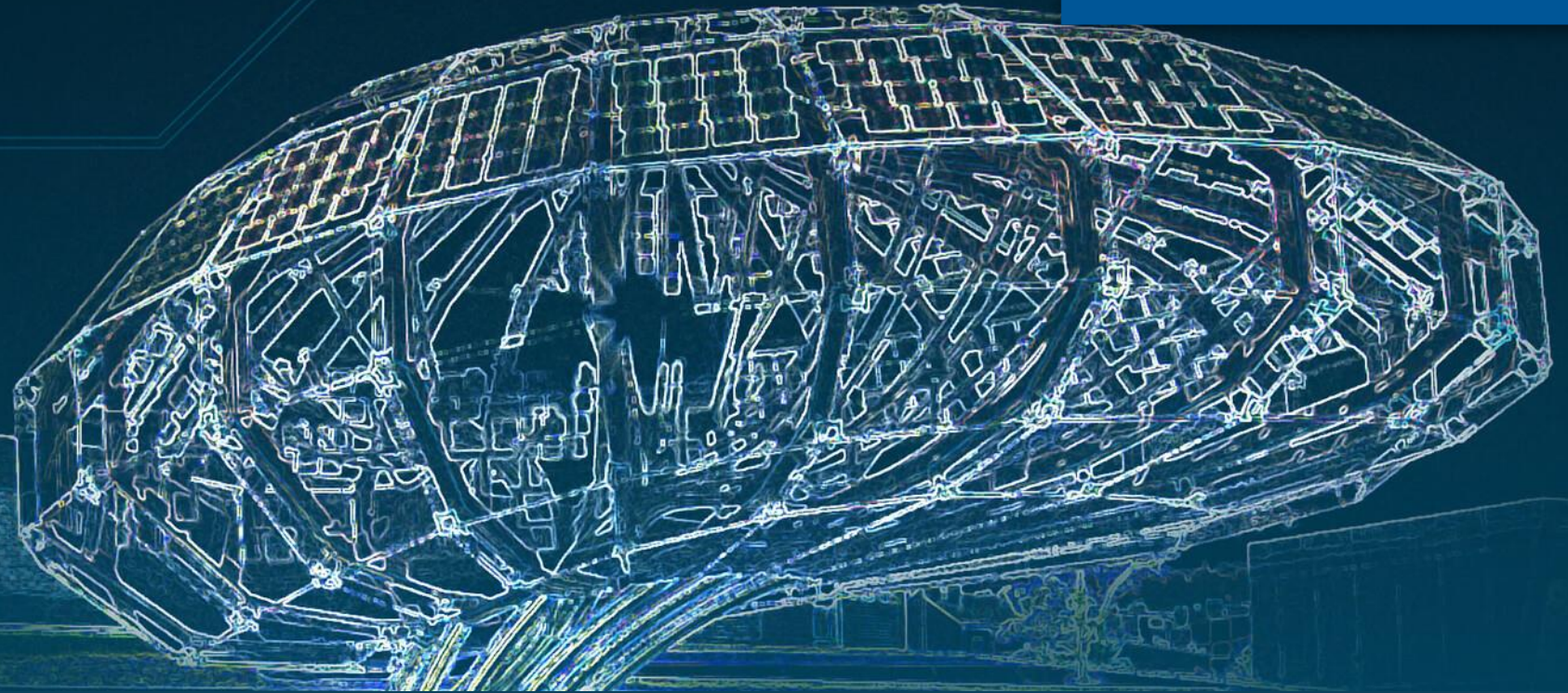


AVL



AVL ITS Europe



AVL Lab Management & Data Intelligence

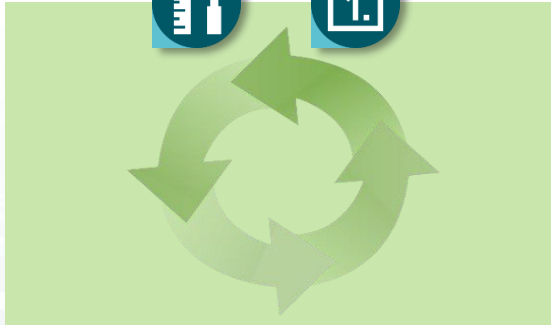
Data Management accross all environments,
all parameters and models and for full life cycle

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.



Integration of Automotive Test & Process Data



Data Warehousing & Life Cycle Management



Data Processing & Enrichment, Calibration

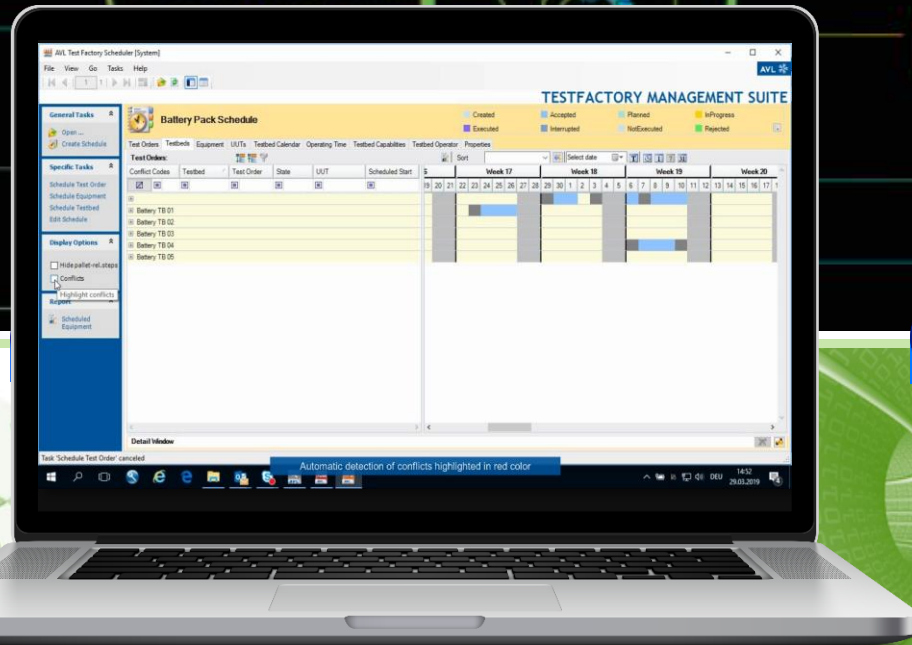


Data Exploration & Advanced Analytics

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Lab Planning



DIGITALIZATION

Right here.
Right now.



Integration of Automotive Test & Process Data

Data Warehousing & Life Cycle Management

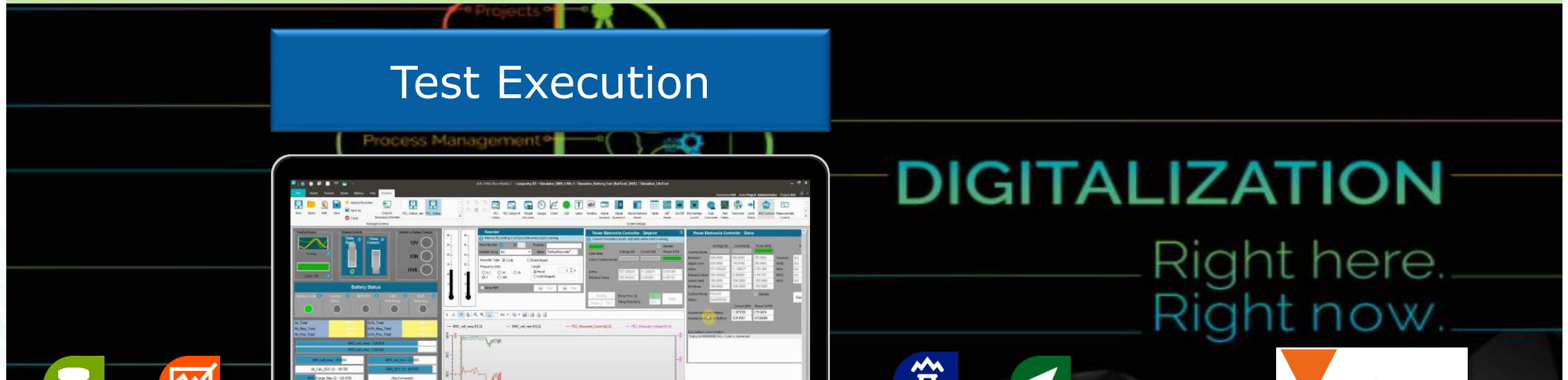
Data Processing & Enrichment, Calibration

Data Exploration & Advanced Analytics

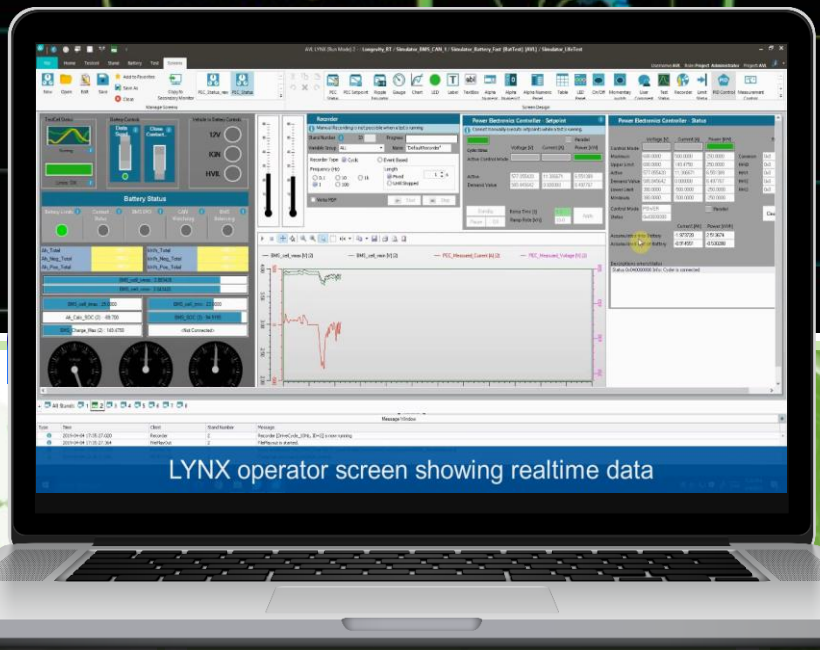
Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Test Execution



DIGITALIZATION
Right here.
Right now.



LYNX operator screen showing realtime data



Integration of Automotive Test & Process Data

Data Warehousing & Life Cycle Management

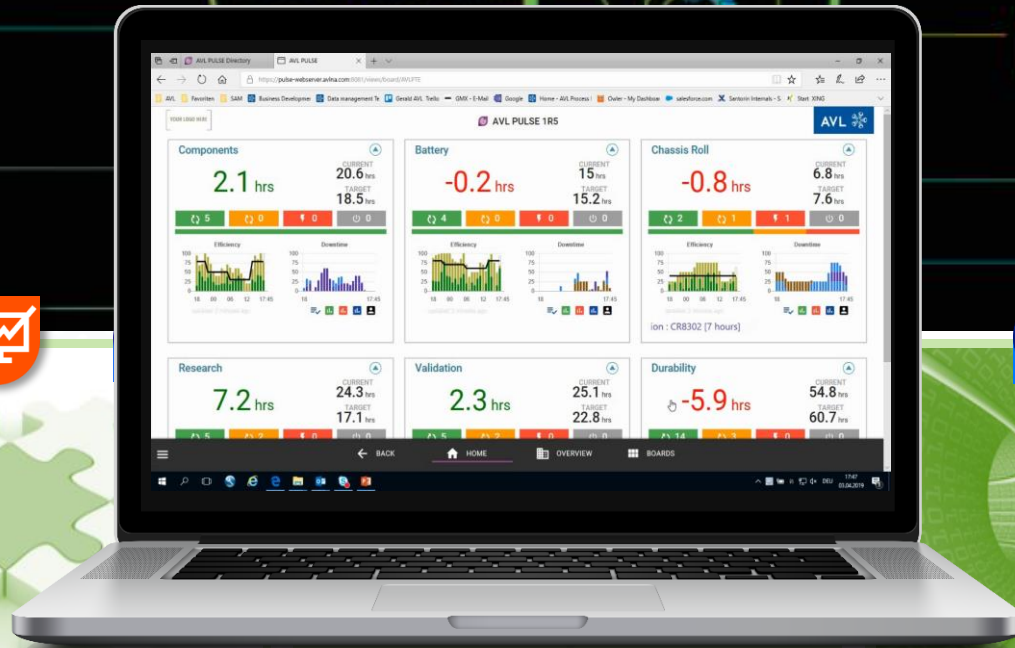
Data Processing & Enrichment, Calibration

Data Exploration & Advanced Analytics

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Live Monitoring



DIGITALIZATION

Right here.
Right now.



Integration of Automotive Test & Process Data

Data Warehousing & Life Cycle Management

Data Processing & Enrichment, Calibration

Data Exploration & Advanced Analytics

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Data Backbone

DIGITALIZATION

Right here.
Right now.



AVL SANTORIN MX 2™

All test results are automatically collected and stored centrally



Integration of Automotive Test & Process Data

Data Warehousing & Life Cycle Management

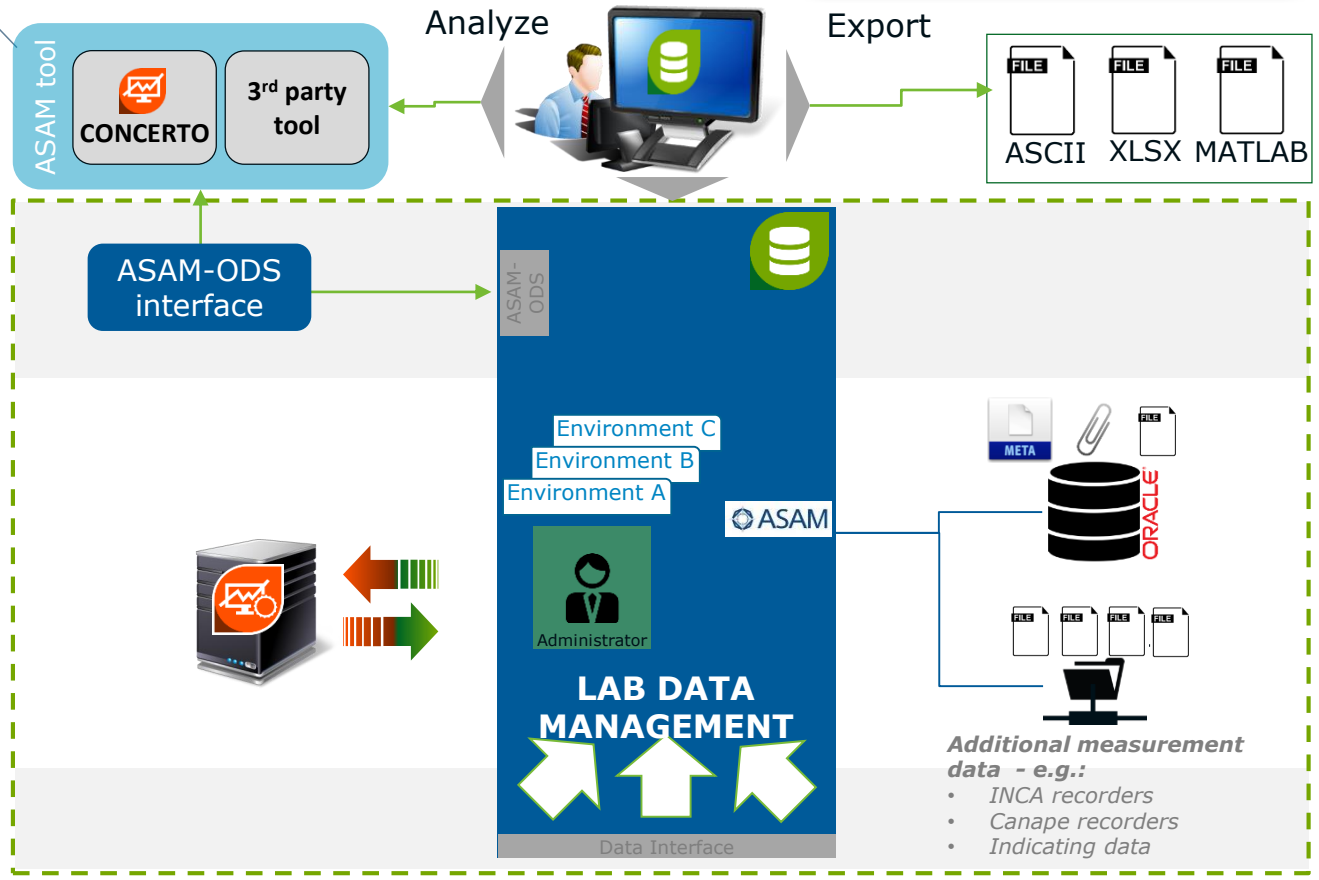
Data Processing & Enrichment, Calibration

Data Exploration & Advanced Analytics

AVL Santorin MX 2™ A FLEXIBLE SOLUTION



	Data view/Data access Structured view, quick search and data exploration. Access via ASAM-ODS interface.	MXview
	Automated Data processing Combining data management with server-based data processing to convert measurements into results	MXautomate
	System Administration Advanced system administration combined with data lifecycle management	MXadministrate
	Data Integrate Mixed Mode Integration and harmonization of different and heterogeneous data sources	MXintegrate



SANTORIN HOST 	3rd party integration 	HiL Testing 	Battery Testing 	E-Motor Testing 	Engine Testing 	PT Testing 	CD Testing 	PEMS Data
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Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Calibration Data Management

AVL CRETA 5™
Calibration lifecycle management

The software tool is fit for purpose to develop safety related software according to ISO 26262.



DIGITALIZATION

Right here.
Right now.



Data Exploration & Advanced Analytics

Data Processing & Enrichment, Calibration

Data Warehousing & Life Cycle Management

Integration of Automotive Test & Process Data



How to ensure data correctness, consistency and quality ...

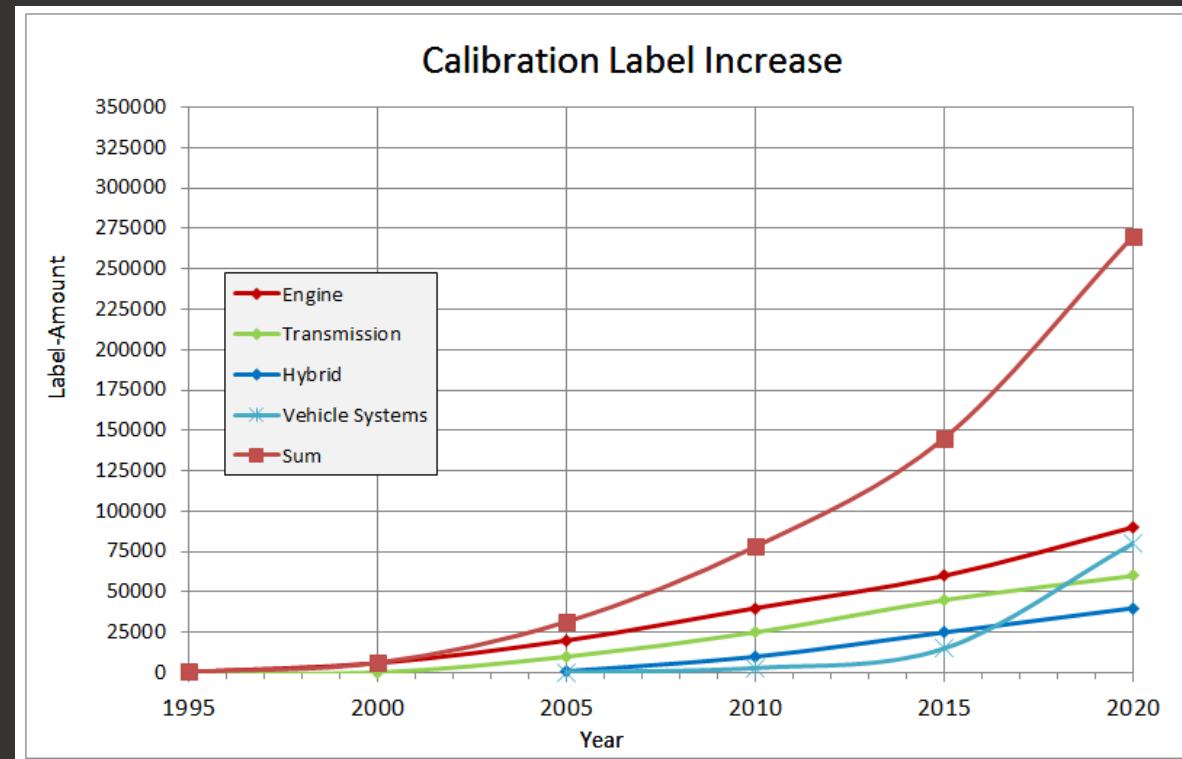
... across ~500 vehicle variants

... for ~60K labels per variant

... in the whole team

... during the whole calibration project

... across all xCU domains



One data management solution ...

... for all domains:

- | | |
|----------------------------|------------------------|
| ▪ Engine Calibration | ▪ ADAS Calibration |
| ▪ Transmission Calibration | ▪ E-Motor Calibration |
| ▪ Chassis Calibration | ▪ Battery Calibration |
| ▪ Brake Calibration | ▪ Steering Calibration |



AVL CRETA 5™ : Key elements



Collaboration



Responsibility Management



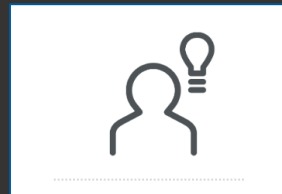
Conflict Free Data Merging



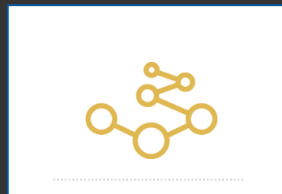
Process Workflow Support



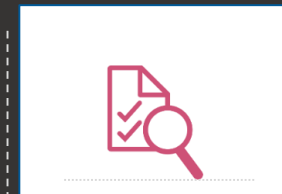
Reporting and Documentation



Know How Management



Traceability and Versioning



Project Status Control



Extensibility



Qualitative Metrics

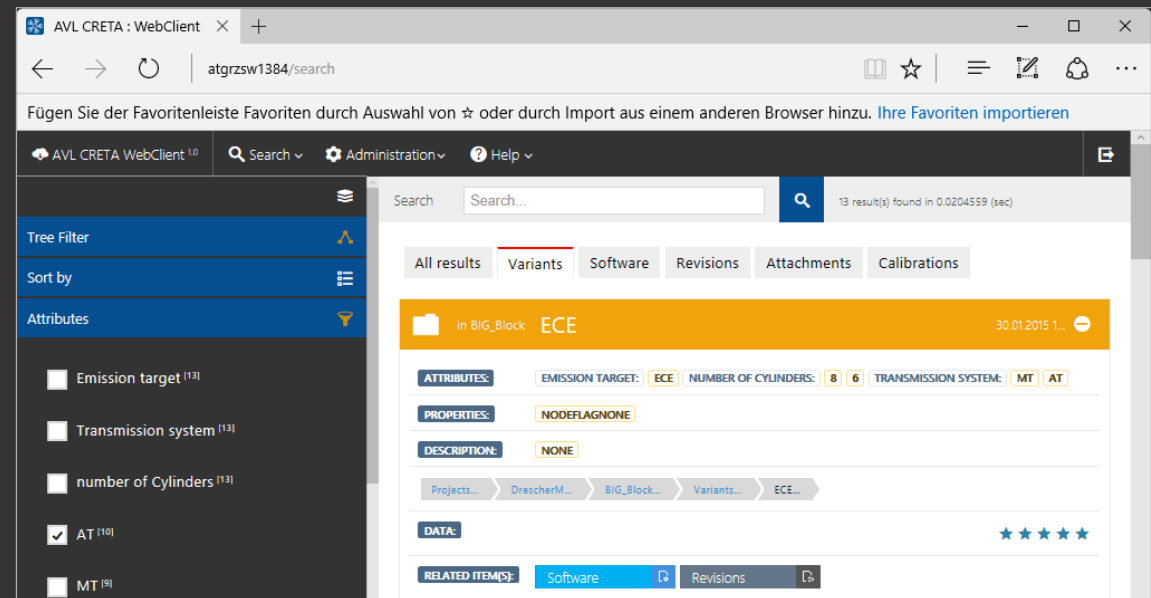
AVL CRETA 5™ : Web client

Web access to calibration data for all teams involved in testing

Simple search and download of calibration datasets for any testing purpose

Clear structuring of results based on attributes like emission level, build type and power ratings

No CRETA Client installation needed – accessible from any web based device



The screenshot shows the AVL CRETA WebClient interface in a browser window. The address bar shows 'atgrzsw1384/search'. The page title is 'AVL CRETA WebClient 1.0'. The main content area displays search results for 'ECE' with 13 results found in 0.0204559 seconds. The interface includes a navigation menu on the left with options like 'Tree Filter', 'Sort by', and 'Attributes'. The search results are displayed in a table-like format with columns for 'ATTRIBUTES', 'PROPERTIES', 'DESCRIPTION', and 'DATA'. The 'ATTRIBUTES' section shows 'EMISSION TARGET: ECE', 'NUMBER OF CYLINDERS: 8 | 6', and 'TRANSMISSION SYSTEM: MT | AT'. The 'PROPERTIES' section shows 'NODEFLAGNONE'. The 'DESCRIPTION' section shows 'NONE'. The 'DATA' section shows a star rating of 5 stars. The 'RELATED ITEM(S)' section shows 'Software' and 'Revisions'.

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Data Analysis

DIGITALIZATION

Right here.
Right now.

The flexibility in visualizing,
analyzing and reporting ...



Data Exploration &
Advanced Analytics

Data Processing &
Enrichment, Calibration

Data Warehousing & Life
Cycle Management

Integration of Automotive
Test & Process Data

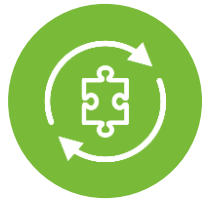
AVL CONCERTO 5™



CONCERTO is the generic data processing platform for visualization, analyzing and reporting many measured and simulated data types. It carries application packages that address application specific tasks.

- Strong connected to data management systems
- High degree of automation

ONE PLATFORM



Harmonization

Harmonize data from different source, with channel names and units.



Standardization

Standardize the analysis and reporting of data based on diagrams, layouts and work environments



Applications

Enhance the platform with off the shelf applications or create your own for specific tasks and needs.



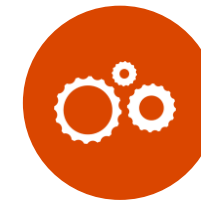
Quick and Easy Data Search

Search the data quick and easily independent of location, on the server or on the local harddisk.



Intuitive Calculations

Enhance the data with calculations, which can be parametrized interactively



Fully Automated Evaluations

Automation of data processing through scripting and integration of 3rd party algorithms.



Interactive Editing and Reporting

No separation between diagram design and visualization or reporting.

New Features



Scripting with Python

Modern and open scripting language for more computation power



Data Indexing & Search Service

Automatic and continuous data indexing for fast and always up to date search results



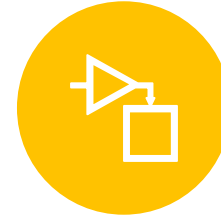
Excel Integration Service

Excel Addons and script functions for integrated and traceable reporting



FMU Model Support

Formulas and Scripts using FMU Models for model validation, comparisons and front loading



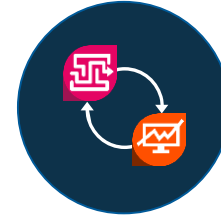
Simulation Extensions

Simulink blocks and Model.Connect Interface for seamless front loading applications



Concerto Automation Service

REST based Service for reliable job scheduling and execution



CAMEO 4™ - CONCERTO 5™ Interface

for powerful reporting and processing during testruns

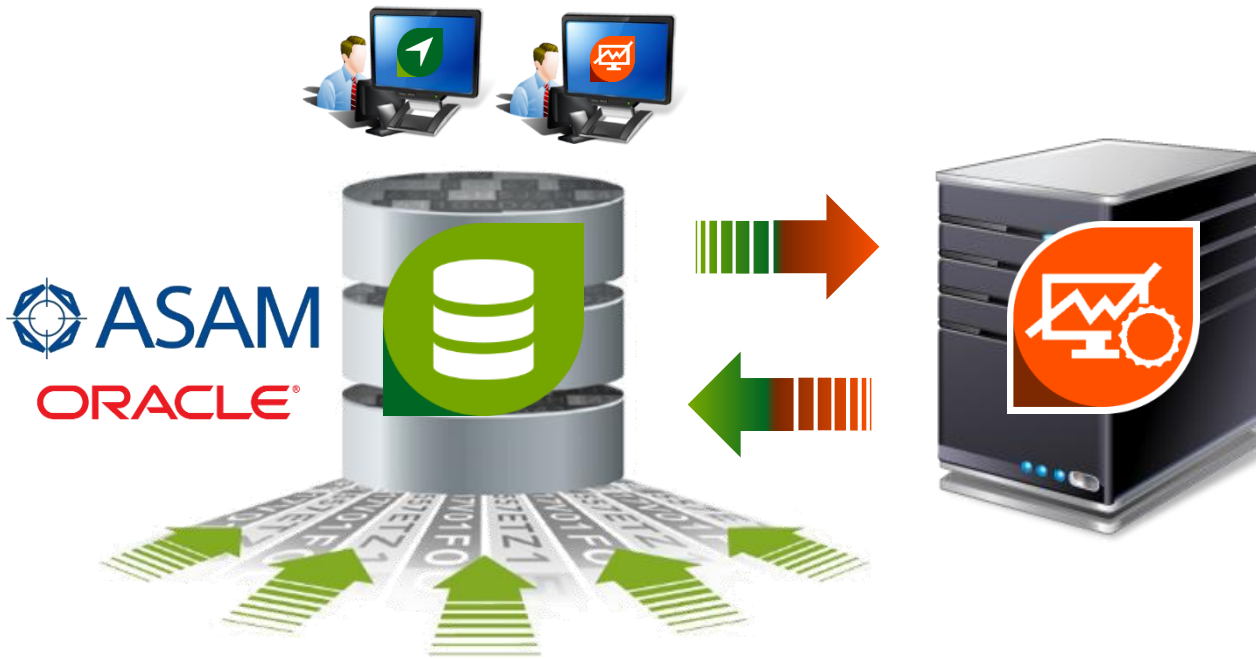


SANTORIN MX 2™ - Automate

Server based data evaluations and processing for increased performance and higher standarization

... and many more **Usability** and **Functional Improvements**

Fully automated server based data processing

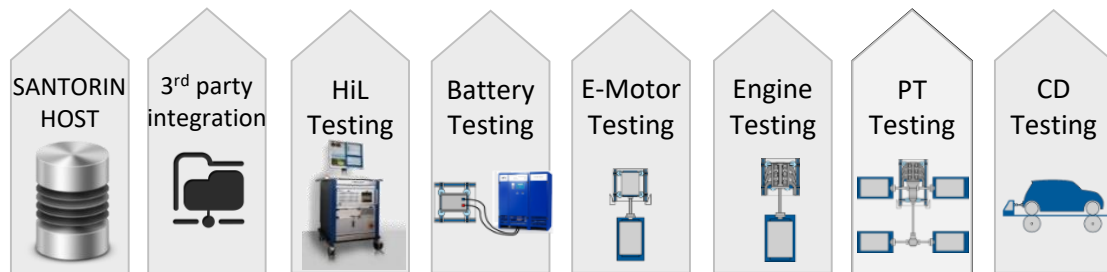


SANTORIN MX 2™ - View

Structured view, quick search and filter options with AVL SANTORIN MX – Navigator or AVL CONCERTO 5™

SANTORIN MX 2™ - Automate

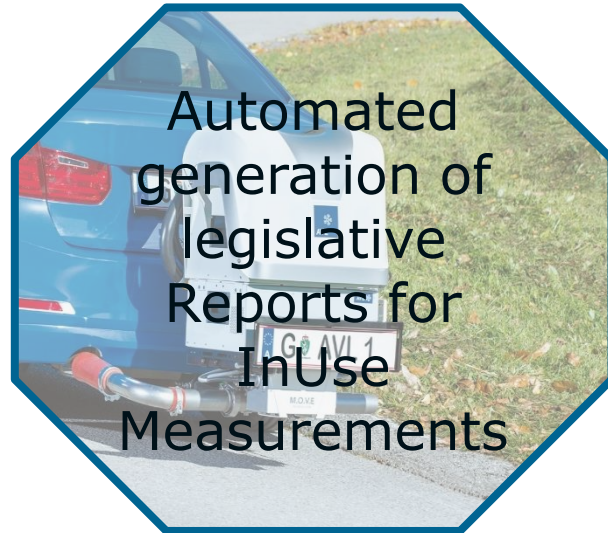
Standardization and simplification with server-based data export. Full integrated AVL CONCERTO 5™ - Server version for efficient data processing and reporting.



SANTORIN MX 2™ - Integrate

Integration and harmonization of heterogeneous data sources

Use Cases an Applications



The added value

One integrated solution for automation and standardization of calculations, evaluations and reports

- Central location of Apps and scripts for easy and seamless distribution and traceability
- Seamless assessment of new legislative regulations for new and existing data
- Efficient transformation of all relevant data into decision relevant information at creation time
- Highest possible time saving by parallel execution of long lasting tasks
- Open up report generation and data evaluation to new user groups by predefined evaluation types

Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

PEMS Data Management

DIGITALIZATION

Right here.
Right now.



Integration of Automotive
Test & Process Data

Data Warehousing & Life
Cycle Management

Data Processing &
Enrichment, Calibration

Data Exploration &
Advanced Analytics



AVL PEMS Data Management Solution™

The AVL solution for next level RDE testing and certification

AVL PEMS Data Management Solution™



Our solution makes sure, that RDE testing can be done in the most automated way possible.

AVL PEMS Data Management Solution™

Efficient RDE testing



The increasing need of RDE testing tasks leads to process and data challenges:

How can I ensure efficient and seamless processes?

Is my vehicle and test configuration data correct?

Is my driving RDE compliant and future-proof?

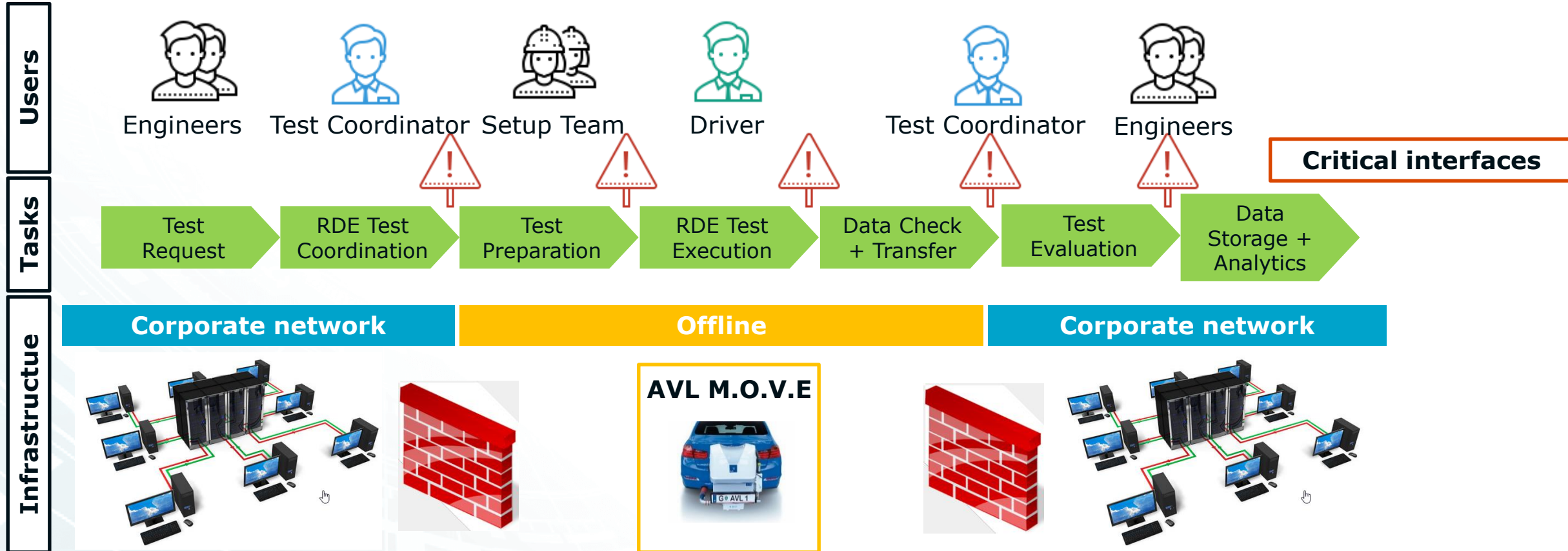
How can I manage and trace my data after the test?

How to evaluate fleet data statistically?

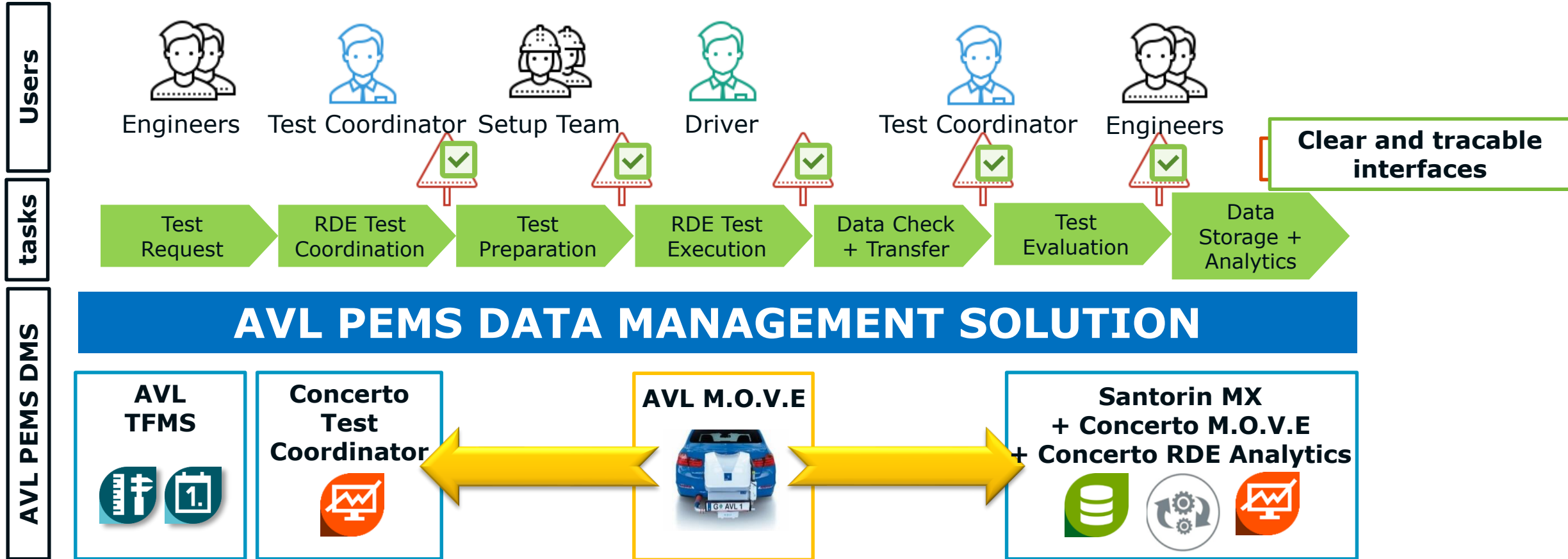


AVL PEMS Data Management Solution™

Current RDE Workflow

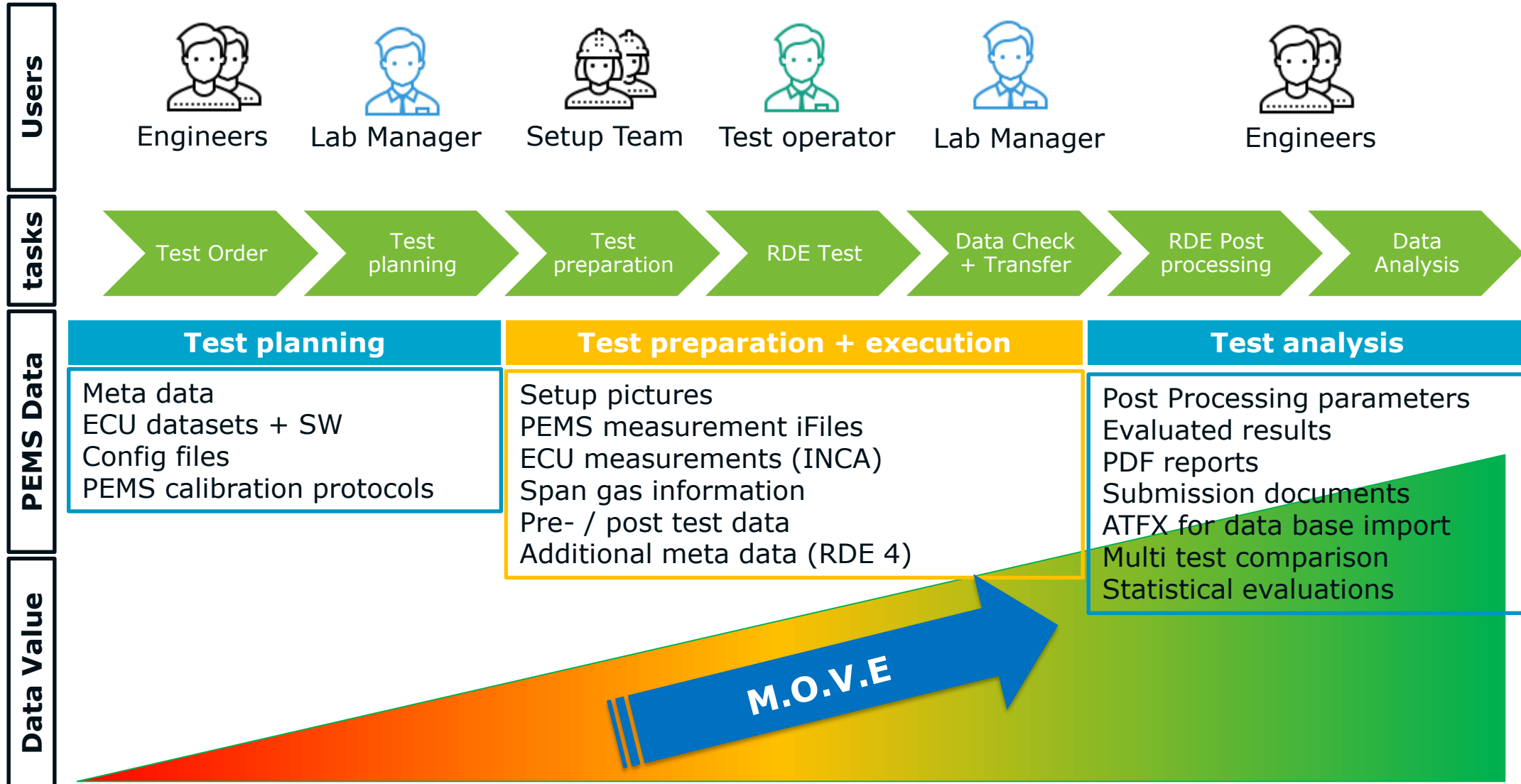


AVL PEMS Data Management Solution™ AVL Solution



AVL PEMS Data Management Solution™

PEMS Data Value Chain



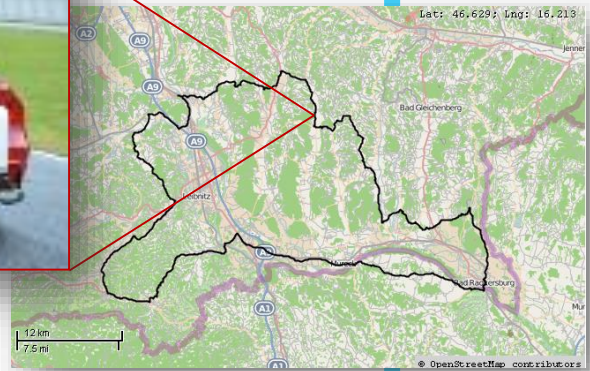
AVL PEMS Data Management Solution™

The Technical Workflow



Electronic Test Order

- Vehicle (VIN)
- Driver
- PEMS
 - Device Setup
 - ...



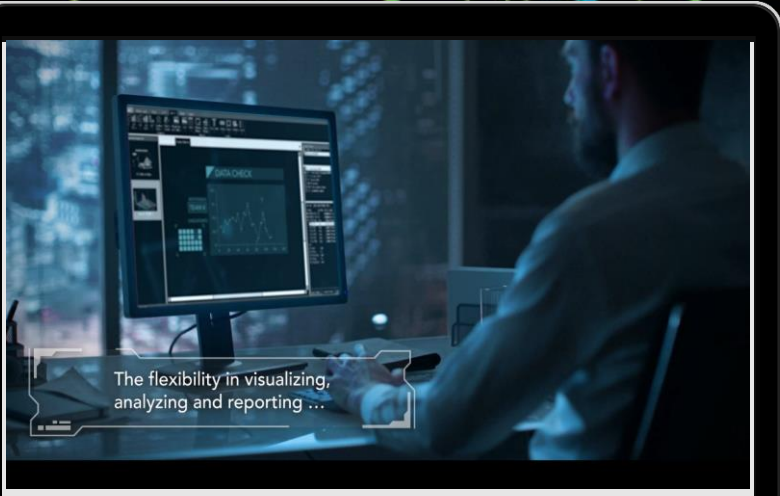
PEMS Measurement Data



Lab Management and Data Intelligence

Lab Data. Calibration Data. Workflows. Lifecycle. Analytics.

Big Data Analytics



Integration of Automotive Test & Process Data

Data Warehousing & Life Cycle Management

Data Processing & Enrichment, Calibration

Data Exploration & Advanced Analytics

BIG DATA ANALYTICS For Automotive Engineers



Big Data for Automotive Engineers

- ✓ **No need to learn distributed computing**
 - Easily run existing code in parallel
- ✓ **Bespoke for Automotive Data**
 - Easily work with automotive data formats (MDF, ...)
 - Data cleansing
 - Rich set of data objects and methods for time series, traces and objects (ADAS)
- ✓ **Open Architecture**
 - Easily employ any modern data science and machine learning framework



Data Science

Engineering

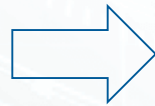
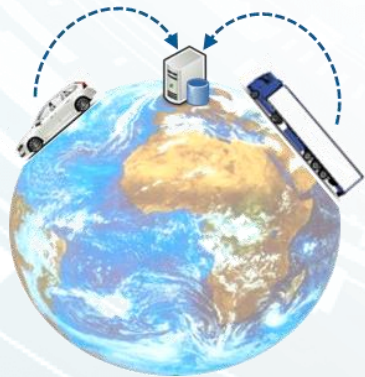
BIG DATA ANALYTICS

Example: Usage Space Analysis

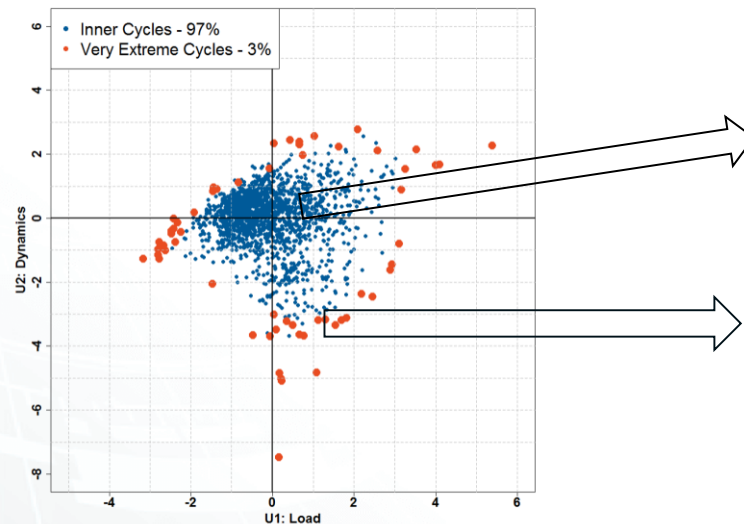


- Analyze usage and environmental conditions from existing data
- Elimination of extreme driving behaviors
- Select and export representative driving cycles

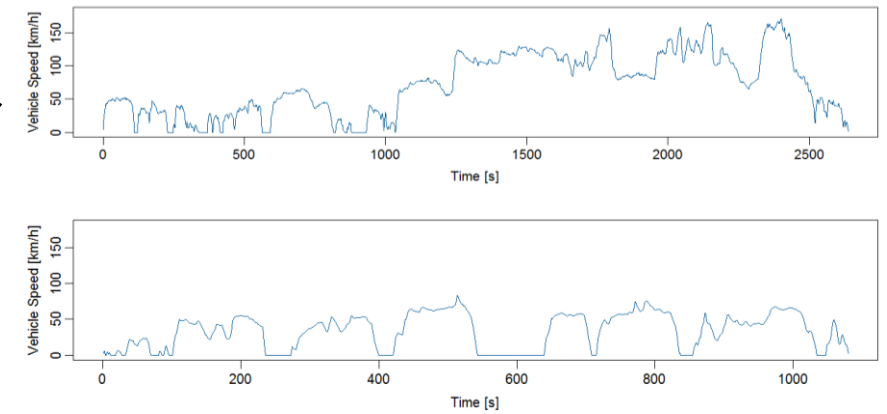
1. Data Collection



2. Usage Space Analysis



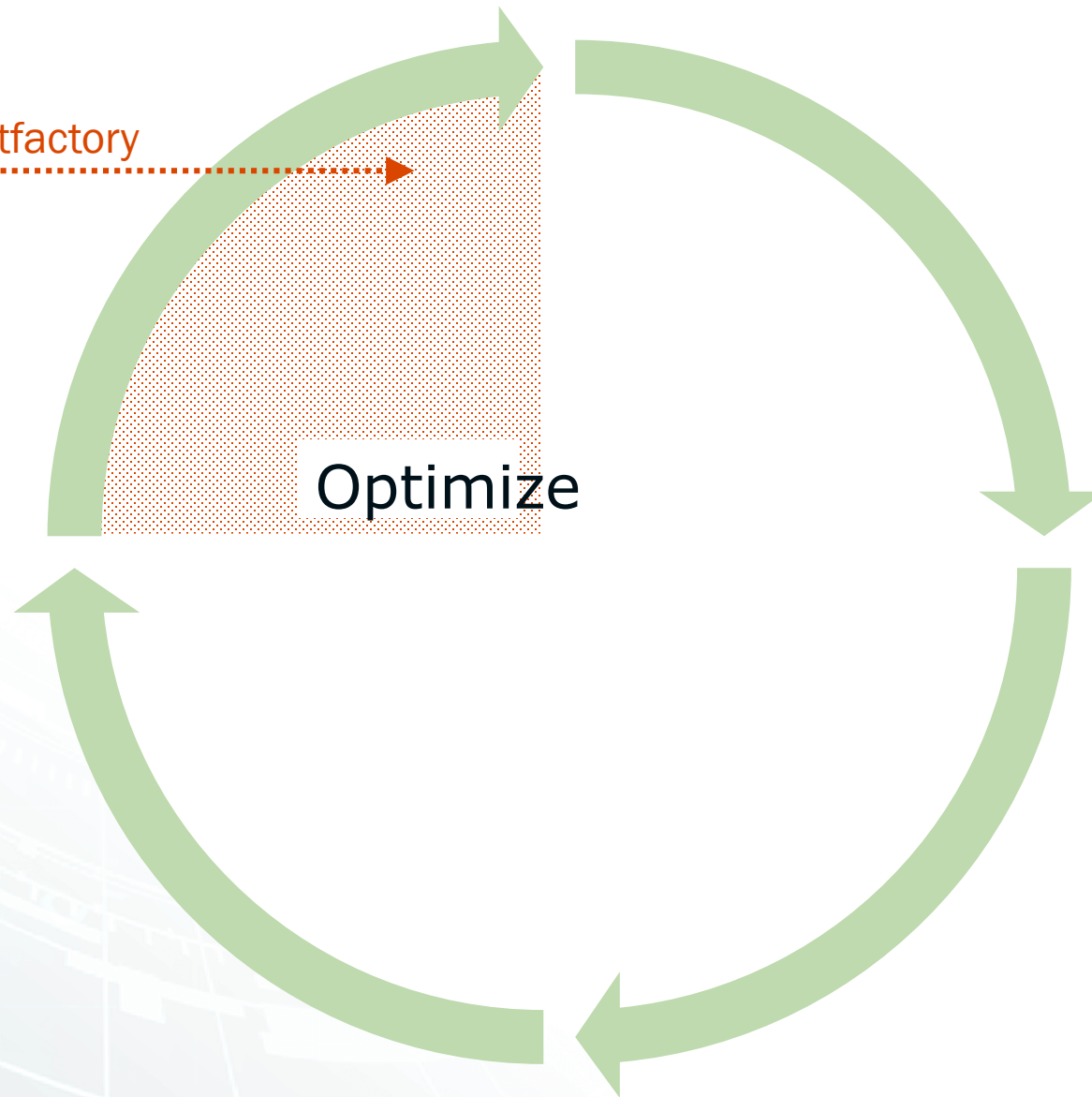
3. Detect representative driving cycles



Where does the data for DaSense come from?



Data –
generated in testfactory



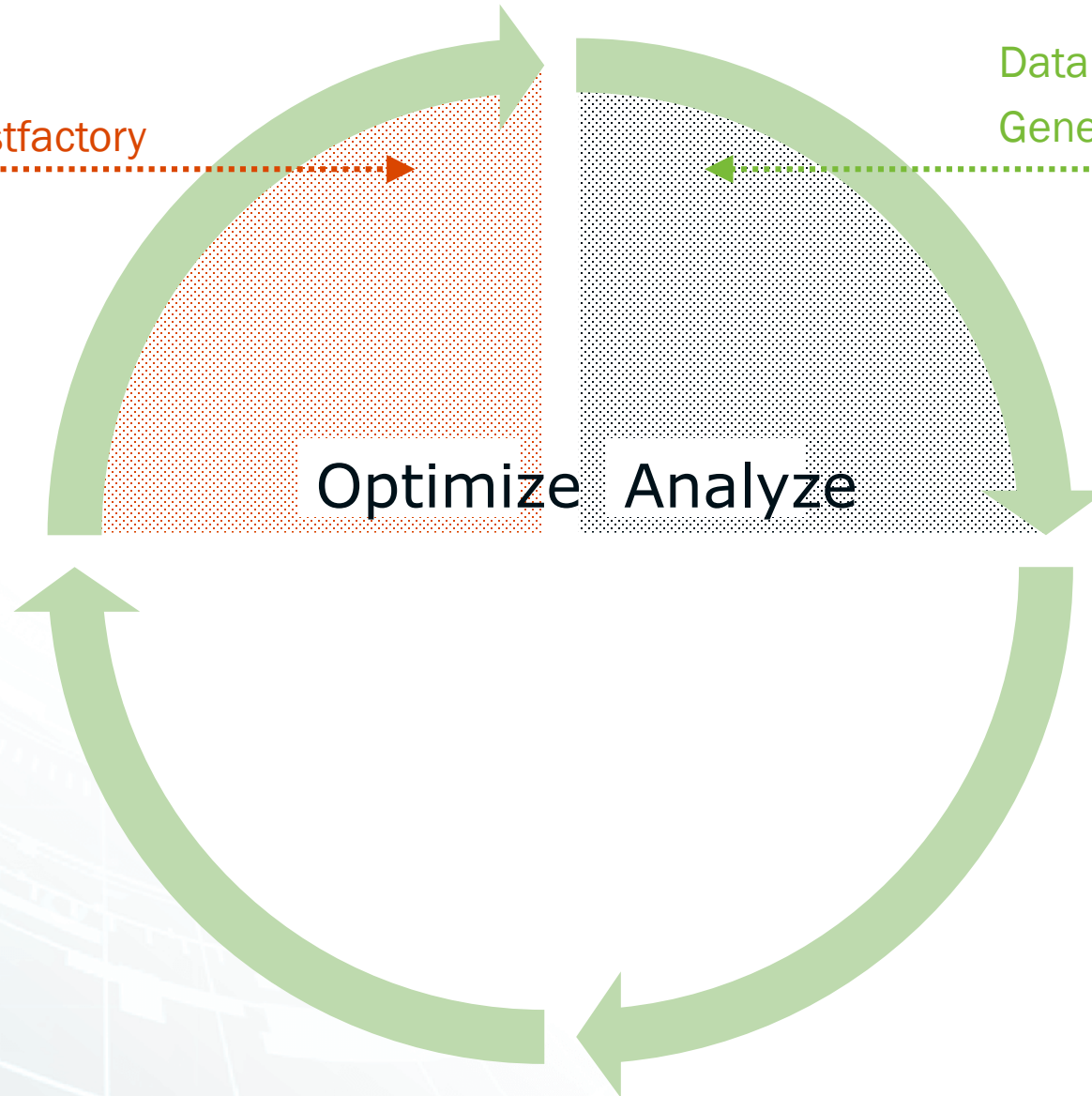
Where does the data for DaSense come from?



Data –
Generated in testfactory



Data –
Generated by test vehicles



Where does the data for DaSense come from?



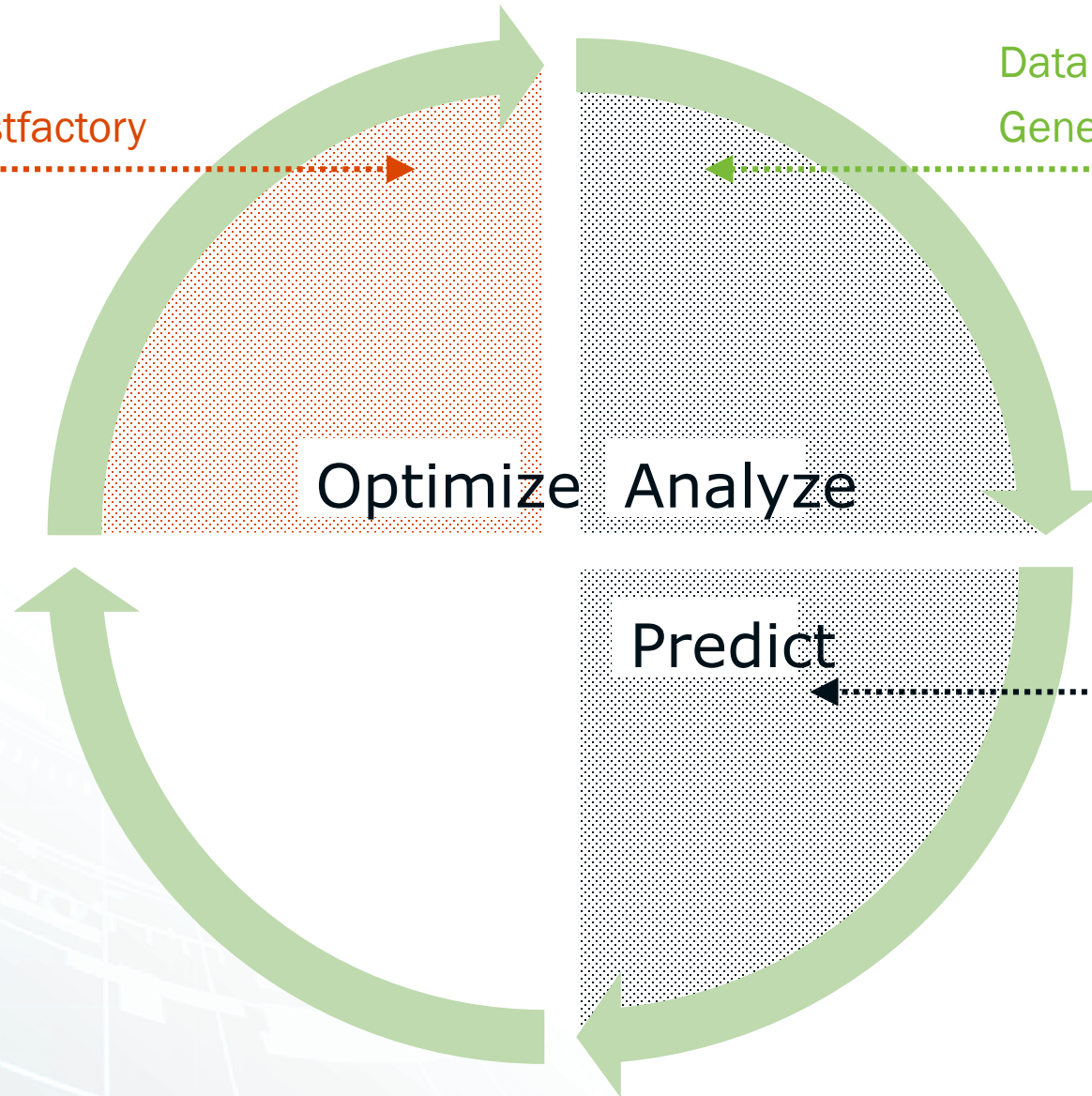
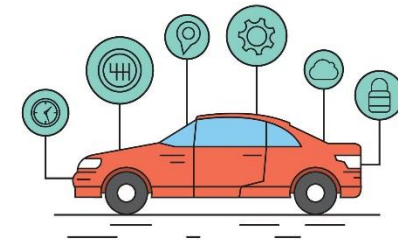
Data –
Generated in testfactory



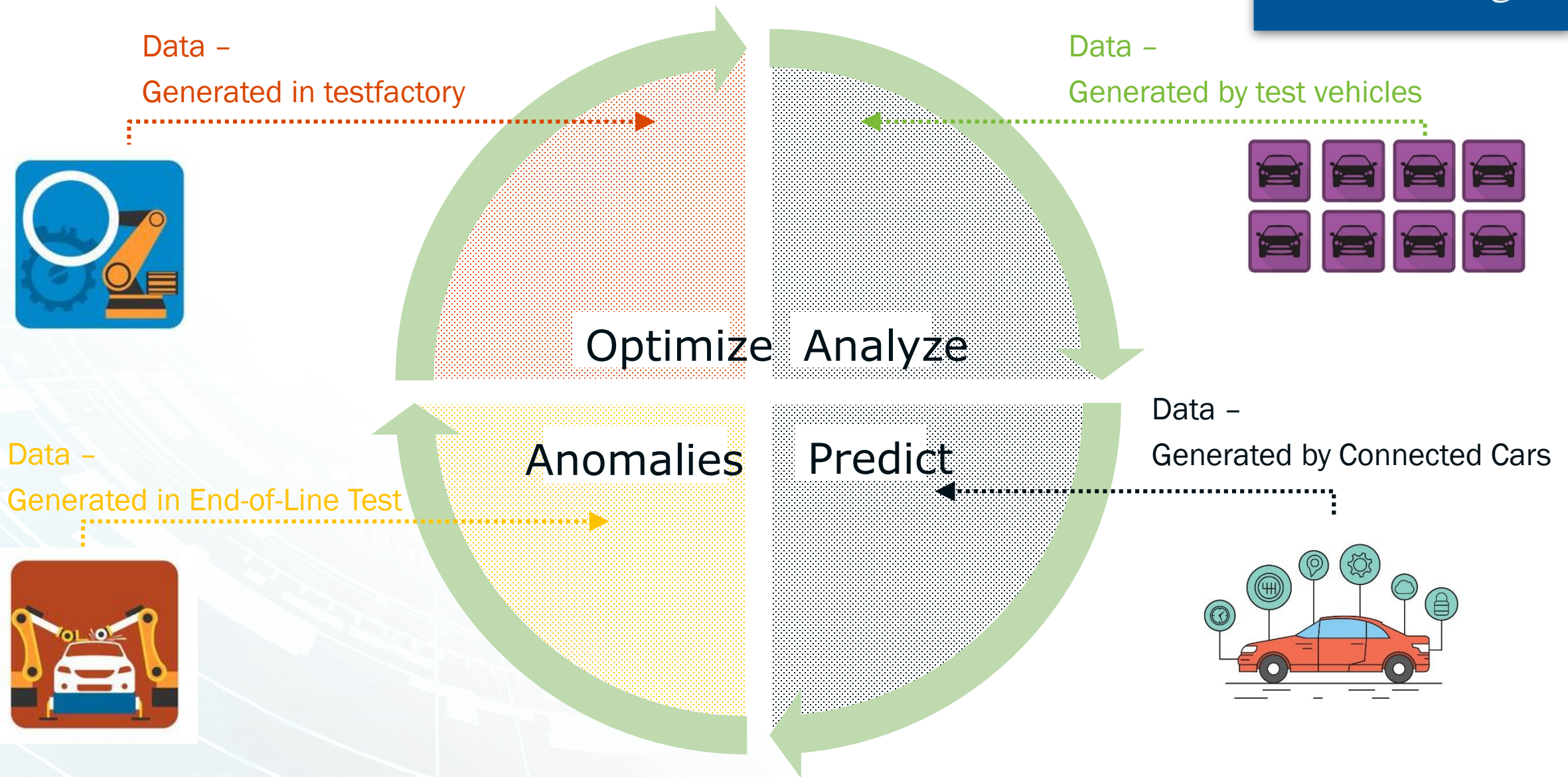
Data –
Generated by test vehicles



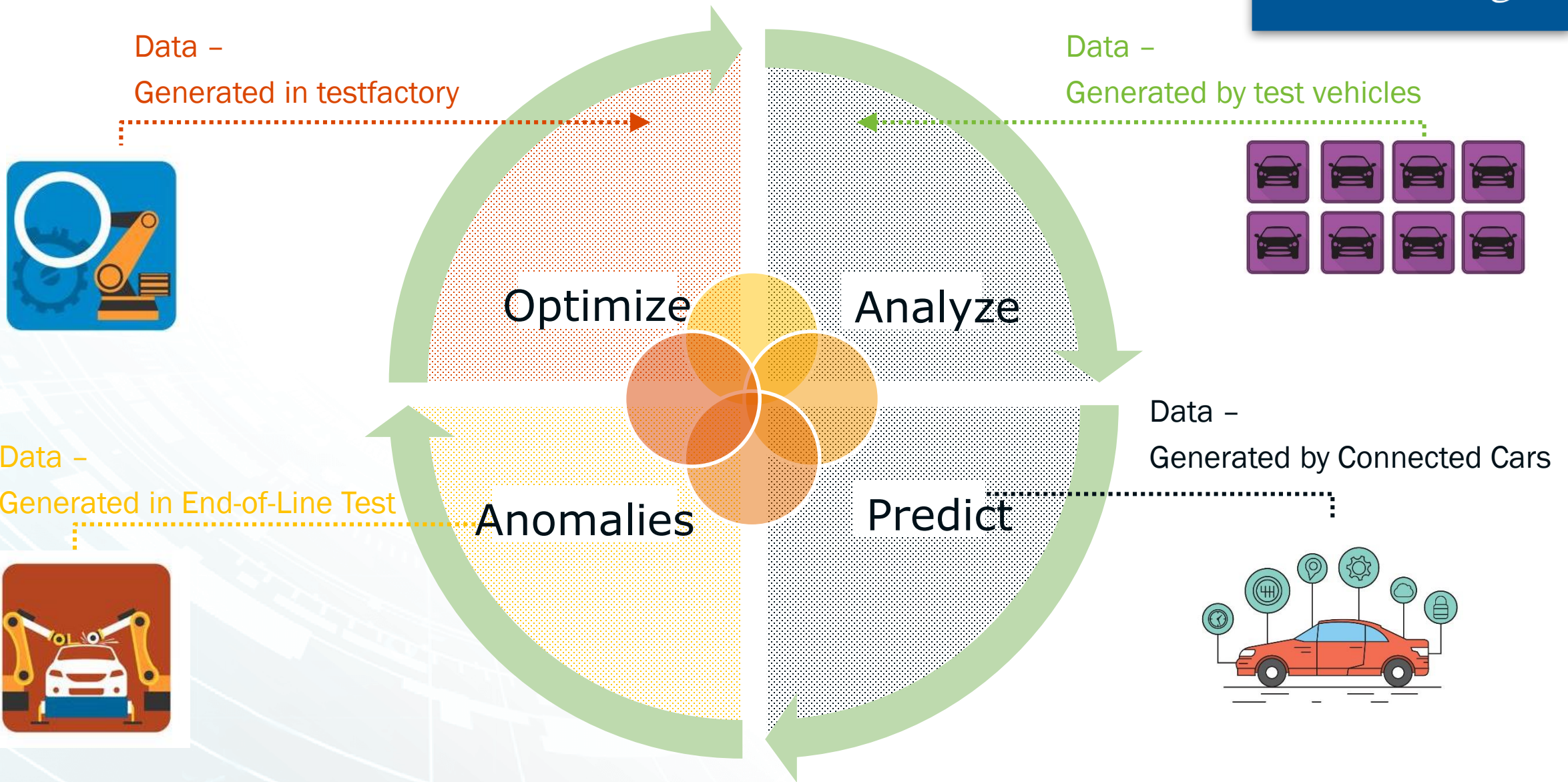
Data –
Generated by Connected Cars



Where does the data for DaSense come from?



Where does the data for DaSense come from?



Where does the data for DaSense come from?



Data –
Generated in testfactory



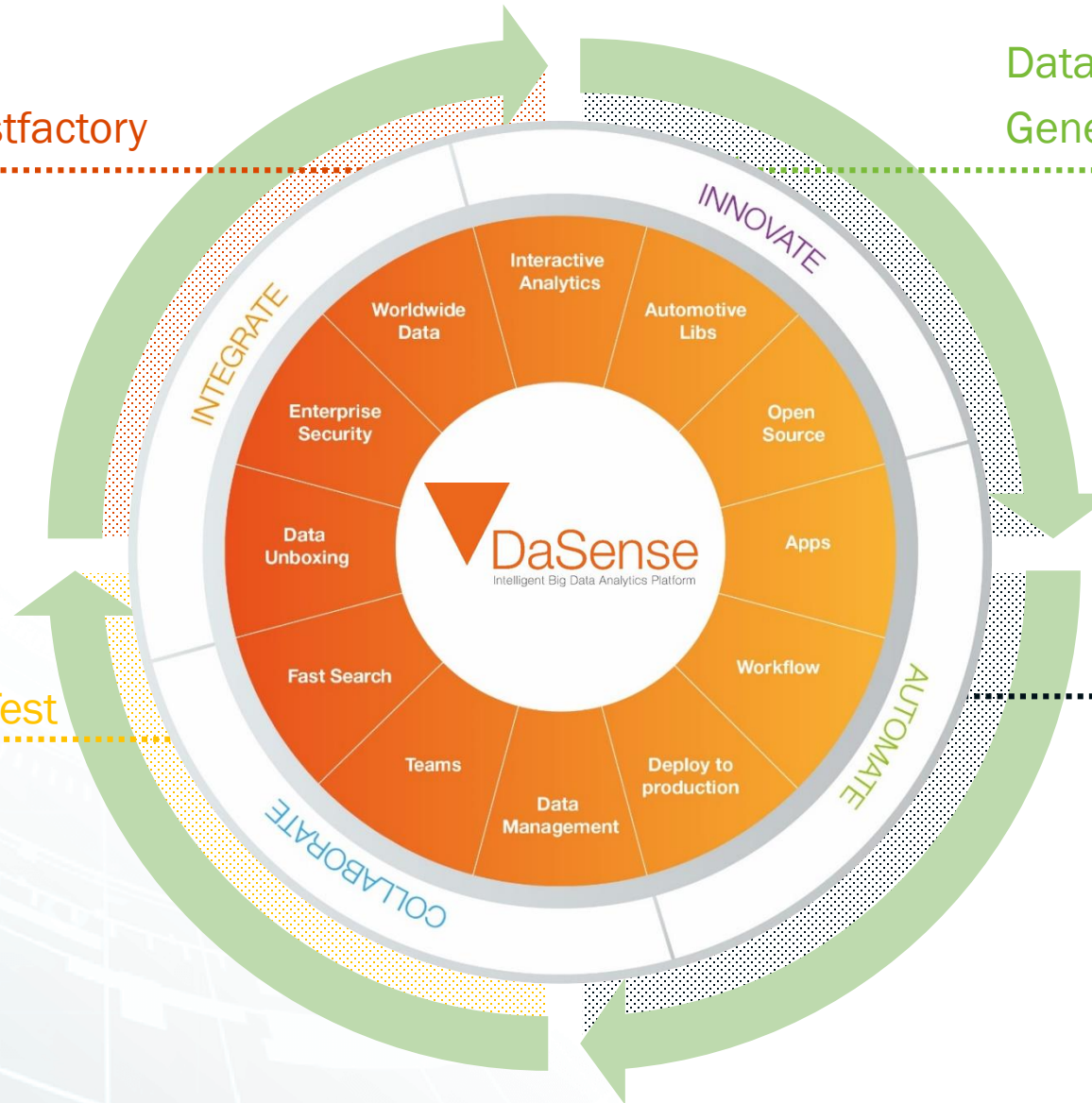
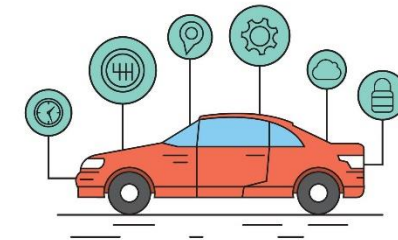
Data –
Generated by test vehicles



Data –
Generated in End-of-Line Test



Data –
Generated by Connected Cars



BIG DATA ANALYTICS

NorCom DaSense



NorCom

Integrate

- ▼ **Worldwide Data**
One access to all test-sites & data
- ▼ **Enterprise Security**
Proven support of enterprise grade security requirements
- ▼ **Data Unboxing**
Seamlessly work with established automotive data formats

Collaborate

- ▼ **Fast Search**
Find what you are looking for, quickly
- ▼ **Teams**
Share ideas, code and data across teams and locations
- ▼ **Data Management**
Comply with local legislation by define rules for data lifecycle



Innovate

- ▼ **Interactive Analytics**
Get fast results at scale
- ▼ **Automotive Libs**
Powerful automotive analysis included
- ▼ **Open Source**
Benefit from fast innovation and the latest AI methods

Automate

- ▼ **Apps**
Big Data Analytics for everyone.
- ▼ **Workflow**
Combine Apps to Big Data Pipelines
- ▼ **Deploy to production**
Unsupervised, automated analysis on incoming data