

SPD Distributed Data Management status update

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X SPD collaboration meeting
JINR Dubna
23.10.2025

Infrastructure

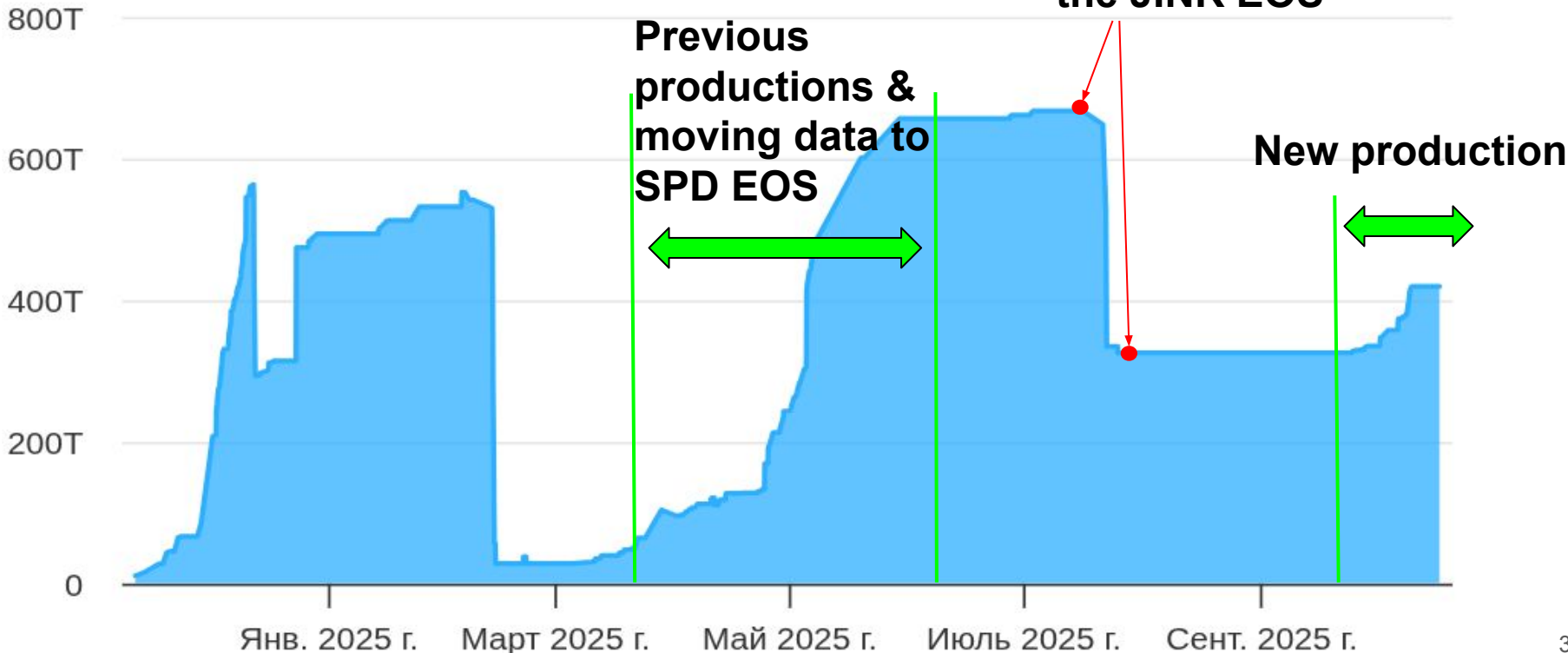
At the moment, the required set of system components of three Rucio-servers, Rucio-daemons and additional components are deployed in Docker containers based on JINR cloud computing infrastructure:

- **Prod infrastructure**. The main Rucio-server which work stable and used for the needs of the SPD collaboration and a set of daemons that are constantly running.
- **Monitoring system**. A set of monitoring system components. It's currently in the pre-production stage.
- **Dev Rucio-server**. This server is used for development, testing and debugging.
- **Int Rucio-server**. All updates and innovations are checked and tested on this installation before being put on the Prod Rucio-server.

Data Management [1/3]

SPD Data Overview

Worldwide



Data Management [2/3]

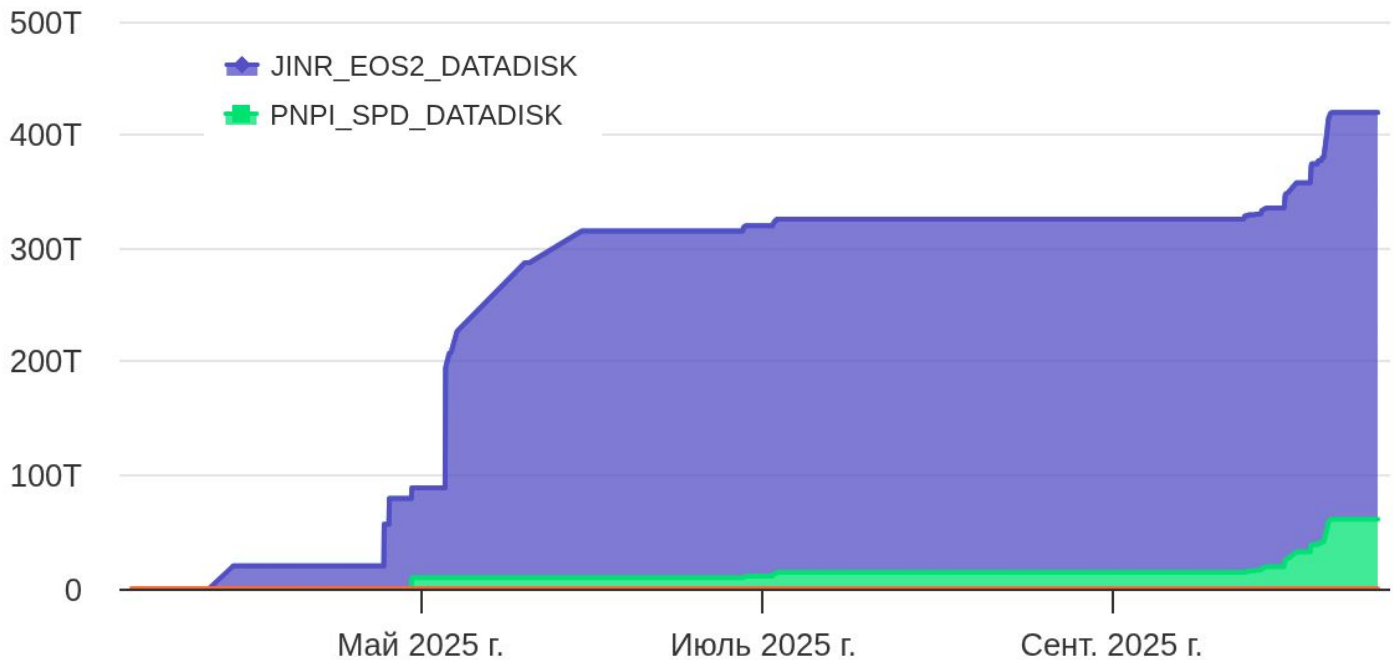
During the current production, the following data were produced

SCOPE:NAME	FILES	SIZE
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-019.SIM.1.S	1250	2.460 TB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-019.SIM.1.P	1250	1.844 GB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-019.RECO.3.R	516	1.035 TB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-019.RECO.4.R	1245	2.498 TB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-020.SIM.1.S	9997	19.672 TB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-020.SIM.1.P	9997	14.745 GB
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-020.RECO.1.R	9899	19.859 TB

Data Management [3/3]

We have several storage facilities:

- **SPD EOS**: Since this year, SPD has own EOS in JINR. We have already migrated the data from the old to the new one.
- **PNPI EOS**: It currently stores a bit of data. It will be used to store replicas.
- **JINR EOS**: no longer in use.



Productions requests management system integration [1/3]

Productions requests management system is used:

- as an information system that stores information about past productions;
- as an information system that keeps information on versions of software used;
- an interface for requesting a production with certain parameters.

More information about is in [Alexey Anisenkov](#)'s report this afternoon.

Productions requests management system is integrated with Rucio to import metadata about finished productions.

SPD Data processing

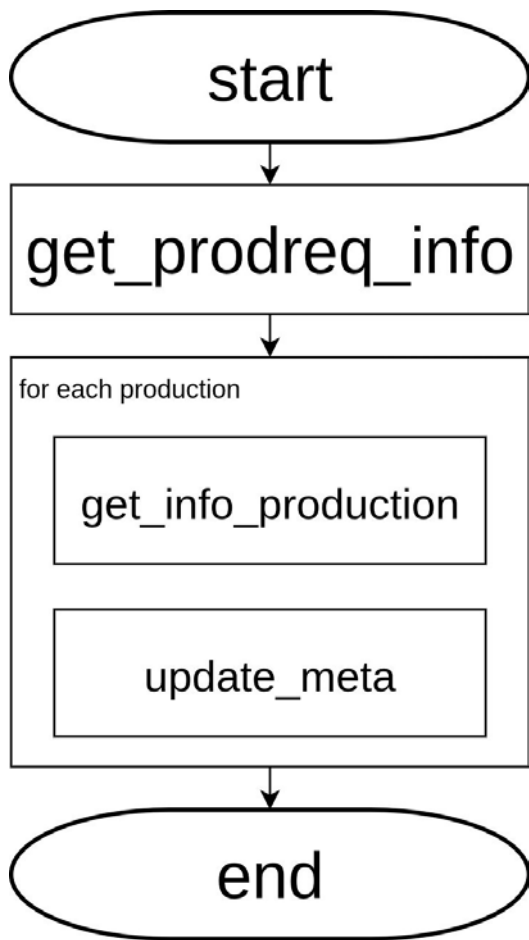
 [Requests](#) [Config](#) [API](#)



SPD Data processing
Requests interface



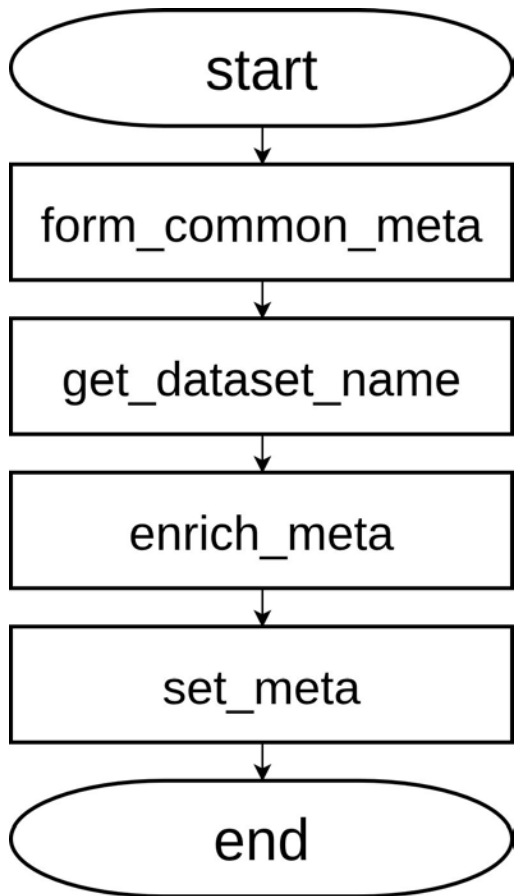
Productions requests management system integration [2/3]



A module has been developed for importing information about productions from Productions requests management system to Rucio. This utility is configured to run in cron once per hour.

It's currently in the pre-production stage.

Productions requests management system integration [3/3]



There are **nested step descriptions** (simu, reco) in the production description. Therefore, a **general description** is formed for each datatype (simu, reco) and is supplemented with **information describing this step**.

METADATA key	Example of METADATA value
campaign	SPD MC 2025
collision_type	pp
energy	27
events_file	4000
polarization	UU
geometry_type	["Micromegas", "TS", "ECal", "RS", "BBC", "ZDC (sketch)"]
seed_max	5000
seed_min	1
stage	S2
tag	minbias-P8-spdroot4172-dev
description	P8, FARICH PID for pi/K/p fixed, open-charm signal event generation
script	/cvmfs/spd.jinr.ru/production/MC/minbias-P8-spdroot4172-dev.27GeV.V02_D0sig/simu.C
datatype	simu

Monitoring System[1/4]

Rucio collects a bunch of metrics that can be used to monitor different activities, but does not provide a ready-made monitoring solution. It was necessary to:

- **deploy** all the necessary infrastructure;
- **configure** each component;
- **study** information provided by Rucio;
- **build** visualization panels.

Types of information for monitoring:

- **Metrics** provided by Rucio-server and Rucio-daemons: a measurable numerical characteristic that shows how the system works.
- **Messages**: information about replication and deletion operations, Scope, name, size, status (successful/failure), duration, etc.
- **Traces**: information about the execution of a single transaction.
GET, PUT – from PanDA;
UPLOAD, DOWNLOAD, TOUCH – from users.

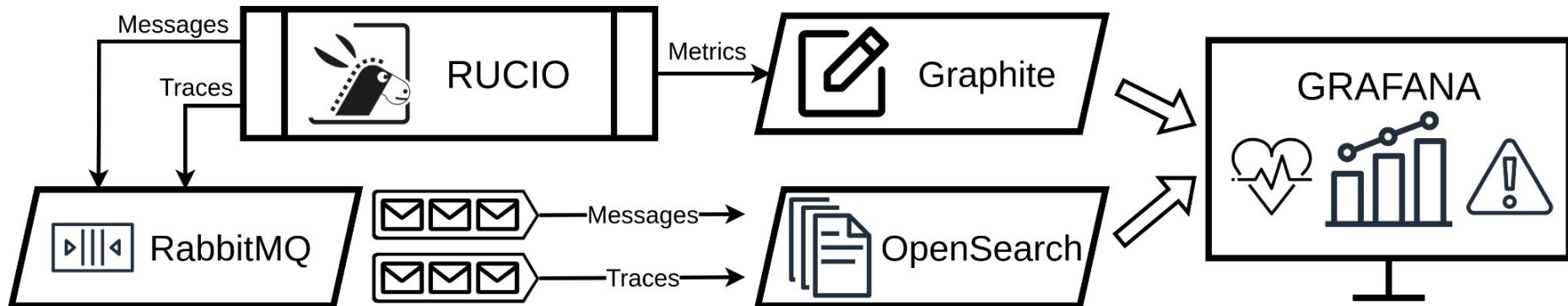
Monitoring System[2/4]

Components of Monitoring System:

- **Graphite**: collects metrics from Rucio server.
- **RabbitMQ**: queues with messages and traces.
- **OpenSearch**: documents with messages and traces (long term storage).
- **Grafana**: visualizations.

Information input to the monitoring system:

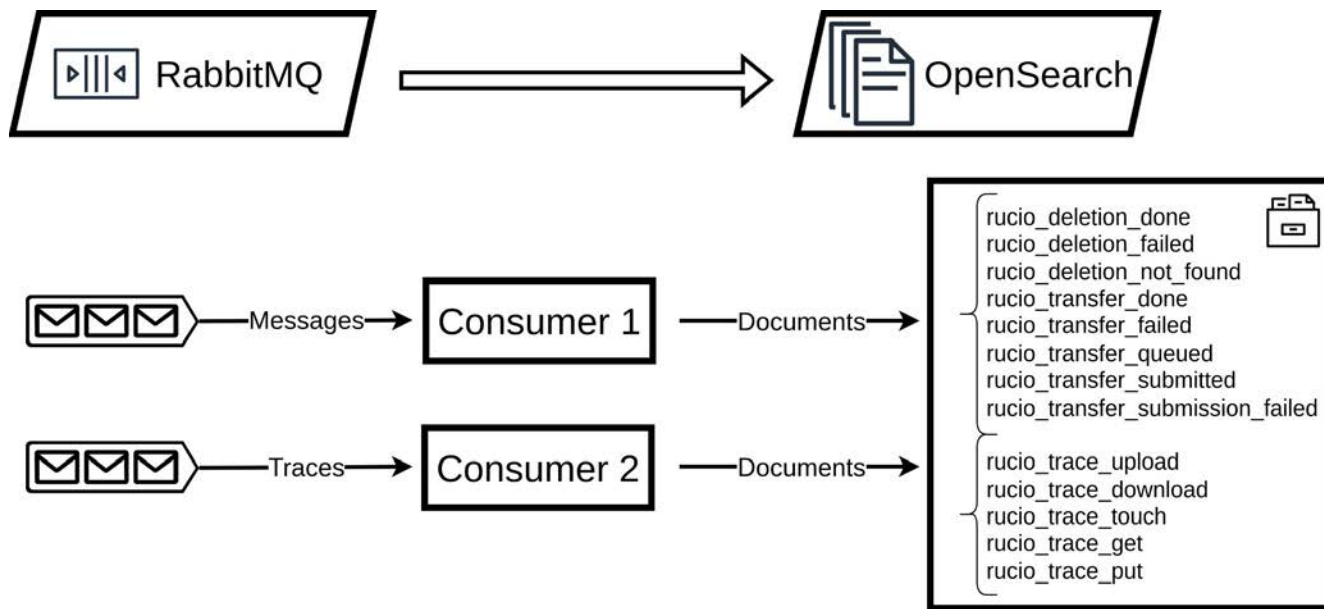
- **Metrics** sent to Graphite automatically.
- **Messages** sent by daemon to RabbitMQ automatically.
- **Traces** sent to RabbitMQ automatically.



Monitoring System[3/4]

Document – a unit of information in OpenSearch. Structured data in JSON format (like a row in table).

Index – a collection of similar documents that have similar parameters. A logical space for storing information. (as a table in the database).



The following indexes have been described in OpenSearch and two consumers have been developed.

Monitoring System[4/4]

health	status	index	uuid	pri	rep	docs	count	docs.deleted	store.size	pri.store.size
yellow	open	rucio_trace_upload	WEQkdZF0TM2MkAHzzaZzBA	1	1	133		0	135.8kb	135.8kb
yellow	open	rucio_transfer_queued	mCXJo6WjRHa8-zBo0bKo7Q	1	1	1592610		0	385.8mb	385.8mb
yellow	open	rucio_deletion_failed	HcmZfy8ITaunD5rHpjbm9g	1	1	5		0	14.1kb	14.1kb
yellow	open	rucio_trace_put	PdZLv9zBS8WiTcRR3XiVgg	1	1	733710		0	366.3mb	366.3mb
yellow	open	rucio_transfer_submitted	07YfPGd0TQ2ZadA7os5IRA	1	1	467646		0	142.3mb	142.3mb
yellow	open	rucio_deletion_done	kezjdZa9SX2GpK6XU8luTw	1	1	507340		0	93.8mb	93.8mb
yellow	open	rucio_trace_touch	9I6J7UEGTy-25zjAvl3bDA	1	1	0		0	208b	208b
yellow	open	rucio_transfer_done	aXNNF80HQj--Livqjddr6A	1	1	199323		0	110.5mb	110.5mb
green	open	.opensearch-observability	MnInmQADRn2W36RcsHgFjA	1	0	0		0	208b	208b
yellow	open	rucio_transfer_submission_failed	fqSz1208R9uZ4BBN5lB62w	1	1	1307739		0	336.1mb	336.1mb
yellow	open	rucio_transfer_failed	0lgFhz5XQyOwm7cf0icOMA	1	1	331712		0	197mb	197mb
yellow	open	rucio_trace_get	E6CwiYg1SYG3BV0Re9wIXA	1	1	226467		0	109.1mb	109.1mb
yellow	open	rucio_deletion_not_found	xKsiLJ4yTGWMPiL1ykEKdQ	1	1	47230		0	6.8mb	6.8mb
yellow	open	scopes	8LLkv18iQK-70dPb6ijCtA	1	1	120		0	18kb	18kb
yellow	open	rucio_trace_download	IKo1MFGVQNecIFic5D5dWw	1	1	748		0	300.5kb	300.5kb

There are already a lot of documents in OpenSearch for monitoring (~ 5kk documents).

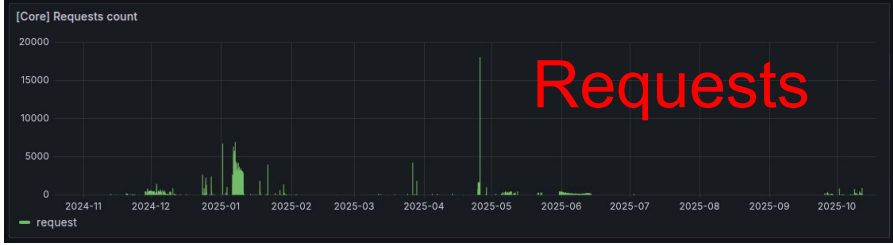
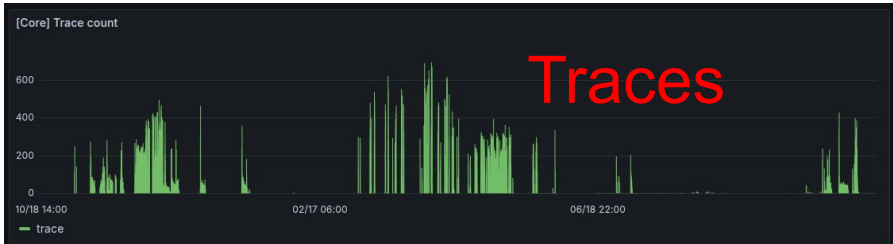
Each production generates many traces (1 job = 1 trace = 1 document).

Each transfer/deletion generates several messages → several documents.

Monitoring System (from metrics) [1/2]

We can monitor:

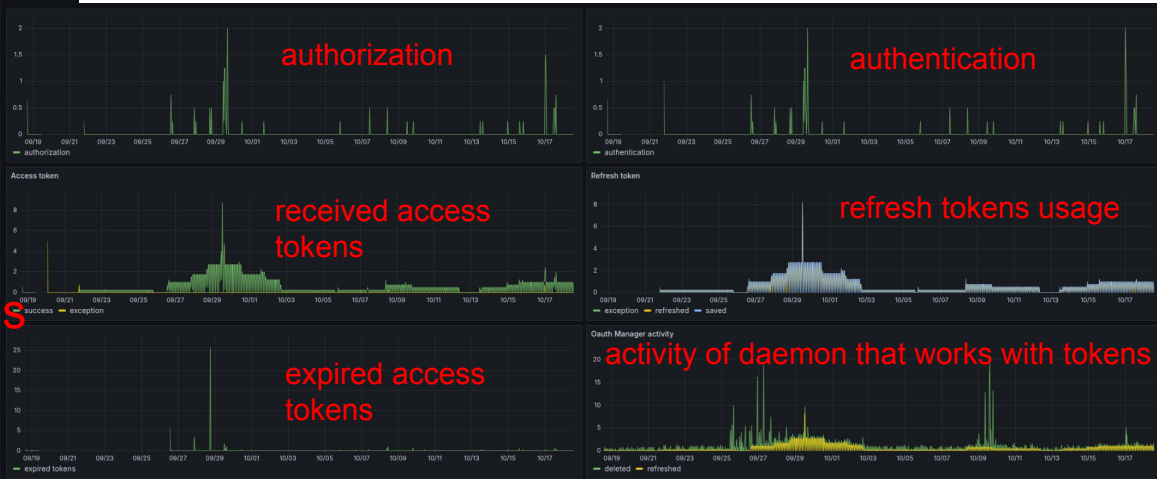
- counts of traces and requests;
- daemons activity and theirs errors;
- authentication/authorization via IAM;
- deletion process;
- transferring process;



Monitoring System (from metrics) [2/2]

- > Conveyor-submitter (3 panels)
- > Conveyor-poller (3 panels)
- > Conveyor-finisher (2 panels)
- > Transmogriifier (5 panels)
- > Undertaker (1 panel)
- > Reaper (5 panels)
- > Oauth Manager (5 panels)
- > Judge (1 panel)
- > Necromanser (1 panel)
- > Automatrix (4 panels)

Dashboard with
~25 visualizations
with
rucio-daemons
activities



Trace Monitoring [1/3]

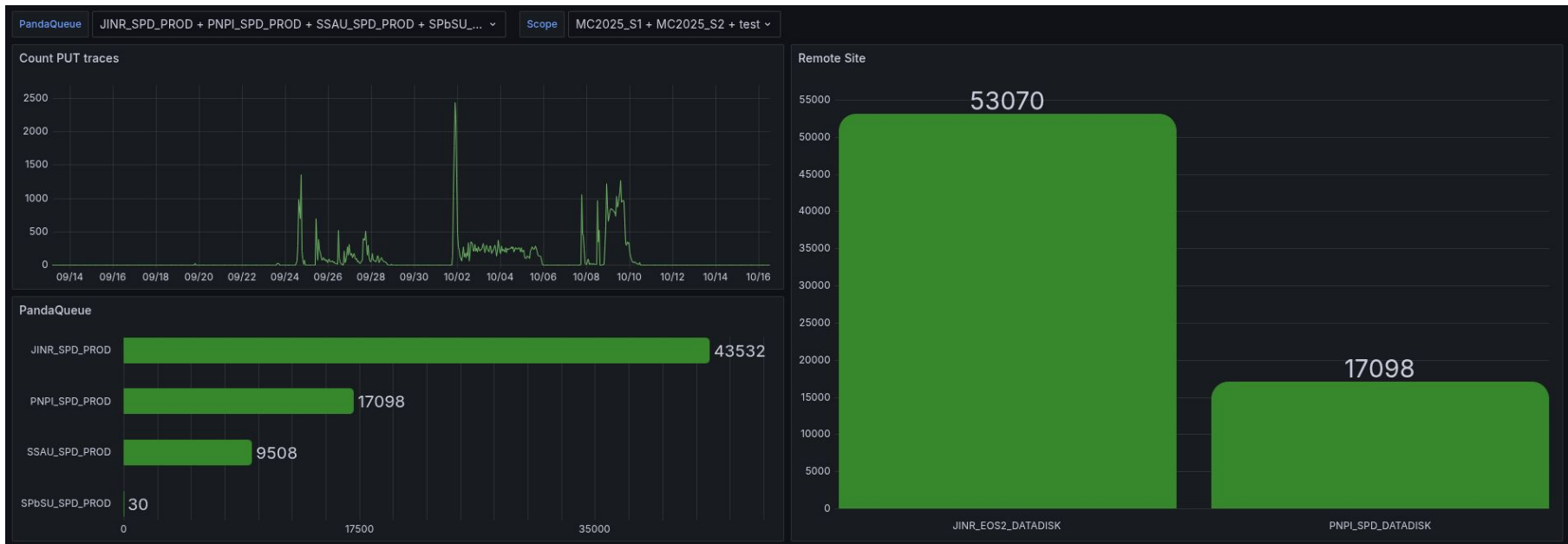
We have the following visualizations of GET/PUT traces:

- number of traces (documents);
- number of jobs per Panda Queue/Remote Site/Local Site;
- number of jobs by task ID;
- number and types of clientState (it's ok or error);
- number and types of errors;
- number of jobs per Scope/Dataset/computer node;
- average file size;

UPLOAD/DOWNLOAD traces:

- number of traces (documents);
- user activity;
- number and types of clientState (it's ok or error);
- number and types of errors;
- average file size;
- number of activities per protocol;

Trace Monitoring [2/3]



Trace Monitoring [3/3]

Jobs per Scopes

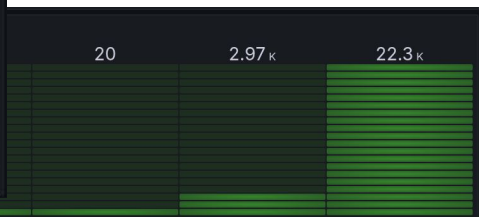
MC2025_S1	251994
MC2025_S2	69886
test	442

Jobs per dataset

MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-020.SIM.1.log	11475
MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-020.SIM.1.S	11474
MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-008.SIM.1.log	11343
MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-008.SIM.1.S	11338

Jobs per computer nodes

hostname.keyword	Count
g142.zsc	4949
g143.ssc	4559
wn2a001.jnr.ru	1705
wn2a000.jnr.ru	1569
wna024.jnr-1.ru	1408
Total	278179



419	421	422	423	424	425	426	431
Client State Count		Reasons of not 'OK' Client State					
DONE	STAGEIN_ATTEMPT_FAILED	error code: 1362, message: Xrdcp was unable to open file stacktrace: NoneType: None					
32224	339	337					
		error code: 1099, message: Failed to stage-in file stacktrace: NoneType: None					
		2					

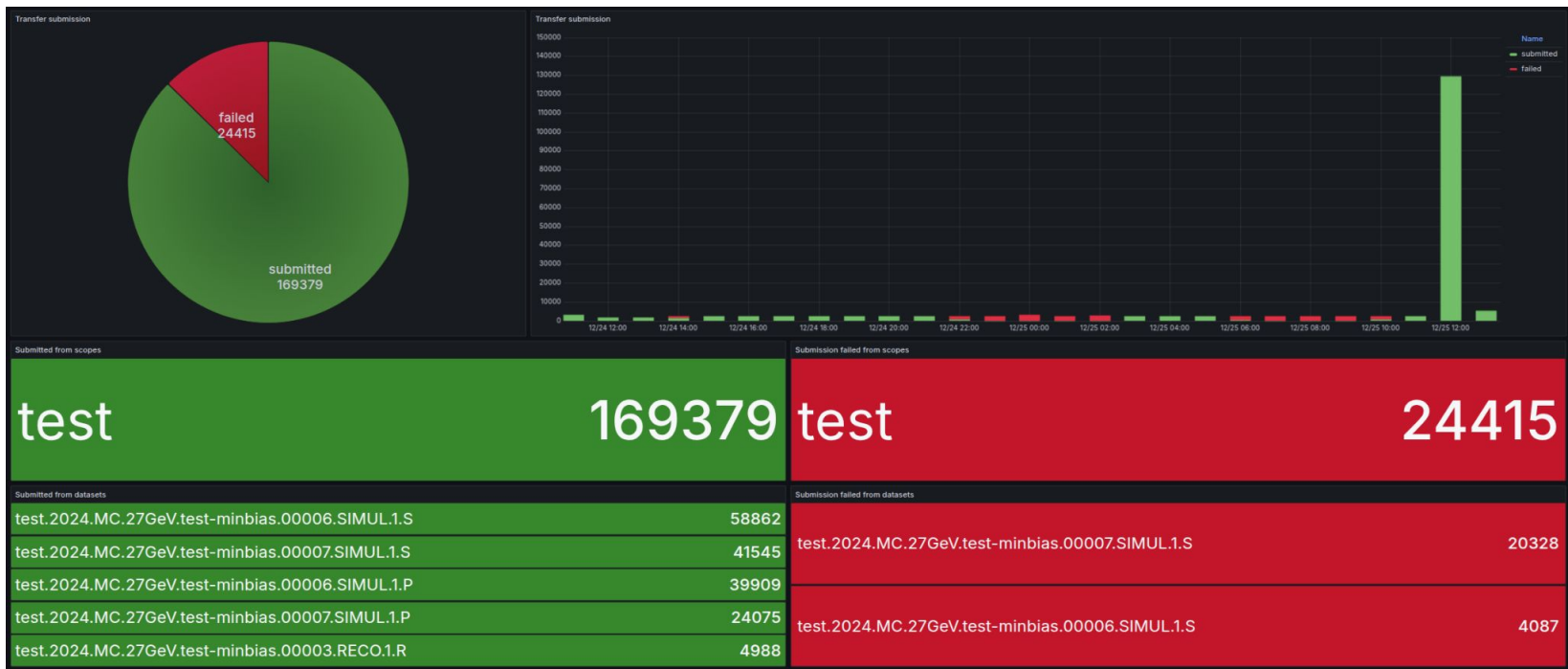
Message Monitoring [1/4]

We have the following visualizations of messages:

- count successful/failure transfer submission;
- count of successful/failure submissions per Scope/Dataset;
- count success/failure transfer;
- sum of transferred bytes total and per Scope/Dataset;
- avg duration of transfer;
- avg transferred file size;
- count successful transfers and sum transferred bytes between RSEs;
- count success/not_found/failure deletions;
- sum of deleted bytes total and per Scope;
- avg duration of deletion;
- avg deleted file size;
- count files/sum bytes deleted by RSEs;

Message Monitoring [2/4]

Transfer submission



Message Monitoring [3/4]

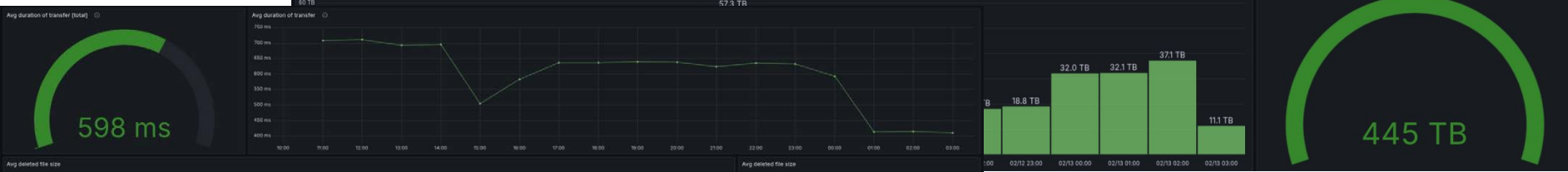
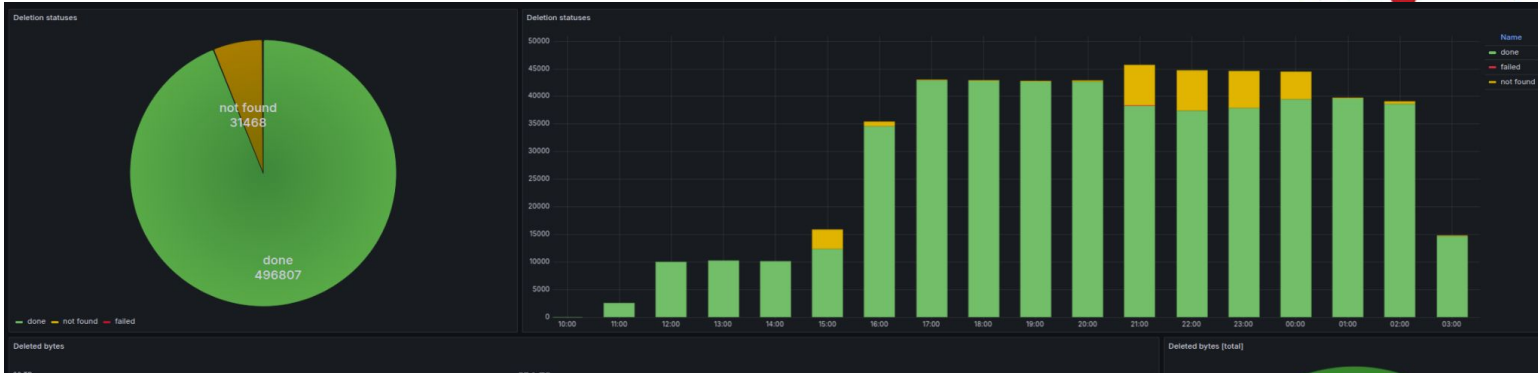


Transfers



Count successful transfers (source/destination)	Sum transferred bytes (source/destination)
PNPL_PROD_DATADISK DCACHE_WEBDAV_TEST 9589	PNPL_PROD_DATADISK DCACHE_WEBDAV_TEST 19.0 TB
JINR_SPD_LOCALGROUPDISK PNPL_PROD_DATADISK 430	JINR_SPD_LOCALGROUPDISK PNPL_PROD_DATADISK 485 GB
JINR_SPD_LOCALGROUPDISK JINR_SPD_DATADISK 34	JINR_SPD_LOCALGROUPDISK JINR_SPD_DATADISK 69.2 GB
JINR_SPD_LOCALGROUPDISK DCACHE_WEBDAV_TEST 4816	JINR_SPD_LOCALGROUPDISK DCACHE_WEBDAV_TEST 10.1 TB

Message Monitoring [4/4]



Count successful deletion by RSE		Sum deleted bytes by RSE	
PNPL_PROD_DATADISK	158423	PNPL_PROD_DATADISK	178 TB
JINR_SPD_LOCALGROUPDISK	338384	JINR_SPD_LOCALGROUPDISK	267 TB

Deletions

Future plans

- Update Rucio – move to next LTS version.
- Update production environment – adding several rucio-daemons into production environment (to limit the number of submitted requests to FTS).
- Possible changes/additions in current monitoring.
- Monitoring of user activity – needs to be completed.
- The development of monitoring of data volumes by scopes – already begun.
- Consistency-check – need to integrate standart Rucio solution and developing own tools (Also need monitoring).
- User policy – dividing users into groups and reviewing the allowed actions for these groups.
- Start using TAPE storages.
- User support – development documentation for users.

Thank you for your attention!

Backup slides

About Rucio



Rucio is an open-source software framework that provides functionality for data management and access in a distributed storage environment. Rucio also provides protection against data loss and speed up access to data through a controlled number of replicas.

Currently, the Rucio system can be used to:

- organize data in a hierarchical structure for easy navigation and management;
- unified interaction of a heterogeneous network and storage infrastructure;
- distribute data for storage;
- adaptive data replication and recovery;
- automated data transfer between storages;
- storage of all types of experimental data;
- data lifecycle management;
- storage and management of metadata;
- provides metrics for monitoring data usage, system performance and the status of various components.

Official Rucio documentation: <https://rucio.cern.ch/documentation/>

Quick terminology recap



File – the smallest operational unit of data in Rucio.

Dataset – a named set of files.

Container – a named set of datasets or, recursively, containers

DID – rucio LFN for data (file/dataset/container) as combination of a scope and a name.

Scope – a scope partitions the namespace into several sub namespaces.

Replica – a managed copy of a file.

RSE – the logical abstraction of a storage system for physical files. It has a unique identifier and a set of meta attributes describing properties.

Contact information and additional resources

For all question contact:

- konak@jinr.ru

Official Rucio documentation:

- <https://rucio.cern.ch/documentation/>

Previous guide:

- <https://git.jinr.ru/nica/spdroot/-/wikis/Rucio%20basics>

New rucio guide:

- <https://git.jinr.ru/spd/spd-dc/rucio/ddm-utils/-/blob/dev/userguide/README.md>

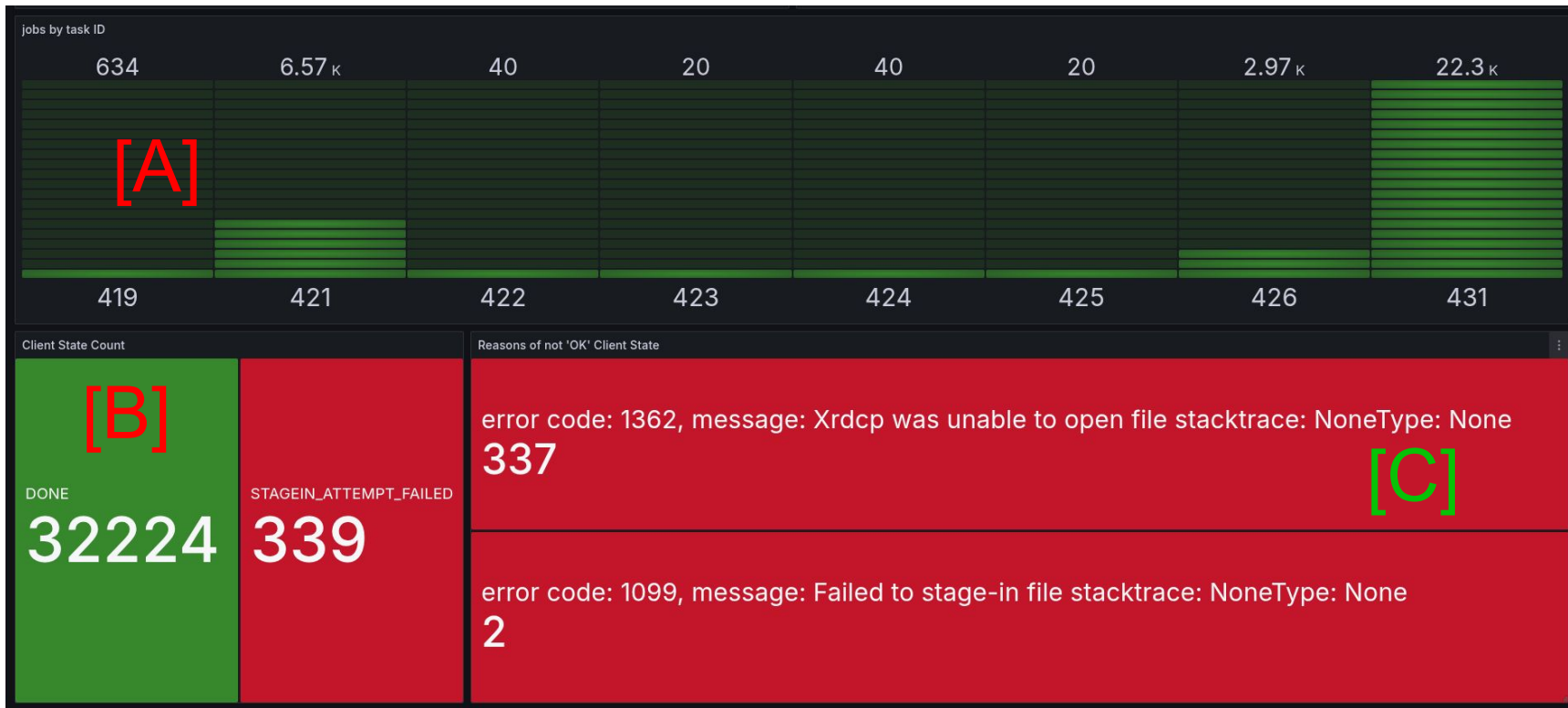
Trace Monitoring (get) [1/3]



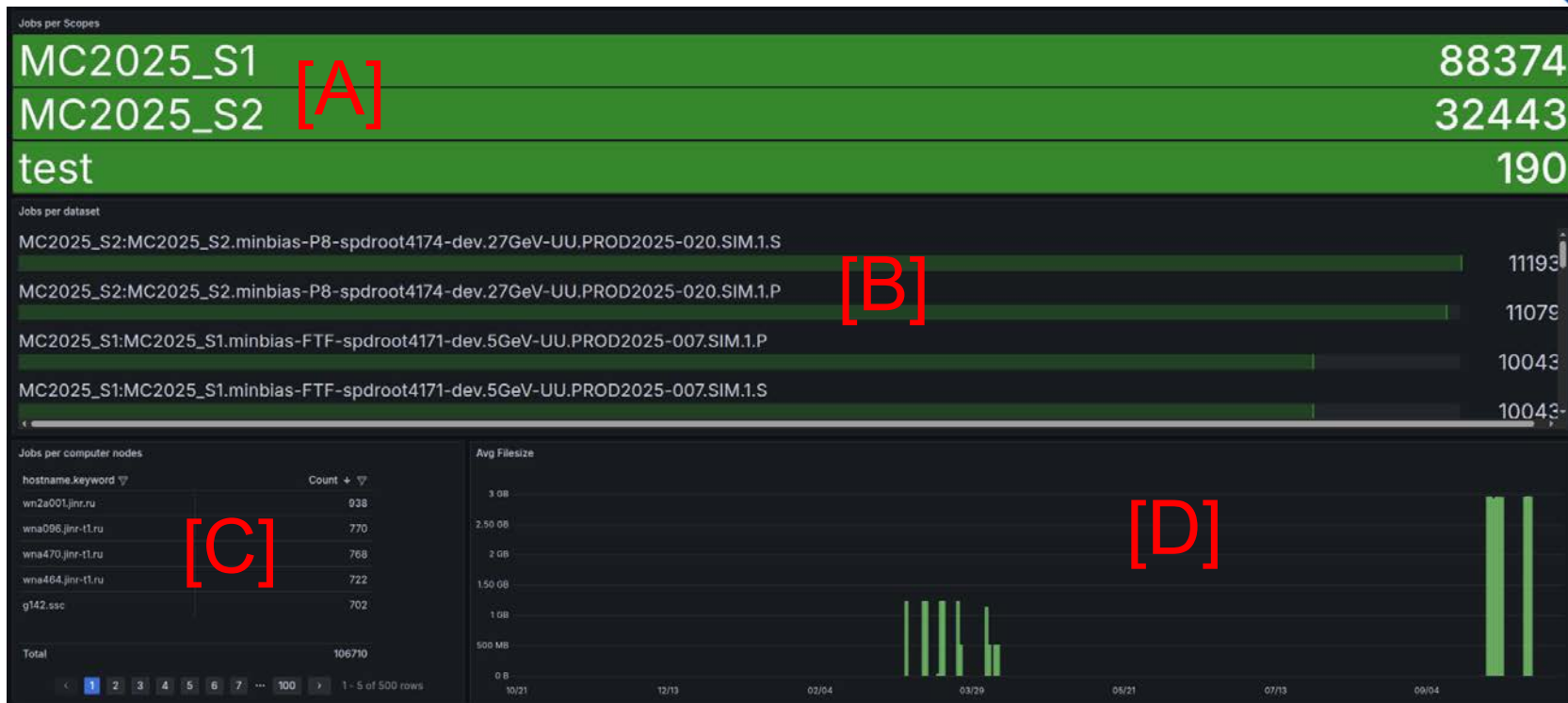
- number of GET traces (documents) [A];
- number of jobs per Panda Queue [B];
- number of jobs per Remote(on slide)/Local(not shown) Site [C];

Trace Monitoring (get) [2/3]

- number of jobs by task ID [A];
- number and types of clientState (it's ok or error) [B];
- number and types of errors [C];



Trace Monitoring (get) [3/3]



- number of jobs per Scope [A];
- number of jobs per Dataset [B];
- number of jobs per computer node (hostname - count) [C];
- average file size [D];

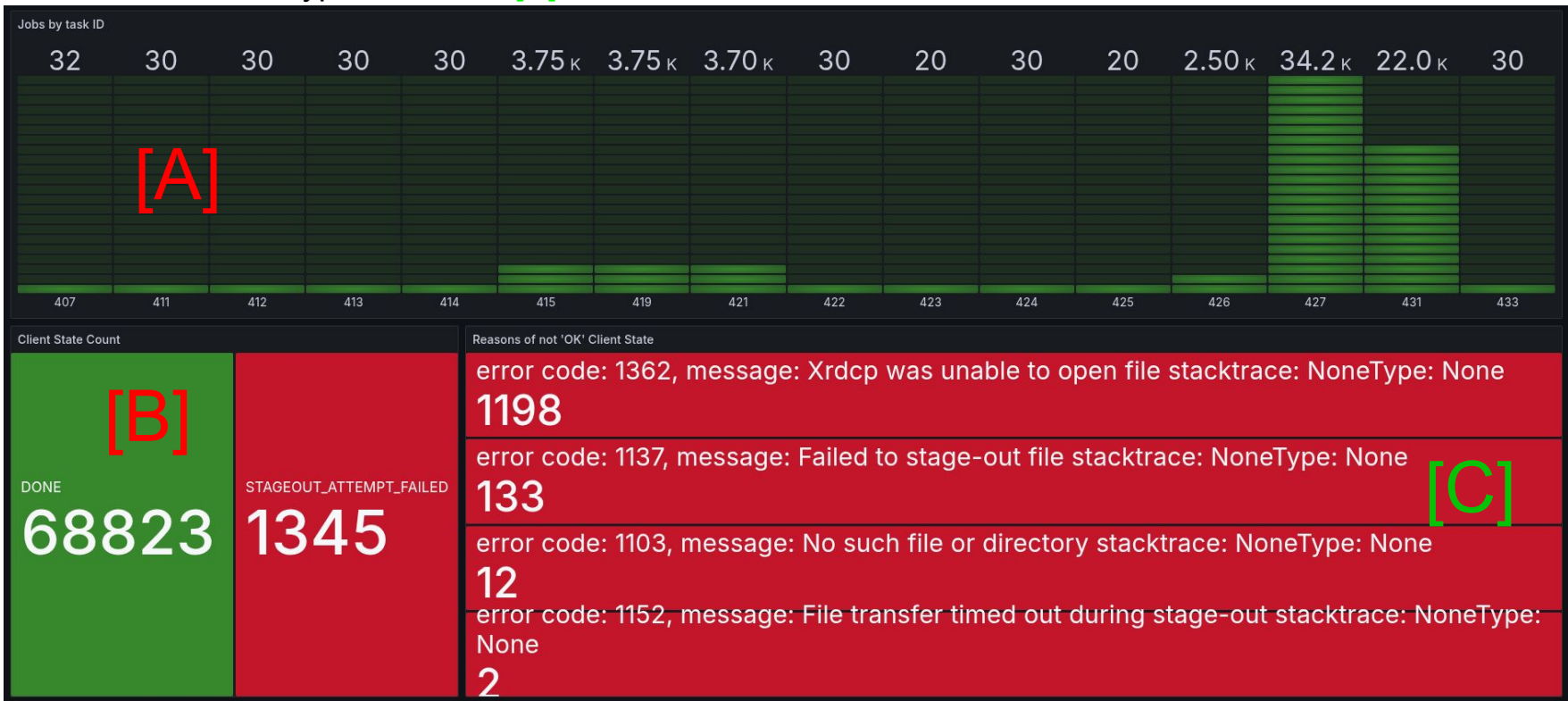
Trace Monitoring (put) [1/3]



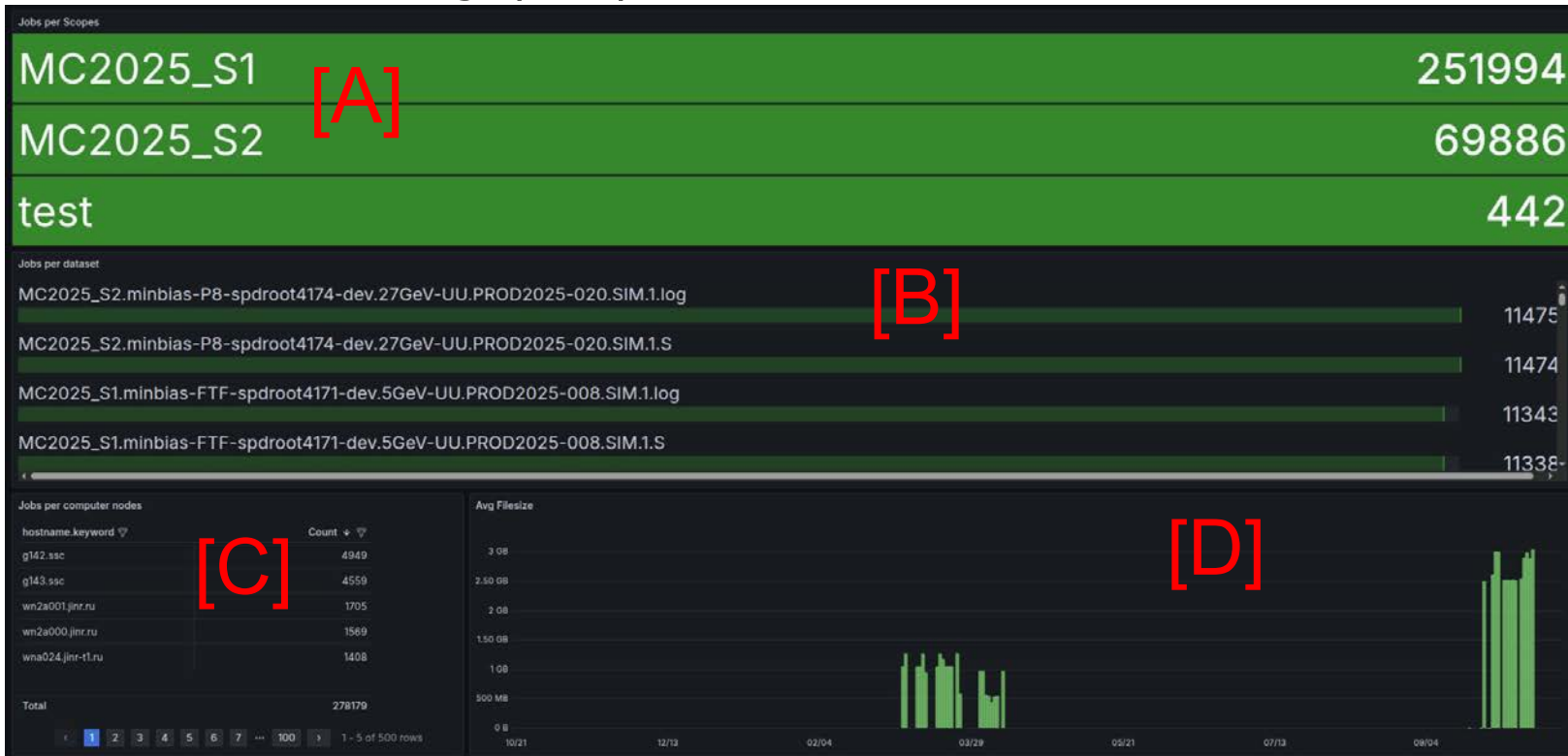
- number of PUT traces (documents) [A];
- number of jobs per Panda Queue [B];
- number of jobs per Remote(on slide)/Local(not shown) Site [C];

Trace Monitoring (put) [2/3]

- number of jobs by task ID [A];
- number and types of clientState (it's ok or error) [B];
- number and types of errors [C];



Trace Monitoring (put) [3/3]



- number of jobs per Scope [A];
- number of jobs per Dataset [B];
- number of jobs per computer node (hostname - count) [C];
- average file size [D];

Messages Monitoring (transfer submission)



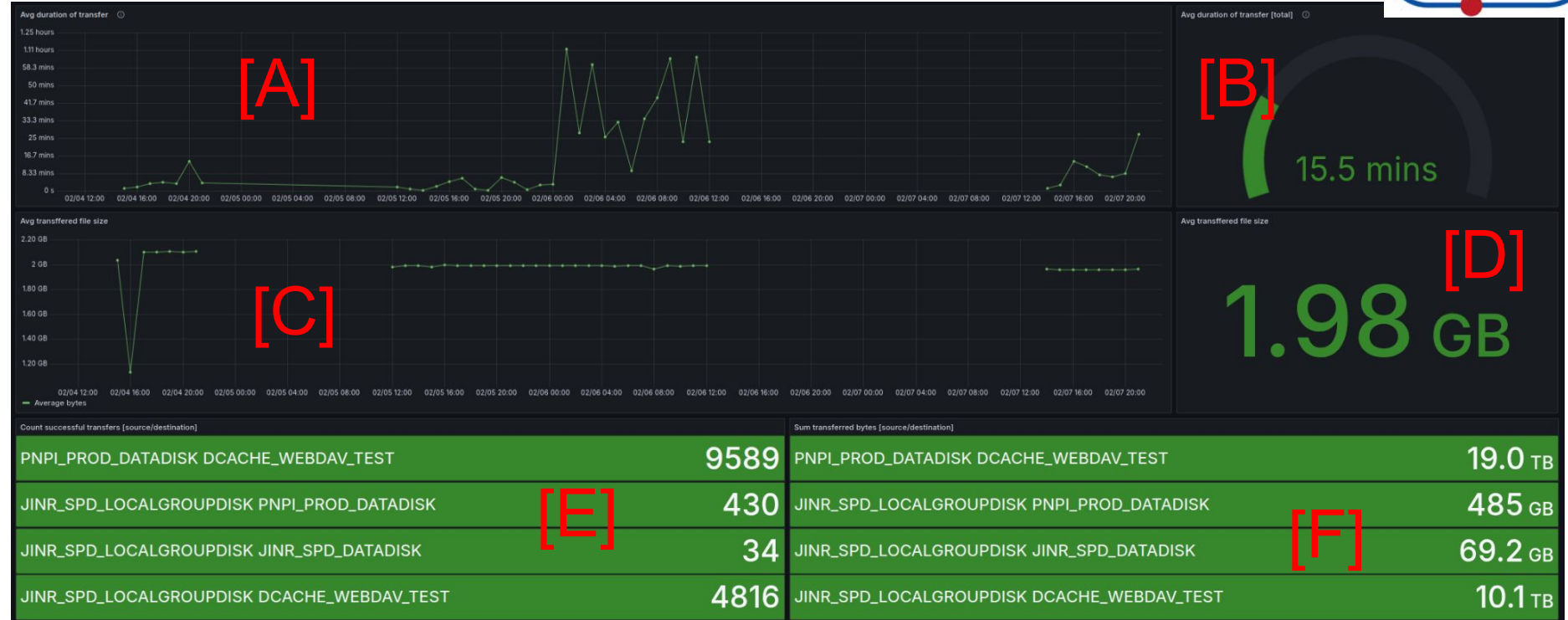
- count successful/failure submission [A, B];
- count of successful submissions by Scope/Dataset [C, D];
- count of failure submissions by Scope/Dataset [E, F];

Messages Monitoring (transfers) [1/2]



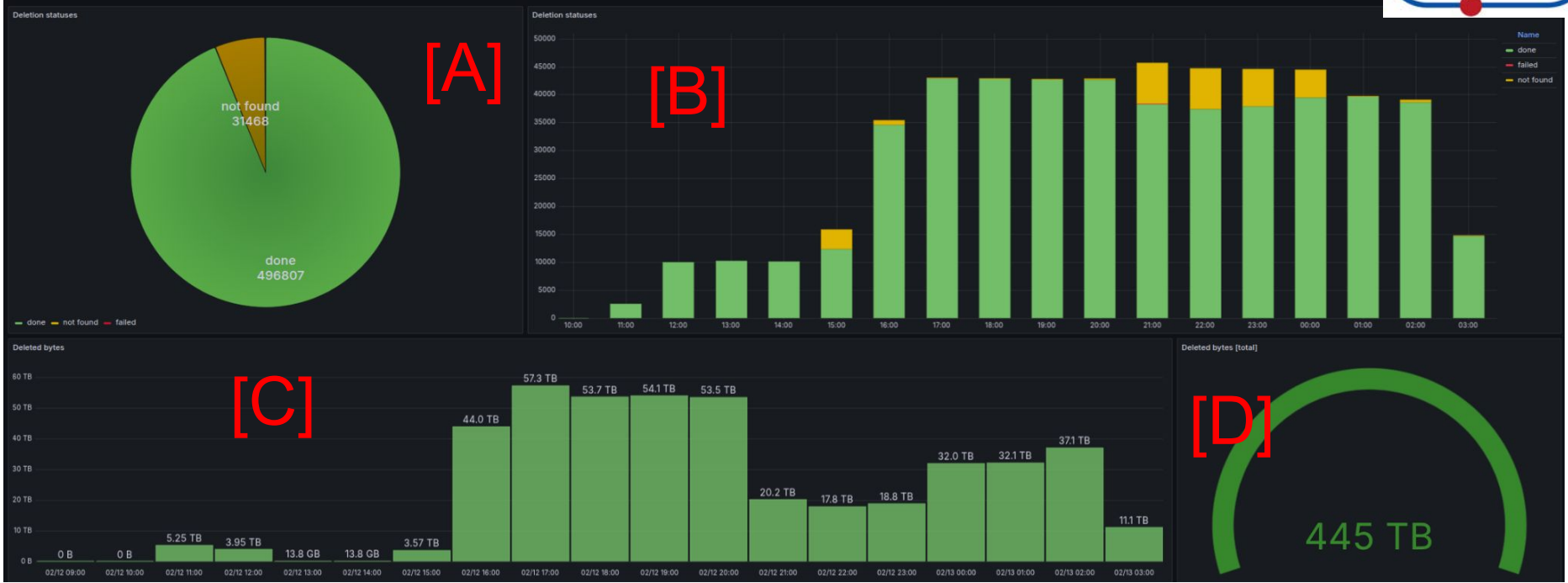
- count success/failure transfer [A, B];
- sum of transferred bytes [C, D];
- transferred bytes per Scope (not shown);
- transferred bytes per Dataset (not shown);

Messages Monitoring (transfers) [2/2]



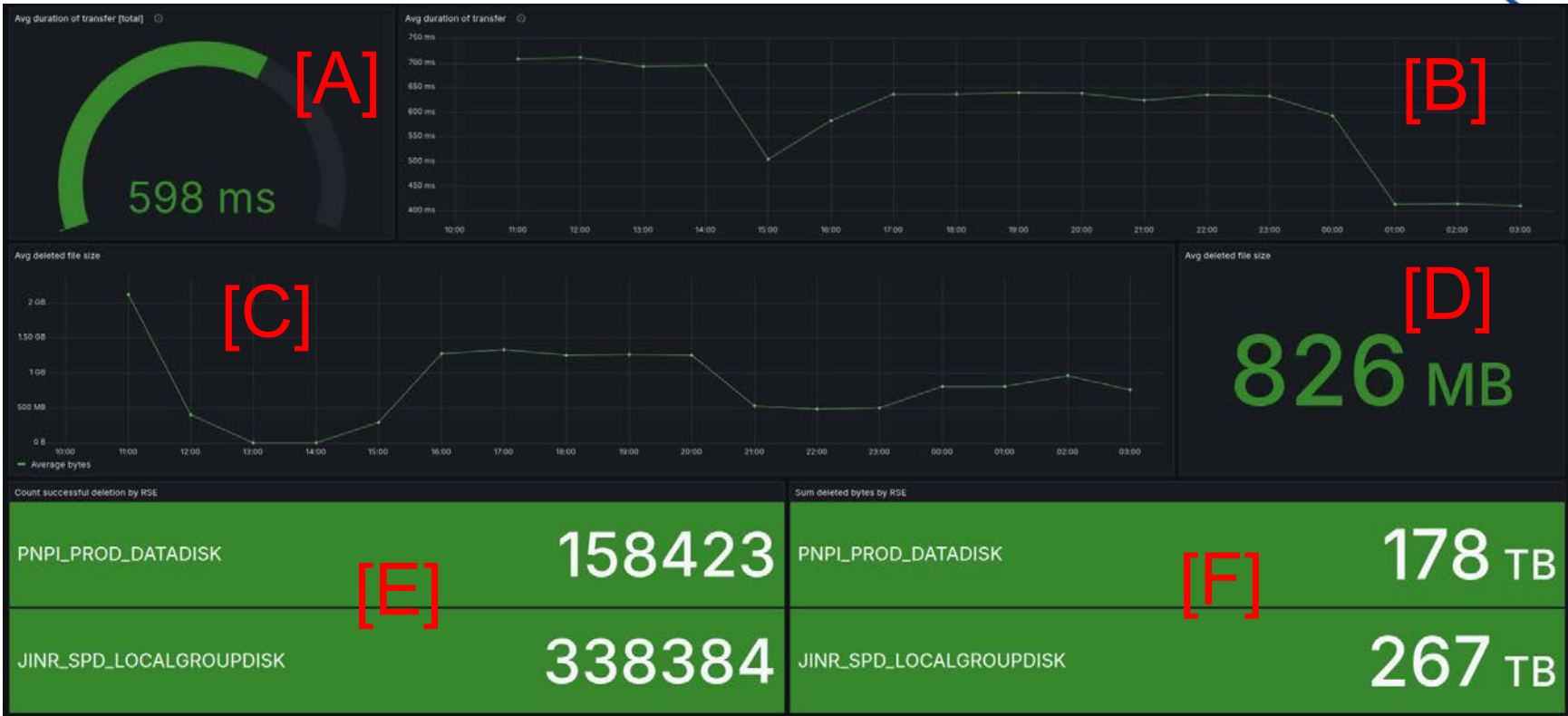
- avg duration of transfer [A, B];
- avg transferred file size [C, D];
- count successful transfers between RSEs [E];
- sum transferred bytes between RSEs [F];

Messages Monitoring (deletion) [1/2]



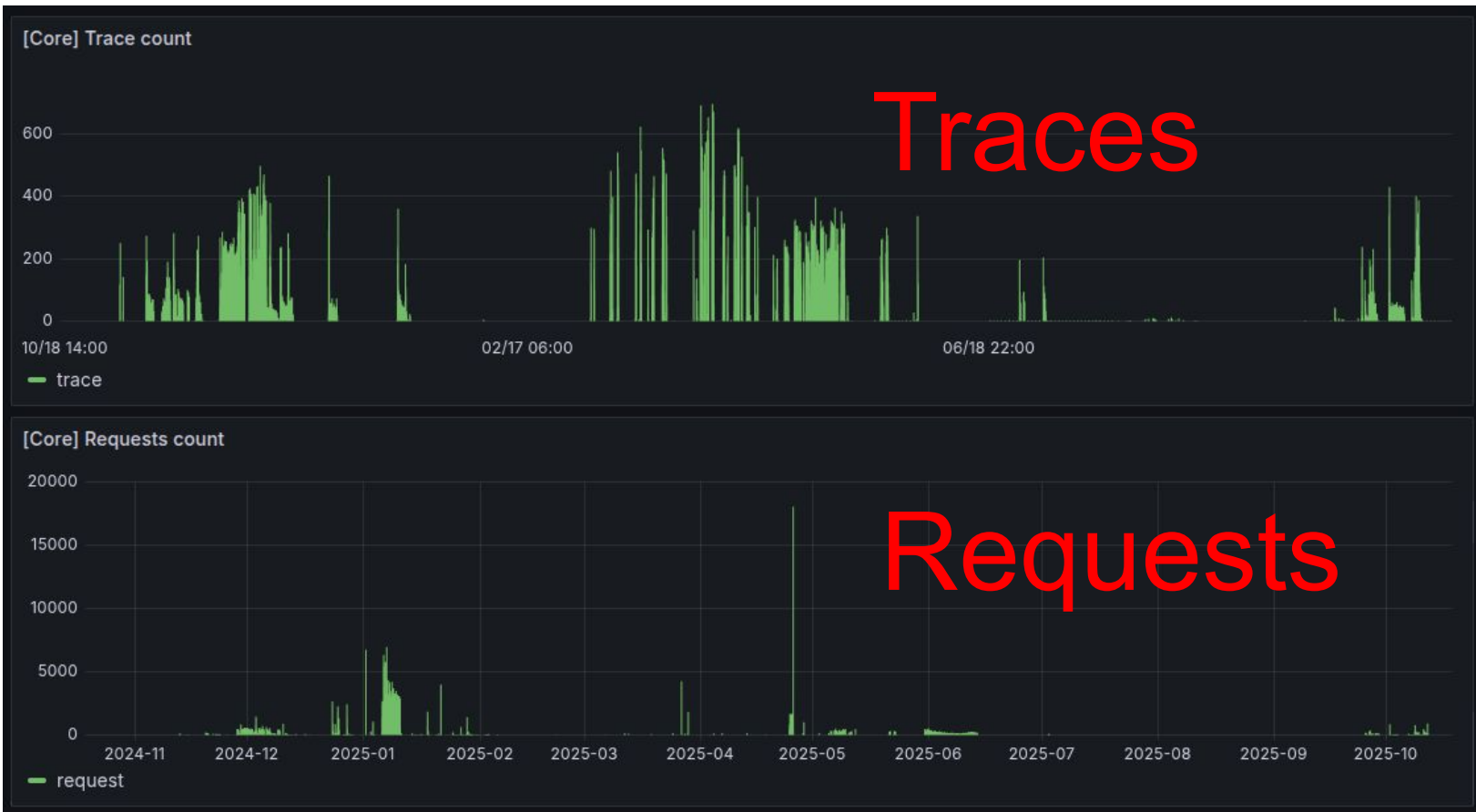
- count success/not_found/failure deletions [A, B];
- sum of deleted bytes [C, D];
- count deleted bytes per Scope (not shown);

Messages Monitoring (deletion) [2/2]



- avg duration of deletion [A, B];
- avg deleted file size [C, D];
- count files/sum bytes deleted by RSEs [E, F];

Common Monitoring



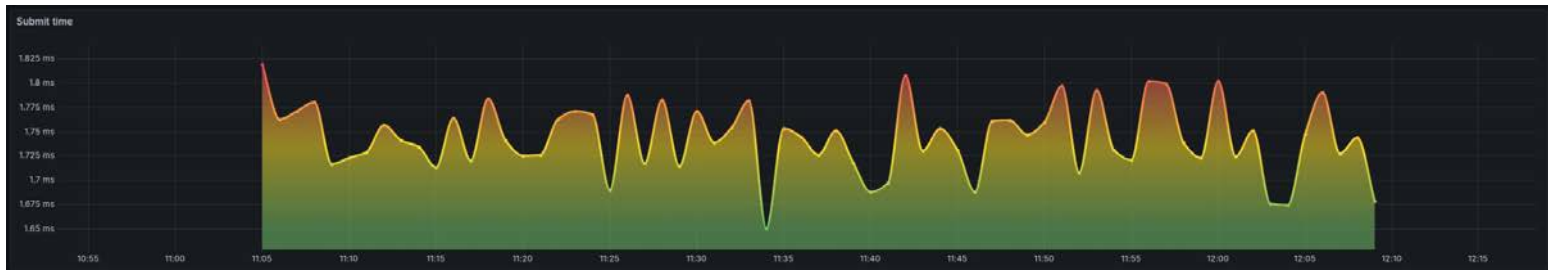
Deletion Monitoring



Unlocked replica = replica can be removed

Transfer Monitoring [1/2]

Indicators of success/failure requests for transfer, and time spent for submit transfer.



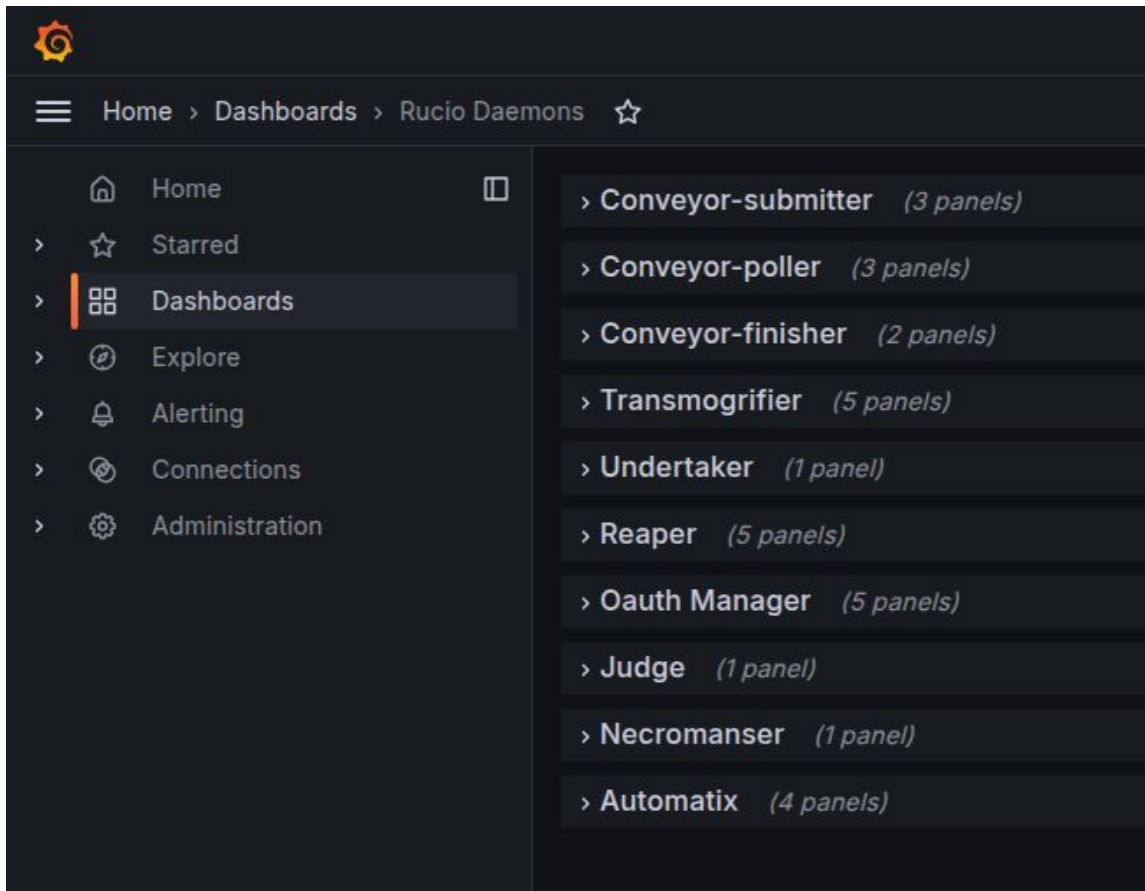
Transfer Monitoring [2/2]

Statuses of transfers and size of bulk transfer





Daemons Activity



There's too much here. It is not possible to cover everything in one presentation.

Using the rucio-client at cvmfs

- 1) Enter at lxui.jinr.ru using ssh. Run command at CLI:

```
ssh <sso_nickname>@lxui.jinr.ru
```

```
alex@alex-konak573:~$ ssh konak@lxui.jinr.ru
konak@lxui.jinr.ru's password:
Last login: Tue Mar 11 15:06:43 2025 from bk081.jinr.ru
```

- 2) Activate rucio client. Run command:

```
source /cvmfs/spd.jinr.ru/sw/ddm/rucio-clients/latest/bin/activate
```

```
lxui04:~ > source /cvmfs/spd.jinr.ru/sw/ddm/rucio-clients/latest/bin/activate
(1.31.7) lxui04:~ > █
```

- 3) Authenticate in rucio. You can use any rucio-client command. For example: **rucio whoami**

```
(1.31.7) lxui04:~ > rucio whoami
account_type : USER
status       : ACTIVE
suspended_at : None
created_at   : 2024-08-01T12:19:41
email        : konak@jinr.ru
account      : konak
deleted_at   : None
updated_at   : 2024-08-01T12:19:41
```

Install your own rucio-client

You can install a rucio-client on your workstation, by following this instruction.

https://git.jinr.ru/spd/spd-dc/rucio/ddm-utils/-/blob/dev/userguide/client_installation.md

It describes the steps performed to prepare for installation and two installation methods.

If you have any questions, please contact konak@jinr.ru

How to authenticate

We offer two flow of authentication in rucio-client.

Using proxy-certificate	Using SPD-IAM
You need to have user certificate issued by Russian Data Intensive Grid (https://ca.grid.kiae.ru/RDIG/) or JINR Grid Certification Authority (https://ca.jinr.ru/)	With authentication command need to specify parameter “ -S=oidc ” or export this - export RUCIO_AUTH_TYPE=oidc
Usercert and userkey in “.pem” format need to be placed in <home_dir>/.<globus> with access mode 600 and 400	You need using browser to authenticate
You need to register user certificate in SPD-IAM	
Generate proxy-certificate with command <code>voms-proxy-init -voms spd.nica.jinr:/spd.nica.jinr</Role></code>	
export proxy-cert with command <code>export X509_USER_PROXY=/tmp/<proxy_cert></code>	
rucio-client at cvmfs use auth method with proxy by default	

Auth with proxy-certificate

- 1) Create proxy-certificate using command `voms-proxy-init -voms <VO:VO-role>`

```
lxui03:~ > voms-proxy-init -voms spd.nica.jinr:/spd.nica.jinr/Role=production
Contacting spd-voms.jinr.ru:15000 [/C=RU/O=JINR/OU=GRID/OU=hosts/CN=spd-voms.jinr.ru] "spd.nica.jinr"
Remote VOMS server contacted succesfully.
```

```
Created proxy in /tmp/x509up_u8102.
```

```
Your proxy is valid until Tue Apr 01 02:34:53 MSK 2025
```

- 2) Export created proxy-certificate

```
lxui03:~ > export X509_USER_PROXY=/tmp/x509up_u8102
```

- 3) Authenticate with activated rucio-client

```
(1.31.7) lxui04:~ > rucio whoami
account_type : USER
status      : ACTIVE
suspended_at : None
created_at  : 2024-08-01T12:19:41
email       : konak@jinr.ru
account     : konak
```

Auth with SPD-IAM [1]

1) **export RUCIO_AUTH_TYPE=oidc**

```
lxui03:~ > export RUCIO_AUTH_TYPE=oidc
```

2) Authenticate with activated rucio-client

```
(1.31.7) lxui03:~ > rucio whoami
```

```
Please use your internet browser, go to:
```

```
https://spd-rucio.jinr.ru/auth/oidc_redirect?mz6Chd3grZtm57vrYcLWKQv
```

```
and authenticate with your Identity Provider.
```

```
Copy paste the code from the browser to the terminal and press enter:
```

3) Use your internet browser to authenticate in SPD-IAM with following link

Auth with SPD-IAM [2]

4) Allow authorization through the client

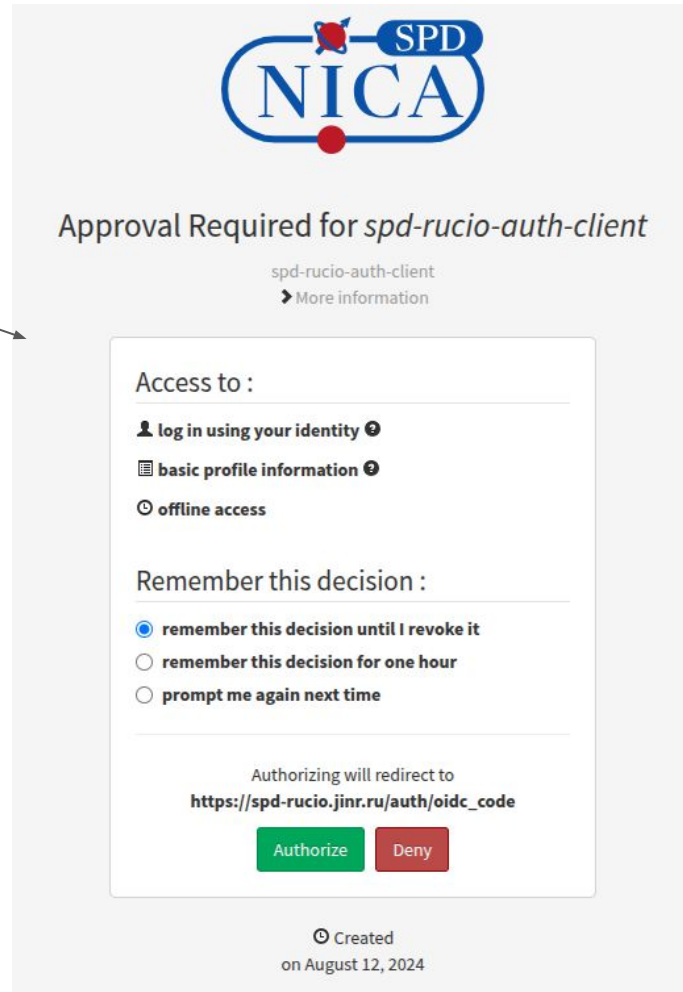
5) Copy special code from Rucio Web UI and paste it to the terminal

RUCIO

SCIENTIFIC DATA MANAGEMENT

Please copy-paste the following code to the open terminal session with Rucio Client in order to get your access token:

`ehY3NT9VhozkuGlCpGx4wUIEA9ZyfBaJaRGMvt133mZ9RBYolo`



The screenshot shows the SPD NICA logo at the top. Below it, the text reads "Approval Required for *spd-rucio-auth-client*". Underneath, it says "spd-rucio-auth-client" with a link for "More information". The main content area is titled "Access to :" and lists three options: "log in using your identity", "basic profile information", and "offline access". Below this is the "Remember this decision :" section with three radio button options: "remember this decision until I revoke it" (selected), "remember this decision for one hour", and "prompt me again next time". At the bottom, it states "Authorizing will redirect to https://spd-rucio.jinr.ru/auth/oidc_code" and has two buttons: "Authorize" (green) and "Deny" (red). At the very bottom, it says "Created on August 12, 2024".

Auth with SPD-IAM [3]

6) Paste special code to the terminal

```
(1.31.7) lxui03:~ > rucio whoami

Please use your internet browser, go to:

    https://spd-rucio.jinr.ru/auth/oidc_redirect?mz6Chd3grZtm57vrYcLWKQv

and authenticate with your Identity Provider.
Copy paste the code from the browser to the terminal and press enter:
ehY3NT9VhozkuGlCpGx4wUIEA9ZyfBaJaRGMvt133mZ9RBYolo
account_type : USER
status       : ACTIVE
suspended_at : None
created_at   : 2024-08-01T12:19:41
email        : konak@jinr.ru
account      : konak
deleted_at   : None
updated_at   : 2024-08-01T12:19:41
```

How to explore data [1]

- To view the list of DIDs, use the command **rucio list-dids <did_pattern>** (shows a list of dids match given pattern)

```
(1.31.7) lxui03:~ > rucio list-dids MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001*
```

SCOPE:NAME	[DID TYPE]
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.R	DATASET

```
(1.31.7) lxui03:~ > rucio list-dids MC2025_S1:MC2025_S1.minbias-FTF*
```

SCOPE:NAME	[DID TYPE]
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.log	DATASET

```
(1.31.7) lxui03:~ > rucio list-dids MC2025_S1:*RECO*
```

SCOPE:NAME	[DID TYPE]
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.2.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.2.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.log	DATASET

```
(1.31.7) lxui03:~ > rucio list-dids MC2025_S1:*
```

SCOPE:NAME	[DID TYPE]
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.5.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.3.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.2.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.2.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.S	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.NA.PROD2025-004.SIM.331	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.SIM.1.P	DATASET
MC2025_S1:MC2025_S1.minbias-FTF-spdroot4171-dev.5GeV-UU.PROD2025-005.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.RECO.1.R	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.RECO.1.log	DATASET
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-004.RECO.1.R	DATASET

We do not recommend searching all over the production scope! This loads the system and may take a long time to complete. Check the table (slide 3) and search for the production you are interested in.

How to explore data [2]

- To get content from dataset/container use **rucio list-files <did>**

```
(1.31.7) lxui03:~ > rucio list-files MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.P | head -n 8
```

SCOPE:NAME	GUID	ADLER32	FILESIZE	EVENTS
MC2025_S1:p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000001.root.1	61BBC477-7554-45BE-948C-BBFEED0419E1	ad:76e05c6b	1.422 MB	
MC2025_S1:p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000002.root.1	E5B745C7-E285-4D84-ABDA-0252CA694D45	ad:53cc796a	1.422 MB	
MC2025_S1:p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000003.root.1	BC9D8822-466B-4491-8831-723AB58C3482	ad:71da4ed5	1.422 MB	
MC2025_S1:p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000004.root.1	BC830E72-AC7C-47B3-9363-552953AE3603	ad:054aac17	1.422 MB	
MC2025_S1:p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000005.root.1	E752A5F4-410C-4A4F-A022-92B4F64EF709	ad:e6cfaba0	1.422 MB	

- To get PFNs use **rucio list-file-replicas <did> --pfns**

```
(1.31.7) lxui03:~ > rucio list-file-replicas MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.P --pfns | head -n 8
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/49/cf/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000001.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/5b/c1/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000002.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/ae/24/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000003.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/79/8e/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000004.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/9e/41/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000005.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/89/d5/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000006.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/08/ce/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000007.root.1
root://eos.jinr.ru:1094//eos/nica/spd/datadisk/rucio/MC2025_S1/7a/0a/p.MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-002.SIM.1.000008.root.1
```