White paper: Networking AC charging stations with Powerline communication

Smart Powerline networking for AC charging infrastructure

The number of electric vehicles in Europe is rising steadily by the year. General interest in alternatives to the conventional combustion engines is also growing steadily. More and more charging facilities can be seen going up in company car parks, multi-storey car parks and at multi-family residential buildings.

Dynamic load management systems ensure that optimum control can be kept of the individual charging processes, taking into account the local power connection capacity. The data communication between AC charging stations and load management is quickly established and can be expanded at any time using Powerline communication. There is no need for LAN cables - which saves time and money.

Background:
AC charging infrastructure with multiple car parks requires that the charging stations are connected, not only for load management, but also for payment systems and firmware updates.

Challenge:
The communication network cabling required for this increases the cost and labour involved in planning and installation.

Solution:
With devolo MultiNode powerline technology the existing electrical wiring or power rail can be used to connect all charging stations easily and reliably. The MultiNode devices can be integrated into the charging station or can be installed in the junction box. 100+ network nodes are supported.

The design of a data network

In order for effective charging and load management to be possible in residential, semi-public and public spaces, it is essential for AC charging stations to be connected. Until now, cable ducts had to be installed, Ethernet cables had to be laid and network switches had to be configured. And for the switches there has to be separate power supplies on site. Externally, the communication infrastructure must be weatherproof, and protected against vandalism and unauthorised access.

Data communication over the electrical wiring

As an alternative to LAN cables, communication over the electrical wiring (Powerline communication, or PLC) should be considered.

- The aim is an efficient and cost-effective installation
- Networks need to be easily expandable in the future
- Wi-Fi cannot guarantee reliable coverage

devolo MultiNode

devolo MultiNode

With the MultiNode, the powerline specialists of devolo have developed a precision-fit solution for networking AC charging stations which vastly reduces the planning and implementation times for the communication infrastructure needed. The devolo MultiNode uses the power rail or power cables to transmit data. The central MultiNode device is networked by LAN cables either to a router or directly to the energy management system. The MultiNode devices distributed among the charging stations are also connected by LAN cables. Each MultiNode acts as a repeater in the network and thus increases the range.

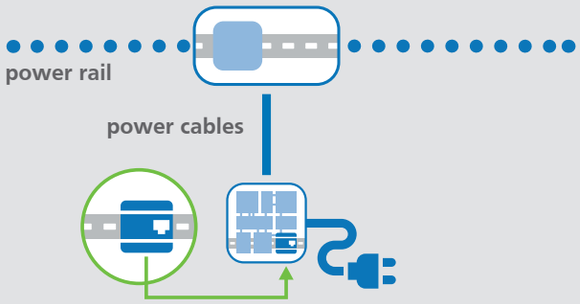


Fig. 1: The MultiNode device is installed in the charging station, where it is connected to the communication interface.

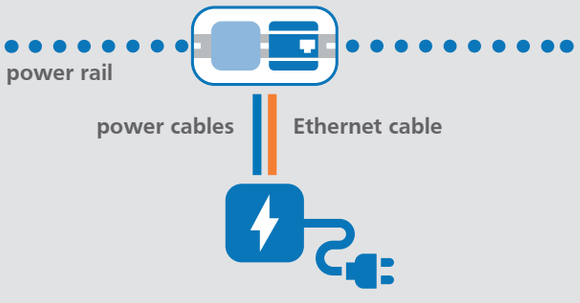
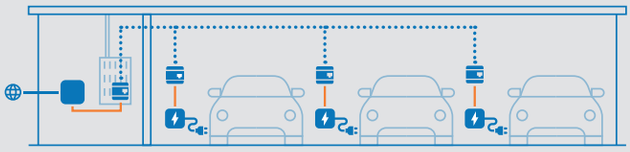


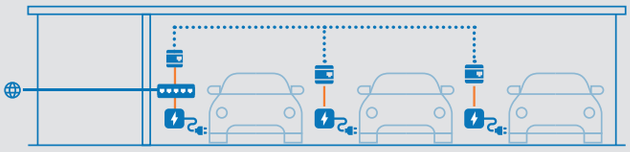
Fig. 2: A short Ethernet cable runs from the MultiNode in the fuse block to the wall box.

For every application scenario

Requirements for communication networks vary with different charging infrastructure projects. Large installations are equipped with dedicated energy management. All of the charging stations are connected through the power rail to the central Multi-Node device and the energy management system or to a router. Smaller installations often apply a master/slave configuration to the charging stations. The devolo MultiNode is well suited for both scenarios.



An energy management system coordinates the power for all charging stations.



Master/slave configuration. The master charging station takes over the energy management and controls the slave charging stations.

Future expansion – growth as needed

It is common for projects to start with a few charging stations, just enough to meet current demand. This keeps the initial investment down. But it is important, nonetheless, to make considerations and prepare for later expansion. If Powerline-based data communication has been chosen, later growth is quick and easy to achieve. The communication network can be expanded by installing more charging stations with integrated devolo MultiNode, or by installing additional fuse blocks, each containing a MultiNode. There is no need to lay new cables nor to install and connect additional Ethernet switches in a car park. Currently, Powerline networks support 100+ network nodes.

Setting up and managing the PLC network

The devolo Management Software is used to install, monitor and update the PLC network. Once all MultiNode devices have been installed, it takes only minutes to set up the network on site. The MultiNode devices connect automatically within a customised topology. The network configuration consists merely of setting the network access parameters. This protects the network, after which further network segments can be installed where necessary. The management software provides remote monitoring of the network topology and the states of the network connections. A standard interface allows for integration with an energy management system or with multi-system management systems.

Advantages of Powerline technology for charging infrastructures

Powerline technology is the ideal networking technology for charging stations.

1) Dual-use infrastructure
With the installation of the power rails and charging stations, the foundation for the data infrastructure is already in place.

2) Scalable
Future network expansion is possible without structural changes. Powerline networks currently support 100+ network nodes.

3) Suitable for all structural conditions
Powerline communication is especially well-suited for structures in the vicinity of the charging infrastructure. Solid walls and fire doors create a nearly insurmountable problem for wireless solutions. Powerline communication penetrates solid walls unhindered and travels easily from floor to floor.

4) Stable network
The Powerline network is self-organising and always automatically determines the topology best adapted to the physical conditions. In addition, unlike Wi-Fi networks, interference to the wireless date stream caused by vehicles or people is not possible.

5) Security
The communication devices are installed in the charging stations or fuse blocks and thus protected from unauthorised access. Additional protection is provided by standard AES-128 encryption. Attacks such as deauthentication (deauth) are also impossible on PLC networks. As such, PLC networks are very resilient

6) Range
Each MultiNode acts as a repeater in the network, maximising the range for large networks.

About devolo

In the professional sector, devolo is a reliable partner of international telecommunications providers, global industrial corporations, leading medium-sized companies and the fast-growing energy industry. Anywhere secure, high-performance data communication is needed, partners rely on devolo.

With over 50 million Powerline adapters sold, devolo belongs to the world's market leaders. More than 1000 international top-product test reviews and distinctions underscore our leadership in innovation. devolo was founded in 2002 in Aachen, Germany, and is represented in many countries in Europe.

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