DIRAC Interware as a service for high-throughput computing in JINR

V.V. Korenkov[1] , N.A. Kutovskiy[1], V.V. Mitsyn[1], I.S. Pelevanyuk[1],
D.V. Podgainy[1], V.V. Trofimov[1], A.Yu. Tsaregorodtsev[2]

[1]*Meshcheryakov Laboratory of Information Technologies, JINR, Dubna, Russia*
[2]*CPPM, Aix-Marseille University, CNRS/IN2P3, Marseille, France*

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What was done

Tier-1   CICC/Tier-2   Clouds   Govorun   NICA Cluster   UNAM

Running   **Running**   **Running**   **Running**   **Running**   **Running**

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.

What is DIRAC?

DIRAC is a framework that provides all the necessary components to build ad-hoc grid infrastructures **interconnecting** computing resources of different types, allowing **interoperability** and simplifying **interfaces**. This allows to speak about the DIRAC *interware*. Originally developed by LHCb, but later released as open-source.
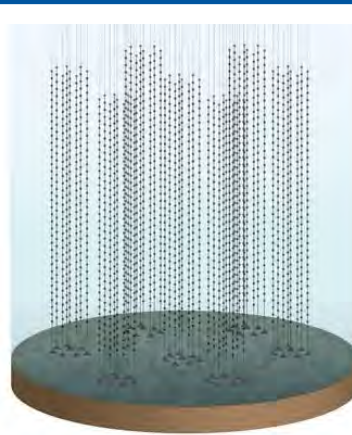

Web

CLI

API
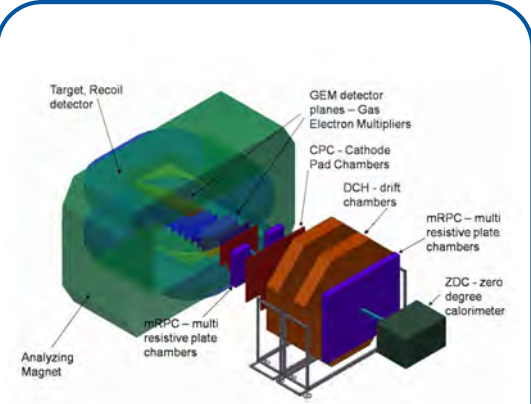
REST
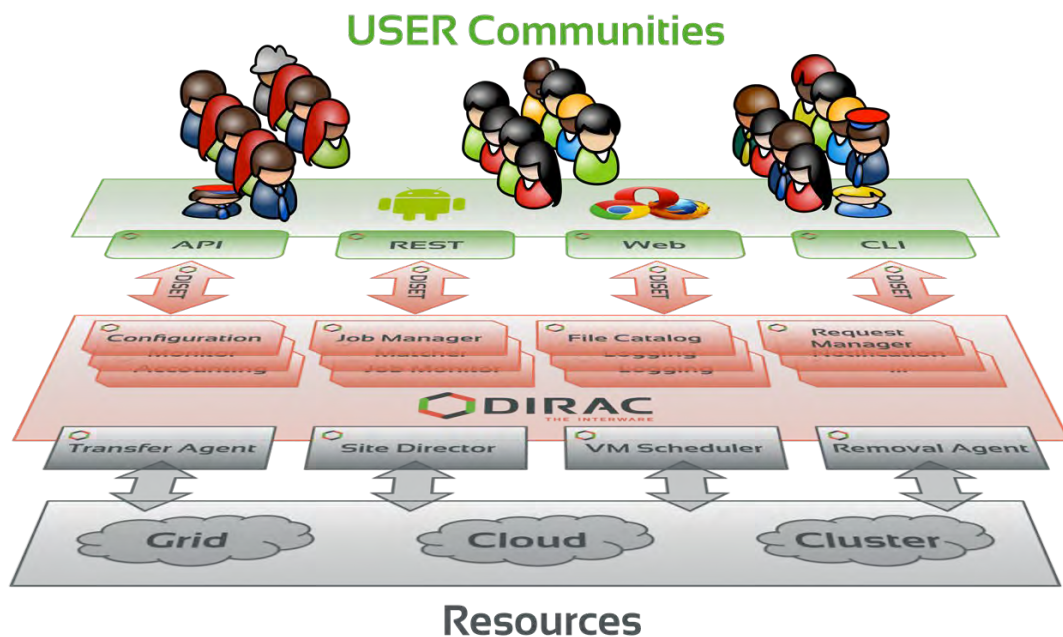
It is useful for experiments
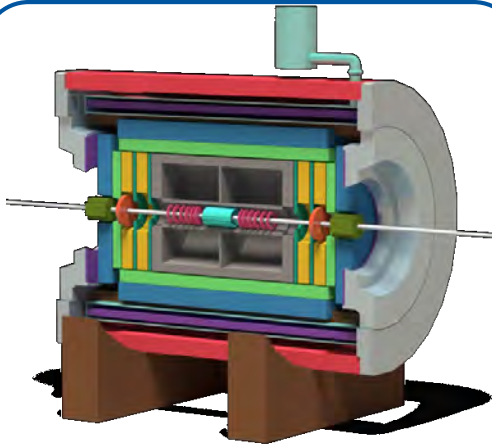
MPD@NICA

Monte-Carlo – Real
Analysis – Maybe

Baikal-GVD

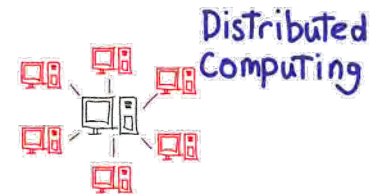Monte-Carlo – Real

BM@N

Monte-Carlo – Real
Reconstruction – Tests
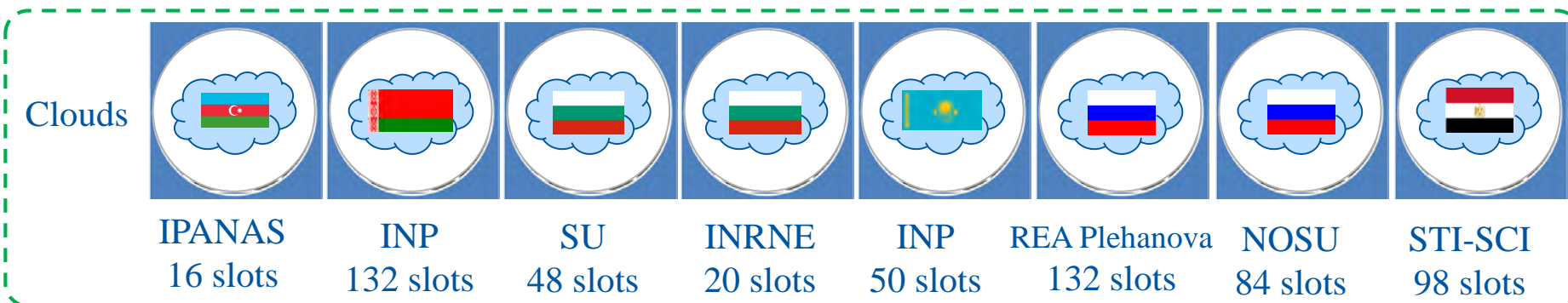

SPD

Monte-Carlo – Real

Folding@HOME

Teaching

It is useful for resources

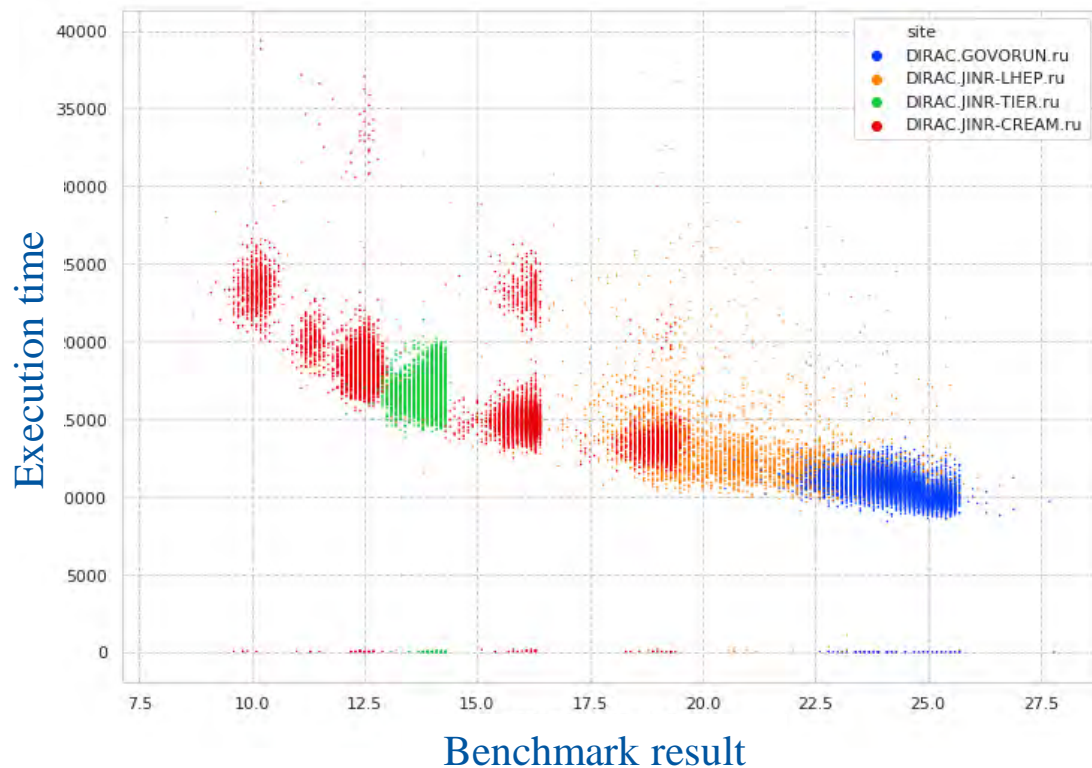| JINR					MPD collaboration
Tier-1 920 slots	CICC/Tier-2 1000 slots	Cloud 80 slots	Govorun 184-870 slots	NICA Cluster 250 slots	UNAM 100 slots

Unique approach to use cloud computing resources was developed and applied. Now it is included in DIRAC as a basic module. With developed module JINR Member-states clouds were used for SARC-CoV-2 study.

Clouds							
IPANAS 16 slots	INP 132 slots	SU 48 slots	INRNE 20 slots	INP 50 slots	REA Plehanova 132 slots	NOSU 84 slots	STI-SCI 98 slots

Total amount of cores dedicated to DIRAC exceeds 3000
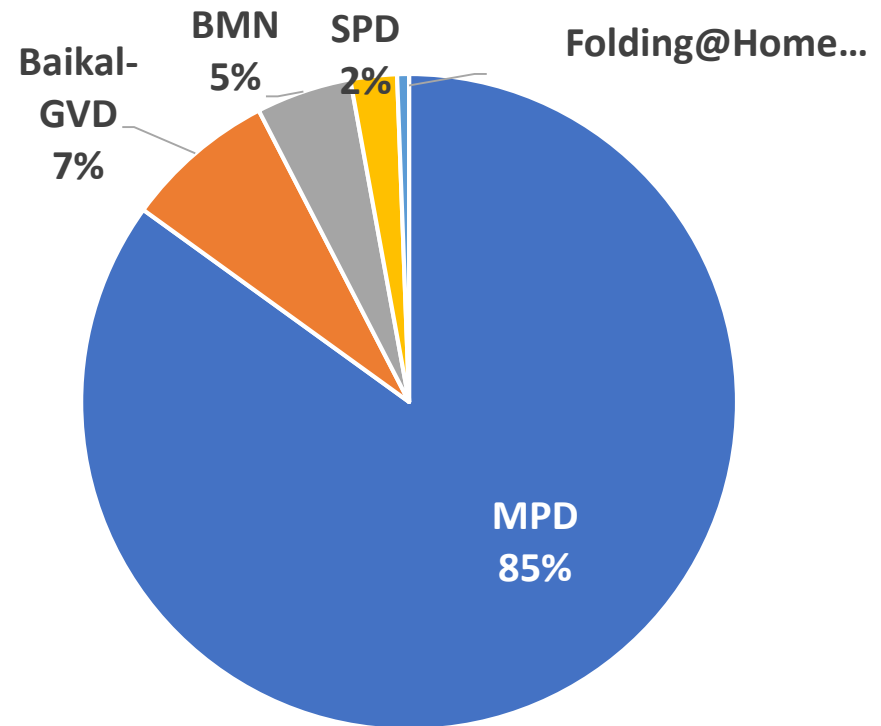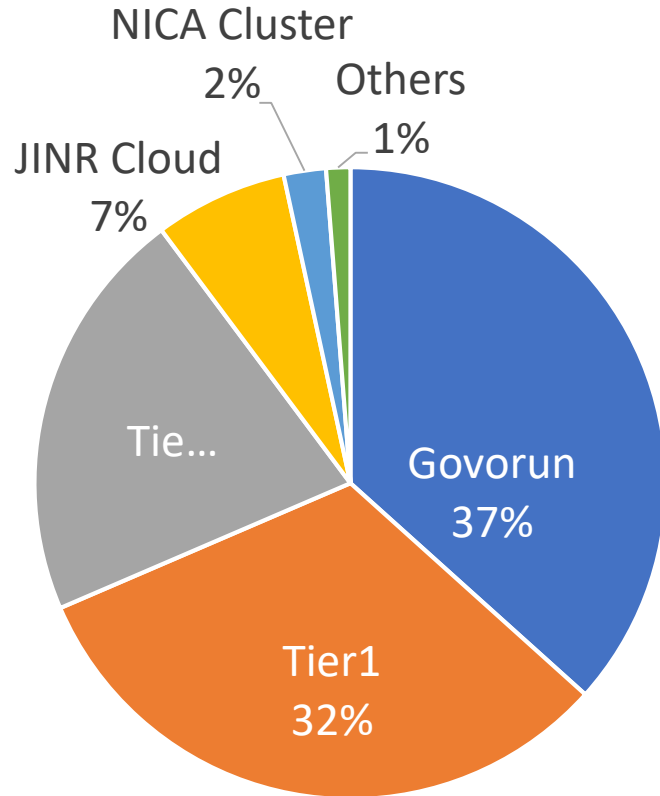
It is good for analysis

Central job management provide many advantages in accounting, monitoring, and performance study.

At first, we checked that benchmarks work correctly. On the plot there is visualization that shows dependency between job execution time and CPU core speed test.

Advantages:

- Immediate spotting of inefficiencies on a resource.
- Study of different processors performance.
- Better overview of user workload

Contribution in 2021

Left pie chart:
- Govorun 37%
- Tier1 32%
- Tie... (Tier2)
- JINR Cloud 7%
- NICA Cluster 2%
- Others 1%

Right pie chart:
- MPD 85%
- Baikal-GVD 7%
- BMN 5%
- SPD 2%
- Folding@Home...

Total HS06 hours in 2021: 86 million
(~530 years of computation on a single average CPU core)
+65% comparing to 2020

Use of all resources united by DIRAC increase speed at least 2.7 times. (Compared with use of only Govorun supercomputer)