White Paper

Enhance EV Charging Solutions with Network Control and Traffic Management

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Background

Around the world, many countries are investing in alternative renewable energies to meet their net-zero emissions targets by 2030. Sustainability considerations have brought electric vehicles (EVs) center stage. Public and private EV charging networks are being installed at rapid pace as adjacent component manufacturers and systems integrators embrace new development opportunities, and even traditional fossil fuel industries and automobile brands seek to transition into the EV market.

Challenges

Providing a seamless front-end and back-end EV charging network experience requires a robust communications network for reliable and secure connectivity. There are numerous technologies for connecting EV charge points, ranging from built-in cellular modems to dedicated industrial gateways serving multiple charge points, as well as industrial routers supporting multiple backhaul connections and industrial switches for connecting multiple charge points at a single location.

Amid the market's rapid growth, an up-and-coming EV charging solutions provider sought to maximize its operational capacities. To expand their solutions for connecting, managing, and monitoring EV charging networks, they needed a wide range of rugged network devices with flexible deployment options. They approached Advantech Australia to find a suitable platform to pair with their proprietary technology.

System Requirements

To ensure ease of operation, EV charging equipment should be simple to navigate with an intuitive user interface. The charging process should be easy to initiate and monitor, and any errors or issues should be easy to diagnose and resolve. For rapid onboarding of new charging stations, a simplified provisioning process is essential. This includes automated registration and configuration of new equipment as well as integration with existing networks. Field engineers should be able to deploy equipment quickly and easily without requiring detailed knowledge of the product.

Another important requirement is that EV charging solutions should be remotely manageable. This allows operators to monitor and control charging stations from a central location and troubleshoot and resolve issues promptly to minimize system downtime. However, the solution should also be equipped with robust security features to prevent unauthorized access or data losses. Additionally, because product certification can be time consuming, EV charging equipment should be certified to meet local regulations and comply with universal regulations for diverse vehicle types. Particularly for products that are built to be distributed internationally, pre-certification can drastically reduce lead time.

Finally, the system solution should be highly flexible and scalable to allow for future development as network complexity evolves. This includes support for new charging standards and protocols, as well as the ability to add new charging stations to the network.

Solution

Building on years of fruitful collaboration, Advantech was selected as a partner to develop EV charging equipment and network infrastructure. To address legacy connection issues and bridge power gaps, Advantech provided an all-in-one solution based on its UNO-1372G-J industrial DIN-rail IPC equipped with EKI-7706G-2FI and EKI-7720G-4FI industrial Gigabit Ethernet switches.

EKI-7706G-2FI is a compact managed switch with 2 x fiber ports that allows all connected client devices to be managed remotely and the traffic for each port to be controlled precisely. Meanwhile, EKI-7720G-4FI is a high-density L2 managed switch that can provide the network backbone with X-Ring Pro, connecting different subsystems such as CCTV and digital signage systems. X-Ring Pro offers ultra-high speed recovery times of <20 ms, effectively minimizing network downtime for EV charging stations. To withstand outdoor installation and operation in extreme environments, both switches support a wide operating temperature range of -40 ~ 75 °C/-40 ~ 167 °F. Similarly, the UNO-1372G-J industrial-grade IPC features an innovative heat dissipation mechanism that supports a wide operating temperature range of -20 ~ 60 °C/-4 ~ 140 °F.

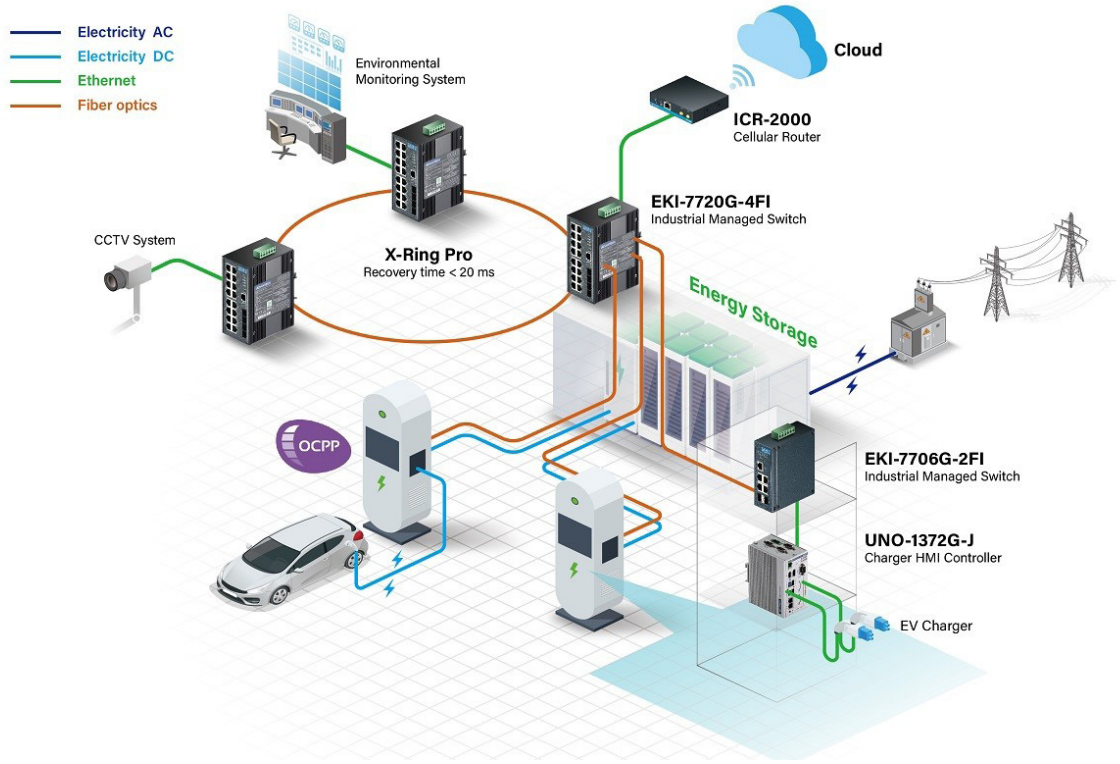
Compared to their previous hardware, which comprised four products in one system, Advantech's all-in-one EV charging platform provides a turnkey infrastructure solution. The UNO-1372G-J unit serves as the controller for interacting with the charger and software interface, while EKI-7706G-2FI switches provide one-to-one network connections and EKI-7720G-4FI switches overlook all the chargers with a one-to-ten connection. These managed switches enable better network control by allowing users to configure and monitor LAN settings, control LAN traffic, prioritize channels, and create virtual LANs. Managed switches also offer redundancy features that duplicate and recover data in the event of a device or network failure.

To ensure flexible configuration and expansion, UNO-1372G-J also features Advantech's iDoor technology for integrating diverse fieldbus, I/O, and peripheral modules. Because specific components can be replaced or upgraded without changing the entire system, EV charger providers are able to quickly expand charging networks and offer a wider range of intelligent vehicle-to-grid charging solutions. In fact, Advantech provides three platform form factors that can be flexibly configured to satisfy a wide range of needs. For example, the system can be easily expanded from two ports to four ports to serve as a hub PC with additional optional peripherals.

Project Implementation

- UNO-1372G-J021AE: Compact DIN-rail controller powered
- EKI-7720G-4FI: Managed Ethernet switch with 16 x GE and 4 x SFP ports
- EKI-7706G-2FI: Managed Ethernet switch with 4 x GE and 2 x SFP ports

System Diagram



Benefits

Advantech provided an all-in-one solution EV charging network and management solution that was pre-certified, eliminating the need for additional testing and regulatory approval. Moreover, the integrated all-in-one system provides a turnkey platform that field technicians can easily deploy and manage without IT support, while providing operators with full visibility and remote control of the deployed equipment.

- Pre-certified hardware solutions shorten lead times and time-to-market
- Total solution flexibility with a wide product range and customizable configuration
- Compliance with international equipment standards enables global distribution
- Easy access to all devices and nodes with the provision of managed GE switches
- Optimized network recovery time of <20 ms via X-Ring Pro
- Scalable equipment ensures long-term useability for future applications