White Paper

Connected Car Brings Intelligence to Transportation

As urban population grows at an exponential rate, traffic jams are becoming more hideous and driving more and more tedious. Creating a better driving experience can change people's perception of driving and make it more sustainable. Delivering this experience though places new demands on head units, requiring them to make driving safer and more enjoyable, as well as capable of supporting connection to intelligent transportation systems (ITS) (Figure 1).

In this article, we show how these challenges can be met with the NEXCOM IVT 1100 all-in-one in-vehicle computer based on Intel® Atom™ processor E3825. We explain how the IVT 1100 supports smart mobility under the framework of ITS; we demonstrate how the IVT 1100 enables the transformation of a connected car and brings out the value of big data analytics; and we elaborate on how the IVT 1100 enables new in-vehicle features and services.

We additionally consider how Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) and other technologies secure in-vehicle environments. The article also covers Intel® IoT Gateway and how it accelerates time to market for the NEXCOM IVT 1100.

Figure 1. Creating a better driving experience places new demands on head units.

Drive towards Intelligence

With more than half of the global population living in cities, roads and highways are more and more clogged with traffic. To optimize traffic flows, ITS solutions are being developed or tested to help implement dynamic traffic management with measures such as dynamic tolling, variable speed limits, traffic condition alerts, and highway platooning.
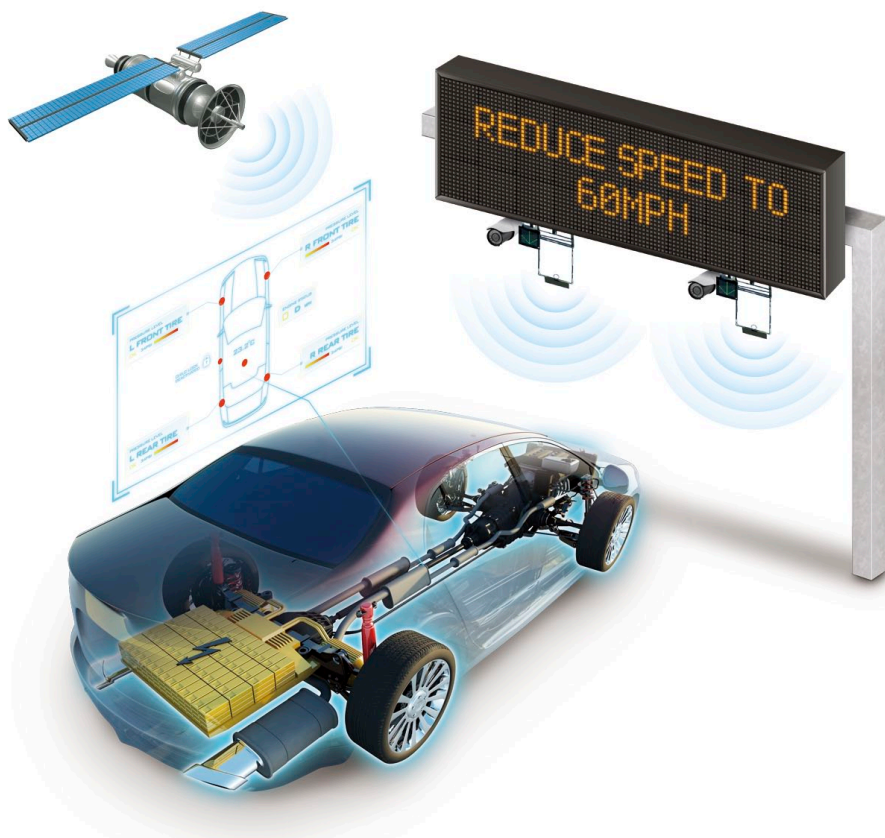
To get to destinations efficiently, head units need access to real-time traffic information so they can provide drivers with alternative routes to reduce travel time, toll fees, and fuel costs. However, some head units on the market lack either intelligence or connectivity; others are not reliable.

The NEXCOM IVT 1100 in-vehicle computer meets these needs by providing computing and communication backbones for data processing and data exchange while enabling information visualization with its 7-inch touch display (Figure 2). Based on the Intel Atom processor E3825, the IVT 1100 is equipped with dual-core computing power, Gen 7 Intel® HD graphics, and outstanding integration of I/O interfaces with support for graphics, image, and digital signal processing. The IVT 1100 also supports connections to in-vehicle sensors, cameras, cellular networks, and internet.

These supports are important as they enable the IVT 1100 to provide functions that matter to vehicle operations. For instance, the IVT 1100 can offer different route options based on current traffic conditions, allowing drivers to choose based on their preferences. On the road the IVT 1100 keeps a close contact with infrastructures, alerts drivers to changing lane restrictions and traffic lights, and can suggest detours to avoid possible delays.

The IVT 1100 interacts with in-vehicle sensors and other vehicles as well. On the highway, the IVT 1100 enables a vehicle to form a convoy with other vehicles by keeping a certain distance from them and moving at a similar speed to remove the burden of driving from drivers. When approaching the destination, the IVT 1100 can seek and reserve a sensor-enabled parking space and assist with parking.
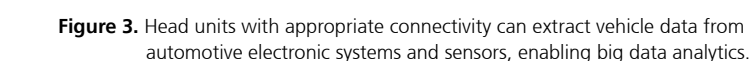

Figure 2. The NEXCOM IVT 1100 all-in-one in-vehicle computer provides computing and communication backbones for smart mobility under the framework of ITS.

In addition, the IVT 1100 can help save lives in case of an accident. By making automated calls to emergency services and giving the vehicle's GPS location, the IVT 1100 can reduce emergency services' response time and casualties in road accidents. According to the Harmonised eCall European Pilot (HeERO) consortium, "if all cars were equipped with the eCall system, up to €20 billion could be saved annually."

Connect the Car

Vehicles are composed of a variety of automotive electronic systems and sensors that can be information gold mines. Head units with appropriate connectivity can extract vehicle data from these automotive electronic systems and share the data with cloud servers where big data analytics can be performed (Figure 3).

Figure 3. Head units with appropriate connectivity can extract vehicle data from automotive electronic systems and sensors, enabling big data analytics.

To enable data mining for information, the IVT 1100 supports controller area network (CAN) and on-board diagnostics-II (OBD-II) protocols which are widely used in in-vehicle communication standards. Additionally, the IVT 1100 provides Wi-Fi and Bluetooth networks through the Intel® Dual Band Wireless-N 7260 adapter, as well as 3G/4G connectivity.

A connected car provides many of the benefits the Internet of Things (IoT) can offer. From a driver's perspective, head units open up opportunities for remote diagnostics and preventive maintenance, giving drivers more control over their vehicles. This means that drivers can check vehicle status online via mobile devices before driving. If a part shows signs of aging or other degradation, head units will search for a nearby car shop with the item in stock. Paying mechanics a visit only when necessary reduces not only the chance of roadside breakdown, but also the number of unnecessary trips.

Driving can become even more personal with head units that know their drivers and can automatically apply different settings such as dashboard preferences and adaptive cruising systems.

Head units also make possible usage-based insurance, also known as black box insurance. By recording data events, head units help insurers create driver profiles based on an individual's driving behavior to devise tailored-made insurance packages and set fine-grained pricing policies.

Come Down to One Unit

Heads units evolve rapidly as new features are added and premium features become standard. The Intel Atom processor E3825 at the heart of the IVT 1100 provides the performance and upgrade path needed for head units. The Intel® Atom™ processor E3800 product family delivers several advancements in visual processing capabilities with its Gen 7 Intel HD graphics, enabling faster media conversions, enhanced HD video transcoding, and highly efficient image processing. Graphics performance is enhanced through dedicated execution units and fixed-function and hardware decode engines.

The powerful processor graphics enable the IVT 1100 to consolidate functions ranging from navigation to vehicle recording as well as car audio/video that normally run on separated hardware units (Figure 4). Furthermore, the Intel Atom processor E3800 product family includes single-, dual-, and quad-core configurations, enabling a range of performance and allowance for spare system headroom for mobile device integration, cloud-based and location-based services, and future feature expansion.

Figure 4. The powerful processor graphics enable the IVT 1100 to consolidate functions.

Ward off Threats

Vehicles are becoming an expansion of our connected digital lives. With automotive electronic systems, vehicle data, and personal information at stake, it is crucial to guard head units against security threats.

The Intel Atom processor E3800 product family includes hardware-assisted encryption capabilities like Intel AES-NI and malware protection like Secure Boot that are not available with the previous generation processor. Intel AES-NI speeds up the data encryption and decryption used to protect vehicle data and personnel information from loss or tampering. Secure Boot allows only chosen software to run on the IVT 1100, not allowing malware to launch and take control. The processors also support Error Correcting Code (ECC) memory to improve data integrity and to keep head units up and running without requiring a reboot in case of memory errors.
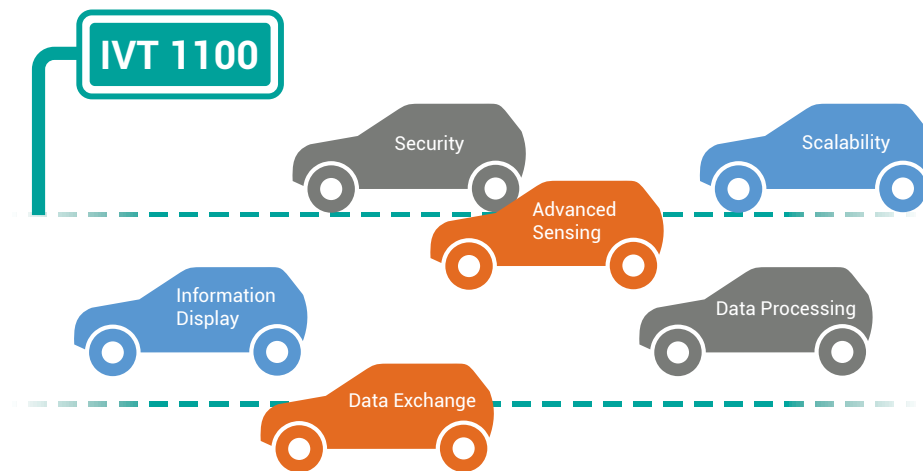
Moreover, the IVT 1100 comes in a double DIN sized enclosure based on the ISO 7736 standard for head units to facilitate the system installation. It is noteworthy because time to market is an important consideration for vehicle manufactures. The IVT 1100 also supports the Intel IoT Gateway. This solution integrates Intel® processor-based hardware, the Wind River Intelligent Device Platform* XT, and

McAfee Embedded Control*, delivering a full suite of networking, embedded control, integrated security, and remote manageability technologies. These pre-integrated, pre-validated hardware and software building blocks provide core functions that help vehicle manufacturers to speed up innovation and create new offerings.

Conclusion

To continually deliver new, exhilarating driving experiences, the automotive industry relentlessly pursues innovation. Integrating intelligence, connectivity, and security, the NEXCOM IVT 1100 in-vehicle computer with Intel Atom processor E3825 exemplifies how head units can deliver situational awareness, offer driving assistance, increase driving safety and efficiency, and make driving more personal and enjoyable (Figure 5). As vehicles continue to evolve, head units based on the NEXCOM IVT 1100 will continue to evolve, developing new capabilities in everything ranging from advanced sensing, data processing and information visualization to data exchange and entertainment features. An in-vehicle computer like IVT 1100 will help build the founding pillars of not only intelligent transportation systems but also IoT.

Figure 5. The NEXCOM IVT 1100 provides key capabilities to continually deliver new, exhilarating driving experiences.

NEXCOM

The Intelligent Systems

Founded in 1992, NEXCOM integrates its capabilities and operates six global businesses, which are Multi-Media Solutions, Mobile Computing Solutions, IoT Automation Solutions, Network and Communication Solutions, Intelligent Digital Security, and Healthcare and Medical Informatics. NEXCOM serves its customers worldwide through its subsidiaries in five major industrial countries. Under the IoT megatrend, NEXCOM expands its offerings with solutions in emerging applications including IoT, robot, connected cars, Industry 4.0, and industrial security.

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