## Agenda

- **Welcome & Agenda Review**  
  10:00 a.m.

- **Scope**  
  10:15 a.m.

- **Status Update**  
  - “Rollover” Criteria  
  - Families  
  - Idle: Options for V2.0  
  10:30 a.m.

- **Blade Servers**  
  11:00 a.m.

- **Active Mode Efficiency: Rating Tool and Evaluation Method**  
  11:40 a.m.

- **Adjourn**  
  12:30 a.m.
Layer Cake

- Building program incrementally
  - Tier 1 foundation: PSUs, Idle, Reporting, Data Output
  - Version 2.0: Add active mode efficiency element
  - Version 3.0 (if not achievable in 2.0): Set levels for active mode efficiency

<table>
<thead>
<tr>
<th>Version 1.0</th>
<th>Version 2.0</th>
<th>Future Versions</th>
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</thead>
<tbody>
<tr>
<td>Data Measurement and Output</td>
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Active Mode Efficiency: Disclosure and Levels
Goals and Outcomes

• Review focus areas for upcoming Server V2.0 Draft 1

• Discuss blades servers and proposed measurement methodology

• Active mode requirements update
ENERGY STAR Servers: Version 2.0 Scope

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Updates to scope

• Tier 1: 1S-4S servers in rack-mounted and pedestal form factors – “Stand-alone”
  – Managed and unmanaged
  – Blades excluded

• Scoping considerations
  – Modularity/shared resources
  – RASM – *redundancy, availability, serviceability, management*
  – Specialized usage cases
  – Form factor
Scope: Server Types

SERVER MARKET

V1.0:
• Managed and unmanaged

V2.0:
• Managed and unmanaged
• Resilient

Special Cases:
• HPC
• Fully Fault Tolerant
• Server Appliances
• >4 Socket?

Unmanaged

Managed

Resilient (Managed)
Scope: Form Factors

SERVER MARKET

V1.0:
• 1S-4S servers
• Pedestal and Rack-mounted

V2.0:
• 1S-4S servers
• Pedestal and Rack-mounted
• Blades
Rollover Requirements

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Layer Cake

Version 1.0
- Data Measurement and Output
- Standard Information Reporting
- Idle and Power Management
- Power Supply Efficiency & PF

Version 2.0
- Data Measurement and Output
- Standard Information Reporting
- Idle and Power Management
- Power Supply Efficiency & PF

Active Mode Efficiency:
Disclosure

Future Versions
- Data Measurement and Output
- Standard Information Reporting
- Idle and Power Management
- Power Supply Efficiency & PF

Active Mode Efficiency:
Disclosure and Levels
Rollover Criteria

• Power Supplies
  – CSCI Silver (multi-output) and Gold (single-output)
  – Efficiency and PF levels maintained from Preliminary Draft
  – NPL dropped for Version 2.0

• P&P Datasheet
  – Suggestion received to continue performance benchmark disclosure in addition to a specialized rating tool
  – Revised format to present active mode efficiency data

• Data Measurement and Output
  – Power, inlet air temperature, and processor utilization
  – Edits made to accuracy/sampling criteria based on stakeholder feedback
P&P Datasheet

- Draft 1: sample datasheet format provided for comment
- New efficiency rating section
  - Designed for SPEC tool (speculative at this stage)
  - Full results disclosure, standardized format to avoid misrepresentation of results
- Graphical representation of power data
  - Cost calculator
P&P Datasheet

- Graphical representation of power-performance benchmark results
  - Ratio of power consumed to benchmark performance result
  - Actual power consumption
  - Ideal case: power consumption would be if it scaled exactly to the load

- Power of fan when cooling different loads (stakeholder suggestion)
Data Measurement and Reporting

• Draft 1: revised section to incorporate stakeholder suggestions and feedback

• Series of requirements to provide users with tools and data necessary to operate the server most efficiently

• Version 1.0: 1S/2S (managed) and 3S/4S (all) must provide data on input power consumption, inlet air temperature, and utilization of all logical CPUs during normal operation

• Version 2.0: Extending to all servers in scope, with modifications to accuracy and sampling
  – Accuracy of power measurement on a per-psu basis
  – V1.0 structure for processor utilization
  – Rolling average of data optional
Server families and reporting

• Balance of manufacturer testing/reporting burden with data applicability
  – P&P datasheet – *how close to purchased configuration?*
  – Submittal data – *do representative tests validly apply to the grouped configurations?*

• QPI vs. P&P Datasheet
  – QPI is an *internal document* for compliance
  – Datasheet is intended for customer use – provide a uniform format for important configuration, power, and efficiency information
Family structure

• Accepting feedback on the V1.0 process, and planning to work with stakeholders to improve the existing process

• For Version 2.0, considering modifications for storage, memory, and I/O
  – part numbers may vary
  – For storage and memory, capacity may vary, with worst case power consumption used for testing in max/min configurations

• Family structuring is a data-driven process
“We believe an idle power requirement is inappropriate for server Energy Star … increasing cost and limitations of power, the uptake of virtualization technologies … conspire to reduce the relevance of idle power.”

“It is strongly suggested not to … delete idle requirements in favor of an overall benchmark. We believe Idle should be addressed [because] for many applications low loads on servers will remain quite common.”

“Idle power requirements should be included as part of the evaluation under [the Version 2.0 efficiency rating], allowing the server to receive a single, overall score …”
A case for Idle?

Glass Half Full? Half Say They Are Fully Deployed…
- As of June 2009, 90% of organizations were implementing server virtualization; over half say they have completed their transition

...Or Glass Half Empty? What Is “Fully Deployed?”
- Despite reported progress, the average organization claims that just a third (34%) of their total server infrastructure consists of virtualized servers
- Even in “fully deployed” organizations, this percentage remains at 37%

Source: CDW's Server Virtualization Life Cycle Report, January 2010
Addressing idle in future versions of the program

• EPA believes Idle remains a relevant concern …
  – for many server applications where virtualization and resource scaling remain elusive or “inappropriate”
  – as a datapoint to provide a full range of the server power profile
  – as an incentive for continued industry efforts to optimize resource scaling

• An automated rating tool presents the opportunity to streamline idle power measurement
Energy Efficient Ethernet

- EPA continues to strongly support this effort

- Stakeholder feedback received on the timeline to availability of hardware

- Draft 1: propose replacement of the mandatory EEE requirement

- Will reconsider former requirement in future versions of the program
ENERGY STAR Servers: Blades

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Bringing blade servers into the program

• Blade servers and systems were dropped from V1.0 consideration
  – Insufficient data/development time

• Will be part of V2.0
  – Evaluated using rating tool
    • Use of “same language” when discussing efficiency
  – Chassis requirements (allow sale of ENERGY STAR blades independent of chassis, but provide minimum criteria for a chassis sold or marketed for use with qualified blades
Stakeholder feedback

- **Blades are efficient**
  - the form factor has necessitated a clamp down on waste heat
  - many of the savings (and product differences) may be in the chassis design

- **Testing can be expensive**
  - fully-populated chassis testing is not common and resource-intensive

- **Customers do what they want**
  - responses differed from manufacturer to manufacturer
  - some customers purchase individual blades, others a fully populated chassis, yet others a chassis with open bays for future expansion
Blade testing proposal

- **Chassis requirements**
  - If shipped with a chassis, the chassis must be approved (supports PM, does not introduce undue power consumption in idle/full load, adaptive cooling)

- **Single blade server**
  - Tested for idle and full power in a supported chassis (independently metered)

  - Partially populated chassis: ½ bays populated
    - Tested for idle and full power, and with the rating tool

  - Single blade power levels compared with this test to derive chassis idle and full power
    - Rating tool results divided by the number of installed blades to derive efficiency rating
Route through the program

- Tested for Idle/Full Load
- Half populated with the same model blade server
- Meets minimum thermal management, data management criteria
- Tested for Idle/Full Load, half populated
- Efficiency Rating Result
  - Idle/Full Power
  - Efficiency Rating Result

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Discussion

• Blade Server
  – Is ½ populated scenario present in the market?
  – Is individual metering of blade for single blade test a reasonable request?
  – Is individual blade power relevant data to a purchaser?

• Blade Chassis
  – What is worst case for chassis efficiency?
  – Are there alternative methods to derive the chassis power?
  – Which scenarios should be targeted to define best/worst case *chassis efficiency*?
ENERGY STAR Servers: Active Mode Evaluation

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Active mode

- EPA intends to pursue a disclosure-oriented structure for active mode
  - Coexists with required rollover baseline criteria
  - Required: operation of the rating tool, willingness to publish complete results (in context) in ENERGY STAR data sources for any ENERGY STAR server

- Why
  - Currently, barriers preventing open customer access to efficiency and operational data
    - Fear of marketing misrepresentation
    - Benchmarking tools specific to limited end uses
Active mode efficiency

- EPA’s objective: institutionalize server energy efficiency reporting
  - Make such information available as the norm rather than from a special request

- EPA seeks to establish an efficiency rating for servers that encompasses a broad range of activities and end uses

- EPA has looked to collaborate with industry to develop an efficiency rating tool for this purpose. The Standard Performance Evaluation Corporation (SPEC) has offered to develop a solution - SERT
Active mode efficiency

- EPA is committed to adoption of the SPEC efficiency rating tool as an element of the ENERGY STAR specification provided the tool meets EPA’s acceptance criteria.
Characteristics

• SPEC is developing a written description of their tool to share with ENERGY STAR stakeholders

• First-order efficiency evaluation
  – Rating of hardware efficiency along with fundamental elements of the software stack (OS)

• Composed of a series of loads ("modules"), each oriented toward a specific server subsystem. Tentative list:
  – CPU
  – Memory
  – Network I/O
  – Disk (Storage)

• Each module adjustable to load levels between 0-100% of capability
  – Capacity calibrated as part of the evaluation

• Results presented for each subsystem and as an aggregate a total system result
Testing process

• SPEC following elements of their Benchmark Methodology
  (www.spec.org/power_ssj2008/docs/SPECpower-Methodology.pdf)
  – Controller server to harness and automate setup, measurement, and reporting

• Test process characteristics:
  – repeatability, duration, accuracy
Key considerations

• System architecture and OS
  – Architecture: EPA received strong feedback from stakeholders that initial development should focus on support for both x86 and RISC systems
  – OS support: EPA believes that the effect an operating system has on overall system efficiency must be included in a general efficiency evaluation, though under a structured system that supports comparable results and avoids unrealistic tuning

• Resources
  – EPA strongly supports a broad-based tool meeting the considerations above
  – Availability of resources will be crucial – if there is not development support, the first version of the tool will move forward accordingly

• Structure
  – Locked down vs. structured guidelines and disclosure
# Schedule Goals

<table>
<thead>
<tr>
<th>Month</th>
<th>Specification (rollover criteria/structure)</th>
<th>Rating Tool</th>
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</thead>
<tbody>
<tr>
<td>February</td>
<td>Draft 1 distributed</td>
<td>Availability of design document</td>
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<td></td>
<td>Comment Period</td>
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<tr>
<td>March</td>
<td>Draft 2 distributed (refined definitions, rollover criteria, blade requirement structure, active mode reporting format)</td>
<td>Development commences</td>
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<tr>
<td>April</td>
<td>Comment period</td>
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<td>May</td>
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<tr>
<td>June</td>
<td>Draft 3 distributed</td>
<td>TBD: Beta availability (testing and comment period)</td>
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<tr>
<td>July</td>
<td>Version 2.0 finalized</td>
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Discussion

- System architecture
- OS support
- Rating tool pros – cons: locked down vs. tune-and-disclose
- Module structure (CPU, Memory, I/O, Storage)
Closing
Coming next

- EPA to distribute Draft 1 (comment period announced)

- Stakeholder comments to EPA. Areas of focus:
  - Stakeholder feedback on disclosure plan and SPEC tool
  - Blade testing scenario – correct balance of burden and accuracy?
  - Families

- Webinar to discuss family structure

- EPA to notify stakeholders on the beginning of the development period
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