



Kontrol



Legal compliance of automated
driving functions (ADAS/AD)

THIS IS WHAT HAPPENS WHEN WE DO NOT FOLLOW THE TRAFFIC RULES



3rd November 1967
The day Sweden switched
from driving on the left to
right side of the road –
Dagen H

Legal Situation

Vehicle regulations

Provisions for vehicles (Homologation law)

International level: broad detailed regulations

National level: widely harmonized

Provisions for drivers (Road traffic law)

International level: little regulation

National level: detailed, different, disharmonised



UN/ECE R 157, 79



ARIZONA

Laissez-faire, hands-off regulatory approach.



COLORADO

Welcoming testing environment.



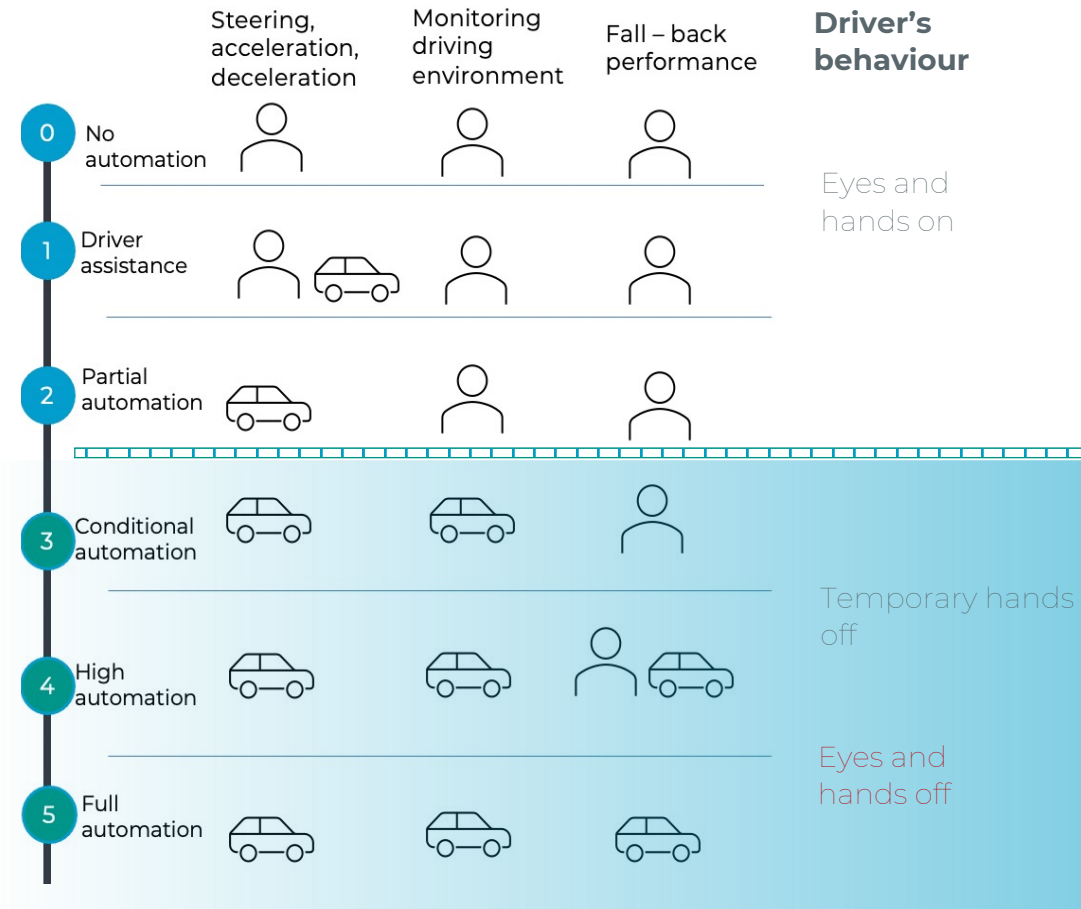
**StVO
StVZO**

Vehicle rules are capturing driver rules!

Motivation

approx. 80 million new cars are sold yearly

98% of those cars have **Advanced Driver Assistance System**



? **SAFETY & INSPECTION**

? **TESTING**

? **REGULATORY**

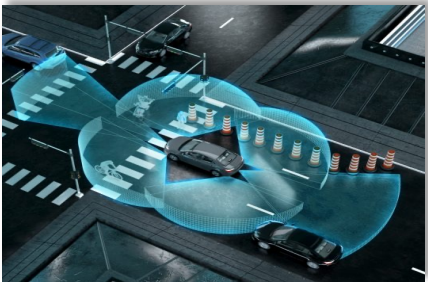
? **LIABILITY**

ADAS/AD chain of effects

1

Sense

Sense the environment



2

Perception & Localization

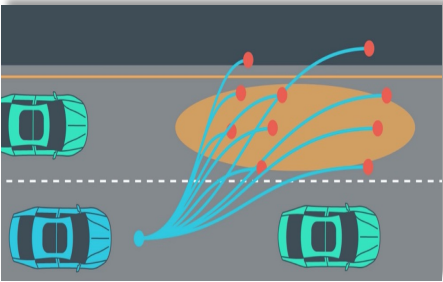
Understand the world



3

Behavior/ Motion Planning

Calculate trajectory and behavior



4

Validation & Verification

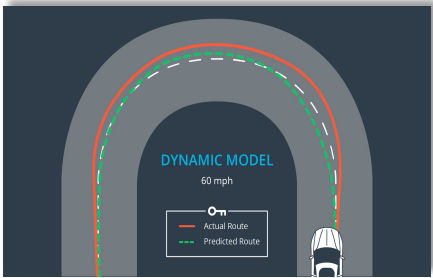


Certification

5

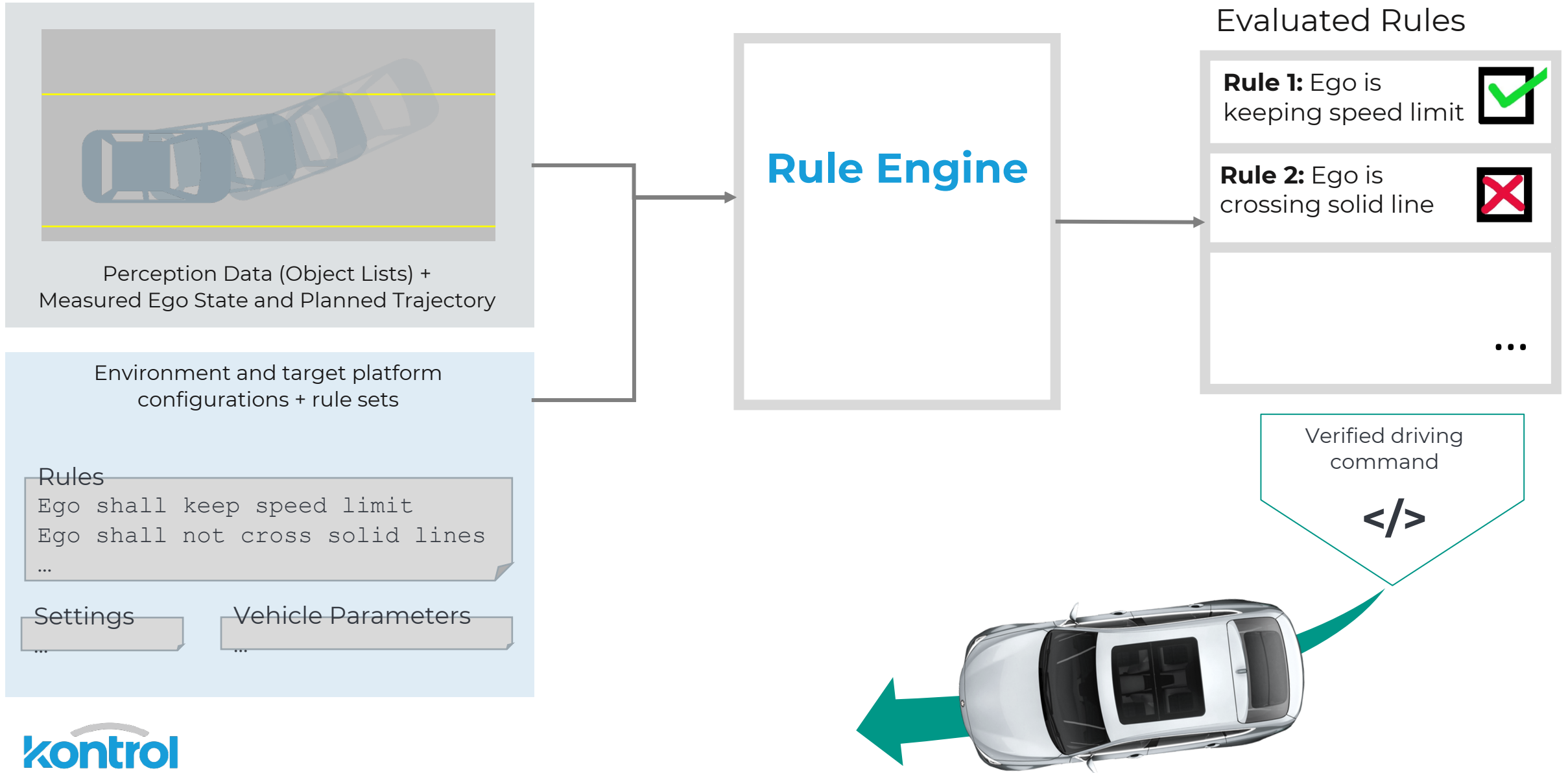
Vehicle Control

Follow trajectory and control car



Rule-based Verification

At a High Level



Checking the Rules

STEP 1: Calculate area reachable by planned trajectory

STEP 2: Apply rules

STEP 3: Verify path

Rule 3: Keep safe longitudinal distance

Rule 2: Keep safe lateral distance

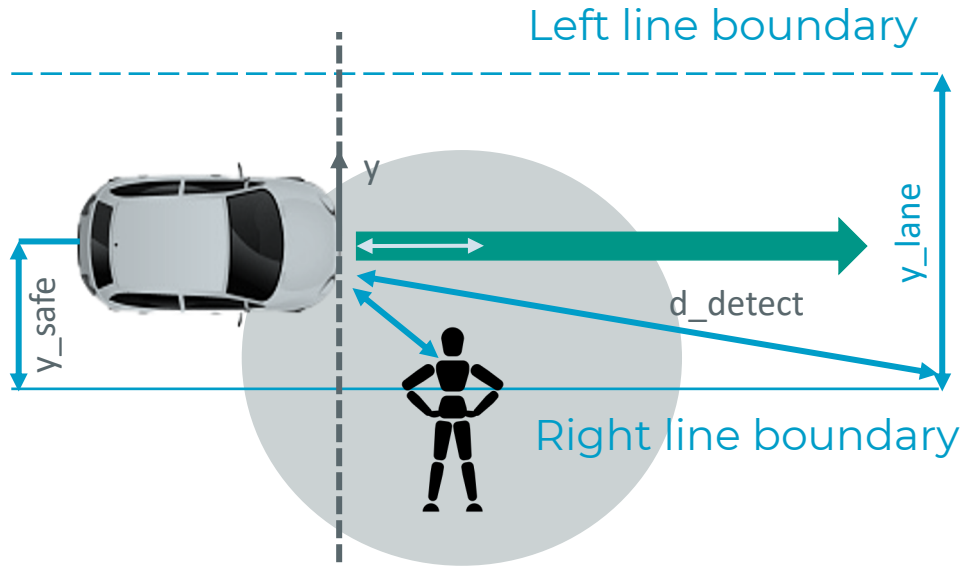
Rule 1: Do not cross Solid line

Compliant & Safe

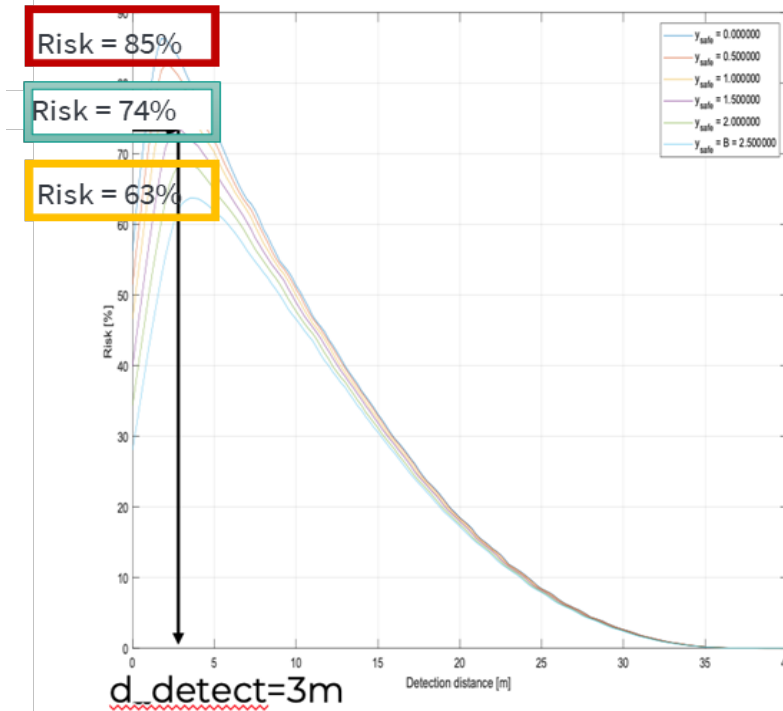
Kontrol increases vehicle safety since planned trajectory is always verified for compliance with traffic legislation

Rule Interpretation – Example

Rules with room for interpretation



Step 1.
Transform traffic regulation into precise, logical formulas written in human and machine-readable language



Step 2.
Identify situation where rules apply and quantify the risk

Derive KPI's for sensors and path planners.

STEP 3.

Verify trajectory against rules set and give feedback.

Reports & Optimization

Warning
to nominal system
in case of violation.
+ Logging

Your Solution

Features:

- ✓ Requirements as a service
- ✓ Converts very complex traffic legislation into machine readable language
- ✓ Monitors the legal compliance of ADAS/AD behaviors with traffic regulations
- ✓ Optimized and quantifiable risk estimations.
- ✓ Objective KPI's for your ADAS/AD function.
- ✓ Runtime verification and real time data
- ✓ Evaluated set of data.
- ✓ Applicable to all mobility topics: cars, trucks, drones, planes, ships, delivery robots

APPLICATIONS



R&D and Data analysis, Parameter definition



Vehicle verification in real time/secondary safety layer.

Demonstration at testing ground - Video



THANK YOU

Christian Eder
VP Business & Project Development
+49 151 68832590
Ch.eder@kontrol.tech