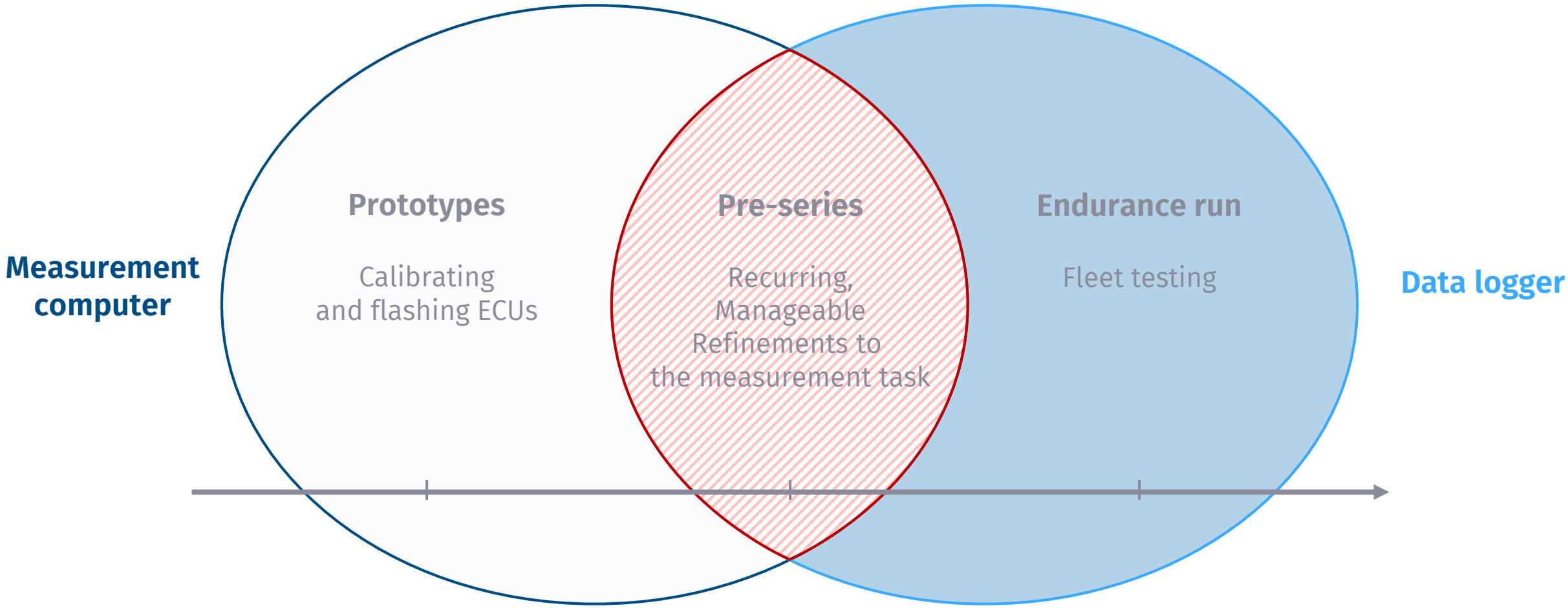
Bye Bye Measurement Computer –
Efficient and Intelligent Logger Solutions for Road Testing

CSM web seminars

CSM Xplained
measurement technology

Innovative Measurement and Data Technology

Application scenarios for data recording in road tests



Measurement computer

The measurement computer

Measurement computer = laptop

- On the lap of an operator
- On a special holder (operation by the driver)
- Robust (rugged) versions are also available, which are often used in practice

Picture: Adobe Stock #141674977 by velishchuck

Laptop vs. compact data logger

Measurement computer

Picture: Adobe Stock #603215726 by Camerene P

Pre-series

Recurring
Manageable
Refinements to
measurement task

Endurance run

Data logger

Always in loops

Always in loops

Always in circles

Equipment

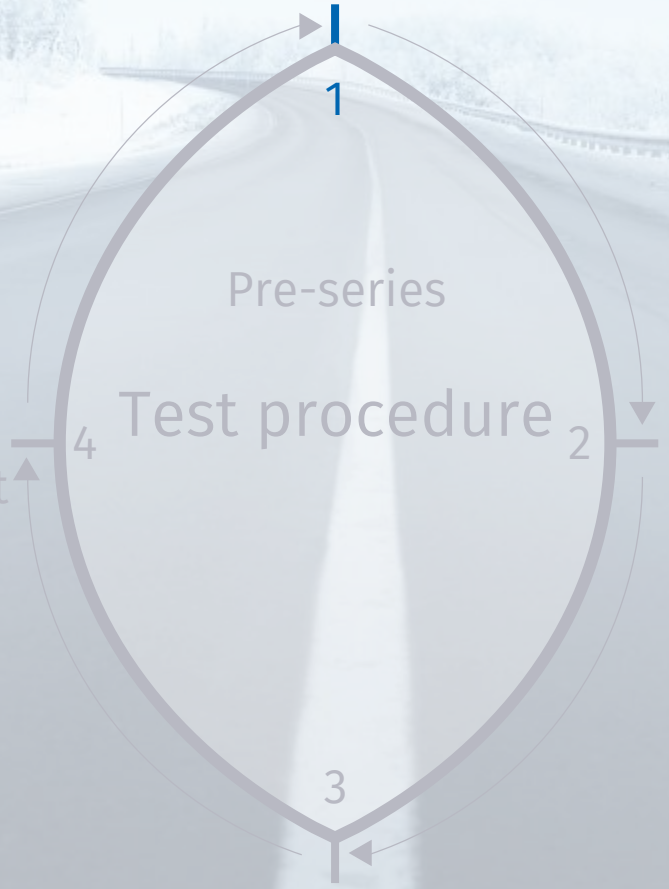
Refinement of the measurement task

4 Test

Measurement computer

- Handling
  - Complex setup of the measurement computer
- Occupant protection (flying parts in the event of an accident)
- Connectors on laptop not suitable for road tests
  - Possible loss of data due to connectors shaking loose or not making reliable contact due to vibration
- Possibly unsuitable laptop hardware that is not vibration-resistant
- Insufficient operating temperature range of laptops

Always in loops



Data logger

- Handling
  - Already installed when the measurement technology is installed
  - Can be installed in any suitable place in the vehicle, even behind covers, in the glove compartment, etc.

UniCAN 3
data logger on
www.csm.de

Always in loops

Measurement computer

- Operation
  - Additional personnel / operator may be required
  - Complex data management
    - Many work steps to be carried out manually (file naming, storage location, metadata) and process for standardization necessary for several users
  - Data management prone to errors
    - Potential for errors when entering data manually

Always in loops

Test drive and return to the starting point

Data logger

- Operation
  - No need for technically experienced on-site measurement support
    (no developer or application engineer required)
  - Cost and time savings

test vehicle

es

edure

2 **Test drive and return to the starting point**

Data logger

- Less error-prone due to
  - Less manual work
  - Less complex hardware and software (reliability and stability)

FPGA architecture

- CPU and operating system specially developed for driving tests

test vehicle

edure 2 **Test drive and return to the starting point**

Data logger

- Operation
  - The measurement data is stored systematically (partly during the measurement run)
  - Process reliability
    - Structured use of file name, META data
    - No different workflows due to changing operators

test vehicle

edure 2 **Test drive and return to the starting point**

MQTT

- Message Queuing Telemetry Transport (MQTT)
- Standardized solution (standard for IOT messaging, open transport protocol)
- Timely information about the location and operating status of data loggers and vehicles
- Loggers can be easily integrated into web-based dashboards, for example, using MQTT
- Fleet management
  - Possibility to obtain an overview of the entire fleet at any time via a dashboard
- Quick recognition of special incidents based on selected live values

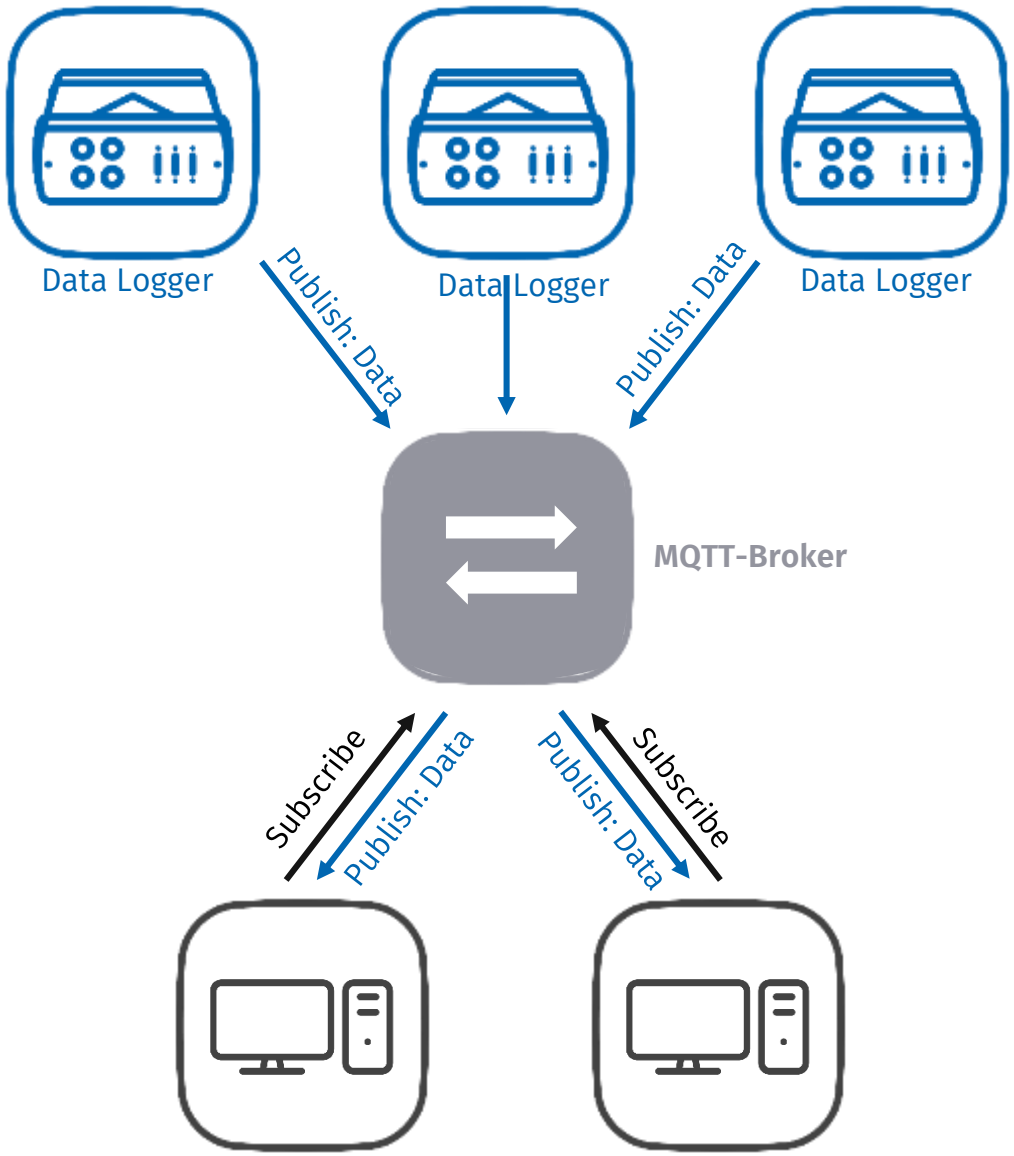
test vehicle

edure 2 **Test drive and return to the starting point**

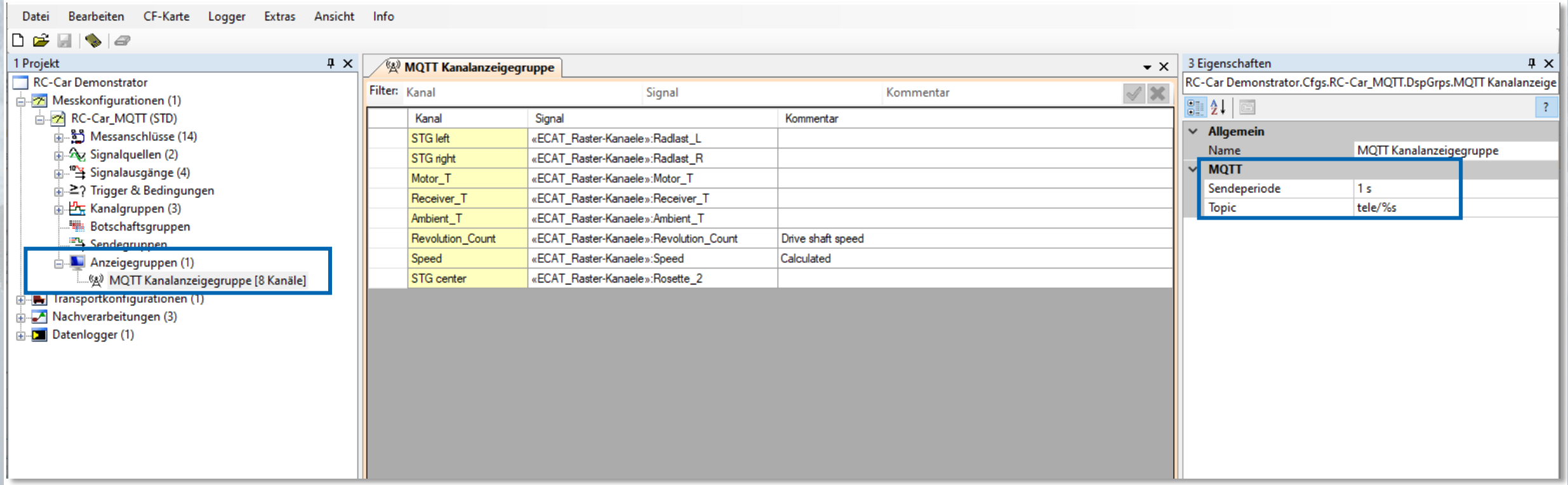
MQTT - Operating principle

- A client connects to an MQTT broker (server, intermediary) and regularly stores status information there

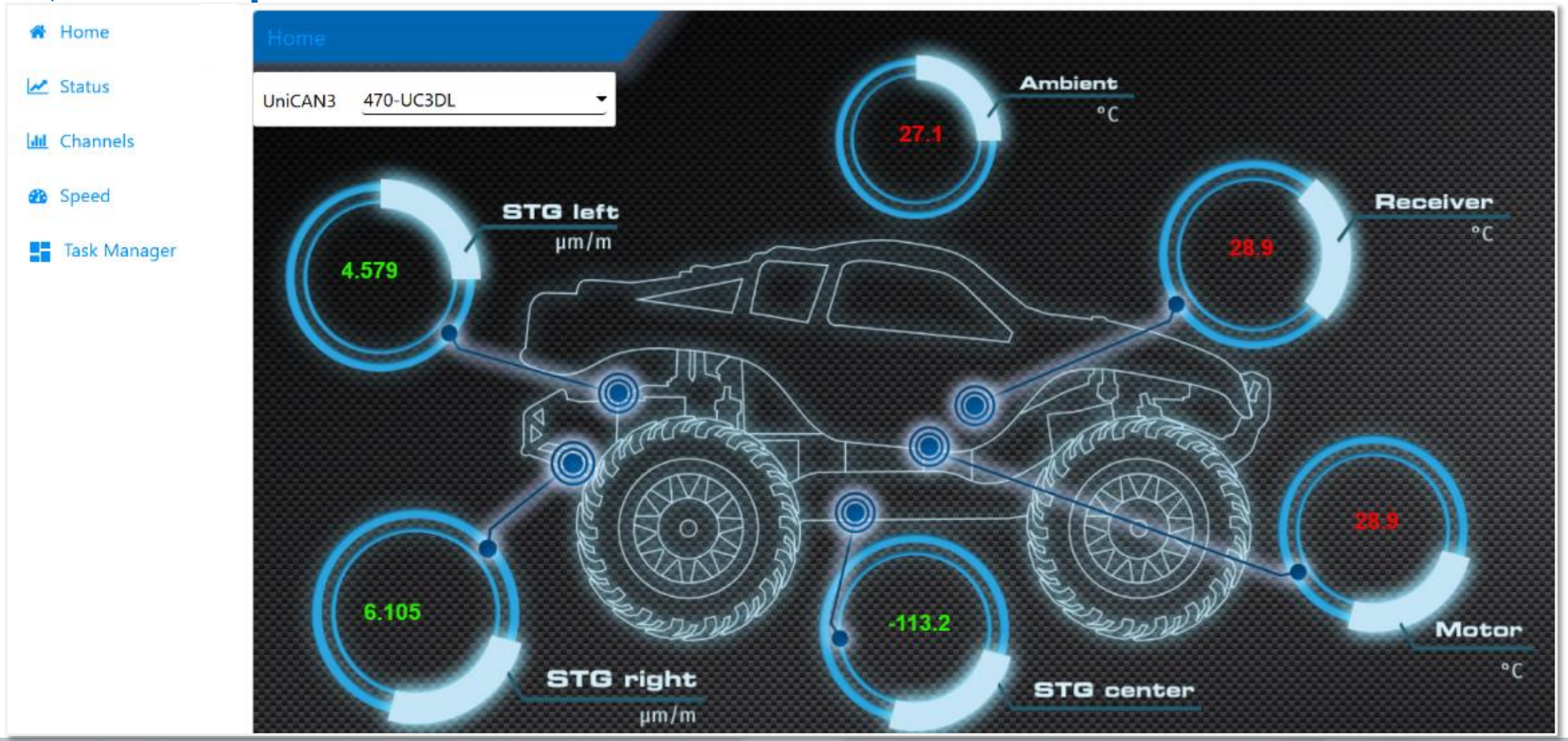
- On the user side, a client connects to the MQTT broker and subscribes to receive messages from other clients



MQTT – Configuration



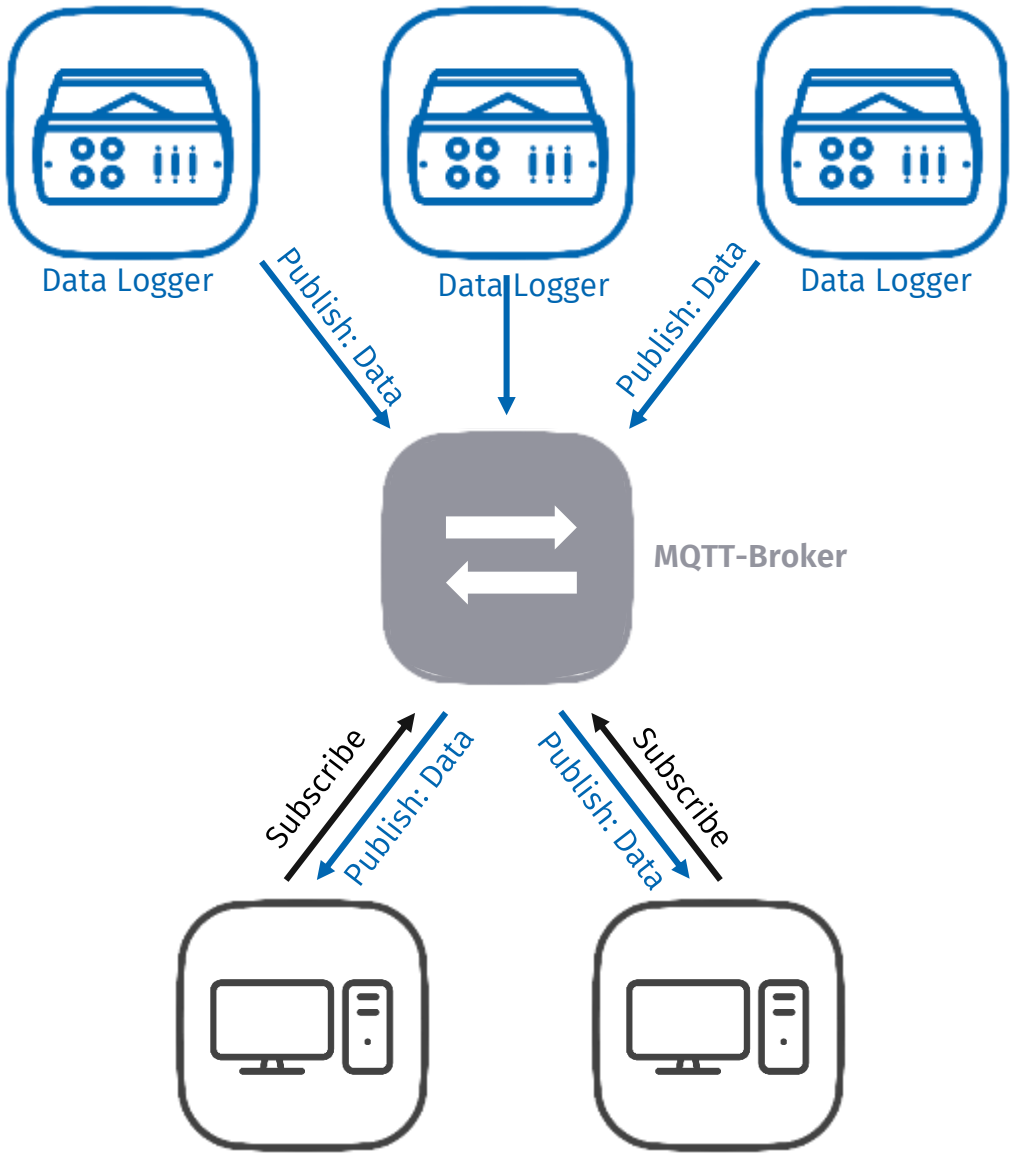
MQTT – Example dashboard



MQTT - Range of functions

- Real-time information using the standardized MQTT transmission protocol
- Sending of regular status information from the device (e.g. data storage fill level, GPS position data, CPU load, ...)
- Configurable message content by the end user (selected measurement channels)
- Access and security:
  - Authentication of the user User/PW
  - Encryption of messages via TLS protocol
- Adjustable update rate: 1s to 10 min
- Data buffering in the event of temporary connection problems

Note: Broker / Dashboard not offered by CSM (recommendation: service provider or setup by customer)



Always in loops

Equipment of the test vehicle

1

Pre-series

Test procedure

2 Test drive and return to the starting point

3

Data analysis

4 Refinement of the measurement task

Equipment

Refinement of the measurement task

4 Test

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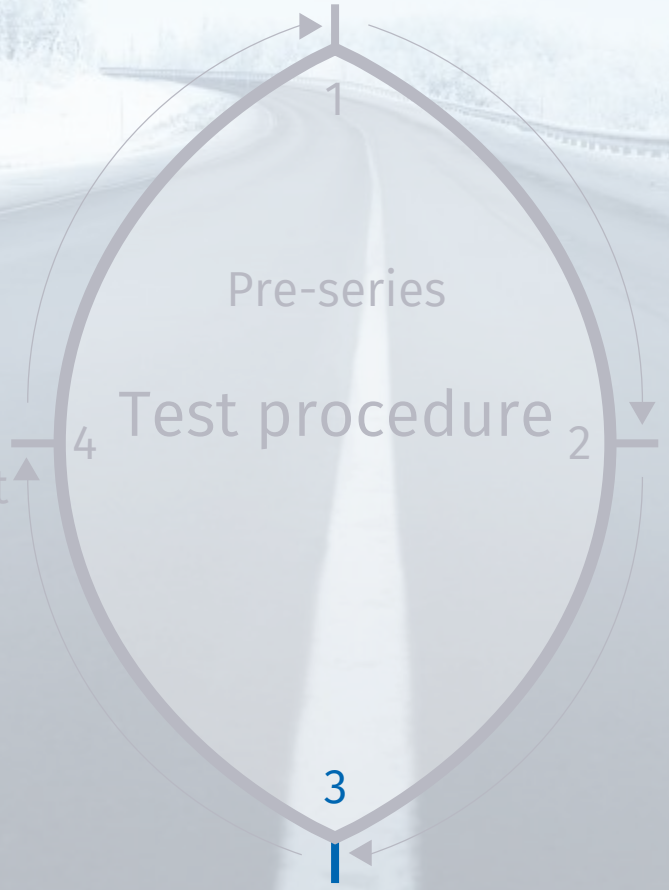
Measurement computer

- Data loss
  - Data records may be lost in the event of incorrect operation

Always in loops



Data logger

- Data transmission using ABC strategy, for the fastest possible availability of measurement data during and after test drives
- Data can be used immediately as it is already in MF4 format

Remote data transmission

- LTE modem (+UMTS / EDGE / GPRS)
- WLAN module (WPA2-Enterprise (RADIUS) and WPA2-Personal (PSK))

ABC strategy

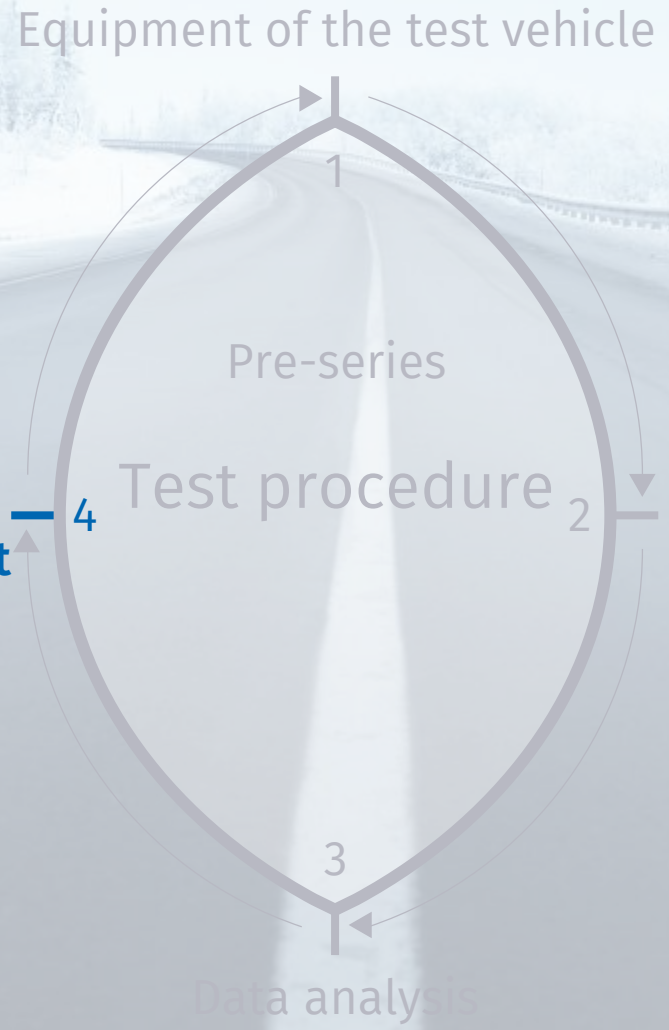
- "ABC strategy": Always Best Connection
- Access data for mobile connection, WLAN and LAN can be stored simultaneously, plus a priority for these accesses
- When a connection is established, the logger checks whether the access routes are available and selects accordingly
- A list of several WLAN access points can be stored for WLAN

Onboard data conversion

- Conversion of measurement data into MF4 format already on the logger
- In future, it will be standard with the UniCAN 3 for the device itself to convert the raw data into MF4 format. This means that ready-to-read MF4 files are copied or uploaded to the server

Always in loops

Refinement of the measurement task



Always in loops

Refinement of the measurement task

4

Equipment

Test

Measurement computer

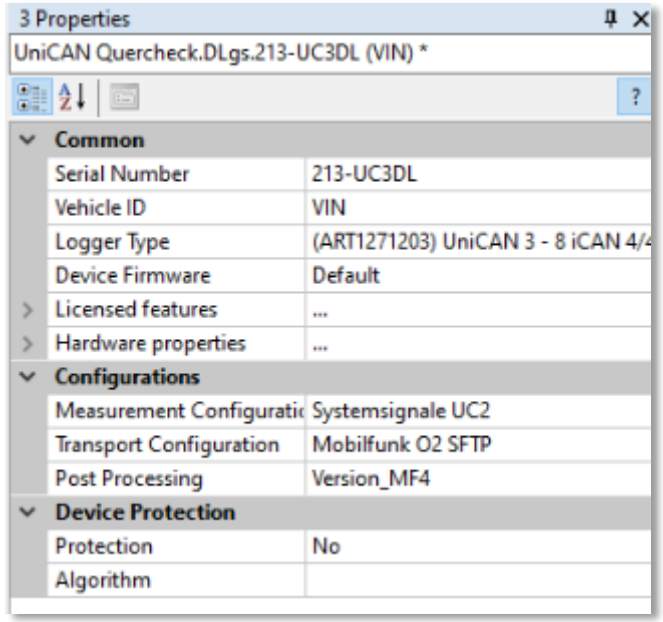
- Time required for Refinements

Data logger

- Remote configuration
  - Faster workflows
  - More cost-effective vehicle support

Remote (re-)configuration

- Configuration update
- Firmware update
- Option update
- Target server update



The data logger as a replacement for the measurement computer

Prototypes

Calibrating
and flashing ECUs

1

Pre-series

Recurring,
Manageable
Refinements to
the measurement task

2

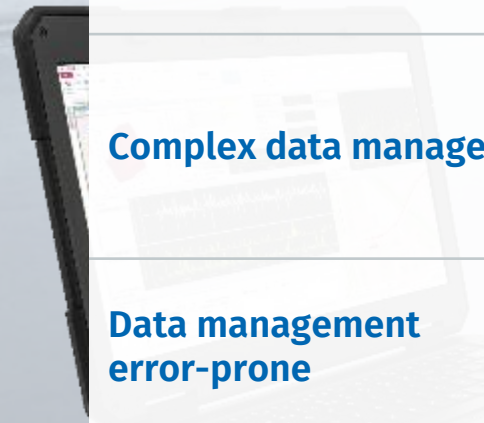
3

4

Endurance run

Fleet testing

Situation	Measurement computer problem	Data logger solution
Operation	Additional personnel required	No additional personnel required on site
Handling	Holder and space for computers / distraction for the driver	Can be installed in many (confined) places in the vehicle, directly when installing the measurement technology
Danger to occupants	Flying parts in case of accident	Safe installation
Complex data management	Many steps have to be carried out manually (file naming, storage location, metadata) and a standardization process is required for multiple users	Low susceptibility to errors / Very high process reliability
Data management error-prone	Potential for errors when entering data manually	Automated file storage
Data loss	Data records may be lost in the event of incorrect operation	Real-time transmission and backup to server



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Efficient logger solutions are able to compensate for their basal shortcomings compared to measurement computers with intelligent functions.

This provides the user with the advantages of both worlds (measurement computer and data logger).

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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