Welcome to the “Optimize Vehicle Testing” Webinar

The presentation will begin at 11am Eastern Standard Time

All attendees microphones are muted for the entire webinar session. Be sure your speaker is active and join the audio conference.

If you have a question, please send it to the host using the “Q&A” function.
Questions will be answered at the end of the presentation.

Organizational Information

- All participants' **microphones** are **muted** during the webinar.
- Please do not forget to **activate** your PC **speakers** to enable **audio** or connect **headphones** to your PC. You may have to take the step of joining the audio conference to hear sound.
- Please type any questions you have into the WebEx Q&A dialog
- You can open the Q&A window by selecting the “Q&A” icon in the WebEx toolbar at the top of your screen:

- Today’s presentation will be E-mailed to all attendees. The webinar will also be posted on our website: http://www.hbm.com/en/3157/webinars/
- If you have additional technical questions, feel free to contact our technical support team at support@usa.hbm.com or support@hbm.com

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Presenter

Ravi Shukla

- Business Development Manager at **HBK – Hottinger, Brüel & Kjaer**
- Degree in Electrical Engineering from University of Michigan
- Previously HBM BDM and Application Engineer for QuantumX & SomatXR Data Acquisition Systems
- Test & Measurement Experience for 10+ years

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Agenda

- Challenges in Automotive Industry and Software Development
- Review typical workflow in linking Physical Sensor data during ECU calibration and diagnostics
- How to fine-tune Software in Lab or Mobile Testing
- QuantumX/SomatXR Data Acquisition xCP-on-Ethernet Integration
- Live Examples of xCP-on-Ethernet working on 3rd party software tools
- Summary and Benefits

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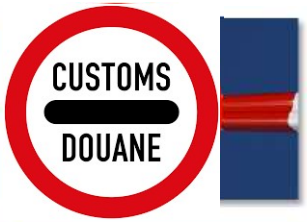
Influencing Factors to the Automotive Market



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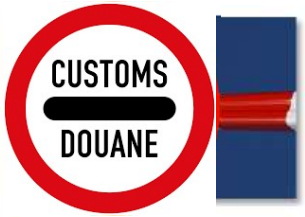
Influencing Factors to the Automotive Market



Geo politics / economical
import taxes – protectionism!

Service / Sharing
Position-based digital journey

Urbanization / urban transport
Density, safety, traffic jams, parking, public transport, …

Old and New Players
Classic OEM / Tier 1 / Start-ups
Sharing services

Sustainability & Laws
Zero Emission, overall emission reduction of fleet , energy mix, noise, safety

Society & consumer trends
(voice, touch, gesture, always on, streaming, crypto digital currency, online ordering, monthly services, …)

Innovative Technologies
Digital Transformation as Mega Trend – software, smart / IoT, blockchain, 3D printing, autonomous driving, SaaS, simulation, ….

Employees &
Work environment
(work / life, digital, interactive)

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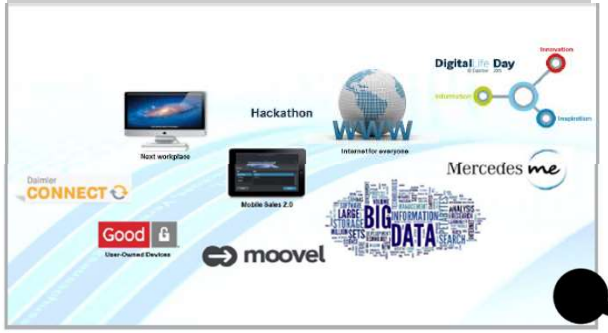
The Automotive Mega Trends

Networked / Connected / Digital



Autonomous

Shared / On-demand

Electrified

Pictures on courtesy of Toyota Motor Cooperation

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The Challenge from a Product point of View

The Mega Trends – Sustainable – Electrified – Autonomous – Networked and Shared

The amount of software grows exponentially driven by multiple forces

- Innovation through an improved user experience in whatever geographical market
- Increasing **efficiency / performance**
- Increasing **comfort and safety** by further assistance (ADAS) or autonomous driving

The Challenge from a Product point of View

In vehicle electronics are established in all domains of a vehicle since decades. It started with radio and entertainment, electronic control or management units (ECU) attached to engine, gearbox, brakes, for safety – very local, dedicated sensors and actuators, typically CAN networked. The amount of ECUs was growing and growing and thus the overall networked complexity.

The Challenge - the amount of software in vehicles grows exponentially driven by multiple forces

- Innovation through an improved user experience in whatever geographical market
- Increasing **efficiency / performance** by electrification, hybrids or alternative fuels
  - Means electric drive, fuel cell, battery, charging, recuperating, overall thermal management, …
- Increasing **comfort and safety** by further assistance (ADAS) or autonomous driving
  - Networked vehicles: V2V, V2I, to OEM including Over-the Air update (OTA) from the user

Challenges for Electronic development from testing point of view

- Need towards **less,** but more **powerful electronics** and an open **software framework**

(example: AUTOSAR – AUTomotive Open System Architecture)

- **Object-oriented programming languages** and **enhanced operating systems**
- **Scalable** and **reusable function blocks** cross domains and across different cars
- **Safe operation** is must, fulfilling safety standards (SOTIF, ISO 26262 / ASIL)
- **Quicker** from idea to roll-out into vehicles is a market advantage
- **Easy to maintain** when in use (OTA – Over-the-Air services)

Flexible tools are required for system and software development and testing

Reference:
SOTIF – Safety Of The Intended Functionality (ISO/PAS 21448)
ASIL – Automotive Safety Integrity Level (ISO 26262)

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The Challenge for EE development and testing point of view

- Adding additional software into intelligent vehicles of the future is costly
- There is a need towards **less,** but more **powerful electronics** and an open **software framework**
- From code size optimization in C and assembler towards **object-oriented programming languages** and **enhanced operating systems** with the right links for maintenance and further improvements
- **Scalable** and **reusable function blocks** cross domains and across different cars (AUTOSAR) reduce cost
- **Safe operation** is must, fulfilling safety standards (SOTIF, ISO 26262 / ASIL), so high code quality
- **Quicker** from idea to roll-out into vehicles is a market advantage
- **Easy to maintain** when in use (OTA – Over-the-Air services)

Flexible tools are required for system and software development and testing

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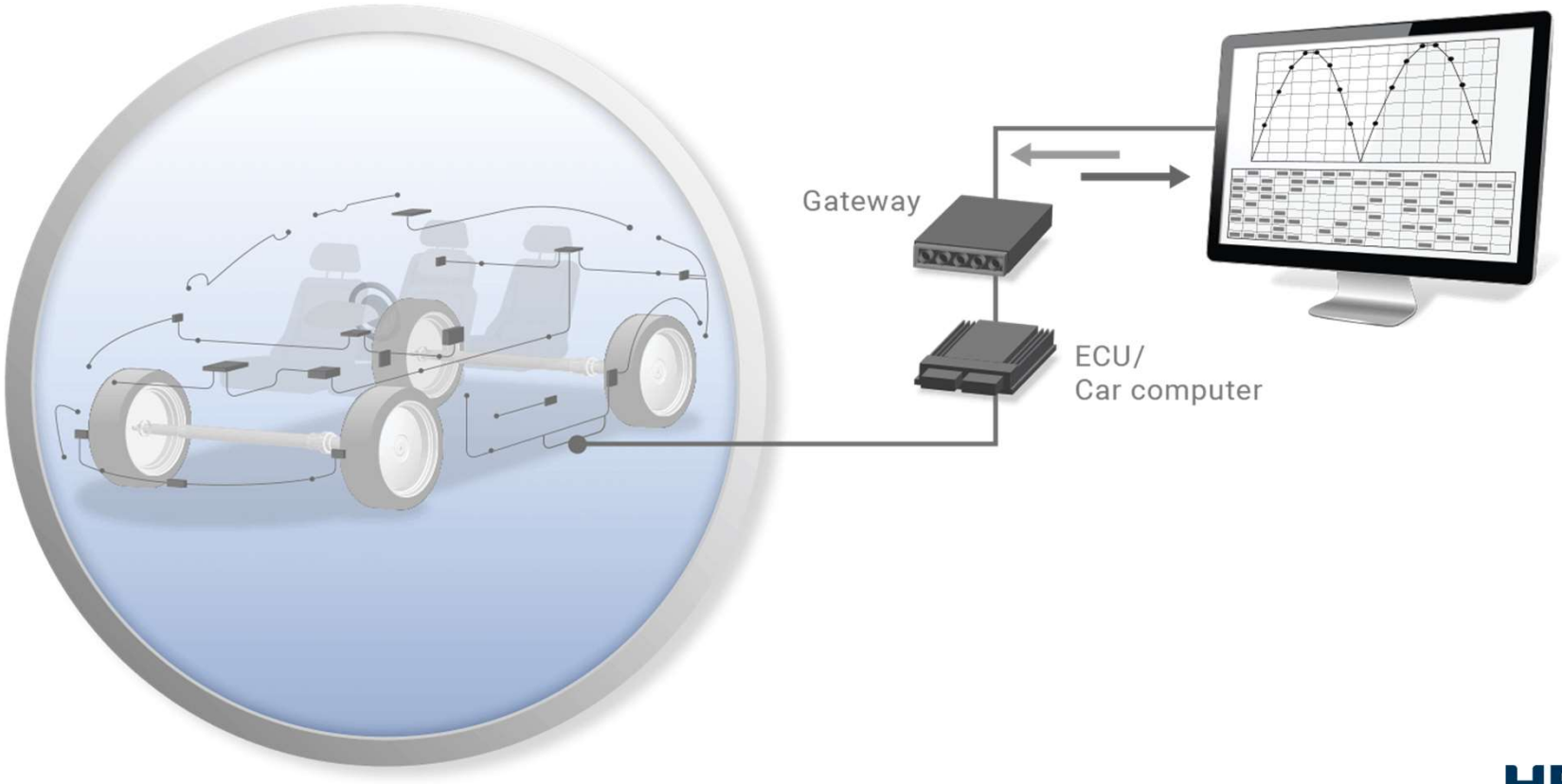
Fine-Tuning Software – Typical Setup



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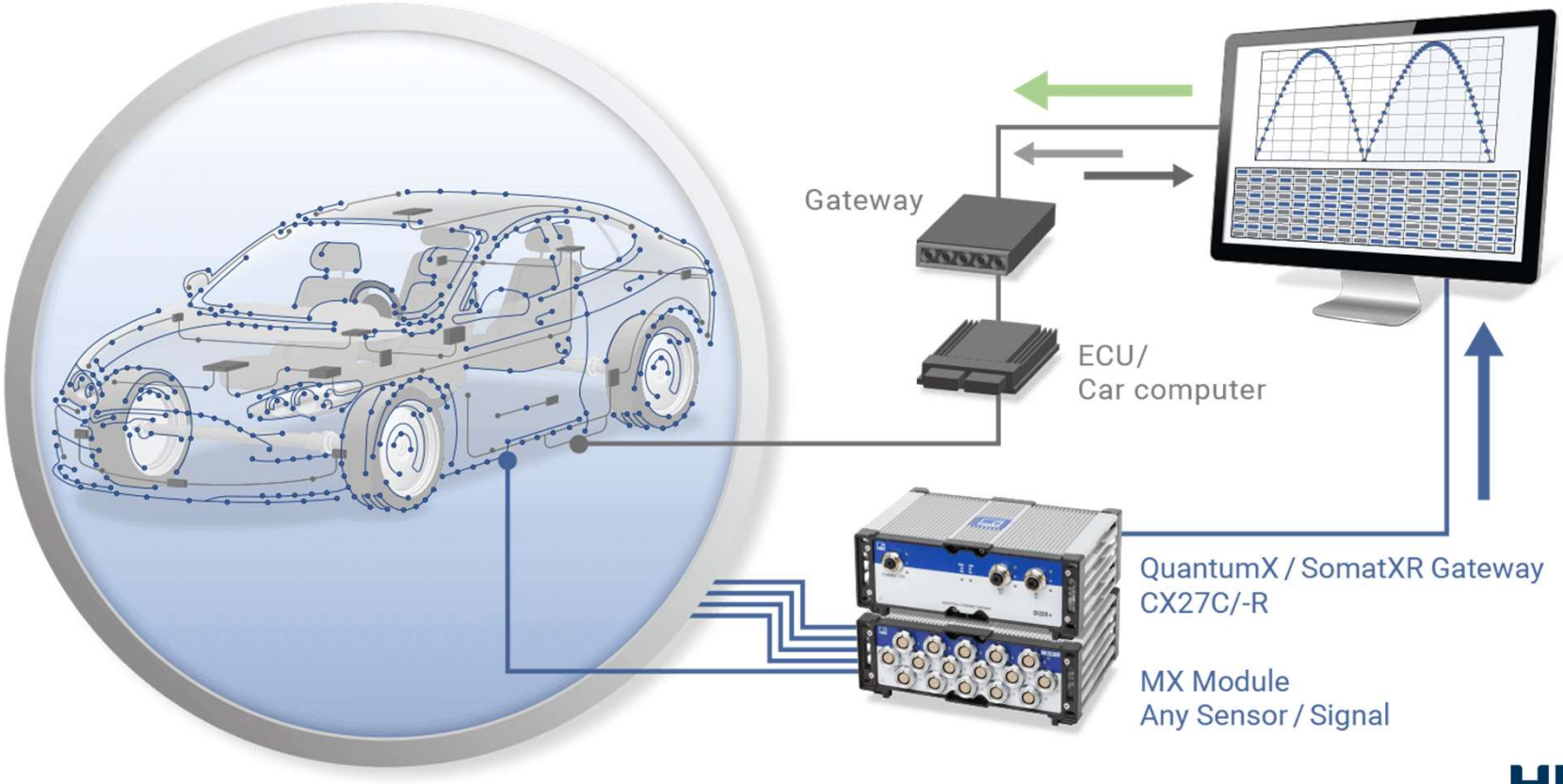
Fine-Tuning Software – Enhanced Setup



XCP – Calibration Protocol

ASAM Association for Standardization of Automation and Measuring Systems

Who offers this?

- XCP is an open calibration protocol, standardized by ASAM ensuring interoperability and can run on any “X” network transport layer (CAN, CAN *FD*, FlexRay or Automotive Ethernet)
- Successful because of its stability and backward-compatibility.

What does it offer?

- Time stamped **measurement** data, parameter **tuning** (calibration), **bypassing** functionality, **flashing** of ECUs and **debugging**
- **High data throughput** with XCP-on-Ethernet

What do you need?

- Parameter description files (A2L) and most likely a decrypting access key to electronics (SKB)

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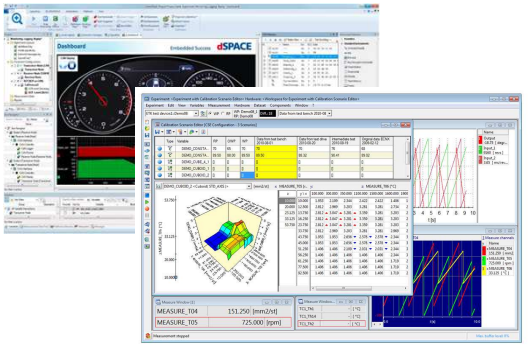
QuantumX or SomatXR CX27C-R Gateway

Functionality

– **EtherCAT™** for test bench OR

– **PROFINET IRT** for test bench

- **Ethernet Gateway** (up to 2 MS/s) allowing to integrate all connected measurement modules to a PC
- **XCP-on-Ethernet** Gateway integrating any sensor to
  - INCA from ETAS
  - CANape from Vector
  - ControlDesk from dSPACE
  - Vision from ATI
  - DiagRA® X from RA Consulting
  - PUMA Open from AVL
  - Fleet recorders and many more



So this is all about openness and integration in **bench test automation** and **Cal tools in parallel.**

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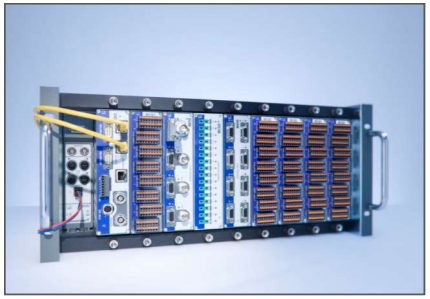
QuantumX – Versatile Distributable Data Acquisition System

Every module is a DAQ system…

… integrate in real-time …



… scale up and distribute modules…

… stand alone recording!

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QuantumX – Freely scale your System

Universal– “Swiss Army Knife of Measurement”
more than 16 transducers types
MX840B, MX440B

High Speed Mechanical
Force, Torque, Speed
MX410B, MX460B

High Accuracy Full Bridge
MX430B, MX238B

High Channel Count
Bridge, IEPE, +/-10V, 4..20 mA, thermocouple
MX1615B, MX1601B
MX1609KB, MX1609TB

Fully Isolated (CAT II / CAT III)
Voltage, current, universal thermocouple
MX403B, MX809B

Available a ruggedized version!

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QuantumX – Freely scale your System

Optical Fiber Bragg Module
Strain, force, acceleration, temperature, inclination
MXFS8DI

Real-time Integration + Ethernet Gateway
EtherCAT, PROFINET, **xCP-on-Ethernet**
CX27C

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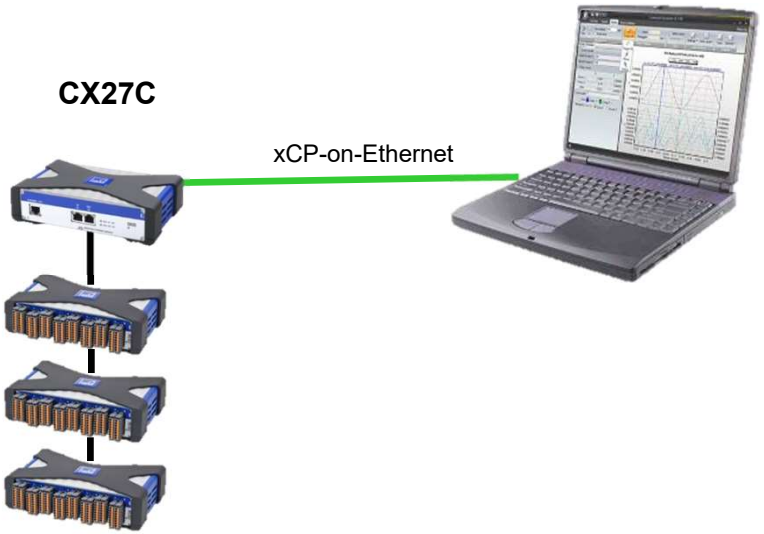
Integrate QuantumX / SomatXR DAQ into any Automotive Measurement and Calibration Software in the market



Established Software packages

- CANape from Vector (dynamics, gearbox)
- INCA from ETAS (engine, motor)
- ControlDesk from dSPACE
- Vision from ATI
- PUMA Open from AVL
- dSPACE prototyper / HiL
- DiagRA X
- Any automotive recorder

...

Task

- Optimization **function of ECU software**
- Optimizing overall mechatronics / system
- Mobile vehicle testing engineers
- Powertrain testing engineers

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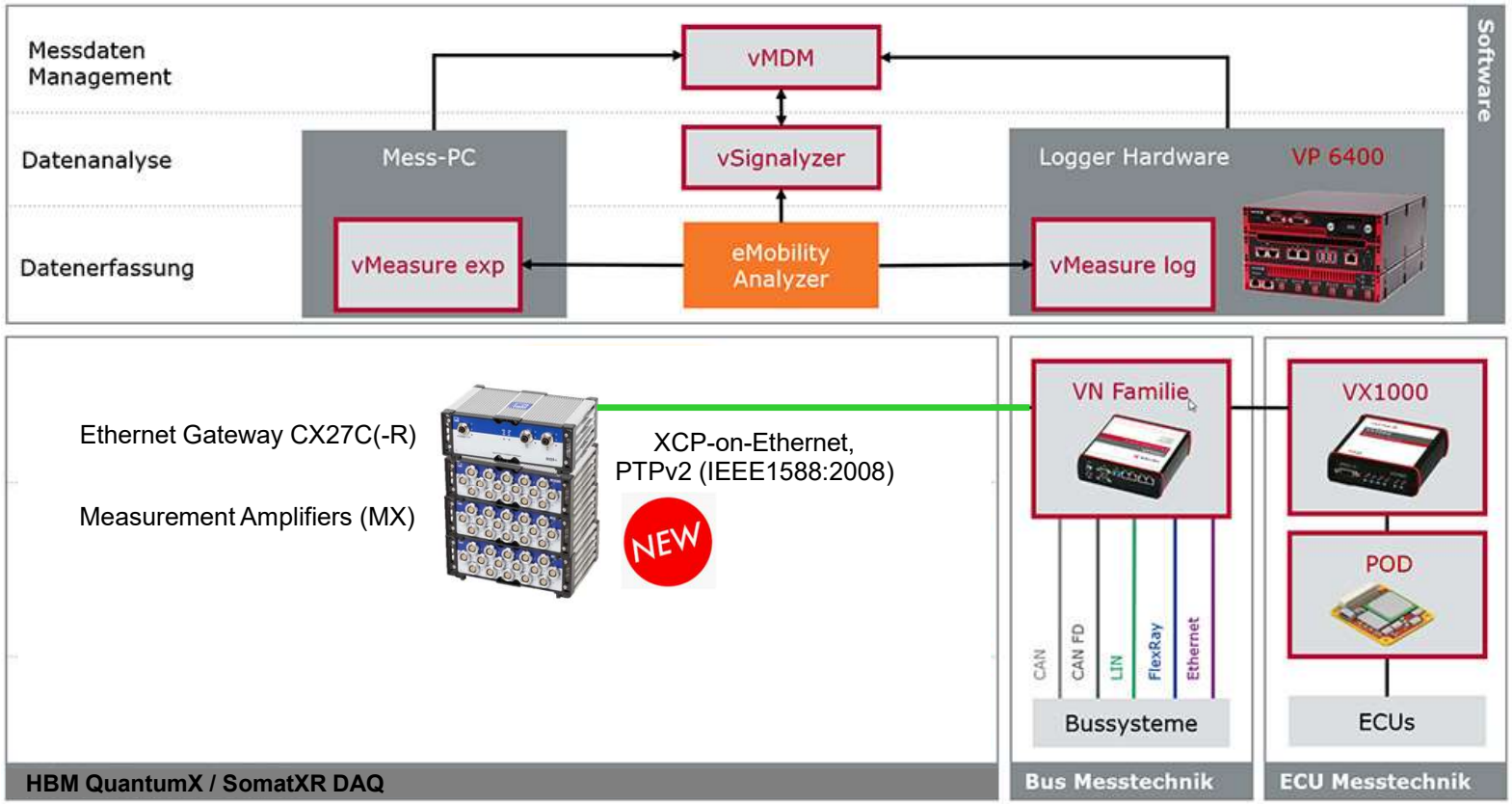
Vector Informatik Eco System Integration (HBM Integration)



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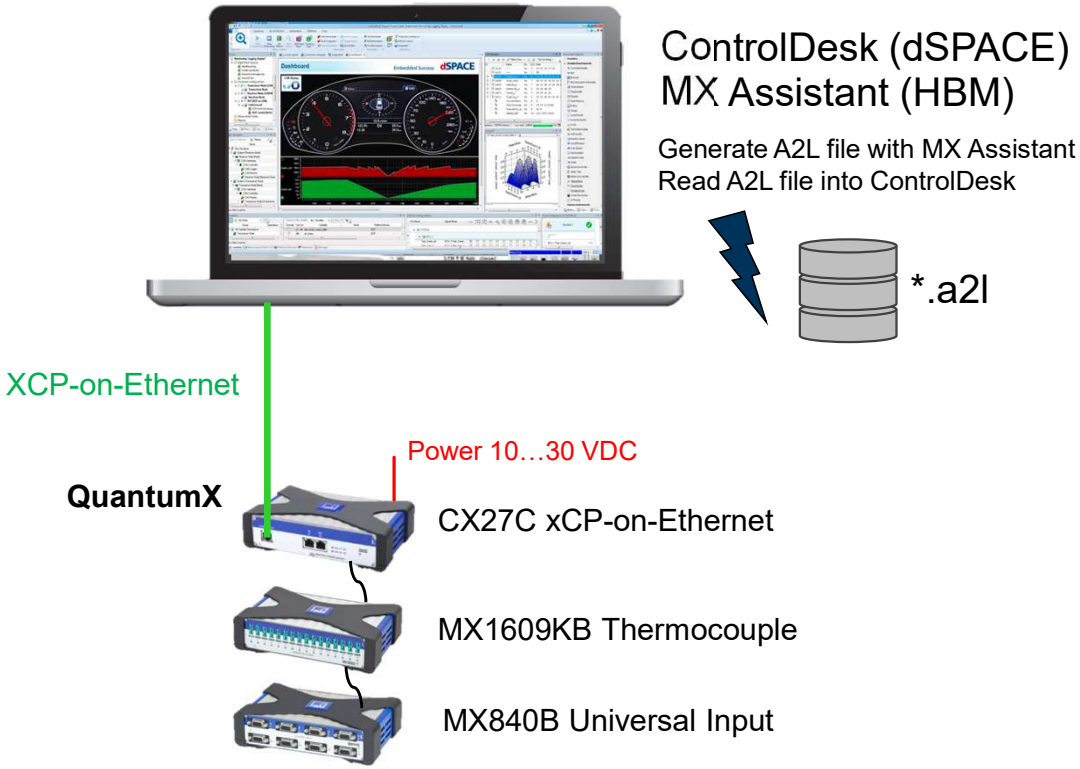
QuantumX Integration into ControlDesk



SomatXR Integration into ControlDesk

dSPACE
ControlDesk

XCP-on-Ethernet

SomatXR DAQ

CX27C-R

Any sensor input
Any channel size
Any distance

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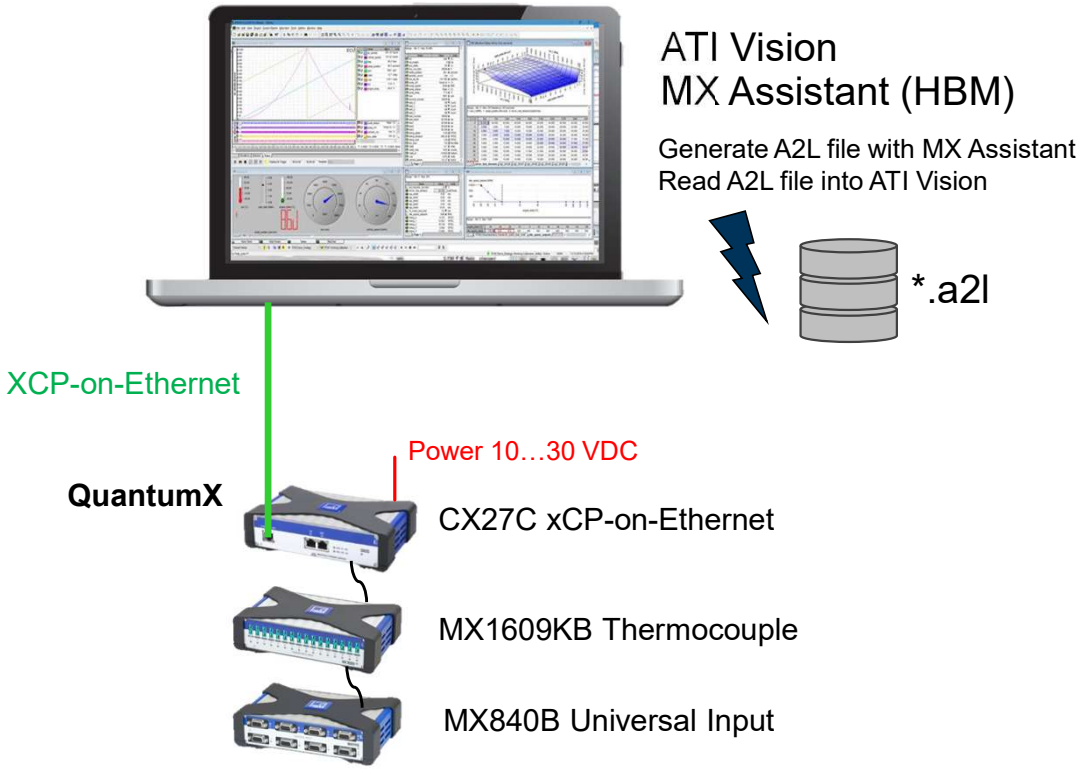
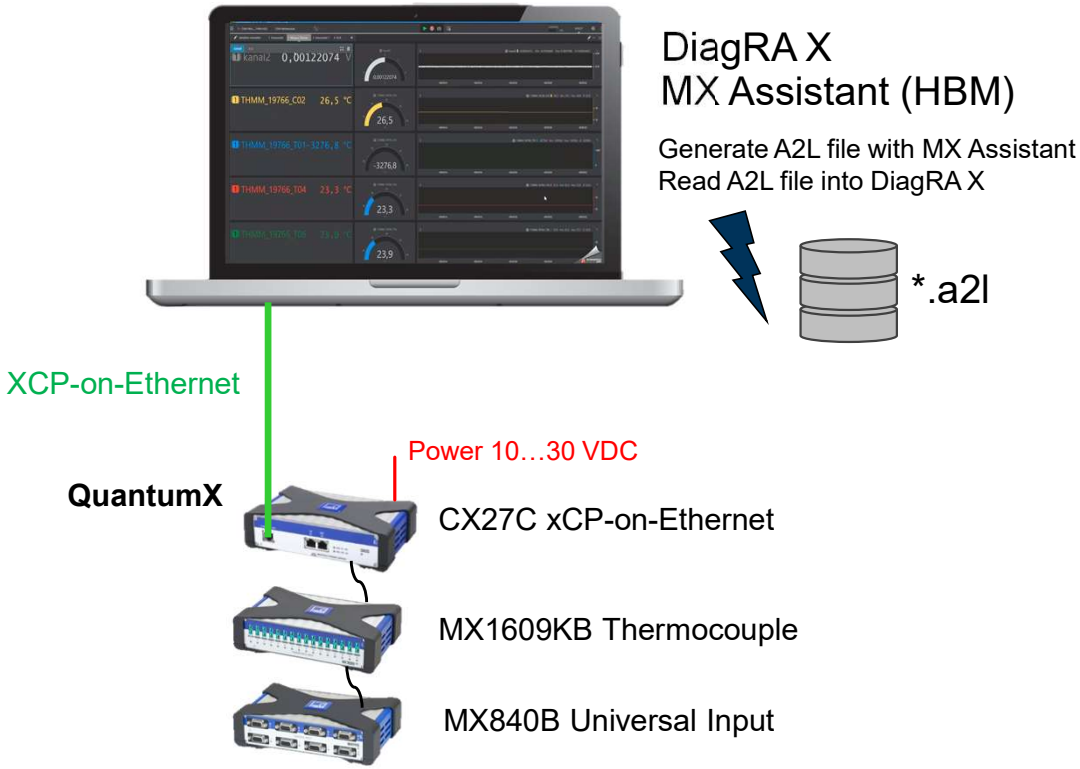
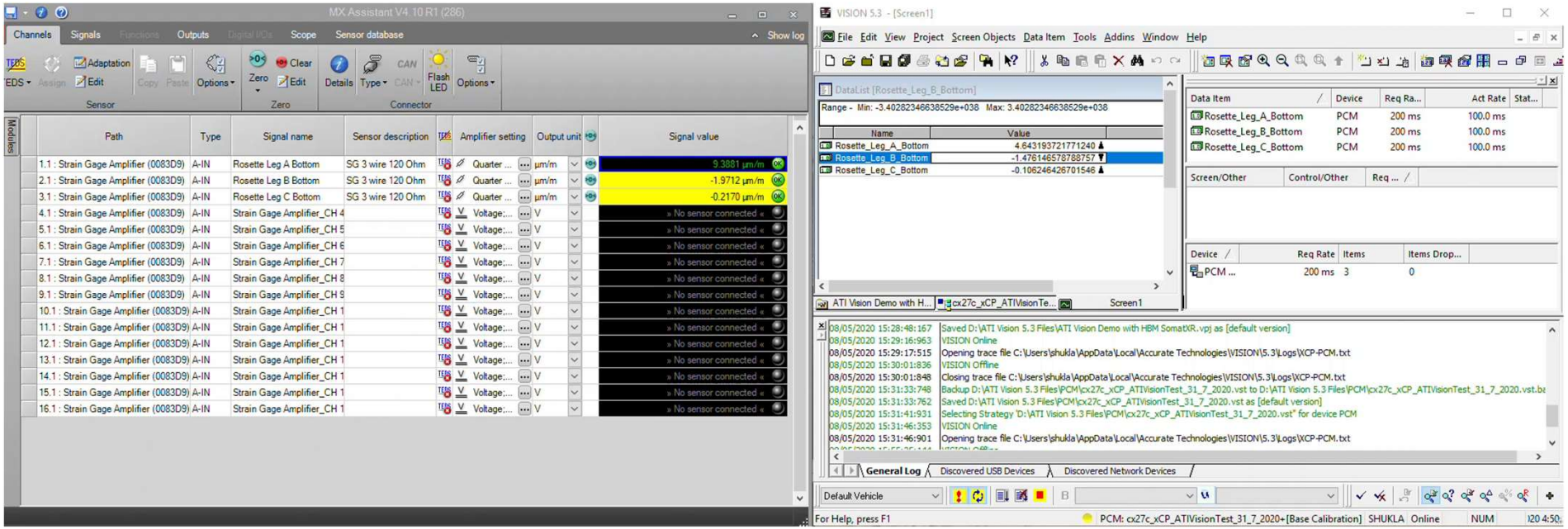
QuantumX Integration into ControlDesk



QuantumX Integration into DiagRA X



QuantumX analog signals working within ATI Vision Software



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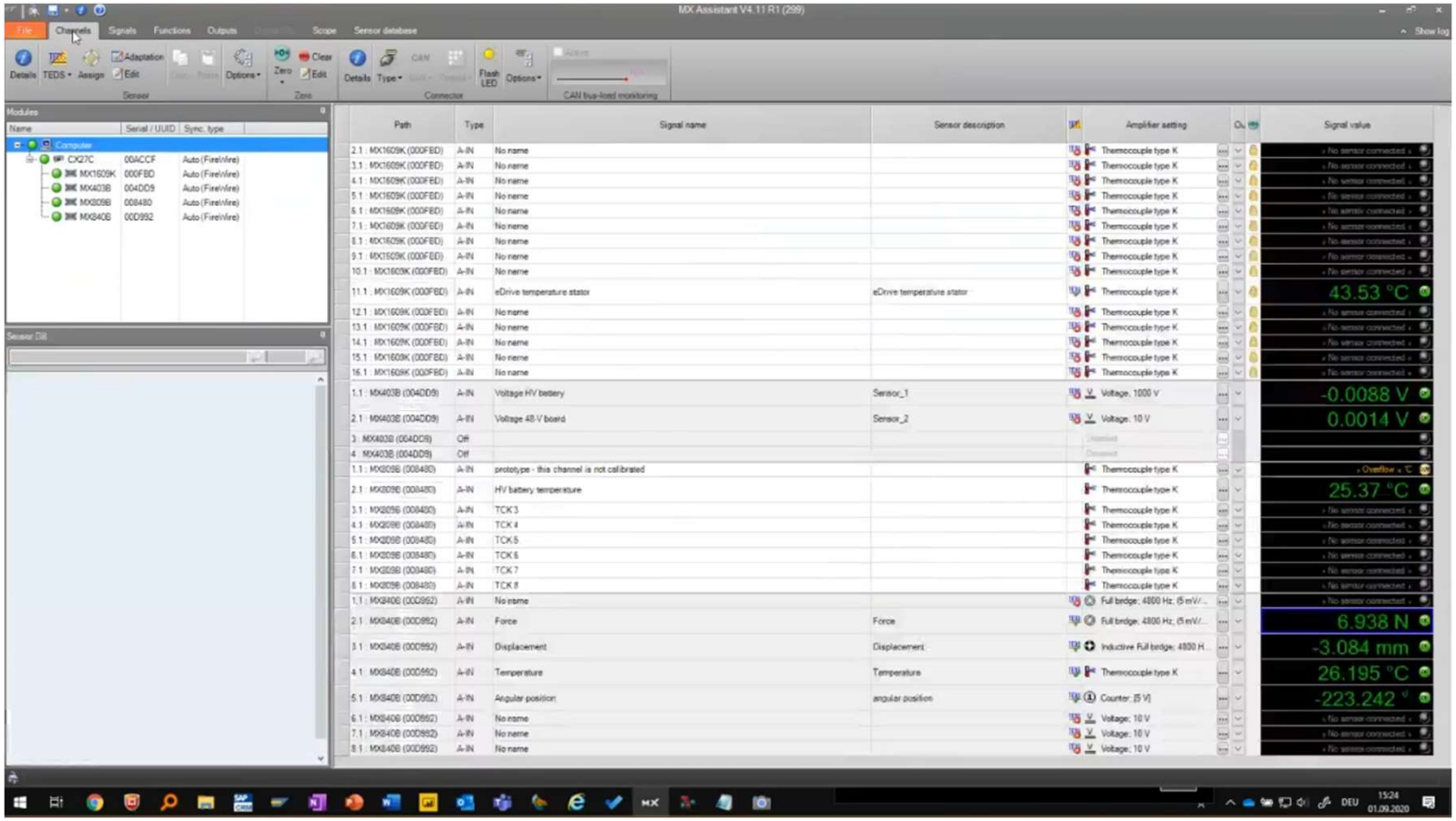
QuantumX analog signals working within Vector CANape



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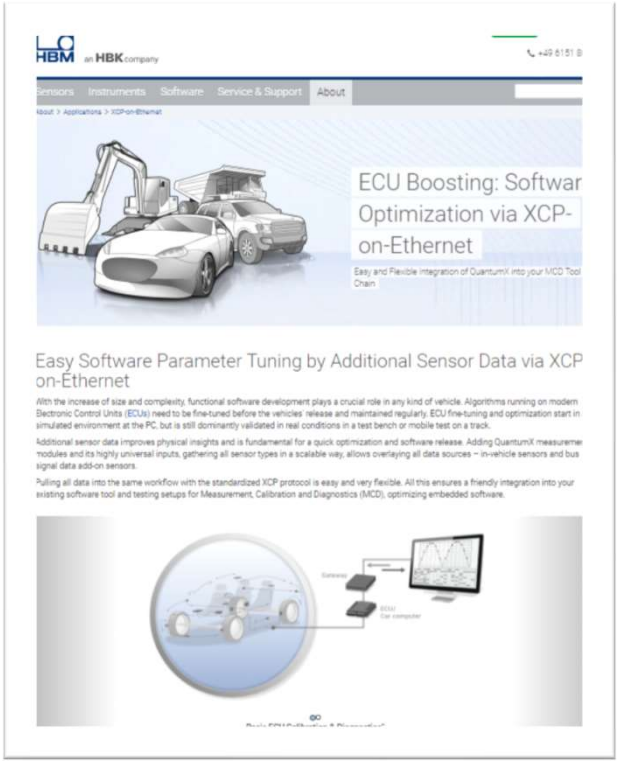
Further Information



Visit hbm.com for dedicated webpages on QuantumX CX27C & SomatXR CX27C-R

Webinar / Video

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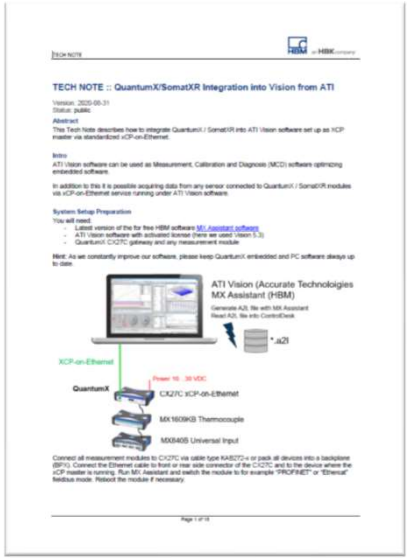
Further Information



Tech Notes available on hbm.com

- Vector: CANape
- dSPACE: CALdesk
- ATI: ATI Vision
- More to come

Contact our Sales & Support

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Summary and Benefits

- Integrate any sensor input - mechanical, electrical, thermal, flow, … for a better physical view
- High-quality signal inputs
- Work mobile, in lab or in bench testing integrating in real-time to your test automation software
- Choose between standard or ultra-ruggedized modules or combine both
- Use the modules in many other testing applications – mobile, lab or bench - one system

Questions?

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Thank you for your attention

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Thank You

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