

Bluetooth Conference

Enabling „Effortless Connectivity“ Between Devices

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The Potential of Bluetooth in Automotive Applications

Horst Wunderlich, Martin Schwab:

DaimlerChrysler AG, Research and Technology, Germany

Lars-Berno Fredriksson: Kvaser AB, Sweden

Matthias Nikola: Philips/VLSI Technology GmbH, Germany

Contact: Dr. Horst Wunderlich (e-mail: horst.h.wunderlich@daimlerchrysler.com)
Phone/Fax: +49 (0) 7 11-17-9 36 33/-9 52 37)

Bluetooth - Potential for Automotive Applications

Focus of Applications

Development of Wireless Systems for TECHNICAL TASKS

Wireless Communication for Passenger Cars and Commercial Vehicles

- In-Vehicle Systems:
Single Units and
Systems, Subsystems
- Short Range Applications:
Production Process and
Service



Bluetooth - Potential for Automotive Applications

Focusing on Systems
for Technical Tasks

Systems for Technical Tasks



Actuator



Controller



MMI
Man Machine
Interface



Subsystem
Door-Module

Sensor

Systems for Consumer Services and Office Communication



Telephone



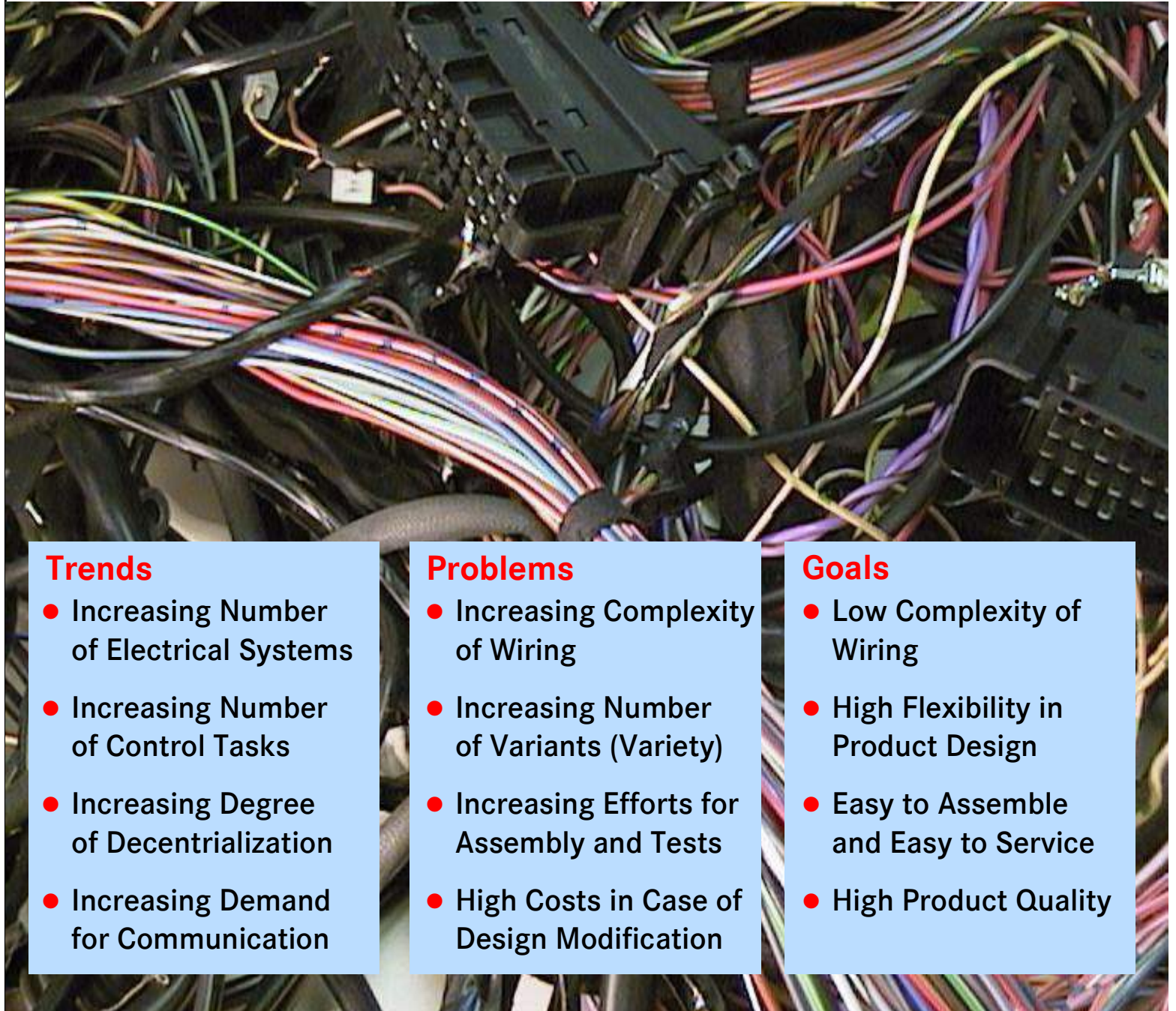
Telematics



PC and
Peripheral Devices

Bluetooth - Potential for Automotive Applications

Motivation for
Wireless Systems



Trends

- Increasing Number of Electrical Systems
- Increasing Number of Control Tasks
- Increasing Degree of Decentralization
- Increasing Demand for Communication

Problems

- Increasing Complexity of Wiring
- Increasing Number of Variants (Variety)
- Increasing Efforts for Assembly and Tests
- High Costs in Case of Design Modification

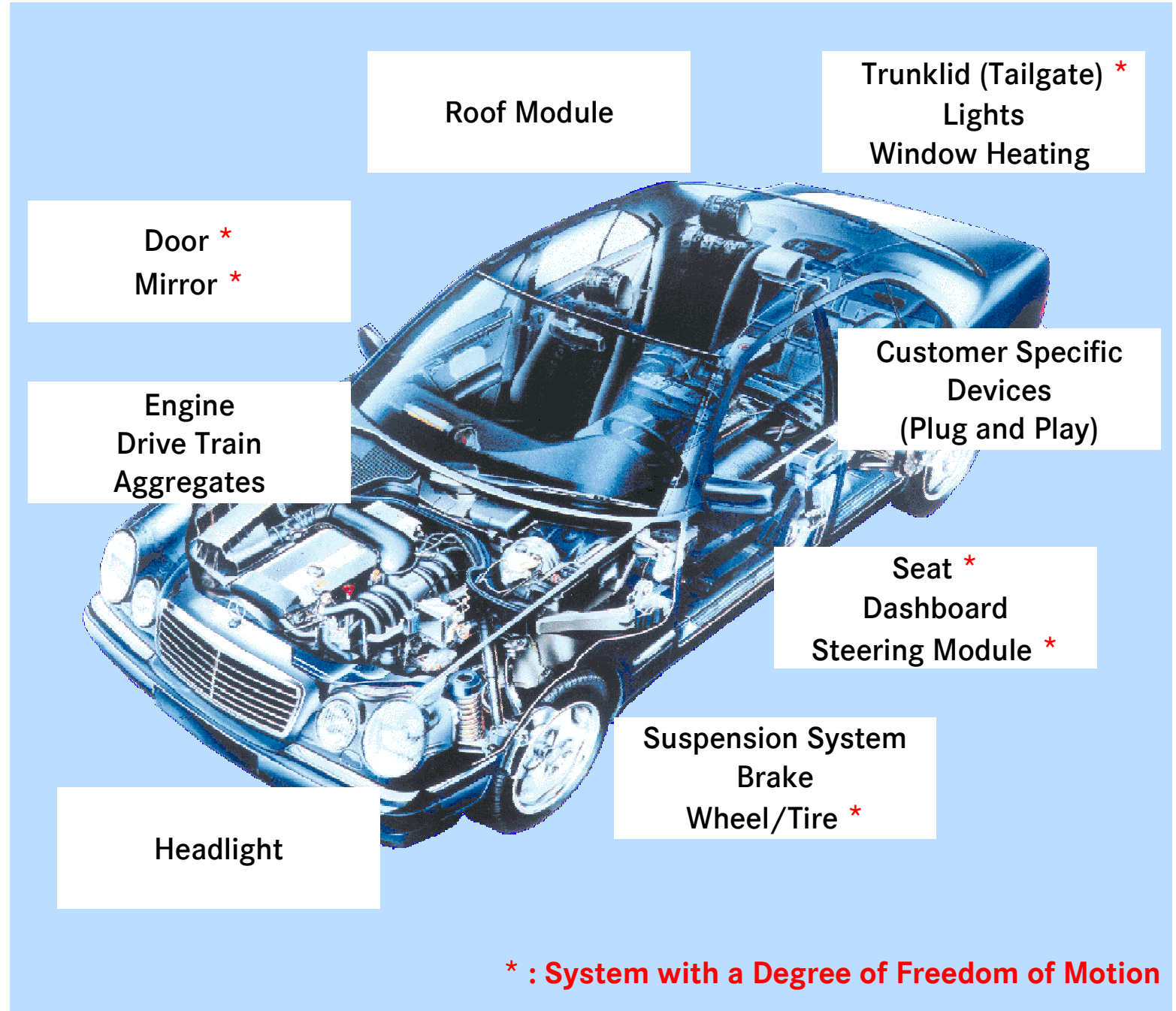
Goals

- Low Complexity of Wiring
- High Flexibility in Product Design
- Easy to Assemble and Easy to Service
- High Product Quality

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Potential Applications

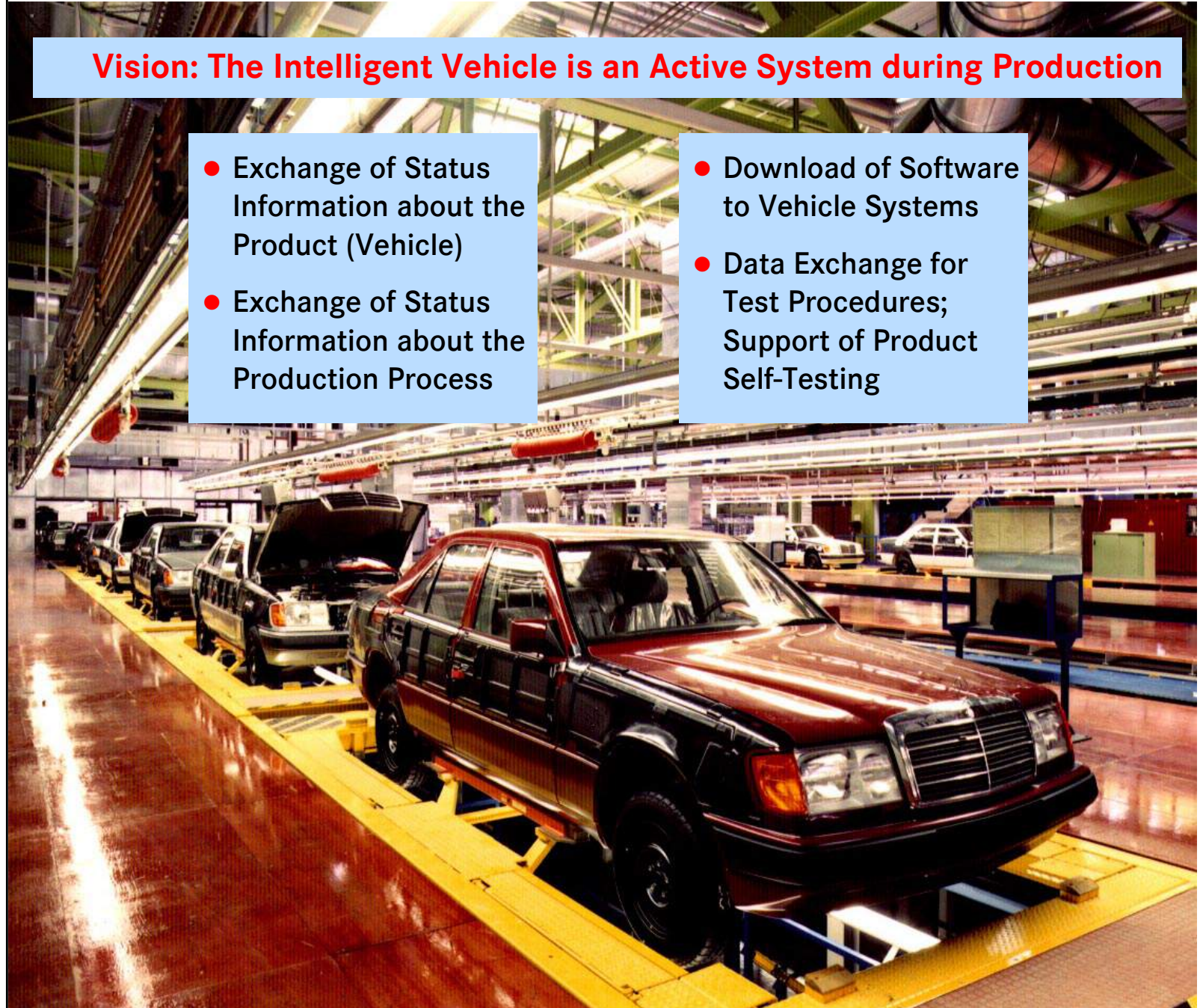
In-Vehicle
Communication



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Potential Applications

Communication during
Production Process

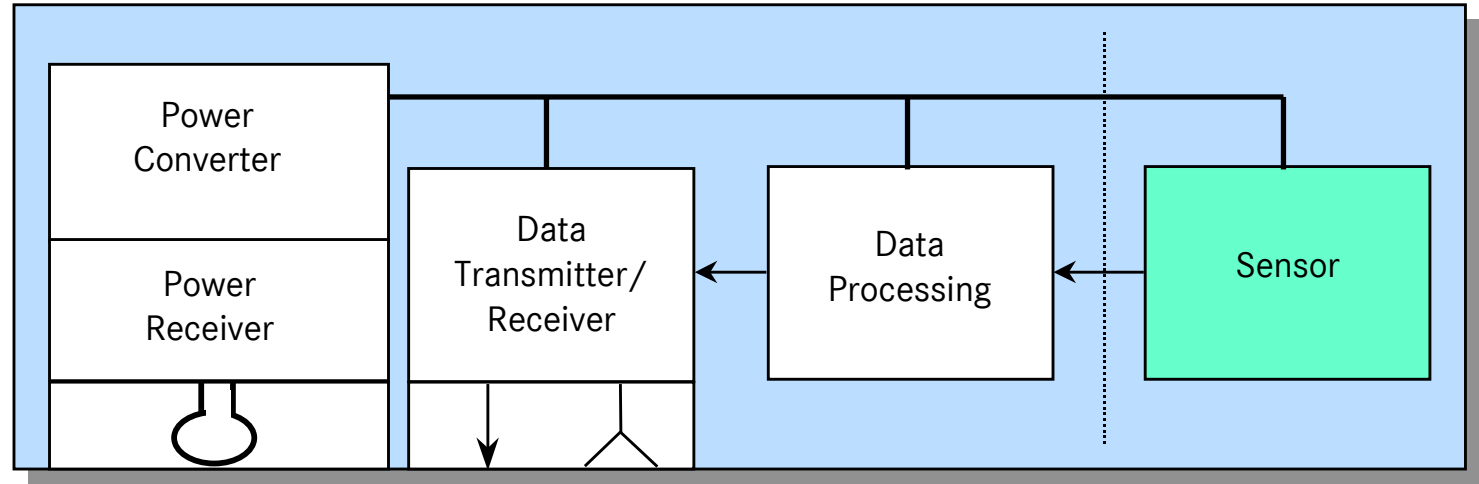


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Architecture of
Wireless Systems

Intelligent Sensor Unit
with Data and Power
Transmission

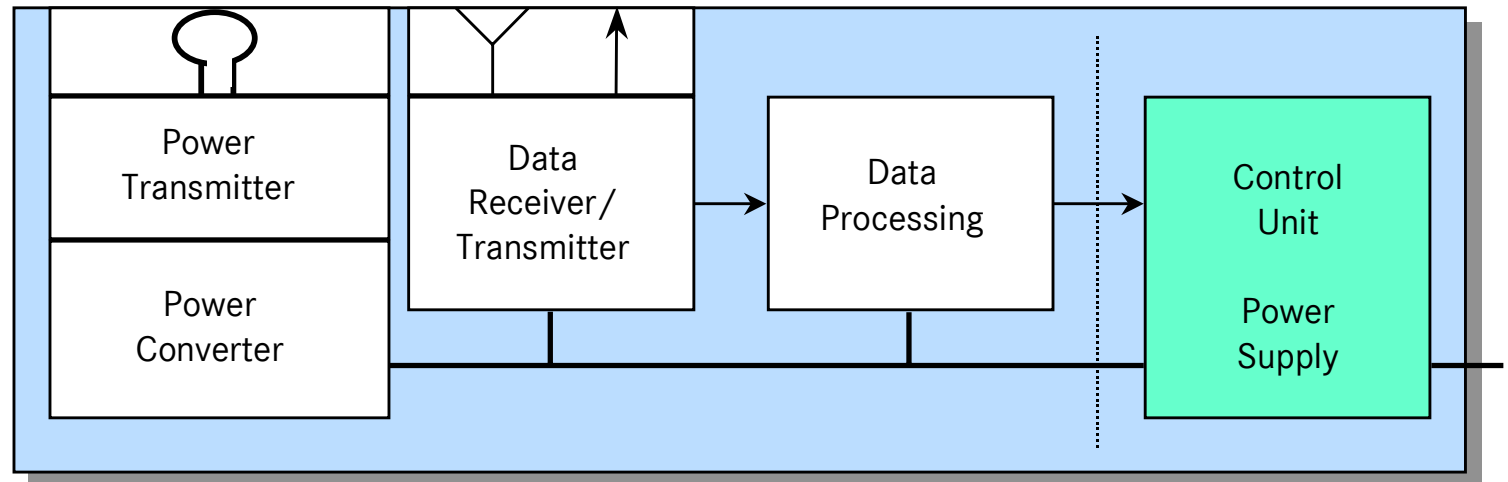
Wireless Sensor Unit



Transmission Path



Basic Unit



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Requirements

Operational Requirements

- Full Functionality and Reliability
- Operation with Several but a Limited Number of Units
- Real Time Communication: Short Data Packages and Short Response Time ($\approx 1\text{ms}$)
- Fully Reliable Communication: Data Security, Data Integrity, and Authentication
- Characteristics of Onboard Vehicle Power Supply
- Electromagnetic Compatibility (EMC)

Environmental Conditions

- Temperature Range (- 40°C - 85°C, up to max. 160°C)
- Humidity, Corrosion Resistance, Dirt
- Mechanical Vibrations

General

- Operation in a Limited Area or within Short Distances
- Compatibility with Materials and other Surrounding Parts (Reflection, Shadowing, Multipath Propagation)
- Low Volume, Low Weight
- Design to Cost; Free of Licence Fee
- Worldwide Certification

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Requirements for
Further Developments

BLUETOOTH Seems to be a Promising Technical Concept for Technical Tasks in Automotive Applications

Technical Modifications for Bluetooth

- Medium Access Control
- Hardware and Software Design:
Integration of Hardware and Software for Wireless Systems
(Radio Module, Communication Interface, Electrical/Electronic Device)
- Modified Standard for Technical Tasks:
Automotive Applications
(and additionally
Industrial Applications, Factory Automation)

Development and Business Processes

- Cooperation between all partners:
Supplier of Single Units: Radio Module, Communication Interface,
Controller, Sensor/Actuator, ...
System Supplier: Door, Seat, Dashboard, ...
Vehicle Manufacturer
- Business has to be Attractive for all Partners

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Potential Market

Market Figures for Wireless Systems/Bluetooth Nodes

- 1 BT Station per Vehicle: \approx 50 Million per Year
- BT for N Subsystems per Vehicle: \approx Nx50 Million per Year
- BT for Single Units in Vehicles: \approx 10xNx50 Million per Year

