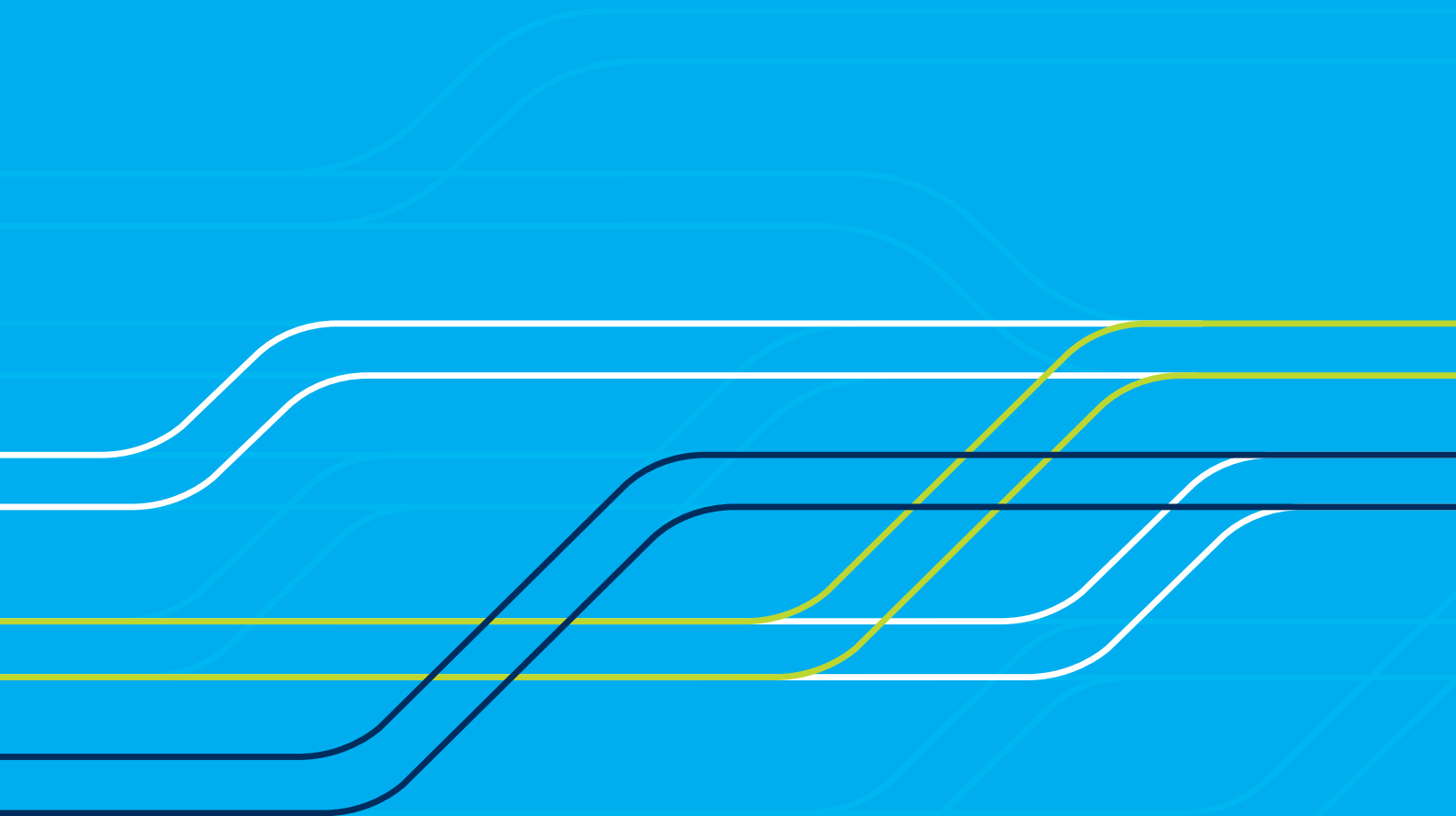
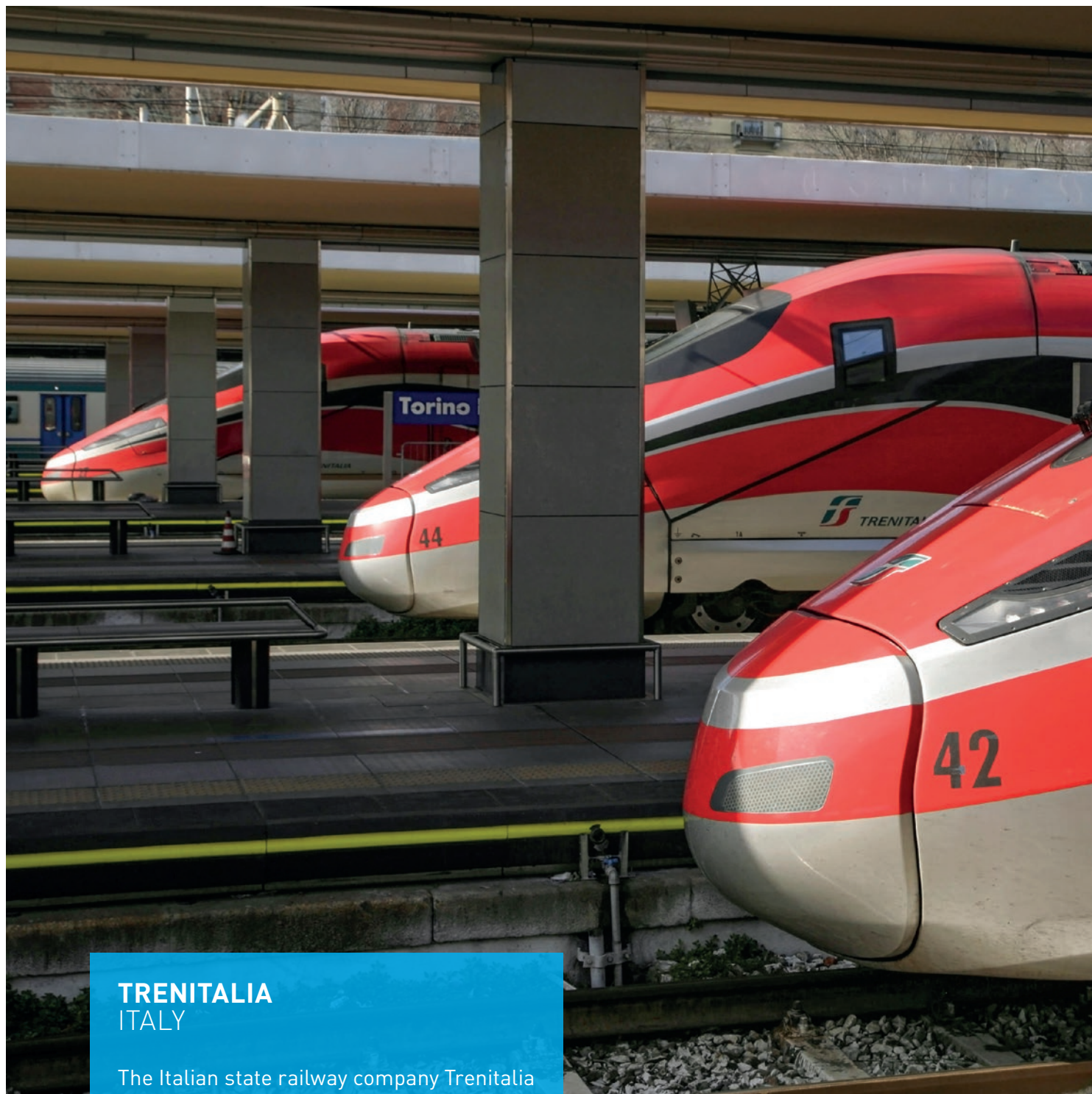


IVU.rail

DEPLOYING VEHICLES & STAFF EFFICIENTLY





TRENITALIA ITALY

The Italian state railway company Trenitalia uses IVU.rail every day to plan, optimise and dispatch over 14,000 employees and 6,000 train trips entirely from the cloud. All data for inter-city and regional transport is integrated across the company, and booking and reservation systems are directly linked.



IVU.rail

EFFICIENT PLANNING AND MANAGEMENT

Every day is filled with complex tasks for railway companies: creating timetables, planning vehicle schedules, organising duties, operating trains, managing data and much more. These complex tasks require specialists with the right training and the right tools. IVU.rail maps a railway company's operational processes in their entirety, offering a suitable solution for every task.

IVU.rail allows railway companies to establish an entirely digital workflow and to integrate all operations from planners to train drivers. Whether they use the end-to-end solution or stand-alone products, all data remains in a single system, ensuring efficiency on the rails and in the control centre.

We understand the complexity of the tasks that railway companies need to tackle, which is why IVU.rail contains all the tools required for successful operations. It is a configurable standard system, facilitating a quick and easy implementation.

As the industry-leading resource management system, IVU.rail supports railway companies around the world to optimally deploy vehicles, ensure employees are at the right place at the right time, provide information to millions of passengers and manage transport contracts.

IVU.RAIL MANAGES COMPLEXITY EFFICIENTLY.

IVU.rail

COMPLETE SOLUTION FOR RAIL TRANSPORT

An integrated, one-stop solution: IVU.rail supports railway companies with all operational tasks: from timetable planning and run scheduling, dispatching rolling stock and staff, fleet management and passenger information, through to the management of transport contracts. IVU.rail plans routes and train paths, optimises vehicle and duty schedules, dispatches train drivers and on-board personnel, eliminates disruptions, organises parking, alerts passengers, consolidates data, and increases efficiency. From inter-city, regional and freight transport, to suburban and underground rail systems: IVU.rail was specifically developed to meet the requirements of rail transport and is equipped to master the challenges faced by railways.

SERVICE PLANNING

IVU.timetable

Network and
timetable planning



IVU.pool

Data integration

RESOURCE PLANNING

IVU.run

Vehicle scheduling



IVU.duty

Duty scheduling



IVU.timetable

manages all train path and route data and supports the entire planning process up to publishing, including ordering and managing train paths.

Page 6-7

IVU.run

supports the entire run scheduling process, from daily deployment through to multi-day vehicle scheduling including maintenance and service times. Powerful optimisation ensures efficiency.

Page 8-9

IVU.vehicle

plans and controls the entire deployment process, from allocating services and planning workshop visits, to quickly reacting to operational disruptions.

Page 14-15

IVU.pad

is the digital workplace for employees in the field. The web app contains all important information, such as duty schedules and handbooks, and improves communication between all employees.

Page 16-17

IVU.pool

consolidates timetable data from the entire range of different planning systems across companies and standardises the data to create the basis for integrated passenger information.

Page 28-29

IVU.duty

creates efficient duty schedules for staff through smart optimisation. A flexible rule system and numerous automated functions make workloads easier.

Page 12-13

IVU.crew

supports the entire personnel dispatch process and ensures that all employees are where they need to be. Powerful optimisation ensures efficient personnel deployment.

Page 16-17

IVU.fleet

is the interface between the train and the dispatch team. The background system transfers data, monitors sensors and supports evaluation tasks.

Page 20-21



OPTIMISATION & AUTOMATION

Achieve your ideal result with the smart algorithms of IVU.rail – taking into account rules, costs, social compatibility, and operational stability.

DISPATCHING

FLEET MANAGEMENT

TICKETING

PASSENGER INFORMATION

CONTROLLING

IVU.vehicle

Vehicle dispatch



IVU.fleet

Control centre

IVU.fare

Tariff management and fare collection

IVU.realtime

Dynamic passenger information

IVU.control

Accounting and reporting

IVU.crew

Personnel dispatch



IVU.cockpit

On-board software

IVU.ticket

On-board ticketing

IVU.journey

Integrated journey planner

IVU.pad

Digital workplace

IVU.box

On-board unit

IVU.validator

E-ticketing terminal

IVU.cockpit

runs on the on-board computer on the train. The software displays dispatch changes, communicates with the dispatch team, and supplies passenger information

Page 20-21

IVU.fare

manages sales processes, from setting fares to settling ticket sales (paper or e-tickets) within networks and individual companies.

IVU.validator

is the e-ticketing customer terminal. Whether it is used for boarding checks or as a stand-alone sales terminal, the intuitive user interface makes it easy to operate.

IVU.journey

computes the best route for passengers at all times. The travel planning system forms the basis for digital travel information, including car- and bike-sharing initiatives.

Page 24-25

IVU.box

is the user-friendly on-board computer with a touch screen for the driver's cab. It communicates with the control centre, records the train position and manages the on-board systems.

IVU.ticket

is the software used for sales and inspection terminals. It handles the entire ticketing process, from printing tickets through to selling and validating e-tickets.

IVU.realtime

provides real-time information to passengers on all channels. Directly linked to the control centre, the system generates a consistent flow of data from train to passenger.

Page 24-25

IVU.control

records planned and actual data, merges this data and prepares it for further processing, e.g. for management of transport contracts or for evaluations and analyses.

Page 30-31

IVU.timetable

RELIABLE TIMETABLES

All basic and infrastructure data within one system: With IVU.timetable, routes, headways, and journeys can be perfectly coordinated.

IVU.timetable supports the entire timetabling process, from structuring the route network and creating timetables through to publishing services and supplying information to operation control and passenger information systems. Railway companies benefit when train formations are planned in detail. For example, IVU.timetable enables strengthening, weakening and portion working of train formations, while the direction of train movement is calculated automatically based on preset system parameters.

The integrated transport path management and planning tool makes it easy to handle route resources within the planning process. Ordered train paths can

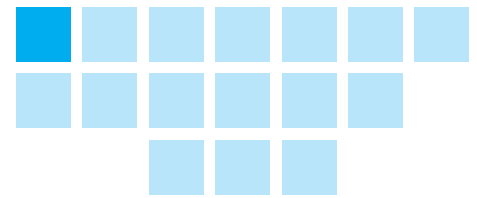
be easily combined with planned trains and scheduling can be modified in the event of any changes. IVU.timetable issues a warning when train path changes result in conflicts. Planners can flexibly work around planned timetable deviations such as engineering work. The system ensures consistent planning information: from journeys and vehicle schedules through to duties.

Whether the task at hand involves simply configuring individual routes or integrating data from other operators and subcontractors, with IVU.timetable you have all the information at your fingertips at all times. IVU.timetable makes everything easy: from assigning infrastructure restrictions and entering parameters such as seating capacities and itineraries, to designing timetables.

DB REGIO GERMANY

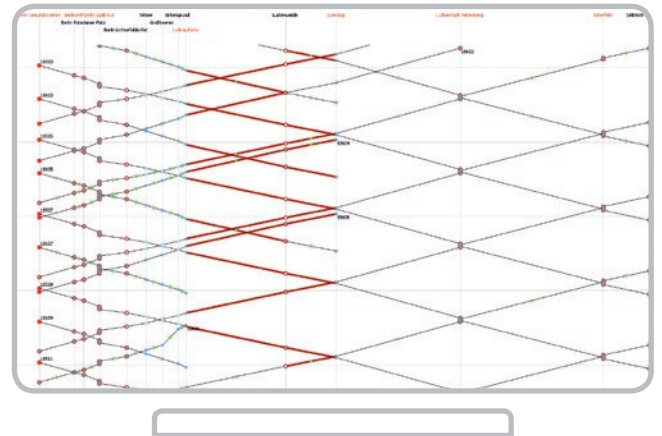
From timetable planning and run scheduling to dispatching vehicles and staff: The largest regional transport company in Germany benefits from an end-to-end process chain and standardised data storage in all its regional rail networks.





IVU.timetable at a glance

- **Integrated train path management**
Standardised management and planning of transport paths and trains: IVU.timetable makes it easy to handle route resources
- **Detailed train formations**
Strengthening, weakening and portion working of vehicle formations can be planned in detail
- **Intelligent checking algorithms**
A single change can have major repercussions: IVU.timetable supplies consistent planning information automatically
- **Automatic conflict warnings**
IVU.timetable issues a warning when there are infrastructure restrictions
- **Future-proof data model**
The train path management function is already equipped for the upcoming TAF/TAP TSI standards



The line graph in IVU.timetable clearly displays the timetable and any conflicts as a result of infrastructure restrictions.



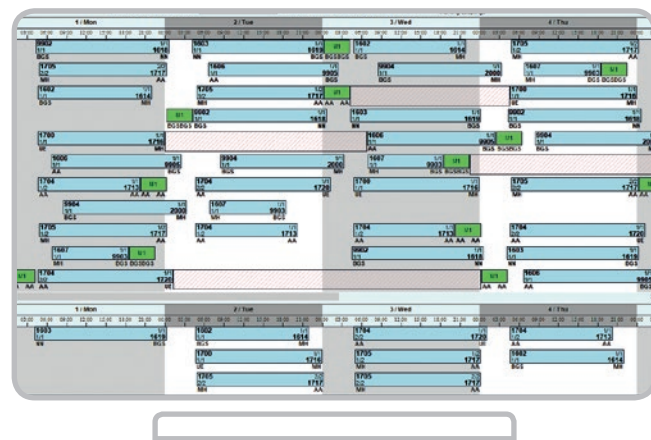
IVU.run

EFFICIENT VEHICLE SCHEDULES

Creating efficient daily vehicle schedules and optimising vehicle requirements: IVU.run supports the entire run scheduling process, from one-day schedules to multi-week scheduling cycles including maintenance and service times. Numerous automated functions and reliable, highly configurable rule systems support more efficient workflows.

IVU.run adopts timetables seamlessly from IVU.timetable or from third-party systems via standard interfaces. The system includes all relevant information for linking journeys to vehicle schedules: vehicle type, service intervals, turnaround times, train strengthening. IVU.run calculates the position and orientation of vehicles within the vehicle formation automatically, just as it does with changes in direction. For maximum efficiency, IVU.run suggests suitable subsequent trips for every journey as requested. There are internal control mechanisms in place to ensure that the final vehicle schedule meets all operational requirements and regulations.

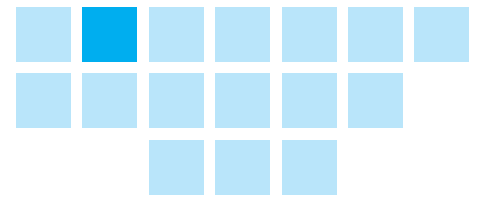
IVU.run's powerful optimisation core performs complex tasks. It creates and optimises multi-day vehicle schedules, which in turn support efficient vehicle parking. The integrated track occupancy planning function automatically assigns the relevant tracks if required, something made possible by detailed rule system. Optimisation also allows extensive variant planning to calculate various different scenarios and their costs. This is helpful in many planning scenarios, for example when railway companies apply for new concessions.



IVU.run links train journeys to run schedules

SBB CARGO SWITZERLAND

The freight transport subsidiary of Swiss Federal Railways replaced several stand-alone systems with IVU.rail to plan and dispatch around 350 locomotives and 2,200 employees in one integrated system. IVU.rail directly maps transport processes and enables end-to-end resource management right through to daily scheduling.



IVU.run at a glance

■ Powerful optimisation

Tried-and-tested algorithms generate efficient vehicle schedules and support improved resource utilisation

■ Integrated planning processes

IVU.run is part of an integrated scheduling software, integrated seamlessly into timetable and duty scheduling

■ Automatic suggestion system

Efficiency, resilience, operational stability – IVU.run automatically suggests the best possible vehicle schedules

■ Flexible rule editor

Planning requirements from maintenance intervals to vehicle restrictions can be entered flexibly

■ Extensive variant planning

If there is a new transport contract or changes to services, IVU.run supports scenario and cost planning



TRAIN PATH MANAGEMENT EFFICIENTLY KEEPING TRAINS ON TRACK



**FROM TRAIN PATH REGISTRATION
TO DISPATCH:** An entirely digital flow
of data is essential. IVU.rail creates a
consistent data pool from rail to driver.



Rail transport requires long-term planning of all operational resources: Train paths need to be ordered from the network operator, and vehicle and personnel availability needs to be checked in advance. At the same time, volatile conditions such as short-notice train path changes create challenges for planners and dispatch managers.

IVU.rail's integrated train path management function helps them to tackle such highly complex tasks by allowing them to view the latest timetable that has been planned and published by the network operator in IVU.rail and incorporate it into operational timetable and vehicle scheduling.

The module has an option for importing transport paths into IVU.rail via interfaces regardless of whether the current timetable is being edited or not. The system already supports the upcoming European TAF/TAP TSI standards for digitalising train path applications.

The system also provides a train path history. It enables planners to analyse train path changes before transferring them to the scheduled trains. For instance, there may be a difference between ordered and received train paths or an update to a train path because of new tracks or other infrastructure work.

An integrated conflict model also makes planners aware of technical conflicts between a train and a scheduled train path. To support the tracking of changes over time, timetable planners can manually determine if they want to change the train and its trips to match the new train path. The adjustment process that follows is automatic to reduce error-prone and time-consuming manual edits. The graphical dispatch view displays and filters emerging vehicle dispatch conflicts automatically using a colour code. This allows dispatch managers in the control centre to keep track of ongoing conflict situations at all times.

IVU.duty

PERFECT DUTY SCHEDULES

The optimal duty schedule at the touch of a button: IVU.duty generates efficient duty schedules for the entire workforce, from train drivers and service staff through to workshop employees. The intelligent suggestion system and powerful optimisation algorithms simplify these complex tasks.

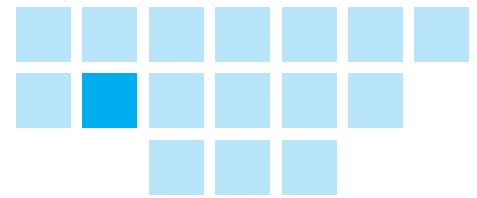
IVU.duty is closely linked to IVU.run, meaning that IVU.duty directly extracts all relevant data from vehicle scheduling. The system takes any changes to individual vehicle schedules into account immediately, and suggests amendments to duty schedules where required. Thanks to its flexible rule editor, IVU.duty automatically takes all operational, collective agreements and legal requirements into consideration.

The duty optimisation algorithms automate the entire planning process on request. In a matter of minutes, they merge numerous duty elements, crewing guidelines and qualification requirements to produce an optimal duty schedule. This schedule can be used immediately without any further manual editing.

IVU.duty adapts to the relevant company objectives such as minimising costs or making duties as balanced as possible. Special adjustment optimisation helps you transfer timetable changes made during the year with minimal changes to existing duty schedules.

The variant planning function of IVU.duty facilitates strategic decision making. For example, it helps to identify potential efficiency improvements and cost reductions, the assessment of the impact of rule changes and the preparation of price quotes for new concessions.





IVU.duty clearly displays scheduled duties and duty components in a graphical format



TRANSDEV GERMANY & SWEDEN

Transdev is a leading international private transport operator for rail and bus services. For example, the railways in Germany and Sweden use IVU.rail to plan and dispatch vehicles and staff in an integrated manner.

IVU.duty at a glance

■ Intelligent optimisation

Thousands of duty elements are merged to produce an optimal duty schedule that ensures efficiency

■ Integrated suggestion system

IVU.duty automatically adds tasks and groups them together according to the rule system for a faster planning process

■ Adaption optimisation

IVU.duty leaves existing duties largely untouched, even in the face of short-notice changes to the duty schedule

■ Flexible rule editor

Duty guidelines, labour laws and company agreements: Rules can be flexibly stored and adjusted

■ Extensive variant planning

If there is a new transport contract or changes to services, IVU.duty calculates the impact on staff and associated costs

IVU.vehicle

OPTIMAL VEHICLE DEPLOYMENT

IVU.vehicle ensures that the rolling stock is allocated in the most cost effective and efficient manner possible. The system assists with planning staff assignments, workshop visits, and parking, and optimises the deployment of locomotives, multiple units and carriages.

Building on the schedule planning features of IVU.run or vehicle runs from an external system, IVU.vehicle's extensive suggestion system flexibly supports the allocation of vehicles to schedules. The clearly arranged display of available and suitable vehicles is particularly helpful when a replacement service needs to be organised at short notice. In addition, the automatic conflict check prevents errors and ensures that all rules are observed. At the same time, the system monitors the current operational situation and issues an alert if there are disruptions so that dispatch managers can react quickly.

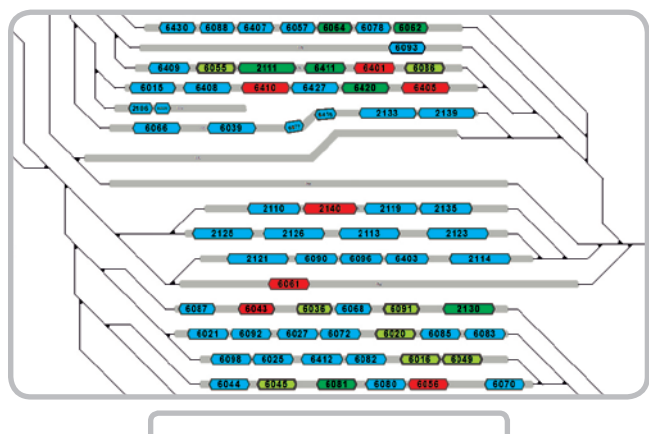
The integrated track occupancy planning function enables arrivals and departures to be monitored and managed in real time and also allows the planning of parking and shunting movements. Dispatch managers can create workshop orders directly in IVU.vehicle or adopt them from another system and block the relevant vehicles from being allocated.

The intuitive user interface clearly displays all key information, including planned and current vehicle workings, routes, vehicles and staff deployed, service intervals and conflicts. IVU.vehicle ensures that railway companies are equipped to efficiently manage all types of operational scenarios.

IVU.vehicle at a glance

- **Intelligent suggestion system**
IVU.vehicle knows which vehicles are available and makes a suitable suggestion for every vehicle schedule
- **Effective conflict check**
Comply with all rules and speed up workflows: the automatic conflict check prevents errors
- **Integrated disruption management**
IVU.vehicle displays all information about the current operations situation and offers support if there are disruptions so that the dispatch team can act quickly
- **Clear track occupancy planning**
IVU.vehicle supports scheduled track occupancies according to the timetable situation in real time as well as shunting movements
- **Automatic dispatch**
IVU.vehicle's automatic dispatch function speeds up vehicle deployment and ensures efficiency

On the graphic track plan in IVU.vehicle, all dispatch information is visible at a glance.



VR GROUP FINLAND

Helsinki's main station is always a hive of activity. The terminus station with 19 tracks is the most important transport hub in Finland. The Finnish State Railway uses IVU.rail to dispatch its regional trains and to coordinate parking in real time.

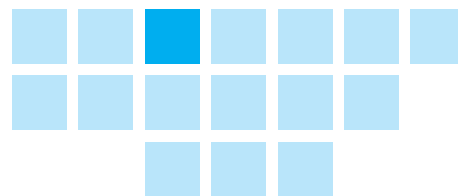


PHOTO: ROMAN VUKLOV



IVU.crew + IVU.pad SATISFIED EMPLOYEES

The right member of staff in the right place at the right time: IVU.crew supports the entire personnel dispatch process and ensures that all employees are where they need to be, whether that is driving a train or operating a lifting platform in the workshop.

IVU.crew has the right tool for every work step, ranging from long-term roster layout and holiday planning, to medium-term dispatch and short-term fleet management, right through to correct settlement and evaluation. The continuous flow of data ensures consistency. IVU.crew automatically transfers every change to the integrated payroll accounting feature, which has flexible rule systems to simplify performance evaluations.

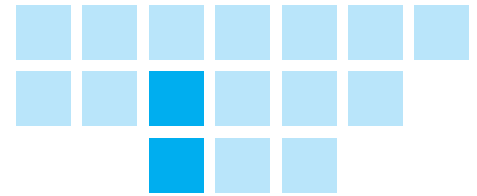
All planning phases benefit from powerful optimisation algorithms. During the process of devising weekly

schedules and roster layouts, IVU.crew calculates the optimal outcome based on operational requirements, ensuring a resilient duty schedule, satisfied employees, and efficient operations. Dispatch optimisation also takes into account employees' preferences and qualifications, pays attention to restrictions, and ensures fair, balanced duties.

IVU.crew and IVU.pad are closely linked, with the mobile app keeping employees in the loop at all times. Key information such as duty schedules, manuals and forms are a click away. Whether it is holiday planning, duty requests or duty swaps, digital dispatch speeds up workflows and ensures satisfied staff.

AVG KARLSRUHE, GERMANY

To ensure faster dispatch, the tram and train pioneer AVG relies on an entirely digital workflow using IVU.crew and IVU.pad. Reporting duty sign-ons, viewing duties, displaying time sheets and submitting duty requests: routine tasks for the more than 500 train drivers who work for the company.



IVU.crew and IVU.pad at a glance

■ Powerful optimisation

IVU.crew's advanced algorithms always achieve the best result for operations and personnel

■ Real-time updates

IVU.crew sends an alert if a member of staff is not there, so that delays do not turn into operational disruptions

■ Integrated payroll accounting

Overtime, illness, covering shifts:
IVU.crew registers any change immediately

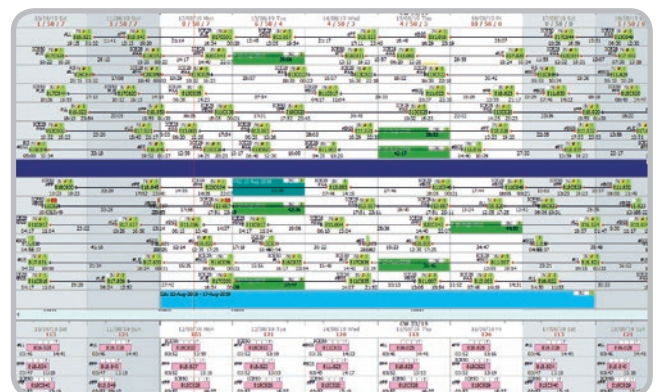
■ Direct employee communication

IVU.pad sends all important information to employees directly, in seconds at the click of a mouse

■ Digital workflow

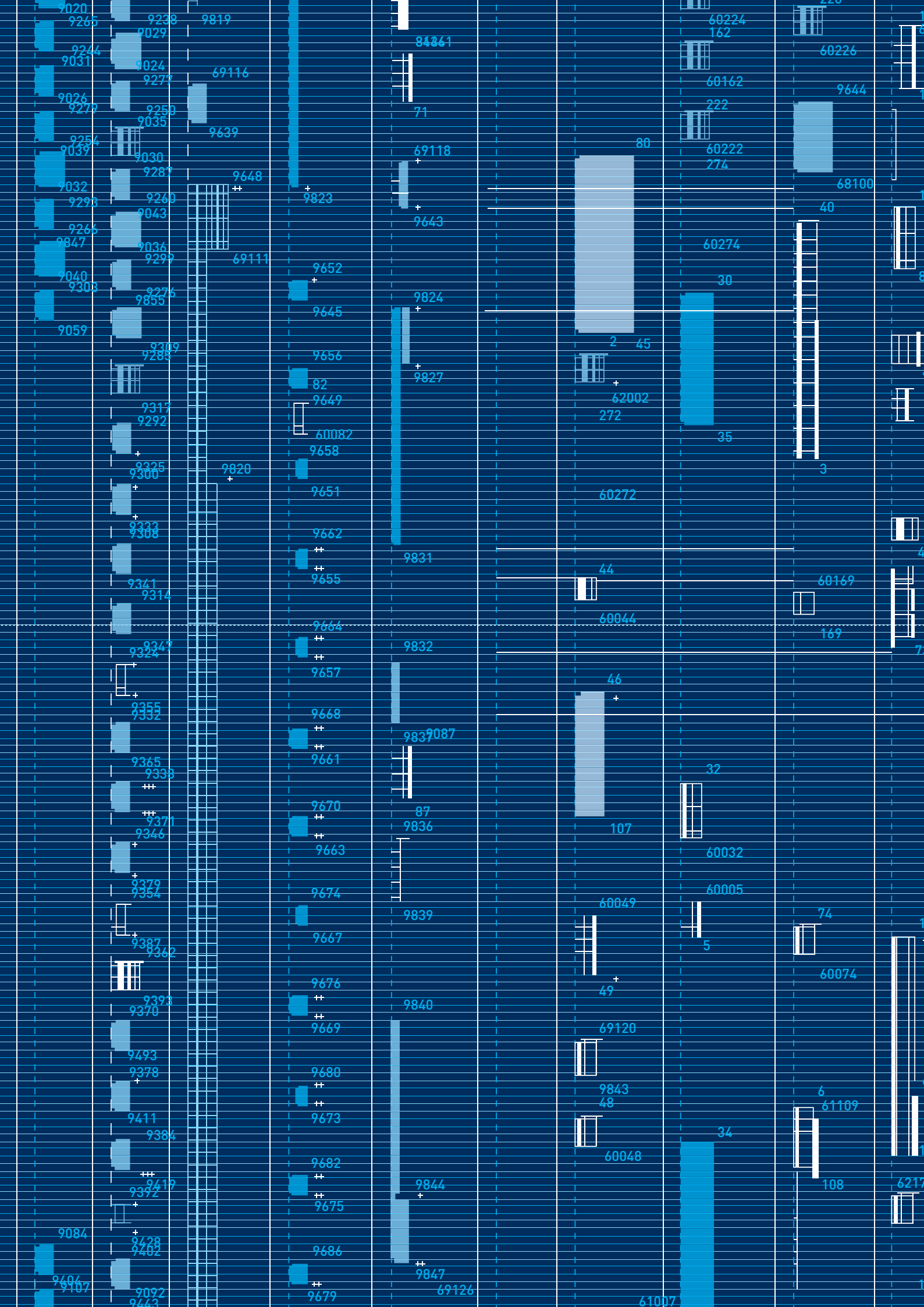
IVU.pad makes the dispatch process simple: all duty information stays within a single system

IVU's configurable rule system checks employee job allocations and reports conflicts



IVU.pad keeps mobile employees in the loop and speeds up workflows







IVU.fleet + IVU.cockpit

INTERFACE TO THE TRAIN

IVU.fleet and IVU.cockpit give the control centre a constant direct line to the driver's cab. Delays, track changes, journey information: Dispatch managers at railway companies can use numerous functions to keep drivers and passengers informed, to communicate with peripheral train equipment, and to evaluate trips.

IVU.fleet is the land-based background system for train communication: Seamlessly connected to the dispatch team in IVU.vehicle, it communicates continuously with the driver-operated on-board computer software IVU.cockpit. The system automatically forwards journey scheduling changes to the train. The clearly arranged user interface of IVU.cockpit displays all information immediately, with additional dispatch information if required. The system also establishes radio communication with the train driver at the touch of a button.

As the control centre on board the train, IVU.cockpit complies with ITxPT and is compatible with all important protocols for on-board and external data transmission. The on-board computer software records the peripheral data from sensors as well as the train position via GPS. IVU.cockpit provides visual and acoustic passenger information and modifies it in the event of dispatch actions.

After the trip is completed, a substantial amount of data is available for further use and analysis. This includes, for example, location data or passenger count data. IVU.fleet consolidates this data and sends it to IVU.fleet.statistic for evaluation. This ensures that railway companies always have a full overview of their services.

Map-based display of the operations situation in IVU.fleet



Driver assistance in IVU.cockpit



IVU.fleet and IVU.cockpit at a glance

■ Efficient workflows

IVU.fleet automatically informs train drivers and passengers about any schedule changes and connects to data hubs

■ Smooth communication

Whether you use analogue and digital private mobile radio or public mobile radio, train drivers and the dispatch team remain in touch

■ Comprehensive passenger information

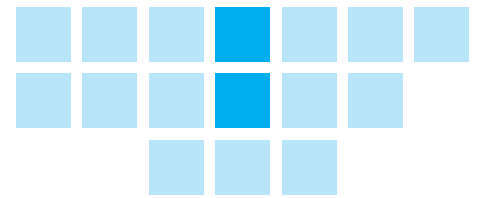
IVU.cockpit allows the dispatch team to trigger visual and acoustic information and make announcements in the trains

■ Compliant connections

Whether it's used on board or for communication with the control centre: The entire system complies with technical standards such as ITxPT, GSM-R, LTE and more

■ Integrated data management

Collecting and evaluating data: IVU.fleet and IVU.cockpit record, consolidate and prepare sensor data



VNR VIETNAM

The Vietnamese National Railway uses IVU.rail to plan and manage its entire deployment of resources in passenger and freight transport in an integrated manner. Powerful on-board computers establish contact with the state-of-the-art control centre and IVU.realtime informs passengers about current departure times in real time.

OPTIMISATION DRIVES EFFICIENCY

OPTIMAL RESULTS FOR HIGHLY COMPLEX SCENARIOS IN SECONDS

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

IVU has been working on optimisation for over 20 years in close partnership with the mathematicians at LBW Optimization GmbH, a spin-off of the renowned Zuse Institute in Berlin. The company develops new mathematical optimisation processes based on current scientific findings. The algorithms the company has created form the centre-piece of IVU optimisation cores.

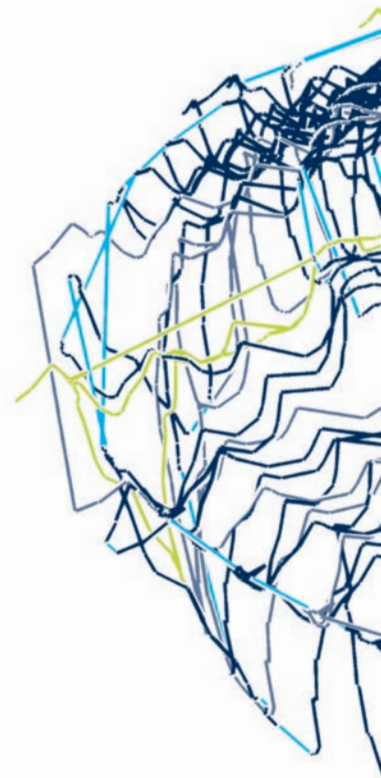
These solutions allow you to quickly generate duty and run schedules that meet all legal and operational requirements. Time is freed up for staff to support new or more frequent services. At the same time, the system creates more balanced duties that improve staff satisfaction. Optimisation means that dispatch managers can respond directly to disruptions or engineering work and adapt duty and vehicle schedules in seconds with only minimal changes and automatically forward them to the dynamic passenger information system. Optimisation also improves the service quality for passengers.

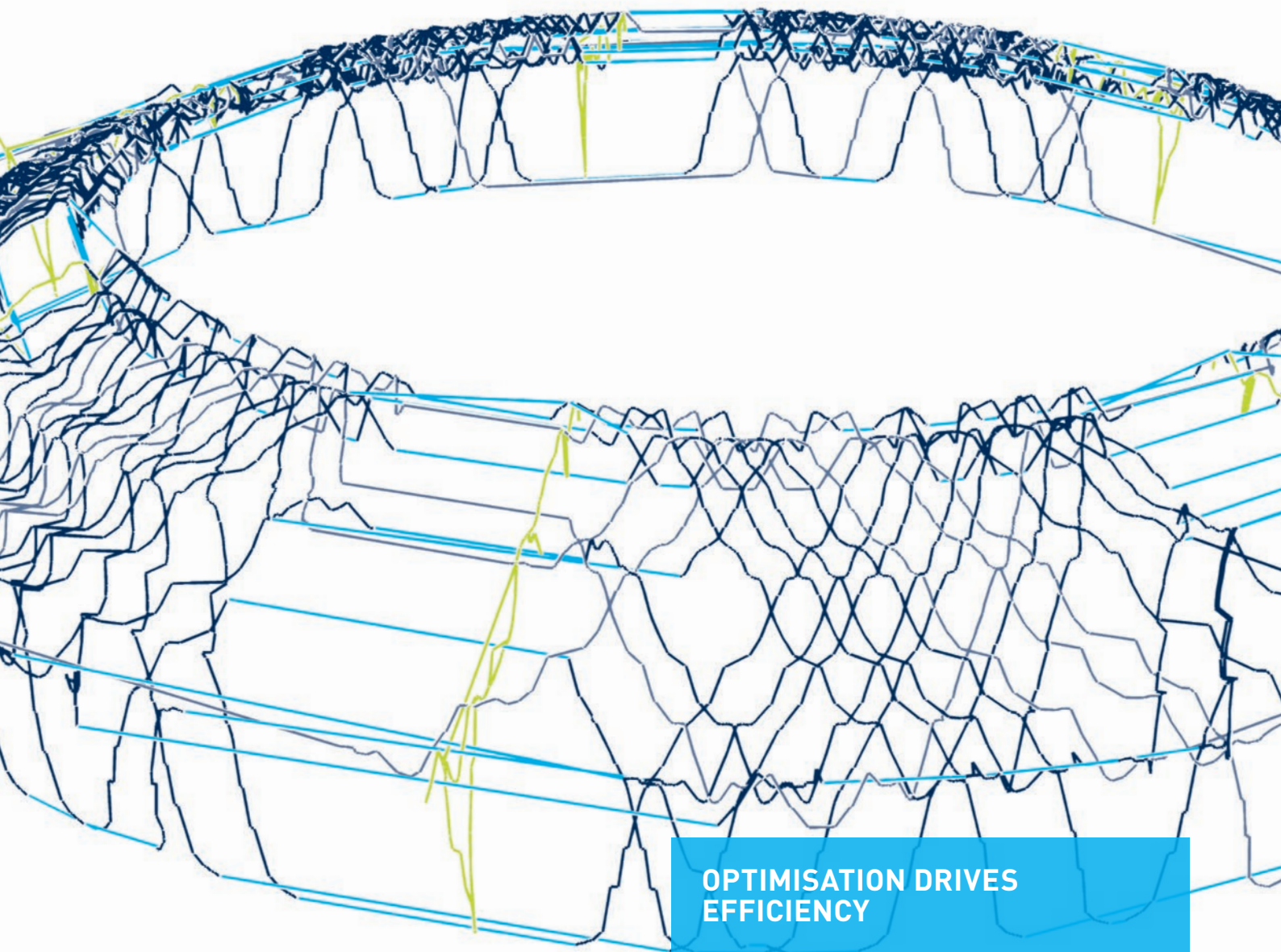
Maximum efficiency

IVU.rail planning products allow you to coordinate duty and vehicle schedules for maximum efficiency. The vehicle schedule optimisation function always finds a needs-based low-cost solution for the number of journeys that need to be planned. The duty schedule optimisation function then ensures that all vehicle schedules and resulting activities are optimally covered.

IVU.rail's automatic personnel dispatch (APD) function also optimises staff allocation. The system organises roster layouts and allocates the relevant employees to them. Depending on the operational requirements, it considers aspects such as fair allocations or balanced work time accounts. In addition, the APD automatically takes qualifications, holidays, further training courses, and requests into account, thus increasing driver flexibility.

Optimisation not only assists with day-to-day operations in rail transport, but also helps with business decisions such as with applications for new concessions. This makes it possible to calculate scenarios for routes that have not yet been acquired and use them as a basis for an efficient service offering that puts operators a vehicle's length ahead of the competition.





OPTIMISATION DRIVES EFFICIENCY

Optimisation is a core competence of IVU. From initial timetable planning to the deployment of resources: The algorithms of IVU systems solve highly complex problems.



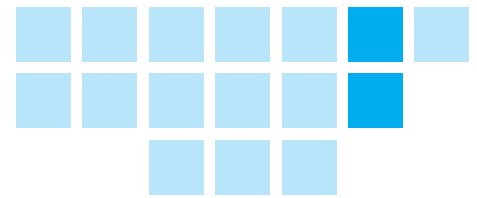
IVU.realtime + IVU.journey REAL-TIME INFORMATION ACROSS ALL CHANNELS

Up-to-date and accurate passenger information on train station displays and on smartphones: IVU.realtime keeps customers informed in real time across all channels. The dynamic passenger information system, which is directly linked to the control centre, generates a consistent flow of data from the vehicle to the passenger.

Standardised interfaces connect IVU.realtime to a large number of different data sources, including external data hubs. The system uses the incoming real-time data to calculate passenger-appropriate departure forecasts and transmits this information automatically to the various output media. Where required, information can be added manually and automatically and relayed either visually or acoustically over external systems.

The IVU.realtime.app is the perfect app for passengers: Complete with a departure monitor, real-time connection search tool, trip companion and door-to-door navigation. Just like all other output media, it can be fully adapted to your railway company's individual design requirements.

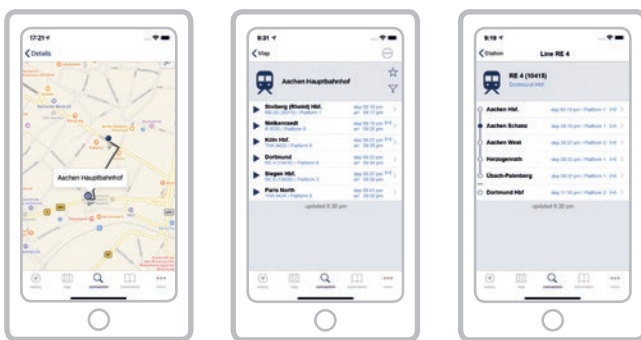
If you also want to give passengers the option to look for information on the website, the IVU.journey travel planning system is a good starting point. Whether you are travelling to your destination directly or your journey involves changes, stops and journey interruptions, the system always calculates the best connection. IVU.journey also factors car- and bike-sharing initiatives into the route calculations, where these services are available.



WKD POLAND

Up-to-date transport information is particularly important for commuters. This is why Warsaw's regional railway keeps its 8 million passengers a year updated in real time with IVU.realtime. The system transmits data from all trains to over 100 stop displays at the stations as well as directly to passengers' smartphones.

The mobile IVU.realtime.app informs passengers about current departures and accompanies them from door to door



IVU.realtime and IVU.journey at a glance

■ Efficient real-time information

Whether you have 10 connections or 10,000, IVU.realtime processes and distributes real-time data in a fraction of a second

■ Consistent data flow

The same information is displayed across all channels, from displays and the app, right through to data hubs

■ Mobile app

The IVU.realtime.app delivers passenger information to smartphones, complete with a trip companion

■ Barrier-free access

Additional information on vehicles with wheelchair-accessible entrances and disabled-accessible WCs

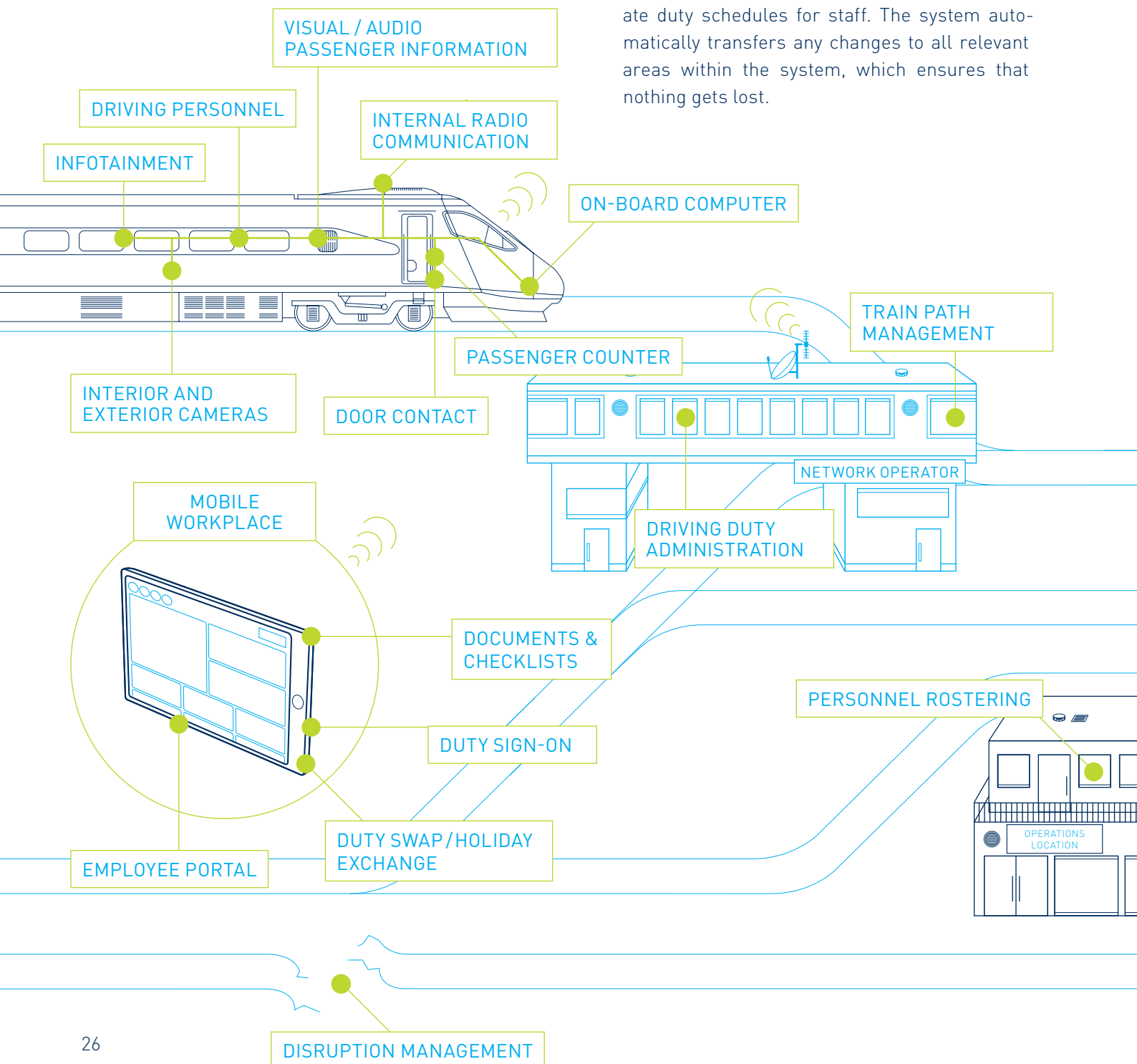
■ Customisable design

The visual representation and sound of all passenger information can be adapted to your individual requirements

FULLY INTEGRATED SOLUTIONS FROM A SINGLE SOURCE

It's a long way from the timetable to the journey and then on to settlement. Numerous processes interlink and form a complex overall system. Optimal coordination is required to ensure that trains and passengers arrive at their destinations safely and on time. IVU.rail integrates all resource management tasks into a single software programme and enables entirely digital workflows.

Everything remains in one system: As soon as the timetable planning is complete, trips have been created, and transport paths have been booked, the run scheduling develops suitable vehicle schedules, which are then used to create duty schedules for staff. The system automatically transfers any changes to all relevant areas within the system, which ensures that nothing gets lost.



All dispatch functions and dispatch system users are directly connected to the schedules. For efficient vehicle and personnel deployment, smart optimisation algorithms incorporate all variables, from maintenance intervals and set-up times, to qualifications, breaks, duty requests and parking. Disruptions are identified in real time and transmitted to all upstream and downstream roles in order to make the necessary changes.

At the same time, drivers receive up-to-date journey information on their tablets. The mobile app IVU.pad keeps them up to date wherever they are. They have important documents such as duty schedules, manuals and forms at their fingertips, making heavy briefcases a thing of the past.

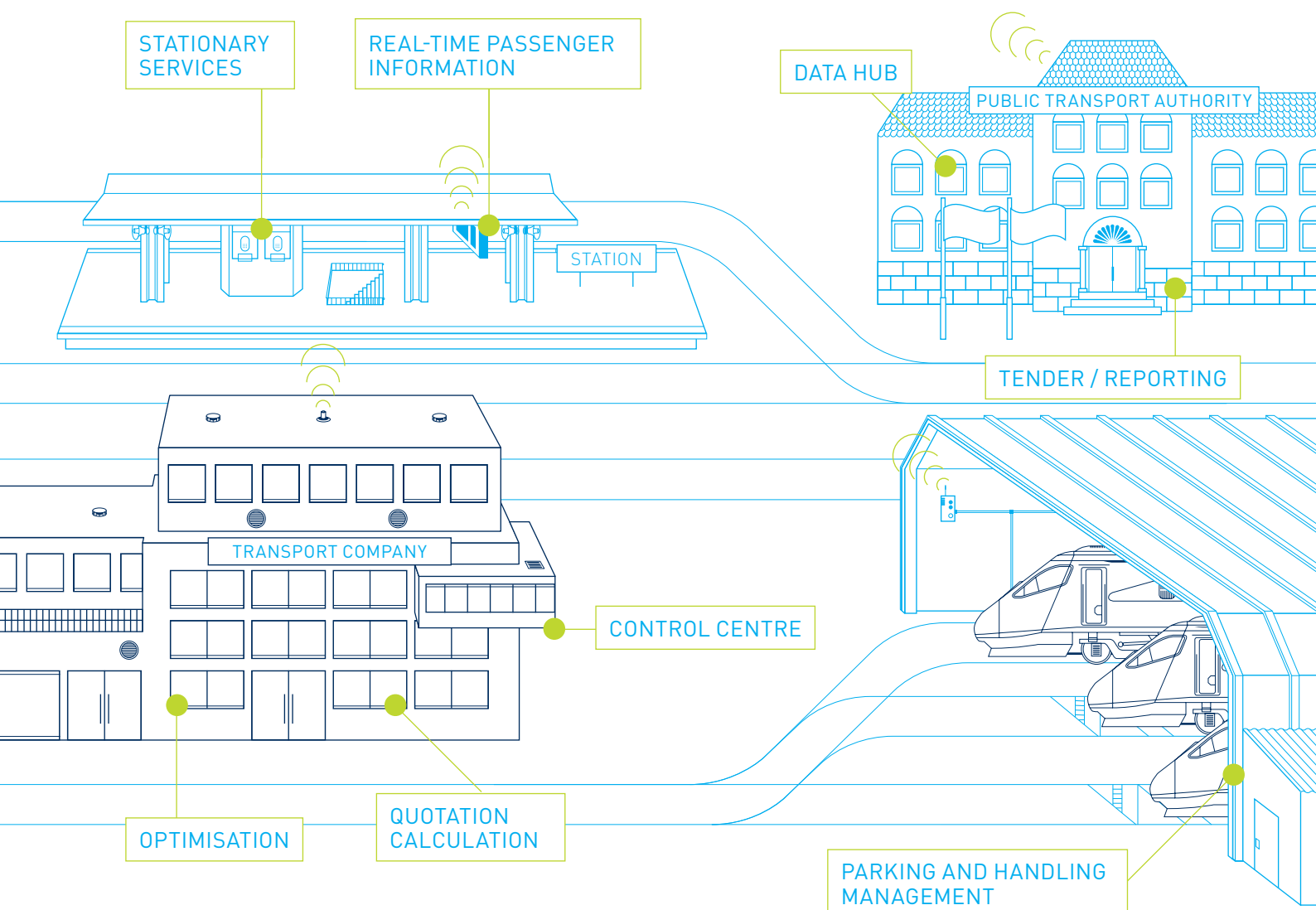
On the trains, the on-board computer controls all passenger information, including displays

and voice output, and establishes contact with the control centre. On the touch display, drivers can see all the details of the timetable situation at a glance and operate the system quickly and intuitively even during a hectic workday.

Thanks to the comprehensive integration of the IVU products, passengers are informed about possible connections at the next station while they are still on the train and static displays announce deviations from the timetable. In payroll accounting and controlling, the actual number of hours worked by the drivers and the services performed are recorded and evaluated for quality management purposes.

Whether regional trains, metros, freight or inter-city transport: with IVU.rail, all data is available at all times.

MANAGING COMPLEXITY EFFICIENTLY.



TIMETABLE ADMINISTRATION FOR PUBLIC TRANSPORT ASSOCIATIONS

Various threads come together in public transport associations. Timetables and network data from various transport operators and railway companies converge to form a mutual body of information. Regardless of which planning tool or system the data originates from, IVU.pool can manage it.

The IVU.pool integration solution has interfaces to all common formats as a basis for network-wide timetable information. This makes it easy to import timetable data from a wide variety of sources and integrate it into a standardised overall network. IVU.pool seamlessly manages different timetable versions, allowing associations to take the construction timetable for summer into account as early as spring.

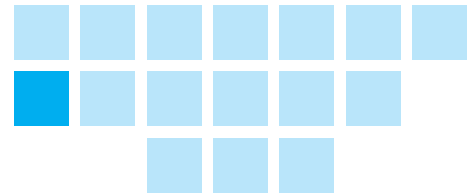
IVU.pool allows you to not only create timetables directly in the system, but also import them and add

your own data, such as walking distances between the neighbouring stops and stations of different operators or connecting times between the lines of different companies. You can also add points of interest or barriers at stops and in station buildings, with IVU.pool also retrieving data from site maps and architectural drawings. This makes it possible to model vehicle accessibility and transfer connections.

Automated features for importing and exporting data or routing lines for map displays take on standard tasks and speed up workflows. The extensive user management feature of the multi-client solution also makes it easier to work with external partners. IVU.pool optimises how public transport associations perform their tasks and roles.

Building the pedestrian network in IVU.pool





IVU.pool at a glance

- **Standard interfaces for import and export**
IVU.pool integrates the timetables of various companies and generates an overall timetable
- **Version management made simple**
Engineering work, events, holiday timetables: IVU.pool automatically looks ahead to anticipate future changes
- **Automated processes**
If desired, IVU.pool performs standard, recurring tasks automatically, which speeds up workflows
- **Importing real graphs**
IVU.pool manages and imports real graphs to generate a clearly arranged visual representation of route layouts on maps
- **Data enhancement made easy**
It is easy to add extra information such as transfer times or walking distances in buildings

DELFI FRANKFURT, GERMANY

DELFI e.V. uses IVU.pool alongside other tools to integrate all German public transport timetable data mostly automatically. The fruit of these labours is a Germany-wide public transport data set containing 250,000 stops, which makes it easy to plan routes.



IVU.control

ANALYSING AND MANAGING DATA

After the trip comes the evaluation and settlement phase: IVU.control records relevant target and actual data, merges it and prepares it for further processing. This supplies railway companies and public transport authorities with all the data they need to settle services, analyse deployment of resources and find ways of improving their service offerings.

IVU.control connects numerous automatic interfaces directly to the relevant IVU.rail products and to other systems. This process results in every journey, every route, every vehicle movement, all deployed employees and lots of other information seamlessly making its way to the central database. This makes it easy to control important details such as punctuality, vehicle and personnel deployment, and capacity utilisation. Efficient and flexible evaluation tools deliver accurate responses to complex issues.

IVU.control compares target and actual data and analyses cancellations automatically based on causes, type of replacement service and other criteria defined in the relevant transport contract so that services can be settled. On request, the system automatically generates statistics or reports for internal and external reporting in Excel or PDF format: complete with all graphs and formatted in accordance with individual requirements.

IVU.control also helps you to calculate station and train path fees for trains and to conduct extensive quality surveys using the associated tablet app.

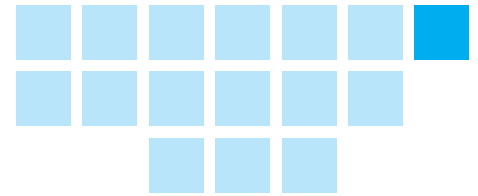
Detailed assessment of actual and target data in IVU.control



NASA

SAXONY-ANHALT, GERMANY

NASA GmbH plans, orders and finances regional rail passenger transport in Saxony-Anhalt on behalf of the state. The company uses IVU.control for financial controlling of the transport contracts.



IVU.control at a glance

■ Dynamic data analysis

IVU.control collects all transport data in a central database, enabling complex evaluations to be performed

■ Extensive performance assessment

Automatic comparisons of target and actual data, as well as evaluations make the process of settling transport contracts easier

■ Straightforward evaluation

Evaluation tools allow you to combine data flexibly using the drag-and-drop function to establish interrelationships

■ Automatic reports

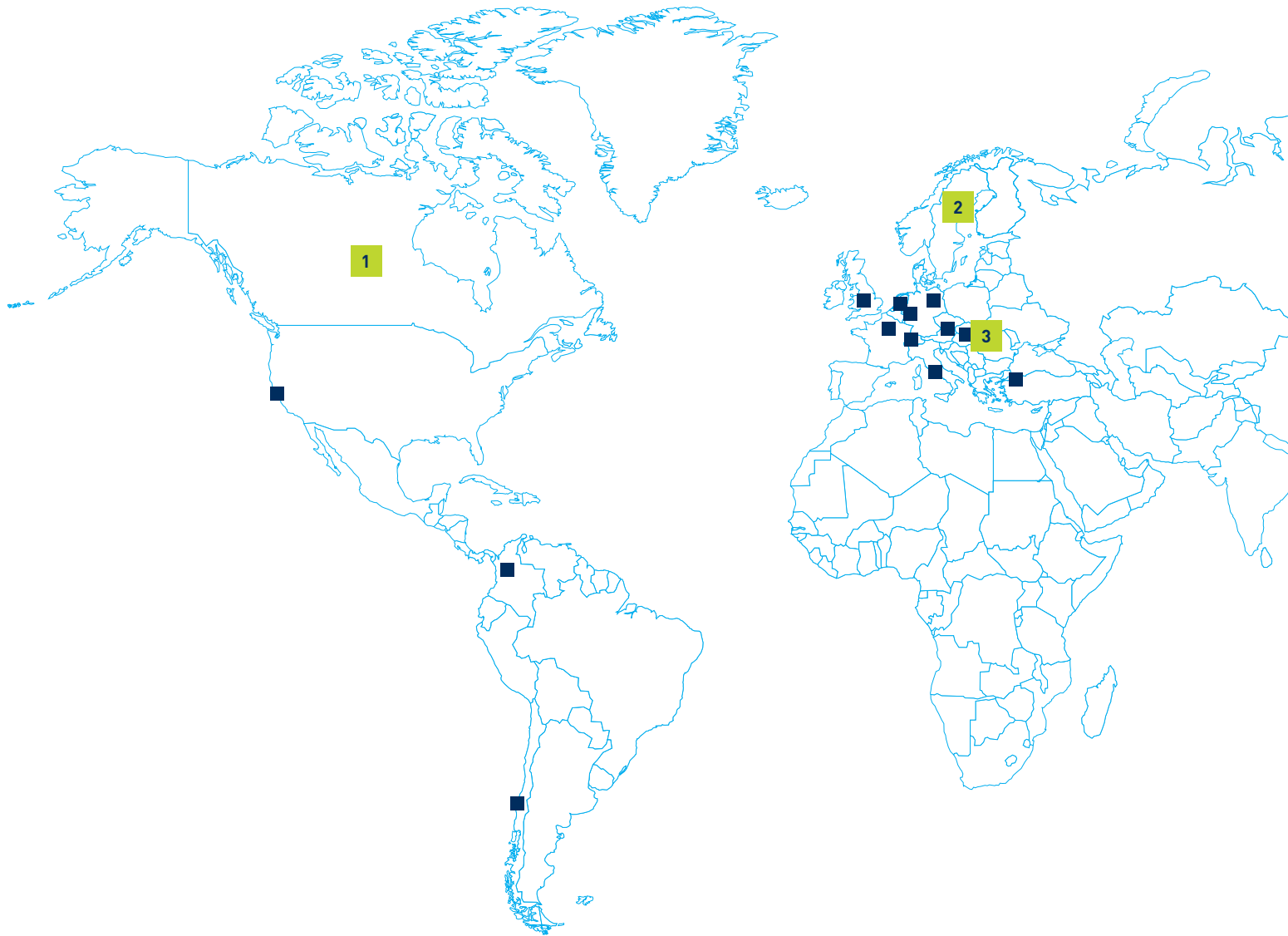
Individual report templates allow you to produce customised statistics and analyses for internal reporting

■ Central data management

Uniform data storage based on the data warehouse principle enables efficient information management



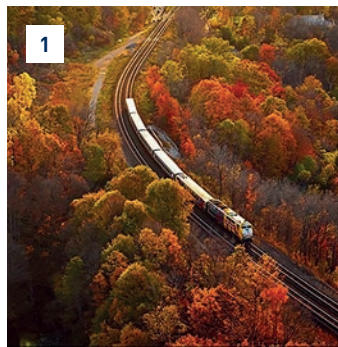
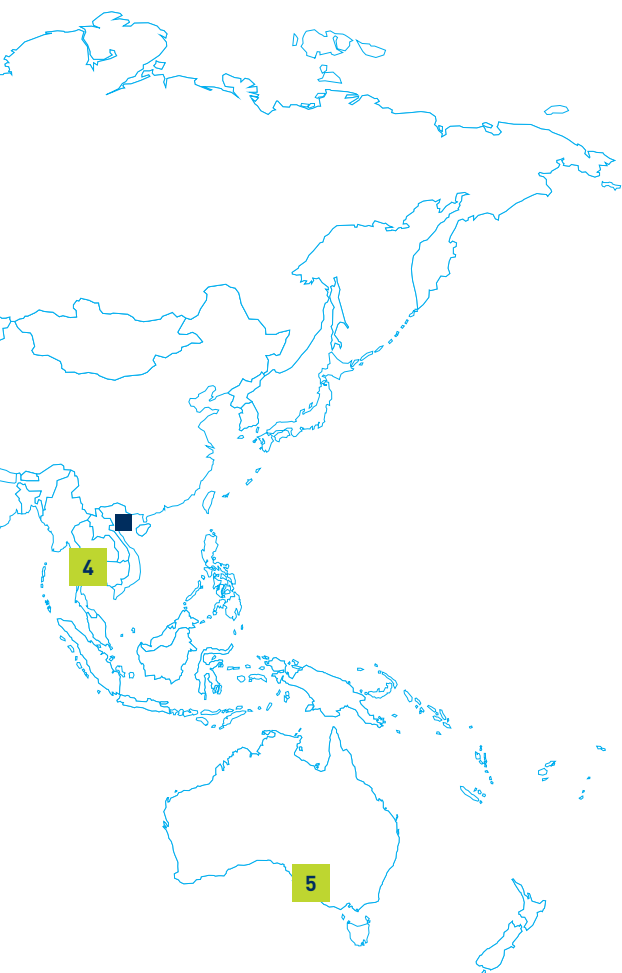
MADE IN GERMANY MOVING THE WORLD



Engineering ingenuity, IT expertise and mathematical research are the cornerstones of the systems that keep public transport moving. More than 500 customers trust this tried-and-tested combination.

With more than a multiple locations worldwide, IVU is always near at hand for its customers. Our team includes employees from over 20 different countries. No matter the location, we speak the language of transport operators and understand their needs.

BERLIN (HEADQUARTERS) |
AACHEN | OLTEN | VIENNA |
VEENENDAAL | PARIS |
ROME | BIRMINGHAM |
BUDAPEST | ISTANBUL |
SAN FRANCISCO | BOGOTÁ |
SANTIAGO | HANOI



1

VIA RAIL CANADA

Planning and optimisation of duty schedules for more than 1,200 train drivers, conductors and other on-board personnel, sometimes with multi-day revenue trips.



2

SJ SWEDEN

Development of a standardised planning and dispatch environment for all resource deployment for Sweden's largest railway company.



3

MÁV-START HUNGARY

Integrated planning and dispatch of around 1,000 traction units and 9,000 employees in a standardised process landscape.



4

BEM BANGKOK, THAILAND

Timetable planning, vehicle and duty scheduling for the Bangkok MRT Blue Line and MRT Purple Line metro lines with more than 400,000 passengers a day.



5

DPTI ADELAIDE, AUSTRALIA

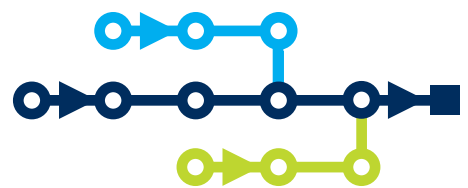
Planning and optimisation of all vehicle and personnel deployment as well as comprehensive scenario modelling for the Adelaide Metro.

WORKING TOGETHER TO ACHIEVE YOUR GOALS



IVU.rail

The requirements of railway companies are as diverse as the regions in which they operate. IVU.rail offers all the benefits of a standard solution, such as minimal development effort and predictable project durations. At the same time, thanks to its modular structure, the system can be customised precisely to individual needs. What is needed is always exactly what is used. Tailor-made interfaces also connect to proprietary peripheral systems. This means that IVU.rail products fit seamlessly into any environment and are immediately ready for use.



IVU.xpress

Every railway and transport company has its own identity and its own ways of working. The IVU.xpress implementation process ensures that IVU products can be put into operation quickly and efficiently in any environment. Clear objectives enable the definition of a project schedule with reliable milestone dates for project kickoff, system design, configuration and rollout. Each system can be used productively from the outset and covers all use cases that are needed for smooth operation.



IVU.support

Successful IT projects are based on mutual trust, which we value highly. We work on an equal footing with our customers. Whether it involves regional, inter-city or freight transport, each project receives our full attention. We work together to analyse the needs in question and identify the best possible solution. That's why our work doesn't end once our systems are put into operation. We provide our customers with support throughout the entire project and beyond. IVU.support is available after the project to ensure that you have the necessary tools to exceed employee and customer expectations.



IVU.cloud

Why should railway companies have to deal with complex IT issues when they want to focus on operating trains? IVU.cloud allows IVU to take on full technical operations management for IVU.rail, from hosting and maintenance through to installation of updates. High-performing, highly available, secure, and reliable: The IVU.cloud enables optimum use of IVU products for every company, regardless of its size. It can be seamlessly integrated into the existing IT landscape and remains fully scalable, for instance when new links or routes are added. This gives you flexibility and conserves resources.

Headquarters

IVU Traffic Technologies AG

Bundesallee 88

12161 Berlin

Germany

T +49-30-859-06-0

F +49-30-859-06-111

contact@ivu.com

www.ivu.com