



Bus-News

M A G A Z I N E

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Turning England's Buses Electric... p.8



The Latest Industry News and Updates...

Broken down in our directory categories Electrification, Digital Solutions, Bus Interiors, and Maintenance & Servicing so you can easily find the items you're most interested in... p.7



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Letter from the Editor



began on 23rd March and covered a small proportion of the year, bus companies reported they started seeing declines in journeys in the preceding weeks.”

This decline in bus usage has been going on for a number of years and so cannot be wholly attributed to Covid. Between 2007 and 2015 for example, annual bus journeys in England were consistently around 4.6 billion.

Bus ridership has now returned to around 75% of pre-pandemic levels, while car ridership has fully recovered. This suggests an anxiety among bus users about travelling in a non-private space. As we can see, much needs to be done to grow passenger numbers to help operators, to give people transport options and to address the decarbonisation challenge.

At Bus-News, we look forward to an ongoing recovery of the industry as it comes back stronger and greener from this crisis.

Our next Bus-News magazine will be published on 4 May in the run-up to Bus World Turkey, which will take place in Istanbul from 26 to 28 May. 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 2021!

*Josephine Cordero Sapién,
editor-in-chief*



Dear Readers,

Welcome to our very first issue of the Bus-News e-magazine. We launched Bus-News, sister site to Railway-News, in December 2020, a time when the entire transport sector was confronted with unprecedented challenges. Of course, the entire planning and development process started before Covid, when the dominant challenge in the transport sector was decarbonisation. This long-term challenge remains and much is being done to **transform bus fleets to electric** rather than diesel.

However, one key way of decarbonising transport – and addressing other transportation issues in urban areas such as congestion – is moving people out of private vehicles to walking, biking and public transit.

In its **Annual Bus Statistics: England 2019/20** report, the UK government said there were 4.07 billion journeys in England in 2019/20 (year ending March 2020), a decrease of 238 million it said could “largely be attributed to the effects on passenger journeys from COVID-19 in the last quarter of 2019/20. While the national lockdown

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U-LIFT

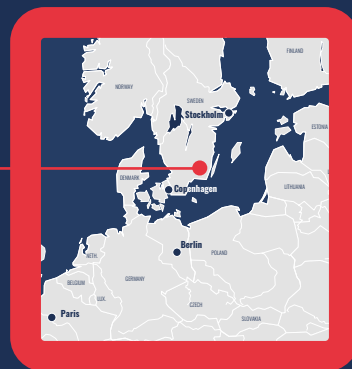
U-Lift AB med huvudkontor i södra Sverige tillverkar och säljer rullstolslyftar och ramper för järnvägsapplikationer, samt minibussar, låggolvsstadsbussar och lätta lastbilar. U-lift är ett ledande företag inom fordonskomponenter med produkter för resenärer med nedsatt rörlighet.

U-Lift AB based in South-Sweden develops and markets wheelchair lifts and ramps for railway applications, as well as for minibuses, low-floor city buses and load lifts for light commercial vehicles. U-Lift is a leading company in the automotive market with products for people with reduced mobility.

U-Lift AB mit Sitz in Süd Schweden entwickelt und vermarktet Rollstuhllifte und Rampen für Bahnanwendungen, sowie für Kleinbusse, Niederflur -Stadtbusse und Lastaufzüge für leichte Nutzfahrzeuge. U-Lift ist ein führendes Unternehmen im Automotive mit Produkten für Reisende mit eingeschränkter Mobilität.

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- Proactive monitoring and solving of issues;
- Talented team to support operations throughout implementation and maintenance.

Strong business case for customers



Most customers indicate Sqills' breadth of functionality, price level, and revenue / cost provide a compelling business case to customers.

Key strength:

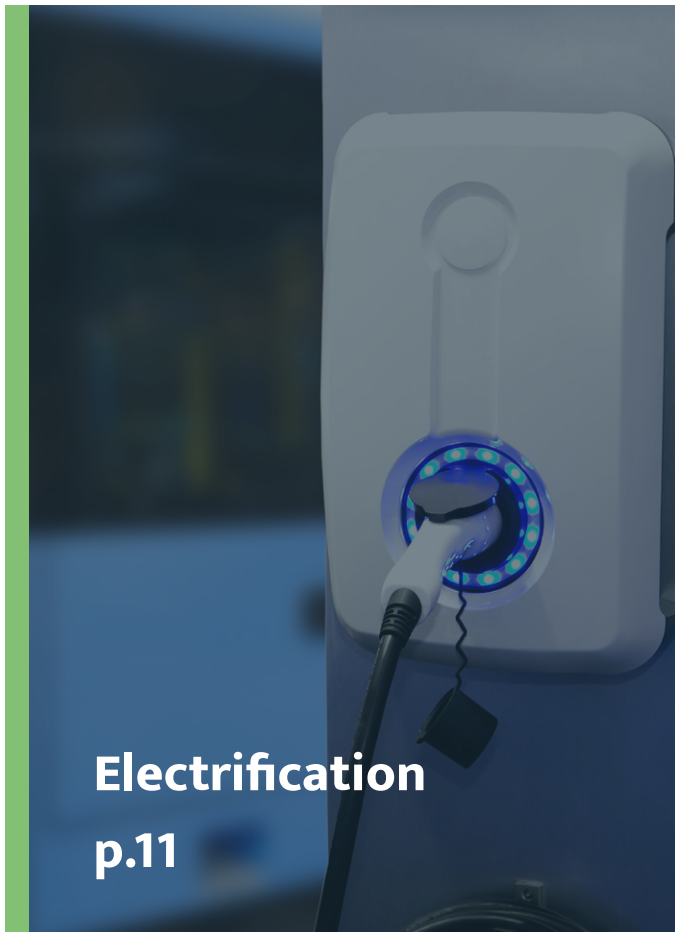
- Off-the-shelf product de-risks implementation;
- Rail and bus focus reduces the need for customisation;
- Revenue and cost benefits;
- Competitive pricing.

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exceeding expectations

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Turning England's Buses

In the year 2019/20, a mere 2% of England's 32,300 local buses were electric (4% in London, 1% in the rest of the country) – that's roughly 640 buses in the country. 84% were diesel, 14% were diesel-hybrid and 1% was methane/biomethane.

Clearly, there is a huge amount of work to be done to decarbonise

buses to meet important climate change targets.

For context, currently, **3% of transport greenhouse gas emissions in the UK are produced by buses and coaches.**

Bus Back Better

Positively, as stated in the 'Bus Back Better' strategy, "Buses are the easiest, cheapest and quickest way to improve transport. Building a new railway or road takes years, if

not decades. Better bus services can be delivered in months. Experience shows that relatively small sums of money, by the standards of transport spending, can deliver significant benefits."

Also in its Bus Back Better strategy, the government laid out its five principles that would underpin its roadmap to a zero-emission fleet, which were:

- We will consider all technologies fairly, assessing



es Electric

their cost, contribution to decarbonisation and utility

- We will provide the financial support and incentives needed for the market to scale up quickly
- We will take a place-based approach to investment wherever appropriate
- Both operators and LTAs must play their part
- We will ensure our plans for buses lead to overall carbon reductions

With regards to the first principle, the government’s ambition is for the fuel being used to be green – with ‘carbon-free’ fuel being used in the future and for zero-emission vehicles to take precedence over low and ultra-low-emission vehicles.

With regards to the second principle, the government said it recognised the high upfront capital costs of both vehicles and energy infrastructure, which could be a barrier to making a transition to greener options. Consequently, it

said that as a first step it would invest **120 million GBP in zero-emission buses in 2021/22 in addition to 50 million GBP from 2020/21** to deliver the first all-electric bus town or city.

ZEBRA Scheme

The 120 million GBP in funding will be allocated under the UK government’s ZEBRA scheme – the zero emissions bus regional areas scheme.

It will provide funding for local transport authorities outside of London to assist with the introduction of zero-emission buses and the associated infrastructure. It aims to bring together “*LTAs, bus operators, energy companies and other stakeholders to develop financial and commercial models of delivering zero emission buses at scale, with government and non-government funding*”.

Phase 1 – now concluded – involved local authorities submitting their applications, phase 2 – currently ongoing – will see the shortlisted authorities develop their business cases, after which the most successful ones will be allocated funding.

There was a fast-track and a standard process through which LTAs could apply and in July the government announced 23 shortlisted authorities, triggering the start of phase 2.

All-Electric Bus City

In January, the Department for Transport announced that Coventry and Oxford were set to become the UK’s first all-electric bus cities. The

two cities developed proposals to receive up to **50 million GBP to replace their entire fleet of buses with all-electric ones** and to install new infrastructure and pay for electric grid updates.

In the case of Coventry, the city said it had been awarded the full 50 million GBP to fund 297 all-electric buses, which would be on its streets by 2025. The funding became available in April. Local bus operators will contribute a further 75 million GBP into the new electric buses.

Oxford and Coventry were the two successful cities among a total of 19 bids.

hydrogen buses. 40% of the fleet are hybrid buses. The first electric buses – six in total – entered service in 2014. **2020 was the first year that more electric buses than diesel buses entered passenger service and 2021 marks the first year that no diesel buses have entered service.** However, the purely diesel London Buses fleet is 4,697 – almost 52% of the entire fleet.

The Future

The UK government is currently consulting on ending the sale of new diesel buses in order to achieve

net zero by 2050. To compare, the phase-out date to end the sale of petrol and diesel cars and vans is 2030. However, the government says that a “*key factor will be ensuring these ambitions do not make bus services more expensive to operate overall, otherwise fares will rise or services will be cut – potentially leading to greater overall carbon emissions as more journeys are made by car*”.

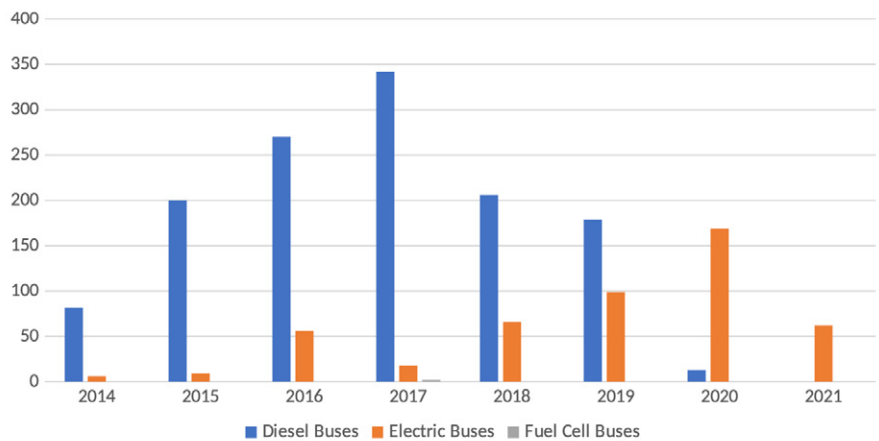
No date has yet been set, but in November of this year the UK will host the United Nations’ annual climate change conference, COP26, which will throw a spotlight on how the UK is tackling climate change, including in transport.

A Look at London

With **51% of all local bus journeys in England taking place in London** (2019/20 figures), what is the situation like in the capital with regards to electric buses?

The London Buses fleet comprises a total of 9,068 buses of which 485 are electric – 268 single deck and 217 double deck – and two are

Buses entering service in London, by fuel type



Route 312 in London became the first in the city to operate exclusively electric buses © Aubrey Morandarte BY-SA 2.0 licence

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Electromobility for all.

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



Photo: Daimler Truck AG

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NFI Group

The Tipping Point Is Now: Driving Zero-Emission Transit Forward



The world of transportation is changing — it's not a matter of if vehicles will move towards electric, but when and how fast.

Governments around the world are focused on delivering significant greenhouse gas emission

reductions, with both the European Union and the United States targeting reductions of more than 50% by 2030, and electrification of our transportation networks will be key to achieving those goals. Seeing major opportunity, transportation companies, including original equipment manufacturers, are vying for their piece of this new market and many companies cannot innovate and produce fast enough.

The road to electric mobility is not for the faint of heart. It takes innovation, ingenuity and a drive to integrate new, rapidly changing technology. Innovation and drive are exactly what have allowed one company, NFI, to lead the evolution to zero-emission mobility. A global leader in buses, coaches and aftermarket parts, NFI traces its roots to the early 1900s when it was founded in Winnipeg, Canada.

Today the company has over 105,000 vehicles in service operating in 11 countries. NFI has quietly been establishing itself as the leader in electric buses, having completed more than 40 million electric service miles and delivering over 1,500 electric buses since 2015.

NFI's strategy has always been to be propulsion agnostic: to evolve and adapt its bus structures over time, moving with customers as they make the transition to alternative fuel sources. NFI has assisted customers in making the transition from diesel to hybrid, to compressed natural gas, and, now, to battery and fuel cell-electric buses and coaches. The company has designed its platforms and manufacturing facilities so that numerous vehicle types (single-deck bus, double-deck bus, motor coach, shuttle, etc.) with a variety of propulsion systems can be built on common production lines. The company also has significant scale with the ability to build up to 7,000 electric buses per year.

Propulsion is just one piece of a very complex puzzle. In the automotive world, companies build vehicles and the customers come, showing up

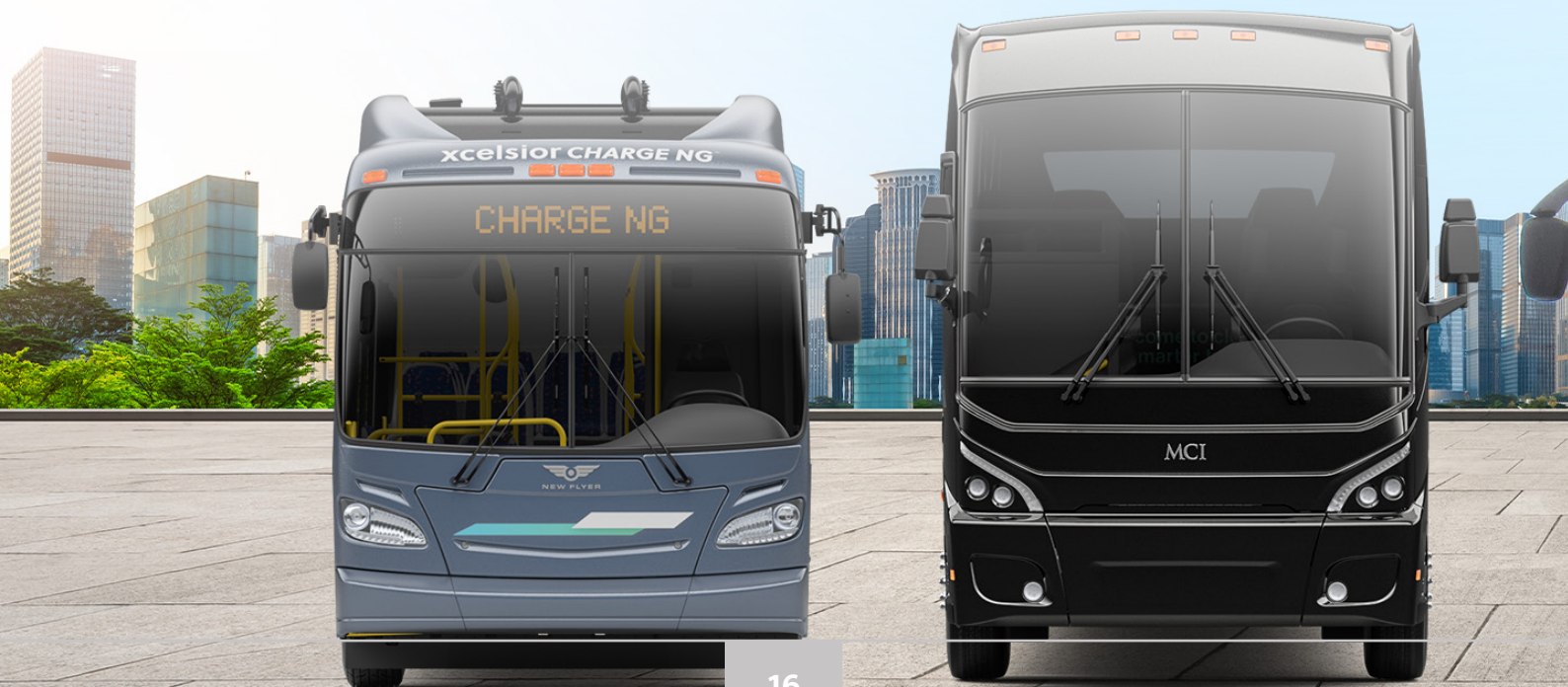
on sales floors and dealerships to purchase vehicles on the spot. There is very little customisation involved.

In the world of public transportation customisation is paramount. Bus producers cannot just put a bus on a shelf and wait for transit agencies and operators to come and buy it. Bus producers need to manage the delicate dance of balancing production standardisation and efficiency (i.e. economies of scale), with extremely specific customer requests that require a high degree of customisation. Today's customers are looking for vehicles with advanced driver assistance programmes, enhanced passenger experiences, including wifi and charging stations, and, in response to the COVID-19 pandemic, they want to be able to assure passengers that vehicles are clean and safe.

As transit agencies make the transition to zero-emission electric fleets, there have been two major realisations: First, each unique operator has differing requirements for battery range, geographic considerations and electricity usage that drives the need for unique

tailored solutions. In addition, it is not just about the bus. As the vehicles themselves have become more complex, so too has the need for associated infrastructure and expertise around electronic systems and service. There is also a real opportunity for telematics to support operators and transit agencies in better understanding how their buses and drivers are performing, to evaluate state of charge and energy consumption and determine areas for improvement.

Battery technology continues to improve, allowing for lighter loads and longer range. For some transit operators, a single-deck battery electric bus with the ability to travel over 250 miles on a single charge will feel like a great fit. For others, who have unique topography issues or range anxiety, a hydrogen fuel cell-electric bus might work best, where the hydrogen fuel cell tank acts as a range extender for an otherwise fully electric bus. The addition of a hydrogen fuel cell may extend a vehicle's range by up to 150 miles but comes with added costs and complexities related to hydrogen sourcing, infrastructure and safety logistics.



It is precisely these types of questions and issues that led NFI to launch **Infrastructure Solutions** in 2018; the company recognised that many transit agencies need a partner to help guide them smoothly through the infrastructure required to support various types of electric buses and coaches – someone to support their mobility projects from start to finish. To date, NFI has installed more than 200 EV chargers, and is dedicated to providing safe, reliable project management for smart, sustainable mobility projects.

NFI has delivered electric vehicles to some of the largest transit operators in the world with vehicles operating in London, Los Angeles, Toronto, Montreal, Seattle just to name a few.

In Seattle, Washington, the King Country Metro Transit Department is now full steam ahead with its electric bus programme, after conducting a series of pilot projects measuring various electric buses against predetermined key performance indicators. The transit agency has committed to operating a 100% zero-emissions fleet powered by renewable energy

no later than 2040. They currently operate diesel-electric hybrid buses, electric trolley buses, and battery-electric buses, and NFI's New Flyer has delivered over 1,800 buses to the transit agency since 1979, over half of those being zero-emission or hybrid propulsion.

As King County Metro conducted its pilot project and moved into electric bus installation, NFI was a partner in lockstep with King County Metro throughout. This partnership was key in ensuring the transit agency could confidently move forward with their electric vehicles knowing they had a trusted partner to help guide and support them along the way.

As Rob Gannon, Metro General Manager from 2016-2020, said, *“[NFI’s] New Flyer has consistently delivered what we asked for and in the timeline we’ve needed.”*

As NFI looks to the future, with the realisation that the transportation industry is on the cusp of major change, the company has been turning its attention to workforce development, including but not limited to training and developing

very specialised electrical skills. In 2020, NFI invested in and completed over 150,000 hours of internal training across its teams.

The company also operates the **Vehicle Innovation Center**, or VIC, in Anniston, Alabama, North America's first and only innovation lab dedicated to advancing bus and coach technology and providing critically needed workforce development, to teach skills and share knowledge on electric bus technologies and infrastructure in the face of rapidly increasing zero-emission bus adoption. The VIC has welcomed over 4,000 people through over 300 events to date, and features customer training, electric bus component exhibits, and a hands-on bus simulator.

NFI has found success by continuing to reinvent itself and to think beyond. The key for companies in the electric vehicle space will be to continue looking into the future, to remain flexible and adaptive, and to envision and build the vehicles and services that transit operators need, before they even know they need them.

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- This DC bestseller has been sold more than 3,500 times.

Bus depots in Berlin, Madrid and Torino are already connected — when can we help to electrify your bus-depot?



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C9 DEPOT— New solution 2022 for space-limited bus depots

DC-Wallbox-Charger

DC charging station designed to meet high power charging demand at bus depots

Simultaneous Charging

Module design allows the power output to range from 60 kW to 180 kW per plug with simultaneous charging of all connected vehicles

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COMECA

The Benefits of Smart Charging for Electric Buses



The decision to switch to electric power brings to light several issues: the size and equipment of depots, the distribution of electric power, the management of recharging times and vehicle downtime and the management of the range and mileage covered by each vehicle.

The challenge is to **guarantee the availability of the buses** while

reducing the costs associated with energy consumption when they are charged at the depot, which in some cases can exceed 250 vehicles. This is where the intelligence of the infrastructure comes into play through the use of smart charging software.

How Does Smart Charging Work?

Smart charging **distributes the power and charging time of each bus in a co-ordinated way**

to ensure availability and charging for its next journey. It **optimises the total power consumed** by the charging installation.

In this way, this solution **helps to smooth out the power consumed** or to **manage the reduction in power consumption** during a given period. Smart charging adapts the electrical consumption of the depot according to the tariff reductions of the different electrical energy suppliers and the availability needs of the vehicles. As a result, Smart charging helps to **optimise the cost of charging electric vehicles**.

What Are the Benefits at the Time of Installation?

Reduction of CAPEX

Opting for smart charging from the beginning of the project is an asset to **moderate the expenses related to material investments (CAPEX)** and to **make savings**.

Indeed, as the charging is intelligent, the power requirement at the point of delivery to the electrical network is lower. During installation, the size of the MV substation, the MV-LV transformer and the LV switchboard is reduced, which lowers the investment cost.

This reduction in size also impacts the size of the power cables in the electrical infrastructure, which results in lower material costs such as copper or aluminium.

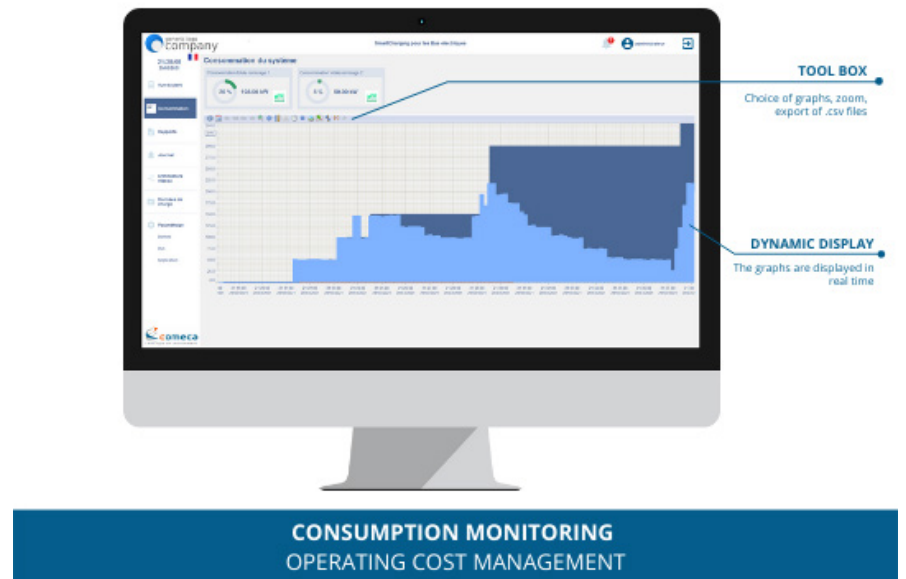
How Can This Gain Be Assessed at the Time of the Study?

The evaluation is **based on the planning of operations**. The study of each route to be carried out determines the need and allows the operator to select the type and brand(s) of bus. The energy requirement for recharging the batteries is calculated on this basis, which enables the matching with the operational schedule.

When the duration of each bus's stay at the depot and its next trip is known, it is possible to draw a **current vs time graph of the depot's energy requirement**.

- **Without smart charging:**

The full charge of the bus is triggered when the bus is



connected to the terminal, several buses entering the depot at the same time will inevitably cause a **peak in consumption**.

=> **The electrical installation is designed to support this peak but will be oversized the rest of the time.**

- **With smart charging:**

The start of full charging of some buses can be delayed to limit this consumption peak. By staggering the recharging and metering the recharging, the **consumption is**

smoothed out and the **peak consumption is greatly reduced**.

=> **The electrical infrastructure is proportional to the need.**

What Are the Operational Benefits?

Load Management and Vehicle Availability

Smart charging is linked to operational planning to **intelligently distribute charging power according to scheduling**

and operational priorities to ensure that each bus is fully operational for its next journey.

Integration of Operators' Usual Tools

Smart charging does not disrupt the habits of operators, who still use their usual planning tool. In case of unforeseen circumstances, a charging point can be managed manually, and the other charging points are then automatically given an adaptation instruction, if necessary.

Optimisation of Operating Costs

The smart charging system generates operating balances to optimise energy consumption and facilitates the search for

contracts with the best rate in relation to the depot's consumption signature.

Seasonal Preconditioning of Vehicles

Smart charging can **control the preconditioning of each bus** according to its departure time from the depot and the season. As the bus is connected to the system, it is easy to **switch on the heating or cooling of the passenger**

compartment before the driver starts their journey.

This way, the batteries are not required to adapt the ambient temperature, which **increases the vehicle's autonomy** while ensuring a pleasant temperature. All this from the very beginning of the journey for the driver as well as for the first users.

For more information, please visit [Comeca's dedicated page for large electric vehicle charging systems.](#)

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PIONEERING THE CONNECTED BUS



Nomad's ground-breaking vision 'connecting everything' remains relevant. Now, the opportunity is not just to connect the passengers, but also bus operators, maintainers and on-board staff by enabling the vision of the connected bus..



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Nomad Digital

smarter transport, connected passengers

The Connected Bus



The connected vehicle is broken down into:

- The connected train
- The connected tram
- The connected bus

Whilst all three forms of transportation are popular, in this article, we will focus on how the connected bus will benefit the operator.

The Industry

Travelling by bus within the UK has always been a popular, affordable and an effective means of travel, whether it's for: travelling to work, travelling to school, socialising, sight-seeing, day trips and long-distance journeys.

The UK bus infrastructure has been around since the early 1830s and the first passenger bus was pulled by horses (London). Since then, the UK bus industry has gone from

strength to strength, increasing in popularity and proximity, significantly in the 1950s. Due to its popularity – to this current day; the vision of the 'connected vehicle' is now at the forefront of many bus operator's priorities. The Department for Transport reported, "4.32 billion (bus) journeys in England in 2018/19".

The Nomad Tech

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, which assists the process of delivering images onto the screens. Furthermore, the connected bus has a telematics unit which captures all the output available from the 'CAN Bus'. The 'CAN Bus' is a bus system which feeds back information of all critical and non-critical bussystems: breaks (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 required, alerting and reporting. Nomad provide the data to the customer in the form of a dashboard. The operator can see real-time and historical information about the bus. Live camera feeds are available on request, whether it be an incident in real-time or a historical report. The telematics unit also lets the processor and NVR know when the bus has doors open or is in reverse, which activates the reversing camera to show images with zero latency on the driver's monitors, which is essential for the driver when performing a reversing manoeuvre.

So Why Does Anyone Want a Connected Bus?

One element is to improve and understand the failure patterns. To enable predictive maintenance instead of reactive maintenance. This is an augmentation to any RAMS (Reliability Availability Maintainability Safety) process,



therefore maximising the bus fleets availability. The Nomad solution provides in-depth and real-time information on the performance of crucial equipment and components on-board – partnered with diagnostic alerts – providing bus operators and owners the intelligence and sufficient time required to take pro-active action to prevent unplanned maintenance. **Reduced costs and increased revenue are key factors for many, but with such a solution implemented, it is about improving the overall reliability of fleets, which is primary.** All buses share the same purpose – transportation, but it is how that raw data from a bus is used to reap the benefits, such as a maximised service.

Another aspect important to every operator is security. If there is an incident inside or outside the bus, the cameras will capture the footage (internal and external cameras – live feed and recording). The driver can 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. Usually the operator would have to sacrifice their bus' hard drive to provide recordings to the police but, Nomad's system has the video evidence locker, which 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 unless of course approved.

Final Thoughts

Nomad's ground-breaking vision 'connecting everything' remains relevant. Now, the opportunity is not just to connect the passengers, but also bus operators, maintainers and on-board staff by enabling the vision of the connected bus.

Credit to our connected bus team. Lead by Robert Leyland.

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VTC 1020

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- 5 x RS232 and 2 x RS485



VTC 6221

Communication Hub In-Vehicle Computer

- Intel Atom® Quad Core x7-E3950
- 6 x SIM Cards and 3 x WWAN LTE/5G Support
- 3 x mini-PCIe and 2 x M.2 socket expansion



VTC 7251-7C4

Communication Hub and Digital Surveillance

- Intel Core™ 8th Gen. CPU
- 4 x Independent 10/100/1000 Mbps PoE 802.3af/at
- 3 x WWAN module slot
- 4 x mini-PCIe slot and 1 x M.2 Key B slot



NEXCOM

Smart Buses Steer into Smart Cities with Vehicle Telematics



The core thrust of smart city transformation is the concept of a “smart bus” promising to elevate road safety, operational efficiency, and passenger satisfaction.

What a smart bus needs is vehicle telematics data which can bring far-reaching changes in driver management, asset management and passenger services. Additionally, time, costs and efforts must be considered to ensure successful, largescale implementation on

smart buses. This article discusses how smart bus services can be delivered for cost-sensitive bus carriers with compact vehicle terminals like NEXCOM’s VTC 6221 powered by Intel Atom® processor x7-E3950. Moreover, we analyse the data extracted using the

telematics data from the in-vehicle VTC 6221 and deliver extended applications by integrating it with real-time communication, multi-display passenger information, bus announcement and other systems. They are solutions in delivering a high cost-performance value, ultimately, reshaping the landscape of the transportation industry.

Smart Cities Need Smart Bus Services

By 2050 the world population is anticipated to reach 9.7 billion (United Nations, 2019), and approximately 68% are expected to be living in urban areas (United Nations, 2018). Thus, meticulous planning of bus services is significant when it comes to maintaining and increasing ridership. Large populations positively correlate to city traffic; exacerbating problems like long travel time, unexpected delays and road collisions. This could result in frustrating passengers and in other road users blaming bus services, ultimately ruining their reputation. As for local governments, simultaneously keeping cities lively and thriving and achieving environmental sustainability is a difficult balance to accomplish.

The Elements of Smart Bus Services

A Treasure Trove of Vehicle Telematics Data

To address concerns about bus service operation, mobility in urban areas, and environmental sustainability, NEXCOM's VTC 6221 vehicle terminals are equipped with: Intel Atom® processors, data acquisition and sensing capabilities,



Figure 1. Smart buses are data treasure troves containing vehicle operation information, diagnostic messages, and transportation statistics

wireless communication technologies supporting electronic logging, vehicle-to-infrastructure (V2I) communication and passenger infotainment. The aim is to transform bus services with vehicle telematics. To advance bus service operation, the vehicle terminals have integrated multiple communication and sensing technologies to gather vehicle status and in-vehicle activities (Figure 1).

The VTC 6221 has met the SAE J1939 standards with optional module, communicating with vehicle microcontrollers over a control area network (CAN). It collects vehicle operation information and provides diagnostic messages about abnormalities. The location tracking function is 24/7 anti-theft protected, information is generated by a combination of a GNSS receiver with the dead-reckoning option when GNSS signals are interfered and blocked, and G-sensor for motion detection. Transportation statistics can be obtained by

using the VTC 6221 in conjunction with passenger counters, door sensors, ticket machines and other peripheral devices. With VTC 6221's rich I/O design, bus carriers can compute the number of trips, boarding/alighting passengers, bus stop dwell time, etc. to evaluate transportation performance and the scope of fare evasion. Furthermore, wireless connections like LTE and 5G networks enable bus locations and transport statistics to be shared in real-time, providing live bus arrival information for bus bunching mitigation, and allowing for active adjustments to minimise passenger waiting time and direct voice communication in case of emergencies (Figure 2).

Wi-Fi connections present a cost-efficient alternative for uploading less time-sensitive data to backend servers after buses return to bus depots. Furthermore, the beacon technology, a variant of Bluetooth developed for the Internet of Things is ideal for accurate proximity sensing. It can be used to

manipulate traffic lights, granting priority to incoming buses. This prevents buses from being stuck in traffic, thus, increasing bus schedule reliability and passenger satisfaction while reducing fuel consumption and greenhouse gas emissions.

Passenger Infotainment

Thanks to the quad-core architecture of the Intel Atom® processor x7-E3950, the VTC 6221 can also provide passenger infotainment, and present signage contents and vehicle telematics data.

Combining with the graphics engine integrated in the processor, vehicle terminals can drive up to three displays simultaneously, showing route information, Ultra 4K commercials, and location-based promotions inside and/or outside a bus.

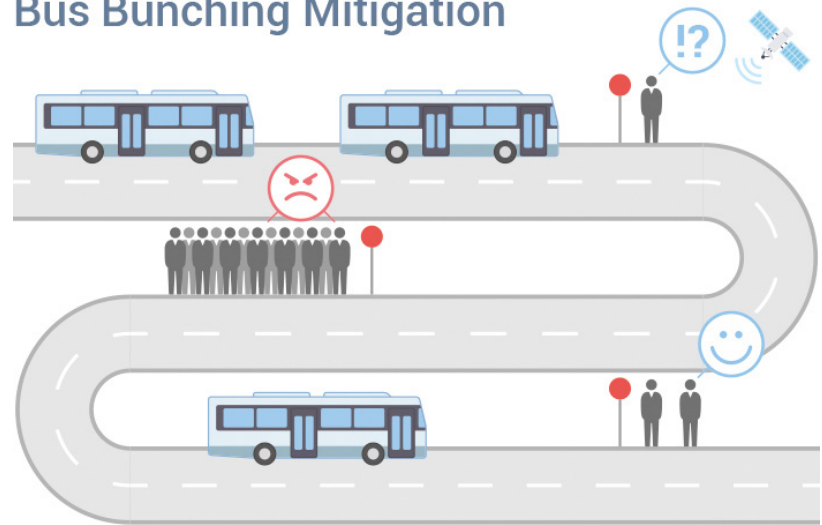
Moreover, extra system headroom is available for GNSS-based bus stop announcement and passenger side speakers to facilitate driver-passenger interaction.

Navigate through the Harshness

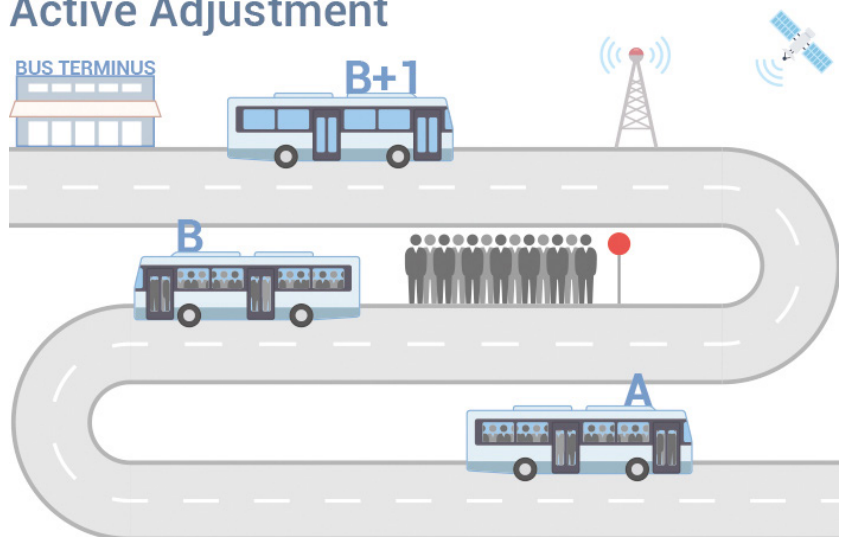
Taking advantage of the extended temperature support and the high power efficiency of the Intel Atom® processor, the VTC 6221 offers enhanced system durability even when confined in a small space with poor ventilation or under an ambient temperature ranging from -40°C to 70°C. The unstable vehicle power supply—transient voltage fluctuations and spikes induced by turning on ignition igniters or windshield wipers is dealt with by

Figure 2. Wireless communication allows bus carriers to use vehicle telematics to their advantage for service improvements

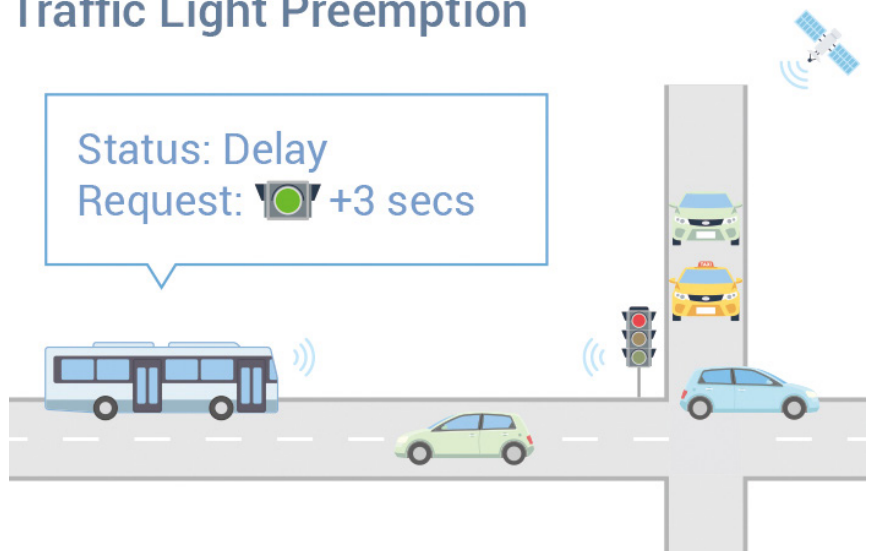
Bus Bunching Mitigation



Active Adjustment



Traffic Light Preemption



ignition on/off delay, 9V-to-36V DC support and low-battery voltage protection to avoid premature system failure. System reliability is further ensured by the fanless design which prevents dust and grease accumulation on the VTC 6221.

Put on Full Alert

The VTC 6221 brings additional benefits to bus services (Figure 3). In terms of driver management, vehicle terminals incorporating iButton readers grant bus access only to authorised drivers during their duty hours and combines vehicle status data, compiling their hours of service (HoS) logs.

While on the road, driving behaviour data of harsh braking, acceleration and speeding can be recorded and/or streamed live to assure safety guidelines are met. For asset management, vehicle operation information and diagnostic messages assist dispatchers to track the health status of an entire bus fleet and predict maintenance schedules, maximising bus utilisation while reducing accidents from vehicle malfunctions.

As for location tracking and motion detection, functions can be used to track buses; in the event of unusual incidents, GNSS coordinates, tilt angles, and pre-edited contents can be sent to registered phone numbers (Figure 4) under the driver's control. By using the utility software tool provided by NEXCOM, bus carriers can programme their software to set receivers to dispatchers, authorities, and even insurance companies based on the severity of the incident.

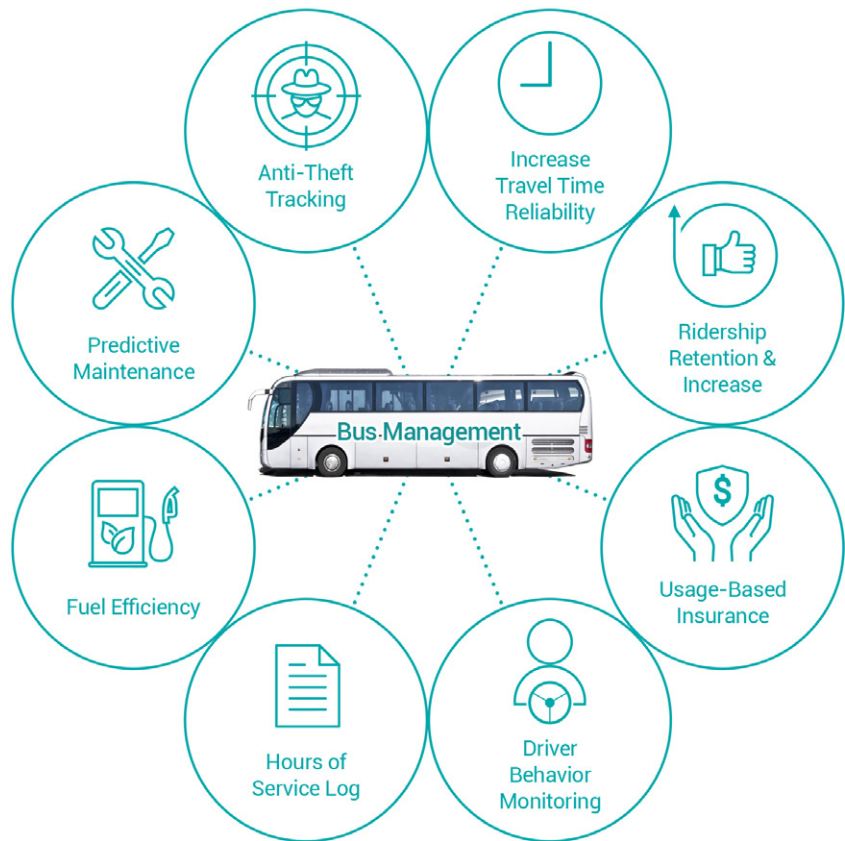


Figure 3. Vehicle telematics data also has various potential applications in terms of driver management and asset management

Conclusion

Information technology is reshaping the landscape of the transportation industry. Given the trends towards urbanisation and the rise of megacities, bus carriers must soon remodel service operations.

To usher in bus service reinvention, NEXCOM is propelling the proliferation of vehicle telematics with rugged mobile computing solutions to help bus carriers exploit data goldmines to confront challenges in daily bus operation and continuously drive operational improvement.

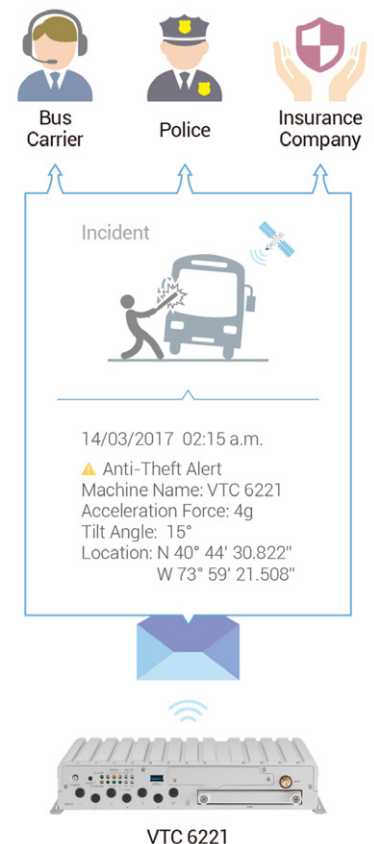


Figure 4. NEXCOM vehicle terminals feature 24/7 anti-theft tracking to strengthen the physical security of buses

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Which is why for over 10 years, ETA has standardized its hardware on the Sintrones® VBox, an incredibly robust onboard COTS computer that powers vehicle equipment and negotiates the flow of data to SPOT's cloud servers. With Sintrones® under the hood, the stability of the SPOT™ system is never in question.

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The modular design allows the SPOT™ platform to scale to suit any size of a transit agency. Operations with just a few vehicles will realize a quantum leap in capabilities. At the same time, large agencies can save upwards of 60 percent in deployment costs yet not sacrifice anything regarding features or performance.

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SPOT™ is an ITS that grows with you

The SPOT™ platform is always improving, with updates and performance enhancements delivered wirelessly every two weeks.

ETA deploys these updates directly to your onboard hardware without the need for human intervention.


Compare this to legacy systems where patches are less frequent, and each deployment requires the IT staff to physically touch every asset.

Experience matters

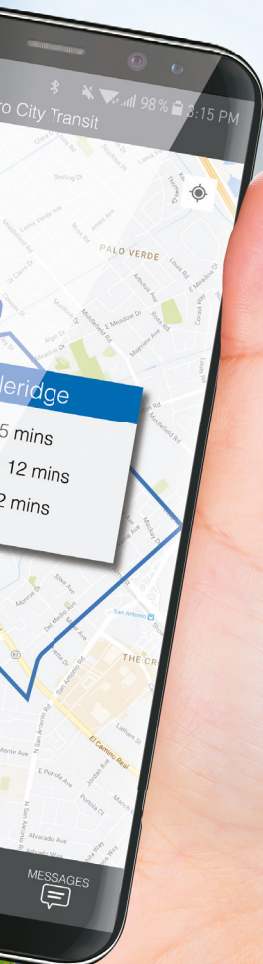
Over 20 years of mass transit know how.

ETA has influenced transit technology since the mid-1990s. We were the first to embrace cloud technology to shift from hardware-driven to software-driven (SaaS)

solutions. SPOT's DNA is designed to address the

common pitfalls of connectivity, cost, and integration. Our solutions have improved the real-time display of information regardless of technology. 

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- ▶ Digital passenger counting
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- ▶ Fare categories/counting
- ▶ GTFS
- ▶ Instant replay
- ▶ Reporting and analytics
- ▶ Route management
- ▶ Service messaging
- ▶ Tracking websites & mobile apps
- ▶ **Free software updates included!**

Optional upgrades:

- ▶ Automatic passenger counters
- ▶ Automatic vehicle announcements
- ▶ Automatic vehicle monitoring
- ▶ Business intelligence
- ▶ Digital display systems
- ▶ Fare collection integration
- ▶ GTFS-RT (real-time)
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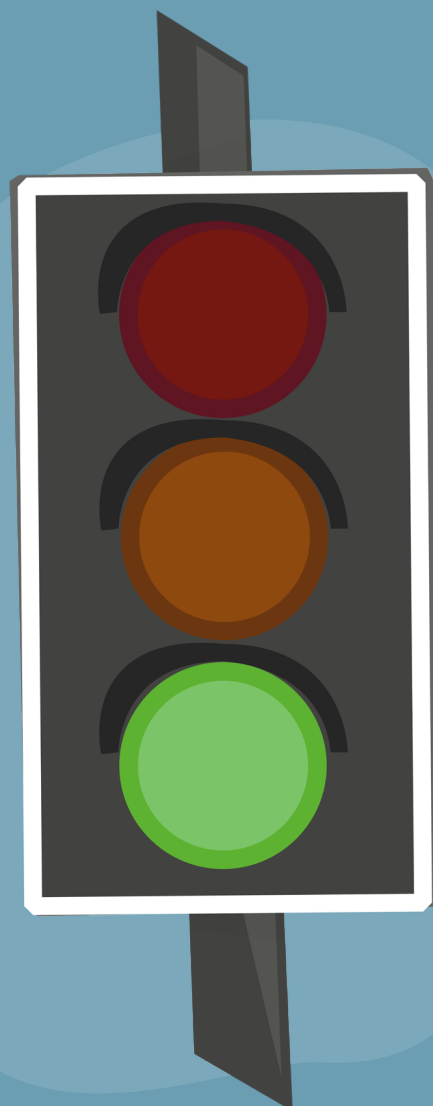
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Unlock the Potential of Transport Data

“The transport sector creates incredible amounts of data, but as an industry we’re not making the most of it. Through analytics and insights, data can help us improve decision making and operational efficiencies, as well as provide better value for customers,” says Andy Monshaw, Ticketer Group CEO.



The transport sector produces a phenomenal amount of data and yet uses so little of it to its own advantage – and to that of its customers.

If you look at operators alone, there’s so much information to work with. They can record the number of tickets sold, the amount of people on a bus at any given time and the

condition of vehicles, to name but a few.

The transport industry could, and should, be doing so much more with this information. Just think about the last 18 months. During the pandemic, authorities allocated a lot of money to public transport to ensure that essential workers could move about. However, they had



to do this with only a sliver of the information needed to make the most effective decisions.

The raw data the industry is sitting on can be analysed and turned into valuable insights to help it deliver better value for customers, improve operational efficiency and support better decision making.

Clearly there's a gap to be closed, but gradual change is happening as operators and authorities come to understand the value this data holds.

The Need to Innovate

We need to innovate to stay relevant, and data is key to driving the kinds of bus services passengers' desire.

Passengers want to be well informed and in control of their entire journey – from door to door – and a wide range of technology solutions are starting to revolutionise the operation of buses in ways that responds to these customer needs.

Many trends were accelerated due to the pandemic, for example touch-free travel through technologies such as contactless payments and tap on/tap off readers. The benefit of the latter has been that operators and authorities can now see passengers' exact journeys and travel patterns, which can help improve capacity management, and planning more efficient and optimal routes.

The addition of passenger counting technology has also been of great benefit to operators since the arrival of Covid-19, as this simple enhancement allows drivers to record passengers alighting a vehicle, and when combined with ticket data, provides full visibility of

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on-board passenger levels. With this information, drivers can more easily ensure passenger safety by staying under Covid-friendly capacity thresholds.

The need to become more adaptable and dynamic helped the sector start to realise the benefits of capitalising on its data sources, particularly as it continues on its journey to digital transformation.

As we move past the pandemic, we're seeing more and more opportunities. Operators are turning to data analytics to better understand customer journeys and optimise route planning, while passengers can use the information gathered to help plan their rides. This might be checking the time of, or space on an upcoming bus, plan ahead based on quiet times, or ensuring there's available space in the disabled area if travelling by wheelchair.

One of the most exciting opportunities is around demand-responsive transport (DRT). This is the ability to run services that don't operate to a specific timetable or route, but rather to flexible passenger demand. This will revolutionise public transport, better connect rural and urban areas and make public transport easier and more accessible than ever before.

Data plays a key role in driving DRT, as real-time data will help multimodal and intermodal journeys become easier. We're delighted to be at the forefront of this area, as Ticketer recently partnered with Via to provide a seamless integrated ticketing offering that allows passengers to purchase a single ticket for use on both conventional bus and DRT services within the same public transport network. With journeys

booked via a simple-to-use app, DRT becomes more accessible and customer-friendly, which will help drive uptake.

Transparency and sharing are key to successful data-driven transport networks.

Integrating with Via's flexible DRT solutions is just the start of our journey towards creating an industry framework that enables partners to integrate and deliver an improved passenger experience.

But we have a lot of work to do. Many operators don't yet have the technology in place to source the necessary information to create insights, for example. However, we are seeing more authorities coming forward to help operators deploy the technology required to be able to deliver this information, such as tap on/tap off readers and passenger counting solutions.

Another issue is the lack and cost of data analysts. It's great to have the data, but if you're unable to easily analyse the information you have, what use does it bring? The skills within the industry simply aren't there at the moment, but there is a different solution. By adding an additional application programming interface (API) layer to your technology, which enables different applications to 'talk' to each other, you can let AI and big data analytics do the work for you.

In creating a central data repository able to scale to the volumes of data available in the sector, storing and cleansing data, and making it available for mass data aggregation and analytics in a secure way, it will become possible to connect the dots and allow access to invaluable

insights. The sector as a whole will flourish by providing passengers with seamless public transport services that will not only benefit company bottom lines, but also sustainability objectives.

For this to become a reality, we need to break down silos, in addition to improving data governance and legislation. This is something we as an industry are currently getting to grips with through improved communication and collaboration, and the future is looking positive.

Let's innovate,
collaborate and
communicate!

Data insights and analytics provide a huge opportunity for the public transport sector to update and reinvest itself, providing new revenue streams, efficiencies and services that will see customers park up their cars and return to public transport.

The industry is heading in one very clear direction, and those that don't start their data journey soon are at risk of being left behind. It's time to innovate, collaborate and communicate – together we can develop data-driven transport networks optimised to provide the best service for customers.

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FLOWBIRD

Bus Back Better with Flowbird



Alistair Aitken, Business Development Executive at Flowbird

Flowbird, the bus ticketing and payments specialist, has launched a new bus technology package that will help operators transform the travel experience for customers... and fully participate in a vibrant future.

The company's 'Bus Back Better' offer ticks all the boxes for contactless payments and capped ticketing set out by the Department for Transport in its vision for the future of bus travel.

The Flowbird package not only offers easier, safer transactions for passengers but also strongly positions bus operators to participate in the enhanced partnerships with local transport authorities that will be so important to the future viability of providers of bus services.

The new Flowbird package includes a driver console, contactless cEMV, capped fares capability, BODS compliance and ITS0 certification, along with cloud hosted back-office software and a long warranty. In addition, flexible payment terms, low transaction fees and monthly charges make this offer attractive to large and small bus operators.

“We know that successful bus provision and use is critical for the effective functioning of our society and economy.

The National Bus Strategy and the funding opportunities unveiled by government reflect this key role, so as technology partners for bus operators, we have developed a package that makes investment in contactless ticketing and payments both future-proof and affordable.”

“Our Bus Back Better offer supports the immediate needs of operators in optimising available government support while at the same time delivering the digital systems specified in Enhanced Partnerships that will open up new opportunities for bus companies.”



High on the list of priorities for the DfT’s bus strategy are:

- Simpler bus fares with daily price caps
- Better service integration and ticketing across all transport modes
- Contactless payment on all buses

“Besides meeting government requirements, the new solution offers straightforward integration with other applications such as passenger apps and m-ticketing, as well as validators for ‘touch on touch off’ – perfectly preparing operators for the new era of fare payments and wider mobility systems,” said Alistair Aitken, Business Development Executive at Flowbird.

The package also provides a pathway to Flowbird’s bus-oriented mobility hub – which is available for operators and local transport authorities – opening up new retailing opportunities and ‘on demand’ service provision as the wider transport sector moves

towards greater multi-modal integration. Bus transport will play an even greater role in getting people out of cars on to sustainable transport – and bus operators can be confident that this package will provide them with a reliable solution today and a future-ready platform for tomorrow.

Included in the Bus Back Better package is CloudFare, a powerful cloud-hosted back office that provides operators with a range of features to run, manage and monitor bus operations, support growth in ridership and help deliver enhanced passenger satisfaction.

CloudFare provides complete control over fare pricing and ticketing structures, manages existing schemes, while enabling the introduction of new payment options. It is hosted by Flowbird as a secure software service and includes a settlement system, operator and customer facing web portal, Payment as a Service and automatic fare collection.

The Bus Back Better package is the latest innovation from Flowbird in

its position as a core technology partner for bus operators in towns and cities around the world. Flowbird systems are enabling the sector to respond to growing consumer demand for frictionless travel, while speeding up boarding times and making it easier, quicker and safer for people to access and use public transport.

For example, for Lothian Buses in Edinburgh, the company provided the enabling technology for Scotland’s first ever ‘tap & cap’ contactless system. At the same time, Flowbird’s back-office expertise is creating flexible, modular and scalable solutions for the management and control of network assets and systems, including ticket retailing infrastructures in France, Northern Ireland, the United States, Finland, Australia and beyond.

To find out more about the Flowbird Bus Back Better package, call **01202 339 452** or go to www.flowbird.group/transport/bus-back-better/

FLOWBIRD

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Bus Interiors

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Passenger Comfort is Crucial

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Global Textile Manufacturer

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Gurit

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Treadmester Flooring

p.50

Customized Solutions for Bus, Train and Tram



Door Opening Push Buttons PK52, CK and PK
and Hand Rail Button HSTI

TSL-ESCHA

Passenger Comfort is Crucial



The CK push button series impresses with its flat design and robust stainless steel front panel © TSL-ESCHA



HST handrail buttons from TSL are used on many buses and trains © TSL-ESCHA

When using public transport, it is important for people with reduced mobility to be able to quickly find and operate door-opening push buttons.

Traveling by bus or train should be easy, safe and comfortable for every passenger. A door-opening

push button must work just as reliably in extreme heat and with dust as it does in high humidity or freezing temperatures. In addition to functional reliability, TSL-ESCHA products also focus on passenger comfort.

Passengers with reduced mobility should be able to recognise and operate TSL products easily. Push buttons, warning devices and signal lights comply with

the recommendations of the relevant associations and meet all requirements, including TSI-PRM (Technical Specifications for Interoperability – Persons with Reduced Mobility).

To ensure that boarding and alighting can proceed smoothly during passenger change, push buttons must be recognisable at first glance. These must be clearly distinguishable in colour from the



“It is important for us to always have our finger on the pulse and to set standards with new developments and the implementation of new requirements in order to give people with reduced mobility the best possible and safest feeling when traveling by bus and train.”

surface on which they are mounted. The minimum contrast value is normatively required in EN 16584-1:2017 as well as in EU Regulation No. 1300/2014 (TSI PRM:2019) not only when new, but permanently. This is intended to ensure the best barrier-free access possible for visually impaired passengers in public transport.

In order to save the operator from having to regularly check the required contrast values, the operating elements of TSL are uniquely designed. The coloured pictographs are mounted behind a resistant transparent cover. As a result, the colours remain unchanged and the pictographs are protected against wear and soiling. In addition, the colours of the panels are applied using a coating process, providing long-term protection.

As the only manufacturer, TSL-ESCHA has always offered devices with the push button series CK, PK52 and PK that fully provide permanent contrast. Push buttons which have been in use for up to 20 years have proven this.

Similarly, the door control elements of TSL are not only identifiable by touch in accordance with TSI-PRM, but also provide additional haptic recognition options such as braille to visually impaired persons.

“We attach great importance to the fact that our push buttons, warning indicators and signal lights comply with the standards and TSI-PRM and create added value for passengers,” explains Klaus-Peter Schmauch, Technical Manager of TSL-ESCHA. *“Large touch surfaces, optimum brightness of the LEDs, braille, and acoustic warning and information signals make it easier for people with impaired hearing and vision as well as mobility-impaired passengers to participate in traffic.”*

TSL-ESCHA develops, manufactures and distributes customised solutions. For example, a handrail button with vibration feedback (HSTIV) was developed for a customer project in Scandinavia, as there was previously no comparable solution. The vibration feedback starts for a short time when the button is pressed, so that additional feedback is felt. This function is

intended to offer more comfort and safety for visually impaired passengers.

The HSTIV is also available with optional lighting. The colour green stands for better localisation of the handrail button. The colour red provides visual acknowledgement of the stop request after the button has been pressed. This assures the passenger that their stop request has been accepted, especially in fully occupied vehicles when the “bus stop” signal cannot be recognised.

In combination with the vibration feedback, passengers can feel and see the button being pressed. Everything for more safety and a smooth process in public transport.

For more information, visit www.tsl-escha.com or contact the TSL-team at info@tsl-escha.com with any questions.



**PERFECT FOR THE
URBAN JUNGLE**

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< Bus Interiors

Camira

As global textile manufacturer Camira approaches its 200th anniversary of providing to the transport industry, we spoke with Peter Daly, Head of European Transport Sales, to learn about the company's rich heritage, and the exciting plans it has for the future...

So, where did Camira's transport textile roots begin? How did you grow to become the global organisation you are today?

Peter Daly: Our heritage stretches all the way back to 1822, when a cloth manufacturer named John Holdsworth founded a worsted spinning mill named Holdsworth in Halifax – a town in the North of England celebrated for its woollen textile heritage. Over the years, the company greatly expanded and built a renowned reputation for providing speciality cloths for transport companies, and supplying them to organisations across the world.

In the 1900s, Holdsworth solidified its expertise in the transport industry, becoming a founding member of the Moquette Manufacturers' Association and

symbolising the firm's commitment to the iconic textile construction which remains a beloved staple in the Camira portfolio to this day. The company also began to concentrate on the export market, developing its presence across the globe and, by the 1990s, sales in North America formed approximately a fifth of the company's turnover, in addition to significant growth being achieved in continental Europe and Australasia.

This growth was complemented by significant investments in machinery and state-of-the-art equipment, making the Holdsworth factory one of the most modern and largest weaving units of its type in the world!

After six generations in the family, the Holdsworth business was sold in 2005 for real estate

development of its historic mill complex. Two years later, in 2007, Camira purchased the Holdsworth brand name and assets – including the moquette looms on which our transport textile heritage is founded – and brought the historic firm into the Camira Group, ensuring its expertise and capabilities continues to play a valuable part in the transport industry.

Could you tell us about some of Camira's highlights from the last two hundred years? There must be a lot to choose from in such an extensive period!

PD: Of course! There are so many key moments – from the construction of Holdsworth's famous offices by Sir Charles Barry in the 1860s through to working with Transport for London on the

creation of their iconic textiles in the 1900s (a partnership that remains as strong as ever today), and even the launch of Hybrid, our pioneering wire-woven capability, in 2019. Indeed, this year had a highlight of its own, as, this summer, we released Aura – our beloved moquette – in an incredible 200 colourways to celebrate our upcoming bicentennial anniversary!

The ongoing coronavirus pandemic has obviously had a major impact on public transport, do you see bus interiors changing as a result?

PD: Many people envisage that interiors will move towards ‘wipe clean’ seating – with hard plastic, vinyl and polyurethanes becoming the preferred choice, but we believe that there is a very bright future for natural materials to work alongside

a variety of other complementary surfaces; and that’s certainly something we’re seeing in our own customer base.

There’s a large amount of research which indicates that the use of natural materials within interiors is incredibly beneficial for our wellbeing – particularly in light of the recent focus on indoor air quality and the emission of VOCs (volatile organic compounds) which can be harmful to human health – and this is something that operators are really considering when designing their vehicles. With wool being nature’s ultra-intelligent fibre type, it is a naturally low emitter of VOCs, and actually improves indoor air quality. These in-built health properties, combined with its sustainable nature and the textural and visual appeal of a wool fabric, make it a truly timeless

choice for bus interiors – as popular today as it was when we started back in 1822.

Finally, do you have any exciting plans in the pipeline that you can share with us?

PD: Whilst we can’t give specifics just yet, our Design and Innovation teams are busy working on a number of exciting projects that we’re very much looking forward to sharing – so we are proud to say that the forward-thinking ethos, passionate commitment, and continuous development that defined the Holdsworth name for centuries remains alive and well in the Camira brand.

And, of course, our 200th anniversary officially takes place next year, so preparations are very much underway for the big celebration.



The Aura collection: 200 colours for 200 years

As we approach 200 years of providing textiles to the transport industry, we have paid homage to the past whilst embracing the future of mobility with the launch of our iconic moquette Aura in 200 colourways in 9 distinctive designs.

With shorter lead times and minimum order quantities of just 50 metres, the Aura collection truly defines flexibility and versatility.

camira





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Maintenance & Servicing

Stertil-Koni

Safe, Reliable, Efficient and Ergonomic –
Stertil-Koni Vehicle Lifts for Maintaining Bus Fleets

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stertilkoni®

LIFTING SOLUTIONS FOR PUBLIC AND PRIVATE TRANSPORT



SUPERIOR SOLUTIONS



 a member of the Stertil Group

stertil[®] KONI

Safe, Reliable, Efficient and Ergonomic Stertil-Koni Vehicle Lifts for Maintaining Bus Fleets



In bus and coach fleet maintenance facilities all over the world you can find Stertil-Koni heavy duty vehicle lifts.

Inspection, service, maintenance and repair has never been safer,

easier and more ergonomic. Our vehicle lifts provide full accessibility to all sides of the bus, allowing the mechanic to work ergonomically and safely standing upright under the vehicle. We have a vehicle lift for every workshop situation.

Due to intensive use of buses and coaches regular maintenance is

required. Stertil-Koni provides a complete range of heavy duty vehicle lifts that are designed and manufactured in-house by a team of specialists with expertise in the bus fleet lifting industry. Our lifts are suitable for any bus fleet and for any model, for both single axle and multiple axle buses, and for existing and new bus workshops.

Secure and Easy

We offer a diverse range of hydraulic vehicle lifts, from platform lifts and in-ground lifts to mobile column lifts. All are equipped with a built-in overload mechanism and a patented gravity mechanical locking system that works entirely independently of the lifting system and is permanently enabled.

All Stertil-Koni vehicle lifts for buses and coaches are equipped with the ebright Smart Control System. A full colour 7" touchscreen that provides intuitive, ease-of-use with maximum visual information about the lifting process.

Suitable for Low-Clearance Vehicles

The Stertil-Koni SKYLIFT platform lift has drive-on platforms that are flush with the workshop floor, very suitable for low-clearance vehicles like buses and coaches. No overhang, no crossbeams, no base frame: only four independent Y-shaped support legs providing optimal working space for the mechanic. Available in the lifting capacities 20,000kg, 25,000kg and

35,000kg and with platform lengths ranging from 7 to 14.5 metres. In a tandem configuration the lifting capacity goes up to 70,000kg and 30 metres! The Stertil-Koni 4-Post Lift is our cost-effective platform lift.

Wheel-Free Maintenance

Wheel-free maintenance jobs can be done safely with our in-ground vehicle lifts.

The Stertil-Koni DIAMONDLIFT is a piston lift which can be installed either as a cassette or frame mounted version. The ECOLIFT is a scissor lift with an ultra-shallow construction and low rise axle-engaging scissors suitable for all ground types. Both in-grounds are available in either a two, three or four-piston configuration, and have models with various lifting capacities. The DIAMONDLIFT and the ECOLIFT both have the Continuous Recess® System.

This system means that the lift is flush with the workshop floor in the start position and the pit is covered with automatic cover plates made from anodised aluminium and have a skid-resistant surface.

Flexibility and Moveability

The Stertil-Koni mobile column vehicle lifts can very easily and ergonomically be moved around the workshop as required without taking up valuable working space. Available in a wide range of capacities, up to 32 mobile column lifts can be connected, so even the longest articulated bus can be lifted. Capacities of an individual column lift range from 7,500kg to 17,500kg. These convenient wireless mobile columns mean no dangerous cables over the workshop floor, reducing the risk of tripping and also increasing productivity due to reduced connectivity and configurability time.

The "Green" Regenerative Vehicle Lift

The Stertil-Koni EARTHLIFT® is the only regenerative mobile column lift in the industry. This environmentally friendly solution uses the patented Active Energy Retrieval System: re-charging of the batteries occurs during the descent of the lift and, the



heavier the vehicle the more the batteries are charged. The EARTHLIFT® is the ultimate in sustainable technology with 35 percent more lifting cycles before battery recharging is required; thus increased efficiency and more jobs going through the workshop each day.

Electric Buses

Speaking of green technology... The global electric bus market is expected to grow exponentially because of all of the mandates across the globe for the reduction of CO2. Stertil-Koni has been present in workshops around the world and gained together with its customers and partners a wealth of experience with lifting electric clean-energy buses and other

commercial vehicles. Whether it's battery-electric vehicles or hydrogen fuel cell vehicles. Stertil-Koni is on top of the renewable energy developments in the transportation and vehicle manufacturing industries.

Although in most cases adapters are not required, we do have a comprehensive range. As an industry specialist, Stertil-Koni can provide advice depending on customer requirements. We listen to and advice customers on lifting solutions for their maintenance, repair and service requirements. Stertil-Koni is the heavy duty

lifting specialist with a complete range of lifts and can give you the best advice based on your particular fleet, workshop and circumstances.

**Need a lifting partner?
Please contact us.**

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🌐 www.stertilkoni.com



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