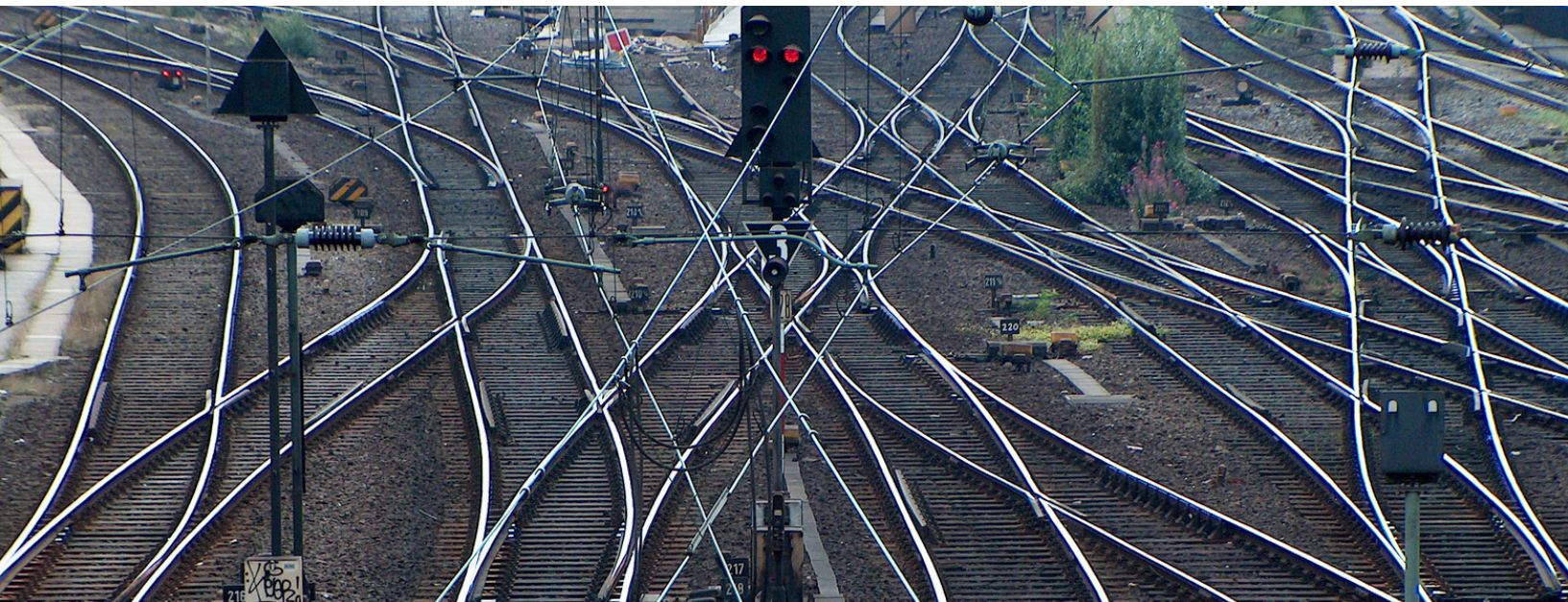




Traffic • Software • Service

Train Planning System (TPS) Network Capacity Management





TPS gets your timetable planning and management moving

You are something special. After all, your railway network structure is so unique that you know you can't use just any standard software. And your demands are so specific that you know only a customised solution will fit the bill. That's when you should get to know TPS. Right from the word "go", the HaCon Train Planning System was developed to allow the integration of any and all customer-specific functions. And you also profit from multi-user operation, which is a central element in the TPS architecture. As a result, trains can be processed by different users at the same time. Rights, roles, groups and users are defined precisely.

You stay on track. TPS combines infrastructure, timetable and train path management as well as all interaction. Thus, you can optimise your work and business processes in no time flat. The entire network is always taken into consideration during all types of planning, while the local planning priorities are also carefully observed.

You are an individualist. You not only have definite ideas about how your user interface should look like. Thanks to TPS, you can also determine all the validation rules and how they work for train data and timetables, whereby an individual central configuration keeps

everything under control on different levels of use. In addition to the system-wide levels of use, differentiations are made by roles, groups and users. With his or her own personal system settings, any user can work on any computer in the system and TPS makes a note of the settings used last in its "central brain" so that they are ready to go again the next time that user logs on.

You are independent. Just like TPS. The program is completely independent of third-party software wherever possible. This means that the rights of third parties, which would entail additional licensing fees, for example, are not an issue here. The only exception: for the database, we decided in favour of using the unparalleled technology of Oracle®.

You want your freedom. TPS eliminates the need for restrictions in the timetable periods. Continuous, ongoing planning makes long-term and short-term planning possible in just one closed database. We call it the "permanent capacity plan". And it enables you to plan reliably for the future and more efficiently than ever before.

You are flexible. TPS can be integrated as a module into an already existing environment.

"With an IT product as complicated as this, you have to be able to turn all the screws."

You can also edit your planning context – according to criteria relating to space, time and/or organisation.

In short: TPS sets your timetable planning and your timetable management in motion. Find out for yourself what TPS can do for you.

Full steam ahead all through Europe: With TPS as an EU-compliant planning system

TPS supports you in planning your capacity according to the legal regulations for discrimination-free train path access. At the current time, the entire train path management process can be coordinated either by workflow management systems connected to TPS or by internal workflow mechanisms.

There is also a complete range of TPS web services available for all the interaction required between TPS and external systems. The software maps the different rail companies and the corresponding contracts in their entirety.

Your advantage: Even if different operators in Europe use identical train numbers, individual trains can be clearly identified on the basis of the contract between the infrastructure operator and the rail company. As a result, the TPS structure makes it possible to create timetables that cross borders and even cross all of Europe – provided that all the necessary information has already been fed into the system.

Always flexible: Adaptability sets the switches for success

TPS is adaptable and can be configured to meet individual needs. The customisation can even go so far that the customized interfaces of different customers are so different that they look like a

different software solution has been used. At the current time, some 1,600 different switches can be set to determine the TPS configuration.

TPS is a standard software program that is always based on the same current setting when it's up and running. You can, for example, tweak the system in certain areas while the planning process is running, or switch different options on or off. If you want to add a new user

TPS – Overview

Architecture

Multi-User-System:

- Capability of simultaneous planning of trains by different users
- For support of a comprehensive planning process, planners insert train- and infrastructure-related notes in order to store local knowledge against infrastructure data and train schedules
- Integrated protection mechanisms against unintentional changes

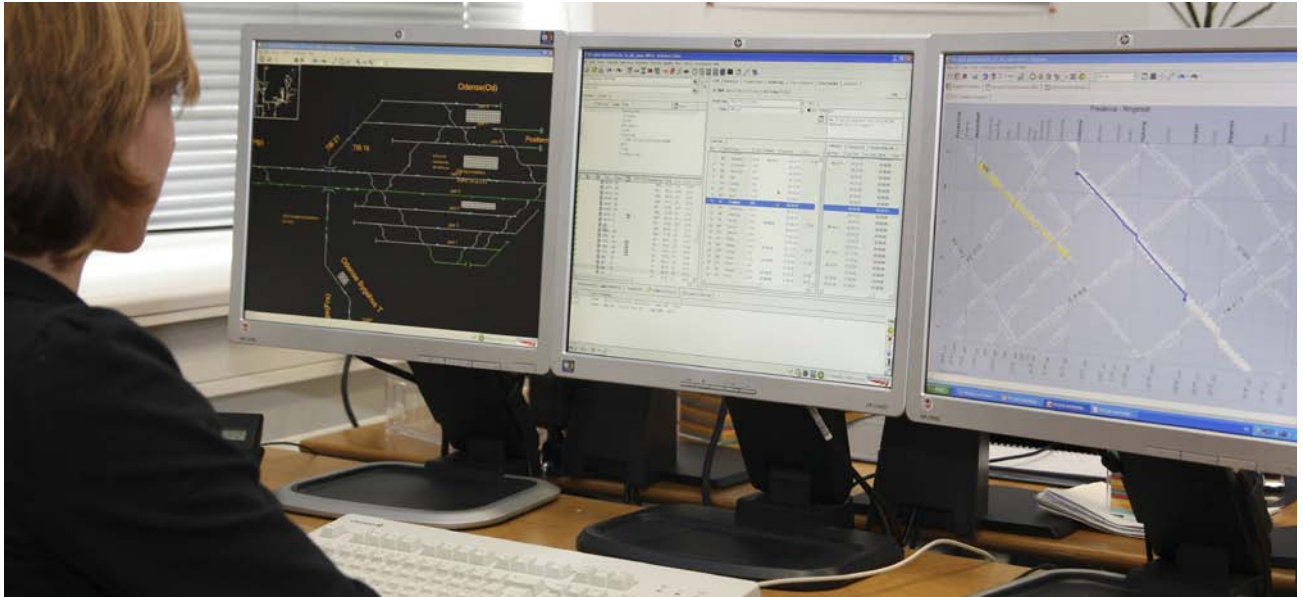
Network Wide Modelling

The TPS architecture guarantees adequate performance, especially in large railway networks:

- Smooth handling of huge infrastructure and train dataset
 - Access to the database also via computer networks of small bandwidths
 - Intelligent use of Caches on local clients or on department servers to ensure best performance
- The complete national railway network may be taken into account for all planning activities
- Planning contexts for individual use can be defined, either locally restricted by defined regions, corridors or station/location sets, by day run patterns, single days or periods, or operationally restricted by train types or train operating companies (TOCs)

Security

- Quality based change reporting
- Complete undo- und redo-functionality
- Recycle bin function: unintentionally deleted data can be restored without problems, even on the next day
- Management of access rights
- Authorisation via login name and password



or make any structural changes in operations, you, the customer, can make all the necessary changes yourself. We provide you with intensive training on the individual configuration options.

Planning without limits:

Timetable creation and update

TPS is capable of rolling planning. This means that the system revolutionises conventional planning methods based on the traditional "copy-forward" principle. You no longer work on current and future timetables separately, one beside the other. On the contrary, the "perpetual timetable" with ongoing planning is not subject to the traditional timetable restrictions. As a result, each change has to be entered into the plans only once – from a single location. And for you that means: less time and trouble for data collection, less susceptibility to human error. Everything is connected with everything else in a single timetable. In this way, you can, for example, directly allocate a validity period for trains, which can also exceed the timetable period.

Automatically good: Regulations for success

TPS also has train regulations for working zones integrated into the timetable creation process, allowing a direct feedback process from the working zone regulations into the long-term or short-term timetable creation process. Information loss due to a breakdown in communications is now a thing of the past.

A cooperative multi-user regulation provides for an efficient workflow in TPS. This optimises the communication between your planners, who deal with different working zone scenarios and have to continuously coordinate their activities with one another right down to the last detail. TPS supports your planners with automatic train path search and in their search for solutions to any kind of conflicts. If they search for a train path from point A to point B, TPS will automatically suggest a conflict-free solution.

Extensive checks and related message systems provide for the automatic validation of the timetable. The configuration of the validation process can also be customised. This means that you, as the customer, decide which conflict messages, error messages and warnings appear in which way.

You are running the show: Complete control over the timetable

Based on the train properties, TPS can calculate running times as well as allow arrival and departure times that deviate from the calculations – if changes in the infrastructure data are to be expected, for example. This gives your planners complete control over the timetable. Everyone is always completely clear about how time allowances and reserves are used.

Planners may use the key symbol on the user interface to "lock" certain times in order to make sure that schedule times that have



already been coordinated with the train operating companies are not changed or deleted. The remaining schedule times can be added accordingly using a calculation of the driving dynamics to the times protected in this way. Thus, TPS answers not one but three questions at the same time: When should be the latest departure at the starting point? What is the earliest arrival time at the final destination? How does a timetable with economic manner of driving look like, that is punctual and at the same time spreads time reserves evenly?

**More intelligent than you think:
Automation for greater efficiency**

TPS is always one step ahead of your planners, with respect to the operating days key, for example: TPS automatically identifies the regularities in the alteration of originally regular operating day patterns. Or take the train number allocation, for example: If there are different train numbers for one and the same physical train, TPS recognises this automatically and prevents the train concerned from being planned as two different trains. As for all messages, TPS also uses interactive direct links to the data objects concerned as part of the message itself, so that planners safely and efficiently achieve their objectives.

From the plan to the publication: Timetable publications at the click of a button

TPS provides timetable publication output for different target groups. These might be working

- Stand-alone offline working is possible, based on TPS data freezes which can be taken as snapshots out of the database at any time; freezes of timetable versions for comparisons; change control of all offline changes;
- All changes of data are secured by data base transactions, so that data consistency is always guaranteed

Flexibility and Customisation

- TPS is designed to enable integration as a module in an existing IT environment
- Automatic interfaces for data communication to other systems are available (web services, export data subscriptions)
- Individual functionality and system behaviour can be enabled and controlled easily:
 - Integrated hierarchical permission model (access permissions, roles, groups, users)
 - Flexible train status management for mapping of workflow
 - Powerful reporting system including data warehouse support
 - Customer specific interfaces
 - User-specific configuration of validation procedures for train data and timetables
- Workstation independent, central configuration: each user may work with his own settings at any TPS workstation in the network

Development

- Quality based standard processes for conception and development
- Source code completely realised in standard programming language C++
- Cross-platform-development under MS Windows (Vista, XP), Linux and Mac OS (other UNIX-systems on demand)

Risk Management

- TPS is widely independent of third party suppliers:
 - Oracle® is the central data base management system
 - Usage of database standards without using database product-specific features like triggers or stored procedures
 - TPS uses one of the leading application frameworks (<http://qt.nokia.com>) with self-maintainable source code licence
 - Clear license situation, no third party software licensing fees
 - Defined support processes for third party software
- Specifically developed automatic code generators accelerate the development process and help to ensure product quality
- Automated testing

Support

All support processes are handled quality assured by our web-based communication system IRS:

- Customers, users and developers communicate online
- Each issue report contains category, status, priority and assigned responsible individuals
- Powerful filters generate individual views
- Protocol of all changes with time stamps

Hardware

Clients

- Standard-PCs with 2 GB memory recommended; parallel usage of other applications possible, such as MS Office products
- Operating systems MS Vista/Windows XP, Linux, Mac OS
- Full support of Citrix server and clients
- Ergonomic three-screen-solution for TPS workstations recommended (minimal resolution 1280x1024)

Server

- Windows/UNIX/Linux standard server for Oracle® database
- Mirroring on fallback server



timetables for engine drivers or staff at signal boxes as well as public timetable books or other related schedule information. The standard interfaces can be used to provide a wide variety of output formats to other systems such as booking or ticketing systems with data from TPS. The way in which this data is provided in individual cases is configured individually for the customer concerned.

In addition, you also have access to the standard interface of the HaCon timetable information system HAFAS – as well as to the entire range of HAFAS printed products. The relationship to the public timetable, whose times are updated in the planned times as required according to configurable processes, remains the same during the entire planning process. This increases overall efficiency.

This makes planning fun: Clearly-structured and user friendly, focused on results

TPS displays the validation status for trains in an easy-to-understand manner. Regardless of whether the platform is not long enough to ac-

commodate the length of the train, whether the train doesn't have enough traction or braking force or the tracks cannot support the weight – TPS makes the problem clear in the individual case and directly offers an option to adjust the planning right on the screen.

TPS is easy to use over three screens: the infrastructure, timetable and graphical editor are synchronised. The view can be configured as desired so that a single editor can also be enlarged on all three screens. In addition, TPS reduces the planners' administration work, which often makes up a large part of their working time, to a minimum. In the future, your team can concentrate on the core tasks, will be more motivated – and can plan better than ever before.

Moreover, it is also critical that timetable reserves are used specifically and transparently to obtain greater results quality. TPS provides you with complete transparency with respect to why and how timetable reserves have been used. As a result, you can increase the quality of your timetable without unnecessarily reducing the network capacity available.

No changes without a check back: Controlled change management

Many timetable changes only go into effect together or not at all, or must be cancelled because a track maintenance has been can-



cancelled or takes longer than originally planned. In TPS, the trains affected have to be changed only once. A change scenario can then easily be extended to a number of additional days or cancelled altogether. Your advantage: change scenarios can be used repeatedly any number of times by using change control mechanisms. To do so, a "change group", which has already been created, is copied into the new timetable, modified as required, checked and applied to the current overall timetable. That saves time, reduces the time and effort involved in planning and improves efficiency. Old scenarios can be easily archived and accessed as required.

Thanks to the TPS change management system, you can find out at any time who has made what changes and when. You can also easily manage the many alterations made in the planning during the year via train variants. Any effects of the changes are calculated immediately and indicated accordingly. Your planners are able to identify non-valid changes at a glance.

Be one of the many to choose TPS and win: References

TPS was put into operation for the first time by the Danish State Railway (DSB) in 2002. In addition to the DSB operator, Banedanmark, the Danish railway infrastructure company, and Trafikstyrelsen, the supervising authority, also work successfully with TPS in Denmark. Appro-

ximately 40 users at three locations manage a network of 4,400 km, with 3,000 lines in the long-term and 10,000 in the short-term planning. 15 other systems in the Danish production environment are linked with TPS.

Further European railway networks that have already made the decision in favour of TPS are Network Rail, the British railway infrastructure company, and Réseau Ferré de France (RFF), the state operator of the French rail network. Once fully implemented, 400 users at three locations in Great Britain will be planning a network of 27,000 km and 90,000 lines in the long-term planning and up to one million in the short-term planning. 250 other production systems are linked with TPS.

Three major European railway networks already rely on TPS from HaCon. When will you join them?

HaCon Business Segments

Consulting	Software	
IT and Projects Transport and Traffic	Train Planning System TPS	Timetable Information HAFAS
Intermodal Systems	Network Capacity Management	Information Management



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