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

**Combination** | **Allocation** | **Min System** | **Max System**
---|---|---|---
#1 | 100% | #1 | #1
8x Drive B | 6x Drive B | 9x Drive B

#1 | 40% / 60% | #2 | #2
8x Drive B | 2x Drive B | 4x Drive B
4x Drive E | 4x Drive B | 7x Drive E

#2 | 20% / 80% | #2 | #2
10x Drive E | 1x Drive B | 2x Drive B
6x Drive E | 2x Drive B | 9x Drive E
# Example System 2

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<th>Over/Under Rounding</th>
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#2 + #3

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#2 + #3
System 2 Drawer Rounding

- Min System
- Max System

3x Drive H
9x Drive G
5x Drive H
13x Drive G
3x Drive H
9x Drive G
6x Drive H (20%)
18x Drive G (38%)

1x Drive H
3x Drive G
21x Drive D
2x Drive H
6x Drive G
29x Drive D
1x Drive H
2x Drive G (-33%)
21x Drive D
3x Drive H (50%)
8x Drive G (33%)
37x Drive D (28%)

1x Drive H
1x Drive G
22x Drive D (-18%)
1x Drive H
1x Drive G
42x Drive D (11%)
2x Drive H (100%)
4x Drive G (33%)
Example System 3 (NAS)

Combination

#1

22x Drive A
4x Drive D

Allocation

20% - Block I/O
80% - File I/O

Min System

Max System

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”