Open. Together.
Hardware innovations for data growth challenges at cloud-scale

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General Manager & Distinguished Engineer
Microsoft Corporation
Microsoft & OCP

- Joined Open Compute Foundation
- Open Cloud Server (OCS) spec
- Cloud SSD M.2 spec

2014

- Local Energy Storage – Server UPS
- Switch Abstraction Interface (SAI)

2015

- SONiC Network Switch Software
- Project Olympus spec

2016

- Project Olympus expansion – Intel/AMD/ARM64, GPU, JBOD, JBOF
- Project Cerberus spec

2017

- Project Denali spec
**Project Cerberus updates**

Cerberus Master/Slave architecture - Specification augmented to extend Root of Trust domain to peripheral components

- BMC
- Motherboard CPU
- NIC
- SSD
- Accelerator

All *Project Olympus* motherboards now have Cerberus capability enabled for secure bringup

**Project Denali updates**

Version 1.0 specification approved by Denali JDF members in February 2019 (15 member companies collaborating over 12 months)

Specification scope expanded to include storage/media disaggregation beyond the Cloud
- Enterprise Arrays
- Computational Storage
- IoT Applications

Microsoft Denali EDSFF Prototype – *Up to 70% savings on non-media SSD costs*
Data cacophony
Where is the data coming from?

Generated at the **Endpoints**
Collected and pre-processed at the **Edge**
Analyzed, stored, archived at the **Core**

Data propagates from endpoints to core and back

Source: IDC’s Data Age 2025 study, sponsored by Seagate
Data opportunities

IDC predicts Global DataSphere will grow from 33 Zettabytes (ZB) in 2018 to 175 ZB by 2025

Source: Data Age 2025, sponsored by Seagate with data from IDC Global DataSphere, Nov 2018
Supply capacity not sufficient to keep up with 6x projected growth in storage demand
Need new radical solutions for data processing improvements to address this supply/demand gap
Announcing Project Zipline
Project Zipline

**Targeted for legacy and modern datasets** Covering various usage scenarios from Edge to Cloud

**Full solution stack implementation** - Algorithms + Software + Hardware

**Compression without compromises** Always-on data processing enabled by trifecta of high compression ratios + high throughout + low latency
**Project Zipline compression gains**

Cloud Data Set #1

- Uncompressed: 100%
- Zipline: 8%

Cloud Data Set #2

- Uncompressed: 100%
- Zipline: 5%

Cloud Data Set #3

- Uncompressed: 100%
- Zipline: 4%

Data sets taken from: Application Services Logs, IoT Text Files, System Logs
Open sourcing Project Zipline

Compression algorithm and specifications
Interoperability across endpoints (edge to cloud)

Hardware architecture specifications
High bandwidth, low latency implementation

Verilog RTL source and test suite
Open sourced IP – Industry first for OCP contributions
Enabling faster adoption in the silicon ecosystem
Project Zipline – Usage model examples

- Network data processing
- Smart SSDs
- Edge computing
- Analytics
- Industrial IoT
- Storage Archival Systems
- Database accelerators
- Productivity Applications
- Cloud migration appliances
- General purpose Microprocessors
Ecosystem partners

<table>
<thead>
<tr>
<th>Category</th>
<th>Partners</th>
</tr>
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<tbody>
<tr>
<td>CPU</td>
<td>Intel, AMD, Ampere, arm, Marvell, SiFive</td>
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<tr>
<td>Networking</td>
<td>Broadcom, FUNGIBLE, Mellanox Technologies</td>
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<tr>
<td>Storage</td>
<td>EIDETiCOM, NGD Systems, Pure Storage</td>
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<tr>
<td>EDA</td>
<td>Cadence, Synopsys</td>
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OPEN COLLABORATION

- **Open Rack and Project Olympus**
  collaboration with Facebook and Quanta

- **Open Accelerator Module**
  collaboration with Facebook and Baidu

- **OCP alternative cooling**
  committee
Learn More

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>2:05pm</td>
<td>Executive Track</td>
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<td>Michael Cornwell</td>
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<td>Software-defined Flash Futures Driving Next-Generation Cloud Services</td>
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<td>4:10pm</td>
<td>Expo Hall</td>
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<td></td>
<td>Badriddine Khessib, Bryan Kelly</td>
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<td></td>
<td>The State of Hardware Security: Cerberus Present and Future</td>
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Visit Microsoft booth A6 – hardware, demos

Attend talks and workshop sessions

Get specs and collateral at OCP Github repo