PDCC AdHoc

Ethernet-APL Power Classes

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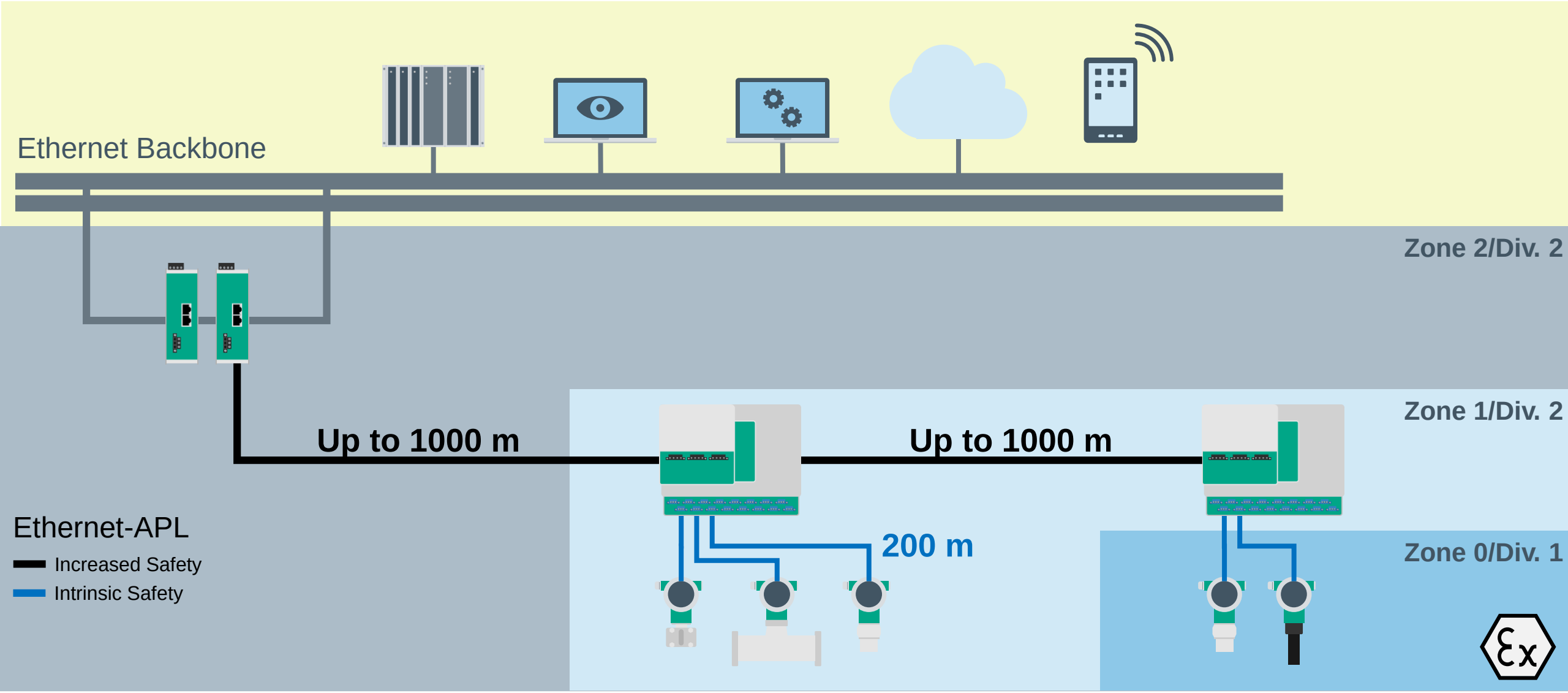
Ethernet-APL Trunk-Spur-Topology



Ethernet-APL Power Classes

- In process automation applications Ethernet-APL currently defines the following power classes (A and C for spurs, 3 and 4 for trunks).

Power Class	A	C	3	4
$U_{PS(max)}$ (VDC)	15	15	50	50
$U_{PS(min)}$ (VDC)	9.6 [1)]	11.61 [1)]	46	46
$I_{PS(min)}$ (mA)	55.56	95	1250	2000
$P_{PS(min)}$ (W)	0.54	1.1	57.5	92
$U_{PL(min)}$ (VDC)	9.0 [3)]	10.6 [3)]	28.8	28.8
$P_{PL(min)}$ (W)	0.5	1.0	36 [2)]	57.6 [2)]

[1)] This is the minimum output voltage at the port connector (due to the internal current limiting circuit, especially for resistive current limitation the internal required voltage is higher).

[2)] Not specified in Ethernet-APL port profiles, as it depends on the cable length, values given are for maximum allowed voltage drop across the trunk cable/minimum required supply voltage for a field switch.

[3)] The difference between $U_{PS(min)}$ and $U_{PL(min)}$ is taking 10.6 Ω cable resistance into account (200 m AWG18 spur @ 70 °C).

Application Background

- Ethernet-APL **spur power classes A and C** are limited to **0.5 W or 1 W** at the field device due to intrinsic safety requirements (2-WISE), which already adds relevant effort for low power design of the field devices.
- Internally in the field switch this equals to summed power of about 1 W for a power class A field device (internal resistive current limitation in the field switch) and 1.2 to 1.3 W for a power class C device (internal electronic current limitation in the field switch).
- Goal is, that over the years the **power consumption of a field device declines from 500 mW to about 250 mW**, but for this more power efficient MCUs need to be developed first.
- Originally for an Ethernet-APL Trunk only **power class 3** was introduced, providing a minimum of **57.5 W (46 V x 1.25 A)** to the trunk.
- Taking cable losses into account a minimum of **36 W (28.8 V x 1.25 A) is available at the field switches**, which is distributed to the switch electronics and the field devices.
- As the number of field devices therefore is pretty limited, a decision has been made to introduce **power class 4**, which allows to feed a minimum of **92 W (46 V x 2 A)** to the trunk.
- This results in a **minimum available power at the field switches of 57.6 W (28.8 V x 2 A)** and allows to **supply significantly more field devices at similar/slightly increased infrastructure cost** (e.g. larger power feeding inductors), but allows a more cost effective overall system.
- Therefore getting to higher power numbers in process automation applications has been important.
- Even if Ethernet-APL uses engineered power instead of PoDL, higher power also for other applications might be important.

Thank you!