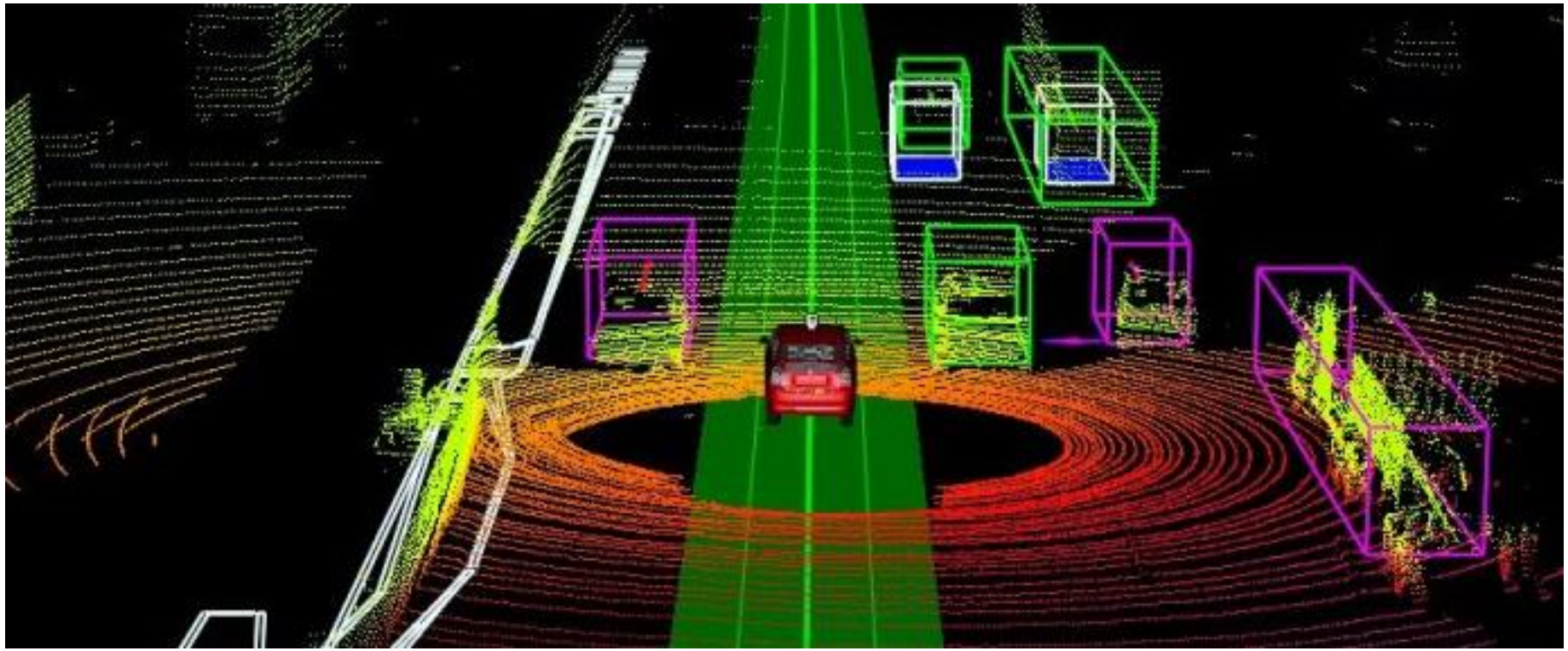


The Automotive LiDAR Market

April 2018

YOLE Développement

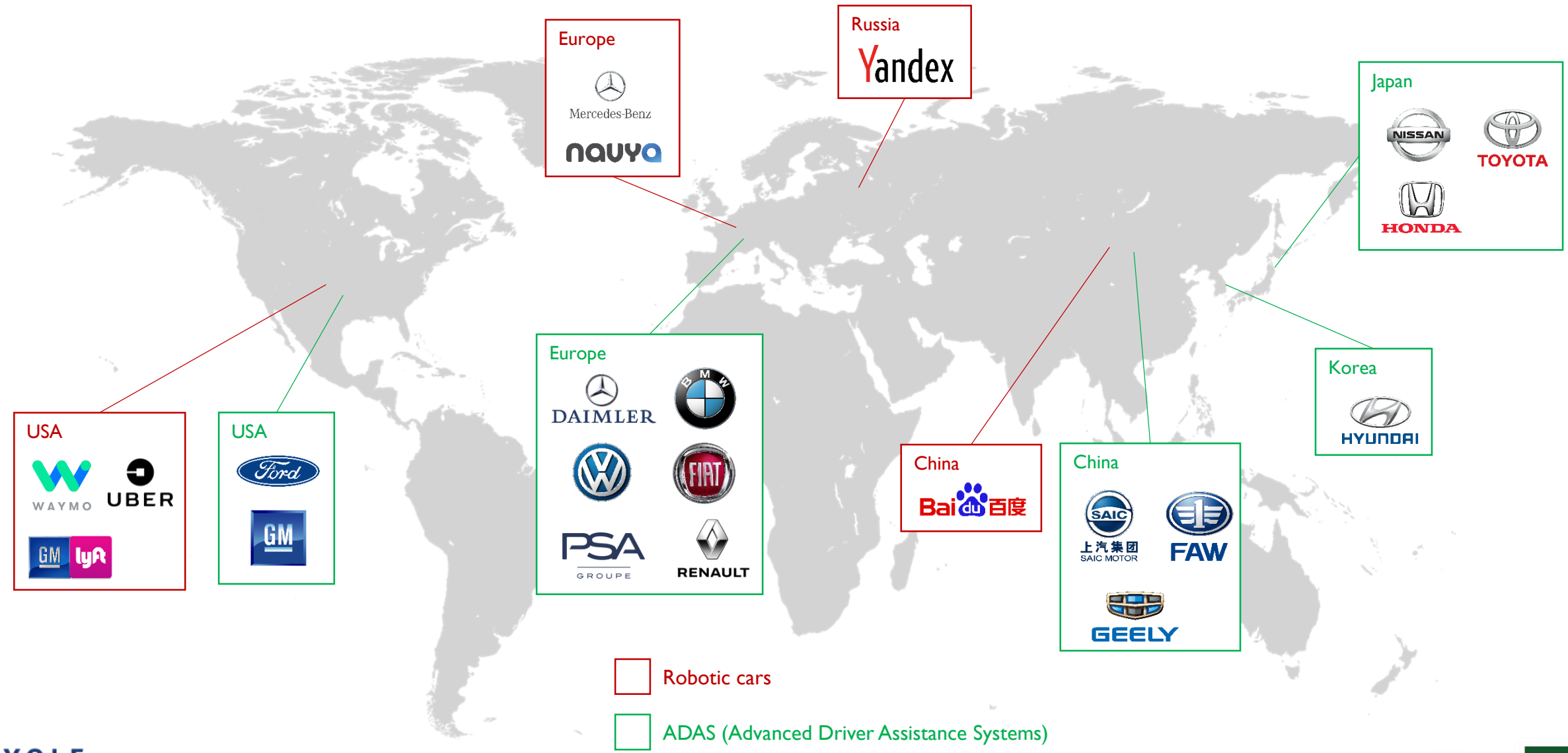
WOODSIDE CAPITAL PARTNERS

WCP

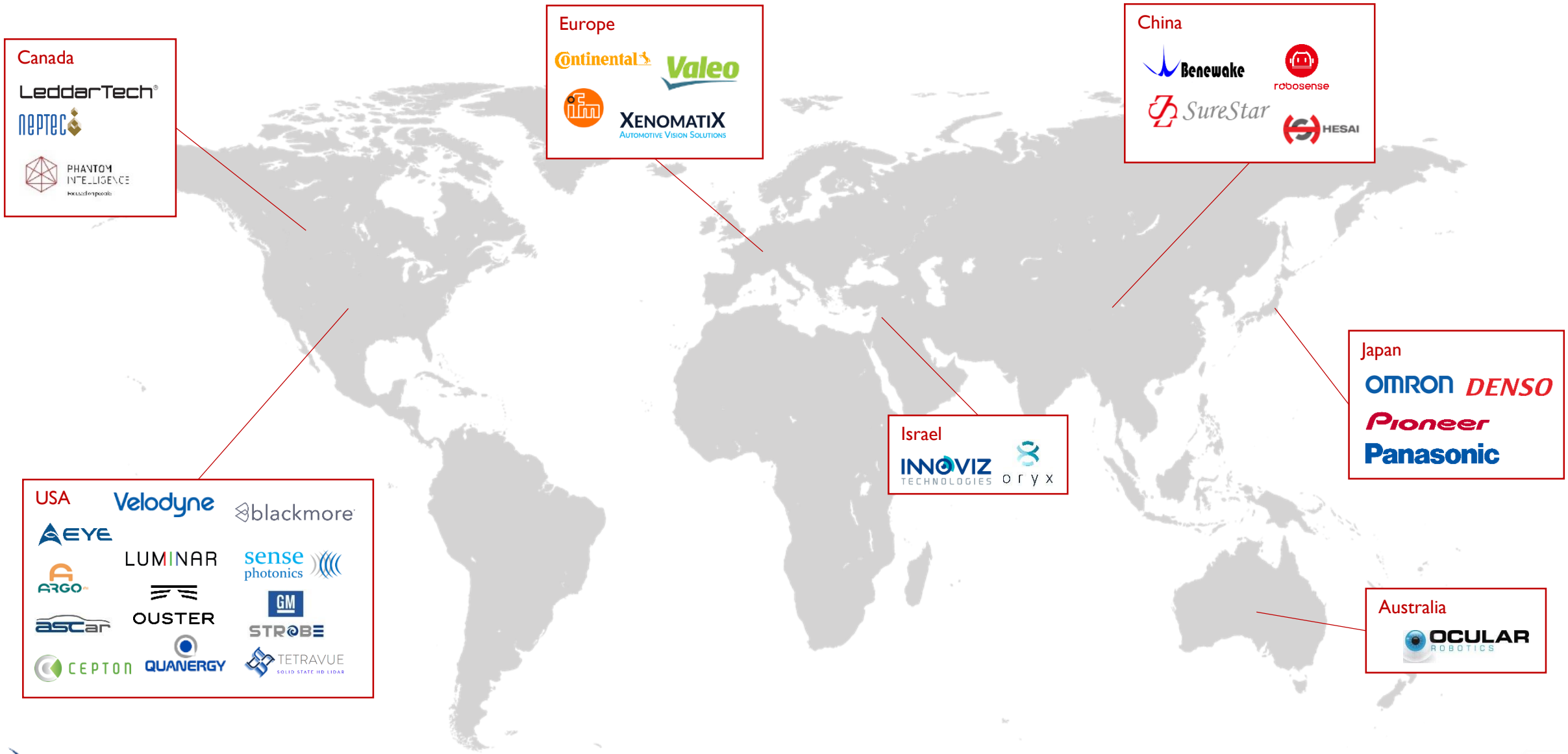
Market and Technology Overview

Market Map

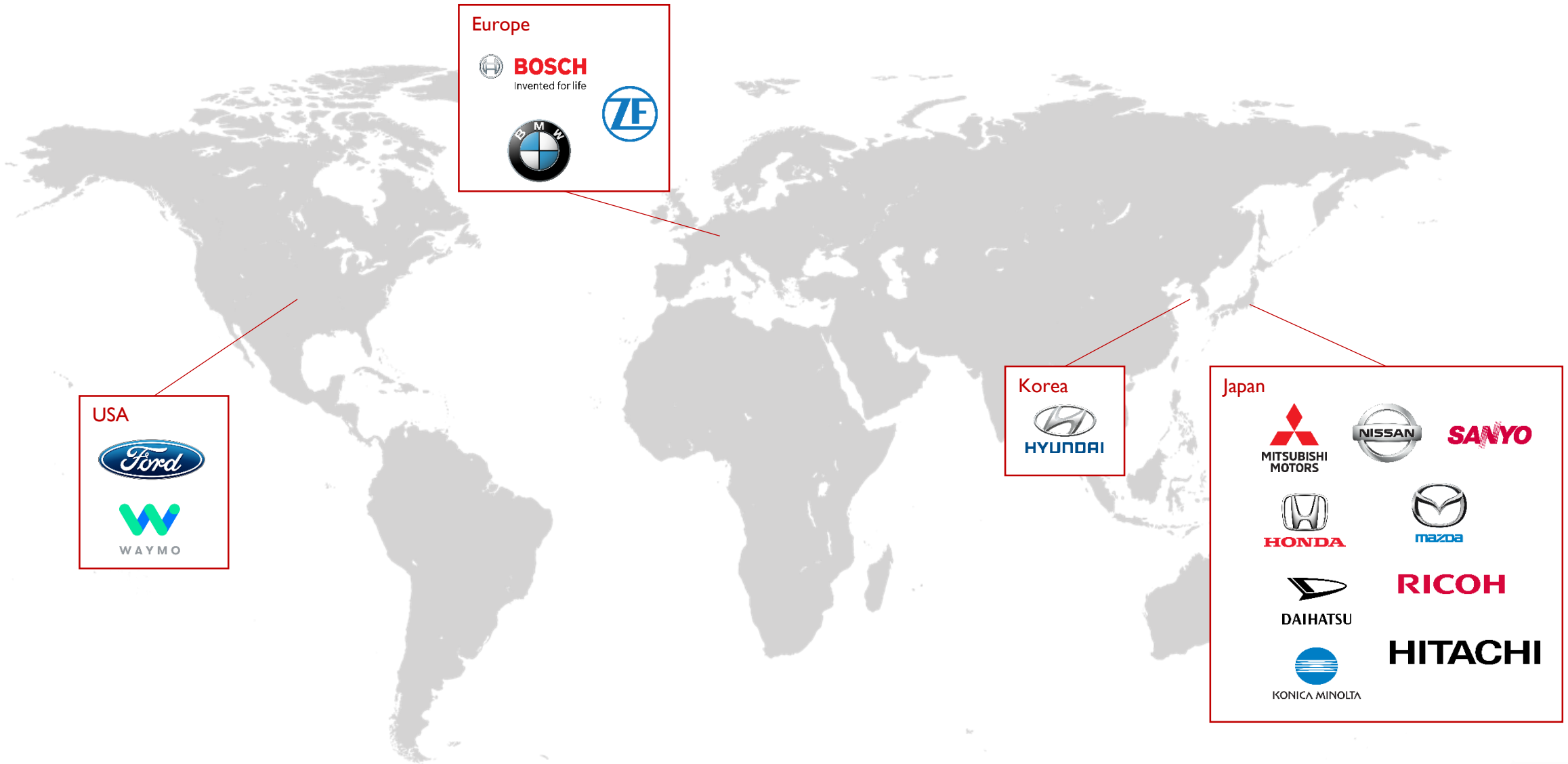
LIDAR FOR AUTOMOTIVE: POTENTIAL OEM



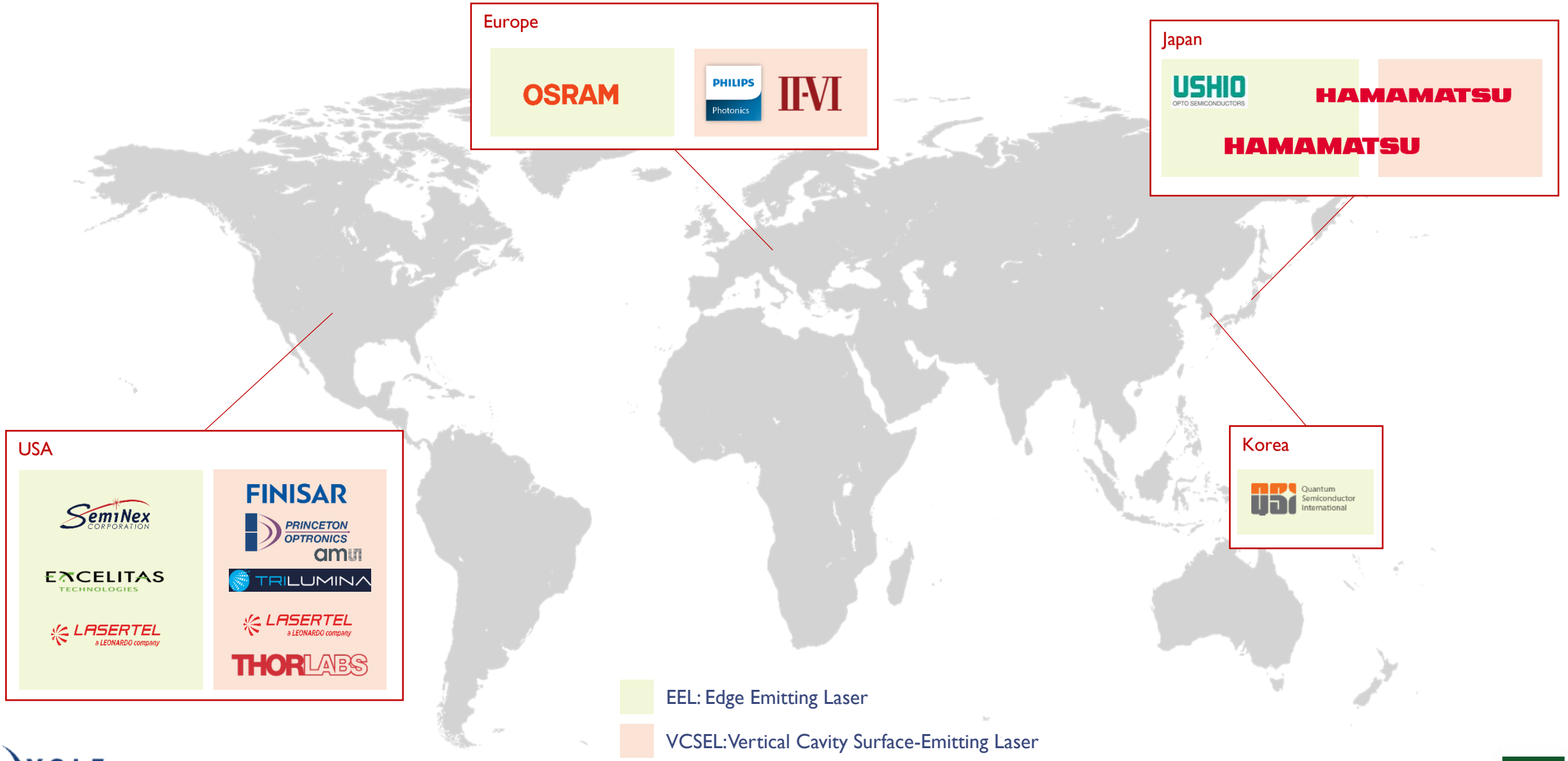
AUTOMOTIVE LiDAR MANUFACTURERS



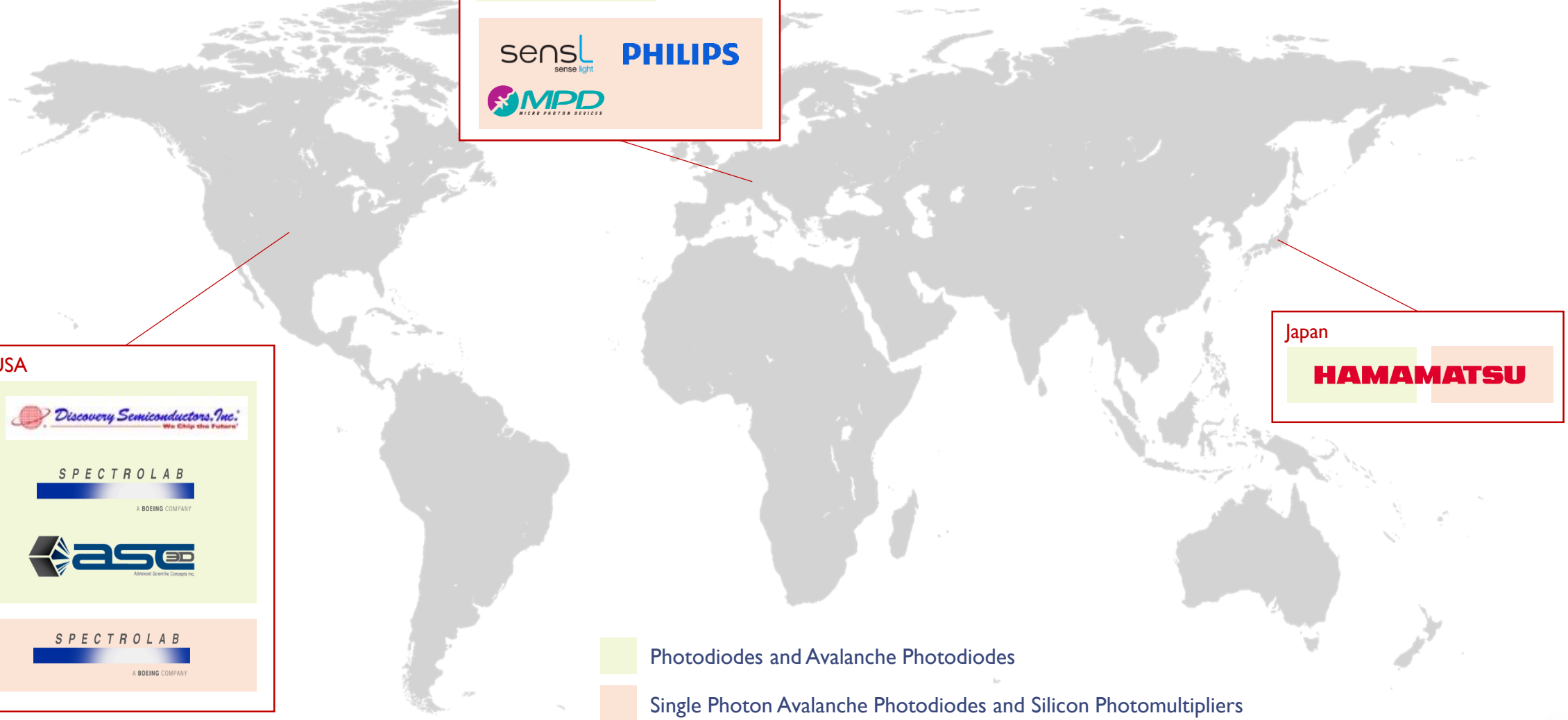
POTENTIAL AUTOMOTIVE LIDAR MANUFACTURERS (STEALTH MODE)



ILLUMINATION SOURCE PLAYERS



PHOTODETECTOR PLAYERS



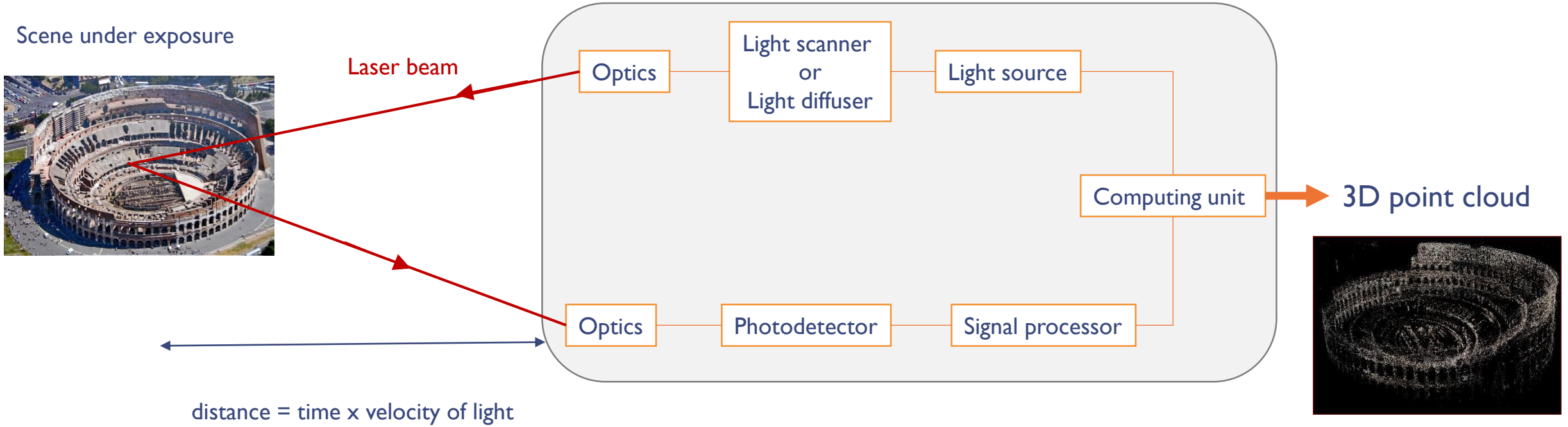
Photodiodes and Avalanche Photodiodes

Single Photon Avalanche Photodiodes and Silicon Photomultipliers

Technology Overview

LiDAR PRINCIPLE AND COMPONENTS

The basic working principle of the LiDAR is very simple.
A light source illuminates a scene. The light scattered by the objects of the scene is detected by a photodetector.
Measuring the time it takes for the light to travel to the object and back from it, allows to know its distance.



LiDAR system

AUTOMOTIVE LiDAR ECOSYSTEM

Photodetectors

PD/APD

HAMAMATSU

Discovery Semiconductors, Inc.

SPECTROLAB

A BOEING COMPANY

epc

esprot photonics corporation

SPAD/SiPM

sensL

sense light

PHILIPS

MPD

MICRO PHOTON DEVICES

ASC

Advanced Scientific Concepts Inc.

IC

FPGA

XILINX

LATTICE SEMICONDUCTOR

ALTERA

ADC

CIRRUS LOGIC

wolfson microelectronics

Amplifier

qorvo

intersil

A Renesas Company

LiDAR systems

Active players

Velodyne

Valeo

Benewake

robosense

速腾聚创

SureStar

LeddarTech

HESAI

镭神智能

LeiShen Intelligent System

OUSTER

R&D players

CEPTON

OCULAR ROBOTICS

ifm

Panasonic

ARGO AI

sense photonics

neptec

Technologies Corp

QUANERGY

XENOMATIX

AUTOMOTIVE VISION SOLUTIONS

LUMINAR

AEYE

OMRON

oryx

Continental

TETRAVUE

SOLID STATE HD LIDAR

INNOVIZ TECHNOLOGIES

GM

STROBE

Laser sources

EEL

OSRAM

VCSEL

LUMENTUM

HAMAMATSU

EXCELITAS TECHNOLOGIES

PHILIPS Photonics

THORLABS

II-VI

USHIO

OPTO SEMICONDUCTORS

FINISAR

Optical elements

MEMS

innoluce

Optical filters

Alluxa

Optical systems

VIAVI

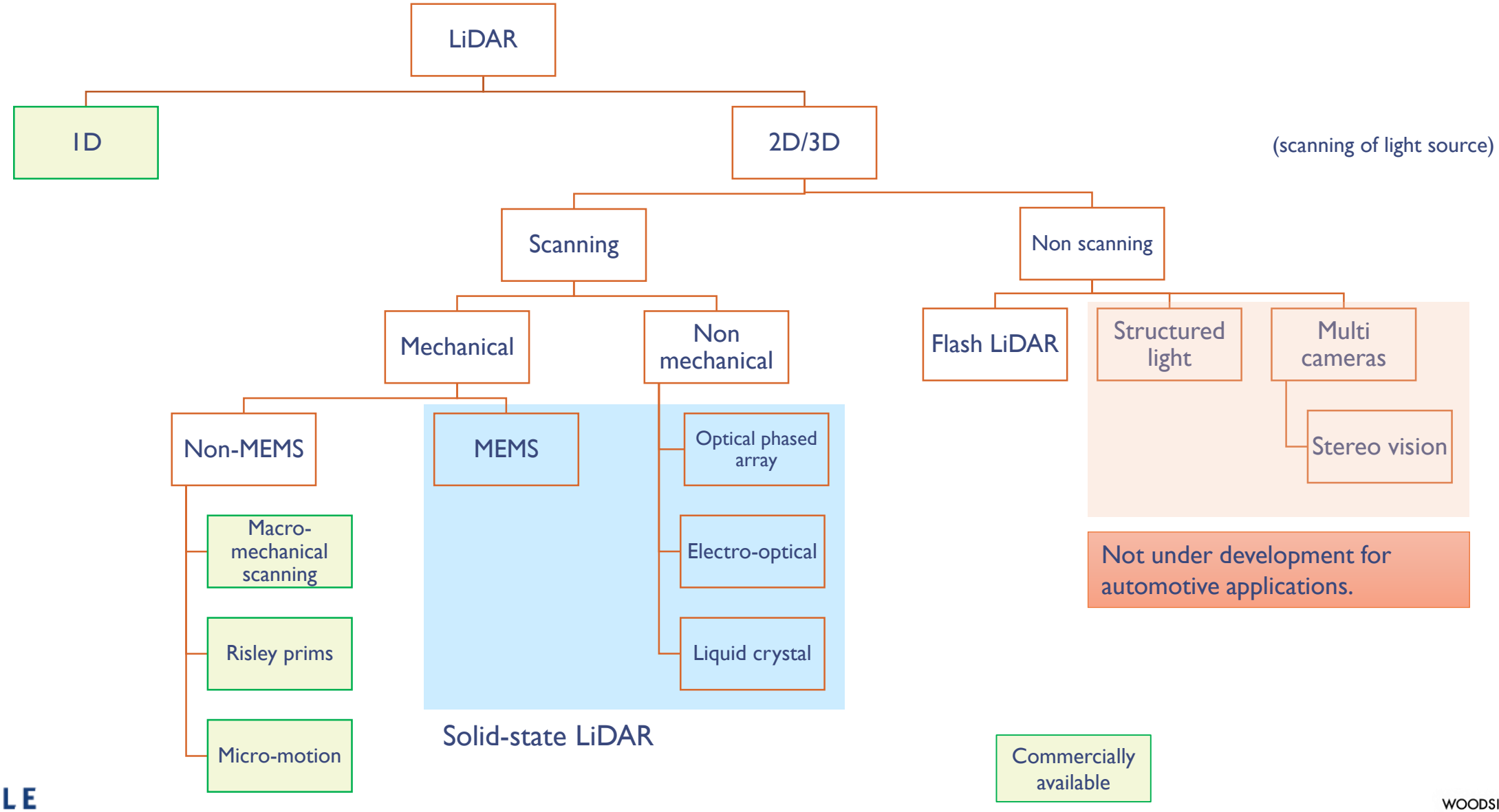
ASIA OPTICAL

ADC: Analog Digital Converter
APD: Avalanche Photodiode
EEL: Edge-Emitting Laser
FPGA: Field-Programmable Gate Array

IC: Integrated Circuit
MEMS: Micro-Electro-Mechanical System
PD: Photodiode
SiPM: Silicon Photomultiplier

SPAD: Single-Photon Avalanche Diode
VCSEL: Vertical Cavity Surface-Emitting Laser

TAXONOMY OF LiDAR TECHNIQUES



AUTOMOTIVE LiDAR PLAYERS

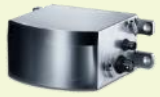
	Multi-channels Macro-mechanical scanning	Other mechanical scanning	MEMS LiDAR	Flash LiDAR	Optical-phased array LiDAR
Pulsed LiDAR	Velodyne, Valeo, robosense, SureStar, HESAI, OUSTER, 镭神智能 LeiShen Intelligent System, OCULAR ROBOTICS	neptec Technologies Corp, 1540 nm, CEPTON, LUMINAR, 1550 nm, Panasonic	LeddarTech, INNOVIZ TECHNOLOGIES, robosense, Pioneer, AEYE, 1550 nm, Valeo	ARGO, 1350 nm, sense photonics, Continental, TETRAVUE, SOLID STATE HD LIDAR, XENOMATIX, AUTOMOTIVE VISION SOLUTIONS	QUANERGY, robosense
Phase shift			Benewake	ifm	
CW LiDAR					
FMCW				oryx, 10 µm	blackmore, 1550 nm

Except when noted, wavelength is between 830 nm and 940 nm.

CW: Continuous Wave
FMCW: Frequency Modulated Continuous Wave

AUTOMOTIVE LiDAR COMPARISON CHART

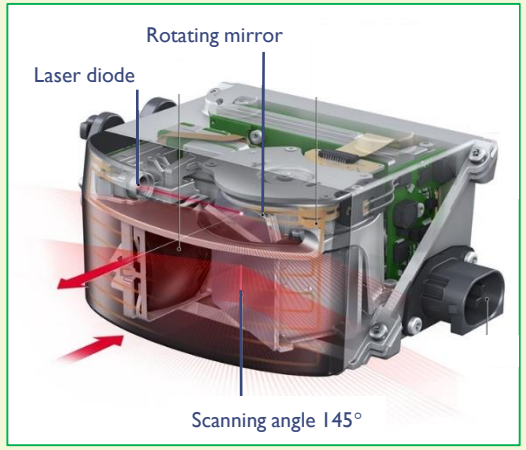
Current offering

ADAS vehicles Robotic vehicles								
	Valeo ibeo	Velodyne LiDAR	Velodyne LiDAR	Velodyne LiDAR	robosense 速腾聚创	OUSTER	SureStar	ibeo
Model	ScaLa 1	HDL-64	HDL-32	VLP-16	RS-LiDAR-32	OS-1	R-Fans-32	Lux (XX)
Channels	4	64	32	16	32	64	32	4 - 8
Range (m)	100 - 200	100 - 120	80 - 100	100	200	100	200	120 – 200
Data rate (pts/sec)	NA	1,300,000	700,000	300,000	640,000	1,310,720	640,000	NA
Horizontal resolution	0.25°	5Hz: 0.08° 10Hz: 0.17° 20Hz: 0.36°	5Hz: 0.08° 10Hz: 0.17° 20Hz: 0.35°	5Hz: 0.1° 10Hz: 0.2° 20Hz: 0.4°	5 Hz: 0.09° 20 Hz: 0.36°	0.18°	0.05°	12.5/25Hz 0.125° to 0.25°
Power (W)	7	60	12	8	13.5	NA	12	~7-10
Operating temperature	NA	-10° to 50° C	-10° to 60° C	-10° to 60° C	-10° to 60° C	NA	NA	-40° to 85°C
Cost ($)	$600	$75,000	$30,000	$8,000	$16,800	$12,000	NA	$10,000 - $20,000

MECHANICAL AUTOMOTIVE LiDAR

ACTIVE

Mechanical LiDAR for ADAS



In 2017, Audi released the A8 with Level 3 autonomy thanks to the Scala LiDAR from Valeo. The A8 is capable of traffic jam assist. It is the only LiDAR available for consumer cars.

Active players:

In collaboration with:

Valeo, ibeo, Audi

Mechanical LiDAR for Robotic cars

Robotic cars are equipped with multi-channels LiDAR in which multiple lasers and photodetectors are rotating 360°. These LiDAR are bulky and cannot blend in consumer cars.

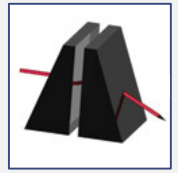
Active players:

Velodyne, Valeo, robosense 速腾聚创

Risley prisms LiDAR

1540 nm

neptec Technologies Corp



Capitalizing on its industrial LiDAR, Neptec develops new automotive LiDAR.

Micro-motion LiDAR

CEPTON

Other mechanical LiDAR

LUMINAR

1550 nm

ADAS: Advanced Driver Assistance Systems

SOLID STATE LIDAR

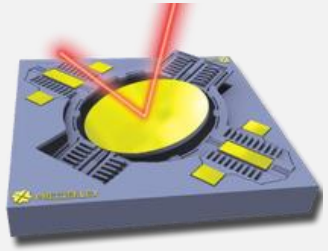
Solid-state LiDAR is a broad name to describe LiDAR which are not using conventional motors but semiconductor solutions to scan or steer light through a scene.

Macro-mechanical scanning — Current technology

MEMS LiDAR — 2018 – 2019

OPA LiDAR — 2022 – 2023

MEMS LiDAR

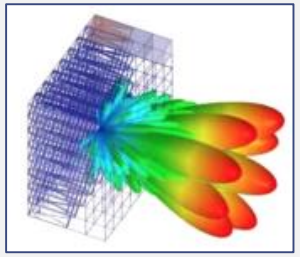


Courtesy of Preciseley Microtechnology Corp.

In a MEMS LiDAR, a micro-scanner integrated with actuators on silicon steers the laser beam during illumination.

- Batch production ⇒ Cheaper.
- Automotive robustness is under test.

OPA LiDAR (Optical Phased Array)



Courtesy of Quanergy

In a OPA LiDAR, steering of the illumination is obtained by controlling the phase of an array of lasers.

- No moving parts ⇒ More robust.
- Still difficult to design due to novelty.

MEMS LiDAR players

USA: AEYE, LUMINAR

Europe: Valeo

Israel: INNOVIZ TECHNOLOGIES

China: robosense 速腾聚创

Canada: Benewake, LeddarTech®

OPA LiDAR players

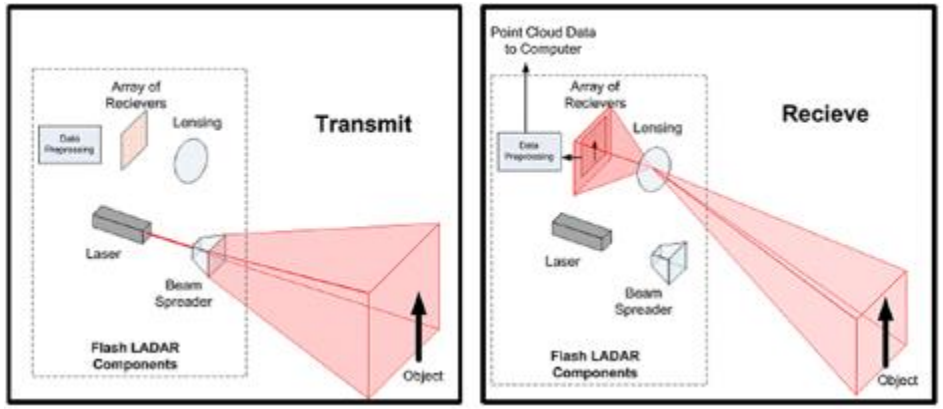
USA: QUANERGY, blackmore

China: robosense 速腾聚创

MEMS: Micro-Electro Mechanical Systems
OPA: Optical Phased Array

FLASH LIDAR

In Flash LiDAR, a laser beam is not scanned over the scene, but this last is illuminated at once. As a result, no moving part is needed. On the other hand, an array of photodetector is needed to form an image.



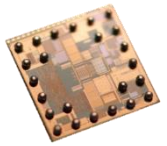
Courtesy of Advanced Scientific Concepts, Inc.

Pros and cons of Flash LiDAR

Pros	Cons
• No moving parts. • Potentially better spatial resolution.	• Photodetector array needed. • More photons are needed.

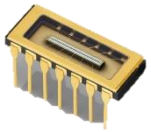
Photodetector arrays

PIN photodiodes



CCD or CMOS image sensor with time of flight capability.

APD



Higher gain than PIN photodiodes.

SPAD

Single photon detection but limited to digital one bit operation.

SiPM

High gain and high sensitivity.
CMOS technology.

Flash LiDAR players

USA

sense photonics

ARGO AI

TETRAVUE
SOLID STATE HD LIDAR

Europe

Continental

ifm

XENOMATIX
AUTOMOTIVE VISION SOLUTIONS

Israel

oryx
10 µm

APD: Avalanche Photodiode
PD: Photodiode

SiPM: Silicon Photomultiplier
SPAD: Single-Photon Avalanche Diode

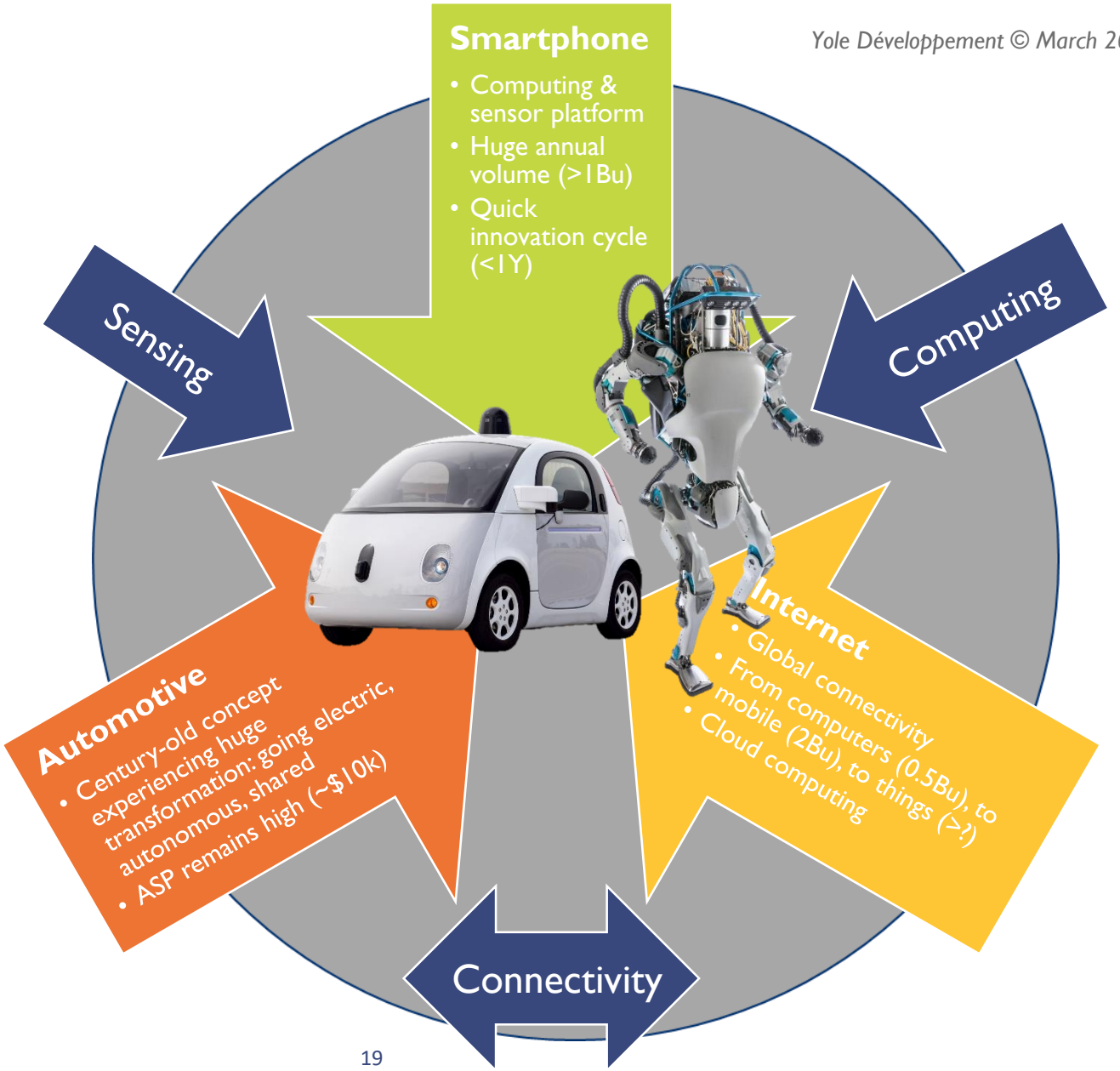
TAM Forecast

TAM: Total Addressable Market

CONVERGENCES LEADING TO THE ROBOTICS REVOLUTION

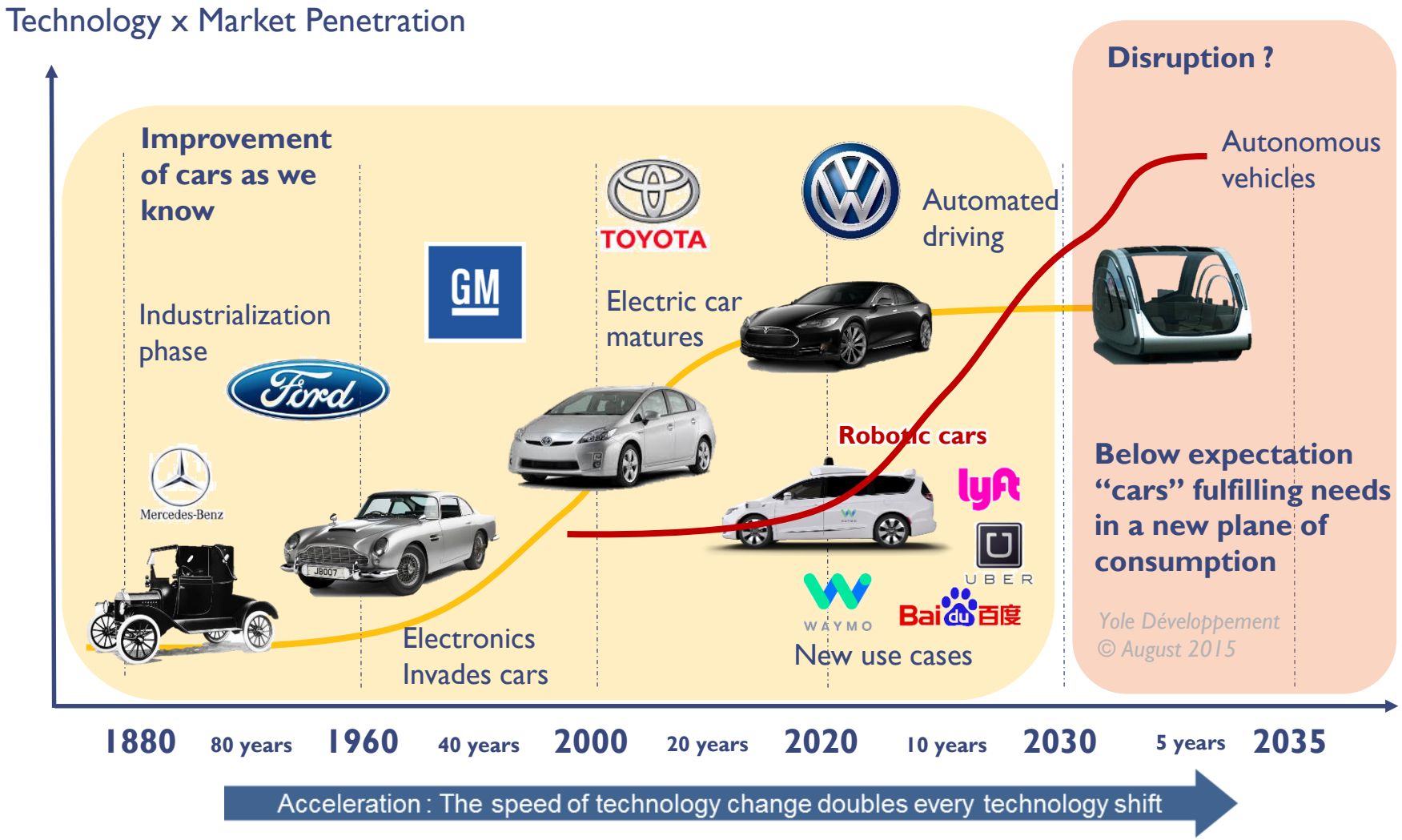
Why now?

- Smartphones helped develop advanced microelectronic technologies at low cost
- The internet provides a communication/cloud computing infrastructure coupled with high demand for connected devices
- Autonomous vehicle R&D allows for high-priced technology testbeds fueled by car brands' search for differentiation

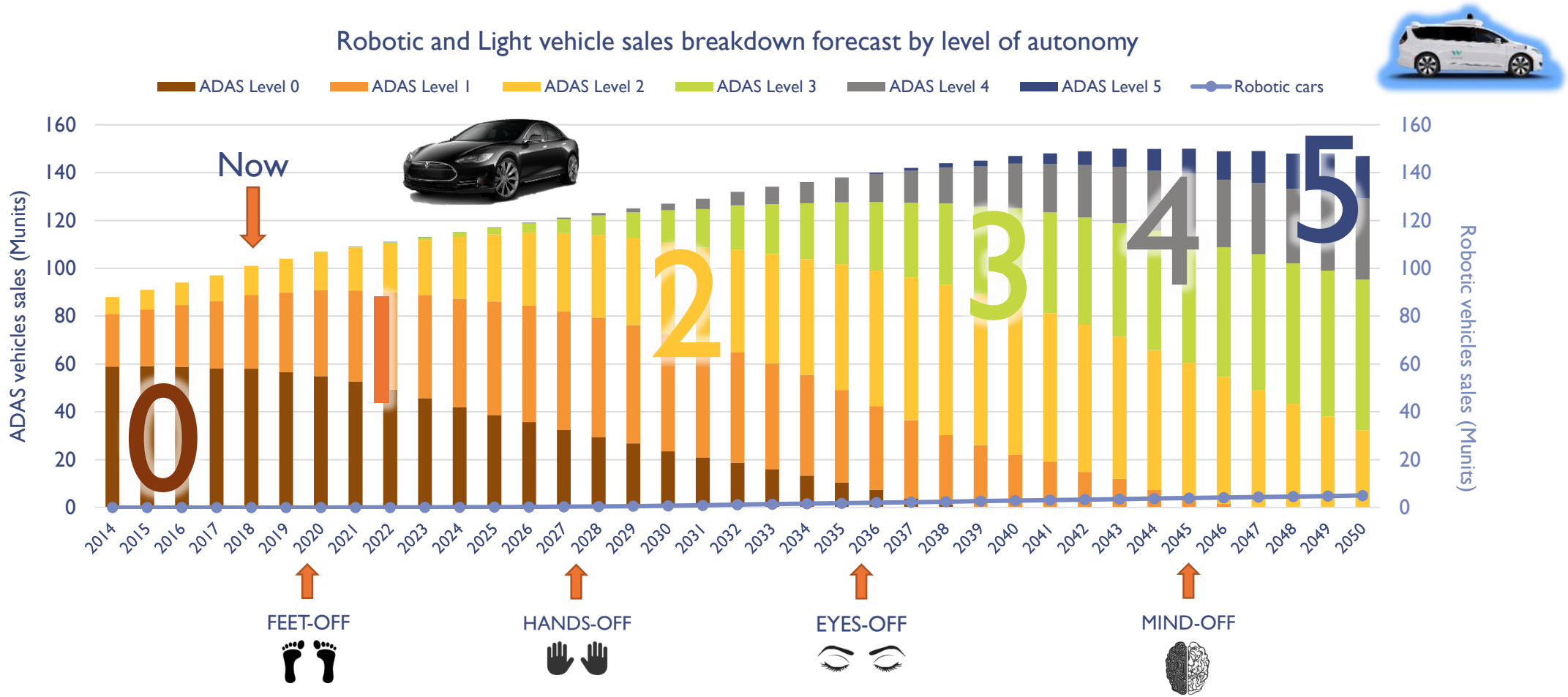


AUTONOMOUS VEHICLES: THE DISRUPTION CASE

Two distinctive paths for autonomous vehicles

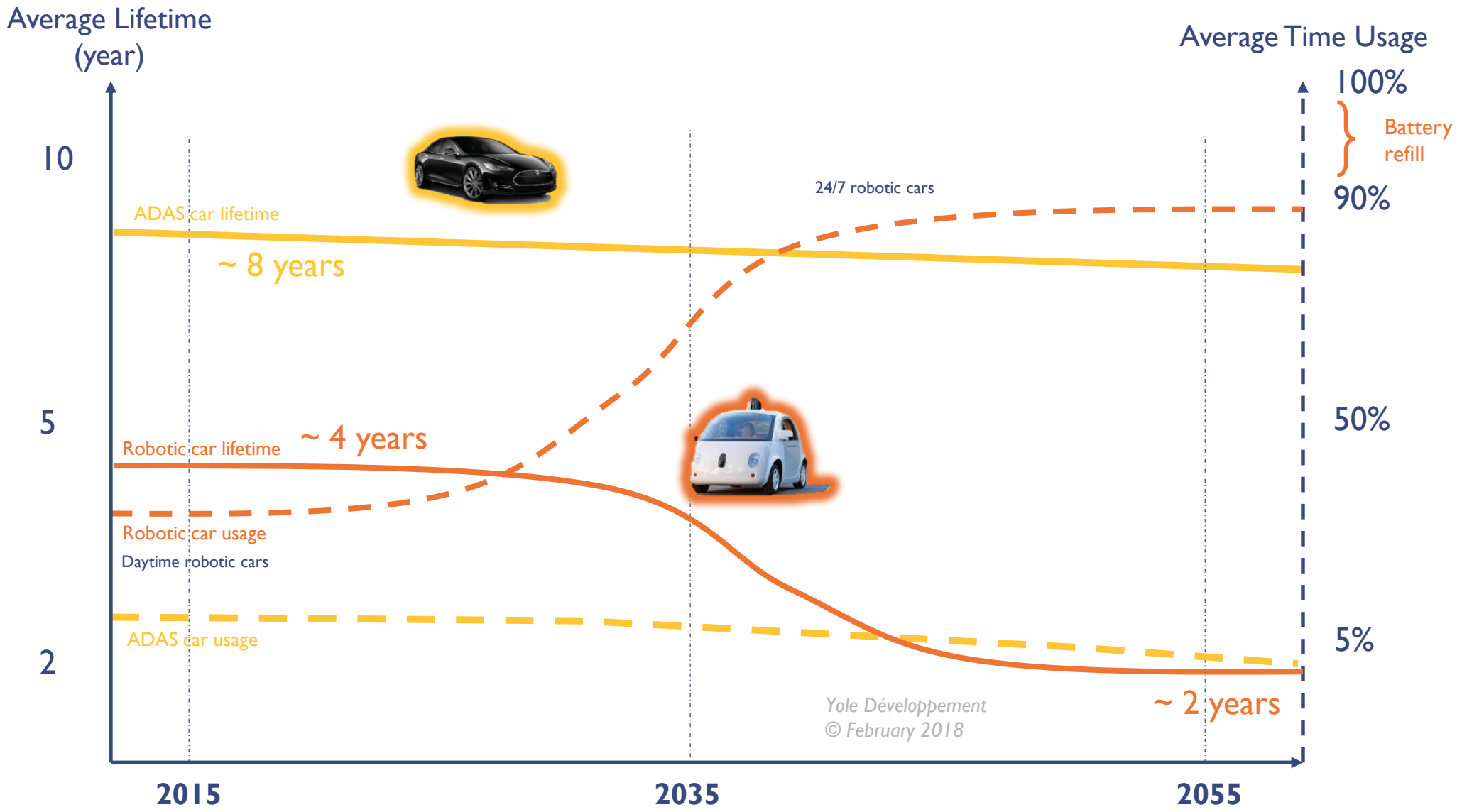


MARKET PENETRATION OF ADAS VEHICLES



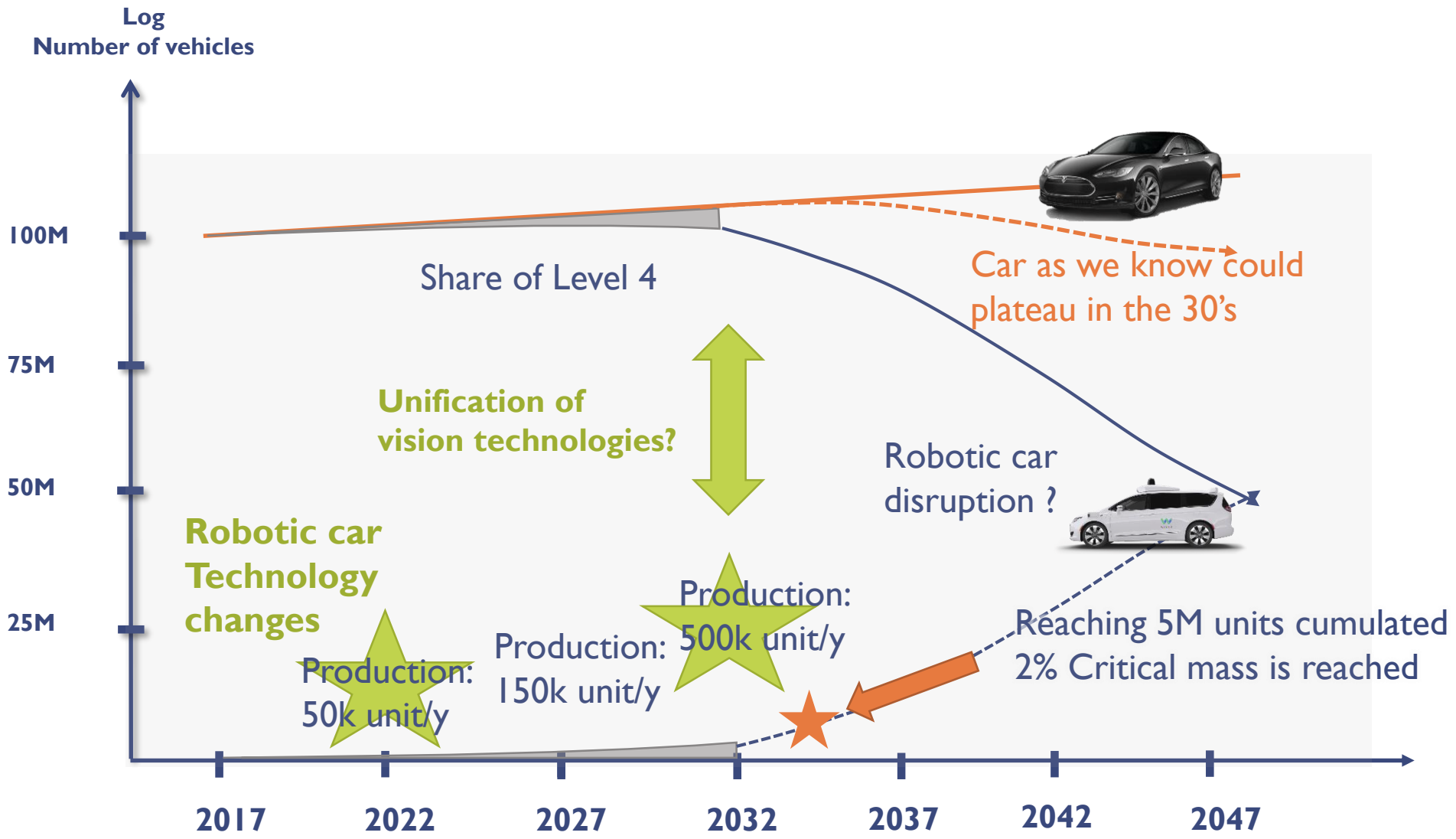
By 2045, more than 70% of all vehicles sold will integrate autonomous capabilities!

ROBOTIC CARS versus ADAS CARS



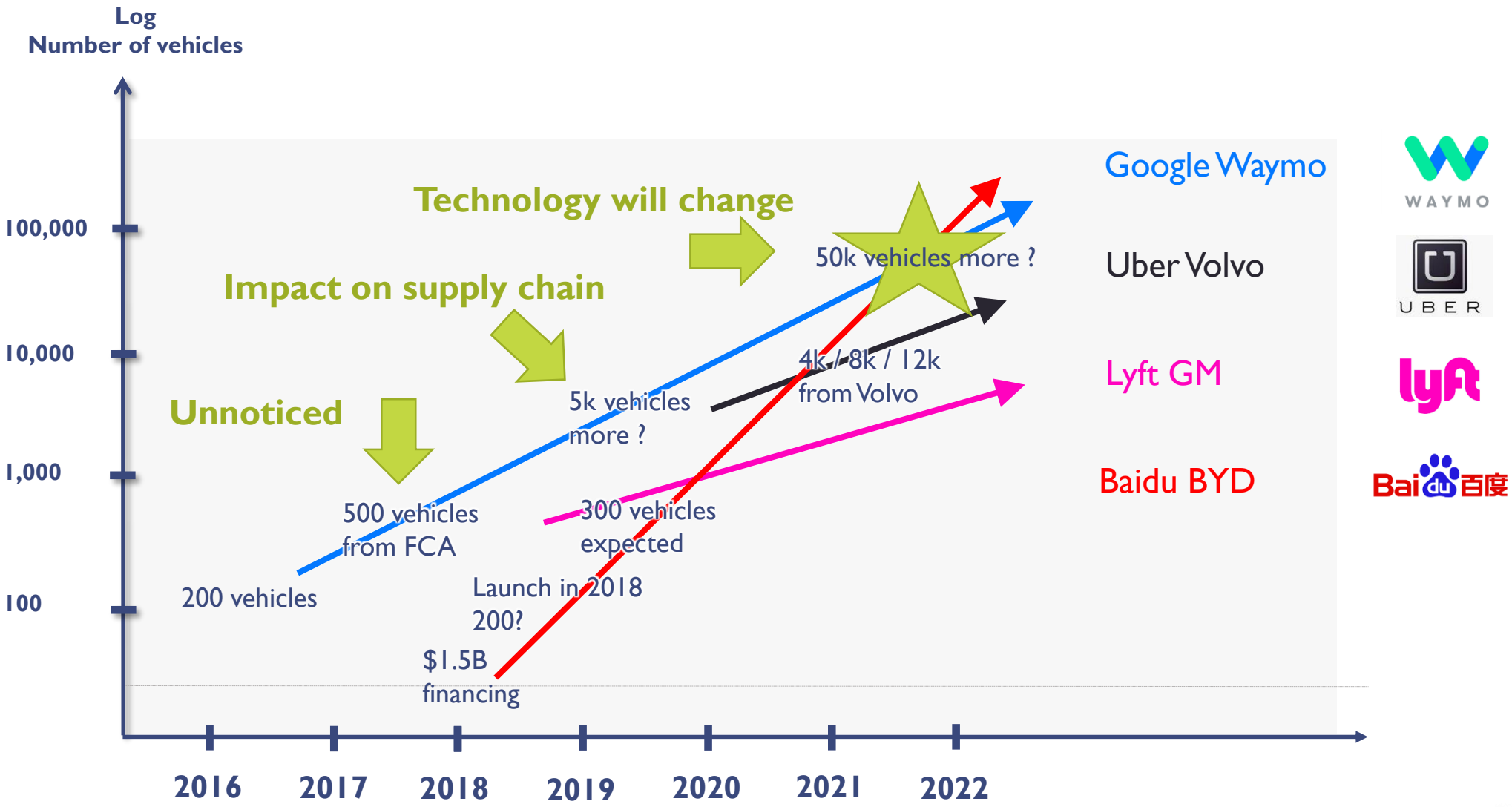
AUTOMOTIVE MARKET TREND

Emergence of the robotic vehicle market



ROBOTIC VEHICLE MARKET TREND

Emergence of the robotic vehicle market



AEB PRODUCTS VS SENSOR TECHNOLOGY

> 80 km/h

ACC

Radar

50-80 km/h

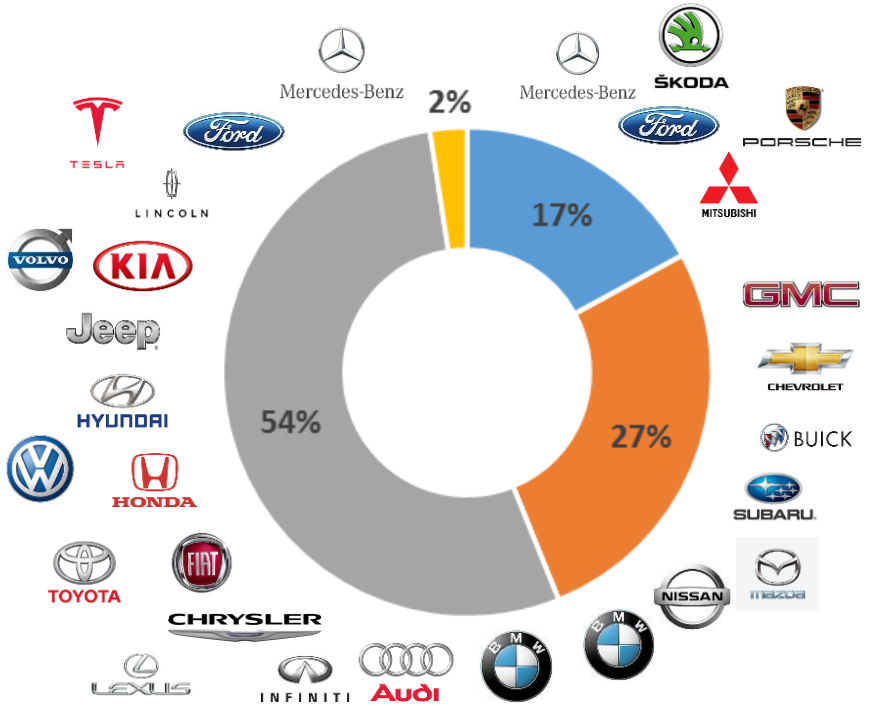
AEB Inter-Urban

Camera + Radar

10-50 km/h

AEB City

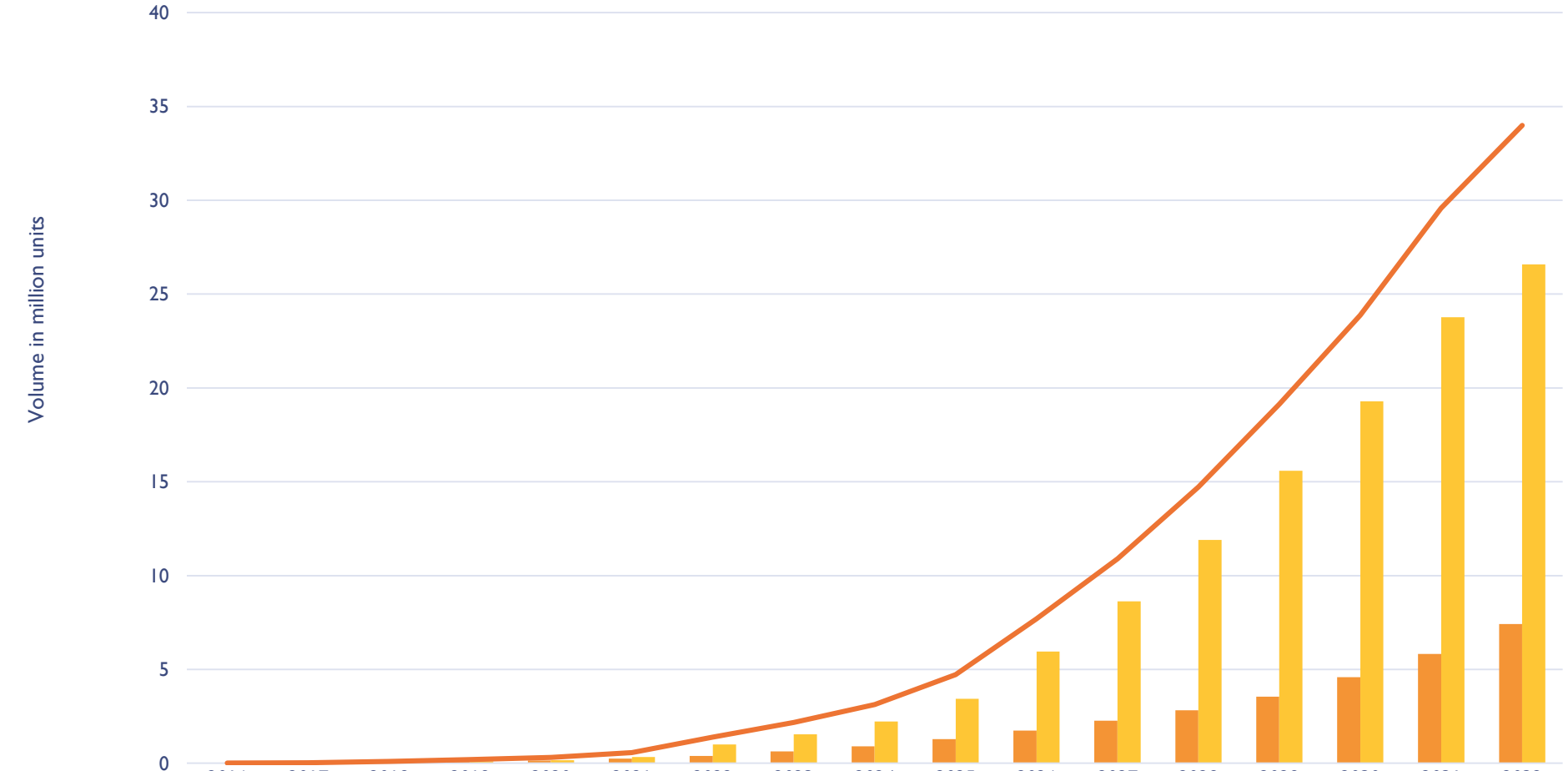
Camera



- **Radar is massively employed in AEB systems** especially for inter urban conditions where vehicle velocity is high and detection range has to be at least 250m. Half of the case, it is used in combination with cameras.

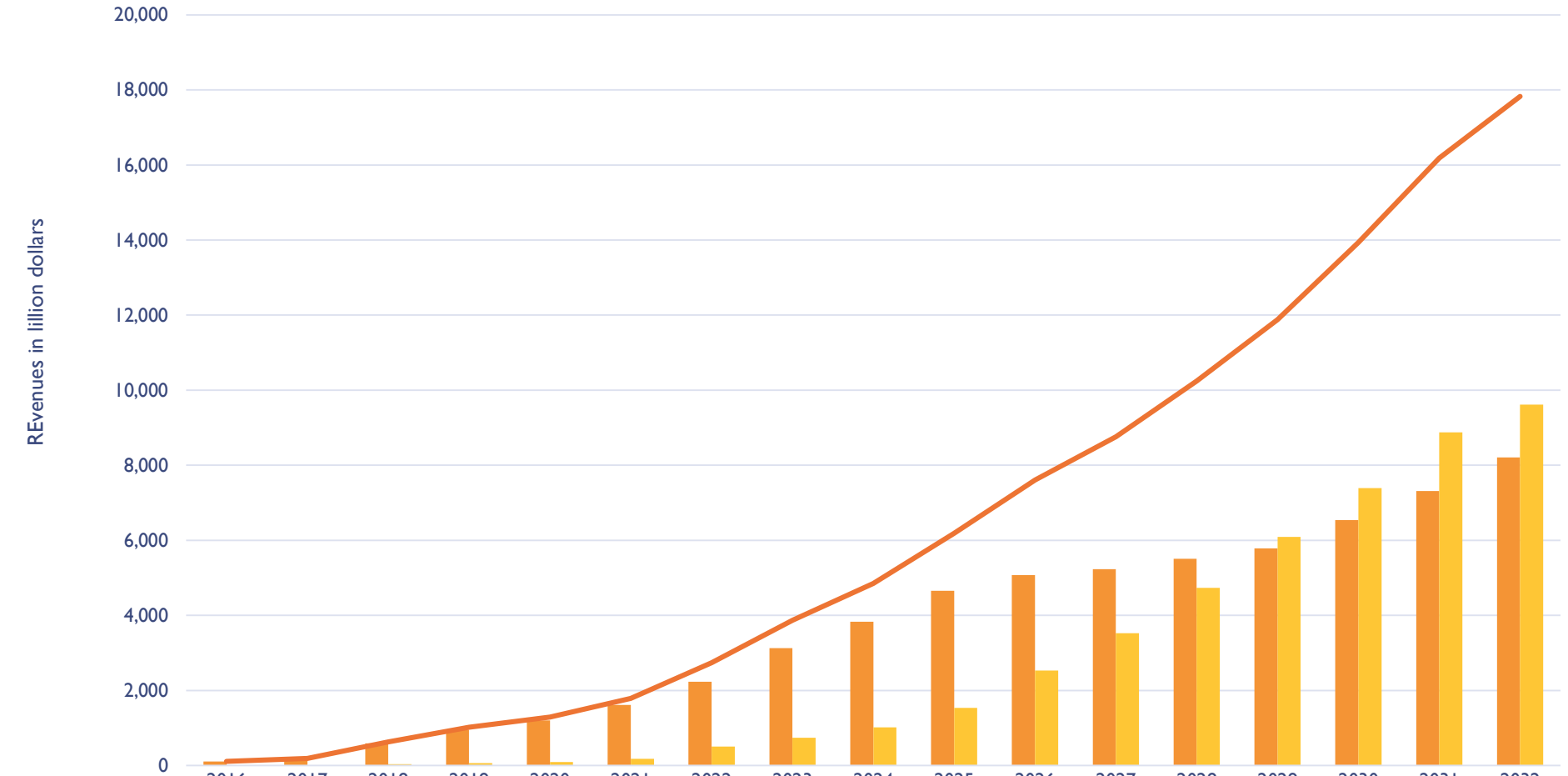
- **For AEB city, camera is preferred** for the moment as it can accommodate shorter distance due to reduced velocity and object recognition has a critical importance especially for pedestrian detection.

AUTOMOTIVE LIDAR SHIPMENT



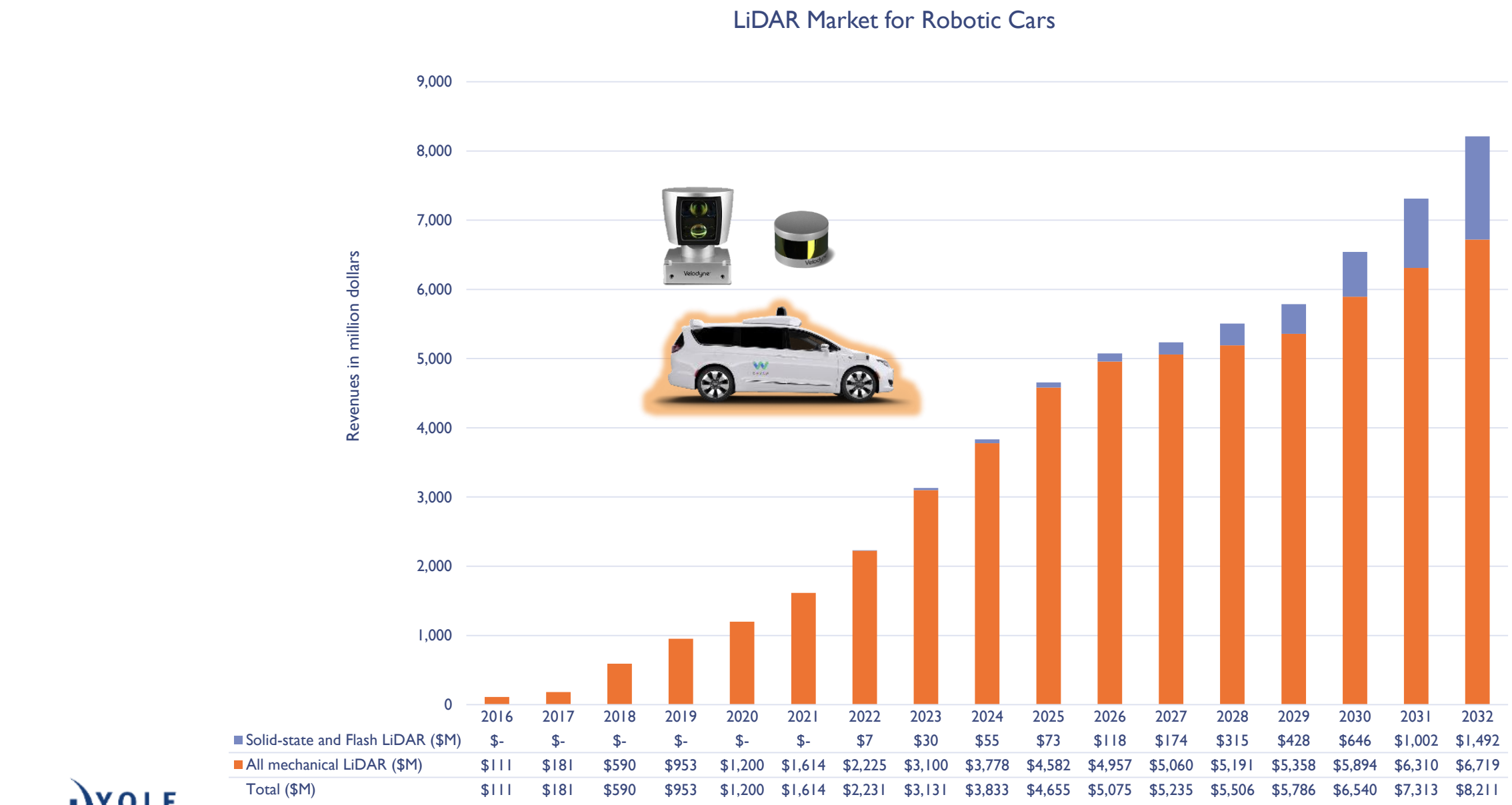
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Robotic Cars	0.006	0.012	0.048	0.096	0.14	0.24	0.39	0.63	0.90	1.3	1.7	2.3	2.8	3.5	4.6	5.8	7.4
ADAS Vehicles	0.00	0.01	0.05	0.1	0.2	0.3	1.0	1.5	2.2	3.4	5.9	8.6	11.9	15.6	19.3	23.8	26.6
Total	0.006	0.022	0.1	0.2	0.3	0.6	1.4	2.2	3.1	4.7	7.7	10.9	14.7	19.1	23.9	29.6	34.0

AUTOMOTIVE LIDAR MARKET



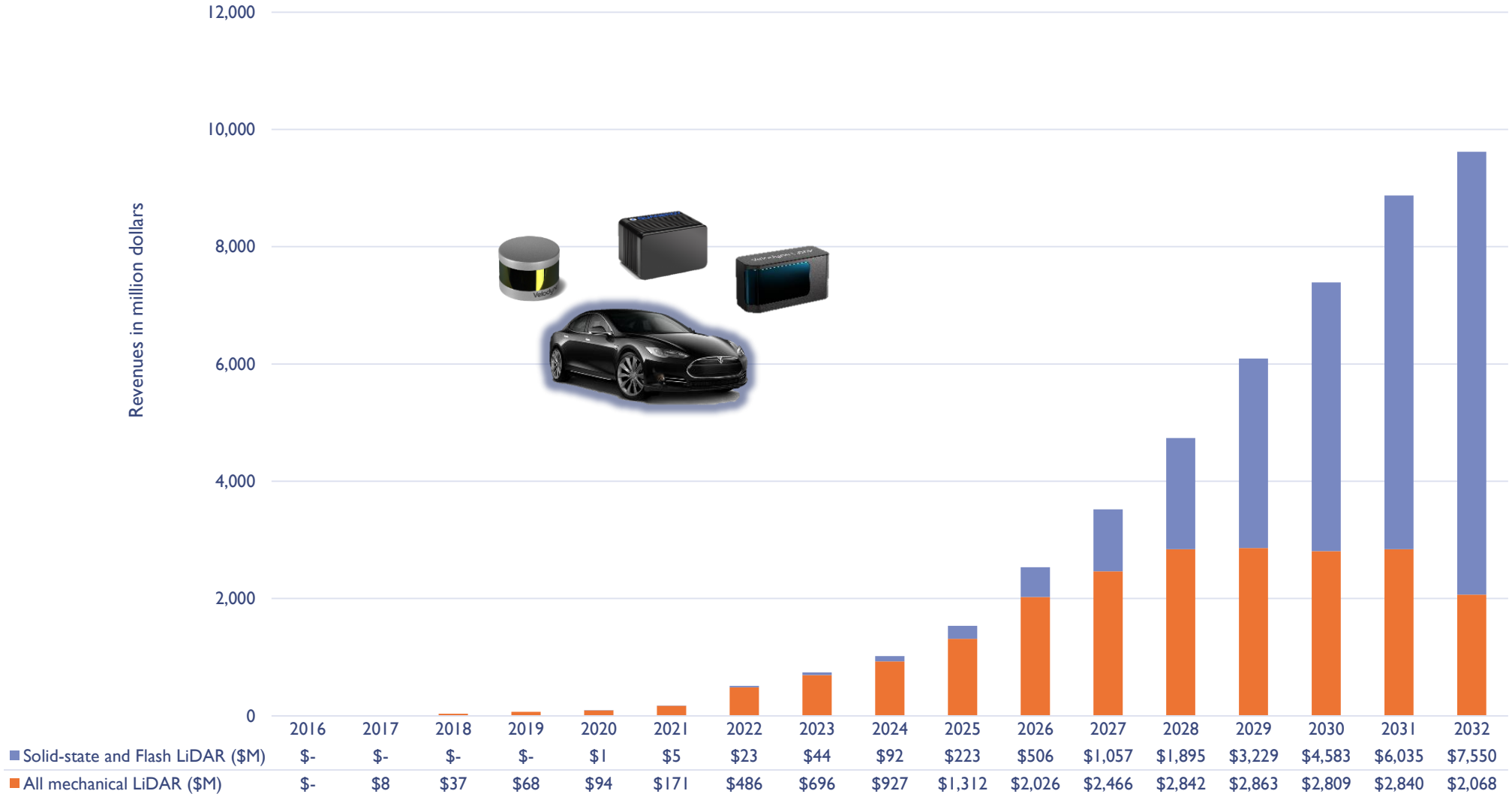
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Robotic Cars	$111	$181	$590	$953	$1,200	$1,614	$2,231	$3,131	$3,833	$4,655	$5,075	$5,235	$5,506	$5,786	$6,540	$7,313	$8,211
ADAS Vehicles	$-	$8	$37	$68	$95	$176	$509	$740	$1,019	$1,535	$2,532	$3,523	$4,737	$6,092	$7,391	$8,875	$9,618
Total	$111	$189	$627	$1,022	$1,294	$1,790	$2,740	$3,871	$4,852	$6,190	$7,607	$8,757	$10,243	$11,878	$13,932	$16,188	$17,829

ROBOTIC CARS LIDAR MARKET IN MILLION DOLLARS



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Solid-state and Flash LiDAR ($M)	$-	$-	$-	$-	$-	$-	$7	$30	$55	$73	$118	$174	$315	$428	$646	$1,002	$1,492
All mechanical LiDAR ($M)	$111	$181	$590	$953	$1,200	$1,614	$2,225	$3,100	$3,778	$4,582	$4,957	$5,060	$5,191	$5,358	$5,894	$6,310	$6,719
Total ($M)	$111	$181	$590	$953	$1,200	$1,614	$2,231	$3,131	$3,833	$4,655	$5,075	$5,235	$5,506	$5,786	$6,540	$7,313	$8,211

ADAS LIDAR MARKET IN MILLION DOLLARS



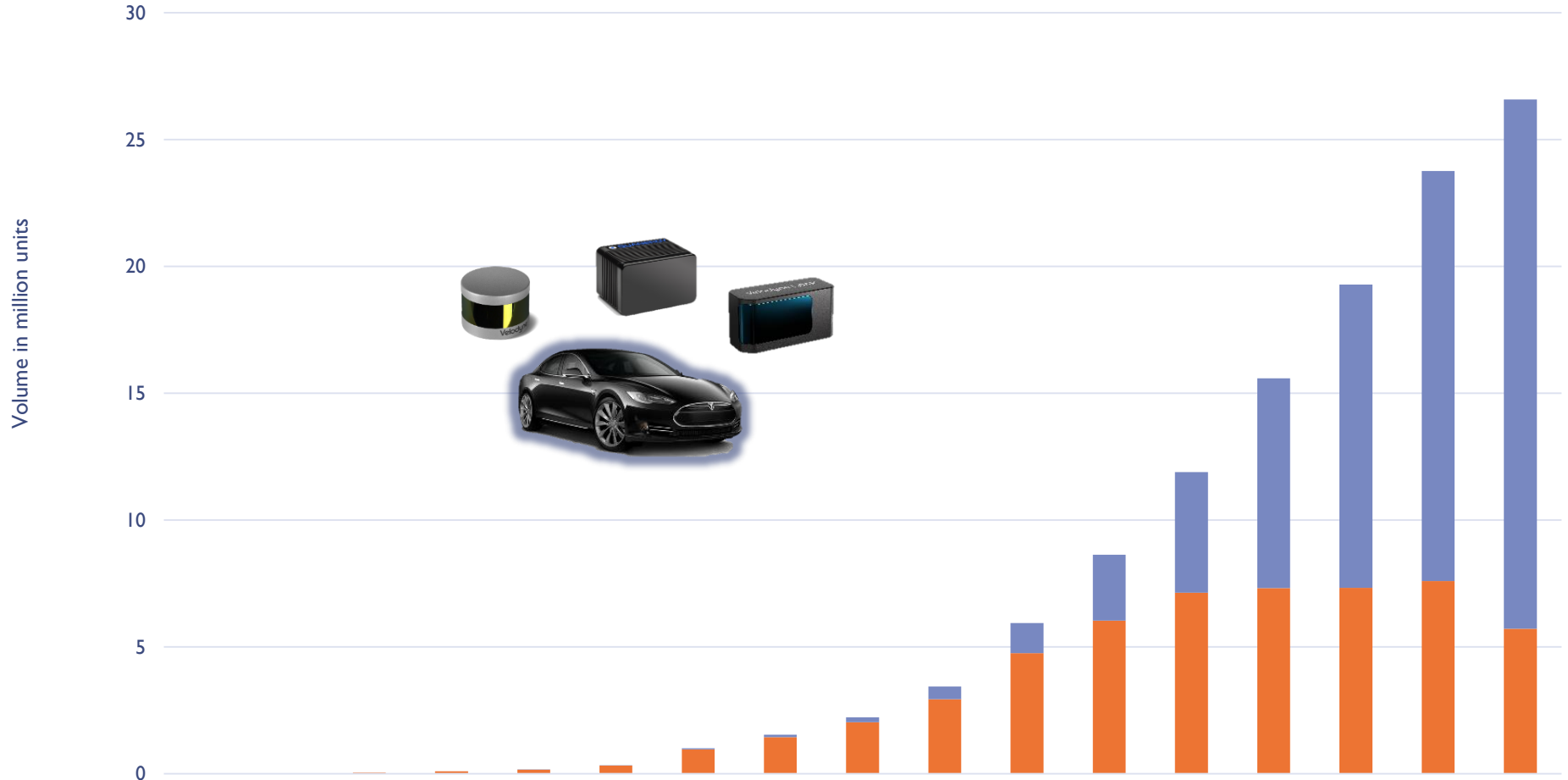
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Solid-state and Flash LiDAR ($M)	$-	$-	$-	$-	$1	$5	$23	$44	$92	$223	$506	$1,057	$1,895	$3,229	$4,583	$6,035	$7,550
All mechanical LiDAR ($M)	$-	$8	$37	$68	$94	$171	$486	$696	$927	$1,312	$2,026	$2,466	$2,842	$2,863	$2,809	$2,840	$2,068

ROBOTIC CARS LIDAR SHIPMENT IN MILLION UNITS

Volume in million units

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Solid-state and Flash LiDAR (Munit)	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.02	0.04	0.05	0.09	0.13	0.25	0.35	0.54	0.87	1.3
All mechanical LiDAR (Munit)	0.006	0.012	0.048	0.096	0.14	0.24	0.38	0.61	0.87	1.2	1.7	2.1	2.6	3.2	4.0	5.0	6.1
Total	0.006	0.012	0.048	0.096	0.14	0.24	0.39	0.63	0.90	1.3	1.7	2.3	2.8	3.5	4.6	5.8	7.4

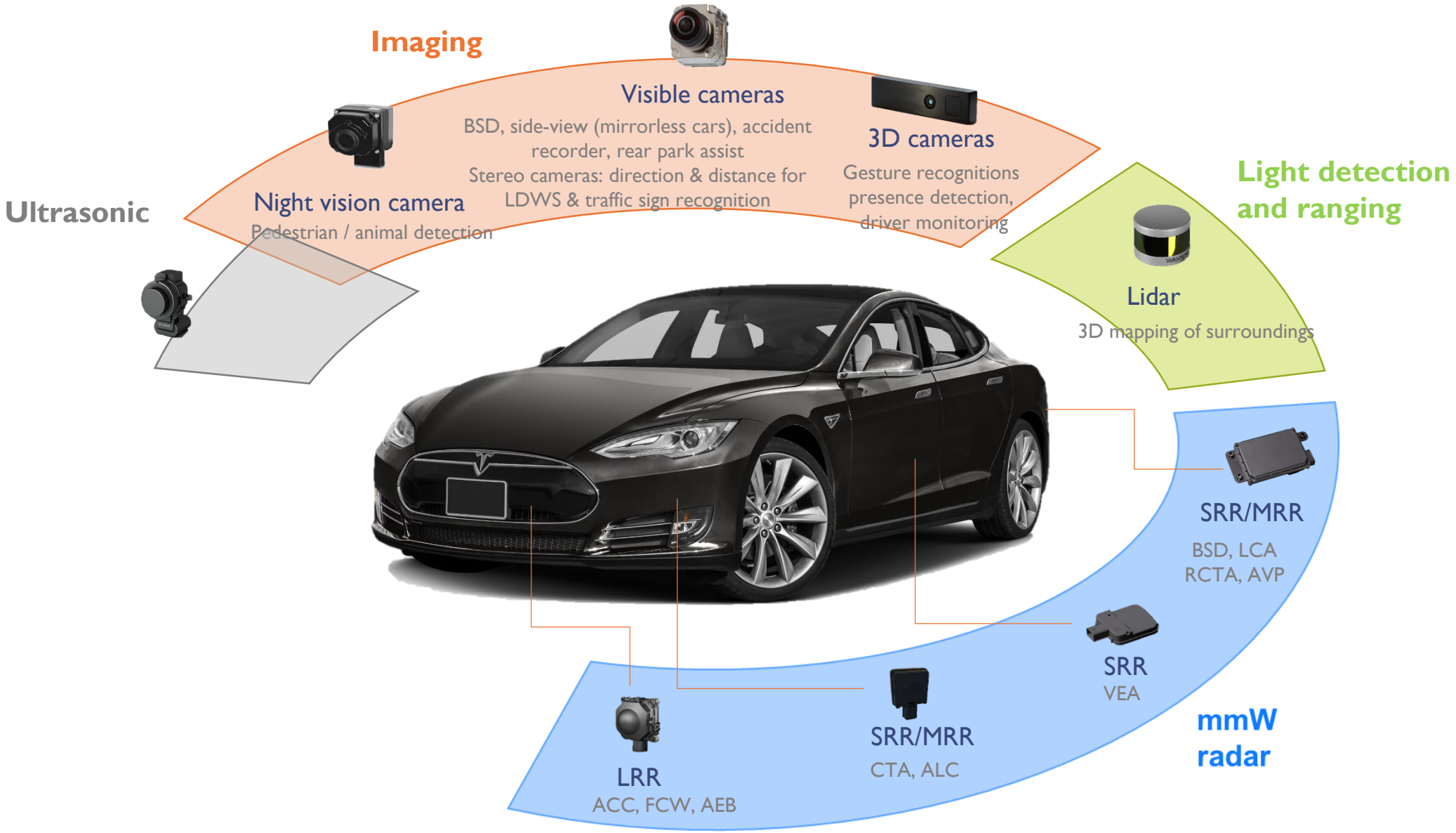
ADAS LIDAR SHIPMENT IN MILLION UNITS



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Solid-state and Flash LiDAR (Munit)	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.09	0.2	0.5	1.2	2.6	4.8	8.3	12.0	16.2	20.9
All mechanical LiDAR (Munit)	0.00	0.01	0.05	0.10	0.16	0.32	0.96	1.45	2.0	2.9	4.8	6.0	7.1	7.3	7.3	7.6	5.7
Total	0.00	0.01	0.05	0.1	0.2	0.3	1.0	1.5	2.2	3.4	5.9	8.6	11.9	15.6	19.3	23.8	26.6

LiDAR Alternatives

SENSORS IN AUTOMOTIVE NAVIGATION



China

CHINESE AUTOMOTIVE LIDAR LANDSCAPE

Photodetectors

IR Sensors

中国兵器工业集团有限公司
CHINA NORTH INDUSTRIES GROUP CORPORATION LIMITED

IC

FPGA

深圳市国微电子有限公司
SHENZHEN STATE MICROELECTRONICS CO.,LTD

SSMEC
(Shenzhen State Micro-electronics)

GOWIN

安路科技 ANLOGIC

华微电子 SINO-MICROELECTRONICS

Amplifier

SGMICRO

ADC

北京时代民芯科技有限公司

MXTronics

云芯微电子 YUNCHIP

LiDAR Systems

Mechanical

robosense 速腾聚创

HESAI

SureStar

镭神智能 LeiShen Intelligent System

Solid-state

robosense 速腾聚创 *MEMS and OPA

Benewake

LiDAR Users *R&D phase

Delivery Robots

Baidu 百度

JD.COM 京东

Robotic Cars

Baidu 百度

ADAS

SAIC 上汽集团 SAIC MOTOR

FAW

GEELY

Laser Sources

EEL

Accelink

O-Net Technologies

VCSEL

华芯半导体SINOSEMIC

Optical Elements

MEMS Scanners

ZhiSENSOR

WIO TECH 微奥科技

Optical Systems

水晶光电 科技触点·观知未来

Zhejiang Crystal-Optech

ADC: Analog Digital Converter
EEL: Edge-Emitting Laser
FPGA: Field-Programmable Gate Array
IC: Integrated Circuit

IR: Infrared
MEMS: Micro-Electro-Mechanical System
OPA: Optical Phased Array
VCSEL: Vertical Cavity Surface-Emitting Laser

USE CASE OF AUTOMOTIVE LIDAR IN CHINA

Robotic cars

Under test

Baidu 百度

Freight trucks

Under test

Baidu 百度

FOTON

Buses/Shuttles

HAYLION 海梁科技
Technologies

ADAS vehicles

Under test

GEELY

SAIC 上汽集团 SAIC MOTOR

FAW

Formula cars

2017 AIWAYS杯

robosense 速腾聚创

Delivery robots

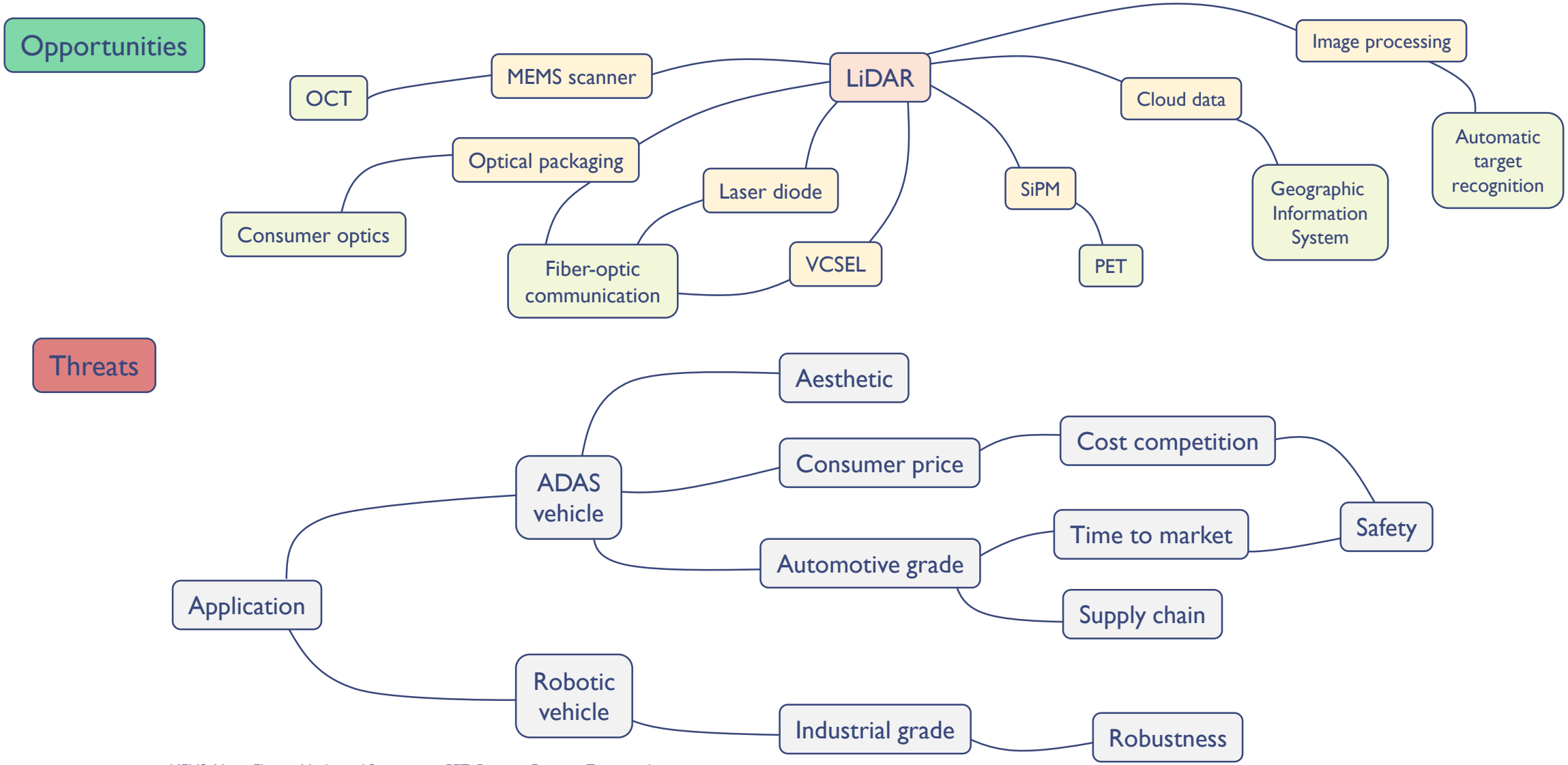
Under test

Baidu 百度

JD.COM 京东

Opportunities and Threats for New Companies

OPPORTUNITIES AND THREATS



MEMS: Micro-Electro-Mechanical System
OCT: Optical Coherence Tomography
PET: Positron Emission Tomography
SiPM: Silicon Photomultiplier

LiDAR M&A Transaction Analysis

LIDAR M&A TRANSACTION ANALYSIS

Date	Buyers	Target	Transaction Value ($M)	EV/Revenue Multiple (x)	EV/EBITDA Multiple (x)	Business Description
04/12/2018	Luminar	Black Forest Engineering	-	-	-	The company's line of business includes developing or modifying computer software and packaging
12/01/2017	Rockwell Automation	Odos Imaging	-	-	-	Manufacturer of advanced cameras intended to offer time-of-flight 3D imaging technology. The company's core technologies are targeted on 3D time-of-flight and freeze motion applications
10/27/2017	Argo AI	Princeton Lightwave	$52.5	-	-	Developer of Geiger-mode LiDAR technology designed to detect and process photons digitally, precisely and in real-time
10/09/2017	Cruise Automation	Strobe	$36.5	-	-	Processor of 3D vision system intended to be used in self-driving cars. The company's next generation technology will help to put the bulky, expensive lidar capabilities on a computer chip
09/28/2017	AutoLiv	Fotonic i Norden	-	-	-	Manufacturer of industrial three dimensional (3D) cameras. The company's 3D cameras offer cameras based on time-of-flight and structured light technology, enabling the customers to use the cameras for various applications
03/13/2017	Valeo SA	Gestigon GmbH	-	-	-	Gestigon GmbH designs and develops a 3D image processing software for body and gesture recognition. It is used in automotive industry in driver cabins for detailed driver and passenger monitoring
01/24/2017	AMS AG	Heptagon	$605.3	6.7x	-	Manufacturer of high end optical packaging and micro-optics sensors for smart devices
11/11/2016	Infineon Technologies	Innoluce	-	-	-	Developer of technologies for miniature laser scanning purposes. The company has developed a micro-electromechanical systems mirror technology platform for miniature laser scanning
08/02/2016	ZF Friedrichshafen AG	Ibeo Automotive Systems GmbH	-	-	-	Ibeo Automotive Systems GmbH manufactures laser scanners for the automotive sector
05/01/2016	Otto	Tyto Lidar	-	-	-	Developer of sensor technology created to be used in autonomous vehicles
04/25/2016	Ficosa International, S.A.	ADASENS Automotive GmbH	-	-	-	ADASENS Automotive GmbH is engaged in the development and marketing of vision algorithmic and sensor fusion technology. The company offers vision algorithm for lane, vehicle, object, light, and traffic sign detection
03/03/2016	Continental	Adv.Scientifics Hi-Res LIDAR Business	-	-	-	Advanced Scientifics designs, manufactures, and delivers single-use systems and equipment for the preparation, processing, storage, and transportation of biopharmaceuticals
02/18/2016	Leica Geosystems	Sigma Space Corporation	-	-	-	Sigma Space Corporation develops LiDAR, laser ranging, attitude determination, spectroscopy, and radiometry instrumentation for remote sensing.+G40

75th Percentile	**$328.9**	**6.7x**	**NA**
Mean	**231.4**	**6.7**	**NA**
Median	**52.5**	**6.7**	**NA**
25th Percentile	**44.5**	**6.7**	**NA**

LiDAR Private Placement Transaction Analysis

LIDAR PRIVATE PLACEMENTS TRANSACTION ANALYSIS

Date	Investor(s)	Company	Capital Raised ($M)	Business Description
03/20/2018	BMW i Ventures, Millennium	Blackmore Sensors and Analytics	$17.8	Developer of frequency-modulated continuous-wave (FMCW) idar imaging technology designed to support analytic tools software. The company's technology is used in making 3D lidar sensors for automotive safety and self-driving cars
03/09/2018	Project A Ventures, Vito Ventures	Artisense	$4.0	Provider of computer vision and artificial intelligence technology and data. The company's technology creates a dynamic global 3D map by crowdsourcing data from all sensors feeding the system and enables Dynamic Global Mapping for GPS-denied autonomous navigation
12/26/2017	Shenzhen Fortune Venture Capital	LeiShen LiDAR	$15.0	Developer and manufacturer of laser radar products and technologies. The company's advanced LiDAR products include anti-collision devices, laser scanning radar, displace sensors, special robots, special fiber lasers and three dimensional scanners
12/11/2017	Cox Enterprises, Fontinalis Partners	Ouster	$27.0	Developer of high performance LIDAR technology intended to bring 3D sensing to the masses. The company's high performance LIDAR technology, OS1, provides industry leading performance, scalability, reliability and form factor
10/24/2017	Fluxunit, High-Tech Gründerfonds	Blickfeld	$4.3	Blickfeld's laser range scanners (LiDARs) and object detection and mapping software use proprietary technology that creates high-definition, three-dimensional geometric maps
10/01/2017	Kleiner Perkins Caufield & Byers	AEye	-	Developer of robotic vision systems designed to act as visual cortex of autonomous vehicles. The company's robotic vision systems leverage computer vision and solid state MEMS-based LiDAR
09/26/2017	Aplus Capital, China Growth Capital	JingChi	$52.0	JingChi develops autonomous driving technology uses deep learning to deliver fully autonomous vehicles that operate without human intervention by using a combination of LiDAR, cameras and radar sensors along with artificial intelligence
09/20/2017	Graduated from Bosch DNA	Hesai	-	Developer of hybrid LiDAR designed to facilitate autonomous driving. The company's LiDAR is a 40-channel solid-state hybrid which uses smart sensing technology for autonomous cars and natural gas leak detection systems
09/13/2017	Plug and Play Tech	Vayavision	-	Developer of an autonomous driving technology intended to provide an AI platform for monitoring self-driving vehicles. The company's AI sensor fusion platform and point and shoot LiDAR, addresses the heart of the autonomous vehicle challenge
09/07/2017	360 Capital, Amiti Ventures	Innoviz Technologies	$74.0	Innoviz Technologies is a provider of LiDAR-based remote sensing sensors and systems designed to offer accurate mapping and localization
08/22/2017	Arab Angel, IDEA Fund	Sense Photonics	$3.2	Sense Photonics produces advanced LiDAR and 3D sensor solutions for the autonomous vehicle, UAV and industrial automation markets
08/15/2017	Atlantic Labs, B10	Enway	-	Developer of a software stack designed to facilitate autonomous operations of service vehicles. The company's software stack uses a sensor fusion approach that can combine inputs from LiDAR, cameras, radar, GNSS, IMU and wheel odometry
08/09/2017	Undisclosed Investor	Sense Photonics, Inc.	-	Sense Photonics develops a light detection and ranging (LiDAR) solution for autonomous vehicles (AVs), drones, industrial automation, mobile devices, and other applications
07/19/2017	Third Point Ventures and WRV	Oryx Vision	$50.0	Developer of a next-generation automotive LiDAR (light detection and ranging) technology designed to simplify autonomous driving with the robustness of a digital camera
07/18/2017	Osram Licht	LeddarTech	$101.0	Provider of a solid-state LiDAR sensing technology designed to offer light detection and ranging. The company's solid-state LiDAR sensing technology offers traffic management sensors for object detection and distance measurement applications

LIDAR PRIVATE PLACEMENTS TRANSACTION ANALYSIS

Date	Investor(s)	Company	Capital Raised ($M)	Business Description
07/12/2017	ChinaEquity Group; CASIM	Shanghai Slamtec Co., Ltd.	$22.1	Shanghai Slamtec Ltd. develops laser sensor solutions for robots in auto localization and navigation
06/13/2017	Kleiner Perkins Caufield & Byers	AEye, Inc.	$16.0	AEye develops and manufactures light detection and ranging (LIDAR) vision systems for autonomous vehicles
05/17/2017	DENSO International America	TriLumina	$9.0	TriLumina manufactures semiconductor lasers
04/14/2017	1517 Fund, Canvas Ventures	Luminar Technologies	$36.0	Luminar Technologies develops and manufactures LiDAR based sensors for vehicles. Its sensor system enhances the visibility of vehicle drivers, as well as allows reacting safely at highway speeds
02/16/2017	Samsung Venture Investment	TetraVue	$10.0	TetraVue provides 3D camera technologies and optics solutions to government agencies
01/01/2017	Plug and Play Tech	Mirada Technologies	-	Developer of lidar vision systems designed to facilitate autonomous driving. The company's lidar system utilizes miro-fluidic beam steering technology for autonomous transportation
01/01/2017	Private Investors	Cepton Technologies	$8.0	Provider of LiDAR technology for automotive, industrial and mapping applications designed to deliver 3D sensing services
12/27/2016	Undisclosed Investor	TriLumina	$6.9	TriLumina manufactures semiconductor lasers
11/15/2016	Millennium Technology	Blackmore Sensors and Analytics	$3.5	Developer of frequency-modulated continuous-wave (FMCW) idar imaging technology designed to support analytic tools software. The company's technology is used in making 3D lidar sensors for automotive safety and self-driving cars
09/26/2016	EnnoHub	NewSight Imaging	$0.5	Manufacturer of chips which have built-in sensors for image transfer. The company designs and develops chips to be used in robotics, drones, Internet of Things (IoT), self-driving LiDAR systems, medical devices and smart manufacturing devices
09/01/2016	1517 Fund, Canvas Ventures	Luminar	$36.0	Luminar provides a ultra high-resolution, long range LiDAR sensor
08/22/2016	Sensata Technologies	Quanergy	$90.0	Developer of 3D time-of-flight LiDAR sensors. The company develops LiDAR sensors and software for real-time 3D mapping and object detection, tracking and classification
08/16/2016	Ford Motor; Baidu	Velodyne Lidar	$150.0	Velodyne Lidar was developed to create a full 360 degree environmental view for use in autonomous vehicles, industrial equipment/machinery, 3D mapping and surveillance
07/17/2016	Australian Small Scale Offerings	Ocular Robotics	$0.6	Designer and manufacturer of robotic sensor systems. The company specializes in designing and marketing robotic systems for autonomous navigation, 3D mapping, mine automation, intelligent surveillance, situational awareness, emergency response vehicles, etc.
04/08/2016	Kickstarter	Scanse	$0.3	Manufacturer of low scanning LiDAR sensors for development and research. The company provides a sensor based LiDAR laser to scan, detect and avoid environmental obstacles

LIDAR PRIVATE PLACEMENTS TRANSACTION ANALYSIS

Date	Investor(s)	Company	Capital Raised ($M)	Business Description
03/28/2016	Denso International	Tri-Lumina	$9.2	TriLumina manufactures semiconductor lasers
03/04/2016	Delphi Automotive, Samsung, GP	Quanergy	$90.0	Quanergy Systems develops and markets sensing solutions for real-time 3D mapping and object detection, tracking, and classification
02/29/2016	Vertex Ventures Israel; Magma	Innoviz Technologies	$9.0	Innoviz Technologies develops technologies of autonomous driving
12/01/2015	Private Investors	Benewake	-	Provider of solid-state LIDAR products intended to make robots eyes. The company's solid-state LIDAR products is used for drones, Robotics and Autopilot
08/10/2015	Microsoft Ventures Accelerator Beijing	Hesai	-	Developer of hybrid LiDAR designed to facilitate autonomous driving. The company's LiDAR is a 40-channel solid-state hybrid which uses smart sensing technology for autonomous cars and natural gas leak detection system
02/28/2015	Cottonwood Technology	Trilumina	$4.0	TriLumina manufactures semiconductor lasers
01/01/2015	Undisclosed Investor	XenomatiX	$1.8	Developer of automotive vision systems. The company specializes in developing laser-based automotive vision systems that allows vehicles to digitize and understand road conditions in real-time (Solid State LiDAR)
01/01/2015	EcoMotion	Vayavision	$0.0	Developer of an autonomous driving technology intended to provide an AI platform for monitoring self-driving vehicles. The company's AI sensor fusion platform and point and shoot LiDAR, addresses the heart of the autonomous vehicle challenge
01/01/2015	Lighthouse Capital Partners	Hesai	$2.0	Developer of hybrid LiDAR designed to facilitate autonomous driving. The company's LiDAR is a 40-channel solid-state hybrid which uses smart sensing technology for autonomous cars and natural gas leak detection systems
11/18/2014	BDC Venture Capital, Go Capital	LeddarTech	$7.0	Provider of a solid-state LiDAR sensing technology designed to offer light detection and ranging. The company's solid-state LiDAR sensing technology offers traffic management sensors for object detection and distance measurement applications

Select LiDAR Private Company Profiles

AEye (former US LADAR)

Company Overview

AEye is a developer of robotic vision systems designed to act as visual cortex of autonomous vehicles. The company's robotic vision systems leverage computer vision and solid state MEMS-based LiDAR together with compressive sensing algorithms and deep learning software, enabling vehicle owners to ensure safety for autonomous vehicles.

Type:	Integrator/Systems software		
Address:	5700 Stoneridge Drive Suite 102 Pleasanton, CA 94588 United States	Website: Founded:	aeye.ai 2013
Revenues (Estimated):	N/A		
Total Capital Raised:	$21.62M		
Investors:	Airbus Ventures, Band of Angels, BootStrapLabs, Intel Capital, Kleiner Perkins Caufield & Byers		
Main partners:	Robotic car manufacturers		
Number of Employees:	34		
Application/Market:	Automotive		
Type of technology:	Fiber Laser, MEMS, 2D Scanner, Pulse		
Main products:	IDAR		
Wavelength:	1550 nm		
Commercial Status:	Mass Production (Late 2018)		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Luis Dussan	CEO
Ransom Wuller	Co-Founder, President & CFO
Jordan Greene	Co-Founder & Lead Strategist
Wen Hsieh Ph.D	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Argo AI

Company Overview

ARGO AI is a developer of artificial intelligence software designed to offer self-driving technology. The company's artificial intelligence technology helps to tackle robotics and artificial intelligence for self-driving vehicles, enabling its users to availlable effective self-driving technology.

Type:	Integrator/Software software		
Address:	40 24th Street, Pittsburgh, PA 15222 United States	Website: Founded:	argo.ai 2017
Revenues (Estimated):	N/A		
Total Capital Raised:	$1.00B (Strategic Investment)		
Investors:	Ford Motor Company		
Main partners:	Robotic car manufacturers		
Number of Employees:	259		
Application/Market:	Automotive		
Type of technology:	Flash, SPAD Array, Pulse		
Main products:	N/A		
Wavelength:	1350 nm		
Commercial Status:	N/A		
Manufacturing location:	Pittsburgh, PA		

Selected Senior Management

Professional	Professional Title
Bryan Salesky	Co Founder and CEO
Peter Rander	Co Founder and COO
Mark Fields	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Blackmore

blackmore

Company Overview

Developer of frequency-modulated continuous-wave (FMCW) idar imaging technology. The company's technology is used in making engines and develops 3D lidar sensors for automotives and self-driving cars, enabling customers to eliminate interference and improve long range performance.

Type:	Integrator/Hardware/Systems software		
Address:	3991 Valley Commons Dr, Bozeman, MT 59718 United States	Website: Founded:	blackmoreinc.com 2016
Revenues (Estimated):	N/A		
Total Capital Raised:	$21.35M		
Investors:	BMW iVentures, Next Frontier Capital, Millennium Technology Value Partners		
Main partners:	Robotic car manufacturers, Outdoor Mapping, ADAS		
Number of Employees:	22		
Application/Market:	Automotive, industrial, mapping, UAV drone		
Type of technology:	Optical-phased Array, Single Photon, FMCW, Mapping LiDAR		
Main products:	Automotive LiDAR, HRS 3D geospatial LiDAR,		
Wavelength:	1550 nm		
Commercial Status: (input by Yole)	Prototype Phase		
Manufacturing location:	Bozeman, MT		

Selected Senior Management

Professional	Professional Title
Randy Reibel	Co-Founder, CEO
Stephen Crouch	Co-Founder, CTO
Trenton Berg	Co-Founder
Richard Harjes	Board Member
Samuel Schwerwin	Board Member

Benewake

Company Overview

Benewake is a provider of solid-state LIDAR products intended to make robots eyes. The company's solid-state LIDAR products is used for drones, Robotics and Autopilot vehicles for the auto-avoidance, simultaneous localization and mapping, terrain following and object recognition.

Type:	Hardware/Integrator/Systems software		
Address:	10-F, Block A, Keshi Building Xinxi Road Beijing Haidian District 100085	Website: Founded:	benewake.com 2015
Revenues (Estimated):	N/A		
Total Capital Raised:	N/A		
Investors:	Bosch DNA, Ecovacs, IDG, Shunwei Capital		
Main partners:	Robotic car manufacturers, Drone Manufacturers, ADAS		
Number of Employees:	80		
Application/Market:	Automotive, mapping, UAV drone		
Type of technology:	1D, solid state, Phase-Shift, AGV Lidar		
Main products:	AGV LiDAR		
Wavelength:	850 nm		
Commercial Status: (input by Yole)	Phase-shift		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Li (Benewake) Yuan	CEO

Cepton Technologies, Inc.

Company Overview

Cepton Technologies is a provider of LiDAR technology for automotive, industrial and mapping applications designed to deliver 3D sensing services. The company's SORA 200, is a lightweight 3D LiDAR sensor, which delivers long-range, high-resolution and low-cost mapping capabilities to unmanned aerial vehicles.

Type:	Hardware/Integrator		
Address:	103 Bonaventura Drive San Jose, CA 95134 United States	Website: Founded:	cepton.com 2016
Revenues (Estimated)	N/A		
Total Capital Raised:	$8.00M		
Investors:	N/A		
Main partners:	ADAS, Outdoor mapping		
Number of Employees:	50		
Application/Market:	UAV drone, automotive, geospatial		
Type of technology:	EEL laser, Micro-motion technology, Pulse		
Main products:	HR80 Lidar, Sora UAV LiDAR, Vista automotive		
Wavelength:	905 nm		
Commercial Status: (input by Yole)	Released Vista LiDAR Product in April 2018		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Mark McCord Ph.D	Co-Founder & VP, Engineering

Espros Photonics Corp. (epc)

Company Overview

ESPROS Photonics is a world-class foundry, product, and technology solution provider for optoelectronics manufacturers, imager designers, and researchers. The privately owned company with more than 50 employees working in the Swiss headquarters was founded in 2006 by Beat De Coi.

Type:	Component manufacturer/Hardware/Integrator		
Address:	St. Gallerstrasse 135, 7320 Sargans, Switzerland	Website: Founded:	espros.com 2006
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	N/A		
Main partners:	ADAS		
Number of Employees:	50		
Application/Market:	Automotive		
Type of technology:	Time of flight CCD and CMOS image sensors.		
Main products:	Chips and Modulels		
Technology: (If component manufacturer)	IC's		
Wavelength:	400 -1000 nm		
Commercial Status: (input by Yole)	Commercially available		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Beat De Choi	CEO

Excelitas Technologies

Company Overview

Excelitas Technologies is a manufacturer of custom-designed specialty lighting and sensor components. The company's specialty lighting and sensor components include customized optoelectronics and advanced electronic systems.

Type:	Component manufacturer/Hardware/Integrator		
Address:	200 West Street Suite E403 Waltham, MA 02451	Website: Founded:	excelitas.com 1931
Revenues (Estimated)	N/A		
Total Capital Raised:	$107.76M		
Investors:	AEA Investors, Morgan Stanley Credit Partners, PerkinElmer, Veritas Capital		
Main partners:	ADAS		
Number of Employees:	5500		
Application/Market:	Automotive		
Type of technology:	Silicon Avalanche Photodiode array.		
Main products:	LEDs and other lighting products		
Technology: (If component manufacturer)	EEL Laser, Si ADP Array, Solid state		
Wavelength:	N/A		
Commercial Status: (input by Yole)	Commercially available		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
David Nislick	CEO
Joel Falcone	COO
Barry McCaffrey	Board Member

Fastree 3D

Company Overview

Fastree 3D is a developer of 3D imaging sensors platform designed to enable vehicles and machines to recognize and locate fast moving objects in three dimensions. The company's 3D imaging sensors platform takes advantage of CMOS fabrication processes used for consumer electronics products to develop high precision sensors for industrial applications.

Type:	Component manufacturer/Hardware/Integrator		
Address:	EPFL Innovation Park, Ch. De la Raye 13, 1024 Ecublens, Switzerland	Website: Founded:	fastree3d.com 2013

Revenues (Estimated)	N/A
Total Capital Raised:	$0.14M
Investors:	A3 Angels, Go Beyond, Investiere and Fondation Des Fondateurs, EPFL Innovation Park, MassChallenge, Venture Kick
Main partners:	Automotive/ Industrial
Number of Employees:	8
Application/Market:	Automotive, Robotics, Body movement
Type of technology:	Time of flight image sensor
Main products:	Pulse Xenon Lighting, Emitters, LEDs,
Technology: (If component manufacturer)	ToF image sensor
Wavelength:	N/A
Commercial Status: (input by Yole)	N/A
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Claude Florin	CEO
Lucio Carrara	CTO
Claude Florin	Board Member

Hesai Technologies

Company Overview

Hesai is a developer of hybrid LiDAR designed to facilitate autonomous driving. The company's LiDAR is a 40-channel solid-state hybrid which uses smart sensing technology for autonomous cars and natural gas leak detection system, enabling car companies to monitor mixed gas composition, control industrial process and detect hazardous gas leakage.

Type:	Hardware/Integrator/Systems software		
Address:	10th Floor, Building L2-B Hongqiao World Center, Building A4, 925 Yecheng Road Shanghai, Jiading District China	Website: Founded:	hesaitech.com 2013
Revenues (Estimated)	N/A		
Total Capital Raised:	$18.00M		
Investors:	Bosch DNA,Dami Ventures, Grains Valley Venture Capital, Jiangmen Venture Capital, Lighthouse Capital Partners, Microsoft Scale Up		
Main partners:	Robotic car manufacturers		
Number of Employees:	56		
Application/Market:	Automotive		
Type of technology:	Scanner/Flash (Macro-meca)		
Main products:	Cosmo Technology 40-wire hybrid solid state		
Wavelength:	N/A		
Commercial Status: (input by Yole)	Currently on sale and in the general market place		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Yifan Li Ph.D	Co-Founder & CEO
Shaoqing Xiang	Co-Founder & CTO
Kai Sun Ph.D	Co-Founder, Board Member, Chairman & Chief Scientist

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Ibeo

Company Overview

Manufacturer and marketer of sensors and scanners. The company specializes in the manufacture sensors and sensor systems for industrial applications and laser scanner technology for the automobile industry.

Type:	Component manufacturer/Hardware/Integrator		
Address:	Merkurring 60-62 22143 Hamburg Germany	Website: Founded:	ibeo-as.com 1998
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	40% stake acquired by ZF Friedrichshafen		
Main partners:	Robotic car manufacturers		
Number of Employees:	50		
Application/Market:	Automotive		
Type of technology:	N/A		
Main products:	ibeo HAD (Highly Automated Driving)		
Wavelength:	N/A		
Commercial Status: (input by Yole)	N/A		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Ulrich Lages	CEO
Michael Kiehn	Director of Sensor Development

Innoluce BV

Company Overview

Developer of technologies for miniature laser scanning purposes. The company has developed a micro-electromechanical systems mirror technology platform for miniature laser scanning. The technology has applications for industrial, medical and consumer products.

Type:	Component manufacturer/Hardware/Integrator		
Address:	Kerkenbos 1234 C 6546 BE Nijmegen Netherlands	Website: Founded:	innoluce.com 2010

Revenues (Estimated)	N/A
Total Capital Raised:	$1.93M
Investors:	Participatiemaatschappij Oost, Business Angels Technostarters, Infineon Technologies, Point-One Innovation Fund
Main partners:	Robotic car manufacturers, Medical Device Groups
Number of Employees:	9
Application/Market:	Automotive, Medical
Type of technology:	Solid State Scanning Modules
Main products:	Laser Scanning Module, Probe, Development Board
Technology: (If component manufacturer)	MEMS scanner
Wavelength:	Any wavelength
Commercial Status: (input by Yole)	Commercially available
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Marijn van OS	Co-founder, CEO
Diederik van Lierop	Co-founder, CTO
Har Diepenmaat	Co-founder, Advisor

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Irvine Sensors

Company Overview

Manufacturer of vision systems and miniaturized electronic products for defense, security, and commercial applications. The company's products include miniaturized infrared cameras, miniaturized visible spectrum cameras, unattended aerial sensor systems, stacked chip assemblies and microchips and sensors.

Type:	Component manufacturer/Hardware/Integrator		
Address:	Lyndon B. Johnson Freeway Suite 900 Dallas, TX 75243	Website: Founded:	irvine-sensors.com 1974
Revenues (Estimated)	N/A		
Total Capital Raised:	$16.54M		
Investors:	Fundamental Capital, Griffin Partners		
Main partners:	Robotic car manufacturers, UAV Drone, Industrial, and Security Firms		
Number of Employees:	11		
Application/Market:	Automotive, Industrial, Security		
Type of technology:	N/A		
Main products:	ALERT, HAL, 3D stacking,		
Technology: (If component manufacturer)	3D Stacking		
Wavelength:	Any wavelength		
Commercial Status: (input by Yole)	N/A		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Bill Joll	President & CEO
Chet White	Board Member

Innoviz Technologies

Company Overview

Provider of LiDAR-based (Light Detection and Ranging) remote sensing sensors and systems designed to offer accurate mapping and localization. The company's InnovizOne system offers smart 3D remote sensing for fully autonomous vehicles, as well as provides real-time 3D images of the vehicle's surroundings.

Type:	Hardware/Integrator/Systems software		
Address:	15 Atir Yeda Street Kfar Saba 4464312 Israel	Website: Founded:	innoviz.tech 2016
Revenues (Estimated):	N/A		
Total Capital Raised:	$82.00M		
Investors:	360 Capital Partners, Aptiv, Delphi Automoive, Magma Venture Partners, Samsung Catalyst, SoftBank Ventures Korea, Vertex		
Main partners:	Robotic car manufacturers		
Number of Employees:	100		
Application/Market:	Automotive		
Type of technology:	MEMS, Pulse		
Main products:	Innoviz Pro, Innoviz One		
Wavelength:	905 nm		
Commercial Status: (input by Yole)	2018: Tier 1 qualification 2021: Mass Production		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Omer Keilaf	Co-Founder & CEO
Amit Steinberg	Co-Founder & CTO
Zohar Zisapel	Co-Founder & Chairman
Emanual Timor	Board Member
Ran Achituv	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Lasertel

Company Overview

Manufacturer of high-power semiconductor laser components designed for defense, medical, industrial, scientific, and graphic art applications.

Type:	Hardware/Integrator		
Address:	7775 North Casa Grande Highway	Website:	lasertel.com
	Tucson, AZ 85743	Founded:	2000

Revenues (Estimated)	N/A
Total Capital Raised:	N/A
Investors:	Presstek, SELEX Galileo
Main partners:	Industrial, Medical
Number of Employees:	63
Application/Market:	Automotive, Defense, Industrial, Medical
Type of technology:	N/A
Main products:	Direct Diode Sources, LiDAR Sources, Advanced Optics, etc.
Technology: (If component manufacturer)	VCSEL
Wavelength:	830 nm - 940 nm
Commercial Status: (input by Yole)	Commercially available
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Mark McElinney	President

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

LeddarTech Inc.

LeddarTech
MASTERING LIDAR SENSOR TECHNOLOGY

Company Overview

LeddarTech is a provider of a solid-state LiDAR sensing technology designed to offer light detection and ranging. The company's solid-state LiDAR sensing technology offers traffic management sensors for object detection and distance measurement applications, enabling companies with solid-state LiDARs that deliver high performance and reliability.

Type:	Hardware/Integrator/Systems software		
Address:	4535 Wilfrid-Hamel Boulevard Suite 240 Quebec City, Quebec G1P 2J7 Canada	Website: Founded:	leddartech.com 2007
Revenues (Estimated)	N/A		
Total Capital Raised:	$117.00M		
Investors:	Access Capital Quebec, Aptiv, Bank of Canada, BDC Venture Capital, Integrated Device Technology, Sofimac Partners,		
Main partners:	Robotic car manufacturers, Industrial LiDAR, ADAS		
Number of Employees:	100		
Application/Market:	Automotive		
Type of technology:	Laser, LED, VSCEL, Mems, 1D, PD Array		
Main products:	LeddarCore SoC, LeddarVu 8-segment solid state LiDAR		
Wavelength:	905 nm, 940 nm		
Commercial Status: (input by Yole)	Commercially available		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Charles Boulanger	CEO & Board Member
Pierre Olivier	CTO
Fabio Gambacorta	Board Member
Simon Morris	Board Member
Nicolas Landrin	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

LeiShen LiDar

Company Overview

LeiShen LiDar is a developer and manufacturer of laser radar products and technologies. The company's advanced LiDAR products include anti-collision devices, mosquito killing devices, fiber-optic equipment, laser scanning radar, displace sensors, special robots, special fiber lasers and three dimensional scanners.

Type:	Hardware/Integrator		
Address:	F6, TaiJiaLe Industrial Park, Tongguan Road Tianliao Community, Gongmin, Guangming New District Shenzhen, 518106 China	Website: Founded:	leishen-lidar.com N/A
Revenues (Estimated)	N/A		
Total Capital Raised:	$15.80M		
Investors:	China Merchants Capital, Northern Light Venture Capital, Rushan Investment Management, Shenzhen Fortune Venture Capital		
Main partners:	Robotic car manufacturers, Industrial LiDAR		
Number of Employees:	N/A		
Application/Market:	Automotive,		
Type of technology:	Fiber Laser, Macro-meca		
Main products:	Navigation type TOF laser radar N301		
Wavelength:	N/A		
Commercial Status: (input by Yole)	Commercially available		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Hu Xiaobo	Founder, CEO & Chairman

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Luminar Technologies, Inc.

LUMINAR

Company Overview

Luminar Technologies is a provider of a ultra high-resolution, long range LiDAR sensor. The company's LiDAR sensor bounces lasers off of the environment and, using the speed of light, calculates distances to each measured point which is used to construct 3D environment models, enabling autonomous vehicles to operate safely.

Type:	Hardware/Integrator/Systems software		
Address:	Portola Valley, CA United States	Website: Founded:	luminartech.com 2012

Revenues (Estimated)	N/A
Total Capital Raised:	$36.00M
Investors:	1517 Fund, Canvas Ventures Fund, GVA Capital, Invariantes Fund,
Main partners:	Robotic car manufacturers
Number of Employees:	250
Application/Market:	Automotive
Type of technology:	Scanner/Flash (Other mechanical)
Main products:	Model-G 3D LiDAR (Robotic vehicle)
Wavelength:	1550 nm
Commercial Status:	Not currently on the market. TRL 7, Still in development
Manufacturing location:	Orlando, FL

Selected Senior Management

Professional	Professional Title
Austin Russell	Co-Founder & CEO
Jason Eichenholz Ph.D	Co-Founder & CTO

Micro Photon Devices

Company Overview

MPD produces Single Photon Counting Avalanche Diodes, "SPAD", fabricated either using custom Silicon, standard CMOS or InGaAs/InP technologies.

Type:	Component manufacturer/Hardware/Integrator		
Address:	Via Antonio Stradivari 4 39100 Bolzano BZ Italy	Website: Founded:	micro-photon-devices.com 2004

Revenues (Estimated)	N/A
Total Capital Raised:	N/A
Investors:	N/A
Main partners:	N/A
Number of Employees:	6
Application/Market:	N/A
Type of technology:	Photon Counters and SPAD Devices
Main products:	Photon Counters (PDM, PDC, InGaAs/INP, SPC2, SPC3)
Technology: (If component manufacturer)	SPAD array
Wavelength:	SPAD 400 - 900 nm, 900 - 1700 nm
Commercial Status: (input by Yole)	Commercially available
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title

Neptec Technologies

Company Overview

Neptec Technologies is a developer of intelligent 3D robotic vision (LiDAR) solutions for the Robotics and Autonomous Systems that operate in harsh environments; Neptec's OPAL LiDAR used in Heavy Industries, Marine, Airports, Defence and Security

Type:	Hardware/Integrator/Systems software		
Address:	302 Legget Drive, Suite 202 Ottawa, ON K2K 1Y5 Canada	Website: Founded:	neptectechnologies.com 2011
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	N/A		
Main partners:	Industrial OEMs, Robotic car manufacturers, ADAS		
Number of Employees:	35		
Application/Market:	Industrial, Automotive		
Type of technology:	Laser (EEL), Scanner/Flash (Risley Prism), Photodetector (APD), Pulse		
Main products:	OPAL LiDAR, 3DRi SDK		
Wavelength:	1540 nm		
Commercial Status: (input by Yole)	OPAL 3 LiDAR commercially available; OPAL nano 2018		
Manufacturing location:	Ottawa, Ontario		

Selected Senior Management

Professional	Professional Title
Mike Sekerka	CEO
Paul C. LaBarge	President
Dr. Philip Church	CTO

NP Photonics

Company Overview

Manufacturer of fiber lasers. The company offers fiber lasers and single-frequency lasers for sensing, defense, metrology and research markets.

Type:	Component manufacturer/Hardware/Integrator		
Address:	9030 South Rita Rd Tucson, AZ 85747 United States	Website: Founded:	npphotonics.com 1998

Revenues (Estimated)	N/A
Total Capital Raised:	$19.74M
Investors:	Enterprise Partners Venture Capital, Shepherd Ventures, Telesoft Partners
Main partners:	N/A
Number of Employees:	23
Application/Market:	Defense, Industrial
Type of technology:	Silica glass fibers (erbium, ytterbium,
Main products:	Micron Fiber Lasers, Fiber Amplifiers
Technology: (If component manufacturer)	Fiber laser
Wavelength:	1000 nm, 1500 nm, 2000 nm
Commercial Status:	Commercially available
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Nasser Peyghambarian	Founder and General Manager
Arturo Chavez-Pirson	CTO
Carl Eibl	Board Member
George Kenney	Board Member

Ocular Robotics

Company Overview

Ocular Robotics is a designer and manufacturer of robotic sensor systems. The company specializes in designing and marketing robotic systems for autonomous navigation, 3D mapping, mine automation, intelligent surveillance, situational awareness, emergency response vehicles, port automation, critical infrastructure and border protection.

Type:	Hardware/Integrator/Systems software		
Address:	F1/13-15 Forrester Street Kingsgrove, New South Wales 2208 Australia	Website: Founded:	ocularrobotics.com 2009

Revenues (Estimated)	N/A
Total Capital Raised:	N/A
Investors:	N/A
Main partners:	N/A
Number of Employees:	N/A
Application/Market:	Automotive, Robotics
Type of technology:	Macro-meca, hyperspectrial imaging
Main products:	RobotEye 3D LiDAR, Ocular Vision, Ocular Hyper Spectral, Ocular Naked
Wavelength:	905 nm
Commercial Status: (input by Yole)	Currently on sale and in the general market place
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Mark Bishop	Founder & CEO
David Wood	CTO

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Opsys Tech Ltd.

Company Overview

OPSYS is involved in the development of products and technologies for new applications in the optical market such as Autonomous vehicle control and intelligent sensors.

Type:	Component manufacturer/Hardware/Integrator		
Address:	26 Harokmim St Holon, 5885849 Israel	Website: Founded:	opsys-tech.com 2016

Revenues (Estimated)	N/A
Total Capital Raised:	N/A
Investors:	N/A
Main partners:	N/A
Number of Employees:	17
Application/Market:	Automotive, Power
Type of technology:	N/A
Main products:	RF Over Fiber (Acon Series, RF Links); Sensing (Pluggable OTDR); Automotive (LiDAR and an Electric Optic Module)
Technology: (If component manufacturer)	Fiber-optics
Wavelength:	N/A
Commercial Status:	R&D
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Rafi Harel	Co-Founder & CEO
Guy Gertel	Co-Founder & SVP of Sales and Marketing

Oryx Vision

Company Overview

Oryx Vision is a developer of a next-generation automotive LiDAR (light detection and ranging) technology designed to simplify autonomous driving with the robustness of a digital camera. The company's automotive LiDAR technology uses microscopic light-sensing antennas to build a LiDAR, as simple as a digital camera to create a 3D view of their surroundings.

Type:	Hardware/Integrator/Systems software		
Address:	36 Shacham Street Petah Tikvah 4951729 Israel	Website: Founded:	oryxvision.com 2009
Revenues (Estimated)	N/A		
Total Capital Raised:	$67.30M		
Investors:	Bessemer Venture Partners, Maniv Mobility, Third Point Ventures, Trucks Venture Capital Union Tech Ventures, WRV		
Main partners:	Robotic car manufacturers, ADAS		
Number of Employees:	40		
Application/Market:	Automotive		
Type of technology:	Flash, rectenna Array, FMCW		
Main products:	Flash automotive LiDAR		
Wavelength:	10,000 nm		
Commercial Status: (input by Yole)	Tests begin in 2019 Market release is expected in the 2022-2023 year		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Rani Wellingstein	Co-Founder & CEO
David Ben-Bassat	Co-Founder
Adam Fisher	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Ouster

Company Overview

Developer of high performance LIDAR technology intended to bring 3D sensing to the masses. The company's high performance LIDAR technology, OS1, provides industry leading performance, scalability, reliability and form factor.

Type:	Hardware/Integrator		
Address:	350 Treat Ave San Francisco, CA 94110 United States	Website: Founded:	ouster.io 2016
Revenues (Estimated)	N/A		
Total Capital Raised:	$30.00M		
Investors:	Fontinalis Partners, Cox Enterprises		
Main partners:	Robotic car manufacturers		
Number of Employees:	40		
Application/Market:	Automotive		
Type of technology:	Scanner/Flash: Macro-meca		
Main products:	OS-1^{16}: $3,500 / OS-$1^{64}$: $12,000 / OS-$2^{64}$: $24,000		
Wavelength:	905 nm		
Commercial Status:	Currently on sale and in the general market place		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Angus Pacala	Co-Founder CEO
Mark Frichtl	Co-Founder CTO
David Blau	Board Member

Quanergy

Company Overview

Provider of solid state LiDAR sensors and smart sensing services designed to offer a laser sensing technology vital for self-driving cars. The company's services help in real-time capture and processing of high-definition 3D mapping data as well as object detection, tracking and classification.

Type:	Hardware/Integrator/Systems software		
Address:	482 Mercury Drive Sunnyvale, CA 94085	Website: Founded:	quanergy.com 2012

Revenues (Estimated)	N/A
Total Capital Raised:	$150.10M
Investors:	Alrai Capital, Aptiv, Daimler, Golden Partners Capital, Lahlouh, Newbury Ventures Rising Tide Fund, Samsung Venture
Main partners:	ADAS, Outdoor Mapping, Robotic Car Manufacturers
Number of Employees:	42
Application/Market:	Automotive
Type of technology:	Optical phased array, pulse, phase shift,
Main products:	M8, S3, S3-Qi
Wavelength:	905 nm
Commercial Status: (input by Yole)	R&D Phase (Testing)
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Louay Eldada	Co-Founde Co-Founder, Chief Executive Officer, President & Chairman
Tianyue Yu	Co-Founder & Vice President of Products
James Disanto	Board Member
Tamer Hassanein	Board Member

Phantom Intelligence

Company Overview

Phantom Intelligence works to improve obstacle detection and collision mitigation solutions to increase the safety of all vehicles. Includes digital signal processing techniques (also known as full-waveform processing).

Type:	Hardware/Integrator		
Address:	319 Rue Franquet Quebec, QC G1P 4R4 Canada	Website: Founded:	phantomingellience.com 2011
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	N/A		
Main partners:	Robotic Car Manufacturers		
Number of Employees:	7		
Application/Market:	Automotive		
Type of technology:	PD Array		
Main products:	N/A		
Wavelength:	N/A		
Commercial Status:	R&D Phase		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Jean-Yves Deschenes	President

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Photek Limited

Company Overview

Photek is a specialist manufacturer of vacuum based tubes and camera systems for photon detection who specialize in ultra-high speed imaging and advanced photon counting camera systems.

Type:	Component manufacturer/Hardware/Integrator		
Address:	26 Castleham Road, St Leonards on Sea, East Sussex, TN38 9NS, United Kingdom	Website: Founded:	photek.com 2011
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	N/A		
Main partners:	N/A		
Number of Employees:	3		
Application/Market:	Automotive		
Type of technology:	N/A		
Main products:	AuraTek Multi-Channel Photon Counter, Demagnifiers, Image Intensifiers, Magnetic Focus, Photodiodes		
Technology: (If component manufacturer)	PD Photomultipliers, vaccum tubes		
Wavelength:	N/A		
Commercial Status: (input by Yole)	N/A		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

RoboSense

Company Overview

RoboSense provides LiDAR-based vision solutions for self-driving vehicles. The company is working on offering robotic perception solutions which can seamlessly integrate LiDAR hardware, 3D data processing algorithms, and deep learning technology.

Type:	Hardware/Integrator/Systems software		
Address:	Robosense Bldg, Block 1, South of Zhongguan Honghualing Industrial Dist, No. 1213 Liuxian Avenue, Taoyuan Street, Nanshan District, Shenzhen, China	Website: Founded:	robosense.ai 2014
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	Shenzhen Valley Ventures		
Main partners:	Robotic Car Manufacturers		
Number of Employees:	16		
Application/Market:	Automotive		
Type of technology:	Macro-meca, MEMS, OPA, pulse		
Main products:	RS-LiDAR-16, RS-LiDAR-32, RS-LiDAR-M1Pre, RS-LiDAR-M1, Coupling Platform, RS-LiDAR-Algorithms		
Wavelength:	905 nm		
Commercial Status:	Macro-meca products currently on sale; 2019 will introduce the MEMS product		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Chunxin Qiu	Founder & CEO
Letian Liu Ph.D	CTO

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

sdPhotonics LLC

Company Overview

sdPhotonics develops next generation photonic devices for a variety of applications, offering materials production capabilities, R&D services in semi-conductor device development, and advanced laser and detector technologies.

Type:	Component manufacturer/Hardware/Integrator		
Address:	UCF High Technology Incubator CREOL, Building 53 4000 Central Florida Blvd.	Website: Founded:	sdphotonics.com 2006
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	N/A		
Main partners:	N/A		
Number of Employees:	10		
Application/Market:	Automotive, Semiconductor		
Type of technology:	N/A		
Main products:	Lasers		
Technology: (If component manufacturer)	VCSEL		
Wavelength:	N/A		
Commercial Status:	R&D		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

SemiNex

Company Overview

SemiNex Corporation manufactures high power, infrared laser diodes for military, industrial, cosmetic and medical applications.

Type:	Component manufacturer/Hardware/Integrator		
Address:	100 Corporate Place Suite #302 Peabody, MA 01960	Website: Founded:	seminex.com 2003

Revenues (Estimated)	N/A
Total Capital Raised:	$2.54M
Investors:	eCoast Angels, National Institutes of Health, State Trade and Export
Main partners:	N/A
Number of Employees:	11
Application/Market:	Industrial, automotive, medical
Type of technology:	N/A
Main products:	Laser diodes, lasers for LiDAR, Infrared lasers, Medical lasers, laser engine
Technology: (If component manufacturer)	InP
Wavelength:	1300-1700 nm
Commercial Status:	Commercially available
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
David Bean	President ; President and Board Member
John Callahan	Vice President, Engineering & Executive, Development
Greg Smith	Board Member
Michael Marsh	Board Member

Sense Photonics

sense photonics

Company Overview

Sense Photonics is developing ultra high performance, low cost LiDAR solutions.

Type:	Hardware/Integrator/Systems software		
Address:	3021 East Cornwallis Rd Durham, NC 27709 United States	Website: Founded:	sense-photonics.com 2016

Revenues (Estimated)	N/A
Total Capital Raised:	$3.28M
Investors:	Arab Angel, Congruent Ventures, IDEA Fund Partners, Prelude Ventures, Service Provider Capital
Main partners:	Robotic Car Manufacturers
Number of Employees:	7
Application/Market:	Automotive
Type of technology:	Flash, Image Sensor, Pulse
Main products:	N/A
Wavelength:	905 nm
Commercial Status: (input by Yole)	Prototype Phase
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Scott Burroughs	President, CEO, Board Member
Russell Kanjorski	Chief Commercial Officer, Board Member
Joshua Posamentier	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

SensL

Company Overview

SensL is a producer of low light measurement and detection systems. The company engages in developing and manufacturing silicon photomultipliers, measurement instruments and photon counting devices for applications which use low light detection.

Type:	Hardware/Integrator		
Address:	6800 Airport Business Park Cork T12 CDF7 Ireland	Website: Founded:	sensl.com 2004
Revenues (Estimated)	N/A		
Total Capital Raised:	$3.51M		
Investors:	Delta Partners, Enterprise Equity Venture Capital, Enterprise Ireland		
Main partners:	Robotic Car Manufacturers		
Number of Employees:	16		
Application/Market:	Automotive		
Type of technology:	N/A		
Main products:	Silicon Photomultipliers (C-Series, J-Series, R-Series)		
Technology: (If component manufacturer)	SiPM or SiPM array, Macro-meca, Pulse		
Wavelength:	905 nm		
Commercial Status: (input by Yole)	Prototyping Phase		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Bryan Campbell	CEO & Board Member
Carl Jackson Ph.D	Co-Founder, CTO, VP of Engineering & Board Member
Dermot Berkery	Board Member
Frank Walsh	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

SureStar

Company Overview

Developer of a LiDAR technology intended to offer an increased efficiency of data collection with the help of accurate and three dimensional images. The technology provides airborne, mobile, terrestrial LiDAR and other laser scanners for use in digitization of cities, intelligent transportation, topographic mapping, engineering surveying, and deformation monitoring.

Type:	Hardware/Integrator		
Address:	Room 502, Building 1, Number 5 Yongfeng Road Beijing, Haidian District 100094 China	Website: Founded:	isurestar.com 2005
Revenues (Estimated)	N/A		
Total Capital Raised:	$153.00M		
Investors:	China V Fund, Legend Star, Star VC, Yunhui Capital		
Main partners:	N/A		
Number of Employees:	N/A		
Application/Market:	Automotive, Industrial, Consumer		
Type of technology:	N/A		
Main products:	R-Fans (Series), A-Pilot Airborne LiDAR, R-Angle Vehicle Lidar, U-Arm Terrestrial 3D Laser Scanner		
Wavelength:	N/A		
Commercial Status:	N/A		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

TetraVue

Company Overview

Developer of 3D vision technology designed to offer smart vision for smarter machines. The company's 3D vision technology uses Time of Flight (TOF) technology which has ultra high definition, solid state flash that captures high definition images indoor or outdoor at a long range with less power than a night light

Type:	Hardware/Integrator/Systems software		
Address:	2330 Cousteau Ct Vista, CA 92081 United States	Website: Founded:	tetravue.com 2008
Revenues (Estimated)	N/A		
Total Capital Raised:	$20.00M		
Investors:	KLA-Tencor, Lam Research, Tsing Capital, Samsung Catalyst, Robert Bosch Venture Capital, Nautilus Venture Partners, Foxconn		
Main partners:	Robotic Car Manufacturers		
Number of Employees:	10		
Application/Market:	Autonomous driving, VR/AR, movies, robotics, sports, industry		
Type of technology:	Flash LiDAR		
Main products:	Long Range, High Definition 4D Camera		
Wavelength:	N/A		
Commercial Status:	N/A		
Manufacturing location:	San Jose, CA		

Selected Senior Management

Professional	Professional Title
Hal Zarem	CEO
Paul Banks	Founder & President
Bruce McWilliams	Board
David Fisher	Board

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Uber

UBER

Company Overview

Uber provides peer-to-peer ridesharing, food delivery, transportation services. On-demand ride-hailing application allows passengers to request a variety of personal transportation options.

Type:	Hardware/Integrator/Systems software		
Address:	1455 Market Street San Francisco, CA 94013 United States	Website: Founded:	uber.com 2009

Revenues (Estimated)	$7,500
Total Capital Raised:	$17.19M
Investors:	BAML, Brand Capital Dragoneer Investment Group, G Squared, K2 Global, Sequoia Capital, SoftBank Group, Tencent Holdings
Main partners:	N/A
Number of Employees:	17,000
Application/Market:	Automotive, Mobility
Type of technology:	Velodyne LiDAR and own development in progress
Main products:	N/A
Wavelength:	N/A
Commercial Status: (input by Yole)	Testing phase with licenses across the globe
Manufacturing location:	N/A

Selected Senior Management

Professional	Professional Title
Dara Khosrowshahi	CEO
Thuan Pham	CTO
Arianna Huffington	Board Member
David Trujillo	Board Member

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Velodyne LiDAR

Company Overview

Velodyne is a manufacturer of auto sensor products. The company develops various sensing and mapping products that enables 3D scanning of the environment.

Type:	Component manufacturer/integrator/Soft/OEMS		
Address:	345 Digital Drive	Website:	www.velodynelidar.com
	Morgan Hill, CA 95037	Founded:	1983
	United States		
Revenues (Estimated)	$250M		
Total Capital Raised:	$150.00M		
Investors:	Baidu, Ford		
Main partners:	Almost all robotic car manufacturers		
Number of Employees:	183		
Application/Market:	Automotive, UAV/Drone, Industrial, Mapping		
Type of technology:	Mechanical (Large and small)		
	Solid-state (In-development)		
Main products:	HDL, VLP, Puck		
Technology: (If component manufacturer)	APD, SiPM, SPAD		
Wavelength:	905 nm		
Commercial Status: (input by Yole)	Mechanical TRL 9		
	Solid-state TRL 8		
Manufacturing location:	San José, CA, USA		

Selected Senior Management

Professional	Professional Title
David Hall	Founder & CEO
Michael Jellen	President & COO
Robert Brown	CFO

SELECTED LIDAR PRIVATE COMPANY PROFILES (CONT'D)

Voxtel Inc.

Company Overview

Voxtel is a leading developer, manufacturer and supplier of innovative photonic and advanced 3D imaging technologies, which are provided to consumer, industrial, and military OEM system integrators.

Type:	Component manufacturer/Hardware/Integrator		
Address:	15985 NW Schendel Ave Beaverton, OR 97006 United States	Website: Founded:	voxtel-inc.com 1999

Revenues (Estimated)	N/A
Total Capital Raised:	N/A
Investors:	N/A
Main partners:	N/A
Number of Employees:	44
Application/Market:	N/A
Type of technology:	InGaAs
Main products:	Laser Rangefinders—Eyesafe, Photoreceivers—InGaAs, Detector Arrays—InGaAs APD, Focal Plane Arrays (FPAs) & Flash Ladar FF
Technology: (If component manufacturer)	ADP array InGaAs, Electro-optical devices and systems.
Wavelength:	900-1700 nm
Commercial Status:	Commercially available
Manufacturing location:	Beaverton, Oregon

Selected Senior Management

Professional	Professional Title
George Williams	President & CEO

Waymo

Company Overview

Developer of autonomous automobiles intended to transform mobility by making it easier and safer. The company's autonomous cars are self-driven without a steering wheel, pedals and are also integrated with sensors and software that are designed to detect pedestrians, cyclists, vehicles and road works, enabling users to have a safer and enjoyable traveling experience.

Type:	Hardware/Integrator/Systems software		
Address:	1600 Amphitheatre Way 94043 Mountain View, CA United States	Website: Founded:	waymo.com 2009
Revenues (Estimated)	N/A		
Total Capital Raised:	N/A		
Investors:	Alphabet (X - Google Accelerator)		
Main partners:	N/A		
Number of Employees:	575		
Application/Market:	Automotive, Mobility		
Type of technology:	Proprietary LiDAR		
Main products:	N/A		
Wavelength:	N/A		
Commercial Status: (input by Yole)	Testing phase with licenses across the globe		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
John Kafcik	Founder & CEO
Sacha Arnoud	Director of Engineering

Xenomatix

XENOMATIX
AUTOMOTIVE VISION SOLUTIONS

Company Overview

Developer of automotive vision systems. The company specializes in developing laser-based automotive vision systems that allows vehicles to digitize and understand road conditions in real-time.

Type:	Component manufacturer/Hardware/Integrator		
Address:	Research Park Haasrode Esperantolaan 4 3001 Leuven Belgium	Website: Founded:	xenomatix.com 2013
Revenues (Estimated)	N/A		
Total Capital Raised:	$1.87M		
Investors:	N/A		
Main partners:	Robotic Car Manufacturers		
Number of Employees:	20		
Application/Market:	Automotive (ADAS, robotic)		
Type of technology:	Hundred beam lasers configuration and CMOS imager combination		
Main products:	XenoLidar, XenoTrack, XenoWare		
Technology: (If component manufacturer)	VCSEL, Flash, CMOS Sensor		
Wavelength:	905 nm		
Commercial Status: (input by Yole)	2018: Sample Product 2020-2021: Mass Production		
Manufacturing location:	N/A		

Selected Senior Management

Professional	Professional Title
Filip Geuens	Founder & CEO

SILICON VALLEY AND EUROPEAN PRESENCE

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