

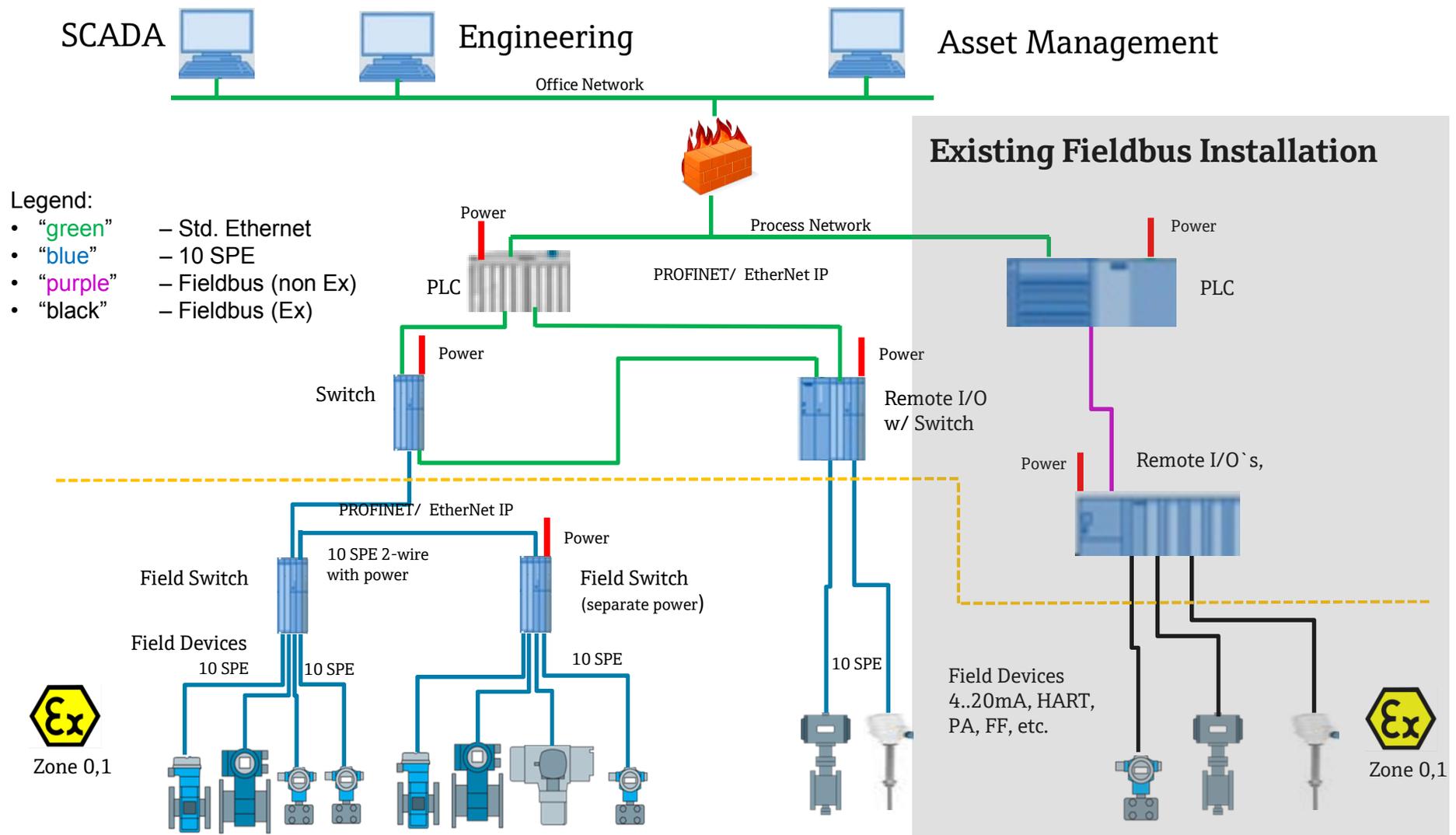
Process Automation Use Case for 10SPE

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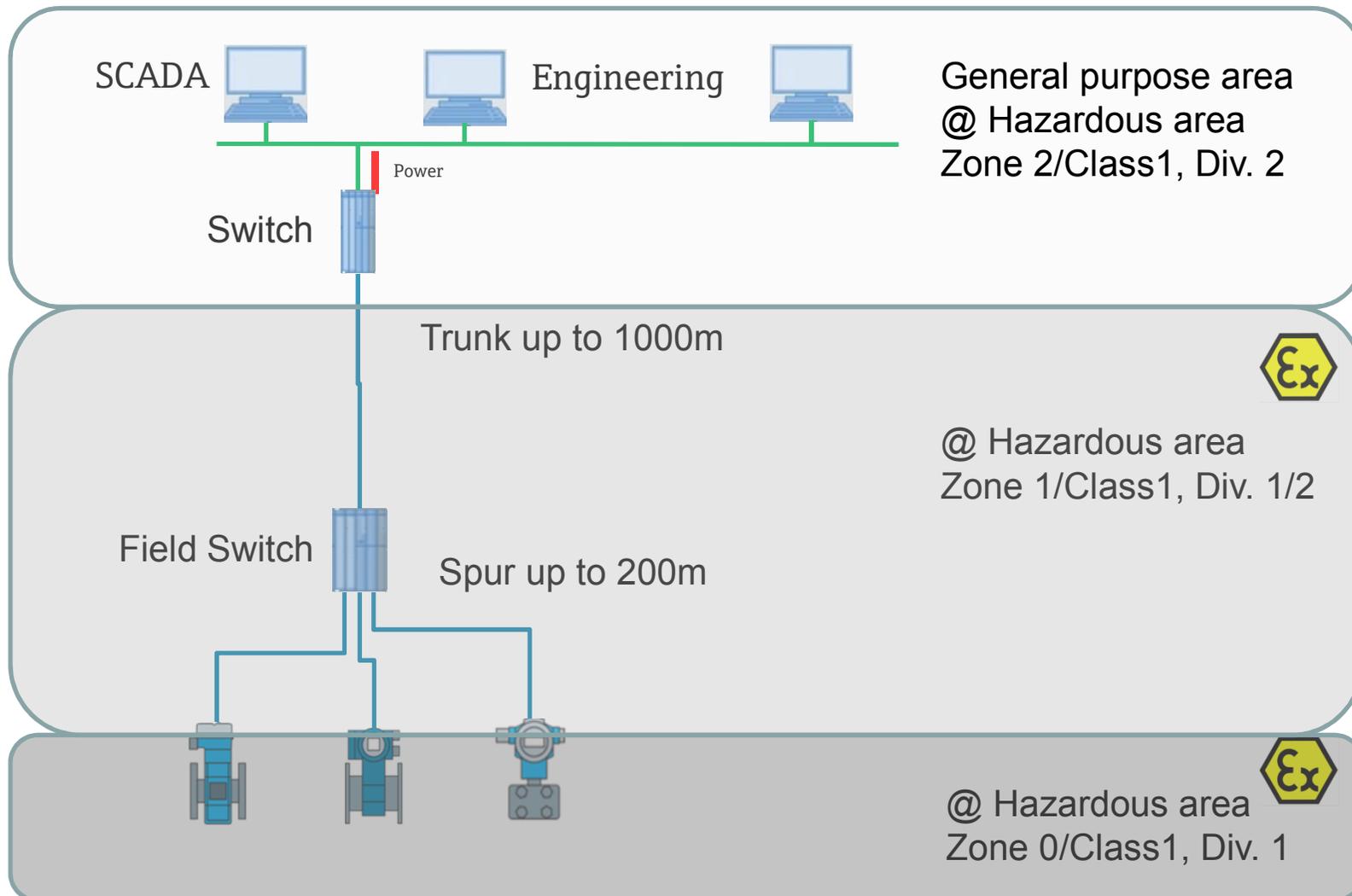
Purpose

- **Scope**
 - Initiate discussion/understanding on typical topologies and installations for industrial applications in Process Automation
 - Typical topology, length and components
 - Environmental conditions: Non-Ex and Ex
- **Rationale**
 - Understanding of the specific requirements on a Ethernet Phy for the Process Automation
 - Topology and resulting link segment characteristic enables specification on the Ethernet Phy
- **Objective**
 - The link segment and the Phy shall not preclude the ability to create intrinsically safe devices and systems
 - The link segment current, voltage, power and stored energy shall comply with IEC 60079
 - The Phy shall not preclude the ability of future transmission speed extension (100 Mb/s)

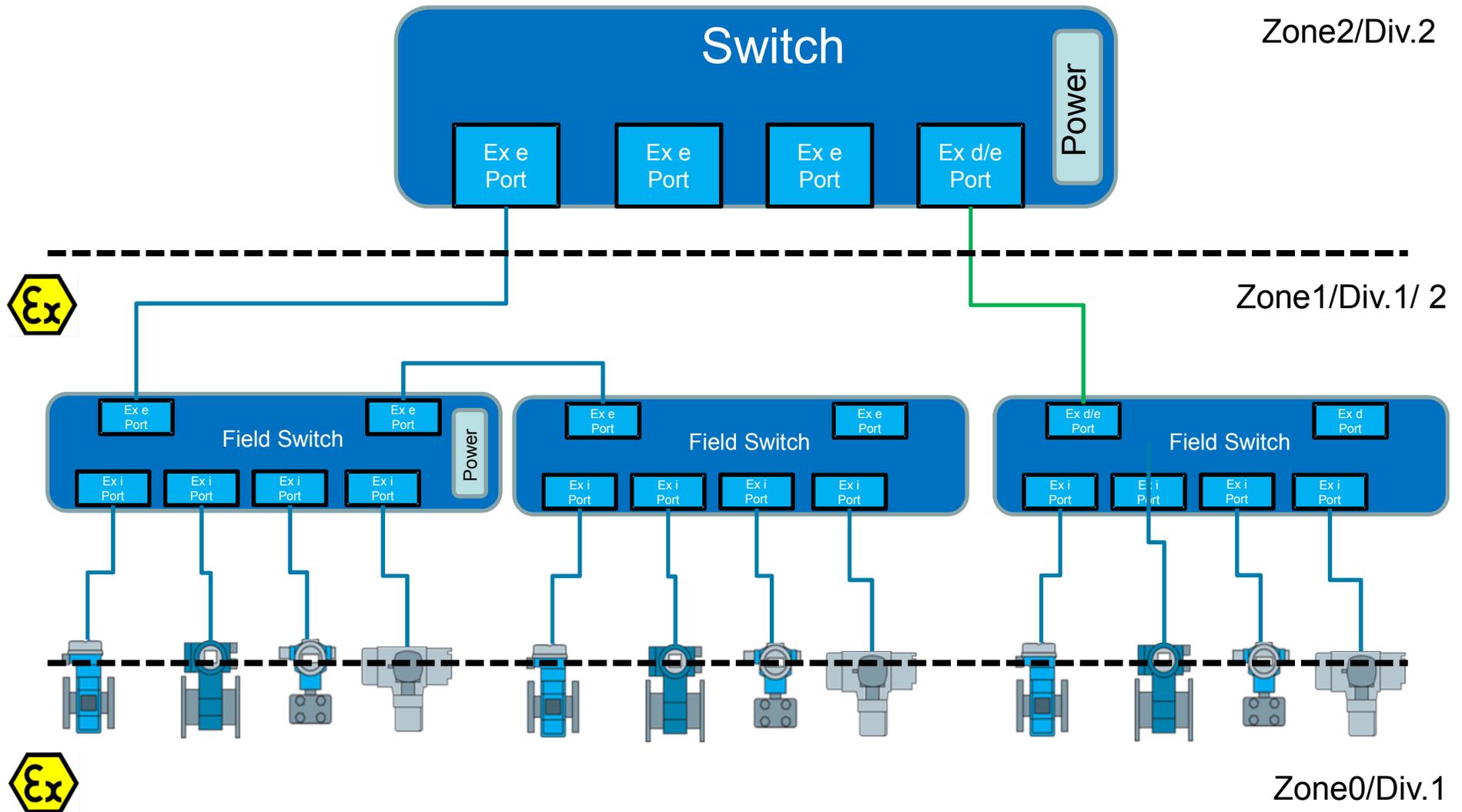
Overview Topology in Process Automation



Generalized Overview of the Topology



Switched Topology



Characteristics of the topology

- Components are installed within different environmental conditions – hazardous areas where different handling of flammable gases, vapors and dust are attributable to normal chemical and physical processes
 - The process automation differentiate different zones with different requirements
 - **Zone 0,1,2:** The explosive characteristics of the air mixtures of gases, vapors, or dusts vary with the specific material involved. Materials have been placed in groups based on their ignition temperatures and explosion pressures
 - The zone defines the probability of hazardous material being present in an ignitable concentration in the surrounding atmosphere.
- Zone 0: Area in which an explosive gas-air mixture is continuously present or present for long periods.
- Zone 1: Combustible or conductive dusts are present. Area in which an explosive gas-air mixture is likely to occur for short periods in normal operation.
- Zone 2: Area in which an explosive gas-air mixture is not likely to occur, and if it occurs it will only exist for a very short time due to an abnormal condition.

Protection types



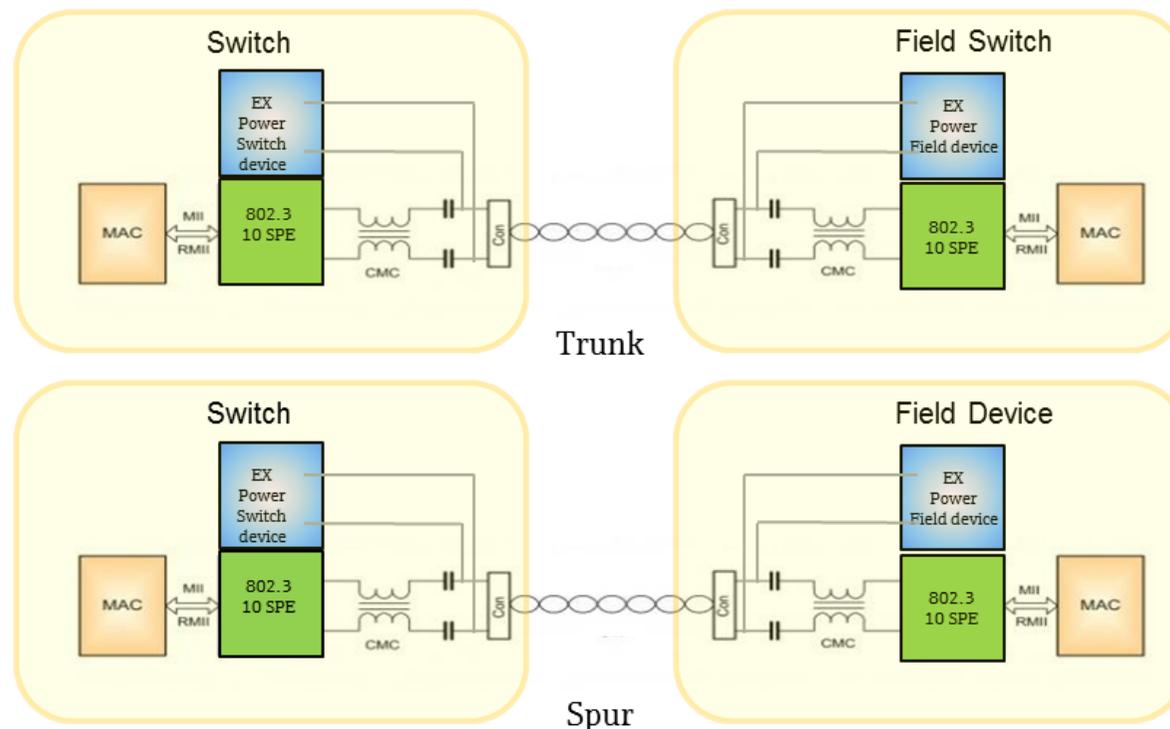
		Zone
Ex d	Flameproof (Explosion proof) Enclosure	1, 2
Ex e	Increased Safety	1, 2
Ex ia	Intrinsically Safe	0, 1, 2
Ex ib	Intrinsically Safe	1, 2
Ex o	Oil Immersion	2
Ex p	Pressurized Apparatus (Purged Apparatus)	1, 2
Ex q	Powder Filling (Sand Filling)	2
Ex m	Encapsulation	1, 2
Ex n or Ex N	Non incentive or/and normally no sparking circuits	2

Typical requirements

- Long distances into the field: typically 1000 meters - called as Trunk with or without power supply into the field
- Shorter distance in the field to the different field devices: typically 200 meters - called Spur
- Powering of the field devices in the field by single twisted pair including communication
- Field devices operating in hazardous areas are intrinsic safe – limited energy in order to avoid release of sufficient electrical or thermal energy under normal or abnormal conditions
- Power consumption of the field device: typically 500 mW to 5 W

Link segment consideration

- Single pair link supports communication and optional power
- Phy power consumption adequate for low power field devices
- 10 Mb/s, full-duplex via MII-Interface including auto negotiation (support for future extension of transmission speed)
- Cable length 200 m for Spur, > 1000 m for Trunk



Summary – Take away

- Ethernet down to the field in Process Automation has to consider the specific requirements: length, hazardous atmosphere and more
 - The outcome of IEEE 802.3 10 Mb/s Single Twisted Pair shall not preclude the ability to create intrinsically safe devices and systems
- The typical Process Automation architecture differentiate Trunk with up to 1000m down to the field and Spur with up to 200m between field device and Field Switch
 - The IEEE 802.3 10 Mb/s Single Twisted Pair should have the ability to bring Ethernet down to the field considering the specific Process Automation topology requirements
- Typical field devices are sensors and actuators that are powered via the network (power over single twisted pair)
 - The IEEE 802.3 10 Mb/s Single Twisted Pair shall not preclude IS compatible design
 - Especially for low power field devices the power consumption of the Phy has to be small
 - The IEEE 802.3 10 Mb/s Single Twisted Pair shall not preclude future extension of transmission speed