

Reaching SDV Level 5 when budgets shrink

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The Levels of Software-Defined Vehicles



SDV LEVEL 0 Software-enabled

Mechanical functions made possible via software

- No Updates
- No connectivity

- Parking assistance
- Adaptive cruise control



SDV LEVEL 1 Connected

Information and control via connectivity

- Static software
- Dynamic environment

- Live traffic information
- Mobile phone companion app



SDV LEVEL 2 Updateable

Vehicle maintenance via OTA updates

- Static functionality
- Dynamic software

- Navigation update
- Security patches



SDV LEVEL 3 Upgradeable

New functions via software upgrades

- Static target hardware
- Dynamic functionality

- New function in a single car line



SDV LEVEL 4 Software Platform

Car always feels new via cross-generation software upgrades

- Singular software provider
- Dynamic target hardware

- New function delivered to all vehicle generations



SDV LEVEL 5 Innovation Platform

Full customization via ecosystem of 3rd party functions

- Diverse software providers

- New 3rd party function deployed in a multi-brand fleet

Customer experience

Scope of adaptability and dynamics

Examples

The Levels of Software-Defined V



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Examples

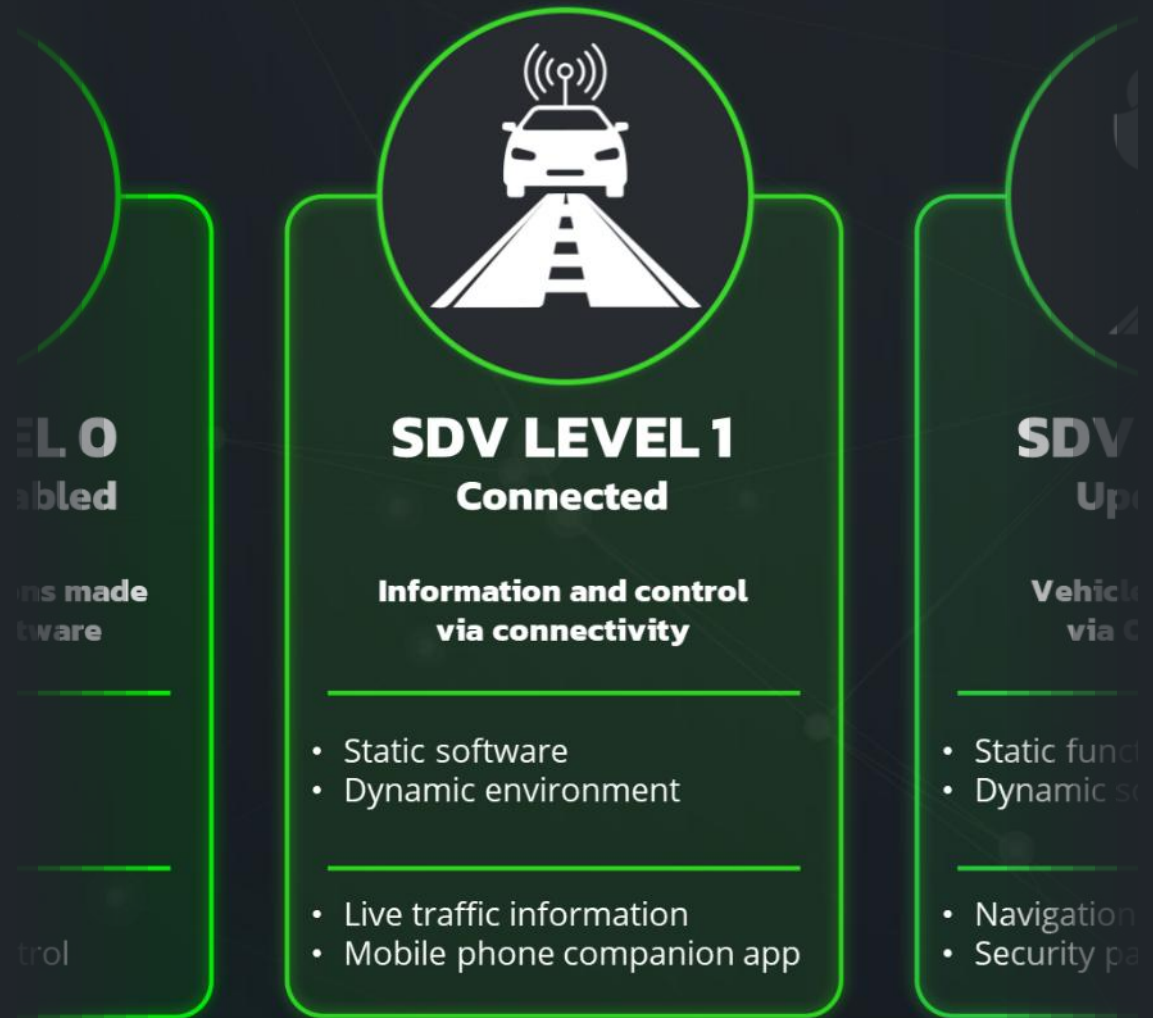
SDV LEVEL 1

Information

- Static so
- Dynam

- Live tra
- Mobile

The Levels of Software-Defined Ve



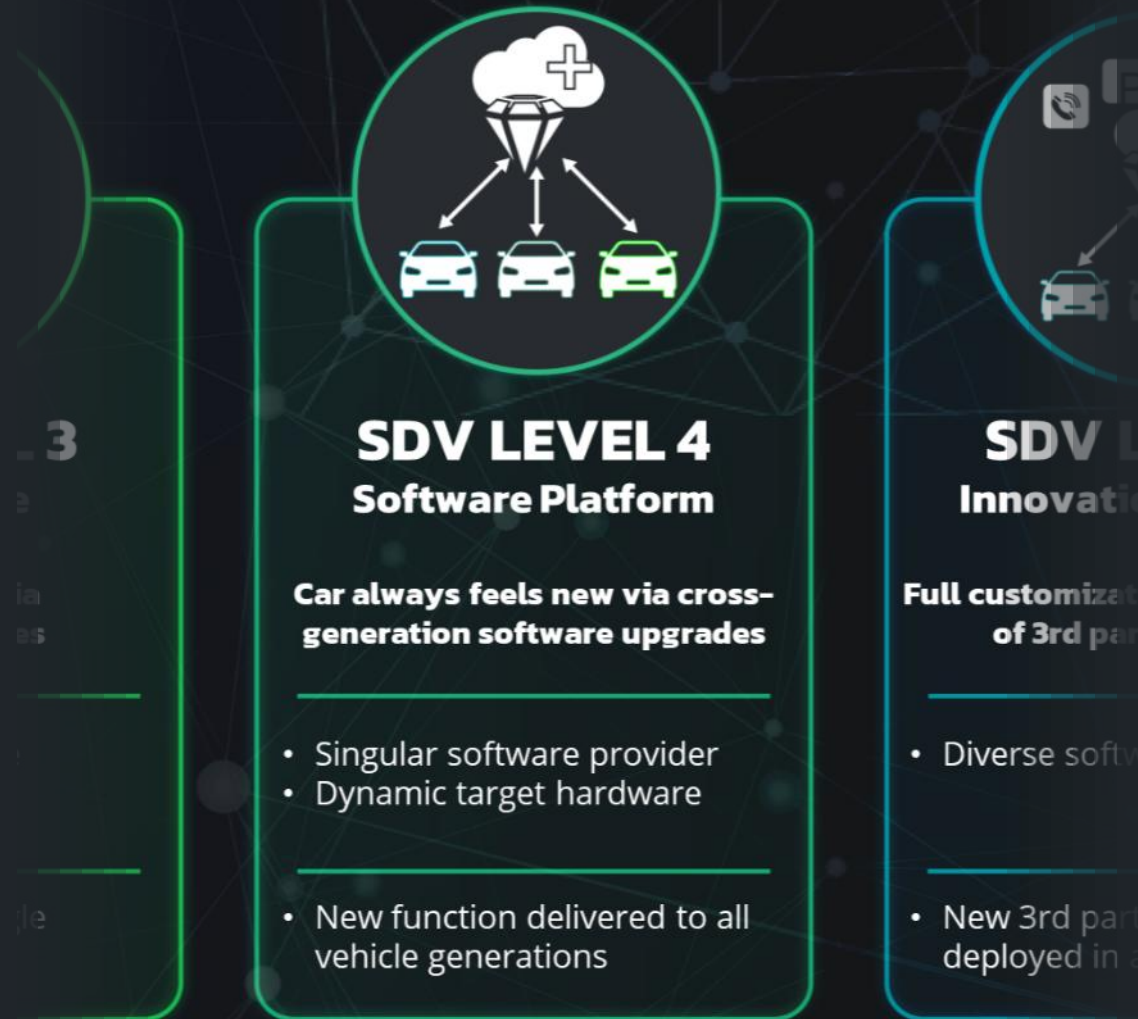
Levels of Software-Defined Vehicles



Software-Defined Vehicles



Defined Vehicles



Defined Vehicles



SDV LEVEL 5 **Innovation Platform**

**Full customization via ecosystem
of 3rd party functions**

- Diverse software providers
- New 3rd party function
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The Levels of Software-Defined Vehicles



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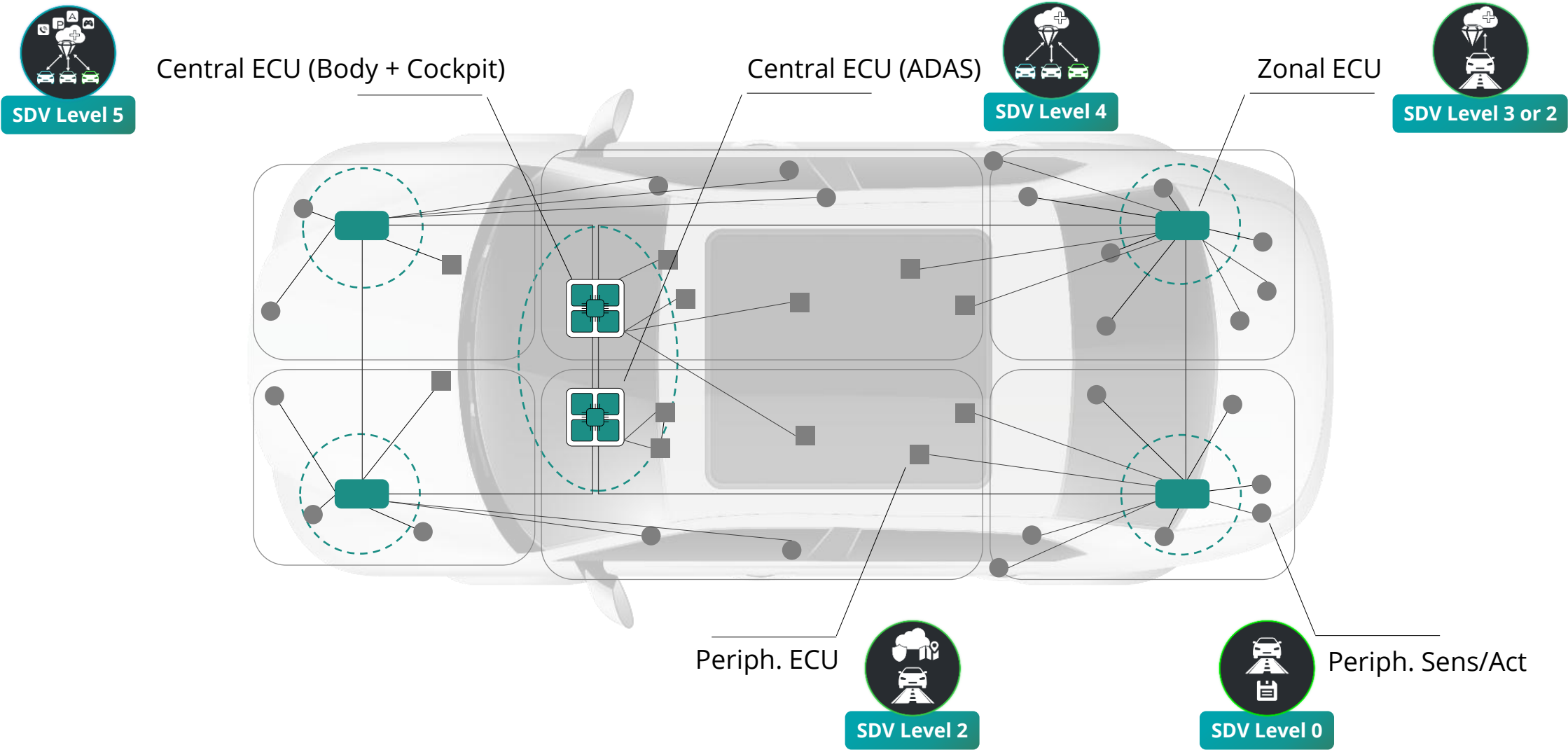
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Optional Domain Restriction

Example: SDV Level 4 for cockpit domain

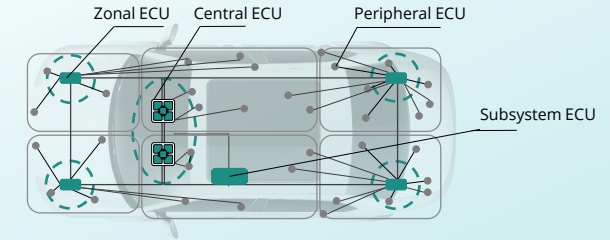
Do I really need to re-architect my complete platform to reach level 5?

Primary SW pitfall: Doing SDV everywhere

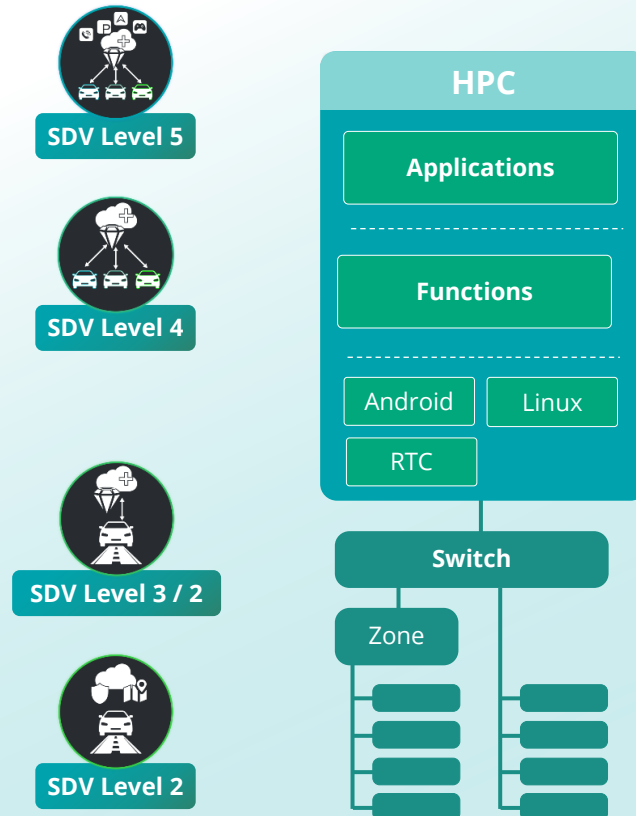


The most common mistakes

When building scalable E/E architecture



Scalable E/E architecture



Pain points

Targeting the wrong upgradability level for an ECU type

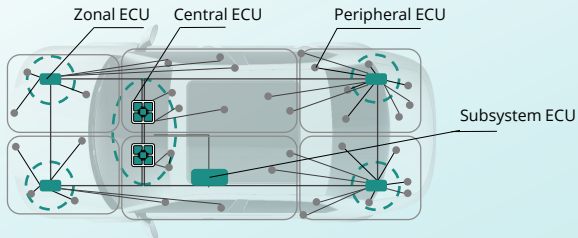
Software reusability blocked by insufficient backward/forward compatibility and portability across vehicles

Lack of integration automation and high number of variants

Failure to scale hardware across vehicle trims (low/high price-points)

Right-sized SDV Architecture

Reduce cost while capturing SDV value

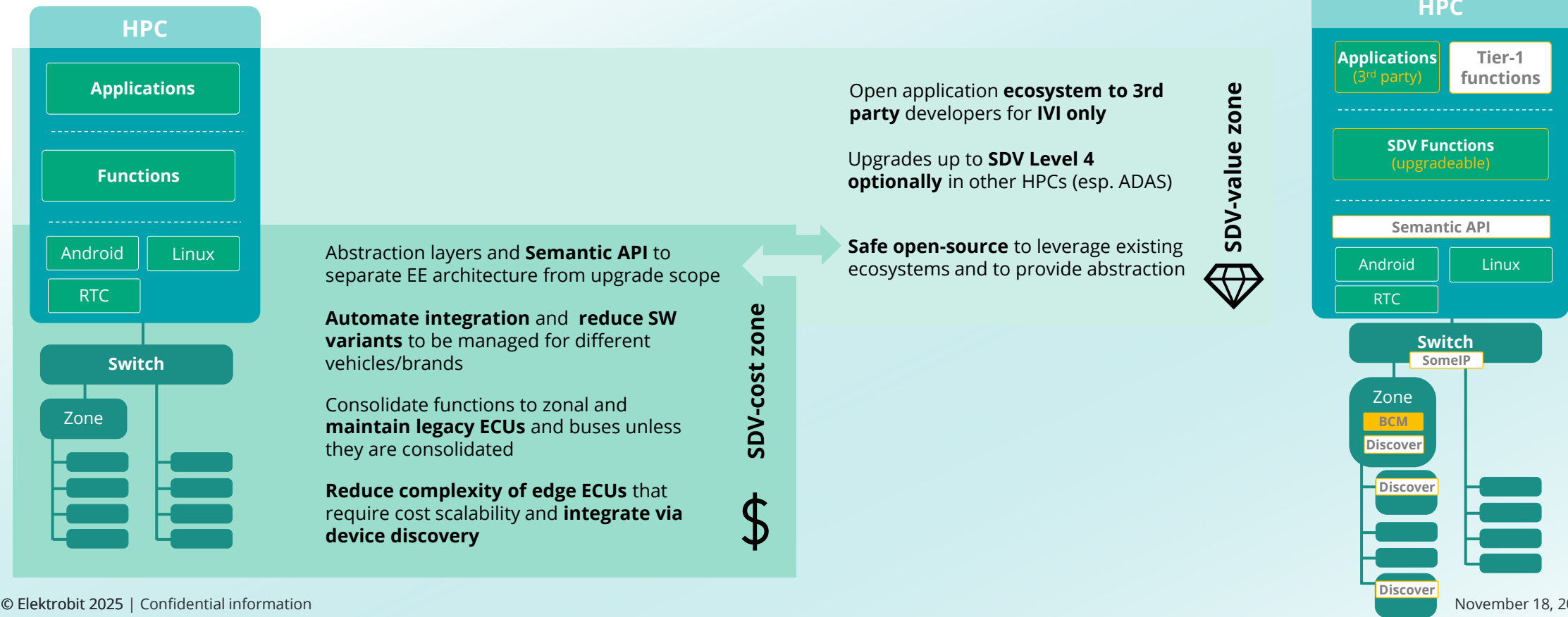


1
Leverage your existing E/E architecture

2
Implement non-disruptive cost reductions

3
Capture value with low-hanging fruit

4
Iterate on scalable E/E architecture





SDV example – new function of pet protection

„Roll-down the window by 10% when an animal is in the car and the outside temperature is above 25°C“

Optimize for roll-out of the function across vehicle lines.

1. The function is completely agnostic of the vehicle architecture.
2. It is relevant for all vehicle price-points, yet available sensors and acutators may differ (e.g. interior camera, seat occupancy)
3. It has no direct safety allocation if e.g. anti-pinch is already solved in the actuator

SDV example – new function of pet protection

Pet protection

Focus on fast dev. and deployment
Can be built on Android or AGL

Interface for vehicle functions and data

Needs to expose window lifter and sensors (vehicle agnostic)
Can be built on COVESA VSS or JASPAR

Window lifter & movement

Focus on function logic to be re-used across vehicles
Can be HPCs or Classic AUTOSAR
Deployment flexible depending on the EE architecture

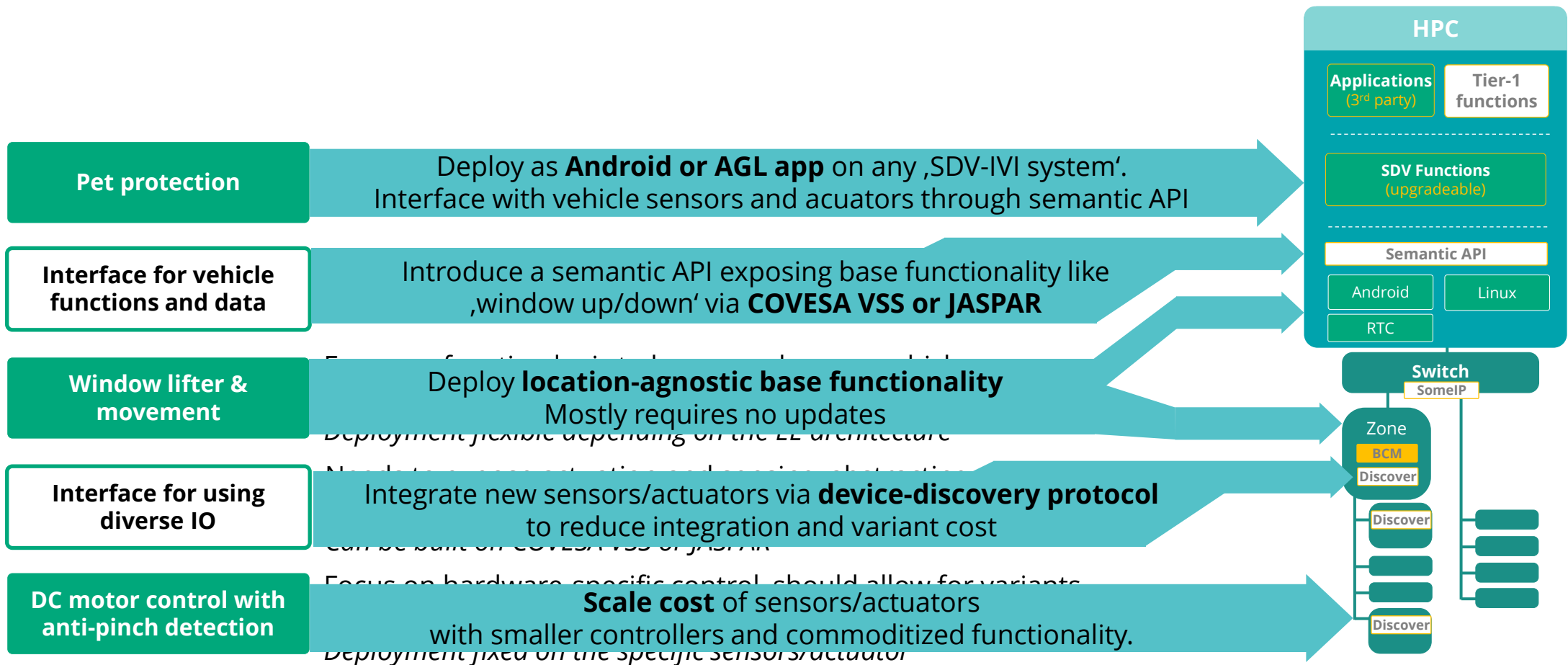
Interface for using diverse IO

Needs to expose actuation and sensing, abstracting specific HW
Can be built on COVESA VSS or JASPAR

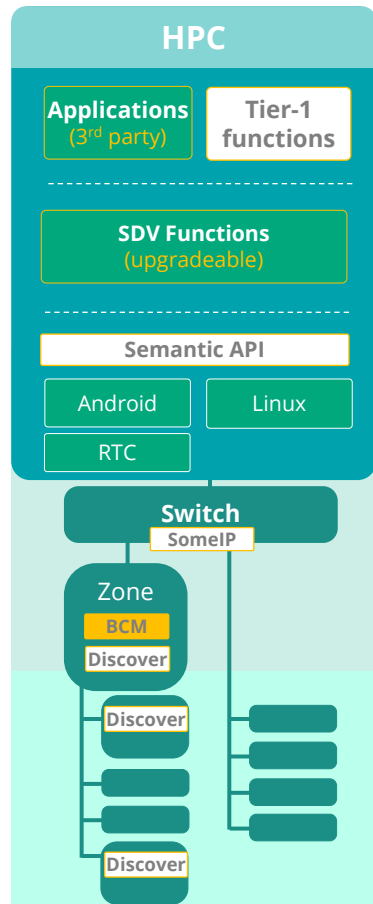
DC motor control with anti-pinch detection

Focus on hardware-specific control, should allow for variants
Can be small scale controllers, must have safety and real-time
Deployment fixed on the specific sensors/actuator

SDV example – new function of pet protection



SDV example – new function of pet protection



Upgrade scope limited to HPC

Reduction of SW variants on HPC and zonal

Re-use of peripheral ECUs

Incremental introduction of pluggable commodity sensors and actuators

Right-sized SDV



A semantic API on Cockpit systems is your fast-path to SDV
Expose vehicle base functionality in a standard API and use app frameworks



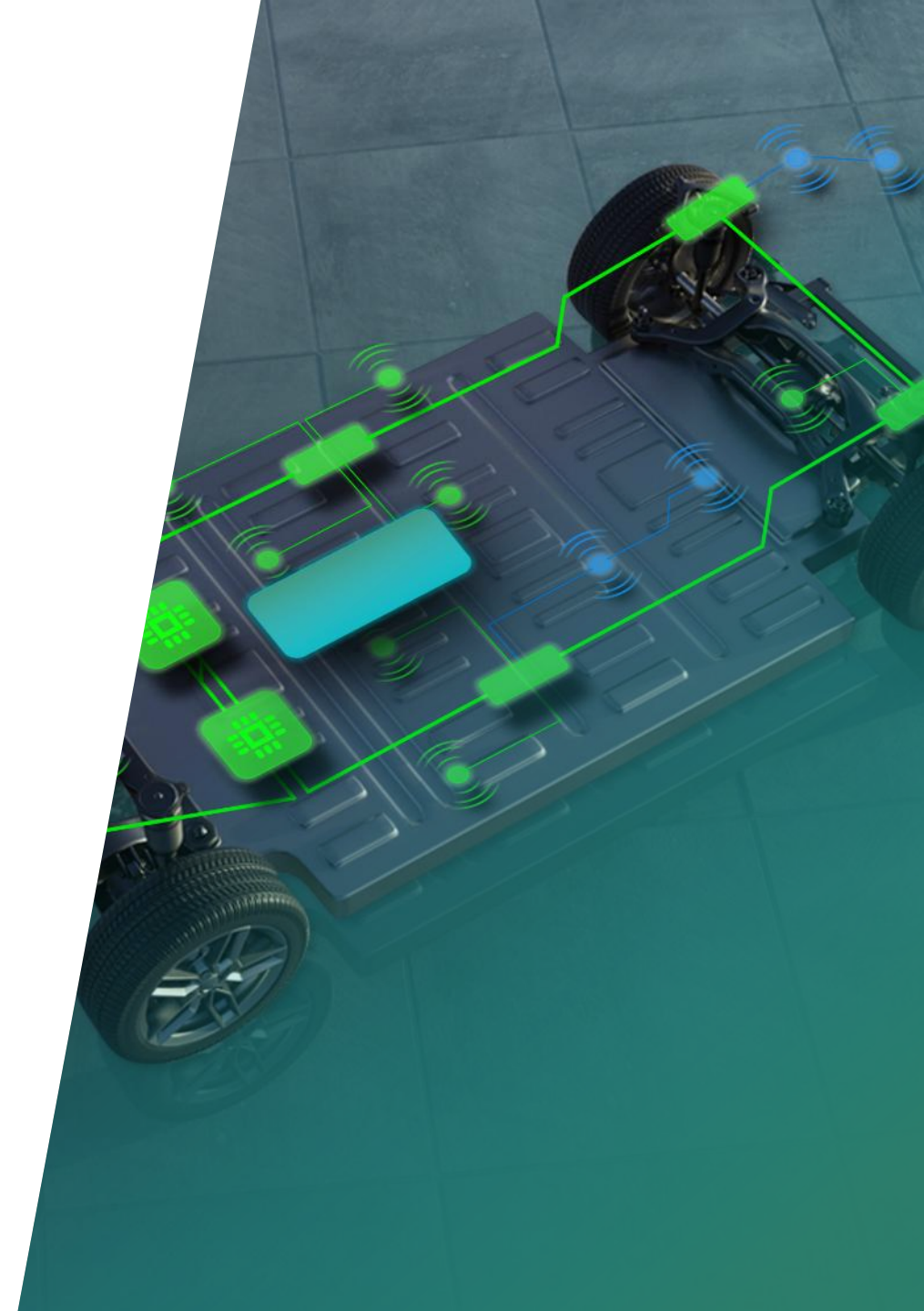
Re-use your existing EE architecture
You only evolutionarily change your architecture for cost improvements



Grow on open ecosystems
Build your SDV functions on top of ecosystems like COVESA and JASPAR



Commoditize peripheral hardware with device discovery
Achieve price scalability across your vehicle line-up with standardized sensors/actuators



Contact us



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