Quality of Service in Storage
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Overview

• What is Quality of Service (QoS) and Why
• What QoS dCache supports
• What are QoS transitions and how we do them
• Examples
What is QoS and Why
What is QoS and Why

Workshop_QoS.v1

Workshop_QoS.v10
What is QoS and Why
What is QoS and Why

Workshop_QoS.v10

Precious
What is QoS and Why

Workshop_QoS.v10

Archival
QoS Summary

- Different ways to store Data
  - SSD, Tape, Spinning disk, # of copies
  - You have QoS “capabilities”/attributes such as
    - Access latency: low ↔ high
    - Probability of data loss: low ↔ high
    - Throughput: low ↔ high
    - Replica: n’copies
QoS Summary

• Considerations
  • Different capabilities have different prices
    • Amazon – S3 vs Glacier
      • S3 – fast; secure
      • Glacier – secure; durable; high latency for first byte but cheaper
QoS Conclusion

- User or experiment framework should have the possibility to pick the right compromise based on
  - Requirements
  - Cost
What is QoS for dCache

- Disk (scratch space)
- Disk + Tape (raw data + analysis data)
- Tape (archival data)
- Replica Manager (Disk + Disk) (raw data +...)

dCache/QoS
QoS

- A file has a life cycle associated with:
  - Ingest
  - Access
  - Archival
  - Removal
QoS

- Scientific data
  - At it’s young stage – frequently accessed
  - Later – rarely accessed/archived
**QoS**

QoS is not static

- We need a way to change QoS attributes of an object
QoS/transitions

http request

REST-API

http response

Controller

MigrationModule

PnfsManager

PinManager

PoolManager

PathMapper

PoolsManager
QoS transitions

- Disk → Disk + Tape
- Disk + Tape → Tape
- Tape → Disk + TAPE
QoS/transitions
QoS/transitions
QoS/transitions

- Filtered data
- Fast and Durable
QoS/transitions
QoS/transitions

- Archival
QoS/transition
QoS/transitions

- New algorithms
Demo

Query available QoS for object

$\texttt{curl} \quad \text{http://localhost:3880/api/v1/qos-management/qos/file}$

{"name": ["disk", "tape", "disk+tape"], "message": "successful", "status": "200"}
Demo

Query available for object file

```bash
$ curl http://localhost:3880/api/v1/qos-management/qos/file
```

```json
{
    "name": ["disk", "tape", "disk+tape"],
    "message": "successful",
    "status": "200"
}
```

- File is a stored object type (file/directory)
- disk, tape, disk+tape are available QoSs
Demo

Query available QoS

```
× curl http://localhost:3880/api/v1/qos-management/qos/file/disk

{
    "status" : "200",
    "message" : "successful",
    "backendCapability" : {
        "name" : "disk",
        "transition" : ( "tape", "disk+tape" ),
        "metadata" : {
            "cdmi_data_redundancy_provided" : "1",
            "cdmi_geographic_placement_provided" : ( "DE" ),
            "cdmi_latency_provided" : "100"
        }
    }
}
```
Demo

Query QoS of test.log file

```bash
{
  "fileMimeType" : "application/octet-stream",
  "currentQos" : "tape",
  "mtime" : 1495035613301,
  "fileType" : "REGULAR",
  "creationTime" : 1495035412938,
  "size" : 378
}
```
Demo

Change QoS

```bash
$ curl -X POST -H "Accept: application/json"
   -H "Content-Type: application/json"
   http://localhost:3880/api/v1/namespace/public/test
   -d '{"action": "qos", "target": "disk+tape"}'
```
**Demo**

**Query qos of test.log file**

```
{
  "fileMimeType" : "application/octet-stream",
  "currentQos" : "disk+tape",
  "mtime" : 1495035613301,
  "fileType" : "REGULAR",
  "creationTime" : 1495035412938,
  "size" : 378
}
```
Thank you