



Centralized Monte-Carlo productions



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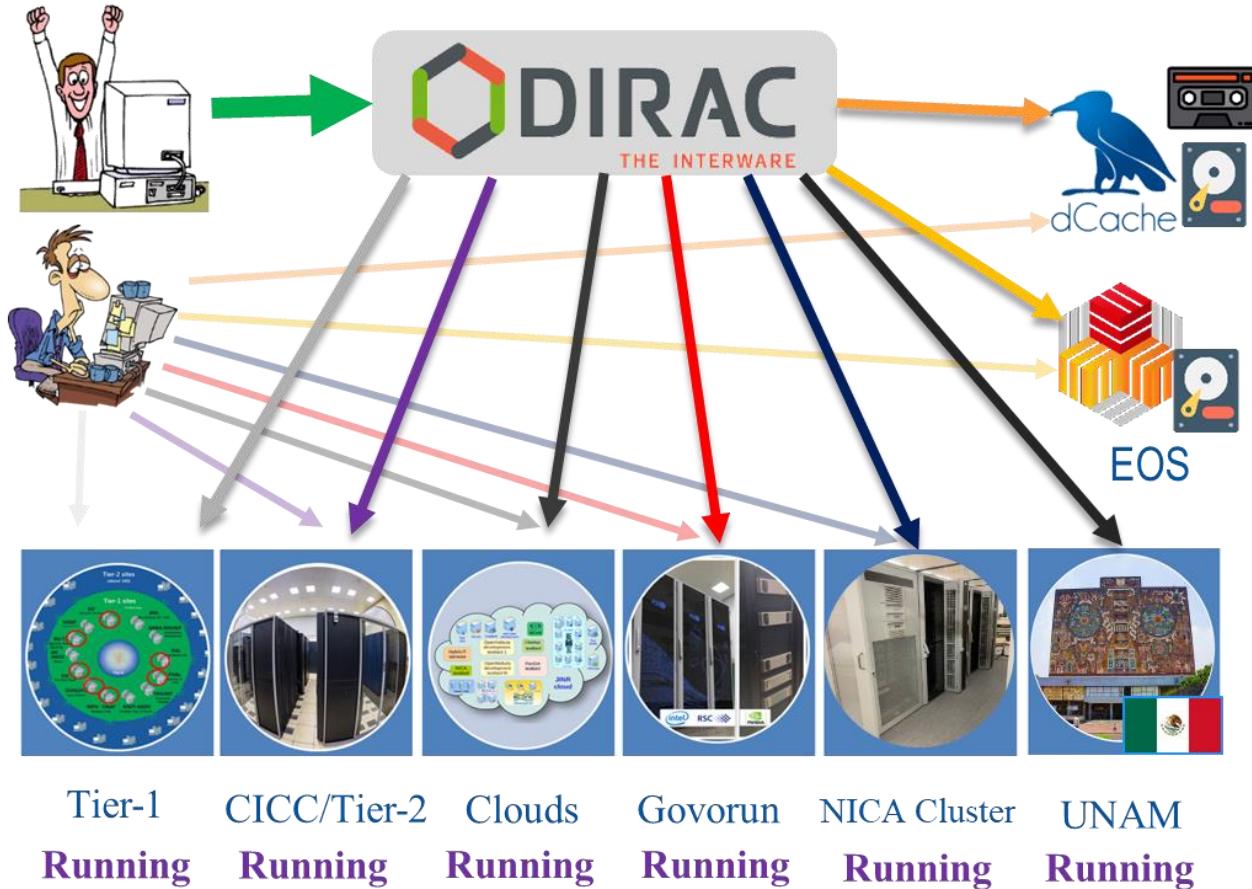
"MPD Collaboration
Meeting "
22.04.2021
Dubna



<https://mpdforum.jinr.ru/c/MCProd>

Topic	Replies	Views	Activity
Request 12: PWG3 - vHLLE+UrQMD, min. bias, AuAu @ 7.7 GeV	7	43	2d
Request11: PWG4 - dielectrons, 15M minbias BiBi@9.2, new dE/dx	8	100	25d
Mass production storage on NICA cluster	2	43	Feb 20
Request 10: PWG3 - vHLLE+UrQMD, flow, 15M min. bias AuAu @ 11.5 GeV	12	98	Dec '20
Nica cluster problem	1	49	Nov '20
Request 6: PWG1 - SMASH, BiBi @ 9.46 GeV, min. bias, GEANT3	11	228	Oct '20
Request 9: PWG3 - UrQMD, flow, 10M min. bias AuAu,BiBi @ 7.7 GeV	3	106	Oct '20
Request4: PWG3 - UrQMD, min. bias, BiBi @ 9 GeV	29	319	Sep '20
Request 8: PWG1 - SMASH, pp, C+C, Ar+Ar, Xe-Xe, Au+Au@ 4, 7, 9, 11 GeV, min. bias, Generator-level only	2	111	Sep '20
Request 7: PWG2 - BiBi@9, 15M minbias	6	145	Sep '20
Request5: PWG4 - dielectrons, 10M minbias BiBi@9.46	18	261	Aug '20
Request3: PWG2 - resonances, embedded 10M minbias AuAu@11	1	112	Jun '20

Available resources



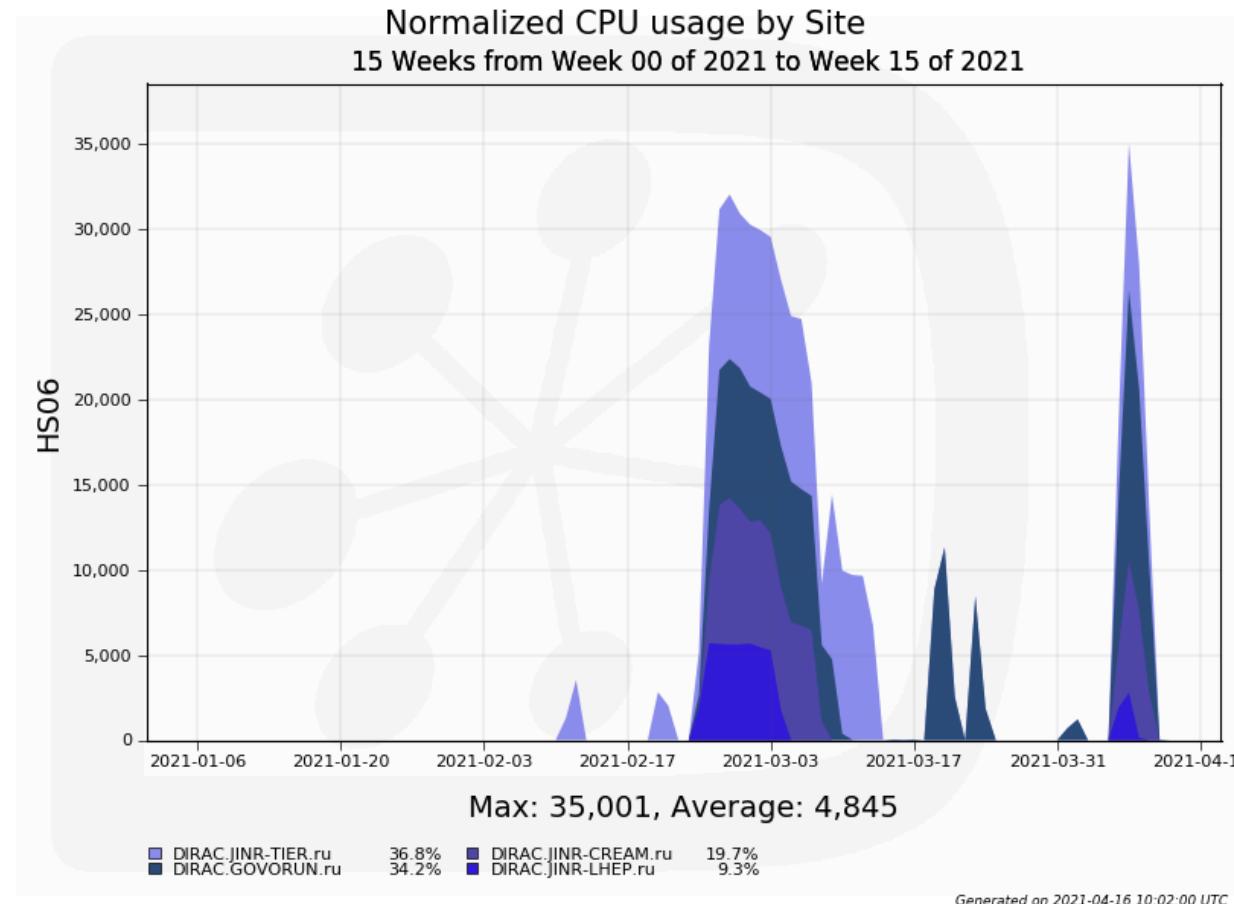


Available resources(1)

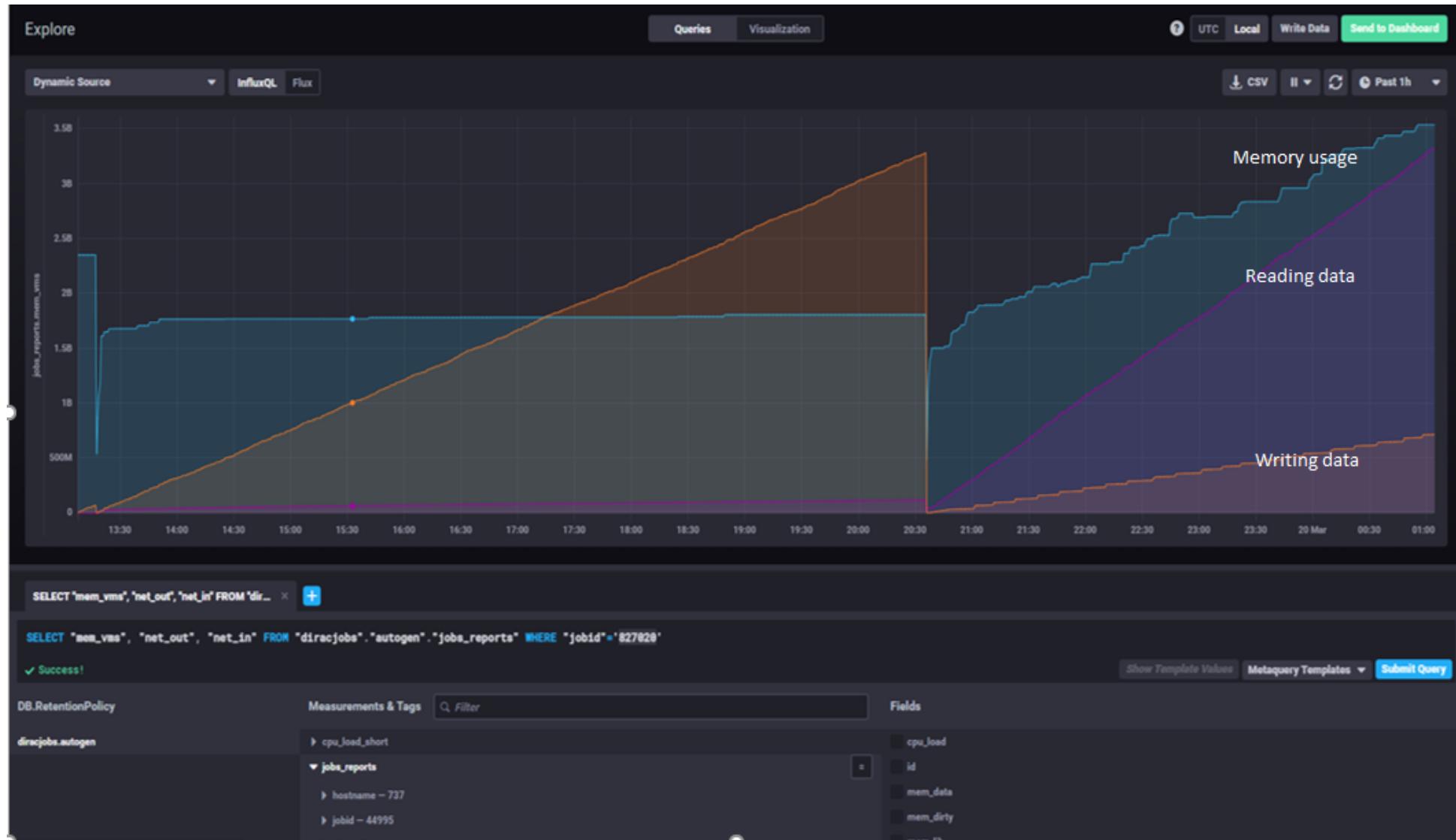
- NICA offline cluster 250 cores(limit for users)
- GOVORUN 184-776(776 in last production) cores
- Tier1 600(was 445) cores
- Tier2 500(was 485) cores
- Clouds 70 cores
- UNAM 100 cores

Up to 3 500 000 reconstructed events per day in the last production.

Statistic for 2021



Dirac job monitoring





Mass production storages:

Main storage, integrated in Dirac File Catalog, size 250 TB

- /eos/eos.jinr.ru/nica/mpd/dirac/mpd.nica.jinr/vo/mpd/data/

LHEP mirror, will be integrated in Dirac File Catalog, size 200 TB

- /eos/nica/mpd/sim/data/ (80% filled!!!)

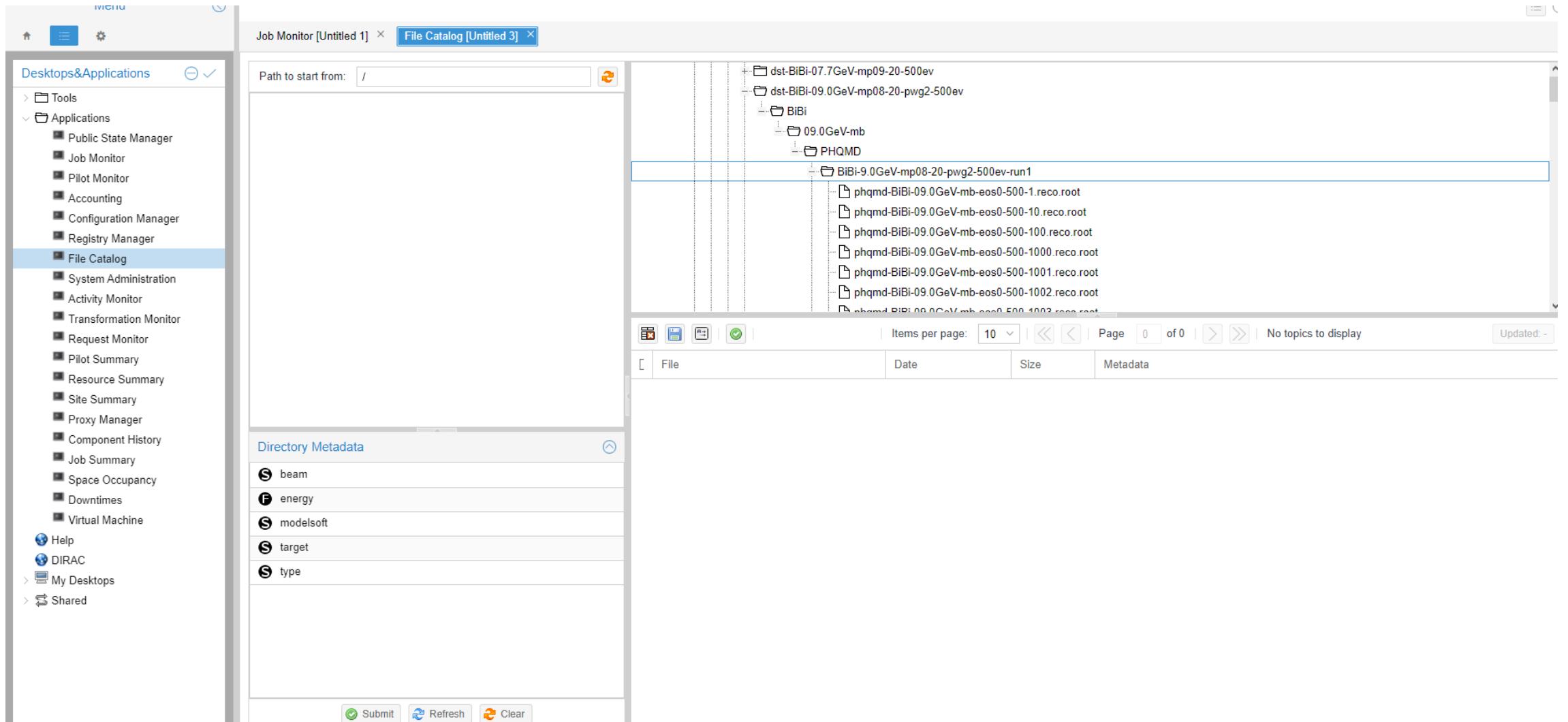
Data produced not from Mass production requests

- /zfs/store6.hydra.local/mpddata/data/ , size 85 TB
- /eos/hybrilit.jinr.ru/nica/ , size 100 TB

dCache(LIT type robot), tested

WebUI: <http://mpdroot.jinr.ru> -> SOFTWARE -> DataBases -> MPD DataBase

Dirac file catalog



The screenshot shows the Dirac File Catalog interface. The left sidebar contains a navigation menu with sections like Desktops&Applications, Tools, Applications (including Public State Manager, Job Monitor, Pilot Monitor, Accounting, Configuration Manager, Registry Manager, File Catalog, System Administration, Activity Monitor, Transformation Monitor, Request Monitor, Pilot Summary, Resource Summary, Site Summary, Proxy Manager, Component History, Job Summary, Space Occupancy, Downtimes, Virtual Machine), Help, DIRAC, My Desktops, and Shared. The 'File Catalog' item is currently selected.

The main area displays a file catalog tree under the path '/'. The tree structure includes:

- dst-BiBi-07.7GeV-mp09-20-500ev
- dst-BiBi-09.0GeV-mp08-20-pwg2-500ev
- BIBI
 - 09.0GeV-mb
 - PHQMD
- BiBi-9.0GeV-mp08-20-pwg2-500ev-run1
 - phqmd-BiBi-09.0GeV-mb-eos0-500-1.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-10.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-100.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-1000.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-1001.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-1002.reco.root
 - phqmd-BiBi-09.0GeV-mb-eos0-500-1003.reco.root

Below the tree, there is a 'Directory Metadata' panel listing:

- beam
- energy
- modelsoft
- target
- type

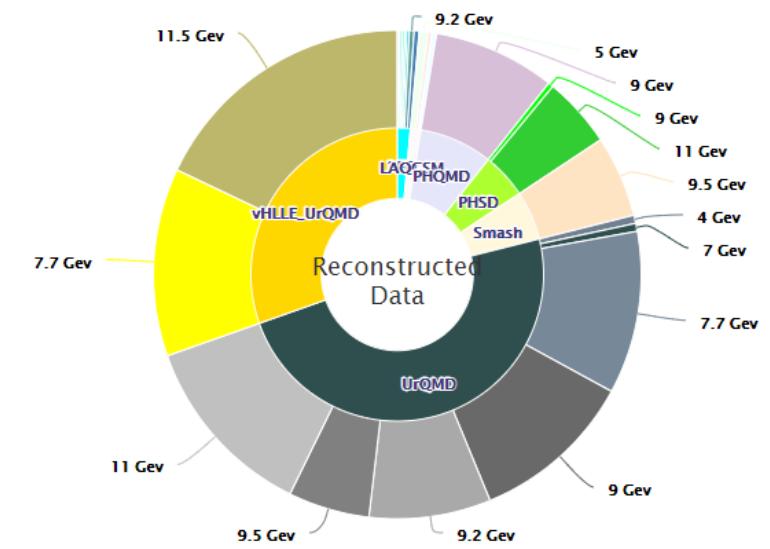
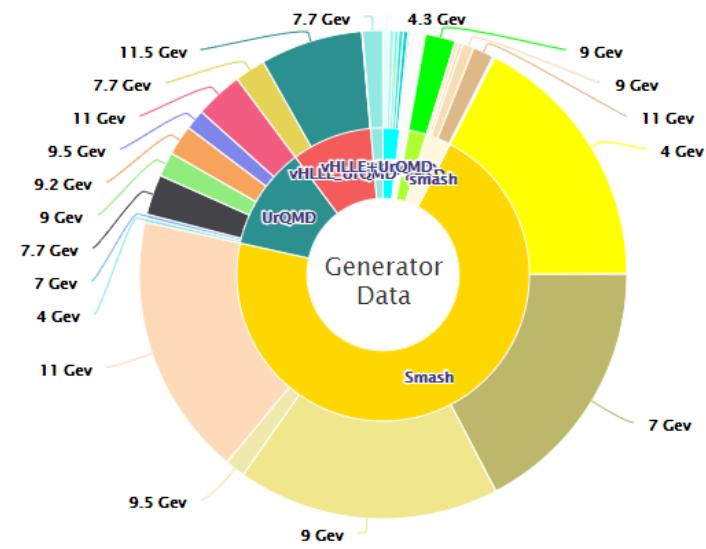
At the bottom of the interface are buttons for 'Submit', 'Refresh', and 'Clear'.

MPD mass production 2020-2021 summary :

Generator	PWG	Coll.	\sqrt{s}	# of events(10^6)	Reco
UrQMD	PWG4	AuAu	11	15	+
		BiBi	9	10	+
			9.46	10	+
			9.2	15	+
		AuAu	11	10	+
	PWG3	AuAu	7.7	10	+
		BiBi	7.7	10	+
			9	10	+
		BiBi	8.8	15	+
		AuAu	11.5	15	+
vHLL-E-UrQMD	PWG3	AuAu	11.5	15	+
		AuAu	7.7	20	+
		BiBi	9.46	10	+
		ArAr	4/7/9/11	20/20/20/20	-
Smash	PWG1	AuAu	4/7/9/11	20/20/20/20	-
		XeXe	4/7/9/11	20/20/20/20	-
		CC	4/7/9/11	20/20/20/20	-
		pp	4/7/9/11	50/50/50/50	-
				665	165
Total					



Mass production DataBase(1)



Mass production DataBase(2)

Generator	Beam	Target	Energy, Gev	Centrality	Number of Events, Ev	Generator mod.	Reconstruction mod.	Comment	Path	Sourced from	
3FD	Au	Au	11.6	02.0_02.0fm	240000	3fd-2019-06-26V-e08a167-tph-ON			lit:/zfs/store6.hydra.local/mpddata/data/models/3FD/AuAu/11.6GeV-02.0_02.0fm/3fd-2019-06-26V-e08a167-tph-ON	Generator	View
3FD	Au	Au	6.4	02.0_02.0fm	95000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF	dst-2019-02-25-3a2384d-1G3Mlem	mpdroot changeset: 2019-02-25 3a2384d Geant3 Mlem cluster finder	lit:/zfs/store6.hydra.local/mpddata/data/exp/dst-2019-02-25-3a2384d-1G3Mlem/AuAu/06.4GeV-02.0_02.0fm/3FD/3fd-2018-03-17-bc2a06d-tph-urqmdOFF	Reconstruction	View
3FD	Au	Au	6.4	02.0_02.0fm	135000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF	dst-2019-02-25-3a2384d-1G3Mlem	mpdroot changeset: 2019-02-25 3a2384d Geant3 Mlem cluster finder	lit:/zfs/store6.hydra.local/mpddata/data/exp/dst-2019-02-25-3a2384d-1G3Mlem/AuAu/06.4GeV-02.0_02.0fm/3FD/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Reconstruction	View
3FD	Au	Au	9.2	02.0_02.0fm	308000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF	dst-2019-02-25-3a2384d-1G3Mlem	mpdroot changeset: 2019-02-25 3a2384d Geant3 Mlem cluster finder	lit:/zfs/store6.hydra.local/mpddata/data/exp/dst-2019-02-25-3a2384d-1G3Mlem/AuAu/09.2GeV-02.0_02.0fm/3FD/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Reconstruction	View
3FD	Au	Au	9.2	02.0_02.0fm	307000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF	dst-2019-02-25-3a2384d-1G3Mlem	mpdroot changeset: 2019-02-25 3a2384d Geant3 Mlem cluster finder	lit:/zfs/store6.hydra.local/mpddata/data/exp/dst-2019-02-25-3a2384d-1G3Mlem/AuAu/09.2GeV-02.0_02.0fm/3FD/3fd-2018-03-17-bc2a06d-tph-urqmdOFF	Reconstruction	View
3FD	Au	Au	4.7	02.0_02.0fm	450000	3fd-2019-06-26V-e08a167-tph-ON			lit:/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/04.7GeV-02.0_02.0fm/3fd-2019-06-26V-e08a167-tph-ON	Generator	View
3FD	Au	Au	5.6	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			lit:/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/05.6GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Generator	View
3FD	Au	Au	5.6	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF			lit:/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/05.6GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-tph-urqmdOFF	Generator	View
3FD	Au	Au	6.4	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			lit:/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/06.4GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Generator	View

/cvmfs usage

- git tag -a mp10 9fceb02 -m “Mass Production 10”
- /cvmfs/nica.jinr.ru/sl6/mpdroot
- /cvmfs/nica.jinr.ru/centos/mpdroot

```
lxpub01:/cvmfs/nica.jinr.ru/sl6/mpdroot > ls -lat
total 23
drwxr-xr-x 11 cvmfs cvmfs 4096 Oct  9 18:17 dev
drwxrwxr-x  8 cvmfs cvmfs 4096 Sep 21 18:27 ..
drwxrwxr-x 11 cvmfs cvmfs 4096 Jul 10 08:48 mp_072020_pwg3
drwxrwxr-x  5 cvmfs cvmfs 4096 Jul 10 08:48 .
drwxrwxr-x 11 cvmfs cvmfs 4096 Jul  8 13:15 mp_072020
lxpub01:/cvmfs/nica.jinr.ru/sl6/mpdroot > █
```

- /cvmfs is not yet available on NICA and UNAM clusters.

Recommendations for using the NICA cluster

- Do not use /scratch2 for long-term storage of files - quickly transfer them to EOS!
- Do not copy file from /weekly to /eos, use /tmp or /toEos on ncx104, /scratch2->/toEos->/eos more than 10 times faster then /scratch2->/eos
- Run Your jobs from /tmp, and use /tmp as data output for small file (size of /tmp ~220 GB) as data output for big files please use /scratch2
- Don't forget clean working folders in /tmp and /weekly after using
- Use /scratch2(nfs) instead of /scratch1(glusterfs)

<http://mpdroot.jinr.ru/howto-work-with-nica-cluster/>



DAOS

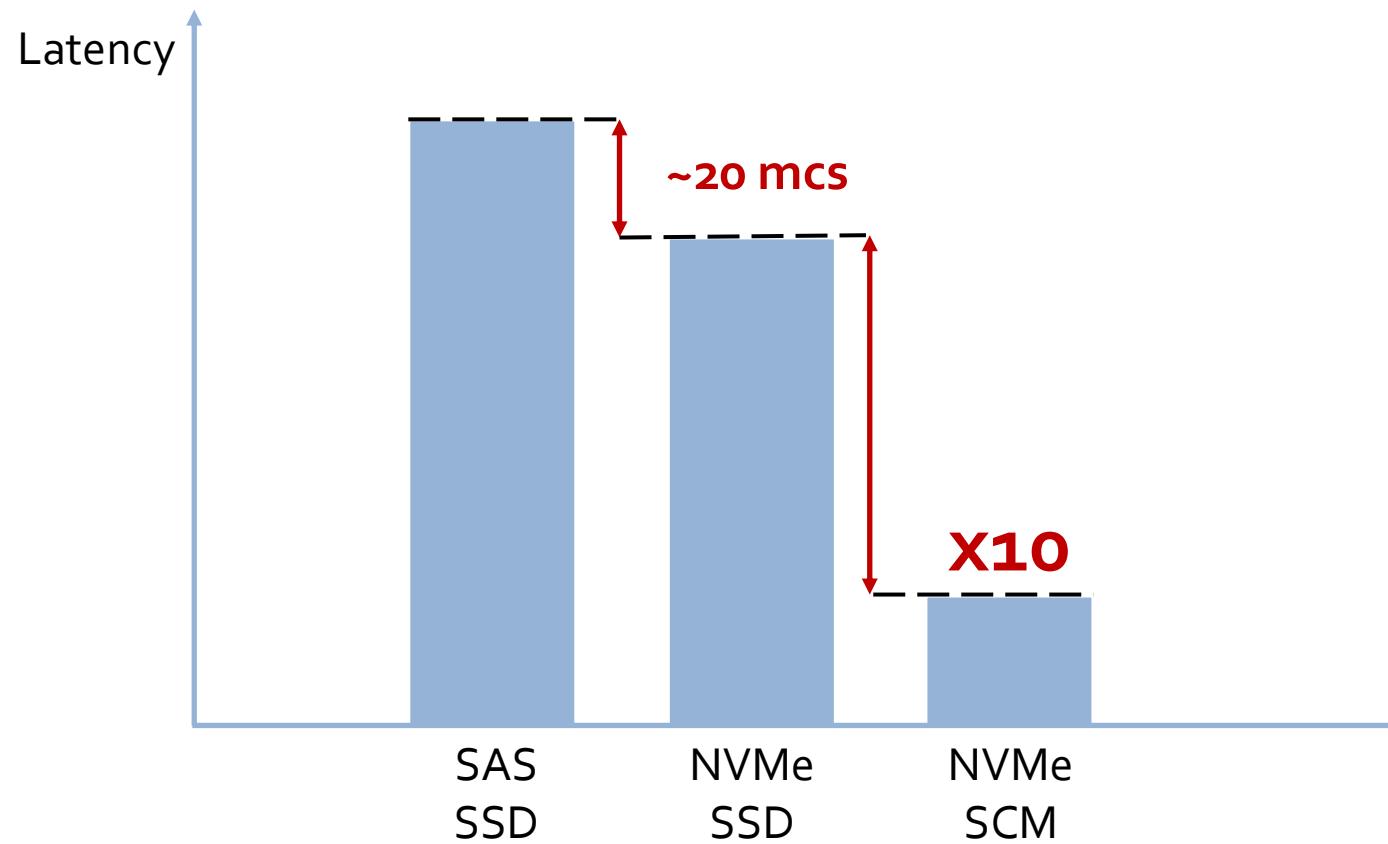


One of the priority areas for the development of the supercomputer "Govorun" is to increase the volume of data storage and improve access parameters. **DAOS** (Distributed Asynchronous Object Storage) storage system is being implemented, which allows the use of NVMe non-volatile memory and also supports Optane DC Persistent Memory.

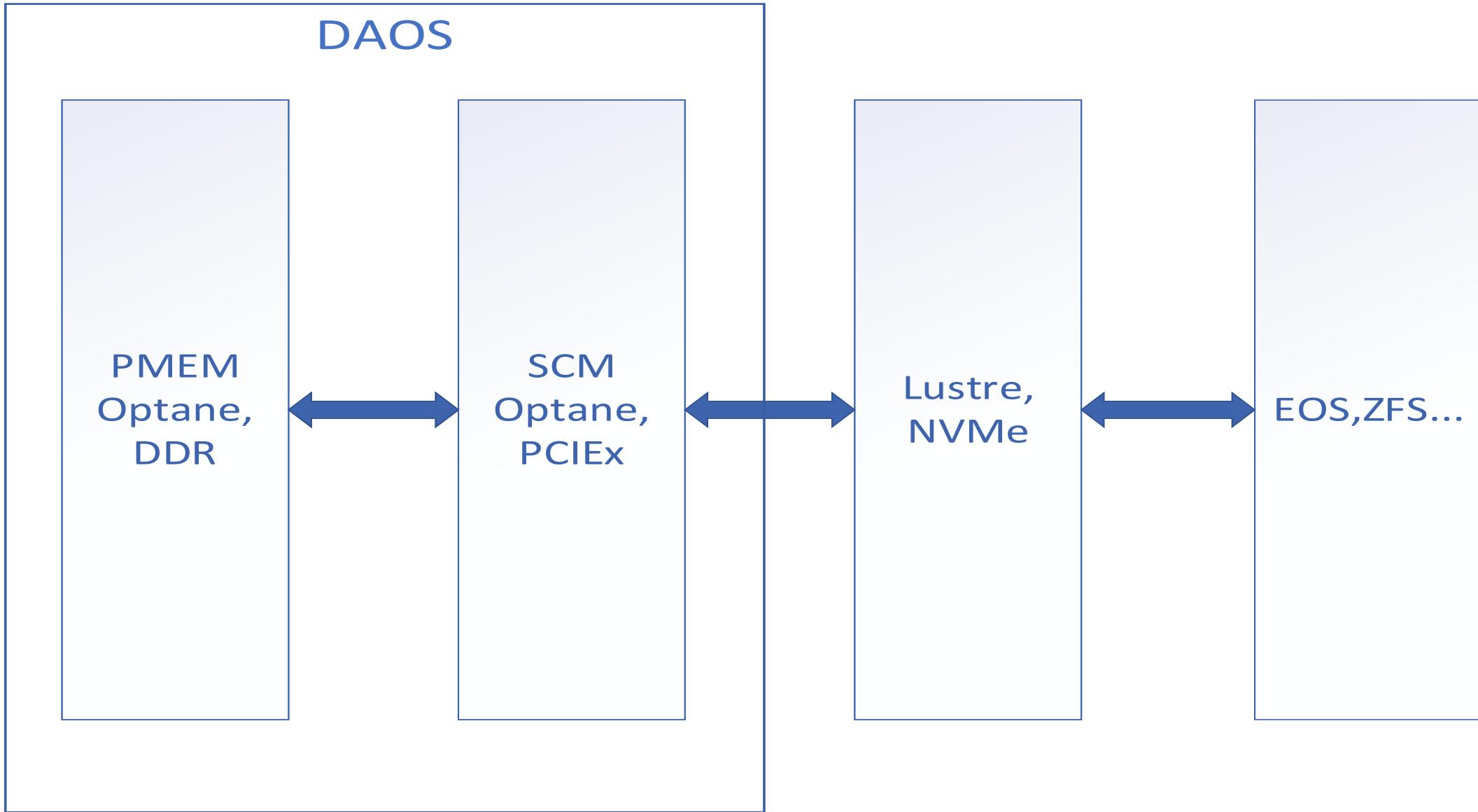
#	information									io500		
	list id	institution	system	storage vendor	filesystem type	client nodes	client total procs	data	score	bw	md	
										GiB/s	KIOP/s	
1	sc20	Pengcheng Laboratory	Pengcheng Cloudbrain-II on Atlas 900	Pengcheng Laboratory	MadFS	255	18360	zip	7043.99	1475.75	33622.19	
2	isc20	Intel	Wolf	Intel	DAOS	52	1664	zip	1792.98	371.67	8649.57	
3	sc19	WekalO	WekalO on AWS	WekalO	WekalO Matrix	345	8625	zip	938.95	174.74	5045.33	
4	isc20	TACC	Frontera	Intel	DAOS	60	1440	zip	763.80	78.31	7449.56	
5	isc20	Argonne National Laboratory	Presque	Argonne National Laboratory	DAOS	16	544	zip	537.31	108.19	2668.57	
22	isc20	JINR	Govorun	RSC Group	Lustre	50	800	zip	90.87	35.61	231.88	

DATASTORAGE BY DAOS

Distributed Asynchronous Object Storage - designed for massively distributed Non Volatile Memory (NVM). DAOS takes advantage of next-generation NVM technology, like Storage Class Memory (SCM) and NVMe express (NVMe)

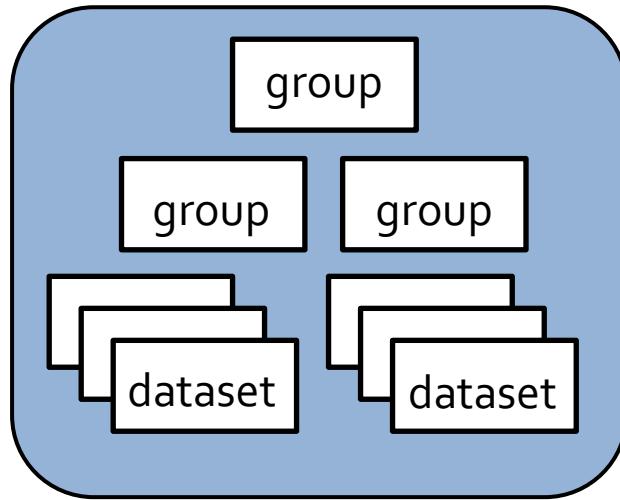


DataStorage

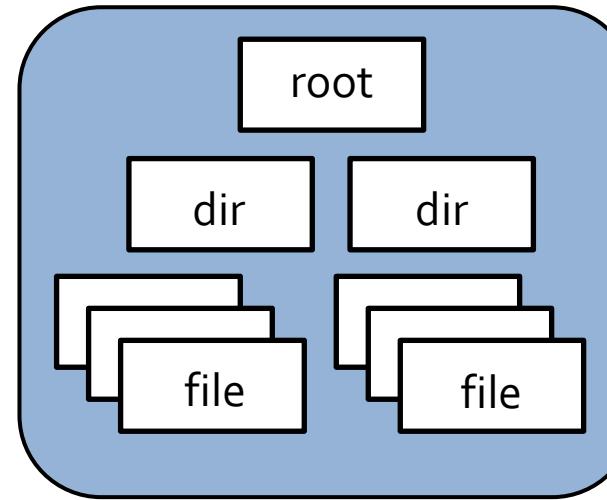


DAOS MODES

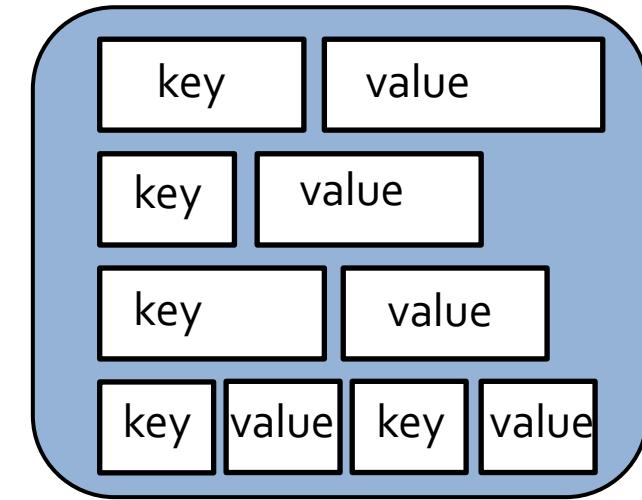
HDF5



POSIX



Key-value





Exploring Object Stores: RNTuple DAOS Backend

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SFT group meeting, 7th December 2020

ROOT project,
EP-SFT, CERN

<http://root.cern/>





- File system: stores metadata and data of file hierarchy (typically on a block device).
- Object storage: manages data as objects (~ user-defined metadata + data, identified by a UUID). Decouples namespace operations from data read/write.
- Similar to a key-value storage where the key is a UUID, but specifically tuned for high workloads.

Conclusion

- 12 mass productions request were done.
- 665M events generated + 60M taken from P. Batyuk.
- 165M events were reconstructed
- ~154TB data written to EOS disks(all registered in DIRAC FileCatalog)
- Tapes over dCache tested. Mostly needed for RAW data from detector.



Plans:

Make an application on the Dirac portal for launching productions by users. Logic done.

Daos implementation.



Thanks for:

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Thanks for attention

