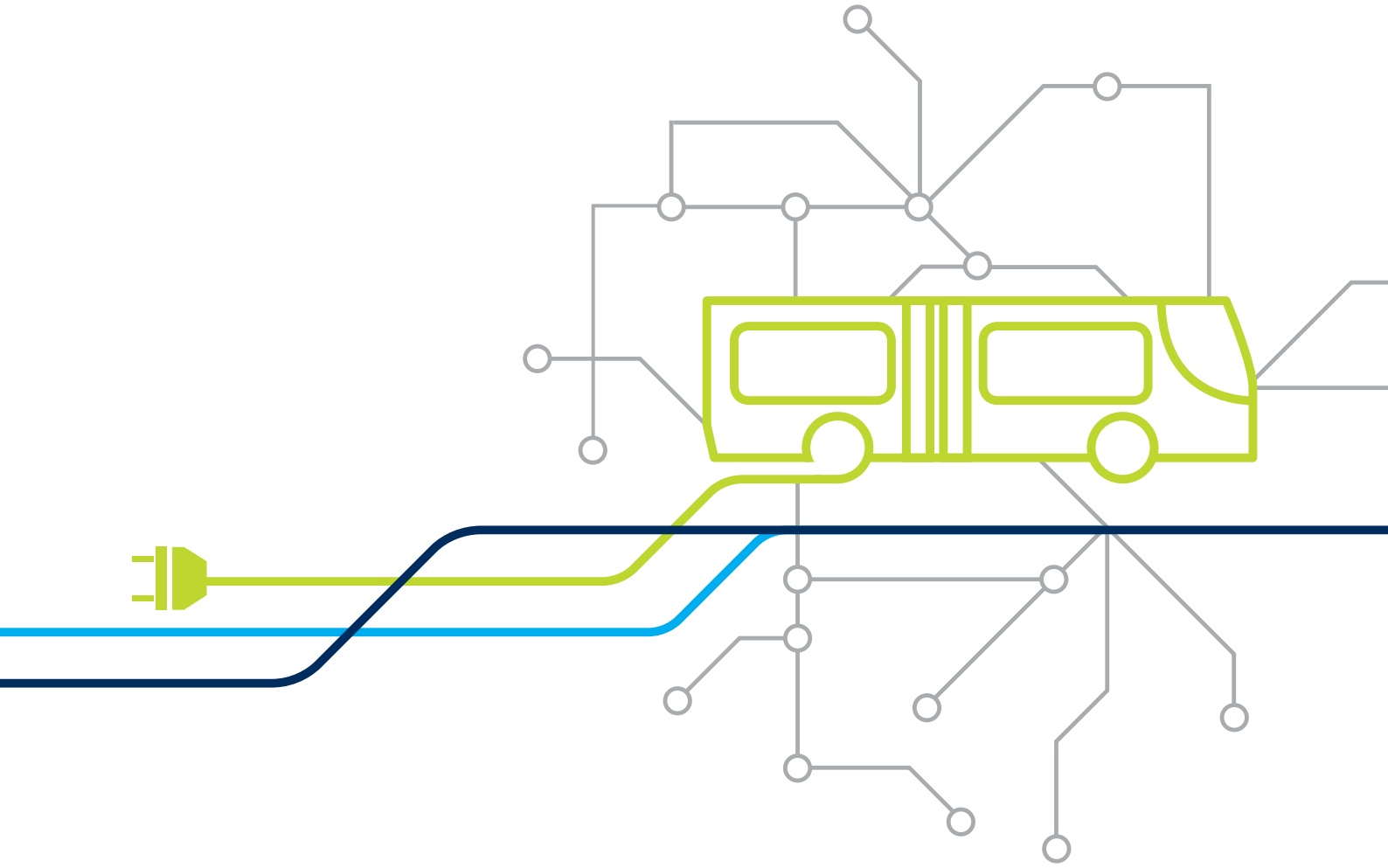
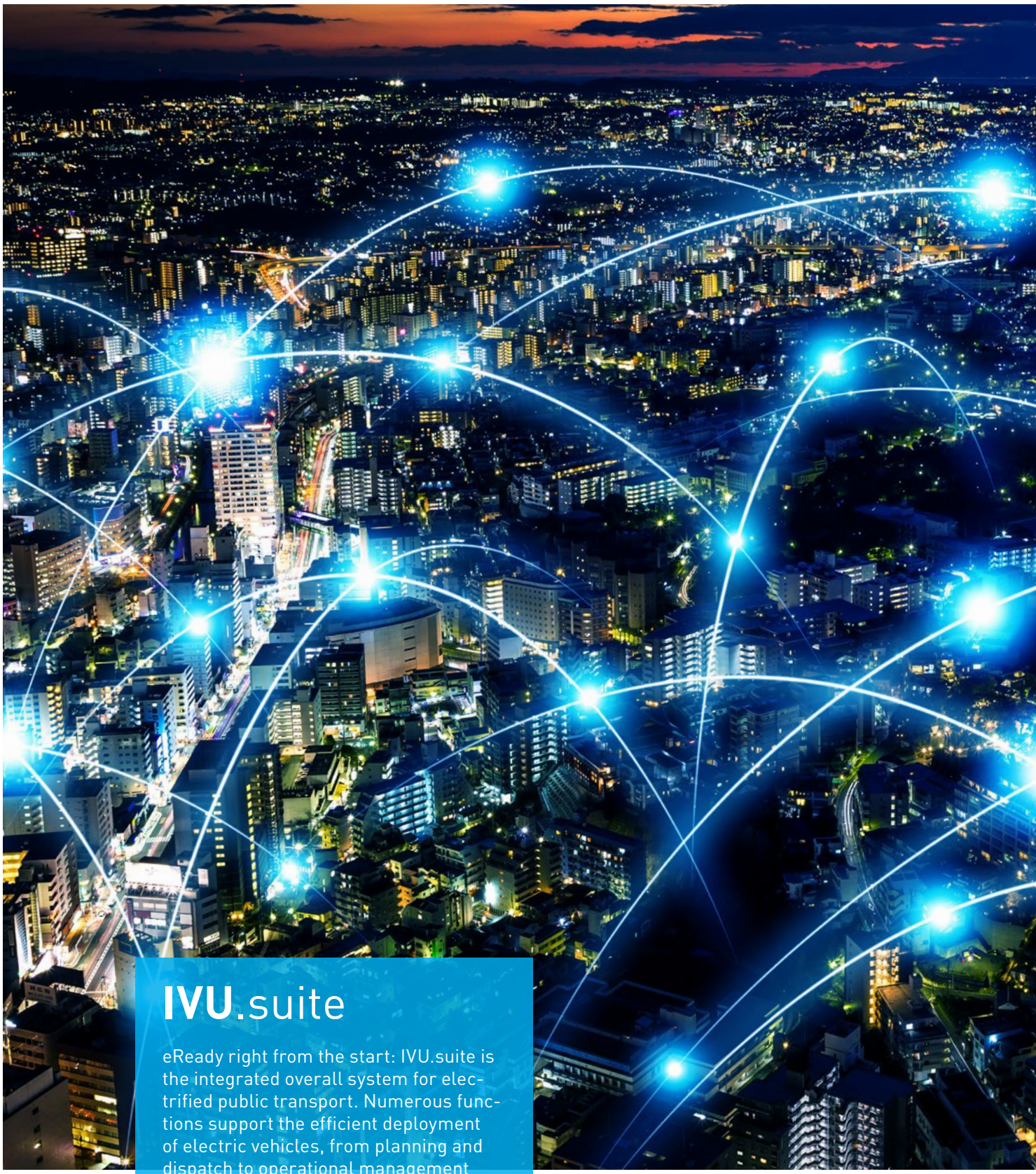
IVU TRAFFIC TECHNOLOGIES

IVU.suite eReady

FOR ELECTRIC BUSES





IVU.suite

eReady right from the start: IVU.suite is the integrated overall system for electrified public transport. Numerous functions support the efficient deployment of electric vehicles, from planning and dispatch to operational management and settlement.

IVU.suite
FOR THE E-MOBILITY OF TOMORROW

The future of mobility is electric. Transport operators face many challenges, such as determining power supply requirements, planning and building charging stations, adjusting vehicle workings to suit ranges, integrating charging times, monitoring the state of charge (SoC) and infrastructure, planning charging processes, dispatching in realtime and learning from the data. IVU.suite maps all relevant operational processes for the deployment of electric buses, offering a suitable solution for every task.

IVU.suite enables transport operators to achieve more. Across all process steps, they establish an entirely digital workflow for planning, deployment and operation of mixed bus fleets. From battery-powered electric buses to buses powered by combustion engines and all the way to fuel-cell buses, all necessary functions are provided in a single user interface – regardless of manufacturer. This makes the changeover easy, especially for operators with mixed fleets.

We understand that transport operators' tasks are as specific as the routes they operate, which is why IVU.suite contains everything that is required for successful operation of every vehicle type. One standard system for all – and equipped for future developments.

On a daily basis, IVU.suite products help more than 500 transport operators worldwide to deploy tens of thousands of buses and trams efficiently, put employees in the right place at the right time, provide information to millions of passengers and settle traffic data.

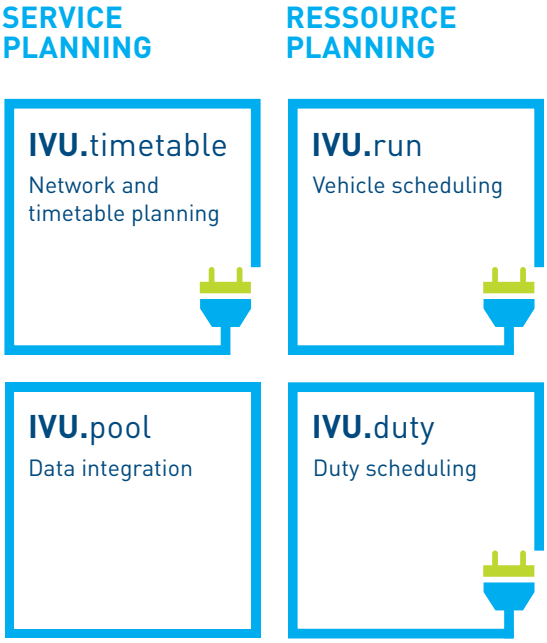
IVU. SYSTEMS FOR GREEN CITIES.

IVU.suite
E-MOBILITY INTEGRATED

Battery-powered electric buses have now become commonplace for many transport operators. Charge management and charging times, ranges and route lengths, depot charging or opportunity charging – planners and dispatch managers must find the optimum solution to this complex puzzle. IVU.suite provides answers.

The standard IVU system provides numerous functions for the efficient deployment of electric buses right from the outset. Even in the standard configuration, extensive automation helps transport operators to optimise operational workflows and integrate electric buses seamlessly into planning, dispatch and fleet management.

From a single bus to a whole fleet, from mixed fleets to electric-only vehicles – IVU.suite is ready today for the challenges of tomorrow.



IVU.timetable
administers all basic and infrastructure data and supports the planning process, from structuring the route network and creating timetables through to publishing information.
Page 6-8

IVU.run
supports the entire schedule planning process, from daily deployment through to multi-day vehicle workings including maintenance and service times. Effective optimisation ensures efficiency.
Page 6-8

IVU.vehicle
plans and controls the entire vehicle deployment process. The integrated depot management monitors mileages and service intervals and supports the planning of parking spaces.
Page 14-19

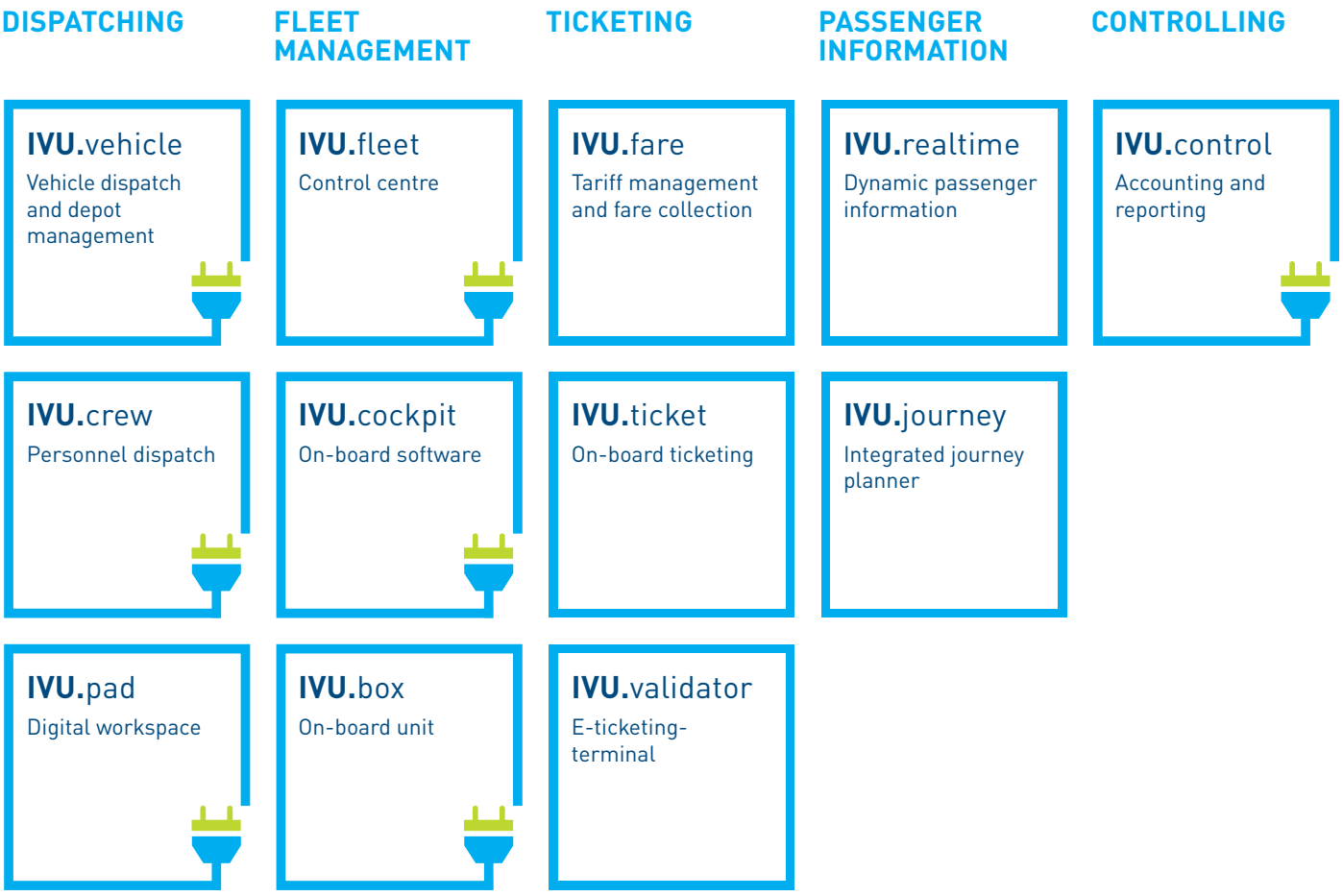
IVU.pad
is the digital workplace for employees in the field. The web app, which can also be used offline, contains all kinds of important information such as duty schedules, handbooks or forms, and speeds up dispatch.
Page 9

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.

IVU.duty
creates efficient duty schedules for staff through smart optimisation. A flexible rule system and numerous automation functions alleviate workloads.
Page 9

IVU.crew
supports the entire personnel dispatch process and ensures that all employees are where they need to be. Effective optimisation ensures efficient duty schedules.
Page 9

IVU.fleet
helps operators to respond quickly and appropriately in every operational situation. The traffic control system continuously monitors all aspects of a trip and suggests suitable actions.
Page 20-21



IVU.cockpit
runs on the IVU.box on-board computer. The software provides helpful driving instructions, communicates with the control centre, and supplies passengers information.
Page 20-21

IVU.fare
manages sales processes from setting fares through 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.

IVU.box
is the user-friendly on-board computer. It communicates with the control centre and manages on-board systems. It is also available as IVU.ticket.box for integrated ticketing tasks.
Page 21

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

IVU.realtime
provides real-time information to passengers on all channels. The system is directly linked to the control centre and generates a consistent flow of data from the vehicle to the passenger.

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 22

BVG
BERLIN, GERMANY

More than 1,400 buses form the backbone of Berlin's public transport system. By 2030, the entire fleet will be completely electrical. For efficient vehicle workings, BVG relies on IVU.suite's optimisation tools.

CREATE OPTIMAL TIMETABLES AND VEHICLE SCHEDULES

Efficient and robust vehicle workings and charging plans for battery-powered electric buses: IVU.suite supports overall vehicle working scheduling from daily deployment all the way to vehicle workings for several days, including maintenance, service, and charging times – either out on the route or in the depot. Numerous automated functions and self-learning algorithms make workflows much faster.

INTEGRATED TIMETABLE PLANNING

IVU.suite stores all relevant data about the network, including information about terrain or infrastructure data such as charging possibilities. Automatically linked to the battery and consumption profiles of each vehicle type and route section, the system provides planners with a comprehensive overview of their network. In addition, IVU.suite indicates if routes are unsuitable for battery-powered electric buses, thus supporting the respective decision-making processes.

RANGE FORECAST

Machine learning inside: To help planners create the optimum vehicle working for every vehicle type, IVU.suite has learning capabilities. The system knows the power consumption of the different electric bus models as well as the age of their batteries from which it determines a forecast of the expected range.

To deliver a result that is as exact as possible, the algorithms use real data from the completed trips. In this case, details about the vehicle along with relevant environmental factors such as topography, outside temperature, number of passengers or traffic situation are incorporated in the calculations. If little or no data is available, for example because not enough electric buses are operating yet or a vehicle working is new, the system determines the likely energy consumption for the individual vehicle workings based on simulation models.

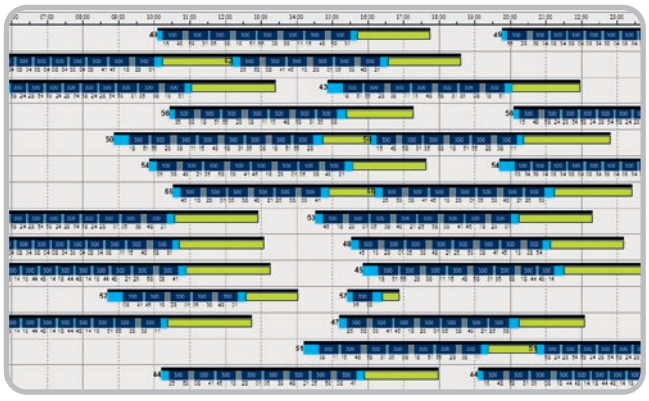
Photo: BVG / Andreas Süß

PRODUCTS IN USE:

IVU.timetable and **IVU.**run

Display of the transport network in IVU.timetable

The integrated duty and vehicle working scheduling creates optimal vehicle working schedules



SCHEDULING CHARGING PROCESSES

The planning process for vehicle workings for battery-powered electric buses must also take charging times into account. That's why vehicle working scheduling in IVU.suite makes it possible to create the necessary charging processes at the same time. Based on anticipated energy consumption for different vehicle types as well as the existing infrastructure, such as the number of charging stations in the depot and their availability, the system enables the creation of suitably sized charging time windows right at the planning stage.

The software also closely monitors total charging capacity to ensure, on the one hand, that upper power limits and locking periods are adhered to, but also that all vehicles are sufficiently charged. If necessary, planners can even assign parking spaces and charging stations as part of the vehicle working scheduling. Specific activities such as preconditioning can also be conveniently entered in the system. The end product is a complete charging plan that includes the intended charging duration as well as the planned charging curve.

The charging plan is also available to the vehicle dispatch, operations monitoring and depot management departments along with other areas of work. This guarantees a seamless flow of data and ensures a standardised planning and dispatch process.

At a glance

- **Utilising information**
  Topography, infrastructure, consumption profiles: IVU.suite alleviates timetable planning with important information
- **Approaching charging stations**
  Whether it is depot charging or opportunity charging, charging stations including capacities can be scheduled during timetable planning
- **Integrated user interface**
  All in one system: planners profit from a standardised user interface with functions for all drive types
- **Machine learning**
  IVU.suite has learning capabilities: Based on the vehicle workings driven, algorithms determine exact range forecasts for each vehicle type
- **Automatic suggestion system**
  The right vehicle type for the right vehicle working – automated suggestions for suitable vehicles accelerate the planning process
- **Extensive charging planning**
  From the state of charge to the infrastructure all the way to the charging duration, IVU.suite supports the overall charging planning process
- **Taking activities into account**
  Whether they involve cleaning or preconditioning, any activities on the vehicle are easy to plan and enter in the vehicle working schedule
- **Predicting power consumption**
  Weather, passenger numbers, battery age: Interfaces to the vehicle monitoring system enable detailed forecasts

Photo: CleverShuttle

DEPLOYING STAFF EFFICIENTLY

The right personnel for every duty – the duty scheduling tools of IVU.suite provide support for the entire staff rostering process, from the establishment of the first duty schedule, to personnel dispatching and communication with drivers.

Closely linked to vehicle working scheduling, duty scheduling immediately maps every modification and suggests duty adjustments if necessary, for instance, if additional activities such as charging or preconditioning arise. Thanks to a flexible rule editor, the system automatically observes all operational, collective agreement and legal requirements as well as any qualifications that are required.

IVU.pad supports day-to-day operations: The mobile app keeps drivers, workshop employees or service staff in the loop at all times. Important information, such as duty schedules, manuals, training documents or the designated parking space for the bus, is just a fingertip away. In addition, dispatch can enter specific information about the vehicle or the trip, such as the state of charge or operational guidelines.

Regardless of the drive in question – the integrated solutions in IVU.suite ensure entirely digital workflows, from timetable planning all the way to personnel.

PRODUCTS IN USE:

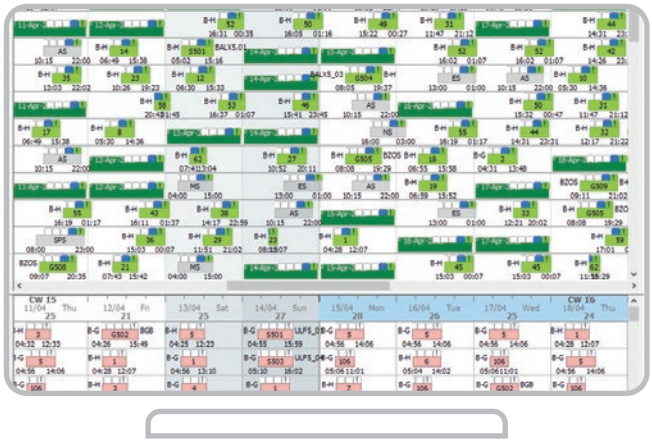
IVU.duty, **IVU.**crew and **IVU.**pad

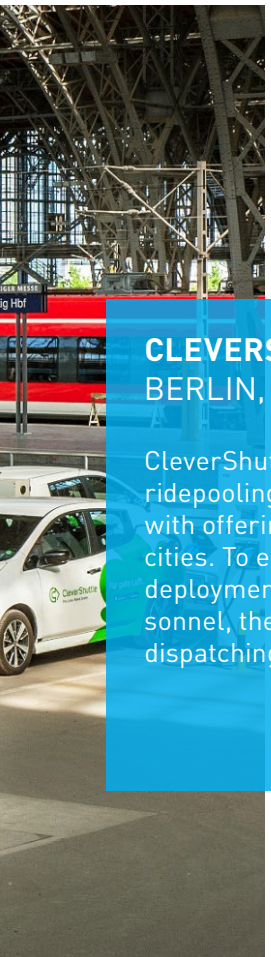
At a glance

- **Flexible rule editor**
  Rules such as qualifications, labour laws and company agreements can be entered and adapted in a flexible manner
- **Integrated duty and vehicle working scheduling**
  For optimum results, duty scheduling synchronises the charging times for the buses with employee break times
- **Direct employee communication**
  IVU.pad sends all important information to employees directly – in seconds at the click of a mouse
- **Simple fault messages**
  IVU.pad makes it easy to record disruptions: Digital forms help to enter the data and forward all information directly

IVU.pad keeps mobile employees in the loop and accelerates workflows

IVU.crew's configurable rule system checks allocations of activities to employees and reports conflicts



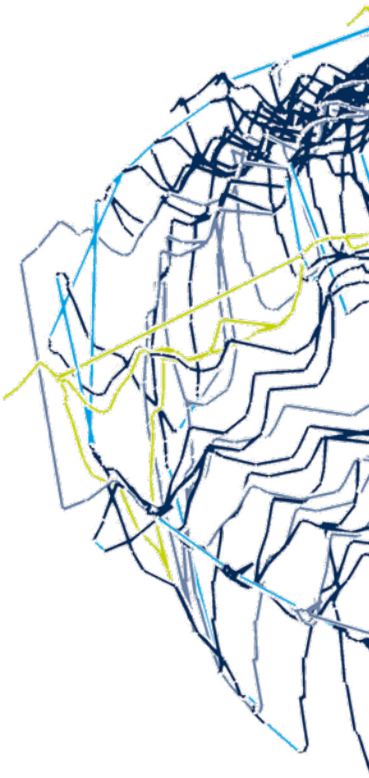


CLEVERSHUTTLE
BERLIN, GERMANY

CleverShuttle is the leading ridepooling expert in Germany with offering services in six cities. To ensure the efficient deployment of its driving personnel, the company uses the dispatching solutions of IVU.suite.

OPTIMISATION DRIVES EFFICIENCY
PLANNING – DISPATCH – OPERATION

Planning vehicle workings for electric buses and matching duties is a demanding task – deploying all resources properly and optimally poses a challenge. But there is significant potential in this. Making vehicle and duty schedules just a few percent more efficient can save transport companies a lot of money. This applies in particular to electric bus or mixed fleets. IVU's optimisation solutions help to overcome the complex requirements of different vehicle and drive types and extract the maximum from the available resources.



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

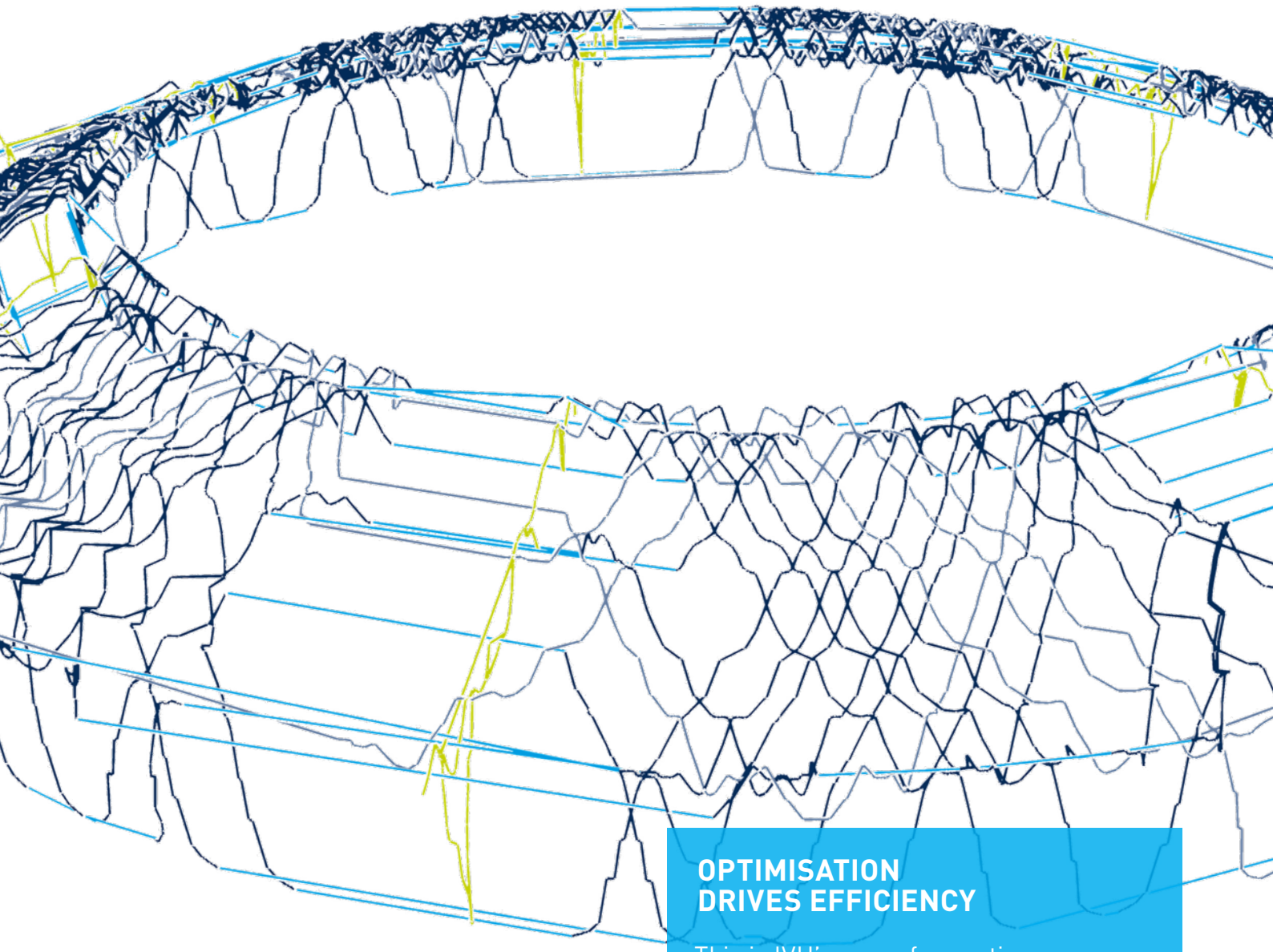
These solutions allow to quickly generate duty and run schedules that meet all legal and operational requirements. This delivers optimum vehicle workings that deploy electric buses efficiently and help to save costs in the process. At the same time, the system creates more balanced duties that improve staff satisfaction. Optimisation allows dispatch managers to react directly to disruptions or construction works and adapt duty schedules and vehicle workings in seconds to suit the ranges of electric buses, thus preventing cancellations and ensuring stable operation at all times. This way, optimisation also improves the service quality for passengers.

Maximum efficiency

IVU.suite planning products allow to coordinate duties and vehicle workings for maximum efficiency. The integrated duty and vehicle working scheduling synchronises the charging times of electric buses with the break and relief possibilities entered in the system, thus helping transport operators to make optimum use of available resources.

IVU.suite'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 could, for example, consider aspects such as fair allocations or balanced work time accounts. In addition, 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 transport companies, but also helps with business decisions such as the preparatory planning for the deployment of electric buses. It can be used to calculate different scenarios for timetables and vehicle working schedules as well as for the layout of infrastructure – thereby clearing the way ahead for traffic with zero local emissions.

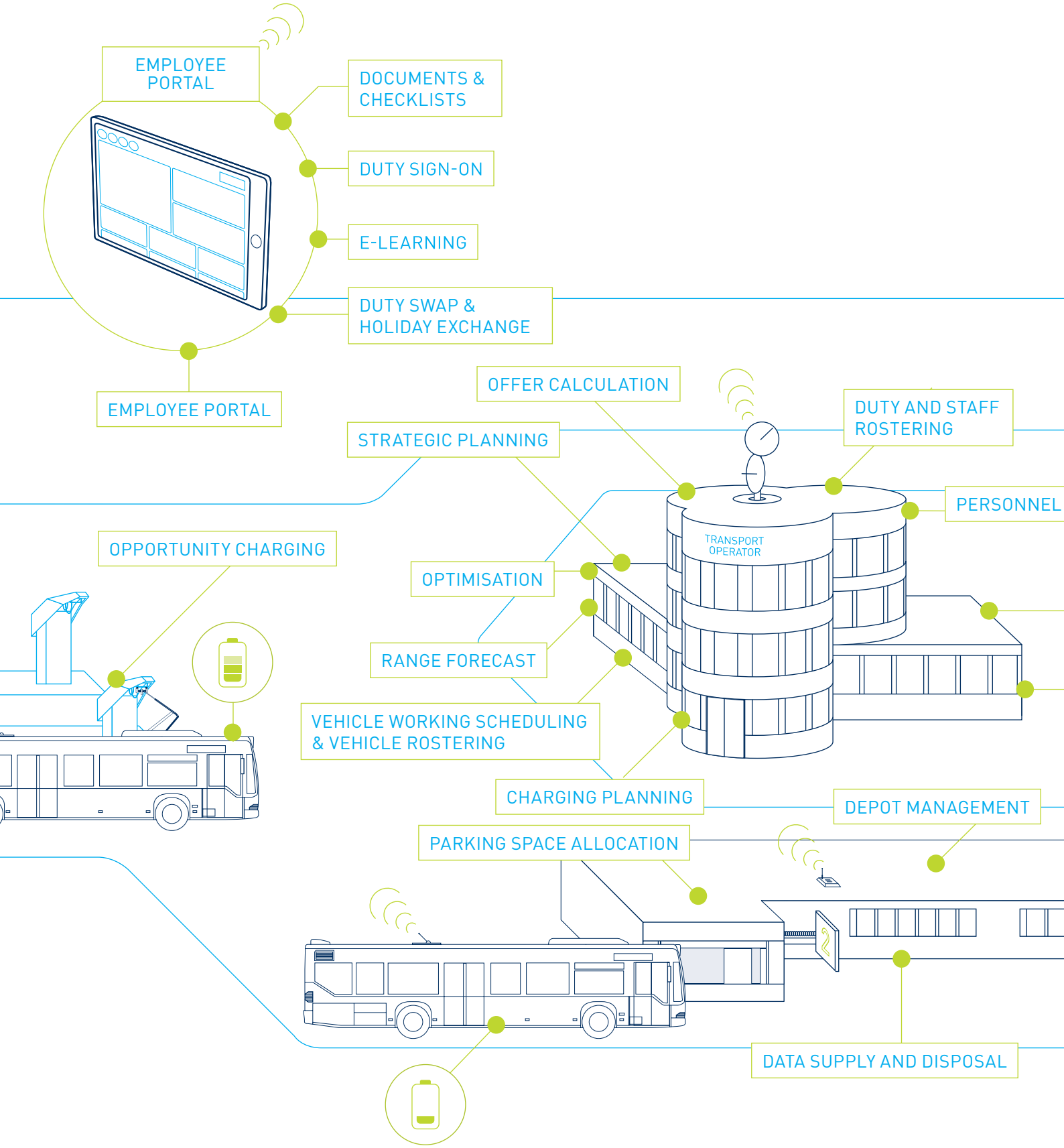


OPTIMISATION DRIVES EFFICIENCY

This is IVU's area of expertise. From initial timetable planning to the deployment of resources – the algorithms of IVU systems solve highly complex tasks.

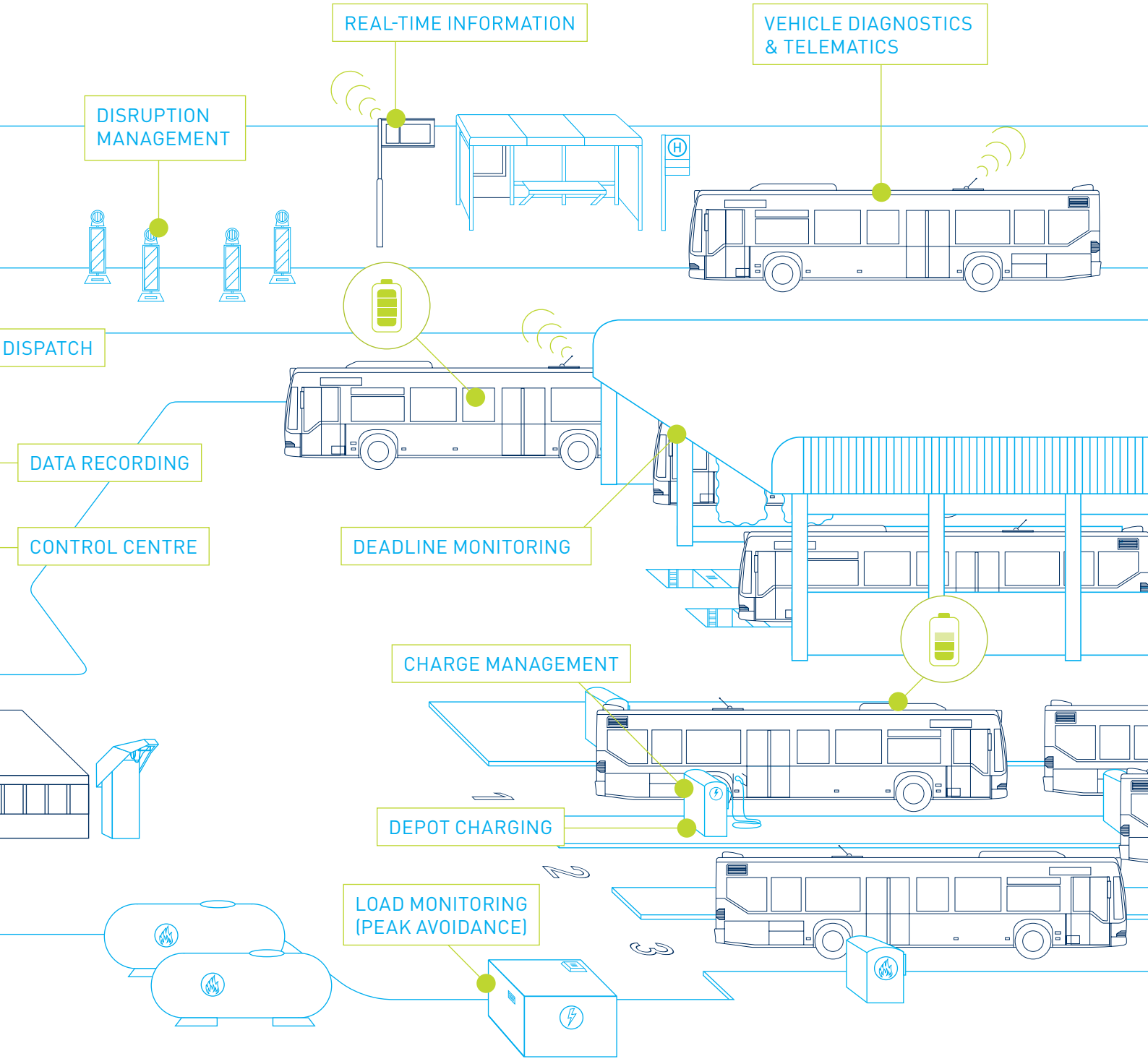
IVU.suite
IN THE FIELD

Electric mobility is driving connectivity at transport operators. Every vehicle movement and every activity is coordinated down to the finest details to ensure seamless workflows. The fuel that makes it all possible is data.



From timetable planning through to settlement, there is a continuous flow of data that records all areas and all tasks. Planners create trips and generate vehicle workings, buses register every detail of a trip for exact range forecasts, depot managers allocate parking spaces, personnel dispatch managers assign duties, the control centre controls the traffic and informs passengers, charging systems monitor capacities and loads.

IVU.suite supports all these processes. It stores the resulting data, processes it and passes it on to areas in a targeted manner. As a result, vehicle workings can be tailored exactly to the actual ranges, charging processes can be planned precisely and duty schedules can be optimised. This allows transport operators to maintain control of all events at all times.



ORGANISING DEPOTS AND PARKING

Parking, charging, maintaining and redeploying electric buses smoothly: IVU.suite's depot management system assists with all processes in the depot – for all vehicle types, in a single system. Whether it's mixed operations or purely electric fleets, numerous automated functions accelerate workflows and make cooperation easier across all areas of responsibility.

AUTOMATIC PARKING SPACE ALLOCATION

When a bus enters the depot, the correct parking space is important for the subsequent depot exit. With this in mind, IVU.suite links parking planning with deployable vehicle working scheduling. The system suggests vehicle workings as well as suitable points to park the vehicle by determining the optimum parking space at the vehicle dispatch stage and automatically specifying lane occupancy for departures and arrivals.

The dispatch personnel can specify in detail which criteria and strategies the system uses. For instance, it is possible to specify whether parking is to be organised by vehicle type or line. Additional specifications can include the operating status or state of charge, parking space availability, travel path, output available at the charging station or capacity utilisation of the charging infrastructure.

The overall process is completely transparent: The dispatch user interface shows the selected

Photo: Connexxion

CONNEXXION
HILVERSUM,
NETHERLANDS

The largest urban and regional transport company in the Netherlands. Connexxion operates more than 1,500 vehicles, including around 150 electric buses, and has been relying on IVU.suite since 2005.

parking space and enables manual intervention, if necessary. Consequently, dispatch is always in control of all operational workflows.

INTEGRATED DEPOT MANAGEMENT

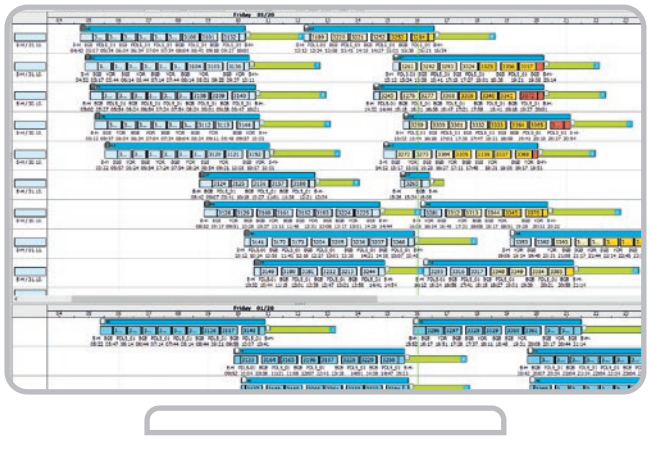
Whether it involves battery-powered, diesel or fuel-cell buses: Most of the workflows in the depot are always identical. When it comes to temporary parking, manoeuvring activities or interior and exterior cleaning, the drive system used is irrelevant. Therefore, IVU.suite maps the processes for electric and combustion-engined vehicles in a single user interface.

The depot view in IVU.vehicle shows charging processes, parking space assignments and buses at the depot

At a glance

- **Standardised processes**
  Vehicle dispatch and parking planning from a single source: IVU.suite combines processes logically
- **Open interfaces**
  Thanks to open standards such as OCPP, transport operators are not tied to specific vehicle and charging station vendors
- **Flexible rule editor**
  Criteria and strategies for parking can be specified in detail and easily entered in the system
- **Optimum parking**
  Vehicle type, state of charge, next vehicle working: Powerful algorithms automatically determine the optimum parking space – even in the case of modifications at short notice
- **Integrated dispatch**
  Whether it is used for a mixed fleet or purely electric operation, IVU.suite combines activities for all vehicle types in a single user interface
- **Automatic conflict warning**
  Whether it is an incorrectly parked vehicle or a defective charging station – IVU.suite informs dispatch if problems occur
- **Executing charging plans**
  From charging management to depot management, IVU.suite monitors the overall charging infrastructure

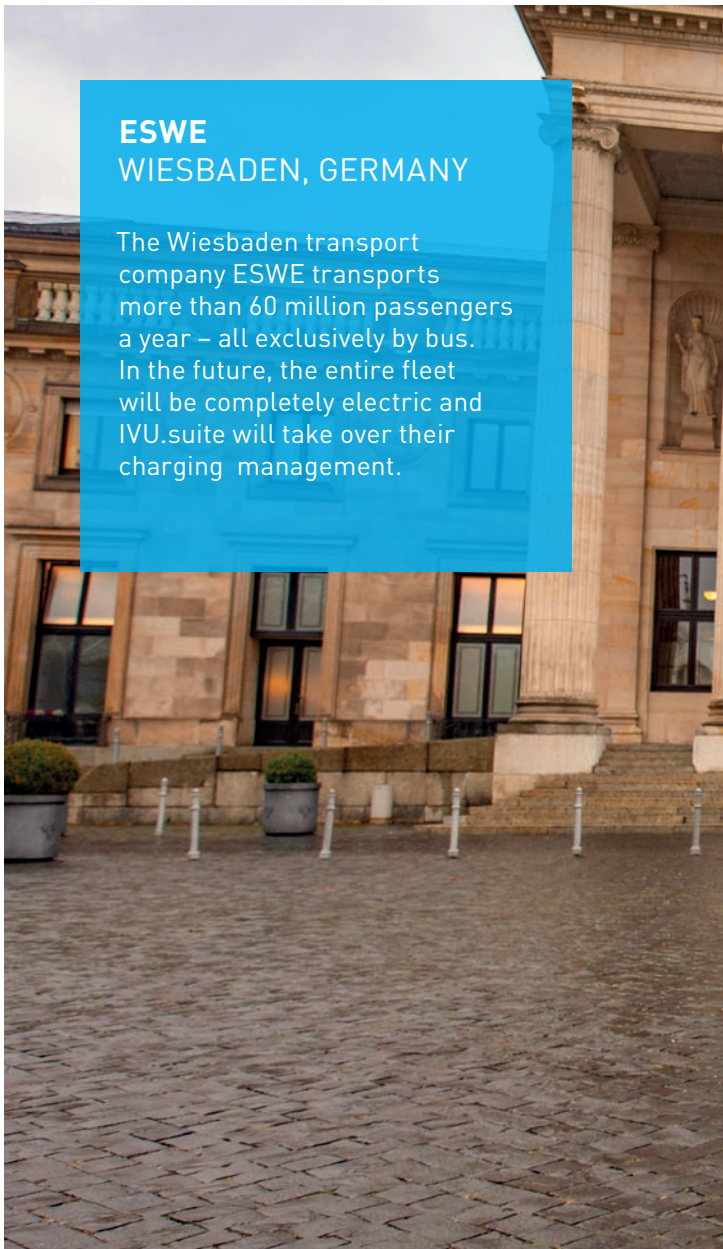
IVU.vehicle shows all dispatch information at a glance



The system enables detailed planning and monitoring of all necessary activities as well as the allocation of workshop capacities. If IVU.suite detects a battery-powered bus, it automatically assigns specific tasks such as charging or preconditioning to the list of activities. In this context, all roles in the depot work with the same tool. Consequently, dispatch, workshop, cleaning and manoeuvring personnel are on the same page at all times, regardless of vehicle type.

CHARGING MANAGEMENT INTEGRATED

The direct link to the charging station: As the user interface between the bus and the charging management system, the depot management system in IVU.suite provides the optimum charging plan for all incoming vehicles and vehicles that need to be parked. The plan derives from, among other things, the state of charge,



ESWE
WIESBADEN, GERMANY

The Wiesbaden transport company ESWE transports more than 60 million passengers a year – all exclusively by bus. In the future, the entire fleet will be completely electric and IVU.suite will take over their charging management.

Photo: ESWE Wiesbaden / Daimler Truck AG

the next vehicle working or vehicle- or season-dependent consumption.

If a vehicle is connected to a charging station, the system uses the open communication protocol OCPP to transmit the charging plan and sends preconditioning specifications to the vehicle in accordance with VDV 261 in order to achieve an optimum range prior to departure. At the same time, dispatch is informed of the location of the bus and its state of charge.

If a driver parks the vehicle in a different location than planned, the system automatically calculates a new charging plan for this position or alerts dispatch if a conflict occurs. IVU.suite also issues notifications for defective charging stations and blocks them to prevent vehicles parking beside them. This ensures that electric buses always leave the depot with sufficient power in the battery.

PRODUCTS IN USE:

IVU.vehicle

MONITORING CHARGING PROCESSES

Fully charged into the vehicle working – with IVU.suite, planners and dispatch managers have the overall charging process under control, from long-term charge planning to controlling the infrastructure and all the way to energy management in the depot. The software compiles all relevant data, calculates optimum charging scenarios and ensures that battery-powered electric buses always have sufficient power for the intended vehicle workings.

State of charge, age and condition of the battery for every vehicle, total output of transformers, energy costs, number of available charging stations and buses to be charged, planned following vehicle workings: Sophisticated algorithms take every aspect of charging planning into account and determine the correct charging strategy for every vehicle and every depot. In this way, charging processes only drain as much output as is actually required. Smart peak shifting avoids load peaks and capacity overloads and distributes charging processes dynamically across vehicles and charging stations in order to reduce losses. In addition, the intelligent allocation of vehicles to charging stations helps to make the best use of the available infrastructure and save electricity costs. For this purpose, IVU.suite takes into account the special characteristics of different charging devices and adapts charging plans flexibly – even if a charging station should fail.

Interfaces to the systems operated by the power utilities also enable transport operators to participate in the energy market and exploit price fluctuations to ensure that they always consume the cheapest electricity.

QBUZZ
AMERSFOORT,
NETHERLANDS

Qbuzz is one of the leading transport companies in the Netherlands. With IVU's integrated dispatch and depot management system, the company is able to manage its growing mixed fleet in a single system.

Photo: Qbuzz

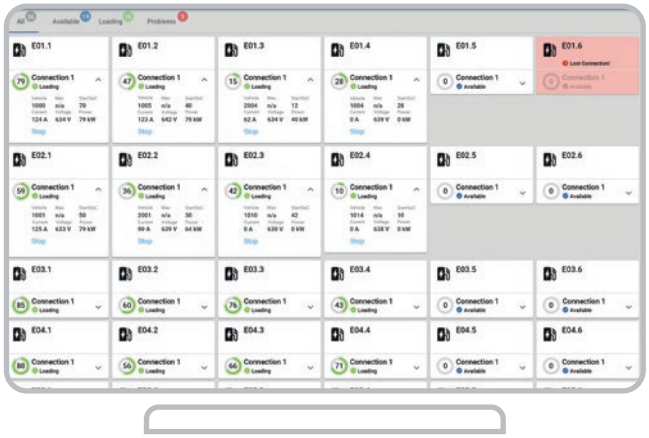
At a glance

- **Compiling data**
  Infrastructure, vehicles, vehicle workings: Intelligent algorithms observe every aspect and generate optimum charging plans
- **Modelling charging processes**
  The right output depending on battery and charging station: IVU.suite automatically takes the technical conditions into account
- **Taking capacities into account**
  Smart peak shifting optimises the distribution of charging processes to avoid load peaks and capacity overloads
- **Reacting flexibly**
  Whether it involves a transformer failure or a defective charging station: IVU.suite adapts charging plans flexibly to the current situation
- **Monitoring charging processes**
  Always informed: Comprehensive monitoring and logging functions alert dispatch managers in the event of deviations

PRODUCTS IN USE:

IVU.vehicle

Display of all relevant data for monitoring the charging infrastructure and charging processes in one view in IVU.vehicle



OPERATIONS UNDER CONTROL

Keeping the entire fleet under control at all times – with IVU.suite, dispatch managers can control and monitor day-to-day operations on the road. Whether it involves battery, hydrogen or diesel power, the system provides the right function for every vehicle type. Numerous automated functions help to ensure a swift and appropriate response in every operational scenario.

IVU.suite continuously monitors all aspects of a trip – from the vehicle status and the timetable situation through to the current deployment of vehicles and personnel. Dispatch managers have access to important information such as the state of charge, remaining range, and other data of relevance to operations at all times. If energy is in danger of running short, IVU.suite automatically alerts the dispatch managers and suggests possible measures. In addition, the software always checks the anticipated consequences of dispatch interventions per vehicle type.

In order to use battery-powered electric buses as efficiently as possible and to extend ranges, IVU.suite supports the control centre with extensive functions. The clearly laid out user interface not only displays the state of charge, but also provides information on the current range prognosis for all electric vehicles. Dispatchers can thus see at a glance whether the next trips can still be carried out and can react in good time, for example to exchange a bus in cooperation with the depot. IVU.suite automatically records all dispatch measures that affect the vehicle and calculates updated range prognoses.

At a glance

- **Checking the state of charge**
  Information in realtime: IVU.suite transmits the current state of charge for every vehicle directly to fleet management
- **Reacting swiftly**
  Continuously updated range forecasts enable dispatch managers to take action before the power runs short
- **Informed dispatch**
  Predicting the impact of a travel path modification on the range: Forecasts help to estimate the consequences of dispatch measures
- **Integrated working**
  Whether it is a diesel or electric bus, IVU.suite combines all vehicle types in a mixed fleet in a single user interface
- **Monitoring charging stations**
  To ensure that buses can charge along the route, dispatch managers know in advance whether a charging point is ready-to-operate or occupied
- **Connecting with depot management**
  A continuous flow of data ensures better planning: IVU.suite transmits the states of charge and forecasts to connected systems

Photo: ÜSTRA

ÜSTRA
HANOVER, GERMANY

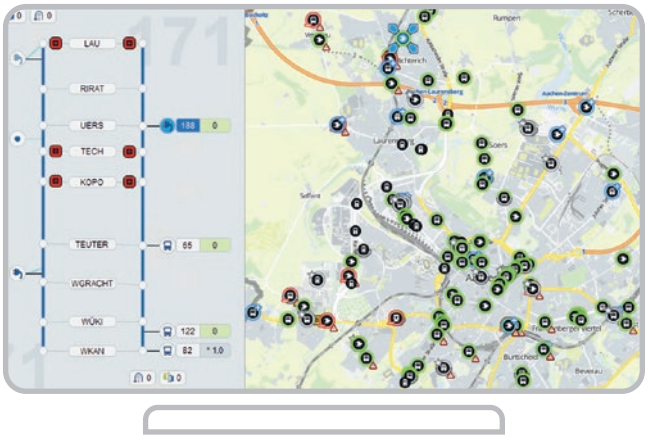
As early as 2024, Hanover's public transport company plans to use electric transport throughout the city. IVU.suite's fleet management provides an overview.

PRODUCTS IN USE:

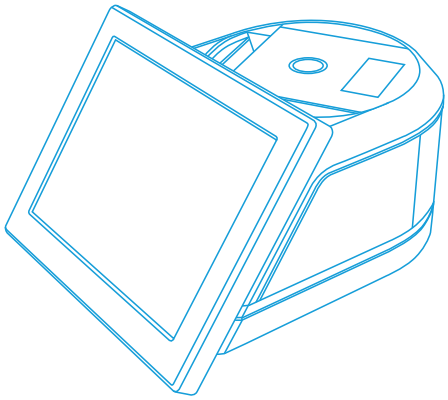
IVU.fleet, **IVU.**cockpit and **IVU.**box

Driver assistance in IVU.cockpit

Schematic and map-based display of the operations situation in IVU.fleet



A compact device for vehicle operations and ticketing – the on-board computer IVU.ticket.box prints tickets, scans bar-codes, validates e-tickets and controls peripheral devices



COLLECTING AND EVALUATING DATA

PRODUCTS IN USE:

IVU.control

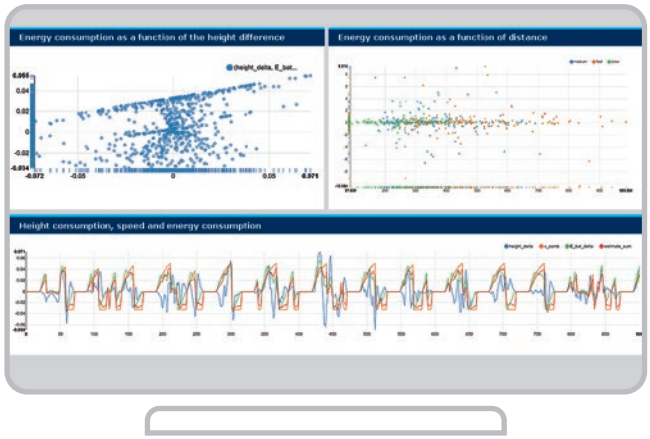
From route topography to the battery profile and all the way to the consumption profile, IVU.suite records all relevant target and actual data, merges it and prepares it for further processing. This provides transport operators with all the information they need to analyse electric bus deployment and to determine how they can further optimise their performance.

Uphill and downhill gradients, battery status, vehicle type, time of day, traffic situation, degree of occupancy, status of charge, vehicle working schedules, outside temperature, weather conditions, vehicle weight – every detail is relevant when it comes to optimising electric vehicle deployment. Sophisticated big data technologies make it easer to handle this information and enable targeted analyses as a means of exhausting all potential.

Assistance is provided in this context by IVU.suite's intelligent algorithms: Machine learning enables the creation of exact range forecasts depending on the vehicle type, route, week day or season. The more data is available, the more accurate the prediction. This ensures efficiency and cuts costs – for the deployment of electric buses as well as for infrastructure planning.

In addition, IVU.suite makes it possible to precisely calculate actual driving performance. Transport companies can thus comprehensively document the use of the electric buses for the public tranpsort authorities, for example if transport contracts contain corresponding guidelines.

Evaluation of the influences on energy consumption



At a glance

- **Big data**
  Route topography, vehicle type, weather situation: A sophisticated data storage concept processes all relevant details
- **Machine learning**
  Intelligent self-learning algorithms: Every vehicle working generates new data that improves the calculation of forecasts
- **Targeted analyses**
  Which routes are suitable for electric buses? When does energy consumption rise? Comprehensive evaluations provide the answers
- **Careful planning**
  Enough power for the next vehicle working at all times: IVU.suite automatically takes analyses into account during planning
- **Creating reports**
  Tabular and graphical evaluations for planning and management ensure informed decisions

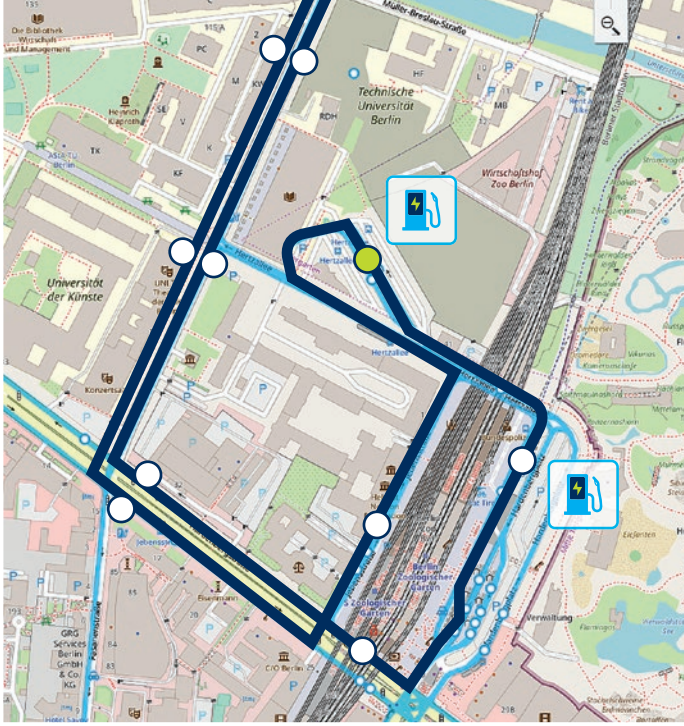
STRATEGIC PLANNING FOR ELECTRIC BUSES

Bespoke planning – from the very start. Even before the first battery-powered bus leaves the depot, IVU helps transport operators to make the right decisions to ensure that all vehicles are efficiently deployed with support from ebus solutions, a subsidiary of "eplan" solution.

eplan is specifically designed for the strategic planning of electrification of bus fleets. It uses current operating data to carry out comprehensive planning, analysis and comparison of different electric bus concepts. A detailed evaluation of existing vehicle workings and courses provides insights into the available potential for electrification and enables the timely identification of suitable locations for charging stations.

Different vehicle types, charging infrastructure variants, energy requirements, special situations such as delays: eplan simulates different situations, thereby individually determining the feasibility of electrification – and where opportunity charging is possible or when pure depot charging is more suitable. Building on the possible deployment profiles, the system calculates the service life and replacement intervals of individual components to provide a long-term profitability calculation.

The integrated optimisation ultimately models efficient scenarios that are optimised in terms of cost and benefit and makes concrete proposals for setting up the suitable infrastructure. In this way, transport operators receive reliable data to optimise preparations for the deployment of electric buses.



At a glance

- **Professional support**
  Experts provide support during the preparation of electrification and accompany the decision-making process
- **Modelling scenarios**
  Based on local conditions, eplan calculates different variants and determines the most expedient electric bus concept
- **Overview of consequences**
  The basis for informed discussions: eplan maps all technical and operational consequences of electric bus deployment
- **Defining requirements**
  The correct vehicle technology and suitable infrastructure: eplan helps to define requirements for the catalogue of specifications
- **Optimising costs**
  Reliable and low-cost electrification: Powerful algorithms optimise the infrastructure requirements

ebusplan
Solutions for Clean Transportation

ebusplan is a reliable partner for the strategic consultation and planning of every electrification project in public transport. The experts of ebusplan help to embark into the future of electromobility, and to optimally deploy e-buses.

ebus SOLUTIONS

ebus solutions develops new software solutions for the efficient deployment of electric buses, with the expertise of IVU and ebusplan in the background. The eplan systems make it possible to strategically plan scenarios in order to make well informed and sustainable decisions.

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