dCache.org

dCache, Bridging Between Sync-n-share and Compute Cloud

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(on behalf of DESY and dCache team)

ISGC 2015

Fermilab NDGF Nordic DataGrid Facility DESY HELMHOLTZ ASSOCIATION LSDMA

Need a sync-n-share service at DESY

- **Requirements**:

  Easy to use,

  Store everything at DESY,

  Integrate with existing infrastructure.

- Anticipated **future usage**:

  change data between syncing and non-syncing storage,

  like Amazon, provide different QoS with different costs,

  share data without syncing,

  3rd party transfers between sites,

  immediate access to sync space from compute facilities.

How we solved it at DESY

- Looked around, chose two open-source projects:
  - **dCache**: **powerful managed storage** system

    Integration with scientific data life-cycle;

    "Hot" data can be stored on SSDs, "cold" on cheaper HDDs, "archive" tape;

    … but no sync and share facilities.
  - **ownCloud**: **popular front-end**

    Our collaborators adopting ownCloud makes it more attractive;

    … but assumes storage is managed.
- Combining these two gives DESY the best of both worlds:

  dCache is mounted on servers with **NFS v4.1/pNFS**, running community edition ownCloud.

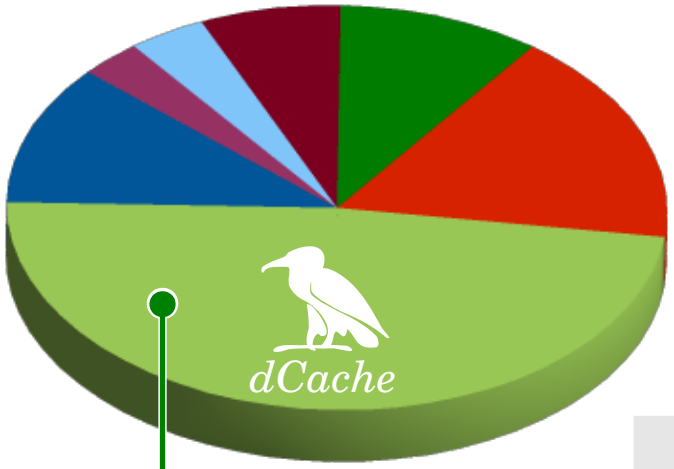
  Integrated with DESY Kerberos, LDAP and "Registry".

open source

dCache.org

What is dCache?

LHC data stored on each storage system



- **dCache (96 PB)**
- DPM (34 PB)
- EOS (0 PB)
- StoRM (20 PB)
- CASTOR (14 PB)
- BeStMan (7.6 PB)
- Globus FTP (6.1 PB)
- ARC (0.01 PB)
- xrootd (22 PB)

Source: BDII (2014-11-14)

Core team

DESY
5 FTEs

Fermilab
2 FTEs

nlic
1.5 FTEs

dCache

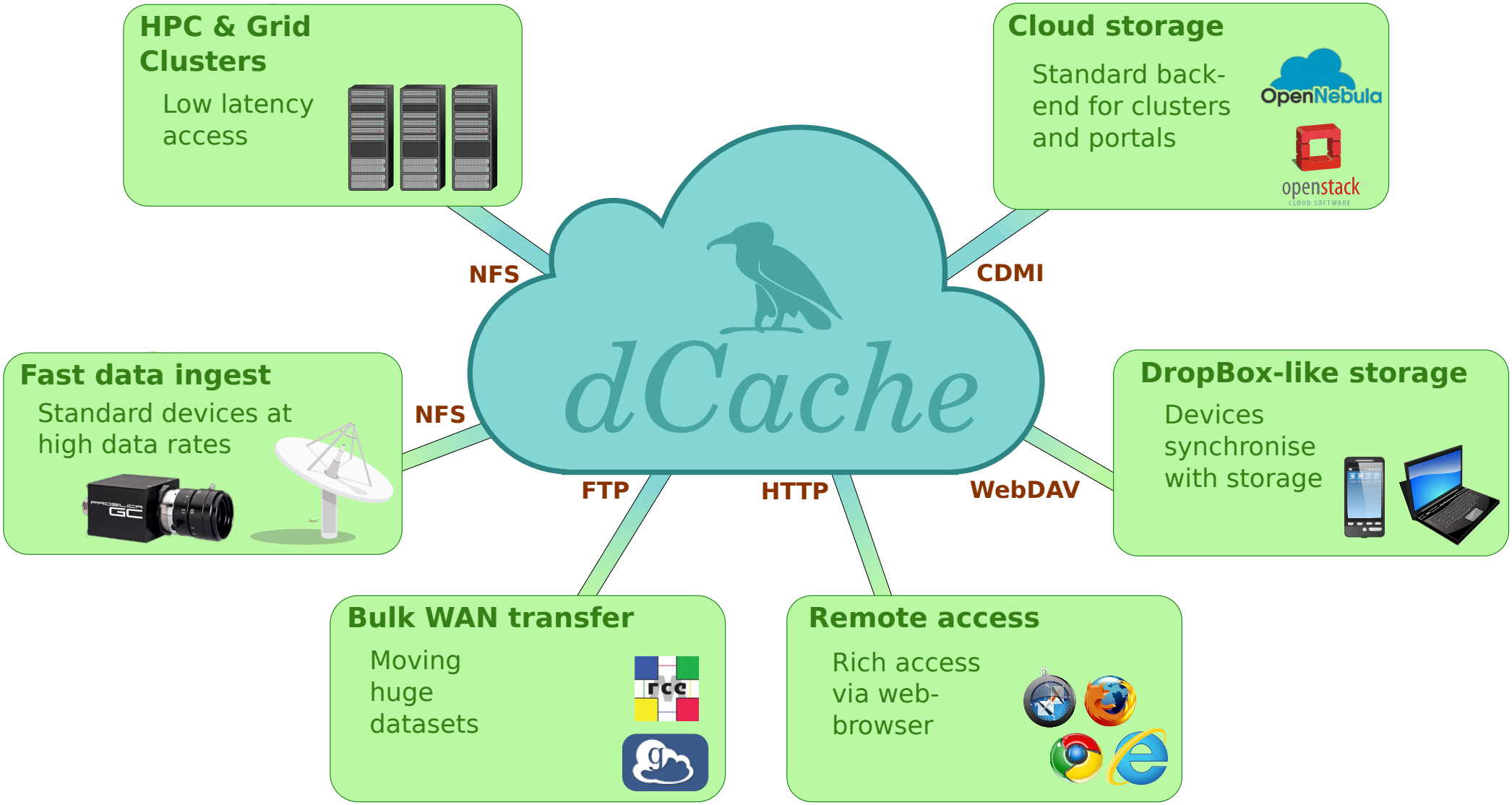
Student mentor programme

htw
Hochschule für Technik und Wirtschaft Berlin
3 students

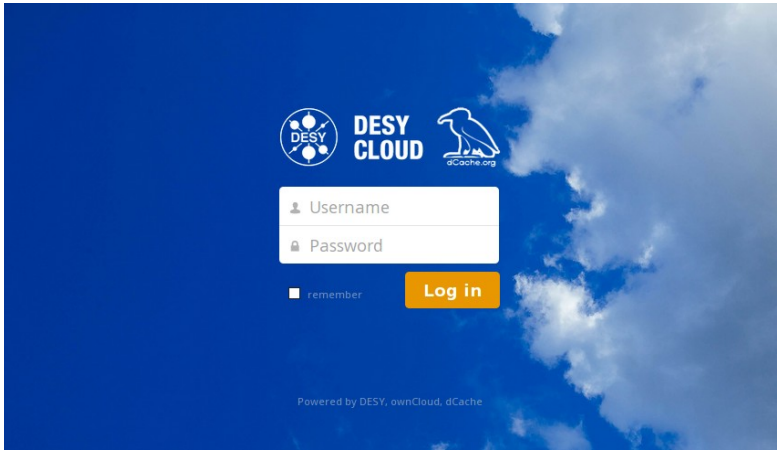
Collaborations

EGI
globus online
PHYSICS AT THE TERA SCALE Helmholtz Alliance
LSDMA
EUROPEAN MIDDLEWARE INITIATIVE
OpenGridForum
SNIC
Open Science Grid

The scientific cloud vision



The DESY Cloud service



- Status: **production**(-ish), but only for a few groups:

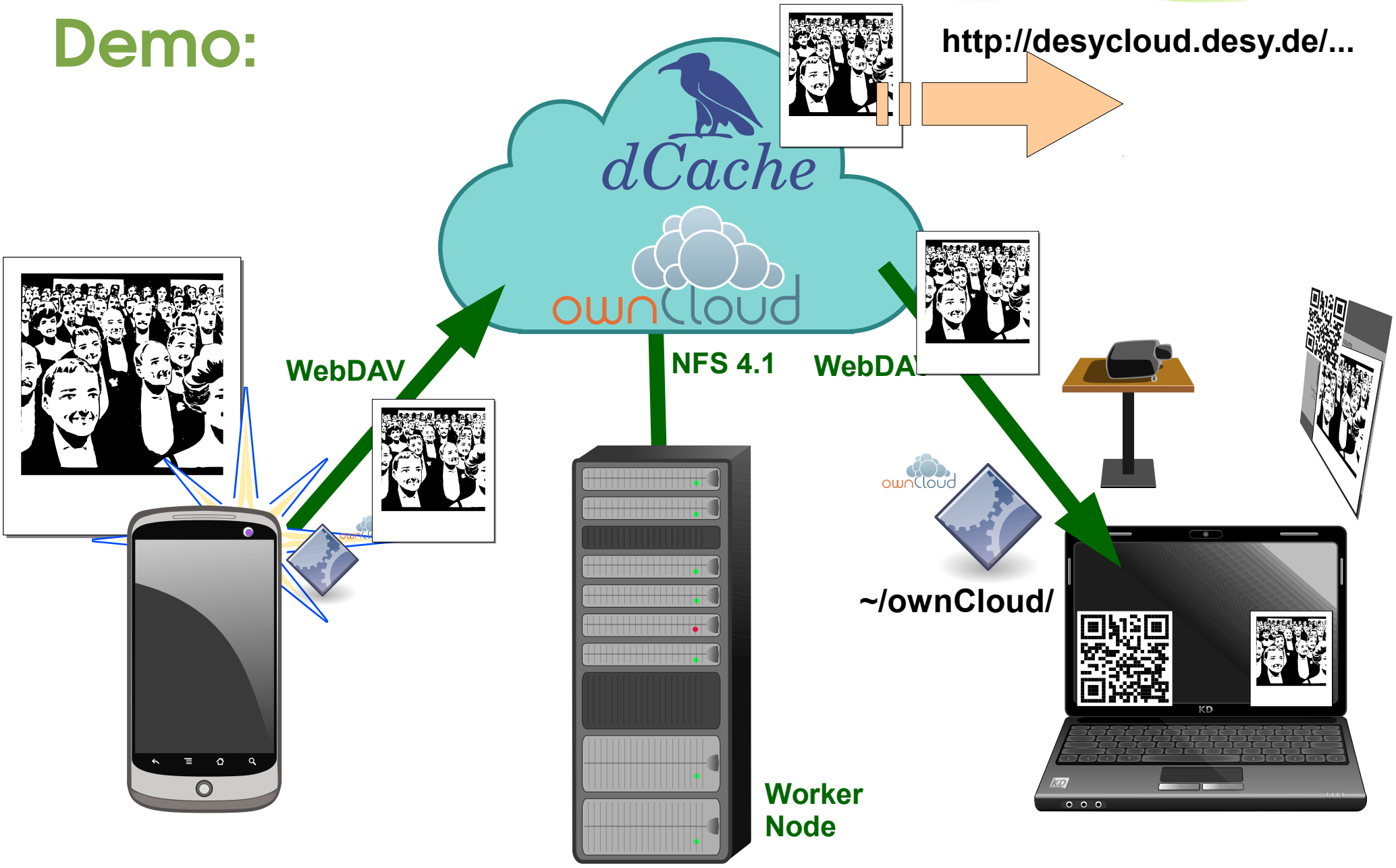
  219 users, 2×10^6 files, 2.4 TiB

- Required minor **patches** to ownCloud & dCache:

  Changes always pushed into regular dCache releases; ownCloud 8 has all changes.

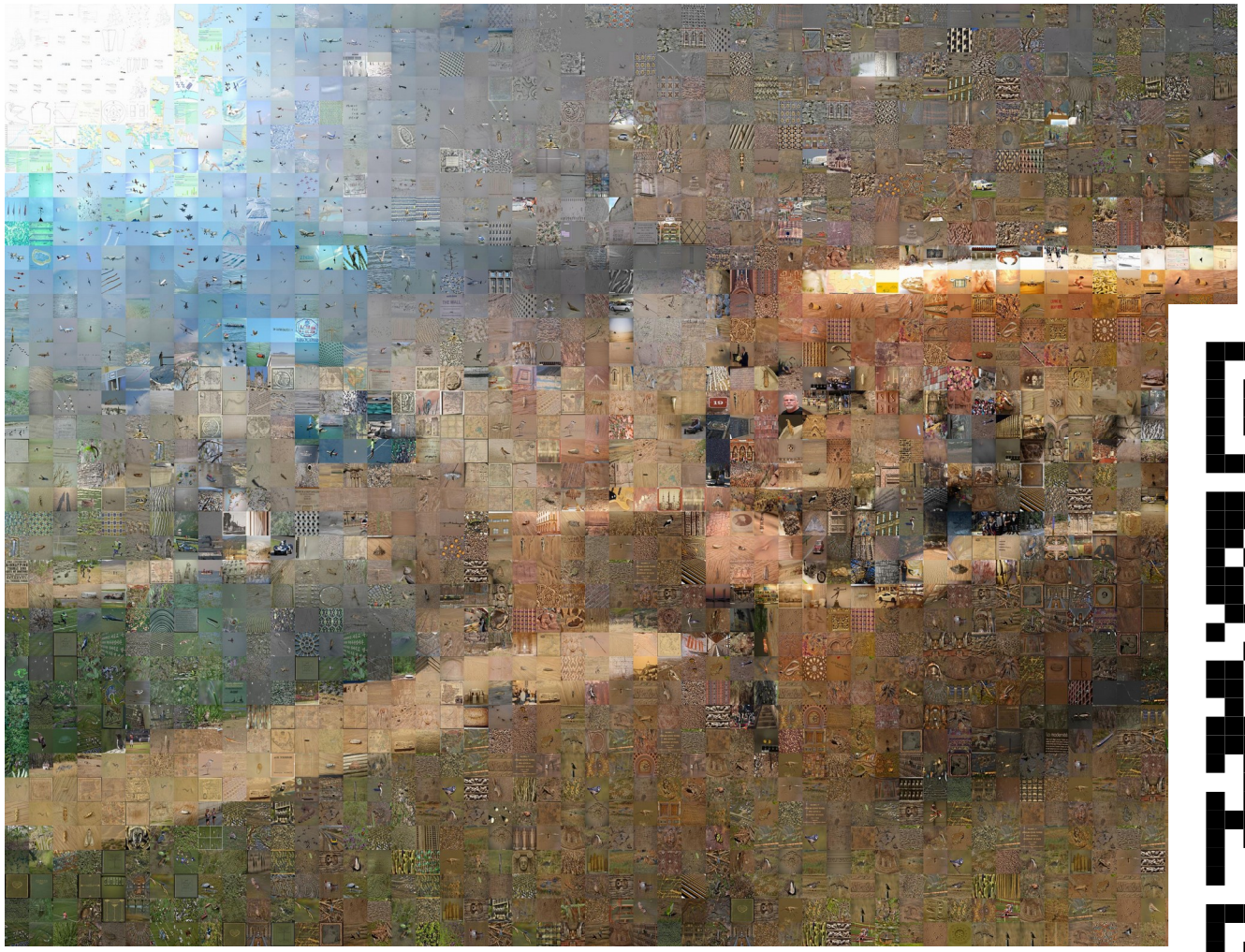
- Have a blueprint for **any site** to reproduce.

Demo:


http://desycloud.desy.de/...
dCache
ownCloud
WebDAV
NFS 4.1
WebDA
~/ownCloud/
Worker
Node

Demo: sync-n-share

Demo: processed image, from WN



Development and future work

- Allow **direct access** to ownCloud files:
  - Supporting direct access from worker-nodes, 3rd party transfers, …
  - Files in dCache need to be owned by the **user** (i.e., not user `owncloud`)
  - Couldn't fix ownCloud: work-around within dCache
- **Consistency** between ACLs and shares:

  dCache ACLs to honour ownCloud shares and vice versa
- **Integrity**; e.g., propagate and handling checksums,
- **Notification**: avoid client polling,
- **Redirection** support for sync-client:

  ownCloud server proxying data is bottleneck; want syncing to be more efficient by taking data from where its stored.

CDMI: cloud storage

- SNIA/ISO standard for Cloud Storage
- (Optionally) Provides:
  - File-system view,
  - Object-store view,
  - Multi-tenant,
  - Metadata,
  - Data retention policies,
  - Alternative protocol discovery,
  - Usage statistics,
  - Billing information,
  - ...

So, where can I get CDMI?

Server developers don't want to support something that isn't going to be useful: where's the clients?

Client developers don't want to support something that isn't going to be useful: where's the servers?

- **EGI FedCloud** may help break this:
  - FedCloud is strongly standards based (== CDMI)
  - Adding CDMI support for all major IaaS cloud software.

The plan for dCache

- We will be adding support for CDMI.
  - Initial support is for the filesystem

    (it's a bit like WebDAV)
  - Then adding object-store and metadata support.
- Plan on providing CDMI this summer.

Thanks for listening … any questions?

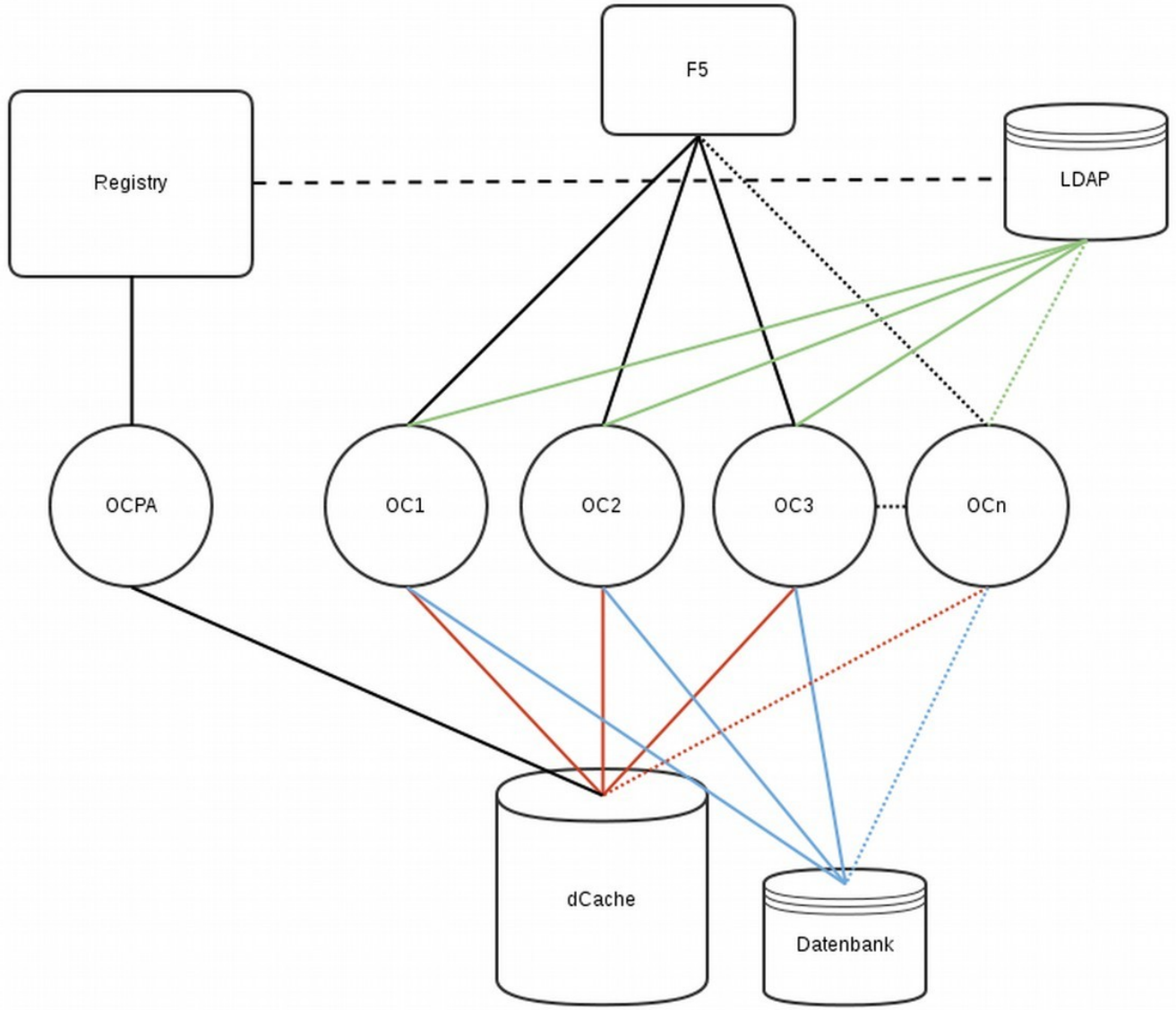
Backup slides

Not just ownCloud ...

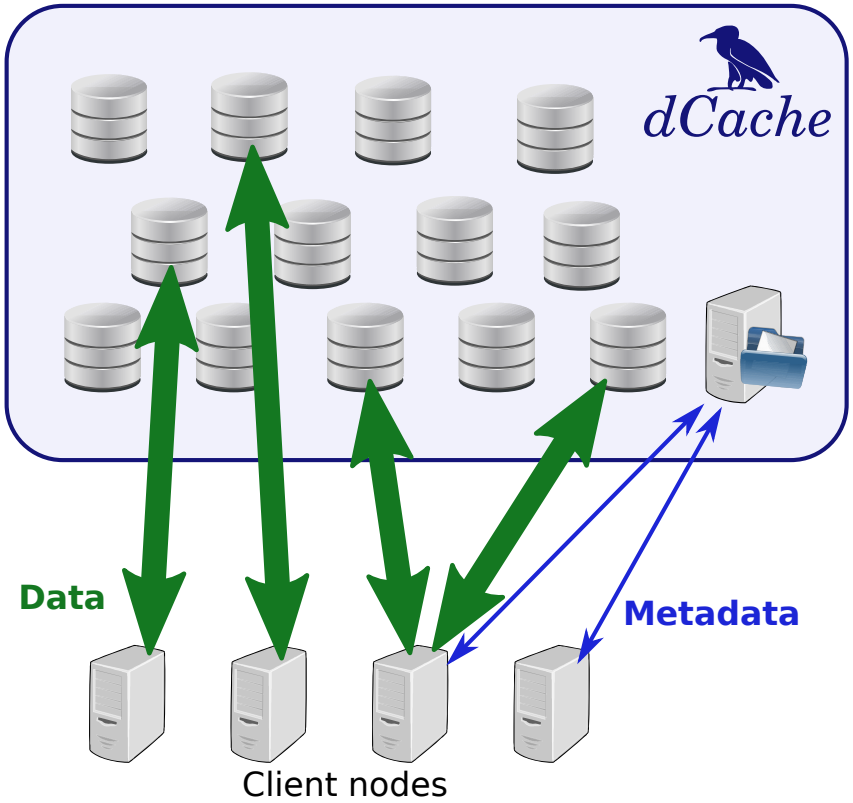
- dCache team hosted a **two-day workshop** with project- and technical-lead of DCORE
  - Provides cloud storage with features beyond ownCloud
  - Some "big name" customers
- Initial "lite integration" by **December 2014**

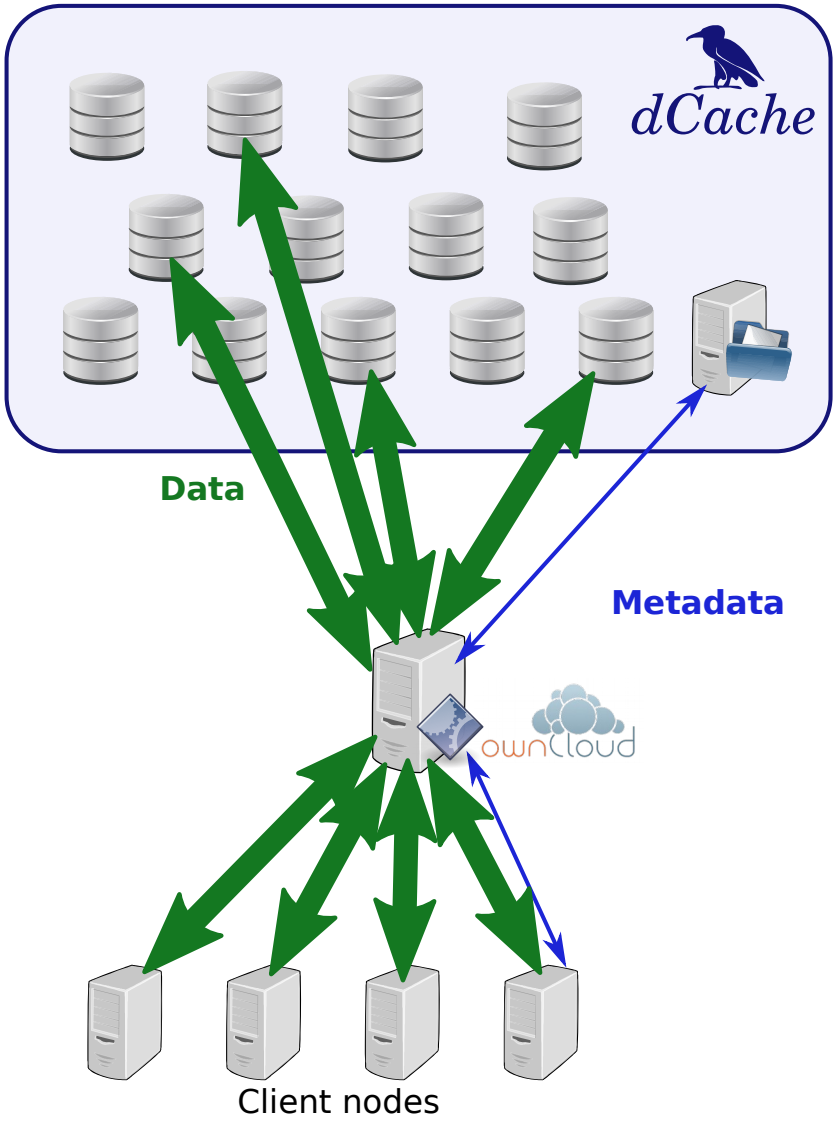
  (includes redirection support)
- Then providing "tight integration" with shared namespace

Integration within DESY infrastructure

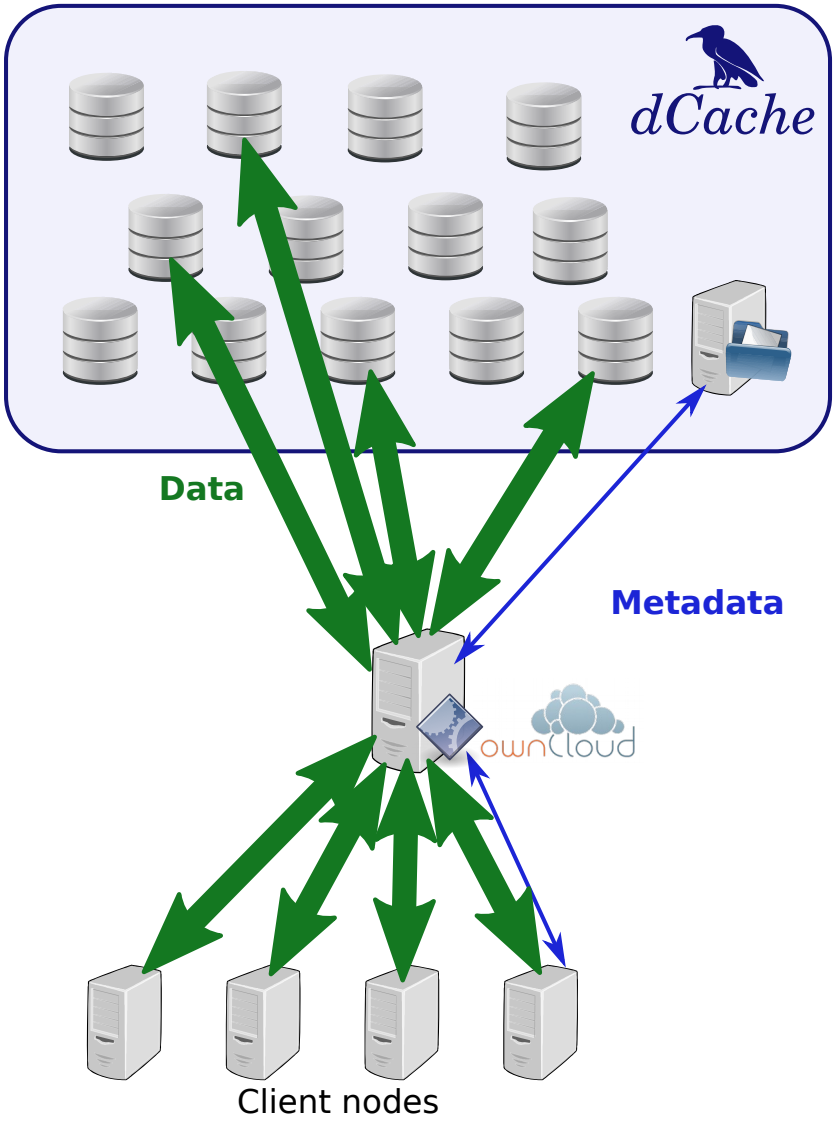


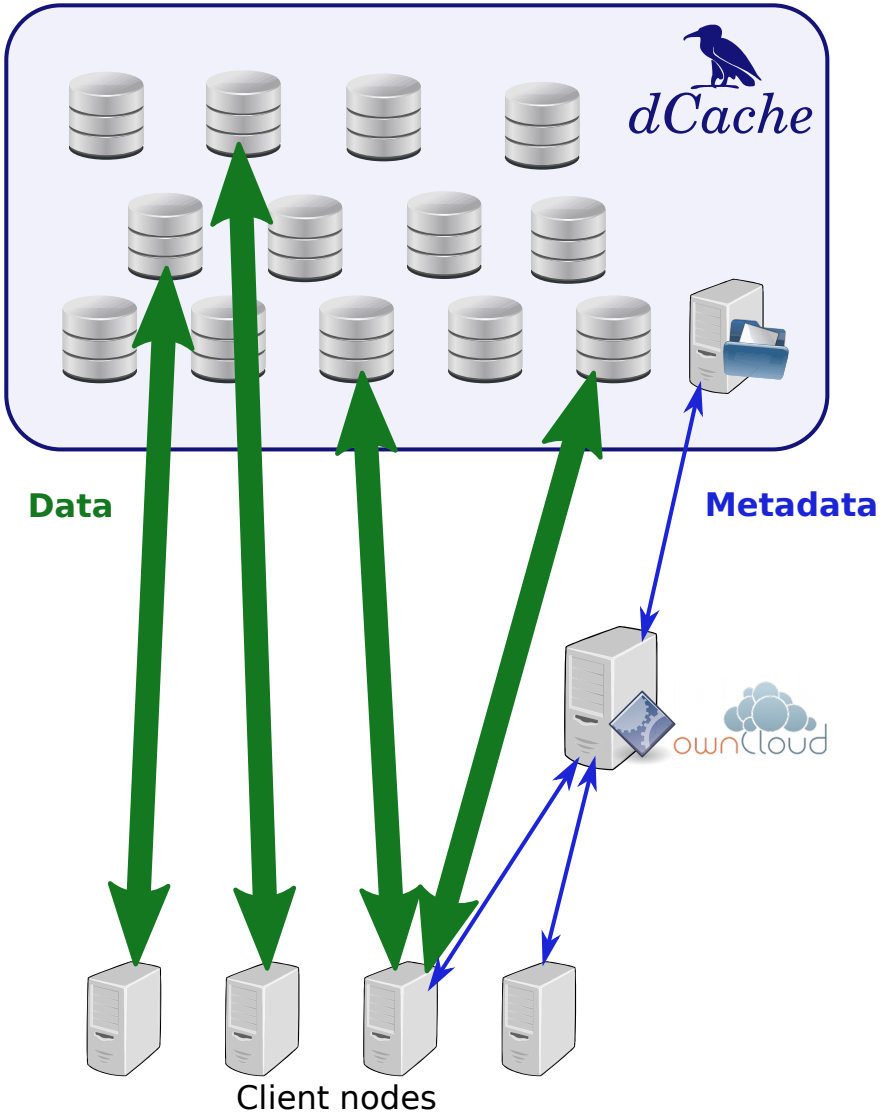
NFS v4.1/PNFS vs ownCloud (currently)





ownCloud: currently vs with redirect





Experience: problems with ownCloud

- If underlying FS disappears, **all sync-clients delete all data**.
- If underlying FS returns `EIO` on read, sync-client creates 0-length file: **impossible to recover**.
- Bulk delete through web interface is **unreliable** (under investigation).
- Rename directory causes client to **delete all files and upload** them again.
- Admin interface **awkward** with O(5k) users.

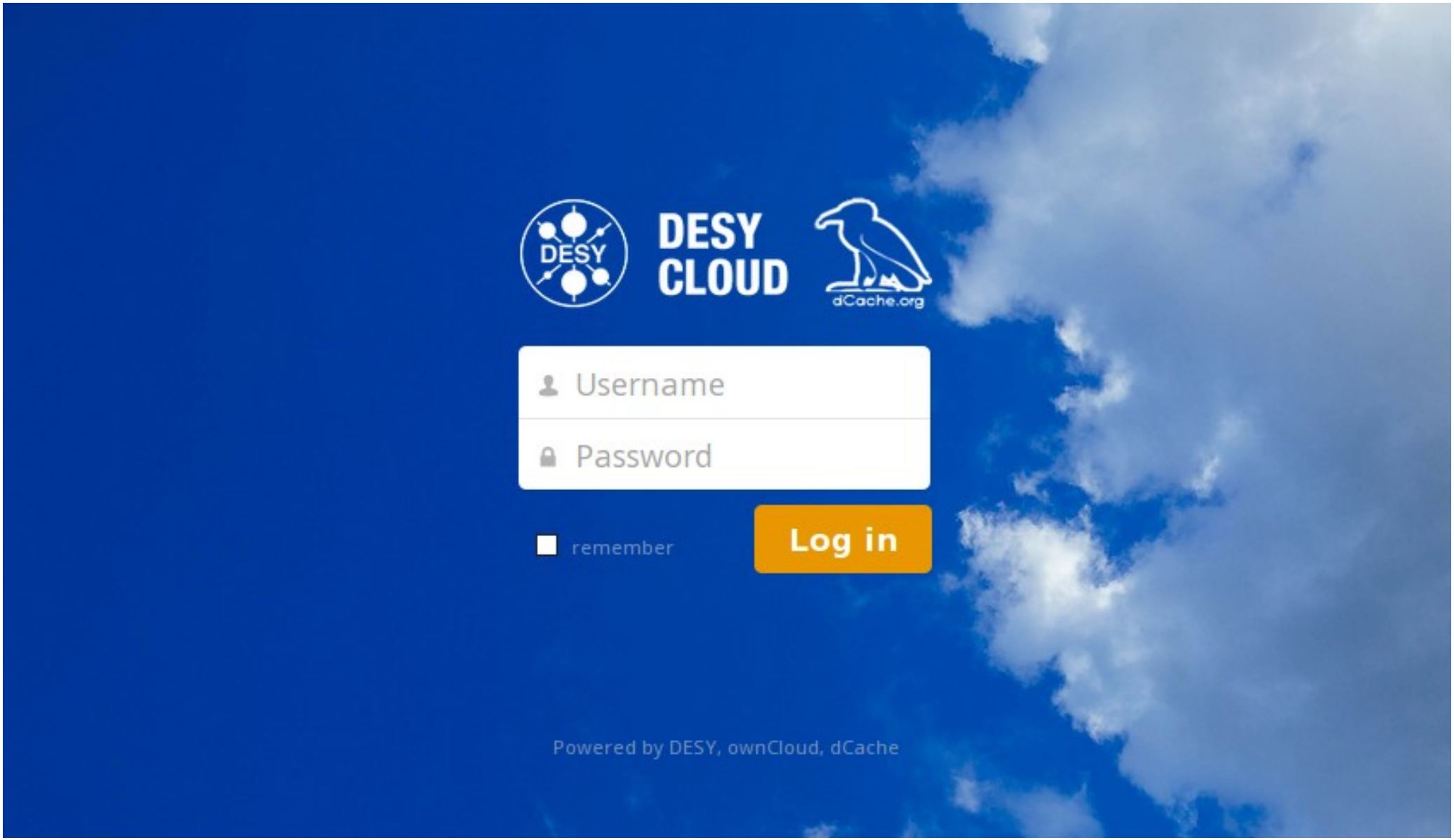
Thinking about sync-and-share

- Like other systems, small fraction of data is "hot"

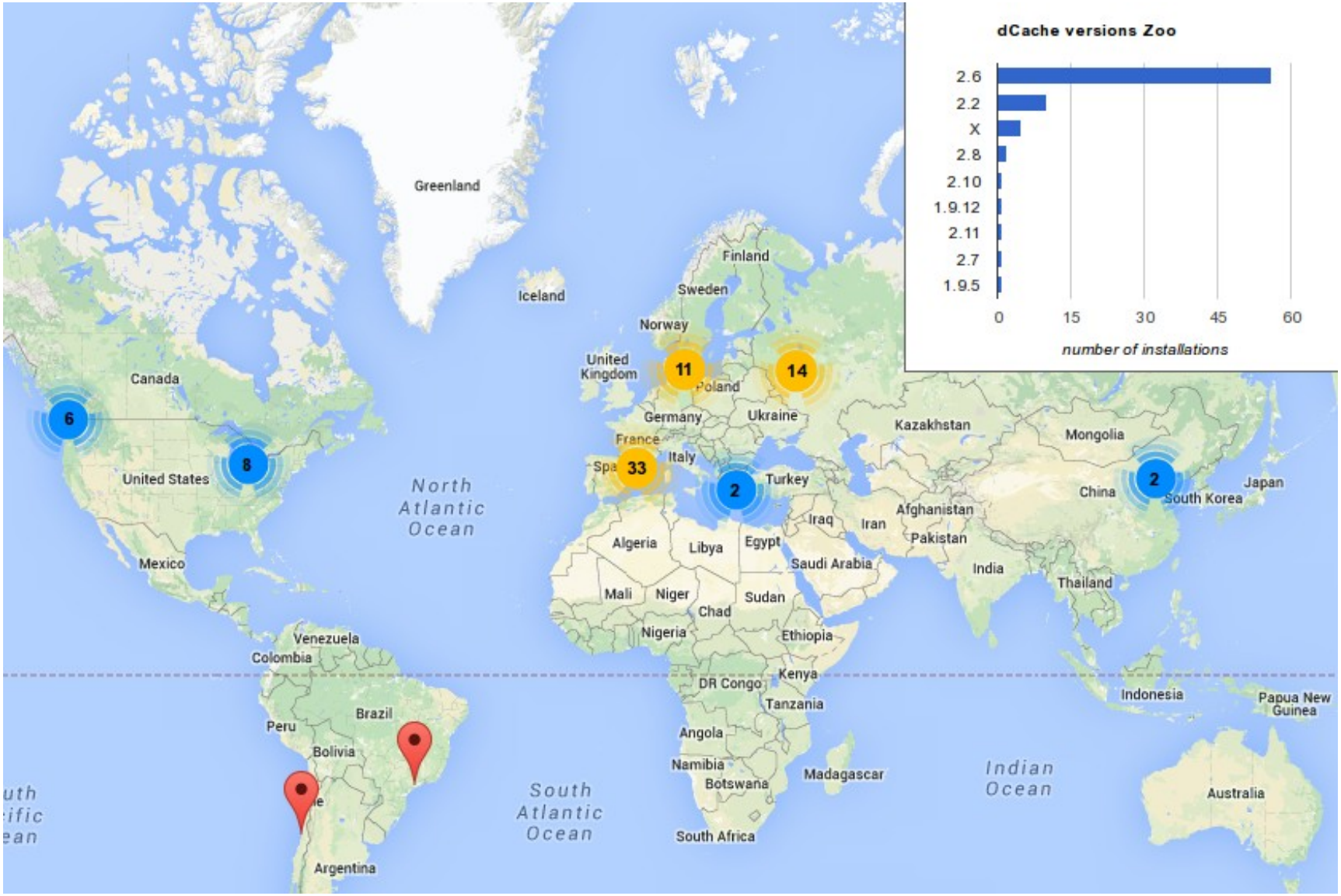
  SSDs provide better performance, but can't afford only SSDs; nice to have system that places hot data on SSDs, cold data on HDD.

- Amazon had a smart idea: allow people to choose how much to pay

  Let users choose between Normal and Glacial QoS; e.g., disable sync for Glacial-like storage but allow access via web interface


DESY
DESY CLOUD
dCache.org
Username
Password
remember
Log in
Powered by DESY, ownCloud, dCache

WLCG dCache instances (only WLCG sites shown)



Over 10 years “Big Data” experience

Era	Disk cache	Grid Storage	Generic Storage	Cloud Storage
Additional Communities	hermes, ZEUS, CDF, H1, HERA B	ALICE, ATLAS, CMS, IceCube, LHCb	Fermilab Intensity Frontier, European XFEL, Belle II, LOFAR, SNIC, Industry, CFEL SCIENCE, PETRA III	EGI, LSDMA
Additional Authen-tication	Trusted host	X.509, Kerberos	Username+PW	SAML, OpenID, OAuth, Token, ...