Five Ways to Save Server Power

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Operations Work Group

Agenda

- Scope of this presentation
  - What is in scope
  - What is out of scope

1) Identify the culprits
2) Enable server processor power saving features
3) Right-size server farms
4) Power down servers when not in use
5) Remove old systems that provide no useful work

- Questions

Scope of this presentation

- What is in scope
  - Tactical solution - Make the use of existing systems more efficient
  - Release trapped capacity
  - Change of mindset re: 24/7/365
  - x86/x64 commodity hardware only
- What is out of scope
  - Virtualization & consolidation
  - Replacing hardware
  - Changes to power or cooling infrastructure
  - Capital expenditure

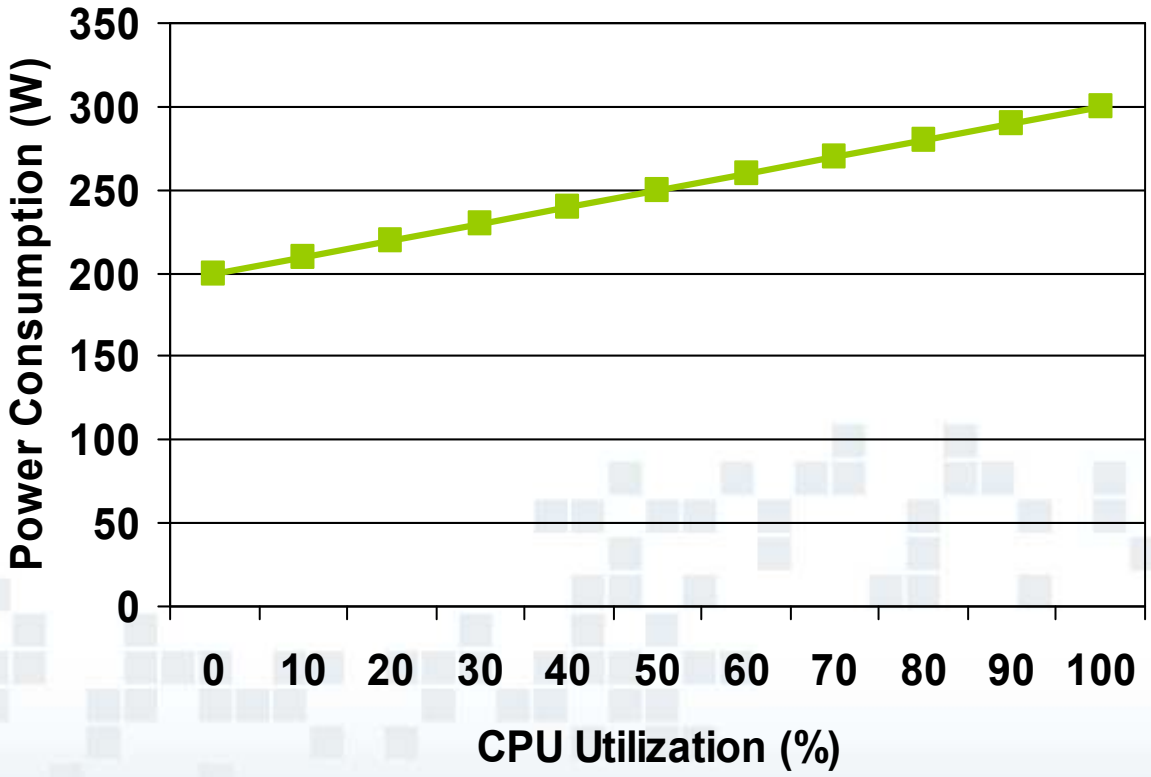
1) Identify the culprits

- Before you can measure potential savings you need to know what you are currently consuming
- One watt saved at the server level can mean many watts saved at the utility input
- Power can be measured without investing in new hardware

Power Provisioning for a Warehouse-sized Computer, Pages 3-4, June 2007 [Fan, Weber, Barrosso]
http://labs.google.com/papers/power_provisioning.pdf

1) Identify the culprits

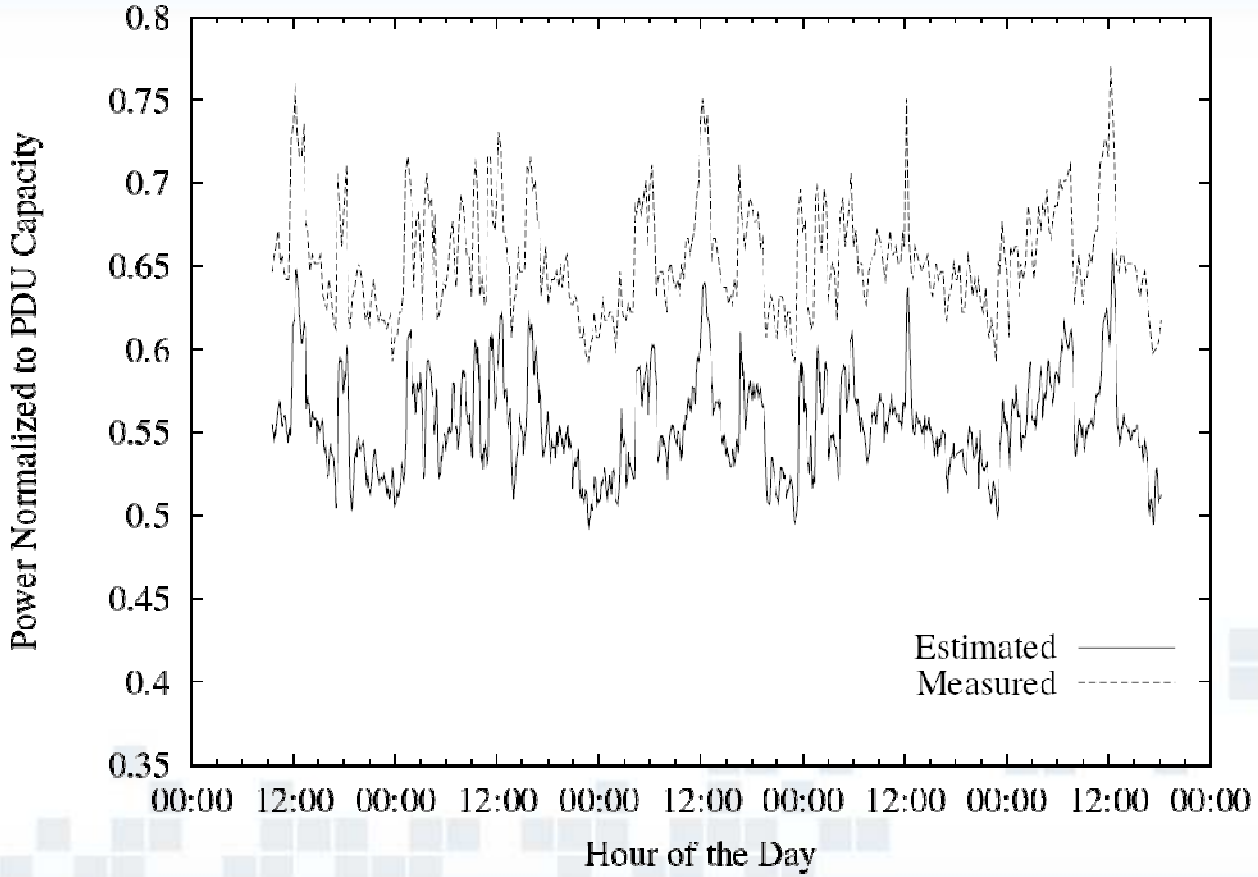
- CPU utilization tracks power consumption closely



1) Identify the culprits

- For n% CPU utilization, the power used P_n can be calculated using the following formula
- $P_n = P_{idle} + (P_{max} - P_{idle}) / 100 * n$
- So for an example where P_{idle}= 200W and P_{max} = 300W at 10% CPU utilization
- $P_{10} = 200 + (300 - 200) / 100 * 10 = 210W$

1) Identify the culprits

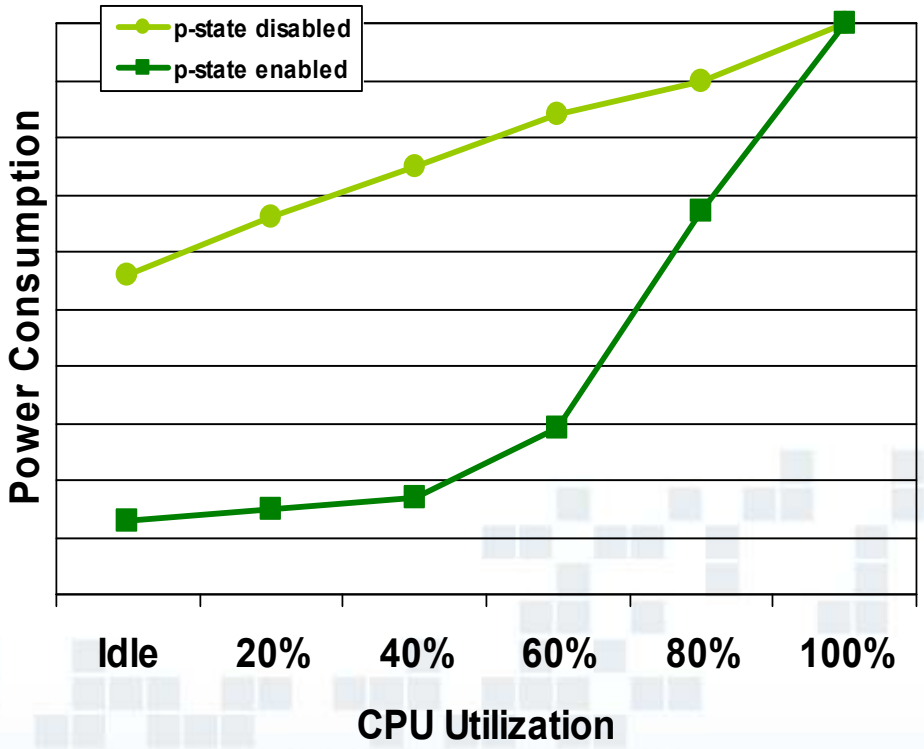


2) Processor Power Saving

- Processor power saving features have been common on desktop processors for years
- Starting to become available on server CPUs
- Changes internal CPU clock multiplier and CPU voltage in microseconds – known as p-state
- Can provide up to 20% saving in total system power consumption with no impact on performance
- Requires BIOS and OS support

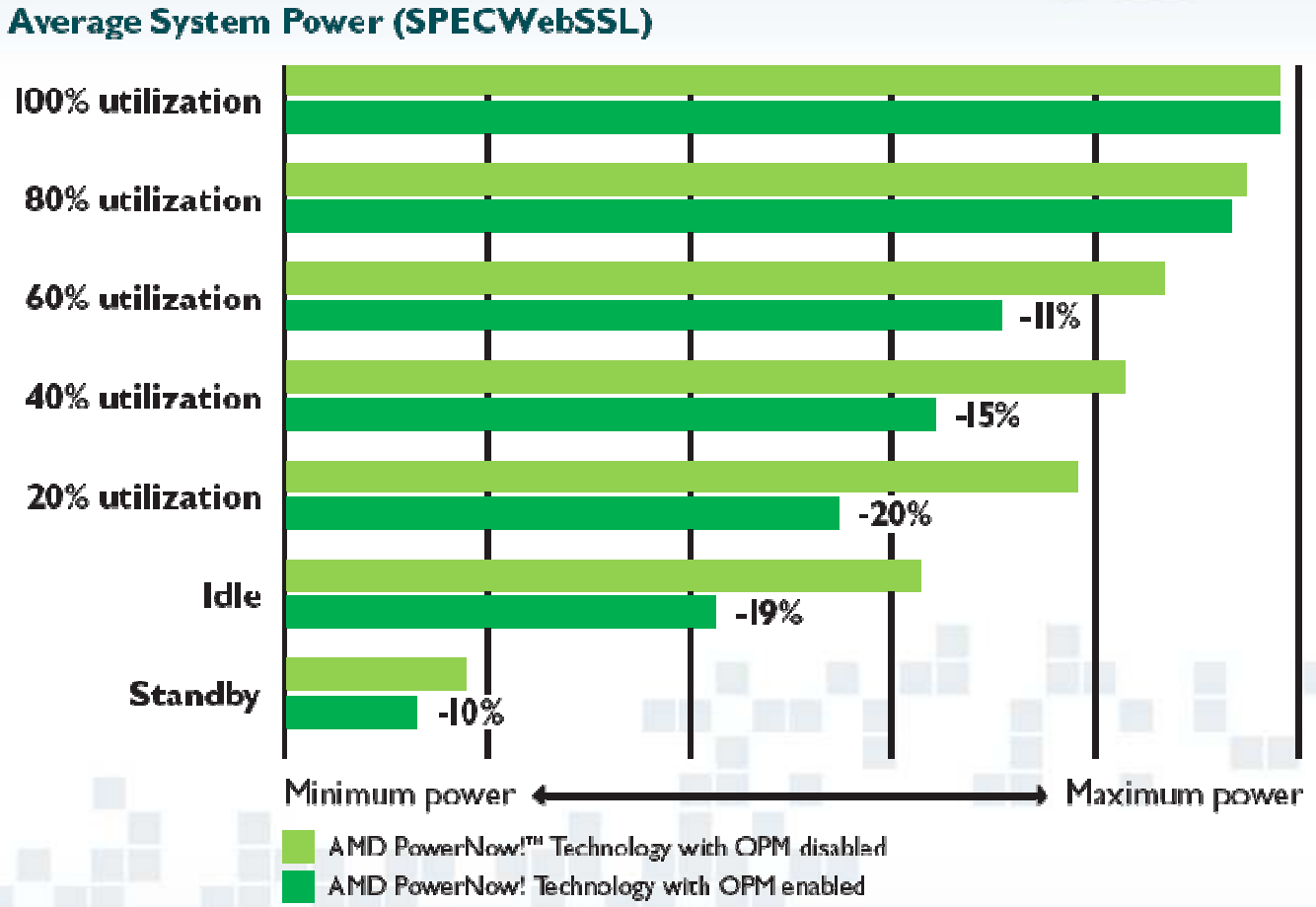
2) Processor Power Saving

- P-state savings (processor level)



Power and Cooling in the Data Center, page 5
http://enterprise.amd.com/Downloads/34146D_PC_WP.pdf

2) Processor Power Saving

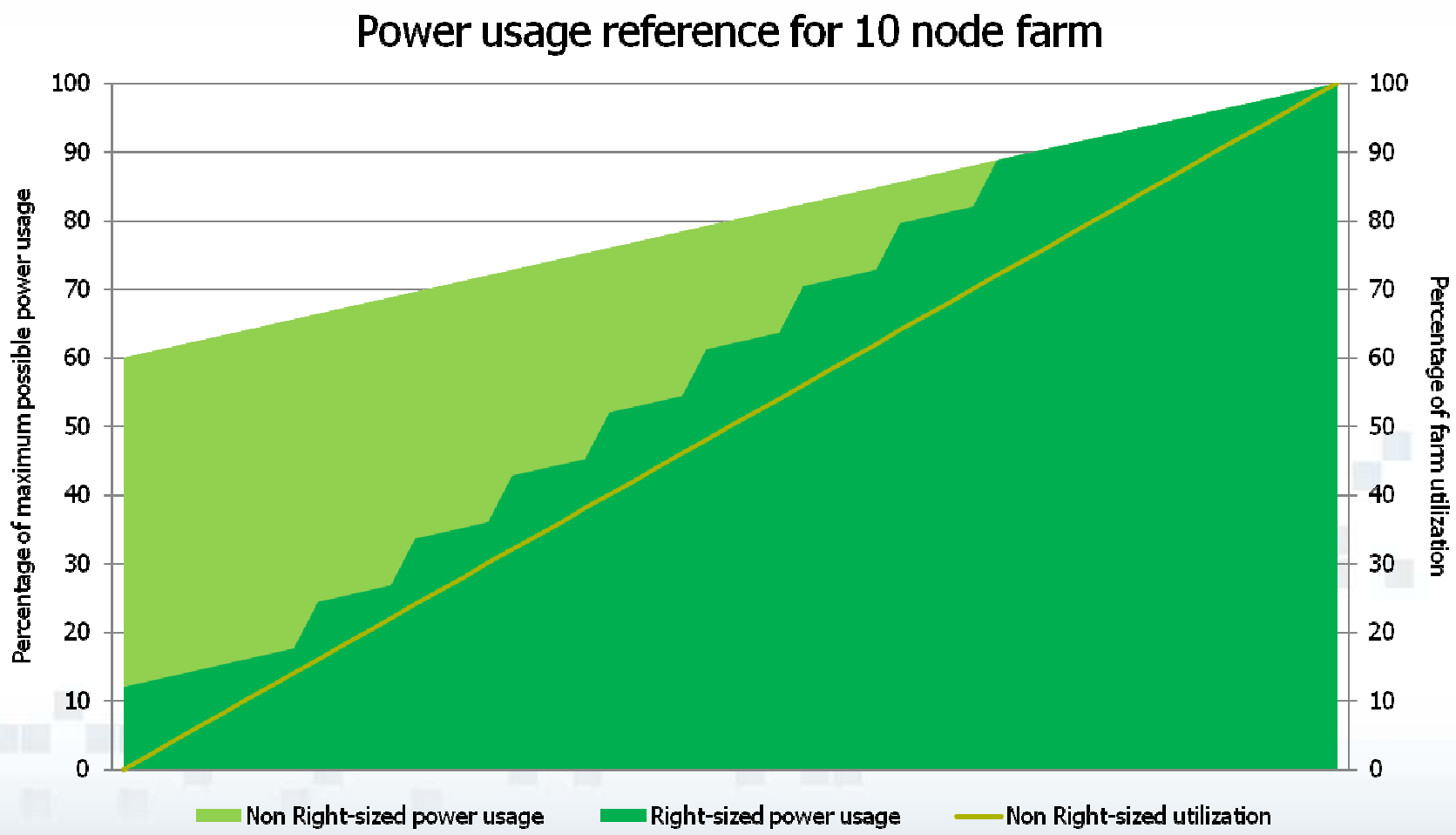


Power and Cooling in the Data Center, page 7
http://enterprise.amd.com/Downloads/34146A_PC_WP_en.pdf

3) Right-size Server Farms

- Many server farms are over-provisioned
- Analyze usage patterns for deployed farms
- Calculate minimum farm size to provide required capacity and maintain service levels
- Power down excess capacity
- Re-evaluate regularly and power on as necessary to meet increasing demand

3) Right-size Server Farms



4) Power Down Servers

- Some server types go unused for prolonged periods
  - Test and Development servers
  - Servers running backup software
  - Etc.
- Analyze usage patterns
- Power down when not in use

4) Power Down Servers

- Can be automated using scripts and Wake-On-LAN or Out-Of-Band management
- Power up regularly for patching
- Server monitoring tools may need to be informed when servers are powered down and put into 'maintenance mode' or equivalent

5) Remove Old Systems

- Anecdotal evidence suggests ~10% of servers are no longer used
- Analyze system usage patterns
- Check for consistent low utilization

5) Remove Old Systems

- There may be regular peaks for maintenance tasks (backup, virus scan etc.)
- Usually low and static number of network connections (legacy connections that go unused)
- Power down and redeploy or recycle

Summary

1) Identify the culprits
2) Enable server processor power saving features
3) Right-size server farms
4) Power down servers when not in use
5) Remove old systems that provide no useful work

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