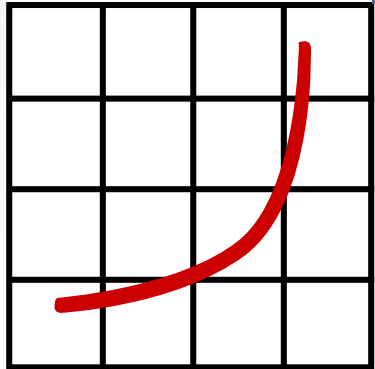


Benchmarking the Energy Efficiency of Servers

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Chair, SPEC Power and Performance Committee



spec

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Agenda

- SPEC's Philosophy
- SPEC in a Nutshell
- SPEC Power and Performance Committee
- Committee Status
- Benchmark Prototype
- AC Measurement – Automation
- SPEC's Recommendation
- Q&A
- Example of the Level of Details: Minimum Power Meter Requirements

SPEC's Philosophy

- To ensure that the marketplace has a fair and useful set of metrics to differentiate systems
 - A good benchmark, that is reasonable to utilize, will lead to a greater availability of results in the marketplace.

- To provide a standardized suite of code that has already been ported to a wide variety of platforms
 - The system can then be tuned for the best results.

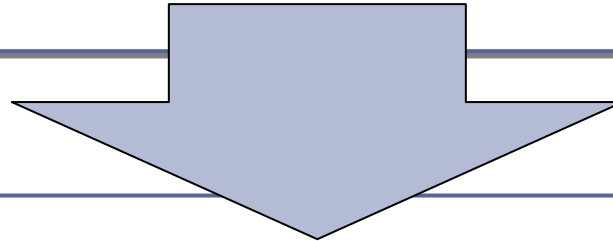
- SPEC welcomes organizations to join and participate in our work, and stands ready to offer guidance on workloads and benchmarks.

SPEC in a Nutshell

- A world-wide non-profit consortium formed in 1988 to establish, maintain and endorse a standardized set of relevant benchmarks that can be applied to the newest generation of high-performance computers
- Development of benchmark suites, review and publication of submitted results (no certification)
- Over 80 computer hardware and software vendors, educational institutions, and government agencies
- Large repository of well documented, peer reviewed, benchmark results
- Understanding of workloads, benchmark code, fair comparisons across different systems

Industry Needs

The drive to create the SPECpower benchmark comes from the recognition that the IT industry, computer manufacturers, and governments are increasingly concerned with the energy use of servers. Development of the SPECpower benchmark provides a means to measure energy use in conjunction with performance metrics.



Development

On January 26, 2006, the SPEC Power and Performance Committee began development of the first generation SPEC benchmark for evaluating the energy efficiency for server class computers. The SPECpower benchmark's goal is to provide a means to fairly and consistently report system energy use under various usage levels. The goal of the committee is to utilize proven SPEC server benchmarks in order to provide workloads under which energy use can be measured.

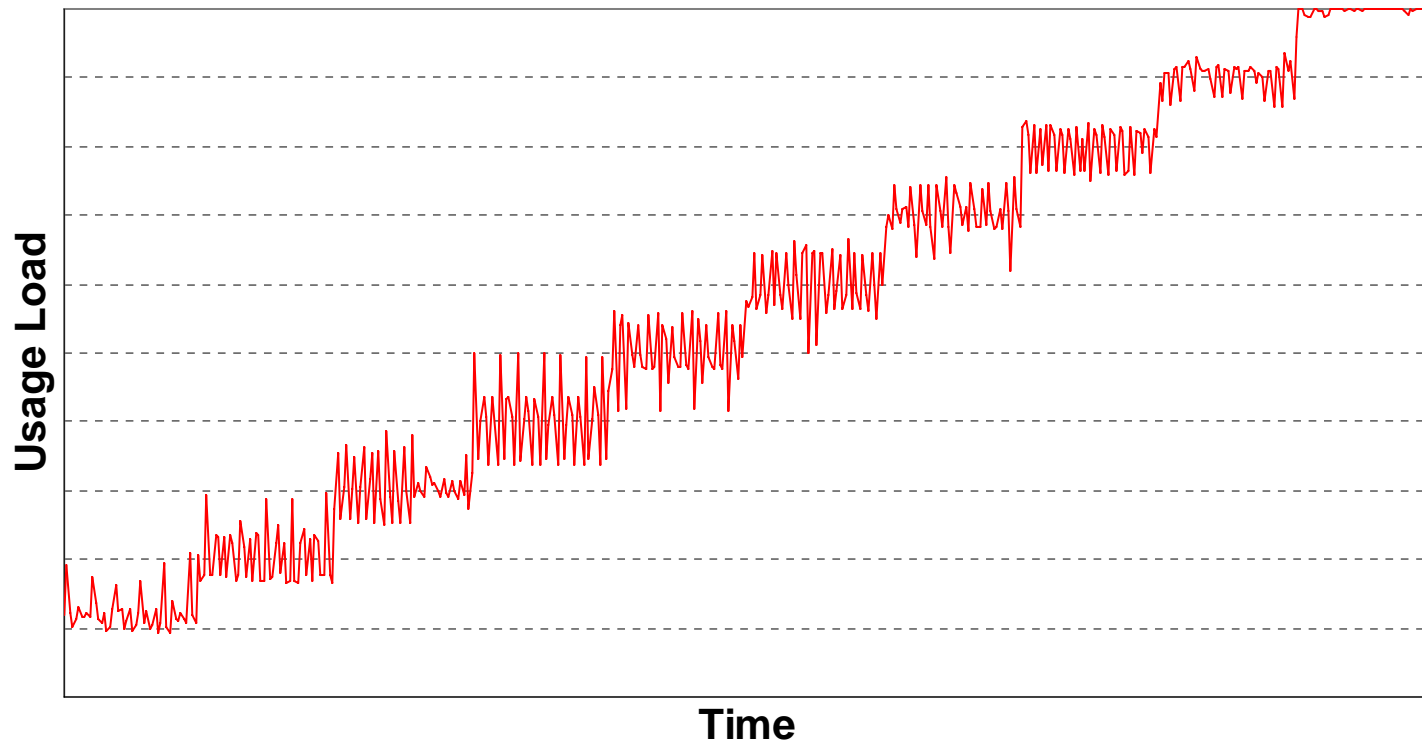
Committee Status

- Current SPEC member companies committed to developing a power-performance measurement standard include AMD, Dell, Fujitsu Siemens Computers, Hewlett-Packard, Intel, IBM, Sun Microsystems, SPEC Associates and SPEC Supporting organizations.
- The SPEC Power and Performance Committee has developed a working prototype and slated the completion of the final version for 2007.
- The Committee is hereby placing an open call for participation, please contact info@spec.org for additional information.
- Information on development of SPEC Power and Performance Benchmark is available at www.spec.org/specpower.

Benchmark Prototype

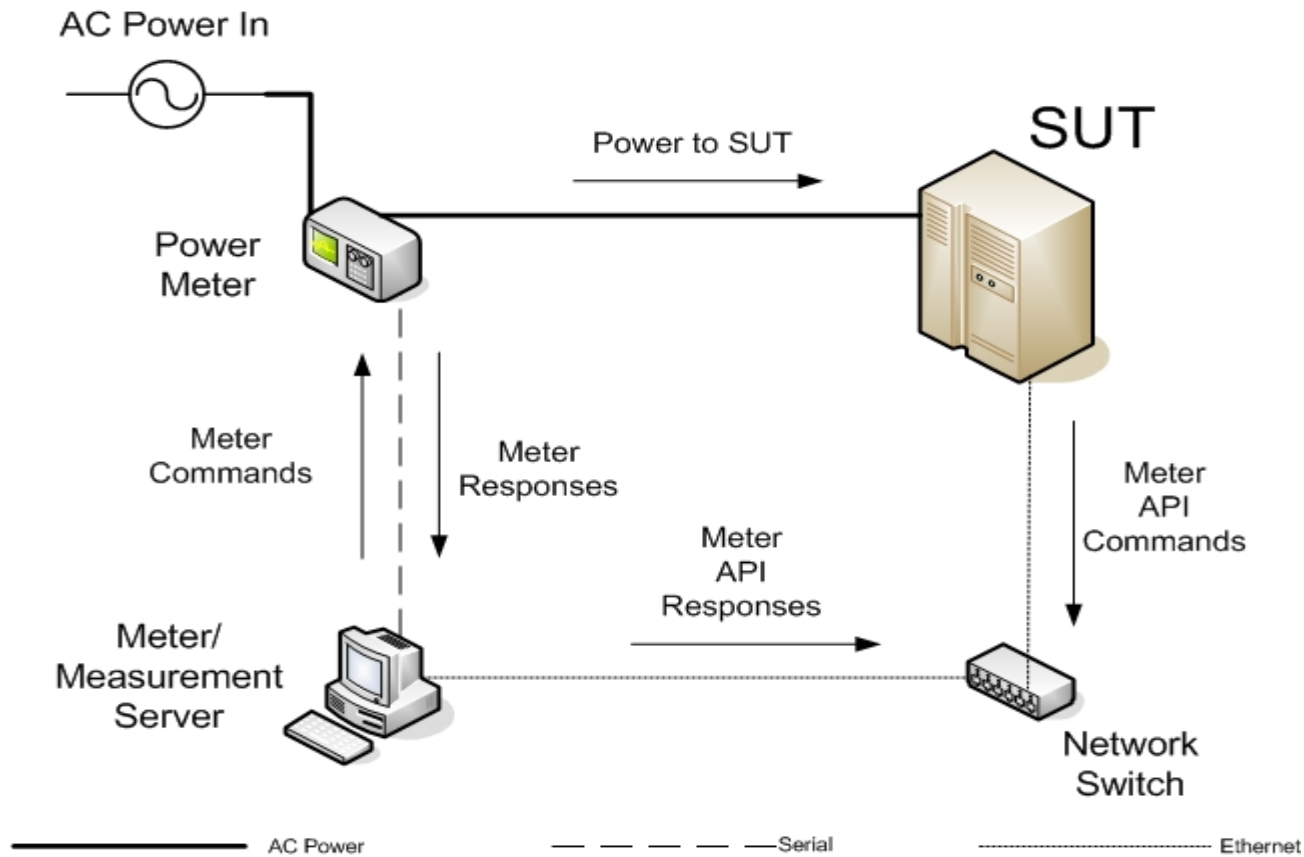


Variable system utilization in order to provide multiple usage loads and energy measurement points



AC Measurement – Automation

Energy measurements are made at the AC input to the system under test



The SPEC Board of Directors encourages the EPA to give strong consideration to working with an established industry standards corporation during development of an Energy Star program for servers.

Q & A

Example of the Level of Details: Minimum Power Meter Requirements



Calibration	The meter must be able to be calibrated by a standard traceable to NIST or counterpart national metrology institute in other countries
Crest Factor	The maximum crest factor of the meter must be ≥ 3
Measurements	True Power (W), volts, amps, power factor must be reported by the meter. Frequency needs to be measured only at the beginning and end of the measurements
Logging	The meter has to store measurements to an external device, with a reporting rate of $\geq 1/\text{sec}$. A power meter with automatically download capabilities is highly recommends.
Power Accuracy	2% of the reading
Power Resolution	3 digits
Power Range	The meter must be able to handle the maximum expected power consumption. It should match the requirements of the system under test.