Smart Cars and the Road Ahead

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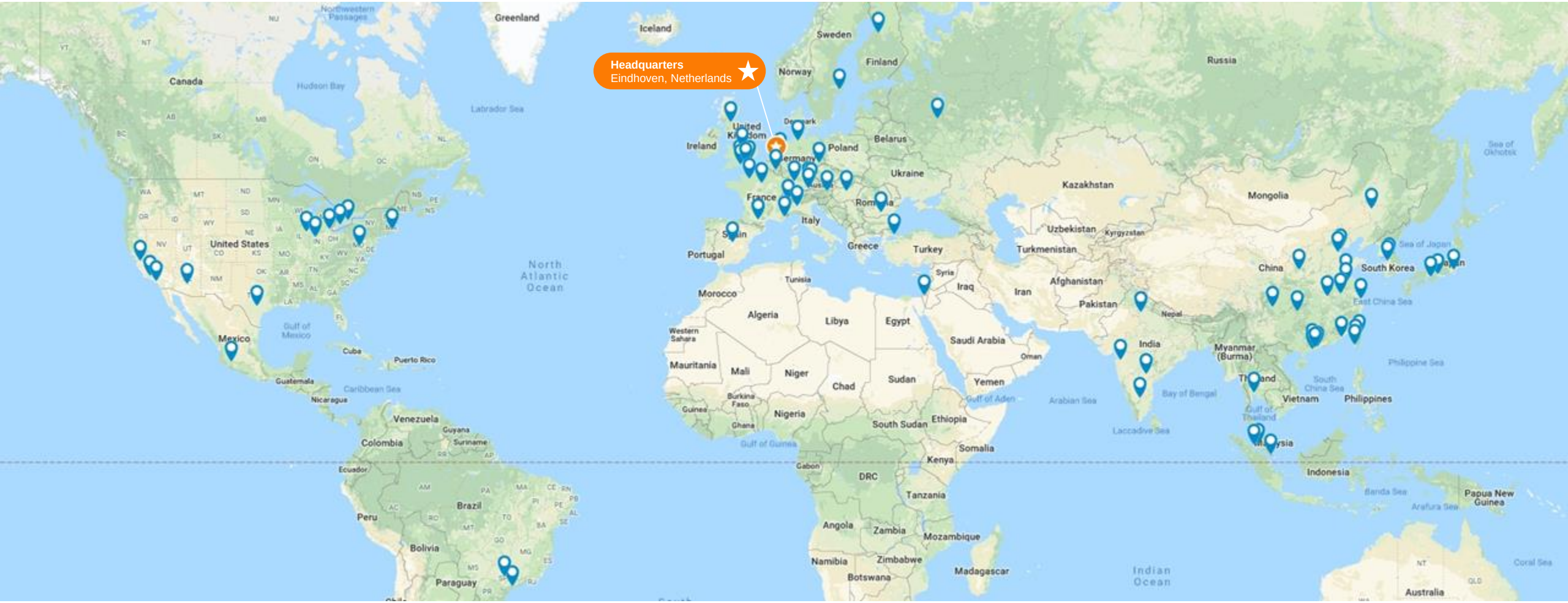
NXP Semiconductors

NXP | SECURE CONNECTIONS FOR A SMARTER WORLD

NXP Locations

~30,000 employees with operations in more than 30 countries



Global Trends

The Main Drivers of Innovation

Secure Connections for a Smarter World

Everything
Smart

40B+ devices with
intelligence shipped in 2020

Processing

Everything
Connected

1B+ additional consumers online,
30B+ connected devices

Connectivity

Everything
Secure

Potential economy savings
up to half trillion dollars

Security

Secure Connections for a Smarter World is Becoming Reality

Cloud Infrastructure

Enabling Technologies

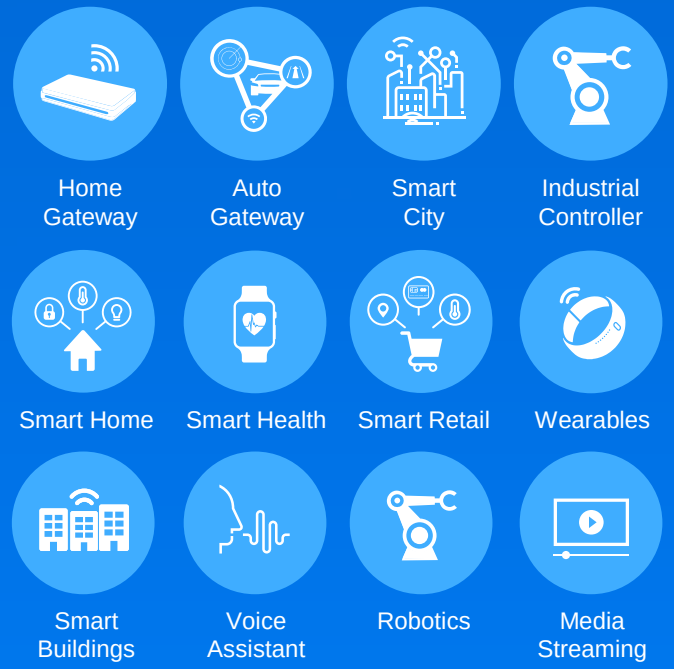
Processing (incl. AI/ML)

Connectivity

Safety & Security

Sensing

Edge to Node



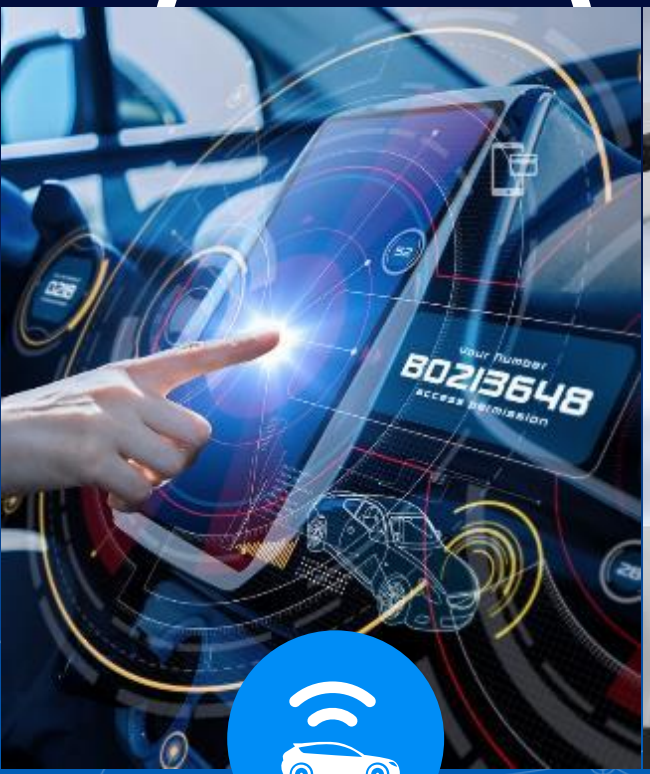
NXP has all enabling technologies

Bringing the Edge to Life

Advancing solutions that make lives easier, better and safer.

Sense Process Connect Act

Leading functional safety & security



Automotive

Industrial & IoT

Mobile

Communication Infrastructure

Automotive

Solutions for Safe and Secure Mobility

Value Proposition

Solution portfolio

Comprehensive System Solutions for fast time to market and scalability

Innovation power

In-house high-performance processing, security and mobile eco-system capabilities

Automotive safety and reliability

Zero defects methodology
Leading with security and functional safety

NXP Makes Safe and Secure Mobility Happen

Technology Leadership

#1 Auto Analog / RF / DSP

#2 Auto Microcontrollers

#1 Auto Application Processors

+

Applications Leadership

#1 Car Infotainment

#1 Secure Car Access

#1 In-Vehicle Networking

#1 Safety

#2 Powertrain

Innovation Leader ADAS

Innovation Leader Security

=

#1

in Auto Semiconductors

2017 Global Auto Semi Market: $34.5B

1. Based on 2017 Auto TAM
2. Auto RF/DSP includes Secure Car Access, Radio/Audio, V2X and Radar Transceivers
3. Source: Strategy Analytics, IHS Markit, NXP

Megatrends Transform Automotive Industry

Connected Infotainment

ZERO
Time Wasted

Autonomy

ZERO
Accidents/Congestion

Electrification

ZERO
Emissions

Safe and Secure Mobility

Increasing Complexity of Businesss Infrastructure

New business models, new alliances

Microsoft and Volkswagen – cloud connectivity

Toyota and SoftBank – Monet

Connectivity replaces physical inspection

GM Cruise and Honda

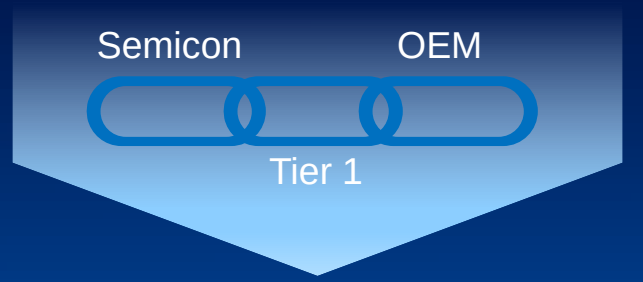
BMW, Audi, Daimler, Intel owns HERE

Didi & Uber

Google Waymo with Fiat Chrysler

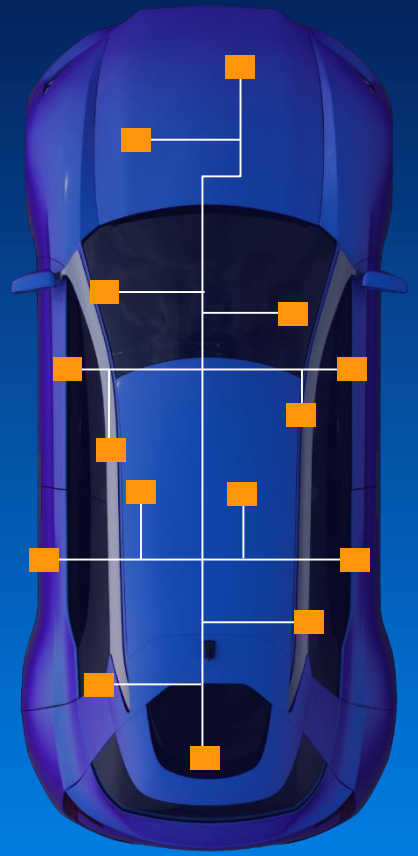
New market entrants From IT, mobile, gaming

From value chains…towards value networks



Architecture Transformation

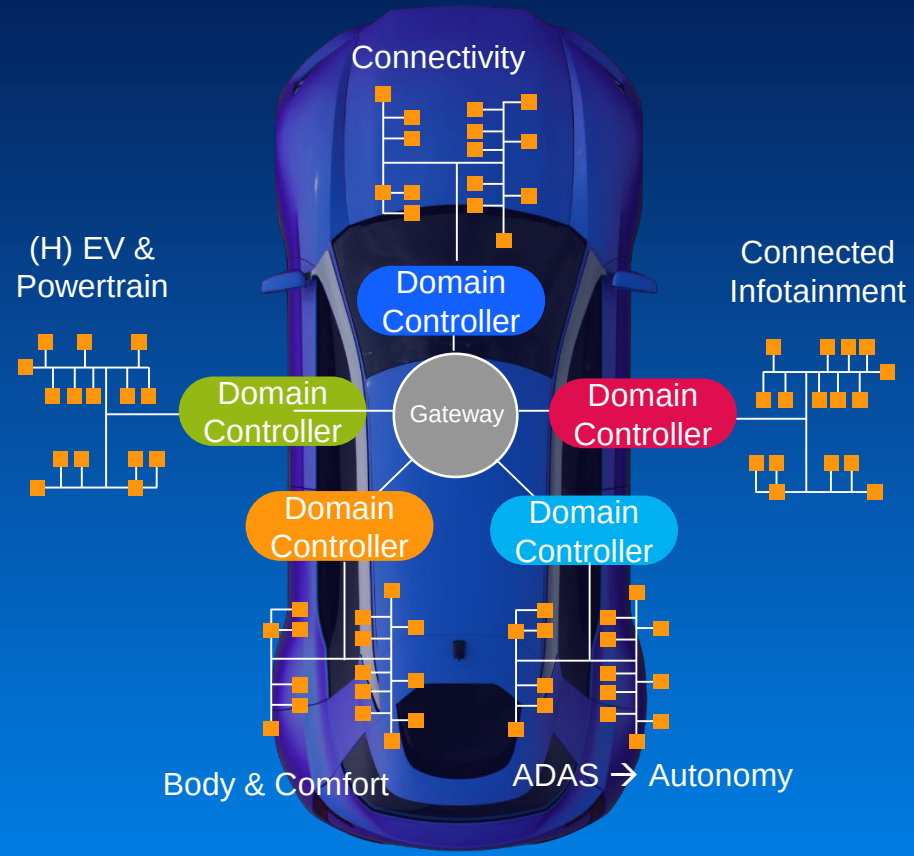
Yesterday
FLAT



- Low bandwidth, flat network
- One MCU per application

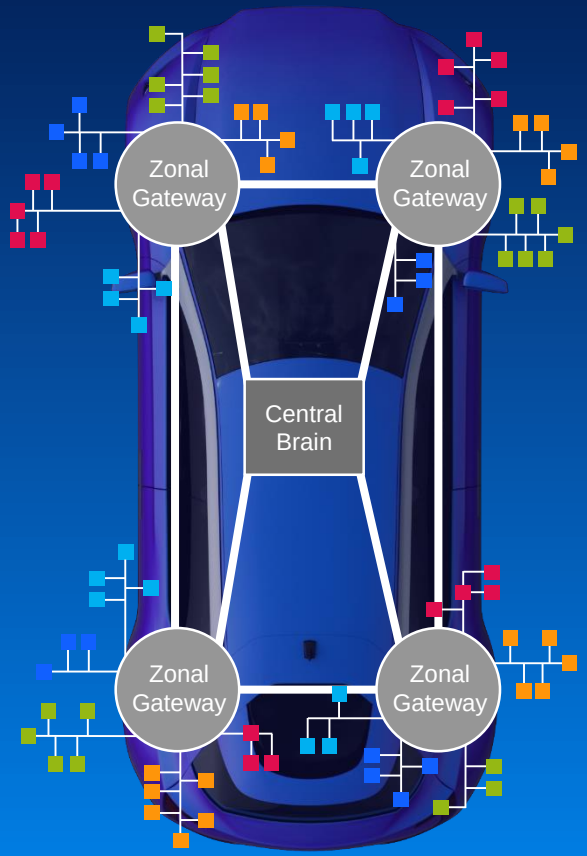
Flat to hierarchical

Today/Tomorrow
DOMAINS



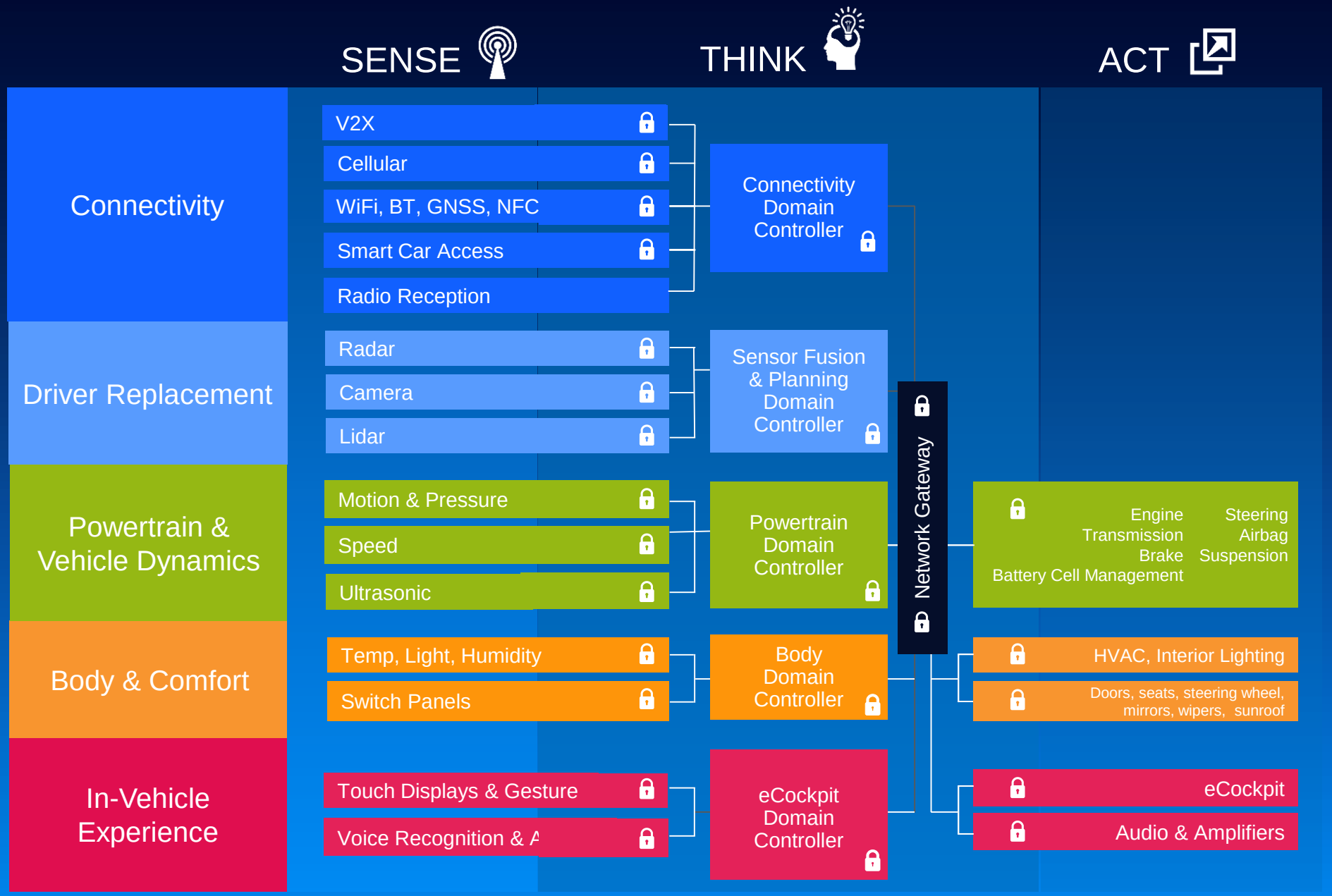
- High bandwidth network
- Gateway key to communication between domains

After Tomorrow
ZONEs



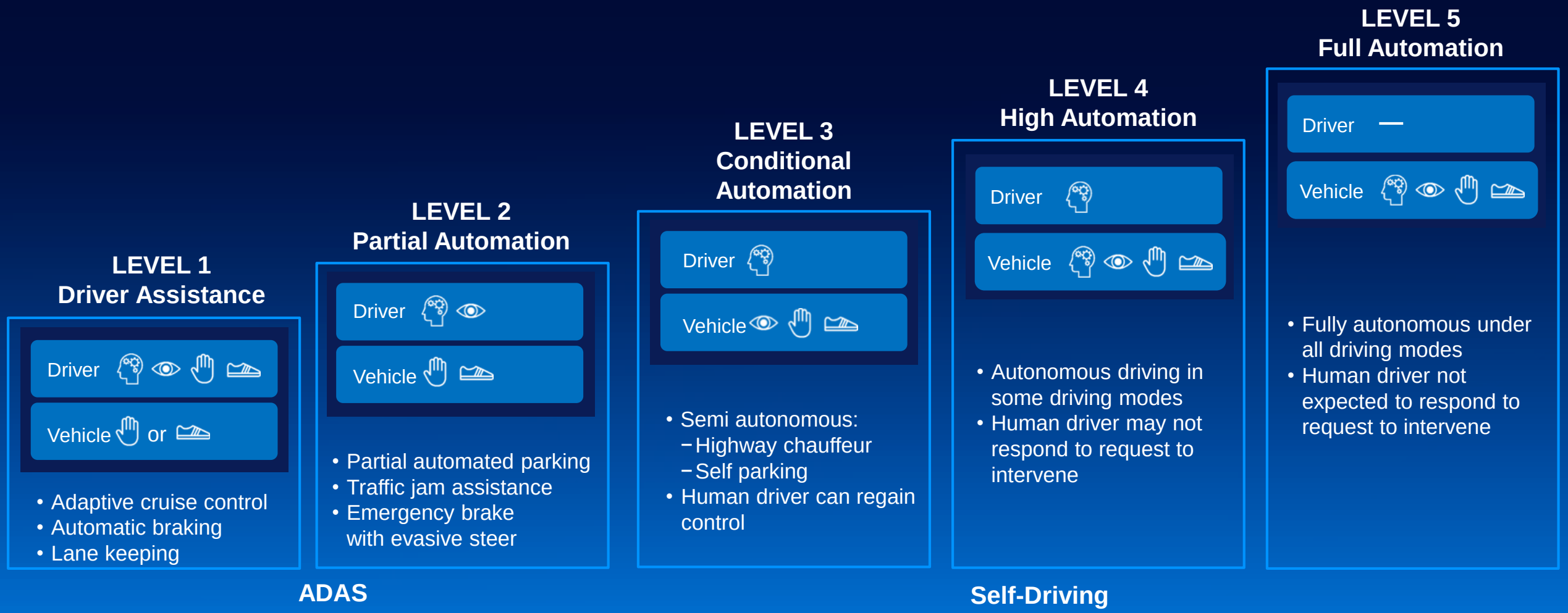
Domain Architecture

- Domain MPUs
- Edge Nodes & Sensors
- High Bandwidth
- Gateway
- Safety & Security



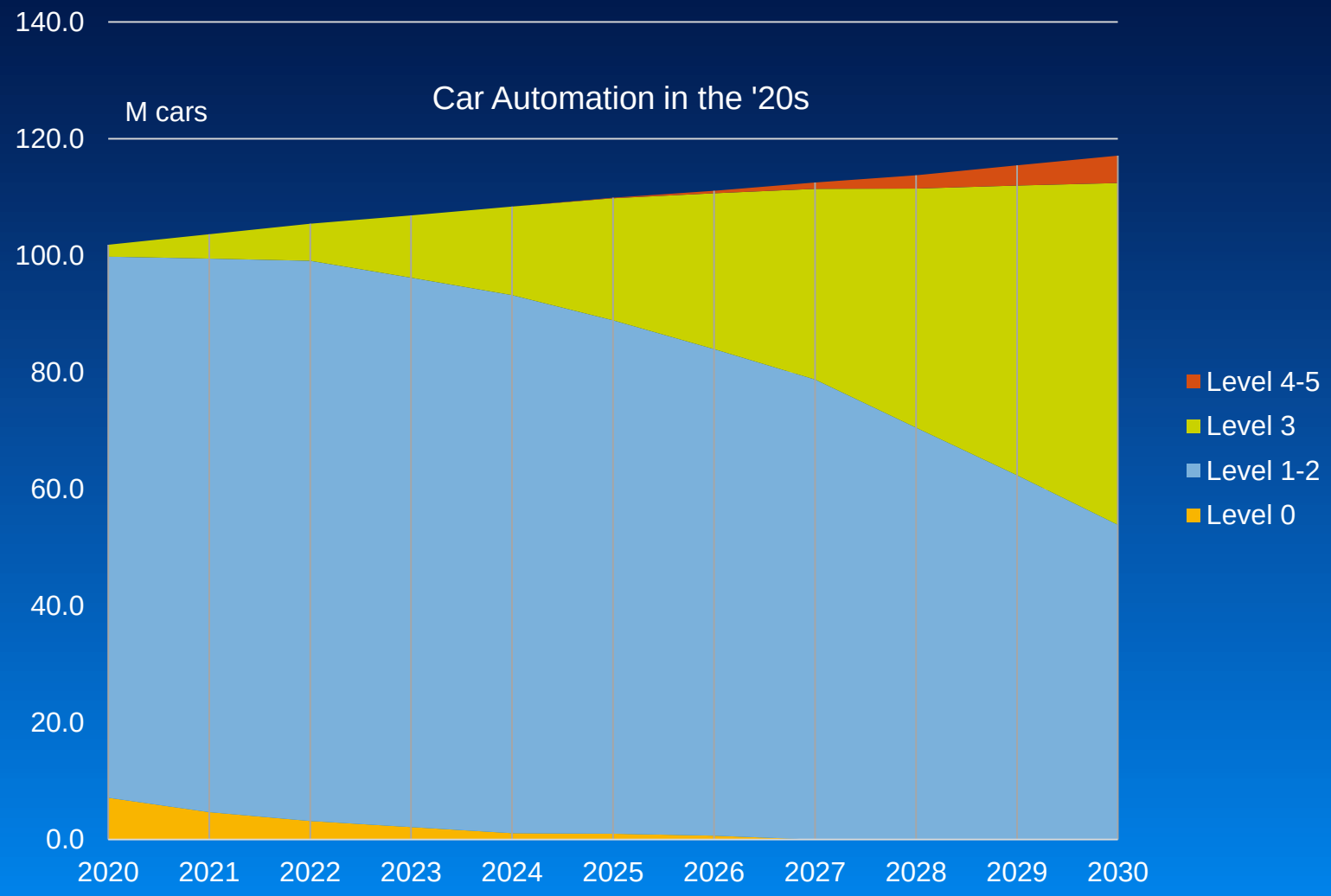
MAKING
VISION ZERO
A REALITY
NXP

Levels of Automation



Responsibility for safe operation | Control of complete vehicle | Control of steering | Control of vehicle speed

Driver Assistance & Autonomous Driving



Source: NXP, based on SA, IHS, GS, JPM, F&S

High-performance Sensing

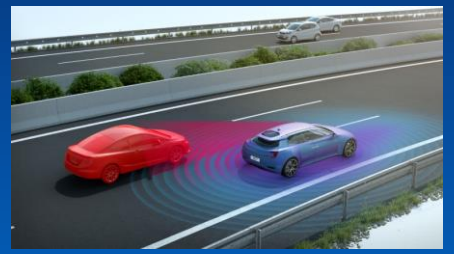
Precise Recognition of the Analog & Human Environment

Beyond Line of Sight

Mesh Networks
(V2X, ZigBee)

Line of Sight

Radar



Laser

Vision

Ultrasound

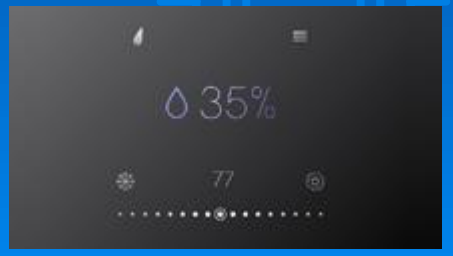
Human Contact

Face & Gesture Recognition

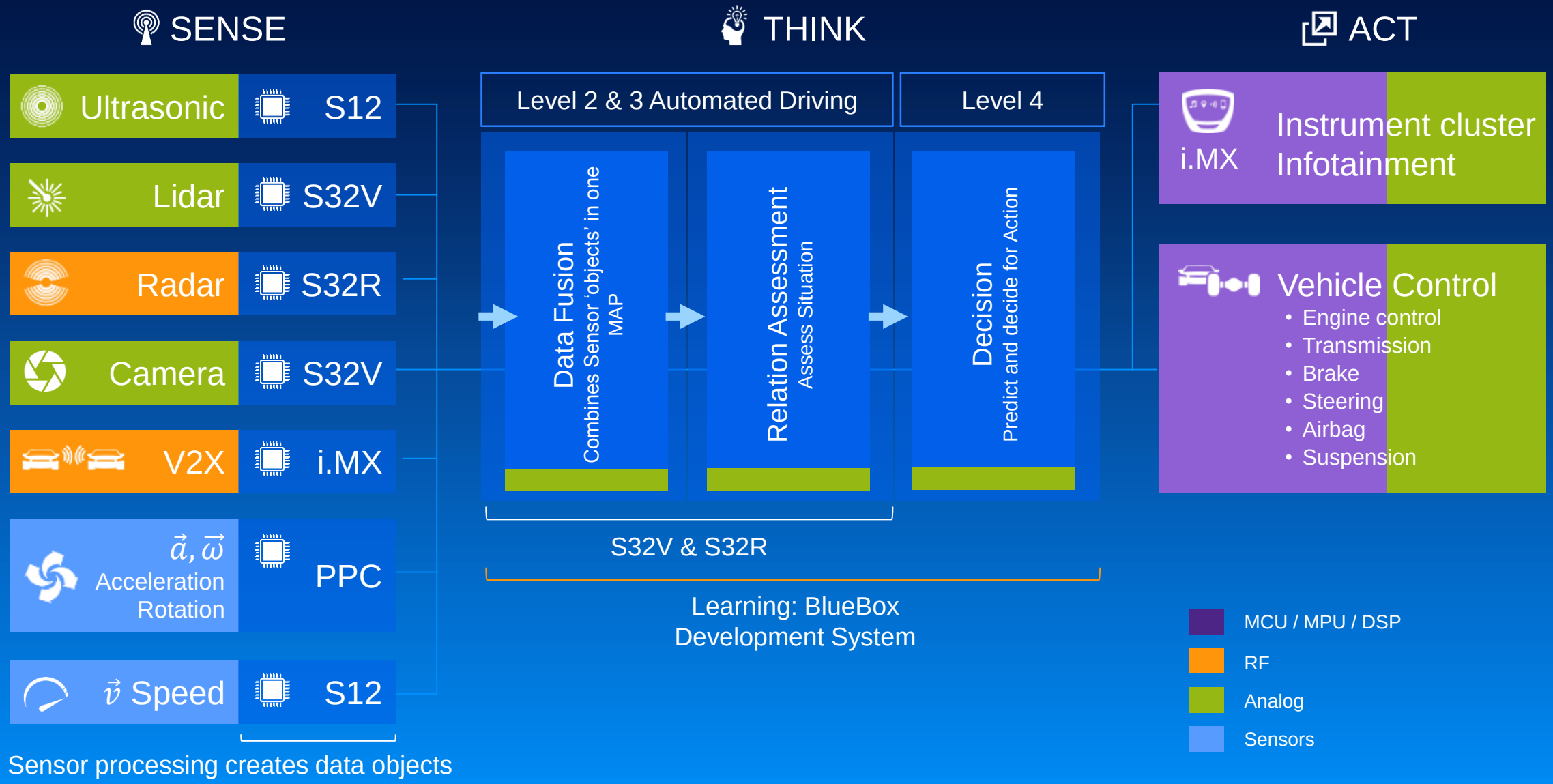
Biometrics (Fingerprint & Iris)

Voice Recognition

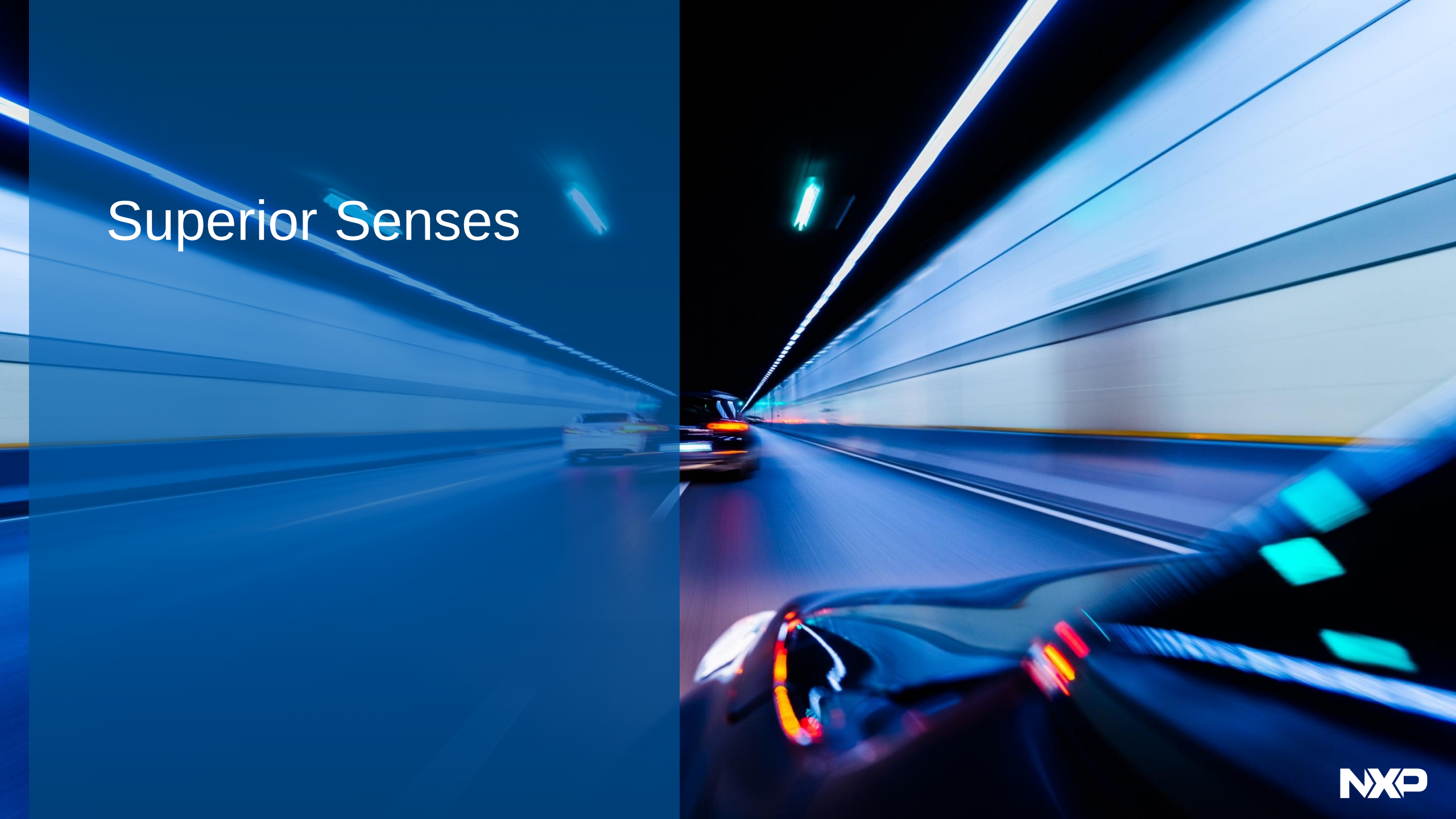
Motion, Pressure, Temperature Sensing



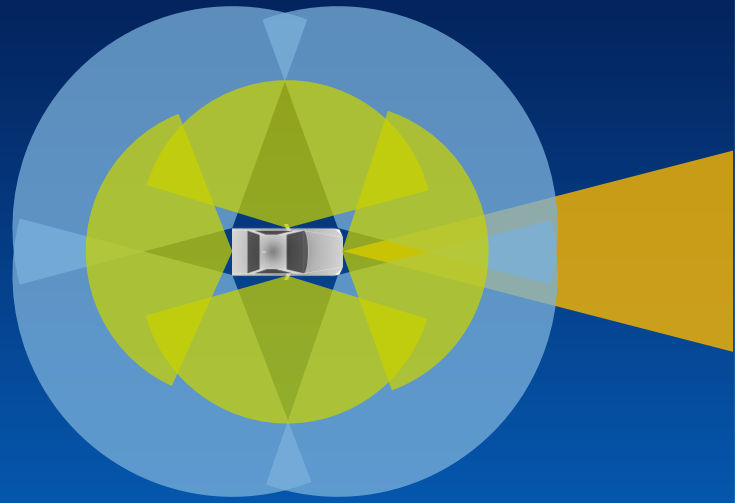
Sensor Fusion and Highly Automated Driving

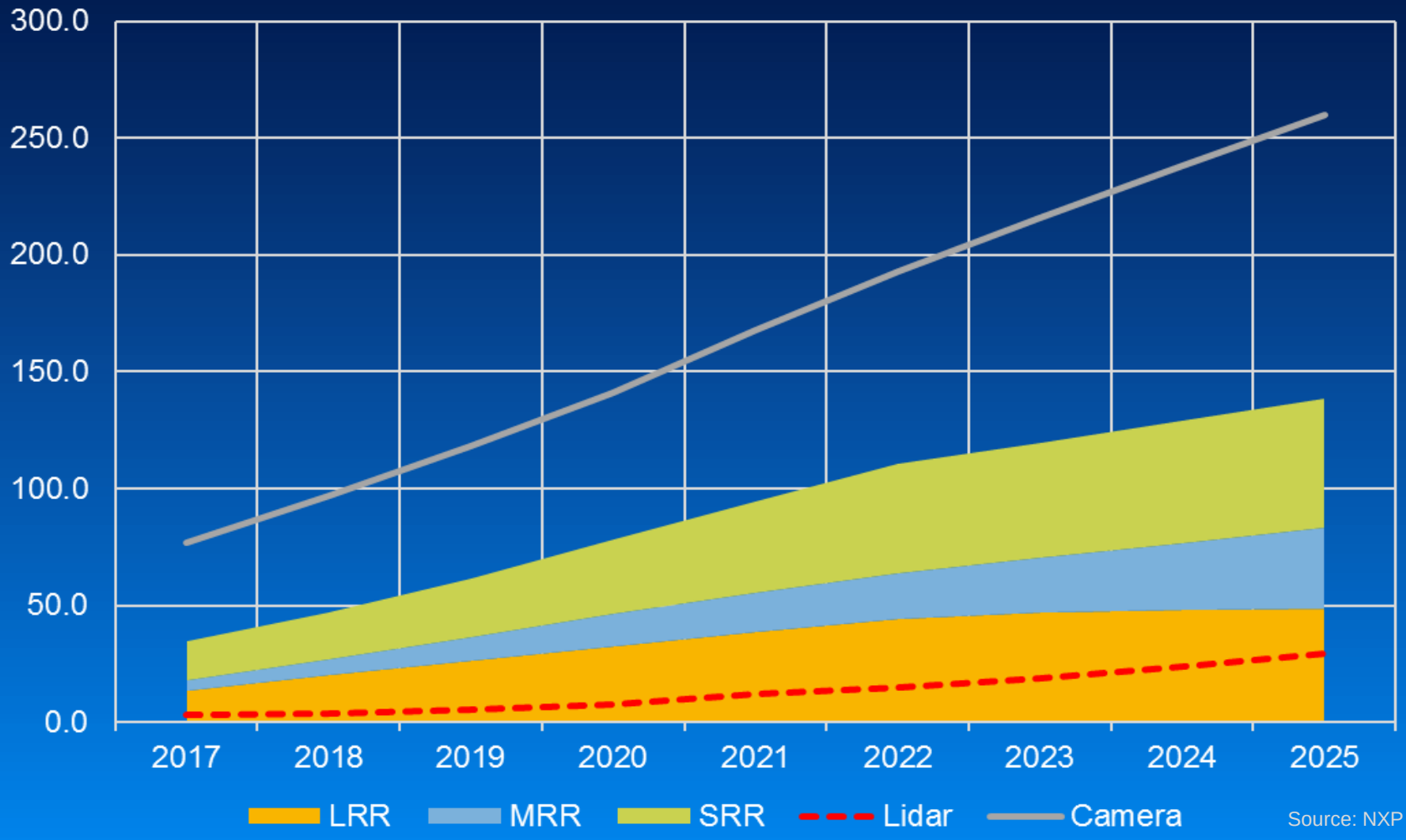


Superior Senses



ADAS Sensor Market

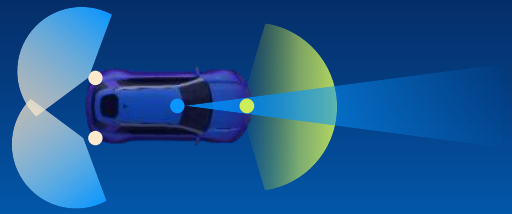




Source: NXP based on SA

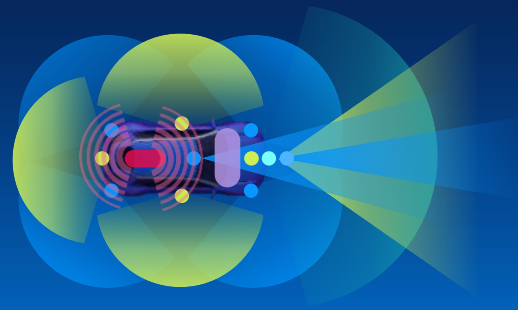
Automation Multiplies Sensors and Silicon Content

In Production
Level 1/2



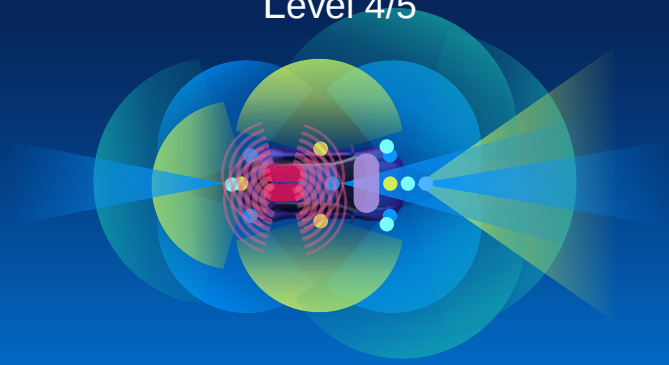
	units
Radar	1-3
Camera	1
Lidar	
V2X	
Fusion	

In Development
Level 3



	units
Radar	4-6
Camera	≥4
Lidar	0-1
V2X	0-1
Fusion	1

New Entrants
Level 4/5



	units
Radar	6-10
Camera	6-8
Lidar	1-3
V2X	1-2
Fusion	1

1. Source: Strategy Analytics, NXP CMI

77GHz Radar · Lidar · Camera · Fusion · V2X

NXP Strongly Positioned with Broad ADAS Play

ADAS Expected to Exceed 10% of NXP Automotive Revenue by 2019

Radar

#1 Leader[1], design wins at 10 of top 10 OEMs

Major new wins with RFCMOS at 7 OEMS

Parking Camera

Safe processing & machine learning

Designed in at >10 major OEMs

V2X

Leader: Modem, Processor, SW, Security

In production with GM, ramping at VW 2019

ADAS Vision

Safe automotive vision SoC

Partnerships with leading tier-1s

Lidar

Safe processing with AI

Working with 5 Lidar leaders

System Selling

Full solutions adding $ value

Networking & power management

Fusion and Central Processing

Safe processing with integrated AI capability

Leading MIPS for automotive safety (ASIL D)

1. Source: NXP Internal

Superior Senses with **Radar**

Demand for scalable and complete system solutions

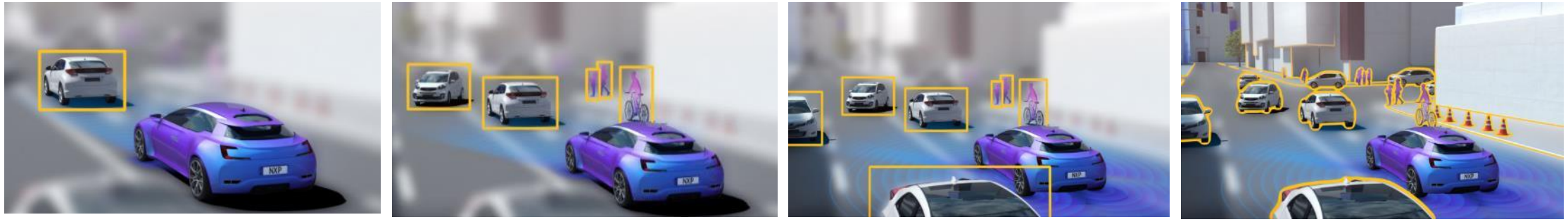
Short-range to high-resolution long range

360° cocooning

Imaging capabilities

Radar: Taking Safety to New Levels – Saving Lives

Detecting other cars + Seeing pedestrians & bicycles + Full 360° surround view *small & low-power sensors* + Precise Environmental Map *e.g., curbstones & pylons in distance*



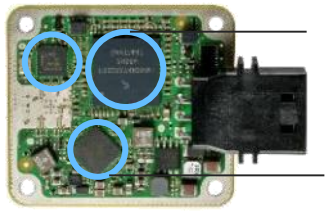
NXP full performance span

Bulky	24GHz	77 GHz	Multiple 77 GHz
High Power	SiGe	RFCMOS	Low Power
Low Res	Radar processing <1 GFlops	Advanced object detection 15-20 GFlops	Imaging Radar >350 GFlops
			High Res

Radar: NXP's Unique Scalable Full System Solutions

Full 77 GHz System Solution + **Full Performance Span** = **Winning Across All Segments**

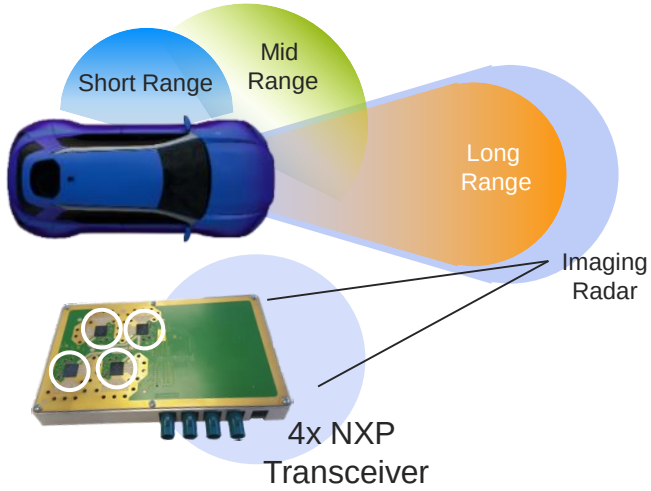
RFCMOS Transceiver

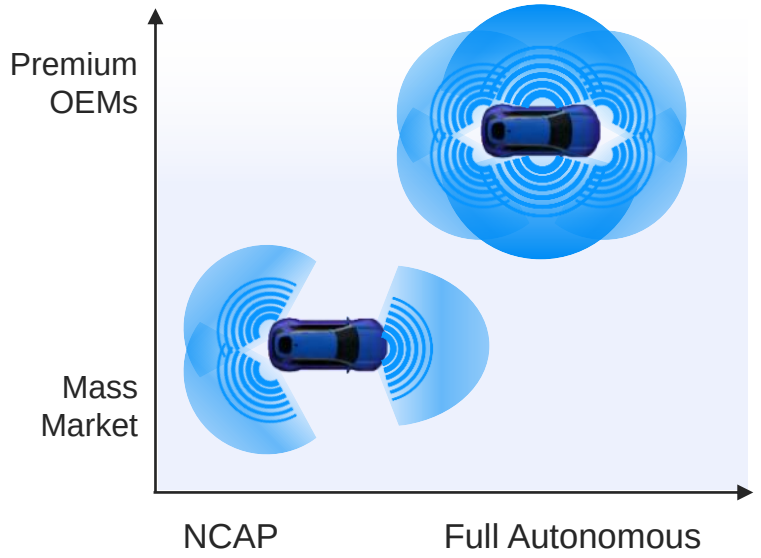


S32 Radar Processor

Power Management

Ethernet





Full reference design

Plus software development kit

Plus functional safety

- SiGe & RFCMOS transceiver portfolio
- Scalable processor families
- From simple sensor to imaging radar

Designed in with all top 10 OEMs…

…while also growing with new players

System solutions for China

Superior Senses with **Radar**

Sensor Platform With Imaging Capabilities, 360°

NXP #1 in Radar

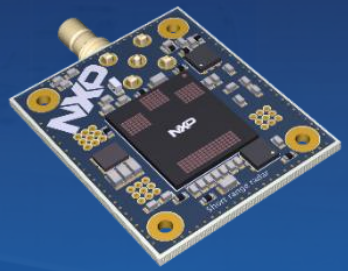
Proven Performance with full System Solutions:

Transceiver (SiGe, CMOS)
Microprocessor
Power Management
Network IF
SDKs for Algorithms Development

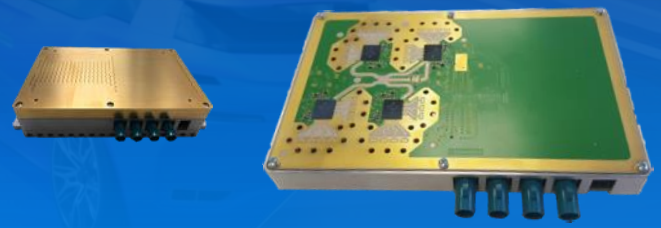
Mid-range, Ultracompact

Mid-range Module
Chipset; SOP2018

Tiny Antenna-in-Package,
SOP 2021
Saving PCB cost and design–in efforts



High-performance Imaging



Chipset SOP 2021

Safe and Secure Mobility

An Attractive Market ...
And a Truly Inspiring Vision to Pursue!

zero
emissions

zero
accidents

zero
time wasted

NXP

SECURE CONNECTIONS
FOR A SMARTER WORLD