EOS Resource Monitor

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Introduction:
- CERN distributed filesystem
- Service for thousands of users
- Currently 1/2 exabyte of space

Management:
- sets limits on resource consumption (quotas)

My project objective:
- Create monitor of quotas and their usage
My project

Motivation:
• Facilitate quota management
• Spot potential issues faster (quota usage, EOS SW, …)

Requirements:
• Customisable monitor
• Applicable to all EOS storage instances
• Mid- to long-term lifetime
• CERN IT support
• Require minimal maintenance

Documentation can be found here.
Framework

Considerations:
- Frontend: Flask, Django, Kibana, Grafana
- Backend: MySQL, EOS storage, ElasticSearch, MetricTank

Selection:
- Best fit to all requirements (CERN IT mid- to long-term support etc.)
- Kibana + ElasticSearch
  (rich settings and features, advanced access control)
- Grafana + MetricTank
  (simpler, easier to maintain)
Dashboard

Two dashboards:
• Current status (last data collection)
• Timelines (any time range)

EOS Resource Monitor

- Monitors current status of limits on file count and space (quotas). Quotas are independently assigned by quota managers per user/group/project.
- Timeline is shown in the separate dashboard.
- New data is released every day.

Definitions
- *quota* (as a limit set) is identified by unique combination of path + size/gid
- *quota node* is a directory path where quota accounting is set. Any number of quotas can be defined as space and/or file count limits for a specific user/group/project. All quotas are independent, e.g., multiple quotas for same path are possible, also /panels/002 can have total quota smaller than quota set for /dsk/da1/002, etc.
- User/group ALL is a summary of all users/groups in the quota node.
- Group/project always has a special quota type preventing other quotas to be set for the same path.
- number of files and bytes are accounted to the nearest quota node as one goes up the path tree

Usage
- You can choose a time window in the top right corner. It should cover only one data point, otherwise the metrics won’t be calculated correctly.
- A filter can be added using “Add filter” button on the top of the dashboard or in the search bar above.
- EOS instances may suffer from quota accounting inconsistencies which can be spotted in this monitor (> used bytes than quota, 0 files but space being used, etc.)

Project documentation with more details and usage examples can be found here.
Dashboard filter

Many possibilities:
- Filter by interactive visualisations
- Custom filter entry
Treemap visualisation

Quota node tree (quotas summed recursively)

standard  simple  tier0
test

Back  Toggle scale
Overview of the quota

<table>
<thead>
<tr>
<th>Total Space Quota</th>
<th>Total Used Space Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.6PB</td>
<td>11.6PB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total File Quota</th>
<th>Total Used File Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>391.2m</td>
<td>67.3m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>File Quota Usage</th>
<th>Space Quota Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>File quota usage</td>
<td>Space quota usage</td>
</tr>
<tr>
<td>17%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Quotas visualisation (example)

Usage of Space Quotas [%] (ordered by quota size)

- /eos/pilot/proc/recycle/, project [p]: 18.15%
- /eos/pilot/opstest/eosquotamon/annal, it [g]: 74.51%
- /eos/pilot/opstest/eosquotamon/dir3, it [g]: 72%
- /eos/pilot/opstest/eosquotamon/dir/, apacanow [u]: 52.93%
- /eos/pilot/cms/tier0/, zh [g]: 0.68%
- /eos/pilot/cms/xcache/simple/, zh [g]: 0.04%

Quota name: /eos/pilot/opstest/eosquotamon/dir/, apacanow [u]
Usage of space quotas: 72%
Max maxlogicalbytes: 1.5GB
Top groups visualisation

Top 10 Groups Using Most Files

- it: 48
- c.3: 9
- cdrom: 4
- adm: 1
- nobody: 0
- root: 0

File quota used
## RAW data table

### All Quotas and Usage Accounting Info

<table>
<thead>
<tr>
<th>Path</th>
<th>ID type</th>
<th>ID</th>
<th>Space quota</th>
<th>Used space quota</th>
<th>File quota</th>
<th>Used file quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>/eos/plotoptest/eosquotamon/anna/</td>
<td>group</td>
<td>adm</td>
<td>0B</td>
<td>1.5kB</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir1</td>
<td>group</td>
<td>adm</td>
<td>0B</td>
<td>2k</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir1</td>
<td>group</td>
<td>ALL</td>
<td>50TB</td>
<td>9.1TB</td>
<td>10m</td>
<td>48.1k</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir2</td>
<td>group</td>
<td>ALL</td>
<td>100TB</td>
<td>683.7GB</td>
<td>1m</td>
<td>615</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir1</td>
<td>group</td>
<td>ALL</td>
<td>0B</td>
<td>1.3GB</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir2</td>
<td>group</td>
<td>ALL</td>
<td>1.2GB</td>
<td>1.1GB</td>
<td>5m</td>
<td>27</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir3</td>
<td>group</td>
<td>ALL</td>
<td>10TB</td>
<td>1.1GB</td>
<td>1m</td>
<td>1</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir3</td>
<td>group</td>
<td>ALL</td>
<td>10GB</td>
<td>745.1MB</td>
<td>2m</td>
<td>11</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/dir4</td>
<td>group</td>
<td>ALL</td>
<td>0B</td>
<td>11.6GB</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>/eos/plotoptest/eosquotamon/anna/</td>
<td>group</td>
<td>c3</td>
<td>0B</td>
<td>1.8MB</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500TB</td>
<td>19.5TB</td>
<td>38m</td>
<td>93.8k</td>
</tr>
</tbody>
</table>
Total quota timeline
QUESTIONS?

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