Geodata Infrastructure for the Management of Railway Assets-Related Research Data

Storage and Publication of Infrastructure and Sensor Data in Railway Domain

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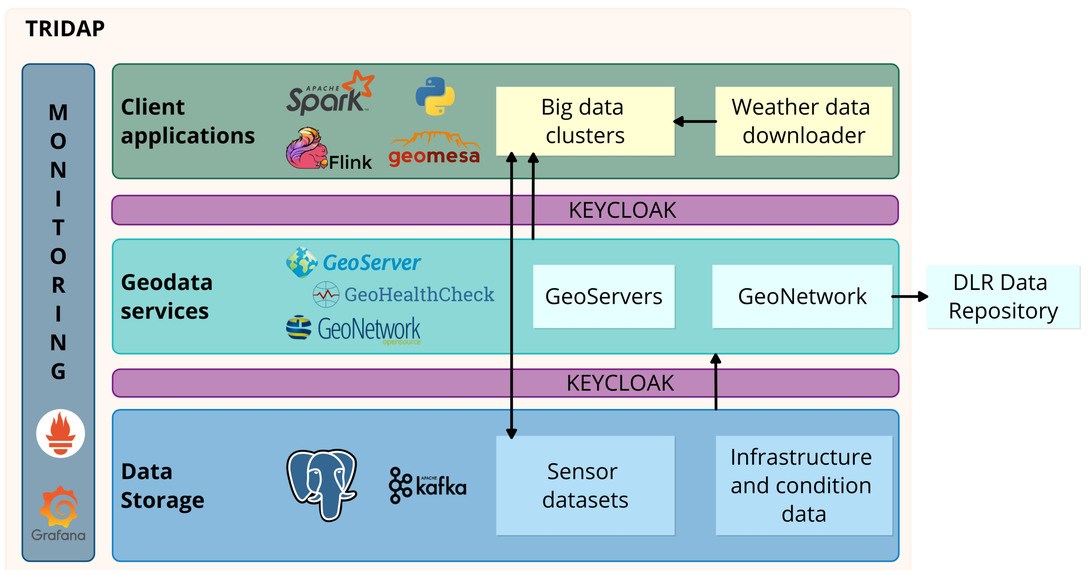
Summary

- DLR Institute of Transportation Systems is currently developing a platform called „Transportation Infrastructure Data Platform“ (TRIDAP).
- Goal: Management of datasets generated in the research department in a FAIR-compliant way
- Purpose: Storage, analysis and sharing of information on railway assets along with their condition, as well as large amount of measurement datasets collected from several sensors mounted on multiple field units.
- Documentation of the datasets to make them Findable, Accessible, Interoperable and Reusable (FAIR).
- The datasets are served to the clients in standardised data formats through standardised interfaces provided by the GeoServer.
- Software stack: PostgreSQL database, Keycloak, Apache Kafka, Apache Flink, Apache Spark, GeoServer, GeoNetwork, GeoHealthCheck, GeoMesa, Prometheus and Grafana.

Architecture



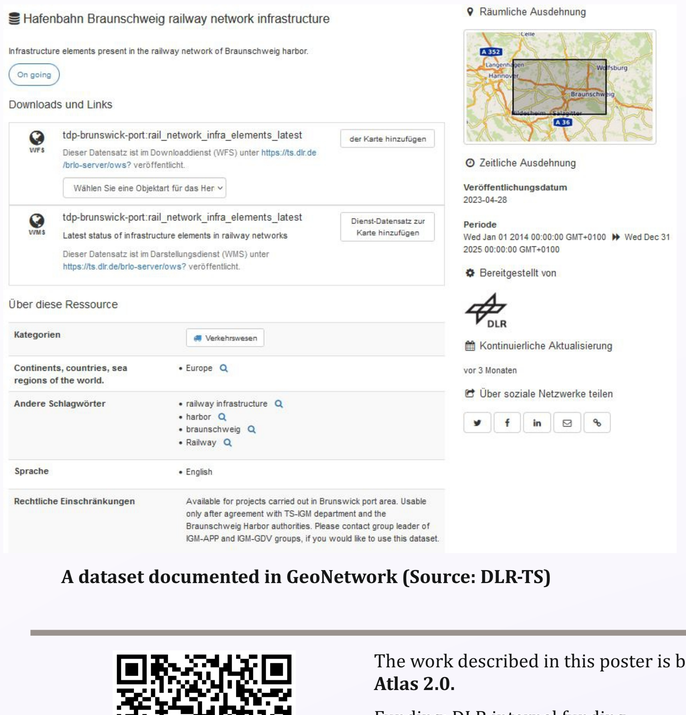
Architecture of TRIDAP (Source: DLR-TS)

Features

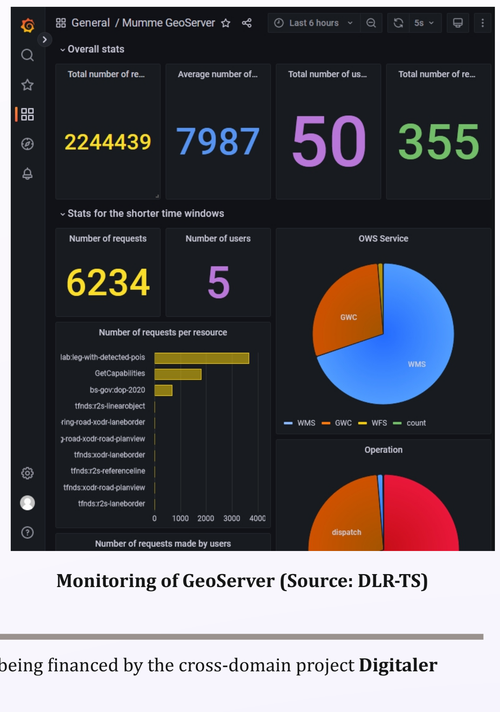
- Storage of georeferenced railway infrastructure data in a relational database (PostgreSQL)
- Storage of multi-sensor measurement data gathered from multiple field units and their metadata (HDF5 format)
- Provision of data through standardized interfaces offered by the GeoServer.
- Documentation of metadata in GeoNetwork
- Big data cluster for data processing

Currently under development:

- Extension of database to support the storage of railway condition data
- Validation of selected datasets
- Experiments with SensorML to store additional metadata on sensor configuration
- Python library to download and fuse weather data from multiple sources
- Setup of monitoring Framework



A dataset documented in GeoNetwork (Source: DLR-TS)



Monitoring of GeoServer (Source: DLR-TS)

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Project volume: 6.6 Million Euros

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Datasets

- Railway topology - nodes and edges
- Railway infrastructure - tracks, switches, bridges, railway crossings
- Degradation of tracks and switches
- Problems identified during manual verification processes
- Continuous collection of multi-sensor measurement data from multiple units in the field for more than five years
- Global Navigation Satellite System (GNSS) receivers, inertial measurement units (IMU), accelerometers, weather sensors, cameras, barometers, ammeters, voltmeters, laser scanner and odometer.
- Total Size: 60 TB

RailDriVE (Source: DLR-TS)

Locomotive at the harbor in Braunschweig (Source: DLR-TS)

Local Dynamic Map

- The Local Dynamic Map (LDM) provides data through virtual interfaces and user interfaces.
- Data is inserted on independent viewing levels and can be accessed via established standards (e.g. Fiware, OGC).
- Provision of basic services within the service layer
  - LDM as a database and data hub for geodata with static and dynamic layers
  - Merging of the datasets using a multilayer approach
  - Use of standardized interfaces
  - Provision as API as well as WebApp/Frontend

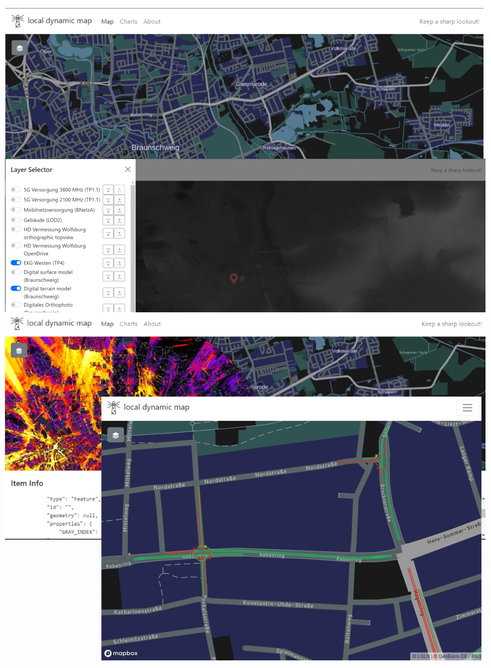
Dynamic Data

Quasi-Dynamic Data

Quasi-Static Data

Static Data

Local Dynamic Map Layer (Source: DLR-TS)



Local Dynamic Map Interface with provided layers (Source: DLR-TS)

FAIRness of TRIDAP Datasets

Based on FAIR-Aware Questionnaire [5]

	Findable	Accessible	Interoperable	Reusable
Supported, In Progress	Provision of discovery metadata	Controlled access to datasets Existence of metadata after the deletion of original dataset		Use of community-endorsed standards Open file formats Digital preservation
Planned	Datasets are assigned a PID Provision of human and machine-readable metadata	Provision of license information	Use of controlled vocabularies	Storage of provenance information Professional data curation

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