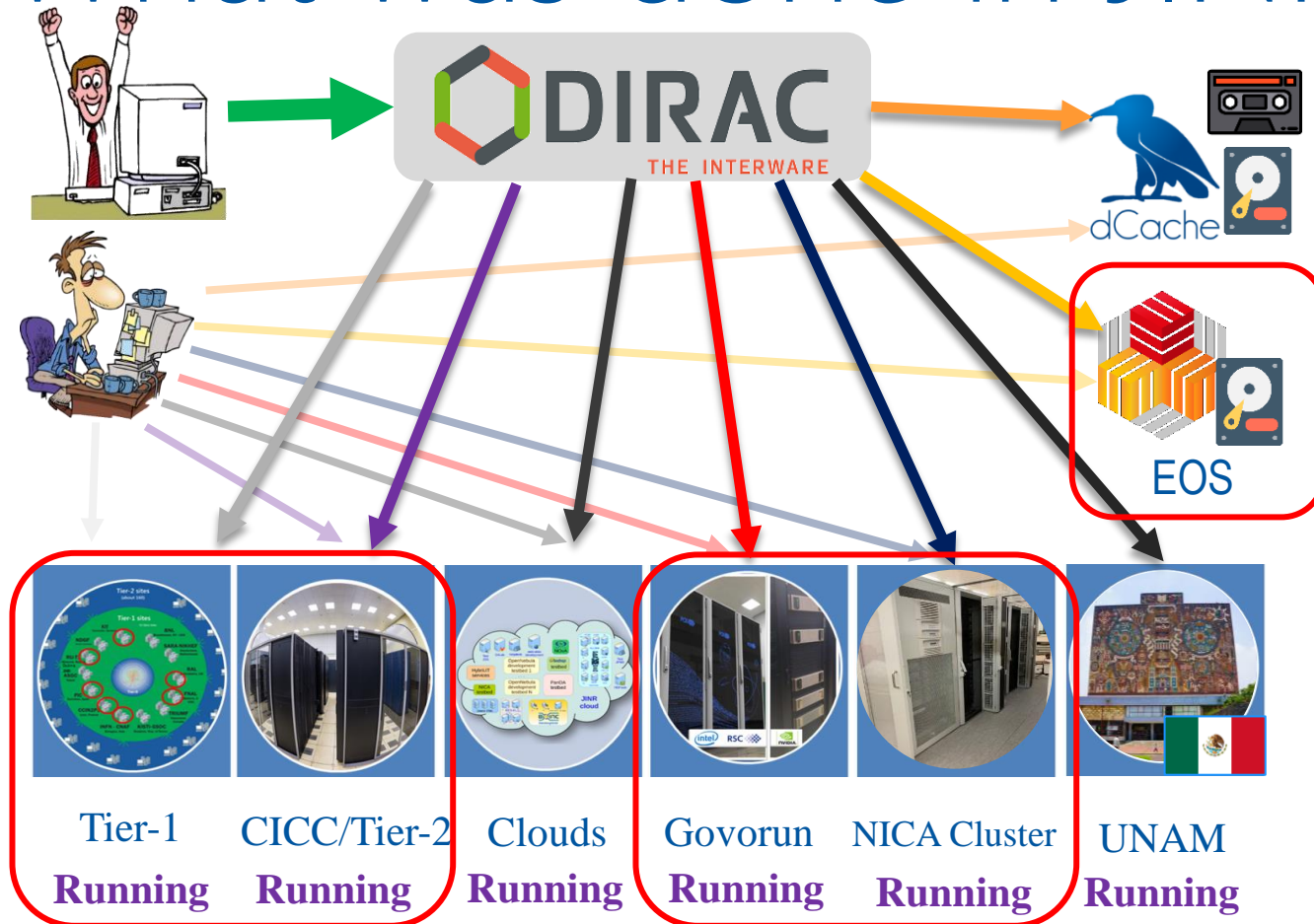


DUBNA

DIRAC Interware as a tool for the organization of scientific computing

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What was done in JINR



The computing resources of the JINR Multifunctional Information and Computing Complex, clouds in JINR Member-States, cluster from Mexico University were combined using the DIRAC Interware.

File types

Type	Description
RAW	Raw data of events written by DAQ after Event Builder
DIGI(digits)	Digits of detectors after digitizer macros
DST _{exp}	Reconstructed events: hits, tracks, vertex and other reconstructed data
GEN	Generated events after simulation
DST _{sim}	Reconstructed events containing modeled information for comparison

BMN offline job types

Experiment data	Monte-Carlo data
RawToDigit	GenToSim
DigitToDst	SimToDst
DstToAna	DstToAna

RawToDigi



Tier-1	CICC/Tier-2	Govorun	NICA Cluster
Not tested	Not tested	OK	Not tested

Now, only Govorun supercomputer are able to handle multiple raw files with size >40GB.

Full RawToDigi was performed on Govorun for Run7/4720-5186_BMN_Krypton!

All calculations took 1,5 days on 100 cores on Govorun.

For 349 files, average size of each file 37 GB.

Workflow is the following:

1. Download raw file using root protocol from EOS-MLIT to Lustre
2. Process raw file
3. Upload result to EOS-MLIT with `dirac-dms-add-file` (with registration in DIRAC FileCatalog)

DigiToDst



Tier-1

OK

CICC/Tier-2

OK

Govorun

OK

NICA Cluster

OK

All resources may perform DigiToDst since files are not so big.

DigiToDst was performed on all clusters.

Workflow is the following:

1. Download digi file using `dirac-dms-get-file LogicalFileName`
2. Process digi file
3. Upload result to EOS with `dirac-dms-add-file` (with registration in DIRAC FileCatalog)

GenToSim



Tier-1

OK

CICC/Tier-2

OK

Govorun

OK

NICA Cluster

OK

All resources may perform GenToSim since files are not so big.

GenToSim was performed on all clusters.

Workflow is the following:

1. Download r12 file using root protocol via xrdcp
2. Generate root file
3. Upload result to EOS with `dirac-dms-add-file` (with registration in DIRAC FileCatalog)

SimToDst



Tier-1

OK

CICC/Tier-2

OK

Govorun

OK

NICA Cluster

OK

All resources may perform SimToDst.

SimToDst was performed on all clusters.

Workflow is the following:

1. Download root file using `dirac-dms-get-file LogicalFileName`
2. Process digi file
3. Upload result to EOS with `dirac-dms-add-file` (with registration in DIRAC FileCatalog)

Simplified job example

```
dirac-dms-get-file /bmn/digi/run7/1002.root
```

```
root -l -q -b run_reco_bmn.C("1002.raw", "out.root", 0, 0)
```

```
dirac-dms-put-file /bmn/dst/run7/1002_dst.root \\  
out.root \\  
JINR-EOS-BMN
```

Output data

After resulting file created on the worknode it should be uploaded to some storage.

DIRAC provides simple commands to upload data using user certificate for authentication, which is necessary to submit jobs to grid resources Tier1 and Tier2

Upload file to storage:

```
dirac-dms-add-file /bmn.nica.jinr/exp/dst/run7/Krypton/mpd_run_trigCode_4721.root  
out.root JINR-EOS-BMN
```

Download file from any storage where it exists:

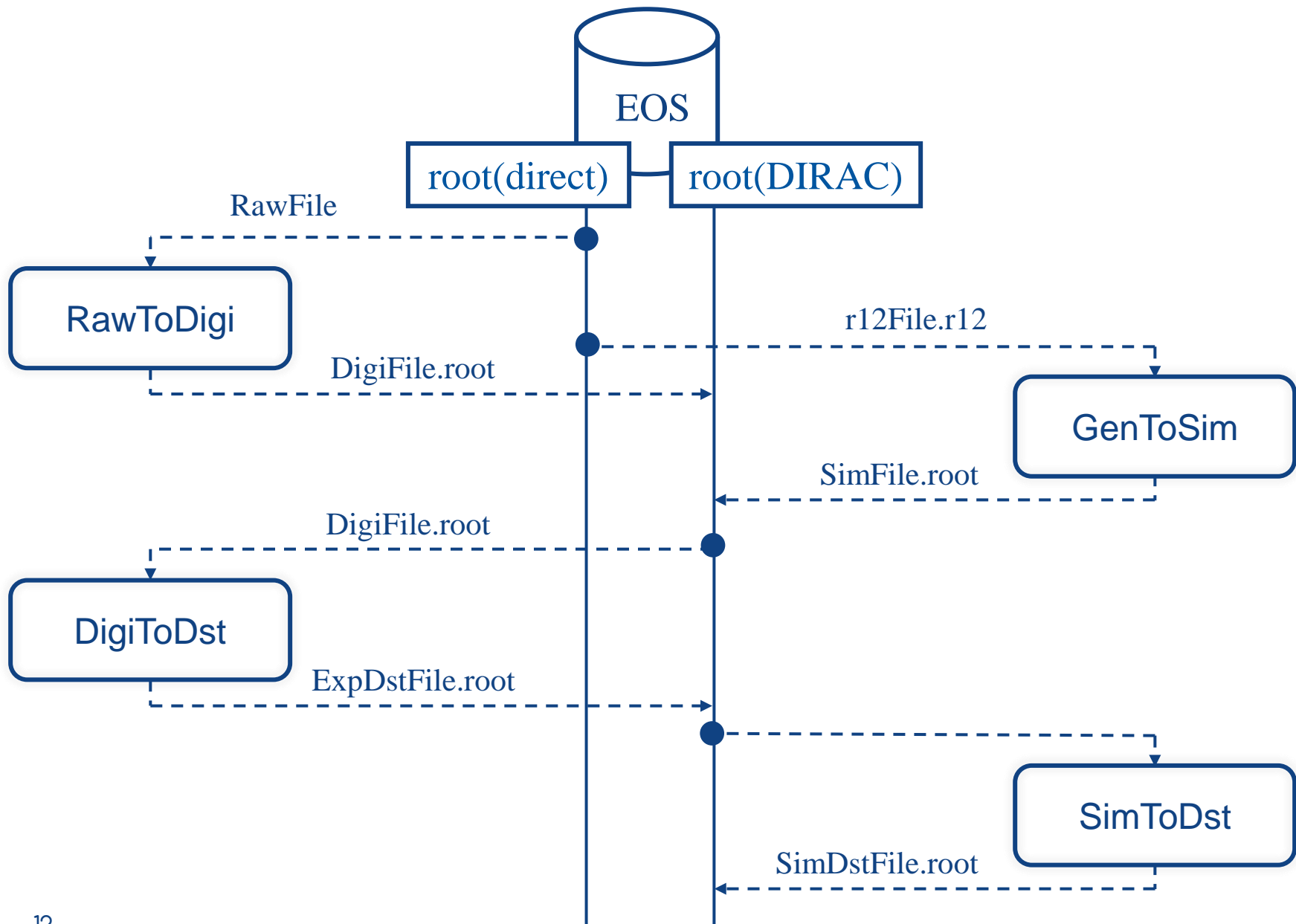
```
dirac-dms-get-file /bmn.nica.jinr/exp/dst/run7/Krypton/mpd_run_trigCode_4721.root
```

JINR-EOS-BMN is basically a EOS-MLIT.

It is possible to access files written by DIRAC commands if you have access to EOS.

Path is the following:

```
/eos/nica/bmn/dirac/bmn.nica.jinr/exp/dst/run7/Krypton/mpd_ru  
n_trigCode_4721.root
```



BM@N Software

It is good practice to use CVMFS for software. If CVMFS version is not working correctly, it is possible to compile custom version of software directly on resources. It is bad practice, but sometimes necessary.

In that case jobs should be aware of site they are running on to choose correct software path

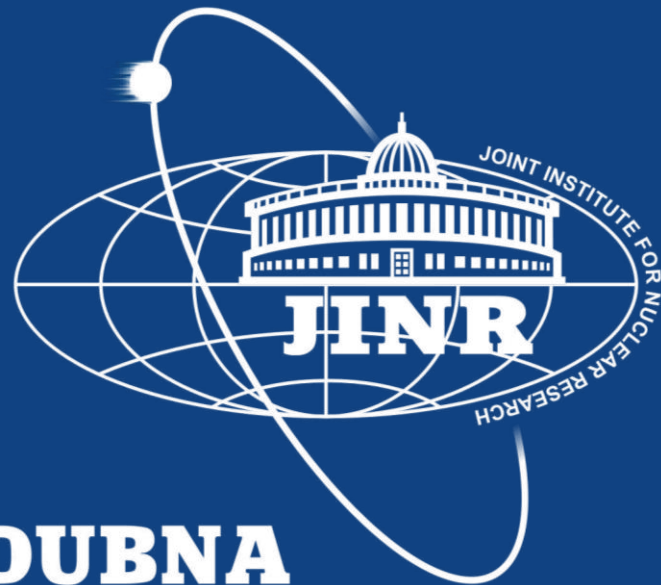
```
if [[ "$DIRACSITE" == "DIRAC.GOVORUN.ru" ]]; then
    BMN_SOFTWARE=/lustre/stor1/dirac/bmn/bmnroot
elif [[ "$DIRACSITE" == "DIRAC.JINR-TIER.ru" ]]; then
    BMN_SOFTWARE=/eos/nica/bmn/users/ipelevan/s17/bmnroot
elif [[ "$DIRACSITE" == "DIRAC.JINR-CREAM.ru" ]]; then
    BMN_SOFTWARE=/eos/nica/bmn/users/ipelevan/s17/bmnroot
elif [[ "$DIRACSITE" == "DIRAC.JINR-LHEP.ru" ]]; then
    BMN_SOFTWARE=/nica/mpd21/bmnroot
```

Job types / Resources

	Govorun	Nica cluster	Tier1	Tier2
RawToDigi	Custom – OK CVMFS – Fail	-	-	-
DigiToDst	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK
GenToSim	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK
SimToDst	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK	Custom – OK CVMFS – OK

Conclusion on BM@N+DIRAC

- Resources used so far:
 - Govorun, Tier1, Tier2, NICA cluster
 - JINR EOS in MLIT
- VOMS bmn.jinr.ru created and working. You just need a certificate.
- If it is not possible to use software from CVMFS there are some workarounds
- For RAW data it is important to establish standart filesize which will not be exceeded. Otherwise, huge problems during RawToDigi
- To prepare this talk the a team was working:
Konstantin – BM@N Software
Igor – Experiment data processing
Dmitry – Monte-Carlo data processing



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