dCache developments

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Physics at the Terascale (2015-11-18)
INDIGO-DataCloud: cheat sheet

• A Horizon-2020 project
  
  **Approved:** January 2015; **Started:** April 2015; **Ends:** September 2017

• 26 partners (inc. DESY and KIT) from 11 European countries,

• **Budget:** over €11 million

• **Objective:** develop an Open-Source platform for computing and data, deployable on public and private cloud infrastructures.

• Requirements from 11 INDIGO communities.
What is INDIGO-DataCloud

- **Biological and medical science,**
  Biological, molecular and medical imaging, life science research applied to medicine, agriculture, bio-industries and social, structural biology.

- **Social science, arts and humanities,**
  Georeferencing (e.g., of current and historical maps), cultural heritage, smart sensors.

- **Environment and earth science,**
  Biodiversity and ecosystem research, interactions between geosphere, biosphere and hydrosphere, earth system modelling.

- **Physical science,**
  Astrophysics, theoretical and experimental research in physics.
The dCache core team

• The **permanent** effort:
  • 1 FTEs at NeIC,
  • 3 FTEs at DESY,
  • 1.5 FTEs at Fermilab.

• The **project money** effort:
  • 2 FTE LSDMA → 1 FTE in 2016,
  • 4 FTE INDIGO-DataCloud.

**Total:** 11.5 FTE (10.5 from 2016).
## Future: improved media handling

<table>
<thead>
<tr>
<th>Media Quality</th>
<th>Access Latency</th>
<th>Durability</th>
<th>Data rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIGH</td>
<td>OK</td>
<td>OK</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>Reasonable</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td>Not so clear</td>
<td>OK</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
<td>Quite OK</td>
<td>OK</td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
<td>OK</td>
<td>OK</td>
<td>MEDIUM</td>
</tr>
</tbody>
</table>
Making QoS choices meaningful

- **Low latency & lowest price** → Class #1
- **High throughput & super durable** → Class #2
- **Large volume & cheap & archive** → Class #3

Diagram:
- Access Latency / ms
- Durability / P_{data_loss}
- Discover & Match
- VS
- Canonical classes
- GUI
- REST API
Federating QoS Choices
Improved media handling: Data-LC

Data Lifecycle is just time dependent changes of:

- Storage Quality of Service
- Ownership and Access Control: PI Owned, limited access → Site Owned, Public access
- Payment model: pay-as-you-go → pay-in-advance for rest of lifetime
- Maybe other things
{Replica → Resilience} Manager

• Complete redesign

• New features include:
  • Better handling of temporary offline pools,
  • Useful diagnostic information,
  • Supports multiple replication strategy:
    per storage-class, configurable replication & partitioning,
  • Integrated alarm support,
  • Reduced load on dCache:
    Information from PoolManager & namespace, not directly querying pools,
  • Fairness in choosing between foreground or background replication,
  • Configurable policy on internal replication failures.
dCache on Ceph

• The start of support for cluster filesystems: GPFS, Ceph, ... – Ceph is our initial focus.

• Two approaches:
  • **Single pool** per cluster (easier, but less useful),
  • **Multiple pool** per cluster (allows load-balancing, harder to achieve)

• Benefits to dCache:
  • **Data distribution**: delegated to underlying cluster storage,
  • **Integration**: (re-)use existing site storage infrastructure.

• Benefits to cluster storage:
  • **dCache features**: protocols, authentication, tape integration, ...
  • **Future proof**: migrate from storage technology without down-time.

• Plan to demo prototype at ISGC 2016 (March next year)
Summary

• dCache team is strong after recently expanding,
  New project money means more features,
• Resilience manager as replacement for replica manager,
• QoS and Data-Lifecycle places more control in users hands,
• dCache on Ceph coming soon.
Backup slides