Express Bay – Performance in the Front of the Box

Mike James
Board Member, SCSI Trade Association
Engineering Director, SanDisk
Express Bay Components

25W Power

Vertical Receptacle

Multifunction Connector

Cooling

Accessibility / Serviceability

Traditional Drive Form Factor

Flash Memory Summit 2013
Santa Clara, CA

http://www.scsita.org/
Disk Drive Connectors

SAS Connector Flip Side

Port B

SAS Backplane Connector

Accommodates both SAS & SATA Drives

Pluggable

Flash Memory Summit 2013
Santa Clara, CA

http://www.scsita.org/
SFF-8639 Dual-port SAS and PCIe x4 Connectors

Legacy SAS
Primary Data Port

PCIe Sidebands

Legacy Power Segment

PCIe Ref Clock

PCIe Data Port 1

Legacy SAS Secondary Data Port

PCIe Data Port 2

PCIe Data Port 3

PCIe Data Port 4

http://www.scsita.org/
Connecting Through the Backplane
Connecting a Single SFF PCIe-connected Device
Connecting SAS or SATA Devices to Express Bay

Flash Memory Summit 2013
Santa Clara, CA

http://www.scsita.org/
Connecting SAS or SATA Devices to Traditional Bay
Dual Port With PCIe for High Availability

Socket1/Root Complex1

Socket2/Root Complex2

Storage Enclosure

Flash Memory Summit 2013
Santa Clara, CA
Wide Port SAS for Increased Throughput

Server

SAS Controller

SAS SSD

SAS SSD

SAS SSD

SAS SSD

2.4 GB/s full-duplex per SSD
SSD Performance Scales with Power

\[ P = P_{\text{base}} + P_{I/O} \times \text{IOPs} \]
Power Limit Control

What power levels are supported?

e.g. 9W, 15W, 25W

Set Power Level

http://www.scsita.org/
# Bandwidth per Device Connected

<table>
<thead>
<tr>
<th></th>
<th>SATA</th>
<th>SAS</th>
<th>Wide-port SAS</th>
<th>PCIe</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Ports / Lanes</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Transfer Rate per Port/Lane</td>
<td>Half-duplex 6 Gb/s</td>
<td>Full-duplex 12 Gb/s</td>
<td>Full-duplex 12 Gb/s</td>
<td>Full-duplex 8 Gb/s</td>
</tr>
<tr>
<td>Max Bandwidth</td>
<td>0.6 GB/s</td>
<td>2.4 GB/s</td>
<td>4.8 GB/s</td>
<td>8 GB/s</td>
</tr>
</tbody>
</table>
Express Bay Summary

- Preserve the enterprise storage experience for PCI Express storage
- Meet SSD performance demands with PCIe, SAS, or SATA
- Serviceable, accessible bay offers configurability