IT Forum - Feb. 3rd, 2015

Storage Management at EPFL

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Project Manager, Storage
Outline

• Background
• Objectives
• Approach
• Findings
• Proposed services
• Transition to new services
Background

- NAS-2 end-of-life Q4-2014
  - Needs replacement
- Explosion of produced data
  - More space needed, increasing costs
- New needs appeared
  - LIMS, Research data archival, etc

**Projection de l’évolution des volumes de données pour l’ensemble de la FSV**

Source: Gael Anex, “Présentation Projet Données Recherche”, COSIB, 20.03.2013
Objectives

- Offer a shared storage service for EPFL users at an affordable cost, which considers current and foreseen needs
- Develop an organizational and a financing model for the service
Approach

- Gathering user needs
- Reviewing vendors and best practices
- Procurement of solution (RFP)
- Organizing the service
- Migration and deployment
Timeline

Project phases

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Design</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Users</td>
<td>Gathering User Needs As Is / to Be</td>
<td></td>
</tr>
<tr>
<td>Technology/Technology for deployment</td>
<td>Reviewing Vendors and Best practices</td>
<td>Specifications</td>
</tr>
<tr>
<td>RFP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization and Roadmap for deployment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Steering Committee

- Project initiation
- Status meeting
- Release for next phase
- Validation of specs and release for RFP
- Reception of proposals
- Selection of a solution and release for implementation
- Status meeting
- Q1 2014 Release for beginning of exploitation
Findings

<table>
<thead>
<tr>
<th>Feature</th>
<th>NAS EPFL</th>
<th>NAS schools</th>
<th>Storage @ labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup / snapshots</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Mirroring</td>
<td>●</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IO performance</td>
<td>+++</td>
<td>+++</td>
<td>○</td>
</tr>
<tr>
<td>Homogeneity</td>
<td>●</td>
<td>●</td>
<td>-</td>
</tr>
<tr>
<td>Redundancy (e.g. RAID)</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Shareability</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>External access</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cost</td>
<td>$$$$$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Physical security (data center)</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Access control</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
</tbody>
</table>

- Yes       - No       ○ Depends

NAS @ schools (mainly NetApp)

DIT EPFL (EMC) exp. 12/2014

~100 TB

257 TB

1356 TB

NAS2 apps
NAS2 users (personal/shared)
IC NAS
IC Labs
ENAC NAS
ENAC Labs
SV Nas
STI Labs
SV Labs
SB Labs

Storage @ labs

Genomic data (Vital-IT)
Storage: target

- Bring data to higher quality storage
  - Absorb more volume growth (in EPFL Storage)

• Assumption
  - Yearly net growths
    • Storage @ labs +30%
    • NAS @ schools -50%
    • EPFL Storage +70%
# Acquired Infrastructure (RFP)

<table>
<thead>
<tr>
<th>MA</th>
<th>INJ</th>
</tr>
</thead>
</table>
| NetApp FAS 8040 HA Pair  
Flash cache  
9 shelves (DS4246-24x4TB)  
usable ~600 TB (864 TB raw) | NetApp FAS 8040 HA Pair  
Flash cache  
9 shelves (DS4246-24x4TB)  
usable ~600 TB (864 TB raw) |

*Additional FAS 2254 (2x) acquired under same RFP, used for applications*
Proposed storage services methodology

• In addition to user requirements

• Performed extensive modeling / simulations
  – Growth, TCO, cost splitting, risk exposure, …
  – Evaluated different hypotheses, scenarios and models

• Aim: reduce costs and limit financial risks (subsidies)

• Assessed technical feasibility
## Proposed storage services

<table>
<thead>
<tr>
<th>Features</th>
<th>Collaborative Storage</th>
<th>Home Directories</th>
<th>Online Archive</th>
<th>Raw Storage</th>
<th>SwitchDrive</th>
<th>Switch FileSender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replication</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>-</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Snapshots</td>
<td>●</td>
<td>●</td>
<td>limited</td>
<td>-</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Performance</td>
<td>++++</td>
<td>++++</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>N/A</td>
</tr>
<tr>
<td>Protocols</td>
<td>CIFS, NFS</td>
<td>CIFS, NFS, WebDAV</td>
<td>CIFS, NFS</td>
<td>CIFS, NFS</td>
<td>HTTP, Client, WebDAV</td>
<td>HTTP</td>
</tr>
<tr>
<td>Offered quota</td>
<td>1 TB per lab*</td>
<td>20 GB staff</td>
<td>-</td>
<td>-</td>
<td>25 GB per user</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 GB students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 GB hosts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price (CHF/TB/year)</td>
<td>300.-</td>
<td>Free</td>
<td>200.-</td>
<td>100.-</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Typical use</td>
<td>Collaboration, Active projects</td>
<td>Home directories</td>
<td>Rarely modified data Reference data</td>
<td>Scratch Backup target</td>
<td>Sync and share across devices</td>
<td>Send large files</td>
</tr>
</tbody>
</table>

* Other units can get up to 1TB with a cap at 20 TB
## Proposed storage services

<table>
<thead>
<tr>
<th>Service</th>
<th>Disks</th>
<th>Performance</th>
<th>Snapshots</th>
<th>Replication</th>
<th>Backup</th>
<th>Price CHF / TB.yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>FC 15K</td>
<td>High</td>
<td></td>
<td>●</td>
<td>●</td>
<td>4’178</td>
</tr>
<tr>
<td>Tier 2</td>
<td>FC 10K</td>
<td>High</td>
<td></td>
<td>●</td>
<td>●</td>
<td>2’773</td>
</tr>
<tr>
<td>Tier 3</td>
<td>FC 10K</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td>764</td>
</tr>
<tr>
<td>Tier 4</td>
<td>SATA 5K</td>
<td>Low</td>
<td></td>
<td></td>
<td>●</td>
<td>2271</td>
</tr>
<tr>
<td>Tier 5</td>
<td>SATA 5K</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td>294</td>
</tr>
</tbody>
</table>

### Flat rates for 2013-2014

**Tier 1**: 8'355 CHF/TB  
**Tier 2**: 5'547 CHF/TB  
**Tier 3**: 1'527 CHF/TB  
**Tier 4**: 4'542 CHF/TB  
**Tier 5**: 588 CHF/TB

### Proposed Services

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<tr>
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<th>Disks</th>
<th>Performance</th>
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<th>Backup</th>
<th>Price CHF / TB.yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative NAS</td>
<td>SATA 7K + SSD cache</td>
<td>High</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>300</td>
</tr>
<tr>
<td>Online Archive</td>
<td>SATA 7K + SSD cache</td>
<td>Bounded through QoS</td>
<td>●</td>
<td>○</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Raw</td>
<td>SATA 7K + SSD cache</td>
<td>Bounded through QoS</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
Storage Service Organization

- Storage Infrastructure
  - Operate Infrastructure
  - Delegate management roles (permissions, quotas)
  - Ensure Business Continuity
  - Provisioning

- Storage Administrator
  - Runs service
  - SLA
  - Contact with users

Service Desk/1234
  - Defining governance
  - Planning
  - Tracking costs

Backup
  - Disaster recovery

VPSI
  - Request storage space
  - Pay for service
  - Follow usage reports

Professor (head of lab)
  - Use storage

Use storage service
  - Use storage

Local IT support (lab, group of labs, or school IT)
  - Advice to users
  - Manage quotas/permissions (users/units)
  - Local support
  - Report on usage
  (operational, tactical)

Researcher (lab)
  - Workstations
  - Equipments
Transition to new services

Migration

• In 2-steps

  – From NAS-2 to NAS-3
    • One-to-one
    • Objective: decommissioning NAS2
    • Finished (except mynas => feb’15)

  – Within NAS3
    • Reorganization into new services (decision by owners)
    • With help of IT managers
    • 2Q15 ~ 3Q15
Transition to new services

Operation

• Beta version of storage with select labs (feb-mar’15)

• Finalize services for mar-apr’15
  – New service manager and operation team
  – Provisioning portal (to be integrated in ServiceNow)

Future

– Archive
– Backup of individual machines
Questions

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