KPA EtherCAT platform

EtherCAT Studio

KPA EtherCAT Studio

KPA EtherCAT Studio
is a tool for EtherCAT network engineering, configuration and diagnostics.

Functionality:
- Configuration
  - Master: topology, slave-to-slave, synchronization, …
  - Slaves: IO's, Gateways, Modular devices, Drives, …
  - Process image
- Diagnostics
  - Categorized Messages / traces
  - Data and Frame Loggers
  - Diagnostic Scanner
 - Causes and Remedies
  - Connection Quality

Operating systems:
- Windows ®

KPA EtherCAT Studio • Development Framework

KPA EtherCAT Studio Development Framework (SDF) provides:

- Integration
  - User interface components
    - master, slave, process image, statistics, charts, …
  - Automation interface
    - COM, WCF, .NET remoting
  - Extensions
    - Plug-ins and tools

- Localization
  - Multiple languages

- Customization and Brand Labeling

# KPA EtherCAT Studio • plug-ins and tools

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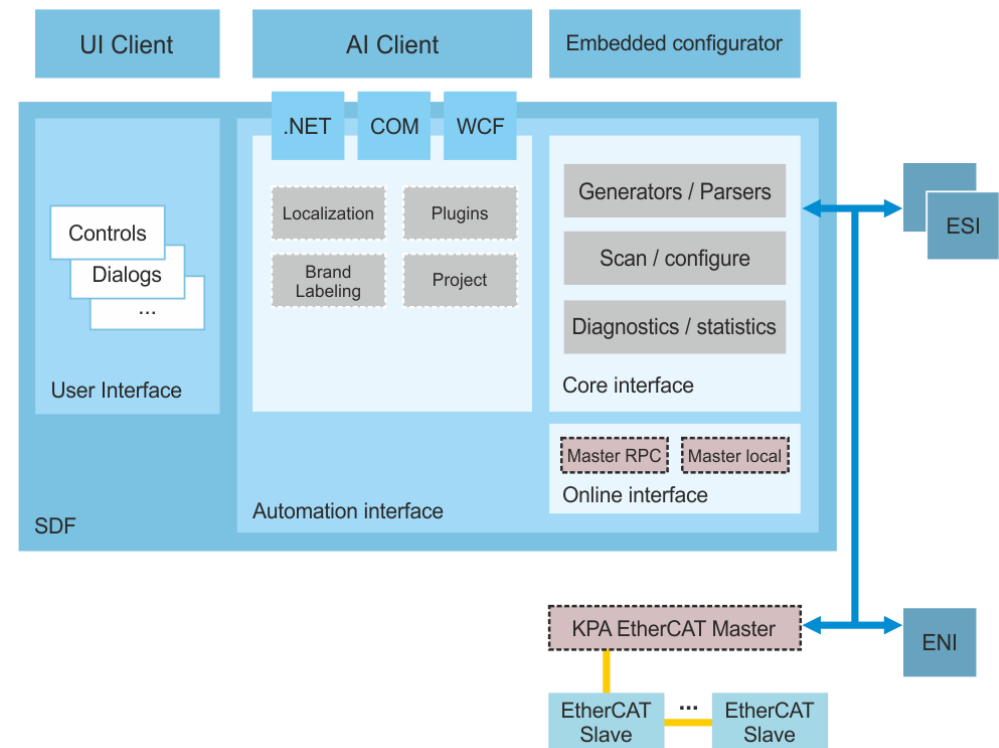
KPA EtherCAT Studio extendable through plug-ins and tools.
End users could write custom plug-ins (SDF is required).

- Slaves Library Collections
  - Vendor ESIs collections
  - Customizable ESI collection (uESI)
  - Custom Properties (Attributes View, Find and Replace)
- Runtime Data Logger (Oscilloscope style - Master 2)
- Tasks and Sync Units
- Extensible Process Image (Master 2)
  - Custom PI Variables
  - Statistics/Diagnostics in PI
  - Mailboxes services in PI
- Slave development tools
  - ESI/EEPROM Editor
  - OD Editor
- Master Events (Master 2)

KPA EtherCAT Studio • integrations

KPA EtherCAT Studio integrated into several IDE / Development tools:
- KPA Automation
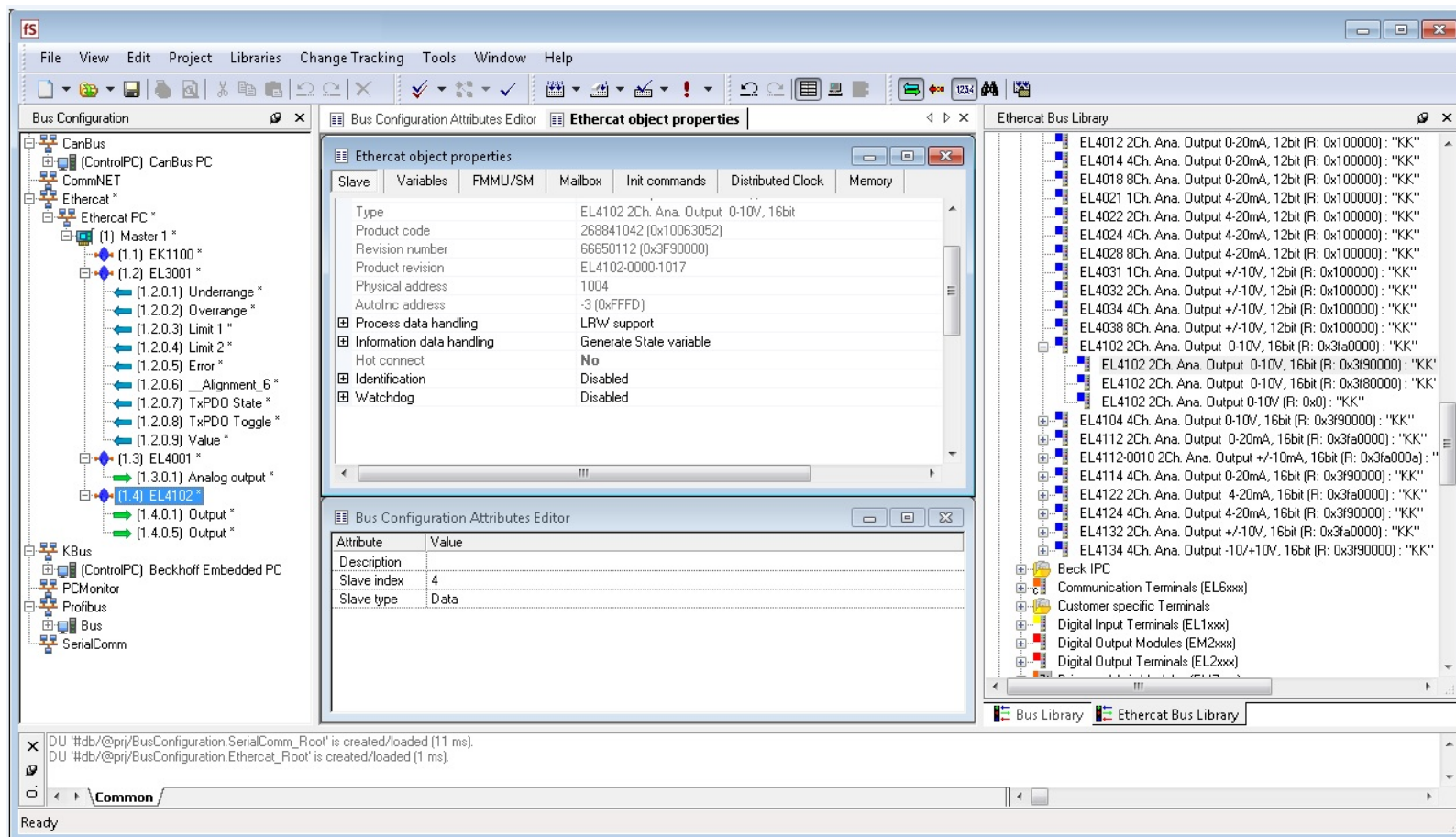
KPA EtherCAT Studio • integrations

KPA EtherCAT Studio integrated into several IDE / Development tools:
* KW Software MULTIPROG

KPA EtherCAT Studio • integrations

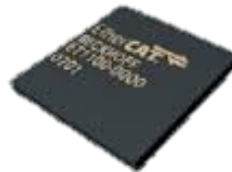KPA EtherCAT Studio integrated into several IDE / Development tools:

- MS Visual Studio

- Unitronics Unilogic

- Copadata Straton

- Isagraf Rockwell

...

KPA EtherCAT Studio - all in one tool for EtherCAT slave developers


EtherCAT Slave
device via
EtherCAT Master

EtherCAT Slave
information xml-file

KPA EtherCAT Studio • tools for process engineer's

KPA EtherCAT Studio provides easy-to-use user slaves library (uESI) collection for quicker and faultless project configuration

- Expert creates predefined configurations based on ESI and store as uESI
- End user selects uESI component according to the plan

KPA EtherCAT Studio • master/slave configuration

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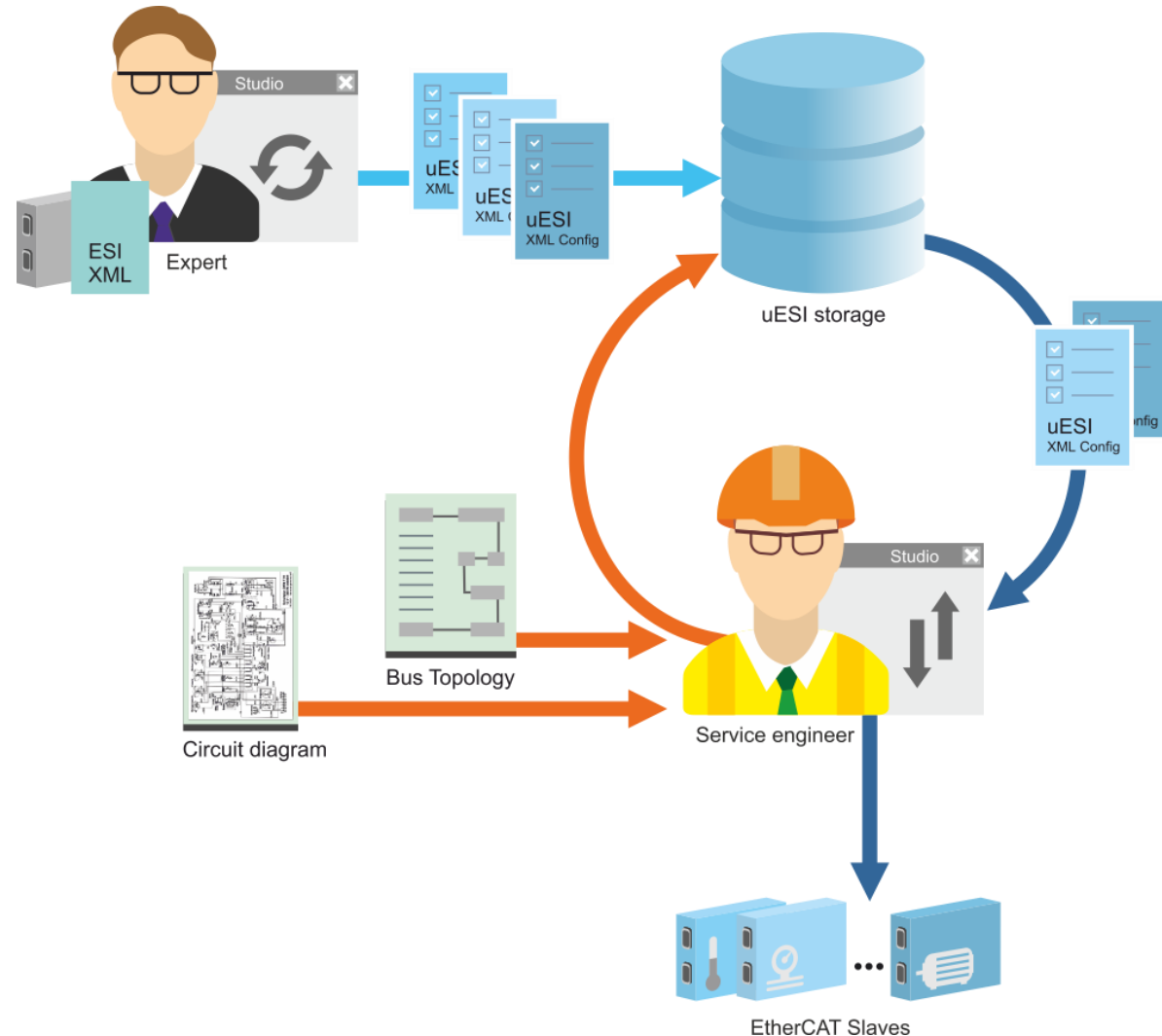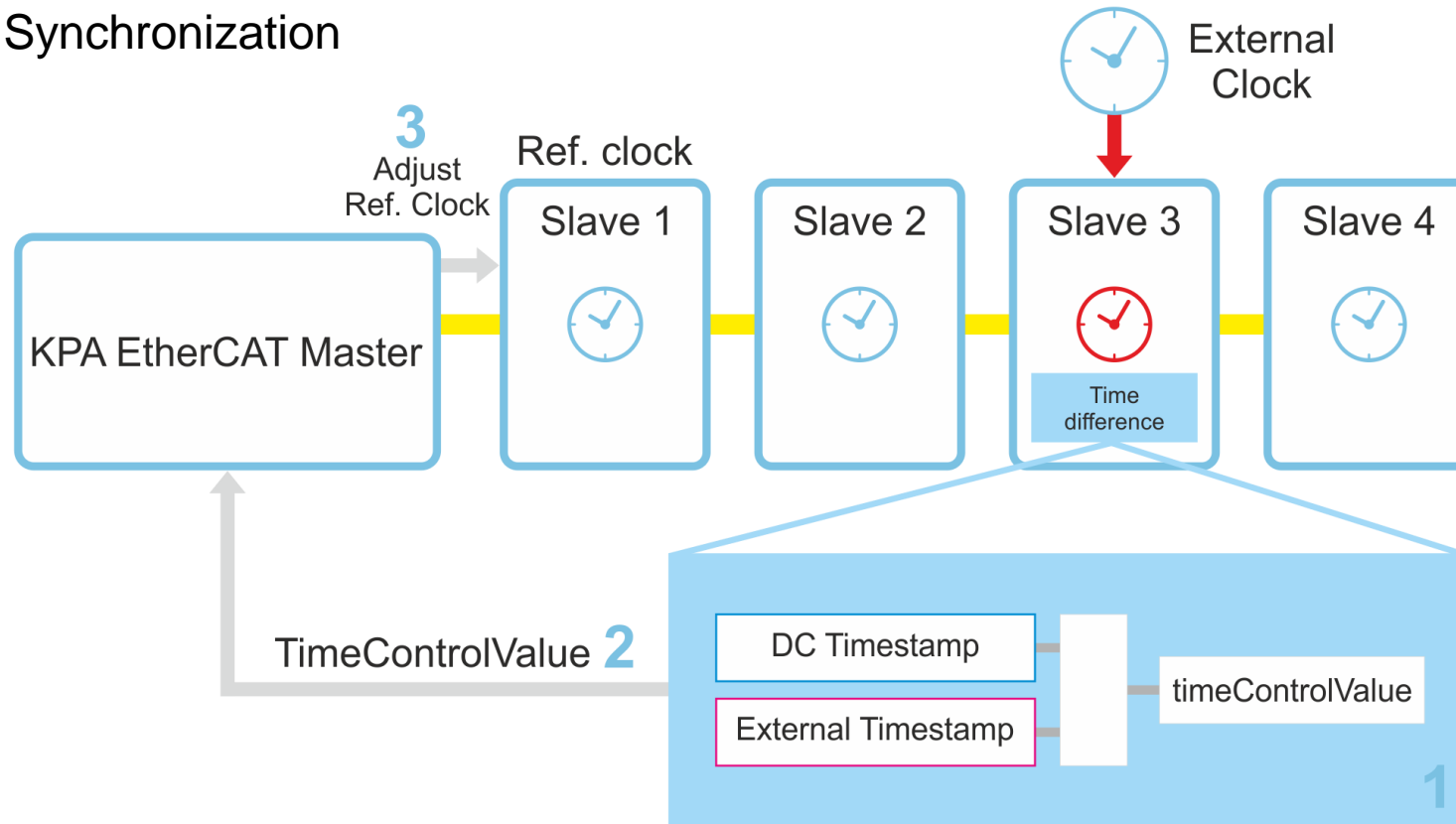
- Synchronization

- Master as a Reference Clock
- Slave as DC master
- External synchronization

KPA EtherCAT Studio • master/slave configuration

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- Hot connect
- Device replacement
- Alias

starting from master 1.6
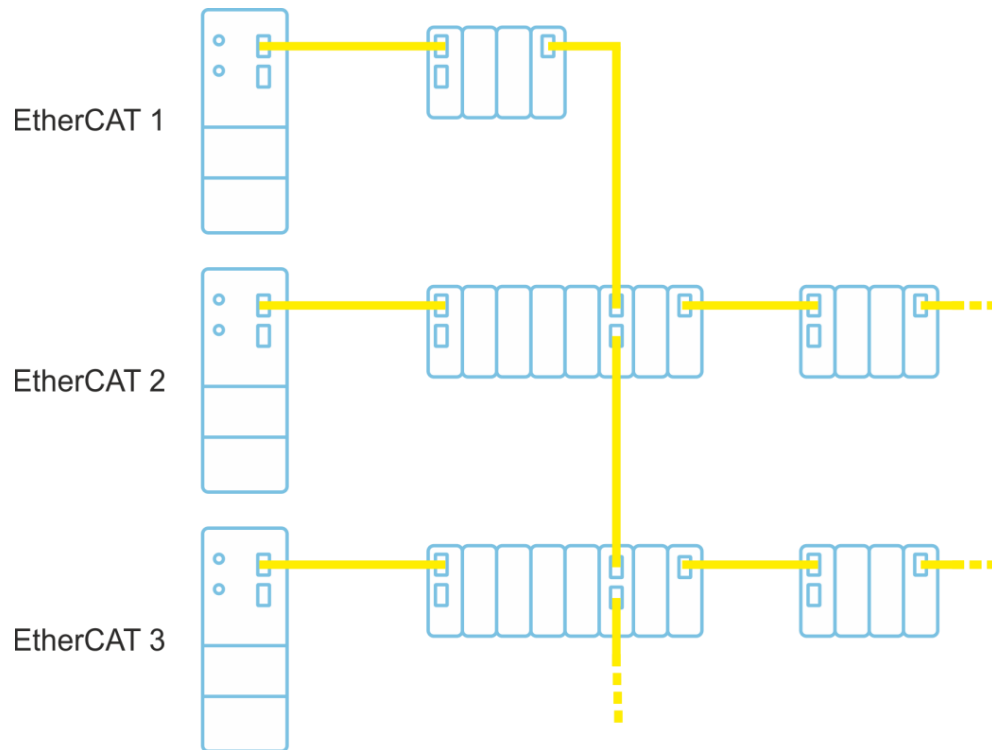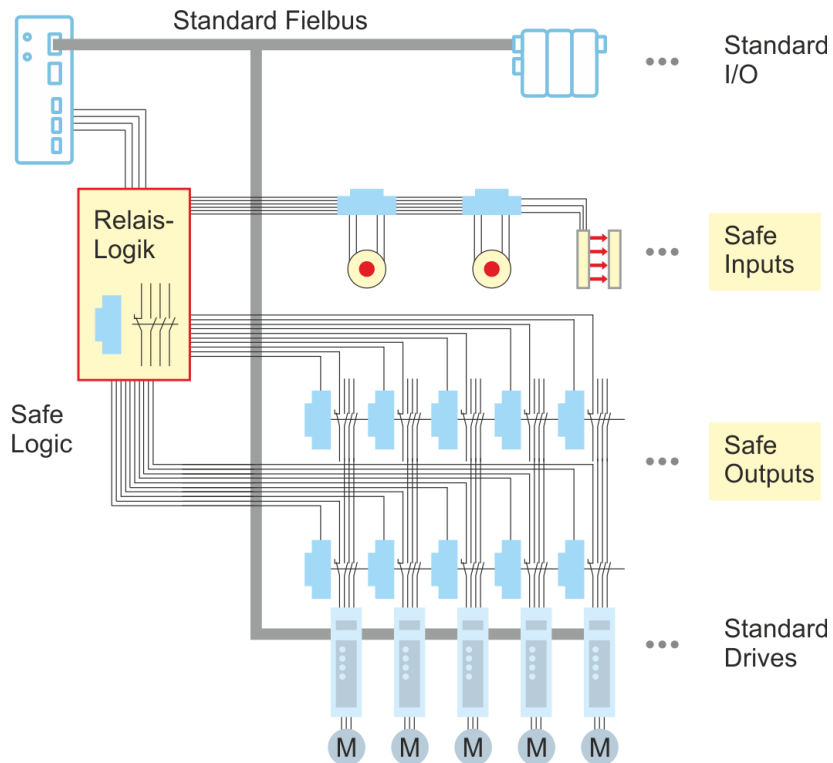- explicid device identification

.kønig
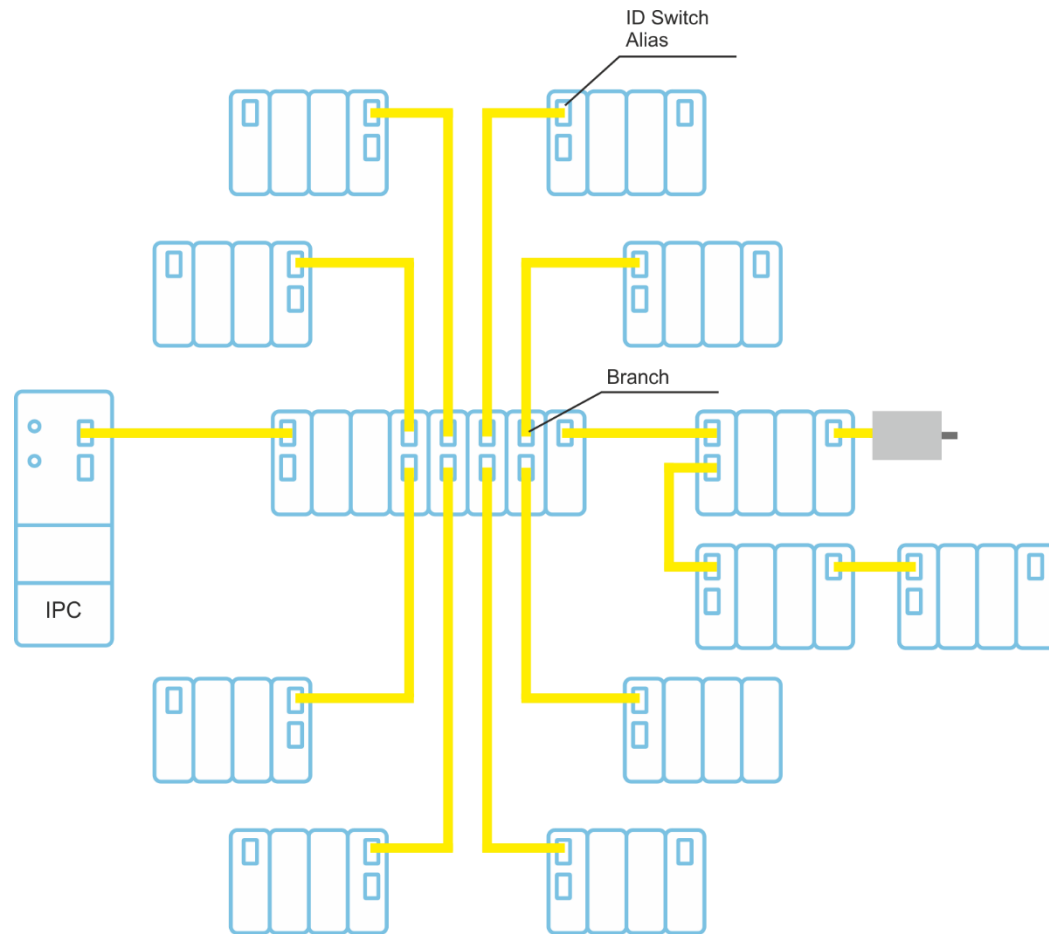
- Master to Master communication

Share data from master 1 network to master N network and vice versa
starting from master 1.6 external syncronization,
e.g. Beckhoff slaves: EL6692, EL6688
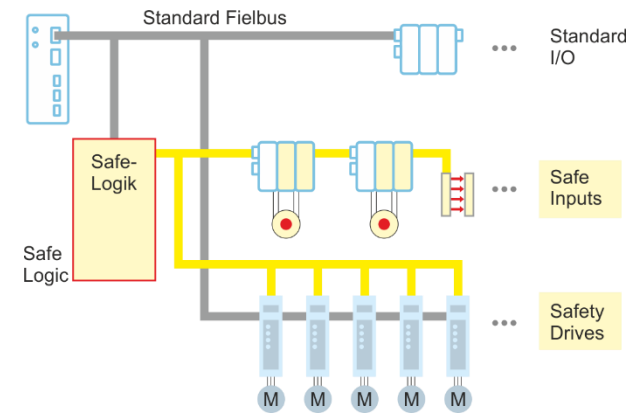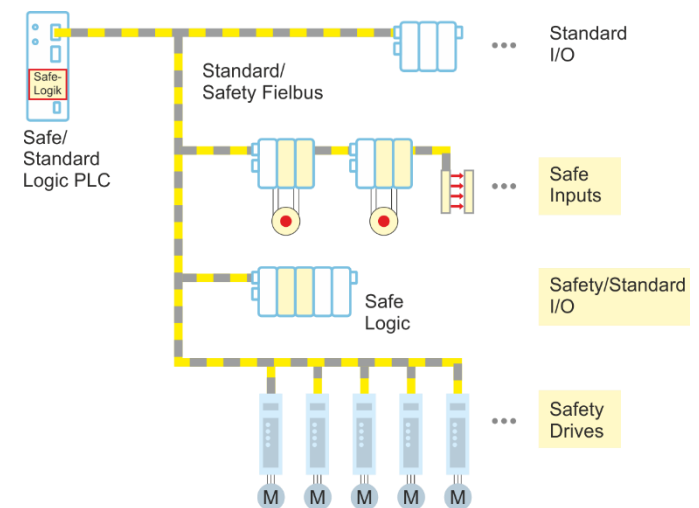
EtherCAT 1

EtherCAT 2

EtherCAT 3

KPA EtherCAT Studio • master/slave configuration

I/O-Connections

Standard Fielbus

Standard I/O

Relais-Logik

Safe Inputs

Safe Logic

Safe Outputs

Standard Drives

M M M M M

Separate Safetybus

Standard Fielbus

Standard I/O

Safe-Logik

Safe Logic

Safe Inputs

Safety Drives

M M M M M

Safetybus

Standard I/O

Safe-Logik

Standard/ Safety Fielbus

Safe/ Standard Logic PLC

Safe Inputs

Safe Logic

Safety/Standard I/O

Safety Drives

M M M M M

KPA EtherCAT Studio • master/slave configuration
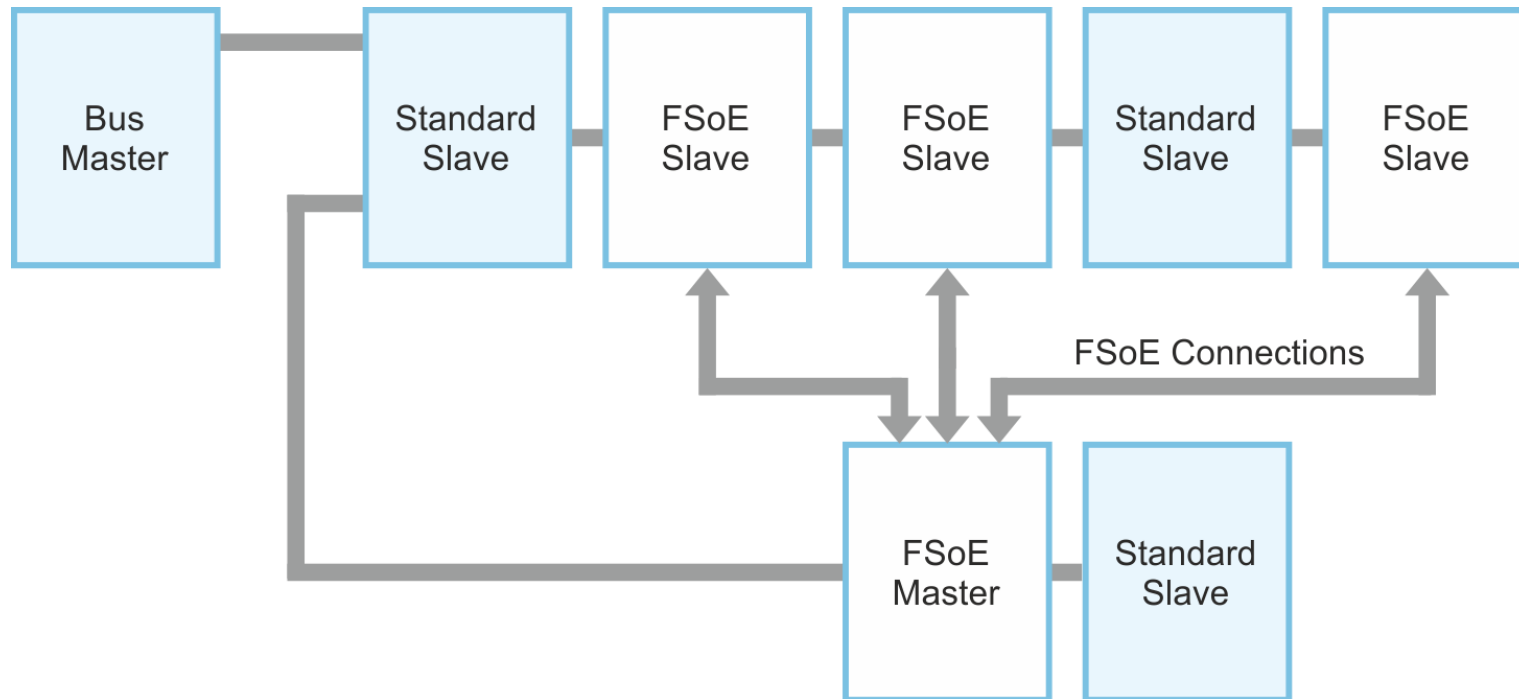
KPA EtherCAT Studio • master/slave configuration

KPA EtherCAT Studio • master/slave configuration

KPA EtherCAT Studio • master/slave configuration
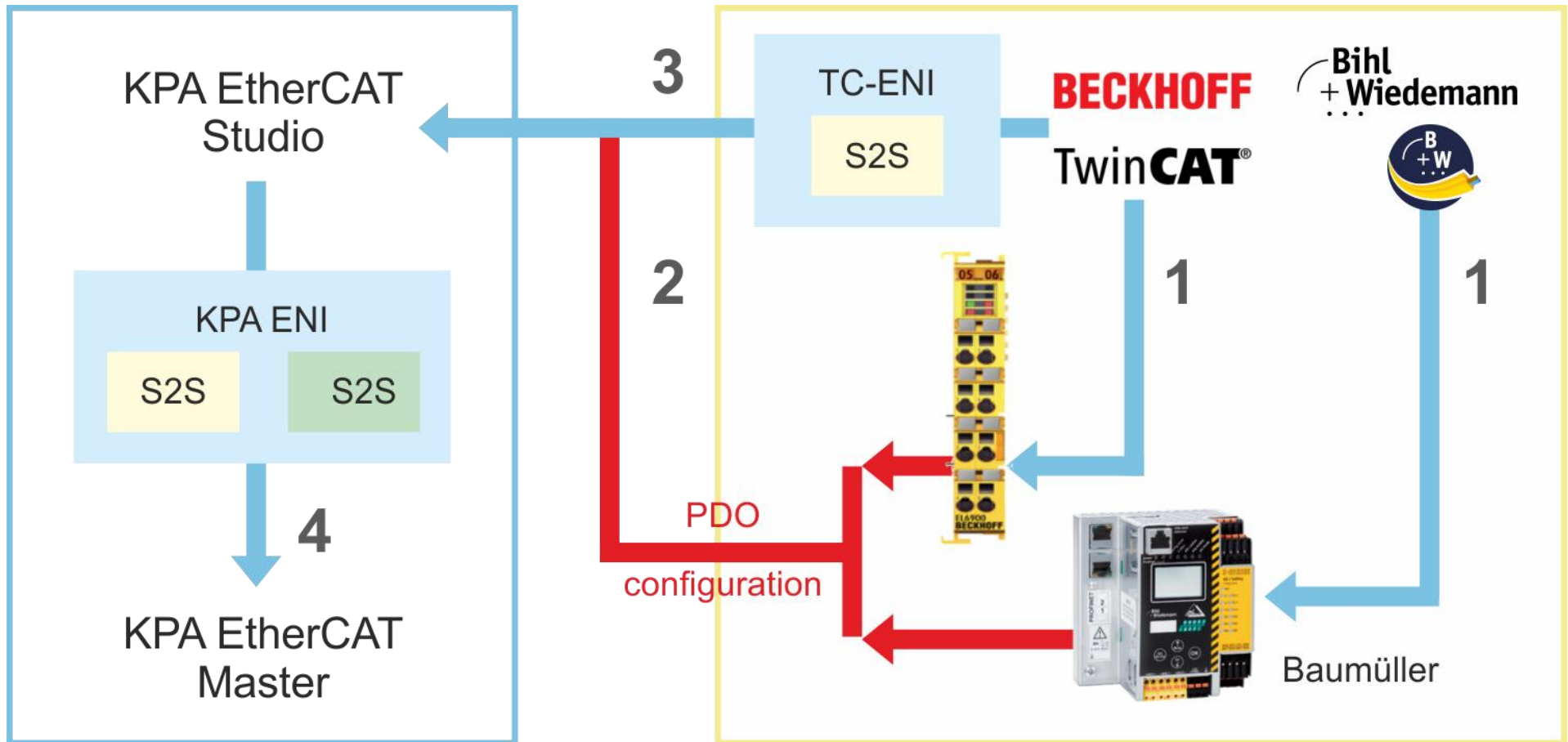
1. Create FSoE program logic and flash to the Safety Master device
2. Connect KPA Master to EL6900/AS-i 3.0/… and upload PDO-configuration
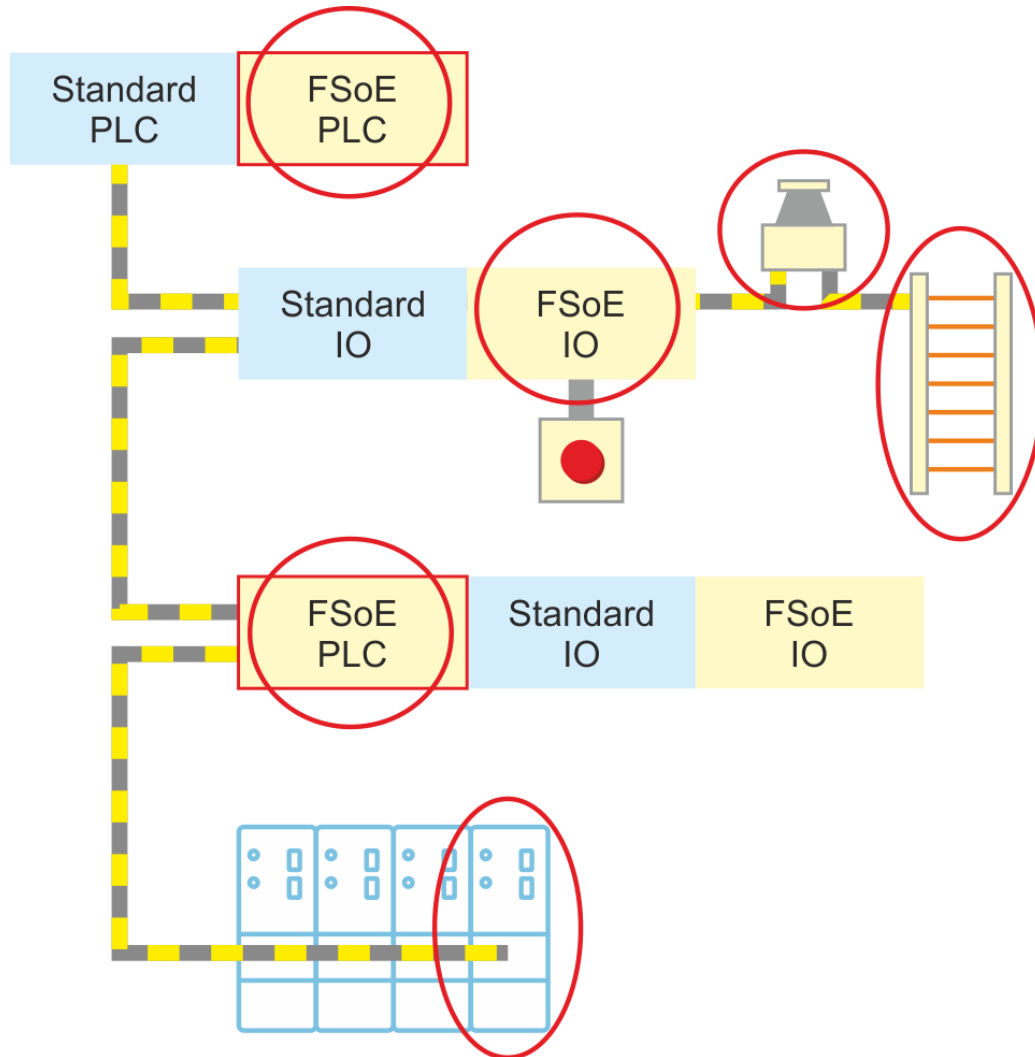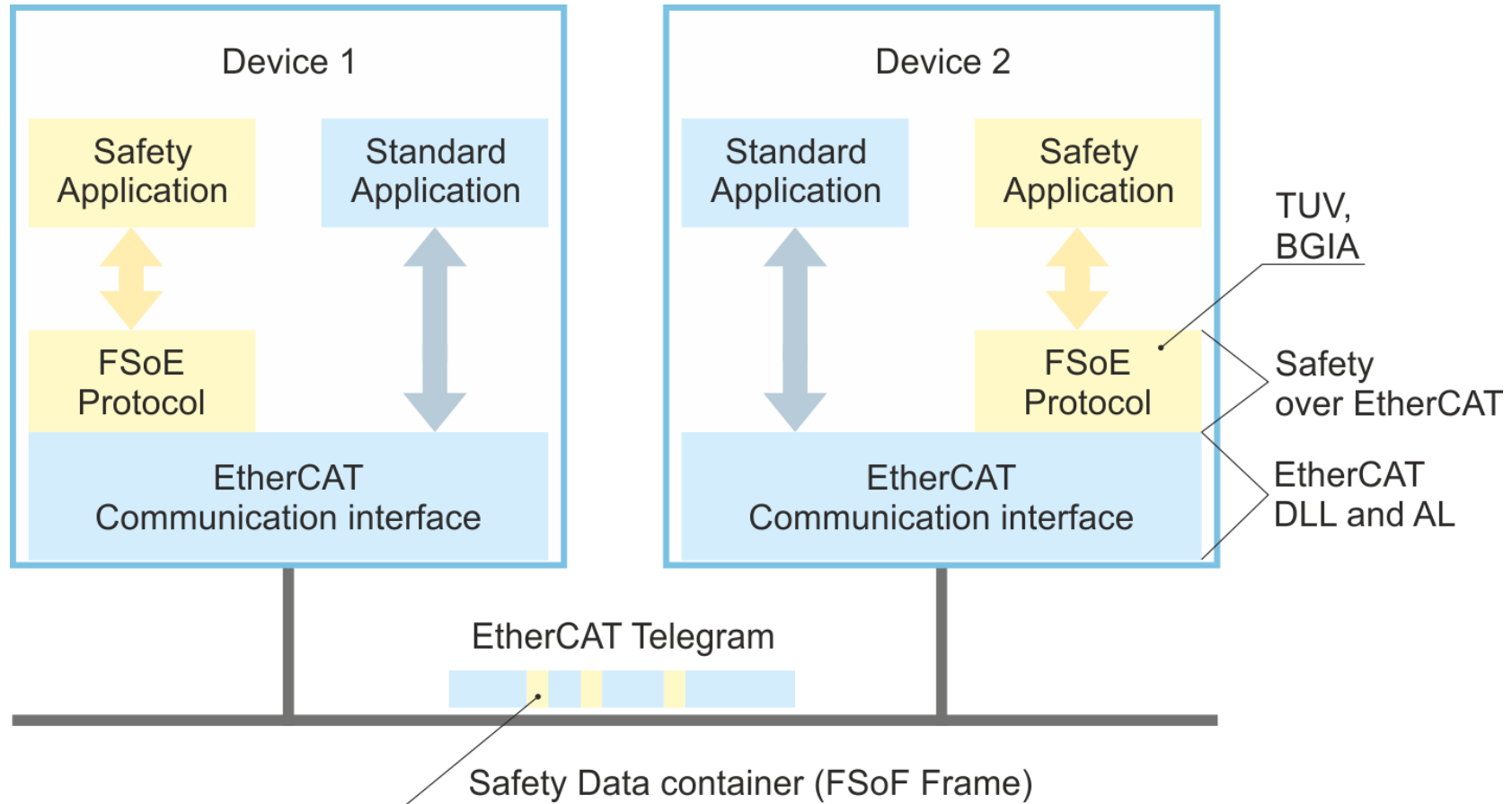3. Configure S2S in EtherCAT Studio or import ENI-Data file with S2S from TwinCAT
4. Download KPA ENI into KPA Master

KPA EtherCAT Studio • master/slave configuration

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- Different topologies: daisy chain, star, ring
- Different redundancy modes: cable, master
- fail-safe to broken cable / slave
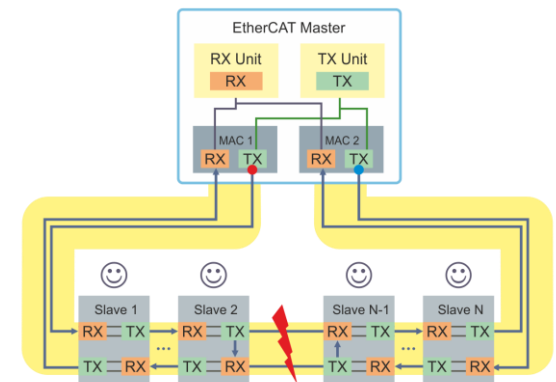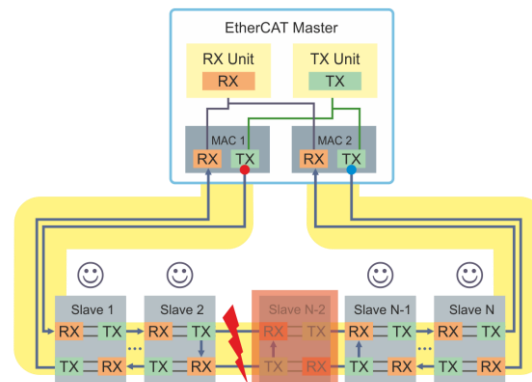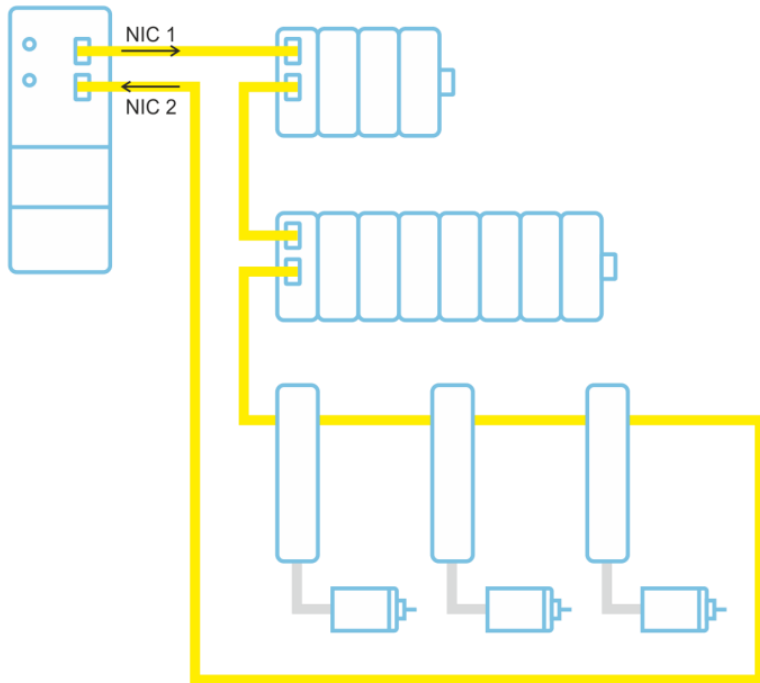
KPA EtherCAT Studio • slave configuration

- Modular devices
- Gateways
- IO's
- Drives
- …
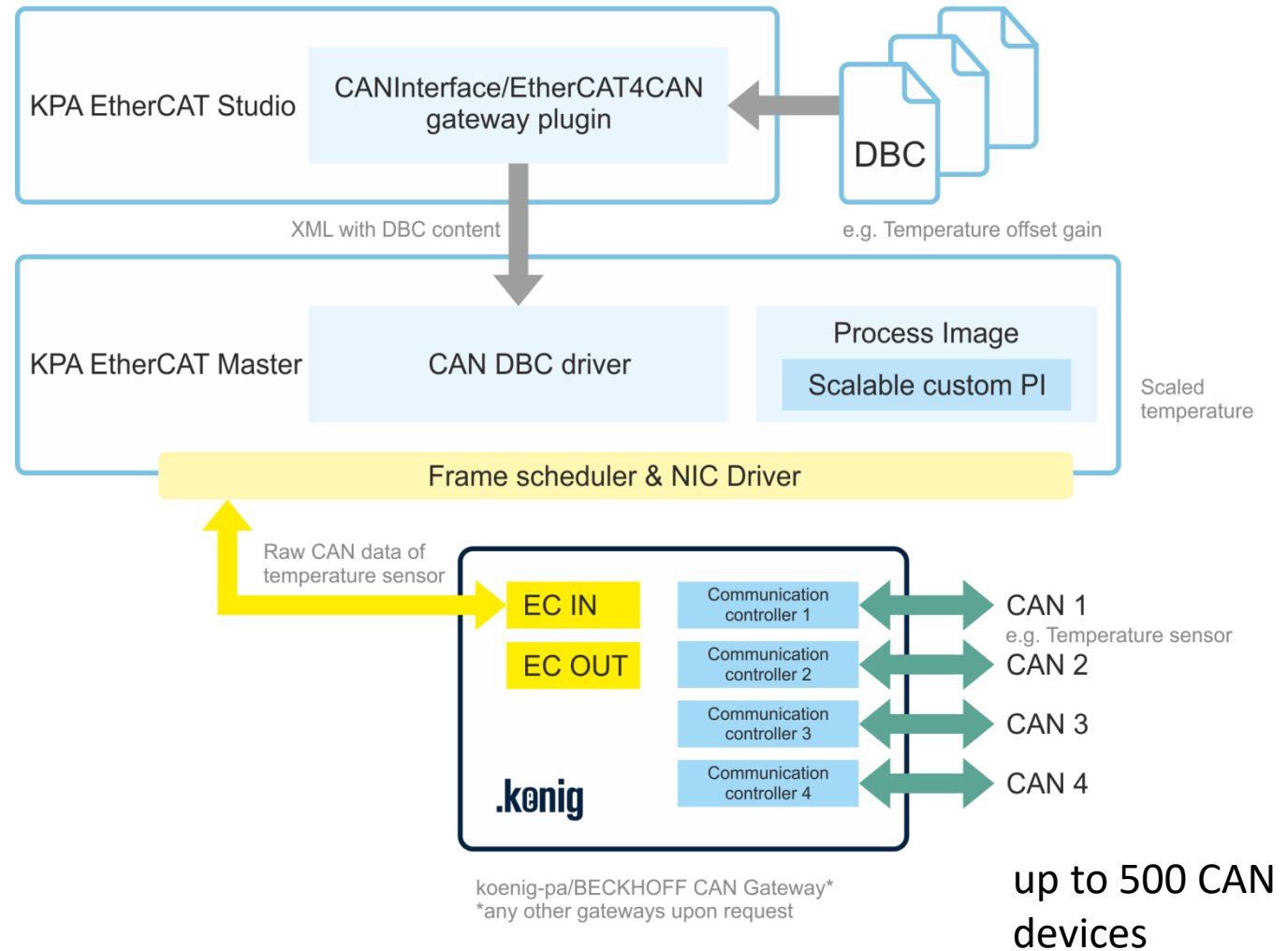
KPA EtherCAT platform

EtherCAT Master

KPA EtherCAT Master

KPA Master Development Kit (MDK)
enables developers to configure any EtherCAT Master functionality.

Hardware Platforms:
- ARM, Cyclone, Power PC, x86/x64, Zynq, Sitara

Operating Systems:
- INtime ®, RTX/RTX64, Windows
- QNX, VxWorks, T-Kernel
- Linux, Xenomai, SYS/BIOS, FreeRTOS
- any other through clear OSAL (abstraction layer)

Functionality according to ETG 1500:
- Class A (Standard)
- Class B (Basic)

KPA EtherCAT Master • features and extensions

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Feature Packs:
- Cable Redundancy
- Hot Connect
- TCP-IP/UDP-Mailbox Gateway

Extensions:
- External synchronization
- Multi-Master
- Event Handler
- Data Logger
- Frame Logger
- DBC-CAN
- OPC UA
- Master OD
- Online auto configuration
- Master Redundancy
- WebUI

Premium

Standard
ETG.1500 Class A

Basic
ETG.1500 Class B

PDO
CoE
FoE
S2S

EoE
SoE
AoE
VoE
DC

Cable
Redundancy

Hot Connect

TCP/UDP MBx

\+

Extensions
Feature packs

| External DC Sync |
| DBC CAN |
| Cable Redundancy |
| Hot Connect |
| Multi-Master |
| TCP/UDP MBx |
| Online Configuration |
| WebSocket / OPC UA |
| Process Image Logger |
| Master Redundancy |

KPA EtherCAT Master • features and extensions

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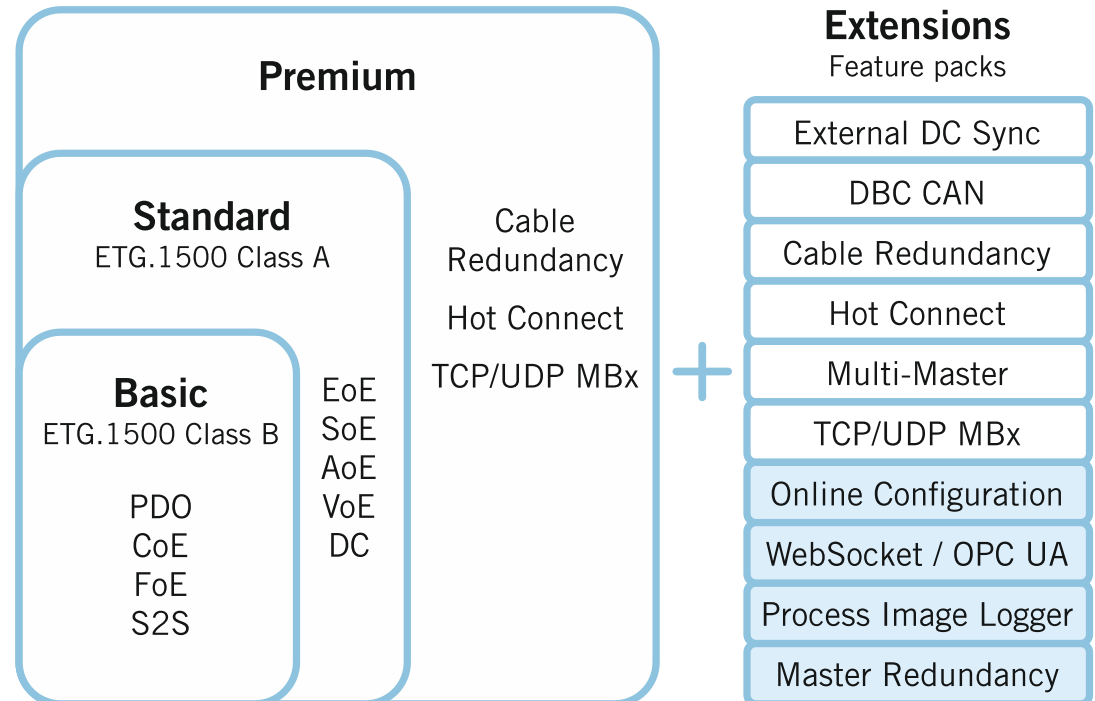
TCP-IP/UDP-Mailbox Gateway

- Black channel/ gateway interface in master
- Device parameterization using vendor tool

SEW,
Stöber,
ESR
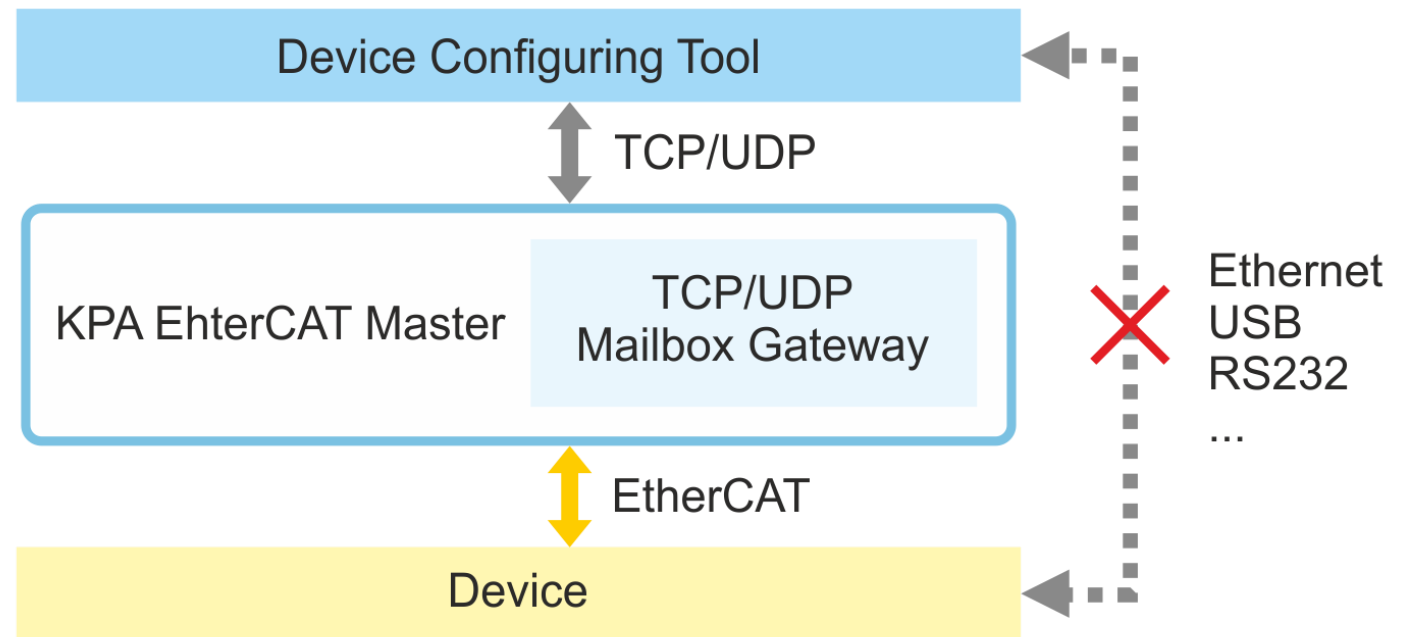
KPA EtherCAT Master • features and extensions

Web UI, OPC UA, Autoconfigurator

- autoconfigure topology and adjust setting using web interface
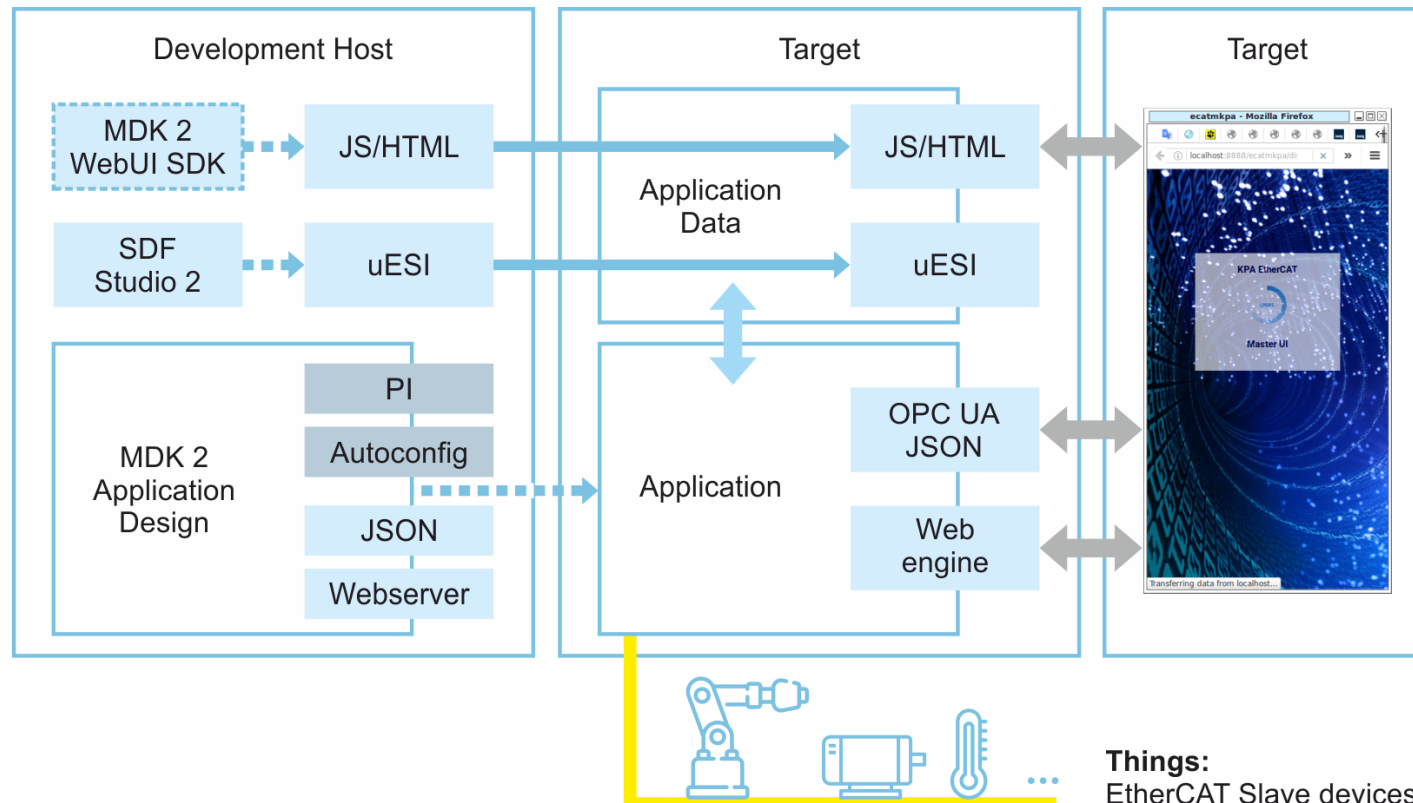- access Process image from Web Application
- access Process image from HMI using OPC UA

starting from master 2.0

Things:
EtherCAT Slave devices

KPA EtherCAT Master • features and extensions

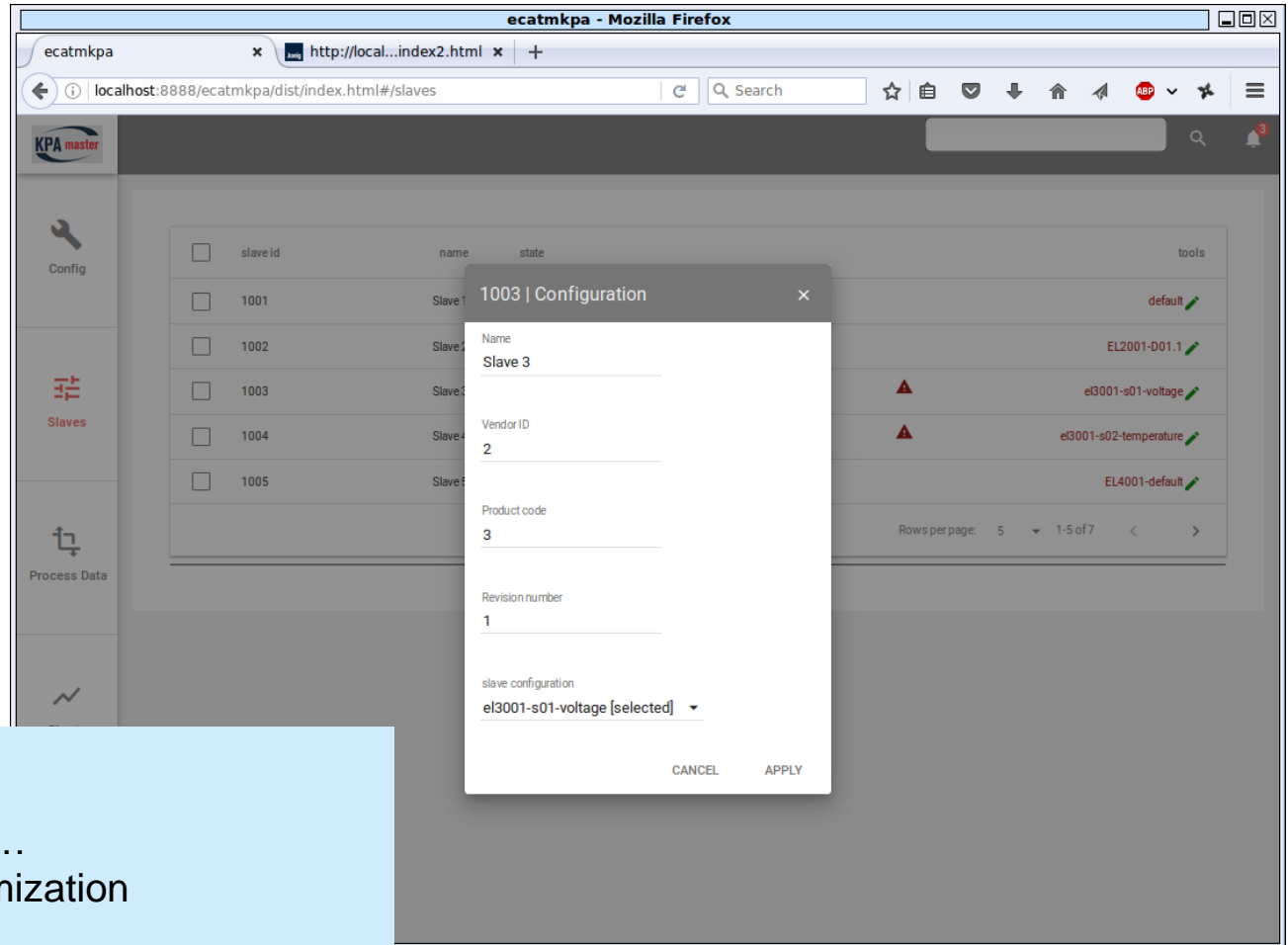**Web UI, OPC UA, online configuration**
starting from master 2.0

MDK 2
application
design

MDK 2
WebUI
objects

module

module

web application
* in source code: js, html, …
* brandlabeling and customization

KPA EtherCAT Master • features and extensions

Multiple Masters

- Multiple synchronized master instances controlling several/different EtherCAT topologies

starting from master 1.6
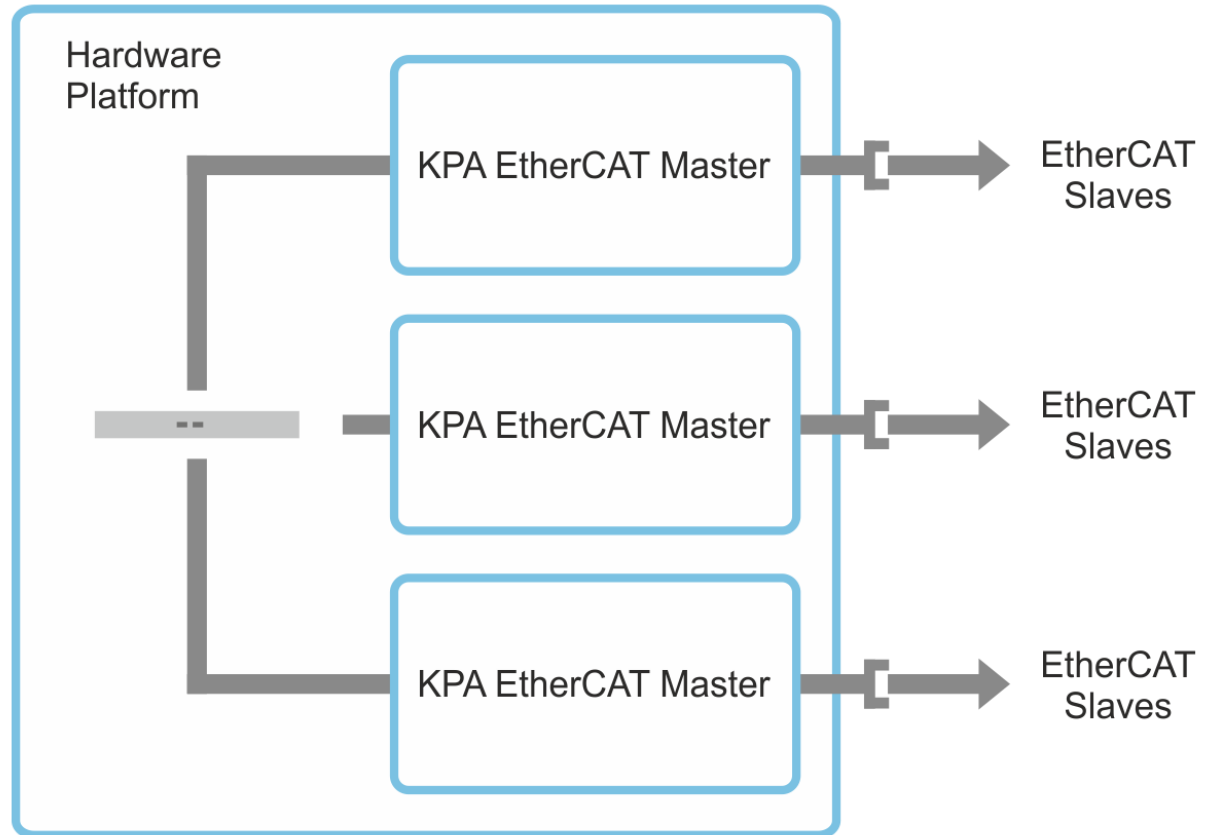
KPA: Master Redundancy

starting from master 2.0

KPA EtherCAT Master • features and extensions

Event Handler
- Event driver diagnostics module
starting from master 1.6
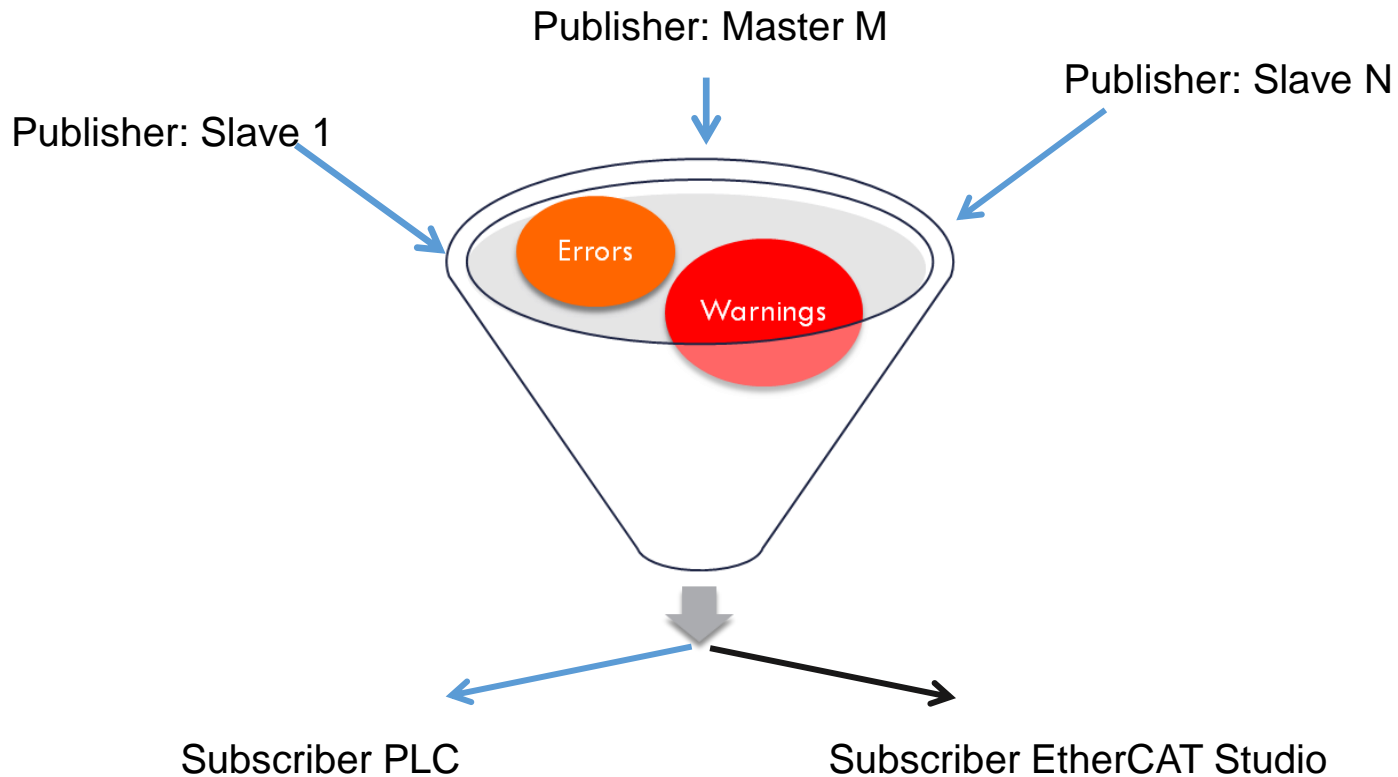
Data logging
* LabView, Mathlab
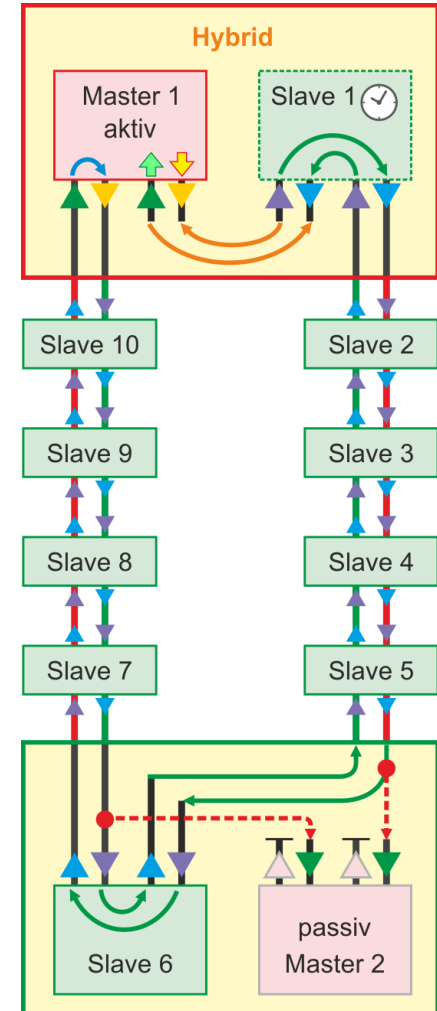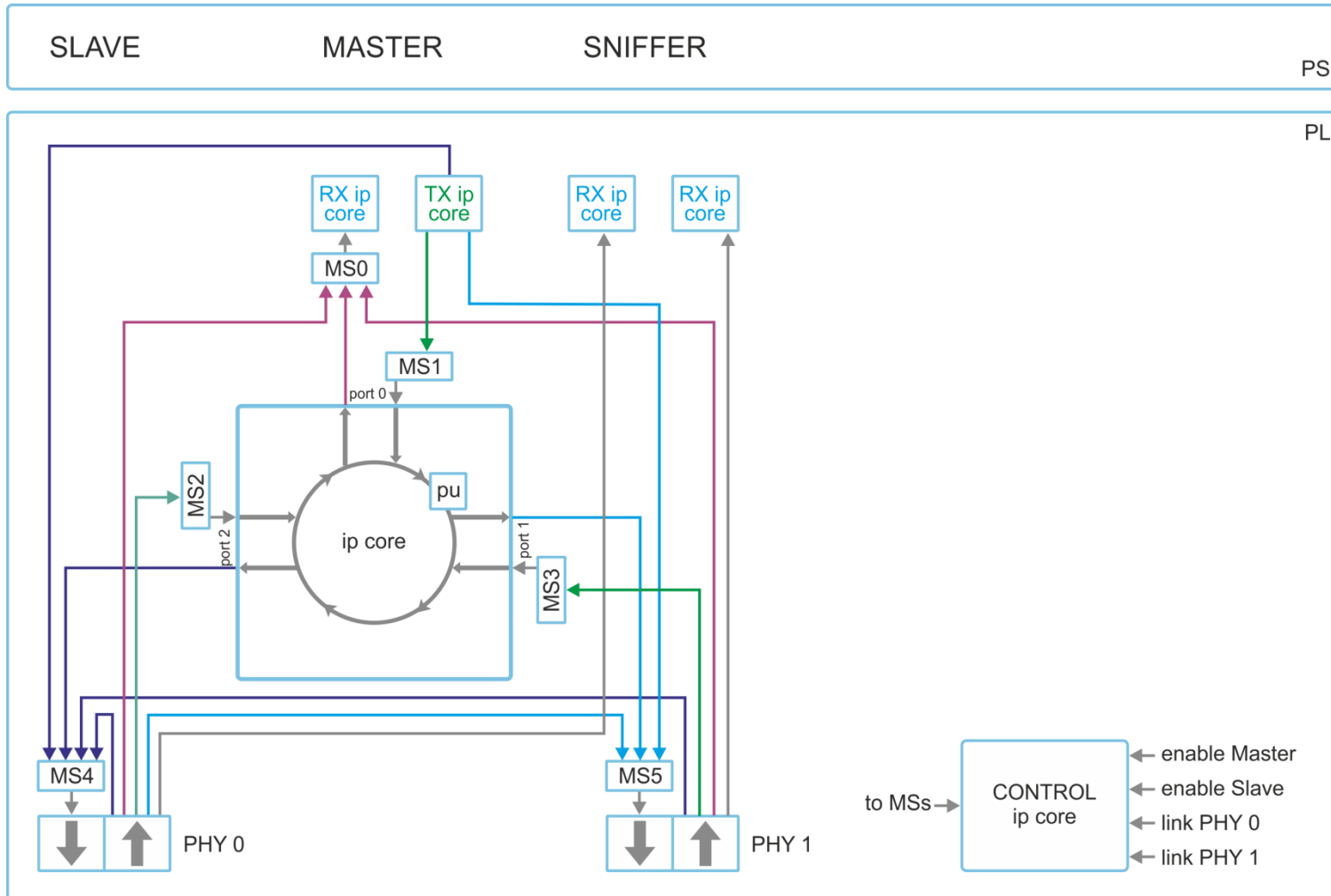starting from master 2.0
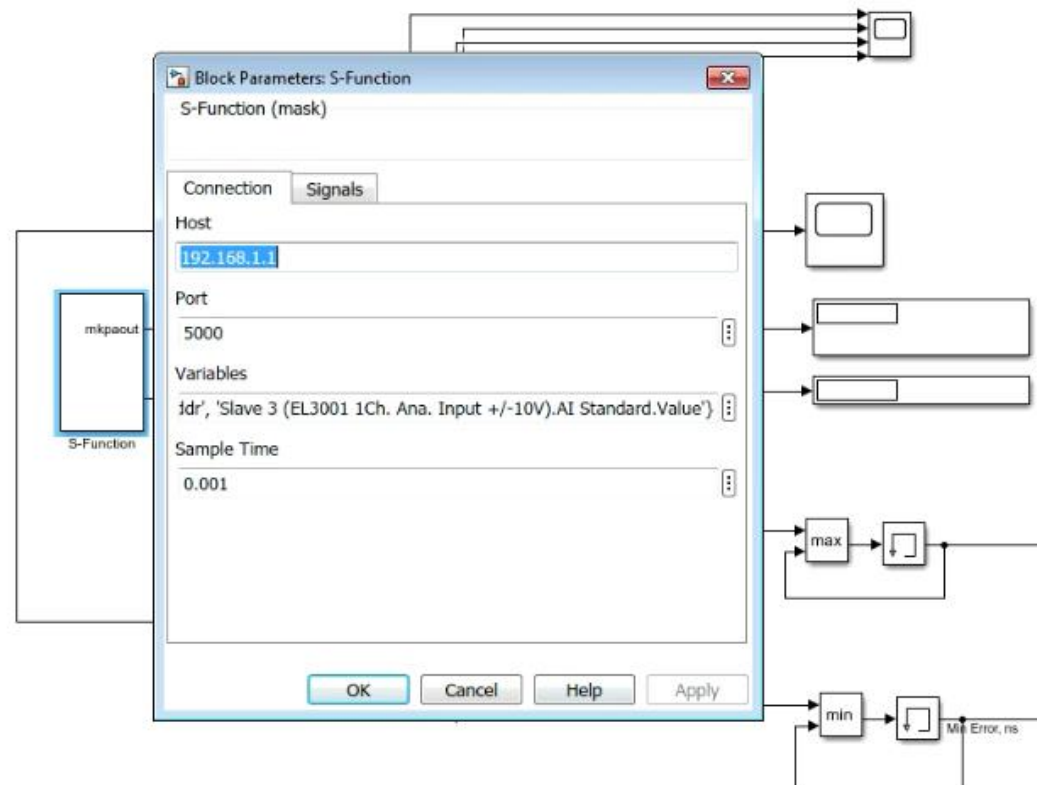
Mailboxes:
- VoE → Vendor over EtherCAT
  Custom mailbox protocols – medical, secured, …
- EoE → Ethernet over EtherCAT
  IP settings in EtherCAT Studio
  IP settings in master.ini
  Routing in OS
- SoE → Sercos over EtherCAT
  Similar to CoE
- AoE → ADS over EtherCAT
  Used in Beckhoff gateways: CAN, Profibus, …

KPA EtherCAT Master • performance and timings

Thread / Time in us	OS: Xenomai 2.6 Zynq 7020 CPU 800MHz 8x DIDO/AIAO slaves	OS: Xenomai 2.6 Zynq 7020 CPU 800MHz 16 Ds402 Axis	OS: INtime 6.1 intel core i7 duo 3.4GHz 16 Ds402 Axis	OS: QNX 6.5 intel core i7 duo 3.4GHz 16 Ds402 Axis
RT (Outputs)	23	29	6	2.1
RX (Inputs)	16	25	5	1.4
Mailbox	4	4	3.2	0.3
Diagnostic	1	1	0.6	0.2
Total CPU Time	**44**	**59**	**14.8**	**3.9**

KPA EtherCAT platform

EtherCAT Slave

KPA EtherCAT Slave

KPA EtherCAT Slave stack is a cross-platform source code written in "C".

Hardware Platforms:
- 8, 16 & 32Bit μC, e.g. 80C16x, x86,
  ARMx, ppc52xx, ATmega128, Xilinx, Sitara, C2000, …

Compatible with ESCs:
- Beckhoff ET1x00, Xilinx/Altera FPGAs, TI PRUs, …

Operating Systems:
- INtime ®, Linux, QNX, RTX, VxWorks, Windows ®, Xenomai, xPC Target

Functionality:
- KPA Basic Version
  - Static Object Dictionary (OD)
  - CoE
  - Flash size≥55kB, RAM size≥3kB
- KPA Standard Version
  - Dynamic Object Dictionary (OD)
  - CoE, FoE, EoE, SoE, VoE

KPA EtherCAT Slave

KPA EtherCAT Slave stack news:

Ti PRUs under Linux / Vxworks

EoE under linux for Ti Sithara

Source code updates related to latest Conformance Test tool
and ETG Specification changes

Contacts

The USA

Germany

Italy

Japan
South Korea
China
India

koenig-pa GmbH
Im Talesgrund 9a
91207 Lauf a.d. Pegnitz
Germany
www.koenig-pa.de

email: sales@koenig-pa.de
tel.: +49 9128 725 631
tel.: +49 9123 960 5796

Thank you for your attention