ENERGY STAR® Server Specification Discussion Document

ENERGY STAR Stakeholder Meeting
October 31, 2007

Background

In July of 2007 EPA released a framework document to begin a dialogue with stakeholders to potentially shape an initial draft ENERGY STAR specification for Enterprise Computer Servers. The document contained some key findings of EPA's research to date, as well as a number of questions indicating what additional information EPA needs to move forward with a possible specification for these products.

The purpose of this discussion document is to encourage stakeholders to brainstorm ideas prior to the server working group session to help facilitate a thorough discussion of the potential criteria presented by EPA. The first section of this document presents the key themes of the stakeholder comments submitted to EPA on the draft framework document along with questions and initial thoughts for discussion. In addition to power supply efficiency, which was referenced in the framework document, some additional criteria are presented for discussion later in the document.

Key Themes Taken from Comments on the Framework Document

EPA received over 25 sets of comments on the ENERGY STAR Specification Framework Document released in July of 2007. The following is a list of key themes taken from these comments for further discussion. Additional questions posed by EPA are also provided for consideration. EPA intends to use these questions to frame the discussion during the working group session. However, attendees are also encouraged to share any additional concerns or comments not covered below.

1. *Definitions and Scope of a Possible Specification:*
   - Specification should cover volume, blade and possibly medium-sized servers. Large servers (e.g., mainframes and supercomputers) should not be covered, and desktop-derived servers (low-end servers built primarily from desktop components) should remain under the Version 4.0 computer specification for Tier 1.

   Discussion Points: EPA is investigating the coverage of large servers under a Tier 1 specification if this proves feasible. For those server products that end up being excluded from a Tier 1 specification, EPA will pursue these classes of servers under a Tier 2 specification (possibly also including desktop-derived servers). EPA is interested in further discussion on what products could effectively be covered by this specification.

   - EPA roughly defines "enterprise" servers as servers designed with capabilities and reliability above and beyond that of desktop-derived servers (i.e. used for mission critical applications). Characteristics that stakeholders feel help define these products include:
     - Redundancy (including "hot-swappable" components),
     - Processor scaling (# of processors/cores),
     - Memory capacity and type (e.g., # of Dimms, ECC memory),
     - Capable of utilizing external storage (NAS and/or SAN) ,
     - Dedicated management controllers,
     - Other components (internal disks, network adapters, option slots),
     - Rack Space (e.g., 1u, 2u, 3u, etc.), and /or,
     - "Server class" operating systems.

Discussion Points: Can a workable definition be made for Enterprise servers from the above characteristics to accurately cover the scope of the specification and separate these products from standard computers (desktop and notebook) and desktop-derived servers covered under the Version 4.0 computer specification? Can these characteristics also be used to further separate servers effectively by class or function (e.g., volume, mid-range, large servers)?

- Covering other IT equipment found in data centers (storage and/or networking equipment) under a simplified Tier 1 specification may be possible, but these products would need separate metrics/benchmarks for Tier 2.

Discussion Points: Can storage and/or networking equipment be effectively covered by a Tier 1 specification? Can we identify some key requirements or components that are shared across all of these equipment types (e.g., power supplies)? How can "enterprise class" storage and networking equipment be delineated from other devices? What challenges need to be considered when trying to cover each of the various product types with one overarching specification?

2. *Possible Criteria for a Tier 1 Specification – Power Supply Efficiency*

- Basing a Tier 1 specification on power supply efficiency and then focusing on energy and performance metrics for Tier 2 is a viable approach to covering servers in the short and longer terms.

- The 80 Plus server test procedure (www.80PLUS.com/servers.htm) for server power supplies should be sufficient to characterize the efficiency of these components, with some minor points for discussion, such as:
    - Coverage of multi-voltage supplies,
    - Cooling methods, and
    - Appropriate test voltage(s)

Discussion Points: Is a single 208 VAC/230VAC test voltage sufficient to characterize the efficiency of these products? How might a specification based on power supply efficiency address products with shared power supplies (e.g., blade servers, dc powered servers) or multi-voltage power supplies? Can power factor play a role in efficiency under this specification? EPA is interested in reviewing any data or supporting information that manufacturers might be able to share regarding server power supply efficiency.

3. *Possible Criteria for a Tier 2 Specification – Energy and Performance Metrics*

- The SPECpower benchmark (still under development, information available at http://www.spec.org/specpower) is the closest thing industry has to a universal energy benchmark, but is currently only based on one workload, which may not be sufficient to cover all server types/uses.

Discussion Points: EPA would like to discuss the challenges of using SPECpower further with attendees. What types of products are excluded from SPECpower? What other options exist for measuring whole machine energy-efficiency performance for those products not covered by SPECpower?

To aid in the development of a Tier 2 specification, EPA is considering requiring manufacturers to report SPECpower results under Tier 1. Note that this is for reporting purposes only and would not be the basis for performance qualification under Tier 1.

4. Incentives for Energy Saving Technologies in the Data Center
- Any possible specification needs to be aware that servers and other IT equipment are parts of a larger system when included in a data center, and emphasis should be on saving energy holistically on the data center level. Therefore, the specification needs to properly address technologies which save energy in data centers as a whole, including:
  - Virtualization (Raises utilization and decreases number of boxes),
  - Blade Systems (Large density and shared resources), and,
  - Close-coupled cooling.

  Discussion Points: EPA believes that an ENERGY STAR specification for servers and other IT equipment could be one building block to help data center operators save energy in the data center, but recognizes this is only one element of a broader strategy. How can EPA measure and/or promote the use of energy saving features, or at least ensure that they are treated equitably by the specification?

Additional Specification Criteria for Consideration:

In addition to the stated goal of covering servers based on power supply efficiency (Tier 1) and a whole machine performance metric (Tier 2), EPA has a number of other possible criteria under consideration. EPA believes that Tier 1 should include as many of these criteria as possible, but any criteria which is not deemed feasible for Tier 1 would be further investigated for the Tier 2 specification. EPA is interested in collecting stakeholder feedback on these preliminary ideas. Key questions regarding each criterion have been included, where appropriate, below.

5. Standardized Information Reporting
- To help buyers purchase an energy-efficient product that best serves their situation, EPA is considering a requirement for easy access to standardized information to allow consumers to compare performance, capability, and power use of the server. This information would be analogous to the well known DOE labels on white goods.

  Discussion Points: What information could be reported on such a label to help buyers compare products based on performance and/or capability? Would industry find such labels helpful in relaying consistent information on their products? Could the output of the SPECpower benchmark be used to collect/supply some of this information?

6. Access to Power Use and Temperature Information
- EPA believes that an important step in improving data center operations is easy and uniform access to information on power use and inlet/output air temperature of individual equipment in the data center. To this end, EPA supports the development and inclusion of standard Ethernet protocols for querying power and temperature information of servers and other IT equipment.

  Discussion Points: EPA believes that most enterprise products already contain many of the necessary sensors to gather this information – is this the case? Is it viable to promote a standard way of querying this information for data center operators? Could collaboration with the Distributed Management Task Force (DMTF) or use of the Simple Network Management Protocol (SNMP) produce such a standard?

7. *Active Power Management*

- EPA is also investigating specification requirements for active power management. EPA realizes different manufacturers have different approaches to power management and is therefore, considering developing a list of active power management techniques and requiring a certain number to qualify (e.g., 2 out of 5).

  Discussion Points: Which techniques for active power management could be addressed by this requirement? Ability to enter low power states at times of low utilization? Power scalability of hardware (e.g., processors, fans, etc.)? Power capping?

8. *Energy Efficient Ethernet*

- EPA is interested in supporting IEEE 802.3az for all Ethernet ports. This will provide for reducing the link rate on Ethernet links during times of low utilization with methods to resume full speed operation with minimal latency. It is expected to apply to 1 Gb/s, 10Gb/s, and both ordinary copper cabling and backplane applications. For further information see: http://ieee802.org/3/eee_study/public/index.html.

  Discussion Points: This project has recently advanced from a Study Group to a Task Force within IEEE 802. EPA realizes that products utilizing the standard will most likely not be available in a Tier 1 time frame and therefore, is considering it for Tier 2. Do stakeholders have any suggestions or concerns with the inclusion of this requirement and/or the proposed timing?