



## The L3Pilot Approach

From vehicle data collection to a common data base

EUCAD 2021

Online-Event

**Barbara Metz**  
**Johannes Hiller**



# The L3Pilot project - aims

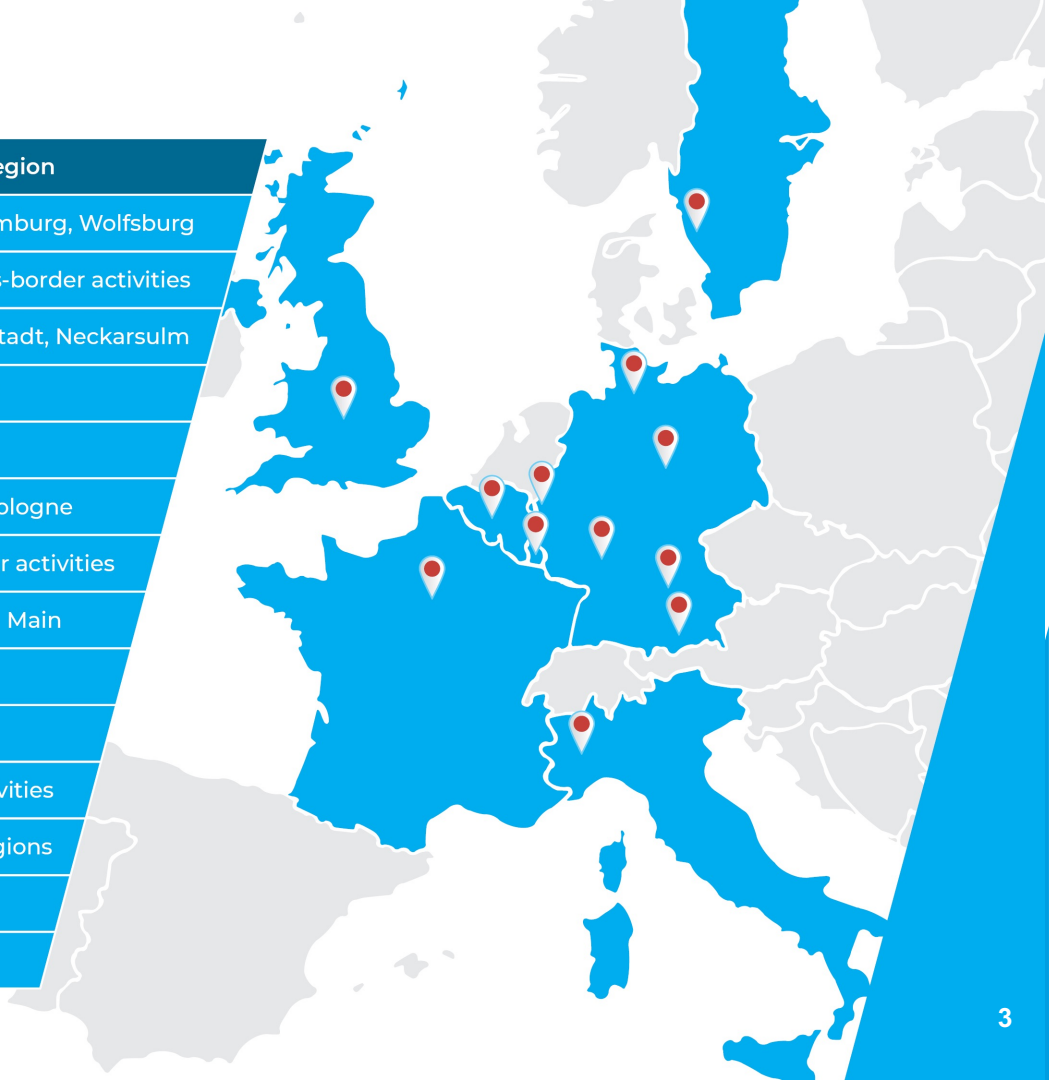
The European research project **L3Pilot**

- tests the viability of automated driving as a safe and efficient means of transportation on public roads.
- focuses on large-scale piloting of SAE Level 3 functions.
- tests the technologies over a wide range of driving situations, including parking, driving on highways and driving in urban areas.
- provides valuable data for **evaluating technical aspects**, user acceptance, driving and travel behaviour, as well as impact on traffic and safety.

Project duration: Sept. 2017 – Oct. 2021

# Pilot across Europe

Partner	Country	Region
Volkswagen	DE	Hamburg, Wolfsburg
Aptiv	DE, LU, FR	cross-border activities
AUDI	DE	Ingolstadt, Neckarsulm
BMW	DE	Munich
CRF	IT	Turin
FEV	DE	Aachen, Cologne
Ford	DE, BE, UK	cross-border activities
Honda	DE	Frankfurt am Main
ika	DE	Aachen
JLR	UK	Coventry
PSA	FR, DE	cross-border activities
Renault	FR	Paris and other regions
Toyota	BE	Brussels
Volvo Cars	SE	Gothenburg



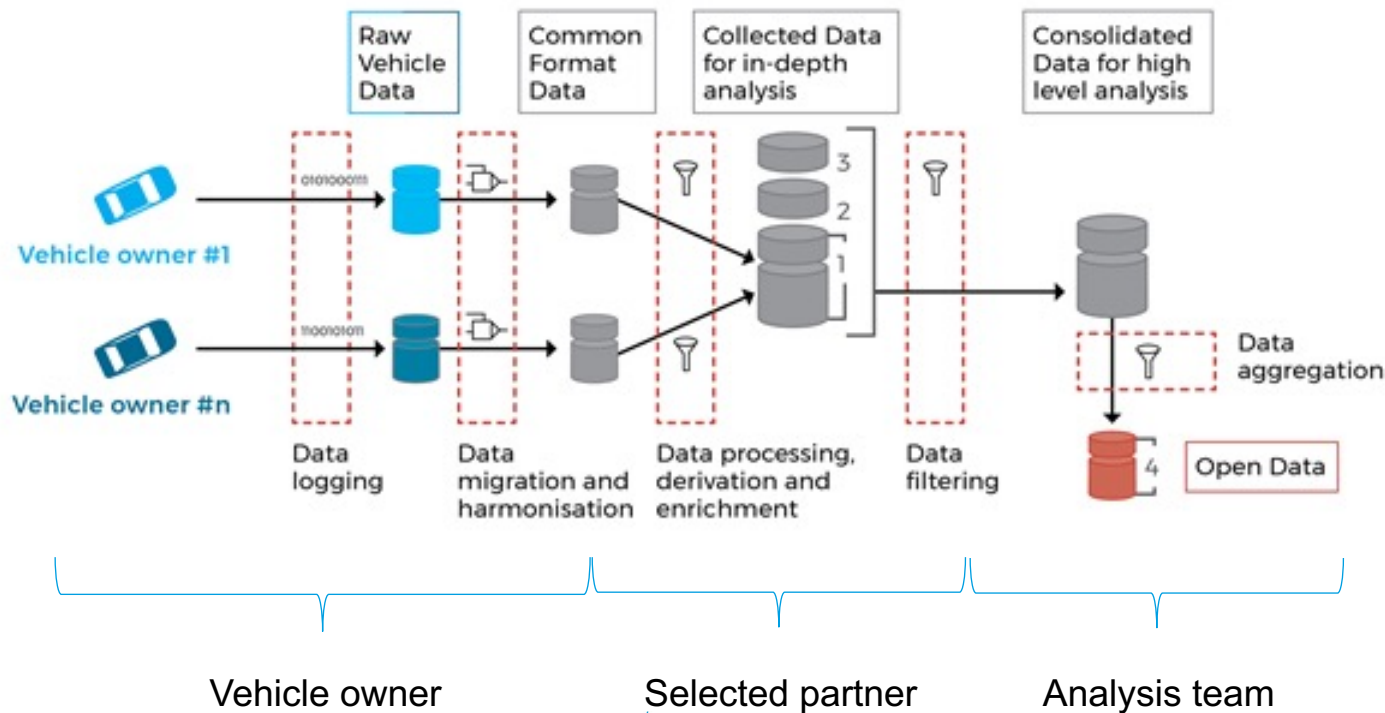
## The L3Pilot project – Challenges for data analysis

For the evaluation of technical aspects of motorway functions, data from **11** different **tests sites** logged in **7 European countries** is available.

Requirements on data processing & analysis:

- Harmonized analyses across all involved test sites.
- Keeping confidentiality of vehicle owners and avoid benchmarking:
  - All results need to be based on more than one test site.
  - Results can not be traced back to specific test sites, not even by data analysis team.

# The L3Pilot project – Data flow for motorway pilot



## Data processing by vehicle owners

To ensure that all motorway data can be analysed in a harmonized way each vehicle owners converts its data into a **common data format**.

The common data format specifies

- All required signals
- Units and resolution for continuous signals and coding for categorical signals
- Unified coordinate system e.g. for object data

Trip based data in the common data format is handed over to selected partner.

## Data processing by selected partners

To ensure that all motorway data can be analysed in a harmonized way

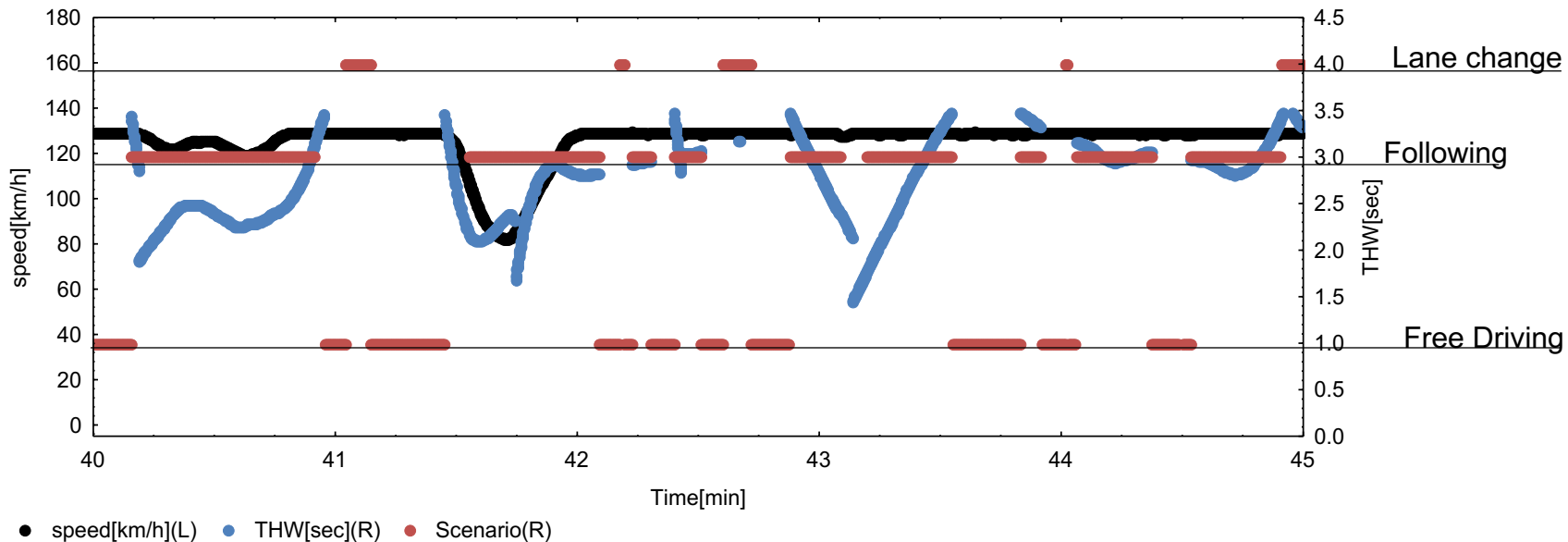
- continuous trip based driving data is segregated into **driving scenarios**, which serve as the basic unit for data analysis.
- selected partner use **common scripts** to process the data and derive the performance indicators needed to answer the research questions.

The commonly used scripts

- Segregate the contiguous data into driving scenarios.
- Calculate performance indicators separately for the identified driving scenarios.

Performance indicators per driving scenario are uploaded anonymized into a **consolidated database**.

# Segregation into driving scenarios - example





## Data analysis by analysis team

Based on the data in the consolidated data base, research questions on impact of motorway functions on driving behaviour are answered by:

- Analysing performance indicators per driving scenario
- Comparing measured driving behaviour in **baseline condition** and with **activated motorway function**.

Through the consolidated data base it is guaranteed:

- That results are based on all available data from all test sites.
- That data from single test sites can not be identified.

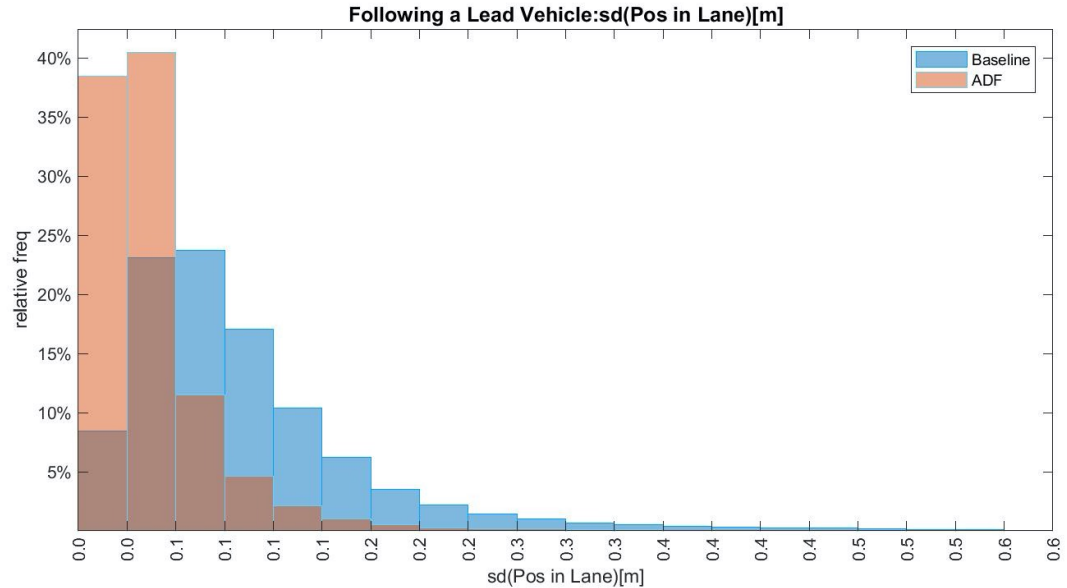
# Combined analysis - example

Scenario: Following a Lead Vehicle

RQ-T7: Lane keeping

Performance indicator:

Standard deviation of lane position



## Data analysis in L3Pilot - Conclusions

Because of the requirements on data security and confidentiality, a complex process for data processing and data analysis was implemented.

Through this process it is achieved that research questions can be answered

- In a harmonized way
- Based on all available data
- Without being able to identify the source of the data


Data set	Level of detail	Type of information	Access
Logged data	High	continuous information, all signals logged by vehicle owner	Vehicle owner
Common data format	Medium	continuous information, commonly defined subset of signals	Selected partner
Consolidated data base	Low	aggregated data per scenario / trip	Analysis team

# Data analysis in L3Pilot – Lessons learned

Implementing and testing the presented process required a considerable amount of time and work:

- Individual NDAs between vehicle owners and selected partners can take months.
- Setting up a data base that meets requirements of vehicle owners on confidentiality but still meets the needs of researchers requires lots of discussions.
- Successful conversion of logged data into common data format requires repeated and thorough testing by vehicle owners and selected partners.
- Errors in the conversion to common data format or in the common scripts sometimes become visible only after the full process of data analysis (e.g. by verifying the detected driving scenarios based on the video).
- ....

# Thanks to all Partners in L3Pilot

OEMs	       	       
Suppliers	  	    
SMEs	 	       
Insurers	 	
		 



Thank you for your kind attention.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723051.