

The influence of efficient infrastructure and terminal planning on rail transport costs



Türker Ahi, Mersin, October 10 2013

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1 Introduction



- The costs of rail transport are very much determined by intermodal **terminals** and rail **infrastructure**
- As rail infrastructure is a long term investment, the quality of the infrastructure for future rail services and the respective costs are decided in the **planning** phase
- The layout of an intermodal terminal is crucial for the future **operations costs** for an intermodal service provider.
- An efficient terminal and the efficient use of rail infrastructure can therefore lead to a substantial improvement of the **competitiveness** of rail transport.

② Transport costs

Operating costs in rail freight transport

- Locomotive (maintenance, insurance, depreciation..)
- Wagon (maintenance, insurance, depreciation..)
- Personnel (Driver, conductor, administration...)
- Energy
- Access charge (railway policy decision)
- Shunting/Pushing and other additional services
- Overhead

② Transport costs

Example: Container train: Izmir – Eskisehir



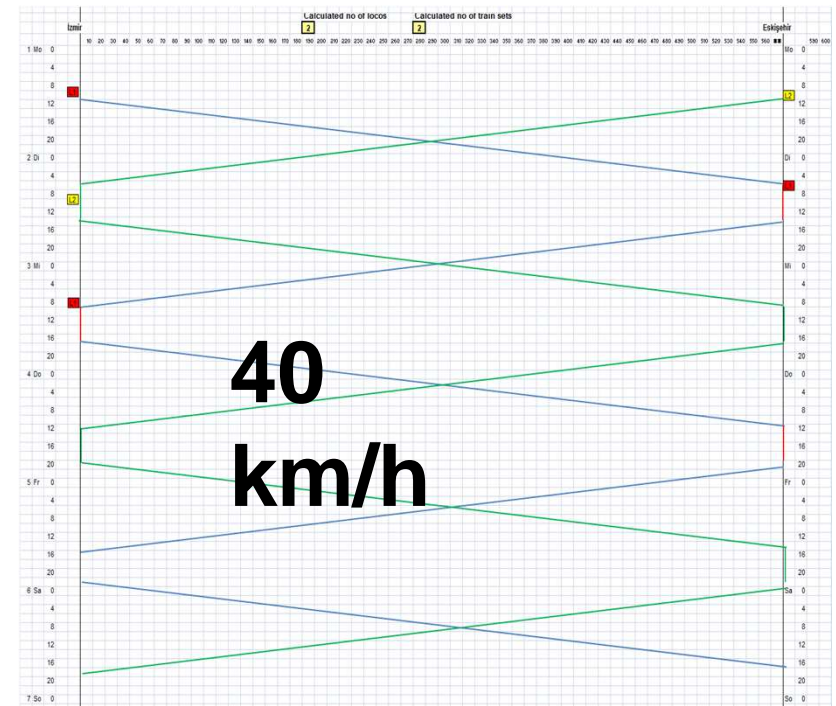
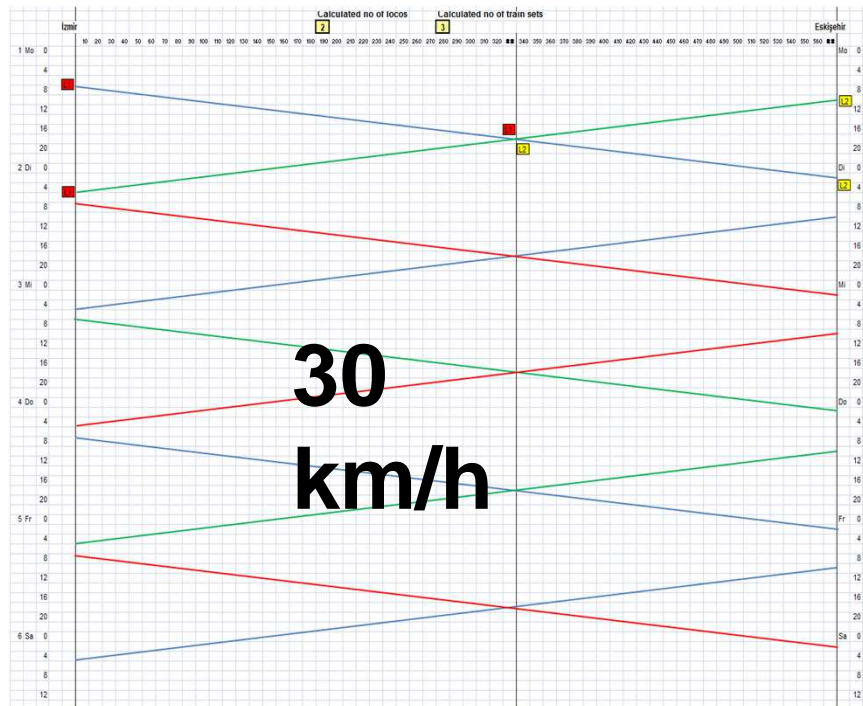
Train transport variant	Current-Average Case
Average speed (km/h)	30
Distance (km)	567
Total transport hours/roundtrip	37.80
Locomotive cost TL per roundtrip	9,306
Personnel TL per roundtrip	3,150
Infrastructure TL per roundtrip	2,268
Energy TL per roundtrip	17,010
Wagon TL per roundtrip	12,398
Shunting TL per roundtrip	2,640
Overhead TL	6,884
Total TL per roundtrip	52,776
Total TL / TEU full utilization	358.59
TL / ton km	0.063

Truck transport variant	Truck cost
TEU / truck	2
Driver costs (TL/day)	113
Travel time (days)	0.50
Trucks per day loaded (no)	56
Total fuel cost (TL/truck)	504
Truck rent (TL/route)	88
Total cost / transport	704
Total cost (TL/day)	39,600
TL/TEU single trip	352.00
TL / ton km	0.084

③ Optimization of train operation

Roundtrip time

- An improvement of the **roundtrip time** can be achieved through different measures. However it can lead to significant savings.
- One opportunity is the improvement of the time table. This can be achieved by a better **planning** of the time table, shorter block sections by **manning stations**, shorter **waiting times**, higher speed through better **infrastructure quality**.
- If the average speed for the example Izmir – Eskisehir is increased from 30 to 40 km/h the total time saving would be 9,5 h per roundtrip



③ Optimization of train operation

Effects of optimization on operating costs

- The increase average speed leads to 12% saving in the costs of the transport and improves competitiveness
-> 1 Wagon set saved
- After this optimization the price of container transport on rail is **competitive** with truck

Variant	Current-Average Case	Optimum Timetable Case
Average speed (km/h)	30	40
Distance (km)	567	567
h per roundtrip	37.80	28.35
Locomotive cost TL per roundtrip	9,306	9,306
Personnel TL per roundtrip	3,150	2,363
Infrastructure TL per roundtrip	2,268	2,268
Energy TL per roundtrip	17,010	17,010
Wagon TL per roundtrip	12,398	8,266
Shunting TL per roundtrip	2,640	1,760
Overhead TL	7,016	6,146
Total TL per roundtrip	53,788	47,118
Total TL / TEU full utilization	358.59	314.12
TL / ton km	0.063	0.055

Truck:
352 TL/TEU
0.084 TL/ton km

③ Optimization of train operation

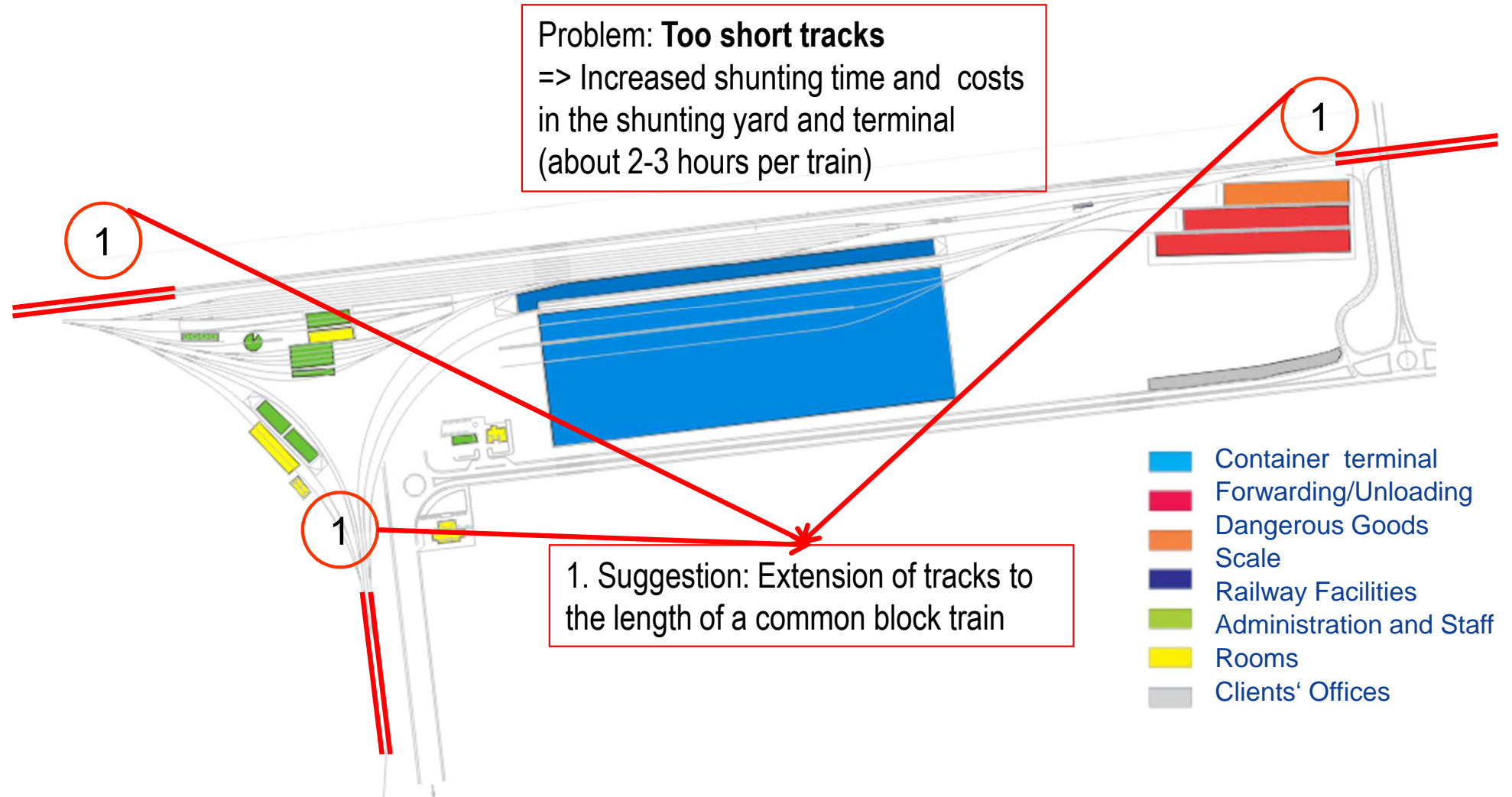
Original Terminal planning: Freight village Eskisehir

- The infrastructure improvement is a long term improvement. Several factors will need to be adjusted.
- However the 9,5 h per roundtrip can be saved also on other parts of the transport chain
- The terminal for container handling and its layout determines the time consumption as well

③ Optimization of train operation

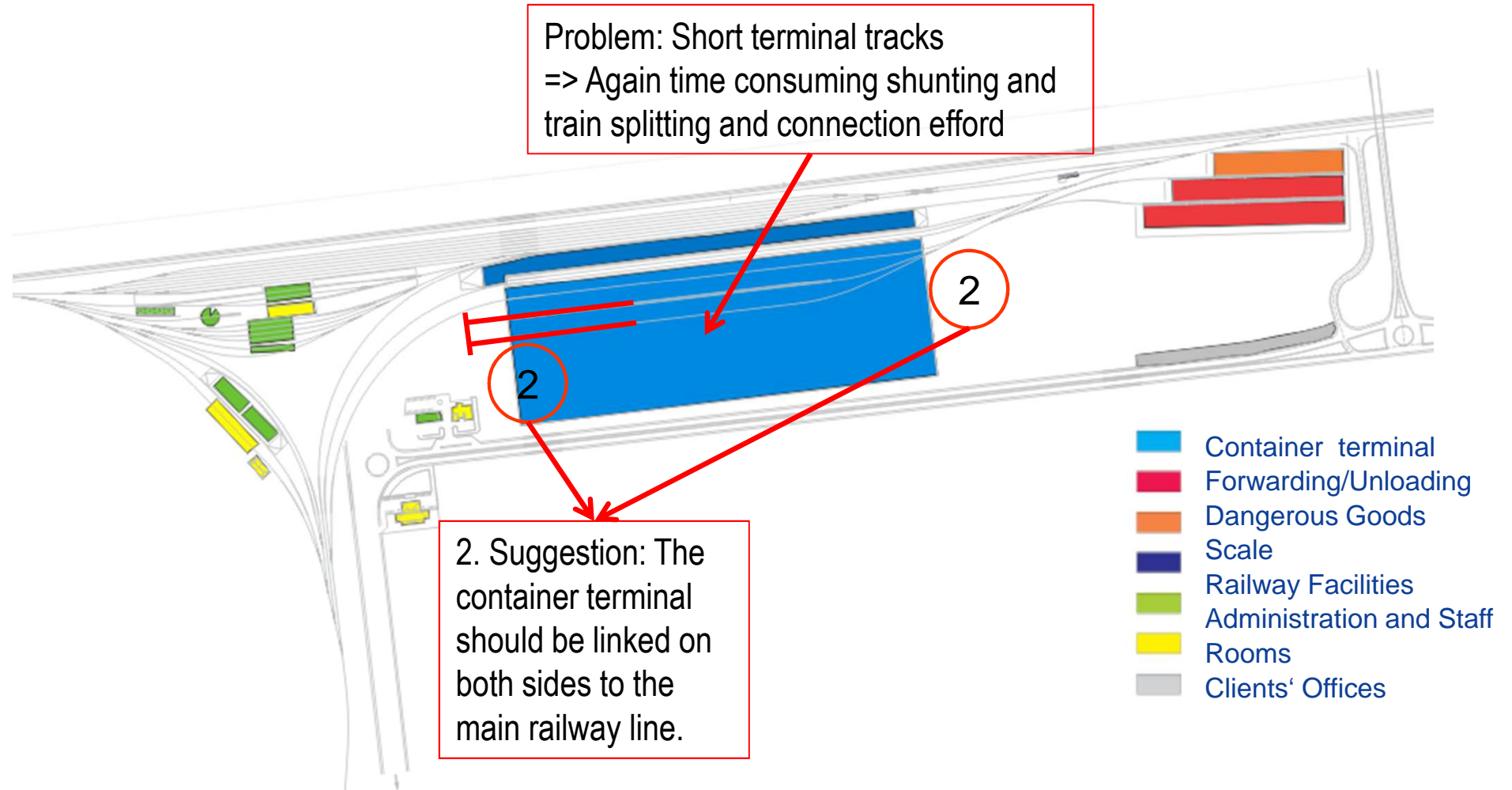
Problem & Possible optimizations - 1

- Example: Basic layout of Eskisehir terminal from 2008



③ Optimization of train operation

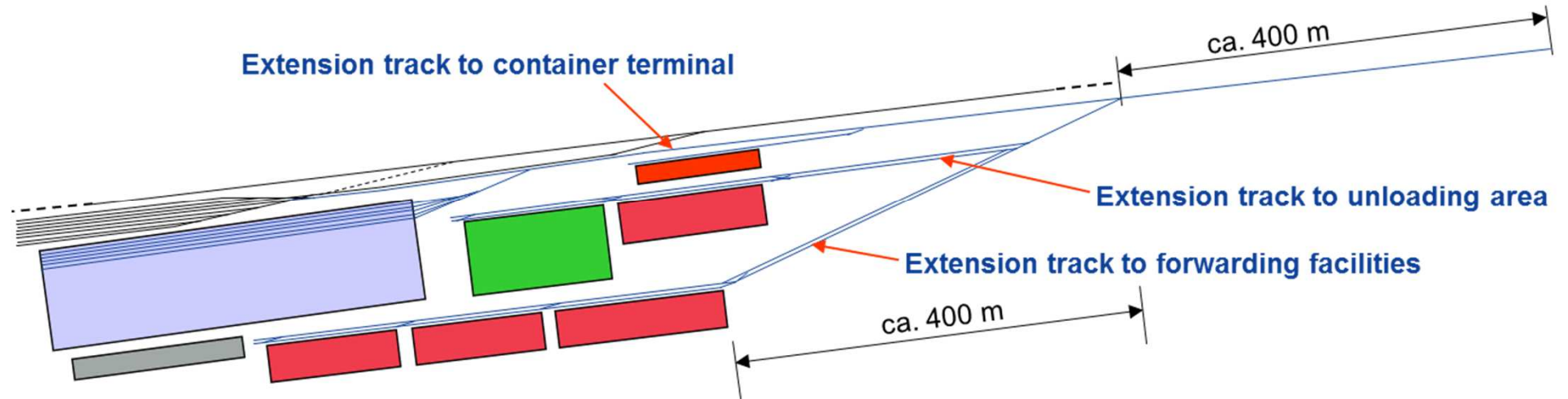
Problem & Possible optimizations - 2



③ Optimization of train operation

Track Solution

- Potential intermediate solution for a terminal to decrease time consumption



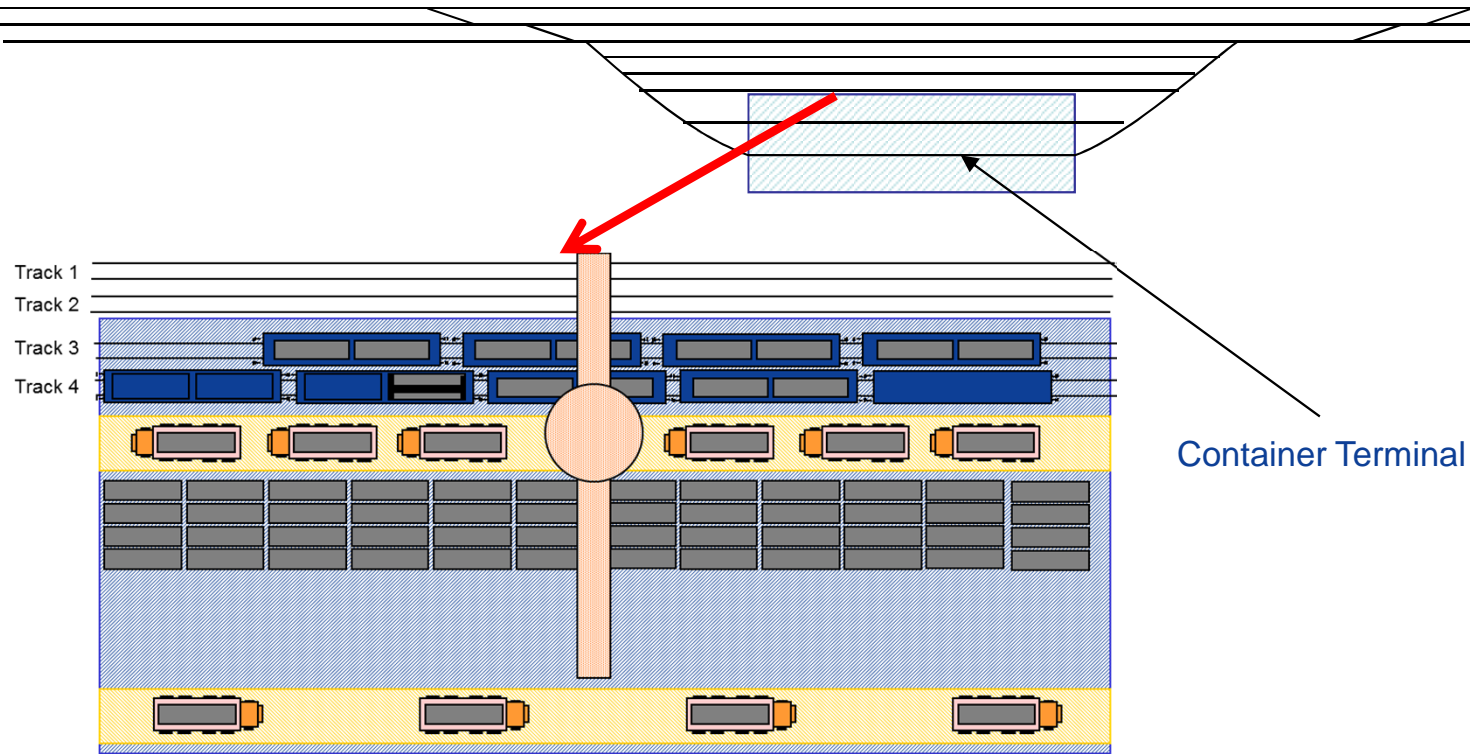
Advantages:

- Savings of time and costs in the processes: train splitting-shunting-reconnecting
- No crossing of terminal tracks and tracks to unloading area
- Rail track access to areas in the southern part of the freight village
- Modular expansion possible

③ Optimization of train operation

Terminal ideal layout (no shunting required)

- Potential ideal terminal situation



Advantages:

- Main line locomotives can operate in the terminal
- Same capacity in the terminal requires fewer tracks
- Reduced crossing of road and rail
- For electrified line possible access with momentum

③ Optimization of train operation

Improvement and results

- Not only operation costs for rail and intermodal operators are effected by such optimization also the terminal operates **faster and cheaper**
- The terminal is able to handle significantly **more volumes** and will attract operators if it is more efficient
- **Other services** related to the container transport business (as usual in freight villages) will also benefit from such optimizations

③ Optimization of train operation

Effects of optimization on operating costs

- With effective infrastructure and time table the operating costs will be significantly saved
=> Increase of average speed,
=> reduction of duration of roundtrip, shunting, personal and wagon costs
=> more benefits after line electrification with **E-Loco**: fewer locomotive and energy costs
- After optimization the price of container transport with train is competitive with truck

Variant	Current-Average Case	Optimum Timetable Case	Optimum Case - Electrified
Average speed (km/h)	30	40	40
Distance (km)	567	567	567
Hours per roundtrip	37.80	28.35	28.35
Locomotive cost TL per roundtrip	9,306	9,306	8,334
Personnel TL per roundtrip	3,150	2,363	2,363
Infrastructure TL per roundtrip	2,268	2,268	2,268
Energy TL per roundtrip	17,010	17,010	2,209
Wagon TL per roundtrip	12,398	8,266	8,266
Shunting TL per roundtrip	2,640	1,760	1,760
Overhead TL	7,016	6,146	3,780
Total TL per roundtrip	53,788	47,118	28,980
Total TL / TEU full utilization	358.59	314.12	193.2
TL / ton km	0.063	0.055	0.034

Truck:
352 TL/TEU
0.084 TL/ton km

THANK YOU !

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