



AUTOMOTIVE

Autonomous driving: The short-term impact

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A large teal graphic on the right side of the slide features a circular, textured pattern. Overlaid on this pattern is the text "INDUSTRY RESET" in a bold, white, sans-serif font, arranged in two lines.

Agenda

Where are we now?

Enabling technologies

Component pricing

Market dynamics

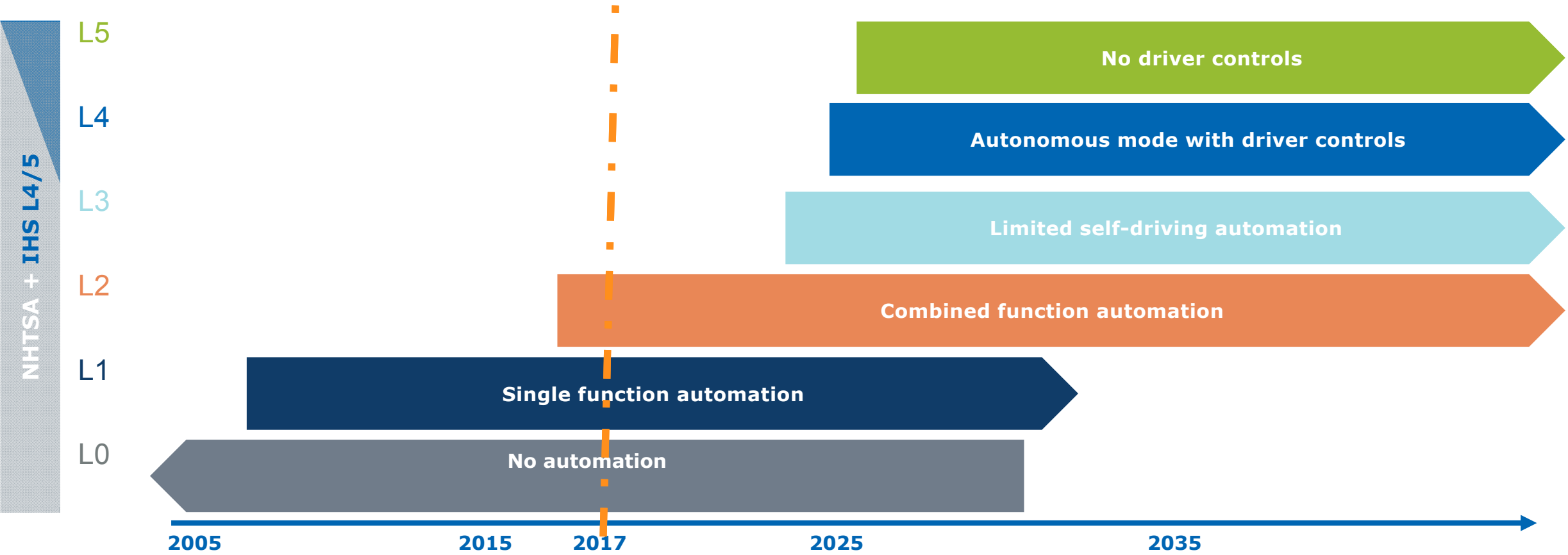
2017?

Q&A

The big picture

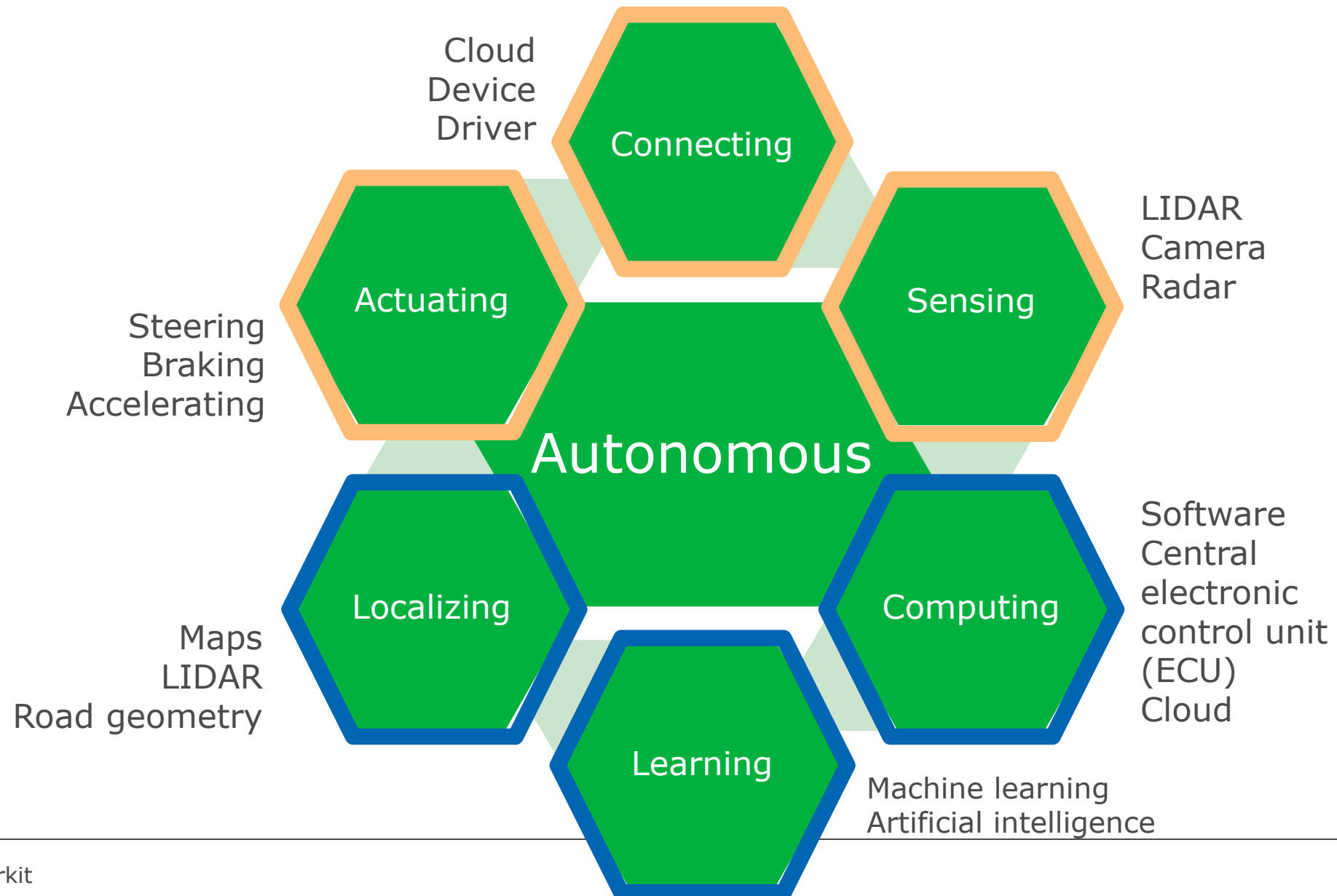


So where are we now?

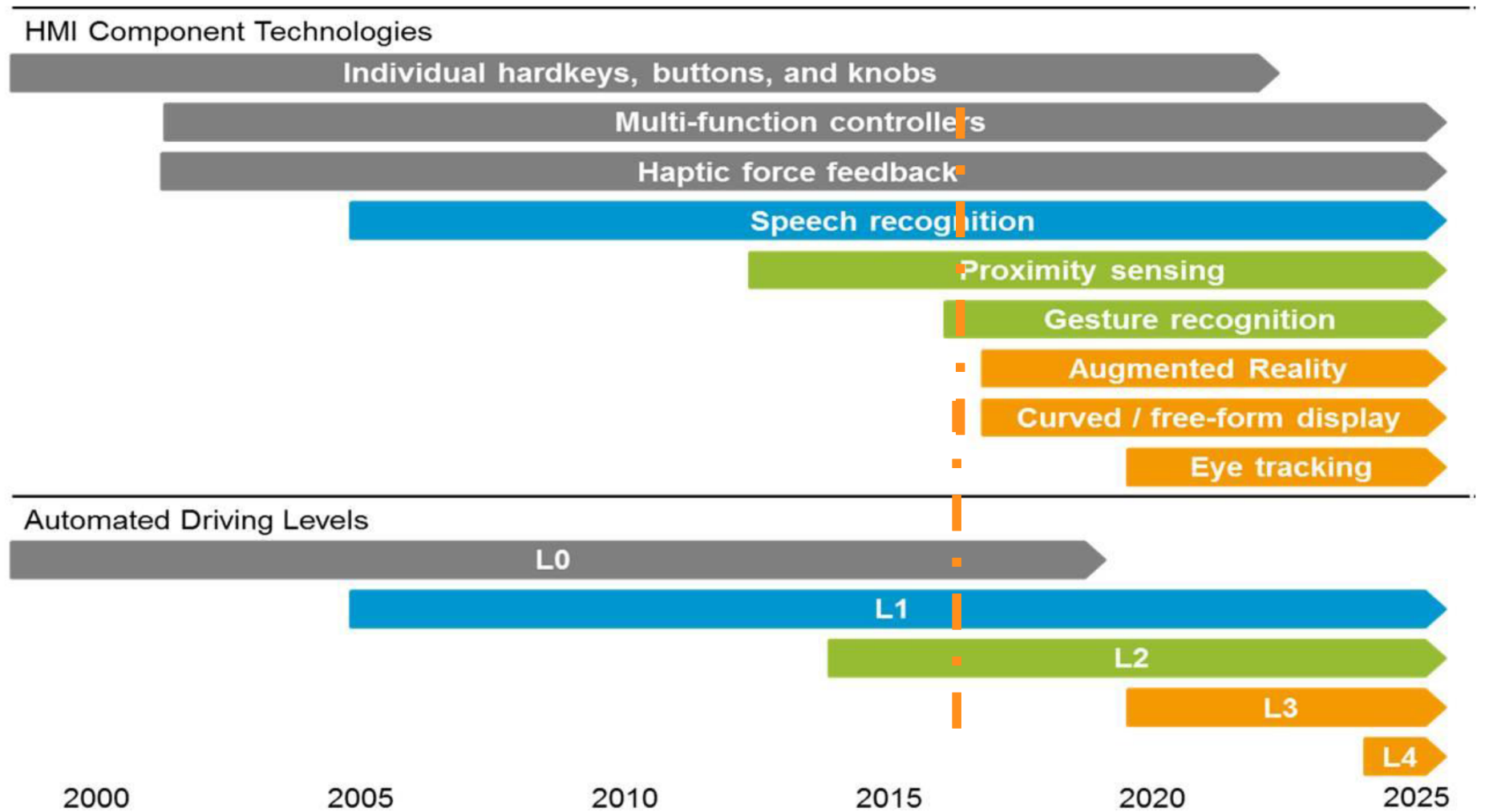


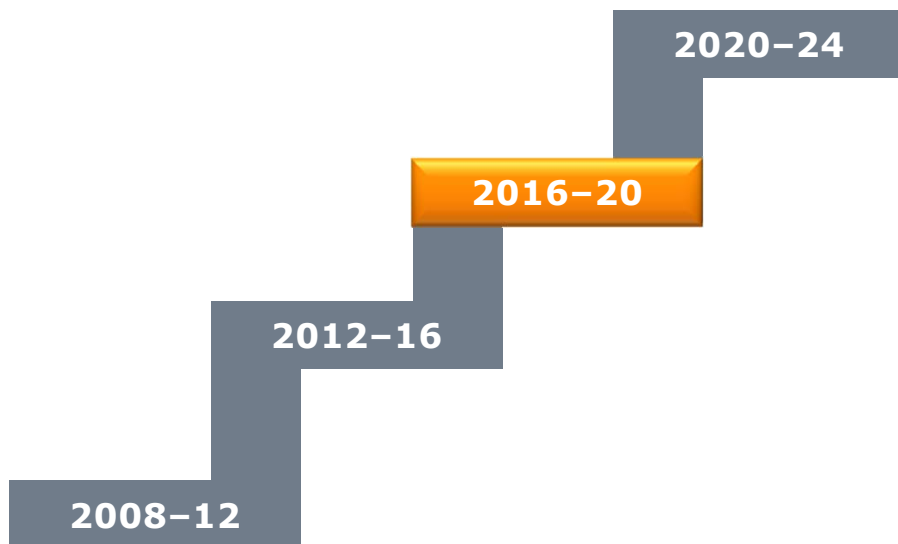
Enabling technologies

The autonomous ecosystem comes together



Developments in autonomy to shape user interface





Human-centric inputs

- Speech recognition
- Gesture recognition
- Driver monitoring

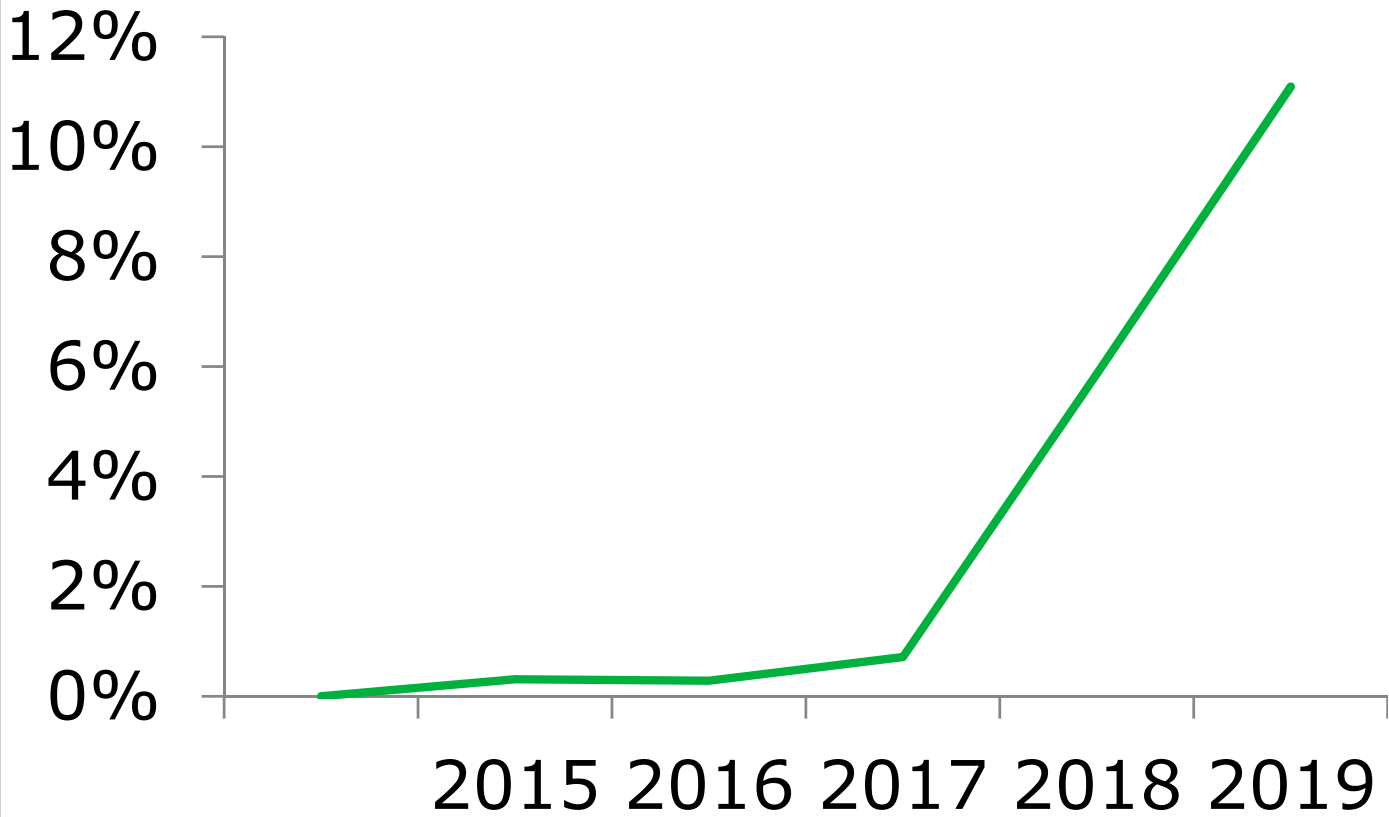
Display applications

- Rearview e-Mirrors
- Side-view e-Mirrors
- HVAC, passenger, door, etc.

Display technologies

- Curved displays
- AMOLED displays
- Augmented reality head-up display

Facial monitoring world fitment rate



Source: IHS Markit

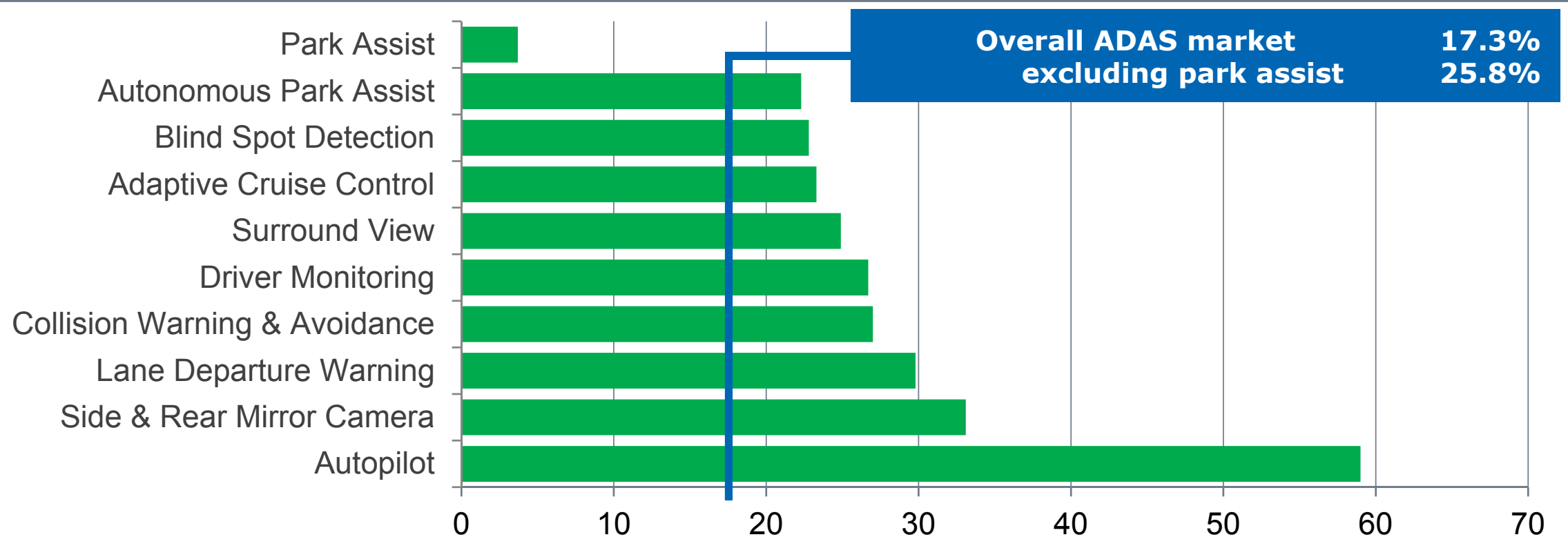
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Assessing drivers' mental states, cognitive loads, and attention levels will become increasingly important

Regionally, Japan is forecast to see the highest fitment rates of facial monitoring, followed by North America

Advanced driver assistance systems (ADAS) growing rapidly

ADAS unit growth: CAGR 2017–22

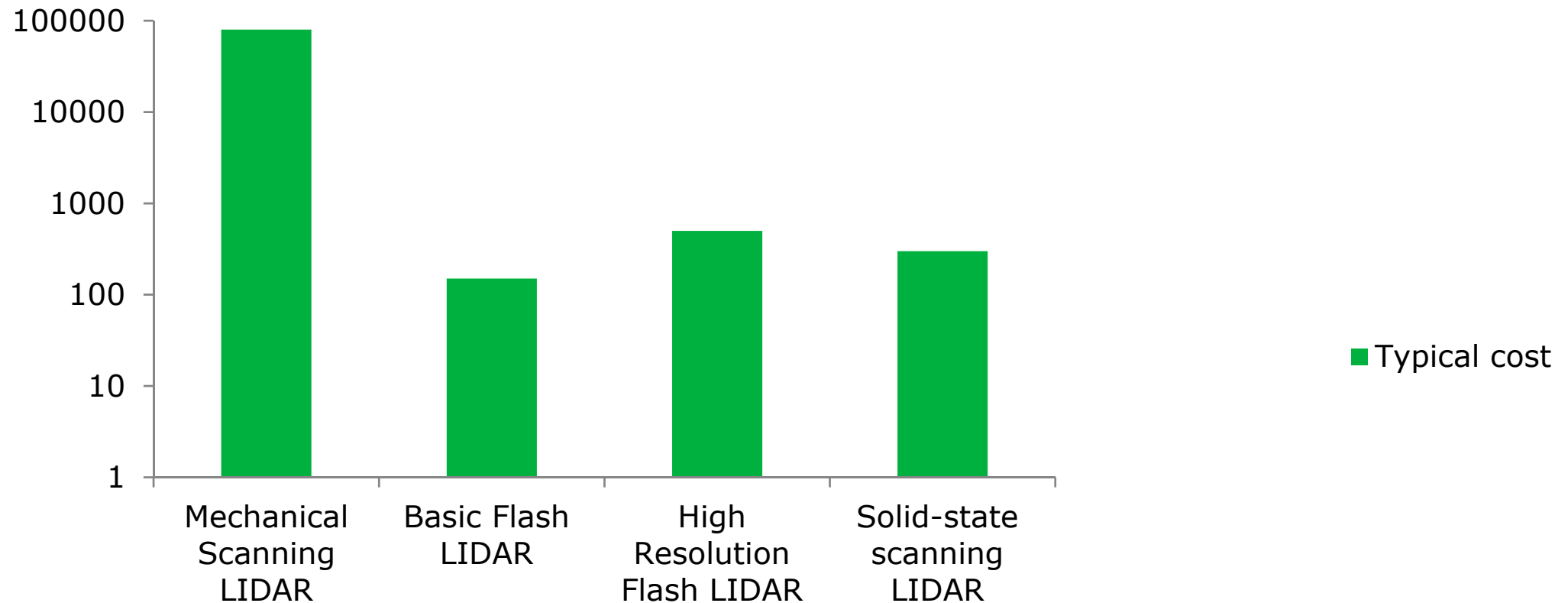


Source: IHS Markit

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High-performance solid-state LIDARs: A key to system cost reduction

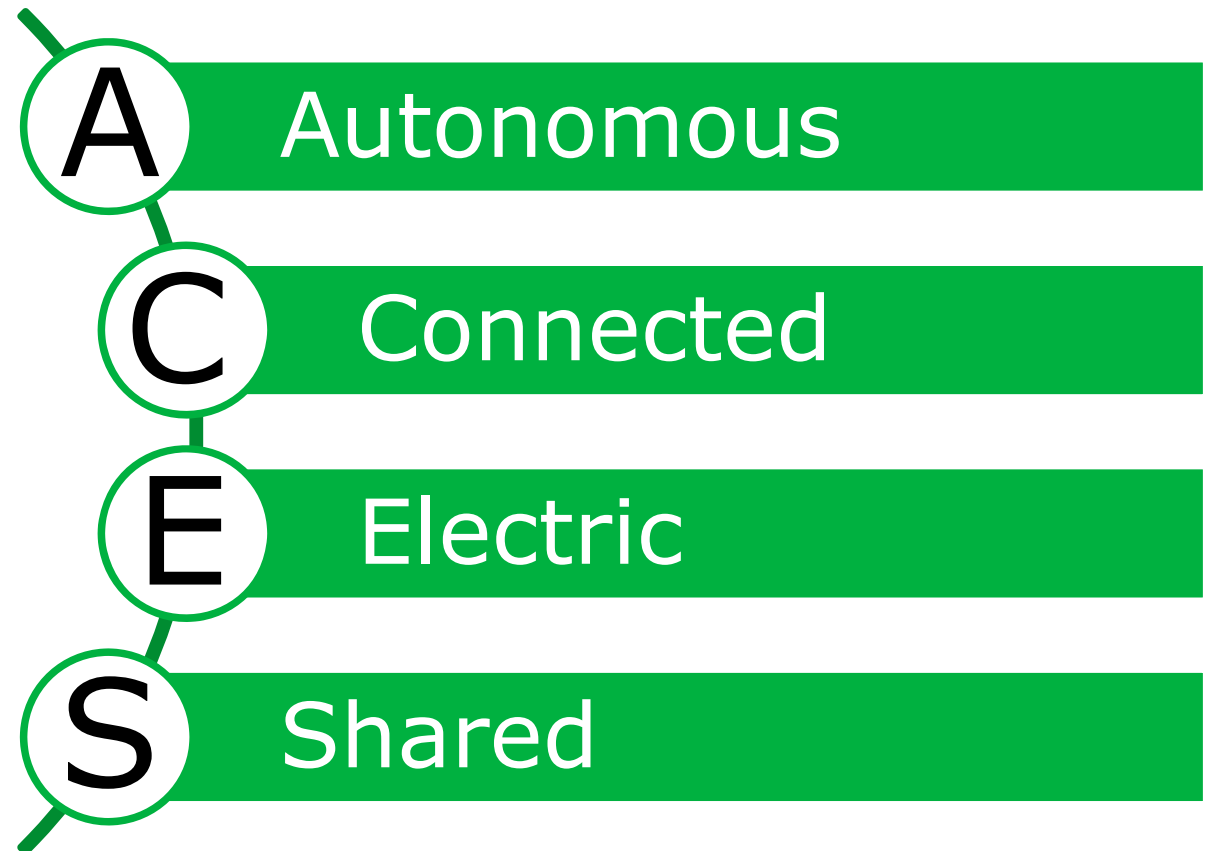
Typical cost



Wider change

Mobility manifesting

- Automaker subbrands become the home for new technologies
 - BMW **i**
 - Mercedes-Benz **EQ**
 - Volkswagen **ID** concept vehicles
- Companies establish stand-alone mobility units
 - Google **Waymo**
 - General Motors **Maven**
 - BMW **ReachNow**
 - Volkswagen **Moia**
 - Daimler **car2go**
 - PSA Group **Free2Move**



Testing and pilot schemes

Location	Initiated by
United Kingdom–Milton Keynes	Government
United Kingdom–London “Gateway project”	Government
United States–Pittsburgh	Uber
Sweden–Gothenburg	Volvo
Germany–Autobahn	BMW, Audi, Mercedes-Benz

Adaptation of infrastructure

- Dedicated autonomous driving lanes
- Road signals and signs

Education of drivers

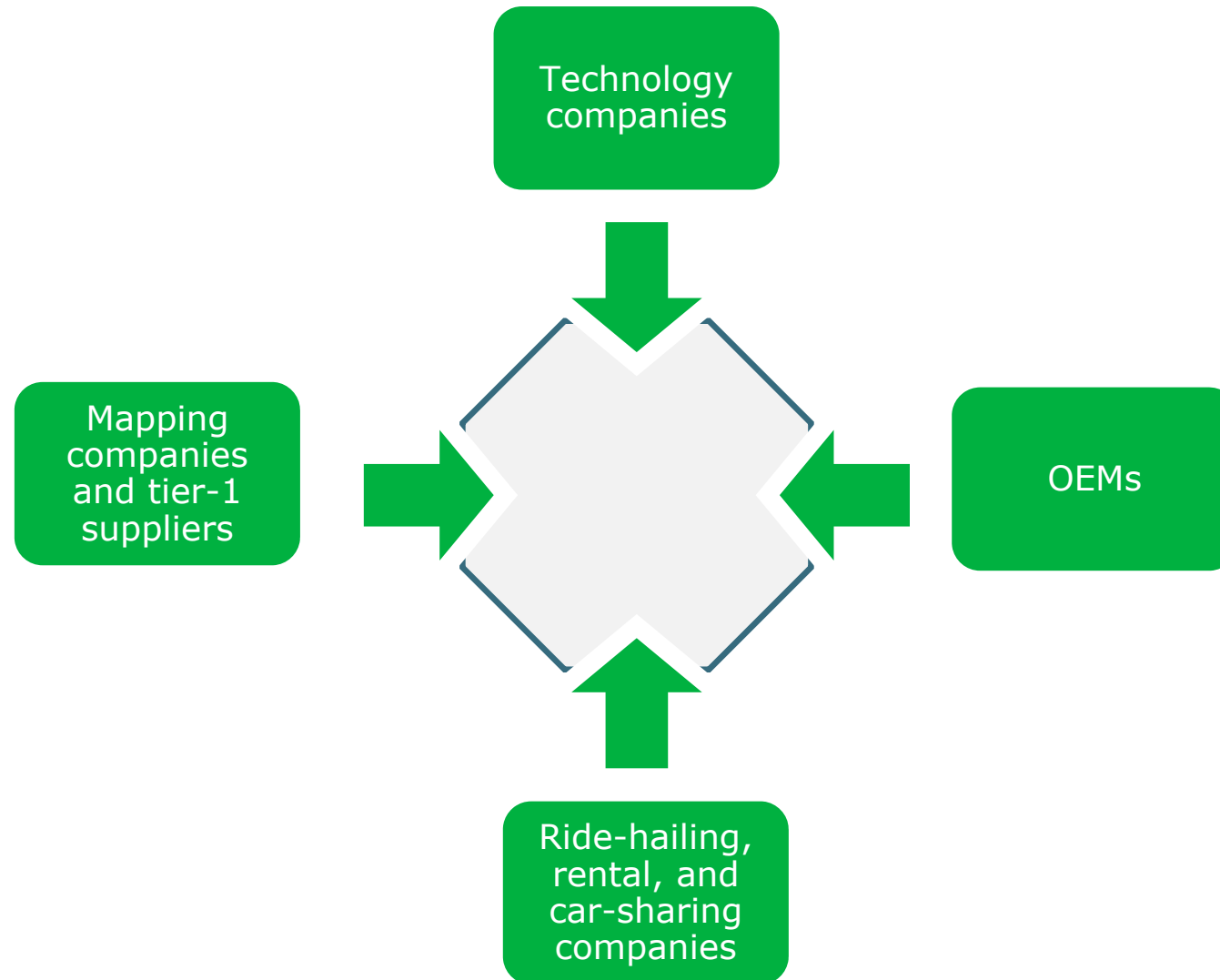
- Addressing safety concerns
- How to interact with autonomous vehicles

Forms of testing

	Key information	Comment
Ride-hailing	<ul style="list-style-type: none"> ▶ State-sponsored pilots ▶ Private research and development and testing 	<ul style="list-style-type: none"> ▶ Singapore (Delphi, NuTonomy) ▶ Pittsburgh (Uber, Delphi)
Special routes	<ul style="list-style-type: none"> ▶ Simple and fixed city trips ▶ Campus fixed trips ▶ Airport shuttle (two-year test) ▶ Between train stations 	<ul style="list-style-type: none"> ▶ Las Vegas–January 2017 (Navya) ▶ Santa Clara University (Auro) ▶ New Zealand (Navya) ▶ Paris (EasyMile)
Self driving–only zones	<ul style="list-style-type: none"> ▶ Small city section at first ▶ Urban mega-centers 	<ul style="list-style-type: none"> ▶ Campus, military base, airport ▶ China, likely as low-emission zones
Low-speed driving	<ul style="list-style-type: none"> ▶ Urban or closed communities 	<ul style="list-style-type: none"> ▶ To limit and avoid crashes
Route- or lane-specific	<ul style="list-style-type: none"> ▶ Commuter routes ▶ High-occupancy vehicle lane for self-driving 	<ul style="list-style-type: none"> ▶ Replace current ride-sharing routes ▶ Seattle-Vancouver proposal

Market dynamics

Strategic partnerships



Recent strategic partnerships/acquisitions

- Uber and Volvo
- HERE—expanded consortium of ownership
- Autoliv/Volvo–Zenuity
- Nvidia/multiple OEMs
- Bosch/TomTom
- Intel/Mobileye



Regulations

Regulatory activity is already influential, but it becomes one of the most important market forces for ADAS

New Car Assessment Program (NCAP)

US NCAP adding 7+ new ADAS in 2018

Euro NCAP continues to move forward on new automatic emergency braking (AEB) features

Little-to-no activity from other countries

Voluntary agreements

US commitment for standard AEB by 2022

Will effectively make AEB standard everywhere in a few years, with rare local model exceptions

What is next?

Standards and guidance

ISO 26262 + Automotive Safety Integrity Level

New automated vehicle guidelines expected in the United States

Steady progress on cybersecurity and driver distraction guidance in the United States

Sharing economy

Open question everywhere today

Even China allowed ride-hailing services in legal gray zone

Regulation likely to be defined by the current market

Guidance will shape the future of automotive technology; regulatory decisions will affect how the sharing economy evolves

2017 automotive technology foresight

Autonomy & artificial intelligence

Sensor advances, artificial intelligence, innovative interiors, and platform development toward public deployment

Autonomous, Connected, Electric, and Shared (ACES)

Creation of further subbrands and further development of stand-alone mobility units

Collaboration and mergers and acquisitions

OEMs acquiring new competencies; more supplier consolidation possible, achieving scale in data and services

Electronic architectures

Sensor fusion ECUs and central ADAS domain controllers will drive further advances in autonomy, reduce cost, and save weight

New automotive user experience (UX)

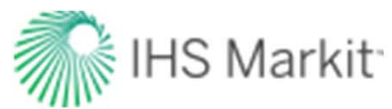
Developments in user interface technologies, design, or service models aim to reinvent the automotive UX

Disruptors

Mobility providers and start-ups push OEMs and suppliers to diversify products and business models

2017–18
foresight

Thank you!



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