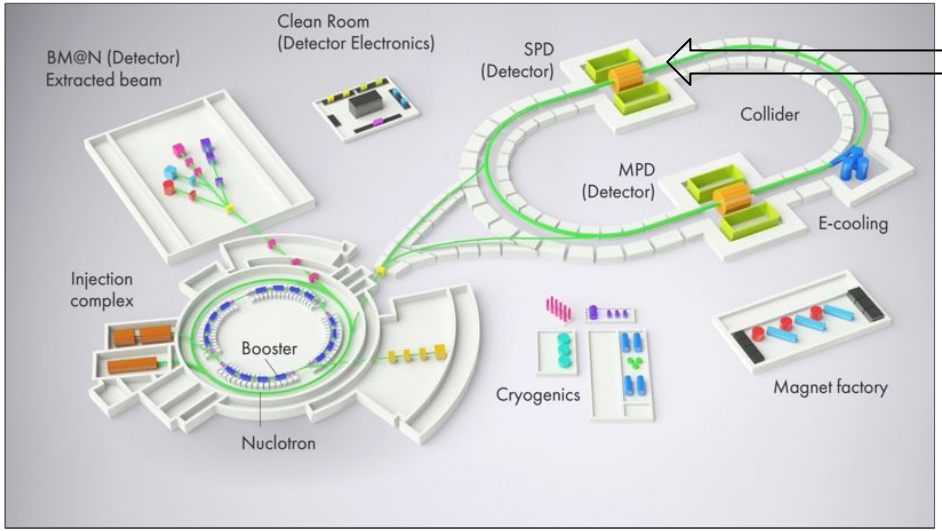
SPD Computing Infrastructure and Data Production

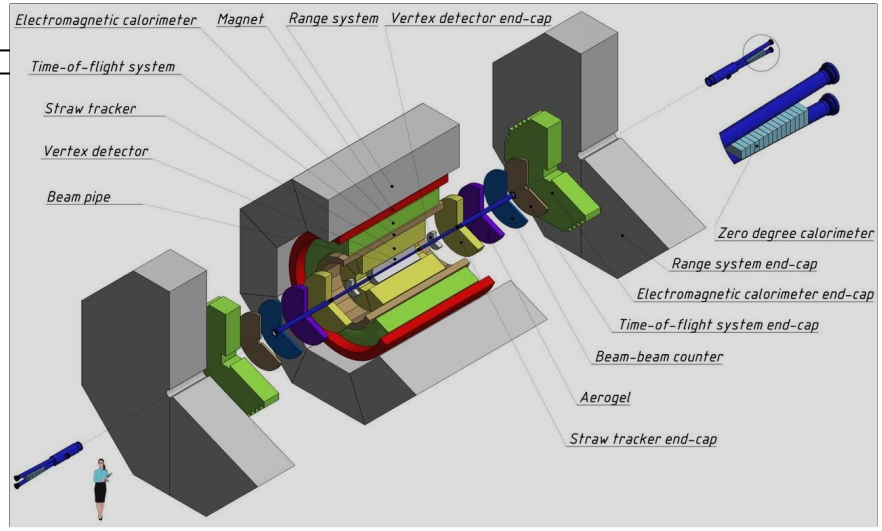
Alexey Konak
JINR MLIT
konak@jinr.ru

JINR AYSS Conference “Alushta-2026”
09.06.2026

Spin Physics Detector (SPD)

The spin structure of the **nucleon** is one of the fundamental properties of matter. The spin of a nucleon is distributed between its components — **quarks** and **gluons**, and their mutual movement.
The EMC, HERMES, and COMPASS experiments have made it possible to study in detail the contribution of **quarks** to spin. However, the role of **gluons** remains poorly understood and requires further research.

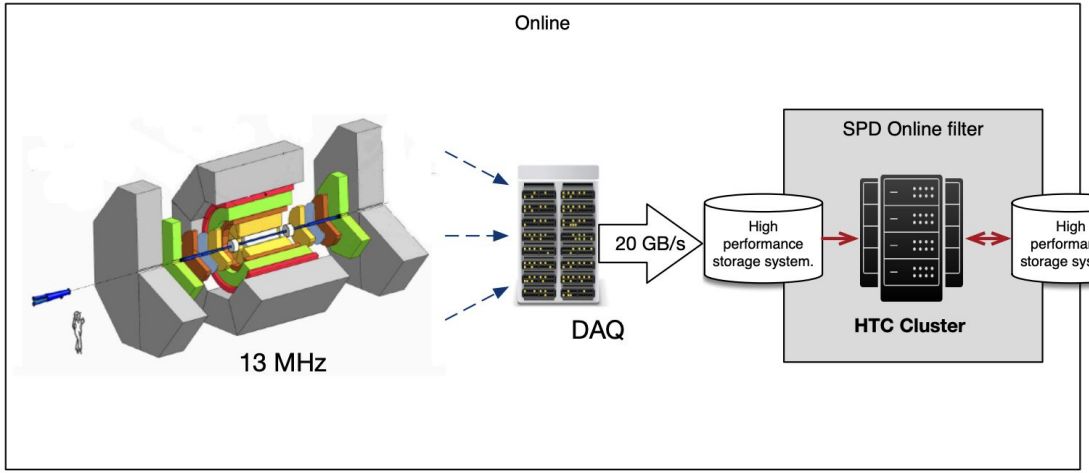


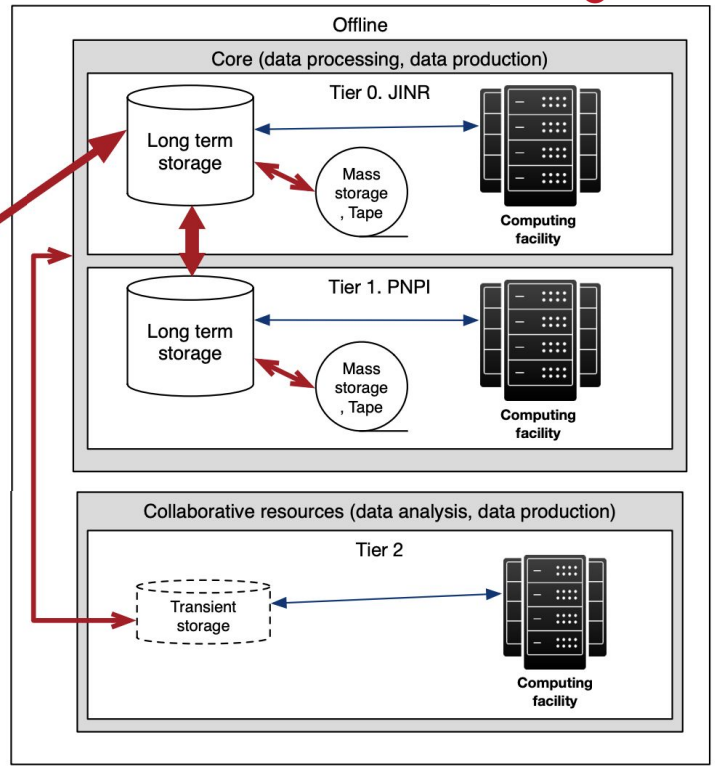


The SPD facility is being developed for a more accurate study of the contribution of **gluons** to the spin of the **nucleon**.

V. Abazov et al. (SPD Collaboration). "Technical Design Report of the Spin Physics Detector at NICA" Natural Sci. Rev. 1 1 (2024) https://doi.org/10.54546/NaturalSciRev.100101

Computing Infrastructure: The Ecosystem





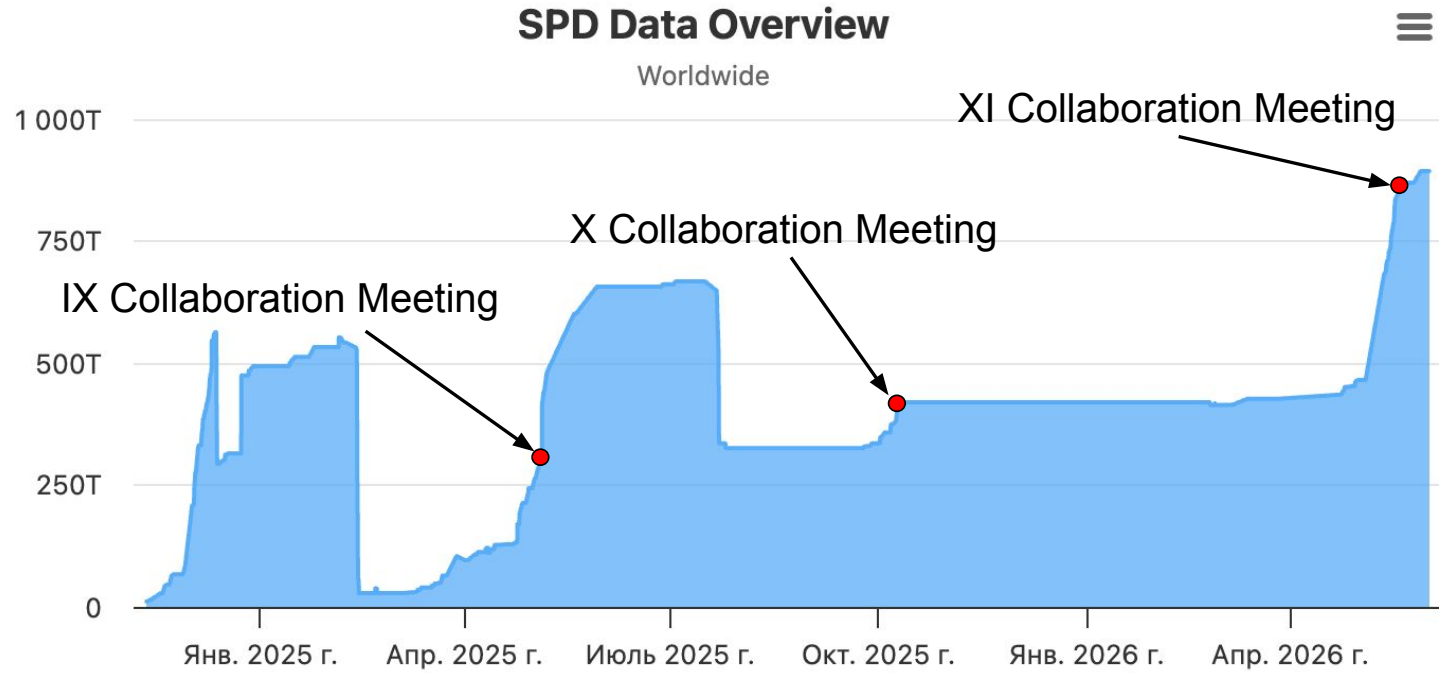
Online Filter:

- **Nikita Greben** – Prototyping the SPD Online Filter as a Private Cloud Infrastructure.
- **Polina Korshunova** – Data Flow and Data Control in the SPD Online Filter Middleware.
- **Леонид Романычев** – The Workflow Management System for the SPD Online Filter.

Offline Data processing:

- **Alexey Konak** – SPD Computing Infrastructure and Data Production.
- **Nikita Monakov** – SPD Production control panel.

SPD Data growth



- At the moment there are two storages available: at JINR and at PNPI, we expect more remote storages to connect
- Last year we migrated from the shared JINR EOS to the dedicated EOS for the SPD
- Final results of the central productions replicated automatically to both JINR and PNPI

Productions requests management system

ID	Request	campaign	status	# procs	version	C	E	P	Events	Geometry	description
22	22 PROD2026-001	SPD MC 2026	DONE	2	4.1.7.5	pp	27	UU	5000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	Charmonia production
23	23 PROD2026-002	SPD MC 2026	DONE	2	4.1.7.5	pp	27	UU	5000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	Charmonia production, Additional to PROD2026-001
24	24 PROD2026-003	SPD MC 2026	DONE	2	4.1.7.5	pp	27	UU	10000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	Charmonia production, Additional to PROD2026-001
25	25 ANA2026-001	SPD MC 2026	INPREPARATION	1	4.1.7.5-muon-reco-update	pp	27	UU	5000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	
26	26 PROD2026-005	SPD MC 2026	RUNNING	2	4.1.7.6	pp	27	UU	40000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	MB production
27	27 PROD2026-004	SPD MC 2026	RUNNING	2	4.1.7.5	pp	27	UU	20000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	Charmonia production, Additional to PROD2026-001
28	28 PROD2026-006	SPD MC 2026	RUNNING	2	4.1.7.6	pp	27	UU	40000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	MB production, Additional to PROD2026-005
29	29 PROD2026-007	SPD MC 2026	RUNNING	2	4.1.7.6	pp	27	UU	40000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	MB production, Additional to PROD2026-005
30	30 PROD2026-008	SPD MC 2026	RUNNING	2	4.1.7.6	pp	27	UU	40000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	MB production, Additional to PROD2026-005
31	31 PROD2026-009	SPD MC 2026	RUNNING	2	4.1.7.6	pp	27	UU	40000000	DSSD, ECal, FARICH, RS, TOF, TS, BBC, ZDC	MB production, Additional to PROD2026-005
ID	Request	campaign	status	# procs	version	C	E	P	Events	Geometry	description

- Allows to organize requests, keeps the history, with built-in API has rich integration potential

Control panel of the production manager



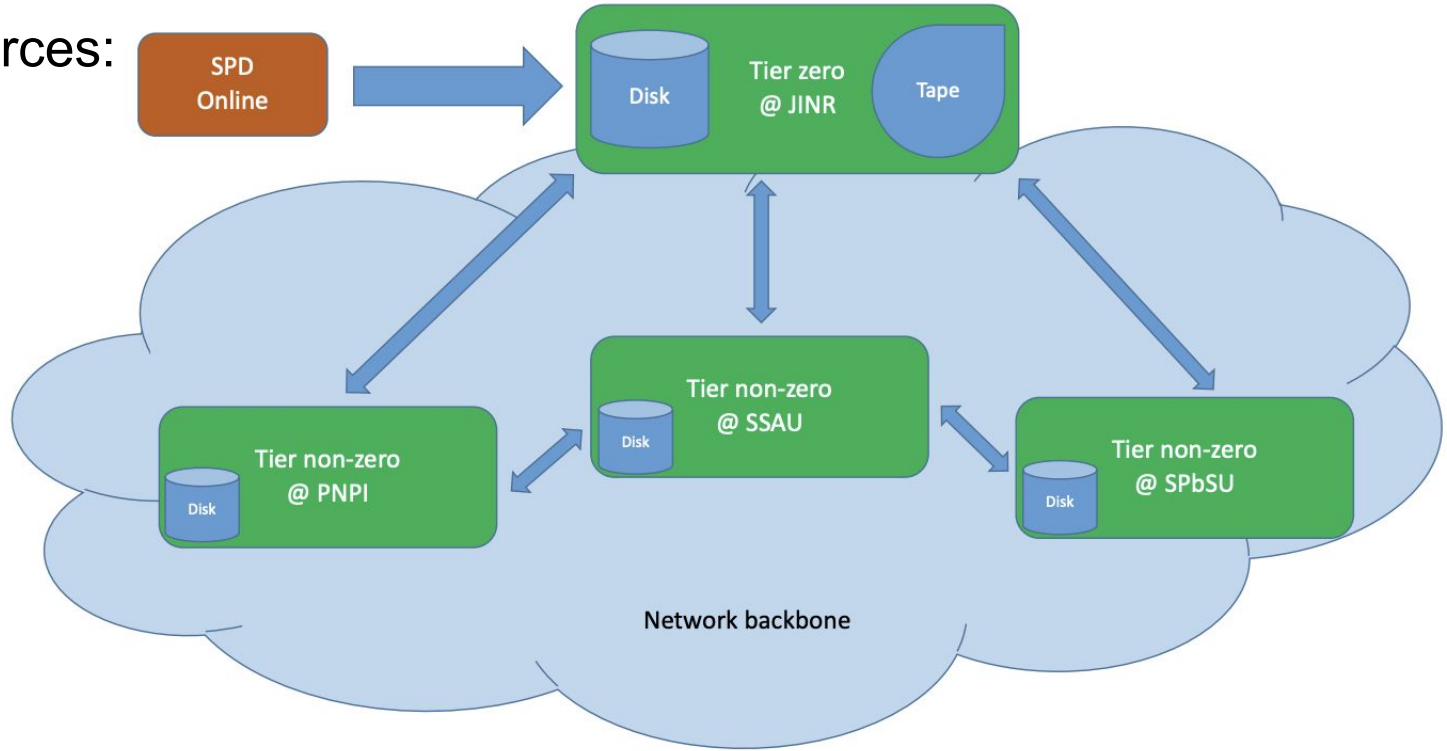
Welcome, Alexey Konak Tasks Log out

Task ID	Task name ↑ ↓	Parent ID	Creator	Status	Done jobs	Default/Current priority	Total events	Submit time ↑ ↓	Start time ↑ ↓	End time ↑ ↓
668	PROD2026-009.RECO.1	668	Elena Zemlyanichkina	running	8212	900/900	0	18:02, 16 May 2026	18:09, 16 May 2026	None
667	PROD2026-008.RECO.1	667	Elena Zemlyanichkina	running	8170	900/900	0	18:01, 16 May 2026	18:05, 16 May 2026	None
666	PROD2026-007.RECO.1	666	Elena Zemlyanichkina	running	9074	900/900	0	07:05, 15 May 2026	07:09, 15 May 2026	None
665	PROD2026-006.RECO.1	665	Elena Zemlyanichkina	running	9001	900/900	0	06:46, 14 May 2026	06:49, 14 May 2026	None
664	PROD2026-005.RECO.1	664	Elena Zemlyanichkina	running	9318	900/900	0	07:19, 13 May 2026	07:23, 13 May 2026	None
663	PROD2026-004.RECO.1	663	Elena Zemlyanichkina	running	4856	900/900	0	09:23, 09 May 2026	09:27, 09 May 2026	None
662	PROD2026-009.SIM.1	662	Elena Zemlyanichkina	done	10000	900/900	40000000	08:10, 07 May 2026	08:16, 07 May 2026	None
661	PROD2026-008.SIM.1	661	Elena Zemlyanichkina	done	10000	900/900	40000000	08:10, 07 May 2026	08:16, 07 May 2026	None
660	PROD2026-007.SIM.2	660	Elena Zemlyanichkina	done	10000	900/900	40000000	08:06, 07 May 2026	08:10, 07 May 2026	None
659	PROD2026-007.SIM.1	659	Elena Zemlyanichkina	aborted	0	900/900	0	08:01, 07 May 2026	None	None

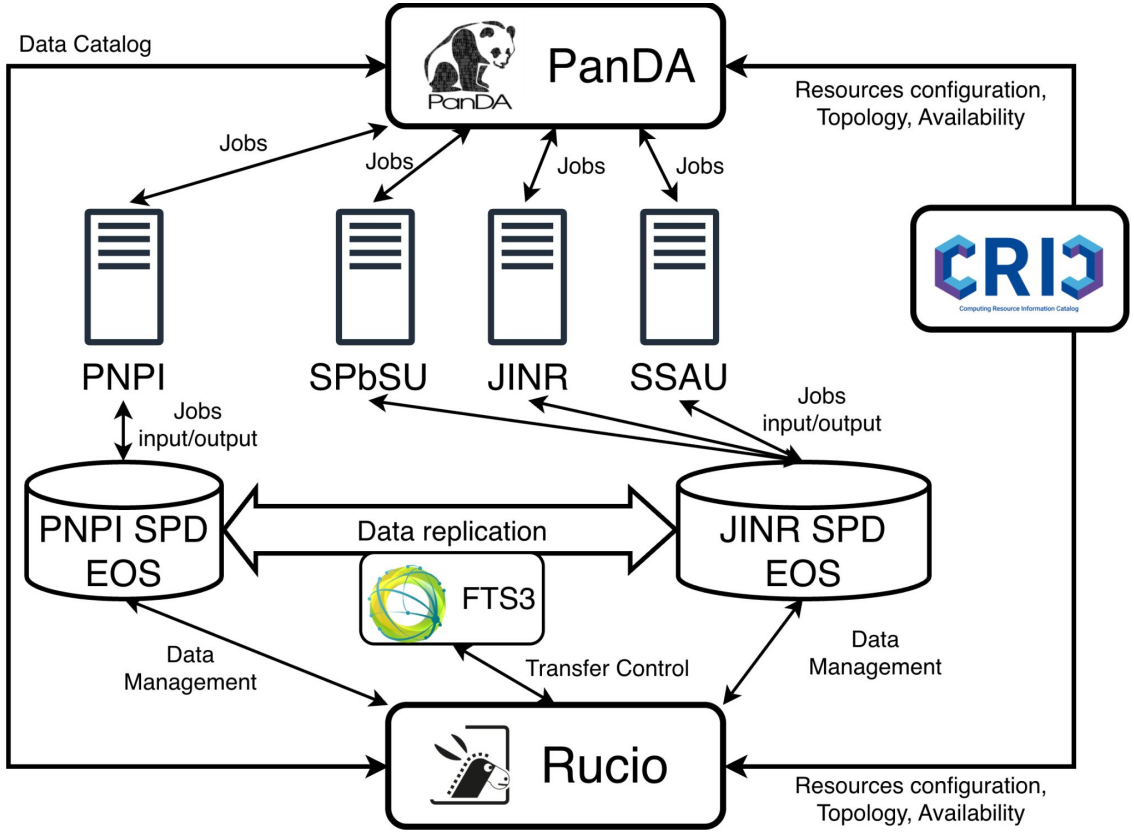
- A special service for launching productions. See **Nikita Monakov**'s report for more details.

Resources for SPD Computing

- Computing resources:
  - JINR (T1, T2)
  - PNPI
  - SPbSU
  - SSAU
  - MEPhI
  - TSU
- Storage facilities:
  - JINR
  - PNPI



Distributed Computing Infrastructure

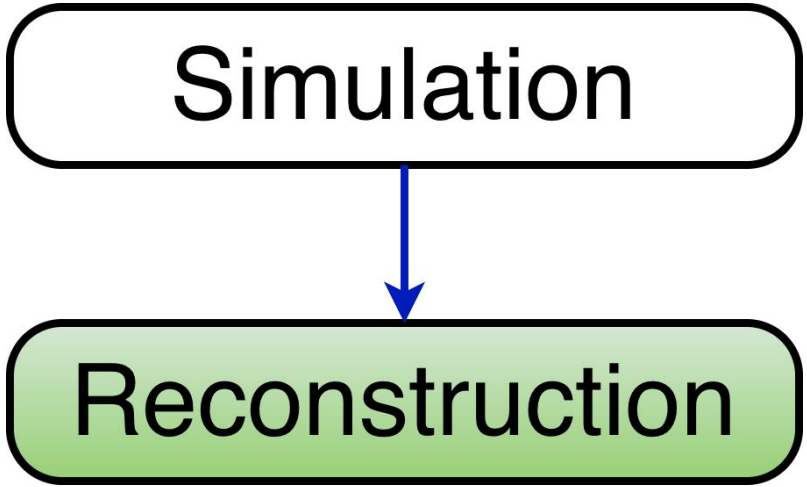


Offline data processing system includes the following components:

- Storage Elements: JINR, PNPI.
- Computing Elements: JINR (T1, T2), PNPI, SPbSU, SSAU.

- Authentication system: JINR SSO.
- Authorization system: IAM.
- Information system: **CRIC**.
- Data management system: **Rucio**.
- Data transfer service: **FTS**.
- Workflow management system: SPD own solution & **PanDA.**
- Workload management system: **PanDA**.

Current Data Processing Pipeline



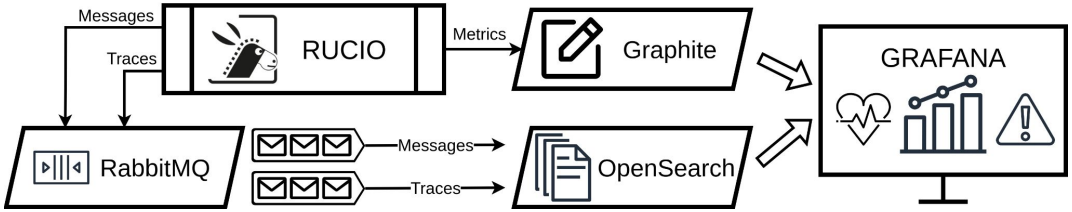
Right now we have only two processing steps and types of data:

- Simulation
- Reconstruction

Examples of datasets from Rucio:

MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.S
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-001.SIM.2.P
MC2025_S1:MC2025_S1.minbias-P8-spdroot417-dev.10GeV-UU.PROD2025-003.RECO.1.R
MC2025_S2:MC2025_S2.minbias-P8-spdroot4174-dev.27GeV-UU.PROD2025-019.RECO.3.R
MC2025_S2:MC2025_S2.minbias-P8-spdroot4173-dev.27GeV-UU.PROD2025-018.RECO.1.R
MC2025_S2:MC2025_S2.minbias-P8-spdroot4173-dev.27GeV-UU.PROD2025-018.SIM.1.S
MC2025_S2:MC2025_S2.minbias-P8-spdroot4173-dev.27GeV-UU.PROD2025-018.SIM.1.P
MC2026_S2:MC2026_S2.charmonia-P8-spdroot4175-dev.27GeV-UU.PROD2026-001.RECO.6.R

Data Monitoring







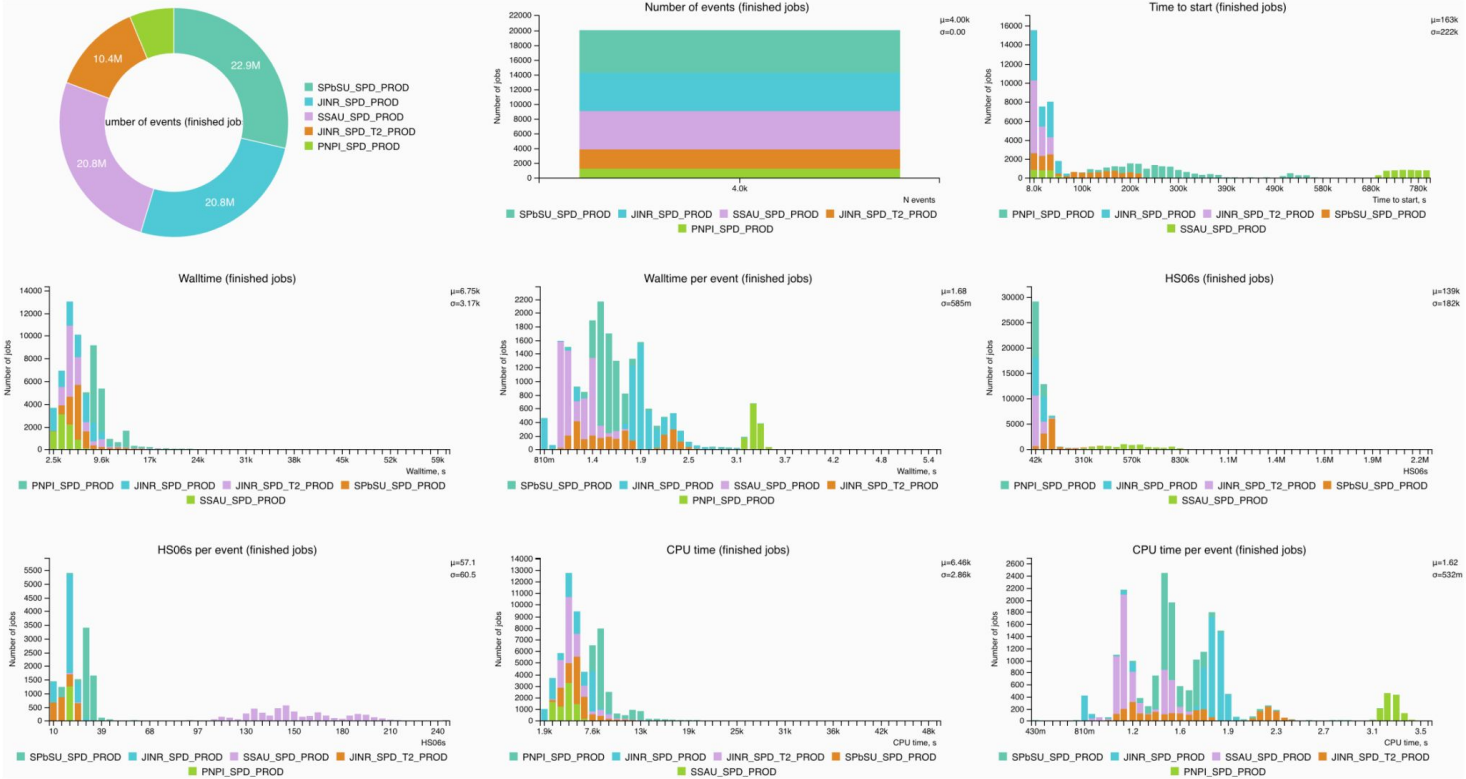






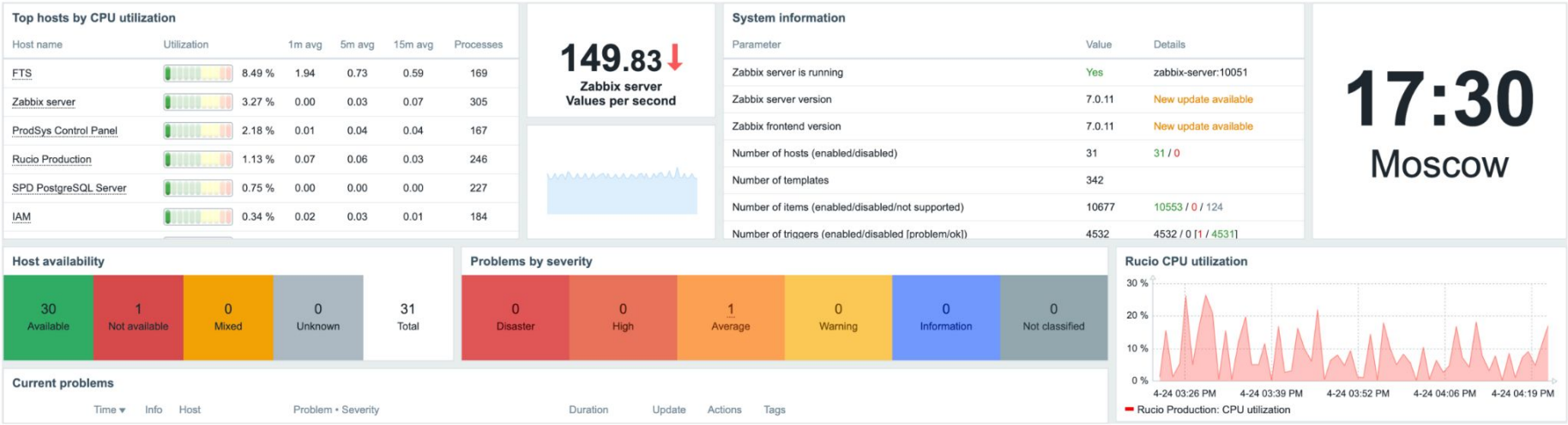
Based on the recommendations of the Rucio developers, we designed and implemented the Rucio monitoring system.

Processing Monitoring



We have deployed PanDA monitoring, a special system designed to track the progress of job and task processing.

Infrastructure Monitoring



- We monitor the status and load of the servers in JINR (on which our systems are running) with **Zabbix monitoring**.

Distributed Infrastructure Monitoring

- The goal is to increase awareness of the system status in real time. We need to test (to verify that all should work as expected) and monitor the statuses of the systems.
- To do that we are developing:
  - A software platform for testing components of a geographically distributed data processing system for the SPD experiment
  - Monitoring of the components of the geographically distributed data processing system for the SPD experiment.

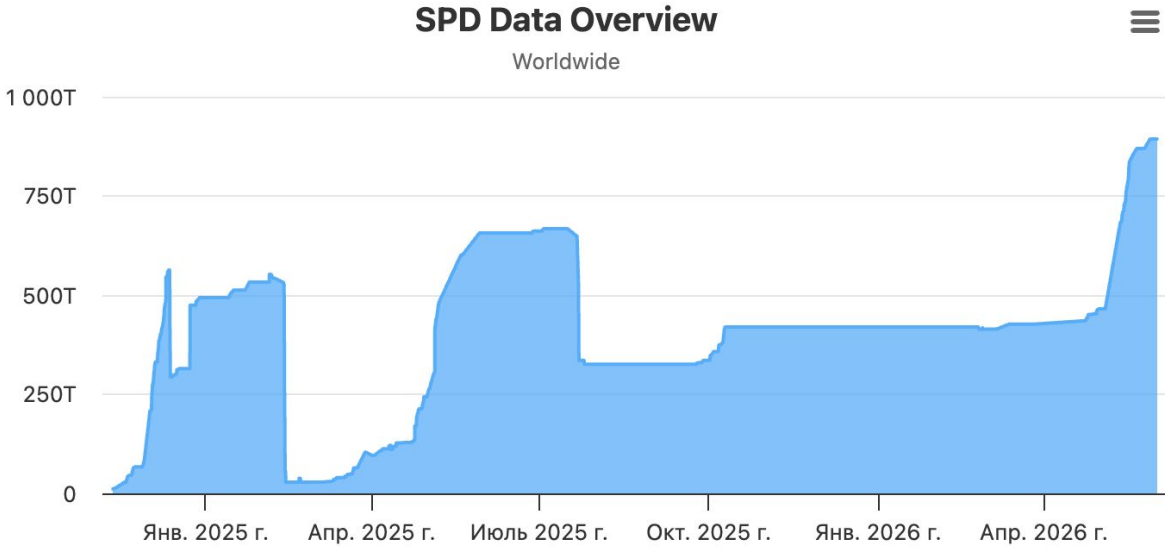
test results

timestamp	site	service...	service_name	result	error_type	mes...	endpoint	check_type	response...
05.05.26 12:24	PNPI	SE-XROOTD	PNPI_EOS_xrootd	success		Alive	root://mss3.pnpi.nw.ru:1094	XRootD Stat	0.726
05.05.26 12:24	JINR	SE-XROOTD	JINR_SPD_EOS-XROOTD	success		Alive	root://eos-spd.jinr.ru:1094	XRootD Stat	0.326
05.05.26 12:24	PNPI	SE-WEBDAV	PNPI_EOS_webdav	success		Alive	davs://mss3.pnpi.nw.ru:8000	WebDAV Stat	0.379
05.05.26 12:24	JINR	SE-WEBDAV	JINR_SPD_EOS-WEBDAV	success		Alive	davs://eos-spd.jinr.ru:8000	WebDAV Stat	0.224
05.05.26 12:24	INPBSU	SE-WEBDAV	INPBSU-SPD-STORM	fail	ServiceNotFound	Failed afte	davs://grid02.hep.by:8443	WebDAV Stat	0.437
05.05.26 12:24	JINR	Rucio	Rucio-prod	success		Alive (Ruci	https://spd-rucio.jinr.ru:443	Rucio Client	0.0217
05.05.26 12:24	JINR	PanDA	PanDA-prod	success		Alive	https://vm221-129.jinr.ru:25443	HTTP	0.0200
05.05.26 12:24	JINR	Harvester	SPD-221-126	success		Alive	https://vm221-126.jinr.ru:8080	HTTP	0.0274
05.05.26 12:24	JINR	FTS	SPD-FTS	success		Alive	https://spd-fts.jinr.ru:8446	HTTP	0.0554
05.05.26 12:24	SSAU	CE	SSAU-CE	fail	Network	Failed afte	https://spd.ssau.ru:443	ARC CE	7.20
05.05.26 12:24	SPbSU	CE	SPbSU-CE	fail	Network	Failed afte	https://alice30.grid.pu.ru:443	ARC CE	6.96
05.05.26 12:24	PNPI	CE	PNPI-CE	success		Alive	https://gt2.pnpi.nw.ru:443	ARC CE	0.387
05.05.26 12:24	JINR	CE	JINR-CE-T2	success		Alive	https://lcgce01.jinr.ru:443	ARC CE	0.267
05.05.26 12:24	JINR	CE	JINR-CE-T1	fail	SSL	Failed afte	https://ce03.jinr-t1.ru:443	ARC CE	2.61
05.05.26 12:24	INPBSU	CE	INPBSU-CE	fail	Network	Failed afte	https://grid04.hep.by:443	ARC CE	7.13

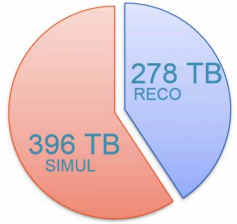
certificates info

timestamp	issuer	cert not after	service name	status	days left	service type	endpoint
05.05.26 15:19	JINR	27.10.26 9:56	spd-requests.jinr.ru	VALID	174	manual	https://spd-requests.jinr.ru:443
05.05.26 15:19	JINR	17.04.27 6:05	spd-cric.jinr.ru	VALID	346	manual	https://spd-cric.jinr.ru:443
05.05.26 15:19	JINR	08.10.26 12:26	spd-iam.jinr.ru	VALID	156	manual	https://spd-iam.jinr.ru:443
05.05.26 15:19	RDIG	08.02.27 0:05	PNPI_EOS_webdav	VALID	278	SE-WEBDAV	davs://mss3.pnpi.nw.ru:8000
05.05.26 15:19	RDIG	08.02.27 0:05	PNPI-CE	VALID	278	CE	https://gt2.pnpi.nw.ru:443
05.05.26 15:19	JINR	20.02.27 10:12	JINR_SPD_EOS-WEBI	VALID	290	SE-WEBDAV	davs://eos-spd.jinr.ru:8000
05.05.26 15:19	RDIG	26.03.27 9:07	JINR-CE-T2	VALID	324	CE	https://lcgce01.jinr.ru:443
05.05.26 15:19	RDIG	08.08.26 9:32	JINR-CE-T1	VALID	94	CE	https://ce03.jinr-t1.ru:443
05.05.26 15:19	JINR	24.10.26 14:33	INPBSU-SPD-STORM	VALID	172	SE-WEBDAV	davs://grid02.hep.by:8443
05.05.26 15:19	JINR	24.10.26 14:35	INPBSU-CE	VALID	172	CE	https://grid04.hep.by:443
05.05.26 15:19	JINR	17.12.26 12:16	PanDA-prod	VALID	225	PanDA	https://vm221-129.jinr.ru:25443
05.05.26 15:19	JINR	17.04.27 6:11	SPD-221-126	VALID	346	Harvester	https://vm221-126.jinr.ru:8080
05.05.26 15:19	JINR	27.01.27 10:17	SSAU-CE	VALID	266	CE	https://spd.ssau.ru:443
05.05.26 15:19	JINR	16.07.26 21:46	SPbSU-CE	VALID	72	CE	https://alice30.grid.pu.ru:443
05.05.26 15:19	JINR	12.01.27 8:27	SPD-FTS	VALID	251	FTS	https://spd-fts.jinr.ru:8446
05.05.26 15:19	JINR	17.11.26 8:00	Rucio-prod	VALID	195	Rucio	https://spd-rucio.jinr.ru:443

Current Status

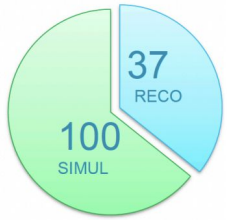


- Total output datasets volume – more than 680 TB



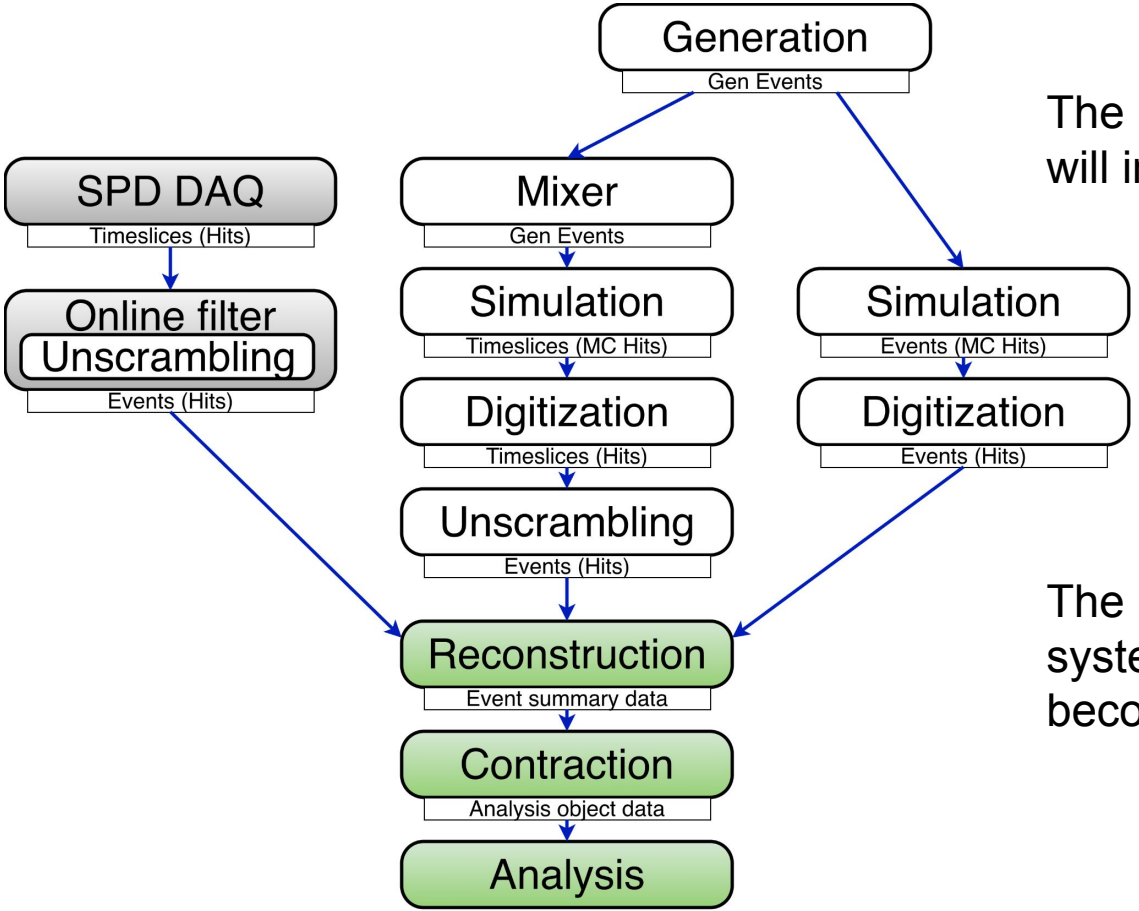
- Successfully processed about 440k jobs across 137 tasks





- The infrastructure based on **PanDA** and **Rucio** has already been deployed and is actively used for Data Production.
- JINR, PNPI, SSAU, SPbSU sites took part in the data processing.
- **~30 production** campaigns were conducted, **~900 TB of data** was produced.
- Comprehensive **monitoring** has been developed to fully monitor the entire infrastructure.

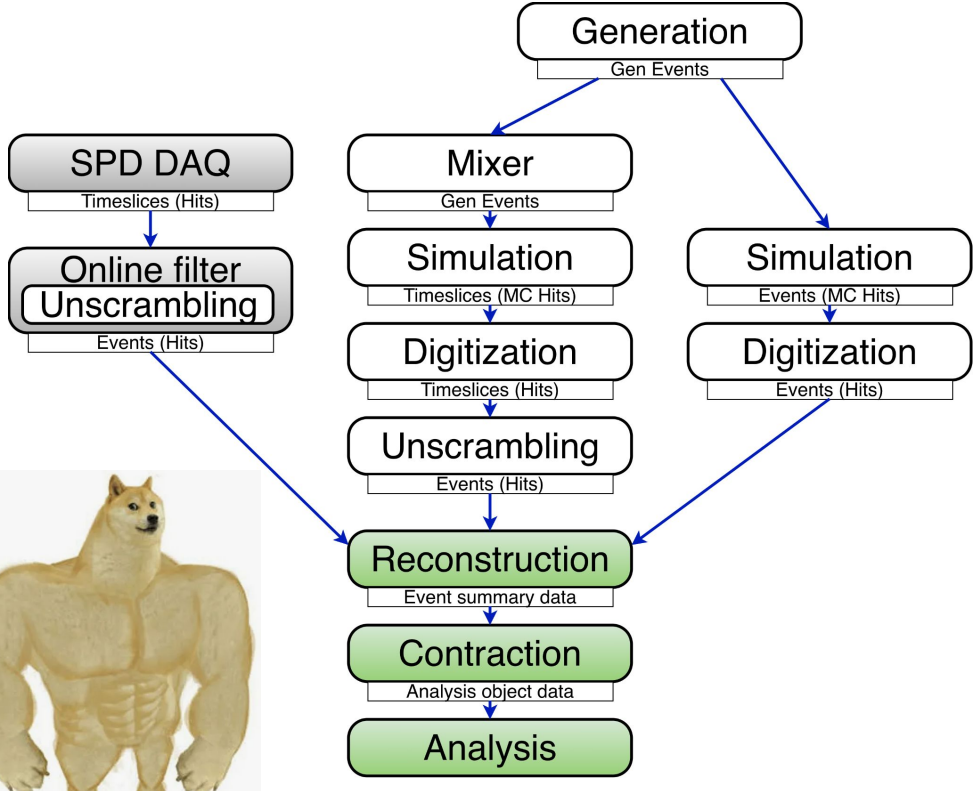
What awaits us in the future

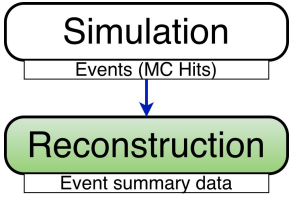


The number of processing steps will increase.

The requirements for monitoring, systems and services will also become more serious.

Thank you for your attention!





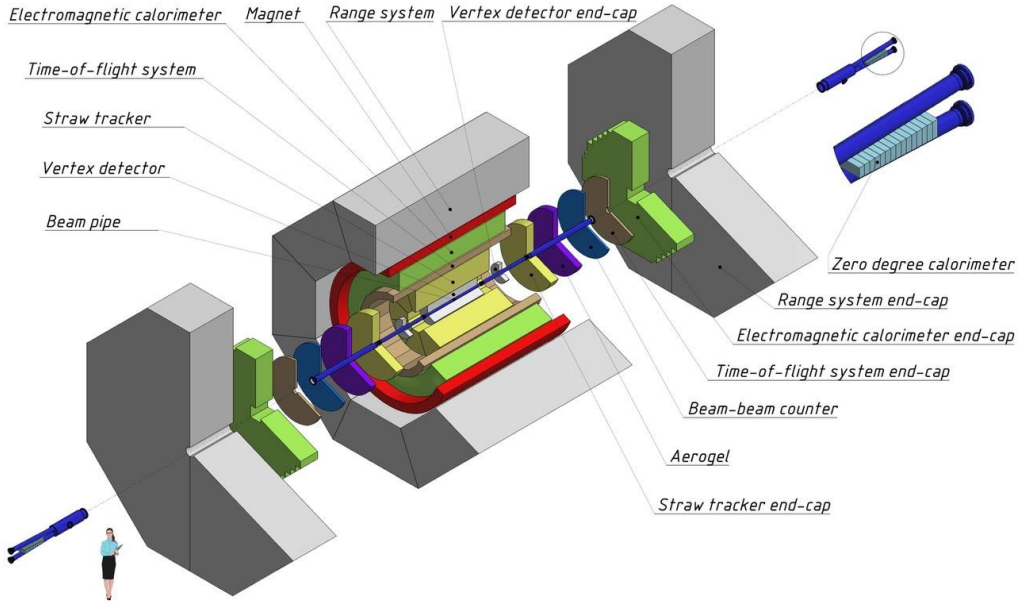


Backup slides

Spin Physics Detector (SPD)

The spin structure of the **nucleon** is one of the fundamental properties of matter. The spin of a nucleon is distributed between its components — **quarks** and **gluons**, and their mutual movement.

The EMC, HERMES, and COMPASS experiments have made it possible to study in detail the contribution of **quarks** to spin. However, the role of **gluons** remains poorly understood and requires further research.



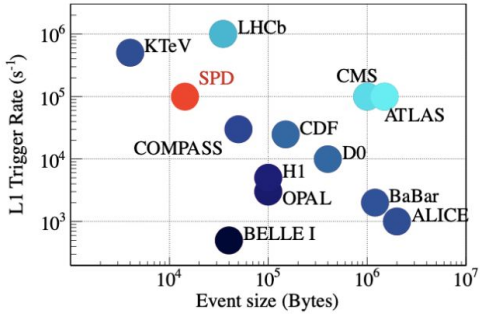
The SPD facility is being created for a more accurate study of the contribution of **gluons** to the spin of the **nucleon**.

SPD as data source

- Data from the detector – 20 GB/s (or 200 PB/year "raw" data, ~3*10^13 events/year)
- Simulation results – ??? (the exact volume is unknown, but it is comparable to the data volume from the detector.)
- Data of various intermediate formats along the way from “raw” to ready for analysis by physical groups – ??? (there will be a lot of them...)

The expected event rate of the SPD experiment is about 3 MHz (pp collisions at $\sqrt{s}$ = 27 GeV and 10^{32} cm^{-2}s^{-1} design luminosity). This is equivalent to a raw data rate of 20 GB/s or 200 PB/year, assuming a detector duty cycle is 0.3, while the signal-to-background ratio is expected to be on the order of 10^{-5}. Taking into account the bunch-crossing rate of 12.5 MHz, one may conclude that pile-up probability cannot be neglected.

- SPD TDR



The goal of the online filter is at least to decrease the data rate by a factor of 20, so that the annual growth of data, including the simulated samples, stays within 10 PB. Then, data are transferred to the Tier-1 facility, where a full reconstruction takes place and the data is stored permanently. The data analysis and Monte-Carlo simulation will likely run at the remote computing centres (Tier-2s). Given the large data volume, a thorough optimization of the event model and performance of the reconstruction and simulation algorithms are necessary.

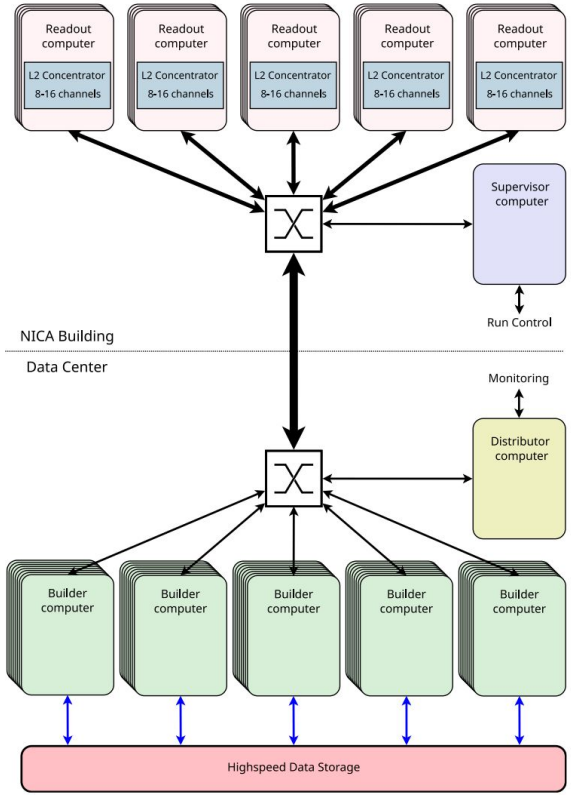
SPD DAQ

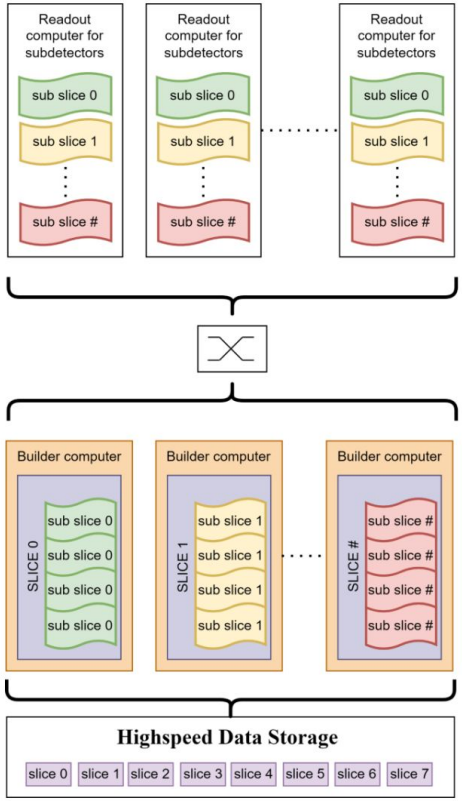
Why triggerless DAQ:

- No fast detectors to form a “classic” trigger signal.
- No 4π detector with 100% efficiency to detect the collisions.
- The wide SPD physical program eliminates a possibility of rejecting events at a hardware level.

Free run DAQ Speciality

- DAQ provide data organized in time slices which placed in files with reasonable size (a few GB).
- Each of these file may be processed independently as a part of top-level workflow chain.





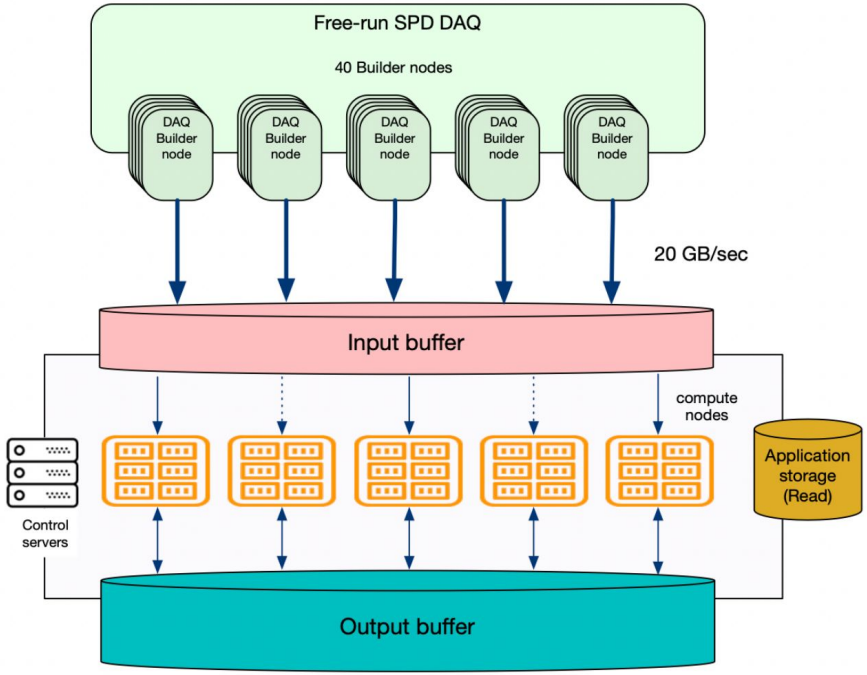
SPD Online Filter

Online filter is the first stage in data processing chain for SPD Experiment (right after DAQ)
Main goals:

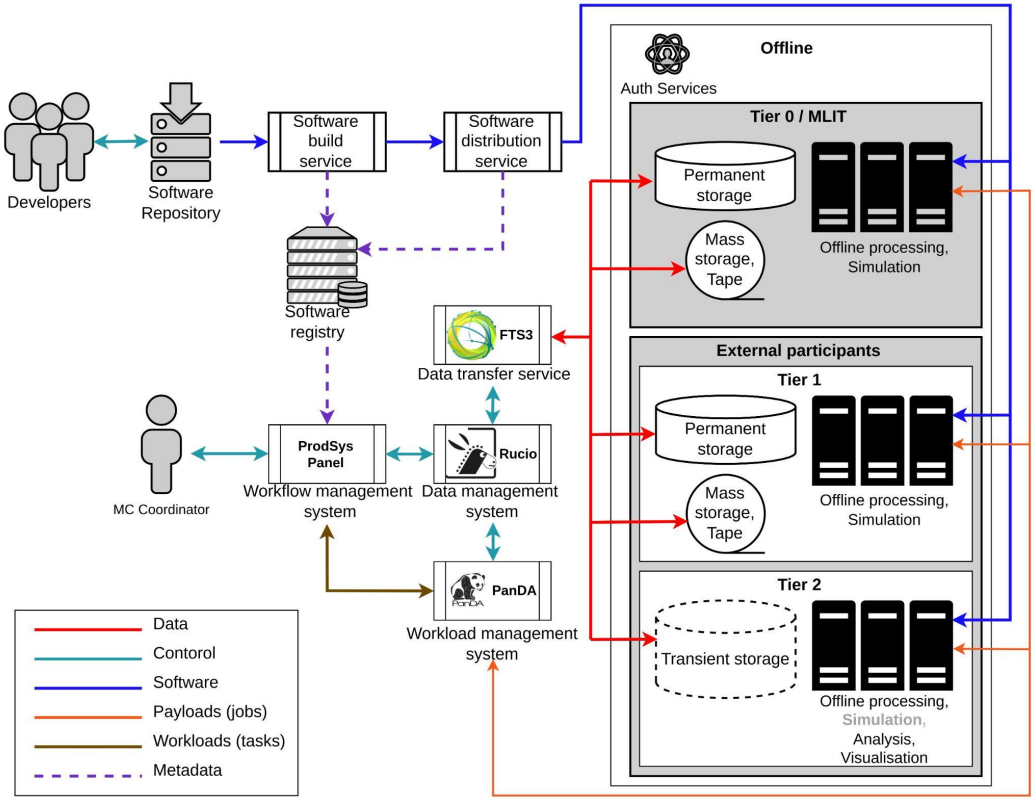
- Events unscrambling through partial reconstruction.
- Software trigger, which essentially is event filter.

SPD Online Filter is a high performance computing system for high throughput processing.

- Hardware component: compute cluster with two storage systems and set of working nodes: multi-CPU and hybrid multi CPU + Neural network accelerators (GPU, FPGA etc.)
- Applied software: performs informational processing of data. Had to use same framework as ‘offline’ applied software.
- Middleware component: software complex for management of multistep data processing and efficient loading (usage) of computing facility.



SPD distributed data processing system



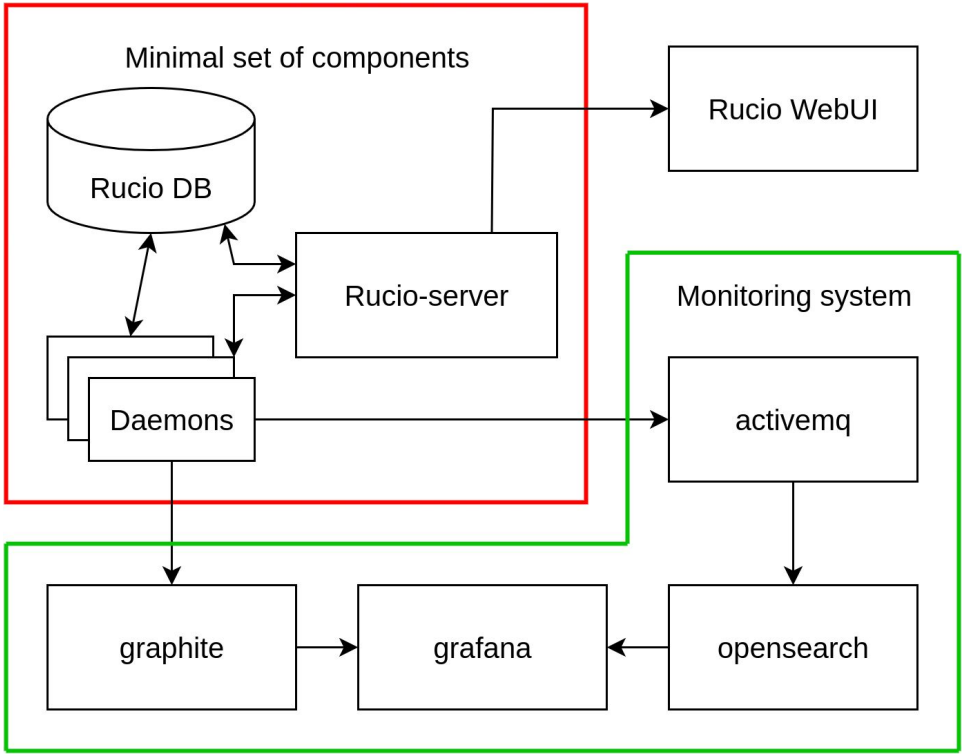
Offline data processing system includes the following components:

- workload management system (WMS) – PanDA,
- workflow management system (WFMS) – ProdSys Panel,
- data management system (DMS) – Rucio,
- data transfer service (DTS) – File Transfer Service 3 (FTS3),
- information system (IS) – Computing Resource Information Catalog (CRIC)

SPD Identity and Access Management (SPD IAM) provides authentication to all services and systems.

SPD Rucio deployment

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

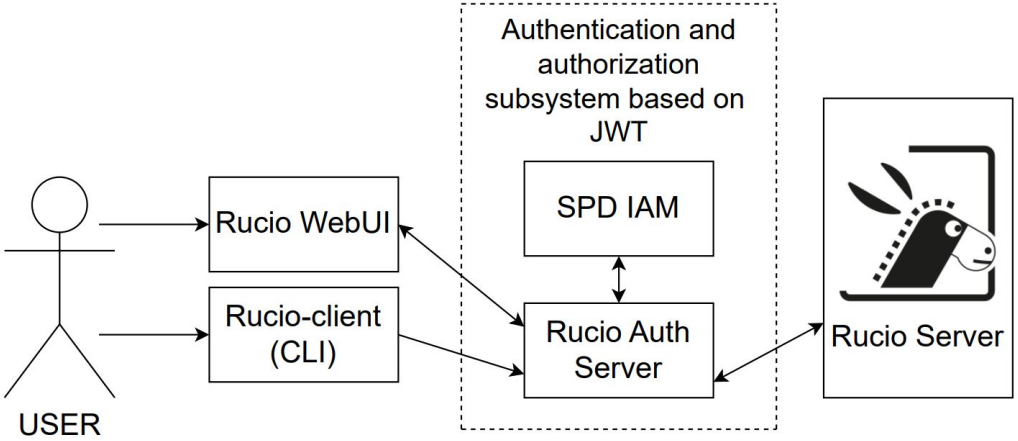


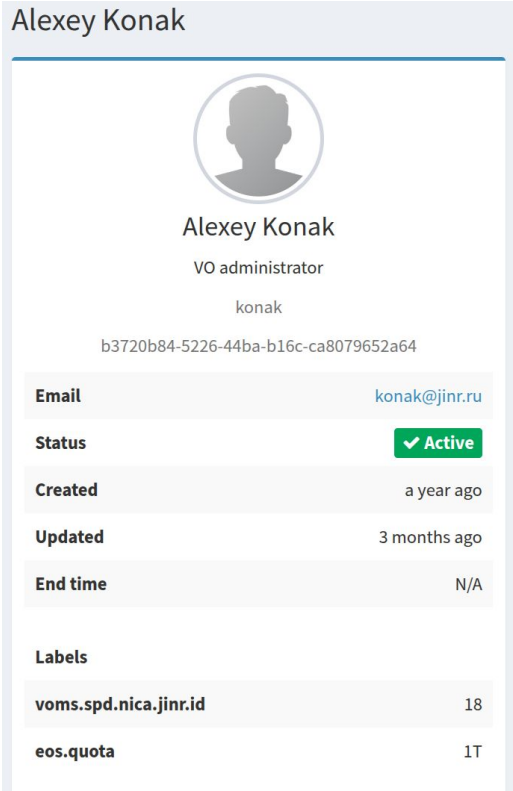
- **Production Infrastructure** with main Rucio-server which works stable and used for the needs of the SPD collaboration.
- **Development environment.** This infrastructure is used for development, testing and debugging.
- **Integration environment.** All updates and innovations are checked and tested on this installation before being put on the Prod infrastructure.

- PostgreSQL as the RDBMS backend

IAM integration

- IAM is a single source of info about users and their rights in the distributed computing environment of the SPD experiment.
- IAM provides authorization to all services and systems (including Rucio) with an access token and an ID token obtained during authorization in SPD IAM.
- Information about users imports from IAM to Rucio.
- User quota is defined in the IAM it is taken into account in Rucio and in EOS.





CRIC integration

- Importing configuration information about storage systems from CRIC to Rucio.
- Management of storage system configuration from a single location.
- Creation of new RSE is possible with CRIC Controller.

VO	NICA Site	State	Tier	Site	Storage Units
spd	JINR-SPD	ACTIVE	T1	JINR	SPD-JINR-DATA
spd	PNPI-SPD	ACTIVE	T2	PNPI	SPD-PNPI-DATA
spd	SPbSU-SPD	ACTIVE	T2	SPbSU	
spd	SSAU-SPD	ACTIVE	T2	SSAU	

Storage Unit Name	Site	Type	State
SPD-JINR-DATA	JINR-SPD	DISK	ACTIVE
SPD-PNPI-DATA	PNPI-SPD	DISK	ACTIVE
Storage Unit Name	Site	Type	State

Associated Params

Search:

Parameter	type	value	Param description	Allowed values	Ops
max_transfer_limit	integer	50	Max destination transfer limit used by Rucio	- any -	
static_usage	string	4 PB	The value for static usage in rucio	- any -	

RUCIO

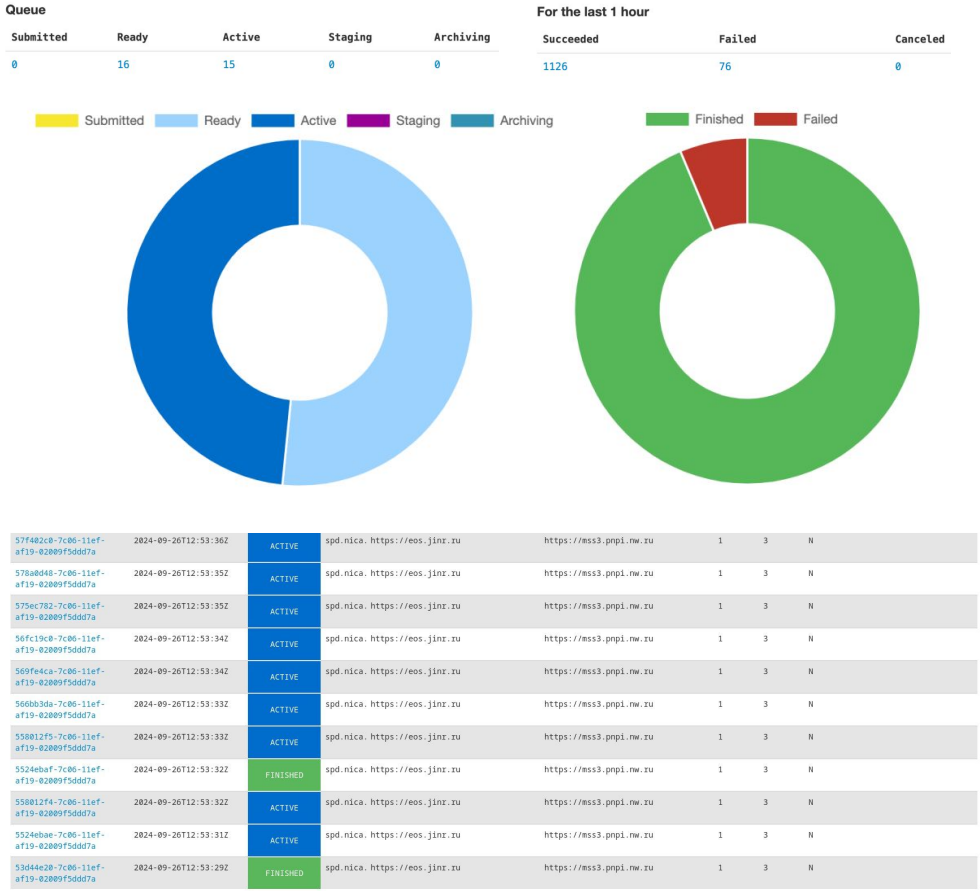
CRIC Controller utility

CRIC

Computing Resource Information Catalog

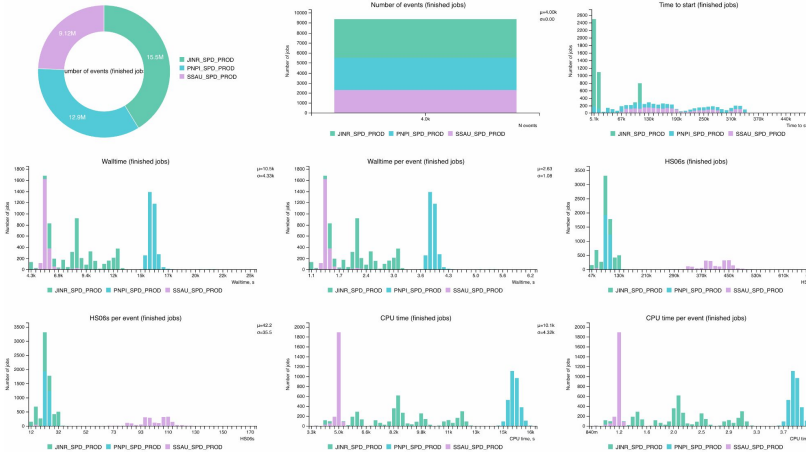
FTS3 integration

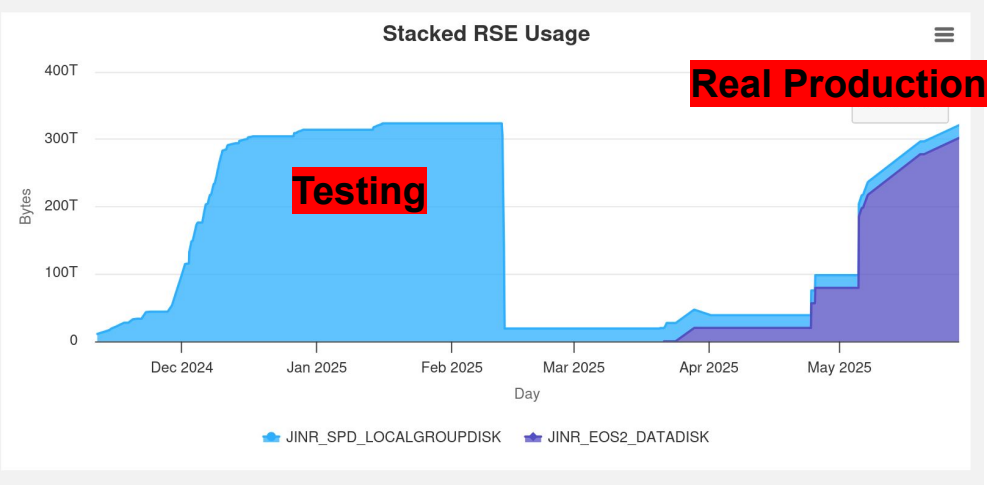
- One instance of data transfer service.
- Transfers and delegation with x509_proxy credentials
  (oidc not implemented yet).
- Custom docker image with conveyor-daemons.
- No limitation of number of transfers (in progress).
- Keeping two replicas of productions on two sites.

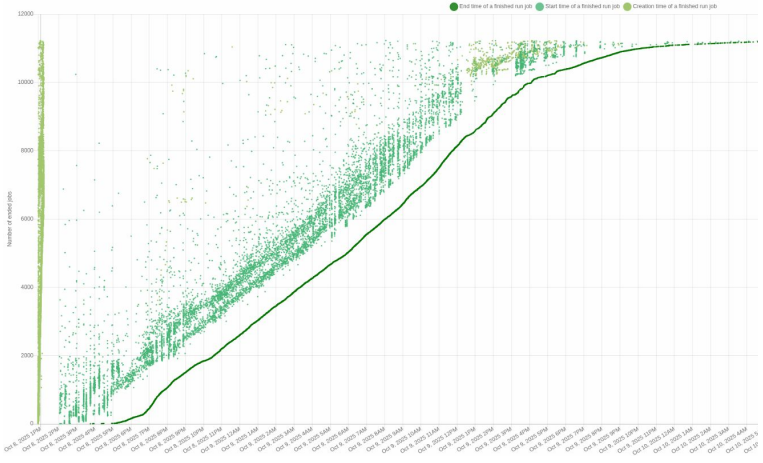


PanDA integration

- PanDA and Rucio is used for mass production of SPD.
- Interaction of PanDA and Rucio was tested in various forms as well as different data organisation.
- Rucio informs PanDA about storage space left.







Development of Monitoring System

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:

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

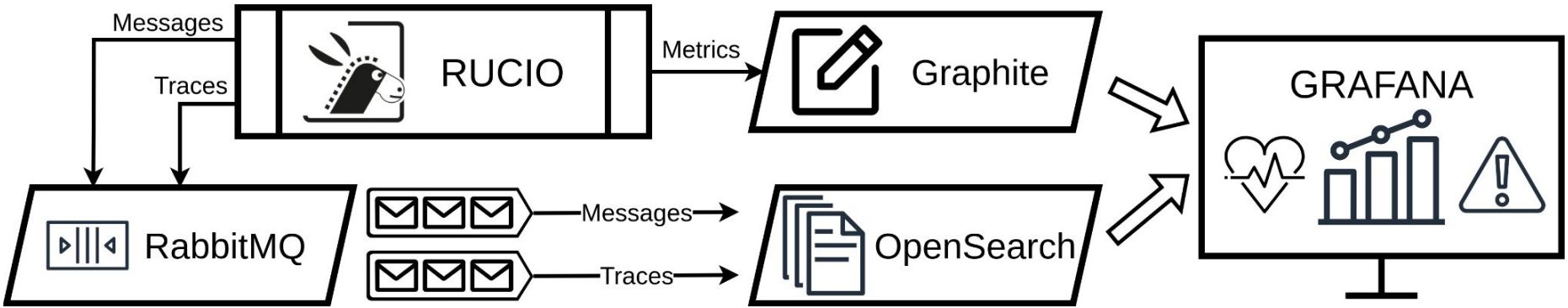
Types of information for monitoring:

- **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

Components of Monitoring System:

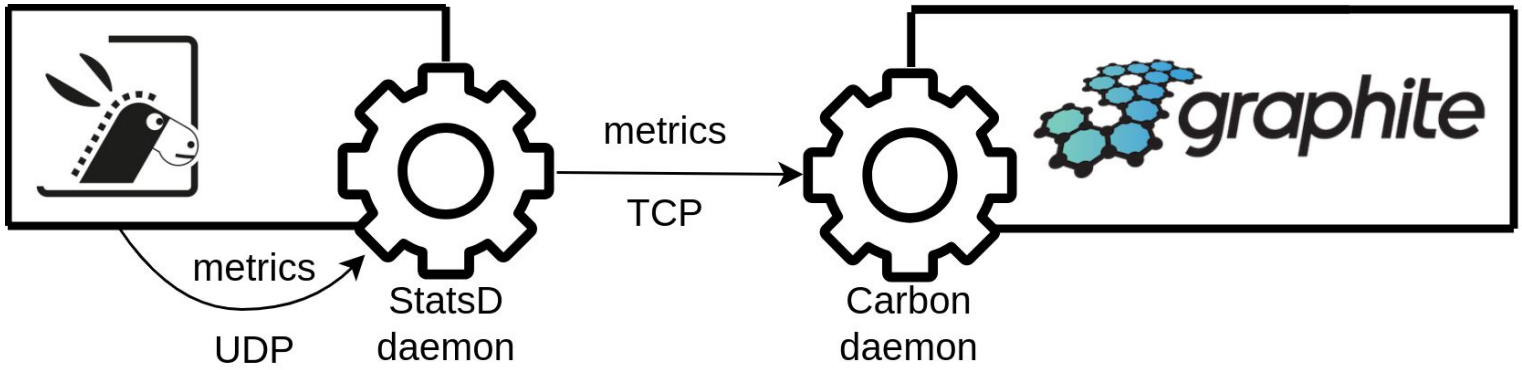
- **Graphite**: collects metrics from Rucio server.
- **RabbitMQ**: queues with messages and traces.
- **OpenSearch**: documents with messages and traces (long term storage).
- **Grafana**: visualizations.



Metrics delivery

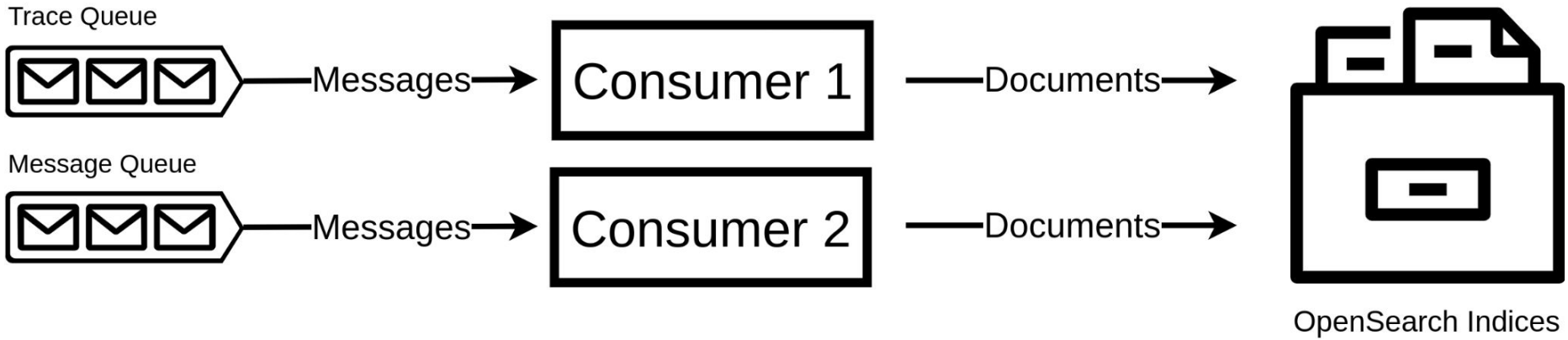
Metric is a measurable numerical characteristic that shows how the system works. **Metrics** sended to Graphite automatically.

1) Metrics generation – the **Rucio** code is instrumented using a library for collecting metrics. The metrics are collected in a memory buffer and sent in batches to the **StatsD daemon** (on Rucio side).
2) Aggregation and forwarding – The **StatsD daemon** pre-aggregates the received metrics and converts them for transmission to Graphite (buffering is possible if Graphite is not available).
3) Receiving and storage – **Carbon daemon** (on Graphite side) receives metrics and writes them to disk in an efficient format. (Whisper is a fixed-size, time-series database format for storing numerical data over time.)



Messages/Traces delivery

Queues in RabbitMQ are used for temporary storage of Rucio messages and traces. One entry in the queue is called a **message**.

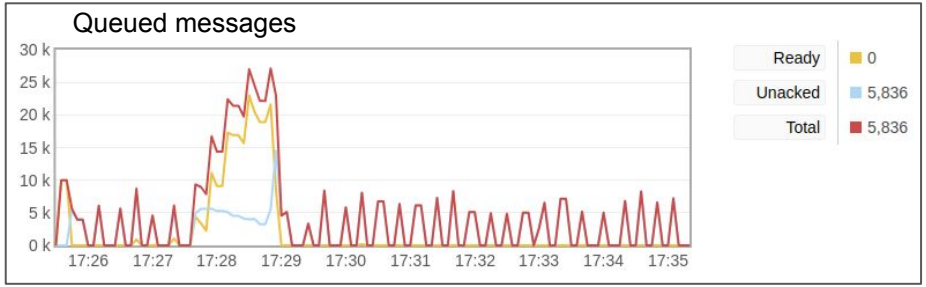


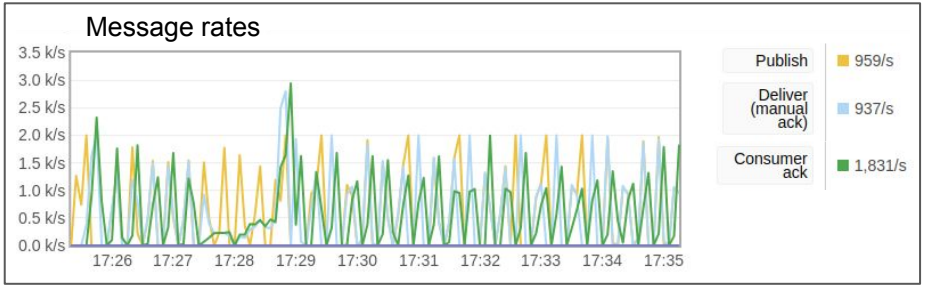
Special consumers are used to deliver messages in OpenSearch. It also preprocesses documents and distributes them to different indices (by event_type).

One unit of information in OpenSearch – **document**. Documents are stored in Indices. **Index** is a logical space for similar documents in OpenSearch.

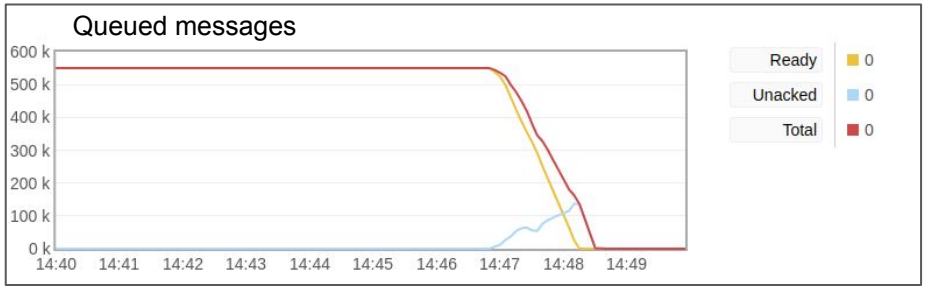
Messages/Traces delivery

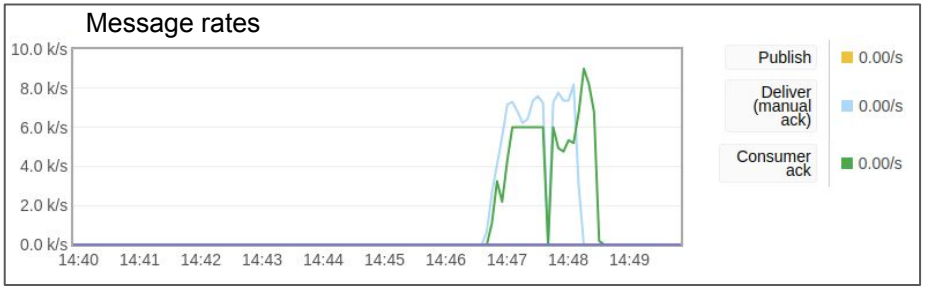
A special Rucio-daemon sends **messages** to the RabbitMQ queue (messages are taken from the Rucio-DB and sent in batches of 10k).





Traces are automatically sent to the RabbitMQ queue after the Rucio-server receives them.





The consumer test from the queue with traces turned out to be artificial. I haven't been able to test it online yet.

OpenSearch indices

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	841369	0	90.7mb	90.7mb
yellow	open	rucio_trace_put	PdZLv9zBS8WiTcRR3XiVgg	1	1	733710	0	366.3mb	366.3mb
yellow	open	rucio_transfer_submitted	O7YfPGd0TQ2ZadA7os5IRA	1	1	1286321	0	371mb	371mb
yellow	open	rucio_trace_touch	9I6J7UEGTy-25zjAvl3bDA	1	1	0	0	208b	208b
yellow	open	rucio_deletion_done	kezjdZa9SX2GpK6XU8luTw	1	1	585189	0	108.1mb	108.1mb
green	open	.opensearch-observability	MnInmQADRn2W36RcsHgFjA	1	0	0	0	208b	208b
yellow	open	rucio_transfer_done	aXNNF80HQj--Livqjddr6A	1	1	781302	0	405.8mb	405.8mb
yellow	open	rucio_transfer_submission_failed	fqSz1208R9uZ4BBN5lB62w	1	1	1387101	0	356.7mb	356.7mb
yellow	open	rucio_transfer_failed	0lgFhz5XQyOwm7cfOicOMA	1	1	563410	0	295.5mb	295.5mb
yellow	open	rucio_trace_get	E6CwiYg1SYG3BV0Re9wIXA	1	1	226467	0	109.1mb	109.1mb
yellow	open	rucio_deletion_not_found	xKsiLJ4yTGWMPiL1ykEKdQ	1	1	86715	0	12.6mb	12.6mb
yellow	open	scopes	8LLkv18iQK-7OdPb6ijCtA	1	1	120	0	18kb	18kb
yellow	open	rucio_trace_download	IKo1MFGVQNecIFIc5D5dWw	1	1	748	0	300.5kb	300.5kb

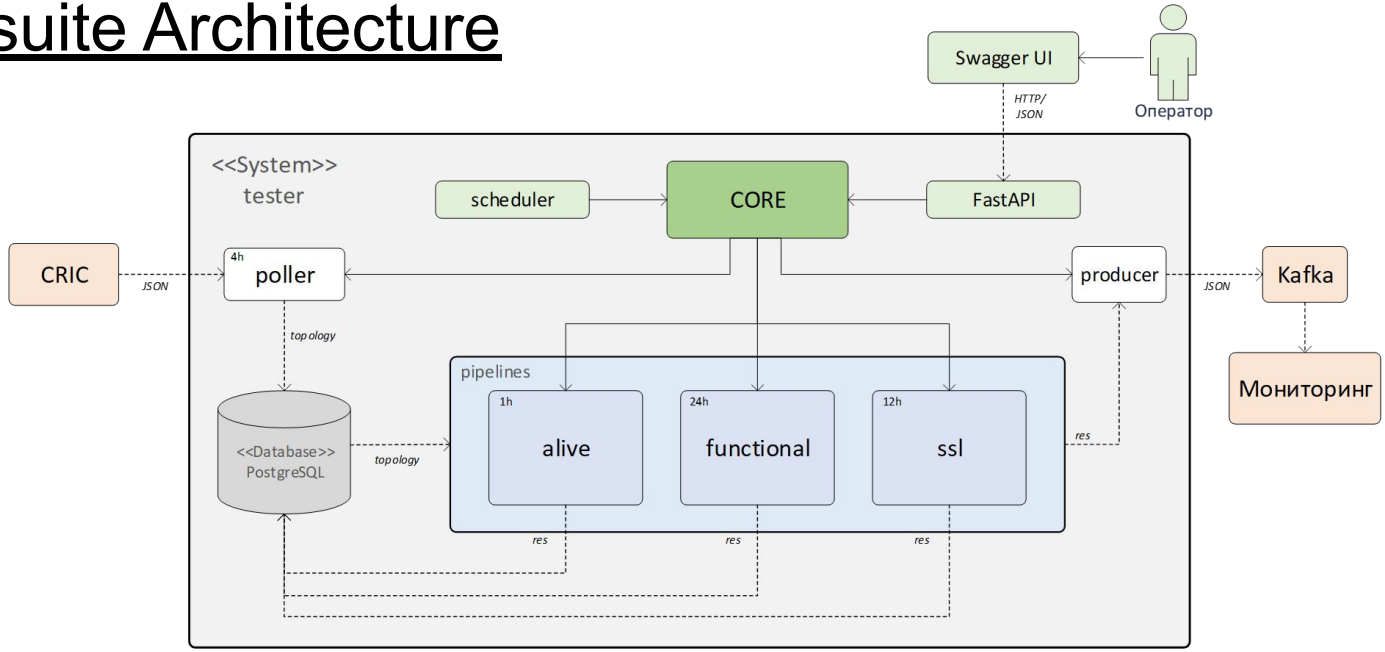
There are already a lot of documents in OpenSearch for monitoring (~ 8kk documents).
Each production generates many traces (1 job = 1 trace = 1 document).
Each transfer/deletion generates a message –> 1 document.

Test suite Requirements

The requirements for the testing system being developed are as follows:

- Testing – support for various types of testing modules (Availability, Functional, SSL).
- Save information – store service topologies, results history in the database, logging the progress of testing.
- Integration and monitoring – importing the list of services from CRIC, Transfer of results to the monitoring system in real time.
- Management and schedule – scheduled periodic startup, manual tests.

Test suite Architecture



- The Core manages the testing lifecycle. It starts on a timer, forming test pipelines, performing the testing process, sending the results to the monitoring system.
- Pipeline is a chain of tests. Each pipeline runs independently. The tests within the same pipeline follow one after the other.

About tests

Alive

Services and systems must be accessible over the network.

Executed every 30 minutes.

Each type of object has its own test:
- Rucio – rucio ping
- PanDA – request “isAlive”
- Harvester – request “/icons”
- FTS – fts-rest-server-status
- CE – arcinfo -c <endpoint>
- SE – getinfo of / with webdav and xrootd protocols

SSL

Host certificates of services must be valid

Executed every day.

- Requesting a host certificate.
- Verification of the certificate.
- Checking the certificate's lifetime.

LifeTime > 7 days – SUCCESS
LifeTime ⩽ 7 days – WARNING
LifeTime ⩽ 0 – CRITICAL

Functional

Services and systems must correctly perform operations.

Executed every day.

Special tests for each service. Not everything is ready yet.

Rucio – upload/download
FTS – delegate+transfer

Testing process



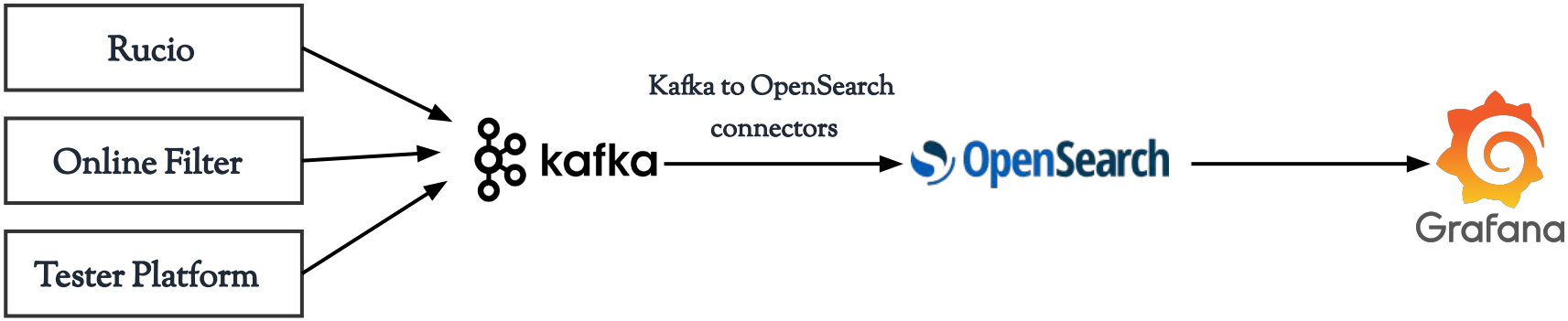
The system core performs the following actions:

- gets a list of testing services from CRIC;
- generates test pipelines (chains);
- runs test chains;
- saves the test results and sends them to the monitoring system.

Monitoring System

The main purpose of creating such monitoring is:

- Collect information about the health and operation of systems in one place
- Visualization of this data for analysis by system administrators



Data sources: collecting traces and metrics from critical experiment nodes and the testing system.

Apache Kafka: provides fault-tolerant reception and buffering of large data streams in real time.

OpenSearch: indexing and long-term storage of monitoring data with the possibility of fast full-text search.

Grafana: building dynamic dashboards and visualizations for operational monitoring of the distributed environment.

To be continued...