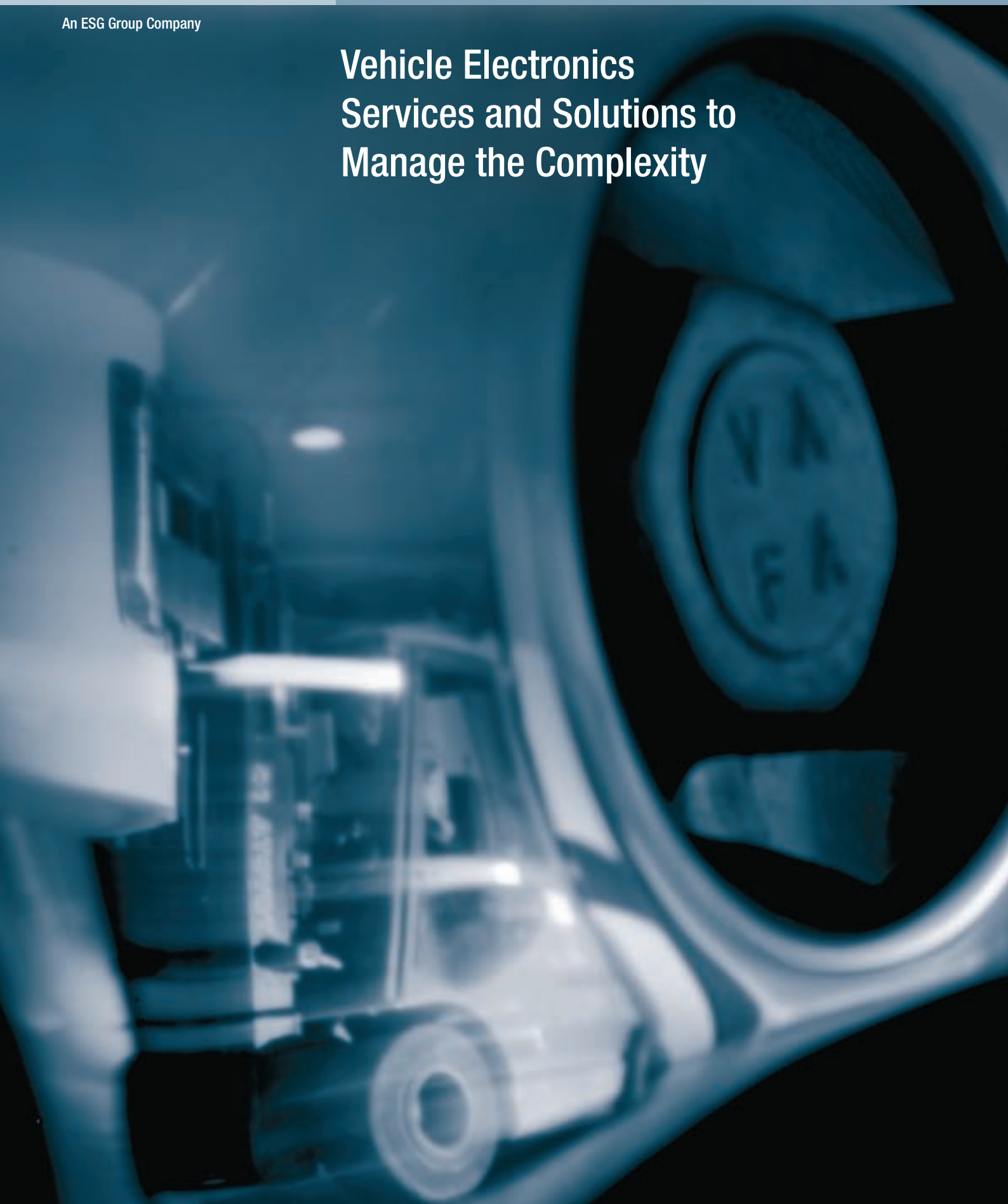
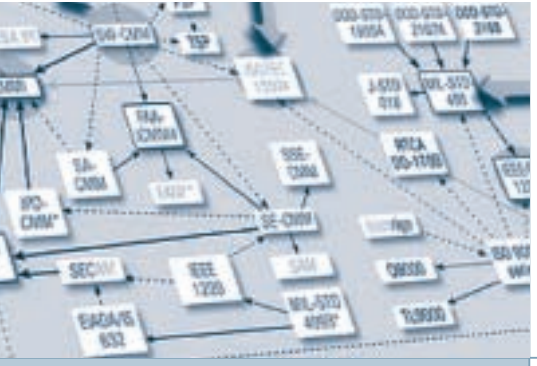
SERVICE XPERT

An ESG Group Company

Vehicle Electronics Services and Solutions to Manage the Complexity





Innovations & development cycles

Commercial vehicle manufacturers are experiencing a technological change. The proportion of electrical and electronic components in vehicles is rising rapidly.

Innovation & development cycles

- **Increasing proportion of electronic control units**
- **Increasing software complexity**
- **Coping with complexity**
- **Range of variants and versions**
- **Extension of the V-Model**
- **Increasing cost of integration and testing**
- **Consistent tool sequences and integrated data management**
- **Process alteration and optimisation**

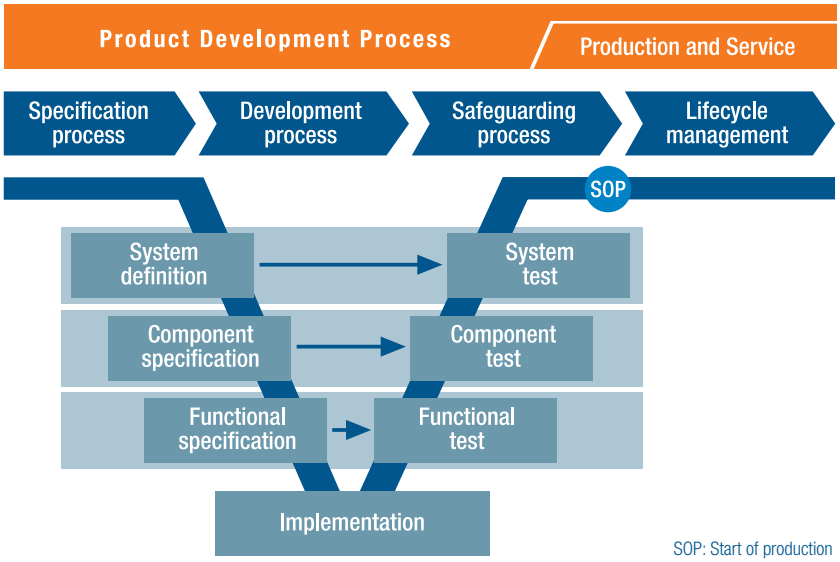
Electronic systems play a decisive role, both prior to the development of the vehicle and later during its ongoing development. Nowadays, they are the yardstick against which the degree of innovation is measured. As a result, they influence public perceptions and function as an example set for the competition.

The proportion of electronics in the overall equipment of a commercial vehicle has now risen to as much as 30% and the trend is upwards.

Factors such as innovations, shortening product lifecycles and development times as well as increasingly fiercer competition and further pressure on costs are the main driving forces behind progress in the commercial vehicle industry.

We view it as our task to advise you in integrating these innovations and to support you in any conceivable way. As the transfer agent of the ESG Group responsible for the Commercial Vehicles area, we take proven technologies, methods and solutions used in the automotive industry and adapt them to the requirements of the particular market.

We cover all specification and integration levels of the development process in accordance with the V-Model (lifecycle process model). The effects of the individual development steps on production and after-sales are checked and optimised by taking a holistic view of the subject matter.



SOP: Start of production

Expertise and experience

Taking proven technologies, methods and solutions in the automotive industry and transferring them into the commercial vehicle segment is the core task of ServiceXpert. Analysis and consulting projects represent the first steps towards introducing a solution.

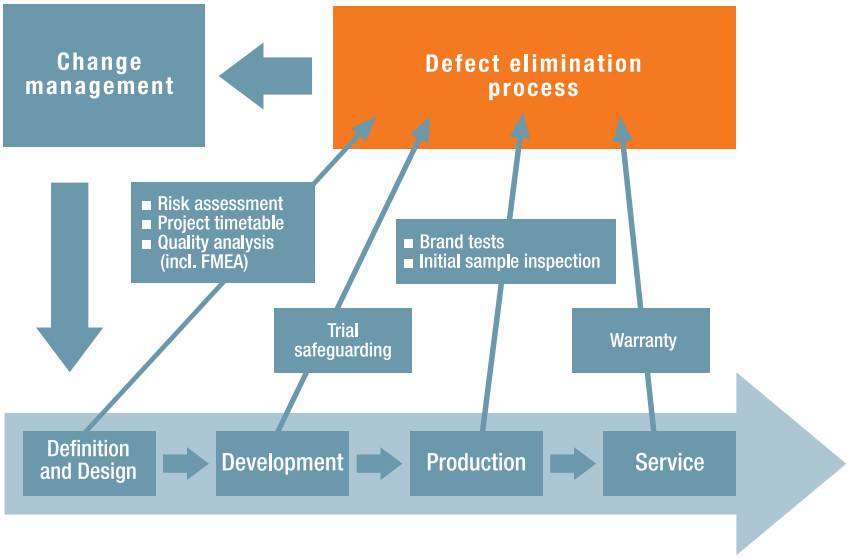
Process consulting

Smooth-running, self-contained processes are essential for a rapid time-to-market and a high quality finished product. The increasing level of networking combined with the interdependencies between individual development partners mean there are more and more media and information discontinuities in this area. Analysing the processes and optimising them for the long term represent an inestimable competitive advantage.

Technology and methodology consulting

Selecting the optimum technologies and methods and using them correctly are both the basis for and the driving force behind entrepreneurial innovation. Adapting tried-and-tested automotive technologies is a rapid and inexpensive way to guarantee in-house innovative potential. Introducing a new method demands a consistent and standardised approach. Our range of services includes the knowledge and selection of methods for tackling certain problems as well as how to introduce and adapt these methods to customers' processes.

Through our active participation in the technology and innovation network of the ESG Group, we gain access to the latest groundbreaking technologies, methods and standards. In addition, you profit from our experience across the board with various industries and customers.

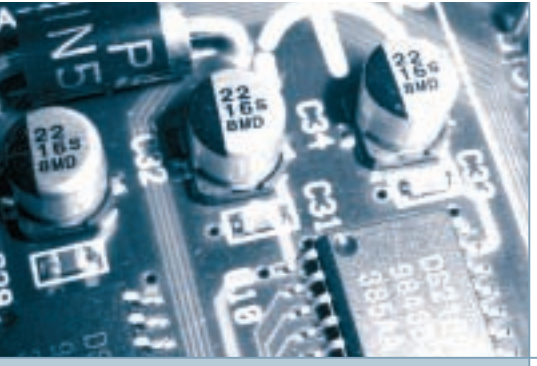


Areas of expertise in technological and methodological consulting

- Diagnostic technologies
- Communication standards
- Vehicle electrical system architectures
- Data modelling

Areas of expertise in process consulting

- Requirements engineering
- Change management
- Elimination of defects
- Diagnostic lifecycle
- Flash data management
- Configuration management
- Compatibility management
- Testing and integration



Embedded system and software development

Software is making an increasing contribution to commercial vehicles and is set to become more and more of a strategic product component in the vehicle manufacturer's arsenal. Software is used for implementing classic vehicle functions as well as innovations resulting from networking.

Services for systems engineering
- Drafting and optimisation of specifications
- Architectural Design
- Bus communication and network management
- Rapid prototyping and modelling

Services for software development
- Functional architectures
- Modelling and simulation
- Code generation, coding, diagnosis

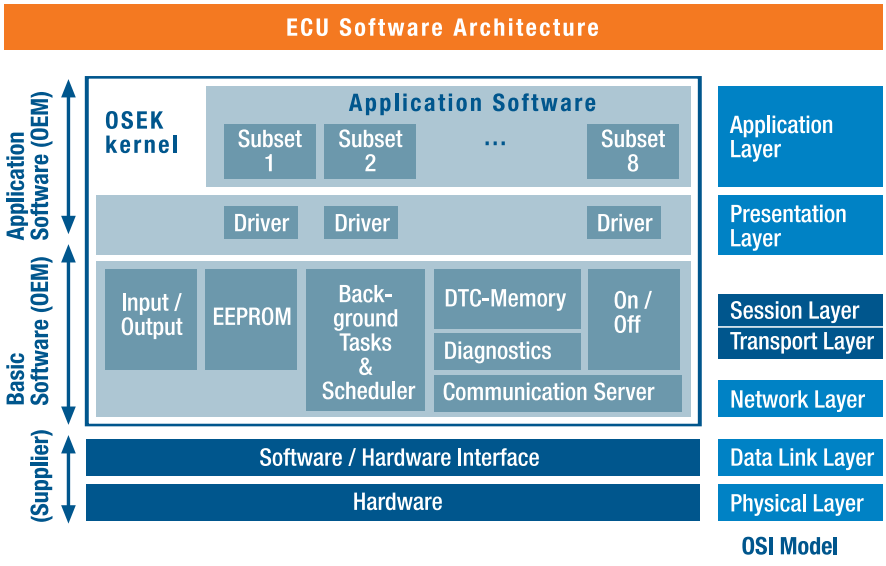
Designing the electronic and software system for a vehicle is an extremely difficult task, since the requirements in the various lifecycle processes are extremely extensive and multifaceted. In the area of embedded systems in particular, it is necessary to take account of the complicated interactions between control unit software, sensor/actuator systems and mechatronic components. In order to solve a complex design problem, what is needed is a development process that ranges from dealing with requirements and boundary conditions through to signing off the system, and that takes account of all development phases.

Systems engineering

Systems engineering involves integrating all technical parameters as well as ensuring that all physical, functional and technical interfaces are compatible. The objective is to design a system that fulfils the specified requirements.

Software development

Software development focuses on depicting the logical system architecture in a specific software system. It includes all the programs and data that are processed in the distributed, process-controlled system of the vehicle.

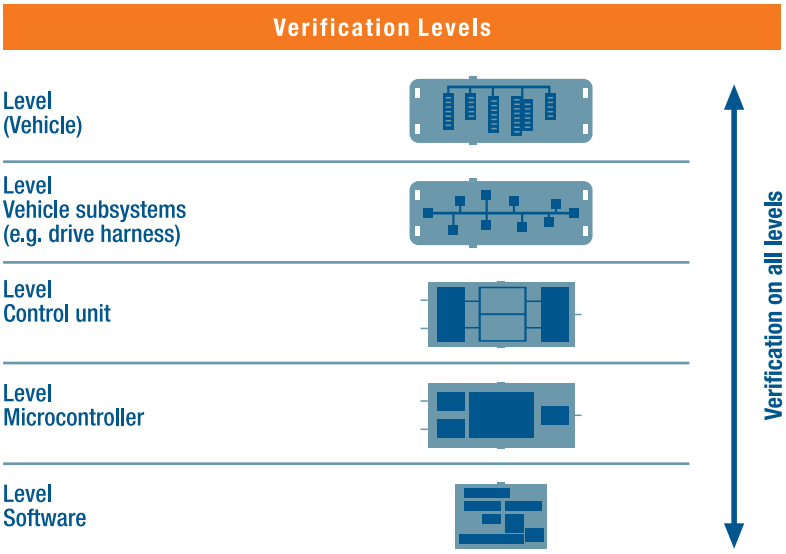


Integration & testing

Complex embedded electronics (EE) systems

Source: ESG,Testcenter

Important preconditions for integrating electronic systems smoothly and performing tests on them successfully are an active exchange of information and close cooperation between the development and test departments of both the manufacturer and the suppliers.



System integration represents a key pillar in the development process according to the V-Model. This is where the functional requirements are brought into line with the implemented functions. Integration concepts and detailed timetables have to be prepared for integration on the various system levels (component, subsystem, overall system).

For the verification of functions to be successful, it is crucial for test strategies to be worked out that can safeguard vehicle functions and variants. Before the actual testing can start, the scope of the system and the tests must be defined jointly with the technical departments. If necessary, ServiceXpert can obtain the necessary test instruments and software tools under its own responsibility and validate the electrical system properties in accordance with the system trial. There are various different ways of implementing integration and test platforms: In the laboratory on laboratory vehicles, on prototypes as well as on the real vehicle. If any components or subsystems are unavailable, they must be simulated using suitable tools. Experienced test engineers from ServiceXpert and the ESG Group are at your disposal for these tasks.

Services for system integration
- Integration concepts
- Planning the integration

Services for the test at the system levels
- Test strategy
- Test case determination
- Performing the tests
- Documentation

Infrastructure services
- Analysis of needs
- Selecting tools
- Introducing tools
- Adapting tools

Engineering data management

The degree to which all data remains up-to-date and compatible throughout the entire product lifecycle of a vehicle represents an important prerequisite for internal and external processes to take place efficiently. This is based on methods and systems for engineering data management.

Services for requirements engineering
- Introduction of methods
- Introduction of tools
- Use of tools

Services for requirements management
- System maintenance
- Verification
- Documentation

Services for compatibility management
- Various alternatives
- Data management

Services for configuration management
- Change management
- Feedback analysis
- Release planning

Solutions relating to engineering data management systems
- Concept
- Implementation

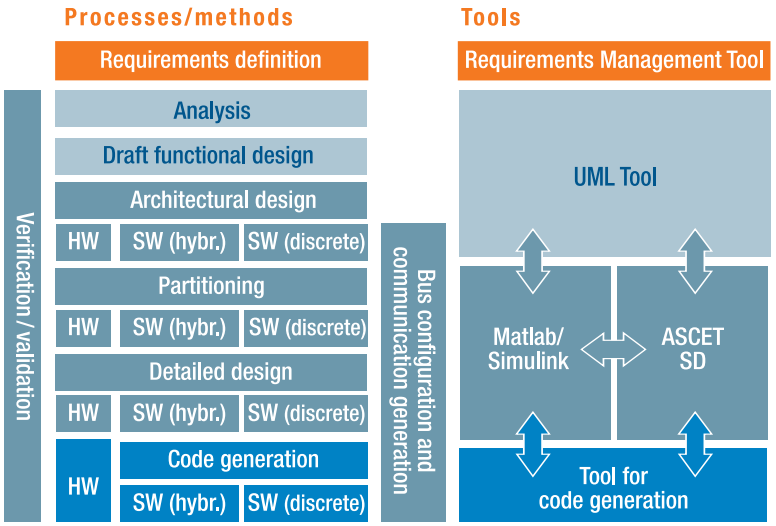
The main demand on requirements engineering is to have a system and process description that is structured, function-oriented and consolidated and which can be used for deriving specifications to be used for calls for tenders.

Requirements management takes the processes instigated during the development phase and continues them throughout the entire product lifecycle. New and modified technical requirements are integrated into the overall system of the "vehicle". Furthermore, aspects realised and implemented during the development process must be checked and continuously readapted in terms of compatibility and configuration management.

Networked systems and decentralised functions in vehicle electrical systems place exacting demands on compatibility management. This fulfils the role of safeguarding system integrity in the long term.

One principal activity in configuration management concerns identifying a system configuration at a defined moment in order to permit control and traceability throughout the entire software lifecycle.

ServiceXpert's service portfolio includes the concept and implementation of IT systems for engineering data management based on content management systems (CMS).



Source: ESG,Testcenter

Integrated diagnosis

One of the challenges facing the manufacturers of commercial vehicles involves reliably detecting and efficiently repairing malfunctions and component defects – especially in view of the increasing complexity of the vehicle.

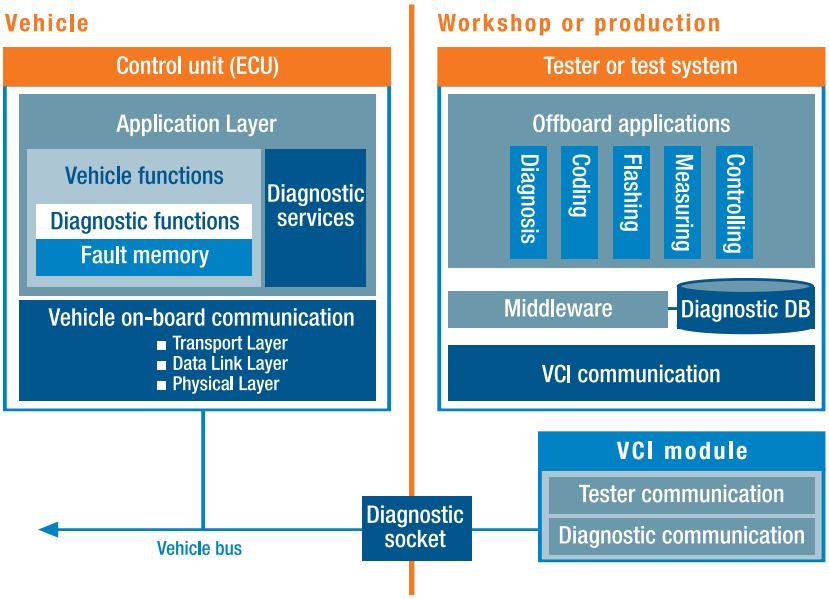
The diagnostic functions required for repair, maintenance and end-of-line programming must be suitably distributed throughout the vehicle and external test and diagnostic systems. This calls for a clear diagnostic strategy and an implementation concept for the individual lifecycle processes. The increasing standardisation of control unit architecture (AUTOSAR) and the MCD profile in the ASAM layer model provide significant support for this implementation concept.

Onboard diagnosis

The fault detection function in a control unit initiates an appropriate error handling routine if there is a malfunction and causes an entry to be made in the fault memory of the control unit. This entry can be read out subsequently using a diagnostic tester. When the vehicle functions are distributed over several control units, interpreting the fault memory entries and definitively tracking down the malfunction represent a real challenge.

Offboard diagnosis

The vehicle electrical system is connected to a diagnostic tester during production and in the after-sales service. It is possible to query all control units with a diagnostic function via the diagnostic socket. The information downloaded in this way is used for troubleshooting as well as for selecting and setting the parameters for test sequences used in functions and components.



Services relating to diagnostic strategy

- Distribution of onboard and offboard constituents
- Management of lifecycle processes
- Diagnostic works standard

Services for onboard diagnosis

- Use of diagnostic methods
- Setting up the diagnostic infrastructure
- Networking tasks

Services for offboard diagnosis

- System concepts
- Communication with the diagnostic tester
- Modelling diagnostic information
- Managing diagnostic data

ServiceXpert

ServiceXpert, an ESG Group company, is the software house for technical information systems used by the leading companies in the markets for consumer goods, capital goods and commercial vehicles in Europe.

We are your specialist for complex processes and we assist you in the planning, implementation and operation of systems used for managing information throughout the product lifecycle. We concentrate our systems and services on the areas of marketing/sales, development and after-sales service. Our solutions are based on the concept of integrated data management for technical product information.

According to our estimates, commercial vehicle manufacturers follow the main development trends in the automotive industry with a time lag of about three to five years. As a result, we offer products and services as a transfer agent in close consultation with the Automotive Division of ESG.

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