

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



Workshop_QoS

What is QoS and Why



Workshop_QoS.v1

...



Workshop_QoS.v10

...



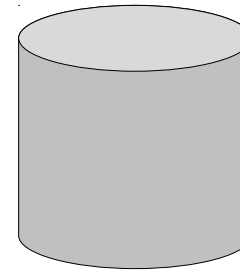
What is QoS and Why



What is QoS and Why



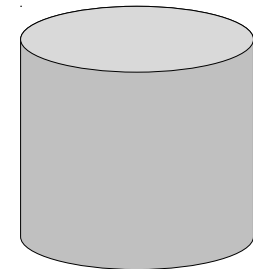
Workshop_QoS.v10



Precious



Workshop_QoS.v10



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 \leftrightarrow high
 - Probability of data loss: low \leftrightarrow high
 - Throughput: low \leftrightarrow 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

dCache/QoS

What is QoS for dCache

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

QoS

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

QoS

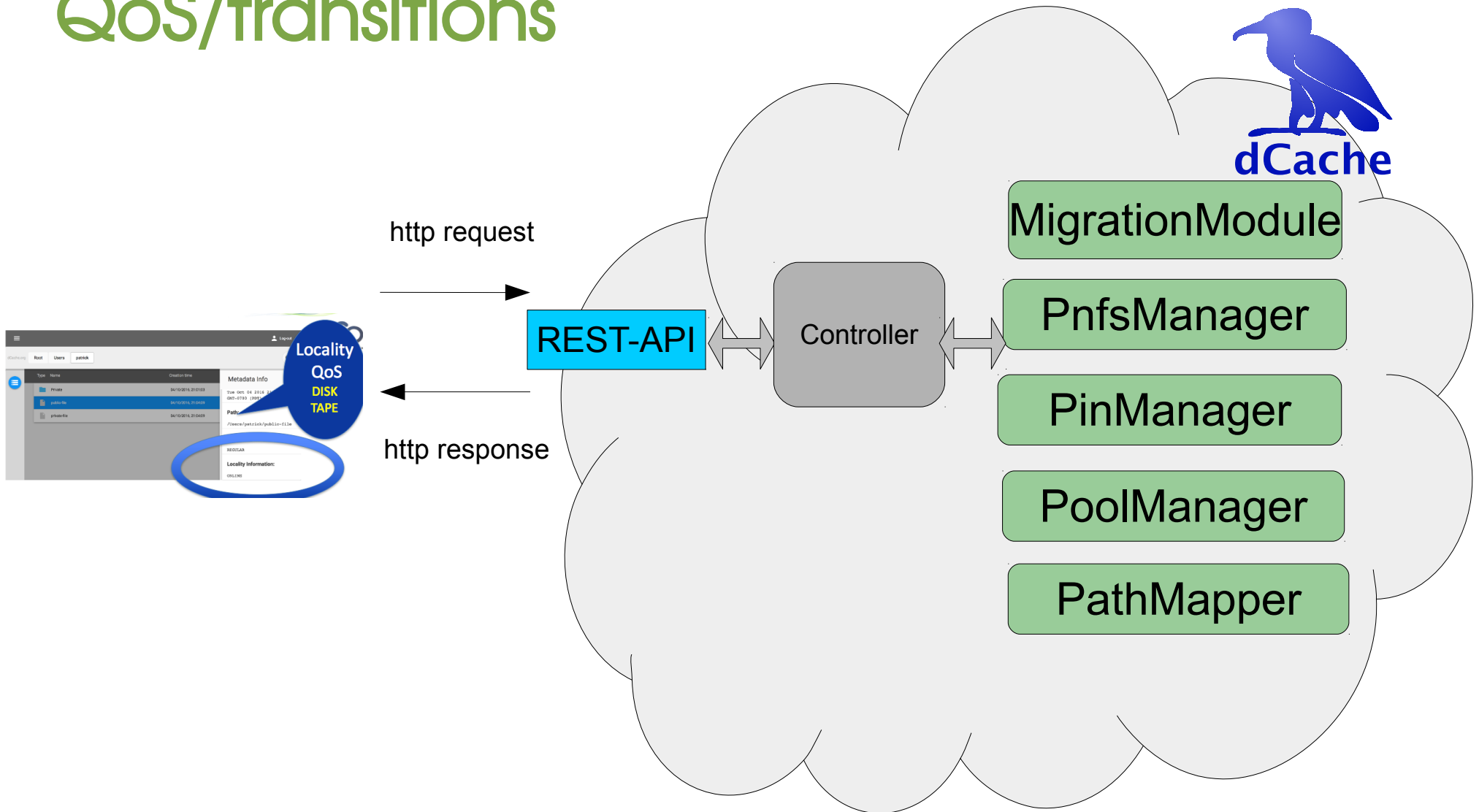
- Scientific data
 - At it's young stage – frequently accessed
 - Later – rarely accessed/archived

QoS

QoS is not static

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

QoS/transitions

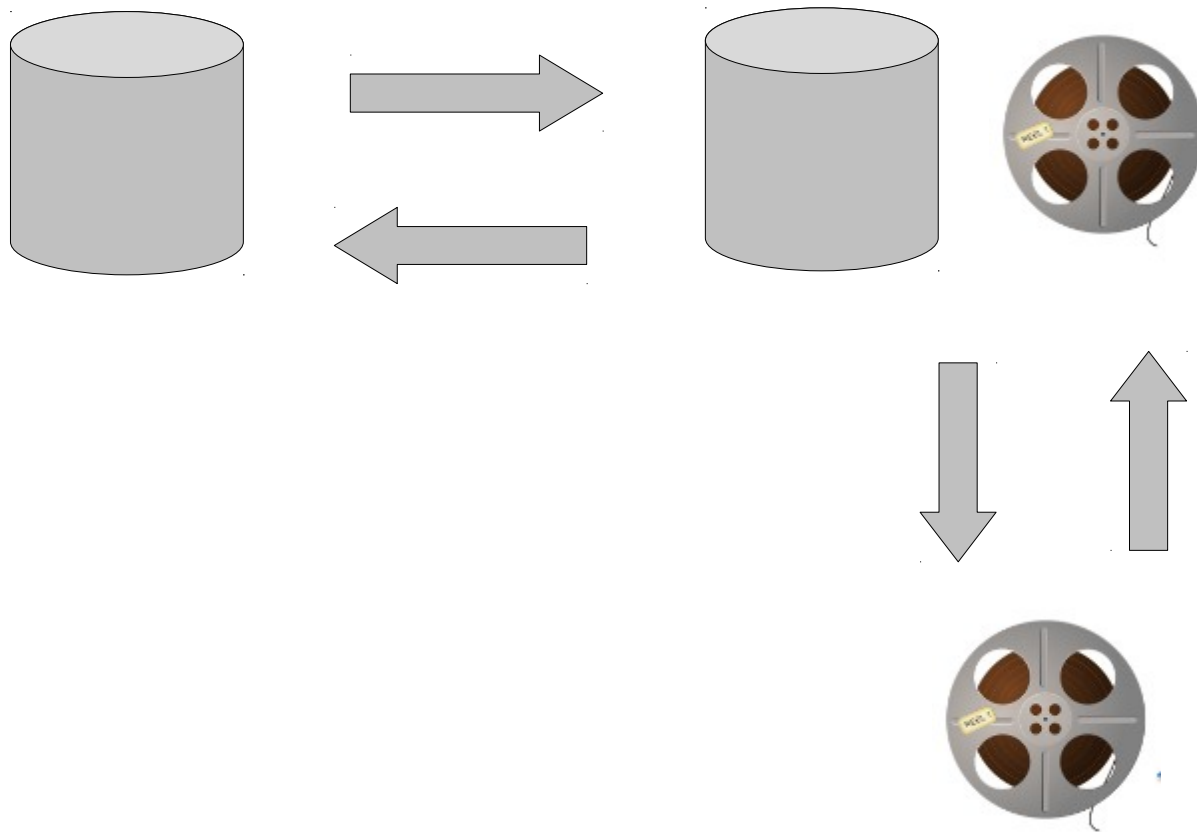


QoS

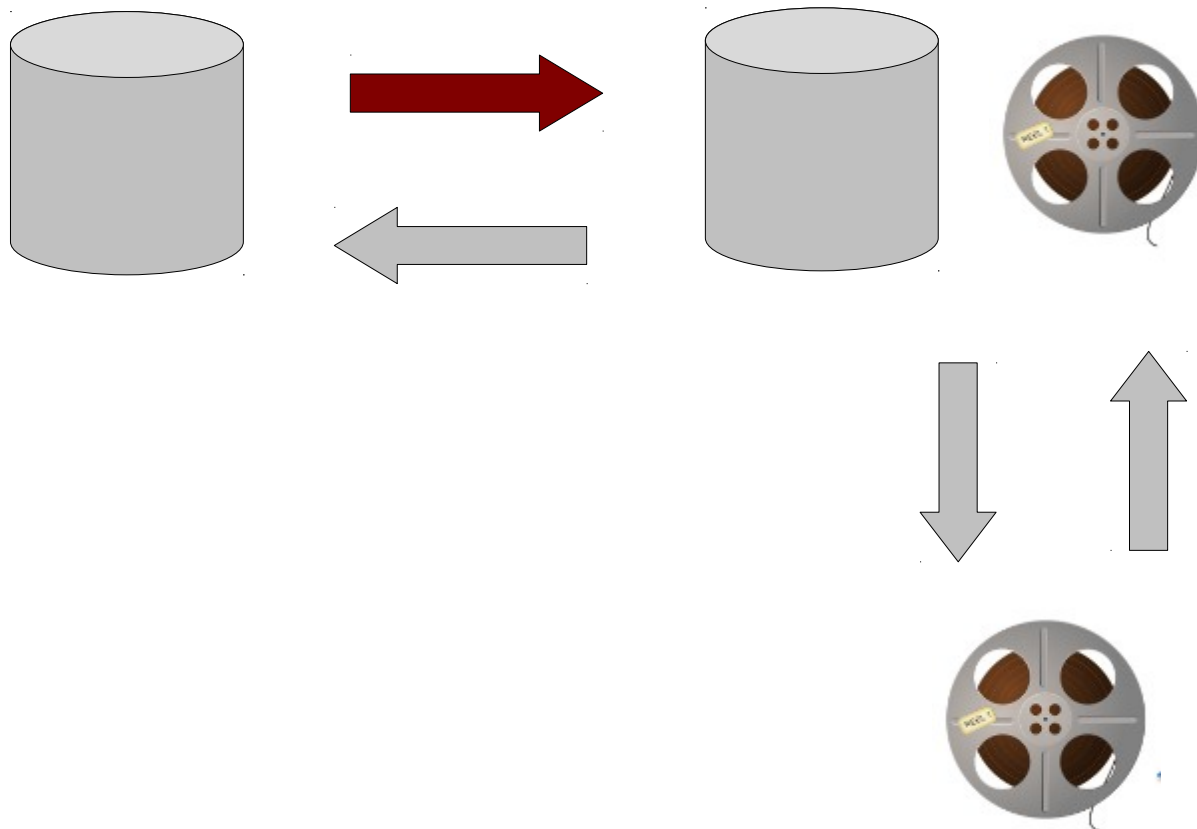
QoS transitions

- Disk → Disk + Tape
- Disk + Tape → Tape
- Tape → Disk + TAPE

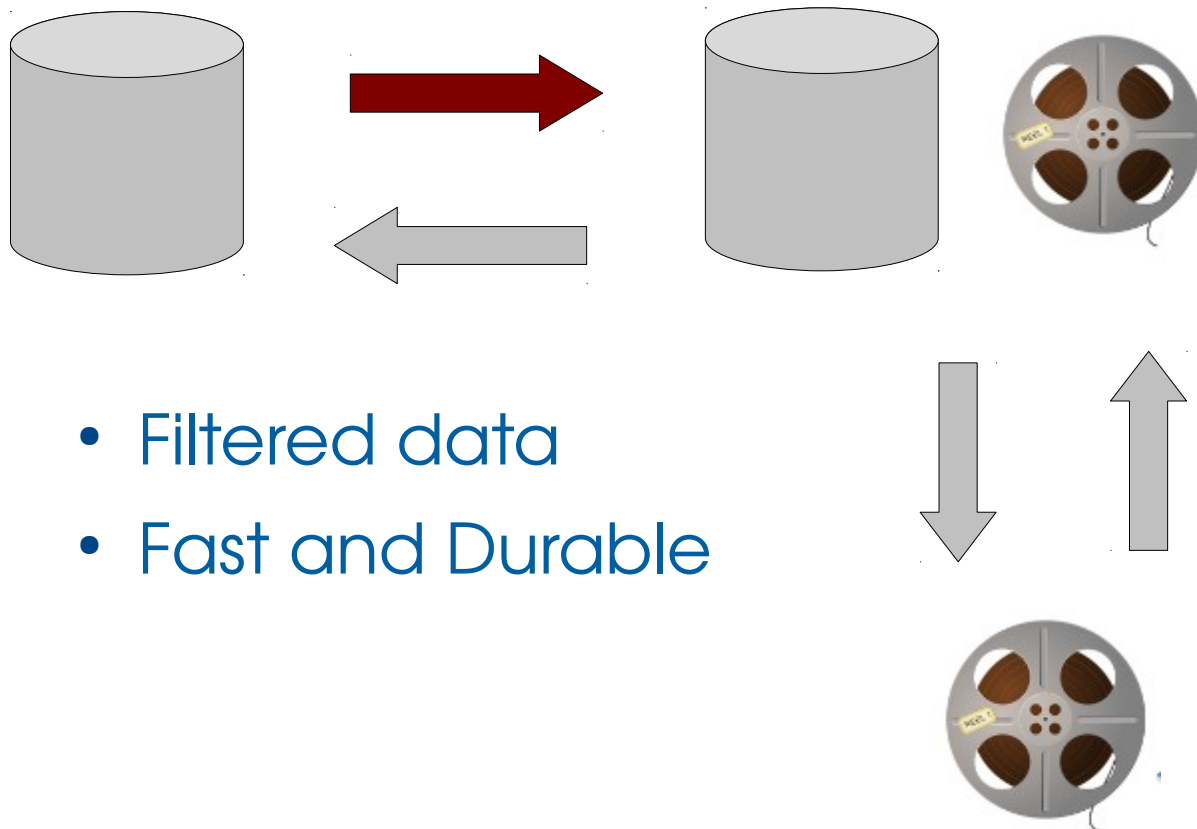
QoS/transitions



QoS/transitions

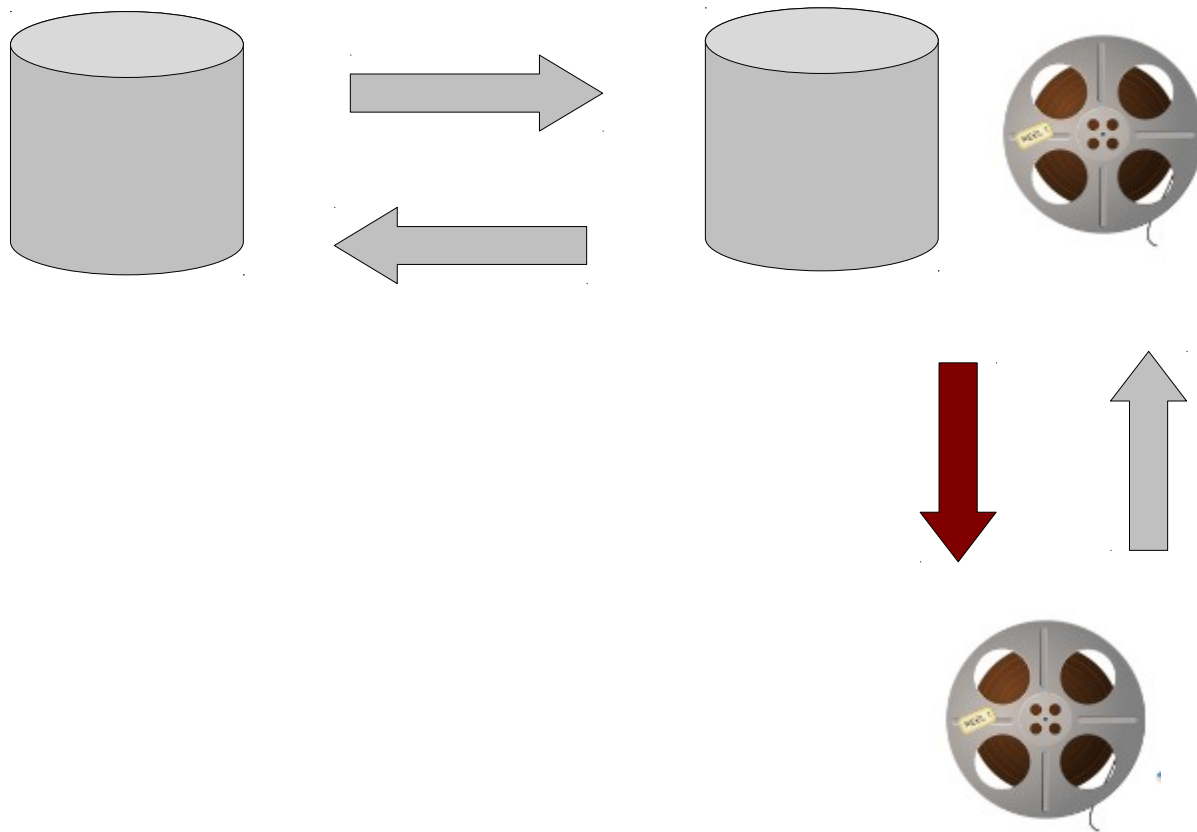


QoS/transitions

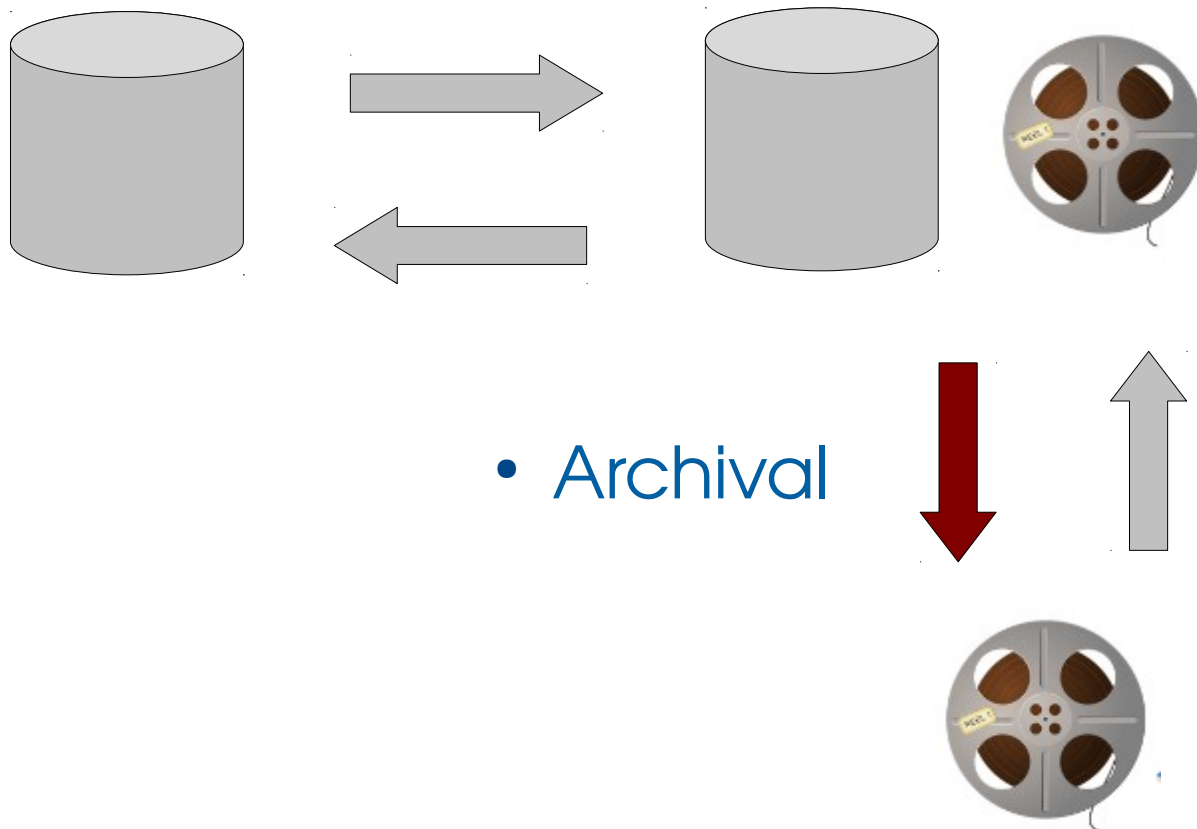


- Filtered data
- Fast and Durable

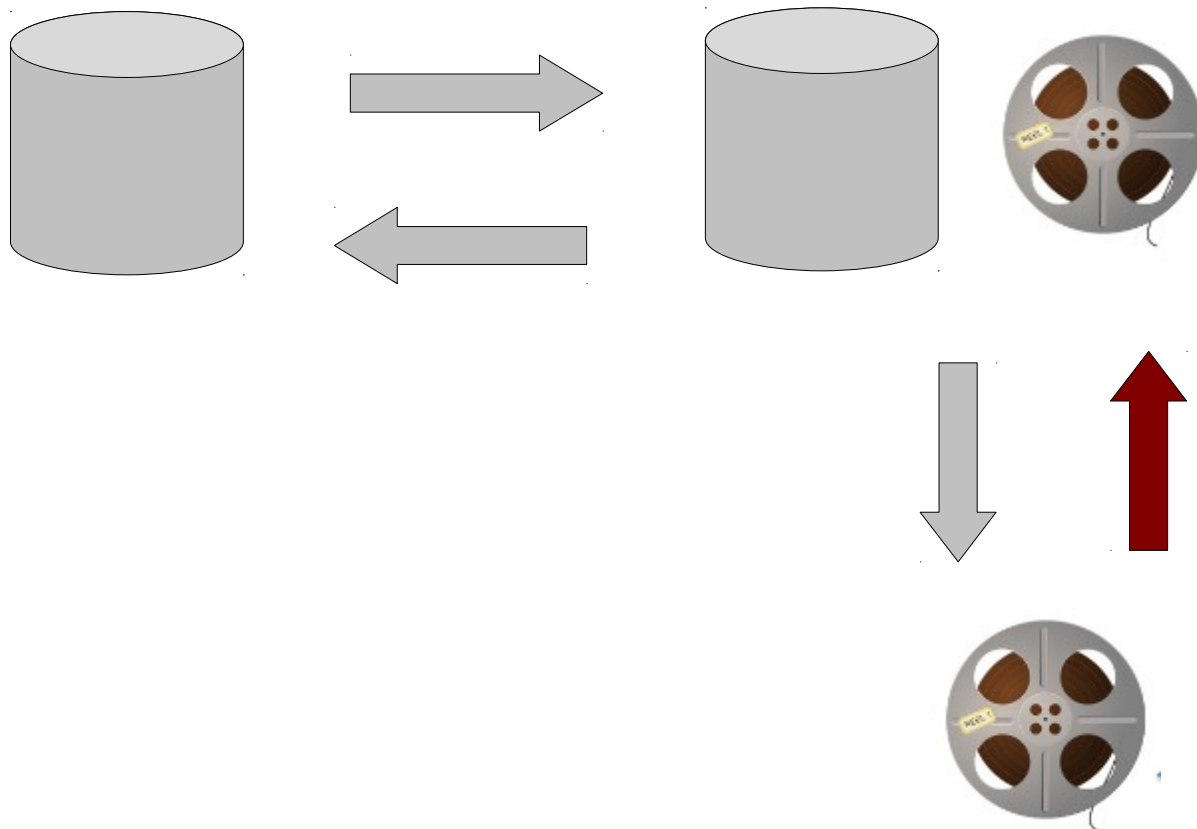
QoS/transitions



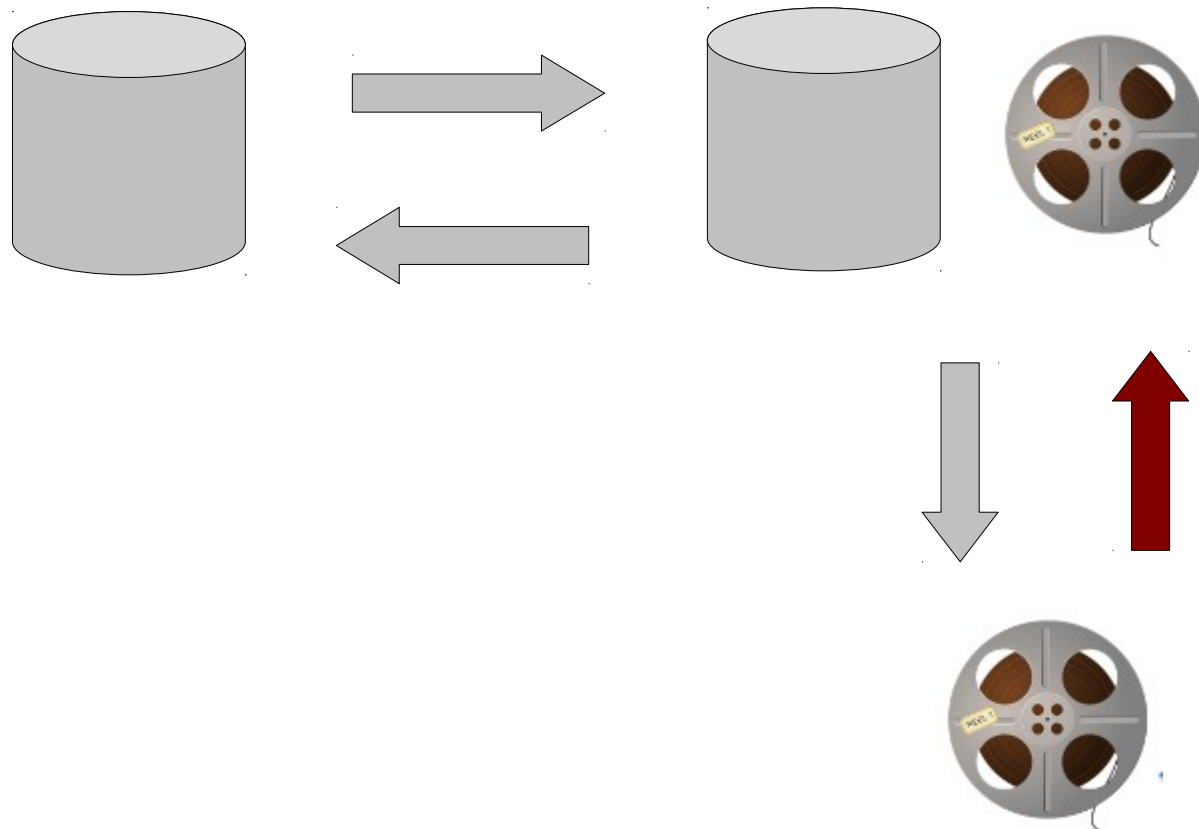
QoS/transitions



QoS/transitions



QoS/transitions



- New algorithms

Demo

Query available QoS for object

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

```
{"name":("disk","tape","disk+tape"),"message":"successful","status":"200"}
```


Demo

Query available for object file

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

```
{"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

```
x 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

```
x curl http://localhost:3880/api/v1/namespace/myDirectory/test.log/?qos=true
```

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

Demo

Change QoS

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

Demo

Query qos of test.log file

```
x curl http://localhost:3880/api/v1/namespace/myDirectory/test.log/?qos=true
```

```
{  
  "fileMimeType" : "application/octet-stream",  
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}
```

Thank you