A New PoE Application: Power Backup For Desktop Computers

Steve Robbins

Introduction

- A potentially huge application for PoE that has not yet been explored is desktop computers. PoE can provide enough power to prevent data loss during power failures.

- The 802.3at Task Force should look ahead and be certain that nothing in the new standard prohibits or hampers this application.

- This may have significant implications for the new Classification protocol.

Why Use PoE to Protect PCs?

- What are the present choices for protecting a large number of PCs in an office building?

Backup Method	Issues
One large UPS for entire building.	Very expensive. Makes sense for hospitals, but not many other customers.
Small UPS dedicated to each PC.	Expensive. High maintenance. Environmental issues.
All employees use laptop computers.	Expensive. Possible security problems.

- PoE would be the least expensive alternative.
  - □ One central UPS. Relatively small.
  - □ Low marginal cost if PoE is already installed for IP phones.

How Would It Work?

- **There are two approaches**
  - Sleep mode (ACPI G1 state)
    - System context stored in volatile memory (RAM).
    - PoE can maintain Sleep power only until the central UPS runs down. Data will be lost if power is not restored by then.
  - Hibernation mode (ACPI S4 state)
    - System context is stored in non-volatile memory (hard drive).
    - After everything is stored, power can be completely turned off for an indefinite time period without loss of data.
    - However, PoE would need to provide significant power (TBD) for a short time (~30 sec) while the system context is being stored.

Applicable Standards and Docs

- EnergyStar Computer MOU
- Advanced Configuration and Power Interface(ACPI)
- ATX Power Supply Spec
- IEEE Std 802.3af
- IEEE Std 802.3at

EnergyStar Requirements

- EnergyStar Computer MOU (Version 3.0)
  - Tier II: Computer models first shipped on or after July 1, 2000
  - Guideline A, Table A

Maximum Continuous Power Rating of Power Supply	Watts in Sleep Mode
≤ 200W	≤ 15W
> 200W ≤ 300W	≤ 20W
> 300W ≤ 350W	≤ 25W
> 350W ≤ 400W	≤ 30W
> 400W	10% of max continuous output rating

- Version 4.0, now in draft, proposes ≤ 5W sleep mode power for all desktop computers. Proposed effective date: Jan 1, 2007.

ACPI Specification

- **Global System States**
  - G0 Working
  - G1 Sleeping
    - Consumes minimal power.
    - Stores system context in volatile memory.
  - G3 Mechanically Off
  - S4 Non-Volatile Sleep (hibernation)
    - Stores system context in non-volatile memory (hard drive).
    - When in S4, the system can go to G3 without loss of context.
    - Automatically restores system context when returning to G0.
    - Note: May consume a lot of power briefly while storing data.

ATX Power Supply Specs

- **Present ATX requirements**
  - Must include enough hold-up capacitance to sustain all outputs for at least 16ms after AC power is removed. (Provides time for UPS to kick in.)
  - The PWR_OK must interrupt the CPU at least 1ms before the supply rails start to sag. (Provides time to park the HD.)
  - 5VSB is always on whenever AC power is available. Minimum rating is 2A. (Inrush up to 2.5A allowed for 500ms).

Implications For PoE Systems

- Many PDs (perhaps all) would step from minimum load (MPS level) to full load nearly simultaneously when facility power is lost. PSE must be able to handle this.
- Because ATX power supplies have some hold-up time, the central UPS can be the less expensive type.
- PCs that use Sleep protection mode would draw a few Watts continuously. The UPS must be large enough to maintain them for at least several hours, perhaps days.
- PCs that use hibernation protection mode would initially draw a lot of power (TBD), but would turn off after approximately 30 sec.
- New classification protocol may need to support dual request levels (see next 2 slides).

Extended Classification

- **Example: A typical computer after 2007**
  - ☐ Sleep requires 5W continuously.
  - ☐ Hibernation requires 35W for 35 seconds.
- **PoE Classification Process**
  - ☐ The PC must recognize the PSE type
    - If the PSE is Af, the PC will go into Sleep.
    - If the PSE is At, the PC will go into Hibernation, unless the required power (35W) is not available.
  - ☐ The requested power must reflect the mode
    - For Sleep, PC presents a Class 2 signature.
    - For Hibernation, PC requests at least 35W.

Possible Classification Flow Chart
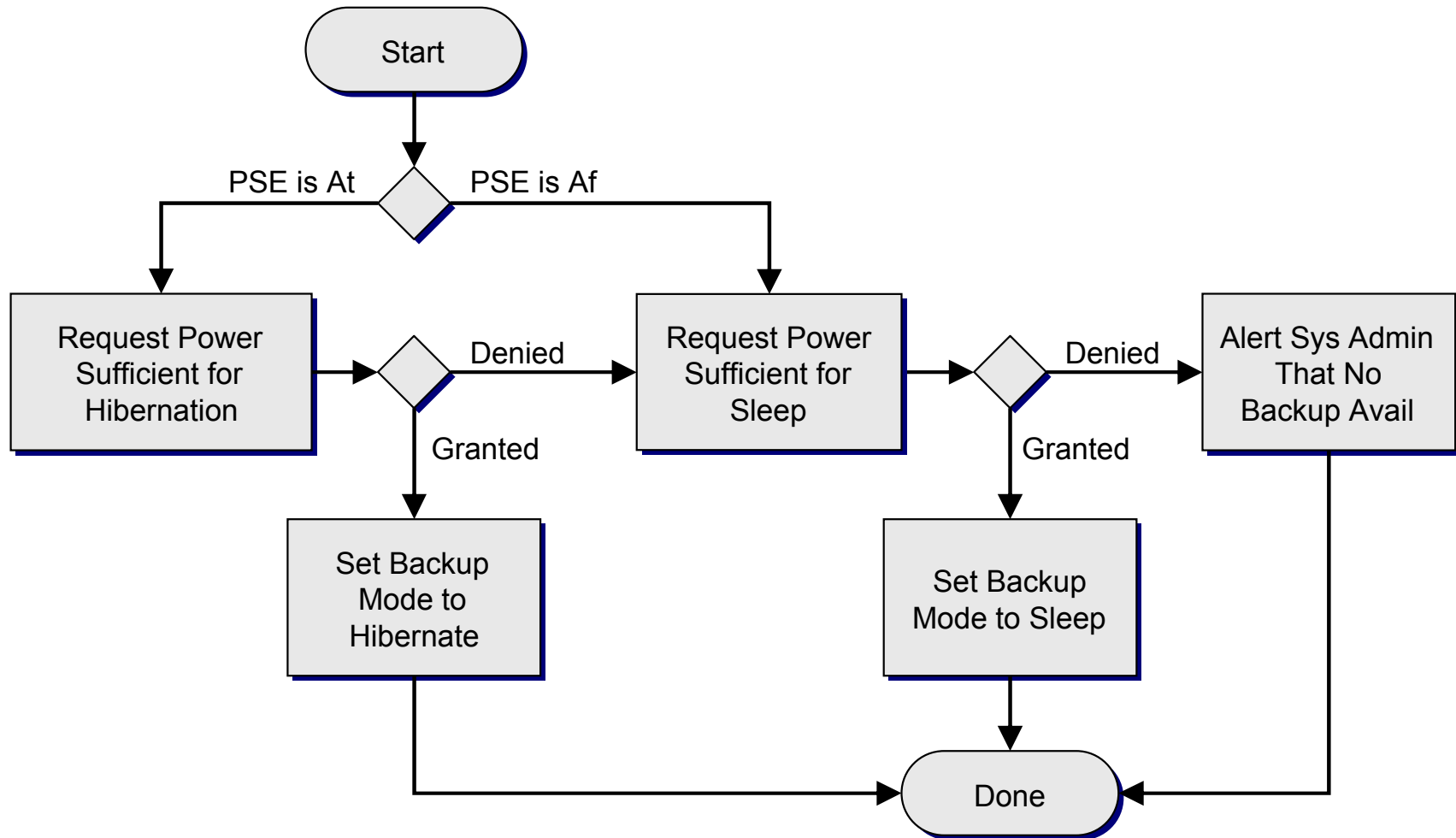
Implications For PC Designers

- The PD can't be on a NIC because there is no way to power the motherboard through a PCI slot. There are two other alternatives:
  - Place the PD on the motherboard. Output of PD is diode-ORed with 5VSB output of ATX power supply.
  - Place the PD inside the ATX power supply. Ethernet data would pass through the PS to the NIC.
- The peak power drain while entering hibernation (S4) must be within the capabilities of 802.3at (TBD).
- When the power switch is turned off, the chassis should be safe to open. So the switch has to kill the PD as well as the ATX.

IEEE 802.3at Task Force

Summary

- Battery backup for desktop computers may eventually become the dominant PoE application.

- Existing PoE technology (802.3af) is already sufficient to offer Sleep protection for some desktop computers. By 2007 all new PCs will have Sleep power levels well within Af limits.

- Sleep protection lasts only until the UPS runs down. Better protection must use Hibernation mode.

- Hibernation mode protection may push the limits of PoE Plus. PC makers may need to optimize designs for min power while copying data to HD.

- This application may have significant implications for the new extended classification protocol.