Green Data Center from a Server EE Standard view
绿色数据中心与服务器能效标准

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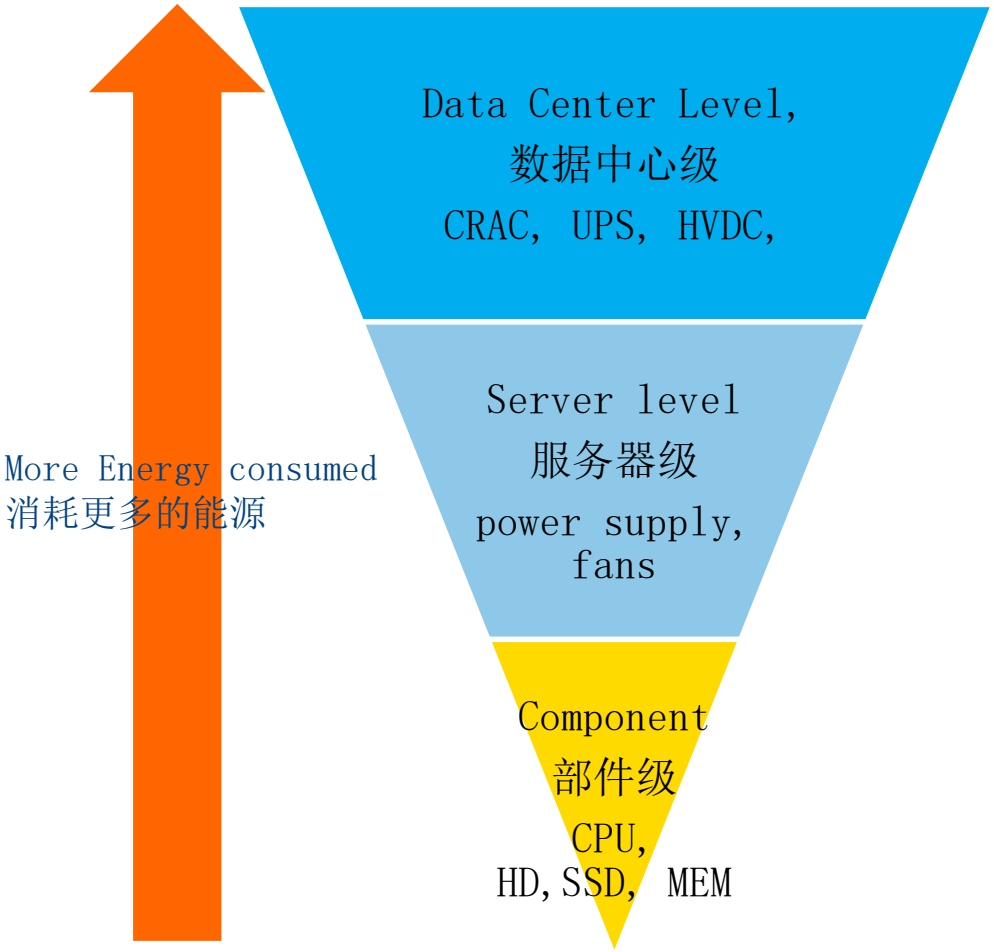
Green data center – A systematic view
从一个整体的视角看绿色数据中心

- PUE works only for data center infrastructure EE metric
- PUE=输送给数据中心的总功率/IT负载功率 ， PUE只是反映数据中心基础设施的指标
- More and more energy consumed from component level to server level, to data center level
- 从部件级到服务器级到数据中心级，需要成倍的能源消耗
  - Improving server EE can significantly improve data center energy efficiency
  - 提高服务器的能效可以有效的提高数据中心的能源效率，减少数据中心的整体能耗



Global Server Energy Efficiency Standard Landscape
全球服务器能效标准现状

US: ENERGY STAR v3 (voluntary*)

* Mandatory for gov’t procurement

EPEAT Servers (voluntary*)

* Mandatory for gov’t procurement

EU: ErP Lot 9 (mandatory)

China Server EE (mandatory)

Japan TR Servers (mandatory)

Korea E-standby (mandatory)

SPECpower

ISO/IEC JTC1 SC39

EU: ETSI Server standard

Green Grid

Two Questions in Server Energy Efficiency Standard
服务器能效标准的两个主要问题

Idle power, lower idle power is better?

空闲功率，更低更好？

How to define the active performance metrics for EE evaluation?

为了评价能效如何定义一个工作状态的性能参数？

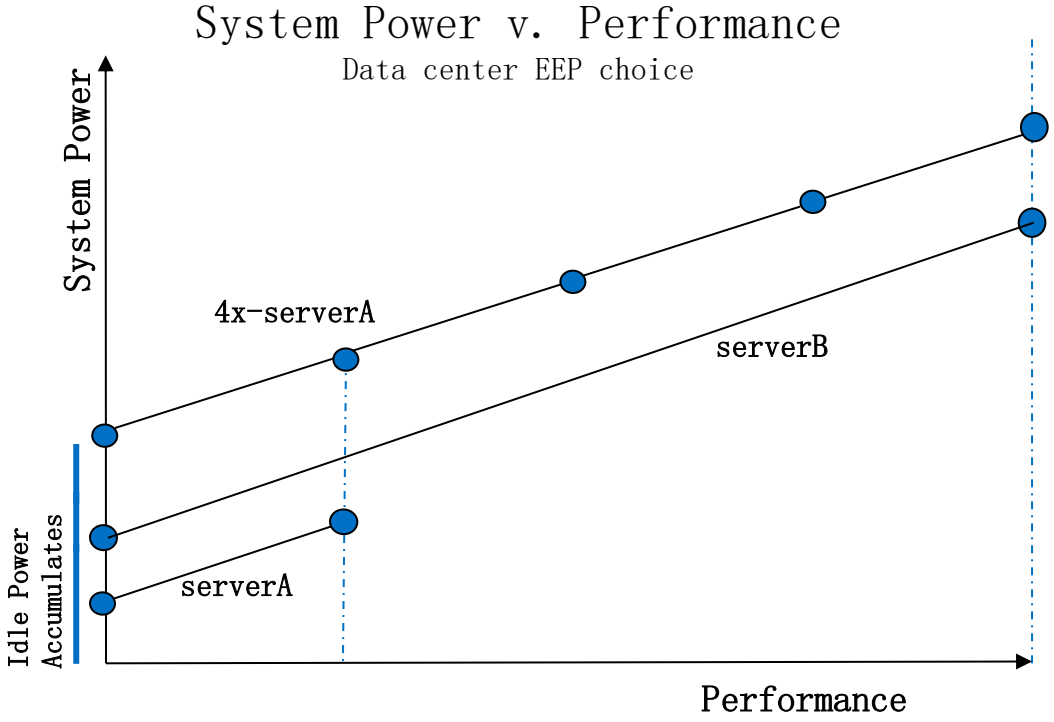
The key is to evaluate them in a holistic data center view.

需要一个全面的从数据中心角度来定义服务器能效标准

Energy Efficient Performance (EEP) Metric Challenge
空闲功耗作为能效指标的问题

So which one is better. Assuming a data center that needs to support more than 2x server A capacity?

当部署在数据中心时，下面哪个服务器更好？



Server A has a better Perf/Watt score.

But… the better efficiency choice for the data center is serverB.

服务器A有更好的 性能/功耗 比

但对于数据中心来说，空闲功耗高的服务器B反倒是更好的选择

Active Server Performance Benchmark -- SERT 1.0 Performance Benchmark Testing Worklets 工作状况下的性能评测工具

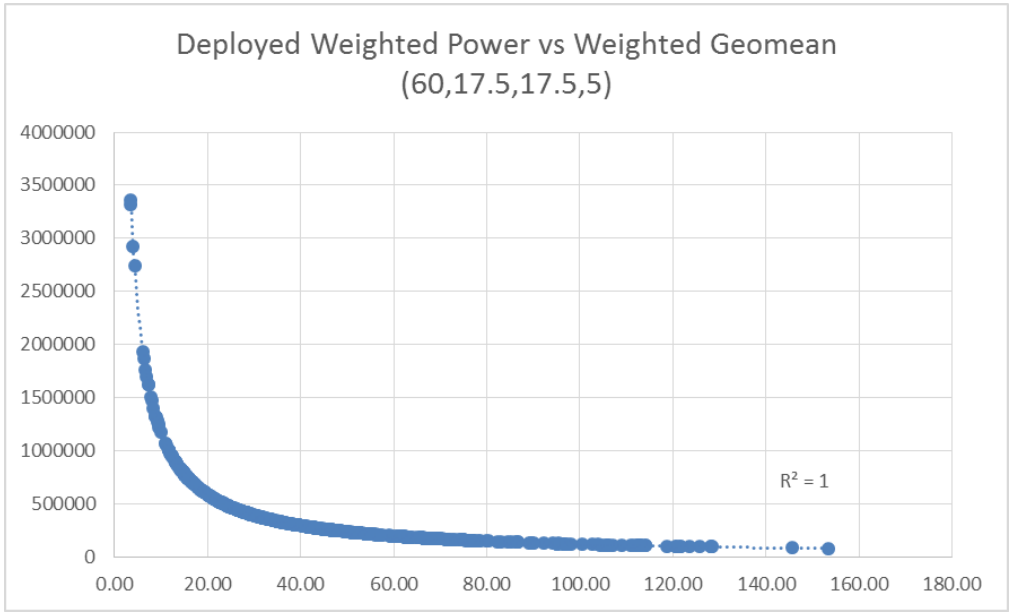
Workload	Load level	Worklet Name
CPU 处理器	100%, 75%, 50%, 25%	Compress
		CryptoAES
		LU
		SHA256
		SOR
		SORT
		XMLvalidate
Memory 内存	Flood: Full, Half Capacity: 4GB, 8GB, 16GB, 128GB, 256GB, 512GB, 1024G	Flood
		Capacity
Storage 存储	100%, 50%	Random
		Sequential
Hybrid 混合	100%, 87.5%, 75%, 62.5%, 50%, 37.5%, 25%, 12.5%	SSJ
Idle 空闲	Idle	Idle

Create a single number SERT metric from a deployed server model 部署服务器模型与工作状态性能指数

Deployed server model is the assessment of the power consumption of a deployed group of servers required to execute a defined workload versus the aggregated efficiency score for that server. 部署服务器模型是给定一个工作负载来评价各种不同能效服务器消耗的整体功耗分析模型。

Weighted Geomean of 60% CPU workload (including SSJ), 35% Memory workload, and 5% Storage workload

- Calculate worklet scores using a geometric mean, instead of arithmetic mean, as it is currently calculated in SPEC SERT®
- Assessing the Best Method to combine Flood(2) and Capacity(2) scores
- Include storage, but only at a 5% weight.



Summary 总结

- Server EE performance is getting important for green data center development.
- 服务器能效标准对于数据中心节能减排越来越重要
- Idle power can not be an EE indicator for server EE as used in PC EE standard
- 空闲功耗不适宜作为服务器能效的评价指标
- Active power performance can be benchmarked by different component of computation worklets
- 工作状态下的性能可以通过各种计算程序工具进行评价
- The single combined metric for active performance is obtained from the total energy consumption analysis from a data center view (deployed server model).
- 用数据中心整体的分析方法可以得到一个合理的综合工作状态性能评价指数