



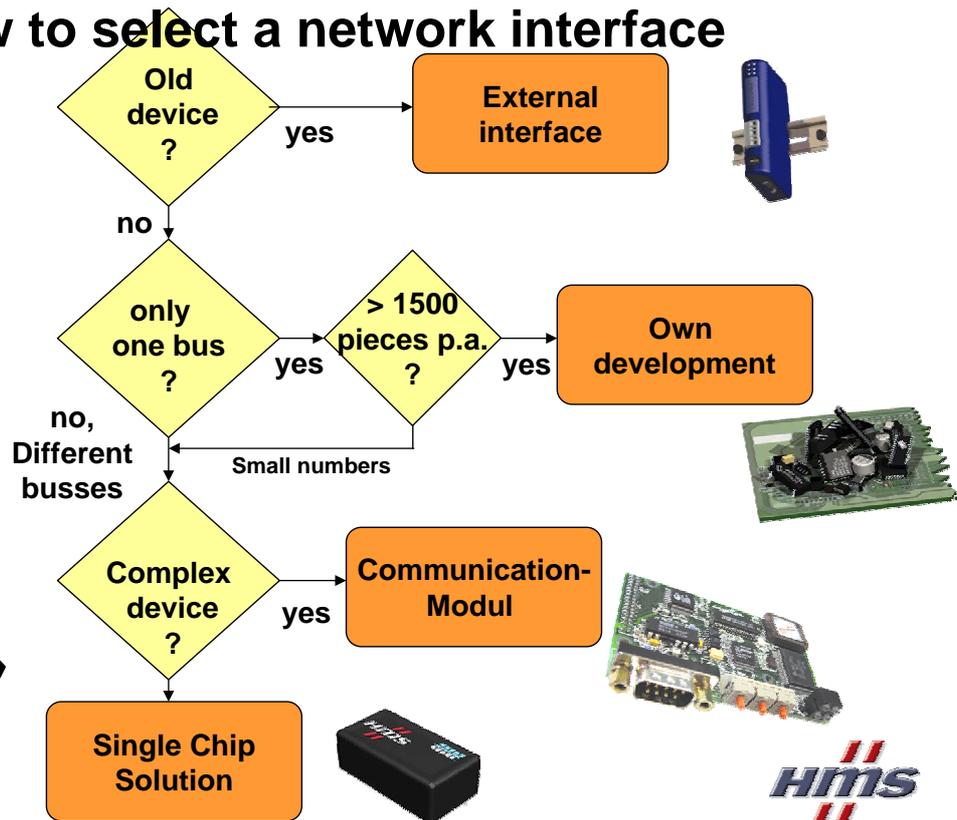
# PROFIBUS slave development

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## How to select a network interface



## Set of Interfaces (Hilscher)



PC-cards



OEM-Module

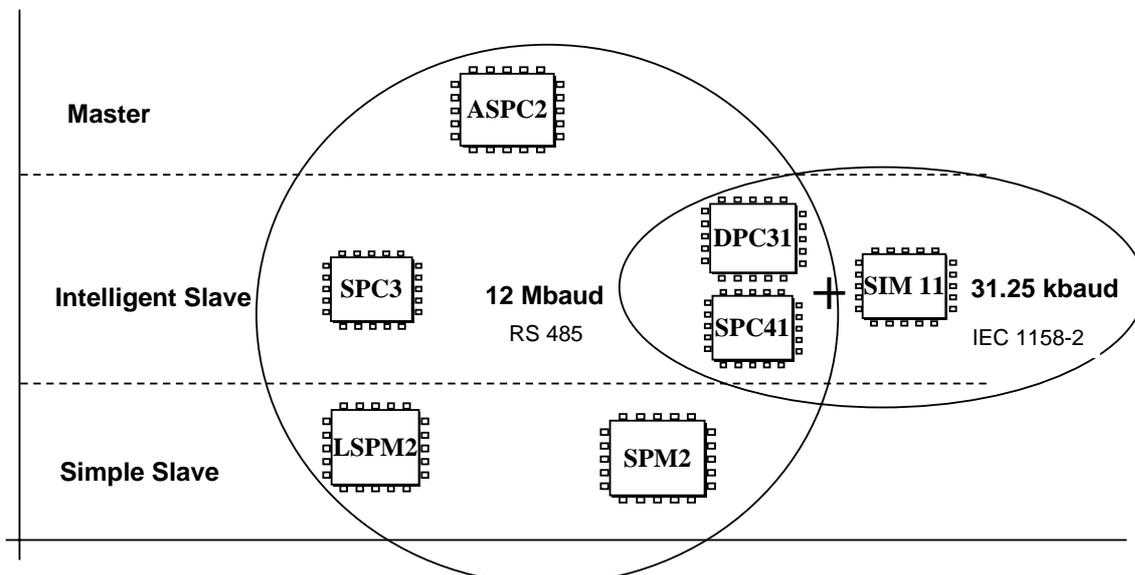


ASIC Kits

- same firmware
- same 'easy-to-use' user interface
- same configurator
- same device driver
- different formfactors



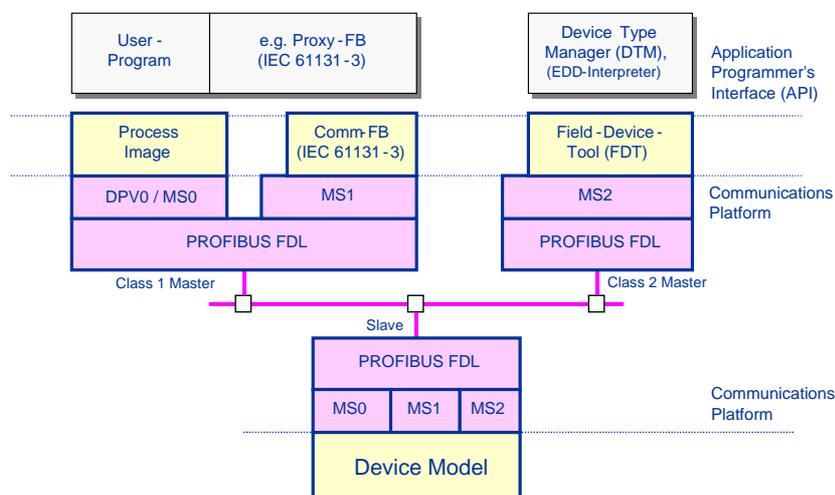
## Set of ASICs (SIEMENS)



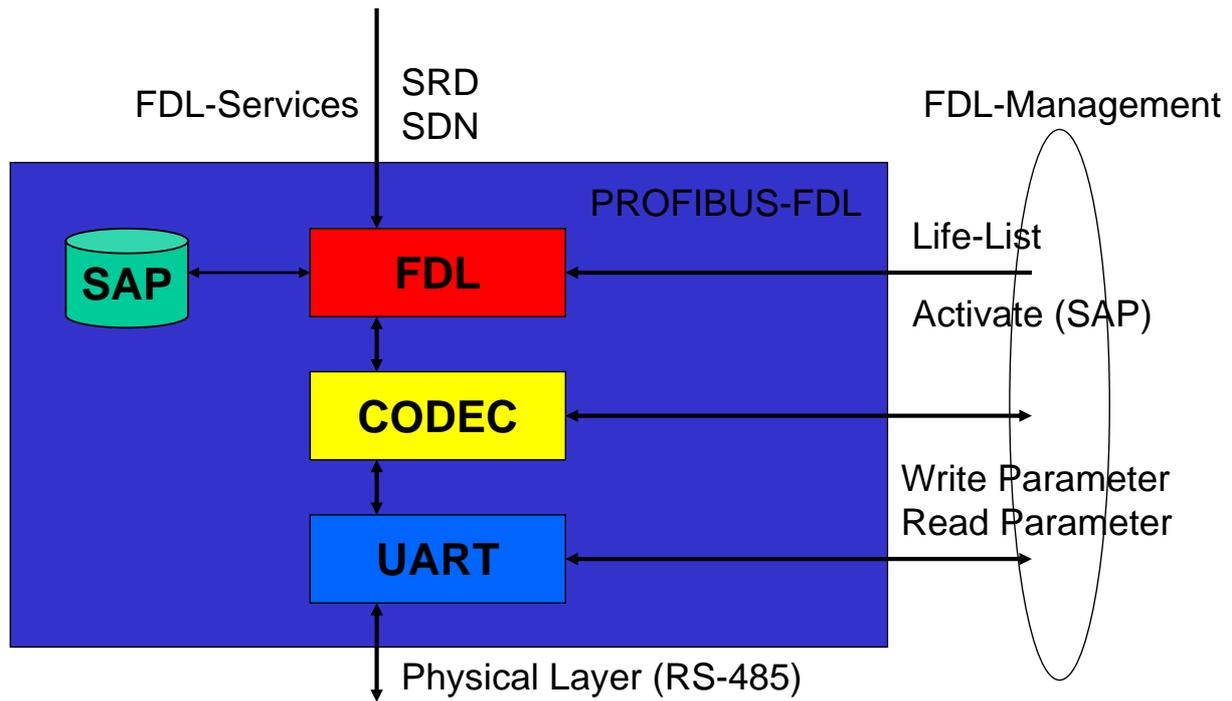
## The application defines the requirements

Short Name	Application	Requirements	Bitrate / Speed
PA/GA	Processautomation Buildingautomation	Long distances Slow processes	93.75 KBit/s
MPI	Programming	Compatible with SIMATIC	187.5 KBit/s
FMS	Master-Master communication	Not for new systems	500 KBit/s
DP	Remote I/O	Efficient protocols	1.5 MBit/s
MC	Motion Control	Short and stable cycle times	12 Mbit/s

## PROFIBUS DP System Structure



## Possible internal structure of Fieldbus Data Link



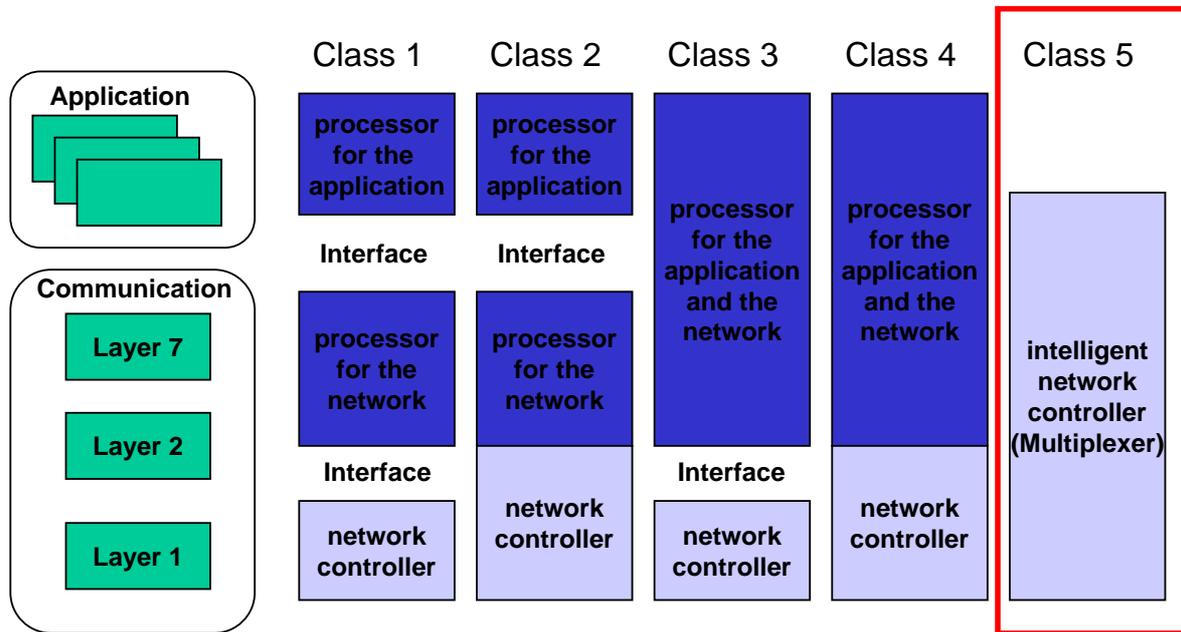
## Implementation Technologies

- Software (C)
- Hardware (ASICs / VHDL)
- Hybrid solutions

Bitrate	≤ 187.5 kBit/s	≤ 1.5 MBit/s	≤ 12 MBit/s
UART Block	HW	HW	HW
CODEC Block	SW	HW	HW
FDL Block	SW	SW	HW

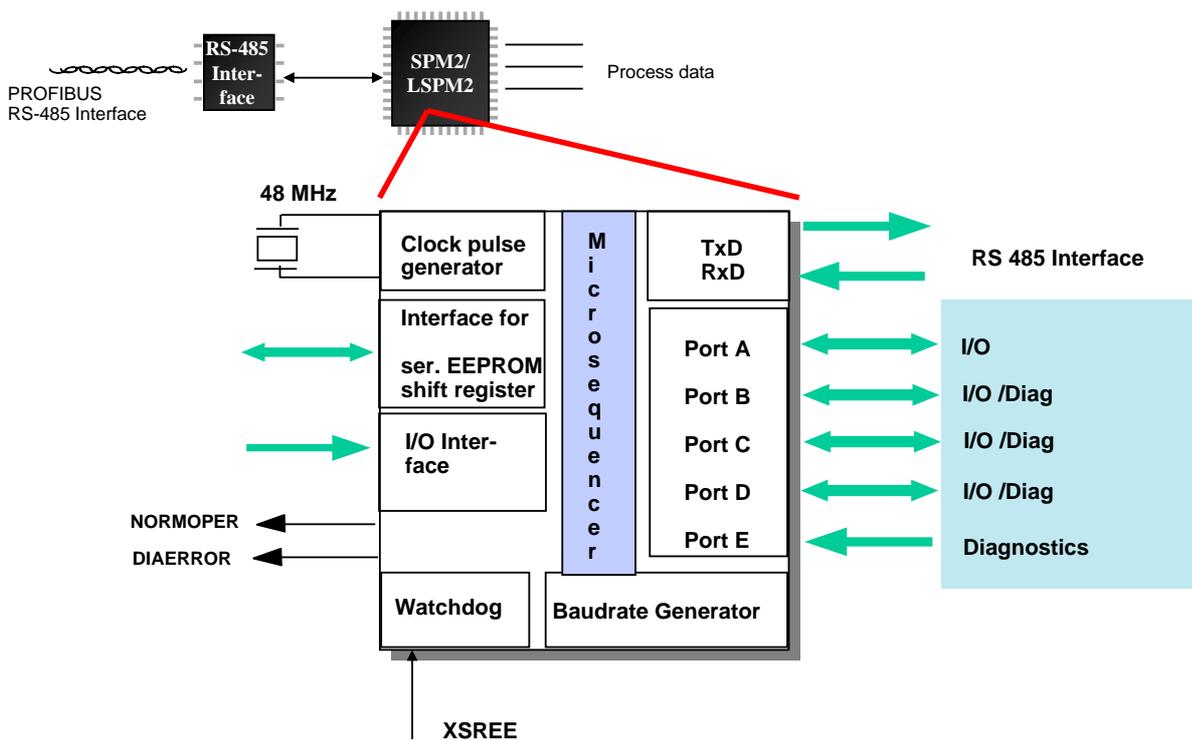
For mass production and top speed special HW is mandatory

## Classification of network interfaces



Adopted from Prof. Bender, TR-Fachkongress, 1992

## Class 5: Multiplexer interface



## Examples of Multiplexers (SIEMENS)



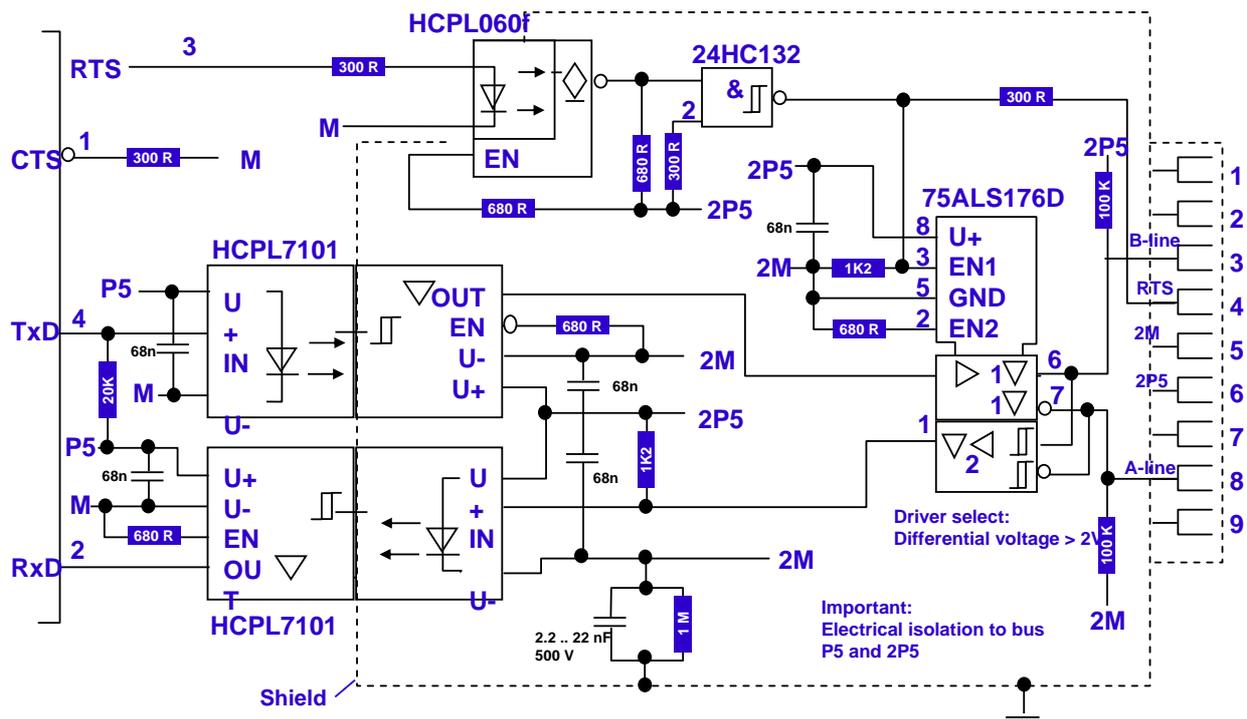
MQFB, 80 Pin, 2cm<sup>2</sup>



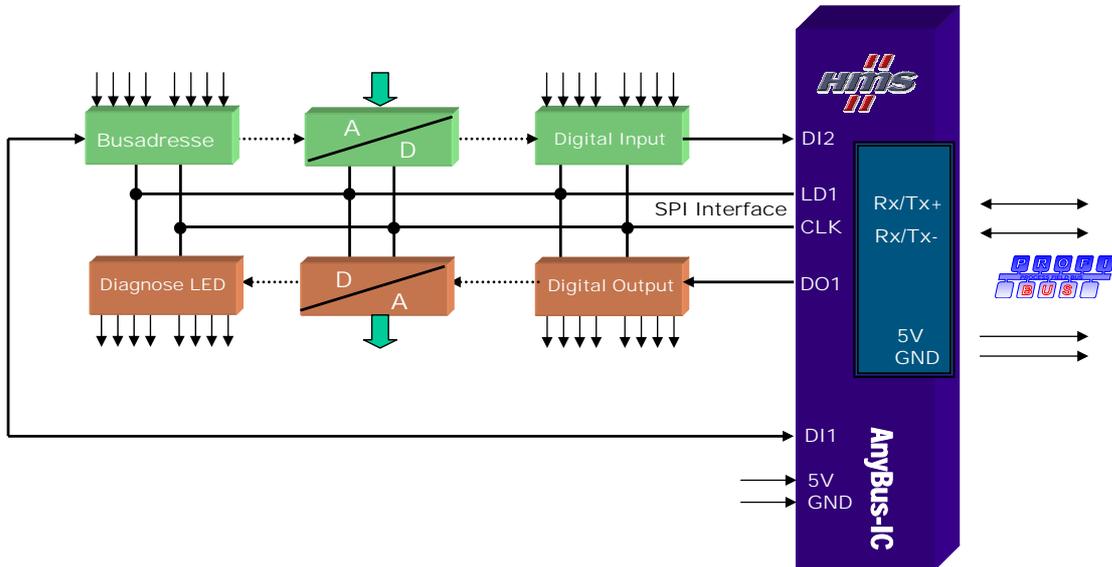
PQFB, 120 Pin, 10cm<sup>2</sup>

- Transmission rate up to 12Mbaud
- DP Protocol completely integrated
- No processor required
- Data Volume:
  - LSPM 2 - 32 bit I/O & 8 bit diagnostic
  - SPM 2 - 64 bit I/O & 16 bit diagnostic

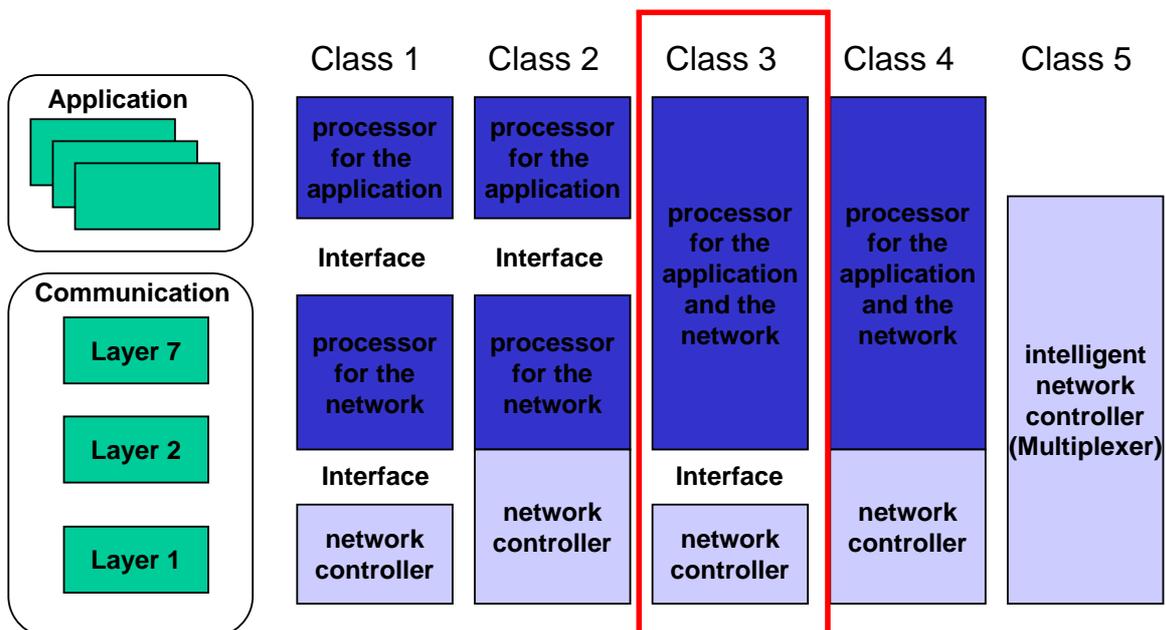
## Serial PROFIBUS interface (Example)



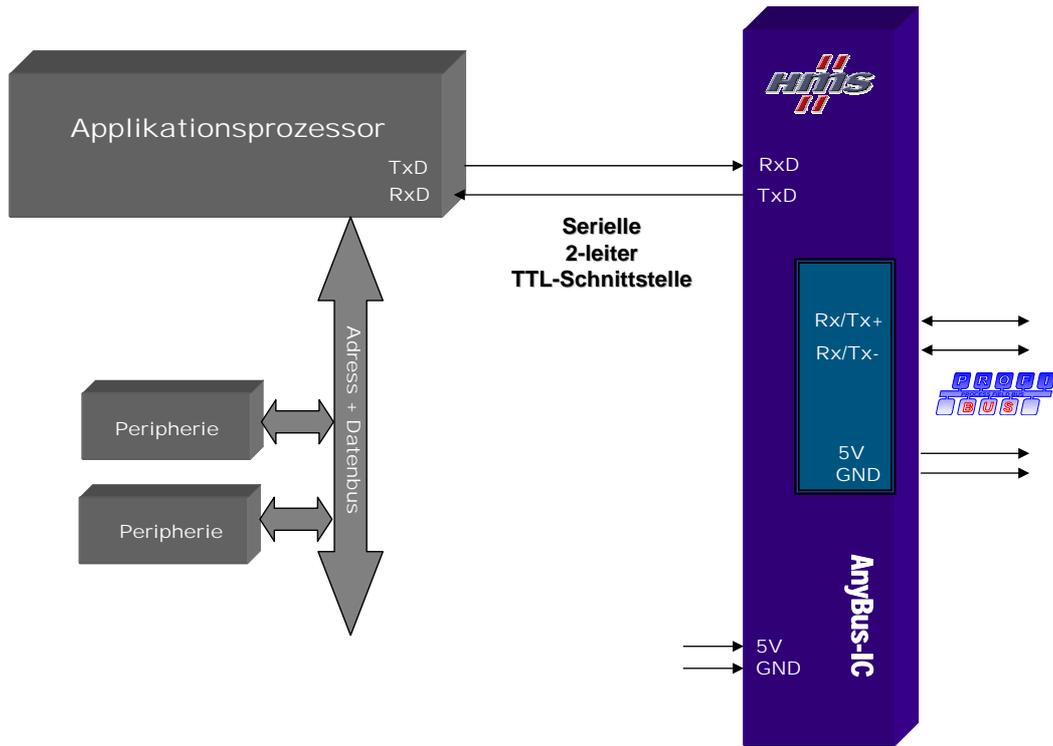
## Class 5: Multiplexer interface



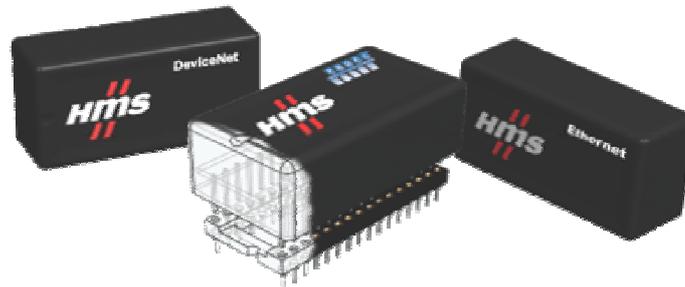
## Classification of network interfaces



## Class 3: Simple application



## Complete interfaces (HMS)



**DIL 32 Format**

42 x 21 x 12 mm

**AnyBus-IC includes all analog and digital interfaces of the Interface to the bus**



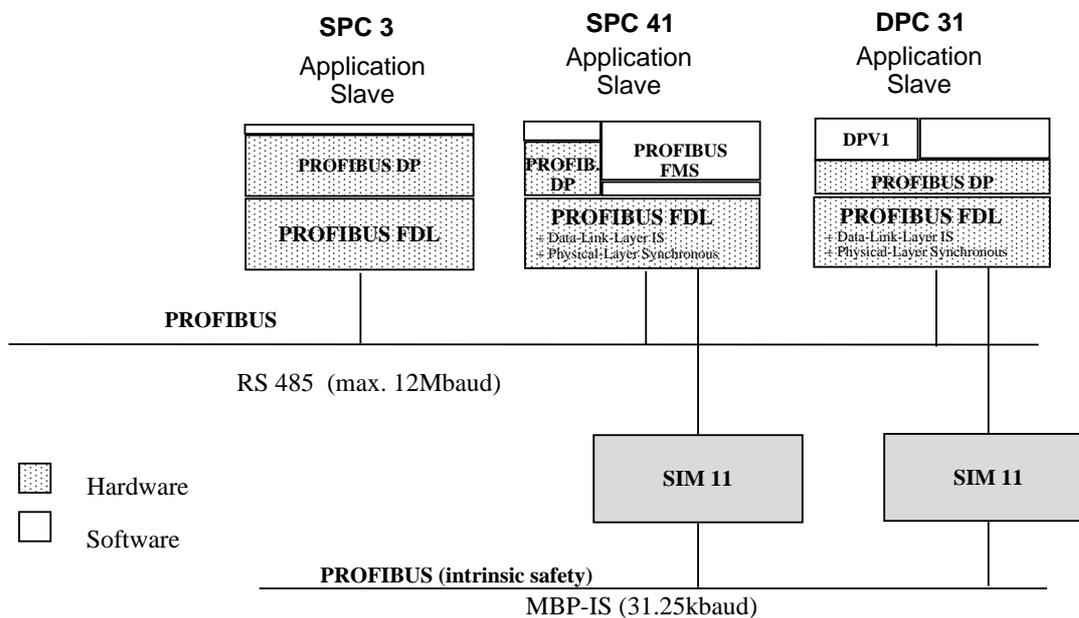
## Intelligent ASICs (SIEMENS)



Max. Transmission Rate [Mbaud]	12	12	12	12
Transm. Medium	RS 485	RS485 / MBP-IS (with SIM 11)		RS 485
Protocol	DP (DPV1)	DP/FMS/PA	DP/DPV1	DP/DPV1/FMS
Message Buffer [kByte]	1.5	1.5	6	1,000 external
Housing	PQFP, 44 Pin	PQFP, 44 Pin	PQFP, 100 Pin	MQFP, 100 Pin

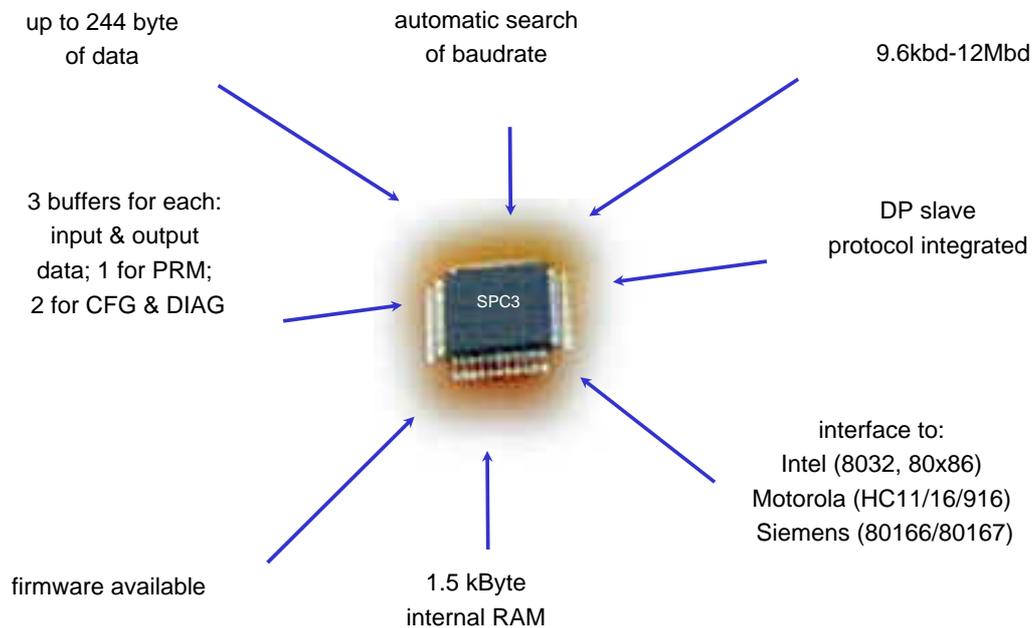


## Available Firmware for the SIEMENS ASICs





## One of the most used.... SPC3 (VPC3)



## Simple adaptation of SW libraries Example with SIEMENS



```

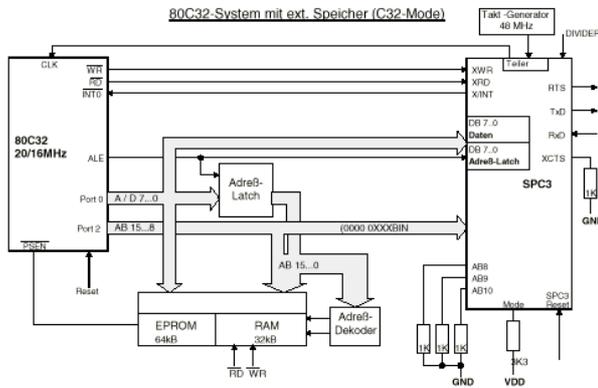
if(DPS2_GET_IND_NEW_PRM_DATA())
{ /*=== New parameter data ===*/
  UBYTE SPC3_PTR_ATTR *prm_ptr;
  UBYTE param_data_len, prm_result;
  UBYTE ii;
  prm_result = DPS2_PRM_FINISHED;
  do
  { /* Check parameter until no conflict behavior */
    prm_ptr = DPS2_GET_PRM_BUF_PTR();
    param_data_len = DPS2_GET_PRM_LEN();
    /* data_length_netto of parametration_telegram > 7 */
    if (param_data_len > 7)
    {
      if ((*(prm_ptr+8) == 0xAA) && (*(prm_ptr+9) == 0xAA))
        prm_result = DPS2_SET_PRM_DATA_NOT_OK(); /* as example !!! */
      else
      {
        for (ii= 0; ii<param_data_len & ii <10; ii++) // store in the buffer
          prm_tst_buff[ii] = *(prm_ptr+ii+7);
        prm_result = DPS2_SET_PRM_DATA_OK();
      }
    }
    else
      prm_result = DPS2_SET_PRM_DATA_OK();
  } while(prm_result == DPS2_PRM_CONFLICT);
}

```

User makes changes to adjust  
code to own application



# PROFIBUS-DP – CAN Gateway for Motion-Controller



The motors to turn the CDs are controlled over a PROFIBUS-DP – CAN gateway



Project with: Balzers Process Systems



# PROFIBUS-DP force interface in a connector



Singlechip 8051 controller with a SPC3

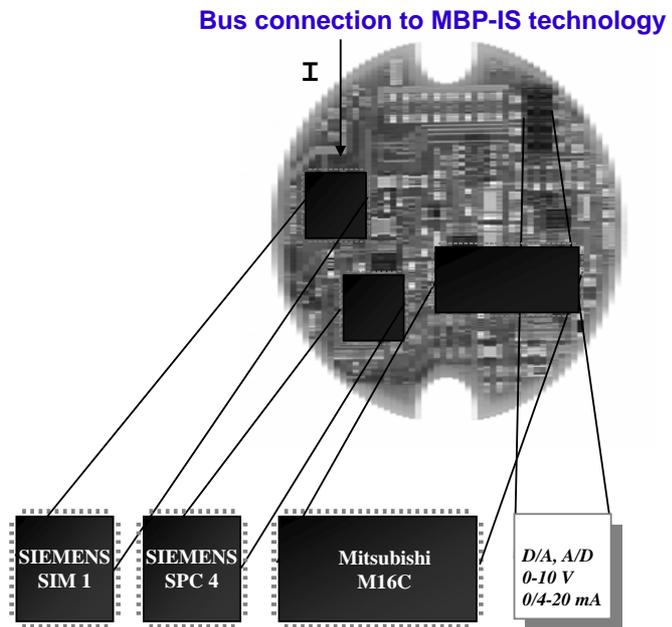


Project with: Force Measuring Systems AG

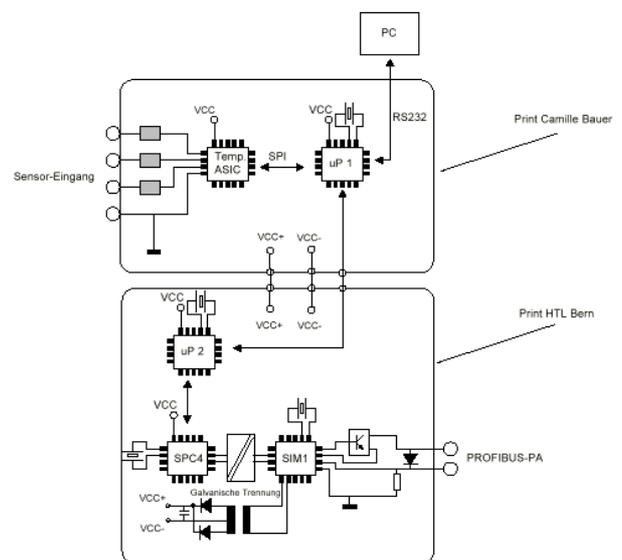


## Class 3: Low power Interface (e.g. PROFIBUS-PA Interface for temperature transmitter)

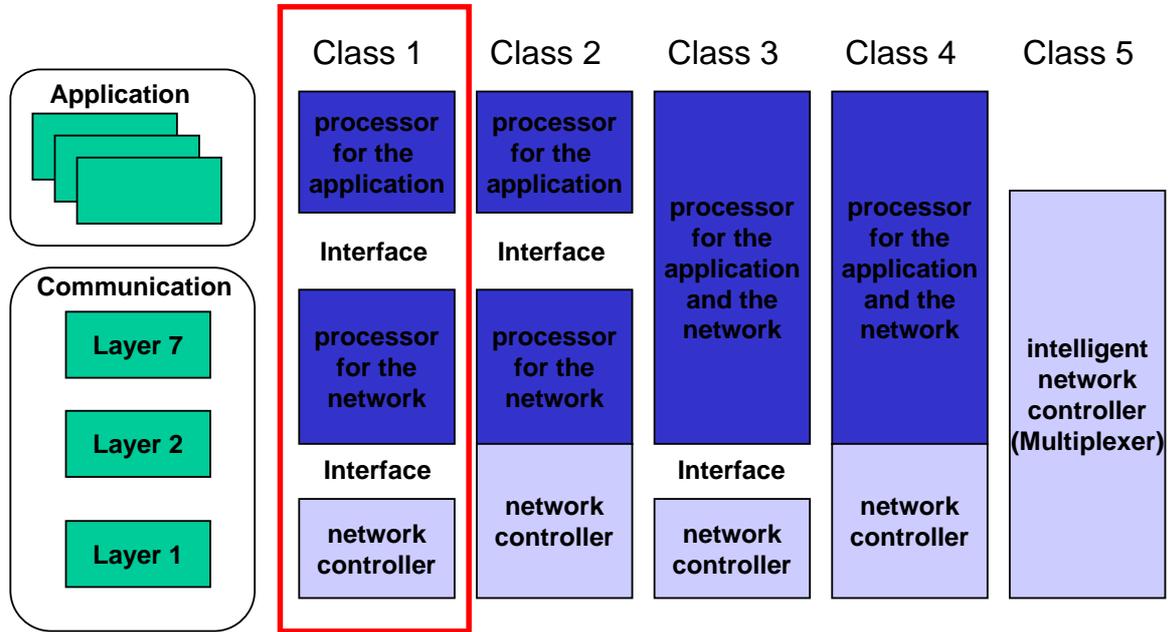
- PROFIBUS-PA Interfaces for Field devices are very small and require only a few ASICs
- The use of low power Microcontrollers and the low power PROFIBUS ASICs reduces power consumption and ensures powering over the bus at less than 10 mA.
- direct replacement of existing "Round Boards" is possible



## PROFIBUS-PA interface for temperatur transmitter

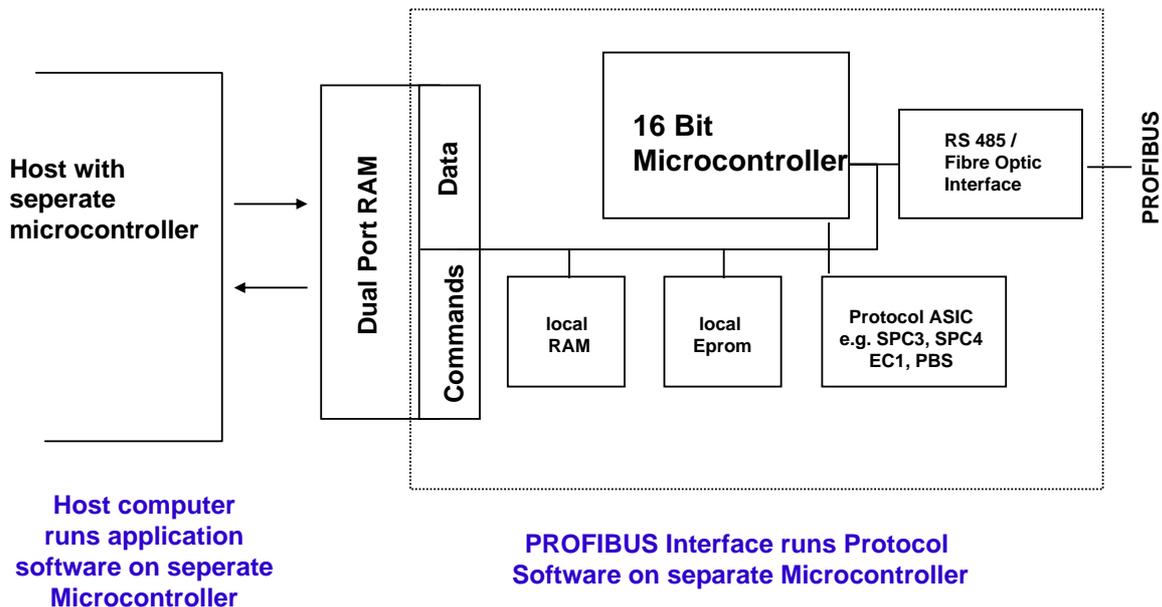


## Classification of network interfaces

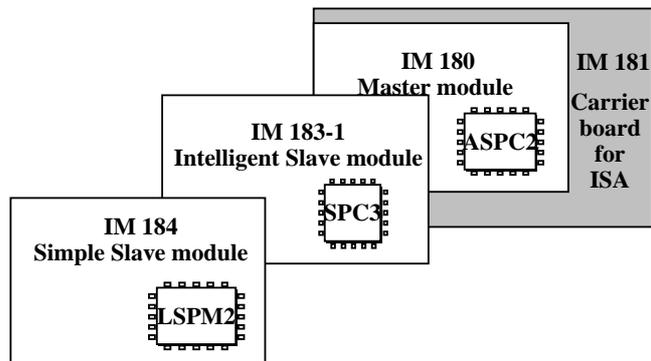


Adopted from Prof. Bender, TR-Fachkongress, 1992

## Class 1: High performance interface (e.g. frequency converter with PROFIdrive profile)

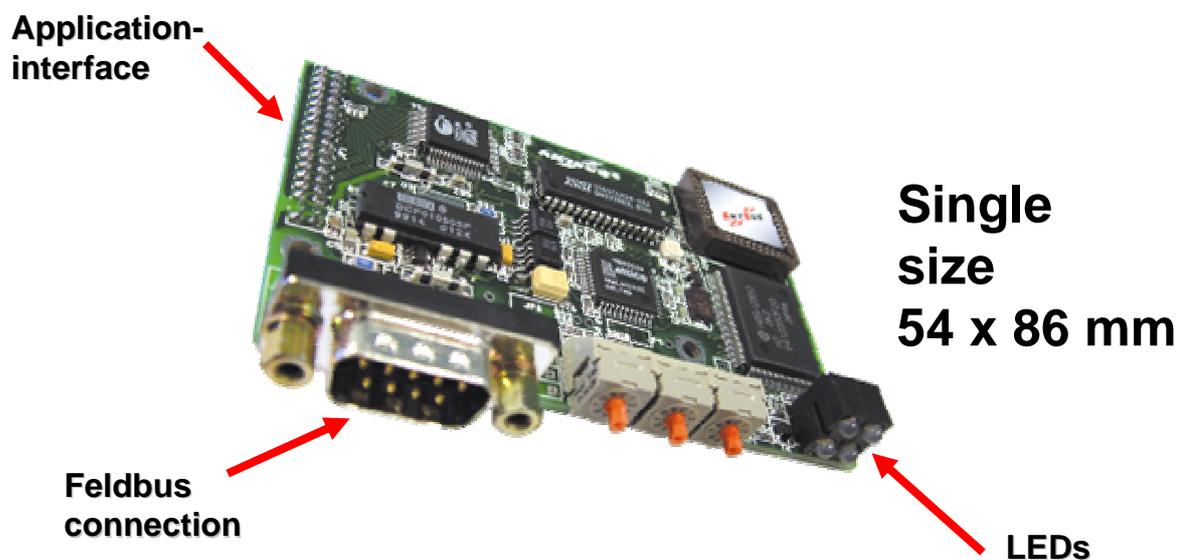


## Available Moduls (SIEMENS)

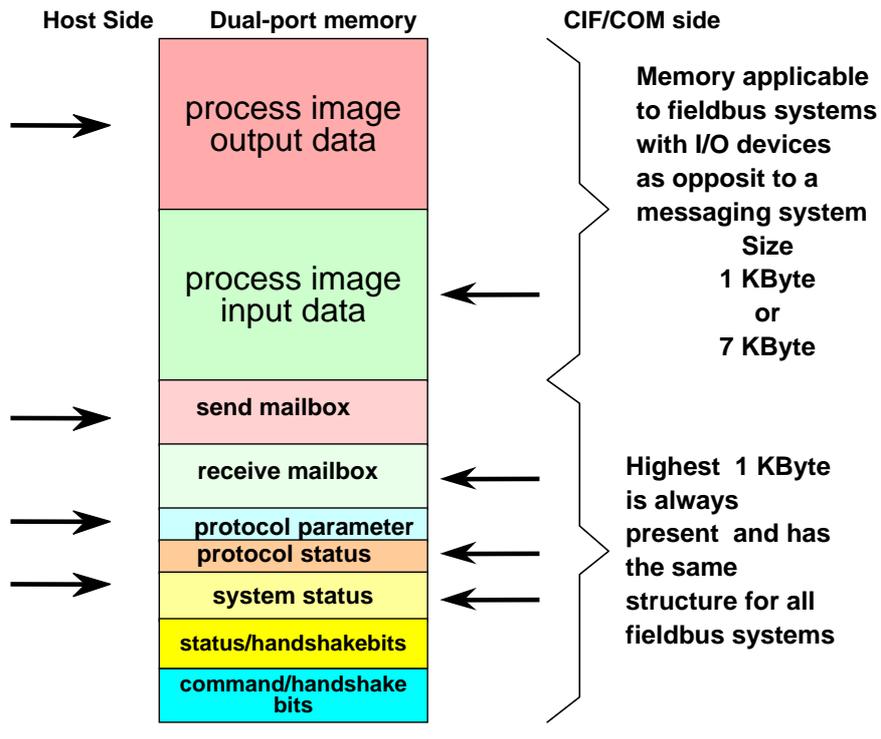


- ✓ 5V DC power supply
- ✓ 0 to 70 °C permissible ambient temperature
- ✓ Transmission rate up to 12Mbaud

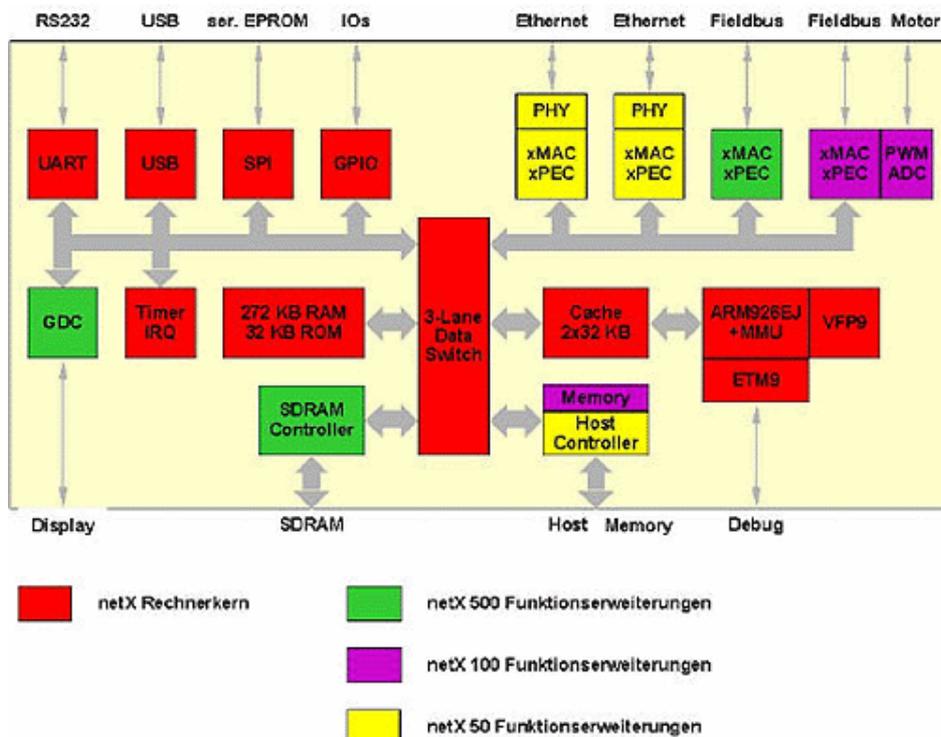
## Example of Moduls (HMS)



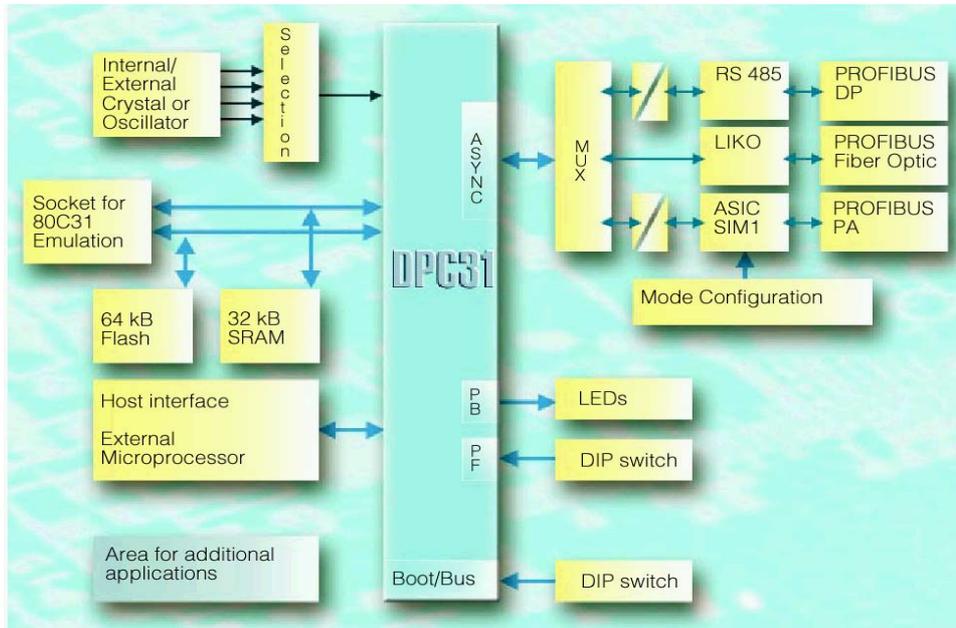
## The Hilscher Dual-port Memory



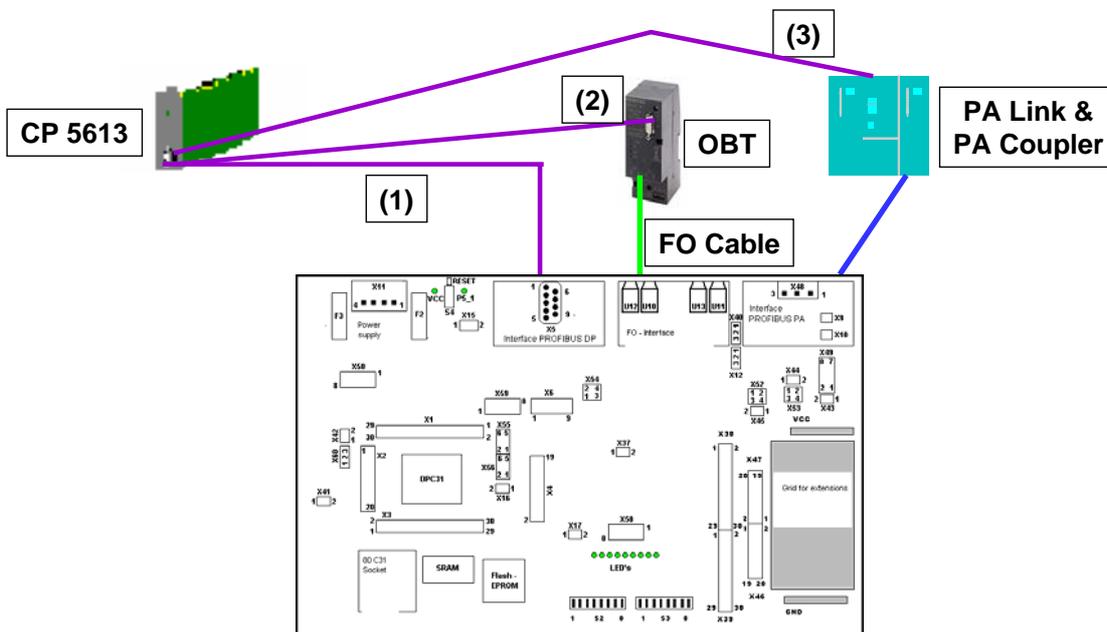
## NetX High performance ASIC



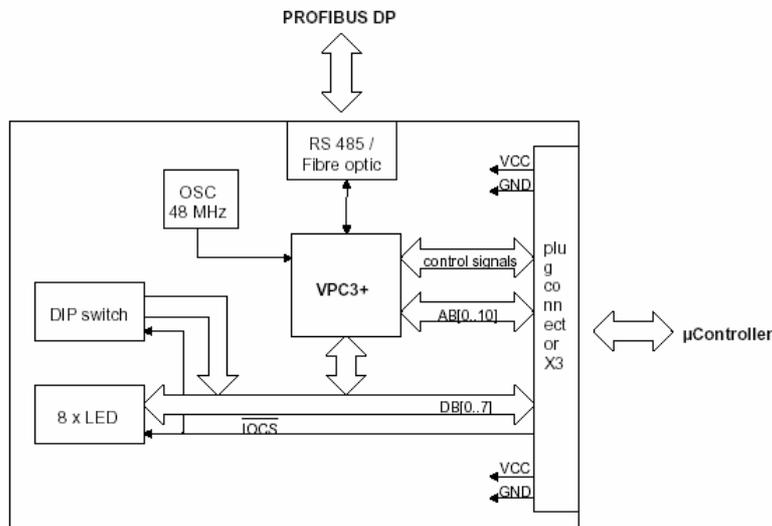
# Development Kit DP & PA - Test Board (SIEMENS)



# Development Kit DP & PA - Test Board

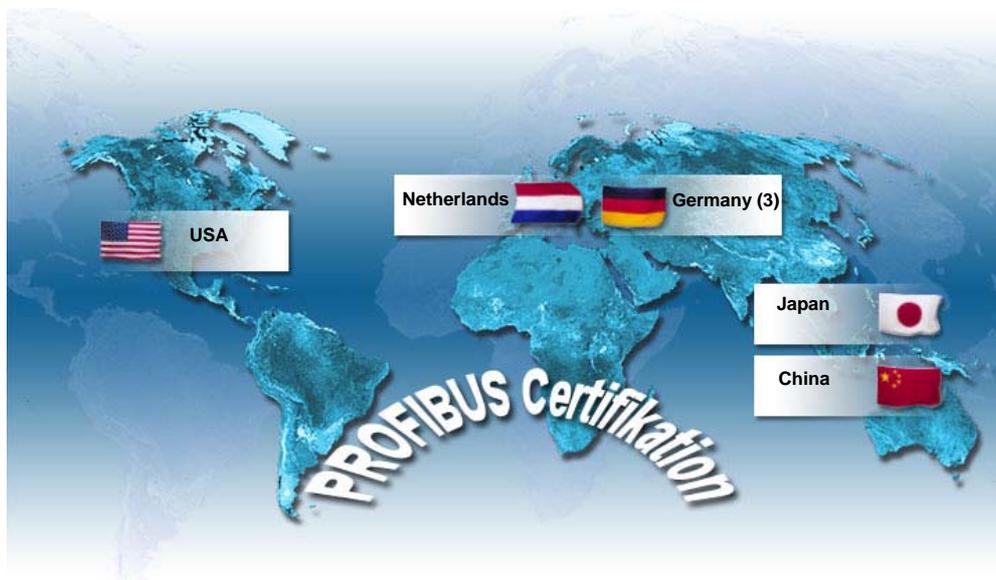


## Development Kit VPC3+ - Test Board (PROFichip)

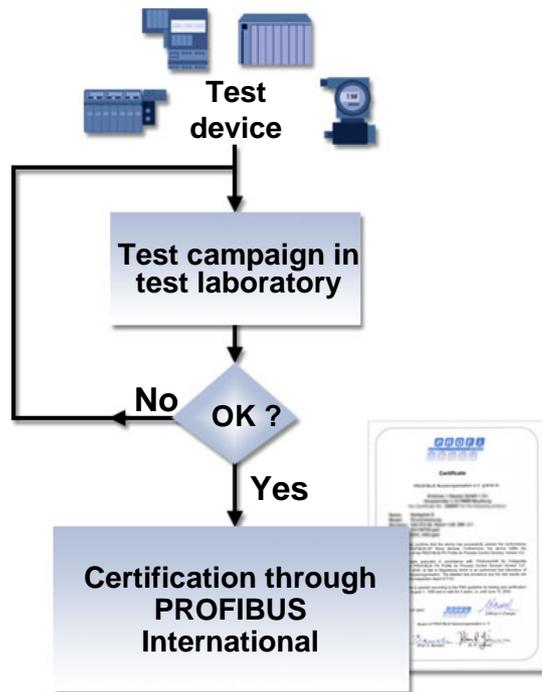


## PROFIBUS Test Laboraories (PTL)

- PROFIBUS certification tests in 7 independent PTLs worldwide
- Certification in accordance with general framework defined by PROFIBUS International ensures quality standard
- Certification ensures interoperability and thus plant availability



## Certification Procedure



### Certification rules

- Uniform test measures and test process
- Comprehensible and documented results

More than 800 certificates awarded