Introduction and Instructions for Exercises

ILDG Hands-on Workshop

July 8, 2025

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- Alternatively, use a container https://gitlab.desy.de/ildg/hands-on/toolkit-image
  See `README` there for instructions

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- Alternatively, use a container https://gitlab.desy.de/ildg/hands-on/toolkit-image
  See `README` there for instructions
- We will focus on these scripts:

```
try-fc      # Access or modify file catalogs
try-mdc     # Access or modify metadata catalogs
try-se      # Access or modify storage elements
try-token   # Get a valid token (needed for write operations and storage access)
try-xml     # Generate or validate config. or ensemble XMLs
```

Hands-on

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try-fc      # Access or modify file catalogs
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try-xml     # Generate or validate config. or ensemble XMLs
```

- See also `SETENV` which lists some commands for adding the current directory into your `$PATH`

Some clarifications regarding the setup of this hands-on

- `try-*` commands are for *demonstration and test purposes*
  - The options available (see them with `-h`) have been chosen to facilitate this hands-on
- Nevertheless, these commands are a good resource for learning the underlying commands for accessing MDCs, FCs, and SEs
  - For example, use `-n` for a "dry-run", i.e. to not take any action other than to echo the command that would be invoked (which is usually a `curl` command)
- A regional grid (RG) has been set up for the purposes of this hands-on. The RG is named `hands-on` and all participants have been added to it

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⚠ Note to **JLDG** users: The workflow for writing data to jldg storage elements is different than what will be demonstrated here

Try reading Metadata Catalog

Command: `try-mdc`

- List all ensembles

```
[koutsou@localhost try-client] % try-mdc -le
[ws_show] 'HASH'
#Check = 'OK'
#Code  = '200 OK'
#Op    = 'GET'
#URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/query?xpath=/markovChain&limit=5000'
result → H[4]:
     limit = 5000
     offset = 0
     result → A[250]:
              mc://hands-on/rqcd/qcdML/ens_001_example
              mc://hands-on/test/cdummy0/pdummy0/edummy1
               ...
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp12450kp12450-16×32
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp12500kp12500-16×32
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp13350kp13350-16×32
     total = 250
status = 'MDC_SUCCESS'
# DONE: 1 sec
```

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#Check = 'OK'
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#Op    = 'GET'
#URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/query?xpath=/markovChain&limit=5000'
result → H[4]:
     limit = 5000
     offset = 0
     result → A[250]:
              mc://hands-on/rqcd/qcdML/ens_001_example
              mc://hands-on/test/cdummy0/pdummy0/edummy1
               ...
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp12450kp12450-16×32
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp12500kp12500-16×32
              mc://ldg/qcdsf/clover_nf2p1/b7p20kp13350kp13350-16×32
     total = 250
status = 'MDC_SUCCESS'
# DONE: 1 sec
```

- These are the ensembles listed under the (default) LDG catalog; Try adding e.g. `-jldg`

Try reading Metadata Catalog

Command: `try-mdc`

- You can also add simplified queries, for example all ensembles with `wilsonTmQuarkAction` and `beta` of 4.05:

```
[koutsou@localhost try-client] % try-mdc -qe 'wilsonTmQuarkAction beta=4.05'
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/query?xpath=/markovChain%5B*//wilsonTmQuarkAction%20and%20*//beta=4.05%5D&
   result -> H[4]:
         limit = 5000
         offset = 0
         result -> A[9]:
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L20T40_k0.15701_mu0.003
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L20T48_k0.15701_mu0.006
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L24T48_k0.15701_mu0.006
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.003
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.006
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.006-2
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.008
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.012
                  mc://ldg/etmc/tmqcd_nf2/tlSym_b4.05_L32T64_k0.15701_mu0.012-2
         total = 9
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

Tokens

Command: `try-token`

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- For this hands-on, a public client has been registered already, and the secret has been shared with you
- The client id is hard-coded in `try-token`. Provide the secret on the command line (either in a file or explicitly as a string):

```
[koutsou@localhost try-client] % OPT_S="storage.read:/public/ storage.read:/ldg/ storage.read:/hands-on/ storage.modify:/hands-on/ metadata.w
[koutsou@localhost try-client] % SECRET="ANfG ... 3uOqE"
[koutsou@localhost try-client] % try-token -v -c "$SECRET" -s "$OPT_S"
[token] Using shared client 1d636a1d-2f8a-41b4-83b6-058ab080af61
 ...
export BEARER_TOKEN=eyJr ... f11nQ
```

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[koutsou@localhost try-client] % try-token -v -c "$SECRET" -s "$OPT_S"
[token] Using shared client 1d636a1d-2f8a-41b4-83b6-058ab080af61
 ...
export BEARER_TOKEN=eyJr ... f11nQ
```

- Copy and paste the last line `export BEARER_TOKEN= ...`

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[koutsou@localhost try-client] % try-token -v -c "$SECRET" -s "$OPT_S"
[token] Using shared client 1d636a1d-2f8a-41b4-83b6-058ab080af61
 ...
export BEARER_TOKEN=eyJr ... f11nQ
```

- Copy and paste the last line `export BEARER_TOKEN= ...`
- The commands that need a token will now read `$BEARER_TOKEN` from your environment

Homework

- Example uses of the `try-*` commands follow
- Feel free to experiment beyond these examples

Colab./group	Participant		Wed.	Thu.
BMW	Finn	Stokes	08:00 UTC	08:00 UTC
CLS	Wolfgang	Soeldner	08:00 UTC	08:00 UTC
	Fernando	Romero-Lop	08:00 UTC	08:00 UTC
ETMC	Jacob	Finkenrath	08:00 UTC	08:00 UTC
	Petros	Dimopulos	08:00 UTC	08:00 UTC
JLDG	Issaku	Kanamori	08:00 UTC	08:00 UTC
	Takeshi	Yamazaki	08:00 UTC	08:00 UTC
FASTSUM	Ryan	Bignell	08:00 UTC	10:00 UTC
	Jon-Ivar	Skullerud	08:00 UTC	10:00 UTC
OpenLat	Anthony	Francis	11:00 UTC	10:00 UTC
QCDSF	Utku	Can	11:00 UTC	10:00 UTC
	Roger	Horsley	11:00 UTC	10:00 UTC
	James	Zanotti	11:00 UTC	10:00 UTC
TELOS	Ed	Bennett	13:00 UTC	10:00 UTC
Intertwin	Tejhas	Kapoor	Unavailable	
CLQCD	Yujiang	Bi	Unavailable	
QCDSF	Hinnerk	Stueben	Unavailable	

Hands-on

Download an ensemble XML and validate it

- List ensembles with `try-mdc -le`
- Download an ensemble XML of an existing ensemble, format it, and write it to a file:

```
[koutsou@localhost try-client] % try-mdc -ge mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060 -fmt -o ens.xml
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble?id=mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060'
   result = '[written to file ens.xml]'
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

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[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble?id=mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060'
   result = '[written to file ens.xml]'
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

- `ens.xml` should be a valid ensemble XML. Confirm with `try-mdc`:

```
[koutsou@localhost try-client] % try-mdc -ve ens.xml
[ws_show] 'HASH'
   #Check = 'OK'
    ...
   result = 'XML is inline with the schema!'
   status = 'MDC_SUCCESS'
# DONE: 0 sec
```

Hands-on

Download an ensemble XML and validate it

- Alternatively, download the *schema* with `try-mdc` and validate it locally with `xmllint`:

```
[koutsou@localhost try-client] % try-mdc -se -o ens.xsd
...
[koutsou@localhost try-client] % xmllint -schema ens.xsd ens.xml -noout
ens.xml validates
```

List and download config XMLs

- We can list and download configuration XMLs, providing the `markovChainURI` as an argument

```
[koutsou@localhost try-client] % try-mdc -lc mc://ldg/etmc/tmqcd_nf2/tlSym_b4.2_L48T96.154073_mu0.002
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/config/query?mcu=mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060&limit
   result → H[4]:
         limit = 5000
         offset = 0
         result → A[1142]:
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0300
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0301
                  ...
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1460
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1461
         total = 1142
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

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```
[koutsou@localhost try-client] % try-mdc -lc mc://ldg/etmc/tmqcd_nf2/tlSym_b4.2_L48T96.154073_mu0.002
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/config/query?mcu=mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060&limit
   result → H[4]:
         limit = 5000
         offset = 0
         result → A[1142]:
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0300
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0301
                  ...
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1460
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1461
         total = 1142
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

- Options for pagination are also available, e.g. use `-<number>` to limit the list to `<number>` configs and `+<offset>` to list starting from `<offset>` config

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   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/config/query?mcu=mc://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060&limit
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                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0300
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.0301
                  ...
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1460
                  lfn://ldg/etmc/tmqcd_nf2/tlSym_b3.8_L20T48_k0.164099_mu0.0060/conf.1461
         total = 1142
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

- Options for pagination are also available, e.g. use `-<number>` to limit the list to `<number>` configs and `+<offset>` to list starting from `<offset>` config
- Option `-0` will just count the configs and not list any files

Hands-on

Generate an ensemble XML and validate it (either by the MDC or locally)

- `try-xml` with a numeric argument generates an example (but valid!) ensemble XML

```
[koutsou@localhost try-client] % try-xml 999 > ens.xml
MCU:  'mc://hands-on/test/cdummy0/pdummy0/edummy999'
```

Hands-on

Generate an ensemble XML and validate it (either by the MDC or locally)

- `try-xml` with a numeric argument generates an example (but valid!) ensemble XML

```
[koutsou@localhost try-client] % try-xml 999 > ens.xml
MCU:  'mc://hands-on/test/cdummy0/pdummy0/edummy999'
```

- `ens.xml` is a valid ensemble XML. Confirm with `try-mdc` (or via `xmllint` using the schema already downloaded):

```
[koutsou@localhost try-client] % try-mdc -ve ens.xml
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'POST'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/validate'
   result = 'XML is inline with the schema!'
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

Hands-on

Listing storage allocations

- List all storage allocations

```
[koutsou@localhost try-client] % try-fc -la
# DONE(WS): 0 sec
    name │ baseUrl                                                                │ baseAca     │ updated                     │
   ──────┼────────────────────────────────────────────────────────────────────────┼─────────────┼─────────────────────────────
    h-ho │ https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/hands-on/    │ /hands-on/  │ 2025-06-24T21:49:28.886319Z │
    j-ho │ https://dcache.fz-juelich.de:2880/pnfs/fz-juelich.de/data/ildg/hands-on/ │ /hands-on/  │ 2025-06-24T21:50:10.157044Z │
    z-ho │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/     │ /hands-on/  │ 2025-06-24T21:39:52.450884Z │
   Total = 3 (limit = 100)
# DONE: 0 sec
```

Hands-on

Listing storage allocations

- List all storage allocations

```
[koutsou@localhost try-client] % try-fc -la
# DONE(WS): 0 sec
    name │ baseUrl                                                          │ baseAca      │ updated                     │
   ──────┼──────────────────────────────────────────────────────────────────┼──────────────┼─────────────────────────────
    h-ho │ https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/hands-on/      │ /hands-on/ │ 2025-06-24T21:49:28.886319Z │
    j-ho │ https://dcache.fz-juelich.de:2880/pnfs/fz-juelich.de/data/ildg/hands-on/ │ /hands-on/ │ 2025-06-24T21:50:10.157044Z │
    z-ho │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/       │ /hands-on/ │ 2025-06-24T21:39:52.450884Z │
   Total = 3 (limit = 100)
# DONE: 0 sec
```

- These correspond to the `hands-on` RG

Hands-on

Listing storage allocations

- List all files under storage allocations `z-ho`:

```
[koutsou@localhost try-client] % try-fc -lsa z-ho
    lfn                                                    │ surl
   ────────────────────────────────────────────────────────┼──────────────────────────────────────────────────────────────────────────────────────
    lfn://hands-on/rqcd/qcdML/ens_001/ens_001_1-100        │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_1     │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_2     │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_3     │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_4     │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_5     │ https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
   Total = 6 (limit = 100)
# DONE: 1 sec
```

Hands-on

Listing storage allocations

- List all files under storage allocations `z-ho`:

```
[koutsou@localhost try-client] % try-fc -lsa z-ho
    lfn                                                   | surl
   ───────────────────────────────────────────────────────+──────────────────────────────────────────────────────────────────────────────────────
    lfn://hands-on/rqcd/qcdML/ens_001/ens_001_1-100       | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_1    | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_2    | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_3    | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_4    | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_5    | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
   Total = 6 (limit = 100)
# DONE: 1 sec
```

- Pagination is also available, e.g. `try-fc -lsa z-ho -0` will just count the files

```
[koutsou@localhost try-client] % try-fc -lsa z-ho -0
 ──────────────────────────────────────────────────────────────────────────────────────────

   Total = 6 (limit = 0)
# DONE: 1 sec
```

Hands-on

Listing storage allocations

- Get the storage URL of one of the files, say `config_1`:

```
[koutsou@localhost try-client] % try-fc -ll lfn://hands-on/rqcd/qcdML/ens_001_example/config_1
    lfn                                                  | surl
   ------------------------------------------------------+--------------------------------------------------------------------------------------
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_1 | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
   Total = 1 (limit = 100)
# DONE: 1 sec
```

Hands-on

Listing storage allocations

- Get the storage URL of one of the files, say `config_1`:

```
[koutsou@localhost try-client] % try-fc -ll lfn://hands-on/rqcd/qcdML/ens_001_example/config_1
    lfn                                                      | surl
   ----------------------------------------------------------+--------------------------------------------------------------------------------------------
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_1 | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
   Total = 1 (limit = 100)
# DONE: 1 sec
```

- Some logical files may have more than one SURL. E.g. a recently uploaded CLS ensemble

```
[koutsou@localhost try-client] % try-fc -ll lfn://ldg/cls/nf21/D200r000/D200r000n9
    lfn                                      | surl
   ------------------------------------------+--------------------------------------------------------------------------------------------
    lfn://ldg/cls/nf21/D200r000/D200r000n9 | https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/ldg/cls/nf21/D200r000/D200r000n9.lime
    lfn://ldg/cls/nf21/D200r000/D200r000n9 | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/ldg/cls/nf21/D200r000/D200r000n9.lime
   Total = 2 (limit = 100)
# DONE: 1 sec
```

Hands-on

Listing storage allocations

- Get the storage URL of one of the files, say `config_1`:

```
[koutsou@localhost try-client] % try-fc -ll lfn://hands-on/rqcd/qcdML/ens_001_example/config_1
    lfn                                                 | surl
   ─────────────────────────────────────────────────────+──────────────────────────────────────────────────────────────────────────
    lfn://hands-on/rqcd/qcdML/ens_001_example/config_1 | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/hands-on/rqcd/qcdM
   Total = 1 (limit = 100)
# DONE: 1 sec
```

- Some logical files may have more than one SURL. E.g. a recently uploaded CLS ensemble

```
[koutsou@localhost try-client] % try-fc -ll lfn://ldg/cls/nf21/D200r000/D200r000n9
    lfn                                     | surl
   ─────────────────────────────────────────+────────────────────────────────────────────────────────────────────────────────────
    lfn://ldg/cls/nf21/D200r000/D200r000n9 | https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/ldg/cls/nf21/D200r000/D200r000n9.lime
    lfn://ldg/cls/nf21/D200r000/D200r000n9 | https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/ldg/cls/nf21/D200r000/D200r000n9.lime
   Total = 2 (limit = 100)
# DONE: 1 sec
```

- To download or list files on a storage element, you'll need the bearer token, e.g.:

```
[koutsou@localhost try-client] % try-se -get https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/ldg/cls/nf21/D200r000/D200r000n9.lime
ERROR: Invalid token (BAD_TOKEN_ENV BEARER_TOKEN)
```

Hands-on

Other things to try:

- `try-mdc -o config.xml -fmt -gc lfn://<lfn>` : get configuration XML, format it, write it to `config.xml`
- `try-mdc -vc config.xml` : check whether `config.xml` is a valid configuration XML
- Some useful links for navigating, listing, or searching metadata
  - Simple listings: https://www-zeuthen.desy.de/ape-cgi-bin/ildg-mdc.cgi
  - Listing with search: https://mdc.zam.kfa-juelich.de/
  - API: https://idefix-vm11.zeuthen.desy.de/ildg/mdc/swagger-ui/index.html#/

Hands-on

- For the following, make sure you have a token. As shown in an earlier slide:

```
[koutsou@localhost try-client] % OPT_S="storage.read:/public/ storage.read:/ldg/ storage.read:/hands-on/ storage.modify:/hands-on/ metadata.w
[koutsou@localhost try-client] % SECRET="ANfG ... 3uOqE"
[koutsou@localhost try-client] % try-token -v -c "$SECRET" -s "$OPT_S"
[token] Using shared client 1d636a1d-2f8a-41b4-83b6-058ab080af61
...
export BEARER_TOKEN=eyJr ... f11nQ
```

Hands-on

- For the following, make sure you have a token. As shown in an earlier slide:

```
[koutsou@localhost try-client] % OPT_S="storage.read:/public/ storage.read:/ldg/ storage.read:/hands-on/ storage.modify:/hands-on/ metadata.w
[koutsou@localhost try-client] % SECRET="ANfG ... 3uOqE"
[koutsou@localhost try-client] % try-token -v -c "$SECRET" -s "$OPT_S"
[token] Using shared client 1d636a1d-2f8a-41b4-83b6-058ab080af61
...
export BEARER_TOKEN=eyJr ... f11nQ
```

- `try-token` with no arguments will print some info if `BEARER_TOKEN` is set correctly

- In particular, note the scope:

```
[koutsou@localhost try-client] % try-token
[token] Using environment variable BEARER_TOKEN
    ...
    "scope"     :       metadata.write:/hands-on/
                        storage.modify:/hands-on/
                        storage.read:/hands-on/
                        storage.read:/ldg/
                        storage.read:/public/
```

Hands-on

Add an ensemble to the metadata catalog (MDC)

- First, create a simple ensemble XML (same as in a previous slide)
  ⇒ We will use `try-mdc` with a MC URI as argument. Put something unique instead of "999":

```
[koutsou@localhost try-client] % try-xml mc://hands-on/homework/ens999 > ens.xml
```

Hands-on

Add an ensemble to the metadata catalog (MDC)

- First, create a simple ensemble XML (same as in a previous slide)
  ⇒ We will use `try-mdc` with a MC URI as argument. Put something unique instead of "999":

```
[koutsou@localhost try-client] % try-xml mc://hands-on/homework/ens999 > ens.xml
```

- Conventions for naming of URIs (e.g. `mc://`, `lfn://`, etc.) are detailed in `ildg/hands-on/Material/howto/HOWTO-identifier.md` on the gitlab.

Add an ensemble to the metadata catalog (MDC)

- Now insert it onto the Metadata Catalog (MDC):

```
[koutsou@localhost try-client] % try-mdc -ie ens.xml
[token] Using environment variable BEARER_TOKEN
──────────────────────────────────────────────────────────────────────────────────────────
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'POST'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/insert'
   result → H[5]:
         id = 'mc://hands-on/homework/ens999'
         aca = 'hands-on/homework/ens999'
         created = '2025-07-01T14:13:48.232354Z'
         updated = '2025-07-01T14:13:48.232354Z'
         xml = '<markovChain xmlns=" ... "> ... </markovChain>'
         status = 'MDC_SUCCESS'
# DONE: 1 sec
```

Add an ensemble to the metadata catalog (MDC)

- Now insert it onto the Metadata Catalog (MDC):

```
[koutsou@localhost try-client] % try-mdc -ie ens.xml
[token] Using environment variable BEARER_TOKEN
──────────────────────────────────────────────────────────────────────────────────────
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'POST'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/ensemble/insert'
   result → H[5]:
         id = 'mc://hands-on/homework/ens999'
         aca = 'hands-on/homework/ens999'
         created = '2025-07-01T14:13:48.232354Z'
         updated = '2025-07-01T14:13:48.232354Z'
         xml = '<markovChain xmlns=" ... "> ... </markovChain>'
         status = 'MDC_SUCCESS'
# DONE: 1 sec
```

Remember, the MC URI must be unique! So *randomize the URI* (e.g. change `999` to something else) to avoid an error (`BAD_REQUEST`) when there is a conflict with the URI uploaded by another participant

Add an ensemble to the metadata catalog (MDC)

- You should be able to see the ensemble inserted using `try-mdc -le`:

```
[koutsou@localhost try-client] % try-mdc -le
[ws_show] 'HASH'
   #Check = 'OK'
    ...
   result → H[4]:
          limit = 5000
          offset = 0
          result → A[251]:
                   mc://hands-on/homework/ens999
                   mc://hands-on/rqcd/qcdML/ens_001_example
                   mc://hands-on/test/cdummy0/pdummy0/edummy1
                    ...
                   mc://ldg/qcdsf/clover_nf2p1/b7p20kp12500kp12500-16×32
                   mc://ldg/qcdsf/clover_nf2p1/b7p20kp13350kp13350-16×32
          total = 251
   status = 'MDC_SUCCESS'
# DONE: 0 sec
```

Add a configuration XML

- Use `try-mdc -c` to generate an example configuration XML. You can explicitly specify the identifiers (i.e. `mc://` and `lfn://`)

```
[koutsou@localhost try-client] % try-xml mc://hands-on/homework/ens999 lfn://hands-on/homework/ens999/cfg123 > cfg.xml
MCU:  'mc://hands-on/homework/ens999'
LFN: 'lfn://hands-on/homework/ens999/cfg123'
```

Hands-on

Add a configuration XML

- Use `try-mdc -c` to generate an example configuration XML. You can explicitly specify the identifiers (i.e. `mc://` and `lfn://`)

```
[koutsou@localhost try-client] % try-xml mc://hands-on/homework/ens999 lfn://hands-on/homework/ens999/cfg123 > cfg.xml
MCU:  'mc://hands-on/homework/ens999'
LFN: 'lfn://hands-on/homework/ens999/cfg123'
```

- You can validate this config. XML with `try-mdc -vc cfg.xml`

Hands-on

Add a configuration XML

- Use `try-mdc -c` to generate an example configuration XML. You can explicitly specify the identifiers (i.e. `mc://` and `lfn://`)

```
[koutsou@localhost try-client] % try-xml mc://hands-on/homework/ens999 lfn://hands-on/homework/ens999/cfg123 > cfg.xml
MCU:  'mc://hands-on/homework/ens999'
LFN: 'lfn://hands-on/homework/ens999/cfg123'
```

- You can validate this config. XML with `try-mdc -vc cfg.xml`
- You can download the config. XML schema with `try-mdc -sc ...` and validate it locally

Hands-on

- Now insert the configuration XML to the catalog:

```
[koutsou@localhost try-client] % try-mdc -ic cfg.xml
[token] Using environment variable BEARER_TOKEN
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
    ...
         updated = '2025-07-01T14:54:54.836254Z'
         xml = '<gaugeConfiguration xmlns="..."><dataLFN>...</gaugeConfiguration>'
   status = 'MDC_SUCCESS'
# DONE: 0 sec
```

Hands-on

- Now insert the configuration XML to the catalog:

```
[koutsou@localhost try-client] % try-mdc -ic cfg.xml
[token] Using environment variable BEARER_TOKEN
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
    ...
         updated = '2025-07-01T14:54:54.836254Z'
         xml = '<gaugeConfiguration xmlns=" ... "><dataLFN> ... </gaugeConfiguration>'
   status = 'MDC_SUCCESS'
# DONE: 0 sec
```

- And list the config. XMLs under `mc://hands-on/homework/ens999` :

```
[koutsou@localhost try-client] % try-mdc -lc mc://hands-on/homework/ens999
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'GET'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/mdc/config/query?mcu=mc://hands-on/homework/ens999&limit=5000'
   result → H[4]:
         limit = 5000
         offset = 0
         result → A[1]:
                  lfn://hands-on/homework/ens999/cfg123
         total = 1
   status = 'MDC_SUCCESS'
# DONE: 1 sec
```

Hands-on

Accessing storage elements

- So far, we have only added metadata. No actual *data* have been uploaded

Hands-on

Accessing storage elements

- So far, we have only added metadata. No actual *data* have been uploaded
- For adding data, we need to identify a Storage Element (SE)

Hands-on

Accessing storage elements

- So far, we have only added metadata. No actual *data* have been uploaded
- For adding data, we need to identify a Storage Element (SE)
- List base URLs of some known SEs

```
[koutsou@localhost try-client] % try-se -gu

Base URLs:
   JLDG    http://www2.jldg.org/Config/
   LDG_C   https://xfer-archive.cr.cnaf.infn.it:8443/ildg/
   LDG_H   https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/
   LDG_J   https://dcache.fz-juelich.de:2880/pnfs/fz-juelich.de/data/ildg/
   LDG_Z   https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/
```

Hands-on

Accessing storage elements

- So far, we have only added metadata. No actual *data* have been uploaded
- For adding data, we need to identify a Storage Element (SE)
- List base URLs of some known SEs

```
[koutsou@localhost try-client] % try-se -gu

Base URLs:
   JLDG    http://www2.jldg.org/Config/
   LDG_C   https://xfer-archive.cr.cnaf.infn.it:8443/ildg/
   LDG_H   https://dcache-desy-webdav.desy.de:2880/pnfs/desy.de/ildg/
   LDG_J   https://dcache.fz-juelich.de:2880/pnfs/fz-juelich.de/data/ildg/
   LDG_Z   https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/
```

- We will use `LDG_Z`. Set it as a variable in your shell, e.g.:

```
[koutsou@localhost try-client] % export LDG_Z=https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/
```

Accessing storage elements

- Now create a file to stand in as our "data", e.g.:

```
[koutsou@localhost try-client] % echo "Some data generated on `date` by `whoami`" > data.txt
```

Accessing storage elements

- Now create a file to stand in as our "data", e.g.:

```
[koutsou@localhost try-client] % echo "Some data generated on `date` by `whoami`" > data.txt
```

- And upload to the storage element, using a URI that matches the `lfn://` from before:

```
[koutsou@localhost try-client] % try-se -put data.txt $LDG_Z/hands-on/homework/ens999/cfg123
OK (201 Created) 1 sec put to https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg//hands-on/homework/ens999/cfg123
```

Accessing storage elements

- Now create a file to stand in as our "data", e.g.:

```
[koutsou@localhost try-client] % echo "Some data generated on `date` by `whoami`" > data.txt
```

- And upload to the storage element, using a URI that matches the `lfn://` from before:

```
[koutsou@localhost try-client] % try-se -put data.txt $LDG_Z/hands-on/homework/ens999/cfg123
OK (201 Created) 1 sec put to https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg//hands-on/homework/ens999/cfg123
```

Note that this is not strictly inline with the VO Policy of ILDG

✗ The file we generated and are uploading does not comply with the ILDG file format
✗ Storage resources need to be provisioned and allocated by the RG

Accessing storage elements

- You can now list the file *by its SURL*, but not *by its LFN*:

```
koutsou@localhost try-client] % try-se -list $LDG_Z/hands-on/homework/ens999/cfg123
cfg123
```

Accessing storage elements

- You can now list the file *by its SURL*, but not *by its LFN*:

```
koutsou@localhost try-client] % try-se -list $LDG_Z/hands-on/homework/ens999/cfg123
cfg123
```

```
koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123
ERROR [get_surl_list] No SURL for lfn://hands-on/homework/ens999/cfg123
```

Accessing storage elements

- You can now list the file *by its SURL*, but not *by its LFN*:

```
koutsou@localhost try-client] % try-se -list $LDG_Z/hands-on/homework/ens999/cfg123
cfg123
```

```
koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123
ERROR [get_surl_list] No SURL for lfn://hands-on/homework/ens999/cfg123
```

- This is because the LFN and SURL have not been inserted into the file catalog (FC)

Relating LFNs with SURLs on the file catalog

- Insert the LFN — SURL pair on the file catalog

```
koutsou@localhost try-client] % try-fc -i lfn://hands-on/homework/ens999/cfg123 $LDG_Z/hands-on/homework/ens999/cfg123
──────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
[token] Using environment variable BEARER_TOKEN
[ws_show] 'HASH'
   #Check = 'OK'
   #Code  = '200 OK'
   #Op    = 'POST'
   #URL   = 'https://idefix-vm10.zeuthen.desy.de/ildg/fc/insert'
   result → A[1]:
      HASH = {
         id = 727907958339113572
         created = '2025-07-01T15:26:21.144041Z'
         lfn = 'lfn://hands-on/homework/ens999/cfg123'
         surl = 'https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123'
      }
   status = 'SUCCESS'
# DONE: 1 sec
```

Relating LFNs with SURLs on the file catalog

- Now you should be able to list and download the file by its LFN

```
[koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123
cfg123
```

Relating LFNs with SURLs on the file catalog

- Now you should be able to list and download the file by its LFN

```
[koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123
cfg123
```

- Note the option `-lol`, i.e. "list online"

```
[koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123 -lol
SURL: https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
──────────────────────────────────────────────────────────────────────────────────────────────
                64   05 Jul 2025 19:25:43  cfg123                                   ONLINE
```

Relating LFNs with SURLs on the file catalog

- Now you should be able to list and download the file by its LFN

```
[koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123
cfg123
```

- Note the option `-lol`, i.e. "list online"

```
[koutsou@localhost try-client] % try-se -list lfn://hands-on/homework/ens999/cfg123 -lol
SURL: https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
──────────────────────────────────────────────────────────────────────────────────────────────
                64   05 Jul 2025 19:25:43  cfg123                                    ONLINE
```

- `NEARLINE` instead of `ONLINE` would indicate the file is on tape. If you try to download a file which is `NEARLINE`, you may need to wait until it's retrieved from tape first

Hands-on

- Download our test file from the SE (remove the local file first)

```
[koutsou@localhost try-client] % rm -f cfg123
[koutsou@localhost try-client] % try-se -get lfn://hands-on/homework/ens999/cfg123
_____________________________________________________________________________
OK (200 OK) 2 sec get from https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
-rw-r--r--@ 1 koutsou  staff  64 Jul  1 18:28 cfg123
```

Hands-on

- Download our test file from the SE (remove the local file first)

```
[koutsou@localhost try-client] % rm -f cfg123
[koutsou@localhost try-client] % try-se -get lfn://hands-on/homework/ens999/cfg123
_____________________________________________________________________________
OK (200 OK) 2 sec get from https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
-rw-r--r--@ 1 koutsou  staff  64 Jul  1 18:28 cfg123
```

- And it should contain the text we inserted a few minutes ago:

```
[koutsou@localhost try-client] % cat cfg123
Some data generated on Tue Jul  1 18:08:37 EEST 2025 by koutsou
```

Cleaning up

If you would like to clean up, be careful! All participants of this workshop have the same access permissions

Cleaning up

If you would like to clean up, be careful! All participants of this workshop have the same access permissions

- Remove the ensemble and config XMLs from the metadata catalog

```
try-mdc -de mc://hands-on/homework/ens999
try-mdc -dc lfn://hands-on/homework/ens999/cfg123
```

Cleaning up

If you would like to clean up, be careful! All participants of this workshop have the same access permissions

- Remove the ensemble and config XMLs from the metadata catalog

```
try-mdc -de mc://hands-on/homework/ens999
try-mdc -dc lfn://hands-on/homework/ens999/cfg123
```

- Remove the entry from the file catalog

```
try-fc -d lfn://hands-on/homework/ens999/cfg123  https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
```

Cleaning up

If you would like to clean up, be careful! All participants of this workshop have the same access permissions

- Remove the ensemble and config XMLs from the metadata catalog

```
try-mdc -de mc://hands-on/homework/ens999
try-mdc -dc lfn://hands-on/homework/ens999/cfg123
```

- Remove the entry from the file catalog

```
try-fc -d lfn://hands-on/homework/ens999/cfg123  https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
```

- Remove the file from the storage element

```
try-se -delete  https://globe-door.ifh.de:2880/pnfs/ifh.de/acs/grid/ildg/hands-on/homework/ens999/cfg123
```

Hands-on

To summarize, the workflow we followed for adding an ensemble and configs included:

Hands-on

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- Relating *data* with *metadata*
  - The configuration storage URL and its logical filename were related by inserting the pair as an entry on the file catalog

What next?

- See: ildg/hands-on/material/exercises/ex0.md on the gitlab
  - Examples of websites that provide listings of the MDC content
  - Examples of some lower-level communications with the MDC and FC e.g. via `wget` and `curl`
  - Introduction to XPath queries
- See: ildg/hands-on/material/exercises/ex1-binary.md on the gitlab
  - Tools for inspecting LIME files
  - Checking whether a file is ILDG-compliant, checksums, etc.
  - Packing and unpacking files