IEEE P802.3bt
Application Considerations and Capabilities

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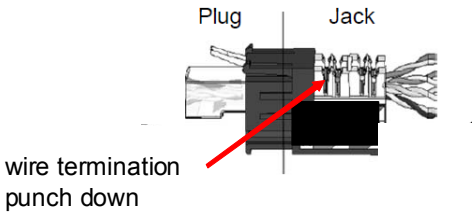
Supporters

- Robert Wagner, Ronald Nordin – Panduit
- Paul Vanderlaan – Berk-Tek LLC
- Paul Kish – Belden
- Shadi AbuGhazaleh – Hubbell Premise Wiring
- Sterling Vaden – Vaden Enterprises
- Valerie Maguire – Siemon Company
- Robert Lounsbury – Rockwell Automation

Discussion

•802.3at detection and rejection criteria for 802.3bt enables;
- − Backward compatibility
  - ▪Ensuring interoperability
- − PSE to turn on power only on the same pairs as those used for detection.
  - ▪Powering only compliant PDs
- − Rejection of links
  - ▪Mechanism of turning power on a link (same pairs) is dependent on detecting compliant links (rejecting non-compliant links).

•Implementation of 802.3at detection and rejection criteria supports;
- – Prevalent use case(s) while ensuring interoperability; eliminating possibility of damage to non-compliant devices. e.g., two different switch ports connecting two separate PDs or DTEs with single cable via combiners or splitters.
- −Rejecting non-compliant links on a pair/conductor basis. When faults are introduced during connector terminations, it's generally to fewer than all 4-pairs and typically a single pair or conductor of a pair.



•802.3bt should maintain and expand 802.3at detection and rejection criteria for above and in consideration of developing use cases.

•Consider diversity of IoT (Internet of Things) and structured cabling applications to assess benefits of independent power channel control.
- – PSE to turn on power only on the same pairs as those used for detection.
- – Rejection of links

Discussion

- Maintain 802.3at detection and rejection criteria for 802.3bt.

33.2.5 PSE detection of PDs

In any operational state, the PSE shall not apply operating power to the PI until the PSE has successfully detected a PD requesting power.

The PSE probes the link section in order to detect a valid PD detection signature. The PSE PI is connected to a PD through a link segment. In the following subclauses, the link is not called out to preserve clarity.

The PSE is not required to continuously probe to detect a PD signature. The period of time when a PSE is not attempting to detect a PD signature is implementation dependent. Also, a PSE may successfully detect a PD but then opt not to power the detected PD.

The PSE shall turn on power only on the same pairs as those used for detection.

33.2.5.4 Rejection criteria

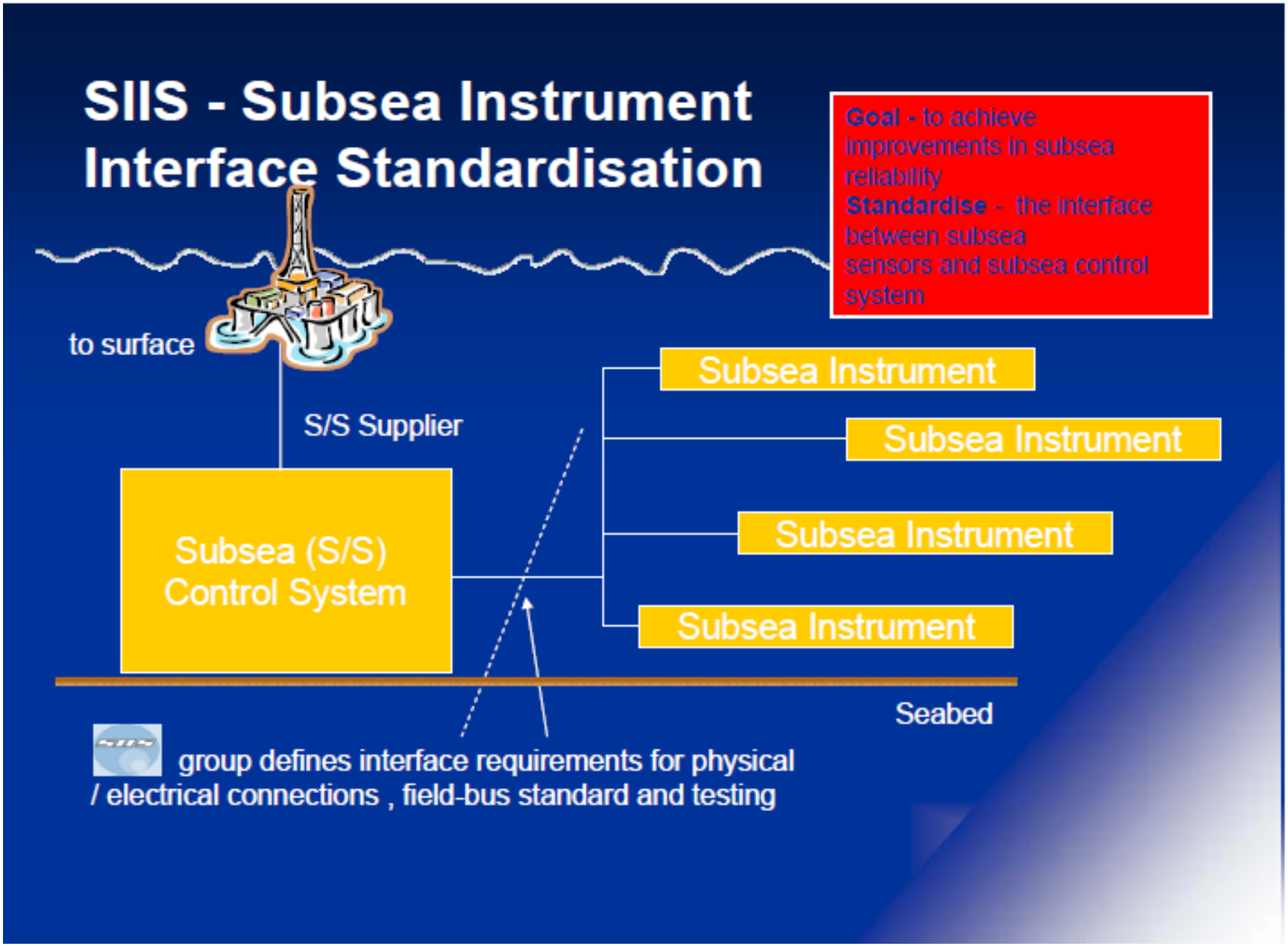
The PSE shall reject link sections as having an invalid signature, when those link sections exhibit any of the following characteristics between the powering pairs, as specified in Table 33–6:

a) Resistance less than or equal to R_{bad} min, or
b) Resistance greater than or equal to R_{bad} max, or
c) Capacitance greater than or equal to C_{bad} min.

A PSE may accept or reject a signature resistance in the band between R_{good} min and R_{bad} min, and in the band between R_{good} max and R_{bad} max. A PSE may accept or reject a parallel signature capacitance in the band between C_{good} max and C_{bad} min.

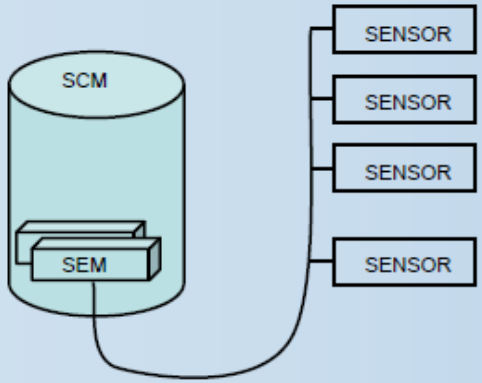
In instances where the resistance and capacitance meet the detection criteria, but one or both of the offset tolerances are exceeded, the detection behavior of the PSE is undefined.

Example sensor network evolving to Ethernet



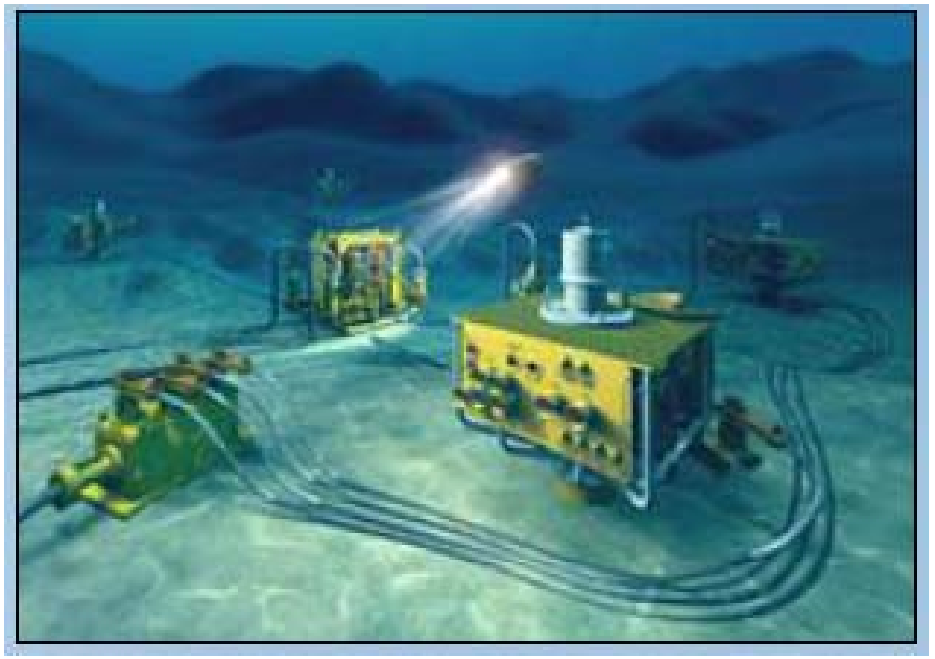
Migration of sensors to Ethernet (100BASE-T)

- **Standard interface between the subsea control module and subsea sensors**



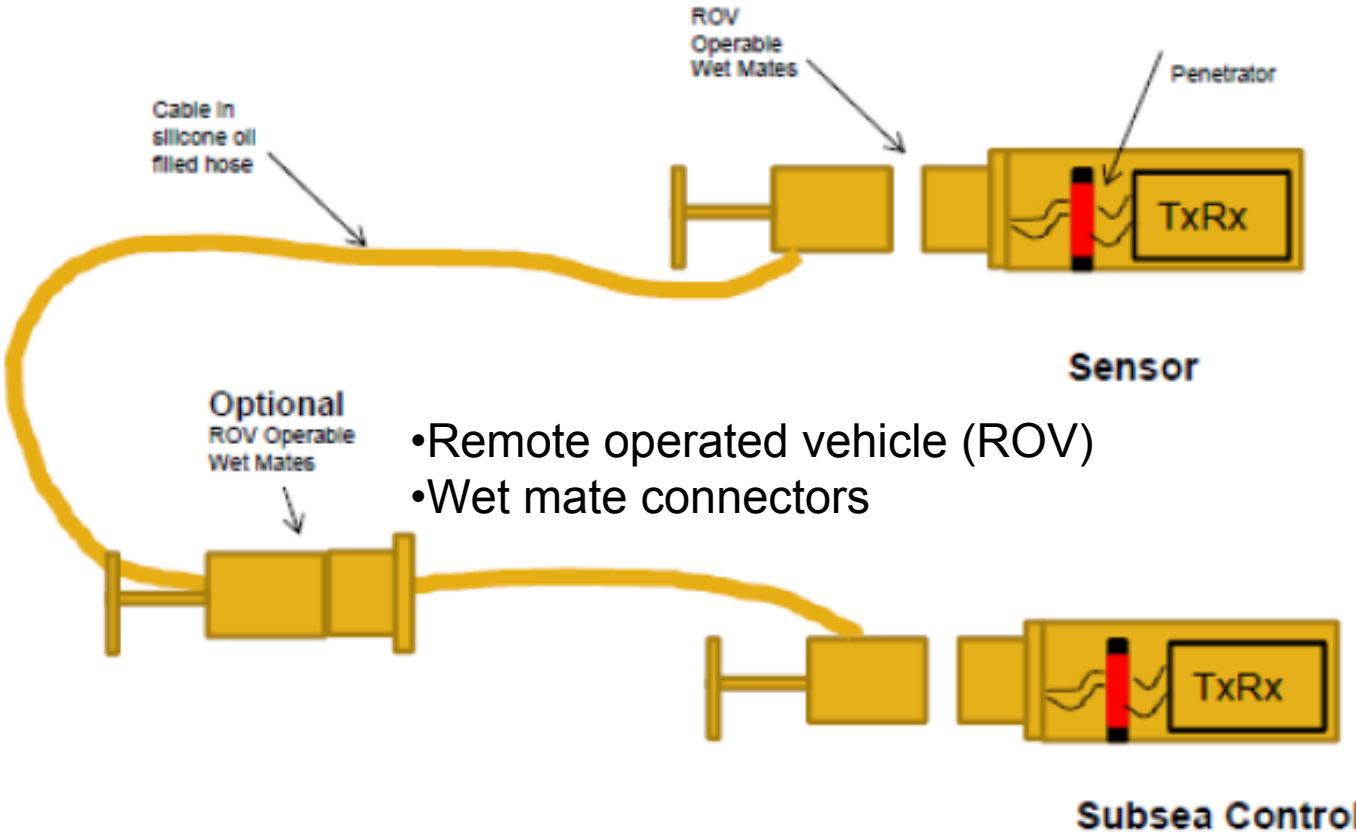
SIIS has developed a tri-level classification system for control system to sensor interfaces:

Level 1 – Simple instrument loops (4-20 mA)
Level 2 – CANbus (Fault tolerant) CANOPEN
Level 3 – Ethernet TCP/IP



- **From ten industry protocols considered, SIIS chose three based on cost comparisons and levels of support across industry.**

Ethernet jumper link (copper)



- Remote operated vehicle (ROV)
- Wet mate connectors

- Ethernet performance for bandwidths of 100Mb (or better).

- 802.3at detection and rejection criteria for 802.3bt enables capability options for subsea control module/sensor implementations and other sensor applications evolving to Ethernet 100 Mb/s and power.
  - 4PPoE providing independent control of power and data expands power options for sensor applications requiring 100 Mb/s and power.

What Industrial Automation Needs*

- Standardized MAC and PHY technology
- Wired and wireless IP-enabled devices at the edge of the industrial network
  - Discrete sensors (e.g., proximity sensors)
  - Analog sensors (e.g., temperature sensors)
  - Actuators (e.g., motor control devices)
  - Meters (e.g., power monitors)

**Source: Page 24 first two bullets addressing MAC/PHY and sensors:*
https://mentor.ieee.org/802.24/dcn/14/24-14-0008-00-0000-nuts-and-bolts-of-the-internet-of-things.pdf

Conclusions

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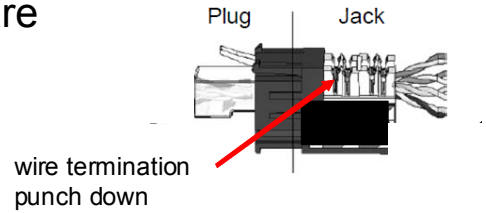


•802.3at detection and rejection criteria for 802.3bt enables capability options for implementation of sensor applications evolving to Ethernet (PoE).
- –4PPoE providing independent control of power and data expands power options for sensor applications evolving to 100 Mb/s Ethernet and power.

•Maintain 802.3at detection and rejection criteria for 802.3bt
- −PSE to turn on power only on the same pairs as those used for detection.
- −Rejection of links

Backup

Connecting the things…

•IoT is about putting things on the Internet….. door locks, appliances, smart meters, video surveillance, health care devices, thermostats…sensors…

•Structured cabling and pathway standards continue to evolve to address connectivity between network devices;

•Industrial

•Broadcast

•Building automation

•Health care

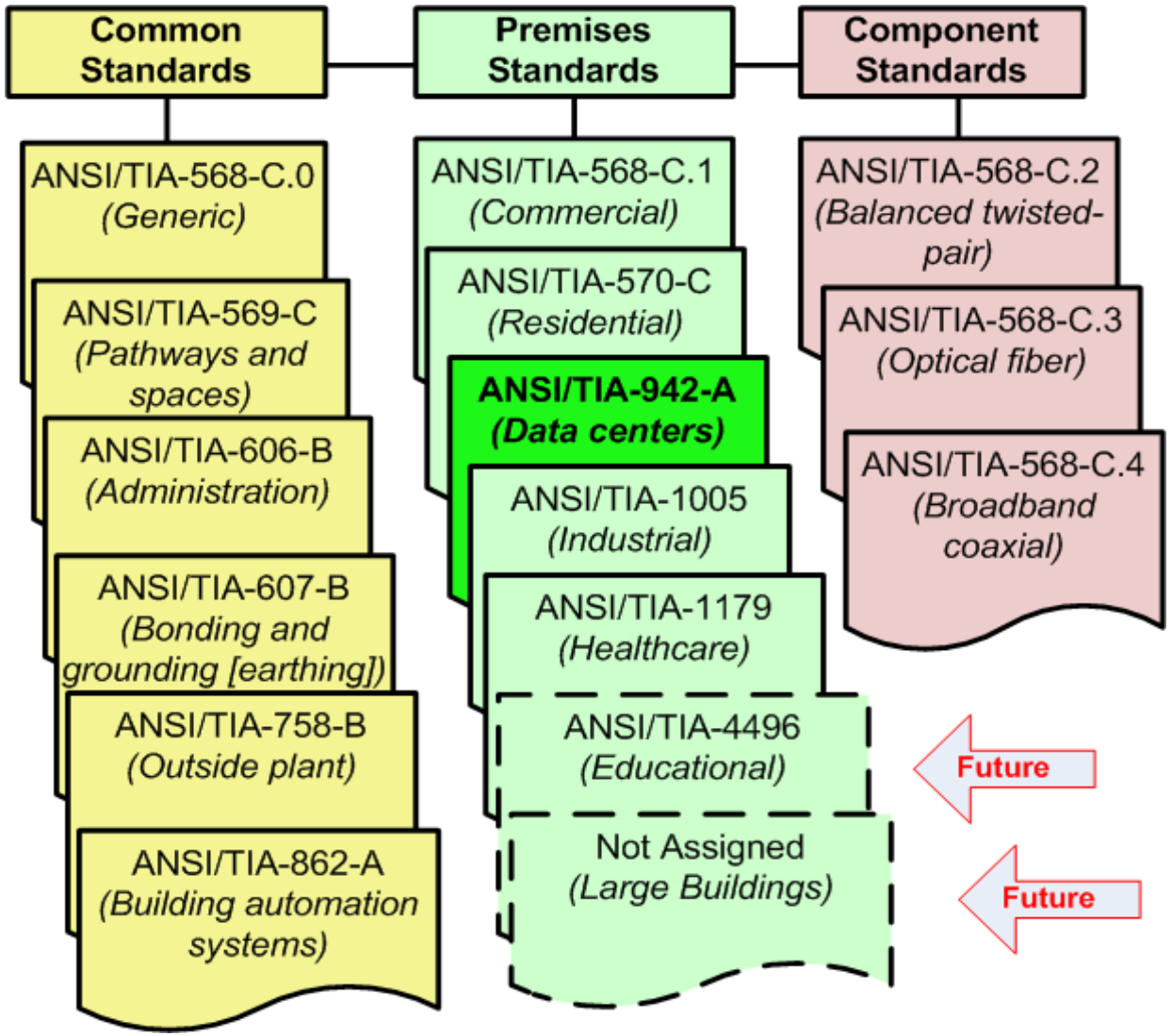
•Educational facilities

•“Intelligent Building” technologies

•Data centers

TIA/TR42 Cabling Standards

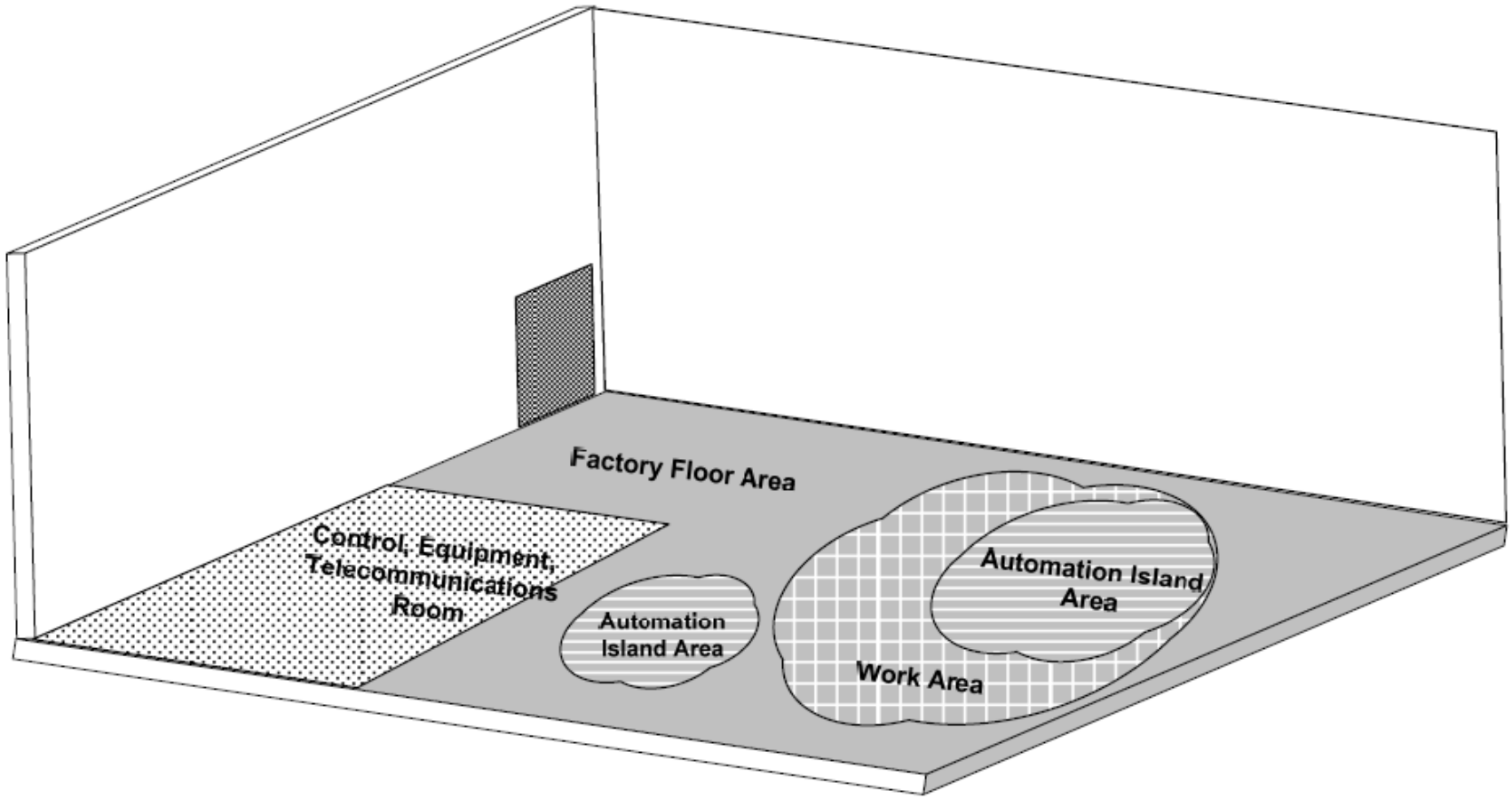
Industrial Cabling – ANSI/TIA-1005
Building Automation – ANSI/TIA 862-A



ANSI/TIA-1005-A Cabling For Industrial Premises

- **Industrial Cabling performance requirements**

Cabling in industrial areas may require a combination of environmental compatibility (components, protection, isolation, separation) and enhanced transmission performance in order to support the intended applications.



Example of Industrial Areas

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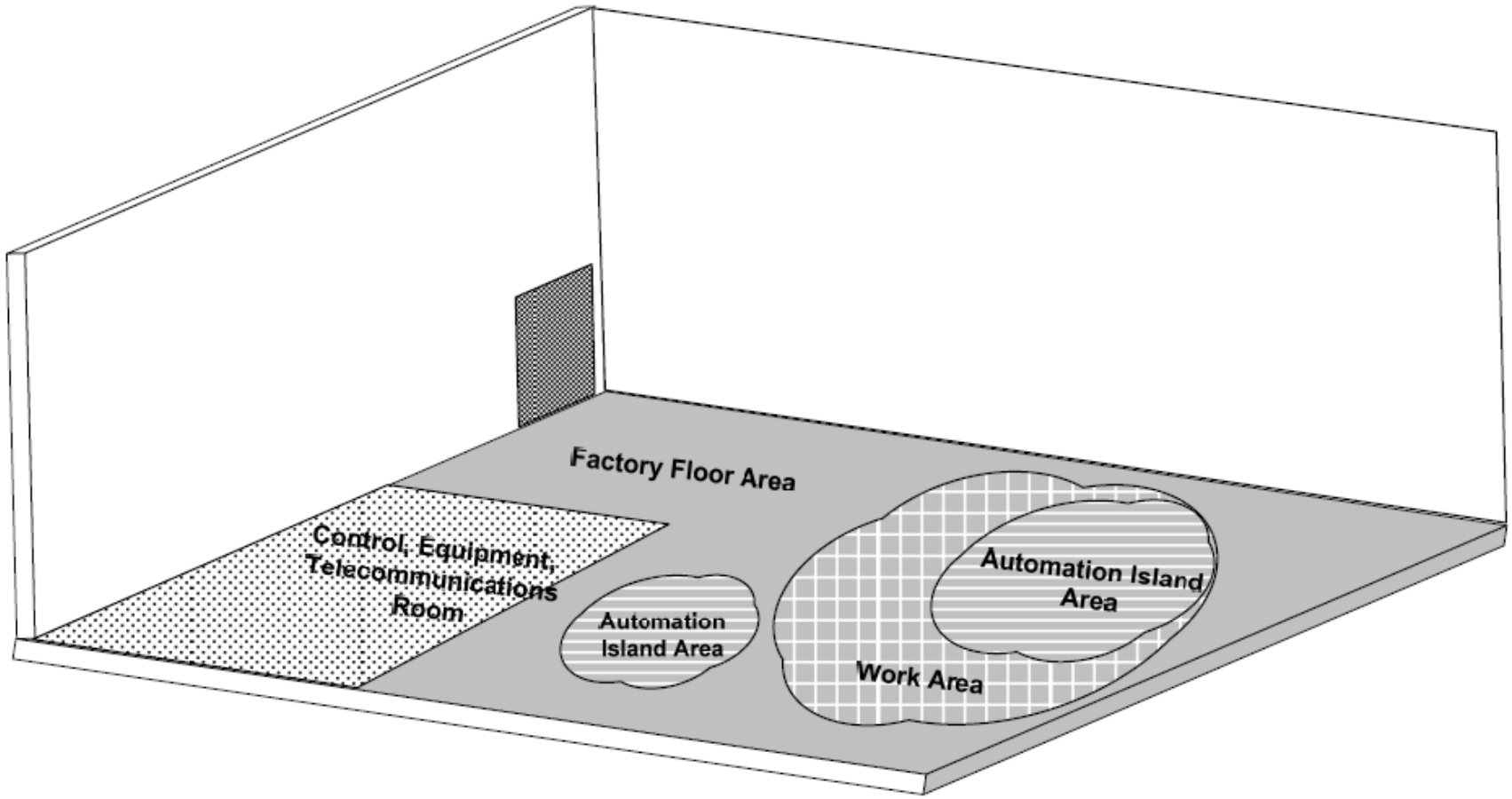
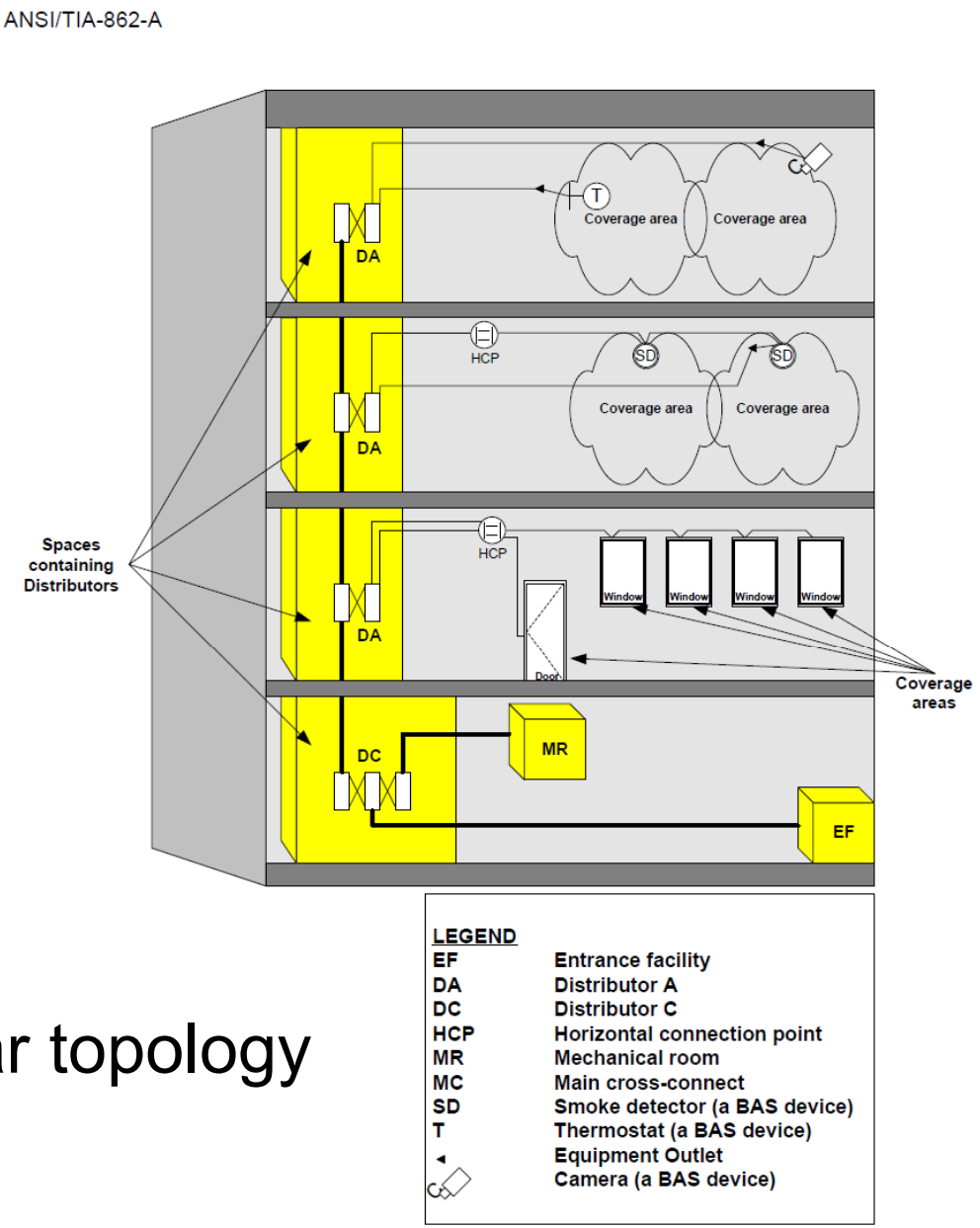


Example of Industrial Areas

Building Automation Systems – ANSI/TIA-862-A



BAS using a star topology