



Whitepaper

# Comprehensive system for e-buses integrates all operational processes.

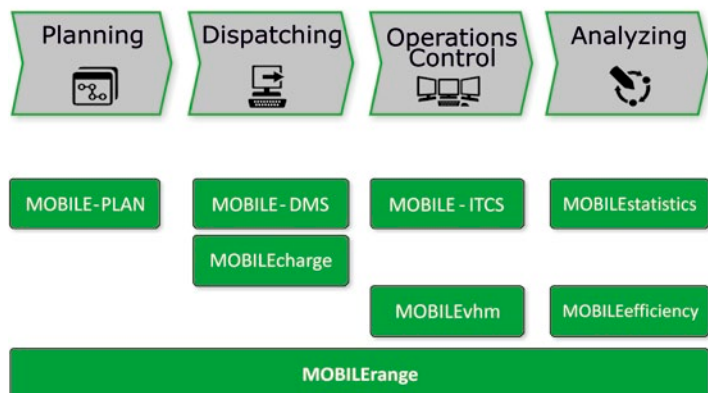
**INIT makes e-mobility easier.**

**init**

The Future of Mobility

*E-mobility in public transport is being strongly pushed at the political level. Consequently, e-mobility is being rolled out in many areas at quite a pace. Public transport companies will have to master this challenge, afflicted with numerous uncertainties attached. They must rethink and adapt a wide range of operational processes and their supporting IT systems.*

## Electromobility within the INIT product range



*INIT covers the specific requirements of e-mobility within their integrated ITS system MOBILE.*

In recent months, INIT has incorporated the specific requirements of e-mobility into core information systems and developed additional applications. The fact that INIT's hardware and software portfolio covers all operational processes of a public transport company has proven to be a particular advantage in the context of e-mobility. INIT's customers only need a few upgrades to set up an integrated system which accommodates all e-mobility-related tasks, resulting in a substantial improvement in efficiency. While many providers' solutions only cover individual aspects, INIT offers a complete end-to-end solution.

## Electromobility in planning and depot management

The introduction of e-buses further complicates the already complex task of trip, block and duty scheduling. New parameters are added to the equation: the number of e-buses in the fleet, their range, charging times, energy consumption, and the positioning of charging stations. All have a direct impact on vehicle requirements, productivity, and overall costs. This is reason enough to examine various scenarios in advance – which is made possible thanks to the MOBILE-PLAN planning system and the integrated MOBILEopti<sup>2</sup> block and duty optimization tool. Public transport operators can

simulate scenarios based on different parameters and use these results for making financially sound decisions. Based on the battery capacity and energy consumption per kilometer and minute, the range can be calculated for each bus type.

## Monitoring and operations control

It is necessary to monitor the current state of charge because the actual range of electric vehicles is significantly harder to predict than of vehicles with conventional combustion engines. The route profile, traffic jams, starts and stops, the need for air conditioning and above all, the driver's individual driving style have a direct impact on total energy consumption. With the significantly reduced overall range, there is increased risk of a vehicle coming to a standstill. A new function in the Intermodal Transport Control System MOBILE-ITCS allows the charge level to be monitored remotely from the control center. Dispatchers can get a quick overview of charge levels for individual vehicles from the vehicle list. The charge level is highlighted in green, yellow, and red depending on the current percentage. It is also possible to define threshold values. An alert can be triggered when the charge level falls below a certain threshold to ensure the dispatcher is aware and can respond accordingly. In a later development stage, the system will also check whether the vehicle can manage the additional distance on its current charge level in the event that a dispatching measure is carried out (e.g. deviation).

## Centralized charge management and depot management

A general distinction is made between charging in the depot and en route. However, both require a central charge management system that integrates vehicles, charging points, depot management, and the energy supply. Charging processes can be controlled using INIT's new charge management system, MOBILEcharge. This system provides predictions of future energy consumption, monitors

charging processes, and ensures appropriate charge management and balancing to avoid expensive peak loads.

Also MOBILE-DMS is ready for e-mobility: vehicles' current charge levels, available charging bays, and planned pull-outs are all taken into account as soon as a vehicle enters the depot.

### Vehicle status and quality of driving

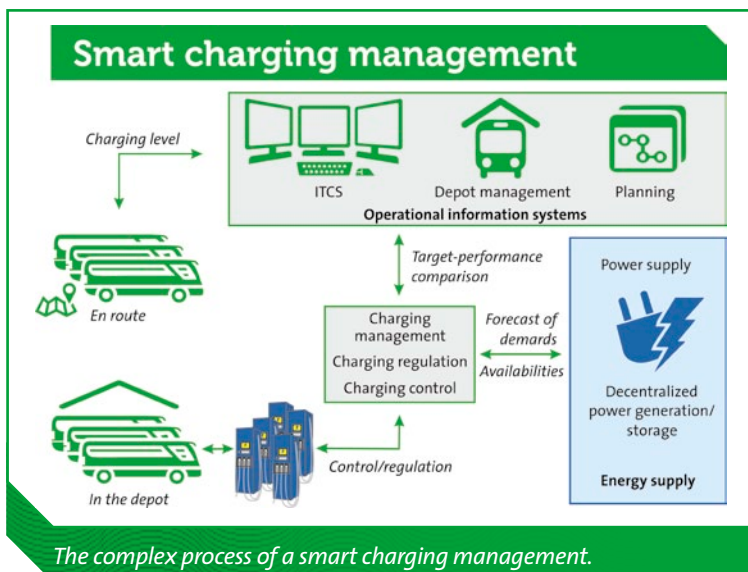
However, it is more than just the current charge level that needs to be considered when integrating electric vehicles into a fleet. Transport operators also need to look at the general condition of the vehicle, especially as there is no historical statistical data available on e-bus operations. The vehicle health management system, MOBILEvhm is part of the MOBILE-ECO<sup>2</sup> software suite. MOBILEvhm continuously monitors the vehicle's condition during active operation, generating status messages, and simplifying planning of vehicle repairs. The second function of MOBILE-ECO<sup>2</sup> is MOBILEefficiency, which helps to promote safe and energy-efficient driving. It tracks actual energy consumption and driving situations along with influencing factors such as the

vehicle used, the driver, topology, route, and even weather conditions. It automatically generates reports accordingly. MOBILEefficiency not only provides important analysis and statistical data on energy consumption – it also helps to promote an energy-efficient driving style.

### Range prediction

Range limitations and susceptibility to fluctuation are widely regarded as particular weak spots in e-mobility. That is why it is critical to monitor charge levels while vehicles are en route and also calculate their remaining range as accurately as possible. MOBILERange uses historical operational data from the MOBILEefficiency analysis system combined with state-of-the-art machine learning algorithms to generate a model for an individual vehicle's battery consumption for specific sections of a route. MOBILERange functions as a central service for other applications that require range information for planning, scheduling and operational management purposes. For example, it calculates the actual range of a vehicle based on the real-time state of charge for the Intermodal Transport Control System, MOBILE-ITCS. With MOBILERange the deployment of electric buses can be much better planned and controlled in operation.

With its perfectly adapted systems and new applications, INIT provides a comprehensive solution that carefully considers all aspects of e-mobility in public transport. This overall solution allows public transport companies to roll out e-mobility in a way that is safe, controlled, and predictable – and over all ensures an efficient and successful operation of their e-bus fleet.



*If you would like to know more about our comprehensive e-bus system, please contact Heiko Bauer: [heiko.bauer@carmedialab.com](mailto:heiko.bauer@carmedialab.com). We look forward to hearing from you.*

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- *Ticketing & Fare Management*
- *Operations Control & Real-Time Passenger Information*
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*and they also benefit from our proven Service & Maintenance support.*

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INIT is the worldwide leading supplier of integrated planning, dispatching, telematics and ticketing systems for buses and trains. For more than 35 years, INIT has been assisting transport companies in making public transport more attractive, faster and more efficient.

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