

BUILDING UP ON RAILWAY COORDINATES

Introduction Railway Project 2009

Coordinates for track machine guidance

Reference data

Exploitation of the full coordinate potential

Railway project 2009

Feedbacks

Conclusions

The Railway Project 2009

The main goal of the "Railway Project 2009" was to outline the conditions required to achieve interoperability of railway infrastructure data all along the European Railway lines based on absolute coordinates.



Euref



GIS



Tracking industry



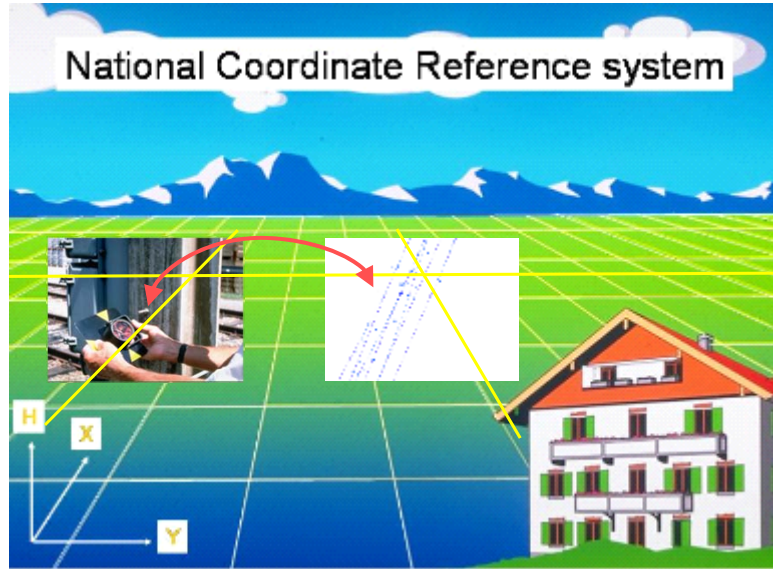
Railway economy



Infrastructure maintenance



Railway signalling



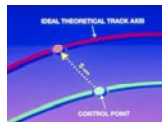
COORDINATE BASED TRACK MACHINE STEERING



Measure the position vectors from the track machine towards coordinate defined reference points



Calculate from these vectors the track machine position in absolute coordinates



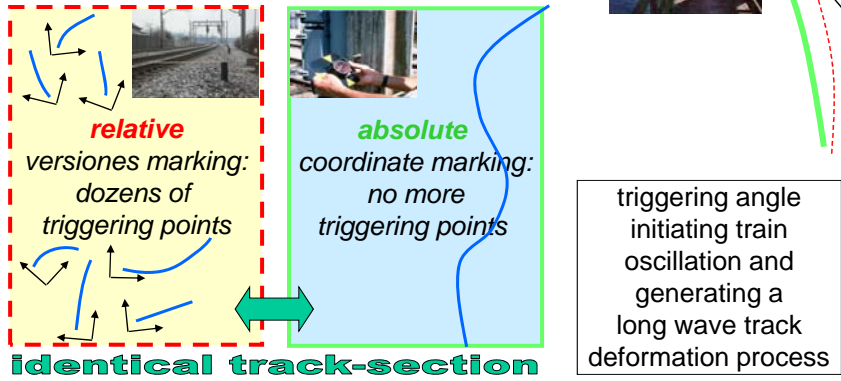
Determine the difference between the track machine position and the ideal theoretical track axis



Guide the track machine to put the track back to the ideal positiontheoretical track axis

COORDINATE BASED TRACK MACHINE STEERING

Red: Before 1986. Relative working method
Green: After 1996. Absolute working method



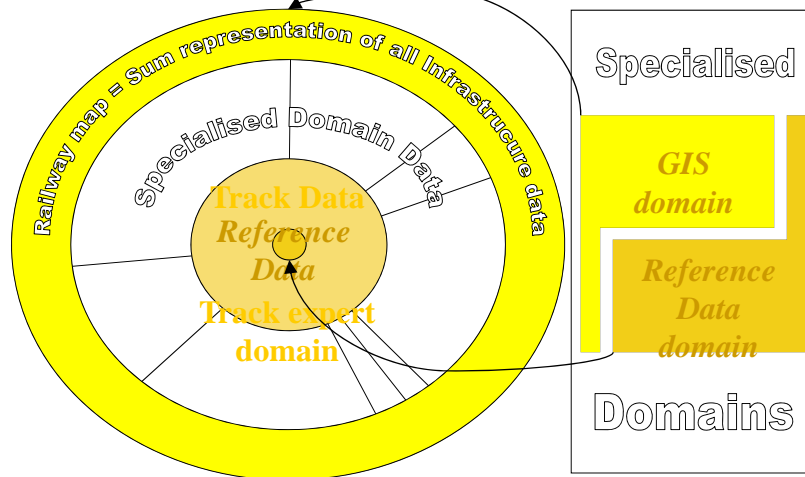
TOPORAIL, SWISS TRACK CALCULATION SYSTEM



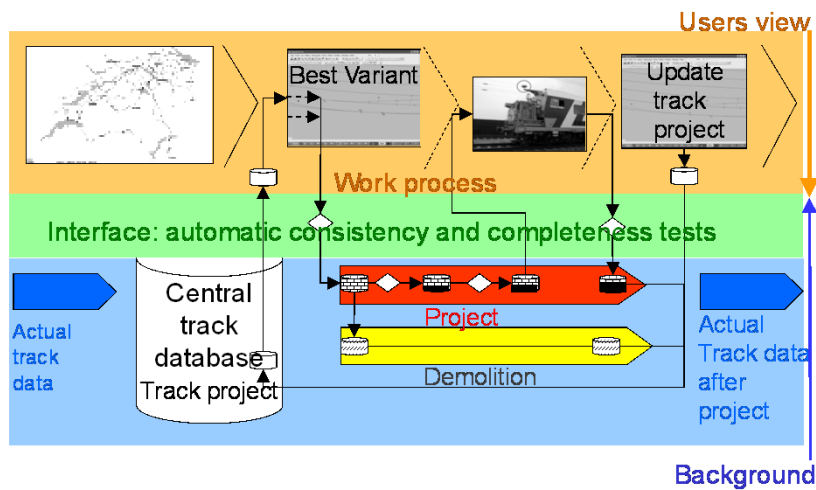
Fig 4: The Toporail track calculation system from the Swiss Rail

SHELL DATA MODEL WITH INTERACTIONS

Structured Railway Data „Shell Modell“ Organisations interaction



100% COMPLETE DATA

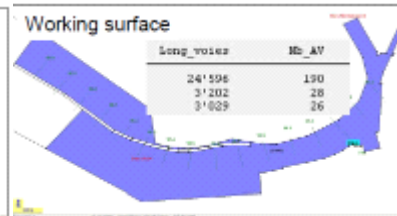
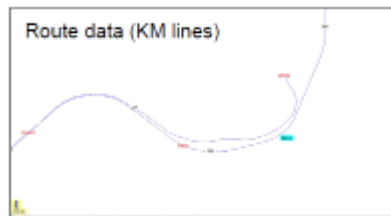
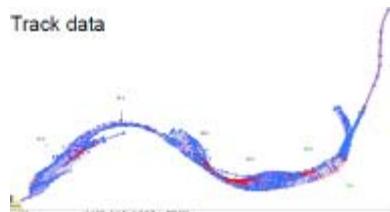
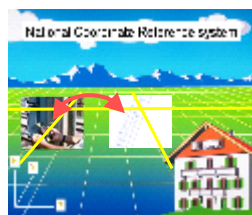


DEVELOPMENT OF TRACK QUALITY

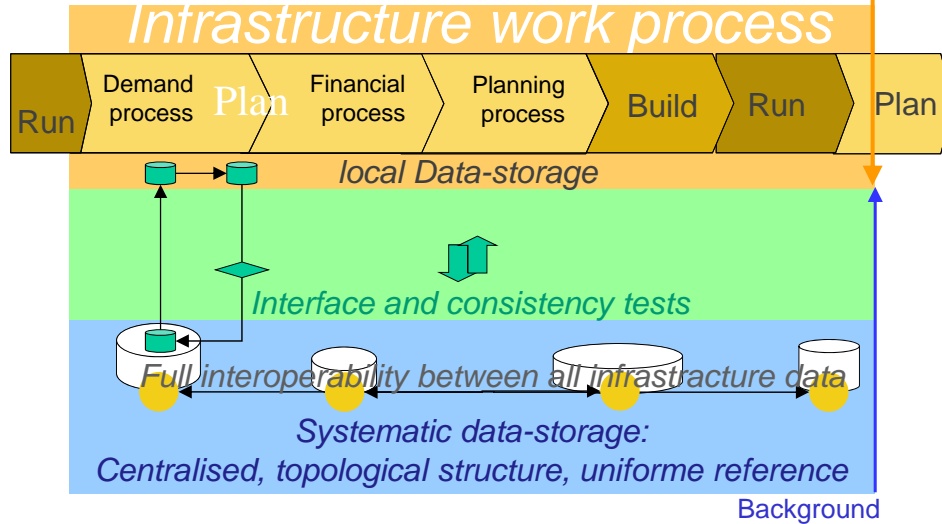
Year	Total length [km]	Best track quality part [km]	Part of best quality [%]
Category 1 main track			
1996	2721.202	1080.428	39.7
1986	2579.004	509.229	19.7

The best track quality part comprises the track segments on which a note between 10-22 was measured by the track quality measuring car. The note is quoted on a scale between 10 for a perfect tracks and 110 for the worst possible track. The best track quality part doubled in 10 years.

SUBJECTS OF RAILWAY REFERENCE DATA



WORK PROCESS DRIVEN DATA MANAGEMENT Users view



RAILWAY INFRASTRUCTURE MAINTENTANCE

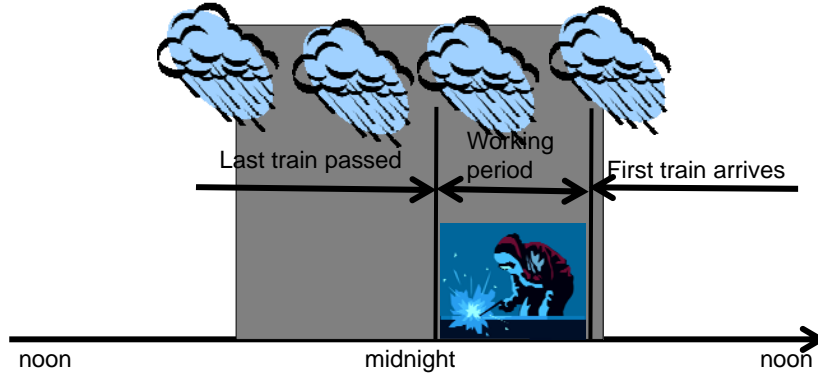
Infrastructure work process: Governs exhaustively the kernel tasks of maintaining the (railway) infrastructure assets by planning, building and running them at highest data quality level and based on systematic data-storage

This final development stage will enable:

- standardised mechanisms to store, archive, authenticate access, transfer, preserve, curate, certify and interpret railway data;
- improved availability of primary digital data sources;
- a shift away from approaches based on the secondary sources which are often incomplete and incorrect;
- use of the data as the central element for the professional facility management
- improved analysis, acquisition, visualisation of data.

WORK ENVIRONMENT IN RAILWAY MAINTENANCE

- short working periods
 - dark
 - often bad weather conditions
- } • no errors allowed
• continuous operation
• reliable steering
- 100% data quality**



THE RAILWAY PROJECT 2009

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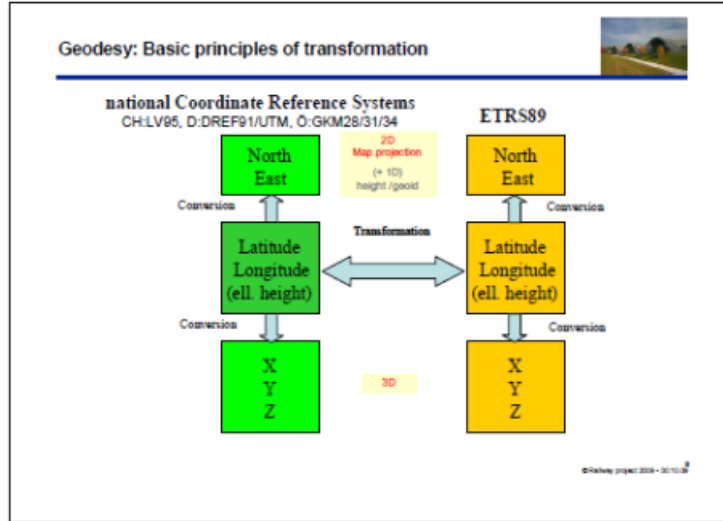


Infrastructure maintenance

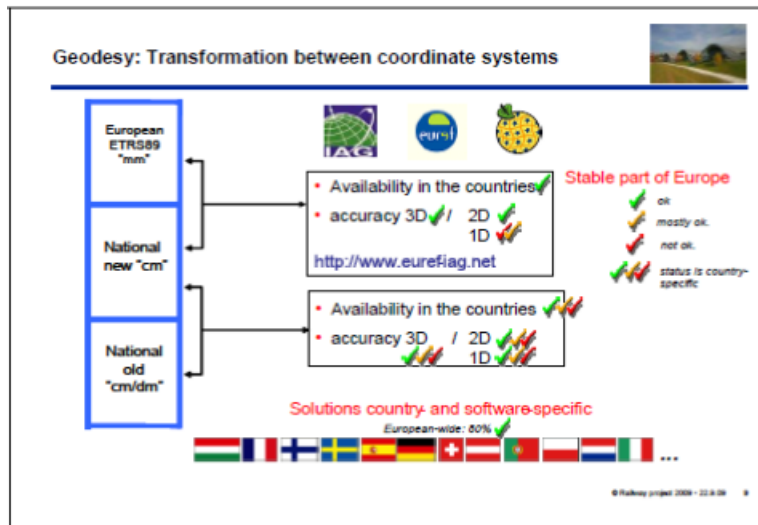


Railway signalling

INTRODUCTION ETRS89



TRANSFORMATION



OUTCOMES OF THE RAILWAY PROJECT 2009

- Need to work Cross Border adopted
- To base on ETRS is feasible
- Map projection stays in responsibility of national railways
- All countries are to achieve an undistorted reference frame
- Accuracy to be achieved is 1 cm
- The hight problem needs further investigation
- All phases to be integrated and supported
- In addition data modeling, quality concepts, standard data exchange interfaces and update concepts are to be elaborated and implemented

CONCLUSIONS

Coordinates have a double function:

Reference data making interoperability between European railways possible

Base for future automatic track maintenance guaranteeing high Precision

Open questions:

Will the instrument industry be interested, willing and able to support the railways with the development of continuous GNSS-based hardware and software for high precision track machine Steering?

The work goes on!

THANKS FOR YOUR ATTENTION

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