

PROFIBUS Technology introduction



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**F&B, Pharma, C.Chemicals
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What is PROFIBUS?


PROFIBUS is the open
Fieldbus Standard for Automation
of PROFIBUS International.

PROFIBUS covers all requirements of all
branches of Automation Technology.

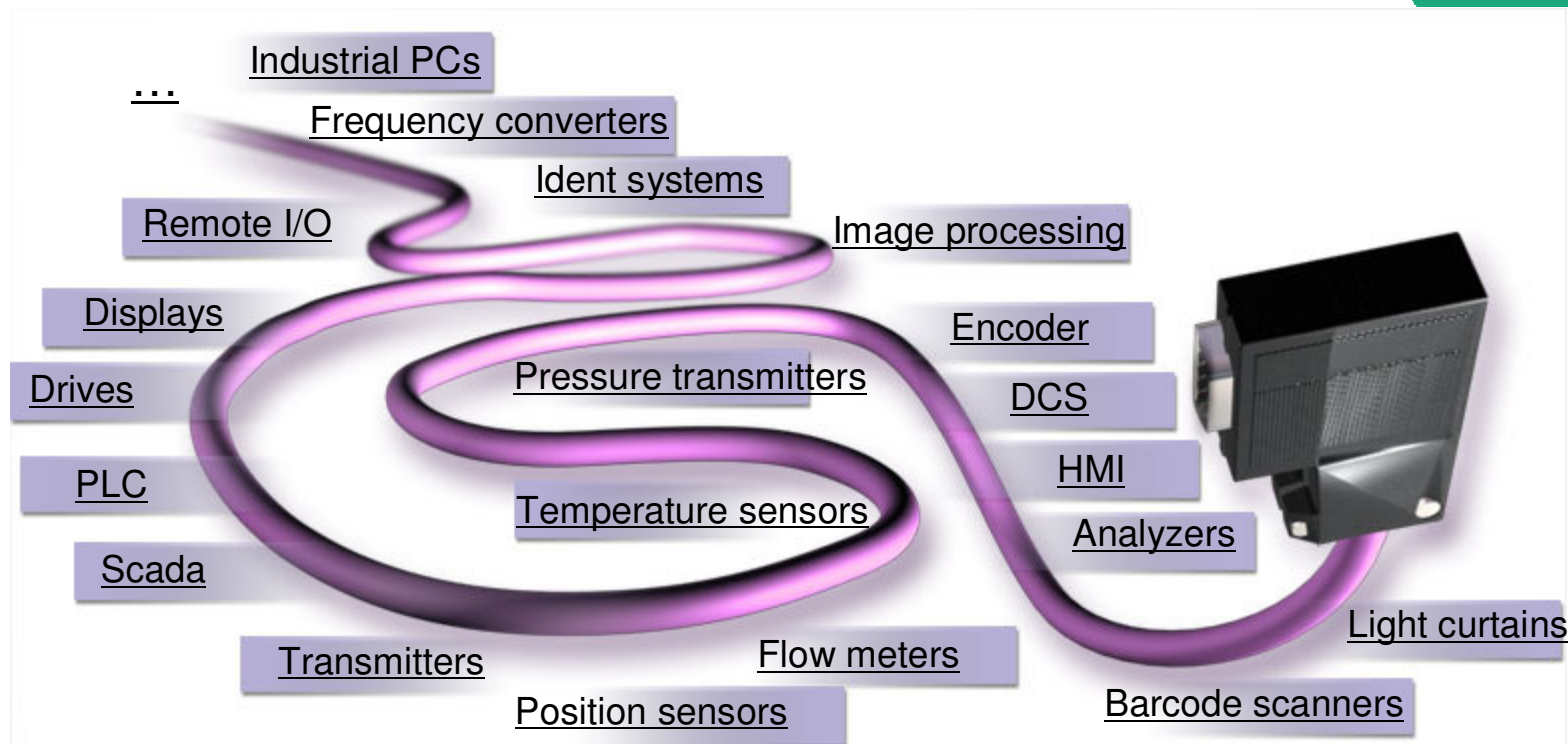
PROFIBUS ...

- Is a digital communication system optimized for automation tasks
- Covers both fast time-critical applications and complex communication tasks
- Supports numerous Application Profiles

Milestones to Market Leadership (technical)

- 
- 2002** **PROFIBUS DP-V2 part of IEC 61158/IEC 61784;**
10 profiles available
 - 2000** **100.000 PROFIBUS devices in process automation**
 - 1998** **PROFIBUS PA – Profile for process automation**
 - 1997** **PROFIdrive – Profile for variable-speed drives**
 - 1996** **PROFIBUS becomes European Standard EN 50170**
 - 1995** **1st application in process automation (PA)**
 - 1993** **PROFIBUS DP becomes DIN 19245 (Part 3)**
 - 1991** **PROFIBUS becomes DIN 19245 (Part 1 and 2)**

PROFIBUS : Online Product Guide

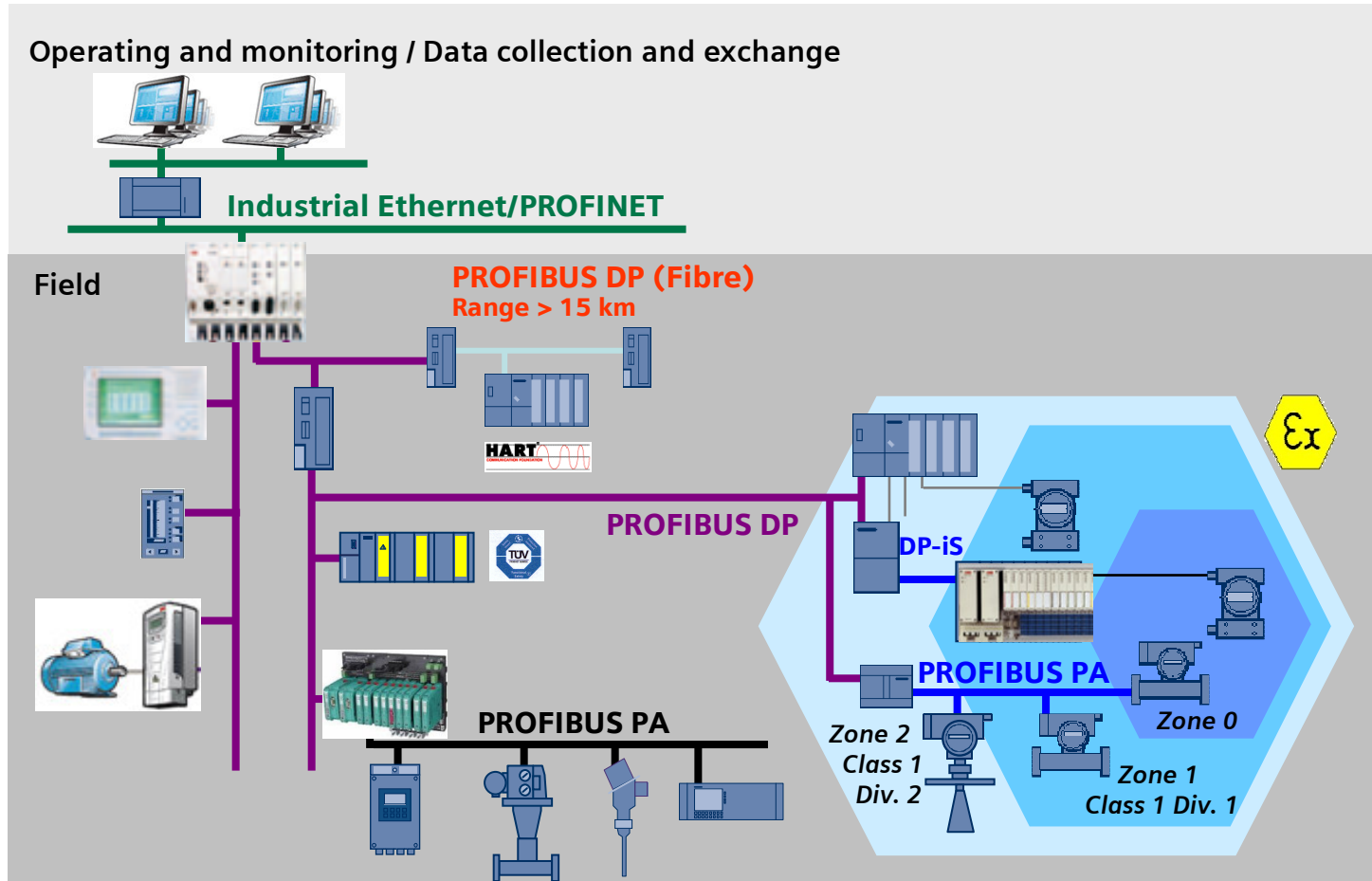


More than 2500 products available
from more than 200 manufacturers

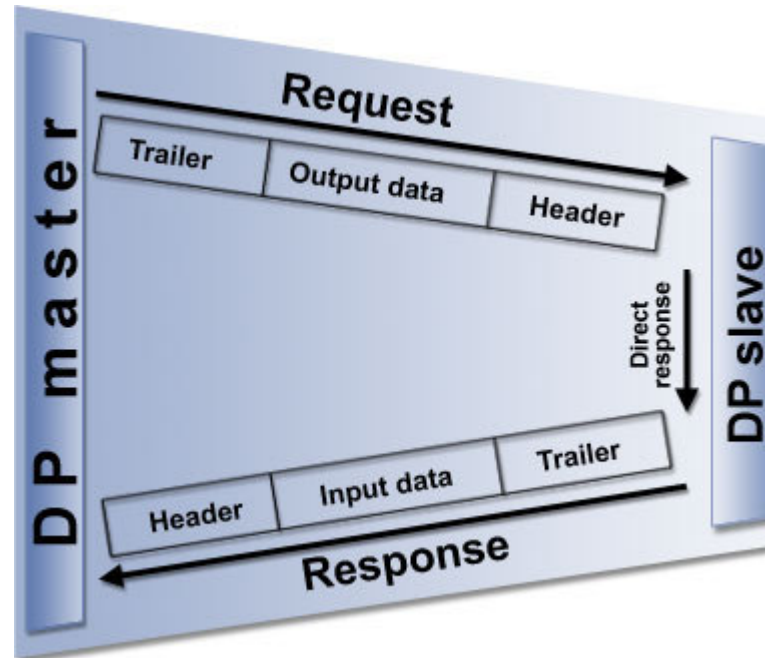
User-friendly search functions

Continuous updates by member companies

PROFIBUS Architecture

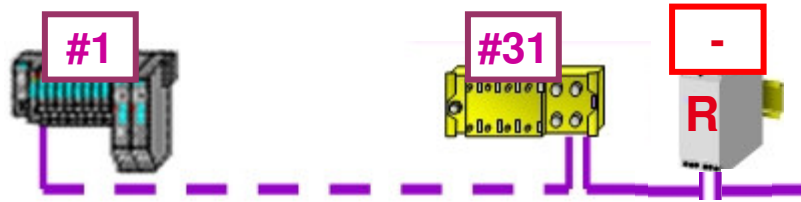


PROFIBUS master/slave principle



- Each PROFIBUS system has at least one master
- A maximum of 127 devices (masters + slaves) are permitted in a single system
- Several masters can be integrated

Networks & Segments



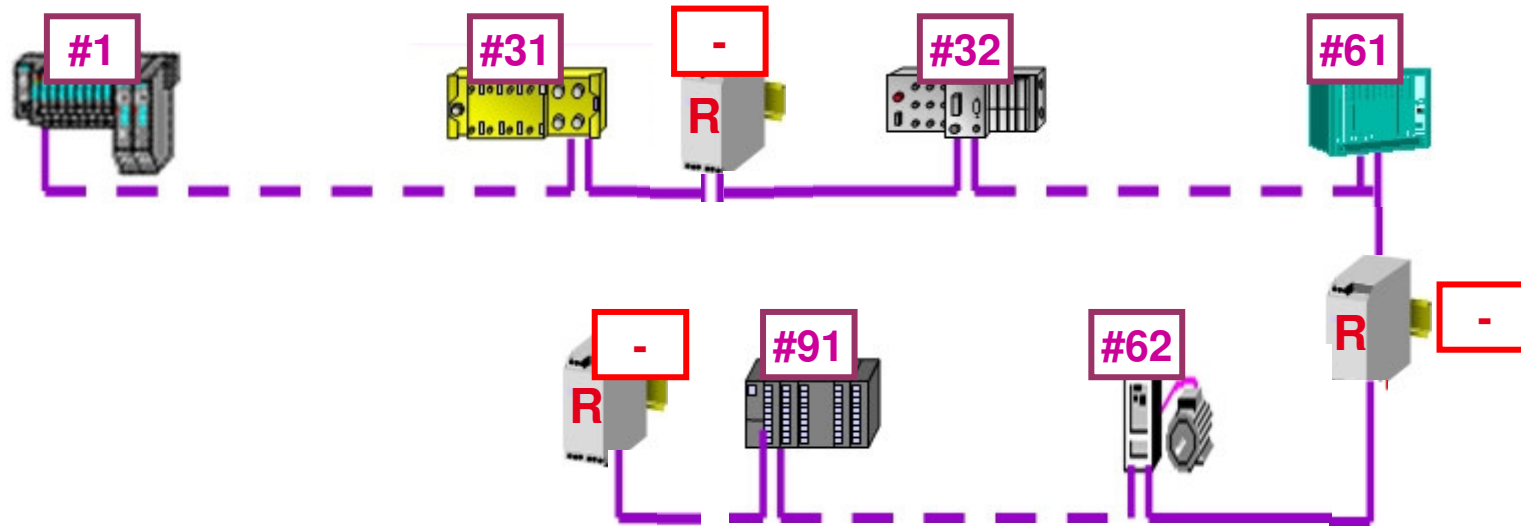
31 addressable devices

32 bus loads



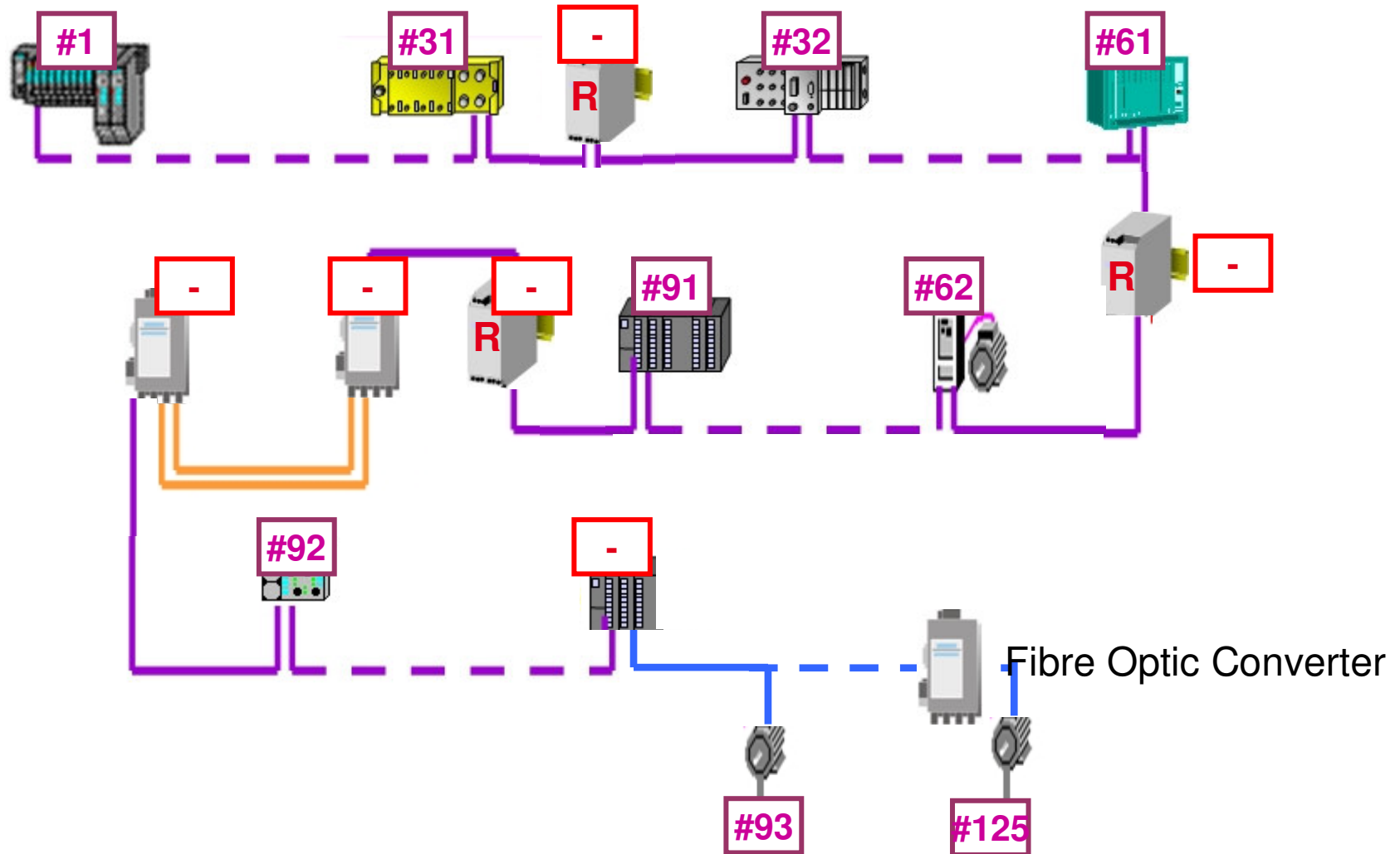
Repeater

Networks & Segments

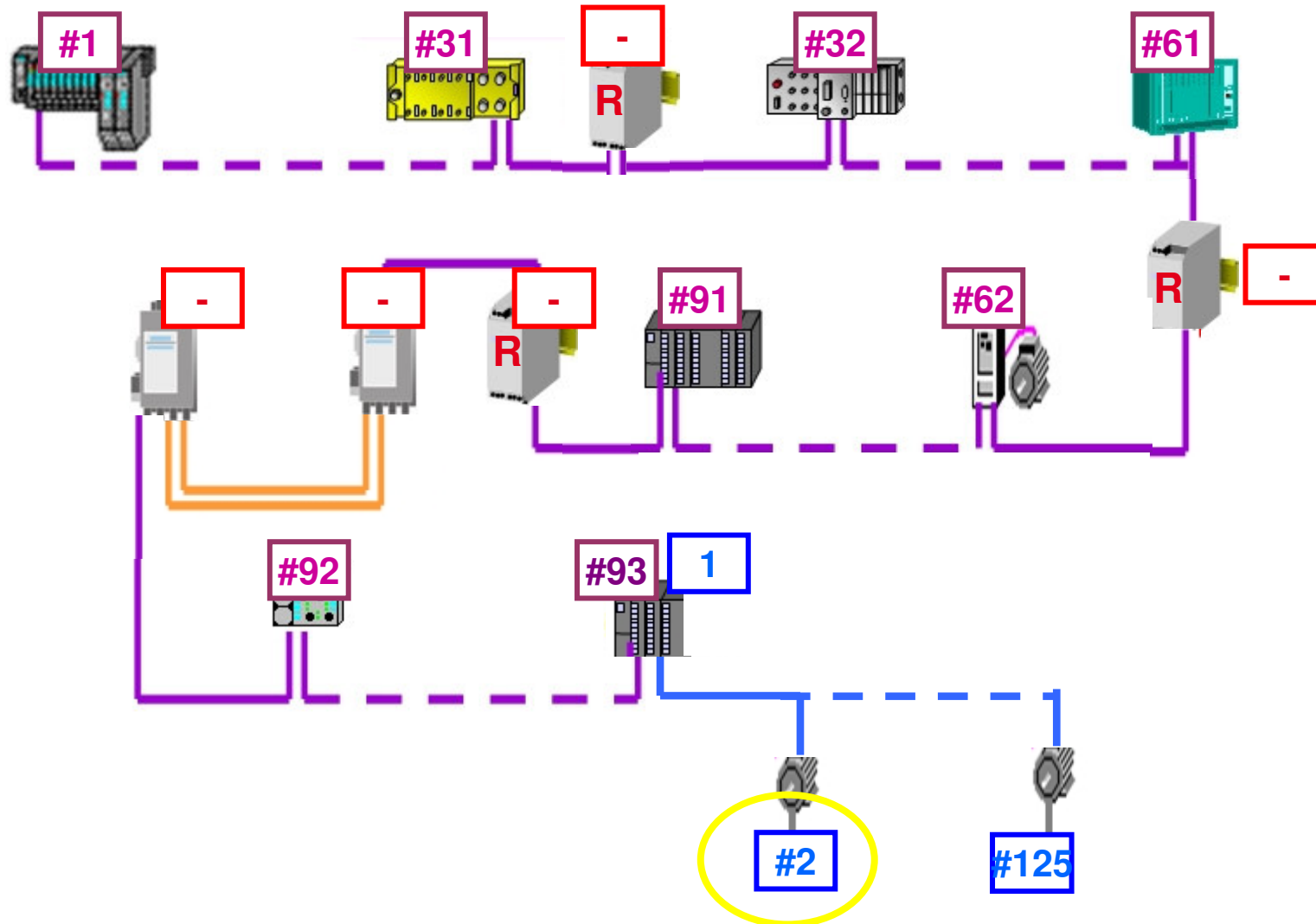


**30 addressable devices
+
2 repeaters**

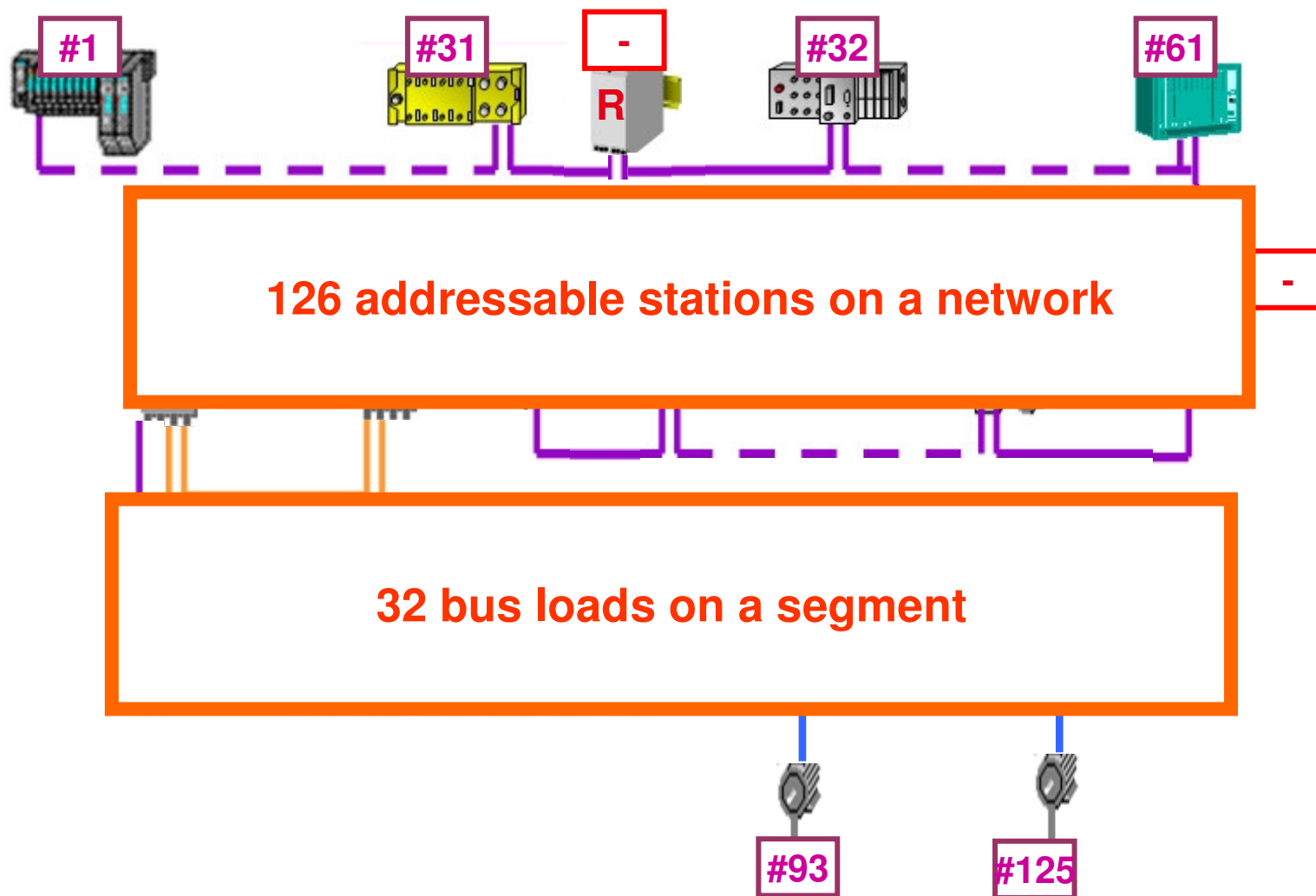
Networks & Segments



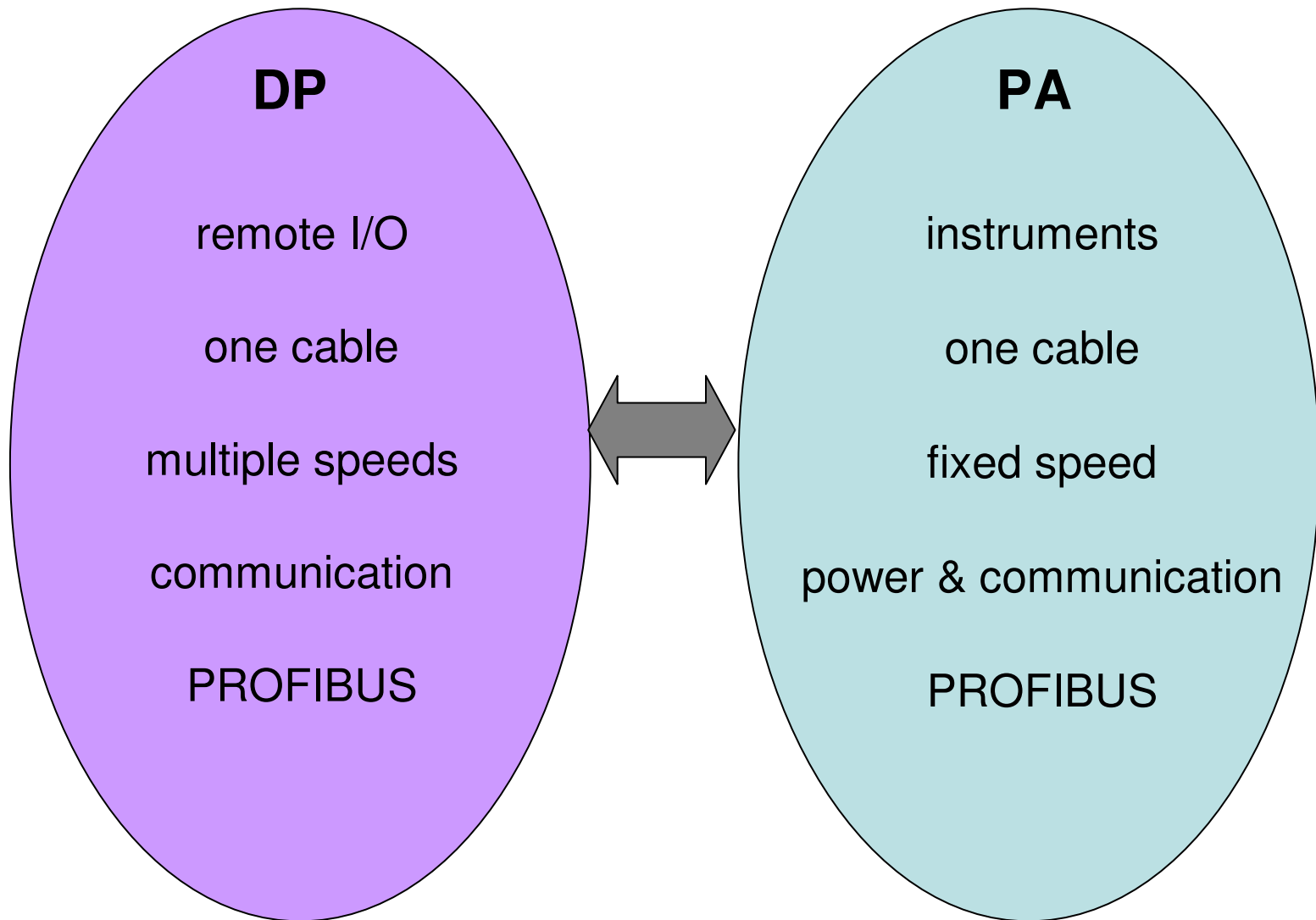
Networks & Segments



Networks & Segments



DP and PA



PROFIBUS DP - copper

	RS485
Data Transmission	Digital; differential signals (RS485); NRZ
Transmission Rate	9.6 to 12000 kbps
Cable	Twisted, shielded two-wire cable
Remote power supply	Possible with additional cores
Ignition Protection Type	Possible for EX
Topology	Line, tree, star with termination
Number of nodes	Up to 32 per segment. Max 126 per network
Number of repeaters	Max 9 (with signal refreshing)

Data Rate vs Segment Length

Transmission Rate (kbps)	Max Segment length (m)
9.6; 19.2 ; 45.45 ; 93.75	1200
187.5	1000
500	400
1500	200
3000; 6000; 12000	100



Values apply to cable type A

Data Rate vs Spur Lines

Transmission Rate (kbps)	Max Total Spur Lines (m)
9.6; 19.2	500
93.75	100
187.5	33
500	20
1500	6.7
>1500	0



Values apply to cable type A

PROFIBUS Fibre – Segment Length

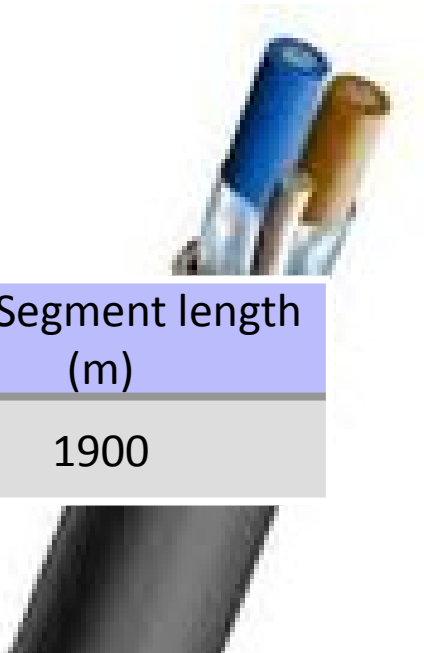
Fibre Type	Transmission Range
Multi-mode glass	2-3km
Single-mode glass	>15km
HCS	Ca. 500m
Plastic FibreHCS	Up to 300m



PROFIBUS PA

	MBP
Data Transmission	Digital; MBP
Transmission Rate	31.25kbps
Cable	Twisted, shielded two-wire cable
Power on Cable	Yes with MBP
Ignition Protection Type	Possible for EX
Topology	Line/Ring with termination
Number of nodes	Up to 32 per segment. Max 126 per network
Number of repeaters	Max 9 (with signal refreshing)

PROFIBUS PA – Segment Length



Type	Transmission Rate (kbps)	Max Segment length (m)
Standard	31.25	1900

In reality – it depends on the devices you have & the coupler you use!

Make sure that you have **min. 9V** at the end of the cable!

PROFIBUS PA – Spur Line Length

Number of devices on segment	Max single spur length (m)
1-12	120
13-14	90
16-18	60
19-24	30



Network Rule 1: Addresses

Address	Purpose
0	Master (Class 2)
1	Master (Class 1)
2..125	Slave
126	Address for Software Address Setting
127	Broadcast/Multicast

- Most configuration tools block address 0 and 126 for slaves
- Address 126 is default “factory setting” address for slaves with no hardware address configuration
- Address 127 is broadcast/multicast address (sync or freeze)

Maximum 124 slaves per network!

Network Rule 2: Number of Devices

- Maximum 126 addressable nodes on a network
- Maximum 124 slaves on a network
- Maximum 32 bus loads per RS485/MBP segment
 - includes devices without addresses
- Devices that generate new segments
 - Repeaters
 - Fiber Optic Couplers
 - DP/PA Couplers

Save a place on every segment for a bus
analyzer/configuration tool!

Network Rule 3: Segment Lengths

PROFIBUS DP (copper)

Max segment length depends on speed

Must have minimum 1m cable between devices
(1.5M++)



PROFIBUS DP (fibre)

Max segment length depends on fibre type

PROFIBUS PA

Max segment length is fixed at 1900m

Check that you have min. 9V at segment end

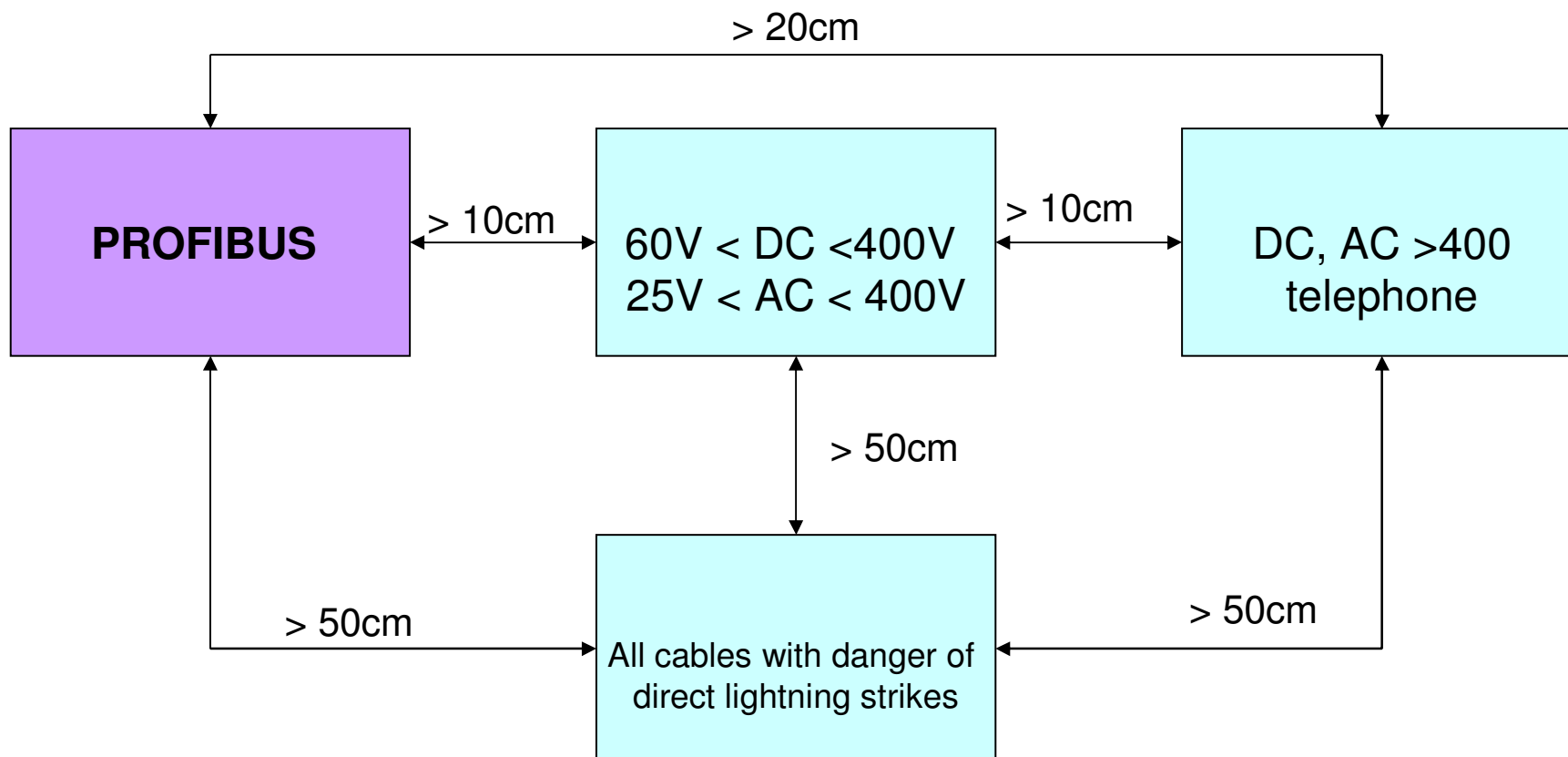
Network Rule 4: Terminate

- Each network segment must start & end with termination
- Terminator can be built into network connector or device
- Terminator can be separate powered terminator



**Incorrect termination is the
number one installation error!**

Network Rule 5: Cable Spacing



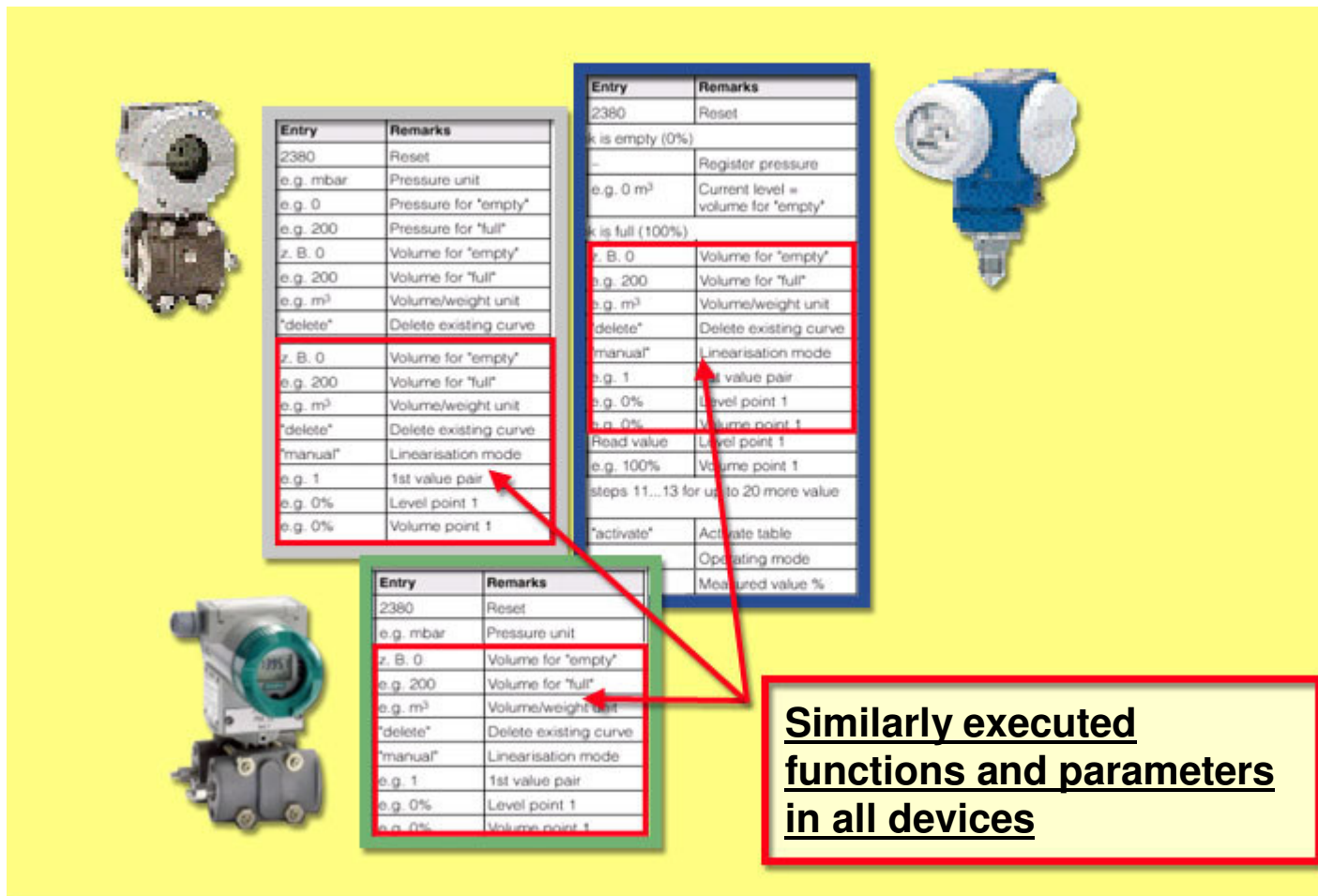
Top 5 Faults*

1. Termination
2. Power Lines
3. Cabling Rules
4. Configuration Faults
5. Damaged or non-certified interfaces

*Based on over 300 field studies carried out by PROCENTEC

Interoperability Due to Profiles

Vendor-independent device interchanging



Entry	Remarks
2380	Reset
e.g. mbar	Pressure unit
e.g. 0	Pressure for "empty"
e.g. 200	Pressure for "full"
z. B. 0	Volume for "empty"
e.g. 200	Volume for "full"
e.g. m³	Volume/weight unit
"delete"	Delete existing curve
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"manual"	Linearisation mode
e.g. 1	1st value pair
e.g. 0%	Level point 1
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Similarly executed functions and parameters in all devices

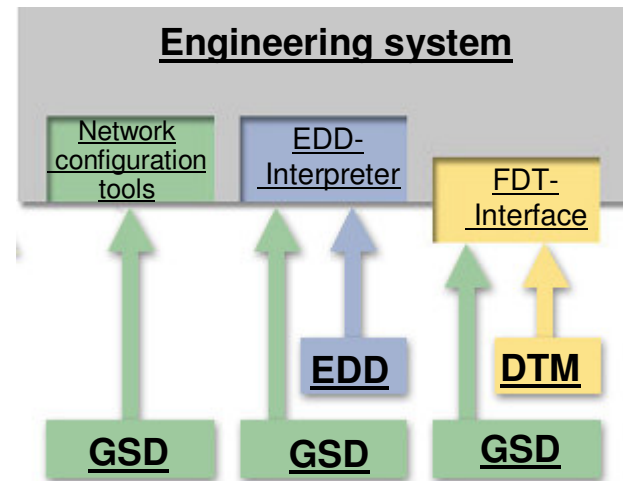
PROFIBUS Integration Technologies

PROFIBUS offers three application-orientated graded technologies for device integration

GSD technology

EDD technology

FDT/DTM technology



GSD

- Mandatory basic description for each PROFIBUS device
- Integration in the master and exchange of measured values and manipulated variables

EDD and FDT/DTM

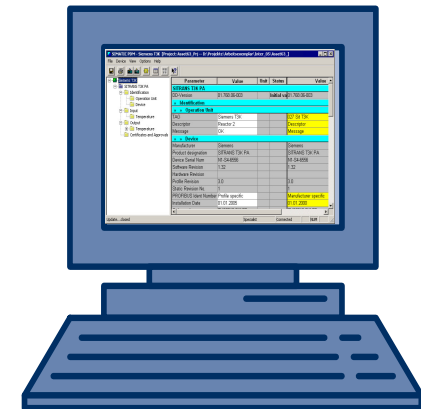
- Used in addition to GSD (optional)
- Exchange of additional information with the master for e.g. diagnostics or asset management

- Electronic Device Description
Sometimes called DD
- Describes all acyclic data (configuration information) which is used by the class 2 master

Describes:

- Configuration parameters**
- Parameters interactions**
- Where parameters are located**
- Simple procedures**

ENGINEERING STATION (CLASS 2 MASTER)

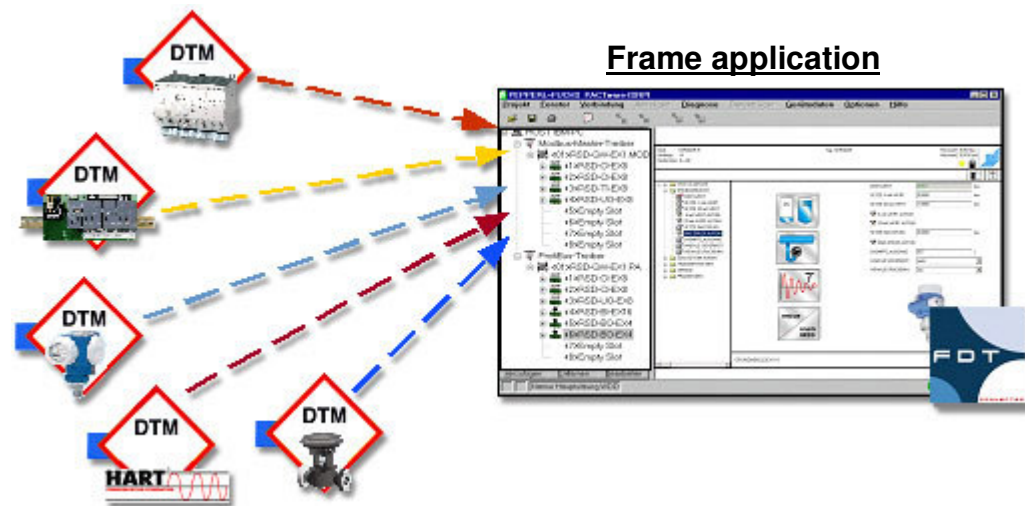


FDT (Field Device Tool) Interface

BSS-

FDT

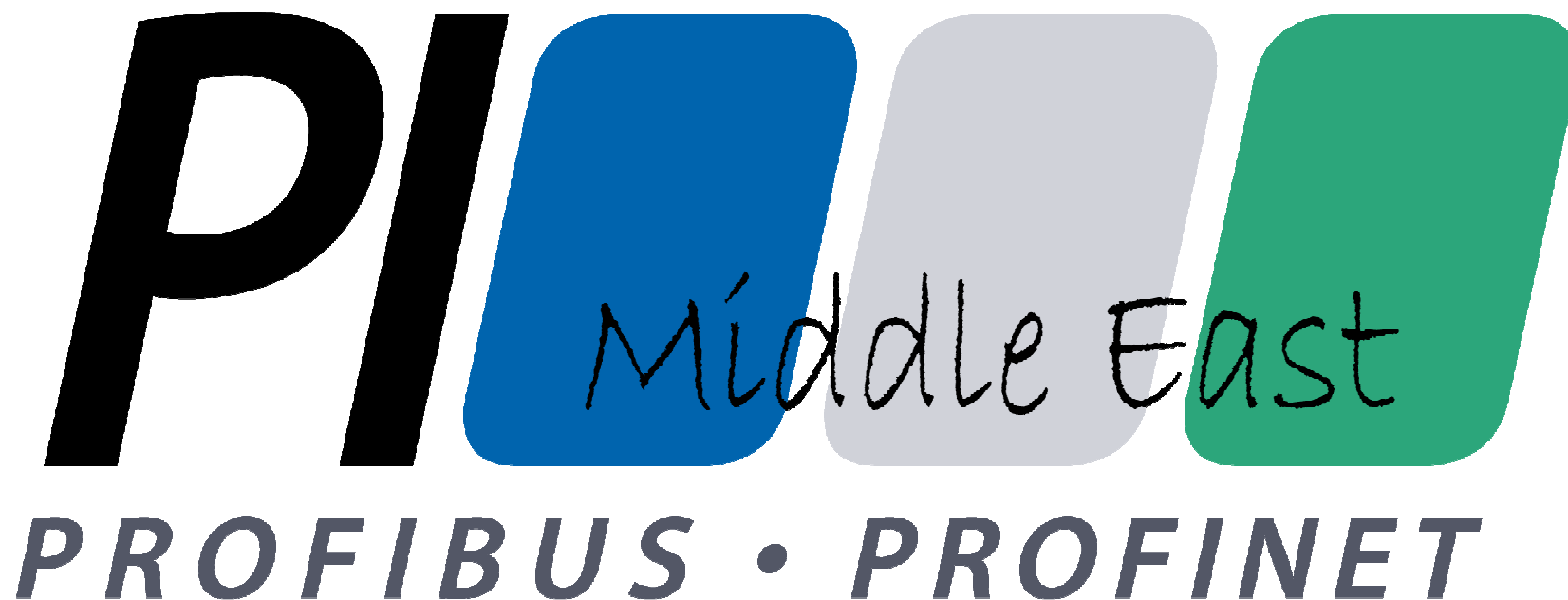
- is a vendor-independent, open interface specification (not a "tool")
- serves as the interface for the open connection of field devices of different manufacturers to tools and control systems using DTM
- defines the interaction between the DTMs and an FDT frame application in the engineering system



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THANK YOU



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