


AutoTech Partnerships and Alliances – Reshaping Automotive



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An Industry in Motion

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- A photograph of an airplane wing and engine against a sunset sky, with a list of industry challenges overlaid.
- Software increasingly more important
 - Cars are more technologically complex
 - Acceleration toward electrification
 - New critical raw materials and components driving up the cost of a vehicle
 - Global pandemic and supply chain disruption
 - Competition and economic pressures on price levels
 - Industry profitability is under pressure
 - Traditional automotive barriers to entry are potentially strategic weaknesses

Dynamics of the Industry Ever More Turbulent

EV + ADAS + SDV = Transformation & Revolutionary Development	ICE + Hybrid + ADAS = Incremental & Evolutionary Development
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BEV sales versus ICE sales growth in Q2	BEV	ICE
10 W. Europe Mkts	49%	8%
China	49%	20%
USA	67%	14%

Tesla Model Y top selling model in first half of 2023 in U.S., China and top 4 European markets (F,D,E,I)

- BEV adoption is beginning to hit a market inflection point
- Chinese BEVs in Europe are averaging \$43k versus European OEMs \$60K
- Chinese BEVs exported to Germany are currently around 40 to 45% more expensive than home market pricing
- EU has announced a subsidy study on Chinese BEVs
- Germany is emphasizing German - Sino relations and welcomes competition to protect German OEMs sales in China
- VW agreed a deal to leverage Xpeng’s technology platform to remain competitive in China

The Accelerated Shift From Automotive to Autotech

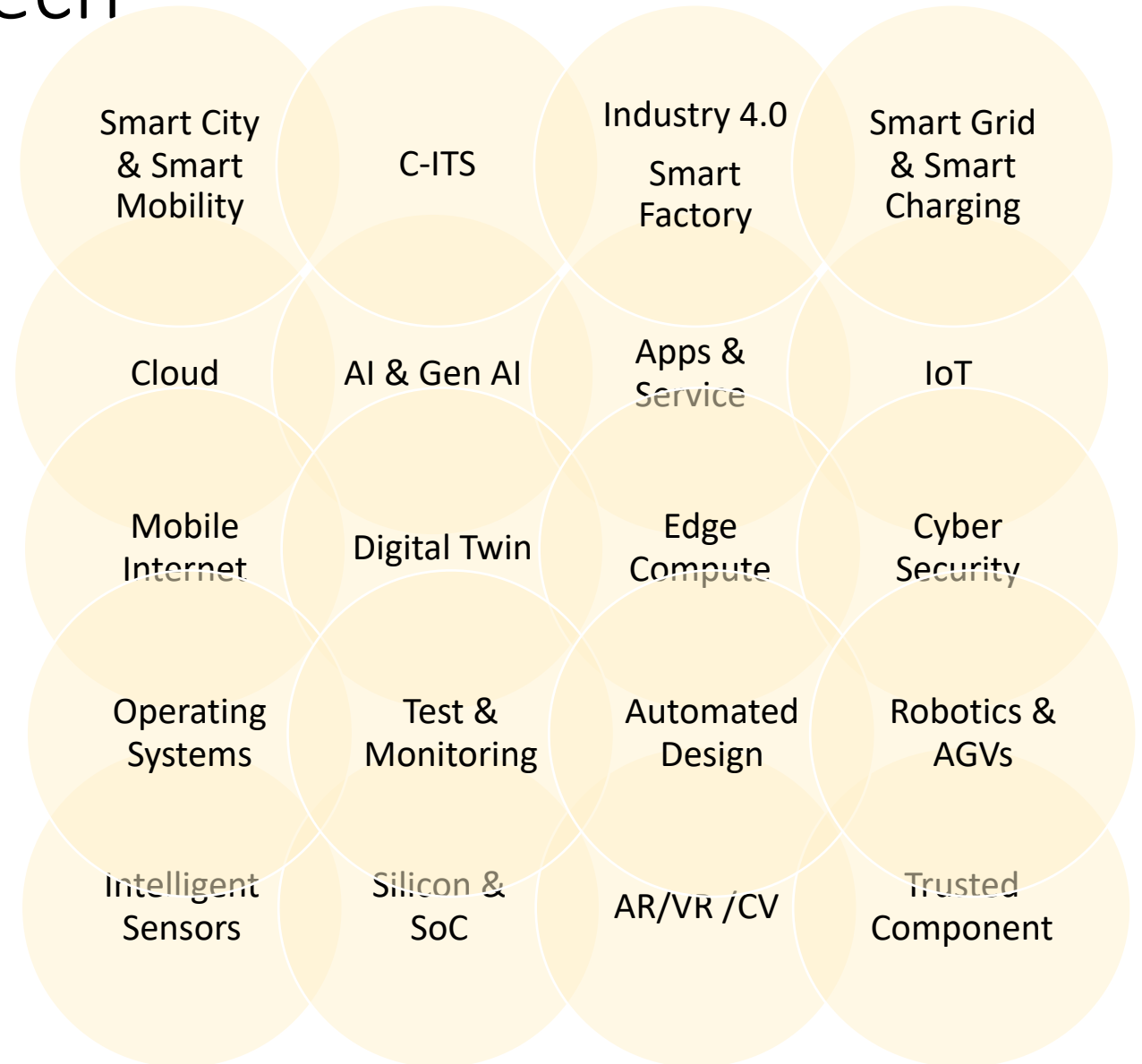
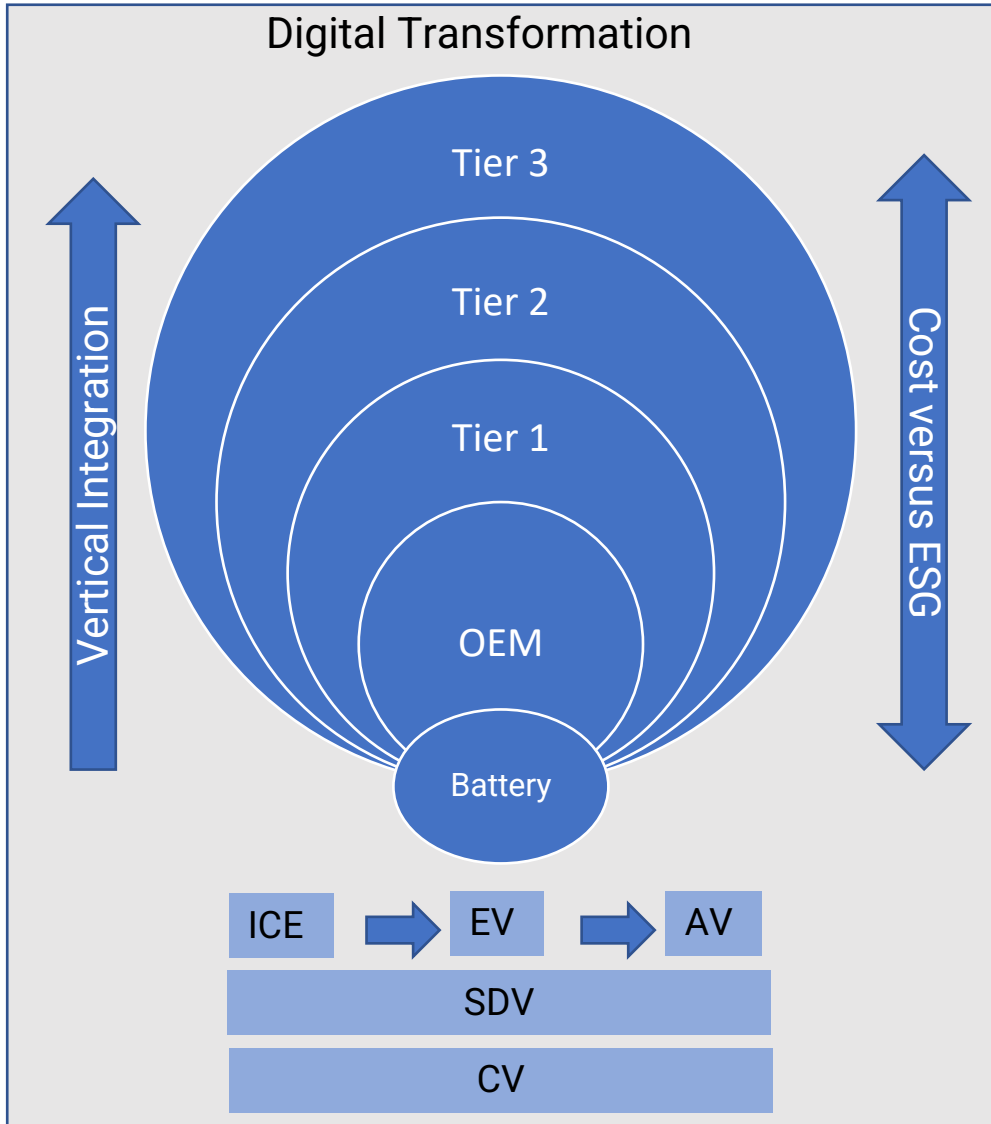
ICE + Hybrid + ADAS = Incremental & Evolutionary Development

- Prioritize protecting profits
- Competitive pressure from traditional players
- Rationalized platform portfolio – less complexity more scale
- Optimize structures, processes, fixed costs, manufacturing, locations and business models
- OEMs drive traditional suppliers to reduce costs along the entire value chain
- Double down on existing model and mindset & borrow from new model only if it enhances scale, time to market or profitability

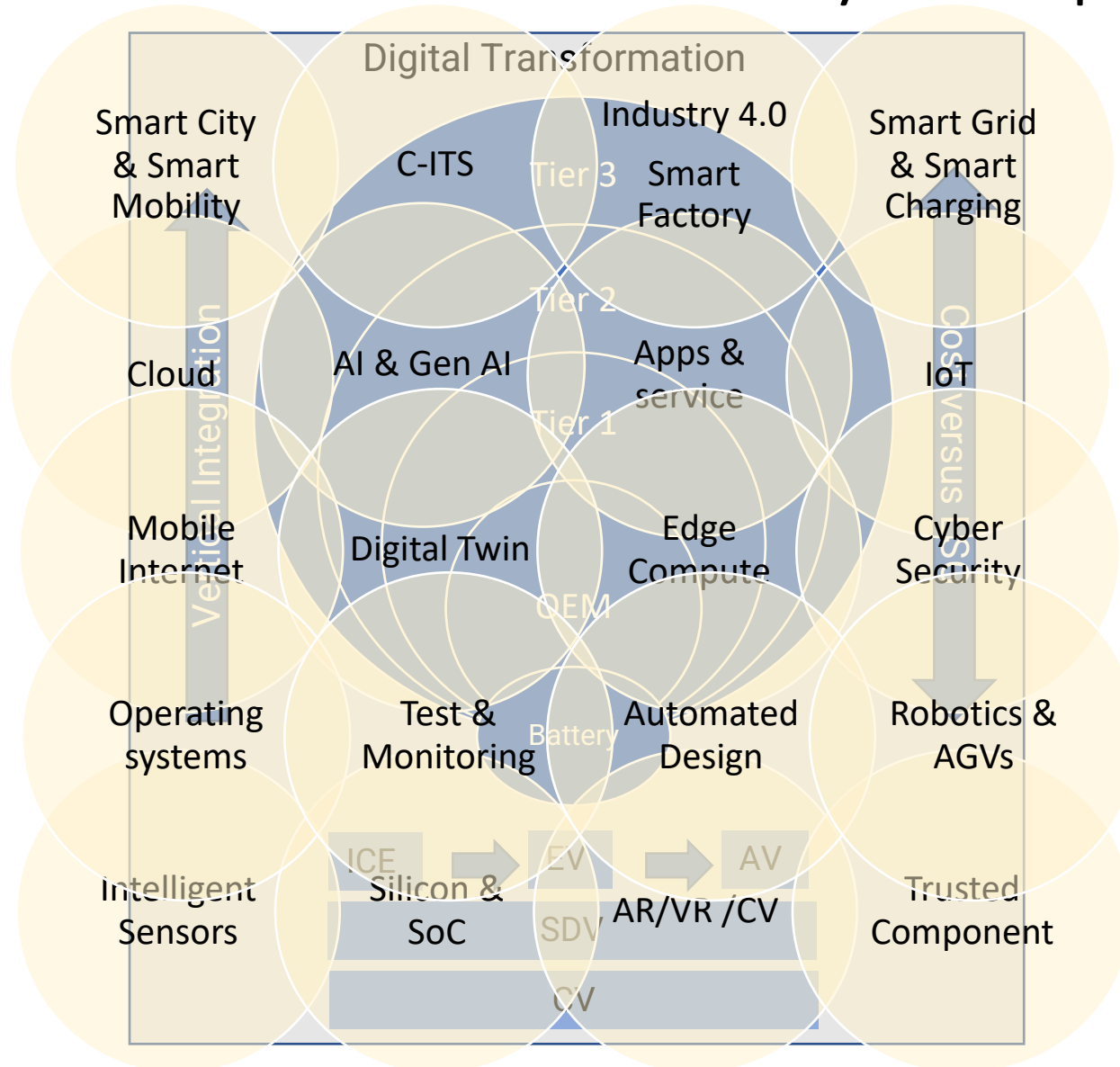
EV + ADAS + SDV = Transformational & Revolutionary Development

- Prioritize growth and speed of innovation
- Competition from traditional and fast-moving new entrants
- Digitize vehicle lifecycle:
 - Shift left virtual HW/SW design
 - Automated agile manufacturing
 - Stretch right – customer engagement, OTA support, cyber security and services
 - Sustainable and circular economy EOL
- Leverage cloud-based partner ecosystems
- High performance EE architectures
- Strategic partners for innovation, technical capability and time-to-market

Automotive and Autotech



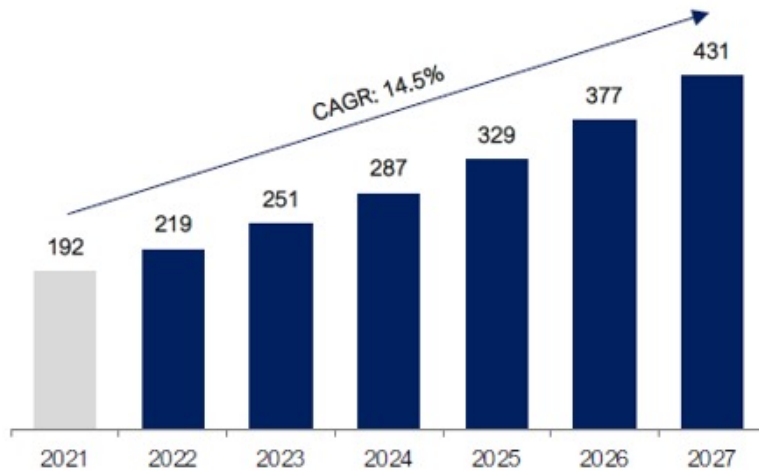
The Resultant Industry Complexity



- As technology rapidly advances in the multiple autotech areas and new players enter, industry boundaries are blurring & converging, and rules are being rewritten
- Innovation in this complex autotech environment requires identifying where tomorrow's opportunities lie and how disruption is playing out
- Success will be achieved by creating and delivering seamless simple solutions for consumers and their vehicles across the boundaries that their digital & real lives journey
- In the energy sector, partnerships are becoming increasingly important, showing the relevance of the energy transition and electrification of vehicles
- Nearly a quarter of partnerships forged by automotive suppliers are with companies from adjacent industries

The Size of Autotech

Global AutoTech Market Size (\$ billion)



Source GCG

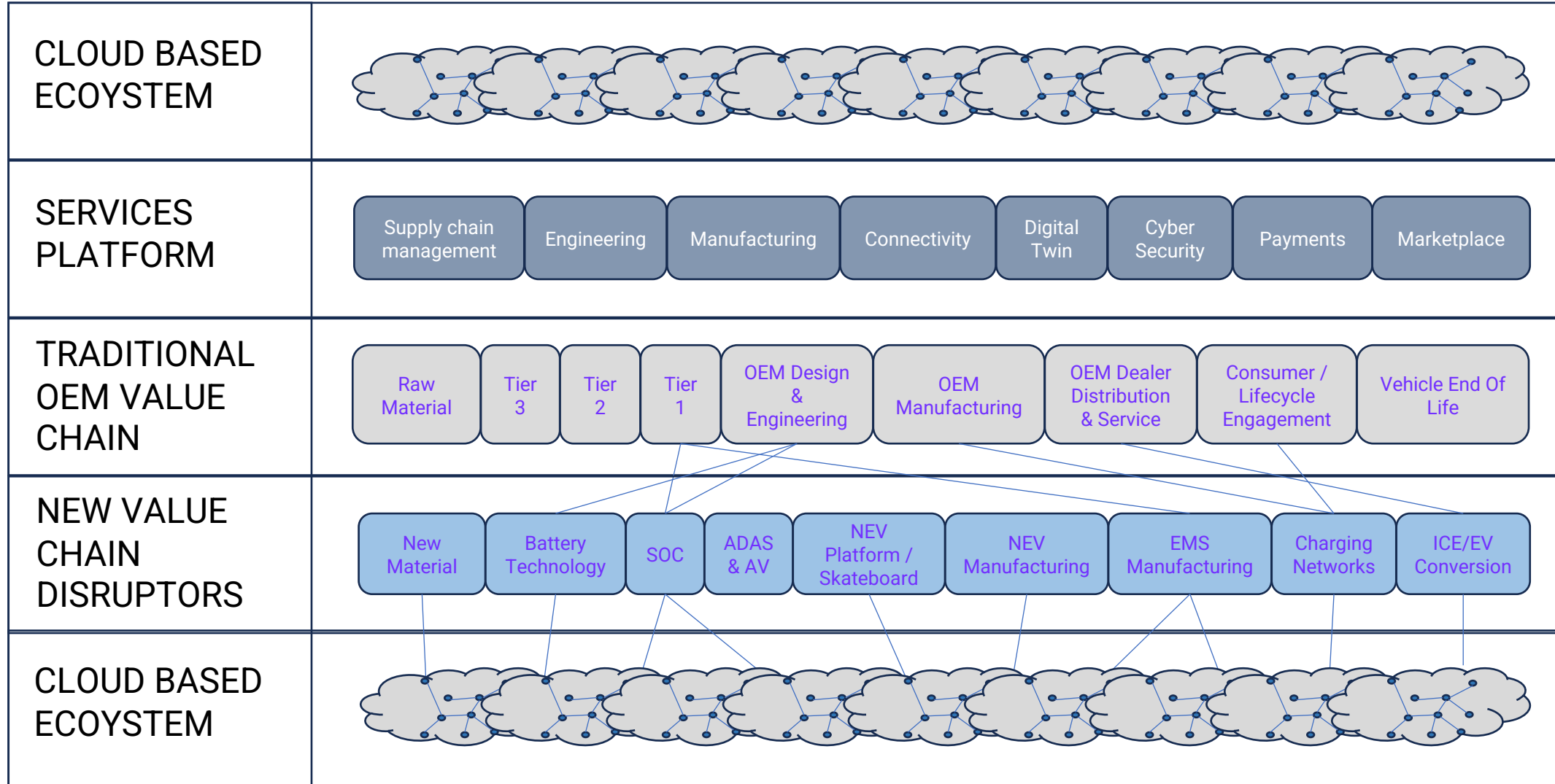
Autotech Area	2023 investment \$bn	Total invested \$bn	Funded Companies	Total Companies
Advanced driver assist	\$0.96	\$10.87	311	559
Autonomous Vehicle	\$0.27	\$29.80	132	255
Connectivity	\$0.29	\$4.41	250	609
Distribution & Service	\$0.66	\$11.91	365	1775
EV Total	\$3.63	\$44.08	595	2097
Mobility Services	\$0.12	\$0.35	32	80
Vehicle system total	\$0.72	\$5.66	501	2322
YTD 2023	\$6.53	\$106.73	2154	7617

The global automotive market is around \$3Tn in 2023 and estimated to reach \$6Tn by 2030

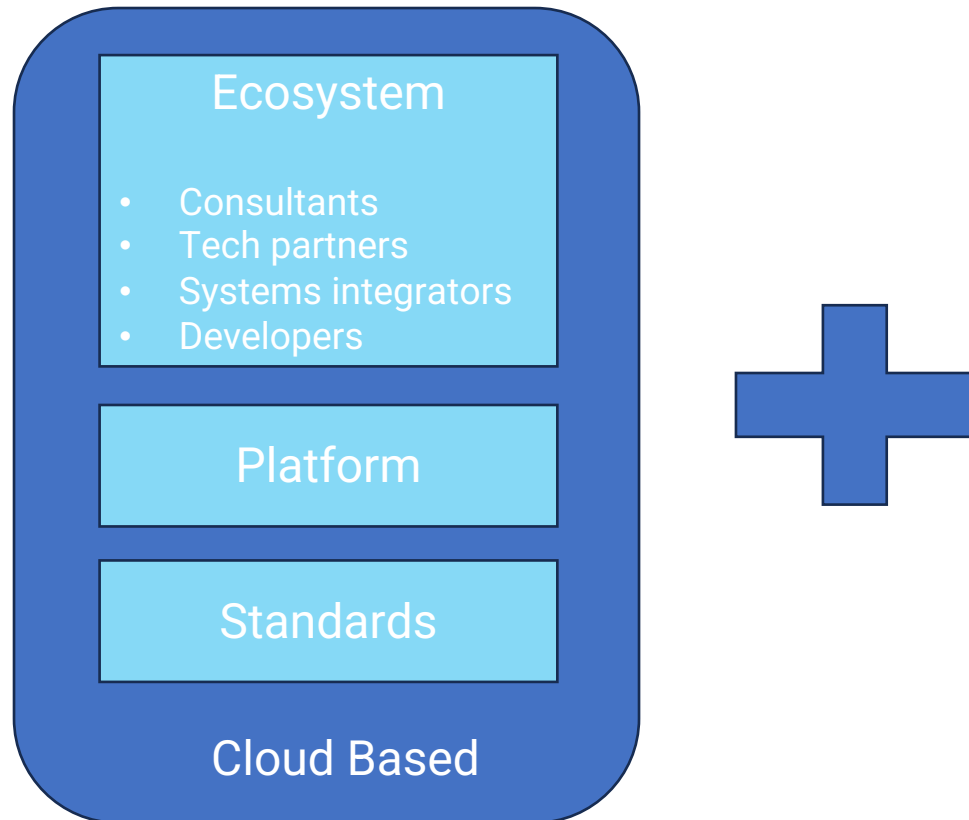
Year	Investment \$Bn
2022	\$24.10
2021	\$49.50
2020	\$28.40
2019	\$30.40
2018	\$36.70
5-year total	\$169.10
5-year average	\$33.82

- The autotech market is comprised of multiple technology areas, all receiving significant investment and generating increasing revenue growth
- Integration of AI with operations, rising cloud adoption and the need to digitize the entire value chain has led to engineering, manufacturing and supply chain software & service as a cloud-based solution
- Mobility-as-a-Service and fleet management services, linked with IoT and AI, enhance operational efficiency and customer satisfaction
- Software defined vehicle solutions, combined with AI, cloud and sensor fusion, are enhancing driver assistance and cross system connectivity
- Battery and thermal management technology is vital to vehicle performance and vehicle-to-grid energy transfers
- The global automotive cybersecurity market is expected to grow at a CAGR of 21% from \$2.1 billion to \$5.6 billion by 2025

Evolving Automotive Value Chain and Ecosystems



The New Automotive Partnership



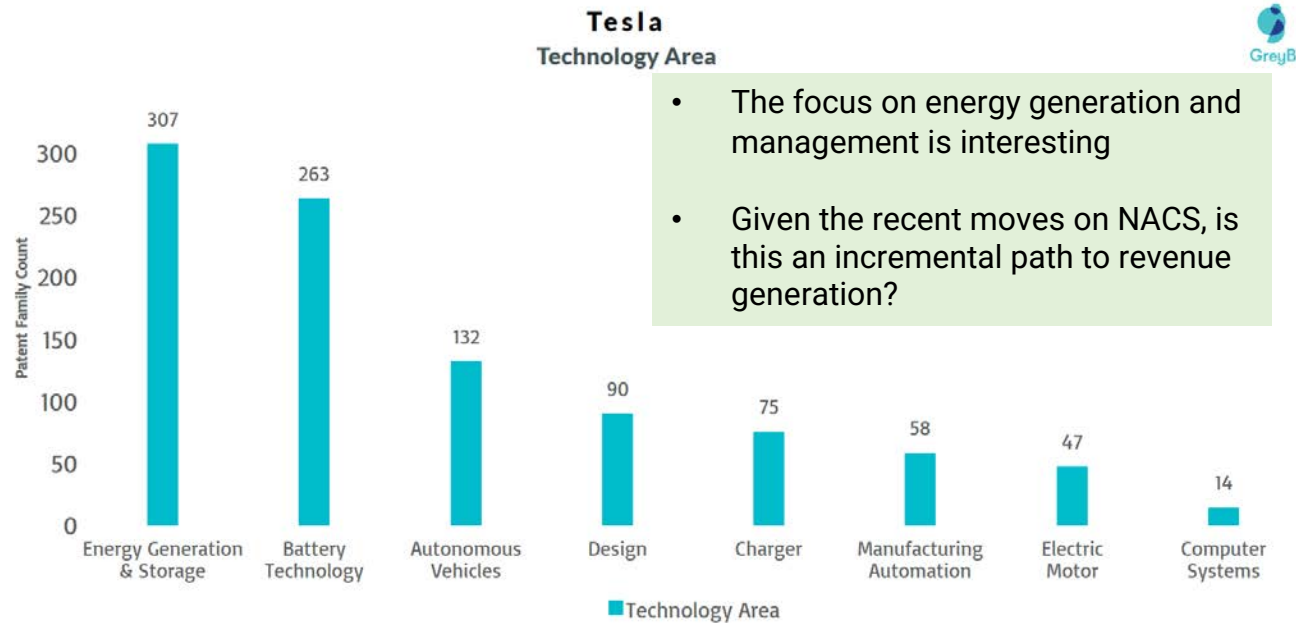
Partnerships in the automotive industry are not new but, in an age of cloud technology, they have emerged as the best mechanism to rapidly access and commercialize innovation.

IAA 2023 showed a level of maturity of the industry and much more openness to partnering because, increasingly, they are seen as influential to the success and speed of the industry's transformation.

There are several reasons this is happening:

- Needing to keep abreast of multiple technology developments and new entrants
- Speed and scale of transformation requires external partners
- Entrepreneurial investment burden in game-changing technologies needs to be shared
- Access to specialized software skills which can reduce investment and accelerate progress
- JVs and partnerships have also become central to developing more sustainable electric vehicle value chain from scratch

Global Automotive Patents



- The focus on energy generation and management is interesting
- Given the recent moves on NACS, is this an incremental path to revenue generation?

- Automotive patent litigation has shifted dramatically in the last two years, with over 75% of suits being filed by non-practicing entities (NPEs), such as Avanci, compared to only 50% in the previous five years
- Over 100 automotive patent lawsuits were filed in 2020 and 2021, the first time that triple digit suits have been filed in the automotive sector



- According to GlobalData's automotive global patent database, grants and filings were led by the batteries sector in the second quarter of the 2023
- Battery patent publications were up 36% in Q2 with filings at 18,599 and grants at 9,953.
- Filings for electrification technologies were down 4% in Q2 with filings at 10,618 and grants at 10,930
- Filings for autonomous driving were up 16% in Q2 with filings at 10,769 and grants at 6,775
- Electrical products were up 4% in Q2 with filings at 7,702 and grants at 6,540
- Active and passive safety products were up 14% in Q2 with filings at 8,051 and grants at 6,617
- Analysis shows that China is emerging as the largest source for applied for and granted patents in the electric vehicle powertrain battery area
- In Q2, the leading company assignees of battery patents were LG Corp and CATL

IAA Mobility - Conference Within a Conference



VOLKSWAGEN GROUP

Implementation plan

Enforce customer centricity & upgrade UX	Fast ramp-up of 100% Tech Co. as local R&D hub	Lever strength of local JV partners
Build on revitalized brands & BEV ramp up	Technology Partnerships with Horizon Robotics & Thundersoft	Product Partnerships with XPeng and local JVs

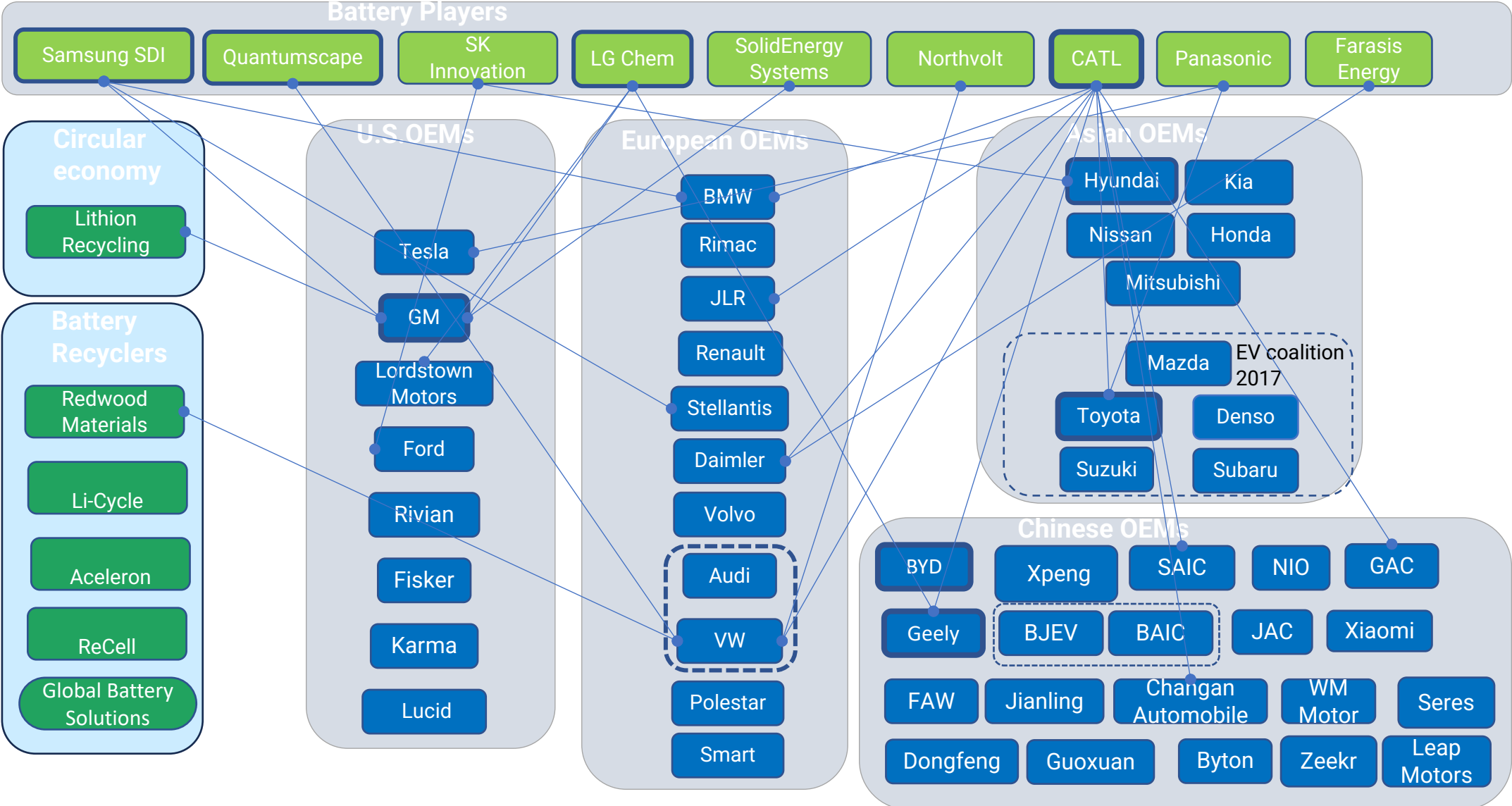
Oliver Bloom, CEO of VW Group, said that it was the first German company to enter China 40 years ago, but he sees China as a “fitness center” for VW: “They need to work out harder and faster in order to stay competitive”.

Emerging Classes of Ecosystem

1. Batteries and Recycling
2. EV Platforms and Charging
3. Connectivity, Edge, AI, Apps & Cybersecurity
4. EE, SW and Chipsets
5. EV Startups and Contract Manufacturing
6. Design , Manufacturing and Managing the Vehicle Lifecycle

- Each of these areas is vital to the success of the new Autotech enterprise. Each class has a set of services and technologies that are distinct and accelerating rapidly, with new and existing players innovating rapidly
- Each has a distinct ecosystem, although some have common players beyond the OEMs
- Some drive cross-industry partnerships, to facilitate structural sector coupling
- All are a combination of horizontal and vertical partnerships between entities in different parts of the value chain, to secure access to technology and talent

Batteries & Recycling – Players & Relationship Map



Diversity of JV and Partnership Deal Activity

- According to BlueGreen Alliance Foundation, EV investment in 327 U.S factories and battery facilities totaled \$156B since 2010; \$126B has come since the start of 2021

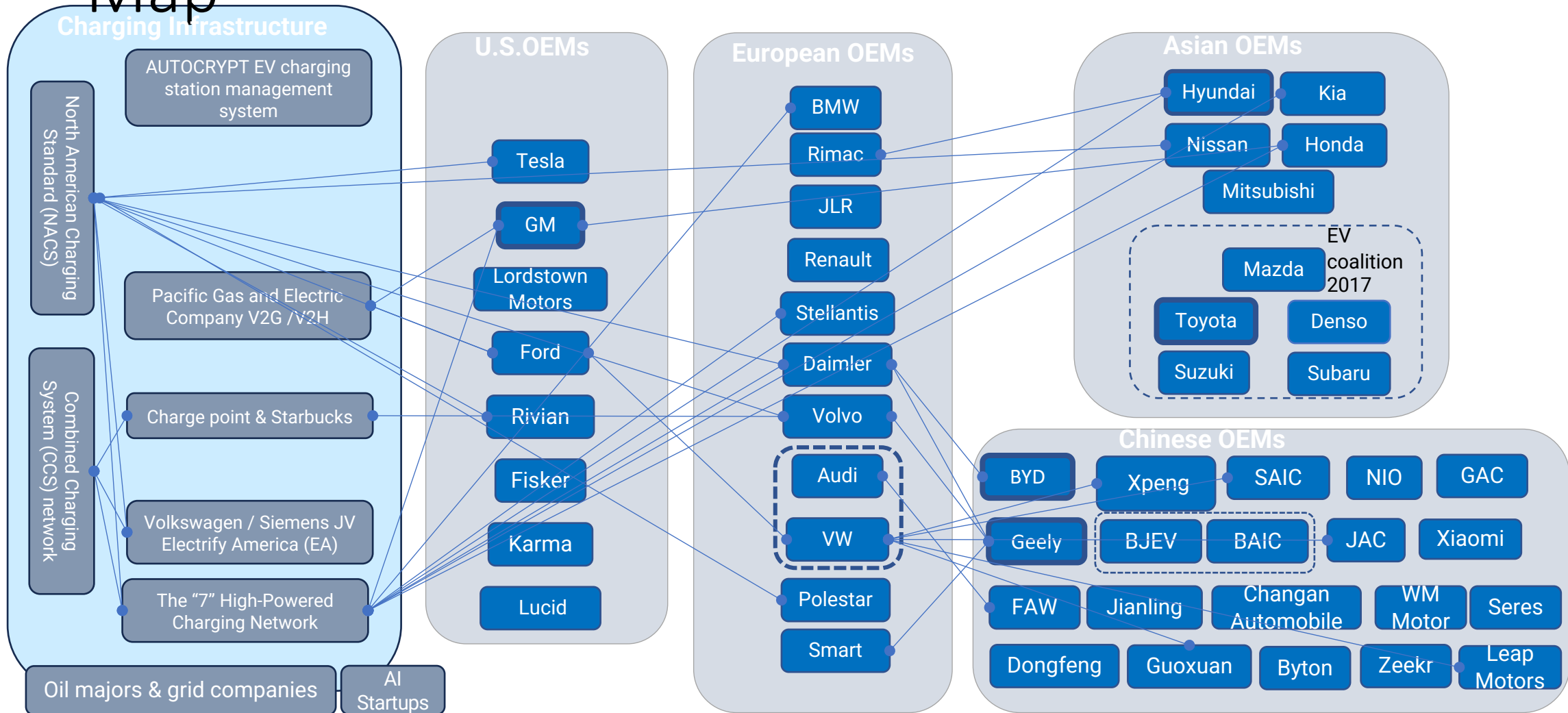
New Partnerships:

- Honda and LG are collaborating on a \$4B battery JV in the U.S.
- General Motors is taking an equity stake in Australia's Queensland Pacific Metals to source nickel and cobalt for its Ultium battery cells
- Polestar, is developing the world's first carbon-neutral car in partnership with key suppliers, including SSAB, Hydro, Autoliv and ZF

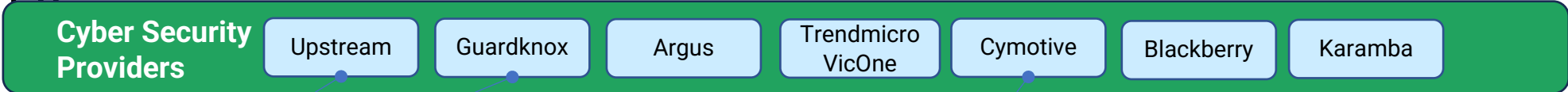
Supply Chain Alliances:

- Finnish pulp, paper, and forestry company, Stora Enso, entered into a partnership with Northvolt to develop batteries from forestry by-products.
- Bosch and IBM entered into a partnership to use quantum computing and simulation technology to find alternatives to the rare earths and battery metals needed for electric vehicles

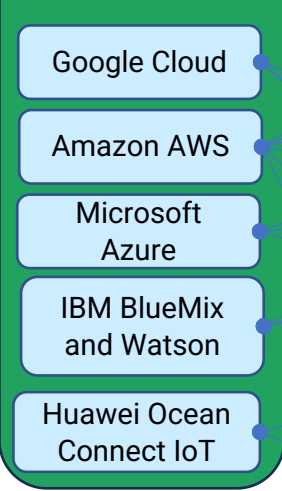
EV Platforms & Charging – Players and Relationship Map



Connectivity, Edge, AI, Apps & Cybersecurity: Players & Relationships



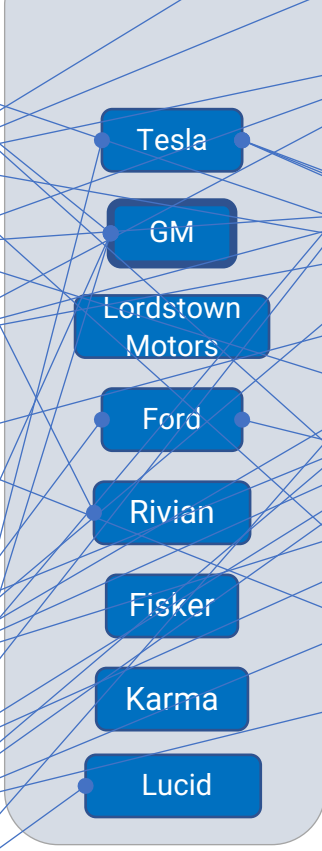
Cloud Providers



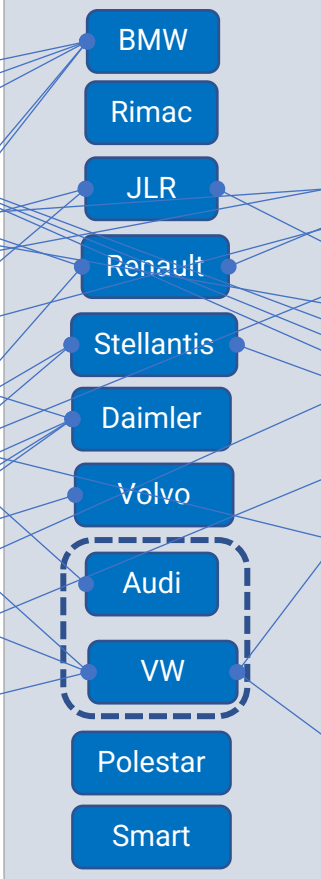
Connectivity Providers



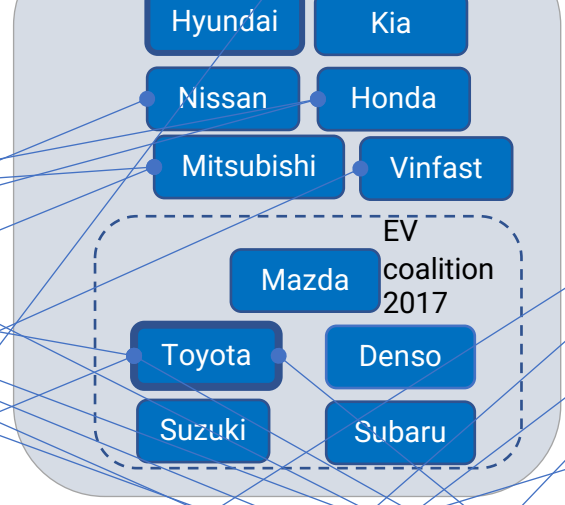
U.S. OEMs



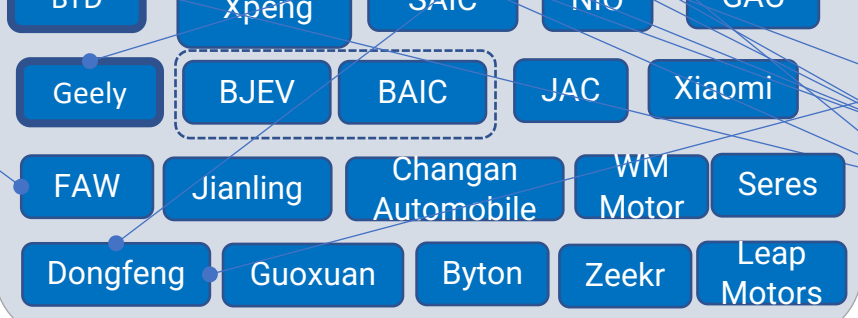
European OEMs



Asian OEMs



Chinese OEMs



Cloud Providers



Connectivity Providers



Chinese OEM Smartphones

Car manufacturers are trying to shape their ecosystems to create a differentiated user experience by seamlessly integrating their own smartphones with digital cockpit systems

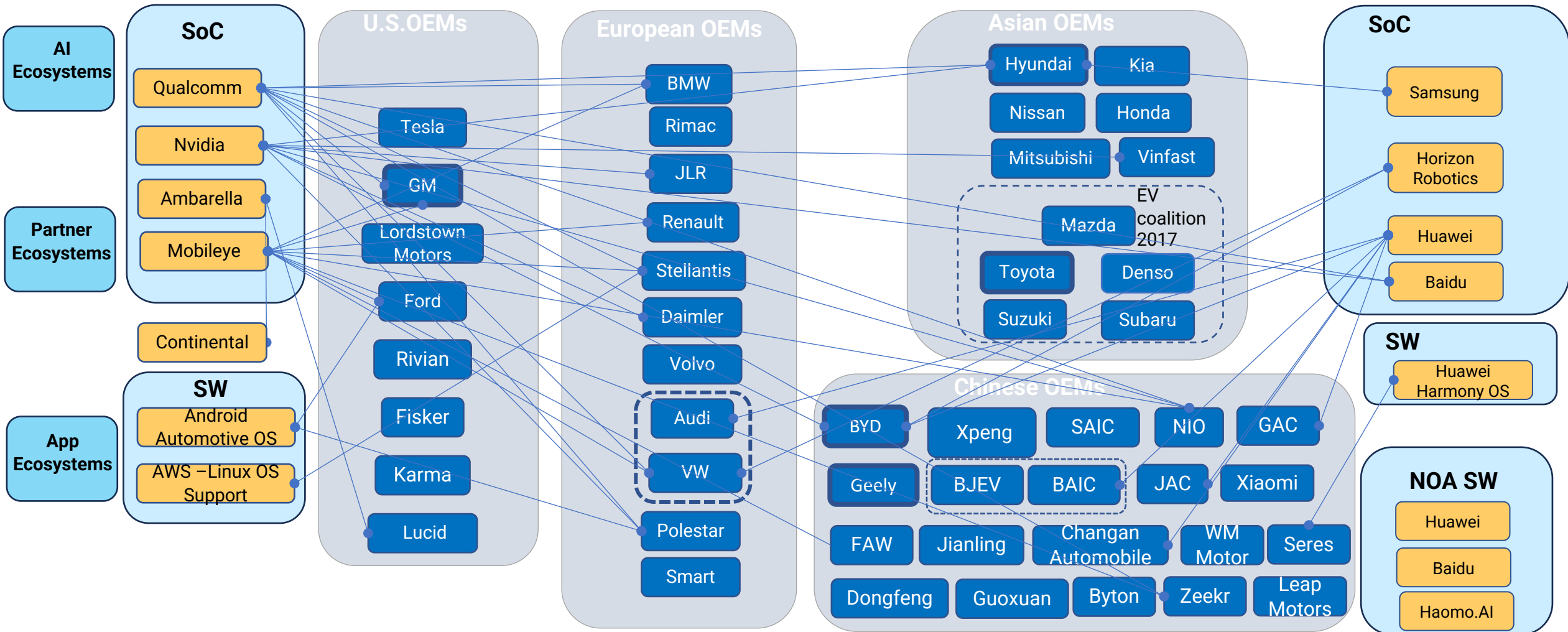
On 21 September 2023, NIO unveiled its first NIO Phone at the 2023 NIO Innovation and Technology Day, with three different models priced between US \$900 and US \$1,000)

NIO joins a growing number of carmakers such as Xpeng and Li Auto (in cooperation with OPPO) that have leveraged smartphones to explore ways to enrich the automotive ecosystem

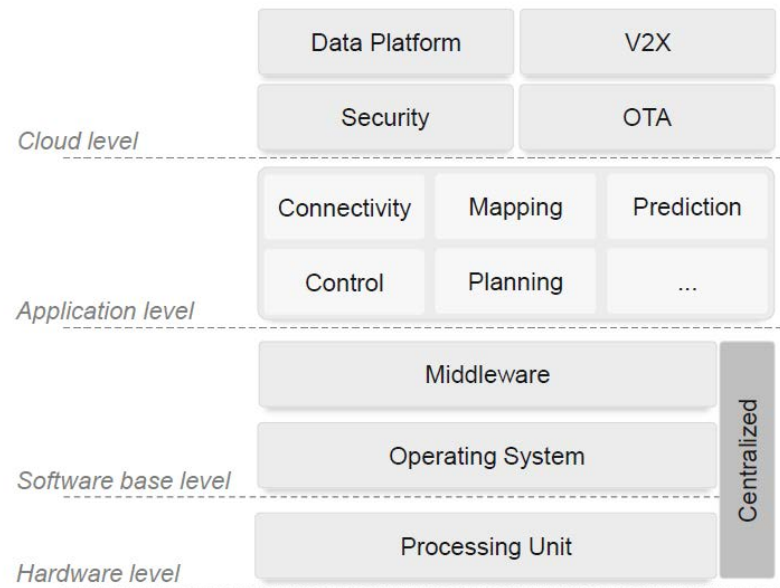
Remote control for combined digital life



EE & SW & Chipsets – Players and Relationship Map



SDV - Standards and IP

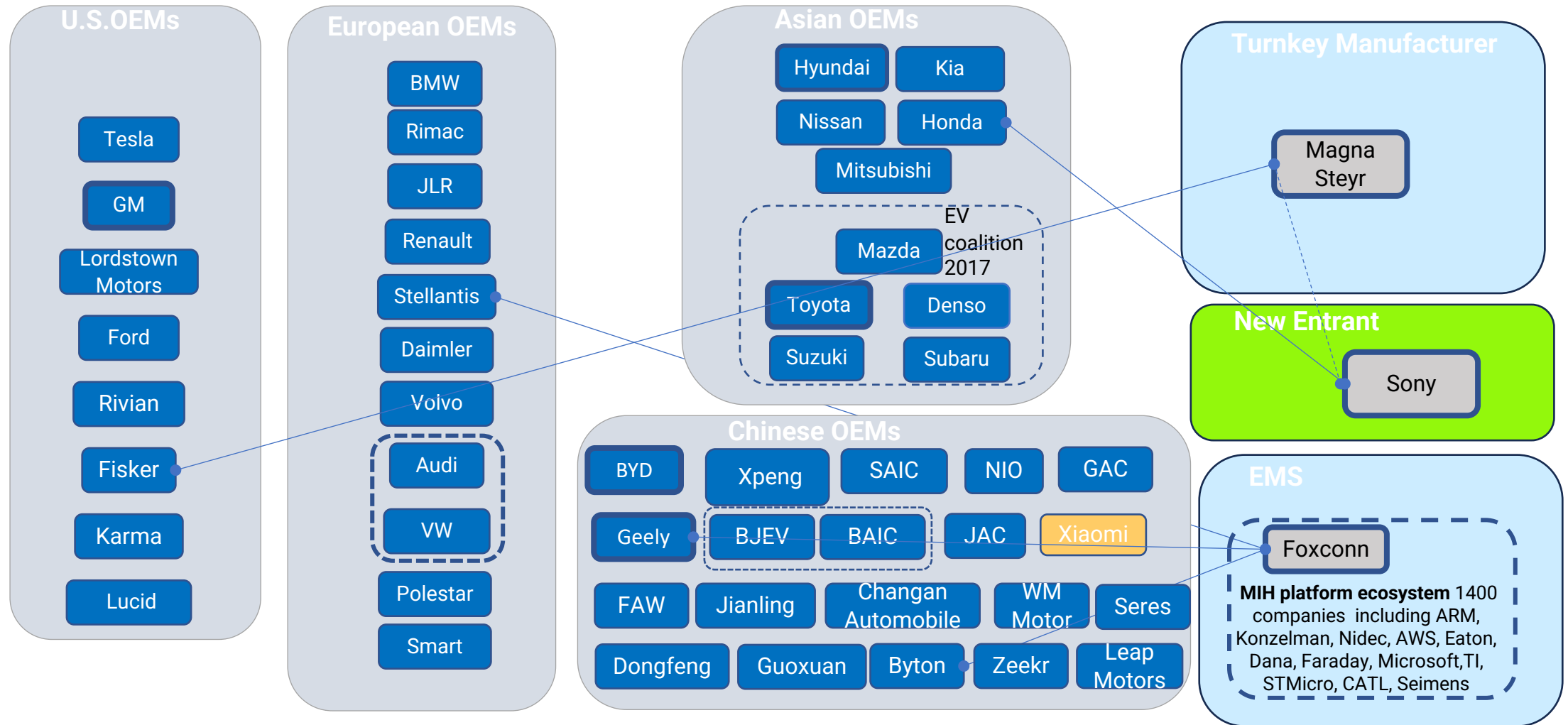


COVESA
SDV Eclipse
SOAFFE
AUTOSAR

- OEMs are moving from monolithic architectures to microservice architectures with high reuse of software
- Requirement to identify what can be common, what needs to be differentiated and what needs to be specifically customized. This is the only way to accelerate development and scale efficiently
- Containerized middleware and APIs for ecosystem cloud and vehicle deployment
- Common standards based around microservice architectures for non-safety related functionality
- Open-source software can build on common standards
- Software as a product sold or traded will become a norm for OEMs and traditional suppliers with emerging platform-based ecosystems, via partnerships and marketplaces
- Standards-based software offers monetization advantages over traditional software approaches, but also means that new IP management strategy, systems and processes are required

Concern over AUTOSAR patent holders that are now no longer in existence

EV Startups & Contract Manufacturing – Players & Relationship Map

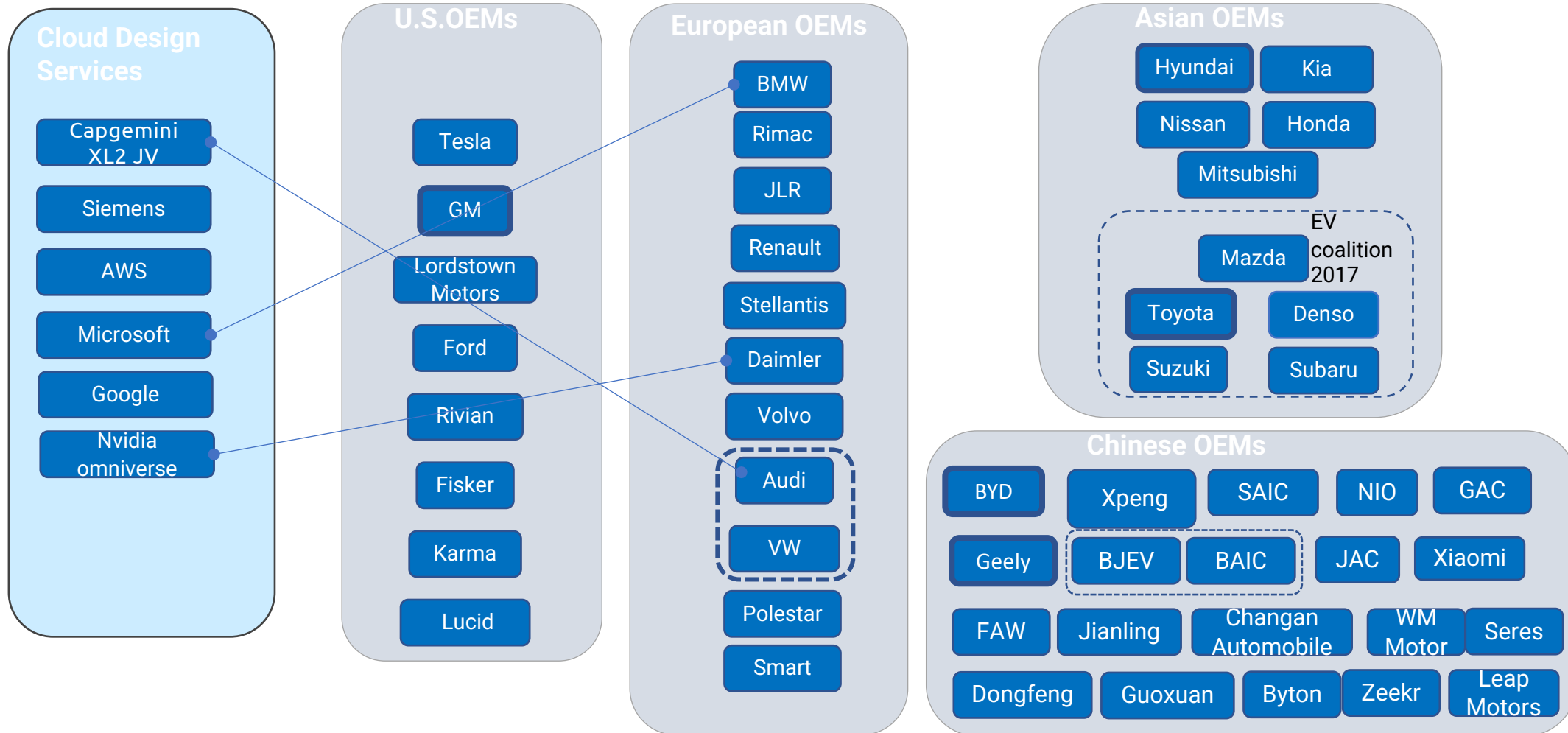


Fox in the Hen House

Industry	Tech Products and Equipment
Location	Taiwan
Market Cap - End of 2022 (\$M)	45,067
2021 Revenue (\$M)	214,657
2021 Profit (\$M)	4,990

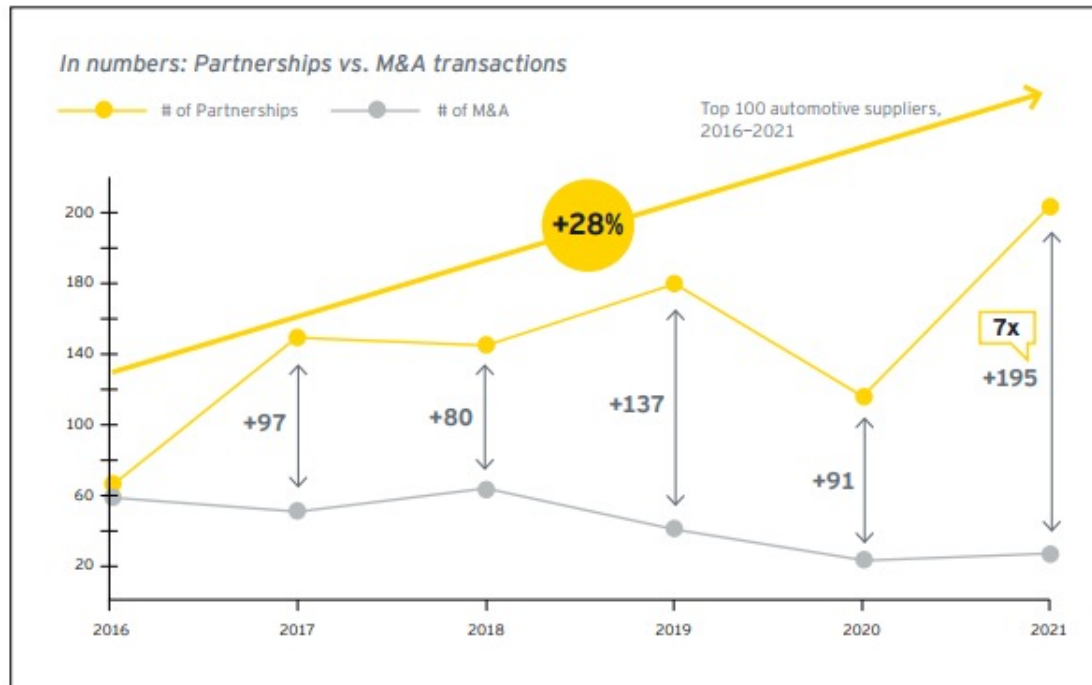
- Hon Hai Technology Group (Foxconn) is the largest EMS company in Taiwan
- EV is a focus area for the company. It established an open EV platform (MIH) and has built a strong supply chain network with global EV industry players
- In addition to MIH, Hon Hai has power semiconductor and mass production capabilities in automotive display, and continues investing in electric drive and control, and self-driving technologies.
- As a non-traditional Tier 1 company, Hon Hai intends to build a standardized and large-scale EV production model based on years of IT / cellphone EMS industry experience
- **ZF Group and Foxconn announce partnership for passenger car chassis systems** - 25 July 2023
- **Foxconn partners with ADI to develop new-generation digital cockpit** - 24 July 2023
- **Stellantis and Foxconn** have created a 50-50 joint venture to design and sell semiconductors for the automotive industry from 2026 - June 20, 2023
- **Foxconn and Saudi Arabia Public Investment Fund** will build electric cars in the kingdom under a joint venture

Design, Manufacturing & Managing the Vehicle Lifecycle



Partnership Activity

An EY study on partnerships noted that since 2016 there is a change from tightly controlled in-house development which favored mergers and acquisitions (M&A) to a more open approach emphasizing partnerships and joint ventures (JVs)



In 2016, M&A and partnerships were on a par. By 2021, there were 7 partnerships for every M&A

Source Ernst & Young

Theme	% Deals	Rationale
Capability	44%	Skills, software, technology & patent access
Scale	36%	Adding product or capacity scale
Growth	13%	Market expansion or new market
Cost Synergies	5%	Integration along value chain
Defense	2%	Forward /strategic position in new technology /market

In the report six out of ten automotive executives say they've started to carry out their technology-related transformation plans. Around half of suppliers are looking at partnerships to achieve this

Winning at Partnerships

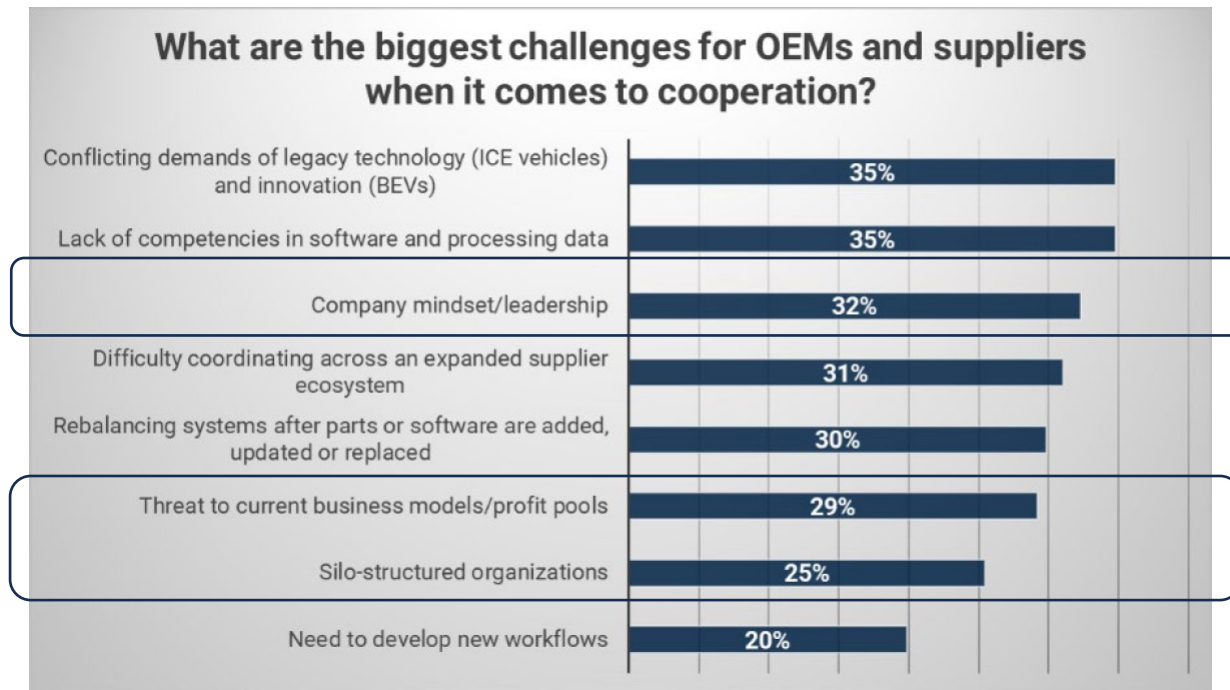
Single partnership check list:

- Clear vision & objective
- Clarity on partnership gives and gets
- Partner selection criteria
- Structure to fit the partnership
- Co-create a common mission & roadmap
- Adaptive systems and processes to embrace variety of partners
- Open mind to new ideas, technologies and processes
- Align rapidly on principals of technology and software approach, monetization and go-to-market
- Dispute resolution process
- Define the end state and exit strategies

Set up structure to manage multiple partnerships with a joint destination and potential to enhance each partnership's outcome. Collective intelligence and agile movement.



Emerging Trends & Challenges



Source: Wards Intelligence

- Identifying emerging king makers in the complex partner relationships
- In the new landscape, can any one company emerge as a vertical powerhouse?
- Silo organization and management thinking represent significant challenges in transitioning from a controlled supplier chain to collaboration in partner ecosystems
- China pace of development and sophistication
- The 6 ecosystem areas mean the entire established value chain is in uncoordinated transformation
- Moving from a slow central management model to a collective knowledge agile swarm management model is key to survival

Thank You

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