

DVN CONFERENCE | NOVEMBER 2022

# INTEGRATION

## ECO-SYSTEM

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# CADILLAC



# PRODUCTION

Vehicle Integration

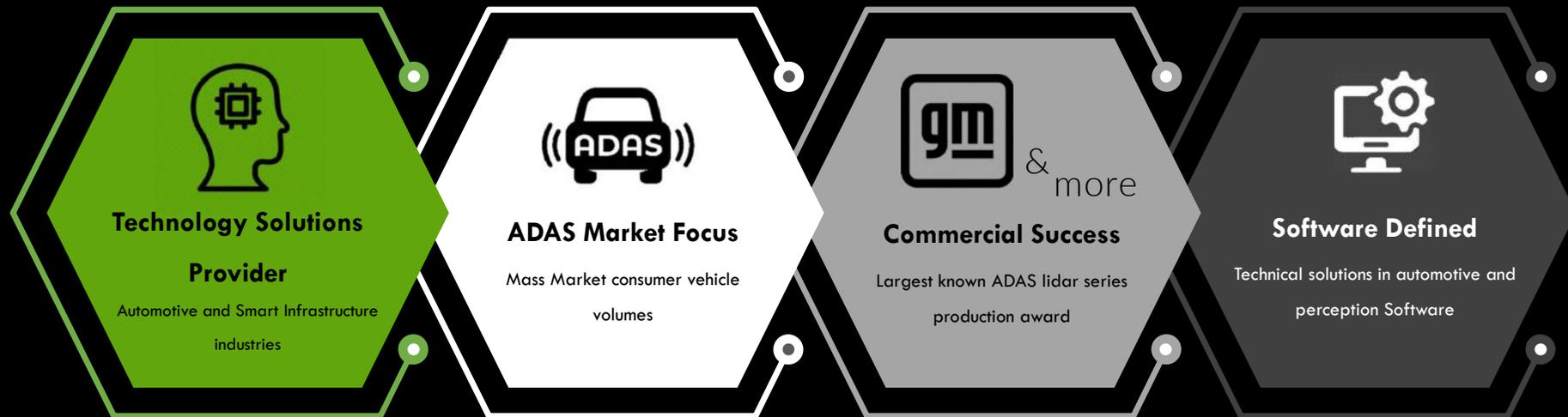


# PRODUCTION

Vehicle Integration



# ABOUT CEPTON



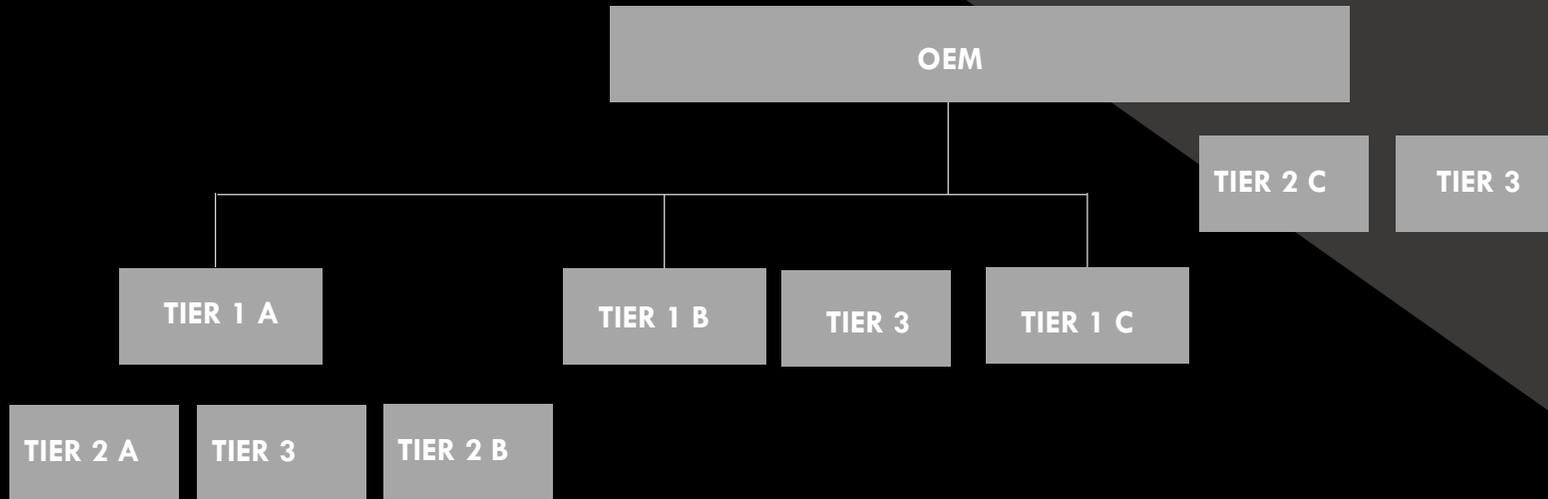
Vision: Enable Safe and Autonomous Transportation for Everyone



# INTEGRATION ECO-SYSTEM

WINDSHIELD  
HEADLAMP  
FASCIA  
ROOF





**CONNECTED    AUTOMATED    SHARED    ELECTRIFIED**

# AUTOMOTIVE LIDAR DEVELOPMENT **COLLABORATION** MODEL WITH TIER 1



Cepton has multiple years of successful collaboration experience with Tier 1s



## Performance

FOV, Range, Resolution, Accuracy



## Power/Thermals

Low Power, Thermals



## Embeddability

Small, Hidden, Easy to Mount



## Point Cloud

Frozen, Calibrated



## Reference Design

Manufacturable, Reliable



## Reliability

Repeatable, robust and tough



## Delivery

Uses existing infrastructure and supply chain



## Manufacturability

Over 100 years of experience



## Vehicle Integration

Bracket design and integration expertise



## Alignment/Cal

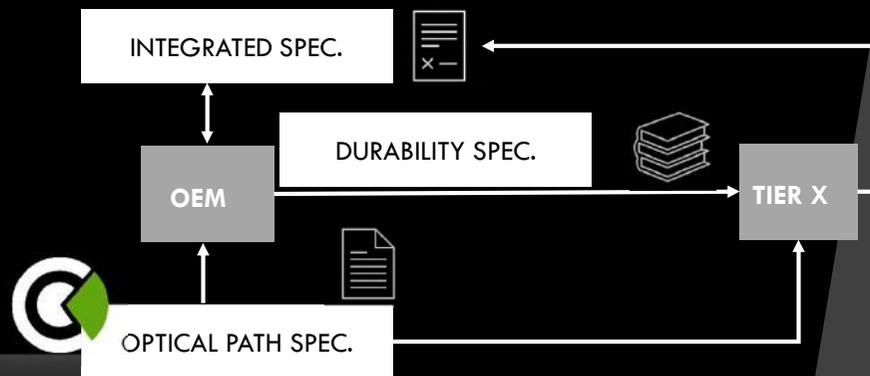
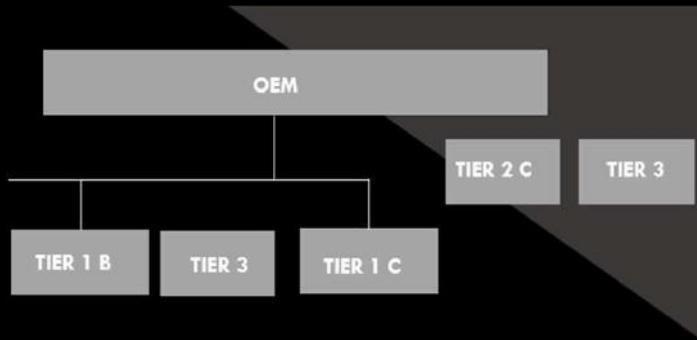
Facilities built for lidar



RASIC is well defined, yet flexible for development and collaboration based on OEM needs



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## Optical Path Specification

e.g.

- Transmissivity (NIR) incl. reflection loss
- Flatness
- Cleanliness & Surface quality



## Material Integrity Specification

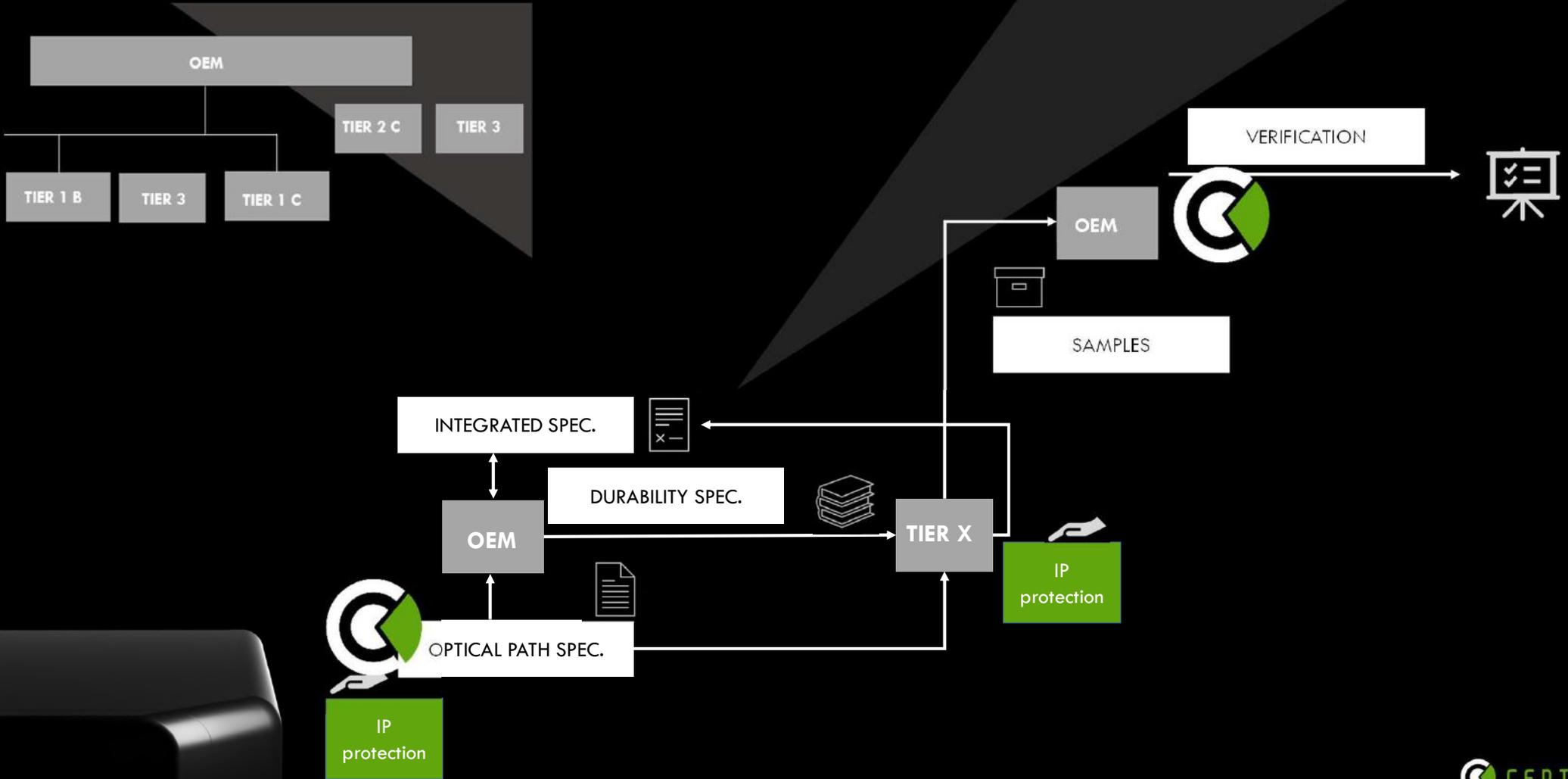
e.g.

- Scratch resistance
- No "transmissivity in the visual light spectrum"
- Ability to include a heater
- Ability to mold into trim-matching contour
- General durability requirements based on comprehensive OEM experiences/lessons learned

Vista®-X120 Plus



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Vista®-X120 Plus

# INTEGRATION LOCATIONS

## Headlamp *KOTTO*



- Existing cleaning mechanism
- Protection cover for the lidar
- Good FOV for side/forward-looking scenarios (T-Junction)
- Using existing cabling/ECU network
- Challenging space claim for lidar (small footprint required)

## Behind the Windshield



- Elegant, hidden integration
- Existing cleaning mechanism
- High availability (clean area compared to bumper)
- Excellent forward-looking perspective on the scene

## Front Fascia



- Minimal new real-estate needed
- Easily embeddable / non-intrusive
- Next gen with 2<sup>nd</sup> surface concept

## ▼ Rake Angle

50° to 70° accomplished  
Anything further possible but with increased losses

## ▼ Transmissivity 94% Achieved

Over 90% with rake angles  
50% before

## ▼ New Coating process

Increased light transmissivity by 6-8%

## ▼ Hood & Windshield Blockage

Developed algorithm to detect and handle blockage cause by hood and windshield

## ▼ Extrinsic Calibration

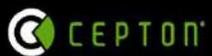
Developed adaptive extrinsic calibration to adjust for windshield



# WINDSHIELD INTEGRATION

## E X P E R I E N C E

Cepton leads the industry in  
lidar behind the windshield  
integration



## Field of View

Make use of the beneficial location to cover left/right side of the vehicle and rear/front

## Packaging

Compact form factor and multiple fixation and mounting options help integration in existing concepts

## Thermal

Optimized thermal integration solution by separating thermal areas.

## Cleaning

Utilizing the synergies between lamp and sensor for cleaning

## Cover material

Select IR transparent material. Avoid reflections.  
Extrinsic calibration.

Image source: Copyright: Volvo Group Trucks Central Europe GmbH



# HEADLAMP INTEGRATION EXPERIENCE

Joint concept study  
with ZKW based on  
Volvo FH



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# BUMPER INTEGRATION EXPERIENCE



## ▼ Packaging

Mounting concepts for next-gen lidar integration (2<sup>nd</sup> surface)

## ▼ Cover Material

Hidden sensors behind high performance material

## ▼ Range Performance Evaluation

Maintain Key Performance Indicators of the sensor front-end while achieving seamless integration

## ▼ Blockage Detection

Identify sensor window blockage and initiate cleaning to ensure perception performance

## ▼ Maintenance

Calibration & field repair



# INTEGRATION LOCATIONS



Back Bumper



Front Grill or Fascia



Side Mirrors



Tailgate or Trunk Area



# THANK YOU!

