Trapeze Rail System
Simulation and Planning
Enabling future railway plans
– Cost reductions through realistic planning and simulation

The worldwide growth in demand for travel and increasing competition between all modes of transport places ever greater demands on railways. To meet this challenge, railway businesses must increasingly strive to make better use of their existing and planned resources.

Trapeze Rail System assist in achieving these objectives. By drawing on experience, tried and trusted solutions are combined with new innovation to meet specific requirements.

### Key Advantages at a Glance
- Holistic planning supports the requirements of both infrastructure operators and train operating companies
- Timetable development with consideration of the entire life cycle of strategic long-term planning right up to real-time operation
- Data integrity for networks, timetables, staff and rolling stock
- Configuration of all organisational variables, numerous user types and various sites
- High-performance analysis tools with decision-making support functions

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#### FUNCTIONS – PLANNING

**Train Operations**
- Simulate operations (rolling stock, signalling systems, energy)
- Running time calculation
- Identification of conflicts
- Validation of timetables
- Data for cost-benefit calculations

**Power Supply Network**
- Simulate power supply demands, electrical outages and emergency scenarios
- Assessment of substation locations
- Assessment of supply robustness
- Simulate AC & DC networks & return circuits

**Timetables**
- Robustness analyser
- Networks capacity optimisation
- Timetable stability
- What-if scenarios

**Network Planning**
- Negotiate track access
- Identify available tracks
- Path request management
- Possession request management

**Timetable Planning**
- Stations, stops and connections
- Unlimited what-if timetables
- Running times
- Conflict detection & validation
- Route planning
- Possession planning

**Vehicle Planning**
- Interactive feedback between vehicle planning and crew planning
- Auto validation
- Capacity and blocking
- Fuel and maintenance
- Vehicle optimisation

**Crew Planning**
- Interactive feedback between vehicle planning and crew planning
- What-if scenarios and cost calculations
- Employee qualifications
- Crew optimisation

**Crew Roster**
- Rostering
- Manually and automatic
- Employee assignment
- Roll-out
- Optimisation

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Trapeze Group – your long-term partner

Trapeze is a well established provider of leading solutions within planning, simulation and modelling for the railway industry worldwide. We have extensive experience in implementing system for clients with widely different operating procedures and requirements. A careful analysis of requirements is always carried out before a solution is implemented at the client’s site. Open communication with customers and partners ensures that the solutions are effective and can be implemented without interrupting operations.
Complex requirements:

Comprehensive planning tools

Delivers better balance between infrastructure, rolling stock, staff, service and cost

Delivery of an operational railway timetable involves the coordination of three key components: infrastructure, rolling stock and staff. These all have very different requirements and constraints. Trapeze addresses these by developing, delivering, and supporting planning and simulation tools that help railway planners and engineers understand the issues identified during the planning stage, and to develop effective operational plans that satisfy key business requirements.

Close Co-operation: Train Operating Companies and Infrastructure Operators

The planning of daily train schedules involves sharing and exchanging data between various stakeholders. To match this, Trapeze has expertise in providing electronic support for the business processes involved in e.g. line capacity and train path bidding and allocation.

Successful Management:

Efficient Planning

The systems Trapeze delivers make company-wide planning and management tools available. These tools enable the planning and integration of the various operational functions over the entire lifecycle – from long-term strategic plans right up to their implementation in daily operation. Each part of the organisation can then clearly identify the effects that future schedules will have and so forecast operational performance and financial effects.

Well-Founded Decisions:

Market-Orientated Action

Ensuring a flexible response to the needs of the market or to operational problems demands a quick and effective decision making process. Modern graphic interfaces in combination with optimised tools provide user support in developing and delivering robust and cost-effective timetables. These easy-to-use tools both reduce staff training times and can be put to highly flexible use.
Trapeze delivers planning and simulation modules that can be customised to suit individual needs and integrated to form a larger overall system. Our modelling and simulation tools form the basis of long term and short term operational planning. Combined with our solution for the-day-to-day operational management Trapeze delivers a 360 degree solution for a variety of railway clients worldwide. The flexibility of the Trapeze Rail System means that customers can be confident that the system will meet their respective requirements.

Simulation of Train Operations
Trapeze’s simulation tool RailPlan enables rail experts and engineers to predict the behaviour of rolling stock, signalling systems, and power supply networks, and to combine these to show complete train movements. The full benefits of RailPlan become evident when simulating the operation of a complete railway system – conflicts are identified, and the effect of failures and incidents predicted and presented. RailPlan has been developed to simulate all types of signalling and train control systems. It can be used to assess various options for infrastructure development and provides accurate data for cost-benefit calculations. RailPlan offers a broad range of applications, e.g. determining signal headways, assessing the locations of points and crossings, and validating the viability of timetables.

Simulation of the Power Supply Network
As an integral part of the modelling of train movements in RailPlan, the PowerPlan module simulates the demands that will be made on the power supply network. Its dynamic feedback function allows the power supply behaviour to modify the power available to the trains in the RailPlan simulation. It allows the assessment of substation locations, robustness of supply, and susceptibility of the network to degraded performance. PowerPlan not only simulates AC and DC networks, but also return circuits.
Conflict-free Timetables

With more than 500 installations globally, Trapeze’s timetable Planning Tool, TrainPlan, is amongst the world’s most-used timetable development tools. Thanks to its highly developed conflict detection and solution routines, TrainPlan is setting industry standards.

Creating Conflict-Free Timetables

TrainPlan offers a fully scalable timetabling tool that meets the requirements of a wide range of users: from a single planner in an engineering consultancy, through to national rail organisations with multiple locations networked to a single national database. TrainPlan provides an extremely robust timetable database capable of storing all the development versions of a timetable, from the strategic plan to the short-term engineering plan. To satisfy the broad spectrum of operational users, data handling is customised to support the relevant business rules and deliver the required local outputs. The system is fully language configurable.

TrainPlan offers a modern graphic interface that allows several information windows to be displayed across multiple screens. The displays include familiar tabular and graphical images like time-distance line diagrams, platform occupation diagrams, corridor graphs and timetable books. Where appropriate, these displays can be manipulated using drag & drop functionality.

Due to TrainPlan the process of creating conflict free timetables is accelerated significantly. At the same time safety mechanisms within the system allow planning data to be managed securely.
Simulation of Timetable Stability

The Timetable Robustness Analyser (TTRA) is a high-speed simulation tool that assesses the stability of timetables over very large areas.

TTRA simulates possible train delays, caused for example by excessive station dwell times, traction performance problems, or temporary speed restrictions, and models the knock-on effects for the system being investigated. One timetable can have the characteristic that delayed trains will lead to considerable knock-on effects, whereas another version of the timetable may, by contrast be able to “absorb” such effects more readily.

The use of TTRA at the planning stage helps identify which of the timetables are most robust, and substantially reduces the risk of train delays in operation. This not only makes travelling more reliable for customers, but also means that train operators can avoid the sometimes substantial financial and reputational penalties that poor service delivery can incur.
**Integration of Timetables and Resources**

**Planning the effective use of resources is a crucial part for all train operations**

Not only does the process ensure resources are planned to achieve delivery of the advertised timetable, it also sets the fundamental cost base for the business as a whole. The significance of efficient resource planning should not therefore be under-estimated. Today much greater emphasis is being placed on the process, the efficiency of the result and the importance of resource planning.

Creation of crew and vehicle schedules using timetable data generated in the planning process

For a train operating company, existing operating options are limited by two factors: mobile resources (rolling stock, staff), and track capacity. Solutions for train operating companies that cover the integrated planning of trains and resources are therefore valuable. They ensure shorter planning periods, create the conditions for plans to be developed in parallel, and ensure that all relevant factors are considered.

Optimisation procedures further speed up resource planning and enable disruptions or problems to be managed effectively, whilst taking into account operational conditions. Restrictions created by staff knowledge and certification, staff working hours, any technical limitations due to the section compatibility of the vehicles and any legal or contractual restrictions can all be considered. These are built into the tool to ensure the feasibility of the vehicle and crew plans generated. These plans can be continually compared with the current version or with a daily version to ensure that changes have not been overlooked.
Trapeze Group delivers solutions that consider the full 360 degrees of passenger transport. Hundreds of government and commercial organizations across Europe, North America and Asia Pacific have turned to Trapeze to realize efficiencies, enhance the quality and scope of their services, and safely transport more people with less cost.