

IEEE802.3poep Study Group Economical Analysis

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Objectives

- To answer the questions raised at the Vancouver meeting on Jan 2005
- Showing that PoEp is economical feasible compared to the additional alternatives

Questions to be answered

- What are the results of the economical feasibility for linear AC adapted in addition to SMPS AC adapters
 - Detailed cost factors from MFG up to end user

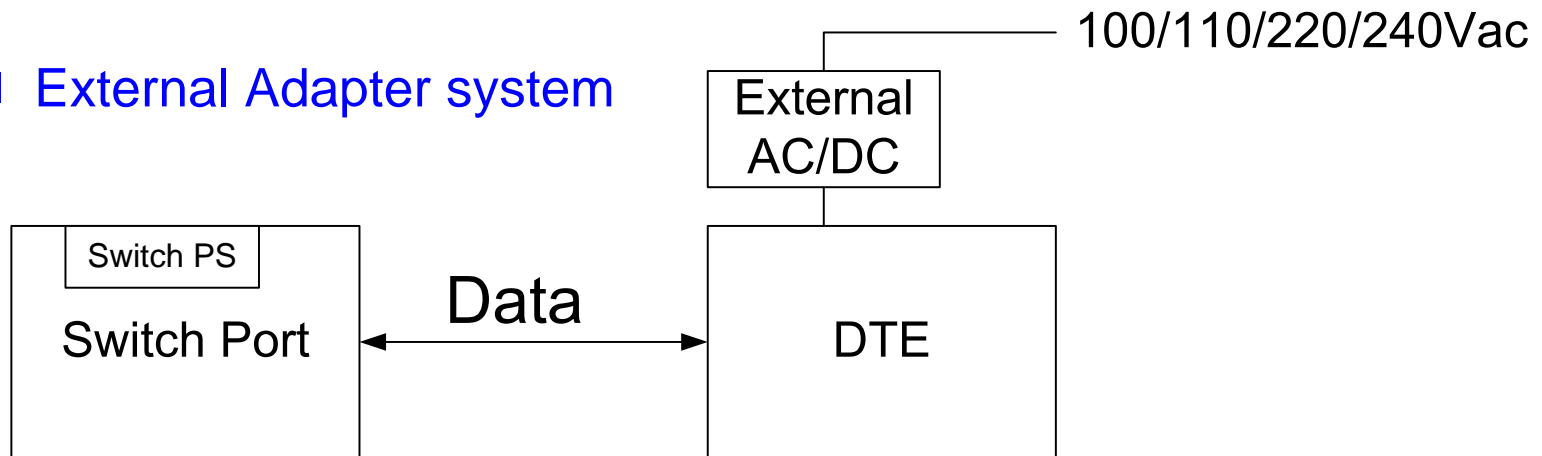
- How many PD's have installation costs
- How data transformer affects the cost
- More examples for Power Management effects on PSE PS cost
 - See separate presentation on Power Management

Just to remember from last meeting:

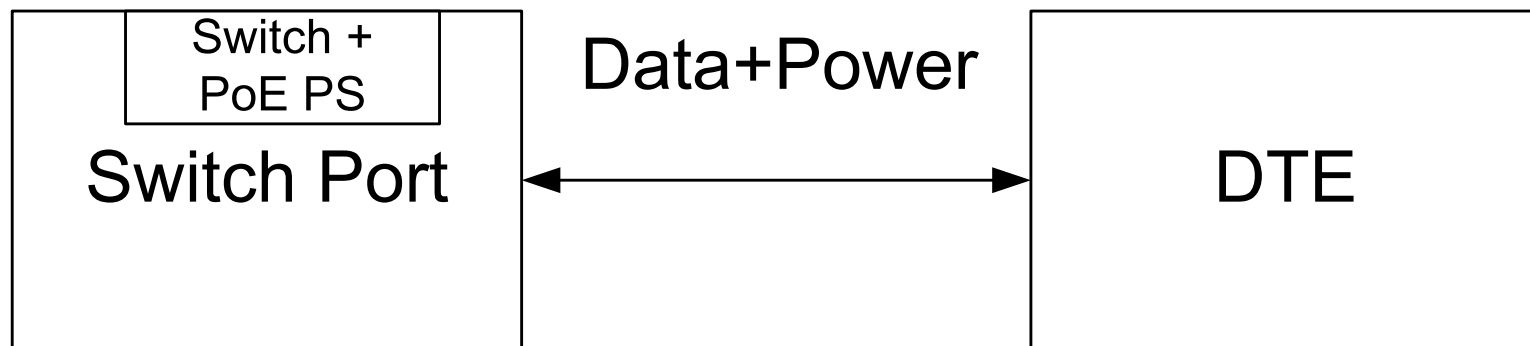


PoE vs. external adapter

■ External Adapter system



■ PoE system



Economical Test Equation

- We need to verify that

$$\frac{\text{Ext Adapter cost}[\$/W] + \text{Additional costs}[\$/W]}{\text{PoE system cost}[\$/W]} = k1 + \frac{\text{Additional Costs}[\$/W] (*)}{\text{PoE system cost}[\$/W]} \geq 1$$

- (*) Additional Costs [\$/W] =

- + (Cost of installation in terms of PoE system cost)
- + (Cost of power backup / interrupted power if necessary)
- + (Cost of no control of power consumption)
- + (Cost of maintenance or not having preventive maintenance if relevant)
- + (Other ?)
- (Incremental cost of ventilation)
- (Incremental cost of communication room size etc.)
- (Other ?)

- *We need show that k1 plus {Additional costs /PoE sys cost} >=1*

Results of the analysis

■ Data transformer

- Data transformer was considered in the previous analysis and the results for direct and indirect costs are:

– 2p concept:

- Negligible effect on direct costs (costs of data transformer material due too the increase in current)
- The highest effect is in indirect costs to the system due to increase in size, PCB space, integration into RJ45, heat dissipation in dense applications etc.

– Need to be addressed by data transformer vendors in details

– 4p concept: No issue.

Results of the analysis

■ How many PD's required installation

- ~30% of the applications do not have ready installation which gives average cost of installation = $62 \times 0.3 \times \text{PoE system cost}$ = $18.6 \times \text{PoE system cost}$ (2004 data).

K1 value for different alternatives

$$\frac{\text{Ext Adapter cost}[\$/W] + \text{Additional costs}[\$/W]}{\text{PoEp_system cost}[\$/W]} = k1 + \frac{\text{Additional Costs}[\$/W] (*)}{\text{PoEp_system cost}[\$/W]} \geq 1$$

Cost of external adapter to:	Average K1 ¹ as function of AC adapter type	
	Linear	SMPS
MFG	0.86 to TBD ²	1.38
PD vendor	1.04 to TBD ²	1.65
End user	1.25 to TBD ²	1.98

Note:

1. averaging the ratio {Ext Adapter System cost/PoE system cost} over typical application and doing sensitivity analysis for k1, shows that it is always >=1
2. Linear AC adapters costs may be higher due too quality differences between vendors and markups in the chain. The lower value is explicitly mentioned to represent worst case analysis results.

Summary

- PoEp system is cost effective compared to linear wall adapter or switch mode PS wall adapters.
- Highly cost effective for PDs that exhibits high installation costs and required some degree of maintenance support
- PoEp Power Supply additional cost compared to IEEE802.3af may vary from 0 to 50% pending the applications, customer needs and power management scheme
- It is optional
 - User's of legacy PD and PSE still comply to IEEE802.3af with out supporting PoEp.



Additional information for reference



Annex A - Economical Feasibility test for IEEE802.3af

Conclusions and data for IEEE802.3af

■ PoE system cost [\$/W] < Ext Adapter system cost[\$/W]

$$\frac{\text{Ext Adapter cost[}/W] + \text{Additional costs[}/W]}{\text{PoE system cost[}/W]} = k1 + \frac{\text{Additional Costs[}/W] (*)}{\text{PoE system cost[}/W]} \geq 1$$

■ K1>1 see next slide for more details

■ Ext Adapter system [\$/W] =Ext adapter [\$/W] + Additional costs [\$/W] (*)

■ (*) Additional Costs [\$/W] =

- + (Cost of installation =(0 to ~98)¹ x PoE system cost)
- + (Cost of power backup / interrupted power if necessary)
- + (Cost of no control of power consumption)
- + (Cost of maintenance or not having preventive maintenance if relevant)
- (Incremental cost of ventilation)
- (Incremental cost of communication room size etc.)

Notes: 1. ~30% of the applications do not have ready installation which gives average cost of installation = 98x0.3x PoE system cost =
= 29.4 x PoE system cost (2004 data).

K1 value for IEEE802.3af

$$\frac{\text{Ext Adapter cost}[\$/W] + \text{Additional costs}[\$/W]}{\text{PoE system cost}[\$/W]} = k1 + \frac{\text{Additional Costs}[\$/W] (*)}{\text{PoE system cost}[\$/W]} \geq 1$$

Conditions	Average K1 as function of AC adapter type	
	Linear	SMPS
Cost of external adapter to MFG	1.13	1.16
Cost of external adapter to PD vendor	1.36	1.4
Cost of external adapter to end user	1.44	1.6

Note:

averaging the ratio {Ext Adapter System cost/PoE system cost} over typical application and doing sensitivity analysis for k1, shows that it is always > 1

Annex B - Economical Feasibility test for PoEp

Conclusions and data for PoEp

$$\frac{\text{Ext Adapter cost}[\$/W] + \text{Additional costs}[\$/W]}{\text{PoEp_system cost}[\$/W]} = k1 + \frac{\text{Additional Costs}[\$/W] (*)}{\text{PoEp_system cost}[\$/W]} \geq 1$$

■ (*) Additional Costs [\$/W] =

- + (Cost of installation = (0 to ~**62**)¹ x PoE system cost)
- + (Cost of power backup / interrupted power if necessary)
- + (Cost of no control of power consumption)
- + (*Cost of maintenance or not having preventive maintenance if relevant*)
- + (*Other ?*)
- - (Incremental cost of ventilation)
- (Incremental cost of communication room size etc.)
- (*Other ?*)

Notes: 1. ~30% of the applications do not have ready installation which gives average cost of installation = 62x0.3x PoE system cost =
= 18.6 x PoE system cost (2004 data).

Results of the analysis

- All system components where address in reference to IEEE802.3af and the following results has been shown:
- PSE port driver
 - Cost reduction of 25%-37% in \$/W pending the implementation being used.
- PSE power supply:
 - In average, no change in \$/W cost.
 - Increase of 0% to 50% in ABS cost pending of the power management scheme being used.
 - Increase of 0% per simplest PM example scheme
- Heat due to increase in power delivered.
 - Increase of 0% to 50% pending the power management scheme being used, and power supply efficiency, room size and ventilation
- PD (PoE interface + DC/DC converter circuits)
 - Reduction of 33% average in \$/Watt cost pending the implementation being used.
- See Power Management presentation for more info.