1.4 Harnessing Energy and Information Networks

1.4.1 Foreword

In recent years, OEMs have added a steady stream of convenience, safety, telematics, and entertainment features to their vehicles [YAZAKI 2006]. At the same time, macrocommutator- and microprocessor-based on integrated macro- and microelectronics-based systems approach technologies are replacing many conventional fluidical and mechanical systems.

In this environment, the demand for supporting power and data distribution has multiplied dramatically. The conventional wire harness continues to provide the foundation for the in-vehicle energy and information distribution [high-power application specific integrated matrixers (ASIM) that drive electro-mechanical (E-M) motors, locks, etc., low-power application specific integrated circuits (ASIC) that carry data such as speed, temperature, and so on].

By adopting a more advanced in-vehicle energy-and-information network (E&IN), OEMs may provide the enhanced driving experience customers want while addressing pressing issues of space, mass, and cost. E&INs are an evolution in automotive mechatronic technology that spans nearly 80 years.

New strategies and technologies share the stage with proven approaches to energy and information distribution.

Advances in energy and information distribution have not eclipsed previous technologies but have refined them, adding important options to the engineer’s tool chest.

Cost may be a major factor in determining how advanced technologies are implemented. System designers must be able to draw on the best of existing and new approaches to achieve the desired results within given cost parameters.

The challenge may be to add greater functionality and more vehicle features, while minimising or eliminating corresponding increases in the physical infrastructure. In many ways, this is as much an art as it is a science.

An automotive in-vehicle E&IN (Fig. 1.23) incorporates the ASIM macroelectronics, ASIC microelectronics, physical media, and supporting technologies that deliver energy and/or information (data) used to activate and control various automotive vehicle functions [FUHRMAN 2002].

In application, this takes the form of a local system of interconnected devices and supporting components such as controllers and gateways.

Several hyponetworks may be integrated to form the vehicle’s power and data infrastructure.

This integration is the job of gateways that allow data sharing while preventing unwanted interference between different networks; and bridges, which provide data filtering between similar networks.
Different E&IN architectures are employed to connect the different devices and hyponetworks in an automotive vehicle. It is even possible to have two architectures in the same automotive vehicle (ring architecture could be used for a hyposystem the node on a bus network).