ENERGY STAR Computers v8
Simplified Expandability Score
Category Concept

Presented to ENERGY STAR®

March 12, 2018
Objectives

1. Discuss existing categorization approaches and challenges
2. Simplified expandability score concept
3. Compare alternatives and discuss pros-cons
Challenges with P-Score Categorization

- Only a weak correlation between P-score and a system’s TEC

- P-score ignores other computer design trends, such as growth in high-bandwidth interfaces

- Does not capture the differences in amenity between large and small form factor systems and power supply up-sizing implications
TEC Does not Scale with P-Score, Especially in Mini Desktop Systems

TEC vs. P-Score
(QPL Models Available on Market after 1/1/2016)
Why not categorize based on power supply sizing?

- Boundary effects
- Upsizing incentive
- Does not capture hardware amenity
Alternative: Simplified Expandability Score

**Concept:** use combination of PSU sizing and expandability attributes to differentiate amenity/performance

**Simplified expandability score (SES) =**

\[
A \times (\#\text{PCIe slot lanes}) + B \times (\#\text{High-speed external data ports})
\]

**#PCIe slot lanes:** PCIe lanes accessed by motherboard slots

**#High-speed data ports:** the number of external data ports (accessible outside the product enclosure) with maximum bandwidth exceeding 10 Gbps

Today, this means Thunderbolt 2, 3 and USB 3.1, but could include future high-bandwidth ports
Example:
PSU Size + Simplified Expandability

High Expandability Gaming
- D2 gaming PC w/dGfx and liquid cooling
- Tower form factor
- 2 PClex16, 5 PClex1
- CEC ES = 595

Mainstream Business PC
- Integrated graphics
- Minitower form factor
- 1 PClex16, 3 PClex1
- CEC ES = 370

Low expandability mini desktop
- Mini desktop
- 1 M.2 port
- CEC ES = 150
Similar Segmentation as Expandability Score, But Fewer Attributes

Desktop TECs by CEC Category

A (25)  
B (59)  
C (3)

Desktop TECs by SES Category

A (25)  
B (55)  
C (7)

Only 8 of 87 models change category
Categorization within Desktop Product Family
Business desktop, 72 configurations

ENERGY STAR v6 Categories

SES Categories

Less differentiation within product families.
Summary of Categorization Approaches

- Tracks TEC needs of models better than P-score
- Approximates the CEC’s expandability score with simpler inputs
- Provides less differentiation within individual product families

Needed: broader attribute collection to test, compare, and validate categorization approaches.
BACKUP MATERIALS
Small Form Factor and Mini DTs Will Soon Dominate Mainstream DT Sales

Desktop Market Share Forecast
(based on IDC Q4 2016 Data)
Minis Are Inexpensive, Efficient, Space-Saving, Increasingly Popular

<table>
<thead>
<tr>
<th>Model</th>
<th>MSRP</th>
<th>P-Score</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asus Chromebox</td>
<td>$205</td>
<td>2.8</td>
<td>Bare bones</td>
</tr>
<tr>
<td>Dell Inspiron i3050</td>
<td>$229.99</td>
<td>4.82</td>
<td>Home, small office</td>
</tr>
<tr>
<td>HP Pavilion Mini</td>
<td>$319.99</td>
<td>3.4 – 3.8</td>
<td>Home, media streaming</td>
</tr>
<tr>
<td>Acer Revo One</td>
<td>$393</td>
<td>4.2</td>
<td>Home, media streaming</td>
</tr>
<tr>
<td>Mac Mini</td>
<td>$499.99</td>
<td>2.8 – 5.6</td>
<td>Home, small office</td>
</tr>
<tr>
<td>HP Z2 G3 Workstation</td>
<td>$699.99</td>
<td>7.4 – 13.6</td>
<td>CAD workstation</td>
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</table>
Without Discrete Graphics Systems

PSU and Simplified ES Categories
No Discrete Graphics

Power Supply Size (W)

SES Category
A
B
Which systems change category?

Tabulation of Categories: ES vs. SES

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>2</td>
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<tr>
<td>B</td>
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