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**211 – Disruptor OEM Guide**

This report thoroughly profiles new and emerging automakers from around the world and highlights the maturity of their technology, business models, and partnerships, selecting which ones have the greatest potential to impact automotive industry over the coming years.

Enabling
CASE

#212

Tech Giants Roadmap in Automotive

To date, tech giants like Google, Amazon, Apple, Baidu, and Alibaba have assisted the IVI, connected, and autonomous strategies of major OEMs around the world. In many cases, these companies have developed systems intended for a broad range of vehicles and multiple vehicle segments – one example being the adoption of smartphone mirroring systems as a common infotainment feature in many vehicles across different segments and regions.

However, as their ecosystems of automotive-focused technologies, systems, and features continues to evolve – tech giants today are considering opportunities to expand their presence further and become a direct competitor. Some tech giants have already begun this journey by investing into, or acquiring, automotive companies, hiring industry talent, and announcing new subsidiaries dedicated to investigating and testing new automotive solutions.

This report outlines the role of tech giants in automotive while tracking their strategies across several industry sectors. It details what products, services, and technologies they provide for the industry today while assessing how equipped they are for expansion. Each giant is profiled thoroughly alongside the partnerships they share with OEMs and other key industry players today. Individual releases for Europe, China, and the U.S. understand how these relationships and offerings can vary by region.

COVERAGE



GLOBAL



NA



CHINA



EUROPE

FREQUENCY



ANNUALLY



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ONE-OFF

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Key questions answered

- > What offerings do tech giants already have within the automotive sector?
- > What capabilities do tech giants have that could position them strongly for future expansion?
- > What relationships do tech giants already have with different car makers and what do they support as part of those contracts?
- > Which tech giants are more likely to play a collaborative vs competitive role to traditional car makers?

This research supports



PRODUCT PLANNERS



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STRATEGY



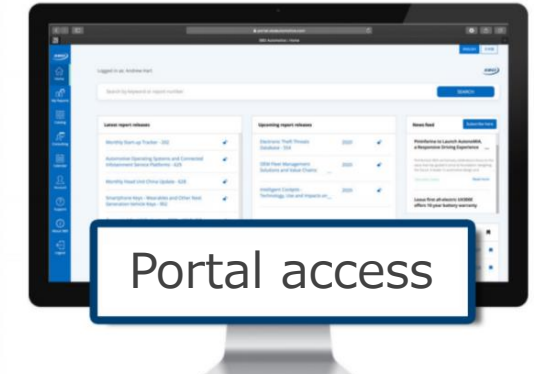
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TECH GIANTS ROADMAP IN AUTOMOTIVE
A data-driven analysis of the tech-enabled value chain of the future

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September 2023

TECH GIANTS IN AUTOMOTIVE GUIDE

A data-driven analysis of the tech-enabled value chain of the future



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- Tech Giants diverse automotive patent concepts
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- Apple
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- Google
- Microsoft
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- Alibaba
- Tencent
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- Motivational factors for tech giants
- *How?* Tech Giants looking to deliver their strategy
- Tech Giants' capabilities are growing
- *What?* Tech Giants' have in for the automotive industry
- Tech Giants flexible offerings to automakers
- *Which?* Tech Giant is building more partnership

Example slides from the report



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Who are tech giants?



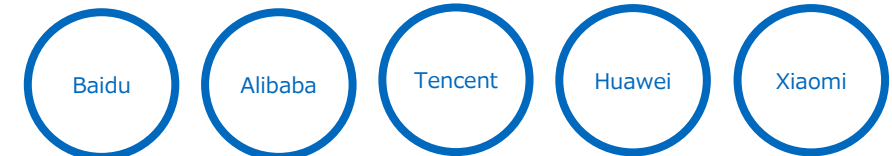
FAANG

- Coined by CNBC's Jim Cramer, FAANG represents the core American tech giants – also commonly referred to the big four or GAFA with the more recent addition of Netflix.
- Some believe that the dominance of FAANG to be anti-competitive given their market share, their stretching impact and broad eco-systems delivering value through their scale.



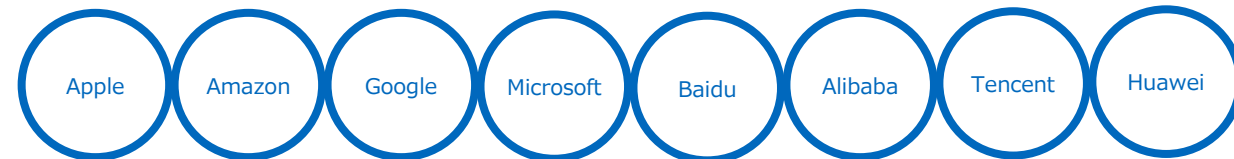
Editor's pick of a noteworthy other

Microsoft is a tech giant of the highest order but pursues a much different corporate strategy than FAANG companies, focusing on product & subscription monetization less than data and retail-driven revenues



BATH-X

- BATH represent four giants from the China market.
- Their scale may be smaller than FAANG, but they have dominance within China, and a presence outside of China
- Recently Xiaomi has been added by many to form BATH-X

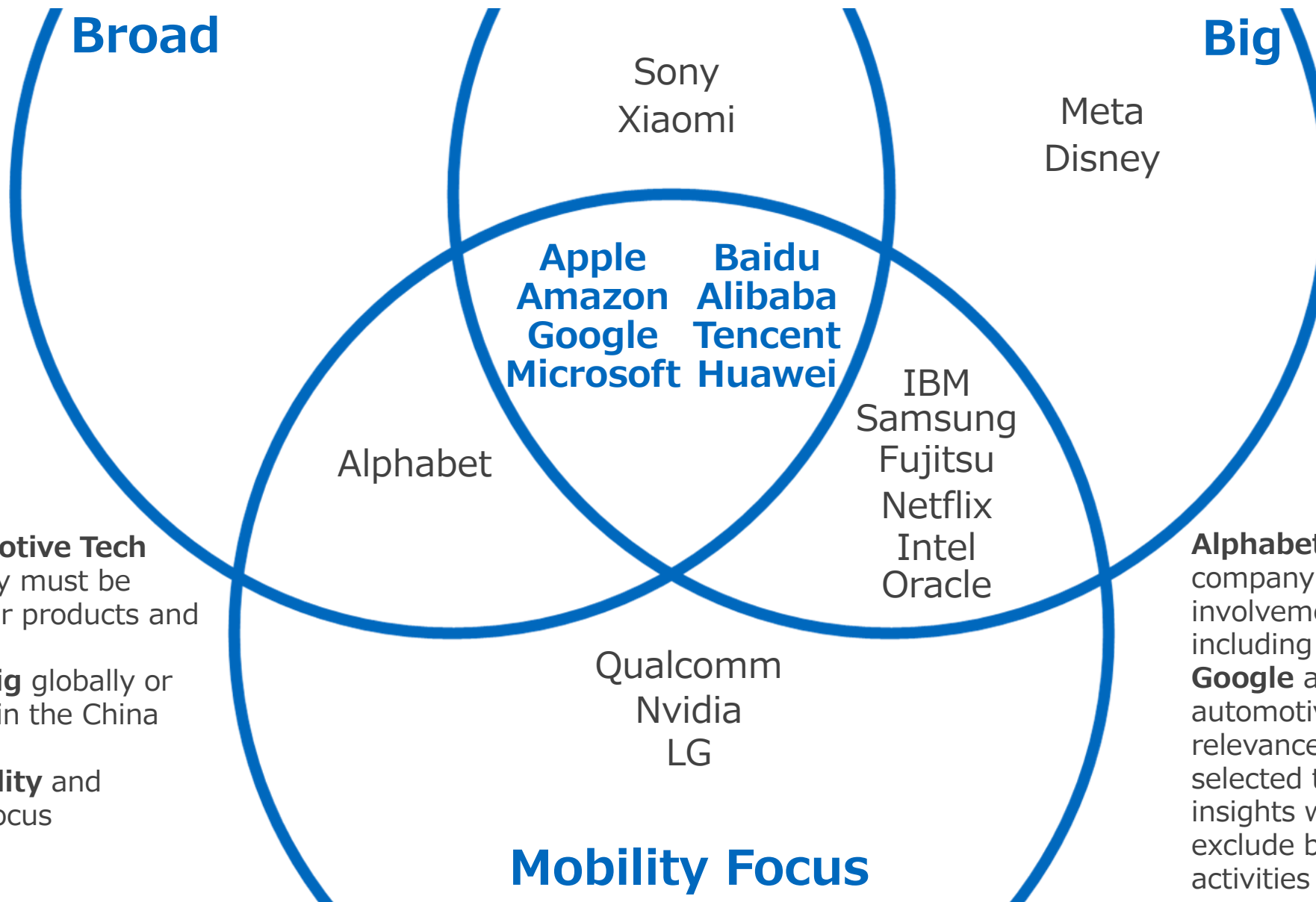


SBD's Tech Giants in Automotive

- Eight tech companies focused on this report.
- We are excluding Meta, and Xiaomi, and have decided to focus on Google.
- See the next slide for our decision criteria that led to this decision.



Choosing the Automotive Tech Giants



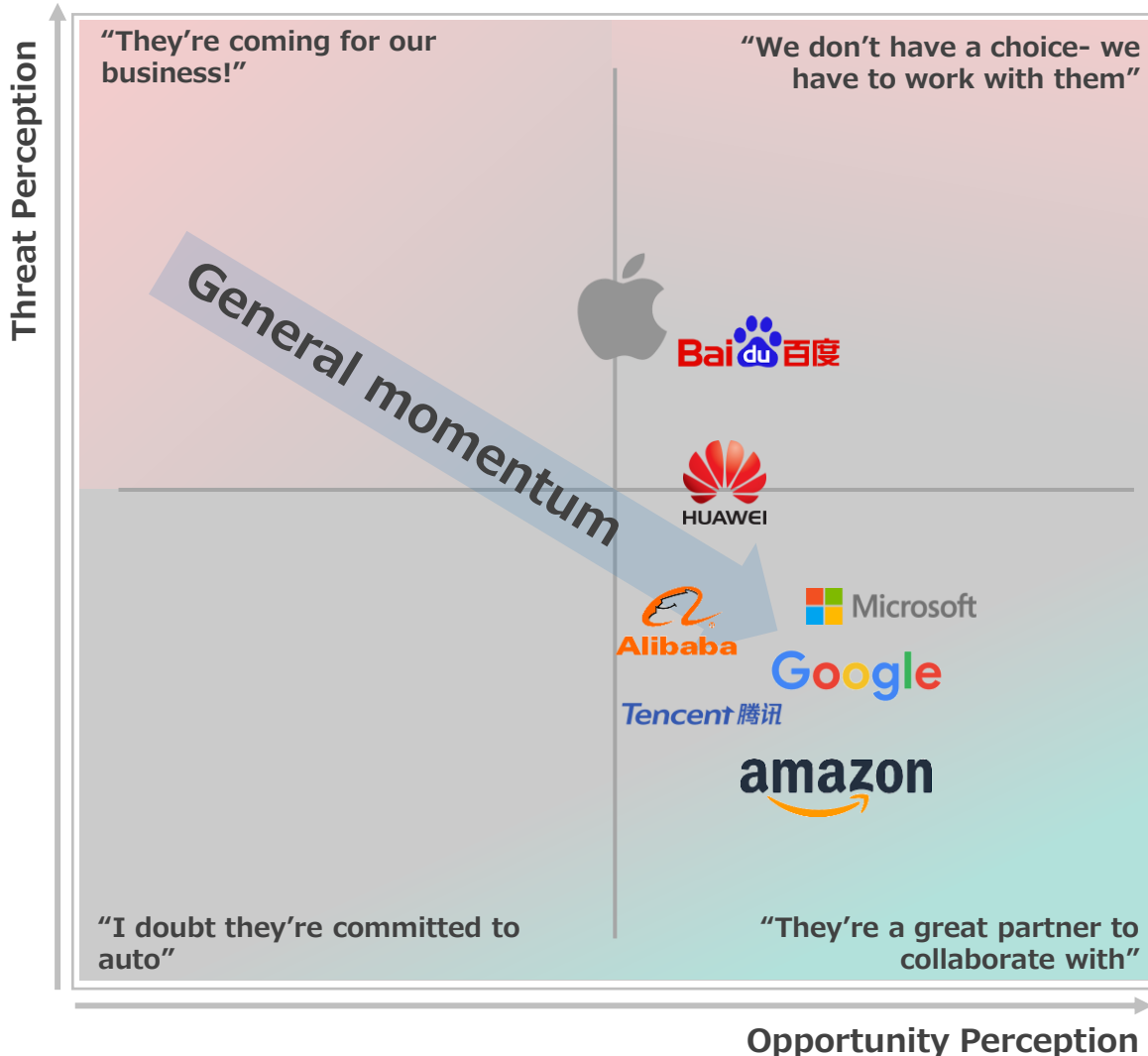
To be an **Automotive Tech Giant** a company must be

- **Broad** in their products and services
- Either very **big** globally or very big within the China market
- Have a **mobility** and automotive focus

Alphabet is a very broad company with influence and involvement with many projects including smart cities, whereas **Google** and **Waymo** have more automotive technology-specific relevance – hence SBD has selected to include Waymo insights within Google data but exclude broader Alphabet activities

Automakers perceiving Tech Giants as partners

Automakers moving from seeing Tech Giants as threats and desiring them as partner



The divide between Tech Giants and OEMs is over – the relationships are now pretty normal.

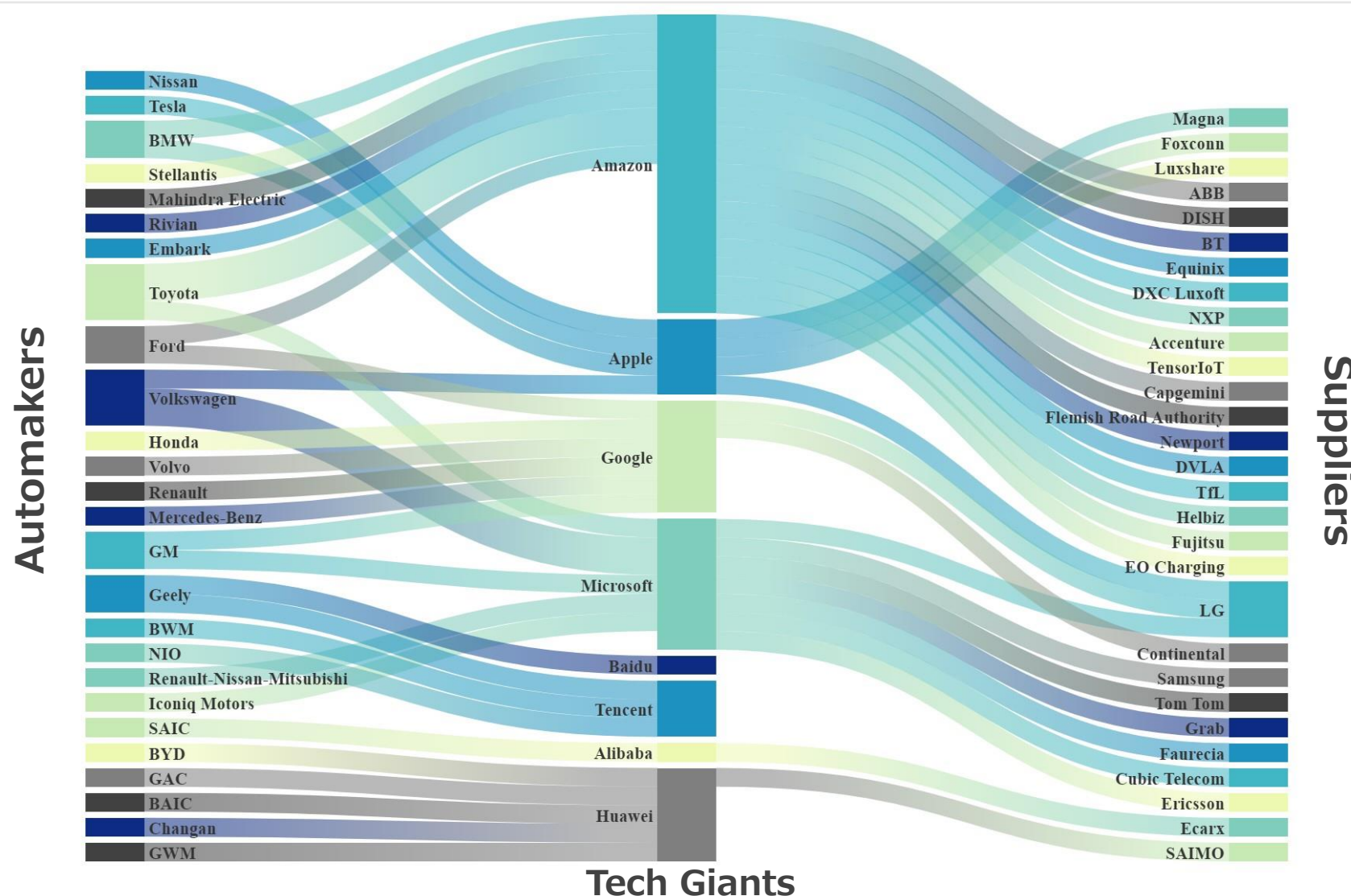


Christoph Grote
SVP Electronics & Software at BMW



Adaptive alliances forming with Tech giants

Forming supplier partnerships on delivering B2B offerings



- **Tech giants as 'Tier-0.5' partners for in-house development:** With some automakers planning in-house development of services/features, they prefer dedicated teams from the tech giants working closely with the automotive experts. This nature of such collaboration is even stickier than traditional automaker-supplier contracts.
- **Tech giants have distinct capabilities (software):** Traditionally, automakers have relied upon Tier-1 suppliers (primarily hardware companies) for product development, but as modern cars evolve and become more feature-rich, software, AI and cloud expertise become paramount and most sought-after. This is an area where the Tier-1 suppliers are evolving but aren't yet dominating as much as the tech giants.
- **Some tech giants are collaborating with suppliers:** Tech giants like Amazon, Microsoft, and Apple have had partnerships both on the OEM and supplier side while Baidu, Huawei, and Google are largely targeting the automakers only.



How? are Tech Giants looking to deliver their strategy

Tech Giant strategies have been observed to fit into four key trends – these are not exhaustive but considering these strategies identifies some distinctively different approaches between the Tech Giants. This chart table shows the indicated activity for each Tech Giant against each of SBD's four categories of *How* a Tech Giant is behaving. In addition, then with *Why* and *What*, Tech Giants are pursuing a mixture of strategies for *How* they pursue their motivations.

Tech Giant	OEM integration and partnership		Autonomous investments and acquisitions		Cloud and data services		Open-source software enablement	
Apple		Integrating the different services offered with vehicles (Carplay, Siri, Apple Music, Maps)		Developing its own self-driving car (Project Titan)		Developing new technology (Iron Heart) and AR/VR Gadgets (Vison Pro)		
Amazon		Software for dashboards and digital cockpit				AWS Service for mobility service platform		
Google		Increased partnership for in-vehicle integration of offering		Waymo's partnership with ridesharing companies for self-driving cars		Android automotive for infotainment and maps		Offering multiple open source-platform (Fuchsia, TensorFlow)
Microsoft				Cruise's partnership for commercial self-driving vehicles		Storage solution and MS dynamic 365 products for in-vehicle		
Baidu		Baidu Map Large Screen Edition for integration		Integrated navigation-assisted driving				Competing with other tech giants by developing platforms like ERNIE Bot
Alibaba		OS for an embedded vehicle OS						
Tencent		Increased OEM partnership across the different layers of the tech stack				Using the Tencent hybridization model through Tencent Cloud		
Huawei		Increased partnership with automakers using Huawei Intelligent Automotive Solutions						



What? Tech Giants have in store for the automotive industry

Legend

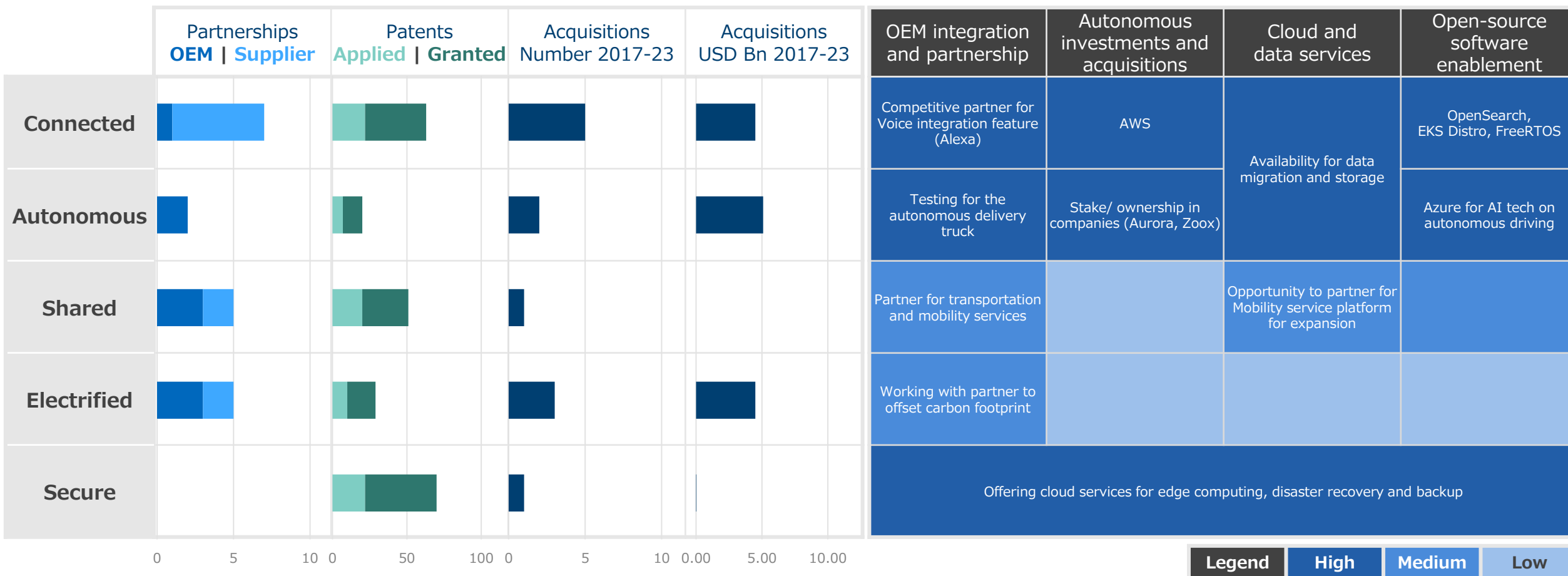
Automotive & Mobility

Future

Tech Giants	Connected		Autonomous	Shared	Electrified	Secure
Alibaba	Ali OS	Amap				
Amazon	Alexa/Echo Alexa Automotive		Autonomous Mobility AWS			
	AWS inc. Automotive		Autonomous Mobility Zoox			
Apple	Vehicle Personalization Iron Heart		Self Driving Car	Maps -Including Multi-modal planning & EV routing		Digital Key CarKey
			Apple Car - Project Titan	Ride Sharing - Didi Investment	Apple Car - Project Titan	
Baidu	Baidu Map					
	IQIYI		Apollo			
	CarLife			Hello Chuxing		
Google	Maps	Android Automotive	Waymo			Android Automotive Stolen Vehicle Tracking
	GAS	Cloud Services	Lyft Integration			
				Waze Carpool		
Huawei	HiCar	AR-HUD & Hologram AR-HUD	Huawei Intelligent Automotive Solution			
	Huawei Smartphone	Huawei connected car cloud service				
Microsoft	Microsoft Connected Vehicle Platform			Bing Maps Inc. EV Station Info		
	Azure inc. Automotive					
	Cloud Storage					
Tencent	Dingdang VPA	Tencent Map				
	TAI 3.0	TAI 4.0				



Amazon – Collaboration, patents and acquisitions



SBD Insights

- BMW has expanded the partnership with Amazon Web Services cloud software to manage data from its autonomous vehicles. This partnership will be integrated into BMW's "Neue Klasse" platform due out 2025 for its future lineup of electric vehicles, allowing for the processing of triple the amount of vehicle data compared to current models. The increased data processing power will enable higher levels of autonomous driving and support both Level 2 and Level 3 autonomous driving systems.



What the Excel Version Contains



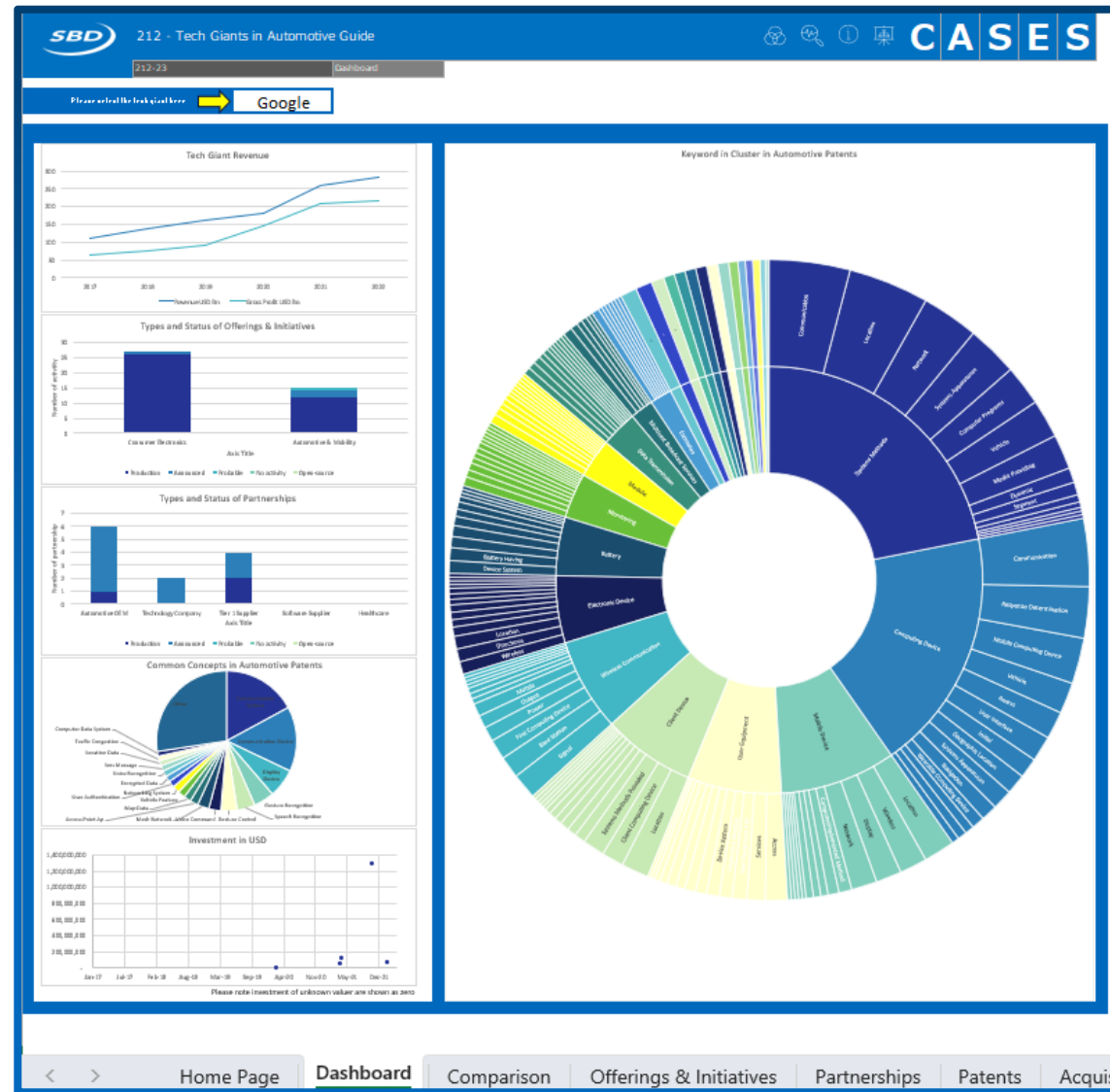
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#212/Tech Giants in Automotive



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10,000+

Tech Giants Examined:
8

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<div>SBD</div>			212 - Tech Giants in Automotive Guide			<div><div></div><div></div><div></div><div></div></div>			C	A	S	E	S		
212-23			Comparison												
Company Name			Apple	Amazon	Google	Microsoft	Baidu	Alibaba	Tencent	Huawei					
Basic info	Headquarters		Cupertino, California, United States	Seattle, Washington, United States	Mountain View, California, United States	Redmond, Washington, United States	Beijing, China	Hangzhou, China	Shenzhen, China	Shenzhen, China					
	Founded		1976	1994	1998	1975	2000	1999	1998	1987					
	# of employees		164,000	1,541,000	190,234	221,000	41,000	251,000	86,000	197,000					
	CEO		Tim Cook	Andy Jassy	Sundar Pichai	Satya Nadella	Robin Li	Daniel Zhang	Ma Huateng	Ren Zhengfei					
	Revenue (/ USD billion)	2022	394.3	513.9	282.8	198.2	17.9	134.6	81.0	92.3					
		2021	365.8	469.8	257.6	168.1	19.5	109.5	85.6	100.0					
		2020	274.5	386.1	182.5	143.0	16.4	72.0	73.6	136.7					
		2019	260.1	280.5	161.9	125.8	15.4	56.2	53.6	123.0					
		2018	265.5	232.9	136.8	110.4	14.9	39.9	45.0	105.2					
		2017	229.2	177.9	110.9	96.6	13.0	23.0	36.2	92.5					
	Gross profit margin	2022	43.3%	43.8%	55.3%	68.4%	13%	36.76%	43.1%	6.6%					
		2021	41.8%	42.0%	56.9%	68.9%	8.5%	12.5%	48.5%	19.1%					
		2020	38.2%	39.6%	53.6%	67.8%	13.4%	17.9%	38.2%	8.1%					
		2019	37.8%	41.0%	55.6%	65.9%	5.9%	15.1%	31.5%	9.1%					
		2018	38.3%	40.2%	56.5%	65.2%	15.2%	27.7%	31.2%	10.2%					
		2017	38.5%	37.1%	58.9%	64.5%	18.5%	30.4%	38.0%	9.3%					
Products	Computer		Production	No Activity	Production	Production	No Activity	No Activity	No Activity	Production					
	Smartphone		Production	No Activity	Production	Production	No Activity	No Activity	No Activity	Production					
	Tablet		Production	Production	No Activity	Production	No Activity	No Activity	No Activity	Production					
	Smart glasses		Announced	No Activity	No Activity	Production	No Activity	No Activity	No Activity	Production					
	Virtual Reality (VR)		Announced	Production	Production	Production	No Activity	No Activity	No Activity	Production					
	Augmented Reality (AR)		Announced	Production	Production	Production	No Activity	No Activity	No Activity	No Activity					
	Smart watch		Production	No Activity	Production	No Activity	No Activity	No Activity	No Activity	Production					
	Smart TV		Production	Production	Production	No Activity	No Activity	No Activity	No Activity	Production					
	Self driving car		Announced	No Activity	Production	No Activity	Production	Production	No Activity	No Activity					
	AI powered products		Announced	No Activity	No Activity	No Activity	Production	Production	Production	Production					
	Robotaxi		No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity					
	Product development tools (automated)		No Activity	No Activity	No Activity	No Activity	Production	Production	Production	Production					
	Smart manufacturing		No Activity	No Activity	No Activity	No Activity	Production	Production	Production	Production					
	Digital cockpit products		Production	Production	Production	No Activity	No Activity	No Activity	No Activity	No Activity					
	Smart home		Production	No Activity	Production	No Activity	Production	Production	Production	Production					
	Robo-assistant		No Activity	No Activity	No Activity	No Activity	No Activity	Production	Production	No Activity					
< >			Home Page Dashboard Comparison Offerings & Initiatives Partnerships Patents Acquisitions References Definitions +											: ◀ ▶	

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Excel Tabs:
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212-23		Offerings & Initiatives					
Core Data							
Company	Product Offering or Initiative	Development Status	Announce date	Launch date	Description	OEM Adoption	Reference
Apple	Mac	Production		2008	Apple's very own laptop running on MacOS which connects seamlessly with the apple eco-system.		
Apple	iPhone	Production		2007	Apple is working on a new iPhone and Apple Watch feature that detects if you're in a car crash and dials 911 automatically.		Apple 20,Apple 23
Apple	iPad	Production		2010	Apple's tablet that today comes with its own M1/M2 chip for computing capabilities		
Apple	Glasses (AR Glasses)	Announced		2023	Apple Glass is expected to run on Starboard (or perhaps glassOS,) a proprietary operating system uncovered in the final		Apple 33
Apple	Watch	Production		2015	Apple's Smart watch to connect easily with its ecosystem.	High Levels of Adoption	
Apple	iCloud	Production		2011	iCloud is apple's cloud data storage platform.	High Levels of Adoption	Apple 34
Apple	Apple Card	Production		2019	Apple Card is a digital credit card from Apple that works seamlessly with your iPhone. So far it's only available in the US.		Apple 27
Apple	Apple Pay	Production		2014	Apple pay is a mobile payment service provided by apple that allows users to make payments in person, apps or on the web		Apple 32
Apple	Apple App Store	Production		2008	Apple's integrated app store which is a platform allowing users to download compatible applications for their use.		
Apple	CarPlay	Production		2014	working on a software update to provide in vehicle, climate control and multi display output	High Levels of Adoption	
Apple	Siri	Production		2011	Siri is a virtual assistant that is part of Apple Inc.'s iOS, iPadOS, watchOS, macOS, and tvOS operating systems. The assistant		Apple 22
Apple	Apple Music	Production		2015	Apple's music streaming platform integrated into carplay.		Apple 35
Apple	Apple News+	Production		2015	Apple's news aggregator		Apple 36, Apple 40
Apple	iMessage	Production			Cellular messaging service offered by apple.		Apple 37
Apple	Facetime	Production		2010	Video calling application.		Apple 29
Apple	Apple ID	Production		2013	Apple is also Working to Replace IDs Like Passport and Driver's License With iPhones		Apple 38
Apple	Maps	Production		2012	Apple released its mapping service in iOS, replacing Google Maps as the default mapping service for Apple operating		Apple 19 - Apple 1
Apple	Safari	Production		2003	Safari is a graphical web browser		
Apple	Self driving shuttles	Announced		2024	Apple plans to adapt Volkswagen's T6 transporters, into self-driving shuttles for employees on its campus	Low Levels of Adoption	Apple 3, Apple 25
Apple	Project Titan ("Apple Car")	Probable	2014	2026	Apple developed vehicle	Low Levels of Adoption	Apple 3, Apple 25
Apple	EV Batteries	Probable	2020	2025	Apple allegedly wants to use lithium iron phosphate (LFP) battery for its electric vehicle, partly because they are cheaper to		
Apple	Swift	Open-source		2014	Programming language created by Apple for building apps for iOS, Mac, Apple TV, and Apple Watch.		Apple 44
Apple	Darwin	Open-source		2000	Darwin is an open-source Unix-like operating system first released by Apple Inc. in 2000. It is composed of code derived from		
Apple	Vehicle Personalization (IronHeart)	Announced	2021	2024	IronHeart: Apple is working on technology that would access functions like the climate-control system, speedometer, radio		Apple 7

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Company	Country	Patent Number	Kind	Patent Date	Application Number	Application Date	Assignee	Members of Patent 'Family'	Title
Huawei	WO	WO22047617	A1	Thursday, 10 March 2022	WO2020CN112822	Tuesday, 1 September 2020	HUAWEI TECHNOLOGIES CO LTD	CN112752682 A WO22047617 A1	[EN] METHOD AND SYSTEM FOR IMPROVING VEHICLE SECURITY
Google	US	US2021184758	AA	Thursday, 17 June 2021	US20190715775	Monday, 16 December 2019	GOOGLE INC	US11211997 BB US2021184758 AA	[EN] NETWORKING WITH HAPS AND ADDITIONAL GROUND-BASED NODES
Tencent	US	US2022073076	AA	Thursday, 10 March 2022	US20210527700	Tuesday, 16 November 2021	TENCENT HOLDINGS LTD	CN110780602 A CN110780602 B	[EN] METHOD, APPARATUS, AND DEVICE FOR CONSTRUCTING SIMULATED VEHICLE LANE CHANGE TRAJECTORY, AND STORAGE
Baidu	US	US2022076038	AA	Thursday, 10 March 2022	US20210529780	Thursday, 18 November 2021	BEIJING BAIDU NETCOM SCI AND TECH CO LTD	CN112580571 A EP3961582 A2	[EN] METHOD FOR CONTROLLING VEHICLE AND ELECTRONIC DEVICE
Google	WO	WO22050944	A1	Thursday, 10 March 2022	WO2020US49174	Thursday, 3 September 2020	GOOGLE INC	WO22050944 A1	[EN] AUTOMATIC ROUTING THROUGH ELECTRIC VEHICLE CHARGING STATIONS
Apple	US	US2019118610	AA	Thursday, 25 April 2019	US20180089641	Wednesday, 30 August 2017	APPLE INC	CN109070687 A CN109070687 B	[EN] VEHICLE THERMAL MANAGEMENT SYSTEM AND HEAT EXCHANGERS
Google	US	US2017277191	AA	Thursday, 28 September 2017	US20160079591	Thursday, 24 March 2016	WAYMO LLC	AU2017238151 AA AU2020204157 AA	[EN] ARRANGING PASSENGER PICKUPS FOR AUTONOMOUS VEHICLES
Huawei	US	US2022078795	AA	Thursday, 10 March 2022	US20210531050	Friday, 19 November 2021	HUAWEI TECHNOLOGIES CO LTD	CN111988759 A CN111988759 B	[EN] DATA PROCESSING METHOD AND APPARATUS, AND SYSTEM
Huawei	US	US2021329568	AA	Thursday, 21 October 2021	US20210362660	Tuesday, 29 June 2021	HUAWEI TECHNOLOGIES CO LTD	CN111385763 A EP3890408 A1	[EN] SIGNAL SENDING METHOD, PRIORITY CONFIGURATION METHOD, AND DEVICE
Tencent	US	US2021334420	AA	Thursday, 28 October 2021	US20210371900	Friday, 9 July 2021	TENCENT HOLDINGS LTD	CN110069887 A EP3901771 A1	[EN] DRIVING SIMULATION METHOD AND APPARATUS, ELECTRONIC DEVICE, AND COMPUTER STORAGE MEDIUM
Huawei	US	US2022052798	AA	Thursday, 17 February 2022	US20210513652	Thursday, 28 October 2021	HUAWEI TECHNOLOGIES CO LTD	CN111865509 A EP3965334 A1	[EN] COMMUNICATION METHOD AND APPARATUS
Tencent	US	US2021385693	AA	Thursday, 9 December 2021	US20210407087	Thursday, 19 August 2021	TENCENT HOLDINGS LTD	CN110225555 A JP2022517664 T2	[EN] METHOD AND APPARATUS FOR CONTROLLING QUALITY OF SERVICE OF SIDELINK COMMUNICATION, MEDIUM, AND
Huawei	US	US2022060934	AA	Thursday, 24 February 2022	US20210520104	Friday, 5 November 2021	HUAWEI TECHNOLOGIES CO LTD	CN111918237 A EP3965501 A1	[EN] COMMUNICATION METHOD AND COMMUNICATIONS APPARATUS

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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