

# eurotransport

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Issue 5 · 2016

## Bus Developments

Belgrade's new e-bus network; a global overview of the full-electric bus market; exploring wireless technology benefits on buses; development of the European Bus and Coach Passenger Rights regulation, creating a fair deal for Scotland's bus users; and a look at the EBSF\_2 project

## RTPI & Smart Ticketing

Malta's tallinja card success; Nottingham's advanced mobile apps; expansion of Denmark's Rejsekort system; and how Stagecoach is tackling passenger demands

## Security

Ensuring the security of Europe's public transport systems from Mauro Borioni, Project Manager at Bologna's SRM

## Switzerland

Simon Rimle, Member of the Management Board at PostBus, explains how the Swiss bus operator is taking a bold step into the future

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*Turn to page 24 inside for our event preview*

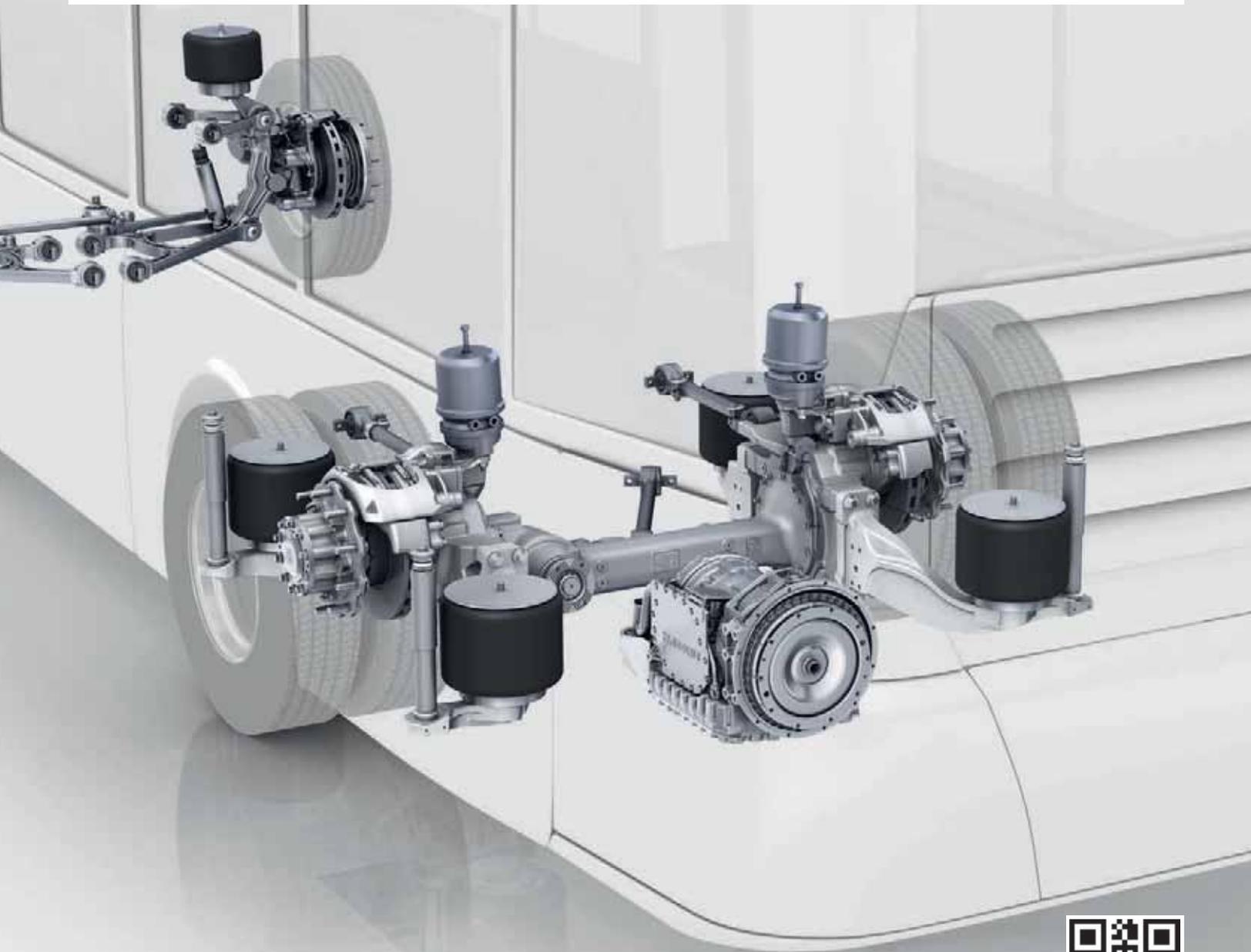


# IMPRESSIVE ALL ALONG THE LINE: COMPONENTS AND SYSTEMS FROM ZF

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MOTION AND MOBILITY





**Craig Waters**  
Editor

# Smart tickets please

In our current digital age, the use of ticket machines and paper tickets are simply not delivering what passengers want – seamless and efficient travel. Passengers don't want to queue to get a ticket before taking a mode of public transport. People should be able to travel when they want with just a tap of a card or – as we are beginning to see gaining popularity – the touch of a mobile phone; being safe in the knowledge that they will be charged correctly. Also, today's passengers expect to have real-time information at their finger-tips to instantly embark on a journey or quickly adapt their route in response to unforeseen conditions.

RTPI and smart ticketing are two aspects of our industry that must evolve and move forward to enhance passenger experience. In Malta bus passengers are witnessing a transformation to services with a new fleet tracking management system and 'intelligent' bus cards; and Nottingham City Transport in the UK are introducing a significant upgrade to their mobile app offering. Read about these progressive projects in our RTPI & Smart Ticketing Supplement starting on page 29 in this issue.

*Eurotransport's* popular **Smart Ticketing & Payments** conference returns to London this year. Co-located with **Real-Time Passenger Information 2016**, the events take place on 23 November and will bring experts from the worlds of passenger information delivery and smart ticketing together to network and discuss the challenges and trends to effectively deliver multi-modal, end-to-end journey information and ticketing/payment options to better serve passengers. You'll find our preview of both events in this issue starting on page 24 – sign-up for your delegate place today.

As always, if you represent a public transport operator or infrastructure owner and would like to contribute to a future issue of *Eurotransport* with an article or news item, please don't hesitate to contact me via the email address below.

We are also looking for industry experts to contribute exclusive online-only articles and blogs to feature on [www.eurotransportmagazine.com](http://www.eurotransportmagazine.com) and our weekly e-newsletters – so do get in touch if that interests you. You will also find details of past, current and future issues, daily industry news updates, plus industry conference and event information on our website.

Don't forget you can also join our groups on LinkedIn, Twitter and Facebook – just search for *Eurotransport*.

**Craig Waters**  
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# SMART CITIES IN THE AGE OF IOT

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An aerial photograph of a city skyline at sunset or sunrise, with a warm orange and yellow glow. A network of white lines connects various points across the city, with several circular icons containing padlock symbols, representing smart city infrastructure and IoT connectivity.

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# CONTENTS

- 3 INTRODUCTION**  
**Smart tickets please**  
Craig Waters, Editor
- 4 WEBINAR REVIEW**  
**Integrated communication solutions for the rail sector**  
In association with Sepura
- 5 FOREWORD**  
**Integration is the key**  
Martin Russ, Managing Director, AustriaTech GmbH
- 6 NEWS**
- 10 SWITZERLAND**  
**How PostBus is moving into the future**  
Simon Rimle, Head of Communication & Member of the Management Board, PostBus
- 13 SWITZERLAND**  
**Project SAEIV: the road to implementation**  
Léonard Sandoz, Head of Engineering & Technical Project Manager, transN
- 17 WEBINAR PREVIEW**  
**Technology-enabled on-demand/flexible transit services: new opportunities for PTAs**  
In association with DemandTrans Solutions
- 19 SHOW PREVIEW**  
**PMRExpo 2016**
- 21 SECURITY**  
**Ensuring security of Europe's public transport systems**  
Mauro Borioni, Project Manager, SRM
- 24 SHOW PREVIEW**  
**Real-Time Passenger Information 2016 and Smart Ticketing & Payments 2016 – Eurotransport's co-located events**
- 41 WHAT'S HAPPENING IN...AUSTRALIA & NEW ZEALAND?**  
**On the right track: the future of Australian and New Zealand transport infrastructure**  
Yasha Vojdani, Interim Executive Director and Angé Anczewska, Manager of Development and Engagement, UITP Australia New Zealand

## COMING UP IN THE NEXT ISSUE:

- Foreword from Claire Haigh, Chief Executive of Greener Journeys
- **NEW!** Alternative Power Supplement with articles about Arriva's research on Zero Emission Vehicles; electric buses in Gothenburg; and Nottingham's Electric Bus Project
- London Underground's Escalator Passenger Safety Strategy
- A look at Metro de Madrid's infrastructure inspection and maintenance vehicle
- Transport for Greater Manchester's control room activities and their work to assist visually impaired passengers

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## RTPI & SMART TICKETING SUPPLEMENT

- 30 Malta's 'tallinja card' offers excellent convenience and flexibility for passengers**  
Konrad Pulé, General Manager, Malta Public Transport
- 33 Advanced mobile apps to enhance NCT's understanding of customers in real-time**  
Anthony Carver-Smith, Marketing Manager, NCT and Tom Quay, Managing Director, Base
- 36 A smarter approach to bus travel**  
Alistair Smith, Group Director, Commercial and IT, Stagecoach
- 38 Rejsekort: unifying different ticketing elements to create a common-use system**  
Bjørn Wahlsten, CEO, Rejsekort A/S
- 44 TRANSPORT DATA**  
**Where next for open transport data in Europe?**  
Jonathan Raper, Board Member – Department for Transport Transparency Board, UK
- 49 SHOW PREVIEW**  
**Euro Bus Expo 2016**

## BUS SUPPLEMENT

- 54 EBSF\_2: testing the Bus of the Future**  
UITP colleagues Michele Tozzi (Project Director) and Yannick Bousse (Dissemination Manager) and Silvia Magnalardo (Ravenna Demonstration Leader c/o Pluservice)
- 57 Belgrade's new e-bus network marks significant steps**  
Željko Milković, Director; Dušan Savković, Executive Director for Technical Operations for Electric Subsystem; Slobodan Misanović, Project Manager; and Jovana Paunović, PR – JKP GSP 'Beograd'
- 60 Much ado about nothing? Development of the full-electric bus market**  
Marc Schabka and Christoph Länger, Siemens Mobility Urban Transport Division
- 63 European Bus and Coach Passenger Rights: experiences from the first three years**  
Andras Mogyoro, Legal Officer – Passenger Rights Unit, European Commission
- 67 Wireless technology on buses: the evolution of the passenger experience**  
Bernd Heidtmann, Product Manager Antennas, HUBER+SUHNER
- 70 A fair deal for Scotland's bus users**  
Colin Howden, Director, Transform Scotland



# Integrated communication solutions for the rail sector

In association with Sepura, *Eurotransport* hosted its latest webinar on 4 October 2016 which focused on transportation organisations and their communication requirements. Topics raised during the webinar included the best way to utilise TETRA and LTE systems to improve operations and how to develop integrated solutions to cover voice and critical data.

The speakers from Sepura who participated in the webinar were **Amanda Esteban** (Transport Solutions Product Manager), **Marta Fontecha** (Product Marketing Director) and **Felipe Sanjuan** (Business Development Director of Transportation).

Sepura has more than 40 years' experience in designing and deploying communication systems for transportation. Covering buses, trams, subways and railway networks, Sepura's voice and data systems drive efficiency, promote safety and give fast access to critical information when it is most needed.

During the webinar a case study was presented to the audience about Bilbao Metro demonstrating how the operator is supporting security and enhancing its operations.

The speakers of this webinar showcased Sepura's radio

communications solutions, which are based on the TETRA standard and are complemented with broadband technologies, and how they provide continuous voice and data communication between vehicles and control systems.

As is customary at the end of a *Eurotransport* webinar, there was time for an audience Q&A session where Amanda, Marta and Felipe answered some questions and gave further comments about Sepura's highly flexible and scalable solutions that can be tailored to the specific requirements of customers, therefore providing a scalable system that grows with communication requirements.

For further information on Sepura's market-leading solutions, please visit [www.transport.sepura.com](http://www.transport.sepura.com)

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This webinar is available on demand via the Eurotransport website:  
[www.eurotransportmagazine.com/webinar8](http://www.eurotransportmagazine.com/webinar8)

# Integration is the key

...by Martin Russ, Managing Director,  
AustriaTech GmbH



**What will future mobility systems look like? How can urban public transport stay reliable and comfortable? How will mobility behaviours change over the next 10 years? There will not be just one answer, but what we can say for sure is that we need a more integrated look at all of these issues. Over the past year ITS Austria has focused on how to transform an intelligent transport system into an integrated mobility system.**

With current trends such as sharing, automated driving and digitalisation, there is a strong need to identify future fields of action for the continued development of an intelligent transport system. Sustainability and environmentally-friendly transport – especially in cities – has to be combined with user-centred solutions and the option to choose. The output of this one year ongoing stakeholder process was a roadmap including the potentials of the so-called ‘Mobility as a Service’ strategy and an integrated mobility system.

When we look at existing services and possibilities of public and individual transport in cities, there are many good solutions and some widely-developed infrastructure, with each mode being well coordinated. The real potential lies in the combination of all existing modes and the ability to offer linked and integrated services with tailor-made solutions to seamlessly combine the travel options of different providers and to include one single access payment. The idea sounds great, but how easy will it be to realise this vision?

The first steps towards an integrated transport system in Austria were made in 1984 when the federal states of Vienna, Lower Austria and Burgenland harmonised their timetables and rates. However, integration nowadays means a lot more. One project that has already been deployed is ‘KombiMo II’ – a project funded by the public transport operator in Graz. They developed so-called multi-modal hubs that combine public transport with other services such as car-sharing, bike-sharing and e-taxis with several trains or bus stops having these additional services available. The users have one mobility card which allows them to book and pay for any service. The first multi-modal hub was opened in September 2016 and four more are due to follow.

Another project with a similar approach was ‘SMILE’ where different services of public transport in Vienna – train, bike and sharing services – were combined in a single app. Based on the SMILE developments, the Wien.Mobil mobility platform combining all these mobility services together with new sharing and ticketing concepts is in operation and provided as an app to travellers as well. The mobility platform integrates various means of transport service and combines them with a common route planner and ticketing feature.

In order to develop such solutions, data – in various forms and content – are necessary. It also means bringing different stakeholders together to set up long-term processes. The operators must be willing to share their information (or data) and jointly develop interfaces. The efforts are often great, but the benefits for the users are even greater. Users get a more efficient way to plan their travel and the existing infrastructure will be used in a more effective way. This is especially true for urban areas where those services can contribute to reducing the need to own a car; helping to make transport safer; and guaranteeing mobility for every single user, which results in reducing negative impacts. One of the most well-known examples in Austria is the Traffic Information Austria project (‘VAO’ – Verkehrs Auskunft Österreich). The national-funded project was set up in 2012 and is now operated as a platform. The aim of VAO was to develop a single intermodal traffic information platform for the entire country, including public transport data, traffic situations and traffic information. In 2015 the platform advanced to focus on real-time traffic data. However, these data alone will not make a service. Instead, partners could use the platform and add their specific traffic related information. Today approximately 18 services and apps based on VAO are available. Route requests have increased to three million per month in 2016.

But what can success stories such as this show us for future mobility solutions?

We need clear policy goals and the commitment of all partners to create an open framework for experimentation and learning. The first steps will be to start with pilots and ‘living labs’ and to later scale-up. We must therefore work together – policy, research and industry – and of course between all modes. We have to face the crucial challenges together and take into account that it will take time to develop and establish these new solutions, as well as for the users to familiarise themselves with these new ways of utilising mobility, without losing the freedom to choose. There are many exciting years and ground-breaking activities ahead of us. 📍



## Moxa's TN-4500A series meets modern day train requirements

Moxa's new ToughNet TN-4500A series EN 50155 switches provide up to 28 ports, including 4Gb ports to meet the high bandwidth requirements necessary for modern day services on trains.

To ensure a smoother installation process, the TN-4500A series (pictured) provides up to 20 PoE ports and each has a maximum 30 W power supply, with a total power supply of 120 W for on-board devices, including IP cameras, IP phones, and wireless devices, without requiring any extra power cables. The TN-4500A series is designed for applications on trains and railways, including CCTV, PIS, PA, P-Wi-Fi, and TCMS, and it is compliant with the EN 50155 requirements that ensure reliable network communications in railway rolling stock environments.

"To meet the future trends of IP networks and converged network transmissions, the network backbone must be reliable and also support sufficient bandwidth to accommodate data, voice, and video transmission across a single network," explains Joe Lin,

Product Manager for Moxa's Industrial Ethernet Switches. "Moxa's new TN-4500A series Ethernet switches have a maximum of 28 ports, including Gb ports supporting PoE which allows operators to deploy more Ethernet devices on-board trains. In addition, a 24-110 VDC input range, isolated dual-inputs power supply with a total PoE power budget of 120 W, can provide customers with sustained network reliability as well as considerable flexibility for a diverse range of applications. Featuring high bandwidth, high port count and an industrial-grade design, the TN-4500A series ensures very smooth rail network operations."

The TN-4500A series Ethernet switches are compliant with the essential sections of the EN 50155 standard, covering operating temperature, power input voltage, surge- and vibration-resistance, ESD, as well as conformal coating and power insulation.

[www.moxa.com](http://www.moxa.com)



## London trials new digital bus stop display screen

Transport for London (TfL) is trialling a new battery-powered bus stop display screen that will for the first time provide real-time travel information on non-TfL bus services as well as its own.

Simon Reed, TfL's Head of Technical Services, said: "We are continually exploring new ways to deliver information to our customers while they are on the move and to ensure we are at the forefront of new technology as it develops. We will trial this screen for three months and then evaluate how successful it has been and what our customers think of it. If cost-effective, this type of display could be quickly and cheaply installed at other bus stops with no shelter or power supply. This will widen our reach in providing real-time bus arrival information at the stop to our passengers."

The new screens (pictured) can be quickly and easily attached to bus stop posts and as they are battery-powered they are not limited to bus stops with shelters and an electrical power supply.

The trial began on 17 October 2016 and is scheduled for completion at the end of February 2017.

[www.tfl.gov.uk](http://www.tfl.gov.uk)

## Trust-based technologies showcased at international event

TRUSTECH Incorporating CARTES is the largest international event dedicated to 'trust-based technologies' with unprecedented networking opportunities and not-to-be-missed keynote speakers.

As announced in 2015, CARTES events have become TRUSTECH – Pay, Identify, Connect and Secure. Secure Payment, Identification and Connections are the buzz words for the three-day event offering unrivalled networking opportunities.

At TRUSTECH 2016 industry experts will speak on current trending topics such as Blockchain, Fintech, Data Management and E-ID and E-Governments.

Cannes and its famous Palais des Festivals have been picked as the new venue

for the three-day event which is expected to attract 18,000+ attendees from 130+ countries, 1,800+ CEOs, 400+ exhibitors and sponsors and 250+ speakers.

TRUSTECH Incorporating CARTES will be taking over a town that attracts over 300,000 attendees per year, making it France's number two destination for business tourism.

TRUSTECH will include a selection of Start-ups and Fintechs who will showcase their latest innovations for the payment and identification industries.

Discover many solutions related to transport which will be presented at the event such as new access solutions or biometric ID solutions.

[www.trustech-event.com](http://www.trustech-event.com)

## New products from ATRON for the Swiss market

A modern e-ticketing system that allows simple and customer-friendly access to public transport is the aim of the Swiss Public Transport Operators' Association – VöV. A core element of this system is the future pricing system 'ZPS' which will connect all sales channels in Switzerland via the 'NOVA' standardised interface.

ATRON offers seamless integration of the NOVA offline application into the ATRON DEBAS system. Tickets can be sold via the NOVA app or any other existing tariff in parallel, thus offering a smooth migration to the ZPS tariff model for ATRON customers.

The Retrofit-Kit provides a cost-effective upgrade for ATRON's last generation vending machines ensuring modern and prospective solutions such as LTE communication, support of the NOVA offline app and payment with Swiss TWINT/paymit app for mobile phones.

ATRON offers a new and extremely cost-effective, cashless vending machine: the new ACT 420 Chip Card Terminal sells electronic tickets from prepaid or post-paid accounts as well as using contactless credit cards.

ATRON's well-known ticket sales application with its unique usability features is now available as a smartphone app. Small vehicles and mobile sellers can seamlessly integrate into the PTO sales channels with a small and modern smartphone that can simultaneously be used for other tasks as well as schedule information.

[www.atron.de](http://www.atron.de)



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## INIT contactless payment technology for National Express West Midlands

National Express West Midlands – one of the five largest British public transport providers – has awarded a contract to INIT for the supply and installation of a ticketing system. The contract covers the equipment of 1,600 buses with driver consoles, on-board computers/ ticket printers and passenger terminals as well as the service provision via a hosted back-office system. In addition to fast ITSO card-based transactions, the solution enables the use of contactless bank cards for ticket payments in accordance with the EMV standard.

Winning National Express West Midlands as a new customer has created further expansion of INIT's presence in the UK which is already well-established in the East Midlands region close to Birmingham, as transport operators in and around Nottingham and Derby have also opted for INIT as a

technology partner in the area of ticketing and fare management.

"National Express is not just an important new customer for us in the UK," explains Jens Mullak, Managing Director of INIT Ltd. "As our solutions are in use around the globe, this is of course a key benefit for an international group such as National Express." He sees a "growing trend" for contactless payment around the world: "I think it's a gradual process. But with the popularity of contactless bank cards and the usage of mobile phones, this will surely replace more-and-more cash payments. INIT's innovative contactless payment solutions allow operators to offer contactless payment and/or use countless bank cards as tokens for travel, calculating the fare and fare-capping in the back-office."

[www.initag.com](http://www.initag.com)

## Green light for new Trafford Park Metrolink line

Greater Manchester's Metrolink network in the UK is set to expand even further after plans for a new £350 million tram line through Trafford Park were recently given the green light.

Chris Grayling, the UK's Secretary of State for Transport, granted Transport for Greater Manchester (TfGM) legal powers to build the new 3.4 mile (5.5km) line under a Transport and Works Act order. That means work could start on the line this winter – and be operational by 2020/2021.

TfGM, which owns the Metrolink network, has developed plans for the Trafford Park line and will shortly appoint a contractor.

The delivery of the line will provide a major public transport boost for the area, offering fast, frequent transport links for

thousands of workers in the area and better connecting people to business, leisure and retail opportunities.

Trafford Park itself is the largest major employment zone in Greater Manchester outside the city centre and is home to over 1,300 businesses and more than 33,000 jobs – with employees travelling from across Greater Manchester and further afield.

The new Trafford Park line, which will increase the size of the Metrolink network to more than 66 miles (106.5km) served by 99 stops, will branch-off from the existing Pomona stop and call at six new tram stops at key destinations, including Wharfside, the Imperial War Museum, key business areas through the industrial park and visitor

destinations such as Eventcity and the intu Trafford Centre.

The majority of the new route is not on roads to ensure faster, more reliable journey times.

The £350 million funding package to build the line has already been secured by Greater Manchester Combined Authority through the 'earn-back' funding arrangement as part of the Greater Manchester devolution deal.

Mayor of Greater Manchester, Tony Lloyd, welcomed the news, saying: "This new line will boost our economy and bring us closer to our goal of a world-class transport system for Greater Manchester. I look forward to seeing the first shovel in the ground this winter."

[www.tfgm.com](http://www.tfgm.com)



Credit: www.ONLYLYON.COM

## Keolis strengthens its foothold in the driverless vehicle market

Keolis – an innovative leader in sustainable and connected mobility – has confirmed its commitment to the driverless vehicle market with the purchase of four new Navya autonomous shuttles for operation in France and other parts of Europe.

Keolis has also taken a minority share in Navya, as part of a €30 million capital increase announced by Navya in early-October 2016.

These developments build on the preferential partnership Keolis recently signed with Navya and the subsequent launch of the NAVLY trial in Lyon, France. This was the world's first public transport service using autonomous electric shuttles and started operating in September 2016.

Keolis is keen to see autonomous vehicles become a part of everyday mobility. They are eco-friendly and safe, and make it possible to provide public transport to areas that are served poorly or not at all, and for people with reduced mobility, on-demand 24 hours a day. They provide a sustainable solution for first and last mile journeys, in assisting people getting to and from transport hubs.

Keolis is investigating the possibility of using these vehicles for a range of locations – initially mostly in airports, hospitals, university campuses, tourist attractions, industrial sites and shopping centres. It is currently working on 10 different autonomous vehicle projects around the world.

The first two Navya shuttles ordered by Keolis are expected to be delivered by the end of 2016 and the remaining two are scheduled for the first half of 2017.

[www.keolis.com](http://www.keolis.com)



Credit: Bombardier

## Gothenburg to get new FLEXITY trams by 2019

A contract worth €140 million has been awarded to Bombardier Transportation together with consortium-partner Vossloh Kiepe for the supply of 40 FLEXITY low-floor trams (pictured) for the Swedish city of Gothenburg.

Endrick Schubert, Chairman of Göteborgs Spårvägar (Gothenburg's tram operator) said: "...these trams will form an important contribution to further developing public transport in Gothenburg. We have chosen the best tram for our city."

The first two trams are scheduled to be delivered to Gothenburg in the spring of 2019 and will be tested and run for more than 20,000km each before final acceptance. The vehicles will gradually replace the city's current fleet and enable the operator to provide much needed additional capacity. The contract also includes an option for up to 60 additional trams, valid until 2026.

FLEXITY is trademark of Bombardier Inc. or its subsidiaries.

[www.bombardier.com](http://www.bombardier.com)



## HUBER+SUHNER launch 4x4 Wi-Fi MIMO indoor antenna

HUBER+SUHNER – leading international manufacturer of components and systems for optical and electrical connectivity products – has launched its innovative Omni-S MIMO 4x4 antenna (pictured).

The new omni-directional SENCITY® Omni-S MIMO 4x4 antenna features four ports and can be used as a 4x4 Wi-Fi MIMO multi-port antenna. It has been especially designed for installation of Internet in trains.

HUBER+SUHNER have produced a flat and unobtrusive antenna – a design which prevents damage and vandalism.

"Our latest antenna has an extremely rugged design and is able to cater for 4x4 Wi-Fi, which makes it the perfect solution for mass transit," said Bernd Heidtmann, Product Manager RF at HUBER+SUHNER.

The antenna meets the stringent rolling stock standards EN 50155 and EN 45545-2, covering an exceptionally wide range of application needs. The installation of the antenna on-site is straightforward due to its single-hole mounted design.

[www.hubersuhner.com/railway](http://www.hubersuhner.com/railway)

## Platinum buses rolled-out in the West Midlands

In late-August 2016, the first of the new 'Platinum' vehicles for National Express West Midlands started operating between Wolverhampton and Walsall. More Platinums will be rolled-out through the autumn.

At the unveiling, National Express Managing Director Peter Coates said: "This latest £8 million investment means that during 2016, we are introducing nearly 100 new Platinums in the West Midlands. When the roll-out is finished, these luxurious new buses will be carrying passengers in every district in the Black Country. These beautiful buses are our pledge as part of the West Midlands Bus Alliance to increase the amount of people taking the bus, to keep our customers happy and to keep the air clean across the West Midlands."

Platinums are lighter and more fuel-efficient than conventional buses and their Euro 6 engines are among the cleanest in the world. Platinum buses were first introduced in May 2015 across Birmingham, Solihull, Coventry and Walsall; the new Black Country Platinums (pictured) have been made to an even higher spec and are fitted with USB chargers in the seat backs.

[www.nationalexpressgroup.com](http://www.nationalexpressgroup.com)



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## First cross-border Citadis trams delivered for service between Strasbourg and Kehl

Alstom has recently delivered the first of the new Citadis trams for Strasbourg – less than two years after signing a framework agreement with the Strasbourg transport company CTS (Compagnie des Transports Strasbourgeois) for the supply of 50 trams. The first part of this agreement concerns an order for 12 trams, worth a total of €41 million. The first tram will now begin dynamic on-track testing with the following 11 Citadis due to be delivered by May 2017.

The trams will be added to CTS's existing fleet as part of the extensions to lines A and D. On line D they will run all the way to Kehl in Germany. Entry into commercial service is scheduled for April 2017. This will be

France's first ever tram to cross a border.

The Citadis trams in Strasbourg will be the first trams approved by German federal BOSTrab regulations covering the construction and operation of trams in Germany. The trams are 45m-long and have the capacity for 288 passengers. They are equipped with LED lighting and full glass doors to enhance passengers' feelings of comfort and safety. In line with PRM (Persons with Reduced Mobility) regulations, the trams are equipped with easily accessible door knobs, wider seating and areas for wheelchair users and passengers with strollers.

[www.alstom.com](http://www.alstom.com)

## EVENTS

### SmartMetro

Date: 1-3 November  
Location: Copenhagen, Denmark  
e: [marketing@globaltransportforum.com](mailto:marketing@globaltransportforum.com)  
w: [www.smartmetro.eu](http://www.smartmetro.eu)

### Euro Bus Expo 2016

Date: 1-3 November  
Location: NEC Birmingham, UK  
e: [info@eurobusexpo.com](mailto:info@eurobusexpo.com)  
w: [www.eurobusexpo.com](http://www.eurobusexpo.com)

### PMRExpo 2016

Date: 22-24 November  
Location: Cologne, Germany  
e: [Mueller@pmev.de](mailto:Mueller@pmev.de)  
w: [www.pmrexpo.de](http://www.pmrexpo.de)

### Real-Time Passenger Information 2016 co-located with Smart Ticketing & Payments 2016

Date: 23 November  
Location: London, UK  
e: [sgooding:russellpublishing.com](mailto:sgooding:russellpublishing.com)  
t: +44 (0)1959 563 311  
w: [www.rtpiconference.com](http://www.rtpiconference.com)  
w: [www.smartticketingconference.com](http://www.smartticketingconference.com)

### Trustech 2016

Date: 29 November-1 December  
Location: Cannes, France  
e: [contact@trustech-event.com](mailto:contact@trustech-event.com)  
w: [www.trustech-event.com](http://www.trustech-event.com)

If you have a diary event you wish to publicise, send details to Martine Shirtcliff at: [mshirtcliff@russellpublishing.com](mailto:mshirtcliff@russellpublishing.com)



# How PostBus is moving into the future

Yellow Postbuses have been travelling on Swiss roads for 110 years. During this time they have become an important part of the public transport network. As **Simon Rimle**, Head of Communication and Member of the Management Board, explains to *Eurotransport*, PostBus is now taking a bold step into the future and testing a wide range of very different innovations that should benefit the entire industry.

Every child in Switzerland recognises the Postbuses. The yellow buses and their three-tone horns are just as much a part of the country's image as chocolate or watches. Postbuses have been crisscrossing Switzerland ever since 1906, with the first being driven in the region of Berne, the Swiss capital. Over the past 110 years Swiss Post has successfully developed PostBus into a strong brand that represents punctuality, security and friendly drivers.

From very early on the Postbuses travelled on mountain roads and over the Alpine passes, becoming synonymous with school excursions and holidays in the Alps. The image of a yellow Postbus against a mountain backdrop has become imprinted in the minds of many Swiss nationals, and has been deliberately chosen for advertising campaigns by Swiss Post or by tourist organisations and even featured in commercials.

### Switzerland's leading bus company

Today PostBus is the leading bus company in Switzerland. With over 3,900 employees and 2,200 vehicles (ranging from minibuses to articulated buses), PostBus transports 145 million passengers a year. PostBus runs on 877 routes, both in conurbations and in remote valleys of the Alps and its foothills. As the largest transport company in the Swiss bus industry, PostBus enjoys a leading position in various areas. The company considers its responsibility to be the development of new technical solutions and to test innovations that could also benefit other bus operators.

### Emerging trends

Two major trends are shaping the mobility of the future: electric drive

systems and digitalisation. In both fields PostBus aims to find solutions to meet these future challenges. To this end the company has the long-term intention to stop relying on fossil fuels. There is still a long way to go before this objective can be achieved, but PostBus are already in the process of testing alternative drive systems. By the end of 2016 it will have completed a five-year test involving five fuel-cell Postbuses. PostBus has been producing the hydrogen for the vehicle drive systems itself directly on site. The fuel-cell Postbuses (**pictured above**) have been operating successfully with both passengers and residents being extremely satisfied because the vehicles are so quiet. The cost effectiveness of the vehicles has yet to be established, however, as they are significantly more expensive to operate than traditional diesel vehicles.

At the beginning of 2017 PostBus will begin several years of tests with two electric buses. The main problems here concern battery supply and the performance of the drive system in different topographical areas. Whereas fuel-cell Postbuses and electric buses are still at an early stage of development, diesel hybrid buses are already in circulation in a number of regions. PostBus currently operates 36 diesel hybrid buses. Although they are slightly more expensive to purchase than traditional buses, they consume 25-30% less fuel than vehicles that run purely on diesel.

Whilst drive system electrification concerns the hardware of a transport company, to a certain extent, digitalisation involves software and mobility as a whole. Digitalisation is likely to bring about fundamental changes in mobility; the affected areas include route planning, electronic ticketing, sharing services and mobility-on-demand. Digitalisation is also enabling companies from outside the industry to gain a foothold in the mobility sector and this poses a challenge for traditional companies like PostBus. PostBus is aware that

if it does not take action; test innovations and offer digital services, then other globally-active companies from the IT industry will do so. PostBus aims to push ahead with innovations that will be of benefit to Swiss customers and other bus companies; thus developing itself from a traditional transport company into a full-service mobility provider.

PostBus has set up a Mobility Solutions Department in an effort to remain innovative. In 2014 PostBus was also actively involved in founding the Valais/Wallis Mobility Lab together with Swiss Post. The Mobility Lab is an organisation in Sion with very lean structures, whose partners work together based on the requirements of each project. The fundamental issue at the heart of each of the projects is how to simplify mobility for customers. The following partners are involved in the Mobility Lab, besides Swiss Post and PostBus: The Federal Institute of Technology Lausanne (EPFL), HES-SO Valais-Wallis, the canton of Valais and the city of Sion. To follow is a number of projects that are currently running under the umbrella of the Mobility Lab.

**CIBO**

CIBO (Check-In, Be-Out) is an electronic ticketing system that works on a smartphone with the help of an app. The service enables users to simply register for a PostBus journey, and be subsequently invoiced for the route travelled. Upon boarding the bus, the passenger checks in to the system using the app – this involves the use of the WLAN router that is already fitted in 70% of PostBus’s vehicles. A smartphone can also be registered via iBeacon technology, which is far less expensive than installing WLAN routers. When the passenger leaves the vehicle the system automatically registers the end of their journey before calculating the price of the transport service. At the end of each month an invoice is issued according to the best-price procedure.



**PubliBike is PostBus’s bike rental scheme and currently operates in 11 locations in Switzerland**

CIBO is a Mobility Lab project that began in May 2016 and will run until the end of 2016. A number of Swiss transport companies are currently testing new electronic ticketing solutions; these include CICO (Check-In, Check-Out) and BIBO (Be-In, Be-Out). In summer 2016 the transport companies PostBus, BLS and SBB agreed to work together to create a common standard for electronic ticketing.

**‘Nose’**

The aim of the ‘Nose’ project is to find out whether the advantages of a smart city can also be of benefit to peripheral regions. Data for the ‘Nose’ project in Sion is collected from networked vehicles and used appropriately. In specific terms, the current project uses the data obtained from large numbers of individual vehicles to determine which sections of streets become frozen in the winter and therefore require salting. Thanks to the precise data obtained from ‘Nose’, it will be



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## SWITZERLAND

possible to save several tonnes of salt and, in turn, money. Individual municipalities are therefore already interested in 'Nose'.

### PubliRide

With the PubliRide project, PostBus is in the process of establishing a network of car-sharing opportunities via private vehicle in various locations in Switzerland. In peripheral regions where trains or buses do not run very frequently, PubliRide can represent an extension to the public transport system. In conurbations and cities, on the other hand, PubliRide can help take the pressure off the roads because fewer people will have to travel in their own vehicle. Both individuals offering journeys and those looking for journeys become members of the PubliRide community. They can offer people seats in their vehicles, or search for car-sharing opportunities, via a smartphone app or on a website. PostBus has developed PubliRide together with the German car-sharing network Fliinc. Thanks to this partnership, a connection can be made between car-sharing opportunities and public transport. If a customer is looking for a transport option for a particular journey, they will be shown public transport connections as well as car-sharing opportunities. PubliRide currently exists in six different locations in Switzerland.

### SmartShuttle

PostBus has become a familiar name far beyond the Swiss borders, thanks to the SmartShuttle project. Two autonomous PostBus shuttles have been operating in Sion city centre since 23 June 2016. This is the first time in Europe that vehicles of this kind have operated in public areas. An extensive approval procedure involving national and cantonal authorities was required prior to the test, which will last until October 2017. This process was a novelty for all the partners involved.

The SmartShuttle project intends to provide the answers to two questions: Is it possible for self-driving vehicles to run in public areas, and will the public accept these autonomous vehicles? This applies not only to passengers, but also to other road users. The two minibuses run in Sion city centre from Tuesday to Sunday afternoon each week. They cover a specific stretch of road of at least one kilometre, which has stops, but no timetable. As the system is still being tested, the journey is free-of-charge for passengers. There are eleven seats in each vehicle, as well as space for transporting either a pushchair or a wheelchair.

Security is a key aspect of the project. The maximum speed is therefore limited to 20km/h, and every journey is accompanied by a so-called safety driver. The safety drivers observe the road and would be able to stop the vehicle in the event of an emergency. If needed, they can also carry out manoeuvres using a joystick. There is no steering wheel in the vehicle, however, and it does not have accelerator or brake pedals. 3D maps were prepared for the autonomous vehicles in advance and the shuttle then follows these routes precisely. If there is an obstacle in the way, it is detected by cameras and sensors so that the vehicle will stop immediately. The SmartShuttle project has triggered huge interest – not only from potential customers, but also in the media and among the general public. During the summer holidays, people came to Sion especially to see the autonomous shuttles. PostBus also has very promising regular B2B contacts. It will no doubt take a while for autonomous buses to be employed as public transport on a regular basis, but the first areas of application have already been identified: large company premises, airports or tourist areas.



The SmartShuttle self-driving vehicle operates a limited service in Sion city centre and is still under tests

### PubliBike

PubliBike, Switzerland's leading bike-sharing service, is a PostBus subsidiary. It is not merely a Mobility Lab project, but a company that is already in operation, and currently has networks in 11 locations in Switzerland. Both e-bikes and traditional bikes are available. The self-service bike rental scheme works both with a customer card and as a day rental. PubliBike has participated in service tenders for setting up major bike rental systems in the cities of Berne and Zurich – the results of which are not yet legally enforceable, however.

With PubliRide, PubliBike and the SmartShuttles, PostBus is testing and operating mobility services over the 'last mile', which means the company is moving away from its traditional area of activity – regional passenger transport. PostBus understands that mobility services and mobility requirements will change in the future, as increasing numbers of people no longer own their own cars, preferring instead to share them. More and more people want transport services that are on-demand, to a certain extent, and no longer pay attention to timetables, but wait until just before they need to travel to find out about transport options. They combine private and public transport as well as travelling by bike or on foot. Thanks to digitalisation, corresponding route planners can be developed with added benefits offered.

In the future we may find ourselves using our smartphone in the morning to order a self-driving vehicle that will come and fetch us from our front door to take us to the station, where we will then catch a train. These vehicles will be electric and therefore silent and emission-free. The time they are not in use is low, which will ease the parking situation in inner cities. We do not yet know whether this vision will become a reality one day. There is still a long way to go. However, PostBus has sensed the wind of change and wants to be there as an innovative company right from day one when a clear course is set for the future. PostBus itself will only have a future if it adapts to meet today's changing needs and offers appropriate services. 🚗



**Simon Rimle** has worked for over 25 years as a business economist (Higher School of Economics and Administration – HWV) in the Swiss public transport sector. He worked for many years at Swiss Federal Railways (SBB), starting as an apprentice railway traffic technician before managing the Marketing and Sales Department for the Brünig railway line and finally becoming Head of Communication at SBB Real Estate. He has managed the Communication and Public Affairs team and been a Member of the Management Board since 2012. One of his central focuses in this role has been on PostBus's positioning in its transformation from a leading bus company in Switzerland's public transport sector to an integrated mobility provider.



# Project SAEIV: the road to implementation

Following the merger of two public transport companies – TN (Transports publics du Littoral Neuchâtelois) and TRN (Transport Régionaux Neuchâtelois) – in 2012, the Swiss region of Canton de Neuchâtel had inherited two disparate ITCS systems. The newly-formed TransN public transport company was tasked with implementing a new system to unite the two. Head of Engineering and Technical Project Manager for transN, **Léonard Sandoz**, shares here details of the project that is implementing their new Intermodal Transport Control System, as well as the key factors that defined the decision-making process.

Les Transports Publics Neuchâtelois (transN) is the public transport company of Canton de Neuchâtel in Switzerland and is implementing a new Intermodal Transport Control System (ITCS) called 'SAEIV' (Système d'Aide à l'Exploitation et à l'Information des Voyageurs). The project was launched in May 2014, first to meet the Swiss legal constraints, then to implement a new ITCS to answer the needs of the transN company.

Due to Swiss laws, public transport companies have to provide specific information to their customers, owing to the fact that public transportation modes are not accessible to travellers at all places and times. If individuals want to use a bus or a train they need to be at the right place at the right time. Prior to starting any journey,

they need information about it; during the trip they need to be informed about relevant information and any malfunctions on the network; in fact, traveller information is required before, during and potentially after the trip.

When someone boards a public transportation vehicle they become the public transport company's responsibility and they want to be informed during their entire trip. This is an assurance for the traveller who needs to know that they're in the best vehicle for their desired destination. Reliability, punctuality and security are fundamentals for Swiss public transportation.

Information is even more important in the case of potential traveller perturbation, which could be caused by delays, no planned stops or any

## SWITZERLAND



**Left: Embedded hardware equipment used to be housed above the driver. Right: The new system means there is now a lot more space in the area above the driver. One box (which contains the system board computer) is able to run the new system**

other events which cause insecurity. In such cases, fast and correct information has to be provided, to allow the customer to re-organise themselves during the trip.

### The geography of Canton de Neuchâtel

Canton de Neuchâtel is located in the western part of Switzerland, in the Jura mountainous region. A lake lies south of the canton. History and geography have shaped the area, which is commonly divided into three geographical regions, the first of which is located along the lake. Two large valleys form the second part of the canton, and the mountainous area is the third. At the end of 2015 the population of the canton was approximately 178,000, living on 802.93km<sup>2</sup>. The capital of the canton is Neuchâtel and the city and its agglomeration have approximately 55,000 inhabitants. Another main city of the region is La

Chaux-de-Fonds with approximately 40,000 inhabitants. The two valleys have fewer inhabitants but are larger areas.

### The history of transN

In 2012 the merger between the two historical public transport companies created the Transport Publics Neuchâtelois S.A – transN is the trade name.

The two former companies – TN (Transports publics du Littoral Neuchâtelois) and TRN (Transport Régionaux Neuchâtelois) – had their own ITCS and, owing to this, transN have to run both ITCS' in order to ensure delivery.

The first ITCS was implemented in 2001 and runs an analogical radio that covers the lake area. This system provides radio voice and radio data to a regulation centre in order to communicate with the

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vehicles and follow them on a virtual map in real-time. Information about the next stop is displayed within the vehicle itself.

The second ITCS is approximately 10 years old and runs a digital radio that covers the valleys and the mountainous area. This system provides radio voice and radio data in order to communicate with the vehicles, to display information in the vehicle and at the stops.

As aforementioned, transN have to provide specific information to their customers and both of these ITCS' are used for this purpose. The first one provides visual passenger information in the vehicles to indicate the next stop and give the next bus departure at some stops thanks to an analogical radio. This

radio system works well with the data, but encounters problems with the voice side. On the second system only the voice network works, but does not cover all the areas it needs to. Moreover, the system cannot effectively manage the data due to many technical reasons. This results in an inability to provide real-time information to the customers.

As two different systems were running, (that were not able to reach the requested information level) a new solution has been implemented.

Results of analyses indicate there are many problems to solve in order to reach a good level of transmission quality. A lot could be eliminated with hardware and software updates or with a better use of the transmission channel.

The biggest problem was, in fact, how to unify the voice and data transmission channel. As the two old public transport companies have merged, the entire vehicle fleet has to run everywhere within Canton de Neuchâtel. Given the existence of two different systems, there were many possible solutions available in order to achieve this.

Some very expensive and inefficient options were explored, and extending one of the radio networks was a possible solution. As soon as the possibility of an extension was explored the scope of the costs were realised. As both radio networks are old – even very old – the need for a real hardware update or complete change was mandatory.



A transN vehicle in which the new system will be installed

Once this point was reached, the obvious question to ask was: do we have to create and own a brand new radio network, or is it better to use one that already exists and pay to use it?

For many years wireless telephone technology has become ubiquitous. Nowadays it is utilised more and more in technical devices and is very reliable. Moreover, this technology is used by most people across the world, so is well-known by everyone.

The radio transmission paradigm shift has existed for some years now and its use has been democratised for mobile applications.

This drive led to a brand new way of thinking and to question whether it is better to own a radio network, or to rent one?

As previously mentioned, Neuchâtel Public Transports Company has two different radio networks – one analogical and the other digital. This fact leads us to choose only one, for technical and economic reasons. Moreover, the goal is that all vehicles can be engaged within the entire Canton de Neuchâtel area. I don't want to have to consider the possibility of extending the scope of the radio network in the event of covering the region outside our canton. Can this be easily achieved without losing too much money?

In order to be linked to another radio network, they must first exist, then our embedded hardware has to be compatible.



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## SWITZERLAND

In order to extend our radio network, questions must be considered such as: How long would it take to implement? How much would it cost? How long will the extension last?

Both old systems were running a radio network. Both systems are not able to efficiently cover the area they need to. Data transmission is not reliable.

Analysing the results indicates that many problems need to be solved in order to reach a suitable level of transmission quality. A lot could be eliminated with a hardware and software update, or with better use of the transmission channel.

Once all technical solutions have been analysed, cost and risks included, we opted to use wireless telephone technology. The reasons include, firstly, the more attractive cost of a standard solution. Secondly, the new solution implementation time was also a significant factor, which can be drastically reduced if we choose a standard solution.

Furthermore, as we had inherited two different old systems, we also had contrasting procedures to ensure the service; such as different words and expressions to deal with the same subject. We therefore had to choose between two paradigms. We considered the following: Is it the company procedure that influences the solution, or is it the solution that drives the procedures and forces the change in the company? As there were several different expressions, words and procedures to achieve the same tasks and, as in parallel, a basic specification was required to merge the needs of all the company's departments; the company decided to implement a standard ITCS system and not a custom one.

Once these different points were agreed by the steering committee, the final project specification began to be written. It was the first step required in order to launch the European public tender.

The immediate next steps after the steering committee acceptance, was to create a project charter which has been used to describe the main points and the main milestones. The project charter's main points were defined, thus:

- Project definition
- Project goals
- Project sponsor and motivation
- Project milestones
- Acceptation criteria
- Review and approbation
- Project risks management
- Project structure and resources
- Project benefits.

This project affects many transN company's vehicles, including 130 road vehicles and 21 railway vehicles.

The first project milestones were:

- Phase one:
  - Review of the system's technical structure and of the system's functional structure



The new on-board computer which is very easy to install

- List of the system's commercial functionalities given by the system and desired by transN (Specifications)
- Public tender
- Phase two:
  - Sign the contract with the new provider (public tender most economical according to our specifications)
  - Create the project's planning
  - Acceptance of provider specifications
  - Factory Acceptation Test
  - System implementation @transN (system and in the vehicles)
  - Vehicle's system integration test
  - Site Acceptation test
  - Acceptance testing
  - Go-live
  - Warranty.

The project execution's timeline is:

- Kick-off meeting with the new provider: July 2015
- Contract signature with the new provider: August 2015
- Product specifications according to public tender specifications: August 2015-February 2016
- Software development and material production: February 2016-May 2016
- Factory Acceptance Test: May 2016
- System installation: May-June 2016
- Seeded test: June-July 2016
- Training: July 2016-October 2016
- Deployment in the vehicle's fleet: August-December 2016
- Site Acceptance Test: December 2016
- Go-live: March 2017. 🚗

### Reference

1. A 'canton' is similar to a region in England or a state in the USA.



**Léonard Sandoz** is a Graduate in Business Computing with an option in software engineering. Léonard has been Head of Engineering and Technical Project Manager for transN since May 2014, supporting the transN Technical Department which manages the transport company's entire vehicle fleet. Prior to his current position, Léonard served for four years within a semi-conductor company as Development Engineer. He was also a Lecturer Assistant in a business computing high school and within the Swiss army.



**Date: Tuesday 15 November 2016**  
**Time: 15:00 GMT**  
**Duration: 60 minutes**

**Moderator:**

- Brian Masson, Multi Modal Transport Solutions

**Speakers:**

- Roger Teal, President, DemandTrans Solutions, Inc.
- Niels Larsen, CTO, FlexDenmark
- Jeff Becker, Senior Director of Service Planning, Regional Transportation District (Denver)

# Technology-enabled on-demand/flexible transit services: new opportunities for PTAs

Technology developments are making the new generation of on-demand/flexible public transport services more cost-effective and better tailored to market circumstances than prior offerings. Such services targeted at the general public – for both first-mile/last-mile access and local circulation purposes – have been deployed in 22 service zones by the Denver transit agency in the largest implementation to date in the USA. The technology platform for managing these services – MobilityDR – is key to this outcome. In this webinar DemandTrans Solutions and its partners show how an appropriate technology platform, in combination with innovative service concepts, provides regional transit authorities with the ability to configure, control, and operate cost-effective DRT/flexible transit services.

During the webinar, Roger Teal will describe how technology has enabled a new generation of DRT services and how the MobilityDR platform makes it feasible to schedule and control vehicles and drivers for many types of DRT/flexible transit services so that agencies can deploy targeted, cost-effective DRT services.

Niels Larsen will discuss how FlexDenmark has used its technology platform to revolutionise how DRT is provided in Denmark and why

technology platforms such as MobilityDR and its next generation version are the key to innovative, cost-effective DRT services.

Jeff Becker will describe how the Denver RTD planned and implemented its large portfolio of DRT/flex transit services and the essential role of the MobilityDR technology platform in enabling it to manage and operate many diverse forms of DRT/flexible transit.

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# PMRExpO

## PROFESSIONAL MOBILE RADIO AND CONTROL ROOMS

The 16th edition of **PMRExpO** will take place from 22-24 November 2016 at Koelnmesse, Germany. Ralf Jäger, North Rhine-Westphalia Minister of the Interior and Local Government, will once more assume the patronage and more than 100 exhibitors have already booked a stand – strengthening its position as the leading European trade fair for Professional Mobile Radio and control rooms.

Koelnmesse has been home to PMRExpO since 2009. Last year the 15th edition of PMRExpO attracted 168 exhibitors and approximately 3,470 visitors. A large number of national and international exhibitors will be attending in 2016, including manufacturers, users and operators of Professional Mobile Radio systems. The German Association for Professional Mobile Radio (PMeV) is the ideal sponsor of PMRExpO, and the organiser is EW Medien und Kongresse GmbH, Frankfurt am Main.

PMeV – which has its registered office in Berlin – is an association of leading suppliers and users of communication systems for professional mobile use. Its members are manufacturers, system vendors, application integration companies, network operators and users. PMeV's objective is to further develop the professional mobile radio market in Germany. For this purpose – and as the leading centre of excellence in the field of Professional Mobile Radio – it offers a platform for a neutral, cooperative dialogue with market partners, politicians, authorities and institutions, independent of manufacturers.

EW Medien und Kongresse GmbH, Frankfurt am Main, is the

leading information provider to the energy and water industries in Germany and supplies up-to-date industry-sector knowledge through different media channels from a single source. Quality, topicality and practical relevance are always at the forefront. Due to its proximity to the German Federal Association of the Energy and Water Industry (BDEW), EW can react quickly to current political and legal developments. EW also organises events on topics relevant to PMR, such as the PMR information day for utilities; the symposium on stand-by duties; events covering emergency and crisis management; and, since 2013, the PMRExpO too.

The PMRExpO trade fair and its accompanying programme of presentations improve year-on-year. The PMR Conference, the Congress on Control Centres and the Specialised Forums will be complemented by the new PMR Specialist Conference for Utilities.

The topics at this year's PMR conference will be devoted, for example, to the criteria for secure communication and information systems; radio within the scope of smart grid and smart metering;

### Hytera's strong presence at PMRExpO 2016

Hytera Mobilfunk will once again attend PMRExpO and their focus this year will be on the high-end DMR handheld PD985, as well as the innovative TETRA outdoor base station. Besides their extensive product portfolio, Hytera Mobilfunk will showcase their solutions and encourage interesting conversations with event attendees.

Alongside their exhibition, Hytera Mobilfunk will again get involved with various panels discussions during the event. Bernhard Klinger, Vice-President of Business Development at Hytera Mobilfunk GmbH and Head of the Broadband Department at the Federal Association of Professional Mobile Radio (PMeV), will present the results of a study which deals with the suitability of commercial mobile communication networks for mission-critical broadband services. Furthermore, Hauke Holm, Vice-President of R&D at Hytera Mobilfunk will participate in a discussion about the future of PMR.

Hytera Mobilfunk will also be part of the new 'PMRExpO Career'. This new concept gives young professionals and companies from the PMR industry a platform to get to know each other. Aleksandra Wodzinowska, Human Resources Manager at Hytera Mobilfunk GmbH will give answers to interested visitors and young professionals during the event.

Visit Hytera Mobilfunk during PMRExpO 2016 at Stand E02.

[www.hytera-mobilfunk.com](http://www.hytera-mobilfunk.com)



Credit: Markus Schwanberg Fotografie/PMRExpO

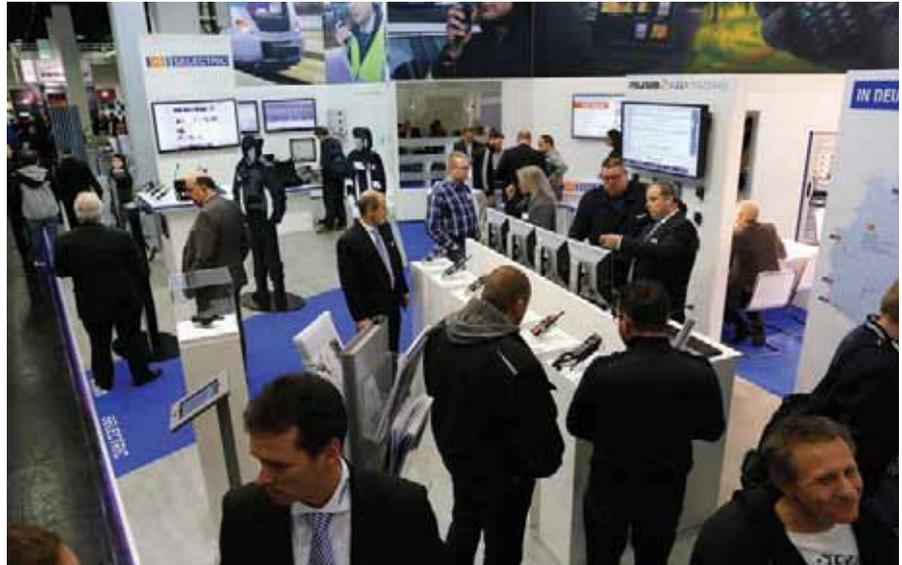
## SHOW PREVIEW

the shared use of public systems; IT security and further current topics relating to PMR.

The Congress on Control Centres will give attendees the latest information on, inter alia, cyber security in the context of public safety control centres; LTE in the context of control centres; the launch of eCall; and public safety control centres as cloud services. The six specialist fora will concentrate on and devote themselves to a panel discussion with the public on particular aspects of topics concerning Professional Mobile Radio. The Specialised Fora will take place at the heart of the trade fair, and all visitors with a valid entrance ticket can attend. The focuses will be: the PMR Forum – an overview of countries; the International Public Safety Forum; Indoor Coverage Forum; the Career Forum – graduates ask, recruiters reply; the Specialist Trade Forum; and the Energy Industry Forum.

PMRExpo Career has now further developed its potential for career opportunities. It consists of two 'Take-off!' and 'Jobboard' programmes and offers a recruitment platform for businesses in the PMR industry and for the further development of job-seekers with and without professional experience. 'Career-Jobboard' enables businesses to publish situations vacant both on the PMRExpo website and at the trade fair itself.

The event website provides all necessary information for anybody planning their trip to PMRExpo 2016, including venue



More than 100 exhibitors have already booked their stands for PMRExpo 2016

details, an interactive floor-plan, a map of the exhibition and full exhibitor list, logistical information including how to reach the event by plane, train, bus and car, plus recommendations for partnered hotels and accommodation. 



Eurotransport is pleased to support PMRExpo 2016 as a standard media partner

Date: 22-24 November 2016

Location: Cologne, Germany

Website: [www.pmrexpo.de](http://www.pmrexpo.de)

Visit us at  
PMRExpo in Hall 10.2  
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CASE: Wuppertal Schwebbahn

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# Ensuring security of Europe's public transport systems

This article gives a brief overview of two EU-funded projects – P-REACT and EUSTO – that aimed in varying ways to tackle antisocial behaviour and ‘volume’ crimes, with a view to protecting Europe’s public transport systems. **Mauro Borioni**, Project Manager, SRM – Bologna’s Mobility and Public Transport Authority – explains the outcomes of the initiatives and shares Bologna’s involvement from his perspective, citing areas for future improvement.

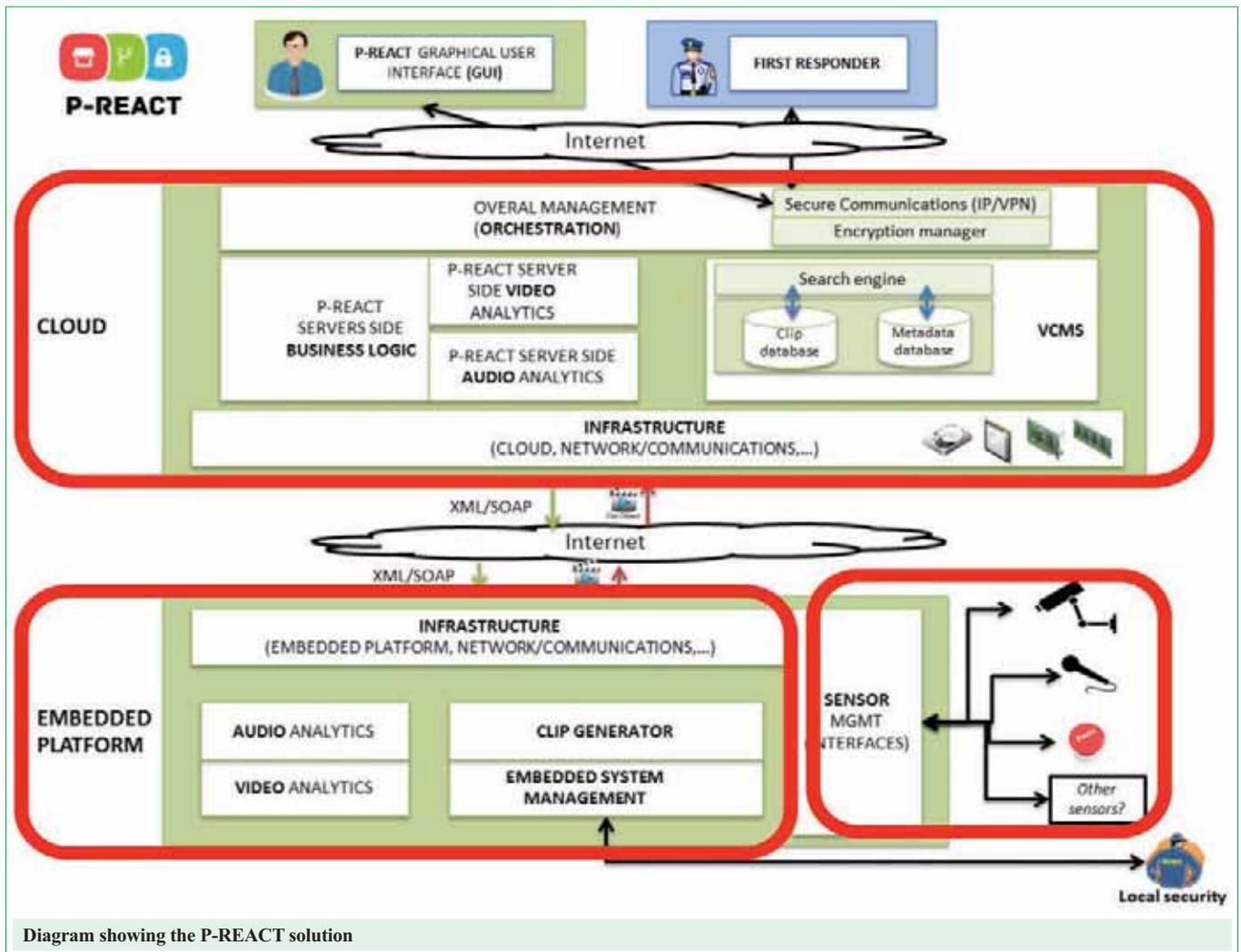
Transport systems are an essential element of modern societies – particularly cities – providing a vital function with strategic significance. Millions of people move every day using their own vehicles or public transport, commuting for the purpose of work or study; to shop or utilise city services; or just for recreation and leisure. As for urban areas, the systems of surface transport play a major role in the lives of the communities that live there: motorways, buses, trams, railways and subways networks, linked and interconnected, may be viewed as the blood vessels that carry energy and feed the organisms of the cities.

Transportation systems and infrastructure are increasingly seen as attractive targets for antisocial and criminal actions – largely due to their innate openness; their ease of accessibility; the large number of people they serve, combined with their increasing complexity and interdependencies. This seems to be the case at all levels: from

antisocial behaviour (such as irritation and harassment at bus stops) to criminal acts and terrorist attacks against critical infrastructures for transportation (such as the tragic events that occurred recently in Europe). Given this range of threat, one of the greatest challenges in today’s society is the protection of transportation systems. And the city of Bologna is no exception: the problem of crime prevention and protection of infrastructure for the transportation of people is a key issue. For this reason SRM (the Agency for mobility and public transport in Bologna) has recently been engaged at European level in order to seek solutions and effective procedures, and apply them to the reality of the city to face the proliferation of criminal acts within the transport systems.

With regard to petty crimes, the commitment of SRM originates from the awareness of the impact they may have on public transport

# SECURITY



and how public transport is perceived by citizens. The term 'petty crimes' can be quite misleading; they usually refer to vandalism, graffiti, shopliftings, robberies, assaults, or thefts which, when compared to terrorist attacks, could be considered to have a low impact. However, this assumption is entirely wrong. Indeed, their impact at the social (and even economic) level increases significantly when they are frequent and amalgamated. Petty crimes may even undermine the social fabric of the community as it is associated with a high rate of fear and general alienation from participation in community life: in this sense, the term 'volume' crime would be more appropriate.

The 'P-REACT' project<sup>1</sup>, in which SRM was involved as Italian partner, offered the possibility to test a solution to increase the security (and the perception) of public transport. The project started in April 2014 and concluded in May 2016 and was funded by the European Union under the Seventh Framework Programme. The project was coordinated by Vicomtech (ES) and, besides SRM Bologna, the partner consortium included Aditess (CY), Certh (EL), Future Intelligence (UK), Kemea (EL) and Kinesense (IE).

To summarise, the P-REACT project developed and tested a novel intelligent surveillance system that integrates video and audio analytics both on-site (using an embedded platform connected to local sensors) and remotely on a cloud service. This intelligent surveillance system has been conceived and designed to anticipate volume crimes in areas where video-surveillance is allowed by current legislation and, more

specifically, in shops and public transportation systems, to automatically detect antisocial behaviour, alert security, and store files and data for possible further employment. The capability of dynamically adapting the analytic algorithms that are performed on-site provides more accurate detection of crime.

The goals of the developers were not to replicate an ordinary video-surveillance system, but to create an innovative one with the following unique characteristics:

- Interoperability (no vendor lock-in)
- Modular, flexible, scalable, and dynamically configurable
- Low-cost
- Distributed between a local embedded platform (on-site) and a central service (cloud)
- Combining multi-sensor technologies (video, depth, and audio analytics) focused on prevention and early detection of petty crimes
- Societal, ethical, legal and privacy-friendly.

The system was tested in restricted areas in Athens to begin with, and then utilised in Bologna in early-2016. Low-cost intelligent sensors (image and audio) were installed in the premises of a bus stop, and these sensors were connected to a cloud-based Video Content Management System in order to process data received by the sensors. Incidents and aggressions were simulated by trained actors, and detected by the sensors that initiated a work flow including alerting

relevant security personnel, or Police, with video and intelligence information, increasing their ability to respond quickly and appropriately. Video and audio data were made available to be stored and kept as evidence for possible future conviction purposes, in compliance with the privacy and ethics regulations at European and Member State level.

The test was essentially split into the following phases:

- The actors went into action in the area controlled by the cameras
- The system in place on the site (bus stop) had detected a suspicious event via a video algorithm, and created high-definition clips. The clips and other relevant information were sent to the private cloud
- The system of private cloud (Web) had established whether a second level of analysis was necessary (according to set routines), and sent a message of warning to the operator's screen. The operator could evaluate the video clip received, request a vision from the camera in real-time, and eventually inform the authorities or the security service
- The video clips and other related information were made available on the cloud for possible future investigations and insights.

The test was successfully conducted, proving the availability and reliability of the system. As of today, an advanced prototype has been achieved, ready to go to market before the end of 2016.

SRM was also involved as Italian partner in the project 'EUSTO'<sup>2</sup> (European Surface Transport Operators Forum), funded by the European Union under the 'Prevention, Preparedness and Consequence Management of Terrorism and other Security-related risks Programme (CIPS 2013)' of DG Home Affairs. The project started in July 2014 and concluded in June 2016, having been led by Kemea (EL) and with Aditess (CY), European University Cyprus (CY), and Fraunhofer IVI (DE) comprising the project consortium. The purpose of EUSTO was to achieve the coordination of national and EU-wide programmes and policies in pursuit of the objectives of the Directive 114/2208, related to the protection of critical infrastructures for surface transport. Indeed, due to the interdependencies, connections, and tight inter-linkages between the different surface transport infrastructures, their effective protection needs the promotion of a stronger cooperation between all the actors involved. These include infrastructure owners, transport service operators, public authorities responsible for the security of strategic infrastructures, researchers, etc. To this end, EUSTO was focused on creating a network between these bodies, providing an ideal platform for discussion and exchange of information and ideas. This would enable mutual knowledge of the Member States' security capabilities specific to terrorist crises to be elevated, in order to enhance preparedness and response capabilities in the case of a terrorist attack requiring mutual assistance at EU level.

More specifically, the activity within the EUSTO project was founded on four European-wide conferences (two annually) with the

active participation of several Surface Transport CI Operators and Owners, as well as National Security representatives. The aims of the conferences are as follows:

- To connect with other owners and operators in their sector to share best-practices
- To provide information on initiatives and tools that may assist with assessing vulnerabilities
- To foster networking among the EU, Member States, security technology companies and energy infrastructure owners and operators
- To develop a common Transport Critical infrastructure taxonomy/classification
- To understand their dependencies and connect to identify inter-linkages between different transport infrastructures
- To promote public-private dialogue to reflect the users' and operators' common priorities and needs
- To identify ways that government agencies can assist owners and operators with protecting their critical infrastructure
- To develop a common 'harmonised' language for national and EU authorities and transport infrastructure operators
- To build common guidelines for developing an Operational Security Plan for Surface Transport Critical Infrastructures that have an EU dimension and will be based on industry best-practices, in pursuit of the objectives of the related EU Directive 114/2008.

The main outcome of EUSTO has been the achievement of the following elements:

- A Security Foresight Platform for Surface Transport Operations, which could potentially be a central point for the exchange of related information
- The provision of support for on-going activities for Surface Transportation Protection (such as Thematic Network or Technology Platform)
- The establishment of a Reference Operational Security Plan that could serve as a basis for Surface Transportation Operators.

The experience gained by SRM in the EUSTO project highlighted that there is still much to be achieved in order to fully implement the EU Directive. Furthermore, this is especially true in Italy where national legislation is yet to be completed; a complete strategy needs to be developed; critical infrastructures require identification in the national territory; and appropriate initiatives for the protection of critical infrastructures need appropriate support. 

## References

1. [www.p-react.eu](http://www.p-react.eu)
2. [www.eusto.eu](http://www.eusto.eu)



**Mauro Borioni** is a Chartered Engineer with experience in transportation, planning for urban mobility and in project management sectors. In 2006 he joined the Mobility Department of the Municipality of Bologna, Italy, where he was involved in EU/National/Regionally-funded project management and drafting and contributing to urban mobility planning (such as the Urban Mobility Master Plan of the city). Mauro joined SRM – Bologna's Public Transport Authority – in 2013 and has since been strengthening his engagement in EU-funded urban transportation project management.

Transportation systems and infrastructure are increasingly seen as attractive targets for antisocial and criminal actions...

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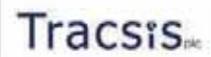
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**Real-Time Passenger Information 2016** will bring together Local Authorities, Passenger Transport Executives, Transport Operators, RTPi consultants and systems suppliers to discuss and debate the current revolution in information; best practice in Real-Time Passenger Information implementation; best practice in achieving optimum ROI in Real-Time Passenger Information; and cutting edge examples of 3rd generation RTPi and ticketing systems.

**What's new for 2016!**

- ➔ The Role of Information in Mobility as a Service
- ➔ Harnessing Big Data
- ➔ Demand-Responsive Transport
- ➔ Preventing Cyber Attack

**TOPIC HIGHLIGHT: The Future of Demand-Responsive Services**

- ➔ How can customers register demand?
- ➔ How can operators respond?
- ➔ Which options make business sense?

Our landmark Real-Time Passenger Information conference launched just four years ago, in 2012; this year will be the fifth annual event. It's a great opportunity to remind ourselves of the opportunities and challenges, the continually-evolving demands of passengers, and the innovations taking place around the UK and Europe to meet them.

**Real-Time Passenger Information 2016** will once again bring together the brightest and best minds in the sector, from politicians to passengers and from software to service managers, to pool their experience and help understand the way ahead for passenger transport.

**2016 speakers include:**



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**RTIG**



**David Sidebottom,**  
Passenger  
Team Director,  
**Transport Focus**



**Alex Hynes,**  
Managing Director,  
**Arriva Rail North**



**Carol Schweiger,**  
Chair,  
**New England ITS**



**Julie Williams,**  
Chief Executive,  
**Traveline**



**Phil Young,**  
Head of Digital,  
**Transport for London**



**Claudio Cassarino,**  
Managing Director,  
**Metro Service**



**Jason Durk,**  
Senior Project  
Manager – Customer  
Information, **Govia  
Thameslink  
Railway**



**Gordon Hanning,**  
Head of  
Concessionary  
Travel and Integrated  
Ticketing,  
**Transport  
Scotland**

'A well organised event, with a great focussed group of attendees'

'Excellent program with very relevant presentations & knowledgeable speakers'

'This is a unique event in that it showcases the value of Real-Time systems in both bus and rail modes from an international range of speakers'



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Taking place on 23 November 2016 at 155 Bishopsgate, London, the **Smart Ticketing & Payments** conference and exhibition will co-locate with our outstanding **Real-Time Passenger Information** conference. Both conferences will attract 200+ delegates from across Europe, enabling the worlds of passenger information delivery and ticketing to network, discuss and collaborate with each other.

### What's new for 2016!

- ➔ The Role of Ticketing in Mobility as a Service
- ➔ Multi-Modal Seamless Ticketing
- ➔ Open Data
- ➔ Protecting Your Fare Collection System from Cyber Attack

### TOPIC HIGHLIGHT:

- ➔ Go-Ahead's bus division is one of the leading proponents of smartcards, with their Key card becoming one of the most widely used deployments of ITSO ticketing since it was first introduced six years ago.
- ➔ Go-Ahead are now responding to customer demand by introducing variable fare pay-as-you-go contactless bank card ticketing, the first of its kind outside London.
- ➔ Go-Ahead will explain the business case for switching focus to open payments, share their experience of delivering a complex project with multiple integration partners, and give an update on the current progress towards launch.

**John Backway**, Head of Commercial Development, **Go-Ahead Group**

**Andreea Sarsan**, Programme Manager, Payments, **Go-Ahead Group**

### 2016 speakers include:



**Chelsea Whitmore**, Transformation Strategy Analyst, **Transport for London**



**Louise Coward**, Insight Manager, **Transport Focus**



**John Henkel**, Executive Sponsor, Integrated & Smart Travel, **West Yorkshire Combined Authority (WYCA)**



**Nicola Moir**, Project Finance Manager, Contactless Transit Project, **The UK Cards Association**



**Stephen Joseph**, CEO, **Campaign for Better Transport**



**Mohammed Bhanji**, Special Advisor to the Chief Commercial Officer, **VIA Rail Canada**



**Sam Norman**, Smart Ticketing Manager, **c2c Rail**



**John Backway**, Head of Commercial Development, **Go-Ahead Group**



**Mathew Hudson**, Head of Business Development, **Transport for London**

'Great event - good mix of speakers both in terms of topics & sector.'

'An excellent opportunity to network with key industry people. A very good event.'

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# INTERVIEW SPOTLIGHT

This year's Real-Time Passenger Information conference has a platinum sponsor from overseas: Respond, a software development company from the Netherlands. Eurotransport interviewed **Pieter Vermeer**, Commercial Manager (right) and **John van Laerhoven**, Executive Director (left) who were willing to share their knowledge and innovations. Here, they reveal their ambitions and goals.



## What are the goals and motives for Respond?

Our goal is to create a safe society. To do so, we are creating innovative software for emergency services and authorities, as well as for larger companies, to control their processes in case of disruptions. It is a challenge to devise solutions together with our clients. We want our solutions to be used during a crisis, and this is only possible when our clients have user-experience. We therefore ensure that our clients can manage their daily processes with our software too; in this way our software can manage even the smallest disruptions.

## What products/solutions can Respond offer the urban public transport market?

To resolve crises you have to start with alarming and providing information. Therefore, we deliver the public transport sector a high intelligent communication tool as well as a process management tool. Respond delivers a total solution to our customers by sharing our knowledge and providing our specialised tools. Both our software and services are available 24/7. A full-service product is essentially what we offer.

## Why did Respond enter the transport market?

Based on our strategy, we have different segments to reach the market with our products. Basically, disruptions and incidents impact everywhere, no matter in which sector we operate. What we want is to increase customer satisfaction. To do so, we use real-time information to inform people properly. Together with the Dutch Railways, we have developed 'Control Center' – a tool that is based on customer orientated thinking, which is also highly suited to other carriers. During a crisis, it is all about how you provide your customers with information. 'Control Center' offers the solution to the transport market.

## Why is Respond going international with 'Control Center'?

We see the successes we have achieved in cooperation with the Dutch Railways. Despite the fact that every railway organisation is different, many aspects are equal, such as dealing with incidents. Therefore, we are convinced that we can support the international market by means of 'Control Center'.

## Which opportunities do you see abroad?

We noticed that the Dutch Railways is a harbinger in the best way to communicate, because several years ago they started to think from

the perspective of the customer. What we have done for the Dutch Railways is enable this method of customer support to be possible for all international businesses. We already have the experience, the right products, the knowledge and the drive. What we now need are companies that are ready to take their business to the next level in customer thinking.

## What is going to be the biggest challenge abroad?

We know that 'Control Center' is of great value, as we have seen at Dutch Railways. Respond is a specialised company and what we bring to the transport market is unique. Use of our software is intuitive and it provides an interface between the field operator and the management and stakeholders. We are more than just a software development company; we go one step further to offer additional service. When we are determined in what we want to achieve, we make sure that it is going to happen together with our customers. We believe that collaboration is the key to success.

## What has been Respond's biggest success to date?

We work closely with the customer and provide a custom solution and personalised services on a standardised platform. Our solutions are based on collaboration and are always well-suited to the need of our users. This, together with 24/7 reliability, is our priority. We are building on partnerships very conscientiously; therefore we can collaborate as equals and evolve naturally together.

## What are the long-term goals of Respond?

At Respond every employee has the same goal. We are aiming to be the leader in software for incident management, notification services, escalations and process management in Europe. We want to share our knowledge with our customers to make them safer and better. We, as an IT company, notice the changes in technology, which are going faster than ever. New technologies bring new opportunities that can enhance this goal. We always have to be on-point with new developments and keep in mind that reliability remains a priority. 🚗

# RESPOND!

[www.respond.nl](http://www.respond.nl)

# RTPI & Smart Ticketing

## SUPPLEMENT

### 30 Malta's 'tallinja card' offers excellent convenience and flexibility for passengers

Konrad Pulé, General Manager, Malta Public Transport

### 33 Advanced mobile apps to enhance NCT's understanding of customers in real-time

Anthony Carver-Smith, Marketing Manager, NCT and Tom Quay, Managing Director, Base

### 36 A smarter approach to bus travel

Alistair Smith, Group Director, Commercial and IT, Stagecoach

### 38 Rejsekort: unifying different ticketing elements to create a common-use system

Bjørn Wahlsten, CEO, Rejsekort A/S

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# Malta's 'tallinja card' offers excellent convenience and flexibility for passengers

Bus transportation in Malta is undergoing a transformation with investments being made to modernise its bus fleet and in implementing new technologies to increase efficiency. **Konrad Pulé**, General Manager of Malta Public Transport, explains that one particular success of the national bus operator has been the introduction of a popular new bus card.

Malta Public Transport is responsible for the operation of all public transport services by bus on the Maltese islands, and covers 30 million kilometres every year with a fleet of 380 buses and a team of over 1,300 people. Throughout the first year of operation in 2015 it is estimated that approximately 40 million passengers were carried – a significant increase when compared to previous years.

## Revolutionising transport: investing in new technology to increase efficiency

Following the share transfer that took place in January 2015, we immediately began the implementation of a number of major changes within the organisation. These were aimed at improving performance in general to align with contractual requirements and to provide an efficient bus service.

Our priority was to change our internal systems to enable us to be in a better position to control the service. This included the replacement of the ticketing and fleet management system across the entire bus fleet, resulting in stronger controls at all levels and better information for our customers.

## New fleet tracking system

The fleet tracking and management system was completely changed

during 2015, enabling us to know where every bus is in real-time. This information enabled us to gather information on service reliability and punctuality. It also enabled us to fine-tune route schedules according to the time of day and the day of the week, therefore providing drivers and passengers with more realistic running times.

Our technology can be upgraded further with other solutions such as signal priority and bus lane enforcement.

A technology-based Control Room was installed in order to manage the services in real-time. Reliability and punctuality of the service are the main two targets of our team and we are making good progress in both, especially taking account of the traffic context in Malta.

Situations can sometimes occur, such as delays to our services due to unavoidable traffic jams or accidents, but our customers can still plan ahead. We launched a mobile app and an SMS service that gives bus users access to real-time information on which buses are due to arrive at their bus stop within the next 30 minutes. This proved to be very successful with over 50,000 downloads in the first three months.

This success was a result of Autobuses De Leon (ALESA) transferring its knowledge to Malta Public Transport. As a result the IT system tested by ALESA in other localities was adapted to Malta in order to improve information for the company and for passengers.

### A successful new bus card

In July 2015 we launched a new bus card. This was a critical step to reduce the dependency on cash transactions, whilst opening up other controlled revenue channels that are more efficient. It required a significant investment in technology and communications, and the results were very positive.

"We were overwhelmed with the success of the new bus card in Malta," said Felipe Cosmen, Chairman of Malta Public Transport. "Half the Maltese population obtained their bus card within a short period of just six months with over 82% of passengers now using a card when travelling by bus. This is a major achievement for the country as it revolutionised the way people buy their bus tickets, especially when one considers that practically everyone used to pay for their bus tickets in cash on the bus until June 2015."

"We had to convince more vulnerable bus users, like the elderly, that this was the way forward," explained Hon Joe Mizzi, the Maltese Minister for Transport and Infrastructure during the Transport Ticketing Conference held in Warsaw, Poland in October 2015. "We had to convince them that they had to have a plastic card to benefit from the reduced fares. The plastic card had to be topped-up with credit to be used on the bus. That was challenging as it presented a completely new concept to this category of bus users. To date, over 70% of the elderly population have a bus card, demonstrating the success of the implementation campaign."



Different tallinja cards and fares are available

### tallinja card

The bus card – branded as 'tallinja card' – is an intelligent bus card designed to make it easy for customers to use the bus. The card is personalised with the customer's photo and name and can be easily topped-up with credit online, over the phone, at any of our sales outlets or at any post office. The credit on the card does not expire. When registering for a tallinja card, customers automatically benefit from cheaper fares than when they pay on the bus. Different cards and fares are available for children, students and adults. There is also a concession card which is available to elderly and disabled passengers; and a specific card for Gozo<sup>2</sup> residents.

This shift in culture brought about new challenges for us to ensure that sufficient and effective top-up channels were easily available to all segments of users. Not only did the use of the card itself surpass our expectations, but the electronic top-up channels were very popular with almost 60% of top-ups taking place electronically over the Internet, or using the phone or mobile app.

Our system is easy to use. There is no need to choose the type of ticket to buy. There is no need to plan and think what the best fare will be based on what travelling patterns may be for the next few days or



Malta Public Transport has a fleet of 380 buses

weeks. The card automatically chooses the best fare available at any time so that customers just have to top-up their cards and validate them every time they board the bus. It can also recognise interchanges carried out along routes, therefore allowing passengers to change routes without being charged again.

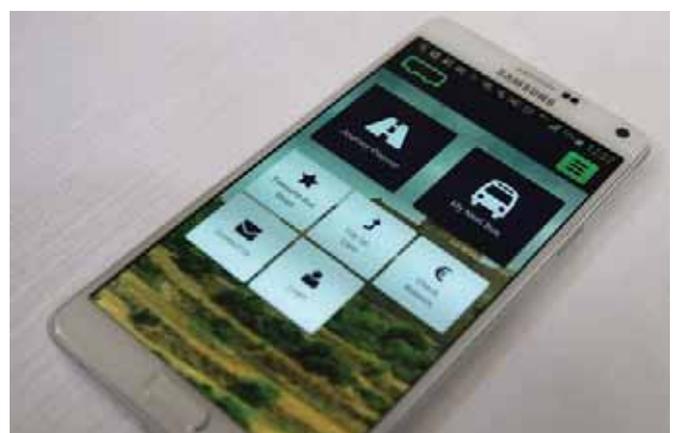
In the first customer survey of 2016, nine out of 10 tallinja card users were satisfied with the service. The opportunities are infinite. Now that half the population in the country has this bus card, it can, and will in the near future, be used for multi-modal transport and integrated ticketing systems.

Malta Public Transport also provides other cards that can be used immediately without the need to register. The '7-Day Explore' card provides unlimited travel for one week. There is a card for adults and another for children (up to 10 years old). An additional card, the '12 Single Day Journeys' card, offers flexibility with reduced fares; perfect for those using the bus every now and then, this card can be shared and is valid for one year.

Standard cash tickets can also be purchased from the driver on the buses. These tickets are Single Journey tickets that can be used to get to any destination within two hours, including interchanging.

### The new, customised fleet: Euro 6 engines and narrower buses for Maltese roads

We have invested significantly in modernising the bus fleet, making it



Passengers can top-up their tallinja card using the Malta Public Transport app

## RTPI & SMART TICKETING

### SUPPLEMENT

safer, more environmentally-friendly and more comfortable. Throughout summer 2015, 143 new Euro 6 buses were put into service featuring the latest emission standards together with improved safety and comfort standards.

Apart from contributing to the overall quality of the service, they also contributed to the reduction in maintenance and fuel consumption costs. Additional new buses have already been introduced in 2016 without any contractual obligation to do so, making our fleet one of the youngest and most environmentally-friendly in Europe.

With the latest technology when it comes to diesel engines, our fleet is environmentally-friendly and efficient, offering our customers an added benefit by contributing towards a better environment when travelling by bus.

All route buses are cleaned and maintained regularly and are equipped with air-conditioning systems for added comfort. All the new buses have two doors to facilitate the boarding and alighting of passengers.

The availability and reliability of the fleet has increased significantly and in a consistent manner, almost reaching the standard levels in Europe in just one year.

### **Investing in people: recruitment and training**

A major recruitment drive was conducted by the company to almost double the amount of drivers. We recruited over 600 new drivers in 2015 bringing numbers up to the required levels in order to provide an efficient bus service. All the new drivers have been through rigorous training to obtain their international Certificate of Professional Competence.

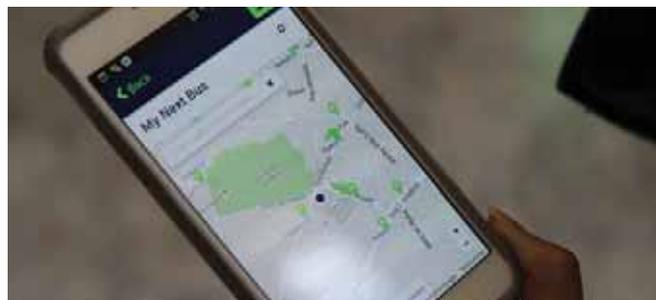
The health and safety of employees and the safety of the environment in which they work is a top priority for us. Buses are constantly on the road and we are not only responsible for the safety of our employees, but also for the safety of our passengers and of the public in general.

With 5,200 bus trips carried out every day, we have a major role to play when it comes to road safety. Despite running very ambitious training plans and putting safety measures in place to reduce accidents, the injuries per million passenger ratio has already dropped significantly over the last year, which clearly shows that we are on the right track.

We are investing in technology and in our employees to improve safety and the overall customer experience. In fact, we have recently

### **Bus services in Malta – historical background**

On 3 July 2011 the bus service in Malta was taken over by a subsidiary of the Arriva Group. This followed a competitive tendering process launched in July 2009 by the government. The operating company faced a number of operational and financial challenges during the last quarter of 2013. The image of the company and the services subsequently systematically deteriorated. A mutual decision was taken between the government and Arriva Malta Limited for the government to buy back the company and take over the bus service and re-issue a competitive tender to identify a new bus operator in 2014. Following this mutual agreement, the public transport service company was taken over by the government on the 2 January 2014 and was operated by the government for the entire year. The Government of Malta issued an 'expression of interest' notice for the provision of scheduled bus services in Malta and Gozo and the sale of the existing company, and Autobuses de Leon (ALESA) was selected as the preferred bidder. The related evaluation and negotiation process was concluded towards the end of 2014. The share transfer was subsequently completed on 8 January 2015 when the new company began operating the public transport service.



**The Malta Public Transport app provides real-time information about bus arrivals**

brought a new driving simulator to Malta which is now being customised to reflect the Maltese road network. Although the simulator is a training system that has been previously tried and tested in other companies in our group, it is a first for Malta that will undoubtedly contribute towards improving the skills of our drivers, particularly in circumstances that could otherwise not be easily assessed and trained on the road.

### **Significantly extending the route network**

A major change was also made to our bus route network in line with the contracted requirements set by the contracting Authority following an extensive government public consultation. This too required investment in planning, training and information.

These route changes meant that there was an increase from 25 million kilometres to almost 30 million kilometres per year. The frequency of trips was also increased from 4,800 up to 5,200 trips daily, with a further increase to 5,600 trips during the summer months.

### **A positive outlook**

In the first six months of 2016 we experienced an increase in passenger numbers and invested in another 33 new Euro 6 buses.

We continue to review the performance of each bus route to identify whether further improvements can be made. It is difficult to provide a high quality public transport service in Malta without sufficient bus priority measures. Our company has established a constructive relationship with the Transport Authority<sup>3</sup> to study solutions that can make public transport easier to use, and faster.

While being very well aware of the challenges we face, we are committed to improve the overall bus user experience and to provide a safe, credible and efficient bus service in Malta and Gozo; one that will convince more car users to take the bus. 🚗

### **References**

1. The name 'tallinja' comes from the Maltese words 'tal-linja' which is the way the Maltese people refer to the bus service
2. Gozo is a smaller sister island in the Maltese archipelago with around 32,000 residents
3. The Authority for Transport in Malta is the contracting authority responsible for developing and controlling public transport in Malta.



**Konrad Pulé** has been involved in the land transport sector for the past 13 years having worked on various transport projects in Malta. He was appointed as Chief Officer for Land Transport within the Authority for Transport in Malta in 2010 where he was responsible for the regulation of driver training, testing and licensing, vehicle registration, goods transport, and passenger transport. In 2015 he took on the role of General Manager of the bus company, Malta Public Transport.



# Advanced mobile apps to enhance NCT's understanding of customers in real-time

Nottingham City Transport (NCT) are introducing a significant upgrade to their existing mobile app offering, including a new mobile ticketing and data analytics system that will allow them to gain greater understanding of their customers in real-time. To learn more, *Eurotransport* interviewed **Anthony Carver-Smith**, Marketing Manager of NCT, and **Tom Quay**, Managing Director of Base – the company behind the upgrade – who has worked with NCT since 2013 on a number of digital technology projects, including the current NCT mobile apps.

“Over the last three years we’ve learnt a huge amount about what matters to passengers and what doesn’t when it comes to travelling around the city,” explains Tom Quay who founded Base’ almost a decade ago at the age of 27. “We’re now well aware of their expectations when using an app to help them catch a bus. It may seem obvious, but until you live and breathe the feedback on a daily basis you can make a lot of assumptions about what people want in a given situation – and you will rarely get it right the first time.”

Tom describes how his team have used this experience to incubate a transport technology start-up from within their existing software business and built a system that they’ve called ‘Passenger’, which he says will help to put real-time information about customers at the heart of the company’s operations. In an industry that has historically experienced difficulty with implementing cutting-edge technology, he’s open about the challenges he faces.

Tom continues: “It’s not just about building an app and then

# RTPI & SMART TICKETING

## SUPPLEMENT

stepping back. Customers expect a response to their questions and feedback quickly and they want to see that you understand their issues, whether they are technology or service related. Too often, we as an industry have created a digital solution and thrown it over the fence, without any real clue as to how it has landed. If we're genuinely going to disrupt the customer experience for the better and keep pace with the changing world, we need to work in different ways; we need to innovate."

The key enabler that Base has built into their new product isn't the technology itself, but the agreement made between the partners. The contract has been designed around Agile software principles, allowing the apps and system to evolve rapidly and change in response to customer needs and feedback. Experimentation is important too, including provision for controlled tests with customers who are keen to trial beta features and new user experience ideas. The first two Agile principles<sup>2</sup> are as follows:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software
2. Welcome changing requirements, even late in the development stage. Agile processes harness change for the customer's competitive advantage.

The contract isn't just a license to use the company's software either. The partners will transfer knowledge at quarterly innovation events, which are an opportunity to strengthen a collaborative culture through interactions between the software developers, designers and operator staff. Shaping the product roadmap and agreeing the priorities together will help to create an ongoing dialogue that helps both sides to empathise with the challenges faced by the other, as they become part of an extended cross-company team.

Anthony Carver-Smith, Marketing Manager of NCT, adds: "We know that in order to embrace the speed of change, we must



**Nottingham City Transport (NCT) has identified the importance of understanding passengers, their journey habits and where they want to go in real-time**

adapt and explore new types of collaboration with experts who share our goals. Opening up data, backing disruptive ideas and sharing our new-found knowledge widely within our own industry will be instrumental in creating public transport networks that rival the comfort and convenience of the car. As we look ahead, the concept of ownership is already being challenged. Fleets of automated taxis and cars won't solve the huge congestion problems our towns and cities are facing, so mass transit has an important role to play. Even if we're not sure what that will look like yet."

In the era of 'big data', companies such as Uber and Lyft are leveraging data to provide the best transport option to customers, and public transport operators cannot afford to be left behind. To this end, the 'Passenger' system will help to provide useful insight from the data generated by millions of users as they travel the NCT network in and around Nottingham. The partnership between Base and the Data Science Initiative of Bournemouth University is underpinning the possibilities of 'Passenger' to create disruptive applications from such big data.

Anthony comments: "Understanding who



**Nottingham City Transport (NCT) carries over one million passengers per week on a fleet of more than 540 buses**

our passengers are, their journey habits and where they want to go in real-time is the true power of mobile apps and big data. We're excited to be leading the development of this capability, as we all start to envisage the city of the future and how our lives – as the people that live in them – will change."

At launch the new NCT Android and iOS apps will provide a single experience for passengers to buy tickets without the need for cash, or the pre-registration requirement of smartcards. Passengers will get real-time departure information via the INIT SIRI feed; be able to plan a journey; and will also benefit from 24-hour expiry on all tickets. A new mobile-exclusive five-day ticket will complement NCT's Easyrider range of products, and allow the operator to learn how it might be used by passengers, particularly those who work less regular hours.

"Tom and his team have a real understanding of two key elements for success; transportation and app technology," says Anthony. "When we saw what they are working on and how they are thinking about the challenges we, as bus operators, are facing now and in the future, it was a no-brainer. Being a partner in the development of these tools is fundamental to our success, and we're excited to be able to adopt the technology as an upgrade to our apps."

Anthony adds: "We have chosen Base and their new venture Passenger Technology Group for a number of reasons. Firstly, they know their onions. Secondly, and most importantly, they are challenging our industry to raise the bar in customer service. We know expectations are increasing all the time and apps are fast becoming the main touch-point between companies and their customers. Transport is no different. As an industry of bus operators we need to get good at apps, and everything that goes into delivering the always-on service our customers expect."

Tom ends with: "We are delighted to be launching 'Passenger' with NCT. We already have a long-established relationship with the team in Nottingham and we are looking forward to creating new opportunities for NCT to lead transport innovation in their world-class delivery of bus services". 

### References

1. [www.wearebase.com](http://www.wearebase.com)
2. Source: The Agile Manifesto, [www.agilemanifesto.org](http://www.agilemanifesto.org)



**Tom Quay** founded Base (We Are Base Ltd) in 2008 and has a background in user experience design and programming. With over 18 years' experience of working in creative technology roles, Tom has spent the last eight years enabling transport innovation and behaviour change through well-designed technology. Tom's key skills are in unifying stakeholder vision and turning complex requirements into real-world applications that are simple to use. Under Tom's guidance, the team at Base have delivered large-scale smartcard management, mobile app ticketing, network dataset management and real-time journey planning systems for transport.

**Anthony Carver-Smith** joined Nottingham City Transport (NCT) in 2002 and is a bus man through and through. After a couple of years working on the front-line in Customer Services, whilst he completed his degree in Business and Technology at Nottingham Trent University, he has undertaken several roles within NCT including network development, customer complaints and quality control. Since 2009 Anthony has been the Marketing Manager for NCT and has responsibility for all customer communication across all channels. NCT's award-winning social media and approach to digital technology comes from Anthony's hands-on involvement and – dubbed "Mr NCT" by followers – he enjoys direct conversation through social media with his customers.



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## Smart Ticketing Solutions.

INIT's integrated ticketing solutions allow a more efficient fare management and provide passengers the most convenient service. They support various standards including VDV-KA, ITSO, Calypso and EMV and allow

- ID- and Account-based Ticketing
- Smart Card Ticketing
- Mobile and Barcode Ticketing
- Check-in / Check-out
- Best Price Schemes
- Back Office System
- Revenue Clearing

Would you also like to ensure your passengers a positive customer experience while managing your fare processes more efficiently? Take the easy way and talk to us!

**init**  
The Future of Mobility



# A smarter approach to bus travel

It seems that all aspects of life in the modern world are becoming 'smarter' and public transport is no different. Today's consumer wants their plans to be researched, decided upon, paid for and confirmed at the touch of a button – usually on a smartphone or tablet and often while they are on the move – and this includes their travel plans. In this article [Alistair Smith](#), Stagecoach Group Director of Commercial and IT, explains how the UK bus industry is attempting to tackle the ever-increasing demands of passengers and even surpass their expectations.

Our challenge in the public transport industry is to deliver the technology and simplicity of travel that our customers increasingly anticipate and to keep up with their ever-changing requirements as much as possible.

Stagecoach, and the wider UK Bus industry, is working hard to achieve this, by joining forces with experts in the development of digital tools for consumers. We believe the right approach is to offer customers a choice of payment options, giving them ownership of that decision and making bus travel more convenient for all.

At Stagecoach we were the first bus operator in the country to equip our entire fleet of vehicles with smart ticket readers and to accept concessionary smart transactions across the board. Since then we have also launched our own commercial ticketing system – 'StagecoachSmart' – at all of our regional bus companies across the UK.

There are now more than 350 million smart transactions made on our bus services across the UK outside London every year – representing the largest smartcard scheme outside the capital.

The introduction of StagecoachSmart also allowed us to offer customers the ability to pay for their bus travel through automatic monthly payments, which has proved popular. In fact, all of our Megarider tickets are now only available via our smartcard and are no longer fulfilled on paper tickets.

Given that our own ticketing scheme involves government-standard ITSO technology, we are able to join forces with other operators and other modes of transport to deliver an even more integrated public transport network for customers.

In the past 18 months Stagecoach has helped deliver multi-operator smart ticketing in all of England's city regions, benefitting approximately 15 million people, as part of an industry-led project, involving all of the country's major bus operators and many smaller companies too.

The project – which involved closer collaboration between bus operators as well as liaising with local authorities – means that customers now benefit from seamless, good-value travel via any operator, using one smartcard in all of the country's city regions outside London.

Work is also underway on a similar scheme in Scotland, with multi-operator ticketing recently introduced in Aberdeen and Dundee, with further projects underway. As well as these city schemes, Scotland's major bus operators are also supporting the introduction of a single standard e-purse; a Scotland-wide 'Saltire Card' scheme that is being developed and delivered by Transport Scotland and which will enable customers to top-up their smartcards with funds – similar to the way an Oyster card works in London. The major Scottish bus operators will cooperate to enable these smartcards to be accepted on all their buses. In the future this will allow end-to-end journeys across Scotland to be completed on the various transport modes.

The country's major bus operators are also working on an ambitious scheme that could see contactless travel introduced on every one of the UK's +32,000 buses outside London by 2022. Work is on-going to investigate the business case around this project and to formulate next steps.

A number of years ago we were the first bus operator to trial contactless technology on our vehicles in Merseyside. While the idea of contactless payments was still very new at that time – and had not been widely adopted – the two-year trial proved that the technology could work for bus operators and customers. We are now working to roll-out contactless technology across our UK Bus fleet.

All of our buses in London also accept contactless payments and it is fast becoming one of the most popular payment methods with consumers across the country. Research shows that UK shoppers made more than one billion contactless purchases on credit and debit cards in 2015, and used the technology for almost one in eight of all card transactions in December.

Another area where technology has developed quickly is our online platform – we recently introduced an entirely new version of our stagecoachbus.com website, which has been designed from the bottom up with input from passengers and built entirely around the key features they have told us they want.

As a result, we have delivered a fully mobilised site, simple journey planning information, live running times and an easy-to-use e-shop that allows people to compare prices and purchase a range of tickets to be stored on their smartcards.

Earlier this year our Oxford Tube product, which is Europe’s most frequent express coach service, introduced a mobile phone app that lets customers buy tickets for travel direct from their smartphone.

The ‘Oxford Tube Mobile Tickets’ app represented the first delivery of mobile ticketing within our UK Bus division. Passengers can purchase their travel securely through Apple Pay, PayPal and credit or debit card. They can then activate their ticket prior to travel and simply show it on their mobile phone to the driver.

A range of Oxford Tube tickets are available through the new app including single; same day return; period return; seven day period pass; 12-trip ticket and Nightrider ticket.

Following on from that, Stagecoach has now launched a new UK Bus app, which is available free-of-charge for Apple and Android mobile phones and offers a range of additional customer benefits to make travelling by bus even easier.

Through the app, for example, we are offering mobile ticketing on our local bus services for the first time, allowing customers to pay for their travel using their smartphone. The move provides an additional payment option for customers alongside existing smart ticketing and cash payments.

Mobile ticketing, offering Dayrider tickets, is now live across our Manchester and Wigan business and will be rolled-out across all of Stagecoach’s regional companies in the coming months. Payments via the app can be made by PayPal, or via debit or credit card.

The app is not all about being smart on ticketing, though – it has a range of other smart features. It offers a simple journey planning tool that helps customers identify their nearest bus stop and the most suitable bus service for their journey requirements, including information on journey length and available fare options.



Stagecoach was the first bus operator in the UK to equip its entire fleet with smart ticket readers

Passengers can also access live running times via their smartphone to check the status of their journey before catching the bus.

In addition, the app enables customers to pinpoint their location during their journey, helping them determine which stop is most appropriate for them; where they are on the route at any one time; and how far they are from their destination. This will be of particular benefit to people who are not regular bus users, or those who may be visiting a new location and are unsure of the route the bus will take.

It is now possible for passengers to research and plan their journey, buy tickets and get journey information all by using their phone. When you think back to as little as five years ago, that was simply not possible. The bus industry – while admittedly still behind other industries in terms of technology – has come a long way in utilising the new tools that are available, to help make life easier for customers.

In Cambridge we are also continuing to trial Near-Field Communication (NFC) mobile phone technology with a view to potentially providing yet another payment option for passengers.

There is no doubt that the future holds further developments in this area. At Stagecoach we are already looking ahead towards prospective plans even while our current projects are being finalised. In 2015 we set up Stagecoach Digital, which brings in new skills and expertise from other industries to support our ever-growing digital agenda and drive further innovation to our customers.

Like many others, the bus industry is modernising. In addition to smart ticketing it is delivering a range of new benefits for customers, including on-board Wi-Fi, leather seats, charging points and the use of social media to engage with customers and provide service information.

Being smart across all areas of our business – including ticketing – will be key to our success going forward. 🚌



Prior to joining Stagecoach, **Alistair Smith** was Head of IT for United Distillers, UK (a division of Guinness) focused on retail and marketing. He is also a former Head of IT for East of Scotland Water. Alistair joined Stagecoach in 1999, becoming Group IT Director in May 2000. He built a cost-effective IT function to support the Group as it operated in the UK and overseas markets in Hong Kong, Sweden, New Zealand and North America. In 2012 he was appointed to the role of Stagecoach Group Director of Commercial and IT and has led many technology developments including the roll-out of Stagecoach’s commercial smart ticketing scheme; the delivery of multi-operator smart ticketing in England and parts of Scotland; the launch of a transformational new Stagecoach UK Bus website and app; and the delivery of real-time information for Stagecoach customers across the UK.



# Rejsekort: unifying different ticketing elements to create a common-use system

The 'old' system for paying public transportation fares in Denmark dated back to the 1970s and comprised tickets, multiple ride discount cards and monthly passes. After many years of use and extensive wear and tear of the system's equipment, action was required to improve the entire process. Instead of updating this outdated equipment, in 2003 the Danish transport operators elected to procure a new ticketing system called Rejsekort that would make it easier for customers to travel with multiple transport operators and ticketing systems. Here **Bjørn Wahlsten**, CEO of Rejsekort A/S, takes a look at what makes the Rejsekort system work, as well as its future initiatives.

In 2003 the Danish transport operators formed the joint venture Rejsekort A/S with the declared objective of 'overseeing the establishment and operation of an electronic ticketing system for public transport by train, bus and Metro, as well as associated activities'.

The owners of Rejsekort A/S include DSB (national rail); Copenhagen Metro and the regional bus operators Movia (Zealand); Nordjyllands Trafikselskab (Northern Jutland); Midttrafik (Central Jutland); Sydtrafik (Southern Jutland) and FynBus (Funen). FynBus operates bus services on the island of Funen and will become the last bus operator to join the Rejsekort system at the beginning of 2017.

## The Rejsekort system

Rejsekort is a chip card-based ticketing system for travelling by bus, train and metro. The Rejsekort unites Denmark's various transport

operators, pricing zones, ticketing systems and discount schemes into a common system that makes it easier to use public transport. Regional implementation of the Rejsekort system began in 2011 and now customers can travel nationwide by train and bus with a Rejsekort.

Beginning in 2017, customers will also be able to use the Rejsekort for journeys between Copenhagen and Malmö, Sweden.

## How does the Rejsekort work?

A Rejsekort is a smartcard with a built-in chip that communicates with card readers and handheld devices used by fare inspectors on buses, trains and the metro. The chip, card readers and handheld devices register and calculate the cost of passengers' journeys.

Customers purchase a Rejsekort and transfer money into their Rejsekort account. Journey fares are then deducted from

this balance. Customers can sign-up for a reload agreement which automatically transfers funds from the customer's payment card every time the Rejsekort balance reaches a designated minimum.

**Check-in and check-out:  
new possibilities for  
planning public transport**

Customers start a journey by 'checking-in' on a bus or at a station. Changing transport mode during a journey requires a transfer check-in; then, at the end of the journey, the customer must 'check-out' to determine the final journey fare. A pre-payment of DKK 25 is deducted upon check-in. The final fare is calculated at the end of the journey and the difference is refunded or deducted from the customer's Rejsekort balance.

Danish train stations have no gates and checking-in/out has been the subject of much discussion during the system's implementation and start-up period. Today more than 98.5% of all journeys are correctly concluded with check-out and customers are getting better at remembering to check-out. Older customers are the best at remembering to check-out, followed by children and parents, among whom mothers are best at checking-out. Those who have the lowest check-out rates are young men; particularly on Thursday and Friday evenings and especially in the early hours of the night.

The extensive check-in/out data from customers gives the transport operators and Rejsekort a precise and detailed picture of traffic flows and travel patterns. This means that the transport operators can plan better for peak/off-peak periods and they are better equipped for managing daily operations, particularly timetabling and coordination of bus and train connections – all of which benefits public transport passengers.



Rejsekort users are required to check-in and check-out to enable the back-office system to accurately charge for each journey made

Rejsekort A/S is responsible for the collection of all ticketing revenue from Rejsekort journeys and the administration of an accounting system that distributes revenue between the transport operators.

**Rejsekort.dk**

In many respects the Rejsekort has changed customer behaviour in the public transport sector.

First and foremost, customers use self-service options to a much greater extent: the majority purchase their Rejsekort at [www.rejsekort.dk](http://www.rejsekort.dk), while 87% of all re-loads are via self-service. Approximately 40% of customers have a re-load agreement for their Rejsekort, nearly 30% re-load their Rejsekort at a Rejsekort ATM and the remainder visit [www.rejsekort.dk](http://www.rejsekort.dk) to transfer funds to their Rejsekort using a payment card. Only about 13% of customers re-load at a staffed point-of-sale.

As a result, [www.rejsekort.dk](http://www.rejsekort.dk) is a very popular website, with more than one million visitors per month. In addition to being able to search for information about the Rejsekort on the website, customers can freeze their Rejsekort; contact the Rejsekort Customer Centre operated and managed by the transport operators; and view their personal Rejsekort information, including an overview of past journeys.

With a Personal, Flex, Business or Commuter Rejsekort, customers can use the self-service options, such as signing-up for a re-load agreement on [www.rejsekort.dk](http://www.rejsekort.dk).

**Rejsekort types**

There are five different types of Rejsekort for customers to choose from:



Approximately 1.9 million Rejsekort cards are currently active

# RTPI & SMART TICKETING

## SUPPLEMENT

1. Rejsekort Personal: issued with the customer's name and (optionally) photo printed on the card. It can only be used by the card holder and a re-load agreement can be registered for the card which can be 'frozen' in the event it is lost
2. Rejsekort Flex: this can be used by anybody and a re-load agreement can be established for the card which can be 'frozen' in the event it is lost
3. Rejsekort Anonymous: this is an anonymous card for use by anybody, but it cannot be 'frozen' or have a re-load agreement on it
4. Rejsekort Business: this is a Rejsekort for companies and public institutions that need to use public transport such as day-care institutions, schools and elderly care homes
5. Rejsekort Commuter Card: this is a personal Rejsekort that can only be used in the area chosen by the card holder when purchasing the card. When travelling outside of the pre-paid zones covered by the Commuter Card, the customer will be charged an additional fare for these extra zones.

Rejsekort Personal, Flex and Commuter can be ordered at [www.rejsekort.dk](http://www.rejsekort.dk), whereas Business must be ordered directly from a transport operator, and Anonymous can only be purchased and re-loaded at a staffed point-of-sale or the Rejsekort ATMs.

### Rejs Nemt and Check Udvej apps

Rejsekort has developed new apps to meet the changing needs of its customers. In 2015 Rejsekort collaborated with a partner company to develop the Rejs Nemt app which sends an 'alarm' to customers reminding them to check-out. Customers now have an extra opportunity to check-out if they forget, thanks to the June 2016 introduction of the Check Udvej app which enables check-out via a smartphone or at [www.rejsekort.dk](http://www.rejsekort.dk).

The Check Udvej app has been a great success with more than 130,000 customers downloading it onto their smartphones.

### Fare harmonisation

The Rejsekort system has provided the impetus for simplifying Denmark's public transport fares – a project that has garnered strong political support. Beginning in 2017, ticket fares in eastern and western Denmark will be harmonised in a simplified fare system.

### Rejsekort – revenue and journeys

In 2015 the Rejsekort system's revenue exceeded DKK 2.6 billion and in the first eight months of 2016 revenue exceeded DKK 2 billion.

In Greater Copenhagen more than 50% of the population over the age of 12 has used a Rejsekort within the past 12 weeks – nationwide, this figure is one in four people.

The Rejsekort is an established part of the public transport infrastructure. In a November 2015 survey, 69% of those asked said that the Rejsekort had made it easier, or much easier, to travel by public transport.



Rejsekort customers can re-load their cards via self-service machines

### Final delivery of the Rejsekort system and future initiatives

In 2015 the final component of the contract to supply the Rejsekort system was delivered. The Rejsekort has been in operation since 2011 and more than 2.2 million Rejsekort cards have been sold, of which 1.9 million are currently active.

The Rejsekort system was delivered some years later than originally stipulated in the contract. Rejsekort A/S kept the project within the financial framework of the original contract price, however, while also receiving compensation worth more than DKK 600 million. Part of the compensation is to ensure that the Rejsekort system delivered is updated to meet today's standards.

A security update is planned to begin in 2017, during which the Rejsekort system will migrate from MiFare Classic to MiFare DESFire.

Rejsekort A/S and the transport operators are closely monitoring technological developments in electronic ticketing, including the need for implementing new functions and technological advances. As a result, the Rejsekort will eventually be available in smartphone solutions making possible to pay directly with a payment card when using public transport. However, no solid business case currently exists for these solutions.

The Rejsekort back-office system is designed so that Rejsekort A/S can offer the transport operators account-based solutions for customers. 



**Bjørn Wahlsten** has been CEO of Rejsekort A/S since July 2008. He studied MA in Economics from Copenhagen University and joined DSB while studying. From the summer of 1975 he was quickly assigned managerial and leadership responsibilities in the fields of HR and organisational development. He then became Deputy Manager of Passenger Trains between 1984 and 1986, then Head of Full-Load and Combined Traffic at DSB Goods from 1986 to 1991. Bjørn then returned to the field of passenger trains with responsibility for the InterCity product and commercial planning in the run-up to the opening of the Great Belt Bridge. He was then appointed InterCity Division Manager in 1993, Director of National and Regional Passenger Trains in 1999 and Member of DSB Group Senior Management. In September 2016 Bjørn became a member of Eurotransport's Advisory Board.



# On the right track: the future of Australian and New Zealand transport infrastructure

By 2050 70% of the world's population is expected to live in urban environments – up from an average of 50% today. Australia and New Zealand are ahead of the curve in this respect, with close to 90% of the population currently living in urbanised areas. For *Eurotransport*, **Yasha Vojdani**, Interim Executive Director and **Angé Anczewska**, Manager of Development and Engagement at UITP Australia New Zealand (UITPANZ), provide details of current major public transport infrastructure projects across the region. These investments demonstrate commitment by Federal, State and Local governments to developing urban infrastructure for a growing and highly urbanised population, and highlight that effective public transport infrastructure networks are vital for the future growth, efficiency and productivity of cities.

Unlike other major cities around the world, Australia and New Zealand have the luxury of space and, as such, our cities have tended to develop over larger geographies, resulting in lower population densities. This type of topography creates challenges for public transport planning and delivery as less-efficient transport outcomes are typically achieved when compared with higher density geographies. For example, as a population we are highly reliant on our cars and, on average, our urban population will only take one public transport trip for every 10 urban private car trips.

## The urban landscape in Australia and New Zealand is changing

With high levels of population growth focussed on our metropolitan and urbanised areas, the public transport and road networks are starting to reach and, in some cases, exceed capacity during peak periods. Infrastructure Australia – the Federal Government's independent infrastructure advisory body – has estimated that the economic cost of congestion in Australian cities will increase three-fold over the next 15 years.

An effective public transport infrastructure network is crucial to ensure that our cities are fit for growth and that the efficiency and productivity of our cities are maintained.

Federal, State and Local Governments have all stepped-up to the challenge. To ensure our cities retain their statuses of being some of 'the best places in the world to live', significant investments in urban transport infrastructure have been committed that are focussed on growing transport networks and improving existing levels of service and quality.

ANZ is currently experiencing a once-in-a-generation transformation across its cities with respect to transport infrastructure. Roads are being ripped up to pave the way for light-rail projects across the country; huge tunnel-boring machines are churning through the Earth's crust to create brand new subterranean transport routes; and transport fleets and rolling stock are also being expanded and modernised. In addition, government agencies are embracing new technologies and innovations in this sector.

With a strong and growing pipeline of projects in the planning phase, this is, by no means, the final stop in our journey.

To follow, in this article, are just a few of many examples of how we are transforming the public transport infrastructure across the region.

## Major rail projects

### Sydney Metro

Sydney Metro' is one of Australia's largest public transport projects.

## WHAT'S HAPPENING IN...AUSTRALIA & NEW ZEALAND?

This new standalone railway will deliver 31 metro stations and more than 65km of new metro rail. Expected project costs are \$12 billion and the first stage of Sydney Metro will deliver the first fully-automated metro rail system in Australia. Sydney Metro City & Southwest is the second stage.

Sydney Metro Northwest is delivering eight new railway stations and 4,000 commuter car parking spaces to Sydney's growing North West. Trains will run every four minutes in the peak – that's 15 trains an hour.

### **Melbourne Metro Tunnel**

The Melbourne Metro Tunnel<sup>2</sup> is one of the largest public transport projects ever undertaken in Australia and the first major investment in Melbourne's CBD rail capacity since the City Loop was completed 30 years ago. The project has a value of \$10.9 billion and will create a new end-to-end rail line from Sunbury in the west to Cranbourne/Pakenham in the south-east, with high capacity metropolitan trains and five new underground stations.

The Metro Tunnel will comprise twin 9km-long rail tunnels connecting the Sunbury and Cranbourne/Pakenham lines. In addition there will be five new underground stations at Arden, Parkville, CBD North, CBD South and Domain with longer platforms to accommodate High Capacity Metro Trains (HCMTs) and high capacity signalling.

### **Brisbane Cross River Rail**

Cross River Rail<sup>3</sup> is the Queensland Government's highest priority infrastructure project and an important part of our vision to cater for future growth, unlock economic opportunities and make Queensland a more internationally competitive state.

A 10.2km-long link from Dutton Park to Bowen Hills – with 5.9km of tunnel under the Brisbane River and CBD – Cross River Rail will connect to both northern and southern rail networks from day one of operations, providing significant benefits to commuters from both directions. This second rail river crossing will ease congestion, improve network reliability and increase accessibility to the Brisbane CBD, allowing more people to travel longer distances, with shorter journey times.

### **Queensland Moreton Bay Rail Link**

Moreton Bay Rail Link<sup>4</sup> will deliver a 12.6km dual-track passenger rail line between Petrie and Kippa-Ring, including six new rail stations at Kallangur, Murrumba Downs, Mango Hill, Kinsellas Road, Rothwell and Kippa-Ring.



Artist impression of the new CBD South underground station along the Melbourne Metro Tunnel line



Artist impression of how the Sydney Light Rail will look at Circular Quay

The Moreton Bay Rail Link will provide a focal point for the local community and will include a number of features including 22 bridge structures, new rail stations, 3,000 car parks, stabling and train crew facilities and a 3m-wide shared path for cyclists and pedestrians across the entire route.

### **Perth City Link**

Perth City Link<sup>5</sup> is a collaborative project funded by three tiers of government and led by the Metropolitan Redevelopment Authority (MRA) and the Public Transport Authority (PTA). The transport project is being delivered in two stages: Rail (2011-2013) and Bus (2014-2016).

The project area is a live operating rail environment. Works are being scheduled to minimise disruption to train services and to people moving in and around the project area. The rail project area is 1.2km-long. Sinking the two remaining (Fremantle Railway) lines between the Horseshoe Bridge and Milligan Street, in conjunction with construction of a new underground Wellington Street Bus Station, will connect Perth's Northbridge District with its main city retail and business area. It will also enhance the vitality of the area by optimising integration of the busiest public transport HUB within the metropolitan area and its surroundings.

### **Perth Forrestfield-Airport Link**

Forrestfield-Airport Link<sup>6</sup> is a new train line that will connect Forrestfield to the city, opening up Perth's eastern suburbs to the rail network for the first time. The rail link will connect with the existing Midland line near Bayswater Station and will run to Forrestfield through underground tunnels to ensure minimal impact on the existing land and road network.

### **Auckland City Rail Link**

The City Rail Link<sup>7</sup> is a rail project that consists of an electrified, double-track rail tunnel underneath Auckland's city centre, running for approximately 3.5km between Britomart Transport Centre and the Western Line, connecting just west of Mount Eden Railway Station. Two underground stations will be provided in Auckland's CBD: Aotea Station (located near Aotea Square) and Karangahape Station (located in the vicinity of Karangahape Road).

In September 2016 the government formally confirmed its intention

to fund its proposed share of 50% of the City Rail Link. The cost of the City Rail Link was then re-estimated to be between \$2.8 and \$3.4 billion, subject to tenders for remaining contracts.

### Major light-rail projects

#### **Sydney CBE and South East Light Rail**

The CBD and South East Light Rail<sup>8</sup> will be running from Circular Quay at the northern end of the Central Business District to the south-eastern suburbs of Randwick and Kingsford. The line will be part of Sydney's light-rail network. Major construction commenced in October 2015 and the project is managed by Transport for NSW, a statutory authority of the New South Wales Government. Construction, operation and maintenance of the line are contracted to the ALTRAC Light Rail consortium.

Transport for NSW is investigating an extension along the southern Anzac Parade corridor. Three potential options are being examined: a 1.9km-long extension to Maroubra Junction; a 5.1km-long extension to Malabar; and a 8.2km-long extension to La Perouse.

#### **Canberra Light Rail**

With operations to commence in 2019, light-rail will run from City to Gungahlin, along Northbourne Avenue and Flemington Road, delivering high quality, reliable and frequent public transport along one of Canberra's busiest corridors. The 12km-long route will offer six-minute peak service (10-15 minute off peak), 13 stops, and 14 light-rail vehicles with a capacity of more than 200 people.

#### **Gold Coast Light Rail (Stage 2)**

The 13km-long Gold Coast Light Rail opened in July 2014. Gold Coast Light Rail (Stage 2)<sup>9</sup> will connect the existing light-rail system at Southport to heavy-rail at Helensvale Station. The 7.3km-long route runs from Helensvale heavy-rail station adjacent to the Gold Coast Line, then adjacent to the Smith Street Motorway to connect with Stage 1 at the Gold Coast University Hospital light-rail station.

The alignment uses existing road and rail corridors, therefore reducing impacts on the community and the environment. The reference design includes three new stations at Helensvale, Parkwood and Parkwood East. It also includes a new 1,000 space car Park 'n' Ride facility at Parkwood Station and a 400 space expansion of the existing Park 'n' Ride facility at Helensvale Station.

### Major bus and ferry projects

#### **Sydney Northern Beaches B-Line**

The NSW Government is delivering a programme of service and infrastructure improvements to deliver a new B-Line<sup>11</sup> bus service. The new service is scheduled to start operating in late-2017. The B-Line will provide more frequent and reliable services for customers travelling between the Northern Beaches and the Sydney CBD.

B-Line services will run every five minutes in the busy morning and afternoon peak commute periods, and every 10 minutes at other times of the day, including weekends. The B-Line service will run until 12.30am every day, with services every 10 minutes in the evenings up to 11pm.

#### **Sydney Ferry modernisation**

The first stage of upgrading the Sydney Ferries' fleet<sup>12</sup> is an investment



Artist impression of the rolling stock set to operate on the Canberra light-rail line which will be 12km-long and is expected to commence in 2019

in six new ferries, with the first vessel due to be on the water in late-2016. The rest will be delivered progressively throughout 2017. Following an open tender process that attracted international bids, Australian shipbuilder, Incat Tasmania Pty Ltd, has been awarded the contract to prepare detailed designs and build the new ferries. Incat is based in Hobart and renowned internationally for high quality environmentally-friendly and efficient vessels.

#### **Melbourne SmartBus**

A network of premium SmartBus<sup>13</sup> routes operates across Melbourne. The SmartBus network includes three orbital SmartBus routes and four Doncaster Area Rapid Transit SmartBus routes that run from Manningham to the City.

SmartBus has been designed to complement Melbourne's radial train and tram network by providing 'cross-town' connections to train stations, tram lines, schools, universities, hospitals and shopping centres. Services run along major arterial roads, making journey times shorter and journeys more direct for passengers. 📍

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**Yasha Vojdani** leads the UITP's activities in Australia and New Zealand. Prior to joining UITP he was a transport sector consultant and has experience working across European and Australasian transport markets.

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# Where next for open transport data in Europe?

As transport data is consistently the most highly requested type of open data, here **Jonathan Raper**, Board Member of the UK's Department for Transport Transparency Board and CEO of TransportAPI<sup>1</sup>, focuses on the progress that has been made in releasing open transport data in Europe and where the challenges to further progress lie.

The open data movement has gained significant traction around the world since public sector information re-use initiatives were revitalised by the open source movement in the middle of the last decade. Governments saw an opportunity to re-connect with electorates through transparency initiatives such as the data.gov website established by the Obama administration in 2009. In 2011 a group of eight governments founded the Open Government Partnership (OGP)<sup>2</sup> and committed themselves to 'pro-actively provide high-value information, including raw data, in a timely manner, in formats that the public can easily locate, understand and use, and in formats that facilitate reuse' (OGP Declaration). The EU created the EU Open Data Portal<sup>3</sup> in 2012 to release data held by EU institutions and has also driven data releases through Directives such as INSPIRE for environmental data. In 2013 the G8 nations signed the Open Data

Charter including an expectation that all government data would be published openly by default. The Global Open Data Index<sup>4</sup> created by the Open Knowledge Foundation tracks progress in the releases of open data around the world.

The status of open transport data releases in Europe needs to be considered at both national and European level to establish the overall picture. At national level there are significant differences across Europe: the UK, Sweden, Finland and France have released significant amounts of open transport data. However, a number of European governments including Germany, Belgium, Austria, Switzerland, Poland and Portugal are not members of the OGP and appear to lack national level commitment to open data, even though some cities such as Berlin (see **Figure 2** on page 45) and Vienna have opened transport data locally. At EU level the Intelligent Transport Systems (ITS) Directive has

addressed the release of open transport data across the Union, but with limited outcomes so far.

To assess existing achievements and the challenges to further progress firstly requires a look at the policy drivers in key European states and at EU level. There are three significant policy drivers for the releases of open data:

1. Open source principles; for example, as in the approach to open data in Finland<sup>5</sup>
2. Economic drivers for open data release; for example, in the G8 Open Data Charter 2013 and the EU Commission communication on Open Data COM/2011/0882
3. Transparency drivers; for example, as seen in the UK Government Open Data Manual<sup>6</sup>.

These policy drivers have different levels of importance for each government depending on cultural and political conditions. Some European governments do not have a political culture of transparency; have small service sectors for data processing; and do not operate on open source principles. In these states open data releases have been limited as the policy drivers are weak, and transport data releases have been limited; for example, Portugal – which is 54th on the current Global Open Data Index. Where these three policy drivers are each strong, there have been significant open data releases. A good example is in the UK, where virtually all transport data has been released publicly and there is a Transparency Board for Transport<sup>7</sup> to supervise and promote further releases of transport data.

A second consideration for many governments is the cost of releasing open data. The operating assumption behind the G8 Open Data Charter and EU COM/2011/0882 is that government is now conducted digitally and the marginal cost of data release is close to zero. The reality is more complex and it depends on how the data is collected and managed as to the real marginal cost of distribution. The starting point for an analysis of open data costs should be each government's Public Task<sup>8</sup> as this is the 'information that a public sector body must produce, collect or provide to fulfil its core role and functions'. It should not matter whether this data is collected by the government itself or through a private sector contractor. In both of these cases taxation is paying for a core government function that



Figure 1: Screenshot from www.data.gov.uk

produces data, and governments should always own the rights to re-distribute this data.

For data that changes periodically, i.e. no more than daily, and that is part of the public task, the marginal costs of distribution through a portal such as data.gouv.fr<sup>9</sup> should be very small. There may be one-off start-up costs, but in principle the data collection process should be designed to produce the data automatically. Transport data that should be covered by this low marginal cost distribution should include road networks, stop/station locations, service timetables and fares information. For dynamic live data such as live departures and traffic speeds, there are costs to operate a distribution model, and these divide into scalable and non-scalable approaches. Many sources of live transport data are provisioned with a capacity that is only sufficient for the public task. Using a non-scalable distribution model means adding



Figure 2: Screenshot from www.daten.berlin.de

The advertisement features a person in a suit holding a glowing blue icon representing the Internet of Things (IoT). Below them is a server rack. The text reads: 'While others think about the IIoT ... we are already there.' It promotes Moxa's solutions for industrial networks and computers. A small box mentions 'sipc drives Nuremberg 22-24 Nov 2016 Hall 9, Booth 231'. The bottom section includes the slogan 'Networks and computers for a smarter industry.' followed by a list of benefits: 'Powerful computers designed for your needs', 'Secure and reliable networks – anywhere, anytime', and 'Vertical integration from SCADA to field device'. It concludes with 'Moxa in the middle.' and the website 'www.moxa.com'. The Moxa logo is at the bottom right with the tagline 'Reliable Networks - Sincere Service'.

## TRANSPORT DATA

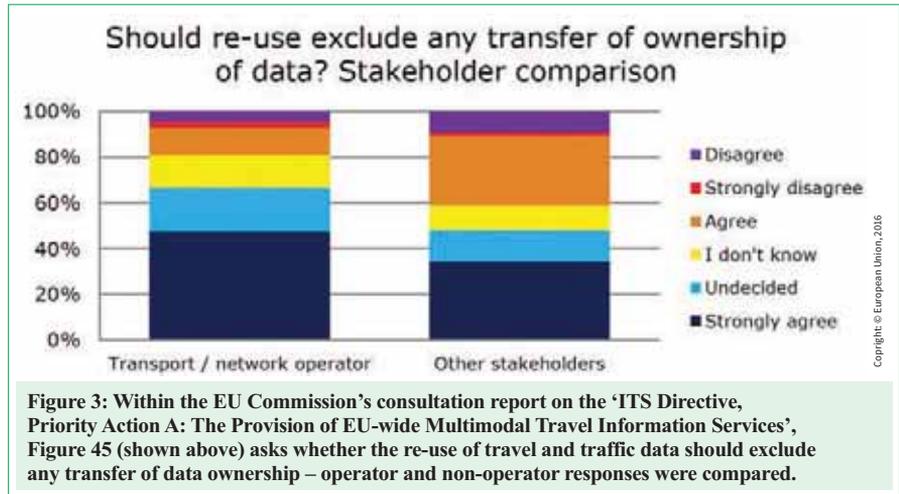
capacity sufficient to handle all end user requests and this can have significant cost, as each additional user means more cost for the government. Transport for London (TfL) operates this kind of model for access to live departures and journey planning and they have committed a budget for this data access under their customer service budget line. Scalable distribution involves transferring a complete copy of the live data through a streaming service so that a data aggregator can take the responsibility for handling the end user enquiries. Many bus companies in Europe offer access to their live departure SIRI streaming feeds; for example, in Tampere, Finland<sup>10</sup>.

Releasing dynamic and live transport data has a cost and, thus, becomes a public expenditure issue, although the unlimited potential costs from end users can be mitigated by scalable distribution through aggregators.

A third consideration around the release of open data concerns the potential demand for the use of the data. It has been argued by some public bodies appearing at the UK Transparency Board for Transport that even if there is a policy driver; an agreed public task producing data; and low marginal costs of redistribution; there still should be no release of open data as there might be no demand for it. This is essentially a circular argument as data users and aggregators cannot demonstrate productive uses if there is no data to re-use. If there are economic drivers for open data release, as in the EU Open Data policy (COM/2011/0882), the release of data should be regarded as an investment in growth by opening up access to the value encoded in the data. The Open Data Institute has documented the evidence for the public benefit from open data<sup>11</sup> showing, for example, that by 2020 the use of open data will have reduced public administration costs across the EU28+ by €1.7 billion, according to Capgemini.

A final consideration around the release of open data concerns specific barriers that exist to data distribution. Privacy is one often cited barrier to the release of open data, and this can be a concern in transport where transaction data can track the individual or log their intentions e.g. in journey planning requests. However, this concern should not be used as a generalised reason to withhold data from release. Data protection legislation in Europe contains provisions that require any processor of data to be registered and to protect personal information, so this should not be an obstacle for open data release, per se.

Another obstacle to open data releases, especially in transport, emerges from the role of the private sector in delivering some government services. Where transport services are contracted out to the private sector by government, the intellectual property rights to the data often belong to the private sector so it cannot be released as open data. If the private transport operator is a monopoly provider it is often motivated to organise its own value-added for-profit data distribution model. In the 2015 EU Commission consultation report on the 'ITS Directive, Priority Action A: The Provision of EU-wide Multimodal Travel Information Services'<sup>12</sup>, it was reported on page 72



that 'private sector transport operators (in rail) are concerned about losing direct control of their data' if open data releases are mandated. However, where monopolies are created or sustained by public policy there should be additional accountability to the public through open data, and government should acquire rights to the data by regulation or at contract renewal.

The current state of open transport data releases in Europe reflects the national policy drivers, perceived and actual costs of distribution, demand for the data, privacy concerns and commercial arrangements around the data. However, where the national situation produces no open transport data releases there are several societal consequences: lower innovation; lack of accountability; loss of growth opportunities through re-use; and it is usually possible to achieve these benefits without any losses for the data creators. The EU Commission has the best opportunity to break through this impasse through concerted action under the ITS Directive. However, this will require the Commission to assert the primacy of growth and innovation over the rights of commercial providers and government data owners to maximise the value from open transport data. 📍

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**Jonathan Raper** is CEO of TransportAPI – Britain's leading provider of transport data-as-a-service. TransportAPI offers a RESTful API for most of Britain's transport system and a digital platform for apps and services. TransportAPI's solutions power transport operator sites such as First Group and Ford Mobility, as well as services such as ELGIN's roadworks.org portal and Heathrow Airport's public transport services for web and apps. Jonathan has led TransportAPI from start-up, through residency at the UK government's Open Data Institute and into a rapid growth scale-up stage employing 13 people. He is a Visiting Professor at City University London, sits on the UK Department for Transport (DfT) Transparency Board and the ICT Knowledge Transfer Network Industrial Advisory Board.

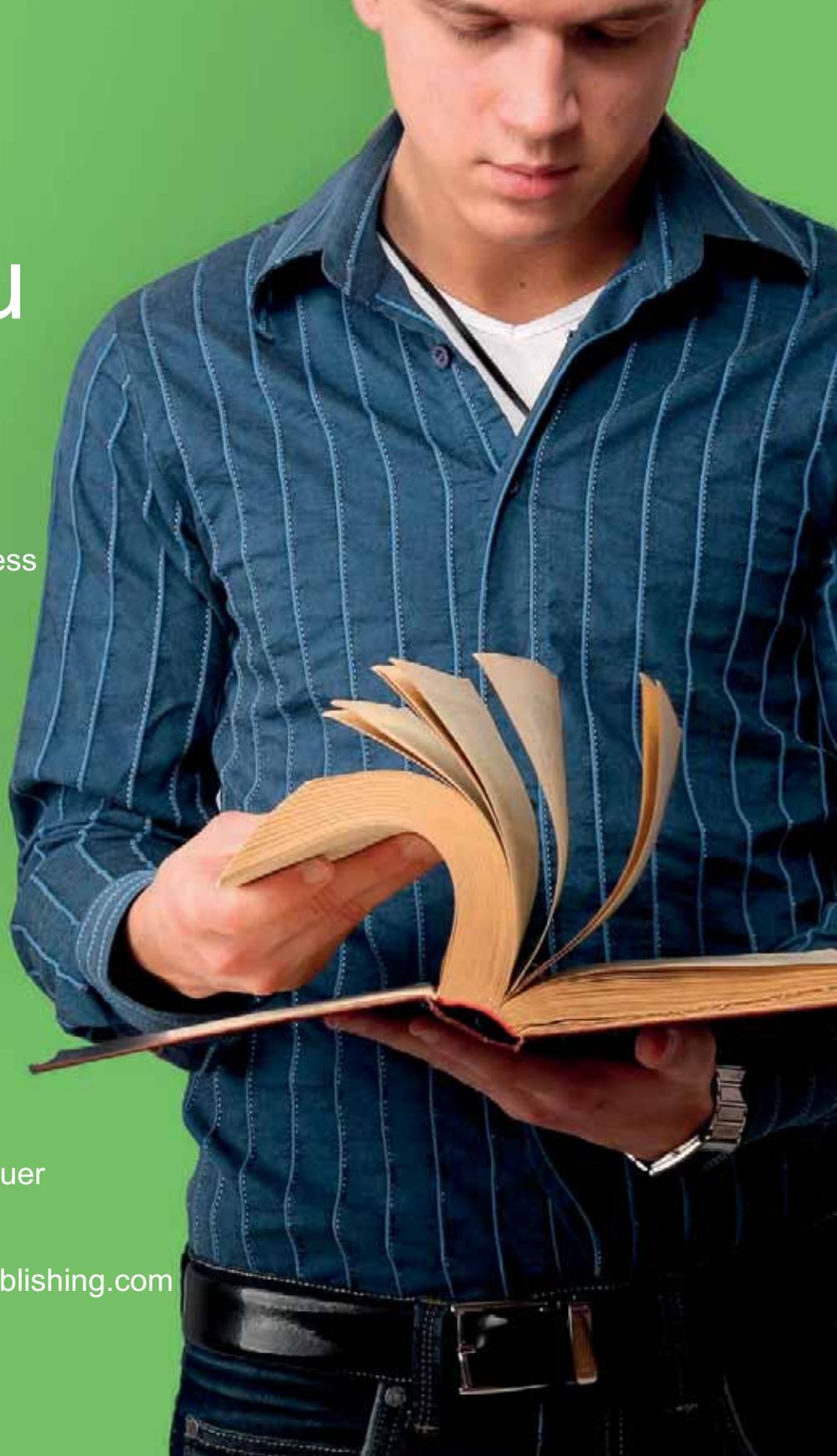
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On 1-3 November 2016, **Euro Bus Expo** – the European platform for the bus and coach industry – returns to the NEC in Birmingham, UK, and with new technology set to be unveiled; the event organisers predict it will be the biggest show yet. The free-to-attend event offers an unrivalled opportunity to meet with the industry and see the latest vehicles, services and product innovations – all under one roof. Confidence in the market is high and the exhibitor space of the event is already sold out.

This year the show will feature 300 exhibitors showcasing 100 of the latest vehicles along with displays covering interiors, accessories, workshop equipment, and services such as training and legislative updates.

Online registration for visitors is already open for the show which occurs every two years. In 2014 approximately 9,000 people from 47 countries visited the show.

With the predicted arrival of driverless cars on the mainstream market in a few years, eyes are already turning to how this technology will be applied to the bus and coach markets, and it will be one of the hot topics at this year's expo.

### Automation

While driverless cars may be attractive, emissions and space considerations mean that for towns and cities, public transport will remain key. And in terms of driverless buses and coaches it is not a case of *if*, but *when* three of the biggest European manufacturers will announce automation plans.

Volvo, Scania and Daimler have all said that while coaches and buses may not yet be at the top of the automation to-do list, there can be no doubt that as the technology spreads, coaches and buses will also go self-driving.

Last year, Volvo Dynamic Steering (VDS) was confirmed as being the first step on the manufacturer's road to coach automation. Volvo has now said that a proof-of-concept driverless vehicle is just two years away.

Meanwhile, Daimler claims to 'lead the way' in self-driving trucks, and it says that the technology will transfer to its Mercedes-Benz coach and bus line-up reasonably easily.

In July it revealed its Future Bus – a fully-automated bus – on a 20km demonstration drive from Amsterdam.

Based on its existing diesel Citaro platform, it demonstrates how far the technology has already come, and how it could be applied to bus routes, where the same piece of road is always used.

Elsewhere, Scania's Group President and CEO Henrik Henriksson said: "We will see automation in all vehicles, large and small. It will come to cities last of all, and coaches and buses will be part of that."

Henrik adds that the eventual move towards driverless coaches and buses forms part of a larger-scale shift that will grow efficiencies and redefine vehicles. It isn't a standalone technology; instead, it will go hand-in-hand with electrification of drivelines and increased vehicle connectivity.

"Automation will come in steps," Henrik says. "It is a highly-disruptive technology that will change the name of the game. Connectivity will be the foundation of an autonomous vehicle."

Already much of the technology needed to deliver autonomous vehicles is already here, and visitors to Euro Bus Expo will be able to see vehicles fitted with keep lane assist, automatic emergency braking, and cruise control of the type that will be used in 'platooning'.

### Indoors and outdoors

Once again the show will feature a technology zone, outdoor display area and an accessibility zone.

There is a wealth of exhibitors covering every conceivable aspect of coach, bus and minibus operation, but undoubtedly the vehicle display will attract significant attention, with a number of vehicle launches planned for the event.

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Meet us at Euro Bus Expo in Birmingham, booth T 174.  
E-mail [meetandgreet@faltcom.com](mailto:meetandgreet@faltcom.com) to set up a personal meeting.

**FÄLTCOM**

SHAPING THE INTERNET OF THINGS

With the move to electric buses – promoted by the decision of London and Paris to move to electric-only bus operation over the next few years – a number of vehicle manufacturers will reveal their latest products. Represented will be vehicles from leading suppliers including: ADL; Beulas; Daimler (EvoBus); EVM; Indcar; Irizar; MAN; Optare; Otocar; Scania; Sitcar; Tamsa; Unvi; Van Hool; VDL; Volvo; Wrights Group; and Yutong.

First-time exhibitors include KFS Special Vehicles; Era Elektronik; Aquarius IT; Isafetek; Find My Bus; Total UK; Jactron; Big Change Apps; Kiel Seating; Allison Transmission; Bowmonk; and QUS AdBlue.

There is also a dedicated Accessibility Zone with passenger lifts, ramps and specialist small vehicles on display.

Returning suppliers confirmed include Lloyd Morgan Group; MiX Telematics Europe; Gas Bus Alliance; DILAX Systems; Green Urban Technologies; Kärcher UK; Distinctive Systems; Scan Coin; Transport Benevolent Fund; Hanover Displays; Lytx Europe; and McKenna Brothers.

### Masterclass

In addition, a Masterclass theatre will provide visitors with free access to presentations from technology experts and operators, covering many of the key issues facing the sector. Always a very popular aspect of Euro Bus Expo, it attracts key speakers on hot topics of the day.

The speaker list at the Masterclass theatre has been confirmed and among those sure to attract attention are presentations from Mark Fowles from award-winning Nottingham City Transport; Jeff Counsell, Managing Director of Midlands-based coach and bus operator Trent Barton; and Martijn Gilbert, CEO of multi-award winning Reading Buses.

There will also be presentations by the Confederation of Passenger Transport (CPT) – the UK's operator trade body – with

## Quantum – the revolutionary wheelchair securement system

With Quantum systems now in place across the UK, Europe and the USA, momentum is growing around new levels of accessibility for wheelchair users on public transport. Quantum (pictured) has been designed to ensure the highest level of passenger safety and accessibility.

Emma Muldoon, a Member of the Muscular Dystrophy Trailblazers, is usually apprehensive about using public transport; she told Q'Straint she feels unsafe on buses as there is usually no way of securing her heavy-power wheelchair to stop it from sliding around.

“Once the system was activated I felt extremely safe and secure on the bus even when it turned around corners. My wheelchair didn't move at all during the journey, which meant I could relax and enjoy the ride rather than feel tense and uncomfortable. I'll definitely start using public buses again if they are fitted with the Quantum securement system.”

Visit Q'Straint at  
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seminars delivered by CPT President and First UK Bus Head of Policy John Birtwistle, alongside CPT Director of Policy Development Steven Salmon.

### Workshops

As the saying goes: *If the wheels aren't turning, the bus ain't earning.* With bus duty cycles in cities being as much as 18 hours a day, workshops are under pressure to ensure that operations are kept running, while having as little spare capacity – important given the amount of capital that can be tied up.

With exhibitors representing every link of the supply chain, Euro Bus Expo 2016 is the premier showcase for the bus and coach sector and is a vital 'must visit' for workshop managers.

To solve the conundrum of how to keep vehicles on the road, workshop managers are increasingly turning to technology and suppliers in the passenger sector have come up trumps with systems that can predict when issues are arising, before they become a problem.

## The smart city: cell-powered traffic information

Billions of devices are expected to be connected to the Internet of Things (IoT) by 2020. Sensors receive and analyse data and communicate with the outside world to create smarter and more attractive environments, products and services. This transformation is described as bigger than before and after the advent of the Internet and smartphones.

Cities around the world have embraced the idea of 'connectedness'. In New York the New York City Department of Transportation (NYC DOT) is introducing a programme to improve the dissemination of traffic information at NY bus stops with the help of cloud-based technology.

Solar cell-powered traffic information signs are equipped with a connectivity platform from Fältcom which receives real-time information

via the Internet from a GPS-connected server on the buses, making it possible to inform riders how many stops away their bus is.

“We are proud that our technology is contributing to develop the dissemination of traffic information and facilitate travel in a metropolis like NYC,” says Fältcom CEO, Mikael Långström.

Fältcom develops smart systems for public transport. The company is the market leader in Scandinavia for mobile platforms on buses. They recently opened a sales office in Cambridge UK.

Visit Fältcom at Euro Bus Expo  
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## SHOW PREVIEW

On the drivetrain, for example, Voith Turbo's in-built gearbox software analyses each change and if it detects any alteration, such as in oil pressure, it can flag up possible problems before an expensive on the road failure takes place.

As many a workshop manager will wryly suggest, the vehicles leave the technicians' care and it is the drivers who 'break them'. The widespread introduction of driver monitoring systems has removed much of that angst and it is now possible to identify drivers who are heavy-handed. The excessive wear caused by harsh braking and cornering, or rapid acceleration, can be detected by cab-based systems.

There are a variety of products on the market, but by identifying the driver (who has to 'log-on') – there is no hiding. Allied with CCTV it also reduces another key cause of downtime, cutting accident rates.

In addition to technology, equipment plays a major part in the show. Alongside suppliers of vehicle lifts – who are also offering a variety of finance and maintenance packages – are tyre providers; suppliers of rolling roads; vehicle washes; and host of other up-to-date equipment.

It is also an ideal opportunity to find out more about the latest drivetrains and how best to look after them, with major manufacturers, such as Cummins, represented, while lubricant suppliers can offer advice about the best solutions to extend life and minimise wear.

Workwear is not forgotten; workshop and yard safety remains a top priority for workshop managers, but you know that PPE which is not user-friendly (or doesn't last soon) gets discarded.

The same goes for pits where there are now a variety of guarding solutions that are easy to use and reduce the risk of staff not bothering to use them.

One of the perennial challenges that managers face is uneven workloads and at Euro Bus Expo a number of options can be considered, from organisations that can supply 'flying engineers' to those who can offer component exchange or rebuild.

### Ticketing

Once the preserve of a simple machine to issue a paper ticket, modern systems provide everything from interfaces to real-time information and the ability to introduce new products – sometimes instantly and remotely to all 'live' machines at once.

While the growth of smartcard technology continues, it is contactless cards that are now the focus of attention. With a dedicated Technology Zone at Euro Bus Expo 2016, operators and specifiers have the opportunity to see all the various products in one visit.

There will be a number of innovative launches at the show as suppliers move to take advantage of the convenience offered by contactless payment cards – and other methods such as mobile-ticketing.

Back-office systems such as timetabling, scheduling and staff/vehicle allocations are designed not only to make quick and simple changes, but also deliver the best efficiencies. Operators who have converted to the latest systems have found that they have been able to make instant savings, thanks to more efficient scheduling. 📱



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## SUPPLEMENT

**54 EBSF\_2: testing the Bus of the Future**

UITP colleagues Michele Tozzi (Project Director) and Yannick Bousse (Dissemination Manager) and Silvia Magnalardo (Ravenna Demonstration Leader c/o Pluservice)

**57 Belgrade's new e-bus network marks significant steps**

Željko Milković, Director; Dušan Savković, Executive Director for Technical Operations for Electric Subsystem; Slobodan Misanović, Project Manager; and Jovana Paunović, PR – JKP GSP 'Beograd'

**60 Much ado about nothing? Development of the full-electric bus market**

Marc Schabka and Christoph Länger, Siemens Mobility Urban Transport Division

**63 European Bus and Coach Passenger Rights: experiences from the first three years**

Andras Mogyoro, Legal Officer – Passenger Rights Unit, European Commission

**67 Wireless technology on buses: the evolution of the passenger experience**

Bernd Heidtmann, Product Manager Antennas, HUBER+SUHNER

**70 A fair deal for Scotland's bus users**

Colin Howden, Director, Transform Scotland



MOTION AND MOBILITY





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The European Bus System of the Future 2 project<sup>14</sup> (EBSF\_2) is an 'Innovation Action' co-funded by the European Union within the Horizon 2020 Research and Innovation programme and coordinated by the UITP – the International Association of Public Transport. The project, in a similar vein to its predecessor EBSF, has been conceived as an open platform for dialogue on bus systems that includes key stakeholders across Europe and encompasses all areas of expertise (from manufacturing, to operations and research). The ultimate goal is to improve the efficiency of operations, mainly in terms of costs and energy consumption, but also to raise the image of the bus for users. EBSF\_2 colleagues **Michele Tozzi** (Project Director), **Yannick Bousse** (Dissemination Manager) and **Silvia Magnalardo** (Ravenna Demonstration Leader) explain more in this article.

The key working areas of EBSF\_2 are energy strategy and auxiliaries; green driver assistance systems; IT standards introduction in existing fleets; vehicle design (capacity, modularity, accessibility); the interface between the bus and urban infrastructures; and intelligent garage/depot and predictive maintenance. All of these rely on field tests by means of new vehicle technologies and infrastructures in combination with operational best-practices to be tested in real urban environments across Europe.

Demonstrations are taking place in 12 cities: Barcelona (ES), Dresden (DE), Gothenburg (SE), Helsinki (FI), London (GB), Lyon (FR), Madrid (ES), Paris Area (FR), Paris City (FR), Ravenna (IT), San Sebastian (ES), and Stuttgart (DE). Each city has committed to test a subset of innovations and several vehicles are being equipped with these solutions that are running in operation for a period of between six to 12 months. The assessment of the innovative measure is a classical before-vs-during-the-implementation comparison of results, with Key

Performance Indicators measuring the performance variations in each case study and cross-case. Tests in controlled environments (through the use of prototypes and simulation tools) are planned to prove the potential of key solutions that are currently at an early stage of development. An example is the adaptation of bus segments to actual passenger demand through coupling systems or unmanned garage movements in Paris City. A key output of the project will be the publication of guidelines to facilitate the introduction of the EBSF\_2 technologies and solutions in bus systems across Europe.

**The Ravenna demonstration:  
new maintenance tools to decrease costs**

Optimised maintenance processes and scheduling are a central issue in improving service reliability and operational effectiveness of bus systems. However, bus maintenance tasks are very often managed using basic procedures. The development of IT standards solutions and

innovative technologies can offer new tools to change the diagnostic process of vehicle fleets and move from preventive to predictive maintenance approaches, eventually decreasing garage/depot and maintenance costs.

The key technological solutions to be implemented and tested within the EBSF\_2 Ravenna demonstration result from the needs of the local public transport company – START ROMAGNA – that operates bus public transportation in the Italian Provinces of Ravenna, Forlì-Cesena and Rimini. With a fleet in excess of 700 buses running on a network of more than 2,100km, the operator transports almost nine million passengers per year. START ROMAGNA is hosting the Italian pilot site by making its facilities and fleet available to demonstration partners (Pluservice, MEL-System, UNIROMA1, the UITP) as well as allowing the installation of new equipment, such as lubricants' quality sensors to optimise the usage of the engine oil, on-board a fleet of buses that will be operating in real service, requiring 12 months testing. The demonstration is led together with the service provider Pluservice – an Italian software house with 30 years of experience in Enterprise Resources Planning systems designed to integrate the processes management of a passenger transport company.

Within EBSF\_2 the software tools developed by Pluservice for the management of the fleet maintenance and garage/depot processes has been made available. START ROMAGNA is already working with such a software and database, which guarantees a good starting point for the innovative applications to be developed and tested. These include:

- Maintenance software with the ability to analyse data coming from lubricants' quality sensors to assess the oil quality. This avoids potential breakdowns by replacing spare parts in advance
- Software to assess and plan the fleet's maintenance costs, according to information on the average distance covered by vehicles through an accurate analysis of the cost items.



Oil filtration test by START ROMAGNA



START ROMAGNA buses in Ravenna

Specific targets have been identified and will serve as a basis to assess the success of the project through quantitative key performance indicators. The overall objective is to minimise operating and maintenance costs by speeding up maintenance operations; reducing the non-operational lifetime of vehicles; increasing the fleet's reliability and economic efficiency; and reducing the vehicles' fuel consumption and emissions thanks to better performance of the engines.

### Technical experiments

Predictive maintenance lessens maintenance costs, breaks, spare-parts usage, and quantity of waste material as well as contributes to a more precise service scheduling. In particular, oil quality monitoring can reveal a lot about the health of an engine and the presence of residual metals indicates that maintenance is necessary before expected. Conversely, if the result of the oil analysis is good, ordinary maintenance can be postponed with a reduction of cost.

Today START ROMAGNA is able to schedule the fleet's maintenance, but no predictive processes are implemented. By utilising the existing software from Pluservice, the maintenance management tool developed within EBSF\_2 will forecast the proclivity of vehicles' components via analysis of historic data related to motor oil sampling. Several qualitative attributes of the engine oil will be observed (conductivity, temperature, amount of water, etc.) to investigate the oil degradation; predict the appropriate timing of replacement; and report on any unexpected contamination, avoiding serious mechanical problems to the vehicles. The maintenance software will be able to analyse the data according to the oil-quality and therefore elaborate on the remaining life of specific engine components to avoid breakdowns.

Six vehicles have been equipped with data collectors and with lubricant sensors that are able to send the information to an Automatic Vehicle Monitoring (AVM) back-office system. The sensors record the oil capability, conductivity and trend in order to sound the alarm when required. In addition, every two vehicles in six are equipped with a purifier to test the action of the filter on the lubricant quality, compared with the vehicles without the filter. It is expected that the frequency of oil changes will be lessened on the vehicles equipped with the filter, with a positive impact in terms of cost and operational effectiveness. The most suitable vehicles for the test are those with a frequency of

## BUS

### SUPPLEMENT

changing the motor oil every 20,000km for diesel-fuelled vehicles and 30,000km for methane-fuelled vehicles. Considering the average distances covered by the test vehicles, a period of 12 months is required to assess the results.

The demonstration is complemented by a new software application for garage/depot budget planning. In the present scenario START ROMAGNA uses only historic data to forecast the maintenance budget; no prediction on maintenance costs is performed. On the contrary, thanks to the new application developed by Pluservice within EBSF\_2, the objective is to optimise the maintenance activities and plan the replacement of spare parts at the right time. This will be possible by combining the data collected by sensors – that reveal the ‘health status’ of specific spare parts that might be damaged – and the distances travelled according to the scheduled service. By knowing in advance the planned kilometres that the fleet will cover, as well as the subsequent maintenance costs, the authority will be able to build a budget plan for the coming year.

To accurately assess the future costs for the management and operation of the fleet, the tool takes into consideration the budget for planned/repairing/extraordinary maintenance; maintenance resulting from accidents; budget for using fuels and lubricants; as well as budget for administrative deadlines and contracts. The interface of the application also allows the visual comparison of planned budget figures with actual figures in order to allow the operator to make corrections on cost management. The analysis of the maintenance budget will involve the entire START ROMAGNA fleet.

The EBSF\_2 Ravenna demonstration is committed to investigating the potential of predictive maintenance and intelligent garage/depot



START ROMAGNA bus maintenance in Ravenna

procedures in improving the efficiency of bus fleets. The goal for the local public transport operator is to provide – as a minimum – the same services to passengers, but with fewer expenses. Overall maintenance cost savings are estimated to be approximately 15%.

In the first six months of the project the two technological solutions have been successfully designed to fulfil a set of functional requirements defined in collaboration with the local operator. Tests are running in parallel and the data collection began in September 2016. The results of the tests will be published according to the project’s scheduling. 

### EBSF\_2 in Brief

The European Bus System of the Future 2 (EBSF\_2), coordinated by the UITP, combines the efforts of 42 partners<sup>5</sup>. The joint collaboration of industries, operators and authorities allows for testing and evaluating a set of technological solutions for improved efficiency of urban and suburban bus systems, as well as attractiveness to users.

- Duration: May 2015–April 2018
- Budget: €12.4m (€10m EU-funded)
- Coordinator: UITP

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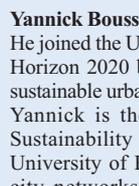
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**Michele Tozzi** is Project Manager at the UITP where he is currently the Director of the European Bus System of the Future\_2 project (EBSF\_2). Michele holds a PhD in Transportation Engineering at ‘Sapienza’ University of Rome. His professional experience includes consulting activities at national and European level and the involvement in EU-funded projects in the field of transit systems and urban mobility.



**Yannick Bousse** works as a Project Manager for the UITP. He joined the UITP in June 2015 being responsible for EU Horizon 2020 bus projects, ELIPTIC and EBSF\_2, and sustainable urban mobility project CIVITAS SATELLITE. Yannick is the holder of an MSc degree in Urban Sustainability from the Geography Department at the University of Reading, UK. Previously with European city networks he has worked on sustainable urban mobility projects in the EU FP7 funding programme and policy dossiers.



**Silvia Magnalardo** is the person responsible for the development of international business opportunities in Pluservice – the Italian software house leader of the Ravenna demo site in the EBSF\_2 project. Silvia coordinates the activities necessary for the company’s internationalisation, including access to foreign markets and participation in projects co-funded by the European Commission. She has five years of experience in project management within several framework programmes: FP7, H2020, Interreg IV C, IPA CBC PROGRAMME and South East Europe.



# Belgrade's new e-bus network marks significant steps

In this article for *Eurotransport* the team from the public utility company JKP GSP 'Beograd' – **Željko Milković**, Director; **Dušan Savković**, Executive Director for Technical Operations for Electric Subsystem; **Slobodan Misanović**, Project Manager; and **Jovana Paunović**, PR – present the project for introducing a new 'EKO1' bus line in Belgrade, operated exclusively by e-buses.

JKP GSP 'Beograd' is the main carrier of public transport in Belgrade and the largest operator in South Eastern Europe. Its development plans focus on the possibilities of applying the concept of e-buses to the most ecologically vulnerable corridors. Previously emphasis was placed on monitoring trends in the development of the concept and on exchange of experiences with companies for public transport and bus manufacturers, followed by a pilot testing.

On 1 September 2016 JKP GSP 'Beograd' began regular operation of five Solo 12m-long buses with a purely electric drive on a new bus line in Belgrade named 'EKO1'. That was the first step in a long-term strategy of using electric drive buses. These vehicles have a steady trend of development and improvement, which makes them more competitive to concepts such as diesel and CNG. For example, significant improvement in terms of reducing vehicle weight has enabled an increase in capacity (80-90 passengers), so that it now approaches the capacity of

a standard diesel-powered bus (100-105 passengers). These are significant advancements that allow the use of e-buses to be used for the first time on the central bus lines of the subsystem in Belgrade.

## From idea to realisation

The idea of introducing buses with a purely electric drive arose in JKP GSP 'Beograd' following continuous monitoring of development trends of the bus transport subsystems in many cities, both in Europe and the rest of the world. The plan was for Belgrade to be included in the 'green' map of cities with electric buses, whereby the vehicles would operate on a completely new line in the city centre – making them more recognisable. Full support for this project was given by Sinisa Mali, the Mayor of Belgrade. The holder of the project is the JKP GSP 'Beograd' in cooperation with the Environment Directorate and the Public Transport Directorate of the City of Belgrade.

The project of introducing electric drive buses in Belgrade included the phases as shown in **Table 1** from January 2015 to September 2016.

### E-bus route selection: 'EKO1'

The 'EKO1' line – that runs for 7.85km from Vuk's Monument to Belvil – is planned to connect the left and right side of the River Sava, i.e. the Old and the New Belgrade, while passing through the central city zone. There are several tourist attractions along the line, as well as the administrative centre of Belgrade, The Faculty of Law, The Faculties of Engineering, The 'Ušće' and 'Delta City' Malls, The 'Kombank Arena' and The 'Novi Beograd' Railway Station.

The introduction of e-buses is a good way of 'rehabilitating' an electrical transport system on the left bank of the River Sava, since there were three trolleybus lines operating there that connected the Old City with Zemun and New Belgrade until the 1970s.

The 'EKO1' line therefore completely justifies the use of electrical buses, since the route passes by some very attractive locations and through some areas with a high level of air pollution and noise.

In 'Direction A' there are 14 bus stops and 18 in 'Direction B'. With five e-buses on the line, the planned time interval for the buses is 16 minutes. The offered transport capacity is approximately 408 seats every hour.

### Electric drive buses: the decision

By analysing electric drive bus operations from different manufacturers using different charging systems and electrical energy storage options, we came up with an operational solution to suit the conditions in Belgrade and agreed that the most appropriate charging system would be to have fast-charging pantograph systems at termini with ultra capacitor energy storage. A breakdown of advantages of the chosen system is shown in **Table 2** on page 59.



The location of the ultra capacitor

Based on the tender for the procurement of five e-buses, the Chinese bus manufacturer, Higer, and its authorised representative for Europe, Chariot Motors, delivered KLQ6125GEV3 electro buses to JKP GSP 'Beograd'. The vehicles have a minimum passenger capacity of 80 and are equipped with two traction asynchronous motors 'Siemens' IPV5135; 2x67 kW nominal power; a system for storing electricity by ultra capacitor 'Aowe' with 20 kWh capacity. The chargers for fast-charging have a power of 150 kW. The charging station at Vuk's Monument terminus is connected to the DC voltage from the tram contact grid and the charging station at Belvil to the three-phase AC voltage from the public power grid. One charger for slow-charging with the power of 40 kW has been installed in the e-bus maintenance and parking depot. The contract includes the delivery of diagnostic equipment and spare parts, as well as the training for driving and maintenance of the vehicles. The entire project cost approximately €2.6 million.

### Initial results and expectations

By implementing the first bus line with purely electric drive buses, a new chapter in Belgrade's bus network has begun. Due to the fact that this is a completely new concept – not only for Belgrade but all of South



The charger

Table 1: Belgrade's e-bus project timeline

Activity	Period
The idea of introducing e-buses in the public transport system	January 2015
Forming of the JKP GSP 'Beograd' working team	February 2015
The analysis of the most adequate concept of an e-bus	March–September 2015
The analysis of possible routes for the line	March–September 2015
Adopting the e-bus concept and the line's route	September 2015
The procurement of five e-buses	September 2015
The project financing model	September 2015
Preparation of the Tender Documents	September 2015
Tendering for the purchase of five e-buses	October 2015
Opening of bids	December 2015
Signing of contract for five 'Higer' A61 e-buses	January 2016
The inspection of five e-buses in their production	April 2016
The delivery of e-buses and building of infrastructure	June–August 2016
The beginning of operations	1 September 2016

East Europe – particular attention shall be paid to monitoring all of the technical characteristics of the system in order to get a true picture of the advantages and disadvantages of the system.

The preliminary operational results are extremely satisfactory, displaying the following attributes:

- Zero pollution observed at the micro-location
- Significantly lower levels of noise compared to diesel-powered buses
- Average electricity consumption on the 'EKO1' bus line is roughly 1.1 kWh/km
- Depending on the mode, number of passengers, traffic conditions and the use of air conditioning, consumption may vary from 0.80 to 1.40 kWh/km
- From the long-term perspective electric vehicles have a more favourable emission of carbon dioxide at the macro plane compared to the vehicles that use fossil fuels
- Profitability of the project after six years
- E-bus is considered the technology of the future.



The e-bus interior

### The conclusion

The introduction of e-buses in regular operation is a significant step in the development of Belgrade's public transport system. The concept of e-buses with pantograph charging systems at stations completely meets the operational conditions in terms of electricity supply, the daily autonomy and the passengers' transport demands. The new 'EKO1'

bus line with electro buses will enable the full effect of the use of this concept in terms of environmental requirements. Tracking the results of the use of electro buses on the 'EKO1' line will serve as the best argument for defining future strategies of public transport in Belgrade, regarding this concept of buses and its mass application.

**Table 2:** The advantages of Belgrade's chosen e-bus system

<p>The advantages of the pantograph charging system:</p> <ul style="list-style-type: none"> <li>■ An acceptable charging time of 5-8 minutes</li> <li>■ The possibility of attaching the charger to tram network (DC) or public distribution network (AC)</li> <li>■ Power of charger 150 kW</li> <li>■ E-bus can be in operation during all working hours (particularly important in summer conditions with the use of air-conditioning)</li> </ul>	<p>The advantages of electrical energy storage by ultra capacitors:</p> <ul style="list-style-type: none"> <li>■ Flexibility for rapid charging and discharging</li> <li>■ High efficiency: 92-98%</li> <li>■ Acceptable mass: 900kg</li> <li>■ Temperature range: -40°C to +65°C</li> <li>■ The possibility of accepting the entire electrical energy in the recuperation phase</li> <li>■ Suitable for recycling</li> </ul>
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**Željko Milković** graduated from the University of Belgrade at its Faculty of Mechanical Engineering, Department of Engine and Vehicles in 1995, as Master Mechanical Engineer. Željko is a Master Mechanical Engineer and currently the Director of JKP GSP 'Beograd'. He has experience in the fields of vehicle operations and maintenance, managing, new technologies and alternative fuels. Željko also has experience and cooperation with the largest companies for public transport in Europe (Wiener Linien (Vienna), PC Tel Aviv, ZET Zagreb and a number of bus manufacturers.



**Dušan Savković** graduated from the University of Belgrade at its Faculty of Mechanical Engineering, Department of Engine and Vehicles in 1985 as Master Mechanical Engineer. Dušan is currently a Specialist for Technical Sciences and is the Executive Director for Technical Operations for Electric Subsystem of JKP GSP 'Beograd'. He has wide experience in the maintenance and operation of trams and trolleybuses and the application of information technology in the maintenance sector.



**Slobodan Misanović** graduated from the University of Belgrade at its Faculty of Transport and Traffic Engineering, Department of Road and Urban Traffic and Transport in 1994 as Master Traffic Engineer and PhD Candidate. He is currently the Project Manager in JKP GSP 'Beograd' and a leading expert in the areas of clean vehicles for public urban transport, technical operations of bus subsystems, alternative fuels, air pollution and energy efficiency. Since 2005 Slobodan has been a permanent Member of the UITP Bus Committee, the ZeUS User Group and the 'Hybrid User Forum Bus-Section' project.



**Jovana Paunović** graduated from the University of Belgrade at its Faculty of Political Sciences, Department of European Integration as is currently working in the PR Department of JKP GSP 'Beograd'. Jovana follows the European development trends and their implementation, examines public opinion and informs the public regarding public transport news and organises a team that aims to implement and promote the CSR activities.

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# Much ado about nothing? Development of the full-electric bus market

Cities and municipalities increasingly focus on designing new strategies that are intended to cope with the on-going and upcoming transformations caused by global phenomena such as urbanisation and climate change. Full-electric buses would appear to be the natural choice for public transport operators and governments looking to influence such positive changes, but how has the market evolved in recent years? [Marc Schabka](#) and [Christoph Länger](#) at Siemens Mobility Urban Transport Division provide an overview of the global up-take of this environmentally-friendly transport option.

Following the Paris agreement in late-2015, which was recently also ratified by China and the U.S., it can be expected that governments will increasingly create necessary frameworks to meet the agreed targets. Additionally boosted by other initiatives such as the 'smart city' hype, the C40 network or various other 'sustainable development' strategies, we may see in the near future different kinds of alliances that will shape the urban transport sector.

The full-electric bus (e-bus) will be playing a significant role in this transition, since cities are progressively interested in putting into

practice ecological alternatives that could, in the near future, transform the transport sector.

Nevertheless, the e-bus market has seen slow growth over recent years due, in particular, to high prices, infrastructural barriers, missing standards and low governmental commitments.

In our investigations we concentrated on mid-size buses and coaches (longer than 6m), with a capacity of more than 20 persons that operate in cities and urban areas, as they represent the largest part of the market for electric vehicles. E-buses are defined by electric drives

and on-board batteries to store the energy they consume. The two main technologies used for charging are currently in use, and differ by the charging taking place on-board and off-board the bus. A key difference is also the mode of charging applied. An electric bus system may either be charged during operation (continuous or interrupted) or overnight (depot-charging). The appropriate solution depends on various conditions regarding the application of the bus systems.

**Market scenario**

The proposed market scenario deals with the development of the e-bus over the period 2016-2026, by dividing the market into five major regions.

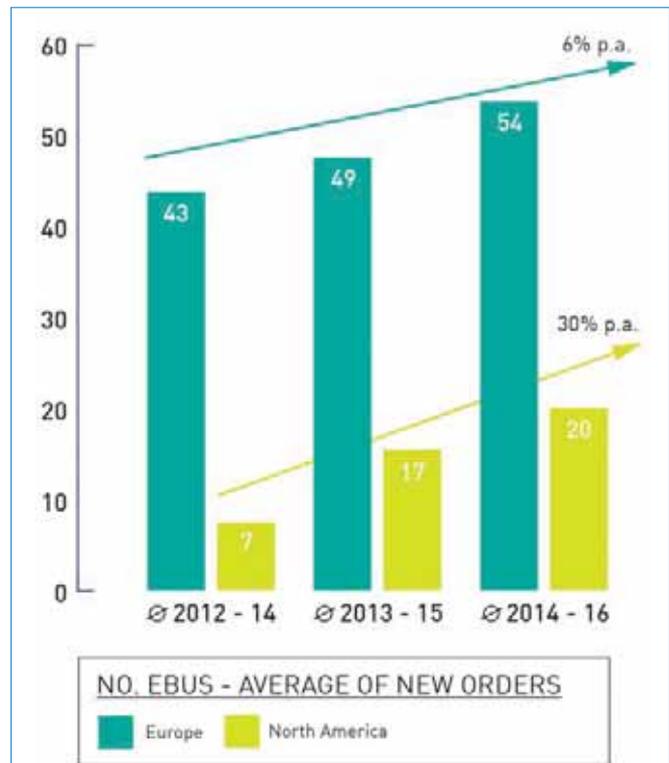
**Europe**

In Europe many cities are focusing on emission reduction forced by EU legislation and other initiatives. Strong economic backgrounds and high levels of living are enforcing the investments into green technologies. E-buses are therefore expected to become a competitive technology against combustion or hybrid vehicles and a considerable increase is to be forecast from 2021 onwards. Hence, the share of new e-buses in the city landscape is expected to move towards 13% compared to normal city buses by the year 2026. Most likely Western European countries will start investing in alternative technologies earlier than its neighbouring countries. Eastern European countries are therefore likely to only have a 5% share of new city e-buses by 2026.

The average number of new orders showed a growth of 6% per year over the period 2012-2016 (see **Figure 1**) and is likely to keep constant over the next five to six years.

**Asia**

Asia – and especially China – represents the biggest market for e-buses during the whole analysed period. Boosted by local policies, it is estimated that the Asian markets account for 97% of the world e-bus market in 2016. Even if Japan and Korea promote environmentally-friendly buses, China is and will remain the largest market for e-buses worldwide. The technological development in China is highly influenced by a high performance battery industry promoting depot-



**Figure 1: Comparison of average new e-bus orders in Europe and North America (2012-2016)**

charging solutions and various local subsidies. This combination creates the perfect conditions for a leading role in the e-bus industry.

It is foreseen that the Chinese e-bus market share might slightly decrease over time but will still account for more than 80% of the world market by 2026 (see **Figure 2**).

In Japan fuel-cell represents an upcoming technology but is still on a non-competitive price level for a mass market roll-out.

**Middle East and Africa**

African and Middle Eastern cities are not particularly focused on low emission transport systems, as the political support appears to be very low. Some countries in the Middle East, such as UAE, have begun to show interest in building up such an infrastructure. Nevertheless, the world market share will remain under 1% by 2026.

**North America**

North America has the largest fleet of diesel-electric hybrid transit buses in operation. Cities are becoming more sensitive towards zero emission technologies and companies like Tesla and Proterra may accelerate market entries of plug-in charged e-bus vehicles. There has been a 30% growth of new orders per year over the period 2012-2015 (see **Figure 1** above and **Figure 3** on page 62) but the number of e-buses still appears to be significantly small. The North American market is expected to have only a 5-10% share of e-buses in cities by 2026, due to low local and governmental commitments towards the e-bus in particular, and this trend will be highly influenced by the development of other clean technologies (especially the hybrid electric vehicles).



**Figure 2: Development of new e-bus orders p.a in Asia**

In North America the share of city buses in relation to overall buses in operation is lower than in Europe, therefore the potential for e-buses is expected to grow more slowly in comparison to Europe.

**Latin America**

In Latin America alternative propulsions are not wide spread. Few cities are discussing the introduction of diesel-hybrid buses and e-buses are reduced to a rare number of initiatives. The capacity and route requirements demand BRT (bus rapid transit) solutions with higher transportation capabilities – and therefore solutions with higher range – with the result that e-bus technologies might not establish themselves in the market very quickly.

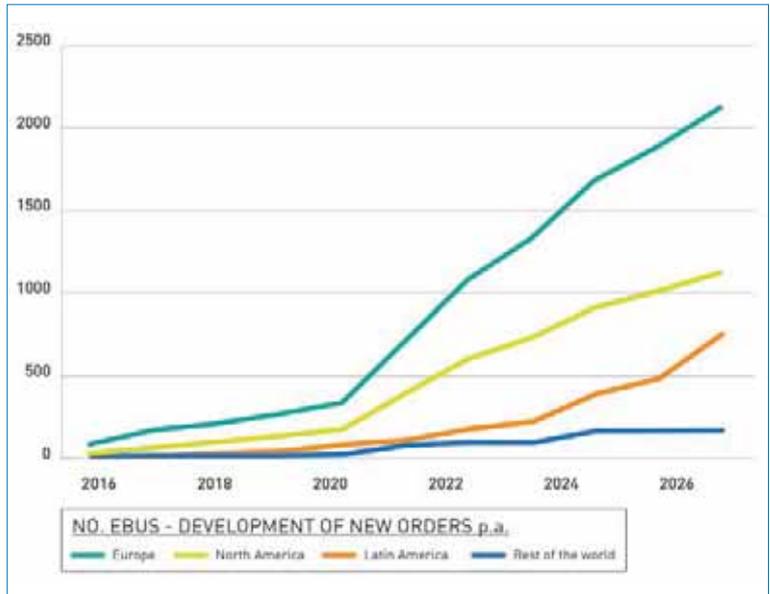
Recent order statistics (see **Figure 1** on page 61) show that the markets for fully-electric vehicles are developing more slowly than assumed in major research literature reviews during recent years. An approximate delay of growth of 1-1.5 years in markets can be expected. In Western Europe as well as in the USA the number of buses in 2016 corresponded on average to roughly the predicted values of 2015; Latin America and CIS (Russian Commonwealth) is over 90% behind the predictions and expectations.

Even in China the planned numbers have not proved to be manufactured, as in July 2016, BYD reported an order suspension of more than 2,200 vehicles for Shenzhen.

The share of the new emission-free city buses is likely to only slowly increase until 2020, while we estimate that a rapid increase will only take place in the period 2020-2026. Different trends influence the development of these markets worldwide, since they are determined by local political, economic and technical factors.

**Conclusion**

Much ado about nothing? Challenging economic developments make it hard to believe that costly new technologies like the e-bus will replace current combustion engine driven systems worldwide in the near future. It is rather unrealistic that the e-vehicles will disappear again from the markets as happened in the last century (e.g. in the 1980s and 1990s).



**Figure 3: Development of new e-bus orders p.a worldwide**

Regulations and consumer pressure for cleaner and smarter technologies will increase the market pressure to introduce zero emission technologies. Strategies such as the ‘smart city’ hype do leverage a faster development, but cast doubts about its feasibility all over the world.

Additional accelerators of this development might be enhanced by driver assistant systems (transporting people with less, or entirely without, the interaction of a driver) and wireless intermediate charging systems.

The industry will react and develop affordable solutions and more likely for developed markets such as Europe, North America and China than for others.

To conclude, the bus industry is evolving rather slowly. Vehicle life spans are approximately 10-12 years and operators are currently deciding which vehicles will be used starting from 2026-2028. It can therefore be expected that new technologies like the e-bus will replace the existing engines incrementally to an extent of 10% of all new buses set into operation in 2026 worldwide. 🚌

**Sources**

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**Christoph Länger** works as Business Development and Product Portfolio Manager at Siemens Mobility in the Urban Transport Division. Since 2003 Christoph has gained experience within various positions within the company, also in the field of e-mobility and industrial management. Christoph started his career as a management consultant responsible for supply chain and IT projects at KPMG consulting and holds a master degree in economics (University of Vienna).



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# European Bus and Coach Passenger Rights: experiences from the first three years

Three years after the EU Regulation on Bus and Coach Passenger Rights came into force, the European Commission (EC) published a report<sup>1</sup> about the first experiences of passengers, national authorities and the industry. **Andras Mogyoro**, Legal Officer at the Passenger Rights Unit of the EC<sup>2</sup>, presents this report in the following article.

Bus and coach transport is the predominant public transport mode in several Member States of the EU. Even in Member States where its market share is less significant, it plays a crucial role as buses and coaches reach communities in remote areas that are not served by any other public transport modes. They are also the preferred choice for households that don't possess private cars and cannot afford more expensive travel modes. The liberalisation of the international coach

market more than a decade ago and the recent liberalisation of the domestic coach markets in several Member States (including Italy, Germany and France) has created steady growth, particularly in the long-distance coach sector<sup>3</sup>.

## Harmonisation of passenger rights in Europe

The Bus and Coach Passenger Rights Regulation<sup>4</sup> (the Regulation) was

adopted in order to extend EU passenger rights to all modes of collective transport. Since March 2013, when it became applicable, passengers travelling by air, rail, waterborne means and bus/coach transport in Europe enjoy a guaranteed level of minimum protection.

Harmonisation of passenger rights mode-by-mode (taking into consideration the specific characteristics of each mode) in the EU helps to create a level playing-field for operators within and across the modes. The principles that govern European passenger rights are common for the four transport modes: non-discrimination, accurate, timely and accessible information and immediate and proportionate assistance in case of transport disruptions. At the same time, each modal regulation contains several provisions that reflect the specific features of the mode in question. One specific feature of bus and coach transport is that bus and coach operators share the same – often congested – transport infrastructure with other users, therefore respecting schedules is often beyond their control. Consequently, unlike in the case of other transport modes, delay at arrival does not trigger compensation.

**The scope and content of the Regulation**

The Regulation applies primarily to regular, scheduled bus and coach services where the boarding or alighting point is situated in the territory of an EU Member State; thus it applies both to domestic and cross-border services. A limited number of provisions mostly related to assistance and compensation in case of road accidents also apply to occasional services, where the group

of passengers is constituted on the initiative of the customers or the carrier.

The EU legislator took account of the different needs and expectations of passengers using urban or regional buses and passengers travelling with long-distance coaches. Short distance services are usually purely domestic services; users do not require reservation and often travel with monthly or yearly passes. They have a much higher frequency than long-distance services, therefore the negative effects of cancellations or long delays are more limited. A significant number of these services are operated on the basis of public service obligation contracts where the contracting authority imposes quality requirements related to passenger rights.

As a consequence the EU legislator granted different rights for passengers using short and long-distance services.

Firstly, every passenger benefits from certain core rights. Discriminatory fares or other discriminatory transport conditions are prohibited. People with disabilities or reduced mobility have a right to bus and coach transport at no additional cost: carriers can only refuse to transport passengers with disabilities if carrying them is physically impossible given the design of the vehicle; the bus stop or the terminal infrastructure; or if doing so would breach health and safety requirements. The core rights include the requirement that passengers must receive minimum information about their journey and about their rights; carriers must implement a complaint handling mechanism; and EU Member States must designate independent national authorities that have the

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mandate to enforce the Regulation and, where appropriate, impose penalties.

Secondly, passengers travelling on regular services where the scheduled distance of the service is 250km or more also benefit from additional rights; most importantly, the right to reimbursement of the full ticket price, or rerouting in the case of a cancellation or a long delay at departure, and adequate assistance in the case of a cancellation or a long delay (in the form of snacks, meals, refreshments, or – if necessary – accommodation, depending on the duration of the transport disruption). In addition, they are entitled to a compensation amounting to 50% of the ticket price if the carrier fails to offer the passenger the choice between reimbursement of the ticket price and rerouting when there has been a cancellation or long delay at departure. Persons with disability or reduced mobility are entitled to specific assistance both at bus terminals and on-board buses and coaches at no additional costs.

Member States may grant exemptions from the non-core rights to regular services that are purely domestic until February 2017, which may be renewed once for another four years. 12 Member States (Croatia, the Czech Republic, Estonia, Greece, Hungary, Latvia, the Netherlands, Portugal, Romania, Slovakia, Slovenia and the United Kingdom) are currently applying exemptions of this type.

Member States may also grant exemptions from the application of the entire Regulation to regular services which are operated partially outside the EU until February 2017, which may also be renewed once for another four years. Thirteen Member States (Austria, Croatia, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, the Netherlands, Slovakia, Slovenia and the United Kingdom) are currently applying exemptions of this type.

### The first experiences about the Regulation

The EC used the activity reports that the national authorities in charge of the enforcement of the Regulation were obliged to publish in 2015. It conducted a stakeholder consultation for bodies representing passengers and the industry at EU level in order to gather information for the ex-post assessment of the operation of the Regulation.

The EC noted that most Member States did not prepare in a timely manner for the application of the Regulation. Some of them only designated the authorities in charge of the Regulation's enforcement and empowered them to sanction operators that breach the Regulation three years after the Regulation came into force.

The representatives of passengers and the industry agreed that two factors have had a major impact on the operation of the Regulation.

Firstly, the lack of suitable bus and coach terminals in several EU Member States hinders the development of bus and coach transport: modern, accessible and safe terminals connected with other transport modes could help to attract new users and convince citizens to opt for bus and coach transport instead of using private cars. In addition, the existence of such terminals could raise the quality of service as terminal operators can give passengers easier access to information about the services and about passenger rights; terminal staff can provide passengers with disabilities with the assistance they need; and passengers can be better assisted when there are transport disruptions.

Secondly, the Regulation did not introduce new accessibility requirements for buses, coaches and terminals; therefore, it did not contribute significantly to improving the accessibility of vehicles and the transport infrastructure (bus stops and terminals) for passengers with disabilities or reduced mobility. In order to make bus and coach transport accessible for these passengers, both the vehicles and the terminals must be accessible. The measures introduced by several Member States – under which operators will in the future be required to use only fleets that can carry passengers with disabilities or reduced mobility – will have only limited results if the transport infrastructure remains inadequate.

On the other hand, there was a clear division between organisations representing industry and passenger organisations as to the impact of the Regulation. The organisations representing carriers felt that the scope of the Regulation reflected the optimal balance between the carriers' obligations and passenger rights, taking the specific constraints of the sector into account, and given the necessary level of flexibility.

Organisations representing passengers regretted that most provisions contained in the Regulation applied only to regular services with a scheduled distance of 250km or longer. They argued that the threshold to differentiate between long-distance services and short-distance services should be much lower, as currently the overwhelming majority of regular bus and coach journeys are only subject to the core provisions of the Regulation. Passengers' organisations also criticised Member States for granting too many exemptions, which deprives passengers of the full enjoyment of their rights.

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The EC has not identified any deliberate or serious breaches of the Regulation since all Member States took the necessary measures to enforce it.

The number of passenger complaints submitted to carriers is not available; the number of complaints submitted to the national authorities is very limited. The EC considers that the low number of complaints is partly due to the fact that the Regulation is relatively recent and citizens are not sufficiently aware of it and also because in some Member States there are not yet fast and inexpensive dispute resolution mechanisms available to redress passenger rights.

The EC also noted that the approach taken by the national authorities enforcing the Regulation varies widely. While some are very proactive in informing passengers about their rights and monitoring the Regulation's application, others do little beyond handling complaints.

### Conclusion

The European Commission's report concludes that in the light of the limited experience regarding the application of the Regulation to date there is no justification for amending it.

The national authorities and stakeholders agree that several of the obstacles that are preventing passengers from enjoying their rights can be removed by applying the Regulation more effectively.

In order to increase passengers' awareness about their rights, the EC has launched a new campaign focusing primarily on social media, inviting national authorities and the industry to combine their efforts and launch similar campaigns at their level.

In the report the EC recommends to those Member States that currently grant exemptions from the Regulation that they review whether it is necessary to continue these exemptions. For example, France granted exemptions for domestic services and services operated partially in third countries when the Regulation became applicable, but then repealed these exemptions without experiencing any negative consequences.

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One of the campaign posters of the Directorate General for Transport and Mobility of the European Commission

Finally, the EC encourages national and local authorities, as well as private investors, to provide multi-modal connections of bus and coach terminals to other transport modes, in order to ensure an interoperable public transport service. It also expounds the value of refurbishing existing terminals or building new terminals that are fully accessible for persons with disability or reduced mobility. Such actions might be eligible for financial support from different EU funds.

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3. For further market information about European coach transport, please visit the Comprehensive Study on Passenger Transport by Coach in Europe, published by the European Commission in April 2016: <http://ec.europa.eu/transport/modes/road/studies/doc/2016-04-passenger-transport-by-coach-in-europe.pdf>
4. Regulation (EU) No 181/2011 concerning the rights of passengers in bus and coach transport.



**Andras Mogyoro** has been working at the Directorate General for Transport and Mobility of the European Commission since 2013 as a Legal Officer in charge of bus and coach and maritime passenger rights.

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# Wireless technology on buses: the evolution of the passenger experience

Bus travel is evolving. Gone are the days when passengers waited patiently for their bus to arrive, relying on printed timetables at bus stops – these days we have mobile apps for that. Given this evolution, once on-board, a bus without Wi-Fi is starting to look a little passé. We are also beginning to see more and more travellers opting to leave their car at home over the coming years, as governments continue to invest in infrastructure, coverage and technology. **Bernd Heidtmann**, Product Manager Antennas at HUBER+SUHNER, discusses the latest technology for buses and how bus operators can get tomorrow's technology today.

Alongside the encouragement by the authorities to leave our vehicles at home, people are becoming more environmentally conscious, monitoring their carbon footprint and the toll their lifestyle takes on the planet. It is therefore important that public transport operators not only adapt to the change in passenger volume, but understand the ever-evolving needs of the modern commuter.

For these reasons there has been a significant technological awakening that has overhauled the experience on-board all forms of public transport – but, in particular, buses – offering services which are more in-keeping with today's standards.

## Commuter connectivity

'Passenger experience' is a term that has been banded around by operators for years, but it has never been more important than it is today. The media often speaks of faster trains, bigger buses and more reasonable travel prices; however, while all of these are admittedly important, passengers are more excited by the in-transit benefits they receive.

Until recently, offering a plug socket to charge electrical devices for free has been the pinnacle of public transport luxury. Now, however, providing consistent, genuinely usable Wi-Fi for passengers is the ongoing battle for operators, in order to enhance their customers' enjoyment and overall experience of the journey, and the demand is most certainly there.

With office hours being a thing of the past, employees are expected to be contactable and connected at all times. The discerning commuter, therefore, must have fast, reliable access to their emails. Arriving at the office to be greeted by 30 emails that could have been answered on your commute is a frustrating prospect, particularly for the increasing number of professionals who consider their journey time a valuable portion of their working day.

## Technology = Security

Of course, technology on-board buses has a variety of applications that become increasingly important as passenger levels rise, and safety is a key concern for all bus operators. A 2007 survey in Malmo', Sweden

# BUS

## SUPPLEMENT

found that 38% of the passengers using its municipal bus services had experienced 'frightening or disturbing situations' when travelling. After the installation of CCTV on 170 buses across the city, 60% said that they felt safer when using the buses and 17% stated that they were actually choosing to travel by bus more often as a result.

While CCTV is now commonplace across many fleets, the technology is continually improving, with better picture quality and the ability to react quicker to nearly-live feeds significantly improving the safety on-board vehicles.

The LA Metro demonstrates this progression. In 2015 it took the idea of CCTV one step further by introducing security cameras that could transmit images live to the smartphones of law enforcement officials. When compared to similar sized cities across the US, this development has contributed to the Metro being the safest in the country.

We will definitely begin to see other cities adopting this security system in the future, converting all CCTV systems on public transport to smart wireless systems.

### Updating wireless systems on-board

Upgrading infrastructure and technology can seem like a hassle, but these changes are proven to make a difference, not only by enhancing the travelling experience, but also by changing peoples' opinions of public transport and furthering the push by governments and authorities to increase passenger numbers.

The good news for operators is that there are systems available that can be retrofitted to existing vehicles, providing benefits such as CCTV, passenger WLAN and passenger counting systems. This means that many bus operators have the potential to bring their fleet up to date, even if they don't realise it.

All of these systems work using wireless connectivity. Beside the numerous radio units in use, antennas on the vehicle are very important as they are a crucial component to receive all these signals. If the antenna doesn't work properly, the performance of the whole system is limited (for example, the achieved data rate for a Wi-Fi on-board system or CCTV). The performance depends not only on the values on the datasheet, but also on the position of the antenna and where it is



On-board radio units and antennas – upgrading technology can contribute to improving the passenger experience

mounted. Obstacles like A/C units will influence the performance, as well as the metal ground plane the antenna has. However, sometimes the best mounting place can't be shared between several single element antennas due to the large amount of different antennas. The length of RF cabling can also pose an issue, as long cabling creates signal loss, which, again, is bad for the performance of the system.

If upgraded systems are to be fitted to buses retrospectively, easy mounting is key, with single hole mounts being preferable. This can be accomplished by selecting a solution that combines several radiating elements for different communication standards (cellular, WLAN, GNSS, TETRA, FM radio) for buses within a single product in the best mounting position.

### Moving forward

How do we get to the point where we have successfully encouraged more and more people to use buses through enhancing the passenger experience? How far away are we from meeting our goals?

In order to accommodate growing technical requirements, developing smaller and more compact equipment that can be used for multiple purposes is very important. With the creation of MIMO systems and antennas that can easily be retrofitted to buses and replace old antennas with minimal effort, we are definitely on the right path.

The truth is that the end-goal is constantly moving and, as such, the bus industry has to work both proactively and reactively to predict consumer trends and adapt to the unexpected. We have recently seen, for example, the previously 'science fiction only' notion of autonomous buses become a very real possibility with the introduction of the Mercedes Future Bus concept.

Couple this with the fact that connectivity systems are already allowing us to plan routes more effectively and pay instantly, and it is looking increasingly likely that we will be able to have a bus experience that involves zero contact with a driver. 

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**Bernd Heidtmann** joined HUBER+SUHNER in 2008 as the Product Manager for Vehicle Antennas. His product focus is on railway and heavy-duty vehicles, including buses. Before joining HUBER+SUHNER, Bernd previously worked for Siemens for 15 years in the communication industry, cellular base station market, in various disciplines.

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# A fair deal for Scotland's bus users

Buses get us to and from where we work; they give us access to shopping and leisure activities; they provide a vital service to those with low incomes and mobility issues; and they connect people and communities with each other. Buses carry lots of people at one time, thus reducing the number of vehicles on the road, which in turn helps to reduce traffic congestion and pollution. For Eurotransport, **Colin Howden**, Director of Transform Scotland, explains the Bus Fair campaign and how over the coming months, results from research will be presented to demonstrate the huge benefits that buses bring to Scotland: for the economy, in tackling inequalities, and cutting road congestion.

A cursory study of the UK mainstream media's coverage of transport might lead one to believe that railways are the mainstay of public transport. In Scotland our ferries also receive much attention; and in Edinburgh the debate that our very fine tram line has provoked has been rather disproportionate to the number of people it serves. But it is of course buses that provide the overwhelming majority of public transport trips in Scotland and in most other places.

However, not everything is rosy with Scotland's buses. Despite still providing three-quarters of all public transport trips, the decline of the bus continues – albeit less precipitous over the past 15 years than in previous decades – with a fall in bus patronage (10% over the past five years), vehicle mileage (12%) and bus fleets (14%).

Bus services are not given the political support or high profile attention they deserve. It was for this reason that we launched our 'Bus Fair' campaign, to turn greater attention to improving the standing of bus services in transport discussions, and draw attention to the measures needed to reverse these negative trends. Most of all we wanted to highlight the fairness aspects of transport investment.

The current big issue in Scottish transport is the Scottish government's proposals for halving and then abolishing Air Passenger Duty. Setting aside the damaging impacts of such a policy for Anglo-Scottish rail services and the prospects for Scotland to meet its climate targets, the equity implications of such a move are startling. It is remarkable that the Scottish National Party (SNP) – a party that likes

to style itself as 'left-of-centre' – sees as its set-piece intervention in transport a tax cut for air travellers, one which will bring disproportionate financial benefits for frequent flyers on higher incomes.

Contrast this situation with that of the bus sector. Since the SNP took power in 2007, its investment into bus services and concessionary fares has been static, at around £250 million per annum (and declining in real terms). Should the government press ahead with its plans to provide an annual tax cut to aviation of £300 million by abolishing APD, one does begin to worry from whose budget this cash will be taken. With rail and ferry franchise payments locked in, and with an ever-expanding roads programme, will the Scottish government turn to the bus budget to fund its aviation subsidies?

Such a move would have deeply damaging social repercussions. Buses are much more important for the young and for older travellers; groups who often have no car alternative. It would also have gender implications, with women being 1.5 times more likely to use buses than men. Perhaps most strikingly, however, is the impact it would have on lower income groups who are five times more likely to use the bus than higher income groups.

For Scotland to have a 'fair' transport policy, it is imperative that more attention is given to improving conditions for bus travellers.

In this respect the government faces two key challenges: Firstly, giving buses priority in urban areas. Greener Journeys' June 2016 report 'The Impact of Congestion on Bus Passengers' found that Edinburgh's bus journeys during the morning peak were now 20% slower than 20 years ago. It is our wish to see local authorities incentivised by central



Buses support 260,000 Scottish jobs and bus commuters contribute £2.3 billion to the Scottish economy

Bus services are not given the political support or high profile attention they deserve

government to invest in bus lanes and other priority measures, and to strengthen partnership working with the bus industry. The second problem that the government faces is what to do in rural areas. While losses to bus services in rural areas may not yet have been as severe as those highlighted by the 'Save our Buses' campaign in England, recent cutbacks in areas such as Dumfries and Galloway suggest that this contagion may be spreading north of the border.

What surprises us is that successive governments have not made the bus more

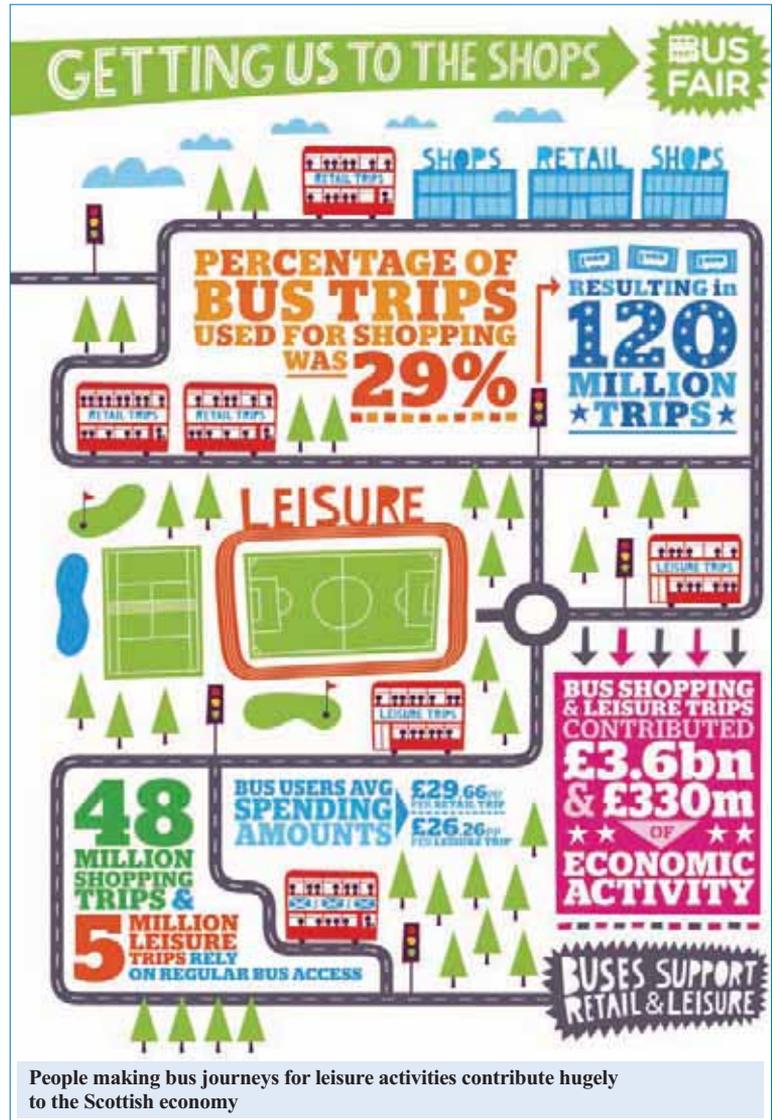
# BUS

## SUPPLEMENT

central to our national transport policy. The bus industry should be seen as a major Scottish success story; the country being home to international transport companies, award-winning bus operators, and a major bus manufacturing industry. In FirstGroup and Stagecoach, headquartered in Aberdeen and Perth respectively, we have two of the UK's largest companies. Meanwhile, in Alexander Dennis, we have the UK's largest bus and coach manufacturer and a market leader in low carbon and zero emission technologies. It's not as if government ministers have a large auto industry to placate: it is 35 years since Linwood, in the words of The Proclaimers, became 'no more'. Meanwhile, the tax cuts that ministers propose handing to aviation will, in the end, prove to be of greatest benefit to our lowland airports – and the airlines that use them – none of whom have Scottish ownership.

Fortunately, the next year provides many opportunities for the Scottish government to set forth a more enlightened transport policy

Our 'Bus Fair' campaign will, over the coming months, publish new research into the benefits that buses bring for the economy in tackling inequalities and cutting road congestion. So far we've established the contribution that bus commuters make to the Scottish economy. We've found that buses support 260,000 Scottish jobs; that bus commuters contribute £2.3 billion to the Scottish economy; and that 11% of people who travel to work by bus at some point in time would leave their job if there was no bus service. We've also found the value that buses provide in getting people to retail and leisure destinations, contributing to £3.6 billion and £330 million of economic activity, respectively. We will



soon be publishing our results on the benefits buses bring in terms of reducing emissions and cutting congestion.

Fortunately, the next year provides many opportunities for the Scottish government to set forth a more enlightened transport policy; one that would both provide greater fairness in transport and which would benefit the troubled Scottish economy. In 2017 we are expecting a comprehensive review of the National Transport Strategy. We are also expecting a new Climate Change Bill as well as a new Climate Change Plan. All of these processes provide ample opportunities for new thinking to transform the country's appreciation of the role of the bus.

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1. [www.busfair.transformscotland.org.uk](http://www.busfair.transformscotland.org.uk)



**Colin Howden** has managed Transform Scotland since 1998 and has, in that time, published widely on all aspects of sustainable transport policy and practice. From 2009 to 2012 he was Board Member and Treasurer of the European Federation for Transport and Environment (T&E), Transform Scotland's European umbrella body. Colin has been active in the environmental movement for over 20 years and was, until recently, a Board Member of Friends of the Earth Scotland. Prior to joining Transform Scotland Colin studied economics at Aberdeen and Manchester universities.

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