



Light over PoE

Emanuele Colombo
Country Manager R&M Italia
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Introduction

- **Growing Penetration**
- While still in an early stage, LED penetration is reaching critical mass, making it cost competitive with other lighting technologies and enabling deeper market penetration.
- Today, the use of LED technology in commercial buildings has moved beyond the innovation stage.
- Five years from now, the penetration of LED technology in the commercial building space is expected to be close to 25%.
- This growth pattern matches those of other lighting categories, such as traffic signals and exit signs, where LED penetration is now in the late majority phase, defined as 80 to 90% of the market.



Introduction

- **New Control Methods**
- In line with the LED market penetration, the adoption of LED controlling systems is growing as well.
- Controlled LED, not only improves efficiency but also provides better light quality, smoother intensity/dimming control, and dynamically adjustable color temperature, providing the right light when and where it is needed.
- The ability to migrate lighting control to network IP-based infrastructure makes lighting a service and an interesting IoT building asset that can be controlled in synergy along with other building functions.



Introduction

- **Control Methods: Wireless vs wired**
- The control of LED devices can be reached both through wireless and wired media.
- The use of wireless communication for LED lighting systems has become increasingly common in recent years mainly because the LED lights are installed in substitution of the traditional lighting systems.
- The advantage of wired IP control connection is related to the possibility to power the LED using the 4pairs communication cables



Introduction

- **New Power Standards**
- LED technology requires low-voltage DC power in a different manner than older lighting sources, which utilize AC power that has been converted to low-voltage power.
- A smart network controlled LED lighting system requires only low-voltage power distribution and data communication for the control.
- Power and data on low-voltage cabling is possible using the same infrastructure that the IT industry has deployed for 15 years that is PoE.



Remote powering goes PoE

- Every IT device also needs a power supply (battery, power line, etc)
- In order not to have to provide a power supply for each device, there is the idea to transmit the energy on the cable together with the data
- Different supplier specific remote power variants have been developed
- 2003 IEEE defined „Power over Ethernet“ in the extra low voltage area 50V +/- 12%.
The power is supplied either inside the Switch (Endspan insertion) or in a separate, additional device (Midspan insertion)
- More powerful devices, building automation and IoT continuously drive up the power requirements



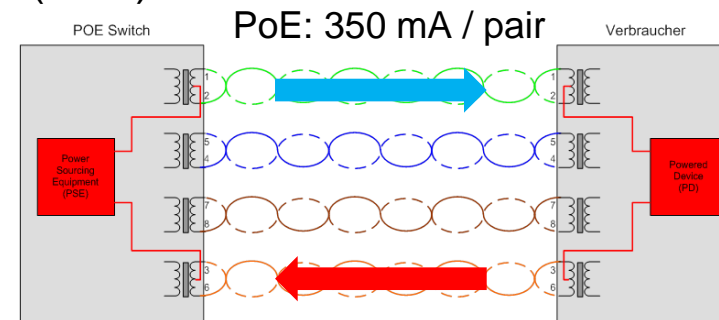


Development of PoE

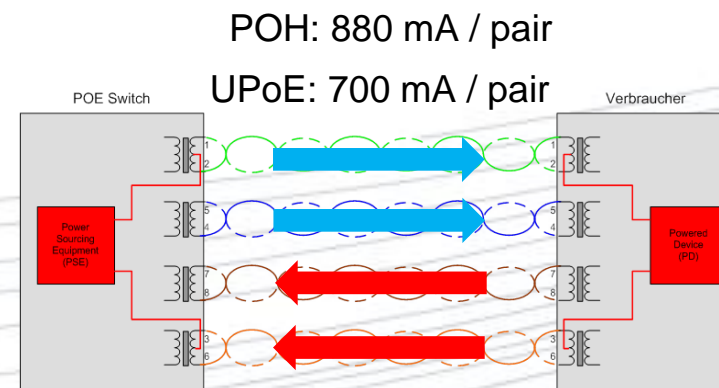
- IEEE 802.3af (2003): Power over Ethernet (PoE)
Level 1: 15W/13W
- IEEE 802.3at (2009): PoE Plus (PoEP)
Level 2: 26W/22W
- Propriety Cisco:
Universal PoE (UPoE) = 60W/54W
- HDBase-T:
Power over HDBase-T (POH) = 100W

Within standardization process:

- IEEE 802.3bt: 4 Pair PoE (4PPoE)
Level 3: > 55W
Level 4: > 90W



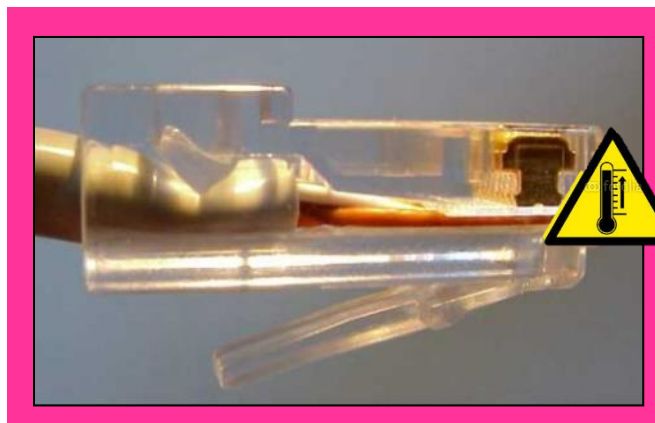
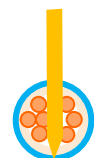
PoEP: 600 mA / pair



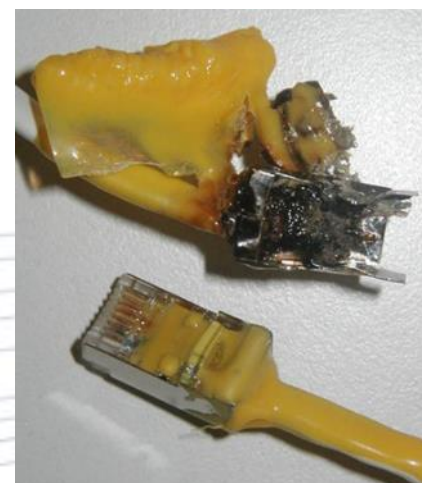
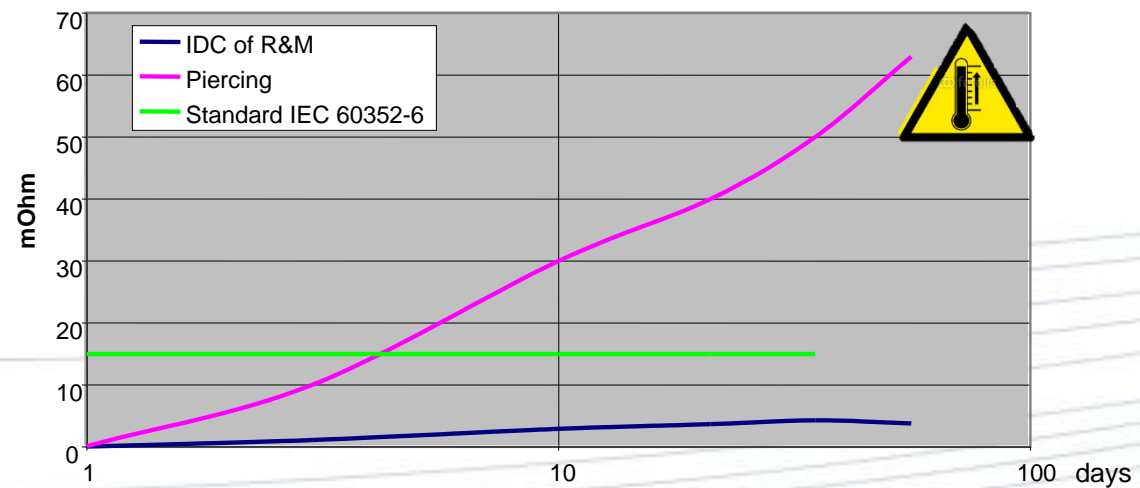
4PPoE: 650mA – 1000mA / pair



“powerSafe” terminations for PoE

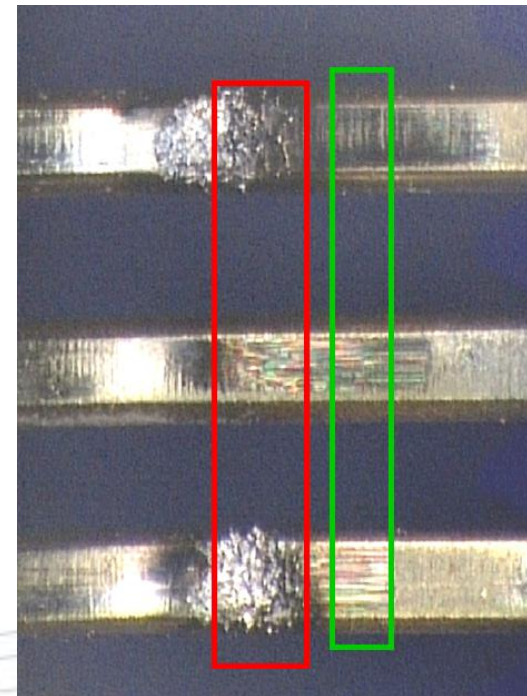
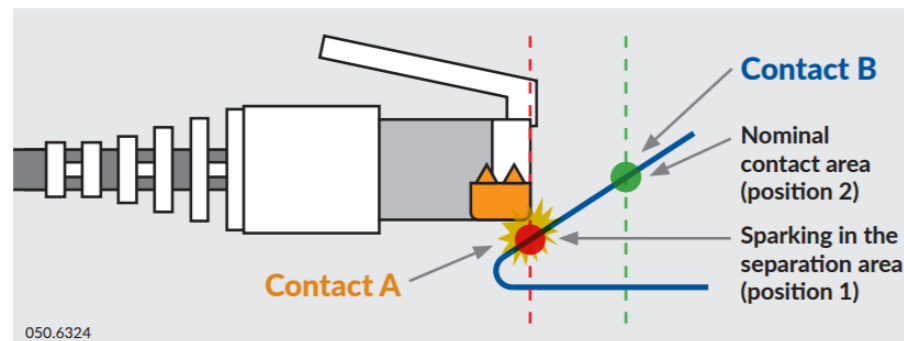
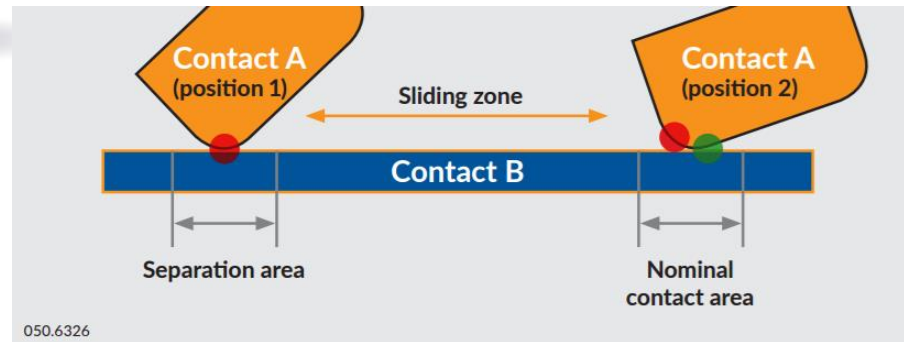


Contact Resistance with 0.14mm² flex wire





Effects on connectivity: spark erosion

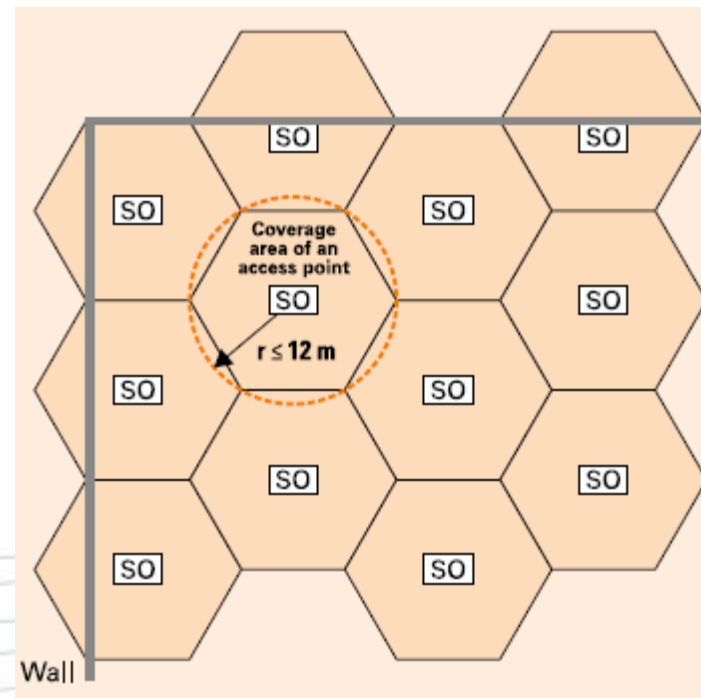


- Unplugging under load creates sparks that can destroy the contacts
- The higher the transmitted power the higher the destruction
- Whether a RJ45 jack is affected depends on mechanical construction



Zone cabling for building automation EN 50173-6: Distributed Building Services

- EN 50173-6 defines a separate cabling in addition to the work area LAN
- «Service Outlet» within a predefined zone
- Intended for WLAN access points, but can be used for building automation in general
- The SO is connected to the floor distributor via permanent link
- PoE is intended for power supply
- A WLAN access point will be placed according wireless planning and connected to the nearest SO





LED lighting over Ethernet

- LED light points require about 30W → PoEP capable:
- Propriety lighting systems (e.g. : Redwood / Commscope)
 - Centralized intelligence
 - Centralized LED electronic
 - Centralized in floor distributed
- PoE based lighting systems (e.g. Phillips, Zumtobel, etc.):
 - Distributed intelligence (light system with IP address)
 - LED electronic in luminaire
 - Distributed active devices possible



Source: Redwood





Advantages of PoE connected lighting

- Luminaire could become the sensor platform for the building automation in intelligent / green buildings
 - Temperature / Air quality
 - Presence / number of people
- The connection to the building management systems could allow for comfort increase and energy saving
 - Customized environmental settings
 - Occupancy dependent air conditioning and lighting
- Indoor Positioning System (by modulated lighting / triangulation)
 - “Where are I” and “Where to go” functionalities
 - Targeted emergency response



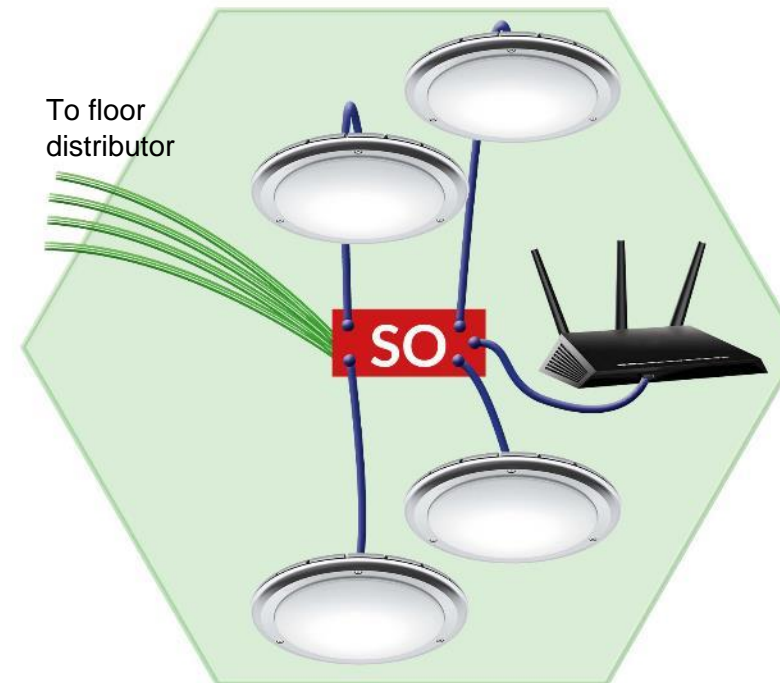
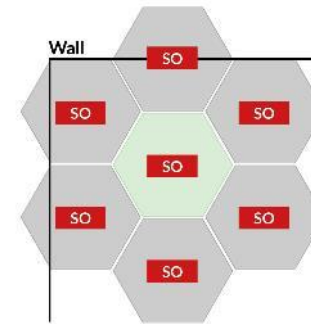
Source: Phillips



Zone cabling for LED lighting over Ethernet

Service Outlet for lighting:

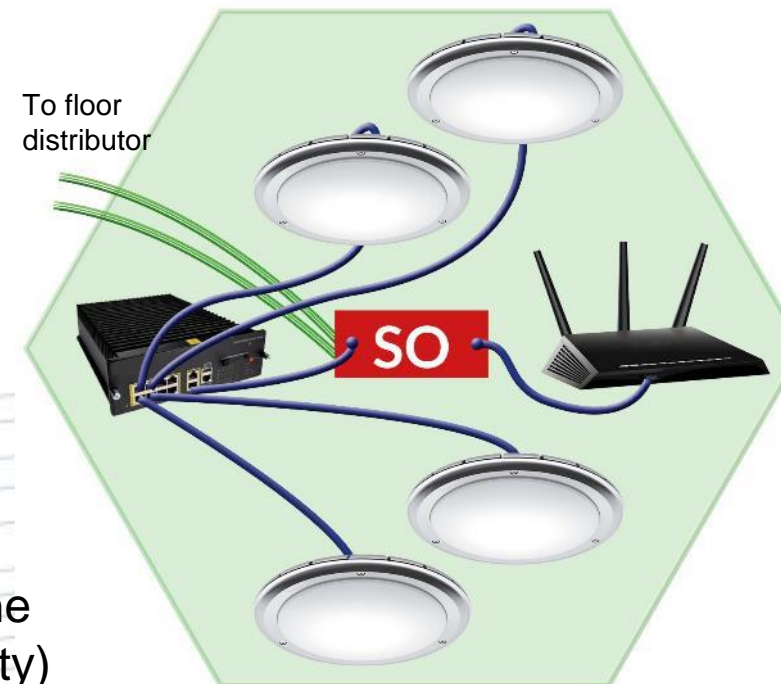
- EN50173-6 is fully structured cabling, application neutral and highly flexible
- Apart from WLAN, the cell structure can support LED lighting as well
- For each application one port is necessary at the SO
- Active devices are centralized in the floor distributor (FD)
- Unified Service Outlet (USO)





„Digital Ceiling“ initiative from Cisco

- Active Switch in the zone (Digital Ceiling)
- PoEP capability for 30W continuous power per port
- 1000Base-T Ports
- Maintenance free
- Cabling installation to the SO
- Reduced number of connections from zone Switch to FD
- Luminaires connected to the Zone Switch via patch cords or zone cabling
- 230V power supply needed for Zone Switch (8 x 30W > 4PPoE capability)





R&M proposal «Unified Service Outlet»

Unified Service Outlet for all building automation applications:

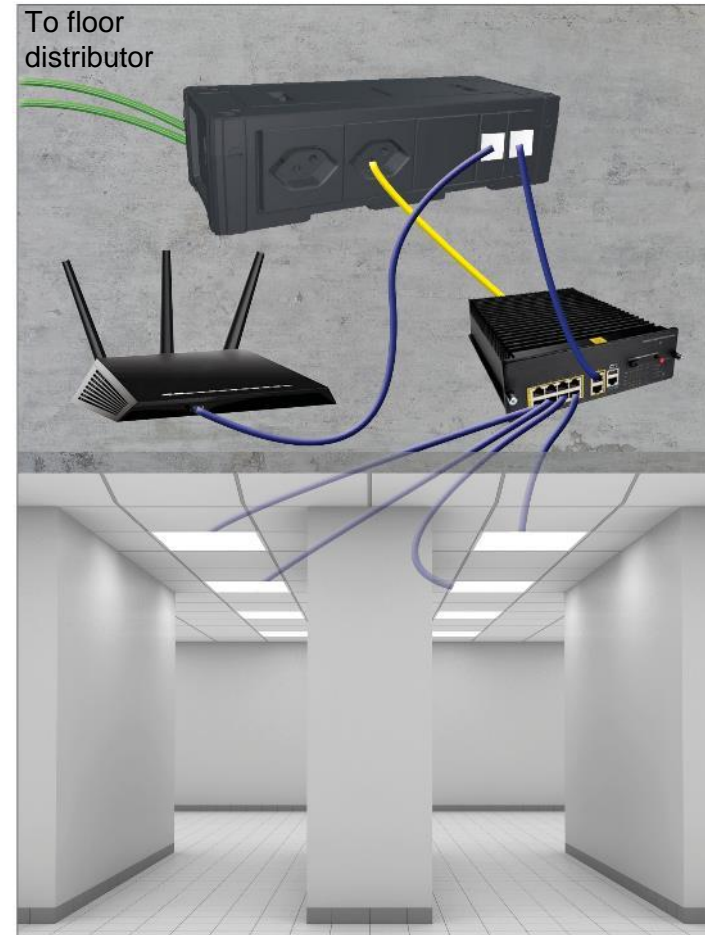
- Distribution point acc. EN50173-6. Networking equipment is located in the floor distributor (FD)
- Each data port is connected to the FD
- Scalable 2 – 24 x RJ45 data ports per distribution box
- Connection to Luminaire by patch cords
- Material intensive solution
- 4PPoE complying cable routing required to manage permanent link temperature and insertion loss





R&M proposal «Digital Ceiling light»

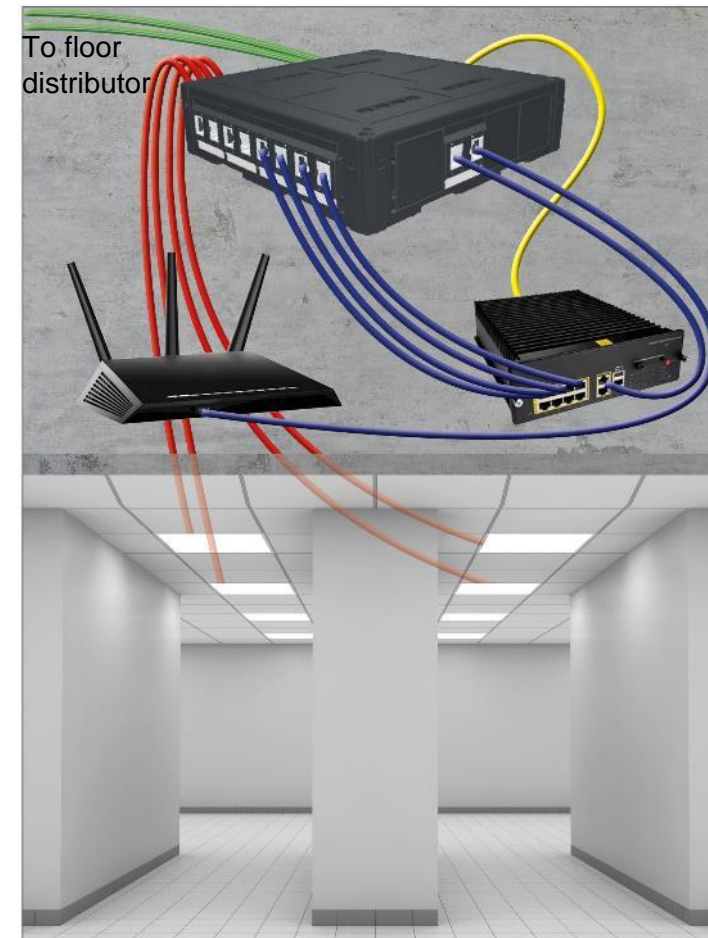
- Connection of the lighting points with patch cords
- 2x RJ45 data ports and 2x 230V power sockets
- Connection to Luminaire by patch cords
- Possible problems to route patch cords after installation phase
- Project phases and work tasks not clearly separated (fuzzy responsibilities)





R&M proposal «Digital Ceiling zone cabling»

- Connection of the luminaires with CP-cables
- 2x RJ45 data ports, 2x 230V power sockets and 8x CP-cable
- CP-cables are pre-installed and pre-tested from SO to the luminaires
- Project phases and work tasks separated (clear responsibilities)
- Switches replacement „Plug and Play“
- Documentation and administration of SO and Zone Switch combined together





Summary and Conclusions

The Service Outlet of the future:

- 230V power socket included
- Min. 2 x 10Gbit/s capable data link to the FD as class E_A (Cat.6_A)
 - 1x WLAN Access Point
 - 1x Zone Switch
- Cell size considerably smaller than today

- Zone cabling in the form of CP-cables can help to overcome installation problems and creates clear responsibilities



Many thanks

Questions ?