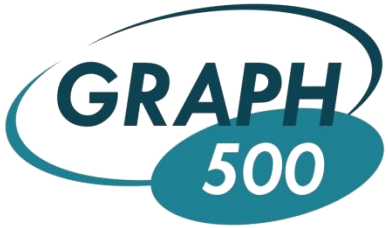
GREEN GRAPH500



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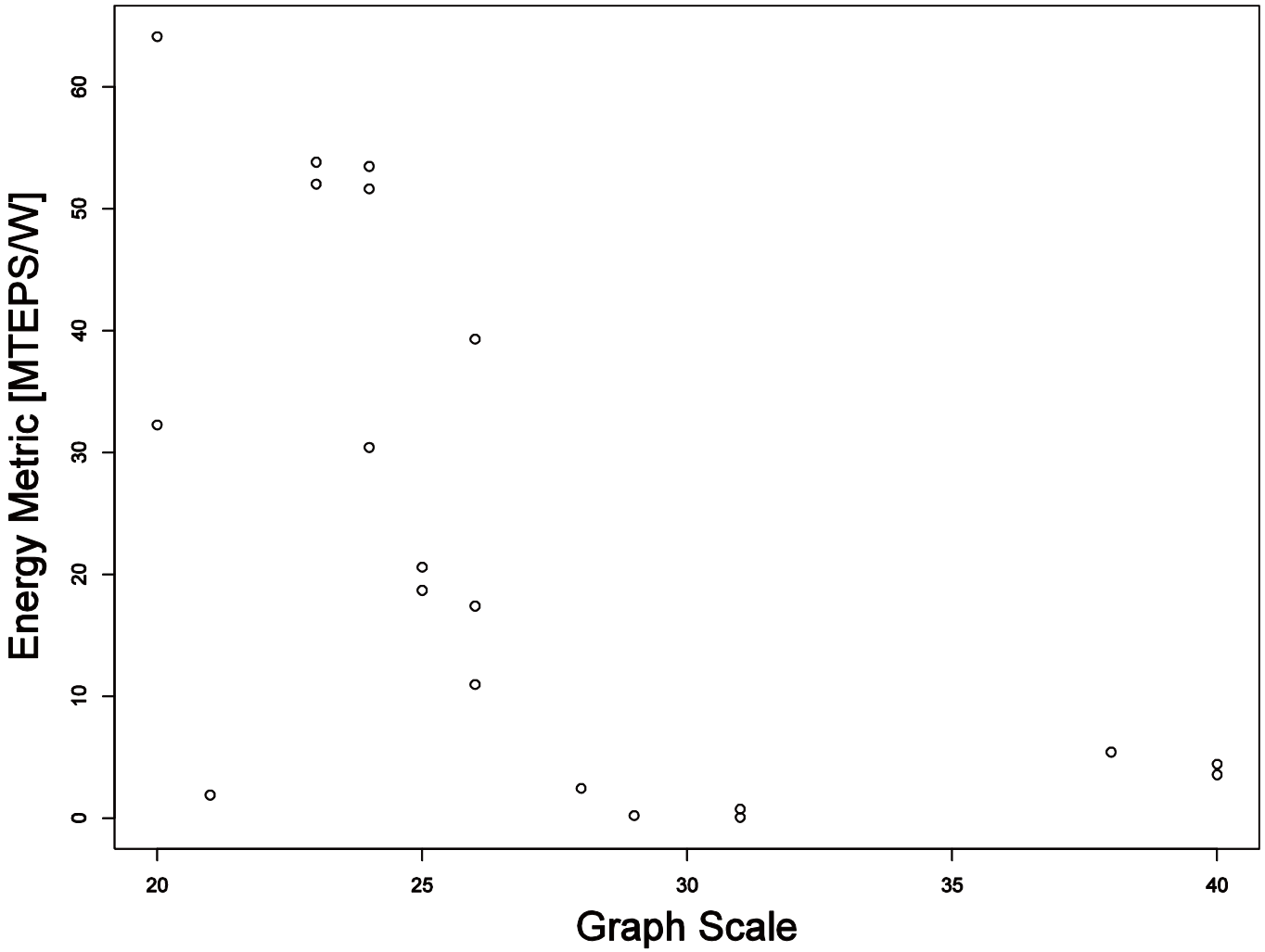
With support of David Bader, Andrew Lumsdaine, Richard Murphy, and Marc Snir

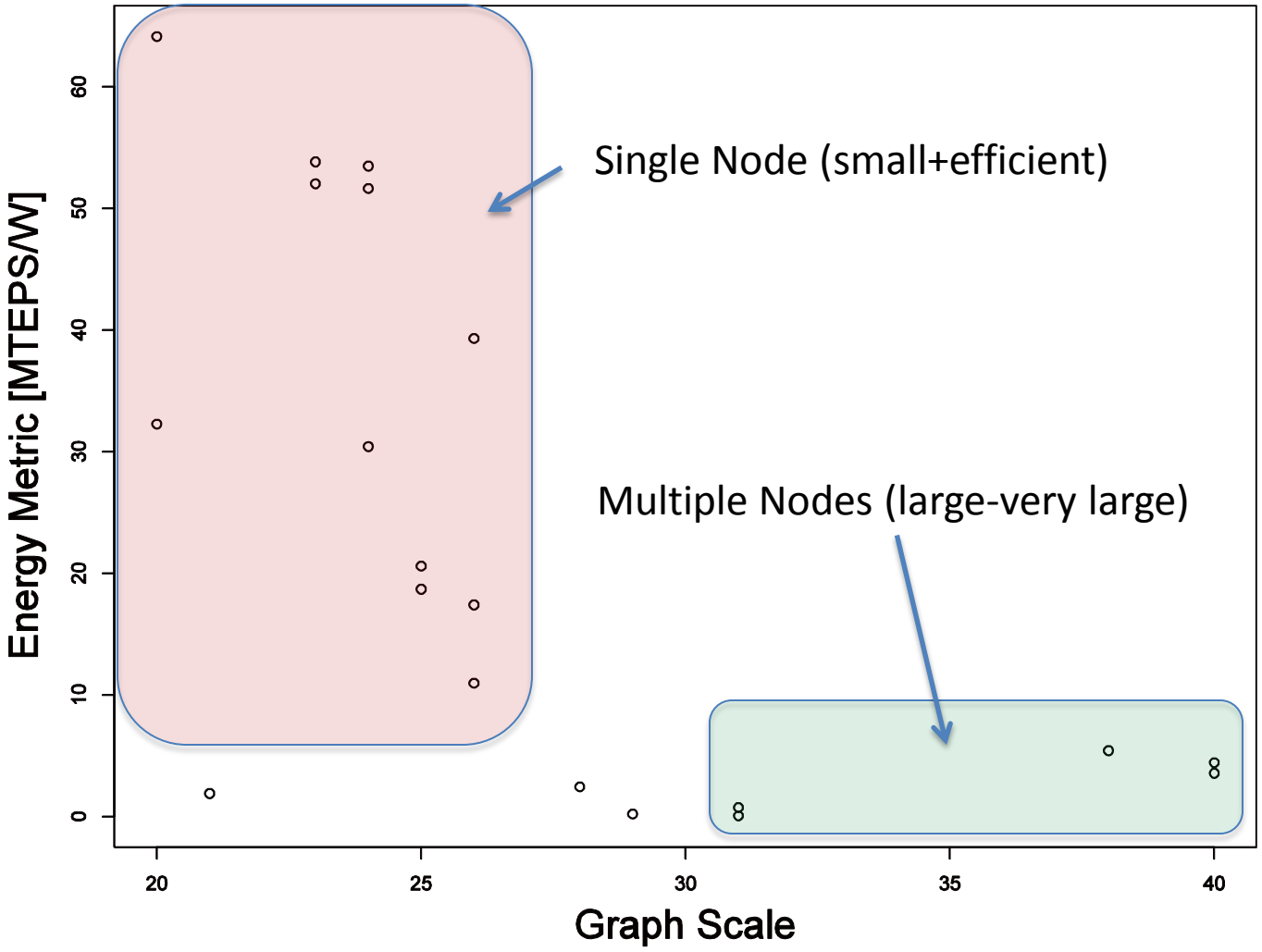
The Green Graph500 List

- 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.

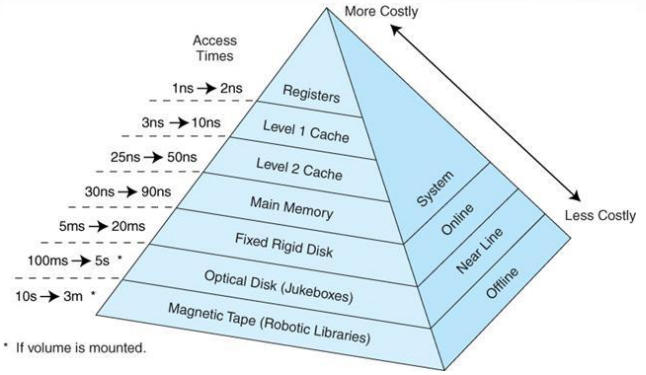
Received Submissions



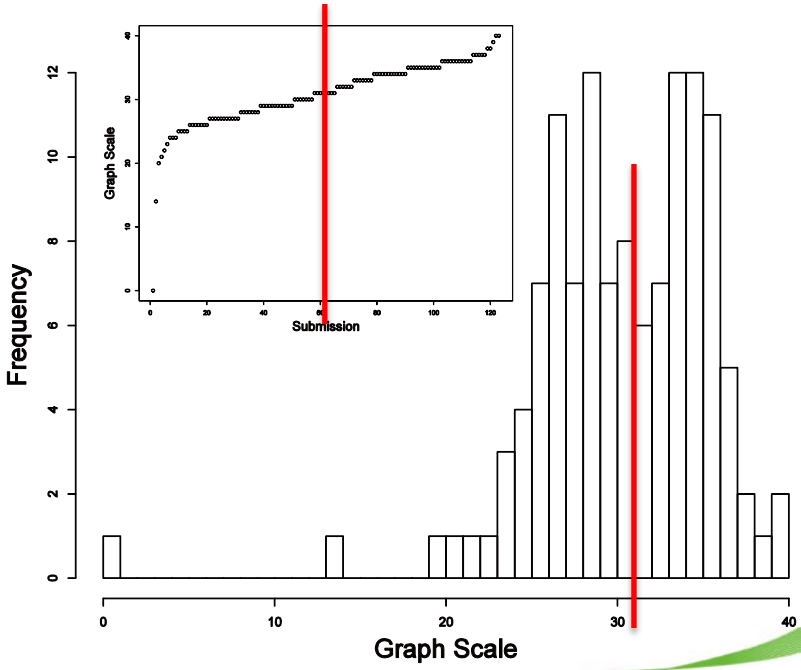
Received Submissions



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
  - June 2013 list: Scale 31



The Small Data List

Rank	MTEPS/W	Site	Machine	G500 rank	Scale	GTEPS	Nodes
1	**64.12**	Chuo University	GraphCREST-Tegra	132	20	0.1538	1
2	**53.82**	Chuo University	GraphCREST-Intel-NUC	110	23	1.0817	1
3	**53.47**	Chuo University	GraphCREST-Mac-mini	90	24	1.9410	1
4	**52.02**	Chuo University	GraphCREST-MBA13	105	23	1.2276	1
5	**51.62**	Chuo University	GraphCREST-Retina15	89	24	1.9873	1
6	**39.29**	Changsha, China	TH-IVB-FEP/C	-	26	9.7440	1
7	**32.25**	Chuo University	GraphCREST-NEXUS10	133	20	0.1186	1

The Big Data List

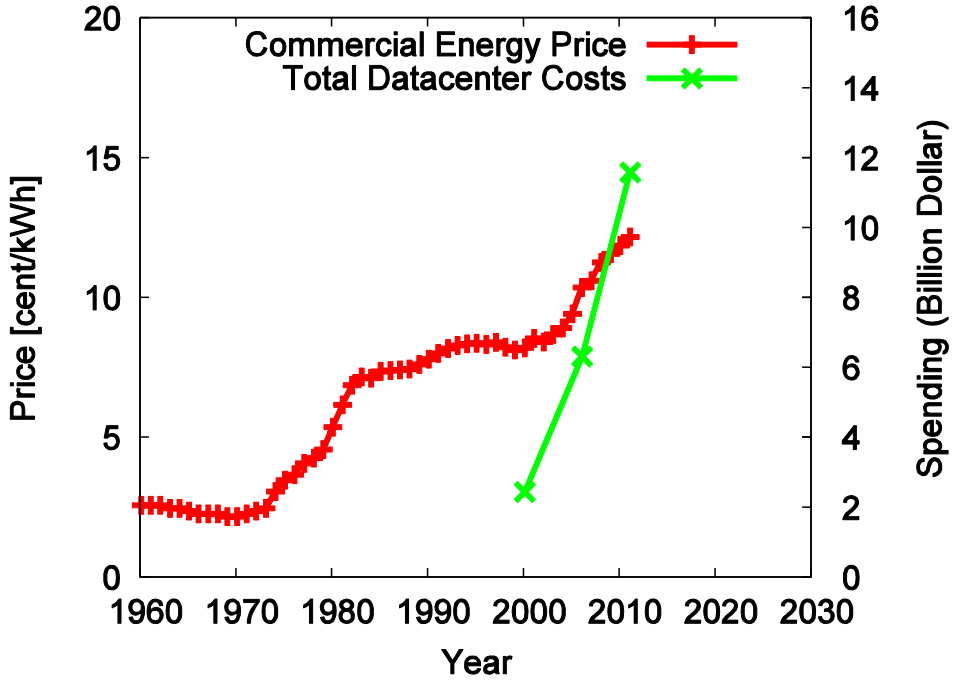
Rank	MTEPS/W	Site	Machine	G500 rank	Scale	GTEPS	Nodes
1	**5.41**	Forschungszentrum Juelich (FZJ)	JUQUEEN	3	38	5848	16384
2	**4.42**	Argonne National Laboratory	DOE/SC/ANL Mira	2	40	14328	49152
3	**3.55**	Lawrence Livermore National Laboratory	DOE/NNSA/LLNL Sequoia	1	40	15363	65536
4	**0.73**	Mayo Clinic	Grace	60	31	10.319	64
5	**0.05**	Swiss National Supercomputing Center	Matterhorn	116	31	0.897	64

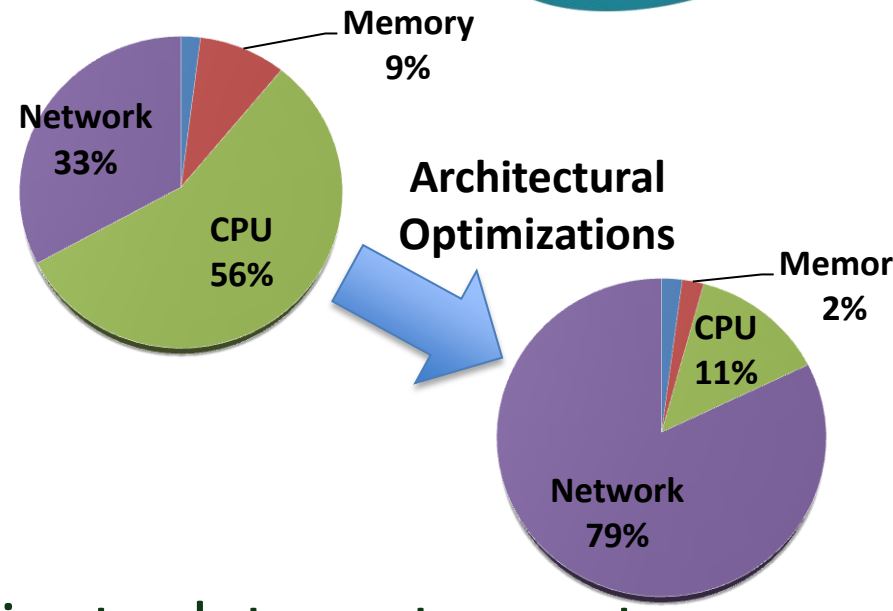
The Future of the List

- Next list: Nov. 2013
  - Submission deadline: aligned with Graph500
- Submission details:
  - Through Graph500, provide output data and energy information, or power trace
- Watch http://green.graph500.org/
- Support:
  - Thanks to David Bader, Andrew Lumsdaine, Richard Murphy, and Marc Snir

BACKUP

Motivation



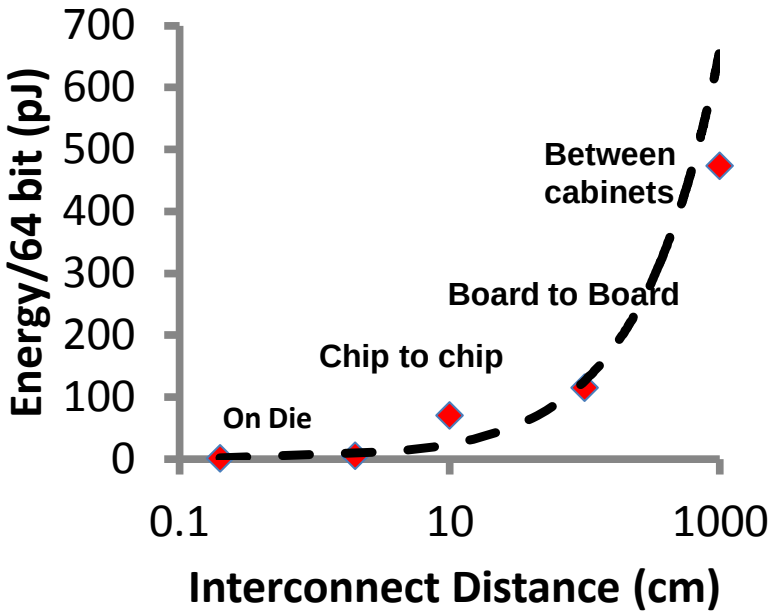


- Big Data analysis may dominate datacenter cost
  - Encourage vendors to provide "greener" hardware

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

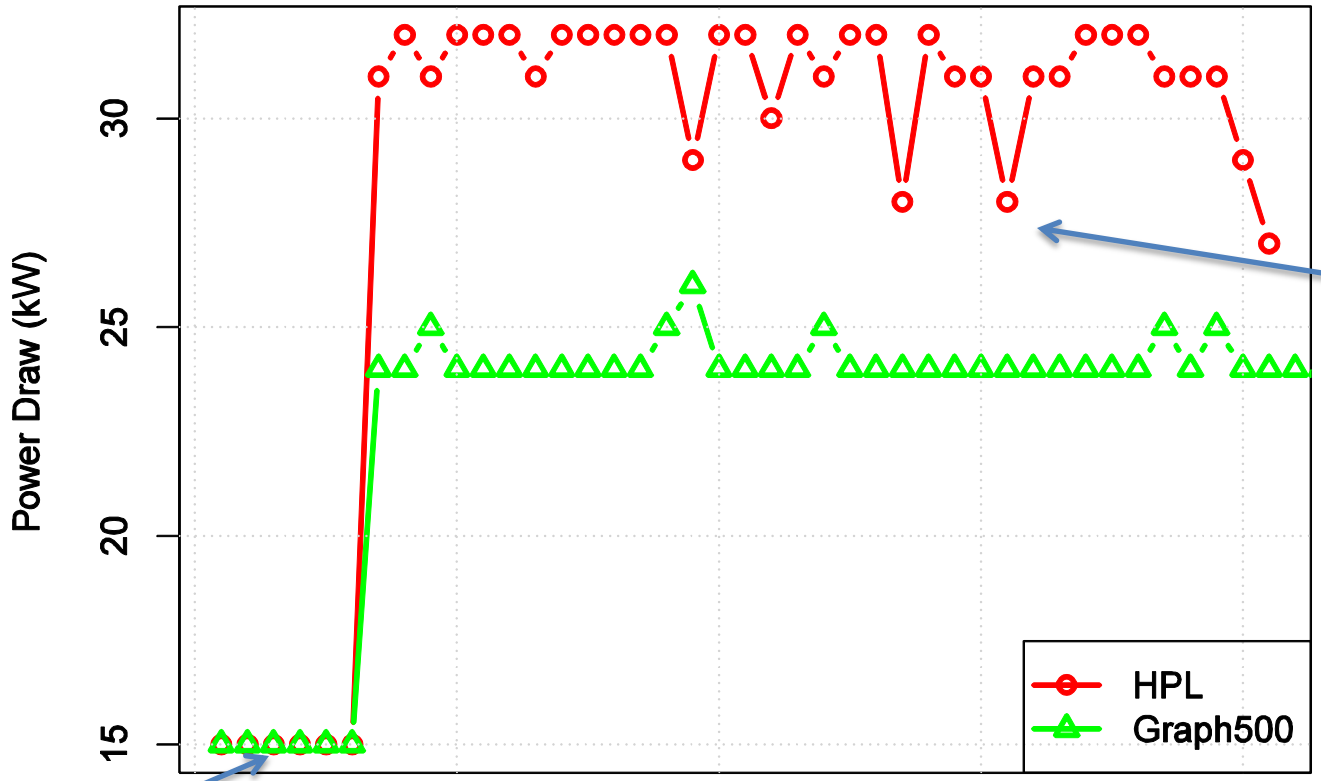
WHY NOT JUST GREEN500?

- 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?

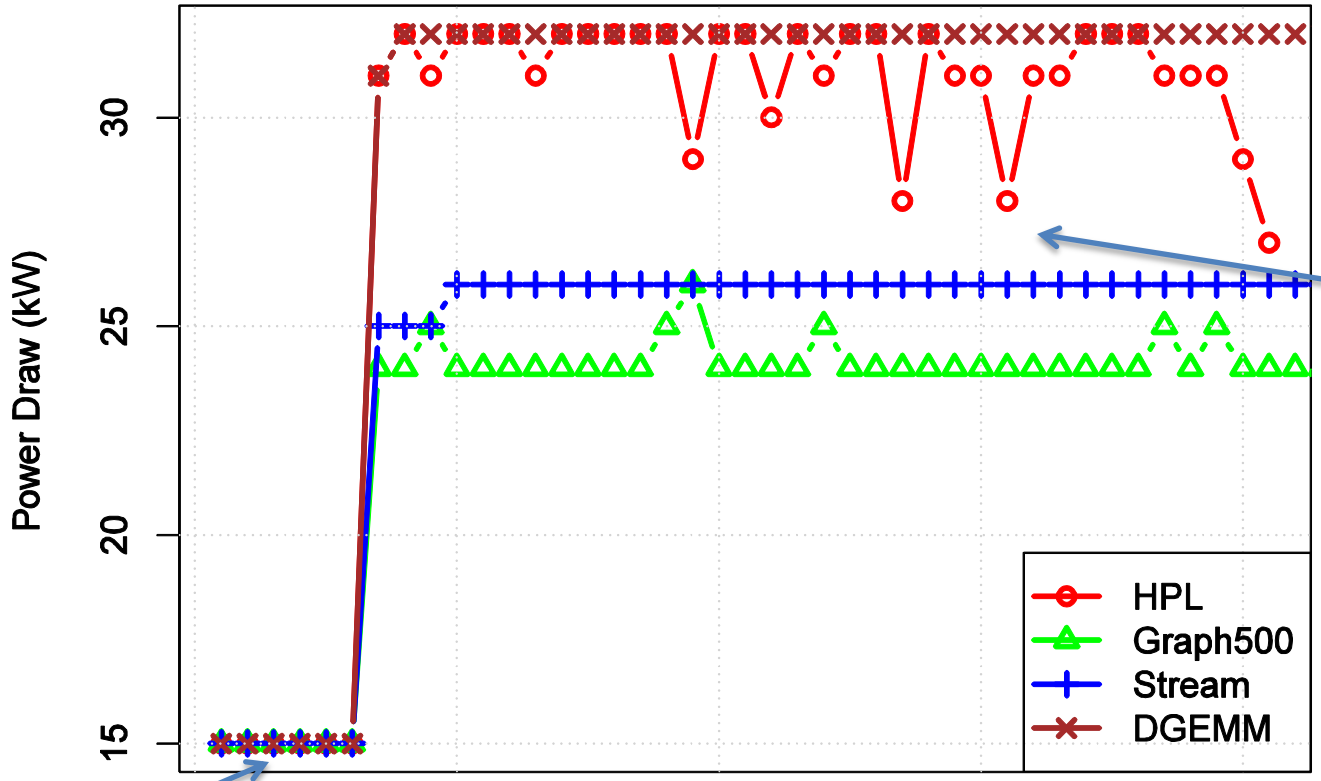


Source: S. Borkar, Hot Interconnects 2011, Keynote

Real Comparative Measurements



Real Comparative Measurements



Panel Bcast

Scale=32

Idle (calibrate wait)

~75 kTEPS/W

452 MFLOPS/W