Redefining In-Vehicle Experiences

As drivers expect more and more connectivity in the car, automakers and suppliers must differentiate their offerings by creating immersive digital experiences that stand out in a crowded market. The latest Intel® Atom™ automotive processors for in-vehicle experiences make designing and incorporating digital and connected features simpler, more powerful, and more cost effective, enabling automakers to maximize profit margins while delivering on market demands.

These processors can power in-vehicle infotainment (IVI), digital instrument clusters, and advanced driver assistance systems (ADAS). With substantial compute in a low-power package, impressive graphics capabilities, and security features—all based on scalable Intel® architecture—these processors allow automakers and suppliers to get cross-fleet solutions to market faster, with lower costs.

Digital Features in Demand

The demand for IVI, navigation, rear-seat entertainment, and other connected car features is surging, though each new feature adds cost and complexity to the design and manufacturing process. As immersive connected features become a mandatory investment for a wider range of vehicle models, it’s critical for automakers and suppliers to manage costs for current and future implementations.

Enabling the Software-Defined Vehicle

Intel is converging its expertise in devices, connectivity, and the cloud to build a new class of smart and connected solutions for transportation. The new Intel Atom automotive processors deliver a flexible architecture for a wide range of connected vehicle features. With a cost-effective, scalable platform for the software-defined vehicle, automakers and suppliers can increase profit margins for vehicles today, as well as for future models.

More compute in a compact, low-power package

The latest Intel Atom system-on-a-chip (SoC) offers visually stunning graphics and Intel® Time Coordinated Computing Technology (Intel® TCC Technology), which makes more demanding and real-time applications possible. Enhanced hardware-level security protects data and vehicle operations.

One flexible, scalable architecture

Utilizing Intel® processors allows for the consolidation of IVI, digital instrument clusters, and ADAS features to one platform, which can then be scaled across a range of SKUs. Flexible architecture and sophisticated virtualization deliver the performance headroom to combine and scale these systems.

The next generation of Intel® Atom™ automotive processors power in-vehicle experiences and speed the deployment of smart and connected features for the next generation of automobiles.
**Lower development costs and complexity**  
Automakers and suppliers can dramatically reduce time to market, complexity, and development by leveraging Intel’s offering of automotive-qualified core components.

In addition, Intel’s industry-leading software tools, operating system (OS) support, and development platform help solutions get to market faster.

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**A REVOLUTION IN DRIVING**

Today’s drivers expect more from their in-vehicle experiences. The new Intel Atom automotive processors power a wide range of new, exciting experiences, such as next-generation navigation systems, heads-up displays, and ADAS technologies like surround-view parking assist.

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**Digital instrument clusters and heads-up displays**  
By digitizing behind-the-wheel instrument clusters, automakers can provide a more engaging and flexible experience that adapts to driving situations. In some cases, instrument clusters can even project images on the windshield, with alerts for low fuel, low tire pressure, and other notifications.

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**Advanced driver assistance systems (ADAS)**  
For semiautonomous vehicles, detecting and reacting to dangers on the road requires highly coordinated efforts between an array of sensors and imaging devices. The Intel Atom automotive module used for IVI or digital instrument clusters can also be used for ADAS by connecting to other cameras and sensors on the vehicle. The module can support backup and surround-view parking assist, adaptive cruise control, lane departure warning, collision warning, and other systems.

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**Infotainment and navigation**  
More consumers are comparing vehicle models based on features like built-in navigation and entertainment, touch and voice control, connectivity to mobile devices, and upgradability throughout the life of the vehicle. With high-performance compute, visually stunning graphics, and support for ultrahigh-definition 4K video on three independent displays, the new processors enable an exciting variety of IVI systems.

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**Rear-seat entertainment systems**  
Happy passengers make for safer drivers. The latest Intel Atom automotive processors can support entertainment solutions such as video displays mounted in the ceiling or the headrests. Entertainment systems can be linked with mobile devices or the front IVI system so passengers can see navigation or access controls from the back seat.

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**Scalable Platform with Hardware-Level Security**  
The new Intel Atom automotive processors enable automakers and suppliers to build in-vehicle experience (IVE) solutions with Intel’s enhanced security features and a scalable architecture with interchangeable platforms that they can use for many model years to come.
Intel Atom SoC
A key offering of this new generation of Intel processor, the latest Intel Atom SoC achieves new levels of image and video processing power in a compact form factor, supporting critical real-time video analytics in smart and connected vehicles. It integrates numerous specialized processors, including an energy-efficient quad-core CPU, a powerful GPU, and dedicated audio, video, and image processors. It also delivers the ability to handle more sensors and tasks.

Built into a compact flip chip ball grid array (FCBGA) and featuring Intel® 14 nm silicon technology, the Intel Atom SoC offers a new graphics engine that doubles the image processing vectors, greatly expanding its video capabilities. It includes the game-changing time coordinated computing (TCC), which coordinates and synchronizes peripherals and networks of connected devices, achieving improved determinism and resolving latency issues.

Scalable, heterogeneous architecture
Developers can save time and resources by optimizing apps once, including graphics and video, and then deploying across SKUs, from mid-range to premium vehicle models. Heterogeneous architecture means workloads can run in the vehicle or in the cloud and on a range of platforms, from Intel Atom to Intel® Xeon® processor-based systems and servers.

Sophisticated virtualization
Intel® Virtualization Technology for Directed I/O (Intel® VT for Directed I/O) provides hardware support for isolating and restricting device access and I/O device assignment. This ensures key safety functions get priority in terms of access to the processor, driving the consolidation of IVI and instrument clusters.

Integrated, validated components
These new processors are also available as an automotive compute module featuring integrated power management and memory. Automotive-qualified modules meet the Automotive Electronics Council AEC-Q100 standard for stress test qualification for integrated circuits, with SKUs that offer a -40°C to 110°C temperature rating and a seven-year lifetime for industrial applications. The module is prevalidated with Intel's automotive software tools and multiple OSs, so suppliers can build simpler printed circuit board (PCB) solutions.

Powerful processing and graphics
The new Intel Atom automotive processors deliver excellent memory speeds and bandwidth (up to LPDDR4 2400 and 38.4 GB/s) in a compact, low-power package. They offer fast graphics and HD video for media-centric applications, with support for 4K video at 60 Hz.

Developer Tools for Intel® Atom™ Automotive Processors for In-Vehicle Experiences
To speed and simplify development, Intel and its partners provide a comprehensive set of developer tools and third-party OS support, including:

- The Intel® C++ Compiler, Intel® VTune™ Amplifier for Systems, and Intel® Graphics Performance Analyzer
- Reference stacks, including an IVI middleware and automotive boot loader
- Reference OS support for Linux®, Android® Auto, Green Hill, QNX, and Wind River Helix® Cockpit
- Hypervisors for multi-OS systems from QNX, Green Hill, and Mentor Graphics
- Performance-tuning tools for the Intel®-based CPU and GPU and complete hardware development vehicles

Enhanced hardware-level security
With advanced protection at the hardware level, these processors can help reduce vulnerabilities. They feature an integrated converged security engine, a dedicated security coprocessor that dynamically adapts the security level to function criticality. They also offer secure boot and fast cryptographic execution with Intel® AES New Instructions (Intel® AES-NI).

Powering the Car of the Future
Smart and connected driving will change lives and societies for the better. By combining Intel’s expertise in technology with ingenuity in the automotive industry, a new vision for transportation is coming to light. With smart, secure technology from door lock to data center, Intel is building solutions that not only help transportation providers meet today’s demands, but also prepare for the amazing future of transportation and autonomy.

Learn More
To learn more about Intel® IoT technologies for automotive, visit intel.com/automotive.