to become an essential format for the standardised exchange of infrastructure data.
- In 2017 SBB Infrastructure’s IT is willing to demonstrate the potential and benefit of railML® / RailTopoModel, with the help of concrete projects and proof of concepts.

Jürg Balsiger, Head of IT Solution Center Infrastructure:

« In 2017 we want to detect the actual potential of railML® / RailTopoModel for SBB. »
Current Use of railML® (1/2).
Current Use of railML® (2/2).

- Rail Control System (RCS) is using railML® in order to archive production data.
- In NeTS (Net-wide Slot System) railML® is applied for the export of single slots with a minimum number of attributes being used by tracks.

With the Project PAIP a new interface is to be implemented using railML® 2.3 / 2.4.
Project «PAIP».

- **Process Alignment Interval Planning**
- Interval = restriction of capacity due to construction activities (suspension, speed restriction section)
- Support and improve planning process of closures in infrastructure
- Integration of a “commercial off-the-shelf” software in the field of capacity planning
- Data exchange between proprietary SBB applications and external (third-party) software
- Exchange of more than 200’000 slots per year
- Modernisation of the existing railML® 1.0-interface
Project «PAIP».

- railML® covers about 60-80% of our requirements
- Remaining coverage is ensured by proper extensions
- Major challenge consists the semantic significance of attributes
- Early contact with the railML® timetable community

**Positive experience:**
Extension can be proposed and incorporated in a relatively straightforward way. Assuming the approval of the railML® community the standard can be extended within few months.
Project «PAIP» – Next Steps.

- Pursue triggered changes of railML® 2.4
- Spring 2017: Start implementation of new interface
- Certification of the application NeTS
- Continuous participation in the timetable community – even after completion of the project
Outlook regarding railML®.

- Potential format for data exchange within SmartRail 4.0
- Potential for use within asset management with version 3 and consequently at the interface between asset and traffic management
- With RailTopoModel there is a increasingly valid conceptual fundament (driven by UIC)
- Currently, there is an IT study under way within SBB regarding a semi-automated maintenance of topology data for Viriato with RailTopoModel being a candidate for the underlying topological model
Consequences Regarding RailTopoModel.

- Consider and incorporate necessary extensions in the conceptual model (RTM) with the goal of accomplishing a homogenous time management in the areas of timetable and infrastructure → One (and only one) time dimension approach!

- Coordination and collaboration between RTM Expert Group and railML® timetable community needs to be intensified (mutual information about and review of current work).
Any questions?

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Steps towards implementing RailTopoModel in ADIF
In 2005 there was a change in the Spanish Railway industry: RENFE (1941) and GIF (1998) splitted into:

- **RENFE Operator**: Owner of trains and responsible for its circulation, working in competition with other railway companies.
- **ADIF**: Owner of the railway infrastructures (tracks, stations, freight terminals) and responsible for its maintenance, the traffic management, the allocation of the capacity of railway operators...
UNDERSTANDING IT SYSTEMS IN IM’S
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Railnet Europe – CIP Platform

**TASKS:**

- Analize the proposed model
- Mapping internal entities to the proposed model (equivalences)
- Develop the software to ensure the maintenance of the output.
- Mantain any changes in Schema Definition (both in source or destiny)
1 WHAT IS THE GOAL?
HOW IS OUR INTERNAL PROCESS?

Traffic Management → Common Segmentation ADIF → WEB IDEADIF → OGC SERVICES

Maintenance Systems Corporate Systems → WEB IDEADIF → SHAPEFILES

IDEADIF

SECTION OF LINES

NODES

KM POINTS (Dynamic Segmentation)
Generating the railML file (MACRO)
Publishing the railml file in http://ideadif.adif.es
Next steps in ADIF...

- Obtain the railml 3 certification.
- Publish railml file with infrastructure information of the network.
- Broaden the output file with more entities.
  - Covering meso and micro levels.
  - Not only infrastructure subschema.
- Support new UIC projects (RTM-BIM, RTM-GIS, RTM-SIM)
CONCLUSIONS...
STRATEGY AND TRANSFORMATION
Event:
Topic: RTM
Implementation: An IT solution provider’s perspective
Date: 19 April 2016
Introduction

GiSmartware:
- French company
- 25 year old, 40 employees
- Software editor

Netgeo platform:
- SOA
- GIS for territorial network managers:
  - Telecom
  - Water
  - Sanitation
  - Power distribution
  - Railway

Netgeo platform:
- Map
- UI
- Schematics
- Application server
  - Auth.
  - Data access
  - Processing
- Persistance
  - Oracle
  - SQL Server
  - PostgreSQL
Netgeo Rail
Built on solid basis

- **RTM: foundation**
  - Strong topological model
  - Standardised by the UIC
  - Well-documented

- **SNCF Réseau: experience**
  - Deep industrial knowledge
  - RTM-compatible Ariane model
  - SOA Repository Gaia

- **GiSmartware: architecture**
  - 25-year experience in software development
  - Robust Netgeo platform
  - Industrialisation know-how
Advantages of RailTopoModel
1/3 – An industrial standard

- **Securing GiSmartware’s investment in Netgeo Rail:**
  - A software designed with the business knowledge of SNCF Réseau, built to fit new customers
  - Netgeo Rail is compatible with any RTM-compliant model

- **Securing IM’s investment in information systems:**
  - RTM reduces the cost of entry for software vendors
  - RTM roadmap secures evolutions
  - This means more choice and better software for IM
Advantages of RailTopoModel

2/3 – An object model

- **Object model:**
  - Sound basis for any software
  - Easy to extend to cater to end-customer’s specificities
  - Guarantee for data quality
Advantages of RailTopoModel

3/3 – Well documented

- A UML model, as an XMI file:
  - Enables efficient tooling (code or UI generation)
  - Guarantees data well-formedness, throughout the system

- An unambiguous serialisation (RailML, for data exchange)
RailTopoModel
Our wishlist

➤ A UML model, as an XMI file?
  ▪ IRS 30100 available as a PDF file, the XMI file is not so readily accessible
  ▪ XMI enables powerful tooling:
    ✓ No place for such tools to be shared (a UIC github account?)
    ✓ Software vendors are ready

➤ Leveraging the knowledge of the community:
  ▪ The RailTopoModel forum is underused:
    Used more for troubleshooting than sharing best practices
Netgeo Rail

Cartographic view: macro or micro level
Netgeo Rail
Description of all your infrastructure
Netgeo Rail

Routes

Event: UIC RTM Conference
Topic: RTM: An IT solution provider’s perspective
Date: 09/05/2017
Netgeo Rail
Do you want to know more?

- Fabrice Simonin
  - GiSmartware R&D manager
  - Netgeo Rail product manager

Contact me:
- fsimonin@gismartware.com
RailTopoModel for route protection and simulation

Exploration work, 4th of may 2017
Why we use RailTopoModel

• Apply “model-driven” methodologies for railway domain
  - Infrastructure
  - Signalling
  - Ertms

• Use of computerized tools
  - Simulation
  - Formal methods
Early Works

1. Focus on modelling of railway infrastructure
   - Infrastructure
   - Route
2. To perform analysis
   - Route calculation
   - Train/route protection
3. Using a prototype RTM implementation
Modelling with RailTopoModel

• How to model Infrastructure?
  - Low level modelling
  - Rules to navigate object smoothly

• How to represent RailTopoModel model?
  - Schematic
  - Graph view
Modelling with RailTopoModel

• How to model Infrastructure to be usable with analysis tools?
  – Level of details / Scaling
  – Navigability
Analysis based on RailTopoModel Model

• Use route model to get
  - Points to control
  - Balises messages to set
RTM implementation prototype

- Based on Python and SQLALchemy
  - Python code easy to extend
  - SQL DB is standard for data hosting
  - PyRTM module to import
  - Still Prototype!
Working On

3. Link to ERSA ERTMS simulator
   - Link ERTMS object to RTM
   - Perform analysis on ERTMS infrastructure

4. Linked with Formal methods tools
   - B method for control command
   - Petri Net model for analysis
Thanks you for your attention!

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