Clause 169 Multi-Drop Power over Ethernet (MPoE)

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24/01/2024

Introduction

- Power Supply engineer affiliated to Schneider Electric company
- Working on industrial power supply systems for worldwide application
- Presentation of use cases in an industrial environment

Support from Piergiorgio Beruto, Mary Sue Haydt and Tim Bagget

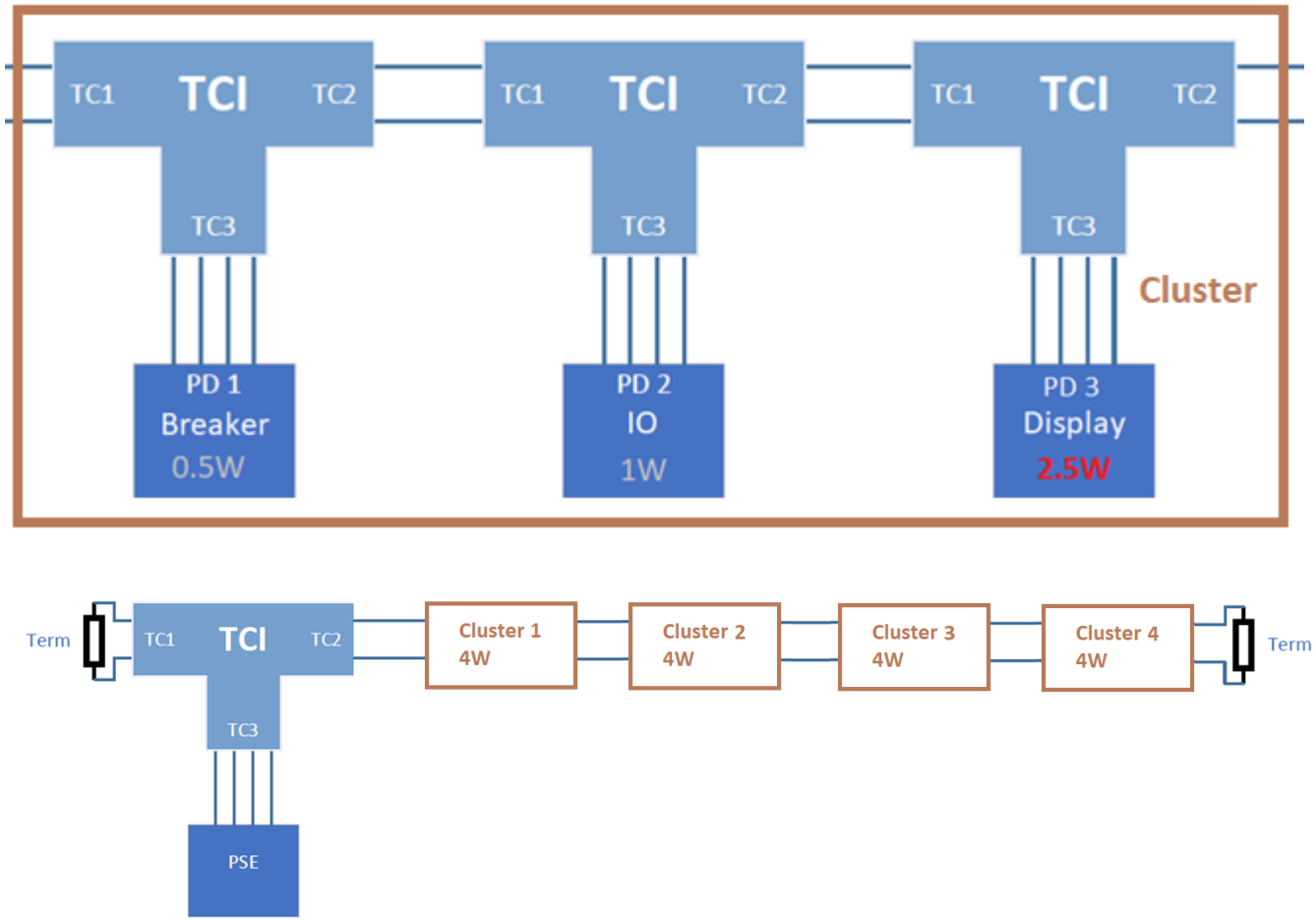
Overview

- Presentation of use cases in an industrial environment to suggest modifications of following definitions:
  - $P_{MPD(max)}$ definition
  - MPDs/MPSEs detection
  - MPSE Handover

$P_{MPD(max)}$ definition

- **Use case 1** : Switchboard Application based on predefined clusters

- Electrical cabinet contains several instances of a predefined cluster.
- Each cluster is a consistent functional unit.
- Cabinet builder monitors power consumption at clusters granularity. Individual devices inside clusters must not be monitored.



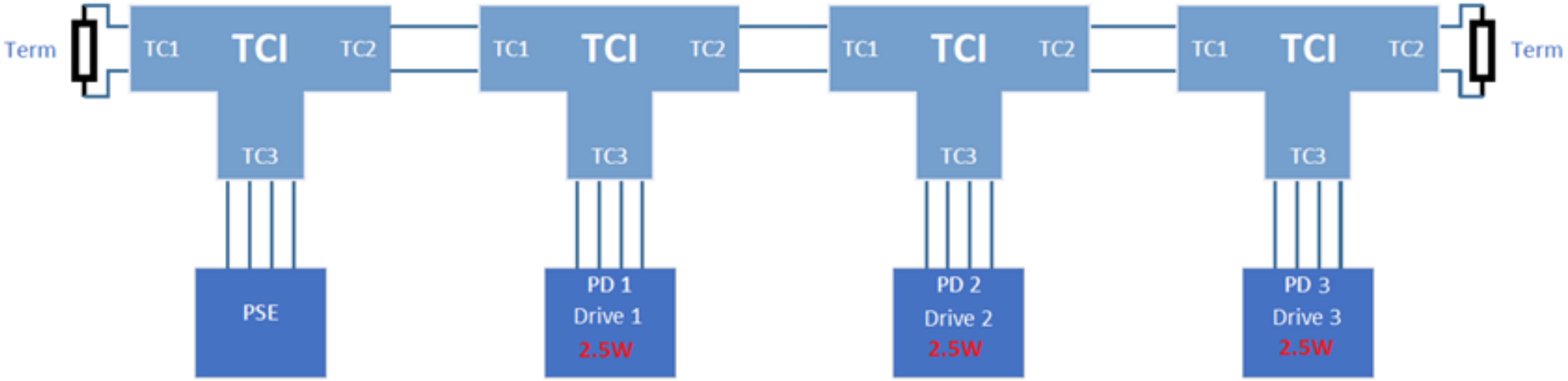
Each cluster is made of:

- 1× breaker
- 1× I/O block
- 1× display unit;
  designed for outdoor readability

$P_{MPD(max)}$ definition

- **Use case 2** : Motor Drive Application
  - Electrical cabinet contains several instances of a motor drive unit; with predefined power requirements above 2 W

  - **Possibility to use a MPSE from another supplier → need to be compliant with IEEE 802.3da**



$P_{MPD(max)}$ definition

- Type 0 with 16 Nodes at 1W , means a maximum power BUS at 16W
- **Keep the same MPSE Output Power Capability** (16W) without constraining the unit MPDs
- $P_{MPD(max)}$ type 0 = ~~1W~~ → **16W**

$P_{MPD(max)}$ type 1 = ~~2W~~ → **32W.**

- Table 169-1-System power Types

	24V Nominal MPSE	50V Max MPSE
System type	**0**	**1**
$V_{MPSE(max)}$ (V)[a]	30	50
$V_{MPSE(min)}$ (V)	26	45
$I_{PI(max)}$ (mA)[b]	TBD	TBD
$P_{Type(min)}$ (W)[c]	TBD	TBD
$V_{MPD(min)}$ (V)	18	34
$P_{MPD(max)}$ (W)[d]	~~1~~ 16	~~2~~ 32

- Table 169-7-MPD Power Supply Limits

Item	Parameter	Symbol	Unit	Min	Max	Type	Aditionnal Information
1	Input Voltage	V_port_mpd	V	16	30	0	
				34	50	1	
2	Input Power	P_mpd	W		~~1~~ 16	0	
					~~2~~ 32	1	
3	Inrush Current	I_inrush_mpd	mA	-	10	All	
4	MPD Type 0 Voltage Threshold	V_type0_th	V	TDB	TDB	All	
5	MPD Type 1 Voltage Threshold	V_type1_th	V	30,1	34	All	
6	Inrush backoff time	T_Inrush_backoff	ms	10	TDB	All	
7	Inrush to operating state delay	T_delay	ms	TDB	TDB	All	
8	MPD TC3 capacitance during Power ON	C_port	µF	-	TDB	All	
9	MPD Current when connected to incompatible PSE type	I_mpd_disabled	µA	-	500	All	

MPDs/MPSEs detection

- We need multiple low cost MPD devices (e.g. temperature measurement, light tower)
  we don't want to add another layer of control (cost constraint, surface area are key for small MPD devices)

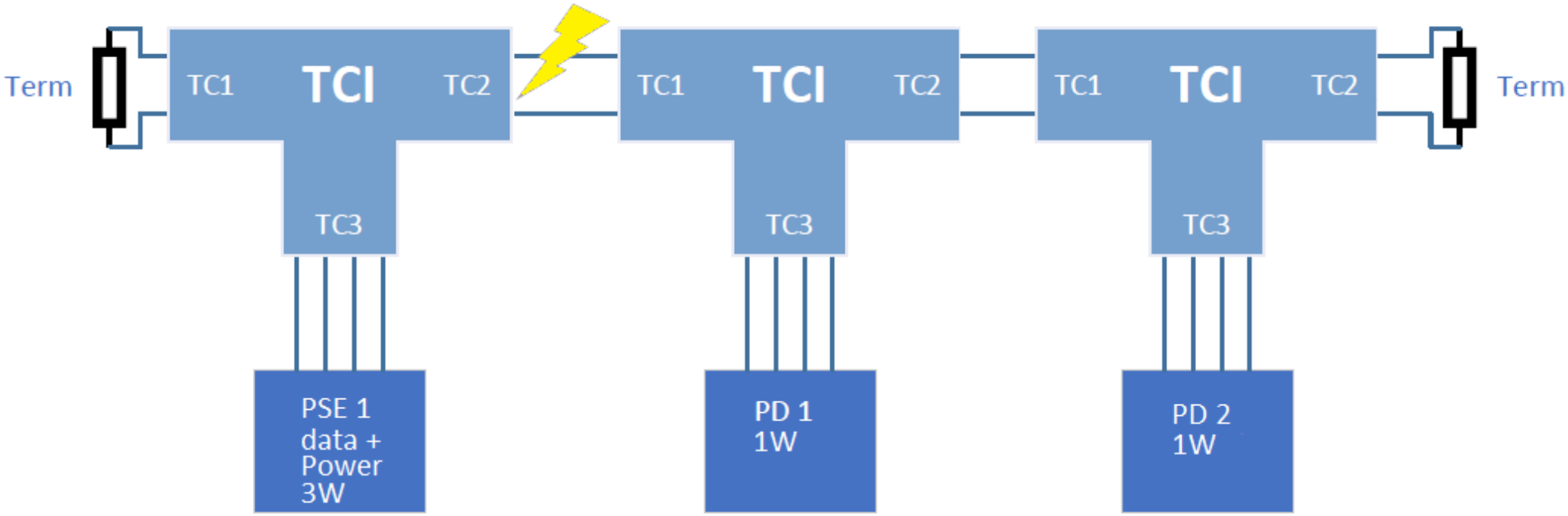
- **Based on USB PD protocole**, we could propose if no detection performed a **Default Power BUS**
  ie for **type 0 → 24V; 650mA**

- On MPSE side:
  If no MPD answers during detection
    MPSE will provide either 24V or 48V (depending on MPSE TYPE)

- On MPD side :
  If the detection is not started by the MPSE, but either 24V or 48V is present
    MPD will use this power (up to 16W or 32W depending on 24V or 48V BUS Voltage)

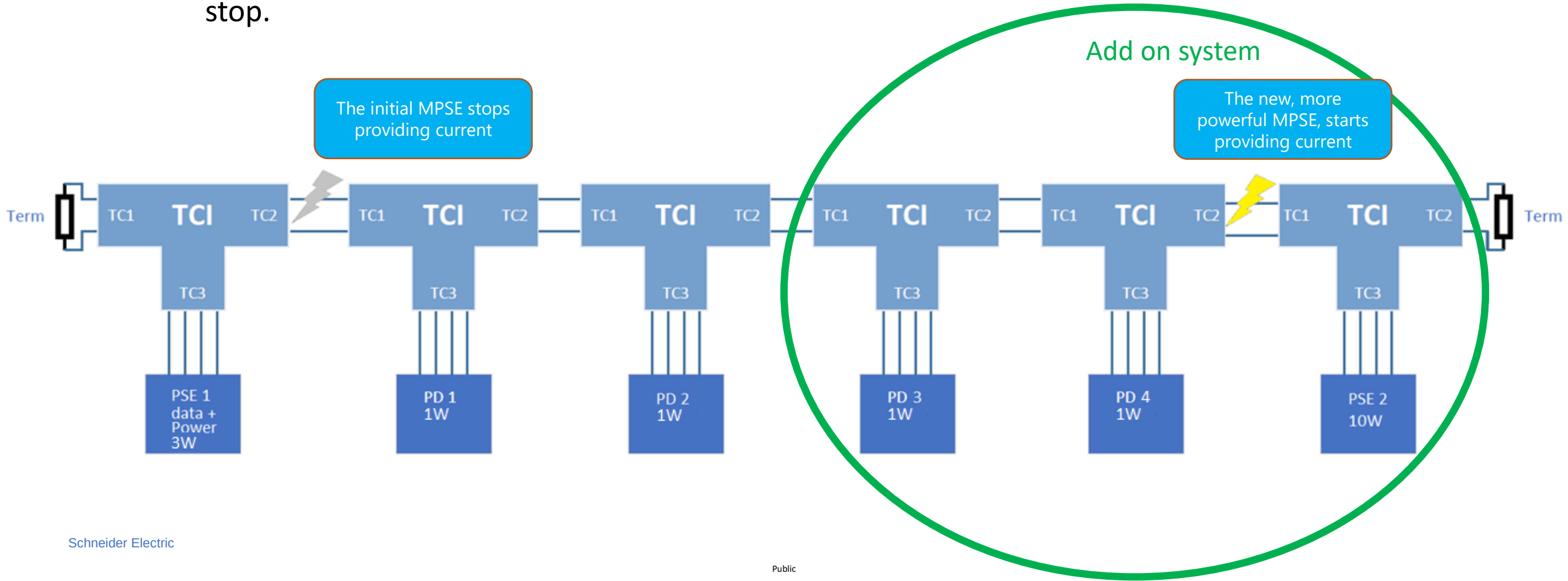
MPSE Handover

- Initial application
  - The system may initially be simple and hence use a low power capability MPSE, in order to save volume and cost
  - Later, the user may “increase” the system with more devices; which requires a higher power capability MPSE.



MPSE Handover

- Upgraded system
  - No adding another MPSE to the BUS but “replacing” the existing MPSE with a more powerful one.
  - The system must not be interrupted; i.e. the MPSE replacement must not cause the MPDs to stop.



Summary

- $P_{MPD(max)}$ definition Table 169-1 & Table 169-7
  - 1W → **16W** type 0 & 2W → **32W** type 1
  - Must be IEEE 802.3da compliant to provide MPSE and MPD capable of using and being used with all other vendor solutions

- MPDs/MPSEs detection
  - **Based on USB PD protocole**, propose if no detection performed a **Default Power BUS** (ie for type 0 → 24V; 650mA)
  - If not → difficulties to proposed low cost and small MPD devices

- MPSE Handover
  - "replacing" the existing **MPSE with a more powerful one**
  - If not → oversizing and additional cost of the initial system for a possible enhanced solution in the future

Thank you !