

Actual Projects

using

ASAM GDI (ISO 20242)



Version 2.0



Middleware

Author

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- Convenor of ISO/TC184/SC5/WG6 and ./WG9
ASAM GDI to ISO 20242, KPIs for Manufacturing Execution Systems
- Chairman of DIN NA 060-30-05
mechanical engineering, factory automation, communication and integration
- Chairman of ADM e.V.
Association of Decentralized Measurement systems

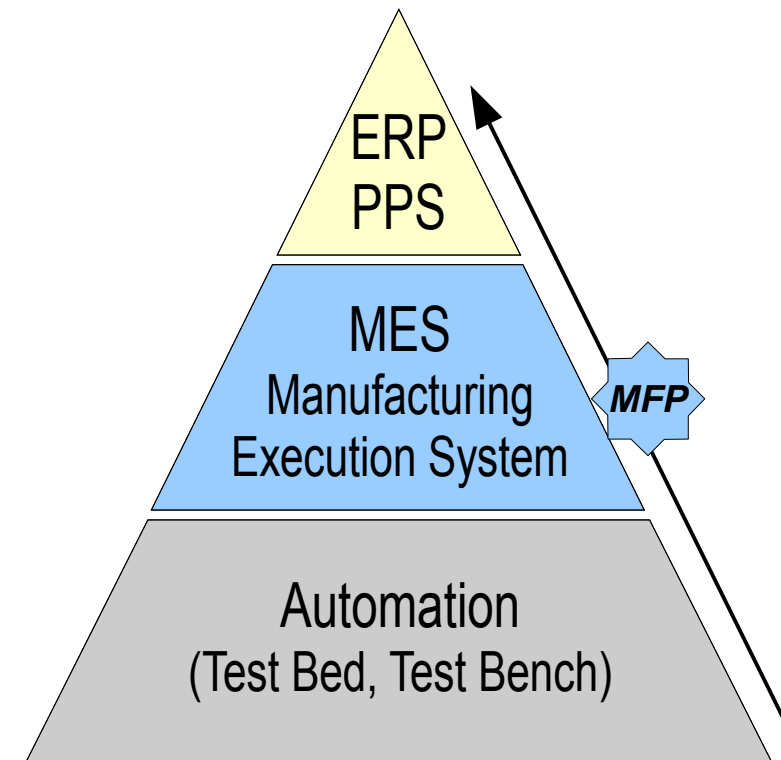


Company



Messtechnik und Fertigungstechnologie GmbH
Measurement and Manufacturing Technology Ltd.

- Patent on high resolution A/D-Converter for Inductive Sensors
- Experienced in Fieldbus Technologies
- Universal Equipment Integration
based on ASAM GDI / ISO 20242
- Device Configuration based on XML
- Tools for handling ODX and FIBEX files
- Lean PPS/MES
for small and medium companies



Co-Author

Dipl.-Ing. Bernd Wenzel

- Managing Partner of **M&K** GmbH
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- Member of ASAM GDI Experts Group
Actual maintenance manager of GDI
- Senior Technical Consultant ASAM e.V.
Support of business manager and Technical Steering Committee

Company



M&K Mess- und Kommunikationstechnik GmbH
Measurement and Communication technology Ltd.

- **Software Solutions**
middleware for device and application integration,
inter process communication
- **Communication Interfaces**
Protocol and Interface integration
- **Embedded Systems**
embedded systems development and testing including
communication access

M&K Connected solutions

Contents

Standardization in ISO

LAPI Device Configuration

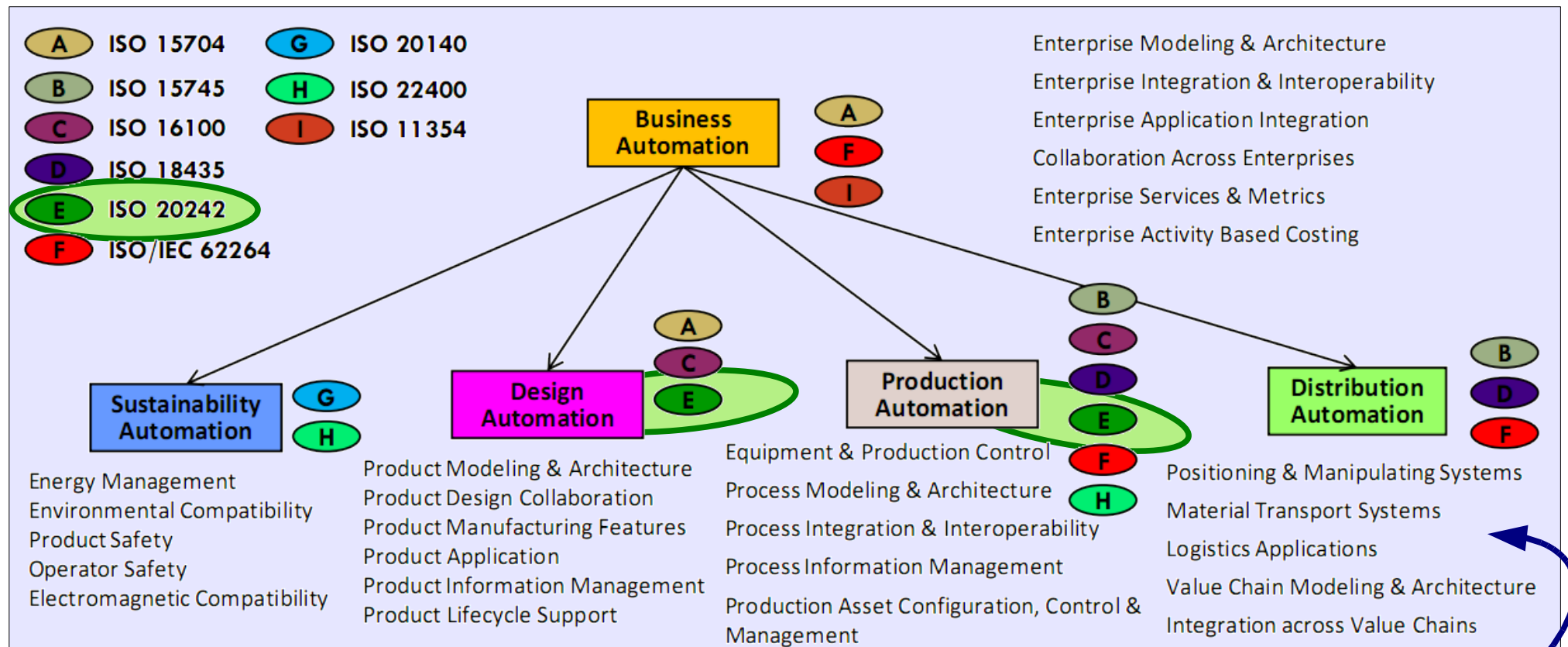
AGILITA Software Agents

M&K Middleware

Environment of ASAM GDI in ISO

TC 184 Automation Systems and Integration

SC 5 Architecture, Communications and Integration Frameworks

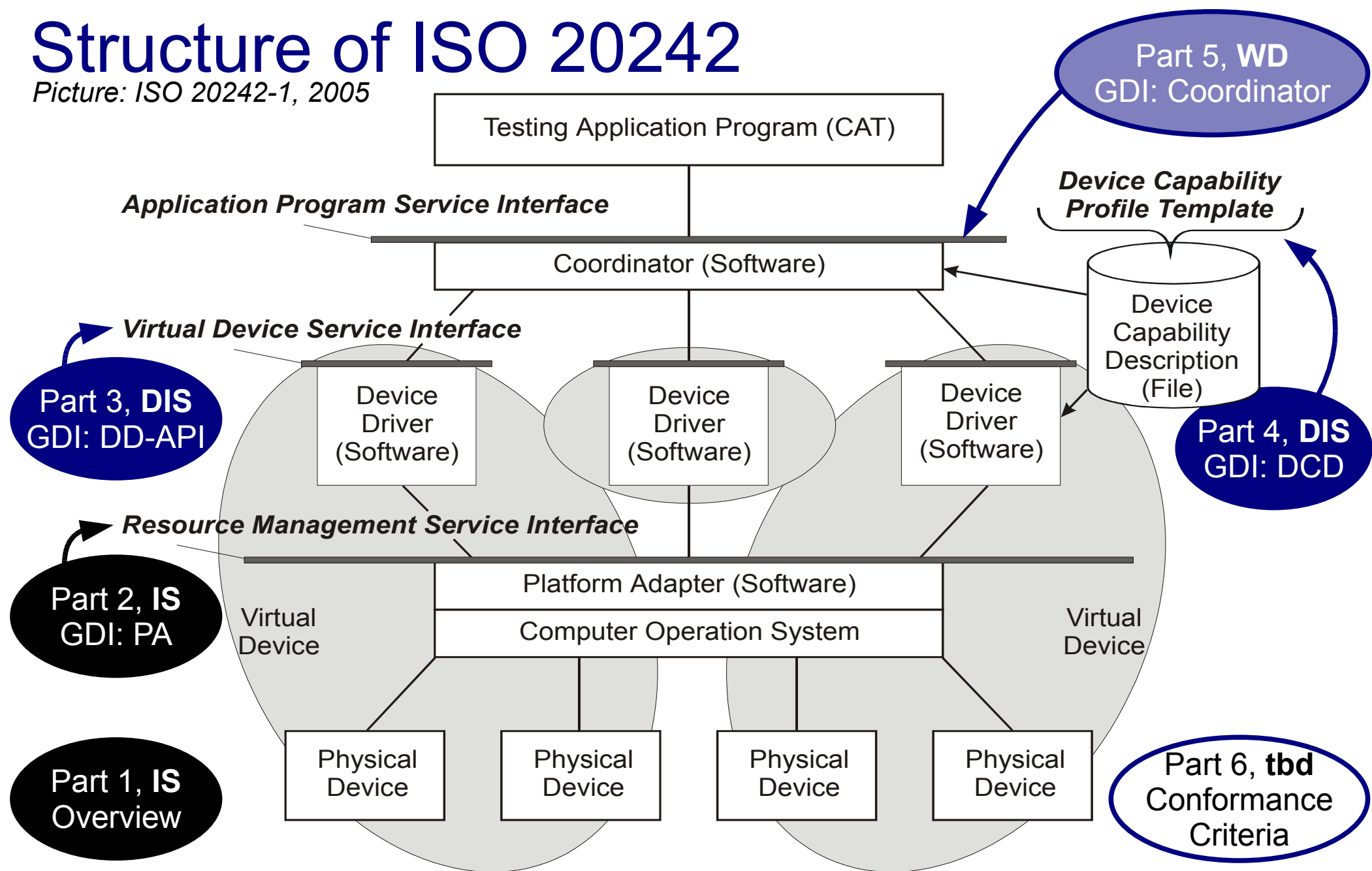


Picture: Em Dela Hostria, Rockwell Automation, Chairman of TC 184 / SC 5, 2010

See also
AGILITA project

Structure of ISO 20242

Picture: ISO 20242-1, 2005

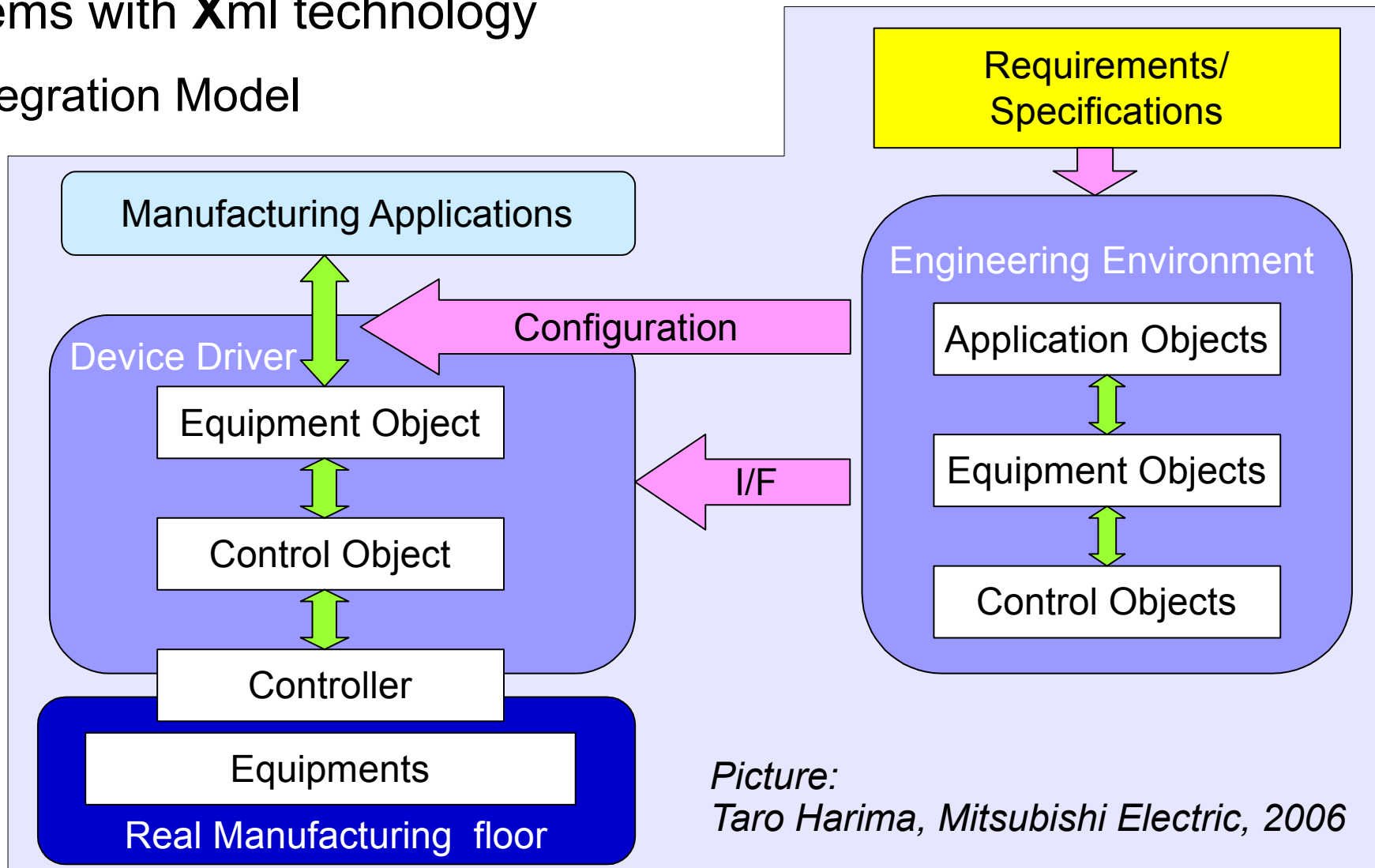


Cooperation with MICX

Manufacturing Information Collaboration systems with **X**ml technology

Integration Model

ISO 20242 Part 4 Annex B
Device Capability Profile Templates
for Manufacturing Applications

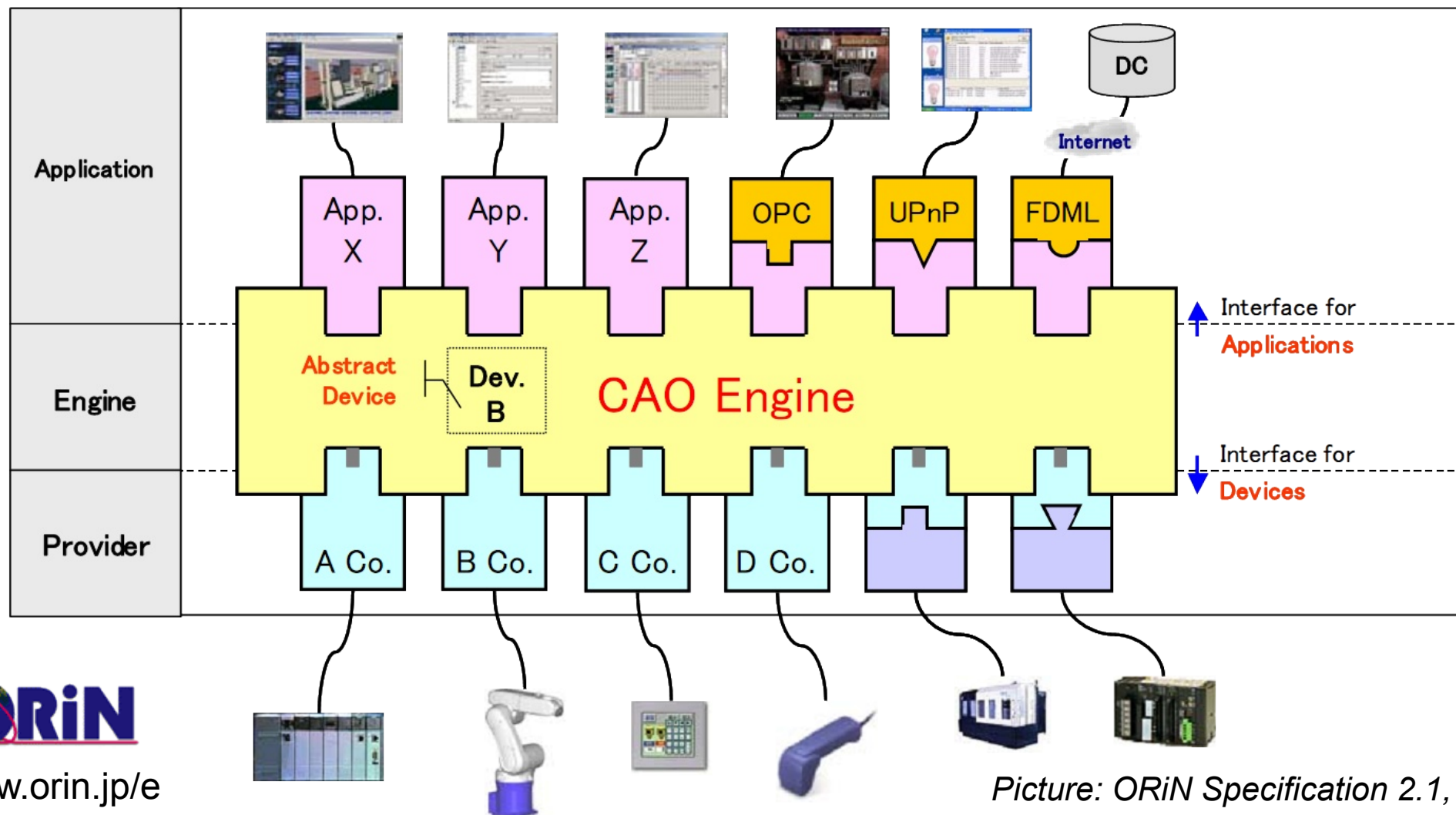


Picture:
Taro Harima, Mitsubishi Electric, 2006

Cooperation with ORiN

Open Robot/Resource Interface
for the Network

ISO 20242 Part 4 Annex C
Device Capability Profile Templates
for Robot Applications



Picture: ORiN Specification 2.1, 2008

Cooperation of ASAM GDI and OPC/UA

Motion in Germany, DIN AA 060-30-05 AK4

- Win-win-Situation for Device Users and Device Vendors:
 - Own range of application supported by the other standard
 - applications created for GDI devices may also access OPC devices
 - applications created for OPC devices may also access GDI devices.
 - Reasonable converters (software only)
 - device vendors may offer
 - GDI devices also in the OPC user market and
 - OPC devices also in the GDI user market.

Advantages of ISO Standardization

- **International Promotion**
ASAM e.V. and GDI standard get known worldwide
in area of automation systems and integration
- **Improved Specification**
Discussions with international experts increase know-how
and improve technologies
- **Increased Reliability**
Structure of ISO stands for stability of standards
- **Extended Application Range**
Ideas from other countries for widening the scope

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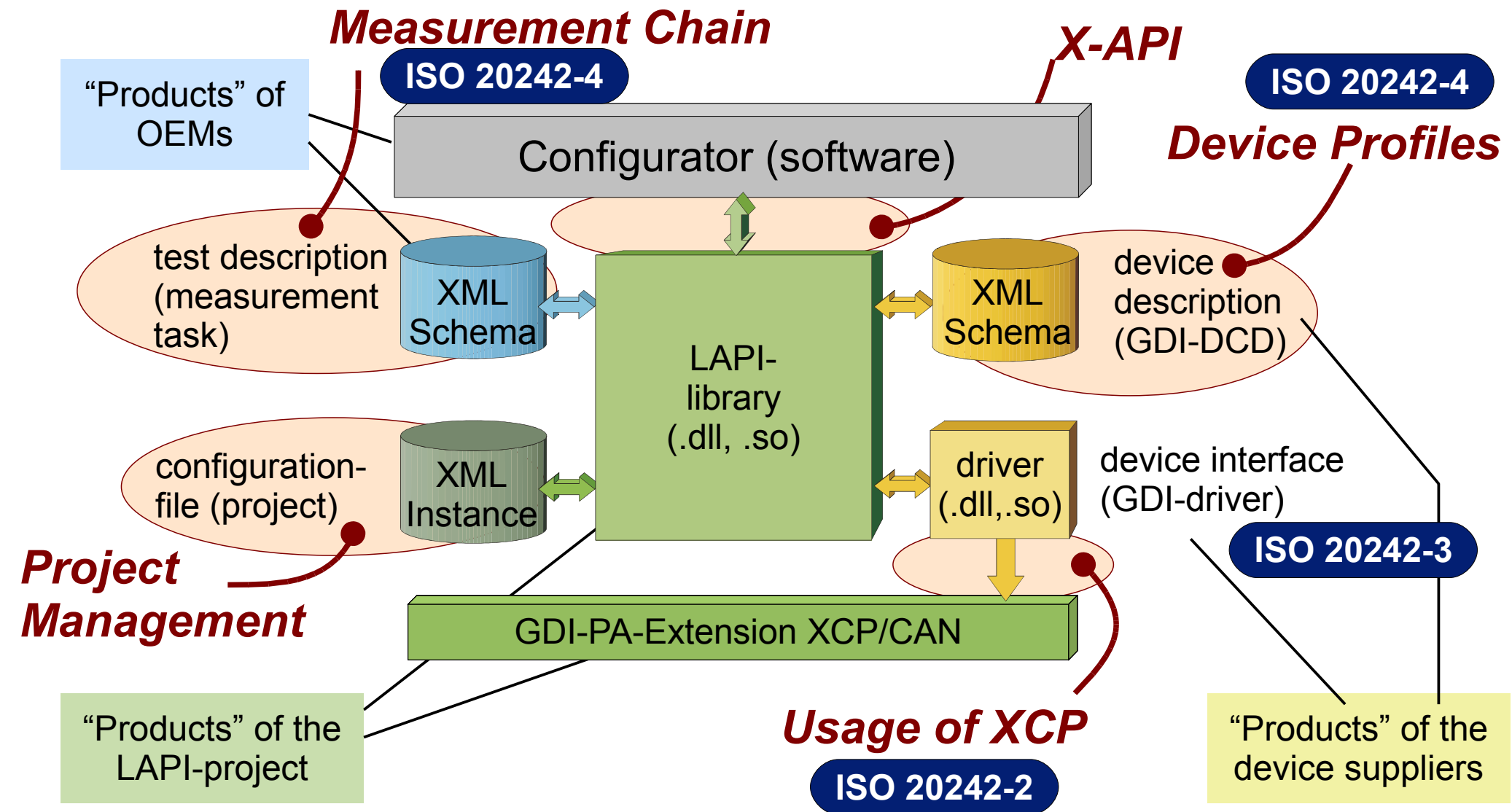
LAPI



www.lapi-ak.de

- Supplier Independent Configuration of Data Loggers and Measurement Modules
(driven by BMW AG, Daimler AG and Porsche AG)
- In use at Daimler since October 2009
- Definition of Configuration API, Device Profiles, XML Schemas, XCP Usage, Measurement Chain and more

Objects of LAPI 1.0/1.1 standardization



Objects of LAPI 2.0 standardization

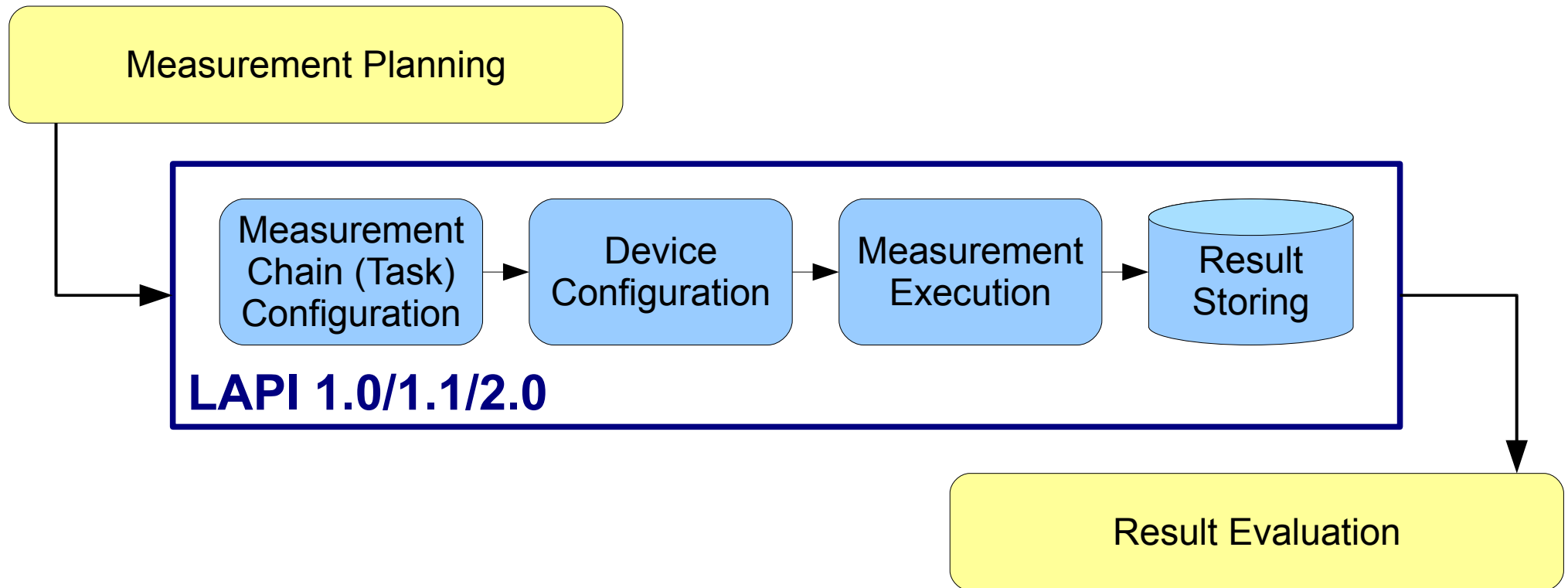
Improving/extending 1.0/1.1 specification and technical features

- Improving Schema construction
- Improving interaction on configuration by online value presentation
- Complete Bus-Analysis and -Trace
- Define LAPI-Scripting
-

About 50 topics for LAPI 2.0 are published in LAPI forum at <http://www.asam-gdi.net/forum> → LAPI-AK → Version 2.0

Objects of future LAPI standardization

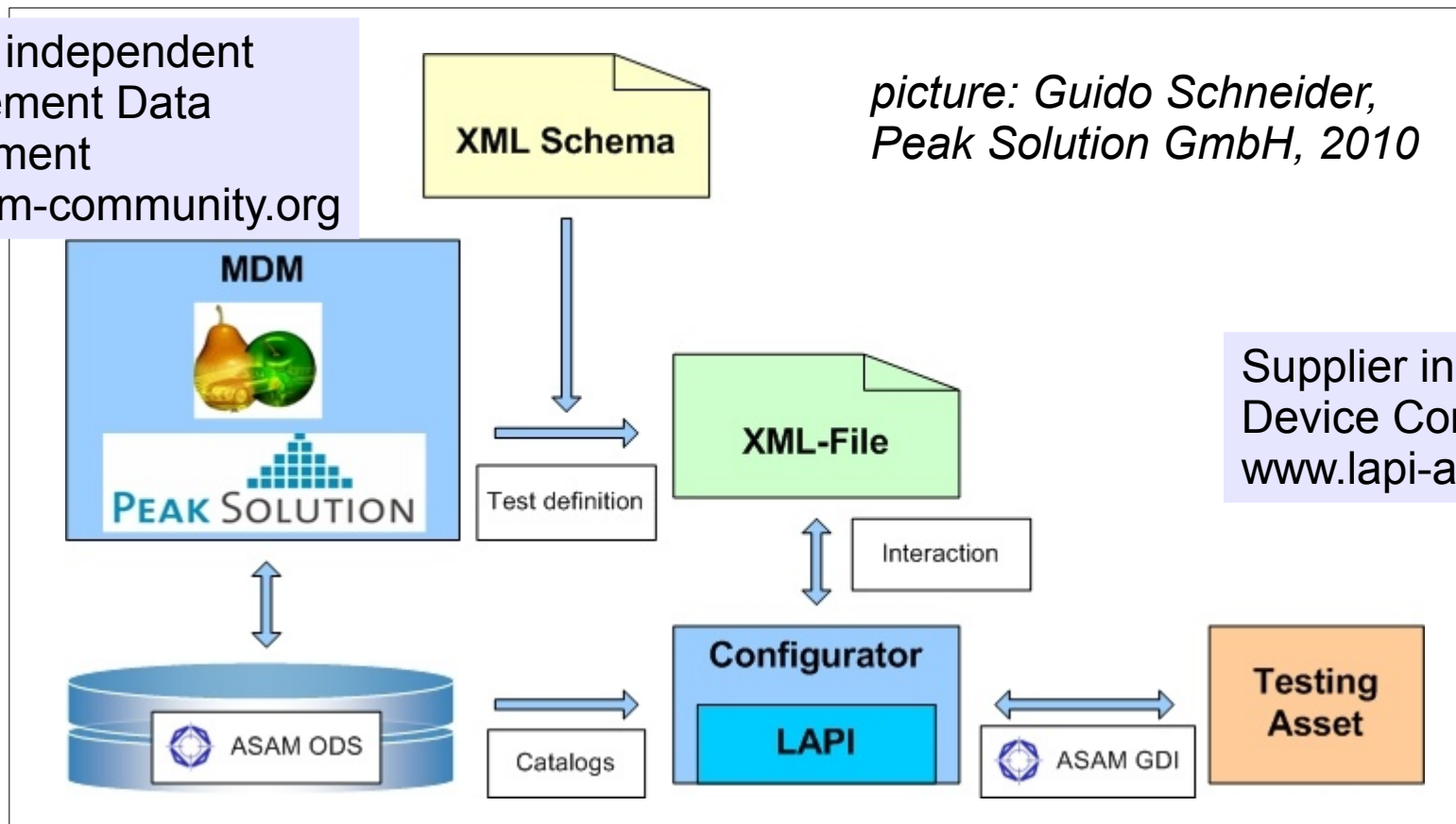
Including Measurement Planning and Result Evaluation



Strategies jointly defined by BMW AG and Daimler AG
other OEMs are invited to join

Cooperation with other projects

Supplier independent
Measurement Data
Management
www.mdm-community.org



Supplier independent
Device Configuration
www.lapi-ak.de

Big chance for synergy effects by handling the overall Measurement Management and Execution with proven standards

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AGILITA Software Agents

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AGILITA and ISO 20242

www.autonomik.de www.agilita-projekt.de



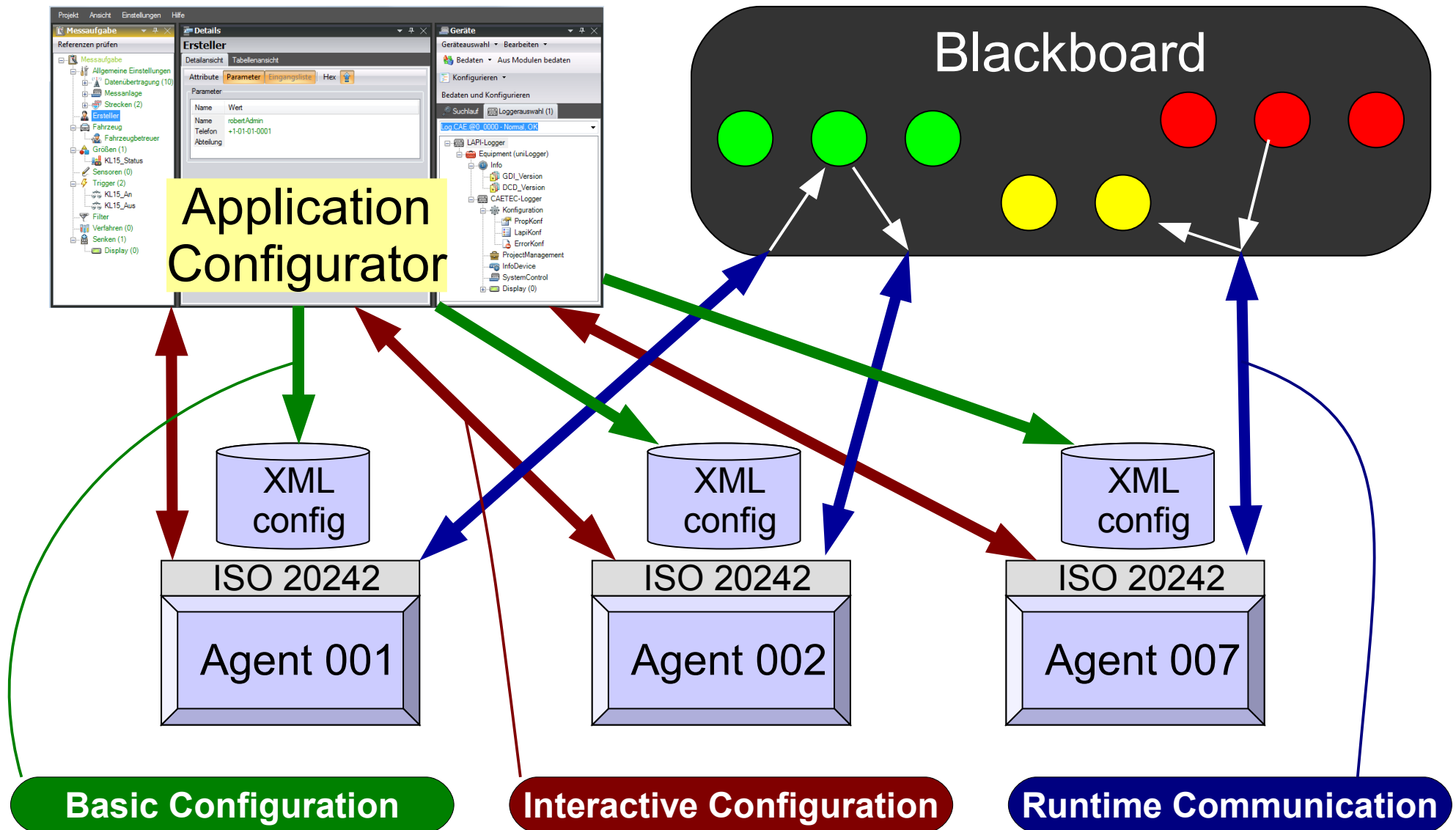
Bundesministerium
für Wirtschaft
und Technologie



- German (government) funded project **AGILITA**
“Agile Production Logistics and Transport Systems”
combining RFID, Automatic Guided Vehicles and
Agent based Manufacturing Execution System
for manufacturing in aviation industry
- **Configurable Software Agents with ISO 20242 part 3 interface are the application backbone (A-MES)**
- **Software Agent Capability Description with XML Schemas, as defined in ISO 20242 part 4 are the base for configuration**
- **Unsolicited Services VDSI_InfReport and VDSI_Accept of ISO 20242 are the base for autonomy of agents**



ISO 20242 Software Agent Communication

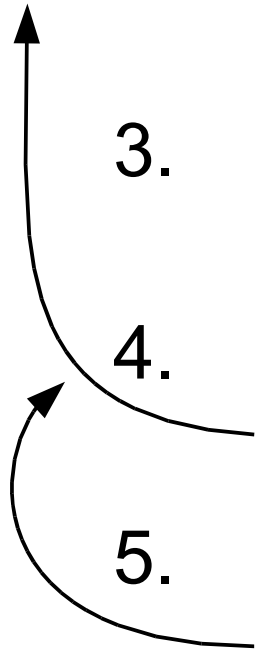
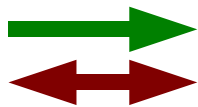


Using Agilita Software Agents

Compare LAPI project with *Data Loggers* = *Software Agents*

1. Configure an application
e.g. define requirements for material transport
2. Select Software Agents
may be automated
3. Create offline configuration for Software Agents
typically automated
4. Interact with Agents for optimal configuration
may lead to corrections of application
5. Start Agents with Configuration Data
restart on errors (not expected)
6. Let the Agents do their Tasks

smart configuration



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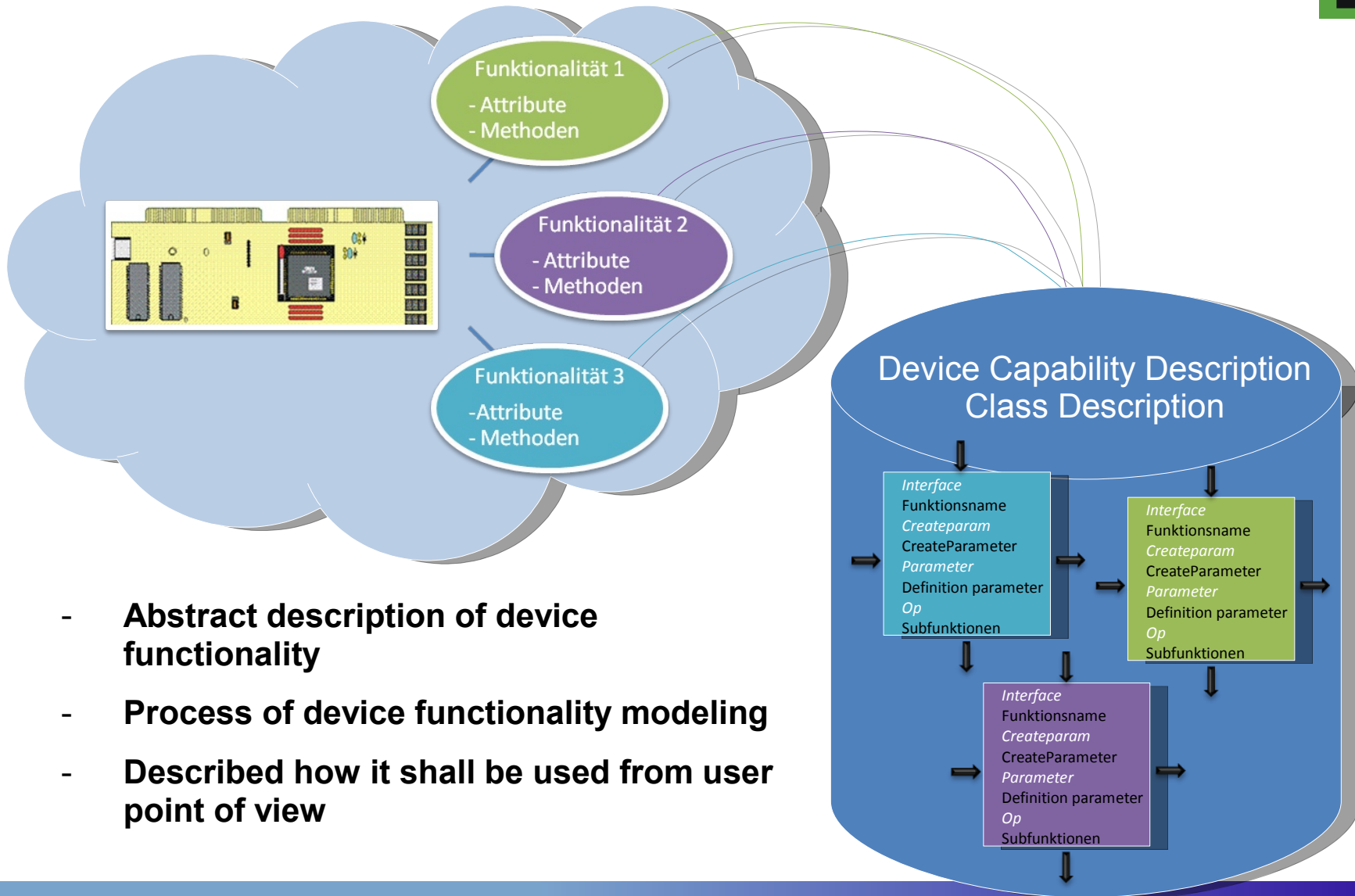
AGILITA Software Agents

M&K Middleware



Bernd Wenzel, M&K: GDI based Middleware

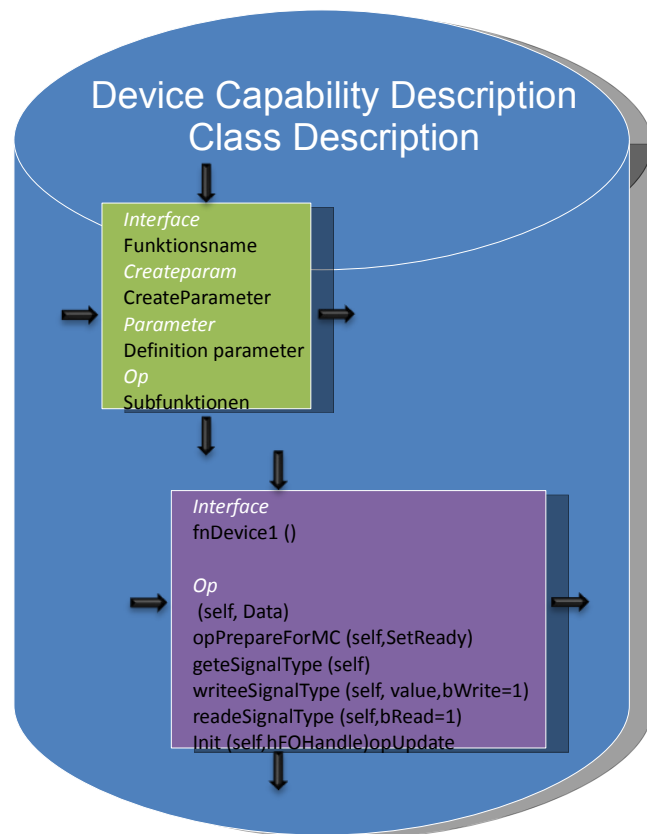
• Abstract Device Functionality Modelling





Bernd Wenzel, M&K: GDI based Middleware

- Usage of Device Functionalities in Applications



Python
(Scripting)

```
PythonWin - [fnDevice1.py]
File Edit View Tools Window Help

- class fnDevice1():
+   def opUpdate(self, Data):
+   def opPrepareForMC(self, SetReady):
+   def geteSignalType(self):
+   def writeeSignalType(self, value, bWrite = 1):
+   def readeSignalType(self, bRead = 1):
+   def init (self, hFOHandle):
```

Transformation

C++

```
fnDevice1.h* - Microsoft Visual Studio
Datei Bearbeiten Ansicht Debuggen Extras Fenster Community Hilfe

fnDevice1.h*
(Unbekannter Bereich)

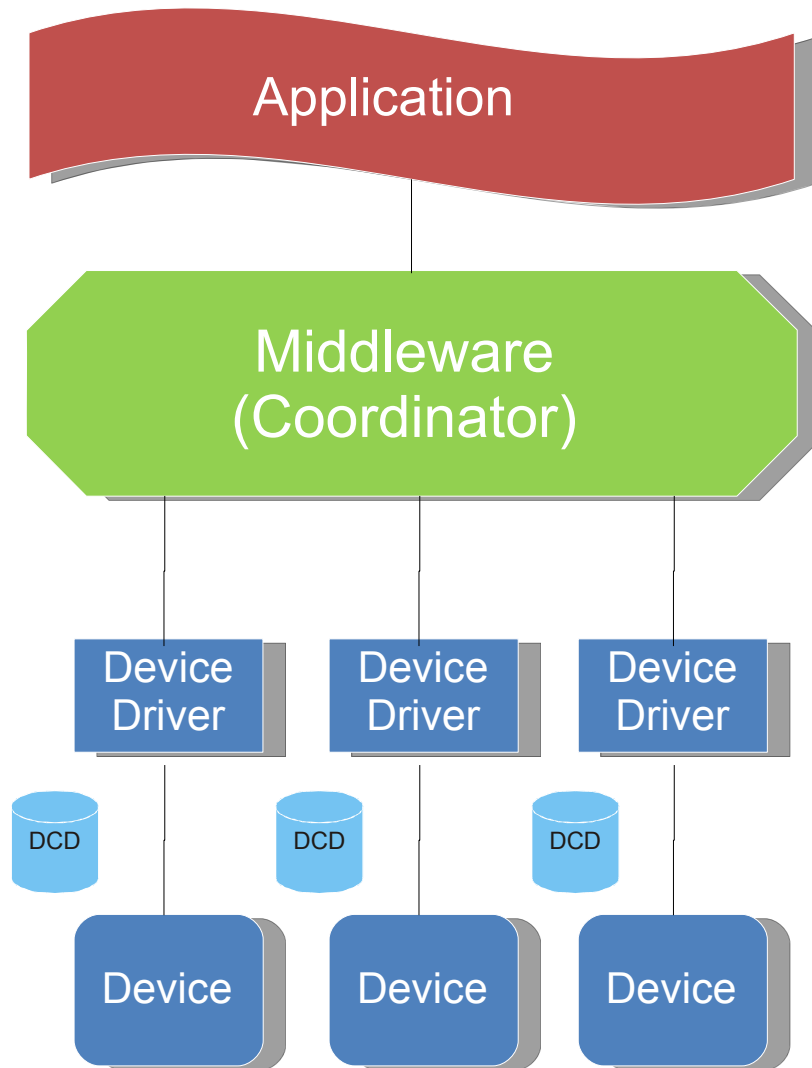
/*
 * This class describes the FO fnDevice1
 */
class fnDevice1
{
public:
    /*
     * operation opUpdate
     */
    void opUpdate(LPEXECfnDIPCh_SignalGenerator_opUpdate* pComplete = NULL);
    /*
     * read eSignalType
     */
    TcGeneratorType readeSignalType(bool bRead = true, LPCfnDIPCh_SignalGen
    /*
     * get current value of eSignalType
     */
    TcGeneratorType geteSignalType();
```



Bernd Wenzel, M&K: GDI based Middleware

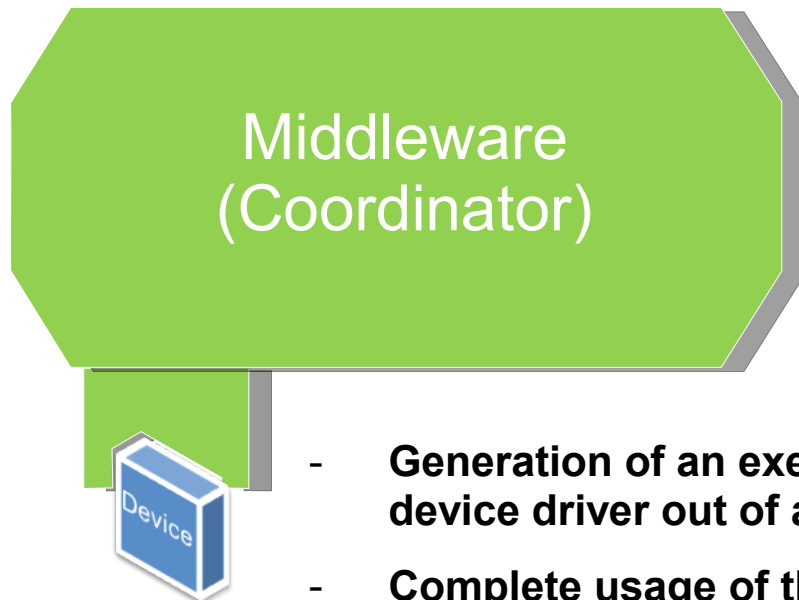
- Principle Concept of ASAM GDI

- **Middleware encapsulate from interface specific knowledge**
- **Directly access to device functionality**
- **Dynamic integration of different device drivers**
- **Different interface versions can be used at same time**
- **Hide complexity**
- **Operating system independent**



Bernd Wenzel, M&K: GDI based Middleware

- Device Driver Development

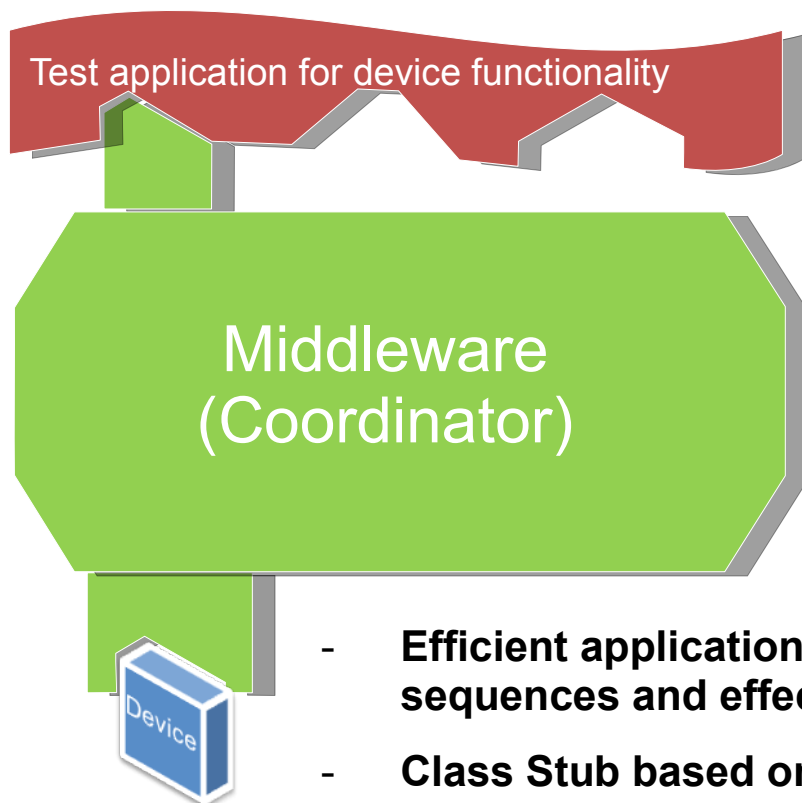


ana@skel 

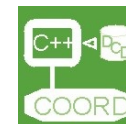
- Generation of an executable C++ program skeleton for a device driver out of a DCD
- Complete usage of the GDI API and linkage to the platform adapter
- Automatic user code integration through directed programming and re-engineering
- Consideration of inheritance, class references and service functions
- VD state control and complete implementation of the Control VD

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- Device Driver Testing



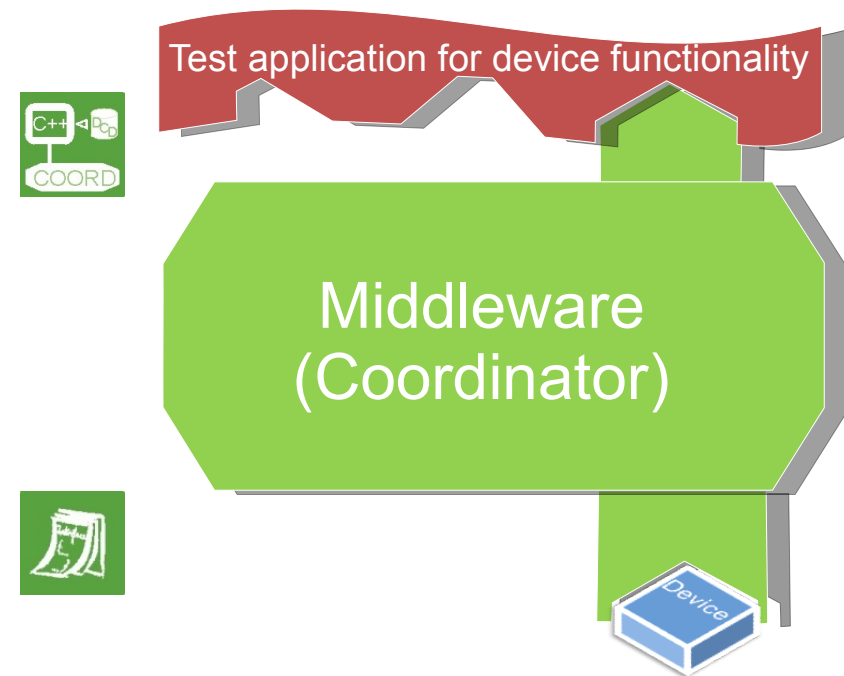
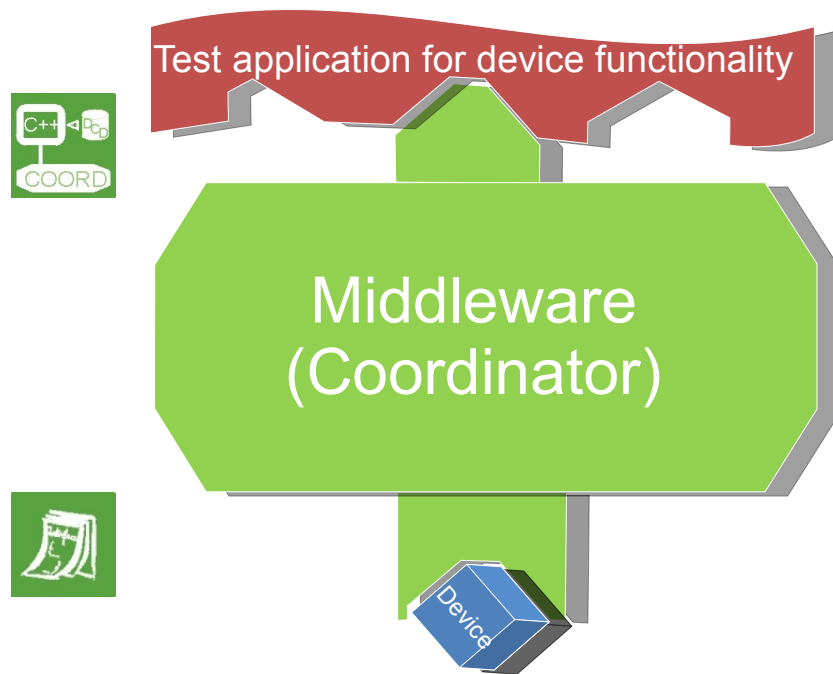
*ana*stub



- Efficient application generation for testing of application sequences and effective usage of device drivers
- Class Stub based on DCD (Module, Interfaces) for object oriented applications
- available for C++ and Python
- Stub classes encapsulate GDI specific Coordinator access (Coordinator API version independent)
- Profile independent usage of GDI device drivers

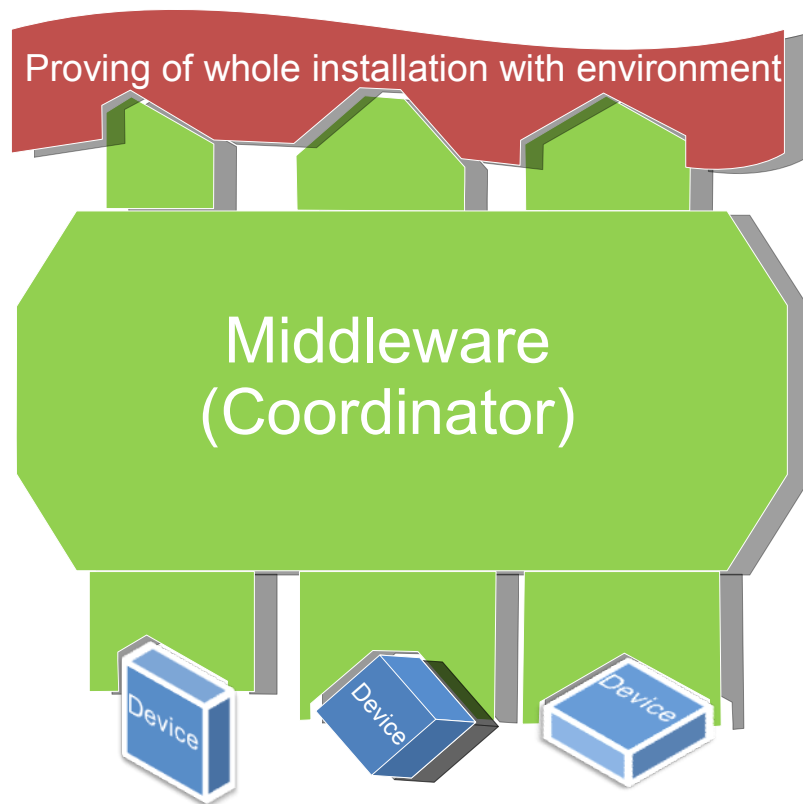
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- Test Application and Device Development



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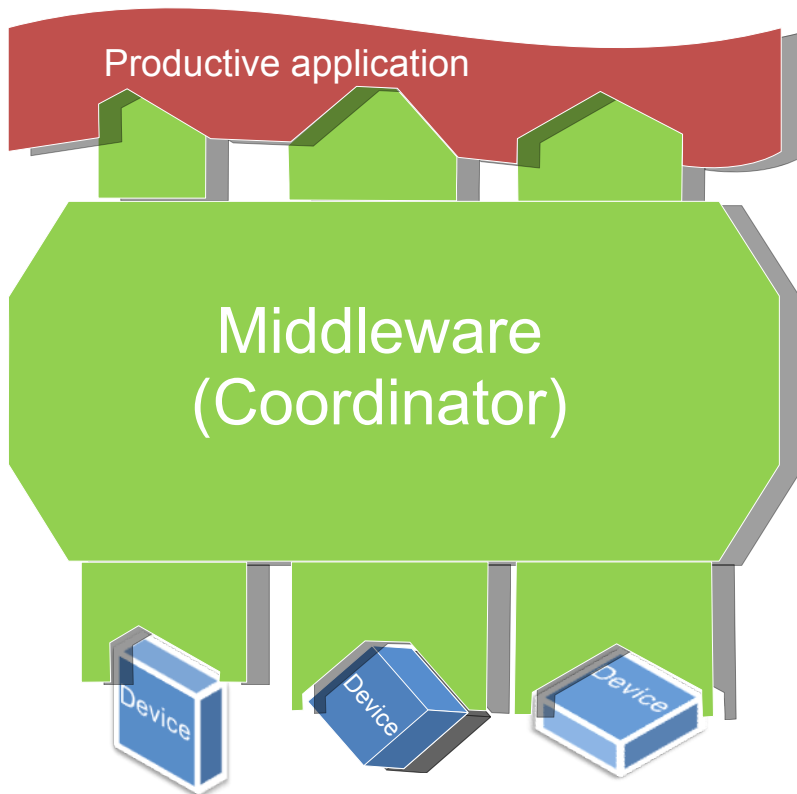
- Test Application for Installation Proving



- **Testing of whole application purpose in interconnection with different devices**
- **Check of application purpose**

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- Running Application used worldwide

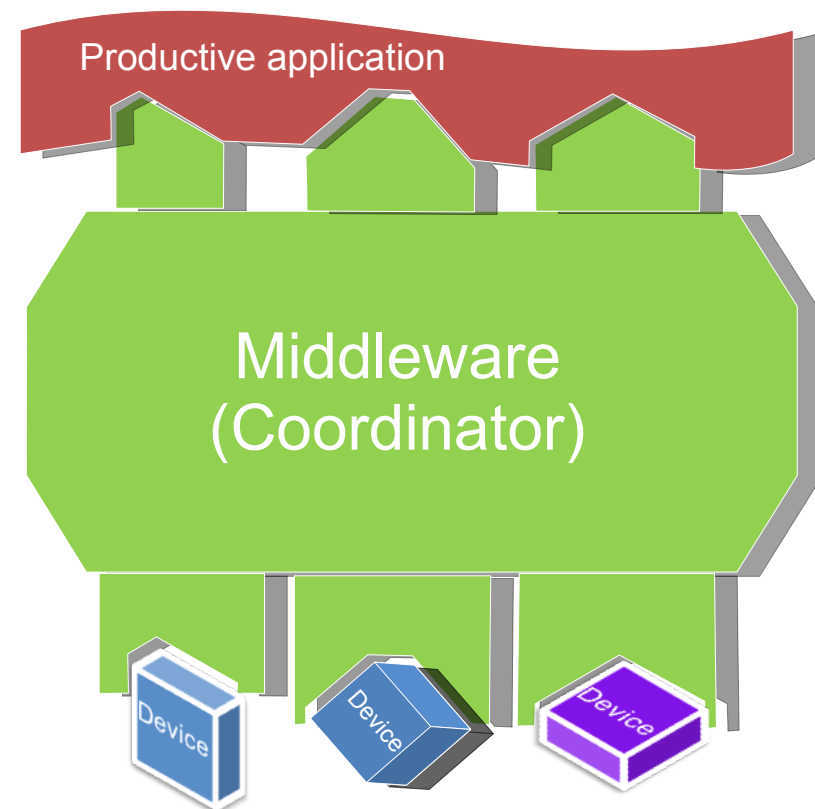
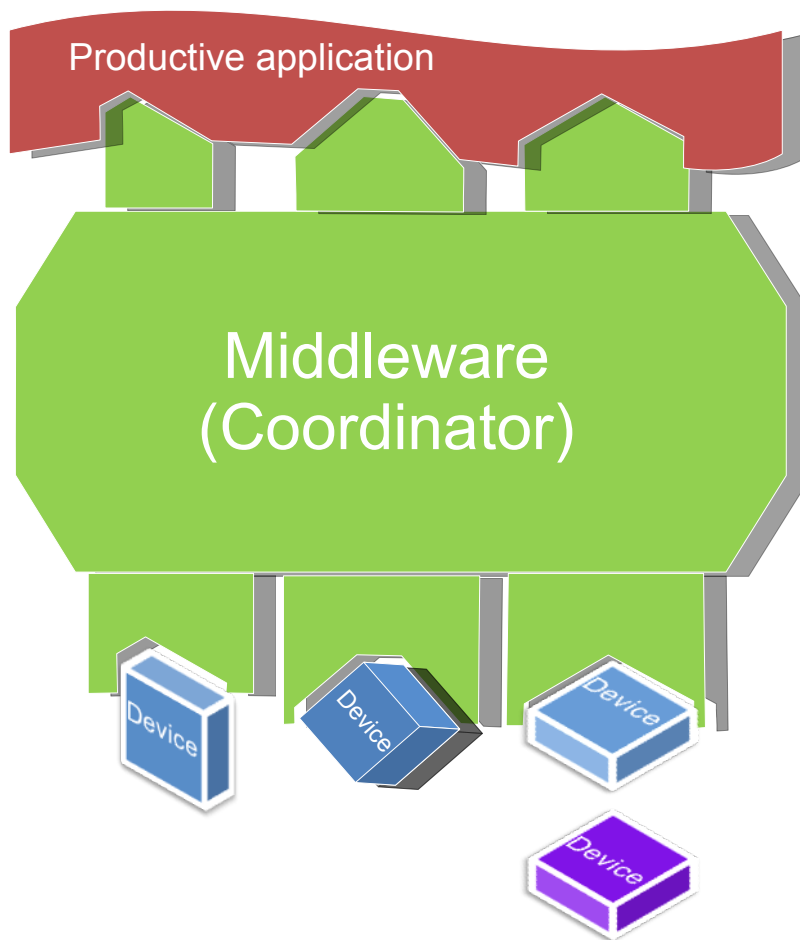


- End of line testing
- Chassis Dynamometer
- Car filling systems
- Inside Ebench Systems



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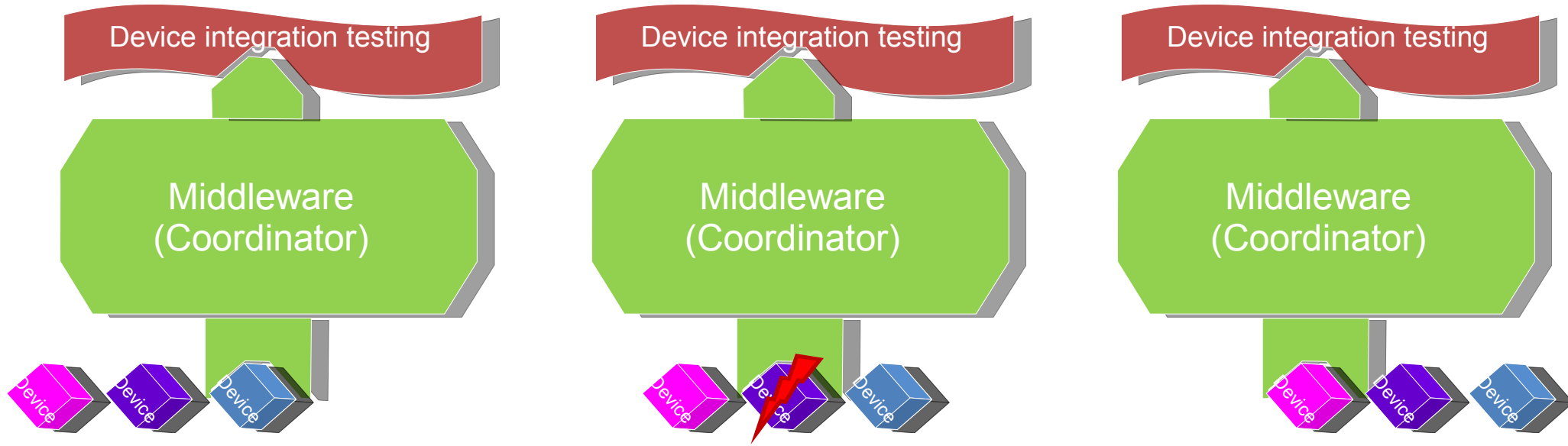
- Device Exchange





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• Conformance Test

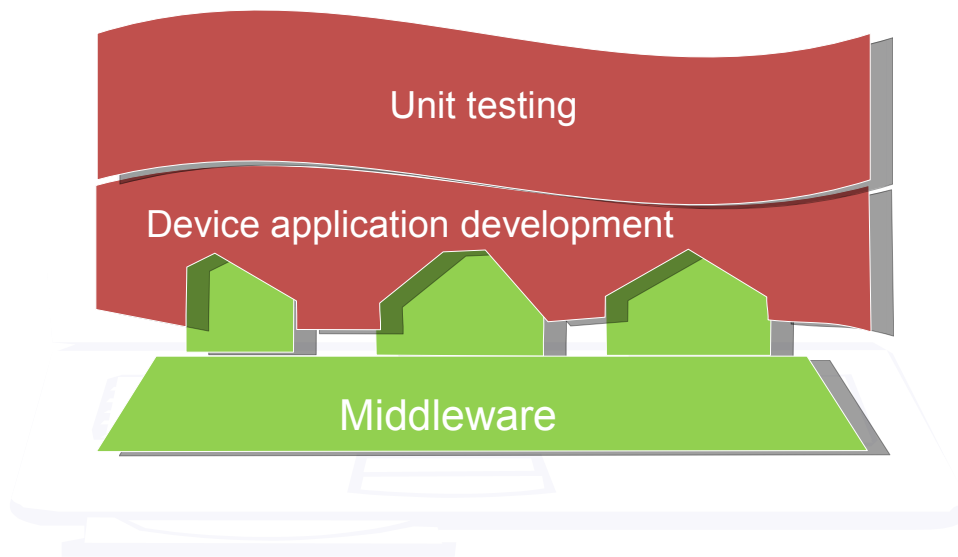


- **Acceptance test of devices**
- **Test can be done by end users**
- **Device can be also integrated in full environment**

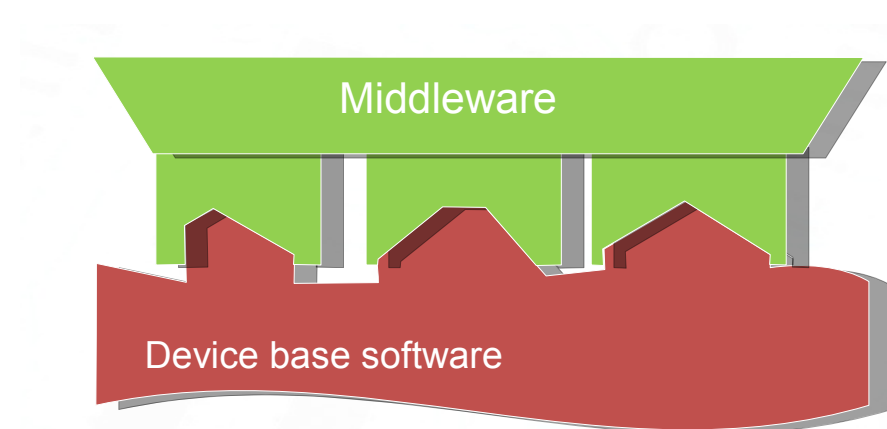


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- Device Application Development



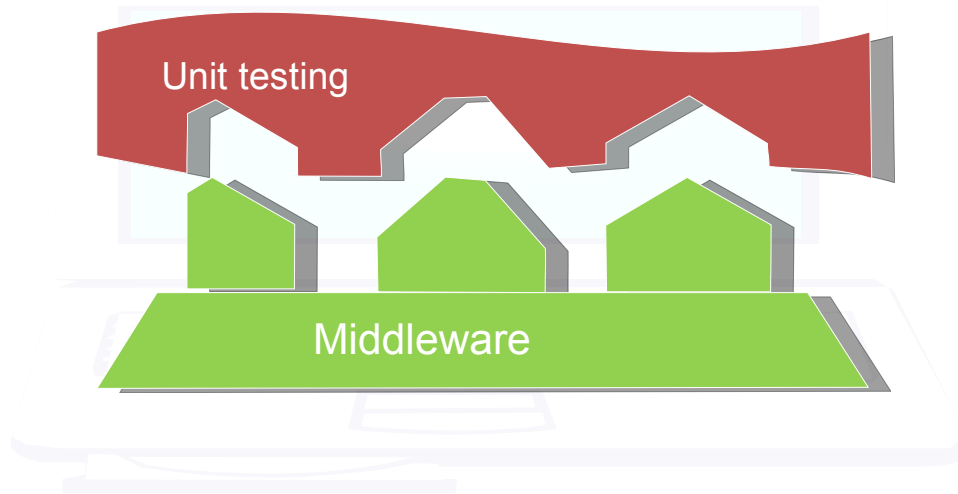
- Software development for Embedded Systems
- Middleware connects between device base software and development environment on host
- Embedded base function are triggered and accessed from IDE in host via middleware
- Device base functionality directly available for Device application software on host



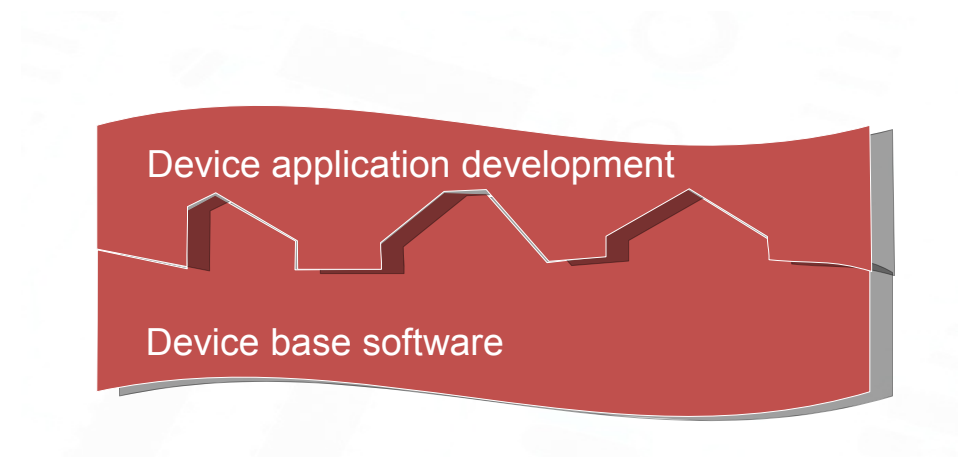


Bernd Wenzel, M&K: GDI based Middleware

- System Test on Target

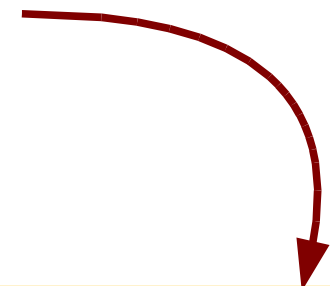


- Device application can be tested with developed unit tests after integration into target
- Unit tests are running on host
- Middleware realizes the connection between unit test on host and target software



Epilogue

- First time standard application causes big efforts, since whole development is handled in short time
Proprietary solutions mostly are developed in small units over a long time period
- Benefit of standardisation is not only technology but more improvement of handling
Standards help to put heavy loads on several shoulders
- Standards do not propagate by their own
Proprietary solutions mostly have marketing because of commercial background



Standards need marketing from their beneficiaries