

System architecture advisory services



Why system architecture?

An innovative and optimized electrical / electronic (E / E) architecture helps to improve vehicle performance, safety and reliability. It also reduces vehicle weight thus resulting in lower overall system costs.

With rising demands for vehicle functionalities the complexity of system architecture is significantly increased. That's why the potential for cross influences has grown and full testing of all possible application scenarios has become a real challenge.

Continental as a system supplier provides technical and advisory support, functional safety management and complete traceability throughout the whole development process, following Automotive Standards.

Packaging improvement
Reliability improvement

Sustainability and efficiency
Comfort features

Increasing functionality

ITS
Lower system cost
Harness & connector optimization
Safety features

Connectivity
Profit from state-of-the-art know-how

Tailor-made system architecture.

Continental offers a wide range of different services regarding system architecture: everything from extensive functional safety consultation to complete development and integration of E/E architecture.

Our experts have profound knowledge of the commonly used software tools for creating system architecture (like PREvision). This guarantees the development of target-oriented organized E/E architectures that are ready to meet even the most sophisticated requirements.

Besides, Continental as one of the world's leading automotive suppliers can offer a wide

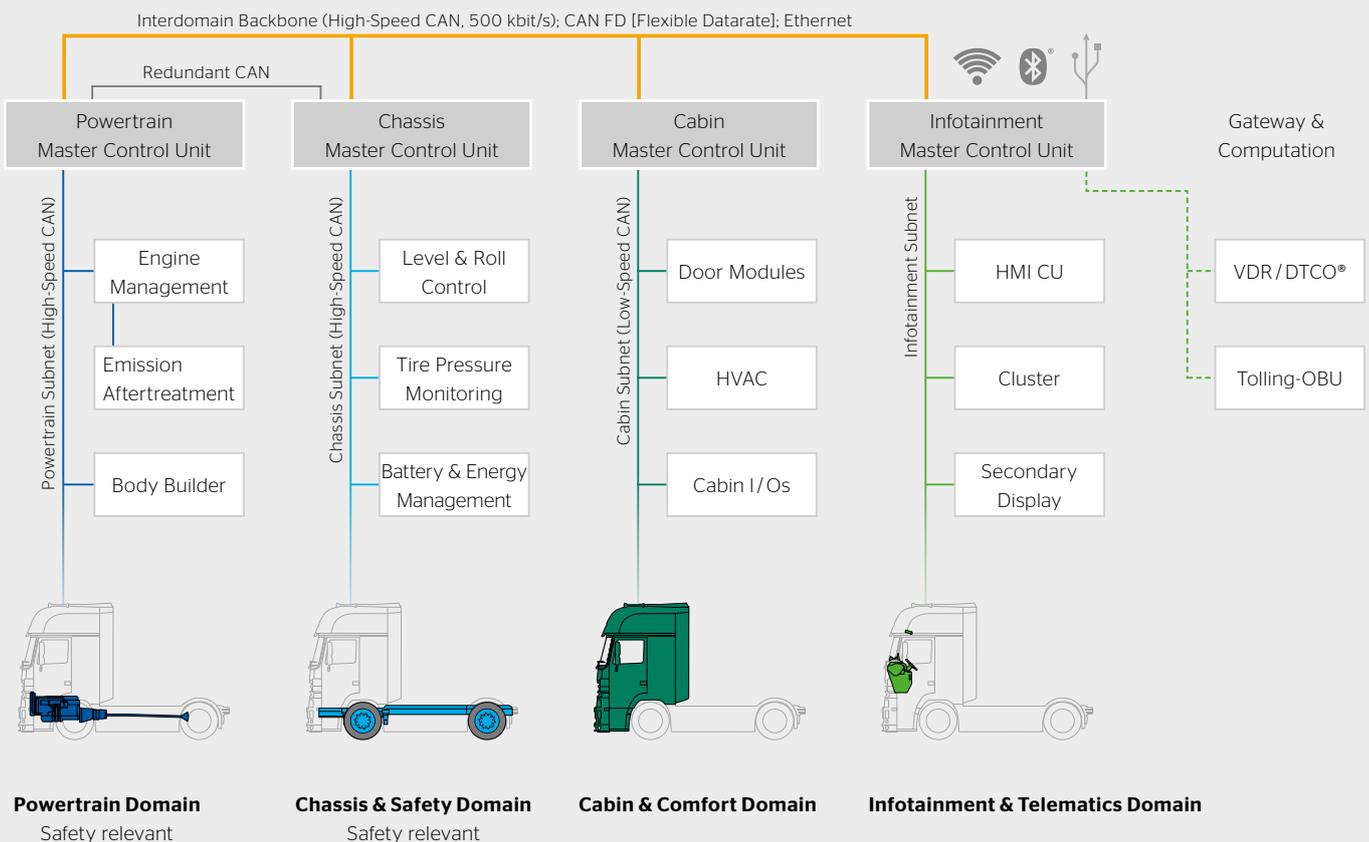
range of additional off-the-shelf products, e.g. a variety of powerful instrument clusters. Naturally our development team is also able to create customer-specific solutions for individual requirements.

We provide our customers with on-site support for every step of the development and integration process.

Advantages at a glance

- Individual service-packages for every demand
- State-of-the-art knowledge and technology
- Development process concurrent to Standard Automotive Process Landscape
- On-site support through Continental experts

Example of a future-oriented, decentralized E/E architecture.



Energy management

Architecture design

Safety compliance

System architecture development process.

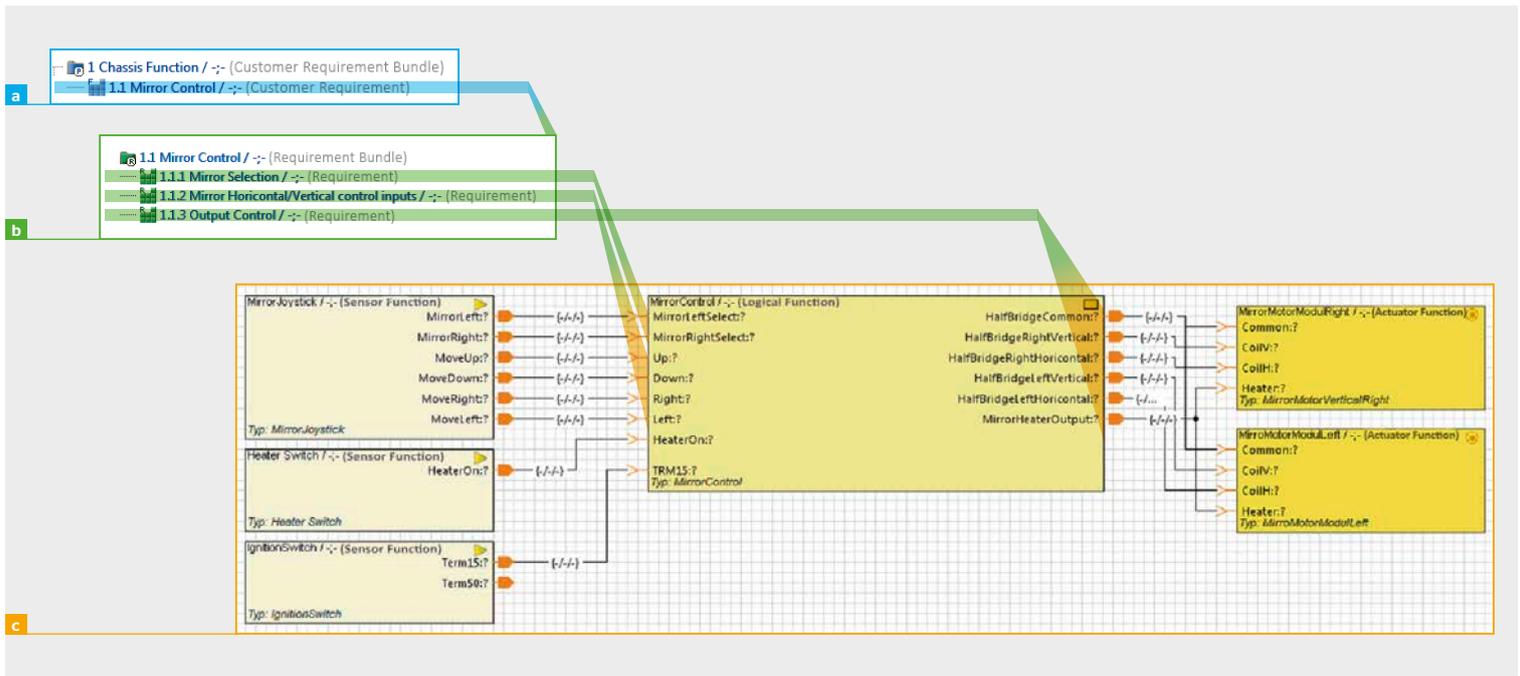
The development process of an automotive system architecture consists of a series of steps, that are all influencing each other. Continental as a system supplier can offer the realization of every step with complete traceability while fulfilling Automotive Standards.

Process Flow

Functional Safety Management >>



Project Management >>



Analysis (a and b) and engineering (c) of requirement specifications for the system architecture.

Step 1 - Requirements analysis and engineering

The first step in developing a system architecture is the evaluation of the range of requirements that the system needs to fulfill. These can be legal requirements, functional/non-functional safety requirements, market, cost and modularity requirements.

After evaluating, these requirements will then be transformed into a Performance Specification and imported into our standard tool PREEvision. This guarantees that every design decision can later be tracked back to the corresponding requirements (traceability).

Step 2 - Logical architecture Functional analysis

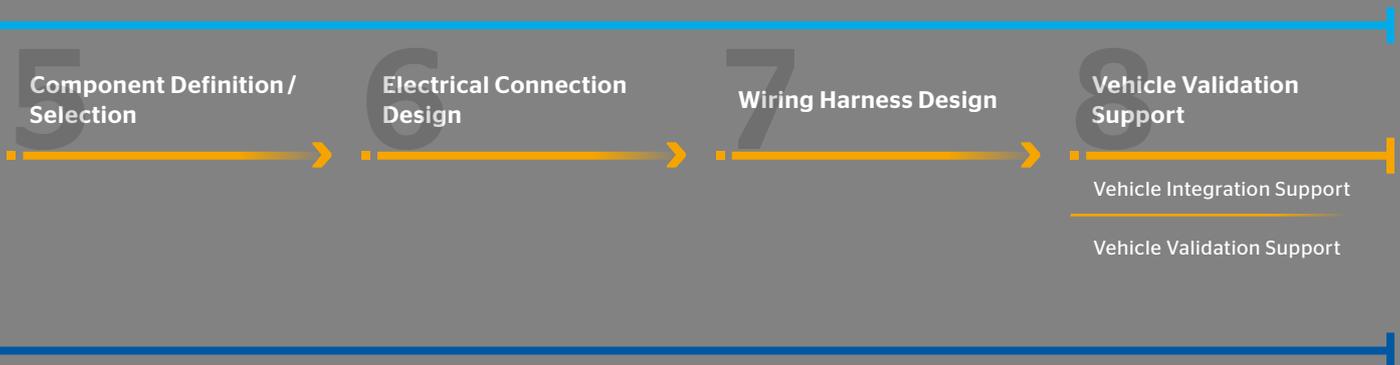
In a second step a functional vehicle design model is established, still independent of the functional distribution. Therefore the types of inputs and outputs as well as the essential factors for processing, quality and safety are evaluated.

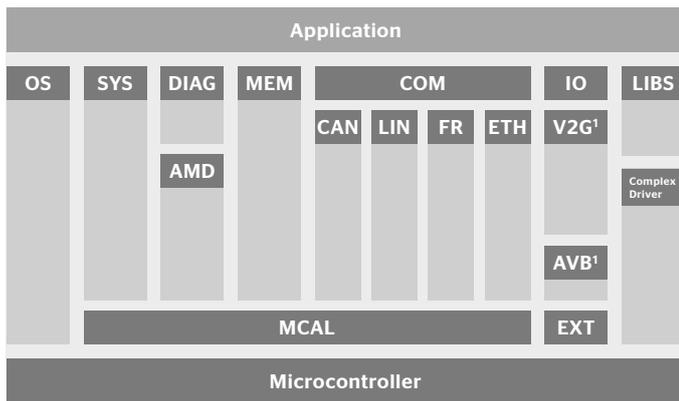
Function distribution

Based on the functional vehicle model that is created during the functional analysis process, different scenarios can be evaluated to find an optimized vehicle architecture. The evaluation process includes:

- Costs for the implementation
- Resource usage: RAM / ROM / CPU, Network
- Wiring harness

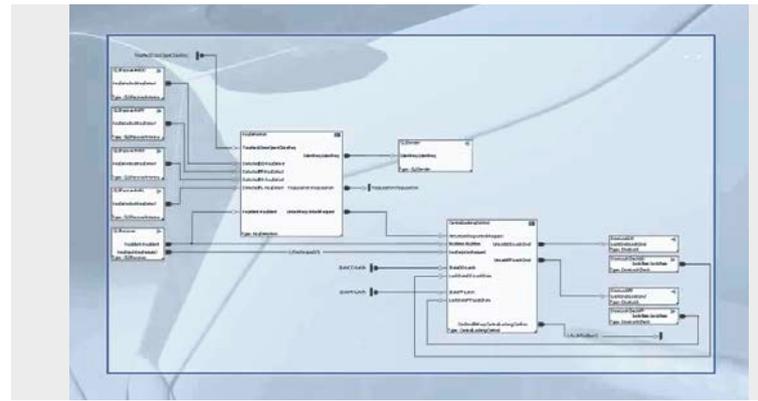
Based on the different requirements, like harness optimization and extensibility, the system scenarios are weighted and the matching functions are assigned to the corresponding control units.





Basic AUTOSAR system architecture

¹ Available extensions for AUTOSAR



Software architecture

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Step 3 - Software architecture

In this step typically a modular software architecture (for example AUTOSAR based) is designed. A base definition of the functionality and the interface to other modules is established. Based on this architecture also the network management (wake up behaviour, shutdown etc.) concept is selected (like AUTOSAR NM, OSEK NM or proprietary). A basic concept for diagnostics that is refined in the network topology / communication design phase is also developed.

Step 4 - Communication technologies

Optimally designed communication technologies are important to create the functional requirements. From the concept to the on-board and off-board diagnostics, we offer a wide service field:

- Design of the bus systems (Flexray / CAN / LIN / Ethernet): topology design, bus system optimization, extensibility analysis etc.
- Analysis and qualification of the existing bus systems and their applications

- Specification and standardization of communication software modules (transport protocol, bus driver, network management)
- Support for system developer in applying the communication technologies
- Validation of the network design: simulation, EMC research
- Diagnostic concept refinement

Process Flow

Functional Safety Management >>

1 Requirements Analysis / Engineering

Customer Requirements

Safety

Legal

2 Logical Architecture

Functional Analysis

Function Distribution

3 Software Architecture

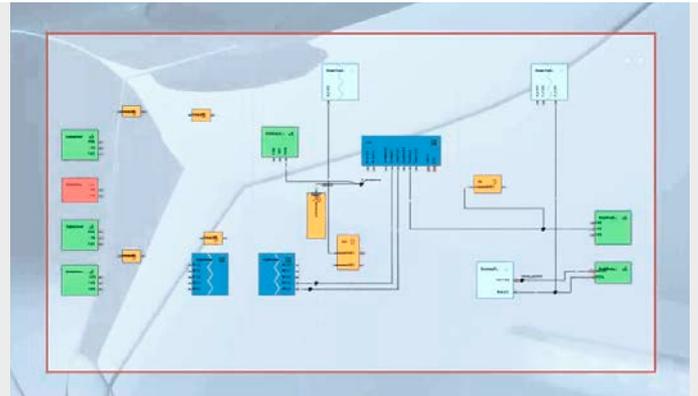
4 Communication Technologies

Project Management >>



Network diagram

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Electrical connection design

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Step 5 - Component definition and selection

When function distribution and communication are settled, the detailed definition and selection of the components take place. Continental can offer a wide range of different off-the-shelf products as well as the development of customer specific ECUs (engine control unit) and instrumentation. This way a fitting solution can be found for every range of production volume. The integration of already existing third party components is also in any case possible.

Step 6 - Electrical connection design

The electrical connections of the wiring harnesses system implements the entire architecture design and is one of the most important steps converting the designs from the previous step to the next:

- Structured implementation of the entire wiring systems
- Connections between all components (pinning)
- Power distribution / simulation
- Optimization in electrical connections, costs and weight

5
Component Definition /
Selection

6
Electrical Connection
Design

7
Wiring Harness Design

8
Vehicle Validation
Support

Vehicle Integration Support

Vehicle Validation Support

Step 7 - Wiring harness design

In this step the wiring harnesses will be further refined, the construction of the wiring harness in a 3D model will be completed and the production data and mounting supports will also be prepared.

- Wire definition and pin attribution
- Definition of logical harness modules
- 3D integration (cable laying and location of other accessories)
- Generation of 2D scaled drawing
- Generation of production data

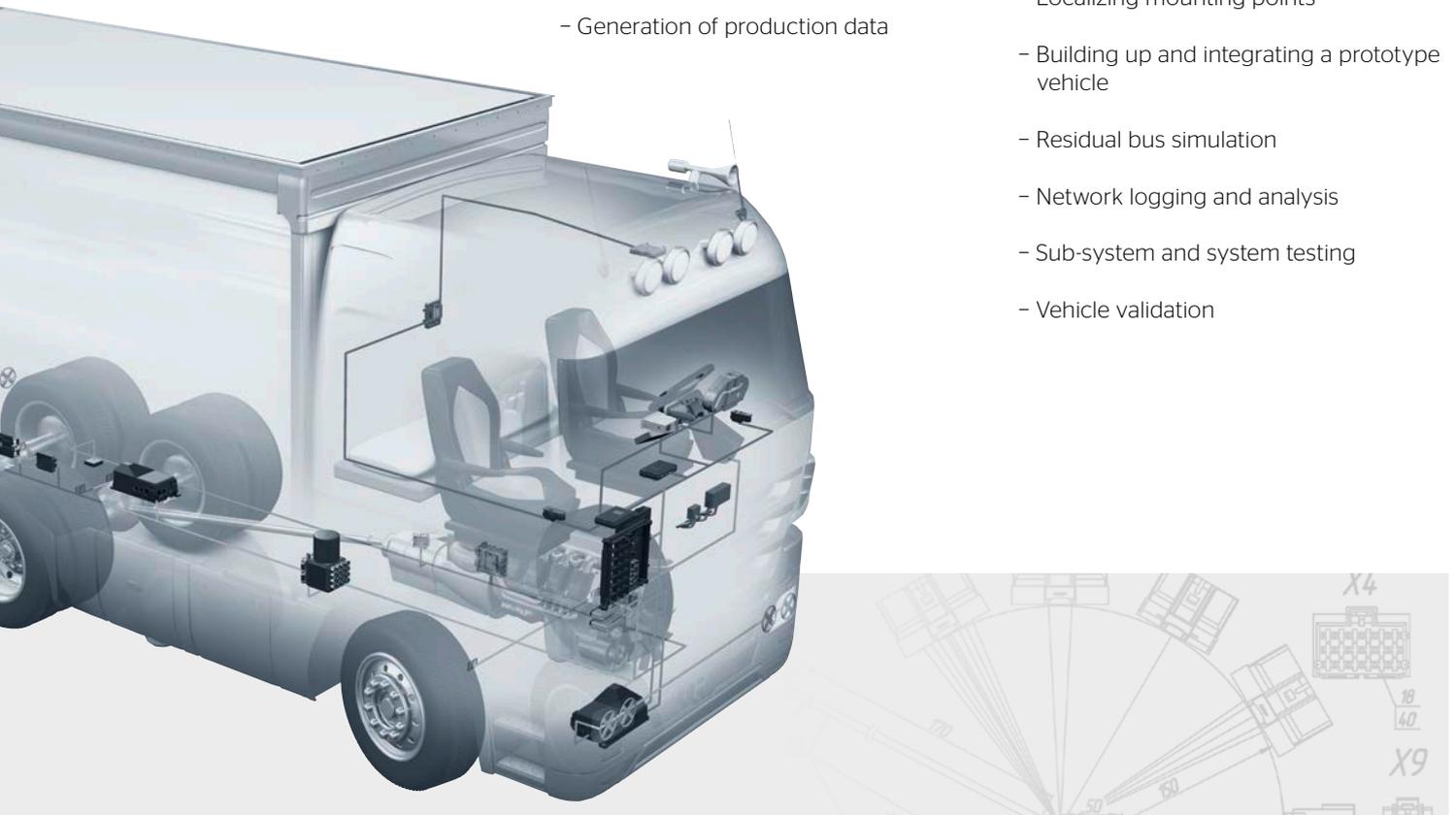
With our comprehensive services, an optimized harness with reduced costs and weight will be released to the manufacturer.

Step 8 - Integration and validation support

We provide on-site support to our customers for the physical integration and validation of the complete E/E system architecture on vehicle level. We support our customers at:

- Localizing mounting points
- Building up and integrating a prototype vehicle
- Residual bus simulation
- Network logging and analysis
- Sub-system and system testing
- Vehicle validation

Integration of system components.



Process Flow

Functional Safety Management >>

1
Requirements
Analysis / Engineering

Customer Requirements

Safety

Legal

2
Logical Architecture

Functional Analysis

Function Distribution

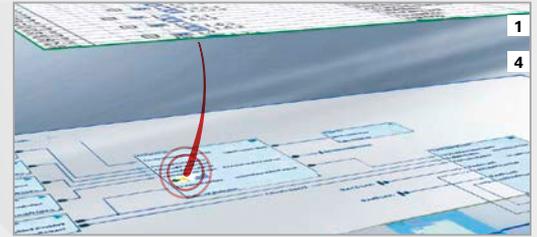
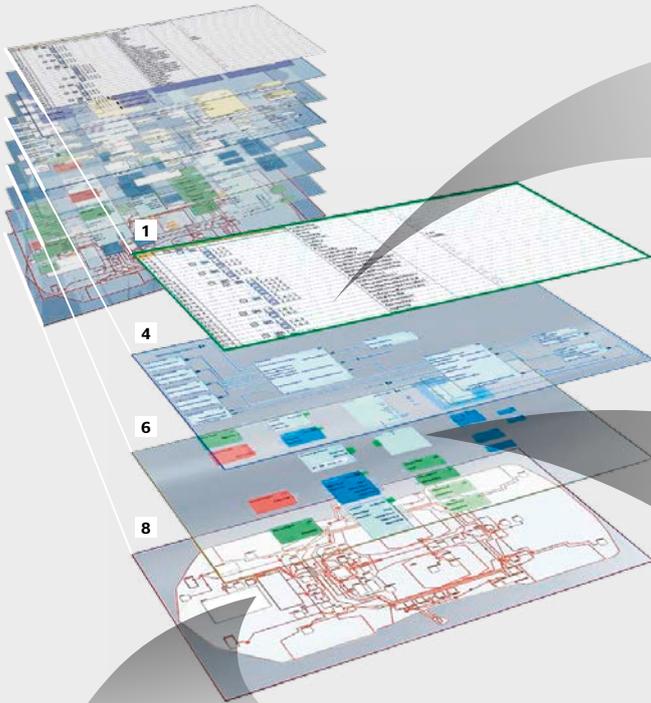
3
Software Architecture

4
Communication
Technologies

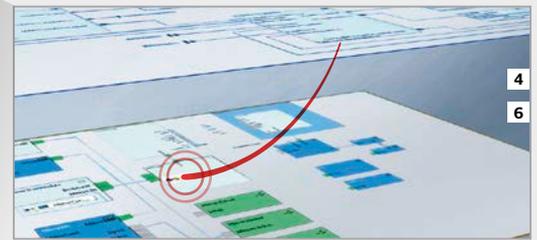
Project Management >>

Our standard software tool offers a unified multi-layered design environment with complete traceability between every step of the development process. This ensures that every design decision can be traced back to the corresponding requirements.

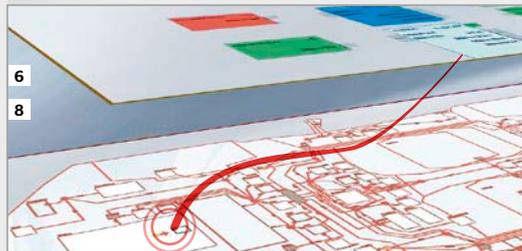
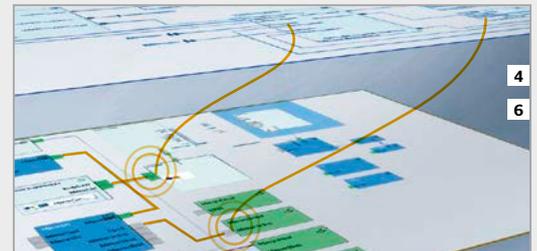
- 1 Customer Requirement List
- 4 Network Topology
- 6 Schematic
- 8 Integration Drawing



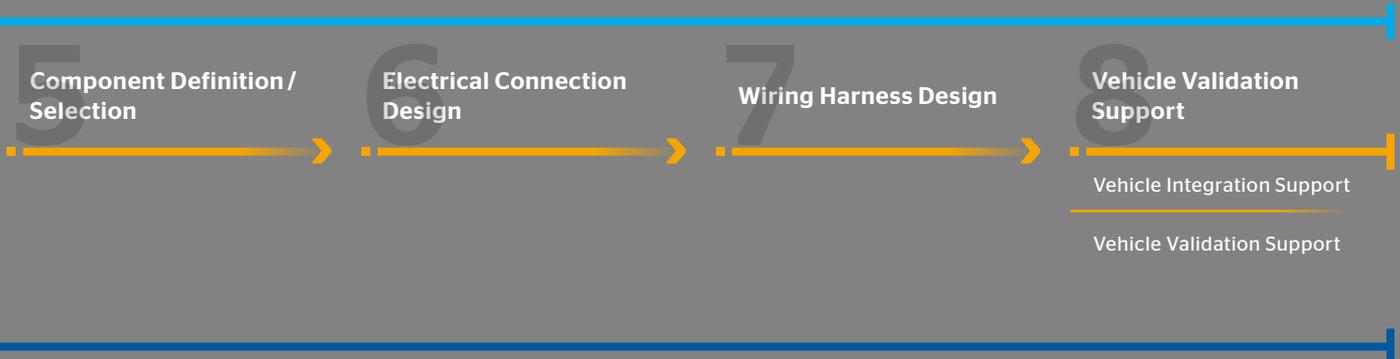
The logical architecture layer and software function network layers allow the development of data flow.



The network architecture layer defines physical connections between hardware components. Virtual functions from the previous layers can be mapped onto hardware components and signals routed over the physical connections.



The geometric topology layer provides the capability to position hardware components into physical installation locations in the vehicle.



Functional Safety.

Functional safety management is an essential part throughout the whole system development process.

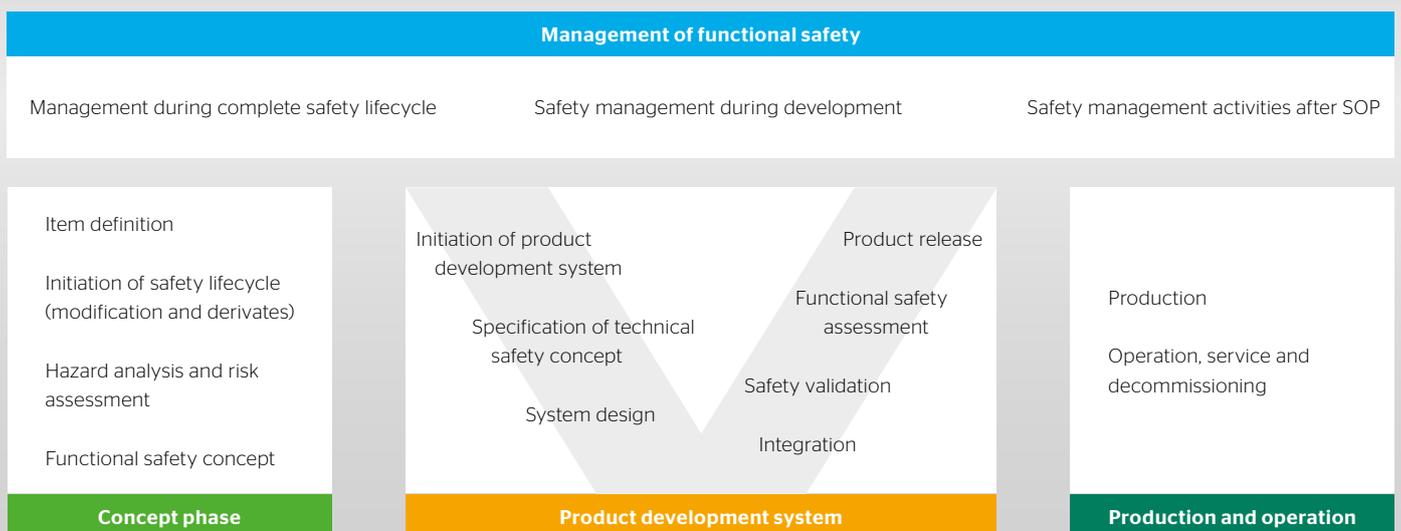
Functional safety as system approach

Before starting with the development of a system architecture a detailed functional safety concept is developed based on the Hazard and Risk Analysis. Safety relevant parts of every phase are identified and documented. Each safety goal/requirement can be traced through the complete development process. This approach ensures, that the resulting system architecture complies with Automotive Safety Standards.

Continental services regarding safety management

We provide the know-how and resources to also handle functional safety management for special vehicles and agricultural vehicles. Additionally we offer support for safety management activities like hazard and risk analysis, FMEDA (failure modes effects and diagnostic analysis) etc. during all steps of the design chain. For customers with existing E/E architecture Continental offers extensive consulting and support.

Customer and industry standard compliant
Methods, tools, testing along the R&D chain



Integration support along the V-Cycle
Change & documentation management

Advisory for manufacturability

Hazard & risk analysis

Project title

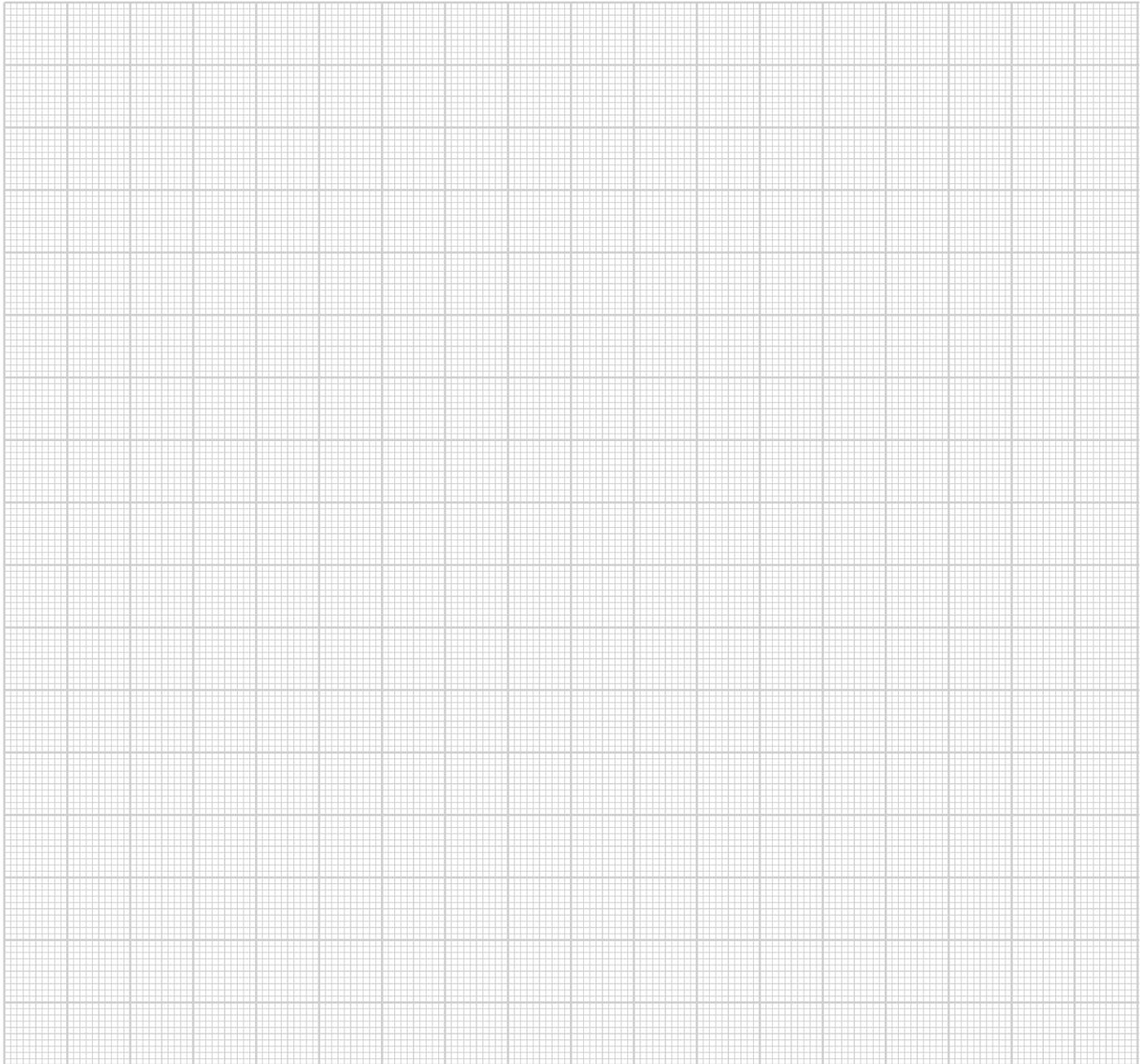
Project contact

Project description

Project start

Deadline

Project sketch



Relevant process steps (please select)

Functional Safety Management >>

1. Requirements Analysis / Engineering 2. Logical Architecture 3. Software Architecture 4. Communication Technologies 5. Component Definition / Selection 6. Electrical Connection Design 7. Wiring Harness Design 8. Vehicle Validation Support

Project Management >>

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