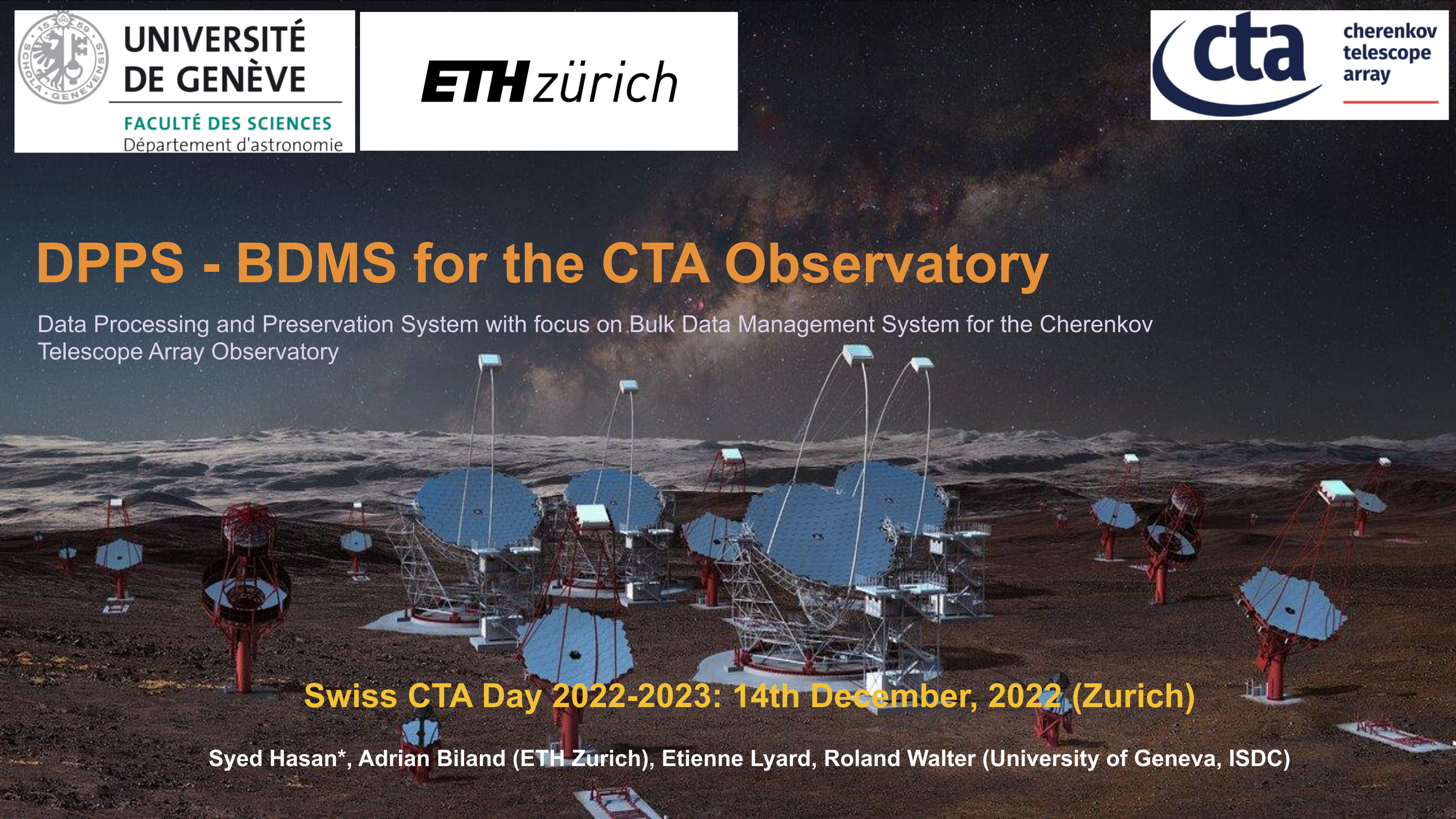


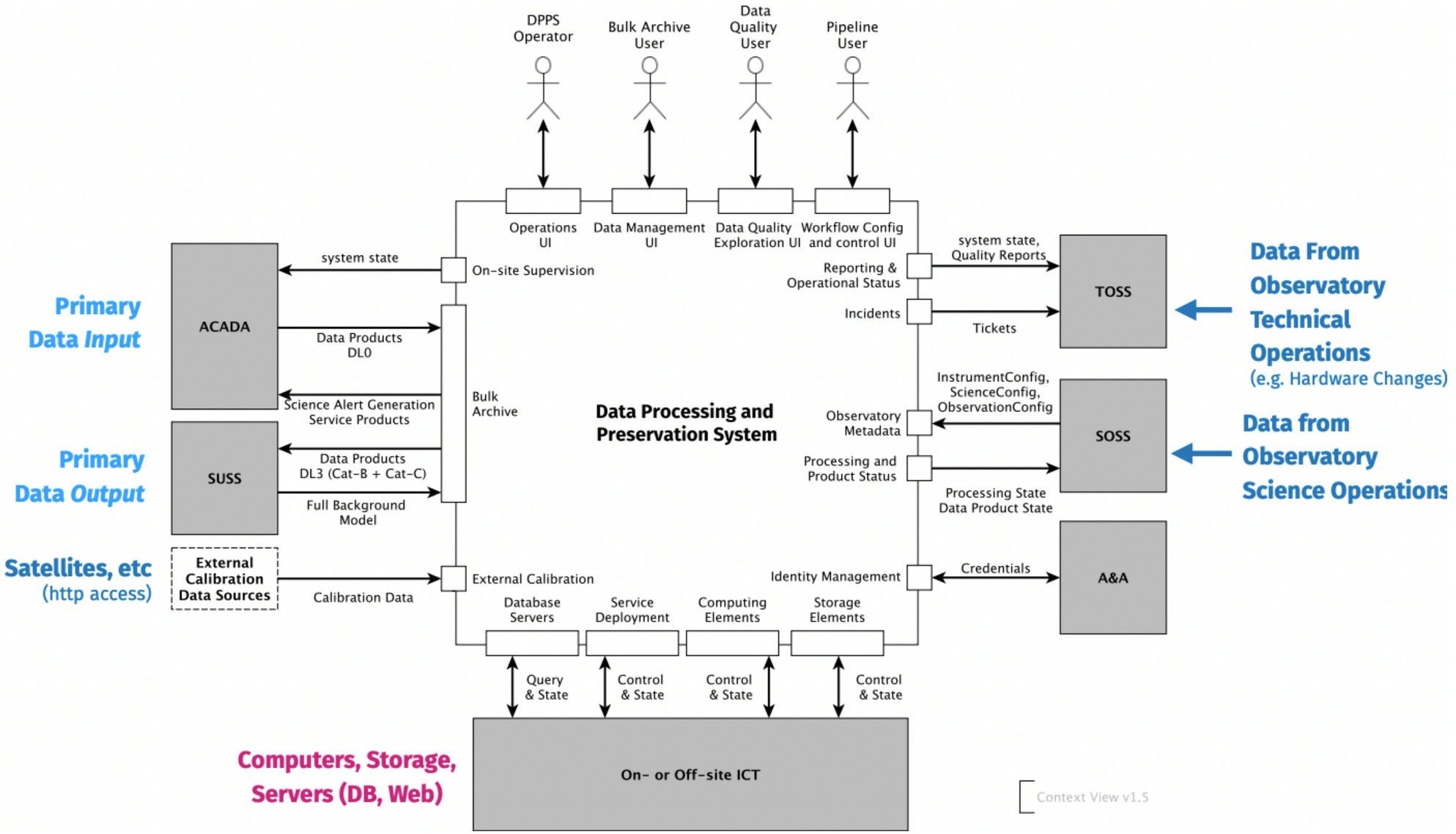
DPPS - BDMS for the CTA Observatory

Data Processing and Preservation System with focus on Bulk Data Management System for the Cherenkov Telescope Array Observatory

Swiss CTA Day 2022-2023: 14th December, 2022 (Zurich)

Syed Hasan*, Adrian Biland (ETH Zurich), Etienne Lyard, Roland Walter (University of Geneva, ISDC)

Data Processing and Preservation System (DPPS)



source: DPPS Introduction, DPPS workshop at DESY (Zeuthen), 10-12th October, 2022
https://indico.cta-observatory.org/event/4313/contributions/35652/attachments/22328/31950/DPPS%20overview%202022.pdf

Bulk Archive managed by Bulk Data Management System (BDMS) and its relationship with other CTAO systems

ACADA: Array Control and Data Acquisition

SUSS: Science User Support System

SOSS: Science Operational Support System

DPPS: BDMS

List of Contributors in Switzerland

- Syed Hasan, Adrian Biland (ETH Zürich)
- Etienne Lyard, Roland Walter (University of Geneva, ISDC)

List of Contributors in Italy

- Stefano Gallozzi, Fabrizio Lucarelli, Georgios Zacharis (INAF OAR, Roma)

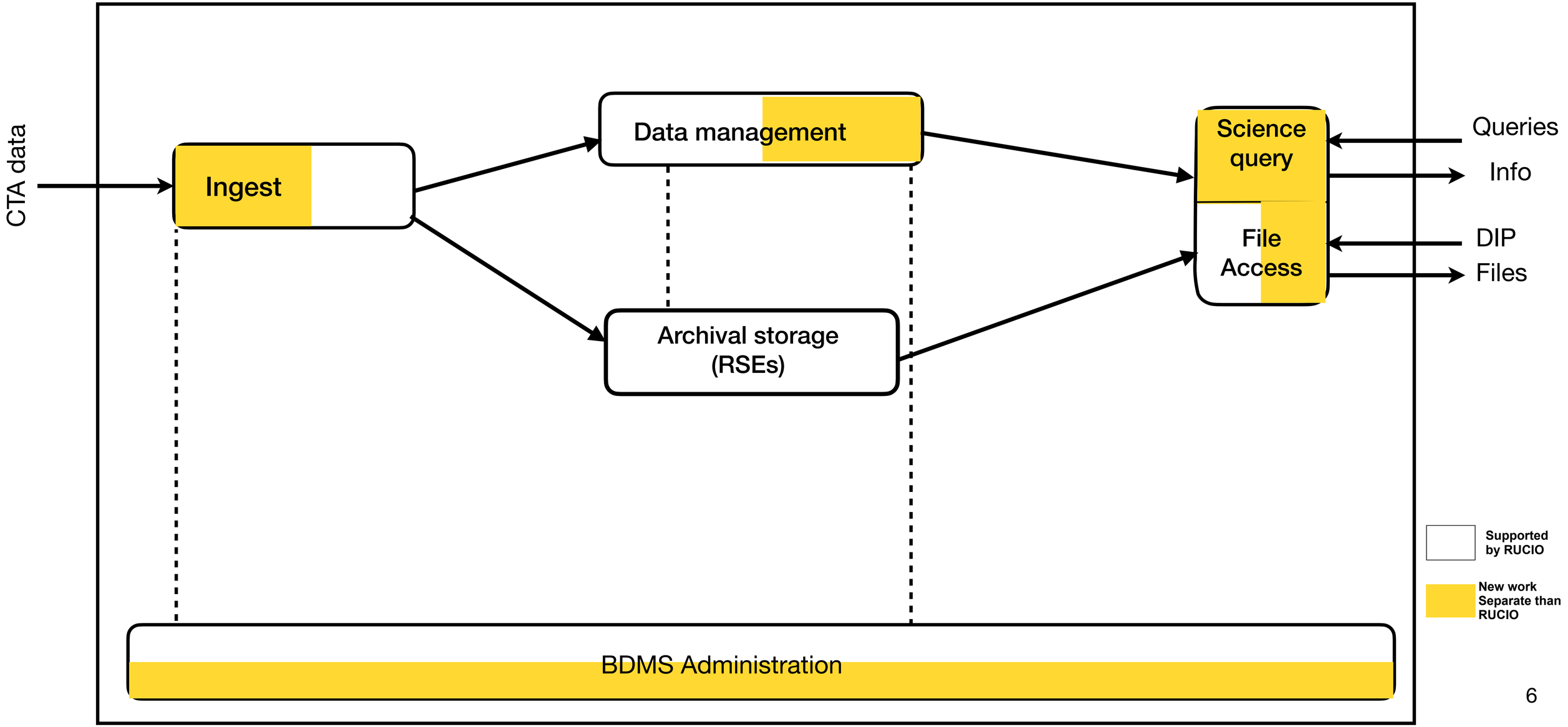
- Close collaboration with EPFL and CSCS (Data Center work package: Volodymyr Savchenko*, Pablo Fernandez, Victor Holanda Rush, and Andrii Neronov)

Data centres for DPPS, SUSS, and SOSS

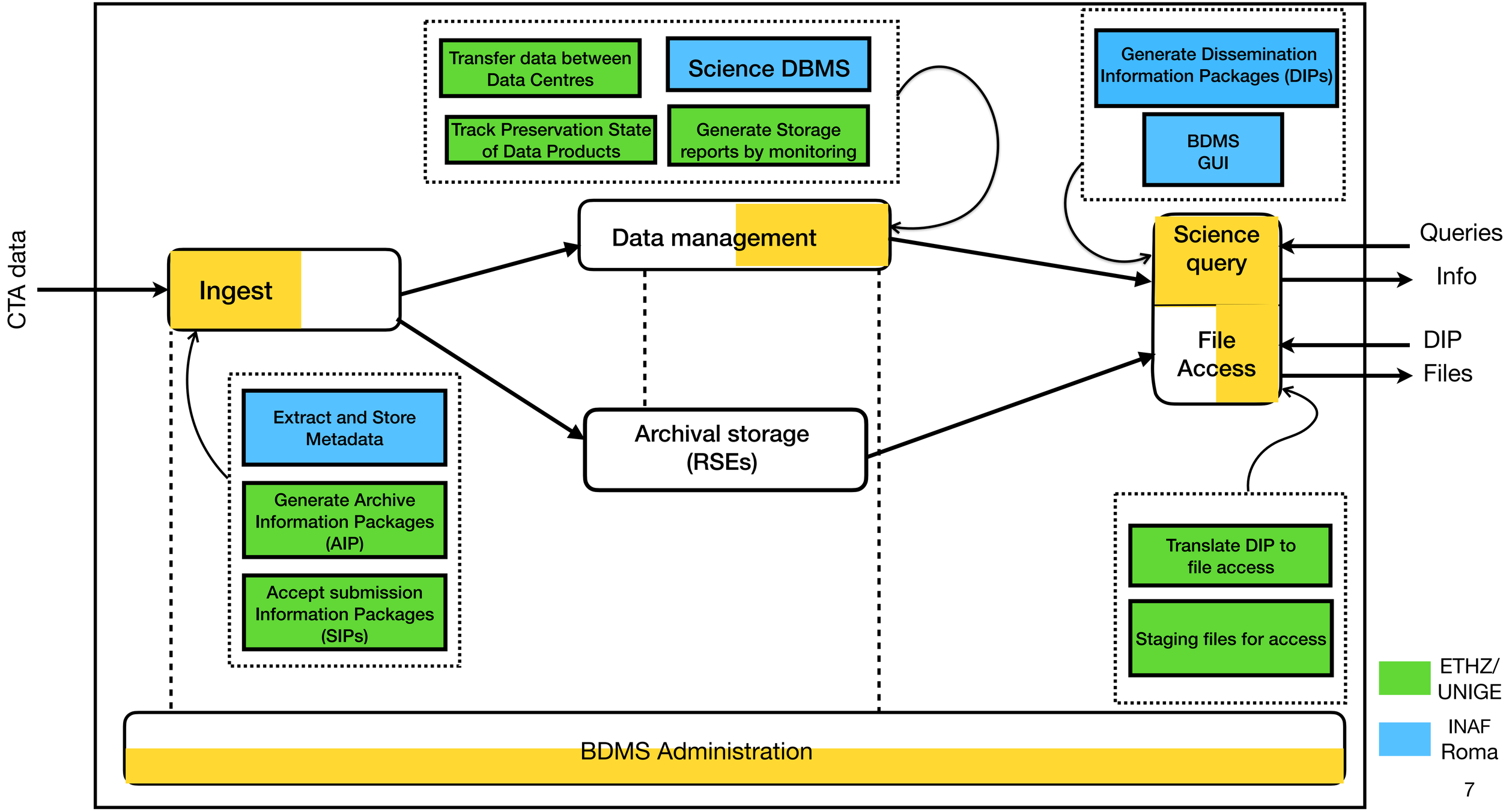
- Off-site data centres: PIC (Spain), Frascati (Italy), CSCS (Switzerland), and DESY (Germany)
- Part of BDMS runs also on on-site ICT

Open Archival Information system (OAIS) ISO Standard - LOGICAL FLOW

- OAIS standards design from high energy astronomy archive experience
- INTEGRAL archive to be the first one to be implemented in the framework of OAIS
- Similar concept could be used for missions such as SKA, OAIS archive can be used



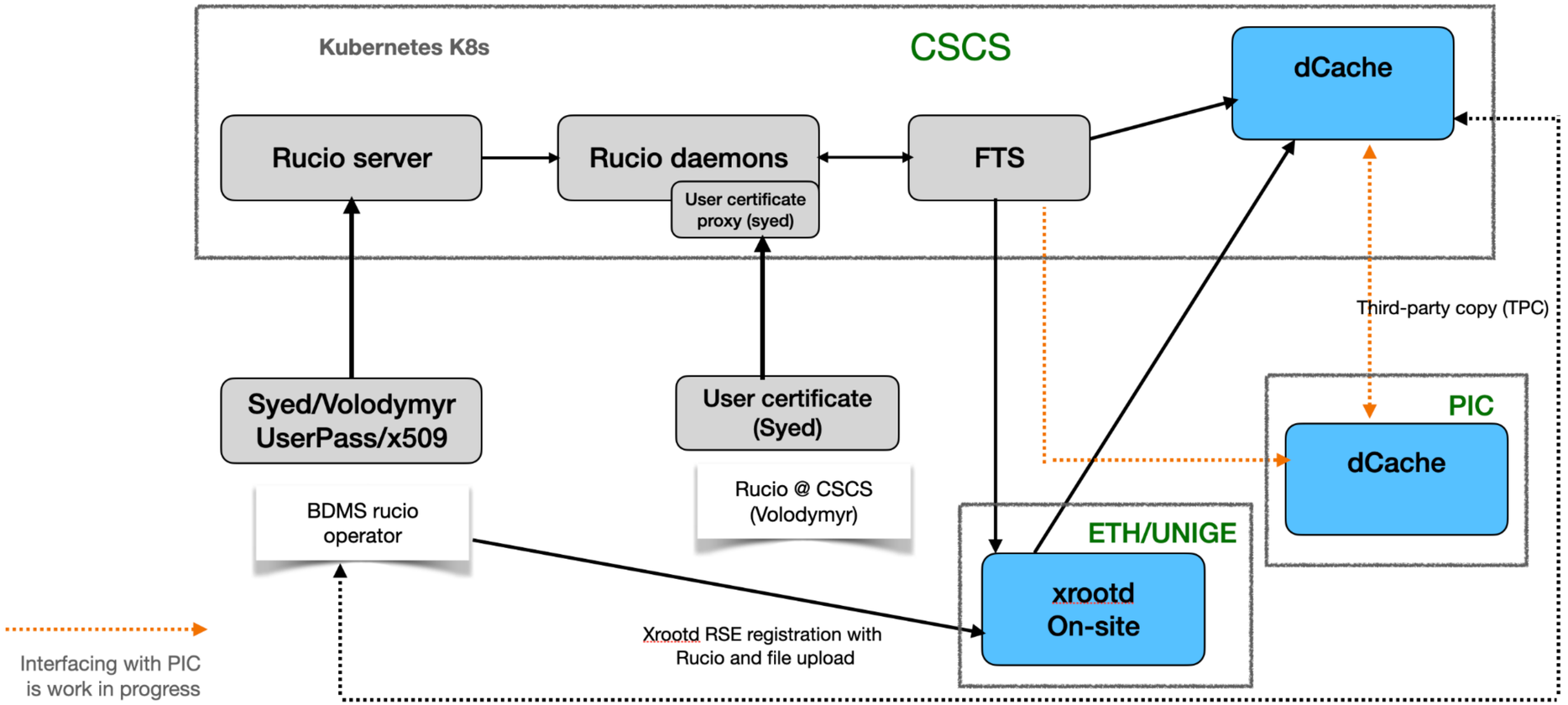
BDMS architecture - Work sharing



Swiss contribution to BDMS

- DPPS Use-cases for BDMS with Level B Requirements as inputs, Level C Requirements
- Architecture design
- Rucio tests with docker and Kubernetes locally (ingest, replication, Rucio storage element (RSE) creation, rule deletion, file deletion)
  - Rucio: Distributed data management tool developed and maintained by CERN, originally developed to meet the requirements of high-energy physics experiment ATLAS
  - Kubernetes: Open-source system for automating deployment, scaling, and management of containerised applications
- Deploy RSEs at different data centers
- Bulk archive implementation using RUCIO with CSCS and ETH Zurich - ingest, replication
- On-going: Rucio deployment and testing at DESY Test cluster

BDMS prototyping efforts in collaboration with CSCS



FTS: File Transfer Service

- Realistic set-up of Rucio storage element (dCache, xrootd) at CSCS, UNIGE (ETH for testing) with certificates and proxy certificates and successfully accessing them (read, write operations)

- Tested replication through RUCIO between UNIGE and CSCS using the same VO (virtual organization) proxy and different protocols (ssh, https, root) and replication

DPPS mini Release 0 (July 2023) - BDMS: Contributions Plan

- Running a Rucio instance with RSEs, Rucio daemons, FTS and Database services to prototype Bulk archive and test its functionality at dedicated Test cluster based on managed Kubernetes at DESY
    - Minimum functionality to test: ingest, retrieve, and query
    - But we will also test replication, rule deletion, file deletion like we have earlier done with localised docker environment
- We need to take special care in choosing Rucio container (the version compatible with DIRAC). It needs to be run as gitlab CI/CD pipeline for automation and testing
    - Automatic deployment on Rancher using Fleet for continuous delivery (CD)
    - fleet yaml file configures -default namespace with Rucio-server image, Rucio database, Rucio daemons, Kubernetes cluster ingress (including authentication), and monitoring using helm charts
- Integrate and test workload with BDMS once the Workload management system (WMS) team develops the DIRAC interface to RUCIO, we will then test whether DIRAC is able to access the RUCIO file catalog for query, retrieve operations
- Coordinate with INAF Roma colleagues on preparing few use-cases for writing Level-C requirements

Work plan for the next six months

- Based on work-share agreements with INAF
  - BDMS Level C requirements and architecture need to be agreed with all partners
  - Definition of interfaces with external subsystems (ACADA, SUSS, SOSS, A&A)
  - BDMS Bulk archive prototyping and implementation to continue, in collaboration with data centres: PIC, CSCS, INFN Frascati, and DESY
    - We will resume data centre tests with PIC (busy with LST data) based on LST experience early next year
  - Token based RUCIO implementation. Fine-grained user access rights management for customised CTA policy package
  - Code reviews, documentation and improvements for long-term maintainability

Thank you for listening !

Backups

DPPS - BDMS Introduction

- **Scope includes**
  - Develop Bulk data management system (BDMS) to archive DL0 data (and potentially DL>0) across four off-site Data Centres (DCs)
  - Prototype Bulk Archive with RUCIO employing dCache, xRootD storage elements, FTS, Databases, Certificates and VOMS membership
  - Extending RUCIO by adding new features/functionality to satisfy BDMS requirements
  - Workflows from DIRAC and its integration into data management with RUCIO
  - Interfaces to/from BDMS

- **Collaborating Institutes**
  - UNIGE, ETHZ and EPFL (Switzerland)
  - INAF - Rome Astronomical Observatory (Italy)

CTA BDMS requirements

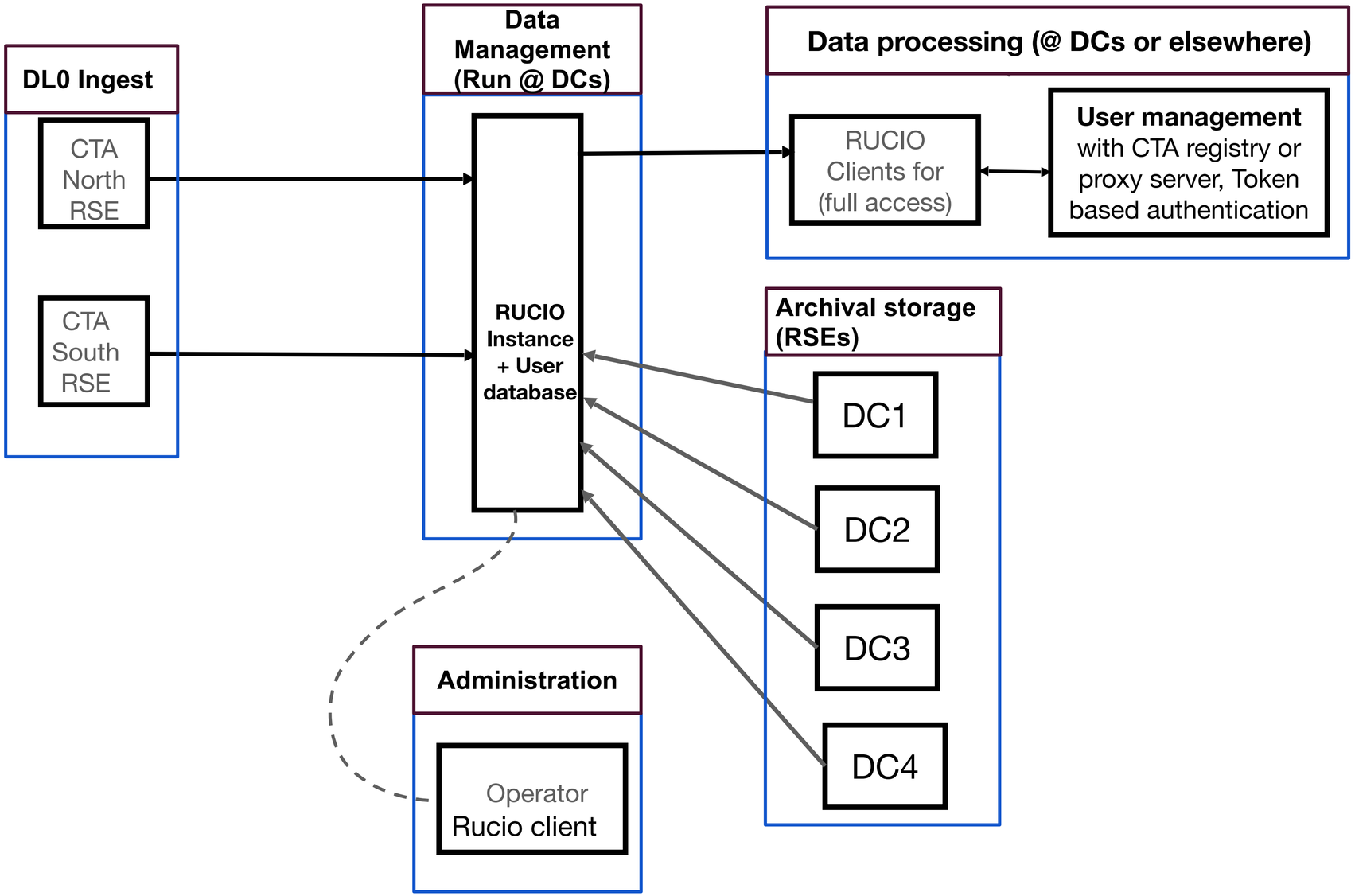
- **Optimally and equally splitting CTA data over 4 Data Centers:** maintaining 2 full archive copies and optimizing transfer costs
  - The data at a remote location in La Palma to be first transferred to PIC and then the replication step to create two replicas among the data centers. Finally, deleting the original copy at PIC
  - Interface PIC - CSCS with Rucio for data transfer

- **Data rights management**: transition to new AAI (authentication, authorization and identity) is well underway, and in Rucio 1.30 (November 2022)

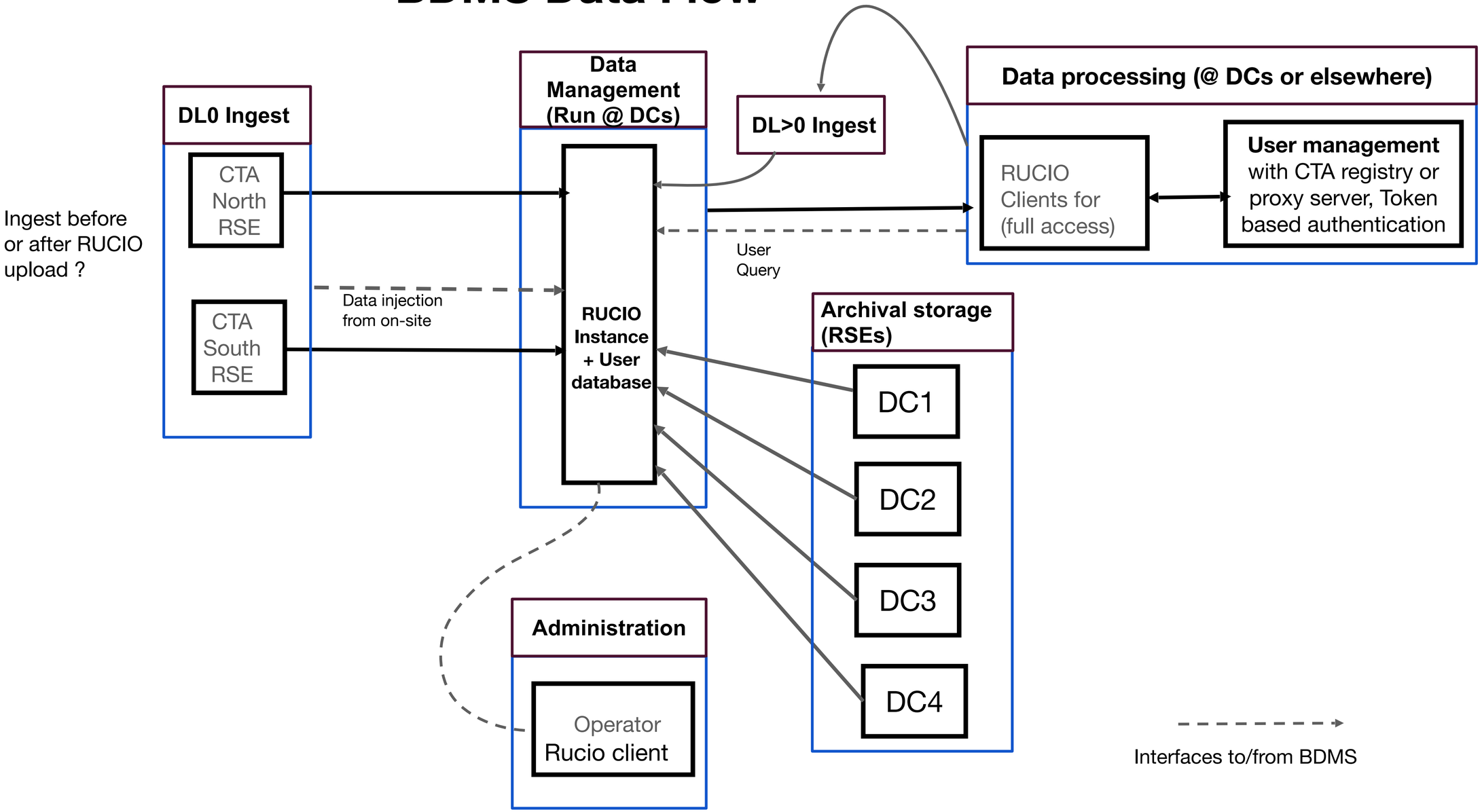
- **Storage resilience, error detection, and disaster recovery**: **Rucio** automatically detects broken data copies and recovers them from the healthy ones

More details: https://redmine.cta-observatory.org/projects/ruciodm/wiki/OAIS_requirements_relevant_to_the_low_level_(rucio)

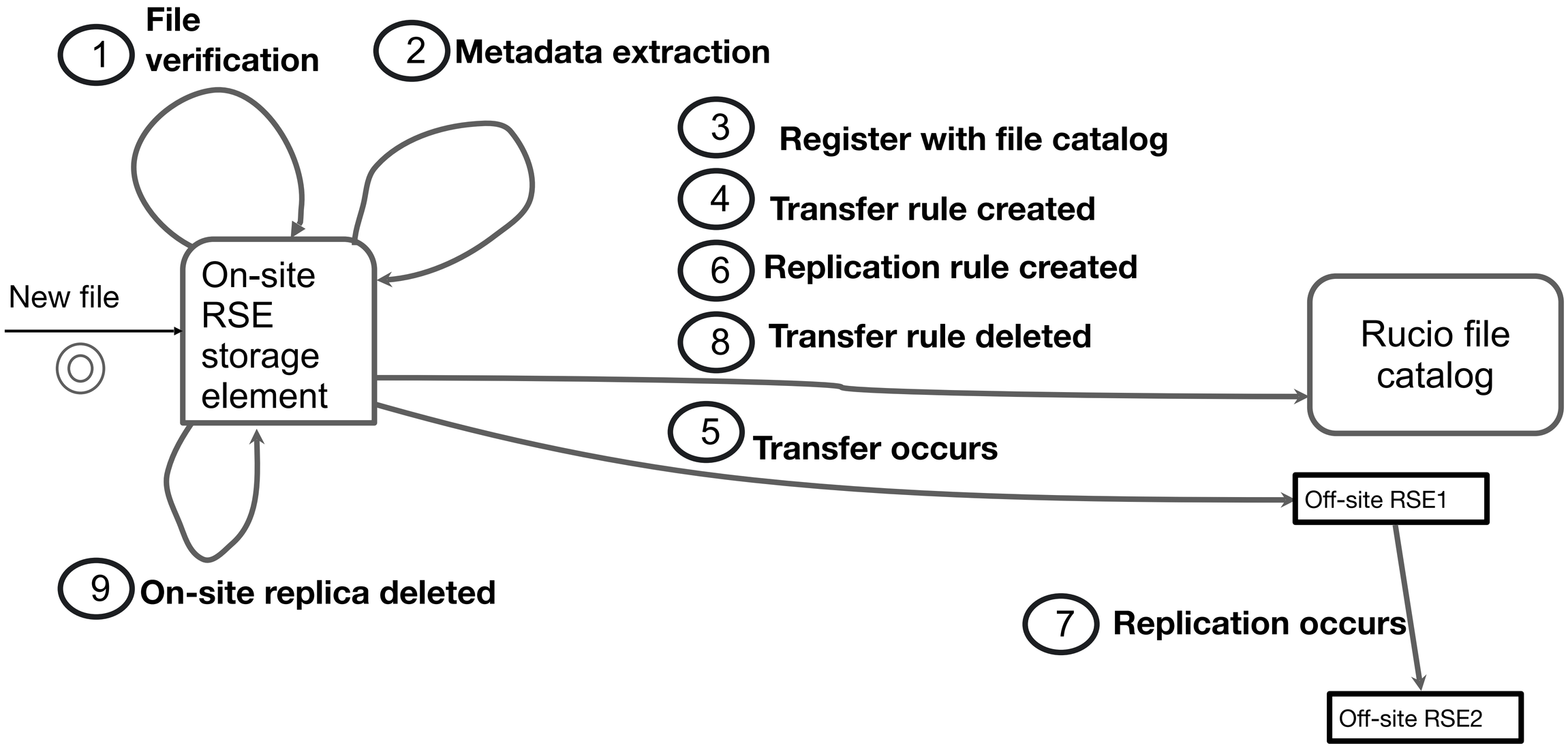
BDMS Data Flow



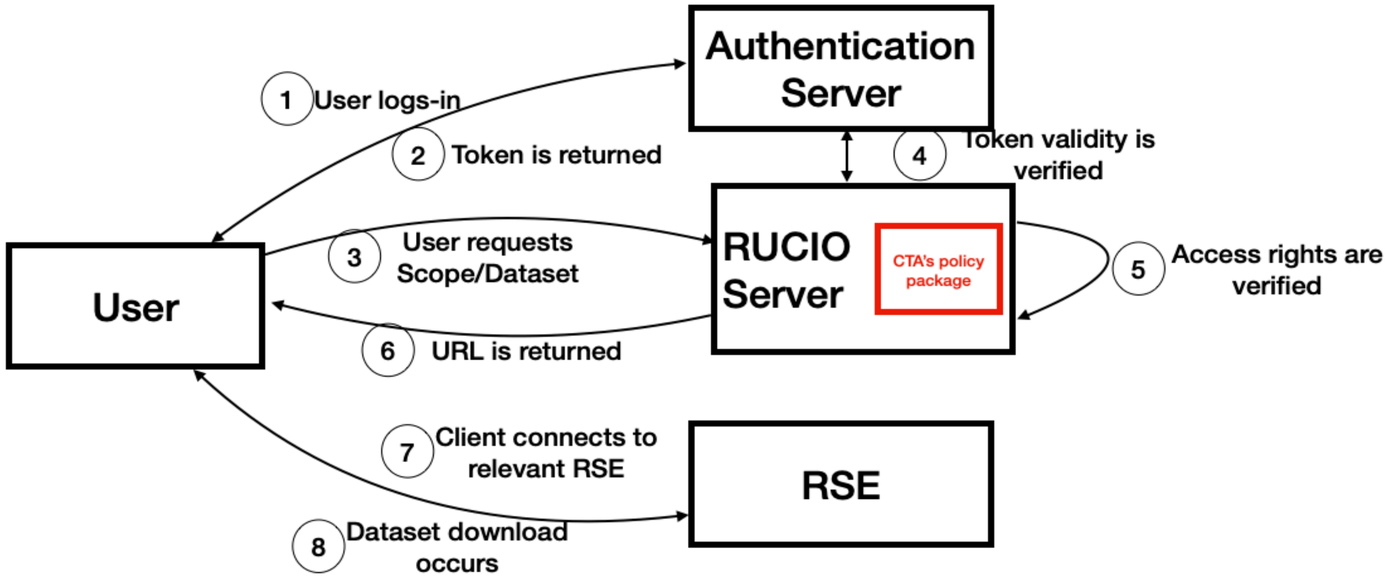
BDMS Data Flow



Ingest with RUCIO



CTA User Access to BDMS



CTA's policy package is the only "brick" that CTA has to implement itself
The access rights must be stored in some way, most probably in a DBMS

DISCLAIMER: This draft architecture may be revised once token-based RUCIO is officially released this fall
The current assumptions are based on certificate-based RUCIO and our understanding of tokens

CTA's policy implementation could be as simple as:

```
Connect to user rights DBMS
allowed_groups = Select groups where <scope=scope, dataset=dataset>
If (returned_tuple has user.groups):
    grant_access
else:
    deny_access
```

BDMS prototype implementation - Test set-up

- Kubernetes K8s instance for installing RUCIO (and its services), dedicated FTS, dCache at **CSCS**
- Why we need User certificate and VOMS proxy ?
  - For accessing dCache (+ performing read and write operations), a **user certificate (grid-based from CERN)** and **VOMS membership (via dteam, EGI)** for proxy certificates needed
  - Accessing the dCache and listing its contents by using a user certificate and VOMS proxy certs

Name	Last Modified
lost+found	Fri Apr 29 14:30:18 GMT 2022
hello-world-from-bdms.md	Fri Sep 16 13:51:52 GMT 2022
pnfs	Wed May 04 10:27:00 GMT 2022
upload	Fri May 13 15:35:43 GMT 2022

dCache installation at CSCS and its set-up as Rucio RSE

- **CTA dcache** service with **0.5Pb, primarily used for Prod6**
  - **RSE name:** CTA-DC-CSCS
  - webdav (port 2880), Xrootd (port 1094)
  - deterministic: True; disk
  - Attributes - fts: https://fts:8446/
  - Protocols: https
    - domains: LAN, WAN, **TPC** (read, write, delete)
    - hostname: **dcache.cta.cscs.ch**
    - impl: rucio.rse.protocols.webdav.Default
    - root path or prefix: **/pnfs/cta.cscs.ch/dteam/bulk-archive/dc-cscs**
    - rse_id: 2c39b68d0c6747708217dabc11eecf89

dedicated FTS deployed in CSCS k8s
https://github.com/cta-epfl/helm-charts/tree/master/charts/fts

```
rucio-admin rse add CTA-DC-CSCS || true
rucio-admin -v rse \
        add-protocol \
        CTA-DC-CSCS \
        --hostname dcache.cta.cscs.ch \
        --port 2880 \
        --scheme https \
        --prefix "/pnfs/cta.cscs.ch/dteam/bulk-archive/dc-cscs"  \
        --impl rucio.rse.protocols.webdav.Default \
        --domain-json '{"wan": {"read": 1, "write": 1, "delete": 1, "third_party_copy": 1}, "lan": {"read": 1, "

rucio-admin account set-limits root CTA-DC-CSCS 1073741824

rucio-admin rse update-distance --distance 10 --ranking 1 CTA-SITE CTA-DC-CSCS
rucio-admin rse update-distance --distance 10 --ranking 1 CTA-DC-CSCS CTA-SITE

rucio-admin rse update-distance --distance 1 --ranking 1 CTA-ECOGIA CTA-DC-CSCS
rucio-admin rse update-distance --distance 1 --ranking 1 CTA-DC-CSCS CTA-ECOGIA
```

- An example showing how the set-up and access is done

```
$ gfal-ls -l https://dcache.cta.cscs.ch:2880/pnfs/cta.cscs.ch/dteam/bulk-archive/site/ctaarc/05/78/cta1Mb-00003
-rwxrwxrwx   0 0      0       1048576 Oct  3 12:52 https://dcache.cta.cscs.ch:2880/pnfs/cta.cscs.ch/dteam/bulk-archive/site/ctaarc/05/78/cta1Mb-00003
```

XROOTD installation at ETH/ECOGIA and set-up as Rucio on-site RSE

- XROOTD set-up as on-site RSE
  - **RSE name:** CTA-ONSITE-TEST
  - xrootd as a docker container running on machine with IP address: **10.236.12.186**
  - ports: **1094:1094**
  - XRDPORT = **1094 (for xrootd)**
  - protocols: root
    - domains: LAN, WAN, TPC (read, write, delete)
    - hostname: 10.236.12.186
    - impl: rucio.rse.protocols.xrootd.Default
    - port: 1094
    - prefix: //rucio
  - network_mode = **host**
  - host certificates: available in the docker container for testing (not for production)
  - rse_id: 8147f3a0cbee453e9c73957e5f6f42f1

Experimenting Rucio set-up with RSEs at different geographies (IP networks)

- RSE at UNIGE:
  - RSE name: CTA-ECOGIA RSE
  - https://www.isdc.unige.ch/~savchenk/cta/
  - Protocols: **ssh** and **http(s)**; two protocols used because https here is read-only (apache server) and to check that the same physical file location on an RSE can be accessed with different RSE protocols

- Rucio upload

```
$ rucio upload --scope ctaarc --rse CTA-ECOGIA cta1Mb-00005 --protocol ssh
2022-10-05 22:51:25,319 INFO    Preparing upload for file cta1Mb-00005
2022-10-05 22:51:25,508 INFO    Successfully added replica in Rucio catalogue at CTA-ECOGIA
2022-10-05 22:51:25,724 INFO    Successfully added replication rule at CTA-ECOGIA
2022-10-05 22:51:37,081 INFO    Trying upload with ssh to CTA-ECOGIA
2022-10-05 22:51:49,740 INFO    Successful upload of temporary file. ssh://login02.astro.unige.ch:22/www/people/savchenk/public_html/cta/ctaarc/70/42/cta1Mb-00005.rucio.upload
2022-10-05 22:52:16,063 INFO    Successfully uploaded file cta1Mb-00005
$ rucio list-file-replicas ctaarc:cta1Mb-00005  --protocol ssh,http
+---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------+
| SCOPE   | NAME         | FILESIZE   | ADLER32   | RSE: REPLICA                                                                                              |
|---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------|
| ctaarc  | cta1Mb-00005 | 1.049 MB   | 4fea810a  | CTA-ECOGIA: http://www.isdc.unige.ch:80/~savchenk/cta/ctaarc/70/42/cta1Mb-00005                           |
| ctaarc  | cta1Mb-00005 | 1.049 MB   | 4fea810a  | CTA-ECOGIA: ssh://login02.astro.unige.ch:22/www/people/savchenk/public_html/cta/ctaarc/70/42/cta1Mb-00005 |
+---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------+
```

● Testing replication between UNIGE and CSCS

- Adding a rule to create a file replica at dCache RSE (CSCS)

```
$ rucio add-rule ctaarc:cta1Mb-00005 1 'CTA-DC-CSCS'
8543b77c4d564b9e969fb9640c28007c
$ rucio list-rules --file ctaarc:cta1Mb-00005
ID                                ACCOUNT    SCOPE:NAME           STATE[OK/REPL/STUCK]    RSE_EXPRESSION    COPIES    EXPIRES (UTC)    CREATED (UTC)
--------------------------------  ---------  -------------------  ----------------------  ----------------  --------  ---------------  -------------------
8543b77c4d564b9e969fb9640c28007c  root       ctaarc:cta1Mb-00005  REPLICATING[0/1/0]      CTA-DC-CSCS       1                          2022-10-05 20:55:26
ffc524d23ab44cabb37c36826dac3ed6  root       ctaarc:cta1Mb-00005  OK[1/0/0]               CTA-ECOGIA        1                          2022-10-05 20:51:25
```

- Checking the replication rule is satisfied

```
$ rucio list-rules --file ctaarc:cta1Mb-00005
ID                                ACCOUNT    SCOPE:NAME           STATE[OK/REPL/STUCK]    RSE_EXPRESSION    COPIES    EXPIRES (UTC)    CREATED (UTC)
--------------------------------  ---------  -------------------  ----------------------  ----------------  --------  ---------------  -------------------
8543b77c4d564b9e969fb9640c28007c  root       ctaarc:cta1Mb-00005  OK[1/0/0]               CTA-DC-CSCS       1                          2022-10-05 20:55:26
ffc524d23ab44cabb37c36826dac3ed6  root       ctaarc:cta1Mb-00005  OK[1/0/0]               CTA-ECOGIA        1                          2022-10-05 20:51:25
```

- Listing replicas for the file with the scope and protocols in use

```
$ rucio list-file-replicas --protocols http,https,ssh ctaarc:cta1Mb-00005
+---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------------------------------------------------------+
| SCOPE   | NAME         | FILESIZE   | ADLER32   | RSE: REPLICA                                                                                                                                              |
|---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| ctaarc  | cta1Mb-00005 | 1.049 MB   | 4fea810a  | CTA-DC-CSCS: https://dcache.cta.cscs.ch:2880/pnfs/cta.cscs.ch/dteam/bulk-archive/dc-cscs/ctaarc/70/42/cta1Mb-00005                                        |
| ctaarc  | cta1Mb-00005 | 1.049 MB   | 4fea810a  | CTA-ECOGIA: http://www.isdc.unige.ch:80/~savchenk/cta/ctaarc/70/42/cta1Mb-00005                                                                           |
| ctaarc  | cta1Mb-00005 | 1.049 MB   | 4fea810a  | CTA-ECOGIA: ssh://login02.astro.unige.ch:22/www/people/savchenk/public_html/cta/ctaarc/70/42/cta1Mb-00005                                                 |
+---------+--------------+------------+-----------+-----------------------------------------------------------------------------------------------------------------------------------------------------------+
```

XROOTD installation at ETH/ECOGIA and its set-up as Rucio on-site RSE

- Registering on-site RSE with RUCIO instance running at CSCS

```
[user@fb664ba781be ~]$ rucio-admin rse add CTA-ONSITE-TEST
Added new deterministic RSE: CTA-ONSITE-TEST
[user@fb664ba781be ~]$ rucio-admin rse add-protocol --hostname 10.236.12.186 --scheme root --prefix //rucio --port 1094 -
-impl rucio.rse.protocols.xrootd.Default --domain-json '{"wan": {"read": 1, "write": 1, "delete": 1, "third_party_copy_re
ad": 1, "third_party_copy_write": 1}, "lan": {"read": 1, "write": 1, "delete": 1}}' CTA-ONSITE-TEST
```

```
[user@fb664ba781be ~]$ rucio upload --rse CTA-ONSITE-TEST --scope ctaarc file1
2022-10-03 09:04:30,613 INFO    Preparing upload for file file1
2022-10-03 09:04:30,760 INFO    Successfully added replica in Rucio catalogue at CTA-ONSITE-TEST
2022-10-03 09:04:30,859 INFO    Successfully added replication rule at CTA-ONSITE-TEST
2022-10-03 09:04:30,921 INFO    Trying upload with root to CTA-ONSITE-TEST
2022-10-03 09:04:31,032 INFO    Successful upload of temporary file. root://10.236.12.186:1094//rucio/ctaarc/7f/e6/file1.rucio.
upload
2022-10-03 09:04:31,330 INFO    Successfully uploaded file file1
```

```
[user@fb664ba781be ~]$ rucio list-rses
CTA-DC-CSCS
CTA-ECOGIA
CTA-MOCK-SITE
CTA-ONSITE-TEST
CTA-SITE
```

Test-setup Objectives: What we have done?

- Realistic set-up of RSEs (dCache, xrootd) at CSCS, UNIGE (ETH for testing) with certificates and proxy certificates and successfully accessing them (read, write operations)

- Testing replication through RUCIO between UNIGE and CSCS using the same VO proxy
  - file upload via different protocols (ssh, https, root) and adding a rule for replication

DPPS - BDMS Current Status and Short-term Goals

- Current BDMS Bulk archive prototyping efforts are in line with DPPS Release 0: “Integration Test” with release date of May 2023
  - But we will keep trying to produce novel prototypes satisfying BDMS requirements
  - Share our code and documentation at BDMS Gitlab repo: https://gitlab.cta-observatory.org/cta-computing/dpps/bdms/prototypes
- Focusing prototyping efforts with scenarios on **file deletion at the on-site, failure recovery, recovering files and metadata after storage element disk failure, file transfer efficiency** in close collaboration with **CSCS**
- Keeping up-to-date with BDMS Level B and Level C requirements
- Performance testing and monitoring (Grafana) with large set of files/datasets
- Discuss and complement our BDMS efforts with our Italian colleagues from INAF Rome

DPPS - BDMS Next Steps

- Testing replication through RUCIO between CSCS and PIC using the same Virtual Organization (VO) proxy
- Implementing and testing the RUCIO Bulk archive Prototype with three RSEs
  - Add a file on the UNIGE RSE, register it to RUCIO
  - Add a rule to replicate to CSCS
  - Add another rule to replicate to PIC
  - Erase the first rule which in turn erases the file at UNIGE RSE (on-site or origin)
- *** We tested the above set-up with three RSEs running as docker containers running on a machine and successfully realized the rule deletion enables deletion of a file at the origin RSE**

- Working on interfaces implementation to/from BDMS
- Token based Rucio implementation
- Developing customized CTA policy package for CTA user access

```
me_in_queue : 108}
[rucio-daemons] 2022-10-05 21:15:41,675 root    1       DEBUG   conveyor-submitter[0/1]: PREPARING REQUEST 293a7d73a431463e84fc32e83f40fc8f DID ctaarc:cta1Mb-00005 TO SUBMITTING STATE PREVIO
US None FROM [('CTA-ECOGIA', 'http://www.isdc.unige.ch:80/~savchenk/cta/ctaarc/70/42/cta1Mb-00005', 'd5da62e29422494797c34e00f085b8d7', 0)] TO https://dcache.cta.cscs.ch:2880/pnfs/cta.cscs.c
h/dteam/bulk-archive/dc-cscs/ctaarc/70/42/cta1Mb-00005 USING https://fts:8446/
[rucio-daemons] 2022-10-05 21:15:41,724 root    1       DEBUG   conveyor-submitter[0/1]: About to submit job to https://fts:8446/ with timeout None
[rucio-daemons] 2022-10-05 21:15:41,729 urllib3.connectionpool  1       DEBUG   Starting new HTTPS connection (1): fts:8446
[rucio-daemons] 2022-10-05 21:15:41,829 urllib3.connectionpool  1       DEBUG   https://fts:8446 "POST //jobs HTTP/1.1" 200 50
[rucio-daemons] 2022-10-05 21:15:41,834 root    1       DEBUG   conveyor-submitter[0/1]: Submit job de21de46-44f2-11ed-beb3-96ada7ec8361 to https://fts:8446/ in 0.10946369171142578 seconds
[rucio-daemons] 2022-10-05 21:15:41,835 root    1       INFO    conveyor-submitter[0/1]: Setting state(SUBMITTED), external_host(https://fts:8446/) and eid(de21de46-44f2-11ed-beb3-96ada7ec83
61) for transfers: 293a7d73a431463e84fc32e83f40fc8f
[rucio-daemons] 2022-10-05 21:15:41,835 root    1       DEBUG   conveyor-submitter[0/1]: COPYING REQUEST 293a7d73a431463e84fc32e83f40fc8f DID ctaarc:cta1Mb-00005 USING https://fts:8446/ with
 state(RequestState.SUBMITTED) with eid(de21de46-44f2-11ed-beb3-96ada7ec8361)
[rucio-daemons] 2022-10-05 21:15:41,842 root    1       DEBUG   conveyor-submitter[0/1]: Finished to register transfer state for de21de46-44f2-11ed-beb3-96ada7ec8361
[rucio-daemons] 2022-10-05 21:15:41,851 root    1       DEBUG   conveyor-submitter[0/1]: Switching to activity User Subscriptions and sleeping 0.9999682903289795 seconds
[rucio-daemons] 2022-10-05 21:15:42,872 root    1       INFO    conveyor-submitter[0/1]: Got 0 transfers for User Subscriptions in 0.02026963233947754 seconds
[rucio-daemons] 2022-10-05 21:15:42,872 root    1       DEBUG   conveyor-submitter[0/1]: Only 0 transfers for User Subscriptions which is less than group bulk 1
[rucio-daemons] 2022-10-05 21:15:42,873 root    1       DEBUG   conveyor-submitter[0/1]: Switching to activity User Subscriptions and sleeping 9.979242324829102 seconds
```

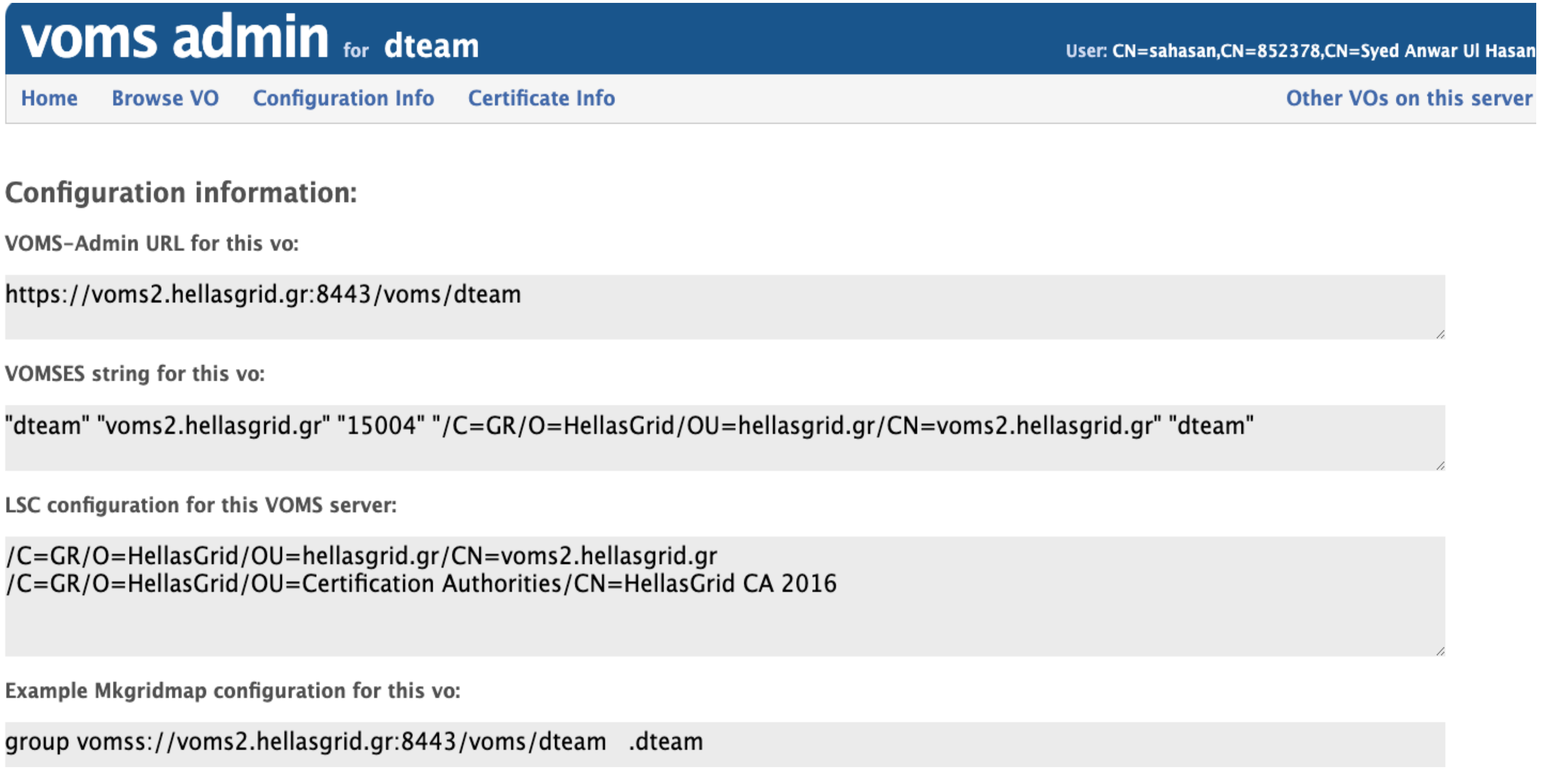
Some logs from daemons

```
[rucio-daemons] 2022-10-05 21:16:48,444 root    1       DEBUG   rse_update[0/1]: Sleeping 9.996049165725708 seconds
[rucio-daemons] 2022-10-05 21:16:49,024 root    1       DEBUG   conveyor-poller[0/1]: Heartbeat renewed
[rucio-daemons] 2022-10-05 21:16:49,024 root    1       DEBUG   conveyor-poller[0/1]: Start to poll transfers older than 60 seconds for activity User Subscriptions using transfer tool: None
[rucio-daemons] 2022-10-05 21:16:49,043 root    1       DEBUG   conveyor-poller[0/1]: Polling 1 transfers for activity User Subscriptions
[rucio-daemons] 2022-10-05 21:16:49,048 root    1       INFO    conveyor-poller[0/1]: Polling 1 transfers against https://fts:8446/ with timeout None
[rucio-daemons] 2022-10-05 21:16:49,063 urllib3.connectionpool  1       DEBUG   Starting new HTTPS connection (1): fts:8446
[rucio-daemons] 2022-10-05 21:16:49,149 urllib3.connectionpool  1       DEBUG   https://fts:8446 "GET //jobs/de21de46-44f2-11ed-beb3-96ada7ec8361?files=file_state,dest_surl,finish_time,start
_time,staging_start,staging_finished,reason,source_surl,file_metadata HTTP/1.1" 200 1754
[rucio-daemons] 2022-10-05 21:16:49,154 root    1       DEBUG   conveyor-poller[0/1]: Polled 1 transfer requests status in 0.10444045066833496 seconds
[rucio-daemons] 2022-10-05 21:16:49,154 root    1       DEBUG   conveyor-poller[0/1]: Updating 1 transfer requests status
[rucio-daemons] 2022-10-05 21:16:49,162 root    1       INFO    conveyor-poller[0/1]: UPDATING REQUEST 293a7d73a431463e84fc32e83f40fc8f FOR Transfer de21de46-44f2-11ed-beb3-96ada7ec8361 of c
taarc:cta1Mb-00005 CTA-ECOGIA --(293a7d73a431463e84fc32e83f40fc8f)-> CTA-DC-CSCS with changes: {'state': <RequestState.DONE: 'D'>, 'external_id': 'de21de46-44f2-11ed-beb3-96ada7ec8361', 'sta
rted_at': datetime.datetime(2022, 10, 5, 21, 15, 43), 'transferred_at': datetime.datetime(2022, 10, 5, 21, 15, 47), 'source_rse_id': 'd5da62e29422494797c34e00f085b8d7'}
[rucio-daemons] 2022-10-05 21:16:49,236 root    1       DEBUG   conveyor-poller[0/1]: Finished updating 1 transfer requests status (1 requests state changed) in 0.08188843727111816 seconds
[rucio-daemons] 2022-10-05 21:16:49,236 root    1       INFO    conveyor-poller[0/1]: Only 1 transfers for activity User Subscriptions, which is less than half of the bulk 100
[rucio-daemons] 2022-10-05 21:16:49,237 root    1       DEBUG   conveyor-poller[0/1]: Switching to activity User Subscriptions and sleeping 9.787679195404053 seconds
[rucio-daemons] 2022-10-05 21:16:50,401 root    1       DEBUG   collection replica update[0/1]: Heartbeat renewed
```

After few minutes, daemons log

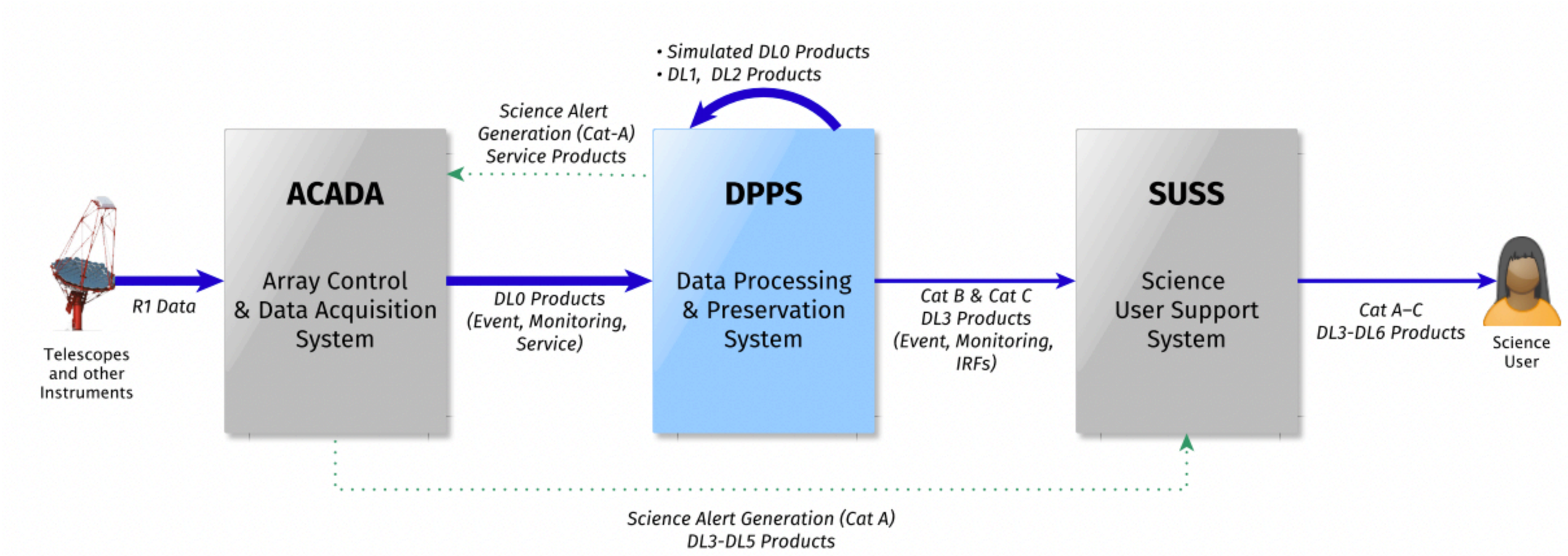
VOMS membership and proxy certificates

- dteam VO from EGI



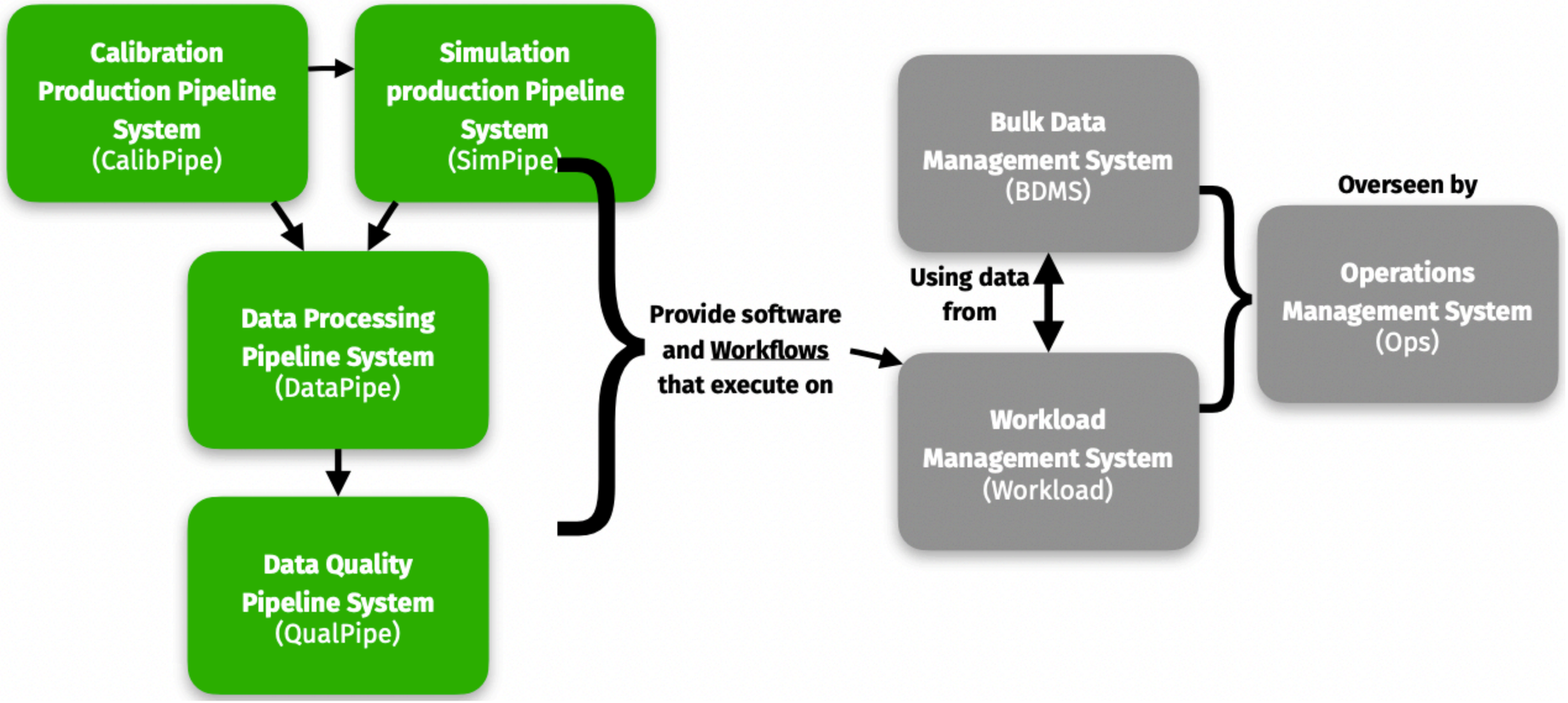
- We might want to move to CTA VO

DPPS - Introduction



DPPS - Introduction

- **Subsystems**



source: DPPS Introduction, DPPS workshop at DESY (Zeuthen), 10-12th October, 2022
https://indico.cta-observatory.org/event/4313/contributions/35652/attachments/22328/31950/DPPS%20overview%202022.pdf

Some Info on Archive Information Package (AIP)