vmware

Mr. Andrew Fanara
ENERGY STAR Product Development Team Leader
United States Environmental Protection Agency
Washington, DC 20460

Re: Energy Star Draft Specification, Public Review Draft, 14 March 2008

Dear Mr. Fanara,

VMware is pleased to have the opportunity to comment on the EPA's Draft 1 ENERGY STAR specification for Computer Servers. We have provided an executive summary, background on the case for virtualization and detailed comments on the draft specification.

This is valuable opportunity for government and industry to work together to improve the environment by increasing the energy efficiency in data centers.   Congratulations on great work so far.

Should your team require any additional supporting data or clarification on these comments, please feel free to contact me at (650) 427-1094 or rsmoot@vmware.com.

We look forward to continuing to collaborate with you and the EPA on this initiative.

Regards,

Rob Smoot
Group Manager, Product Marketing
VMware

VMware response to ENERGY STAR® Program Requirements for Computer Servers
DRAFT 1: Partner Commitments

Executive Summary

Virtualization can make a significant contribution to reducing data center energy
consumption in the near term at returns on investment acceptable to the industry.
Compute servers with an embedded hypervisor reduce barriers to deployment of
virtualization and should be recommended. These servers also have the necessary feature
set to fully utilize the benefits of distributed resource scheduling.

VMware is a member of The Green Grid, the Storage Networking Industry Association
(SNIA), SPEC, and DMTF. VMware is actively working with these organizations to
improve energy efficiency in data centers.

VMware is actively working with DMTF to develop platform power and cooling
management standards.

VMware is actively working with the SPEC consortia on virtualization benchmarking
which will provide metrics that reflect overall throughput a system can achieve running a
workload representative of a server consolidation scenario.

VMware believes that SNIA is the appropriate organization to develop an energy
efficiency proposal for storage.

VMware is working within The Green Grid to improve the energy efficiency of data
centers and develop metrics, measurements and best practices to facilitate this goal.

The Case for Virtualization

Virtualization is referenced twice:
- Page 7 Section B Paragraph 1 last sentence - "Therefore, EPA would like to
  explore how to encourage higher rates of utilization, with the understanding that
  this could not be a specification requirement due to how workloads are typically
  managed in various environments."
- Page 9 Section E - "ENERGY STAR qualified computer servers must come
  equipped with hardware power management and virtualization capabilities."

The specification should include an embedded hypervisor. An embedded hypervisor is a
thin layer of virtualization software that comes pre-installed on a server's internal flash or
hard drive. This software is integrated with the BIOS and embedded in the physical
system. An embedded hypervisor is different than a general purpose operating system or
applications which can be removed from the system by the end user without modifying
the hardware configuration.

Servers with an embedded hypervisor allow customers to install multiple workloads on a single server, eliminating the need for additional servers. The embedded hypervisor allows multiplexing of the underlying physical machine between different virtual machines, each running its own operating system. Consolidation ratios are commonly 5 virtual machines per physical processor, or 10 virtual machines on a 2 CPU server. Because an embedded hypervisor eliminates the need for so many servers, typical consolidations often reduce power consumption by 70-90%. Even if the server is used for only two virtual machines, power is reduced across those two machines by ~40%.

Customers are more apt to use a hypervisor when it is an embedded part of the server. Virtualization is being adopted successfully in the industry and is largely tied to server refresh cycles. Customers plan to have 48% of their servers virtualized within two years per Forrester. This is a proof point on the ubiquity of virtualization and supports the fact that customers are likely to use an embedded hypervisor.

Embedded hypervisors will be available on a wide variety of servers from all of the major system vendors (e.g., Dell, HP, IBM, Fujitsu-Siemens and others) starting in 2008.

Detailed Comments

1 A)   Definitions   Page 3

The definition of a computer server –
        requirement for a baseboard management controller or service processor.
        include an embedded hypervisor.

2)   Qualifying Products   Page 4

See 1 A).

3 A)   Power Supply Efficiency Requirements   Page 5

The power supply used for computer servers should be efficient.

3 B)   B. Idle Power   Page 7

Idle power is configuration dependant and with background activities typical in a computer server it is not clear what the value is. A power managed environment where workloads (i.e., virtual machines) are consolidated dynamically based on demand and unused computer servers powered down is more effective for energy conservation.

A computer server can achieve higher rates of utilization by using virtualization technology. The resulting computer server consolidation results in substantial reduction in energy consumption. In environments containing variable VM composite demand load (e.g., cluster 65% utilized during the day, 45% utilized at night), distributed resource management and power management can maintain high utilization by powering down unneeded resources.

3 C)   Standard Information Reporting Requirements   Page 8

Computer servers should have a BMC (baseboard management controller) and implement the DMTF DSP1009 Sensor Profile and the DMTF DSP1027 Power State Management Profile using the DMTF WS-Management protocol.

VMware supports the idea of providing consumers with additional information on the data sheet that will help illustrate the benefits of power saving features such as virtualization and power management.   Including specific requirements for metrics such as SPECpower_ssj2008 should be postponed until the tier 2 timeframe. This will allow industry groups time to release applicable workloads and benchmarks that will provide for standardized measurement and reporting.

3 D)   Power and Temperature Measurement Requirements   Page 9

Computer server hardware platforms should provide explicit notification via standards to systems software when platform power management affects available system resources, including most notably processor or memory.

Computer server hardware platforms should support a variety of ACPI C- and P-states ACPI C-states increase power savings when processors are idle.

ACPI P-states increase power savings when server processors are used for workloads with diverse processing needs.

Computer server hardware platforms should support industry standards for memory power management as they emerge.

3 E)   Power Management and Virtualization Requirements   Page 9

Computer servers should provide industry-standard automated remote mechanisms for wake from power-off.

Servers should have an industry-standard mechanism to report their current power consumption.

VMware desires to actively work with the EPA on Tier 2 Requirements.

4)   Test Criteria   Page 9

Evaluation of computer server performance needs to consider the entire system – power and performance in consolidated mode vs. un-consolidated mode.