# Enjeux du développement de services pour les véhicules connectés

Journées nationales du GDR GPL
13 juin 2019

Hugues Bonnin, Camille Fayollas, Olivier Flebus
Continental Digital Services France

# Agenda

1. Continental et le futur de l'automobile
2. Intelligent Transportation Systems : Enjeux et Portefeuille
3. Processus d'ingénierie et Organisation
4. Défis de la sûreté de fonctionnement

# Agenda

1. Continental et le futur de l'automobile
2. Intelligent Transportation Systems : Enjeux et Portefeuille
3. Processus d'ingénierie et Organisation
4. Défis de la sûreté de fonctionnement

# Le groupe Continental :
# 5 divisions au 31/12/2018

| Chassis & Safety | Powertrain | Interior | Tires | ContiTech |
|---|---|---|---|---|
| Vehicle Dynamics | Engine Systems | Instrumentation & Driver HMI | PLT Original equipment | Air Spring Systems |
| Hydraulic Brake Systems | Fuel & Exhaust Management | Infotainment & Connectivity | PLT, Repl. Business, EMEA | Benecke-Hornschuch Surface Group |
| Passive Safety & Sensorics | Hybrid Electric Vehicle | Body & Security | PLT, Repl. Business, The Americas | Conveyor Belt Group |
| Advanced Driver Assistance Systems (ADAS) | Sensors & Actuators | Commercial Vehicles & Aftermarket + Intelligent Transportation Systems | PLT, Repl. Business, APAC | Industrial Fluid Solutions |
| | Transmission | | Commercial Vehicle Tires | Mobile Fluid Systems |
| | | | Two Wheel Tires | Power Transmission Group |
| | | | | Vibration Control |

= business units présentes en France

= notre business unit

# Continental Corporation

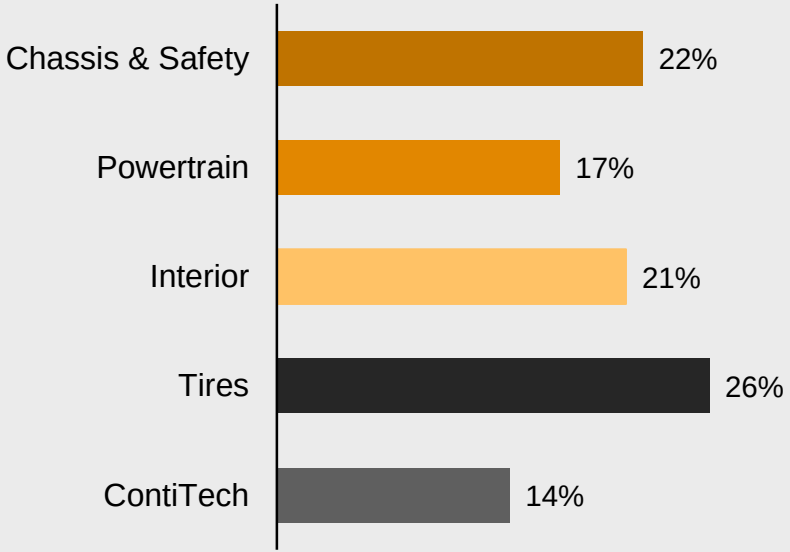
## Les chiffres 2017

**€44.0** Milliards
**Ventes**

**235,473**
Employés

**554 sites***
Dans 61 pays
* depuis1871 avec son siège à Hannovre, Allemagne

Ventes par division en %




Status: December, 2017

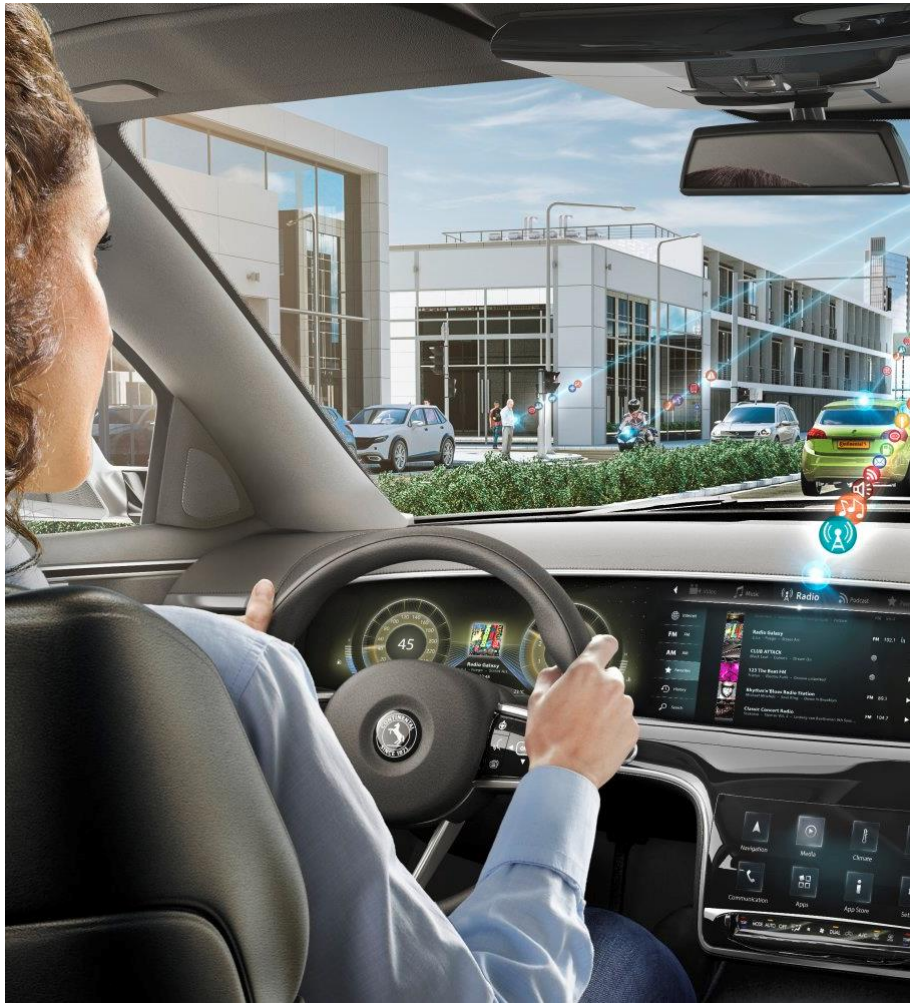
# Véhicule autonome

- Les systèmes actuels d'assistance avancée à la conduite sont la base du futur de la conduite déléguée
- Continental utilise sa capacité d'innovation pour developer ses axes avec des technologies intelligentes qui vont au-delà de la conduite, si le conducteur le veut bien
- **Les avantages** : plus de sécurité, plus de facilité d'usage, plus d'efficience.

**CUbE** (**C**ontinental **U**rban mo**b**ility **E**xperience)

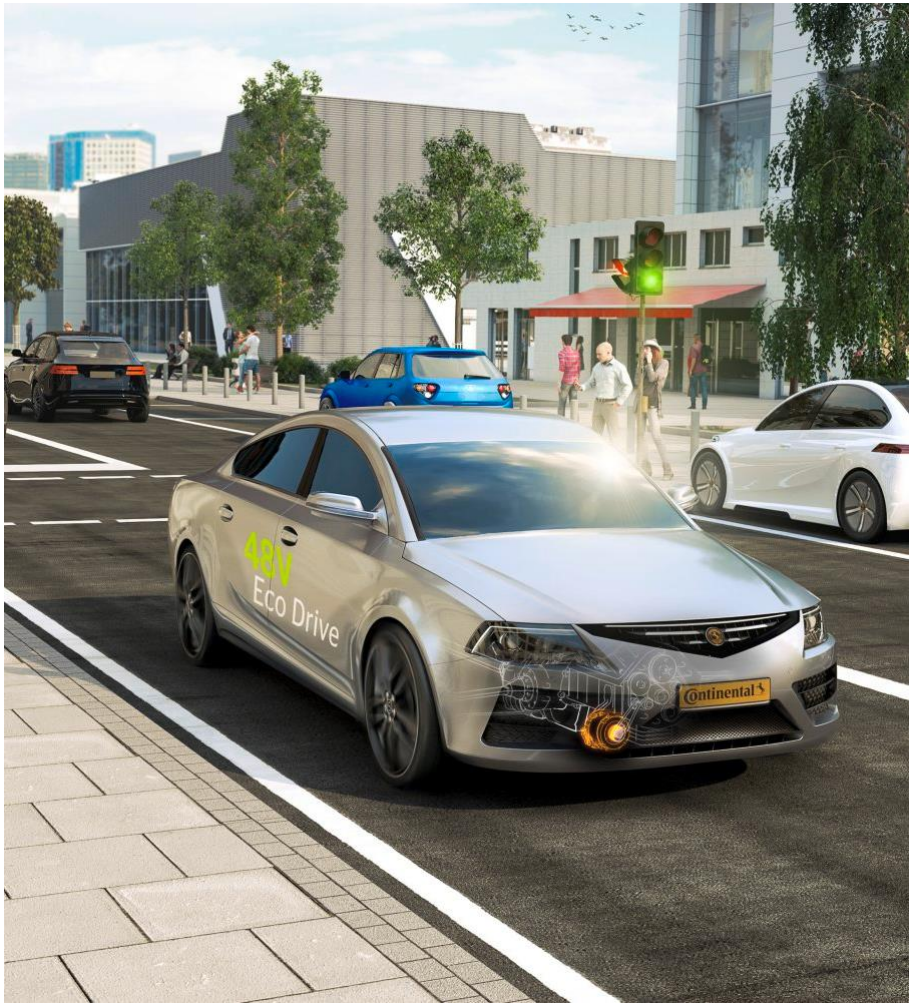
# Connectivité

- Avec le monde numérique, Continental connecte les véhicules et les êtres humains.
- Nous développons et rendons possible des solutions holistiques de connectivité, qu'il s'agisse du véhicule par lui-même, des autres véhicules ou de l'environnement
- De nouvelles possibilités apparaissent avec le développement des systèmes de transports intelligents, avec des solutions utilisant le cloud.. Elles offrent une meilleure experience pour les usagers, conducteurs ou passagers mais aussi pour l'industrie des transports

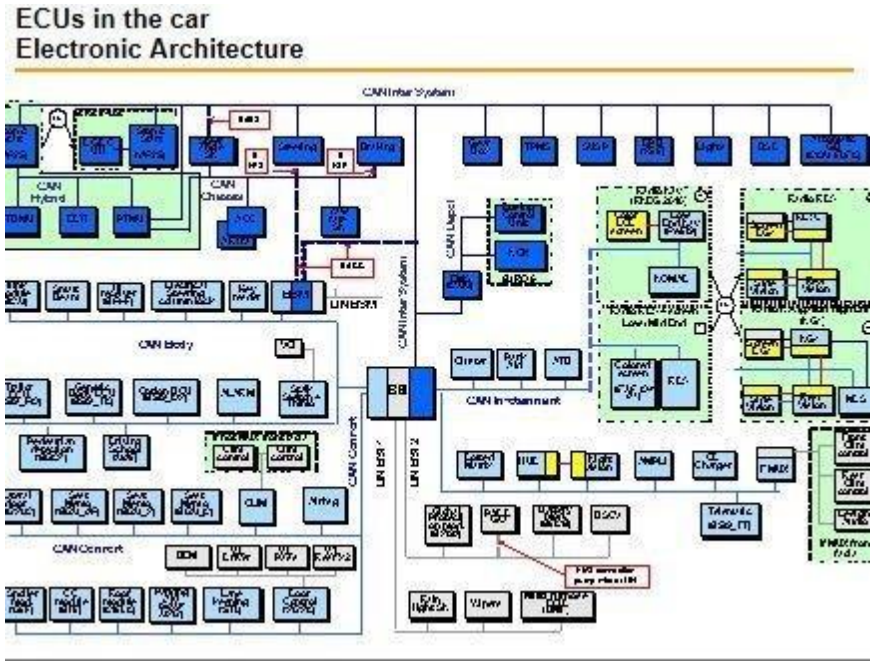


# Mobilité électrique

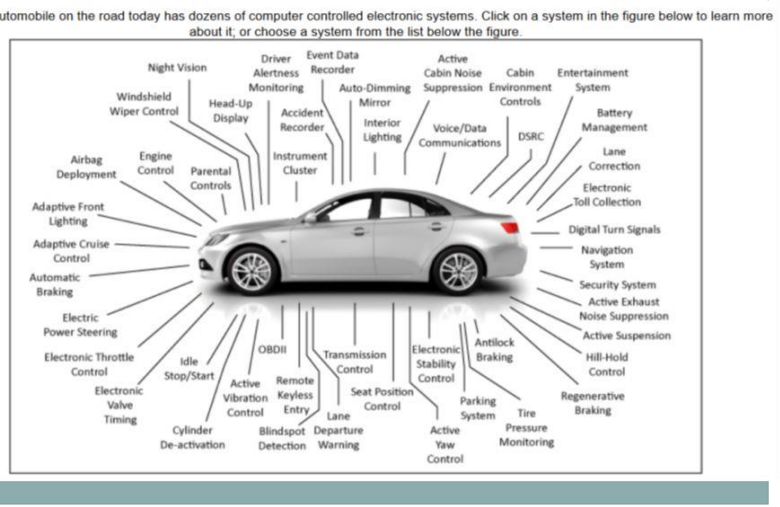
- Avec la vision **“Clean Power”**, Continental démonstre les opportunités offertes bpar une mobilité propre.
- Continental propose aux constructeurs automobiles des composants et des systems pour aider à l’apparition graduelle de solutionts faites sur mesure en matière d’electrification. C’est une evolution qui acommencé avec les systèmes **start/stop technologies** et **48 V** ainsi que les **composants hybrides**, jusqu’aux systems pour véhicules tout-électriques.
- Nos **solutions innovantes** ne font pas que permettre une conduite plus respectueuse de l’environnement et à prix abordable mais aussi la rendent plus pratique et agréable !



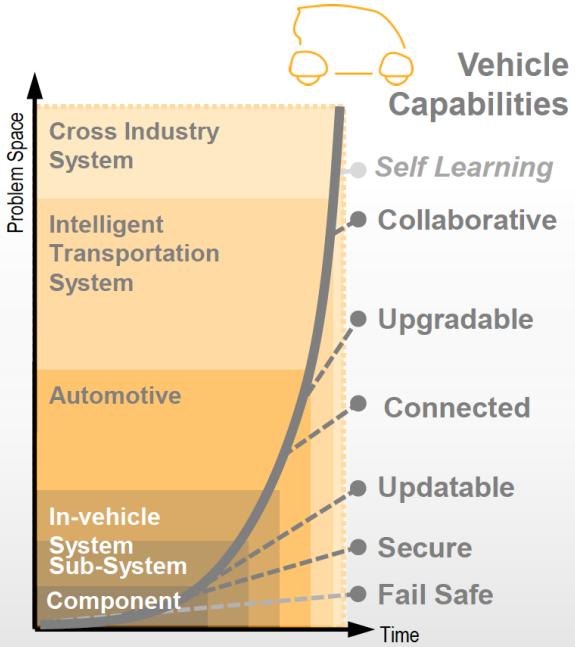
# L’état actuel de l’art des systèmes embarqués




Clemson’s View of Automotive Electronics System
http://www.cvel.clemson.edu/auto/systems/auto-systems.html



# La numérisation demande de nouvelles capacités




## Les défis de la numérisation

- Les véhicules d'aujourd'hui ne sont pas évolutifs
- Les véhicules de demain devront être mis à jour tout au long de leur vie

## Les éléments clés

- La conduite déléguée
- L'électrification
- L'intégration à l'environnement
- La mise sur le marché de nouvelles fonctionnalités

# Agenda

1. Continental et le futur de l'automobile
2. Intelligent Transportation Systems : Enjeux et Portefeuille
3. Processus d'ingénierie et Organisation
4. Défis de la sûreté de fonctionnement

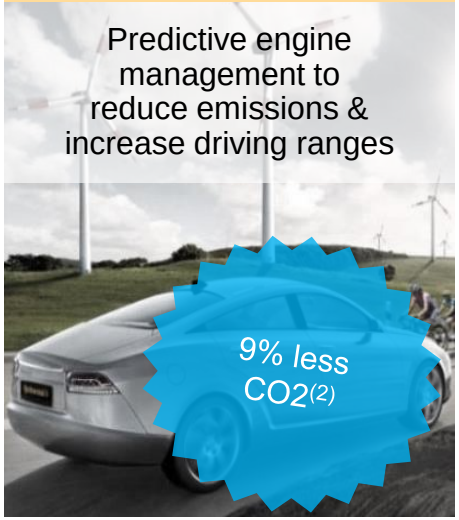
# Less accidents, cleaner air and higher convenience

## Safety

Predictive safety information to reduce accidents & road fatalities

## Efficiency

Predictive engine management to reduce emissions & increase driving ranges




## Comfort

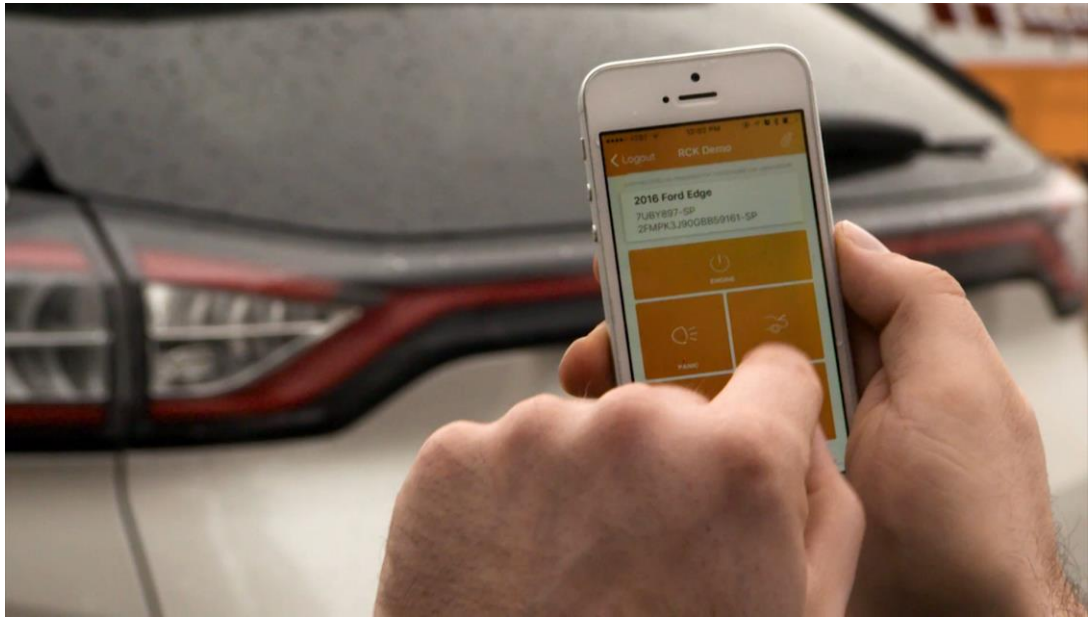
Predictive information to increase comfort & drive user excitement

(1) Autonomous driving and if human error is totally eliminated (Source: McKinsey)
(2) Continental estimates based on connected energy management test rides with 48V system, incl. active-forced feedback pedal
(3) Traffic Jam Chauffeur L4, Cruising Chauffeur L4, Precise Vehicle Localization, Minimum Risk Maneuver, Lane Centering Control, Lane Change Assist, Highway Interchange, Automated Valet Parking, HAD activation

# Key as a Service

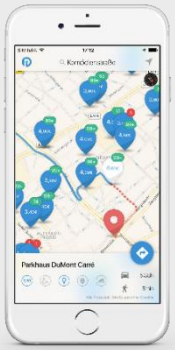
## Remote Cloud Key / OTA Keys

- Consistent access service across all OEMs
- Relies on vehicle's native access technology
- State of the art authentication & authorization architecture
- Can be deployed on a public/private cloud
- Platform will support next generation access technologies and preserve APIs



# City Data as a Service

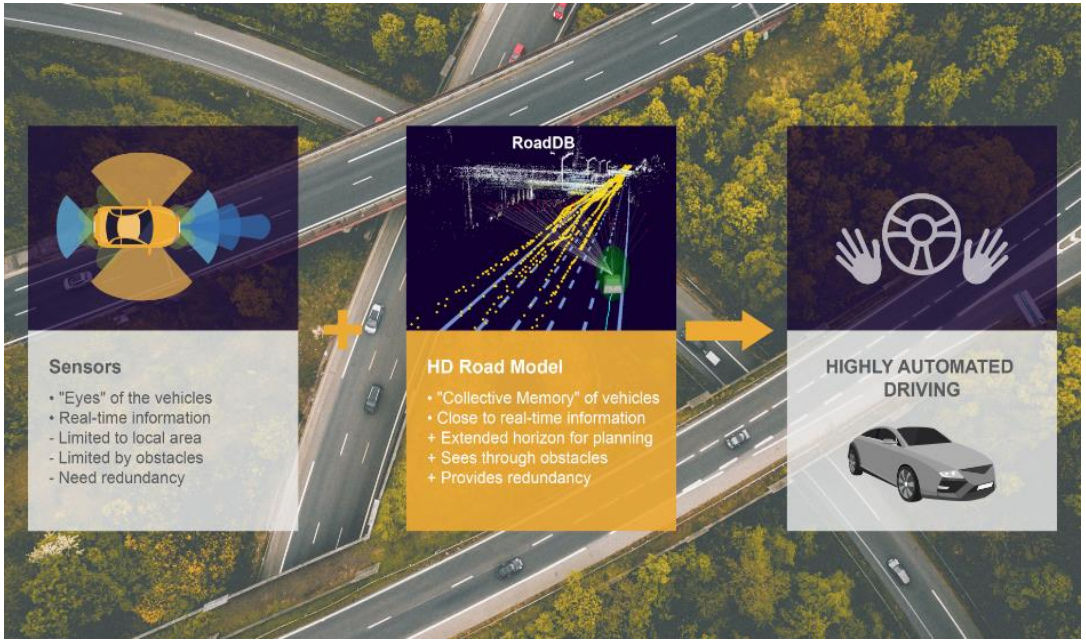
## Off-street & On-street parking



- Reservation & payment services
- Based on 3rd parties data & crowd sourced car environment sensing

# Maps as a Service
## RoadDB®

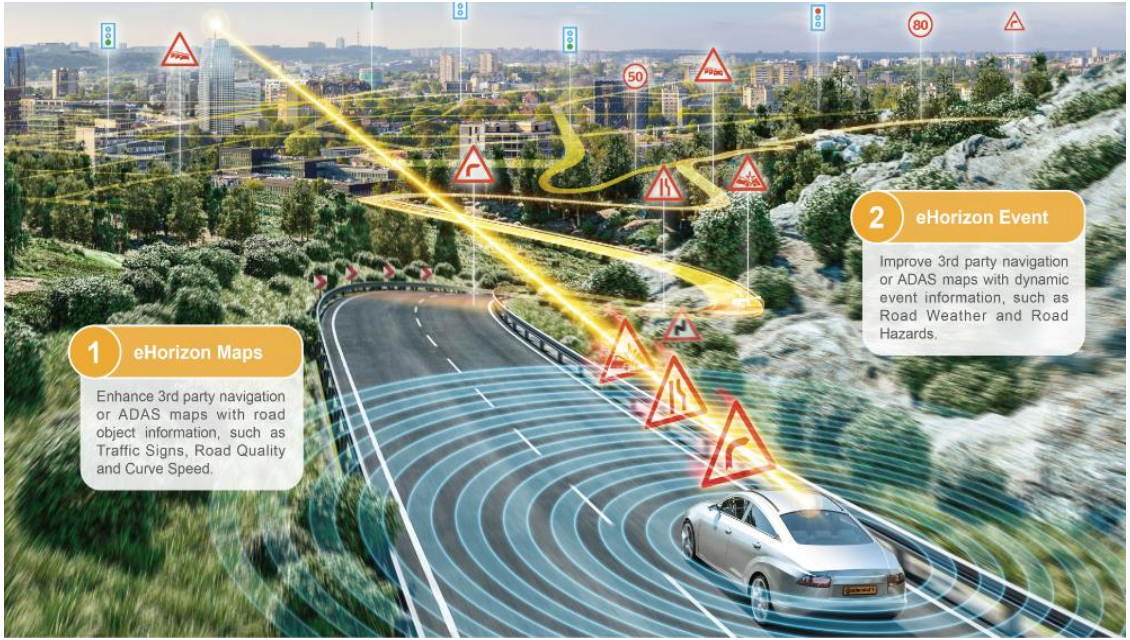
- RoadDB® is an **additional virtual sensor** in the vehicle providing reliable **HD road data** & **precise localization** to enable L3+ automated driving
- RoadDB® is an hardware agnostic software solution
- Developed to support up to ASIL D in-vehicle systems



# Maps as a Service

## eHorizon Maps & Events services

- For safety, environment or comfort matters, the vehicle needs information **beyond 300m** and **around the corner**
- eHorizon provides static & dynamic information on the road ahead, beyond sensor vision
- It supports assisted & automated driving functions



# Quelques exemples de services eHorizon

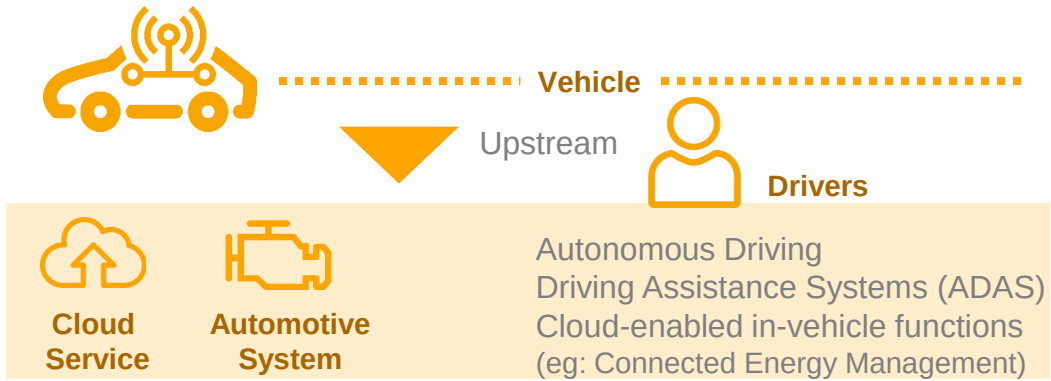
# eHorizon Services

## Traffic Signs

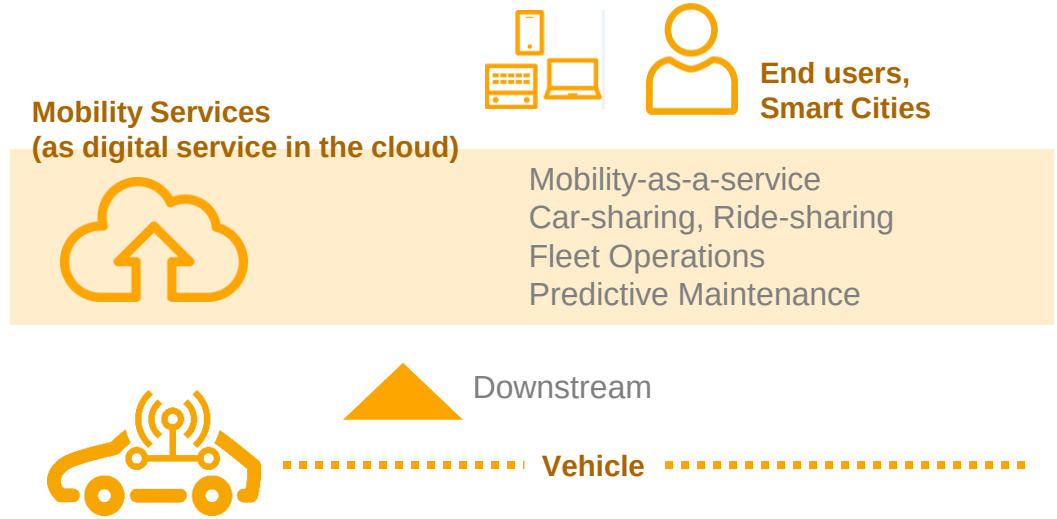
# Agenda

1. Continental et le futur de l'automobile
2. Intelligent Transportation Systems : Enjeux et Portefeuille
3. **Processus d'ingénierie et Organisation**
4. Défis de la sûreté de fonctionnement

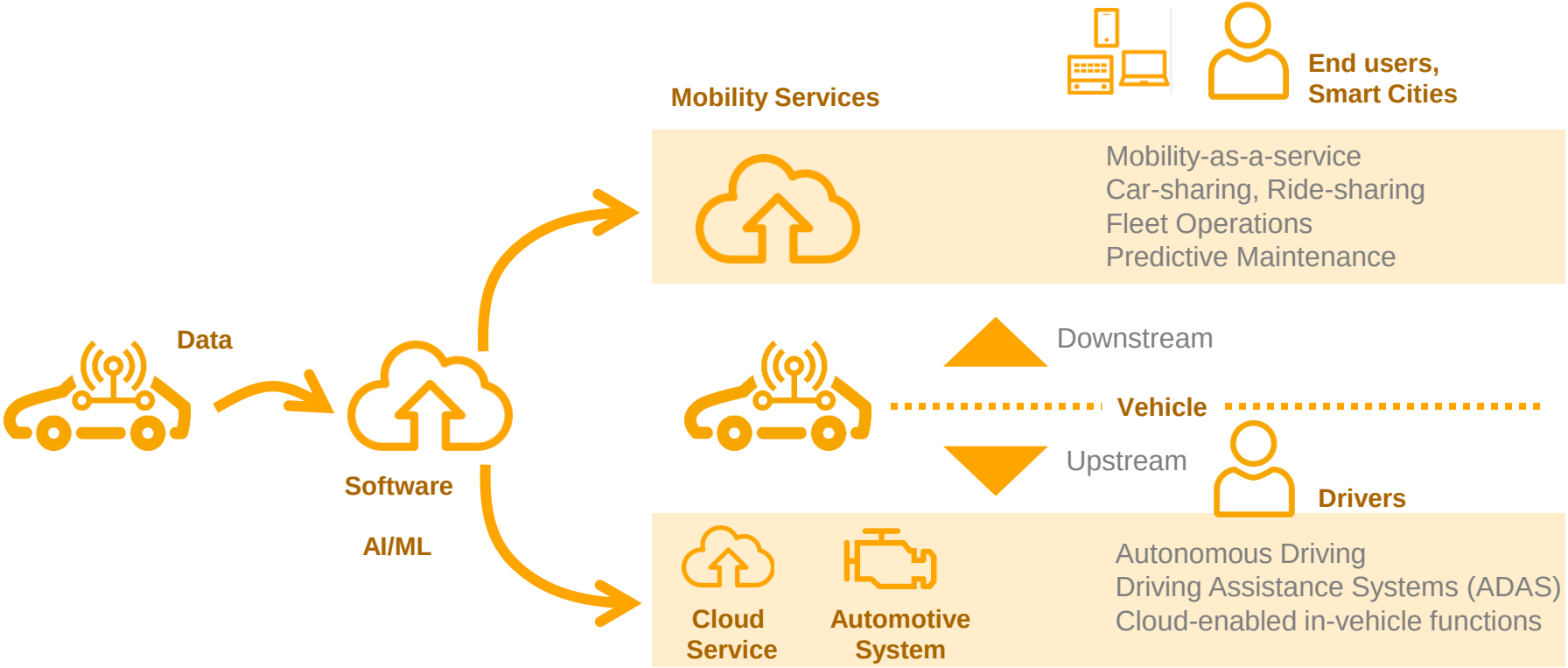
# What do we do?
# Better Cars… and Better Drivers in the future!



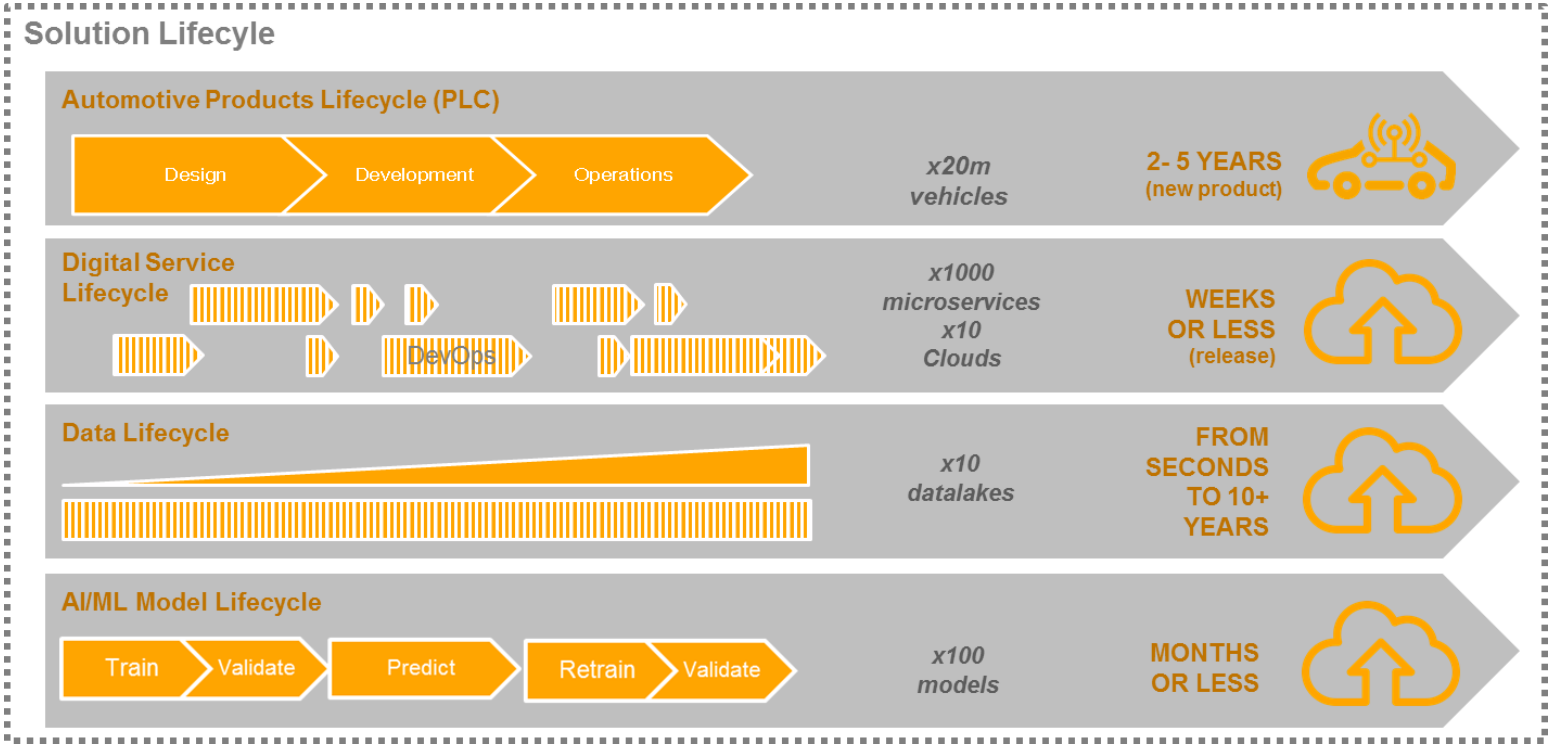
# What do we do?
# Better Mobile Life | Mobility Services



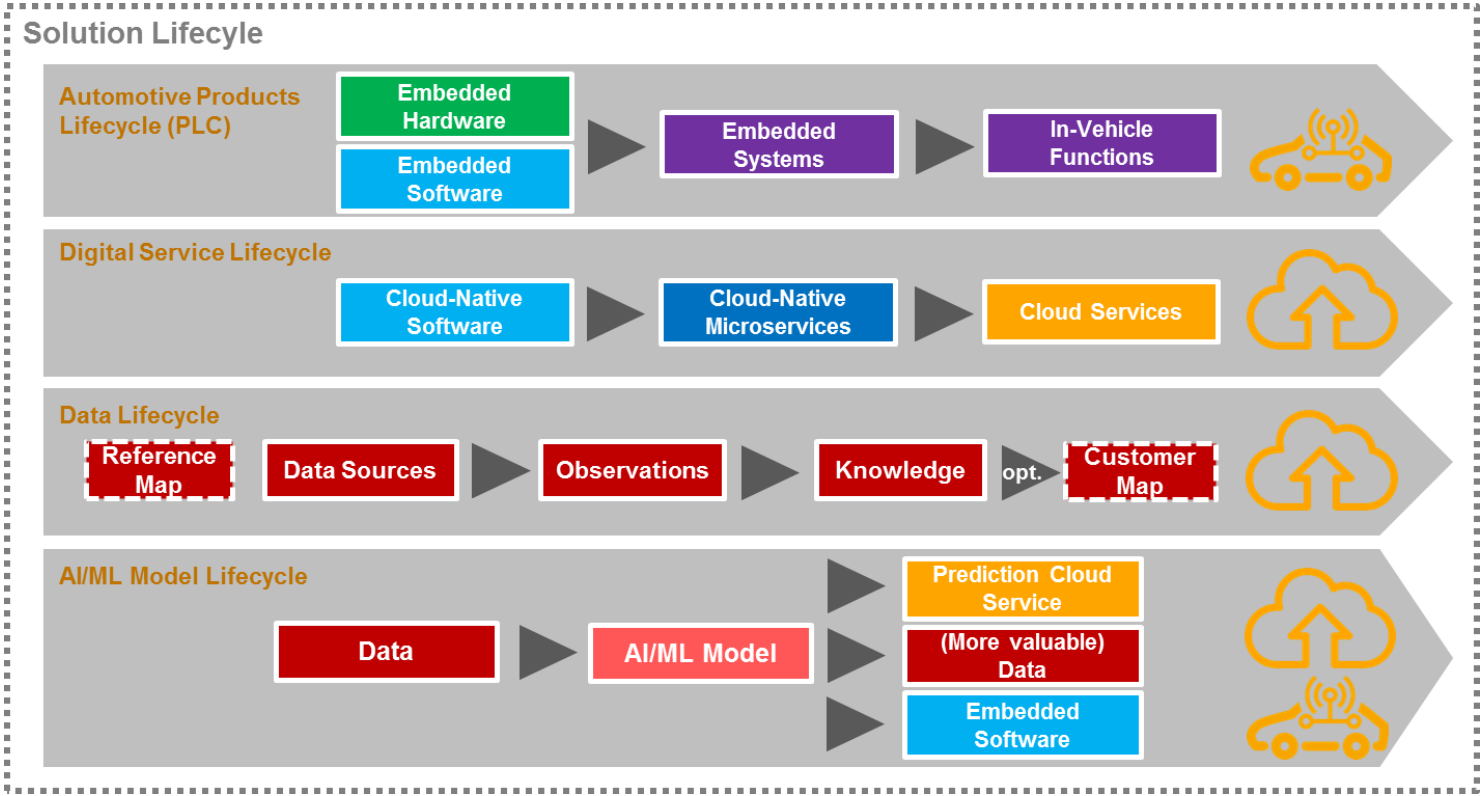
# What do we do?
# Better Cars & Mobility Services… Powered by Data & Artificial Intelligence



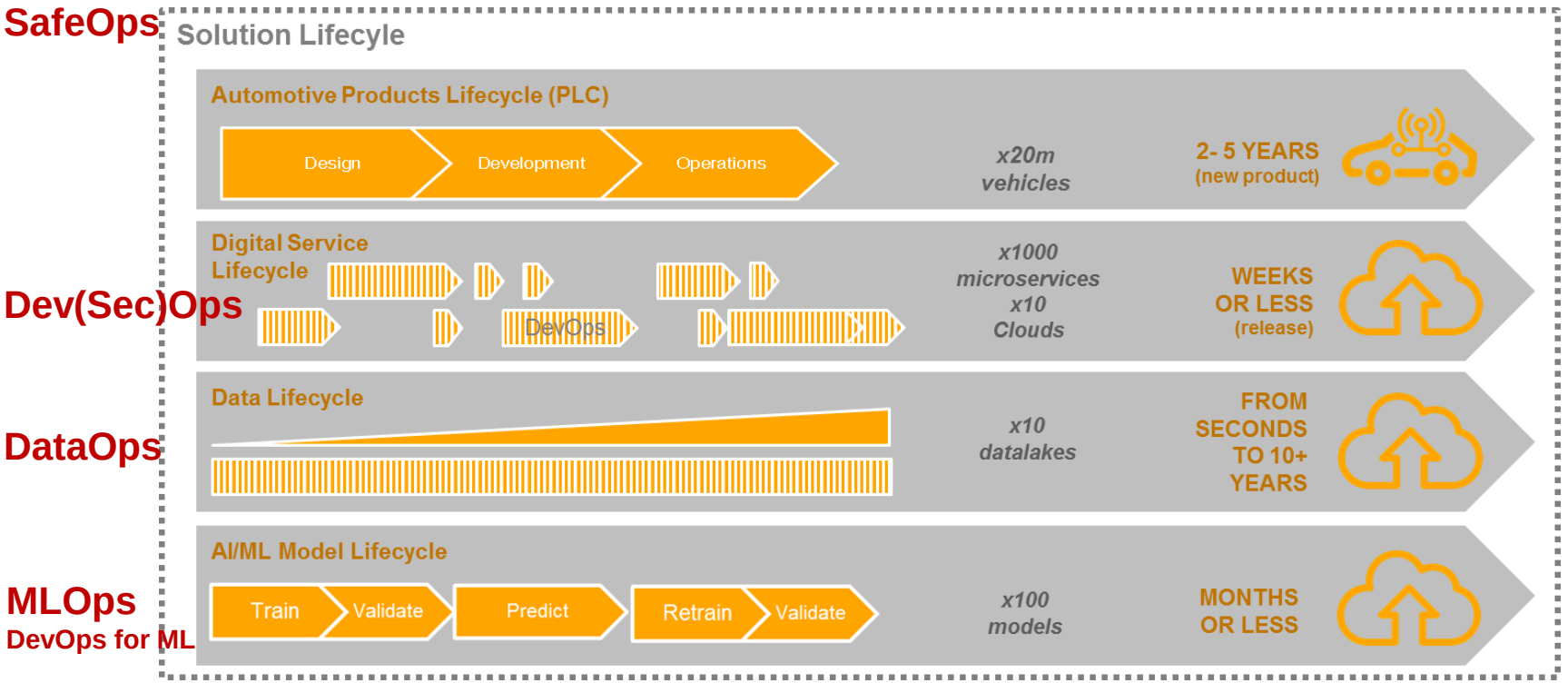
# Challenge #1 – Combine multiple lifecycles & engineering processes
# Challenge #2 – Embrace AI models engineering
# Challenge #3 – Consider Data as an asset, a competitive advantage



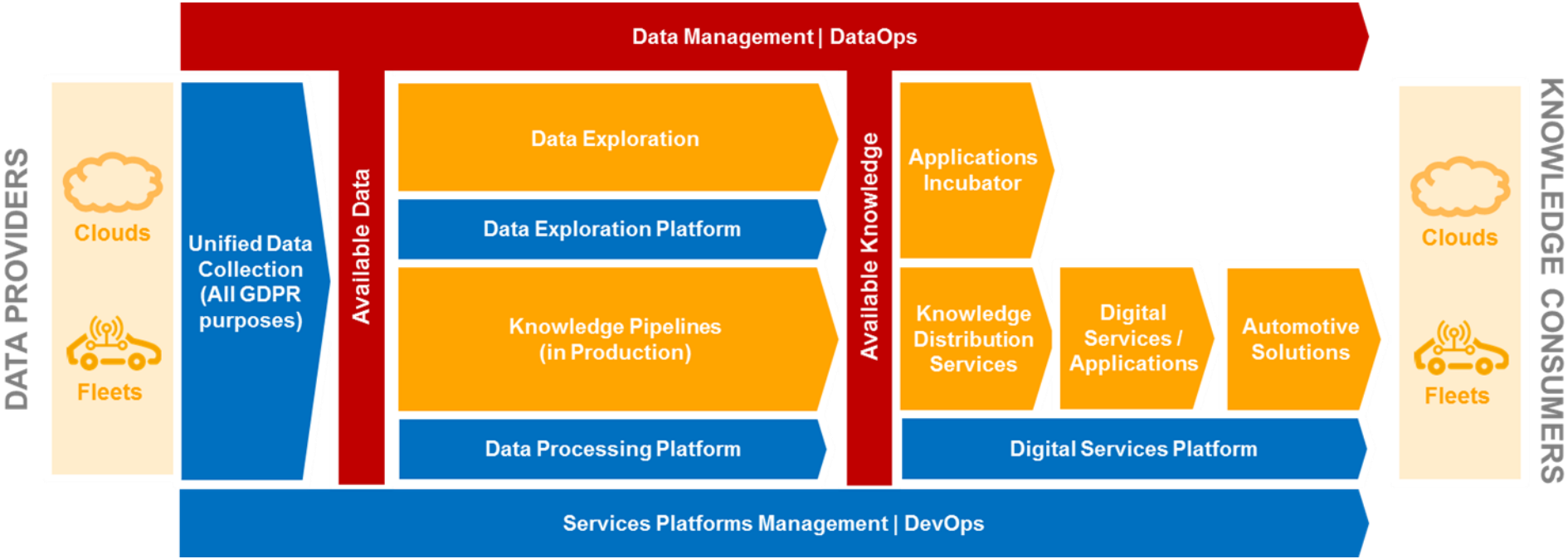
# Every kind of assets introduces new “concepts”, the “things” that we need to engineer (build, integrate and/or transform and then operate).



# We have to go beyond traditional automotive “System Engineering”



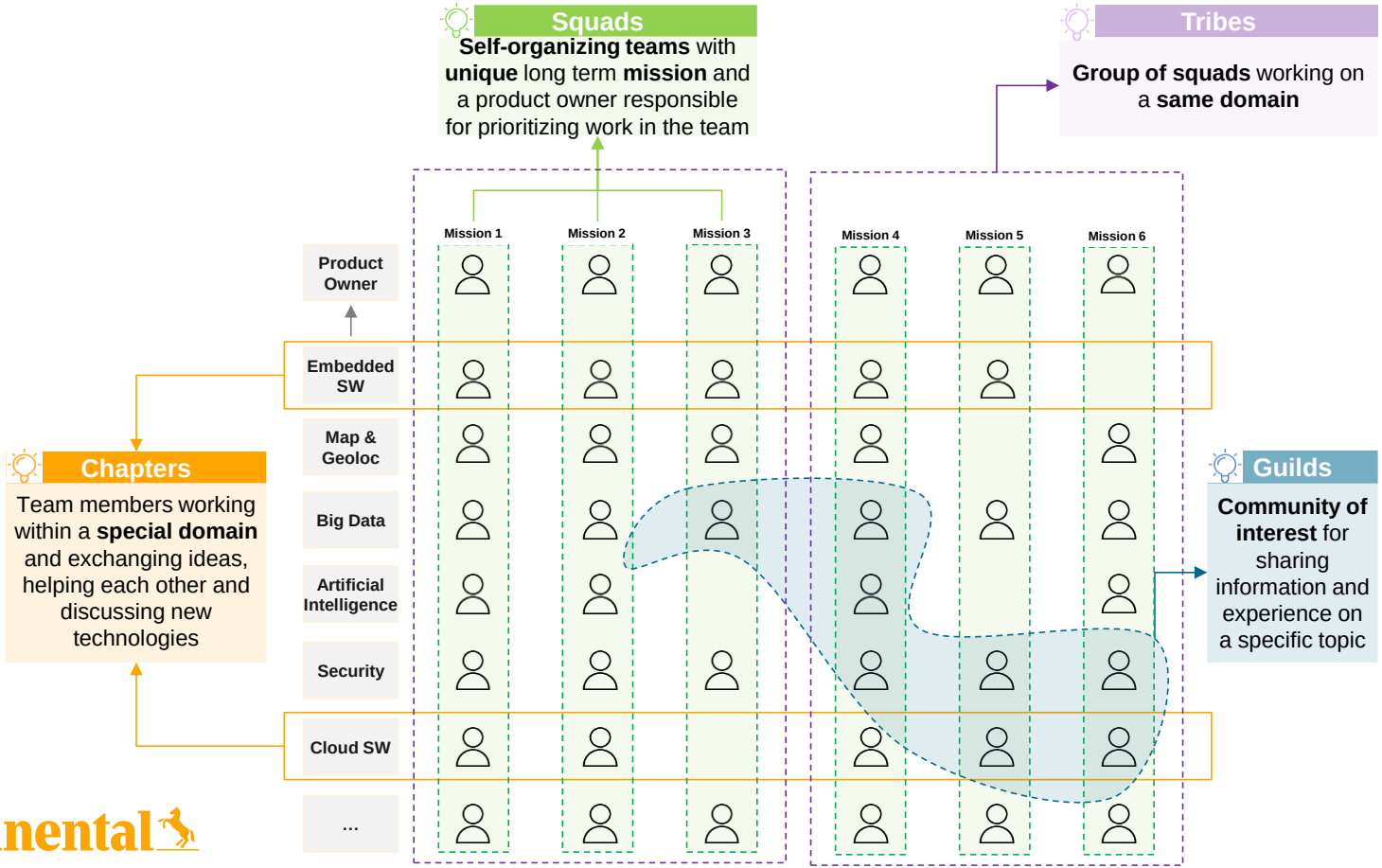
# Platforms to bring “structure” *and* keep options opened
## (simplified view omitting AI/ML)



# What we've initiated to address this cultural shift ;-)

- Agile organization (since day 1)
- Find/Hire people with (all) the right skills and background (digital 90% | automotive 10%)
  - From 10 to 180+ in 12 months
- Business strategy ➔ Prioritize Markets & Products
- Tech strategy ➔ In which areas we need to go beyond the state of the art?
- Trust our people
- Assume that answers and solutions will emerge…

# Our organization – iteration 2



# Our organization – iteration 5 (or 6…): Introducing “Communities”

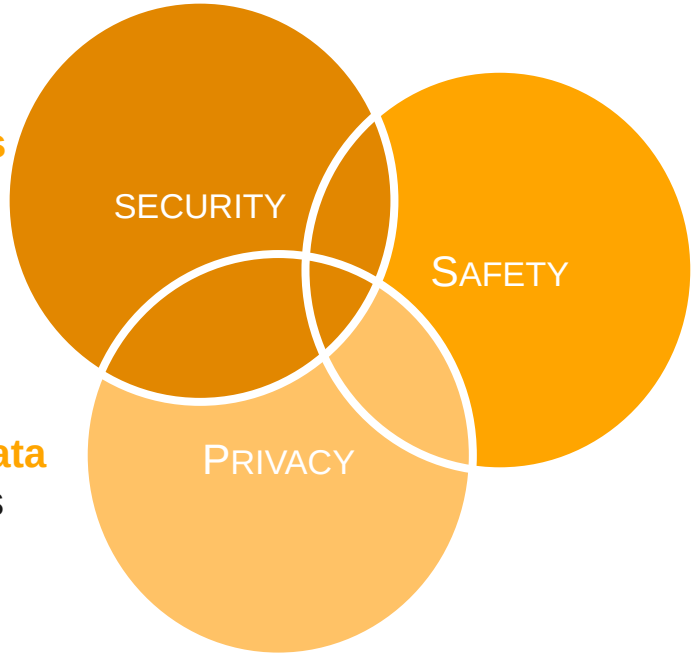
- For a few selected transverse & strategic topics (including Data)
- Merging Business & Technology Drivers
- Promote & enforce a data-driven culture
- Multidisciplinary (Cross-chapters) and cross-products
  - Distributed Data Pipelines, AI, Cloud-Native, Geolocation, Cybersecurity, Privacy, Safety…
- Ability to influence strategy and to make decisions
- A way to increase our agility while still growing fast
- Innovative & Unanticipated opportunities
  - data network effects, explainable AI, tokenization…
- Specific “sharing & learning” events ➔ Community Weeks

# Agenda

1. Continental et le futur de l'automobile
2. Intelligent Transportation Systems : Enjeux et Portefeuille
3. Processus d'ingénierie et Organisation
4. Défis de la sûreté de fonctionnement

# Dependability
## A bunch of challenges for a tripartite team

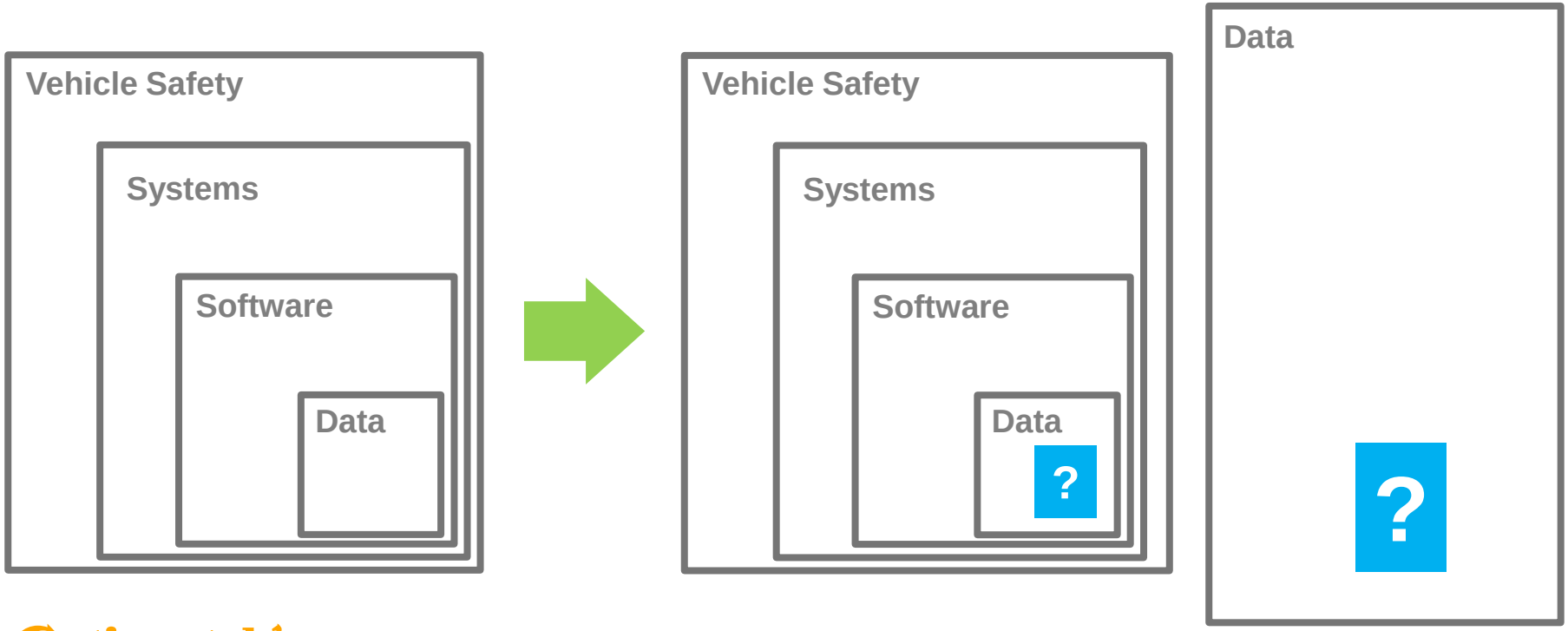
We **protect information systems** from unwanted events



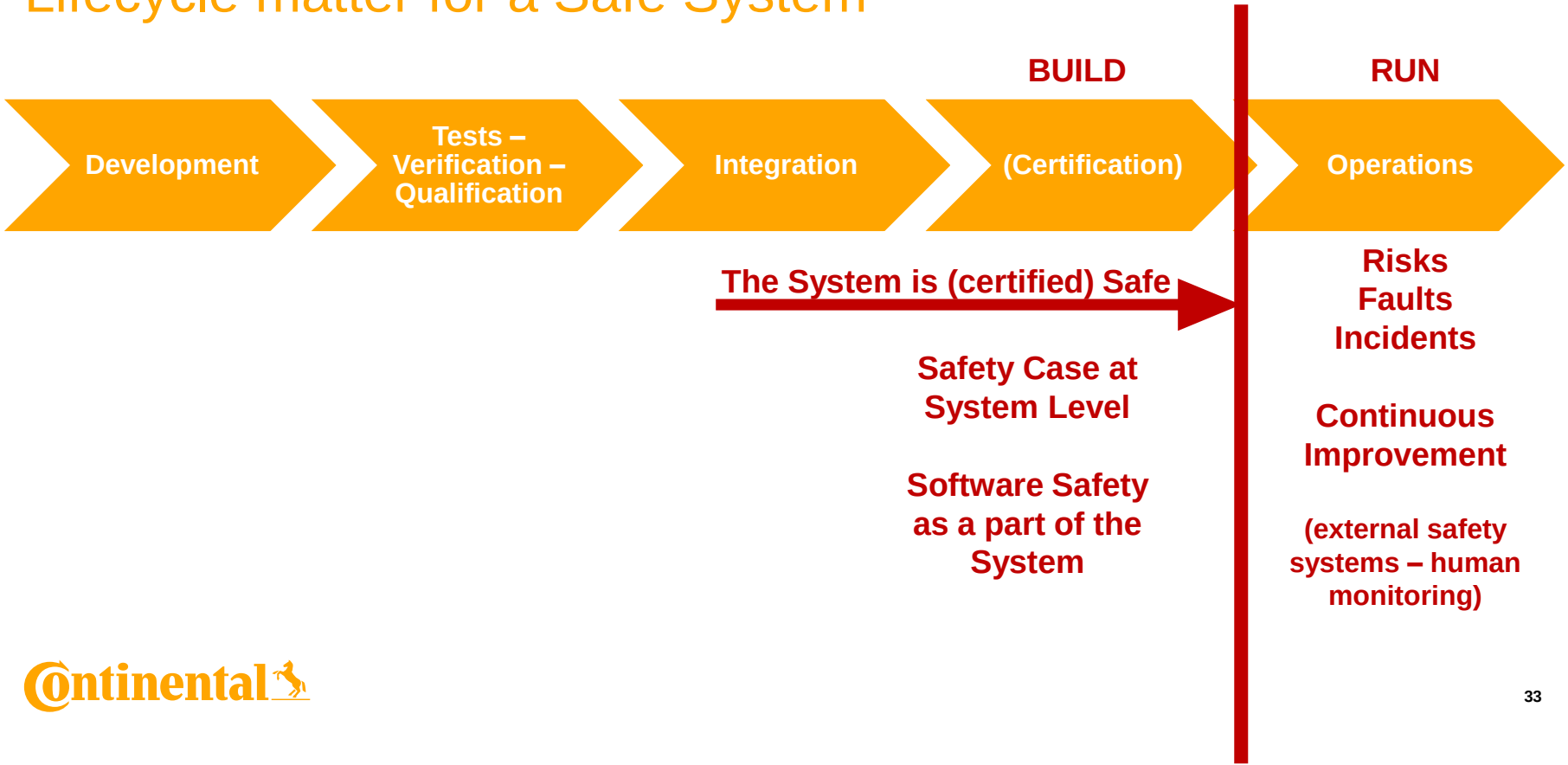

We **protect people's life** from unwanted events

We **protect personal data** from unwanted events

# Data Safety (1/3)
## Data is NOT only IN the systems



# Data Safety (2/3)
## Lifecycle matter for a Safe System



# Data Safety (3/3)

## What about data in the Safe System lifecycle ?

**BUILD** (Certification) | **RUN** Operations

**The System is (certified) Safe**

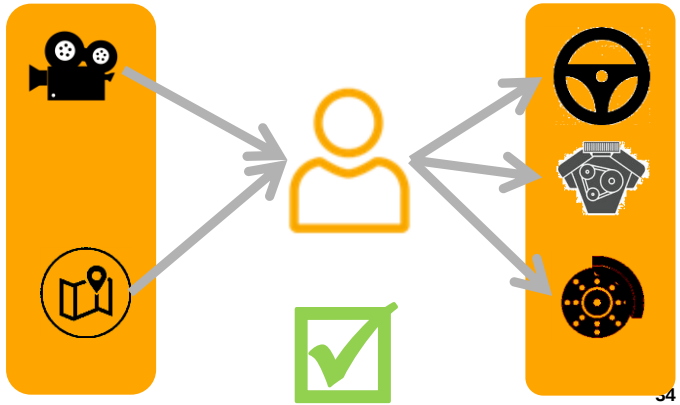
**Safety Case at System Level**

**Software Safety as a part of the System**

**Risks**
**Faults**
**Incidents**

**Continuous Improvement**

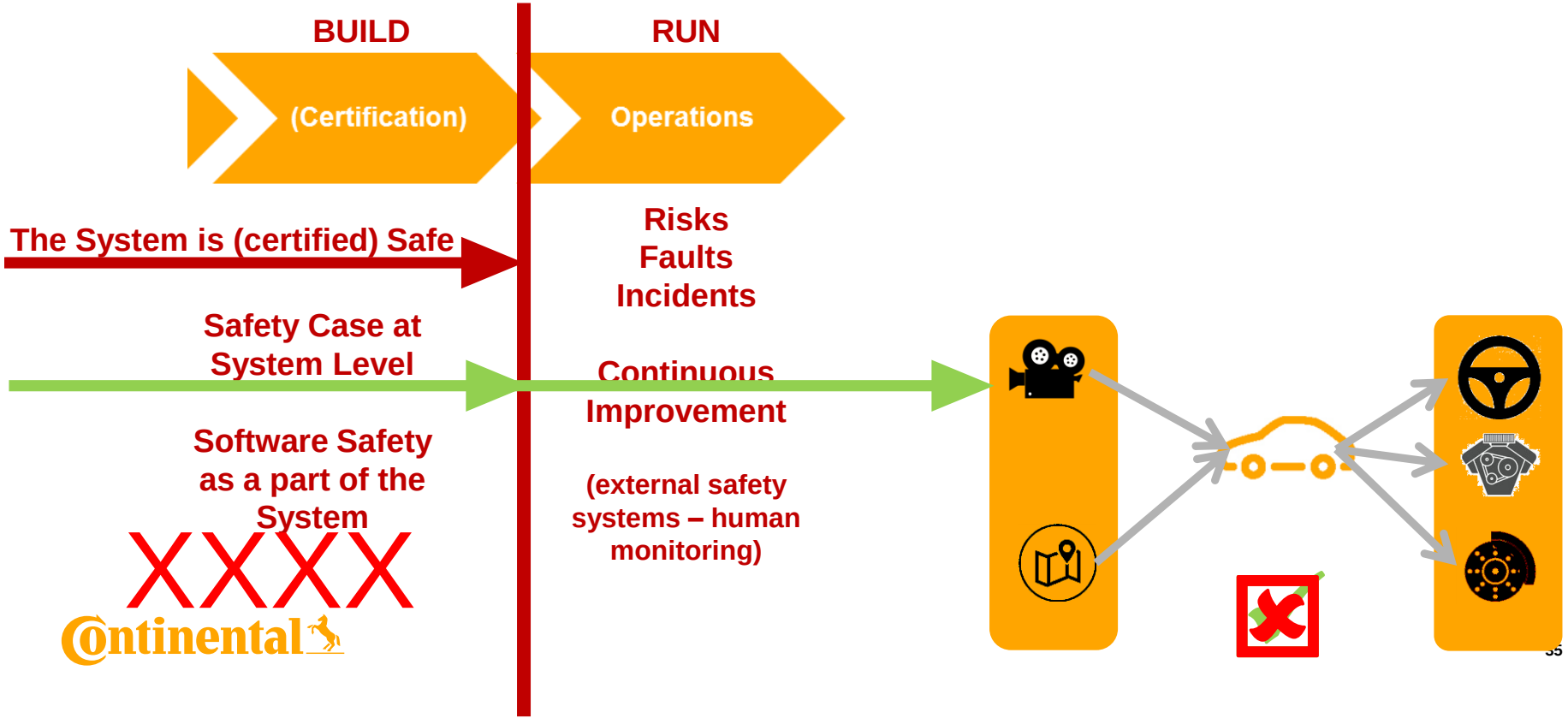
**(external safety systems – human monitoring)**



Continental

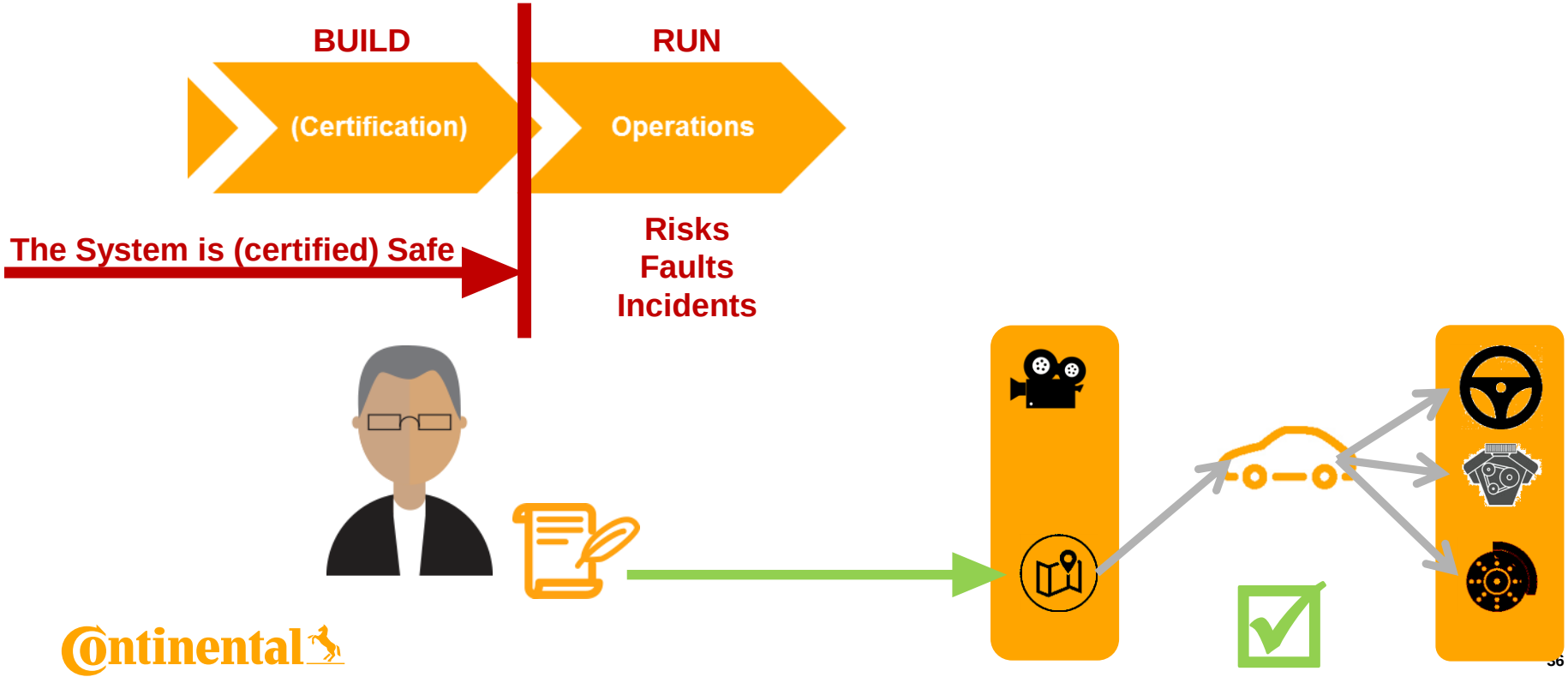
# Data Safety (3/3)

## What about data in the Safe System lifecycle ?



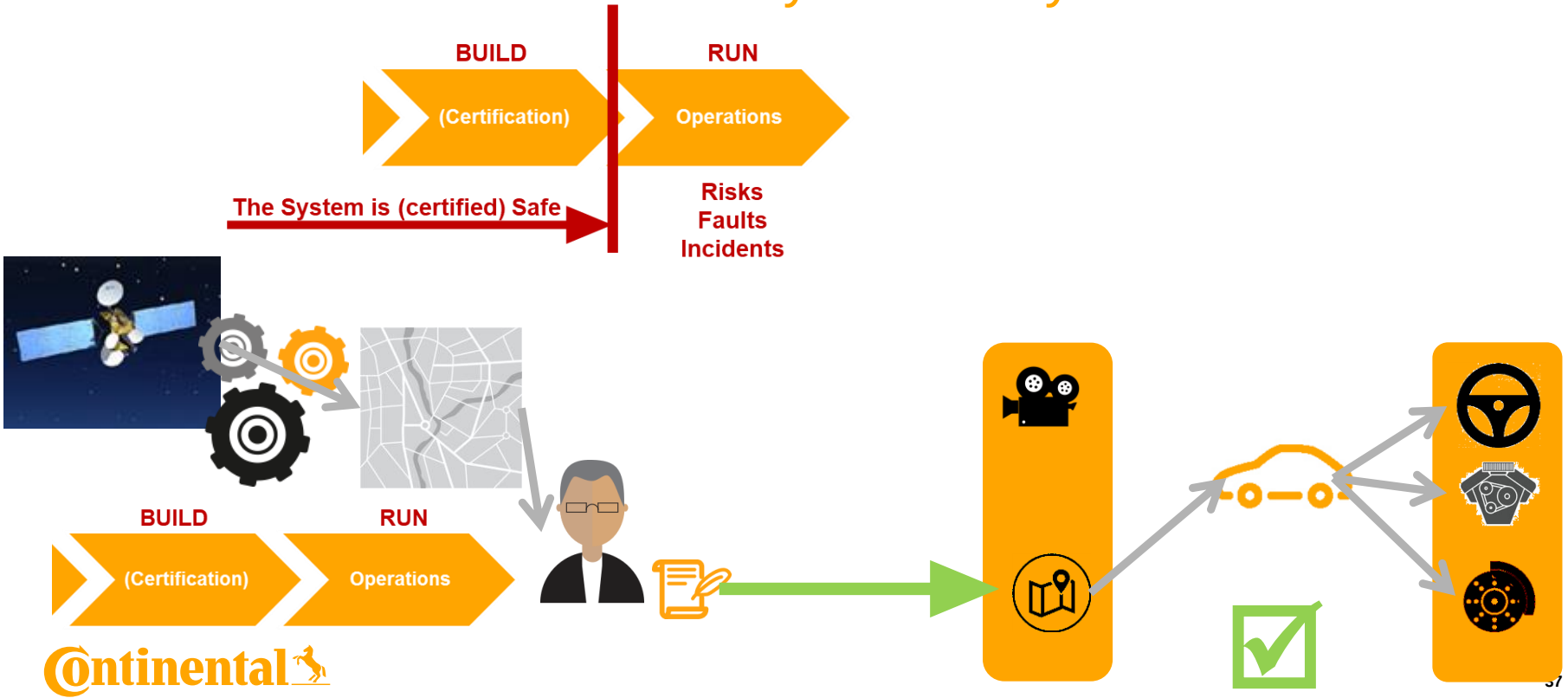
# Data Safety (3/3)

## What about data in the Safe System lifecycle ?



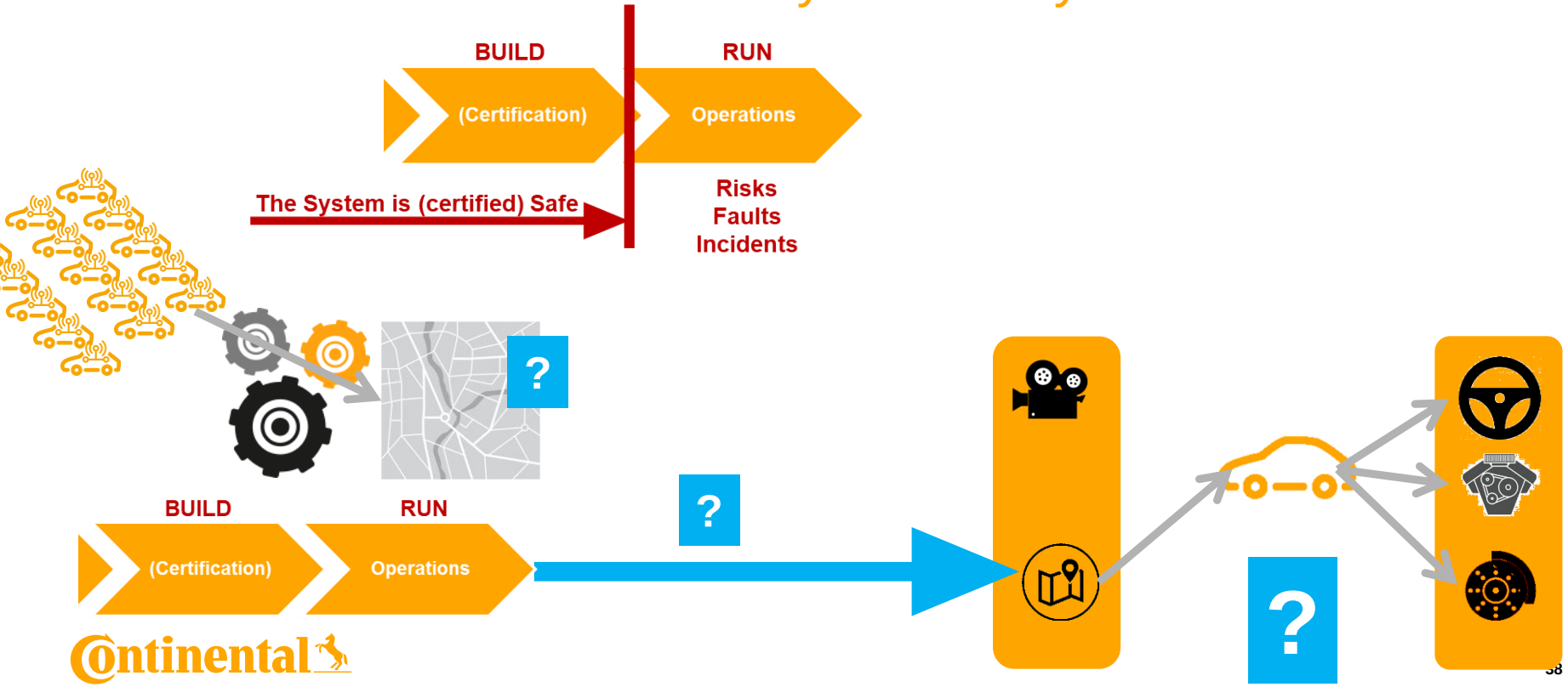
# Data Safety (3/3)

## What about data in the Safe System lifecycle ?



# Data Safety (3/3)

## What about data in the Safe System lifecycle ?



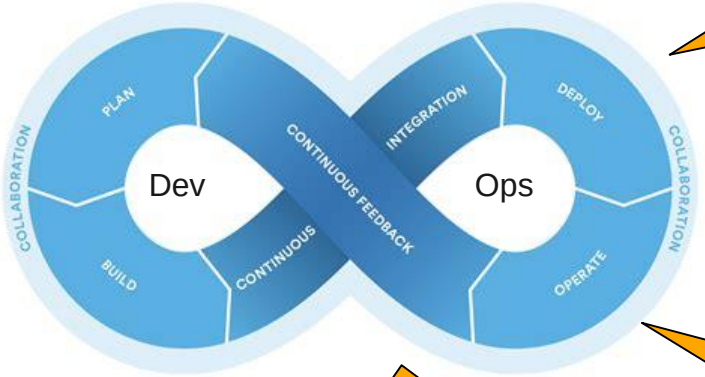

Continental

# Continuous Safety
## From DevOps to SafeOps

› **DevOps motto** : « Think, Code, Deploy, Run, Manage, Learn »

**Dev** part is short, but infinite loop with **Ops** is created

**Dev** part is heavy, and nothing on **Ops** part




› **V-cycle* :** specify, architecture, design, and integrate, verify, validate

*or cascade of abstractions

Continuous change is mandatory : the needs change with time ; cyber security risks force frequent changes ;

*Note that this concept exists in critical systems, but in a « long loop style »*

**Ops** part is an **opportunity :**
- To enhance safety through **observation**
- We imagine **progressive safety concept**

DevOps strong **automation** is a great opportunity for **safety**

# Safe AI/ML (1/2)

## Needs

using AI/ML based system to benefit from

- added value data production (cloud)
- complex environment analysis and decision (embedded)

imply to

- ensure confidence level, with an acceptable level of risk

## Problems

- Data based automatic code generation
- Not in the state of the art neither of manual coding, nor of “certified” code generation
- Data centric systems and development (for learning, verification, or validation)
- Injection of uncertainty in software!

# Safe AI/ML (2/2)
## 3 level of projects

- **ITS Toulouse**
  - discussions bw data scientist + safety guys
- **Continental**
  - working group bw divisions
- **DEEL/Certif**
  - Collaborative research project launched by the IRT Saint-Exupery
    - Core team: Data scientists +Mission team: certify/safety
    - Railway+Aeronautics+Automotive
    - DEEL: 5 years; certif: 1 year + …
    - Next future in 3AI “ANITI”

→ **Culture mixing at the heart**

→ **Sharing of problems and research**
→ **Common point of view**

→ **Mix of cultures**
→ **A lot of discussions, to define the perimeter, the priorities…**
→ **Process analysis => to identify error injection**
→ **Questions like “how to specify?”, “how to deal with uncertainty?”**
→ **Key concepts:**
  → **Explainability, Robustness, Interpretability, Stability**
  → **How do they fit with safety and certification ?**

Continental

# Questions ?

**Merci**
De votre attention !