



**Valeo - a leader in ADAS
with the only Automotive Laser Scanner
in production**



SMART TECHNOLOGY FOR SMARTER MOBILITY

ADAS/AD MARKET: THREE WAVES



WAVE 1: SAFETY AND ACCIDENT REDUCTION

Active Safety comes as standard on most new vehicles
Valeo has booked €6bn+ of business on Active Safety



WAVE 2: LEVEL 2+ ADAS SYSTEMS

New businesses to be awarded all include L2+ functionality
Valeo has launched its first L2 system in 2020



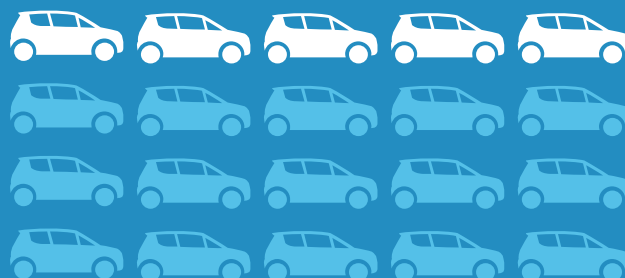
WAVE 3: AUTOMATED DRIVING

New platforms from 2025 onwards are designed for AD
Valeo has contributed to the first L3 programs just being launched and offers the technology for L4

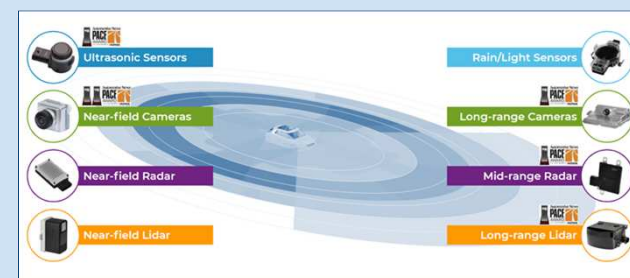
VALEO: LEADER IN PARKING, SAFETY & DRIVING AUTOMATION



**30 years of innovation
15 world's first in 10 years**



**1 in 4 new cars comes with
Valeo ADAS technology**



**Broadest perception
portfolio in the industry**



**Making mobility safe &
more pleasant for everyone**



**Worldwide network of
engineers and production**

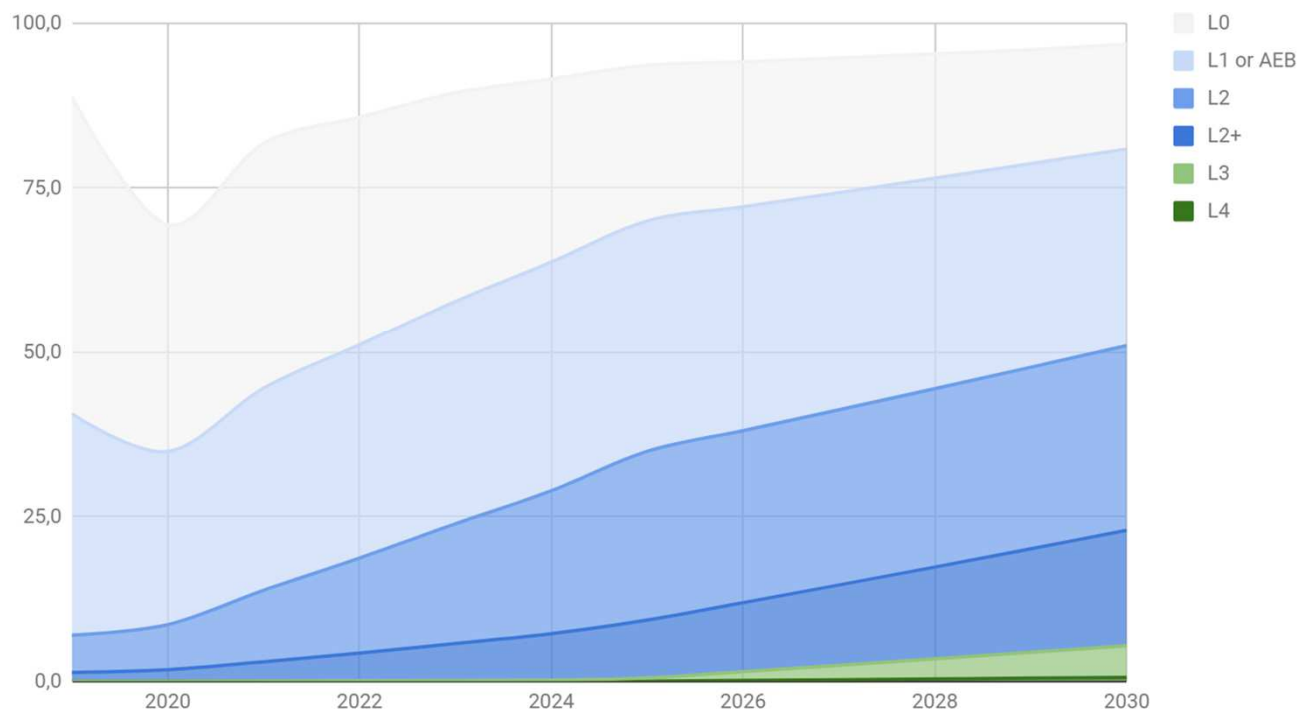


**>1 billion sensors shipped
>30 million systems/year**

Privately Operated Vehicles (POV) Drive Market Growth

- Safety first: Vision Zero
- ADAS is accelerating
- Privately-operated vehicles will focus on Level 2+
- Affordability drives up penetration rates and generates volumes

Vehicle Fitment per SAE Level



Amount of L2/L2+ systems for POV to quadruple by 2025

SAE J3016™: LEVELS OF DRIVING AUTOMATION



WITH L2+ ADAS THE DRIVER REMAINS RESPONSIBLE FOR THE DRIVING MATURITY FOR L4 REQUIRES VOLUMES WHICH ARE FOUND IN L2+

LIDAR IS A KEY ENABLER FOR SAFE AUTOMATED DRIVING

Valeo SCALA™
can detect



LEVEL 3 SYSTEMS ARE ENTERING THE MARKET IN THE PRIVATELY OPERATED VEHICLES SEGMENT – ENABLED BY LIDAR



Audi



Mercedes · L3 in 2021



Honda · L3 in 2021



Lexus

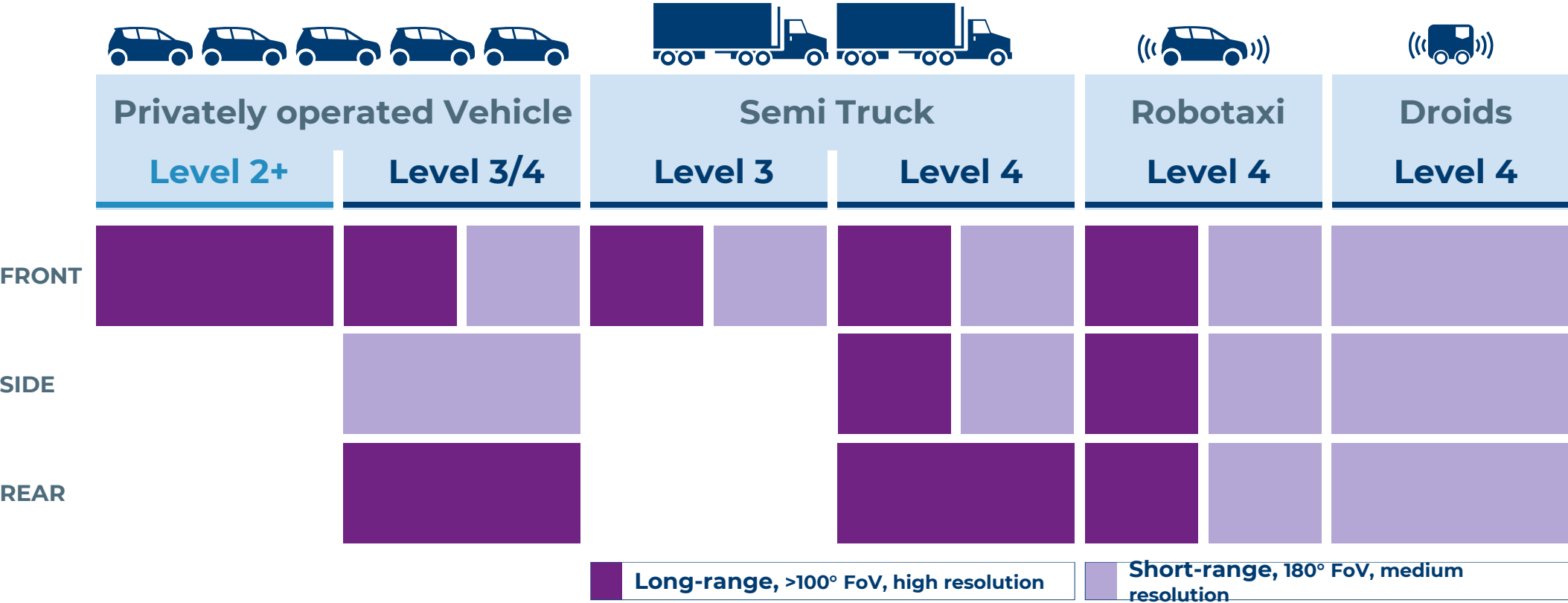


Great Wall · L3 in 2022



Volvo · L3 in 2022

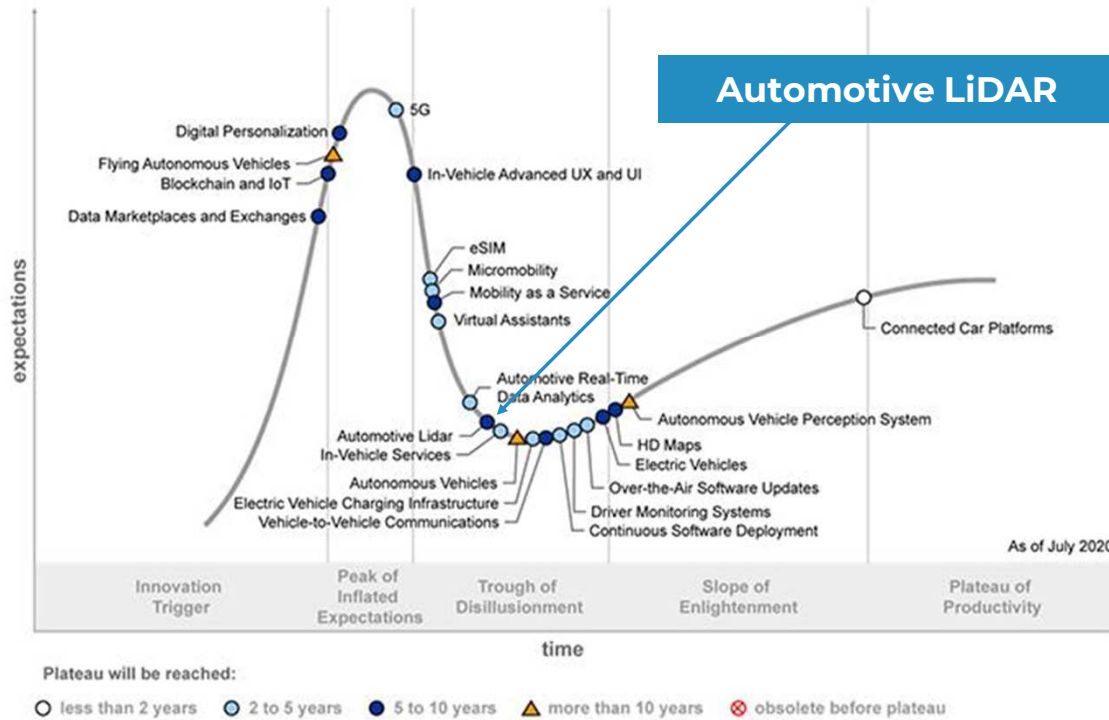
LIDAR APPLICATIONS ACROSS VARIOUS MOBILITY SECTORS



Two main sensor designs able to cover most needs across different sectors.

AUTOMOTIVE LIDAR TECHNOLOGY MATURITY

Hype Cycle for Connected Vehicles and Smart Mobility, 2020



Source: Gartner

The “AD Problem” is complex

- ➔ Market delays
- ➔ Raised sensing expectations

LiDAR “real” capabilities have limits

- ➔ Safety & availability trade-off
- ➔ All-conditions performance

Multiple usages drive LiDAR market

- ➔ Reference systems
- ➔ Delivery droids
- ➔ Robotaxis, robotrucks
- ➔ Private autonomous vehicles

Ongoing convergence between market expectations and technology capability

THE CHALLENGE: AUTOMOTIVE GRADE TECHNOLOGY

Manufacturing	supplier management	process validation	end-of-line testing	process stability	traceability
System Validation	virtual testing	HiL / SiL	lab test test track	real world testing	all seasons worldwide
Development Process	requirement engineering	project management	SOTIF	functional safety	respect deadlines
Software Engineering	sensor control	service functions	calibration	point cloud	object identification
Sensor Design	mechanical robustness	EMC compliance	temperature range	durability	automotive components
Performance	perception range	field of view	resolution	accuracy	frame rate
Basic Requirements	cost	package size	vehicle integration	scalability	credibility

Stringent standardization required to achieve predictable and robust results

THE CHALLENGE: AUTOMOTIVE GRADE TECHNOLOGY

Manufacturing	supplier management	process validation	end-of-line testing	free space	road markings
System Validation	virtual testing	HiL / SiL	lab test test track	noise suppression	static objects
Development Process	requirement engineering	project management	SOTIF	pre processing	dynamic objects
Software Engineering	sensor control	service functions	calibration	point cloud	object identification
Sensor Design	range estimation	blockage detection	end of line calibration	map matching	ego motion calculation
Performance	interference suppression	rain spray detection	online calibration	accuracy	ground topology
Basic Requirements	heating & cleaning control	OTA capability	misalignment detection	scalability	credibility

Stringent standardization required to achieve predictable and robust results

THE CHALLENGE: AUTOMOTIVE GRADE TECHNOLOGY

Manufacturing	supplier management	process validation	end-of-line testing	process stability	traceability
System Validation	virtual testing	HiL / SiL	lab test test track	real world testing	all seasons worldwide
Development Process					
Software Engineering					
Sensor Design					
Performance	perception range				
Basic Requirements	statistical model	scenario database	tool chain validation	ground truth extraction	data management

Stringent standardization required to achieve predictable and robust results

THE BENEFITS: AUTOMOTIVE GRADE PRODUCT & PROCESS

Reliable Product

- ➔ Over environmental conditions
- ➔ Over personal vehicle lifetime
- ➔ Built-in service functions to maximize availability
- ➔ Compliant with safety requirements and various stringent qualifications

Reliable Production

- ➔ Stable industrial setup
- ➔ Secured large scale capacity
- ➔ Robust supply chain

Reliable Teams

- ➔ Stable and competent base
- ➔ Worldwide footprint
- ➔ Able to support solving use case across mobility sectors

Reliable Prices

- ➔ Design to cost to address automotive business constraints
- ➔ Driven by personal vehicles volumes
- ➔ Production on large scale assembly lines

Scalable solutions available for the whole transportation industry

VALEO SCALA™ 3D LASER SCANNER



Launch of 2nd generation in 2021

Over 125,000 SCALA™ on the road worldwide

Optimized for privately operated vehicle use cases

Fully compliant with automotive requirements

World's only automotive grade 3D lidar since 2017

VALEO LIDAR PORTFOLIO

SCALA™ Gen. 2

- ➔ Up to 200 meter range (car)
- ➔ 133 x 10° field of view
- ➔ Up to 0.125° horizontal resolution
- ➔ 16 vertical planes
- ➔ 25 Hz update rate
- ➔ 107 x 94 x 65 mm
- ➔ Point cloud or Object interface



<< €900 at volume

Near-field Lidar (NFL)

- ➔ Up to 30 meter range (car)
- ➔ 100 x 80° field of view
- ➔ 0.4 x 0.4° resolution
- ➔ iToF Flash lidar
- ➔ 25 Hz update rate
- ➔ 60 x 91 x 47 mm
- ➔ Point cloud interface



< €200 at volume

Mobility Kits

- ➔ Sensors, SW Tools, Functions
- ➔ Automotive grade quality
- ➔ Easy to Use (plug & play)
- ➔ Flexible configurations
- ➔ Raw Data output
- ➔ Open interfaces
- ➔ From single parts to thousands



Contact: cda.valeo-mobilitykits.mailbox@valeo.com

The right lidar solution for applications across automotive and mobility sectors

CARS IN 2025+ WILL BE DESIGNED FOR AUTONOMY

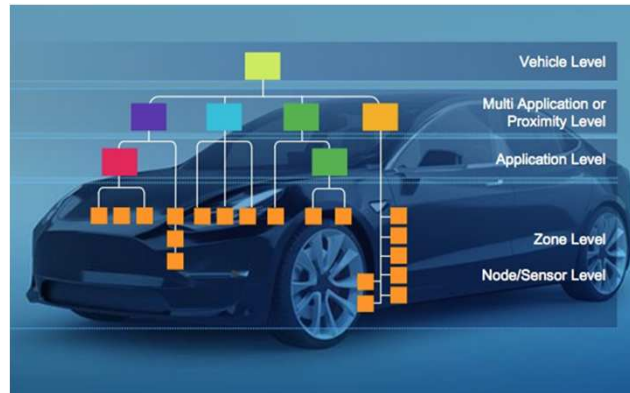
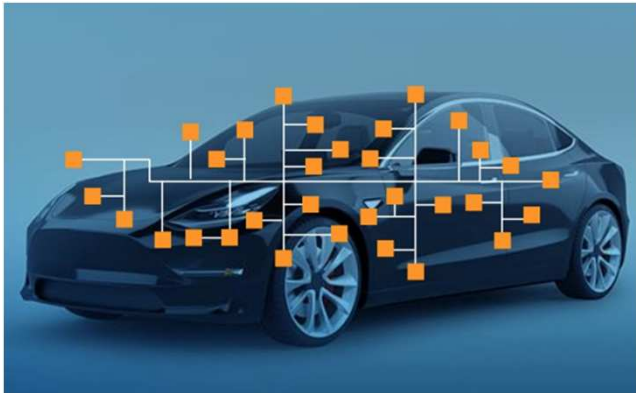
OEMs are significantly changing the E/E architecture

DECENTRAL

Intelligent sensors
Heavy wiring
Flexibility

DOMAIN + ZONE

Synergies
Computing cluster
Service Orientation



Opportunities for Valeo in different Products

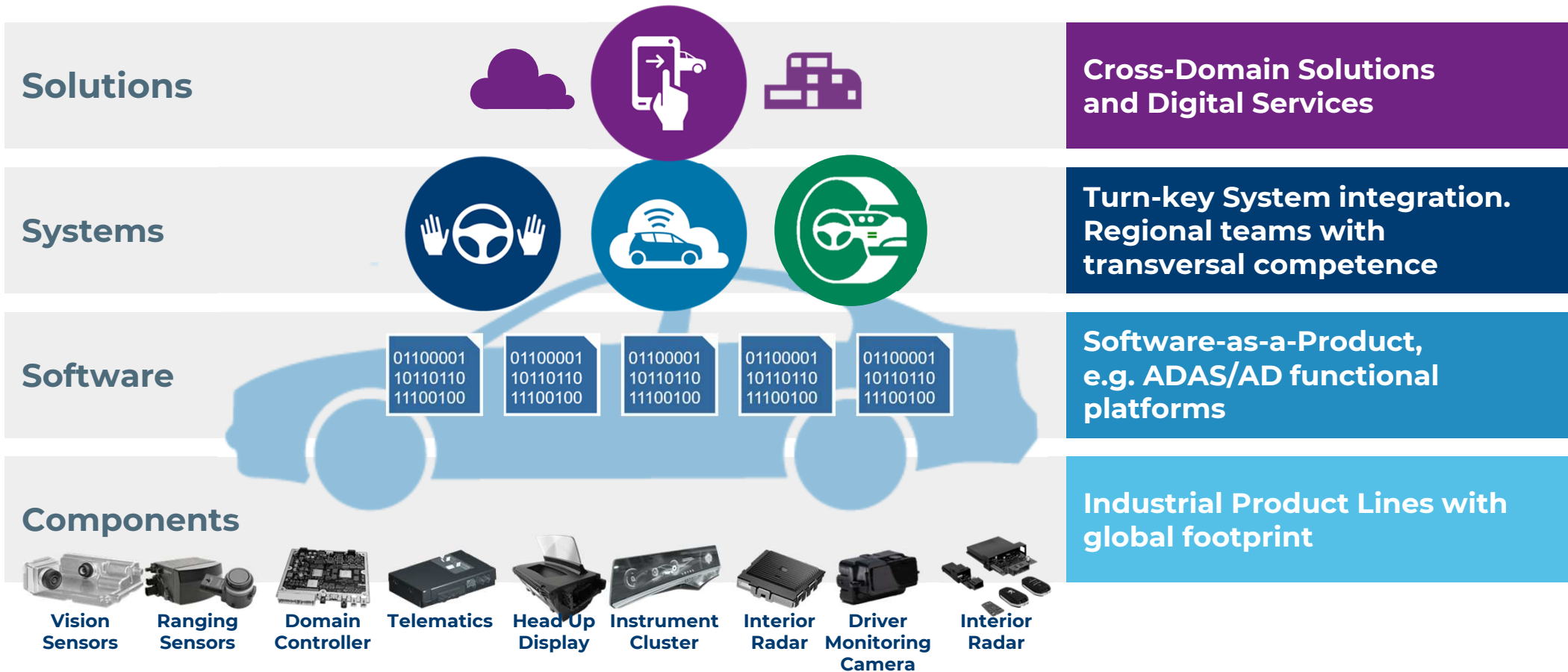
Interior Interface Module

Domain Controllers

Zonal Controllers

Connectivity Module

CDA PRODUCTS AND SERVICES | ADAPTED TO CUSTOMER NEEDS



Vision Sensors

Ranging Sensors

Domain Controller

Telematics

Head Up Display

Instrument Cluster

Interior Radar

Driver Monitoring Camera

Interior Radar



Valeo

SMART TECHNOLOGY
FOR SMARTER MOBILITY

WHAT'S TO REMEMBER



Automotive grade quality is key for any automated driving application



Automotive quality is not easily achieved and requires hard work and above all experience



The world's only truly automotive grade 3D lidar comes from Valeo



Valeo lidar solutions cover the key needs across different mobility sectors

A Leader in ADAS

Most comprehensive sensor portfolio in the industry

Scalable system platforms with re-usable hardware and software modules



22,100
Employees



18
Countries



7,000

Research & Development



3,900

System & Software

VALEO RESERVED

2019 figures

1

1 in 4 new vehicles already come with a Valeo ADAS system

2

>11bn€ Order Intake over the past 3 years

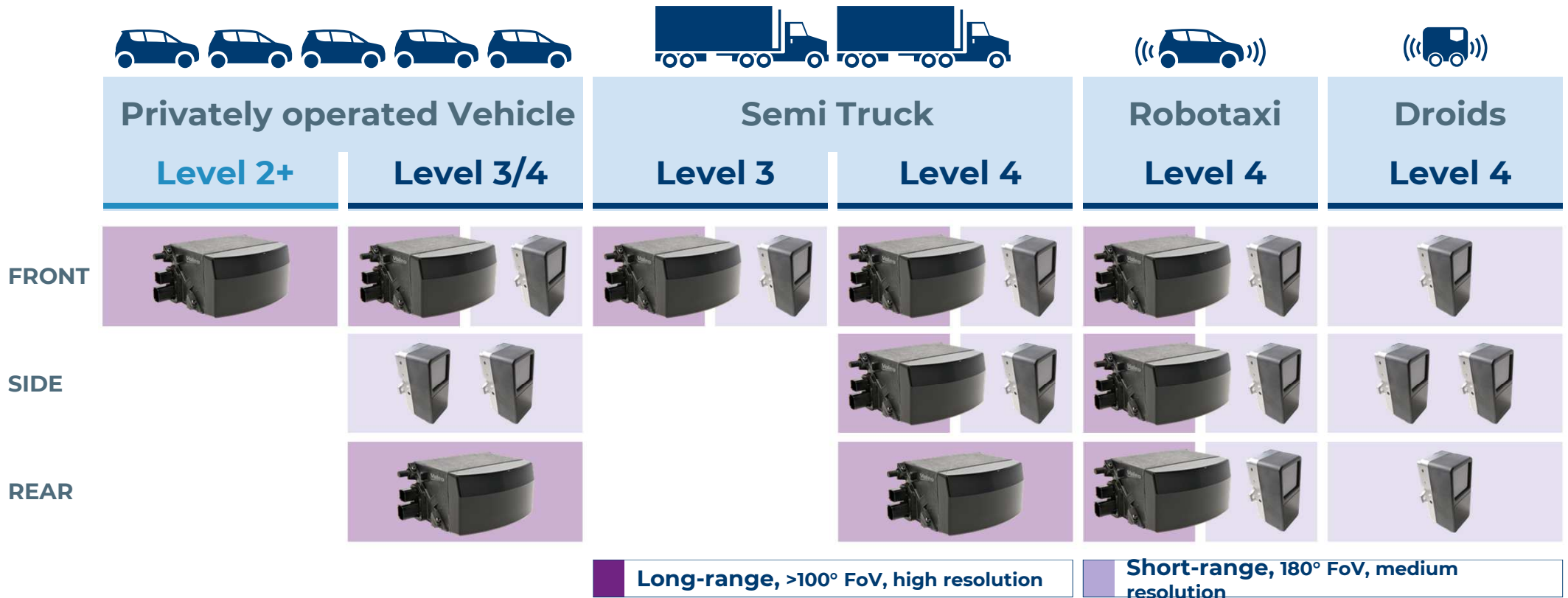
3

1st Stand-Alone Level 2 based on camera-only technology

4

1st AI Driver Monitoring with driver distraction & drowsiness detection

LIDAR APPLICATIONS ACROSS VARIOUS MOBILITY SECTORS



Two main sensor designs able to cover most needs across different sectors

Driverless Vehicles focus on Commercial Services



- Transportation of people and goods will first adopt L4 automation
- Automation becomes a business case, rather than a customer feature
- Uncertainty of regulatory and liability frameworks slows broad deployment



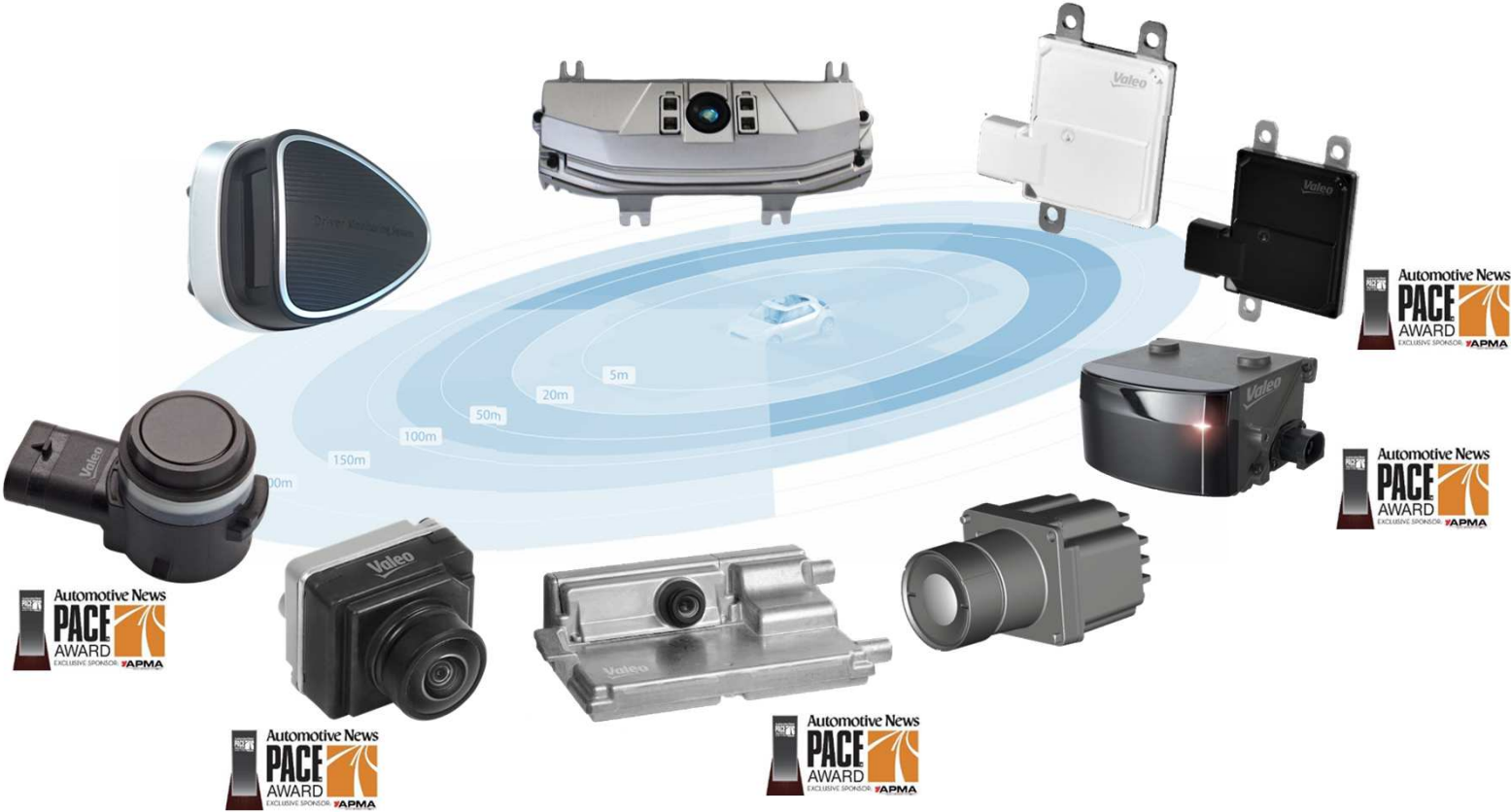
Platforms Generate Economies of Scale

INTERIOR COCOON

Driver and cabin monitoring

EXTERIOR COCOON

Perception and Situational Awareness



Valeo supports both pillars with our platforms for Automated, Connected, UX solutions

Powerful SOC's move the goalposts



- Silicon integration pushes chipmakers up the value chain
- We have built successful co-operations in the ADAS and Connectivity space
- We provide the broadest sensor portfolio in the market complemented by SW stacks



Established players in the western hemisphere...



... agile ecosystem / favourable government

Valeo has built global partnerships and local presence to add value as an integrator

Addressing New Value Spaces: Smart Mobility is More Than Cars

- **CES 2020 Demos:**
 - **eDeliver4U with Meituan**
 - **Mobility kit with TwinsWheel**
- **Cooperation with shuttle-makers**
- **Expand into cyber-services, localization, smart infrastructure etc.**



Credit: Valeo

Credit: Valeo



Credit: Navya



Credit: EasyMile



Credit: Scania



Credit: Valeo

30 YEARS OF VALEO INNOVATION IN ADAS

- Ultrasonic Parking Aid** 1991
- Mirror-integrated Rain Sensor** 1995
- Programmable ASIC** 1998
- Lane-Departure Warning** 2004
- Rear Camera w/ distance overlay** 2006
- Multi-beam Radar** 2006
- 5-camera Surround View** 2009
- Rain-Light-Humidity Sensor** 2009
- Cross Traffic Alert** 2009
- Semi-automatic Park Assist** 2007
- Perpendicular & Braking Park Assist** 2010
- Seamless Top View** 2010
- Parking Aid w/ flankguard** 2011
- Multi-function Front Camera** 2015
- 3D Surround View w/ obj. detection** 2015
- Hidden ultrasonic installation** 2015
- Map-based Park Assist** 2015
- Parking Domain ECU** 2016
- Park Assist w/ remote option** 2016
- Automotive-grade 3D Laser Scanner** 2017
- Invisible Trailer rear view** 2019
- Vision-only L2 driving function** 2019
- Front Camera w/ 100° lens** 2020
- Laser Scanner w/ increased vFoV** 2020
- Camera design for high resolution** 2021
- New vision/fusion based features** 2021
- New Ultrasonic Sensor Interface** 2021

THIS IS JUST THE BEGINNING

1 billion ADAS sensors in the last 30 years, another billion in the next 5 years