dCache 8.2

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FIFE meeting

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dCache releases

- We have been running dCache 7.2 since Oct 2021.
- Current golden release (2 year support) is 8.2.
  - Introduces implementation of new WLCG TAPE REST API.
  - Support of multiple authn/authz schemes in the same xrootd door instance (no need to run separate doors for GSI and tokens).
  - Scaled up and revamped bulk request service.
  - A new TAPE API has been made available for the purposes of bulk staging
  - Addressed issue with group destination directory permissions when using tokens.
- Upgraded to 8.2 on 02/15/2023

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Post upgrade issues - xrootd

- In anticipation of token roll-out the xrootd door has been setup with GSI and token support and TLS required (for token protection).
    - All tests have been made by us using most recent xrootd-client. package available from epel repository (5.5.1)
    - Further tests were done by IFDH folks who seemed to have used similar approach.
    - "Tested for success". All worked well.
- BUT…. Experiments use older version of xrootd-client:
    - Versions older than 4 cannot work with TLS.
    - Versions older than 5.1 cannot work with tokens.
    - Locally built xrootd-client libraries of 5.1 or newer that a part of experiments' software stacks (particularly root) have been built without token support.
- FIX:
    - Reconfigured xrootd door to not enforce TLS. This requires clients who want to use tokens to use (x)roots scheme. That is "s", for secure. Which implies changing many scripts.
    - Since all experiments' software does not work with xrootd using tokens this is considered a reasonable compromise (comparing going back to running different configurations on different ports on the same door hosts.

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Post upgrade issues, xrootd, talking to each other

- We have had a couple of very productive meetings with scisoft team.

- Difficulties of rebuilding frozen releases have been highlighted.

- An understanding has been reached on scope and timeline for token supporting root releases:

  – Releases depending on xrootd-client libraries older than version 5 need to be upgraded.

  – Most recent releases using xrootd-client libraries of version 5.5.1 need to be rebuilt with token support libraries included.

  – Timeline seems to be defined as 1 year.

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Xrootd client version roster

- Just at a random time on a random day

```
64339 xrd.rn=v4.8.0
27136 xrd.rn=v5.1.0
 4115 xrd.rn=v4.5.0
 1144 xrd.rn=v4.8.5
  952 xrd.rn=v4.12.3
   79 xrd.rn=v5.4.2
   41 xrd.rn=v5.5.1
    9 xrd.rn=v5.5.3
    2 xrd.rn=v5.4.0
    1 xrd.rn=v5.5.0
```

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Architectural changes visible to user

- Not related to 8.2 upgrade but an important note:
  - For sometime now we have been running HA door endpoint – fndcadoor.fnal.gov which is HAProxy ™ setup with 3 doors – fndcadoor0[1-3].fnal.gov

  - We advise users to switch from using fndca1.fnal.gov to fndcadoor.fnal.gov for better scalability, load balancing and fault tolerance.

  - Also allows rolling updates with little service disruption.

  - We have no immediate plans to shutdown fndca1.fnal.gov and envision to utilize network alias for backward compatibility.

  - It is my understanding that recent ifdh_config has switched for using fndcadoor.fnal.gov when setting up data transfers.

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WLCG tape API: SRM

- Unlike IF experiment, the LHC experiments have been heavily using SRM to interact with Storage Elements (SE).
- In the nutshell SRM implementations provide:
  - Space management functions.
  - Directory functions.
  - Transfer functions.
  - Elements of data lifecycle (staging, pinning, expunging).
- And it could do above in bulk.
- SRM has been designed and developed in 2003-2006.
  - Implemented as SOAP exchange based Web Service.
    - Requires special client.
  - Non-trivial amount of effort went into ensuring interoperability and protocol clarification.
- Protocol specification is somewhat ambiguous and complex.
- Time to move on having learned the lesson.

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WLCG tape API

- Work on providing "storage portals" have been ongoing in dCache for several years.

- What is storage portal? A web server providing REST API to perform storage management functions.
  - Standard off-the-shelf client – curl.
  - Standard authentication/authorization mechanisms.

- dCache API is described here https://fndcadoor.fnal.gov:3880/api/v1/

- In 7.2 added tape API and bulk request support:
  - https://docs.google.com/document/d/14sdrRmJts5JYBFKSvedKCxT1tcrWtWchR-PJhxdunT8/edit#heading=h.lassqf5agt8x

- We think that ths API will eventually supersede SRM.

- We got CERN WLCG interested in this and within DOMA BDT working group the dCache API has been used as a basis for developing WLCG Tape API Specification:
  - https://docs.google.com/document/d/1Zx_H5dRkQRfju3xIYZ2WgjKoOvmLtsafP2pKGpHqcfY/edit#heading=h.ozszs1lr7q93

- Fully implemented in dCache 8.2

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WLCG tape API: Discovery

```
curl -k https://fndcadoor.fnal.gov:3880/.well-known/wlcg-tape-rest-api
{
    "endpoints": [{
        "metadata": {},
        "uri": "https://fndcadoor.fnal.gov:3880/api/v1/tape",
        "version": "v1"
    }],
    "sitename": "fnal-wlcg-tape-endpoint",
    "description": "Fermilab public dCache WLCG tape REST API"
}
```

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WLCG tape API: Stage Example

```
curl -L --capath /etc/grid-security/certificates
       --cert /tmp/x509up_u`id -u`
       --cacert /tmp/x509up_u`id -u`
       --key  /tmp/x509up_u`id -u`
       -X POST https://fndcadoor.fnal.gov:3880/api/v1/tape/stage
       -H "Content-Type: application/json"
       -d '{"files":
            [{"diskLifetime":"P1D",
              "path":
"/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_1.root"},
             {"diskLifetime":"P1D",
              "path":
"/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_2.root"}]}'
```

Response

```
{
  "requestId" : "66f1814c-0059-448d-b5a6-730e0927a6d8"
}
```

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WLCG tape API: Check status

```
curl -L  --capath /etc/grid-security/certificates
         --cert /tmp/x509up_u`id -u`
         --cacert /tmp/x509up_u`id -u`
         --key  /tmp/x509up_u`id -u`
         -X GET "https://fndcadoor.fnal.gov:3880/api/v1/tape/stage/66f1814c-0059-448d-b5a6-730e0927a6d8"
{
  "id" : "66f1814c-0059-448d-b5a6-730e0927a6d8",
  "createdAt" : 1679024479188,
  "startedAt" : 1679024479216,
  "files" : [ {
    "path" : "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_1.root",
    "startedAt" : 1679024479278,
    "state" : "STARTED"
  }, {
    "path" : "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_2.root",
    "startedAt" : 1679024479301,
    "state" : "STARTED"
  } ]
}
```

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WLCG tape API: Check Request Status

```
curl -L  --capath /etc/grid-security/certificates
         --cert /tmp/x509up_u`id -u`
         --cacert /tmp/x509up_u`id -u`
         --key  /tmp/x509up_u`id -u`
         -X GET "https://fndcadoor.fnal.gov:3880/api/v1/tape/stage/66f1814c-0059-448d-b5a6-730e0927a6d8"
```

```
{
  "id" : "66f1814c-0059-448d-b5a6-730e0927a6d8",
  "createdAt" : 1679024479188,
  "startedAt" : 1679024479216,
  "completedAt" : 1679024840827,
  "files" : [ {
    "path" : "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_1.root",
    "finishedAt" : 1679024840822,
    "startedAt" : 1679024479278,
    "state" : "COMPLETED"
  }, {
    "path" : "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_2.root",
    "finishedAt" : 1679024823790,
    "startedAt" : 1679024479301,
    "state" : "COMPLETED"
  } ]
}
```

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WLCG tape API: Check Archive Status

```
curl —s -L  --capath /etc/grid-security/certificates
        --cert /tmp/x509up_u`id -u`
        --cacert /tmp/x509up_u`id -u`
        --key  /tmp/x509up_u`id -u`
        -X POST https://fndcadoor.fnal.gov:3880/api/v1/tape/archiveinfo
        -H "Content-Type: application/json"
        -d '{"paths":
["/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_1.root",
"/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_2.root"]}'
| jq .
Response
[
  {
    "path": "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_2.root",
    "locality": "DISK_AND_TAPE"
  },
  {
    "path": "/pnfs/fnal.gov/usr/test/litvinse/atom/disk01/g2/dmitri/xist_ttt/xi_1.root",
    "locality": "DISK_AND_TAPE"
  }
]
```

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dCache 8.2 Concluding remarks

- Rolled out WLCG Tape API – try it.
- Have been running stable for a month, looks like a solid release

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