R-Car Series
for Automotive silicon supporting cross-domain Interaction

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CHANGES OF AUTOMOTIVE INDUSTRY

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BIG IDEAS FOR EVERY SPACE

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evolution of Technology FOR owner car and service car

Owner car focuses on driver oriented technology, service car leads automation technology.

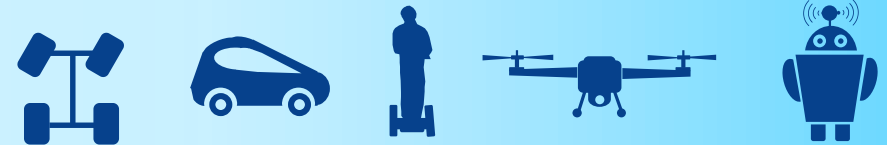Evolution of Owner car | Evolution of Service car

Electric Vehicles
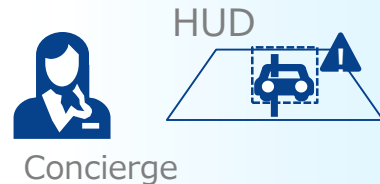
EV Cruising distance **Expand EV types** **Electric mobility, Automation**

Connected Car

Human Interface **OTA update** **Failure prognosis, Insurance/Medical/Traffic service**
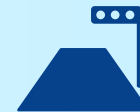
HUD

Concierge Program update

Autonomous Drive

ADAS **Autonomous drive function** **Auto Pilot** **Driverless taxi** **Automated delivery**

Public Highway

Express highway

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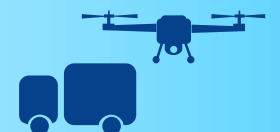
SUMMARY OF MARKET REQUIREMENT IN AUTOMOTIVE INDUSTRY

Autonomous Driving will require not only to evolve Automation also service oriented business model

Market change Technology evolution	Eco Car Electrification	Connected Car	Autonomous Drive
2 big waves in the future automotive	Owner Car	Service Car	

Changes of Automotive industry driven by service
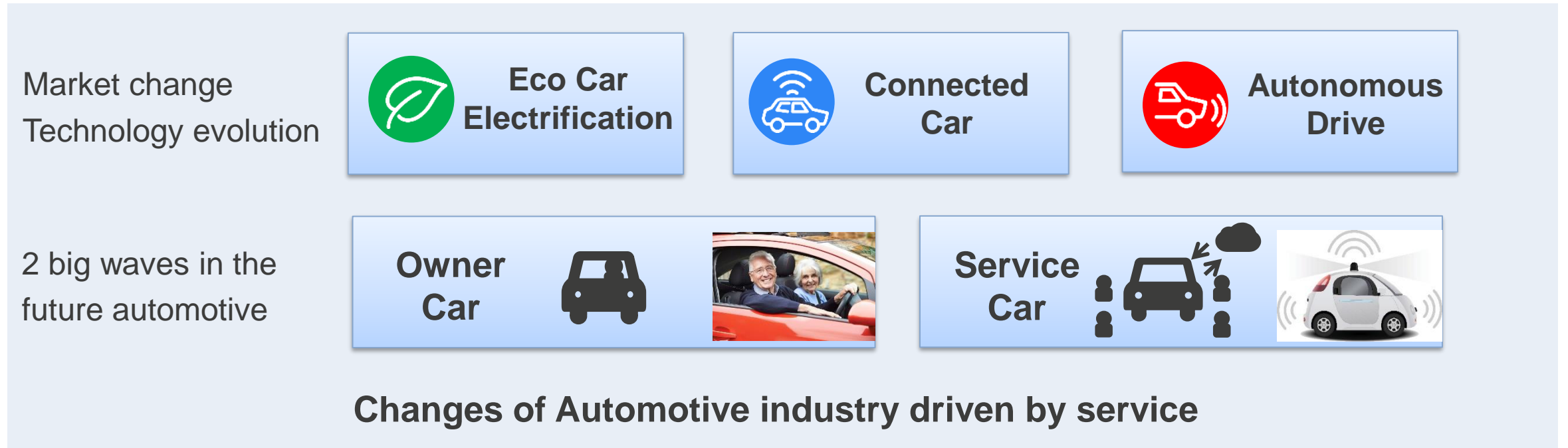
Requirement of robust autonomous driving solution from cloud service to sensing and control

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NEW RENESAS CONCEPT FOR AUTONOMOUS DRIVING

Renesas autonomy

END TO END SOLUTION FROM CLOUD SERVICE TO SENSING AND VEHICLE CONTROL CONTRIBUTE TO NEXT AUTONOMOUS DRIVING SOCIETY

Cloud service

Connected — Connected Cockpit (IVI, Cluster, HMI, Cloud Apps)
Communication gateway (FuSa, Security, network)

Camera **Radar** **Cognitive**

Braking **Steering** **Accelerating**

Global No.1 share in vehicle MCU

Sensing (See) **Judge (Think)** **Vehicle Control（Operate）**
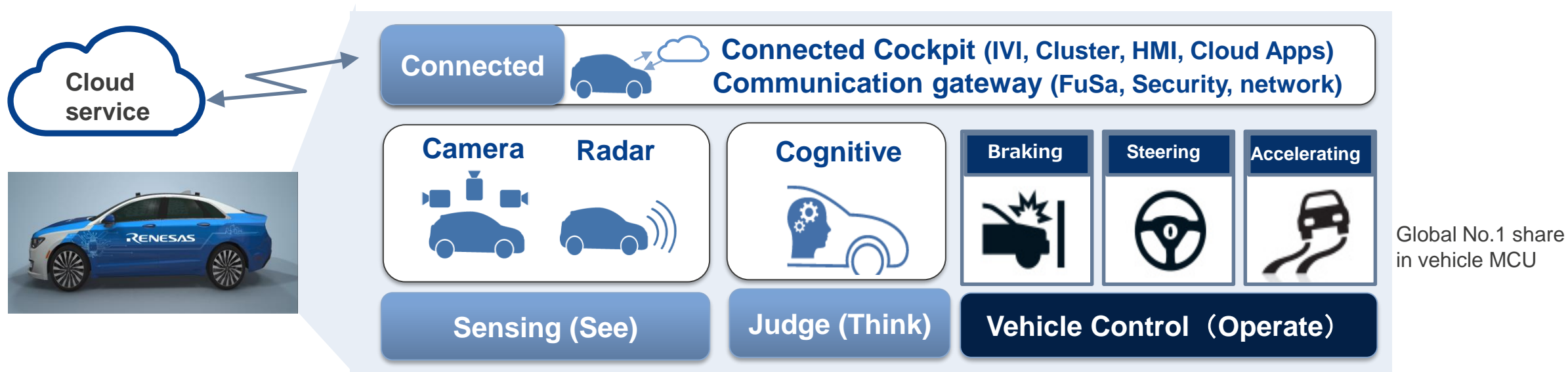
Promote end to end solution in collaboration with many global partners

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CONNECTED CAR

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CONNECTED CAR SOLUTION WITH CLOUD SERVICE

Renesas can link all information to Cloud from control (RH850) to car information (R-Car).
Developed a demo that enables AI concierge service by interactive HMI linking to Cloud.

Cloud Service
using Vehicle Data

Service

Vehicle quality Enhancement	Autonomous driving support	Bid data business	Personalization service

Evolution of Service car

Evolution of Owner car

Datra[1]

Identity authentication
User preference

Maintenance
Failure corrections

Precedence notice
of risk information

Maintenance

Attribute/
Driving condition

Driving
environment

Safety drive

Weather
conditions

Vehicle position
Traffic

Health condition
Medical

Identity
authentication

AR Display

Concierge
Hospitability dialogue

Hologram

Vehicle Control	←	**RENESAS RH850**	+	**Renesas R-Car**	→	Vehicle Information

Renesas R-Car **New Cockpit**

1)W3C/Vehicle Data, ISO22837

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COMMUNICATION GATEWAY FOR CONNECTED CAR

Communication gateway will achieve high speed and robust communication required by cloud service
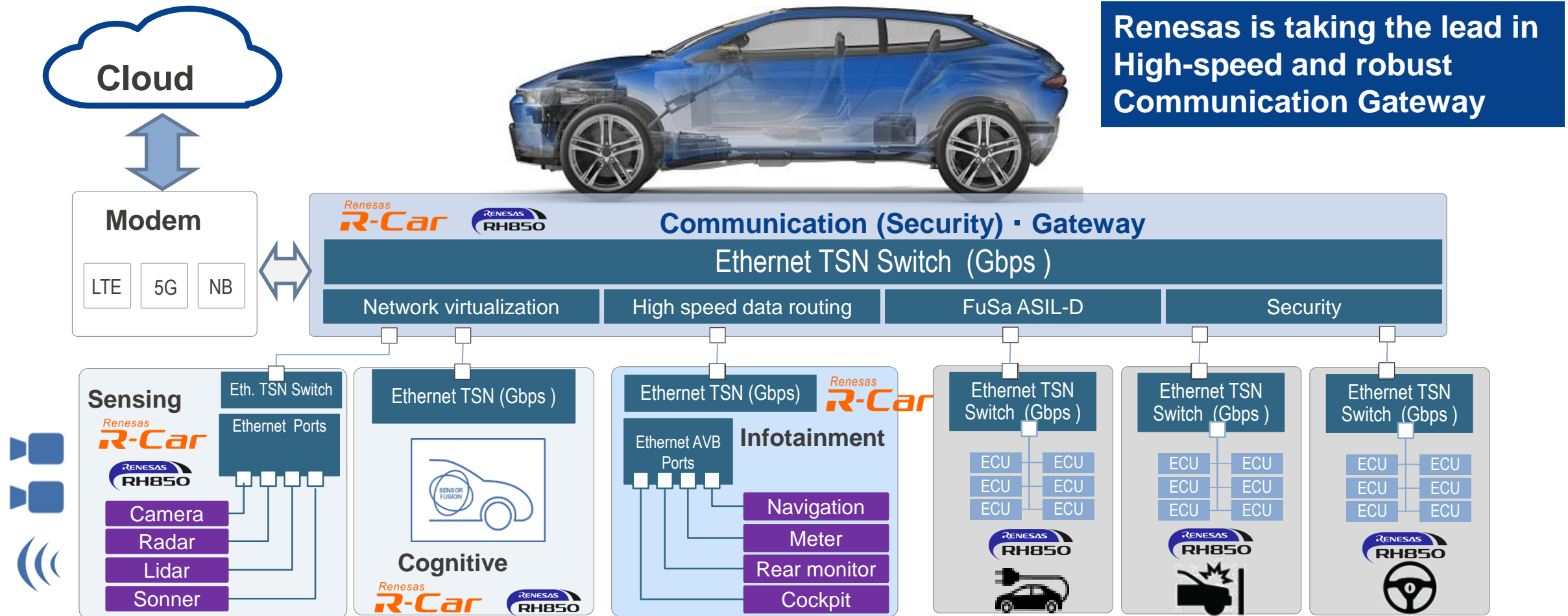
Renesas is taking the lead in High-speed and robust Communication Gateway

Cloud

Modem
LTE | 5G | NB

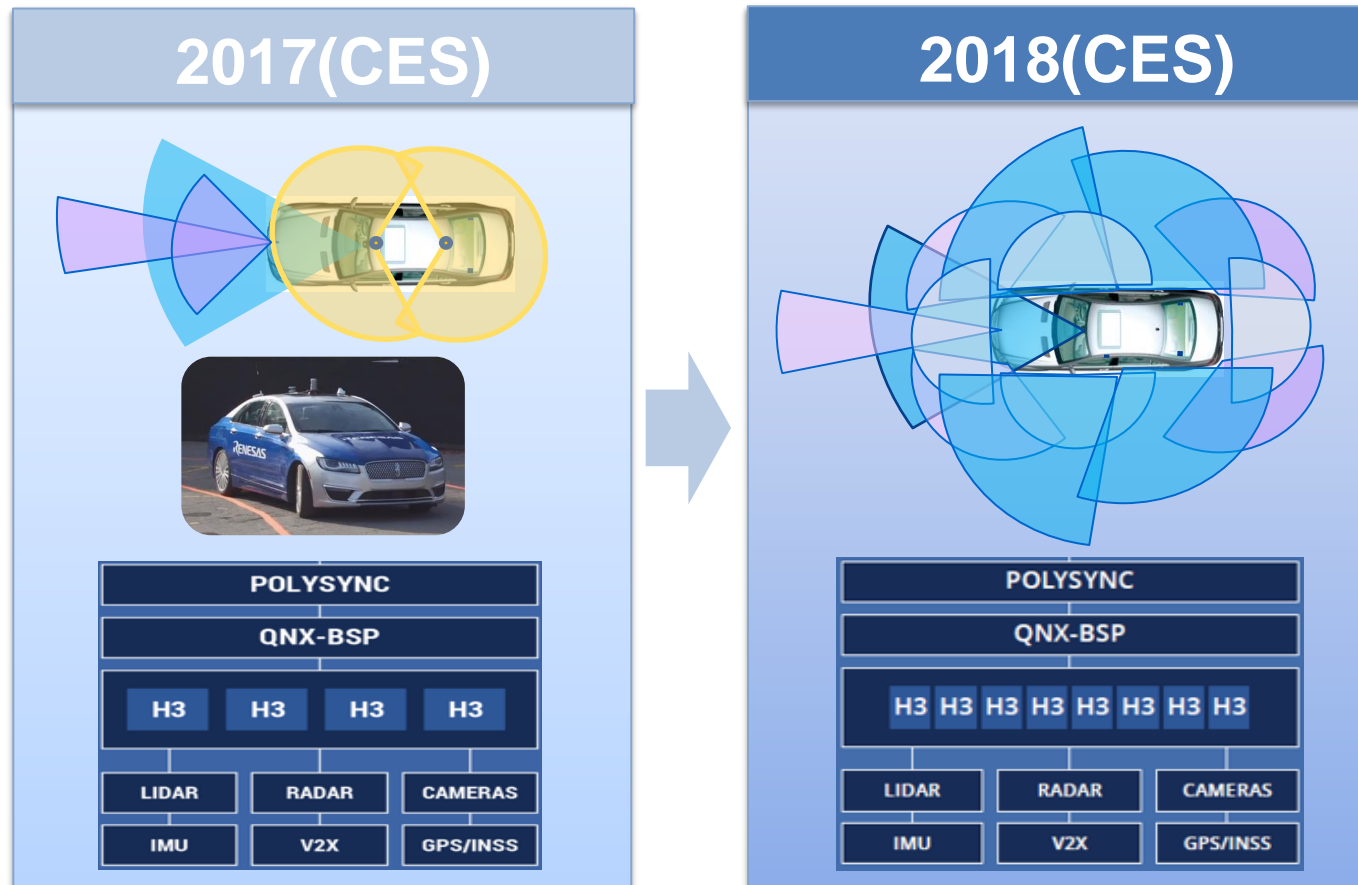**Renesas R-Car** **RENESAS RH850** **Communication (Security) · Gateway**

Ethernet TSN Switch (Gbps)

| Network virtualization | High speed data routing | FuSa ASIL-D | Security |

Sensing
Renesas R-Car
RENESAS RH850

Eth. TSN Switch
Ethernet Ports

Camera
Radar
Lidar
Sonner

Ethernet TSN (Gbps)

SENSOR FUSION

Cognitive
Renesas R-Car **RENESAS RH850**

Ethernet TSN (Gbps) **Renesas R-Car**

Ethernet AVB Ports **Infotainment**

Navigation
Meter
Rear monitor
Cockpit

Ethernet TSN Switch (Gbps)

ECU | ECU
ECU | ECU
ECU | ECU

RENESAS RH850

Ethernet TSN Switch (Gbps)

ECU | ECU
ECU | ECU
ECU | ECU

RENESAS RH850

Ethernet TSN Switch (Gbps)

ECU | ECU
ECU | ECU
ECU | ECU

RENESAS RH850

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AUTONOMOUS DRIVING

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AUTONOMOUS DRIVING DEMO ROADMAP

Autonomous driving demo for next CES2018 will have Fail Operational system of more complicated sensor system and processors to meet level 4/5 safety requirement
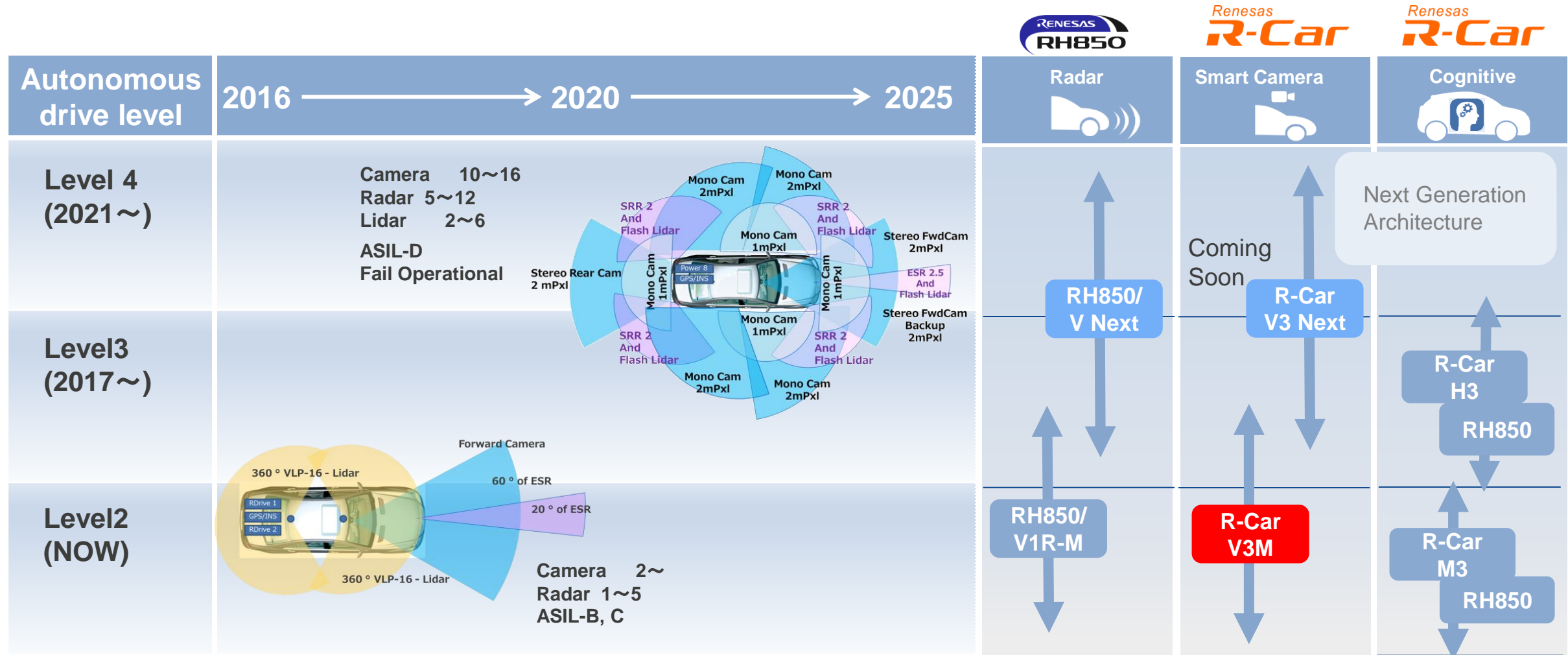

2017(CES)

POLYSYNC
QNX-BSP
H3	H3	H3	H3
LIDAR	RADAR	CAMERAS
IMU	V2X	GPS/INSS

2018(CES)

POLYSYNC
QNX-BSP
H3	H3	H3	H3	H3	H3	H3	H3
LIDAR	RADAR	CAMERAS
IMU	V2X	GPS/INSS

Fail operational system for sensor system

Assumed driver-less service car Level4 and Level5

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SENSING &COGNITIVE SOLUTION FOR AUTONOMOUS DRIVING

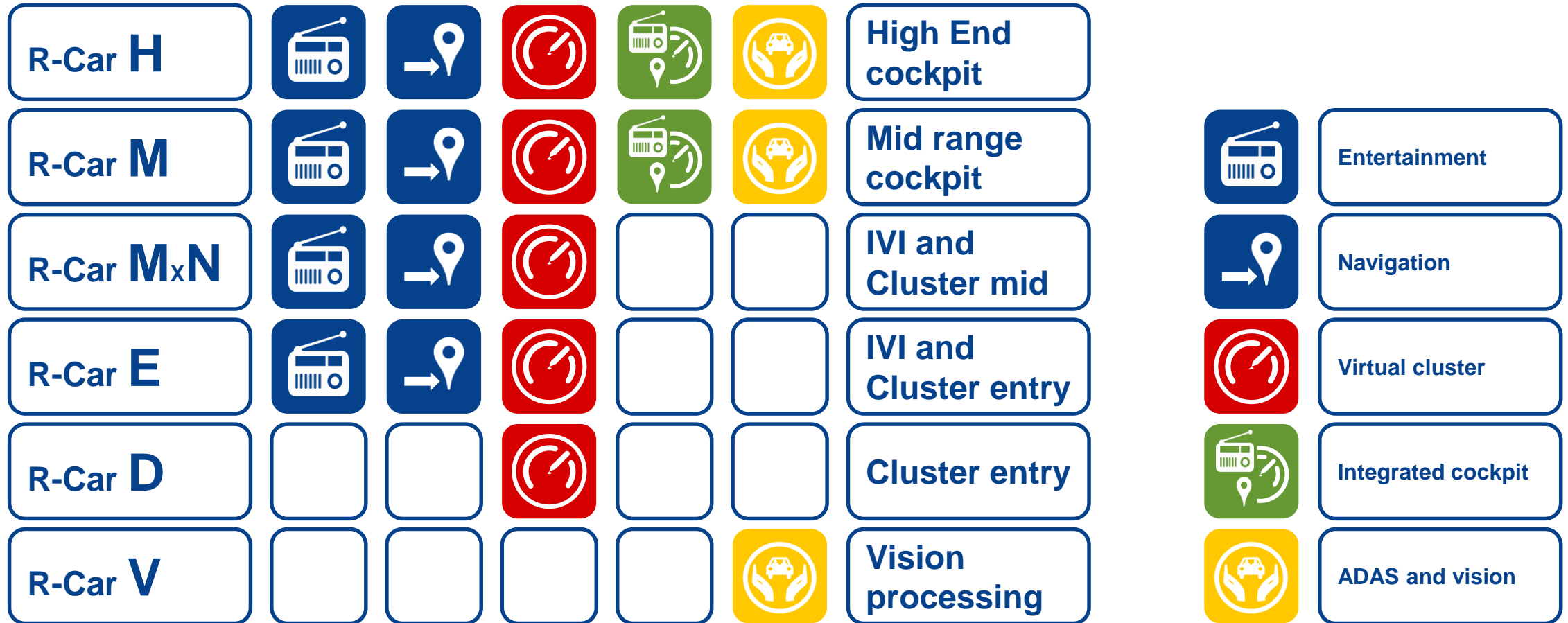Scalable solution for sensing (Camera/Rader) and Cognitive from Level2/3 to Level 4/5

Autonomous drive level	2016 → 2020 → 2025	Radar	Smart Camera	Cognitive
Level 4 (2021~)	Camera 10~16, Radar 5~12, Lidar 2~6, ASIL-D Fail Operational	RH850/ V Next	Coming Soon — R-Car V3 Next	Next Generation Architecture
Level3 (2017~)				R-Car H3 / RH850
Level2 (NOW)	Camera 2~, Radar 1~5, ASIL-B, C	RH850/ V1R-M	R-Car V3M	R-Car M3 / RH850

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R-Car Overview

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R-Car family for
for all automotive applications

New Application

Integrated cockpit

Autonomous drive

Virtual cluster

Vision processing

Entertainment

Navigation

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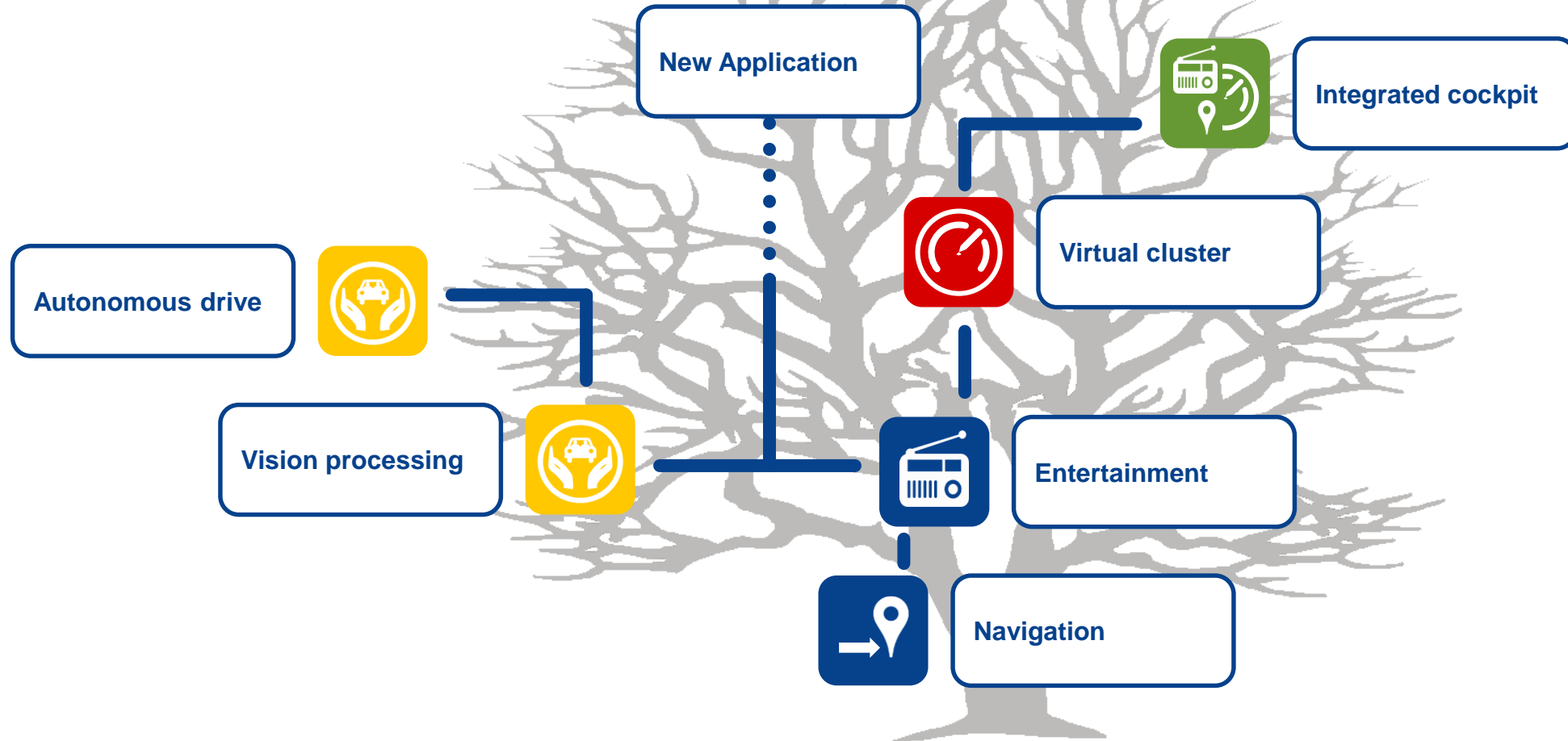
R-Car family
for all automotive applications

	Entertainment	Navigation	Virtual cluster	Integrated cockpit	ADAS and vision	
R-Car H	▣	▣	▣	▣	▣	High End cockpit
R-Car M	▣	▣	▣	▣	▣	Mid range cockpit
R-Car M×N	▣	▣	▣			IVI and Cluster mid
R-Car E	▣	▣	▣			IVI and Cluster entry
R-Car D			▣			Cluster entry
R-Car V					▣	Vision processing

Legend:

- Entertainment
- Navigation
- Virtual cluster
- Integrated cockpit
- ADAS and vision

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One platform
for Many opportunities

R-Car use the **same driver** set and
compatible hardware

- within one generation and

- from generation to generation

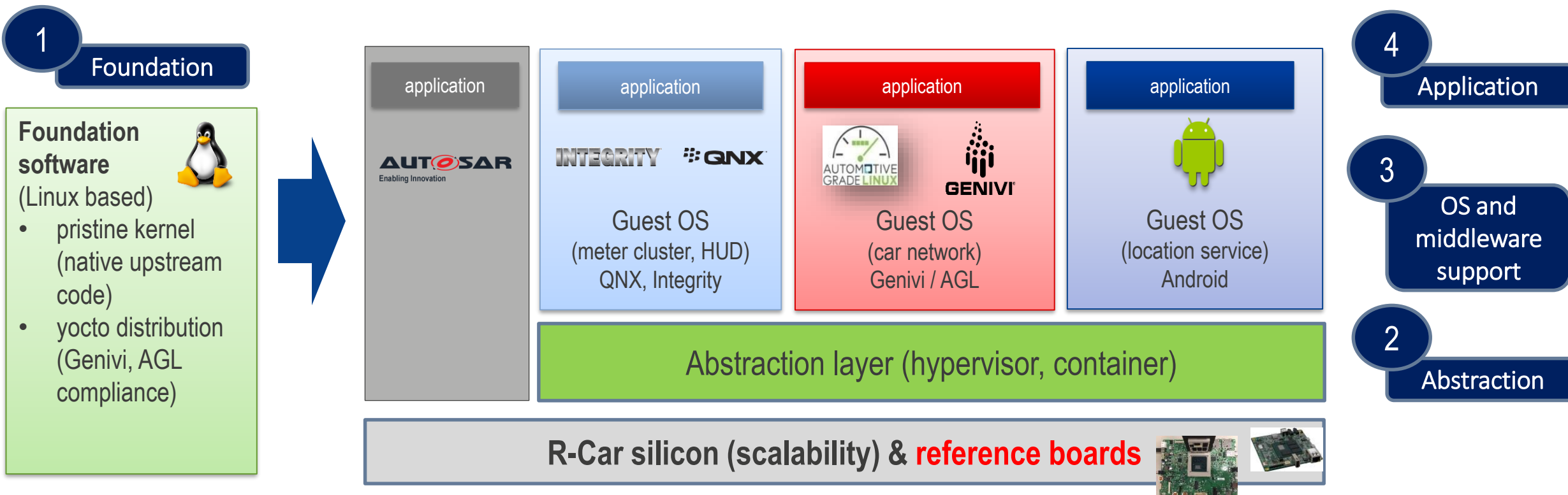**A single software platform** can be used in
many different projects

- Different performance range

- Different application range

ONE
Platform Development

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R-Car Gen3
with Software and Eco system

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R-Car system solution

1 Foundation

Foundation software
(Linux based)
- pristine kernel (native upstream code)
- yocto distribution (Genivi, AGL compliance)

application

AUTOSAR
Enabling Innovation

application

INTEGRITY QNX

Guest OS
(meter cluster, HUD)
QNX, Integrity

application

AUTOMOTIVE GRADE LINUX GENIVI

Guest OS
(car network)
Genivi / AGL

application

Guest OS
(location service)
Android

4 Application

3 OS and middleware support

Abstraction layer (hypervisor, container)

2 Abstraction

R-Car silicon (scalability) & **reference boards**

Renesas provide all key software components to realize this construction

Genivi and AGL – contribution to standardization

G ENVI
D evelopment
P latform

http://wiki.projects.genivi.org/index.php/GENIVI_Demo_Platform

Renesas support R-Car based software eco-system creation and GENIVI and AGL support

U nifiied
C ode
B ase

https://www.automotivelinux.org/news/news/2016/01/agl-shows-demo-ces-2016
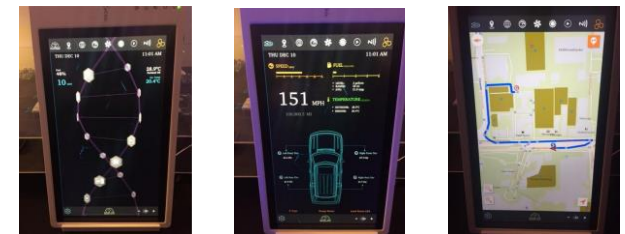
Renesas leads both challenges to achieve next gen automotive standard

R-Car Starter Kit
2 products for customer demand

R-Car Starter Kit Pro — **$499**

- **General purpose computing such as HMI computing**
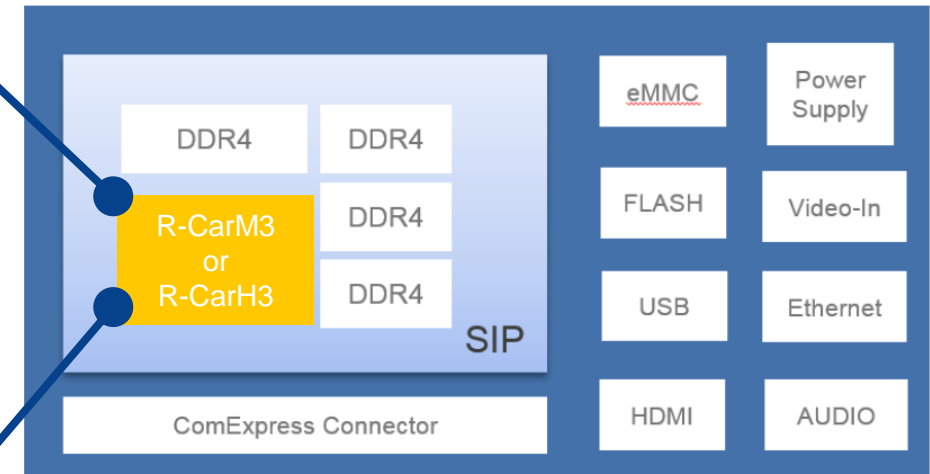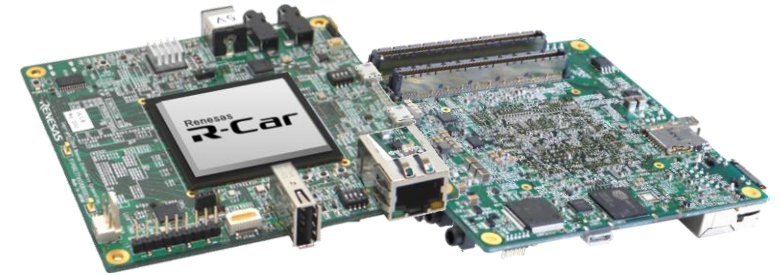- **New R-Car M3 for various apps.**

R-Car M3

R-Car Starter Kit Premier — **$799**

- **High-end computing such as Cognitive computing**
- **R-Car H3 available form last Nov.**

R-Car H3

SIP: DDR4, DDR4, R-CarM3 or R-CarH3, DDR4, DDR4, ComExpress Connector
eMMC, Power Supply, FLASH, Video-In, USB, Ethernet, HDMI, AUDIO

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Infotainment Carrier Board a.k.a "Kingfisher"
R-Car Starter Kit extension for infotainment software development

NEW

Infotainment Carrier Board for R-Car Starter Kit

July 2017 available (from authorized distributers)

Multi Display & Multi Camera
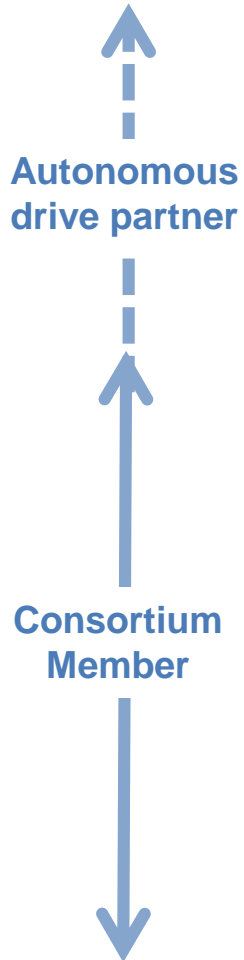Selectable camera LVDS IF for in-vehicle connection

Wireless & In-Vehicle network
WiFi/BT/x2 CANFD/Ethernet AVB/MOST50

Easy to start automotive Linux
Best suited for AGL and GENIVI development

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EXPANDING PARTNERSHIP FOR AUTONOMOUS DRIVING

(OVER 220 COMPANIES)

THANK YOU.

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R-Car

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