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SC' 13, Denver, Colorado

With support of David Bader, Andrew Lumsdaine, Richard Murphy, and Marc Snir

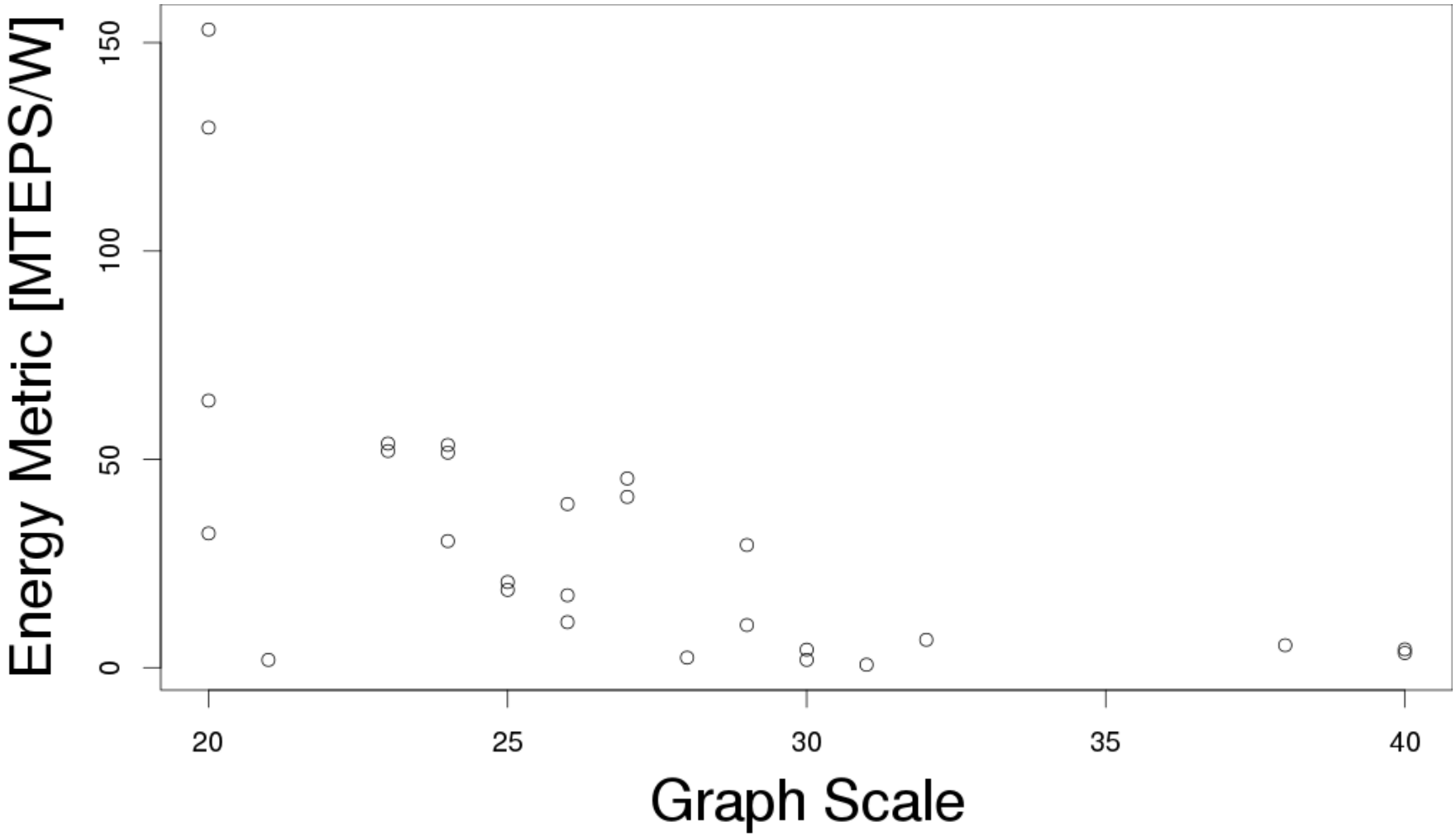
Green Graph 500

GRAPH 500

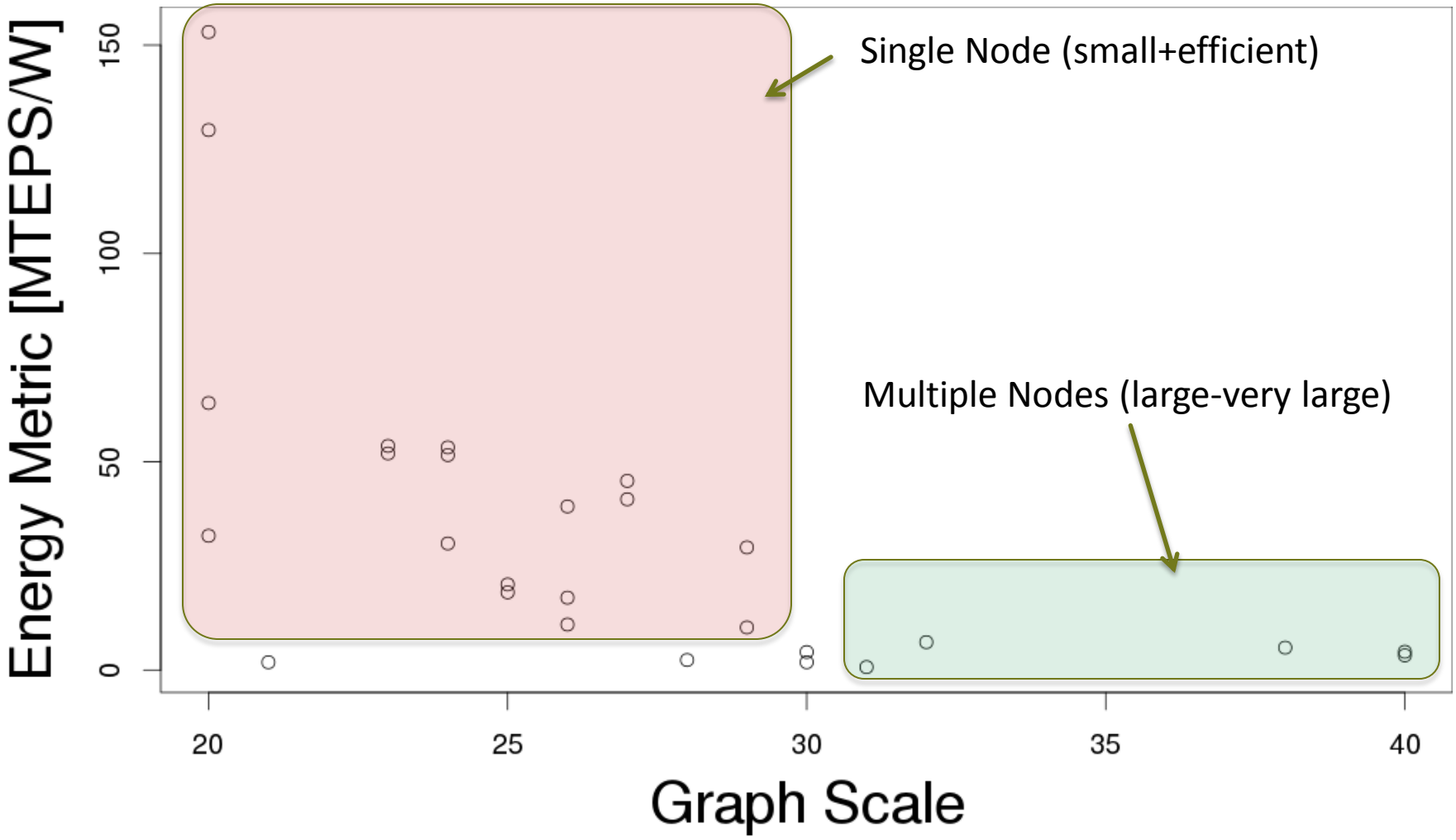
The Green Graph500 List

- **In close collaboration with Graph500 (same rules)**
  - Will have a separate list and separate awards
  - http://green.graph500.org/
- **Measurement techniques compatible with established practice and Green500**
  - Allows comparisons and cross-analyses
  - Only real measurements, no TDP etc.

Received Submissions



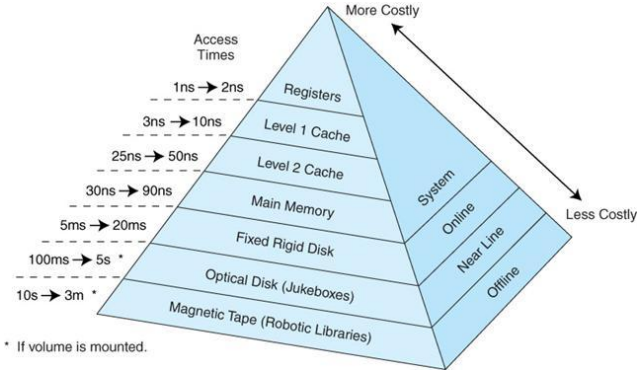
Received Submissions

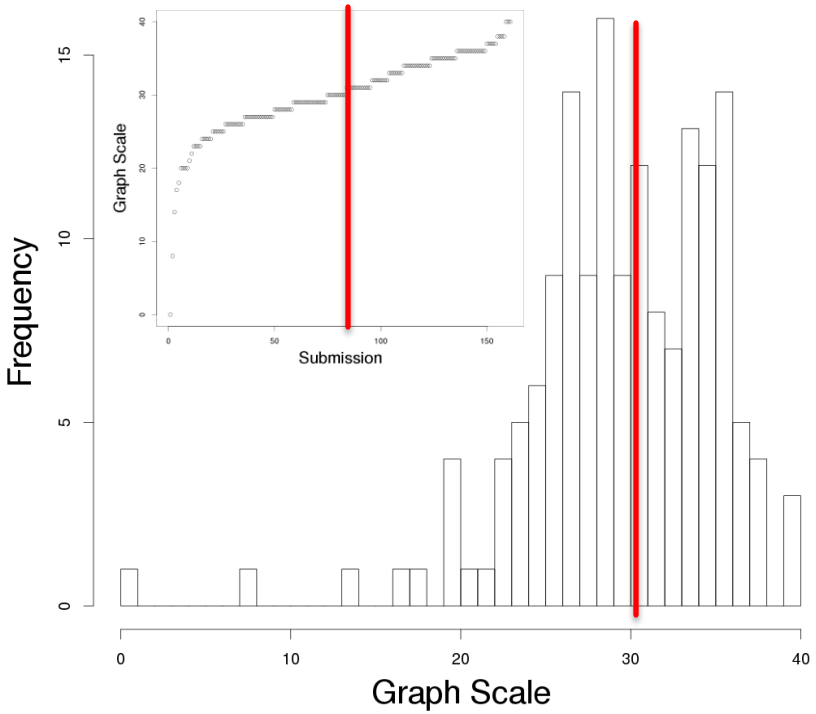


A Natural Split

- **Small Data vs. Big Data**
  - Fundamentally different categories
  - Often: single node vs. multiple nodes
    - *Or: in cache vs. in memory?*
    - *Or: in registers???*

- **Graph500 doesn't limit the "minimal submission" (yet)**
  - Median of Graph500 scales
  - Nov. 2013 list: Scale 30





The Small Data List

Rank	MTEPS/W	Site	Machine	G500 rank	Scale	GTEPS	Nodes
1	**153.17**	Yuichiro Yasui	GraphCREST-Xperia-A-SO-04E	143	20	0.476	1
2	**129.63**	Tokyo Institute of Technology	GraphCREST-NEXUS7-2013	141	20	0.534	1
3	**64.12**	Chuo University	GraphCREST-Tegra3	150	20	0.154	1
4	**53.82**	Chuo University	GraphCREST-Intel-NUC	124	23	1.082	1
5	**53.47**	Chuo University	GraphCREST-Mac-mini	103	24	1.941	1
6	**52.02**	Chuo University	GraphCREST-MBA13	119	23	1.228	1
7	**51.62**	Chuo University	GraphCREST-Retina15	102	24	1.987	1

The Big Data List

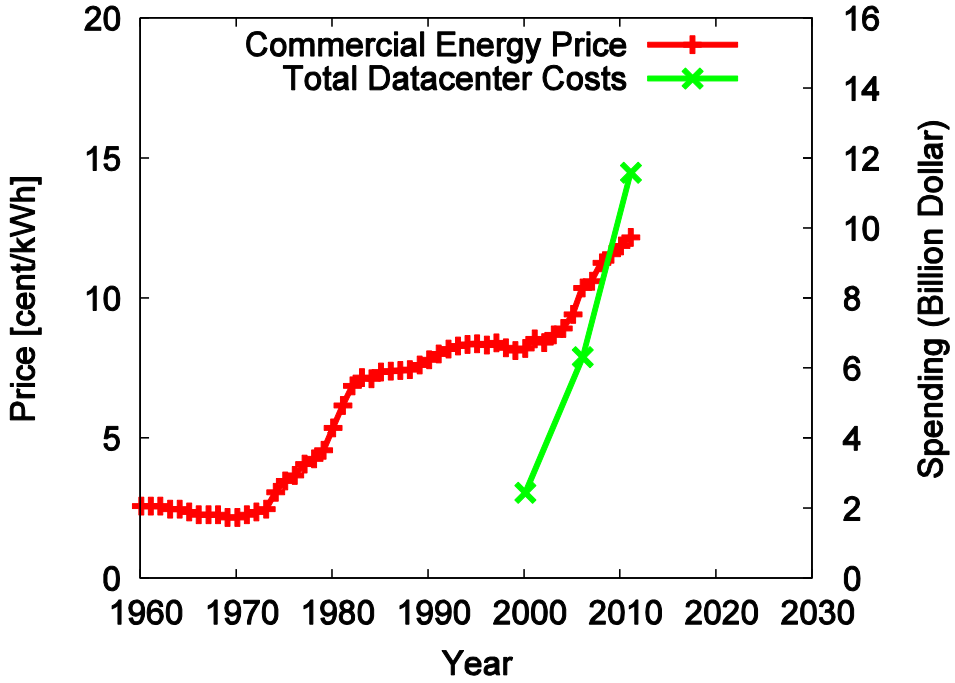
Rank	MTEPS/W	Site	Machine	G500 rank	Scale	GTEPS	Nodes
1	**6.72**	Tokyo Institute of Technology	TSUBAME KFC	47	32	44.01	32
2	**5.41**	Forschungszentrum Julich (FZJ)	JUQUEEN	3	38	5848	16384
3	**4.42**	Argonne National Laboratory	DOE/SC/ANL Mira	2	40	14328	32768
4	**4.35**	Tokyo Institute of Technology	EBD-RH5885v2	96	30	3.67	1
5	**3.55**	Lawrence Livermore National Laboratory	DOE/NNSA/L LNL Sequoia	1	40	15363	65536

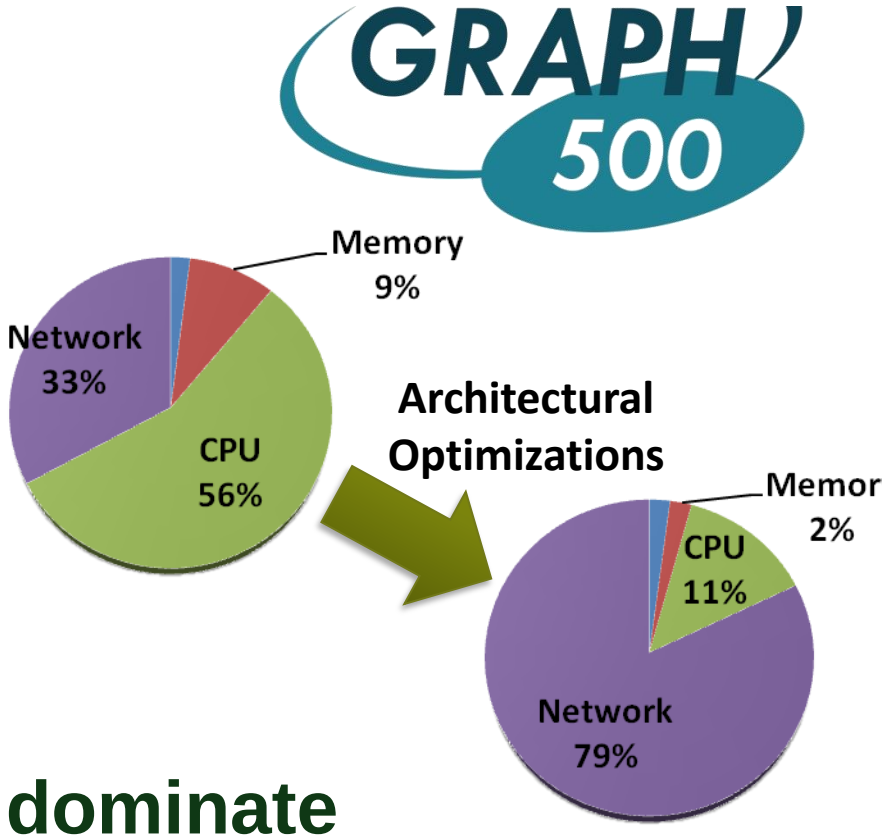
The Future of the List

- **Next list: Jun. 2014**
  - Submission deadline: aligned with Graph500
- **Submission details:**
  - Through Graph500, provide output data and energy information, or power trace
- **Watch** http://green.graph500.org/
- **Thanks for Support:**
  - Thanks to David Bader, Andrew Lumsdaine, Richard Murphy, and Marc Snir

Backup

Motivation



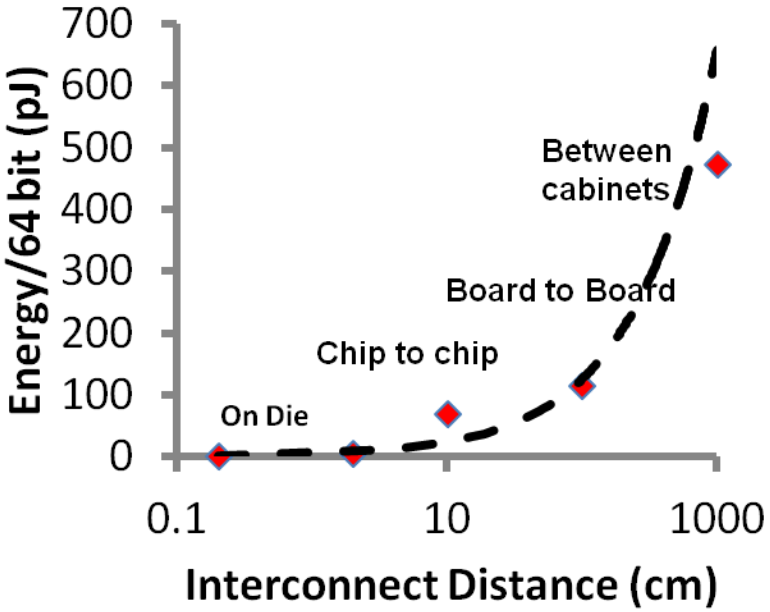


- **Big Data analysis may dominate datacenter cost**
  - Encourage vendors to provide “greener” hardware

Hoefler: “Energy-aware Software Development for Massive-Scale Systems”, EnA-HPC Keynote 2011

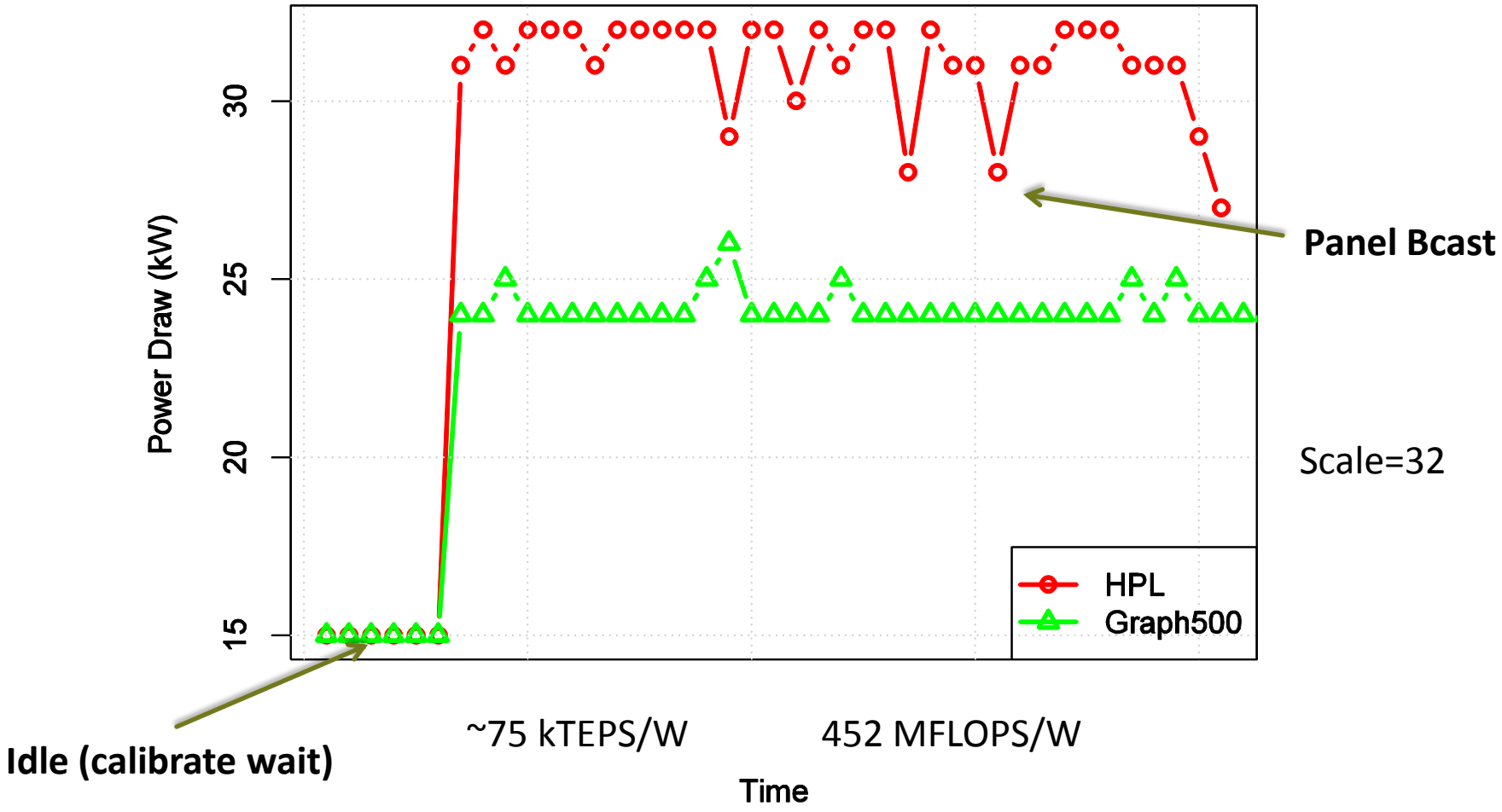
Why not just Green500?

- **Green500 is centered around HPL**
  - HPL: extremely structured, FP/Cache intensive
  - Graph500: unstructured, no good separators, (main) memory and network intensive
- **Completely different optimization goals!**
  - Need to be addressed by vendors!
  - Maybe specialized machines?



Source: S. Borkar, Hot Interconnects 2011, Keynote

Real Comparative Measurements



Real Comparative Measurements