

March 14th, 2008
EMC Corporation
176 South St.
Hopkinton, MA 01748

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

Dear Mr. Fanara,

EMC is pleased to have the opportunity to comment on the Draft 1 ENERGY STAR Program requirements for Computer Servers. We would like to share the following observations:

We support the application of ENERGY STAR requirements for enterprise storage systems. We do remain convinced that the attributes, categories, features, and workloads of storage differ enough from those for general use compute servers to warrant a separate specification.

With respect to compute servers, there is a special category of products to consider that uses standard server technology as the basis of purpose-built devices to perform a dedicated function in the data center. These products are often referred to as "appliances", and may offer security, name services, or other dedicated functions. As some of the attributes of these products will differ from those of general purpose servers, particularly with regard to their inability to run user-installed applications and workloads, these devices should be considered as a distinct category of server.

We do question the practicality of a performance-based efficiency metric, as performance itself has multiple dimensions (e.g., throughput, response time, threshold-based) and doesn't take into consideration other service level attributes such as availability, RTO (recovery time objective), and RPO (recovery point objective). We would like to offer an alternative that we believe will help achieve both the goal of driving the industry to efficiency improvements and assist the customer in making energy-efficient choices. The broad idea is to implement two basic energy consumption metrics. One would measure energy consumption of the entire system while the system is totally quiescent while the second would measure energy consumption under full load. This would provide consumers with an indication of the complete range of energy consumed by the target system, regardless of their unique workload, and allows suppliers to focus on two well-defined use cases. We include more details below and would be pleased to discuss further.

EMC strongly agrees with the EPA that IT equipment should provide environmental information to management systems, and supports the standards efforts of DMTF. However, we also believe that market mechanisms should be allowed to drive the development of those standards, encourage ongoing enhancements, and be open to consideration of future standards and protocols that may be applicable.

The attached addendum to this document includes some more detailed comments on the draft specification.

We appreciate your consideration of these important issues and believe that industry and government have a unique opportunity to work together to drive power and energy consumption improvements for data center equipment. We welcome the opportunity for further discussion.

Regards,

Kathrin Winkler
Senior Director, Product Management
Common Storage Platform Operations
EMC Corporation

Addendum: EMC Corporation - Detailed Comments

1. [page 3, Section 1, item A]: In defining Computer Servers, we suggest that the bullet "Certification for use with enterprise-class server Operating Systems" be clarified to say "Certification for use running enterprise-class Operating Systems on which users may run one or more applications of their choice". We believe this clarification offers the opportunity to distinguish from general purpose servers and purpose-built dedicated appliances.
2. [pages 4 & 5, Section 1, items B - E]: We'd like to offer the following two energy consumption metrics as an alternative consideration to performance - based efficiency metrics:
 - a. **Entire System Quiescent** (measured at line cord)
 - All server hardware installed and powered as per standard configuration
 - Basic functionality loaded/running
 - No network interfaces connected to external hosts/networks
 - b. **System Under Load:**
 - Employ a simple load generator to saturate all processor cores, and write to 100% of any available disk space
 - All server hardware installed and power applied per standard configuration
 - Baseline functionality loaded/running
 - Network interfaces connected only if necessary to support I/O workload generator

EMC Corporation welcomes the opportunity to review the metrics outlined above in more detail with the Environmental Protection Agency.

3. [page 7, Section 3, item A]: With respect to power supply cooling fans, we recommend that cooling fans be considered part of the power supply load if, and only if, they are used exclusively for power supply cooling. If used for system cooling purposes, fans should be considered part of the system load. This approach will avoid designs that are optimized for the power supply rating, but sub-optimized for the system as a whole.
4. [page 7, Section 3, item B]: While we strongly concur that optimizing system usage is one of the most effective measures to improve energy efficiency, we'd like to highlight that encouraging higher utilization can adversely affect the efficiency of storage equipment. For example, de-duplication software reduces the physical storage capacity required for the same logical volume of data. In typical environments, de-duplication of data can defer incremental purchases as well as reduce the backup windows and volume of backup media. It can also reduce access frequency to populations of disks that can then be spun down as a result. However, one thing it will almost assuredly do is reduce the utilization rate. There are likely similar situations with application software that we do not want to encourage to use more computing capacity than required by the task just to maintain high rates of utilization.
5. [page 8, Section 3, item C]: With respect to the noted standard data sheet information reporting requirements, we advocate that labels include only information that is model-specific rather than configuration-specific, to avoid retooling companies' labeling processes.

6. We'd like to offer the following approach helping to define a separate storage equipment specification based on tiered operational and functional workload classifications.

Operational Tier Level:

- Block Level Storage
- File -Level Storage

Functional Category sub-levels

- Networked Enterprise
- Networked Performance-oriented
- Networked Capacity-oriented
- Networked Near-Online

The functional categories above could be defined by a range of standard storage equipment attributes which distinguish each sub-level.

We also offer that the following key storage power and energy efficiency features may also serve to further differentiate storage equipment from general use compute servers. Such features for consideration could be:

- Storage Thin Provisioning (also referred to as Virtual provisioning)
- Disk Drive Spin-Down
- Data De- duplication
- Storage Virtualization
- Solid State Flash Drives
- Delta Snapshot Replication
- Compression

7. The Storage Networking Industry Association (SNIA) has been working toward a common set of categories and metrics for networked storage. EMC endorses this effort, and we hope that the EPA will leverage the product of its work.