ENERGY STAR
Data Center Storage Meeting
Draft 3 Version 1.0 Specification
Supplemental Material – Combinations of Optimal Configurations Examples

July 11, 2012

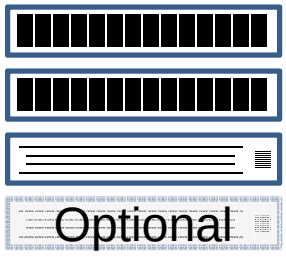
Storage Family Examples

- Expanded examples of Combinations of Optimal Configurations for ENERGY STAR for
  - Increased complexity of tested and sold combinations
  - Inclusion of NAS storage device
- Additional detail can is located in the notes section of the following slides

Example Systems

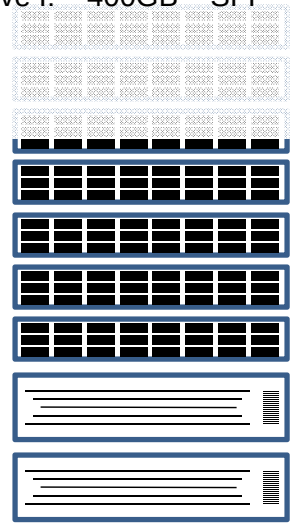
System 1

- Single controller
  - Supports to 28 LFF HDDs (2 drawers of 14x)
  - Optional redundant controller
- Storage media options
  - Drive A: 300GB - LFF – 15K
  - Drive B: 450GB – LFF – 15K
  - Drive C: 600GB – LFF – 15K
  - Drive D: 1TB – LFF – 7.2K
  - Drive E: 2TB – LFF – 7.2K
  - Drive F: 3TB – LFF – 7.2K
  - Drive G: 300GB – LFF – 10K
  - Drive H: 600GB – LFF – 10K
  - Drive I: 900GB – LFF – 10K
  - Drive J: 200GB – LFF – SSD
  - Drive K: 400GB – LFF – SSD



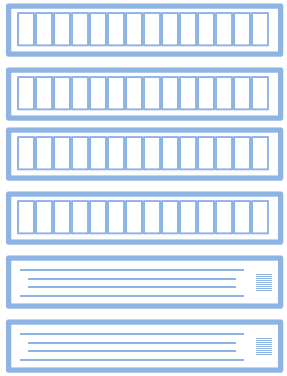
System 2

- Dual controller
  - Supports to 168 SFF HDDs (7 drawers of 24x)
- Storage media options
  - Drive A: 146GB – SFF – 15K
  - Drive B: 300GB – SFF – 15K
  - Drive C: 600GB – SFF – 7.2K
  - Drive D: 1TB – SFF – 7.2K
  - Drive E: 300GB – SFF – 10K
  - Drive F: 600GB – SFF – 10K
  - Drive G: 900GB – SFF – 10K
  - Drive H: 200GB – SFF – SSD
  - Drive I: 400GB – SFF – SSD



System 3

- Dual controller - NAS
  - Supports to 56 LFF HDDs (4 drawers of 14x)
- Storage media options
  - Drive A: 300GB – LFF – 15K
  - Drive B: 450GB – LFF – 15K
  - Drive C: 600GB – LFF – 15K
  - Drive D: 1TB – LFF – 7.2K
  - Drive E: 2TB – LFF – 7.2K
  - Drive F: 3TB – LFF – 7.2K



Submitted Optimal Test Points

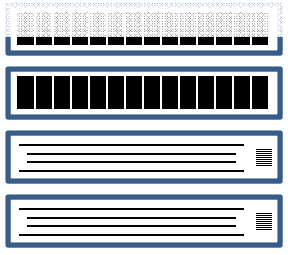
- Vender selected Optimal Test Points selected for Transaction *and/or* Sequential workloads.
  - Additional Capacity Optimal Test Point submitted at Venders choice
- Vender selected storage media and controller options / configuration.
  - Homogeneous examples assume SNIA tool modified to support homogeneous environments for Transaction workloads.
- Note vender chose not to include all available media types in selecting submitted test points:
  - Influenced by their expected market – which drive types are needed in ENERGY STAR qualified systems.
  - Influenced by final process around Component Testing and equivalency.

System 1

– #1 Transaction Optimal
- Dual controllers
- 8x Drive B (450GB – LFF – 15K) (RAID-5)

– #2 Sequential Optimal
- Dual controllers
- 10x Drive E (2TB – LFF – 7.2K) (RAID-6)

– #3 Capacity Optimal
- Dual controllers
- 14x Drive f (3TB – LFF – 7.2K) (RAID-4)

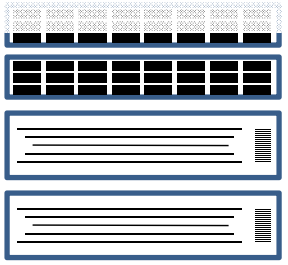


System 2

– #1 Transaction Optimal
- Dual controllers
- 16x Drive A (146GB – SFF – 15K) (RAID-5)

– #2 Transaction Optimal
- Dual controllers
- 4x Drive H (200GB – SFF – SSD) (RAID-1)
- 12x Drive G (900GB – SFF – 10K) (RAID-5)

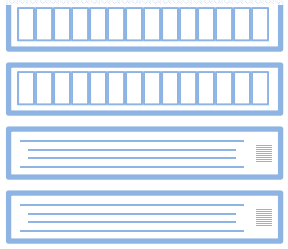
– #3 Sequential Optimal
- Dual controllers
- 45x Drive D (1TB – SFF – 7.2K) (RAID-6)



System 3

– #1 Transaction Optimal
- Dual controllers
- 22x Drive A (300GB – LFF– 15K) (RAID-5)
- 4x Drive D (1TB – LFF– 7.5K) Minimum quantity needed for NAS functionality

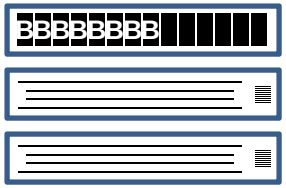
– #2 Sequential Optimal
- Dual controllers
- 37x Drive E (2TB – LFF – 7.2K) (RAID-6)
- 4x Drive D (1TB – LFF– 7.5K) Minimum quantity needed for NAS functionality



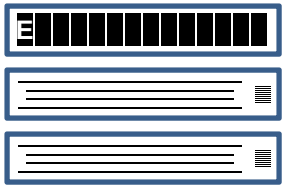
Determining Approved Family Configurations

Example System 1

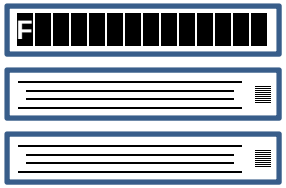
- #1 Transaction Optimized
  - Dual controllers
  - 8x Drive B (450GB – LFF – 15K)



- #2 Sequential Optimized
  - Dual controllers
  - 10x Drive E (2TB – LFF – 7.2K)



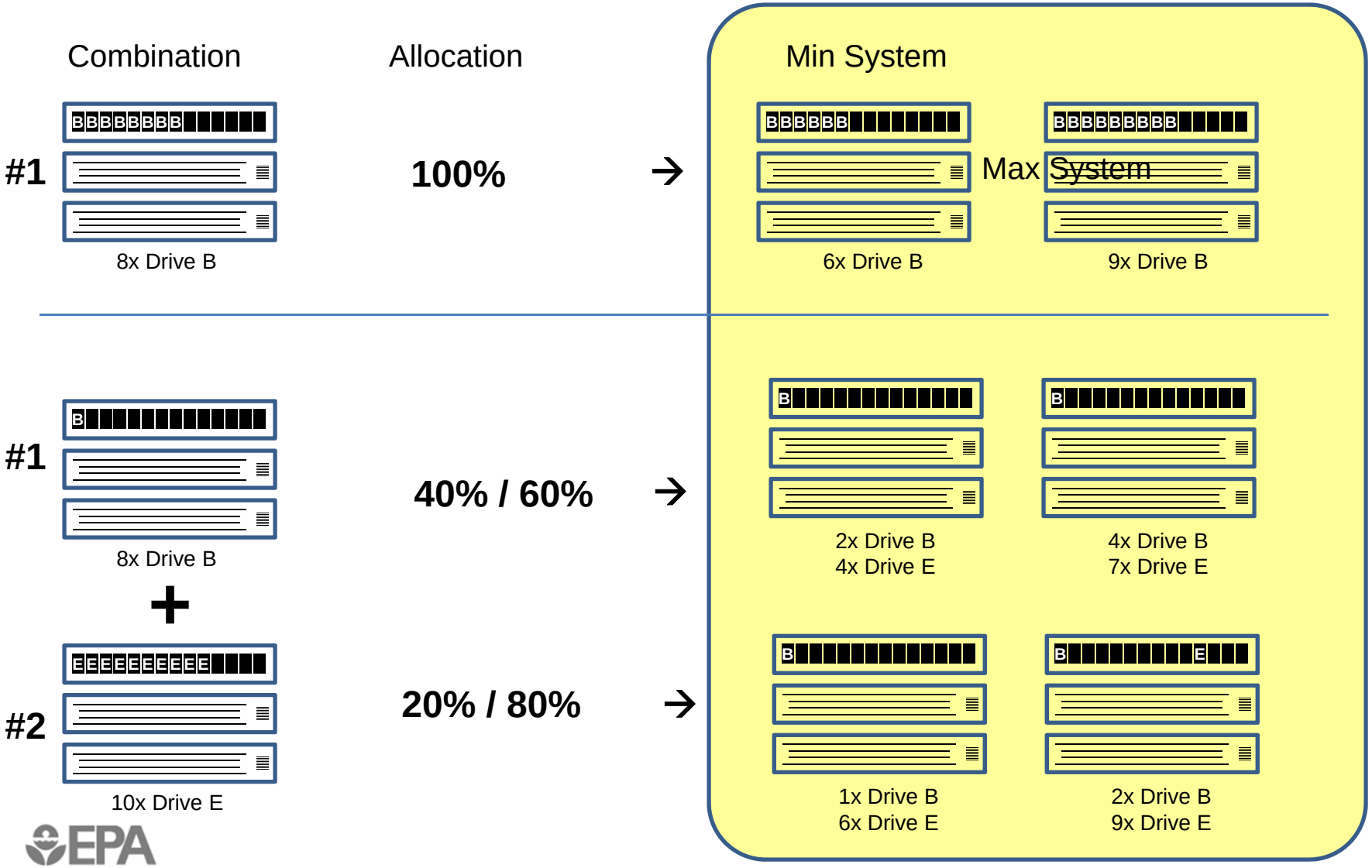
- #3 Capacity Optimized
  - Dual controllers
  - 14x Drive E (2TB – LFF – 7.2K)



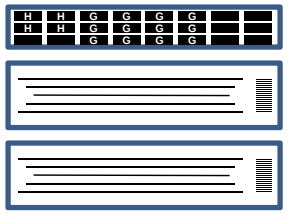
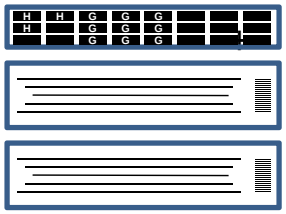
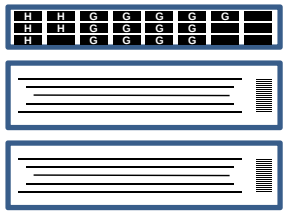
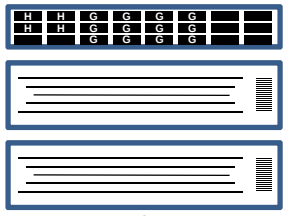
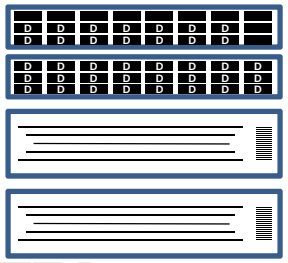
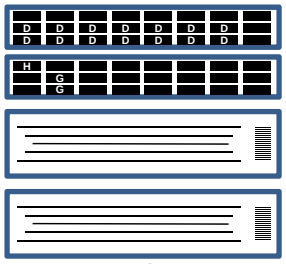
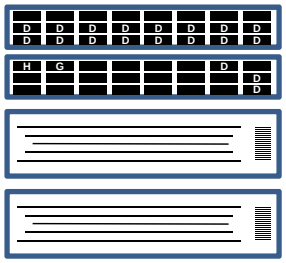
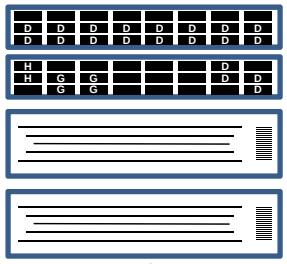
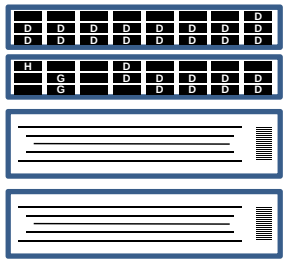
Steps to calculate Approved Configurations

1. Allocate storage media
   - Allocated by % of Optimal test configurations
   - % of allocations must sum to 100%
2. Media Rounding
   - Round UP +5% to nearest whole
   - Round DOWN -20% to nearest whole
     - May use Expanded Minimum Configuration %
3. Drawer Rounding (if applicable)
   - Eliminate –or- fill in partial drawers
   - Keeping overall ratio of drive types the same

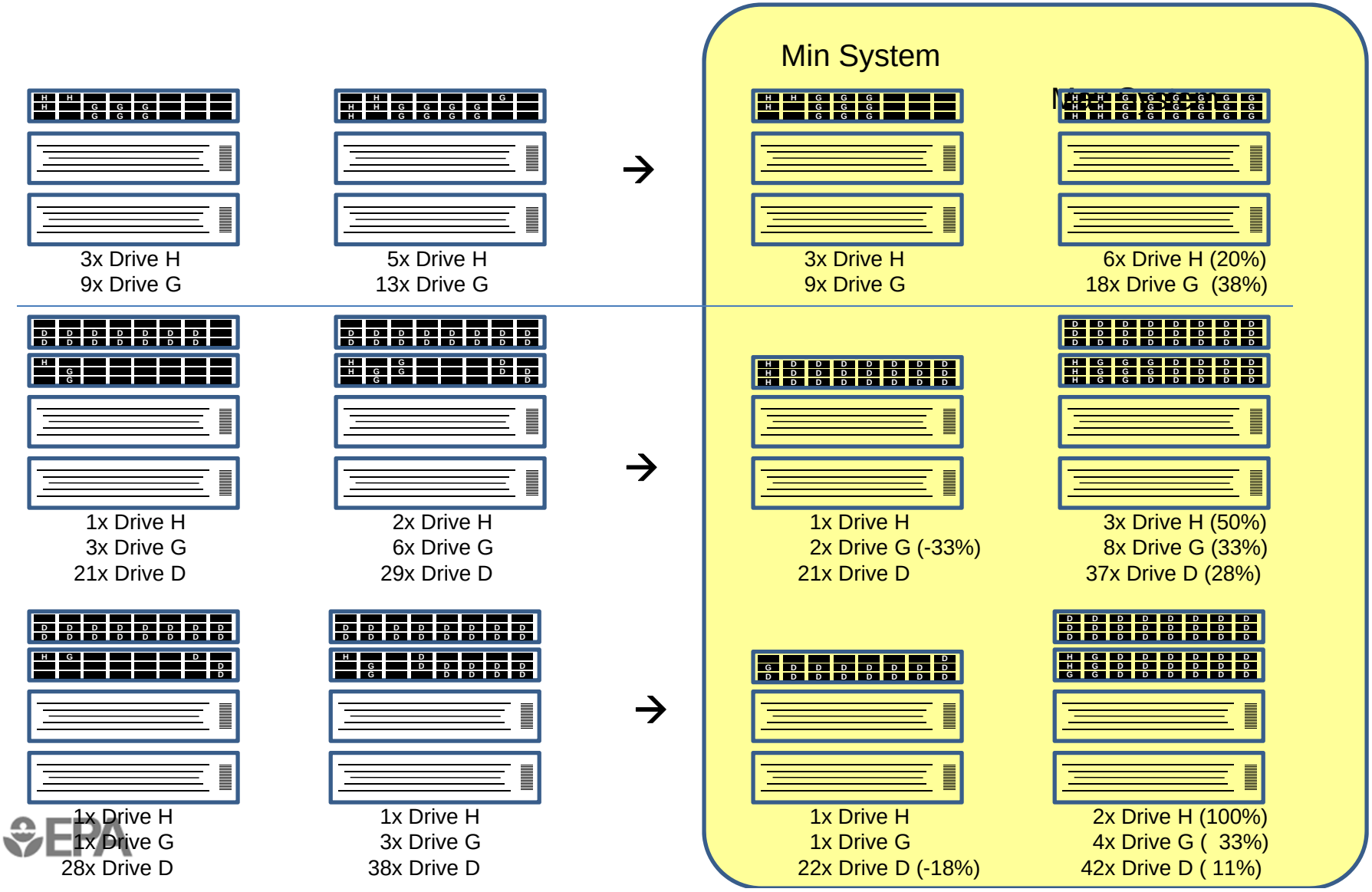
Example System 1



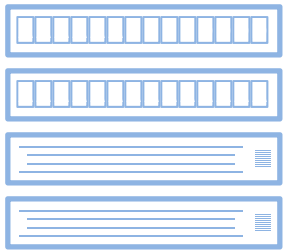
Example System 2

Combination	Allocation		Over/Under	Rounding
#2  4x Drive H 12x Drive G	100%	→	 3x Drive H 9x Drive G	 5x Drive H 13x Drive G
#2  4x Drive H 12x Drive G + #3  45x Drive D	40% / 60% 20% / 80%	→	 1x Drive H 3x Drive G 21x Drive D  1x Drive H 1x Drive G 28x Drive D	 2x Drive H 6x Drive G 29x Drive D  1x Drive H 3x Drive G 38x Drive D

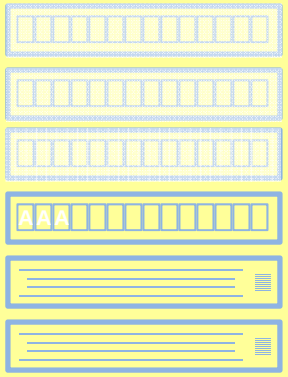
System 2 Drawer Rounding



Example System 3 (NAS)

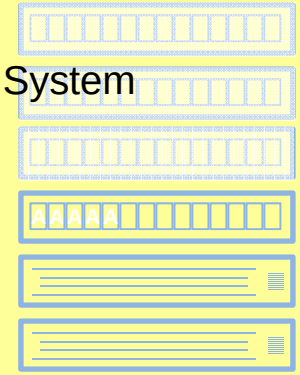
Combination	Allocation	
#1  22x Drive A 4x Drive D	**20% - Block I/O** **80% - File I/O**	→

Min System



3x Drive A

Max System



5x Drive A

Storage media utilized for File I/O access is not regulated under Version 1 of ENERGY STAR for Storage.

Any drive combination may be delivered for File I/O deployment.

References and resources

- ENERGY STAR Data Center Storage specification revision:
  - www.energystar.gov/NewSpecs
  - Select “Data Center Storage”