Evolution, by tackling new challenges.

Patrick Fuhrmann

On behave of the project team
dCache strategy

• After 10 years of storage technology support, we feel the responsibility for sites using dCache.
• Therefore our main concern is the efficiency and evolution of those sites in terms of new hardware and software technologies.
• And not to forget: 3 of those sites are actually the authors of that technology.
• We try to achieve this in various ways:
  • We try to acquire National and European funding and we partner with projects and sites to provide a sustained support infrastructure. (dCache.org)
  • We focus on activities, allowing sites to use our technology for all their customers, not only a particular community. “Alessandra Forti presentation at the WLCG WS”
  • One crucial prerequisite is to provide industry standard interfaces and protocols to your storage.
    – Collaborating with CERN DM on various topics in that direction.
    – Great success with http, even in WLCG (See presentations by Oliver Keeble and Johannes Elmsheuser)
• Evaluating new trends in hardware and software, which we might integrate in dCache.
• Exploring new communities to broaden the spectrum of our services.
Who are we?
The dCache.org collaboration

About 8 developers and support people in total and expecting 3 more within the next 3 months.
Funding and high level objectives
Funding and Objectives

Standardization

2010
- NFS 4.1 / pNFS
- HTTP / WebDAV
- Contributing to the Dynamic Federation

2013
- Deploying new technologies into Production and exploring new communities

2015

2018

Data Life Cycle
- Multi Tier Storage
- Quality of Service
- Migration Archiving

AAI

AARC
- Improve Interoperability of R&E AAI

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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”
More interesting Challenges
Exploring new communities

- Intensity Frontier (IF) at Fermilab.
  - Quote “Craig Group” (plenary talk)

Nice

dCache
- Highly distributed storage with central name space
- Much lower cost (~$100/TB), ~4PB shared by IF experiments
- Read / Write interfaces, but does not look like usual file systems
- Accessible from off-site
- A cache (optionally front-end to tape system) -- old files are flushed

Hm, actually it does ...

HOW?
NFS 4.1 / pNFS

• Reminder
  – Parallel NFS
  – Clients are directly receiving data from distributed storage nodes.
  – Industry standard, pNFS client in the Linux Kernel.

• Already in use for smaller groups at DESY.

• Slowly migrating CMS Grid worker nodes at DESY to NFS4.1/pNFS data access.
  – Encouraging results (next slide)

• Time consuming, as bugs or misunderstandings are still found in the Linux driver implementation.
  – Disadvantage of standards 😊
Job Efficiency (NFS – dCap)

Execution Time (hours)

Job Efficiency (CPU / Wall Time)

NFS 4.1
pNFS
dCap
Exploring more ...

- German support for the Human Brain Project (SMHB)
  - Jülich – Aachen Research Alliance
  - Distributed dCache between Aachen and Jülich
  - dCache’s ability to select pools close to the client or to move data closer to the client made it a perfect match for their requirements.

- Two cities, one system.
  - Similar to NDGF (4 Countries one system)
  - Second copy automatically generated at the other location.
  - Or second location just used as a cache.
Projects in HPC

HPC jobs on supercomputer

HPC jobs get access to dCache storage.
Requirement: CDMI

- ISO/IEC Standard
- Important features for the HPC use cases:
  - File selection based on meta – data
    - (not file name based)
  - Supporting remote ‘data lifecycle’
    - Bring to / release from fast storage
    - Allow tape migration
    - ...
- Required by EGI Fed Cloud
- Supported by INDIGO Data Cloud
- See presentation on CDMI by Paul Millar
Scientific Data Cloud

First Implementation of the Idea:
DESY CLOUD
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 with OwnCloud

See Paul’s presentation
Small file migration to tape

dCache

- Currently used by
  - DESY light sources
  - DPHEP
  - NEXT : DESY CLOUD
- See also Poster and Presentation by Karsten Schwank
Responding to new technologies
Response to CEPH

- CEPH complements dCache perfectly.
  - Simplifies operating dCache disks.
  - dCache accesses data as object-store anyway already.
- dCache is evaluating a ‘two step approach’.
  - Each pools sees it own object space in CEPH
  - All pools have access to the entire space, which is a slight change of dCache pool semantics.
- Would merge CEPH and dCache advantages
  - Multi Tier (Tape, Disk, SSD)
  - Multi protocol support for a common namespace.
    - All protocols see the same namespace
  - All the dCache AAI features
    - Support for X509, Kerberos, username/password
Summary

• “On Top” funding secured again for 3 more years.

• Storage services based on standards extended our user base towards HPC and ‘long tail of science’ communities and helps sites to reduce software stack costs.

• Wider user base broadens our feature set.

• Continue to investigate new hardware and software technologies and will make them available to our customers.
Don’t forget

Upcoming 9th dCache Workshop

18 – 20 May 2015
Amsterdam, Science Park
Visit www.dCache.org for details
The END

further reading
www.dCache.org