



MAKING NEXT-GEN AUTONOMOUS IN-VEHICLE APPLICATIONS POSSIBLE

POSSIBILITIES START HERE



kontron
S&T Group

AUTONOMOUS-ENABLING TECHNOLOGIES	// 4
OPEN SYSTEMS ARCHITECTURE PLAYS AN IMPORTANT ROLE	// 5
REAL-WORLD AUTONOMOUS APPLICATIONS	// 5
A FUTURE OF EFFICIENCY, PRODUCTIVITY AND SAFETY	// 6



Kontron's powerful on-board computers are helping meet the needs of next generation connected and autonomous vehicles. Kontron products ensure stable, non-stop operation in extreme conditions meeting the diverse IoT requirements of the Intelligent Transportation Systems (ITS) Industry.



// Autonomous Driving

While autonomous automobile, train and bus capabilities seem to get all the attention, there are plenty of on and offhighway vehicle applications that can leverage these same advancements. Already implemented are evolutionary forms of autonomous in-vehicle operation such as rugged vehicle gateways, smart agriculture systems, vehicle asset management, mobile fleet data loggers and vehicle servers that have been enabled by the latest communications and computing technologies. These applications increasingly connect and automate heavy vehicles on both public highways and busy worksites enabling companies to realize improved fuel and operator efficiencies while also reducing infrastructure needs and enhancing safety. By extending autonomous vehicle capabilities, companies and operators get the information they need for better decision-making that also contributes to longer vehicle lifespans and operational cost reductions.

A good example that has a long successful history is in the development of autonomous tractors. Perfected over the course of almost 40 years, and using GPS and wireless technologies, most tractors sold in the U.S. already include additional control features such as auto-steering. While fully autonomous tractors have not been approved for use so far, they will need many of the same advanced sensors and connectivity that any other true self-driving vehicle would.

Autonomous trucking (AT) is also gaining prominence. According a recent McKinsey & Company report, ATs are expected to change the cost structure and utilization of trucking, and ultimately, the cost of consumer goods. Sixty-five percent of the nation's consumable goods are trucked to market. Getting to a point where fully autonomous truck fleets are mainstream provides the potential to reduce operating costs by as much as 45 percent. In the McKinsey & Company report, analysts predict this could extrapolate into saving the U.S. for-hire trucking industry between \$85 billion and \$125 billion.

AUTONOMOUS-ENABLING TECHNOLOGIES

As any autonomous designer knows, developing these systems isn't as easy as simply plugging in a High Performance Embedded Computer (HPEC) platform. Applying AI and deep learning algorithms to a specific system can be particularly challenging. Next-generation autonomous in-vehicle systems will rely on fully-validated development tools.

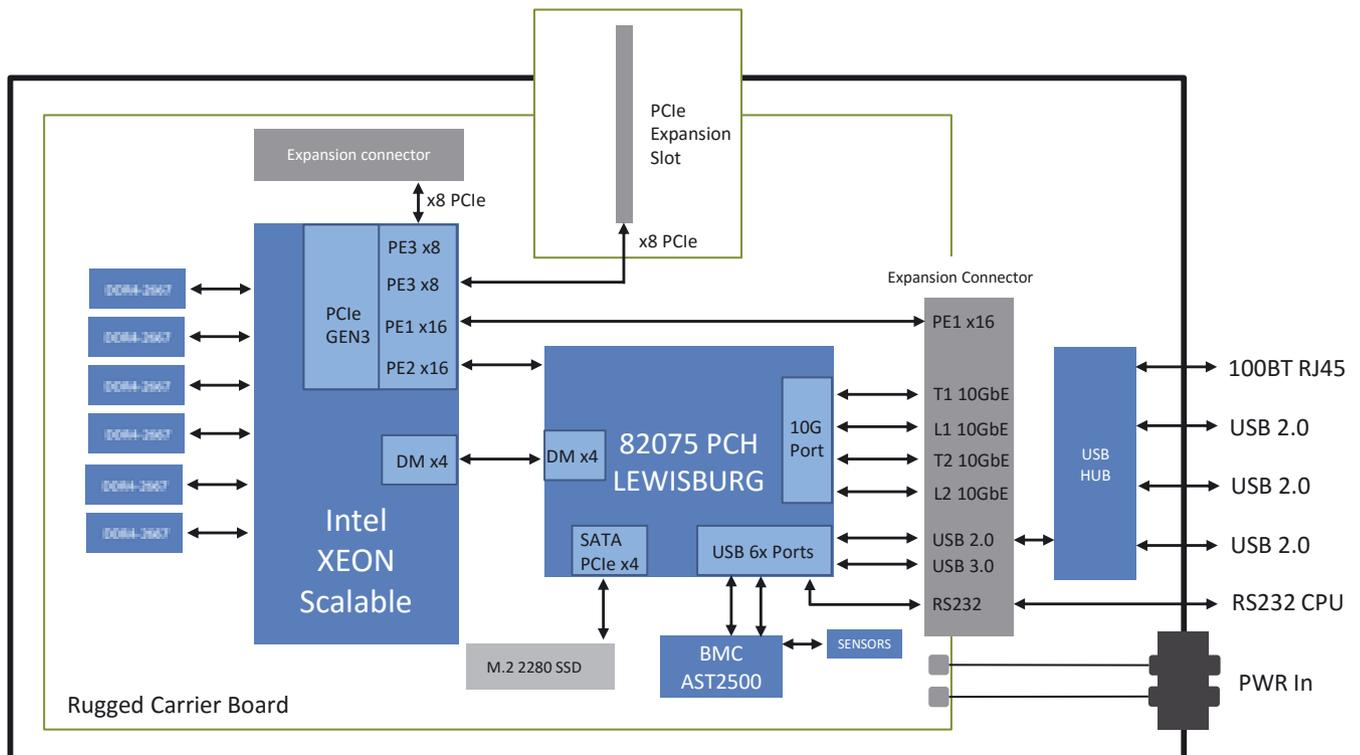


// S2000 Development Platform

Helping to fast-track autonomous in-vehicle applications is the Kontron S2000 Development Platform. With the S2000, developers can test and validate on the same hardware and interfaces that would be used in the actual production deployment of a high-performance autonomous in-vehicle system. Designers can also immediately experiment with actual-size PCIe GPU or accelerator cards in order to optimize the configuration

and system platform for production deployments. Key to autonomous system design development, the S2000 delivers the data center-grade performance from its integrated Intel® Xeon® scalable 8160T 24-core processor. It also features an expansion slot for full-sized GPU, FPGA accelerators and video PCIe cards and a modular, ruggedized carrier board.

It is possible to build modular HPEC systems optimized for deep learning applications with readily available platforms. For instance, Kontron's EvoTRAC S1901 is an open systems architecture platform offering the vast potential to meet the demanding HPEC requirements in cutting-edge sensor processing, artificial intelligence (AI), deep learning and other types of emerging autonomous-based vehicle systems. The EvoTRAC™ S1901 is a powerful computing platform that matches ongoing transportation ecosystem needs. Employing both the S2000 and EvoTRAC™ S1901 facilitates system designs with increased connectivity, remote monitoring capabilities and system interoperability that result in reducing operating costs while making all forms of mobility smarter in the process. To meet market and application goals, developers will find it advantageous to have fully-validated development tools and ruggedized, standards-based open architecture platforms that can deliver the latest in processing technology, in-vehicle power, secure connectivity solutions and certifications that reduce design time and resources.

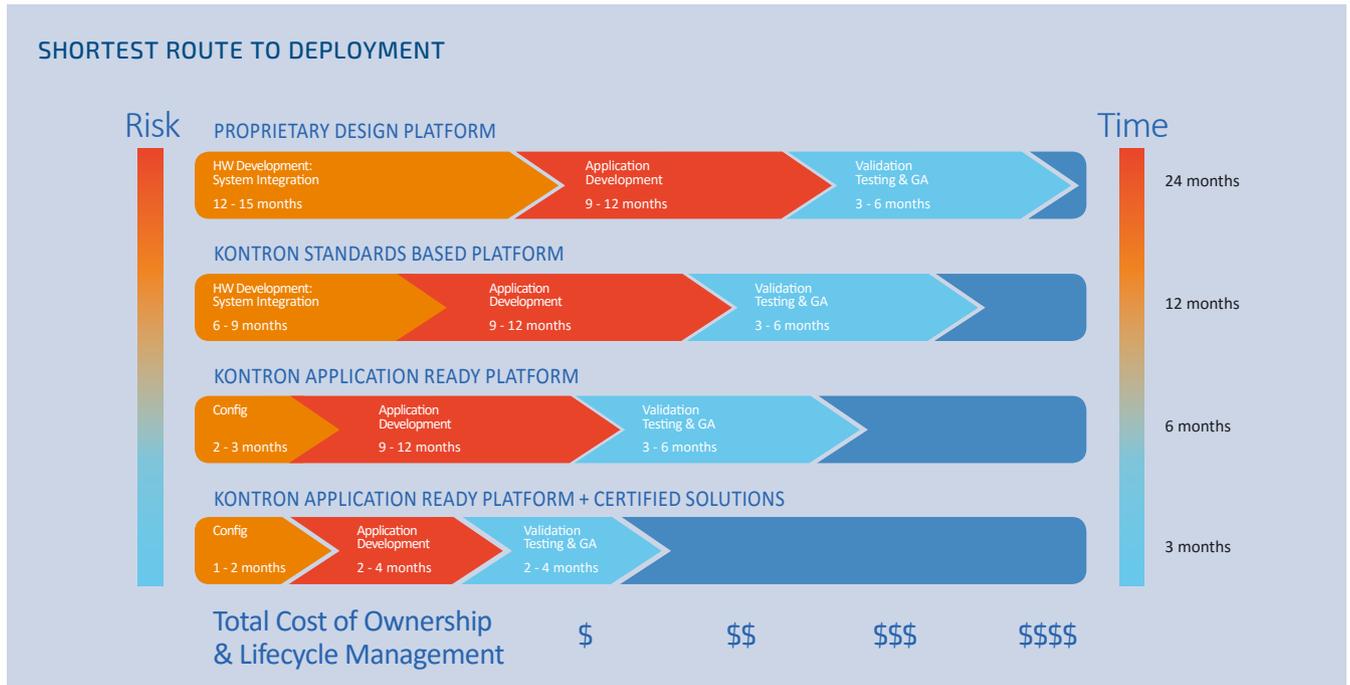


// Software Development Unit System Diagram

OPEN SYSTEMS ARCHITECTURE PLAYS AN IMPORTANT ROLE

Developers can streamline designs, enhance innovation and strengthen their competitive advantage by adopting an open systems architecture approach. Standards-based computing platforms enable more cost-effective system upgrades as well as minimize the need for program reconfigurations. Using modular open systems

architecture technologies allows developers to re-use components across multiple platforms and applications. It also allows commercial vehicle systems developers and operators to adapt quicker and be more responsive to integrating new technologies or satisfying updated user requirements. The bottom line is that open systems architecture solutions will "just work".



REAL-WORLD AUTONOMOUS APPLICATIONS



The EvoTRAC-S1901 System Platform features the latest in Intel high performance processor and is designed to meet the future needs of in-vehicle for AI, Deep Learning and HPEC by providing multiple GPU or Accelerator card options.

Farming

Smarter farming techniques that automate processes have started to have a far-reaching impact on improving yields, reducing waste and subsequently our quality of life. Allowing farmers to automate existing equipment helps maximize their capacity and efficiency. Using wireless connectivity technologies to connect

agricultural machinery, farmers can synchronize workflow using cloud services between fleet agricultural machinery. Computing platforms are also being used in mapping applications that help farming operations carry out field-specific fertilization applied reliably using GPS positioning. This also helps during harvest where autonomous tractors can be set to specific field locations, adjust speed or direction and even synchronize crop loading.



// Farm equipment

Mining

Technologies that optimize mining equipment fleets by monitoring productivity and gather machine information are helping to improve mine yields and contribute substantially to building highly efficient mining operations. In an autonomous mining operation, high-performance computing platforms provide the processing power to capture, monitor and use data from technology-equipped machines for greater insight into equipment operations. It also allows operations to be managed from a single, remote location translating into even larger productivity gains. Plus, this autonomous solution provides a safer environment to conduct remote operations that have led to improved equipment availability and operational consistency while reducing overall costs. Operators can also use the sophisticated on-board intelligence to find optimum drilling locations.



// Mining vehicle

Trucking

A variety of Advanced Driver Assistance Systems (ADAS) can and have had a positive influence in the commercial vehicle market. Safety in larger and heavier vehicles is enhanced with better visibility provided by a variety of V2X applications including Forward Collision Warning, Blind Spot Warning, Lane Change Warning or Driver Monitoring Systems. These sensor and camera-based systems require ruggedized, small form factor computing solutions that can be seamlessly integrated with EvoTRAC in-vehicle products.



The Kontron EvoTRAC™ G103 cellular/WiFi Gateway enables a new range of in-vehicle management, remote access and cloud applications. Delivering broad connectivity capabilities, the EvoTRAC G103 features WiFi, 4G Advanced Pro+ for faster wireless connectivity as well as dual GbE and CAN bus interfaces that support 2.0 A and B, along with two USB 2.0 interfaces. For the highest reliability in extreme on and off-road environmental conditions, it uses Kontron's hardened Type 6 COM Express® COMe E3845 CPU module with a powerful quad core Intel® Atom™ processor, and employs a ruggedized Carrier Board all packaged in a natural convection, sealed IP67 enclosure.

In an intelligent, connected trucking system application, the Kontron EvoTRAC G102 was recently integrated as a gateway. Used in combination with the developer's state-of-the-art software and hardware, it captures a truck's mechanical operational data so it can be used to help reduce fuel consumption. Using wireless technologies and computing performance that enables real-time data analysis, the smart trucking gateway provided valuable operational data such as driver stops, braking information and engine temperature and other diagnostics. Employing this application is helping to lower trucking fleet costs while optimizing an operator's total cost of ownership (TCO).

A FUTURE OF EFFICIENCY, PRODUCTIVITY AND SAFETY

Powerful, flexible open systems architecture HPEC platforms supply the right combination of performance, network bandwidth, high-speed interfaces and innovative features needed in paving the way for autonomous vehicle advancements. High performance embedded technologies are necessary to capably handle massive amounts of data processing that leads to improved access to critical information for faster decision-making and analysis. The HPEC and development platforms available today are the right technologies for the development of more intelligent systems that leverage the vast productivity and cost-cutting benefits that autonomous features can deliver. The autonomous revolution in off highway vehicles will help operators and various industries realize more efficient, reliable and safe transport.

About Kontron | Member of the S&T Group

Kontron is a global leader in IoT/embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

About the Intel® Internet of Things Solutions Alliance

From modular components to market-ready systems, Intel and the 400+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest IoT technologies, helping developers deliver first-in-market solutions.

Intel and Atom are registered trademarks of Intel Corporation in the U.S. and other countries.



GLOBAL HEADQUARTERS

KONTRON S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg, Germany
Tel.: +49 821 4086-0
Fax: +49 821 4086-111
info@kontron.com

www.kontron.com