The Top 10 Best Workloads for QLC

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The Evolution of Enterprise SSDs


Note: Dates represent when Micron® enterprise SSDs launched with each generation of NAND technology.
QLC = Fast Capacity For Less

Lower cost

SLC
1 Bit Per Cell
First SSD NAND technology

MLC
2 Bits Per Cell
100% increase in bit density

TLC
3 Bits Per Cell
50% increase in bit density

QLC
4 Bits Per Cell
33% increase in bit density

Fewer writes per cell
### Endurance Needs are Decreasing

The Industry Transition to QLC

3/4 of ALL enterprise SSDs worldwide in 2017 shipped with ≤ 1 DWPD

<table>
<thead>
<tr>
<th>Year</th>
<th>≤ 1 DWPD</th>
<th>2-5 DWPD</th>
<th>10 DWPD</th>
<th>25 DWPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>61%</td>
<td>28%</td>
<td>10%</td>
<td>1%</td>
</tr>
<tr>
<td>2017</td>
<td>75%</td>
<td>18%</td>
<td>6%</td>
<td>1%</td>
</tr>
<tr>
<td>2018</td>
<td>82%</td>
<td>14%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2019</td>
<td>88%</td>
<td>10%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>2020</td>
<td>90%</td>
<td>7%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2021</td>
<td>92%</td>
<td>7%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2022</td>
<td>96%</td>
<td>4%</td>
<td>4%</td>
<td>1%</td>
</tr>
</tbody>
</table>
The Many Best-Fit Workloads for QLC
Right-Sized, Cost-Effective Performance for the Top Workloads of Today & Tomorrow

<table>
<thead>
<tr>
<th>Block Size</th>
<th>Read-Intensive Workloads</th>
<th>Mixed Workloads</th>
<th>Write-Intensive Workloads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100/0</td>
<td>90/10</td>
<td>80/20</td>
</tr>
<tr>
<td>Small &amp; Random</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100/0</td>
<td>90/10</td>
<td>80/20</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>70/30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>70/30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>70/30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>70/30</td>
<td></td>
</tr>
<tr>
<td>Large &amp; Sequential</td>
<td>128</td>
<td>70/30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1024</td>
<td>70/30</td>
<td></td>
</tr>
</tbody>
</table>

The Many Workloads in this Zone:
- Read-Intensive AI Data Lakes
- Machine & Deep Learning Data Lakes
- Real-Time Analytics & Big Data Hadoop HDFS
- Ceph Large Block & Object Stores
- SQL Business Intelligence
- NoSQL Mongo DB, Cassandra
- Media Streaming CDNs

CY’17-21 CAGRs*
- Read-Intensive AI Data Lakes: 43%
- Machine & Deep Learning Data Lakes: 13%
- Real-Time Analytics & Big Data Hadoop HDFS: 42%
- Ceph Large Block & Object Stores: 36%
- SQL Business Intelligence: 9%
- NoSQL Mongo DB, Cassandra: 20%
- Media Streaming CDNs: 14%

*Based on industry analysis from IDC, Gartner, Statista, Forbes
The Top 10 Best-Fit Workloads for QLC
Right-Sized, Cost-Effective Performance for the Top Workloads of Today & Tomorrow

Block Size | Read-Intensive Workloads | Mixed Workloads | Write-Intensive Workloads
---|---|---|---
Small & Random
| 4 | 100/0 | 60/40 | 30/70 |
| 8 | 90/10 | 50/50 | 20/80 |
| 16 | 80/20 | 40/60 | 10/90 |
| 32 | 70/30 | 30/70 | 0/100 |
| 64 | 60/40 | | |
| 128 | 50/50 | | |
| 1024 | 40/60 | | |

5210 QLC SSD Best Fit Zone

10 Best QLC SSD Workloads:
- AI Data Lakes
- Machine & Deep Learning Data Lakes
- Analytics & Big Data Hadoop, Spark
- Ceph Object Stores
- SQL Business Intelligence
- NoSQL Mongo DB, Cassandra
- Media Streaming CDNs
- Cloud Storage XaaS
- vSAN AFA Capacity Tier
- Finance Regulatory/Compliance Storage
The vast majority of data needs to be read and analyzed quickly. Not rewritten repeatedly.
The Top 10 Best-Fit Workloads for QLC
SATA QLC SSDs allow you to immediately replace HDDs in performance-sensitive workloads

10 Best QLC SSD Workloads
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Typically run on HDDs. SATA QLC offers an immediate path to 450x faster performance without having to rework your server architecture.