ProRail

SIGMA

From rail design to multi-usable data, the road ahead in nowadays rail management

Robert Voute, CGI
Sabine Geldermans, ProRail

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CGI is a global end-to-end IT and business process services leader

High-end business and IT consulting

69,000 professionals, 85% shareholders*

10,000 clients across the globe

System integration, IT and business process outsourcing

400 offices, 40 countries around the world

Client satisfaction: 9.1/10

100+ mission-critical IP-based solutions

$10B annualized revenue

World's 5th largest independent IT and BPS firm

* Before Logica

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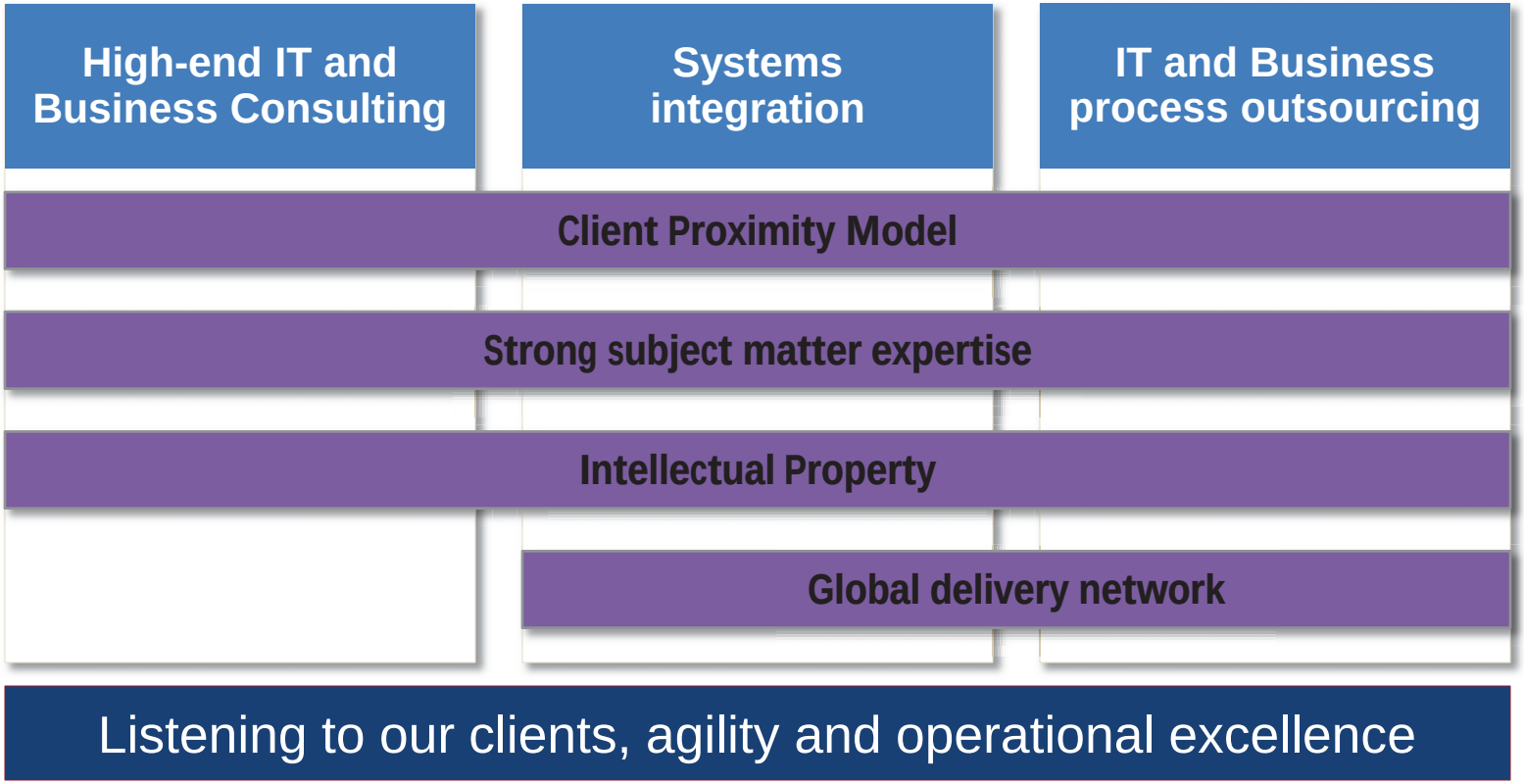
Our range of services



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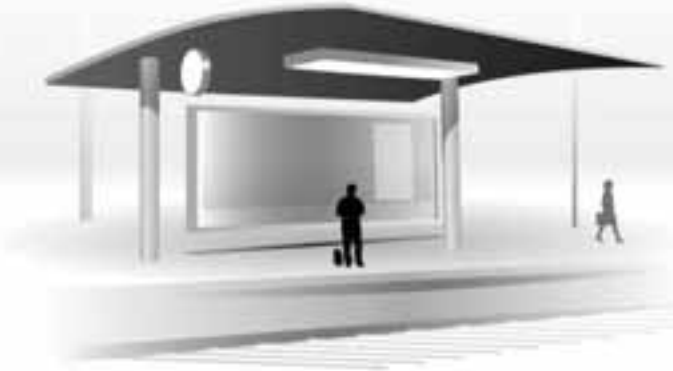
What we do



Maintaining
existing rail network

Managing stations

Construction
laying new track,
building new stations

Informing
operators

Controlling
all rail traffic

Allocating
the space on the track

ProRail

24/7

24 hours per day / 7 days a week / 365 days a year

1,083,000
passengers per day

population 16,7 M
4 M local residents

safety
reliability
punctuality
sustainability

3,300,000
trains per year

115,000
tonnes of freight per day

9 passenger operators

19 freight carriers

passenger transport per year: 139 M km.

freight transport per year: 10 M km.

source: jaarversiag ProRail 2012

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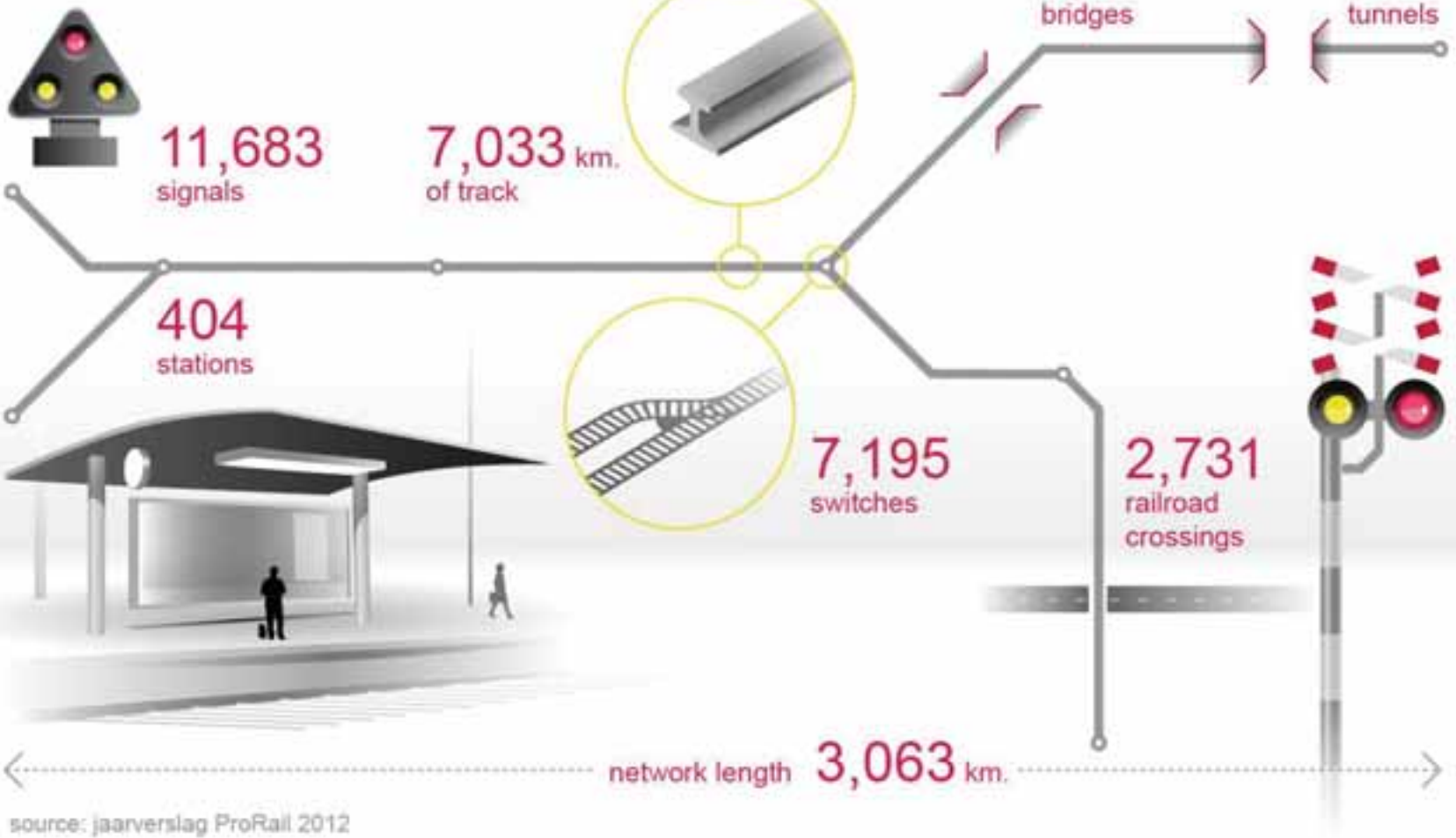
Infrastructure



source: jaarverslag ProRail 2012

Asset Management

Rail track geometry
- XYZ and cant (3d model)
- very accurate: centimeters

Business processes
- Construction: design
- Maintenance: survey data

Background

- Current system is end of life
- Survey data in bulk

New system: SIGMA
Soll Ist Geometry Monitoring Absolute

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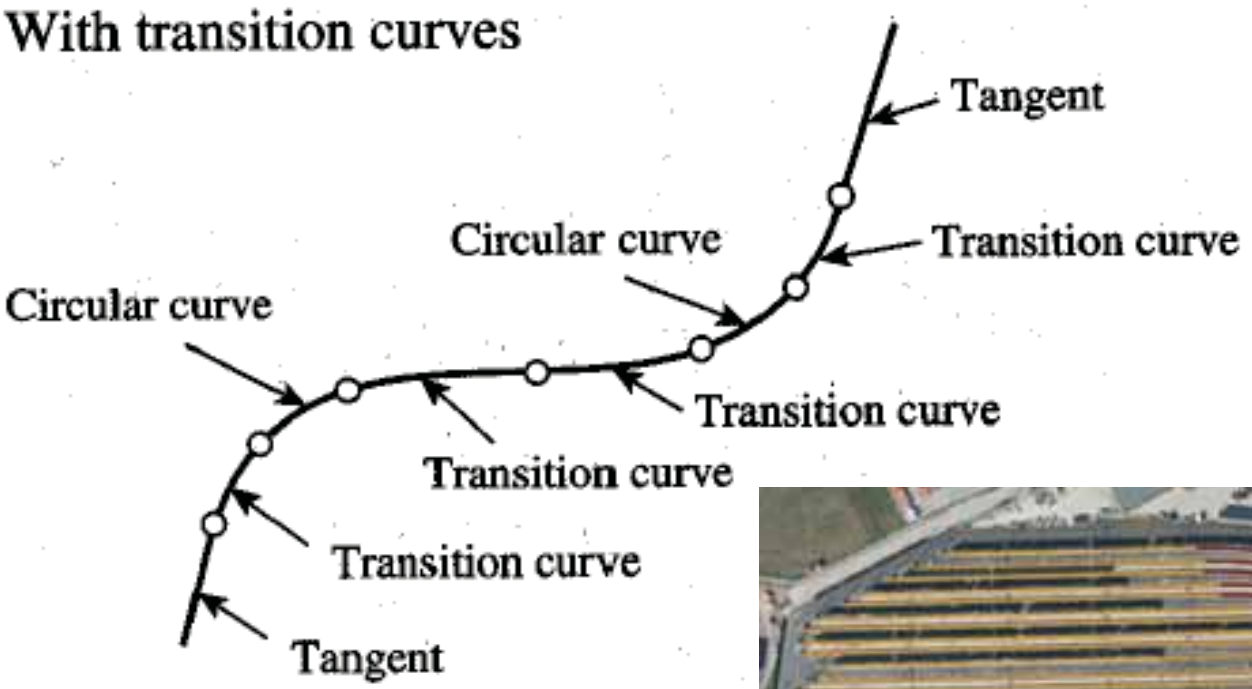
Alignment

Alignment = 3D geometry of track layouts (mathematically correct)

- Horizontal alignment defines physically where the route or track goes (the XY component).
- Vertical alignment defines the elevation, rise and fall (the Z component).
- Very accurate: 1.5 cm

Alignment – horizontal component



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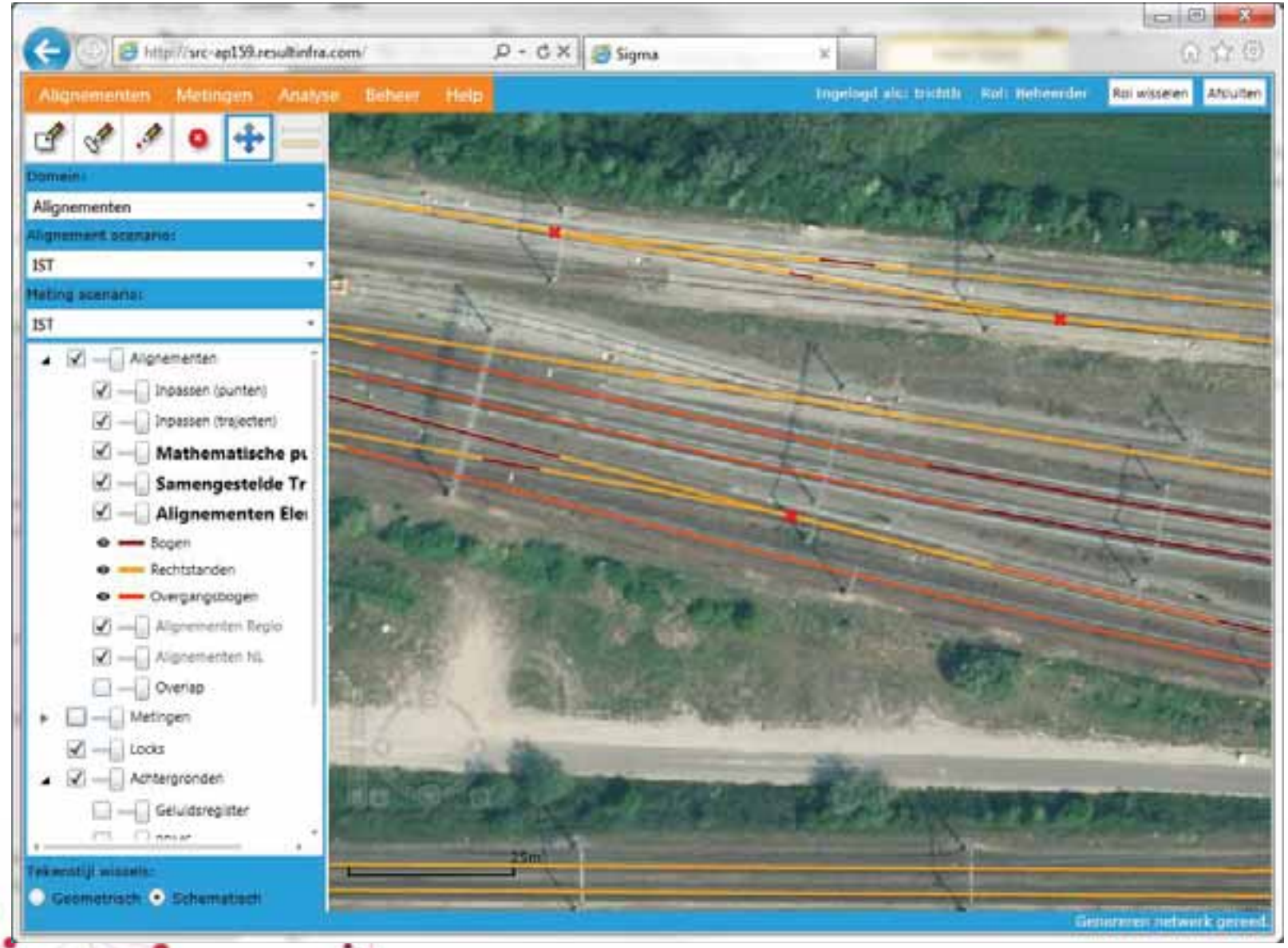
Sigma
Alignementen
Metingen
Analyse
Beheer
Help
Domein:
Alignementen
Alignement scenario:
IST
Meting scenario:
IST
Alignementen
Inpassen (punten)
Inpassen (trajecten)
Mathematische pu
Samengestelde Tr
Alignementen Ele
Bogen
Rechtstanden
Overgangsbogen
Alignementen Regio
Alignementen NL
Overlap
Metingen
Locks
Achtergronden
Geluidsregister
Tekenstijl wissels:
Geometrisch
Schematisch
25m

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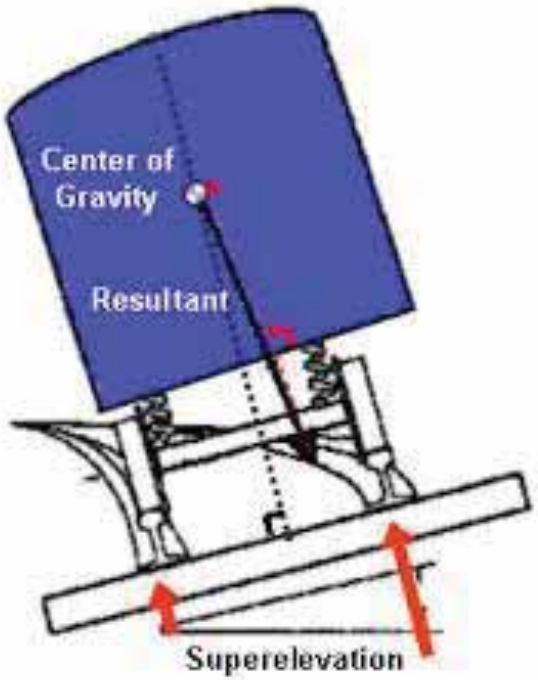
Alignment – cant / superelevation



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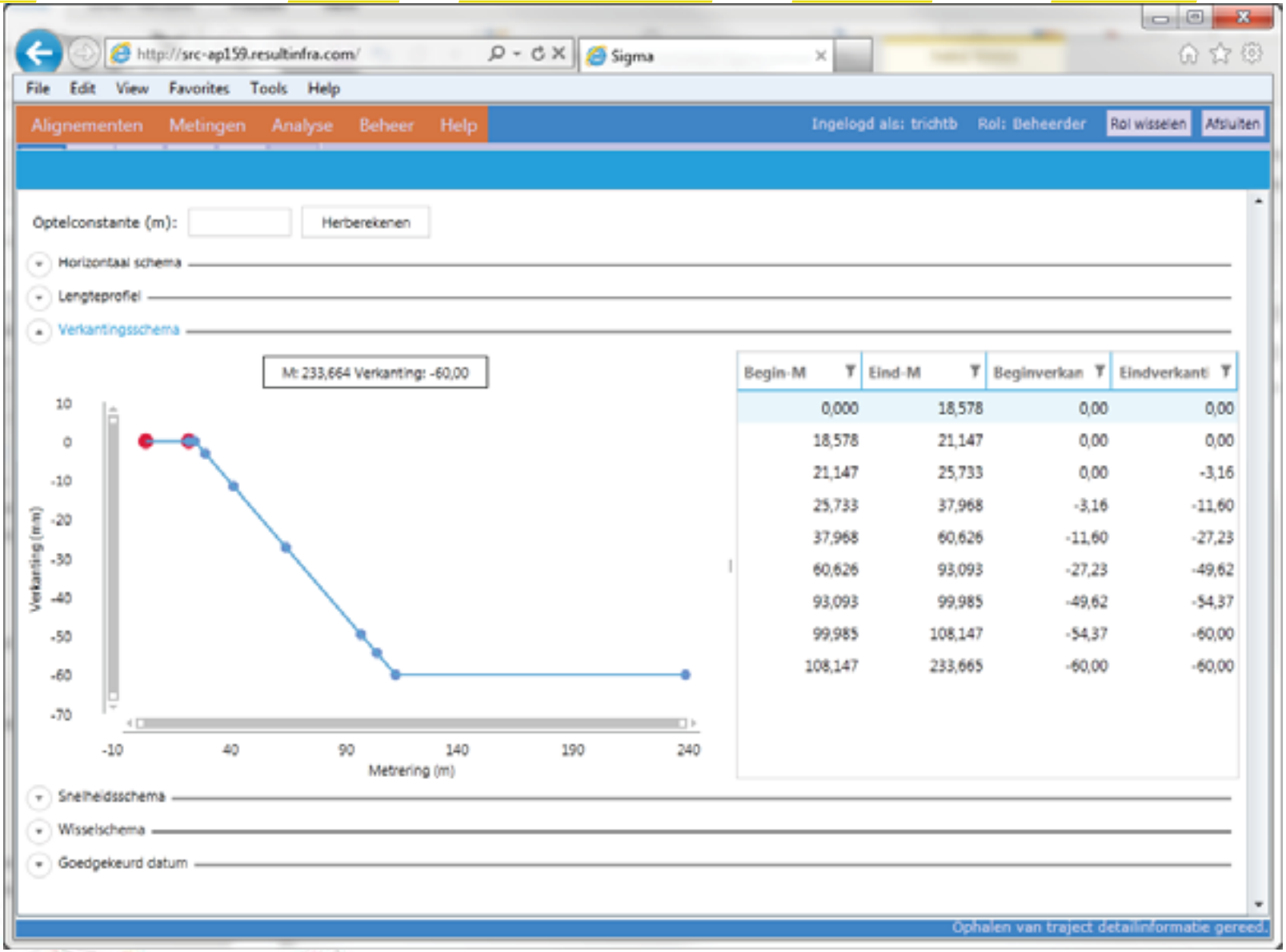
http://src-ap159.resultinfra.com/
Sigma
File Edit View Favorites Tools Help
Alignementen Metingen Analyse Beheer Help
Ingelogd als: trichtb Rol: Beheerder
Rol wisselen
Afsluiten
Optelconstante (m):
Herberekenen
Horizontaal schema
Lengteprofiel
Verkantingsschema
M: 233,664 Verkanting: -60,00
Verkanting (mm)
10
0
-10
-20
-30
-40
-50
-60
-70
-10
40
90
140
190
240
Metrering (m)
Begin-M
Eind-M
Beginverkan
Eindverkanti
0,000 18,578 0,00 0,00
18,578 21,147 0,00 0,00
21,147 25,733 0,00 -3,16
25,733 37,968 -3,16 -11,60
37,968 60,626 -11,60 -27,23
60,626 93,093 -27,23 -49,62
93,093 99,985 -49,62 -54,37
99,985 108,147 -54,37 -60,00
108,147 233,665 -60,00 -60,00
Snelheidsschema
Wisselschema
Goedgekeurd datum
Ophalen van traject detailinformatie gereed.

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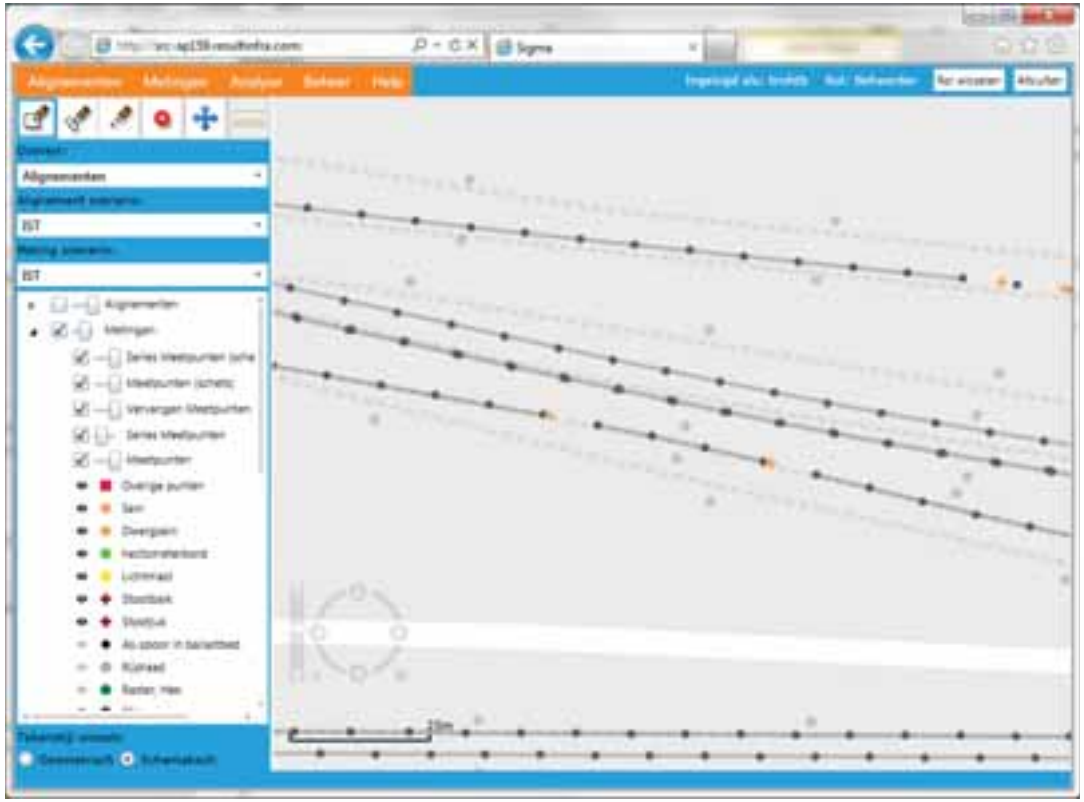
Survey data

Measuring of track geometry

- XY of centerline rail
- Z of lowest rail
- cant



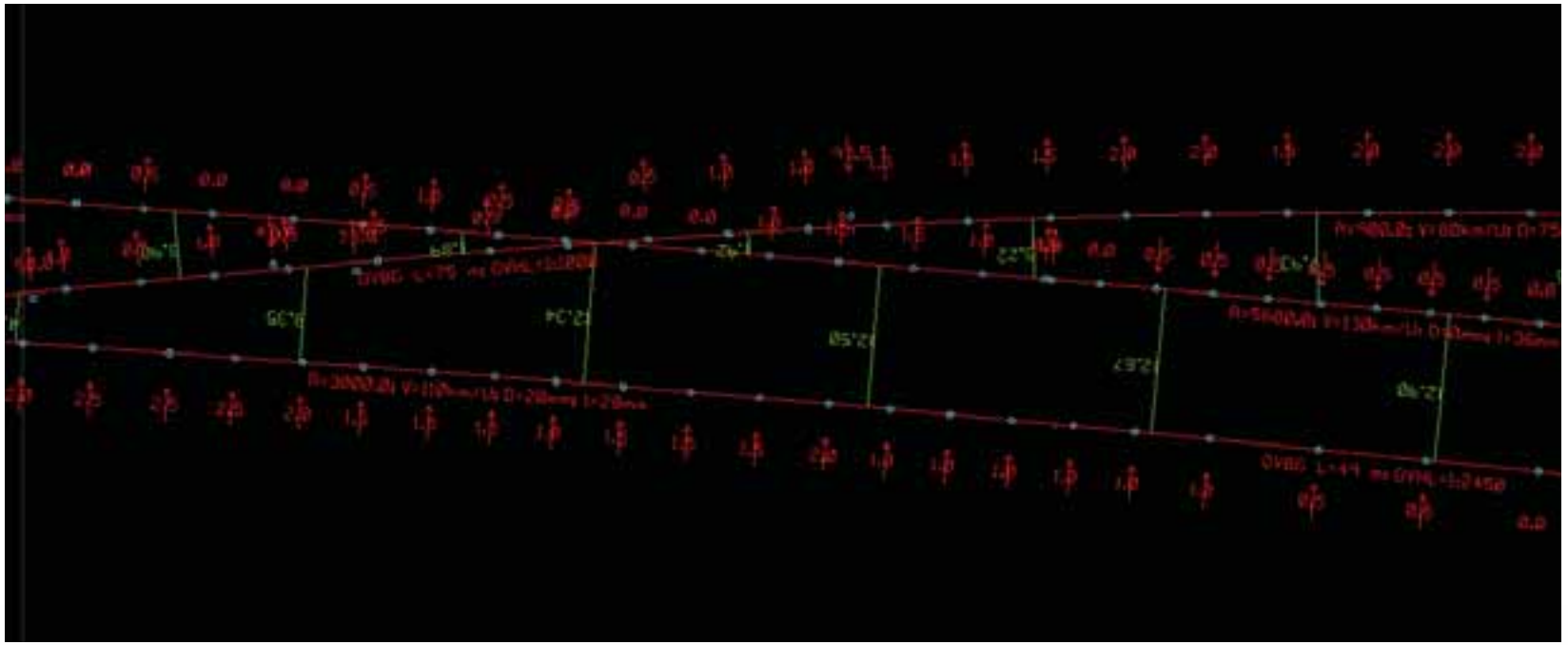
Products / Analyses

Asset Management
- CAD drawings
- Analysis alignment – measurement value

Planned:
- Deviation of design rules
- Trend analysis

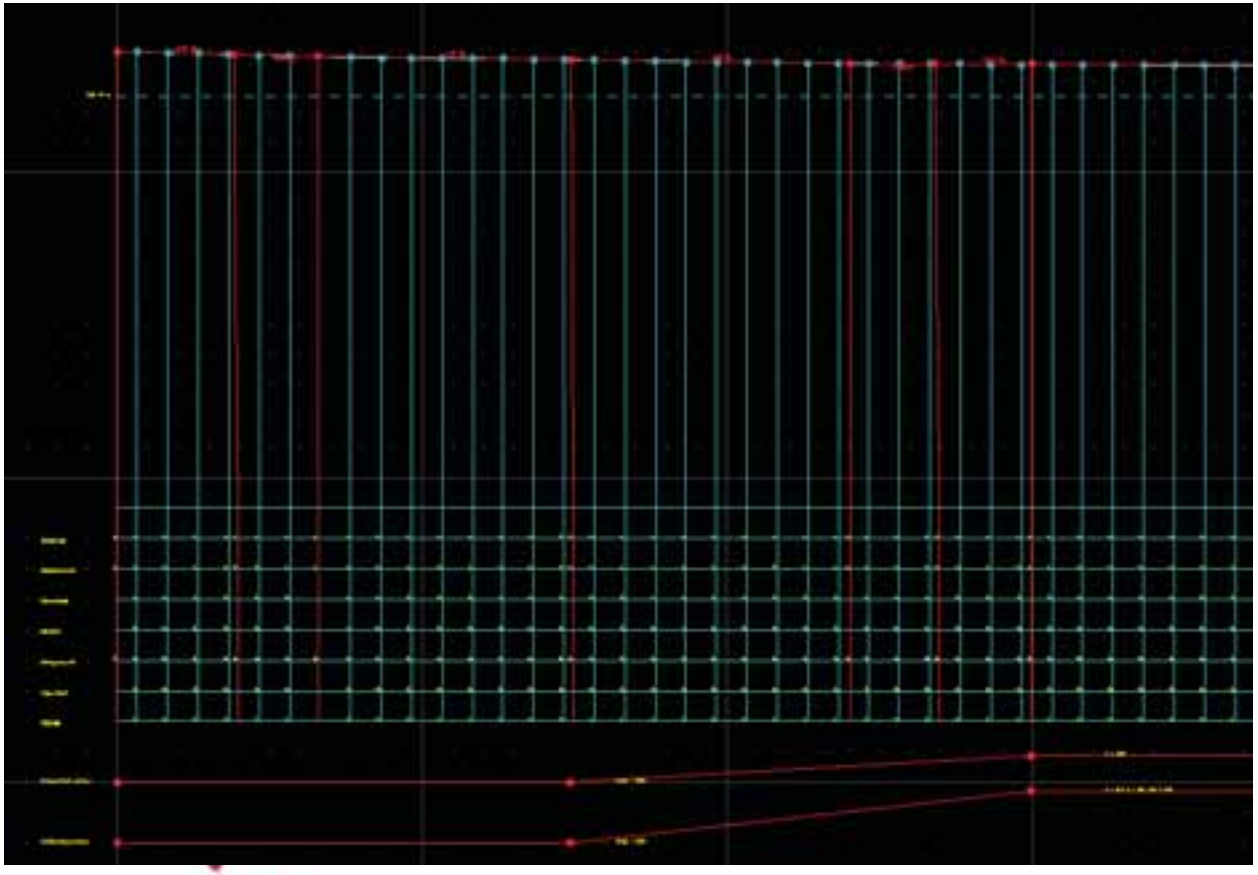
Products / Analyses

“Schift” drawing



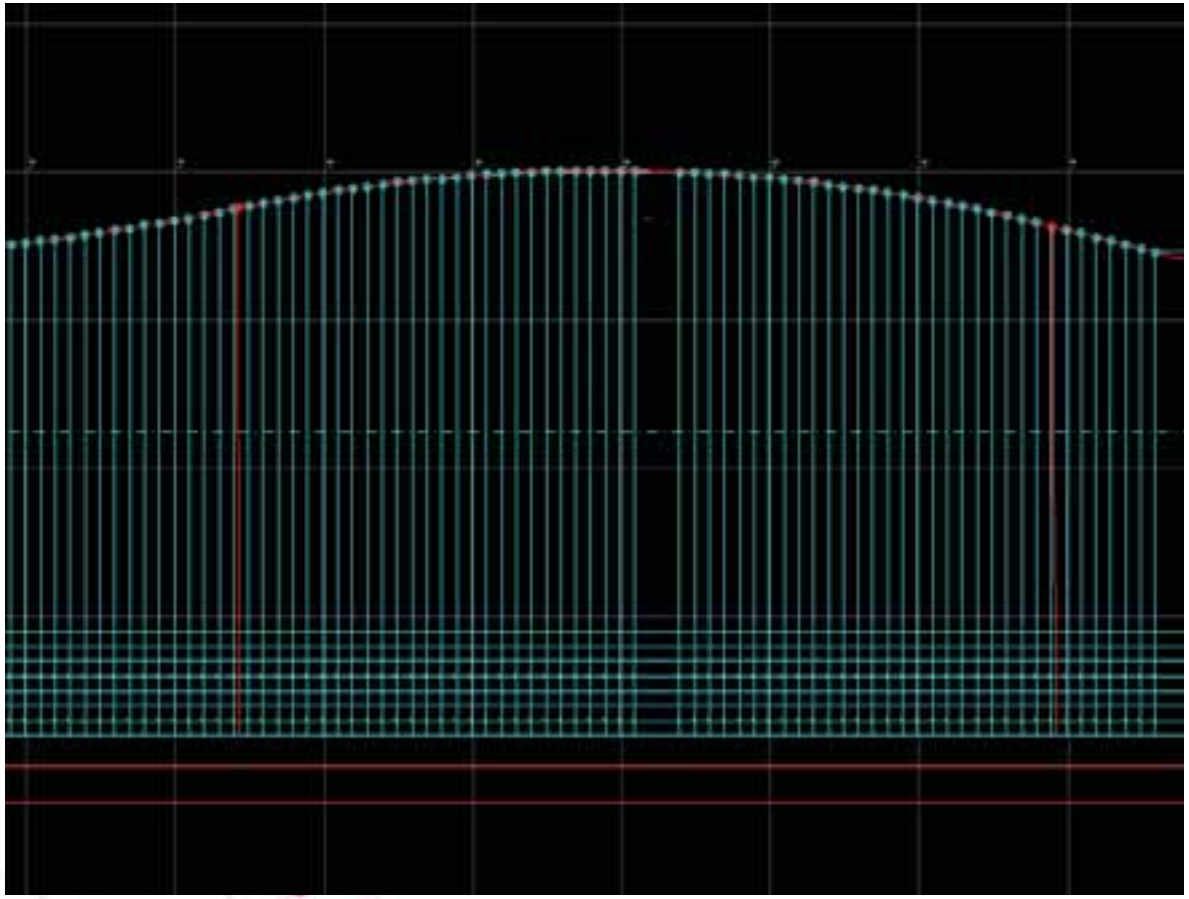
Products / Analyses

“Licht” drawing



Products / Analyses

“Licht” drawing



Products / Analyses

Analysis alignment vs measurement value

	A	B	C	D	E	F	G	H	I	J
1	M	Puntcode	Subtype	ElementT	M(horizor	Afstand	AfstandBi	Lengte	LengteBin	VerticaalT
2	0.118	1012		Boog	0.118	0.007	Ja	0	Ja	Rechtsta
3	4.897	1012		Boog	4.897	0.01	Ja	0	Ja	Rechtsta
4	9.757	1012		Boog	9.757	0.005	Ja	0	Ja	Rechtsta
5	14.53	1012		Boog	14.53	0.004	Ja	0	Ja	Rechtsta
6	19.362	1012		Boog	19.362	0.003	Ja	0	Ja	Rechtsta
7	24.139	1012		Boog	24.139	0.003	Ja	0	Ja	Rechtsta
8	28.994	1012		Boog	28.994	0.002	Ja	0	Ja	Boog
9	34.944	1012		Boog	34.944	0.014	Ja	0	Ja	Rechtsta
10	41.003	1012		Boog	41.003	0.014	Nee	0	Ja	Rechtsta
11	47.085	1012		Boog	47.085	0.018	Nee	0	Ja	Rechtsta
12	52.712	7041		Boog	52.712	-1.749	Nee	0	Ja	Rechtsta
13	52.733	7041		Boog	52.733	-1.728	Nee	0	Ja	Rechtsta
14	53.073	1012		Boog	53.073	0.014	Ja	0	Ja	Rechtsta
15	58.788	7041		Boog	58.788	-1.733	Nee	0	Ja	Rechtsta
16	59.108	1012		Boog	59.108	0.012	Nee	0	Ja	Rechtsta
17	64.487	1012		Boog	64.487	0.012	Nee	0	Ja	Rechtsta
18	64.727	7041		Boog	64.727	-1.727	Nee	0	Ja	Rechtsta
19	69.917	1012		Boog	69.917	0.012	Nee	0	Ja	Rechtsta
20	70.663	7041		Boog	70.663	-1.726	Nee	0	Ja	Rechtsta
21	75.927	1012		Boog	75.927	0.01	Nee	0	Ja	Rechtsta
22	76.606	7041		Boog	76.606	-1.721	Nee	0	Ja	Rechtsta
23	81.925	1012		Overgang	4.002	0.009	Nee	0	Ja	Rechtsta
24	82.551	7041		Overgang	4.628	-1.71	Nee	0	Ja	Rechtsta
25	87.94	1012		Overgang	10.017	0.011	Nee	0	Ja	Rechtsta
26	88.585	7041		Overgang	10.662	-1.715	Nee	0	Ja	Rechtsta

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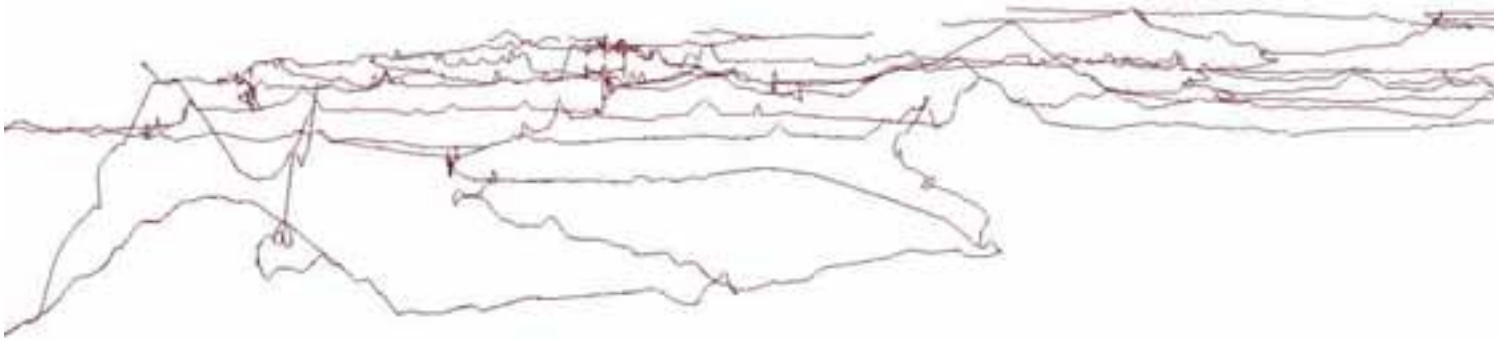
Products / Analyses

Internal ProRail customers

- GIS services (map and feature services)
- ERTMS
- Sound Check
- Incident management



The road ahead

SIGMA delivers track geometry data to ProRail users and contractors:
designs (alignments) and survey data (measurement values)

More use of GIS data and functionality in ProRail business processes

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From IT to business

IT:

- Highly accurate (3D) data to authentic base data.
- Single source and multi use.

Business:

- Fulfill INSPIRE in the future
- Improving the common operational picture (COP) of the rail network and its users

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Single source, multi use

Asset Management

(virtual)
Assets

SIGMA

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Single source, multi use

Asset Management

- Railmaps
- 3D calculations
- Asset management in general
- ERP connection
- ALSO: extend with real time statusses

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Looking at real time…

Operations and control

(virtual)
Trains
(+others)

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Next step to take

Asset Management

Operations and control

(virtual)
Assets

(virtual)
Trains
(+others)

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Real time information

- Incident management
- Operations and control
- Predictive analysis
- Capacity analysis

Maintainance

Planning

(virtual)
Assets

Real time data

Real time data

(virtual)
Trains
(+others)

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So what do we need?

(Virtual) Assets:
- 3D Rail data (SIGMA)
- Track switches (incl. real time status)
- Signals (incl. real time status)
- Network topology
- Schematics

(Virtual) Trains and Others:
- Real time locations
- Front and rear side
- ID
- Status (speed, content)
- Operator

Real time data processing:
- Both assets and trains
- External data
  - Also public data; surprises a lot of people!

Views:
- Geographical vs Schematic
- Scale

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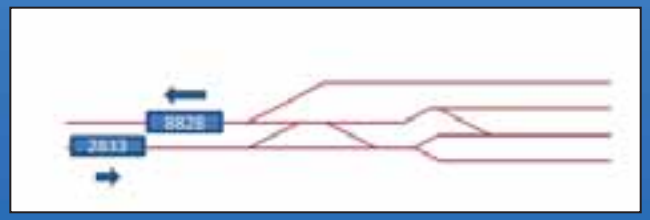
Geographical

Schematics

Large scale



zoom

zoom

Small scale

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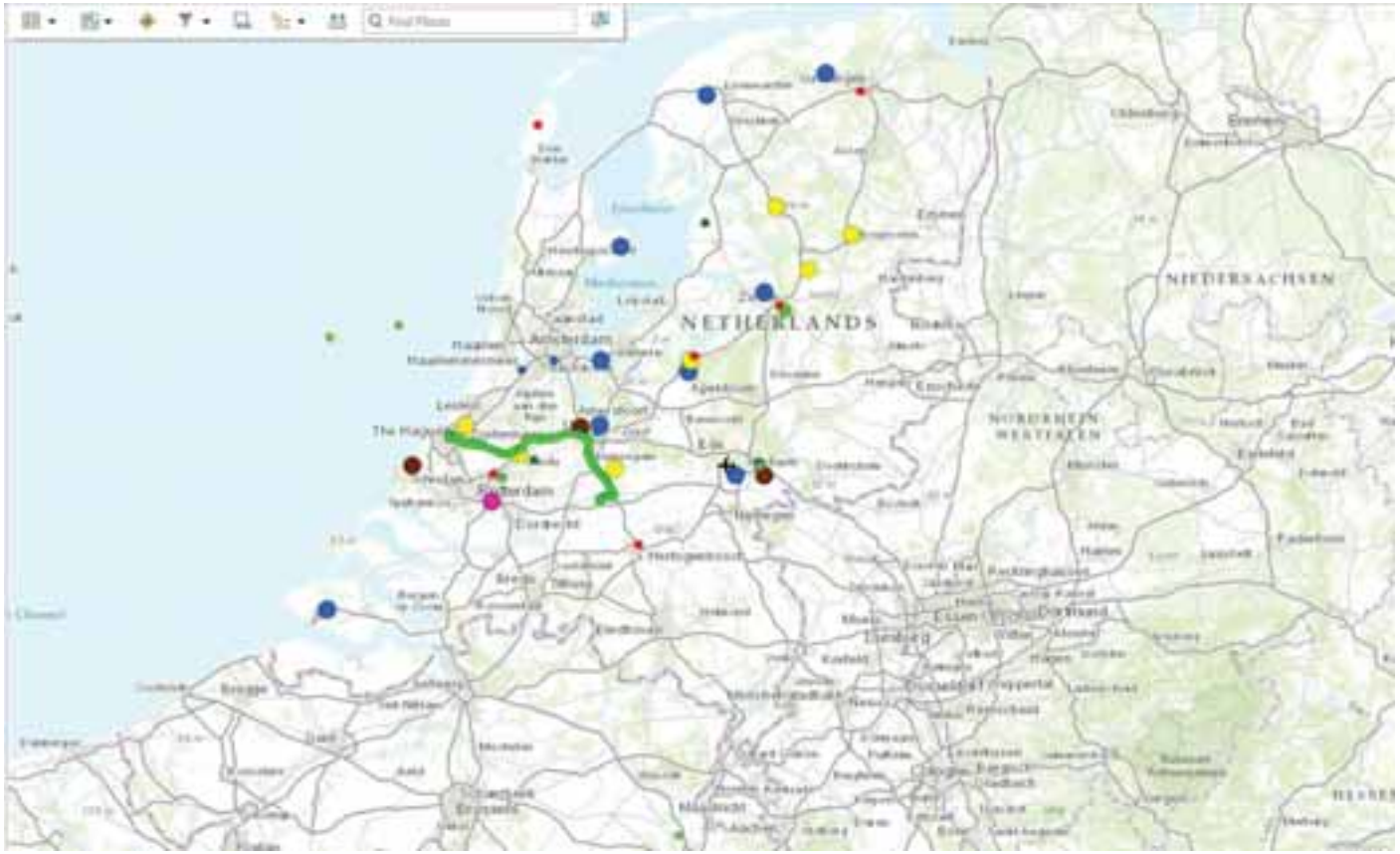
Operational view



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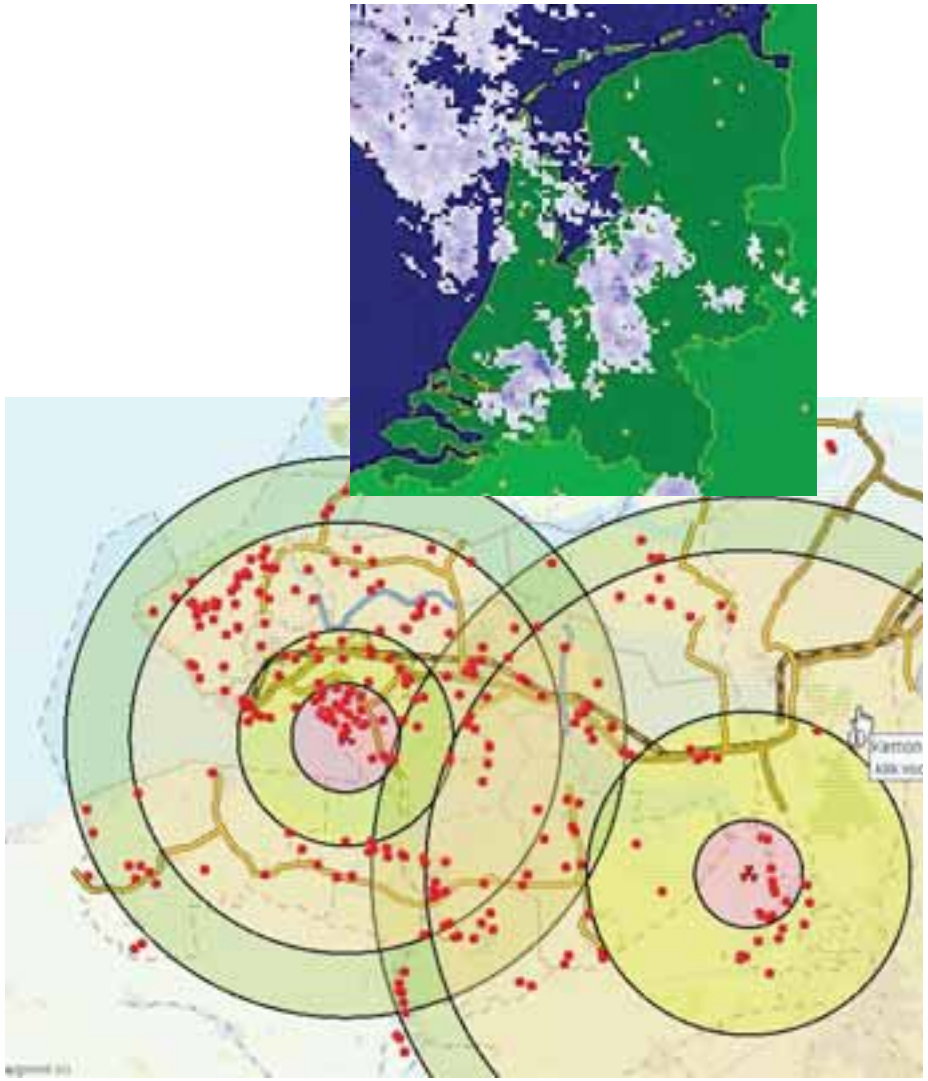
Possibilities

Combinations:

- Built up area's
- Meteo (rain and snow) and other public data
- Other crisis management systems (sensitive area's)

Add on functionality:

- Warnings
- Exchange of information with and from field workers
- KPI's real time



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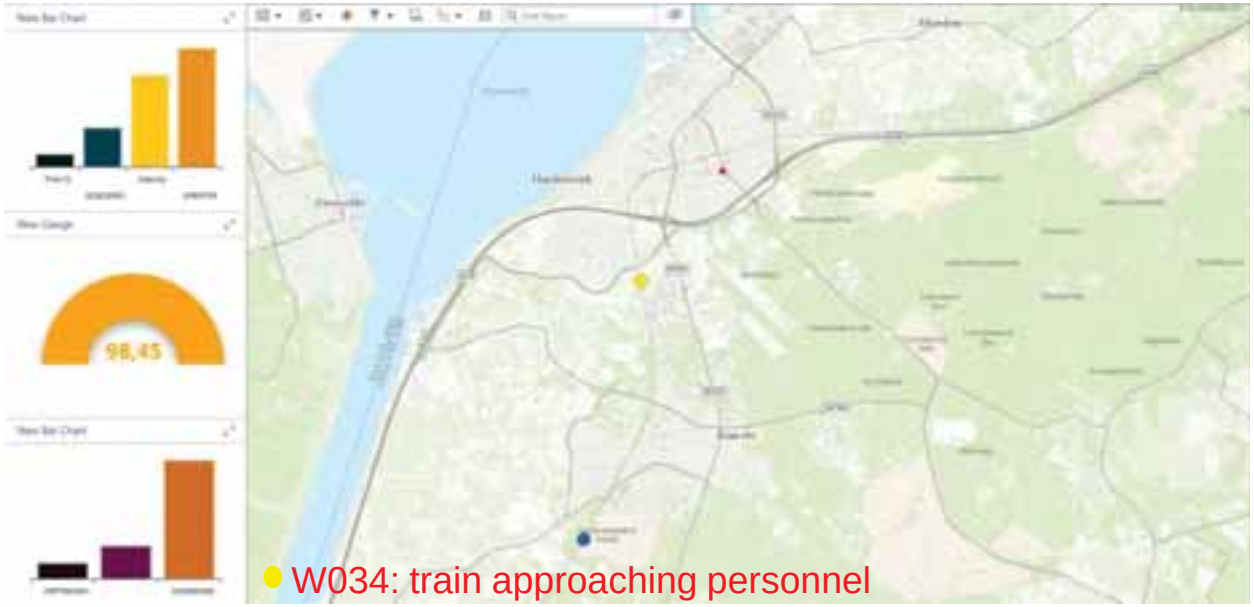
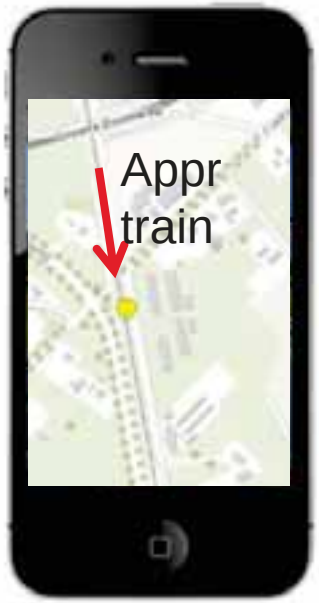
From operations view to app



Warnings and views



Updates

Mobile:

- using own location
- Operational view
- Data of assets close to you
- Adding data (i.e. inspection report or status)

What are we doing right now

- PoC's for:
  - Crisis teams
  - Real time location of trains
  - Dashboards for operations (COP)
- MEAP platforms for mobile
- Going from Silverlight to HTML5
- Changing SIGMA into authentic base registry

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What is suprising?

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