

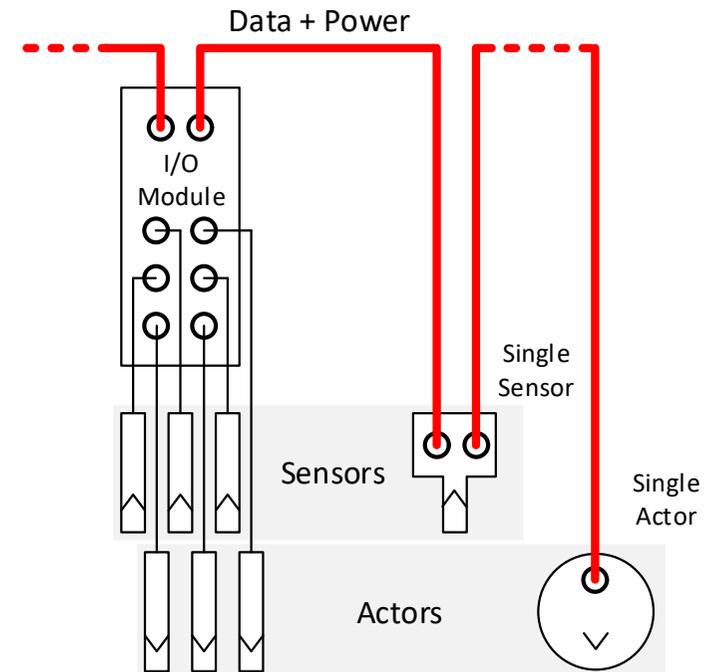
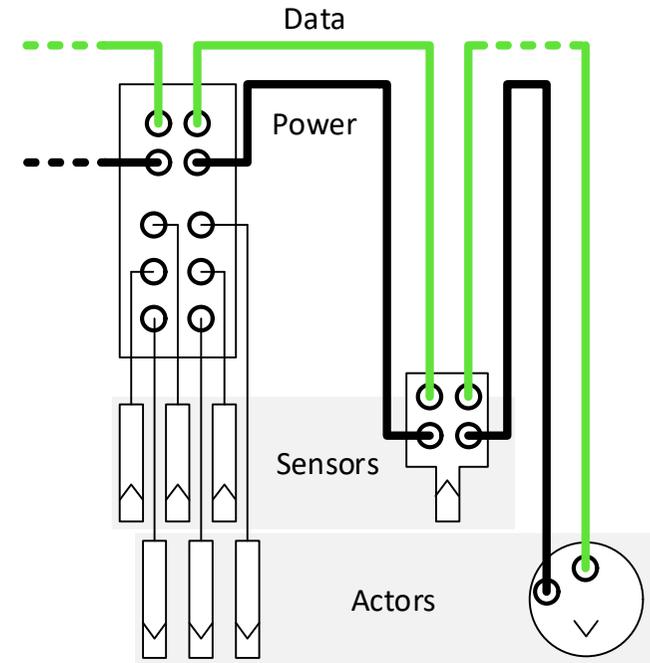
IEEE 802.3 SPMD SG

Considerations for industrial use

Christopher Pohl
Beckhoff Automation

Industrial In-Field Today

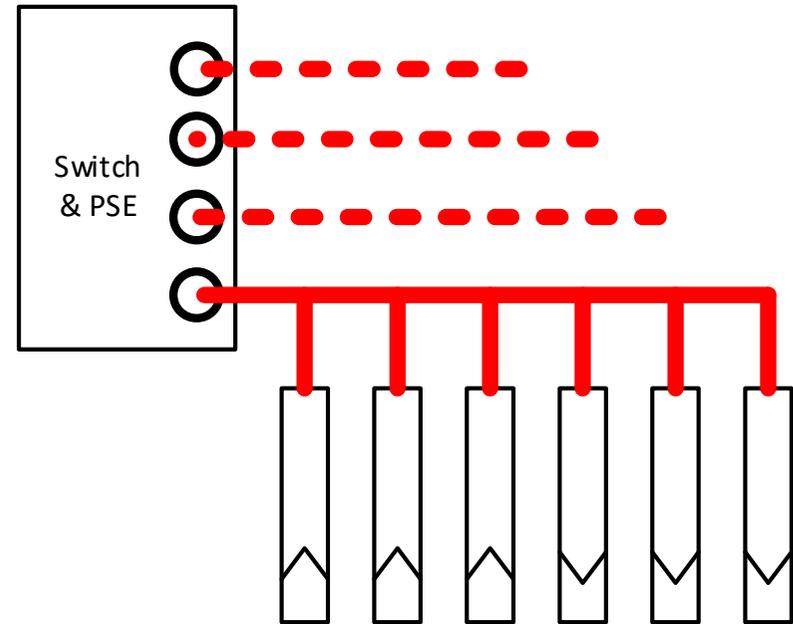
- Standard: Fieldbus and Daisy chained power
- EtherCAT-P as an effort to reduce cabling
- Ethernet based
- “Poodle-Style” Power coupling via inductors
- Daisy chained, engineered power
- Unsuitable for small I/Os
- Overkill for single low end I/Os



Industrial In-Field Requirements

- Lower end multidrop bus **including power**
- Easy to wire in the field
- Small footprint

- Significantly reduce wiring cost
- Allow for more sensors in the field (condition monitoring, predictive maintenance, IIOT, ...)



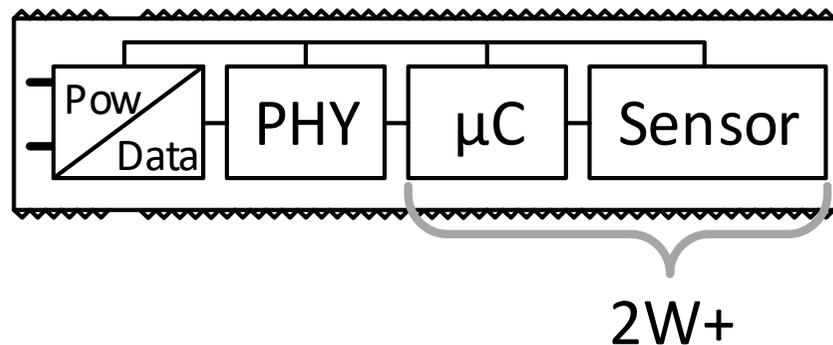
Size considerations

- Simple sensors often come in M8/M12 housing (threaded rods with a longitudinal hole) with as little as 5mm in diameter on the inside
- Remote powering “Poodle Style” has great impact due to inductors/gyrators required
- Being inside the housing would benefit the sensor
- Smaller inductance will result in higher signal droop > tradeoff



Others

- Should be able to provide at least 2 Watts of power to components outside the PHY
- Automatic power allocation scheme required
- 16-32 nodes per line
- Nice to have: 50m end to end



Application Example: IO-Link

- IO-Link is a low cost, P2P, Master/Slave industrial fieldbus
- End points may have high complexity but low communication requirements
- Limited bandwidth ($\leq 230.4\text{kBaud}$), 3/5 wires per device
- Market share 2018 \$3.5bn
 - Devices ~\$2bn
 - Masters ~\$1.5bn
- Expected growth 2019: 12%

[https://drivesncontrols.com/news/fullstory.php/aid/5951/IO-Link_revenues_hit_\\$3.5bn_in_2018_and_are_booming.html](https://drivesncontrols.com/news/fullstory.php/aid/5951/IO-Link_revenues_hit_$3.5bn_in_2018_and_are_booming.html)

