Status of CYGNO Computing model

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Summary

1. CYGNO pledged resources and it availability
2. Recap of the CYGNO computing model
3. Working in progress

1

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- The majority of the additional 2800 HS06 have been allocated at CNAF-T1 as HTCondor queues[1].
- Significant demands for 25 are not expected, partly due to the plan to create a shared CSN2 queue (under CNAF) to handle workload peaks from various experiments.
- The online queue will get bigger to support the demand of next detector (more cameras)

Pledged Resources	2023	2024	2025
CPU (HS06)	**Tot: 2200** Infra.: 1000 online: 400 reco: 400 sim: 400	**Tot: 5000** Infra.: 1000 online: 1200[2] sim/reco: 2800[1]	-
Storage (TB)	**Tot: 75** data: 65 analy.: 3 sim.: 7	**Tot: 150** data: 120 analy.: 10 sim.: 20	-
TAPE (TB)	50	200	-

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CYGNO pledged resources and its availability

Here are the two main issues of the storage:

1. They cannot provide us with the pledge at CNAF (55TB left), as they did before.
2. We are currently in data-taking mode, so we cannot change all the scripts/code in our data chain on the fly without risking breaking things.

	Available (TB)	Used (TB)
Total Today	95	95

CYGNO Storage on Cloud		
Site/Bucket	**Available (TB)**	**Used (TB)**
cygno-analysis CNAF	3	2.34
cygno-data CNAF	65	65
cygno-sim CNAF	7	7
cygno-data BARI	20	~20

PSGE - CSN2

(Pipeline optimization for space and ground based experiments)

PSGE foreseen the generalisation of the CYGNO computing model to small/medium astro-particle experiments and a shared queue

4 pipelines:

- Gravity
- JUNO
- **CYGNO-CSN2**
- GEANT

Pledge Resources	2025 (HS06)
Gravity cloud	1000
JUNO cloud	1000
CYGNO/CSN2 HTCondor/CANF	8000

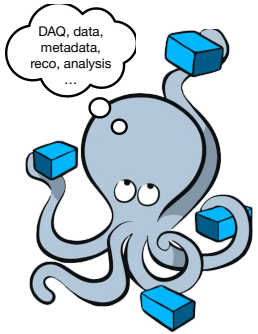
2

Recap of the CYGNO computing model

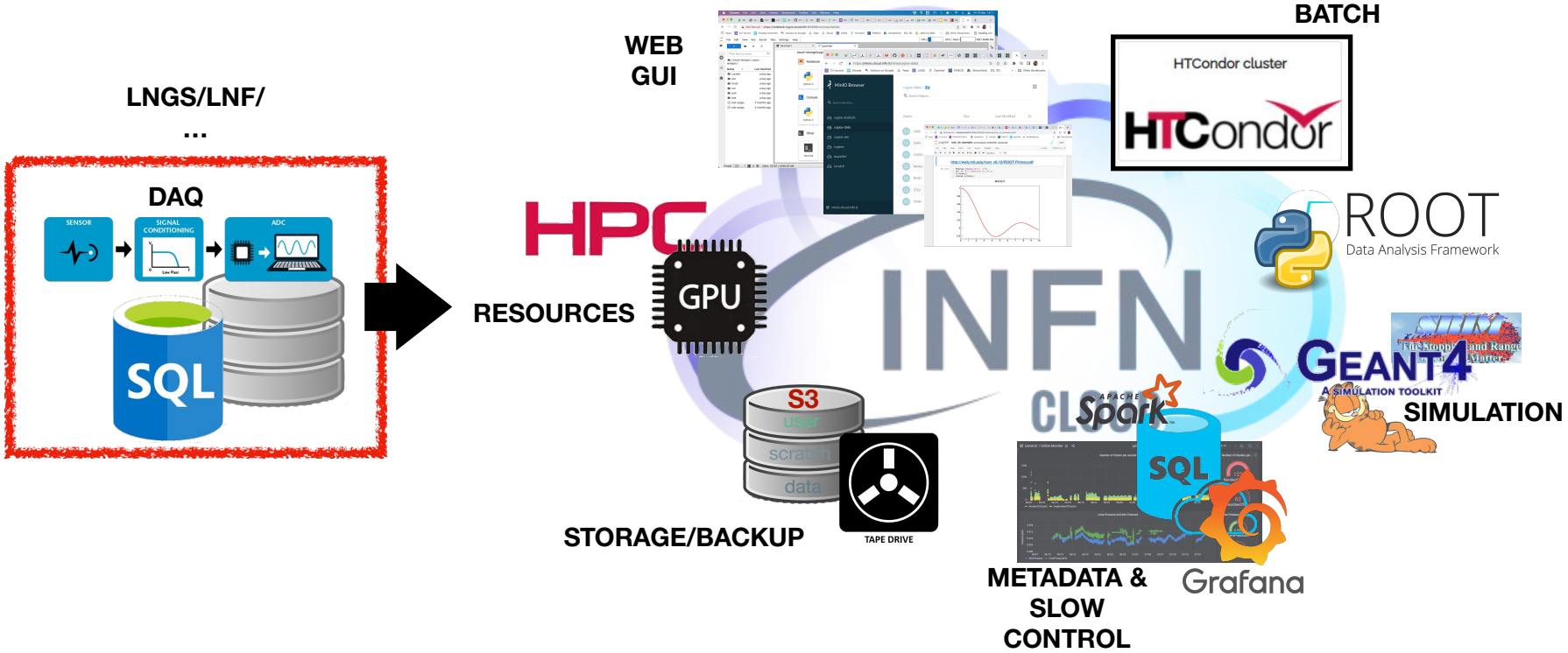
Recap of the CYGNO computing model

the middleware CYGNO project

- experiment **data management**;
- experiment front end **metadata** production and management;
- slow/fast remote **experiment monitor** without access to LAN DAQ (shift workers from all over the world);
- online data **reconstruction** and **pre-analysis**;
- online data **validation** and **qualification**;
- high level/back end metadata production and management, **alarms and warnings** dispatcher also via discord experiment channel.



CYGNO computing model



logical units, “composed” services

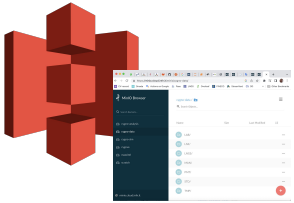
docker Compose

test and development setup at LNF

production setup at LNGS

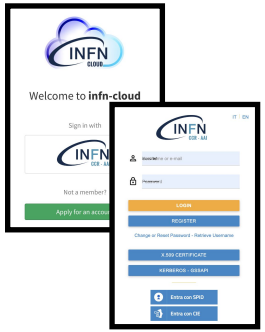
Mariadb replica for metadata
sql.cygno.cloud.infn.it

S3 storage
minio.cloud.infn.it



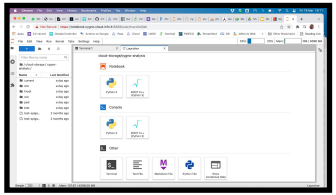
messaging
kafka.cygno.cloud.infn.it

Identity and Access Management
iam.cloud.infn.it



data and metadata monitor
grafana.cygno.cloud.infn.it

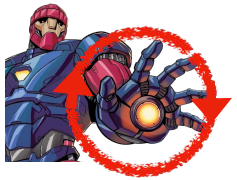
analysis and simulation web interfaces
notebook01.cygno.cloud.infn.it
notebook02.cygno.cloud.infn.it



batch queues
condor01.cygno.cloud.infn.it
condor02.cygno.cloud.infn.it

backup
tape.cygno.cloud.infn.it

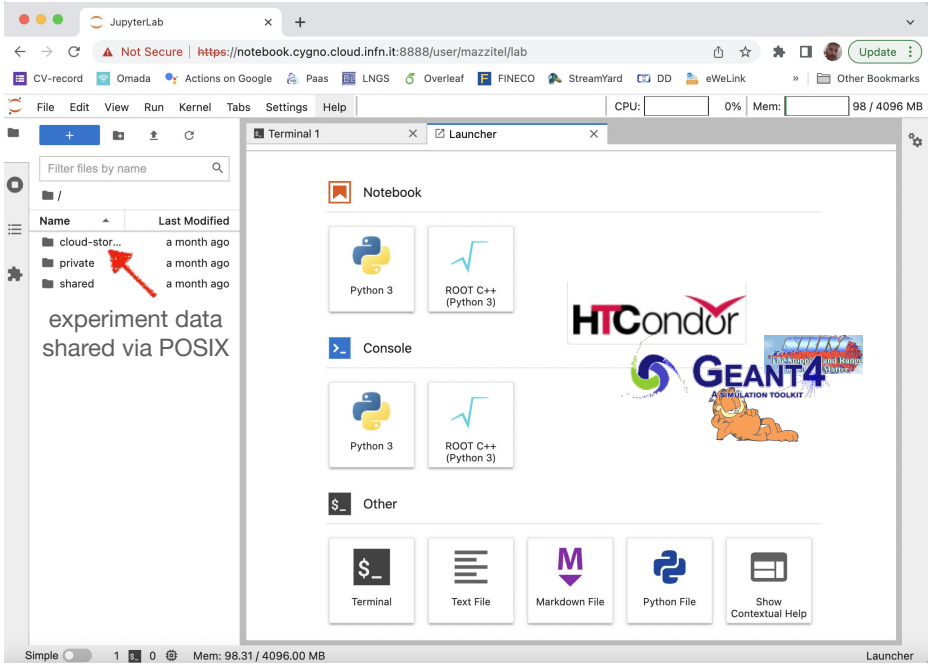
pre analysis and data quality
sentinel.cygno.cloud.infn.it



the user interface and services

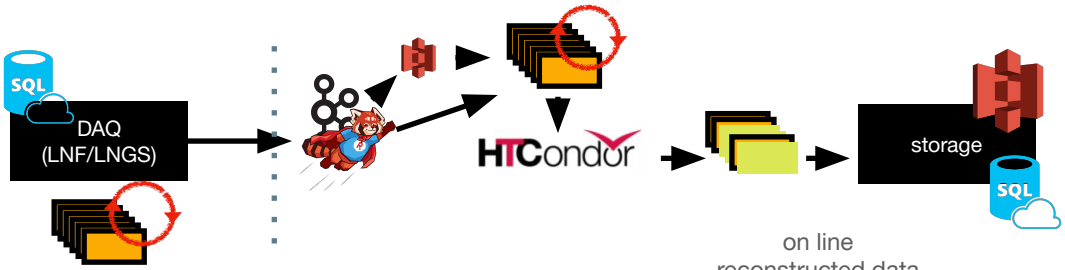
multi-user platform integrated with INDIGO IAM authentication and authorisation, batch system, analysis and simulation software

- the tool is base on “**Dynamic On Demand Analysis Service (DODAS)**” project that allows the integration of cloud storage for persistence services with **analysis** (python/root/ecc) and **simulation software** (GEANT/GARFILD/ecc).
- **notebooks/consoles** for scripting in python and root; **terminals; editor; data access via POSIX** (FUSE simulated)
- **batch system on demand**: from the interface the experiment HTCondor queues can be reach to submit and control job
- **user interface** and **work node** software running on the queues is managed by the experiment and can be easily update on user request.



online data reconstruction

the “sentinel”



on line
reconstructed data
and metadata

- parallel to run data management, single events are send to cloud by means of **kafka producer**
- the **sentinel** process consume data **parallelising the events reconstruction** on the HTCondor queues
- data and metadata are the stored and **presented** for online monitoring

3

Working in progress

Working in progress

Tier1 Queues for the Cygners:

- 2800 HS06, which can be seem as **300 cores**, available at the CNAF Tier1 - Sim&Reco Queues today have together **80 cores**;

- The Reconstruction & Simulation team is already testing the environment, and it will soon fully support CYGNO's requirements.

- And in case of problem with the Queue the cygner can directly contact the CNAF Tier1 support team at:

user-support@lists.cnaf.infn.it

Working in progress

CVMFS:

- It’s a scalable, reliable and low-maintenance software distribution service;

- A CYGNO-specific CVMFS repository has already been requested. It will host all the necessary software, including the experiment's algorithms and their versioning, ensuring efficient distribution and consistency across the computing infrastructure.

Working in progress

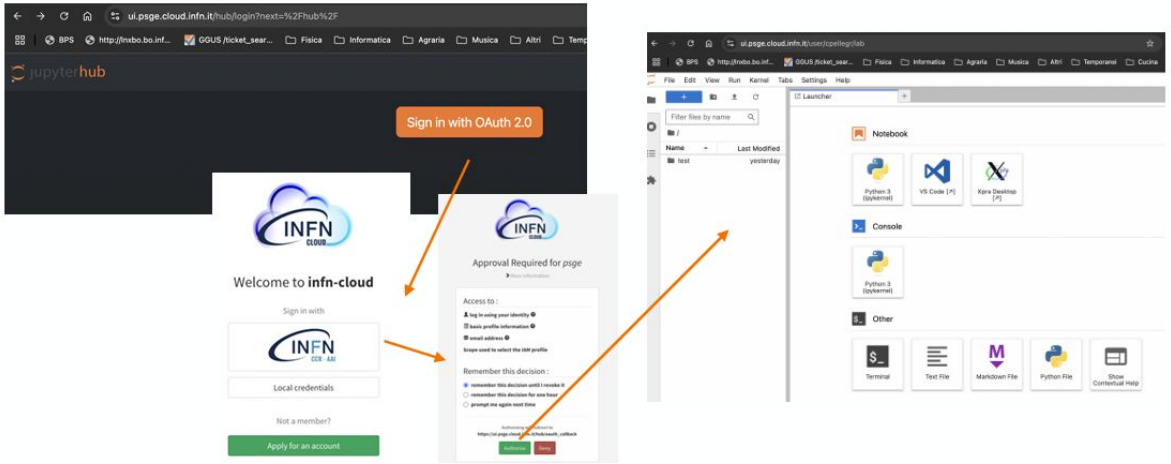
Notebook V2 Turbo Plus:

- It’s a new development (in test phase) to level-up the Jupyter Notebook the you know and use.

Working in progress

Notebook V2 Turbo Plus

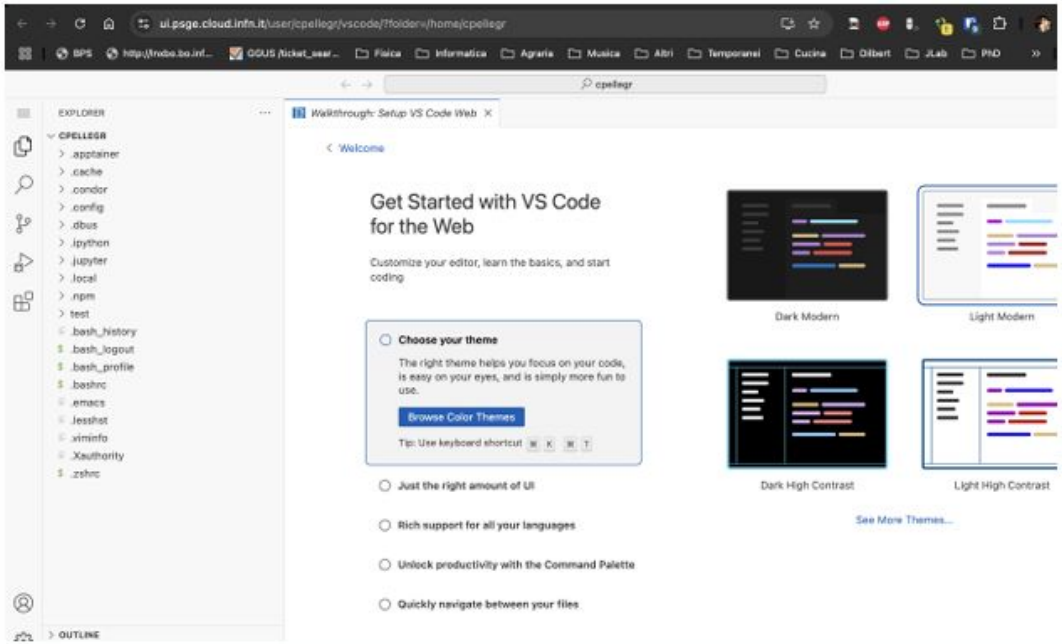
- Same INFN-AAI login



Working in progress

Notebook V2 Turbo Plus

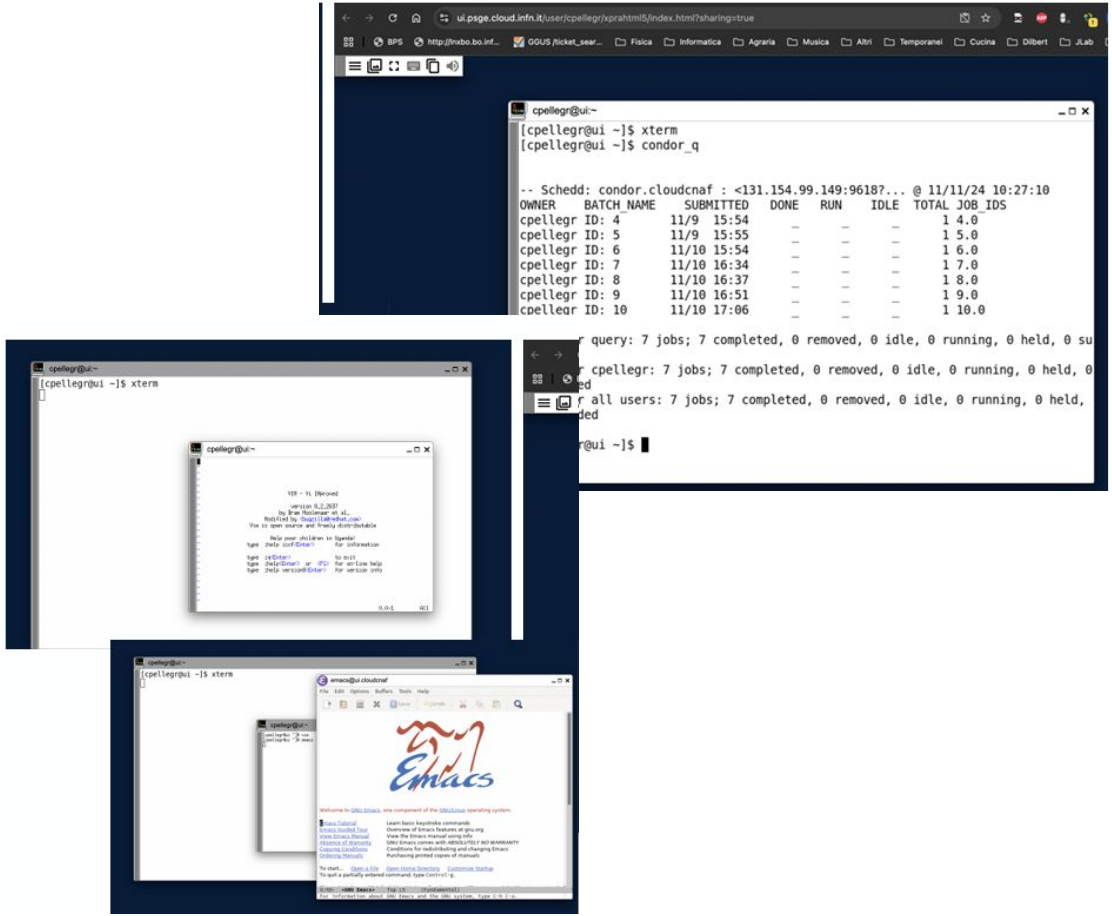
- Same INFN-AAI login
- VS Code integrated



Working in progress

Notebook V2 Turbo Plus

- Same INFN-AAI login
- VS Code integrated
- Remote Desktop with Emacs, terminal and the possibility of open images via xterm)



Working in progress

Notebook V2 Turbo Plus

- Same INFN-AAI login
- VS Code integrated
- Remote Desktop
- Same HTCondor access

```
[cpellegr@ui ~]$ condor_q


-- Schedd: condor.cloudcnaf : <131.154.99.149:9618?... @ 11/11/24 15:01:15
OWNER    BATCH_NAME    SUBMITTED   DONE   RUN    IDLE  TOTAL JOB_IDS
cpellegr ID: 4       11/9  15:54      _      _      _      1 4.0
cpellegr ID: 5       11/9  15:55      _      _      _      1 5.0
cpellegr ID: 6       11/10 15:54      _      _      _      1 6.0
cpellegr ID: 7       11/10 16:34      _      _      _      1 7.0
cpellegr ID: 8       11/10 16:37      _      _      _      1 8.0
cpellegr ID: 9       11/10 16:51      _      _      _      1 9.0
cpellegr ID: 10      11/10 17:06      _      _      _      1 10.0

Total for query: 7 jobs; 7 completed, 0 removed, 0 idle, 0 running, 0 held, 0 suspended
Total for cpellegr: 7 jobs; 7 completed, 0 removed, 0 idle, 0 running, 0 held, 0 suspended
Total for all users: 7 jobs; 7 completed, 0 removed, 0 idle, 0 running, 0 held, 0 suspended

[cpellegr@ui ~]$ condor_status
Name                                      OpSys      Arch   State     Activity LoadAv Mem    ActvtyTime

slot1@offload-10507.condor.psge.cloud.infn.it LINUX      X86_64 Unclaimed Idle      0.000 76800  0+03:48:07
slot1@offload-26050.condor.psge.cloud.infn.it LINUX      X86_64 Unclaimed Idle      0.000 76800  0+03:55:28
slot1@offload-28054.condor.psge.cloud.infn.it LINUX      X86_64 Unclaimed Idle      0.000 76800  0+03:50:50
slot1@vnode-0.localdomain                 LINUX      X86_64 Unclaimed Idle      0.000  4800  0+04:03:39

               Total Owner Claimed Unclaimed Matched Preempting  Drain Backfill BkIdle

  X86_64/LINUX     4     0       0         4       0          0     0        0      0

         Total     4     0       0         4       0          0     0        0      0
```

Working in progress

Notebook V2 Turbo Plus

- Same INFN-AAI login
- VS Code integrated
- Remote Desktop
- Same HTCondor access
- Same integrated storage

&

- CVMFS repository integrated

Thanks for the attention!