
AEYE
iDAR™

Lidar: Intelligent Sensing at Scale

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Aeye, Inc.

Outline

- **Edge Cases**
  …where the subtlest changes in conditions can result in vastly different results
- **Intelligent Sensing**
  …and its role in helping cars to understand context, minimize false positives and reduce latency
- **Moving Perception to the Edge**
  …and its role in helping cars to understand context, minimize false positives and reduce latency
- **Where the Rubber meets the Road**
  …Packaging using proven Tier 1 methods to achieve automotive grade standards and FuSa/ SOTIF system compliance

Motivation for Change

- **Edge Cases**
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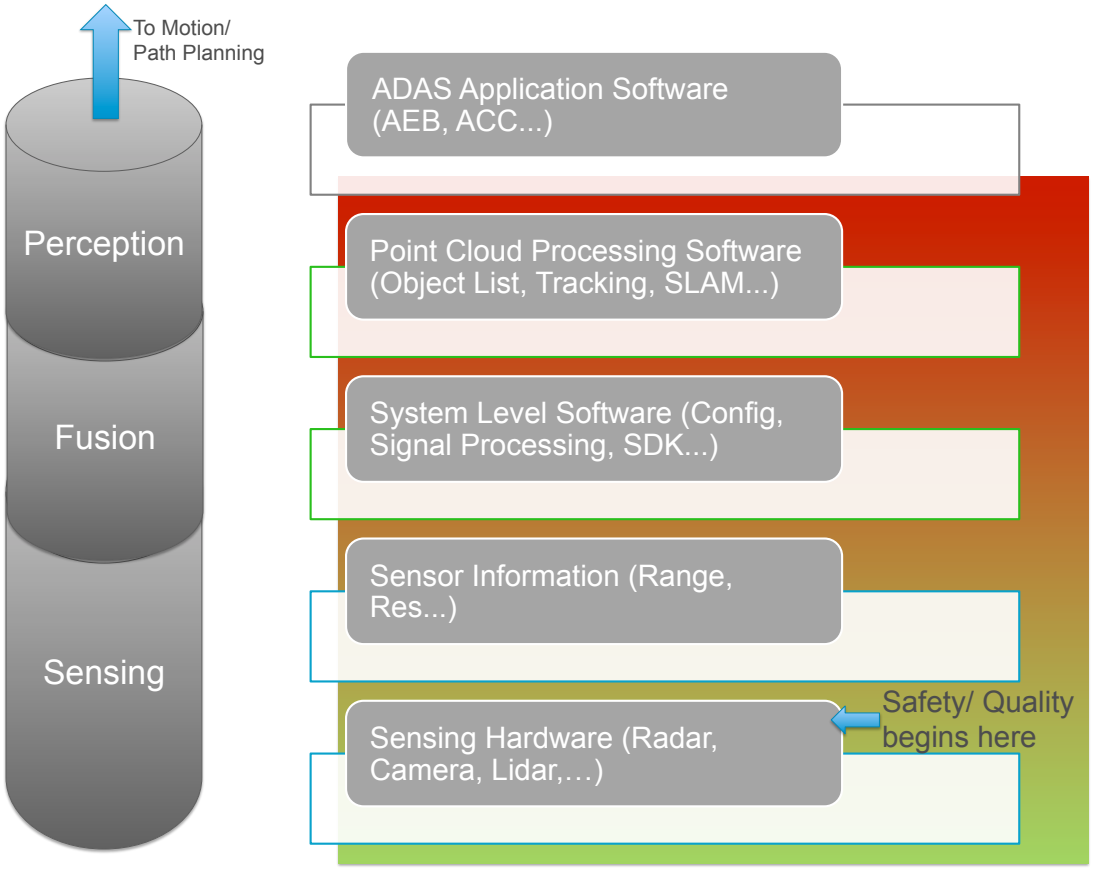
AEye Case Study: Corner Cases



Level of Processing needed to come to the same conclusion

AEYE INTERNAL CASE STUDY

300 NTSA and NCAP scenarios analyzed

56 found to be uniquely applicable to LiDAR

Improved Safety/ Functionality

20 scenarios were found to be significantly enhanced by Agile LiDAR

8 are uniquely enabled by iDAR

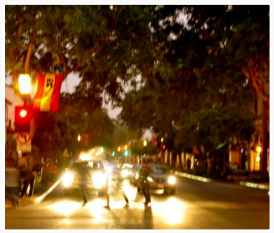
Top Corner Cases for iDAR: AEye NHTSA study

Child
Chasing Ball

Extruded Cargo

Road Debris

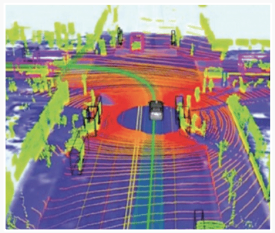
Obscured
Truck Bed



Hidden
Pedestrian

Lane Splitting
Motorcycle

Swerving
Vehicle



SLAM


AEYE

Ingredients for the Next Step in ADAS

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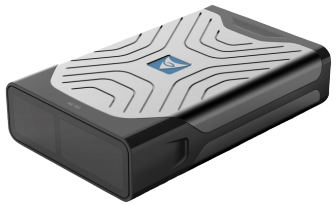
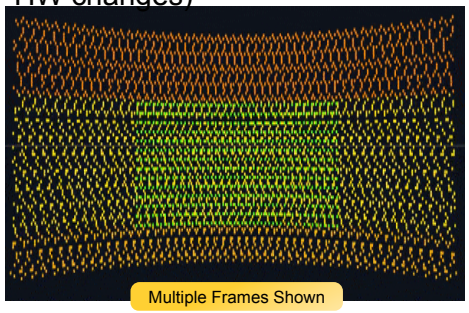
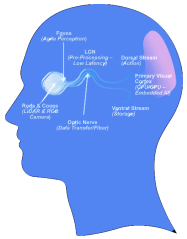
An Intelligent Platform enabled at the Edge



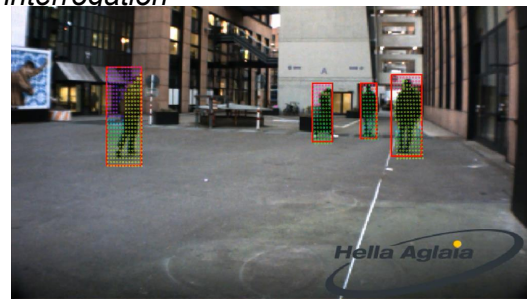
New Solid-State Agile 1550nm LiDAR
Software-definable and dynamically changeable scan pattern (without HW changes)



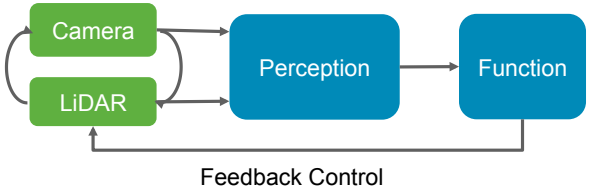
Scan pattern w/ ROI scanning



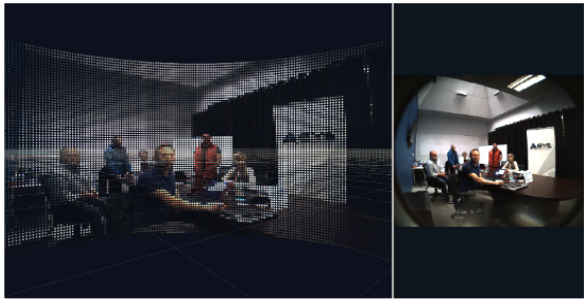
Enabling Platform for Embedded Artificial Intelligence
Enables new feedback loops – real-time edge-processing and advanced target interrogation



ROI scanning with very high resolution based on camera feedback > only areas w/ bounding boxes are scanned



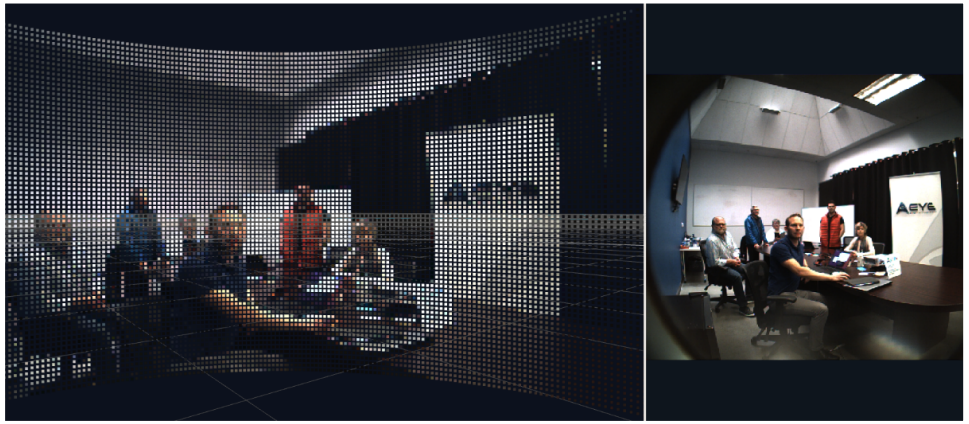
2D Camera + 3D LiDAR hardware fusion
Integrating pixels/voxels at the point of data acquisition – delivers salient sensor data and sensor redundancy



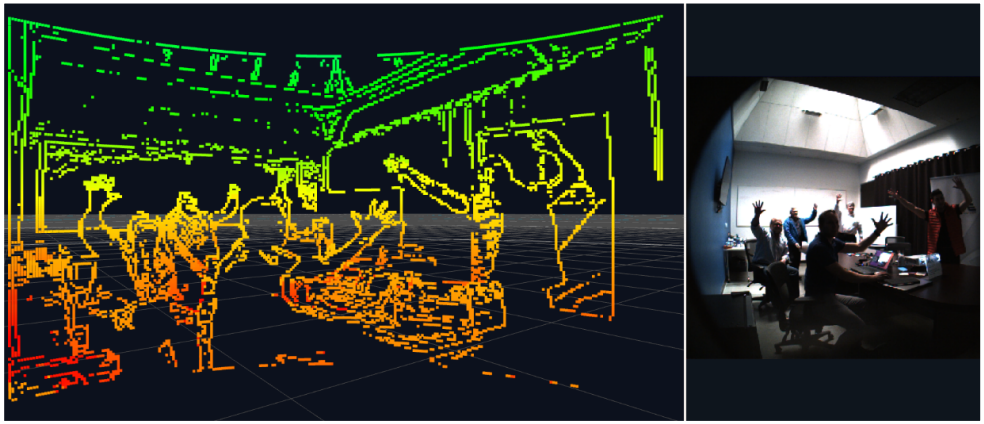
Left: dynamic Vixels™ (full RGB point cloud)
Right: camera

Early-Fusion based Edge Intelligence

True Color Object Acquisition

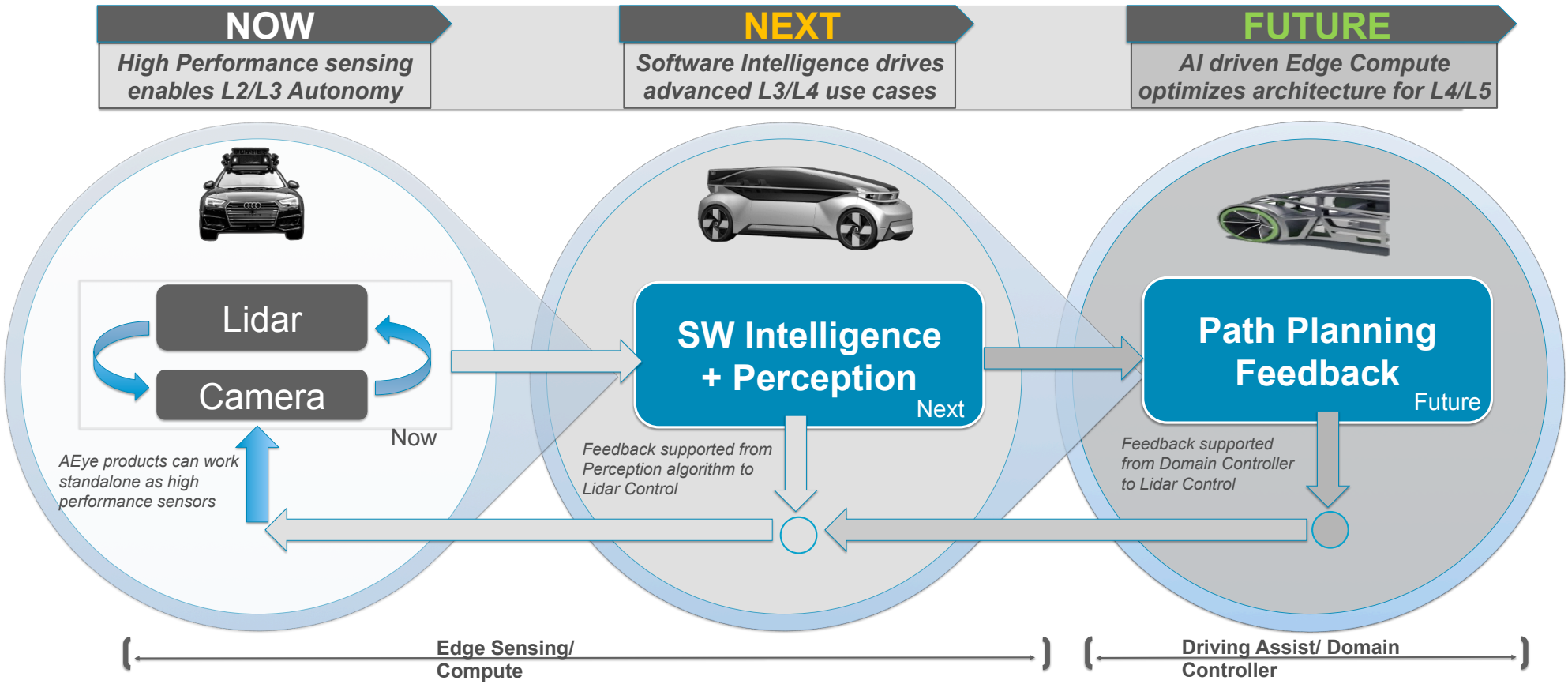


Enhanced Target Extraction



AEye has created the **Dynamic Vixel™**, integrating a 2D Camera and 3D LiDAR dynamically at the point of data acquisition

Sensing/ Perception Architecture of the Future



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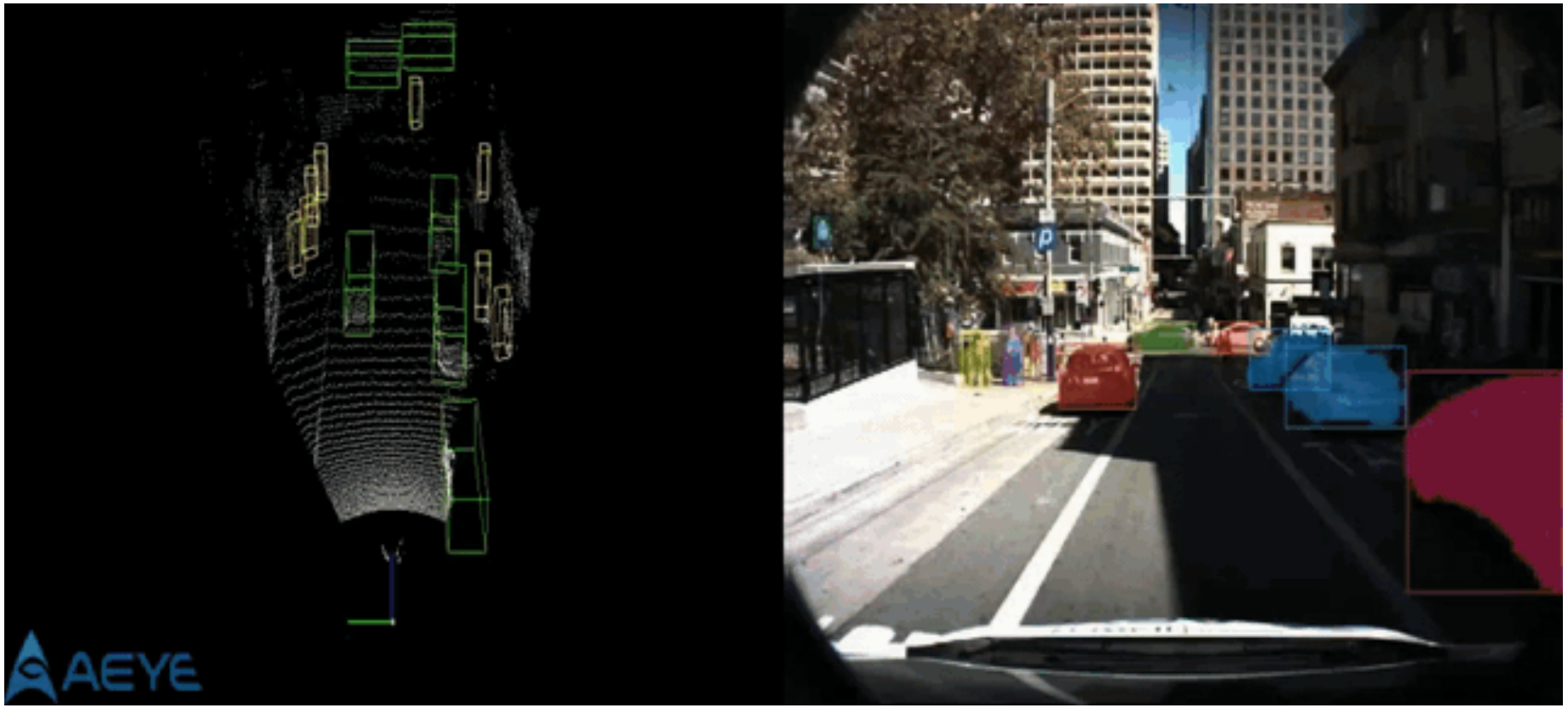
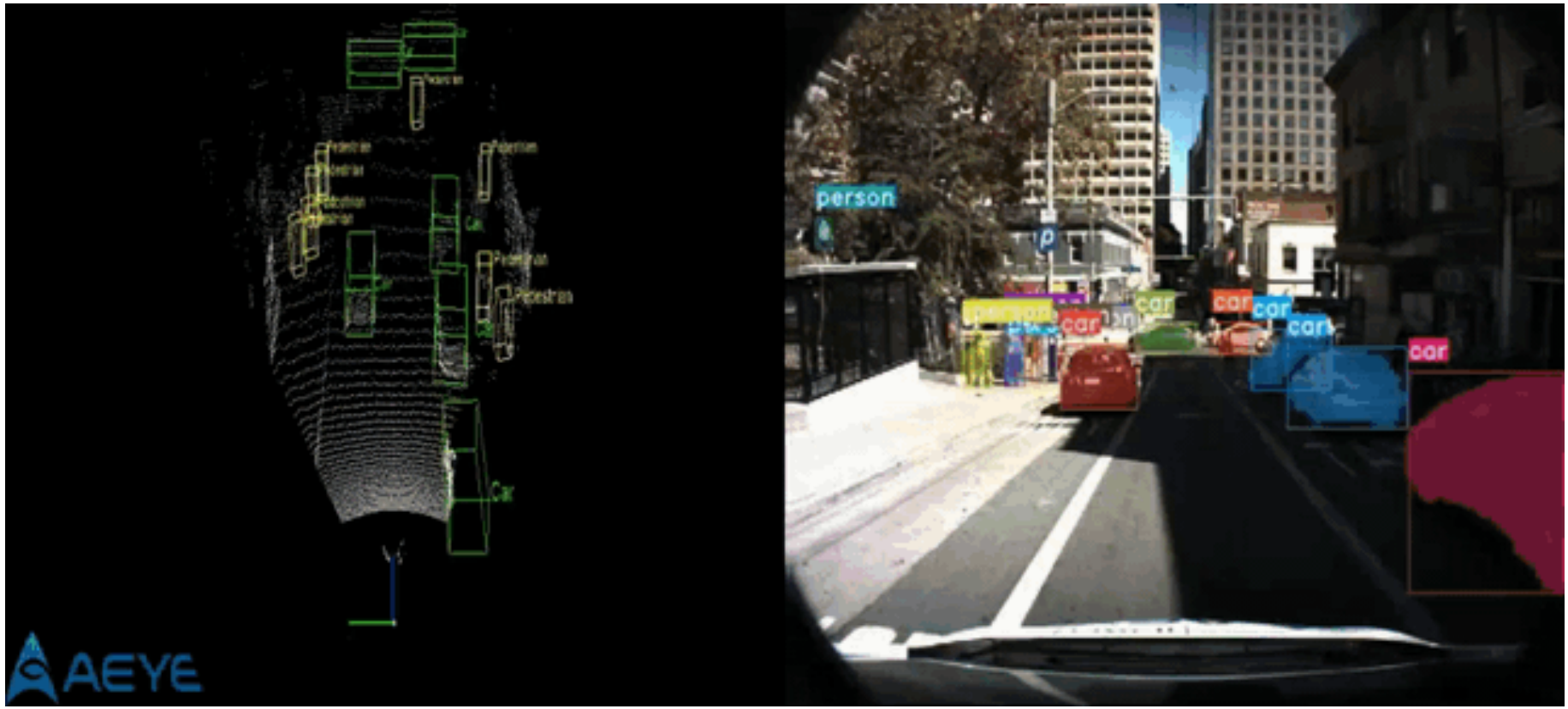
Information Optimization with Dynamic ROIs

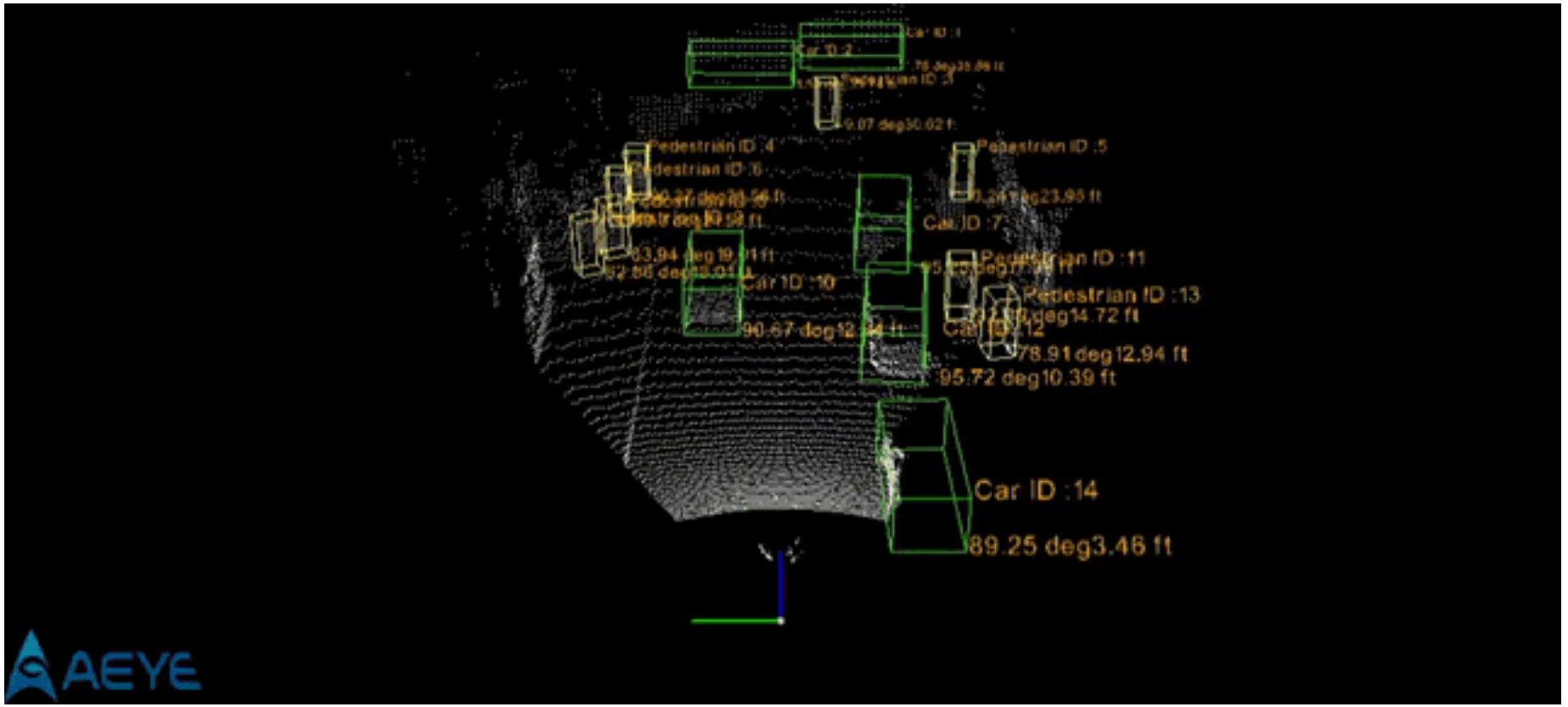
Intelligent (3D First, 2D 2nd) Object Detection



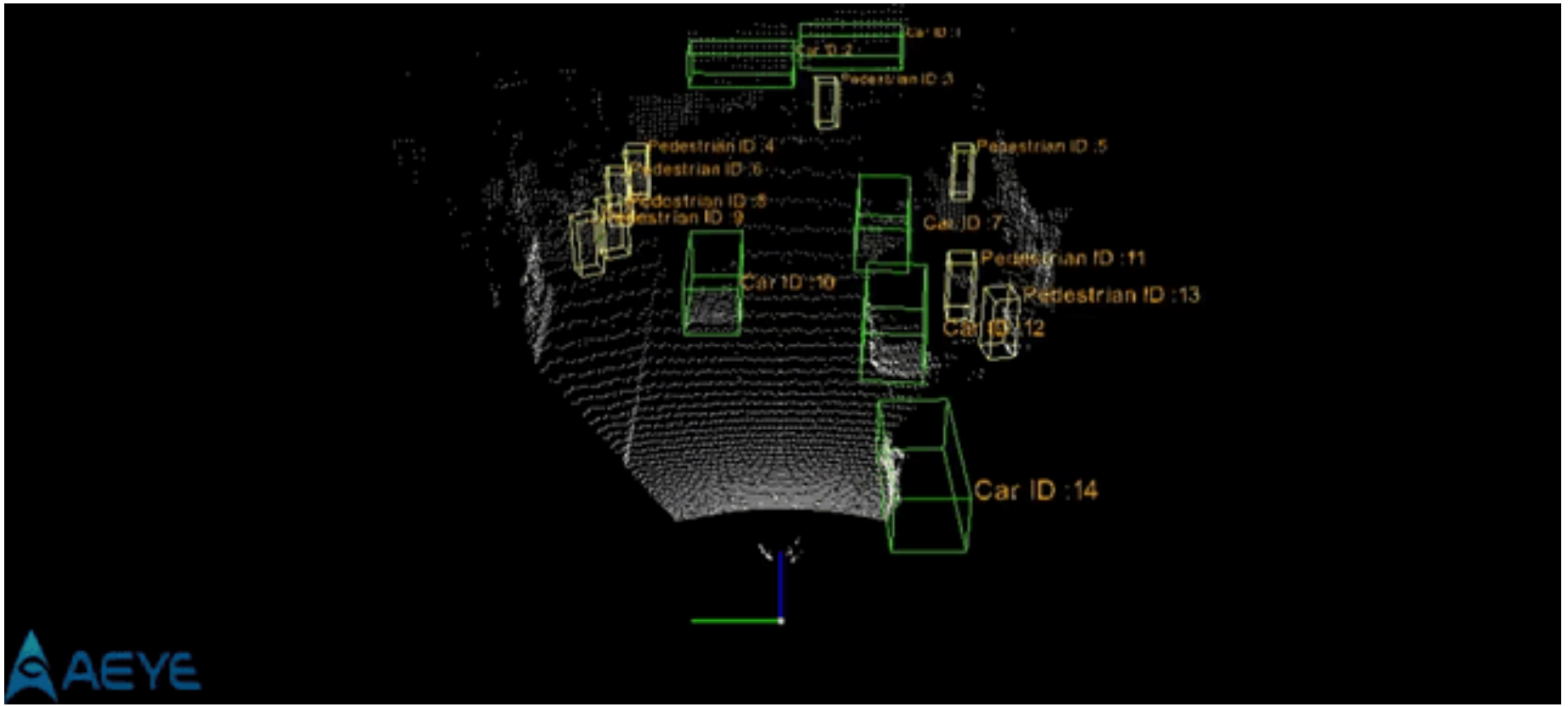
Intelligent Object Classification



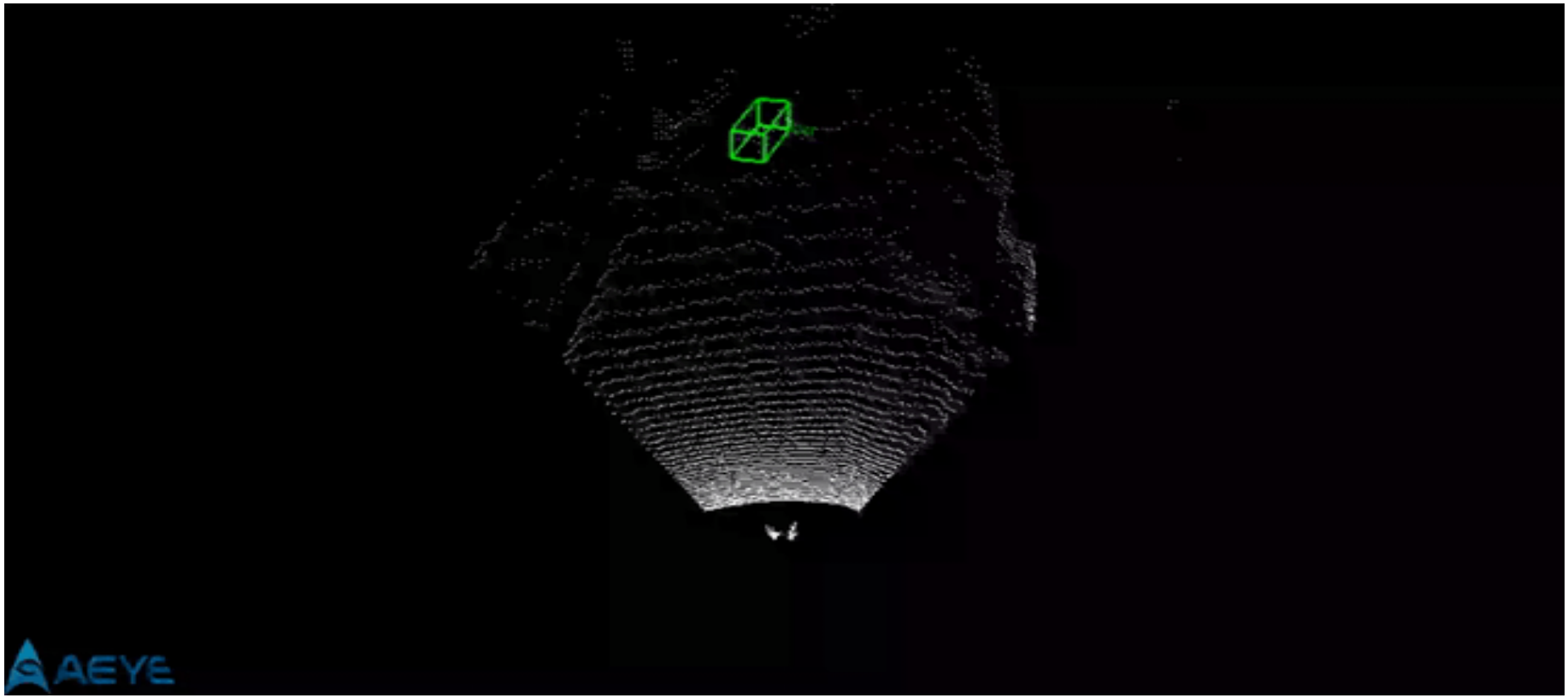
Range and Orientation (No 2D Pose Error!)



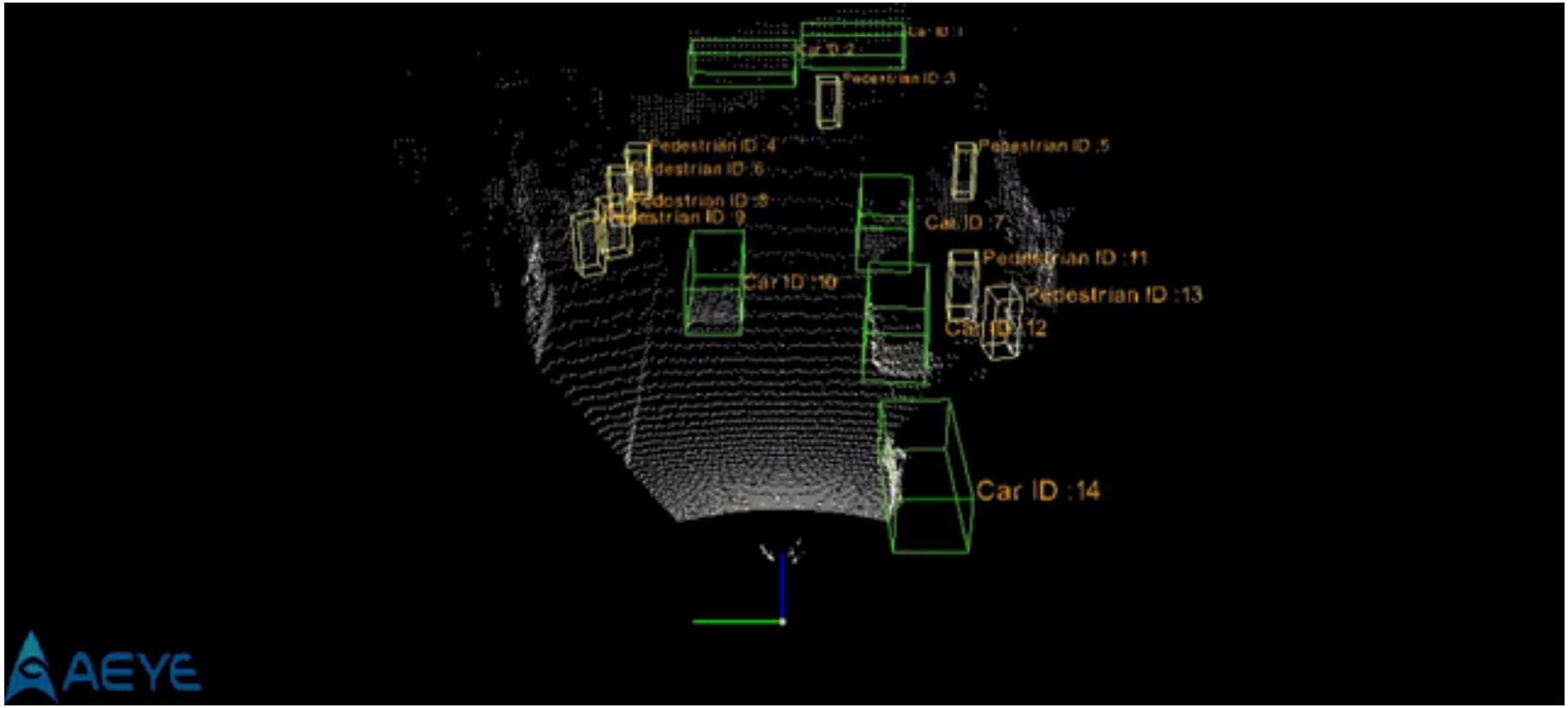
Object Tracking



Motion Forecasting



(Radial + **Lateral**) Velocity



Complete Solution to Power Customer Programs

	2019	2020	2021-Beyond
Hardware			 **Complete Solution** **OEM Perception IP can be integrated** ASIC
Software	Reference Perception libraries* covering common use cases/ tasks	Accurate Perception libraries tailored for iDAR architecture on low power Hydra™ compute platform	Perception ASIC inside chip to deliver massively optimized (Sensing + Perception) Edge iDAR
Product Offering	NRE Projects involving hardening to customer use case	85-90% accurate full Perception system	Qualified Perception out of the box

*including Object Classification, Object Tracking, Ground estimation, Occupancy grids, Lane detection Traffic sign detection, Localization, Weather detection, Obscuration

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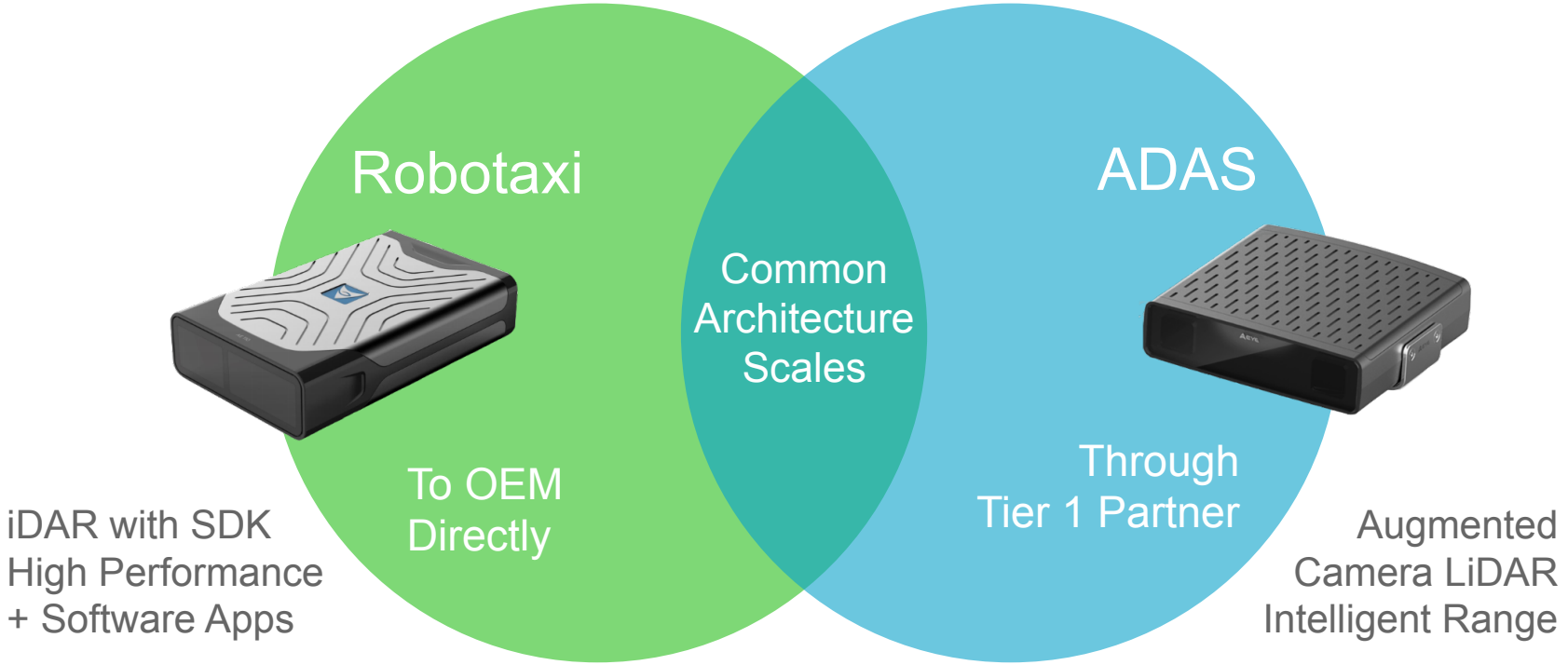
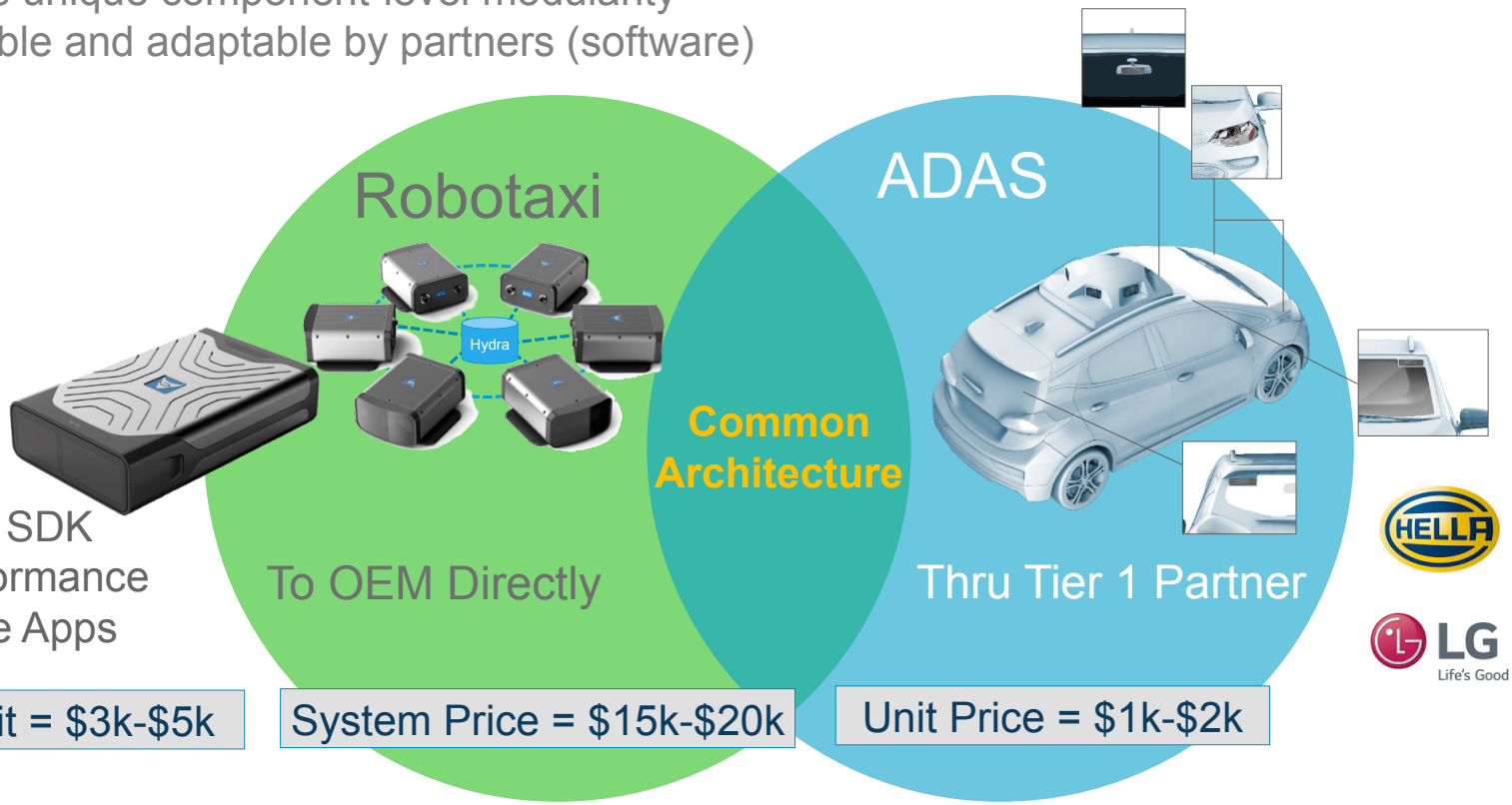
Intelligent LiDAR Solutions for L3+ Autonomy

Solid State MEMS @ 1550nm, Pre-Integrated / Aligned RGB Camera(s)

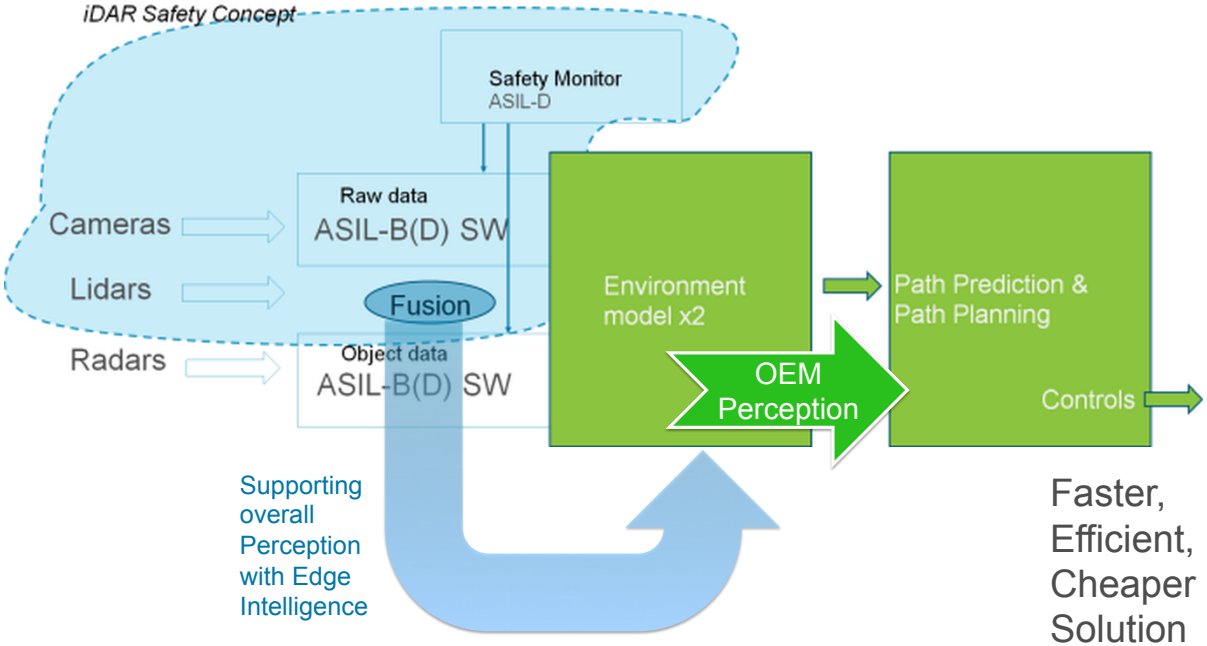


Investment in Common Architecture

- Enables unique component-level modularity
- Extensible and adaptable by partners (software)



Supporting Functional Safety



- ✓ Camera + Lidar fusion improves reliability of detection and classification
- ✓ 3D-first, 2D-fed Perception = accurate and fast estimation of range, pose, speed, direction = better trajectory accuracy, collision avoidance
- ✓ Pre-classification out of the box increases confidence to the high level Perception system, reduces processing time and improves Safety
- ✓ Sensor redundancy with separate signal paths and power lines > ASIL-B(D)
- ✓ Repeating fixed frames once every few frames provide the necessary determinism for test and validation
- ✓ Reducing the number of known unknowns, iDAR Perception helps with SOTIF/ ISO21448

iDAR = Intelligent Detection and Ranging

1 Foundation Technology

Solid State MOEMS

- Automotive grade quality
- Better scan dynamics
- Lower cost
- Durable

1550nm Technology

- Superior eye safety
- Adverse weather capability
- Amplifiable shot energy

Integrated Camera

- Mechanically Fused
- Spatial/Temporal Alignment

2 iDAR™

Agile LiDAR

- Dynamic scan patterns
- 4x-8x information richness derived per shot
- uSec scale revisit time

Dynamic Vixels

- TrueColor Point Cloud
- Onboard Vision Algorithms
- Redundancy/BOM cost savings with camera

AI Driven/SW Definable

- Supports multiple ROIs
- AI/ML Domain Controller Feedback into LiDAR
- Powerful SDK

3 Performance

Automotive Grade Solution

- SWaP for ADAS & Mobility
- AEC-Q, IATF 16949, ISO9001
- ISO 26262 at ASIL-B Q4, 2019
- Dedicated Tier 1 partners
- Optimized power utilization
- Anti-spoofing and interference

World Record LiDAR Performance

- Range of >1km
- Scan rate of 100 Hz
- 1mm Instant Resolution

36 Patents
>1300 Claims

Thank You!