

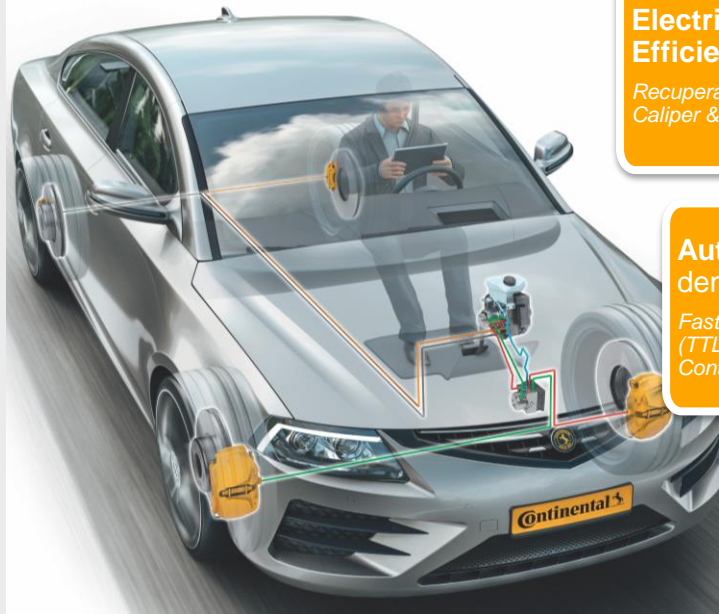


TechTalk **SAFETY AND MOTION**

EVOLUTION OF BRAKE CONTROLS TO MOTION SYSTEMS

Evolution Steps of the Vehicle Architecture

Trends driving Braking Controls to Motion Systems



Electrification demands **Energy Efficiency!**

Recuperation enabled with MK C2 // zero drag Caliper & eDrum Brake increases efficiency

Automated Driving pushes new demands for **Vehicle Performance!**

Fast and precise autonomous pressure response (TTL) ADAS functions paves the way to Motion Control*

Future vehicle E/E Architecture drives **Modularity of SW** towards **Distributed Solutions!**

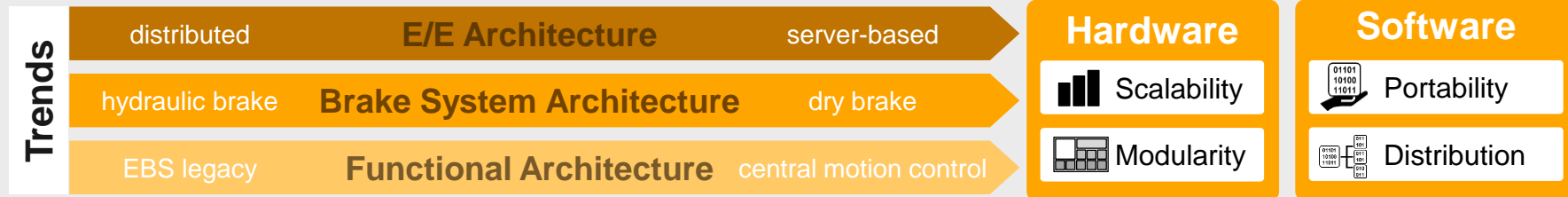
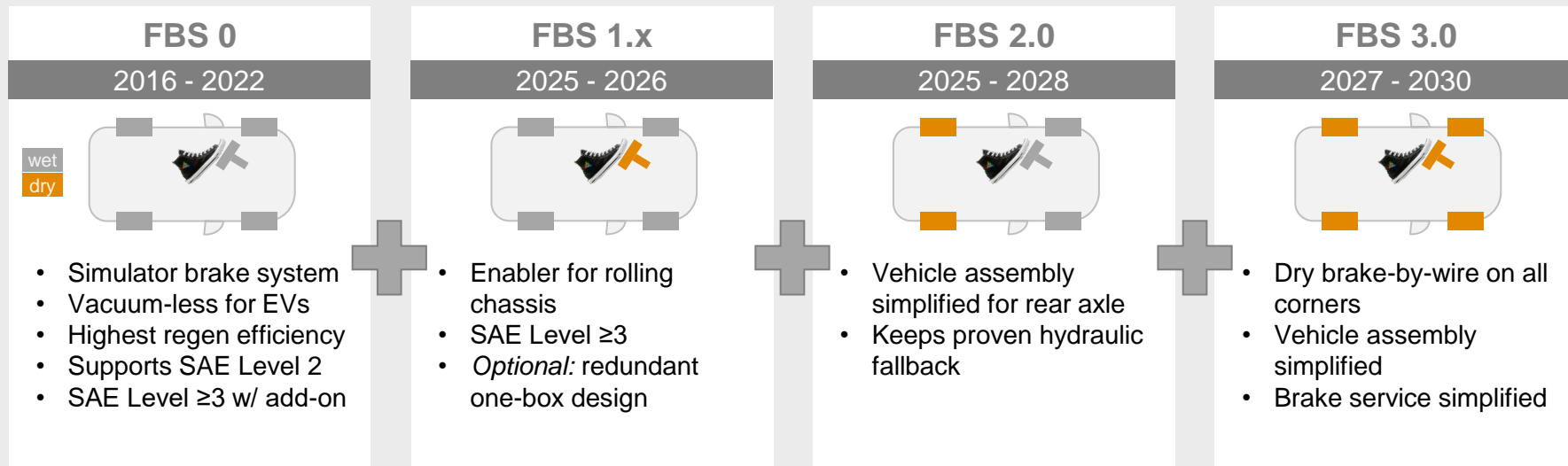
HW Scalability and SW Portability



*TTL = time to lock

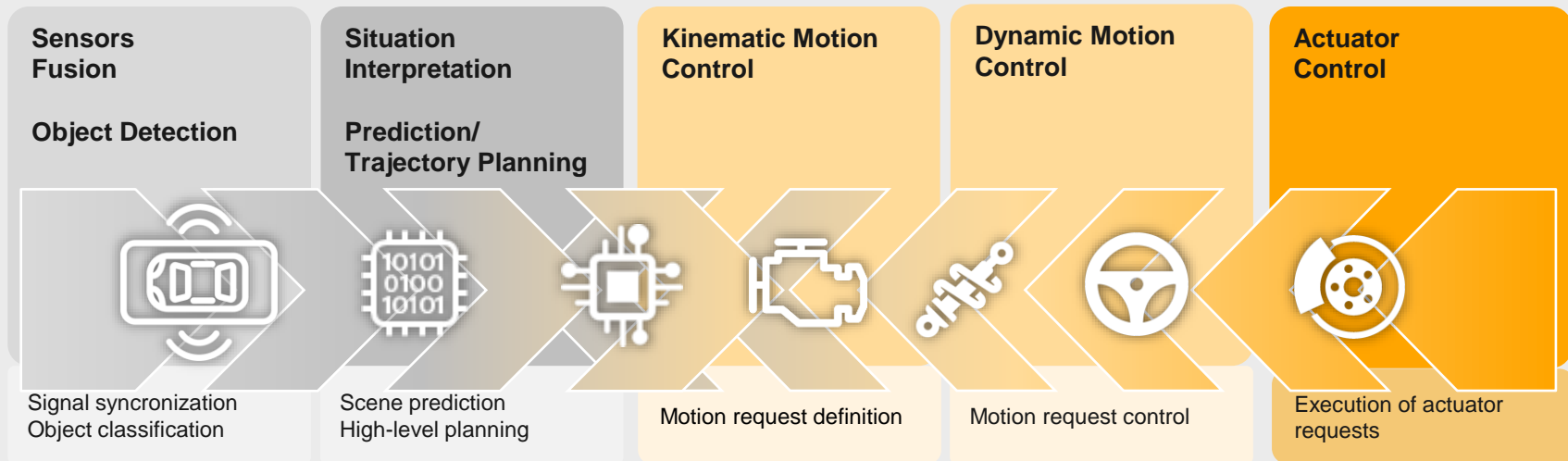
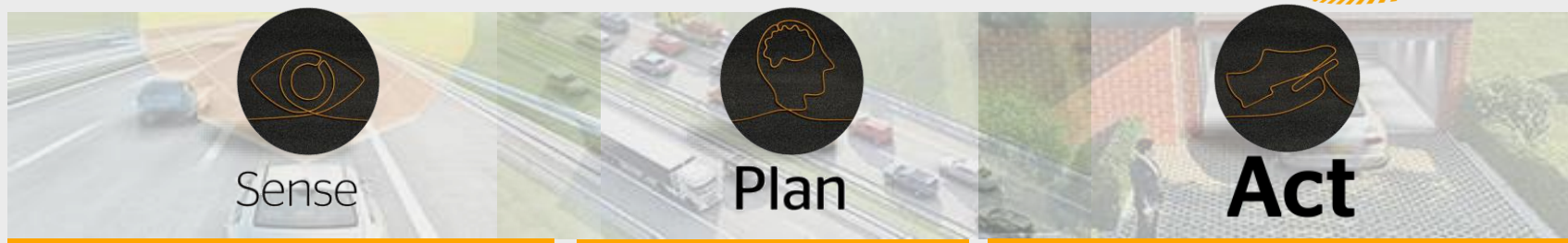
Future Brake System

Evolution Steps

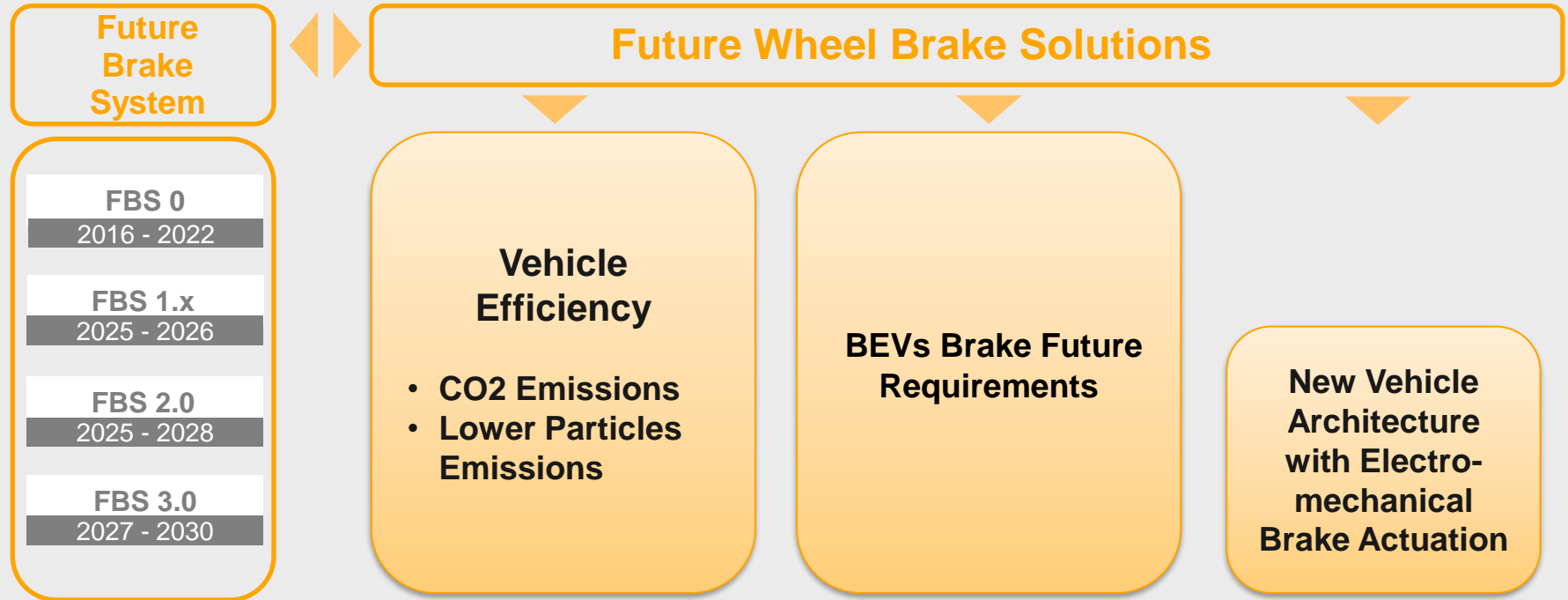


Evolution from Braking to Motion Controls

On the path to autonomous driving



Green Braking and Sustainability



Green Braking and Sustainability

**Vehicle
Efficiency**



**Wheel
Brake
Solutions**

Caliper

**Drum
Brake**



1

Reduced CO2 Emissions

- › Lower Friction Losses

- › 80% Drag Torque reduction by active brake pad retraction
- › Up to 0,5 kg weight reduction/caliper

- › Low drag torque solution → EPB-Si in production on VW ID.3 & ID.4
- › Lightweight Drum solution

2

Lower Particles Emission

- › Reduce Dust Generated Through Braking

- › Hard coated disc and new pad material supported

- › Encapsulated drum → EPB-Si in production on VW ID.3 & ID.4
- › Optimized encapsulation

Green Braking and Sustainability

BEVs Brake Future Requirements



Wheel Brake Solutions

Caliper

Drum Brake



1

Lower usage of Friction Brakes due to recuperation

- › Right sizing of wheel brakes

- › Adaptation of caliper sizes with higher rotor diameters and scalability from 14" to 20"
- › Reduction on pad thickness

- › Right sized Drum Brake
→ EPB-Si in VW ID.3 & ID.4
- › Reduction of lining thickness

2

Corrosion of brake disc due to low usage

- › Optimization of friction couple

- › Hard coated disc and new pad material supported

- › Encapsulated drum as protection against outer influences (water, salt, etc.)
→ EPB-Si on VW ID.3 & ID.4

Green Braking and Sustainability

New Vehicle Architecture



Wheel Brake Solutions

1

Duo-Servo
(e-DS)



2

e-Caliper



3

Simplex
(e-Si)



Vehicle Mass



Front
Axle

e-DS

e-Caliper

Rear
Axle

e-Caliper

e-Si

e-DS

Evolution of Brake Controls to Motion Systems

Modular and scalable setup to serve market needs



*No HW/SW
Modularity*



SW

Advanced Functions

nBrake Functions

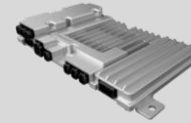
Actuator SW

Base SW

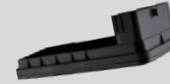
MK Cx

Caliper

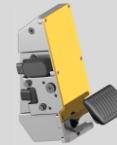
2020



HPC



Brake ECU



Actuator

*Modularity
and
Portability*



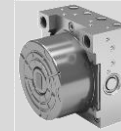
Wheel
Control Unit



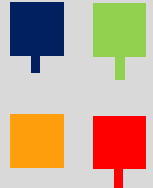
eDrum



eCaliper



Modulator



SW

2030

Continental is **ready** for new Brake System and Motion Control Architecture

The background is a light gray with a network of white lines connecting various nodes, some of which are glowing. Several thick, orange dashed lines curve across the scene, adding a sense of motion and technology.

THANK YOU!