



At the Vanguard of Digitalization

We make public transport fit for the future.



PIONEERING CONNECTIVITY IN PUBLIC TRANSPORT: NETMODULE - CONNECTION IS OUR BUSINESS

We are convinced that public transport has a key role to play in the mobility revolution and in achieving climate protection targets. If we are to inspire even more people to switch to buses and trains, passenger need to be offered an engaging experience - with intelligent passenger information systems, convenient ticketing, the knowledge that they are travelling safely and precise, reliable journey times. This means that transport companies are having to face up to the challenge of rapid digital transformation: in order to leverage efficiency potentials and further enhance customer orientation, vehicles and infrastructure must both be connected to the Internet.

Who we are. What we can do for you.

For more than 20 years, NetModule AG has been a digitization partner for the public transport sector. As a leading manufacturer of communication products for IoT and M2M, we provide European transport operators with innovative, robust and user-friendly connectivity solutions based on state-of-the-art wireless technologies, from hardware to central remote management platforms. Our team of 60 specialists combine the art of engineering with innovativeness, advise on the selection of suitable routers, take care of system configuration and provide support and maintenance.

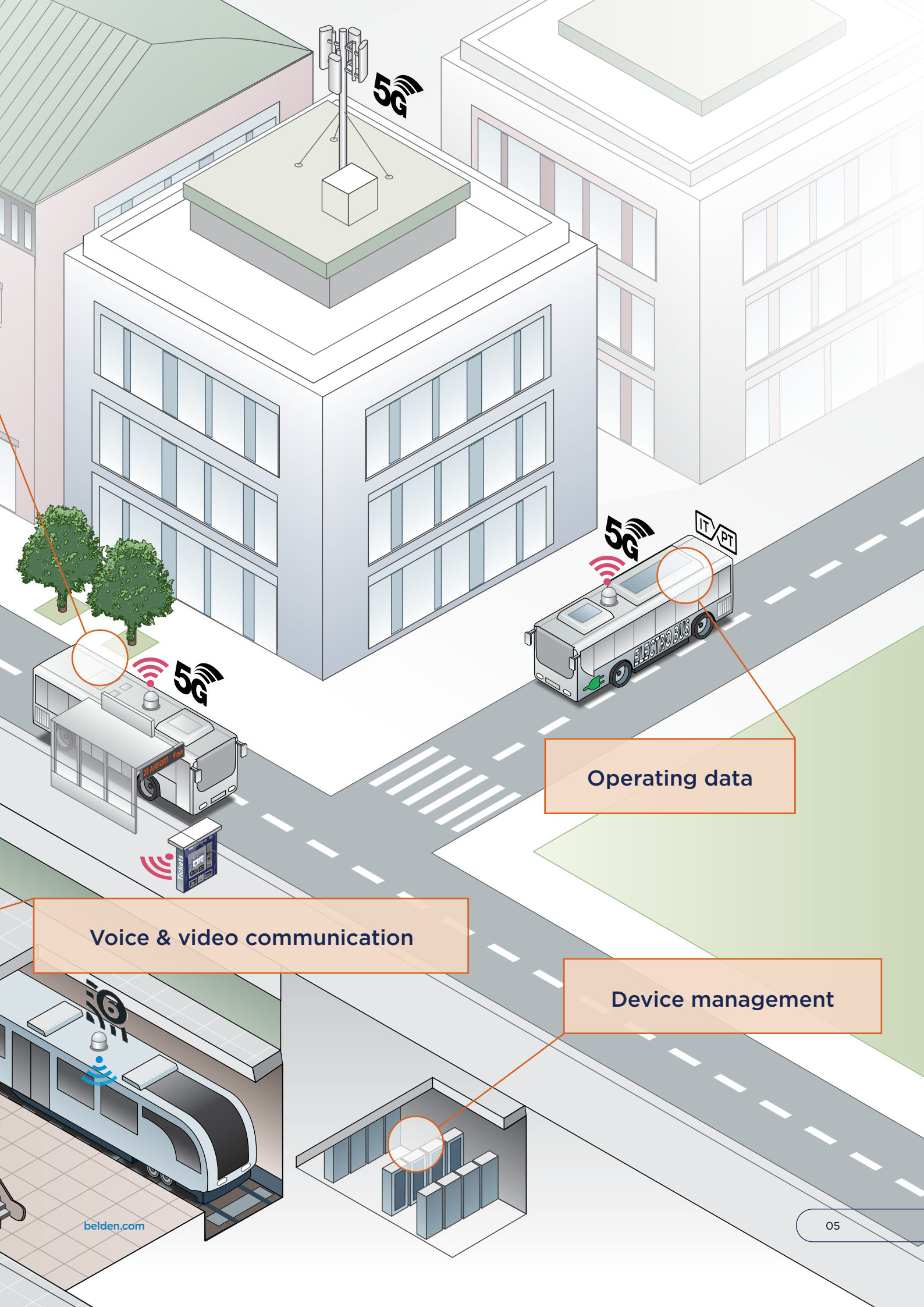
Headquartered in Bern, NetModule AG was founded in 1998. It has a branch office in Winterthur and subsidiaries in Frankfurt and Hong Kong. As of March 2022, NetModule AG has been part of Belden Inc.

THE RIGHT PRODUCT FOR EVERY FACET OF PUBLIC TRANSPORT

Infotainment & WiFi

Remote access

Secure connections

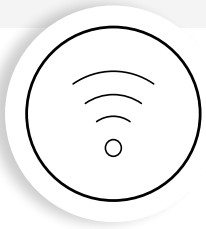


Voice & video communication

Operating data

Device management

YOUR CHALLENGES. OUR SOLUTIONS.



INFOTAINMENT & WIFI

How can public transport offer an enhanced passenger experience?

The challenges of climate protection and the different approach that generation Z has to mobility both heighten the importance of public transport. This means that public transport companies are more than ever facing the need to define themselves as attractive mobility service providers in order to motivate passengers for the revolutionization of transport.

And the fundamental requirement for this is a fast and stable Internet connection like the passengers enjoy at home or at work: They want to read the news, shop, answer emails, chat with friends or stream their favorite series – with lightning-fast download speeds and uninterrupted WiFi reception.

And digital infotainment systems with a mix of passenger information and entertainment have also become standard on public transport. Automatic vehicle location provides real-time information about routes, possible connecting services and disruptions; and precise real-time updates help to enhance acceptance for the use of public transport. At the same time, news and entertainment offerings shorten the perceived journey time. Integrated advertising helps to finance the investment and operating costs.

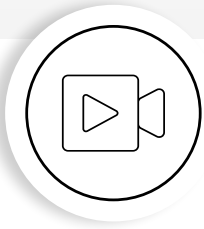
“Free WiFi services and infotainment offerings also significantly reduce the incidence of vandalism.”



AP3400 Access Point

- WiFi 6, cutting-edge wireless technology
- Intelligent configuration options and top-class security functions
- Developed and certified specifically for local and long-distance public transport
- Straightforward retrofitting in existing vehicles





VOICE & VIDEO COMMUNICATION

How can public transport ensure a safe travel experience?

A medical emergency, vandalism and harassment or a technical breakdown along the route: Digital communication systems allow information to be passed on rapidly between drivers, the control center and passengers and enable a swift response in critical situations.

Drivers communicate with the control center at the touch of a button and the control center informs passengers in the form of announcements in vehicles, at bus stops and in stations. If passengers request help using a push-to-talk emergency call station, the service staff will determine the exact location within seconds using GNSS tracking. Another key component of a security concept is video surveillance, which not only helps to solve crimes but has also been proven to prevent them.

The aim is to meet the passengers' need for safety by providing a high level of safety on public transport, to minimize the costs of willful damage to property and to reduce the deployment of security personnel.

“CCTV systems can also be used as intelligent sensors during normal operation, for instance for monitoring capacity on railway platforms or to serve as smoke alarms.”



NB3800 Railway Router

- State-of-the-art cellular technology, 5G-NR and multi-provider bundling: automatic selection
- Voice communication system, Voice over IP gateway
- Up to 1 TB internal router memory
- Compact, fanless, robust design optimally built for rail vehicles



REMOTE ACCESS & DEVICE MANAGEMENT

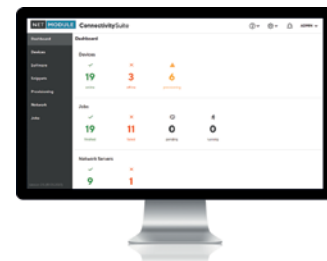
Can large fleets also be managed conveniently?

As the size of the vehicle fleet increases, so does the complexity of device management and the effort involved in scheduling regular maintenance cycles.

This means that digitalized transport companies need an intelligent device management platform to deliver cost efficient and secure administration and remote maintenance of their network of devices: It takes just a few clicks to view the entire fleet and access each individual device. A Web interface allows necessary security updates, firmware updates or configuration changes to be performed remotely during operation, either automatically or 'on demand', without service technicians on site.

Modern network infrastructures remain fully scalable, meaning that new vehicles, systems and devices can be integrated quickly and without expert knowledge.

“Using a device management platform as a central “data hub” enables, for instance, to use passenger counts in order to optimize vehicle deployment by incorporating the current utilization figures.”



Connectivity Suite

- Device management, over-the-air remote updates and configurations
- Remote maintenance at any time, at any location worldwide with just a few clicks
- Large-scale rollout made easy thanks to automated task processing
- On-premises or cloud installation



OPERATING DATA

How can efficiency be boosted in public transport?

Public transport is resource-intensive: Passengers expect an extensive network and a high-frequency service, and at the same time vehicle utilization levels must be high in order to reduce operating costs. Transport operators cannot afford unplanned, long downtimes.

Fleet digitization offers the possibility of monitoring the operational status in real time using condition monitoring systems, making use of temperature sensors and vibration monitors for example. The vehicle routers transmit status information from important components to the control center – securely encrypted and prioritized by relevance to the system. Maintenance teams can use intelligent data analysis to identify problems early and respond proactively, with spare parts being ordered in good time and service intervals planned according to needs (“predictive maintenance”).

This reduces the number of breakdowns and the risk of accidents, timetables are adhered to more reliably, customer satisfaction grows and operating costs are reduced.

“Vehicle telematics also provide valuable information on driving behavior and help to cut fuel consumption, minimize wear and tear and reduce the ecological footprint.”



NB2800 Vehicle Router

- Data capture and qualification in a single unit
- Simplified installation in the vehicle using the interoperable ITxPT architecture
- State-of-the-art cellular technology, 5G-NR
- Interface extensions allow the onboard systems of different types of vehicles such as buses, or municipal, emergency and even agricultural vehicles to be integrated



SECURE CONNECTIONS

Is sensitive data really transmitted securely?

Public transport must be simple and secure. This includes modern-day ticketing at user-friendly ticket machines with options for cashless payment. Whether on the bus, at the bus stop or at the station, straightforward ticketing relieves the burden on drivers and avoids queues, and the stress-free travel experience boosts customer satisfaction.

The challenge facing transport operators is that all ticket vending machines must be networked to the control center and must be enabled for cashless and contactless payments – including wireless options for on-board ticket purchases and in passenger areas without a wired connection.

Handling sensitive payment data also requires maximum security during transmission between the service terminal and the control center, with high connectivity, guaranteed coverage and state-of-the-art encryption technologies such as OpenVPN. This ensures adherence to the highest EU data protection standards and minimizes loss of revenue due to downtime and aborted purchases.

“Digitalized POS terminals make it possible to implement customer-friendly eTicketing services entirely without the need for passengers to work out complex fare zones.”



IloT router range

- Ideally suited for installation in fixed-location systems
- One software platform for all NetModule devices, simple expansion of applications across all hardware ranges
- Multi-talented: Connect services and systems, such as CCTV cameras, digital signage or public WLAN
- Strong, systematic security – manage the attached critical infrastructure with the integrated, industrystandard firewall



SUCCESS STORIES

Whether it be buses or trains, trams or suburban railways, top public transport companies throughout Europe are using NetModule solutions to digitalize and network their vehicle fleets.

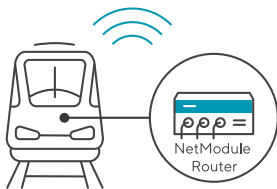
Passenger WLAN & infotainment

Unwired Networks Abellio Rail Mitteldeutschland

The rail transport company Abellio Rail Mitteldeutschland operates 54 trains on the Saxony-Anhalt diesel network (DISA). The commissioning body, NASA solution for on-board networks, including passenger WLAN, which could be rolled out to Abellio companies in uniform quality as a group standard.

We joined forces with our project partner Unwired Networks to develop a concept for Abellio that comprised hardware, passenger WLAN, real-time route information and an entertainment portal as well as network management.

A high-performance NetModule router and access points certified for use on the railways were used to deliver a futureproof platform.



“The quality and modularity of NetModule’s network components provides the ideal basis for demanding customer projects.”

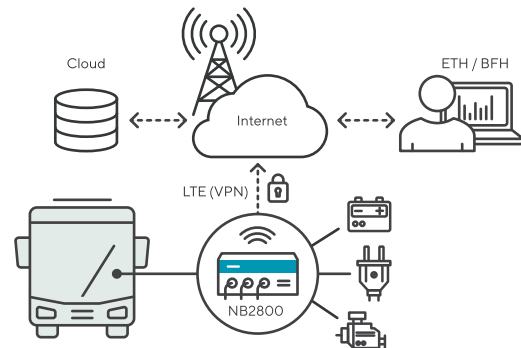
Alexander Szlezak, CEO Unwired Networks GmbH

Customer-specific router

HESS AG

The “SwissTrolley plus” research project is sponsored by the Swiss Federal Office of Energy and has been in service on the routes of the Zurich public transport company since the beginning of 2017. The innovative electric passenger transport vehicle with room for around 160 passengers has been developed and built by the Swiss vehicle manufacturer HESS AG. The particular challenge in this case was that the data from the different parts of the vehicle were to be read out separately and securely isolated from each other to be pre-processed directly on the router. NetModule therefore designed the router for the “SwissTrolley plus” to include special interface connections.

In this way, several gigabytes of data each day are transferred securely to the cloud with LTE and OpenVPN. The data can then be used by the participating universities for their research work on maximizing battery life.



Over-the-air device management

Hamburger Hochbahn

Hamburger Hochbahn AG (HHA) is one of the largest public transport companies in Germany and operates the Hamburg underground and most of the bus services within the Hamburg public transport network (HVV). When they were introducing around 300 self-service terminals to allow modern ticketing, Hamburger Hochbahn AG was looking for a way to connect the ticket vending machines to the Internet in order to be able to offer online services as well as cashless payment options such as debit and credit cards.

Simple management and maintenance of the routers over the air was a prerequisite: The 300 NetModule routers are monitored, controlled and maintained remotely using the Connectivity Suite.



“NetModule was the only vendor that could meet the challenges with its modular routers and device management software.”

Martin Austen, project manager Hamburger Hochbahn AG



About Belden

Belden Inc. delivers the infrastructure that makes the digital journey simpler, smarter and secure. We're moving beyond connectivity, from what we make to what we make possible through a performance-driven portfolio, forward-thinking expertise and purpose-built solutions. With a legacy of quality and reliability spanning 120-plus years, we have a strong foundation to continue building the future. We are headquartered in St. Louis and have manufacturing capabilities in North America, Europe, Asia, and Africa.

For more information, visit us at:
www.belden.com

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