Visteon ®

New architectures for intelligent mobility

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In today's digital cockpit, electronic content, power demands, networking expansion and sensor requirements are accelerating at a tremendous pace, and the pressures on electrical/electronic (E/E) architectures will become even greater in autonomous vehicles. Legacy E/E architectures will simply not be able to manage the needs of autonomous driving, so those architectures must evolve to become much more flexible, powerful and – importantly – **centralized**.

Currently, vehicle E/E components and CANs are unable to be easily changed to meet the new, increased demands upon them. Consequently, developers are looking at ways to enable automakers to build new architectures from scratch. By separating software from hardware, engineers can create proprietary architectures for each vehicle design, providing distinctive differentiation in the marketplace while speeding the course toward fully autonomous vehicles.

Centralized computing for three domains

These new architectures will be built on centralized computing concepts. The electronic control units (ECUs) in today's vehicles are each designed to perform a single function and offer just enough computing power to do that task. Visteon is among the first companies working to centralize large numbers of ECUs into three categories of comprehensive domain controllers:

- A **cockpit domain controller** consolidating separate cockpit electronics products on a single, multi-core chip, accessible through an integrated HMI, controlling the display of the instrument cluster, infotainment and head-up display (HUD).
- An **autonomous driving domain controller**, addressing Level 3 to 5 autonomous driving functions like

automated driving on highways and country roads, inner city driving, as well as autonomous parking.

- An I/O sensor network computer that will handle all the signals from cameras, LiDAR, radar and ultrasonic sources. This controller distributes sensor signals to the cockpit computer and manages the steering of the vehicle.

Driving the need – and automaker preference – for a centralized computing approach, the following trends are fast becoming widespread:

- The need for more and scalable computing power: Centralized computing, using domain controllers, provides unprecedented flexibility, power and speed for handling sensor data, graphics and multiple software domains. These controllers need to be scalable as – depending on usage and configuration – computing power needs can scale from 1TFLOP up to 20 TFLOP.
- Increased electronics content: Cockpit functionality will continue to expand and place further demands on computing power. Upcoming features include augmented reality, driver monitoring, e-mirror functionality, Android and enlarged display concepts for the next generation of the digital cockpit.
- Fast time-to-market means success: Domain computing is complex. Therefore, a new approach introducing easily configurable and adaptable middleware, configuration tooling and "heart beat analysis," which can be used by customers and development partners, is required.
- Domain controller to supercomputer: Over time, the domain controllers being developed today will be fused into a single supercomputer with massive computing power. Moreover, during the next few years, as we learn more about the safety and cybersecurity required for domain controllers, more functionality will move to the cloud, where maximum flexibility and power will reside.

Visteon Platforms and Technology

How does Visteon approach this shift toward centralized computing? The trend for electronic control unit (ECU) consolidation for cockpit electronics and autonomous driving has accelerated automaker demand for the SmartCore™ cockpit domain controller – the first scalable controller with a modular architecture. SmartCore ™ is the base platform for a new era of centralized computing that will extend to autonomous driving controllers for Level 3 to 5 autonomous driving, an approach the automotive community recognizes as a critical enabler to achieve fully autonomous driving.

Visteon's product portfolio, underlying platforms and technologies provide the building block for a scalable, centralized computing approach.