PROFIBUS and PROFINET
Expert Days 2008

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About the presenter

Name: Stefan Ruebesam
Company: profichip - Germany

Department Manager R&D and Support

Stefan Ruebesam is head of the R&D and Support Team in PROFICHIP. He has more than 12 years experience with developing integrated circuits for industrial communication and control applications.

Stefan has been involved in many complex ASIC projects and was one of the driving forces to make profichip the leading independent supplier for PROFIBUS-DP protocol chips and PLC processor technology. His distinct team-player attitude formed an effective and high motivated expert team providing unique technical solutions and excellent customer support.

Expertise:
• PROFIBUS FDL, DP, DP-V1, DP-V2.
• Fieldbus technology.
• Industrial ethernet.
• PLC processor technology.
• System-On-Chip, System-In-Package.
• ASIC and FPGA implementation.
• Various EDA tool chains.

Achievements:
• Establishment of fabless ASIC Design House.
• Successfully implemented more than 20 ASICs.
• Leader in numerous semiconductor projects.
• Research on new IC design methodologies.
• Establishment of seamless verification flow.
• Supported more than 500 customers worldwide.
• Set up semiconductor manufacturing, assembly and test network .

About the company

profichip is a leading fabless ASIC design house with focus on industrial communication and control applications.

Unlike pure service providers profichip is developing, distributing and supporting its <u>own</u> products.

Automation in silicon: Many years of field experience combined with state-of-the-art design methodologies and latest semiconductor technologies result in unique products.

Technical expertise and outstanding support inspire customers worldwide.
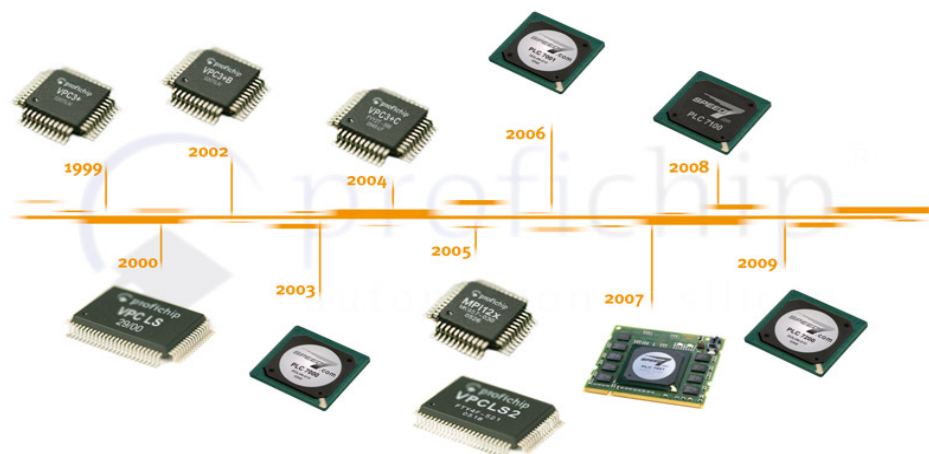
Some technical milestones:

VPC3+	Intelligent PROFIBUS-DP Slave
VPCLS	PROFIBUS-DP Lean Slave
VPC3+B	DP-V1 enhancements
PLC7000	Unique native PLC Processor
MPI12x	PROFIBUS-FDL-Master
VPCLS2	Performance enhanced
VPC3+C	DP-V2 support & RAM extension
PLC7001	Versatile IO functions added
PLC7100	Micro-PLC Processor
PLC7200	Processor for medium-size PLCs

Development of PROFIBUS Devices

A step-by-step approach to a successful PROFIBUS-DP implementation

按照我们介绍的步骤,您将可以成功的实施PROFIBUS-DP应用

STEP 1: Don't get confused! 不要混淆!

PROFIsafe

IEC 61784

DPM1

Concentrate on your key know-how!
PROFIBUS shall be a valuable add-on not the key-part.
Try to benefit from existing solutions.

MBP

NRZ

GSD

RS485-IS

?

Define your basic requirements by answering 3 questions:
回答三个问题来定义您的需求：

Q1: What type of PROFIBUS device is needed?
需要什么类型的PROFIBUS 设备？

Q2: What is your application area?
您的应用是什么范围？

Q3: Which transmission technology applies?
适用于哪一种传输技术？

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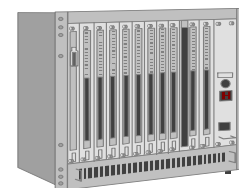
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## Q1: What type of PROFIBUS device is needed?

DP-Master Class 1 (DPM1)

- ⊙ **Central Controller which exchanges I/O data with the distributed I/O devices (DP-Slaves)**
- ⊙ **Several DPM1 are permitted.**
- ⊙ **Typical devices are PLC, PC, IPC, VME Controller**

DP-Master Class 2 (DPM2)

- ⊙ **Configuration, Monitoring or Engineering tool which is used to set up the network or parameterize / monitor the DP-Slaves**
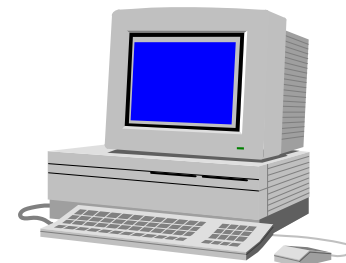
DP-Slave

- ⊙ **Peripheral device directly interfacing the I/O signals**
- ⊙ **'Lean' (single-chip) slaves, intelligent slaves**
- ⊙ **Typical devices are input/output devices, drives, HMIs, valves, transducers, analysis devices, etc.**
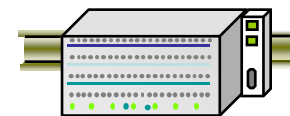
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Q2: What is your application area?
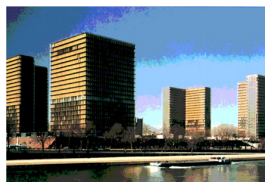

Car Manufacturing

Lime Production

Bottling Plants

Building Automation

- **Manufacturing Automation**
  - Car manufacturing
  - Bottling systems
  - Storage systems

- **Building Automation**
  - Traffic automation
  - Heating, air-conditioning

- **Process Automation**
  - Purification plants
  - Chemical and petrochemical plants
  - Paper and textile plants

- **Power Generation and Power Distribution**
  - Power plants
  - Power distribution

Glue Production

Waste Water Purification

Polymer Storage

Breweries

Food Production

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Q3: Which transmission technology applies?
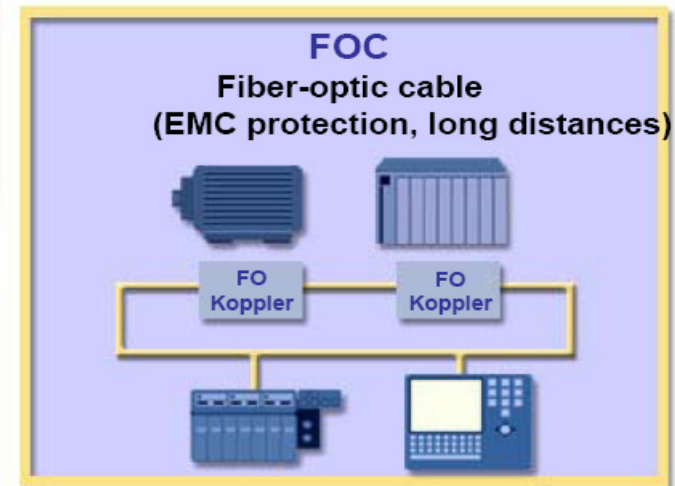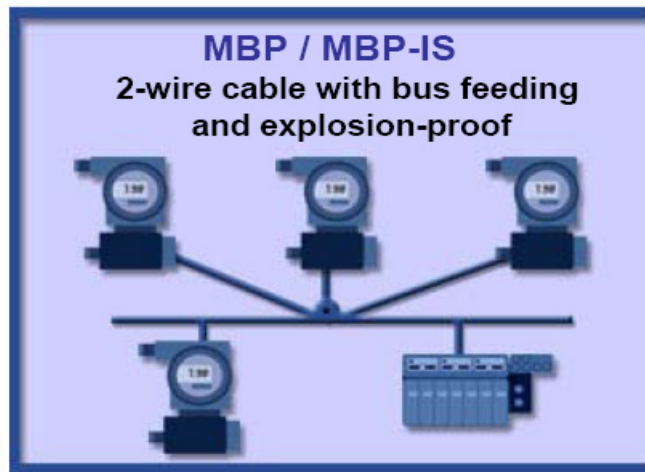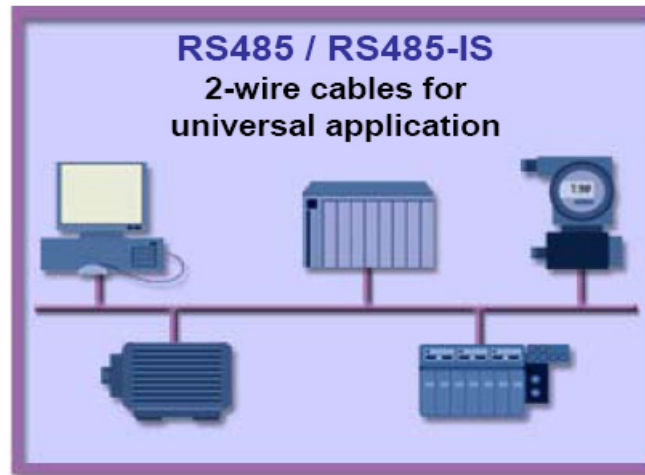
STEP 3: Pick your items from the "Tool Box".

Application Hardware

Application Software

**PROFIBUS-Software
with Application Interface**

Application
Profiles 2

**Application
Processor**

**Application
Cycle**

Application
Profiles 1

**PROFIBUS-DP
Protocol ASIC**

**Dual-Port-
RAM
or
Shared
Memory**

Communication
Technologies

Transmission
Technologies

Physical Interface

**PROFIBUS
Cycle**

PROFIBUS
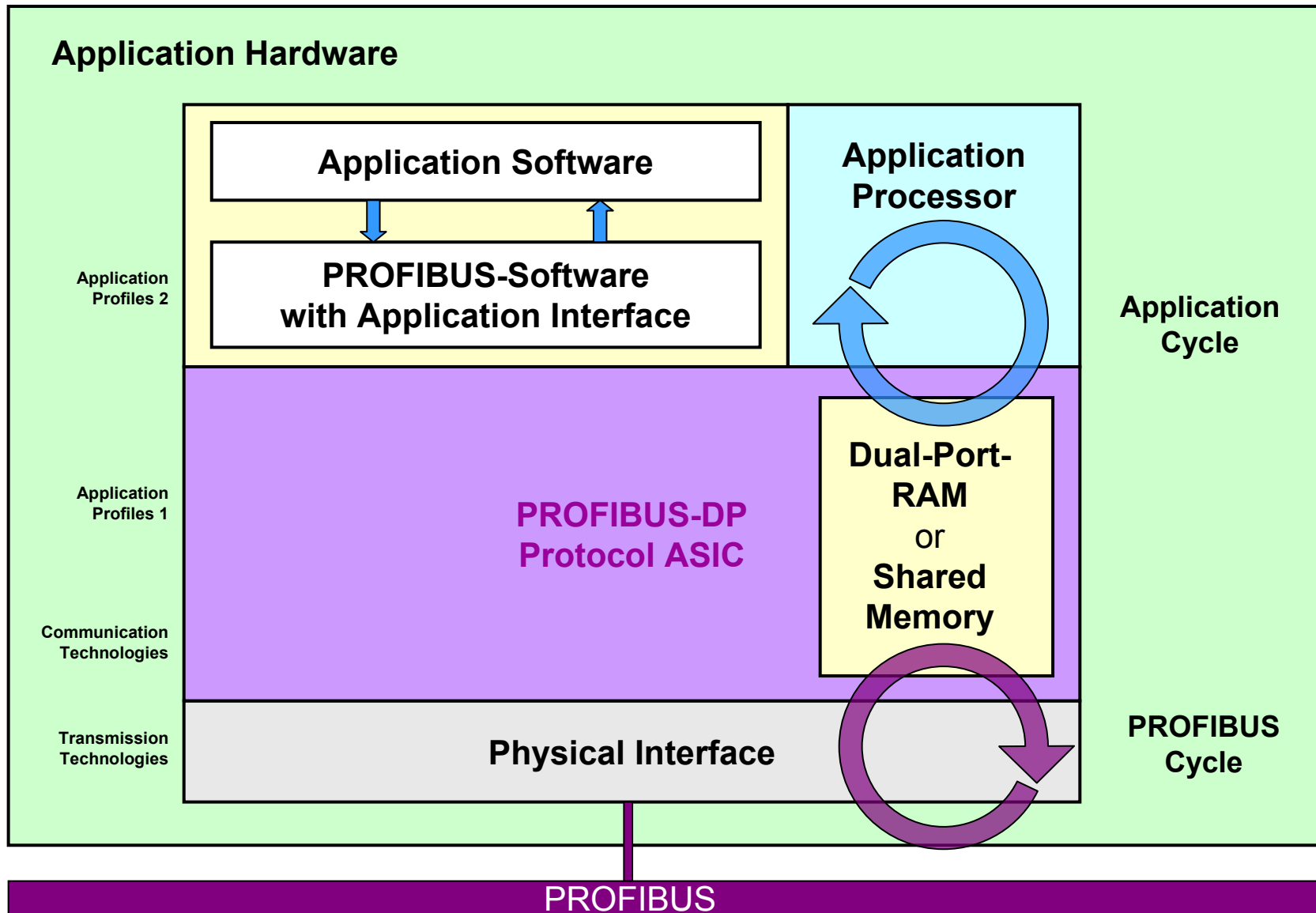
STEP 4: Design the Physical Interface. 设计物理接口

STEP 1 ✓
STEP 2 ✓
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Example: RS485 with 9-pin D-Sub connector
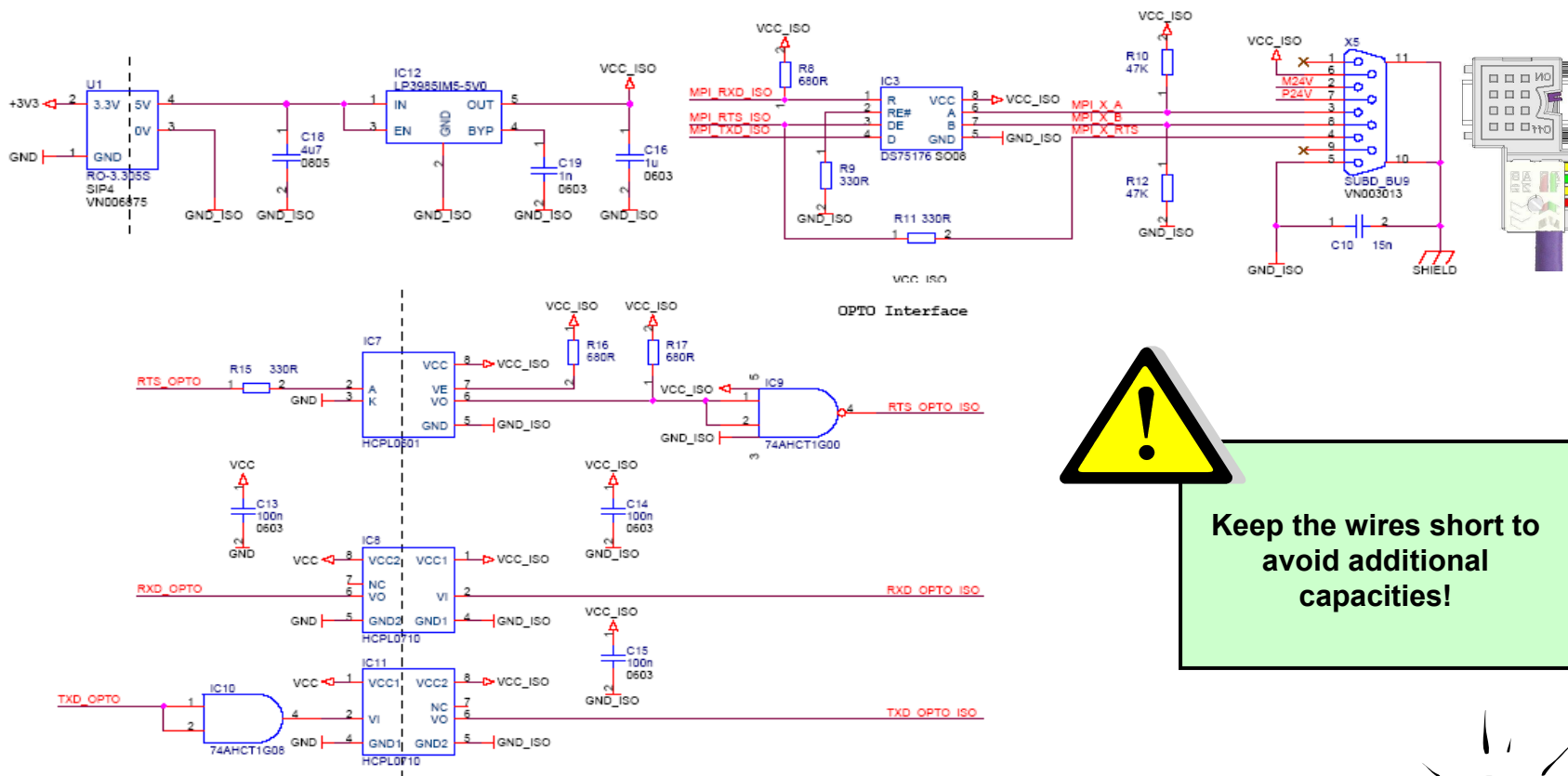
Keep the wires short to avoid additional capacities!

Adapt existing solutions (copy-and-paste) and you are done.

改编现有的解决方案(复制和粘贴) 并且您已经做好了

What types of protocol ASICs are available?

Single-Chips

- ⦿ **All protocol functions integrated in the chip**
- ⦿ **No processor needed**

Communication Chips

- ⦿ **Implement smaller or larger parts of the protocol on the chip**
- ⦿ **Additional processor and software needed**

Integrated Protocol Chips

- ⦿ **Communication chips with integrated processor**

STEP 5: Choose the Protocol ASIC. 选择ASIC协议

Available PROFIBUS-DP protocol ASICs:

Vendor	Chip	Type	Typical Application	Protocol	Processor Required	Communication RAM	Package
Grid Connect	LX-002	M / S	DP-Master	DP	Yes / Int.	8 kB	LQFP100
Grid Connect	LX-180	M / S	DP-Master	DP	Yes / Int.	8 kB	PBGA180
Hilscher	netX 5	M / S	Universal Network Access Controller	DP	Yes	64 kB	LBGA228
Hilscher	netX 50	M / S	Universal Network Controller	DP	Yes / Int.	64 kB	PBGA324
Hilscher	netX 100	M / S	Universal Network Controller	DP	Yes / Int.	64 kB	PBGA345
Hilscher	netX 500	M / S	Universal Network Controller	DP	Yes / Int.	64 kB	PBGA345
Profichip	VPCLS2	S	Single-chip Slave with up to 32 bit I/O	DP	No	n.a.	MQFP80
Profichip	VPC3+C	S	Intelligent Slave	DP	Yes	4 kB	PQFP44
Profichip	MPI12x	M / S	FDL-Master or DP-Slave	DP	Yes	4 kB	PQFP44
Profichip	PLC7001	M / S	PLC Controller with FDL-Master or DP-Slave	DP	Yes	8 kB	EBGA352
Siemens	LSPM2	S	Single-chip Slave with up to 32 bit I/O	DP	No	n.a.	MQFP80
Siemens	SPC3	S	Intelligent Slave	DP	Yes	1.5 kB	PQFP44
Siemens	DPC31	S	Intelligent Slave	DP / PA	Yes / Int.	6 kB	PQFP100
Siemens	SPC4-2	S	Intelligent Slave	DP / PA	Yes	3 kB	TQFP44
Siemens	ASPC2	M / S	DP-Master	DP	Yes	1 MB (ext.)	MQFP100

Source: PI Electronic Product Guide

STEP 1 ✓

STEP 2 ✓

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Example: VPC3+C PROFIBUS-DP Slave ASIC
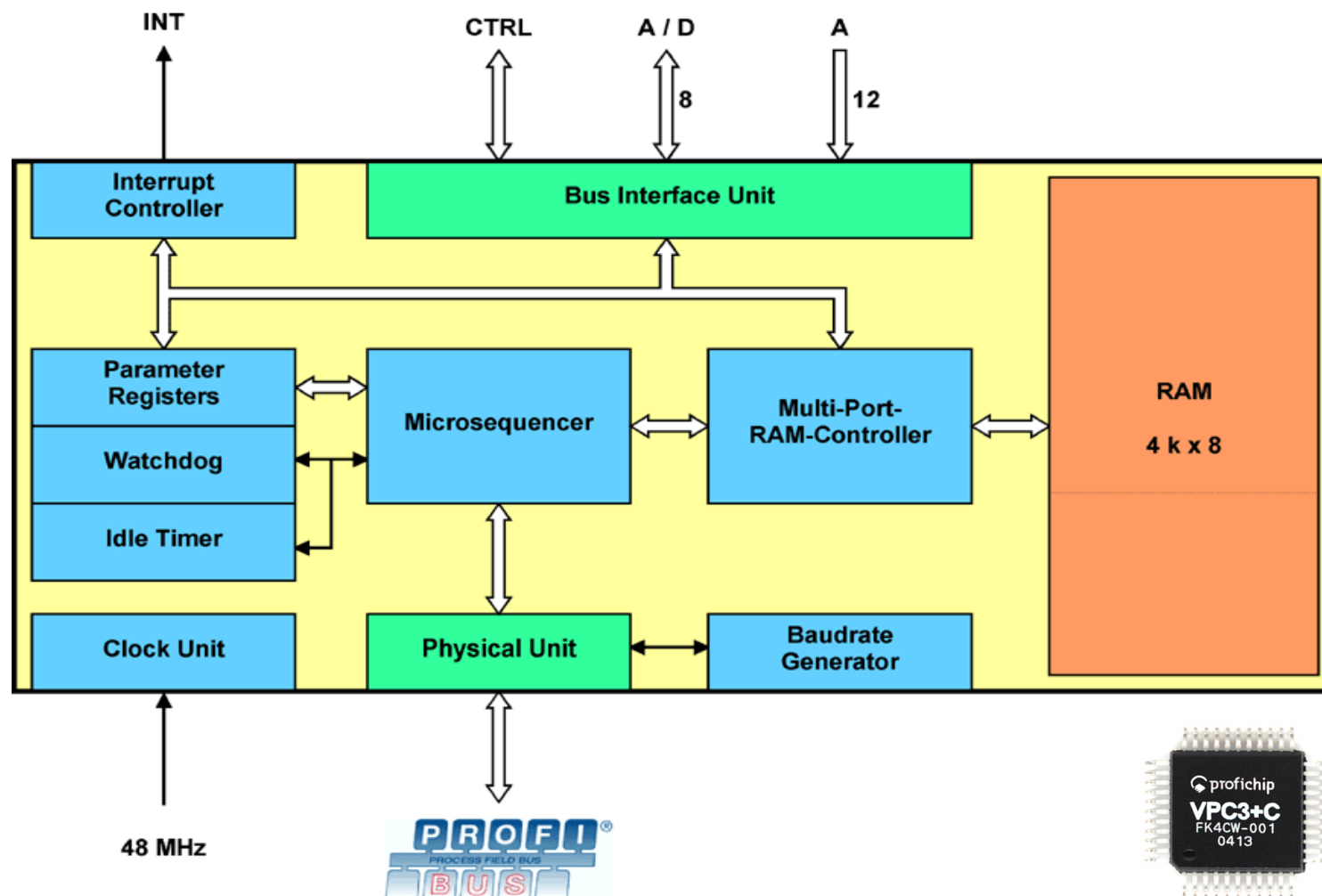
STEP 6: Select the processor.　选择处理器

1. Check your processor in use:

- **Parallel bus interface?** ➜ highest flexibility
- **Serial interface?** ➜ less choices, maybe additional HW required
- **"Emulate" the ASIC interface?** ➜ could be quite slow
- **Supply and IO voltage?** ➜ maybe level shifter needed
- **Performance still OK?** ➜ take account of the additional software
- **State-of-the-art tool chain?** ➜ debugging could be cumbersome
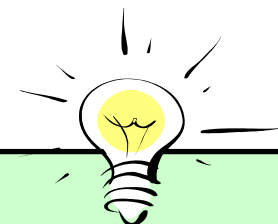
2. If you need to change the processor:

- **Upgrade within the same series?**
- **Keep the existing tool chain?**
- **Keep the test equipment?**

3. If you plan several applications:

- **Try to re-use the same processor (series)**

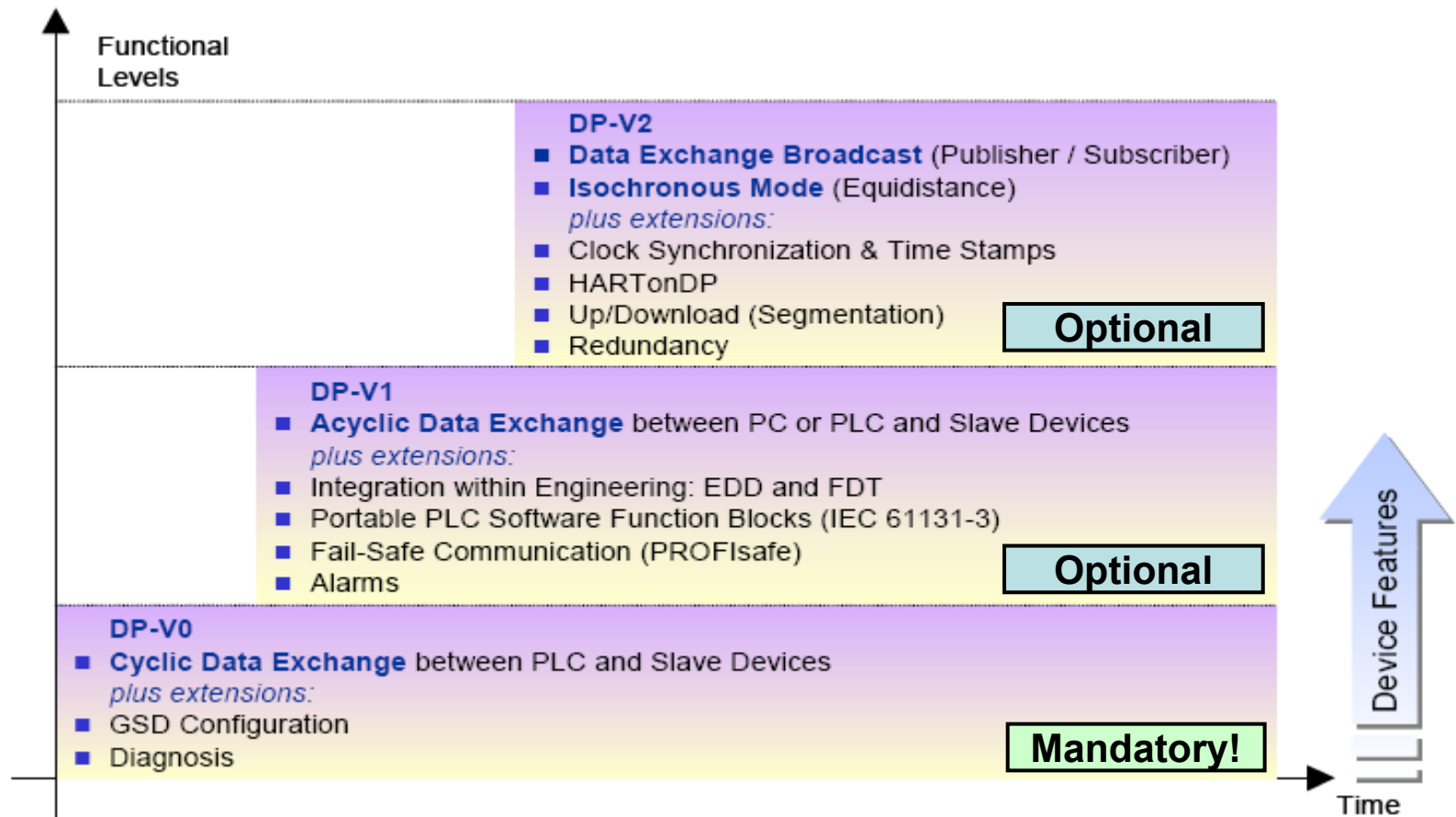**Try to re-use as much as possible from your existing hardware and tool chain!**
尽量重复利用您现有的硬件和工具链!

STEP 1 ✓
STEP 2 ✓
STEP 3 ✓
STEP 4 ✓
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First check what is really needed …

STEP 1 ✓

STEP 2 ✓

STEP 3 ✓

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Functional Levels

DP-V2
- **Data Exchange Broadcast** (Publisher / Subscriber)
- **Isochronous Mode** (Equidistance)

plus extensions:
- Clock Synchronization & Time Stamps
- HARTonDP
- Up/Download (Segmentation)
- Redundancy

Optional

DP-V1
- **Acyclic Data Exchange** between PC or PLC and Slave Devices

plus extensions:
- Integration within Engineering: EDD and FDT
- Portable PLC Software Function Blocks (IEC 61131-3)
- Fail-Safe Communication (PROFIsafe)
- Alarms

Optional

DP-V0
- **Cyclic Data Exchange** between PLC and Slave Devices

plus extensions:
- GSD Configuration
- Diagnosis

Mandatory!

Device Features

Time

STEP 1 ✓
STEP 2 ✓
STEP 3 ✓
STEP 4 ✓
STEP 5 ✓
STEP 6 ✓
STEP 7
STEP 8
STEP 9
STEP 10

… then see where you can get it!

DP-Master Stack

- **Offered by Master-ASIC vendors and 3rd parties**
- **Object Code (Source Code upon special agreement)**
- **Sometimes restricted to a certain processor**
- **Buy-out, project or royalty-based license models**

DP-Slave Stack

- **Offered by Slave-ASIC vendors and 3rd parties**
- **Most often Source Code (C/C++)**
- **Easily portable to different processors**
- **Free DP-V0 stacks for some ASICs available (e.g. VPC3+C)**
- **Buy-out or project license models**

Make sure that protocol ASIC, processor and SW stack are a good match.
确保ASIC协议, 处理器和软件堆栈有好的匹配

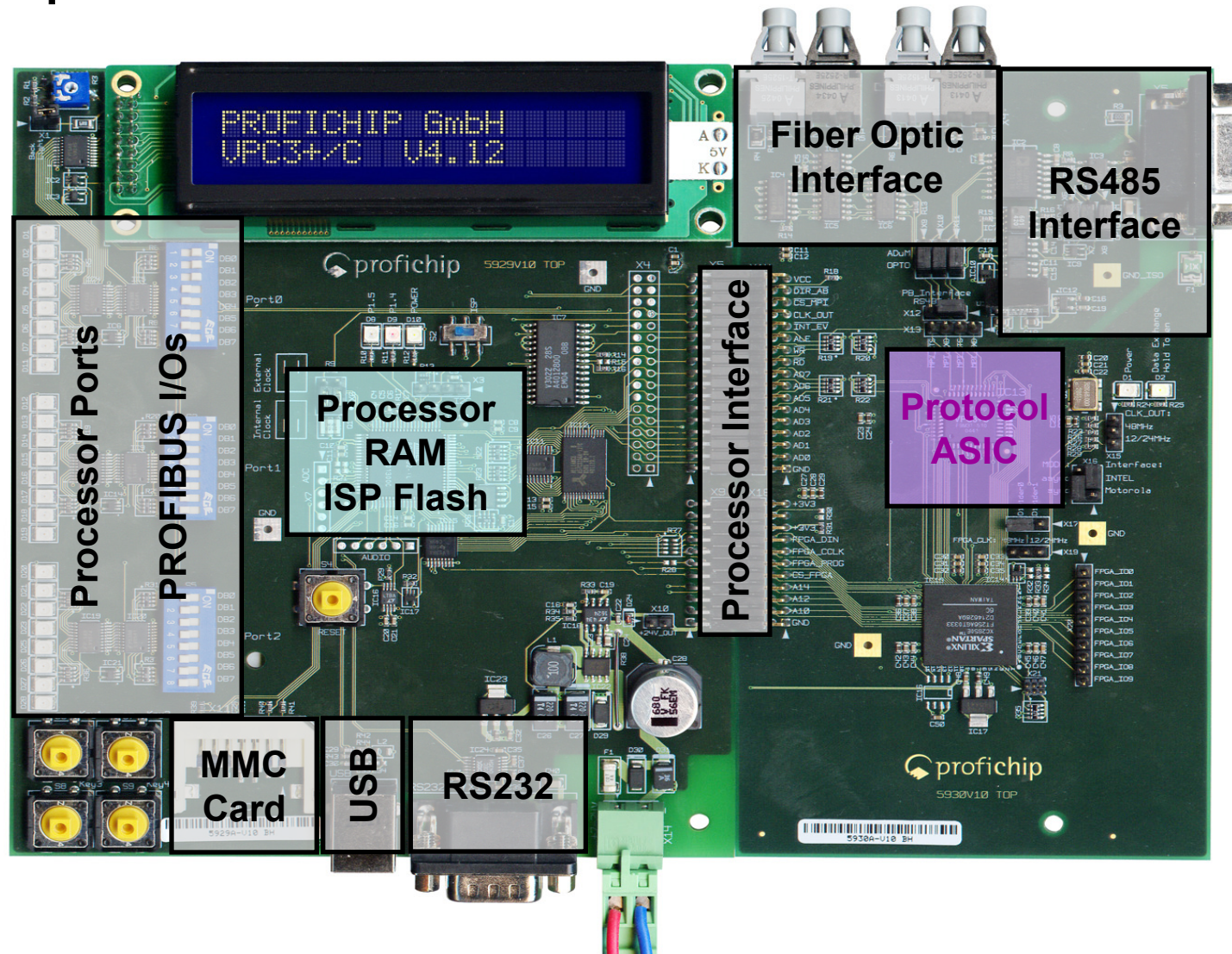**Make sure that the software works smoothly with your tool chain.**
确保软件与您的工具链能够顺利地运行

Keep an eye on portability of the software.
留意软件的便捷

Example: VPC3+C Evaluation - Kit

STEP 1 ✓

STEP 2 ✓

STEP 3 ✓

STEP 4 ✓

STEP 5 ✓

STEP 6 ✓

STEP 7 ✓

STEP 8

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STEP 10

STEP 1 ✓

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STEP 3 ✓

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Join the regional PROFIBUS Association and User Groups

Request an Ident Number

Invest in test and development tools

Create a General Station Description (GSD) file

Develop a configuration tool (option)

Write the product manual

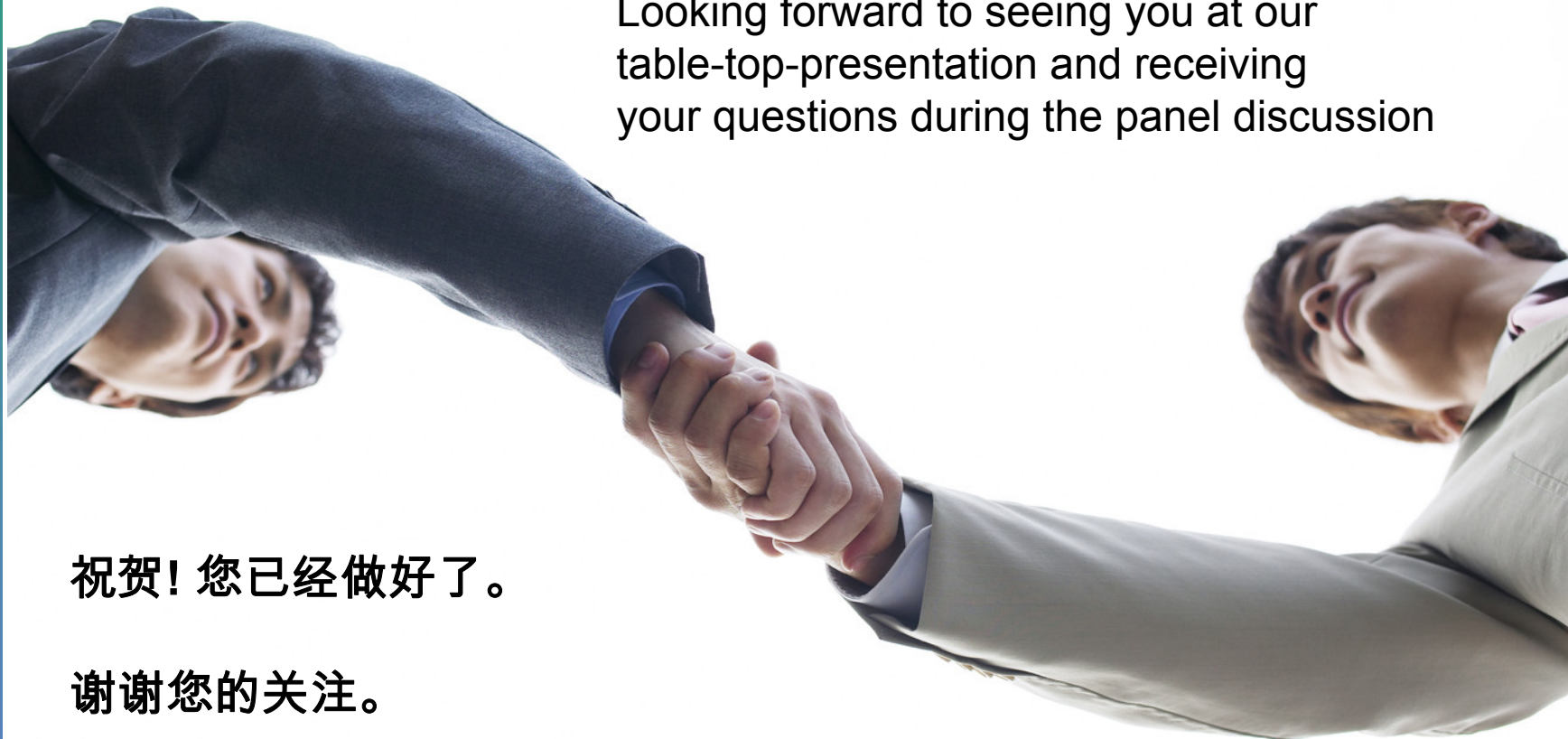**Prepare some application examples (e.g. for popular PLCs)**

Certify the product (EMC, PROFIBUS conformance)

STEP 1 ✓

STEP 2 ✓

STEP 3 ✓

STEP 4 ✓

STEP 5 ✓

STEP 6 ✓

STEP 7 ✓

STEP 8 ✓

STEP 9 ✓

STEP 10 ✓

Thank you for your attention.

Looking forward to seeing you at our table-top-presentation and receiving your questions during the panel discussion

祝贺! 您已经做好了。

谢谢您的关注。

期待在我们的专题小组讨论会
期间能够看见您并且回答您的问题。