

IVU.suite FOR PUBLIC TRANSPORT

WIENER LINIEN AUSTRIA

Wiener Linien relies on IVU products for all its vehicles. It uses fleet management and dynamic passenger information from the IVU.suite for urban transport by tram and bus.

IVU.suite **KEEPING COMPLEXITY** MANAGEABLE

With the IVU.suite, transport operators achieve more: they establish an end-to-end digital workflow and integrate all areas, from planning and dispatch, fleet management, ticketing and controlling through to passenger information. Whether the complete solution is used or individual products, all data remains in one system. This ensures efficiency – both on the road and in the control centre.

Transport operators master complex tasks every day: drawing up timetables, organising services, developing fares, controlling fleets, managing data and much more. To cope with all this, they need trained specialists and the right tools. The IVU.suite fully maps the work processes of a transport operator, offering a suitable solution for every task.

We know that the tasks of a transport operator are as individual as the routes they operate. Which is why IVU.suite inherently contains everything that is required to operate successfully. One standard system for everything – making it quick and easy to implement. Every day, IVU.suite products help more than 500 transport operators worldwide to deploy tens of thousands of buses and trams efficiently, to get employees to the right place at the right time, to inform millions of passengers and to invoice transport data: IVU.suite makes complexity manageable.

IVU. SYSTEMS FOR VIBRANT CITIES.

IVU.suite **END-TO-END SOLUTION** FOR PUBLIC TRANSPORT

Integrated and from a single source - the IVU.suite offers the right support for all areas of transport operations: from planning, dispatch, depot and charging management to fleet management, ticketing and passenger information through to the settlement of transport contracts. IVU.suite products plan routes, inform passengers, ensure connections, control traffic lights, support stationary personnel as well as service and maintenance workshop employees, dispatch drivers, monitor fleets, calculate charging plans for electric buses, manage depots, sell tickets, collate data and increase efficiency increasingly with AI. Whether complete solutions or individual components are deployed, IVU.suite is based on open standards and can be integrated in the most varied of system environments.



IVU.timetable

manages all basic and infrastructure data and supports the planning process from network construction to timetable creation and publication. Pages 6-7

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. Pages 8-9

IVU.run

IVU.duty

work easier.

Pages 14-15

supports full route planning as part of daily deployment, including maintenance and service times. Powerful optimisation ensures efficiency, even with electric huses Pages 12-13

uses smart optimisation to

create efficient duty rosters

for personnel. A flexible

set of rules and numerous

optimisation functions make

IVU.vehicle + IVU.charge plan and control the

entire vehicle deployment. The integrated depot management optimises parking, allocation and charging plans for electric huses Pages 16-17

IVU.crew

supports the entire personnel dispatch process and brings all employees to where they are needed. Effective optimisation ensures efficient personnel deployment. Pages 22-23

IVU.pad

is the digital workplace for mobile personnel. The web app contains all the important information such as duty rosters and manuals and improves communication with employees. Pages 22-23

IVU.fleet

helps operators to respond quickly and appropriately in every operational situation. The control centre system continuously monitors all aspects of trip and supports the implementation of planning measures. Pages 26-27

IVU.incident

IVU.fare

enables centralised incident management, offering standardised workflows for efficient processing without duplicate data entry and seamless automatic documentation.

IVU.cockpit

runs on an IVU on-board computer or a tablet. The software displays scheduling changes, communicates with the control centre and informs passengers. Pages 26-27

manages sales processes, from determining fares to billing of ticket sales, with paper tickets, e-tickets and season tickets in a network or individual operation. Pages 26-27

IVU.ticket

is the software used on sales and inspection equipment. From ticket printing to the sale and validation of e-tickets, it is the solution for simple ticketing. Pages 28-29

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OPTIMISATION & AUTOMATION

Achieve an optimum result with the smart algorithms of IVU.suite - taking into account rules, costs, employee satisfaction and operational stability. Pages 10-11

IVU.box. IVU.ticket.box + IVU.validator

IVU devices make use of IVII software in vehicles communicate with the control centre and perform ticketing tasks. Thanks to intuitive user guidance, they are easy to operate.

Pages 30-31

IVU.realtime + IVU.journey provides real-time information to passengers across all channels. Connected directly to the control centre, the system generates a consistent flow of data from the vehicle to the

passenger. Pages 32-33

IVU.data

collects and curates operational data so that it can be used for any type of data analysis and for deployment of artificial intelligence (AI). Pages 34-35

IVU.control

records target and actual data, merges it and prepares it for further processing, for example, for invoicing transport contracts or for evaluations and analyses Pages 36-37



IVU.timetable **RELIABLE TIMETABLES**

With just two clicks per trip for the optimum timetable - IVU.timetable always ensures the best connections. All basic and infrastructure data is contained within one system, allowing for perfect coordination of routes, headways and journeys.

From setting up the route network and creating the timetable to publishing the service and supplying operations control and passenger information systems, IVU.timetable supports the entire timetabling process - whether for regular scheduled services or for replacement bus service. Numerous automated functions such as predefined routes and times make it easier to create journeys. The system continuously monitors whether specified connections are reached. It warns when conflicts arise

IVU.timetable makes it possible to reschedule flexibly in the event of planned timetable deviations, such as roadworks. If the timeframe changes, the system ensures consistent planning information - from journeys and vehicle schedules through to duties. Different views provide detailed insights, whether as a map, a table or in bar and line charts.

Whether it's just a matter of creating your own routes or integrating data from other operator and third-party companies, IVU.timetable has all the information at hand at all times. Assigning vehicle restrictions, storing specifications such as seat capacities and itineraries or integrated and convenient editing of the transport network on a map basis - IVU.timetable makes it easy.



The map function in the transport network editor makes it easy and convenient to edit new lines

SERVICE PLANNING



IVU.timetable at a glance

- Intelligent checking algorithms One change, big impact: IVU.timetable automatically ensures consistent planning statuses
- Automatic conflict warnings IVU.timetable warns you if predefined connections are not reached to ensure that every connection is made
- Clear visualisations map view, table, bar or line graph: different views provide detailed insights
- Integration of external data Whether subcontractor or networks, IVU.timetable integrates timetable data from various sources
- Sophisticated service Thanks to an intuitive interface, even large transport networks can be maintained quickly and easily



IVU.pool TIMETABLE MANAGEMENT FOR ASSOCIATIONS

Everything comes together in the transport association. The timetables and network data of various transport operators are combined to create a single entity. Regardless of which scheduling system the data originates from – IVU.pool is compatible.

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

IVU.pool allows you to create timetables directly in the system, in addition to importing them and then enhancing them with your own data, such as footpaths between neighbouring stops of different operators or transfer times between routes of different transport operators. Points of interest or obstacles at stops and in buildings can also be stored. This makes it possible to model vehicle accessibility and transfer connections.

Automations for importing and exporting data or routing routes for the map display take care of standard tasks and speed up processes. IVU.pools Quality Gates detect data errors early in the process chain before they become an issue for passengers.

IVU.pool at a glance

 Standard interfaces for import and export IVU.pool automatically checks the data quality, integrates schedules from different operators and turns them into an overall schedule

Simple version management

Construction works, events, holiday timetables – IVU.pool automatically takes future changes into account

Automated processes

IVU.pool performs recurring standard tasks automatically on request, thus speeding up processes and increasing data quality

Import of real graphs

IVU.pool manages and imports real graphs in order to visualise routes clearly on maps

Easy data enhancement

Whether transfer times or footpaths in buildings, additional information can be easily added.



Data collection of the footpath network in IVU.pool



SERVICE PLANNING



DELFI FRANKFURT, GERMANY

DELFI e.V. integrates all public transport timetable data in Germany, including IVU.pool, as far as possible automatically. The result is a Germany-wide, routable public transport dataset with 30,000 routes and 250,000 stops.

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OPTIMISATION IS THE DRIVER OF EFFICIENCY

Planning vehicle workings and duties is demanding - optimising the use of all resources according to the rules is a challenge. But the potential is high: transport operators can achieve major savings with vehicle workings and duties that are just a few percent more efficient.

IVU uses state-of-the-art optimisation algorithms and was able to draw on the expertise of the renowned Zuse Institute Berlin (ZIB) in the development of these mathematical optimisation processes. This makes it possible to create duty and vehicle working schedules that fulfil all legal and operational requirements in a short space of time.

Route optimisation

To maximise efficiency, IVU.suite planning products make it possible to coordinate duties and vehicle workings. Route optimisation always finds a needs-based and cost-minimised solution for the number of trips to be planned. The powerful optimisation core automatically creates routes according to individual requirements and minimises the number of vehicles required. E-optimisation takes into account charging processes and cycles in the depot at the assigned charging points, but also during the trip through opportunity charging.

Duty optimisation

The duty schedule optimisation function then ensures that all vehicle schedules and resulting activities are optimally covered. Thanks to powerful optimisation algorithms, it can combine thousands of duty elements, crewing guidelines and qualifications into an optimal duty schedule within a few minutes. With the help of variants and adjustments, planners can also react quickly to changes at short notice, whereby duty schedules remain largely unaffected.

Integrated duty and vehicle working optimisation

In regional transport, in particular, the vehicle working, and duty schedule must be drawn up simultaneously. With integrated duty and vehicle working optimisation, the transport operator also achieves the best possible results in this

environment. The system starts with a timetable and uses it to create an overall optimised and coordinated duty and vehicle working schedule.

Depot optimisation

Optimisation efficiently harmonises the requirements and needs of the depot and vehicles. The eDMS (depot management system) optimises the charging management system (CMS) for use: from the parking of vehicles, allocation of vehicles to be used on the routes and optimisation of the charging schedule, the operational process is improved and resources can be saved through cost-efficient charging.

Automatic personnel dispatch (APD)

With APD, IVU.suite optimises the allocation of personnel. The system determines duty schedules and assigns the appropriate employees to them. Depending on the company requirements, it ensures fair allocations or balanced working time accounts, for example. In addition, the APD automatically takes qualifications, holidays, further training and requests into account - which increases the flexibility of driving personnel. This is particularly important in times of a shortage of skilled workers - the optimisation ensures that a maximum supply is planned in accordance with the rules even in the event of personnel shortages.

In addition to day-to-day operations, the optimisation also supports business decisions, like when applying for tenders. This enables a balance to be struck between an attractive offer for drivers and operational efficiency – particularly important in times of a shortage of skilled labour. The optimisation can also be used to calculate scenarios for routes that have not yet been won and use them as the basis for an efficient offer, so as to stay one carriage length ahead of the competition.



IVU.run **EFFICIENT VEHICLE WORKINGS**

From the creation of efficient routes to the optimisation of vehicle requirements, IVU.run times. Internal control mechanisms ensure supports the entire vehicle scheduling process. This involves daily deployment through to multi-day vehicle workings, in-cluding maintenance and service times. Numerous automated functions and well-developed rule systems make workflows much faster.

or transfers them from third-party systems via a standard interface. When linking trips to vehicle schedules, the system automatically uses operational requirements to add services such as turnaround times, cleaning and refuelling. The intelligent suggestion system makes planning even easier: taking into account vehicle-specific features and existing restrictions, it recommends suitable links. For example, charge scheduling for electric buses can be comprehensively controlled - from re-

charge status to infrastructure and charging that the finished vehicle working schedule complies with all operational specifications and rules.

IVU.run's powerful optimisation core performs complex tasks. It automatically generates vehicle schedules based on individual require-IVU.run uses the timetables from IVU.timetable ments, minimising the number of vehicles reguired. If necessary, the system can also suggest small changes to the timetable to further increase the savings potential.

> Last but not least, the optimisation enables comprehensive variant planning in order to calculate different scenarios and their costs, for example when transport operator applies for new concessions.

IVU.run at a glance

Efficient optimisation

Sophisticated algorithms help to create efficient routes for diesel and electric buses and save resources

Integrated planning processes

IVU.run incorporates relevant information into the vehicle working scheduling from timetable to the duty schedule

- Flexible rule editor Whether maintenance intervals or vehicle restrictions, planning specifications can be stored flexibly
- Comprehensive variant planning A new concession or changes to the offer - IVU.run helps with the planning of scenarios and costs
- eReady

IVU.run automatically considers into account the requirements of e-buses, such as energy consumption or possible charging processes



Metro Servcie A/S has more than 20 years of experience in the operation and maintenance of driverless metro lines in Copenhagen. For efficient 24-hour operation on all metro lines, IVU.suite for timetable planning and vehicle dispatch.



RESOURCE PLANNING



IVU.run links trips to vehicle schedules



IVU.duty PERFECT DUTY SCHEDULES

he optimum duty schedule at the touch of a button – IVU.duty creates efficient duty schedules for the entire personnel team, from drivers to stationary and control centre personnel, service employees and maintenance workshop employees. The intelligent suggestion system and powerful optimisation make this complex task easy – for both smaller transport operators and large fleets.

Closely linked to IVU.run, IVU.duty obtains all relevant data directly from vehicle working scheduling. The system takes into account any changes to individual vehicle working schedules immediately and suggests amendments to duty schedules where required. Thanks to its flexible rule editor, IVU.duty automati-cally takes into consideration all operational, collective agreement and legal requirements.

Optimisation algorithms automate the entire planning process on request. Within a few minutes, they compile thousands of duty elements, crewing guidelines and qualifications into an optimised duty schedule that can be used immediately - without manual revision. IVU.duty adapts to the respective corporate goals, for example to minimise costs or to realise duties that are as balanced as possible. Variants and adjustments are possible to enable a rapid response to short notice changes and ensure that duty schedules are as unaffected as possible.

Regional transport services in particular benefit from integrated duty and vehicle working scheduling. It synchronises the turnaround times with the drivers' working and break times - and thus ensures the best possible deployment of all vehicles and employees.

IVU.duty at a glance

Intelligent optimisation

IVU.duty combines thousands of duty elements into an optimal duty schedule and thus ensures efficiency

- Integrated duty and vehicle working scheduling To optimise resource deployment, vehicle working times can be synchronised with work and break times and optimised in a single step
- Adjustment optimisation

IVU.duty largely retains existing duties even in the event of short-term changes to the duty schedule

Flexible rule editor

Duty guidelines, labour laws, company agreements: rules can be stored and adapted flexibly

Comprehensive variant planning

A new concession or changes to the offer -IVU.duty calculates the impact on personnel



RESOURCE PLANNING





IVU.duty automatically creates efficient duty schedules with the suggestion system and optimisation



IVU.vehicle + IVU.charge OPTIMAL VEHICLE DEPLOYMENT

IVU.vehicle puts the vehicles on the road and ensures optimised depot management – efficient, resourcesaving, cost-saving. The system offers assistance with planning employee assignments, maintenance workshop stays and downtimes and optimises bus and tram deployment.

Links to the vehicle working scheduling of IVU.run or another system give IVU.vehicle an extensive suggestion system, which speeds up the allocation of vehicles to schedules. The clearly arranged display of available and suitable vehicles is a helpful advantage, particularly when a replacement service needs organising at short notice. In addition, the automatic conflict checker prevents errors and ensures that all rules are observed. At the same time, the system monitors all trips in real time and issues warnings in the event of disruptions so that dispatchers can act in good time.

IVU.vehicle has direct links with maintenance workshop planning. Maintenance schedules can be created so that it is always clear which vehicles are currently available. This means that it is visible everywhere when

a vehicle is not ready for use. In addition, IVU.vehicle allows you to determine the exact location of depots. Charging processes for electric buses are planned with IVU.charge.

The depot management system uses automated processes to increase efficiency at the depot and automatically determines the optimum route, parking space and its communication to drivers and the charging schedule for each vehicle. For electric buses, IVU.charge ensures maximum efficiency and flexibility with the combination of the model-based energy consumption prediction and the direct connection of the integrated load and charging management to the charging infrastructure. In the event of a fault, the depot optimisation function automatically adjusts the route allocation and charging schedules, replacing manual intervention. If an intervention is nevertheless necessary, the system immediately informs you of any conflicts that arise.

The intuitive interface displays all important information, including planned and current vehicle workings, routes, vehicles and employees deployed, service intervals or conflicts, such as location disruptions. The web-based interface gives maintenance workshop personnel clear and easy access to all the information they need. With IVU.vehicle and IVU.charge, transport operators are perfectly equipped for every operational situation.

All relevant vehicle statuses can be recorded at a glance in the graphical map view in the DMS



RESOURCE DISPATCHING





IVU.vehicle and IVU.charge at a glance

Automatic optimisation IVU.vehicle's automatic scheduling speeds up vehicle deployment and ensures efficiency

- Process automation
 Depot optimisation handles processes
 independently and helps to save resources
 when charging electric vehicles
- Powerful conflict checking and resolution
 Comply with all rules and speed up
 processes: the automatic conflict check
 protects against errors
- Integration of real-time data
 To enable dispatchers to act quickly,
 IVU.vehicle displays the actual data of current trips and warns of disruptions
- Optimised charging management
 IVU.charge supports charging management
 for e-buses in optimally planning charging
 processes while taking range restrictions
 into account

IVU.suite FOR THE E-MOBILITY OF TOMORROW

The future of mobility is electric. Transport operators With the IVU.suite, transport operators establish an have a lot to do: determining requirements for power end-to-end digital workflow for the planning, deploygrids, planning charging stations, adapting vehicle ment and operation of mixed bus fleets. From the batworkings to ranges, integrating charging times, monitery-powered electric bus to the combustion engine to toring recharge status and infrastructure, taking load the fuel cell bus - no matter which manufacturer, all limits and electricity prices into account, planning functions are available in a single interface. This makes charge scheduling charging processes in real time and the changeover easy, especially for fleets that use a mix of operators. Thanks to standardised open interlearning from the data. IVU.suite maps all relevant operational processes for the deployment of electric faces, every IVU module can also be connected to buses. A suitable solution is available for every activity - third-party systems.





Proven standard interfaces

Connected via CAN bus, the on-board computers of the IVU.box family receive all relevant data on battery and charging status directly from the vehicle – without the need to install additional hardware.

Comprehensive logging

The IVU.suite records all operational events during a tour, such as traffic conditions or the development of the battery status, and automatically creates vehicle-specific forecast models.



Smart charging

The IVU.suite automatically analyses the vehicle's recharge status and determines the best possible charging time. This avoids consumption peaks and thus saves costs.



IVU.crew + IVU.pad FAIR DUTY SCHEDULES

The right employees in the right place at the right time: IVU.crew supports the entire personnel scheduling process and brings all employees to where they are needed – whether in the driver's seat of the bus or on the lifting platform in the workshop.

IVU.crew contains the right tool for every procedural step – from long-term duty rostering and holiday planning to medium-term scheduling and short-term steering through to correct accounting and evaluation. The continuous flow of data ensures consistency. IVU.crew automatically transfers every change to the integrated payroll accounting system, whose flexible rules simplify the evaluation of benefits.

All planning phases benefit from powerful optimisation algorithms. When creating weekly schedules and duty schedules, IVU.crew calculates the optimum result according to operational specifications, be it a robust duty schedule, satisfied employees or cost-effective operations. Dispatch optimisation also takes into account employees' preferences and qualifications, pays attention to restrictions, and ensures fair, balanced duties.

The IVU.pad is closely linked to this: the mobile app keeps employees up to date at all times. Important disruption messages, e-learning, document management and duty-specific documents are available at the touch of a button. Whether holiday planning, duty requests or duty swaps – digital scheduling speeds up processes and helps keep personnel happy. The IVU.pad serves as a digital workplace for transport operators and makes it easier to communication between personnel and dispatchers.

IVU.crew and IVU.pad at a glance

Powerful optimisation

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

Refresh in real time

IVU.crew warns if employees are not available, so that delays do not turn into operational disruptions

Integrated payroll accounting

Overtime, sickness, substitute duties: The integrated payroll accounting system records every change immediately

Direct employee communication

With the IVU.pad, important information can be sent directly to employees – in seconds at the click of a mouse

Digital workflow

The IVU.pad makes the scheduling process simple: all information on services remains up-to-date in one system and without media disruptions IVU.crew's configurable set of rules checks assignments of activities to employees and reports conflicts



AVA SWITZERLAND

The workplaces of the approximately 170 drivers of Aargau Verkehr AG (AVA) are digital: the IVU.pad contains all the important information about their duties and thus speeds up the processes in dispatching and operations.



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RESOURCE DISPATCHING



The IVU.pad keeps mobile employees up to date and speeds up processes







EFFICIENT FLEET MANAGEMENT FOR ALL DRIVE SYSTEMS



Data communication between the vehicle and the control centre forms the basis for reliable operations. When construction work, accidents and traffic jams disrupt traffic, when battery capacities run low or charging points are occupied, dispatchers must react at lightning speed, divert individual vehicles or provide replacements. IVU solutions are there to help - whether your bus is diesel or electric.

To ensure that the control centre always knows the exact position of all vehicles, the on-board computer software such as IVU.cockpit transmits position reports every few seconds. At the same time, the onboard computer software permanently locates the vehicle, compares the target and actual status of the timetable, controls the passenger information in the vehicle, influences traffic lights and analyses sensors. Based on the current battery status measurement data and a route- and vehicle-specific consumption forecast, the control centre knows in good time whether, for example, an electric vehicle will still be able to complete all the planned trips on a route or whether it needs to be replaced prematurely.

Control centre systems such as IVU.fleet reliably collate hundreds to thousands of such messages, evaluate them and inform the dispatchers. State-of-the-art systems combine all vehicles in a single user interface. Whether diesel buses or battery-powered vehicles are en-route does not matter: all warnings and notices are displayed in the same window.

Always informed

Directly connected to the control centre, passenger information systems such as IVU.realtime inform passengers at stops via a display screen or in apps about the current timetable situation.

Up to 10,000 vehicles can be tracked and the departure information for up to 20,000 stops can be permanently updated. This guarantees that vehicle change notifications are available on the output channels within seconds - at the bus stop display screen, on the website or via smartphone.

IVU's fleet management solutions are prepared for all challenges. The standard systems adapt flexibly to specific requirements - be it a major city or a small town, an individual company or a transport network.

WITH EVERY ROUTE, BUS AND **CONNECTION COMES AN INCREASE IN COMPLEXITY.** Smart IT systems help make it possible to maintain an overview and offer passengers service excellence. This is how transport operators achieves more.

IVU.fleet + IVU.cockpit OPERATIONS UNDER CONTROL

With IVU.fleet and IVU.cockpit, the control centre always has the traffic situation under control. Delays, crowd formation, accidents, emergency call – numerous automated systems help to react quickly and appropriately in any operating situation. IVU.fleet continuously monitors all aspects of trip: from trip sign-on to timetable situation and the cycle interval to the current vehicle and personnel deployment. Regardless of whether irregularities are detected on a vehicle or on an entire route, the system alerts the dispatchers and offers them appropriate measures. Changes to the route, auxiliary vehicle schedules or cancelled trips can be created with just a few mouse clicks.

The automatic connection assurance supports drivers with appropriate advice. For example, waiting longer at a stop so that a connection can be made even if the connecting vehicle is delayed. Thanks to the comprehensive multi-tenant capability from IVU.fleet, this also works smoothly across company boundaries. With the web-based solution of IVU.fleet, dispatchers always have everything under control, even outside the

centralised control centre and en-route. Thanks to the simplified and multilingual user interface, even occasional users can find their way around complex situations. A plus in terms of usability, especially in times of a shortage of skilled labour.

The multi-client capable on-board computer software IVU.cockpit is used in vehicle deployment, which is standard-compliant with ITxPT. With its intuitive and clear interface, it supports drivers in real time, automatically controls the network infrastructure, establishes the connection to the control centre and informs passengers visually and acoustically about how the trip is progressing. IVU.incident forms the perfect interface between the control centre, drivers and passenger information to process any changes and faults immediately and ensure seamless information.

Whether in individual or combined operation, whether 10 or 10,000 vehicles, whether in scheduled, on-demand or replacement transport services – IVU.fleet and IVU.cockpit control every fleet simply and reliably.

Schematic and map-based visualisation of the operating situation in IVU.fleet





The Belgian transport company operates more than 3,200 buses and around 400 trams in Flanders, including the famous Kusttram along the Flemish coast – at 68 kilometres, it is the longest tram route in the world. With the IVU.suite products, De Lijn was able to set up a demand-oriented operations control system.

FLEET MANAGEMENT



Driver assistance in IVU.cockpit

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IVU.fleet and IVU.cockpit at a glance

Integrated monitoring IVU.fleet continuously monitors the operating situation and reports faults as soon as they occur

Efficient disruption management Optimising processes: IVU.fleet supports the implementation of scheduling measures

 Automatic connection and interval assurance

Drivers are automatically notified if a connection is delayed or the interval becomes irregular

Smooth communication Whether analogue and digital private mobile radio or public mobile communication – drivers always stay in contact with control centre

Comprehensive passenger information IVU.cockpit automatically provides acoustic and visual information as well as announcements in the passenger compartment

RMS GERMANY

The service company rms of the Rhine-Main Transport Association (RMV) relies on the complete solution IVU.fare and thus simplifies the entire ticketing process from fare design to settlement. As one of the largest transport associations in Germany, RMV coordinates and organises around 160 small and large regional transport company in bus and rail transport on around 14,000 square kilometres.

IVU.fare + IVU.ticket COMPLETE SOLUTION FOR TICKETING

Developing pricing models, analysing income, acquiring customers – IVU.fare manages the entire spectrum IVU.fare, IVU.ticket calculates the appropriate price of sales processes from setting fares through to settling ticket sales. IVU.ticket brings the tickets to the customer: printing paper tickets, selling and validating e-tickets - the software for sales and inspection devices handles every process reliably, whether on the bus, in the tram or at the counter.

As a central background system, IVU.fare contains all the data required for processing ticket sales, including fares, devices used and sales employees, including their authorisations. The integrated customer management makes the multi-client capable system a complete solution for e-ticketing: from ticket issuing and contract management to automatic SEPA direct

debit, everything remains in one system. Connected to level. The software takes position data from the onboard computer via standard protocol for easier location finding. IVU.ticket supports cash sales as well as cashless card payments at the payment terminal contactless or with PIN entry. It supports common e-ticket standards such as VDV-KA as well as barcode tickets.

The mobile ticketing app and the customer web portal handle the entire sales process and subscription management online. In conjunction with IVU.fare, the transport operator has extensive analysis functions at its disposal.



Sales dialog box from IVU.ticket in the vehicle

TICKETING

Checkout view in IVU.fare

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IVU.fare and IVU.ticket at a glance

- Integrated fare management IVU.fare contains all data for ticket sales, from fare design to settlement
- Secure sales processes All transactions are fraud-, cash- and audit-proof, payment flows can be fully traced
- Comprehensive evaluation Statistics and analysis functions help to evaluate sales and improve offers
- Simple e-ticketing Integrated solutions for issuing and controlling e-tickets
- Fully customisable Whether tickets, customer cards or the app, the layout adapts to the company's design

SYSTEM SOLUTIONS SOFTWARE AND HARDWARE FROM A SINGLE SOURCE

The on-board computer is the digital control centre in the bus and tram. It records and processes all processes in real time, communicates with the control centre, controls the on-board electronics, collects data and informs the passengers.

IVU is a one-stop shop for everything, from the IVU.fleet control centre system and the IVU.cockpit on-board computer software to the device itself. This ensures uninterrupted data flows and smooth processes.

The on-board computers are connected to all the peripherals in the vehicle via interfaces: they support common mobile radio standards as well as analogue or digital radio, record position data via GPS and transmit data via Wi-Fi. They evaluate sensor data, control

The on-board computer is the digital control centre in the doors and manage external e-ticket readers such the bus and tram. It records and processes all pro- as IVU.validator.

Modern data protocols make on-board computer a powerful passenger information platform. Thanks to international standard protocols such as IBIS-IP or ITxPT, they not only inform passengers visually and acoustically about the next stop, but also inform them of the connections currently available there.

Depending on customer requirements, simple equipment with a tablet through to a complete solution is possible, for standardised or mixed fleets. The interaction of all components, from the control centre to on-board technology, creates a future-proof service that benefits passengers and transport operator in equal measure.

IVU.box.gateway

The IVU.box.gateway connects the on-board computer with the peripheral devices and provides all vehicle interfaces in a flexible and cost-efficient manner via Ethernet. This means that not only the IVU.ticket.box or another IVU on-board computer can be used as an on-board computer, but also an Android tablet equipped with IVU.cockpit.

IVU.validator

Whether as a pure reading device for boarding check or with the optional screen as a useroperated sales terminal – the IVU.validator optimally complements the IVU.ticket.box. For example, the device relieves drivers and speeds up boarding when it is attached to the second door.



TICKETING AND ON-BOARD DEVICES

IVU.ticket.box

The on-board computer prints tickets, scans barcodes, validates e-tickets and manages peripheral devices. The payment terminal accepts credit and debit cards, with PIN entry or contactless. Thanks to the touch display, drivers can operate the interface quickly and intuitively even in hectic everyday life.

IVU.realtime **REAL-TIME INFORMATION ON ALL CHANNELS**

Up-to-date and correct passenger information at the stop display and on smartphones – IVU.realtime informs customers on all channels in real time. Directly connected to the control centre, the dynamic passenger information system ensures a continuous 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. In particular, this ensures the consistency of passenger infor-

mation on all information channels. Whether display screen at stop, indoor displays at vehicle, information via apps or social media channels - all information comes from one source and is consistent. Where reguired, information can be added manually or automatically and relayed either visually or acoustically over external systems.

IVU.realtime provides interfaces that can be used to connect passenger apps. Not only are the current departure times displayed, but connections can also be searched for in real time and trips can be navigated "from door to door".

IVU.realtime at a glance

- Powerful real-time information Whether 10 or 10,000 buses, IVU.realtime processes and distributes real-time data in fractions of a second
- Consistent data flow

Same information on all channels, from display screen to the app to the data hub Display and sound of all passenger information can be adapted to individual requirements

Customised design

Incorporation of incident management Direct integration of reports from IVU.incident without

BVG

Germany's largest urban transport company transport operator Berliner Verkehrsbetriebe (BVG) moves over one billion passengers every year – around the clock. IVU.realtime provides real-time information for buses and trams in Berlin.



INFORMATION AND ANALYTICS



duplicate data entryadapted to individual requirements

IVU.data SMART DECISIONS THROUGH GOOD DATA



Optimising operational processes, increasing efficiency and improving customer service at the same time – in order to meet these challenges in the long term, sound data analyses and continuous optimisation are essential for transport operators. With IVU.data, there is now a tool that enables and simplifies the analysis of historicised data. IVU.data is a data warehouse solution that collects, curates and centralises operational data from the IVU.suite and other applications. With integrated, technically complex data aggregation, IVU.data enables comprehensive business analyses to be carried out using algorithms – including those in which AI is used.

With IVU.data as part of the IVU.suite, our customers fulfil the best prerequisites for continuously optimising their operational processes. This allows for automated forecasts and suggested optimisations for planning, dispatch and the control centre to be created in the future.

From the optimal charging of electric buses and the optimisation of timetables in rush-hour traffic to the improvement of control traffic light systems - examples such as these hold great potential for the deployment of data analytics or AI. IVU.data is the right tool for all current and future challenges.

IVU.data at a glance

- Use of AI
- The data is used to enable AI applications, such as calculating the range of electric buses
- Specialist expertise

IVU.data contains the know-how from almost 45 years of technical and specialist experience in the transport sector

INFORMATION AND ANALYTICS





Simply save resources with smart charging in load and charging management



The run time analysis creates suggestions on how to resolve delay hotspots

Free scalability

IVU.data is hosted in the data-as-aservice model and changes, such as for larger fleets, can be incorporated at any time

High performance

Operation in the cloud guarantees maximum availability, a continuous data flow and data security

IVU.control SYSTEMATICALLY MONITORS AND SETTLES TRANSPORT CONTRACTS

Transport contracts are complex sets of rules that also define the consequences of non-compliance. For example, subsidy requirements, reductions or penalties must be calculated and documented. The complexity of the contractual regulations to be taken into account, the interactions between different quality parameters and the enormous volumes of data from various sources require a system specially customised for this task – IVU.control.

For over twenty years, IVU has been continuously developing the system with its customers and users and integrating new requirements. Thanks to regular releases, customers receive updated and extended software versions and are therefore always kept up-to-date.

IVU.control adapts to its users: The required functions can be selected from a modular "toolbox". The individual configurability of the transport contracts ensures that the relevant regulations are precisely taken into account. This enables precise and contract-specific target/actual comparisons at the touch of a button.

With the help of flexible analysis tools, users can also quickly and easily find answers to almost any question – from the smallest detail to highly summarised key performance indicators (KPIs). Automatic data imports and report generation ensure efficiency and a reduction in manual effort.



Punctuality probability for the arrival of vehicles in IVU.control

NASA SAXONY-ANHALT, GERMANY

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

Your advantages with IVU.control

For the transport operator

Performance controlling

IVU.control continuously monitors the scope of transport to be provided depending on the contract and the fulfilment of the specifications for quality based on operational actual data

Automatic reports

Reports and data deliveries to public transport authority can be generated quickly and automatically and their contractual consequences determined in advance

Internal quality assurance

In order to avoid subsidy reductions and penalties, an internal quality assurance system can be set up to check the quality of operations and the effectiveness of measures



CONTROLLING



For the public transport authority

Automated target/actual comparison Transport contracts with different transport operators and individual regulations can be mapped and monitored in detail

Efficient settlement

IVU.control significantly accelerates monthly and annual settlement and limits analyses precisely to the respective area of responsibility

Systematic reporting

IVU.control enables systematic and automated reporting, for example to compare the operating quality in different transport contracts

Document the use of public funds

The use of public funds can be documented in detail (subsidies, reductions, penalties) and proven to auditing bodies

GETTING THERE TOGETHER

There are many steps between winning the concession and starting up the first vehicle. IVU is on hand as a reliable partner for its customers and helps them to keep all requirements manageable – fulfilling their tasks as effectively as possible, including when operations are up and running.

With IVU solutions, transport operators can achieve more: they establish an end-to-end digital workflow and integrate all areas of operations, from planning to driving personnel. Whether they use the end-to-end IVU.suite or stand- alone products, all data remains in a single system. This ensures efficiency – on the road, on rail, as well as in the control centre.

We know that the tasks of a transport operator are as individual as the routes they operate. This is why IVU.suite inherently contains everything that is required for successful bus and rail operations. One standard system for everything – making it quick and easy to implement.

We don't leave our customers to fend for themselves here. Whether it's a question of interfaces to configure, implementing projects quickly, hosting the IVU systems or providing technical support – together we find customised solutions for every requirement so that buses and trains run reliably.





IVU.suite

The IVU.suite is IVU's standard solution. Thanks to its modular design, it can also be customised precisely to individual requirements. Exactly what is needed is always used.



IVU.integration

In a networked world, soft goods products never exist in a vacuum. IVU.integration ensures that all systems interact optimally and data flows seamlessly – from correct timetable printouts and connection of onboard computers and external products to evaluations and statistics



IVU.xpress

Every transport operator has its own identity and its own ways of working. With the IVU.xpress implementation process, IVU.suite can be run quickly and efficiently in all environments. This ensures a predictable project process – from the start of the project to the system design and the final roll-out.



IVU.cloud

With IVU.cloud, IVU takes over the entire technical operational management for the IVU.suite – from hosting and maintenance to the installation of updates. Powerful, highly available, secure and reliable: IVU.cloud remains fully scalable, for example when new links or routes are added. This ensures flexibility



IVU.service

Successful IT projects are based on trust. IVU attaches great importance to this. Whether urban or regional transport, IVU supports customers through the entire project – and beyond. After successful commissioning, customer service is always available as a point of contact to ensure that all vehicles always reach their destination.

Sustainable efficiency is based on consistent data flows. Integrated IT systems make it easier to optimise vehicle and personnel deployment and reduce emissions.



IVU.consult

The IT consultancy IVU.consult supports transport operators in the targeted planning, introduction and optimisation of software. From consulting to the complete provision of services: IVU.consult GmbH customers benefit from expertise in all aspects of the processes and special features of IT systems in public transport.

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