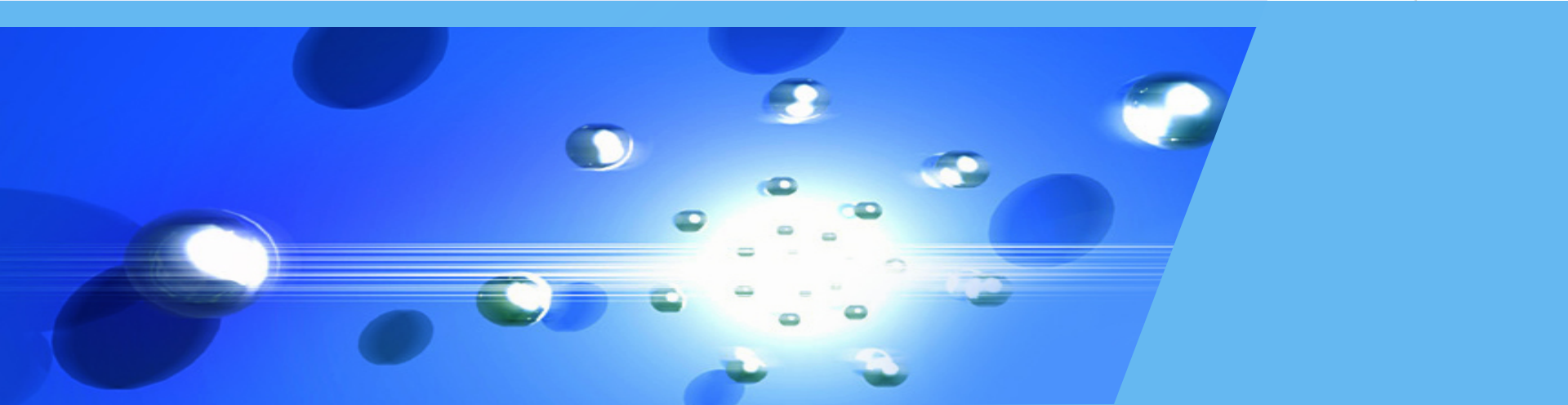




Third Collaboration meeting of  
the BM@N experiment at the NICA Facility



# Software Development for the BM@N Experiment

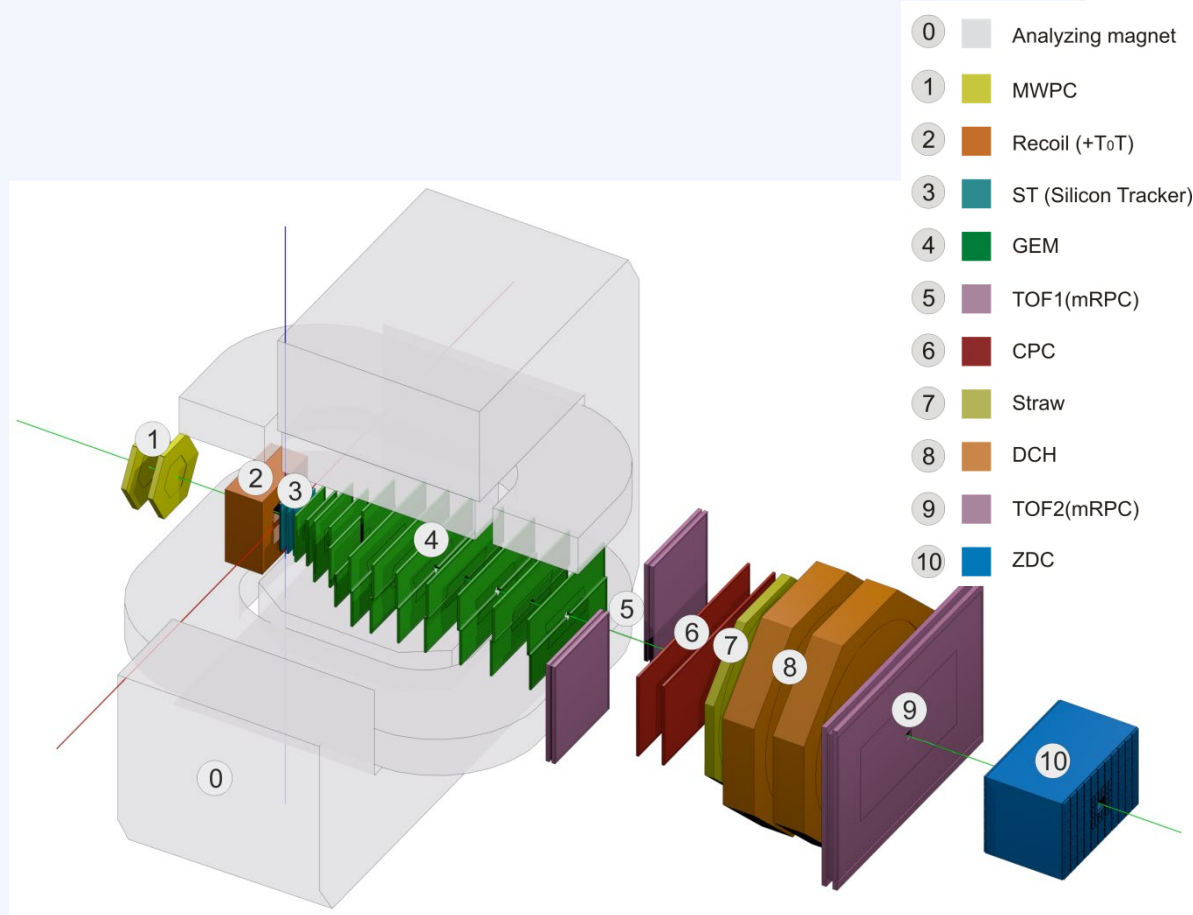
Konstantin Gertsenberger  
Veksler and Baldin Laboratory of High Energy Physics, JINR

on behalf of the BM@N collaboration

# BmnRoot Software

The software **BmnRoot** is developed for the BM@N event simulation, reconstruction of experimental or simulated data and following physics analysis of collisions of elementary particles and ions with a fixed target at the NICA collider.

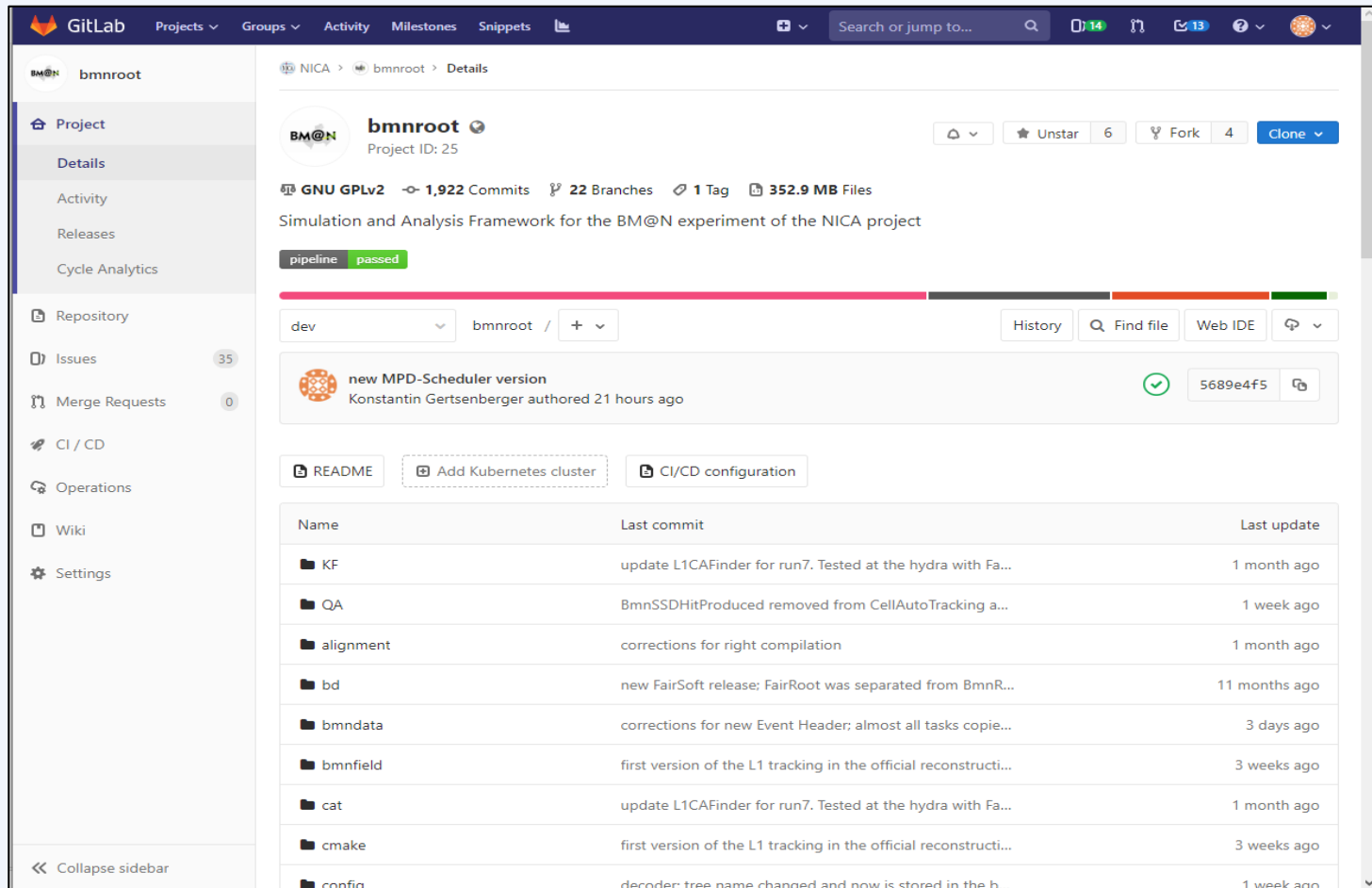
C++ classes, Linux OS support, based on ROOT and FairRoot



Installation Manual: <http://mpd.jinr.ru/howto-install/>

# Git repository for BM@N

The BmnRoot software is available in GitLab@JINR (LIT): <https://git.jinr.ru/nica/bmnroot>  
The current branch is *'dev'*

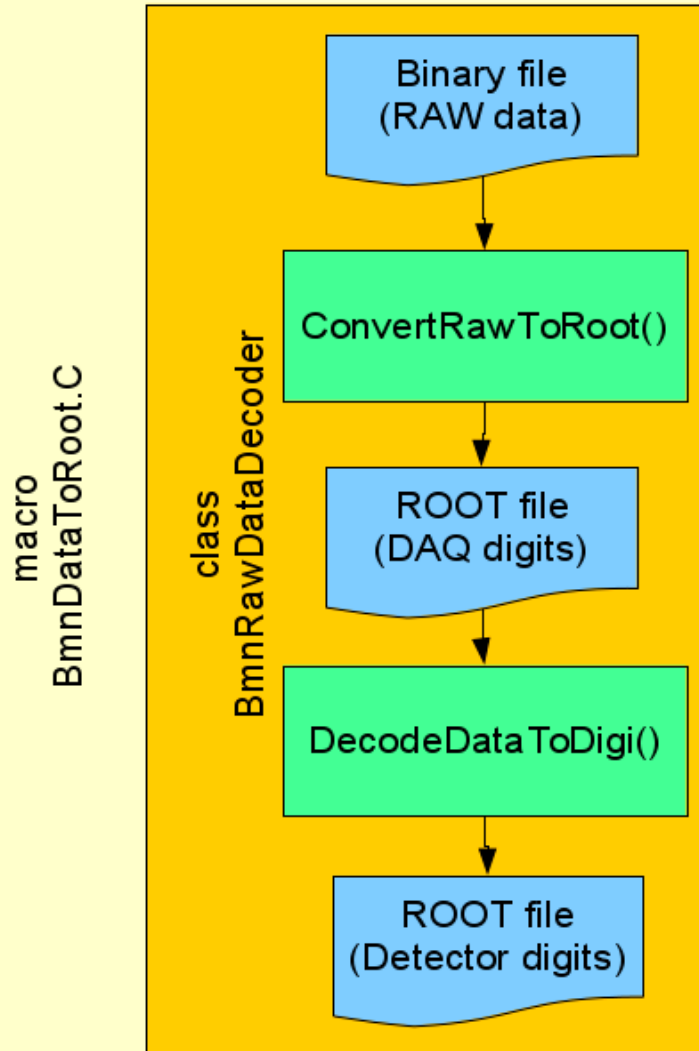


The screenshot shows the GitLab web interface for the 'bmnroot' repository. The left sidebar contains navigation options: Project, Details, Activity, Releases, Cycle Analytics, Repository, Issues (35), Merge Requests (0), CI / CD, Operations, Wiki, and Settings. The main content area displays the repository details for 'bmnroot' (Project ID: 25) under the 'NICA' group. It shows the license as GNU GPLv2, 1,922 commits, 22 branches, 1 tag, and 352.9 MB of files. A pipeline status is shown as 'passed'. The current branch is 'dev'. A recent commit is highlighted: 'new MPD-Scheduler version' by Konstantin Gertsenberger, authored 21 hours ago, with commit hash 5689e4f5. Below this, there are buttons for 'README', 'Add Kubernetes cluster', and 'CI/CD configuration'. A table lists the repository's structure with columns for Name, Last commit, and Last update.

Name	Last commit	Last update
KF	update L1CAFinder for run7. Tested at the hydra with Fa...	1 month ago
QA	BmnSSDHitProduced removed from CellAutoTracking a...	1 week ago
alignment	corrections for right compilation	1 month ago
bd	new FairSoft release; FairRoot was separated from BmnR...	11 months ago
bmndata	corrections for new Event Header; almost all tasks copie...	3 days ago
bmnfield	first version of the L1 tracking in the official reconstructi...	3 weeks ago
cat	update L1CAFinder for run7. Tested at the hydra with Fa...	1 month ago
cmake	first version of the L1 tracking in the official reconstructi...	3 weeks ago
config	decoder: tree name changed and now is stored in the b...	1 week ago

**advanced opportunity for collective development**

# First BmnRoot Release preparation



*The preparation of the first BmnRoot release is a task of the highest priority because it is required for the mass production of BM@N detector digits and then DST files for Run 7*

From the beginning of this year

- separate pieces of raw conversion code for all BM@N detectors have been combined into single Raw Data Converter
- the result tree with detector digits has been renamed and cleaned
- TAI times has been translated to the UTC format
- bugs in raw data conversion, such as wrong mapping, have been corrected
- temporary full digit files have been prepared and can be found on the NICA cluster

Still remaining task

- unification of the silicon and GEMs digits obtaining in two groups is under active development now

**The first release will be issued in May 2019**

# BmnRoot Design

- Use **FairSoft** external packages

ROOT, XRootD, Pythia, HepMC, VGM, MillePede, Geant3/4, GSL, Boost, DDS...

- Use **FairRoot** as a set of base classes and modules of needed by particle experiments

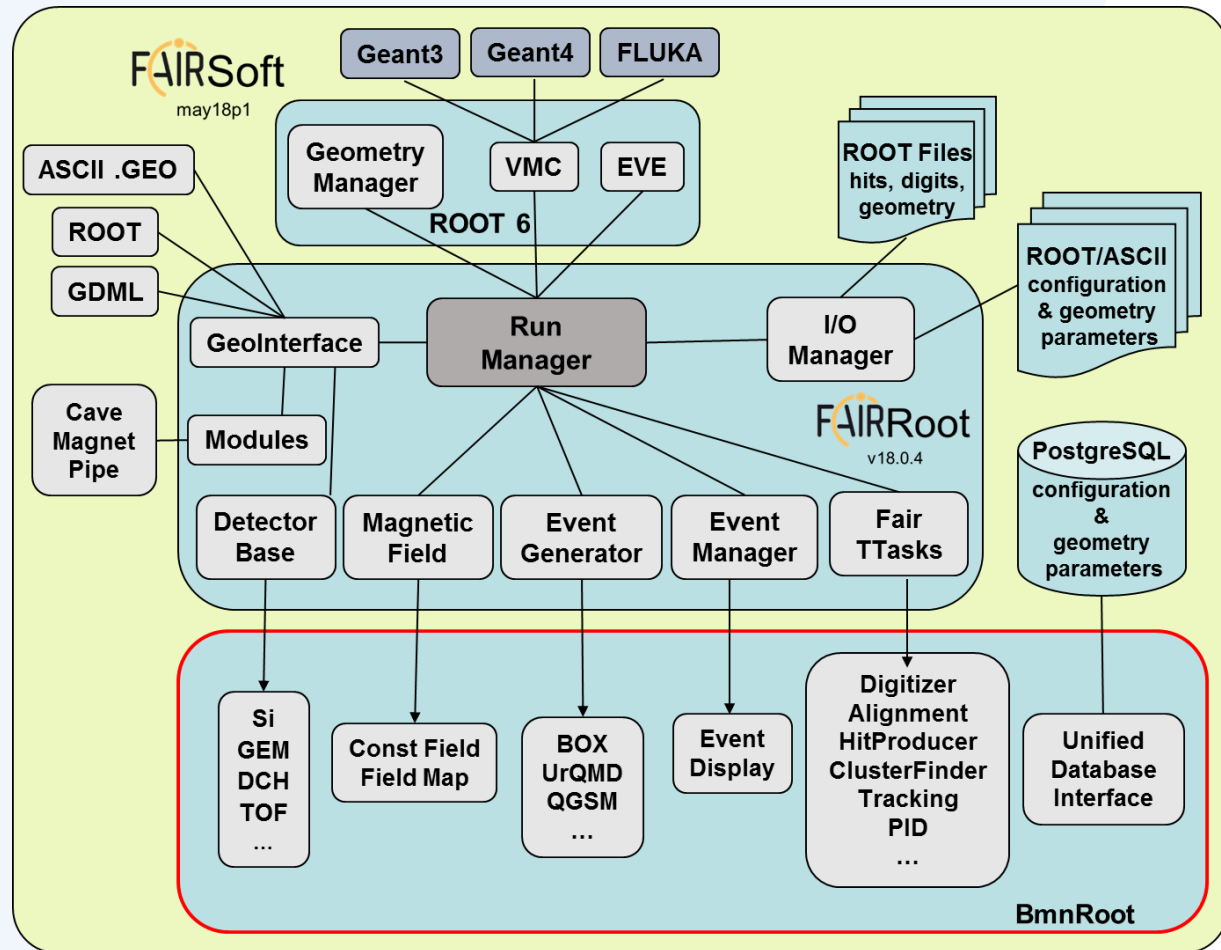
- Extended set of **event generators** for collisions:

UrQMD, Hybrid UrQMD, vHLLÉ + UrQMD, QGSM/DCM-QGSM, HSD/pHSD, HADGEN, 3 Fluid Dynamics, PLUTO simple (for testing) - BOX, ION, PART

- Experiment-specific parts and geometry** are developed for each detector independently

- Particle propagation** by GEANT3 & GEANT4

- Detector response functions, tracking, PID** and other tasks were included as *FairTasks*.



# Data processing in BmnRoot

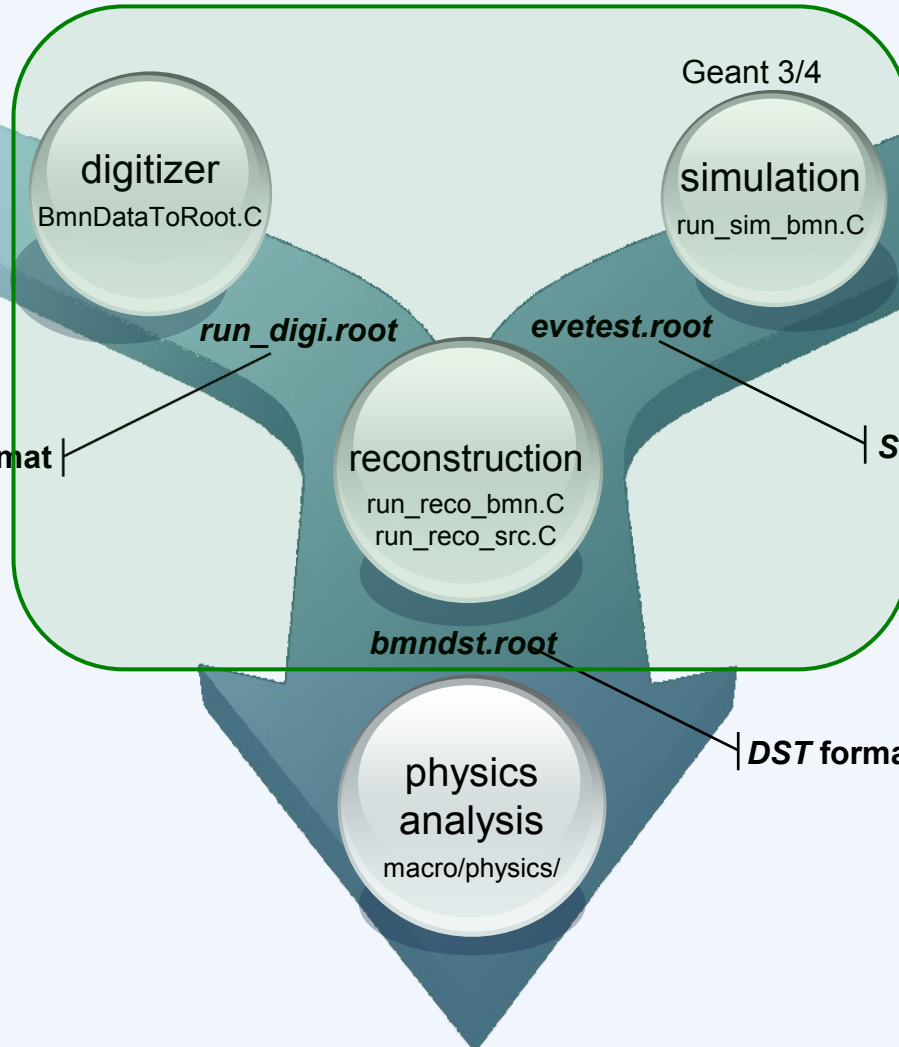
## DAQ Storage

raw data in binary format

*raw\_run.data*

RAW binary format

RAW digits format



## Event Generators

UrQMD, QGSM, Pythia...

*generator.dat*

Geant 3/4

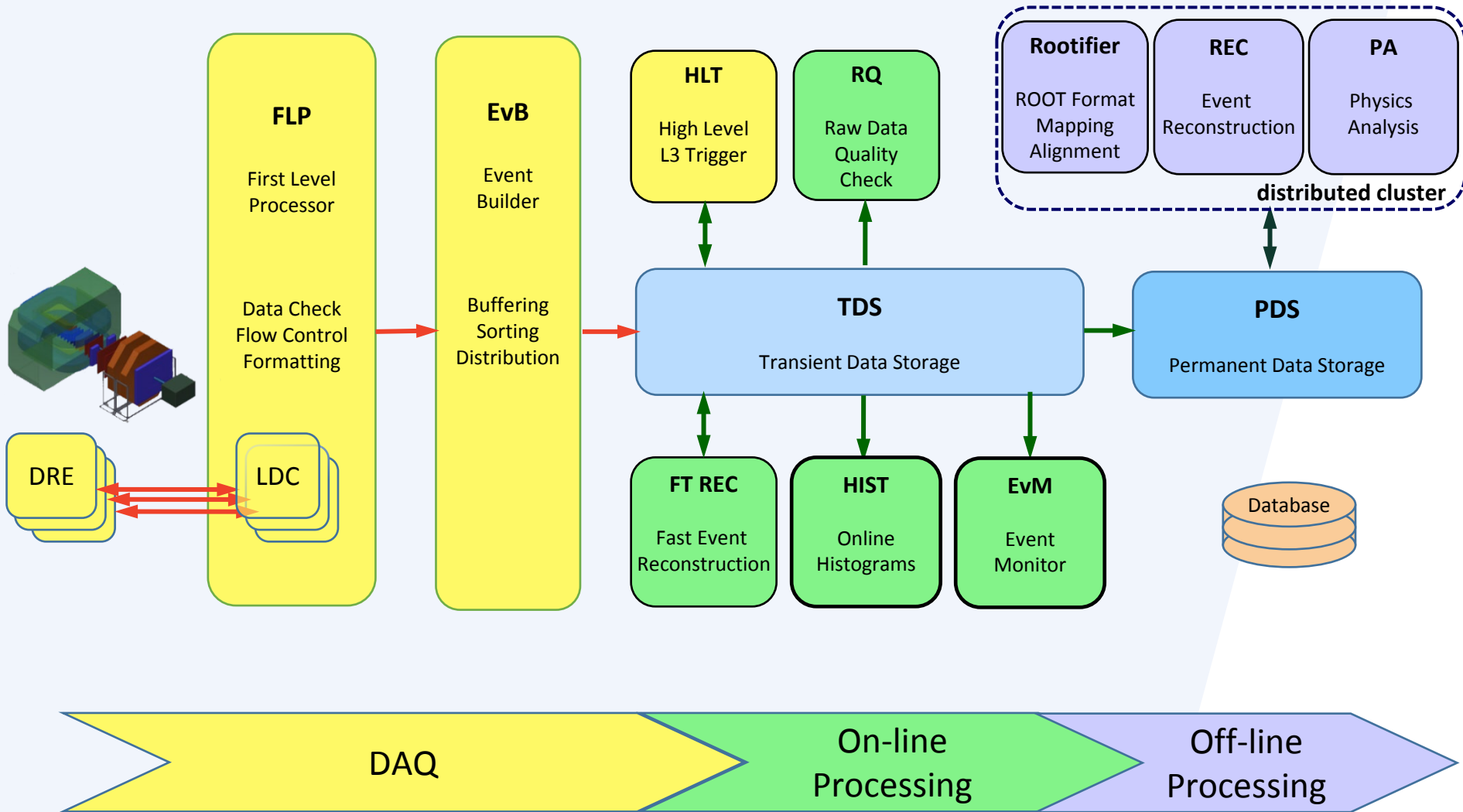
*generator.dat*

SIM format

Sergei MERTS  
Status of BM@N simulation  
and data processing

DST format

# BM@N DAQ Data Flow (proposal)



# Electronic Logbook (e-Log)

BM@N common e-log, Page 1 of 282

Logged in as shift

[Home](#) [Find](#) [Last day](#)

Number of items per page:  [Logout](#)

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) ... 282 > >>

Date	Shift Leader	Type	No Run	Trigger	DAQ Status	SP-41, A	SP-57, A	VKM2, A	Beam	Energy, GeV	Target	Comment
2018-04-05 11:47:06	Rumyantsev	Inform All	5185 per.7	Special Trigger	All	0	0	0	Kr	2.94	Cu (2 mm)	End of the RUN7
2018-04-05 11:09:20	Rumyantsev	New Run	5184 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3 VKM2: I=125A, SP-57=50A, SP41=1250A; 100 k
2018-04-05 08:12:35	Rumyantsev	New Run	5183 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>2 VKM2: I=125A, SP-57=50A, SP41=1250A; 120 k
2018-04-05 07:46:35	Babkin	New Run	5182 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3 VKM2: I=125A, SP-57=50A, SP41=1250A; 208 kev
2018-04-05 07:41:29	Babkin	New Run	5180 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 201 kev
2018-04-05 07:25:08	Babkin	New Run	5179 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 201 kev
2018-04-05 06:01:07	Babkin	New Run	5178 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 201 kev
2018-04-05 05:27:39	Babkin	New Run	5177 per.7	Beam Trigger + Si >3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & Si>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 204 kev
2018-04-05 05:27:06	Babkin	New Run	5176 per.7	Beam Trigger + BD>3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & BD>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 150 kev
2018-04-05 04:47:27	Babkin	New Run	5174 per.7	Beam Trigger + BD>3	All	1250	50	125	Kr	2.94	Cu (2 mm)	Cu target; Tr.= BC1 & BC2 & VC & BD>3; VKM2: I=125A, SP-57=50A, SP41=1250A; 213 kev

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) ... 282 > >>

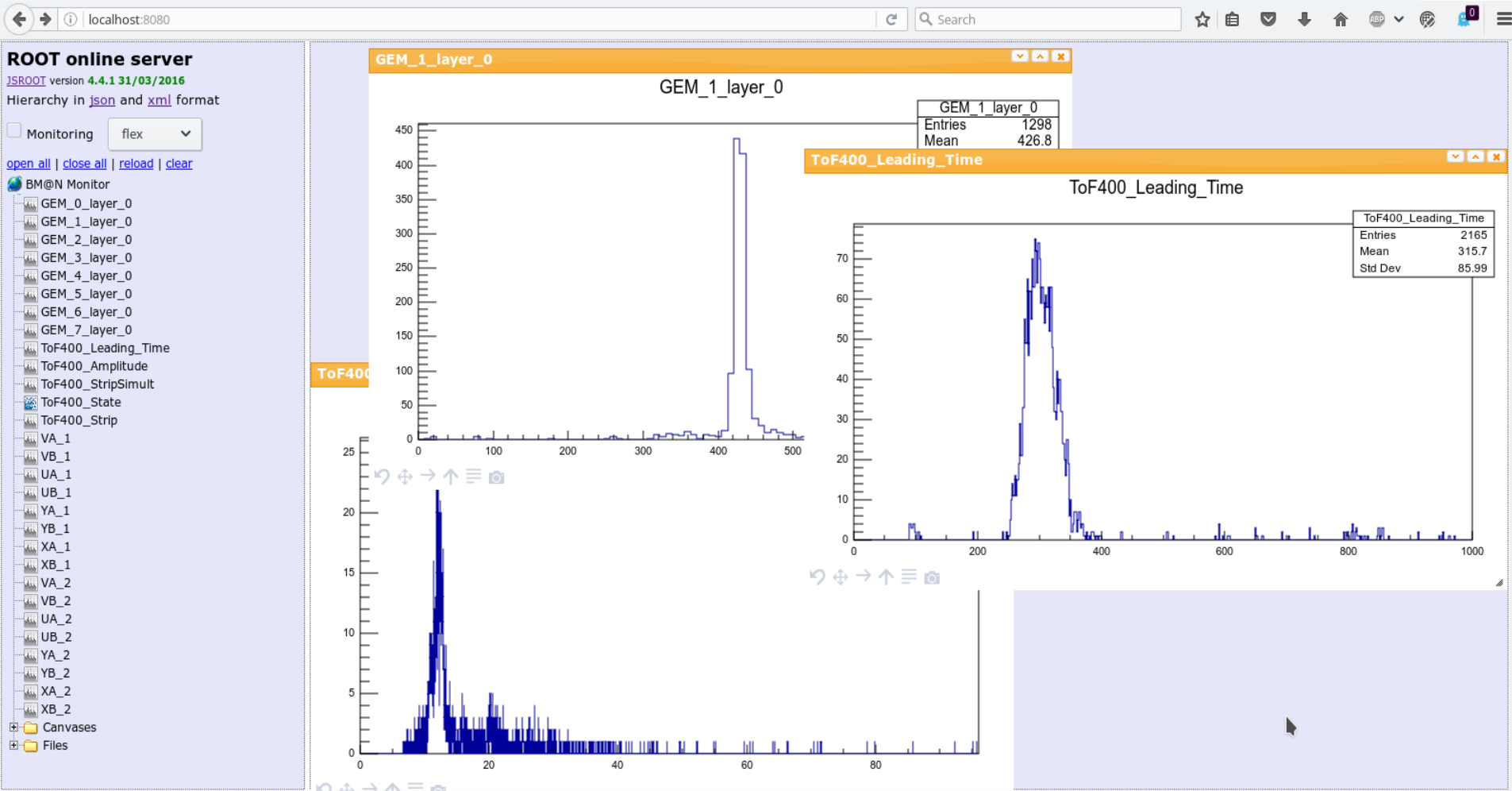
2018 - software team (contact e-mail: gertsen@ijnr.ru)

1. The e-Log platform is a collaborative tool, which provides an interface for shift crews to store and share information with offline users on various events or problems occurring in the experiment during its operation.
2. The e-Log uses a developed Logbook Database based on PostgreSQL DBMS.
3. A part of e-Log data is automatically transferred to the Unified Database of the experiment to use in offline analysis.




# Online Histogramming: Web-interface

jsROOT server provides processed data via the Web

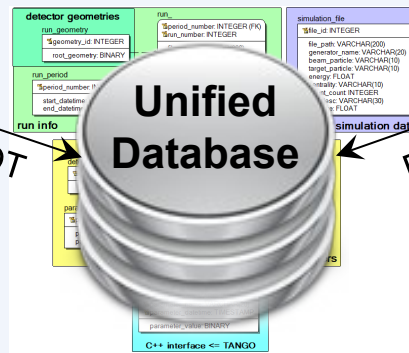


# BM@N Central Database for offline processing


 detector simulation  
 raw data processing  
 event reconstruction  
 physics analysis  
**BmnRoot**


 reading and  
 changing data  
**users**

**C++ database  
 interface w/o SQL**  
 (connect, SQL I/O)

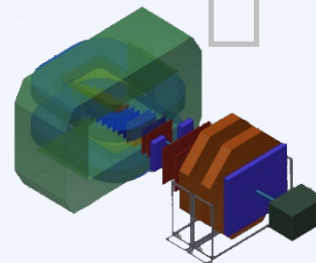


Web-interface

Event	Run	Start Time	End Time	Beam	Tango Cell	Sign	Voltage [kV]	Event Count	File Size [kB]	Run File Path	Quantity
7	1004	2016-04-05 09:53:30	2016-04-05 09:29:31	0	234	Cu	17.93503	17705	20.22	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1003	2016-04-05 07:58:30	2016-04-05 07:27:21	0	234	Cu	17.93503	17244	20.12	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1002	2016-04-05 07:42:30	2016-04-05 07:19:23	0	234	Cu	17.93503	20506	45.08	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1000	2016-04-05 07:25:30	2016-04-05 07:14:42	0	234	Cu	17.93503	20101	45.03	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1075	2016-04-05 08:05:05	2016-04-05 08:30:31	0	234	Cu	17.92212	20154	45.42	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1074	2016-04-05 08:28:30	2016-04-05 08:02:27	0	234	Cu	17.93851	20488	43.91	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1076	2016-04-05 08:15:12	2016-04-05 08:28:30	0	234	Cu	17.93502	19328	16.98	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1074	2016-04-05 04:27:42	2016-04-05 04:15:55	0	234	Cu	17.93609	21212	46.04	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1075	2016-04-05 04:07:00	2016-04-05 04:37:14	0	234	Cu	17.92712	21203	45.62	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1070	2016-04-05 03:38:30	2016-04-05 03:34:31	0	234	Cu	17.93105	20122	45.86	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1069	2016-04-05 03:10:15	2016-04-05 03:36:31	0	234	Cu	17.92912	20504	45.39	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1067	2016-04-05 02:42:30	2016-04-05 02:38:31	0	234	Cu	17.94025	2004	7.50	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1066	2016-04-05 02:20:37	2016-04-05 02:20:31	0	234	Cu	17.94001	9796	15.86	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1068	2016-04-05 02:01:30	2016-04-05 02:15:18	0	234	Cu	16.99710	1524	19.27	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1062	2016-04-05 01:30:30	2016-04-05 01:48:43	0	234	Cu	16.998	3848	4.21	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105
7	1060	2016-04-04 20:10:05	2016-04-04 20:21:45	0	234	Cu	16.99644	20290	43.91	hadoop-bmn-experiment-14725-105_BM0_Acquisition_run_cfg_data_105_data	105

Tango Interface

configuration  
 calibration  
 parameter and  
 algorithm data



Slow Control System

- central data storage for offline data analysis
- unified access and data management
- correct multi-user data processing
- ensuring the actuality, data consistency and integrity
- excluding the multiple duplication and use of outdated data
- automatic backup

# Web-interface of the BM@N database

Menu

Sign Out

## BM@N Experiment Database

Documentation

The Unified Database is designed as a comprehensive relational data storage for offline data analysis in the fixed target experiment BM@N of the NICA project. The use of the BM@N database provides correct multi-user access to actual information of the experiment for data processing.

## Account



Konstantin Gertsenberger  
Admin

Profile

Logout

Period number

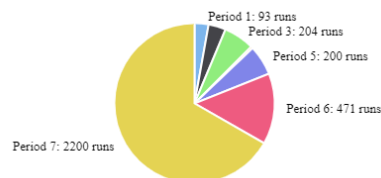
Period 6

Show

Reset

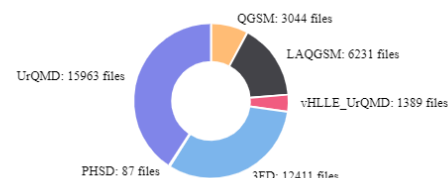
## Experimental Data

Distribution of runs by run periods (show time of all periods)



## Simulation Data

Distribution of simulation files by generators



## Beam - Energy - Target distributions

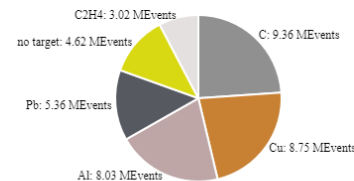
### Beam C ( E = 5.14 GeV/n )

Total: 0.41 MEvents



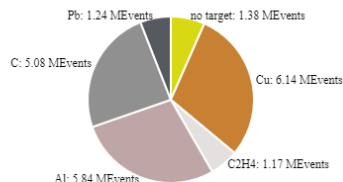
### Beam C ( E = 4.5 GeV/n )

Total: 39.14 MEvents



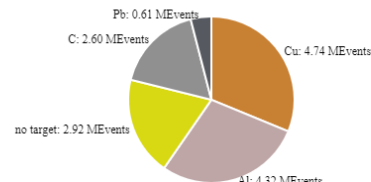
### Beam C ( E = 4 GeV/n )

Total: 20.85 MEvents



### Beam C ( E = 3.5 GeV/n )

Total: 15.19 MEvents



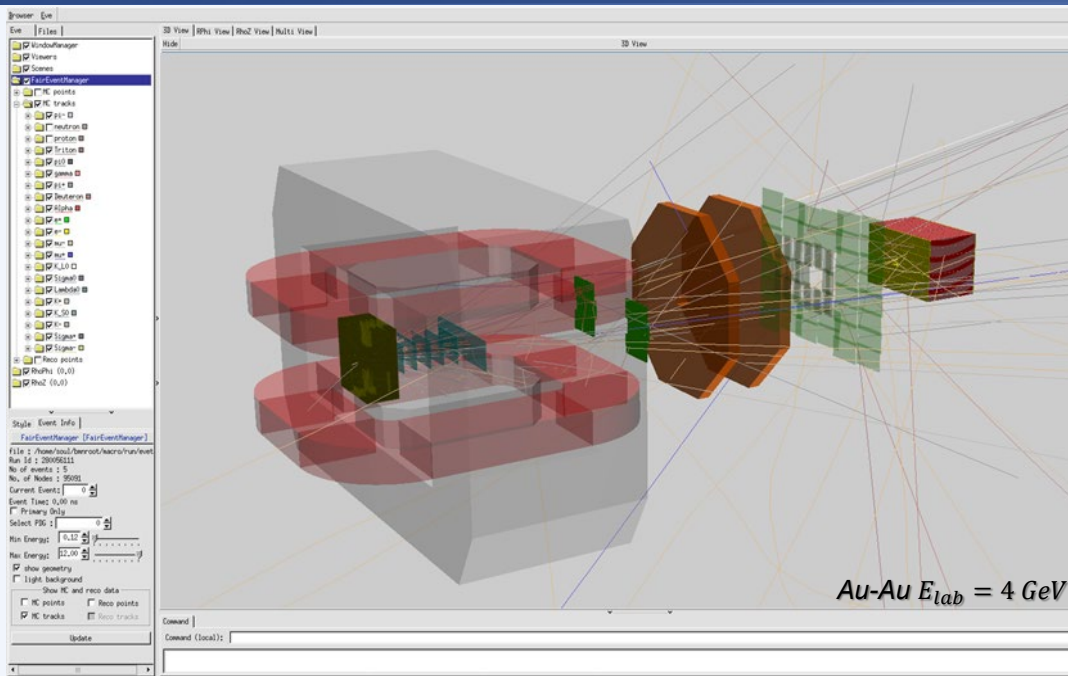
storing information on BM@N experiment sessions and runs, setup geometries, detectors, parameters and parameter values, and generated simulation files

<http://bmn-web.jinr.ru:4200>

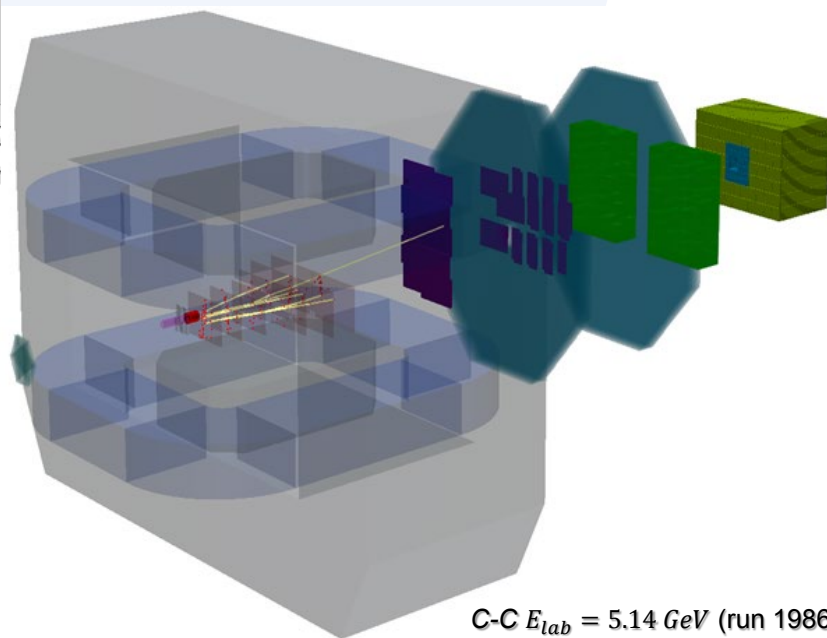
# Event Display for the BM@N experiment

*based on ROOT EVE package  
graphically presents the events by  
means of ROOT GUI and OpenGL*

Event Display for **reconstructed** data:  
*hits, tracks, calorimeter towers*

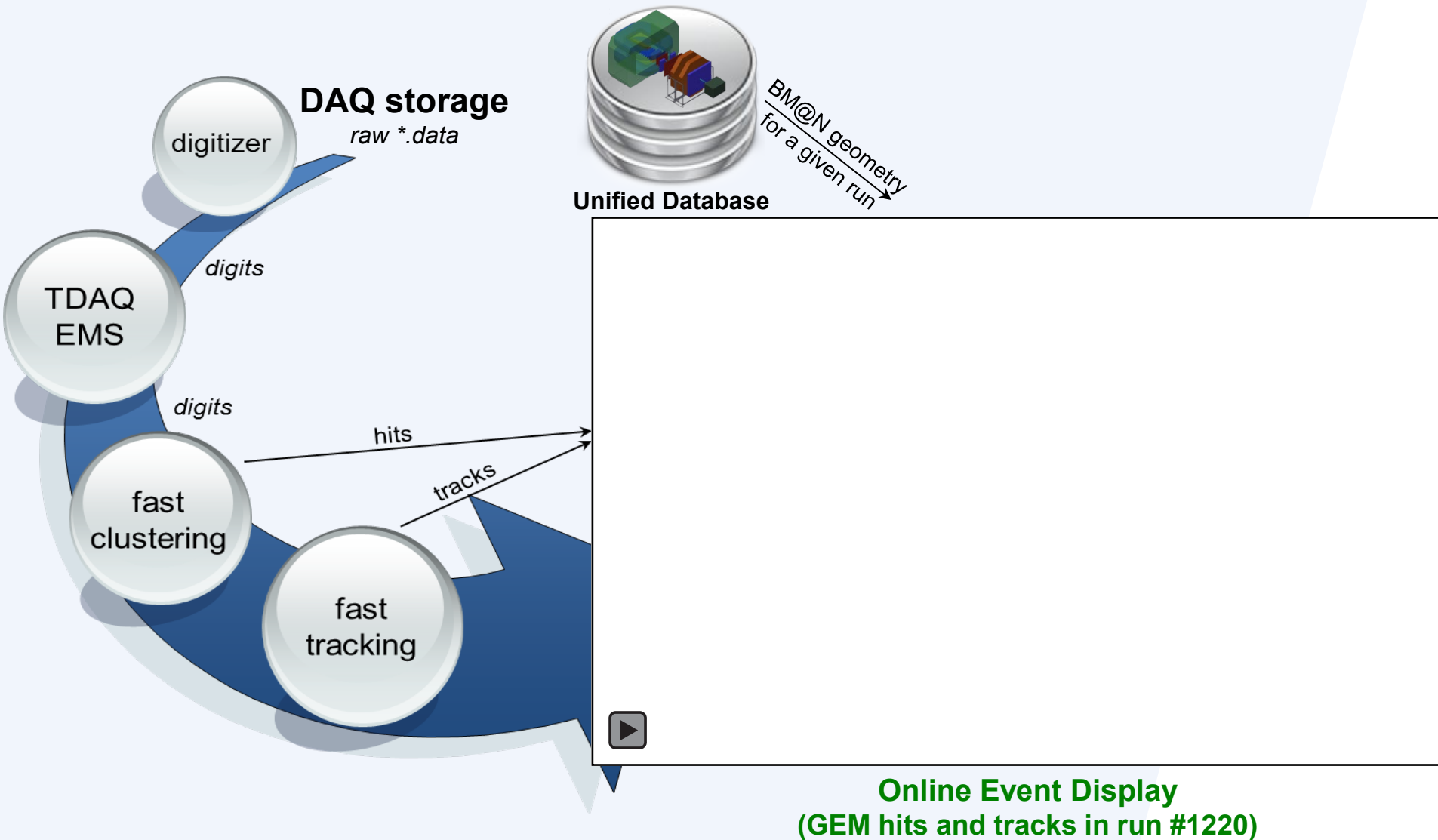


Event Display for **simulated** event data:  
*MC points, tracks, calorimeter towers*



`bmnroot/macro/eventdisplay/eventdisplay.C`

# Online Event Display



# Computing Clusters for NICA

NICA Cluster  
`nc[2,3,8,9].jinr.ru`  
(LHEP, b.215, b.216)



OS: Scientific Linux 7  
Exp. software: Local

**GlusterFS: 320 TB (replicated)**

→ EOS: 4 PB (replicated)

**Sun Grid Engine: 1 496 cores**

→ 4 000 Intel Xeon cores

MICC Tier1/2 Center  
`lx[pub,mpd-ui].jinr.ru`  
(LIT, b.134)



OS: Scientific Linux 6  
Exp. software: CVMFS

**EOS: 4 PB**

**Torque/Maui:**

Tier2: ~200 IX cores

Tier1: ~500 IX cores

HybriLIT platform  
`hydra.jinr.ru`  
(LIT, b.134)



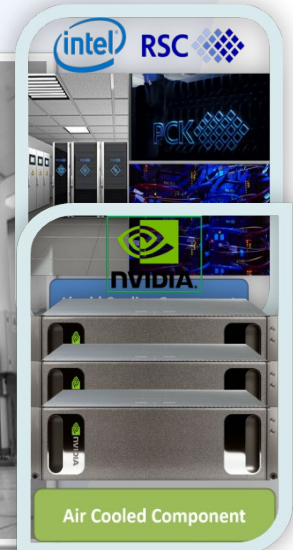
OS: CERN CentOS 7  
Exp. software: CVMFS, modules

**EOS 300 TB, ZFS 200 TB, Lustre 120 TB<sub>SSD</sub>**

**SLURM: 2880 (IX cores) +**

**6048 (IX Phi cores) +**

**40 GPU NVidia Tesla V**



**All external packages for BmnRoot were installed & configured.**  
**Automatic BmnRoot deployment on CVMFS with GIT CI was implemented.**

# NICA Cluster: from a prototype to the future

OS: Scientific Linux 7

(LHEP, b.215, b.216)



Cluster Administrator:  
Schinov B. G.

## Storage

**GlusterFS: 320 TB** (NICA) distributed FS (*replicated*)

sim. data: /nica/data4mpd[1,2]

exp. data: /dataBMN/bmndata[1-7] **4PB EOS soon**

for users: /nica/mpd[0-21]/\$USER

scratch: /monthly/\$USER, /weekly/\$USER

## Software

FairSoft:

/opt/fairsoft/bmn/pro → **may18p1**

FairRoot:

/opt/fairroot/bmn/pro → **v18.0.4**

*SetEnv.sh:*  
need correction!

## Computing

Batch System: **Sun Grid Engine**

Intel Xeon: **1496 log. cores**

**4K cores soon**

## Registration

Email to the cluster administrator from the spokesperson or software coordinator (more preferable)

# MICC Tier1/2 Center: a piece for NICA

OS: Scientific Linux 6

(LIT, b.134)



Cluster Administrator:  
Mitsyn V. V.

## Storage

**EOS: 4 PB** (NICA) distributed FS

sim. data: /eos/nica/bmn/sim

exp. data: /eos/nica/bmn/exp

for users: /eos/nica/bmn/users/\$USER

scratch: /scr/u/\$USER

## Software

**CVMFS**: distributed software FS

*scl enable devtoolset-4 python27 bash* **SetEnv.sh: need correction!**

FairSoft: /cvmfs/nica.jinr.ru/sl6/fairsoft/latest (may18)

FairRoot: /cvmfs/nica.jinr.ru/sl6/fairroot/latest (v18.0.4)

## Computing

Batch System: **Torque/Maui**

Tier2 queue 'mpd': **~200 log. cores** (Intel Xeon)

Tier1 queue 'mpd@bfsrv': **~500 log. cores** (Intel Xeon)

## Registration

<http://lxs-s03.jinr.ru/cicc/index.php/en/registration-at-cicc/>



# HybriLIT Platform: from education to SC Govorun

OS: CERN CentOS 7

## Storage

EOS:

exp. data: /eos/hybrilit.jinr.ru/nica\_bmn (90 TB)

for users: /eos/hybrilit.jinr.ru/user/

scratch: /eos/hybrilit.jinr.ru/scratch, /run/user/\$UID

/eos\_jinr → MICC EOS

## Software

**CVMFS**: distributed software FS

*module avail – print all modules*

FairSoft: `module add FairSoft/may18p1`

FairRoot: `module add FairRoot/v18.0.4`

## Computing

Batch System: **SLURM**

Intel Xeon (queue 'cpu') + NVidia Tesla (queue 'gpu')

*module add GVR/v1.0-1* → SuperComputer Govorun

Intel Xeon Gold (queue 'skylake'): **2880 log. cores**

Intel Xeon Phi (queue 'knl'): **6048 log. cores**

NVidia Tesla V (queue 'dgx'): **40 GPU cards**

## Registration

[http://hlit.jinr.ru/for\\_users/registration/](http://hlit.jinr.ru/for_users/registration/)

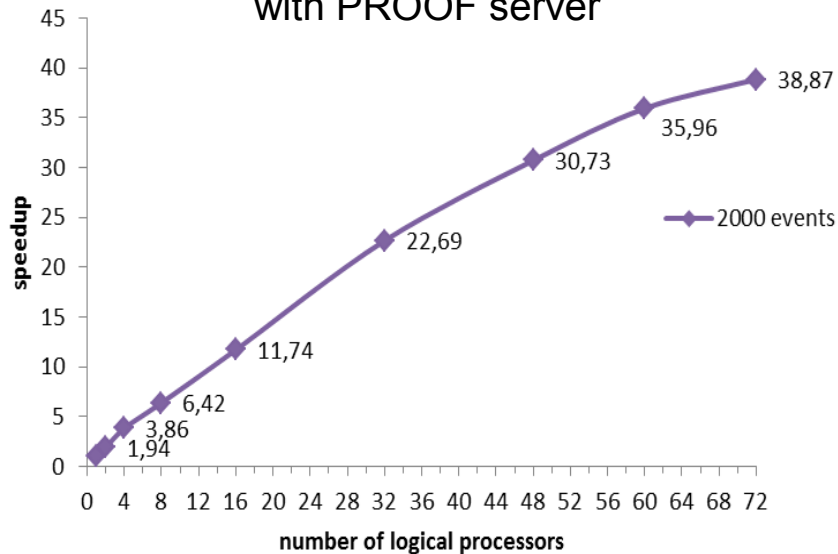
(LIT, b.134)



Cluster Administrator:  
HybriLIT team

# Tools for parallel data processing

! event reconstruction  
with PROOF server



**PROOF** (Parallel **ROOT** Facility) is a part of the ROOT software

Parallel NICA event data processing in ROOT macros on the parallel architectures: user multicore machines, heterogeneous distributed clusters and GRID system

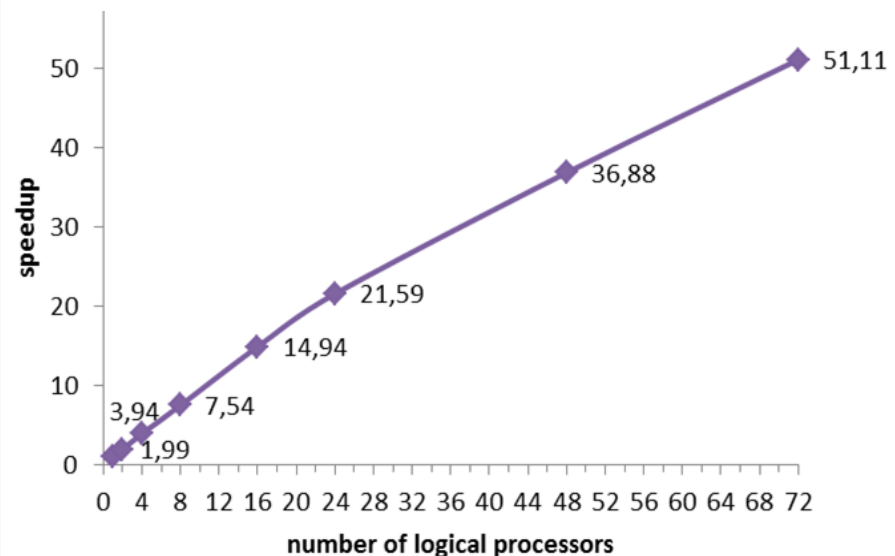
**MPD-Scheduler** for task distribution to parallelize NICA data processing on multicore machines and cluster nodes

**Supports SLURM, SGE and Torque system**

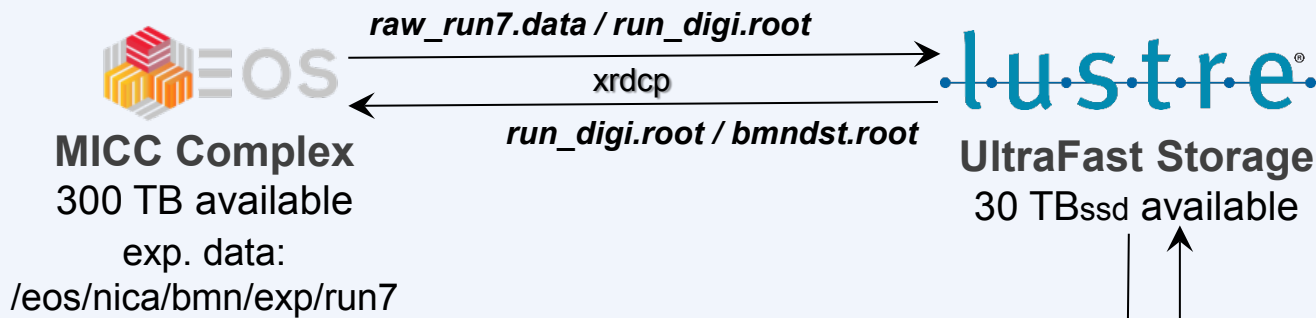
**Can use data of the Unified Database**

Jobs are described and passed as XML file

reconstruction of 72 sim. files  
with MPD-Scheduler



# Digits and DST mass production for Run 7

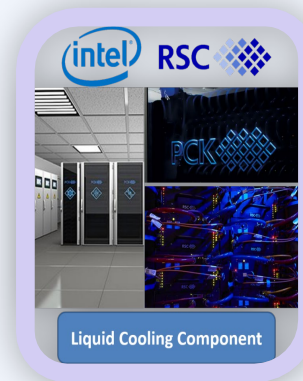


**Supercomputer GOVORUN**

**MPD-Scheduler**  
 \$ mpd-scheduler *raw\_run7.xml*

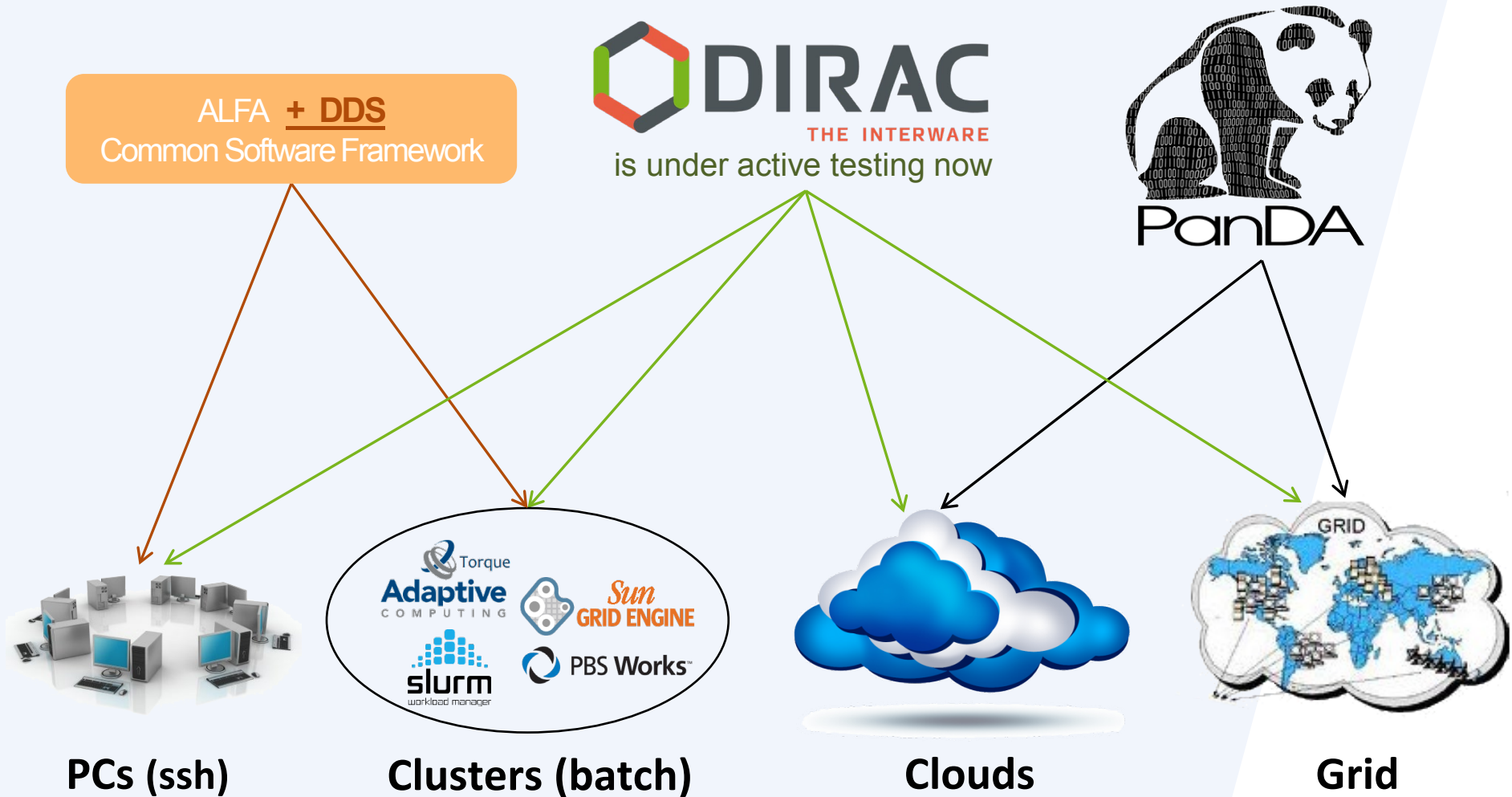
```

<job name="convert_bmn_raw">
<macro path=~ / bmnroot / macro / raw / BmnDataToRoot.C">
  <file input="/eos/nica/bmn/exp/raw/run7/*">
    <put command="xrdcp" path="/lustre/stor/${file_name_with_ext}"/>
    <get command="xrdcp" path="/lustre/stor/bmn_run${last_number}_digi.root"
  output="/eos/nica/bmn/exp/digi/run7/bmn_run${last_number}_digi.root"/>
  </file>
</macro>
<run mode="global" count="100" config=~ / bmnroot / build / config.sh"
work_dir="/lustre/stor"/>
</job>
  
```



Intel Xeon Gold (queue 'skylake'): 2880 cores  
 Intel Xeon Phi (queue 'knl'): 6048 cores

# Workload Manager selection



# Software Tests and Automatic Deployment

The screenshot shows the GitLab Pipelines interface for the project 'NICA' in the 'bmnroot' group. The top navigation bar includes 'Projects', 'Groups', and 'More'. The main content area displays a table of pipeline runs. The table has columns for 'Status', 'Pipeline', 'Commit', and 'Stages'. The pipeline runs are as follows:

Status	Pipeline	Commit	Stages	Duration	Time Ago
passed	#307 by [user]	1-alignment-... -> 7bf94510	Correct estimation of t...	00:11:58	about 17 hours ago
passed	#306 by [user]	1-alignment-... -> f21e1463	Enabled CI tests for all ...	00:21:58	about 17 hours ago
passed	#305 by [user]	1-alignment-... -> 7bf94510	Correct estimation of t...	00:12:26	about 17 hours ago
passed	#303 by [user]	dev -> f21e1463	Enabled CI tests for all ...	00:12:39	about 18 hours ago
passed	#301 by [user]	dev -> 1157e2e4	SILICON: file Silicon_R...	00:13:01	a day ago
failed	#300 by [user]	dev -> e71f6bca	ToF400 analysis draft	00:12:30	a day ago

**GIT CI Tests on merge requests**  
checking compilation and main macros  
→ stable *dev* and *pro* branches

**In case of compilation or macro errors**  
e-mail is sent to the software developers

# Git Issues as a Project Management System

The screenshot displays the GitLab Issues interface for the 'bmnroot' project. The left sidebar shows navigation options: Project, Repository, Issues (38), List, Board, Labels, Milestones, Merge Requests (0), CI / CD, Operations, Wiki, and Settings. The main area shows an 'Issue Boards' view with a search bar and 'Add list' and 'Add issues' buttons. The board is organized into four columns, each representing a milestone or category:

- Raw Converter** (4 issues):
  - Single Silicon and GEM digits included in the Raw Data Converter (Raw Converter, #2, Mar 28)
  - Support all runs in the Raw Data Converter (Raw Converter, #4, Aug 30)
  - Modular Structure of the Raw Data Converter (Raw Converter, #5, Sep 24)
  - Macro for adding TOF700 slewing and INL corrections to the BM@N Database (Raw Converter, #16, May 15)
- Alignment** (1 issue):
  - Global BM@N Alignment (Alignment, #6, Jul 24)
- Simulation** (2 issues):
  - CBM STS geometry/classes/simulation to BmnRoot (Simulation, #14, May 29)
  - Simulation of new ZDC geometry with CBM modules (Simulation, #18, May 29)
- Reconstruction** (8 issues):
  - Tracking selection in the reconstruction macro (Reconstruction, #8, Jun 1)
  - DCH in the BmnRoot reconstruction (conducted runs) (Reconstruction, #9, Mar 27)
  - DCH in the global tracking (Reconstruction, #10, May 22)
  - Matching TOF400 data with global tracks (Reconstruction, #11, Aug 7)
  - Matching TOF700 data with global tracks (Reconstruction, #13, Sep 4)
  - Add CSC to the BmnRoot reconstruction (Reconstruction, #15, Jul 17)
  - Add Feal to the BmnRoot reconstruction (Reconstruction, #16, May 15)

35 issues are open to be done in 2019

<https://git.jinr.ru/nica/bmnroot/issues>

Git Issues:

Milestones → Issue List → Boards with Labels

# NICA Technical Web-site: <http://mpd.jinr.ru>

## NICA EXPERIMENTS

TECHNICAL WEBSITE

MAIN DOCUMENTS EXPERIMENTS SOFTWARE COMPUTING FORUM VIDYO

BM@N WIKI

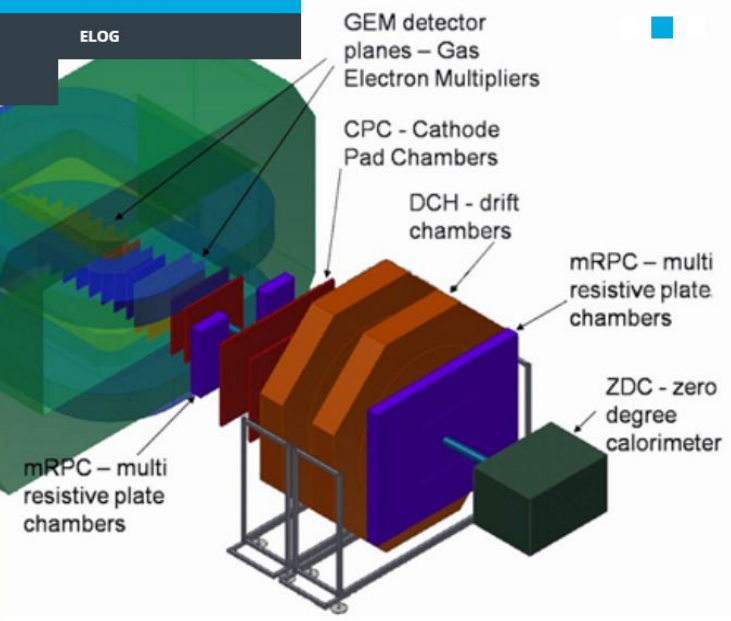
MPD ELOG

SPD

### Baryonic Matter Nuclotron (BNM)

The Nuclotron at JINR will provide beams of heavy ions with energies up to 6A GeV for isospin symmetric nuclei, and 4.65A GeV for Au [...]

Analyzing Magnet



### SOFTWARE

-- BmnRoot  
-- MpdRoot  
-- SpdRoot

### TAGS

BATCH BMNROOT GIT  
GITLAB HOWTO INTERACTIVE

### META

Log in  
Entries [RSS](#)  
Comments [RSS](#)

### CONTACTS

Feedback  
Forum

- ✓ Information
- ✓ Documents
- ✓ Software
- ✓ Computing Section (NICA Cluster, MICC FARM, HybriLIT & Govorun)
- ✓ Tests dashboard
- ✓ Forum
- ✓ Vidyo
- ✓ Mail-lists (updates, errors...)
- ✓ etc.

# NICA Technical Web-site: <http://mpd.jinr.ru>

## NICA EXPERIMENTS

TECHNICAL WEBSITE

MAIN DOCUMENTS EXPERIMENTS SOFTWARE COMPUTING FORUM VIDYO

NICA WEBSITE

MPD COLLABORATION

MAILING LISTS

Public mailing lists. If you are having trouble using the lists, or to subscribe and unsubscribe, please contact [slepov@jinr.ru](mailto:slepov@jinr.ru)

- [mpd@maillist.jinr.ru](mailto:mpd@maillist.jinr.ru) – MPD collaboration members
- [mpdroot@maillist.jinr.ru](mailto:mpdroot@maillist.jinr.ru) – MpdRoot software team
- [bm@maillist.jinr.ru](mailto:bm@maillist.jinr.ru) – BM@N collaboration members
- [bmroot@maillist.jinr.ru](mailto:bmroot@maillist.jinr.ru) – BmnRoot developer team
- [bmshift@maillist.jinr.ru](mailto:bmshift@maillist.jinr.ru) – BM@N shift team
- [bmsoftware@maillist.jinr.ru](mailto:bmsoftware@maillist.jinr.ru) – BmnRoot software group
- [spd@maillist.jinr.ru](mailto:spd@maillist.jinr.ru) – SPD collaboration members
- [spdroot@maillist.jinr.ru](mailto:spdroot@maillist.jinr.ru) – SpdRoot software team
- [flowpack@maillist.jinr.ru](mailto:flowpack@maillist.jinr.ru) – FlowPack

NICA Experiments > Mailing lists

SEARCH ...

April 2019

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					
« Apr						

TAGS

BATCH BMNROOT GIT GITLAB  
HOWTO INTERACTIVE LIT FARM  
MPDROOT PROOF ROOT SCHEDULER  
SGE SOFTWARE

### *BM@N Mail Lists:*

- ✓ BM@N collaboration members
- ✓ BmnRoot developer team
- ✓ BM@N shift team
- ✓ BmnRoot software group



# NICA Technical Web-site: <http://mpd.jinr.ru>

## NICA EXPERIMENTS

TECHNICAL WEBSITE

The screenshot shows the NICA Experiments website. At the top, there is a navigation bar with links: MAIN, DOCUMENTS, EXPERIMENTS, SOFTWARE, COMPUTING, FORUM, and VIDYO. Below this, a dropdown menu is open, listing: BMNROOT, MPDROOT, SPDR00T, DATABASES (highlighted in blue), HOWTO, REFERENCES, and CURRENT JOB LIST. The 'DATABASES' dropdown further lists: BM@N DATABASE (highlighted in blue), CONSOLE UTILITIES, and COMPUTERS DB. The main content area is titled 'Console database utilities' and contains text about the Unified Database and a list of utility options. A calendar for April is visible on the right side of the page. At the bottom, there is a 'TAGS' section with buttons for BATCH, BMNROOT, GIT, GITLAB, HOWTO, INTERACTIVE, LIT FARM, MPDROOT, PROOF, ROOT, SCHEDULER, SGE, and SOFTWARE.

**Console database utilities**

The Unified Database containing information about the NICA cluster. The Web interface for simulation met your conditions, special console application v information about the BM@N experiment and raw Also, console utility *show\_experiment\_files* was developed.

Utility *show\_simulation\_files* is the part of MpdRoot simulation files according to the following options:

- *gen=generator\_name* – output list includes only simulation files from given event generator.
- *energy=N* – output list includes only files with collision energy equal N.  
*energy=L-H* – output list includes only files with collision energy greater or equal L and lower or equal H.  
*energy=L-* – output list includes only files with collision energy greater or equal L.
- *energy=H-* – output list includes only files with collision energy lower or equal H.
- *beam=beam1\_particle* – output list include only files with given first particle beam.
- *target=beam2\_particle* – output list include only files with given second particle beam or target.
- *path=part\_of\_path* – output list include only files with given string in the path.
- *desc=text* – output list includes only files with the text in description.

The commands: *show\_simulation\_files /?* or *show\_simulation\_files -h* or *show\_simulation\_files -help* show small help for the utility.

Examples:

- *show\_simulation\_files gen=QGSM,energy=9,beam=Au,target=Au*
- *show\_simulation\_files gen=urqmd,energy=5-9,desc=50K*

Utility *show\_experiment\_files* is the part of MpdRoot and BmnRoot software. The utility displays the list of experimental raw files according to the following optional parameters separated by comma:

### BM@N Software:

- ✓ BmnRoot repository
- ✓ BM@N central database
- ✓ HowTo Install BmnRoot
- ✓ BmnRoot Start Guide

# NICA Technical Web-site: <http://mpd.jinr.ru>

## NICA EXPERIMENTS

TECHNICAL WEBSITE

MAIN

DOCUMENTS

EXPERIMENTS

SOFTWARE

COMPUTING

FORUM

VIDYO

NICA CLUSTER

HOW TO USE

LIT CLUSTERS

CLUSTER MONITORING

PARALLELIZATION

STORAGE STATISTICS

COMPUTING TDR

## HybriLIT cluster & GOVORUN

Computation component **HybriLIT**

**TOTAL RESOURCES**  
252 CPU cores;  
7728 CUDA cores;  
182 MIC cores;  
~2.5 Tb RAM;  
~57 Tb HDD.

**HARDWARE**  
SuperBlade Chassis including 10 calculation blades for run user tasks.

OS: CERN CentOS 7  
distributed file system: EOS  
batch system: SLURM

hypercomputer «Govorun»  
initial performance: 1 Petaops

Liquid Cooling Component

NVIDIA

Air Cooled Component

The HybriLIT heterogeneous cluster is a computation component of the Multifunctional center for data storage processing and analysis of LIT JINR, which contains a multicore component and computation accelerators: NVIDIA graphic processors and Intel Xeon Phi coprocessors. The detailed information on the heterogeneous cluster, rules and registration form can be found on the JINR HybriLIT [Web-site](#).

With the HybriLIT team an agreement was reached on using the heterogeneous cluster and **GOVORUN supercomputer** for the NICA tasks. Once you have registered in the HybriLIT complex, you can login with your account:

```
ssh [username]@hydra.jinr.ru
```

Please, carefully read the important notes after login.

The external packages for the experiment software, **FairSoft** and **FairRoot**, were installed at the

## NICA Computing:

- ✓ NICA Cluster: How to use, Monitoring, Statistics
- ✓ MICC Complex in LIT
- ✓ HybriLIT and Govorun
- ✓ MPD-Scheduler
- ✓ Using PROOF tool

SEARCH ...

April 2019

M	T	W	T	F	S	S
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22	23	24	25	26	27	28
29	30					
« Apr						

### TAGS

BATCH BMNROOT GIT GITLAB

HOWTO INTERACTIVE LIT FARM

MPDROOT PROOF ROOT SCHEDULER

SGE SOFTWARE

# Summary

- The **BmnRoot framework** for the BM@N experiment provides to users all necessary tools to describe geometries and simulate any kind of detectors for studying their properties, to reconstruct events and make proposed physics analysis both for experimental and simulated data.
- The **first BmnRoot release** will be issued in the next month to perform the mass production of the BM@N digits and DST files for Run 7. Temporary full digit files have been prepared and can be used before the first release.
- Many **offline and online software systems** have been developed: BM@N Unified Database, Event Display and Online Histogramming, e-Logbook, PROOF parallelization and MPD-Scheduler, Cluster Monitoring and Software Test System and many others.
- The big work has been done, but a lot of packages should be added or improved for the experimental data taking and BM@N data processing.
- **RFBR support** with the NICA three-year grant (18-02-40125) enables to significantly improve the Information Systems for online and offline data processing.

# Plans for 2019

- Raw Data Converter:** Combine digits for all detectors in the one Raw Data Converter  
Obtain all digits for Run 7  
Implement a Modular Structure of the Raw Data Converter:
- BM@N Alignment:** Macro for BM@N global alignment based on Millepede II in BmnRoot
- Tracking:** Easy selection of the tracking approach in the reconstruction  
Global Tracking implementation
- BmnRoot:** First BmnRoot Release  
Include all the detectors in the simulation and reconstruction  
Prepare DST files for Run 7 to use them in physics analysis
- Event Display:** All detector data and calorimeter towers in the Event Display
- Unified Database:** A new version of the Unified Database with arbitrary parameters  
Filling with the real simulation files  
Automatic insertion of the Run information in online
- Monitoring System:** BM@N Online Monitoring System implementation (DDS framework)

# *Thank you for your attention!*

More information: [nica.jinr.ru](http://nica.jinr.ru)  
[mpd.jinr.ru](http://mpd.jinr.ru)  
<http://bmnshift.jinr.ru/wiki/doku.php>

Forum: <http://mpd.jinr.ru/forum/>

Email: [gertsen@jinr.ru](mailto:gertsen@jinr.ru)



*Backup slides*

# BM@N News system



http://se49-48.jinr.ru



To make launching your new site easier, you are in bootstrap mode. All new users will be granted trust level 1 and have daily email summary emails enabled. This will be automatically turned off when 50 users have joined.

Let's get this discussion started! There are currently 0 / 5 topics and 0 / 30 posts. New visitors need some conversations to read and respond to.

all categories ▾ **Categories** Latest New (3) Top + New Topic ☰

 <b>Staff</b> <a href="#">READ ME FIRST: Admin Quick Start Guide</a> <a href="#">Privacy Policy</a> <a href="#">FAQ/Guidelines</a>	 <b>Site Feedback</b>	 <b>Collaboration News</b>
<b>Software Development and Data Quality Check Group</b>	<b>Track Reconstruction &amp; Detector Simulation Group</b>	<b>Particle Identification Group</b>
<b>Calorimeter Data Analysis and Simulation Group</b>	<b>Physics Analysis Group</b>	<b>SRC Data Analysis and Simulation Group</b>

**BM@N News system (built on Discourse) for a quick communication and discussions between collaboration members and groups:**  
various topics for different groups, subscriptions, comments...