

RailOpt[®] DSS (Decision Support System) - Integrated optimisation

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RailOpt® DSS is the configurable assistance system for the planner. It helps him automate and optimise his tasks, allowing him to carry out resource planning faster and more efficiently.

The system guides the user through the optimisation process. The system pauses as soon as hard conflicts arise in the planning or the planner wants or has to determine additional priorities. This allows him to influence the proposed solution.

Because the system is configurable, individual requirements can be specified both beforehand and during the optimisation process. This enables the user to prepare plans faster and more efficiently and take new prerequisites into account at any time.

Application and product description

Purpose

RailOpt DSS helps the planner represent specific planning constructs and determine their effects. The outcome can then be used as an aid in decision-making and a planning

basis for resource planning. RailOpt DSS is not a black box, though; it integrates the user into the process of finding the optimum solution.

Area of application

RailOpt DSS is an expansion within RailOpt®. It supports planners and operations supervisors as they seek to deliver optimised planning results, propose solutions and determine their effects in long, medium

and short-term planning and in operations management. RailOpt DSS fits seamlessly into the existing planning modules and accesses the same data and rules.

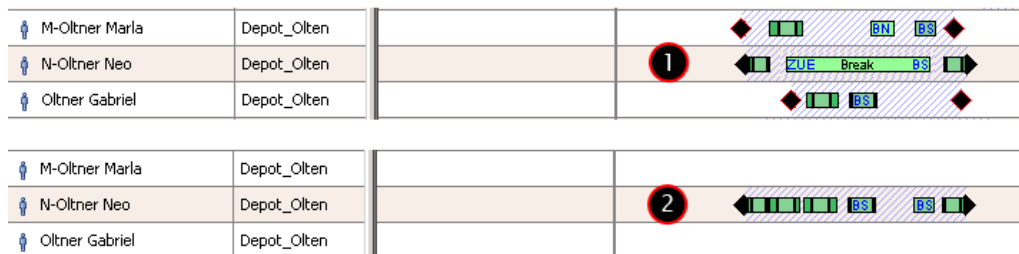


Figure: Example of an original plan (1) and a plan that has been optimised with RailOpt DSS (2)

Products within the RailOpt®-Suite

The RailOpt®-Suite is a comprehensive resource management solution for railway

companies. It covers the key areas with the following products:



RailOpt® Passenger
Planning of all passenger traffic resources



RailOpt® Cargo
Planning of all freight traffic resources



RailOpt® Depot
Planning of activities and resources for idle times



RailOpt® People
Planning of all shift personnel



RailOpt® DIS
Integrated driver information system with all the details required for driving trains

Add-on products

The following add-on products will enable you to expand a RailOpt installation with professional add-ons.



RailOpt® DSS

Configurable assistance system for planners to automate and optimise tasks



RailOpt® WEB

Integrated communication systems for communication between planners and personnel, e.g. to notify delays and enter and manage vacation requests and absences via the Internet



System overview

Data basis

The optimisation is based on the planning results that you achieve with the RailOpt® Passenger, RailOpt® Cargo or

RailOpt® People products, the resources saved in the master data and their planning-related attributes.

Configuration options

Configuration of the DSS is a central element if improved solution variants are to be delivered with RailOpt DSS. To configure different DSS application scenarios, different solvers need to be defined. These are used to specify fundamental rules and priorities for how optimisation is to be achieved.

Configuration is divided into different areas, e.g. work time rule or compactness settings. Within these settings areas, controls can be used to specify the effects of a violation (bonus or costs).

In the optimisation or proposal process, possible solutions are evaluated and prioritised directly on the basis of these settings.

Functions and integration into resource planning

The planner uses RailOpt to plan the resources step by step across the relevant time horizons.

The combination with RailOpt DSS generates synergy effects because new plans

are created or optimised automatically, delivering greater efficiency. This variant is then available as a starting point for the subsequent planning modules.

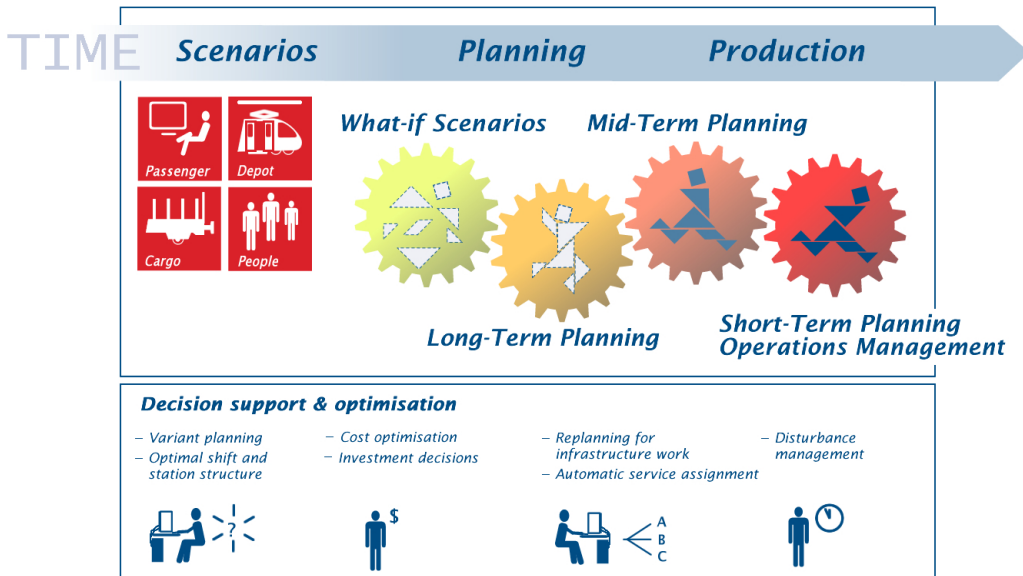


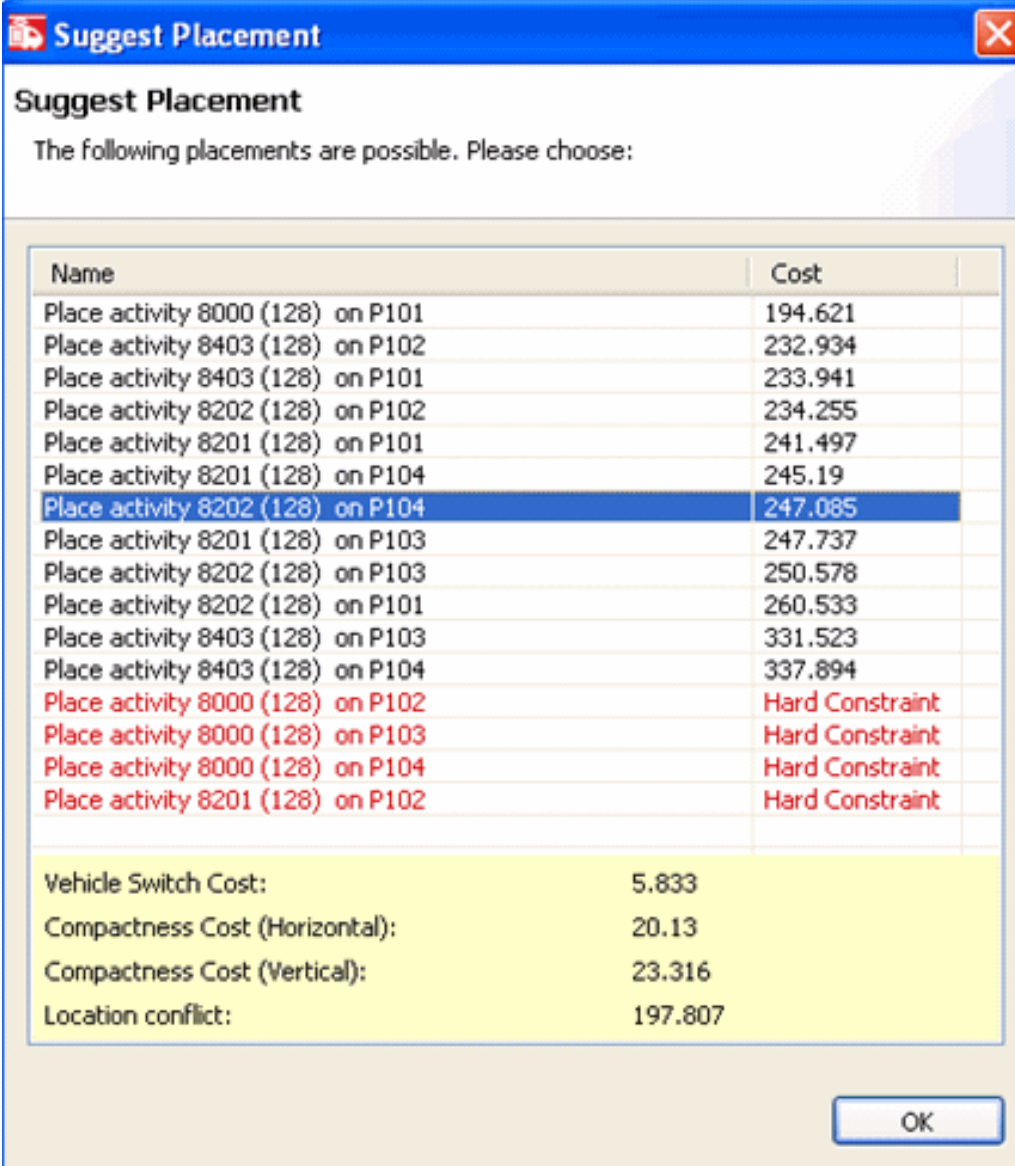
Figure: Example of a planning process across different time horizons with direct connection to RailOpt DSS



User-friendly operation and consistent interface design

Uniform operation steps and the clear and consistent interface design guarantee user-friendly work with RailOpt DSS. This is demonstrated in practical use, e.g.

when setting up the solver configuration and executing the optimisation steps, including selection of the resources and activities.



Suggest Placement

The following placements are possible. Please choose:

Name	Cost
Place activity 8000 (128) on P101	194.621
Place activity 8403 (128) on P102	232.934
Place activity 8403 (128) on P101	233.941
Place activity 8202 (128) on P102	234.255
Place activity 8201 (128) on P101	241.497
Place activity 8201 (128) on P104	245.19
Place activity 8202 (128) on P104	247.085
Place activity 8201 (128) on P103	247.737
Place activity 8202 (128) on P103	250.578
Place activity 8202 (128) on P101	260.533
Place activity 8403 (128) on P103	331.523
Place activity 8403 (128) on P104	337.894
Place activity 8000 (128) on P102	Hard Constraint
Place activity 8000 (128) on P103	Hard Constraint
Place activity 8000 (128) on P104	Hard Constraint
Place activity 8201 (128) on P102	Hard Constraint

Vehicle Switch Cost:	5.833
Compactness Cost (Horizontal):	20.13
Compactness Cost (Vertical):	23.316
Location conflict:	197.807

OK

Figure: Planning proposal from RailOpt DSS

Creating and weighting solver configurations

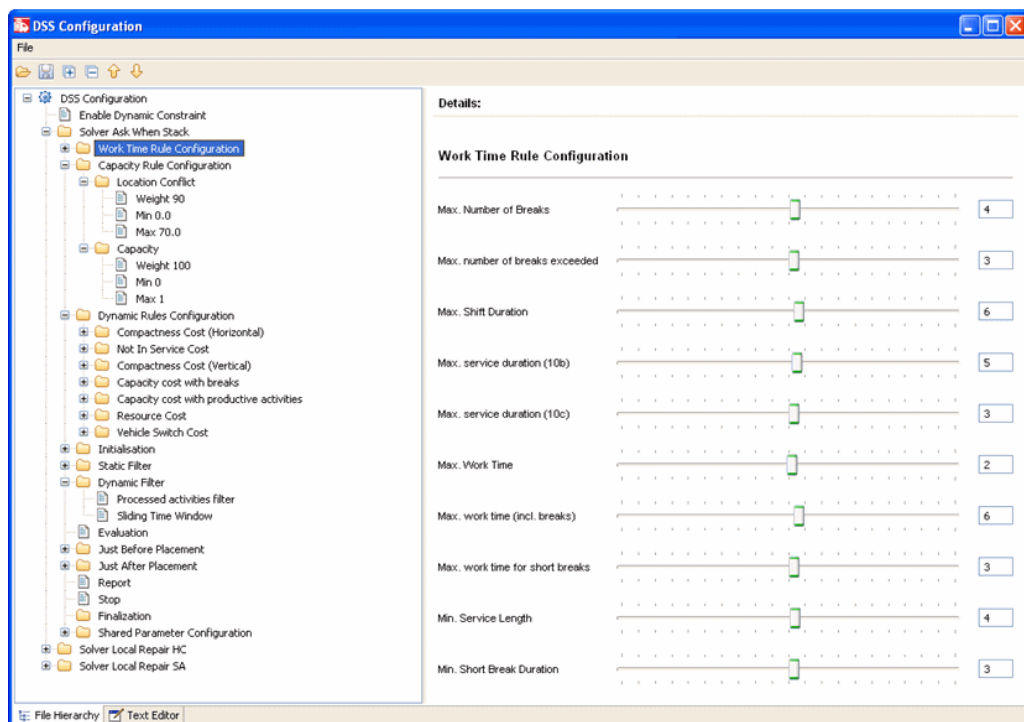
One of the main features of RailOpt DSS is the versatile setting options, which cover a broad spectrum of common industry requirements. These include the following:

- ▶ Determine and prepare planning constructs
- ▶ Resolve and eliminate conflicts in the planning construct
- ▶ Revise and consider alternatives in proposed solutions and optimisations

- ▶ View warnings in the planning construct
- ▶ Monitor compliance with planning constellations

The configuration editor is designed in the form of a Windows folder structure. The planner specifies the weighting for each solver using slide controls, buttons and entry fields.

Figure: Example of a configuration window with solvers



Optimisation with the selection and performance monitor

The planner starts the optimisation process using the selection and performance monitor. The clear design allows the user quickly to select the specific activities and resources that are to be optimised. The system also supports the user with filter options.

If further information or priorities are required during editing, RailOpt DSS pauses the process. The planner can then directly influence the next steps of optimisation. This gives the user the maximum symbiosis of automation, independent intervention and decision.

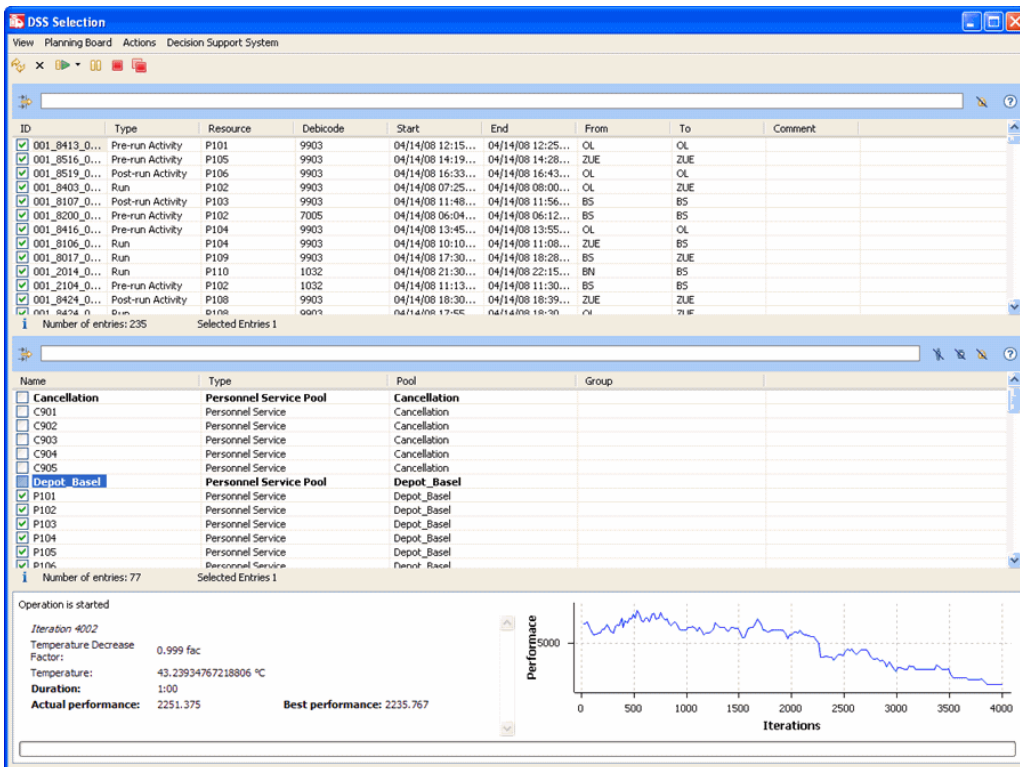


Figure: Interface of the selection and performance monitor with dialog views

Creating automated simulations

RailOpt DSS supports the planner in the following practical cases:

Long-term planning:

- ▶ Optimum services are created on the basis of a fixed service roster (early/middle/late) and a depot structure
- ▶ Determination of the minimum number of services
- ▶ Determination of the optimum location and service structure
- ▶ Other

Mid-term planning:

- ▶ Optimal planning of services based on a fixed resting day schema
- ▶ Replanning after absences
- ▶ Other

Short-term planning/Operations Management:

- ▶ Finding of solutions when replanning for infrastructure work
- ▶ Support for disturbance incidents
- ▶ Other

Development and system design

RailOpt DSS is platform-independent and was developed in the Java programming language. The object-oriented software framework enables the integration of customised expansions. This allows the planning and resource management system to be expanded individually and RailOpt DSS to be integrated directly into the existing RailOpt-Suite.

A RailOpt installation is based on a three-layer architecture consisting of the client, the server and a database. The advantages of such a split include greater stability and flexibility as well as improved access and maintenance possibilities.

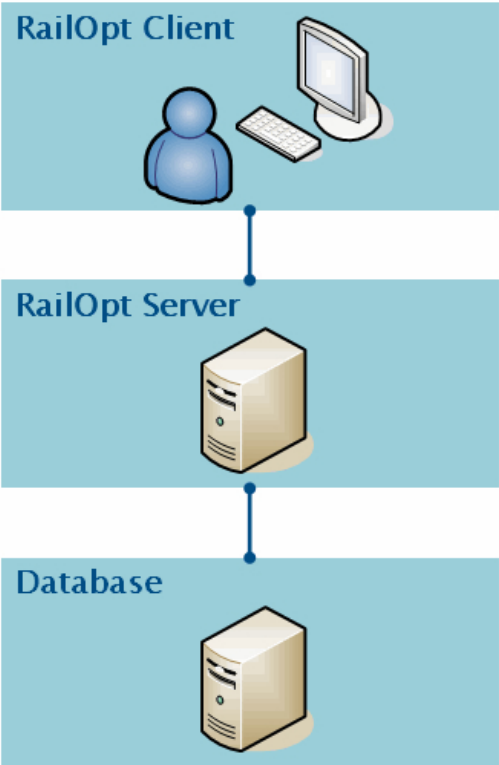


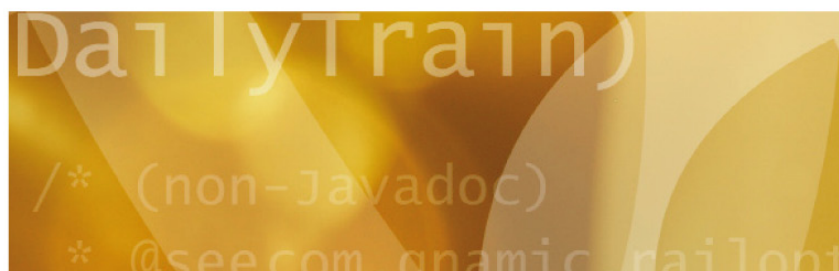
Figure: Three-layer architecture of a RailOpt installation

Summary

1. Direct access to the data model of RailOpt products without additional interfaces
2. Proposals prepared in accordance with the relative weighting of the optimisation objectives
3. Step-by-step decision-finding and planning optimisation performed automatically, semi-automatically or based on manual adjustments
4. Interaction and iterative procedure for solution finding between RailOpt DSS and the user in situation-led breaks
5. Planning changes created and considered in real time
6. Support as well as greater speed in simulations, what-if scenarios and simulation creation

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