



*Rail traffic Explorer
& Simulationbooster*

G. Medeossi & G.Longo

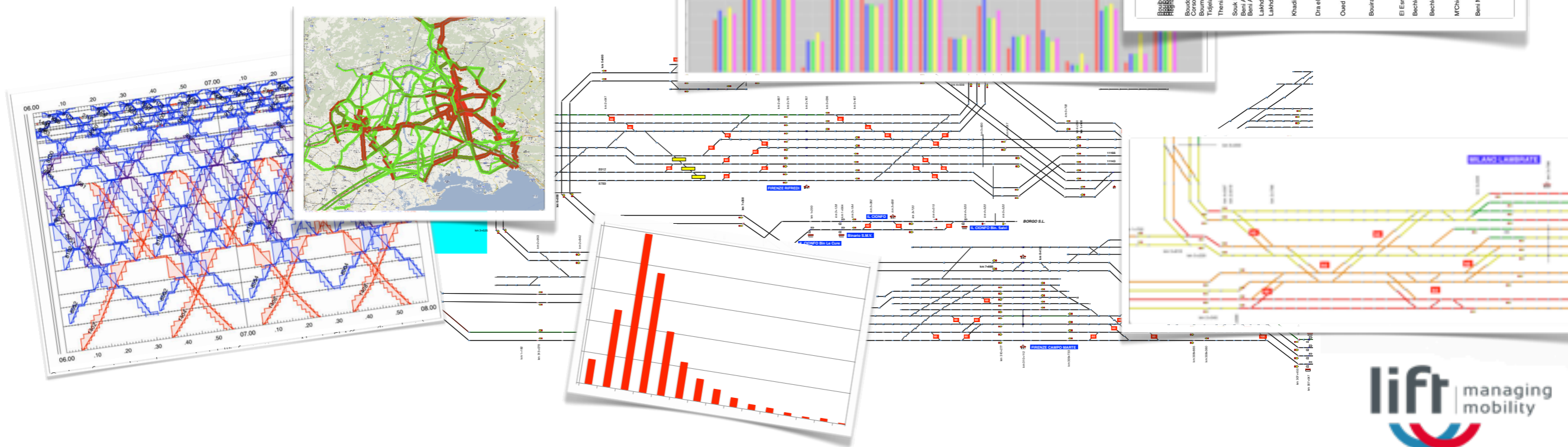
LIFT - Spin-off of the University of Trieste

Studies

- Infrastructure Planning
- Timetables
- Punctuality & Robustness
- Temporary Timetables

Software Products

- TRENOAnalysis
- TRENOExport



References

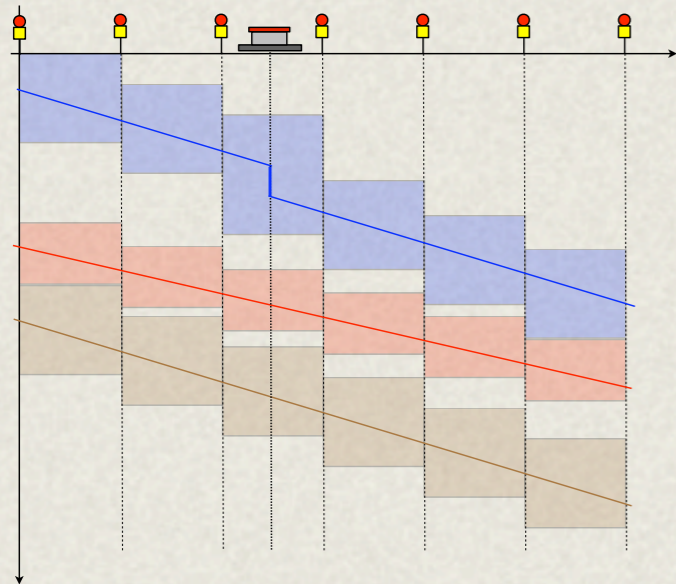


in Italy

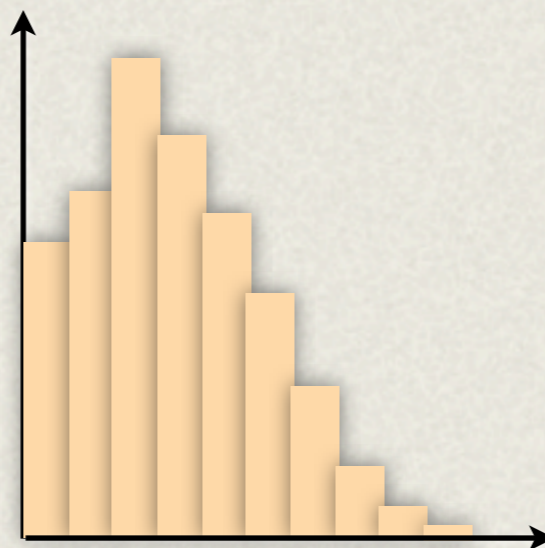
international

- Croatia
- Serbia & Montenegro
- France
- The Netherlands
- Norway
- Chile
- Argentina
- Perù
- Brasil
- Algeria
- Egypt

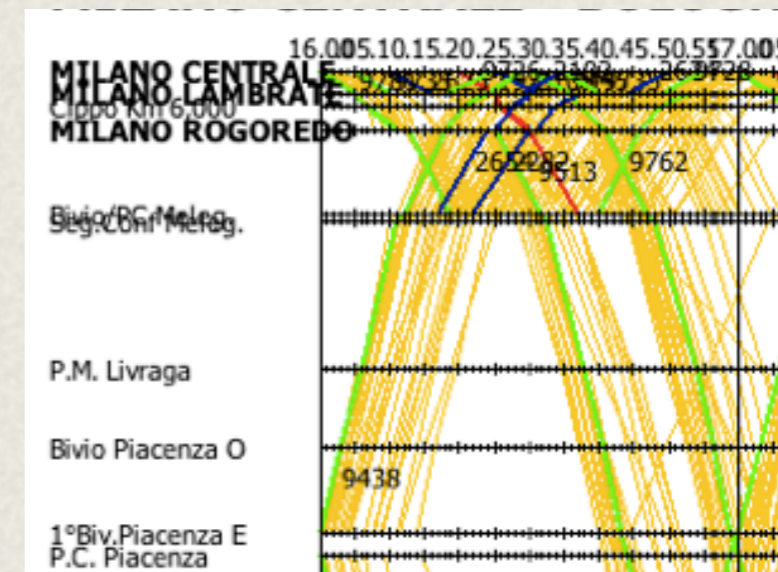
Railway Operations....



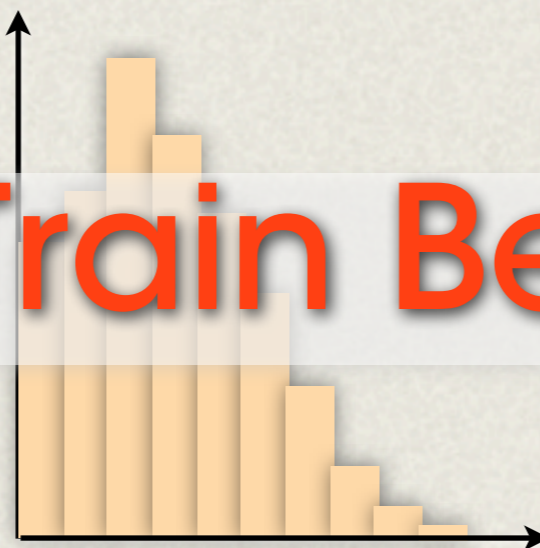
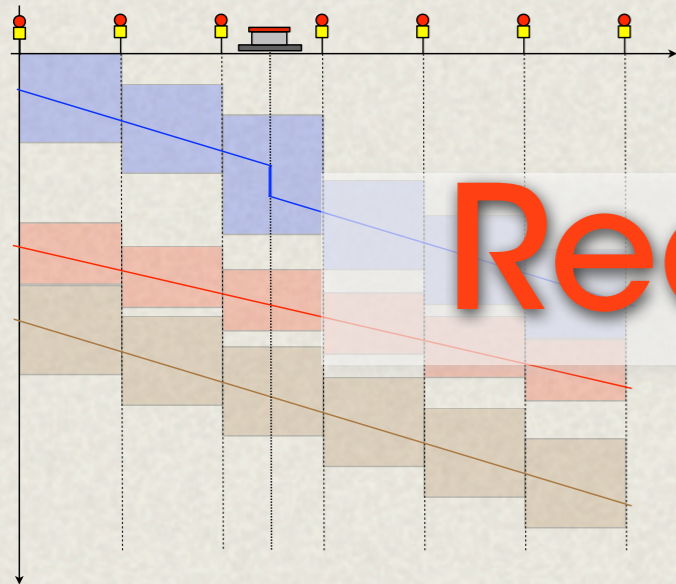
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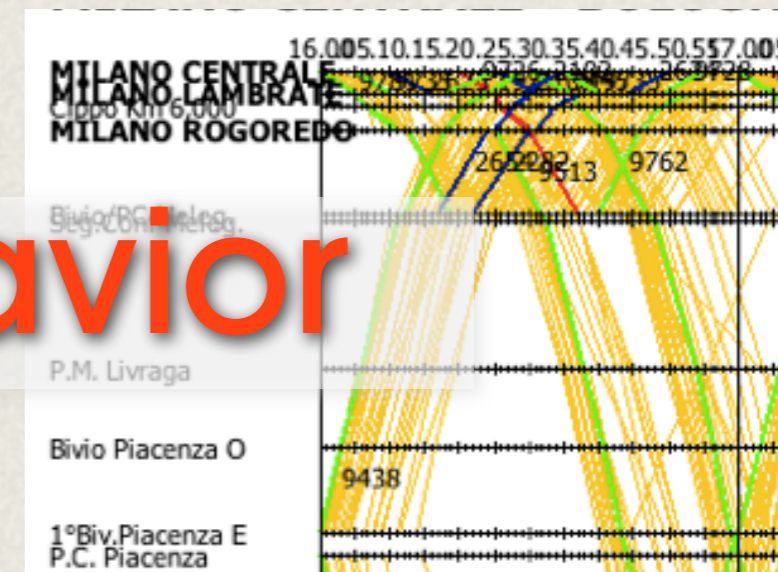
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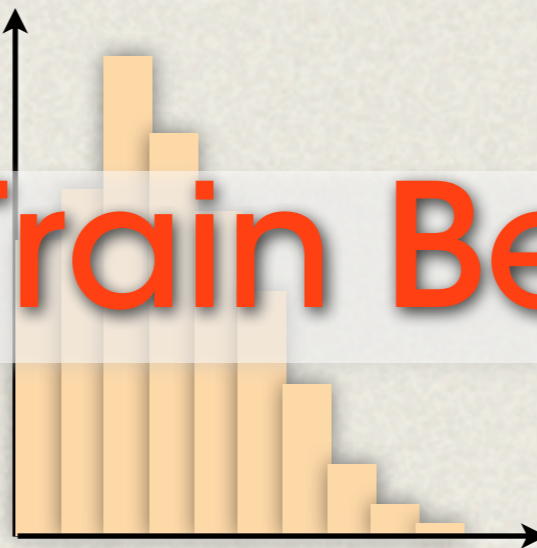
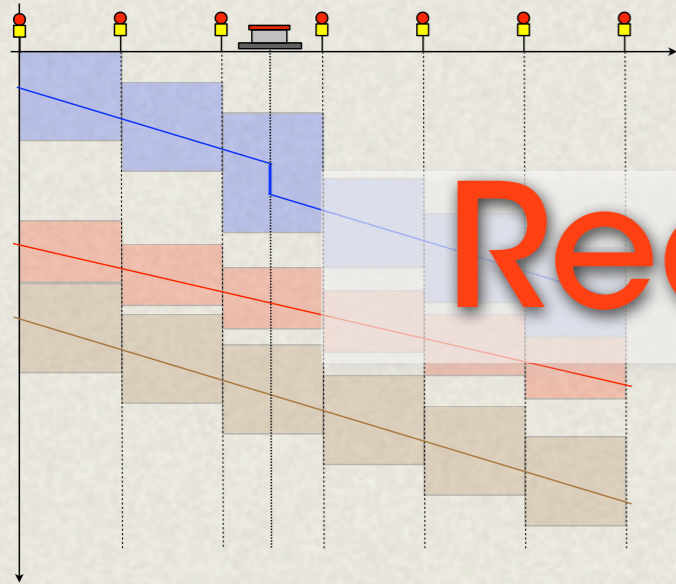
Railway Operations....



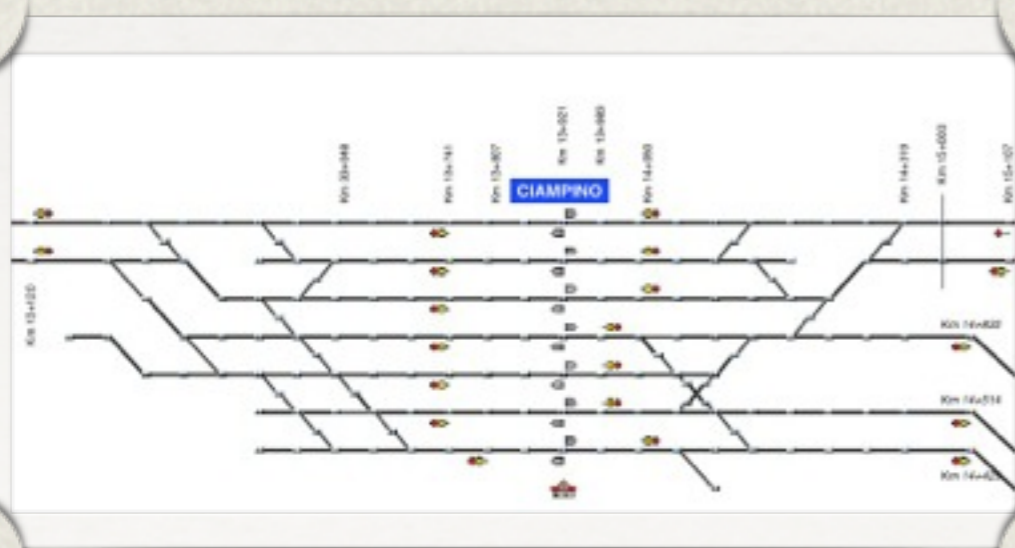
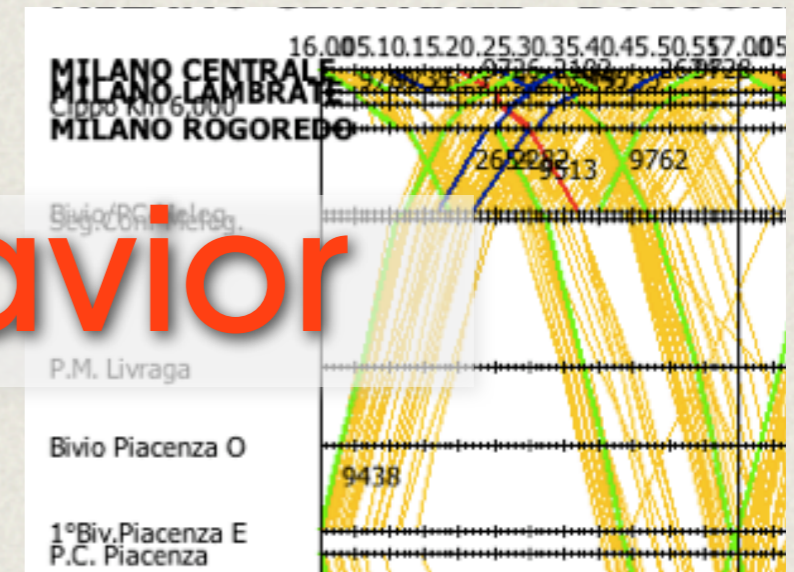
Real Train Behavior



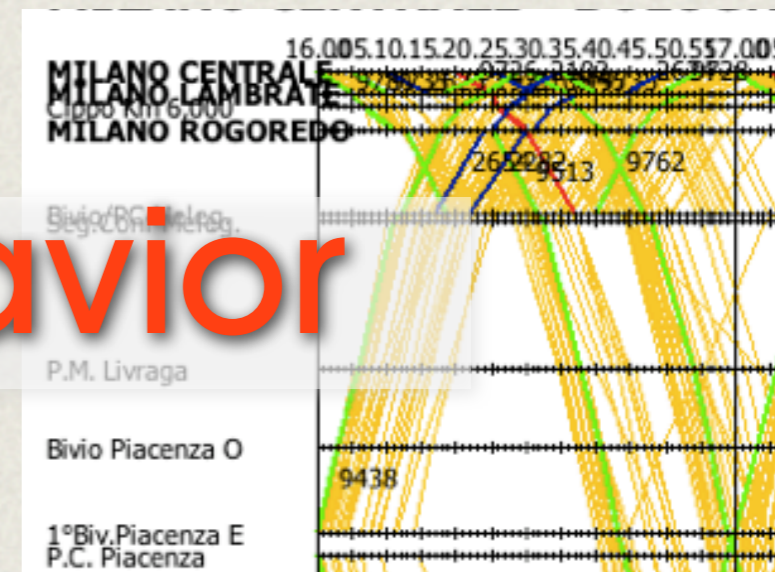
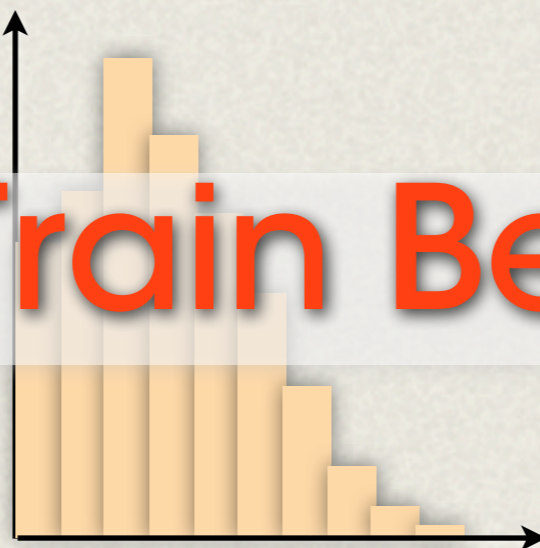
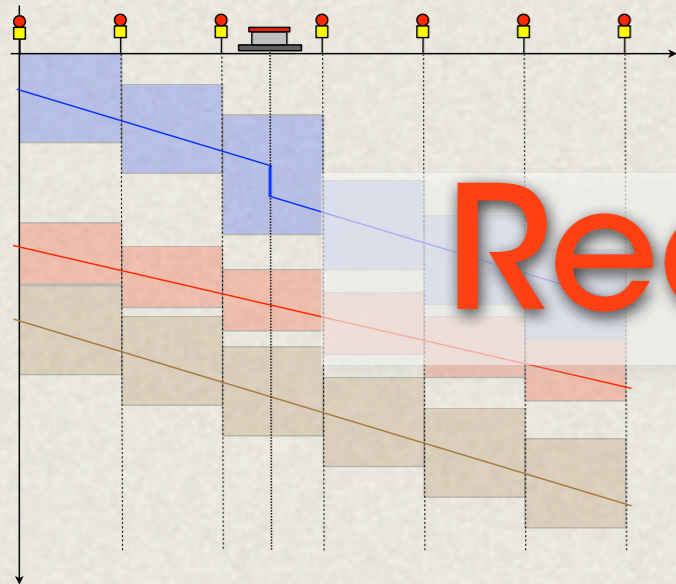
Railway Operations....



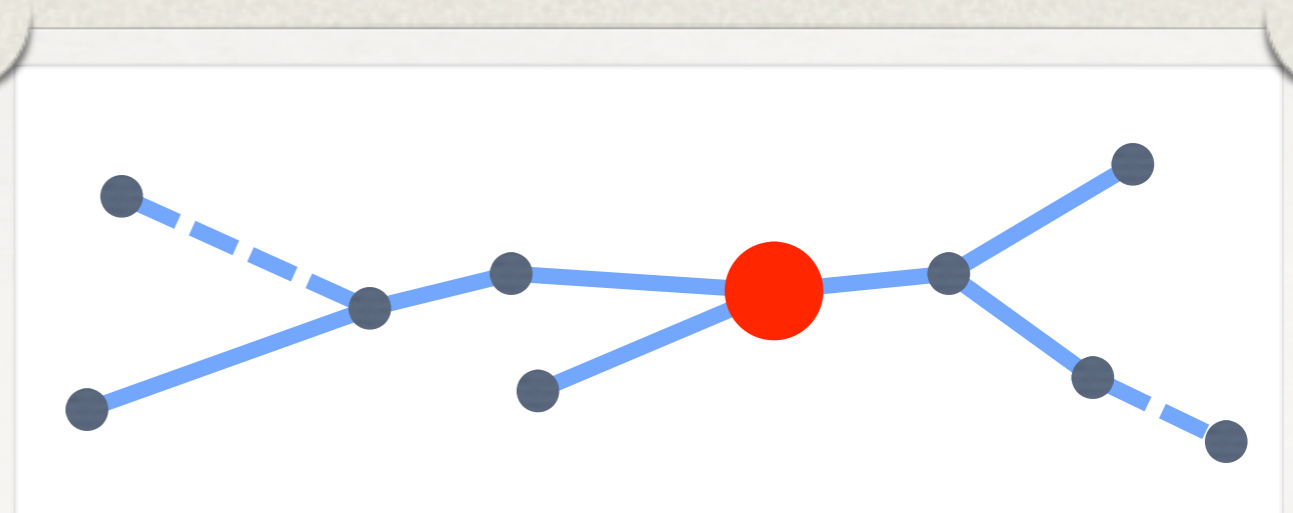
Real Train Behavior



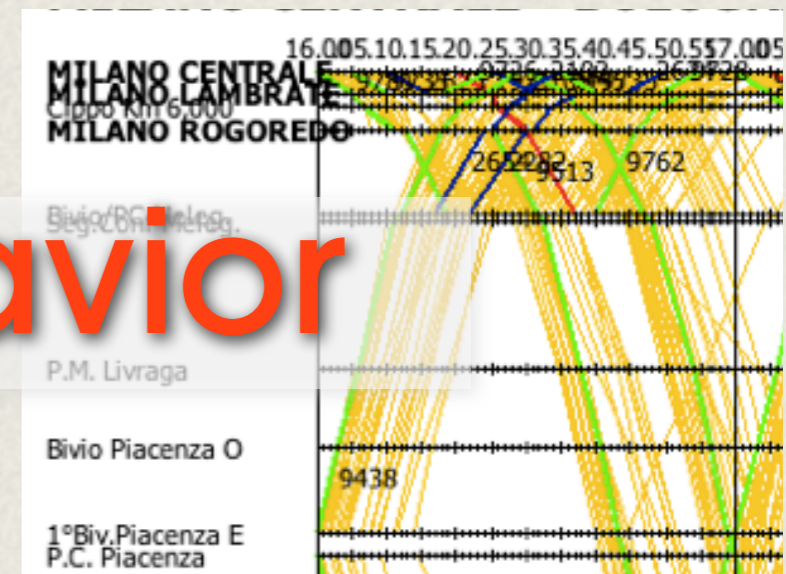
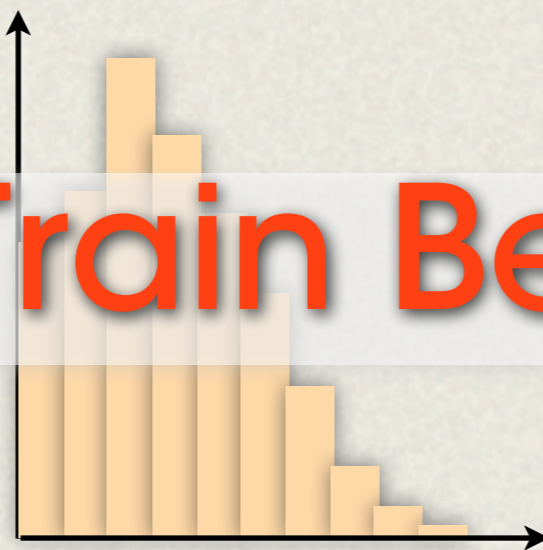
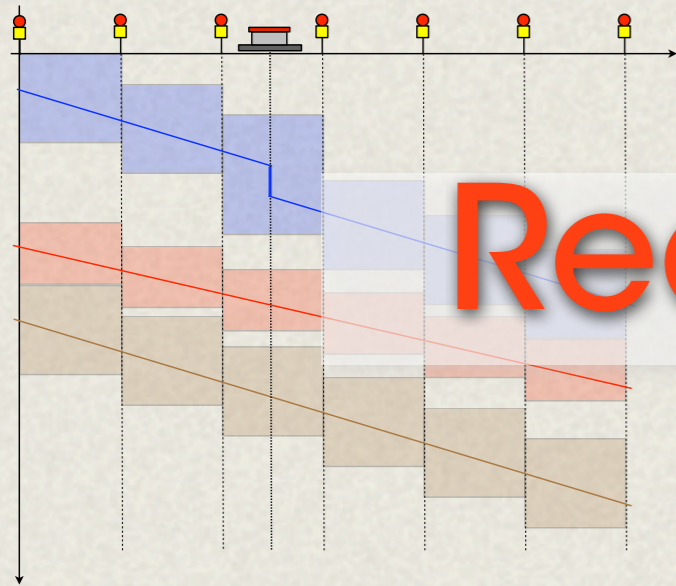
Railway Operations....



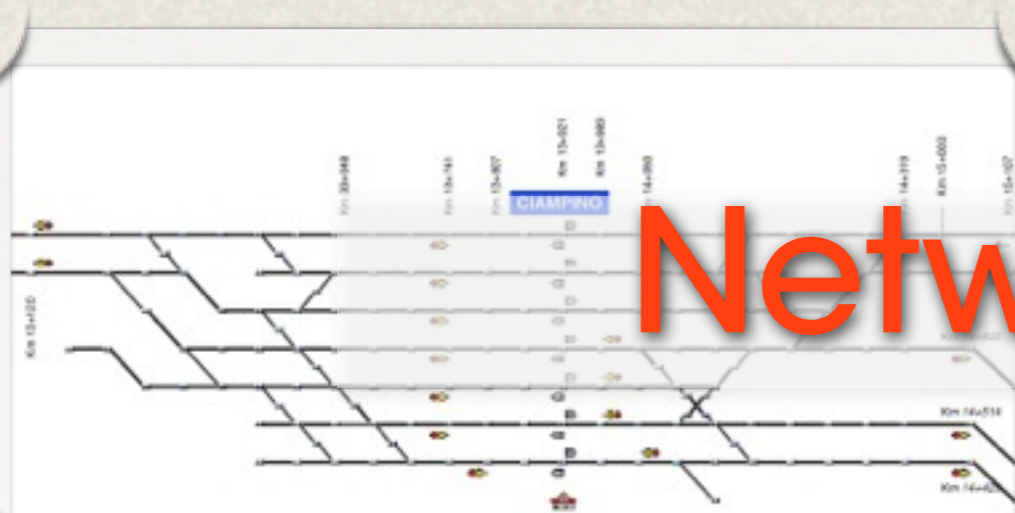
Real Train Behavior



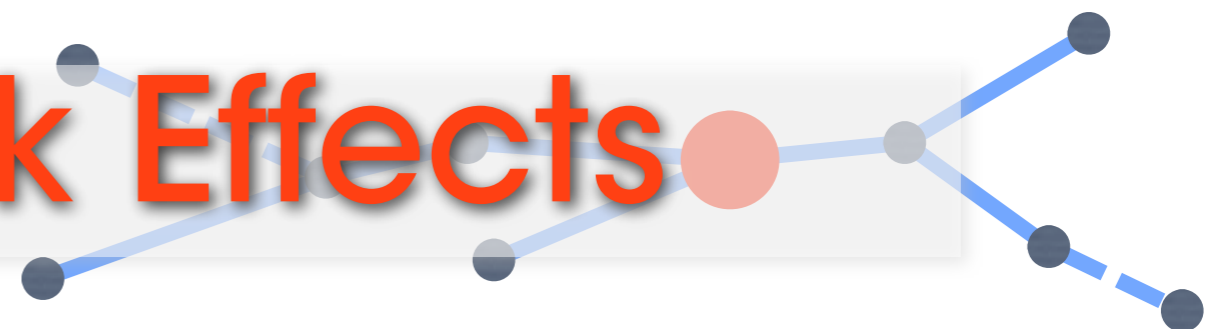
Railway Operations....



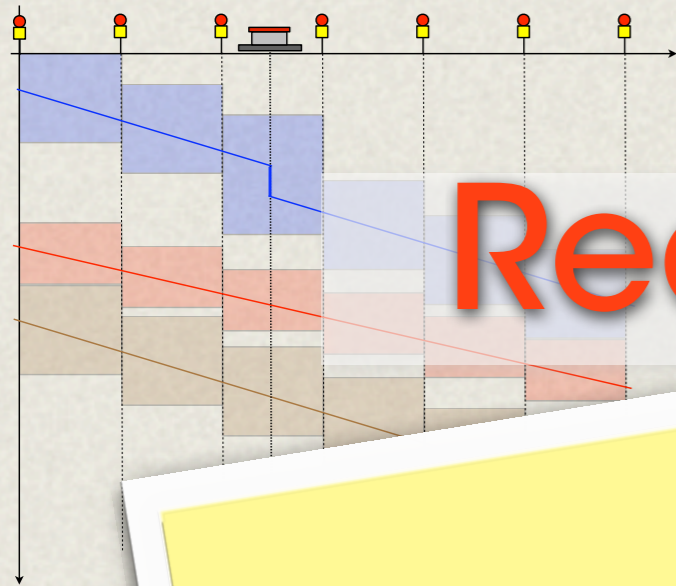
Real Train Behavior



Network Effects

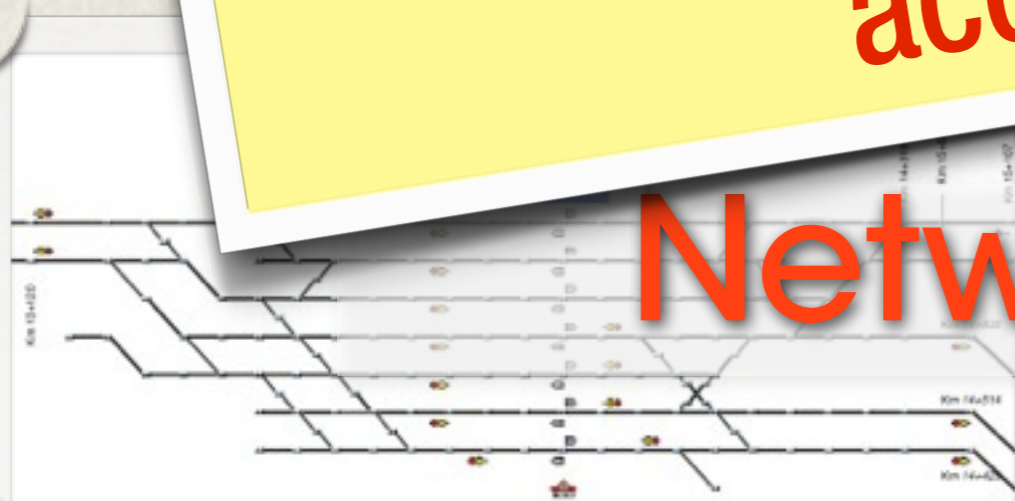


Railway Operations....

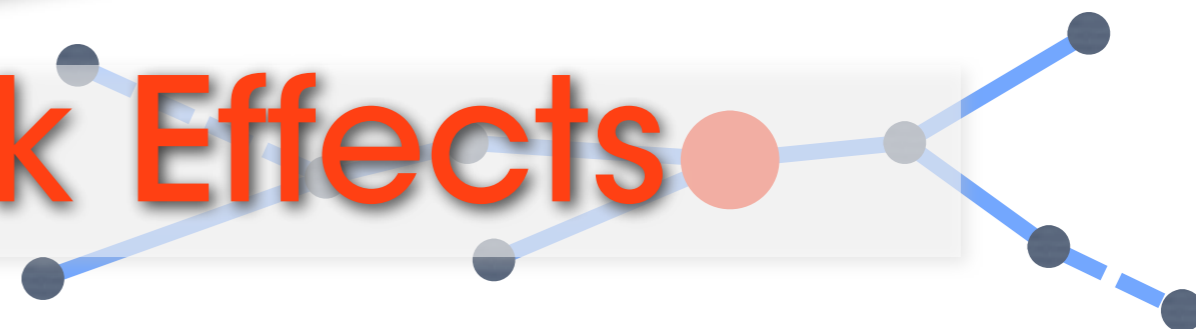


Real Train Behavior

Why not....
representing operations in an
accurate way?



Network Effects



Microsimulation

OPEN TRACK



Microsimulation

OPEN TRACK

Flexible
Intuitive
Accurate
Reliable
Animation

Microsimulation

OPEN TRACK

Flexible
Intuitive

**Why not....
taking full advantage of it?**

Animation



at its best.....

Real behavior of trains (Delays)

Validated

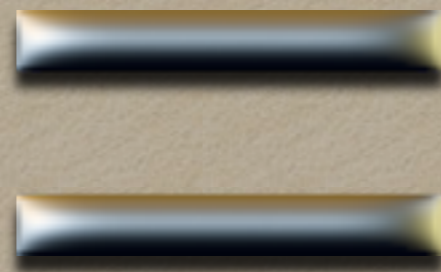
Shuntings

Alternative itineraries

Nice outputs

at its best.....

Real behavior of trains (Delays)



Nice outputs



at its best.....

Real behavior of trains (Delays)

Why not....
doing it automatically?

Nice outputs

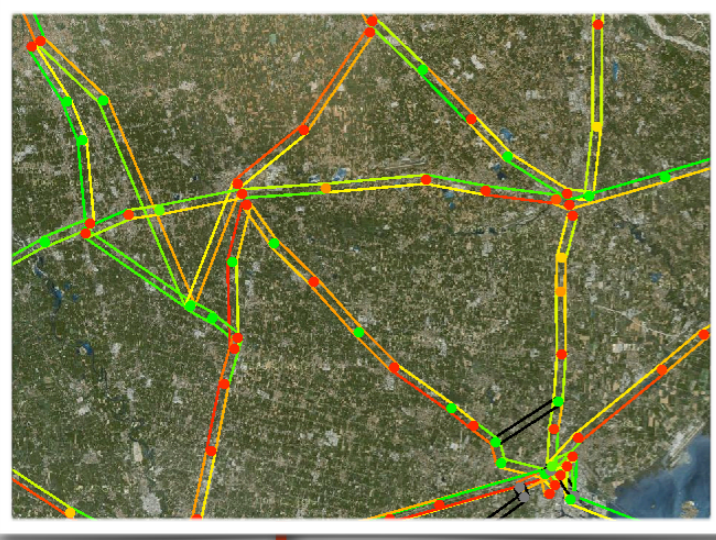
TRENO



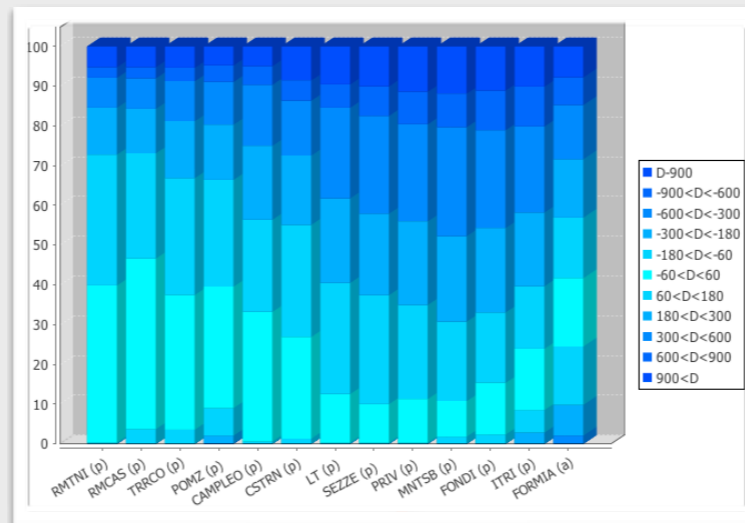
.... a smart box...

Analysis

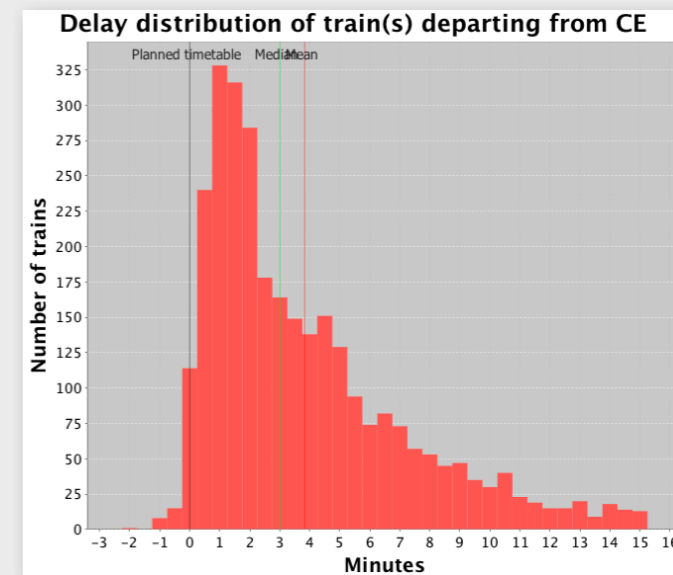
Delays on a map



Punctuality along a corridor



Distributions



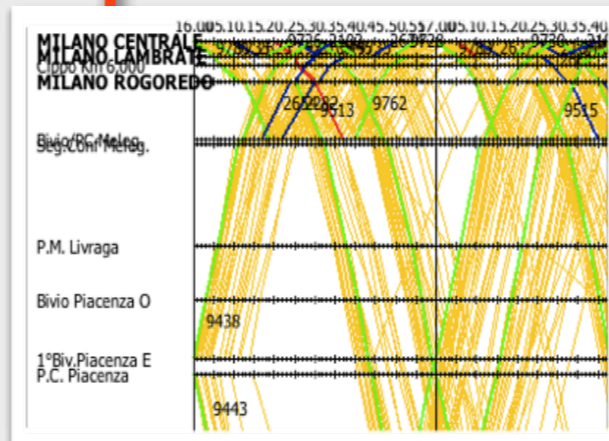
Aggregated

Detailed

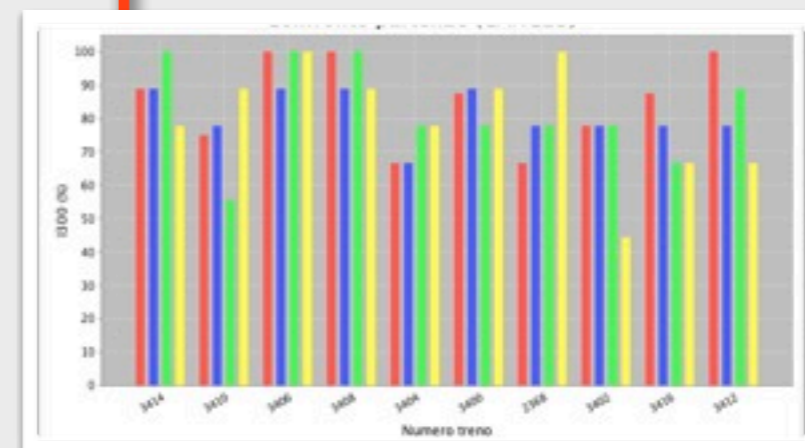
Train number	Edge descr.	Punctuality	M-TDP	F-TDP	Punctuality	M-Arrival	F-Arrival	F-Arrival
24310	DINACLE -	81.54	86.92	96.35	88.63	88.46	68.65	122.31
24310	CSORIA - D	100	135.08	0	131.73	80.39	50	185.88
8005	DINACLE -	88	119.26	0	159	87.76	109.59	109.59
8005	CSORIA - D	100	-1.2	0	73.47	201.43	203.88	341.84
8004	DINACLE -	82.31	84.27	10.96	63.46	84.62	133.27	198.58
8004	NACLE - DI	100	0	0	75	236.54	238.27	388.36
588	DINACLE -	88.33	83.5	17.5	63.33	83.05	144.92	153.56
588	NACLE - DI	100	0	0	86.44	167.8	167.8	279.86
723	DINACLE -	100	126.07	0	122.93	86.44	167.8	167.8
723	NACLE - DI	83.11	82.62	82.62	137.7	83.31	53.14	534.12
8006	DINACLE -	98.08	83.27	8.46	44.71	98.08	100.38	105
8006	NACLE - DI	100	0	0	98.08	143.65	143.65	239.42
8012	DINACLE -	100	114.23	0	95.19	80	80.8	175
8012	NACLE - DI	100	0	0	98.08	122.31	123.46	206.73
586	DINACLE -	87.24	48.2	48.2	80.33	85	142	186.67
586	NACLE - DI	100	0	0	98.33	95.5	95.5	160.83

Train number	Località	Punctuality	M-Stop	F-Stop	Punctuality	M-Departure	F-Departure	F-Departure
24310	DINACLE	100	0	0	80.39	50	145.88	145.88
24310	CSORIA	100	0	0	74.51	211.19	211.76	353.43
8005	DINACLE	100	0	0	73.47	201.43	203.88	341.84
8005	CSORIA	100	0	0	73.47	202.05	205.1	341.84
8004	DINACLE	100	0	0	75	236.54	238.27	388.36
8004	NACLE	100	0	0	75	236.54	238.27	388.36
588	DINACLE	100	0	0	86.44	167.8	167.8	279.86
588	NACLE	100	0	0	86.44	167.8	167.8	279.86
723	DINACLE	88.33	83.5	17.5	63.33	83.05	144.92	153.56
723	NACLE	100	0	0	86.44	167.8	167.8	279.86
8006	DINACLE	100	0	0	98.08	143.65	143.65	239.42
8006	NACLE	100	0	0	98.08	143.65	143.65	239.42
8012	DINACLE	100	0	0	98.08	122.31	123.46	206.73
8012	NACLE	100	0	0	98.08	122.31	123.46	206.73
586	DINACLE	100	0	0	98.33	95.5	95.5	160.83
586	NACLE	100	0	0	98.33	95.5	95.5	160.83

Find the most delayed trains




on the graphic timetable



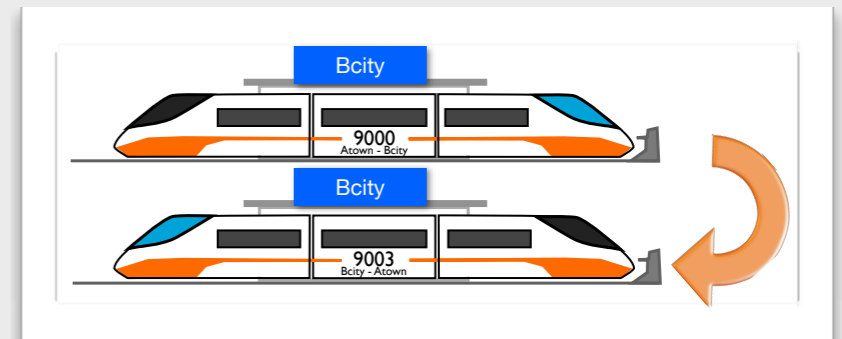
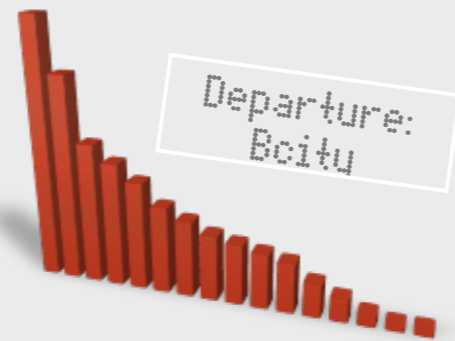
Compare scenarios

Export

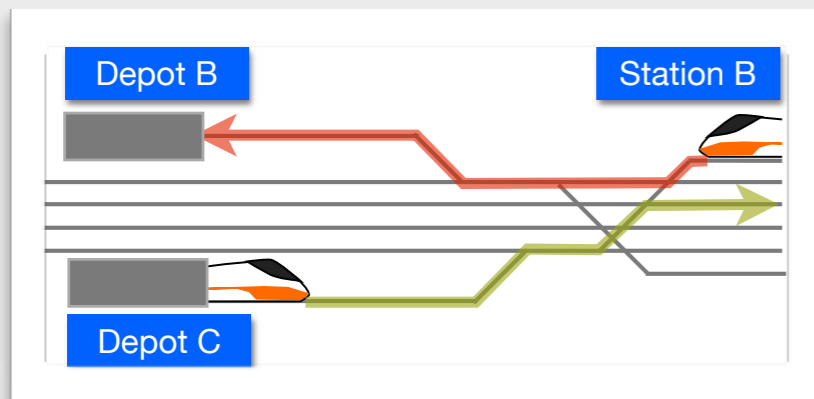
	Arrival	Departure
Atown	18:29	18:47
Bcity	19:10	19:12
Cville	19:42	19:44



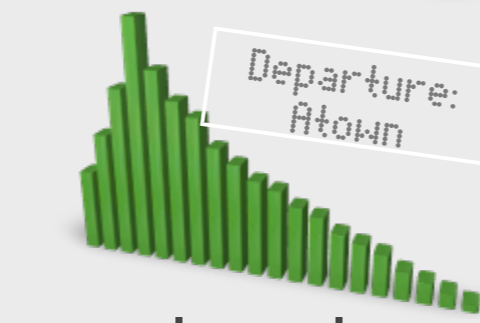
timetable & courses



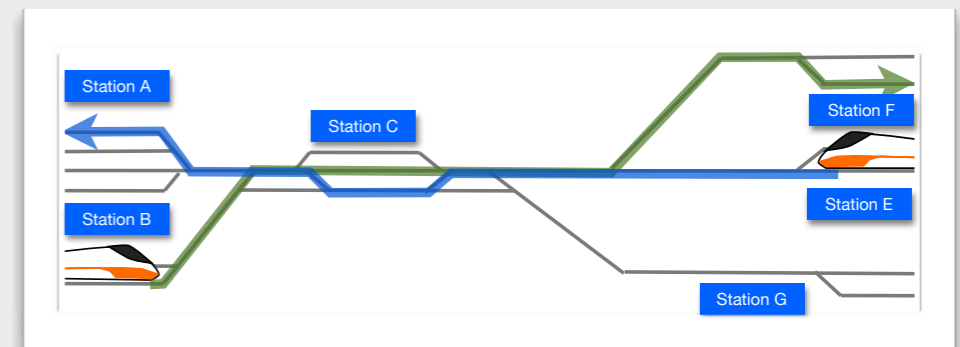
turnaround



shuntings



Real Delays



itineraries




Alternative itineraries

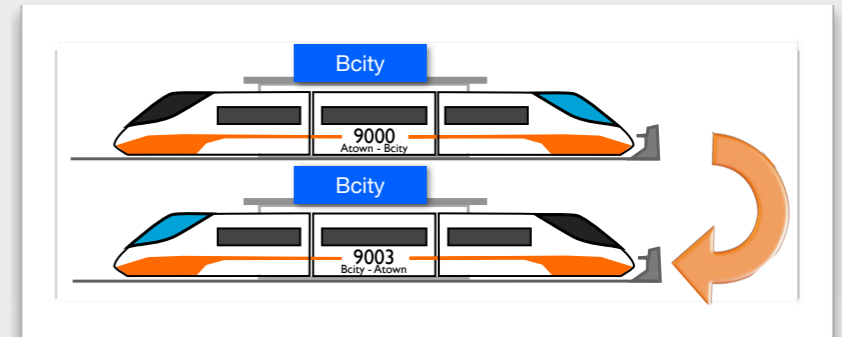
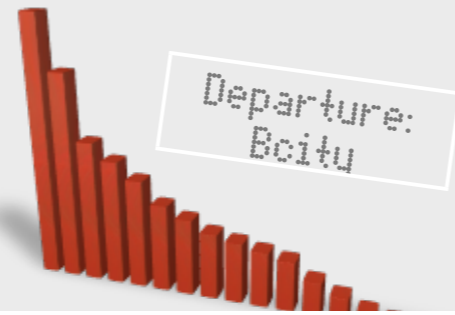


Export

	Arrival	Departure
Atown	18:29	18:47
Bcity	19:10	19:12
Cville	19:42	19:44

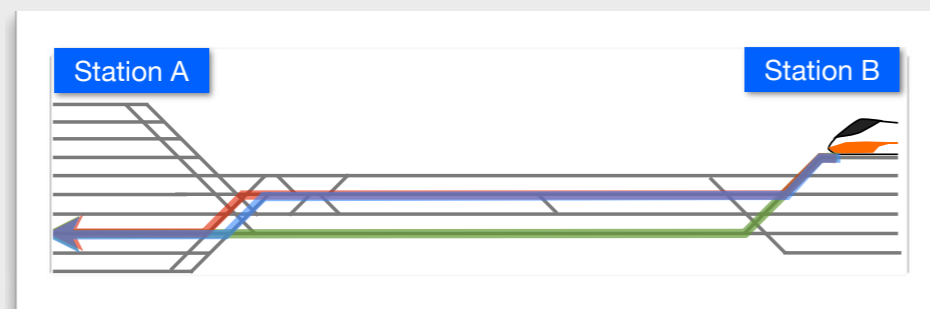


timetable & courses

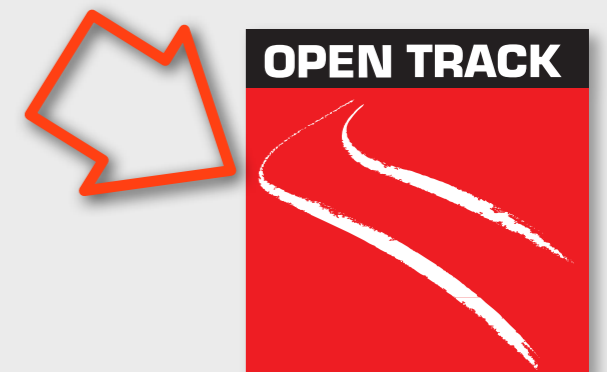


turnaround

in OT define
the Infrastructure, Routes and Paths;
the rest will be done by TRENO



Alternative itineraries



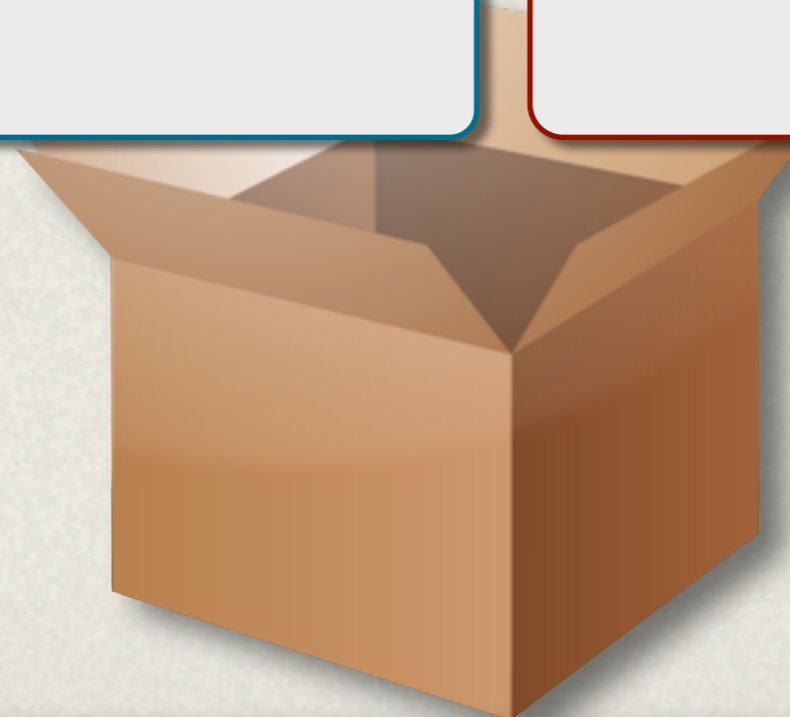
TRENO

Analysis

- Real and simulated traffic data
- Wide range of diagrams
- Point out Critical sections
- Compare different scenarios

Export

- Complete preparation of simulation scenarios:
- Reduce time
 - Reduce error probability
 - Improve precision



Export



	Arr	Dep
Atown	18:29	18:47
Bcity	19:10	19:12
Cvill	19:43	19:44

Timetable



Real Traffic



Export



OT Model incl. Paths

	Arr	Dep
Atown	18:29	18:47
Bcity	19:10	19:12
Cvill	19:43	19:44

Timetable



Import Timetable and Real Traffic Data

Create the Station Layouts

Create the Shuntings

Merge trains in groups, Check delay distributions



Export & import



Export



OT Model incl. Paths

Import Timetable and
Real Traffic Data

Create the Station
Layouts

Create the Shuntings

Merge trains in groups,
Check delay distributions

Export & import

	Arr	Dep
Atown	18:29	18:47
Bcity	19:10	19:12
Cvill	19:43	19:44

Timetable



Real Traffic



5'/station

0,5'/
shunting

1'/group

Workflow



Analyse Real Traffic Data

Create the infra model



Station Layout



Del. Distributions



Export & Import



Simulation



View the results

and if...(1)

different timetable



Import the timetable in TRENO



Export & Import



Simulation



View the results

and if...(2)

different allocation of platforms



Edit the platform occupation



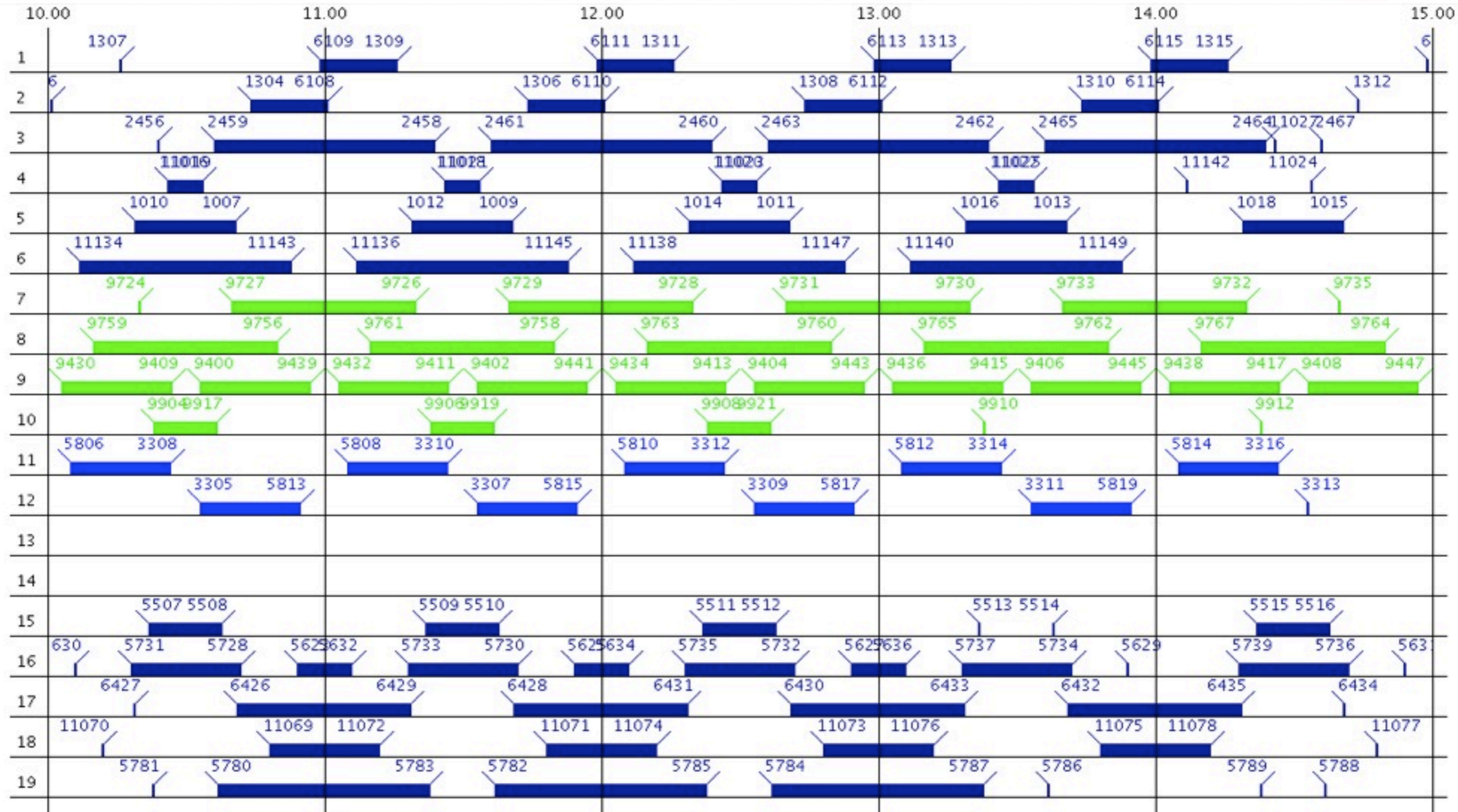
Export & Import



Simulation



View the results



Drag&Drop | create shuntings | define turnaround

Did you test it?



in Italy

international

- Croatia
- Serbia & Montenegro
- France
- The Netherlands
- Norway
- Chile
- Argentina
- Perù
- Brasil
- Algeria
- Egypt

Summarising....

Summarising

**represent operations in an
accurate way**

Summarising

**represent operations in an
accurate way**

take full advantage of OT

Summarising

represent operations in an accurate way

take full advantage of OT

do things automatically

TRENO on:

- Validate simulation
- Multiple scenarios
- Large Networks
- Various trains
- Shuntings
- Various parts of a network
- Simulate again...



TRENO on:

- Validate simulation

- Multiple scenarios

- Load

- Val

- Showings

- Various parts of a network

- Simu



Thank you for your attention!

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