Benchmarking Cloud Storage through a Standard Approach

Wang, Yaguang
Intel Corporation
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Agenda

- COSBench Overview & Update
- CDMI Overview
- CDMI in COSBench
- Testing swift through CDMI
- Current Status
COSBench Overview

A Cloud Object Storage Benchmarking Tool
Announced at the OpenStack design summit 2013 as Open source project.

Supports multiple Object Storage backends
- Swift, Ceph, Amazon S3*, Amplidata*, Scality*, CDMI*

Distributed Model for Traffic Generation
- Drivers: Workload generator
- Controller: coordinates among drivers, collects & aggregates results.

Vigorous code repository and community
- Repository: https://github.com/intel-cloud/cosbench
- Mailing-List: http://cosbench.1094679.n5.nabble.com
User Adoption

Traffic

1,520 Views

Activity last 2 weeks

148 Unique visitors

Quanta Computer
wiwynn
DELL
Seagate
Intel
HGST
a Western Digital company
TEAMSUN
中国电信
at&t
SAKURA Internec
九州云
99cloud.net
eNovance
a Cloud & Managed Services Provider
Zmanda
A Carbonite Company
EVault
A Seagate Company
HITACHI
Inspire the Next
AMPLIDATA
SCALITY
VMware
Australian National University
redhat
BBC
Samsung
(More are anonymous.)
Usage Models

Vmware developed their own adapter to test POC system. ➞ Extensibility

Scality ran for a few days to make hardware qualification work for object integrity check. ➞ System verification

HGST evaluated performance implications to identify optimization opportunities. ➞ System optimization

AT&T was using it for pre-service evaluation, and identified race condition issue. ➞ Service evaluation

COSBench
**Major Progress**

- **New Object Store/Auth**
  - http basic/digest
  - S3/Ceph (Librados based, or Radosgw based)/Scality sproxyd/CDMI (swift through CDMI middleware, scality)

- **Backend**
  - Core Functionalities
    - New selectors / new operator
    - Object integrity checking
    - Response time breakdown
  - Storage policy support for swift
  - Enhance on error handling
  - Trigger supporting

- **Frontend (UI)**
  - Advanced Workload Configuration UI
    - Adds Batch Test Configuration to COSBench
    - Makes COSBench workload configuration more like Iometer

- **Workload management**
  - Support to archive or reload workload
  - Re-submit historical or archived workloads
  - Workload reordering

90+ issues resolved
CDMI Overview

- CDMI: Cloud Data Management Interface
- A Specification defined by SNIA, and accepted by ISO as standard.
Benefits from standard approach

- Easier manage different data source, reduce vendor lock-in.
- Consistent and controlled protocol
  - 100+ APIs from programmable web
    (http://www.programmableweb.com/apitag/storage)
- Reuse development investment
Access Method

- Access Method
  - Path-based style
    - Container/object
  - ID-based style
    - UUID
    - ID can be applied to container or object depending on capabilities.
  - E.g.
    - http://cloud.example.com/root/MyDataObject.txt
Content Format

- Non-CDMI content type
  - Raw content in body
  - Similar to S3

- CDMI-content type
  - Content is wrapped into a json structure in body
  - Could be with different encoding like UTF-8/Base64…
  - See next page.

- Multi-part
  - Json structure is wrapped into multiple parts:
    - header in the first part
    - content in following part (similar to non-cdmi form)
    - ending bracket “}” in part 3
    - A zero-sized part as the closing part.
Message Format

- Request Line
- Header
- Metadata
- Content

PUT /MyContainer/MyDataObject.txt HTTP/1.1
Host: cloud.example.com
Accept: application/cdmi-object
Content-Type: application/cdmi-object
X-CDMI-Specification-Version: 1.0.2
{
  "mimetype": "text/plain",
  "metadata": {
    
  },
  "value": "Hello CDMI World!"
}
Authentication API

- Http Basic & Digest
- Token-Based
  - E.g., OpenStack swift authentication.

X-Auth-User: xxx
X-Auth-Key: yyy

X-Auth-Token: zzz
X-Storage-Token: aaa
X-Storage-Url: http://<storage server>:<port>/xxx

Auth Server

Storage Server
Storage API

- Import parameter list
  - Two basic parameters
    - Token
    - Endpoint
  - From the return of auth system
    - Openstack (auth_token, storage_url)
  - Provided by user
    - Direct (auth and storage system sits together).
    - Security depends on Transport like TLS.
- Combined
  - CDMI
    - Token: http basic/digest/hmac…
    - Endpoint: user
CDMI in COSBench

- CDMI Util (utility)
- CDMI Base (general)
- CDMI Flavor (vendor specific)
Using CDMI adapters

- **CDMI-Base**

  ```xml
  <storage type="cdmi" config="type=<cdmi|non-cdmi; custom_headers=<header:value_reference>" />
  ```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Default</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>String</td>
<td>&quot;cdmi&quot;</td>
<td>Options: &quot;cdmi&quot; or &quot;non-cdmi&quot;, it indicates the content type to be used, &quot;cdmi&quot; means the storage access will follow cdmi content type, &quot;non-cdmi&quot; means the storage access will follow non-cdmi content type.</td>
</tr>
<tr>
<td>Customer_headers</td>
<td>String</td>
<td></td>
<td>This is an experimental parameter to see if possible to support cdmi derivatives, which may require additional headers. The parameter may be removed without notification.</td>
</tr>
</tbody>
</table>

- **CDMI-Swift**

  ```xml
  <storage type="cdmi_swift" />
  ```
Testing swift through CDMI

- Swift + CDMI middleware
  - [https://github.com/osaddon/cdmi](https://github.com/osaddon/cdmi)
- Authentication:
  - Swift specific swauth/keystone
- Two approaches:
  - Through CDMI-Swift adapter
  - Through CDMI-Base adapter, but with “custom_headers” parameter
Custom headers

custom_headers=<header:value_reference> →
Config="custom_headers=X-Auth-Token:token"

X-Auth-User : xxx
X-Auth-Key: yyy

<table>
<thead>
<tr>
<th>token</th>
<th>AUTH_zzz</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage_url</td>
<td><a href="http://10.10.10.11:8080/aaa">http://10.10.10.11:8080/aaa</a></td>
</tr>
</tbody>
</table>

X-Auth-Token  | token |
Current Status

- Path-Style & ID-Style
  - Only Path-Style so far
  - ID-Style supporting has relevant impact to current design, as it requires to track all IDs.

- CDMI vs non-CDMI content type vs multi-part
  - CDMI and non-CDMI content type are tested with Openstack Swift + CDMI middleware
  - No multi-part code yet.

- http basic & digest or token-based
  - Basic and Digest are tested with Tomcat web server separately.
  - Token-based is tested with Openstack swift.

- More flavor adapters
Call for Action

- Welcome more CDMI vendors to contribute flavor adapters into COSBench, or try COSBench to help identify issues.
- Contact me for any COSBench related issues or suggestions:
  
  yaguang.wang@intel.com