EIC Rucio Schema

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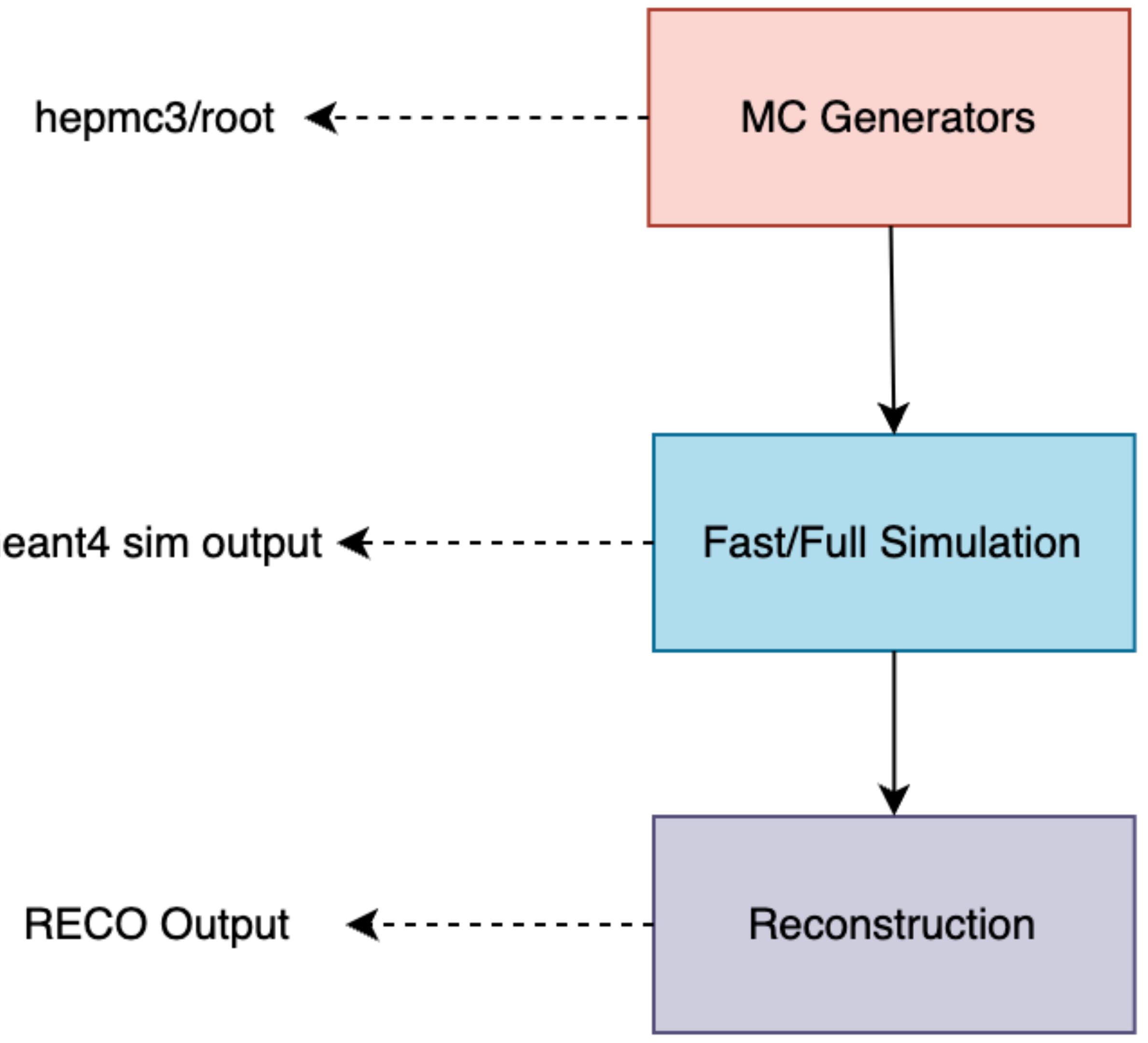
Feb 19, 2024

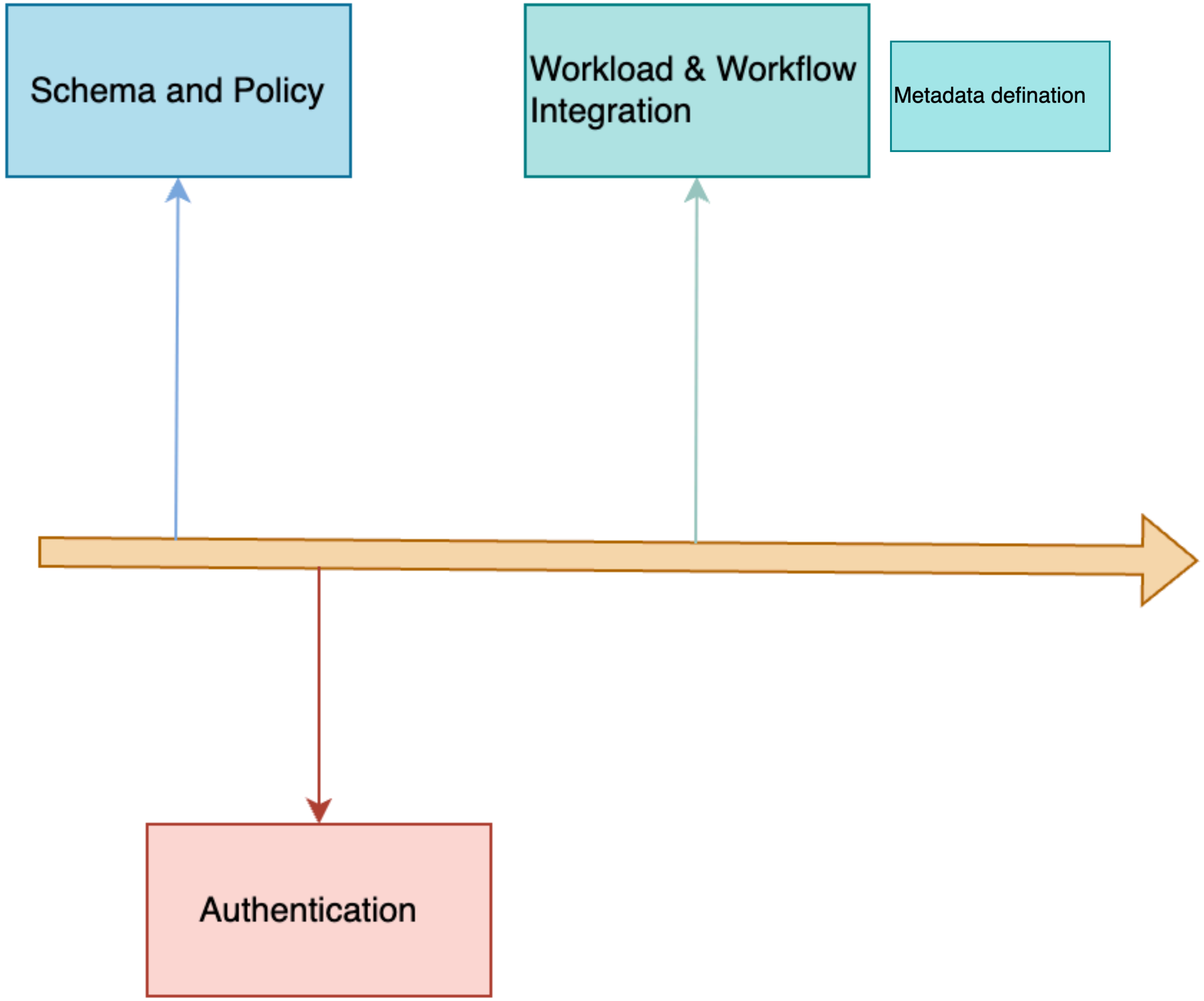
Current MC structure

- Three file type to register to storage:
  - Output of MC generator
  - Geant4 Simulation output.
  - Reconstruction output.

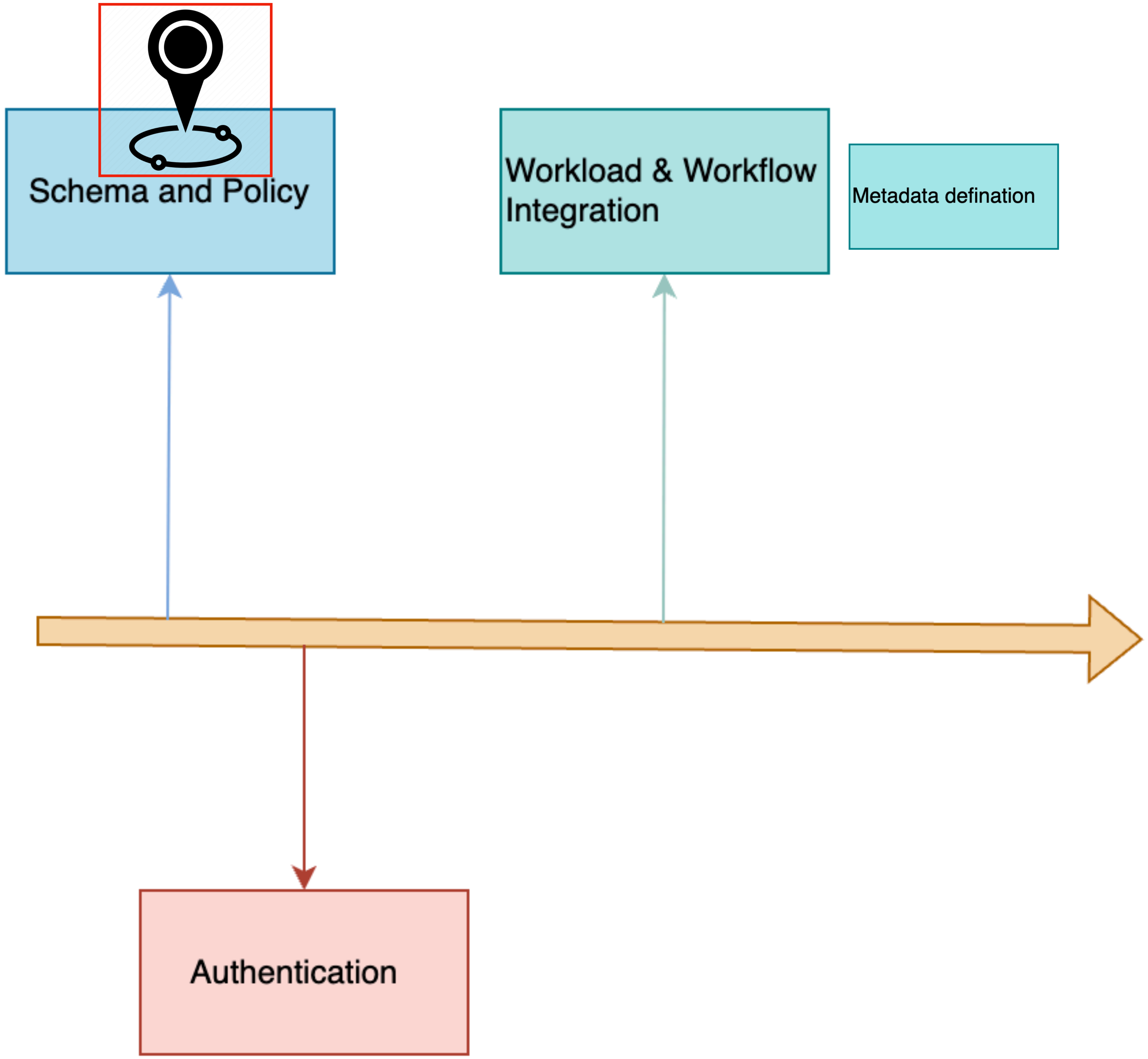
```
EVGEN  /<physics processes>/<generator release tag if available>/<electron momentum>x<proton momentum>/<q2 range>/
FULL  /<campaign tag>/<detector config>/<physics processes>/<generator release tag if available>/<electron momentum>x<proton momentum>/<q2 range>/
RECO  /<campaign tag>/<detector config>/<physics processes>/<generator release tag if available>/<electron momentum>x<proton momentum>/<q2 range>/
```



Things to do:


Schema and Policy
Workload & Workflow Integration
Metadata defination
Authentication

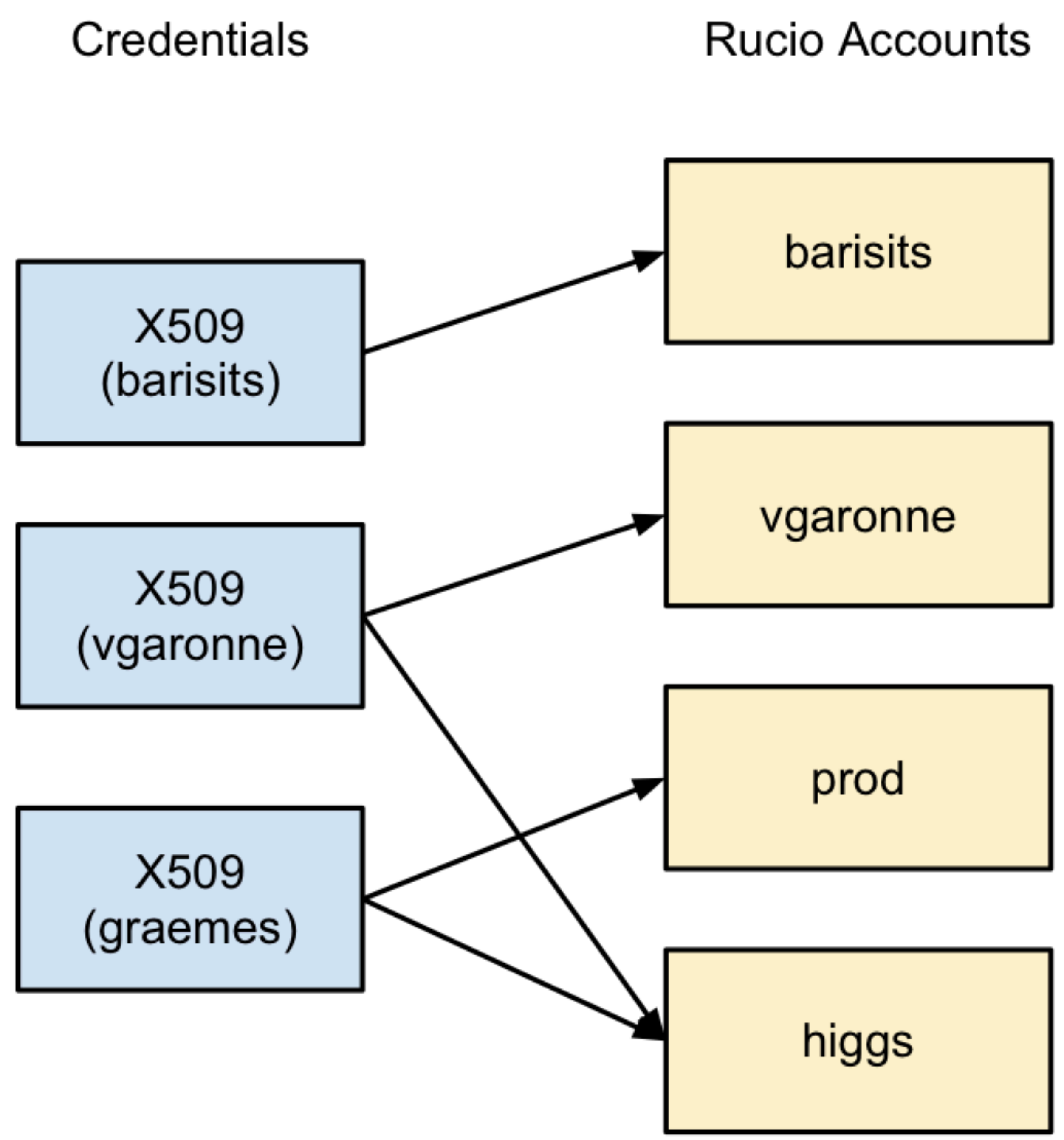
Things to do:


Schema and Policy
Workload & Workflow Integration
Metadata defination
Authentication

Account

- Two types:
  - User account : for each user
  - Group account : for central activity

- Rucio user = "account" + "identity" (N:M mapping)
- "account" = nickname
- "identity" = specification of authentication type + user identifier

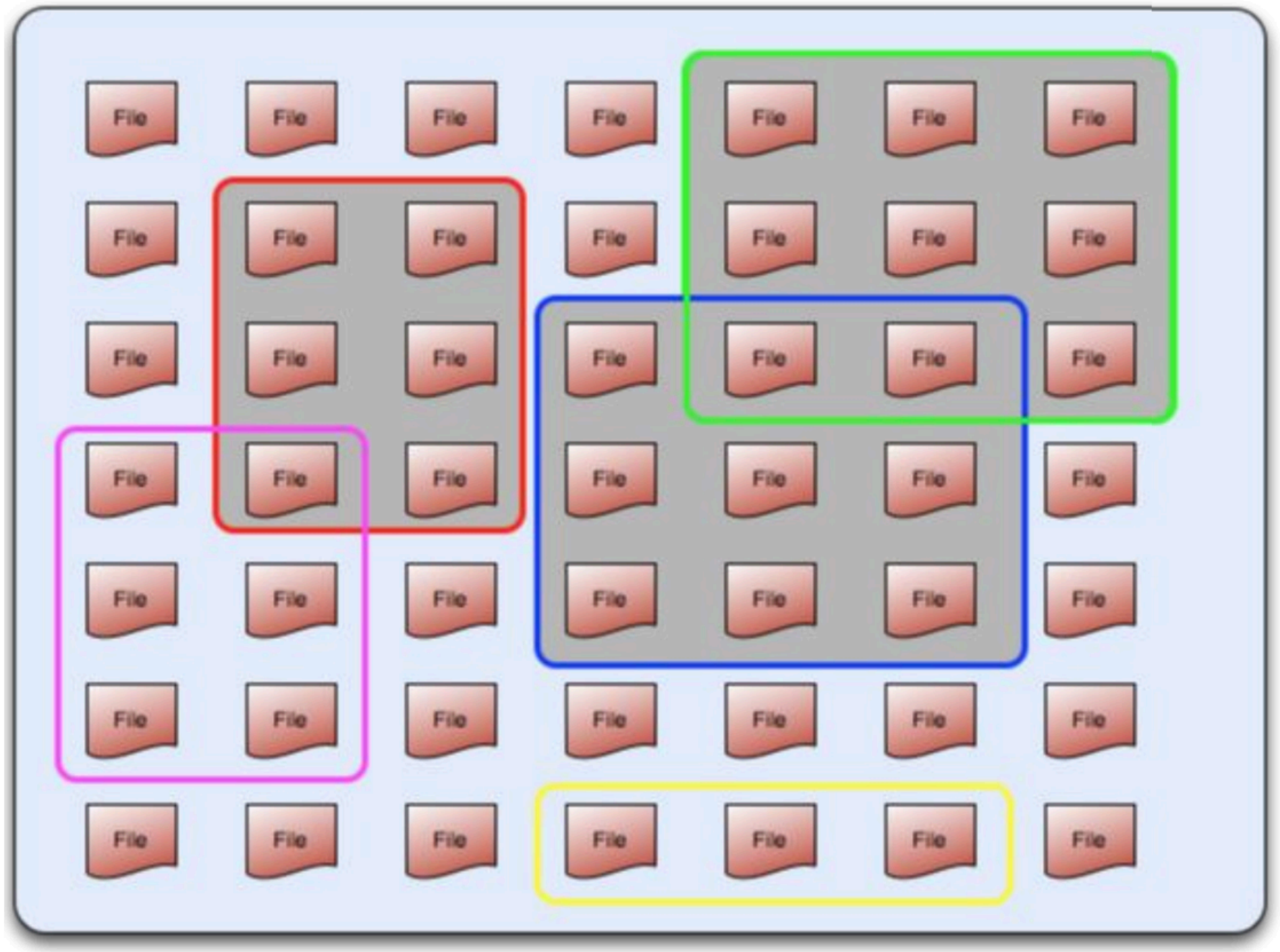


More on Accounts during Authorization Discussion

Rucio Naming Schema

- Any path is referred to as DID (Data Identifier)

  scope:name
- Scope is for Namespace separation.
- **DID can be flat** or hierarchal (partial or full)
- Types of did:
  - File : corresponding to actual file.
  - Dataset : Grouped set of files.
  - Container : Group set of datasets/container



Atlas/rucio-default naming schema

- Flat naming.
- Scope is fine-grained.

User data

Scope: User name, e.g., user.jdoe:this.is.my.test.file001
user.jdoe:this.is.my.dataset1

Group data

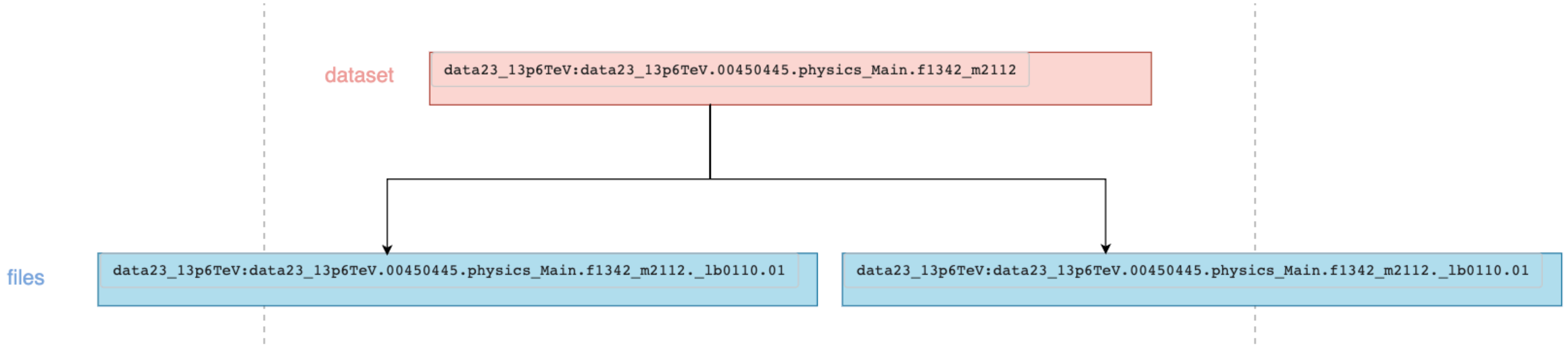
Scope: Group name, e.g., group.thebest:this.is.our.test.file001
group.thebest:this.is.my.dataset1

Detector data

Scope: data + <year>, e.g., data18:16TeV.00199926.calibration.daq.RAW

Reprocessed data

Scope: Campaign +<year> + real data scope, e.g., Repro18Data18:00169783.AOD.r2059



dataset

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112

files

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112._lb0110.01

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112._lb0110.01

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Group data

Scope: Group name, e.g., group.thebest:this.is.our.test.file001
group.thebest:this.is.my.dataset1

Detector data

Scope: data + <year>, e.g., data18:16TeV.00199926.calibration.daq.RAW

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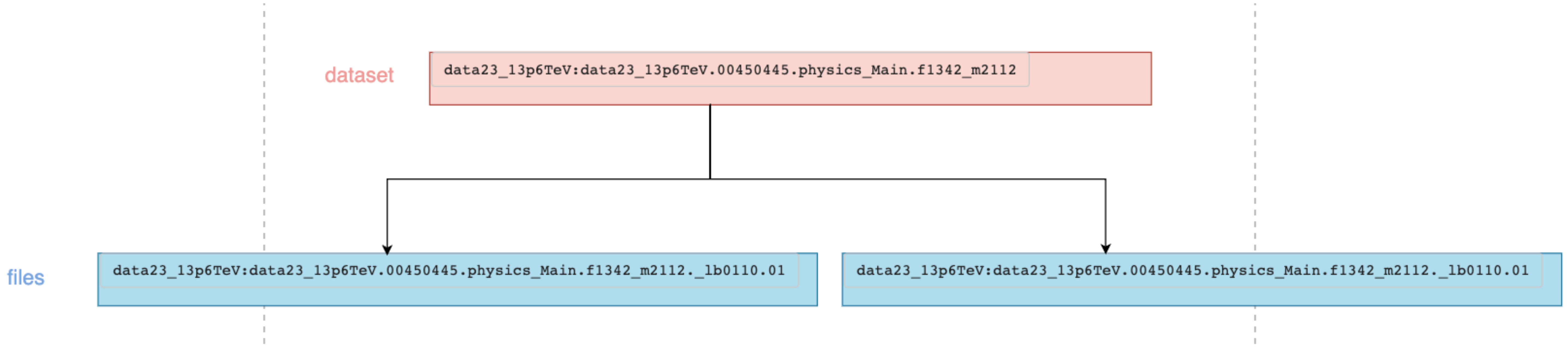


dataset

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112

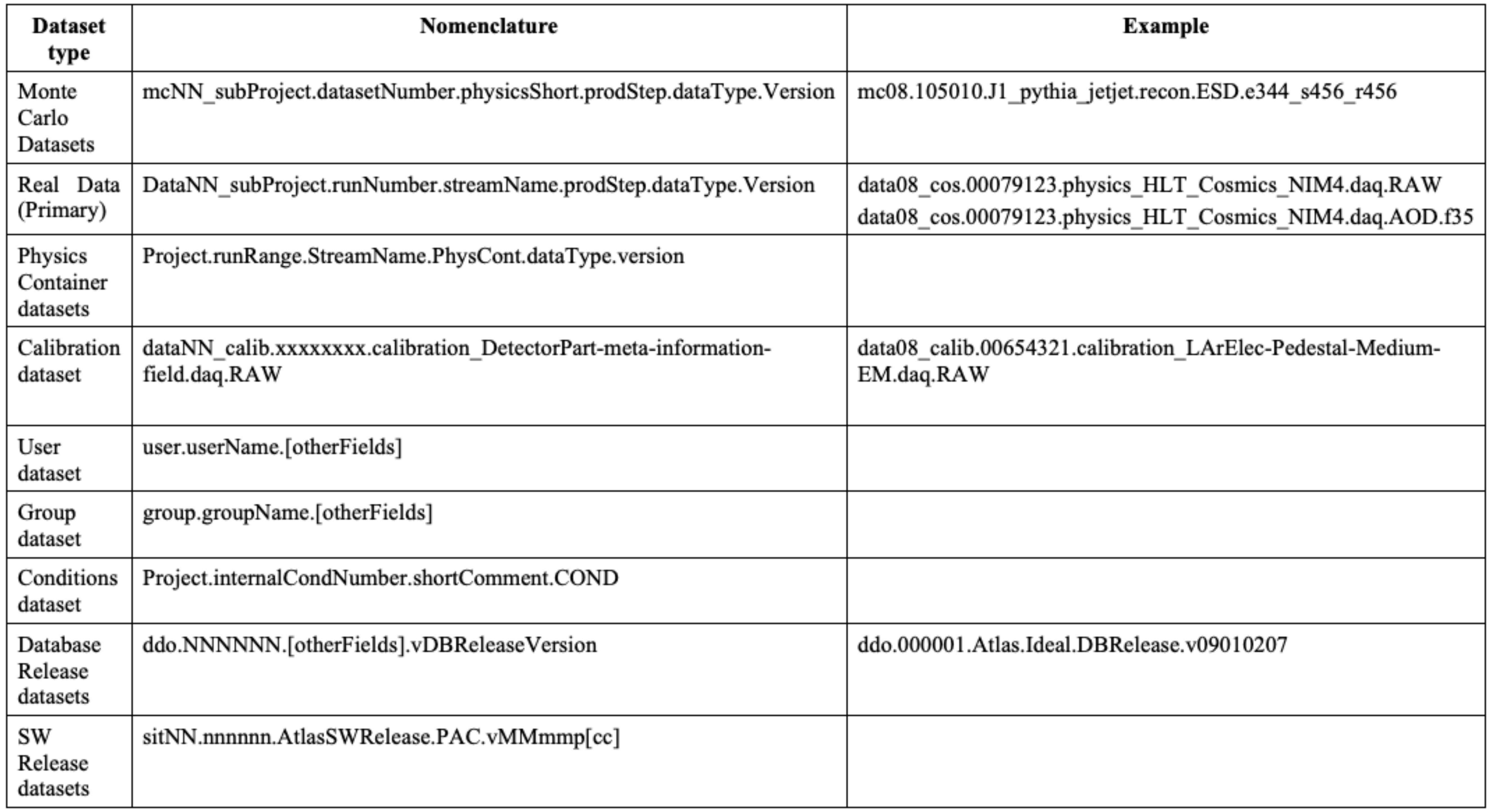
files

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112._lb0110.01

data23_13p6TeV:data23_13p6TeV.00450445.physics_Main.f1342_m2112._lb0110.01

Atlas Dataset naming schema

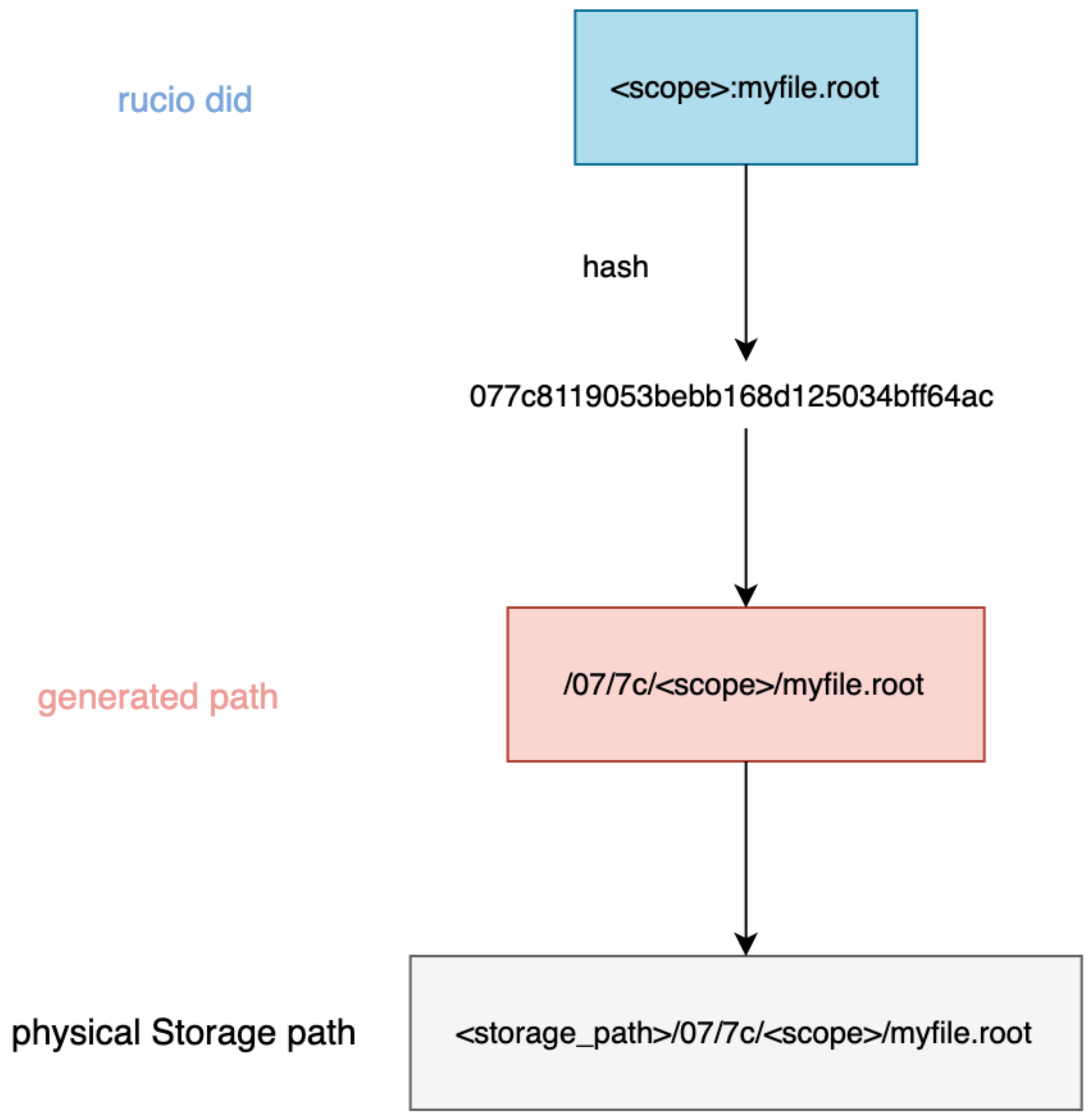
- Flat naming.



Dataset type	Nomenclature	Example
Monte Carlo Datasets	mcNN_subProject.datasetNumber.physicsShort.prodStep.dataType.Version	mc08.105010.J1_pythia_jetjet.recon.ESD.e344_s456_r456
Real Data (Primary)	DataNN_subProject.runNumber.streamName.prodStep.dataType.Version	data08_cos.00079123.physics_HLT_Cosmics_NIM4.daq.RAW data08_cos.00079123.physics_HLT_Cosmics_NIM4.daq.AOD.f35
Physics Container datasets	Project.runRange.StreamName.PhysCont.dataType.version	
Calibration dataset	dataNN_calib.xxxxxxxx.calibration_DetectorPart-meta-information-field.daq.RAW	data08_calib.00654321.calibration_LArElec-Pedestal-Medium-EM.daq.RAW
User dataset	user.userName.[otherFields]	
Group dataset	group.groupName.[otherFields]	
Conditions dataset	Project.internalCondNumber.shortComment.COND	
Database Release datasets	ddo.NNNNNN.[otherFields].vDBReleaseVersion	ddo.000001.Atlas.Ideal.DBRelease.v09010207
SW Release datasets	sitNN.nnnnnn.AtlasSWRelease.PAC.vMMmmp[cc]	

Atlas/rucio-default naming schema: Physical file

- Each file did is mapped to storage path.
  - Based on some policy.
- “Hash” is default policy.



rucio did

<scope>:myfile.root

hash

077c8119053bebb168d125034bff64ac

generated path

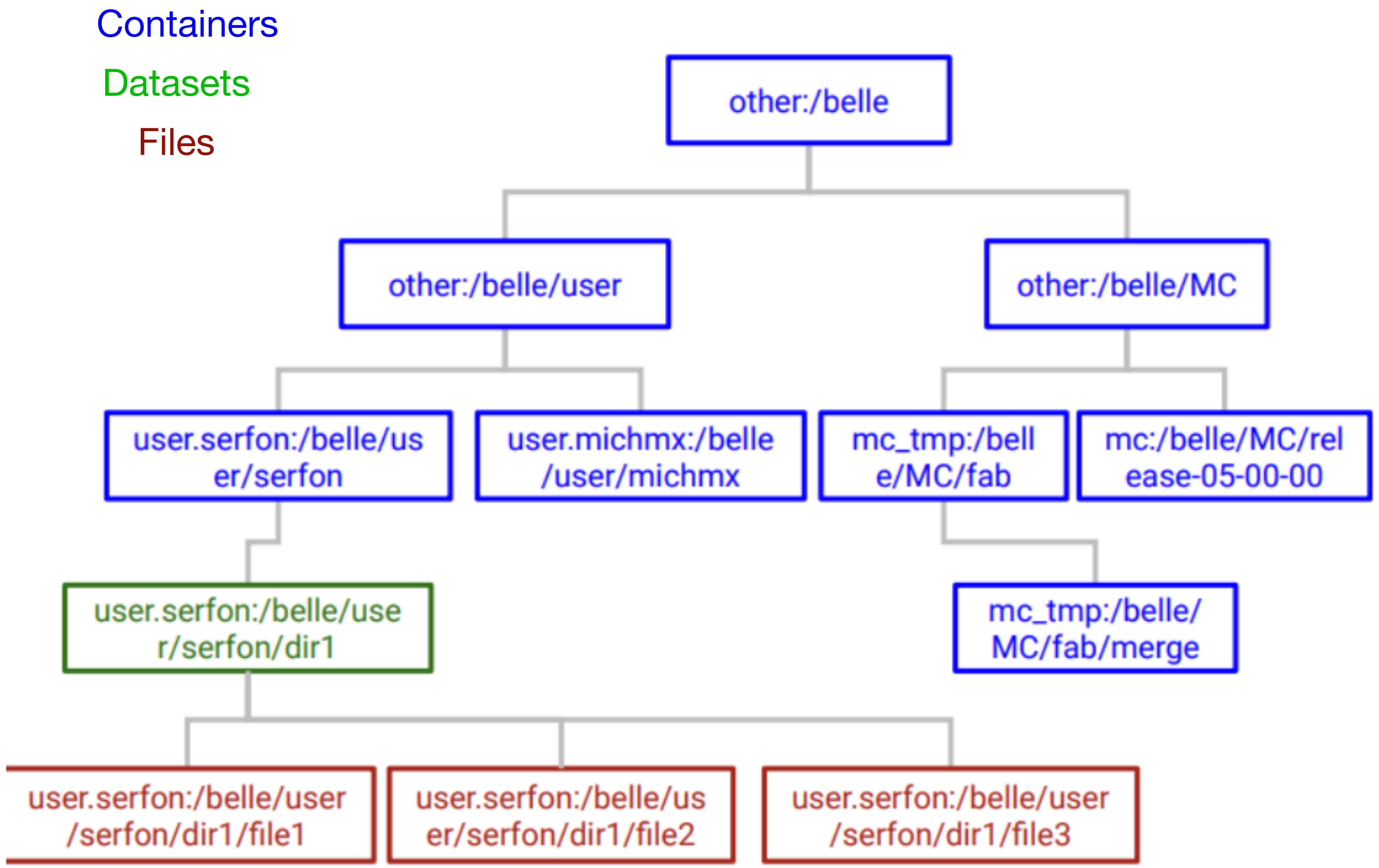
/07/7c/<scope>/myfile.root

physical Storage path

<storage_path>/07/7c/<scope>/myfile.root

<storage_path> = root://dtn-eic.jlab.org:1094/work/eic2

Purely Hierarchal Naming schema: Belle II



Containers

Datasets

Files

other:/belle

other:/belle/user

other:/belle/MC

user.serfon:/belle/user/serfon

user.michmx:/belle/user/michmx

mc_tmp:/belle/MC/fab

mc:/belle/MC/release-05-00-00

user.serfon:/belle/user/serfon/dir1

mc_tmp:/belle/MC/fab/merge

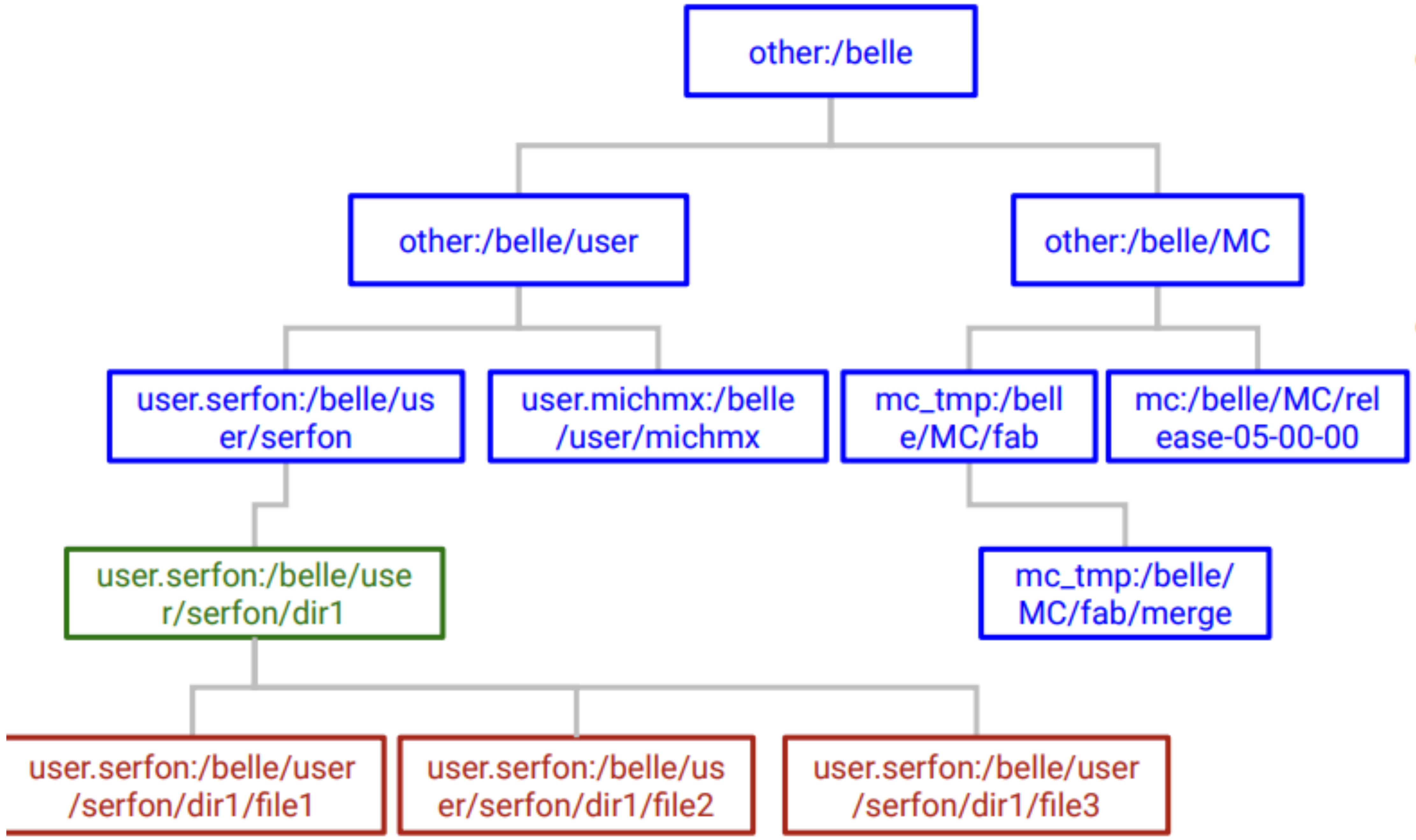
user.serfon:/belle/user/serfon/dir1/file1

user.serfon:/belle/user/serfon/dir1/file2

user.serfon:/belle/user/serfon/dir1/file3

- POSIX like structure
- Pure hierarchy.
  - One DID sits at top.
  - There is chain of child dids.
- Datasets is unit of data management

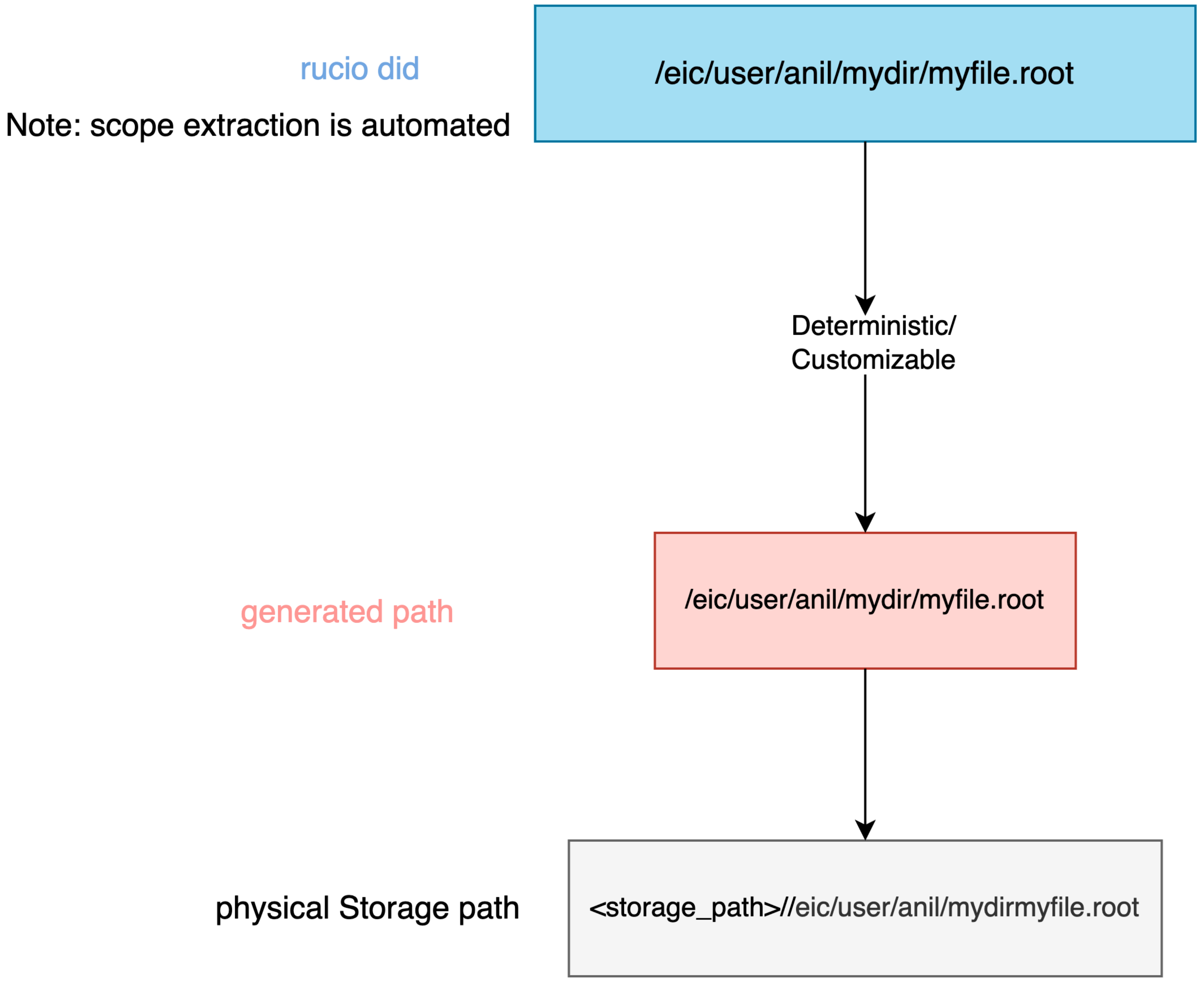
Purely Hierarchal Naming schema: Belle II


other:/belle
other:/belle/user
other:/belle/MC
user.serfon:/belle/user/serfon
user.michmx:/belle/user/michmx
mc_tmp:/belle/MC/fab
mc:/belle/MC/release-05-00-00
user.serfon:/belle/user/serfon/dir1
mc_tmp:/belle/MC/fab/merge
user.serfon:/belle/user/serfon/dir1/file1
user.serfon:/belle/user/serfon/dir1/file2
user.serfon:/belle/user/serfon/dir1/file3

- Example : Creation of files /belle/user/serfon/dir1/file{1-3} on SE A
- The addfile method is a bulk and atomic method that :
  - Creates all the non-existing parent directories in the hierarchy
  - Creates the directory containing the files if it doesn’t exists and create a Rucio rule (RSE expression ANY and grouping NONE)
  - Create the files and their replicas on A

Purely Hierarchal Naming schema: Physical file

- Each file did is mapped to storage path.
  - Based on some policy.
- We define what policy can be.
- Example:


rucio did
Note: scope extraction is automated
/eic/user/anil/mydir/myfile.root
Deterministic/
Customizable
generated path
/eic/user/anil/mydir/myfile.root
physical Storage path
<storage_path>//eic/user/anil/mydirmyfile.root

<storage_path> = root://dtn-eic.jlab.org:1094/work/eic2

Data types: speculative for EIC

- **Raw** : data from detector

- **Data** : reconstructed data
  - Full reconstructed
  - Skimmed per WG or per physics or….

- **MC**
  - Generator output
  - Geant4 Simulation output.
  - Reconstructed
  - Skimmed

- **Group** dataset.
  - Files within each working group for their own work.

- **User** output.
  - Subdivision by username and whatever sub-division workflow/workload management requires.

Flat namespace/semi-hierarchal for EIC

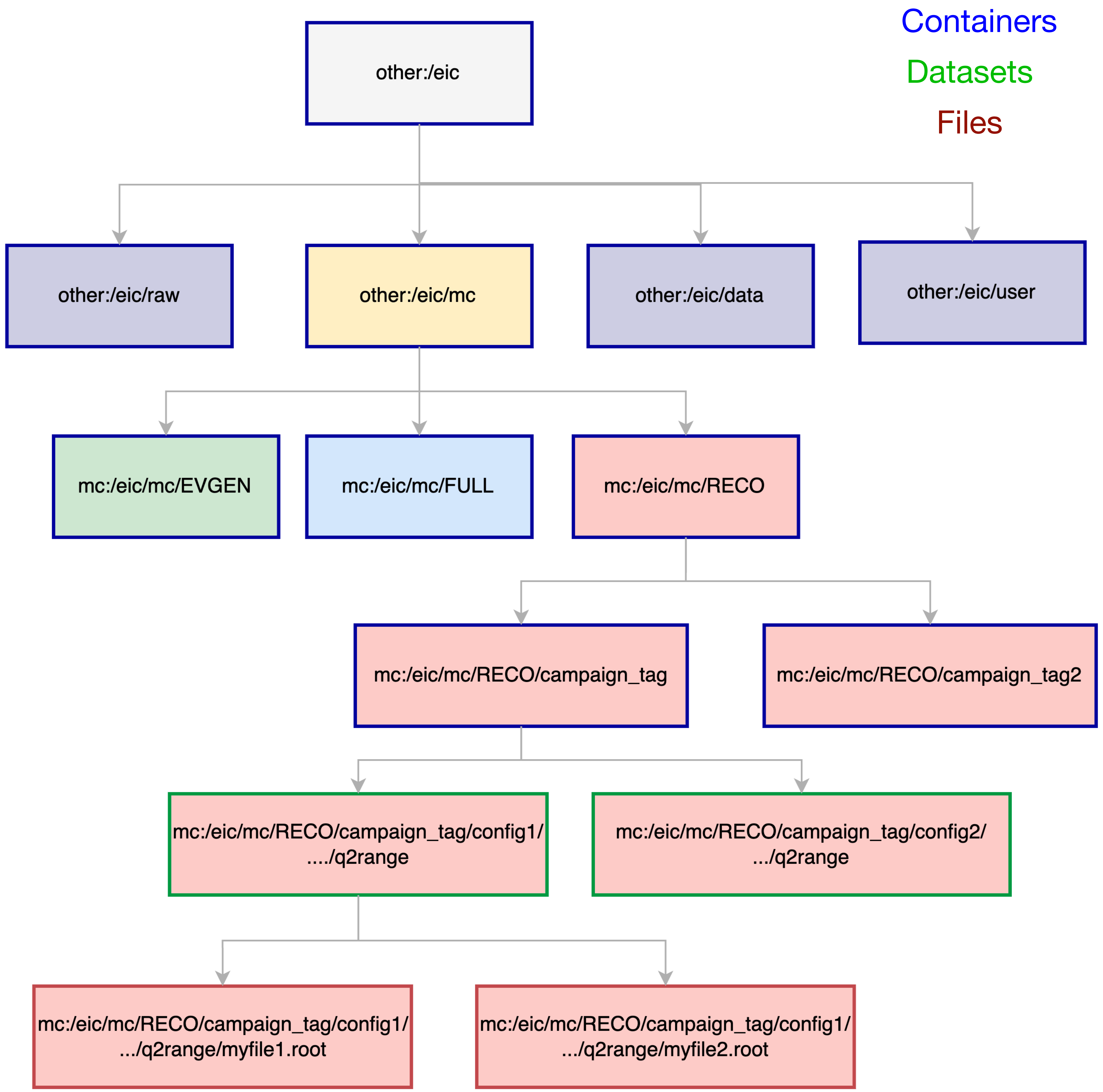
- **Scope:name**
- Fine grained scope.
- Admin needs to be aware of scopes and create new scopes as needed.
- Workflow/central system.
  - Think about how you will mange both scope and name during registration from central system.
- User need to know the scope as well as name.
  - Think about how this info will managed/propagated in future.
- What are steps for registration.
  - One call to rucio for add-replicas file.
  - Next call to create datasets (if not created).
  - Another call to attach file to dataset

Note: I haven’t worked with ATLAS distributed computing

Hierarchal schema for EIC:

- Scope is deterministic.
- Only did’s name to deal with.
- User just need to know the name.
- Storage mapping is one to one.
- Purely POSIX namespace
- Already proven to work in rucio in very large scale by Belle-II.

Note: Name length is max 250 character.


Containers
Datasets
Files
other:/eic
other:/eic/raw
other:/eic/mc
other:/eic/data
other:/eic/user
mc:/eic/mc/EVGEN
mc:/eic/mc/FULL
mc:/eic/mc/RECO
mc:/eic/mc/RECO/campaign_tag
mc:/eic/mc/RECO/campaign_tag2
mc:/eic/mc/RECO/campaign_tag/config1/ ..../q2range
mc:/eic/mc/RECO/campaign_tag/config2/ .../q2range
mc:/eic/mc/RECO/campaign_tag/config1/ .../q2range/myfile1.root
mc:/eic/mc/RECO/campaign_tag/config1/ .../q2range/myfile2.root

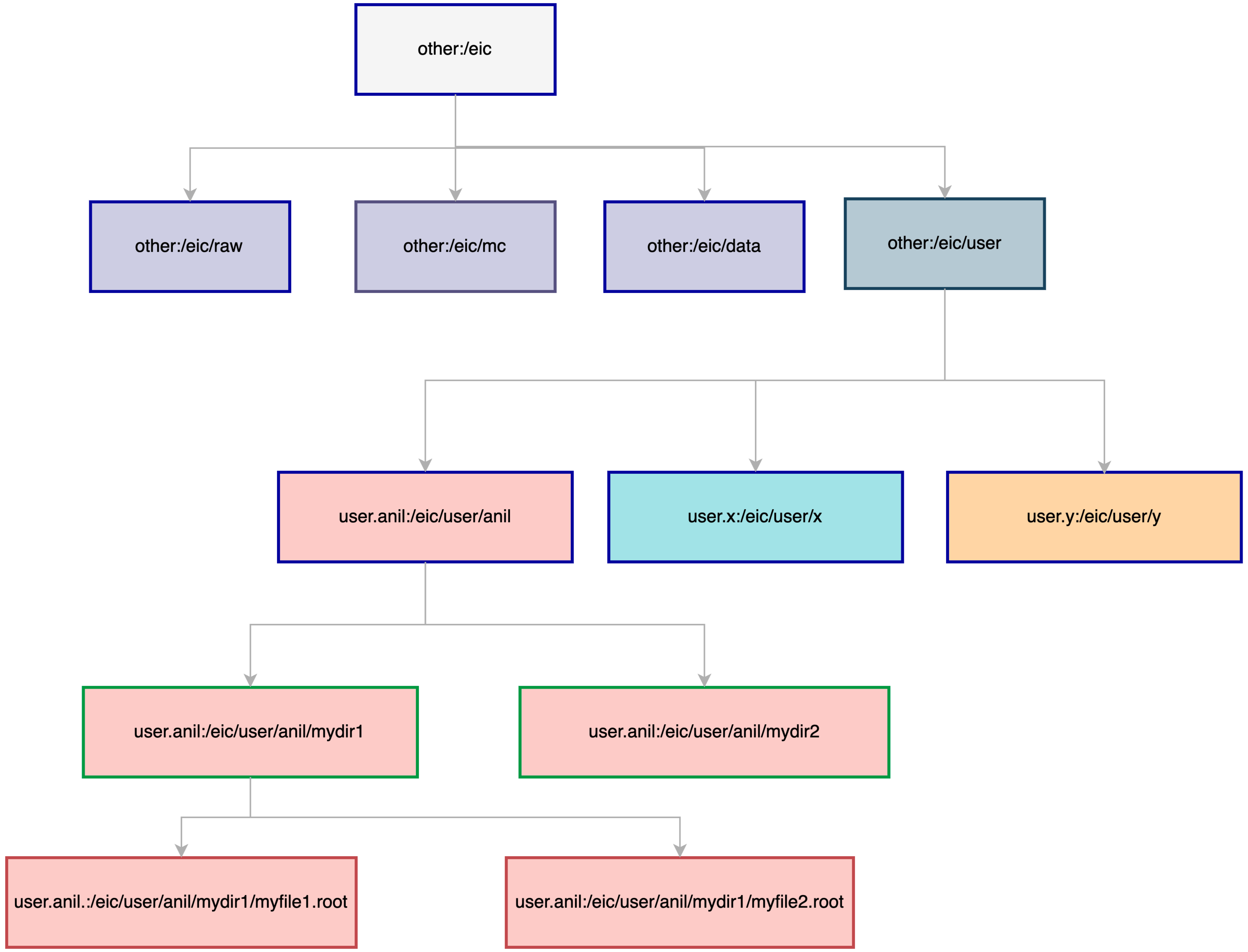
Hierarchal schema for EIC:

Containers

Datasets

Files

Currently only Relevant one are:
- MC
- User ?


other:/eic
other:/eic/raw
other:/eic/mc
other:/eic/data
other:/eic/user
user.anil:/eic/user/anil
user.x:/eic/user/x
user.y:/eic/user/y
user.anil:/eic/user/anil/mydir1
user.anil:/eic/user/anil/mydir2
user.anil.:/eic/user/anil/mydir1/myfile1.root
user.anil:/eic/user/anil/mydir1/myfile2.root

EIC naming: Implementation in Rucio

- Rucio provides plugins.
- Experiments can define their own policy.
- Policy Package.
  - schema: did, scope naming regex.
  - extract_scope: scope2name
  - lfn2pfn: did to storage path mapping for deterministic.
  - construct_surl : did to storage path map for Non-Deterministic.
  - permission: account and auth

- **EIC rucio policy package created and tested.** **[JeffersonLab/eic_rucio_policy_package]**
  - **Will update once the decision is taken.**
  - **Then send this to the rucio admin to add to rucio path.**

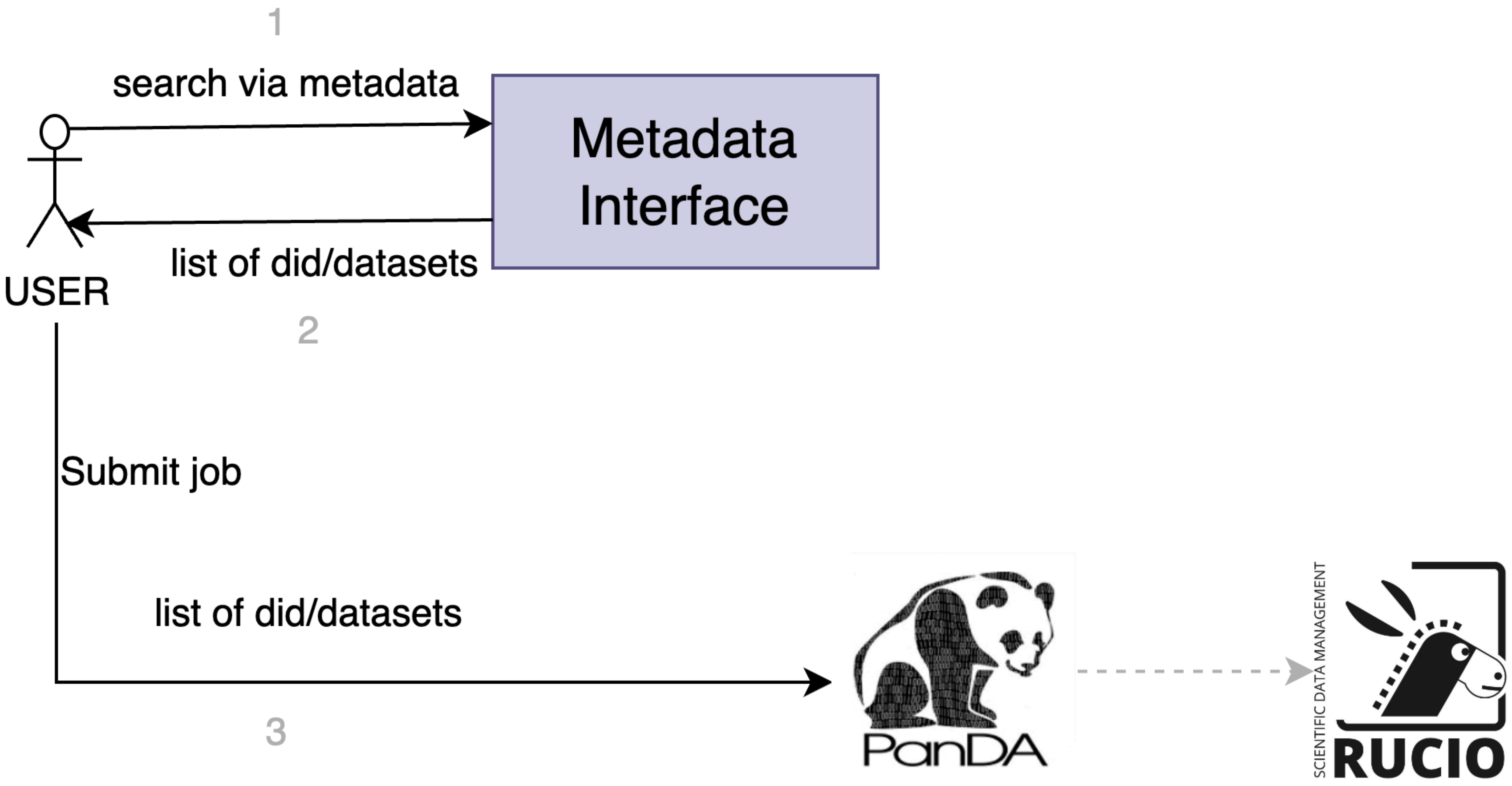
Backup

Metadata in Rucio

- Each DID in rucio have metadata associated with it.
- Metadata canoe classified.
  - Column Metadata: for processing and others ATLAS define
  - Other metadata: User define metadata.
    - JSON
    - External like mongoDB .

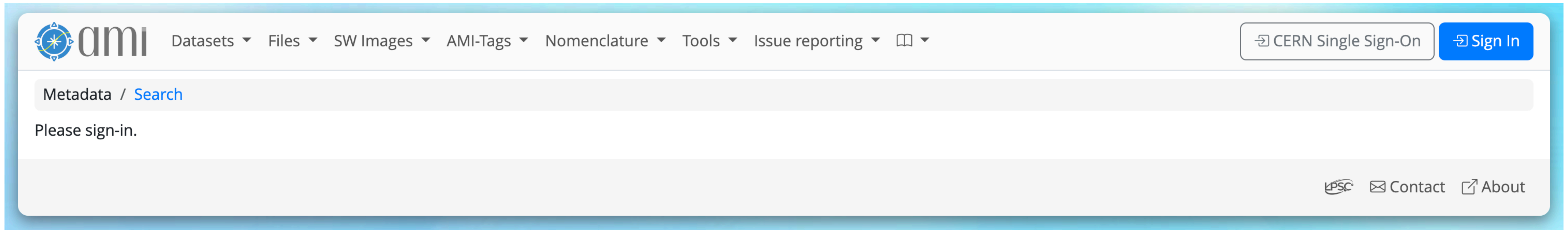
User workflow

Metadata Interface should be build for EIC



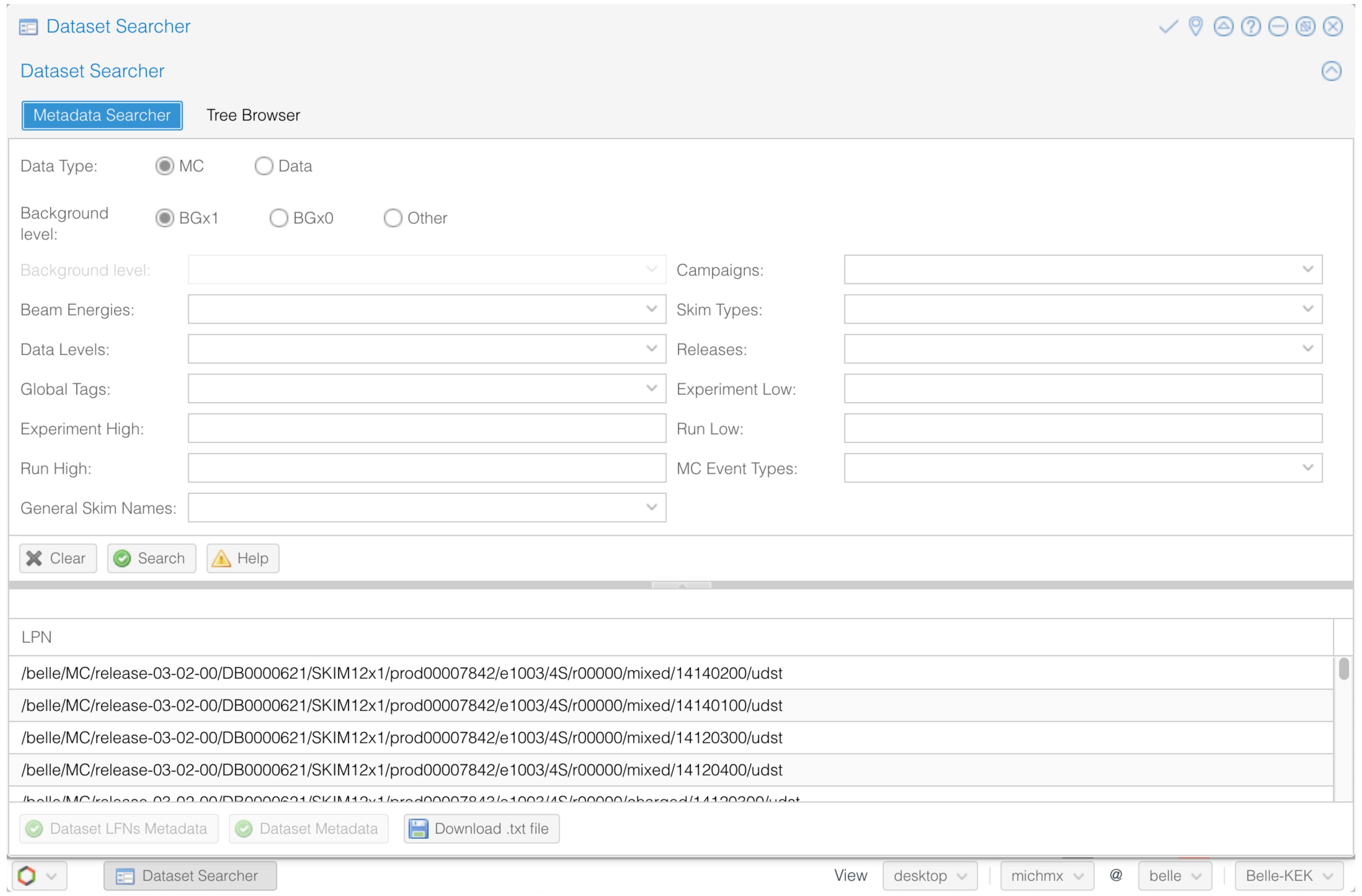
Metadata Interface : experiment example

- Atlas has **ATLAS Metadata Interface (AMI)**
  - https://cds.cern.ch/record/2649430/files/Fulltext.pdf



Please sign-in.

- Belle II has **dataset-searcher, DSS**.
  - It is working on scale for Belle II users.



Data Type: ● MC ○ Data

Background level: ● BGx1 ○ BGx0 ○ Other

Background level:

Campaigns:

Beam Energies:

Skim Types:

Data Levels:

Releases:

Global Tags:

Experiment Low:

Experiment High:

Run Low:

Run High:

MC Event Types:

General Skim Names:

```
LPN
/belle/MC/release-03-02-00/DB0000621/SKIM12x1/prod00007842/e1003/4S/r00000/mixed/14140200/udst
/belle/MC/release-03-02-00/DB0000621/SKIM12x1/prod00007842/e1003/4S/r00000/mixed/14140100/udst
/belle/MC/release-03-02-00/DB0000621/SKIM12x1/prod00007842/e1003/4S/r00000/mixed/14120300/udst
/belle/MC/release-03-02-00/DB0000621/SKIM12x1/prod00007842/e1003/4S/r00000/mixed/14120400/udst
/belle/MC/release-03-02-00/DB0000621/SKIM12x1/prod00007842/e1003/4S/r00000/charged/14120300/udst
```

Dev for Hierarchal Namespace: Rucio side

- One PR made 2 week ago and available in 33.3.0.
  - Atomic did and metadata registration for hierarchal namespace.
- Rucio Upload for hierarchal namespace.
  - PR opened will be available soon.
  - https://github.com/rucio/rucio/pull/6492