The PaNOSC Data Transfer pilot

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Authors: Marco De Simone (CERIC-ERIC) on behalf of WP6 Team

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The Pilot

“A user wants to analyse datasets produced during one of the experiments in the EGI infrastructure using Jupyter notebooks service”

We choose to:

- Transfer data via EGI DataHub based on Onedata from an NFS storage located at Ceric-Eric/Elettra RI to EGI Infrastructure Data Analysis service
- Archive the results back to the originated RI.
- Authenticate users using the EOSC ready PaN community AAI (UmbrellaId)

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Services, technical solutions & partners

For this pilot the following services & solutions have been used:

- EGI Notebooks service for supporting big data analytics.
- EGI DataHub/Onedata for federating data sets from the PaNOSC RIs.
- UmbrellaID as community AAI proxy for the PaNOSC community.

Partners involved for the pilot:

- **EGI, CERIC-ERIC, ILL and CESNET-MCC.**

Technical support (unfunded):

- **Cyfronet** (**EGI DataHub/Onedata**).

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EGI DataHub/Onedata: an overview

EGI DataHub is built on top of the Onedata SW stack. Onedata is composed by the following main components:

- **Spaces** - distributed virtual volumes, where users can organize their data.
- **Providers** - entities who support user spaces with actual storage resources exposed via *Oneprovider* services.
- **Zones** - federations of providers, which enable creation of closed or interconnected communities, managed by *Onezone* services.
- **LUMA** - A mechanism to translate the community userid that is used to perform the analyses with the userid local to the RIs for read and write operations on files.

Available interfaces:

- User web interface, User command-line interface, python libraries, REST APIs and CDMI.

Fundings:

- **EGI DataHub will be officially supported and funded by EGI (30%), Cyfronet (30%) and by the EGI-ACE project (40%).**

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Onedata: PROs

- Open Source (Apache License 2.0).
- Unified data access across globally distributed environments.
- Macaroon bearer tokens for sharing data easily.
- Different RIs storage infrastructures supported including: NFS, CEPH, POSIX, Swift, S3.
- Different interfaces: GUI, CLI, REST APIs and CDMI.
- OnedataFS python library allowing Jupyter Notebook direct access onto Onedata spaces.
- Oneclient for mounting via fuse remote spaces in your local system tree.
- Support for UmbrellaID AAI, OpenID Connect, SAML.
- LUMA in line with current authorization model.
- Supported and funded by EGI (30%), Cyfronet (30%) and by the EGI-ACE project (40%).

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Onedata: CONs

- Root install on storage might be an issue in some RIs
- Minor issues with not updated documentation
- Own transfer protocol (RTransfer), not interoperable with other solutions
- LUMA mapping so far has to be done manually one by one for users & for each provider
- One dedicated space for each RI exporting storage via oneprovider
- Support beyond EGI-ACE (40% of current funding)

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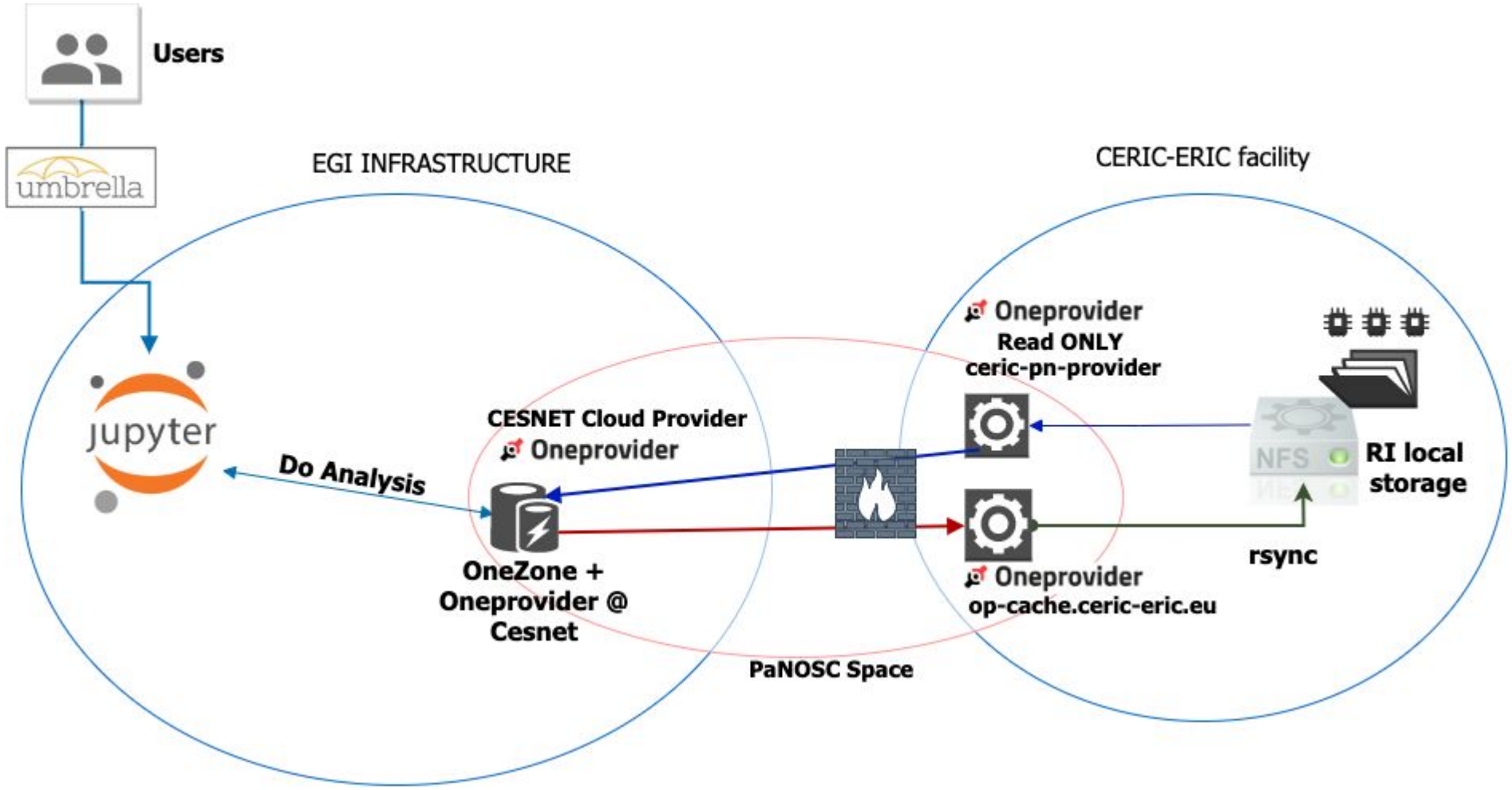
The pilot architecture @ CERIC-ERIC



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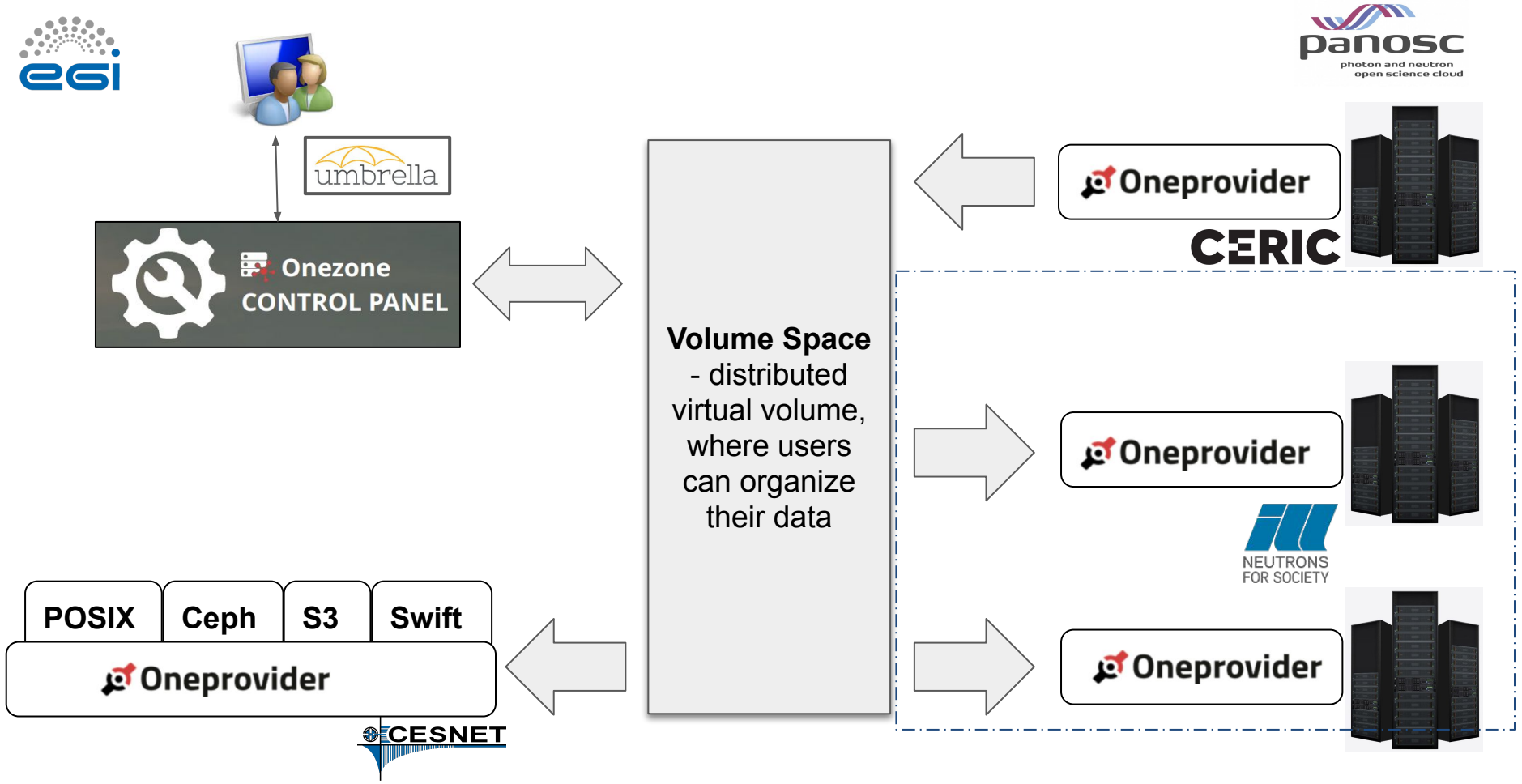
The PaNOSC Space for the pilot



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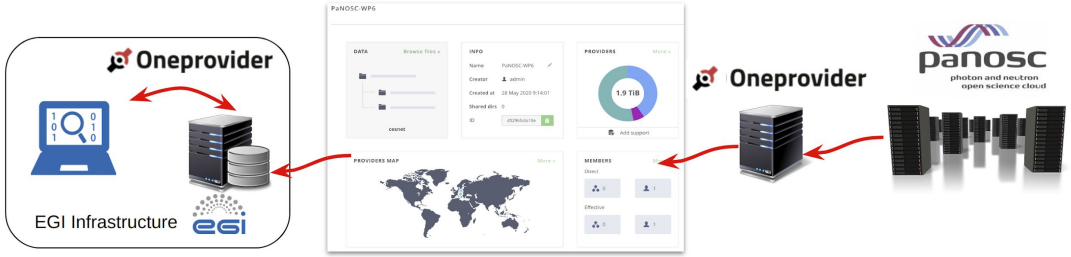
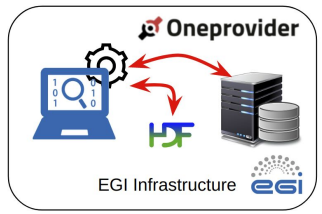
The Pilot in action

1. Reading data in the EGI cloud

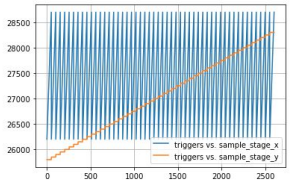


2. Computing in the cloud

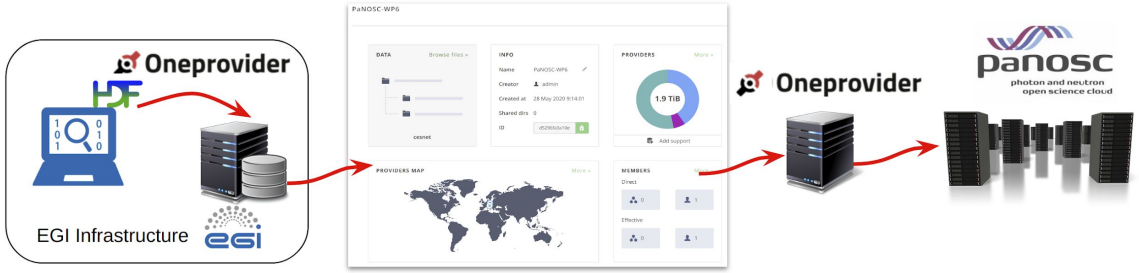



```
In [33]:
# This code snippet simulates the processing of datasets read from the volume space.
# As result of this simulation, the PNG file will be uploaded from the notebooks space
# in the default OneProvider (CESNET-MCC).

get_millisecs = lambda: int(round(time.time() * 1000))
get_millisecs()

print("Available keys: %s" % fh5py.keys())

plt_file="result_%s.png" %get_millisecs()

if ("triggers" in fh5py.keys()):

    # Getting datasets
    triggers = fh5py['triggers']
    timestamp = fh5py['triggers_timestamp']
    sample_stage_x = fh5py['sample_motors/sample_stage_x']
    sample_x_pos = fh5py['sample_motors/sample_x_pos']
    sample_y_pos = fh5py['sample_motors/sample_y_pos']
    sample_stage_y = fh5py['sample_motors/sample_stage_y']

    print("- triggers: %s" %triggers[:])
    print("- timestamp: %s" %timestamp[:])
    print("- sample_stage_x: %s" %sample_stage_x[:])
    print("- sample_x_pos: %s" %sample_x_pos[:])
    print("- sample_y_pos: %s" %sample_y_pos[:])
    print("- sample_stage_y: %s" %sample_stage_y[:])

    # Define data, grid, legend, and save the plot
    plt.plot(triggers[:], sample_stage_x[:], label='triggers vs. sample_stage_x')
    plt.plot(triggers[:], sample_stage_y[:], label='triggers vs. sample_stage_y')
    plt.grid()
    plt.legend()
    plt.savefig(plt_file, dpi = (100))
else:
    print ("Working in progress..")

#fh5py.close()
#f.close()
```

```
Available keys: <KeysViewHDF5 ['andor', 'dante', 'sample_motors', 'triggers', 'triggers_timestamp']>
- triggers: [   1    2    3 ... 2599 2600 2601]
- timestamp: [1.57496154e+09 1.57496154e+09 1.57496154e+09 ... 1.57496179e+09
 1.57496179e+09 1.57496179e+09]
- sample_stage_x: [26200. 26250. 26300. ... 28600. 28650. 28700.]
- sample_x_pos: [0. 0. 0. ... 0. 0. 0.]
- sample_y_pos: [0. 0. 0. ... 0. 0. 0.]
- sample_stage_y: [25800. 25800. 25800. ... 28300. 28300. 28300.]
```



3. Transferring data back to local RI storage



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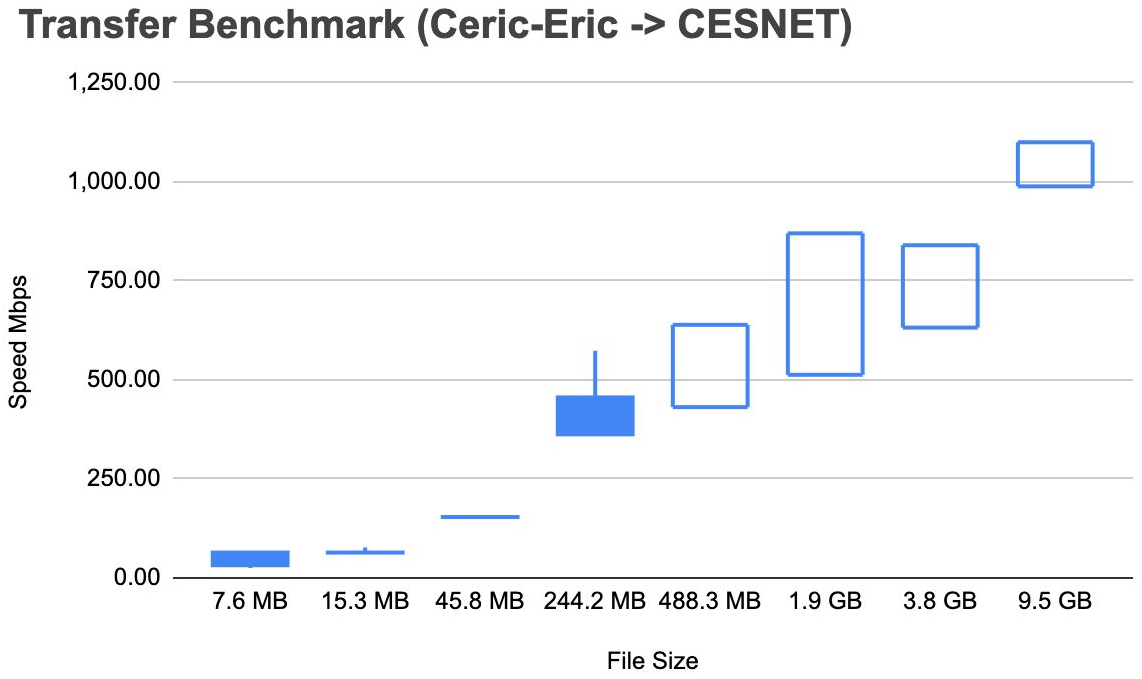
Results & conclusion

- Data transferred up to 100 GB
- HDF5 data files > 1GB can reach the maximum bandwidth available.
- Smaller files have a much smaller throughputs (⅕)
- Files < 50MB in size take the same amount of time of 250MB files, probably to the overhead required by the onedata transfer protocol, a standard pattern of network file transfer protocols.



We could extend the pilot deploying Oneprovider & a PaNOSC Space for each RI, so we will move data between RIs not only towards EGI cloud, once some issue with Luma will be solved

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Resources

1. Data Transfer Pilot on github
2. PaNOSC D6.1 Data-Hub
3. PaNOSC data transfer pilot setup
4. EGI DataHub
5. EGI Notebooks service
6. Onedata documentation
7. UmbrellaID
8. OnedataFS

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Thanks

The Pilot Team:

- Giuseppe La Rocca EGI Foundation
- Enol Fernández EGI Foundation
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