

Industrial Communication: The hard way or the smart way?

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Het ontwerpen van
innovatieve elektronica

Woensdag 19 april 2023
1931 Congrescentrum 's-Hertogenbosch

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Hardware



Software



Test & Measurement



Engineering



Research & Development

HMSat a glance



+9,000,000
devices connected

+400,000
machines connected
to cloud systems

Our field:
Industrial ICT

[Information and
Communication
Technology]

5G Wireless
Smart Grid
AI IoT

Head office in
Halmstad, Sweden



750
employees
worldwide



Offices in
17 countries

Partners in over **50**



2022 sales
2,506 MSEK
[225 M EUR, 245 M USD]

2025



±0

Net positive in
CO₂ emissions



+30%

Staff NPS
Customer NPS

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Modularity Trend

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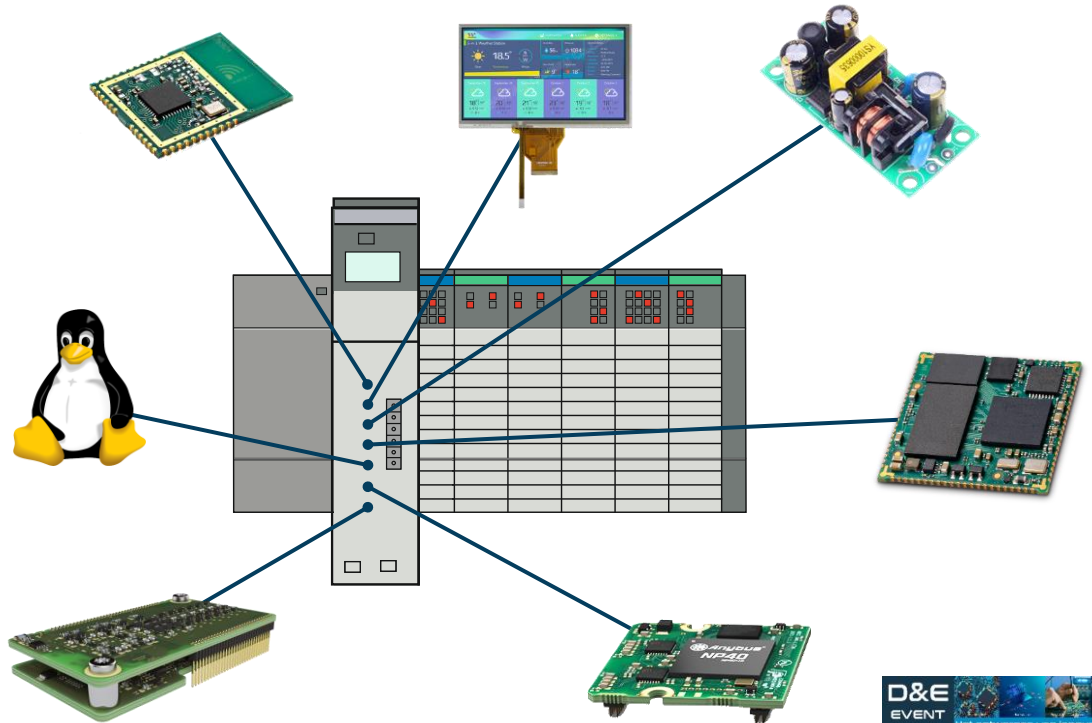
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Modular design-in

Examples

- Wifi, Bluetooth, Cellular
- Display & Touch
- Power Supply
- System-on-chip
- Real-time networking
- Safety I/O
- Linux package





Embedded Networking The hard way

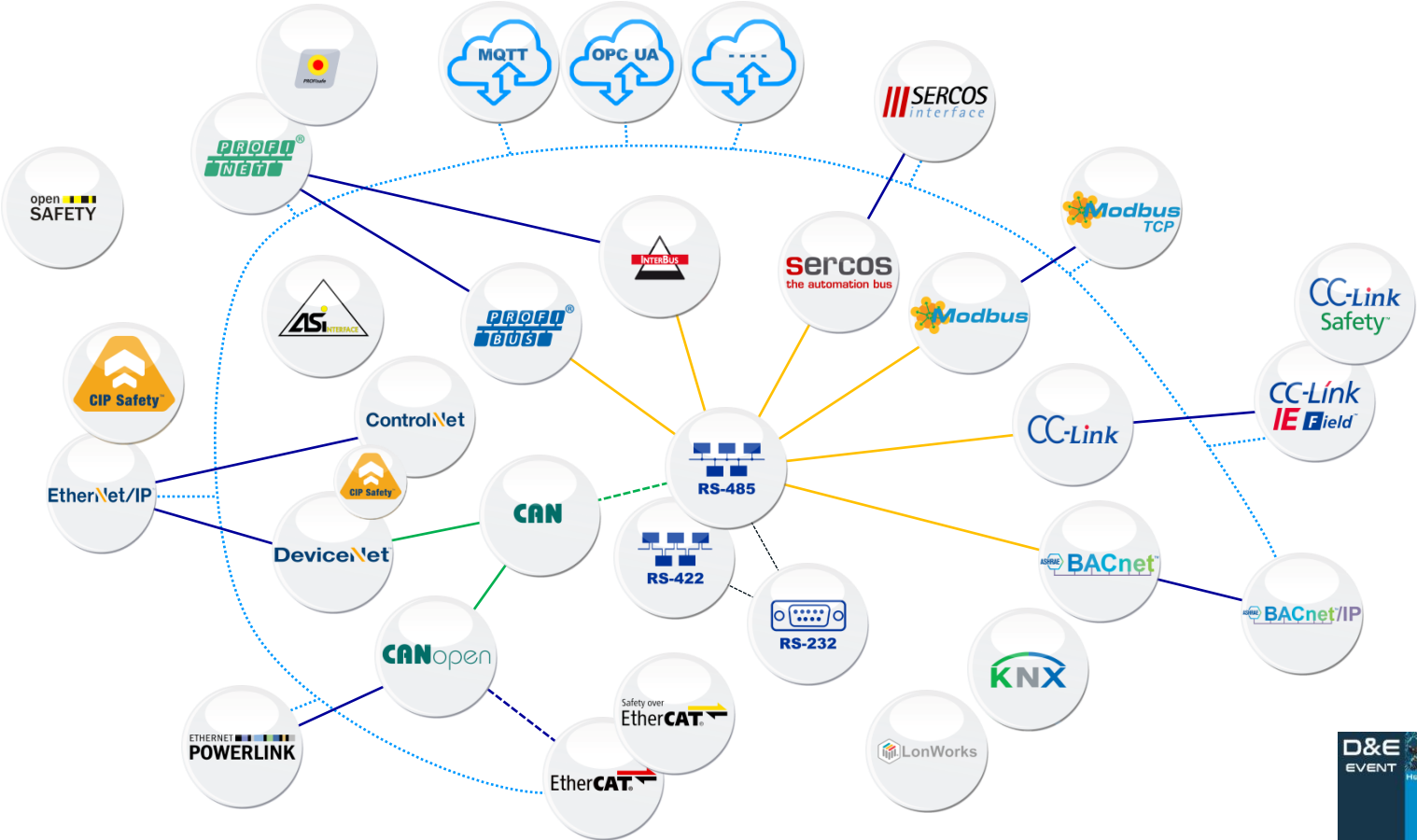
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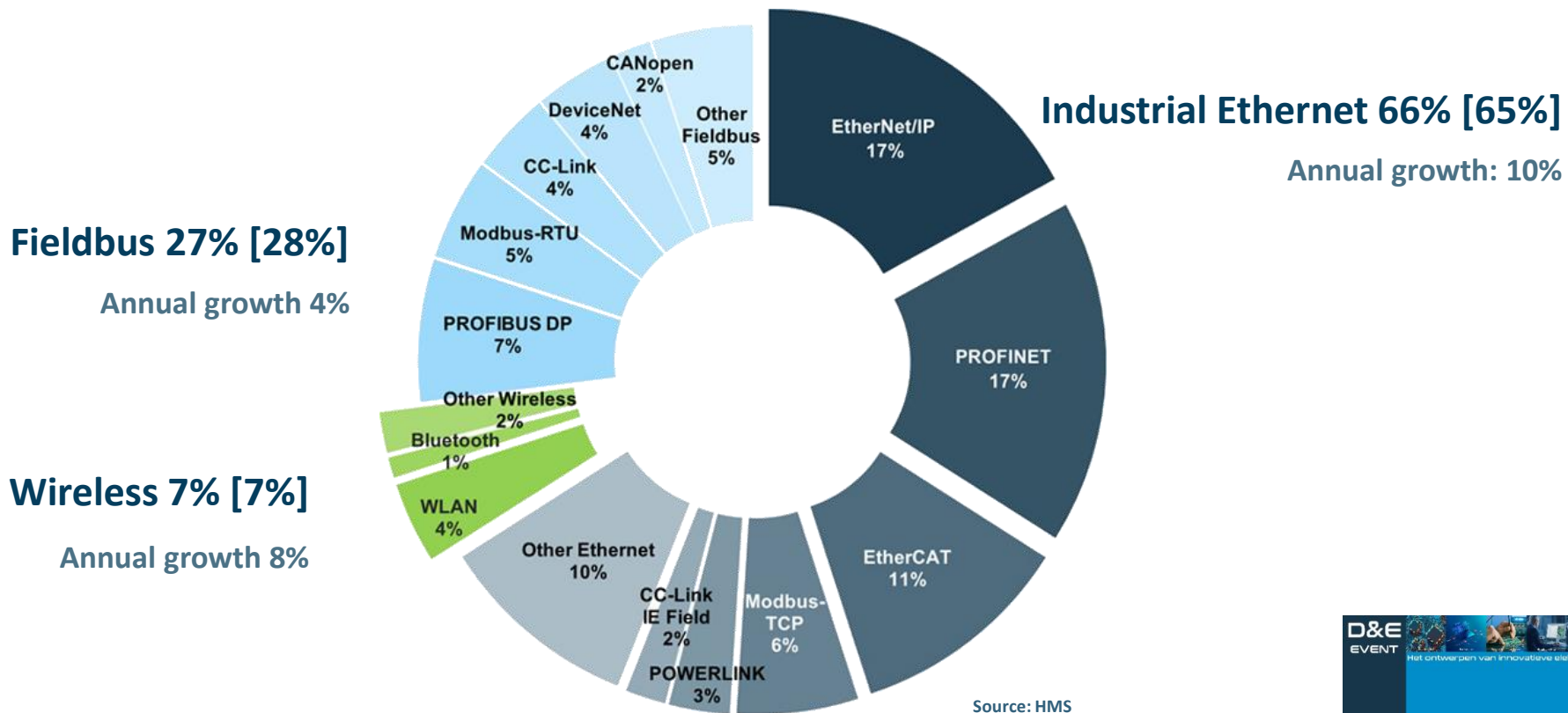
Fieldbus & Industrial Ethernet



Embedded Design-in



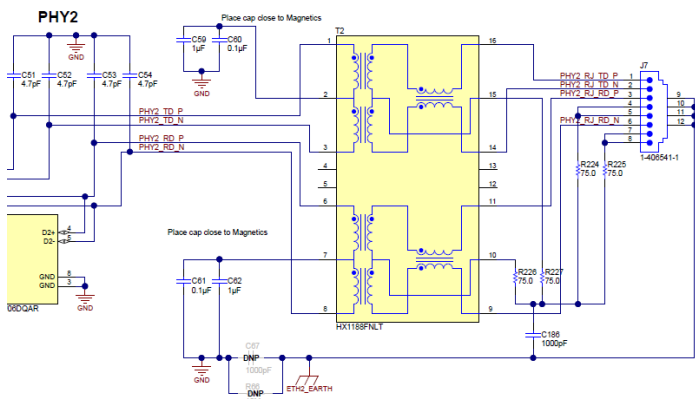
Industrial network shares 2022



Source: HMS

Hardware

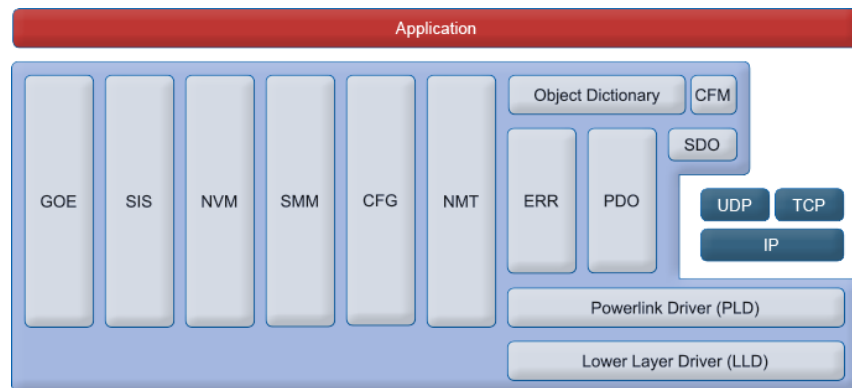
Understanding the architectures



- Beside RJ45 everything is different
- Different MAC's, processing units, ...
- Copper vs Fiber Optics

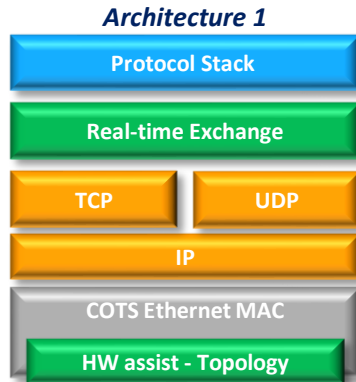
Software

Understanding the protocols



- Stacks requires in-depth knowledge
- Requiring certification

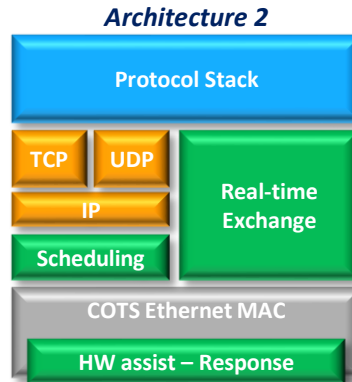
Standard TCP/IP



Standard Ethernet TCP/IP

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

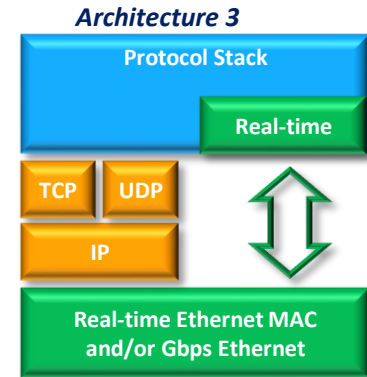
Software by-passing



SW by-passing or traffic scheduling

- PowerLink
- PROFINET IO (RT)
- Etc.

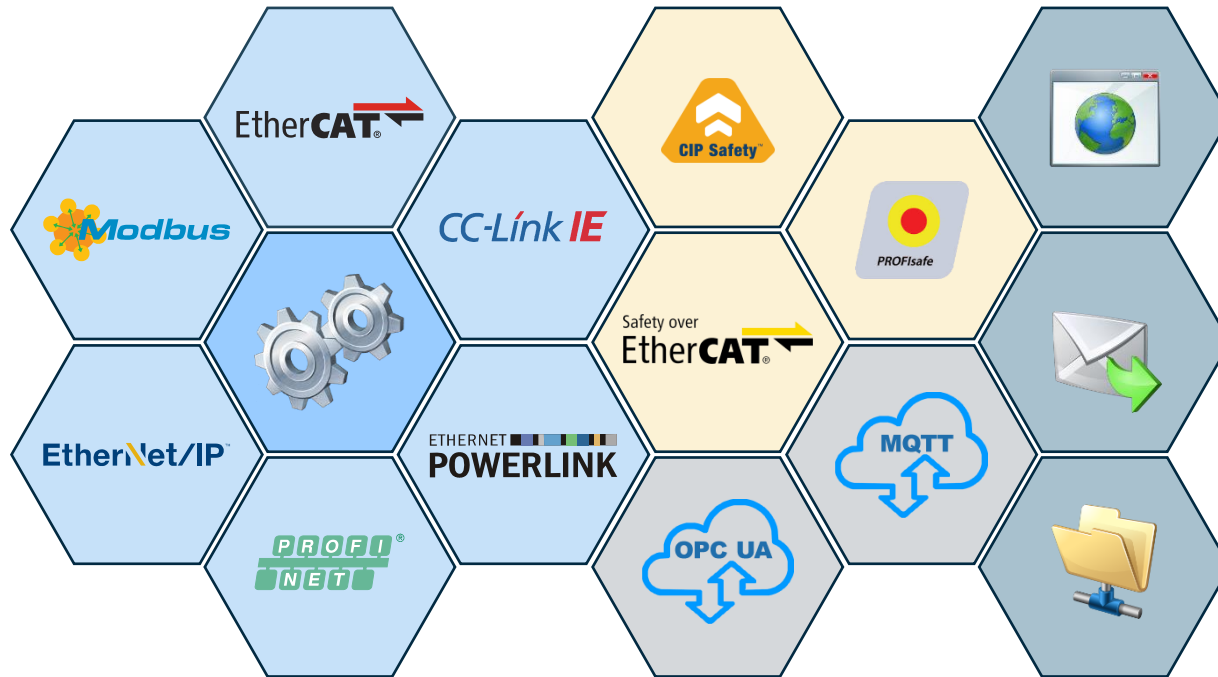
Hardware assisted



Hardware Assisted Real-time

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

Multiple-protocol - Software stacks



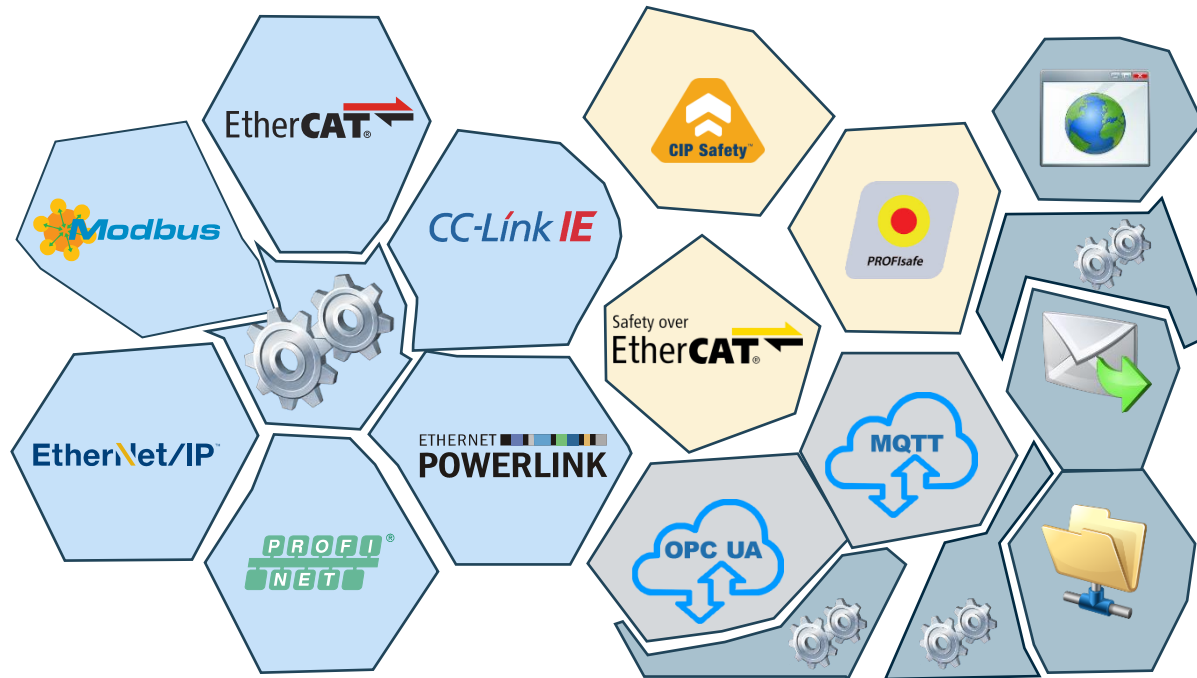
Software is not standardized

- Different vendors
- Different structures
- Different interfaces
- Different drivers
- Different releases

Special attention

- Non-TCP/IP protocols
- Real-time priority
- Software interference

Multiple-protocol - Software stacks



Software is not standardized

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Special attention

- Non-TCP/IP protocols
- Real-time priority
- Software interference

Multi-protocol software-development is a complex task!



Embedded Communication on a module

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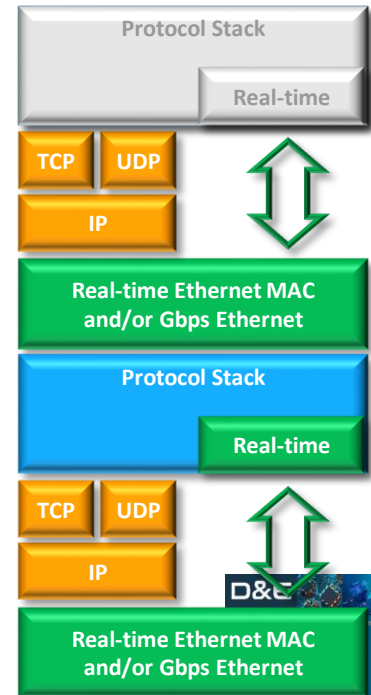
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Embedded Communication

Principle system solution





	Type	Example	Network
	ASIC	Beckhoff ET1100	Fixed 1
	Protocol MCU	TI Sitara AM3357	Fixed 5
	MCU with FPGA	Xilinx Zynq	Flex ± 10
	Module	ABCC B40-series	Flex ± 20



Embedded Communication



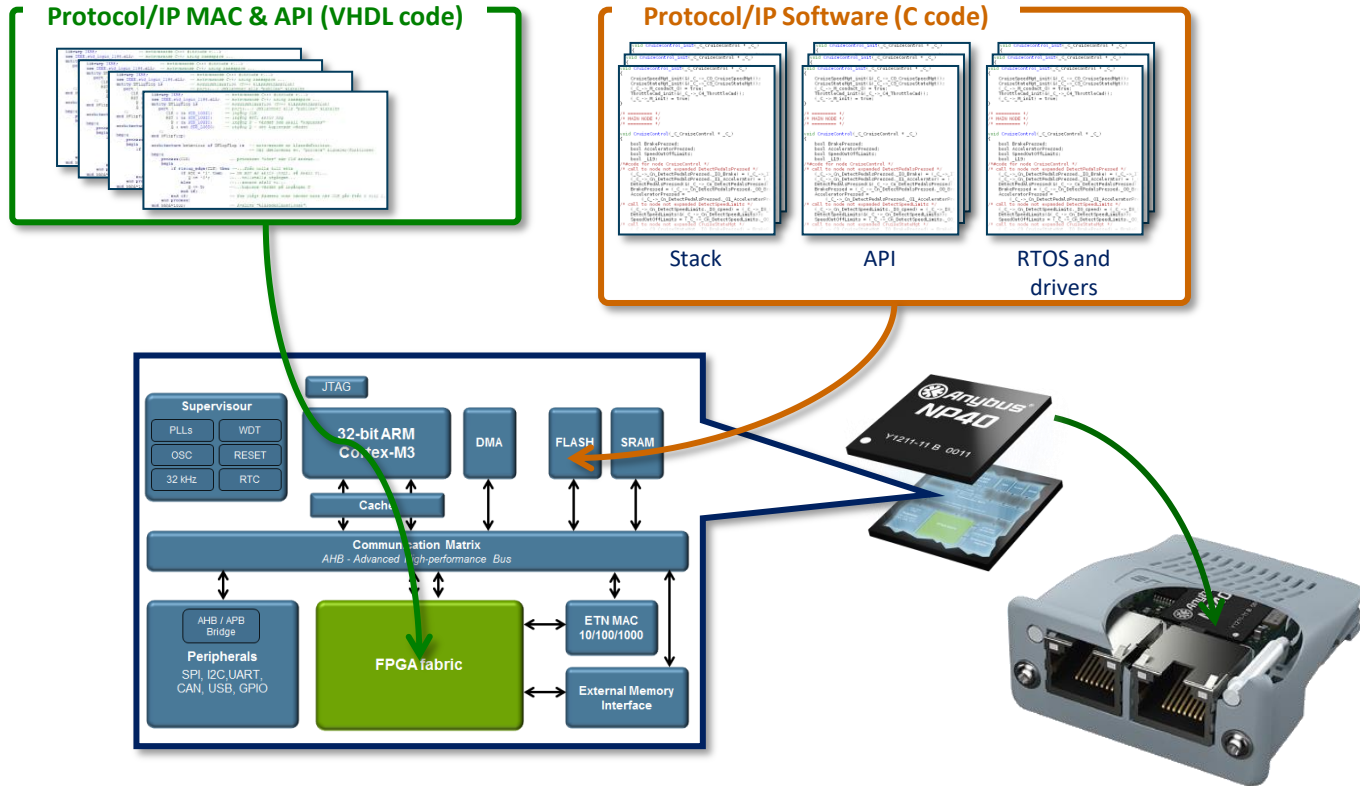
Principle system solution

	Type	Example	Network	Stacks	Certified	Business
						Initial Cost pu
	ASIC	Beckhoff ET1100	Fixed 1	No	No	○○○○○ ●
	Protocol MCU	TI Sitara AM3357	Fixed 5	No	No	○○○○○ ●
	MCU with FPGA	Xylinx Zinq	Flex ±10	No	No	○○○○○ ○○
	Module	ABCC 40-series	Flex ±20	Build-in	Pre	○ ○○○

Embedded Communication – Network processor



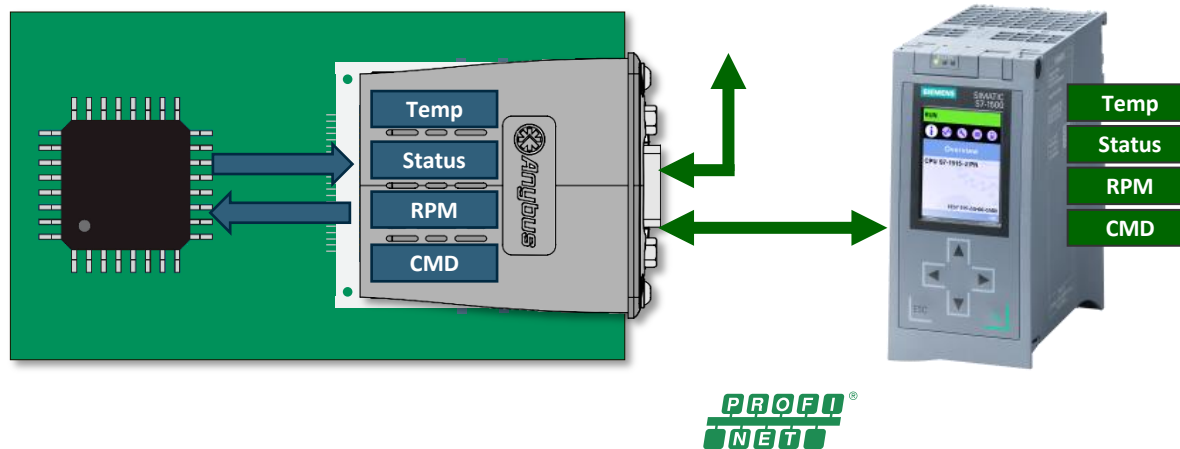
Programmable hard- & software



Embedded Communication



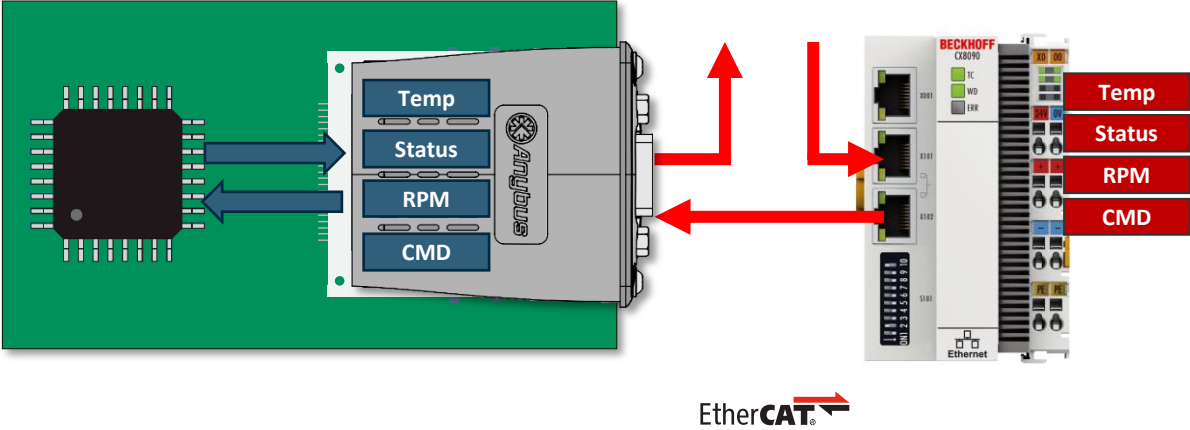
Host & Master principle: PROFINET & EtherCAT



Embedded Communication



Host & Master principle: PROFINET & EtherCAT





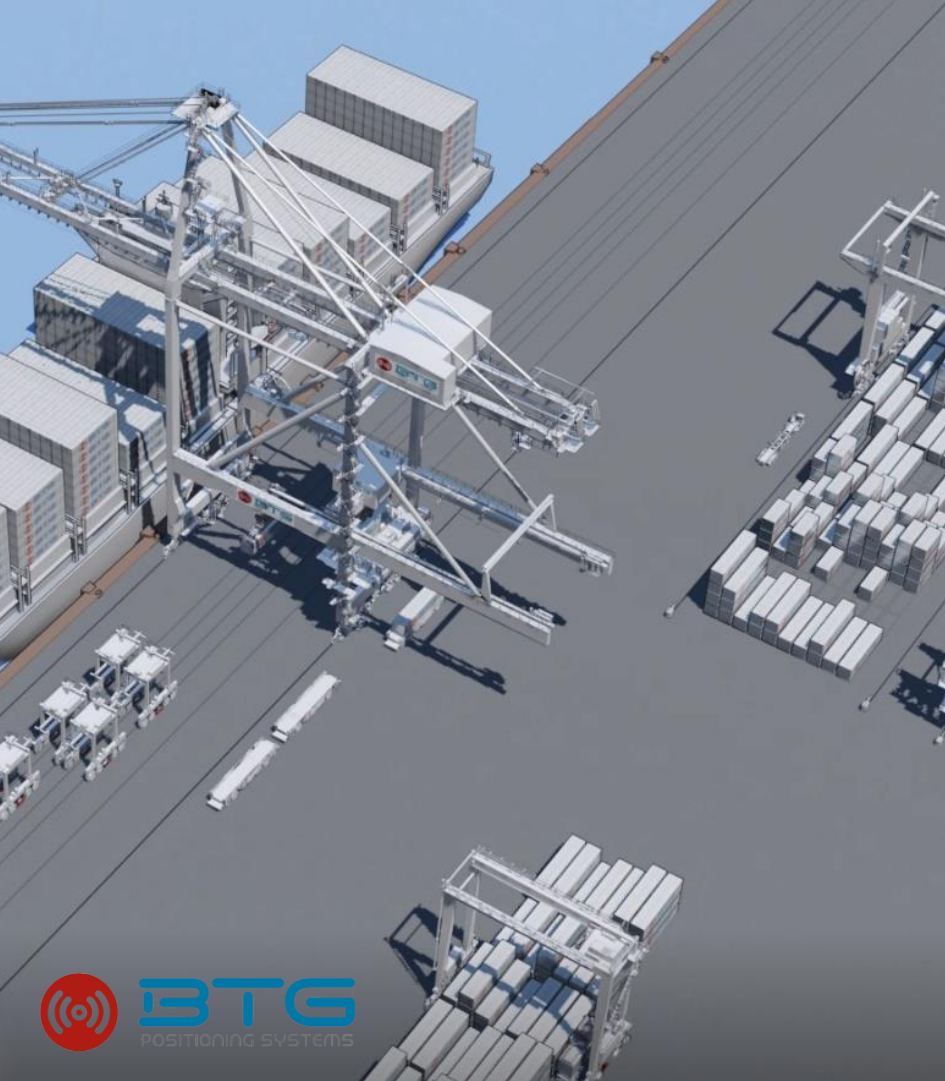
An example

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BTG Positioning Systems

btg-positioning-systems.com



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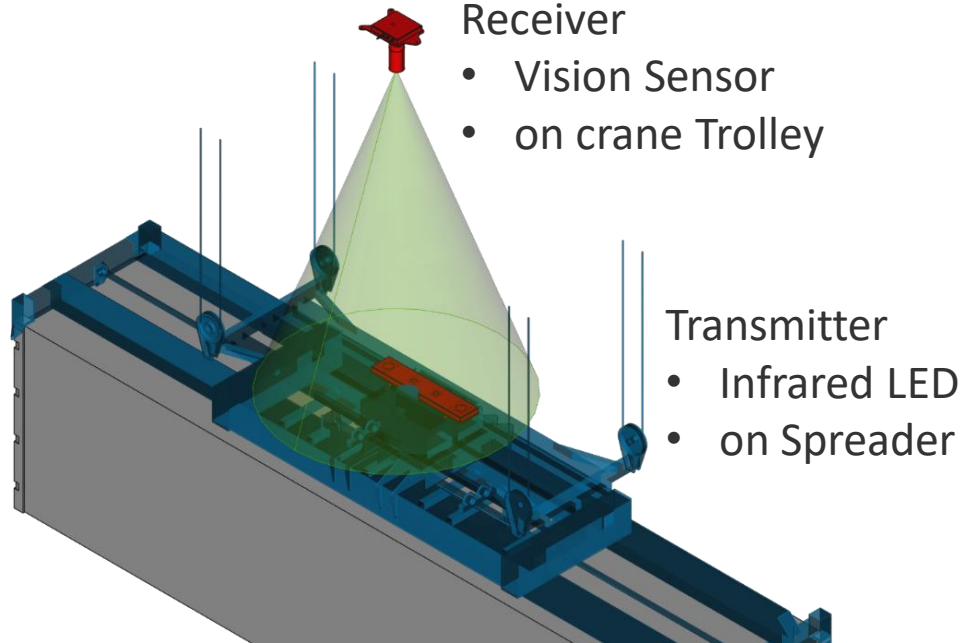


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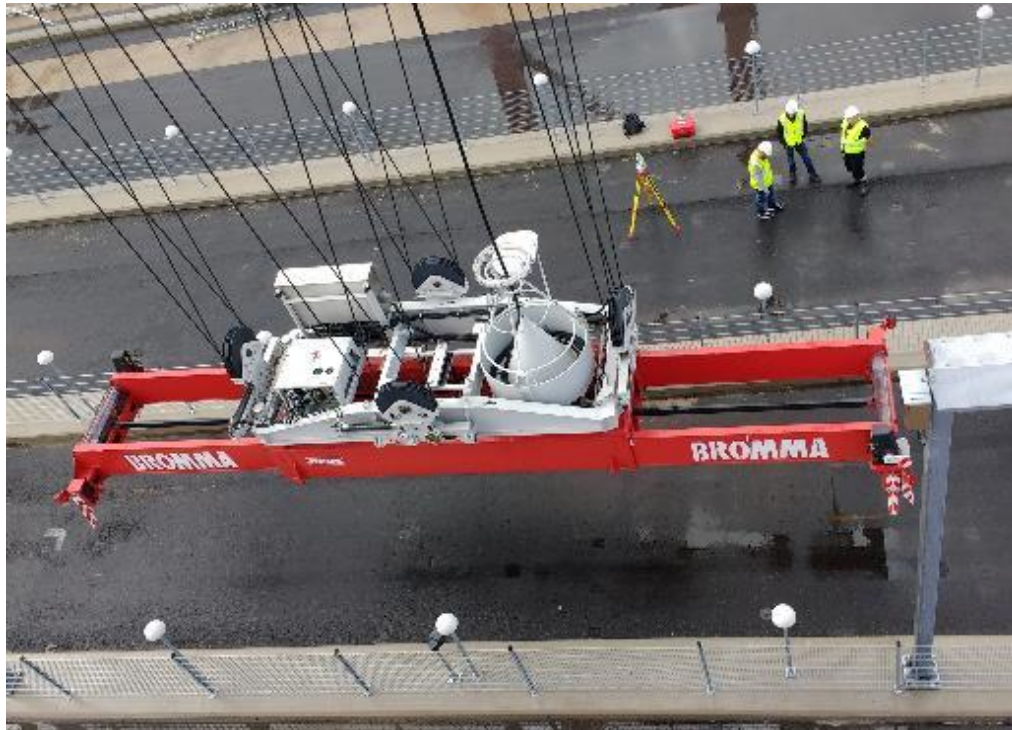
Example

BTG IRM400 Measurement System



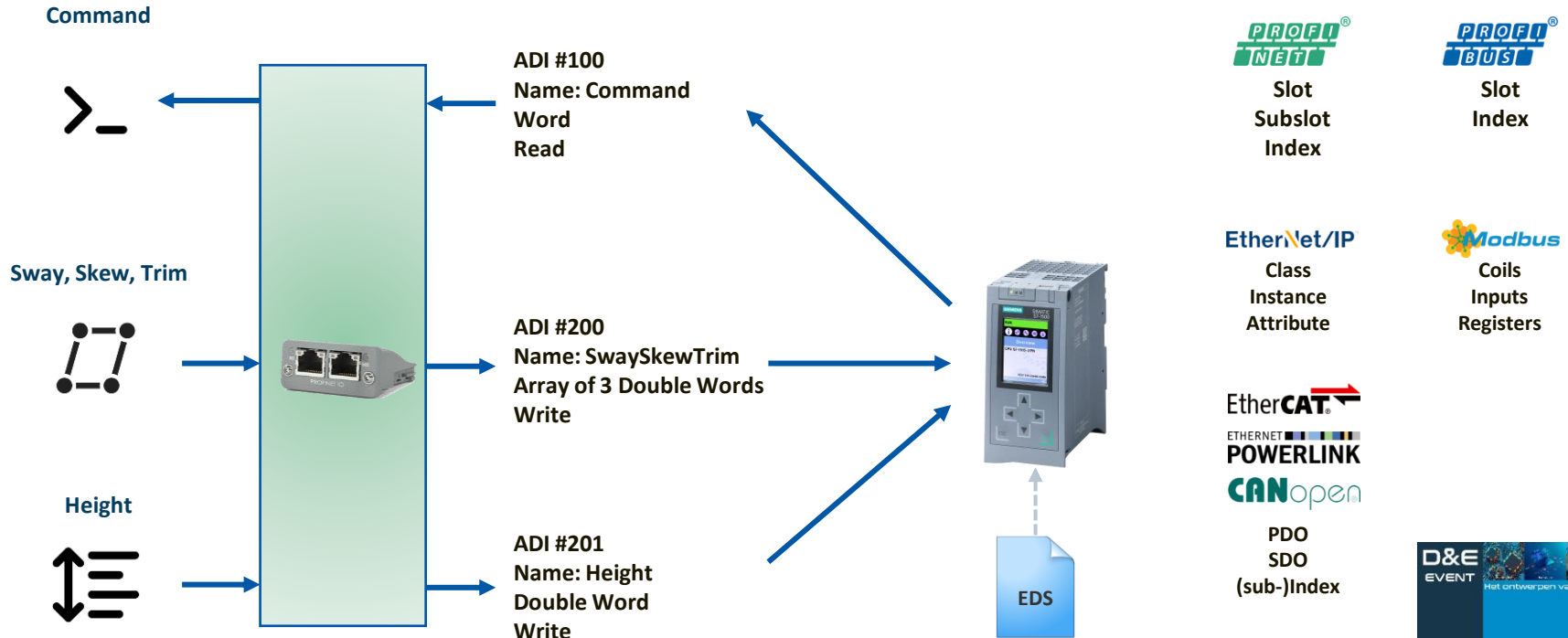
Example

Crane implementations



Example

Application Data Instance (ADI) Definition



ADI Definition - Host-side (asynchrone data)

```
/*-----  
** 1. Instance | 2. Name | 3. DataType | 4. NumOfElements | 5. Bits| 6. ValuePtr | 7. ValuePropPtr | 8. StructPtr | 9. GetADIPtr | 10. SetADIPtr  
**-----  
*/
```

```
const AD_AdiEntryType APPL_asAdiEntryList[] =  
{  
{ 100, "Command",      ABP_WORD,  1,  READ+MAP,  { { &fCommand, NULL } } NULL, NULL, &fctSetLight, },  
{ 200, "SwaySkewTrim", ABP_DWORD, 3,  WRITE+MAP, { { &fSwSkTr,  NULL } } NULL, NULL, NULL,      },  
{ 201, "Height",       ABP_DWORD, 1,  WRITE+MAP, { { &fHeigt,   NULL } } NULL, NULL, NULL      }  
};
```

#	Member	Description
1	Instance	ADI Instance number (1-65536)
2	Name	ADI Name in ASCII
3	DataType	ADI Data Type (Bool, Byte, Word, Quad, Char, (sign/unsigned wgen relevant))
4	NumOfElements	Number of elements in an array
5	Bits	Entry description; Read, Write, Mappable (may be ored)
6	ValuePtr	Pointer to local value variable
7	ValuePropPtr	Pointer to local value properties (Max, Min & Default)
8	StructPtr	Pointer to structure in case of self-defined Data Type
9	GetADIPtr	Pointer to a service routine called when getting the ADI
10	SetADIPtr	Pointer to a service routine called when setting the ADI



The Smart Way Advantages

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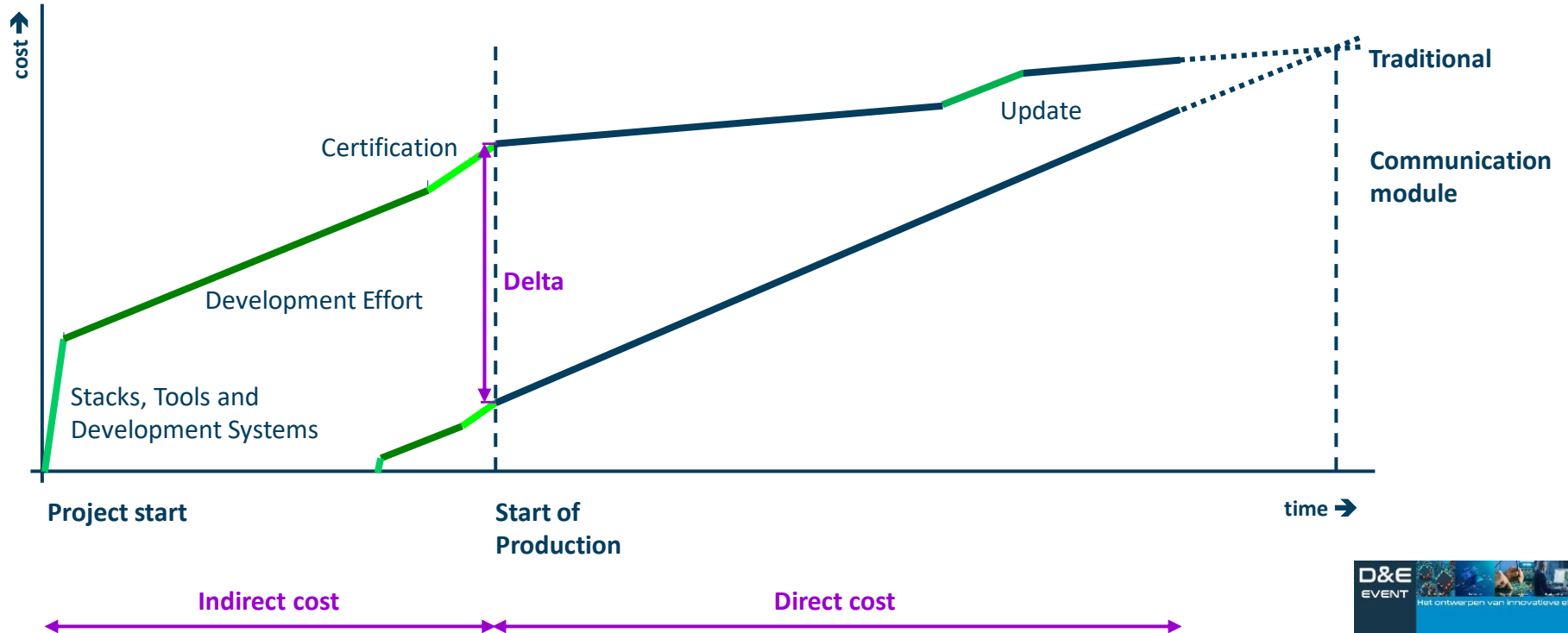
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Time-to-market

- Communication as a service
- No network debugging
- Full support
- Start-up in 1~3 days!

The smart way

Investment versus Service Model



Hardware Meets Software™ with HMS products



Anybus® BY HMS NETWORKS **Ewon**® BY HMS NETWORKS **Intesis**® BY HMS NETWORKS **Ixxat**® BY HMS NETWORKS

You are invited to our booth #6

Demo Anybus CompactCom on Raspberry Pi

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The image features a vertical banner on the left side. It has a dark blue background with a blurred image of a robotic hand holding a tablet. A stream of glowing orange binary code (0s and 1s) flows from the tablet towards the bottom. The HMS logo, consisting of the letters 'Hms' in a bold, blue, sans-serif font with two red diagonal bars above and below the 'm', is centered in the banner.

Hms

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