ENERGY STAR® Stakeholder Discussion: Draft 1 Specification

Wednesday, April 2, 2008

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Agenda

• Identify some key themes across all comments
• Provide initial EPA response and next steps for addressing comments
• Present development timeline moving forward
• Address additional questions and comments
Ground Rules/Housekeeping

- Scheduled time: 90 minutes
- Questions may be submitted through Live Meeting during the presentation
- EPA will address questions at end of presentation
- Notes will be distributed within the next 2 weeks
• ENERGY STAR server and data center efforts initiated in January 2006
  – Early efforts focused on learning about technologies and industry prior to launching development process
• Specification development process is transparent
  – Interaction with stakeholder critical during process
• Several opportunities to comment and provide data
• Final specification represents the top performers available in the marketplace (e.g., top 25%)
Comment Overview

• More than 30 stakeholders submitted written comments
  – Several discussions leading up to Draft 1 release
• Good mix of industry representatives
  – Equipment and component manufacturers
  – Trade Associations
  – International Interests
  – Data Center Managers, Designers, Consultants
• Individual comments are posted to ENERGY STAR Web site, with permission
Partner Commitments

Comments
• Concerns regarding physical labeling of the server and product packaging
  – Major issue for rack mounted, blades (space, airflow)
  – Product packaging used across many configurations

EPA Response
• Recognize that the server market is different from the client market
• Important for vendors to be able to identify ENERGY STAR qualified models
• Labeling requirements may need to differ based on form factor (e.g., rack vs. pedestal)
Section 1: Definitions

Product Scope – Comments

- Exclusion of direct current (dc) powered servers, storage, and network equipment
- Blades require separate consideration

EPA Response

- Dc powered servers may be considered if questions can be resolved re: test procedure, etc.
- Storage and network equipment, separate initiatives (FY 09)
- Blades likely to require unique requirements
Comments

• Focus on volume servers for Tier 1
  – Packaged in 1U or 2U high rack mount chassis
  – Include single processor, maximum 4 processor sockets
  – < 16 GB of DRAM

• Mixed feedback on defining servers by application or by hardware characteristics

• Characteristics unique to servers:
  – Reliability, Availability, Serviceability, and Manageability (RASM) features
  – Multiple LAN and/or WAM networking ports
  – Baseboard Management Controller
  – Error Correcting Code and/or Buffered Memory (mixed feedback)
EPA Response

• Goal is to provide broadest coverage while clearly differentiating between client and server computers
  – Evaluation ongoing re: desktop derived servers
• Important to identify product scope and definitions early in process
  – EPA will share revised definitions for review and comment prior to Draft 2 (e.g., next 2-3 weeks)
Section 3: Power Supply Efficiency

Test Procedure – Comments

• Support for Generalized Internal Power Supply Efficiency Test Protocol (as opposed to 80Plus draft server power supply protocol)

• Supplemental fan power designed to provide system cooling should not be included in test/efficiency calculation
  – Several suggestions provided on how to address this issue

EPA Response

• EPA is currently comparing the two protocols
  – Generalized test protocol does not cover 10% load

• More research needed in the area of fan power, impacts on energy efficiency
Approach – Comments
• Harmonize with CSCI levels
• Remove 10% load from requirements
• End-user interest in addressing sizing issues

EPA Response
• EPA is interested in harmonization
  – Test procedure must be agreed on
  – Final levels will be based on data, need to determine % of market
• Data suggests that <20% load is quite common (especially in redundant configurations)
  – Need current data to show 10% not relevant
  – Assurance of proper sizing may eliminate 10% load
Approaches to Encouraging Minimal Energy Use for Power Conversion in Servers

• Specifying minimum power supply efficiency and power factor across a wide range of anticipated load conditions (10% to 100% load)
  – Encourages power supply to be efficient on the lab bench, but has no influence on redundancy choice or power supply sizing, each of which affect energy use

• Alternative approach is to specify net consumption (ac power in minus dc power out) at two load conditions where servers can be readily tested: max consumption and idle.
  – Represents a server-specific measure of power conversion energy use, based on the redundancy configuration and power supply sizing chosen for that model.
  – Server manufacturers can comply by improving efficiency, sizing power supplies appropriately, or some combination of both.
% Rated Load/Power Supply at 100% and Idle Processor Load for SPECpower Results

- % of Rated PS Load at 100%
- Redundant Load at 100%
- % of Rated PS Load at Idle
- Redundant Load at idle
Sample Calculations for a Range of Server Power Supplies
Comments

- Industry is working toward reducing time spent in idle through virtualization solutions
- Idle depends on hardware configuration and application, many classes would need to be defined
- Several concerns with using SPECpower* levels
- Base idle on % of power draw at max load
- Idle should be coupled with power at peak performance

Web site: [http://www.spec.org/benchmarks.html](http://www.spec.org/benchmarks.html)
Idle Energy cont.

EPA Response

• End users have indicated that many servers are spending a significant amount of time in idle state
• Virtualization is one key strategy for saving energy in the data center but current market penetration is low
• Understand that levels might need to be based on capability of server (e.g., computer 4.0 specification)
• Continued interest in using idle from SPECpower
  – Recognize existing reporting rules
Comments

• Overall strong support for this requirement
• Interest in including annual energy use
  – Do not include cost due to geographic variability
• Report by model not individual configuration
  – Could provide max, min, and typical power use for min and max configuration
  – Could also provide a link to a web based power calculator for specific configurations
• Add information on airflow rate and/or delta Temperature
  – Could help data center managers optimize facility
• No references to SPECpower
  – Must allow for several benchmarks depending on workload
EPA Response

• Goal is to provide transparency and consistency
  – Focus on items crucial to decision making process
• Recognize challenge re: model vs. configurations
  – Focus on base, typical, max, min?
• Understand limitations of using SPECpower for reporting purposes but believe there is some value
• Need to determine standardized information, drill down to the important elements
Comments

- Overall support for virtualization but uncertainty re: how it might be addressed as an ENERGY STAR requirement
  - Several different approaches to virtualization
  - Require hardware solution (e.g., embedded hypervisor)
  - May not be applicable to all servers

EPA Response

- Virtualization is a good strategy for reducing energy use
- Open to other ideas on how to best support virtualization (even outside of the specification)
Comments

• Significant support for including power management requirements

• Several stakeholders provided detailed lists of proposed requirements
  – EPA could require 2-3 enabled PM features from this larger list
Current list of PM features from comments:
- Reduced power levels with decreased workload
- Power capping
- Remote power management - ability to limit system power by external agent
- Ability to migrate workloads across servers
- Processor/chipset voltage/frequency scaling
- Power management of individual processor cores
- Low power memory states
- Low power I/O interfaces
- Dual/Variable speed fans w/ control
- Embedded hypervisor for virtualization
- Rack level or processor level liquid cooling
EPA Response

• EPA is not advocating low power performance levels
• Goal is to provide information on available PM features, should users want to implement them
  – In a vendor neutral way
• Can a list of features be developed that focuses on common set of PM functions, allowing for several approaches
• Should enabling of these features be a requirement?
Comments

• Strong support for measurement and reporting of input temperature and power use

• Mixed comments on what is more important: the ability to measure or standard reporting across the network

• Some concern over picking one protocol (e.g., DMTF), as there are many protocols currently used in the market
  – Could take a simpler approach of simply requiring the output in xml or CSV format

• In future could look at memory and hard drive utilization in addition to processor utilization
EPA Response

- Goal is to provide the ability for managers to access energy and temperature data in a vendor neutral way
- If no industry-wide standard protocol currently exists, and this is not an existing barrier to access this data, measurement and output of this data may be sufficient for the Tier 1 specification
- Additional research and discussions with end users is needed
Section 4: Test Conditions

• Majority support for testing at 230 VAC
• Interest in using 50 Hz in addition to 60 Hz
  – Align with European and U.S. markets
  – Frequency believed to have minimal effect on efficiency
• Allow for standard U.S. office voltages for servers deployed in this scenario (i.e., 115 VAC)
• Allow for other country voltages (Japan, 100 VAC)

EPA Response
• Servers should meet requirements in every market where they’re sold
• Need to develop the right combination of frequency and voltage to represent the broadest application
Section 5: Effective Date

- Support for a Tier 1 effective date of Q4 08
  - Highly dependent on scope and testing requirements
- Tier 2 effective date should be based on lifecycle of equipment (e.g., 2-3 years after Tier 1)

EPA Response

- Tier 1 will expire on a set date and replaced by a more effective Tier 2
  - Tier 2 provides a road map of where EPA wants to go longer term with the specification
  - Need to balance need for market relevance with providing adequate time to prepare for new requirements
Next Steps and Timeline

- Stakeholders encouraged to provide additional comments and data following this meeting
- Proposed definitions will be distributed for review and comment within next few weeks
  - Need to establish product scope to base testing/levels
- Potential in person stakeholder meeting in June
  - Draft 2 specification release targeted for late May
- EPA continuing to work toward a final specification by the end of this year
Discussion/Questions