BLOG

Vehicle Architecture: The Innovation Turning Point›

The automotive industry has a long history of embracing new technology. Each generation of cars and vehicles becomes more advanced as manufacturers introduce new features that improve safety, efficiency and passenger comfort. Despite this continuous improvement, overall automotive design has changed very little for decades, both in terms of how cars are made and in their architectures.

Though electronic content drives many cutting-edge features in new cars, the manufacturing techniques used to connect electronics have not advanced at the same rate as the hardware and software. This stalled advancement could prove problematic to future automotive development if not addressed.

The reason for this lack of change is legacy. As manufacturers develop each new vehicle, they are building on the previous generation. And with so much of the latest innovation occurring in the electronic controls of vehicles, this dependence on legacy designs means each new feature that is added must be incorporated into existing structures.

The Value of Electronics

The tipping point has been reached. Electronics are now so important to automotive manufacturing that they represent over half of the value of many of today's vehicles. New features are controlled with dedicated electronic control units (ECUs), and many cars now require between 100 and 150 ECUs to function correctly. Each ECU must be connected to the existing cable harness that runs throughout the body of any vehicle.

This evolution is quickly becoming a revolution, however, brought about by several new technologies that are emerging at the same time.

Electrification is a primary example of these new technologies. Global concern over our impact on the environment has led to many manufacturers searching for alternatives to the burning of fossil fuels. Most are already producing hybrid or electric vehicles, and several have made commitments to end their production of conventionally powered cars entirely. The adoption of battery-powered vehicles will see a significant change in cable harnesses that must carry the much-higher currents required.

Automotive manufacturers are also adopting advanced driver-assistance systems (ADAS), another revolutionizing technology, due to its promise of improved safety and enhanced convenience. But deployment of ADAS will require an array of sensors that allow each vehicle to detect its surroundings and alert the driver to potential hazards. Each sensor will require an ECU to provide control, as well as cables to deliver both power and high-speed data connections.

The logical technological step beyond ADAS is toward autonomous (self-driving) vehicles. In fact, 81% of the professionals who participated in the Molex/Mouser survey believe that level IV autonomous driving will be available as a standard feature in new vehicles within the next 10 years.

An autonomous vehicle will take the data gathered by the sensor array and act upon it to make the split-second decisions required to avoid hazards and drive more safely. The computing power required to process this volume of data with minimum latency will be far greater than that of the current generation of road vehicles.

Not only will autonomous cars rely on more sensors and computers, but they will also use high-speed wireless connections to share data with other road users. Vehicle-to-everything (V2X) technology will see vehicles communicating with other road users, pedestrians and even traffic control infrastructure to create a safer and more efficient transport system.

New Technologies Require a New Approach

Advances in the field of electric power and the increasing sophistication of ADAS and autonomous vehicles, along with wireless communications, will require a revolution in the way that vehicles are connected. Designers can no longer simply add more ECUs and their associated wiring. Modern cars are already packed with technology, and designers are running out of room.

The cabling required to connect all these systems together is also a major factor. The wiring harnesses of vehicles are large and intricate systems, and each new device results in yet more weight and complexity. In addition, the cable harness is one of the few hand-made components left in the world of automotive manufacturing, therefore making it one of the most time consuming and costly to install.

The new technologies that will become commonplace in the next decade cannot be integrated using traditional cable harnesses. The high-power demands and the need for data speeds that could exceed 10 gigabits per second (Gbps) will require new hardware and new data management techniques.

In the Zone

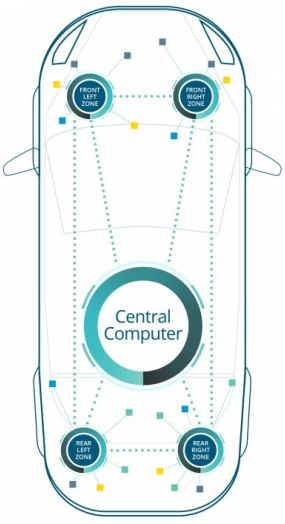
Zonal architecture is the future of vehicle wiring. Traditional vehicles use a domain architecture in which features are grouped by similar function, resulting in a highly complex design. Zonal architecture replaces this complex network with a simplified structure. The functions of the vehicle are grouped by location within the vehicle, including lights and sensors, motors, and controls. Each location is described as a zone and controlled by a gateway placed close to the components for which it is responsible. In this way, the individual cables that link components to controller are kept short, keeping the complexity and weight to a minimum.

Each of the zonal gateways will connect to the central computing cluster at the heart of the vehicle. As a result, inter-zonal communication can take place over a small, high-speed networking cable that greatly reduces both the quantity and size of the cables that must be installed throughout the vehicle.

Combined with the revolution in vehicle power, communications and autonomous driving, the introduction of zonal architecture represents the biggest design change in vehicles for generations. Conventional designs simply will not be able to deliver the performance and reliability that modern consumers demand, and zonal architecture provides the solution that the automotive industry needs.

Molex is applying its decades of experience in automotive connectivity to the development of solutions for zonal architecture. Explore zonal architecture and its implications for automotive manufacturing.

By Molex



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