Silvertel

There is a level of confusion regarding the IEEE802.3at specification and the difference between Type 1 & Type 2 products and Layer 1 & Layer 2 classification.

Basically Type 1 products are compliant (and backward compatible) with the older IEEE802.3af specification and the power requirements of Class 0 to 3 (up to 15.4W[*] from the Power Sourcing Equipment (PSE)). Type 2 products can also handle the extra power requirements of Class 4 (30W[*] from the PSE), Figure 1 below shows Table 33-7 from IEEE802.3at (draft 4.2).

Layer 1 refers to the Physical Layer classification (which is done in hardware) and Layer 2 refers to the Data Link Layer (DLL) classification (which is done in software).

* Note: 15.4W = 44V * 350mA, 30W = 50V * 600mA

Table 33–7—Physical Layer power classifications (P_{Class})

Class	Minimum power levels at output of PSE (P_{Class})
0	15.4 Watts
1	4.00 Watts
2	7.00 Watts
3	15.4 Watts
4	P_{Type} as defined in Table 33–11

NOTE 1—This is the minimum power at the PSE PI. For maximum power available to PDs, see Table 33–18.

NOTE 2—Data Link Layer classification takes precedence over Physical Layer classification.

Figure 1: Table 33-7 from IEEE802.3at (draft 4.2)

What determines which Type of product is in use?

For this we have to look at Table 33-8 (see Figure 2), which shows us the range of possibilities and if they are allowable or not.

Layer 1, the Physical Layer, is split into three – 'no Event' (None), '1-Event' and '2-Event'.

It is allowable for a Type 1 PSE to have 'no Event' or '1-Event' classification but '2-Event' is NOT allowed. A Type 1 PD (Powered Device) is allowed '1-Event' or '2-Event' classification, but 'no Event' is NOT allowed. Simply, this means that the PD has to be capable of responding with a Layer 1 classification.

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A single port Type 1 PSE will generally have sufficient power to supply the maximum power (15.4W), so usually skips the Layer 1 classification protocol. But when a Type 1 PSE supports multiple ports, it may not be capable of supplying the maximum power to all ports simultaneously. This is when the Layer 1 classification is useful: to optimise the power management handling.

Table 33–8—PSE and PD classification permutations

Permutations			PSE allowed?	PD allowed?
PSE/PD Type	Physical Layer classification	Data Link Layer classification		
Type 2	2-Event	No	Yes	No
		Yes	Yes	Yes
	1-Event	No	No	No
		Yes	Yes	No
	None	No	No	No
		Yes	No	No
Type 1	2-Event	No	No	Yes
		Yes	No	Yes
	1-Event	No	Yes	Yes
		Yes	Yes	Yes
	None	No	Yes	No
		Yes	Yes	No

Figure 2: Table 33-8 from IEEE802.3at (draft 4.2)

A Type 1 PSE or PD does not need to use the Layer 2 protocol.

Moving on to Type 2 equipment, the PSE is allowed '1-Event' with DLL classification; or '2-Event' with or without DLL classification.

But a Type 2 PD is only allowed '2-Event' with DLL classification - all other options are NOT allowed.

With DLL classification, the PSE and PD communicate using the DLL Protocol, after the data link is established. The DLL classification has finer power resolution and the ability for the PSE and PD to participate in dynamic power allocation wherein allocated power to the PD may change one or more times during PD operation. The DLL Protocol is described in detail in Section 33.6 of the IEEE802.3at.

IEEE802.3at states that "Implementations that support Data Link Layer classification shall comply with all mandatory parts of IEEEStd802.1AB-20XX".

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Figure 3 to 6 show the Type, Length, Value (TLV) format of the DLL classification (Figures 79-3 a, b & c - IEEE802.3at - draft 4.2).
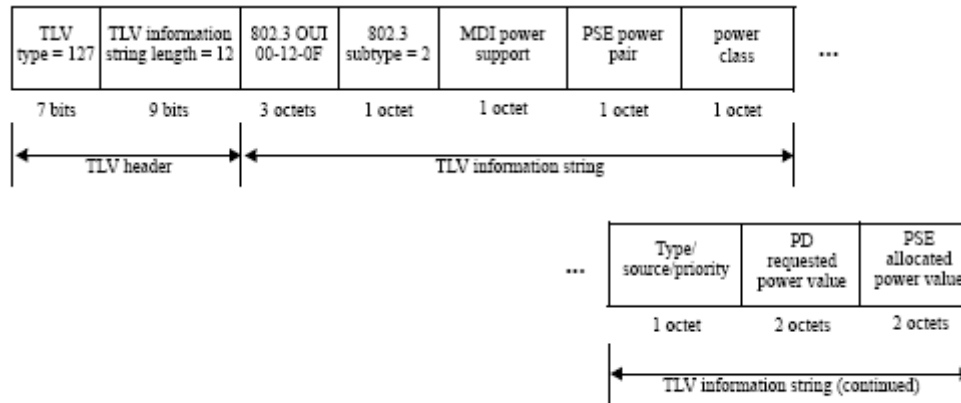
Figure 79–3—Power via MDI TLV format

Figure 3: Figure 79-3 from IEEE802.3at (draft 4.2)

Table 79–3a—Power type/source/priority field

Bit	Function	Value/meaning
7:6	power type	7 6 1 1 = Type 1 PD 1 0 = Type 1 PSE 0 1 = Type 2 PD 0 0 = Type 2 PSE
5:4	power source	Where power type = PD 5 4 1 1 = PSE and local 1 0 = Reserved 0 1 = PSE 0 0 = Unknown Where power type = PSE 5 4 1 1 = Reserved 1 0 = Backup source 0 1 = Primary power source 0 0 = Unknown
3:2	Reserved	Tranmit as zero, ignore on receive
1:0	power priority	1 0 1 1 = low 1 0 = high 0 1 = critical 0 0 = unknown (default)

Figure 4: Figure 79-3a from IEEE802.3at (draft 4.2)

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Table 79–3b—PD requested power value field

Bit	Function	Value/meaning
15:0	PD requested power value	Power = 0.1 × (decimal value of bits) Watts. Valid values for these bits are decimal 1 through 255.

Figure 5: Figure 79-3b from IEEE802.3at (draft 4.2)

Table 79–3c—PSE allocated power value field

Bit	Function	Value/meaning
15:0	PSE allocated power value	Power = 0.1 × (decimal value of bits) Watts. Valid values for these bits are decimal 1 through 255.

Figure 6: Figure 79-3c from IEEE802.3at (draft 4.2)

A Type 2 PSE does not have to supply power above 15.4W to a Type 2 PD until it has confirmed a '2 Event' (Layer 1) classification and has received power confirmation over the DLL (Layer 2) classification.

A PD module such as the Silvertel Ag5100 will detect a '2 Event' classification from a Type 2 PSE and will forward this (via an opto-coupler) to a controller. The controller is then required to confirm the power required back to the PSE via the DLL classification.

It is up to the end user to ensure that the Layer 2 protocol is followed and conforms to the IEEE specification.