QNX in Mobility

How SDVs are Changing Mobility Industries

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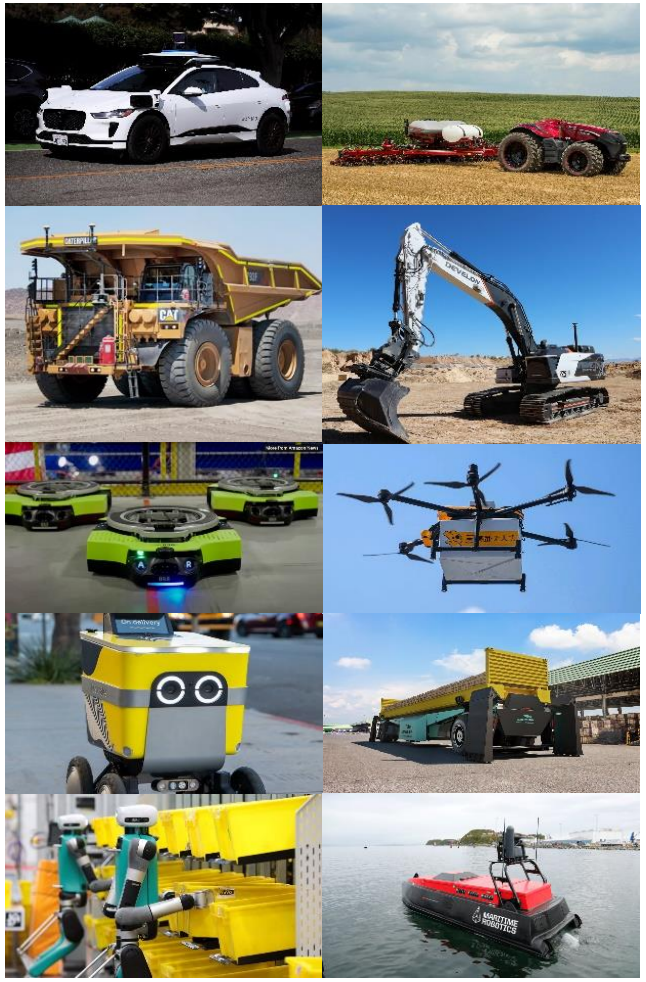


As the automotive industry shifts towards SDVs, this transformation is not only redefining how vehicles operate but also influencing a wide range of industries. SDVs rely on advanced software, real-time data processing, and high-performance compute (HPC) systems to enable autonomous driving, enhance connectivity, and ensure cybersecurity.

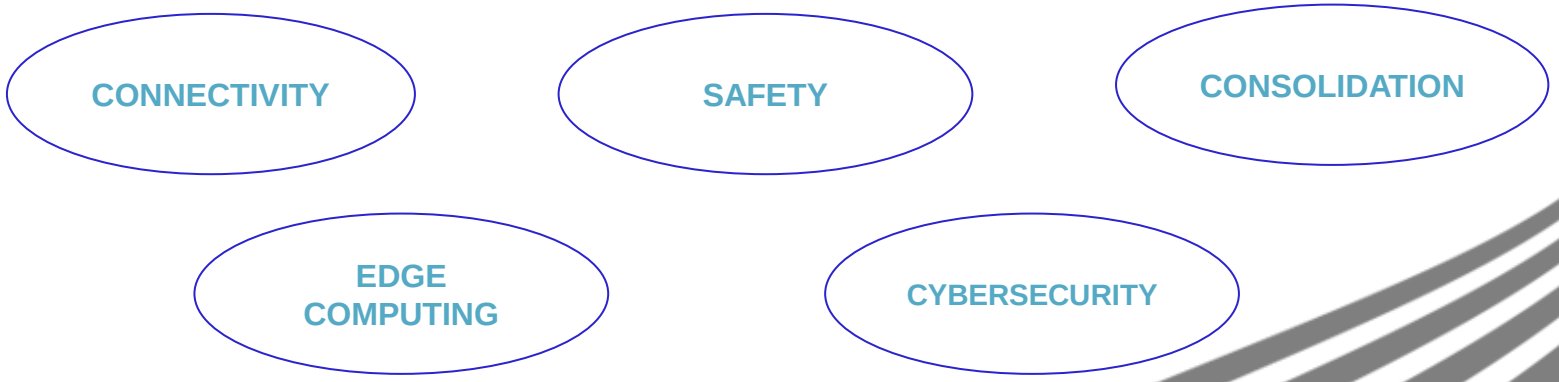
This same SDX (Software-Defined Everything) approach is increasingly being adopted in industries such as warehouse robotics, autonomous mining and farming, last-mile delivery, and autonomous drones. The core principles of SDVs is enabling these sectors and are evolving with smarter, more adaptable, and safer systems that rely on software to drive innovation.

Growth Verticals

Market Trends

Industry Automation

Industry Priorities



The Rise of Robotics and Need For Safety Controls

Industrial Automation and Robotics

Autonomous Mobile Robots / Automated Guided Vehicles

Collaborative Robots

Industrial Robots

Program Logic Controllers

Supervisory Control And Data Acquisition

Software Defined Mobile Robot Platforms

Many of the technologies seen in automotive ADAS are present in industrial, commercial, and even household mobile robots. Although the operating environments are different, there are many similarities in the design architecture. Here are a few examples:

Centralized High-Performance Compute (HPC)

Software-Defined Control Systems

Edge AI Integration

Software Defined Farming and Mining Operations

The challenges of navigating and performing tasks in unstructured environments vary across the diverse and changing terrain and obstacles. Despite these challenges, they leverage many of the same advanced technologies used in automotive ADAS. The integration of these technologies allows for high levels of autonomy and efficiency, making it possible to achieve precision and productivity in environments that lack the predictability of roadways. Here are a few prominent features in these industries:

High-Throughput Data Processing

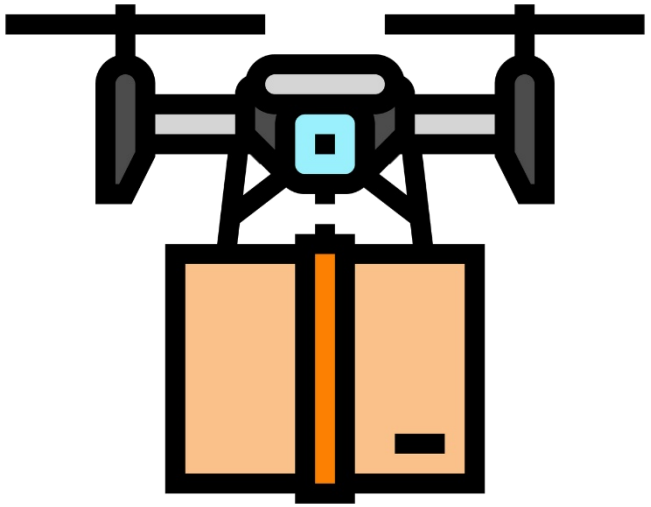
V2X (Vehicle-to-Everything) Communication

Software-Defined Autonomy

Software Defined Drones

Aerial, surface, or underwater drones operate in highly dynamic and unpredictable environments. They rely on advanced technologies like real-time sensor fusion, AI decision making, and autonomous navigation – many of which are derived from auto ADAS innovations. With a software-defined approach, drones can perform complex missions such as surveillance, search and rescue, and environmental monitoring with precision, even in GPS-denied environments. Here are some features deployed in these systems:

Software-Defined Navigation



Edge Computing for Mission Critical Tasks

Sensor Fusion for Precision

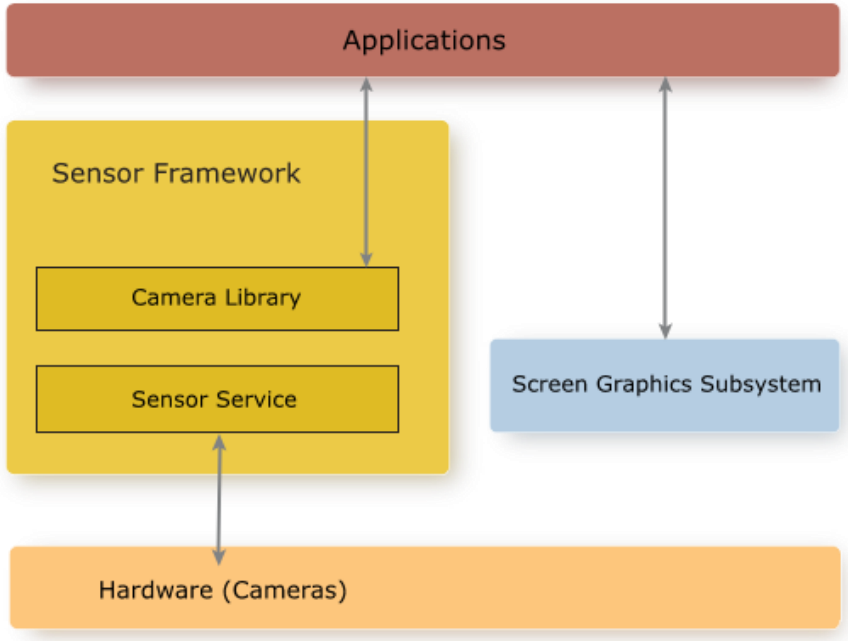
Software Defined Mobile Platforms

Similar to how QNX is deployed in the automotive industry, the industry overall is leveraging the same foundational technologies to ensure the security, reliability and safety of their systems. The OS features required in each of the three use cases addresses the following:

- Upcoming updates and discussions to robotic standards are moving towards the need for certification to IEC 61508 or ISO 26262. Pre-certified RTOS helps reduce certification efforts and challenges.
- As mobile robots are becoming more interconnected, security is becoming more of a top priority and compliance to IEC 62443 is starting become the standard in robotics.
- As ADAS systems are to auto and motion control is to robots, functions like presence detection, velocity limiting, and braking systems must respond to external inputs (e.g. cameras, sensors, radar, LiDAR, etc), within a strictly defined time frame. This requires the system to consistently meet strict deadlines reliably, preventing dangerous delays that could result in collisions.
  - Responsiveness of these systems is highly dependent on maintaining low latency and minimizing jitter. As mobile robots expand into new operating environments alongside humans, any delay or fluctuation in timing can degrade system performance causing injury.
- Whether in auto or robotics, fault-tolerance is needed to ensure continued operation in the event of a failure. With fault isolation, if one component crashes, it does not bring down the entire system, allowing for rapid fault recovery and safe system reconfiguration.

Sensor Convergence: RTOS, Middleware, to Application

The QNX Sensor Framework acts as a bridge, offering a common platform that can handle sensor integration, data management, and safety-critical operation. Leveraging this shared technology foundation, innovations in automotive systems can be adapted to improve the functionality, safety, and reliability of other devices – including medical devices.



Sensor Integration and Data Processing

High-Quality Imaging and Data Visualization

Real-Time Data Management and Playback

BlackBerry QNX Offerings

Customer Product Lifecycle

DESIGN → DEVELOP → DEPLOY →

IDEA	NEEDS ASSESSMENT	FOUNDATIONAL SYSTEM	HARDWARE SOLUTION	SOFTWARE APPLICATION	DEVICE	MONITOR / UPDATE

Product Platform

Reliability, Security, Performance	**Do you need fast and secure boot?** **Do you need multiple operating systems?**	BlackBerry QNX Neutrino Real Time Operating System (RTOS) BlackBerry QNX Hypervisor
Safety	**Are you building safety critical devices?** **Are you virtualizing mixed-criticality systems?**	BlackBerry QNX OS for Safety BlackBerry QNX Hypervisor for Safety

Development Environment

Scalability	**Are your developers dispersed across different locations?** **Need an intuitive and familiar development environment?**	QNX Accelerate (Cloud-Enabled Neutrino RTOS, OS for Safety and Hypervisor for Safety) QNX Software Development Platform

Thank you