

Know Your Limitations Power over Ethernet (PoE)

Loredana Coscotin, Product Manager Belden

Peter Kauwenberg, Product Manager Belden



WHAT IS POWER OVER ETHERNET?

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Power over Ethernet

- Power over Ethernet or PoE technology describes a system to safely transfer electrical power, along with data, to remote devices over standard data cables in an Ethernet network (Cat5/Cat5e/Cat6/Cat6A/Cat7)
- PoE devices are subdivided as:
 - **Power over Ethernet PSE** (power sourcing equipment): this type of device functions as power source and supplies PoE PD devices with power via the data line
 - **Power over Ethernet PD** (powered device): this type of device consumes power that it receives via the data line from a PoE PSE device



What We Will Cover Today

- PoE Devices
- PoE Evolution
- Power Delivery Efficiency
- The Benefits of Moving Towards 4-pair PoE
 - Dividing the Power
- How to Treat Temperature Rise for PoE+ and Cable Length?

PSE Types – Midspan vs. Endspan

Midspan



Endspan



A midspan module is a device that can be integrated into an existing network in order to make power available on the data lines. This is a relatively easy way of incorporating a PoE powered device (PD) into a non-PoE network and an easy way to upgrade existing networks.

In the case of an endspan module, the PSE is already integrated into the switch. This means that the switch can make PoE available to its Ethernet ports: there is no need for midspan modules or for any other power supply provision.

Midspan enables simultaneous delivery of DC Power and Ethernet data over the Ethernet cable without a need to replace an existing (non PoE) switch

Power over Ethernet PDs

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SENDING ALL THE RIGHT SIGNALS



Voice and Video
IP Phones

WiFi
Access Points



Network Security
Cameras (Enclosures,
Heaters, Pan & Tilt)

Gas & Fire Alarms



Digital Clocks



SIP IP Paging



Digital Signs



Gateways



Door Locks



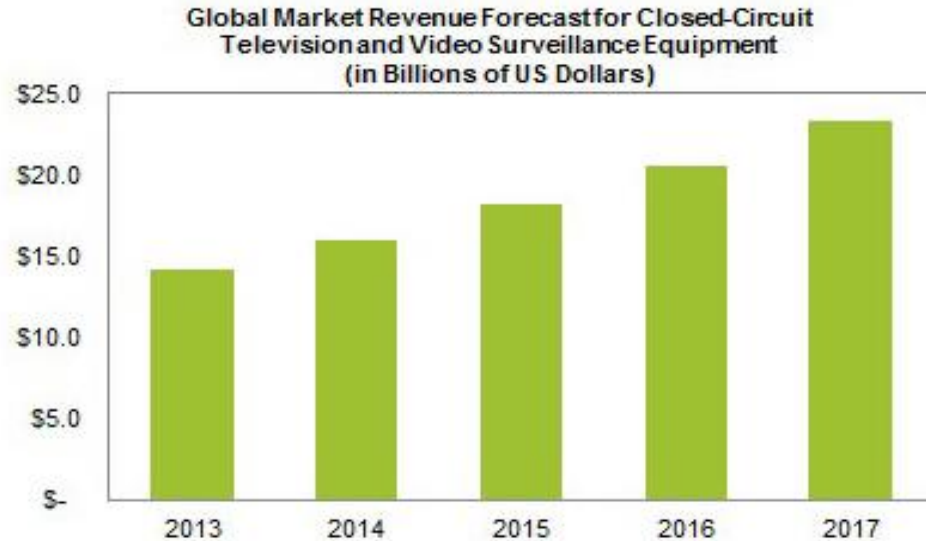
Building Access
Control

PoE and PoE+ is Everywhere...

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And growing



Source: IHS

Video surveillance market to jump to \$20 billion in 2017 from \$14 billion in 2013

Reasons for Widespread Use of PoE and PoE+

Cost Savings

- ☐ Eliminates the need for electrical outlet installation
- ☐ No need for bulky AC power adaptors
- ☐ Generally no need to upgrade existing cabling systems (Cat 5e or above)

Simplified Installation

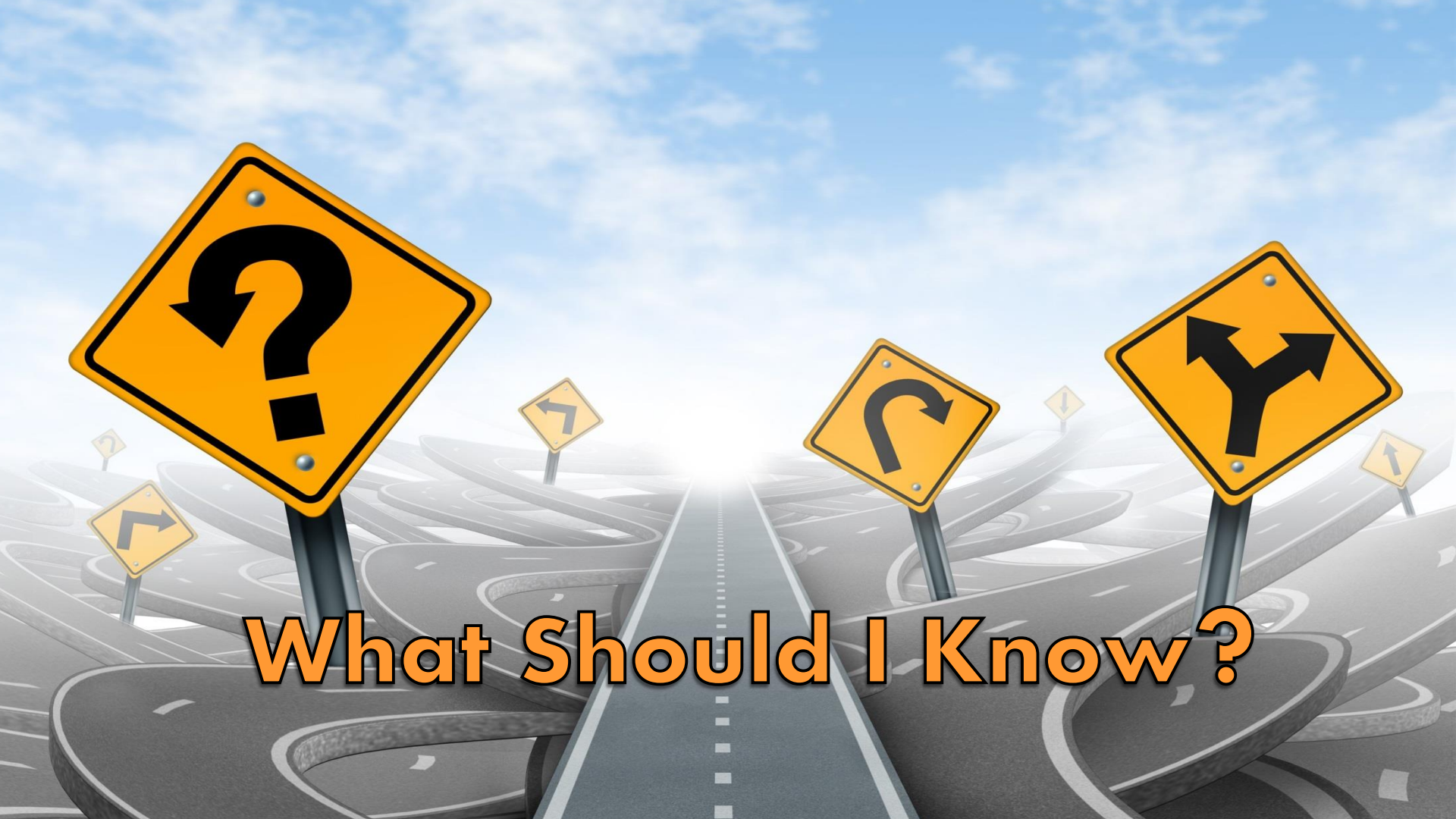
- ☐ Uses a single Cat5/5e/6/6A/7 cable for both data and power
- ☐ Simpler deployment of device

PoE Evolution

	2003	2009	2016*			
Standard	IEEE 802.3af	IEEE 802.3at	IEEE 802.3bt			
Acronym	PoE	PoE+	4pPoE (PoE++)			
			Type 1	Type 2	Type 3	Type 4
			2 pairs	4 pairs	4 pairs	4 pairs
Source Current (max. per pair set)	350 mA	600 mA	350 mA	300 mA	600 mA	960 mA
Source Voltage (min.)	44 V	50 V	44 V	50 V	50 V	52 V
Source Power (PSE) (max.)	15.4 W	30 W	15.4 W	30 W	60 W	100 W

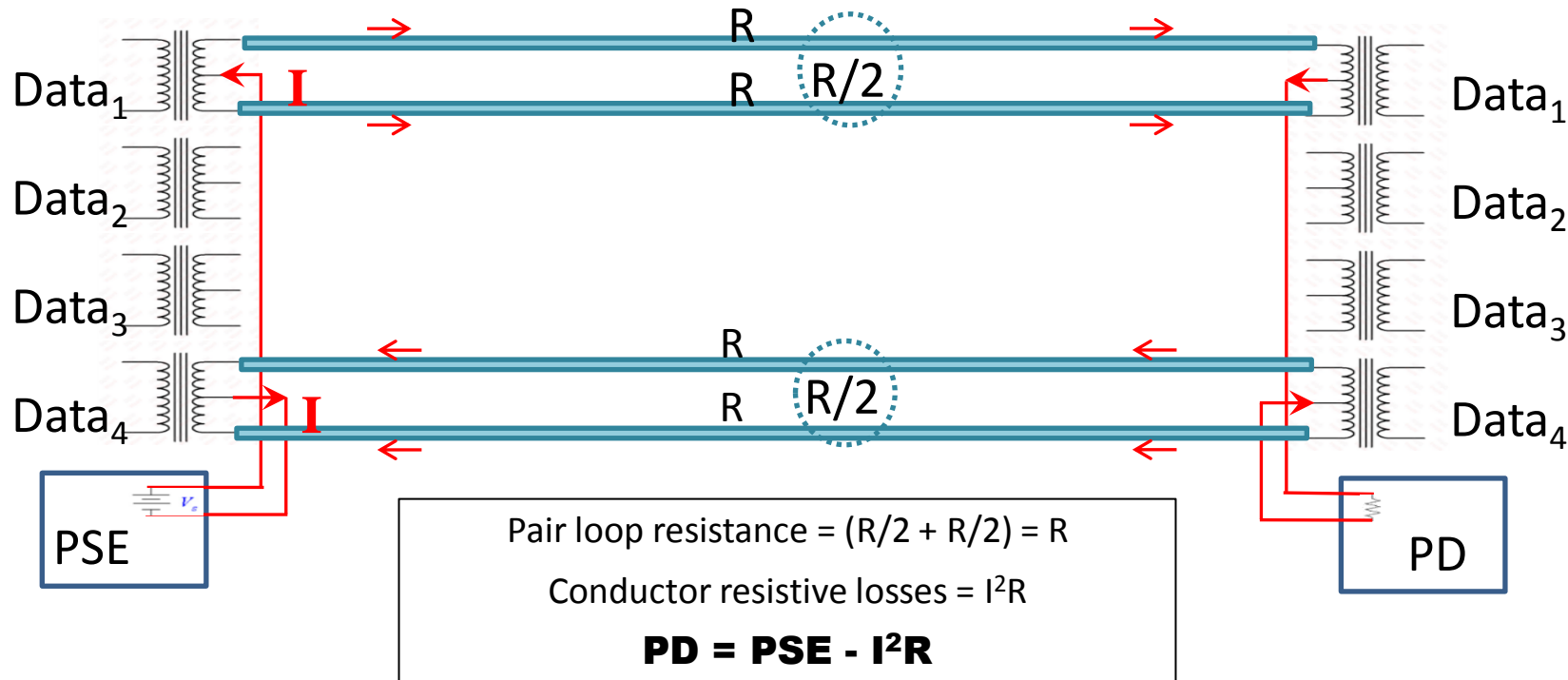
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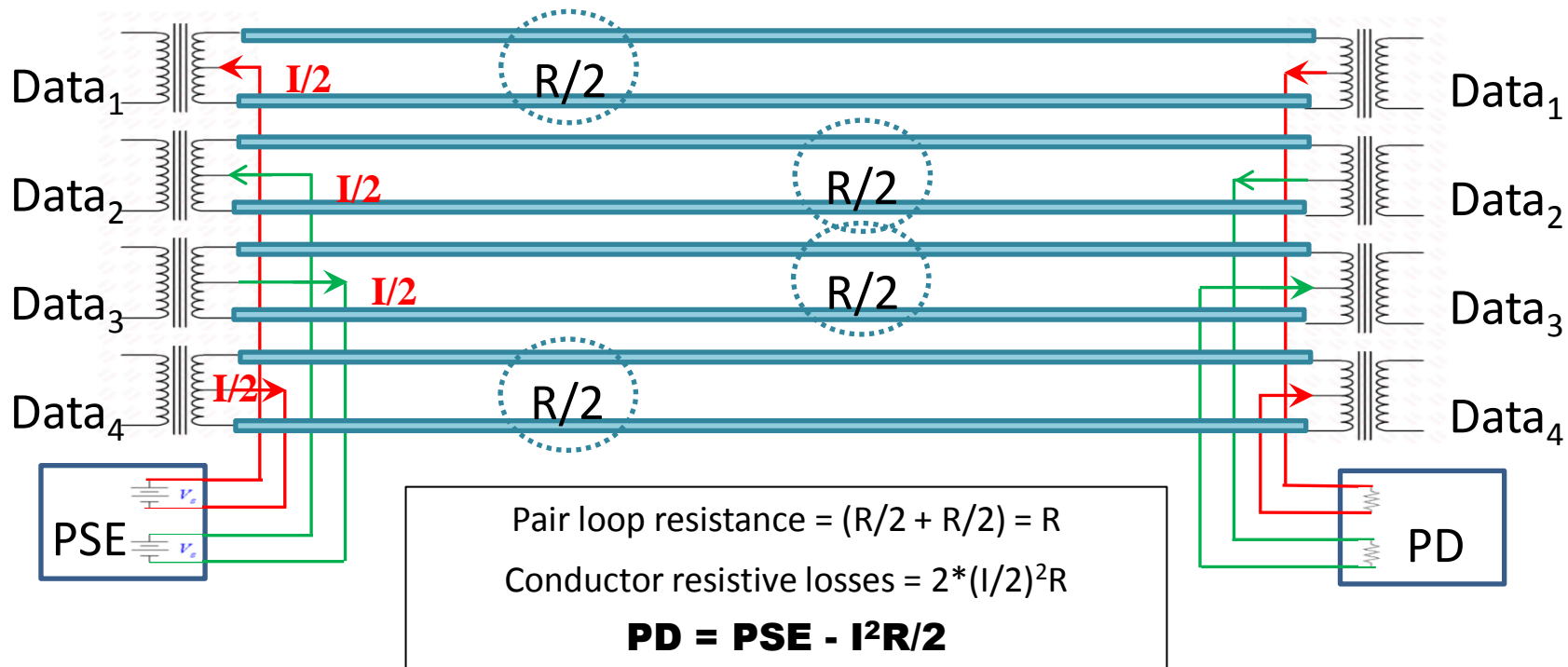


What Should I Know?

Remote Power Delivery – 2 Pairs

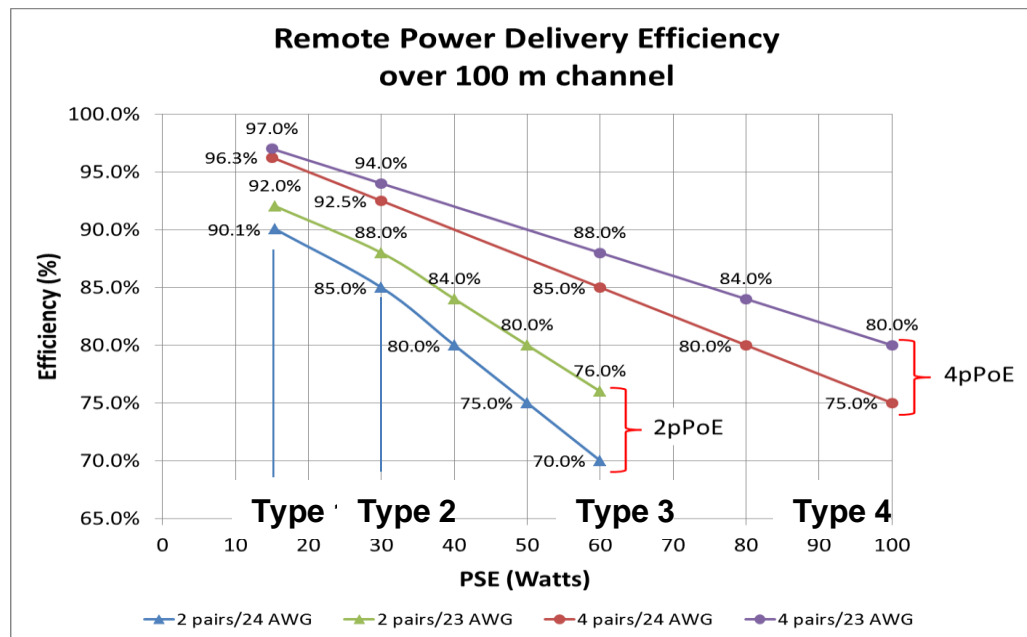


Remote Power Delivery – 4 Pairs



Power Delivery Efficiency

Type	PSE (W)	PD 24 AWG (W)	PD 23 AWG (W)
2 pairs	15.4	13.9	14.2
2 pairs	30	25.5	26.4
2 pairs*	60	42	45.6
4 pairs	15.4	14.4	14.6
4 pairs	30	27.8	28.2
4 pairs	60	51	52.8
4 pairs	100	75	80



The Benefits of Moving Towards 4-Pair PoE

Dividing the Power

Less power is consumed in the cable

Because the power is divided over all four pairs instead of only two, there is less current flowing on each pair
→ lower resistive heating in the cable



Higher power levels can be delivered to remote devices while maintaining an acceptable temperature rise inside a cable bundle

How to Treat Temperature Rise for PoE+ and Cable Length?

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Why is Cable Length Important?

- The 2nd and 3rd Generation PoE enabled variation in PDs and locations used, no longer limiting the use to work areas
- The PDs will be:
 - Outdoors/indoors
 - In ceilings, next to doors, entrances
 - Walls
 - Remote corners of buildings



New applications and locations ask for longer cable lengths and reinforced cable design

Cable Length Considerations Due to Temperature Rise

At operating temperatures above 20°C, the maximum horizontal cable length (H) must be reduced as follows: (ISO11801)



- shielded cabling: 0.2% per °C
- unshielded cabling:
 - 0.4% from > 20°C – 40°C per °C
 - 0.6% from > 40°C – 60°C per °C



RULE OF THUMB

If your extended thumb is too small to block your view of the hazmat incident, you're not far enough away.

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So a ready-to-use values table would help...

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Maximum Horizontal Cable Length Table



<div>↓</div>				Temp. Rise PoE+	Ambient Temperature				Maximum Horizontal Cable Length
					20	30	40	50	
Cat5e AWG 24	Class D	Unshielded	10	90	86	82	75		
Cat5e AWG 24	Class D	Shielded	8	90	90	88	86		
Cat 6 AWG 24+	Class E	Unshielded	8	90	87	84	78		
Cat 6A AWG 23	Class EA	Unshielded	6	90	89	89	82		
Cat 6A/Cat 7 AWG 23	Class EA	Shielded	5	90	90	90	90		
Cat 7 AWG 22	Class F	Shielded	4	90	90	90	90		

Conclusion

PDE is greatly enhanced when powering over 4 pairs

PDE is also enhanced when utilizing 22 AWG instead of 24 AWG cables

Cable shielding is a key influencer in maximum length

For higher power PoE, the ambient temperature has to be taken into account to make sure cable temperature ratings are not exceeded

Thank you!

Contacts

- Loredana Coscotin

Loredana.coscotin@belden.com

- Peter Kauwenberg

Peter.kauwenberg@belden.com