



Die intelligente Steuerung

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BECKHOFF: Produkt Manager TwinCAT**

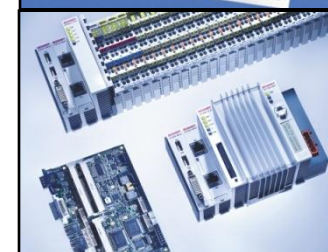
**OPC-Foundation: President OPC-Europe
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Agenda

- Beckhoff Automation – the company
- Industrial automation technology – the scope
- The philosophy – PC based automation
- Embedded systems and connectivity

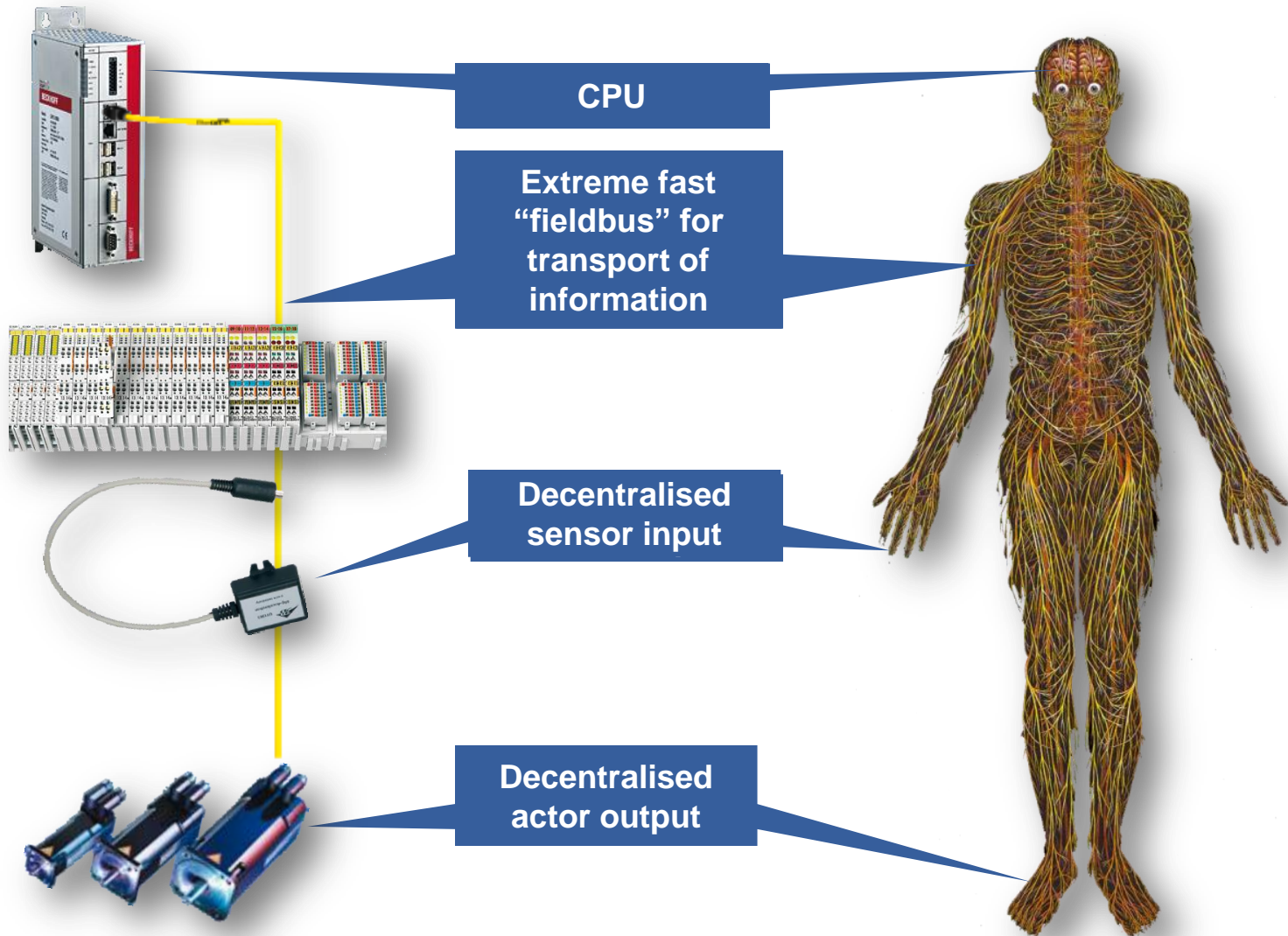
About us...

- ◉ Located in Verl, Germany
www.beckhoff.com
- ◉ Solutions for Industrial Automation
 - ◉ Motherboards, IPC, Ethernet Panels, IO's
 - ◉ Various fieldbus integrations
EtherCAT Technology www.ethercat.org
 - ◉ Scalable real-time extension for
NT / Win2K / XP / Vista and CE
 - ◉ IEC61131-3 PLC / Motion Control / HMI



What are the technical resources?

- The company
- The scope
- The philosophy
- The system



The system

TwinCAT 3 engineering environment

- The company
- The scope
- The philosophy
- The system



shared tree structure for hard- and software

programming language dependent toolbox

The screenshot displays the Microsoft Visual Studio IDE for TwinCAT 3. On the left, the Solution Explorer shows a project tree with folders for SYSTEM, NC, PLC, and Application, containing various hardware and software components. The main editor window shows a ladder logic diagram for a program named MAIN_FBD, with variables like Timer, fbFBD_SamplePOU, eOperation, iResultC, bZero, and bPos. The toolbox on the right provides a selection of function blocks and math operators. The Error List window at the bottom indicates no errors or warnings.

shared output window of all languages



C/C++ Programming languages

Method CustomCodeCyclic: – is called cyclically

```
ULONG      nCounter;

HRESULT CustomCodeCyclic(PFairCppDempInputs pIn, PFairCppDempOutputs pOut)
{
    //pOut->value = pIn->value;
    //pOut->value = pOut->value++;

    nCounter++;
    pOut->value = nCounter;

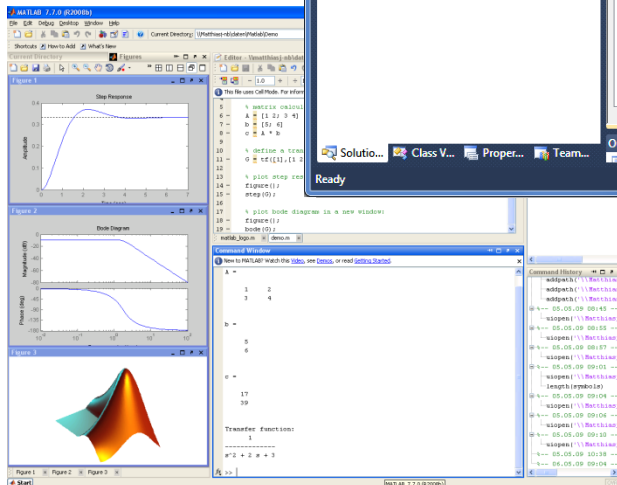
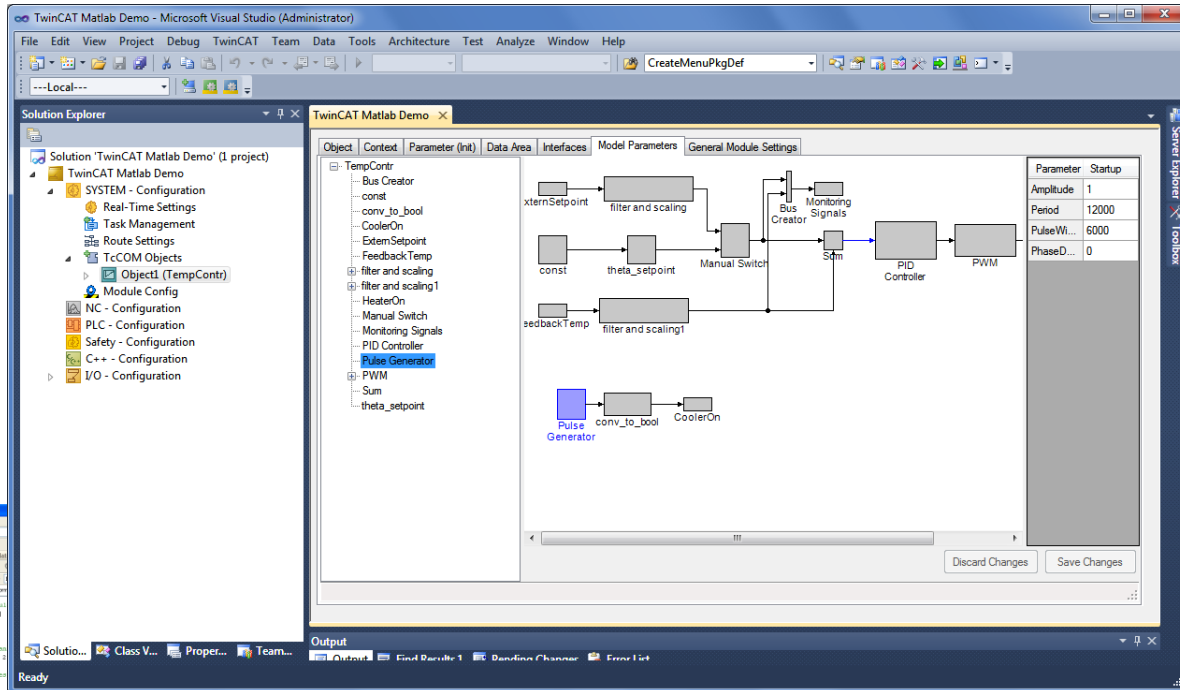
    return S_OK;
}
```

Pointer to logical input/output image

Integration of Matlab/Simulink

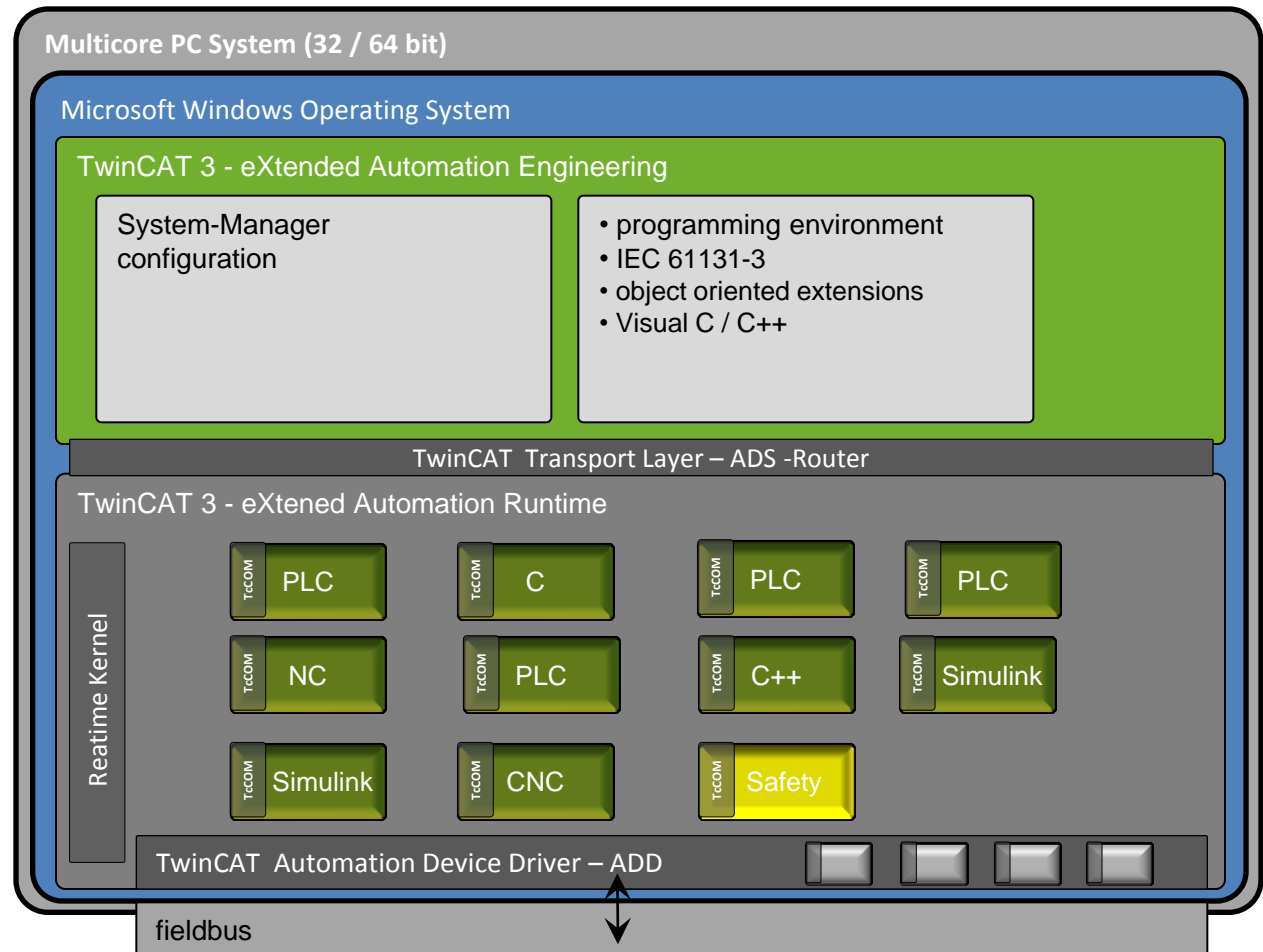
Matlab

- Matrix-Operations
- Easy programmability
- Graphical data preparation
- Many special functions for a wide field of application
- Very common in the scientific/ university environment



PC based architecture

- The company
- The scope
- The philosophy
- The system



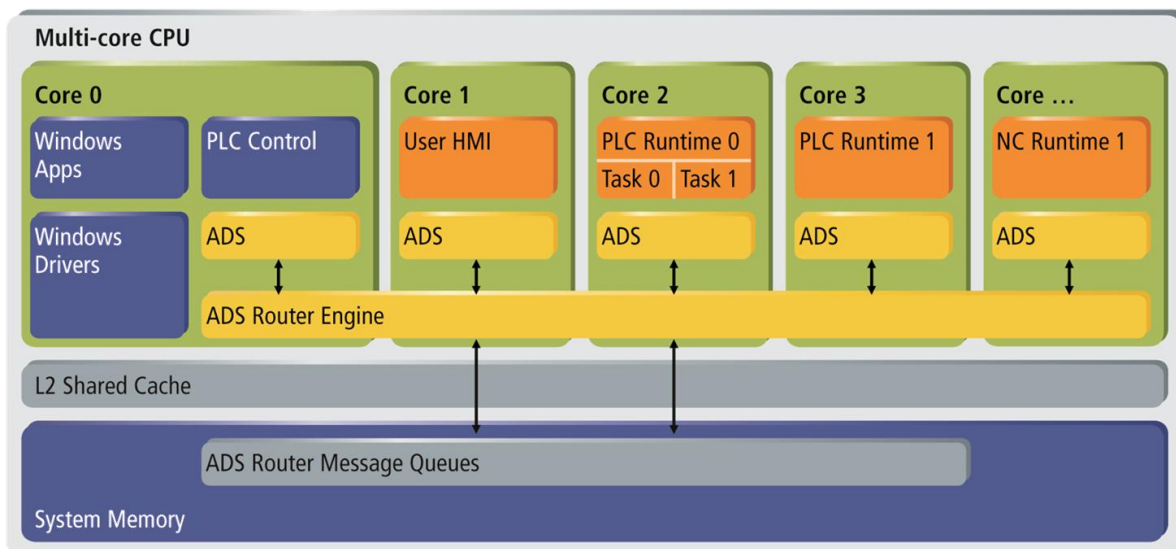
eXtended Automation Runtime (XAR)

Support of multi-core systems

- Distribution of projects to cores (e.g. PLC, NC, Motion Control and HMI run on different cores)
- Scalable base time for each core

Execution time for 1000 PLC commands (μs)

- Intel Core i7 950
- 4 physical Core
- CPU at 3,07 GHz

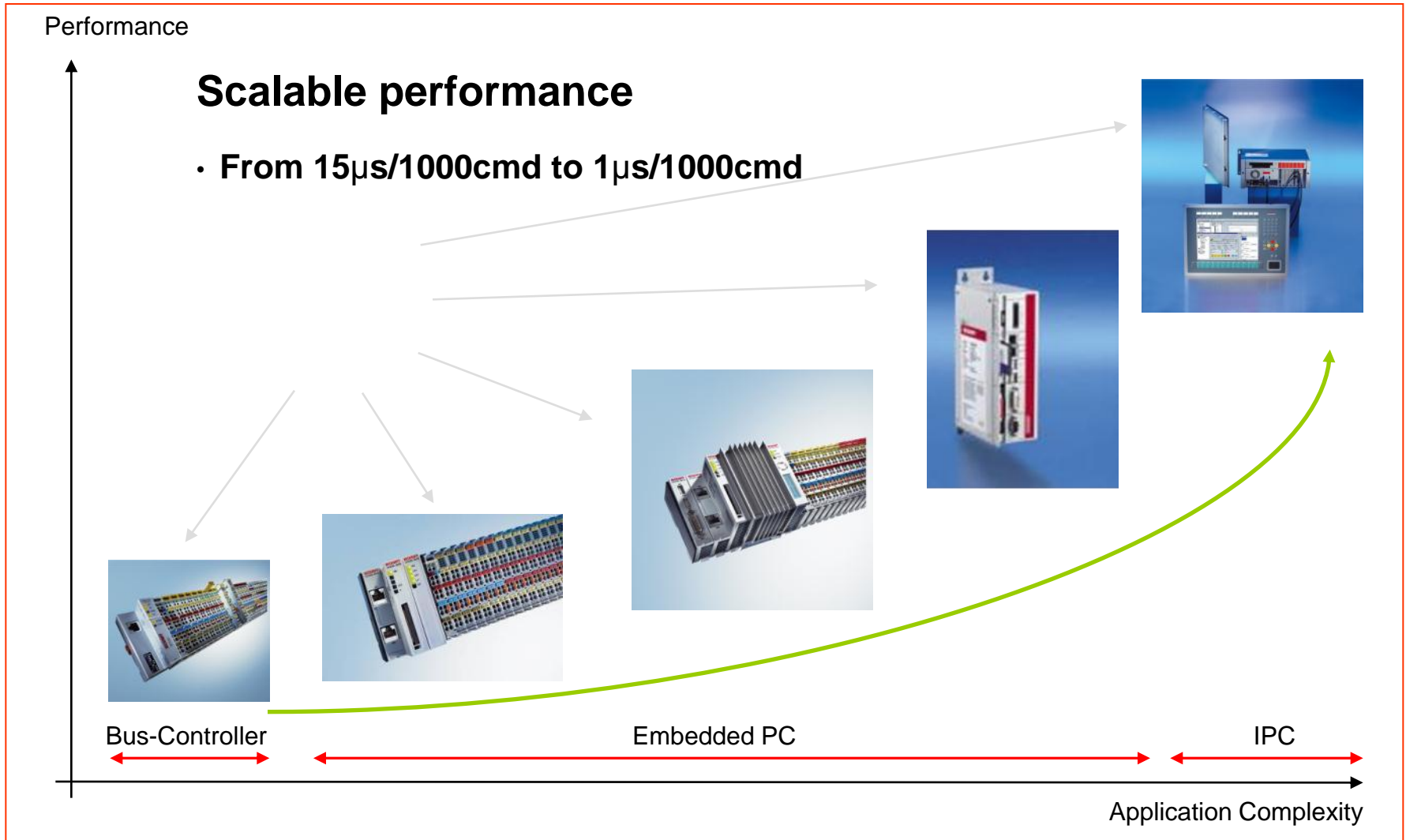


	Core0	Core1	Core2	Core3
bool	0,887	0,894	0,898	0,895
byte	0,672	0,682	0,681	0,688
word	0,613	0,614	0,626	0,617
dword	0,575	0,583	0,583	0,583
sint	3,463	3,472	3,473	3,474
int	3,473	3,484	3,482	3,482
dint	3,487	3,497	3,491	3,496
real	1,813	1,822	1,818	1,820
lreal	4,761	4,769	4,770	4,769

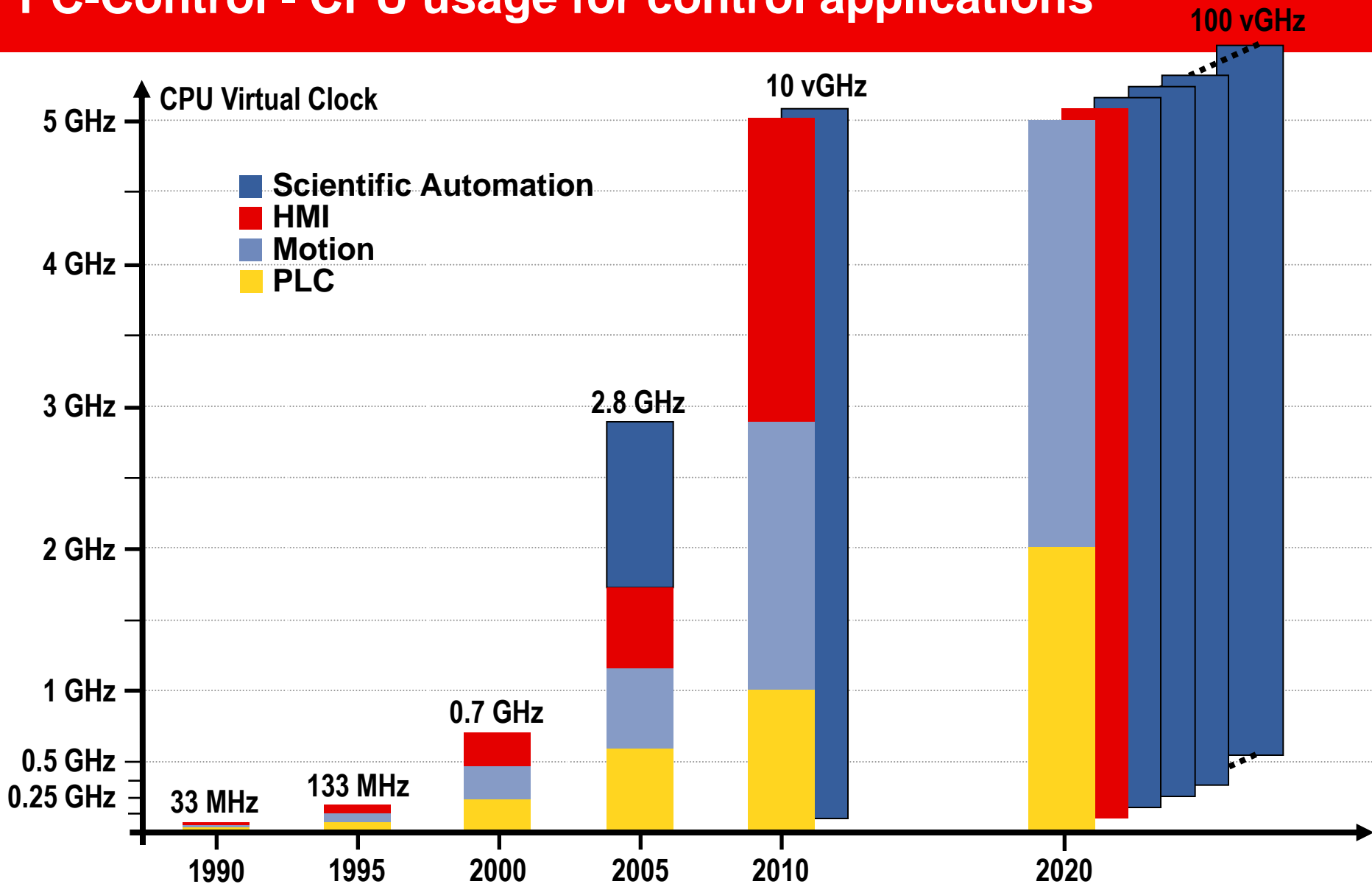


PC Control Features and performance

PC-Control: Scalable performance and cost



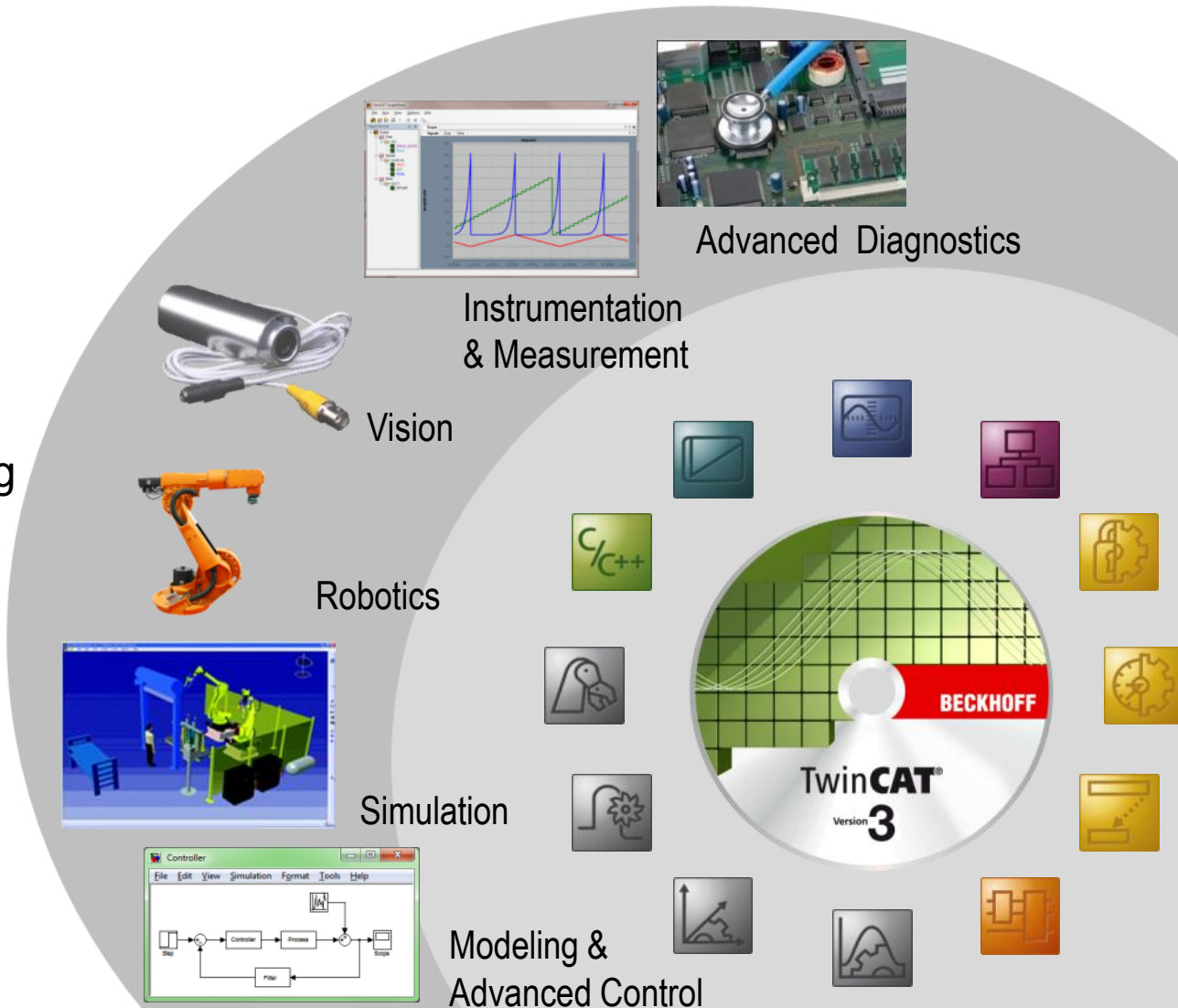
PC-Control - CPU usage for control applications



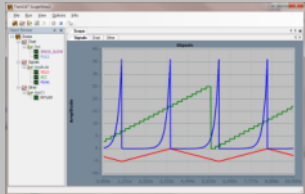
Open and modular platform

TwinCAT extends Automation into new fields of application

- Instrumentation & Measurement
- Advanced control
- Rapid control prototyping
- Simulation/real-time
- Data Analysis
- Test bench Automation
- Scientific Automation



Advanced Diagnostics



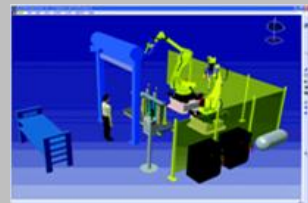
Instrumentation & Measurement



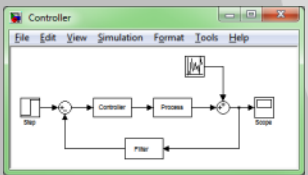
Vision



Robotics



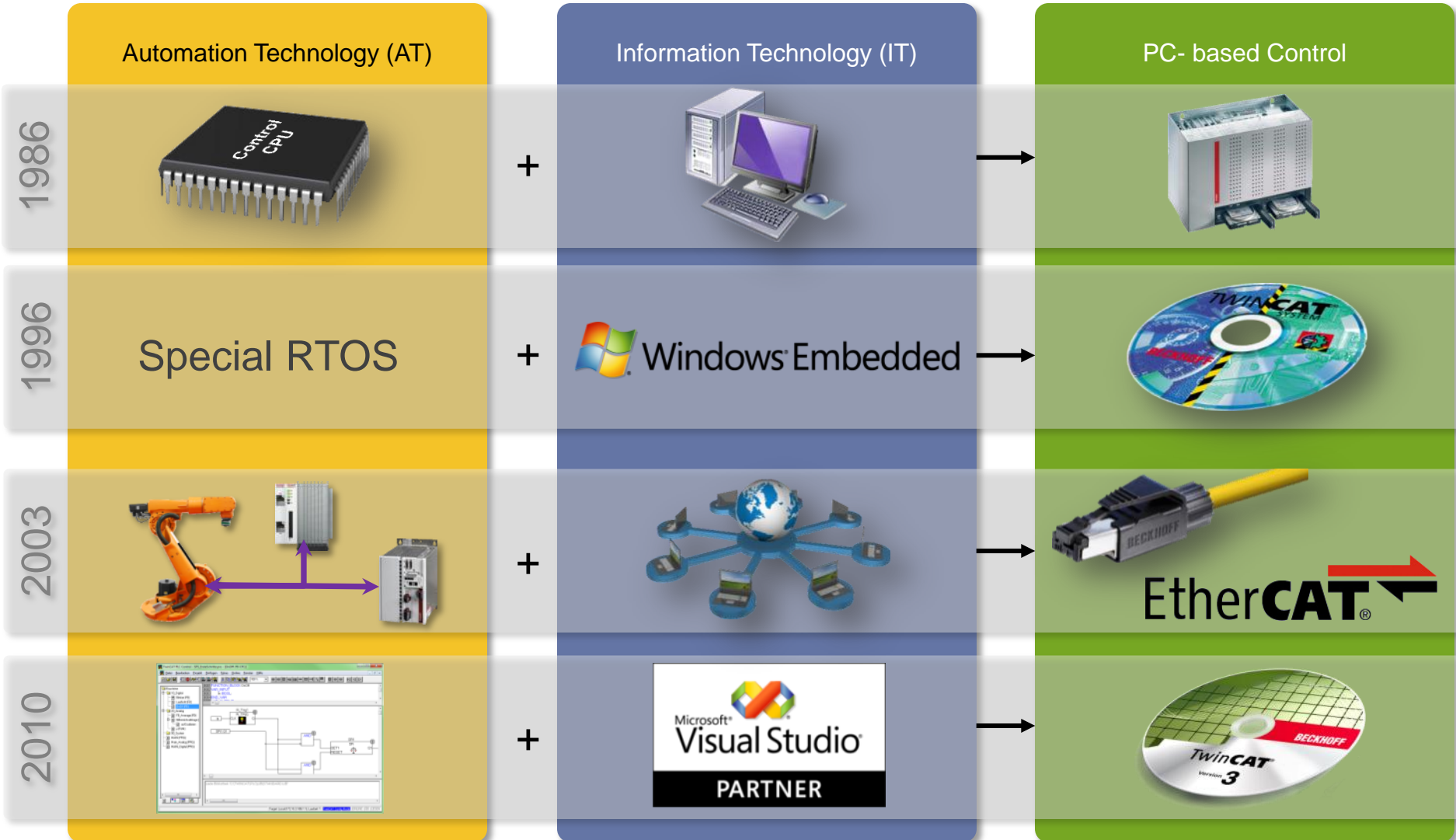
Simulation



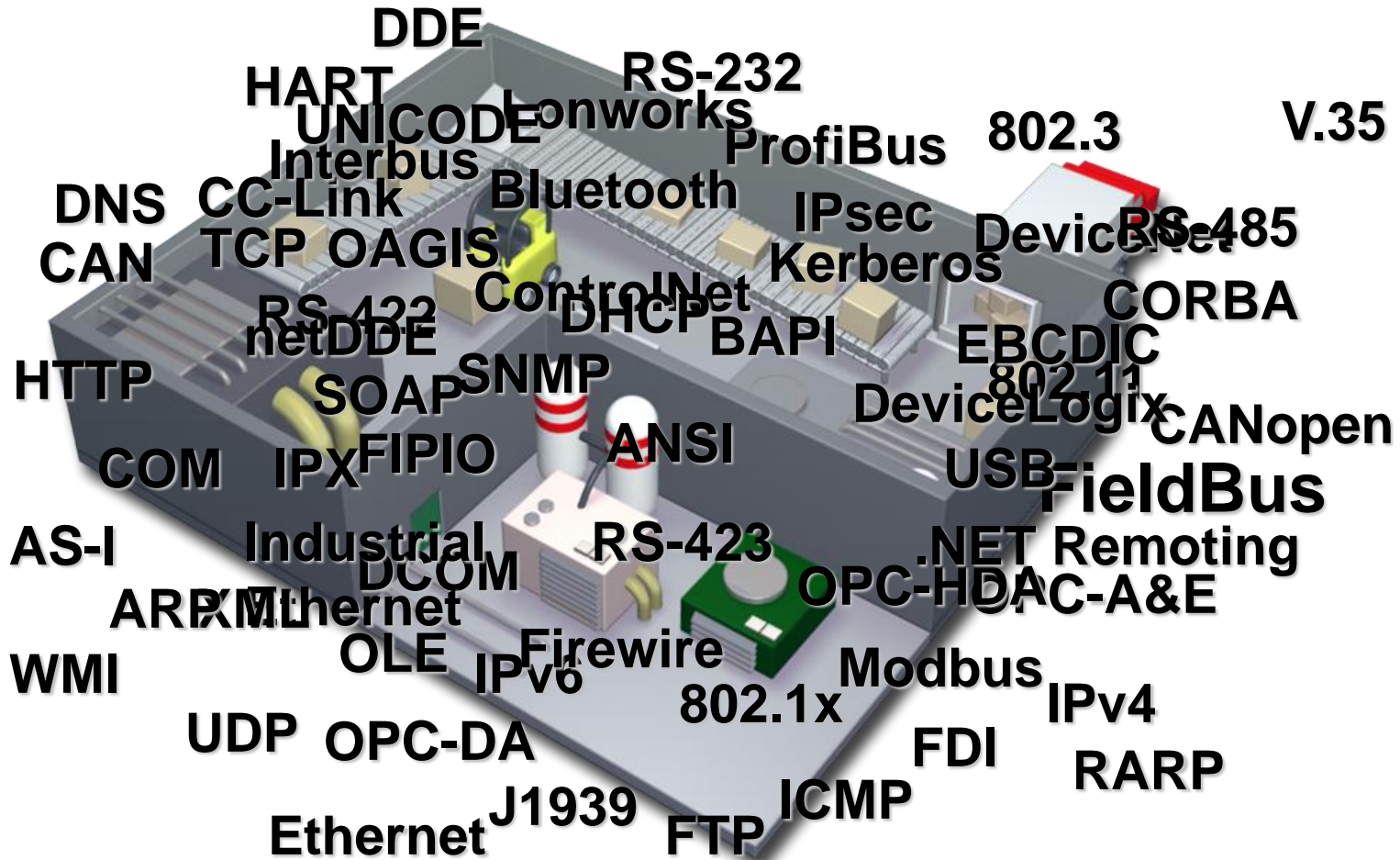
Modeling & Advanced Control



Convergence of Technologies

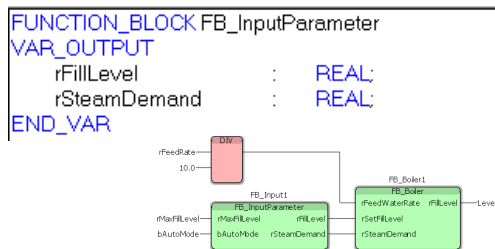


Numerous incompatible protocols

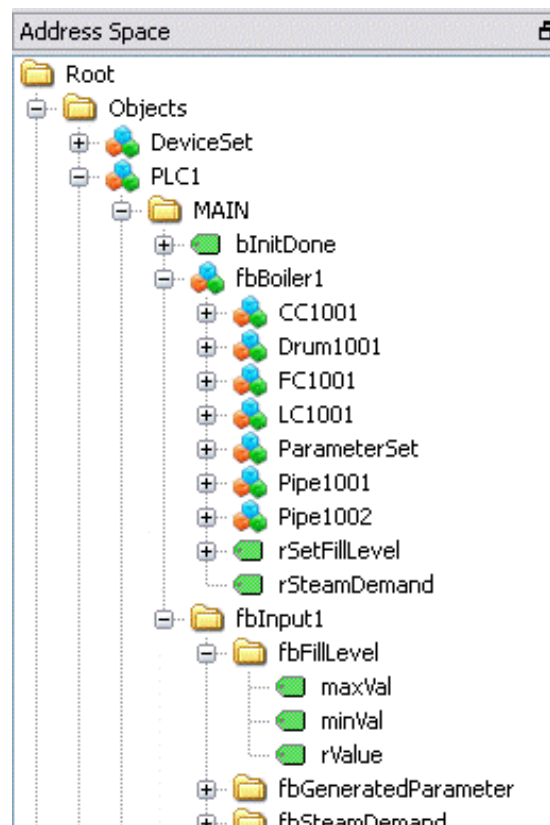


OPC Foundation and PLCopen: Collaboration

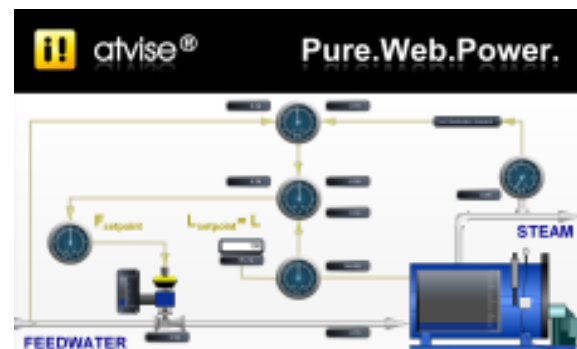
PLCopen:
Content „WHAT“



OPC-UA-Server:
Communication „HOW“



UA-Clients: SCADA/MES/ERP
Presentation



All information about
IEC61131-3 project:

- FB's
- POU's
- Structures
- Tasks / Resources..

- Standardized UA access
- Identical namespace
- Complete information model

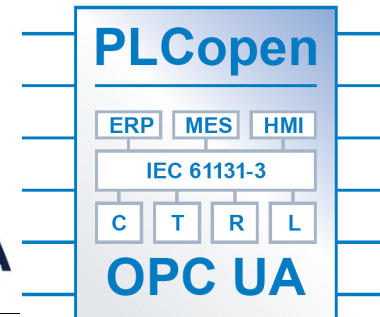
Advantages:

- Re-useable HMI Faceplates
- Rapid engineering
- Transparent PLC controller



Interoperability from embedded controller into the cloud

- OPC Foundation
 - OPC-Unified Architecture: IEC62541
 - Secured interoperability on semantic level



„OPC UA allows a platform independent, easy and secure connection between SAP business systems with distributed shop floor data even on smallest embedded devices”

Dr. Arne Manthey, Product Manager, SAP AG



Embedded Solutions

- Custom specific board
 - HW: ARM9 board, 400MHz i.MX25, Power over Ethernet (custom 12V) 20 GPIOs, Display, Serial Port, USB,
 - OS: Windows Embedded CE6.0R3
 - GUI: Silverlight for Embedded - connectivity via OPC-UA



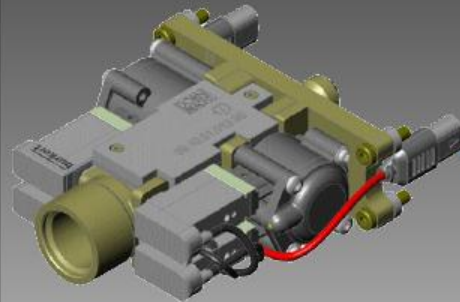
Interoperability from embedded controller into the cloud

Technologie bei Dornbracht
Schlüsselkomponenten



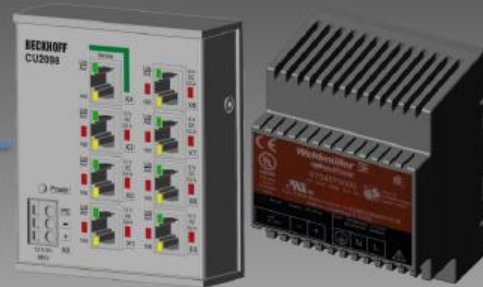
Wassermischen

Steuern
(Aktorik)

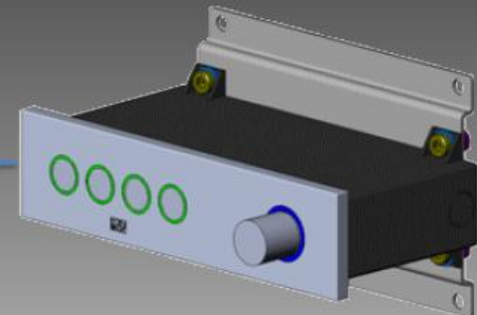


Messen
(Sensorik)

Vernetzung

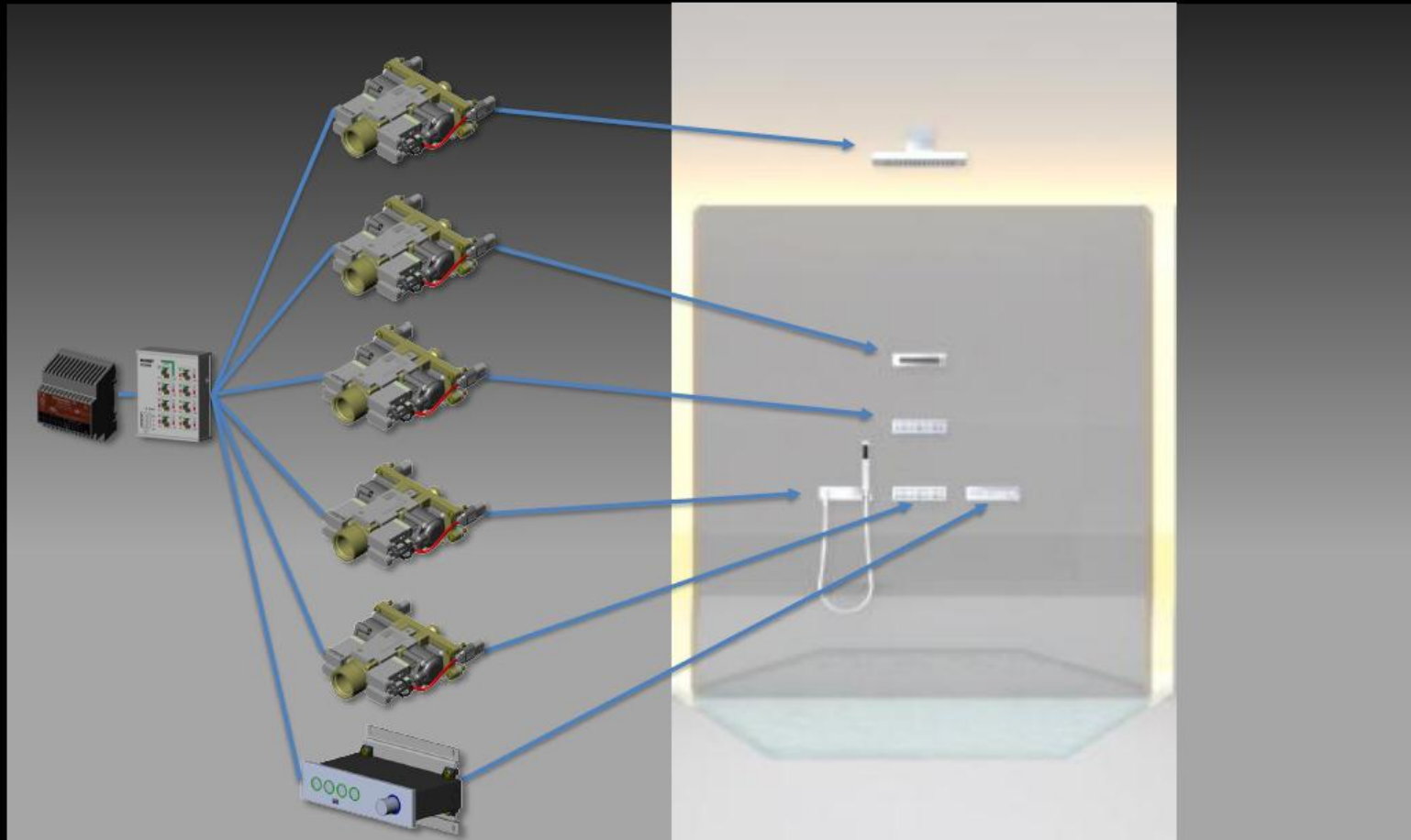


Wasserbedienen



Interoperability from embedded controller into the cloud

Technologie bei Dornbracht
Dezentrale und modulare Systemlogik



Thank you !

Information: www.beckhoff.com



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Microsoft MVP

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