ArcGIS in ETCS Adaptation

Ramboll in brief

- Independent engineering and design consultancy and provider of management consultancy
- Founded 1945 in Denmark
- 14,000 experts
- Close to 300 offices in 35 countries
- Particularly strong presence in the Nordics, the UK, North America, Continental Europe, Middle East and Asia Pacific
- EUR 1.4 billion revenue
- Owned by Rambøll Fonden

Ramboll in ERTMS, Denmark

Replacement of all legacy signalling on the Danish rail infrastructure with ERTMS

Ramboll role: Lead technical consultant

Customer: Banedanmark

Transport

RAIL SYSTEMS

Population growth and urbanization is driving global demand for transport services. As one of the most efficient modes of transport available, rail provides convenient, fast and reliable mobility. It is also a sustainable solution with low climate and environmental impact that can move a large amount of people in a relatively little amount of space.

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Whats needet

Convert legacy track layout to ETCS layout
- Be able to run ERTMS countrywide before complete implementation
- Get inclination from danish terrain model

Map legacy trackside objects to ETCS infrastructure
- To avoid tidious work of manual mapping

Make geographical representation of ETCS infrastructure
- For trainpositioning and visualization of events related to tracksections
- Data verification of vendor data

RAIL SYSTEMS AT A GLANCE

- 800 rail experts
- 50+ years of experience in planning, designing and implementing mobility solutions
- Strong rail system domain know how, combined with general capabilities in civil engineering, environmental services, commercial advice and support, IT and project management

Services:
- Capacity analysis
- Electrification
- Metro and light rail
- Rail safety
- Rolling stock
- Signalling systems and ERTMS
- Intercity and high speed railways
- Track renewal and upgrades

RAMBØLL

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Why
- Infrastructure changes throughout the project
- The coverage from vendors will roll out in stages accross the whole country

Initial data

Data retrieved from Banedanmark
Opendata:

Banedanmarks Open Data

Indgangen til Banedanmarks geografiske data

Søg efter data   🔍

Open Data

Banedanmark stiller en række kort og geografiske data til rådighed for interessenter og samarbejdspartnere med henblik på at smidiggøre udlevering af geografiske data over banen. Du kan søge efter og hente data ved at bruge søgefeltet ovenfor, eller ved at klikke på forstørrelsesglasset i højre side. Mens du gennemser data, vil den geografiske udstrækning vises på et kortet. Når du finder, hvad du leder efter, skal du vælge data, for at kunne se detaljer og få mulighed for download.

Data kan hentes på flere forskellige måder, enten som shapefil eller KML for GIS-applikationer, eller CSV for tabeller og regneark. Desuden kan data via API-linket indlejres i andre applikationer med link-funktionen service eller GeoJSON.

Datoen for de enkelte dataelementer afspejler, hvornår data er kopieret ud på vores eksterne GIS-server og kan derfor variere fra de enkelte objekters udgivelses-/ajourføringsdato. Data kopieres ud hver 2. måned som minimum.

Bemærk, at Banedanmark tager forbehold for fejl og mangler i data, og data må ikke benyttes som grundlag for projektering. Desuden kan der løbende forekomme ændringer i feltdefinitioner.

Gennemse alle GIS-data

Initial data

Data retrieved from Banedanmark Opendata:
- Tracks
- Nodes
- Sections

Data received from Bandanmark Asset Management:
- Point asset data
- Point construction meassures

ETCS transformation first steps

Original network geometry is replicated

Section delimiter nodes are removed

For each intersection in the graph branchnames are calculated

From construction data and asset management information - extend of each branch is calculated and saved

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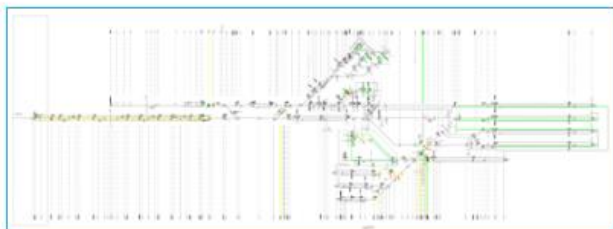
ETCS network complete
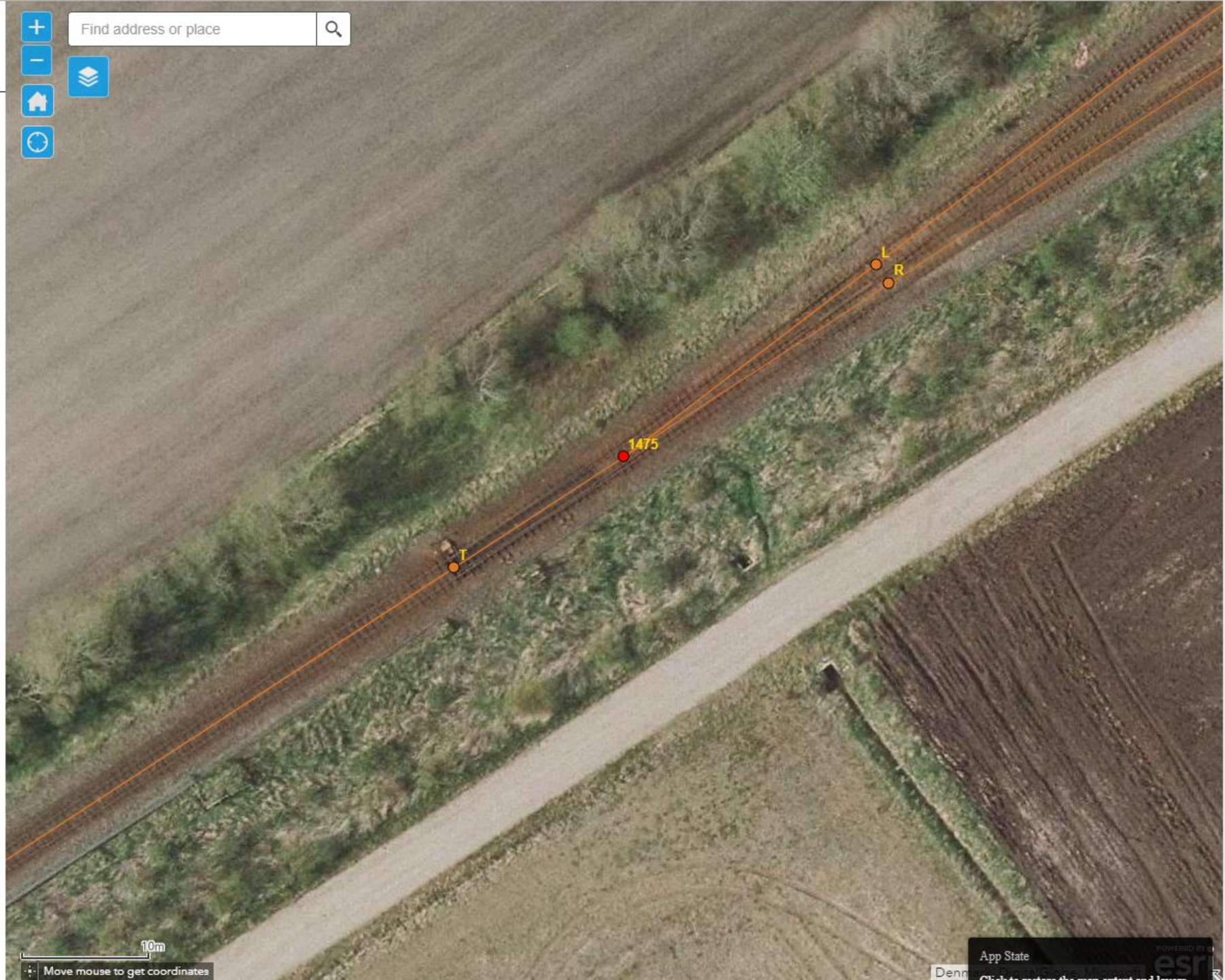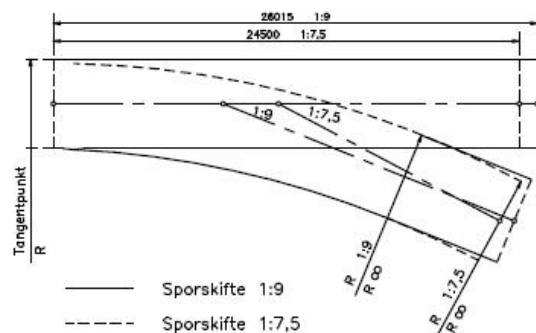
ETCS network complete

Rules for ETCS track extend is applied to generate the track sections and form the geometric network

The new network is baseline for:

- BDK mapping - of legacy tracks, point and trackside objects
- Mapping of vendor data
- Verification of vendor data
- Routing

Mapping sample

Data from vendors are mapped through a topology approach

Mapping sample

Data from vendors are mapped through a topology approach

Vendors topology is table based and should fit with track topology - if not it indicates invalid data on either side

Just 1 common reference is pointed out and data spreads across the network.

track_section	down_ident	down_branch	down_km_pos	up_ident	up_branch
Afl-Bl-SN003-L	Afl-Bl-SN003	left	275,265	Spsk-Bl-SN004	left
Conn-Bl-001-R	Conn-Bl-001	right	272,065	Spsk-Bl-N001	tip
Conn-Hj-002-R	Conn-Hj-002	right	296,2	Spsk-Hj-N105	left
Conn-Hj-003-R	Conn-Hj-003	right	296,8	Spsk-Hj-N117	right
Conn-Hj-004-R	Conn-Hj-004	right	296,8	Spsk-Hj-N116	tip
Conn-Kv-001-R	Conn-Kv-001	right	322,5	Spsk-Kv-N001	tip
Conn-Vr-001-R	Conn-Vr-001	right	276,3	Spsk-Vr-N001	tip
Spsk-Bl-N001-L	Spsk-Bl-N001	left	274,601	Spsk-Bl-N002	right
Spsk-Bl-N001-R	Spsk-Bl-N001	right	274,601	Spsk-Bl-SN004	right
Spsk-Bl-N002-T	Spsk-Bl-N002	tip	275,852	Conn-Vr-001	left

Validations like trackcoverage and length are easily followed up through visual inspection

Inclination

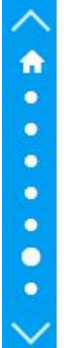DTM - Danish terrain model covers the whole country

Denmark, DigitalGlobe, Microsoft

POWERED BY
esri

Inclination

DTM - Danish terrain model covers the whole country

The tracks are digitized for every meter, and delivered in json

New line from Copenhagen to Ringsted is calculated based on 3D data from CAD

Questions

Spsk-Hj-N118

Questions

QUESTIONS

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