Sync and Share, Quality of Service and \`dCache

Patrick Fuhrmann

On behave of the \`dCache team but especially Tigran, Lusine and Quirin
The dCache.org collaboration

About 11 developers and support people in total

Cheap labor injector
To proceed we need to learn a bit about dCache
Features needed for this presentation

Access via variety of Credentials
Can be all mapped to the same individual

Kerberos
Username
Password
X509
Features needed for this presentation

Access via a variety of Protocols
All to the same file

http/WebDAV
NFS/pNFS
GridFTP
Consequence

We support a typical scientific data life cycle
Scientific Data Cloud

- High Speed Data Ingest
- Fast Analysis
  - NFS 4.1/pNFS
- Wide Area Transfers
  (Globus Online, FTS)
  by GridFTP
Except, something is missing!

The final scientist needs to:

- **Sync with his/her devices**

- **Share data with colleagues**
Scientific Data Cloud

- High Speed Data Ingest
- Fast Analysis
  NFS 4.1/pNFS
- Wide Area Transfers
  (Globus Online, FTS)
  by GridFTP

Sync’ing and Sharing
Why not using ownCloud

We are not running OwnCloud storage

BUT

We are using OwnCloud to provide a particular VIEW into your storage space.

Unlimited hierarchical Storage Space

NFS 4.1 / pNFS
HPC, HTC

GridFTP
Globus Online
How to scale out!

Web Load Balancer

Own Cloud
Own Cloud
Own Cloud
Own Cloud

NFS 4.1 / pNFS

Pool Node
Pool Node
Pool Node
Pool Node

Pool Node
Pool Node
Pool Node
Pool Node

dCache

dCache
DESY Production Instance

- **Fully integrated into DESY infrastructure**
  - Monitoring
  - Kerberos
  - LDAP

- **Groups are added one by one to check scalability.**

- **Currently**
  - 650 Users
  - 7 Tbytes (2 replicas)
  - Some power users up to 200 Gbytes / each

- **Idea: Unlimited space (XXL)**
  - Subset via ownCloud

- NFS (4.1)
- GridFTP
- WebDAV
- ownCloud
But ownCloud is not the only and possibly not the best solution.
• We are investigating further
• dCache collaborates with DCORE
• DCORE provides CubePAD
• Besides other advantages: focus on strong privacy plus sharing
• Tighter integration with dCache
• Final goal: dCache namespace holds CubePAD metadata.
Cube Pad File Manager

DESY Instance
Encrypting and sharing

dCache WebDAV door

Shamir Schema (based on Hydra)

AAAA BBBB CCCC

dCache.org
Encrypting and sharing, cont

- File is encrypted within the browser on the fly to the server (dCache WebDAV).
- Each file gets its own secret symmetric key.
- Symmetric key is split into ‘n’ pieces and stored at ‘n’ different geographical and political Locations. (Shamir Schema).
- One needs to break into ‘m’ < ‘n’ servers to get the entire key.
- Sharing works by sharing the keys.
Now we have:

• Scalable storage
• Access via scientific mechanisms concerning
  – credentials and
  – protocols
• Sync’n Share for easy access from
  – Laptop
  – Mobile devices
  – Browser
Still bits and pieces missing:

Selection of Quality of Service for your storage.

- **QoS**: SSD, Tape, Spinning disk, # of copies
- Or in other words:
  - Access latency: low <-> high
  - Probability of data loss: low <-> high
- **Considerations**:
  - High Quality of Storage is expensive
  - Not all data is equally important
- So the user or experiment framework should be enabled to pick the right compromise based on his/her
  - Requirements
  - Size of your wallet
Storage Quality

- Amazon
  - S3: online
  - Glacier: nearline

- Google
  - Standard
  - Durable Reduces Availability (DRA)
  - Nearline

- IBM (HPSS, GPFS)
  - Storage classes (user defined)

- dCache
  - Storage groups (user defined)
  - Tape
  - Disk (spinning or SSD)
  - Resilient Management (‘n’ copies)
Another useful dCache feature

Multi Tier / Quality of Service

- Removable Media (Tape)
- Spinning Disks
- SSD’s
In order to get this sorted out consistently, 
dCache is following two strategies.

• Providing API and GUI for customers to specify personal QoS setup.

• Agreeing on standard vocabulary to enable PaaS to consistently describe QoS
  – Trying this with RDA and OGF
  – Hope is to agree on a http/REST based protocol to negotiate QoS with arbitrary endpoints. (CDMI good candidate)
  – dCache is part of this activity within INDIGO DataCloud
INDIGO Data Cloud Cheat Sheet

• 11 ++ Million Euros
• 30 months duration
• 26 partners
• The project aims for an Open Source Data and Computing platform targeted at scientific communities, deployable on multiple hardware, and provisioned over private and public e-infrastructures.

• About 800.000 Euro for dCache.
• ~ 2 more FTEs
• Major objectives for dCache is:
  • “Data LifeCycle Support” and
  • “Software Defined Storage”
Summary

• dCache extends its multi protocol, multi credential Mantra by typical Cloud Access Mechanisms.
• Successfully production system with ownCloud but evaluating other systems (CubePad) especially for ‘high privacy’ mechanism.
• Making already established QoS mechanisms in dCache available
  – via GUI for individuals and
  – trying to agree on a standard vocabulary and management protocol with European and International standardization organizations to support the use of QoS by platform services (experiment frameworks)
The END

further reading

www.dCache.org