The DESY Storage Cloud

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The DESY Storage Cloud
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for the DESY CLOUD TEAM
Content

- Motivation
- Preparation
- Collaborations and publications
- What do you get right now?
- Who is involved, how is it integrated?
- How is the system implemented?
- How do you get access?
- The bigger picture. (The Scientific Storage Cloud)
What is this about … ?

It’s about on how modern scientists (people) want to manage their data.
New requirements from DESY users:

- New model in accessing data
  - Anytime from everywhere
  - From mobile devices
  - Bidirectional sync’ing between your cloud space and your local devices

- New model in sharing data
  - Fine grained sharing with individuals and groups.
  - Sharing via intuitive Web 2.0 mechanisms (Apps or Browser)
  - Sharing with ‘public’ with or w/o password protection
  - Sharing of free space (upload)
  - Expiration of shares
Requirements (QoS, Big Data)

> Request for unlimited, indestructible storage space including data life cycle management.

> Request for different quality of services (SLA), coming with different price tags and controlled by customer.

- Data Loss Protection (non-user introduced), e.g.:
  - One copy.
  - Two copies on independent systems.
  - Two copies in different buildings.
  - Two copies at different sites (e.g. Hamburg and Zeuthen)
  - Some of above plus ‘n’ tape copies.

- Access latency and max data rate, e.g.:
  - Regular sync and web access.
  - Worker-node access: High throughput
  - Low latency (e.g. on SSD) for HPC.
But all this should be just one huge repository. Not split into different systems.

Access should be possible with different credentials

- Username / password
- X509 Certificates
- SAML (Single Sign On)
- Kerberos
Big Data, Qos Part

IT is doing this for decades. ~ 10 PetaBytes

Web 2.0

Here we need some help
For the web 2.0 interface we needed some experts.

We went for the most popular solution: Own Cloud

- Reduce likelihood for ‘product disappearing’
- Possibly building a user-community (like today)
  - TU-Berlin, FZ-Jülich, TU-Dresden ****
  - CERN, United Nations
- CERN is evaluating a similar approach and we are in contact anyway (WLCG)
Collaborations and publications

> Collaboration with HTW Berlin (LSDMA)

> Pre-evaluation of cloud solutions by “InFa” -> Q3/2013
  - Erarbeiten und Umsetzen eines firmeninternen Online-Speicherdienstes in einer Teststellung. (Quirin Buchholz)

> Presenting the concept at HEPIX.

> Information exchange with CERN. (CHEP’13) Oct 13

> Berlin Cloud Event, (mostly OwnCloud and PowerFolder) in Mai 14 (we published first paper)

> Participating the CERN Cloud Event (Nov ‘14) including a presentation of our proposed solution.

> Various papers submitted and accepted at ISGC in Taipei in March and CHEP’15 in Japan.
Last Preliminary Remark

➢ The DESY Storage Cloud is NOT in the CLOUD.

➢ Your data is stored on DESY premises and is regulated by DESY agreements. (German and EU law).

➢ We only provide interfaces to/into your storage space, which are similar to those provided by Cloud Providers.
So, what do you get right now?
Sync’ing and Web access

Your Cloud Space

Sync

File up and download
Sharing

Your Cloud Space

- Share files/folders with individuals
- Share files/folders with ‘desy groups’
- Share with ‘public’ with and w/o password
  (Shares can expire)
- Share space(s) with others for upload

File shared with you by others

Others sharing data with you (in your home)
Initial Quality of service

> Each file in your space has two copies on a completely distinct hardware setup.

- Different disks
- Different controller
- Different host system.

> Checksum is calculated on arrival of backend storage.

> Continuous ‘scrubbing’ of disks to detect wrong checksums.
Who do we do that?
Integration into the DESY infrastructure

- Authentication: Kerberos
- User Management: Registry LDAP
- Monitoring
- Accounting
- Virtualization: VMware
- Local and Wide Area Network
- Load Balancing
- Firewalls
- Unlimited Persistent Storage

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Almost all IT groups are involved (See Design Picture)

- Technical Coordination OwnCloud: Quirin
- Technical Coordination DOT: Lusine and Ralf
- Technical Coordination dCache.org: Tigran
- And many more in Network, VM Management, Web Office ...
- Please don’t contact those people directly, use weboffice@desy.de to report issues.
The dCache backend

Pool
Node

Pool
Node

Pool
Node

Pool
Node

Pool
Node

Pool
Node

200 TBytes
RAID 6

200 TBytes
RAID 6

200 TBytes
RAID 6

Namespace

Poolselection

Accounting
Horizontal Scaling

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
How do you get access?
What you need to do, to get access

Get the OwnCloud resource from the DESY registry.
(Here vdR wanted to say something.)

Read the intro @
It.desy.de -> Dienste -> StorageDienste -> DesyCloud

1. Log into desycloud.desy.de with your DESY account credentials
2. Install the OwnCloud client for your preferred OS
3. Configure your sync’s and shares

Report issues to weboffice@desy.de
Things you might want to consider
Syncing might need some thinking
Watch OUT!

!!! Do not sync your entire Own Cloud Space with your laptop -> chose a subdirectory instead.

- Own Cloud Space is potentially unlimited … your laptop isn’t
- Everything someone else shares with you would be sync’ed to your laptop. Shares always end up in our home first.
Watch out !!!

File is listed on the ignore list.

File contains invalid characters that can not be synced cross platform.
Folder Sharing Hierarchy

Inspired by Stefan Klepser

Your very private folder

Actively Created public link

https://desycloud.desy.de/public.php?service=files&
t=3bd49ff864c465d362d697a54584a6e3

Implicitly Created public link

https://desycloud.desy.de/public.php?service=files&
t=3bd49ff864c465d362d697a54584a6e3
Hierarchy enforced

Try to remove the share link ‘checkbox’ for public subfolder
We’ll try to keep the documentation up to date on issues we find.
Towards the scientific storage cloud
We are not running OwnCloud storage

BUT

We are using OwnCloud to provide a particular VIEW into your DESY storage space.
High performance access

NFS mounted,
High performance,
Low latency

On workgroup server

Or worker nodes,
Compute servers

Your Cloud Space

Web and sync’n share

Sync

File up and download

Sync
Wide area file transfer

Wide area transfers

Your Cloud Space

Sync

Web and sync'n share

Sync

File up and download

With Globus Online
Or WLCG Transfer tools (using GridFTP)
Quality of service management

Physical Realization

Two Copies (one building)

Two Copies (Two buildings)

Additional Tape Copy

Small File Manager

Your Cloud Space

Web and Sync’n share

Sync

Sync

File up and download

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Even bigger system

Even bigger system

Hamburg

Zeuthen

> One Namespace -> Transparent Sharing

> Zeuthen is ‘Backup’ for Hamburg, Hamburg is ‘Backup’ for Zeuthen.

> Zeuthen is ‘Cache’ for Hamburg storage if accessed in Zeuthen and vise versa.

> This is based on dCache features. Those setups already exist in North Europe and University of Michigan.
All those nice features are already available in the used backend. (dCache)

They only need to be enabled.

This will happen step by step.

More a political issue, concerning resources.
Just that I don’t forget …
Just not to forget

> **The system is still a pilot**
  - *Which should only influence the overall availability.*
  - *E.g. : Downtimes on short notice.*
  - *We already put significant efforts into keeping your data safe.*

> Payment mechanisms for mobile App’s not clear.
  - Less than 1.00 Euro.

> Sharing with groups
  - Only people with the registry “OwnCloud resource” will get access.
  - Otherwise you would have to share with public link.

> In monitoring but not nightalarm yet.
Just not to forget

> **WebDAV access.**

- *Due to limitations in the definition of WebDAV and the implementation of some OS clients, we are still trying to find a client which works sufficiently satisfying for everyone.*

- *BTW : With WebDAV, currently ‘unlimited storage space’ means 90 TBytes.*

> **Issues with the NFS connection between OwnCloud and dCache.**

- *We observe hick-ups. (Remote I/O Errors)*
  - Currently taken care of by script
  - You shouldn’t notice
  - Will be fixed.
  - Side effect: Web interface might ask you to log-in again.*
Scientific Storage Cloud

LOFAR antenna
Huge amounts of data

X-FEL (Free Electron Lasers)
Fast Ingest

Mounted POSIX FS
(NFSv4.1, pNFS)

Computer farm

WebDAV HTTP(S)
Globus Online
Cloud

Cloud User