Sync and Share, Quality of Service and dCache

Patrick Fuhrmann

On behave of the dCache team
but especially
Tigran, Lusine and Quirin

INDIGO DataCloud

The dCache.org collaboration

Fermilab

DESY

HTW
Berlin
(University)

NDGF
Nordic DataGrid Facility

Cheap labor
injector
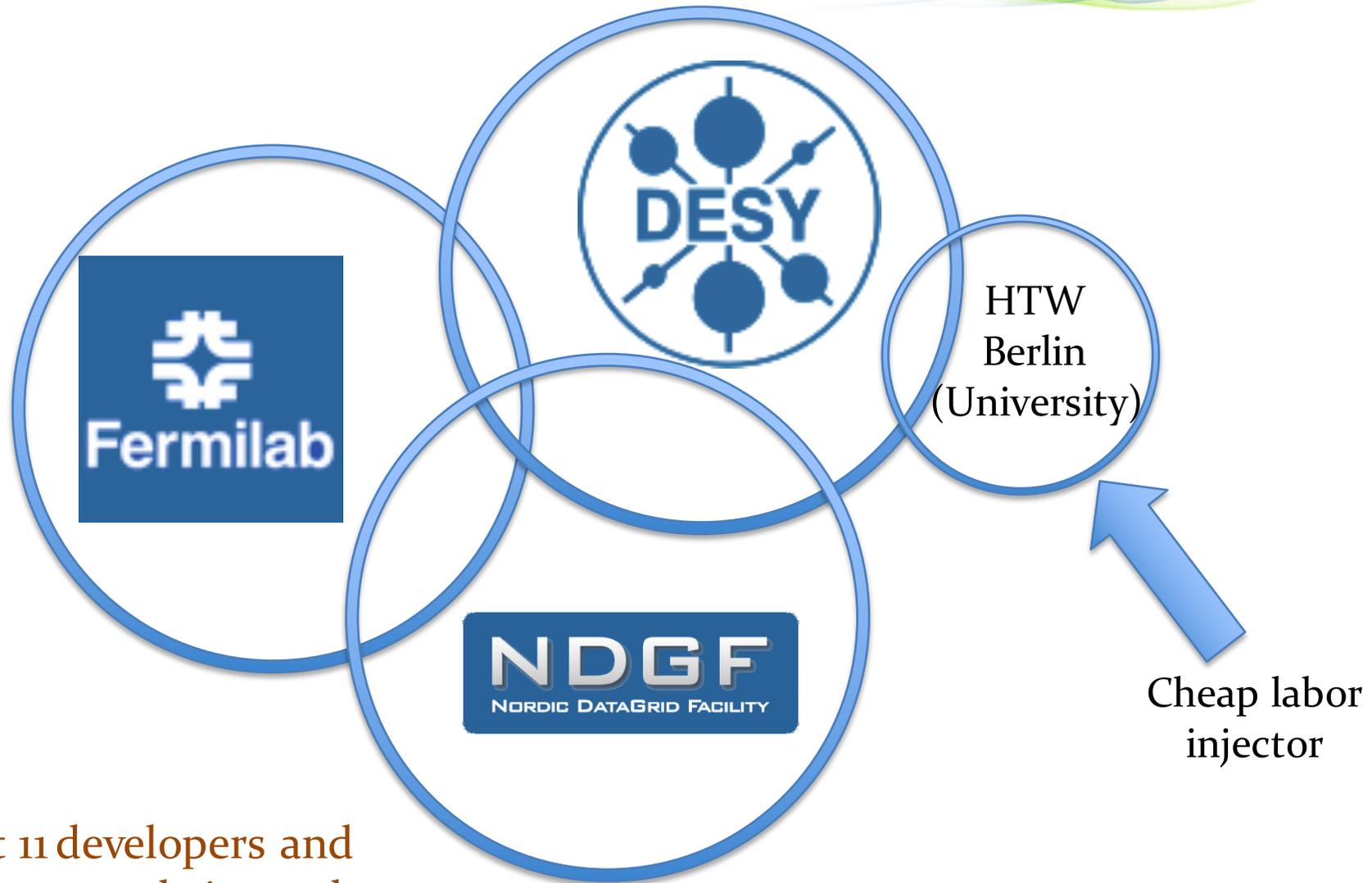
About 11 developers and
support people in total

# Usage
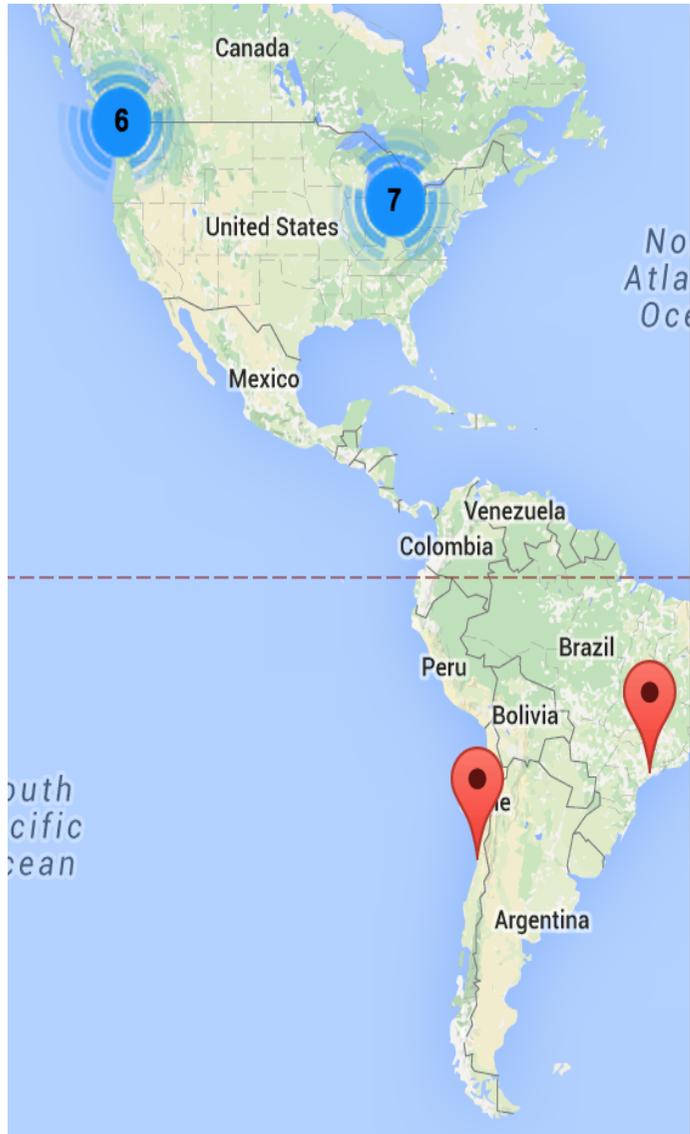
To proceed we need to learn a bit about dCache

Features needed for this presentation

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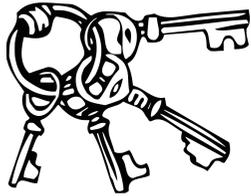
Access via variety of Credentials
Can be all mapped to the same individual

Kerberos

Username
Password

X509

CERTIFICATE

dCache

Features needed for this presentation

dCache.org
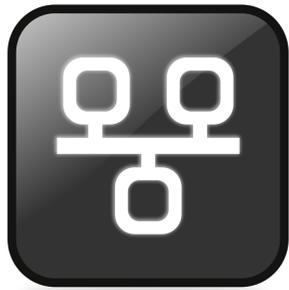
Access via a variety of Protocols

All to the same file

http/WebDAV

NFS/pNFS

GridFTP

dCache

Consequence

We support a typical scientific data life cycle

Scientific Data Cloud

dCache.org

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

dCache.org

High Speed
Data Ingest

Fast Analysis
NFS 4.1/pNFS

Wide Area Transfers
(Globus Online, FTS)
by GridFTP

Sync'ing and Sharing
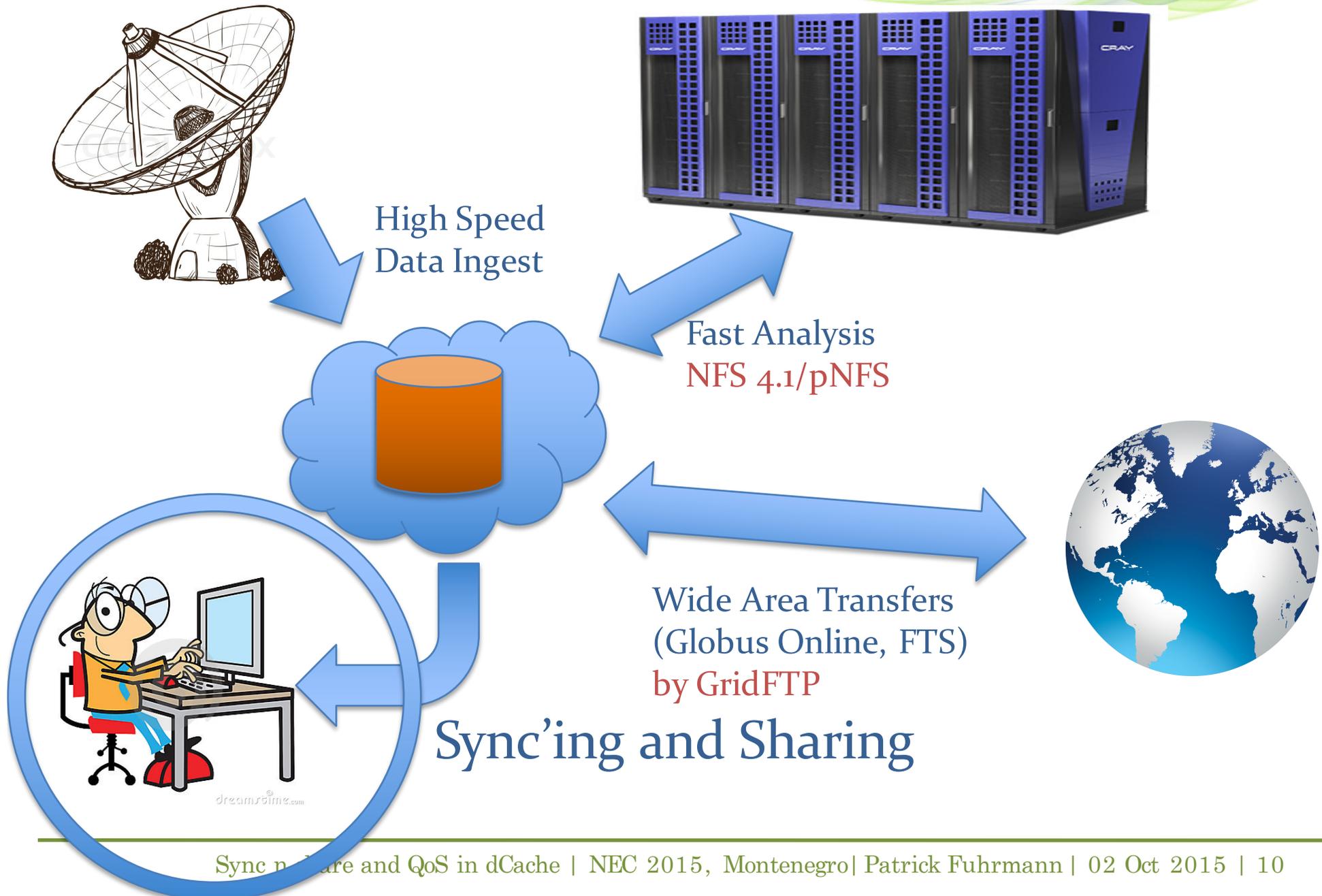
Why not using ownCloud

We are not running OwnCloud storage

BUT

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

ownCloud

Unlimited hierarchical Storage Space

dCache

GridFTP

Globus Online

NFS 4.1 / pNFS

HPC, HTC

How to scale out !

dCache.org

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

dCache

dCache

DESY Production Instance
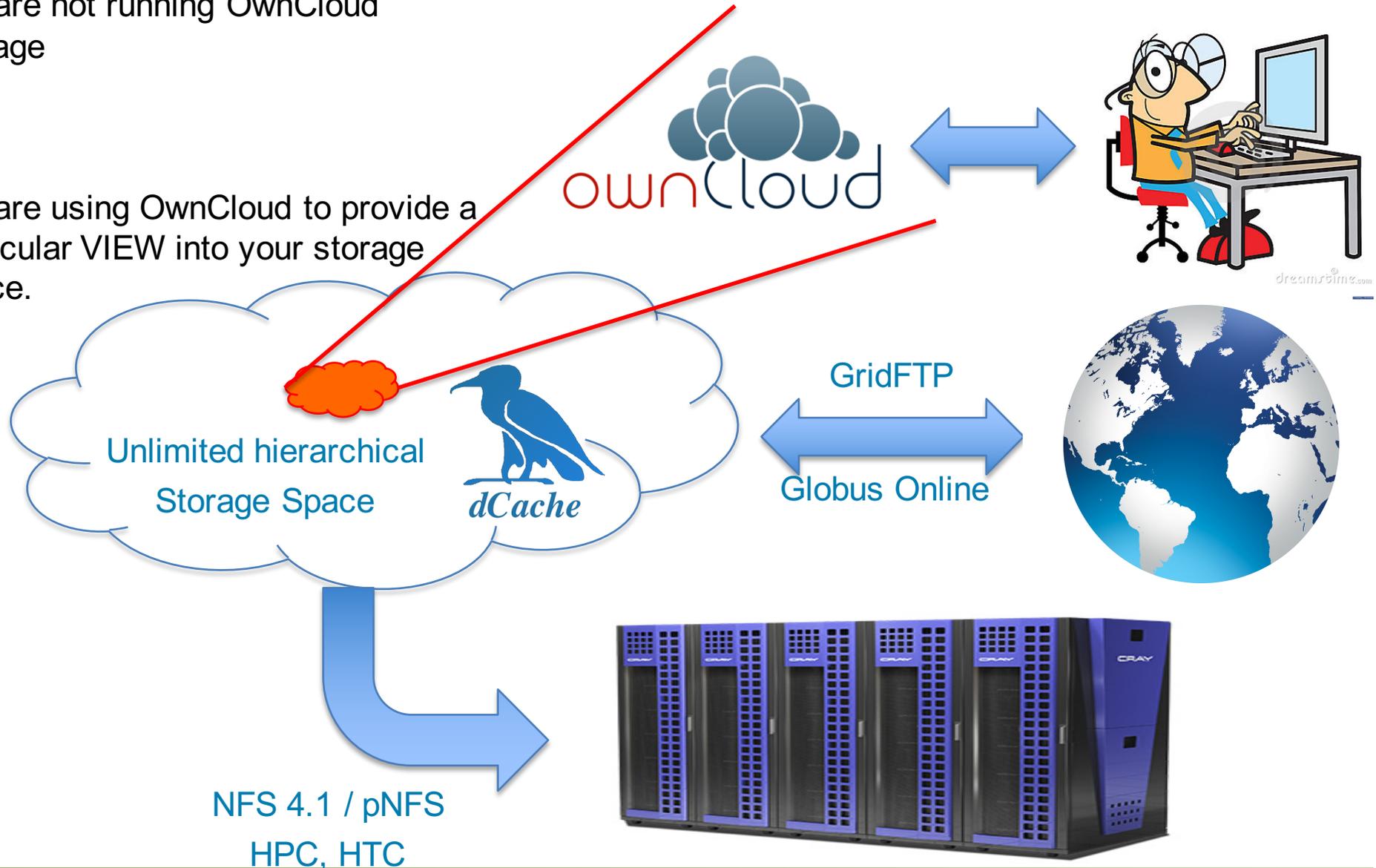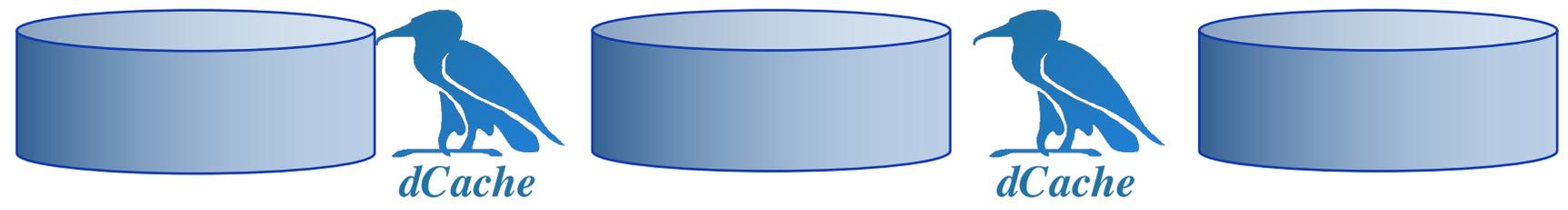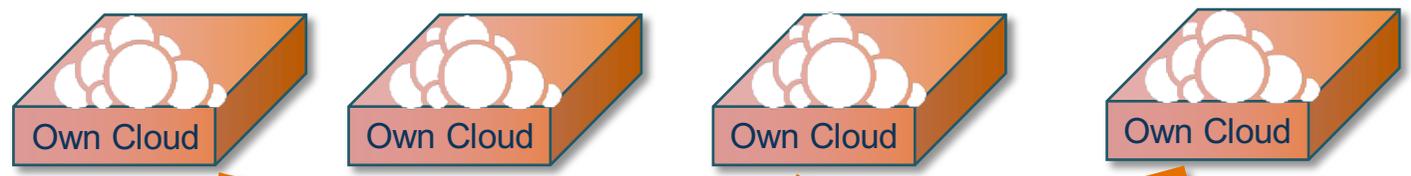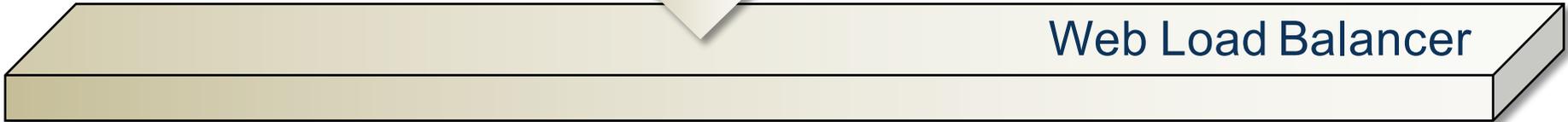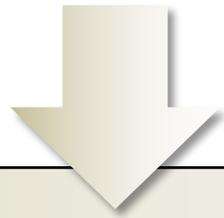
- Fully integrated into DESY infrastructure
  - Monitoring
  - Kerberos
  - LDAP

- 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
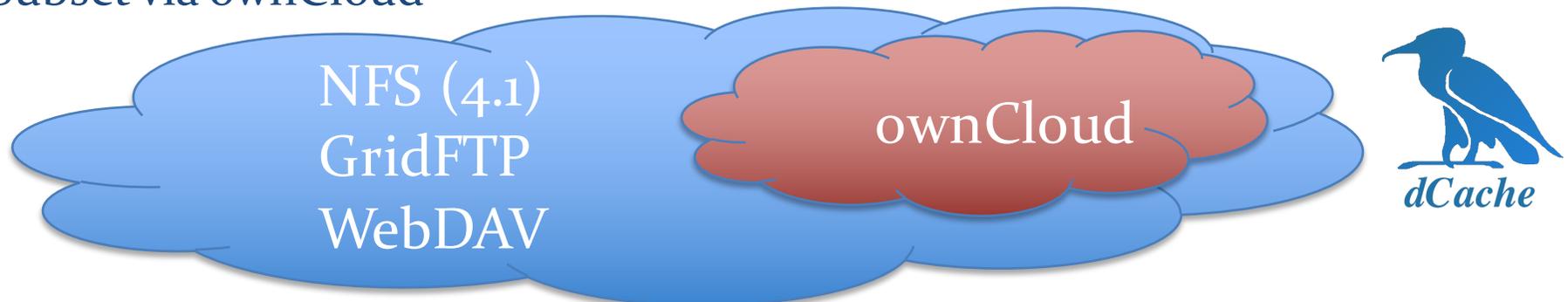
ownCloud

dCache

But ownCloud is not the only
and possibly not the best
solution.
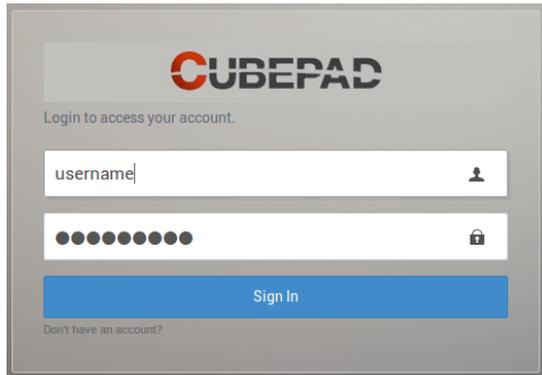
Cube PAD

- 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
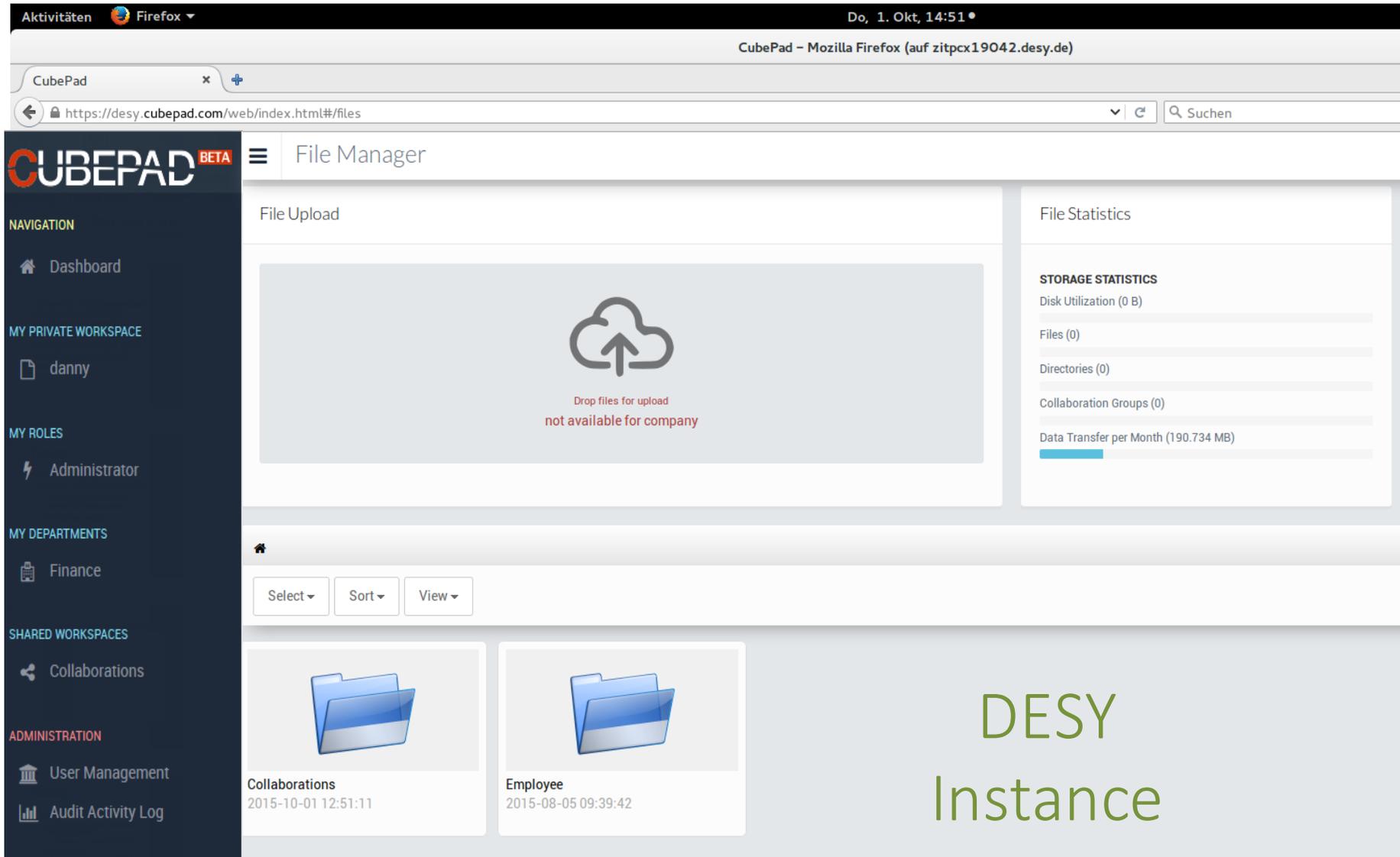
Encrypting and sharing

dCache.org

dCache
WebDAV door

01101010
10101010
10101110
1011001
100

dCache

Shamir Schema
(based on Hydra)

AAAA BBBB CCCC

CCCC

BBBB

AAAA

Encrypting and sharing, cont
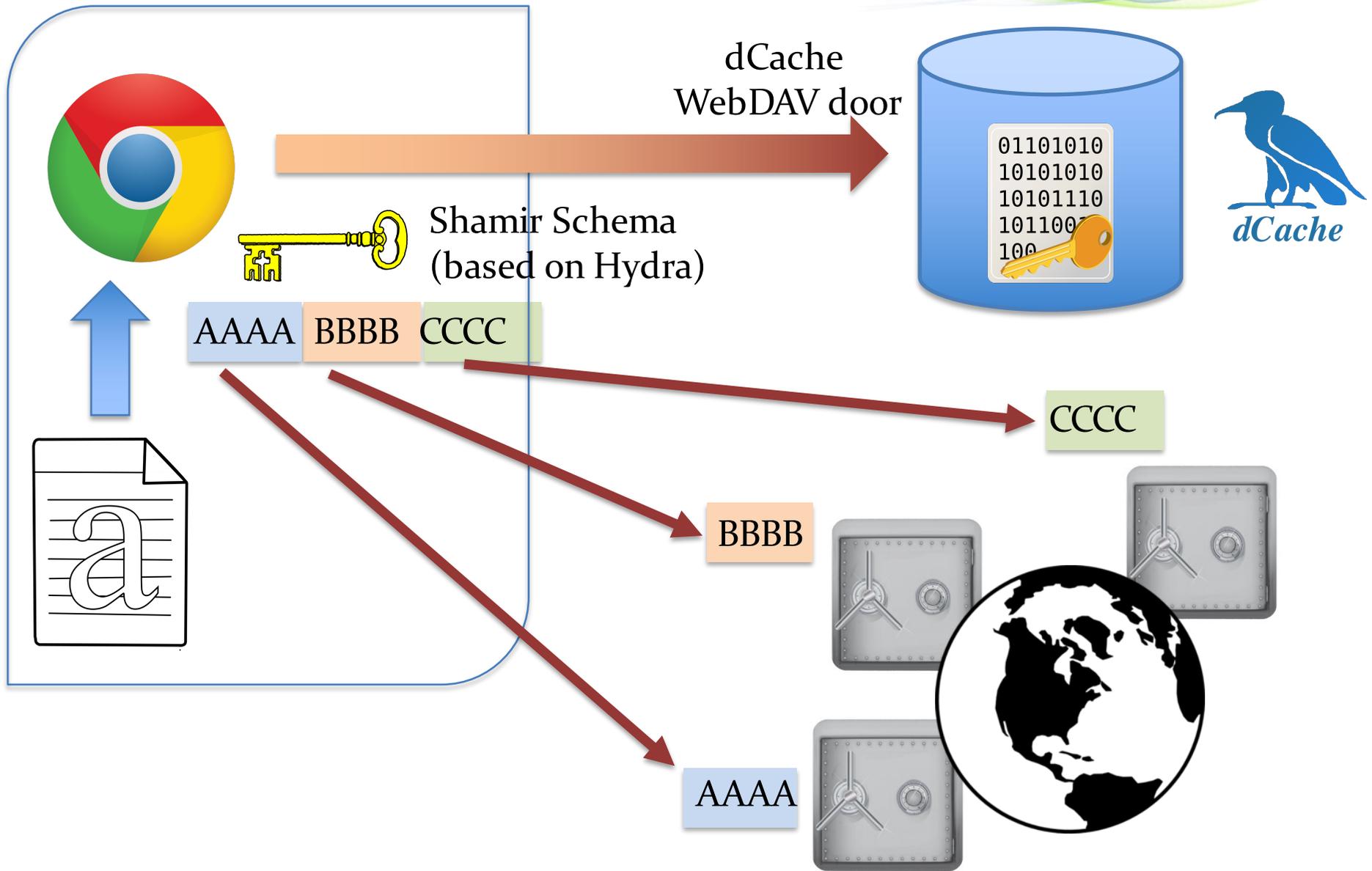
- File is encrypted within the browser on the fly to the server (dCache WebDAV).

- 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
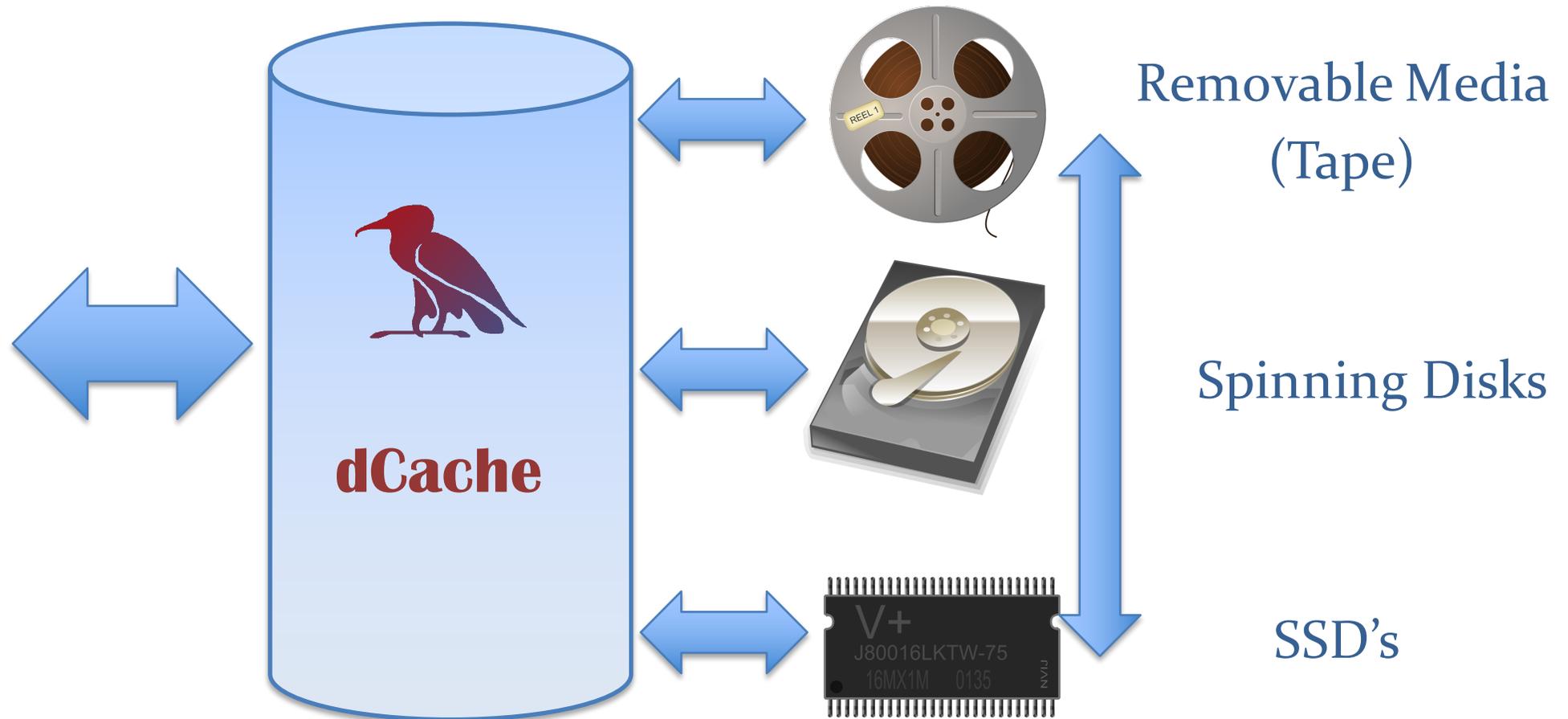
dCache

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

dCache.org

- 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"*

INDIGO DataCloud

Summary

dCache.org
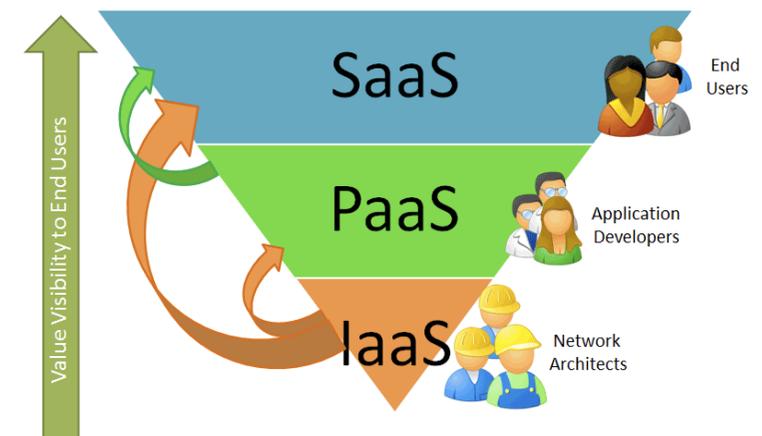
- dCache extends its multi protocol, multi credential Mantra by typical Cloud Access Mechanisms.

- 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