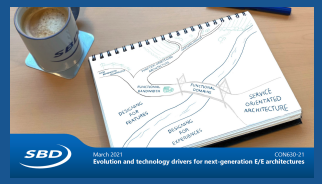

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RELATED SBD REPORTS

CON #536 Global Connected Car Forecast
An assessment of how fast the connected services market is expected to grow in each country, the role government, and the evolution of technology and services.

CON #526 Connected Services Guide
A landscape of the automotive OEM connected service market including types of services, delivery methods, business models and availability.

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CON #630

Evolution and technology drivers for next generation E/E architectures - 2021 Edition

E/E ARCHITECTURE DECISIONS MADE NOW WILL BE A VITAL PART OF MEETING THE AUTONOMOUS, CONNECTED AND MOBILITY EXPECTATIONS OF CONSUMERS 5-10 YEARS FROM NOW

From evolutionary decisions around domain controllers, hypervisors, OTA and gateways, to step-changes including Service-Orientated Architecture (SOA), Ethernet backbone and zonal architectures, OEMs face critical decisions on if, how and when to adopt these next generation technologies in their future models, both volume and premium.

To help explain the features, functions and attributes of emerging E/E architecture solutions, and how they relate to the entire CASE design space, SBD Automotive is creating this report to inform, clarify and support your strategic E/E decisions.

COVERAGE	FREQUENCY	PUBLICATION FORMAT	REPORT LENGTH
NA, CHINA, EUROPE, GLOBAL	ANNUALLY, QUARTERLY, ONE TIME	PDF, POWERPOINT, EXCEL, ONLINE	200+

Key features and benefits

- A well-planned, holistic approach to electrical and electronic architectures will increase vehicle safety, security and system usability, while also reducing costs to the manufacturer.
- Architecture decisions made now will be a vital part of meeting the autonomous, connected and mobility expectations of a consumer 5 years from now.
- Identify key players and better understand your position in the market.
- How does my electrical architecture, with its multi-year development and life, keep up with consumer expectations set by the far shorter consumer electronics lifecycle?
- Measure your company against a roadmap of future architecture adoption by OEM

This research is useful for

PRODUCT PLANNERS

USER EXPERIENCE

MARKETERS

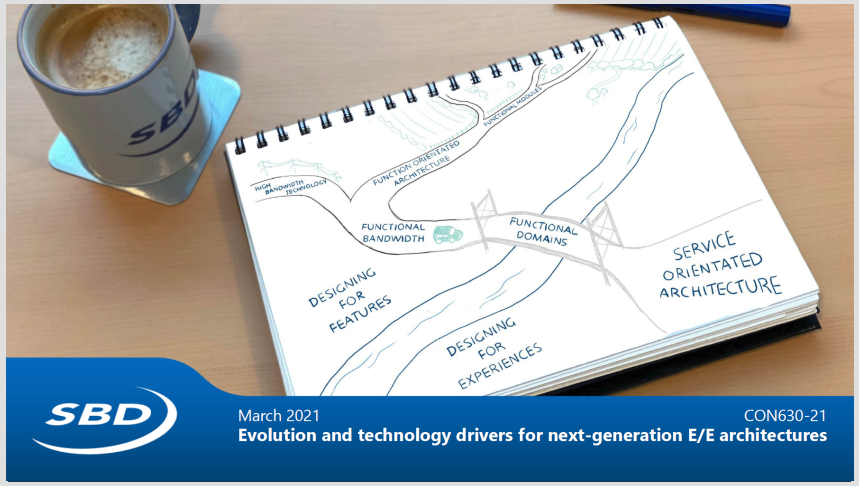
IT

ENGINEERS

What's covered

BRANDS INCLUDING:

Tesla
Audi
Fiat
Ford
Volkswagen
Hyundai
Land Rover
Jaguar
Nissan
Lexus
and many more



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Evolution and technology drivers for next-generation E/E architectures
- 2021 Edition -

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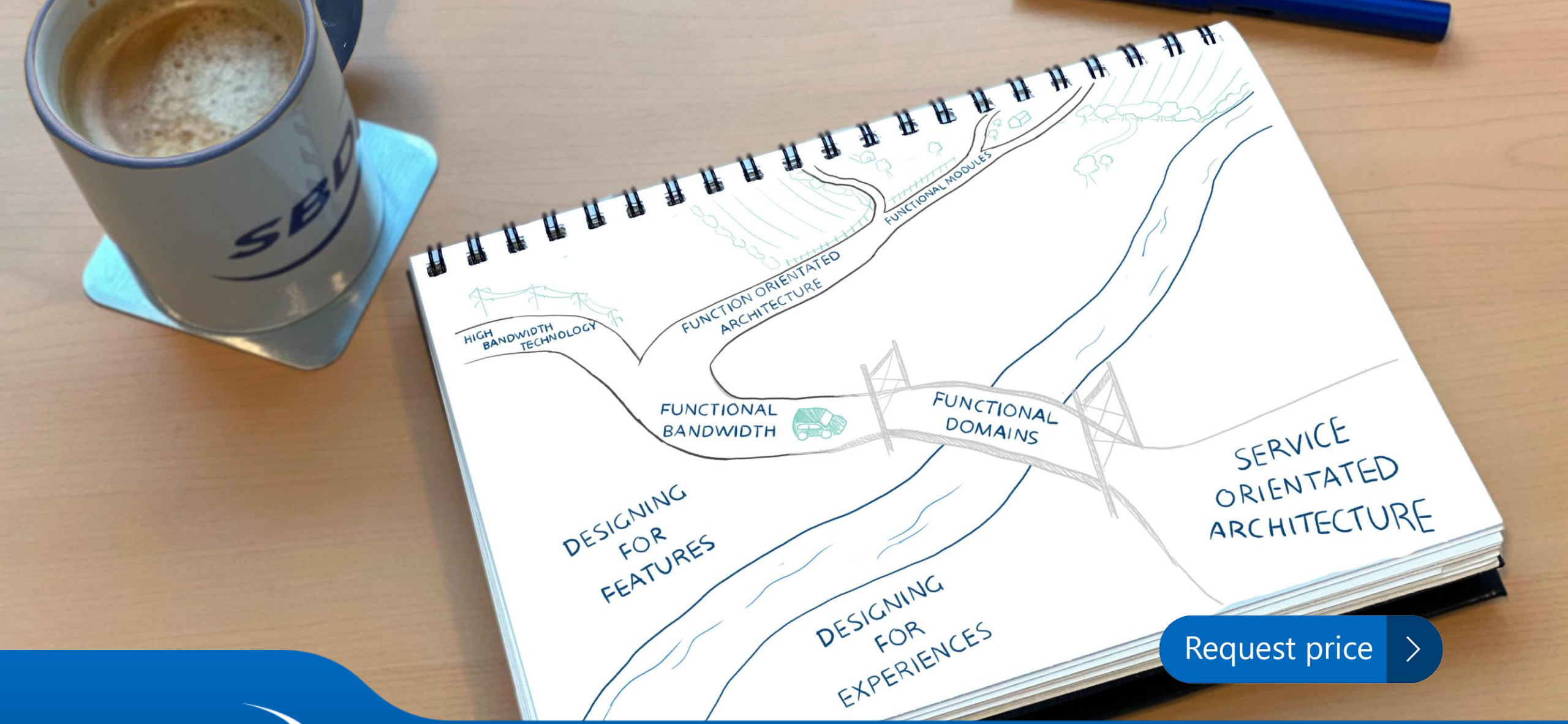

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March 2021

CON630-21

Evolution and technology drivers for next-generation E/E architectures

Introduction

A planned, holistic approach to electrical and electronic architectures will increase vehicle safety, security and system usability, while also reducing costs to the manufacturer. Decisions made now will be a vital part of meeting the autonomous, connected and mobility expectations of a consumer 5 years from now.

How do I make architectural decisions that allow me to deliver great experiences that can be added to year-on-year, without carrying inefficient utility and cost to every vehicle made?

How does my electrical architecture, with its multi-year development and life, keep up with consumer expectations set by the far shorter consumer electronics lifecycle?

There are solutions, such as **hypervisors, Ethernet domain controllers** and **service orientated architecture**, which are great options for flexibility, but only if they deliver your specific and unique customer requirements at the right price point. To help you understand the positives and negatives of the entire design space, and to make informed strategic decisions, SBD Automotive has created –

"Evolution and technology drivers for next-generation electrical and electronic architectures"

Mission statement

Analyze today's state of the art and outline the future roadmap of Electrical Architecture on its journey towards Service Orientation. To enable robust decision making for OEM and supplier future strategies.

Table of contents

What's new in the 2021 Edition?

Section:	Changes:
Executive Summary	• Updated: Key takeaways from the report • New: Volume & sale price comparison between generations of architypes • Updated: Status and forecast summaries from 2021 data

Part I:
Today's Landscape
	• New: Generalized architype: Centralized and Virtualized Function Domain
	• New: Additional models researched and categorized
	  • Audi A1
	  • Cadillac Escalade
	  • Ford Explorer
	  • Honda E
	  • Land Rover Defender
	  • Porsche Taycan
	  • VW ID.3

Part II:
Changing Technology
	• New: Additional technologies
	  • 10BASE T1S
	  • CAN XL

Part II: Changing Landscape	• Updated: Software Defined Car SBD Insight

Part III:
Future Technology
	• Updated: Future outlooks
	  • Upcoming releases
	• New: Future outlooks
	  • OEM
	  • Supplier

Part III: Future Landscape	• Updated: Forecast summaries from 2021 data

Example slides from the report

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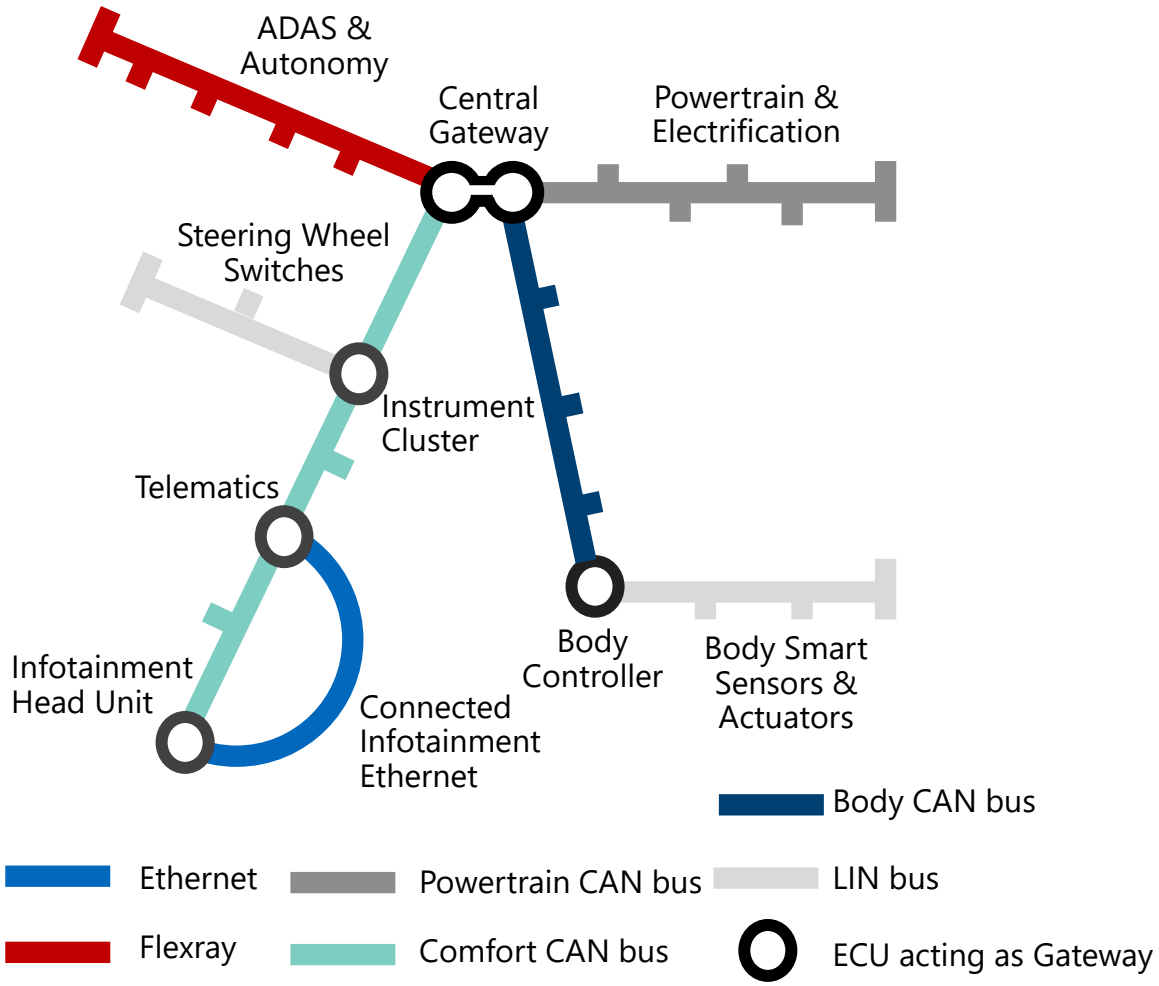
State of the Art The industry is ‘squeezing in more CASE’



Please Note: Flexray is shown as a ‘bus’. This is true at a communication layer but physically is built around a ‘star’ topology.

Example of a generalized architecture where high bandwidth technologies are added to provide specific functions

- Bandwidth has been added as over-lays onto to a CAN based Function Orientated Architecture - for example by replacing a Chassis CAN with Flexray, or by adding an Ethernet channel between two modules.
- Point-to-point Ethernet greatly increases the bandwidth for a specific use case.
- Flexray increases the bandwidth whilst keeping signals robust for safety critical experiences.

Increased bandwidth allows improved CASE experiences without redesigning the whole architecture.

C Ethernet passes **connectivity** for connected infotainment of over-the-air updates to key modules

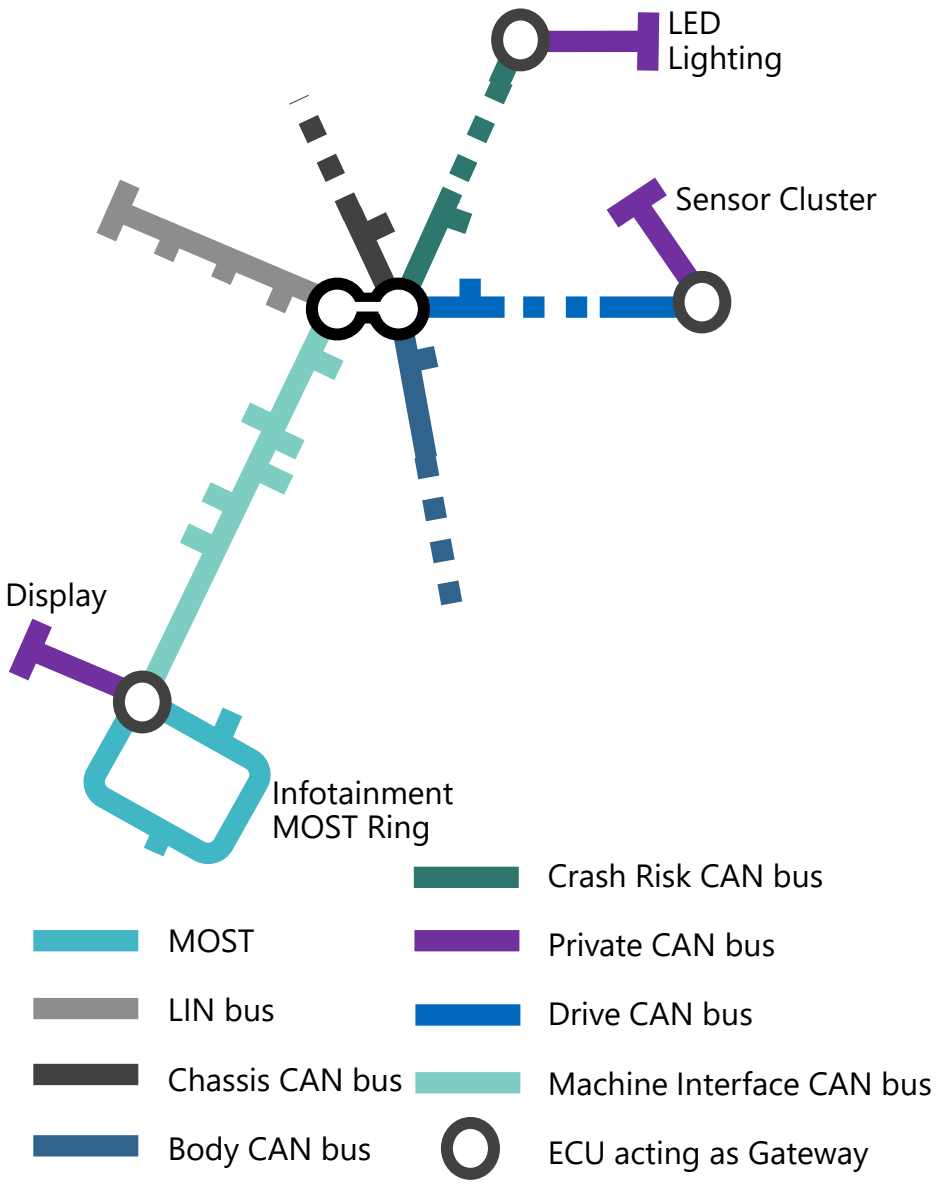
A Flexray allows **autonomy** experiences in today’s state of the art to be delivered.

S **Shared** mobility features can interact with more domains within the architecture.

E Integrates **electrified** experiences with remote user interfaces, and terrain information to improve range.

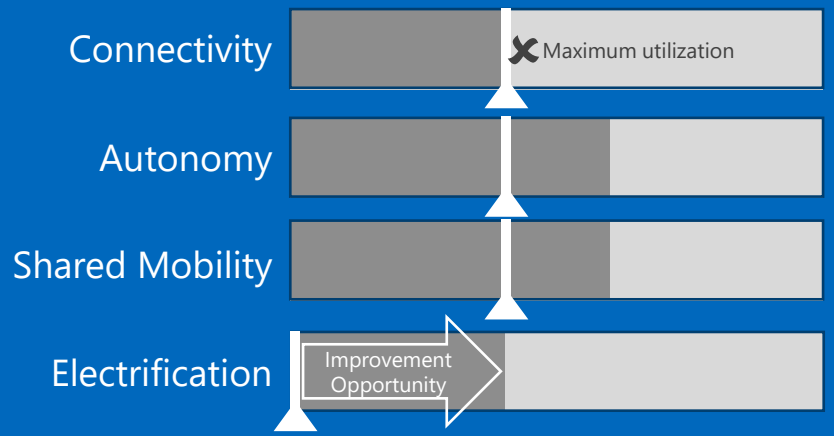
‘Gateway with fiber-infotainment’ Case Studies

- Functional Modules
- Function Orientated Architecture
- Functional Bandwidth
- Functional Domains
- Service Orientated Architecture



718 Boxster
Use of private CAN buses

With 6 functional networks linked to the gateway modules, bandwidth is optimized by being localized to the function where possible. Private sub-networks are used to add specific functionality



- The MOST ring is used exclusively for the audio amplifier and the screen is able to be controlled via a sub-CAN network
- Sensors on a Drive sub-bus allow processed sensor data to be serviced to the bus and be used by multiple functions
- With the quantity of functional buses, it is expected that additional autonomy functionality could be added to the vehicle, but Ethernet would be required to improve connectivity

Future Outlook Linux

Automotive Grade Linux

Technology is of note for many reasons. As Linux offers software virtualization via containers, the ability to host functionally critical services would be a large enabler

- Functional Bandwidth
- **Functional Domains**
- Service Orientated Architecture

Viewpoint

A collaborative project to develop and adopt a fully open source stack based upon the Linux operating system.

Linux is widely adopted for select functions but has been avoided for the hosting of software which is part of a Functional Safety rated system.

A specific opportunity for Linux is its use of Containers to virtualize software from its hardware. Alternative methods such as hypervisors duplicate the entire operating system for each virtual machine, whereas Containers are far more efficient in just duplicating key software modules and interfaces.

See also... Containers are an efficient software virtualization method

Analysis of the implications

What & where?	Opportunity to increase the use of Linux more broadly than the lower risk functionality of a vehicle
Connect	
Physicals	
Lifecycle	Linux opens up a wealth of standard tools which can be used to greatly decrease the time to launch of new systems and extend the lifecycle of existing components
Secure & Robust	Open source software increases the level of use of software and therefore the quality, but also opens up to new risks requiring a new strategy to considering robustness and security
Commercial & Legal	

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