

Project Infrastructure Modell Open track

Building a national network

Themes

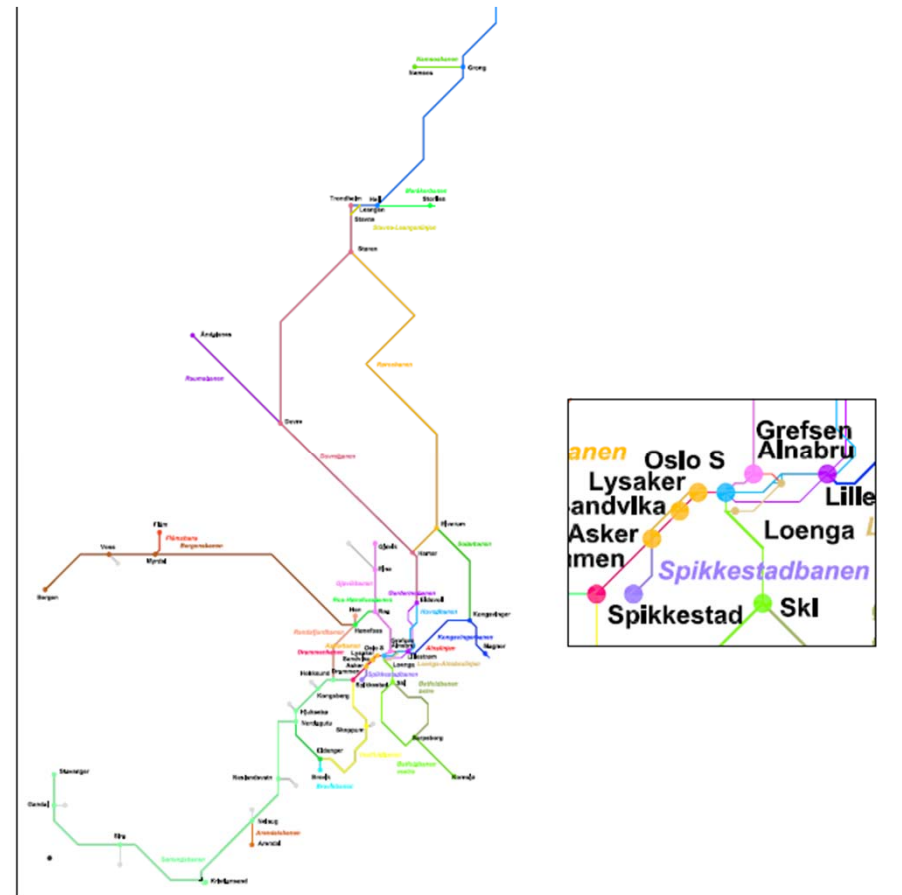
1. Project scope
2. Knowledge fase
3. Production fase
 1. IVT generator
4. Publishing fase
5. Maintenance and development fase

Opentrack usage in Jernbaneverket Capacity group

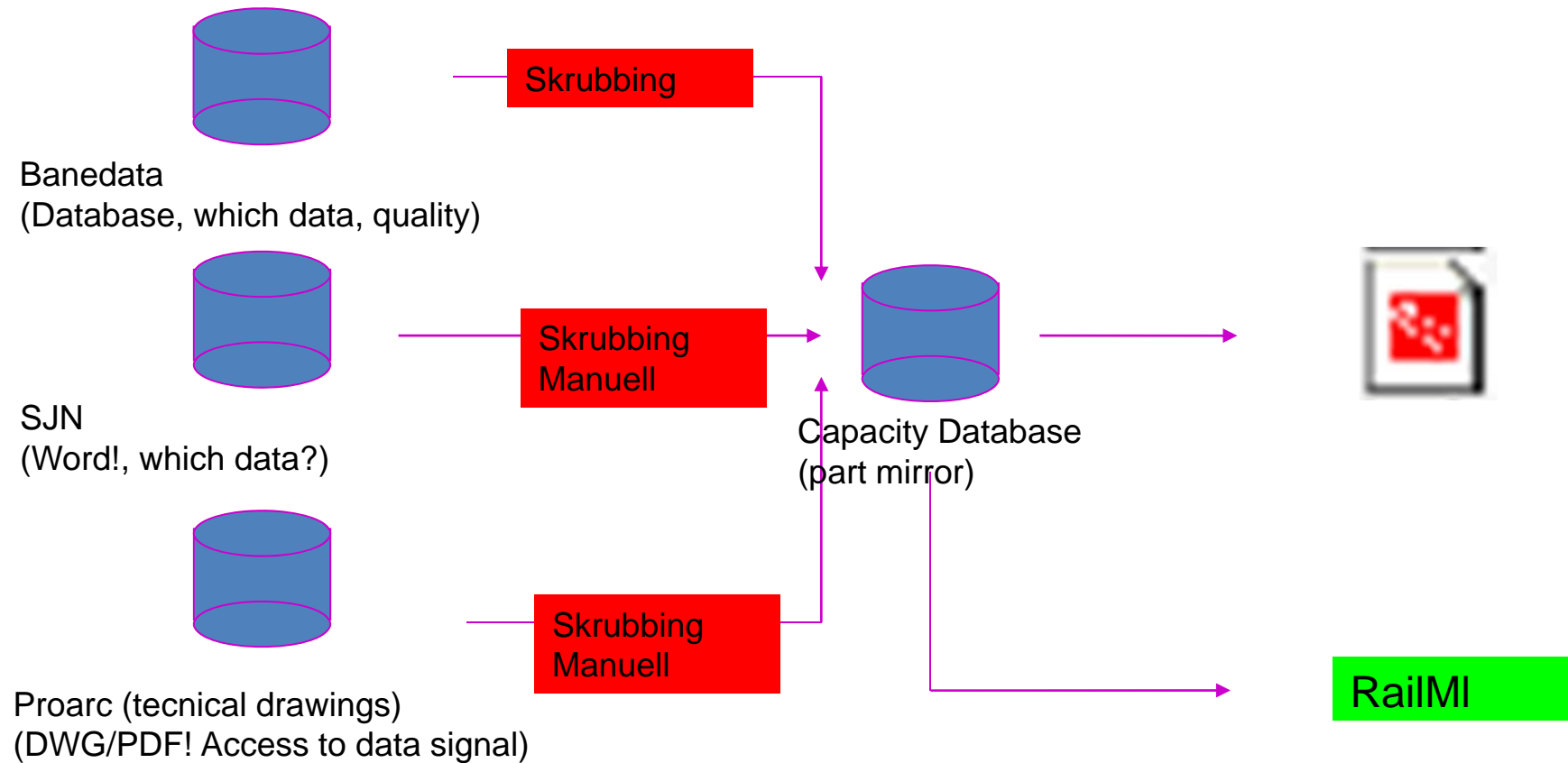
- running time calculation
- signal concept tests (headway, capacity)
 - current status (release points)
 - capacity improvements (resignalling)
 - planed lines (signal concept)
- macro model for strategic timetable
 - today: some construction/modification
 - future: construction in TPS/other tool and test in Opentrack
- timetable stability and punctality testing

Project order

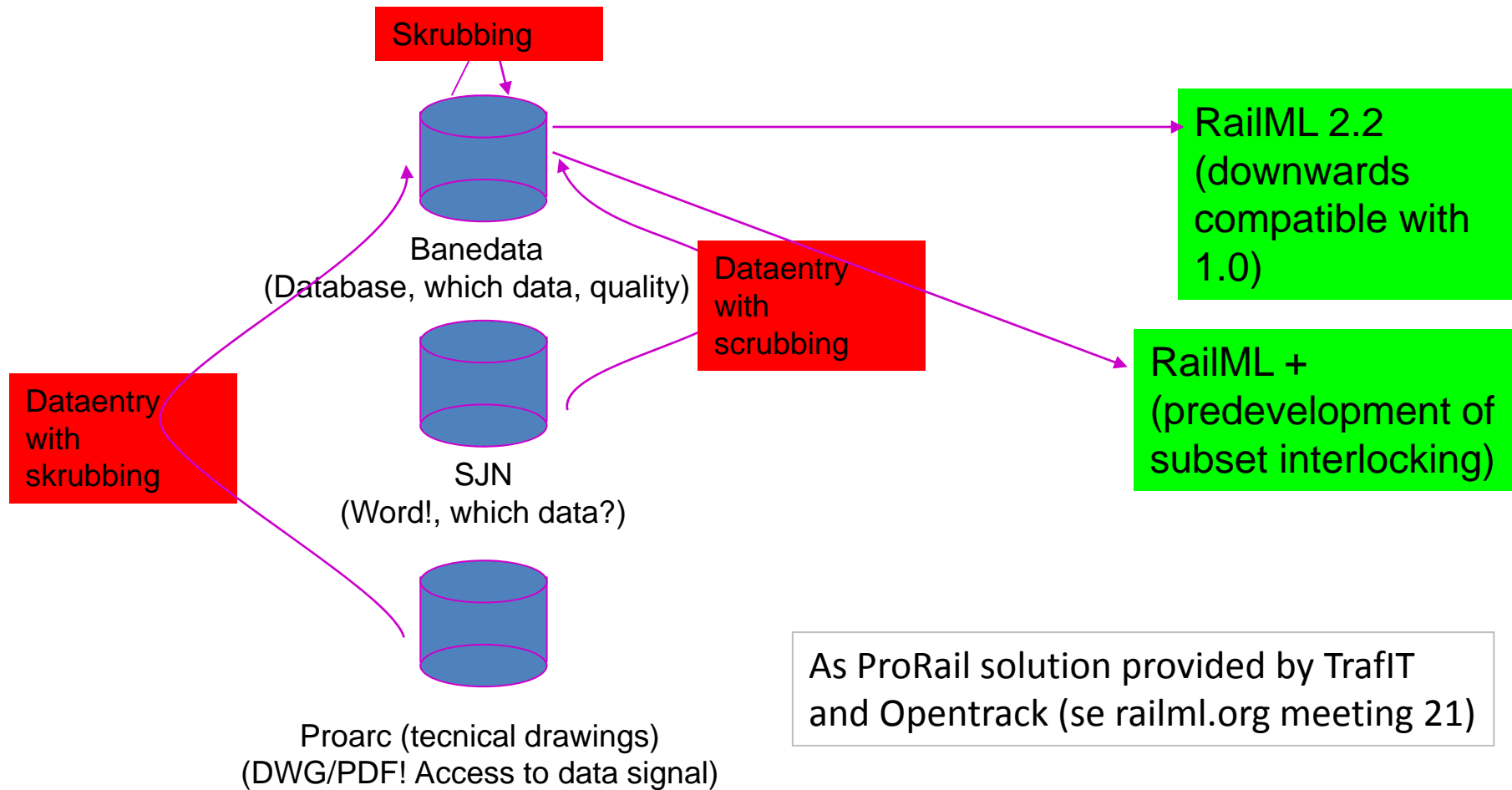
- national network (4154 km of that 241 km double track, 339 stations)
- Lines and station track with routes or as routes
- Detail level for correct representation of driving/traffic behaviour within 96% accuracy.



Datasources for the Datasheets – 1. idea



Datasources for the Datasheets – 2. idea



Datainterface formats Opentrack

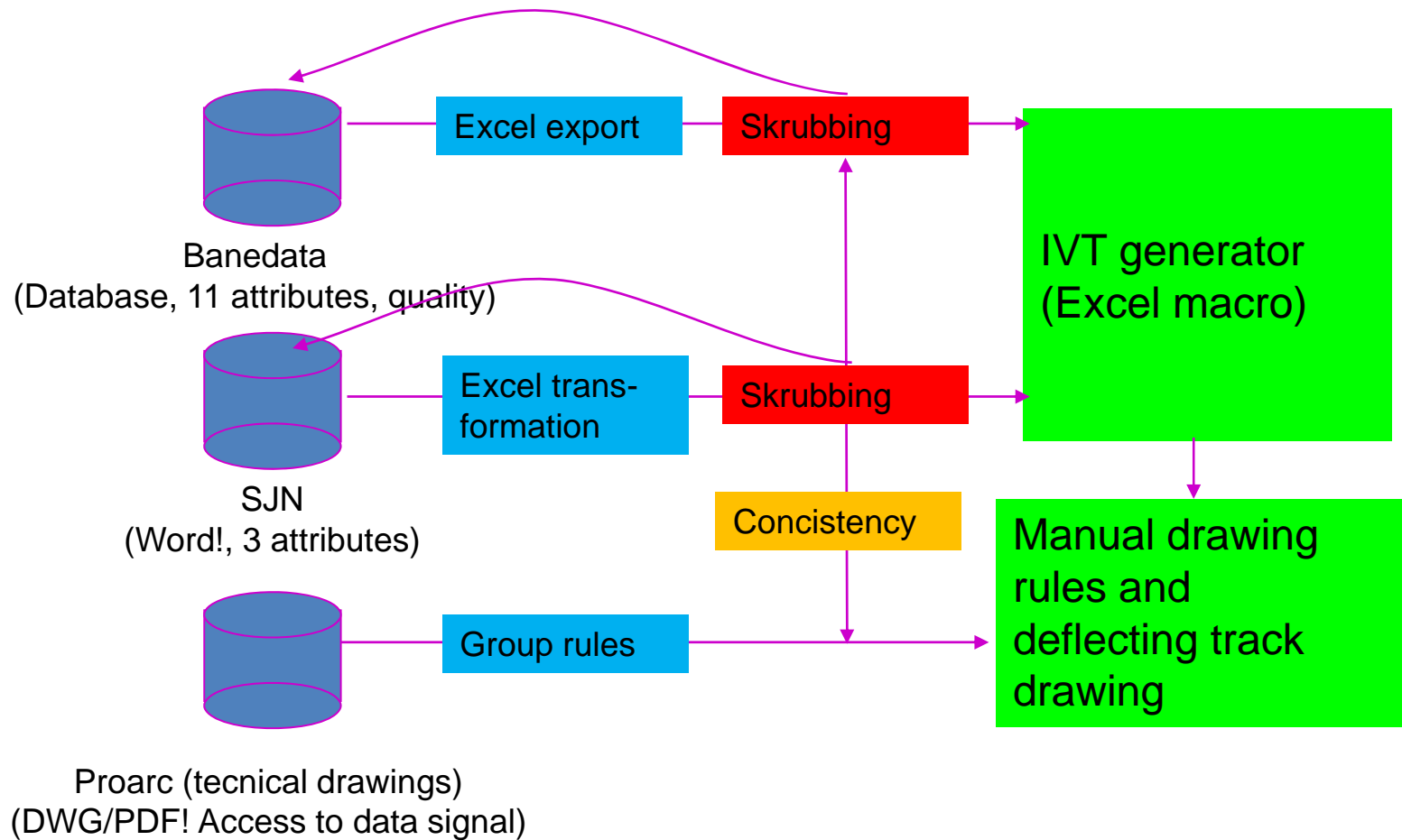
- RailMI
- TrenoMI
- Text
- Not available

Courses

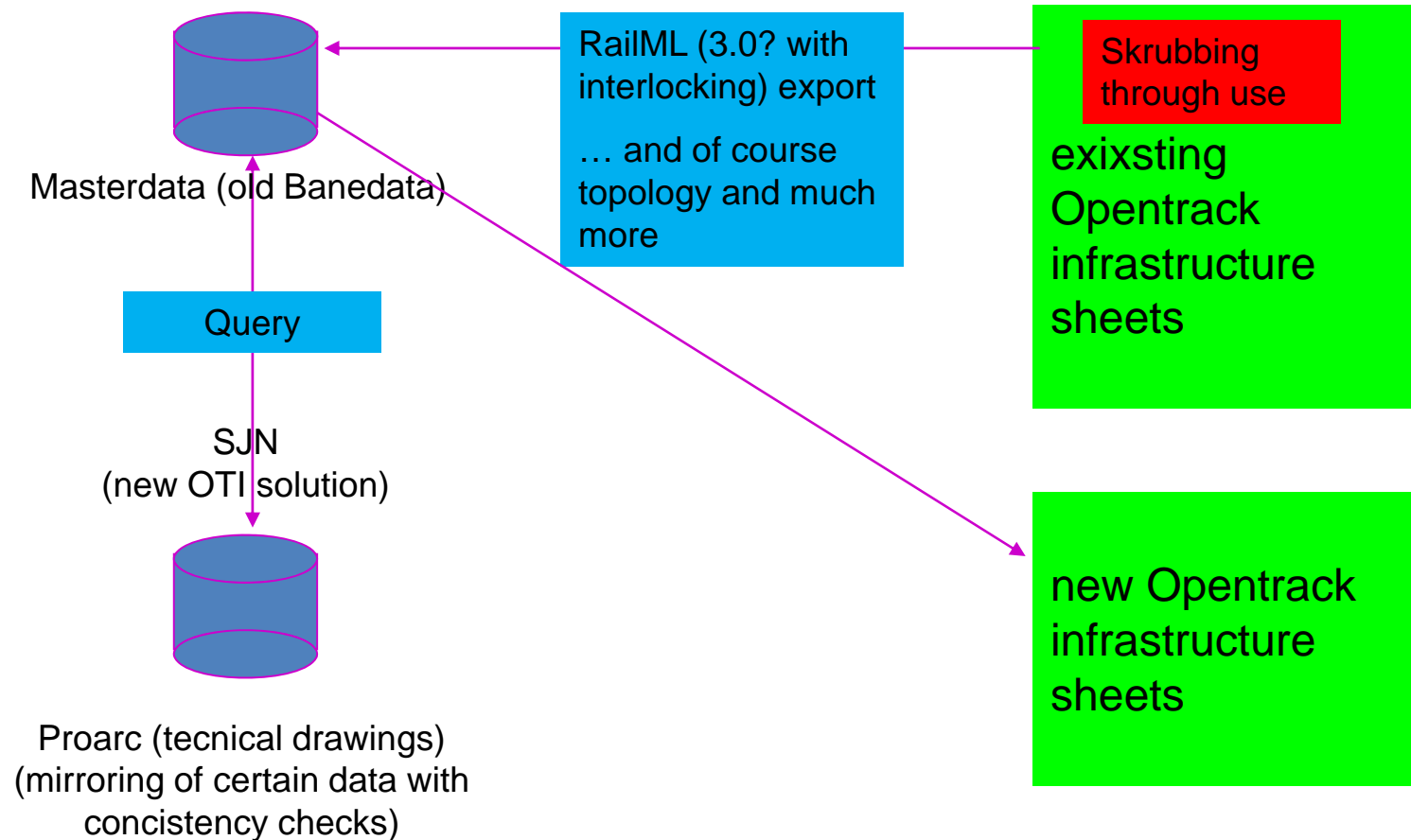
- itinerary 1- n
- path 1- n
- route 1- n
- Infrastructure 1
- Infrastructure 2
- Infrastructure n

Distributions Stations Rolling stock Trains Engines Timetable

Datasources for the Datasheets – 3. idea (final)

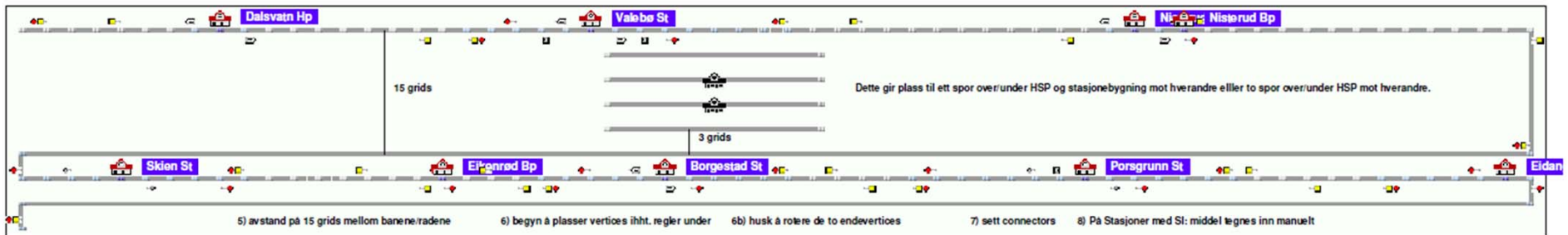
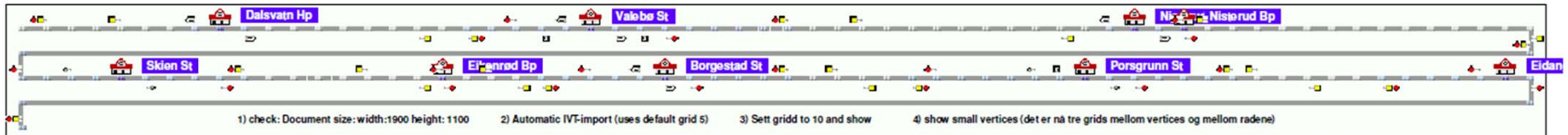


Datasources for the Datasheets – 4. idea (future)



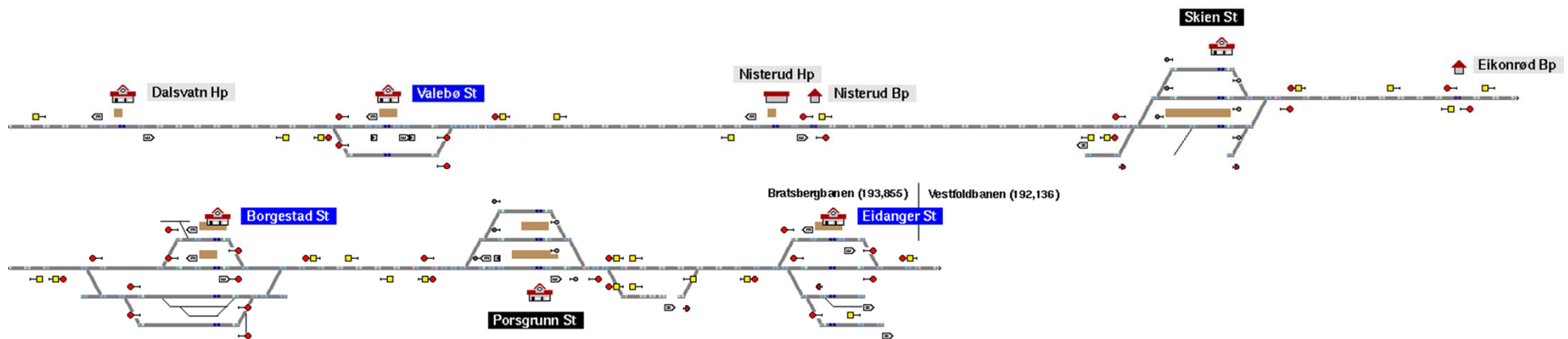
Production fase

Drawing rules



Production fase

Drawing rules



How Jernbaneverket imported its infrastructure data
into OpenTrack using the IVT format

Importing infrastructure data from the format IVT

The infrastructure data must be in the form of ASCII-text data (tab separated) with the following format:

- 1) Position [m]
- 2) Name of node (vertex) in ascending direction (optional)
- 3) Name of node (vertex) in descending direction (optional)
- 4) Location (Kilometre-post) of node (vertex) in ascending direction (optional)
- 5) Location (Kilometre-post) of node (vertex) in descending direction (optional)
- 6) Speed limit (speed 1) in ascending direction [km/h]
- 7) Speed limit (speed 2) in ascending direction [km/h]
- 8) Speed limit (speed 3) in ascending direction [km/h]
- 9) Speed limit (speed 4) in ascending direction [km/h]
- 10) Speed limit (speed 1) in descending direction [km/h]
- 11) Speed limit (speed 2) in descending direction [km/h]
- 12) Speed limit (speed 3) in descending direction [km/h]
- 13) Speed limit (speed 4) in descending direction [km/h]
- 14) Gradient [%]
- 15) Curve radius (0 for straight track) [m]
- 16) Tunnel type (optional) [string, using words from OpenTrack-Inspector (e.g. Tunnel single, smooth) and/or the value of the tunnel factor (e.g. 2.7); no data indicates that the track segment is type: No tunnel]
- 17) Signal type in ascending direction (optional) [string, using words from OpenTrack Signal Inspector (e.g. Main/Distant Signal); no data indicates that this node has no signal]
- 18) Signal type in descending direction (optional) - see above.
- 19) Station name (optional) [String, the same used in the OpenTrack-Station tool (e.g. Basel SBB)]

IVT import

l	lengde	navn up	navn down	km up	km down	spe	spe	spe	spe	spe	spe	spe	spe	gra	rad	tur	signal up	signal down	station
20	149000	HAS (ned 148,025)	HAS (opp)	149	149	75	80	80	110	120	120	10							
21	149492	HAS (opp)	HAS (ned 150,423)	149,492	149,492	115	115	115	75	80	80	10							
22	149690	01_HSA (451)		149,6901	149,6901				115	115	115	7					Main/Distant Signal - Home Signal		
23	150011	SPV-1 1:9 V		150,011	150,011				115	115	115	0							
24	150073		01_HSL (454)	150,0726	150,0726				115	115	115	0						Main Signal - Exit Signal	
25	150120	Aspedammen stasjc	Aspedammen stasjc	150,12	150,12				115	115	115	0					STOP		Aspedammen St
26	150855	01_HSM (453)		150,855	150,855				115	115	115	4					Main Signal - Exit Signal		
27	150934	SPV-2 1:12 H		150,9343	150,9343				115	115	115	5						Main/Distant Signal - Home Signal	
28	151496		01_HSB (452)	151,496	151,496				115	115	115	2						Main/Distant Signal - Home Signal	
29	152714		01_FSB (452)	152,714	152,714				115	115	115	3						Distant Signal	
30	154655	HAS (ned 153,78)	HAS (opp)	154,655	154,655	80	85	85	115	115	115	0							
31	154982	HBP	HBP	154,9817	154,9817				80	85	85	-8							
32	157252	HAS (ned 156,702)	HAS (opp)	157,252	157,252	75	80	80	80	85	85	1							
33	157907	01_FSA (477)		157,9066	157,9066				75	80	80	8					Distant Signal		
34	158639	HAS (opp)	HAS (ned 159,51)	158,639	158,639	90	100	100	75	80	80	7							
35	158996	01_HSA (477)	01_HSB (458)	158,9962	158,9962				90	100	100	10					Main Signal - Block Signal	Main Signal - Block Signal	Prestebakke Br
36	160099		01_FSB (458)	160,0992	160,0992				90	100	100	6						Distant Signal	
37	161625	HAS (ned 160,975)	HAS (opp)	161,625	161,625	75	80	80	90	100	100	7							
38	162462	HBP	HBP	162,4624	162,4624				75	80	80	-10							
39	165350	HAS (opp)	HAS (ned 166,4)	165,35	165,35	110	120	120	75	80	80	-4							
40	166250	LBP	LBP	166,2503	166,2503				110	120	120	5							
41	166587	HBP	HBP	166,5871	166,5871				110	120	120	-7							
42	167103	HAS (ned 166,378)	HAS (opp)	167,103	167,103	100	100	100	110	120	120	-8							
43	167637	01_FSA (471)		167,6367	167,6367				100	100	100	-2					Distant Signal		
44	168427	HAS (ned 167,602)	HAS (opp)	168,427	168,427	55	65	65	100	100	100	-10							
45	168508	01_HSA (471)		168,5075	168,5075				80	80	80	-10					Main/Distant Signal - Home Signal		
46	168874	SPV-1 1:9 H		168,874	168,874				80	80	80	-4							
47	168937		01_HSL (474)	168,9373	168,9373				80	80	80	-4						Main Signal - Exit Signal	
48	168980	STOP		168,98	168,98				80	80	80	0						STOP	
49	169120	Kornsjo stasjon	Kornsjo stasjon	169,12	169,12				80	80	80	0							Kornsjo St
50	169196	STOP		169,196	169,196				80	80	80	1					STOP		
51	169357		ATC REP REP FSM 47	169,3574	169,3574				80	80	80	1						balise	
52	169665	01_HSM (473)		169,6648	169,6648				80	80	80	0					Main Signal - Exit Signal		
53	169729		SPV-2 1:9 V	169,729	169,729				80	80	80	-2							
54	169778	HAS (opp)		169,778	169,778	80	80	80	80	80	80	-2							

Categories

- **Signal** – Main signals and distant signals
- **ATC** – Information about repetition balises
- **Block post** – Where we have block posts
- **Station** – Centre of station area
- **Point switch** – Where switches are located
- **Stop** – Position of stops outside of station areas
- **Platform** – Where main platform starts and ends
- **Speed** – Normal(normal), Pluss(additional), Krenge(tilt)
- **Connection** – Changes in kilometre value
- **Tunnel** – Where tunnels start and ends
- **Vertical** – Height measuring points

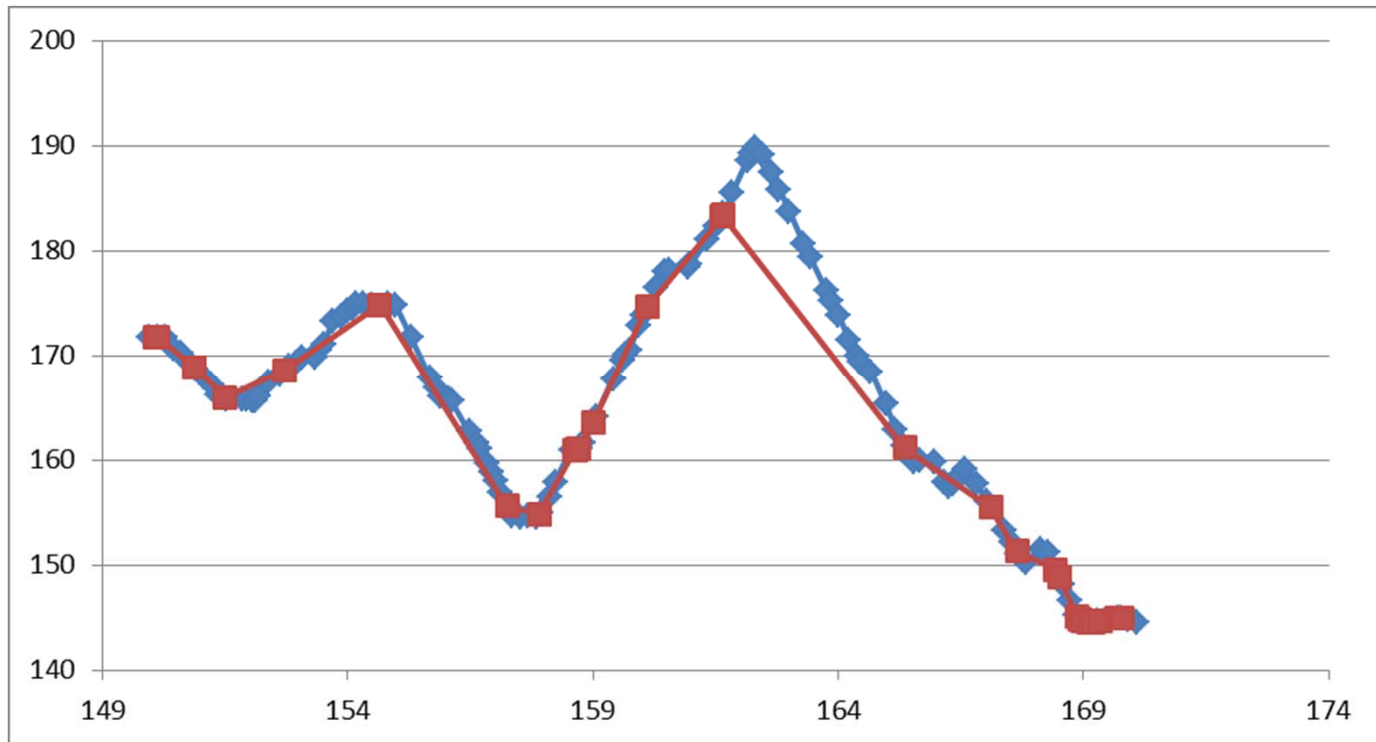
Norwegian infrastructure data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Lokasjon	Beskrivelse	Fra	Sportype	Spc	Hastighet (km/t)	Plusskastig	Krenget	Skiltavstand	Retningskode (Stigende/syn)	Bane	Merknad (langbeskrivelse)	Has opp/
3785	0560-05220	Hastighet, Km93,852--, Fredriksta	93,852	Hovedspor	1	120		10		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3786	0560-05220	Hastighet, Km94,596--, Fredriksta	94,596	Hovedspor	1	105		5		0	Hastighet stigende km	Østfoldbanen vestre linje	ned
3787	0560-05220	Hastighet, Km95,291--, Fredriksta	95,291	Hovedspor	1	40		0		695	Hastighet synkende km	Østfoldbanen vestre linje	ned
3788	0560-00007	Hastighet, Km95,713--, Fredriksta	95,713	Hovedspor	1	105		25		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3789	0560-00007	Hastighet, Km95,965--, Fredriksta	95,965	Hovedspor	1	105		5		252	Hastighet synkende km	Østfoldbanen vestre linje	ned
3790	0560-00007	Hastighet, Km97,066--, Fredriksta	97,066	Hovedspor	1	70		0		500	Hastighet stigende km	Østfoldbanen vestre linje	ned
3791	0560-05240	Hastighet, Km97,566--, Lisleby sta	97,566	Hovedspor	1	105		25		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3792	0560-05240	Hastighet, Km98,031--, Lisleby sta	98,031	Hovedspor	1	130		0		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3793	0560-00008	Hastighet, Km98,534--, Lisleby - R	98,534	Hovedspor	1	70		0		503	Hastighet synkende km	Østfoldbanen vestre linje	ned
3794	0560-05245	Hastighet, Km101,522--, Rolvsøy s	101,522	Hovedspor	1	70		0		504	Hastighet stigende km	Østfoldbanen vestre linje	opp
3795	0560-00009	Hastighet, Km102,056--, Rolvsøy -	102,056	Hovedspor	1	130		0		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3796	0560-00009	Hastighet, Km103,356--, Rolvsøy -	103,356	Hovedspor	1	105		0		0	Hastighet stigende km	Østfoldbanen vestre linje	ned
3797	0560-00009	Hastighet, Km103,873--, Rolvsøy -	103,873	Hovedspor	1	70		0		517	Hastighet synkende km	Østfoldbanen vestre linje	ned
3798	0560-00009	Hastighet, Km104,072--, Rolvsøy -	104,072	Hovedspor	1	130		0		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3799	0560-00009	Hastighet, Km104,326--, Rolvsøy -	104,326	Hovedspor	1	105		0		254	Hastighet synkende km	Østfoldbanen vestre linje	ned
3800	0560-00009	Hastighet, Km105,818--, Rolvsøy -	105,818	Hovedspor	1	95		5		527	Hastighet stigende km	Østfoldbanen vestre linje	ned
3801	0560-05260	Hastighet, Km106,345--, Sandesun	106,345	Hovedspor	1	130		0		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3802	0560-05260	Hastighet, Km106,826--, Sandesun	106,826	Hovedspor	1	95		25		0	Hastighet stigende km	Østfoldbanen vestre linje	ned
3803	0560-05260	Hastighet, Km107,079--, Sandesun	107,079	Hovedspor	1	95		5		253	Hastighet synkende km	Østfoldbanen vestre linje	ned
3804	0560-00010	Hastighet, Km108,307--, Sandesun	108,307	Hovedspor	1	60		0		500	Hastighet stigende km	Østfoldbanen vestre linje	ned
3805	0560-05271	Hastighet, Km108,807--, Sarpsborg	108,807	Hovedspor	1	95		25		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3806	0560-05271	Hastighet, Km109,298--, Sarpsborg	109,298	Hovedspor	1	60		0		0	Hastighet synkende km	Østfoldbanen vestre linje	ned
3807	0560-05271	Hastighet, Km110,196--, Sarpsborg	110,196	Hovedspor	1	50				350	Hastighet stigende km	Østfoldbanen vestre linje	ned
3808	0560-05271	Hastighet, Km110,546--, Sarpsborg	110,546	Hovedspor	1	60				0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3809	0560-05271	Hastighet, Km110,967--, Sarpsborg	110,967	Hovedspor	1	50				0	Hastighet synkende km	Østfoldbanen vestre linje	ned
3810	0560-05271	Hastighet, Km111,02--, Sarpsborg	111,02	Hovedspor	1	120		5		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3811	0560-05271	Hastighet, 111,166, Sarpsborg stas	111,166	Hovedspor	1	80		5		0	Hastighet synkende km	Østfoldbanen vestre linje	ned
3812	0560-05271	Hastighet, 111,59, Sarpsborg stasj	111,59	Hovedspor	1	80		5		0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3813	0560-05271	Hastighet, 111,626, Sarpsborg stas	111,626	Hovedspor	1	60		0		460	Hastighet stigende km	Østfoldbanen vestre linje	ned
3814	0560-05271	Hastighet, Km111,645--, Sarpsborg	111,645	Hovedspor	1	120		5		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3815	0570-00001	Hastighet, Km112,52--, Sarpsborg	112,52	Hovedspor	1	50		5		875	Hastighet synkende km	Østfoldbanen vestre linje	ned
3816	0570-00001	Hastighet, Km115,35--, Sarpsborg	115,35	Hovedspor	1	130				0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3817	0570-00001	Hastighet, Km115,95--, Sarpsborg	115,95	Hovedspor	1	120		5		600	Hastighet synkende km	Østfoldbanen vestre linje	ned
3818	0570-00001	Hastighet, Km117,875--, Sarpsborg	117,875	Hovedspor	1	100		5		925	Hastighet stigende km	Østfoldbanen vestre linje	ned
3819	0570-05430	Hastighet, Km118,8--, Skjeberg sta	118,8	Hovedspor	1	130				0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3820	0570-05430	Hastighet, Km119,484--, Skjeberg	119,484	Hovedspor	1	100		5		0	Hastighet stigende km	Østfoldbanen vestre linje	ned
3821	0570-05430	Hastighet, Km120,432--, Skjeberg	120,432	Hovedspor	1	130		5		0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3822	0570-00002	Hastighet, Km121,302--, Skjeberg	121,302	Hovedspor	1	95		5		1000	Hastighet stigende km	Østfoldbanen vestre linje	ned
3823	0570-00002	Hastighet, Km121,382--, Skjeberg	121,382	Hovedspor	1	100		5		1898	Hastighet synkende km	Østfoldbanen vestre linje	opp
3824	0570-00002	Hastighet, Km122,302--, Skjeberg	122,302	Hovedspor	1	130				0	Hastighet synkende km	Østfoldbanen vestre linje	opp
3825	0570-00002	Hastighet, Km123,84--, Skjeberg -	123,84	Hovedspor	1	130				0	Hastighet stigende km	Østfoldbanen vestre linje	opp
3826	0570-00002	Hastighet, Km124,84--, Skjeberg -	124,84	Hovedspor	1	95		5		1000	Hastighet synkende km	Østfoldbanen vestre linje	ned
3827	0570-05440	Hastighet, Km125,59--, Ingedal sta	125,59	Hovedspor	1	100				900	Hastighet stigende km	Østfoldbanen vestre linje	opp
3828	0570-05440	Hastighet, Km126,49--, Ingedal sta	126,49	Hovedspor	1	130		5		0	Hastighet synkende km	Østfoldbanen vestre linje	opp

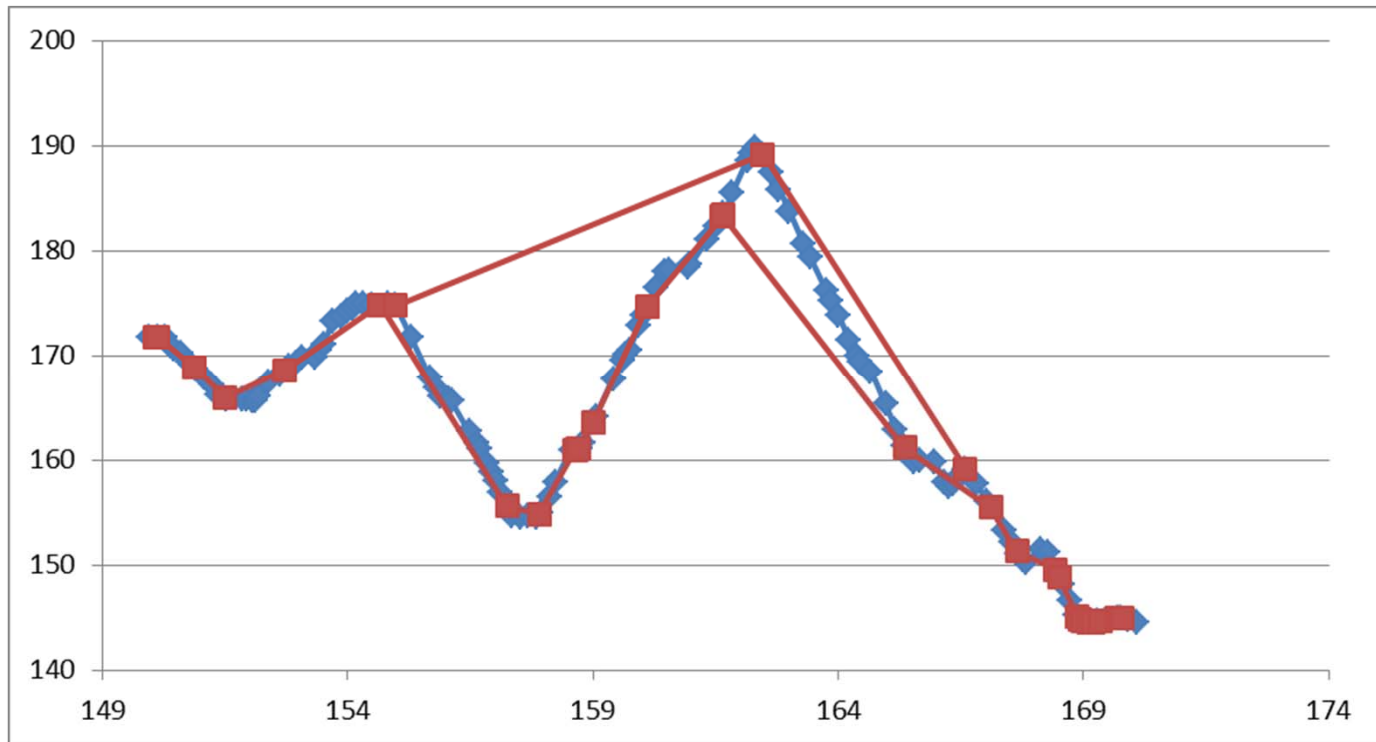
IVT import

1	lengde	navn up	navn down	km up	km down	spé	spé	spé	spé	spé	spé	spé	spé	gra	rad	tur	signal up	signal down	station
20	149000	HAS (ned 148,025)	HAS (opp)	149	149	75	80	80		110	120	120		10					
21	149482	HAS (opp)	HAS (ned 150,432)	149,482	149,482	115	115	115		75	80	80		10					
22	149690	01_HSA (451)		149,6901	149,6901					115	115	115		7			Main/Distant Signal - Home Signal		
23	150011	SPV-1 1:9 V		150,011	150,011					115	115	115		0					
24	150073		01_HSL (454)	150,0726	150,0726					115	115	115		0				Main Signal - Exit Signal	
25	150120	Aspedammen stasjc	Aspedammen stasjc	150,12	150,12					115	115	115		0			STOP		Aspedammen St
26	150855	01_HSM (453)		150,855	150,855					115	115	115		-4			Main Signal - Exit Signal		
27	150934		SPV-2 1:12 H	150,9343	150,9343					115	115	115		-5					
28	151496		01_HSB (452)	151,496	151,496					115	115	115		2				Main/Distant Signal - Home Signal	
29	152714		01_FSB (452)	152,714	152,714					115	115	115		3				Distant Signal	
30	154655	HAS (ned 153,78)	HAS (opp)	154,655	154,655	80	85	85		115	115	115		0					
31	154982	HBP	HBP	154,9817	154,9817					80	85	85		-8					
32	157252	HAS (ned 156,702)	HAS (opp)	157,252	157,252	75	80	80		80	85	85		-1					
33	157907	01_FSA (477)		157,9066	157,9066					75	80	80		8			Distant Signal		
34	158639	HAS (opp)	HAS (ned 159,51)	158,639	158,639	90	100	100		75	80	80		7					
35	158996	01_HSA (477)	01_HSB (458)	158,9962	158,9962					90	100	100		10			Main Signal - Block Signal	Main Signal - Block Signal	Prestebakke Bp
36	160099		01_FSB (458)	160,0992	160,0992					90	100	100		6				Distant Signal	
37	161625	HAS (ned 160,975)	HAS (opp)	161,625	161,625	75	80	80		90	100	100		7					
38	162462	HBP	HBP	162,4624	162,4624					75	80	80		-10					
39	165350	HAS (opp)	HAS (ned 166,4)	165,35	165,35	110	120	120		75	80	80		-4					
40	166250	LBP	LBP	166,2503	166,2503					110	120	120		5					
41	166587	HBP	HBP	166,5871	166,5871					110	120	120		-7					
42	167103	HAS (ned 166,378)	HAS (opp)	167,103	167,103	100	100	100		110	120	120		-8					
43	167637	01_FSA (471)		167,6367	167,6367					100	100	100		-2			Distant Signal		
44	168427	HAS (ned 167,602)	HAS (opp)	168,427	168,427	55	65	65		100	100	100		-10					
45	168508	01_HSA (471)		168,5075	168,5075					80	80	80		-10			Main/Distant Signal - Home Signal		
46	168874	SPV-1 1:9 H		168,874	168,874					80	80	80		-4					
47	168937		01_HSL (474)	168,9373	168,9373					80	80	80		-4				Main Signal - Exit Signal	
48	168980		STOP	168,98	168,98					80	80	80		0				STOP	
49	169120	Kornsjø stasjon	Kornsjø stasjon	169,12	169,12					80	80	80		0					Kornsjø St
50	169196	STOP		169,196	169,196					80	80	80		1			STOP		
51	169357		ATC REP REP FSM 47	169,3574	169,3574					80	80	80		1				balise	
52	169665	01_HSM (473)		169,6648	169,6648					80	80	80		0			Main Signal - Exit Signal		
53	169729		SPV-2 1:9 V	169,729	169,729					80	80	80		-2					
54	169778	HAS (opp)		169,778	169,778	80	80	80		80	80	80		-2					

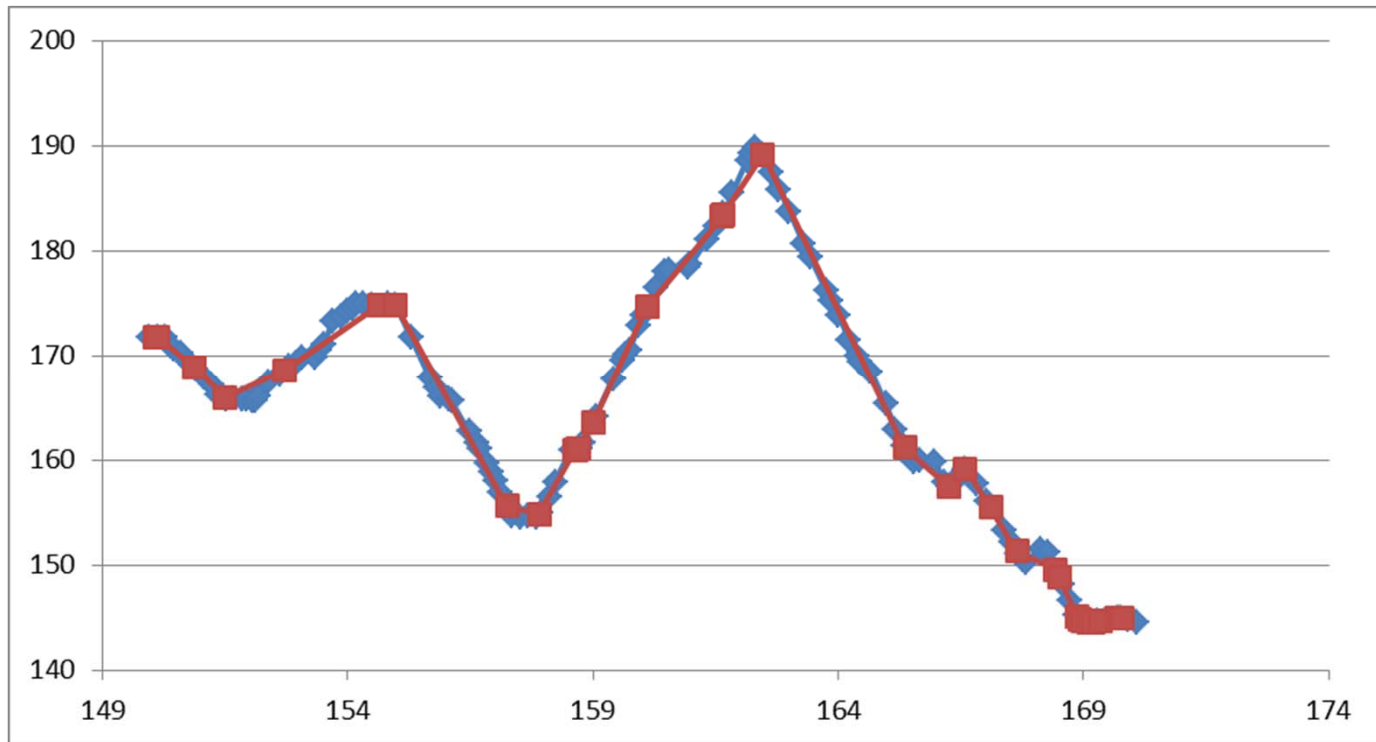
Vertical calculation



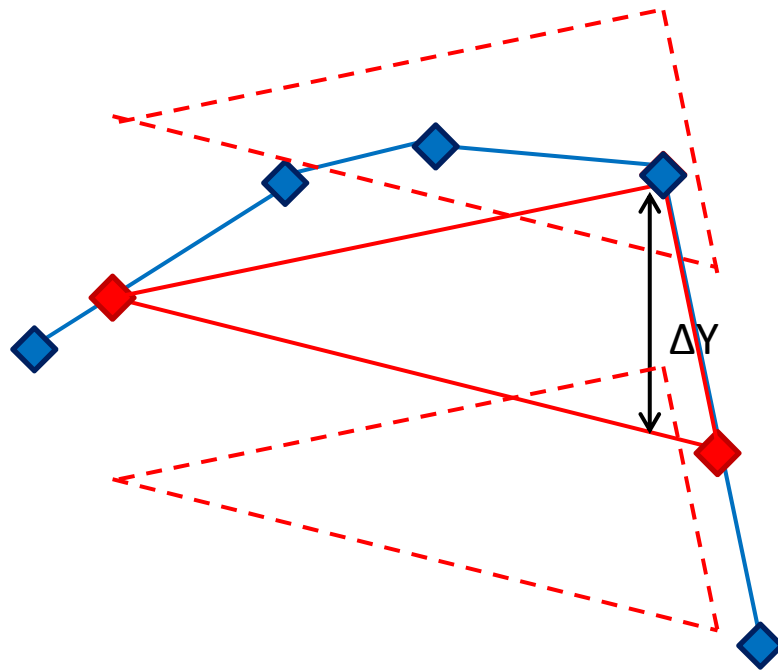
Vertical calculation



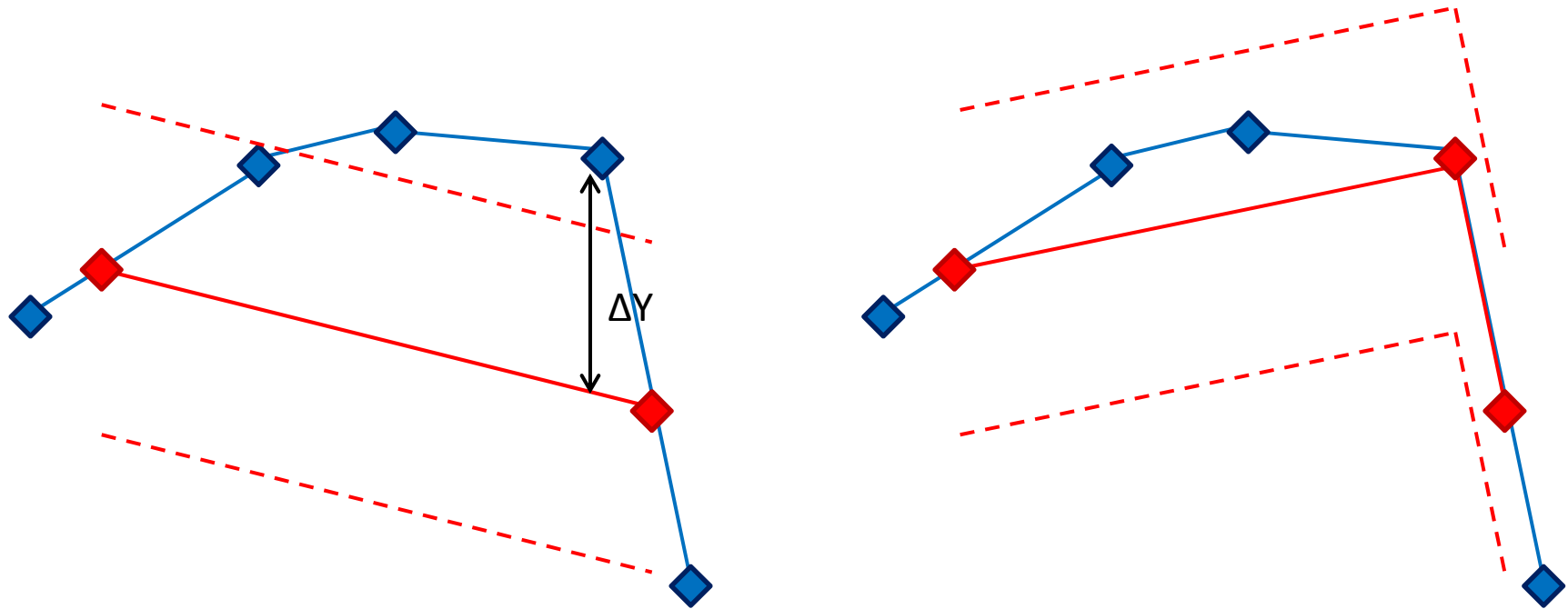
Vertical calculation



Vertical calculation



Vertical calculation



www.jbv.no/railml

Maintenance:

OT as a separate Database of its own with no mirroring demands manual maintenance through list observance.

Development:

this year: planned lines up to 2023 through IVT generator/manual drawing → watch for tender TED in two weeks!

Future: Railml (2.2+int/3.0 generator) → future tender for Railml generator (eksport/import)