IQ SOFT

CONVERGENCE
OLICIES PRACTICES PROCESSES
UBLIC PRIVATE PARTNERSHIP

Data Management

Integrative End-To-End Geodata Collection: From Sensor to GIS

Dr. Rinaldo Wurglitsch
Solution Development Manger

INSPIRE Infrastructure for Spatial Information in Europe

GEOSPATIAL WORLD FORUM

Austrian Federal Railways

- The Austrian Federal Railways (de: Österreichische Bundesbahnen, ÖBB) is the national railway system of Austria
- The ÖBB group is owned entirely by the Republic of Austria and is divided into several separate businesses that manage the infrastructure and operate passenger and freight services

Austrian Federal Railways - Statistics

- carried 464 million passengers
- ~ 5,700 km (~ 3,500 route miles)
- **10,780 km** of track
- 1,230 locomotives
- 3,136 passenger vehicles
- employed 42,893

ÖBB Infrastructure Corp.

- employed 17,612 staff

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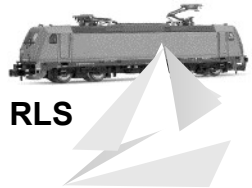
Source: ÖBB Annual Report

Project Vision



from

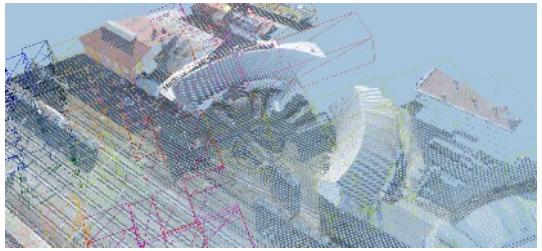
LiDAR Mission

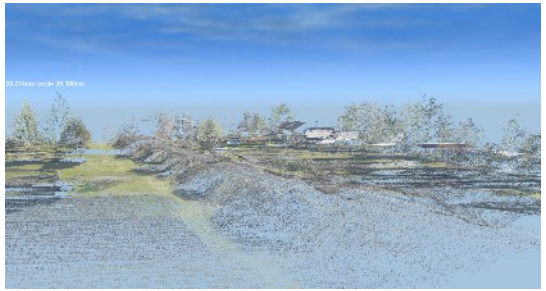
(Light Detection And Ranging)

to

Linear Asset Management

End-To-End
LiDAR Data Processing
for Linear Assets





Challenges

- big data
  - huge heterogenous data collections
  - file system storage
  - no spatial access
- mission management
  - quality assurance
  - historiography
- minimize acquisition expenses
  - automation of processing steps
  - avoidance of multiple surveys

ALS
Airborne
Laser-
Scanning

RLS Railborne Laserscanning

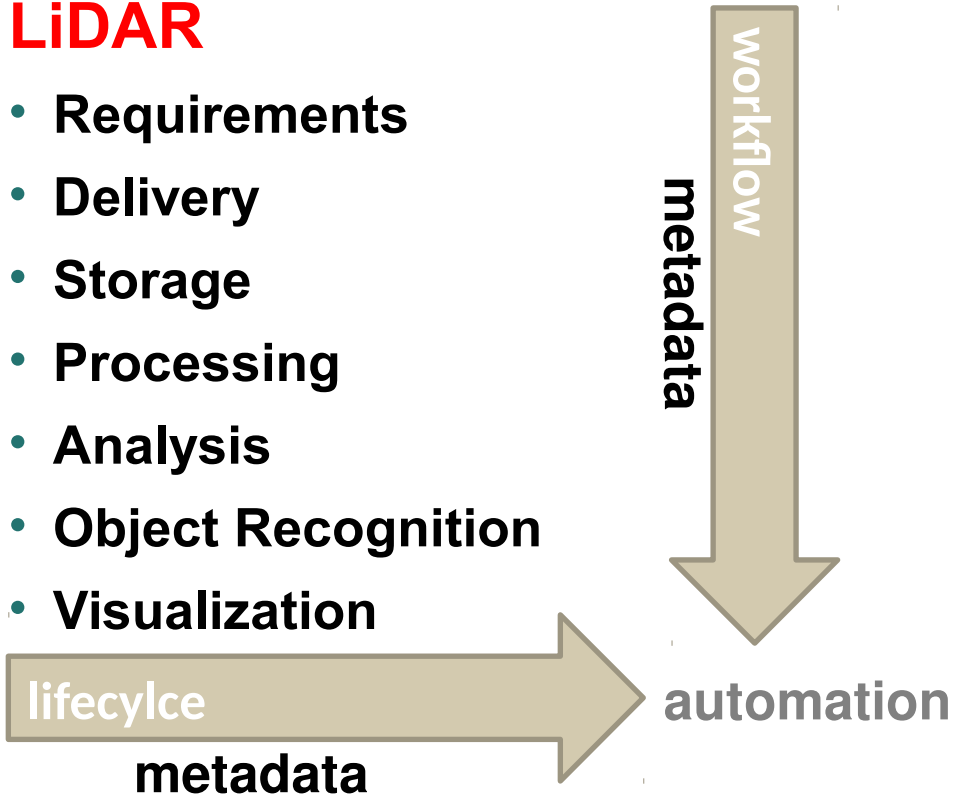
MLS

- TLS Terrestrial Laser Scanning

Increase Efficiency & Transparency

LiDAR

- Requirements
- Delivery
- Storage
- Processing
- Analysis
- Object Recognition
- Visualization



Making Available ...

data acquisition

- Digital Aerial Images
- Digital Orthophotos
- Pointclouds
- Trajectories
- Digital Terrain Models
- Mission Report
- ...

geostore

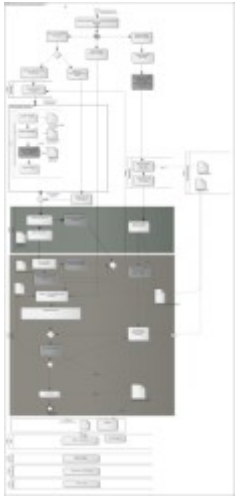
Automatic Processing

- CSW catalog
- Object Recognition
- Pointcloud Extraction
- ...

results

- mission data
- GIS objects
- 3D visualization

Process Flow

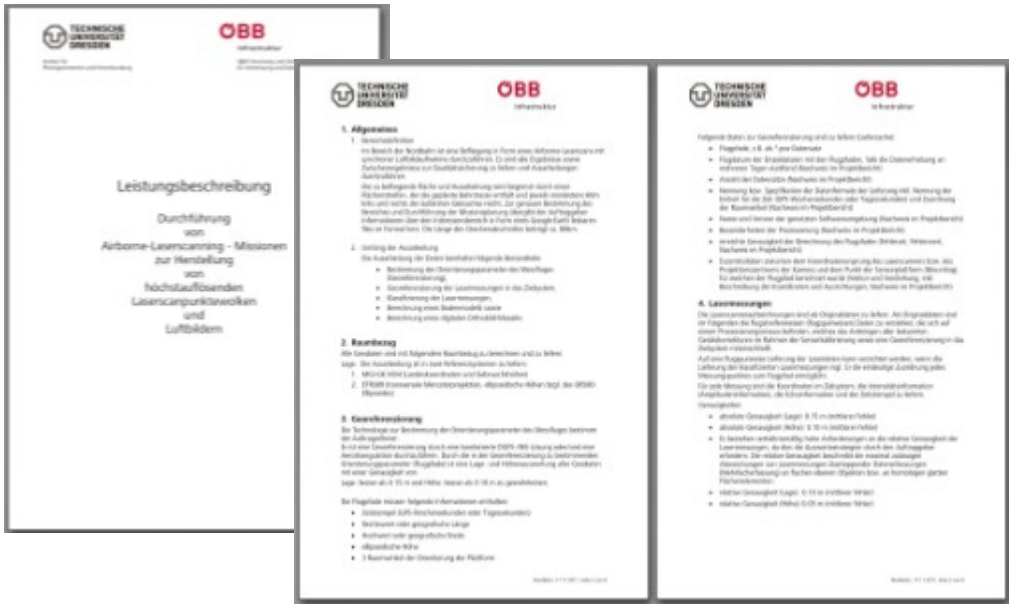


- user request
- process flow
- handover results

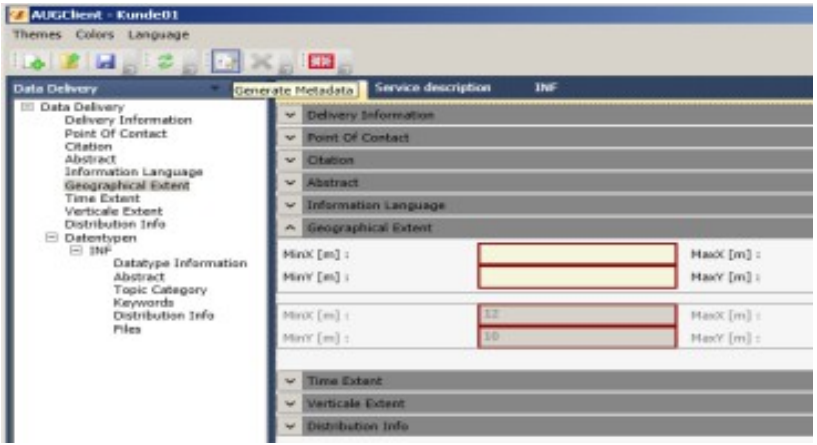
requirements definition → data collection → data storage & preparation → result calculation → data delivery

Quality Management
driven by metadata

Requirements Definition



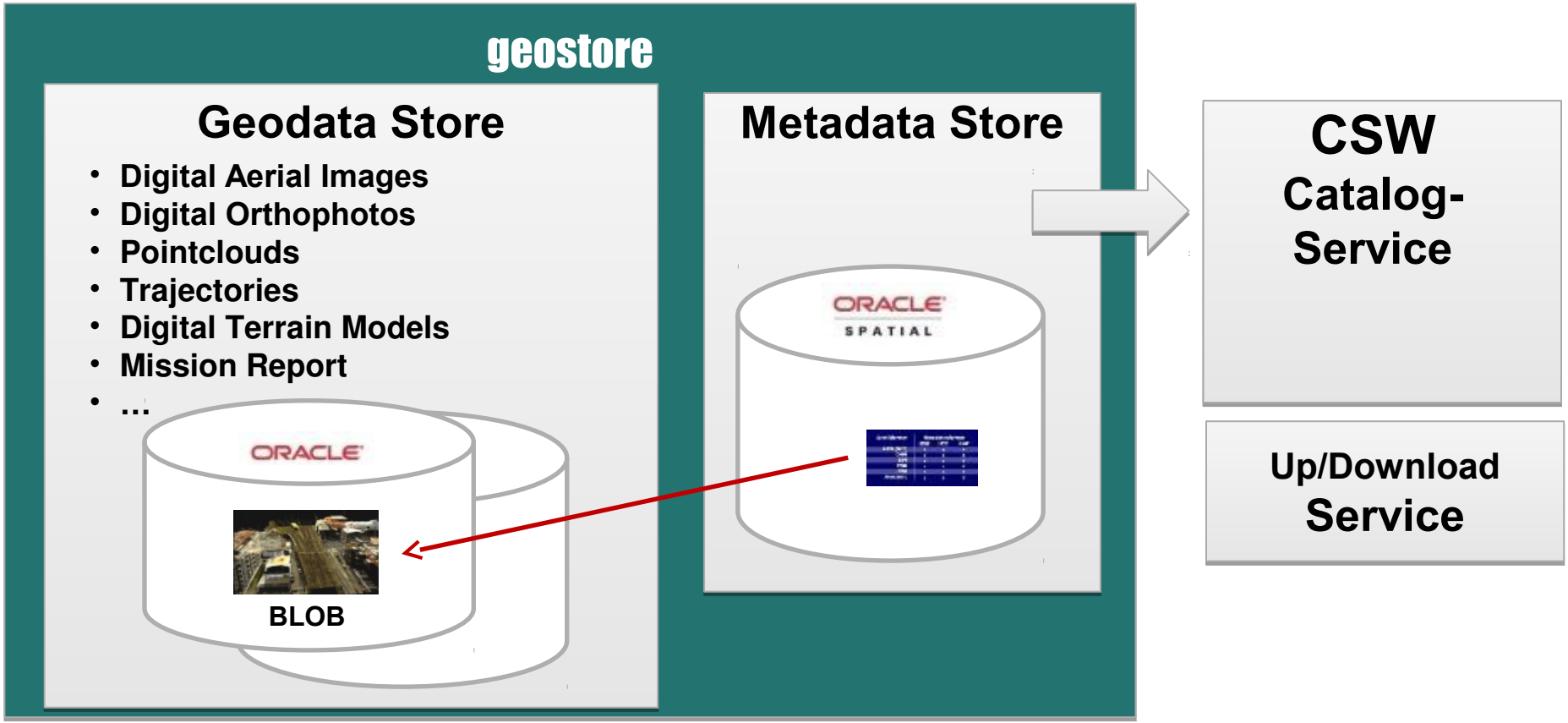
Requirements Definition Template



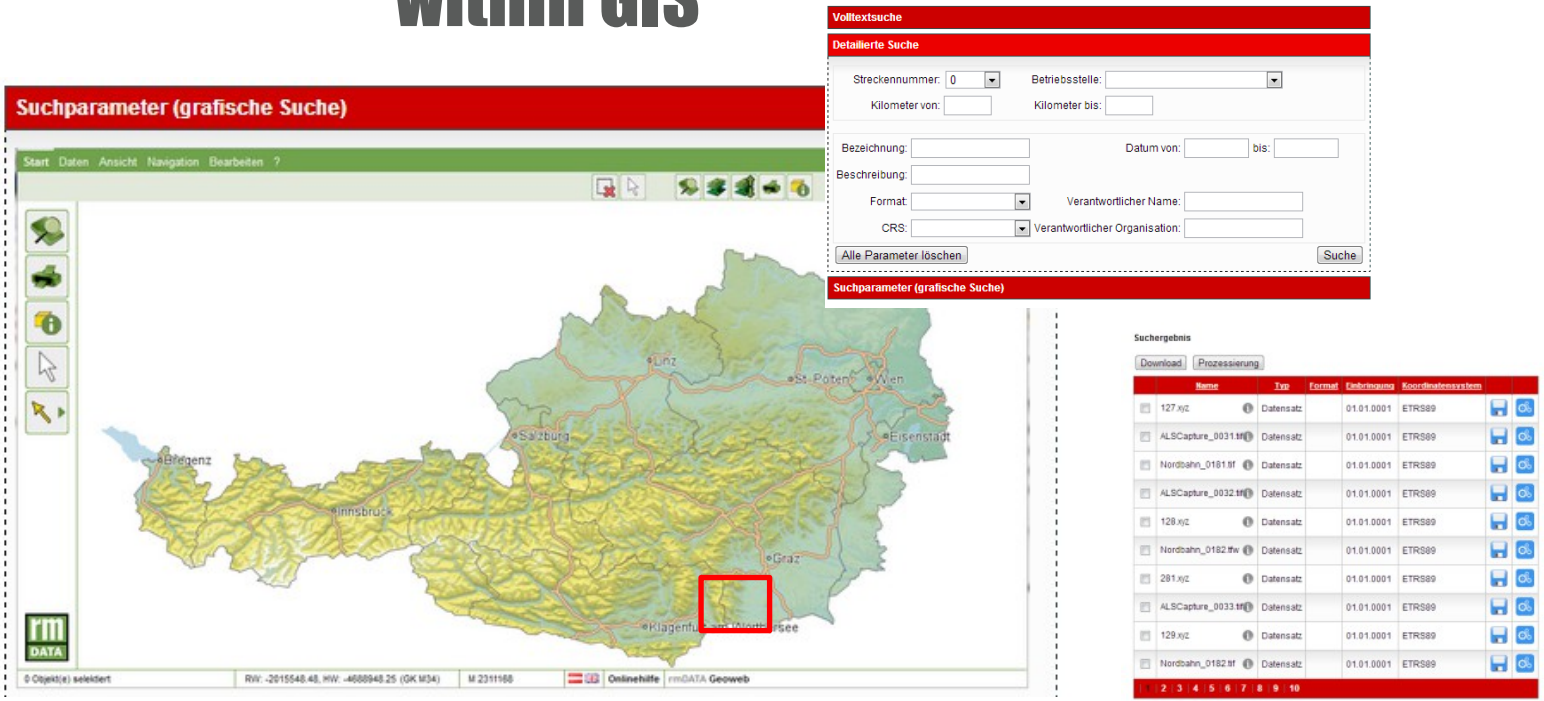
Define ISO conform Metadata

ISO 19115 "Geoinformation – Metadaten"

Geodata & Metadata Store



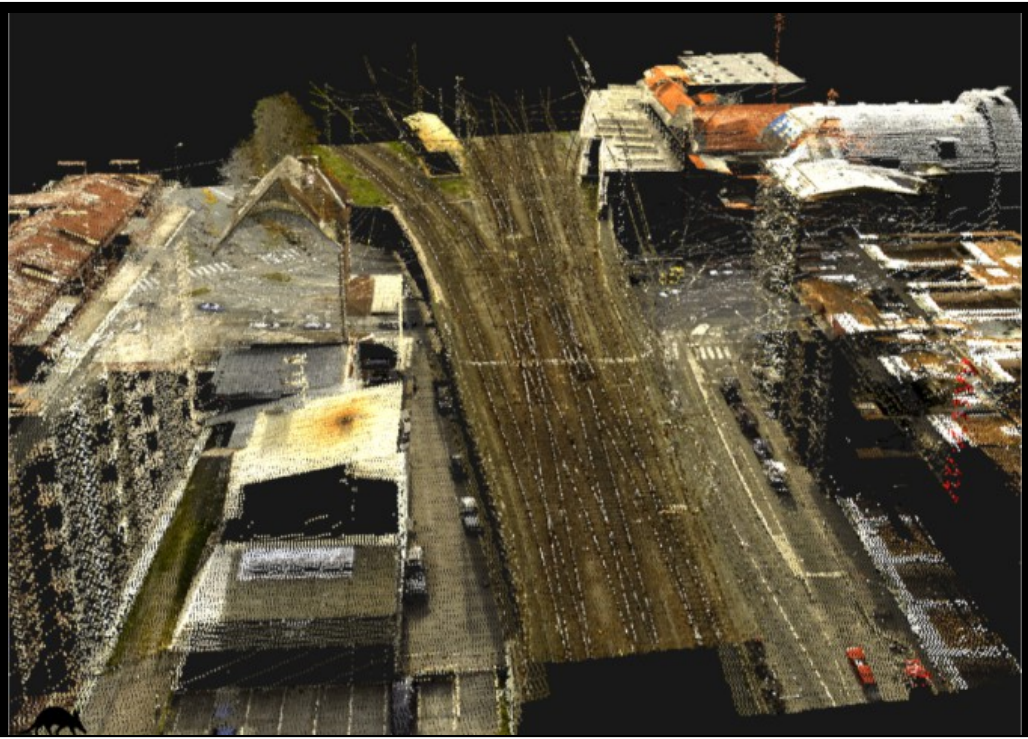
CSW Catalog Integration within GIS



- Searching CSW and
- download from geodata store

Object Recognition

automated processing

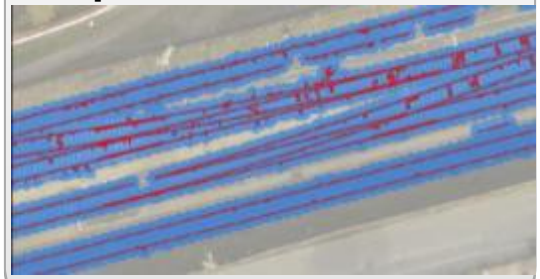


- remote sensing delivers railway corridor recordings
- automated processing with innovative methods of object recognition is applied to

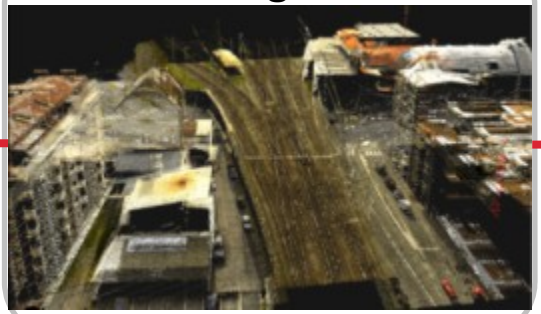
Object Recognition

example: track axis/pylon

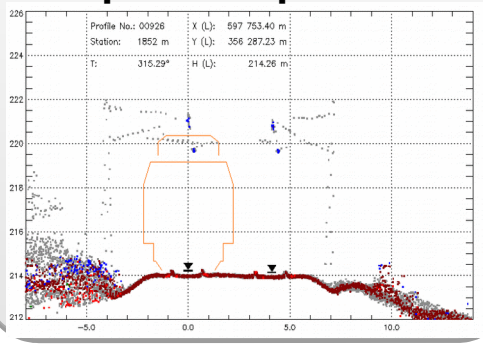
process mask



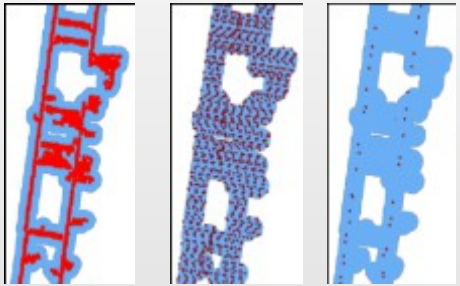
recognition



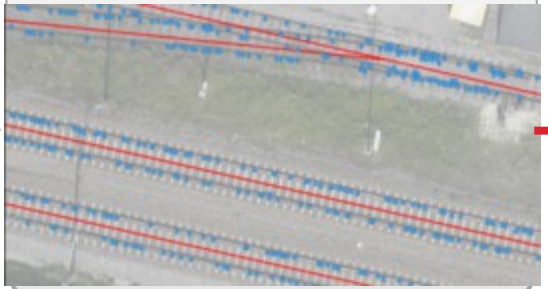
process profile



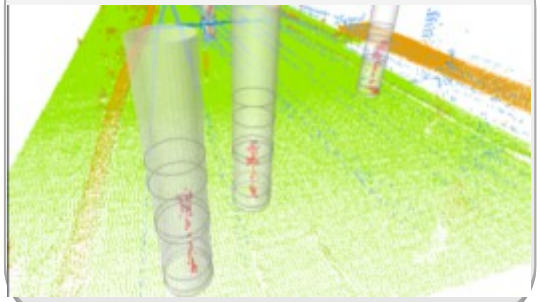
classification

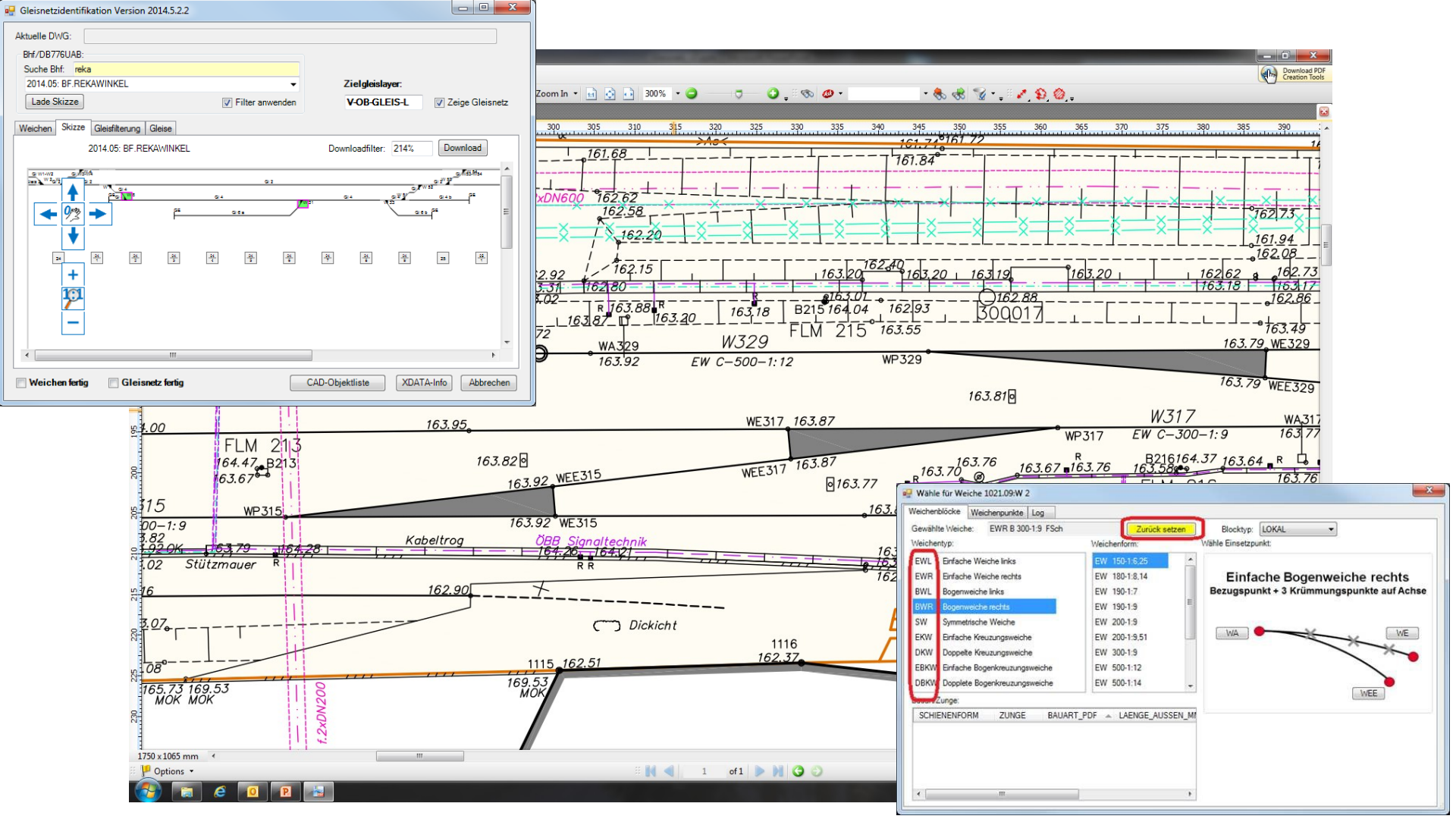


process Ransac



process pylon




Gleisnetzidentifikation Version 2014.5.2.2
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Bhf/DB776UAB:
Suche Bhf: reka
2014.05: BF.REKAWINKEL
Lade Skizze
Filter anwenden
Zielgleislayer:
V-OB-GLEIS-L
Zeige Gleisnetz
Weichen
Skizze
Gleisfilterung
Gleise
2014.05: BF.REKAWINKEL
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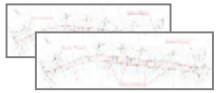
Download
Weichen fertig
Gleisnetz fertig
CAD-Objektliste
XDATA-Info
Abbrechen
Download PDF Creation Tools
Zoom In
300%
FLM 215
W329
EW C-500-1:12
WA329
WP329
WE329
WEE329
300017
FLM 213
W317
EW C-300-1:9
WP317
WE317
WEE317
WEE315
WP315
WE315
Kabeltrog
ÖBB Signaltechnik
Stützmauer
Dickicht
1116
1115
MOK
f.2xDN200
1750 x 1065 mm
Options
Wähle für Weiche 1021.09:W 2
Weichenblöcke
Weichenpunkte
Log
Gewählte Weiche: EWR B 300-1:9 FSch
Zurück setzen
Blocktyp: LOKAL
Weichentyp:
Weichenform:
Wähle Einsetzpunkt:
EWL Einfache Weiche links
EWR Einfache Weiche rechts
BWL Bogenweiche links
BWR Bogenweiche rechts
SW Symmetrische Weiche
EKW Einfache Kreuzungsweiche
DKW Doppelte Kreuzungsweiche
EBKW Einfache Bogenkreuzungsweiche
DBKW Dopplete Bogenkreuzungsweiche
EW 150-1:6,25
EW 180-1:8,14
EW 190-1:7
EW 190-1:9
EW 200-1:9
EW 200-1:9,51
EW 300-1:9
EW 500-1:12
EW 500-1:14
Einfache Bogenweiche rechts
Bezugspunkt + 3 Krümmungspunkte auf Achse
WA
WE
WEE
SCHIENENFORM
ZUNGE
BAUART_PDF
LAENGE_AUSSEN_MI

Integration with existing data

e.g: railway track

orthophotos

pointclouds



geodetic site plans

geodata

inventory

extraction & recognition

Object A: track
residing in rail geometry db

metadata A

Object B: track
result from recognition

metadata B

Object C: track
extracted from geodetic site plans

metadata C

fusion

Object: track

„One Truth“
„Golden Record“

assets

buildings

track geometry

Transfer to GIS

Object: track

Metadata Store

Geodata Store

GIS Object Creation

Georaster Processing Mosaicking

ORACLE SPATIAL

SDO_GEOMETRY

SDO_GEORASTER

references mission data & processing

http://drdsi.jrc.ec.europa.eu/ca/dataset/darstellungsdienst-inspire-obb-daten/res

Darstellungsdienst Inspire Ö... | Lösungen für Ihren Erfolg | IQS... | INSPIRE - Geospatia

Suchen: druck | Zurück | Weiter | Opt

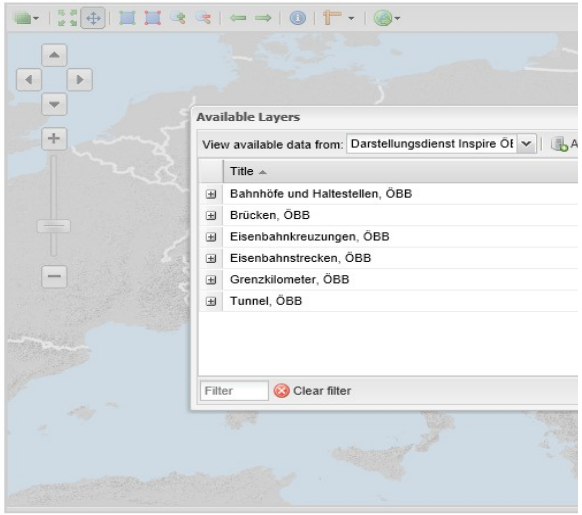
Darstellungsdienst Inspire ÖBB Daten

Aquest recurs no té una descripció

Del resum del conjunt de dades

Strecken und Streckenbezogene Daten der ÖBB

Font: Darstellungsdienst Inspire ÖBB Daten



http://drdsi.jrc.ec.europa.eu/mapstore/composer?locale=en&wmsurl=http%3A%2F%2Fgis.lebensministerium.at%2Fwmsgw%2Fgs107001%2F%3F%26service%3Dwms%26version%3D1.3.

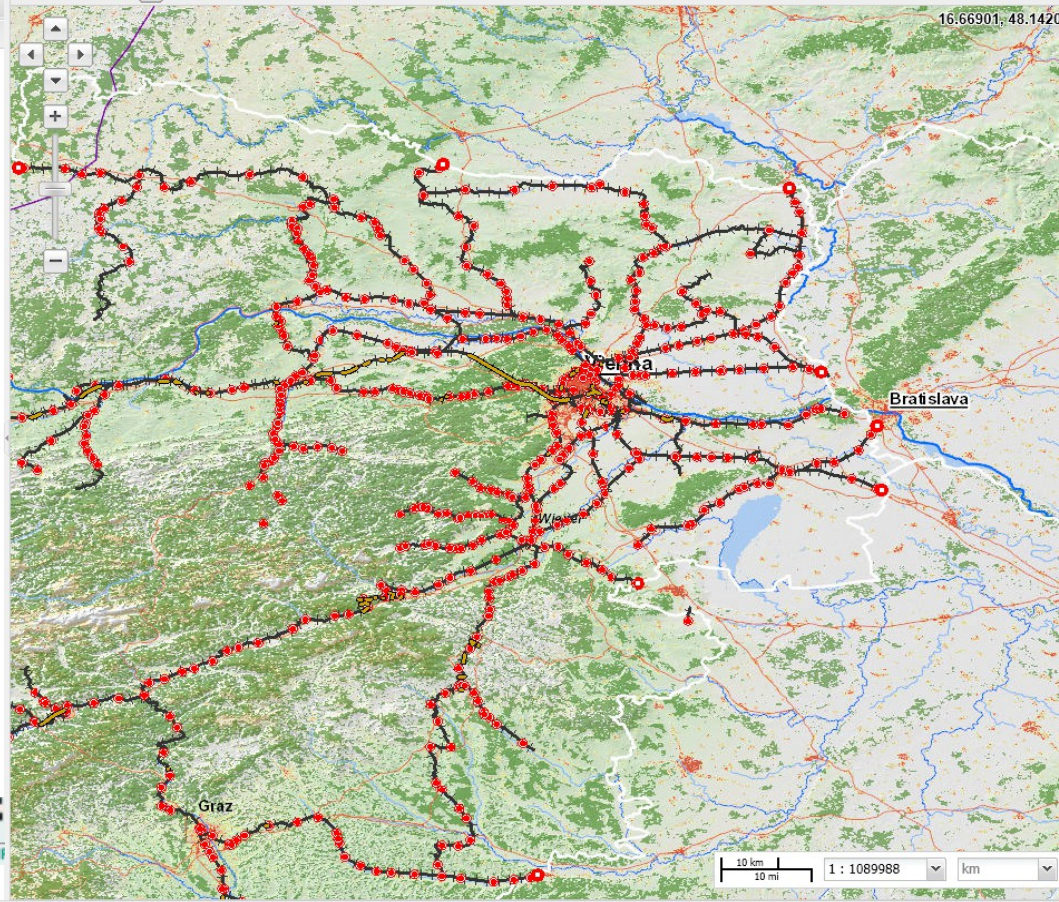
Darstellungsdienst Inspire ÖBB... | MapStore | Lösungen für Ihren Erfolg | IQS... | INSPIRE - Geospatial World For...

Suchen: druck | Zurück | Weiter | Optionen

Full Screen | Help

Layers | Legend | Imported

Resources
- Darstellungsdienst Inspire ÖBB Daten
  - Bahnhöfe und Haltestellen, ÖBB
  - Brücken, ÖBB
  - Eisenbahnkreuzungen, ÖBB
  - Eisenbahnstrecken, ÖBB
  - Grenzkilometer, ÖBB
  - Tunnel, ÖBB



CONVERGENCE
POLICIES PRACTICES PROCESSES
PUBLIC PRIVATE PARTNERSHIP

Interactive 3D Visualization System

- Seamless Navigation
- Absolute Coordinate System
- Vector Data and Label Integration

Object: track

vector data

geoJSON

...

Metadata Store

Geodata Store

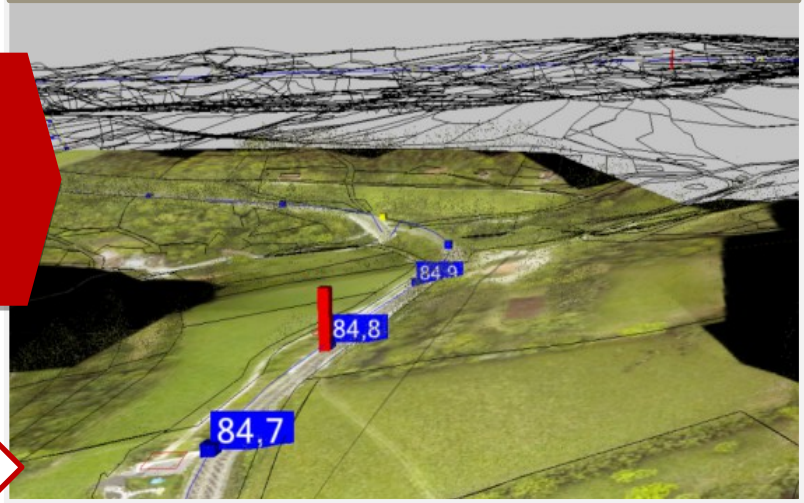
Pointcloud Streaming

WebGL

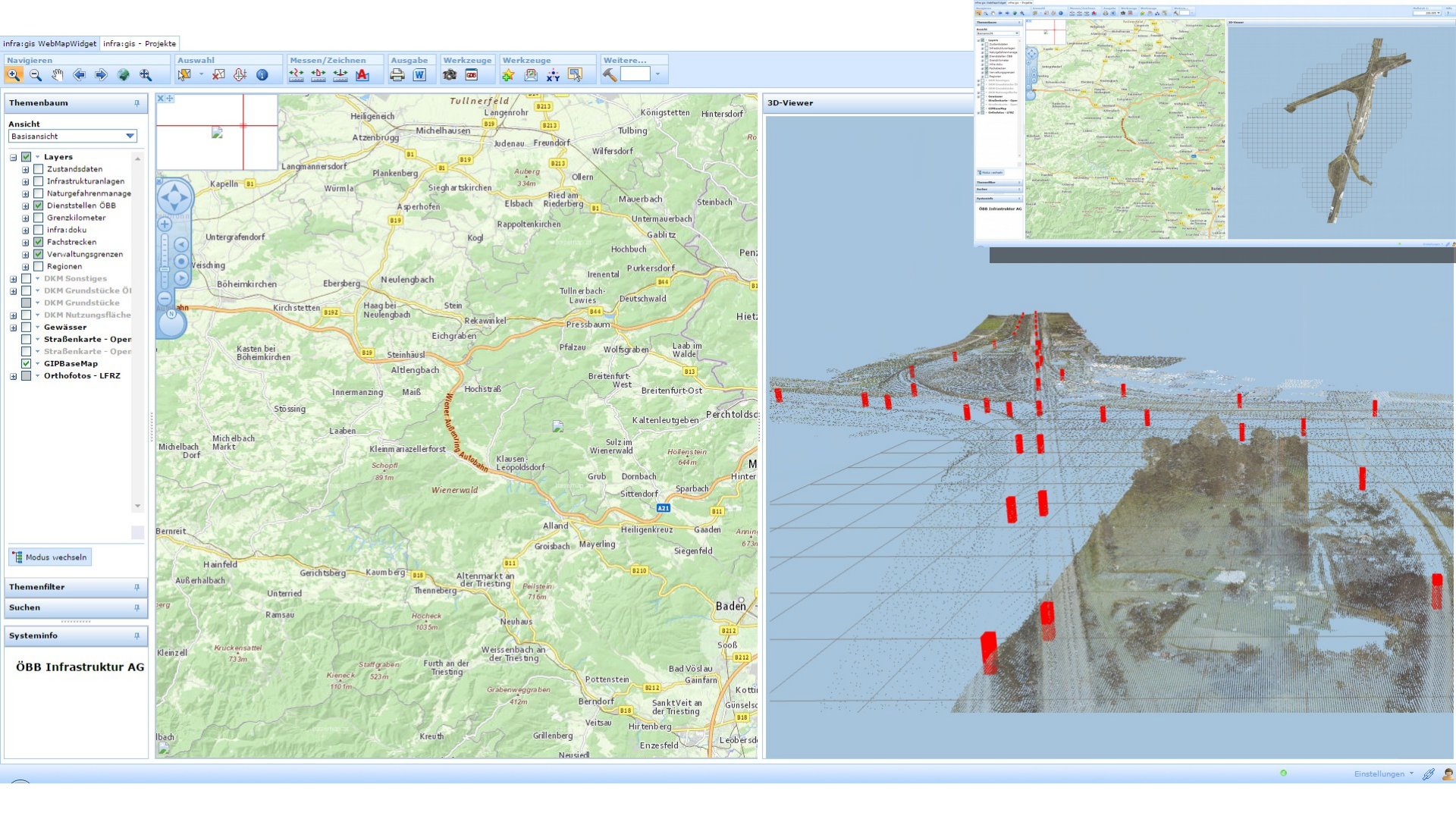
DirectX

Scene, Viewframe, 3d Themes, Animation

3D Viewer



requirements definition | data collection | data storing | result calculation | data delivery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Navigieren
Auswahl
Messen/Zeichnen
Ausgabe
Werkzeuge
Werkzeuge
Weitere...
Themenbaum
Ansicht
Basisansicht
Layers
Zustandsdaten
Infrastrukturanlagen
Naturgefahrenmanage
Dienststellen ÖBB
Grenzkilometer
infra:doku
Fachstrecken
Verwaltungsgrenzen
Regionen
DKM Sonstiges
DKM Grundstücke Öl
DKM Grundstücke
DKM Nutzungsfläche
Gewässer
Straßenkarte - Oper
Straßenkarte - Oper
GIPBaseMap
Orthofotos - LFRZ
Modus wechseln
Themenfilter
Suchen
Systeminfo
ÖBB Infrastruktur AG
3D-Viewer
Tullnerfeld
Langenrohr
Königstetten
Hintersdorf
Heiligeneich
Michelhausen
Tulbing
Atzenbrugg
Judenau
Freundorf
Wilfersdorf
Langmannersdorf
Plankenberg
Auberg
334m
Ollern
Kapelln
Würmla
Sieghartskirchen
Ried am Riederberg
Elsbach
Mauerbach
Steinbach
Asperhofen
Rappoltenkirchen
Untermauerbach
Untergrafendorf
Kogl
Gablitz
Hochbuch
Veisching
Irenental
Purkersdorf
Böheimkirchen
Ebersberg
Neulengbach
Tullnerbach-Lawies
Deutschwald
Kirchstetten
Haag bei Neulengbach
Stein
Rekawinkel
Pressbaum
Eichgraben
Kasten bei Böheimkirchen
Pfalzau
Wolfsgraben
Laab im Walde
Steinhäusl
Altlengbach
Breitenfurt-West
Breitenfurt-Ost
Innermanzing
Maiß
Hochstraß
Wiener Außenring Autobahn
Stössing
Kaltenleutgeben
Laaben
Michelbach Markt
Michelbach Dorf
Klein Mariazellerforst
Sulz im Wienerwald
Hollenstein
644m
Schopfl
891m
Klausen-Leopoldsdorf
Grub
Dornbach
Sparbach
Wienerwald
Sittendorf
A21
Bernreit
Alland
Heiligenkreuz
Gaaden
Groisbach
Mayerling
Siegenfeld
Hainfeld
Gerichtsberg
Kaumberg
Altenmarkt an der Triesting
Außerhalbach
Unterried
Thenneberg
Peilstein
716m
Baden
Ramsau
Hocheck
1035m
Neuhaus
Sooß
Kleinzell
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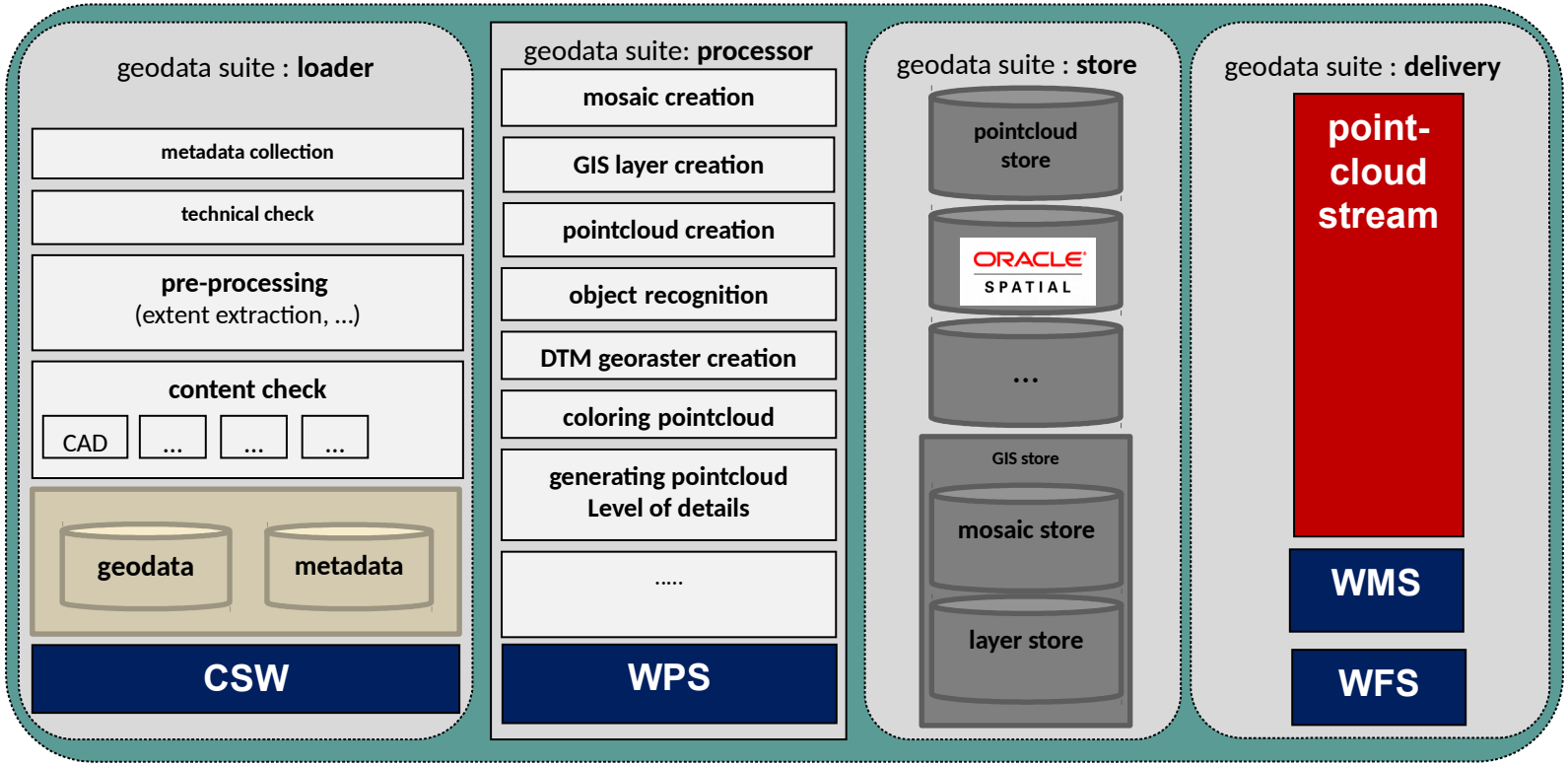
Furth an der Triesting
Bad Vöslau
Gainfarn
Pottenstein
Grabenweggraben
412m
Berndorf
Sankt Veit an der Triesting
Veitsau
Hirtenberg
Kreuth
Grillenberg
Enzesfeld
Einstellungen

geodata suite : solution overview



OGC®
Making location count.
www.opengeospatial.org

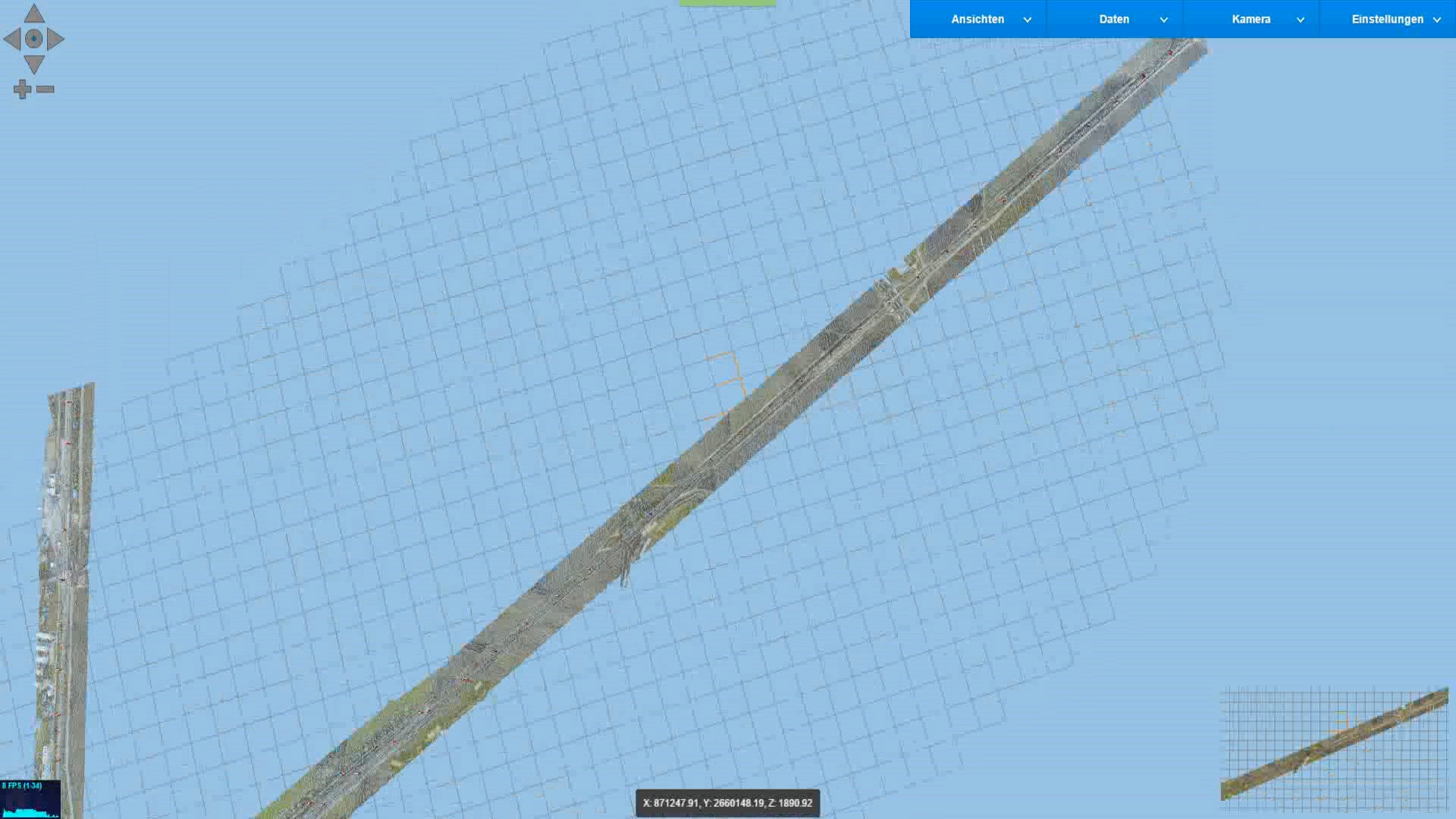
Oracle Spatial

Statistics per **100 km**:

number of points
1,7 Mio. points
storage on filesystem
~ 750 GB
storage in geostore
~ 400 GB
storage of Oracle Spatial objects
SDO_ PC & Georaster ~ 400 GB
resolution of raster
5 cm
density of points
15 points per m²

Oracle Spatial Objects in use:

- **Oracle Pointcloud**
- Oracle Mosaic
- SDO Geometry
- SDO Georaster
- Custom Coordinate Systems


Ansichten
Daten
Kamera
Einstellungen
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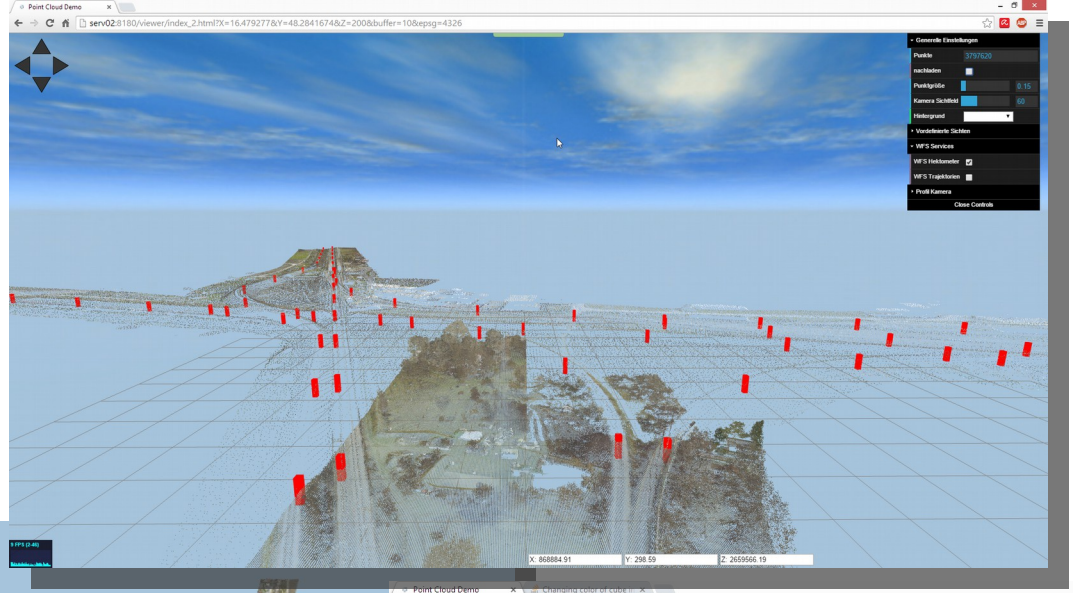
Point Cloud Demo
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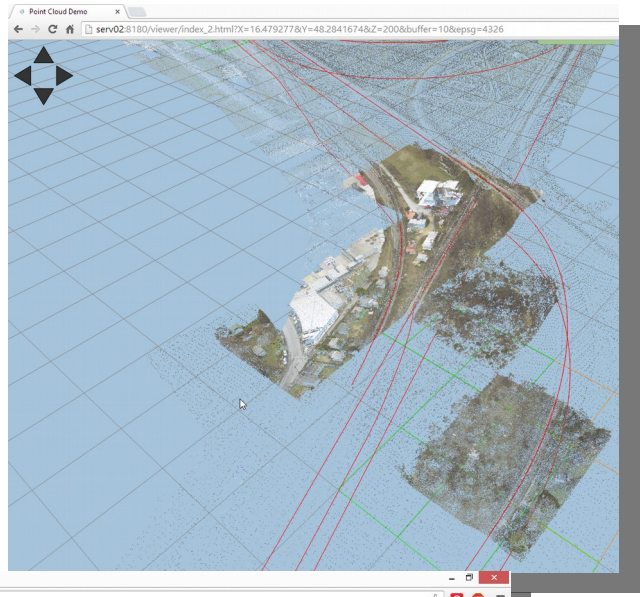
Generelle Einstellungen
Punkte
nachladen
Punktgröße
Kamera Sichtfeld
Hintergrund
Vordefinierte Sichten
WFS Services
WFS Hektometer
WFS Trajektorien
Profil Kamera
Close Controls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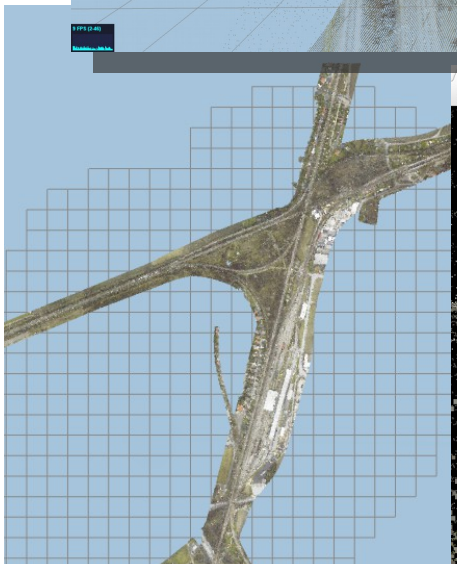
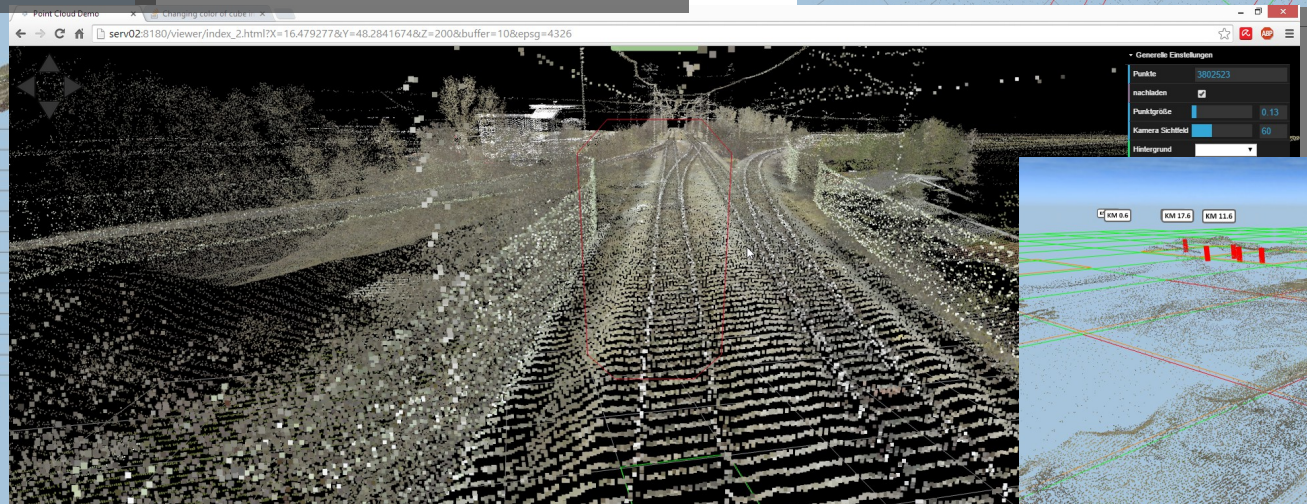
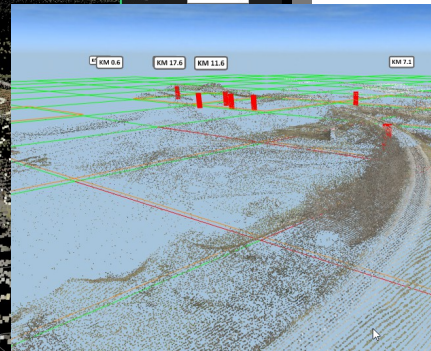



Point Cloud Demo
serv02:8180/viewer/index_2.html?X=16.479277&Y=48.2841674&Z=200&buffer=10&epsg=4326
Generelle Einstellungen
Punkte
3802523
nachladen
Punktgröße
Kamera Sichtfeld
Hintergrund

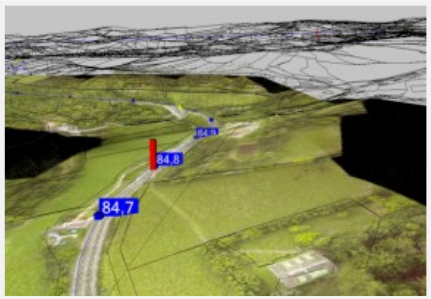

KM 0.6
KM 17.6
KM 11.6
KM 7.1

Summay

- **Optimize** railway planning, construction and maintenance
- **Stores** and **processes** more than 8 billion points of objects along railway tracks
- Enables LiDAR data to be **viewed** with existing infrastructure vector data
- Provides comprehensive **metadata** about railway tracks trough CSW
- Delivers data through **open** services

Q&A
IQSOFT
www.iqsoft.at

Austrian Federal Railways
infra:geodata



OVERVIEW

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- The ÖBB group is owned entirely by the Republic of Austria and is divided into several separate businesses that manage the infrastructure and operate passenger and freight services

CHALLENGES / OPPORTUNITIES

- big data: huge heterogenous data collections, file system storage, no spatial access
- mission management: quality assurance, historiography
- minimize acquisition expenses: automation of processing steps, avoidance of multiple surveys

SOLUTIONS

- Oracle Database 12c Enterprise Edition
  - Spatial Option with Pointcloud and GeoRaster,
- Oracle Fusion Middleware 11.1.1.7
  - MapViewer

RESULTS

- Direct and uniform access to pointcloud data
- Lowering costs of geodata usage by service access
- Consolidation of raster, vector and pointcloud data in a central repository
- Increase of quality using metadata
- Lowering process costs using homogenous processes