



High-end GNSS based Application used for the German Railway Clearance Measuring Train

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International EUPOS® Steering Committee

c/o technet-rail 2010 GmbH Berlin, Germany



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16 - 20 January 2011, Dubai, United Arab Emirates

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Introduction

Preconditions for high end GNSS based applications (clearance measurement)

Ground based augmentation systems

Bidirectional data exchange

DGNSS based service /GSM/GSMR

•Processing options /on the train or service center

Examples Conclusions

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SC-104 Differential GNSS Standardization

Participants include vendors, service providers, and government agencies from around the world

Standards are subjected to performance and interoperability testing prior to adoption and publication

Achieving compatibility and interoperability -between the service providers -between different manufactures we are able to guaranty the trans border use of positioning and navigation services without any looses

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EUPOS [®] characteristic

EUPOS is an common realization of high density reference station networks (single segments)

Common terms of reference and standards for building up and managing the GNSS infrastructure

High redundancy based on additional stations (65-70 km for the 2cm accuracy in real time)

different used signals GPS, GLONASS, GALILEO

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EUPOS ®

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EUPOS Transmitted correction models

- FKP* area modeled corrections
- VRS* Virtual Reference Station (non physical ref. station)
- MAC* Master Auxiliary Concept
- Using NTRIP Internet Protocol as transport layer from multi casting servers
- * Worldwide standardized in RTCM version 3.1

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EUP

European Position Determination System

EUPOS Sparse or Dense network design



Week: 1611 Time: 134490.0 Searching: 0.0 * Contrast: 11.9 Prev.Contrast: 11.9 No. Stations, Satellites: 20 / 20 14 / 15 Rate: 2.00 s IPI: 21.1 IPO: 8.2 mm

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EUP

GPS availability



Week: 1611 Time: 0557920 Searching: 0.0 * Contrast: 0.0 Prev Contrast: 0.0 No Stations: Satellites: 19720 15715 Bate 200 s IPI: 86 IPI: 4.9 mm

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European Position Determination System

EUP®S

EUPOS - different receivers only GPS and GPS/GLONASS



Week: 1611 Time: 121068.0 Searching: 0.0 * Contrast: 0.0 Prev.Contrast: 0.0 No. Stations, Satellites: 20/20 15/18 Rate: 2.00 s IPI: 30.2 IP0: 8.5 mm

ETRS89 based

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Quality control



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EUP S European Position Determination System

EUPOS Services

Service	Description	Accuracy	Format*	Transport Layer	DGNSS System
BULiPOS PP	Post processing	5 mm	RINEX	Internet	GPS+GLONASS
BULiPOS VS	Post processing virtuals station	5 mm	RINEX	Internet	GPS+GLONASS
BULiPOS RT Precise	Real time processing high accuracy	<2 cm	RTCM 2.x, RTCM 3.x	GSM, GPRS NTRIP	GPS+GLONASS
BULIPOS RT	Real time processing	0,5-3m	RTCM 2.x, RTCM 3.x	GSM, GPRS NTRIP	GPS+GLONASS

*Based on ETRS89

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Railway spatial Database for rising the infrastructure maintenance performance of the German Railway



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European Position Determination System

Integrity of the railway navigation database Ambiguity free system determination



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German railway network



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High precision corridors



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High precision corridors



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Client – Server based web application



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Client – Server based web application



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RAIL 2010 TECHNET

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EUPOS/SAPOS-based Vehicle Scheduling and Control System by the German Railway - RaiLaNav Project





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3D clearance measuring train



20 HZ GNSS receiver

Measuring trains: for Wire condition for Rail head condition

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DB_VIS the image information set



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EUP S

DB_VIS the image information set



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Position related to geocodet maps



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Map matching (position, length and scale)



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Chainage direction



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Curvature elements based on the recorded INS data



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Comparison image - scan





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LIRA database objects



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Generate platform edge – strategy to open the railway market



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Conclusions

- Preconditions •3D spatial data as basis •GBAS
- Clearance analyzing
- •Measurements direct in 3D space, also to clearance gauge (distance, collision simulation)
- •Import of old LIRA profiles, add photographs
- •Export of captured values = "geo clearance objects" as products





European Position Determination System



Image by oel van Cranenbroeck when it has to be right

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