



## ElectroKnox Makes Software-Defined Vehicles a Reality with the Xilinx Zynq® Platform

### Zynq UltraScale+™ MPSoC Delivers Processing Power and Versatility in ElectroKnox's SGW1000 Smart Gateway

#### AT A GLANCE:

ElectroKnox Corp. offers domain controller and smart central gateway solutions to bridge various communication protocols in modern connected vehicles. Its high-computing products allow OEMs to adapt to changing vehicle network topology to meet the future needs of software-defined vehicles, without requiring hardware (HW) changes.

**Industry:** Automotive

**Location:** Santa Clara, CA, USA

<http://www.electroknox.com>

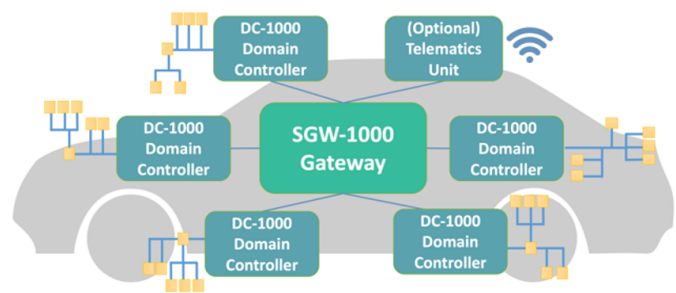


Figure 1. ElectroKnox's automotive gateway hardware is a versatile and powerful foundation for advanced vehicle applications, services, and security.

(Source: ElectroKnox Corp.)

#### SUMMARY:

ElectroKnox sought to build a versatile and powerful foundation for advanced vehicle applications, services, and security. The company's SGW1000 automotive smart gateway solution is a unified HW/software (SW) offering, powered by Xilinx's Zynq UltraScale+ MPSoC platform, that allows OEMs to quickly develop features in SW and deliver them to market faster, bringing the concept of "software-defined vehicles" closer to reality.

Using the programmable logic within the Zynq platform, the SGW1000 gateway introduces complex SW capabilities that were not previously possible on traditional ECUs, such as hosting AI-based intrusion-detection algorithms for security and providing Wi-Fi/LTE support. Zynq's high-performance ARM®-based multicore, multiprocessing systems also make it possible to deploy advanced vehicle features, such as whole-vehicle OTA updates and remote diagnostics—all of which provide OEMs an advantage as vehicle communications become more complex and demands for performance increase over time.

### CHALLENGE:

The automotive market currently has a growing demand for software-defined features and applications. This demand requires an advanced gateway that offers versatility, can move large amounts of data, and provides data acceleration and analytics to customers. There is also a huge gap between OEM- and software-defined vehicle needs that requires a more powerful and well-balanced, versatile solution with a solid middleware platform to plug into.

ElectroKnox developed a solution that meets these needs and not only fits the consumer vehicle space, but also other domains like electric vehicles (EV), construction or commercial vehicles, and robotic transport.

### SOLUTION:

The Xilinx Zynq platform is the critical foundation for ElectroKnox's modular gateway solution from both a HW and SW perspective. A key element of the SGW1000 is its adaptability in both HW and SW.

#### Hardware

Using Zynq's quad-core ARM Cortex®-A53 and dual-core ARM Cortex-R5, the SGW1000 contains enough networking and computing power to serve as either a central or zonal gateway or as a domain controller. The HW acceleration capabilities of the Zynq platform offer more than enough processing power for the integration of other ECU features. As a result, OEMs can save on the cost of ECU HW as well as physical packaging space inside the vehicle.

An additional benefit of the Zynq UltraScale+ MPSoC platform is that it offers customizable interfaces through a variety of I/O including CAN-FD, LIN, and Ethernet ports which provides design flexibility.

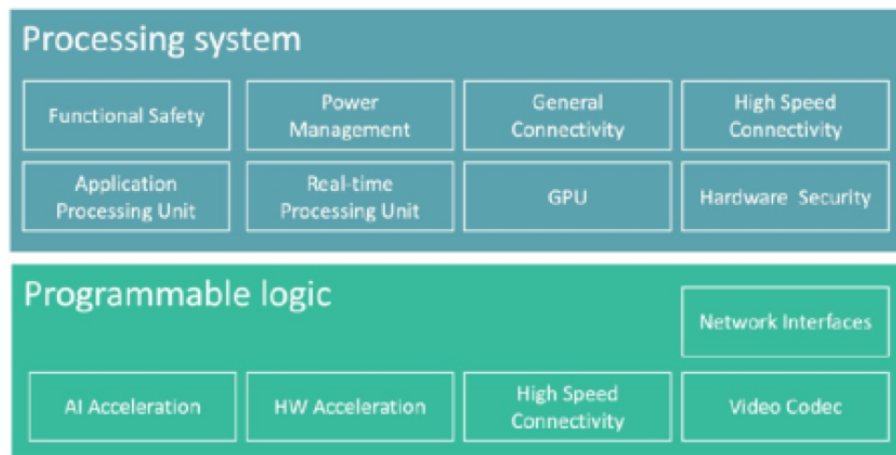


Figure 2. Diagram of ElectroKnox's vehicle computer. (Source: ElectroKnox Corp.)

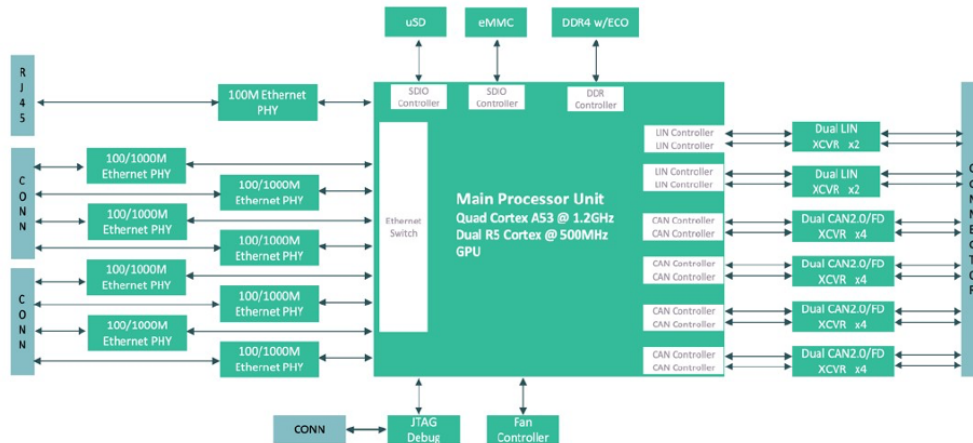


Figure 3. Hardware components block diagram of ElectroKnox's vehicle computer. (Source: ElectroKnox Corp.)

### Software

Using adaptable programmable logic of the Zynq platform, ElectroKnox has been able to add more complex SW which was not previously possible to run on microcontroller-based vehicle ECUs. The SGW1000 is designed to quickly adapt to any vehicle architecture. Its innovative SW development platform is HW-interface agnostic, which provides flexibility for any OEM with varying HW configurations. Its full stack software development kit (SDK) simplifies vehicle feature and application development and improves software reusability.

Vehicle-wide OTA updates are made possible when ElectroKnox's automotive gateway is serving as the central communications module at the heart of vehicle communications. It facilitates, prioritizes, and coordinates updates among multiple ECUs and vehicle domains. In addition, the Zynq device itself is software- and OTA- updatable. The ability for SW and HW modifications within the Zynq device display an unparalleled capability to update system performance even after the vehicle is deployed – which is critical for performing corrective action, adding new features, or updating mission-critical functions.

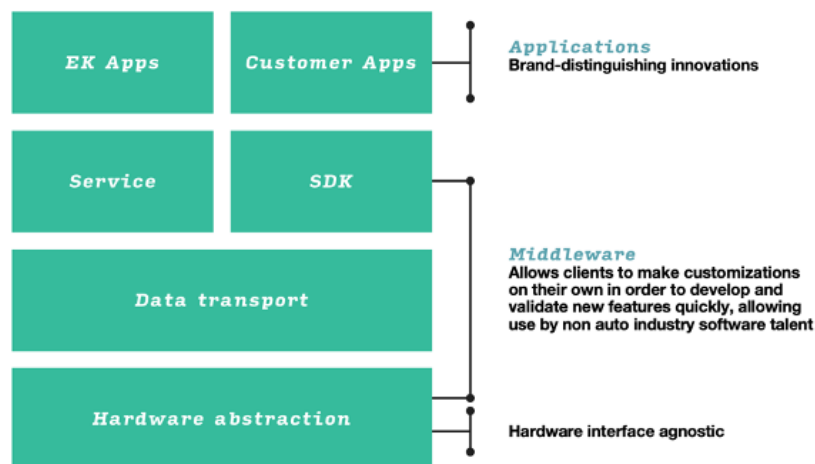


Figure 4. The ElectroKnox software platform features a hardware-agnostic interface and standard-based programmable middleware. (Source: ElectroKnox Corp.)

“We looked at different hardware platform offerings from a variety of angles, including computational power, acceleration, versatility, and upgradability, and ultimately decided to go with Xilinx,” said Brian Xiong, founder and CEO at ElectroKnox. “Using the Xilinx platform alongside our software, we can easily move AI data, sensor data, CAN and high-speed Ethernet data, and be ready for demanding features down the line. Support for new hardware features can easily be extended.”

“One of the things we like most about Xilinx is the flexible architecture which combines multiple processing engines with programmable hardware logic,” added Francis Pang, head of hardware at ElectroKnox. “The EV and auto markets are changing rapidly. With Xilinx, we can adapt more rapidly to meet those needs than had we built with an ASIC. There is still technology that we aren’t sure is going to be adopted down the road. With Xilinx we can continue on with product development without having to worry about redesigning everything.”

## RESULTS:

Since launching the SGW1000 automotive smart gateway, ElectroKnox is getting a great deal of positive feedback from customers. “The hardware that we are providing is versatile, and software-wise, we are delivering unique, open-standard features. The customers love it. It’s exactly what they’re looking for,” Xiong said. “We are giving them the opportunity to introduce more new technologies with fewer restrictions.”

Xiong said the company is looking to pilot projects with new entrants in market – like EV companies and autonomous driving companies that are eager to adapt to cutting-edge technology. Eventually, Xiong said the platform could be used as a data hub to drive control and communication for many service and applications providers.

## ADDITIONAL RESOURCES:

[Learn More about Xilinx’s Zynq UltraScale+ MPSoC](#)

[Learn More About Electroknex](#)

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