Measure accurately, analyse efficiently and manage professionally measurement results (of the electric powertrain)

CSM web seminars
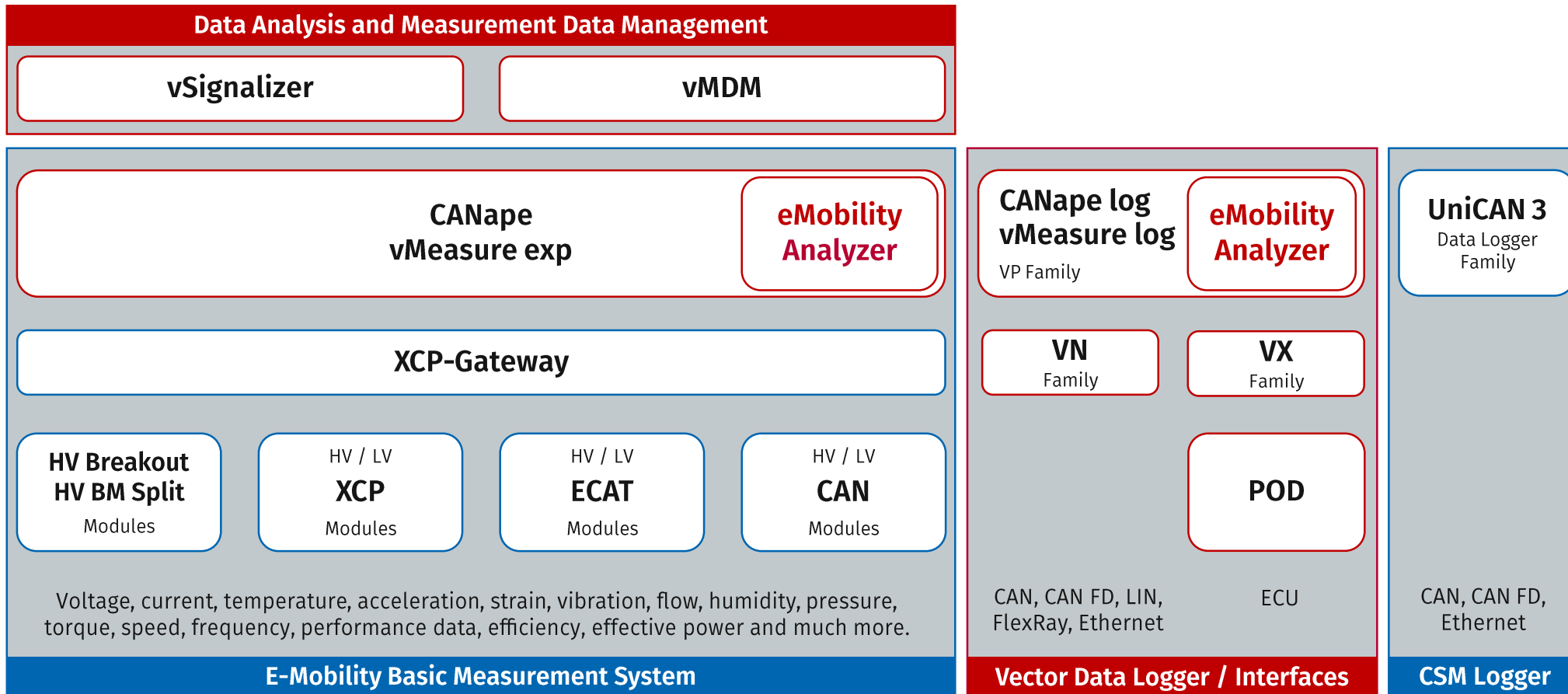
CSM Xplained measurement technology

VECTOR >

The Vector CSM E-Mobility Measurement System

Data Analysis and Measurement Data Management

vSignalizer	vMDM

E-Mobility Basic Measurement System

CANape
vMeasure exp

eMobility Analyzer

XCP-Gateway

HV Breakout HV BM Split — Modules	HV / LV XCP — Modules	HV / LV ECAT — Modules	HV / LV CAN — Modules

Voltage, current, temperature, acceleration, strain, vibration, flow, humidity, pressure, torque, speed, frequency, performance data, efficiency, effective power and much more.

Vector Data Logger / Interfaces

CANape log
vMeasure log

VP Family

eMobility Analyzer

VN — Family	VX — Family

POD

CAN, CAN FD, LIN, FlexRay, Ethernet   ECU

CSM Logger

UniCAN 3
Data Logger Family

CAN, CAN FD, Ethernet

The high-voltage electrical system

The high-voltage electrical system connects various consumers, converters and power electronics with the HV battery.

Required tests in the HV vehicle electrical system

▶ Battery state of charge and energy balance

▶ Dynamic behavior

▶ Investigation of shield currents on HV conductors

▶ Determination of efficiency and effectiveness

▶ Power flow and identification of losses

▶ Compliance with standards such as LV123, 80303 etc.

Achieving meaningful results with precise, fast, time-synchronous and HV-safe measurement technology
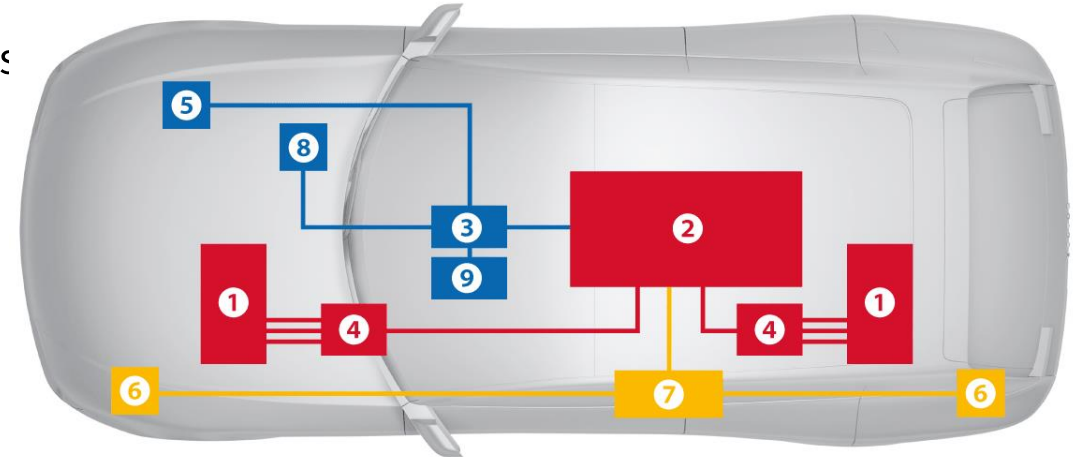
Powertrain
1 Electric motor
2 HV battery
4 Power electronics

Aggregate & On-Board Network
3 HV distributor
5 Compressor
8 PTC heater
9 DC/DC converter

Charging Infrastructure
6 Quickcharge unit
7 On-board charger

Power measurement
in the electric power train

▶ Acquire raw data voltage and current with

CSM HV Breakout Modules

- ▪ Precise and HV-safe measurement with up to 2 MHz

- ▪ up to 1,400 A , 2,000 V peak

- ▪ for laboratory, test bench and mobile use

▶ Fast measurement with **CANape** or **vMeasure**

▶ Power determination with **eMobilityAnalyzer**

▶ Analysis and management of measurement data in

vSignalyzer and **vMDM**

Powered by **VECTOR**
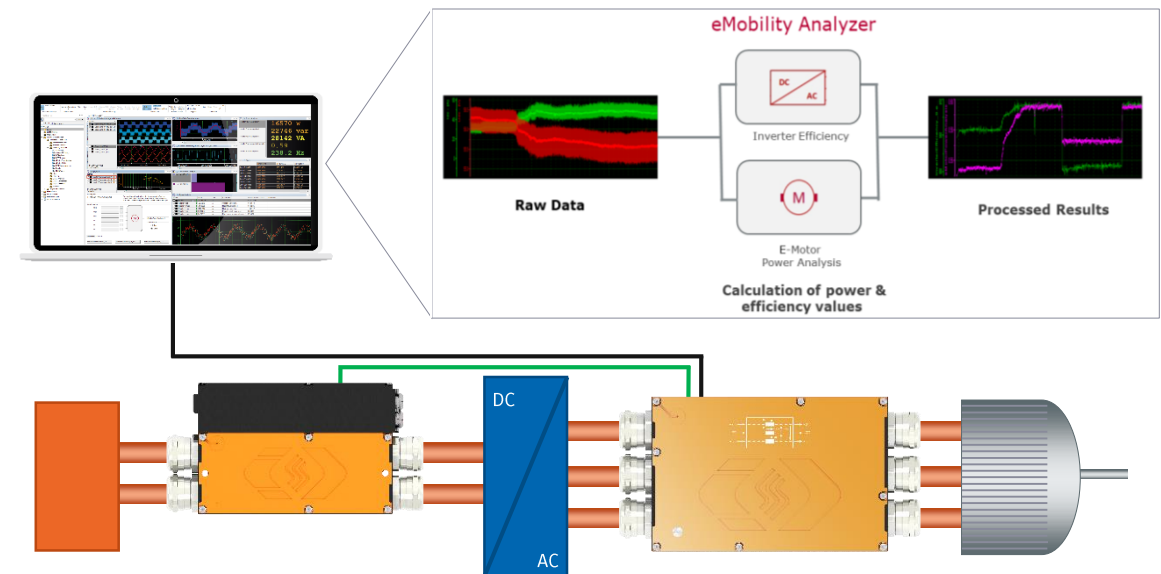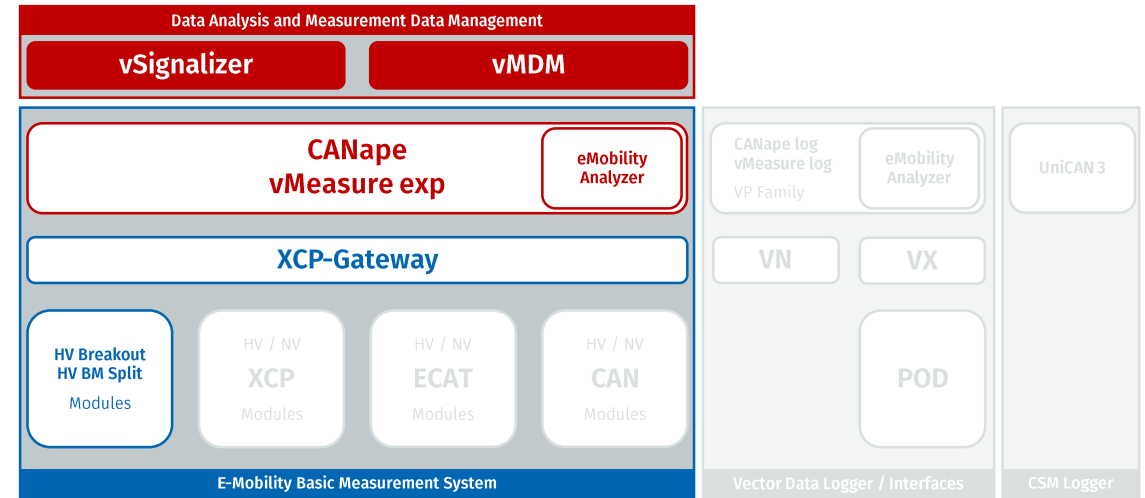
Visualization of the measurement results
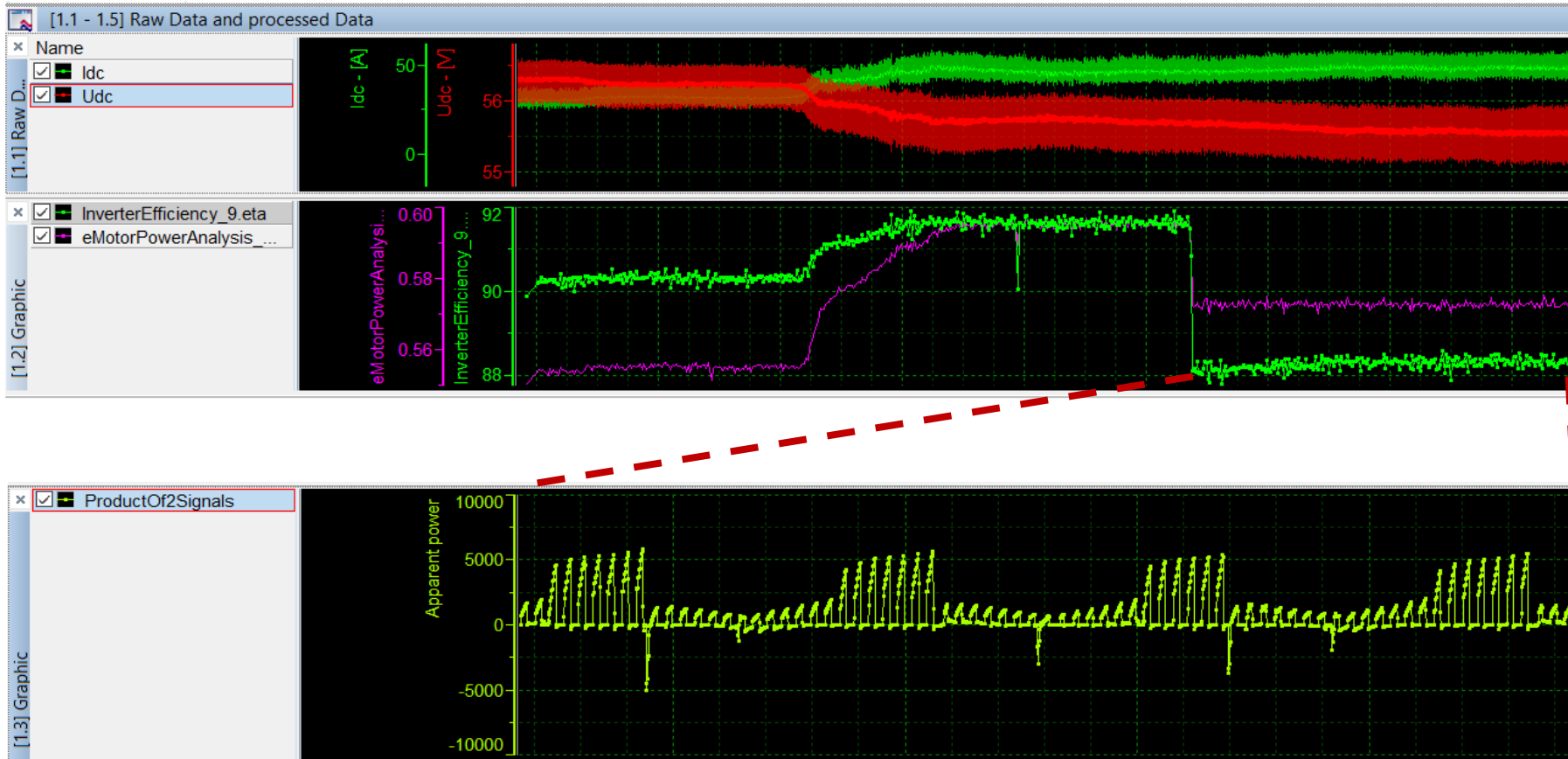
▶ Remarkable: Negative apparent power peaks in one motor winding of the e-motor

Management, analysis and identification of anomalies

▶ Testing, endurance testing and WLTPs generate very large amounts of data.

▶ This requires
- Secure, organized storage of measurement results
- Clear labeling of measurement results
- Filtering according to search criteria
- Recognition of search patterns
- Extraction of KPIs

▶ Efficient methods for automated search for anomalies in large amounts of data

▶ Measurement files with anomalies must be easily recognizable and immediately analyzable in detail

vMDM – a proven solution for the management of measurement data

▶ Solution for efficient management of large amounts of data from development, test bench runs and driver tests in the cloud

▶ Secure storage of measurement data

▶ Protection of data against unauthorized access

▶ Easy exchange of measurement data between distributed teams

▶ Execution of computationally intensive and extensive analyses, classifications and reports without loss of workstation performance

▶ PDF reports and index reports
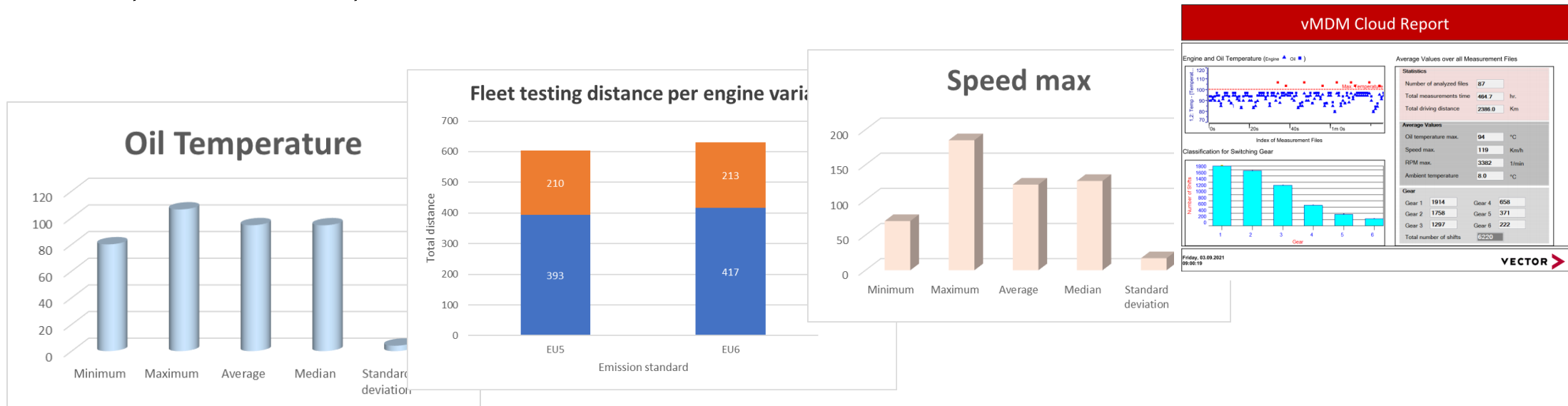
Automated processing of logger and measurement data
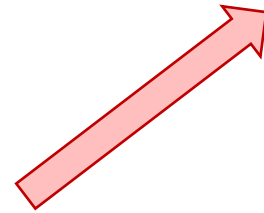

vMDM pro

Vehicle data upload via vLoggerCloud

vLoggerCloud

Automated data upload from test benches
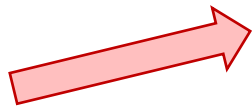
Storage system,
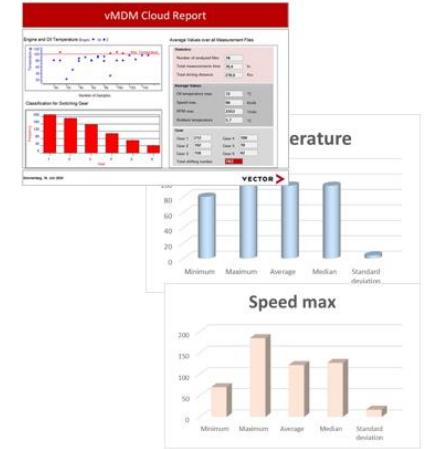Windows file system, permanently scanned
for new data files

vMeasure/CANape

Pre-Processing

Measurement & Analysis Data
MDF

Data Analysis

Meta Data Index

Reporting

Configure

Search

Download
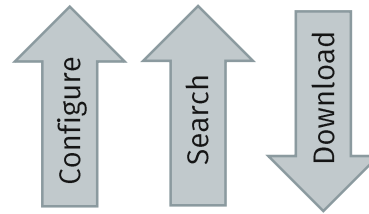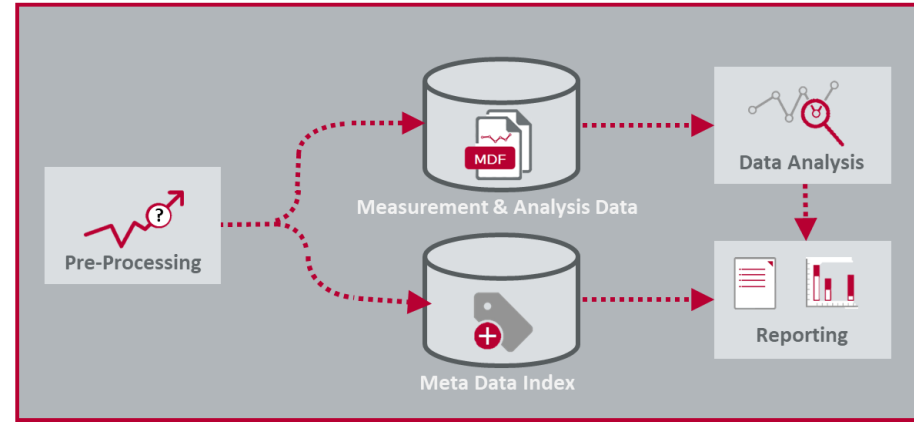
vSignalyzer/ CANape

Report

email

vMDM Cloud Report

Speed max

Report sent by vMDM

vSignalyzer and CANape as vMDM Front-End

▶ Access point to measurement data within vMDM

▶ Entry point to vMDM Collections
  ▪ Interactive visualization of data stored in vMDM

▶ Design of analysis algorithms to be executed in vMDM

▶ Presentation of results
  ▪ Files
  ▪ Channels
  ▪ Attachments
  ▪ Events

▶ Filters and queries for accelerated measurement data search

Results of the pre-processing

▶ Immediate display of pre-processing results in the vMDM Explorer

  ▪ In the example: number of automatically detected dips in inverter efficiency

File Name	Author	Department	Power	BatteryCap...	Range	Software V...	Calibration...	NumberOfHits	Project	Subject	Preprocessing State
SW-I_EMOT_20...	Test Engineer	testing	120 kW	45 kWh	190 km	InvEff_V01SP3	V01SP3_CAL003	7,000	eDrivetrain	Inverter	Success
SW-I_EMOT_20...	Test Engineer2	Validation	120 kW	40 kWh	180 km	InvEff_V01SP2	V01SP3_CAL003	2,000	eDrivetrain	Inverter	Success
Flugzeugmotor...	Test Engineer	Testing	120 kW	45 kWh	190 km	InvEff_V01SP3	V01SP3_CAL001	2,000	eDrivetrain	Ilnverter	Success
SW-I_EMOT_20...	Test Engineer2	testing	120 kW	45 kWh	185 km	InvEff_V01SP3	V01SP3_CAL003	7,000	eDrivetrain	Inverter	Success
eDrive_1.mf4	Test Engineer	testing	120 kW	45 kWh	190 km	InvEff_V01SP3	V01SP3_CAL003	3,000	eDrivetrain	Inverter	Success
eDrive_0.mf4	Test Engineer	testing	120 kW	45 kWh	190 km	InvEff_V01SP3	V01SP3_CAL003	2,000	eDrivetrain	Inverter	Success
SW-I_EMOT_20...	Test Engineer2	testing	115 kW	45 kWh	185 km	InvEff_V01SP3	V01SP3_CAL004	7,000	eDrivetrain	Inverter	Success

▶ Advantages:

  ▪ No manual, time-consuming searching of the measurement files

  ▪ Direct indication of conspicuous measurements and configuration of the measurement object (e.g. SW status, parameter set used)

  ▪ Immediate detailed analysis in vMDM front-end tool

Determining meaningful variables

- ▶ Pre-processing to automatically find anomalies, search patterns, events and calculate characteristic quantities
  - ▪ Max switching currents, voltage dips and edge steepnesses
  - ▪ Fluctuations and tolerance checks
  - ▪ Determination of switching times
  - ▪ Aggregation of data

- ▶ Extensive CANape function library with mathematical, Boolean, statistical functions as well as the functions of the eMobilityAnalyzer

- ▶ Conversion of raw data format to the powerful, standardized mf4 format

- ▶ Definition pre-processing with standard CANape/vSignalyzer on-board tools

Advantages and strengths of the Vector CSM measurement solution

► Innovative, fast, precise and flexible measurement solution

► High measurement accuracy due to robust CSM measurement technology that can be instrumented close to the measurement point

► Synchronous recording of raw values enables exact calculation of performance parameters and characteristics with the eMobilityAnalyzer

► The intensive analyses in pre-processing are performed in the cloud

► Statistical analysis results and overview of conspicuous measurement results with one click

► Detailed analyses in intuitive vMDM front-end tools

For more information, visit www.vector.com and www.csm.de

About CSM

CSM has been setting technological standards for decentralized measurement technology in vehicle development for over 35 years. Our CAN bus and EtherCAT® measurement devices support worldwide renowned vehicle manufacturers, suppliers and service providers in their developments.

Continuous innovation and long-term satisfied customers are our guarantee for success. Together with our partner Vector Informatik, we have developed an easily scalable and powerful E-Mobility Measurement System for hybrid and electric vehicles and are constantly expanding the areas of application. With our high-voltage safe measurement systems designed for fast and synchronous measurements and power analyses, we actively accompany the change to **E-Mobility.**

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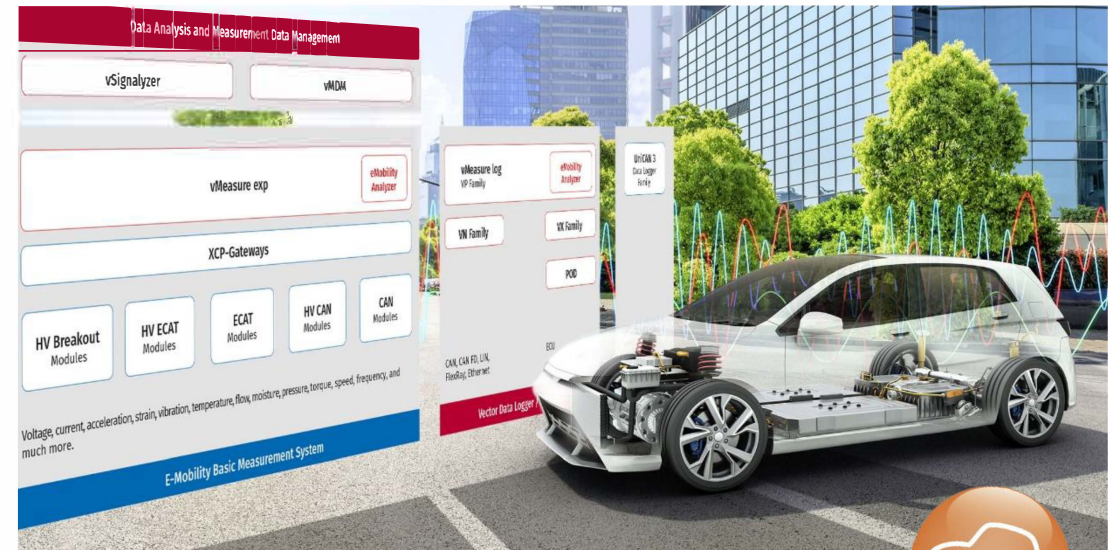
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of CSM Xplained, please visit

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