

OPTIMISATION AS A DRIVER OF EFFICIENCY: MAKING THE MOST OF VEHICLES AND STAFF

IVU TRAFFIC TECHNOLOGIES

■ PLANNING VEHICLE WORKINGS AND DUTIES IS A DEMANDING TASK

deploying all resources properly and optimally poses a challenge. The potential to generate optimised results is therefore significant. A small increase of a few percent in the efficiency of vehicle workings or duty schedules can save railway companies a lot of money. The optimisation solutions of IVU Traffic Technologies make it possible to always maintain an overview of complex run schedules and duty schedules and to utilise existing resources in the most efficient manner.

Rail companies all around the world put their trust in IVU.rail to optimise the planning and dispatch of all their resources and to reduce operational disruptions. The integrated software solution features entirely digital workflows, meaning that all data is always available across all areas of work – from long-term timetable planning and personnel planning through to the daily deployment of vehicles and employees.

In particular, the system's powerful optimisation cores make a significant contribution to this increased efficiency. They allow planners, for example, to instantly create duty and run schedules that meet all legal and operational requirements. This frees up resources that can be utilised to provide additional services, for example. At the same time, the system creates more balanced duties that improve staff satisfaction. In addition, optimisation means that dispatch managers can respond directly to disruptions or engineering works and adapt duty and vehicle workings in seconds with only minimal changes.

It was precisely these advantages that convinced over MTR Pendeltågen, which is a subsidiary of the international MTR Corporation and operates Stockholm's suburban railway network ('Pendeltåg'). The

company has been using IVU.rail since 2016 to provide its passengers with an efficient and reliable service.

Optimised vehicle workings

The Pendeltåg connects the Swedish capital, Stockholm, with the surrounding area. More than 390,000 passengers travel every day on a 241-kilometre rail network with 53 stations. Most of these passengers are commuters travelling to or from work in the Swedish capital or visitors travelling to or from Arlanda airport. Due to the fluctuating passenger volume the models that are deployed typically run with two to four carriages during the day and often only one or two carriages in the evening.

To enable individual carriages to be added and removed as required between journeys, the planners and dispatch managers at MTR need special functions for planning multiple units that precisely map train strengthening and weakening. IVU.rail allows them to track the position of each carriage. Shunting trips are also precision-mapped. This means that vehicle working schedulers always know precisely where a vehicle is and can combine trains efficiently.

To make the vehicle workings of its 110 trains more efficient and robust, MTR Pendeltågen uses the special vehicle working optimisation. Complex algorithms help to always find a needs-based and low-cost solution for the number of journeys that need to be planned. If desired, the system automatically creates unavoidable non-revenue trips and schedules maintenance on the basis of predefined service intervals, taking into account the availability of maintenance resources and parking capacities at depots.

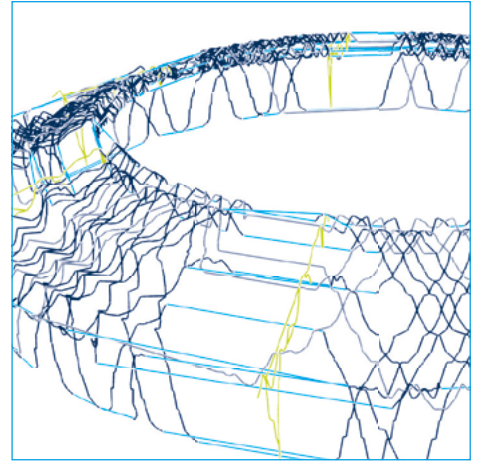
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Integrated resource planning



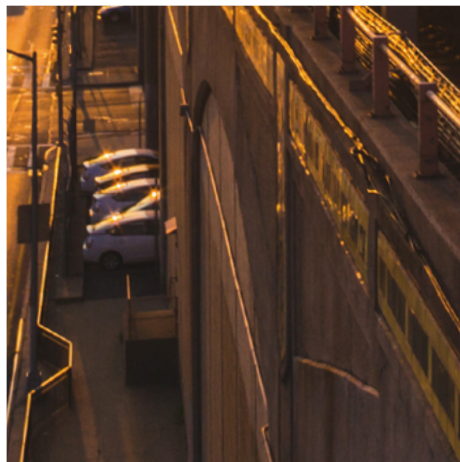
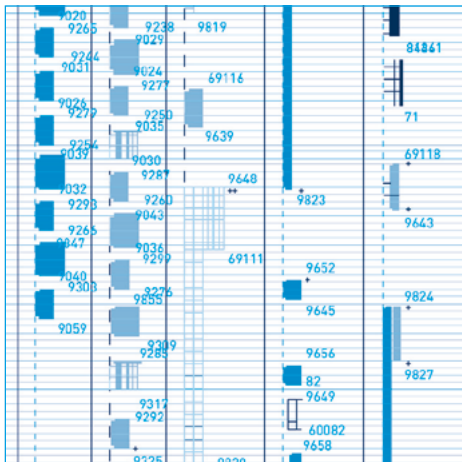
OPTIMISE RESOURCES

From vehicle runs
to duties: IVU.rail
maximises efficiency



INTEGRATE WORKFLOWS

From scheduling
to accounting:
everything stays in
one system



FROM THE CLOUD

With the IVU.cloud,
all-round software
as a service is
provided



MTR Pendeltågen optimises vehicle workings with IVU.rail

Photo:

MTR Pendeltågen AB/Viktor J Fremting

The planners and dispatch managers can also use optimisation functions in the system to calculate different vehicle working schedule variants. These 'what if?' scenarios enable them to instantly respond to any changes by rolling out alternative vehicle working schedules in seconds. Planners and dispatch managers are thus able to maintain a reliable service across the extensive network even when snow or other adverse weather conditions are making regular operations difficult.

Track occupancy planning for greater stability

The stability of vehicle working scheduling in day-to-day operations can be further enhanced if the dispatch and planning system supports track occupancy planning. MTR Pendeltågen uses the track occupancy planning function of IVU.rail to create detailed station run orders. Visualisation of the parking facilities helps dispatch managers to efficiently schedule shunting trips in advance. A schematic diagram of the station shows track details in a plan view format. Dispatch managers can instantly see which tracks are occupied and where shunting might be possible. If vehicles are blocking a travel path or tracks are occupied by multiple trains, the system automatically issues an alert. This relieves dispatch managers of routine activities and significantly speeds up vehicle working scheduling.

Especially in highly liberalised railway markets like Sweden where network operation is regularly tendered out, the operating company frequently changes. Full interoperability of the software systems ensures that the network can be handed over without any operational disruptions, cancellations, or other disadvantages for passengers. The planning and dispatch software must

therefore also be capable of running in heterogeneous system landscapes. Standard interfaces such as RailML allow a smooth exchange of data with affiliated or third-party software systems. This is particularly important when work is performed in cooperation with subcontractors such as maintenance service providers. The IVU solution enables MTR Pendeltågen to easily integrate their maintenance software and incorporate it seamlessly into the existing configuration.

Optimised duty schedules for 1,200 employees

Increasingly complex vehicle working schedules and timetable planning have a direct impact on duty scheduling for employees. To deploy personnel as efficiently as possible across the planned vehicle workings, intelligent systems are needed that take into account all the numerous variables: When can a driver be driving which specific vehicle and where? Do labour law regulations or holidays need to be considered? This allows personnel capacity to be optimised in line with requirements. The results of duty scheduling are ideally fed back into vehicle working scheduling, with vehicle deployment times requiring only minor adjustments and with virtually zero impact on passengers in order to achieve better – i.e. more cost-effective – services.

MTR Pendeltågen creates duty schedules for around 1,500 employees. In addition to the working hours of mobile personnel, the system also manages the duties of office-based employees. A flexible rule system allows mapping of the complex duty rules, which the system uses to propose optimised duty times for individual employees. When doing so, it takes into account not only legal and operational requirements as

well as holiday and time-off requests from personnel, but also details such as supplementary activities or the distances that drivers need to cover to get from the break room to the vehicle or, for a train consisting of multiple units at its final stop, from one end of the train to the other. Passage trips as a passenger and taxi journeys can also be mapped.

In addition, the automatic duty schedule optimisation creates even more efficient duty schedules. Directly integrated in duty editing, automatic scheduling ensures that all vehicle workingsand resulting activities are optimally covered.

Before MTR Pendeltågen created the rule system for optimising duty schedules, the company identified its desired quality criteria and defined the optimisation targets. It was initially a matter of ensuring operational stability and speeding up the planning process. But it was also important to distribute working hours more evenly and thus avoid working time fluctuations. Despite the higher initial investment costs, the results in the event of disruptions are far more robust. Based on the previously defined rules, the system can quickly and efficiently respond to changes in operations such as snowfall in winter or engineering works on the line.

Information via the mobile employee portal

In a large network like Pendeltåg, personnel dispatch managers need to keep in contact with their drivers over great distances. They need to know at all times whether employees have started work, whether they were too late or whether they need to take time off due to illness. In this case, dispatch managers must find a replacement as soon as possible. They also have to provide all the necessary information for payroll accounting.

To enable communication between personnel dispatch managers and drivers, MTR Pendeltågen uses IVU.rail's mobile employee portal. The key advantage of a solution like this is that it works in both directions. While it used to be the case in the past that dispatch managers would receive certain employee information in electronic form, they generally still had to print out duty schedules in the traditional way and hang them up or distribute them by hand. This method was extremely prone to human error, for example when employees forgot or changed their duty times. The printouts were not exactly flexible either, offering no way of entering last-minute changes.

Thanks to the employee portal, drivers and mobile personnel can inform themselves of the latest duty times whenever they want. The system automatically issues a special alert to indicate changes to the duty schedule. Work times can be entered via the web portal, which can also be downloaded

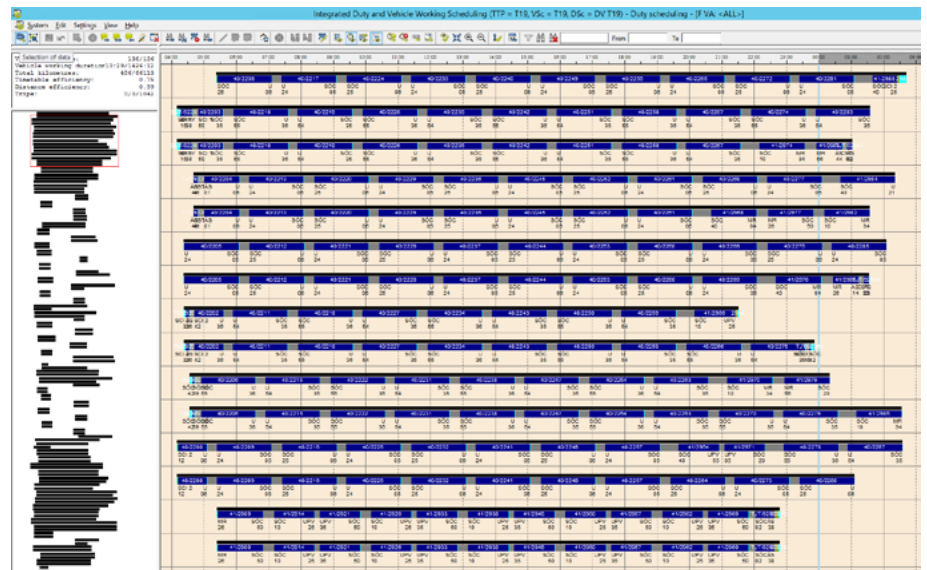
to mobile devices. For this purpose, the client was specially integrated in MTR Pendeltågen's driver app. As soon as they report for duty, employees can check in using their smartphone and thus inform the dispatch manager that they are present.

Efficiency at the touch of a button

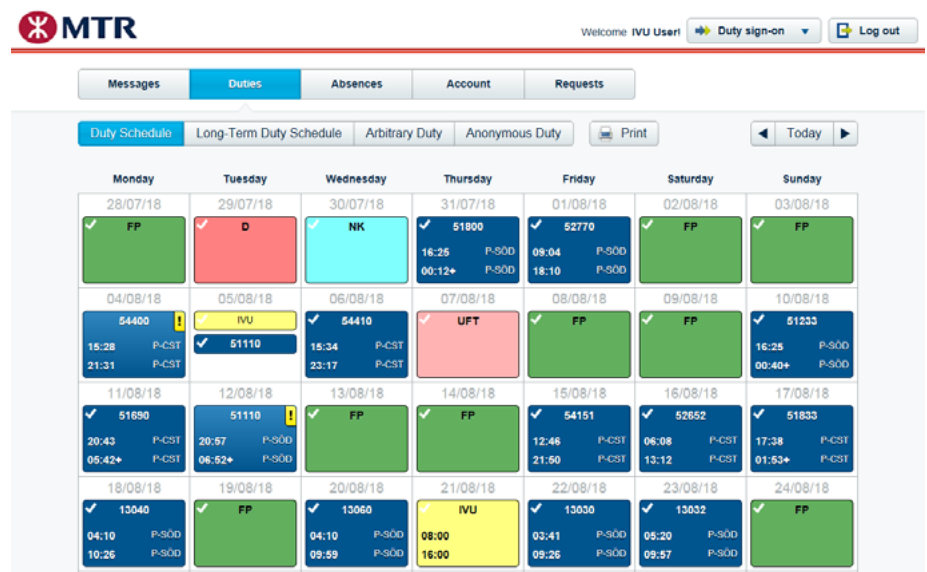
The powerful algorithms, on which IVU works together with the optimisation experts from LBW Optimization GmbH, support the planners and dispatch managers at MTR Pendeltågen throughout the entire planning and dispatch process. To leverage all the optimisation potential, MTR

Pendeltågen can set up and prioritise the optimisation targets as it desires. The central overall system makes it easy to implement a whole range of changes and scenarios. This allows the company to benefit from the efficient deployment of personnel and vehicles which accelerates workflows, minimises costs and, last but not least, ensures that transport operations are more stable and reliable.

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The mobile employee portal informs MTR Pendeltågen's drivers about current duties
 Photo: IVU



IVU.rail's integrated duty and vehicle working scheduling enables MTR Pendeltågen to coordinate duties and vehicle workings optimally.