



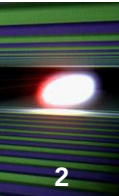
# Profibus in Process Controls

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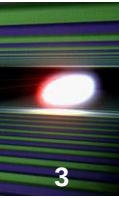


# Field-buses für Cryogenic Controls



- Field-buses @ DESY have a long history:
  - SEDAC:  
Designed at DESY for PETRA (in the 70th )  
Used also for cryogenic control in HERA
  - CAN:  
Used in TTF -> FLASH and several test stands
  - Profibus:  
First used for the refurbished FLASH cryogenic plant  
(With the XFEL cryo plant in mind)  
Used for all XFEL cryo controls

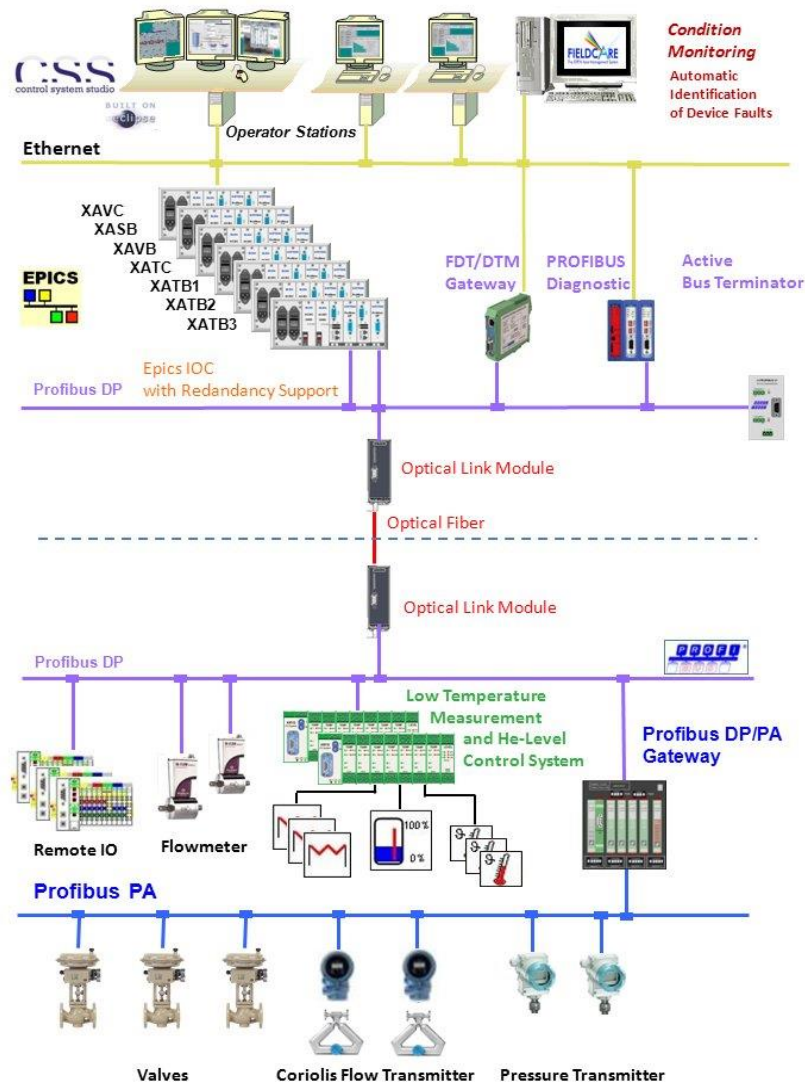
# Why Profibus?



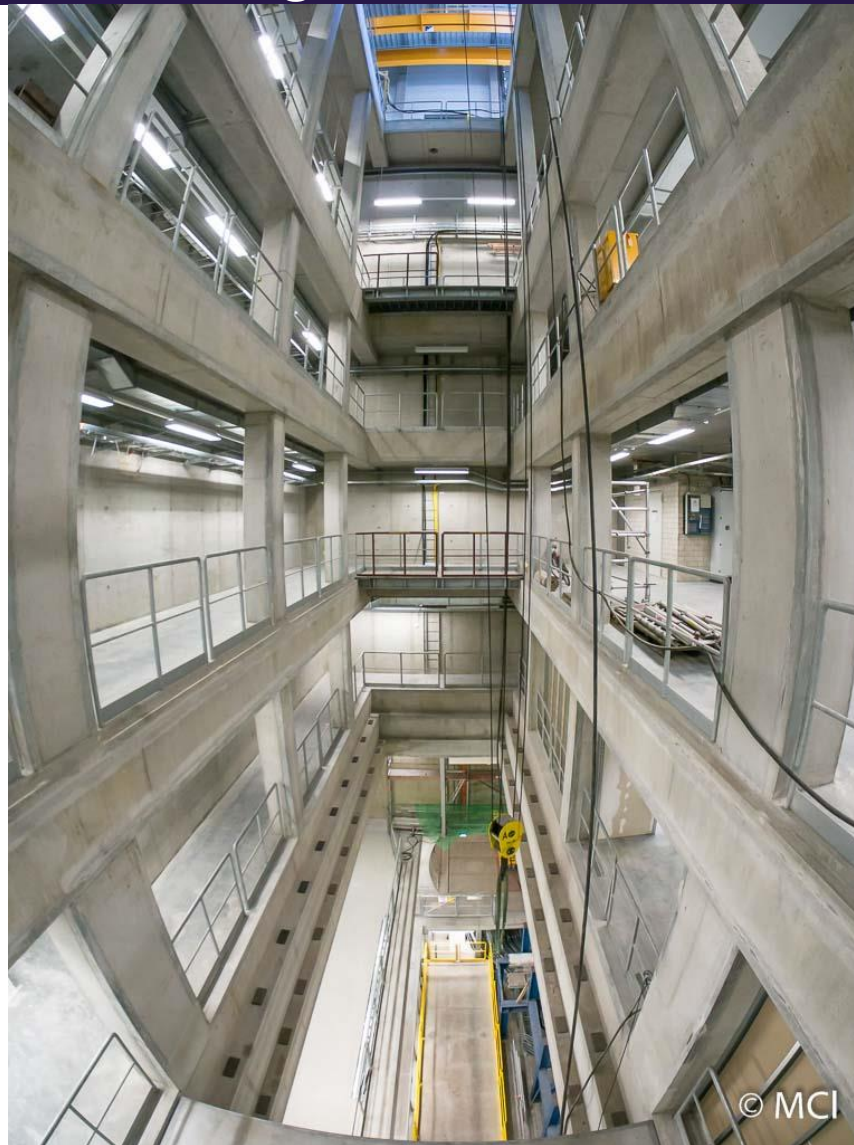
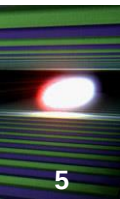
- Profibus is \_the\_ field-bus standard in Germany
- Support for intelligent I/O controller e.g.:
  - Valve positioner:
    - How many movements?
    - Scale of movements?
    - Problem history
  - Pressure transducer:
    - Online recalibration
- ProfiNet/ Profibus
  - Profinet mainly used for PLC-PLC and PLC-process controller communication. Not many direct devices.

# Profibus in the AMTF (Accelerator Module Test Facility)

## Control System Overview



# The Injector Building

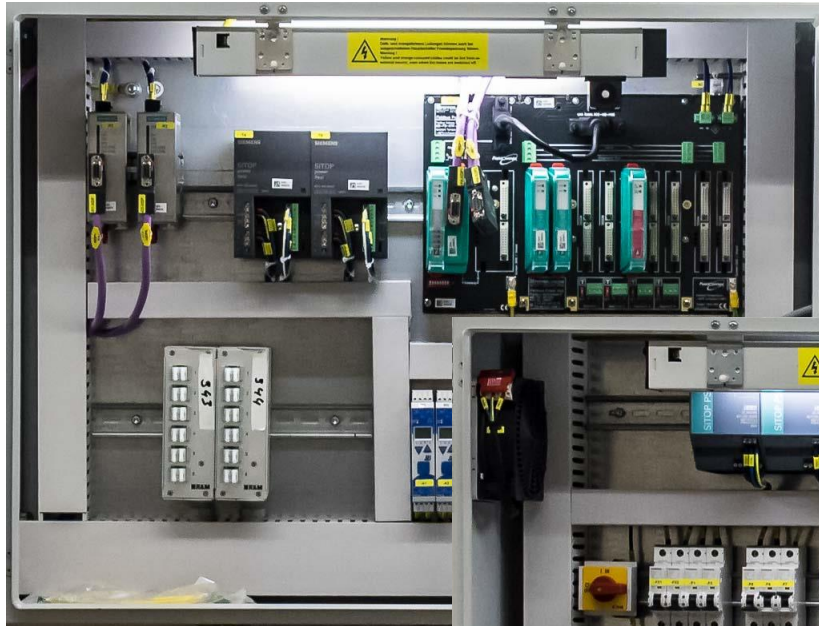




# Equipment in the XFEL Injector Tunnel

6

OLM and DP/ PA Gateways



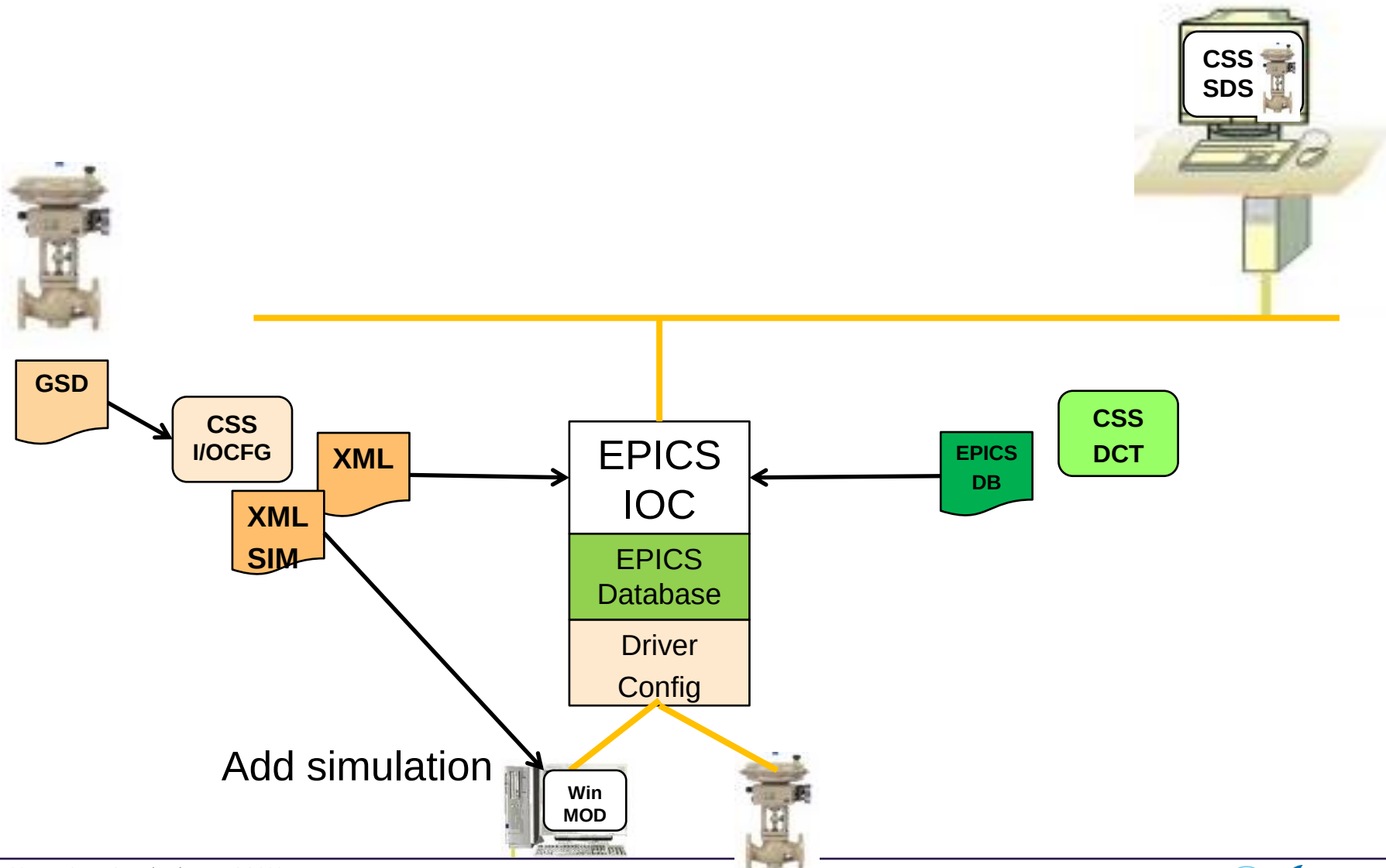
WAGO I/O and Custom  
Temperature- Heater Modules

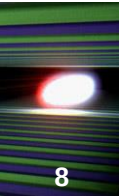


Redundant Power

# Configuration – or: How to get a Valve to the Console

7





CSS (Control System Studio) is used as a toolbox for configuration and display

- Configuration:

- I/O Configurator:

- Read GSD files
    - Create XML configuration of Profibus

- DCT (Database Creation Tool):

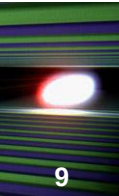
- Create EPICS database text file

- Display:

- SDS (Synoptic Display Studio)

- Synoptic displays stored in XML format





Simulating I/O is a powerful tool

■ Applications:

■ New installations:

→ Verify I/O configuration

→ Test displays

■ Modifying existing configurations

→ Check new logic

→ Check sequence programs

■ In general:

■ Reduce commissioning times

■ Stable applications from the very beginning

Messort: Halle 54 KS2/ PB KS2V

bus✓  
checkBC-502  
PROFIBUS Insp

## Ereignisse

| Ereignis / Zeitraum               | Letzte Minute     | Letzte Periode 24h | Historie 630.6h   |
|-----------------------------------|-------------------|--------------------|-------------------|
| Ausfall Busteilnehmer             | 0                 | 0                  | 0                 |
| Interne Diagnose Busteilnehmer    | 0                 | 0                  | 0                 |
| Externe Diagnose Busteilnehmer    | 0                 | 6                  | 16728             |
| Fehlertelegammme                  | 0                 | 0                  | 0                 |
| Max. Wiederholungen pro Buszyklus | 0                 | 0                  | 0                 |
| Wiederholungen gesamt             | 0                 | 0                  | 0                 |
| Buszykluszeit min/mittel/max [ms] | 17.74/17.98/18.17 | 17.65/17.98/18.68  | 17.63/17.98/30.39 |
| Letzte SNMP-Abfrage               | -                 |                    |                   |

Messdaten löschen

0 Alarme

Busgeschwindigkeit

1.5 MBit/s

Gerätetemperatur

34 °C

Uhrzeit

29.9.2014 17:04:25

Ethernet

PROFIBUS  
Diagnostic

Profibus

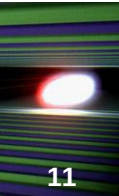
## Teilnehmer (Anzeige des kritischsten Zustands)

| Zeitraum | Ereignisse      |
|----------|-----------------|
| Historie | Bitte Auswählen |

## Mögliche Zustände

Inaktiv/nicht vorhanden Aktivierter Master Aktivierter Slave Ereignis / Diagnose Ausfall / Neuanlauf Stillgelegt

|    | 0                          | 1                           | 2                           | 3                             | 4                             | 5                             | 6                          | 7                           | 8                           | 9                          |
|----|----------------------------|-----------------------------|-----------------------------|-------------------------------|-------------------------------|-------------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|
| 0  | Device 0<br>Location 0     | IOC<br>xpmsCPC001           | IOC-R<br>xpmsCPC002         | KS2_DPKP<br>Rechnerraum       | KEP12<br>Rechnerr.            | Device 5<br>Location 5        | Device 6<br>Location 6     | Device 7<br>Location 7      | Device 8<br>Location 8      | Device 9<br>Location 9     |
| 1  | Device 10<br>Location 10   | Device 11<br>Location 11    | Device 12<br>Location 12    | Device 13<br>Location 13      | Device 14<br>Location 14      | Device 15<br>Location 15      | Device 16<br>Location 16   | Device 17<br>Location 17    | Device 18<br>Location 18    | Device 19<br>Location 19   |
| 2  | Device 20<br>Location 20   | Device 21<br>Location 21    | Device 22<br>Location 22    | Device 23<br>Location 23      | Device 24<br>Location 24      | Device 25<br>Location 25      | Device 26<br>Location 26   | Device 27<br>Location 27    | Device 28<br>Location 28    | Device 29<br>Location 29   |
| 3  | Device 30<br>Location 30   | Device 31<br>Location 31    | Device 32<br>Location 32    | Device 33<br>Location 33      | Device 34<br>Location 34      | Device 35<br>Location 35      | Device 36<br>Location 36   | Device 37<br>Location 37    | Device 38<br>Location 38    | Device 39<br>Location 39   |
| 4  | Device 40<br>Location 40   | Device 41<br>Location 41    | Device 42<br>Location 42    | Device 43<br>Location 43      | Device 44<br>Location 44      | Device 45<br>Location 45      | Device 46<br>Location 46   | Device 47<br>Location 47    | Device 48<br>Location 48    | Device 49<br>Location 49   |
| 5  | 42CV230<br>Coldbox         | 42CV160<br>Coldbox          | 42CV203<br>Coldbox          | 42CV204<br>Coldbox            | 42CV206<br>Coldbox            | 42CV217<br>Coldbox            | 42CV250<br>Coldbox         | 42CV307<br>Coldbox          | 42CV350<br>Coldbox          | 42CV200<br>Coldbox         |
| 6  | 42CV201<br>Coldbox         | DP/PA-GW<br>Coldbox         | 42CV240<br>Coldbox          | 42CV246<br>Coldbox            | 42CV340<br>Coldbox            | Device 65<br>Location 65      | Device 66<br>Location 66   | 42CV202<br>Coldbox          | 42CV103<br>Coldbox          | 42CV112<br>Coldbox         |
| 7  | 42CV114<br>Coldbox         | 42CV127<br>Coldbox          | 42CV300<br>Coldbox          | 42CV302<br>Coldbox            | 42CV113<br>Coldbox            | 42CV110<br>Coldbox            | 42CV104<br>Coldbox         | 42CV301<br>Coldbox          | 42CV303<br>Coldbox          | 42CV306<br>Coldbox         |
| 8  | 42CV400<br>Coldbox         | 42CV401<br>Coldbox          | 42CV406<br>Coldbox          | 42CV407<br>Coldbox            | 42CV408<br>Coldbox            | 42CV500<br>Coldbox            | 42CV106<br>Coldbox         | 42CV111<br>Coldbox          | 42CV245<br>Coldbox          | 42CV255<br>Coldbox         |
| 9  | Device 90<br>Location 90   | 42CV810<br>Coldbox          | 42CV820<br>Coldbox          | 42CV830<br>Coldbox            | 42CV840<br>Coldbox            | 42CV850<br>Coldbox            | 42CV860<br>Coldbox         | 42CV870<br>Coldbox          | Device 95<br>Location 95    | 42CV010<br>Coldbox         |
| 10 | 42CV020<br>Coldbox         | Device 101<br>Location 101  | Device 102<br>Location 102  | 11CV099<br>Sicherh.-Kollektor | 12CV099<br>Sicherh.-Kollektor | 13CV099<br>Sicherh.-Kollektor | Device 106<br>Location 106 | 32CV108<br>Warme Verteilung | 32CV109<br>Warme Verteilung | Device 109<br>Location 109 |
| 11 | Device 110<br>Location 110 | 45CV100<br>Warme Verteilung | 32CV106<br>Warme Verteilung | 47CV100<br>Warme Verteilung   | Device 114<br>Location 114    | Device 115<br>Location 115    | Device 116<br>Location 116 | Device 117<br>Location 117  | Device 118<br>Location 118  | Device 119<br>Location 119 |
| 12 | Device 120<br>Location 120 | Device 121<br>Location 121  | Device 122<br>Location 122  | Device 123<br>Location 123    | Device 124<br>Location 124    | DP/PA-GW-R<br>Coldbox         | Device 126<br>Location 126 |                             |                             |                            |



- Each EPICS database also contains a set of records which represent the state of the Profibus nodes  
This way the operators have an on-line view on the Profibus status.
- It is possible to connect dedicated diagnostic hardware to inspect the Profibus signal levels and the Protocol down to a single bit

- Profibus is in operation for cryogenic controls for about a decade
- Once it is correctly configured it runs very stable
- Intelligent I/O controller like valve positioner and pressure transducers add diagnostic functionalities
- Additional redundancy support increases the availability of the cryogenic control system