ISDM – Initiative for Sensor Data Management

What are the challenges if working consistently with sensor data – from a single test cell to a large test field

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Challenges for test bed users in their daily measurement tasks

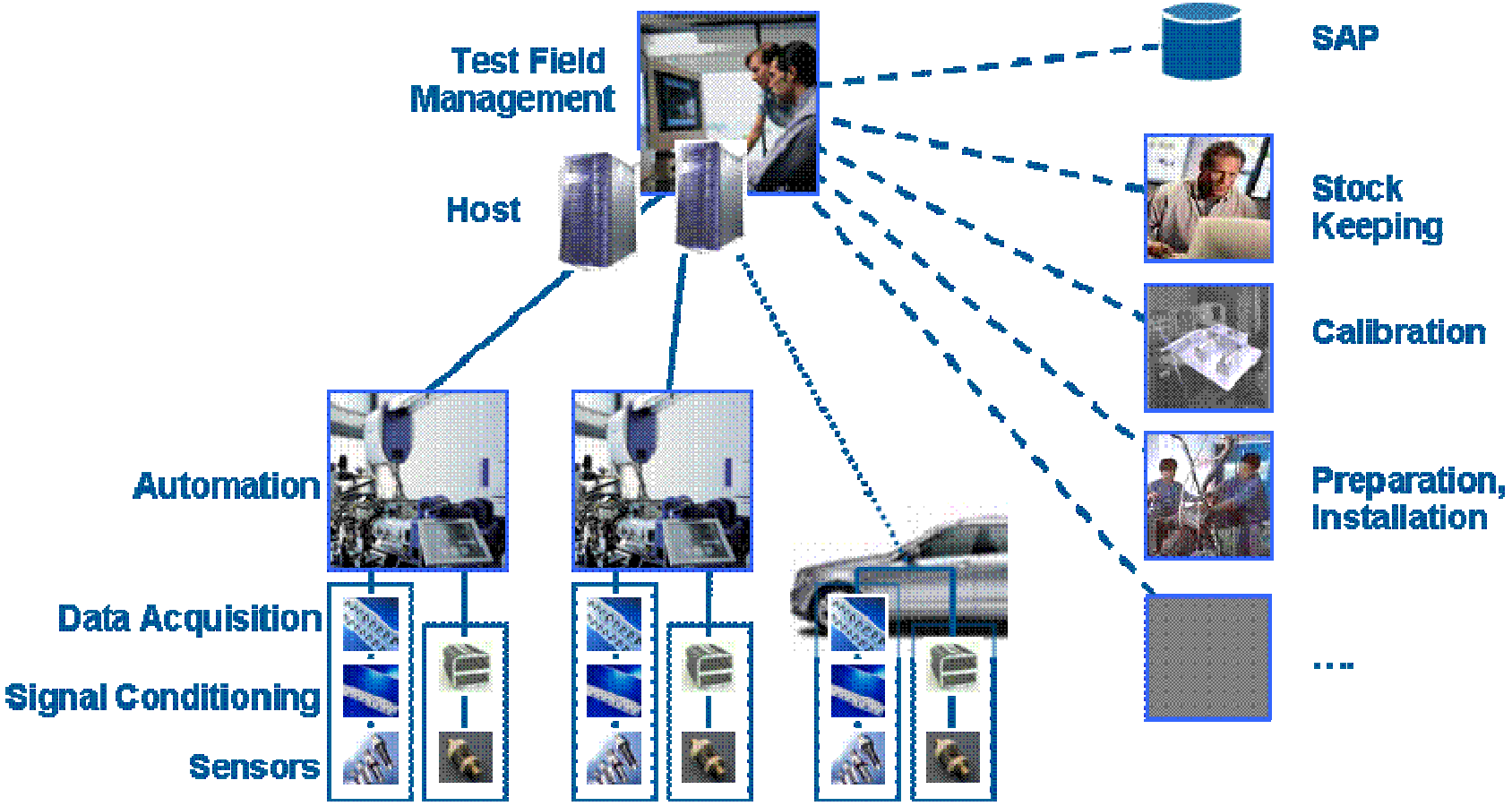
Measurement tasks have to be fulfilled nowadays:

- in a more complex measurement environment (e.g. more sub-systems involved)
- in a more automated way
- in the same or even shorter time
- with less skilled personnel

At the same time it has to be ensured:

- highest measurement quality
- handling of calibration and maintenance requirements
- documented, reproducible measurement set-ups

Overview: The system layers



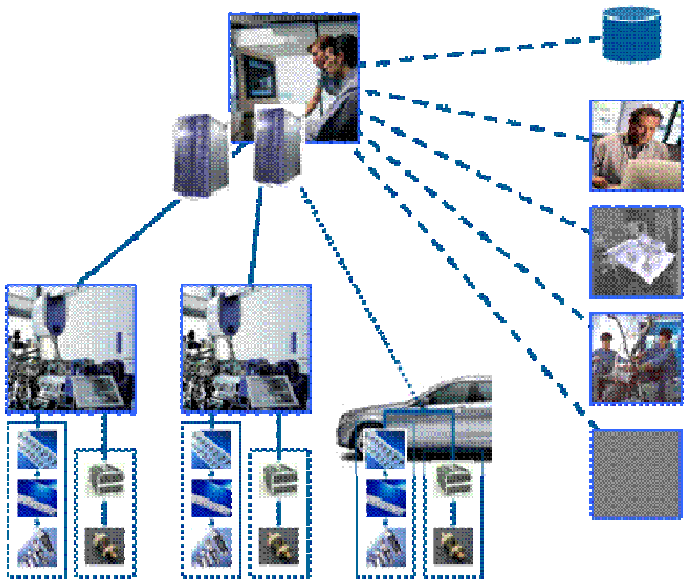
Main general customer requirements

- **Consistent use** of sensor information throughout the complete measurement chain
- **Exchangeability** of solutions (sensors, systems, etc.) from different vendors (open and non-proprietary solutions) – at least minimize required efforts for interoperability of different products
- **Traceability** of measurement data (which sensor, which calibration curve, which measurement point/location, which signal was used for the particular measurement, geometric location of installed sensors)
- **Cost effectiveness** of the new technology (it should save more money then it costs…)

How important are sensors ?

- Tracking of Measurement results back to the sensor data
- Managed information about sensor history
- Support of operational data management
- Autarchic operation of Test Bed
- Concepts for in vehicle use
- Pre selection of sensors (Instance or Type Based)
- Plausibility checks
- Support of build in calibration
- Valid concept for TEDS as well as for non TEDS Sensors
- …

How intelligent use of sensor data may help: Some examples



Sensor Identification

- During test order process the sensor type is defined, instance is defined via TEDS identification
- Plausibility check: planned sensor vs. connected sensor

Stock Keeping

- Initial creation of sensor information in central storage
- Update of calibration information in central storage

In Vehicle stand alone system

- Sensor as transport medium for I/O setup

Why an Initiative of Test Solution Providers was started

Target market:

- automotive testing environment

Purpose:

- discuss and describe common problems and requirements in respect of management of sensor data

Goal:

- agree on common solution possibilities (i.e. standardization activities)

What is ISDM, who stands behind it?

- Considering the previously mentioned requirements the necessity of a standardization work group was evident
- All major suppliers of the Automotive Testing market are participating in the ISDM work group

Scenarios identified by ISDM for a complete testing process

1. Ordering / Registration of a Sensor
2. Stock Keeping
3. Test Order
4. Installation and Preparation
5. Measurement / Test
6. Failure Recognition
7. History Log
8. Maintenance
9. Calibration
10. Removing from Stock

What solutions exist today

- the IEEE1451 (TEDS) standard seems to be the most adequate to base on
  - IEEE1451 is fully focused on the basis information of the sensor

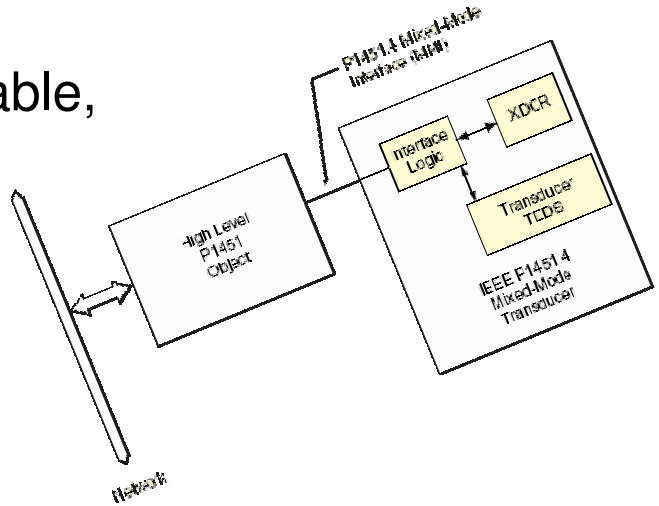
So it began: TEDS

- Transducer Electronic Data Sheet: part of IEEE P1451
- An innovative combination of technologies to simplify and reduce sensor configuration errors
- 1993: Joint effort of IEEE, NIST, and Industry
- An open standard, independent of transducer or data system manufacturer
  - Web Home: http://ieee1451.nist.gov/
- Sensors already available!

Smart Transducer Interface Standards: IEEE 1451

"Common Communication Interface... accepting various transducer bus standards"

- Transducer – Digitizer Convention ONLY
- Connect Analog sensors to existing digital networks
- No limits on manufacturers (transducer or net) – maximize use of existing networks
- NOT a definition for a new networkable, wireless, or "digital" sensor



What the IEEE standard does not cover

- the sensor life cycle
- the sensor embedding into its administration process to gain additional value/benefit
  - purchasing, storing, end of life time
  - commissioning and installation
  - operation process (e.g. test order planning, measurement execution, …)
  - service processes (e.g. maintenance)
  - sensor history
  - …

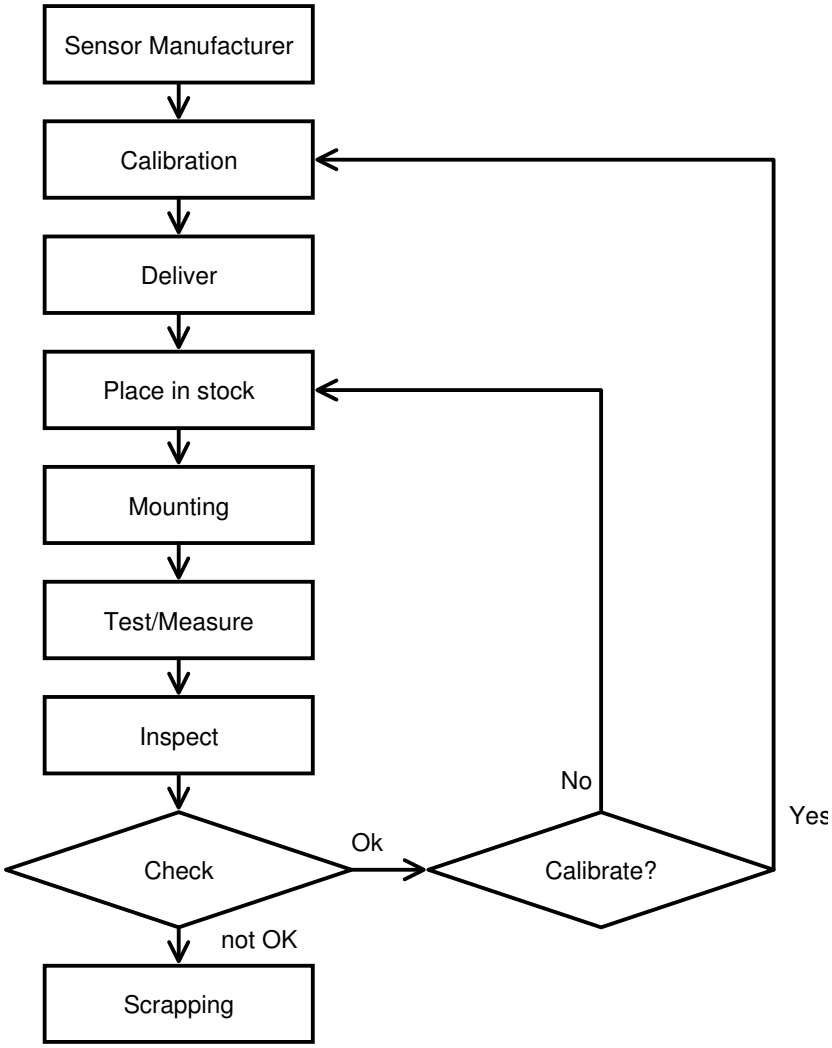
… and if compared to IEEE 1451

Extended TEDS usage to the sensor life cycle

- Ordering
- Stock Keeping
- Test Order
- Installation & Preparation
- Measurement / Test
- Failure Recognition
- History Log
- Maintenance
- Calibration
- Removing from Stock

IEEE1451.4 Scope

Simple Sensor Process Chain



Current TEDS just supplies information about the sensor – not about the process

Additional Needs

- More flexibility in using application specific information
- Interoperability and traceability
- Extending the TEDS content without creating new templates
- No need of modifying the IEEE 1451.4 standard

Summary and Next Steps

- For a typical test field infrastructure a concept based on a central equipment management system will be considered
- The test order and rigging process is supported by additional SW modules
- Basic and extended TEDS add value for several use cases and also for ensuring the quality of the setup
- In vehicle concepts can be based on both pure TEDS decentralized configuration as well as on a centralized data base driven concept

Benefits of ISDM approach

Reduction of Time

- Consideration of all possible scenarios -> accelerates and closes the process chain
- Reduction of test repetitions
- Automated parameterization

Quality increase

- Approach of all suppliers: interchangeability, traceability, cost effectiveness
- No risk of mixing up sensors