

February 2013

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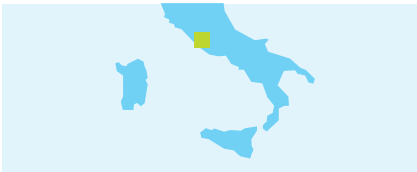
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# MOBILITY FOR MAJOR CITIES



■ Hungarians are proud of their capital city, which is also at the heart of the largest conurbation in the country. In order to meet the growing mobility demands of the future and to avoid falling behind in a European comparison, the city is investing heavily in its infrastructure. The modernisation is being supported by IVU.

Some 1.7 million people live in Budapest – a fifth of the total population of Hungary. The city on the banks of Danube, with an area of 525 km<sup>2</sup>, is the largest conurbation in the country, and its mobility demands are increasing steadily. Already more than 3.8 million passengers use the 2,000 kilometre-long public transport network every day. In addition, the services also cater for the needs of some 2.3 million tourists annually.

From communist times, Budapest has a well-developed and extensive public transport network. More than 180 bus routes, 14 trolley bus routes, 29 tram lines, and 3 underground lines cross the city, providing connections for all districts. The most famous of these is the No. 1 line, which was completed for the World Exhibition in 1896 and is one of the oldest underground railway lines in Europe. However, statistically rail transport only plays a minor role in Budapest. 26 % of all journeys are by tram, 22 % by underground rail, 5 % by trolley bus, and 41 % with normal buses. The remaining 6 % is made up of services like HÉV (an interurban tramway) and other services aimed mainly at

tourists, such as the cable car and funicular. In other words, three quarters of trips with public transport are over-ground on roads.

Road transport is much less predictable than rail transport. At any time, delays can occur due to tailbacks or obstructions. Above all else, operating a bus service reliably in a city like Budapest requires up-to-the-minute information and rapid responses to disturbances. Therefore, Budapest's public transport company Budapesti Közlekedési Központ (BKK) has decided to introduce a new, integrated operational control and passenger information system for its bus and tram network. The requisite systems are being provided by IVU.

### The new IVU.box.touch

The first important step for obtaining reliable, real-time data is to equip the vehicles with on-board computers. The wide range of vehicles in use in Budapest represents a particular challenge in this context. IVU engineers have to integrate a variety of hardware components on vehicles of all types and ages. In all, some 1,500 buses, 150 trolley buses and 600 trams are being fitted out with the new technology.

In Budapest, the latest development from IVU is being installed – the IVU.box.touch. The special feature of this on-board computer is not only its modern user interface but above all its flexibility.



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Dr Helmut Bergstein, Member of the Executive Board

**Dear Readers,  
Dear Customers of IVU,**

For many years, the increasing pressure of growing populations has been causing traffic congestion in conurbations all over the world. In order to reduce this burden on infrastructures and to ensure sustainable mobility, solutions are needed which increase the efficiency of public transport. In this respect, the well-developed European transport systems are regarded as a benchmark all over the world. Mobility for major cities is a topic which will continue to represent a key factor in all economic growth for many years to come, and here IVU has an important contribution to make. After London, Berlin, Vienna, and Zurich, I am now particularly pleased to welcome Budapest as another city of world renown which has chosen to implement our systems for fleet management and for passenger information.

Public transport operators not only have to provide efficient services for their passengers – their internal processes also have to be efficient. A report from Berlin-Marzahn shows how the Berlin transport utility has improved the automation of parking space allocation and signal setting with an innovative depot management system.

Upgrading infrastructure is also a priority in Schwerin, capital of Mecklenburg-West Pomerania. They are making long-term investments in modern technologies in order to encourage more road users to switch to public transport, and passenger comfort is one of the most important arguments. They are now installing further IVU solutions to ensure good connections and to provide comprehensive timetable information.

**I hope you enjoy reading this issue. ■**

IVU.box.touch can be installed in Budapest's public transport buses as a stand-alone server, providing the necessary direct interfaces with the passenger information systems and the operational control systems. In the trams, in contrast, IVU.box.touch is only used as the operator terminal, working together with the IVU.box.server. Since the trams can operate in both directions, they need a driver's terminal at each end, and these are provided with data from

a central server. With the IVU.box.touch, IVU's engineers have developed an on-board computer solution which can be flexibly adapted to meet the various needs of vehicles operating in urban settings.

#### **IVU.fleet and IVU.realtime for Budapest**

The new systems for fleet management and for passenger information are also from Germany. Already in spring of this year, the IVU systems IVU.fleet and IVU.realtime are due to go into operation in the Hungarian capital.

The existing basic radio communications system will then be replaced with UMTS technology and modern communications procedures which will be available for all the various types of vehicles.

Whereas previously the dispatchers of BKK could only use two-way radio to find out about the latest traffic situation and the positions of vehicles, in future real-time data from buses, trolley buses and trams will be visualised on live maps and automatically monitored from the operational control system IVU.fleet. A specially developed disturbance management system will ensure that the controllers are able to respond much more rapidly in

the event of operational disturbances and will be able to organise replacement services more easily.

#### **Real-time information at 250 stops**

Passengers in Budapest will also notice some new features. At the most important stops and stations they will be informed about the up-dated departure times for buses and trams. Digital information columns are being installed at some 250 stops and transport nodes, and these will be supplied by IVU.realtime with data directly from the control centre. In addition, IVU.realtime will also make real time data available via an interface for Web services and for smartphone applications.

IVU is carrying out this project in cooperation with the Hungarian IT service company Synergon, which has overall responsibility as general contractor. ■



600 trams, 1,500 buses and 150 trolley buses are being fitted out with the new on-board computer IVU.box.touch.



# SCHWERIN PLACES ITS FULL TRUST IN THE IVU.SUITE



Thanks to the IVU.suite it is now much quicker and easier to make connections between trams and buses.

■ **In Schwerin, the capital of Mecklenburg-West Pomerania, NVS has been providing a reliable public transport service since 1990. Passenger comfort is always a top priority, and in order to ensure that passengers can be confident of reaching their connections and to provide comprehensive and reliable timetable information, the company has decided to place its full trust in the IVU.suite.**

Since 1908, the electric tram service has been in operation in the federal state capital Schwerin. For more than a century it has been providing reliable transport for local residents and visitors. These days, it is supported by buses operating on 14 routes through the city of the seven lakes. Every year some 17 million passengers are transported on a 190 km long network. In order to continue to provide an attractive public transport service for the future, Nahverkehr Schwerin GmbH (NVS) is investing considerable sums in the upgrading and continual modernisation of the fleet and the transport network. The passengers' perceived comfort depends in particular on short waiting times for connections and the availability of reliable information. Therefore the transport company decided in March 2010 to introduce IVU's systems for operational control and passenger information. After very intensive preparation and a test phase, the control centre went into operation in December 2012. In the spring of this year,

passenger information is to follow. Currently, 40 buses and 30 trams are being fitted out with the necessary new equipment.

## First planning – now operational control

NVS is already very familiar with IVU systems. For many years, the company has been using the planning components IVU.plan and IVU.crew for the planning of its timetables, vehicle workings, and duty rosters. "Thanks to our many years of good cooperation and the extensive test runs of all central components in advance, the commissioning of the new systems was completed to very high standards," explains a pleased Andreas Hellwig,

## Reliable timetable information for 17 million passengers on a 190 km long network.

head of department at IVU Traffic Technologies AG. "The drivers quickly got used to handling the new ITCS on-board computer and our systems were fully adapted to the demands," continues Hellwig. Following on from planning, NVS is now placing its trust completely in IVU systems for computer-based dispatching and passenger information. With the introduction of IVU.fleet, IVU.realtime, and IVU.control in the operational control centre and IVU.ticket.box and software in its vehicles, the public transport company in Schwerin is now using the entire IVU.suite.

## IVU.ticket.box as single computer system

Installing the IVU.ticket.box in the trams as a "single computer system" was something completely new for the IVU engineers, because Schwerin has uni-directional vehicles. The development teams at IVU came up with a special solution for Schwerin in which a single IVU.ticket.box in each vehicle functions as central computer and as operator terminal. In normal bi-directional trams it is necessary to install three components. This adaption to the needs of NVS offers the transport company a considerable reduction in the hardware costs. The communications between on-board computer and control centre are realised completely using public UMTS networks for data, together with VoIP. In order to meet the high demands for stable operations, an external UMTS router has been installed, providing stand-alone administration of the UMTS connections.

NVS and IVU have invested much time and effort into the introduction of the system in order to ensure that the passengers in Schwerin notice as little as possible of all these changes, and so far things have gone very smoothly. "It is important for us that the complex installation procedures stay in the background. The passengers should only notice the quicker connections and the up-to-date timetable information," concludes Andreas Hellwig. ■

# NEW FUNCTIONS FOR DUTY OPTIMISATION

Punctually for this year's user forum, IVU engineers present Release 13 of the IVU.suite offering further new functions. A lot has happened, above all in duty optimisation. For example, the quantity of duty allowances taken into consideration in the optimisation has been increased. Whether for weekend duty, risk allowances, or stand-by duties – all relevant types of allowances can now be integrated. It is also easy to administer the duty allowances which have to be taken into account for the duty creation and optimisation directly in the duty guidelines.

A further innovation is that supplementary times during duties can now be made dependent on the

numbers of vehicles involved. Release 13 includes additional rules for the allocation of supplementary times for brake tests or vehicle checks before or after journeys, allowing automatic duty specification for this element. At the same time, all the rules can also be implemented in the optimisation.

If personnel don't end their shift at the depot, it is now possible to define another location for the start or end of their duty. If necessary, it is then possible to plan a direct handover, for example at their hometown.

In order to ensure that the duty plans comply with typical requirements, Release 13 makes

it possible to specify the shift classes from a reference day for the adjustment optimisation. This means that every operator can predefine the approximate time class for duties in accordance with the regular plan. Inconsistent or incomplete duty plans can then be adjusted during the optimisation.

These are only a few of the new functionalities in the IVU.suite. Interested users can see all the innovations for themselves in the showrooms in Berlin or Aachen. Simply contact us at [publictransport@ivu.de](mailto:publictransport@ivu.de). ■

## IVU.INSIGHT

# ADVANCED MATHEMATICS AND PRACTICAL SOLUTIONS

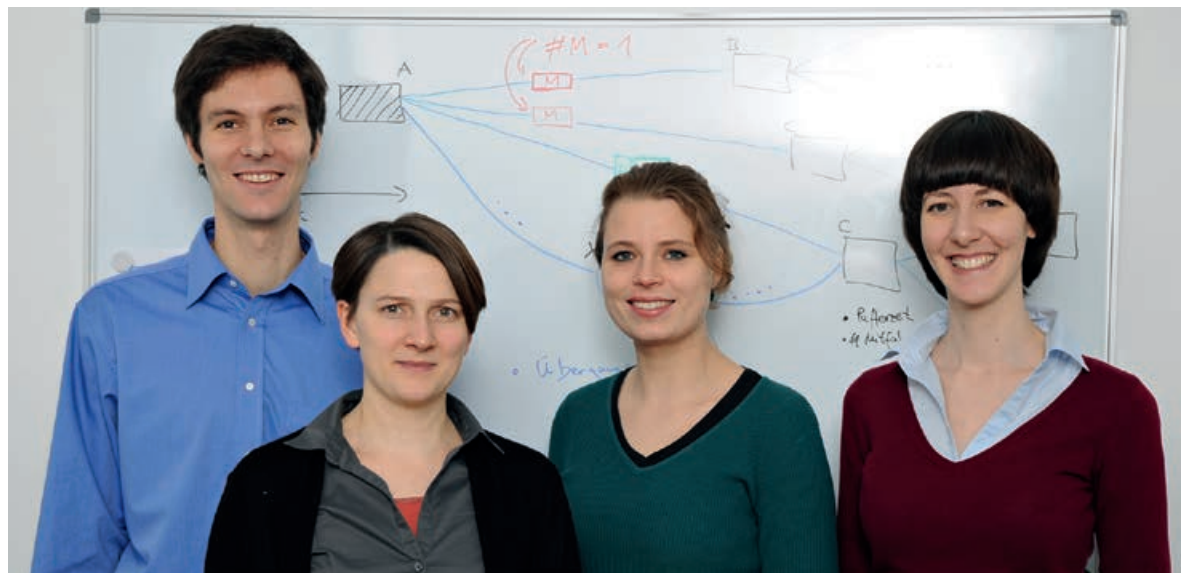
■ The four mathematicians Dr Mareike Massow, Gregor Karbstein, Dr Melanie Win Myint, and Dr Cornelia Dangelmayr are using their well-founded knowledge in combinatory optimisation for the further development of IVU's optimisation tools. IVU News asked them what their daily work is like, and what they find so fascinating about mathematics.

**Mathematics is very theoretical. What is your daily work at IVU like?**

**Win Myint:** Our work is actually very down to earth. Together with our optimisation partners we use the results of the latest research in order to develop new or improved optimisation solutions. We are also in close contact with our customers in order to learn where their operational methods have been extended, where they need improvements to existing optimisation procedures, and whether they need new solutions, as well as to show them potential new optimisation possibilities.

**What is particularly fascinating about your work?**

**Massow:** I am always fascinated by the way in which mathematics can help you to understand everyday things much better. It is particularly impressive to recognise that behind very different topics there are mathematical optimisation problems which have much in common. Finding these similarities and making use of them is our goal, and this stimulates us every day in our work.



Gregor Karbstein, Dr Cornelia Dangelmayr, Dr Mareike Massow, Dr Melanie Win Myint

**What has been your most interesting project so far?**

**Karbstein:** I found the further development of the relatively new adjustment optimisation was very interesting, because here we were able to integrate existing concepts in new optimisation solutions. For example, the adjustment optimisation now also takes the qualifications of personnel into consideration.

**Dangelmayr:** For me, parallelisation immediately springs to mind, which is a more prospective topic. The aim here is to follow technical and algorithm developments and to estimate when and to what extent it is appropriate to implement these in our optimisation tools.

**Massow:** I would say multi-criteria optimisation. This concerns a problem which is encountered in all fields. Various optimisation criteria contradict one another, so that there is not a single optimum solution. The challenge we face is to present multi-dimensional results in such a way that the user can easily identify an available solution which suits them best

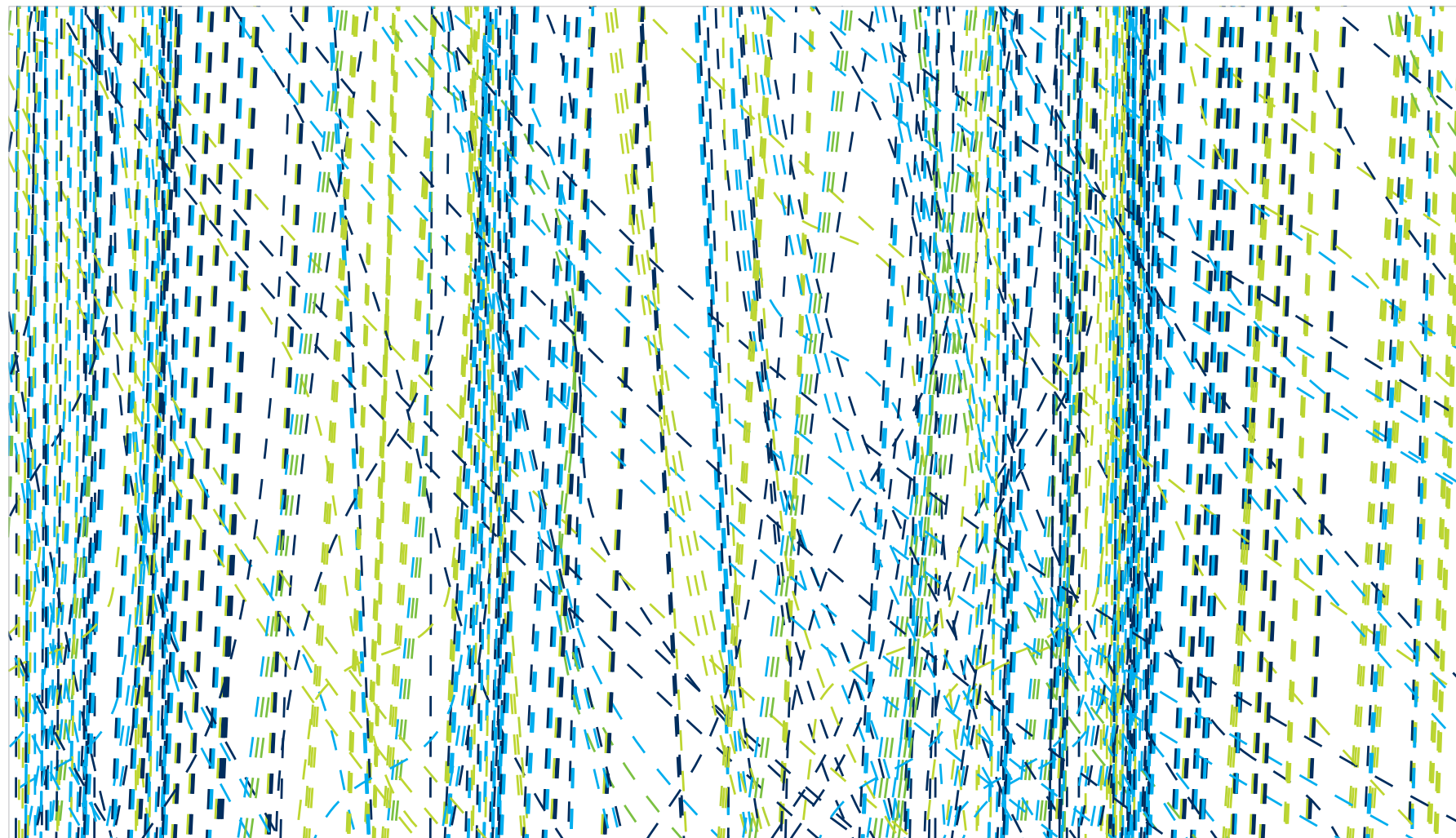
**What would you like to optimise in your daily life?**

**Dangelmayr:** For me it would be a multi-criteria optimisation which would simplify daily life with two children.

**Win Myint:** And I would like to optimise the weather. ■



# RAPID DUTY PLANNING EVEN WITH COMPLEX CONDITIONS



■ **A new algorithm in Release 12 considerably speeds up the calculation of personnel movements and the search for optimum solutions while still including all secondary conditions. As a result of mathematical research, duty planning and optimisation has reached a new level of development.**

Duty planners are familiar with the problem: The driver has to switch locations between duties as efficiently as possible. For example, this might involve going on to the next job, going to a break room, or returning to the depot. The movements not only have to be efficient, but must also comply with all operational regulations. This involves highly complex calculations which are carried out in the IVU duty planning by the path search function. Path search does not consist simply of identifying a previously archived path. In fact it calculates every personnel movement as a combination of passage trips, walking, additional path times, and buffer times. These framework conditions are important to stabilise the personnel path, because even if a passage trip is delayed by two minutes the driver still has to reach the new location

on time. In general, the optimum route is the one which is the first to reach the target location.

The inclusion of secondary conditions can very quickly make the search for the best path exceedingly complex, especially where the calculation has to be made for all possible options. In extreme cases, in particular when passage trips are permitted, it is often necessary to calculate more than 10 million different paths. This highlights the importance of the calculating time for the path search when duties are being planned.

## **The “All-to-all shortest path problem”**

Mathematically, the path search problem falls into various classes, which is what makes it so

**Often more than 10 million different paths have to be calculated in a very short time.**

complex. It is a so-called “all-to-all shortest path problem,” which calculates all possible personnel paths, taking into consideration all the secondary conditions, and then identifies the shortest path.

The problem is made even more difficult because the calculation also depends on the progress already made along the path. Last but not least, the path search is a problem with dynamic costs. This means that the time taken for a path is affected by the starting time. After all, an opportunity for a passage trip is not available at any time.

## **The new path search**

In the final analysis, the quality of the result is the key factor. The speed of the algorithm cannot be increased simply by leaving out complicated requirements. The transport operators still expect an algorithm which will reliably identify the best option despite the various special cases. An algorithm was developed for the calculation of personnel paths in time for inclusion in Release 12 which represents a big improvement over its predecessor in terms of calculating speed. In-house tests and feedback from IVU customers

has shown that it has been worth all the effort. The new path search function rapidly identifies the quickest path and provides a sound basis for the optimisation of duty planning. ■









## NIGHT-TIME AT THE TRAM DEPOT

Within the space of 90 minutes, more than 60 trams arrive or depart at the depot of Berliner Verkehrsbetriebe (BVG) in Berlin-Marzahn. In a matter of seconds, parking spaces have to be allocated and signals set accordingly – the IVU.suite makes it possible.

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# NIGHT-TIME IN MARZAHN

A visit to BVG tram depot in Berlin



■ A recently-introduced system for the automatic allocation of tram parking spaces and signal setting will increase operational efficiency at the BVG depot in Berlin-Marzahn. It is currently still in the test phase, and in order to see that it can enter into full operation as quickly as possible, IVU engineer Jakob Magiera visited the depot in order to observe operations together with the controller, to document incidents, and to fine tune the system.

It is just before 11.00 pm at the depot of Berliner Verkehrsbetriebe (BVG) in Berlin-Marzahn. The freezing temperatures, the thin layer of snow and the darkness lend an air of winter tranquillity to the scene. But lights are cutting through the darkness. An M6 tram is coming into the depot. It stops at a barrier at the entrance and the driver reports by radio to the depot yard supervisor. He gives a short report about the state of the vehicle in case any repair work is necessary. A door on his tram is not opening properly, and the vehicle has to go to the repair shop. The barrier is raised and the tram enters. It moves quickly to one of the ten large gates to the repair hall. The next tram will soon be following. The vehicles have started returning to the depot for the night.

“The late evening period is when the vehicles come back here from the catchment area served

by this depot,” explains Ralf Humboldt-Bitterkleit, who has worked as dispatcher at BVG for many years. Through the large window in the controller’s office he has an overview of the whole depot. “At the moment, one tram is returning every ten minutes, but in half an hour’s time we will have a tram waiting at the barrier every 2-3 minutes. Then we have to move quickly to make sure we don’t get a tail-back forming,” continues Humboldt-Bitterkleit, and he already has his finger on the button of his radio.

## 60 trams in 90 minutes

Three-times every day things get particularly busy at the Marzahn depot. About 4.00 pm, when the auxiliary services return, at 11.30 pm when the remaining trams come in, and then of

**Particularly during the rush hours things have to move quickly in order to make sure that there aren’t any tail-backs.**

course in the early morning at 4.00 am, when the daytime tram services begin running again. Within the space of 90 minutes, more than 60 trams arrive or depart – with only a few minutes separating each of them. In order to ensure that everything runs smoothly, IVU developed a bidirectional interface between the depot control system used by BVG (VICOS, Siemens) and

IVU’s vehicle control system IVU.vehicle. Thanks to this new interface, VICOS can now report all tram movements directly to IVU.vehicle, so that the controller can see the relevant vehicle on the assignment window. He can then select the most appropriate route from a list of available options. This is then sent back to the VICOS depot control system, which sets all the necessary points and signals for the chosen route. The driver can then go directly to the allocated parking position. In addition, IVU engineers have developed a new user interface which combines the allocation of parking spaces and signal control, so that Humboldt-Bitterkleit is able to control the entire traffic in the depot from one workplace. Every vehicle coming into the depot is immediately displayed and can be assigned to a free track. In the past, Humboldt-Bitterkleit

would have had to use binoculars from the observation tower opposite to search for an available track, but thanks to software support the night-time view over the sidings is now only an added

optical attraction.

The parking space allocation with automatic signal control is the most modern depot management system in Germany’s capital city. At all other depots in Berlin, the drivers still have to set the points manually. In Marzahn though, the track allocation and signal setting is now



integrated thanks to the new IVU solution and is controlled automatically by means of IVU.vehicle.

### The new software in test operation

In order to be able to register and process all operational possibilities, any new system has to undergo simulation testing. Since the Marzahn depot is very complex, with its many tracks, signals and points, and a comparable multi-layer test environment is not available, the tests in this case are carried out while operations are ongoing. This is quite a challenge for the controller and the development engineer, which is why Jakob Magiera from IVU is also at the depot today. Together with Ralf Humboldt-Bitterkleit he is observing the late evening returns and noting carefully wherever things do not run smoothly. Because even when everything is in place and the software should theoretically operate without any problems, in real life there

and the vehicle number, so that my colleagues can refer to this," he continues. "Only if we are able to reconstruct all incidents completely back in the office can they be completely eliminated."

Magiera can still remember his first tram ride across the depot after the introduction of the newly-developed system. "At every point I was a bit worried but also excited to see whether the software and the operations would work together as they were supposed to," he recalls with a smile. The maiden trip went well, but with the

### Thanks to the IVU solution, track allocations and signal setting is now integrated and operates automatically from one work-place.

wide range of marshalling tasks and the different types of vehicles, it was only to be expected that there would be some minor glitches in the early stages. Because in addition to organising the

The vehicle workings which have already been planned and earmarked for that track are automatically allocated to the tram which is parked there. The individual vehicle workings no longer have to be allocated separately to the vehicle. For the dispatcher this means that one job less is involved in preparing for the next day.

Through until the final commissioning of the new depot management system, Jakob Magiera continues to work together closely with the BVG dispatchers. Because no matter how modern and technically sophisticated the software is, it can only be fully operational after it has gone through practical tests. "I also really enjoy seeing our systems directly in operation," says the satisfied IVU engineer. "The perspective of the dispatcher is completely different from that of a developer. I find it fascinating to bring both perspectives together and to cooperate to develop a solution,"



BVG controller Ralf Humboldt-Bitterkleit and IVU engineer Jakob Magiera working together on the depot management system.

may turn out to be unexpected incidents. Jakob Magiera and Ralf Humboldt-Bitterkleit are now working together to resolve these. The most important tasks are put at the top of the to-do list and will be tackled first by the development team of IVU. "This close cooperation with the customer is very important in order to be able to address all the sources of errors quickly and effectively," explains Jakob Magiera. "I have to record the errors precisely, including the time, the type of vehicle

normal arrivals and departures, and parking at the appropriate section of track, it is also necessary to integrate the maintenance work in the repair shop and tests on the test track.

"OK Rainer, you can take your tram on Track 9," Humboldt-Bitterkleit instructs the next driver. This vehicle is operating without problems, and can be parked ready to be sent out the next morning. This is also integrated by IVU.vehicle.

he concludes. Meanwhile it is just after half past one. The busy period is now almost over, and most of the trams are back in the depot. Only the night services are still running through the city. While the BVG personnel in the maintenance shop still have a lot of work on their hands, Magiera can call it a day, and look forward to his bed. ■



# NEW MVV TICKET NAVIGATOR IS ONLINE



Advertising hoardings throughout Munich are drawing attention to the new MVV Ticket Navigator

In June 2006, the MVV transport and tariff association in Munich (Münchner Verkehrs- und Tarifverbund) introduced its MVV Ticket Navigator, a specially developed service providing extensive travel and tariff advice on a scale which remains unequalled in Germany. Before starting

out on a journey, travellers using MVV services can not only determine the best route, taking into account all relevant journey parameters, but at the same time they can also find out the best fare. Existing tickets are automatically taken into consideration. The MVV Ticket Navigator has

been developed by the engineers of IVU, who now have completely revised the layout of the system, the user guidance and the presentation of results. The new MVV Ticket Navigator went online a few weeks ago.

## New Design based on customers' wishes

When restructuring the system, wishes expressed by customers played a key role. The result is an updated timetable and tariff information system which is not only state-of-the-art technically, but is also cutting edge in terms of usability. Because the way users respond to a system can differ very much from the expectations of the development engineers, MVV has established a bridge between the two and offers its passengers an effective feedback channel. In this way, MVV not only ensures that the service can be developed technically to meet demands, but also that improvements can be made to further increase convenience and ease of use for passengers. "With the new design and improved functionality, offering much clearer user guidance, we hope to attract passengers who are less frequent users of Internet services," explains the managing director of MVV, Alexander Freitag. He confidently predicts: "We will soon have reached the 100,000 user level." ■



## NEW STANDARDS FOR E-TICKETING THROUGHOUT GERMANY

Paperless ticketing is being introduced by more and more transport operators all over Germany. Modern technologies open up new possibilities and make it easier for companies to introduce e-ticketing. An important contribution is being made by the Association of German Transport Companies (VDV), which has continually been developing the electronic ticket standard in order to create a sustainable system and to avoid the development of island solutions. Already in 2005, the VDV-KA core application was introduced as central security management, so that by means of uniform security mechanisms it would be possible to use the e-ticketing chip cards across all transport operators. On a central platform, the transport companies can now register their ticket products and

administer the association security processes.

In order to prevent misuse of the user-media such as the e-ticketing chip cards, small applications are installed on these with cryptographic keys and signatures – the VDV-KA standard. This ensures that no information can be copied improperly, and that stolen cards or manipulated electronic tickets can be readily recognised by the card reader. This might sound simple, but in fact it involves highly complex cryptographic procedures. The administration for this has for some time been available free of charge to all participants in the central system for Application Security Management (ASM) of VDV-KA.

### E-ticketing for small operators

Even though the world of electronic ticketing in accordance with the VDV-KA standard is becoming simpler and increasingly easy to understand, this advanced technology still represents a challenge for smaller transport companies and associations. Together with VDV Kernapplikations GmbH & Co. KG, IVU has been working on various approaches to successively simplify the organisational, administrative, and technological problems involved. For example, just recently the latest project has been started to design and realise a local adapter with functions for the automatic conversion between the various versions of the VDV-KA standard, which will then be made available free-of-charge to all participants.

This Local Adapter Converter (LAC) makes it possible to link together operational background systems with various VDV-KA interface versions. Of course all security protocols for encrypting the exchanged data between the participants are fully complied with in an extremely robust fashion.

Beginning in March, the LAC developed by IVU will ensure that e-ticketing participants do not have to repeatedly install the new standards. The transferred data will be adapted automatically. In this way, the e-ticketing system will be taken a further important step towards true nationwide applicability.



# PROGRESS IN ITALY



"It is pleasing to see that our work is bearing fruit. IVU Italia is growing – and has been for the past 13 years. I am proud that my team can continue to convince all over Italy with its development expertise."

**Ing. Mario Stefani**, Head of IVU Italia

## IVU SYSTEMS FOR DRIVERLESS METRO Services in Brescia to start in 2013

The north Italian city of Brescia is introducing a new underground rail system, due to be opened this year, in order to counter its increasing traffic congestion and the bottlenecks in the existing bus network. The first 18 trains, running at 3-minute intervals, will be able to transport up to 8,500 passengers per hour, and the operations will be planned and controlled by systems of the IVU.suite. The special feature of the new metro system is that all the trains will be driverless. IVU has already demonstrated its expertise in this demanding form of vehicle management in Copenhagen, which also has a driverless metro in operation. Safety is, of course, the highest priority, in particular when planning the deployment of the vehicles. Therefore the IVU.plan planning system integrates all the relevant operational regulations, and careful attention is paid to full compliance. Naturally, a driverless metro service still requires some personnel, and the duty rosters for staff on the trains and at the stations are also planned and optimised with the IVU system. In this way, the vehicle schedules and the duty rosters for personnel can be closely integrated, ensuring efficient operations.

## TRENITALIA Successful timetable change for the new year

In order to be able to continue to provide quick connections and efficient operation in the new year, the Italian state railway TRENITALIA began its new timetable punctually in December. This meant planning new vehicle workings and duty schedules for 4,000 engines, 28,500 goods wagons, 9,000 carriages and 8,050 train drivers, as well as for 4,800 other on-board personnel. This was achieved with the aid of the IVU.rail personnel and vehicle management system. Since 2009, the system had already been responsible for duty roster planning and optimisation for more than 13,000 employees, and now within only one year the vehicle management system has also been installed nationwide for regional, goods and mainline trains. Thanks to IVU.rail.vehicle, TRENITALIA can now effectively plan the trips and vehicle workings of thousands of trains from leaving the depot through until re-entry, while not only automatically integrating cleaning and maintenance work into the monthly timetable and duty workings but also providing rapid replacements in the event of outages.

## IVU ITALIA CONTINUES TO GROW New offices, new co-workers

Not only is the customer base in Italy steadily growing, but the Italian branch of IVU itself is also expanding. The many new projects require highly qualified specialists who will continue to guarantee rapid and smooth implementation of customer orders. Therefore Ing. Mario Stefani, Head of IVU Italia, is very pleased to welcome on average 3 new co-workers in his team every year. After work is finished, winding down on the roof terrace with a game of table football has become a feature of the Italian corporate culture. And as IVU Italia expands it also needs more office space, and it has now taken on a further two floors in the office building in Via Cornelio Magni.

## FIRST USER MEETING IN ROME Exchange of views and experience on three floors

The IVU User Forum in Berlin has already established itself as an important international event with more than 400 participants every year. On 27 and 28 September 2012, the Italian branch of IVU held its own user meeting in Rome. This was the first Italian customer meeting of this kind and it proved very popular, with more than 50 guests. The discussions and specialist presentations focused in particular on innovations in the IVU.suite and on future development plans for optimisation. In his presentation, Ing. Carlo Bianco (ATM Milano) reported on the progress of the metro in Milan, which is planned and controlled by IVU systems, and on the close cooperation with the Copenhagen Metro and the Riyadh underground railway. All three urban railway operators are using IVU systems and they cooperate closely with one another on the development of technological specifications.



# DIGITAL GUIDE FOR PEOPLE WITH IMPAIRED VISION

## New m4guide research project launched



It is not always easy to find your own way quickly and safely in a city like Berlin with thousands of roads and crossings. For people with impaired vision who are not able to refer to a street map it is a real challenge. The m4guide research project funded by the German Federal Ministry of Economics and Technology (BMWi) on the basis of a decision of the German Bundestag aims to provide a novel navigation system by means of which people with impaired vision will be able to use a smartphone to find their way to their destination safely, either on foot or using public transport. The project, which was launched in December, has a total budget of € 5.6 million. The eleven project partners began their work in January. IVU will primarily be contributing its expertise in database management, routing, and the development of user-interfaces.

The particular difficulty faced during the development of the m4guide is that such a system for people with impaired vision requires the exact registration of many more details, such as the width of pavements, steps, obstacles and street furniture, or road crossings. In view of the busy urban traffic, deviations of only a few metres could prove fatal. The new navigation system is intended to make it possible for people with impaired vision to find the way from the own front door to the nearest bus stop, as well as to move around by bus or by rail, including within stations or public buildings. Other highlights of the system will be the precise location within the radius of a long cane and the detailed integration of hazards and obstacles. The navigation is possible

by means of voice instructions, acoustic signals and vibrations. For users with limited vision, map displays are provided with a zoom function. In the course of the project the satellite localisation will be refined in order to determine the location of the user up to a few handbreadths.

The requirements of the blind and people with impaired vision form the basis for the development of the m4guide because this group places the highest demands on precision, real-time information, and exact guidance. Solutions for the group can be adapted for other users. The m4guide will be useable for everyone who has a commercial smartphone. "Such smartphone navigation for the blind and people with impaired vision augments the existing information system for public transport in Berlin, serving a group of people who are really dependent on public transport," explains Christian Gaebler, State Secretary for Transport and Environmental Affairs.

The travel information and navigation system m4guide will be developed by IVU under the supervision of the Berlin Senate Department of Urban Development and Environmental Affairs together with the German Association for the blind and people with impaired vision, the administrative district of Soest, and four other partners from research, IT, and the transport sector. IVU's engineers will primarily focus on routing and guidance as well as the navigation in station buildings. The data management system IVU.pool and the geographical information system IVU.locate will be employed. ■

## SAVE THE DATE

**Multi-conference Software Engineering**  
26.2. – 1.3.2013, Aachen

**eurasia rail**  
7.3. – 9.3.2013, Istanbul

**Andinatraffic**  
18.3. – 19.3.2013, Bogotá

**20th engineer's job fair**  
19.3.2013, Warsaw

**Post-Expo Latin America**  
16.4. – 17.4.2013, Brasília

**Connecticum**  
23.4. – 25.4.2013, Berlin

**UITP World Congress**  
26.5. – 30.5.2013, Geneva

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