TABLE OF CONTENTS

RELATED SBD REPORTS

403 – Software-Defined Vehicle: Organization & Strategies

In this report, SBD Automotive's experts map out the strategies used to incorporate software-defined vehicles into new vehicle line-ups. Here, it understands how key industry players are organizing themselves as they prepare for SDV development, while identifying the products, services, and business models being pursued by stakeholders today. It likewise highlights the challenges and constraints of SDV development from an organizational perspective.

CON

Connected & Autonomous

#402

Software-Defined Vehicle Forecast

As the presence of advanced hardware and software increases in today's vehicles, the advent of the software-defined vehicle continues to draw closer. Not only is this notable in the uptake of innovative technologies by premium and mass-market OEMs, but also through the newer brands, players, and start-ups announcing vehicles built around such technologies, as well as software-centric features and services.

The market for these new features is ultimately reliant on the correlation between the vehicle's E/E architecture and the platforms adopted from its ecosystem. As such, it is important that any OEM, brand, or start-up looking to develop an SDV has strong strategies for each of these areas that can, together, evolve dynamically.

SBD Automotive's Software-Defined Vehicle Forecast provides a grounded assessment of the growth enabling SDV technologies in different regions and segments. The ten-year forecast works to understand how major OEM groups will deploy future E/E architecture elements, in addition to assessing how these elements are expected to evolve. An adjacent Excel version offers detailed, data-driven, analysis sorted by brand and country.

COVERAGE

GLOBAL NA CHINA EUROPE

FREQUENCY

ANNUALLY QUARTERLY ONE-OFF

PUBLICATION FORMAT

PDF POWERPOINT EXCEL ONLINE

PAGES

83

Request price

Key questions answered

- What is the expected evolution of SDV-specific enablers and technologies?
- How will OEM strategies and choices impact the pace of SDV adoption and 10-year volume impact?
- How will trends and SDV adoption vary by region?
- What are the implications for automotive OEMs and suppliers with the transition to the SDVs?
- What role will legacy systems play and how long will these platforms be supported?

This research supports

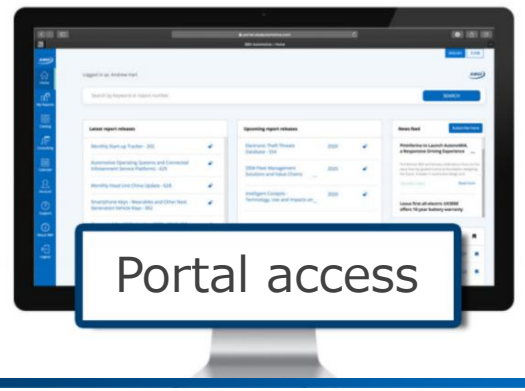
- Product Planners
- C-Suite
- IT
- Engineering

Do I have access?

100+
Reports published per year

50k+
Slides of insights, forecasts & data

4,000+
# of auto professionals who access our reports



Request a quote for

Software-Defined Vehicle Forecast
Annual Report for 2023

Request price

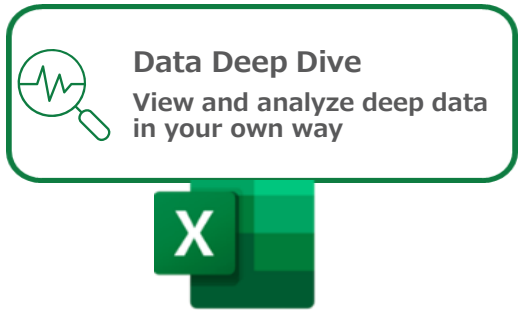
SBD

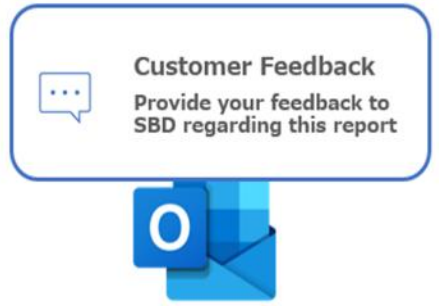
402

Software-Defined Vehicle Forecast

Contents Page

402 - Software Defined Vehicle Forecast





Total number of pages - 83

Introduction

Chapter Introduction

With more complexity in the industry coming from changing customer preferences and uncertainty, automotive OEMs are increasingly on alert regarding all that is happening, and new solutions are being approached. This becomes notable through a continued uptake in more innovative technologies as well as the reshaping of strategies and partnerships aimed at developing E/E architectures, software and achieve SDV.

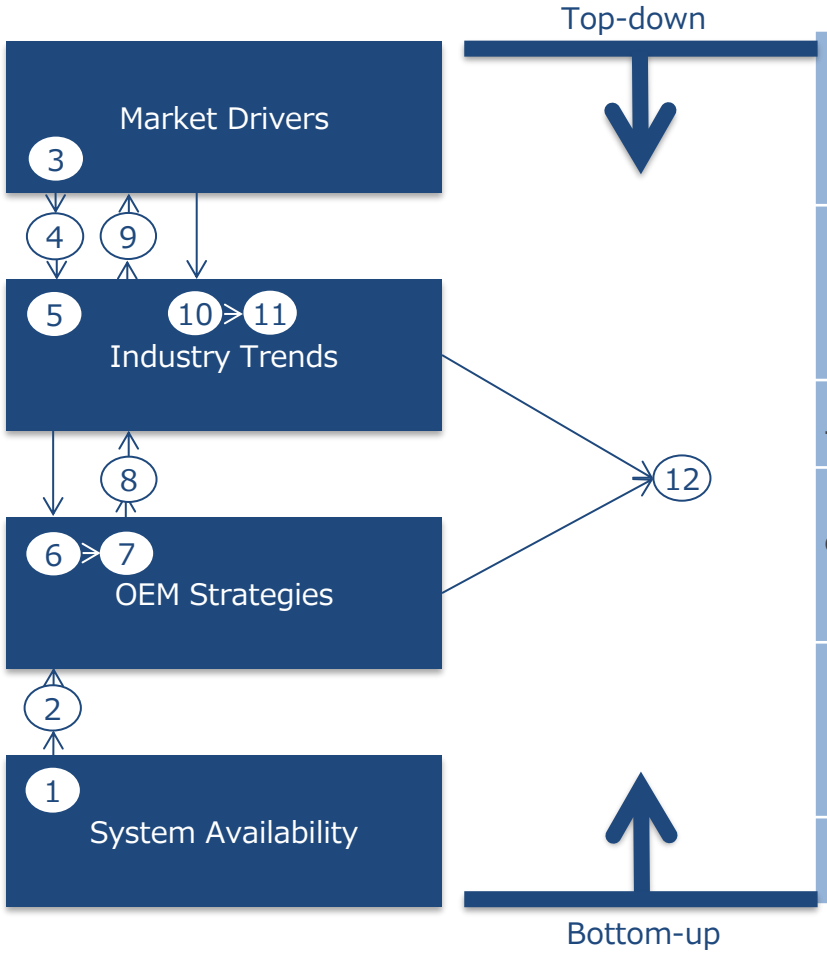
The stronger focus on software solutions remains reliant on the correlation between the vehicle's E/E architecture and the platforms adopted and the need for them to evolve dynamically while decoupled and able to accommodate solutions that have not been introduced yet.

SBD Automotive's Software-Defined Vehicle Forecast provides a grounded assessment of the growth enabling architectures in different regions and segments. The ten-year forecast works to understand how major OEM groups will deploy future E/E architecture elements, in addition to assessing how these elements are expected to evolve. An adjacent Excel version offers detailed, data-driven, analysis sorted by brand, platform and country.

SBD Automotive's **SDV Forecast** highlights the trends in the market as it moves toward state-of-the-art E/E designs, OEM strategies, considering the **5 key outcomes of the Software Defined Vehicle**

Section	Content
Birds Eye View	An overview of the key findings from SBD's various Software Defined Vehicle, and adjacent reports
Executive Summary	Presents key highlights and conclusions from the report.
The Basics	What do you need to know about Software Defined Vehicles?
Analysis	Analysis of five key trends identified in the forecast, including the SBD's view of potential solutions
Summary Tables	Overview of each OEM's offerings in terms of architypes, and their lead platforms today, in five years, and in ten years
Future Outlook	Four OEM personas are considered against drivers and barriers into the future to understand when SDV benefits will be realized in OEM organizations
Next Steps	Can SBD help you with any unanswered questions?

Forecast Methodology



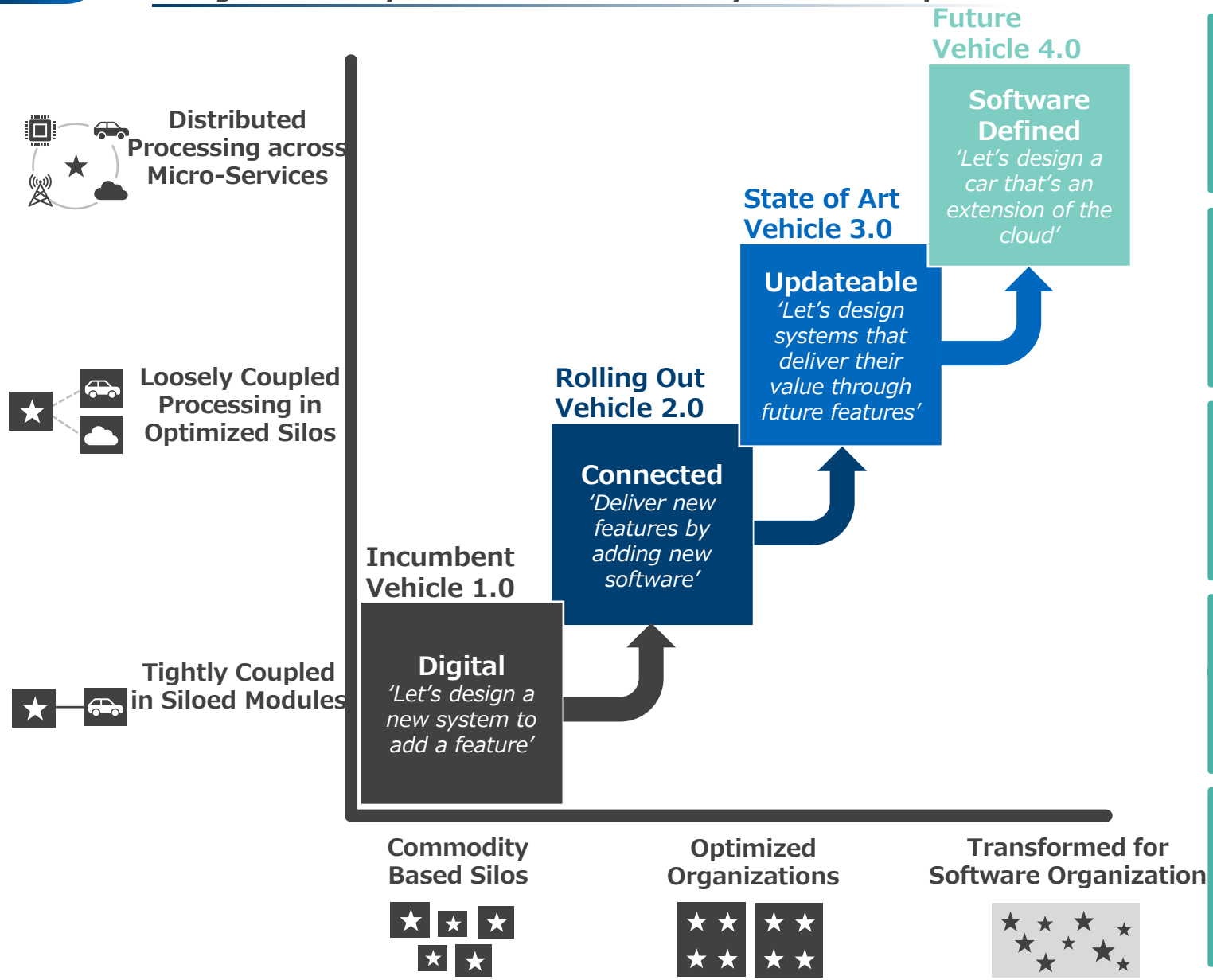
Bottom-up Phase	**Step 1:** A database of model-level architectures is created using data from the SBD's EE Guide.
	Step 2: The sales volume (Global data) of each model is overlaid
Top-down Phase	**Step 3:** Top-level market drivers and major triggers for change are considered, leveraging SBD's Cockpit Forecast and ADAS L0-L3 Forecast
	Step 4: A top-down forecast is created using Step 2 and Step 3 results as starting-points
Industry Trends Phase	**Step 5:** Using Step 4 a top-level roadmap is created
OEM Strategy Phase	**Step 6:** OEM-by-OEM strategy is created using results from Step 1 and 5
	Step 7: OEM strategy is converted into estimations using Step 2 as a starting point, and relying on platform data.
Cross-Check Phase	**Step 8:** Results from Step 7 are aggregated into industry-level forecast
	Step 9: The forecast from Step 8 (bottom-up) is then compared to the Step 4 forecast (top-down)
Aggregation Phase	**Step 10:** Breakdown Step 8 forecast into sub-levels using Step 1 and Step 5 as starting points

GlobalData. Global Data provide vehicle sales volumes, both historical and forecasted, that forms the basis of our volume forecasts, with which we overlay our detailed feature and technology level forecasts and industry expertise

Example slides from the report

Request price

A journey towards truly decoupled / seamless SDVs



Vehicle 4.0 Benefit 1 — **Pace & Agility**

Meeting fast-changing demand through agile and continuous software delivery

Vehicle 4.0 Benefit 2 — **New Experiences**

Tailored experiences through continuous software updates

Vehicle 4.0 Benefit 3 — **Owning Own IP**

Increasing the desire for ownership of selected IP on vehicles

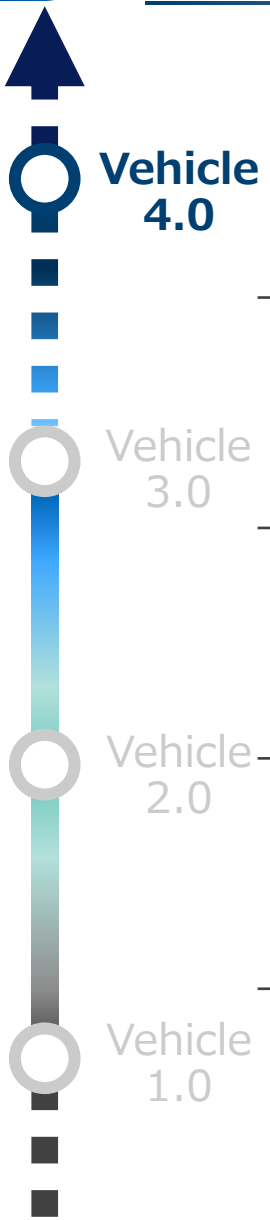
Vehicle 4.0 Benefit 4 — **Simplifying Complexity**

Decoupling and commoditization of systems and organization

Vehicle 4.0 Benefit 5 — **Revenue Flexibility**

Opening up revenue streams for the OEM and accelerating utilization after the vehicle purchase

Vehicle 4.0 – Software Defined Vehicles



1	**SDVs will allow software to be designed, developed, and tested independently of the vehicle's hardware**	• **Coupling** is the level to which software is written for a specific solution • **Hardware abstraction** describes the system architecture which allows the software to run with little to no coupling with the underlying hardware • **Updateability** is one of the most important benefits of abstraction
2	**SDVs will require multiple layers of hardware and software across different domains in order to implement this separation**	• **Middleware** implements the services which separate hardware-specific functionality from higher-level software • **High-performance computers (HPCs)** in vehicles offer significant computing resources which allow virtualization, containerization, and middleware to support software applications
3	**SDVs will allow OEMs to dynamically implement new business models & customer experiences much faster than before**	• **Vehicle 3.0 (Updateable)** represents the state-of-the-art for some OEMs • **Vehicle 4.0 (Software-Defined)** requires further enhancement of cloud integration, connectivity, and continuous integration toolsets/processes
4	**SDVs will create significant disruption in the traditional automotive electronics supply chain while creating new "blue oceans"**	• **Tier 1 suppliers** are threatened by ECU consolidation and OEM internal development trends but have platform & partnership opportunities elsewhere • **Software, service, and cloud providers** all play important roles in SDV delivery
5	**Much of the core SDV software stack will be non-differentiating, making standards & open-source software attractive to OEMs**	• **Adaptive AUTOSAR** enjoys widespread development and adoption as a "middleware" platform, particularly for ADAS/AV systems • **Apollo and Autoware** offer open-source autonomous driving software components & platforms, best implemented with SDVs

Strategies and challenges with changing trends

Overview

Today, only around 20% of owners pay for in-vehicle connected services. As the SDV and software development investments increase OEMs' struggle to increase margins. Different approaches for efficiency or better value proposition can drive improved results in coming years.

Outsourcing and Risk Mitigation

- Renault has recently announced it is strengthening its partnership with Google aimed at SDV development and building on Android Automotive and Google Cloud technology. The choice ensures a reduction in R&D investment, thus improving efficiency, as well as flexibility and reduction in development lead times while giving up some control over the software experience. This could prove the right choice giving Renault access to continually updated state-of-the-art software.
- Stellantis ensures not just hardware efficient development, but also software (which is maintained in-house by several OEMs), through diverse partnerships with industry leaders such as Qualcomm on one side and Blackberry and AWS on the other.
- GM reduced its in-house R&D efforts and investment in order to speed up the development of its Ultifi software platform through partnerships with companies such as Red Hat leveraging its open-source operating system.

Organization Consolidation

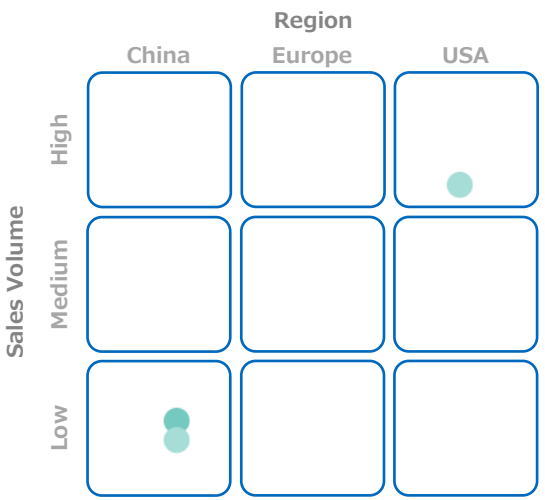
- Tesla maintains its consolidated organization development for both software and vehicle architecture. Most of the development is completed in-house for software and key hardware components. This consolidation and a unique platform allowed Tesla the highest control on its offering and a leader positioning in OTA updates.
- Ford has reorganized its structure around three units called, Ford Pro, Ford Blue, and Ford E with the latter focusing on EVs product portfolio and most of the software engineering development.
- VW is one of the first volume OEMs that consolidated its organization for SDV development, particularly for software through its subsidiary CARIAD. While HPCs are supplied by Tier 1s, most of the software is developed in-house. The Group met significant challenges in delivering value through this organization's software development and new partnerships have been established to move forward with in-house software.

Architecture & Software Efficiency

- Rivian's updated architecture while still premium, reduces costs significantly through ECUs consolidation and combining two together into a single module allowing for a reduction in wiring and liquid cooling. Also, its Connect+ subscription program redefines paid subscription services by including a range rather than hygiene ones included as standard creating more value with a combination of personalized features.
- Through its collaboration with XPeng, VW is introducing the new China Electrical Architecture for vehicles sold in the Chinese market. This is said to improve efficiency by reducing ECUs by 30%, with 3 zonal controllers and a central computer, and also allowing faster and more efficient expansion of digital services by allowing easier OTA updates.
- BMW's Neue Klasse coming in 2025 makes the architecture more efficient some removing ECUs, in favor of two HPCs and zonal domain controllers based on ethernet network and 10Base-T1S replacing CAN.

General Motors Group

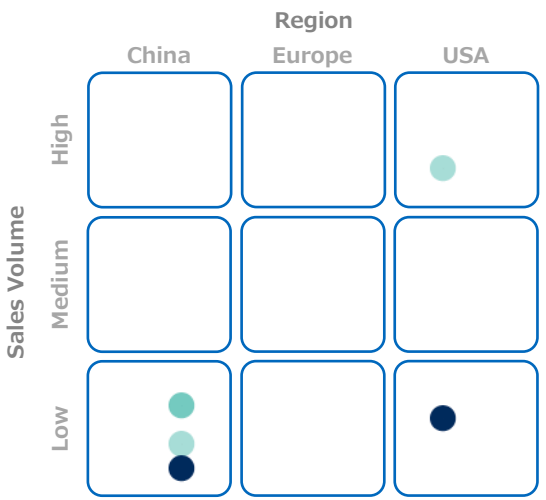
Current Architecture Spread



Summary Table

Architype	%
Veh 2.0 – Basic Ethernet	14
Veh 2.0 – Ethernet Bus	86

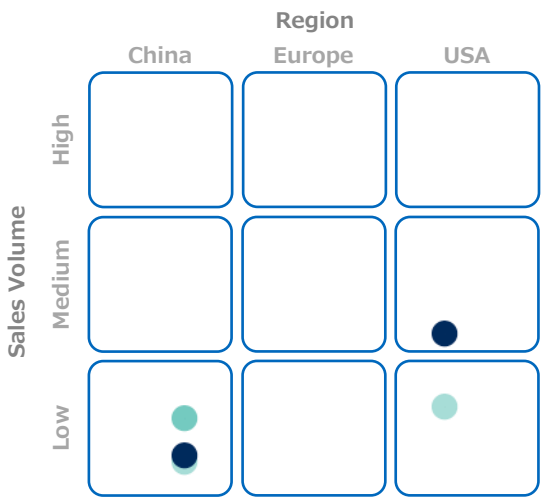
2029 Architecture Spread



Summary Table

Architype	%
Veh 2.0 – Basic Ethernet	15
Veh 2.0 – Ethernet Bus	73
Veh 3.0 - Functional Domain Controllers on Backbone	13

2034 Architecture Spread



Summary Table

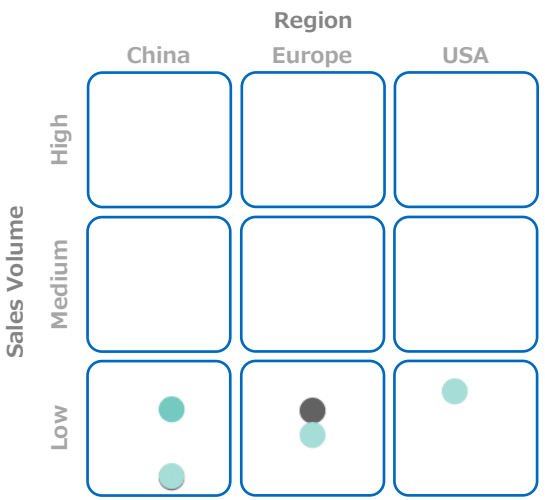
Architype	%
Veh 2.0 – Basic Ethernet	19
Veh 2.0 – Ethernet Bus	29
Veh 3.0 - Functional Domain Controllers on Backbone	52

Future Strategy

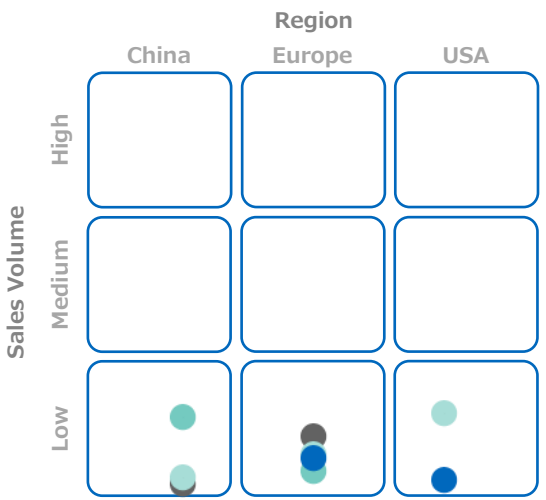
- GM is developing a “Ultifi” SW platform that is based on the open-source Linux OS that allows OTA updates and to manage different hardware sets with single software platform.
- Along with improved OTA capabilities Ultifi is also being developed to create a services ecosystem.
- GM focused its software engineering development on SuperCruise and OnStar.
- While continuing the development and investment in most aspects, GM has recently shut down its Cruise operation aimed at the development of autonomous driving and robotaxi project.
- Targeting electric vehicle sales of 50% of global sales volume by 2030.

Renault-Nissan-Mitsubishi

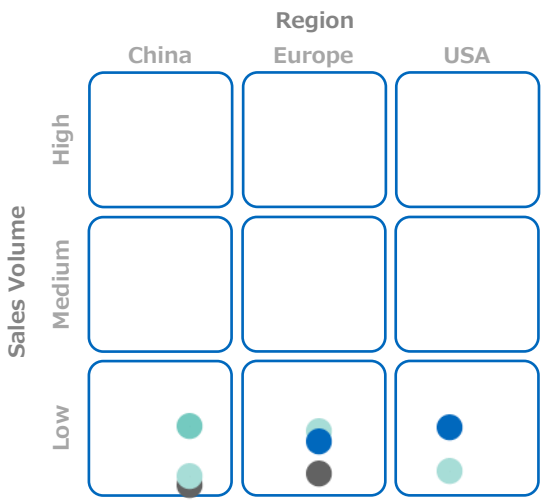
Current Architecture Spread



2029 Architecture Spread



2034 Architecture Spread



Future Strategy

- The Renault-Nissan-Mitsubishi alliance continues the Alliance 2030 – Road to 2030 plan which includes the development of centralized E/E architectures shared with all the brands reaching up to 80% of the models released.
- Renault expected to push the SDV-related research and investment with its overall 4-year strategy Renaulution including several objectives among which is the development of central compute and supporting architecture for SDV.
- Nissan too maintains its Ambition 2030 plan aimed at strengthening its EV market positioning and offer, connectivity, battery technology, and autonomy.
- Both Nissan and Renault are planning the use of LIDAR in upcoming models.

Summary Table

Architype	%
Veh 1.0 – Gateway	28
Veh 2.0 - Ethernet Bus	44
Veh 2.0 – Basic Ethernet	28

Summary Table

Architype	%
Veh 1.0 – Gateway	18
Veh 2.0 - Ethernet Bus	30
Veh 2.0 – Basic Ethernet	40
Veh 3.0 – Centralized Computing	12

Summary Table

Architype	%
Veh 1.0 – Gateway	5
Veh 2.0 - Ethernet Bus	31
Veh 2.0 – Basic Ethernet	24
Veh 3.0 – Centralized Computing	40

Focusing on value for customer and regional habits

SDV Veh 4.0 Outcome 2 — New Experiences

Tailored experiences through continuous software updates

	2025	2026	2027	2028	2029
Established Premium Medium Volumes High Margins High Legacy	Improvement of built-in app stores in infotainment	Services bundles with focus on entertainment improving personalization and offering more value for subscription services			Premium groups likely to establish partnerships with a range of 3rd party providers to effectively promote subscriptions and increase revenues from FaaS
Disrupter Through start-up or resetting for BEV have leapt straight to Vehicle 3.0 but some struggle to deliver the full value	Maintaining their status by adopting new solutions tailored initially to their specific domestic market				3rd party content complemented by innovative solutions that helped these groups distinguish themselves from the rest
High Volume High Volumes Low Margins High Legacy	Potential risks on defining the appropriate balance between features and cost-efficiency	Feedback loop from the frontline workers and data from both private vehicles and fleets into R&D			Reduced offering compared to premium OEMs, and increased focus on more hygiene features becoming standard. Gradually increasing partnerships with 3rd party providers
Chinese New Entrant High Volumes Medium Margins High Legacy	Focus on domestic market's preferences to establish a unique experience				Tailored experiences with strong regional bias

Outcome | Barriers | Solutions

Request the price

Request price

Contact SBD Automotive

Do you have any questions?

If you have any questions or feedback about this research report or SBD Automotive's consulting services, you can email us at info@sbdautomotive.com or discuss with your local account manager below.

info@sbdautomotive.com

Book a meeting

USA | UK | Germany | India | China | Japan

Garren Carr
North America
garrencarr@sbdautomotive.com
+1 734 619 7969

Luigi Bisbiglia
UK, South & West Europe
luigibisbiglia@sbdautomotive.com
+44 1908 305102

SBD China Sales Team
China
salesChina@sbdautomotive.com
+86 18516653761

Andrea Sroczynski
Germany, North & East Europe
andreasroczynski@sbdautomotive.com
+49 211 9753153-1

SBD Japan Sales Team
Japan, South Korea & Australia
postbox@sbdautomotive.com
+81 52 253 6201