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Digital Modelling Standardisation & Digital Continuity in the Railway Sector

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Railway sector requires leverages for performance

Railway system design, construction and operation involve multiple technologies, actors, processes... working together in a continuous collaborative process for evolution.

Customer requirements, evolution of technology, and search for performance are leading to a stronger integration of the Global Railway System.

E.g., future Autonomous Train is an integrated solution involving all subsystems: Train, Infrastructure, and Traffic Management.

Going for global performance requires to design, simulate, implement and operate the Railway System as a continuous whole.
Railway System is complex …

... behaves as a whole

... with multiple sub-systems and dimensions,

... leading to several Projects for standardization

But ... all projects for standardization describe the same System
Railway sector organizes Consistency to Leverage digital continuity

UIC leads the OntoRail project for a Common Digital Dictionary, involving all current projects for digital standardization and their stakeholders.

Unified Rail Digital Dictionary

Autonomous Standardization Bodies

Business processes involving different software

Unicity

Autonomy

Continuity

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Next step for digital continuity: Organize capability to combine standards

A business project willing to take benefit from standard models will have to combine multiple ‘parts’ from different standard models.

Example of a project requiring objects and dimensions managed by multiple standards

Could Ontologies be the solution?
Scope

Who does it?
- Content Consumers
- Content Creators

What to do?
- Provision of primary data
- Creating semantic data presentation structures in the Wiki
- Import RDF data into Wiki
- Automatic application of the data presentation structures on the imported data
- Presentation Data
- Identification of the data of interest in different format
- Collecting these data in .txt files structured as primary semantic data
- Transforming data from one format into RDF format (RDF or Turtle)

How to do it?
- RDF 123
- MediaWiki
- Semantic MediaWiki
- Semantic MediaWiki :: Extensions

The need for access and provide to organized and interconnected data
Solution Architecture

- Operating System: CENTOS 7.6 kvm
- ClamAV Daemon: ClamAV Virus Scanner
- PHP-FPM service for cPanel Daemons (the application-level PHP version manager)
- cPanel DNS Admin Cache
- Exim Mail Server
  - IMAP Server
  - Mailman
- FTP Server
- Apache Web Server
- MySQL Server
Signalling system

field_A EULYNX 1.30
field_B English

A signalling system performs three basic functions:
- train detection (localization);
- train spacing, e.g. by means of a block system;
- route protection (interlocking).

A signalling system uses signals to tell the driver what he should not do.
Element of integration
From Excel sheets to Ontologies

- Test: transformation
  - Input: CSV file (Package, Objects, Attributes / Properties)
  - Output: Ontology (output: RDF file)
- The semantics currently exposed by the Excel files are typically
  - « Package contains Object »;
  - « Object has Attribute(s) »;
  - « Attribute may contain Attributes »
    (analogous to a composite pattern in OOP)
Element of technique

Data Processing

Excel sheet

Using RDF123 software

Mapping graph

RDF output file (here: N3 / Turtle format)
Element of technique

Media Wiki Special pages for Semantic Tools

Page tools
- Change content model of a page
- Compare pages
- Export pages
- Import pages
- Mass delete by DPL query
- Merge page histories
- View deleted pages
- What links here

Page Forms
- Create a category
- Create a class
- Create a form
- Create a property
- Create a template
- Edit multiple pages
- Run query
- Start of form

RDFIO
- RDF Import
- RDFIO Admin Page
- SPARQL Endpoint
- SPARQL Import

Semantic MediaWiki
- Administrative and maintenance functions
- Browse wiki
- Export pages to RDF
- Processing error list
- Property label similarity report
- Search by property
- Semantic MediaWiki Graph
- Semantic search
Element of technique

RDFIO – Import function
Element of technique

All pages, imported from RDF
## Element of technique

**SMW generated page by imported from RDF**

### Alarm information

https://ontorai.org/ontorai/index.php#Alarm_information# IFC_2019 Track_Circuit -- sig the information for failure description None Alarm information 报警信息 0.1

**Category:** Property

<table>
<thead>
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<th>Facts</th>
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<tbody>
<tr>
<td>... more about &quot;Alarm information&quot;</td>
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<table>
<thead>
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<th>RDF feed ▼</th>
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<tr>
<td>HasVersion</td>
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</tbody>
</table>

**Equivalent URI**

https://ontorai.org/ontorai/index.php#Alarm_information# ✓

This page was last edited on 10 April 2019, at 17:13.

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Element of technique

SMW page graph by imported from RDF
What have we achieved?

- A methodology has been created to transform the data from the CSV format into the RDF
- The instruments with which to do this have been identified
- The OntoRail server was created based on Mediawiki + Semantic Media WIKI
- The following extensions have been integrated into OntoRail server:
  - RDFIO
  - Semantic MediaWiki Graph
  - Page Forms
  - NukeDPL
  - DynamicPageList
  - Confirm User Accounts
What do we have to solve?

• Update RDFIO extension to be able to:
  • generate attributes with multiple values
  • apply predefined templates over imported data

• Possibility to make a link between generated pages and Graph (based on Semantic MediaWiki Graph)

• Creation of a Rest API for data import from RDF files (in rdf or ttl format)

• Add modern Skin to Ontorail site (eg. Integration of Dokit platform)

• Identification and integration of new extensions useful for the Ontorail project
What do we have to solve? (Big Thanks Lex 😊)

- Update RDFIO extension to be able to generate attributes with multiple values
What do we have to solve?

- Update RDFIO extension to be able to apply predefined templates over imported data
Thank you for attention

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Thank you for your kind attention.