Ceph at Intel
Several Examples of Our Work

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Storage Group, Intel Corporation
SC15 with University of Minnesota
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Ceph - Areas of Intel Contribution
see intel.com/storage
Ceph Upstream Development Examples from Intel

- Cache tiering proxy read and proxy write
  - Proxy-read: V0.94 HAMMER, Proxy-write: V9.1.0 INFERNALIS RC
- Erasure coding with ISA-L
  - in FIREFLY
- Contributing to Newstore

[prime][2015-10-26_15-30-25]/.count.sh Calculating Organization commits
1  4870 Red Hat <contact@redhat.com>
2  454 Intel <contact@intel.com>
3  269 XSky <contact@xsky.com>
4  240 Deutsche Telekom <contact@telekom.de>
5  202 SUSE <contact@suse.com>
6  196 Cloudwatt <libre.licensing@cloudwatt.com>
7  151 Mirantis <contact@mirantis.com>
8  149 Unaffiliated <no@organization.net>
9  134 Inktank <contact@inktank.com>
10  68 Reliance Jio Infocomm Ltd. <contact@ril.com>
Open Sourced Ceph Tools (github)

CeTune (compliments CBT) Manages+Monitors Virtual Storage Manager

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Ceph Community Performance Contributions

• Intel and Red Hat hosted Ceph Hackathon with focus on performance optimization, in August
• Intel donated 8 node Ceph community performance cluster named ‘Incerta’
  • One common baseline for performance regression tests and trend analysis
  • Accessible to community contributors
  • Periodic automated performance regression tests with latest builds

<table>
<thead>
<tr>
<th>Cluster Name</th>
<th>Sophe Community Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node Count</td>
<td>8</td>
</tr>
<tr>
<td>Node Type</td>
<td>Intel 2U</td>
</tr>
<tr>
<td>CPU</td>
<td>Intel Xeon E5-2650v3, 10-Core (2.3GHz) x 2, Intel Xeon E5620, 4-Core (2.4GHz), AMD Opteron 4184, 6-Core (2.8GHz), Intel Xeon X3440, 4-Core (2.5GHz)</td>
</tr>
<tr>
<td>Memory</td>
<td>8GB</td>
</tr>
<tr>
<td>Disk HBA</td>
<td>On-board</td>
</tr>
<tr>
<td>Disk</td>
<td>10 x 2.5” 1TB 7200RPM, Seagate ES-2.25” SATA, 4 x 600GB WD4, 8 x 1GB Toshiba 7200 RPM SAS, Up to 8 Various 7200 RPM SATA</td>
</tr>
<tr>
<td>NVMe / SSDs</td>
<td>4 x Intel 800GB P3700 PCIe 2.5” NVMe, 1 x Samsung 100GB 2.5” SATA SSD, N/A</td>
</tr>
<tr>
<td>Network</td>
<td>Intel XL710 40GbE QSFP+</td>
</tr>
<tr>
<td>Operating System</td>
<td>CentOS 7.1 Mixed</td>
</tr>
<tr>
<td>Approximate Age</td>
<td>Brand New (Aug 2013) 3.5 Years</td>
</tr>
</tbody>
</table>

• High performance hardware - 3rd Generation Intel Xeon™ E5 Processors, 3.2TB NVMe, 40GbE Networking
• Supports All HDD, Hybrid (HDD+PCIe SSD), or All PCIe SSD configs

From Mark Nelson @ RedHat: http://permalink.gmane.org/gmane.comp.file-systems.ceph.devel/26635

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### 4K Random Read & Write on Intel PCIe SSD

<table>
<thead>
<tr>
<th>Workload Pattern</th>
<th>Max IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K 100% Random Reads (2TB Dataset)</td>
<td>1.35 Million</td>
</tr>
<tr>
<td>4K 100% Random Reads (4.8TB Dataset)</td>
<td>1.15 Million</td>
</tr>
<tr>
<td>4K 100% Random Writes (4.8TB Dataset)</td>
<td>200K</td>
</tr>
<tr>
<td>4K 70%/30% Read/Write OLTP Mix (4.8TB Dataset)</td>
<td>452K</td>
</tr>
</tbody>
</table>

- **OSD System Config:** Intel Xeon E5-2699 v3 2x@ 2.30 GHz, 72 cores w/ HT, 96GB, Cache 46080KB, 128GB DDR4
  - Each system with 4x P3700 800GB NVMe, partitioned into 4 OSD’s each, 16 OSD’s total per node
- **FIO Client Systems:** Intel Xeon E5-2699 v3 2x@ 2.30 GHz, 72 cores w/ HT, 96GB, Cache 46080KB, 128GB DDR4
- **Ceph v0.94.3 Hammer Release, CentOS 7.1, 3.10-229 Kernel, Linked with JEMalloc 3.6**
  - CBT used for testing and data acquisition
  - Single 10GbE network for client & replication data transfer, Replication factor 2

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See complete study at [http://www.slideshare.net/inktank_ceph](http://www.slideshare.net/inktank_ceph)