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How to use the "gen3" butler

Hands-on session

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Documentation is available here: https://doc.lsst.eu/tutorial/butler.html

The **butler** provides an abstracted data access interface
- data backbone of the DM stack
- link between a set of metadata and the actual data location on the storage system
- 3rd butler generation → **gen3**

gen3 comes together with some workflow management tools
- Tasks are described by DAGs (Directed Acyclic Graphs)
  - **QuantumGraphs** in the DM jargon

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A butler repository includes two major components:

1. **data store:** a location where the datasets of your repository are physically located
   - directory on a POSIX file system ⇐ *this demo*
   - S3 bucket
   - …
2. **registry database:** a database which records information about the contents of the data store.
   - postgreSQL database
   - simple SQLite database ⇐ *this demo*

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```
cd /sps/lsst/users/boutigny
mkdir gen3-demo-1
cd gen3-demo-1
export REPO=/sps/lsst/users/boutigny/gen3-demo-1

source /cvmfs/sw.lsst.eu/linux-x86_64/lsst_distrib/w_2022_18/loadLSST.bash
setup lsst_distrib

butler create $REPO
```

```
cca004[0] ls
butler.yaml  gen3.sqlite3
```

```
butler register-instrument $REPO 'lsst.obs.lsst.Latiss'
```

'lsst.obs.lsst.Latiss' : auxTel
'lsst.obs.lsst.LsstCam' : focal plane

We are now going to ingest some auxTel data that Sylvie imported from NCSA
They are located in **/sps/lsst/groups/auxtel/data/raw_ncsa**

```
butler ingest-raws --transfer symlink -j 8 $REPO /sps/lsst/groups/auxtel/data/raw_ncsa/2021-07-07/20210707003*
```

"--transfer symlink" will create symlink under LATISS/raw !
"--transfer direct" will register directly the files with their original path name
"-- transfert copy" will make a copy

We then need to load some calibration data (bias, dark, defect, flat)
Those have been extracted from the NCSA gen3 repository and copied at CC-IN2P3. They are in:
/sps/lsst/users/boutigny/auxtel-gen3/import-calibs/

```
export CALIB=/sps/lsst/users/boutigny/auxtel-gen3/import-calibs/
butler import --transfer copy --export-file $CALIB/export.yaml $REPO $CALIB -s instrument -s detector -s physical_filter
```

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We can check that the import went well with the "butler query-collections" command:

```
butler query-collections $REPO 'LATISS/*' --chains=TREE

        Name                                        Type
-----------------------------------------     -----------
LATISS/calib                                  CHAINED
  LATISS/calib/DM-33875                       CALIBRATION
  u/czw/DM-28920/calib/bias.20210720          CALIBRATION
  u/czw/DM-28920/calib/dark.20210720a         CALIBRATION
  u/calib/DM-32209-20211013a-g                CALIBRATION
  u/calib/DM-32209-20211013a-felh             CALIBRATION
  u/czw/DM-28920/calib/flat.20210720          CALIBRATION
  u/czw/DM-28920/calib/defect.20210720a       CALIBRATION
  LATISS/calib/DM-28636                       CALIBRATION
  LATISS/calib/DM-28636/unbounded             RUN
LATISS/calib/DM-28636                         CALIBRATION
LATISS/calib/DM-28636/curated/19700101T000000Z  RUN
LATISS/calib/DM-28636/curated/20180101T000000Z  RUN
LATISS/calib/DM-28636/unbounded               RUN
LATISS/calib/DM-33875                         CALIBRATION
LATISS/raw/all                                RUN
```

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Reference catalogs

Reference catalogs are used in astrometry and photometry calibrations

Doc is here:
https://pipelines.lsst.io/v/weekly/modules/lsst.meas.algorithms/creating-a-reference-catalog.html

The old gen2 reference catalogs need to be converted to ecsv files (see)
I have converted some of them in: **/sps/lsst/users/boutigny/auxtel-gen3**

```
cd /sps/lsst/users/boutigny/auxtel-gen3
ls *.ecsv
gaia.ecsv  gaia_dr2_20191105.ecsv  pan-starrs.ecsv
```

```
export REF=/sps/lsst/users/boutigny/auxtel-gen3
butler register-dataset-type $REPO gaia_dr2_20191105  SimpleCatalog htm7
butler ingest-files -t direct $REPO gaia_dr2_20191105 refcats $REF/gaia_dr2_20191105.ecsv
```

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How to access to this butler ?

See notebook in: https://github.com/boutigny/Demos

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