GreenGraph500 Submission Rules
Version 1.1

Torsten Hoefler in cooperation with the Graph500 Team

May 24, 2014

This document specifies the rules for submitting to GreenGraph500, a list to compare energy consumption of the fastest supercomputers for data-intensive problems. A supercomputer system and the power measurement techniques must meet all the requirements to enter the GreenGraph500 list.

1 Qualifying Computers

To qualify for entry with a specific problem size in a certain year, a computer must be at least as fast as the lowest ranked computer in the official Graph500 list in the same year. The power reported in the submission to GreenGraph500 must be the power draw measured while achieving the performance reported to the GreenGraph500 list. However, it does not have to match the reported Graph500 performance (even though this is recommended). This means that power-saving features, such as DVFS (dynamic voltage and frequency scaling) or turning off harddrives, which may reduce the feasible problem size or performance, are explicitly encouraged. Using such features should be reported in the submission.

2 Benchmarking Environment and Procedure

The definition of this test build upon established practice by the US EPA Energy Star certification [1], SPECpower, and the Green500 list. Submitters are required to perform all tests and self-certify the tested computers and environments to qualify for GreenGraph500 based on the requirements specified in this document.

The power consumption of a supercomputer is measured as the average true power consumption of a representative component of the computer multiplied by the number of components. If the component does not include the whole machine, then it needs to be ensured that the component is performing absolutely identical and representative work (computation, communication, and I/O) with all other components. This implies that a representative subset of the networking and storage equipment used in the benchmark also needs to be measured. If the idle and full-load state of the equipment can be measured then the full load (including idle) shall be reported for the list.

2.1   Measurement Environment

The environment has to be within the limits below to ensure reproducibility and validity of the results:

1. The supply voltage and frequency has to be within +/- 1% of the rated AC voltage and frequency during the measurements.

2. The ambient temperature has to lie between 10 and 30 degree Celsius.

3. The relative humidity has to lie between 30-80%.

We recommend that power menagement devices from the list of accepted devices of SPECpower are used. The list can be found at:

`http://www.spec.org/power_ssj2008/docs/SPECpower_ssj2008-Device_List.html`

2.2   Measurement Procedure

The idle measurement shall be taken while the system is not performing any active computation (idle) and after it has been running for at least 15 minutes.

The full-load measurement shall be taken while the system is running a workload as specified in the Graph500 rules. The measurement shall be started after the application has been running for at least 10% of the total execution time. The measurement shall run for at least 20% of the total execution time and the average power consumption shall be reported. Two independent measurements shall be performed and only shall only be reported if two runs vary by less than 2%.

2.3   Submission Procedure

Submissions can be directly made through http://green.graph500.org and a computer will be listed if all conditions described in this document are met.

Disclaimer

We reserve the right to change the specifications in following years to adopt to new technologies.

References

[1] Environmental Protection Agency. *ENERGY STAR Program Requirements for Computers Version 5.0.*