

Operations and Technology

Johan Löfvenholm
Chief Operating Officer

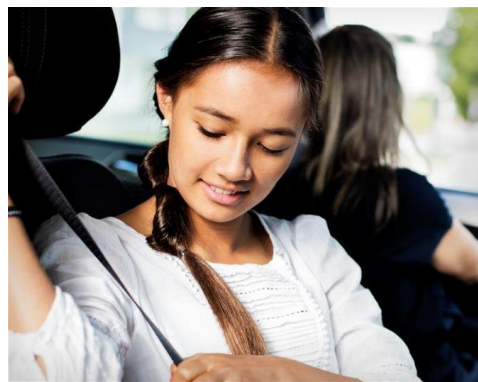


veoneer

For Veoneer – Innovation, Reliability and Quality is Creating Trust

Automotive Safety Grade Solutions Evermore Important

Long industry experience and heritage of proven solutions, *based on "Saving Lives"*



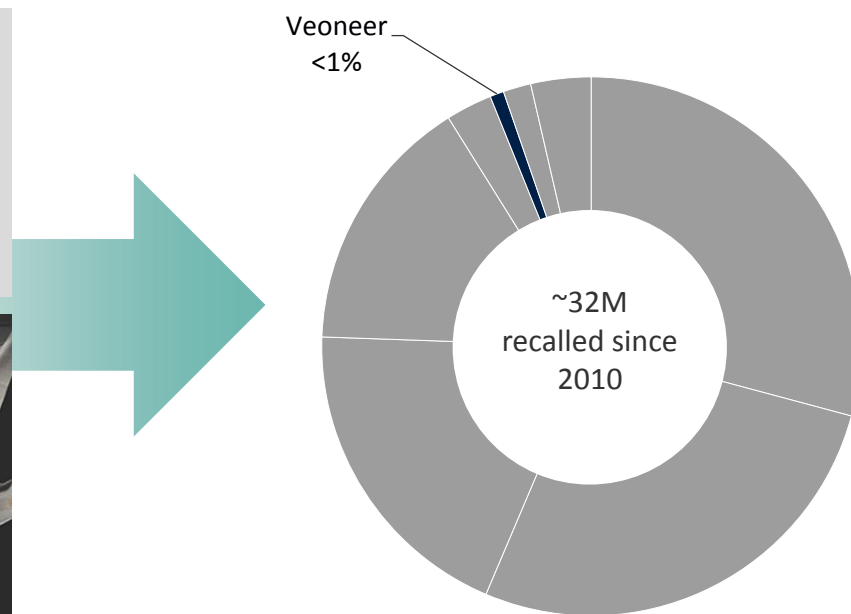
Reliability from solid engineering expertise and production capabilities with a *Relentless focus on Zero Defects*



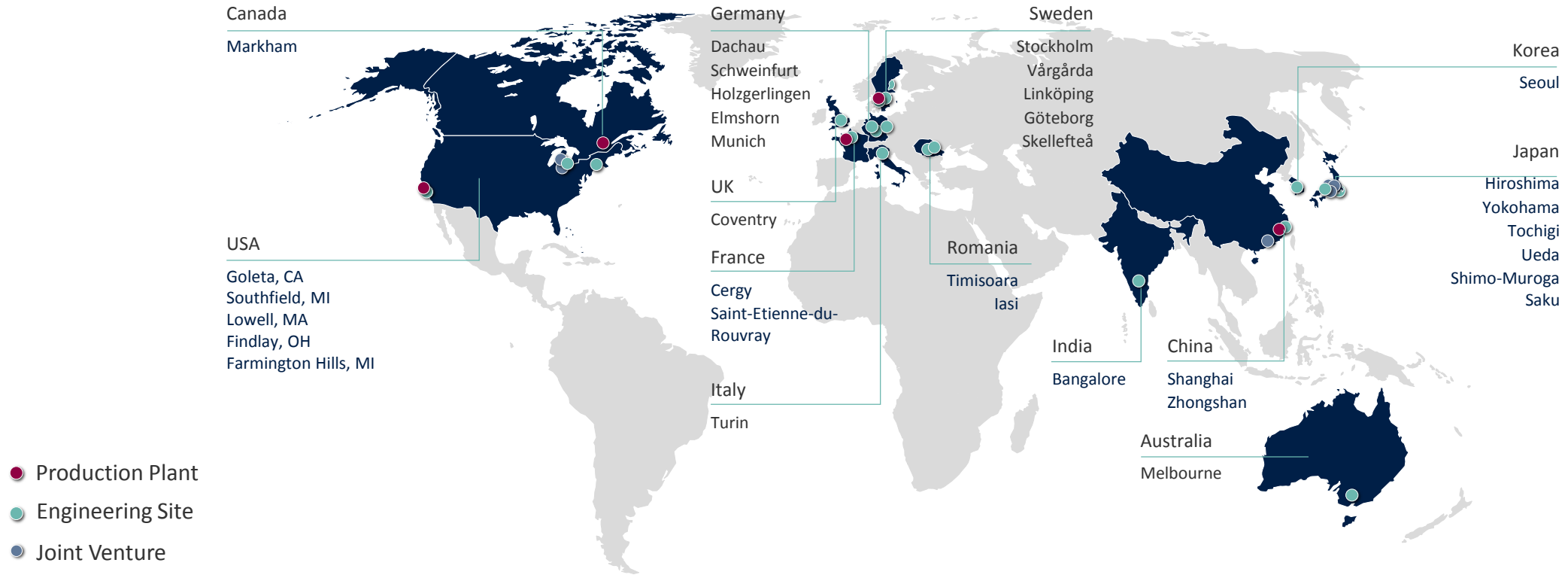
Credibility from track record of breakthrough *Innovations in passive and active safety*



Global Recalls in Safety Electronics 2010A-17A



Our Customers Are Global and So Are We



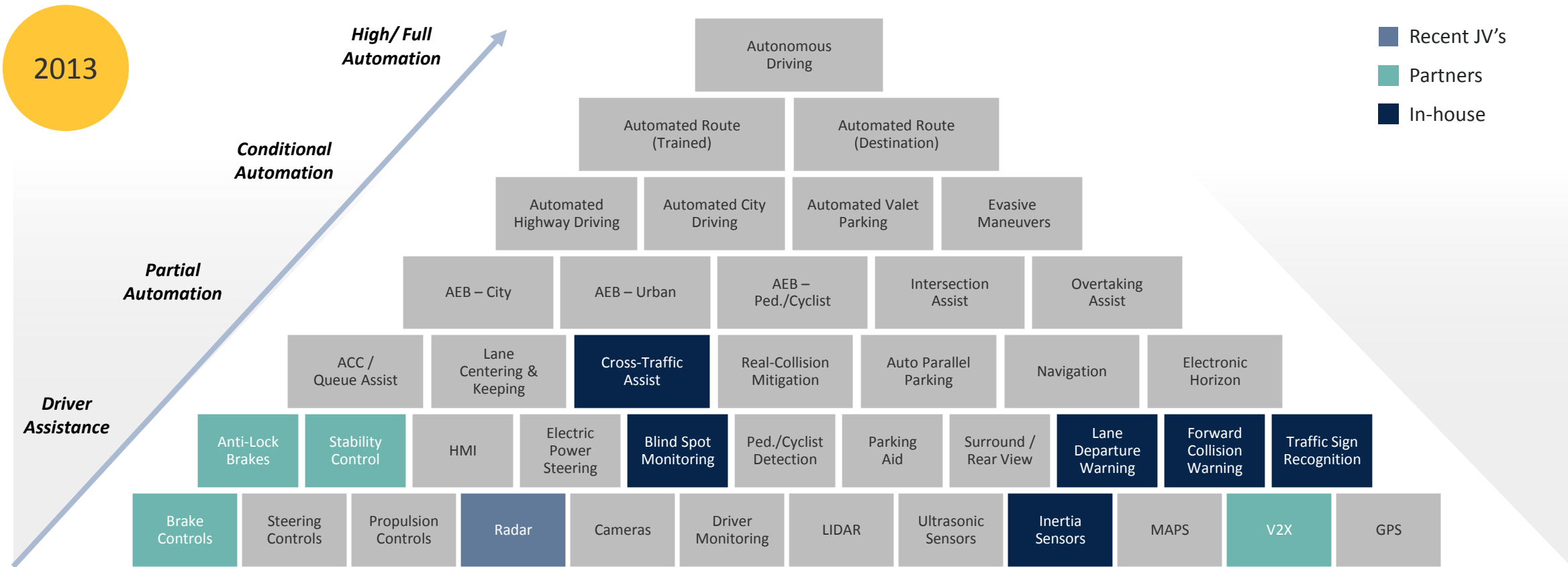
13 COUNTRIES

9 MANUFACTURING SITES

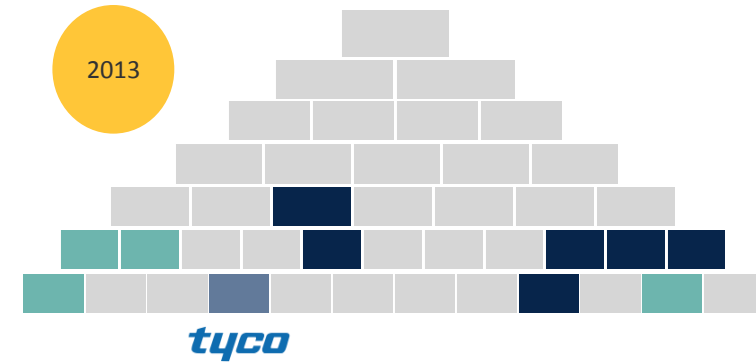
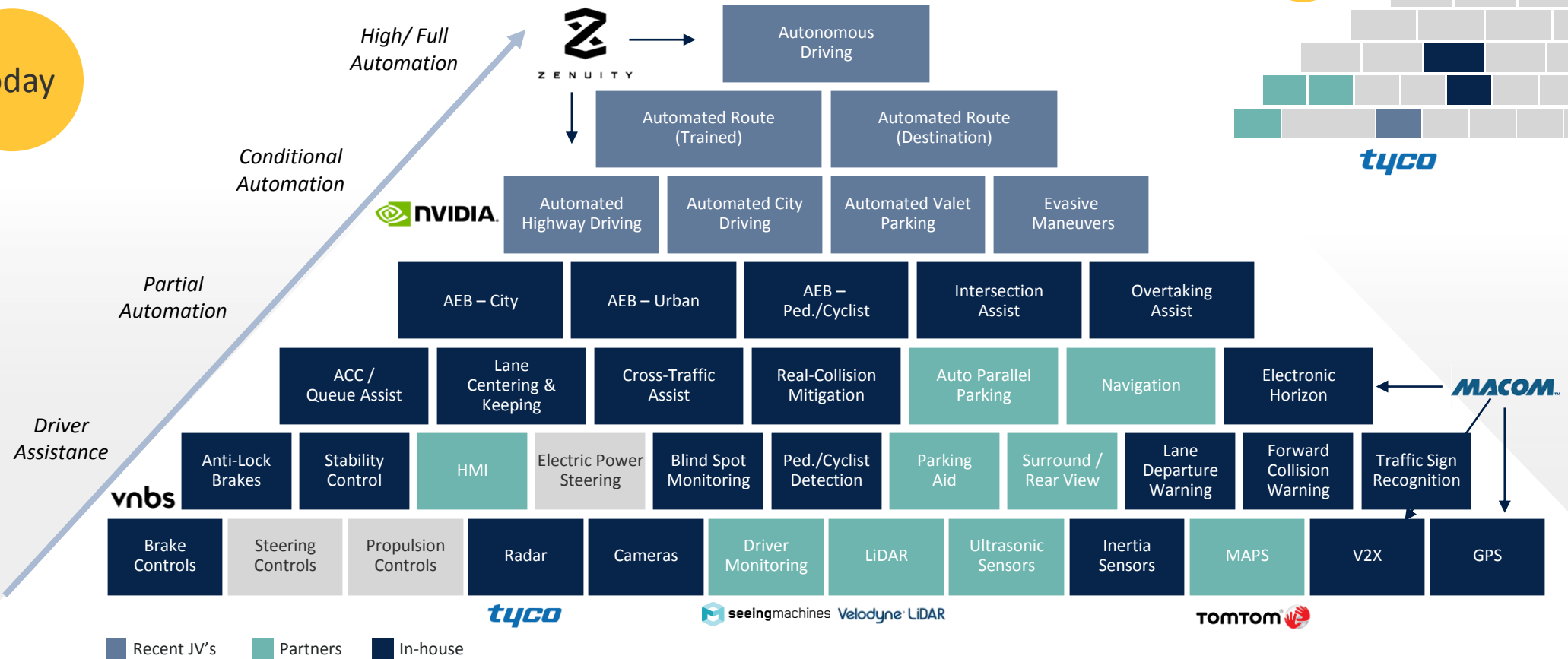
17 TECHNICAL SITES

As of April 2018.

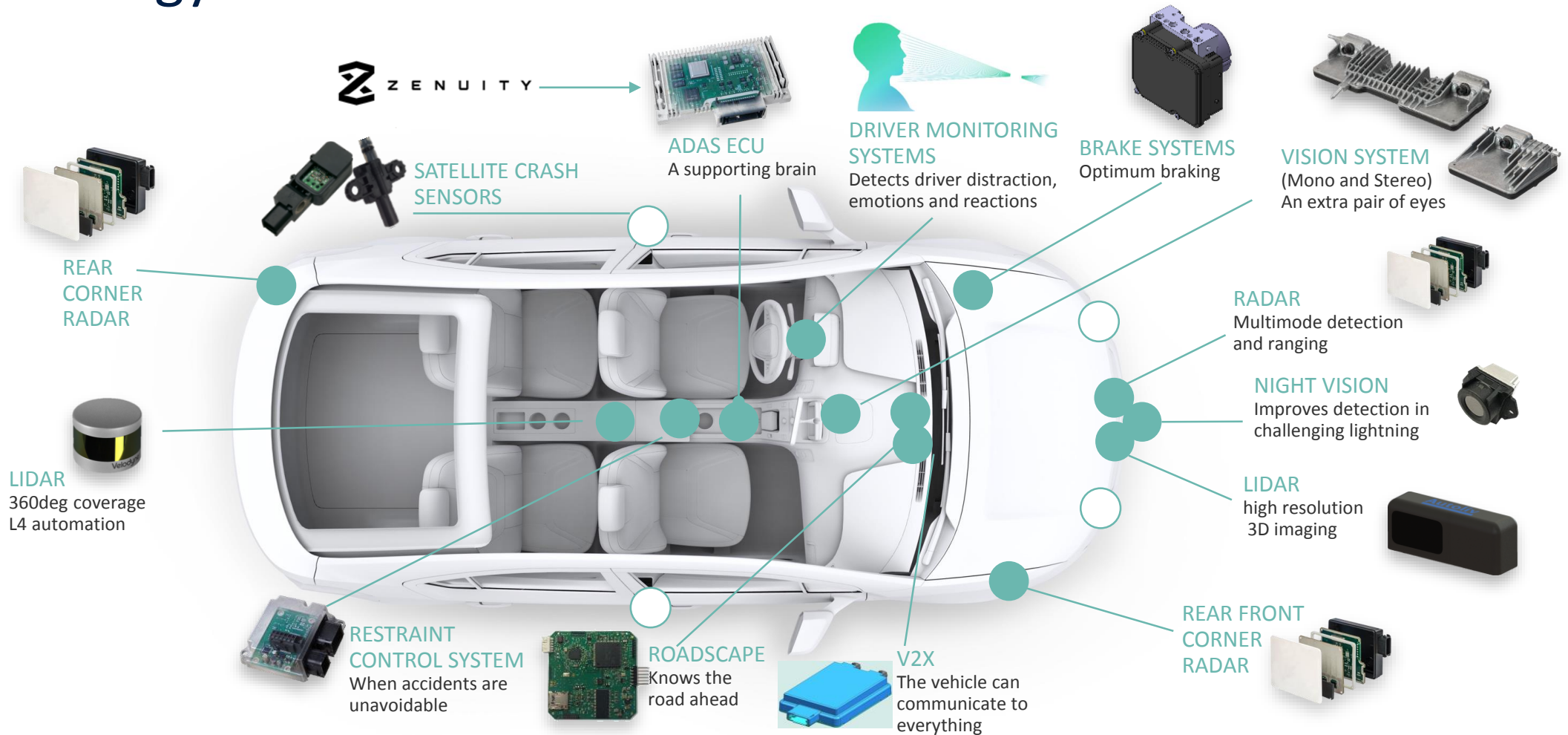
Our Vision of a Full Stack Active Safety Offering for All Levels of Autonomy



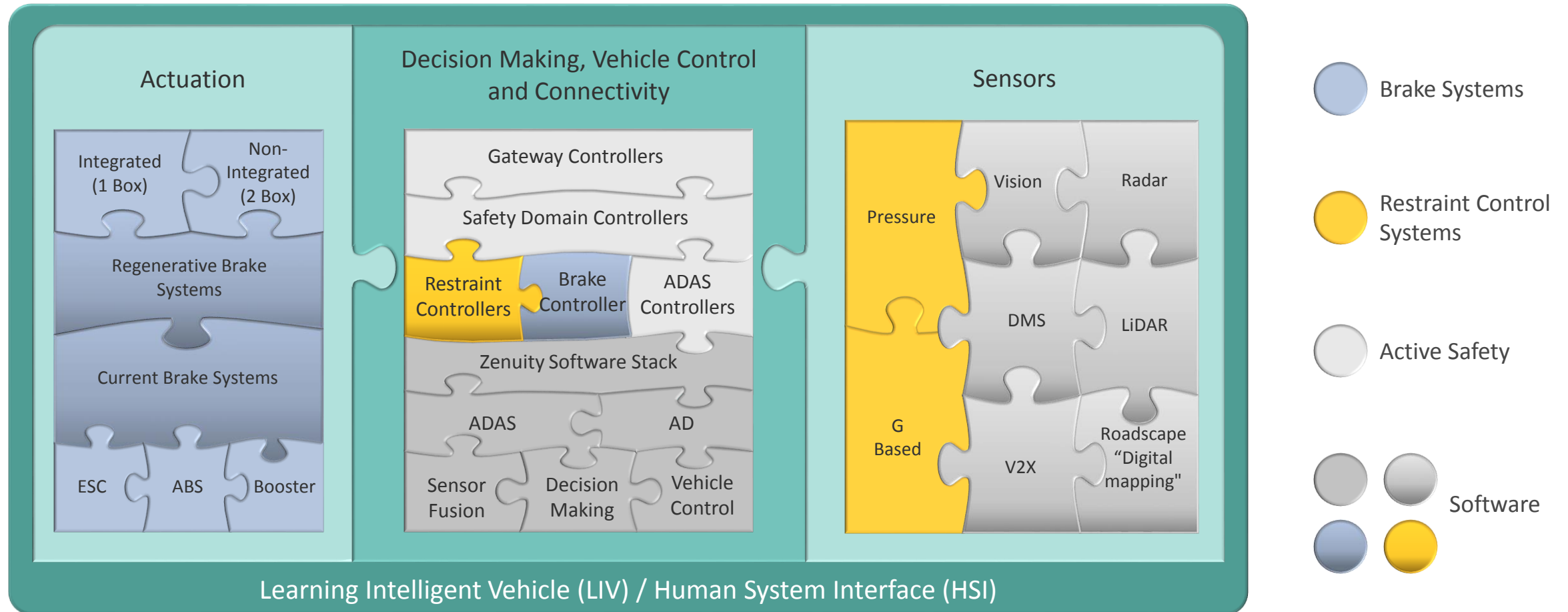
Our Vision Becomes Reality



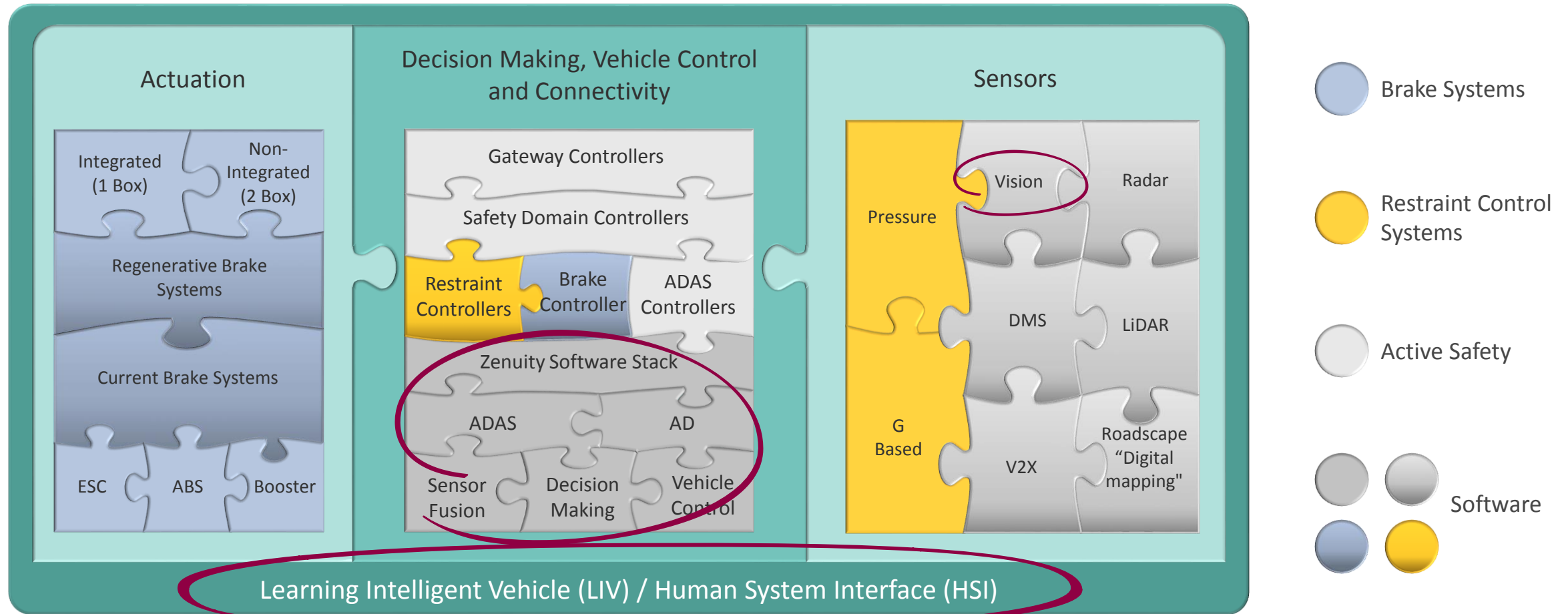
Our Technology Showcase



Our Safety System Approach - How Our Product Lines fit Together



Our Safety System Approach - How Our Product Lines fit Together



Core differentiating Innovations – Three Examples

1

Vision Development

Salah Hadi

Masters, Applied Physics and
Electrical Engineering

Director, Vision Systems

2

System Software

Erik Coelingh

PhD Electrical Engineering, Adjunct
Professor Mechatronics, Chalmers
University of Technology

Technology Advisor

3

Human Systems

Ola Boström

PhD Theoretical and Mathematical
Physics, Associate Professor Traffic
Safety, Chalmers University of
Technology

Vice President Research and Patents

Three Core Examples

1 Vision Systems

2 Software

3 Long-Term Research
Focus on human/machine
interaction

Vision Roadmap - ADAS and HAD Sensing

2017 Mono Vision AEB (3rd Generation)

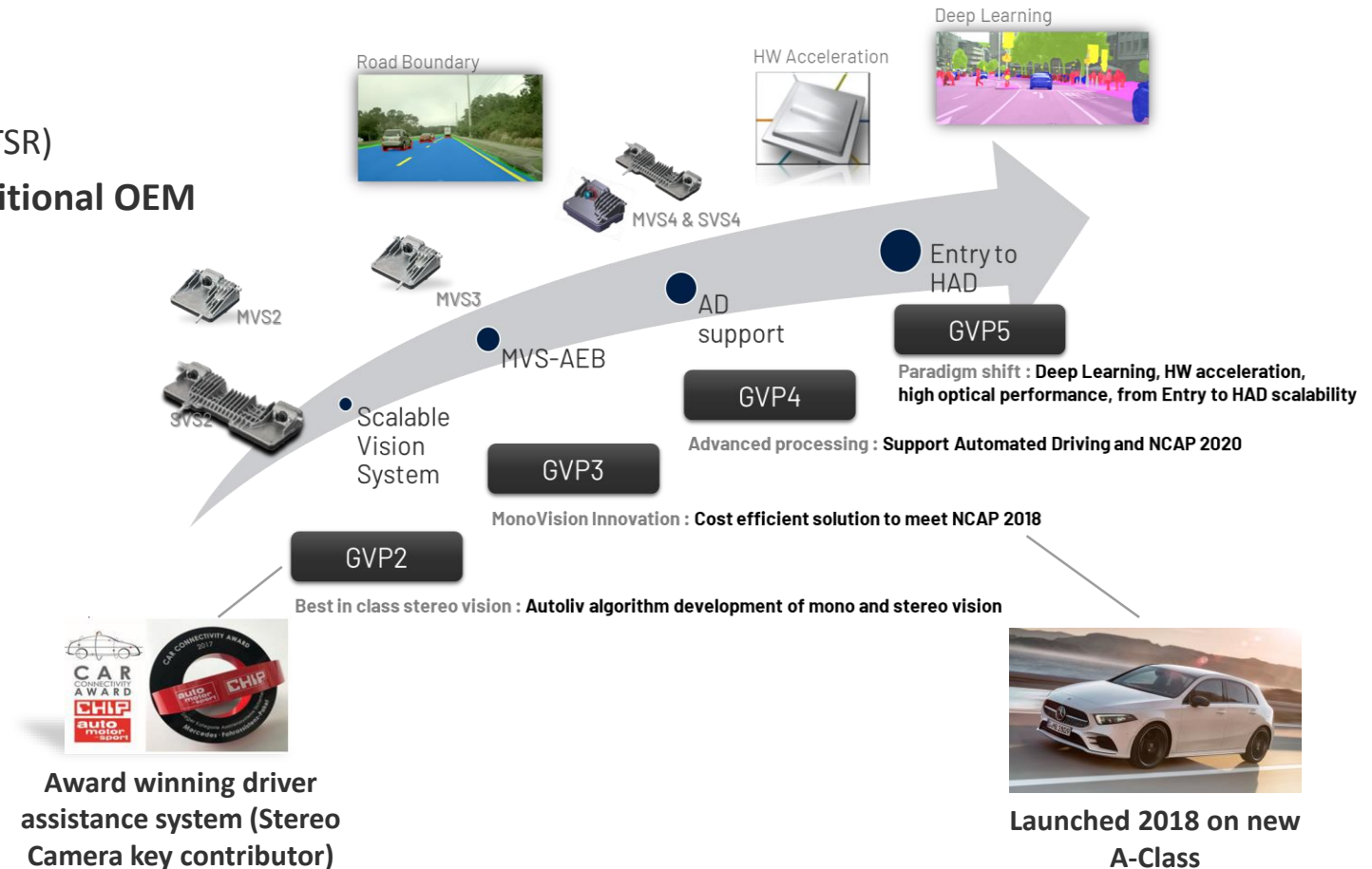
- Mono Camera with Vision only based AEB capabilities
- Cost effective solution to meet NCAP 2018 (Lane, AEB, TSR)
- ▶ **Launched on new A-Class, confirmed SOP with additional OEM**

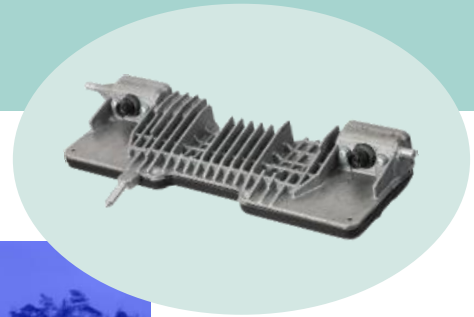
2019 Mono and Stereo Vision (4th Generation)

- Next generation Stereo and Mono cameras
- Support Automated Driving and NCAP 2020
- ▶ **Confirmed SOPs with 5 OEMs**

2022+ Next generation Vision systems (5th Generation)

- High resolution imagers
- Advanced algorithms and processing
- Multiple camera support
- ▶ **In RFQ/RFI with multiple OEMs**

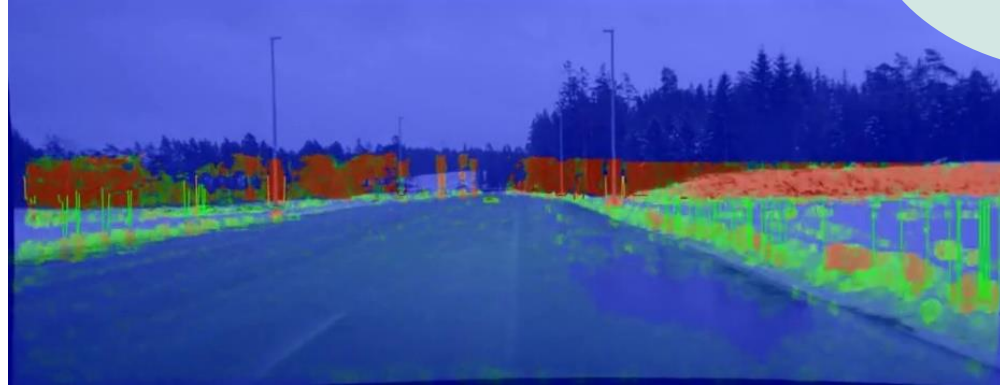




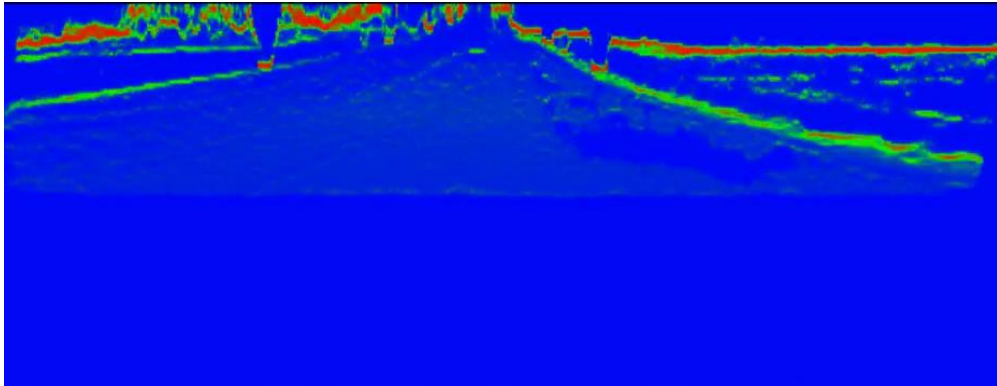
RGB Image from Left camera



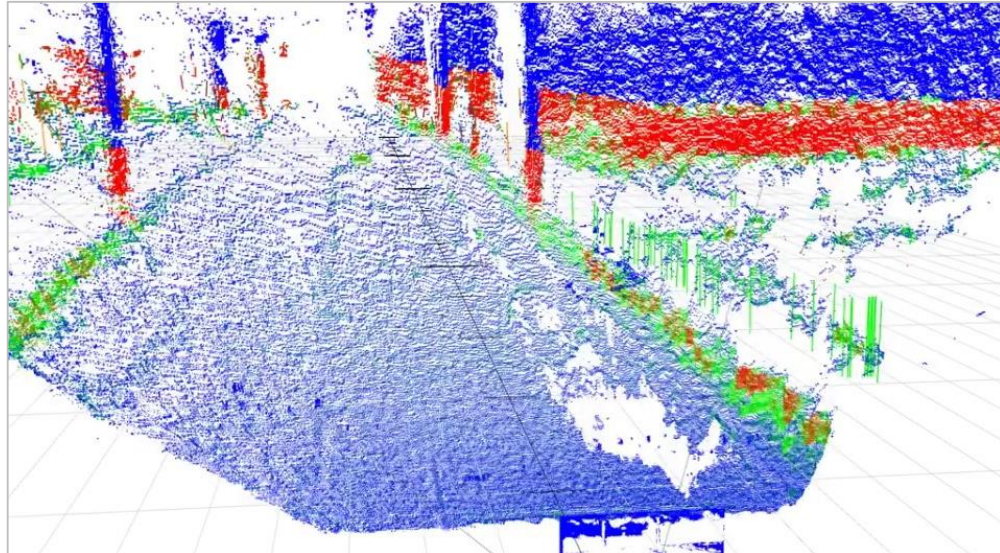
Occupancy grid overlay

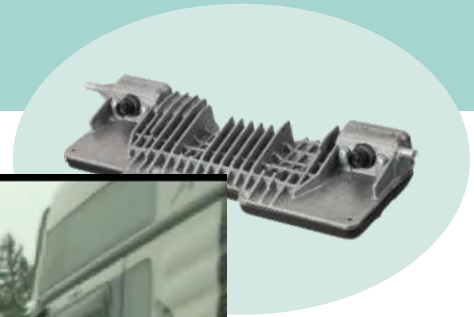


Occupancy grid

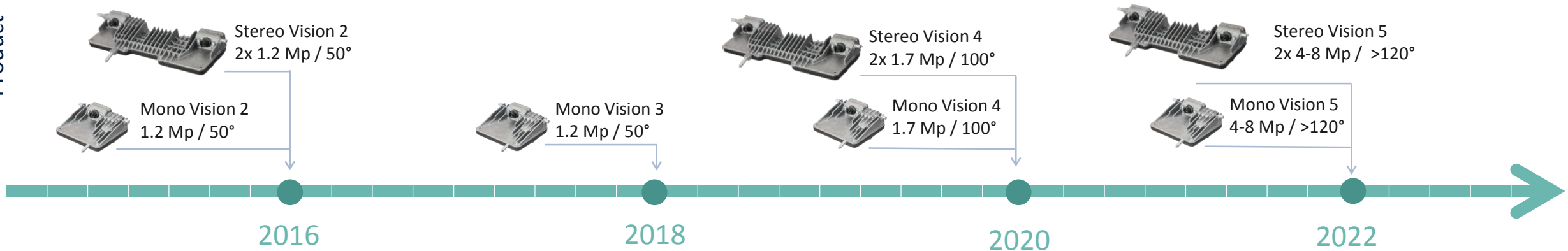


3D point cloud





Product



Feature

MVS2:

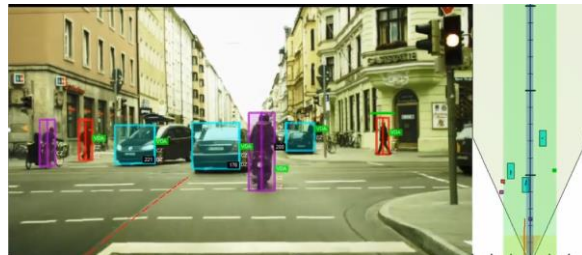
- Lane Departure Warning
- Lane Departure Prevention
- Lane Keep Assist
- High Beam Automation
- Adaptive High Beam
- Traffic Sign Assist (Fused with Navi System)
- Cross Walk Alert/Wrong Way Alert

SVS2:

- MVS2 features +
- 3D Object Detection for ACC S&G/TJA, Automatic Lane Change Assist, Collision Warning and AEB by fusion
- General Object Detection
- 3D Lane Detection
- Road Surface Preview
- Support Object enhanced Map

MVS3:

- MVS2 Features +
- Object Detection (Vehicle/Pedestrian/Cyclist) for ACC S&G and AEB by Fusion
- Road Boundary Light
- Traffic Sign Recognition (without Map information)
- NCAP 2018



MVS4:

- 2:nd Generation Object Detection
- 2:nd Generation Lane Detection & Road Boundary
- Free Space Detection
- Traffic Light Detection
- Support Object Enhanced Map
- NCAP 2020

SVS4:

- 2:nd Generation 3D Object Detection
- Parking Assist
- Small Object Detection



MVS5 Base:

- 3:rd Generation Object Detection (DNN)
- 3:rd Generation Lane Detection & Road Boundary (DNN)

MVS5 Mid:

- Enhanced detection range Objects

SVS5:

- 3:rd Generation 3D Object Detection
- 2:nd Generation Small Object Detection





Z E N U I T Y

Shape the
FUTURE
of DRIVING

Dr. Erik Coelingh
Technology Advisor

Our Product Roadmap

Combining driver support (ADAS) and autonomous driving (AD)

ROBOTAXI CAPABILITY

Driverless	High availability
Increased coverage over time (OTA)	High-performance sensing and compute

HIGHWAY PILOT & AUTO VALET PARKING

On highway (<130 km/h)	Driverless in park areas
Increased functionality over time (OTA)	Additional driver support & NCAP functionality

NEXT GEN DRIVER SUPPORT

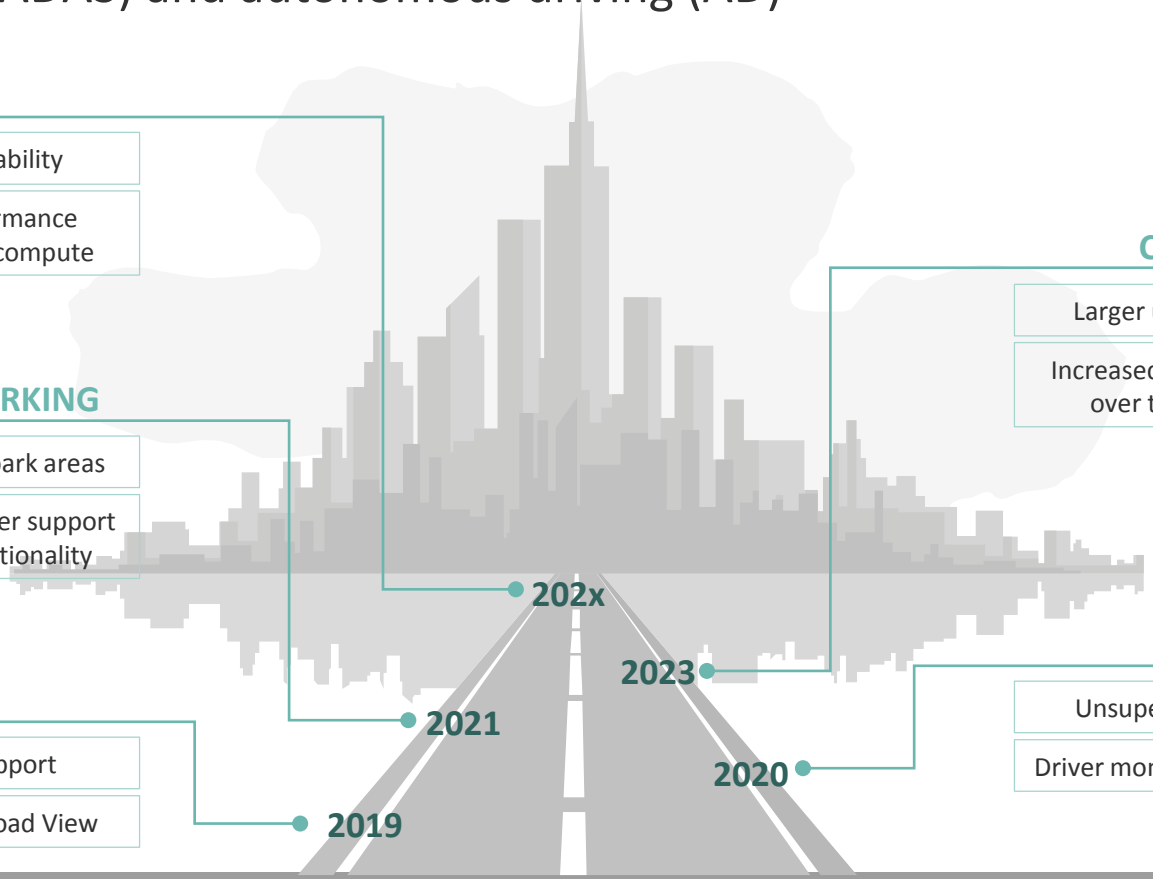
NCAP 2018 - 2020	Driver Support
Connected Cloud	Connected Road View

CITY PILOT & AUTO VALET PARKING

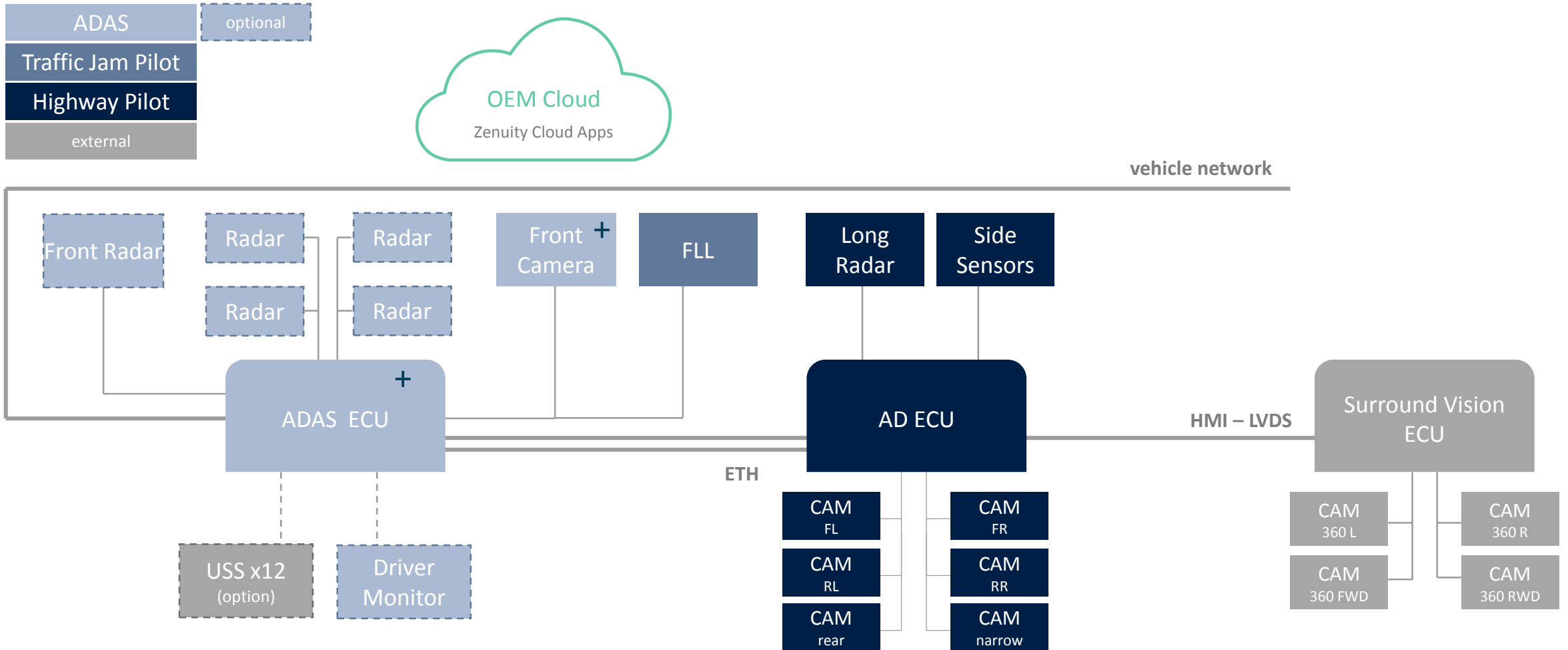
Larger urban roads	Intersection & Traffic light
Increased functionality over time (OTA)	Driverless auto park on public roads

TRAFFIC JAM PILOT

Unsupervised case	Boxed-in (<60 km/h)
Driver monitoring camera	Redundant architecture

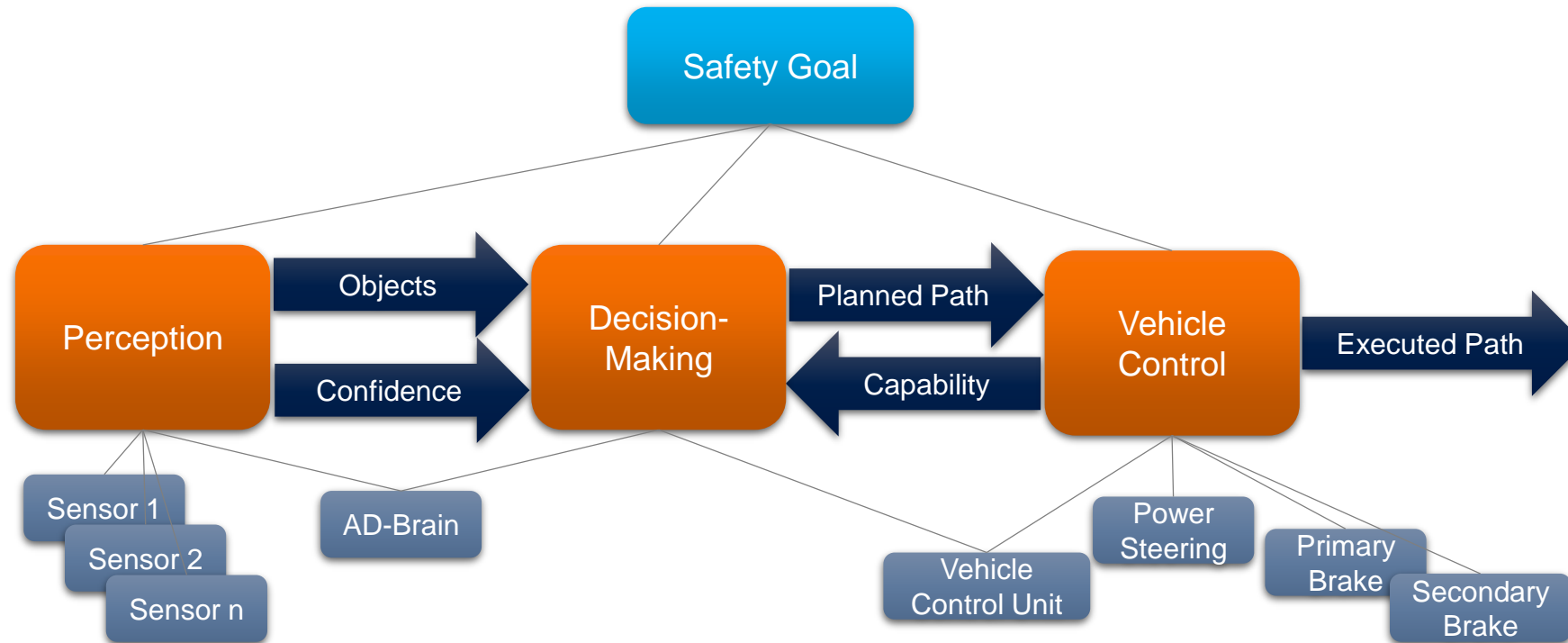


Scalability to Match OEM Needs



Autonomous Driving is All About Safety

As it has to be significantly safer than the average human driver



Combine agile development with robust solutions

Deep Learning



Building Complete Customer Features

Highway Pilot

Perception

Decision-Making

Vehicle Control



with Speed, Agility, Robustness *and* Safety

Conclusions

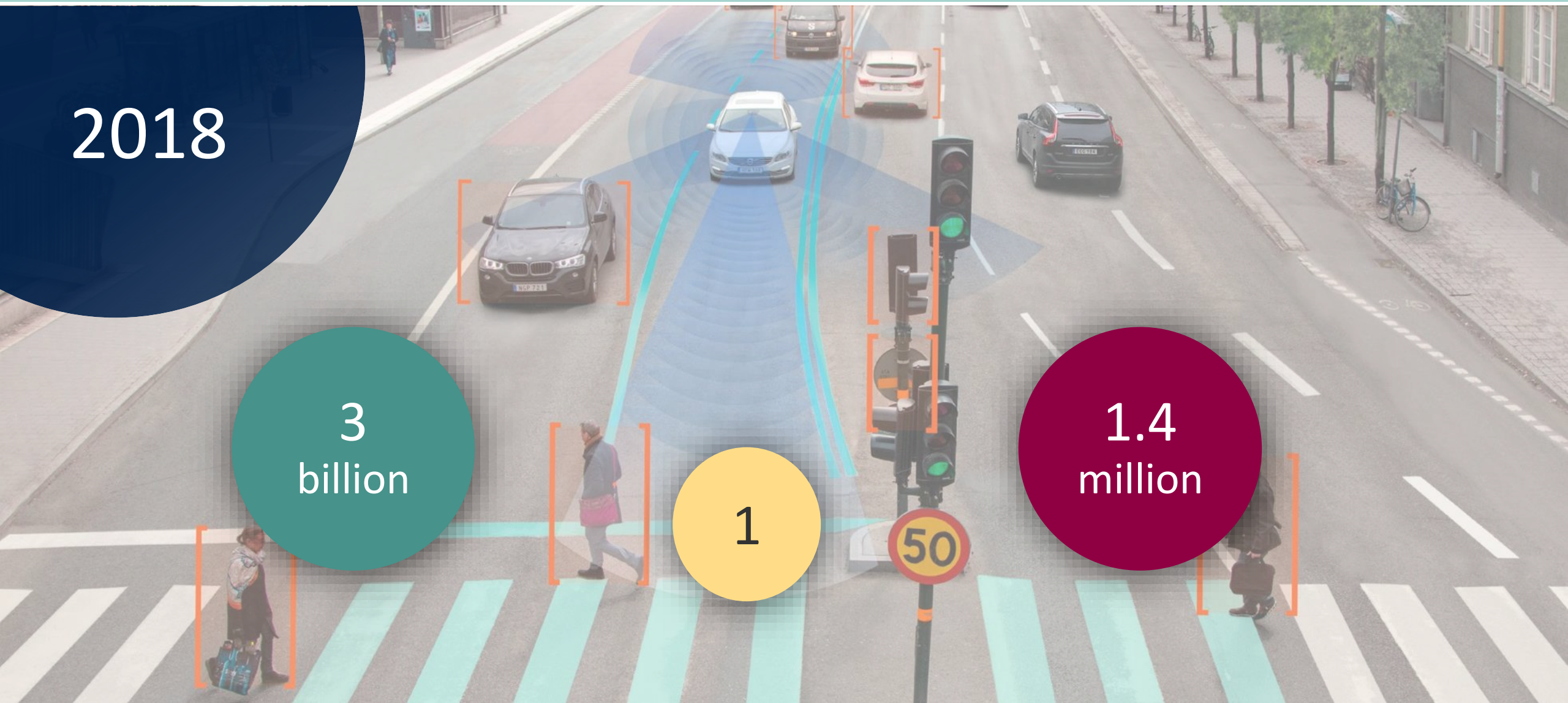
- We can deliver a complete SW stack from sensing to actuation.
- Our starting point was a world-leading ADAS technology, which we continuously enhance and expand with state-of-the-art technologies.
- We scale our SW stack from ADAS to AD, by the combination of speed and robustness.

2018

3
billion

1

1.4
million



2040

3 billion

6 billion

1

1.4 million

0.7 million

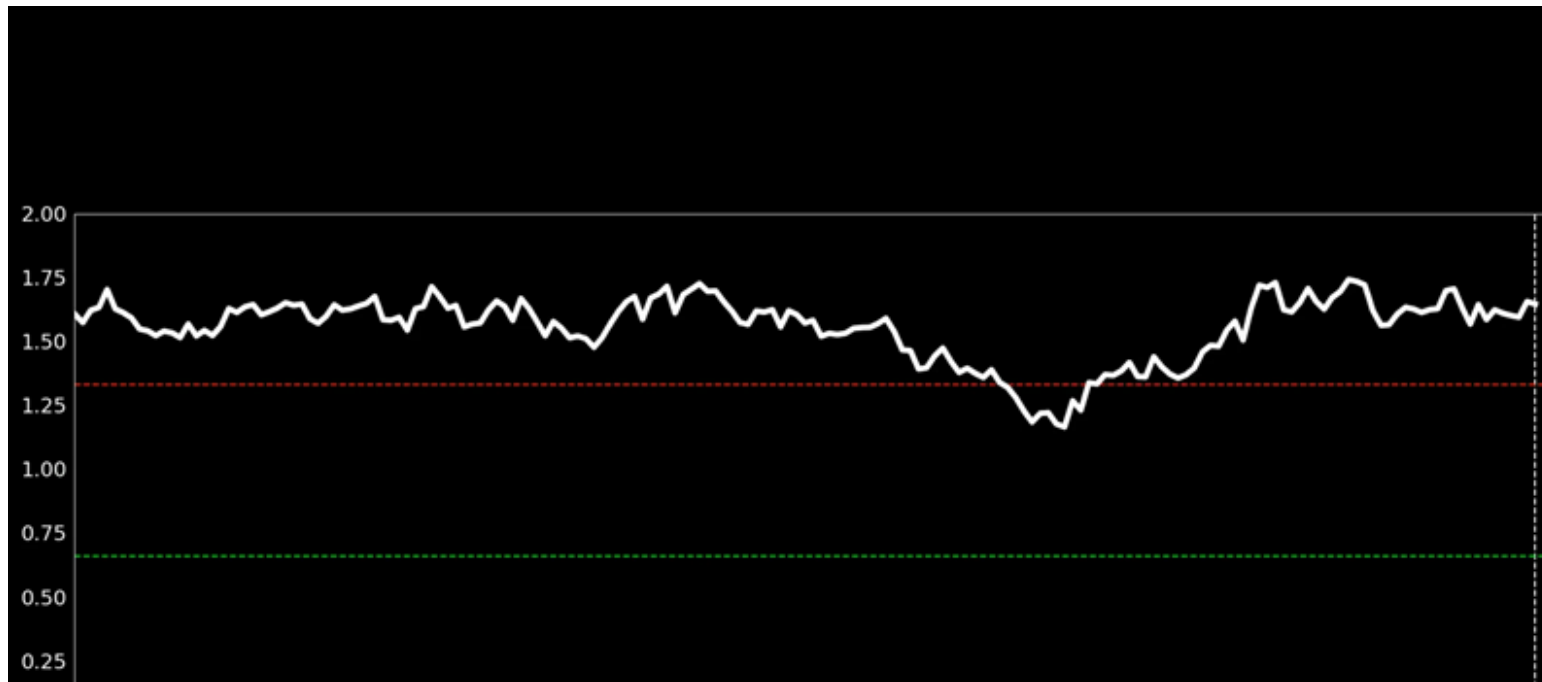
LIV - The Learning Intelligent Vehicle



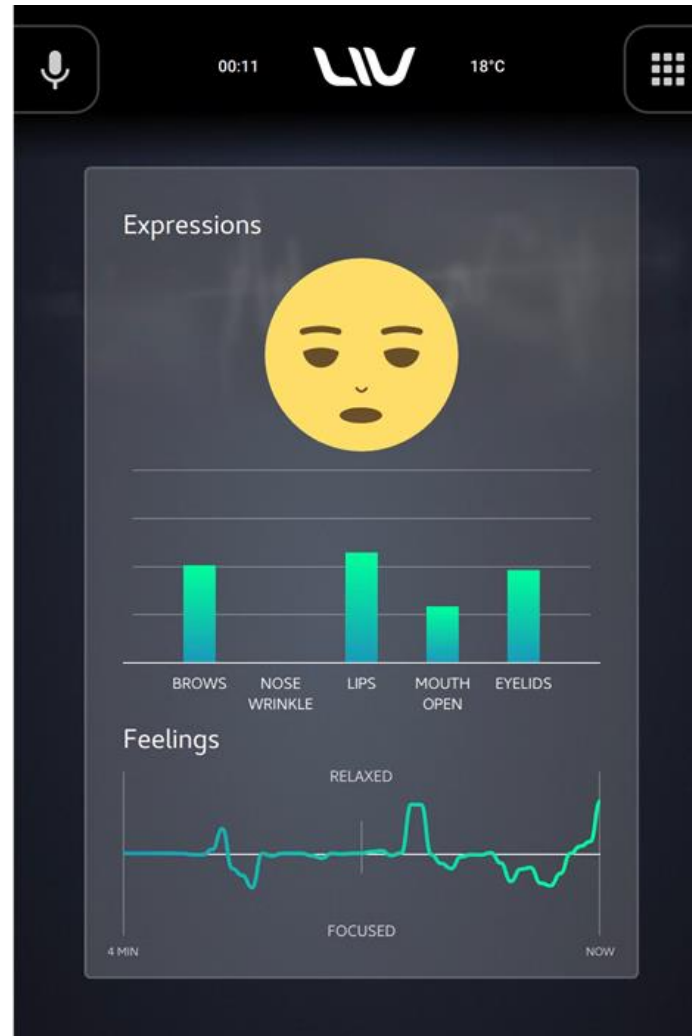
Human and Machine
as a joint **cognitive** system,
sharing **control** and
trusting each other

AI and UX in LIV

Cognitive load (MIT AgeLab)



AI and UX in LIV Emotions (Affectiva)



2040



Half as many traffic fatalities with twice as many consumers, thanks to our human centric approach!

Summary

- ✓ Leading through Innovation, Reliability and Quality
 - Proven Quality track record producing Automotive Grade
 - Proven vision technology and are on track for Highly Automated driving
 - Complete scalable software solutions from perception to vehicle control
 - By creating trust, we can make the future journey not only safe and sound, but an enjoyable user experience

