Supermicro Titanium Power Supply Solution

Summary

Supermicro Green Computing focuses on energy efficiency at every level, from individual components to architecture and deployment, helping customers reduce the costliest capital and operating expenses throughout their data center ecosystem. With the new 1600W Titanium Level Power Supply, Supermicro now offers complete server and storage solutions with the industry's highest efficiency rating of 96%+. This white paper demonstrates that a Supermicro server equipped with redundant 1600W Titanium Level (96%+) power supplies can save a data center customer up to $620 in total cost of ownership(TCO) over a 4-year period.

Introduction

Large scale data centers hosting cloud applications consume enormous amounts of energy, contributing to high operational expenses (OpEx) with the need for expensive cooling equipment to eliminate excess heat (CapEx). Together this CupEx and OpEx comprise a large portion of the total cost of ownership (TCO) for data center owners and Supermicro customers. As energy costs increase, there is a need to shift focus away from raw data center performance to optimizing for energy efficiency while maintaining high service level performance. According to a study by leading consulting firm McKinsey[1], the total estimated energy bill for data centers in 2010 was $11.5 billion and energy costs in a typical data center double every five years. In order to mitigate this effect, data center owners need to proactively adopt measures to ensure that TCO does not dramatically increase due to high energy and capital costs. The key challenge is to find ways to lower the energy usage of data centers while simultaneously ensuring that applications and data have the resources required to enable timely execution. On the server system technology front, highly efficient power supply design provides one of the best, most cost effective means of building a sustainable, high performance and energy efficient data center with lowest TCO.

Figure 1 - Supermicro 1600W Power supply Titanium Level Certified.

Supermicro's Titanium Level Power Supplies

Supermicro is one of the earliest developers of Titanium Level power supplies. The 1U Redundant 1600W power supply, PWS-1K68A-1R, is 96.2% efficient, meaning that for every watt use, up to 96.2% of that watt is available to be used by the server that it powers. Excellent power supply efficiency is maintained over various workloads, not just the four points efficiency measurements required. The efficiency curve of the 1600W power supply, compared with Gold- and Platinum-rated, is shown in Figure 2.

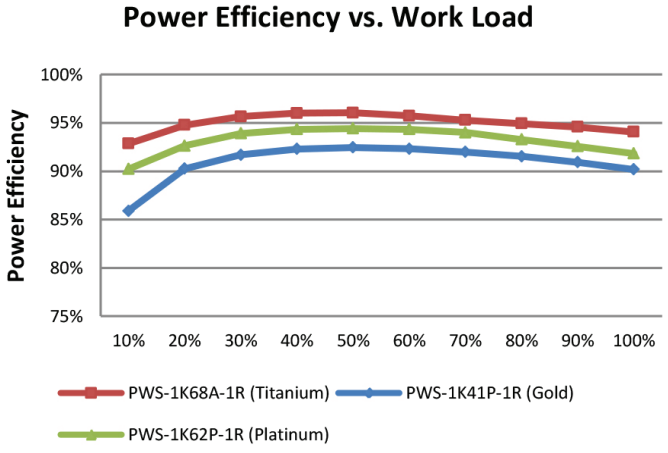

Figure 2 - Power Efficiency for Gold/Platinum/Titanium Level PSU.

Data Center Benefits when Using Supermicro Titanium Level Power Supplies

Supermicro Titanium Levelpower supplies easily pay for thenselves, plus a substantial component of the server they power, over that regular lifttime of server. The calculation in Figure 3 demonstrates how, over a 4 year lifetime, a Titanium Level PWS-1K68A-1R[2] can save up to $620 in energy cost at 50% of 1600W utilization, compared with the Platinum Level PWS-1K62P-1R[3].

Data Center Power Saving Calculation

(Assume server with 2 redundant 1600W power supply modules)

>> Assumes one work load -> 800W net power assumption (50% of 1600W output power)
>> PWS-1K68A-1R (Titanium Certified PSU): 830.48W input power (96.3% efficiency @ 50% load)
>> PWS-1K62P-1R (Platinum Certified PSU):851.06W input power (94.0% efficiency @ 50% load)
>> Average power saving: 41.6W for 2x PSU
>> Assuming server runtime: 24hours/365.25days
>> Product lifetime: 4 years
>> National average energy cost: $0.1/KWh
>> Assuming Power Usage Effectiveness (PUE): 1.5

41.17W * 24hours * 365.25 days * 4 years * $0.1/1000W *1.5PUE = $216.54

Possible Energy Savings: $620 for 4 Yrs

Figure 3 - Data Center Power Saving Calculation Example.

Applying the same methodology to a different work load, we can estimate data center energy savings per server. Figure 4 shows the savings when comparing Titanium to Platinum or Gold[4] Level power supplies. Maximum savings are achieved with a 50% workload.

The Titanium Level power supplies underscore Supermicro's overall strategy to provide efficient solutions to the data center infrastructures. When less energy is wasted within the server, less energy is consumed in the overall cooling infrastructure. Heat-loss prevention and minimal cooling are critical to the goal of increasing the power efficiency and reducing the TCO of a data center.

Data Center Energy Saving per Server

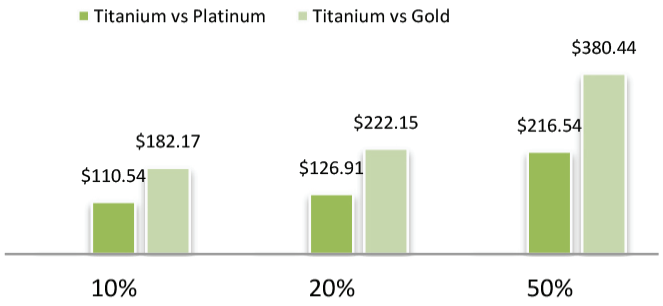

Figure 4 - Data Center Energy Savings at Various Utilization Rates.

Supermicro SuperServer® Solutions with Titanium Level Power Supplies

With the dimensions of 76mm(W) x 360mm(L) x 40mm(H), the PWS-1K68A-1R 1600W power supply is compatible with many existing Supermicro chassis and system products. It will be integrated into Supermicro's X10 product line, including FatTwin™, TwinPro™ and power supply Ultra products. With this highest efficiency, Supermicro's server systems will further outperform competitors' server systems.

Figure 5 - Supermicro FatTwin™ and 2U Twin[2]®.

Other Supermicro Titanium Level power supplies:

1000W PWS-1K02A-1R (Dimension: 73.5W x 40H x 203L mm)

1000W PWS-1K03A-1R (Dimension: 76W x 40H x 360L mm)

Digital Power Control

Another new feature of the Supermicro PWS-1K68A-1R power supply is a high-speed digital power controller with adaptive switching, in place of conventional analog circuitry to generate PWM control signals. With this new digital control, compensation and output parameters can be dynamically configured to match different load conditions resulting in increased efficiency across a wider range of operation. It provides an additional 5-10% efficiency gain at light loads, as well as faster transient response to input AC line voltage fluctuations,

resulting in a <5% Input Current Total Harmonic Distortion (THD) for an increased stability margin. All of these performance gains are summarized in Figure 6.

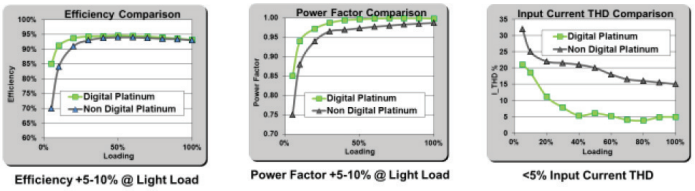

Figure 6 - Digital Power vs. Non-Digital Power Performance Comparison.

Power Management in SPM

In addition to the power management features included in the power supply hardware, Supermicro Power Management (SPM) software enables datacenter managers to monitor CPU/ Memory/System power usage and remotely control power consumption. SPM can control power consumption for a whole system using a policy-based approach.

Administrators can configure policies by data center, room, row, rack, target machine, or logical group defined by self. A policy can be triggered by the condition of power, by temperature threshold, and by time of day. An example of the SPM Dashboard is shown in Figure 7.

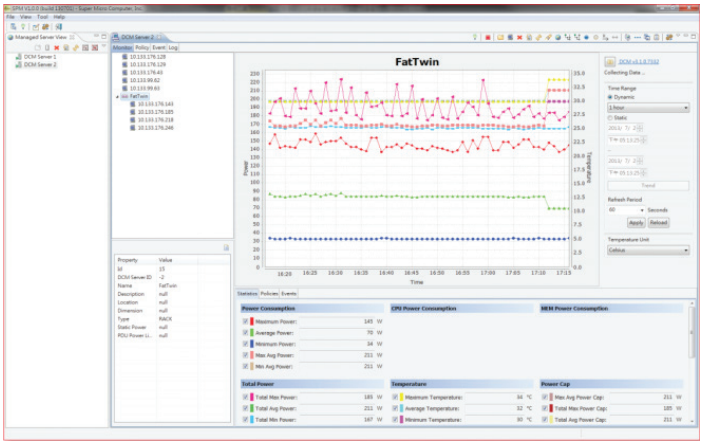

Figure 7 - SPM Dashboard

The four use cases of monitor, limit, survive and optimize shown in the SPM Dashboard are just a superset of power usage models that can be applied in the datacenter to meet power, workload, and compute requirements while also mitigating energy costs.

Conclusion

As power costs increase over time, power efficiency and sustainability continue to be a primary concern for data center managers. Titanium rated power supplies with 96%+ efficiency can easily be implemented to directly reduce operating costs, and capital expenses thus data center TCO. Supermicro's digital switching power control feature and power management software (SPM) also help to further decrease operating costs. Upgrading to a Titanium Level certified power supply can pay for itself with the operational energy savings over the product lifetime. Perhaps most importantly, implementing Titanium certified power supplies is a big step forward in promoting lower power environmentally friendlier data centers. Supermicro's Green Computing solutions, equipped with Titanium certified power supplies, create more sustainable computing solutions that deliver unprecedented levels of energy efficiency.

For more information about Supermicro's power supply solutions, visit *http://www.supermicro.com/products/nfo/power_supply.cfm*

Reference

1. J. Kaplan, W. Forrest and N. Kindler, Revolutionizing Data Center Energy Efficiency, McKinsey, July 2009.

2. http://www.plugloadsolutions.com/psu_reports/SUPER%20MICRO%20COMPUTER_PWS-1K68A-1R_1600W_SO-713.1_Report.pdf

3.http://www.plugloadsolutions.com/psu_reports/SUPER%20MICRO_PWS-1K62P-1R_1620W_SO-235.1_Report.pdf

4. http://www.plugloadsolutions.com/psu_reports/SUPER%20MICRO%20COMPUTER_PWS-1K41P-1R_1400W_SO-84_80+_Report.pdf

5. http://www.supermicro.com/products/nfo/files/FatTwin/FatTwin-White-Paper.pdf