ENERGY STAR®

Version 3.0 Computer Servers Draft 2 Specification Webinar

U.S. Environmental Protection Agency
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EPA

Introductions

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Outline

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- Definitions
- Scope
- Active State Efficiency Criteria
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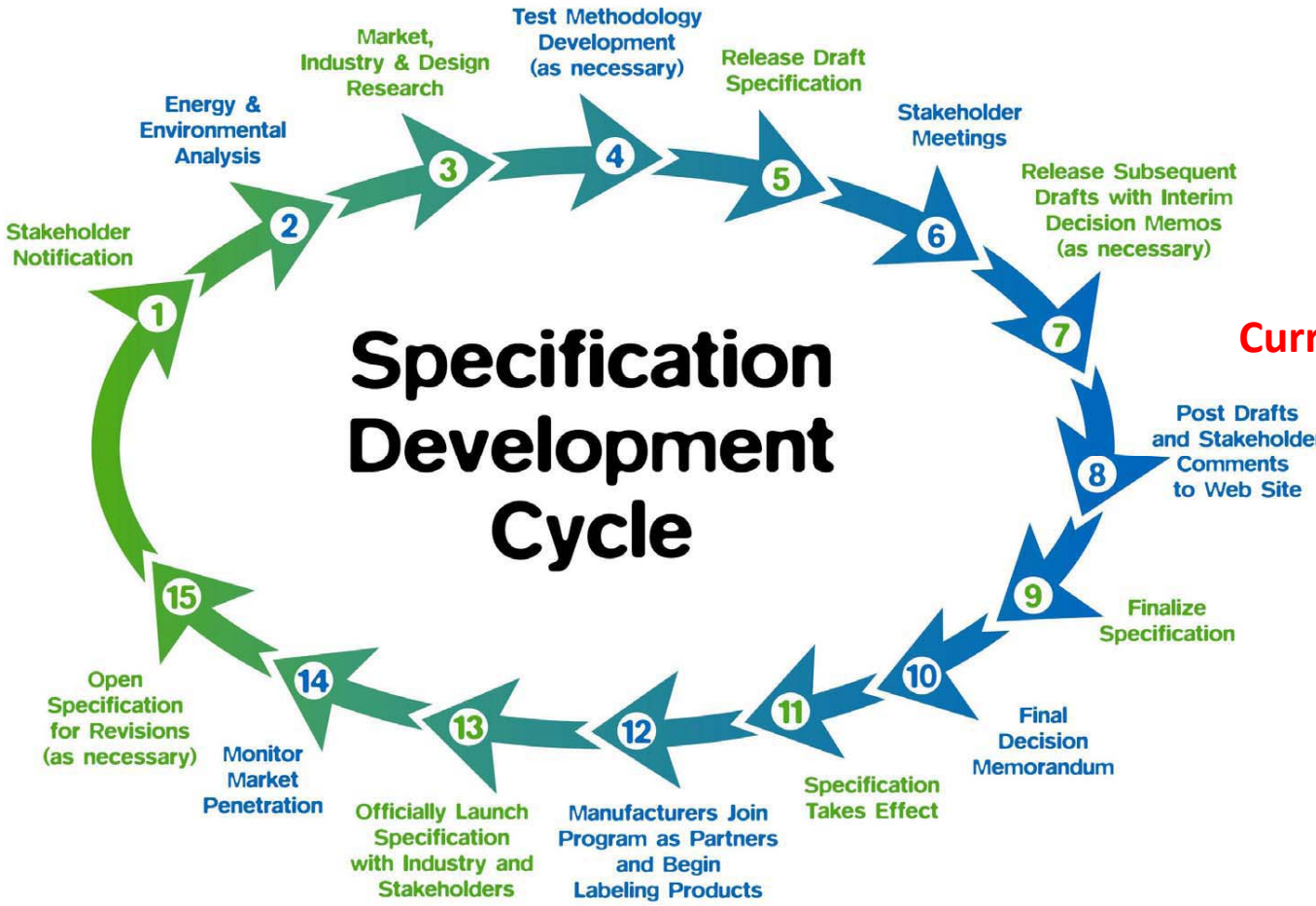
  - Threshold
- Idle State Efficiency Criteria
  - Resilient Servers & Revised Categorization
  - Idle Power Allowances
- Other Testing Criteria
- Timeline & Next Steps

Review of Specification Development Cycle



Current Step

Summary of Draft 1 Proposals

- Proposed 80Plus Platinum equivalent PSU efficiency requirements.
- Proposed more aggressive idle state base and adder allowances, reflecting recent technology improvements.
- Lowered APA max idle power requirement from 46 to 30 watts to reflect recent efficiency improvements in the GPU market.

Definitions

- Managed Server:
  - Definition is obsolete and has therefore been removed.
- Auxiliary Processing Accelerator (APA):
  - Broken out into two new sub definitions, expansion APAs and integrated APAs.
    - Integrated APAs are intended to capture new FPGA like on board technology.
- Product Family Tested Product Configurations:
  - Removed the minimum power configuration and tightened the low end and high end performance configurations to state that they are the highest and lowest performing server in the family.

Question: Product Family Definition

- Do stakeholders have any concerns regarding whether this proposed change to a three point product family structure will capture configurations within a family that are intended for ENERGY STAR certification?

- Note that an ENERGY STAR family will not always contain the full range of configuration offerings within a model line. An ENERGY STAR product family can focus on a subset of efficient configurations within a larger model line so long as the efficient models are clearly identified on the certified product list.

Definitions

- Resilient Server Identifying Characteristics (Appendix B)
  - EPA has received stakeholder feedback that the resilient server market is transforming quickly and that changes to the existing definition are likely required.
  - EPA encourages stakeholders to work together to propose an updated definition to the existing resilient server definition to ensure it best captures products that are resilient only.
  - EPA welcomes any comments and data to support changes to the definition through the Draft 2 written comment process, as well as follow up calls if needed. The intent is to have a revised version of the definition ready for review in the next Draft.

Scope

- EPA is proposing to remove products with integrated APAs from scope in Version 3.0.
  - Have not received any data on products with integrated APAs to determine their presence in the market, nor their energy implications on idle and/or active state efficiency measurements.
  - EPA welcomes additional data to support inclusion for these products in Version 3.0.

Internal Power Supply Requirement

- EPA has harmonized Table 2 with 80Plus platinum equivalent power factor requirements at the 50% load.

Table 2: Power Factor Requirements for PSUs

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
Ac-Dc Multi-output	All Output Ratings	N/A	0.80	0.90	0.95
Ac-Dc Single-output	Output Rating ≤ 500 W	N/A	0.80	0.95	0.95
	Output Rating > 500 W and Output Rating ≤ 1,000 W	0.65	0.80	0.95	0.95
	Output Rating > 1,000 watts	0.80	0.90	0.95	0.95

Active State Efficiency - Metric

- The active efficiency of the product is defined by Eff_{ACTIVE} , *defined below:*

$$Eff_{ACTIVE} = EXP(0.65 * \ln(Eff_{CPU}) + 0.30 * \ln(Eff_{MEMORY}) + 0.05 * \ln(Eff_{STORAGE}))$$

Where:

- *Eff_{ACTIVE} is comprised of Eff_{CPU}, Eff_{MEMORY} and $Eff_{STORAGE}$ which are defined in equations 2 through 4 on the following slides*

- SPEC and Green Grid have determined that the proposed CPU, memory, and storage weightings result in the best apples to apples product active efficiency comparison across a variety of server types.
  - EPA has validated that these weightings result in fair comparisons that can be used to effectively differentiate the market.

Active State Efficiency - Metric

- The calculation of Eff_{CPU} is shown below.

$$Eff_{CPU} = Geomean(Eff_{COMPRESS}, Eff_{LU}, Eff_{SOR}, Eff_{CRYPTO}, Eff_{SORT}, Eff_{SHA256}, Eff_{HYBRIDSSJ})$$

Where:

$Eff_{COMPRESS}$ is the measured Compression worklet score
Eff_{LU} is the measured LU worklet score
Eff_{SOR} is the measured SOR worklet score
Eff_{CRYPTO} is the measured Crypto worklet score
Eff_{SORT} is the measured Sort worklet score
Eff_{SHA256} is the measured SHA256 worklet score
$Eff_{HYBRIDSSJ}$ is the measured Hybrid SSJ worklet score

Active State Efficiency - Metric

- The calculation of Eff_{MEMORY} is shown below.

$$Eff_{MEMORY} = Geomean(Eff_{FLOOD2}, Eff_{CAPACITY2})$$

Where:
Eff_{FLOOD2} is the measured Flood2 worklet score
$Eff_{CAPACITY2}$ is the measured Capacity2 worklet score

Active State Efficiency - Metric

- The calculation of $Eff_{STORAGE}$ is shown below.

$$Eff_{STORAGE} = Geomean(Eff_{SEQUENTIAL}, Eff_{RANDOM})$$

Where:
$Eff_{SEQUENTIAL}$ is the measured Sequential worklet score
Eff_{RANDOM} is the measured Random worklet score

Active State Efficiency - Threshold

- Based on multiple years of SERT data collection, including 120+ unique product families, as well as consistent collaboration with stakeholders.
- EPA balanced the proposed active and idle state efficiency requirements so that together the overall energy requirements target the top quartile of the market and represent products that excel in both areas.
- Analyzed projected pass rates at both configuration and product family based, separated by form factor (rack, blade, tower) and socket count (1, 2, 4).
- All ENERGY STAR products will have to meet their applicable minimum Eff_{ACTIVE} values shown in Table 3 to certify as ENERGY STAR.

Active State Efficiency - Threshold

Table 3: Active State Efficiency Thresholds for all Computer Servers

Product Type	Minimum Eff_{ACTIVE}
Rack	50
Tower	50
Blade	55
Multi-Node	55
Resilient	30

Values in Table 3 subject to change in subsequent draft for the following reasons:

- If EPA adopts SERT Version 2.0.0, an adjustment factor will be applied to these requirements, making them appear smaller, but the underlying assumptions, the function of the metric, and pass rates will not change.
- EPA has been informed that product data is being complied to be shared with EPA highlighting increased active efficiency in newer products and may take this data into account in the next draft.

Active State Efficiency – Analysis Observations

- Have not seen a correlation between performance and inability to meet idle thresholds.
  - 90% of the top performing server configurations in active state efficiency also meet their respective idle state requirements in Draft 2.
- EPA included a previous version of Green Grid's proposed active adder in its analysis and found that the proposed active adder does not substantially alter pass/fail results over the Draft 2, Version 3.0 proposal.
  - A vast majority of configurations that failed the Draft 1 idle state proposed values also failed when including the proposed active adder.
  - Only five families in the data set contain configurations which achieve an $Eff_{ACTIVE} \geq 60$ but cannot not meet their requisite idle state efficiency requirements.

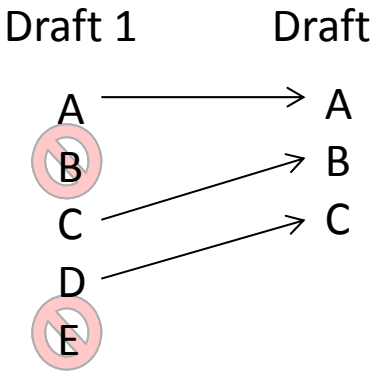
Idle State Efficiency – Resilient Servers

- EPA is proposing to remove idle state requirements for resilient servers in Version 3.0 for the following reasons:
  - Rapidly changing nature of the market
  - Small number of resilient server models in ENERGY STAR data set
  - Limited differentiation in the idle state efficiency of resilient servers
- For the reasons listed above, EPA is not able to confidently maintain idle levels for this product type at this time.
- EPA is maintaining the idle state reporting requirement for resilient servers, and has simplified Table 4 to remove the previous resilient categories.

Idle State Efficiency – Revised Categories

Table 4: Base Idle State Power Allowances for One and Two Socket Non-Resilient Servers

Category	Number of Sockets	Blade or Multi-Node	Base Idle State Power Allowance, P_{BASE} (watts)
A	1	N/A[3]	37
B	2	No	85
C	2	Yes	105



Idle State Efficiency – Idle Power Allowance Changes

- EPA is proposing the following adder changes in Draft 2:
  - Removed the Additional Buffered DDR Channel adder as it only applies to resilient servers, which no longer have idle state requirements (other than reporting).
  - Reduced the memory adder from 0.25 watts/GB above 4GB of installed memory to 0.125 watts/GB above 4GB of installed memory
    - Further discussion with stakeholders and an expanded product data set show that the previously proposed adder in Draft 1 was not sufficiently aggressive.

Request – More Data on Idle Power Allowances

- EPA is seeking additional feedback and data on the following idle power allowance concepts:
  - EPA is open to creating a new definition and adder for non-volatile memory devices, including those that are flash based, if supporting data can be provided that shows that they should be addressed independently of the exiting memory definition and adder.
  - EPA received feedback to raise the adder value for additional I/O devices with greater than 10 Gbit capability beyond the current 8 watt allowance. EPA welcomes energy data to support raising this allowance, and inform what adder levels would be appropriate for these higher speed ports (e.g. 40Gbit+).

Other Testing Criteria

- APA Requirements:
  - EPA has clarified that the APA requirements only apply to expansion APAs, as products with integrated APAs are proposed to be excluded from scope.
  - EPA received stakeholder feedback claiming that the 30 watt idle state power consumption requirement is not sufficient for some expandable APA implementations. This does not align with the publically available data EPA has been able to review. EPA welcomes data from stakeholders to support the claim that the 30 watt requirement is too strict for the latest generation of accelerator hardware to meet.

Timeline

- Draft 2, V3.0 Specification Webinar – August 18
- Draft 2, V3.0 Specification Comment Deadline – August 28
- Draft 3, V3.0 Specification Release – Q4 2017
- Final Draft V3.0 Specification + Final Specification Release – Q4 2017 / Q1 2018
- V3.0 Specification Effective – Q4 2018 / Q1 2019

Any Questions?

Draft 2 Specification Comment Deadline

- Please send written feedback to servers@energystar.gov

Comment Deadline
Thursday, August 28, 2017

Thank You!

- Questions on specification development:

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