ENERGY STAR Server Meeting:
Product Families, Dataset Assembly, Progress

March 11, 2011

RJ Meyers
Una Song

US Environmental Protection Agency
ENERGY STAR Program

Agenda

Time (all EST)	Topic
9:00-9:15	**Meeting Introduction**
9:15 – 10:45	**Product families introduction**
10:45-11	**Break**
11:00-12:30	**Dataset Assembly**
12:30-1:15	**Lunch**
1:15 - 2:00	**(Continued) Dataset Assembly**
2:00 – 3:00	**SERT progress update from EPA and stakeholder input**
3:00 – 3:30	**Remaining topics, meeting summary and closing**

Remote Attendees

- Call in and Live Meeting information available on the ENERGY STAR Computer Servers PD page:
  - www.energystar.gov/productdevelopment
  - *Revisions to Existing Specifications*

- Audio provided via conference call in:

Call in:	+1.877.423.6338 (inside US)
	+1.571.281.2578 (outside the US)
Code:	693908

- Phone lines will remain on mute during presentations, opened during discussion (*please keep phone lines on mute unless speaking*)

- Please refer to the agenda for approximate discussion timing

Product Families for Computer Servers

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Revising the Product Family Structure

- Remains a priority revision for EPA
  - Create a better balance between testing burden and confidence in representative data than is present in Version 1.0
  - Limit missed opportunities to identify equipment capable of meeting ENERGY STAR efficiency levels and feature requirements
  - Ensure test points deliver a broad set of efficiency data from SERT

Experience in Version 1

- Pre-defined Server Configurations
  - Effectiveness
    - Presence of pre-defined configurations allows alignment of testing and marketing of qualification
  - Observations
    - Limits to representative testing have moderate effect on ENERGY STAR traffic
    - Straightforward for EPA to implement – one model number equals one product
    - In other programs where representative testing applies in this model, EPA has worked with stakeholders to create clear “range” qualification listings

Experience in Version 1

- Customer-configured Servers
  - Effectiveness
    - Challenging both in testing and marketing of products
    - Shifts qualification activity back to specific configurations
  - Observations
    - Remains a challenge to implement for EPA
    - Stakeholders have referenced internal methods of modeling power consumption, but are limited in sharing details publically
    - The client Computer program implements “worst-case” testing approach, but Servers have significantly more configurability and component power deltas

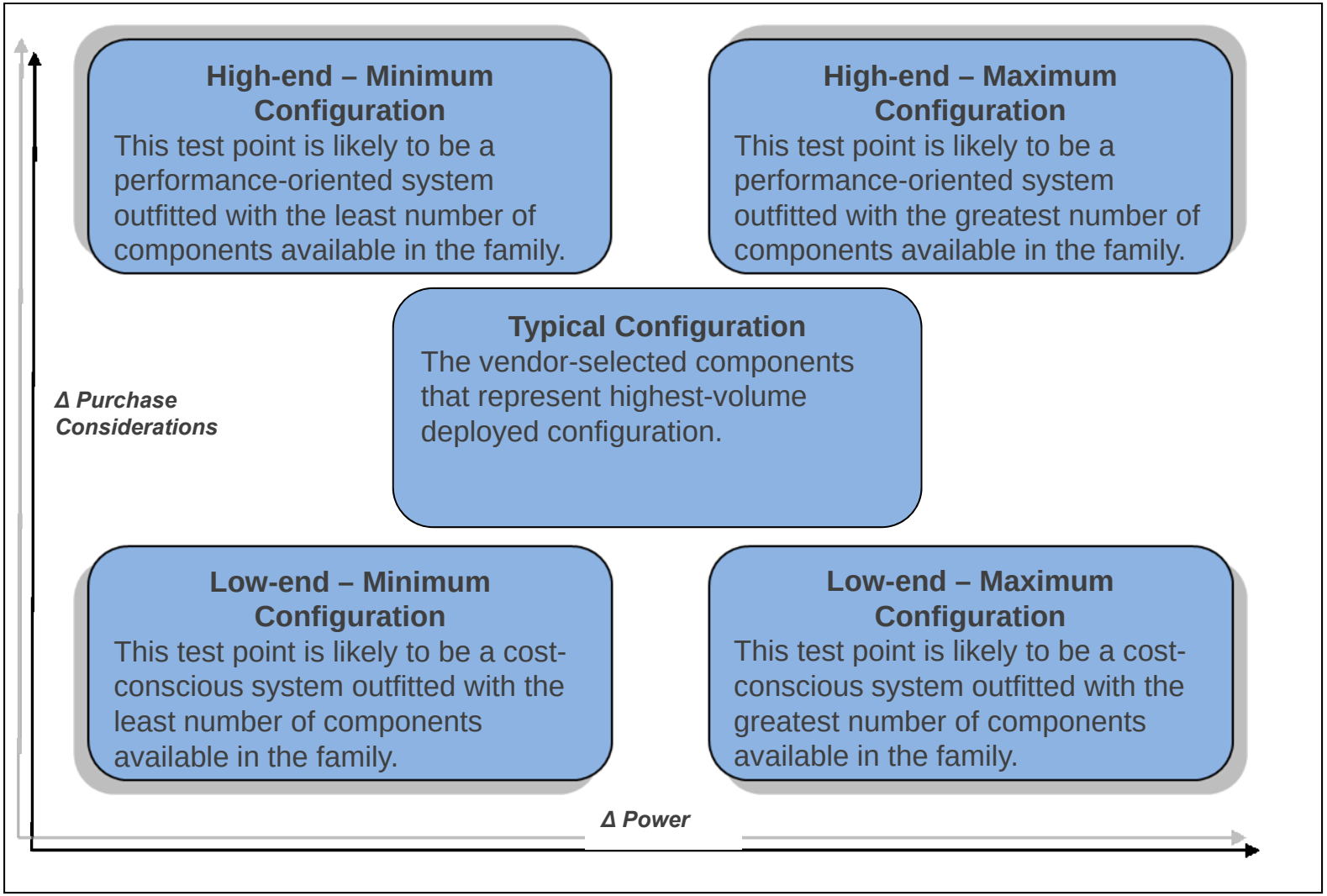
5-point approach

- EPA proposes “bookending” product families with five representative tests
- All configurations within a product family would share a set of core characteristics
- Qualification listings would contain
  - References to the actual configurations tested
  - A configuration identifier that could be referenced by a purchaser for the actual configurations tested AND all other configurations a manufacturer asserts as meeting the applicable ENERGY STAR requirements

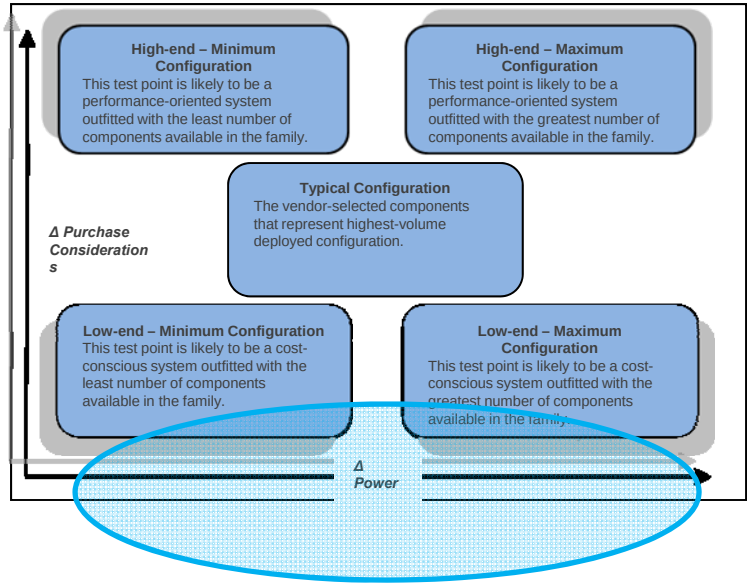
Common Product Family Attributes

- Same model line
- Same form factor (with common motherboard)
- Common Power Supply (PSU) characteristics - discussed further in subsequent slides

5-point Product Family Structure

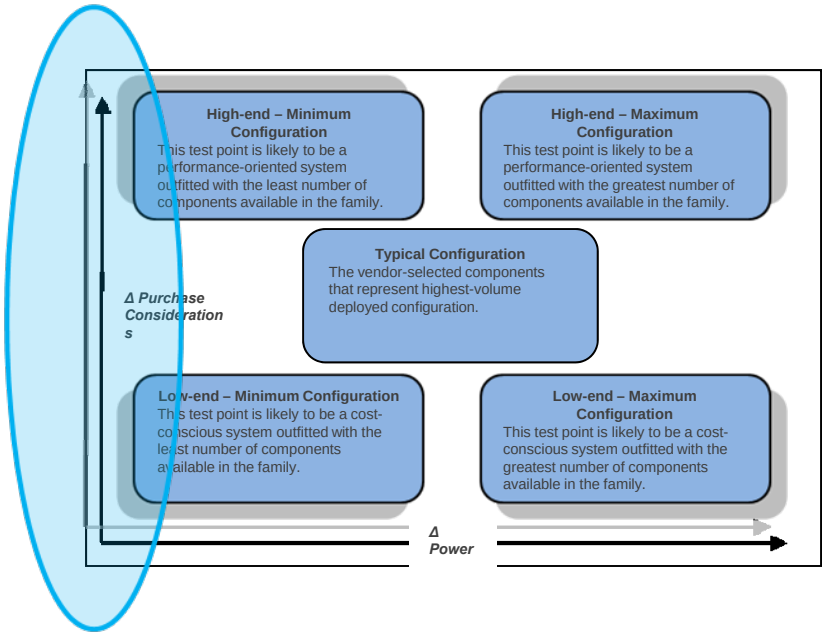


Power



- The horizontal vector represents shifts in power – same as V1
  - **Minimum Power**: minimum configuration that is able to boot and execute supported OSs
  - **Maximum Power**: vendor-selected combination of components that maximize power usage within the Product Family once assembled and operated

Purchase Decisions



- The vertical vector represents shifts in purchasing priorities
  - **High-end**: highest-price or highest-performance computing platform
  - **Low-end**: lowest-price computing platform (likely also more moderate performance, trading performance for system cost)

Outcomes

- For Partners
  - In pre-configured purchase model where groups of configurations share common attributes or are built on a common platform, may reduce testing burden
  - In customer-configurable model, allows a range of configurations
- For EPA
  - Maintains correspondence between test data and represented configurations
  - Reduces potentially duplicative testing and reporting
  - Creates structure to get a broad set of active mode data disclosure
- For Customers
  - Provides a bracket to show where their desired configuration may fall

Example – CPU Components

Product Name	Watts	Cores	Price
3.6 GHz, 6MB Cache	130 Watts	4C	$ 1,663.00
3.2 GHz, 6MB Cache	105 Watts	6C	$ 1,663.00
3.2 GHz, 4MB Cache	105 Watts	4C	$ 1,440.00
3.0 GHz, 6MB Cache	95 Watts	4C	$ 1,440.00
2.4 GHz, 6MB Cache	95 Watts	6C	$ 1,219.00
2.6 GHz, 4MB Cache	95 Watts	4C	$ 996.00
2.2 GHz, 4MB Cache	95 Watts	6C	$ 996.00
1.8 GHz, 4MB Cache	80 Watts	6C	$ 774.00
2.2 GHz, 4MB Cache	80 Watts	4C	$ 551.00
2.2 GHz, 4MB Cache *Energy Efficient*	60 Watts	4C	$ 551.00
1.8 GHz, 4MB Cache	80 Watts	2C	$ 478.00
1.6 GHz, 4MB Cache *Energy Efficient*	40 Watts	4C	$ 471.00
2.0 GHz, 4MB Cache *Energy Efficient*	40 Watts	2C	$ 440.00
1.2 GHz, 4MB Cache	60 Watts	4C	$ 387.00
1.5 GHz, 4MB Cache	80 Watts	2C	$ 219.00

- CPU vendor offers wide range of CPU options
  - Binning
  - Bonding Options
- Server vendor will select several CPU options
  - Varying price and performance points

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1.2 GHz, 4MB Cache	60 Watts	4C	$ 387.00
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- Example: Server vendor selects six CPU types
  - Constrained by server design
  - Offer several price points
  - Fit with overall server portfolio

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- CPU alone brings 24 possible configurations
  - 6 CPU Types
  - 1 to 4 Sockets

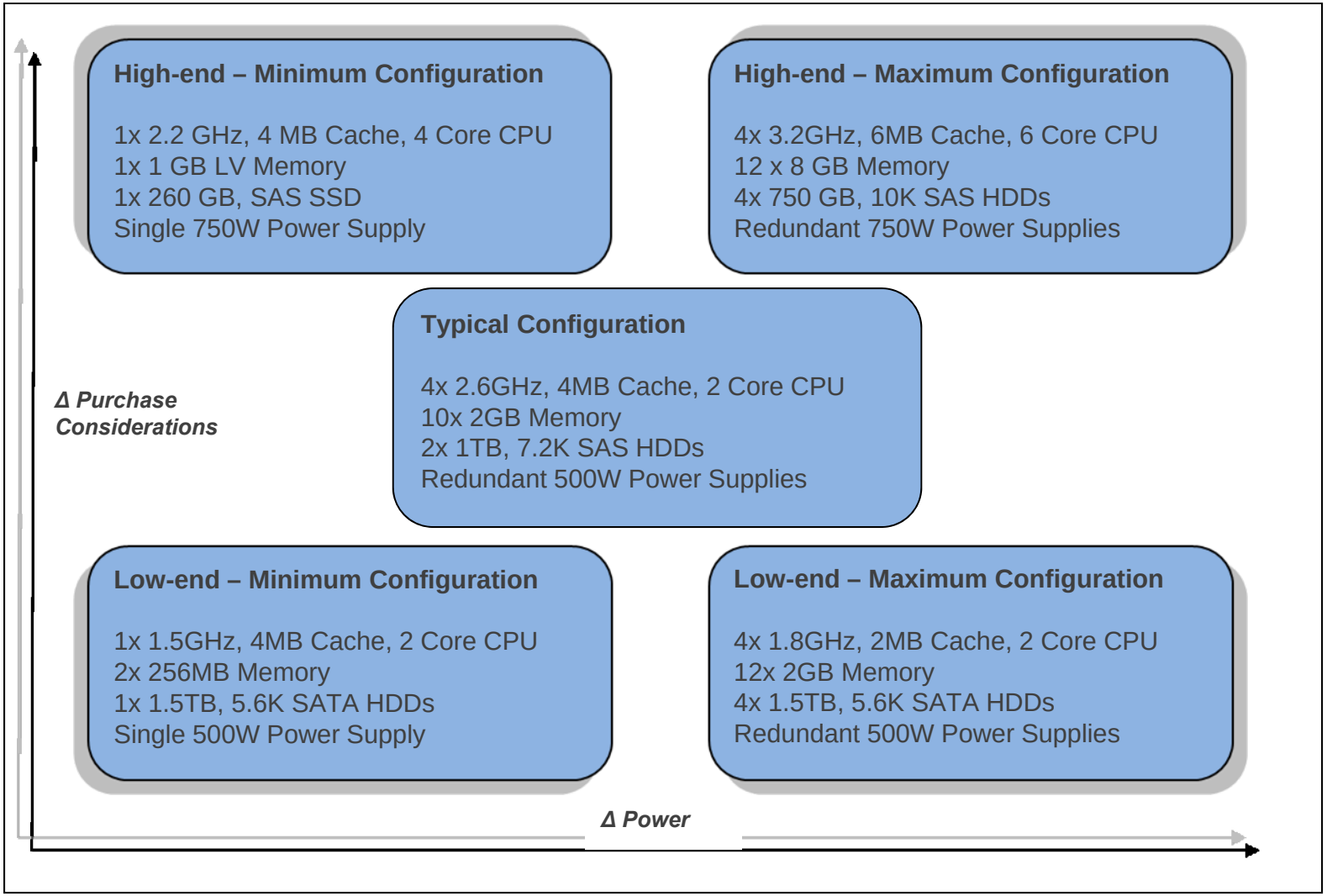
- Add in
  - Memory options (3-4 types)
  - Power Supply Options (1 – 2 types)
  - Storage Options (3-4 types)

- Possible configurations can grow into the 1,000's

Example: Full Configuration

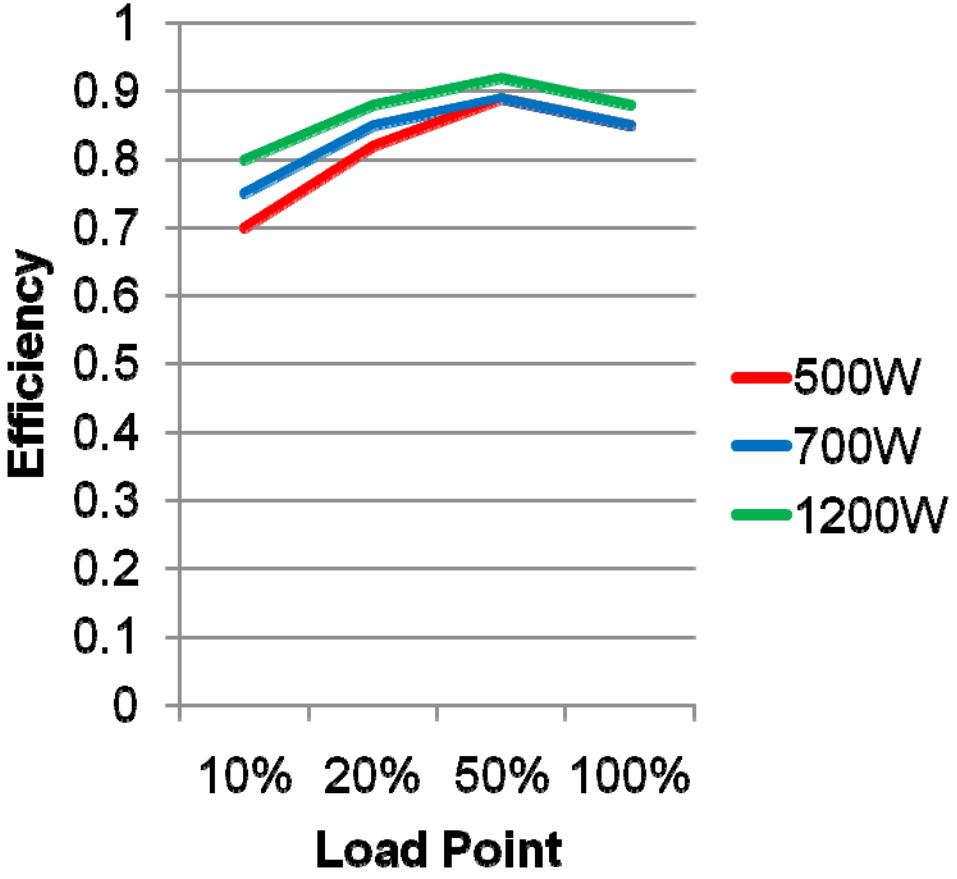
- Server Common Product Family Attributes:
  - Model Line: *A1234 Server*
  - Form Factor: *Rack-mounted*
  - Motherboard: Model *MB1203 w/ 4 CPU Sockets*
- Other Characteristics:
  - 1 or 2 - (Single or Redundant) Power Supplies
  - 5 - I/O Expansion Slots
  - 4 - 3.5” HDD Slots
  - 12 - Memory (DIMM) Slots
- CPU Options:
  - 1.5 GHz / 4MB Cache / 2 Core / 80W
  - 1.8 GHz / 2MB Cache / 2 Core / 80W
  - 2.2 GHz / 4MB Cache / 4 Core / 60W *Energy Optimized*
  - 2.6 GHz / 4MB Cache / 4 Core / 95W
  - 3.0 GHz / 6MB Cache / 4 Core / 95W*
  - 3.2 GHz / 6MB Cache / 6 Core / 105W
- Memory Options (per DIMM):
  - 256 MB
  - 1 GB - LV (Low Voltage)*
  - 2 GB
  - 8 GB
- Storage:
  - 750 GB / 10,000 RPM / SAS / 3.5”
  - 1 TB / 7,200 RPM / SAS / 3.5”
  - 1.5 TB / 5,600 RPM / SATA / 3.5”
  - 260 GB / SSD / SAS / 3.5”
- Power Supply:
  - 500 W Universal, Single or Redundant
  - 750 W Universal, Single or Redundant

Example: Full Configuration



Role of PSUs

- ENERGY STAR PSU efficiency criteria ensure a reasonably flat load curve above 20%
- Across a product family, the idle power point may fall below 15%, leading to larger variations between products
- Risk: wide variations in power due to Idle load point limit representation of the test data



Discussion

Assembling a Dataset for Version 2

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Version 2 Dataset

- EPA is assembling a dataset for all servers in the program scope:
  - 1-4 processor sockets
  - rack-mounted, pedestal, and blade form factors

- EPA's scope for this effort includes blade servers and 3-4 socket servers. This data will be utilized to assess Idle requirements (levels and/or reporting) in light of changes to the product family structure

Version 2 Dataset

- Primary use of the dataset will be to re-evaluate the structure for product families that is currently in effect in the Version 1.0 ENERGY STAR Servers Specification

- Idle State and Full Load power data for each unit under test, with accompanying configuration details
  - Active/SERT data NOT being collected at this time

Configuration Variations

- Processor
  - System speed (e.g., FSB, memory controller speed)
  - For Typical Configuration, impact of unpopulated socket
- PSU
  - Use typical options available to customers
  - Report rationale for PSU selection (e.g., only option available for product family, sized to the rated power)

Configuration Variations

- Storage (HDD or SSD)
  - Select options available to the customer that represent a variety of common end configurations
- Memory
  - Consider several vintages of memory technology such that EPA can evaluate the impact of new memory technologies on overall server efficiency

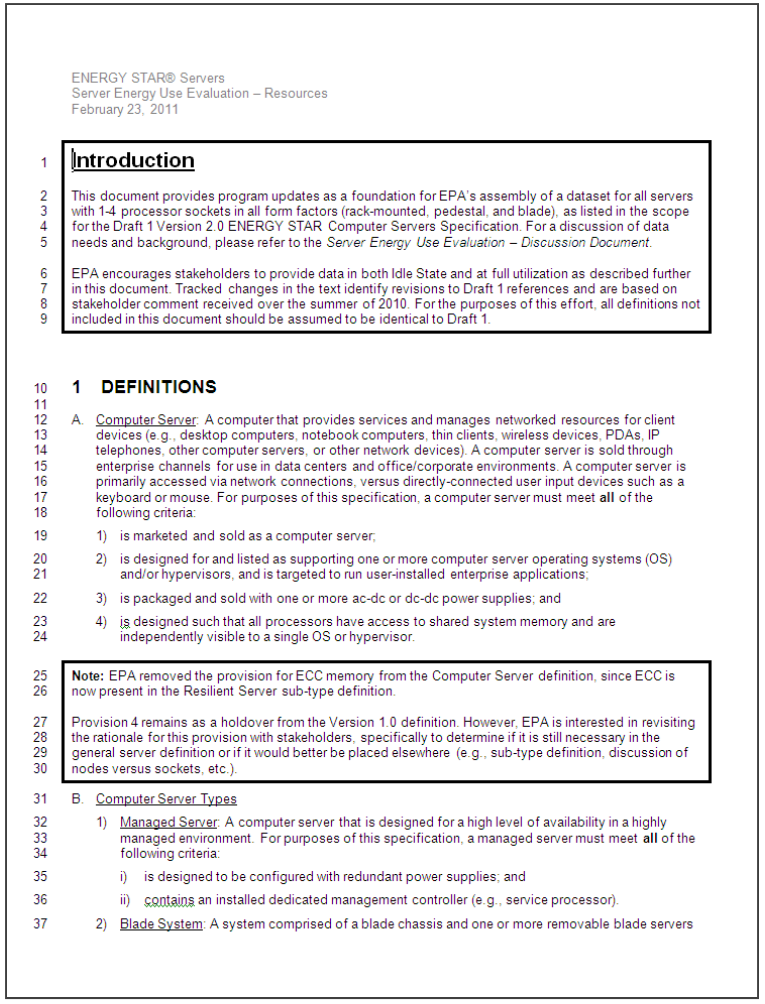
Configuration Variations

- I/O
  - For this effort, EPA specifies minimal I/O capability
  - EPA anticipates limited support for testing performance of I/O in SERT
  - Review of V1 adder structure
    - I/O dataset plus power spec data at Idle for devices
    - Drivers for power differences in hardware

V1 I/O Dataset – Power Range Examples	
10 Gbit Ethernet	
Idle Power Draw	4.9 - 20.8 W
Power per Port	**2.47 – 20.77 W**
Fibre Channel	
Idle Power Draw	3.8 – 37.4 W
Power per Port	**2.72 – 37.4 W**
RAID	
Idle Power Draw	13.8 – 27.3 W
Power per Port	1.71 – 2.3 W

Documentation Updates

- Accompanying the Product Family Discussion document was a summary of revisions relevant to dataset assembly



ENERGY STAR® Servers
Server Energy Use Evaluation – Resources
February 23, 2011

Introduction

This document provides program updates as a foundation for EPA's assembly of a dataset for all servers with 1-4 processor sockets in all form factors (rack-mounted, pedestal, and blade), as listed in the scope for the Draft 1 Version 2.0 ENERGY STAR Computer Servers Specification. For a discussion of data needs and background, please refer to the *Server Energy Use Evaluation – Discussion Document*.

EPA encourages stakeholders to provide data in both Idle State and at full utilization as described further in this document. Tracked changes in the text identify revisions to Draft 1 references and are based on stakeholder comment received over the summer of 2010. For the purposes of this effort, all definitions not included in this document should be assumed to be identical to Draft 1.

1 DEFINITIONS

A. Computer Server: A computer that provides services and manages networked resources for client devices (e.g., desktop computers, notebook computers, thin clients, wireless devices, PDAs, IP telephones, other computer servers, or other network devices). A computer server is sold through enterprise channels for use in data centers and office/corporate environments. A computer server is primarily accessed via network connections, versus directly-connected user input devices such as a keyboard or mouse. For purposes of this specification, a computer server must meet **all** of the following criteria:

1) is marketed and sold as a computer server;
2) is designed for and listed as supporting one or more computer server operating systems (OS) and/or hypervisors, and is targeted to run user-installed enterprise applications;
3) is packaged and sold with one or more ac-dc or dc-dc power supplies; and
4) is designed such that all processors have access to shared system memory and are independently visible to a single OS or hypervisor.

Note: EPA removed the provision for ECC memory from the Computer Server definition, since ECC is now present in the Resilient Server sub-type definition.

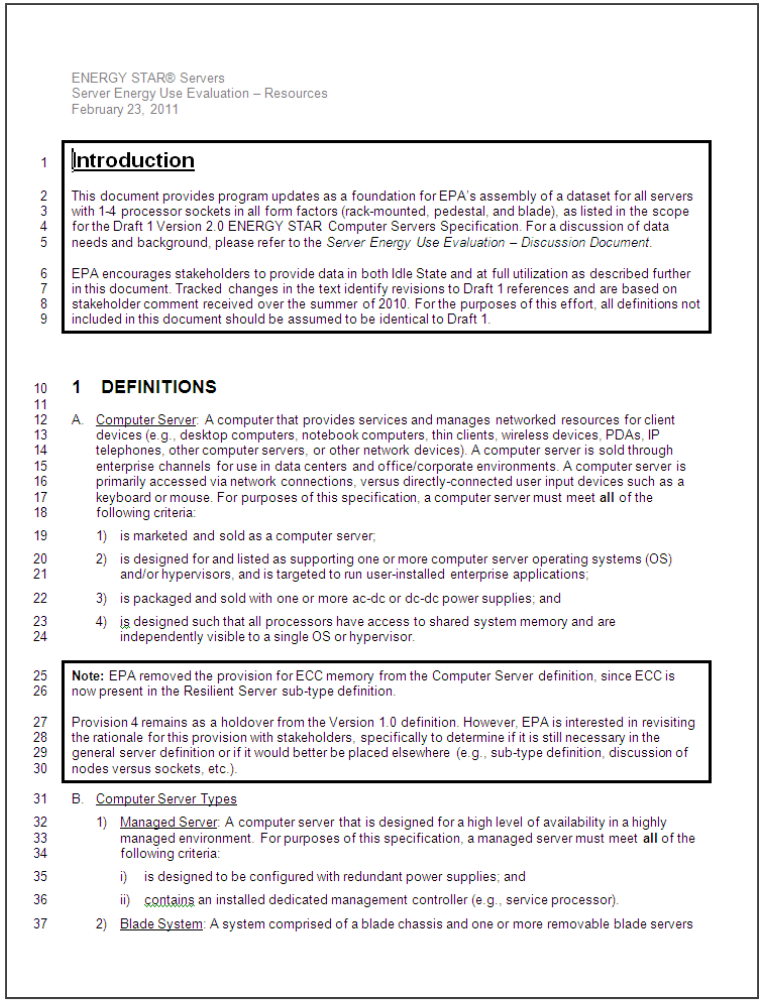
Provision 4 remains as a holdover from the Version 1.0 definition. However, EPA is interested in revisiting the rationale for this provision with stakeholders, specifically to determine if it is still necessary in the general server definition or if it would better be placed elsewhere (e.g., sub-type definition, discussion of nodes versus sockets, etc.).

B. Computer Server Types

1) Managed Server: A computer server that is designed for a high level of availability in a highly managed environment. For purposes of this specification, a managed server must meet **all** of the following criteria:
   i) is designed to be configured with redundant power supplies; and
   ii) contains an installed dedicated management controller (e.g., service processor).
2) Blade System: A system comprised of a blade chassis and one or more removable blade servers

Documentation Updates

- **Definitions** – Updated based on stakeholder feedback to Draft 1 and subsequent comments
- **Qualifying Products** – Provided as a reminder, but matches proposal from Draft 1



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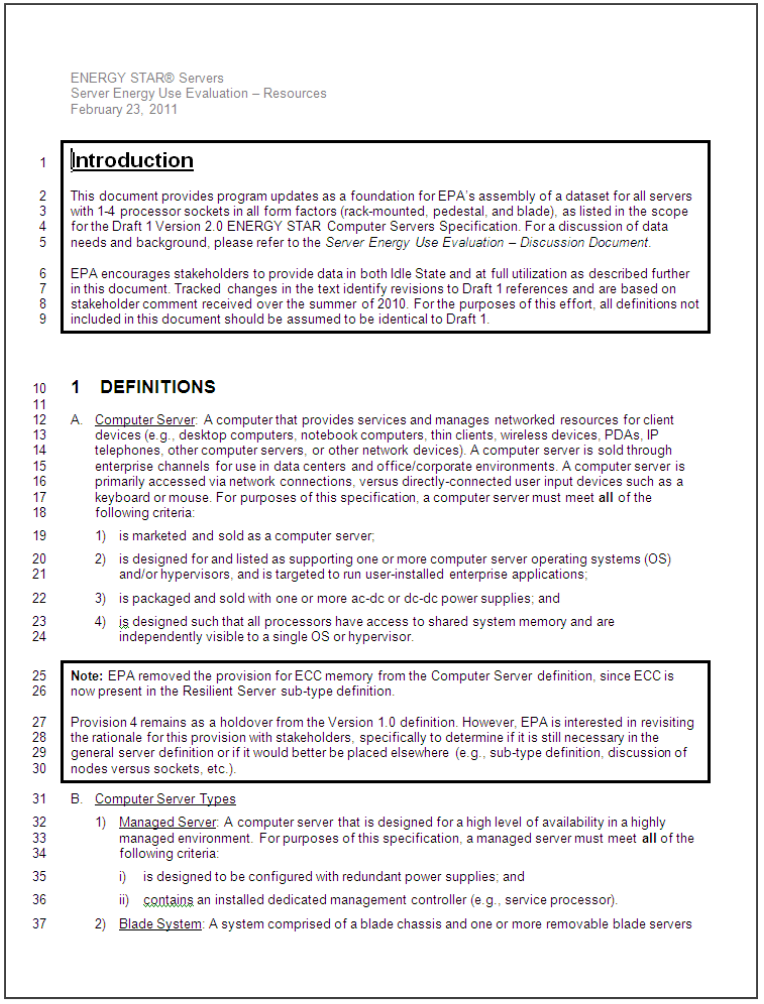
Documentation Updates

- **Test Method** –
  - Updates based on Draft 1 feedback
  - Blade testing
    - N, N-1 format (removed single blade testing)
    - Manufacturer recommendations for location of installed blades
    - Clarified blade chassis loading to account for power domains



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Timing

- March – May: Dataset assembly period for 1S-2S, 3S-4S systems and blade servers
- May - June: Data analysis
- Late June onward: Specification drafting process

Discussion

Update: SERT

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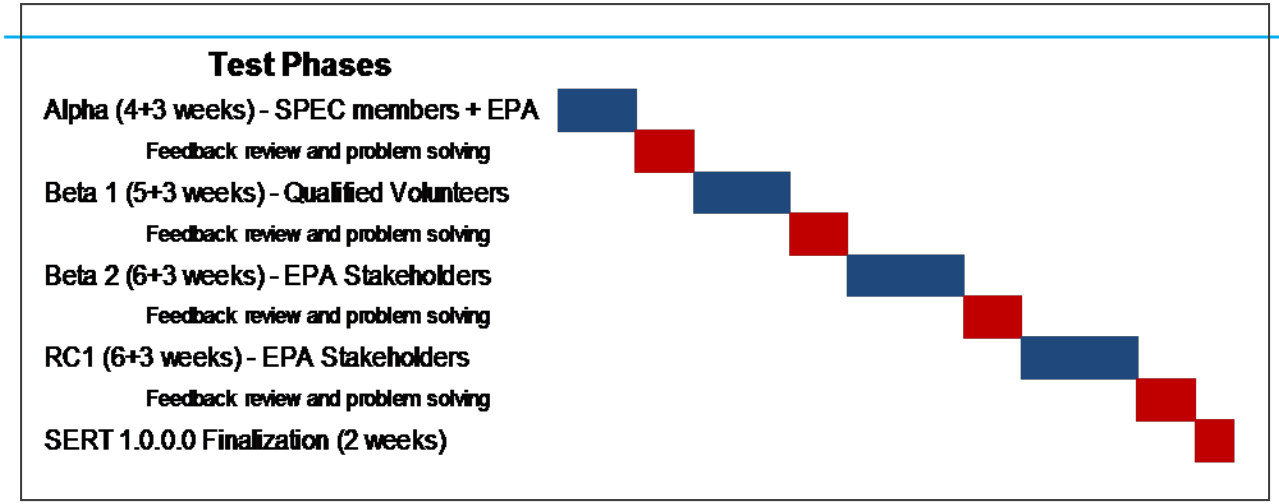
SERT Update

- Development status and items for review
- Details on upcoming review opportunities and milestones
  - Participation process
  - Prerequisites
- Open discussion

Status

- Version 3 of the Design Document released yesterday
  - Link continues to be live on ENERGY STAR website:
    - http://www.spec.org/sert/docs/SERT-Design_Doc.pdf
- Notes from SPEC on content updates:
  - More detail in Workload and Worklet descriptions

SERT Tentative Schedule Pre-Release



Alpha testing planned to begin in March 2011.

Subsequent dates dependent on successful completion of prior phase.

Alpha Participation

- SPEC members, EPA and/or their agents
- Must have an accepted SPECpower_ssj2008 result
- Must commit to provide feedback
- Must commit to share numerical results w/SPEC (not public)

Beta1 Participation

- Expanded participation to include some Stakeholders
- Must have an accepted SPECpower_ssj2008 result
- Must commit to provide feedback
- Must commit to share numerical results w/SPEC (not public)

Beta2 Participation

- Expanded participation to include all Stakeholders
- Must have accepted power analyzer and temperature sensor
- Must commit to provide feedback
- Must commit to share numerical results w/EPA and SPEC (not public)

Release Candidate Participation

- Expanded participation to include all who purchase a SERT license
- Must have accepted power analyzer and temperature sensor
- Must commit to provide feedback
- Must commit to share numerical results w/EPA and SPEC (not public)

Proposed testing prerequisites – Alpha and Beta 1

- To ensure effective and efficient testing of pre-release versions of the tool, testing entities must have some experience in the benchmarking process

- SPEC proposed a set of related qualities:
  - Experience running SPECpower_ssj (generate consistent, valid results)
  - Possession of appropriate temperature and power analyzer equipment (Beta 2 onward)

Getting Involved

- EPA will notify stakeholders in advance of testing opportunities
- Tentative process to sign up to participate:
  - Contact EPA at servers@energystar.gov
    - Interest in testing
    - Capability to run test (contact/organizational info, experience and equipment)
    - EPA will inform SPEC of interested participants
    - Participants will be forwarded Beta test agreement documents
    - A test kit will be provided upon approval

Discussion

Action Items and Closing Thoughts

References and Resources

- ENERGY STAR Computer Server specification revision:

  http://www.energystar.gov/index.cfm?c=revisions.computer_servers

- Version 1.1 (current) ENERGY STAR Computer Server specification:
  http://www.energystar.gov/ia/partners/product_specs/program_reqs/Computer_Servers_Program_Requirements.pdf

Thank you!

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