Embedded Networking Solutions

Twincomm

Anybus: Embedded Industrial Networking Technology

One universal solution for all embedded networking

Kurt van Buul
Twincomm

About Twincomm

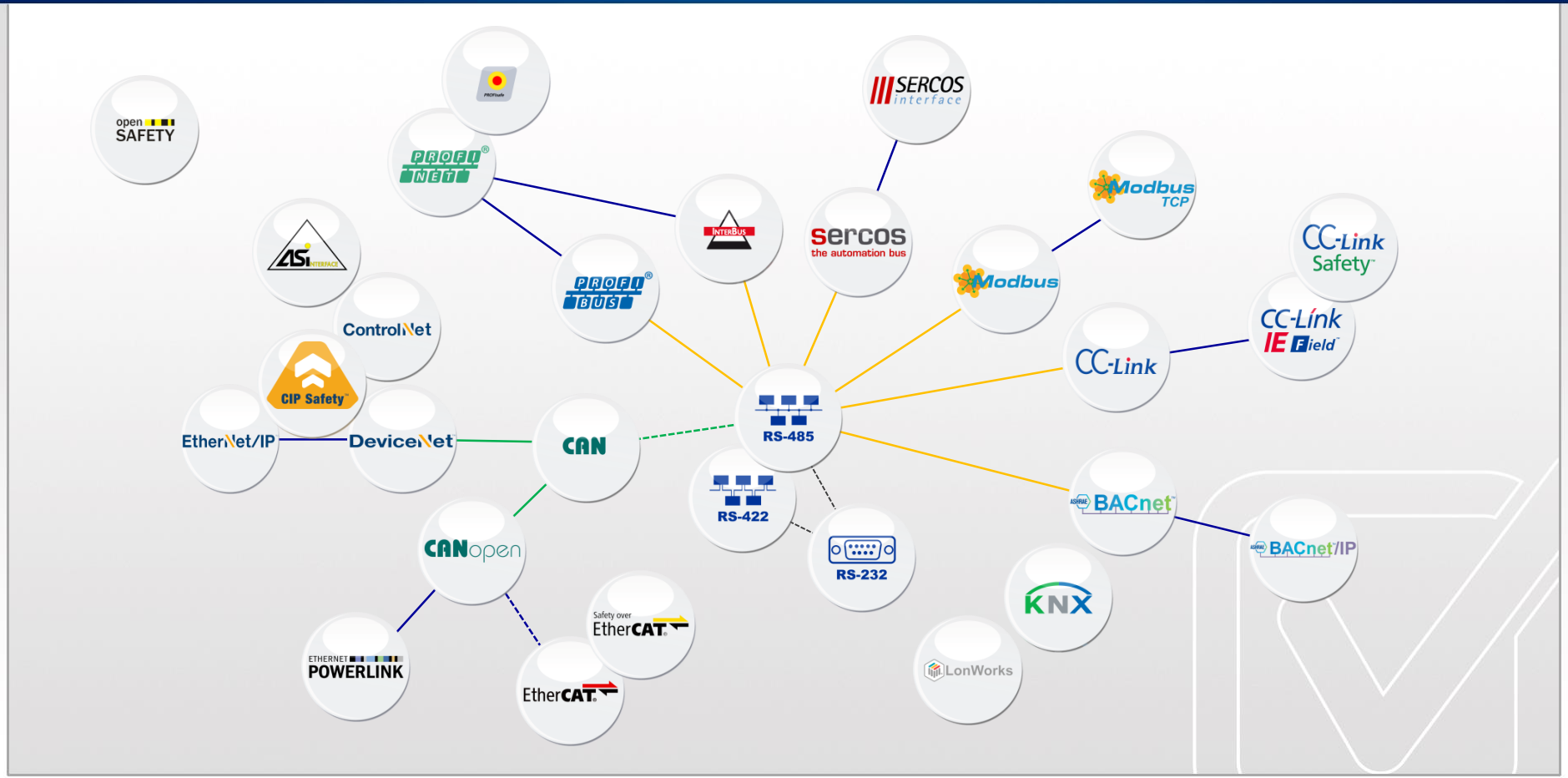
Embedded Networking Solutions

Our products and services enable embedded communication in machines, to systems and between components

PROFI BUS · EtherCAT · EtherNet/IP · ETHERNET POWERLINK · Modbus · sercos the automation bus · CC-Link · BACnet · PROFI NET

CANopen · SAE J1939 · DeviceNet · ControlNet · lin · FlexRay · CAN · CAN FD

Fieldbus & Industrial Ethernet



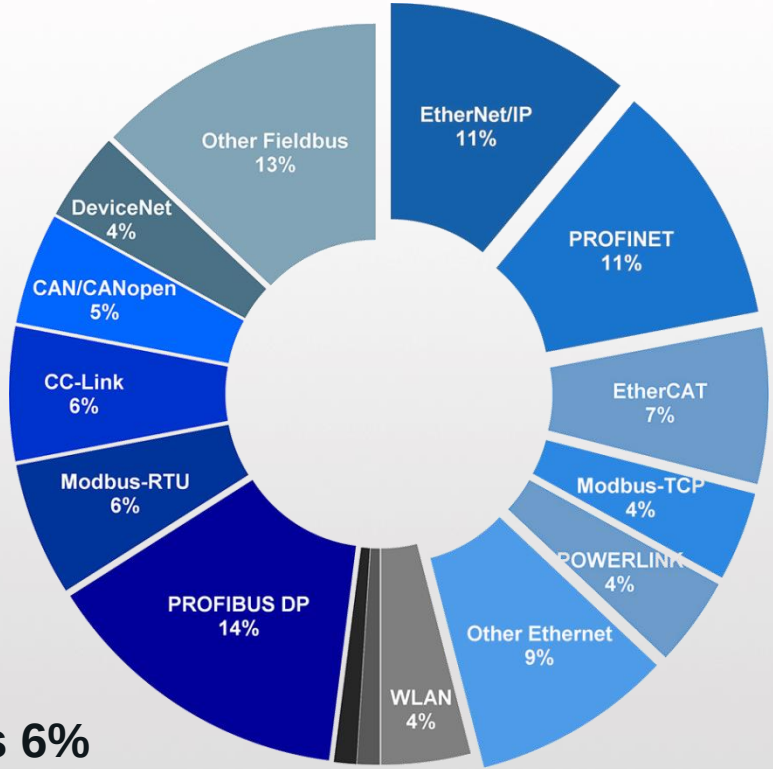
Fieldbus & Industrial Ethernet

Industrial network shares 2017

Industrial Ethernet 46%

Fieldbus 48%

Wireless 6%



Source: HMS

More and more industrial networks

1975
- Ethernet
- Modbus

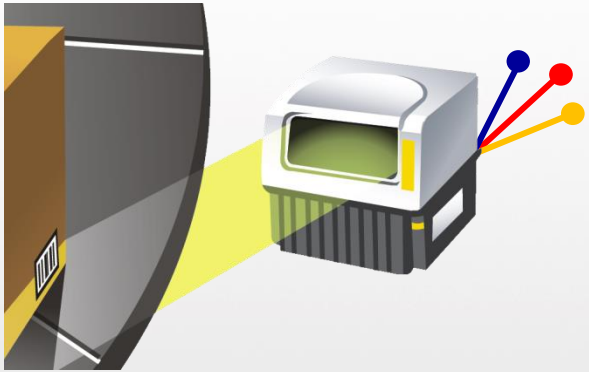
1985
- Ethernet
- Remote IO
- Modbus

1995
- Ethernet
- Foundation FB
- ControlNet
- DeviceNet
- Profibus
- Sercos I & II
- AS-Interface
- Interbus
- FIP
- CC-Link
- CANopen
- Remote IO
- Modbus

2015
- Safety Networks
- Sensor Networks
- Wireless Networks
- BACnet IP
- Sercos III
- Profinet IO
- EtherCAT
- Powerlink
- CC-Link/IE
- FF HSE
- Ethernet/IP
- FL-net
- Modbus TCP
- BACnet MSTP
- Foundation FB
- ControlNet
- DeviceNet
- Profibus
- Sercos I & II
- AS-Interface
- Interbus
- CC-Link
- CANopen
- Modbus

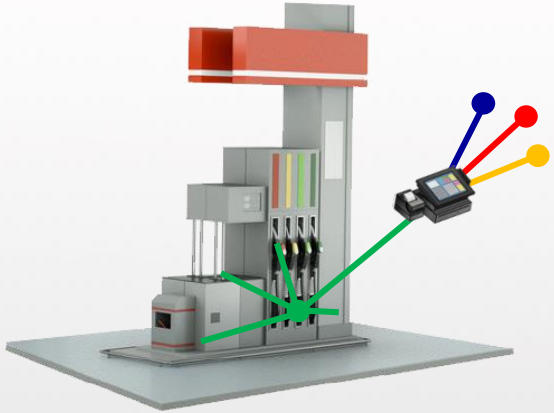
Fieldbus & Industrial Ethernet

Component



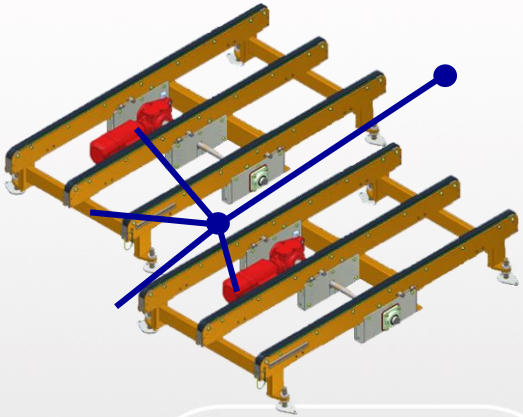
- Standardisation
- Fixed I/O data-set
- Single software variant

System interface



- Flexible
- High-level exchange
- Single driver software

Economical

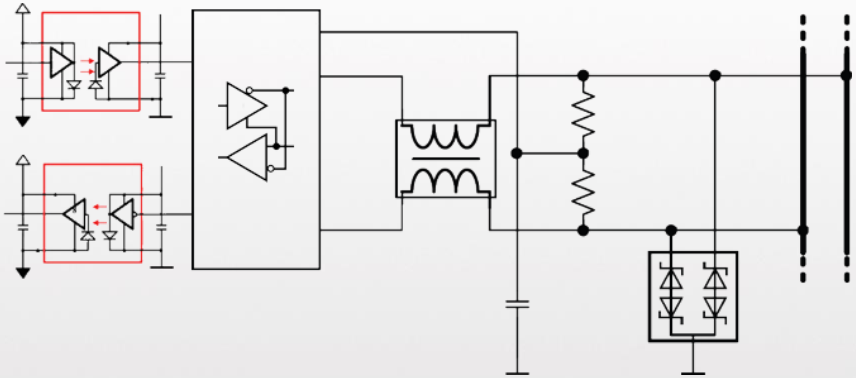


- No-hassle
- Commands / Sensors
- Limited or no software

Fieldbus & Industrial Ethernet

Hardware

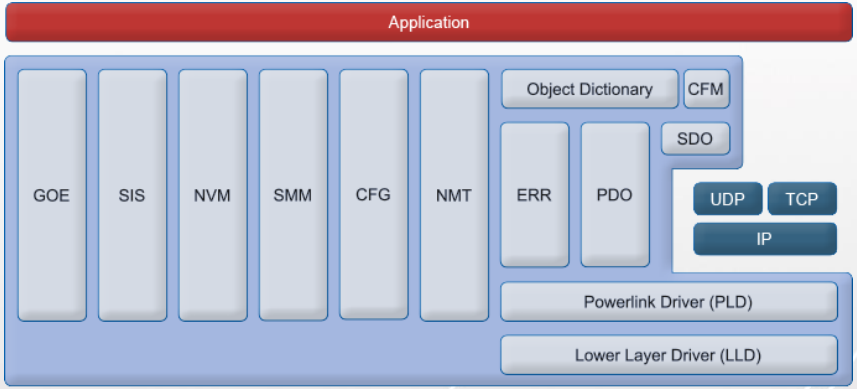
Understanding physical communication



- Every protocol has different physics
- Protection at the right level
- Development time and effort
- Certification

Software

Understanding the protocol

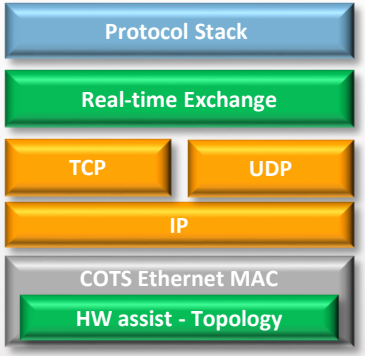


- Protocol Stack + Server, E-mail, FTP, …
- Develop, Buy or Open Source
- Licences
- Certification

Industrial Ethernet - IE handling

Standard TCP/IP

Architecture 1

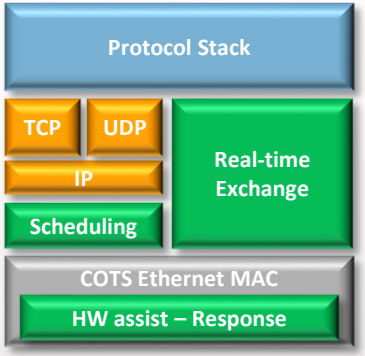


Standard Ethernet TCP/IP

- TCP/IP
- Modbus TCP
- EtherNet/IP
- Etc.

Software by-passing

Architecture 2

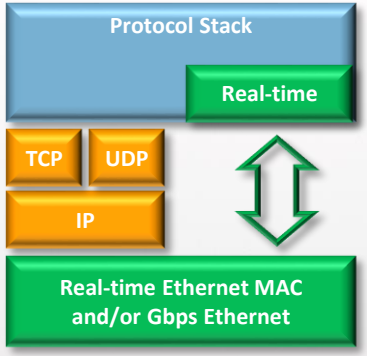


SW by-passing or traffic scheduling

- PowerLink
- PROFINET IO (RT)
- Etc.

Hardware assisted

Architecture 3

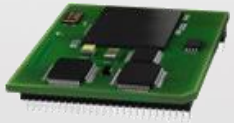


Hardware Assisted Real-time

- PROFINET IO (IRT, DFP)
- EtherCAT
- SERCOS III
- CC-Link IE (Gbps)
- etc.

Industrial Ethernet - Hardware

Principle solution

	Type	Example	Network	Stack	Certified	Development
	ASIC	Beckhoff ET1100	Fixed 1	SW	No	+ + + + -
	Protocol MCU	TI Sitara AM3357	Fixed 5	SW	No	+ + + -
	MCU with FPGA	Xylinx Zinq	Flex ±10	Build-in	No	+ + + - -
	Brick	HMS ABCC B40	Flex ±20	Build-in	Pre	+ + - -
	Module	HMS ABCC M40	Flex ±20	Build-in	Pre	+ - - -

Under the hood – Network processor

Programmable hard- & software

Protocol/IP MAC & API (VHDL code)

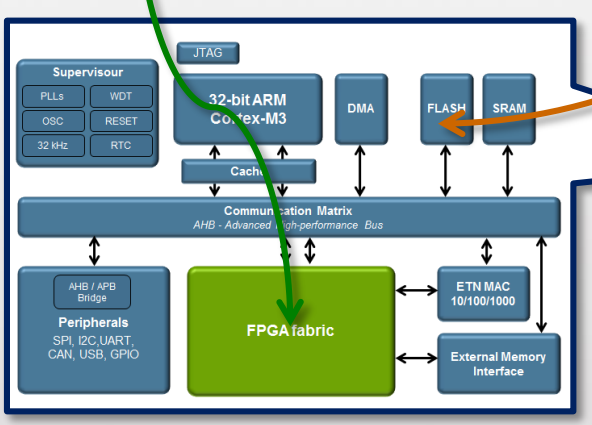
Protocol/IP Software (C code)

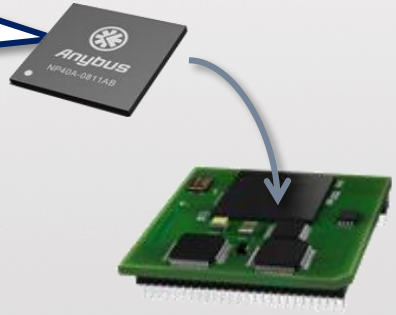
Stack

API

RTOS and drivers

All-in-one

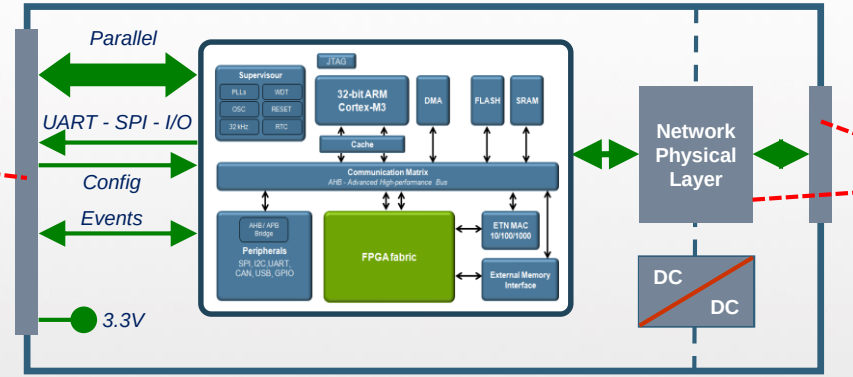




Under the hood – Block diagram

General hardware and application-interfacing

Common application Interface



Network specific

Interfacing

- Parallel (8-/16-bit)
- SPI (20 Mhz)
- Asynchrone UART (625 kb/s)
- Stand-alone I/O (12,5 MHz)

Common software

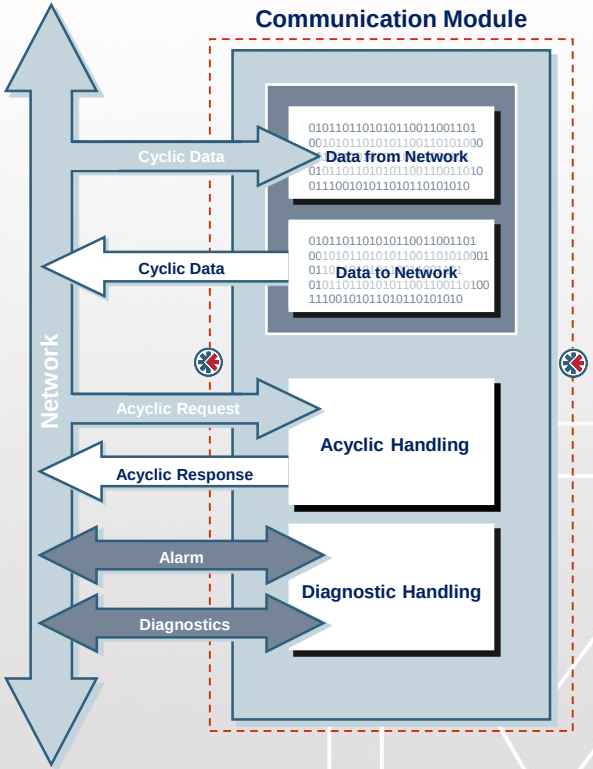
General network communication

Acyclic data handling
- Read or Write Request/Response
- Identification
- Configuration

Data exchange
- Real-time Process Data
- Continuous updating

Alarm
- Warnings & errors

Diagnostics
- Status
- Heart beat



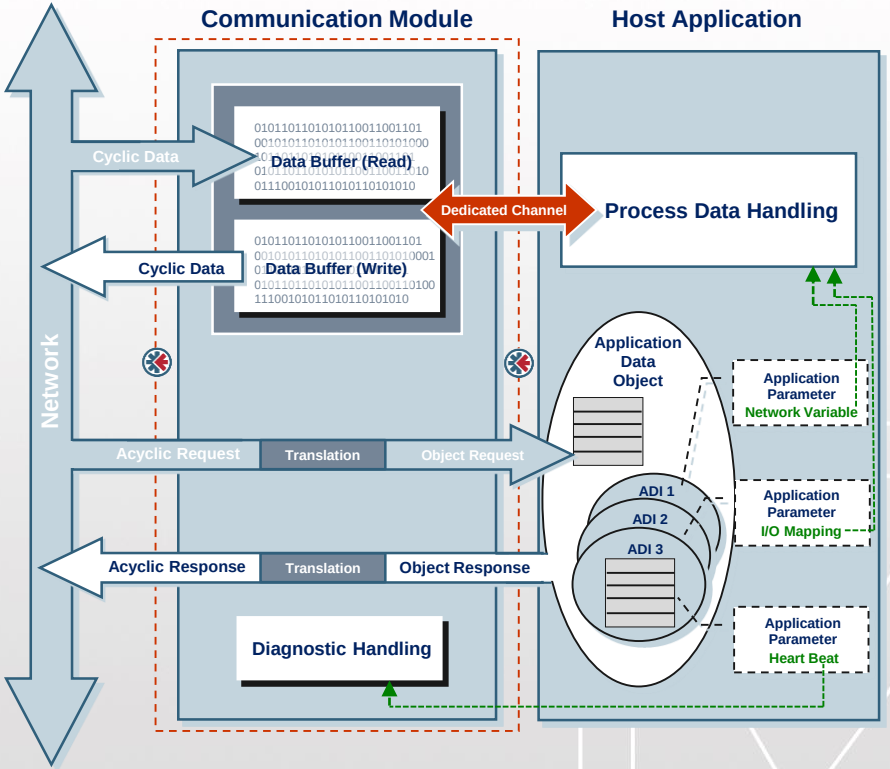
Common software

Software interfacing process

Data objects
- Parameter definitions
- Network variables
- I/O-mapping
- Configuration

Object requests (R/W)
- Passed to application
- Processed
- Response replied

Process data
- Buffered in module
- Continuous updating



Common Software

Software Driver

OS-Independent C-Driver

Application Data Object

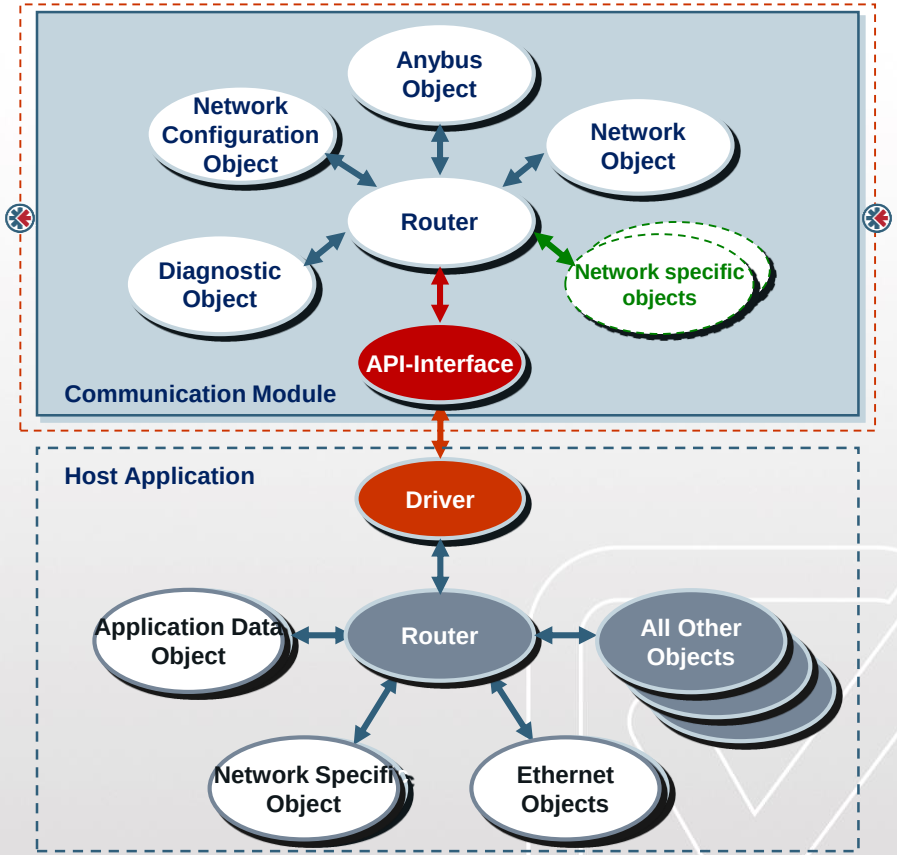
- Name, Data type, Total elements
- Value: Actual, Max, Min & Default

Network Specific Object

- Only when applicable
- Vendor ID, Product ID
- Specific Configuration Data

Ethernet Objects

- File-system & Firmware via FTP
- E-mail client & Web-browser
- Transparent socket interface



One solution for all networks?

Yes, but be aware!

- All networks are different and come with different characteristics

Network architectural characteristics

- Data Speed, Data Size and total bandwidth
- Real-time propagation & synchronisation
- Vendor ID, Product ID & Configuration

Network typical possibilities

- Only available in a typical network

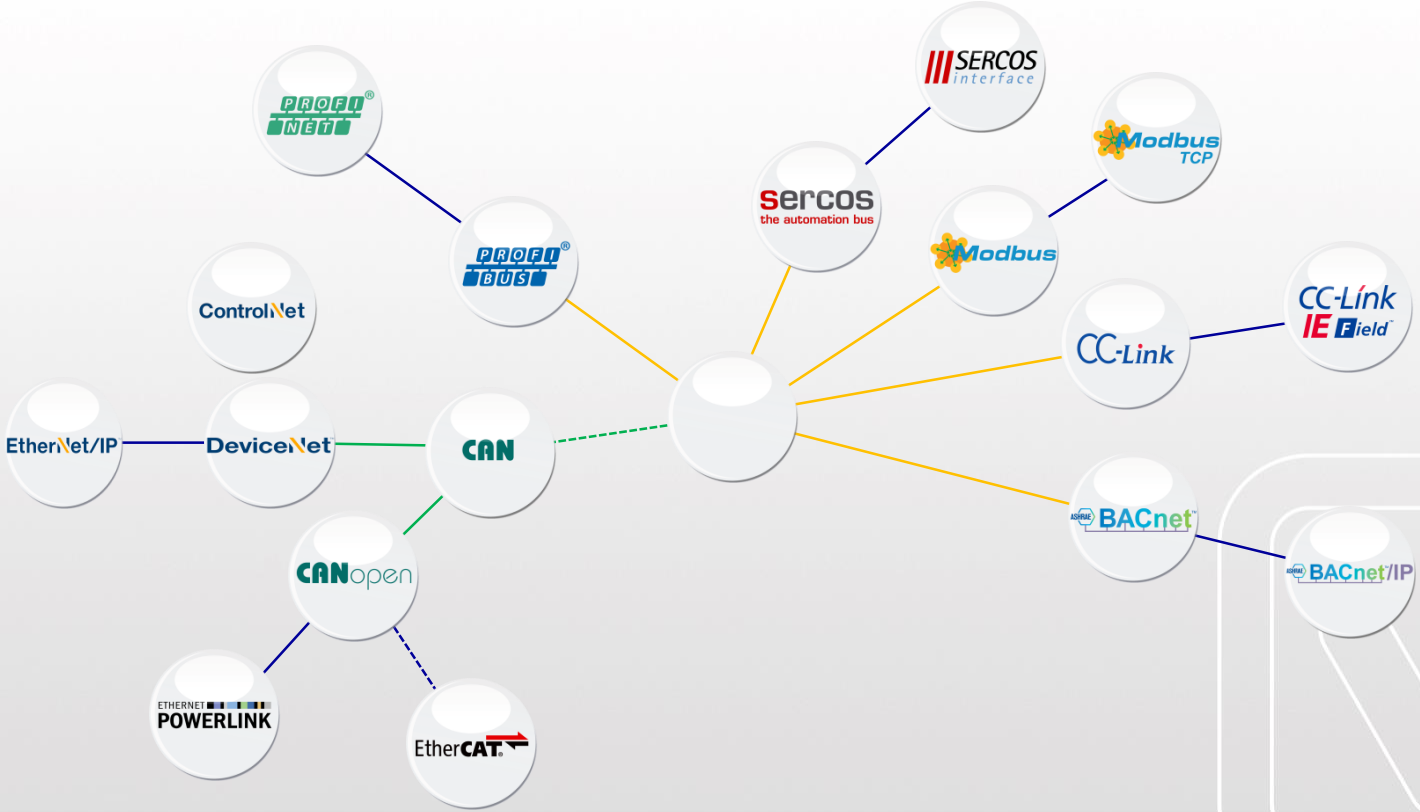
Generic internet protocols

- E-mail, WEB, FTP and Socket-interface
- Only available in TCP/IP-bases networks

Plan on forehand to cover these differences!

Anybus CompactCom

Anybus® - one solution for all networks



Anybus CompactCom

Over 20 Fieldbus & Industrial Ethernet protocols covered

Snap-in modules

Open-frame modules

Chip **Brick** **Zinq**

Anybus CompactCom - Design-in

Benefits

Multi-network connectivity with a single development project

- Limiting your development efforts to an absolute minimum
- Reducing your development costs up to 70%
- Fast time-to-market

Proven solution

- All modules and open frames are pre-certified
- Already millions of devices used across the world

Including all design resources

- Ready to use Hard- and Software designs, notes and applications
- Complete support team

Thanks for your attention!

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