1.11 **FlexRay™ RBW or XBW Networking**

The FlexRay™ protocol is expected to be a comprehensive communication system providing speed, flexibility, and scalability for complex networks. The protocols key features include [CASE 2005]:

- Time and event-triggered communication schemes;
- Support of fault-tolerant (FT) systems;
- High-error detection and error-diagnosis capability;
- Support of different network topologies for cost-effective and safety-enhanced partitioning of the system;
- Dedicated automotive electrical physical layer with sophisticated power-down and wake-up mechanisms;
- Flexible extend ability and full scalability to enable upgrades.

![FlexRay Backbone](image)

**Fig. 1.38 FlexRay™ architecture examples [HANSEN 2005].**

Among the applications that the FlexRay protocol is expected to make possible are RBW or XBW integrated unibody or chassis motion mechatronic control hypersystems such as DBW AWD propulsion and BBW AWB dispulsion, SBW AWS conversion as well as ABW AWA suspension mechatronic control systems (Fig. 1.38) [HANSEN 2005].

RBW or XBW removes the necessity for fluidical and mechanical systems, connecting the driver to these systems using sophisticated mechatronic systems that are less expensive to build and easier to maintain. Other applications that the FlexRay protocol is expected to facilitate include active and passive safety systems, collision avoidance systems, powertrain management systems and driver assistance systems, for example, as shown in Figure 1.39 [CASE 2005].

With a gross data rate of 10 Mb/s, FlexRay delivers approximately 20 times higher net bandwidth than the CAN protocol currently used in advanced automotive control applications.

FlexRay is an open, common, scalable electronic architecture for automotive applications. It may operate in single- or dual-channel mode, providing redundancy where necessary. It allows both synchronous and asynchronous data transmissions. With the former, other nodes on the network receive time-triggered messages in a predefined latency time. With the latter, messages get to their destinations quickly or slowly, depending on their priority.

Currently, FlexRay may handle communications at 10 Mb/s -- the speed of a typical low-end, home-computing local area network. Last, FlexRay clock synchronisation mechanism aptly handles cheap clock oscillators, namely those made out of quartz. And that synchronisation, as with all of FlexRay, is faulting tolerant [GOULD 2005].

For instance, FlexRay automatically and digitally compensates for the differences in the variety of quartz clocks running on the network, as well as in their slight changes in clock frequencies. This clock synchronisation is a distributed mechanism; there is no master time-keeper here.