Building reliable PROFIBUS networks

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Water & Wastewater
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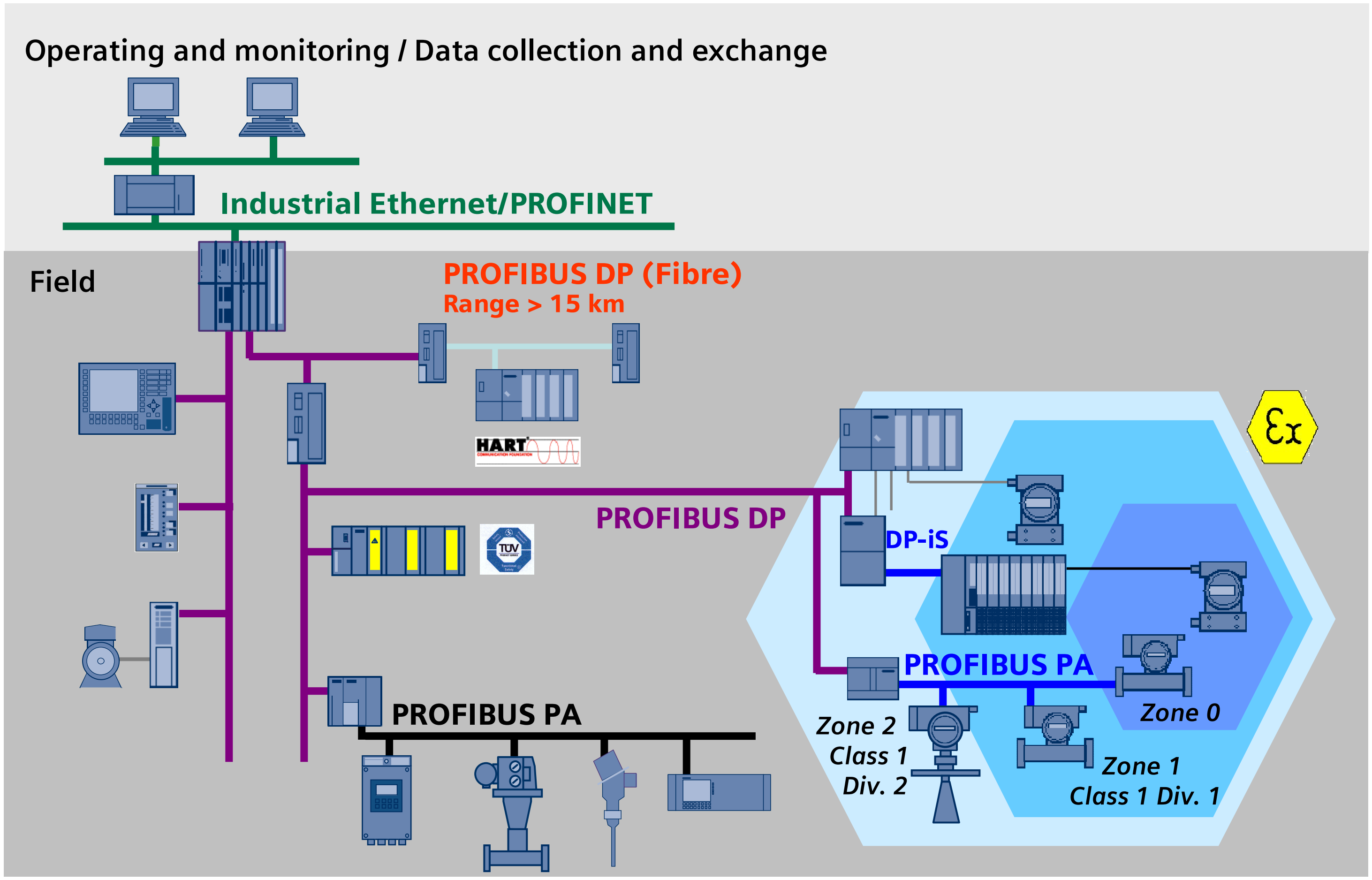
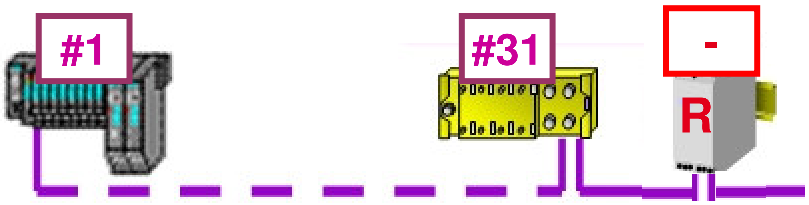
PROFIBUS Architecture

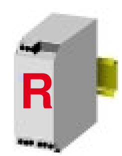


Networks & Segments



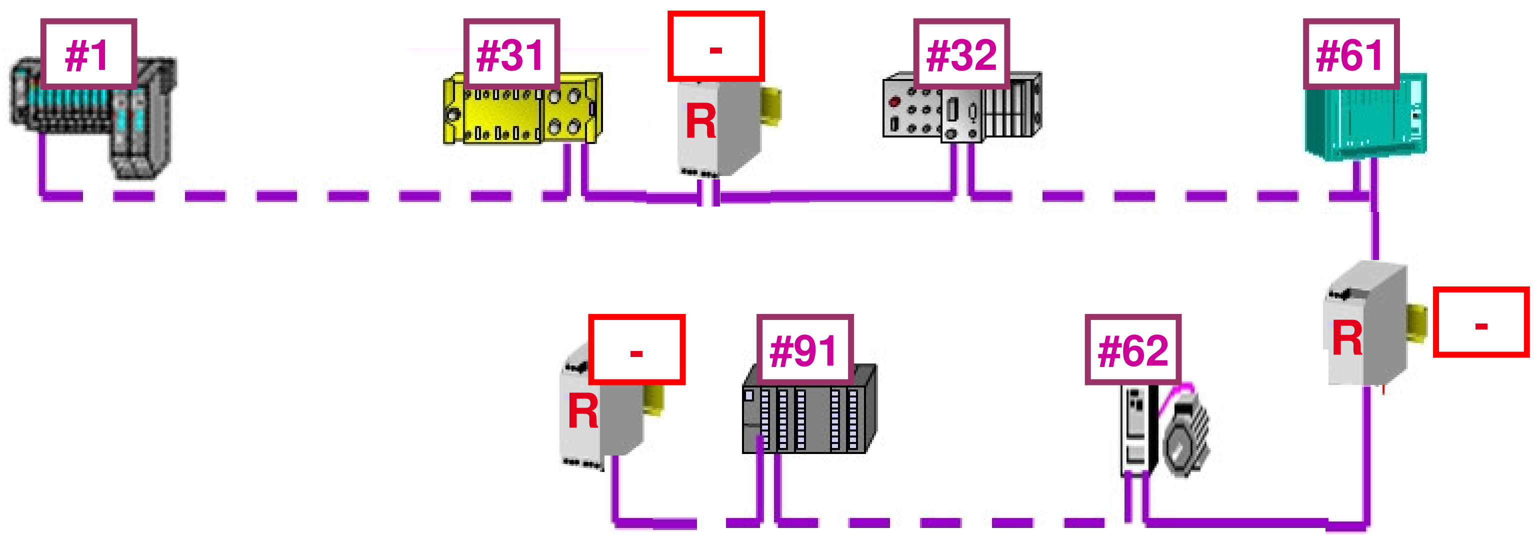
31 addressable devices

32 bus loads



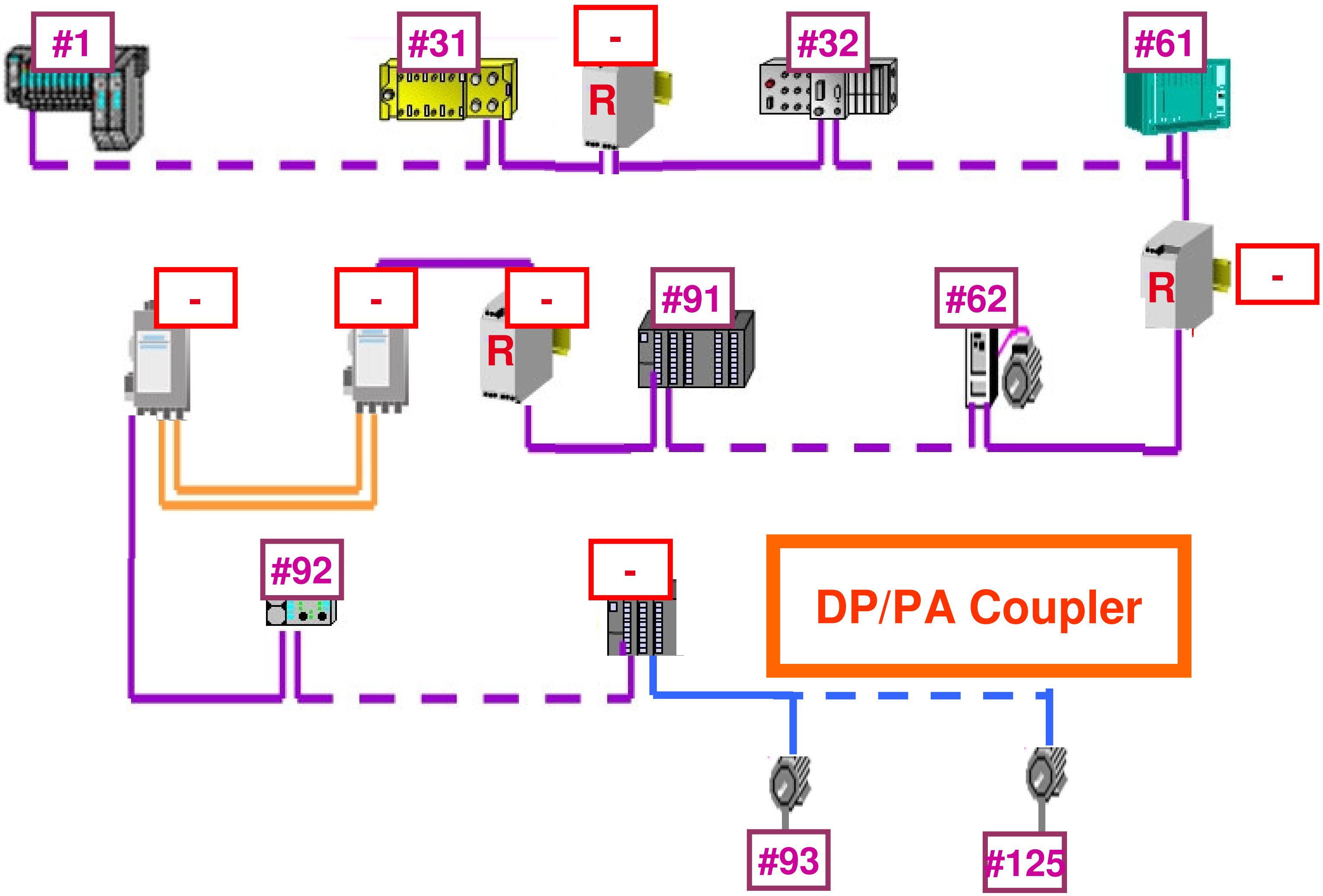
Repeater

Networks & Segments

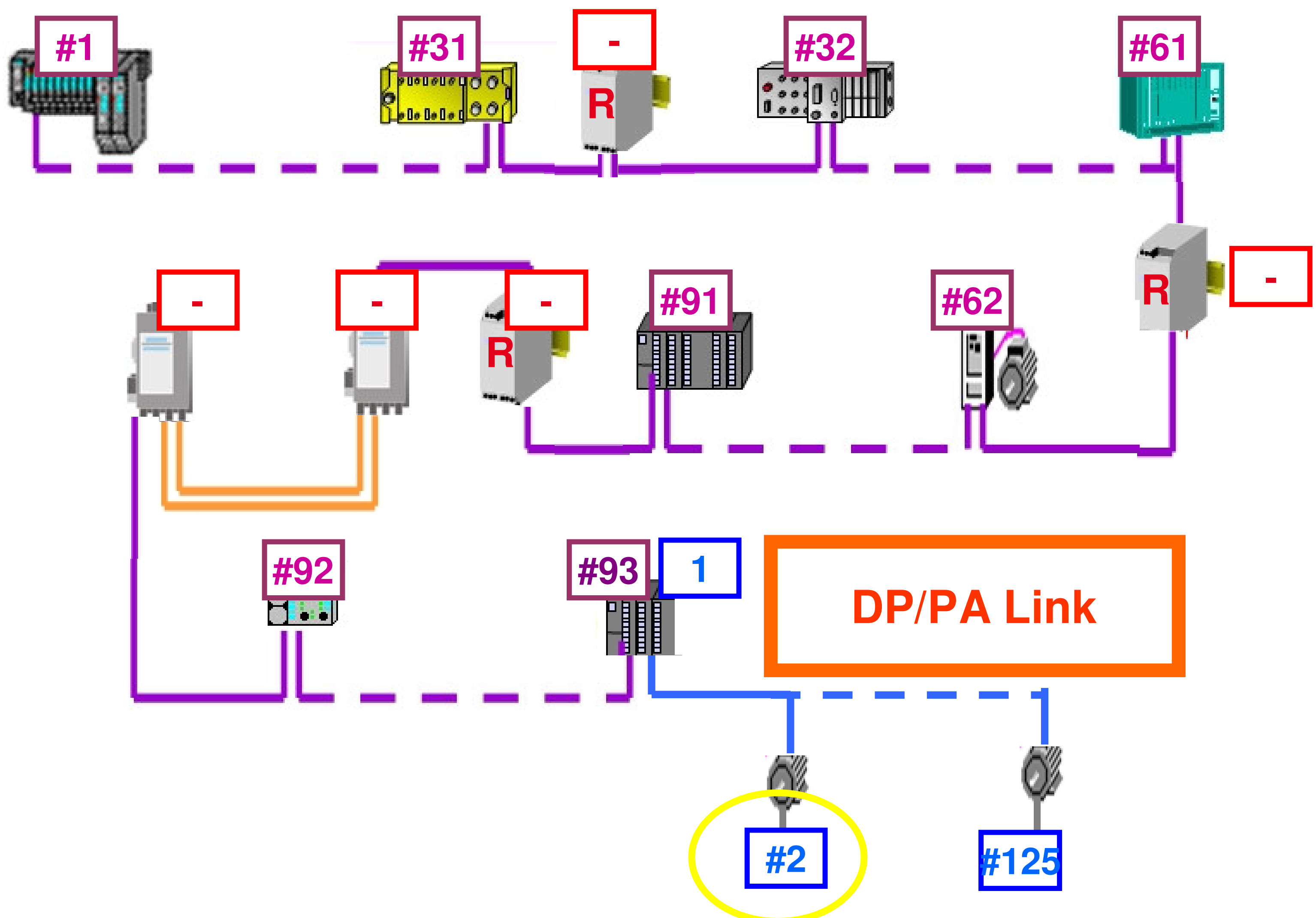


30 addressable devices
+
2 repeaters

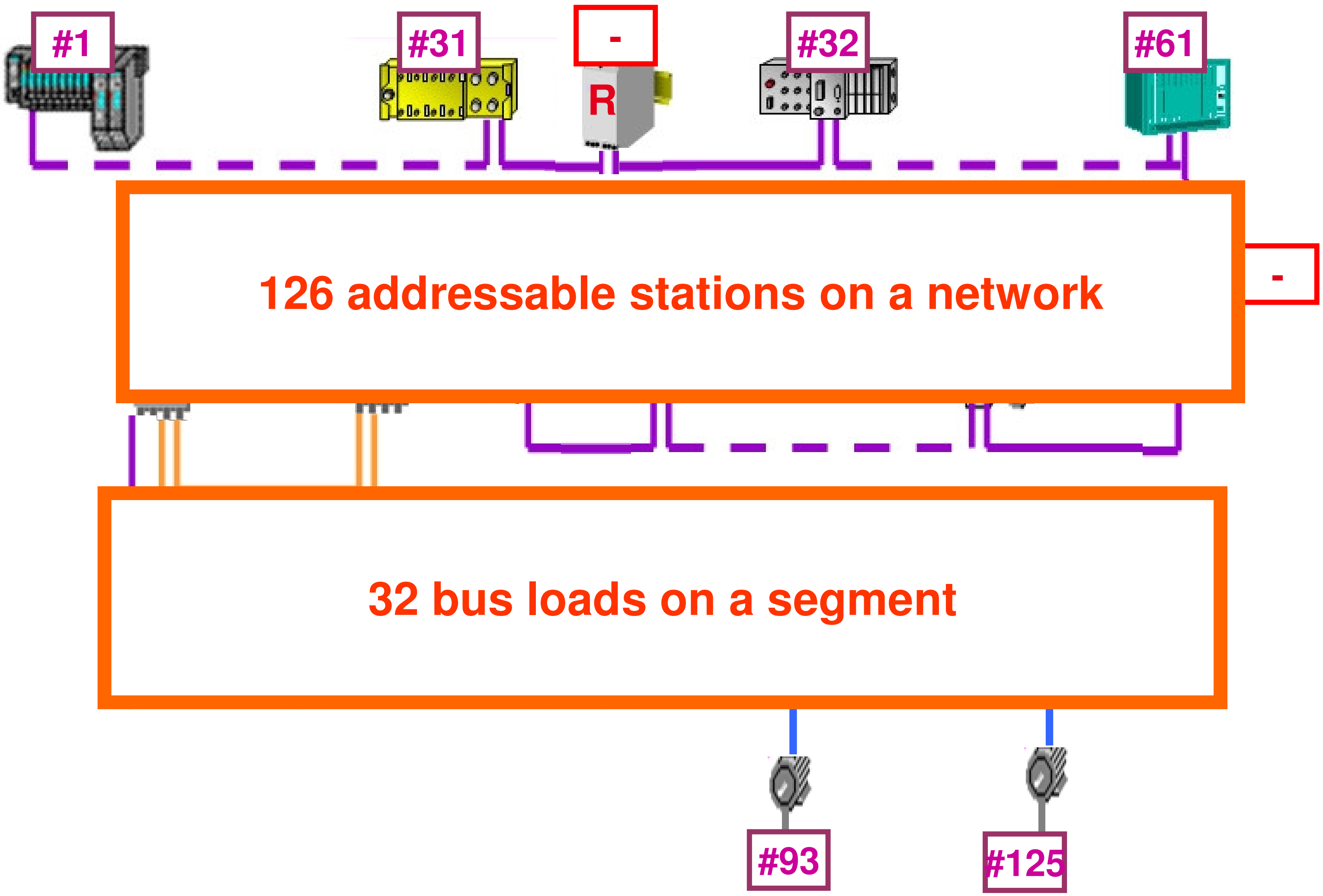
Networks & Segments



Networks & Segments



Networks & Segments



126 addressable stations on a network

32 bus loads on a segment

Middle East
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DP and PA

DP

remote I/O

one cable

multiple speeds

communication

PROFIBUS

PA

instruments

one cable

fixed speed

power & communication

PROFIBUS

PROFIBUS DP - copper

	RS485	RS485-IS
Data Transmission	Digital; differential signals (RS485); NRZ	Digital; differential signals (RS485); NRZ
Transmission Rate	9.6 to 12000 kbps	9.6 to 1500 kpbs
Cable	Twisted, shielded two-wire cable	Twisted, shielded two-wire cable
Remote power supply	Possible with additional cores	Possible with additional cores
Ignition Protection Type	None	Intrinsic safety; Ex ib
Topology	Line, tree, star with termination	Line, with termination
Number of nodes	Up to 32 per segment. Max 126 per network	Up to 32 per segment. Max 126 per network
Number of repeaters	Max 9 (with signal refreshing)	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

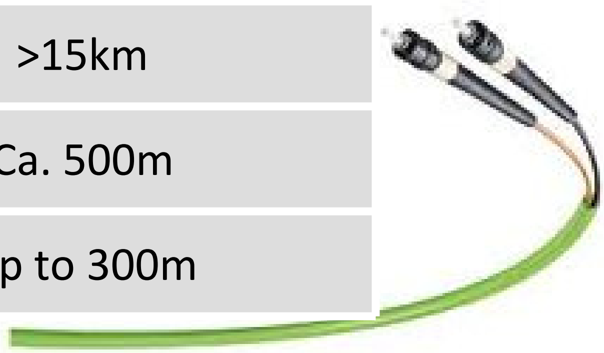
Data Rate vs Spur Lines

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

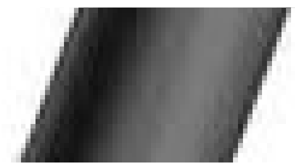


PROFIBUS PA

	Standard	IS
Data Transmission	Digital; MBP / RS-485	Digital; MBP / RS485
Transmission Rate	31.25kbps	31.25kbps
Cable	Twisted, shielded two-wire cable	Twisted, shielded two-wire cable
Power on Cable	Yes with MBP	Yes
Ignition Protection Type	None	Intrinsic safety; Ex ib
Topology	Line/Ring with termination	Line/Ring with termination
Number of nodes	Up to 32 per segment. Max 126 per network	Up to 32 per segment. Max 126 per network
Number of repeaters	Max 9 (with signal refreshing)	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

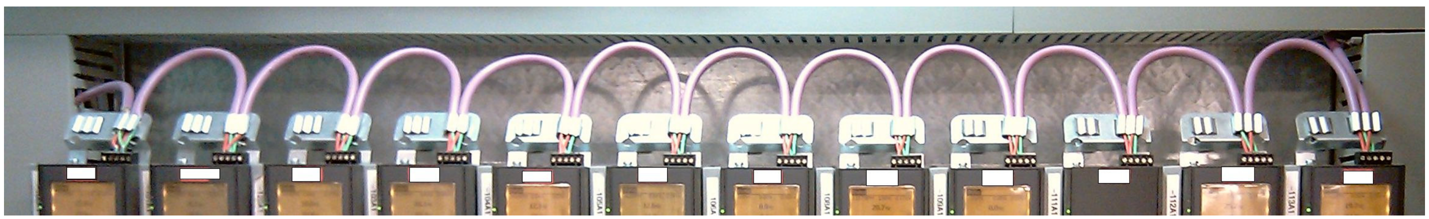
Save a place on every segment for a bus analyzer/configuration tool!

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

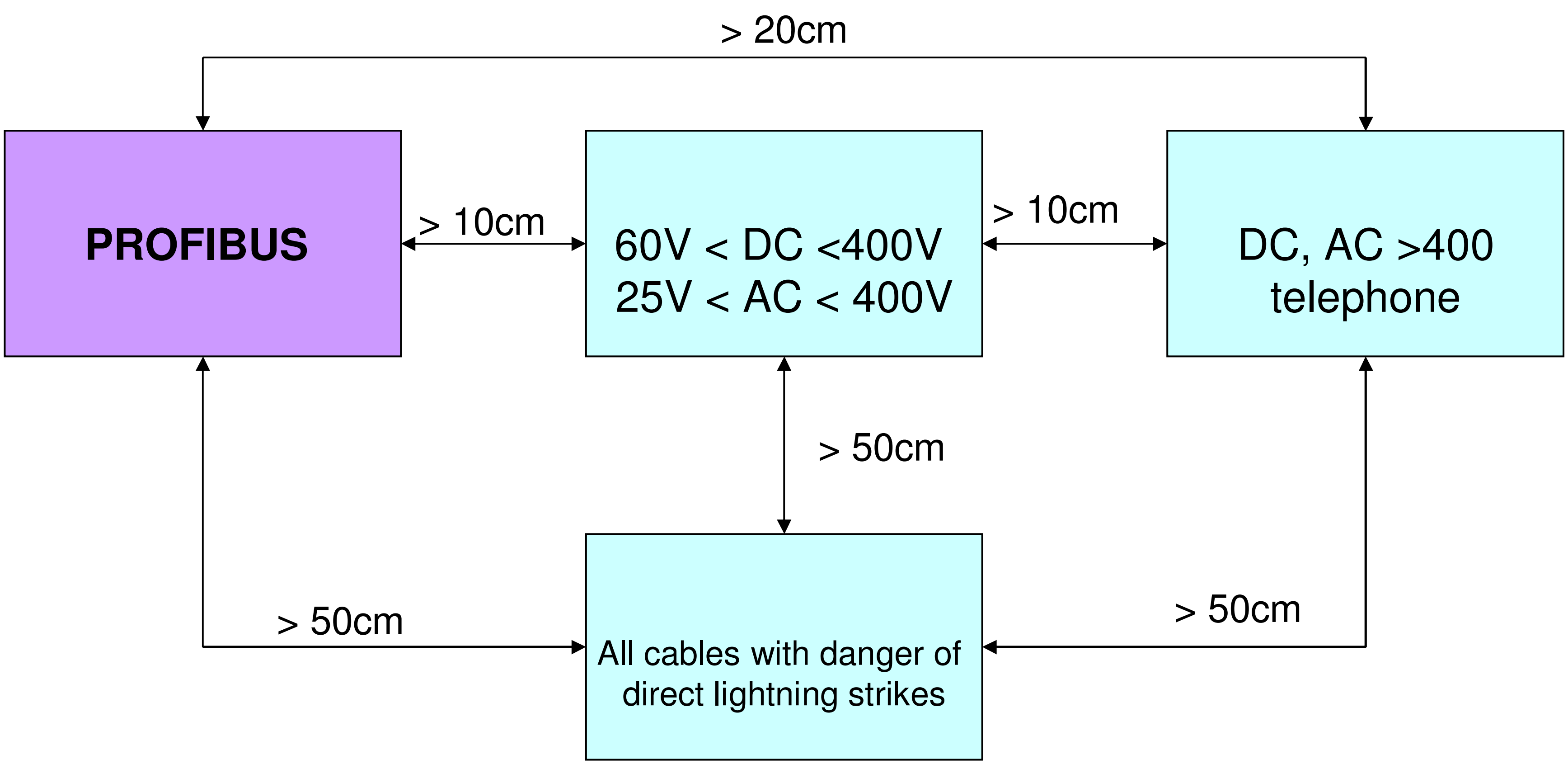
Each network segment must start & end with termination

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

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