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EGI DataHub

Data as a Service – Distributed Data Management

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The work of the EGI Foundation
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Motivation

- Putting up a (scalable) distributed data infrastructure needs specific expertise, resources and knowledge
- No easy way to discover and transfer data
- No easy way of making data (publicly) accessible without transferring it to a sharing service
- No easy way of combining multiple datasets from different data providers
- Users need to access data locally and from compute resources

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EGI DataHub: components and concepts

- **EGI DataHub**: a **Onedata Onezone**, the **federation** and **authentication** service. SSO with all the connected storage providers (Oneprovider) through **EGI Check-in**

- **Oneprovider**: **data management** component deployed in the data centres, **provisioning data** and **managing transfers**. A default one is operated for EGI by CYFRONET.

- **Space**: a **virtual volume** where **users organize data**. A space is supported by one or multiple Oneproviders

- **Oneclient**: a client providing access to the spaces through a FUSE mount point (**local POSIX access**)

- **Web interfaces** and **APIs** are also available

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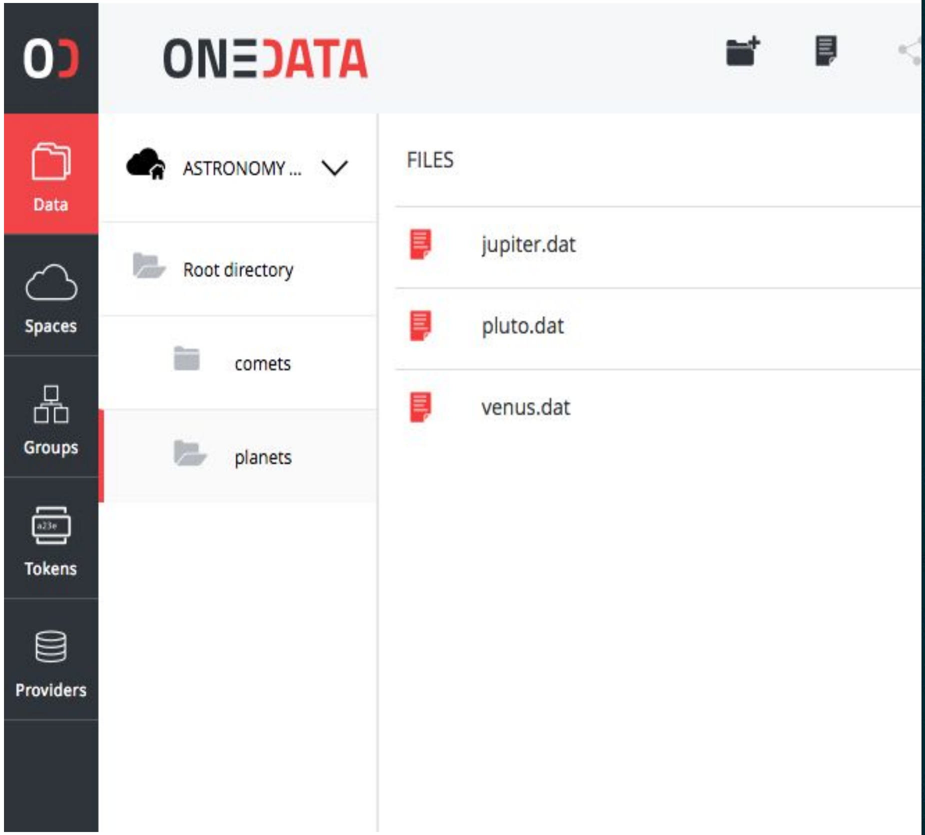
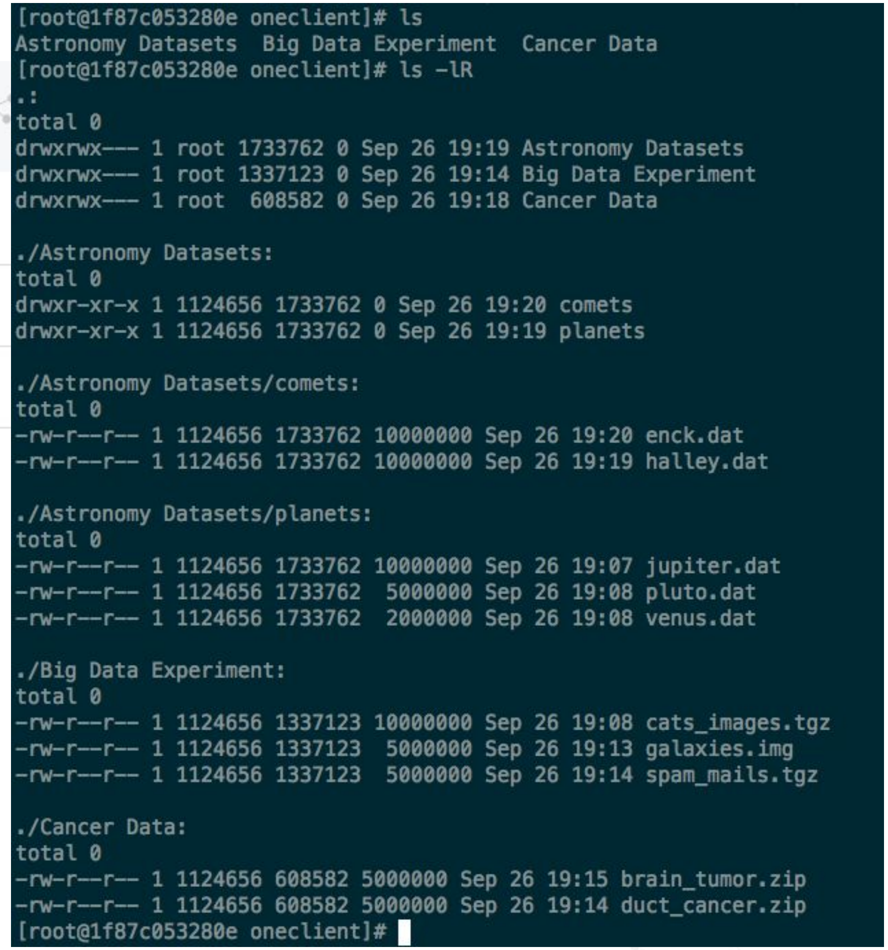
On the client side

Web interface and Oneclient on the CLI





```
[root@1f87c053280e oneclient]# ls
Astronomy Datasets  Big Data Experiment  Cancer Data
[root@1f87c053280e oneclient]# ls -lR
.:
total 0
drwxrwx--- 1 root 1733762 0 Sep 26 19:19 Astronomy Datasets
drwxrwx--- 1 root 1337123 0 Sep 26 19:14 Big Data Experiment
drwxrwx--- 1 root  608582 0 Sep 26 19:18 Cancer Data

./Astronomy Datasets:
total 0
drwxr-xr-x 1 1124656 1733762 0 Sep 26 19:20 comets
drwxr-xr-x 1 1124656 1733762 0 Sep 26 19:19 planets

./Astronomy Datasets/comets:
total 0
-rw-r--r-- 1 1124656 1733762 10000000 Sep 26 19:20 enck.dat
-rw-r--r-- 1 1124656 1733762 10000000 Sep 26 19:19 halley.dat

./Astronomy Datasets/planets:
total 0
-rw-r--r-- 1 1124656 1733762 10000000 Sep 26 19:07 jupiter.dat
-rw-r--r-- 1 1124656 1733762  5000000 Sep 26 19:08 pluto.dat
-rw-r--r-- 1 1124656 1733762  2000000 Sep 26 19:08 venus.dat

./Big Data Experiment:
total 0
-rw-r--r-- 1 1124656 1337123 10000000 Sep 26 19:08 cats_images.tgz
-rw-r--r-- 1 1124656 1337123  5000000 Sep 26 19:13 galaxies.img
-rw-r--r-- 1 1124656 1337123  5000000 Sep 26 19:14 spam_mails.tgz

./Cancer Data:
total 0
-rw-r--r-- 1 1124656 608582 5000000 Sep 26 19:15 brain_tumor.zip
-rw-r--r-- 1 1124656 608582 5000000 Sep 26 19:14 duct_cancer.zip
[root@1f87c053280e oneclient]# 
```

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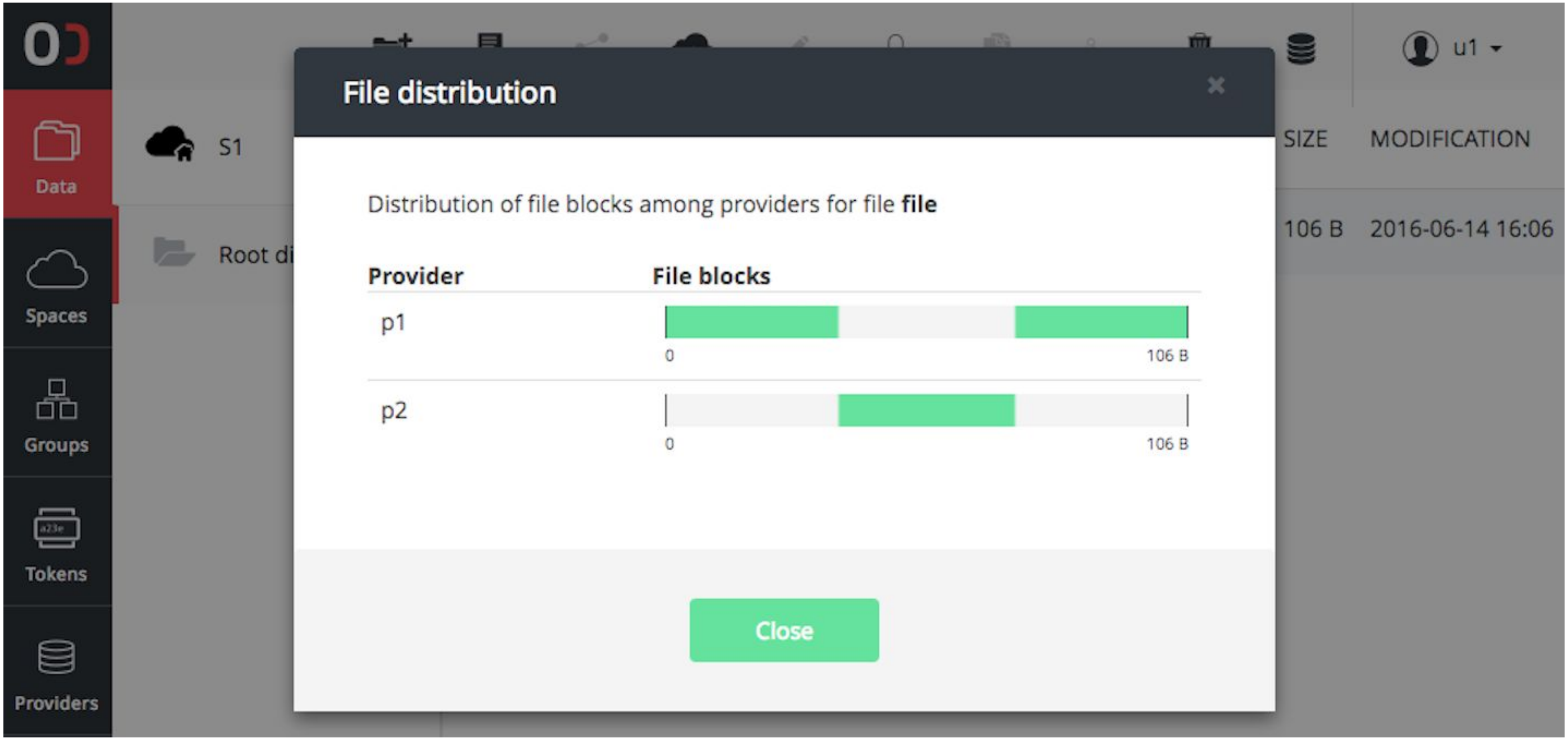
Replica management

File distribution across providers



File distribution

Distribution of file blocks among providers for file **file**

Provider	File blocks
p1	0 … 106 B
p2	0 … 106 B

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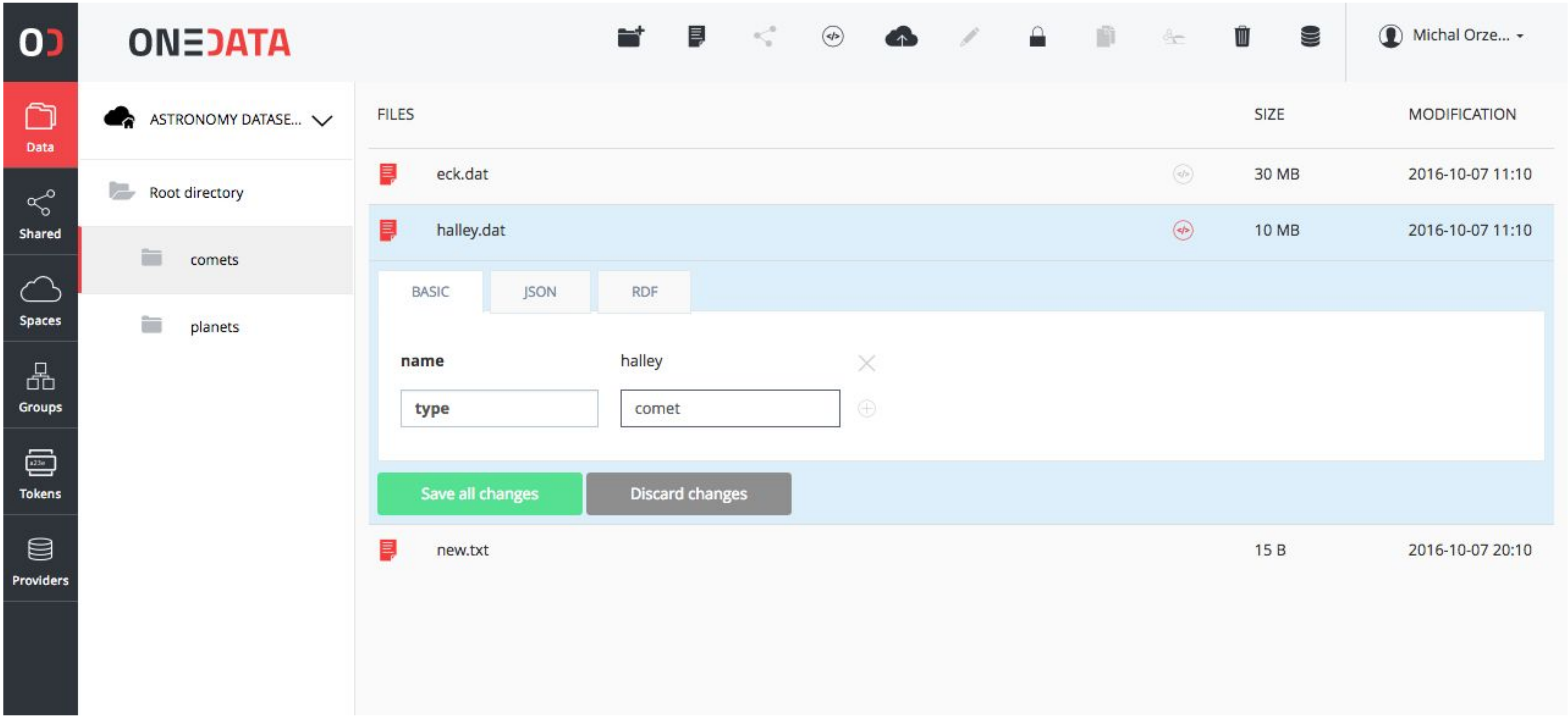
Metadata management

Attaching metadata to files



FILES	SIZE	MODIFICATION
eck.dat	30 MB	2016-10-07 11:10
halley.dat	10 MB	2016-10-07 11:10
new.txt	15 B	2016-10-07 20:10

name	halley
type	comet

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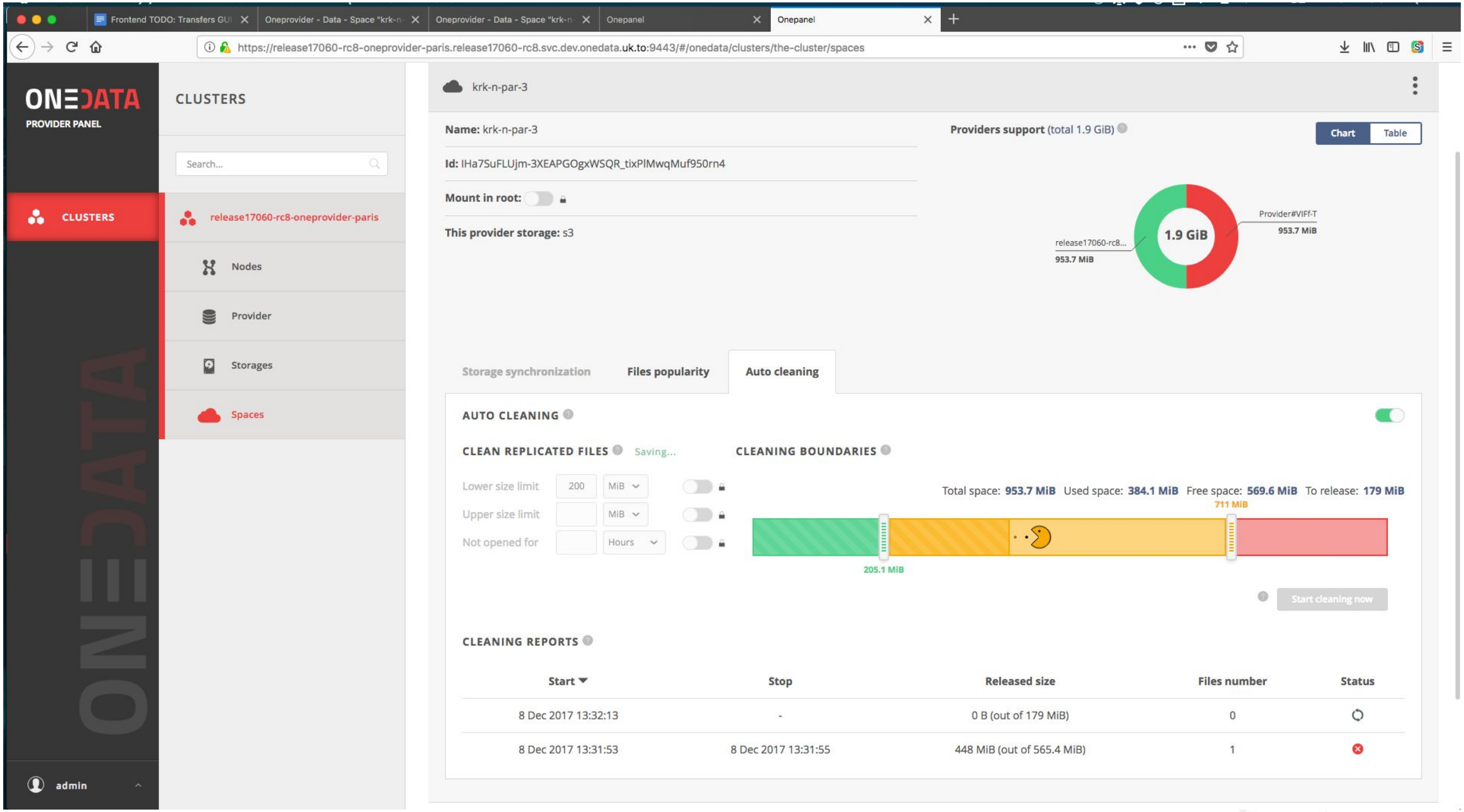
File popularity and smart caching



Name: krk-n-par-3

Id: IHa7SuFLUjm-3XEAPGOgxWSQR_tixPlMwqMuf950rn4

Mount in root:

This provider storage: s3

Providers support (total 1.9 GiB)

AUTO CLEANING

CLEAN REPLICATED FILES

Lower size limit 200 MiB

Upper size limit MiB

Not opened for Hours

CLEANING BOUNDARIES

Total space: **953.7 MiB** Used space: **384.1 MiB** Free space: **569.6 MiB** To release: **179 MiB**

CLEANING REPORTS

Start	Stop	Released size	Files number	Status
8 Dec 2017 13:32:13	-	0 B (out of 179 MiB)	0	○
8 Dec 2017 13:31:53	8 Dec 2017 13:31:55	448 MiB (out of 565.4 MiB)	1	☒

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Multiple usage models

- Transparent data access service
- Doing smart caching of remote storage
- Federating data sources/providers
- Publishing datasets
- Notebooks with DataHub

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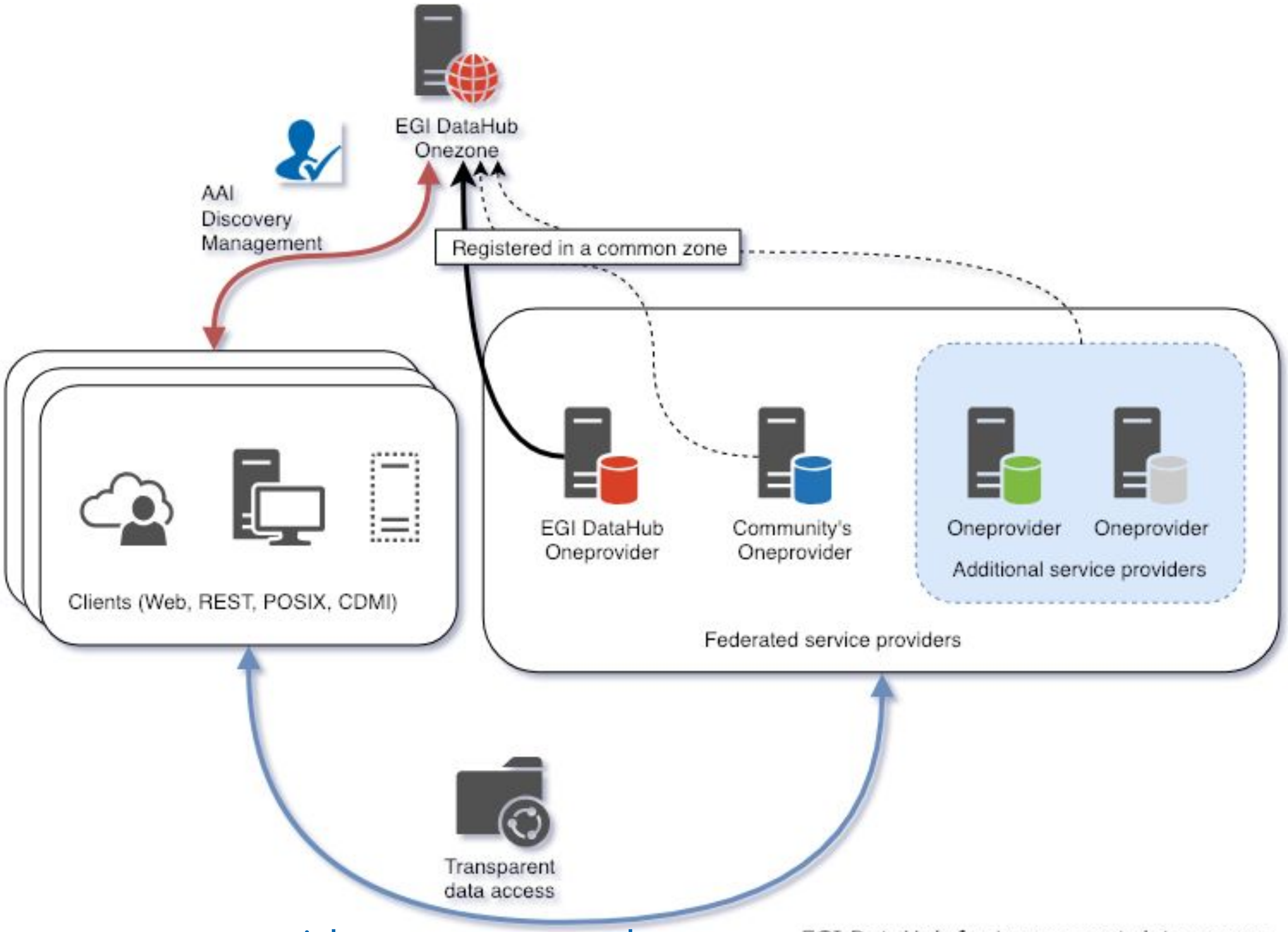
DataHub for transparent data access



EGI DataHub for transparent data access

- Clients uses one or more providers to access data
- Data can be accessed over multiple protocols

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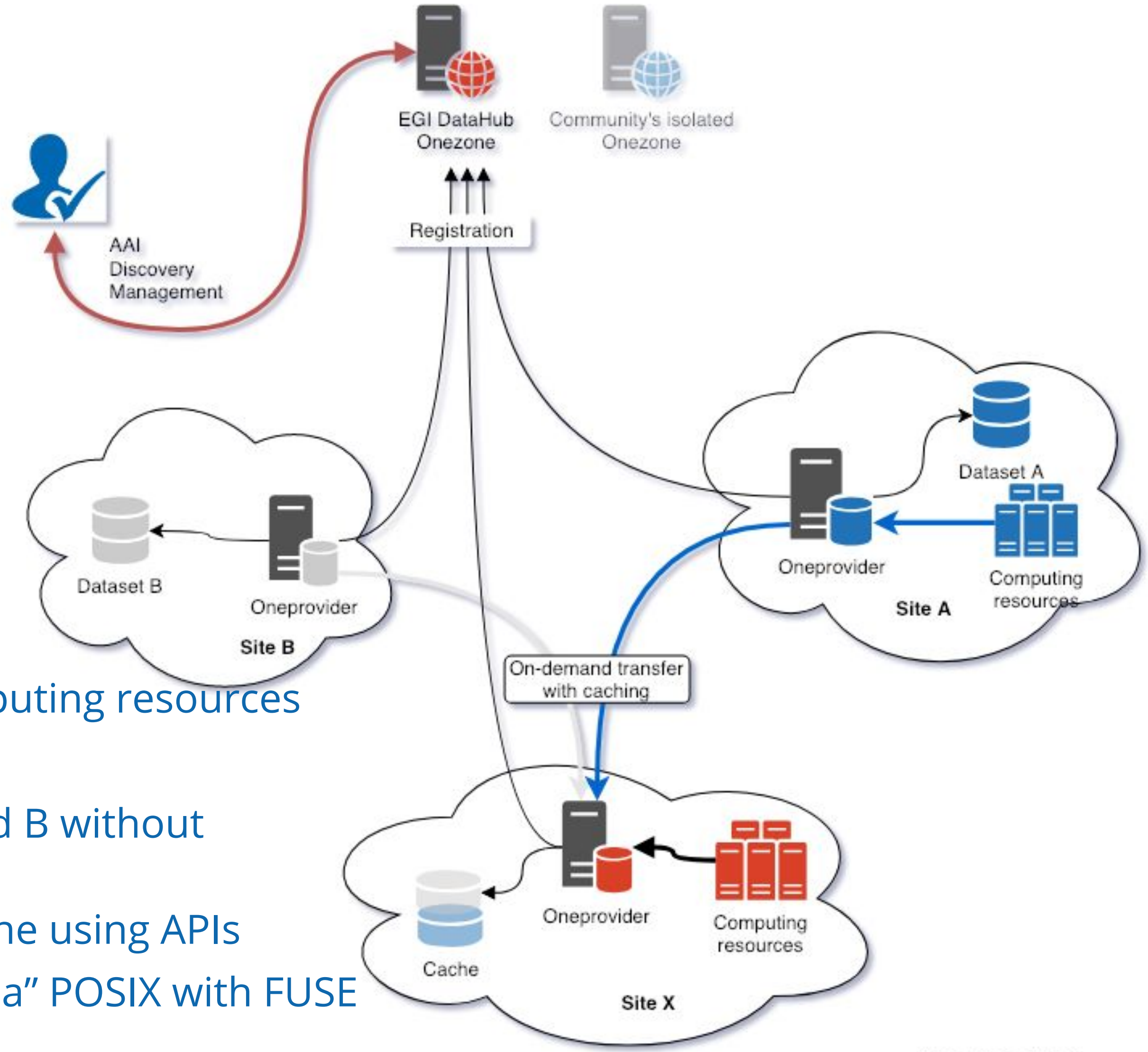
Smart caching of remote storage



Smart caching

- Site A hosts data and computing resources
- Site B hosts only data
- Site X uses data from A and B without pre-staging
- Pre-staging can also be done using APIs
- Data is accessed locally "à la" POSIX with FUSE

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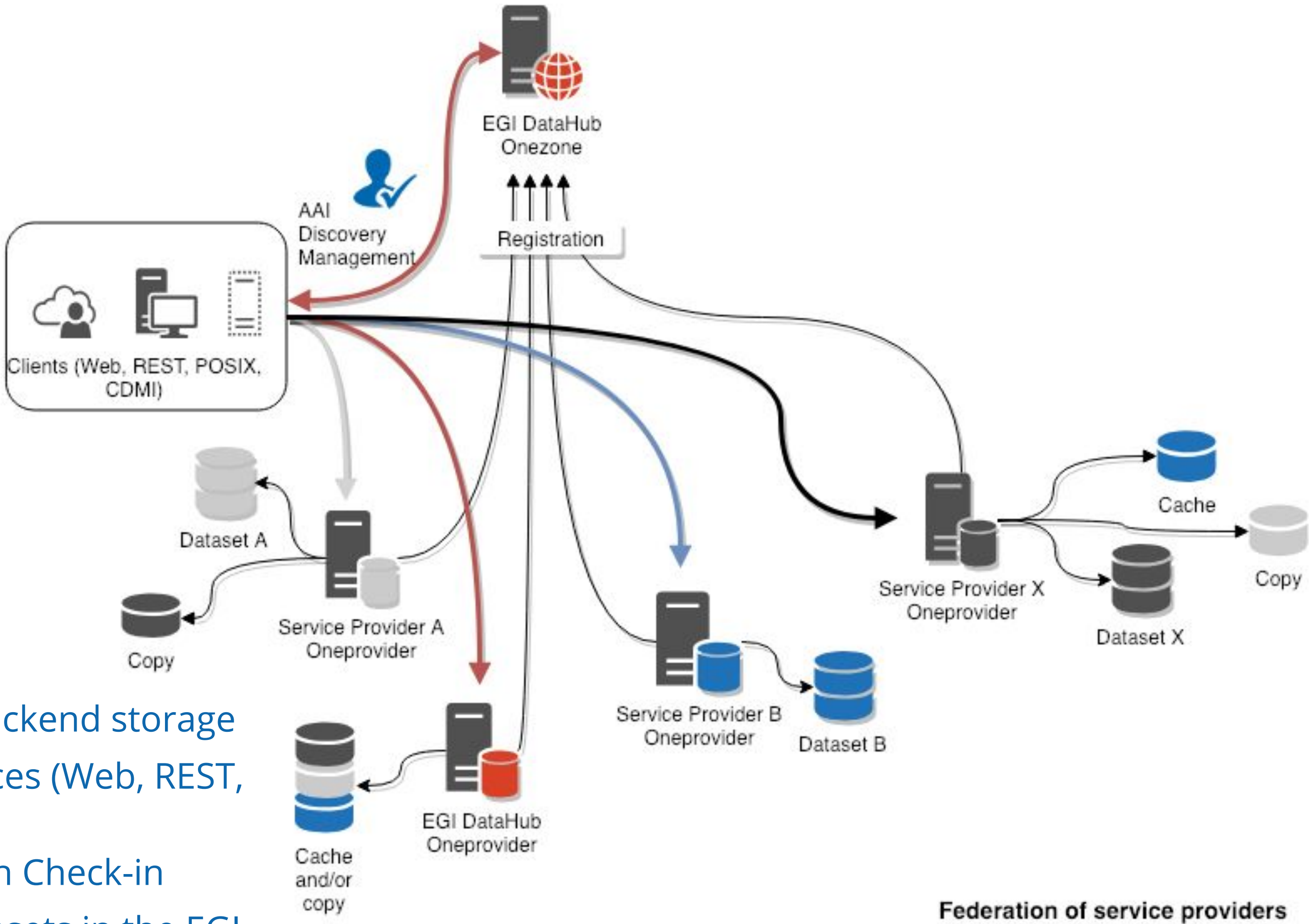
Federation of service providers



Federation of service providers

- Heterogenous backend storage
- Common interfaces (Web, REST, POSIX, CDMI)
- Common AAI with Check-in
- Discovery of Datasets in the EGI DataHub

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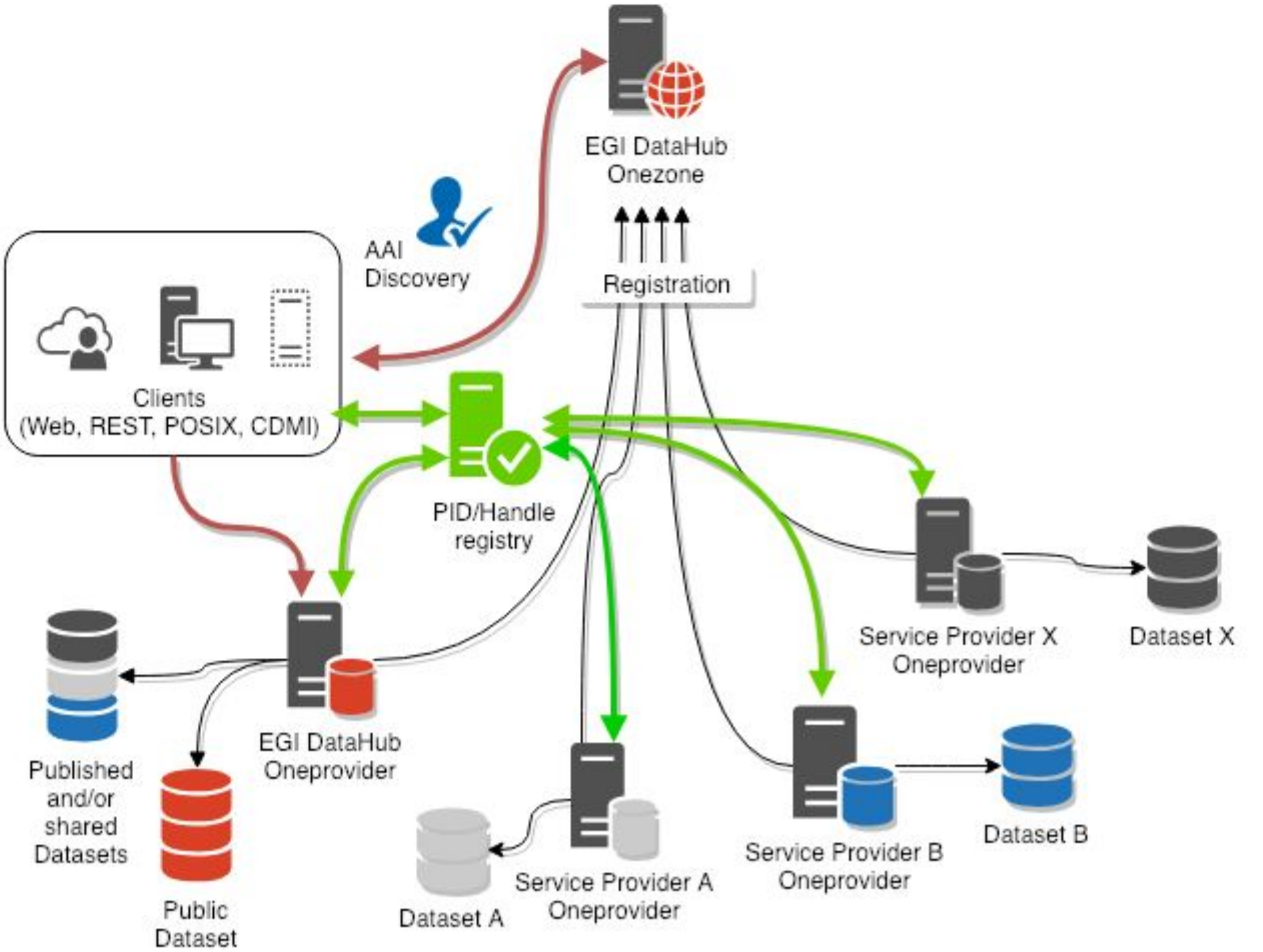
Publishing and discovery of datasets



EGI DataHub Onezone
AAI Discovery
Registration
Clients (Web, REST, POSIX, CDMI)
PID/Handle registry
Service Provider X Oneprovider
Dataset X
EGI DataHub Oneprovider
Published and/or shared Datasets
Public Dataset
Dataset A
Service Provider A Oneprovider
Service Provider B Oneprovider
Dataset B

- PID minting
- Publishing, discovery and access to datasets

Publication of datasets

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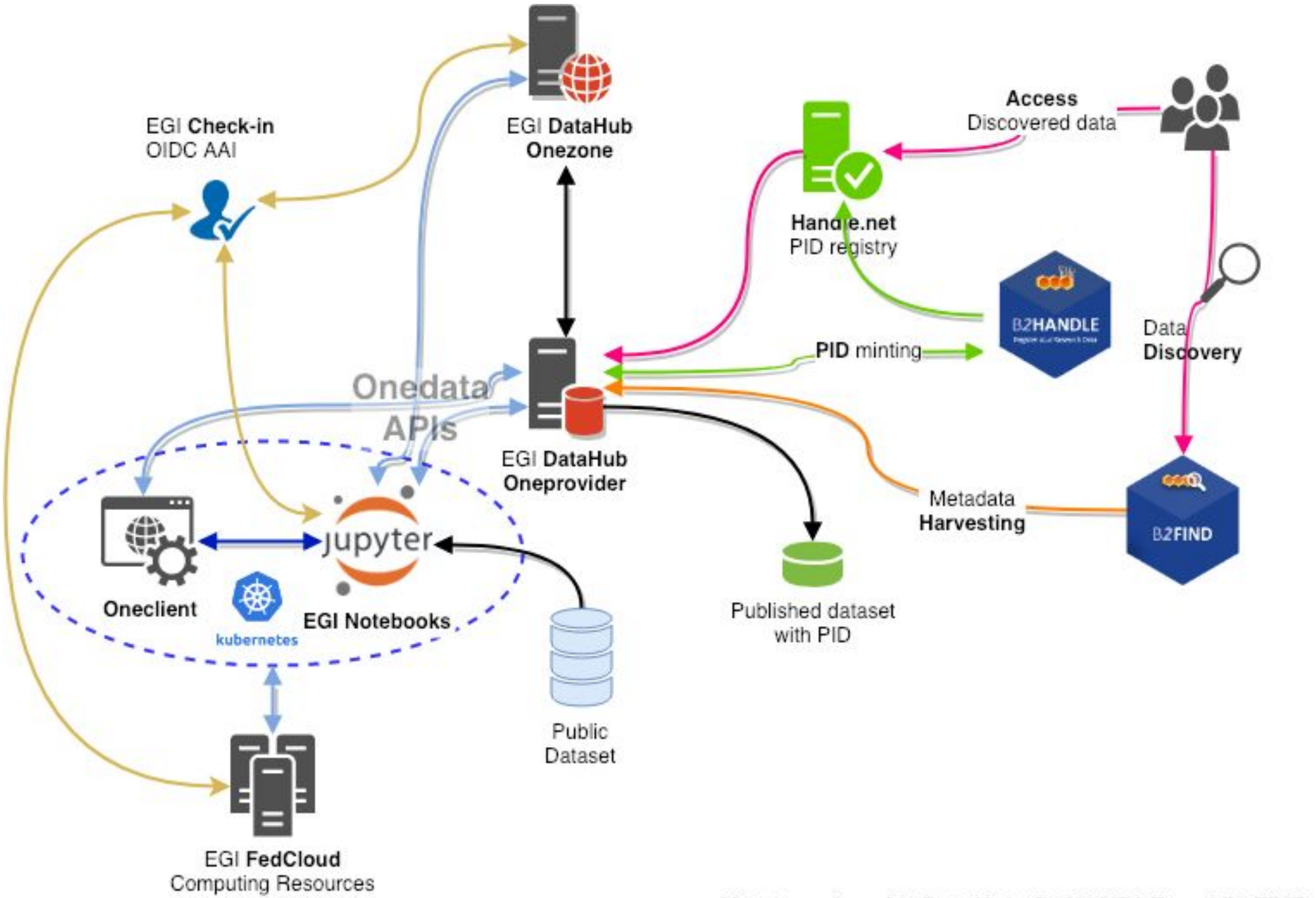
Notebooks with DataHub



Noteboooks with DataHub, B2HANDLE and B2FIND

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Steps to use DataHub and Onedata

- Collecting and analysing dataset specificities
  - Number of files
  - Size of files
- Preparing a pilot
  - Designing and validating usage model
  - Integrating Onedata with existing resources
- Validating the pilot
- Deploying a production setup
  - Ensuring hardware requirements are sufficient
    - RAM, CPU, Disk, Network,…
    - Storage backend

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Deploying Onedata

- Preferred model: using docker containers
  - Using docker-compose
  - Packages for Ubuntu 16.04 and CentOS 7 also available

ONEDATA

docker

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Requirements for production

- Powerful-enough Oneprovider
  - RAM: 32GB
  - CPU: 8 vCPU
  - Disk: 50GB SSD
  - To be adjusted for the dataset and usage scenario

- For high IOPS
  - High-performance backend storage (CEPH)
  - Low latency network

- POSIX mounting
  - Oneprovider close to the Oneclient

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Links

- EGI DataHub
  - https://datahub.egi.eu/
  - https://community.egi.eu/c/egi-services/datahub
  - https://egi-datahub.readthedocs.io/
  - https://wiki.egi.eu/wiki/EGI_Federated_Data

- System requirements
  - https://onedata.org/docs/doc/system_requirements.html

- Official Onedata documentation
  - https://onedata.org
  - https://onedata.org/#/home/documentation
  - Getting started
    - https://github.com/onedata/getting-started
  - Source code: https://github.com/onedata

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Thank you
for your attention.

Questions?

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