CMS Subgroups in dCache 2.2

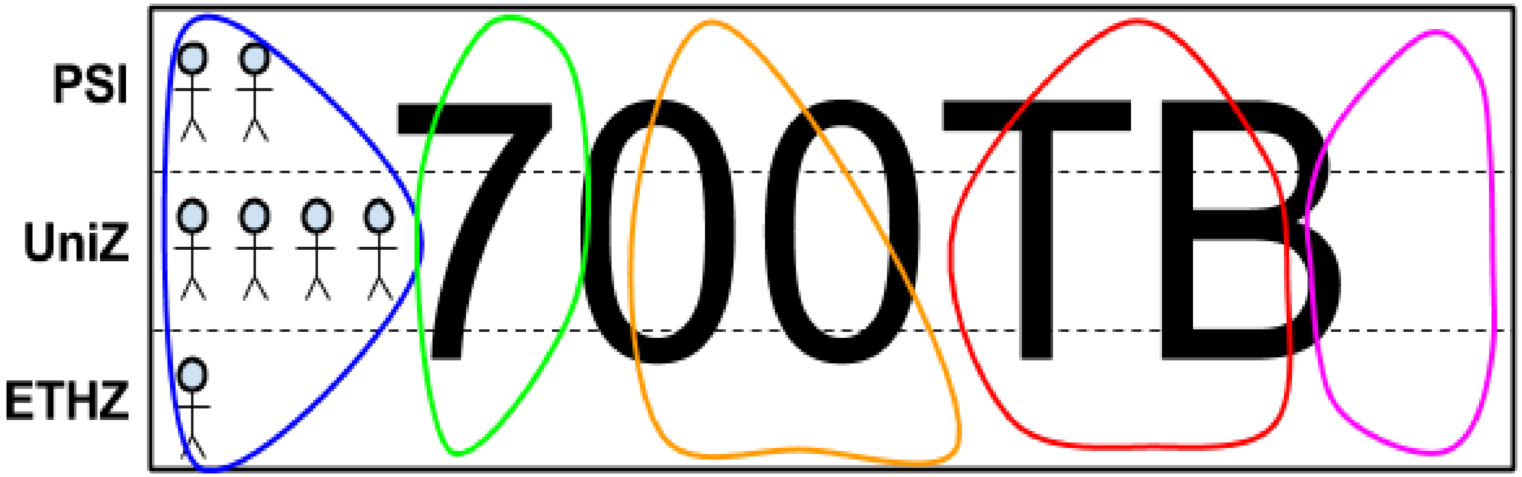
CMS T3 requirements for dCache

• We manage a CMS T3 cluster financed by 3 Swiss Institutes: **PSI**, **UniZ**, **ETHZ** ; during 2013 we will run **700TB net** based on 2*NetApp E5400 + 4*Sun X4500 + 5*Sun X4540 ; Our user requirements for dCache are:

• 50 users perform different CMS analyses, they want to work in **groups** (1 user → 1 group)

• Group files must be readable by other groups, but other groups shall have no permissions for writing/deleting of a group's files; furthermore users want their own private `/pnfs` space.

• They want to prevent the accidental file deletion, monitor the UID/GID space abuse, and make historical UID/GID accounting.



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Compact Muon Solenoid experiment at CERN's LHC

How to prevent the accidental deletion?

- Is the write protection on `/pnfs` so important ? **Yes!**
- Real case, in 2012 a CMS user accidentally deleted 1PB of data from EOSCMS because of a wrong run of a recursive tool + wrong permissions on the dirs.
- Nowadays `uberftp` offers the `-rm -r` option and `srmrmdir` offers the `-recursive` option.
- :-|

From the WLCG Service Report:

Accidental deletion on EOSCMS of 1.6M files (1PB) by an (unprivileged) CMS user;

Several group-writeable areas deleted, only a minor fraction could be recovered;

Permissions tightened, other preventive measures being reviewed.

Our sites are not safe just because we use X509s, VOMS proxies or Space Tokens; luckily we can easily profit from a less naive `/pnfs` permissions assignment.

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How to prevent the accidental deletion?

- Like many WLCG sites we were mapping in gPlazma all the internal and external grid users as the user `cmsuser:cms` + `phedex:cms;` in that way it was impossible to fullfill our requirements.
- We use LDAP to manage users and groups (standard /etc/openldap/schema/nis.schema), with SL5 UIs and WNs configured to use `nss_ldap` and SL6 servers to use the new `nss-pam-ldapd`.
- We decided to create **10 LDAP secondary groups** e.g. **psi-bphys**, **psi-pixel**, **uniz-bphys**, **ethz-higgs**, etc. to partition the 50 users + **5 primary groups for the analyses** + 1 **secondary group cms** to aggregate all the users; we also stored all the users' **X509 DNs** (by a custom /etc/openldap/schema/local.schema); so we can now automatically generate by Python both the files `grid-vorolemap` and `storage-authzdb ; storage-authzdb` can manage a user that belongs to **more than one group**:
- `authorize cmsuser read-write UID GID1,GID2,GID3 / / /`
- According to this new LDAP schema a user has a primary group + 2 secondary groups:
- `$ uid=528(martinelli) gid=533(higgs) groups=533(higgs),520(ethz-higgs),500(cms)`

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How to prevent the accidental deletion?

- `storage-authzdb` generated by Python from our **LDAP** + `storage-authzdb_template` :
- `authorize cmsuserA              read-write   4170   533,520,500   / / /`
- `authorize cmsuserB              read-write   1663   530,510,500   / / /`
- `authorize cmsuserC              read-write   2282   532,515,500   / / /`
- `authorize cmsuser               read-write   501    500       / / /`
- To allow to the internal grid users to work in groups we created **10 group dirs mode `775` owned by root;** `srmcp` will write there new files with mode `664`; `srmmkdir` will create new dirs with mode `775;` only the group members can alter their group dir content, but not the dir itself; both external (user `cmsuser`) and internal grid users can read all the `/pnfs` space.
- `# ls -l /pnfs/psi.ch/cms/trivcat/store/t3groups`
- `drwxrwxr-x 2 root bphys 512 May 13 15:08 bphys`
- `drwxrwxr-x 2 root pixel 512 May 13 15:08 pixel`
- `drwxrwxr-x 2 root higgs 512 May 13 15:08 higgs`

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How to prevent the accidental deletion?

- The users can get protected their **private** CMS `/pnfs` home, both ownership and modes:

```
# ls -l /pnfs/psi.ch/cms/trivcat/store/user
 drwxr-xr-x    2 cmsuserA  bphys 512 Feb 21 11:04 cmsuserA
 drwxr-xr-x    2 cmsuserB  ewk   512 Jan 24 15:53 cmsuserB
 drwxr-xr-x   18 cmsuserC  bphys 512 Jan  5  2010 cmsuserC
```

- Before all the CMS `/pnfs` homes were assigned to the user `cmsuser`, while now a user different from `cmsuserA` will get this error:

```
$ srmrm srm://SE/pnfs/psi.ch/cms/trivcat/store/user/cmsuserA/dir/file
Return code: SRM_FAILURE
Explanation: problem with one or more files:
Permission denied
file#0 : srm://SE/pnfs/psi.ch/cms/trivcat/store/user/cmsuserA/dir/file,
SRM_AUTHORIZATION_FAILURE, "Permission denied"
```

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How to monitor the UID/GID space abuse?

• For us it's important to monitor the group space usage to avoid GIDs that consume too much, so we check the files that belong to a specific GID, wherever they are in `/pnfs`

• Can we use the Explicit, or Implicit, Space Tokens provided by dCache to check the space abuse? We did not manage to do that for several reasons:

• Our quota concept is more a soft quota than an hard quota, we don't want to stop the writes but be aware that a GID is using too much and take actions.

• How to consolidate previously stored `/pnfs` user files into a new group Space Token ?

• We can't have the **users**' **x509 DNs** listed in `LinkGroupAuthorization.conf`, only VOs like `/cms` and its related VO roles.

• Generally speaking Space Tokens are intended to manage VOs, not local VO subgroups.

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How to monitor the UID/GID space abuse?

- So we introduced our group quota model + a related Nagios check:
  - `quota(`**`group`**`)=[TOTAL*(1-PHEDEX-GROUP-SYSTEM)*ACTIVE_USERS(`**`group`**`) / ACTIVE_USERS_TOT] + GROUP_SPECIAL(`**`group`**`)`
- TOTAL = 700TB net for us.
- PHEDEX = fraction of dCache reserved for CMS PhEDEx datasets e.g. 0.5.
- GROUP = the fraction of space reserved for special allocations to groups, e.g. 0.1
- SYSTEM = the fraction of free space the system needs to function properly, e.g. 0.01.
- ACTIVE_USERS(**group**) = the number of **active** users (! `/sbin/nologin`) in that group.
- ACTIVE_USERS_TOT = the total number of **active** users (! `/sbin/nologin`).
- GROUP_SPECIAL(**group**) = a special additional quota assigned to a given group.
- For example: quota(**533**) = 45TB, quota(**530**) = 32TB, quota(**532**) = 18TB, …
- Nagios will run a check that consult both LDAP and Chimera to verify:
  - **usage(/pnfs, group) > quota(group) ?** YES → e-mail to the **group leader**

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How to monitor the UID/GID space abuse?

- To identify the group big dirs the **group leader** could use the `/pnfs` views, functions and CLI that we created inside Postgresql:
- Please consult the following link for the details:
- http://trac.dcache.org/wiki/contributed/NagiosCheckBigDirs
- An example of SQL run:

```
• #  time psql -U nagios -d chimera --command="select * from v_pnfs_du_cmsusers;"
•  pnfs_dir_du
•-------------
•          274 <-- = du -s /pnfs/psi.ch/cms/trivcat/store/user = 274 TB
•  real   2m19.576s
```

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How to create an historical UID/GID /pnfs accounting?

- For us the `/pnfs` files with group **cms** are PhEDEx files or general interest files.
- Because in Chimera the files are now assigned to the 5 primary groups or to the secondary group **cms** it's enough to run a SELECT(group) vs Chimera to get the actual `/pnfs` space usage by that group.
- To store and plot an historical evolution of the `/pnfs` group usage our Nagios quota check returns the `/pnfs` group usage also as performances data:
- `# /opt/nagios/check_quota_pnfs_gid.py -H t3ldap -g 532`

```
 Group 532 /pnfs usage = 29.0TB < 44.7TB = quota(532)|pnfs_usage_gid_532=29.0TB;44.7;;;;
```

- The PNP4Nagios plugin will store the performances data as `.rrd` files and plot them.
- Or we could create a table inside the dCache DBs to store these values.

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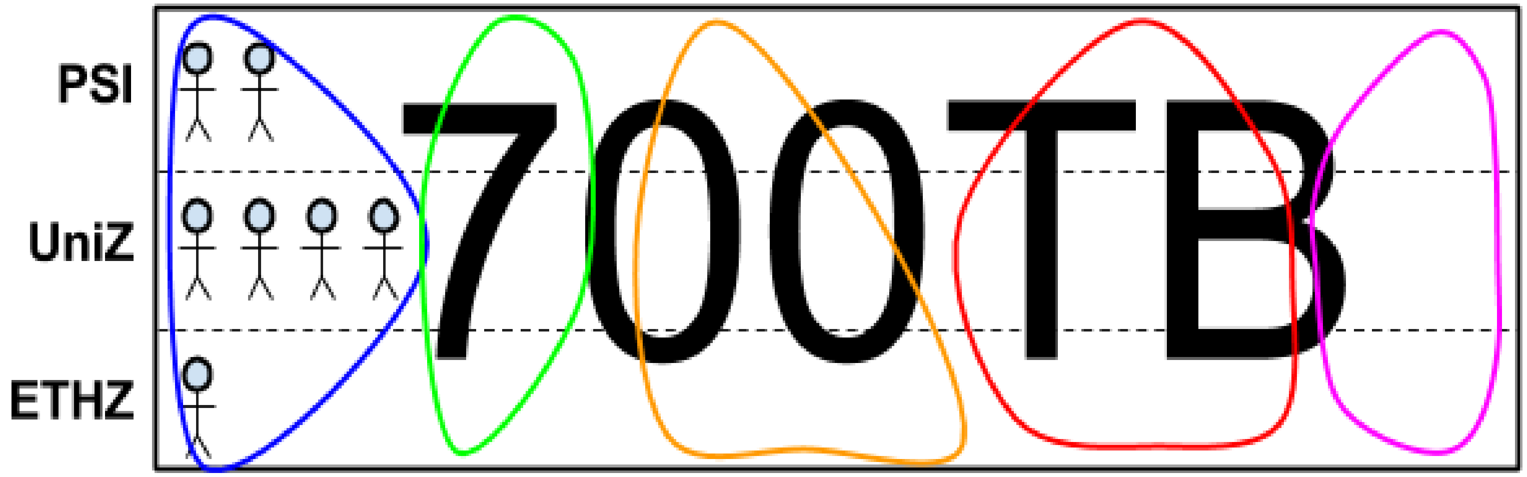
Conclusions

- For our CMS T3 having few `cmsuserX` + one primary group **cms** doesn't model our complex community so we mapped local grid users as LDAP users and introduced 5 primary groups + 10 secondary groups + one secondary group **cms** ; this setup avoids the accidental deletion, allows us to create a group quota system based on active users that we check by Nagios and plot by PNP4Nagios.
- dCache could add a similar `/pnfs` UID/GID accounting table (Billing DB ?).
- If you're interested to replicate the setup just contact us, basically you can recycle all the Python logics and the Nagios check once you have a similar LDAP system at your site.


PSI
UniZ
ETHZ
700TB