

Welcome to the webinar:
**“Road Load Data Acquisition and Vehicle Testing with
CAN FD”**

A graphic featuring the word 'WEBINAR' in a bold, blue, sans-serif font. The 'W' is contained within a dark blue circle, and the entire graphic is set against a light gray rounded rectangular background with a subtle reflection below it.

Finn Lange

- **Product Manager Test & Measurement at HBM**
- Diploma in Business Administration and Electrical Engineering
- More than 5 years of experience in test and measurement
- Product Manager for HBM'S rugged DAQ systems and Mobile Data Acquisition
- **E-Mail:** finn.lange@hbm.com



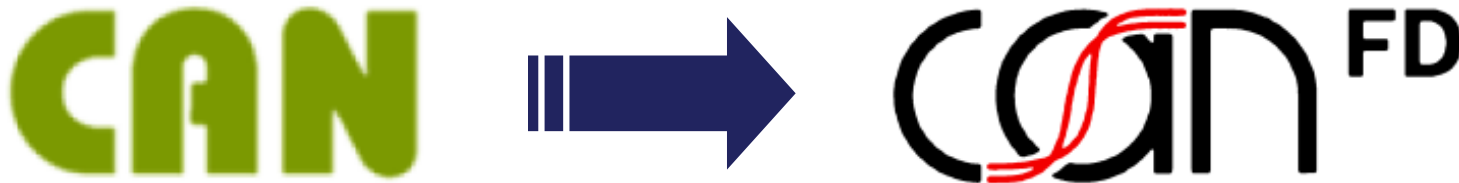
Finn Lange

Road Load Data Acquisition and Vehicle Testing with CAN FD

1. What is CAN FD?
2. CAN FD in mobile vehicle testing
3. Status of CAN FD @ HBM
4. LIVE: CAN FD recording with catman AP

What is CAN FD?

- As complex ECUs in vehicles require more and more bandwidth, the CAN bus reaches its limits



- CAN FD = “CAN with Flexible Datarate”
- Basic idea:
 - Increase of bit rate during data transmitting phase
 - max. 64 Byte (512 bit) per message instead of max. 8 Byte (64 bit)
- Advantage: new CAN FD hardware is compatible to „classic CAN“ and CAN FD, only software configuration needs to be updated
- Parameterization: dbc, arxml (AUTOSAR), fibex (ASAM)

Advantages of CAN

- World-wide standardized (ISO)
- Reduced wiring – cost and weight efficient
- No master/slave system – participants can send and receive messages
- Several participants can use the same sensor
- Low cost – cost effective chips, twisted pair cable, easy installation
- Established hardware / software toolset



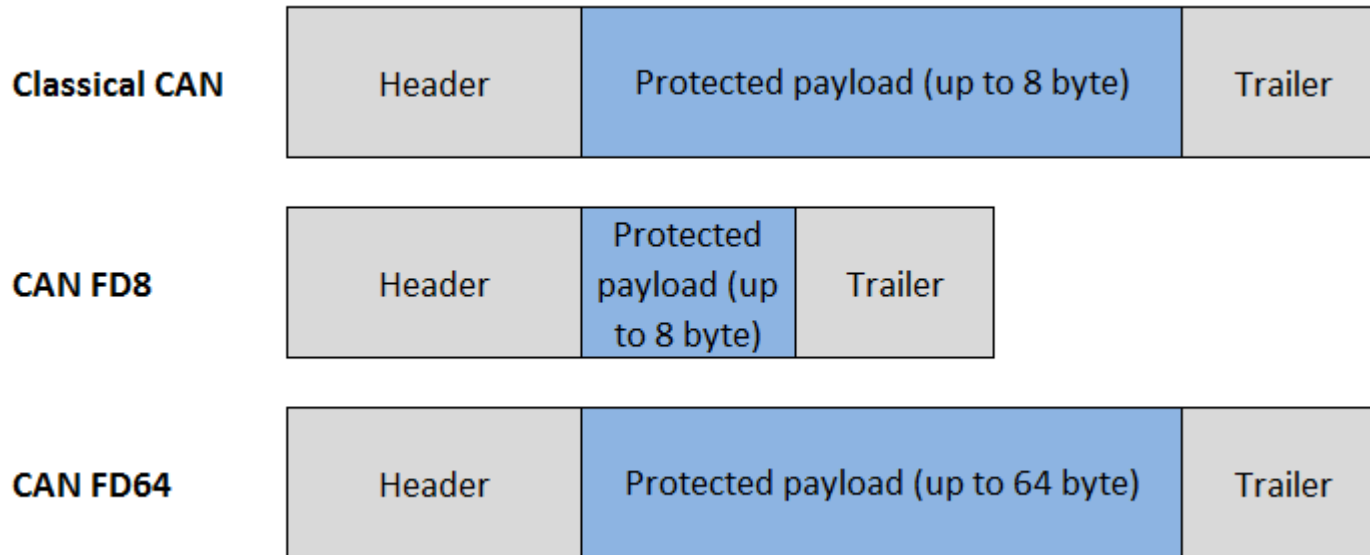
Further improvements of CAN FD

- Lower power consumption
- High-priority messages can interrupt low-priority messages
- Standardized time signature of messages



What is CAN FD?

- CAN FD provides a higher performance / bandwidth
 - Header and trailer stay with CAN bit rates (up to 1 Mbit/s)
 - Data can be transmitted with up to 8 Mbit/s
 - Payload up to 64 bytes



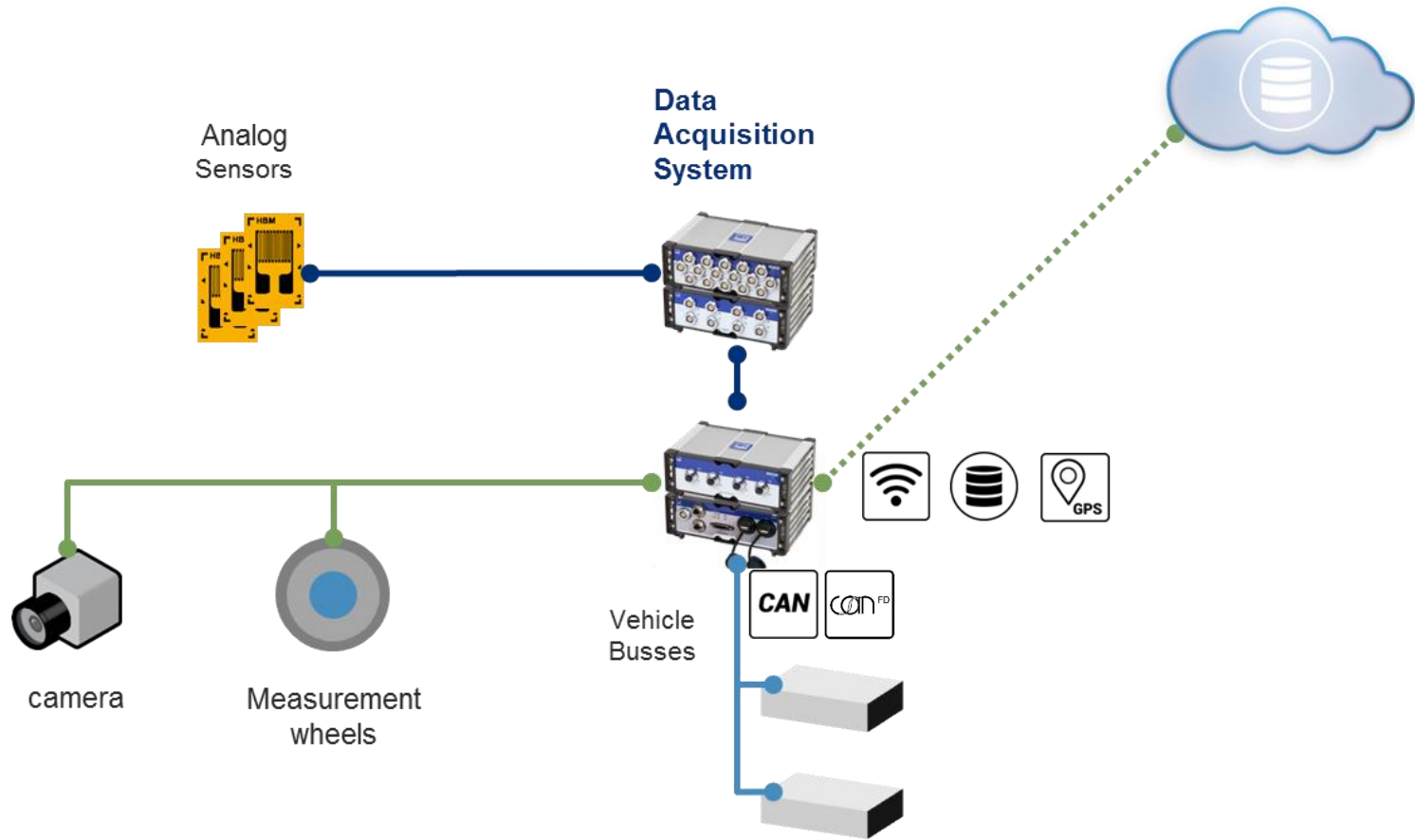


CAN and CAN FD are used to bring sensor data from the car into the DAQ!



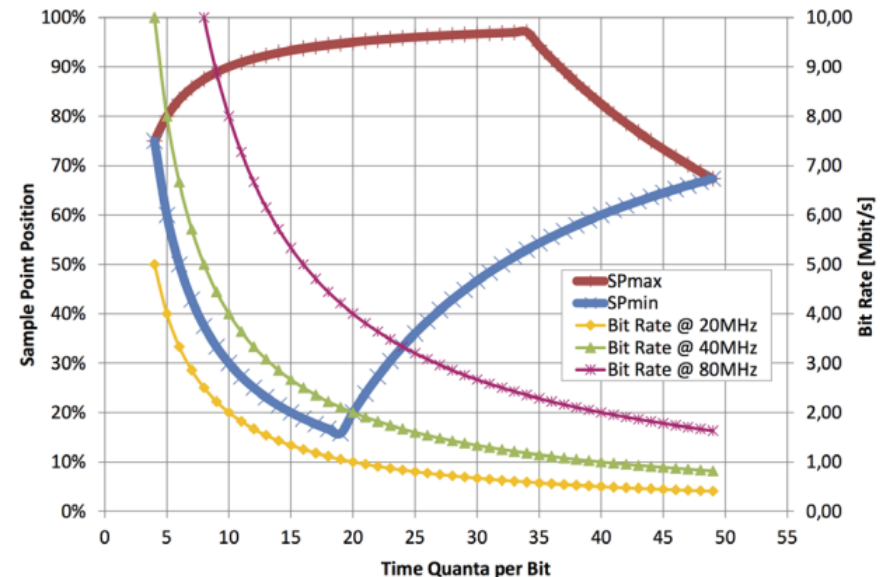
- ➔ Less additional sensors
- ➔ Less cabling
- ➔ Less effort

CAN FD in mobile vehicle testing



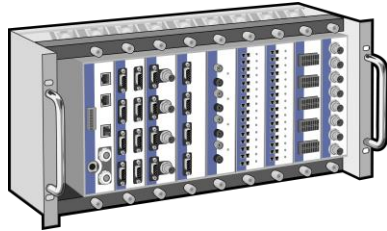
What do I need to know as test engineer about CAN FD?

- Bitrate
 - 2 bit rates needed for arbitration and data phase
 - MX471C defaults: 500 kbit/s and 2 Mbit/s
- Sample Point Ratio
 - MX471C defaults: 87.5 % and 70 %
- Sync jump width (SJW)
 - MX471C defaults: 16 and 12
- Termination
 - Connection to vehicle bus: off
 - Connection to private bus: on
- Listen-only mode
 - Recommended for vehicle bus



Source: CiA, CAN Newsletter 1/2018

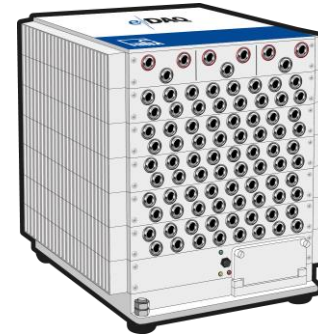
Mobile Testing DAQ platforms from HBM



QuantumX



SomatXR



Somat eDAQ / eDAQlite



+	MX471C	MX471C-R	<i>EXRCPU EXRL-CPU (FD ready)</i>
-	MX840 / A / B MX471 / B	MX840B-R MX471B-R	ECOM EVBM-CAN ELCOM

Standard and ruggedized CAN FD modules MX471C and MX471C-R

- 4 **CAN inputs** measure



– **Classical CAN**



– **CAN FD**

- 2 Gigabit **Ethernet inputs** (front / back)
- CAN protocols:
XCP-on-CAN / FD
- Transmit max. 128 CAN messages per port
- Decode max. 250 CAN messages per port
- 1 CAN raw receiver (per port)
- Improved setup & debugging
- Supply voltage: 10 to 30 V
- Plugging: CAN: 9 pin Sub-D / 5 pin M12 – Ethernet: RJ45 / 8 pin M12 x-coded



Benefits:

- CAN bus data and analog data fully time synchronous together with other MX
- CAN Gateway: send any system signal on CAN bus
- Ethernet Gateway: send any system signal on Ethernet

Status of CAN FD @ HBM

Software

Visualization: Decoded in graph
Raw in table

Trigger: Decoded only

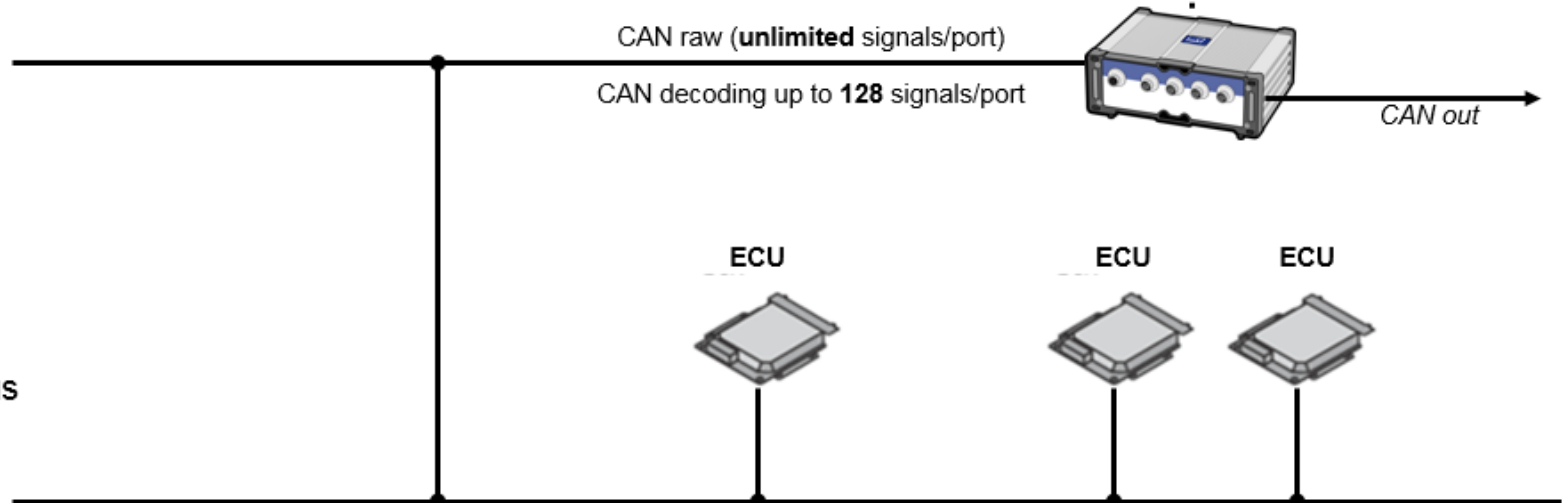
Raw can be decoded in post process analysis



Module

CAN raw	Timestamp	Message ID	Message name	Bytes	0	1	2	3	4	5	6
MX471B-R CAN_CANRaw_Receiver_1											
1	0,000000 s	0x00000481		8	00	80	00	80	00	80	00
2	0,000037 s	0x00000381		8	00	80	00	80	00	80	00
3	0,000045 s	0x00000281		8	00	80	00	80	00	80	00
4	0,000833 s	0x81010000		8	E9	00	00	80	00	80	00
5	0,099974 s	0x00000481		8	00	80	00	80	00	80	00
6	0,099986 s	0x00000381		8	00	80	00	80	00	80	00
7	0,099994 s	0x00000281		8	00	80	00	80	00	80	00
8	0,100803 s	0x81010000		8	E9	00	00	80	00	80	00

Bus



1. Complex ECUs in vehicles require more and more bandwidth, which is addressed with CAN FD in modern platforms
2. Setup and configuration don't change much compared to classical CAN because of backwards compatibility of CAN FD
→ But bus parameters are now more important!
3. HBM offers a powerful DAQ platform for mobile data acquisition, which supports CAN FD in a very flexible way
→ Raw, Decoding, Encoding, Gateway

More information can be found on our website:

- <https://www.hbm.com/en/3755/mobile-field-testing/>
- <http://www.millbrook.co.uk/services/vehicle/road-load-data-collection-and-correlation-vehicle/>

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Sensors Instruments Software Services & Support About HBM

Mobile Data Acquisition in the Field

Field Tests and Mobile Applications

Testing and measuring equipment is subjected to particularly harsh environments in mobile and field tests.

Mobile Data Acquisition in the Field

Vehicles and their components undergo numerous test runs from the conception of the idea to when they are ready for production: from "virtual load tests" conducted on the computer through tests in test stands to mobile tests in the field (road load data acquisition). The vehicles and components under test are subjected to real conditions of use. They are sometimes exposed to extreme ambient and temperature conditions. Whether you are testing cars, construction machines, or trains, each vehicle places special demands on field testing and requires testing in line with the target application.

HBM provides flexible testing and measuring solutions for deployment in mobile data acquisition:

- Many sensors are available to facilitate the acquisition of different physical quantities.
- Rugged data recorders (SomatXR, Somat eDAQXR, QuantumX), optimized for utilization in harsh environments allow mobile data acquisition reliably and safely.
- Cutting-edge software solutions (catman, nCode GlyphWorks) enable convenient online processing and analysis of the acquired data.

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| Road Load Data Collection and Correlation Vehicle

Road Load Data Collection and Correlation Vehicle

Millbrook offers a fully instrumented vehicle for road load data collection and proving ground correlation.

The set-up of instrumentation in the vehicle can be replicated on customer vehicles for data collection on development or benchmark products.

The vehicle:

- 2017 VW Tiguan 2.0 TSI SEL DSG 4wd
- Left Hand Drive, UK road-registered
- Factory accessories include: tow bar, roof box and cycle carrier
- Advanced driver assistance systems include: AEB and ACC
- Off-road package

Available for:

- Proving ground correlation
- Public road correlation

Fitted with the latest HBM SomatXR data acquisition system:

- Over 60 channels permanently installed
- Key channels for structural and powertrain tests
- DC accelerometers in key locations for road load data
- HBM strain gauges on key suspension components
- Torque measurement on driveshafts and propshaft
- Wheels and brackets available for wireless wheel force transducers
- Additional channels can be added on request

Any questions?

- If you have any questions, please do not hesitate to contact us: webinar@hbm.com
- Or email the presenter directly: finn.lange@hbm.com



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