Hyperscale Boot SSDs for future...

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Problem Statement
Flash Capacity Trend

- Data Drive capacity keeps increasing
- Boot Drive capacity trends are also increasing
- Increasing capacity = Increasing expense

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Client vs Hyperscale

<table>
<thead>
<tr>
<th>Metric</th>
<th>Client</th>
<th>Hyperscale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Idle Time</td>
<td>More</td>
<td>Less</td>
</tr>
<tr>
<td>Power Saving Features</td>
<td>Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Performance Metric</td>
<td>Fresh out-of-box</td>
<td>Sustained</td>
</tr>
<tr>
<td>Monitoring Capabilities</td>
<td>Not important</td>
<td>Important</td>
</tr>
<tr>
<td>Endurance Requirements</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Client and Hyperscale Boot SSDs have different requirements
Hyperscale Boot I/O Profile Example

- Boot Drive experiences constant traffic with no idle time
- TRIM rate on Boot Drive is very high
  - Latency stalls due to TRIM are not desirable
Boot Drive I/O Traffic Breakdown

- Majority of the traffic is random in nature
- Majority of the traffic has low queue-depth

- Majority of traffic is random in nature
- Workloads have low queue depth
- User experience is sensitive to latency
Boot Drive Performance @Scale

- Performance methodology for Hyperscale Boot Drives is not clear
- No public minimum bar (or performance target) defined
- Leads to huge drive-to-drive performance variation

Hyper-Scalers struggle with huge variation in drive performance due to lack of public performance targets
Hyperscale Endurance & Monitoring Requirements

- Monitoring at scale is important
  - Boot Drives are deployed all over the world
- Monitoring helps predict & detect failing drives
- Boot SSDs need higher endurance to prevent early wear out
  - Reliability is extremely important as repair at-scale is extremely challenging

Hyperscale Boot SSDs require high endurance and enhanced monitoring at-scale
Security

- Hyperscale customers care and value Security and Privacy
- Industry is fragmented with many standards in this space
- Many “optional” features in Security Standards

Hyperscale Boot SSD require higher level of Security due to scale of deployment and sensitivity in nature of data!
Summary of Boot SSD Challenges

• Capacity of SSDs are increasing
  – Boot Drive capacity needs remain small
• Client SSDs are designed with a focus on Client use-cases
• Hyper-Scalers require higher endurance, robust security features and enhanced monitoring compared to Client SSDs
• Hyper-Scalers have confidential Boot SSD specifications which doesn’t encourage industry collaboration
• Hyperscale Boot SSD test requirements are not clear
The solution...
Meta & Google are collaborating to combine requirements to create a OCP Hyperscale Boot SSD Specification.
Benefits Open Boot Drive Spec

- Meta & Google have merged their SSD boot drive requirements into a single document enabling the following benefits:
  - Allows the wider market to:
    - Understand features Hyper-Scalers need to manage a boot SSD at-scale
    - Enable standardization of boot SSD across general market
  - Reduces SSD market fragmentation
  - Promotes industry alignment on SSD boot drive adoption
  - Enables use of open-source tools to manage & monitor boot SSDs at-scale
  - Allows 3rd parties to create test-suites to simplify the drive qualification process

Open requirements increase industry collaboration and enable Boot SSD standardization
Key Spec Focus Areas

• Specifies requirements for Hyperscale Boot SSD
• This includes requirements around:
  o NVM Express
  o PCI Express
  o SMART Logs
  o Reliability
  o Power
  o Performance
  o Security
  o Side-Band/SM-Bus
  o Sustainability
  o Thermal
  o Monitoring

Everything needed to build a Hyperscale Boot SSD!
Solution

Today

Lack of Industry Standards for Hyperscale Boot Drives

- SSD Boot Drives are customized but there is no Industry Standard to capture all the requirements.

Future

OCP Hyperscale Boot Drive Specification (Target Mid 2022)

- Benefits system makers and SSD providers.
- Enables additional collaboration between Hyper-Scalers and industry.