The Onedata platform

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e-Research Summer Hackfest
Agenda

- Introduction to Onedata
- Internal Architecture
- Live Demo:
  - Example scenarios for distributed data access
  - Sharing
  - FUSE client
  - CDMI & REST Access
- Onedata in HBP
- Open Data Platform
- Hands-on demo
- Summary
Introduction to Onedata
Problems

- Heterogeneity of storage technologies
- High-throughput processing
- Data in large scale multi-cloud environments
- High-throughput transfers
- Replica management
- Sharing:
  - Team-sharing
  - Cross-community data sharing
  - Instant and ad-hoc data sharing
Problems

- Heterogenity of storage technologies
- High-throughput processing
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  - Team-sharing
  - Cross-community data sharing
  - Instant and ad-hoc data sharing
Onedata team

- Currently the Onedata team is composed of 20 people
- We have been developing the platform for > 3 years
- Located in Krakow, Poland
- Supported by:
  - ACC Cyfronet AGH
  - PLGrid
  - INDGO Data Cloud
  - EGI Engage
Onedata spaces

Each Space might be Supported by many providers

- User 1
- User 2
- User 3
- Group

METADATA CHANGE FEED

Community Metadata Index

P2P

ONEDATA Provider

Local Network Attached Storage

ONEDATA Provider

Indigo Cloud Provider 1

ONEDATA Provider

Storage LustreFS

Indigo Cloud Provider 2

ONEDATA Provider

CephFS

P2P

Amazon S3
Onedata system architecture

 Integrating distributed data infrastructures with INDIGO-DataCloud
Oneworld

Integrating distributed data infrastructures with INDIGO-DataCloud
Internal architecture
Onedata system architecture

Integrating distributed data infrastructures with INDIGO-DataCloud

Onezone

POSIX

Ceph

S3

Swift (testing)

FUSE Client

Oneclient

HTTP GUI

REST

FUSE Client

OIDC

SAML (in prep.)

Kademila

DHT

OAI-PMH (in prep.)

Entry GUI

REST APIs

FTP / SFTP (in prep.)

Data Mgmt. GUI

REST APIs

CDMI

WebDAV (in prep.)

ONE WORLD

Integrating distributed data infrastructures with INDIGO-DataCloud
What’s new in Onedata 3.0

- Internal architecture of Onedata 2.x redesigned from scratch
- Access tokens based on macaroons
- Support for POSIX, S3, Ceph, Swift storages
- Provides CDMI, POSIX, REST access to the data
- Support for Zones
- Internal Database migrated to Couchbase
- Fully dockerized
- Batch configuration and deployment
- Many tests at several levels: unit, integration, acceptance, performance, stress

Integrating distributed data infrastructures with INDIGO-DataCloud
Scalability and fault tolerance

Integrating distributed data infrastructures with INDIGO-DataCloud

Oneprovider

Protocols CDMI
Protocols S3
Protocols POSIX
VFS

Control, Remote Data Access
CDMI API

Parallel Processing Nodes using POSIX oneclient, CDMI or REST

Firewall
:443, :53

Storage Access

Ceph
S3
NFS
Lustre

Integrating distributed data infrastructures with INDIGO-DataCloud
Remote file transfers

Distributed Priority Queue
For cluster to cluster transfers

Transfer started by:
- User in GUI
- API-s
- Policy
- Access to Remote Data

Block-based transfer:
- Remote Data Access on the fly
- Pre-staging
- Data Migration
- Data Replication
# CDMI-supported capabilities

## Operations

<table>
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<tr>
<th>Basic object GET PUT DELETE</th>
<th>cdmi_dataobjects, cdmi_read_value, cdmi_modify_value, cdmi_delete_dataobject</th>
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<tr>
<td>Basic container GET PUT DELETE</td>
<td>cdmi_list_children, cdmi_create_container, cdmi_delete_container</td>
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<td>Metadata (container&amp;dataobject)</td>
<td>cdmi_read_metadata, cdmi_modify_metadata, cdmi_size, cdmi_(atime</td>
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<td>Access control lists (rwx)</td>
<td>cdmi_acl</td>
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<td>Big folders</td>
<td>cdmi_list_children_range</td>
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<td>File System Export (FUSE client)</td>
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<td>Move and copy</td>
<td>cdmi_(move</td>
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<tr>
<td>Access by ObjectID</td>
<td>cdmi_object_access_by_ID</td>
</tr>
</tbody>
</table>
Live demo
Demo environment

Integrating distributed data infrastructures with INDIGO-DataCloud
Onedata in HBP
HBP image service with dockerized client

- HBP Scans
  - Space 5TB

- HBP Image Viewer
  - /srv/data HBPScans/

- HBP Atlas Viewer

Integrating distributed data infrastructures with INDIGO-DataCloud
High-performance access

Integrating distributed data infrastructures with INDIGO-DataCloud

Diagnostics

Host
Time range
Chart type
Add chart

summary / last 5 minutes / storage IO transfer

0
-15 000
-30 000
-45 000
-60 000

09:37:40 Nov 10, 2015
09:38:40 Nov 10, 2015
09:39:40 Nov 10, 2015
09:40:40 Nov 10, 2015
09:41:40 Nov 10, 2015
09:42:40 Nov 10, 2015

TX Mb/s
RX Mb/s

09:41:00 Nov 10, 2015
TX Mbps summary: 0
TX Mbps: 0
RX Mbps: 56748.522402
RX Mbps: -56748.522402

Integrating distributed data infrastructures with INDIGO-DataCloud
Open data platform
Open data platform

1: **opendata create snapshot Data-set-1**

2: **opendata publish collection Data-set-1.1** → DOI.1

3: **discover** → DOI.1

4: Visit Collection Web Page (HTTP)

5: **opendata mount remote DOI.1 /localdir/**

6: **opendata fork DOI.1**
Hands-on demo

https://tinyurl.com/onedataHackfestDemo
Summary

- Distributed multi-provider storage
- Flexible access control
- Inter-federations scenarios for sharing data
- POSIX client for mounting user’s space
- Scalable from Single NAS to large datacentre
- Can be deployed on top of high-performance parallel storage solutions with very small overhead < 5%.
- Support for open data scenarios
- Onedata is currently supported by: PLGrid, EGI-Engage, INDIGO DataCloud