

March 2012

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## IVU.PANORAMA

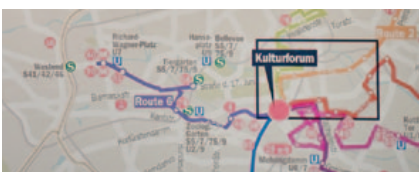


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# RAIL COMPETITION



For some time now, the rail industry has no longer been competing solely with road and air transport for the largest possible share of the mobility market – there is also increasing competition within the railway sector itself. In the medium term, the German Pro-Rail Alliance estimates that the railways' market share of passenger transport will increase to 15 percent. With this larger market share, the competition will also intensify. In 2010, the companies competing with the major players increased their share of the market in short-distance passenger services to some 12.5 percent (pkm), and this trend is continuing. At the same time, the federal states in Germany are showing increased willingness to make their own investments in infrastructure and mobility, thus further increasing competitive pressure. For example, according to a report of the Network of European Railways and the mofair lobby association, the tender volumes in rail passenger transport doubled in 2010 to 60 million train-kilometres per annum. In May 2011, 49.9 percent of contracts in Germany's short-distance rail passenger services went to new contractors.

The same developments can also be observed in other countries. Competition in the railway industry is no longer confined by national borders. In addition to state railways, large international private operators are playing an increasingly important competitive role. However, in order

to submit successful tenders, rail transport companies have to make significant investment commitments. They often face shortages of personnel and time capacity. The companies have not yet learnt to fully exploit all options available to them in the preparation and implementation of tenders.

A further difficulty for the companies is that the transport services which they are asked to provide are becoming more and more complex. Already at the tender stage it is necessary to take account of larger and larger scenarios in terms of planning, scheduling and implementation. This is too demanding for many companies which do not have the necessary planning capacity and which lack the support of IT systems. Often this is coupled with the fear that the pressure from competitors will lead to tenders being submitted at prices which subsequently turn out to be too low for profitable operations.

But just as IT systems now provide valuable support for all the business processes of transport companies, there are also appropriate IT solutions for tender submissions. Planning and optimisation modules help both the contractor and the contract-awarder to act economically and profitably. They calculate the optimum transport requirements on the basis of algorithms adapted specially to the demands of rail transport. This means that the contract awarder can use



Martin Müller-Elschner, CEO

**Dear Readers,  
Dear IVU clients,**

Multimodal mobility is dominating current developments in traffic and transport, as shown in the study 'Mobility in Germany' commissioned by the Federal Ministry of Transport. The car has lost its importance as a status symbol, in particular for young people. Rising fuel prices, increased environmental awareness and growing urbanisation have increased the demand for appropriate, flexible mobility – and here public transport has an increasingly important role to play.

The key criteria are reliability and comfort for passengers in combination with effective operations. In public transport there is still considerable scope for optimisation. Computer science and mathematics can provide a range of possible solutions, and we present some of these in this issue of IVU News.

From personnel and fleet management for the trams in Rome, through timetable planning in accordance with religious requirements in Jerusalem, to effective winter services for the roads of Hamburg – we hope to give you an insight into the daily work of our software engineers and our clients.

If you want to see our systems and test them yourself, why not come to our showroom in Bundesallee 88 in Berlin? Just let us know when you like to visit us in an email to [post@ivu.de](mailto:post@ivu.de).

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

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the software to determine efficient timetables, and also vehicle schedules if required, and to determine the required numbers of vehicles. This helps the companies submitting tenders to present financially viable calculations based on the optimum numbers of vehicles and personnel.

The IVU.suite offers specially developed planning and optimisation tools for railway companies and contract awarders. The institution calling for tenders is able to conduct the best possible tender procedure, with corresponding macroeconomic benefits. At the same time, the bidders are able to submit economically sound and competitive tenders. In addition, products such as IVU.control

establish a shared data basis for contract-awarder and operator. This is very important in order to be able to check accurately that the services are provided to the agreed quality, to make improvements where necessary and to provide sound documentation for both contractual partners. Powerful analytical tools can establish punctuality, cancelled services, infrastructure costs, contract compliance, service quality and operating costs. It is important to take advantage of these possibilities in order to be successful in the face of growing competition in the railway transport market. ■

## IVU.INSIGHT

# IVU AND TU BERLIN LET THE TRAINS ROLL

In March, IVU software engineers will have the opportunity to be duty manager for a day, and to organise timetable operations without any mishaps. In a training course at the Technical University of Berlin, twelve IVU employees will have the opportunity to put their knowledge of railways into practice. The TU Berlin is making available its Railway Operation and Testing Field (EBuEf), which is able to reproduce real-life railway operations. The key element of the EBuEf is an extensive H0 model railway layout which can be operated by an authentic interlocking system and a control centre. The operating layout has been in use since 1962, and today it is mainly applied for university teaching.

For the software engineers from IVU, this change of perspective presents a completely new challenge. For the first time they will be called on themselves to implement the timetables generated with IVU.plan. It is hoped that this practical first-hand experience will give the participants greater awareness of the specific software requirements of their rail customers and of the conditions under which railways operate.

The training session concentrates on topics of special interest for IVU, including track management, operational control, and cooperation between infrastructure companies and railway operators. In particular, the restricted view of the overall rail system from a specific location influences the communication between the controllers, the interlocking system operators, and

the vehicles. This experience is important for the engineers, because the daily challenges faced by their clients should be addressed by the software systems.

In order to promote cooperation with the university, IVU has already made its planning software IVU.plan available to the TU's 'Track and Railway Operations' since 2008 for teaching purposes. The training session on the EBuEf is now a further step towards close cooperation between science and business. ■





# IVU.RAIL BEING USED FOR PLANNING IN ITALY



Trenitalia produces its timetable book with IVU.rail.

Some 600 million passengers every year use the trains of the Italian state railway Trenitalia to reach their destinations. In addition, the company also transports more than 50 million tonnes of freight annually throughout the country on a rail network with 16,700 kilometres of track. The safe transport of passengers and goods is ensured by some 20,000 personnel. A wide range of parameters have to be considered when planning the deployment of train drivers and on-board attendants, which makes this procedure very complex. In addition to legal requirements and health and safety regulations, Trenitalia must also take into account the special features of the regional, freight and main-line operations. That makes the search for the optimum solution a real mathematical challenge. The company has been using IVU.rail since 2009 to plan and optimise its duty rosters. The main line passenger operations (Frecciarossa and Frecciargento) throughout Italy, the regional transport, for example in Tuscany, Campania, Apulia, Abruzzo, Molise, Marche, Calabria, Sardinia, Sicily, and Triveneto, and the majority of the freight transport are already planned with the IVU system. In order to be able to provide personnel with mobile information about their forthcoming duties, the first thousand drivers have been equipped with tablet computers.

The special features of the solution implemented in Italy lie in the possibility for the planning and

optimisation of team duties and the integration of overnight services and long passenger trips during working hours. IVU.rail can develop a range of relevant scenarios. An added feature in Release 12 makes it possible to automatically include the drivers' knowledge of various train types as a parameter for duty roster planning, and to continuously update this. The results are reliable

## Tuscany and nine other regions are now planning with the new system and informing their drivers about their schedules via tablet PCs

and transparent duty plans which can contribute to a long-term increase in productivity. Regular reports give a comprehensive account of targets and results including work tallies, planned and unplanned service sections, compliance with rules, allocation of services, additional personnel requirements, and more besides. In order to optimise all these criteria, Trenitalia also uses automatic personnel scheduling. In accordance with customer preferences, the adaptation goals can be hierarchized and stored in optimisation profiles. In this way, IVU.rail and the optimisation tools generate effective duty plans for all staff groups.

In order to link personnel and vehicle management closely together and to make full use of the optimisation potential, IVU.rail.vehicle is being integrated in the system landscape of the state railway. Under the slogan 'Everything

from one reliable system', the IVU solution will in future take on vehicle planning and dispatching. Since the IVU.rail systems are mutually compatible, there are no problems integrating IVU.rail.vehicle with the existing IVU.rail.crew set-up used for personnel planning and scheduling while still meeting all customer-specific requirements. All plans, cancellations or corrections from the fleet management will then be passed on directly for the personnel dispatching. In addition, IVU.rail.vehicle has an ad-hoc optimisation tool which can also integrate short-term changes in the train composition in the planning and dispatching.

Trenitalia will soon be able to effectively plan daily train working from leaving the depot until the train returns again, to automatically integrate cleaning and maintenance work in the monthly vehicle working plans, and to arrange rapid replacements in the event of breakdowns. ■

### Frecciarossa (red arrow):

high speed line connecting Turin to Salerno, Northern to Southern Italy

### Frecciargento (silver arrow):

connecting Rome and Venice, Verona/Bolzano, Bari/Lecce and Lamezia Terme/Reggio Calabria

# HAMBURG PREPARES FOR THE WINTER

Even if the winter weather has been late in coming this year, the Hamburg disposal and street cleaning service (SRH) is well-prepared for the cold snap. In order to keep roads and foot-paths clear right from the very first snow flakes, SRH ordered a software system from IVU for the efficient planning and execution of winter services in Germany's second largest city – IVU.winterservice. The project was completed in December 2011. Already in the previous three winters, the system had been successfully tested in trial operations on Hamburg's roads. Nearly all of SRH's large gritting vehicles are now equipped with on-board computers with the corresponding software, ensuring the effective deployment of the vehicles and providing comprehensive documentation of the work of the winter service teams.

The roads are always very busy in a large city like Hamburg and road icing can quickly lead to long traffic delays, particularly during the rush-hour. The road conditions may sometimes change within minutes, and in order to be able to respond rapidly and effectively, the Hamburg utility needs a planning system which not only takes into consideration parameters such as the time of day and traffic levels on a road, but which is also able to cope with special cases and emergency assignments without difficulty. For example, if a key thoroughfare or one of the many bridges suddenly freezes over, then it will be necessary

to respond rapidly – but this should not unduly affect other normal duties. Such flexible planning is virtually impossible without software support. IVU therefore developed IVU.winterservice for SRH, combining the specific requirements of the winter service with the tried-and-trusted optimisation algorithms of the IVU.waste solution.

The vagaries of the weather, the high risk potential and the extensive documentation requirements mean that winter services are considerably more complex than normal street-cleaning operations. It is necessary to plan in detail which vehicle will operate in which street, and then to keep records of the resources used (grit, snow ploughs and other equipment, etc.). Complete documentation can be particularly important in the event of an accident, since the winter service provider is automatically guaranteed legally valid evidence.

In addition, it is also necessary to take into account the rights of the employees to accept or refuse certain assignments, and this too must be integrated in the planning and documentation. In some cases there may be important reasons why an assignment cannot be carried out, such as a technical fault on the vehicle. In these cases, the job can then be transferred to another vehicle in the vicinity. But at no time should the timely completion of all the outstanding assignments be endangered.

As well as normal planning specifications, winter services involve complex requirements which have to be linked to the appropriate geodata. For example, as well as defining the starting point and endpoint of a trip, it is also necessary to specify a precise route in advance. Blocked roads or construction work should be taken into account, along with the type of vehicle and the equipment it is fitted with. IVU.winterservice provides the driver with a gritting map showing the exact route and specifying the details of the tasks to be completed. These are transferred electronically to the on-board computer and can then be worked through. The back office automatically receives position reports and telemetric data from the vehicle and details of the status of the job list. The recorded data is subsequently processed and evaluated with special analytical tools. These can be used to filter the vast datasets, for example in terms of location, time, or the type of assignment, and to bring together the relevant aspects. This function is particularly important where there is a legal obligation to provide proof. The results can be presented in tabular form or on a map. The winter can come anytime as far as Hamburg is concerned. The Hamburg street cleaning utility is well prepared. ■





# TIMETABLE PLANNING IN HEBREW

IVU systems modernise public transport in Jerusalem

Every year, millions of tourists, pilgrims, and business visitors are attracted to Jerusalem. Famous for its religious diversity and the historical buildings of the old quarters, it is the largest city of the region with a total of nearly 800,000 residents, and is also an important commercial location. The tourism sector is the largest source of income, and this is promoted by investments in modern infrastructure developments. In order to provide more convenient and faster connections between the city's sights, the Jerusalem Transportation Master Plan Team (JTMT) decided in early 2011 to introduce the scheduling and passenger information systems of the IVU.suite. The decision in favour of the IVU was taken after an international call for tenders. The introduction was successfully concluded only a few months later. Further modules are currently in the implementation phase.

Since June 2011 the systems of the IVU.suite have been in operation to plan and optimise up to 6,500 trips on 154 lines for some 1,000 buses and 42 trams. The situation in Jerusalem makes it necessary to take various language demands into

consideration as well as special planning requirements. Especially for Jerusalem, the software engineers of IVU have combined English-language input masks with Hebrew characters, which are read and written from right to left.

A further challenge arose from the special needs of the religious visitors. For example, the Jewish, Muslim, and Christian holy sites must be

**English-language input masks are combined with Hebrew characters, which are read from right to left**

correspondingly linked by lines. In order for the completed timetables to be transferred from the Ministry to the private operators and the passenger information service, interfaces have been created which allow the exchange of information in Hebrew, Arabic, and English.

After the successful completion of the initial project, JTMT placed orders for further modules of the IVU.suite in the summer of 2011. Measures are currently in progress to implement the

geographical information system IVU.plan.map alongside the timetable planning of IVU.plan. In addition, it shall also be possible to access the passenger information from IVU.journey on smartphones using new apps for Apple and Android systems. Furthermore, it is planned to extend the timetable planning to include East Jerusalem, which will involve handling information in Arabic. By the spring of 2012, IVU systems will additionally be carrying out duty scheduling, fleet management, performance monitoring and settlement.

"The Jerusalem transport system is going through major changes," says Nadav Meroz, general manager of Jerusalem Transportation Master Plan Team. "A key step is the implementation of various cutting edge information technologies. In such a complex city as Jerusalem, a passenger information system is a significant tool which enables the public to adapt to the changes and improve public transport usage. The IVU.suite was carefully selected to meet these needs and we are looking forward to further applications". ■



# 1,000<sup>TH</sup> IVU.TICKET.BOX ASSEMBLED



The Phytex workshop and the SMD assembly line

## THE 4<sup>TH</sup> GENERATION IVU TICKET PRINTER

easy use with a large touch screen

sensors prevent paper jams

easy change of SIM and SAM cards

five channels for VoIP applications

multi-touch and other options

The IVU.ticket.box, which won the 'iF product design award' in 2010 with its multifunctional housing and a modular internal structure, went into series production in 2011 at Phytex. 850 of the modern on-board computer have already been assembled and delivered, and further 300 units will follow in the coming weeks. The series production of the IVU.ticket.box has been possible in particular due to the new modular structure. With this, the systems can easily be equipped with customer-specific electronics – a necessary step in order to combine series production with individual customer requirements.

There is considerable demand for these modern on-board computers. Already the entire Phytex assembly shop is being used for the production of the IVU.ticket.box. On a number of assembly benches, the on-board computers are assembled step by step under the watchful eyes of Phytex personnel. The surface mounting of the electronic components takes place on the SMD assembly lines. In this procedure the individual components are soldered directly onto the print-

ed circuit board, making the final product considerably more robust than with through-hole technology.

A further feature of the IVU.ticket.box is that it is very light. Since it is often installed on the driver's door, a suitable material for the housing was a

## An adaptable housing and modular design enable series production which meets individual specifications.

key factor for the future series production. The intention was to make the IVU.ticket.box suitable for a wide range of vehicles and various installation positions. It has therefore been given a sturdy plastic outer cover fitted onto a robust aluminium housing. This also means that the IVU.ticket.box is able to withstand ambient temperatures as high as 70 degrees Celsius.

The set-up of the ticket printer has been improved as well. A new feature is that a sensor now monitors the ticket printing, which will be auto-

matically stopped in the event of any obstruction to the flow of paper. This prevents paper jams in the system and also provides protection against any possible manipulation by the user.

The developers see future possibilities in the field of user guidance. There is a growing trend

towards user interfaces which are oriented on consumer products such as smartphones or tablet PCs. Icons, gesture control, and multi-touch operation are only a few of the elements which will be considered for the

development of an intuitive dialogue design for the IVU.ticket.box. Further options in the longer term include the integration of faster processors with multiple CPU cores and improved graphics performance. It is above all important for the IVU developers that the products can be individualised, because all the customers have their own particular requirements in terms of functionality, fittings and price and these have to be taken into consideration even with standardised series production. ■



# NEXT GENERATION PASSENGER INFORMATION SYSTEM IN LONDON

Updated departure times for 8,500 buses now available everywhere

Transport for London (TfL) is introducing the next generation dynamic passenger information system. In order to be able to provide comprehensive information for some six million passengers every day, the municipal transport authority has ordered the passenger information system IVU.realtime from the IVU AG. The latest departure times for more than 8,500 London buses from about 19,000 bus stops are collected by IVU.realtime and after processing they are made available on electronic displays, smartphones, and via the Internet. IVU.realtime forms the core and the data hub of the new information system. A new feature is the integration of cloud technology, so that real-time data can be made available for external applications.

A particularly impressive feature of this project is the amount of data which has to be processed. Every second, up to 5,000 departure times of the various bus operators in London are received from the ICTS system and processed. After only two seconds, the information is made available for the relevant media. The system is able to respond to up to two million enquiries per hour.

The text message and Internet information service was officially launched in October 2011. A goal was that passengers should not have to forego the information service even if bus stops are not fitted with an electronic display. The travellers only need to send the code number shown at the bus stop as a text message to a central telephone number and they receive the departure times displayed on their mobile phone. Within a few months the number of people using the service had risen to more than 700,000, generating up to 300 enquiries per second. Since November 2011 electronic displays have been successively going into service at the 2,500 main stops, and this roll-out is already half-finished. The overall system is designed to be fault-tolerant, so that it will continue to operate even if a component malfunctions.

Test operations for IVU.realtime.cloud are due to begin in the summer. With this new service, the real-time data will be made available through an application programming interface (API) for other applications such as smartphone apps. IVU.realtime.cloud thus provides the basis for the

integration of the dynamic timetable information in all sorts of websites. A subscription can be taken out for live stream data which can be integrated into the subscriber's own services. The system will be operated in cooperation with Microsoft in the Microsoft Azure Cloud Infrastructure.

"With this major order we have been able to show the enormous potential of our system," comments Dr Helmut Bergstein, Member of the Executive Board of IVU Traffic Technologies AG. "The technical development of our IVU.suite in accordance with the latest concepts makes it possible for us today to process millions of data-sets in fractions of a second. That opens up many new opportunities in major cities worldwide".

IVU Traffic Technologies AG is carrying out this project together with telent, the British technology services company for telecommunications networks, which has overall responsibility as general contractor. ■



# ASPECT-BASED PLANNING OF SPECIAL BUS SERVICES



Once again on 28 January some 70 Berlin museums opened their doors from 6 p.m. to 2 a.m. for the thirtieth 'Long Night of the Museums'. In order to make the trips between the museums as short and convenient as possible, Berlin's transport company (BVG) operated six special shuttle bus services with 62 buses. From the central Cultural Forum, visitors could travel quickly in any direction they wanted to.

Since June 2010, BVG has been using aspect-based planning in order to integrate such special situations in its normal operations. This innovative procedure is particularly well suited for representing predictable phases of extraordinary demand. The aspect refers to the specific cause of the planning changes, and in addition to special events such as the 'Long Night of the Museums', aspects could also include construction works, extended shopping hours, or school holidays.

Each aspect has its own specific consequences for the operations, and these can be defined before the relevant situation arises. For example, some services may have to be cancelled, other new services added, departure times shifted, vehicle schedules reorganised, and duty rosters modified. If a situation arises which involves several aspects, these can be allocated to the affected routes without any difficulty. Vehicle working schedules and timetables are automatically amended. Aspect-based planning is particularly effective for factors which occur regularly or

where the location shifts. For example, if a road or a section of tram track is being repaired, then the construction site will move over time from one section to the next, with the result that various services may be affected successively. In many cases, the progress on the construction site does not correspond to the time plans, so that it is important to be able to adapt line routes, timetables and vehicle operating schedules flexibly. Manual adjustments to each individual line are now no longer necessary; it is sufficient to establish a link to the relevant aspect.

Aspect-based planning was developed to meet the wishes of the transport companies to flexibly model special situations such as construction sites. These requirements and the goal of the software engineers to integrate as many demands of daily operations in the product development led to the formation of the first IVU User Group. Under the leadership of Hartmut Reupke (BVG) and Martin Stiel (IVU), the users and IVU software engineers are working together on the further development of aspect-based planning. This is necessary to ensure that the products continue to meet market demands in the long term. At this year's User Forum in March, the features of Release 12 will be presented. We will be reporting on this in the next issue of IVU News. ■

## SAVE THE DATE

### 3<sup>rd</sup> UITP MENA Showcase

26. – 28.03.12, Abu Dhabi,  
United Arab Emirates

### General Meeting

30.05.12, Bundesallee 88, Berlin

### Geomatica Andina

04. – 05.06.12, Hotel Sheraton,  
Bogotá, Colombia

### InnoTrans

18. – 21.09.12, Berlin, Hall 2.1 Booth 122

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