半导体助力智能网联汽车关键技术发展

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英飞凌汽车电子事业部高级总监
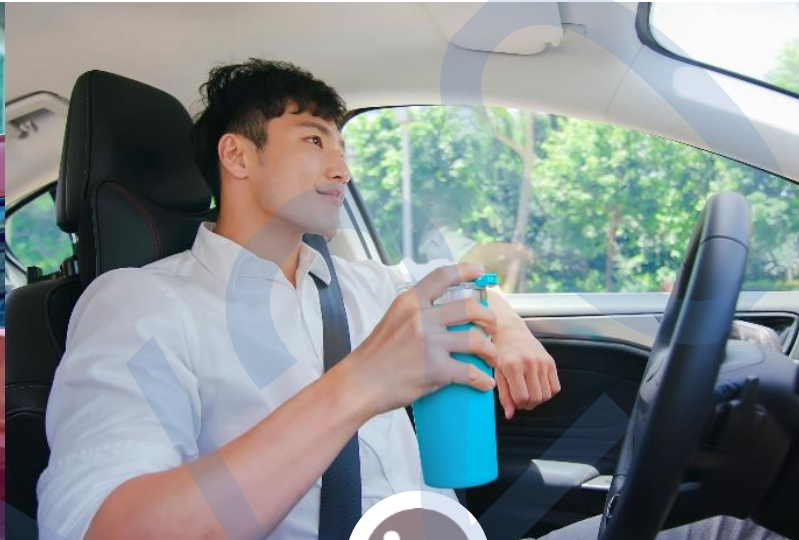
2021-July

infineon

Our core beliefs reflect the automotive megatrends as cars become cleaner, safer and smarter

Zero CO$_2$ becomes real

A driver becomes a passenger

A car becomes a smarter car

A car becomes a smarter car

User experience

Becomes a differentiator - driving content growth, innovations and technologies

Dependable electronics

Dependability is the key driver for the megatrend automated driving

Zone architectures

Reshape the car electronics, classical functions will be reassigned to large ECUs and smart actuators & sensors

A car becomes
a smarter car

Enhanced UI and UX experience
driving infotainment to cockpit domain controller

Smart HMI	Secured connectivity	Advanced audio	Integrated ADAS functions	Frequent software updates
Source: www.harman.com		Source: www.motorauthority.com	Source: www.continental.com	Source: www.Opensynergy.com
Increased displays and pixel densities, AI	**5G, cyber security**	**Premium audio, ANC, power efficiency**	**DMS, OMS, e-Mirror, parking assistance**	**QNX, Linux, Android, iOS, AUTOSAR**

Rapid adoption of consumer electronics for improved in-vehicle experiences

3D camera
Time-of-flight (ToF)

Smart eyes

MMW radar

2D camera

2D imagers are not within our portfolio but can be supported by other system components

Smart ears

Smart nose

MEMS microphones

CO2 sensor

only consumer grade sensor available

Dependability is the key driver for the megatrend automated driving

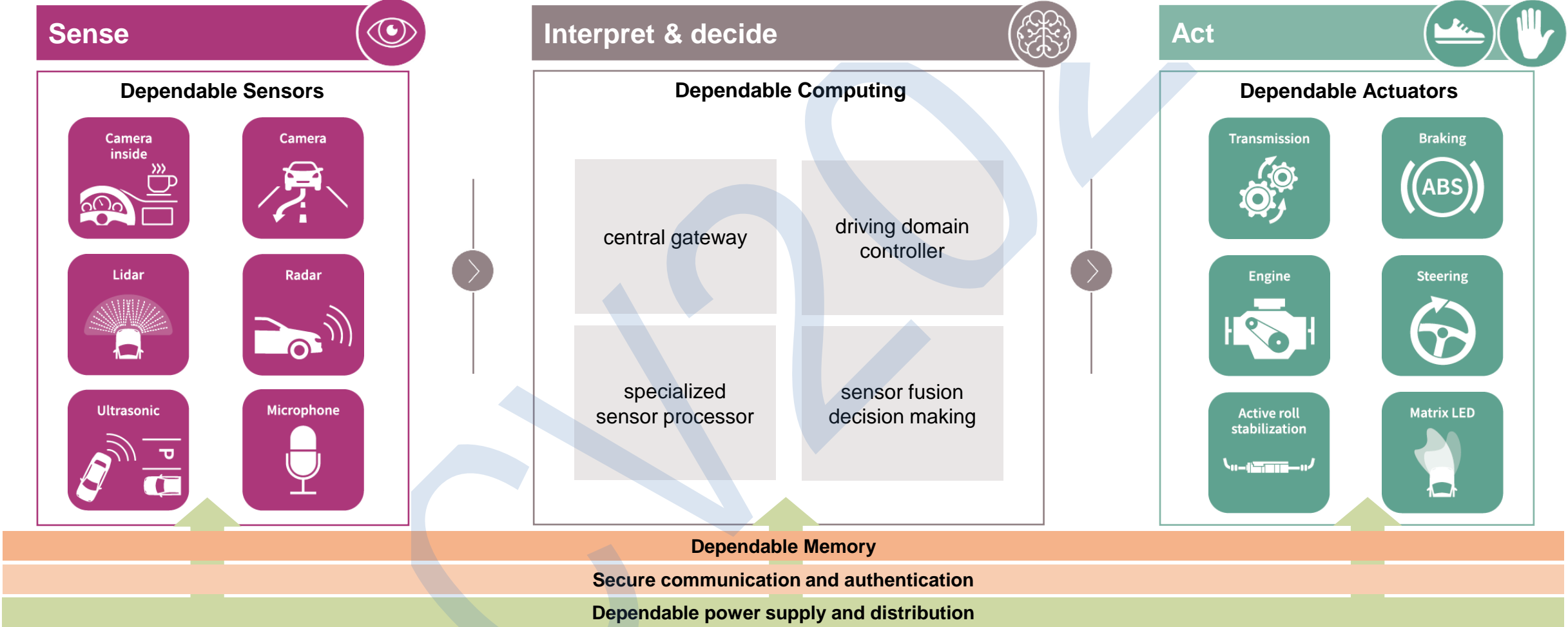**Technology**   ➕   **Trust**   ➖   **Autonomous Driving**

Dependability definition

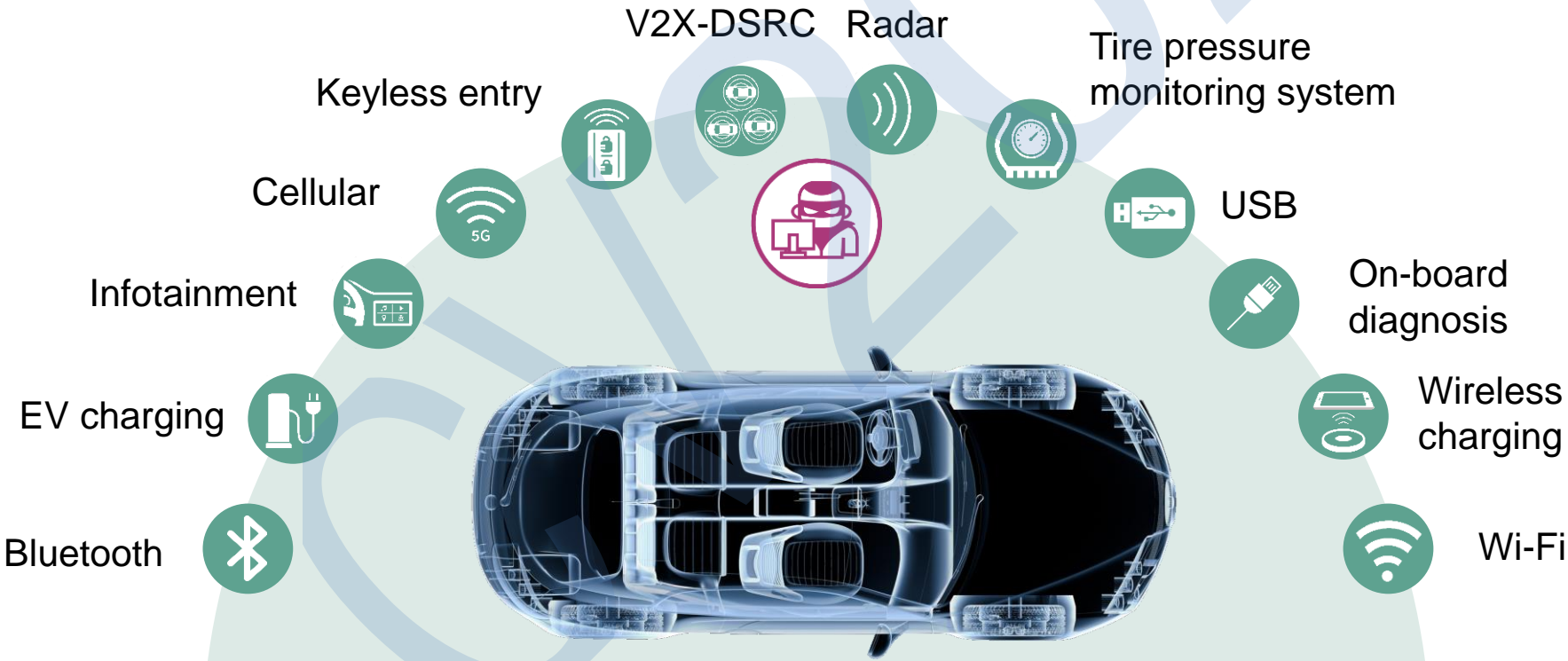*(Noun)* The quality of being trustworthy or reliable; trust in safety

Trust requires dependable systems which are always available

Sense

Dependable Sensors

- Camera inside
- Camera
- Lidar
- Radar
- Ultrasonic
- Microphone

Interpret & decide

Dependable Computing

central gateway	driving domain controller
specialized sensor processor	sensor fusion decision making

Act

Dependable Actuators

- Transmission
- Braking (ABS)
- Engine
- Steering
- Active roll stabilization
- Matrix LED

Dependable Memory

Secure communication and authentication

Dependable power supply and distribution

Dependable systems require **secure** systems, which
always **sense**! always **compute**! always **act**! are always **connected**! are always **powered**!

Connected car revolution

V2X-DSRC   Radar

Keyless entry

Tire pressure monitoring system

Cellular

USB

Infotainment

On-board diagnosis

EV charging

Wireless charging

Bluetooth

Wi-Fi

…What countermeasures can be implemented?

Logic attacks	Side channel attacks	Fault injection	Invasive attacks
PKI, digital signatures, encryption, CMAC, blockchain, MISRA C-CERT coding guidelines	Run-time invariant SW implementation, randomization in HW and SW, dual-rail HW implementation, encrypted computation	Double computation, all safety HW measures	Tamper protection, implanted ROM, full-custom design

Software

Hardware

Security always consists of a combination of hardware and software

The architecture must change to support xEV, AD, SOTA and enable MaaS of the fleets while balancing system cost

› ADAS and AD requires **hierarchical** architecture

› Manage **complexity** introduced by new/advanced functionalities

› Address increased **safety** and **security** requirements

› Increase **flexibility** and enable "upgradability" (SOTA)
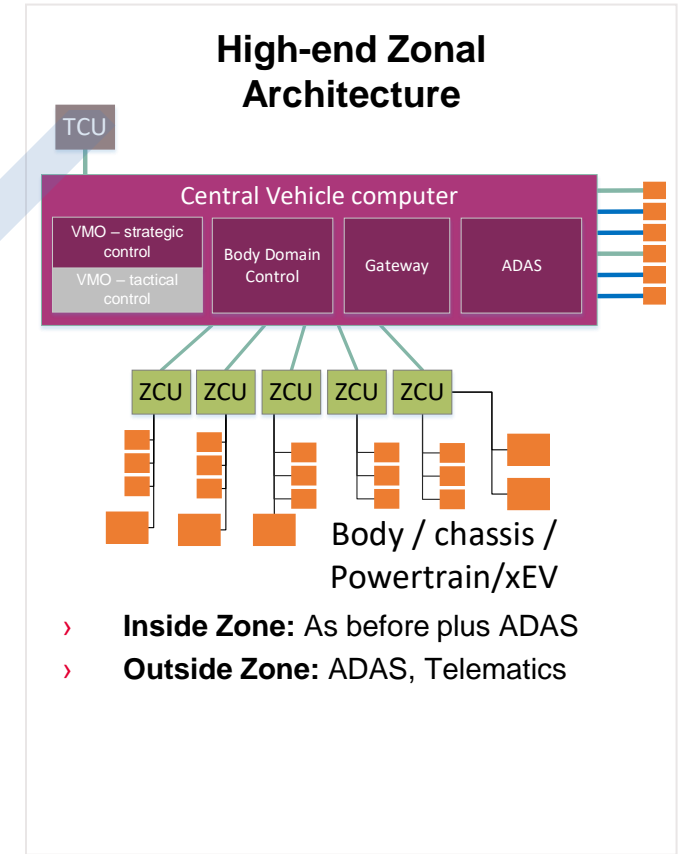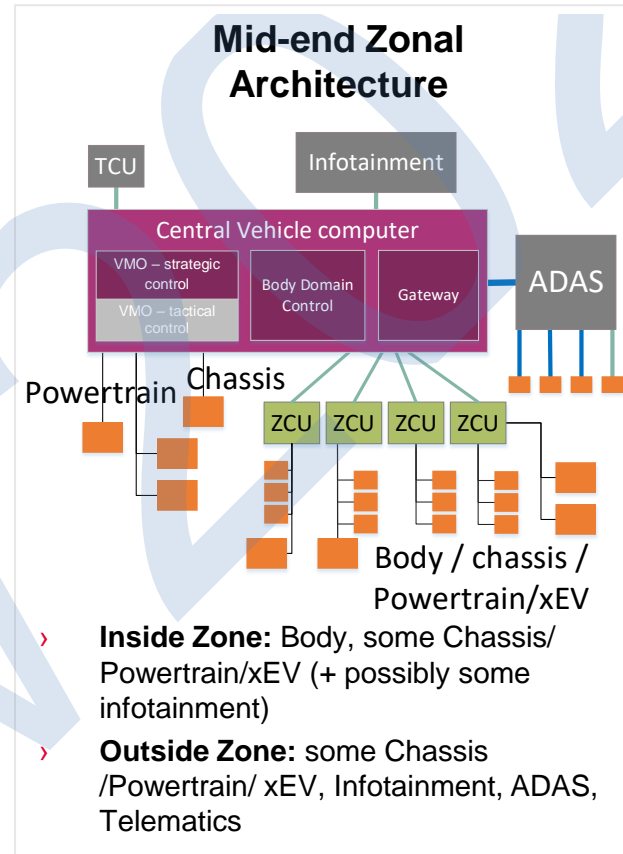
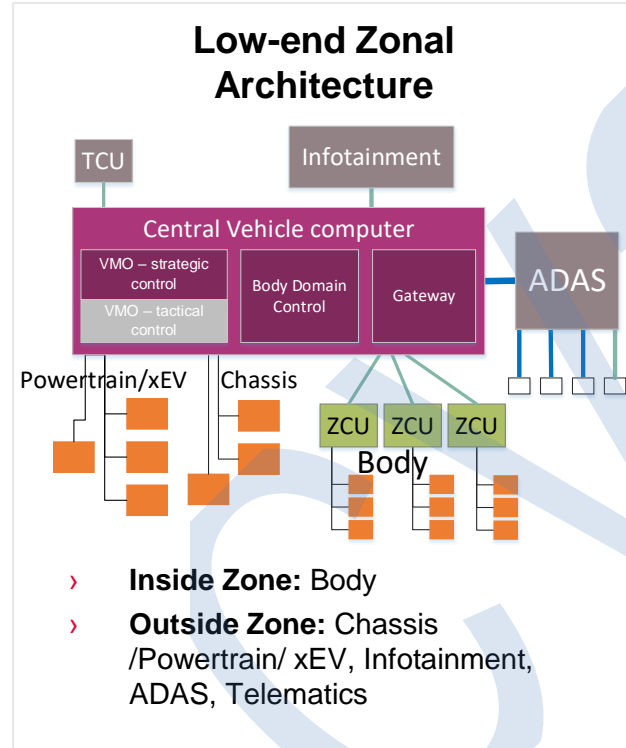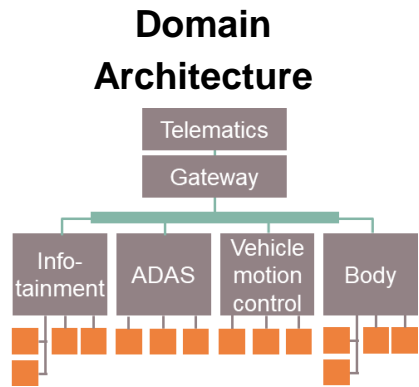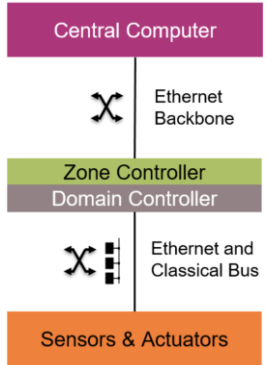› Optimize **system cost** at low power consumption

These approaches can be clustered with good approximation into the following **categories**:

**Domain Control
Domain Integration
Zone Architecture
Car Computer**

E/E Architecture Evolution
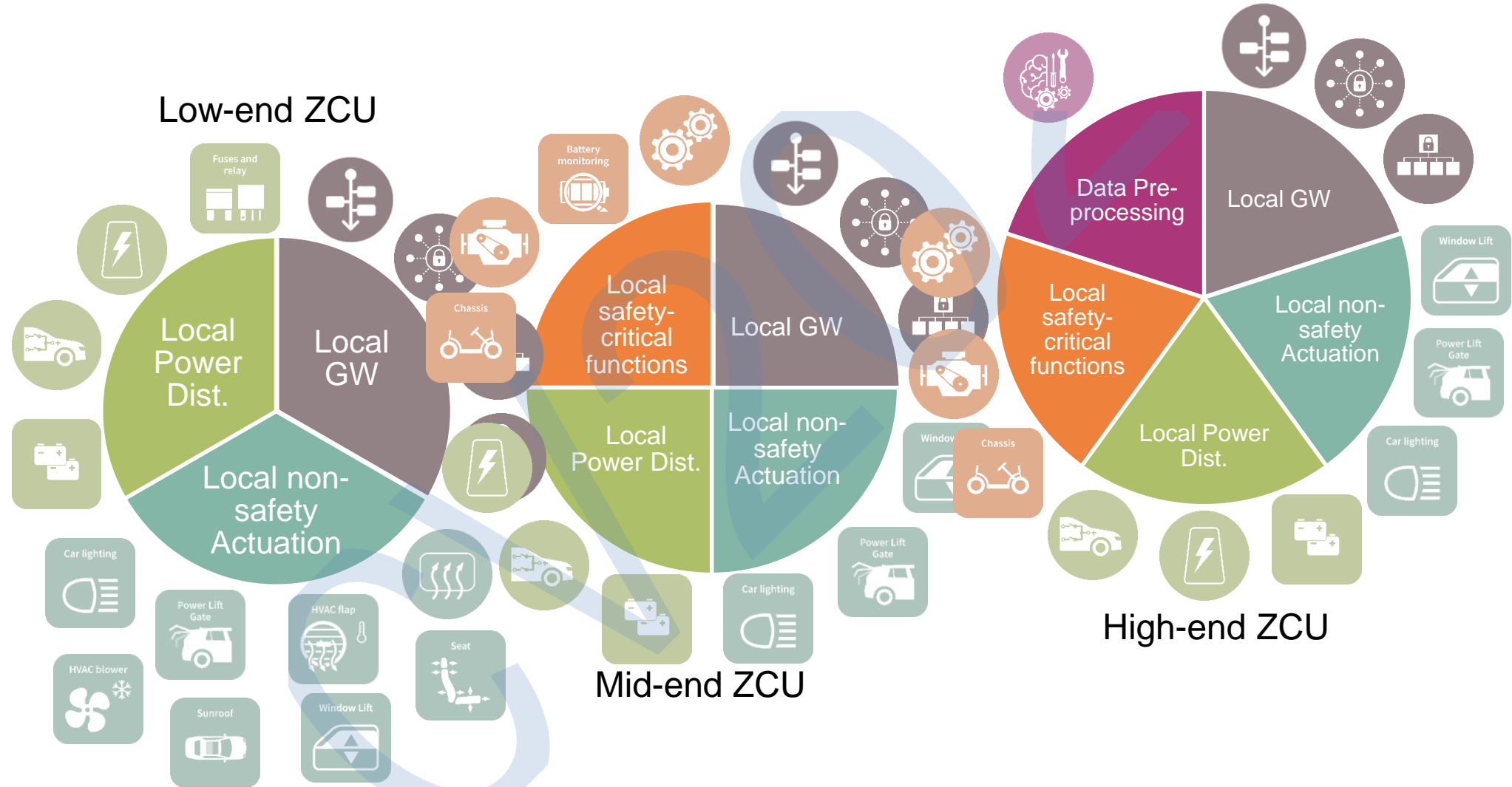## The path to full zonal architecture will take many variations

Domain Architecture

Low-end Zonal Architecture

› **Inside Zone:** Body
› **Outside Zone:** Chassis /Powertrain/ xEV, Infotainment, ADAS, Telematics

Mid-end Zonal Architecture

› **Inside Zone:** Body, some Chassis/Powertrain/xEV (+ possibly some infotainment)
› **Outside Zone:** some Chassis /Powertrain/ xEV, Infotainment, ADAS, Telematics

High-end Zonal Architecture

Body / chassis / Powertrain/xEV

› **Inside Zone:** As before plus ADAS
› **Outside Zone:** ADAS, Telematics

Goal SW defined car

Domain Architectures | Mixed domain / zone architectures | Highly integrated zone architectures

Zone ECU:
Need for Scalability

Low-end ZCU

Mid-end ZCU

High-end ZCU

In any zone controller unit, there are four key pillars that must be addressed

1

Performance and versatility

- DMIPS
- Booting Time
- Dedicated hardware accelerators
- Scalable family

2

Safety and Security

- ASIL-D Safety
- Security accelerators for asym. & sym. cryptography and hash functions

3

Freedom of interference

- Hypervisor / Virtualization
- Memory protection

4

Rich connectivity

- PCIe / xSPI
- High-speed TSN Ethernet
- Network bridges between Ethernet and CAN
- Automotive buses
- Sensors interfaces
- GPIO
- ADC

Premium Services: operational excellence, quality, sales support, application support, R&D and distribution

We are the number 1 partner in the fast changing automotive world

Premium Services

- Operational Excellence
- Passion for Innovation
- System Understanding
- Global customer support and distribution
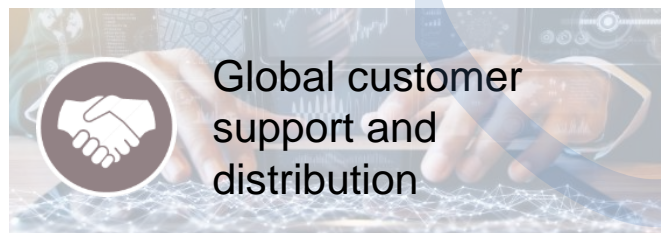
Expert service local to our customers sites
› We provide expert quality analysis and support close to our customers
› Consultative & trusted advisor product selection support
› System & product technical experts to assist customer R&D teams
› Project management support, safe launch & APQP

Operational excellence and automotive quality covering the full product lifecycle process

Disaster and risk management operations & logistics planning

Rigorous capacity planning & tight supply management processes
› Continuously investing for reacting quickly to add future capacity
› Digitized monthly short, mid & long term (5 year horizon) capacity planning
› Standardized tight supply management system (integrated in planning system landscape)
› Dedicated CLM organization

Fast T2M
Distribution is a key for Infineon growth supporting over 35k customers all over the world

Part of your life. Part of tomorrow.