



Bus-News

M A G A Z I N E

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ISSUE ONE 2022



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AND SOLUTIONS FOR
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Letter from the Editor



Dear Readers,

Welcome to our first issue of the Bus-News e-magazine of 2022.

Bus passenger numbers are recovering again now that we are coming out of the other side of the Covid-19 pandemic thanks to the development of vaccines that have slashed mortality and serious progressions of the illness and thanks to vastly improved treatment options for those that need them. With the realisation that we will not be able to eliminate Covid completely, people are making a return to their daily lives in a way that is right for them and for many, this also means a return to public transport. The most recent figures on bus passenger numbers published by the UK government show that there was a percentage increase of 52% (Great Britain) from Q4 2020 to Q4 2021, with a total of 0.78 billion passenger journeys in Britain in the last three months of 2021.

One consequence of the pandemic is the negative economic impact. On page 10 Tiana May writes in her article Strengthening City Transport with Bus Rapid Transport that one reason transit bodies are choosing bus rapid transit over

light rail is that it is substantially cheaper, both in terms of capital investment and operational costs. This means that BRT systems are a good solution for cash-strapped transit agencies and government departments to offer public transport that is cost-effective.

Buses are much easier to implement than railway lines. However, in order to encourage their widespread use they need to be seen by the public as being better than travelling by private car. The infrastructure buses use is just as important as the buses themselves for encouraging modal shift. BRT systems provide buses with dedicated lanes and priority signals so that they do not have to sit in the congestion brought about by private vehicles. They are therefore a central component to decarbonising transport and making cities more liveable.

Our next Bus-News magazine will be published on 10 October in the run-up to EuroBus Expo, which will take place at the NEC in Birmingham, UK from 1 to 3 November.

If you want to be featured on the Bus-News website or in our e-magazine, please get in touch with Andrew Lush at al@a2bglobalmedia.com or call +44 7432 725001.

Please enjoy our first issue of 2022!

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Issue One

2022

Features

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A look at what to expect at this year's Busworld Turkey, which will take place in Istanbul in May.

p.8 Upcoming Bus Events & Exhibitions

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A directory of bus suppliers for digital solutions, bus design & interiors, maintenance & servicing, and electrification & power. Read about all the latest innovations and product developments in the bus sector.

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p.10 Strengthening City Transport with Bus Rapid Transit

Tiana May takes a look at the concept of bus rapid transit (BRT) and its uptake in the United States and Europe.

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busworld®

TURKEY ISTANBUL

Where: Istanbul Expo Center, Istanbul, Turkey

When: 26 - 28 May 2022

Busworld Turkey will take place at the Istanbul Expo Center (Halls 1 and 2) from Thursday 26 May to Saturday 28 May. This will be the ninth time this event has been held.

The B2B exhibition for buses and coaches takes place every two years. Exhibitors are bus, coach and minibus manufacturers and bodybuilders as well as suppliers who manufacture spare parts and components and those who provide services to the industry.

Visitors come from public and private bus and coach operators who run public transit, long-distance passenger transport and tourist services, as well as transit

agencies and any company that purchases buses or coaches.

Busworld says that its Turkey exhibition is its second-biggest and most international event after Busworld Europe, noting that the bus and coach market in Turkey is extremely buoyant. That makes Turkey a prime location for this event. Companies that wish to expand into the Turkish bus and coach market can do so right in the heart of where their desired customer base is located.

At Busworld Turkey in 2020 there were 129 exhibitors with 35 vehicles on display. The almost 8,000 visitors came from 71 different countries.

In addition to the exhibition, there will be exhibitors are able to give presentations. T

Day 1 – 26 May

12:00–12:30 – Iveco Bus
Strategy and Focus on the New Sustainable Electric Buses

14:30–15:00 – HydroBorPEM
Startup manufacturing composite fuel cell membranes and fuel cell stacks for hydrogen and fuel cell vehicles

16:00–16:30 – ZF
Collision Mitigation Systems for Bus

Busworld has been organising events for t
It is currently active in eight regions: Euro
America, Southeast Asia, Russia & Central



a Speakers' Corner (Hall 2 – D60), where
the current programme for this is:

Day 2 – 27 May

10:45–11:15 – Ausis Akilli Ulasim
A talk on the new regulations
coming into effect in Turkey in
2024

11:30–12:00 – Optibus
EV Management Module for
Operators

15:15–15:45 – TTKÖD
Traffic Accident Prevention

the bus and coach industry since 1971.
pe, Turkey, India, North America, Latin
Asia.



Supplier Spotlight

Supplier	Stand
Fogmaker International AB	1/A30
RAAL	2/D05
Senoplast	1/C36
Voith	1/D24
ZF	1/D02

Visit the full exhibitor list [here](#).

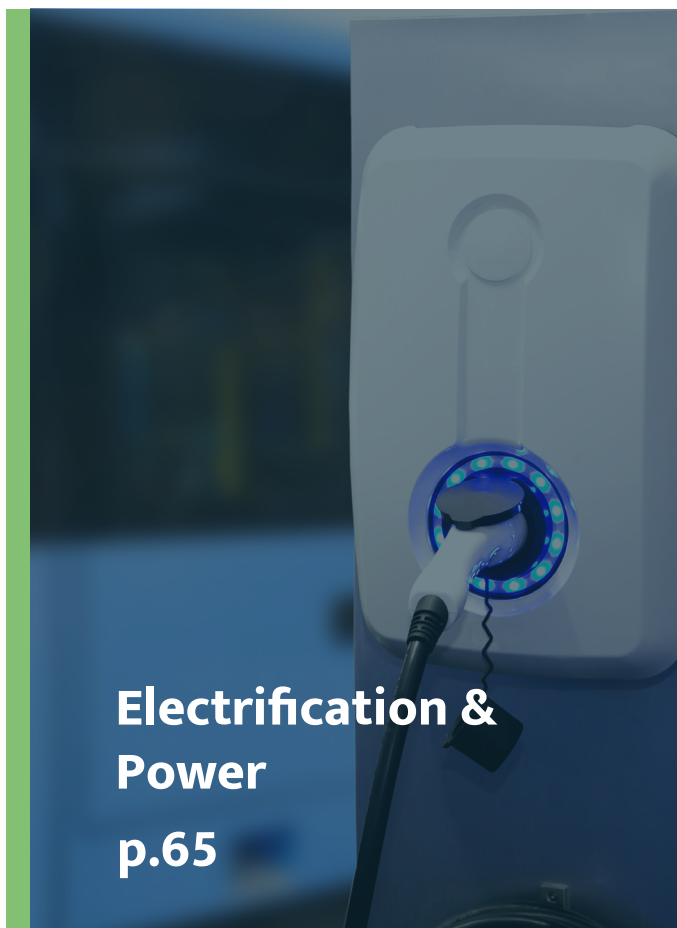


Upcoming Bus Events & Exhibitions

May 2022 - October 2022



Directory





Strengthening City Transport with Bus Rapid Transit

By Tiana May

Bus Rapid Transit (BRT) is a high-capacity bus transit system that offers a fast, comfortable and efficient transportation solution. Compared to a conventional bus route, BRT provides a more reliable and frequent service, overcoming some of the deterrents that typically prevent people from choosing to travel by bus.

To help BRT services run on time, the vehicles operate in dedicated lanes and benefit from transit signal priority systems that provide approaching buses with a green light at intersections. Furthermore,

BRT vehicles use all-door boarding and off-board ticketing options to ensure services are not disrupted at passenger stops. BRT lines therefore significantly reduce delays and mirror the reliability of rail systems within the flexibility of bus infrastructure.

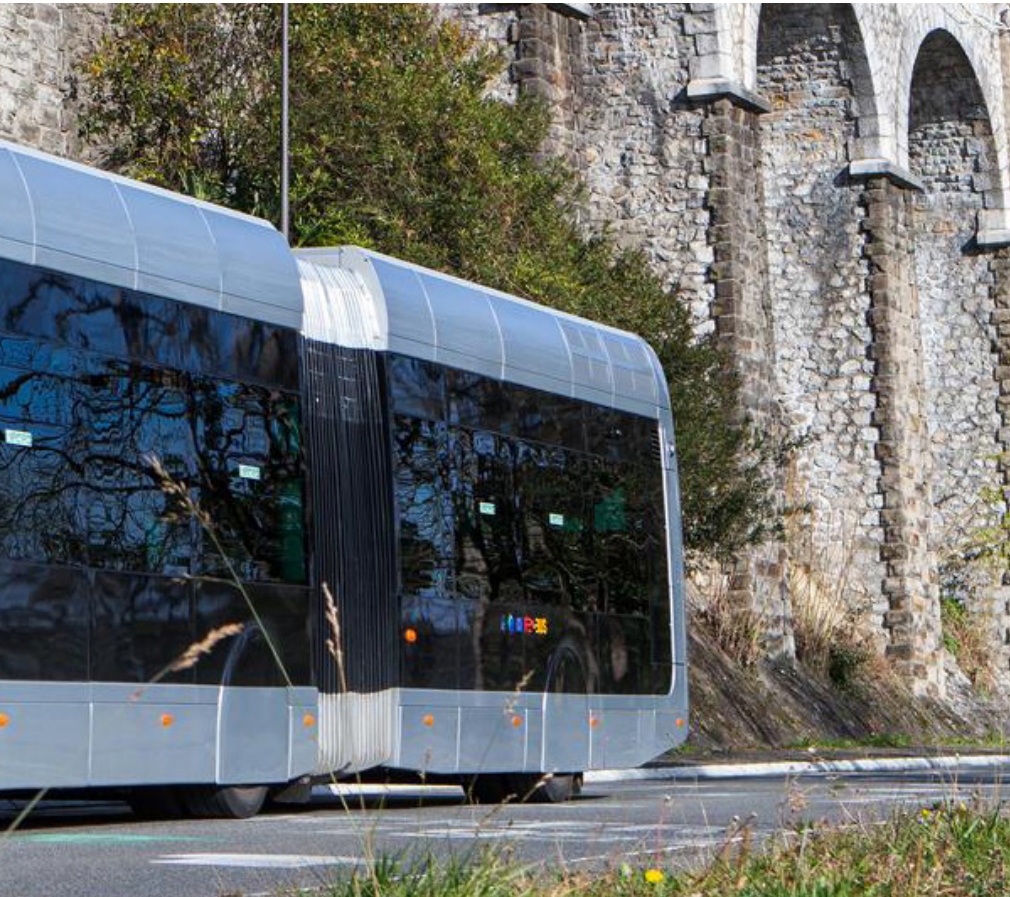
BRT Systems around the World

United States

181 cities worldwide have active BRT systems, with 61 in Latin America,

44 in Europe, and 21 in North America. Although only 14 of these cities are in the US, the popularity of BRT has grown significantly in recent years, and the Federal Transit Administration is investing heavily in numerous BRT projects across the country.

Most recently, San Francisco's first BRT corridor opened on Van Ness Avenue, and is expected to cut journey times by 32 percent. In addition, IndyGo has started construction on the second of its three planned BRT lines in Indianapolis, while four



Van Ness BRT Corridor© Jeremy Menzies, SFMTA Photographer

BRT infrastructure projects are underway in California, Utah and Washington State, backed by 187 million USD in federal funding. These projects provide residents

with desirable transit services, as research has demonstrated that the country's existing BRT routes have improved property value in 10 US cities.

Europe

In Europe, 21 of the 44 cities with BRT routes are in France, including the world's first hydrogen-powered BRT line in Pau. SNCF, the country's state-owned transport operator, states that each BRT line can carry up to 40,000 daily passengers, providing an ideal transport network for mid-sized cities. Furthermore, in large cities such as Lyon and Lille, BRT offers a flexible solution that can fill the gaps of existing transport networks and connect outlying areas.

Elsewhere, other European countries are following France's lead and are implementing more BRT routes within their cities. For example, the city of Taranto, Italy is currently due to begin construction on the first of two electric BRT lines, which will have a total length of 71 kilometers and will use 50 zero-emission buses. These routes are expected to reduce journey times in the city centre by 40% compared to using a private car.



Van Ness BRT Corridor© Jeremy Menzies, SFMTA Photographer

Regions	Passengers per Day	Number of Cities	Length (km)
Africa	491,578 (1.46%)	5 (2.76%)	131 (2.41%)
Asia	9,238,060 (27.49%)	45 (24.86%)	1,691 (31.03%)
Europe	1,613,580 (4.8%)	44 (24.3%)	875 (16.06%)
Latin America	20,829,474 (61.99%)	61 (33.7%)	1,960 (35.96%)
Northern America	988,683 (2.94%)	21 (11.6%)	683 (12.53%)
Oceania	436,200 (1.29%)	5 (2.76%)	109 (2%)

Global BRTData. Version 3.62 Last modified: April 2022. Available at: www.brtdata.org

Why Choose BRT?

As BRT routes require lower investment and operations costs compared to rail alternatives, it is unsurprising that many transit agencies are choosing to invest in this system. For example, in the US, the Metropolitan Atlanta Rapid Transit Authority (MARTA) recently announced that it is reconsidering its plans to add light rail transit along the Clifton Corridor and is instead proposing a BRT solution.

Meanwhile, in some older European cities, light rail infrastructure is

incompatible with the winding streets and right-angled turns of their historic layouts, so BRT lines offer a more practical transport option.

The increased interest in BRT routes is coupled with the global rise in electric vehicles and a drive to combat climate change and air pollution. As the necessity to lessen reliance on private cars and shift to more sustainable modes of transport grows, it is imperative to increase the attractiveness of public transport and offer efficient and reliable services.

BRT is therefore a cost-effective solution that can use zero-emission vehicles to provide attractive transportation services. Indeed, in Metz, France public ridership increased by 25 percent after the BRT line's first year of operations, demonstrating the system's effectiveness in encouraging people to travel by bus. Consequently, as the number of BRT routes increases across the globe, more people will benefit from reliable public transit options and will be encouraged to choose to travel by bus.



Pau BRT © SNCF

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Switchio

Secure Contactless EMV Payments in Public Transport



The video above provides an overview of the key advantages of Switchio's ready-made software solution for secure contactless EMV payments in public transport, among which are a substantial reduction in operating costs and increased added value in the eyes of passengers.

All-in-One Digital Fare Management Gateway

As cities around the world continue their digital transformation, there

is increasing demand in crucial sectors for smart technologies that deliver real benefits, and public transport is no exception. Switchio's comprehensive white-label solution for contactless EMV payments

gives operators across a variety of transit platforms a powerful tool for managing passenger fares and tracking line occupancy. The solution is built around a secure open-loop switch that automatically

aggregates payments and routes them to multiple acquirers, resulting in reduced transaction processing fees; operators can easily change acquirers or add new ones as needed. The system also supports different fare models and a wide range of EMV terminal hardware options.

Among the more tangible benefits of digitalisation are the elimination of outdated paper ticketing systems and the expense of servicing and maintaining mechanical vending machines and validators. Cash handling activities and related employee training are reduced to a minimum. Passengers appreciate faster boarding and the convenience of not having to purchase paper tickets ahead of time. Moreover, the contactless EMV payment system does away with conventional flat-fare systems, instead calculating the price of a journey based on actual time in transit. It comes as no surprise, then, that public transport operators transitioning to fully digital payment systems have seen an increase in ridership and overall passenger satisfaction.

The Switchio solution is delivered as a software as a service (SaaS) in a PCI DSS-certified environment, including management of the entire system.

The platform is fully compliant with VISA MTT (Mass Transit Transaction) and Mastercard PAYG (Pay As You Go) rules and can be fully deployed within three months. To date, it has been successfully implemented in Europe, Africa and with additional projects currently under development in the United States.

If you'd like to learn more about how the Switchio platform can help you harness the power of contactless technology, please visit switchio.com.

switchio



🏠 Directory

< Digital Solutions



Improving Network Connectivity for Arriva

From local buses and coaches to national trains, trams, light rail and water buses, Arriva is one of the leading providers of passenger transport in Europe, employing over 53,000 people and delivering 2 billion passenger journeys a year across 14 European countries.

The company is also one of the largest transport operators in the UK with over 5,000 buses serving passengers across England and Wales.

The Challenge

The majority of Arriva's UK business locations are connected by an expansive network based on MPLS technology, comprised of thousands of devices. This resulted in insufficient internet bandwidth

for the wide range of applications being deployed across Arriva sites.

Paul Sangha, Head of Infrastructure Delivery, who is responsible for defining infrastructure standards, managing deployment and working with third party suppliers, says: *"The problems became clear when I visited our Brixton bus depot. It took up to five minutes for employee computers to boot up and ten minutes to send a document to the printer. Sites were*



still using Windows 7, so teams were resorting to workarounds.”

“Connectivity was via an MPLS network with access to the internet routed through our Doxford site in the North East of England. Our network suffered from internet bandwidth limitations and Doxford was feeling the strain. Our ongoing evolution from onsite to third-party hosted applications exacerbated the problem.”

Paul and his team wanted to take a fresh approach to network design. They knew that SD-WAN would reduce connectivity costs, and at the same time enable encrypted cross-site connectivity for accessing applications and information contained in Arriva’s data centres.

The team developed a business case highlighting the impact of inefficient network performance on Arriva’s business and presented various options for resolving this via a complete network overhaul.

Why Cisco SD-WAN powered by Meraki?

Paul was already familiar with Cisco and said he wanted to work

with a well-known partner with a significant-sized business rather than implement products that might disappear in a relatively young market. The team worked with multiple providers, looking at what the market had to offer in terms of SD-WAN solutions as well as taking advice from industry sources.

Paul explains the decision-making process as follows: *“We knew SD-WAN was the way forward, and Meraki offered the best solution for our needs. We were also able to work closely with Meraki to explore exactly what we needed.”*

Breaking Down the Barriers to Change

Understandably, people can sometimes be reluctant to major technology change and the decision led to resistance within the IT team, with some employees concerned about disrupting a fragile network and preferring to retain the existing network environment.

To help bring all the IT teams on board, the team had several calls with Cisco and spoke with another Meraki customer that had deployed

at scale. Paul says that, *“this was a game changer in terms of giving colleagues confidence that the solution would scale to our needs.”*

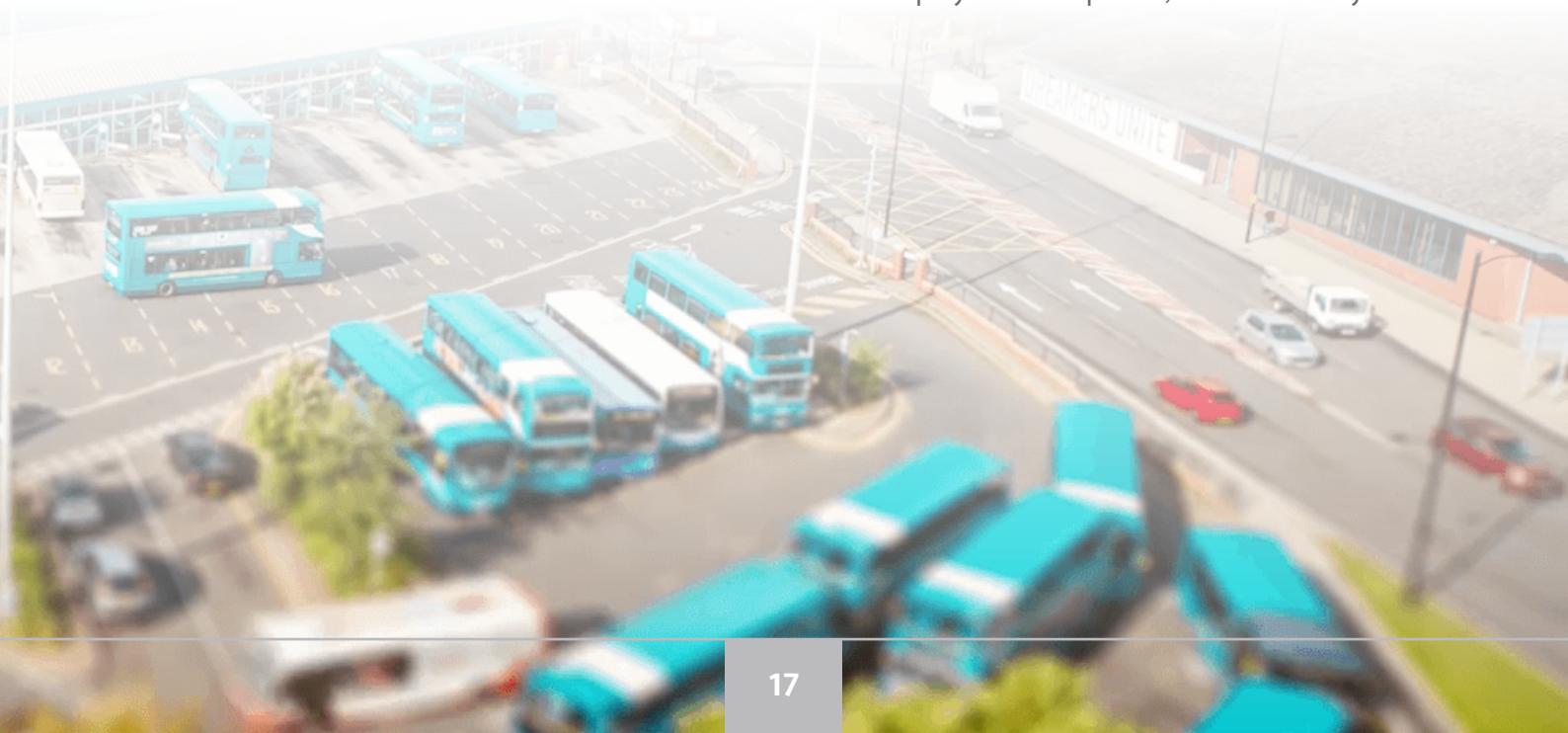
In order to manage a smooth transition, the team audited six sites to verify their networking needs, and at the request of the business, conducted a pilot at Arriva’s Brixton depot, which was a resounding success. This led to business leadership support and from there, the IT team started rolling out the technology.

“The transition was a big ask – but I knew it would be worth it.”

The Deployment

So far, Arriva has deployed around a thousand Meraki devices with two SD-WAN connections per site. It is also upgrading three large administration centres and two new data centres. The scale of the programme and the geographic distribution of the sites has been challenging but the Meraki equipment has been easy to deploy.

Having worked on similar large-scale rollouts in other outsourcing companies, for Paul the key to





“We knew SD-WAN was the way forward, and Meraki offered the best solution for our needs. We were also able to work closely with Meraki to explore exactly what we needed.”

Paul Sangha, Head of Infrastructure Delivery

success lies in understanding the importance of ‘process within projects’: *“There is a large amount of repetition for each installation, so we meticulously maintain a detailed 61-task run book, which we continue optimising to ensure mistakes aren’t repeated. 48 sites in, we’re seeing very few amendments.”*

The Benefits

Cisco SD-WAN powered by Meraki now underpins all of Arriva’s IT. It is completely changing how people work, both through its simplicity and through the plug-and-play nature of devices. It also supports ongoing digitalisation for the company’s front-line teams in line with its infrastructure strategy. Internet connectivity and improved access to cloud services are simplifying migration to Office365, SharePoint, box.com and other newer technologies. They also enable centralised management of hundreds of printers, as well as staff migration to Windows 10 with SCCM (System Center Configuration Manager). Video calling and file sharing across sites is now flawless, and Meraki has reduced complexity for all management through a single portal, eliminating the need to remember multiple passwords across a range of legacy technologies.

Paul expands on the benefits of the Meraki deployment, *“With the*

previous network so poor in many locations, the implementation team is receiving a great response as we migrate network, PCs and printers. Knowing that we’re changing the working lives of so many colleagues is incredibly rewarding, and I can’t wait to see it fully rolled out.”

Network visibility is another key benefit, with the Meraki dashboard used more than any other feature. Project managers, architects and engineers can now drill down to component level, remotely monitoring any changes, identifying and fixing any issues anywhere on the network. The result is a simplified working environment that is easier to manage, improves efficiency and reduces costs.

“We have documented everything at every site and have access to a significant amount of historical reporting with the Meraki dashboard. The ability to track Wi-Fi access point location through the portal allows us to know exactly where network devices are located, which is important in some of the huge garages we need to support.”

Lessons Learned

For Paul, it was also important to understand the concerns of engineers who have used specific technology for many years. For them, SD-WAN was a significant technology shift, so getting IT teams on board was just as important as obtaining business sponsorship.

Finding the right vendor was also key: engagement was particularly critical as they looked at some of our small travel shops. Meraki provided test equipment to migrate the initial site. Paul encourages

organisations going through a similar project to try out the technology in a real environment. the Arriva Brixton test site provided an invaluable template to work from.

If Paul could give any advice for other organisations considering a similar transformation, it would be meticulous planning. *“An implementation of this scale has many moving parts but by sticking to the process – and with continual service improvement – the installation sequence can be completed efficiently.”*

Additionally, talking to other companies that have embarked on a similar journey is valuable. This helped Arriva’s team to really understand how SD-WAN would make things better. And speaking in business terms to the business – no jargon, acronyms or sales talk. Paul continues, *“SD-WAN is a tough one to explain, so expect some initial resistance. We make it very simple by telling staff: ‘You have an issue – this is how we will take the company forward. And transform people’s working lives.’”*

“Both education and publicity have helped everyone at Arriva understand the changes. The Meraki team have been great in this respect, working in close partnership with us, helping us sell the product across the business, getting people on board and offering guidance and education. As a result, most depots are now really keen to get started.”





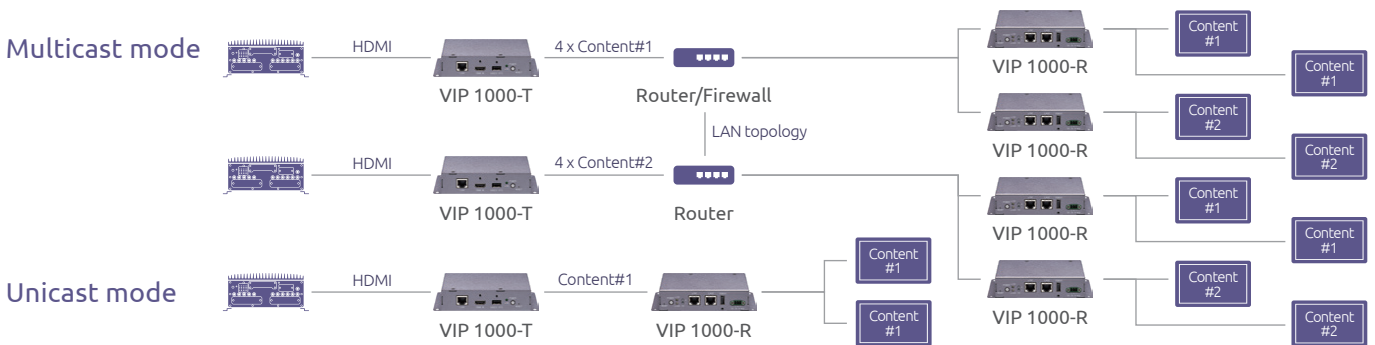
Infotainment/PIS Solutions for In-vehicle and Train

VIP 1000 (VIP 1000-T & VIP 1000-R) is a new Full HD dual HDMI Extender over IP system for public transport applications that extends HDMI signals to over 100m and makes the broadcast of video in in-vehicle passenger information systems (PIS) and infotainment systems simpler and easier.

To support even more displays, the receiver has another RJ-45 network port to act as an in-vehicle video DaisyChain extender. Furthermore, multiple transmitters can deliver different videos over the same network, and you can select the correct signal through a web interface.

Transmit Video & Audio over Ethernet up to 100m

- Extend Full HD HDMI signals over Ethernet to transmit the video streaming to far end
- Video over IP technologies support Unicast, Daisy Chain and Multicast modes
- Quick and easy deployment by existing CAT5e/6 Ethernet cables to reduce TCO
- Maintenance free by the hardware Encode/Decode and the plug & play mechanism
- Designed with 9~36Vdc power range, specialized for in-vehicle public transport applications, like PIS and infotainment



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< Digital Solutions

NEXCOM

NEXCOM VIP1000 Extends FHD HDMI over IP for Passenger Information and Infotainment Systems

The Innovation of Video Transmission

The major problem with HDMI is the cable length limitation. A typical 12-metre city bus already exceeds the recommended limits of HDMI, so alternative video broadcast approaches are needed. One option is additional video sources closer to the screens, but that's a costly approach that adds complexity.

NEXCOM solved this problem by presenting a new FHD HDMI over IP system for public transport applications that extends HDMI signals to over 100 metres and makes the broadcast of video in in-vehicle passenger information systems (PIS) and infotainment systems simpler and easier.

The more efficient and widely used option is video extenders that transmit video data over a network. This approach works well, but many video extenders are of dubious

quality, often only intended for consumer applications and lacking the essential E-mark certification for in-vehicle usage, which confirms their durability and quality.

NEXCOM's VIP1000T/R is a new E-mark-certified in-vehicle HDMI extender over IP solution designed specifically for public transport PIS and infotainment, which works over standard networking hardware, uses common industry standards and outputs to multiple displays up to 100 metres away.

Unicast, Daisy Chain and Multicast

The NEXCOM system manages to overcome distance limitations by leveraging widely used networking standards that reliably deliver data over long distances. Instead of complex solutions to skirt the limitations of HDMI, the VIP1000-T/R solution sends the video signal over commonly available network

cables (CAT5e/6). The VIP1000-T transmitter takes the source HDMI signal, encodes the video using the H.264 codec and then sends that data over the 1000Mbps IP network. At the display end, the VIP1000-R receiver receives the data, decodes it, then broadcasts the video through not just one, but two FHD HDMI outputs. To support even more displays, the receiver has another RJ45 network port to act as an in-vehicle video daisy chain extender. Furthermore, multiple transmitters can deliver different videos over the same network, and you can select the correct signal through a web interface.

Ideal for Vehicles

E-mark is the de facto industry standard for certifying electronics for use in public vehicles. Originally implemented for use in Europe, this standard certifies electronic equipment for reliability in harsh vehicle environments. The



VIP1000-R

transmitter and receiver support 9-36VDC input, suitable for the most commonly used voltages in vehicles, and with the capability to handle voltage fluctuations that can ruin equipment designed for fixed 5/12VDC input. The system is completely plug and play, and in the case of multiple transmitters, a web interface is available to select the correct one.

Non-Proprietary

Adopting commonly used standards and widely available technologies is the cornerstone of compatibility and reliability in every computer setting, avoiding the pitfalls of expensive vendor lock-in. The H.264 codec used for video compression is widely used in IP-based video systems and provides efficient compression of high-quality video for fast transmission over the network. Standard RJ45 ports connect to standard CAT5e/6 Ethernet cables, so installation uses

tools already likely to be found on-site and with a connection interface almost everyone is familiar with.

Limitless PIS and Infotainment

Overall, the VIP1000 is the ideal choice for the easy setup of displays for in-vehicle PIS and infotainment systems in any vehicle, smashing the conventional limits of HDMI and letting you use technologies you're familiar with to extend video broadcast to anywhere in the vehicle. And all while maintaining the certified quality of E-mark.



VIP1000-T

Main Features

- Full HD HDMI (1.4b) extender over IP, maximum 100 metre length
- Wide-range 9-36VDC input
- E-Mark certified for in-vehicle application
- Plug and play
- 2 x full HD HDMI output
- Unicast, daisy chain, and multicast support
- Selectable video source via web interface
- Integrated two-port LAN switch



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Nomad Digital

The Future of the Connected Bus

The Industry

The 'hydrogen bus' is a term you will be becoming more familiar with, should you be part of the travel sector or simply watching the news. The days of petrol and diesel are on their way out, as the transport industry strives to reduce its carbon footprint. Governments, councils and operators are looking towards the future, as the hydrogen bus is set to grace the roads of the United Kingdom and rest of the world. Nomad Digital aims to support bus operators around the globe in their quest for a greener solution by providing the innovative technology

which enables 'the connected bus' – enhancing passenger experience and safety, encouraging ridership and ultimately a more sustainable way to travel.

The Nomad Solution

The connected bus consists of a Nomad high-powered processor which is integrated with a CCTV/network video recorder (NVR) system hosted within the processing unit, driving all cameras, and essentially providing images to various on-board screens. Between the processor/NVR and monitors, the system can convert from

analogue to digital, assisting the process of delivering images on to the screens. Furthermore, the connected bus has a telematics unit which captures the output available from the 'CAN Bus'. The 'CAN Bus' is a bus system which feeds back information of all critical and non-critical bus systems: brakes (data), engine temperature, oil levels, tyre pressure, cabin temperature, battery level, battery top-up and so on. The data is fed to Nomad's domain in the required protocol so that Nomad can interpret, unpack and produce the required, alerting and reporting. Nomad then provides the data to the customer within a user-friendly dashboard.



The operator can gain operational and maintenance insights via real-time and historical bus information. Live camera feeds are available on request, whether it be an incident in real-time or a historical report. The telematics unit also alerts the processor and NVR when the bus doors are open or is in reverse to activate the reversing camera showing images with zero latency on the driver's monitors: an essential feature for the driver when reversing.

Predictive Maintenance vs. Reactive Maintenance

An element to improve and understand is failure patterns, to enable predictive maintenance instead of reactive maintenance. This is an augmentation to any RAMS (Reliability Availability Maintainability Safety) process, therefore maximising bus fleet availability. The Nomad solution provides in-depth and real-time information on the performance of crucial equipment and components on-board. This partnered with diagnostic alerts, provides bus operators and owners with the

intelligence and necessary time required to take proactive action to prevent unplanned maintenance. We focus on improving the overall reliability of fleets to support the industry with increasing ridership and sustainable travel. All buses share the same purpose – transportation; but it is how raw data from a bus is utilised to its full potential to benefit the efficiencies of the operator, therefore supporting an improved service.

Security

Another aspect important to operators is security. If there is an incident inside or outside of the bus, cameras will capture the footage (internal and external cameras – live feed and recording). The driver can also monitor when the luggage compartment is open from the driving position, enhancing the security of the bus. The operator can select any cameras on-board the bus and request footage of incidents filed in a tamper-proof video evidence locker. Typically, the operator would have to sacrifice the bus hard drive to provide recordings.

However, with Nomad's system, the video evidence locker provides a tamper-proof environment (secure file storage) for the content to be uploaded directly to law enforcement agencies. No one can access the virtual video evidence locker without appropriate authorisation.

Final Thoughts

Nomad Digital's vision 'connecting everything' underpins the connected bus. Now, the opportunity is not just to connect passengers during their journey, but also bus operators, maintainers and on-board staff; utilising key data insights to simplify fleet operation and maintenance.

If you would like more information about the contents of this article, please get in touch:
experts@nomad-digital.com



BUS CONNECTIVITY

We pioneer the intelligent journey – a shared and secure network infrastructure to which all authorised onboard systems and devices may connect.



Now is the opportunity to not only connect passengers, but bus operators, maintainers and on-board staff by enabling the vision of the connected bus.



Scan the QR code to learn how we can tailor DRT services to specific areas

Delivering BSIPs?

Talk to us

We can help **improve** your **network** and **reduce costs**

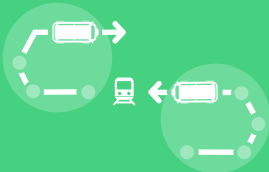
DRT can be **3x cheaper** than running a subsidised fixed-line bus service with greater coverage



DRT optimises low ridership routes



Early morning and late at night **DRT** gets passengers home and to work at off-peak times



DRT feeds frequent fixed-line services



DRT offers flexible mobility solutions for different use cases

Contact our DRT experts in the UK

David Carnero (david@padam.io) & Jack Holland (jack@padam.io)

Padam Mobility

With Funding in Crisis, Can We Really Improve Services?

It's a critical time for bus service funding. Just as Bus Service Improvement Plans (BSIPs) and Enhanced Partnerships change the way everyone works, the funding which has supported operators through the pandemic is set to taper off.

Meanwhile, new funding for BSIPs is estimated to cover only a quarter of proposals submitted to the Department for Transport. Operators and authorities are understandably worried about meeting the aspirations set for the bus industry.

Climate experts agree that switching people out of cars and on

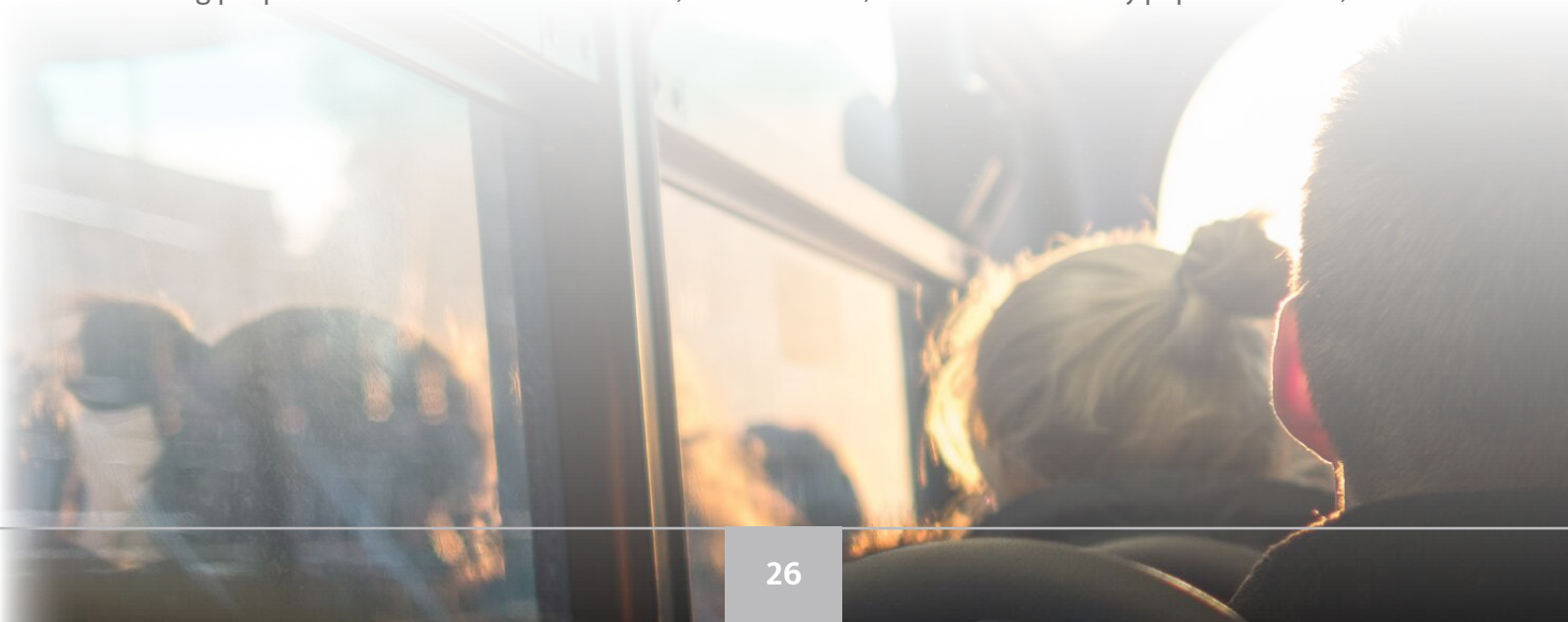
to buses is imperative to save the planet from catastrophe. Meanwhile, the cost-of-living crisis means many are wondering whether they can reduce their reliance on cars and the expensive fuel they consume.

With high stakes and small budgets, it's more important than ever to consider efficiencies. However, the question should really be "can we afford not to improve services?"

Enhanced Partnerships aim to improve the bus network and serve more people in a useful way. It's our experience that when the network is truly useful, we see radically greater numbers of passengers, who also report that they have reduced their car ownership (often people giving up the expensive second vehicle). However, to achieve this, for the bus

network to be perceived as 'useful', it requires service levels that equate to a bus at least every 30 minutes within a short walk of the journey's origin. That means, in most cases, within a short walk of people's homes. It also means a service that enables people who travel beyond core commuter times – for instance, those with late and early shifts – to get to work and home again. It means a service that can be relied on to get to appointments, for socialising and for onward travel.

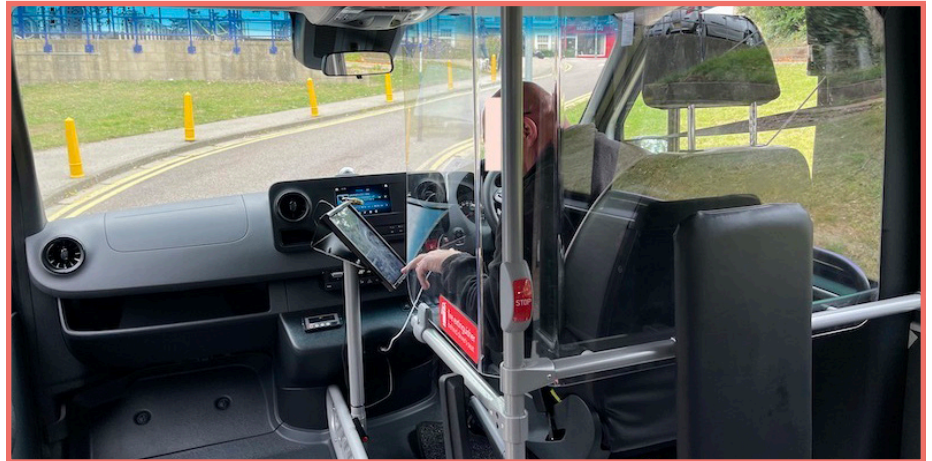
The National Bus Strategy highlighted how networks have shrunk to major corridors, serving fewer people's homes. The impact of cost-cutting has often been to strip away off-peak services and those to smaller villages or less densely populated areas, which has



reduced the pool of people who can use the bus to fulfil their transport needs. Once certain trips (even relatively infrequent ones) can't be completed by bus, people start to look at driving as a solution. And once they have sunk costs in the car, it becomes the first choice for almost every trip. To challenge that, bus services need to be radically improved. But expanding networks back into off-corridor communities and expanding timetables can be expensive. On a more positive note, our experience of developing demand-responsive transport (DRT) services is that this is possible – and using DRT technology to carefully manage resources means it isn't impossibly expensive.

DRT – done well – can be the way to increase network coverage, serve low-density areas and ensure that the late nights and early mornings are covered, providing services to meet off-peak demands. These services have to be booked by phone or app either in advance or in real time. We find that in general about 75% of trips are booked in advance, enabling the operator to forecast the vehicles and drivers needed and match them to the actual demand more closely.

With good publicity and a strong marketing strategy, these services attract new passengers.



When we see DRT introduced even to cover a low-density area, we discover whole new groups of transport demand. Our DRT provision in suburbs and small villages surrounding Strasbourg, that connects people into the fixed rapid transit network, was launched in 2019. The latest consumer research into users indicates that it has enabled people to give up second cars. We are convinced that serving the (in some instances, literal) edge cases increases the overall utility of the system to tip the balance back in favour of the bus.

This works even better where ticketing allows through trips so that end-to-end multi-operator travel is simple and cost-effective. The impact of this is that ridership grows, reducing the subsidy per person and per trip.

Within the context of the Enhanced Partnership, where there is better oversight of the network, it is possible to combine DRT with fixed lines to ensure that people have services that meet their needs, without inflating costs. Equally, where fixed line routes have low patronage, but are providing this 'edge case' service, replacing them with DRT can save money whilst ensuring the integrity of the network.

Analysing the network to ensure that the best value solution is provided for each area – without compromising the service levels is essential. DRT can be designed to serve across areas, as a feeder service or to ensure off-peak travel is possible along fixed lines.

Padam Mobility can advise how to design your services to reduce costs and ensure that your network is an attractive alternative to the car.



Swiftly

Oulu Public Transport Authority Eliminated the Need for Two Buses with Swiftly

The planning team at Oulu Public Transport Authority (PTA) was using anecdotal evidence to adjust run-times and create timetables, which was time consuming and led to inefficient schedules.

The team deployed Swiftly to analyse potential changes on a granular level, leading to shorter run-times, better relationships with operators, cost savings and improvements in on-time performance. Now the Oulu PTA takes an efficient, data-driven approach to planning and scheduling.

At a Glance

- OTP improved by an average of 10–20% on routes adjusted using Swiftly, with some routes achieving OTP improvements over 20%
- Run-times have been reduced by up to 15 minutes on routes modified using Swiftly

- Planners can adjust routes 63% faster with Swiftly
- Relationships with operators have improved as a result of more accurate, efficient schedules
- Optimised schedules reduced vehicle requirements, eliminating the need for two buses and expanding route service without increasing any costs

Plenty of Data, but No Way to Fully Utilise It

Oulu PTA needed a proactive approach to data. When the planning team adjusted run-times and put together new timetables, they relied primarily on anecdotal information, which made the planning process challenging and imprecise. *“The process for creating and adjusting timetables was difficult before Swiftly. It was quite time consuming,”* says Helena Väliäho, Head of Public Transportation at PTA.

The planning team was only able to implement changes a few times

a year. Operators and passengers would have to wait months until a scheduling problem was fixed. The planning team deployed Swiftly to get a granular understanding of where to make changes. *“We have always had plenty of data, but because we didn’t have any analytical tools as advanced as Swiftly we weren’t able to fully utilise our data,”* explains Tomi Paananen, Public Transportation Planner at PTA.

Using Swiftly to Redesign the Planning Process

Using Swiftly has transformed how the team builds new timetables.

“I use the On-Time Performance and Run-Times modules on a daily basis,” says Paananen. *“Before, we adjusted our timetables a few times a year. Now we adjust our timetables every month. Before even a simple line would take multiple hours to analyse. Difficult cases would take us a whole day. Now it takes us anywhere from 15 minutes to three hours.”*



“Swiftly is a game-changer as it gives the public authority the perfect tools to be a proactive planner.”

**Tomi Paananen
Public Transportation
Planner at PTA**

Paananen and Väliäho gave an example of how they use Swiftly to make changes. *“We recently updated Line 20,” says Väliäho. “The operator was saying we needed to add one minute to the total run-time for the route. Tomi and the team looked at it in Swiftly*

and actually ended up taking one minute away.”

“The problem on that line was that it wasn’t spaced out right. We needed to take some time out of one part of the route and put it elsewhere.” says Paananen.

“If we’d done it the way we’d done it before, we would have automatically added one minute to the route, and eventually it might mean adding an additional bus. Those minutes are cost savings for us,” says Väliäho.

“After we implemented that change on Line 20, on-time performance increased by 15% immediately,” says Väliäho.

On-Time Performance Gains, Cost Savings and Eliminating the Need for a Bus

PTA is seeing big results for routes adjusted using Swiftly.

“In total we have adjusted a little under 20 routes with Swiftly. On those routes, on-time performance has consistently improved over 10% and, in best cases, well over 20%,” says Paananen.

“All of the routes we adjusted work really well right now. It looks like we don’t have to touch them at all anymore. Before, we’d change



routes every single year, and now with Swiftly we are able to find a really good solution quickly,” says Paananen.

PTA has also used Swiftly to discover that they can cut two buses without impacting service, which will lead to significant cost savings when they tender a new contract with operators.

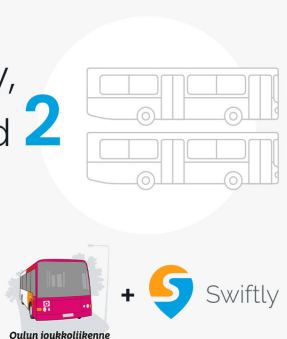
“One of the biggest ways that Swiftly has helped us with cost savings is by showing us that there is usually way too much overall run-time on a route. Minutes are often in the wrong places. With Swiftly, a trip that used to take one hour now takes 50 minutes, meaning that we use fewer cars to provide the same level of service. We’ve downsized cars from 12 to 10, and we save kilometres and work hours too,” says Paananen. “We can redistribute those resources elsewhere to provide better service overall.”

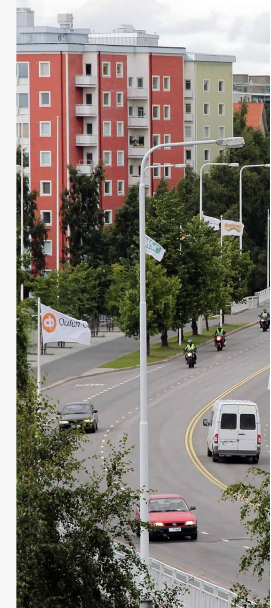
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Tomi Paananen
Public Transportation
Planner at PTA

With Swiftly,
Oulu saved **2**
buses





A Data Tool the Whole Agency Can Trust

“Now that we have this new process, I feel like the trust in our planning has improved,” says Paananen. “Previously I felt like contractors had to be really careful with their driving and adjust the timing themselves during the routes. Now they can just drive as they go. They know that we can step in and change things after a few weeks if something is off, as opposed to waiting half a year until this gets adjusted. That increased operator trust has been one of the best things about working with Swiftly.”

“Whenever I have to make a case for a tool, it’s always about money. Swiftly makes it easier to make that case, because I can easily show how it’s helped. And there are other teams here who are interested in using Swiftly as well, which makes it even more indispensable,” says Väliäho.

“Swiftly has greatly improved the passenger experience: we are

able to detect problems before customers realise them.

Our customer service contacts regarding run-times have significantly dropped,” says Paananen. “Customer service also uses GPS Playback and Live Operations to help passengers.” “If you’re an authority interested in a data-driven approach, Swiftly is the best. If I have to justify my decisions, it’s a lot easier with Swiftly. I can confidently say what I need to say and back it up with data, instead of just sell a pitch.”

He adds, “Swiftly is a game-changer as it gives the public authority the perfect tools to be a proactive planner.”

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Service solutions for the modern transport network

Bidvest Noonan is a people business, operating in the facilities services sector. We employ over 27,000 people and operate nationwide across the UK and Ireland.

We offer a wide range of award winning services to the transport industry including security, cleaning & specialist services.

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Bidvest Noonan

MyBidvestNoonan Interactive Management Platform

Live custom performance measuring for all aspects of our facilities management solution.

Our transport networks have been serving the public for centuries, making journeys easier and transporting cargo simple. These networks are the veins of our economic power which supports our global society.

At Bidvest Noonan we understand the need for modern solutions when serving our transport clients that continuously look for cutting-edge innovation.

Our new interactive management platform, MyBidvestNoonan, streamlines all of our management information which we offer to our clients and condenses it down into a smart app with engaging data. MyBidvestNoonan is available to use across desktop, iOS and Android.

With seven key features our clients are able to access information on their sites instantly, anywhere in the world. Here we will go through each of MyBidvestNoonan's features.

MyBidvestNoonan – Report

Our report function is exactly what it says and more. Any of our colleagues whilst going about their daily duties can use their company-issued handheld device to report or log whatever our clients want to see. This can be as simple as a completed patrol showing the route, date and time or, additionally, we can include a fault-reporting feature so any of our cleaners whilst cleaning a bus or train can report any faults they find on the vehicle. They can take and upload a picture to display the problem, leading to fast fixes and improved quality.

Our report feature also has an accident and incident-reporting function which demonstrates site statistics that are bespoke to each client's requirements. We can demonstrate that we are compliant against safety checks, show different types of incident/accident in line with each client's reporting requirements, tailored to each specific contract.

MyBidvestNoonan – Track

The track feature uses IoT and NFC (near-field communication) technology to build a tracking system for our colleagues using schematic site diagrams and digital information. Once we have the required information, we plot our solution, whether security or cleaning, to the beacon points and can then portray service compliance with evidence, showing that areas we have maintained and the time spent maintaining them.

This feature brings significant benefits to our clients and colleagues. We can ensure any lone workers are tracked and know exactly where they are located in case of an emergency.

We can also track things like restroom occupancy rates to develop our cleaning schedules, achieving a much smarter way of working.

MyBidvestNoonan – R.A.I.D

R.A.I.D (Risk.Analysis.Intelligent. Deployment) is our risk-based model which operates by applying a methodology to a variety of data sources taken from police crime data and the Office for National Statistics, our data and our clients' incident-reporting data. Our software then applies a score to each location based on data and intelligence to determine the overall risk categorisation of each location and recommends layered resourcing options.

We completely analyse all of our clients' locations. The results then support our solutions, recommending security provision, locating crime hotspots and more.

MyBidvestNoonan – Time & Attendance

Enabling our workforce to view, manage and book on to their shifts with ease, our time and attendance solution supports our colleagues with an easy-to-use app. With full transparency our clients can see shift fulfilment perfectly. The app supports our contract management when viewing any potential gaps in service delivery.

MyBidvestNoonan – Audit

The custom audit feature provides our clients with a whole host of dynamic data. Much like the report feature our software gives our management teams and clients the ability to conduct regular audits throughout their site. This data then generates reports delivered directly into our clients' inboxes.

Our data collated from audits gives us insights into areas that require improvement. This is a valuable tool that helps us drive continuous improvement.

MyBidvestNoonan – Training

As a people first business we are always looking for ways to support our colleagues to reach their potential. Within our software we have a dedicated training feature. In this section of MyBidvestNoonan we can create a custom development journey for our employees to learn and develop new skills.

We tailor the learning and development path to each employee with skills applied to each contract requirement, and can provide training reports to support compliance and QHSE.

MyBidvestNoonan – Helpdesk

Our last but definitely not least feature of our software is our helpdesk. It provides 24/7/365 support to our clients through a team of readily available specialists that is able to pick up and handle any issues our clients may be facing.

We track all tasks generated through to completion assigning owners and following up on timescales to ensure an end to end support function.

Summary

We have so much technology available at our fingertips it would be a waste not to utilise it to keep improving the way we do business.

Our MyBidvestNoonan software offers a significant improvement on the traditional methods of managing security and cleaning solutions. We will be continuing to innovate in this space in the future, looking for smarter ways of working and automating our processes.



PSI Transcom GmbH

Reliable Driving Operations through Harmonised Workshop and Depot Management



Reliability, quality, efficiency and sustainability are pivotal challenges facing public transport companies. Consequently, companies that link all the related processes in an optimised way have an advantage. The co-ordination of operations and workshops holds great potential and benefits all involved.

Ensuring daily operations, meeting passengers' increasing quality demands, and reducing costs: transportation companies are facing many and varied challenges which are almost impossible to meet without the support of information technology. The integrated interaction of the

various departments and IT systems is more crucial now than ever before. This is the only way to leverage all areas of potential. Depot management systems (DMS) play a key role here.

For example, a DMS can be used to order and block vehicles for

workshop tasks and to classify the vehicles' operational capability at the same time. Up to now, however, the selection of vehicles for delivery to the workshop has usually been carried out solely via the data-carrying (master data) systems such as those from SAP, Microsoft Dynamics NAV or Maximo which



A DMS monitors and controls all processes in a depot, from vehicle arrival and supply through repair and storage.

follow standardised rule-based maintenance or cleaning intervals.

These systems do not know or take the on-site operational situation into account when planning. Even special workshop resources that may be relevant to a job are not included in the selection process. This is further complicated by the fact that detailed planning of work processes in the workshop itself is frequently done manually using analogue planning tables.

In simple terms, this means:

Workshop activities and operational requirements are characterised by numerous media discontinuities and lack co-ordination.

The consequence: vehicle bottlenecks are more likely and the utilisation of workstations and employee capacities in the workshop is uneven. A look at practice shows that vehicles which cannot be processed due to a lack of resources are nevertheless reserved for processing by the workshop on a daily basis. This means that vehicles are unavailable for dispatch (damaged in some way that prevents their use) on a regular basis, causing bottlenecks for no reason.

Operational Business Has Priority

Therefore, considerable potential can be leveraged by automating

and harmonising these processes. A system that is also aware of the operational situation in the depot should be introduced to take over the planning of workshop orders. In this context, it makes sense to expand the depot management system used, which builds a bridge between the workshop, operations and the systems used in each case.

In addition to interfaces for importing and exporting workshop orders, planning resources and fault information, a corresponding add-on module should also include a graphic planning table. It provides an overview of the current occupancy of the workstations in the workshop and utilisation of employee capacities.

For instance, if a vehicle is needed for operational purposes, the DMS can overwrite the leading system's workshop order and postpone it so that the timing suits. In parallel, it can reserve another vehicle for the workshop based on the known, operational requirements and thereby ensure utilisation of the workstations and employee capacities. This enables the extended workshop management to take account of the numerous unplanned orders that come in throughout the day and allows for continuous readjustment of the solution calculated statically in the morning.

Automatic Job Planning Ensures Optimum Capacity Utilisation

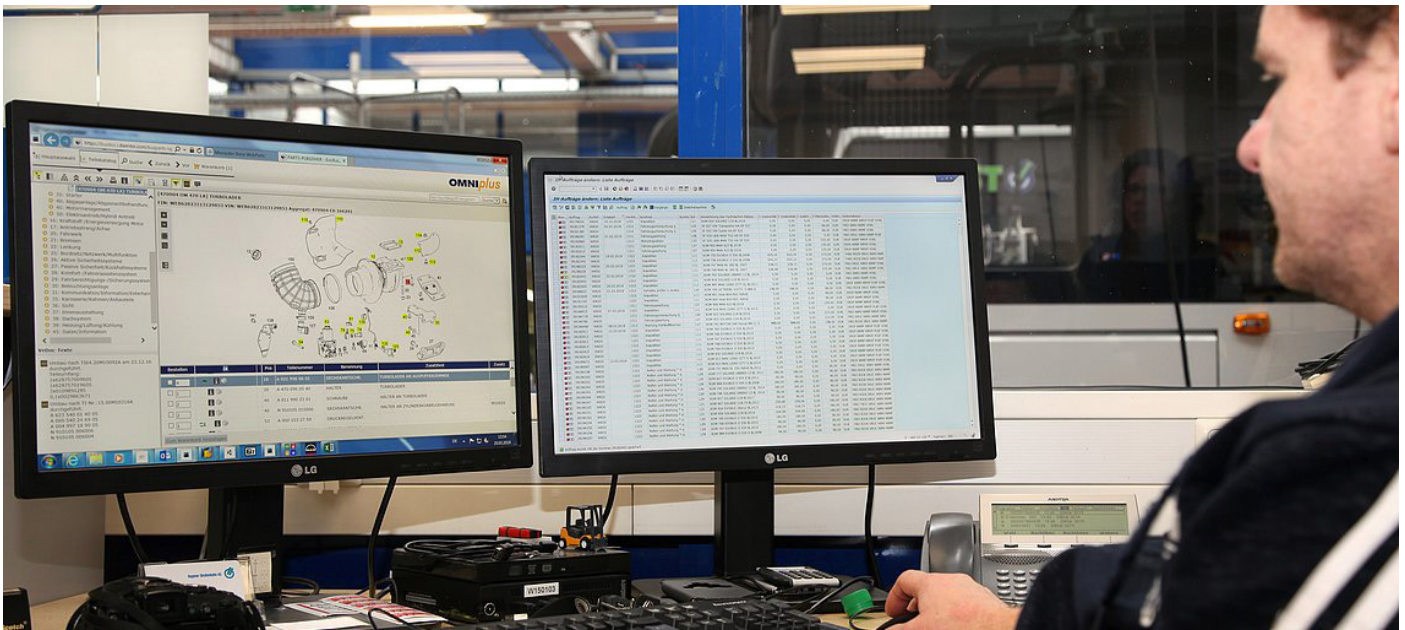
The **Qualicision** optimisation module, which is part of **PSIttraffic/DMS**, facilitates the optimised automatic scheduling of orders,

taking various – even conflicting – parameters into account.

This allows criteria to be assigned different priority levels during vehicle selection. Ensuring operational running is always top priority. As such, this criterion is to be regarded as a restriction: if a vehicle is in high demand in operations due to operational circumstances and the earmarked deadline has not yet been exceeded, it cannot be set aside for the workshop.

In contrast, criteria such as compliance with specified maintenance, inspection and cleaning intervals, as well as the requirement to utilise the workshop's capacity evenly are assigned different priority levels in the decision-making process. These criteria may be defined individually, depending on the availability of resources, especially those such as work statuses, personnel or tools. Finally, the process of finding solutions is completely automatic and the module only generates reports if conflicts which cannot be resolved automatically arise. These conflicts are automatically postponed to the future to allow the employees in charge to search for solutions and respond in a non-pressurised manner.

Solutions that monitor the current operational situation in real time and reliably provide vehicles for scheduled workshop appointments using optimisations have an advantage.



Thus, the previous planning of work steps manually using an analogue planning table in the workshop can be replaced by a digital Gantt display.

It provides an overview of work status occupancy as well as the utilisation of employee work capacities. Work orders can also be manually assigned to days in table format and via suitable dialog boxes, as well as in combination with existing assignments.

Integrated Workshop Management Ensures Driving Operations

By integrating operational workshop management into the DMS, vehicles and required work can be consistently tracked within one system. This eliminates the need for paper documents and manual data transfers to a second system. More precise planning and short response times prevent vehicle shortages, which in turn ensures that the driving operations run smoothly.

The use of intelligent decision-making software also allows for the balancing of conflicting goals and the calculation of balanced results. The simultaneous transition from manual work scheduling to an automated system in the workshop also helps optimise the utilisation of individual work statuses and employee capacities. Additionally, connections to existing workshop management systems, for example those for commercial processing, can be maintained.

Your benefits with PSITraffic/DMS

- Transparency at the depots
- Vehicle parking and assignment in real-time based on Qualicision
- Improved vehicle availability
- Reduction of the vehicle reserve
- Optimised vehicle supply (cleaning, sanding, refuelling)
- Manual, semi or fully automatic vehicle dispatching
- Use of standard interfaces
- Integration with AVMS (Automatic Vehicle Management System)

- Integrated quality management system

More Room for Manoeuvre

Linking operations and the workshop via an operational workshop management module opens up considerable efficiency potential. A particularly valuable aspect is the integration of a multi-criterion decision-making aid that allows companies to individually prioritise and weight the planning parameters that are relevant to them.

This solution, which is currently unique on the market, provides transport companies with investment security for existing IT systems in the workshop.

PSI 

Electric Buses Depot and Charging Management plus Personnel Dispatching: All from a Single Source

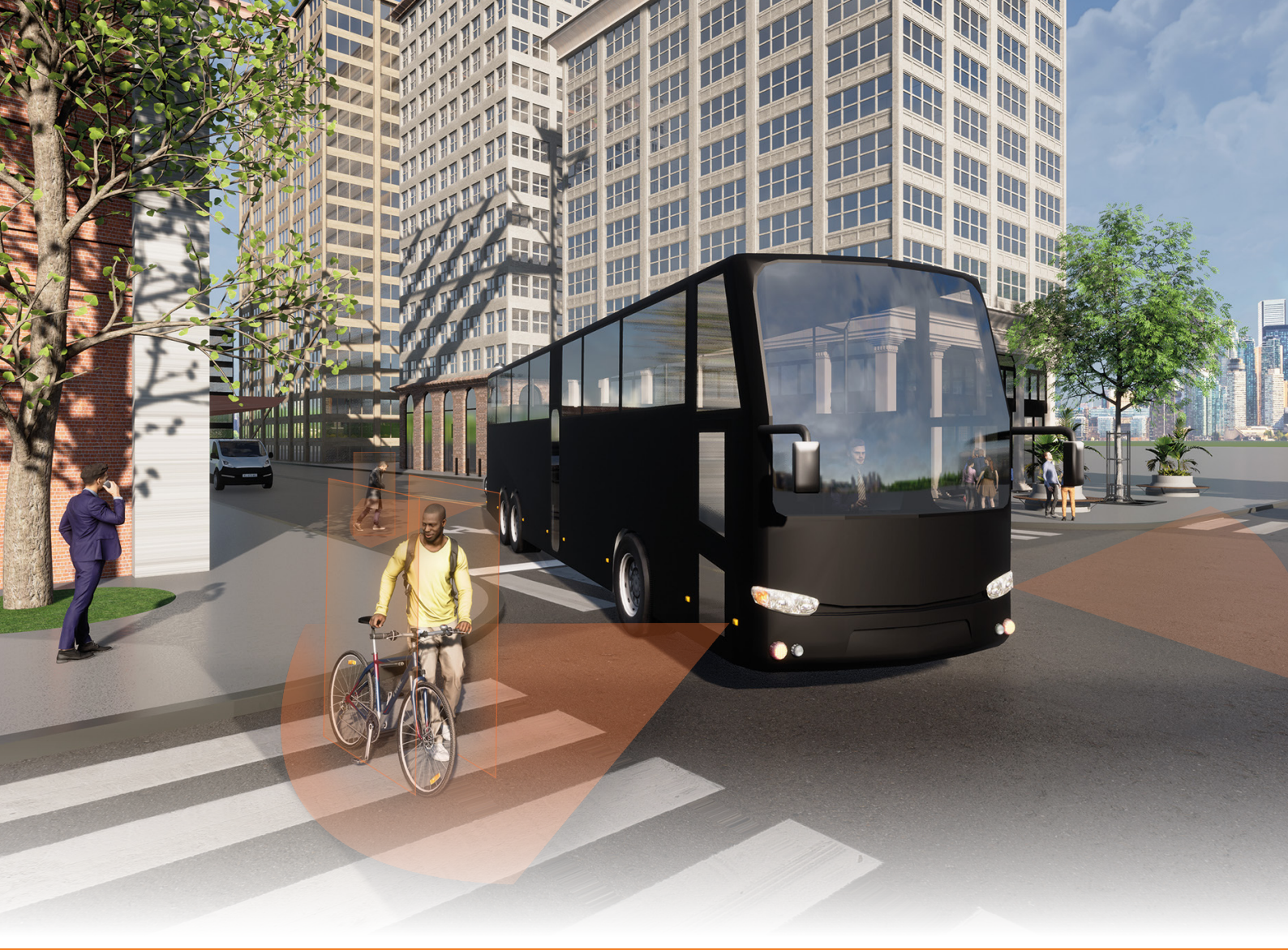


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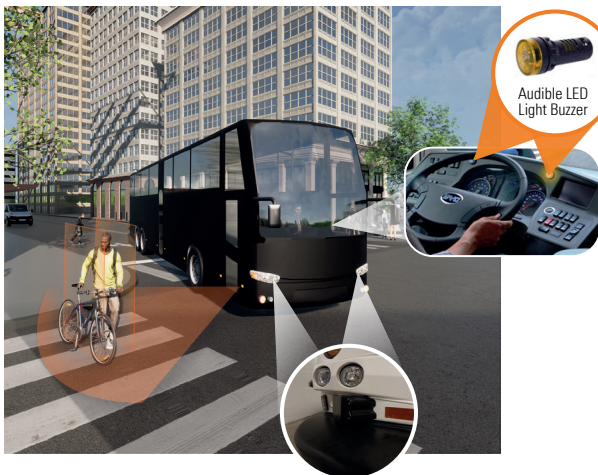
PSI 

Software for the Mobility of Tomorrow



BLIND SPOT AWARENESS/ SAFE TURN ALERT

Bus to Pedestrian Mitigation with Collision Avoidance



System Features:

- Outside warning announcement
- Audible and visual alerts sent to operator
- Passive system requiring no driver interaction
- Volume automatically adjusts based on ambient noise
- Multiple recordable messages

BLIND SPOT AWARENESS/ SAFE TURN ALERT

Bus to Pedestrian Mitigation with Collision Avoidance

Safe Turn Alert (STA) and Blind Spot Awareness (BSA) are two safety products from Protran, geared at addressing potentially dangerous conditions that arise when buses make turns in busy traffic intersections. This article describes how these two products help bus operators reduce accidents that occur when buses collide with pedestrians and bicyclists.

Buses are designed to protect passengers in the event of catastrophic roll-overs. The Roll-Over Protection System (ROPS) includes structural beams, designed to take the weight of the bus in case it flips over. The so-called "A-pillar" is the one at the front of the bus. Because it is structurally re-enforcing, it typically has a large cross-section. As a result, it blocks the view of the driver, as shown in Figure 1. The bus industry has not been able to solve this problem other than offering surveillance camera-based solutions, but those may distract the driver. Figure 2 shows the blind spots during a right turn. Figure 3 shows a busy intersection in a major US city. Note the pedestrian in or very close to the driver's blind angle.

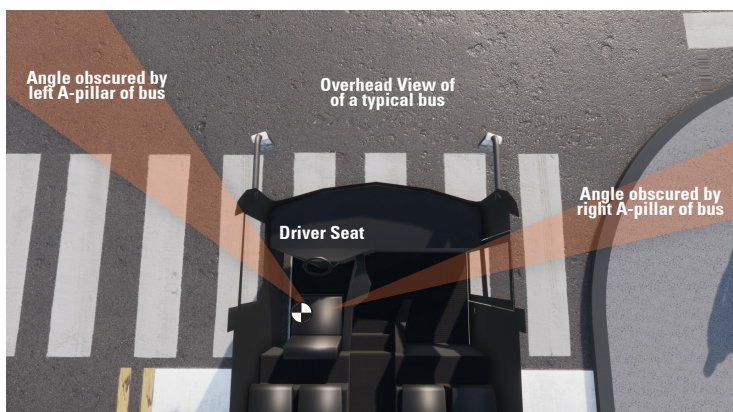


Figure 1. Layout of typical bus



Figure 2. Blind Spots most critical during a right turn

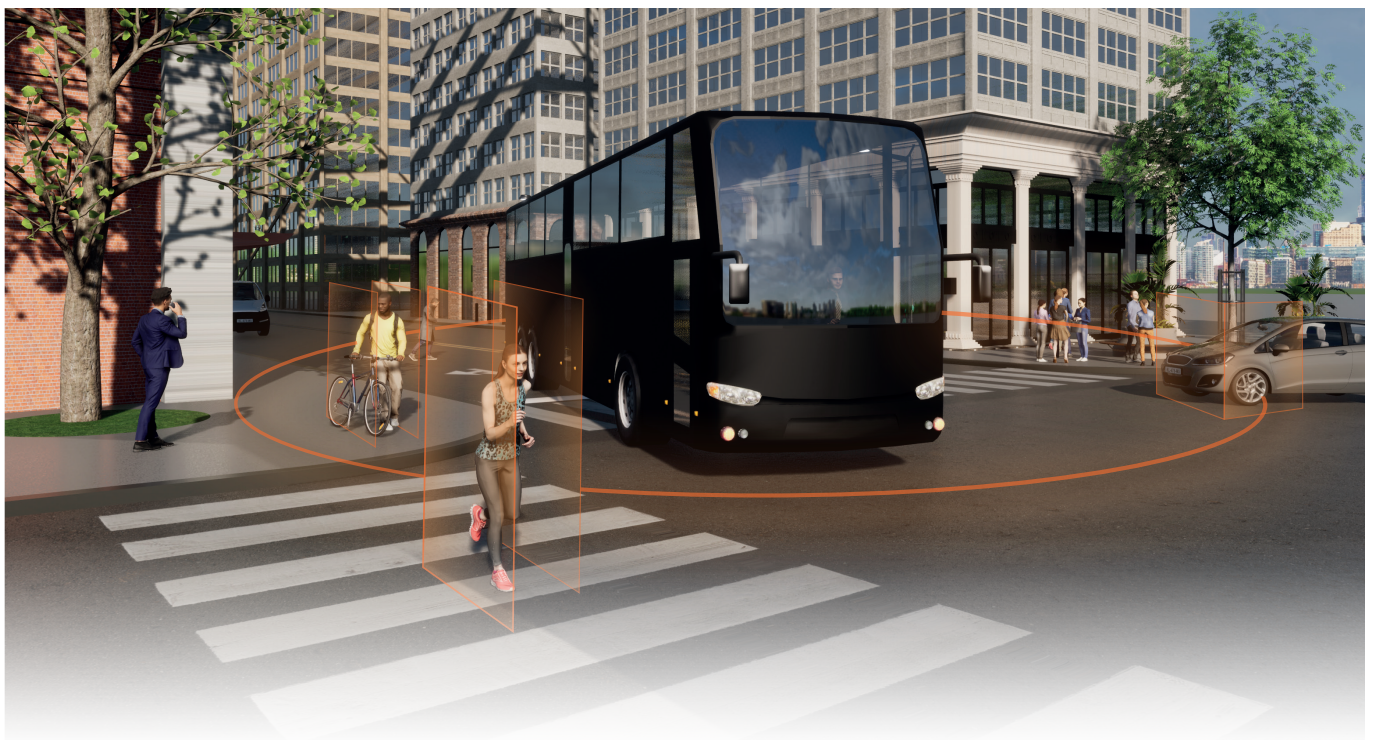


Figure 3. Pedestrian in the driver's blind spot during a right turn at a busy intersection

Safe Turn Alert (STA)

STA consists of a sensor and a control unit that detects when a bus-driver initiates a turn. The STA system delivers an audible alert to pedestrians and bicyclists on the outside. The message comes out of speakers mounted on the outside. During a turn, the bus makes an announcement such as "Attention, bus is turning". By alerting pedestrians through an audible warning, pedestrians and bicyclists get roughly two additional seconds to react to a turning bus – which often is the difference between an impact and a non-impact. STA has GPS capability, which requires an internal GPS antenna to be mounted on the exterior of the bus. The STA system can be complemented with an additional product, the BSA.

Blind Spot Awareness (BSA)

BSA is an optional addition to the STA system. It requires the STA to be present on the bus, and cannot be sold separately. The BSA consists of sensors mounted in the front left and right corners of the bus. The BSA sensor uses radar technology plus advanced signal processing to track individual pedestrians or bicyclists, and can make intelligent determinations about the potential danger based on locations, angles, and speeds. When the BSA system determines that a pedestrian or bicyclist may pose a danger (e.g., a collision may occur), it alerts the driver immediately through visual and audible alerts in the instrumentation panel.

The lights are shown in Figure 4



Figure 4. Schematic showing the BSA warning lights on the bus instrumentation panel

Bus Design & Interiors

Treadmaster Flooring p.42

Yellow Window p.44

Camira p.45

Corex Honeycomb p.48

U-Lift p.50

Treadmaster Flooring

The Routemaster – A London Icon



Treadmaster Flooring is proud to have been part of this famous bus since the very beginning.

Treadmaster's TM3 & TM4 flooring has long been associated with the Routemaster bus; from its inception in the early 1950s, right through the 1960s and continuing to the vehicle's extensive revival in 2012.

This affiliation continues to this day with the Routemaster Association, an organisation tenaciously keeping this transport icon on the road.

In the last six months Treadmaster Flooring has been working alongside the Routemaster Association to supply it with all the original flooring components, which it in turn sources to its ever-increasing membership. Some of

these components have not been manufactured in over 25 years, consequently leading to a complete redesign and followed by production on our state-of-the-art CNC Router.

TM3 & TM4's synthetic rubber-bonded cork materials give both an excellent degree of oil and grease resistance, coupled with a high coefficient of friction properties; these

combined compounds and features give both materials a durability suitable for many years of service. The Routemaster Association was formed in the late 1980s with the aim of supporting operators and owners who had started to acquire examples of this London icon following the commencement of large-scale withdrawals from London service.

Since then, the association has developed into a leader among bus interest and support organisations; and working together they help keep the Routemaster on the road.

Their principal aims are to:

- Share knowledge and operating experience
- Provide technical information
- Provide help with obtaining spare parts
- Provide Routemaster-related news
- Cater for the historical and preservation interest

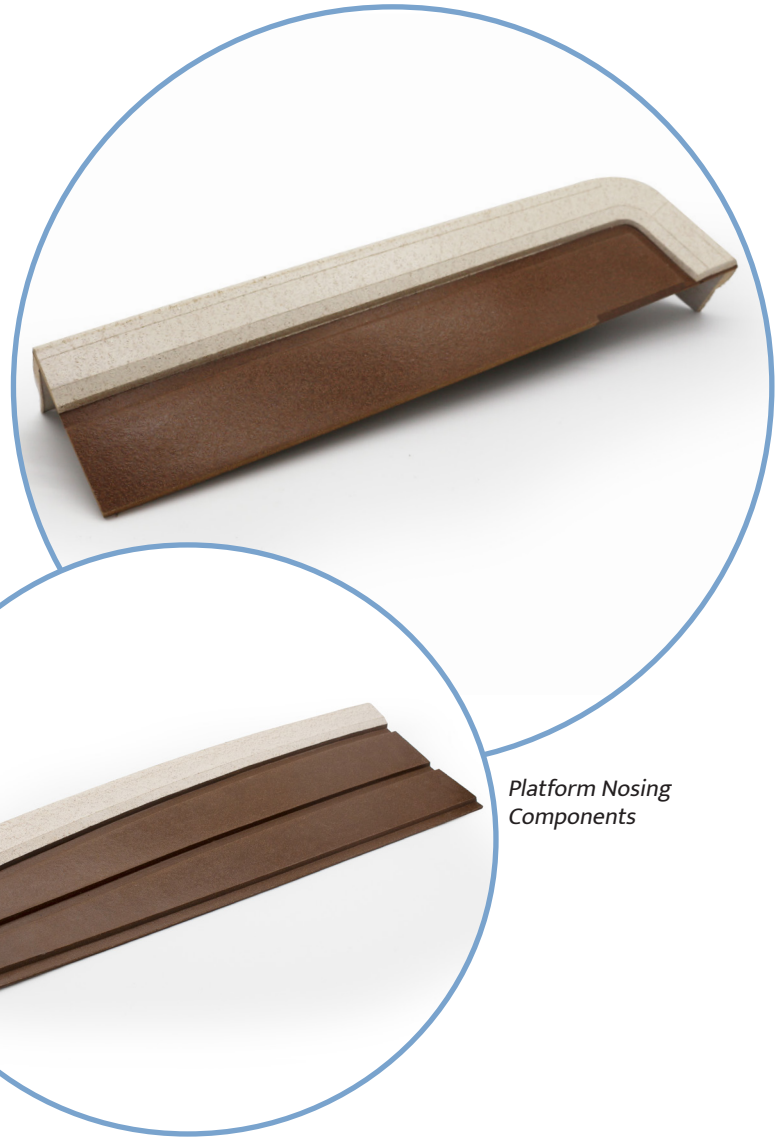
The Routemaster Association often organises, or is involved with, a number of events. Events have taken place at many venues including Brighton, Brooklands, CarFest, Gaydon, Leighton Buzzard, Quainton Road Railway, Shuttleworth and Worthing.

A big milestone was the 50th anniversary of the unveiling of RM1 back in 2004. The Routemaster 50 rally was held in London at Finsbury Park over two days in July of that year where nearly 100 Routemasters were in attendance. Ten years later the 60th anniversary of the unveiling of RM1 was marked with the largest-ever gathering of the Routemaster bus. Over two days in July 2014, the Routemaster 60

rally was again held in London at Finsbury Park where 136 Routemasters were in attendance.

A number of specially produced items have been sourced and / or manufactured by the association, including window rubbers, bodywork fixings, bonnet roundels, indicator ear rubbers and sliding bulkhead windows as well as a number of mechanical items such as gearbox piston seal kits, brake adjuster and key, handbrake quadrant and pawl, and king pin sets.

We hope to build on our growing relationship with the Routemaster Association and provide it with flooring parts for years to come.



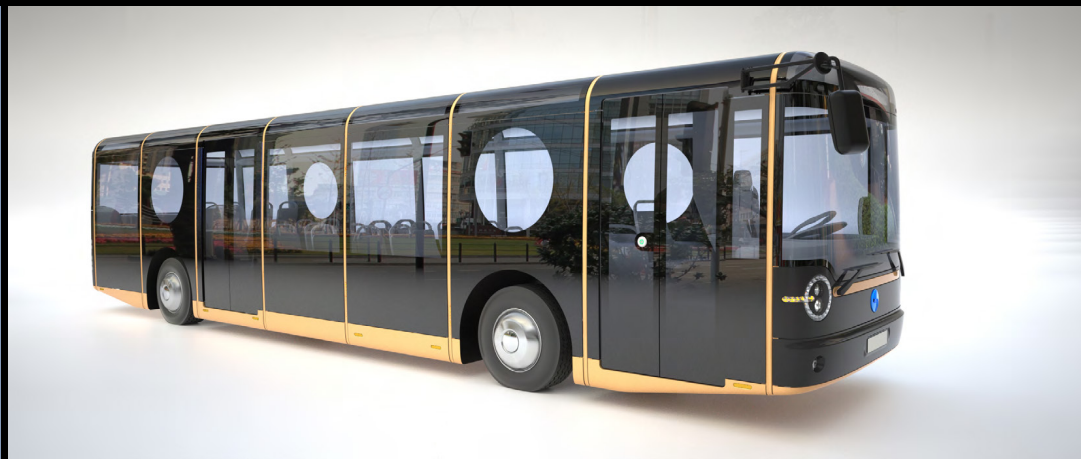
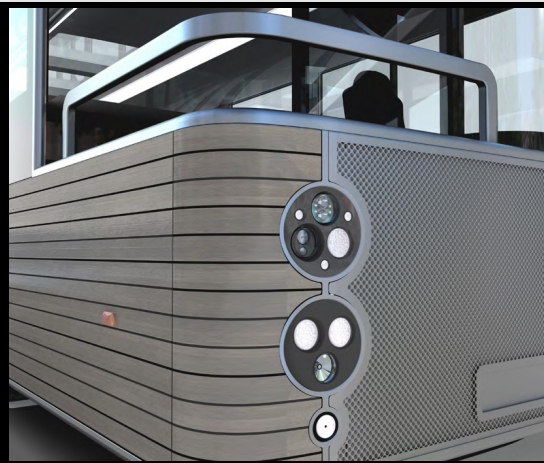
Platform Nosing Components

If you're interested in becoming a member of the Routemaster Association please visit routemaster.org.uk for more information.

treadmaster
flooring



YELLOW WINDOW



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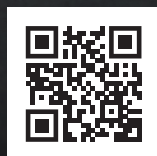


Make bus seats into billboards

Opening up a world of advertising potential, Camira Print is here to revolutionise the way products are sold and stories are told.

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camira
PRINT



200 YEARS OF
TRANSPORT
TEXTILES
EST 1822

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< Bus Design & Interiors

Camira

Fabric Manufacturer Camira Launches Revolutionary Digital Print Technology

In an exciting development for the transport industry, Camira Print removes design and colour constraints for bus and coach operators.

In a year in which the global company celebrates its 200th anniversary in transport textiles, Camira has signalled its commitment to remaining at the forefront of the industry with the introduction of the innovative Camira Print.

Perfectly complementing the manufacturer's renowned weaving capabilities, the launch expands its offering to encompass digital printing – providing customers with an unparalleled level of flexibility

and freedom when choosing the optimal textile for their bus or coach interior.

Revolutionary Design Potential

Removing many of the design constraints associated with traditional woven textiles, Camira Print fabrics can be created without restrictions on pattern repeats, scale or colour, as well as significantly reducing lead times and minimum order quantities. With a variety of design options, customers also have the flexibility to choose from a range of readymade prints in standard colours, opt for custom colours or create something entirely new

– working with Camira's in-house design studio to develop a totally bespoke creation.

Ciara Crossan, Transport Creative Manager at Camira, explains, “We've really worked hard to provide customers with a design option for every need. With the Camira Print collection, we have brought together a selection of carefully curated palettes and trend-led patterns to provide customers with a readymade range of printed fabrics which can be dispatched within days.

For those who would really like to push the boundaries in terms of creativity, there is truly no limit to what is possible with Camira Print – they can create immersive



advertising campaigns, recreate photographs, go as big as they like in terms of scale, as bold as they like in terms of colour – this technology really does unlimit so much of what is restricted at the moment.”

Moquette Fabric, Made from Wool

In an appealing blend of tradition and innovation, each Camira Print creation is applied to a lightweight moquette fabric – the construction on which Camira’s rich heritage is built. With a velour finish, the textile has been created exclusively for digital print and is woven from naturally sustainable wool to deliver saturated colour and comfort.

High Technical Performance

Meeting the industry’s key technical performance standards, Camira Print textiles achieve the European flammability regulation, ECE Reg 118.03, and the North American flammability regulation FMVSS 302. Indicating high durability, the newly launched textile capability also has an abrasion performance of over 100,000 rubs.

“A light shed moment for the industry.”

Jonathan Thompson, Director of Transport at Camira, comments on the launch, “We’re incredibly

excited to introduce Camira Print to the transport market; not only is it a first for Camira, but also for the industry. Providing an unmatched level of design, colour and manufacturing freedom, customers can create truly unforgettable fabrics which it has just not been possible to create – until now. Truly a light shed moment for the transport industry, Camira Print will revolutionise the way in which fabrics are designed and made. We can’t wait to see the ways in which our customers use this new technology.”

Camira Print can be explored online [here](#).

camira



Corex Honeycomb

Aluminium Honeycomb Panels from BCP Utilising Corex Honeycomb

Composite panels are essential within the bus industry, to provide panelling for flooring, walls and bus body shells and components and to reduce weight in the production of the vehicles. Lightweight panels lower the overall weight of the vehicle which reduces the cost to run it. Corex Honeycomb and Bespoke Composite Panels (BCP) have product ranges that are suitable for the industry for a variety of applications.

Aluminium Honeycomb

Corex Honeycomb manufactures aluminium honeycomb that can be used within both flat and curved composite panels, which are made by our sister company Bespoke Composite Panels. During this process, the aluminium honeycomb is bonded to a skin with an industrial adhesive using a heated press. This ensures the panels are connected together as tightly as possible, increasing their strength. BCP panels can be made with a range of skins and varying thicknesses of honeycomb,

depending on their end usage. These panels are engineered to be extremely strong and supportive, but also lightweight to ensure they are not adding any excess weight in their application.

Benefits of using aluminium honeycomb for composite panels include:

- It is lightweight
- It is strong, corrosion-resistant and a good conductor of heat and electricity
- Aluminium is 100% recyclable, without any loss of its natural qualities
- It is easy to shape, form and fabricate

Composite Panels

The durability of BCP composite panels means they are able to withstand a large amount of interaction with external forces while still remaining in good condition. Should they become damaged however, the panels are easy to swap out making them an economically viable option for the bus industry, for use in bus body shells and components, as well as flooring and partitions. Composite panels can also be used when manufacturing ramps on buses

for assistance to enter the bus. Composite panels are an excellent option for vehicle maintenance in case of changing and replacements.

Superflex

Alongside the standard honeycomb range, Corex Honeycomb also manufactures flexible aluminium honeycomb – Superflex. Superflex has the same properties as our standard hexagonal cell-shaped aluminium honeycomb, but the cell geometry has been adapted so the aluminium honeycomb can bend and flex. This new product has excellent formability and is easier to use for round shaped surfaces, and the resulting benefit of this cell configuration is that the flexible honeycomb can be used for curved panels as well as spherical, cylindrical and organic shapes.

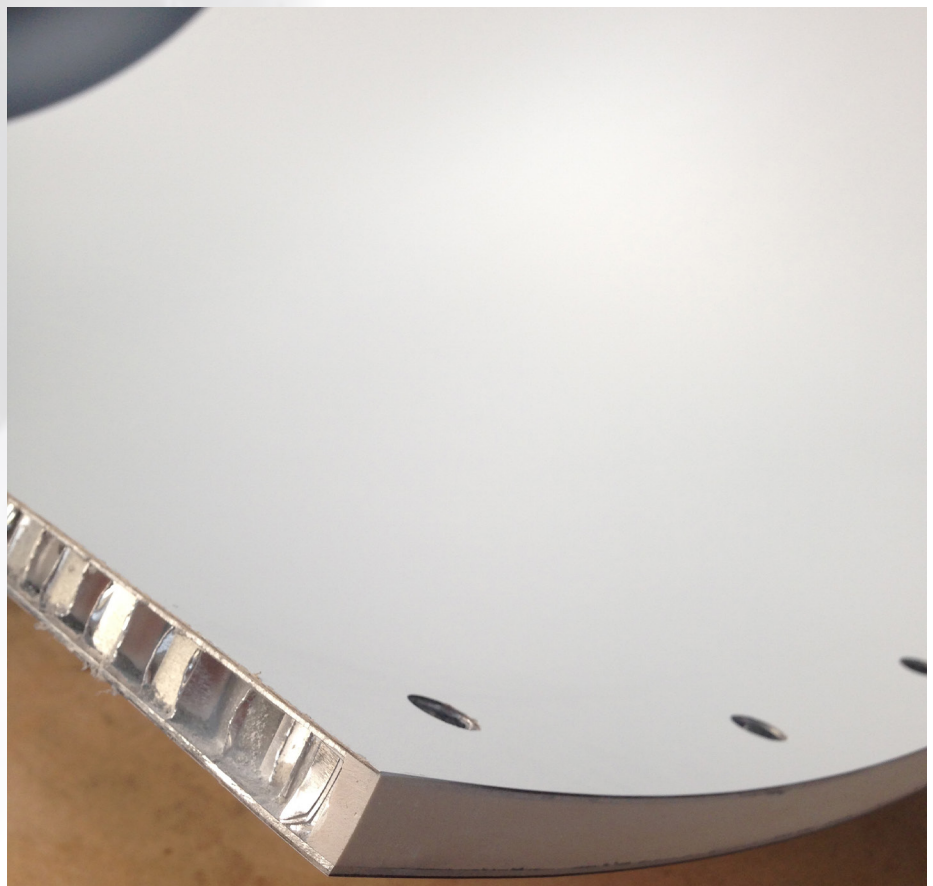
Curved Panels

There are two ways to manufacture curved aluminium honeycomb composite panels. The first method involves a jig, which is built to form the curve in the panel. The aluminium panel rests on the jig and is placed inside a vacuum bag. The vacuum within the bag causes the skin and core to be



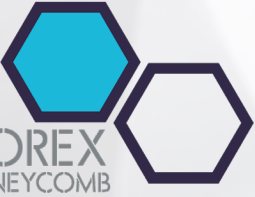
pressed together by atmospheric pressure. This method is most suitable when repeatedly making curved composite panels each to the same size and standard. This type of method is used by BCP to make universal access toilet (UAT) doors on trains in order to make them more accessible and provide additional space. Other products that can be made from these curved aluminium panels allow for more fittings or equipment to be incorporated within a bus. These larger curved panels could also be used on a bus in the stairwell going to the top floor of the bus. Their durability also means they are able to withstand a large amount of interaction with external forces while still remaining in good condition.

The second method is machining, where parallel lines are cut in the piece of honeycomb. The position and the depth of the cut correlates to the size of the curve in the panel. Where there are deeper cuts in the panel, there will be more room to form a larger radius of curve. This method is typically used for one off pieces.



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U-Lift

Local Manufacturer in Global Market



U-Lift in Backaryd has made itself known as a world-leading manufacturer in the global market

U-Lift in Backaryd, with its 20 employees, is the small company that has made itself known as a world player in the global market. With its quality-assured lifts, ramps and air suspensions for freight and passenger transport, the company is now an established global supplier. With a clear goal of continued growth, U-Lift is not slowing down.

U-Lift in Backaryd is a well-established company that started as early as 1957, then focusing on luminaires and later furnishing of buses and trains. Nowadays, the focus is entirely on lifts, ramps and air suspensions for various types of freight and passenger transport, and then mainly passenger vehicles and trains.

The production of electro-hydraulic lifts started in the 1970s and U-Lift has over the years grown as a recognised and stable supplier. The company is certified according to

the standards and directives that apply to the industry and there are also industry-unique standards.

“We are a leader in the industry with exports to mainly the European countries but also globally from Brazil to China,” says Stephane Thomsen, Sales and Marketing Manager at U-Lift in Backaryd.

Increasing Growth

U-Lift is established with offices, production facilities and

warehouses in Backaryd, Sweden. The planned investments include, among other things, expanded production areas and warehouse space, in order to meet the steadily increasing order backlog. The investments also apply to the personnel side, where U-Lift will continue to recruit new employees.

“We started at the turn of the year with recruitment and we need to strengthen further to match the order intake,” says **Stephane Thomsen**. He describes the company as being in a positive phase with “growing pains” right now.

“We have a goal to grow 15 percent a year, which is a goal that we follow and exceed. It also means that we must increase our production capacity. The train-side is a stable market under constant growth and we are already receiving orders for 2023,” says **Stephane Thomsen**.

World-Leading Manufacturer

The car-side is a more cyclical sector, but even here U-Lift has secured orders and sees a clear increase.

Customers include several significant manufacturers, such as Siemens, Skoda, Stadler and Ural Locomotives. Other manufacturers for which U-Lift is a long-term supplier are Ultimate Europe, Koncar, Bombardier, Alstom, Newac Group and Pesa.

“U-Lift has a customer portfolio with several large and world-leading manufacturers in the automotive and transport sector. This is far ahead of the competitors in the market,” says **Stephane Thomsen**.



*U-Lift in Backaryd is ready for new challenges and continued strong growth (from left: **Mattias Olsson**, CEO, **Fredrik Jonsson**, Chairman of the Board, and **Stephane Thomsen**, Sales and Marketing Manager)*

Local Connection

U-Lift’s policy states the local anchorage as an important element. This also applies to the choice of partners.

“Our principle is to first and foremost ensure we work with sustainable local partners where possible. It is also a requirement from our customers,” says **Stephane Thomsen**.

U-Lift is highlighted as an attractive employer, where short decision paths, participation, responsiveness and commitment characterise the business.

“Our ambition is to attach valuable expertise to us in all areas within the company’s business areas. U-Lift has a will to be at the forefront and take on challenges with curiosity and great commitment to continue to create growth in line with our goal description,” says **Stephane Thomsen**.

Facts / U-Lift

U-Lift designs and delivers the following products for passenger vehicles:

- U-SWING air suspension
- Wheelchair lift VTBA-500P
- Load lift VTB-500 LOS
- Ramps (TriFold and EcoBoard)

... And for trains:

- Wheelchair lifts (INV-300 and UPL-300)
- Ramps (TriFold and EcoBoard)

Mattias Olsson | CEO
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www.u-lift.se





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Pfaff Verkehrstechnik

Pfaff Verkehrstechnik Now Supplies Electromechanically Adjustable Roof Working Platforms for Buses



Pffaff Verkehrstechnik has expanded its product portfolio to include solutions for servicing and maintenance work on the roofs of a wide variety of buses, primarily on electric and gas-powered vehicles.

The new roof working platforms with an adjustable height of 1.5m to 4.5m can be flexibly adapted to the respective bus fleet due to different segment lengths of 3m to 9m

according to the modular principle, regardless of whether it is simple buses measuring 12m, double-decker buses measuring 14m or articulated buses measuring 18m.

The electromechanical, telescopic platforms and sliding fall protections at the front and rear ensure ergonomic all-round fall protection, regardless of which

fleet vehicle is currently in the work area. Employees reach their workplace on the roof of the vehicle safely via adjustable stairs with the correct step height. Optional components such as crane systems for battery replacement, various lighting systems, signalling systems or monitored access doors further increase safety.

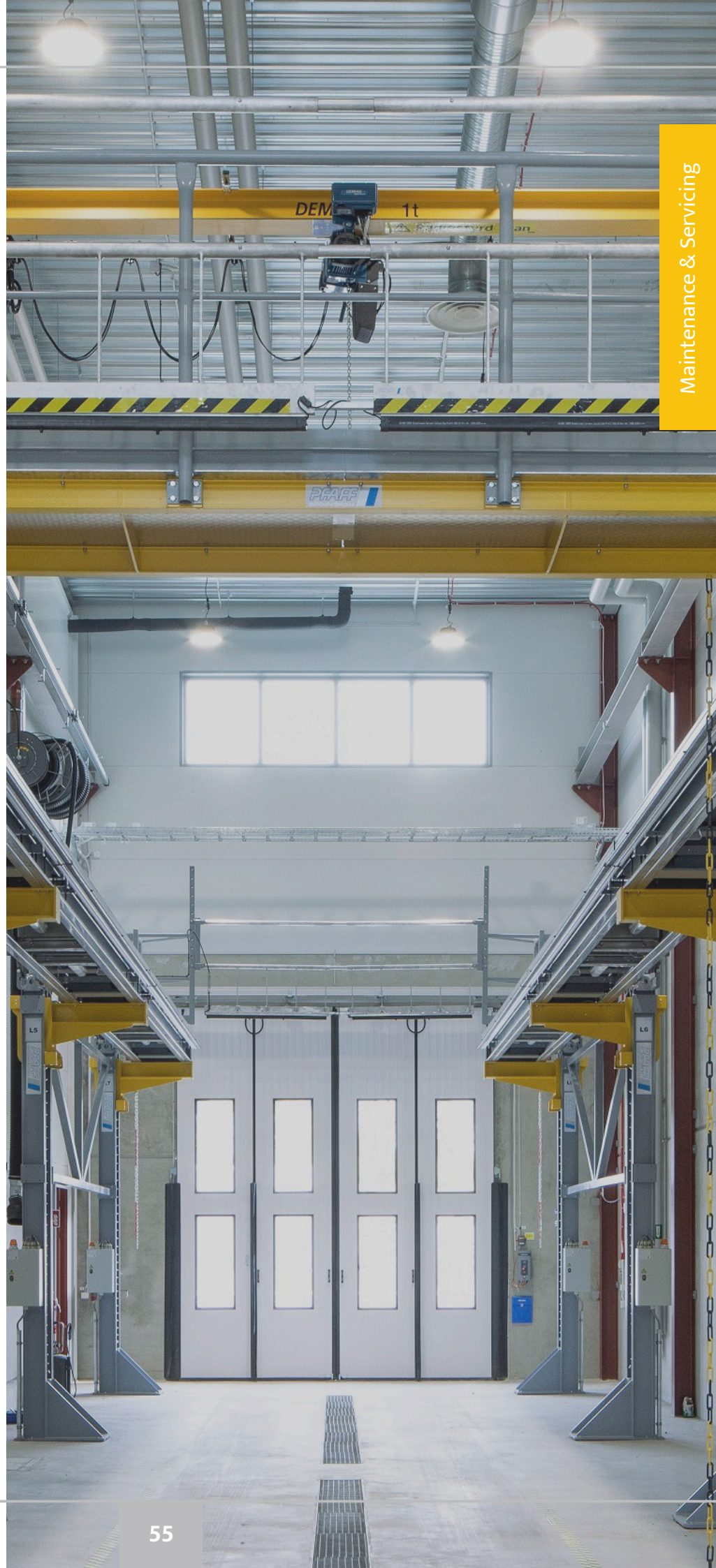
Electromobility on the Rise

With the new roof working platforms, the company is responding to the growing market for electromobility and the operational safety required here. Electromobility is an important future-oriented topic, not only in Germany. The environmentally conscious country of Sweden is also considered a pioneer in this field; Pfaff Verkehrstechnik has already delivered a system to a Swedish company, and further projects are in the pipeline.

The conversion of vehicle fleets to sustainable drive systems in local public transportation is currently being promoted throughout Europe by the EU Clean Vehicle Directive. Electric vehicles play a vital role in this. They contribute to climate protection and also reduce dependence on fossil fuels. They have thus developed into a driving force within the context of energy system transformation.

New Challenges Due to E-mobility

However, the constant increase and regular inspection of electric buses also poses new challenges for depots, garages and employees.





Pfaff Verkehrstechnik expands its product portfolio with solutions for servicing and maintenance work on buses, especially electric buses

In contrast to conventional buses, which run on diesel and require hardly any work on the roof, electric buses require more maintenance work on the roof, since the electrical system and heavy technical components such as battery packs, along with fuse boxes, inverters and air conditioning systems are located there for the sake of convenience. These components require regular maintenance. The curves on the plastic roof, however, present special hazards and challenges for personnel. The new roof working platforms from Pfaff Verkehrstechnik ensure the highest levels of safety and ergonomics for all bus variants – employees feel as safe on them as they do on the ground.

Mechanics can now easily ensure absolutely safe working conditions even for mixed fleets of vehicles, e.g. ones consisting of diesel, hybrid and electric buses, without damaging the vehicle with improvised safety measures. The flexibly adjustable roof working platforms set high safety standards, as potential fall points are minimised and the vehicle roof can be accessed ergonomically all around. They provide fleet operators with modern, safe and reliable mobility.

Due to short set-up times, the vehicles are quickly back on the road again and the operating times in transport operations are extended.

Service from Planning to Commissioning and Over the Entire Life Cycle

The new roof working platforms for buses complement the product range, which has so far focused primarily on rail-bound vehicles. Pfaff Verkehrstechnik's service package ranges from planning the work platform to commissioning and personnel training. The installation in new and existing buildings is preceded by a comprehensive consultation and analysis of the current infrastructure. An extensive after-sales service, plus long-term maintenance contracts and a spare parts service are also available.

Further Information

This video illustrates how the new roof working platforms work: <https://www.youtube.com/>.

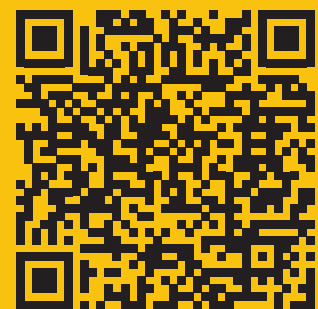
Further information on Pfaff Verkehrstechnik and its products can be found at: www.pfaff-silberblau.com/rail-systems/.

About Pfaff Verkehrstechnik

Pfaff Verkehrstechnik GmbH is an affiliated company of Columbus McKinnon Engineered Products GmbH, which is also based in Kissing, under the umbrella of Columbus McKinnon Corporation (CMCO), Getzville USA. As well as supplying transportation components, Pfaff Verkehrstechnik primarily supplies complete planning, installation and maintenance of turnkey jacking systems for rail vehicles. Pfaff jacking systems are used worldwide.

More information about the services and products of Pfaff Verkehrstechnik can be found [here](#).

Scan the QR code below to find out more about Columbus McKinnon Engineered Products




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Totalkare

C & G Coach Services Chooses Totalkare's Mobile Brake Tester



One of East Anglia's busiest coach operators has increased its in-house maintenance capabilities by investing in mobile brake testing equipment from workshop equipment expert Totalkare.

C & G Coach Services operates a versatile fleet of modern luxury coaches throughout Cambridgeshire. Regarded as one of East Anglia's busiest coach operators, the company transports thousands of customers each year

throughout the UK. And now, to ensure the continued availability of its vehicle fleet, C & G Coach Services has taken its brake testing in-house, which will offer immediate time savings and considerable cost savings over time.

Totalkare has installed a mobile brake tester at C & G Coach Services' Chatteris workshop. The DVSA-approved brake tester has a simple, yet strong and flexible design, testing up to 16,000kg axle load. Its adjustable feet enable



the brake tester to be deployed on uneven ground and still deliver reliable results.

The tablet unit supplied communicates wirelessly with the brake tester, enabling tests to be conducted with ease from the comfort of the driver's seat. In addition, the brake tester is also supplied with a computer, printer, monitor and cabinet, and is connected equipment ready.

Jody Day, Transport Manager at C & G Coach Services, said *"We were impressed by Totalkare's strong reputation and rapid response to our brake tester enquiry. The product is a great fit as it provides*

the highest level of road safety for our fleet."

"The mobile brake testers will offer C & G Coach Services several benefits," said Jack Longstaff, Area Sales Manager at Totalkare. "Conducting brake tests in their workshop means neither the vehicle or its driver are wasting time driving to and from the test centre or incurring test fees – over time this will amount to significant time and cost savings."

Are you looking to save money on your brake testing costs? Try Totalkare's brake test calculator and find out how much you could save!

Do you require support with your bus and coach maintenance?
 Contact Totalkare on
 0121 585 2724
sales@totalkare.co.uk
 or visit
www.totalkare.co.uk
 for further information
 and live chat assistance.





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Natsco

We Deliver More than Just Parts, We Deliver Solutions



Natsco is built on integrity and common sense.

Natsco has been a trusted partner for transit parts and services for over 30 years. We have the knowledge and experience in bus and passenger rail. We hire the right people who have spent their career in public transit, adding up to over 1000 years of experience in a team that cares.

Natsco Services

Our service team has spent the last 10 years working with many major component suppliers as well as several OEM passenger car manufacturers. Services range from upgrading emergency lighting systems (to FRA standards) on existing fleets, to striping down then rebuilding flood damaged cars and providing continuous support with design and implementation of fleet product upgrades. Most

recent activities include the concept design, manufacture and installation of passenger barriers for a fleet of 1,500 passenger rail cars and suburban bus fleets. Our teams are mobile and are supported by experienced engineers.

Developing replacement parts supply for specific areas where failures are high has been a focus for our services team as well. Our facilities are equipped to provide minor and major component



Capable of working with Transit Vehicles



Bus



Subway/Commuter



Rail, Tram/LRV

Natsco at a Glance



GROWTH
2011 - 2 people
2021 - 70 people



LOCATIONS
Milton, Ontario
Buffalo, New York



STAFF
35 Professional
35 Technicians



PARTNERSHIPS
OEMs
Aftermarket
Manufacturers
Transit Authorities



and assembly rebuilding for such items as driver seats, heaters and mirrors. Stocking common parts enables quicker turn around for customers. Natsco also supplies kits of preselected material individually picked and packed for ease of use in the maintenance shops.

Natsco Transit Solutions – Parts

We continue growth in the bus and rail aftermarket parts areas by offering stocking programmes, project management services and new product development. Many transit systems have asked

our team to work with shop floor mechanics who recognise where extensive labour and above average failures exist. By working directly with shop experts the opportunity to create savings is much higher. Further, transits are pleased with savings in labour and fewer failures. There are many solutions which can be developed for excessive failure items. Call our sales team to discuss where we can support your fleet.

Natsco Product Innovations

On the Natsco website we have issued “INNOVATORS” for products

which we have available. Some of these are product alternatives to OEM parts which we have developed. There are many items that provide substantial savings to customers. These parts have been tested to meet and exceed maintenance expectations. Verified through testing or vendor engineering groups, these components can save thousands of dollars every year.

Natsco Savings to Authorities

The aftermarket is known to operate on inflated parts

Services Team

We're committed to go above and beyond your expectations when creating solutions for you.



Mike Roy
Executive Vice President

Mike's focus on customer service and customer relationships is the backbone to Natsco's team success and continued growth.

mikeroy@natsco.ca
905-699-7009



Todd Coulter
Vice President – Sales & Operations

Todd has successfully managed and grown an aftermarket division in the rail industry over a 7-year period.

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416-998-7043



Chris Kreuter
Vice President – USA

Chris is based in New Jersey and is dedicated to sales and business development across the US.

chriskreuter@natscotransitsolutions.com
732-939-5355

pricing. Many transits are under the impression that parts are proprietary. However, this not the case for hundreds of expensive parts. Your budgets for material can be reduced by thousands of dollars every year. We have proven this and provided the savings to many small and large properties. Call us to work with you on a solution that meets your needs and will provide value for years to come.

Natsco has worked with many customers both in Canada and the USA to provide development support for obsolete material. This area can be extremely difficult for transit agencies who do not

have technical resources and the time to review their options for alternatives. We have worked with many vendors who provide solutions for this situation. Let us help with these frustrations. In conclusion, Natsco can help and support your organisation in many different ways. Our team can quickly provide you with engineering support, a cost savings programme that would provide compounded savings year after year along with service, kitting and many other options that provide value.



Natsco Locations

Canada

375 Bronte Street North
Milton, Ontario L9T 3N7

USA

1800 Broadway Street, 4A
Buffalo, New York 14212

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AKASOL by BorgWarner

Charging Forward to Accelerate the World's Transition to E-mobility

The battery systems of BorgWarner's Akasol brand have been providing energy for multiple electrified commercial and industrial vehicles for numerous years. The modular approach does not only offer remarkable flexibility, scalability and safety, but also very high economic efficiency.

With very high energy densities on the system level and in our view the most compact liquid cooling, AKASOL battery systems have very low space requirements and emit only little heat. These are the ideal preconditions for long battery life with a high power output for safe, reliable and durable operation. Thanks to the modular design and free scalability of the AKASystem, we can tailor solutions to meet our customers' needs for bus, commercial, industrial, rail and marine applications.

AKASOL developed four types of high-performance lithium-ion battery systems and each type has

been designed to serve a specific application, adjusting characteristics such as cell type, cycle life and cost per kWh.

The AKASystem AKM CYC: More Energy for the Long Haul

The ultra-high-energy battery system AKASystem CYC uses the new cylindrical-cell battery modules with very high energy density. It is robust and scalable, and acquisition costs per kWh are comparatively low. In comparison to what current technology permits, this new technology will allow electric vehicles to increase their range by more than 60 percent. This system is developed for long-distance traffic such as buses using overnight charging facilities, intercity coaches and trucks.

AKASystem OEM PRC: Serial Technology for Various Applications

The latest AKASystem OEM lithium-ion battery system proves:

powerful, specifically adapted lithium-ion battery systems for commercial vehicles can be both high-quality and affordable at the same time. AKASOL is among the first in the world to offer a system that is compatible with the standardised PHEV modules of all major producers. This means that even commercial vehicles for series production are ideally equipped for their demanding tasks and, at the same time, remain flexible should the module supplier change at any point.

AKASystem AKM POC: High-End Technology for Heavy-Duty Performance

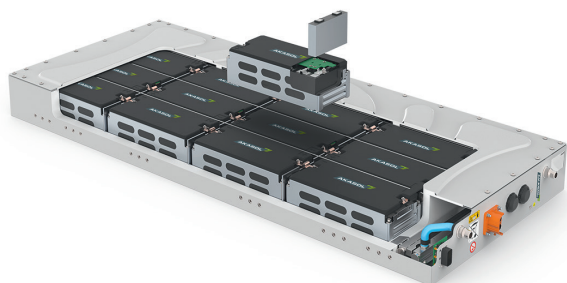
Hybrid and electric vehicles benefit from a liquid-cooled and freely scalable system that not only fulfils the highest safety standards, but also currently belongs to one of the most powerful battery solutions in the world. Robust, maintenance-free and fast-charging, the AKASystem AKM is ideal for use in commercial hybrid and electric vehicles with very high requirements when it comes to life cycle, performance and high system voltage.



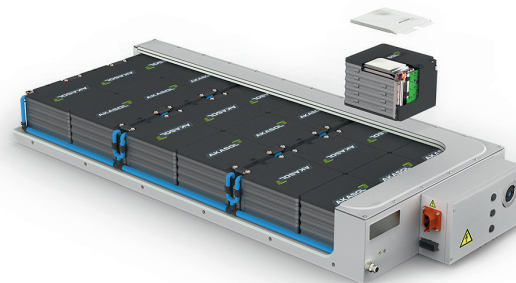
AKARack PRC



AKASystem AKM CYC



AKASystem OEM PRC



AKASystem AKM POC

AKARack PRC: The Flexible 48V Solution

The AKARack is revolutionary due to its characteristics – it offers very high energy and power density in combination with its flexible scalability. Thus, it is the ideal solution for applications in a power range from 5kW to approx. 50kW.

With 6.6kWh to 40kWh in stored energy, it is outstanding for use in industrial and construction machinery, such as small excavators or front loaders, as well as in the 48V on-board power supply system in commercial vehicles, and even for small boats. If an output of 50kW or even more energy is required, the 48V systems can also be operated as a AKASystem AKR PRC in parallel.

From Cell to System: Akasol's Test and Validation Centre

With the state-of-the-art test and validation centre at our Darmstadt location, we create optimal conditions for all new and further developments in the field of high-performance lithium-ion battery systems. From endurance tests, high and low-temperature tests in climatic chambers and tests of electromagnetic compatibility in the EMC chamber, to leakage and corrosion tests, and realistic functional, performance and aging tests: we make sure that our products meet all necessary standards to ensure maximum safety. Last year, we expanded test stands, technologies and the

necessary expertise to simulate a wide variety of environmental influences in our facility, where we conduct tests across all phases of development. For this purpose, we have state-of-the-art system test rooms, a continuous-running room for long-term tests, workshops with diagnostics areas for cells, modules and systems, and an electronics laboratory. With this broad portfolio of testing facilities, our test and validation centre covers nearly all major tests for our products, from the cell and module levels through to the completed battery system.



AKASOL

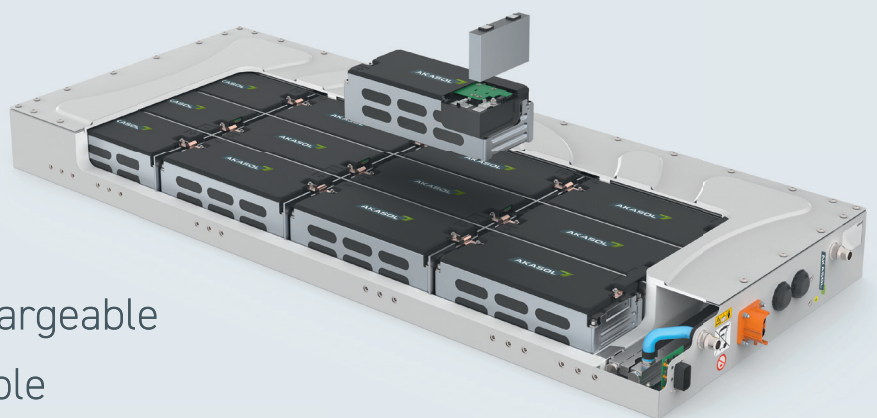


Electromobility for all.

High-performance battery systems for electric city buses from the market leader.

AKASYSTEM 15 OEM 50 PRC

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- › Safe, robust, reliable
- › Automotive certified
- › Liquid-cooled and fast-chargeable
- › Modular and freely scalable



www.akasol.com

THE E IN MOBILITY

by  **BorgWarner**

Comeca

Solutions and Principles for Charging Electric Buses



What Solutions Are Available for Recharging My Vehicle?

In Europe, the vast majority of current electric buses are charged with direct current (also called DC). AC buses are more common outside Europe, particularly in China.

Discover all the possible solutions for recharging electric buses with direct current, depending on the different aspects of your vehicle fleet.

Two Types of Connection Solutions: Per Socket and per Opportunity

Electric buses with a battery are powered only by the battery on the vehicle, which provides the energy required. The choice of bus and battery size will depend on the power requirements, electrical energy, distance to be covered, climate, topography of the journey and the chosen recharging infrastructure.

There are two connection solutions for vehicle charging:

- Plug-in charging (CCS2 in Europe). This connection method represents the traditional energy supply model for the vehicle (similar to refuelling). The user manually connects the charging socket to the vehicle. This type of socket is available on our Comeca chargers, for power ratings of 50 to 160kW.
- Recharging by opportunity (via a pantograph, dome, etc.) allows much greater power to be conveyed and therefore considerably reduces the vehicle's charging time.

No manual intervention is necessary with this technology: it is the vehicle that warns of its arrival and alerts the charger of its intention to charge. Physical contact is then established between the two systems. This technology can deliver power up to 640kW.

Comeca's range of electrical recharging solutions responds to these two recharging modes and is adapted to meet our customers' needs. We assist our customers by studying their projects in order to offer them the most convenient solution. Our charging stations are accessorised to make their use even more ergonomic: brackets, reels and storage devices are just some of the solutions we offer to make the use of our charging stations optimal.

3 Possible Recharging Solutions: At the Depot, at the End of the Line and at the Station

Different recharging solutions are possible for 100% battery-electric buses:

- Charging at the depot: the bus is recharged during the inactivity phase (usually at night) in order to be ready for the start of service (in the morning). The distribution of energy to all the charging stations is then managed globally to smooth out the electrical power over the entire charging period, which is known as 'smart charging'. Various elements are taken into account: bus parking times, service schedules, etc. This technology makes it possible to reduce the size of the electricity delivery point and the electrical



infrastructure associated with the charging stations. It also reduces the amount of electricity and therefore the total cost of ownership of the buses.

- The end-of-line charging system: this method allows rapid recovery of autonomy and thus limits the size of the batteries. The bus terminus must be connected with sufficient power to limit the downtime of the bus to a few minutes.
- The pantograph charging system (ascending or descending): this system requires a stop of a few seconds or minutes (from 3 to 10 minutes) and allows the vehicle with low-capacity on-board batteries to increase its range limited by the size of its battery. The vehicle is therefore recharged at some stations to ensure its journey.

These methods are not necessarily exclusive and can be combined to suit the needs of each mobility operator and each city: it is possible to recharge the bus in the evening at the depot and by pantograph during the day, for example. The

preferred solution must be selected, taking into account the needs and constraints of each player.

Comeca's portfolio of solutions allows us to meet each need in the most appropriate way, from the electrical network to the charging point. Our solutions also allow us to meet all customer requirements relating to charging times: a need for a five-hour charge during the night or a shorter charge at the terminus of the main line of the network.

Vehicle and Charger Interoperability

Interoperability at the Core of Comeca's Solutions through Test Procedures

Interoperability must allow each vehicle put on the market to be recharged by different brands of chargers.

At Comeca, we make it a priority to be interoperable with all the manufacturers present on the markets for which we sell our products.

To make this possible, we have set up a test procedure and we meet our partners at our site in Le Mans (France), in order to confirm the interoperability of buses, coaches, trucks, etc. This test procedure can be carried out in just one day.

Since the first launch of its recharging solutions, Comeca has ensured its compliance with the two CCS standards ISO 15118 and DIN 70121 by calling on an external laboratory to validate all the normative points.

Comeca Solutions and Interoperability Tests

When it comes to charging infrastructure for electric vehicles, standards evolve and compliance can be incomplete. On-board systems have software versions that are constantly evolving, which is why we have set up an

interoperability test programme with all bus and electric car manufacturers that meet the Combo CCS standard. We regularly monitor the manufacturers' market to identify new entrants and plan interoperability tests. At the end of these tests, we produce an 'interoperability report' co-signed with the manufacturer concerned. Our requirements in this area mean that we are now interoperable with the majority of buses used in Europe.

The recharging infrastructure market has a large number of players. Few are capable of adapting to the constraints of 360°, turnkey projects that will guarantee an appropriate investment cost, a limited cost of ownership, guaranteed availability, flexibility in operation and the evolution of charging power over the life of the installation.

Scan the QR code below to find out more about Comeca, integrated, ultra-fast charging solutions for large vehicles, buses, trucks, utility vehicles.



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TRANSPORT & E-MOBILITY, CHANGE IS IN THE AIR!

Integrated ultra-fast charging solutions.



Skeleton Technologies

The Role of Next-Generation Supercapacitor Energy Storage in Zero-Emissions Urban Transportation

On 15 March, ACEA, the European Automobile Manufacturers' Association released the latest statistics for the European bus market, showing a big increase in registration numbers for electric buses, growing from 2,210 in 2020 to 3,282 in 2021.

For 2021, electric buses already represent 10.6% of all bus registrations within the EU. Add to that the 10.1% for hybrid-electric buses, and together the hybrids and full electric buses represent over a fifth of all new registrations in the EU.

Sure, Europe is still far behind for example the Chinese market, where the city of Shenzhen alone has a fleet of 16,000 electric buses, but the future is electric. In Europe, battery manufacturers are heavily scaling up production to meet the demand from both the passenger

car market and the transportation sector. Electric buses are the key to efficient, zero-emissions public transportation.

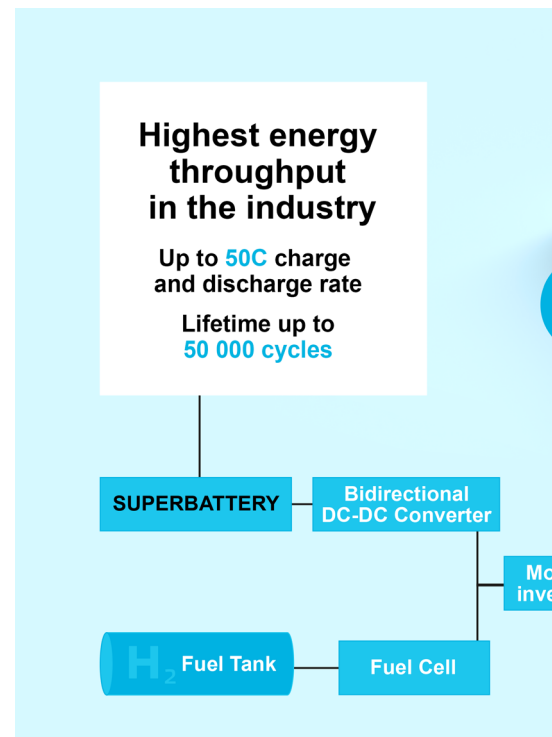
Fuel-cell electric buses represent a new and rapidly growing sub-category of zero emission buses. For example, one of the European market leaders, Solaris, has sold a promising 54 hydrogen buses in 2021 after first launching the model in 2019.

Supercapacitor-Based Technologies Ready for Mass-Adoption

Skeleton Technologies, the global leader in supercapacitor energy storage technologies, is working with a number of customers on fuel-cell electric bus applications, where the current challenges include the comparatively slow response time of batteries and the oversizing of the battery pack – both are currently required to reach

the necessary power to support the fuel cells. Oversizing leads to increased costs, and unnecessary increase in weight and volume of the battery pack.

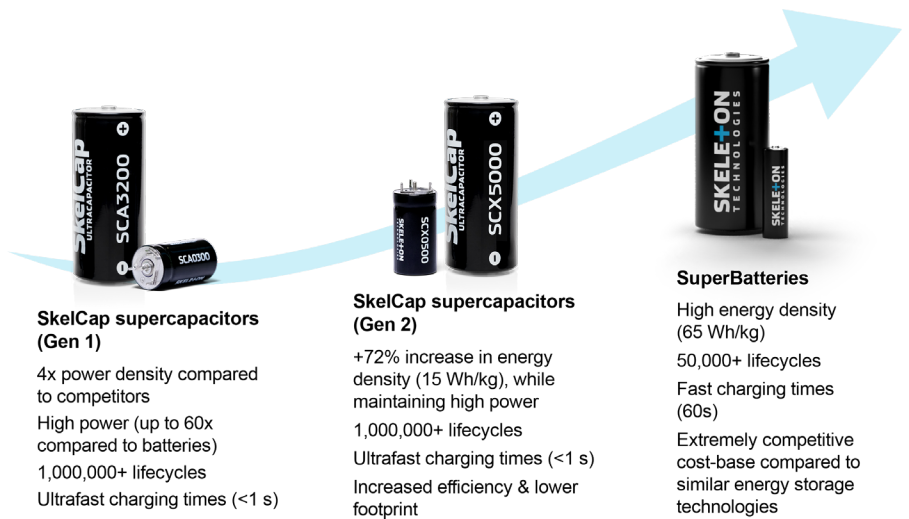
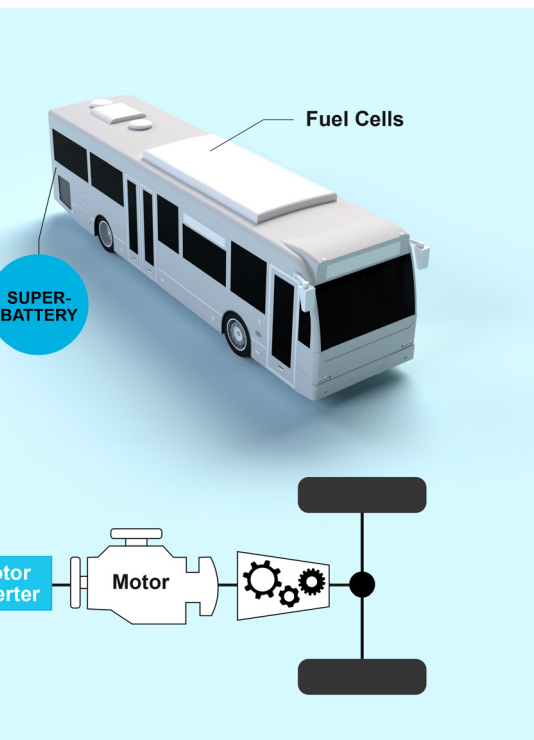
Skeleton's upcoming SuperBattery technology fills the gap in the market between traditional



supercapacitors (max. 30 sec application time) and lithium-ion batteries, eliminating the need to size the battery packs on power requirements.

SuperBatteries are the key enabling technology for fuel cell buses, by enabling quick response time and power boost, and decreasing the power demand from the fuel cells. They also offer a 10-fold increase in energy density compared to current state-of-the-art supercapacitors on the market, while maintaining long lifetimes and much higher power than lithium-ion batteries.

SuperBatteries can withstand a much higher number of charge-discharge cycles than lithium-ion batteries and therefore can serve throughout the lifetime of the bus without the need of a replacement. It is also an inherently safer technology than conventional lithium-ion batteries and is not subject to a risk of fire, which is even more important for a vehicle with a hydrogen tank.



SkelCap supercapacitors (Gen 1)

4x power density compared to competitors
High power (up to 60x compared to batteries)
1,000,000+ lifecycles
Ultrafast charging times (<1 s)

SkelCap supercapacitors (Gen 2)

+72% increase in energy density (15 Wh/kg), while maintaining high power
1,000,000+ lifecycles
Ultrafast charging times (<1 s)
Increased efficiency & lower footprint

SuperBatteries

High energy density (65 Wh/kg)
50,000+ lifecycles
Fast charging times (60s)
Extremely competitive cost-base compared to similar energy storage technologies

Electrification & Power

A combination of fuel cells and SuperBatteries is the most cost-effective solution for fuel cell electric buses because of:

- Reduced size requirements compared to li-ion batteries partnered with fuel cells
- Lower initial cost due to eliminating the need for an oversized battery pack to match the power requirements
- Increased lifetime – SuperBatteries last for the entire lifetime of a vehicle
- Inherent safety – no risk of fires
- Enabling regenerative braking at maximum motor power

SuperBatteries are also a more sustainable technology compared to batteries, using no cobalt and only a fraction of the lithium used in lithium-ion batteries.

On-Going Projects with Bus OEMs

Skeleton Technologies is working with a number of bus OEMs on the implementation of supercapacitor-based energy storage solutions. One such project is underway with

Wrightbus, one of the leaders in the development of hydrogen fuel cell-powered buses for both long-range and urban transportation.

Skeleton’s Sales Director for the transportation sector, Tobias Ragnarsson, comments on the future of the bus industry: *“While China is a clear leader in e-bus adoption, the trend in Europe is also very clear: the adoption of battery electric and fuel cell buses is increasing fast and the market is realising the potential of supercapacitor energy storage. We’re in talks with a number of companies with ambitious plans for their electric bus technologies and fleets, so the future of zero-emissions transportation looks promising and at Skeleton, we’re delighted to be a part of the solution and the fight against climate change.”*

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SKELE+ON
TECHNOLOGIES

01

The biggest opportunity the bus sector has seen in decades

Transportation accounted for 24% of global CO2 emissions from fuel combustion in 2020, three quarters of which came from road vehicles like cars, trucks and buses. If we are going to reach the target of net zero emissions by 2050, as set out by the Paris Agreement, then this needs to change quickly.

In fact, we need to see average year-on-year decreases in transport-related emissions of 2.1% from 2021 to 2030. Achieving this requires a multitude of actions, including the rapid electrification of buses.

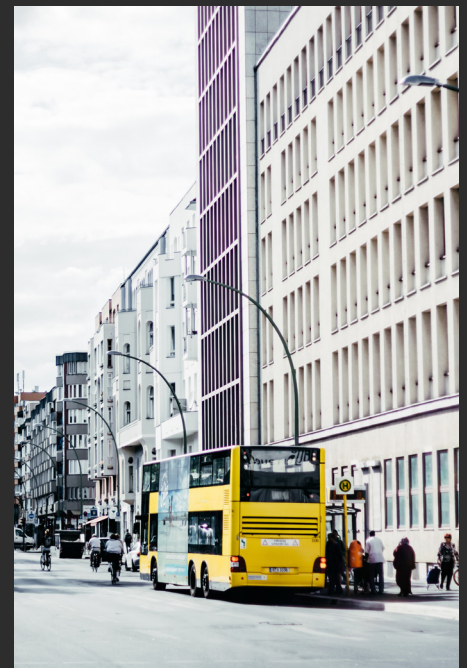
Governments are increasingly introducing measures designed to shift the market towards energy-efficient vehicles, such as fuel economy standards, vehicle efficiency regulations, low emission zones and stricter sustainability reporting requirements. This means every bus operator is going to have to get serious about decarbonising their fleets soon. Those who have already started, or that are looking to start the process soon, could have a significant advantage over their competitors in terms of putting the necessary infrastructure in place.

At Hitachi, we want to ensure that the narrative around fleet electrification is one of opportunity rather than obligation, but also that operators have the support they need to benefit. Knowing where to start is a common barrier to action, which is where our experience and technological expertise can really add value.

Understanding the business challenge

Bus networks are an important part of modern society, helping millions of people get to work, socialise and manage their daily lives. But across Europe, bus operators and the services they offer are under pressure. There is a need for innovative thinking and bold strategies across the sector, because public transport is key to solving some of the many sustainability challenges, principally inefficient use of assets and wasted capacity.

For example, many households own multiple cars, which sit idle during the day. When they are used it is typically for short journeys with one or two passengers. Buses are a much more efficient way of meeting this demand, but not in their current state.



"People who look at this as just a set of challenges to overcome will be missing out on a longer set of opportunities that will bring about real change to their business and help mitigate the climate crisis."

Mike Nugent
Head of EV at Hitachi Social
Innovation Business

02

An opportunity to change how bus operators interact with the market

Knowing that you must address fleet electrification does not make the task at hand any simpler. Even with governments providing incentives and the cost of electric buses coming down, the actual process of decarbonising a large fleet of buses is likely to be a long-term, complex and expensive process.

A clear opportunity

Electrification presents bus operators with the potential to make two important, long-lasting changes to their operations as well as open up new revenue streams down the line. The first is through reducing carbon emissions. While electrification alone will not fully eliminate an operator's emissions, it can have a big impact. A study of fleet electrification in Norway in 2019 found that an operator's footprint was lowered by 37% through the implementation of electric and biofuel, with full electrification leading to a further 52% reduction. The ability to control your own charging infrastructure and potentially generate your own power could also mean no longer having to rely on other parties for energy.

Driving efficiencies is another area where fleet decarbonisation can provide immediate benefits to operators. Decarbonisation generates a wealth of data that can provide fleet managers with much more visibility than they currently have. Additionally, if charging continues to offer a more cost-effective alternative to traditional fuels, operators could see cost savings. More effective route planning and optimisation of vehicles could also help to deliver more uptime. Studies have shown that when construction, fuel, maintenance, infrastructure and air pollution impacts are all taken into account, the total lifecycle-cost of electric buses is currently very competitive with LNG and hybrid diesel buses. As battery and charging technologies continue to evolve, electric buses may soon become cheaper to run over the long-term.



Overcoming uncertainties

Electrification certainly presents a potentially significant opportunity, but there are some ongoing risks that need to be managed too.

Changes in the market

Adding to the general trend of falling passenger numbers over the last few years, the global Covid-19 pandemic had a huge impact on the number of people travelling by bus. As well as health concerns, the large-scale move to hybrid and remote working means less people are commuting. Committing the significant investment needed for electrification in a potentially sustained period of shrinking revenues represents a serious risk.

Too many options

Mitigating the climate crisis has unleashed a huge wave of innovation. The result of this is the constant emergence of new models, technologies and potential partners. But which ones are the right option for you? With so many choices on the market, fleet managers are understandably wary of making a move that potentially limits their options in the future.

The need for considerable investment

While the costs of electric buses are becoming more competitive, there is no denying the significant expenditure required here. The cost of procuring buses, charging infrastructure and batteries as well as reconfiguring depots and upgrading the grid network all mean that it could take some years before you start generating a return on your investment.

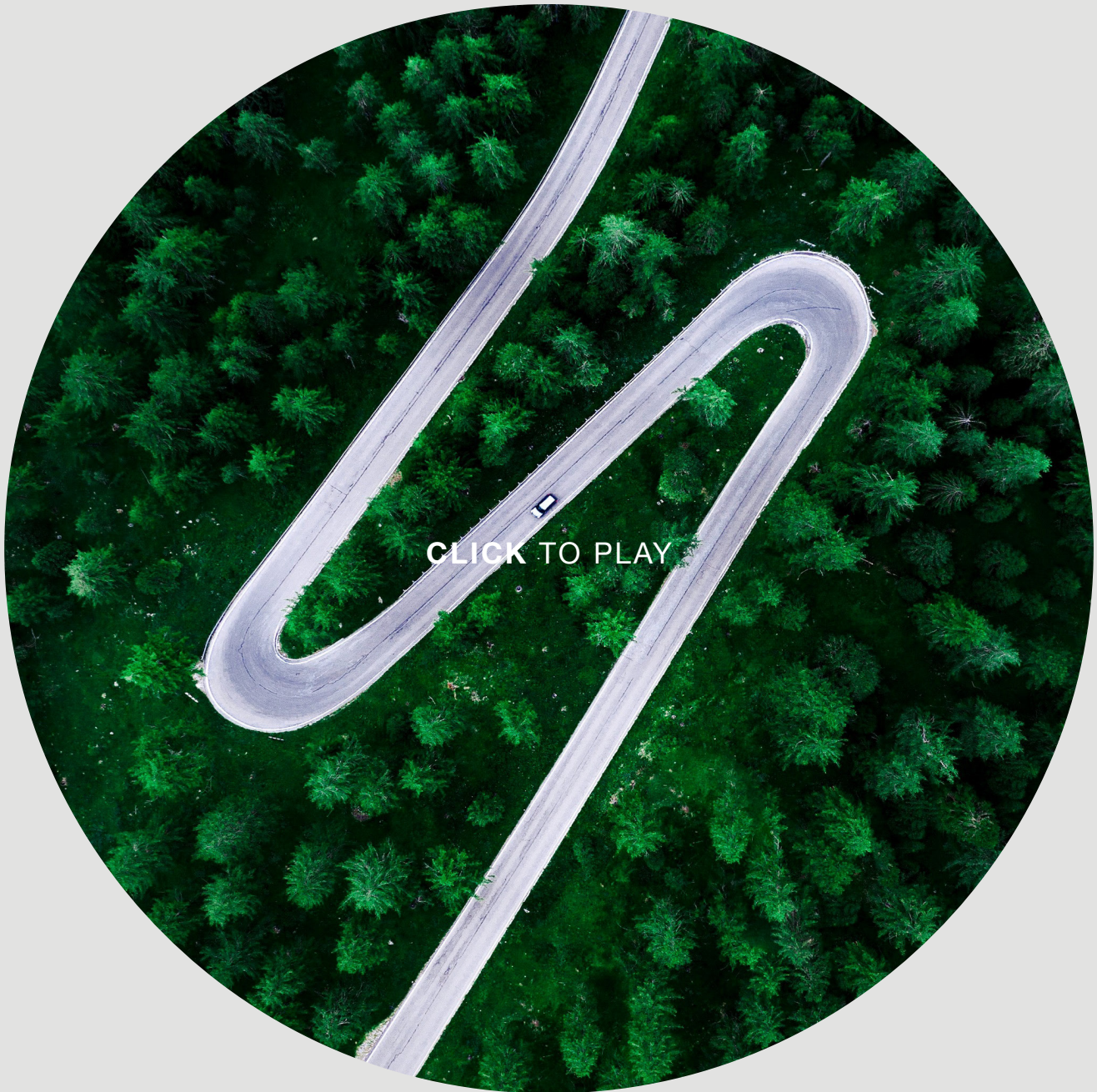
Conclusion

The electrification process is complex and requires long-term strategic focus from bus fleet managers to implement successfully. From procuring vehicles and redesigning depots to the overall management of the programme, there are a lot of moving parts, stakeholders and emerging technologies to maintain oversight of. That's where we come in. By becoming an end-to-end strategic and technology partner to bus operators, we can help demystify and re-risk the electrification process.

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ZeroCarbon Road To Zero



Hitachi ZeroCarbon helps you transition to the zero-carbon world. We provide end-to-end decarbonisation solutions that can transform your business to help you open up new revenue streams and stay ahead of the curve.

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