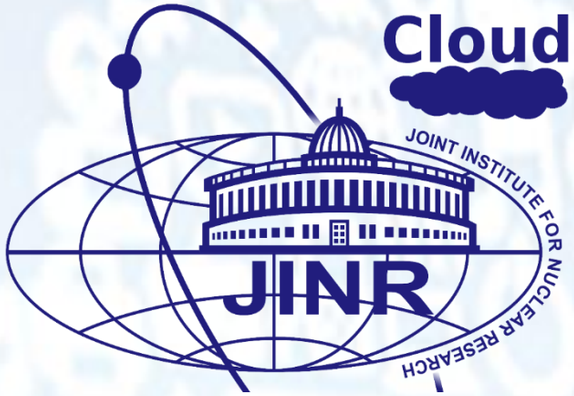

Distributed information and computing infrastructure of the JINR Member States organizations

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[3] Plekhanov Russian University of Economics

The XXIV International Scientific Conference of Young Scientists and Specialists (AYSS-2020)
09 - 13 November 2020

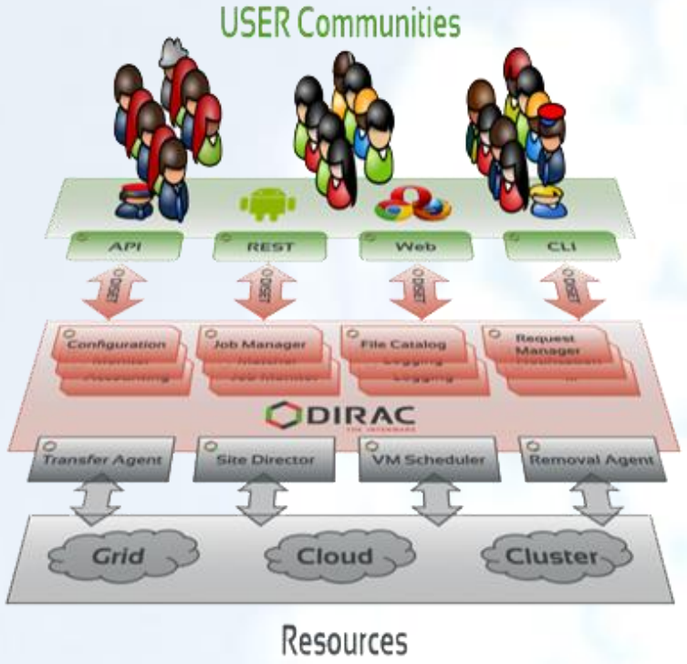
Relevance

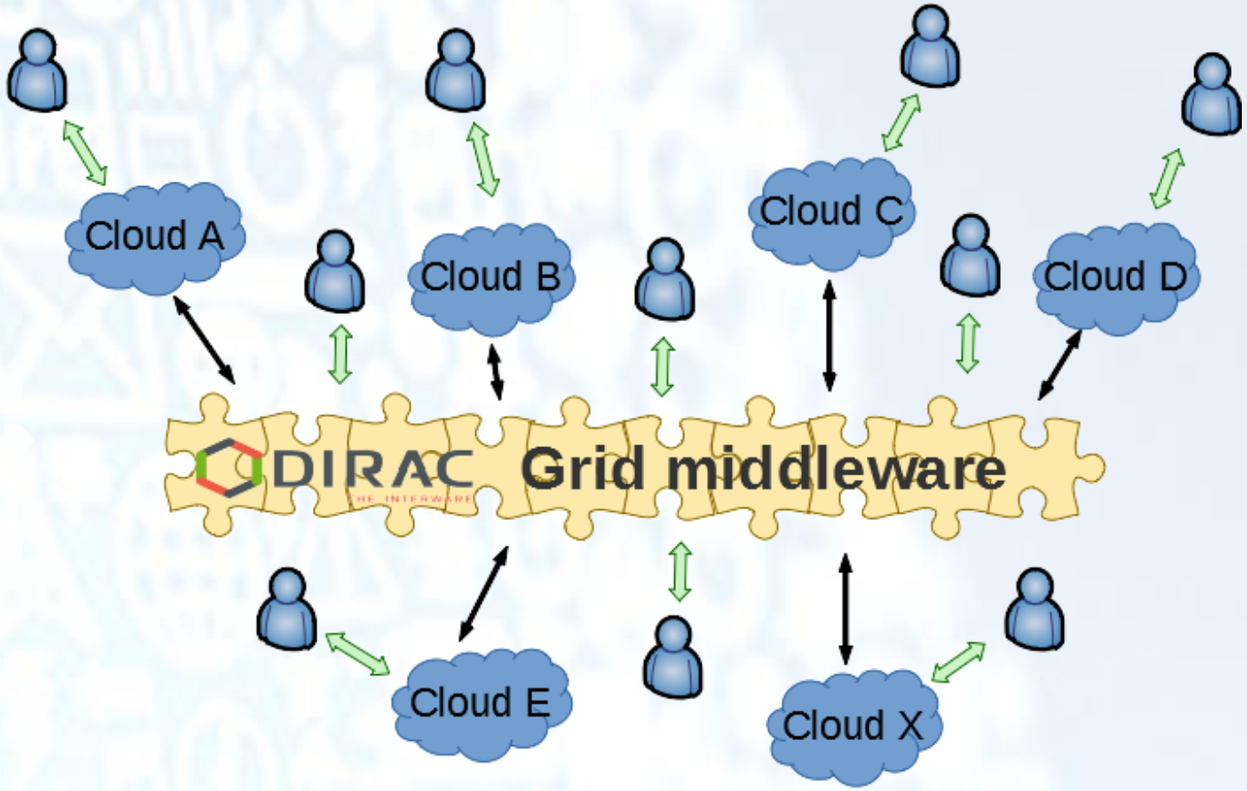
JINR participates in a large number of research projects, in many of which computer infrastructures are an important tool for obtaining significant scientific results.

In this connection, the pooling of JINR's computational resources and organizations from its member countries is an important and urgent task, the solution of which would significantly accelerate the conduct of scientific research.

Distributed cloud infrastructure

Grid middleware (interware) – DIRAC:
- good scalability
- easier to maintain
- DIRAC services are deployed at the JINR cloud



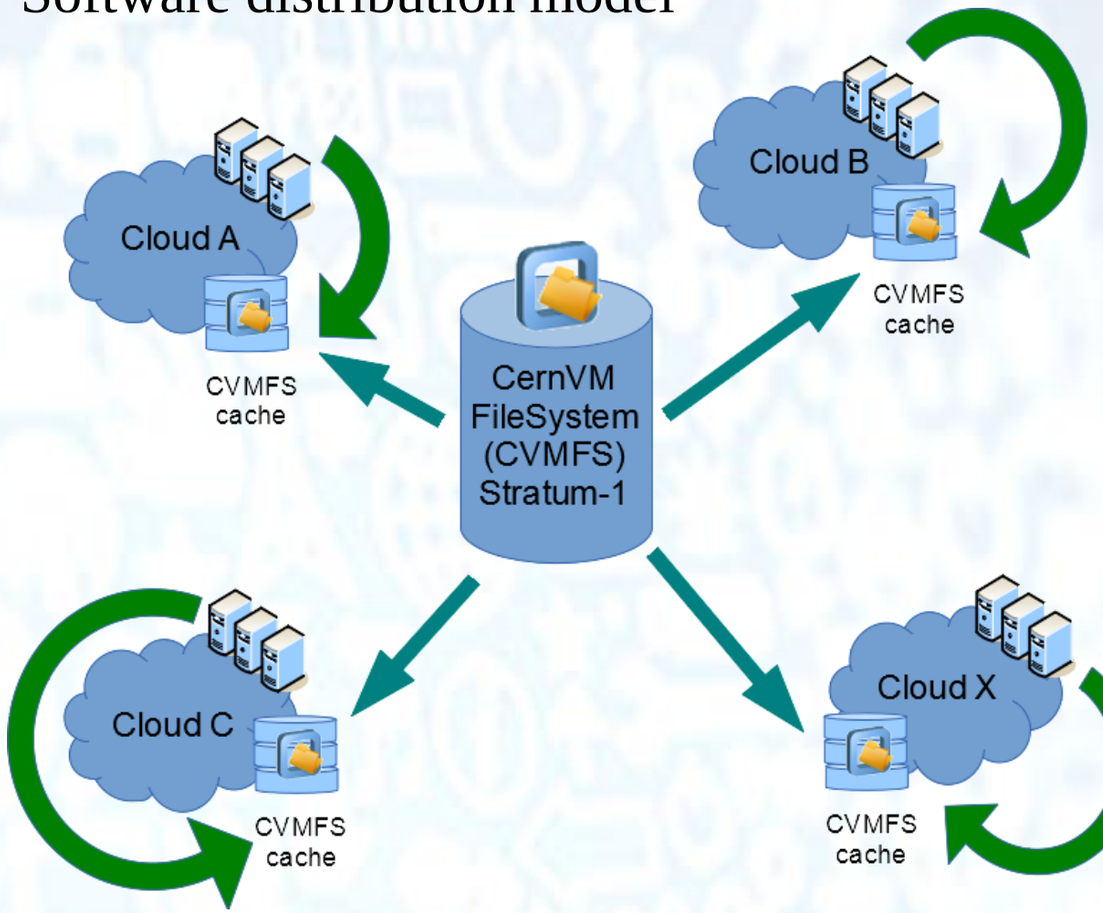


The Workload Management System with Pilot Jobs introduced by the DIRAC allows to aggregate in a single system computing resources of different source and nature, such as computational grids, clouds or clusters, transparently for the end users.

Distributed cloud infrastructure

CernVM-FS is a web-based, global, and versioning file system optimized for software distribution.
The file system content is installed on a central web server from where it can be mirrored and cached by other web servers and web proxies.
File system clients download data and meta-data on demand and cache them locally.
Data integrity and authenticity is ensured by cryptographic hashes and digital signatures.

Software distribution model

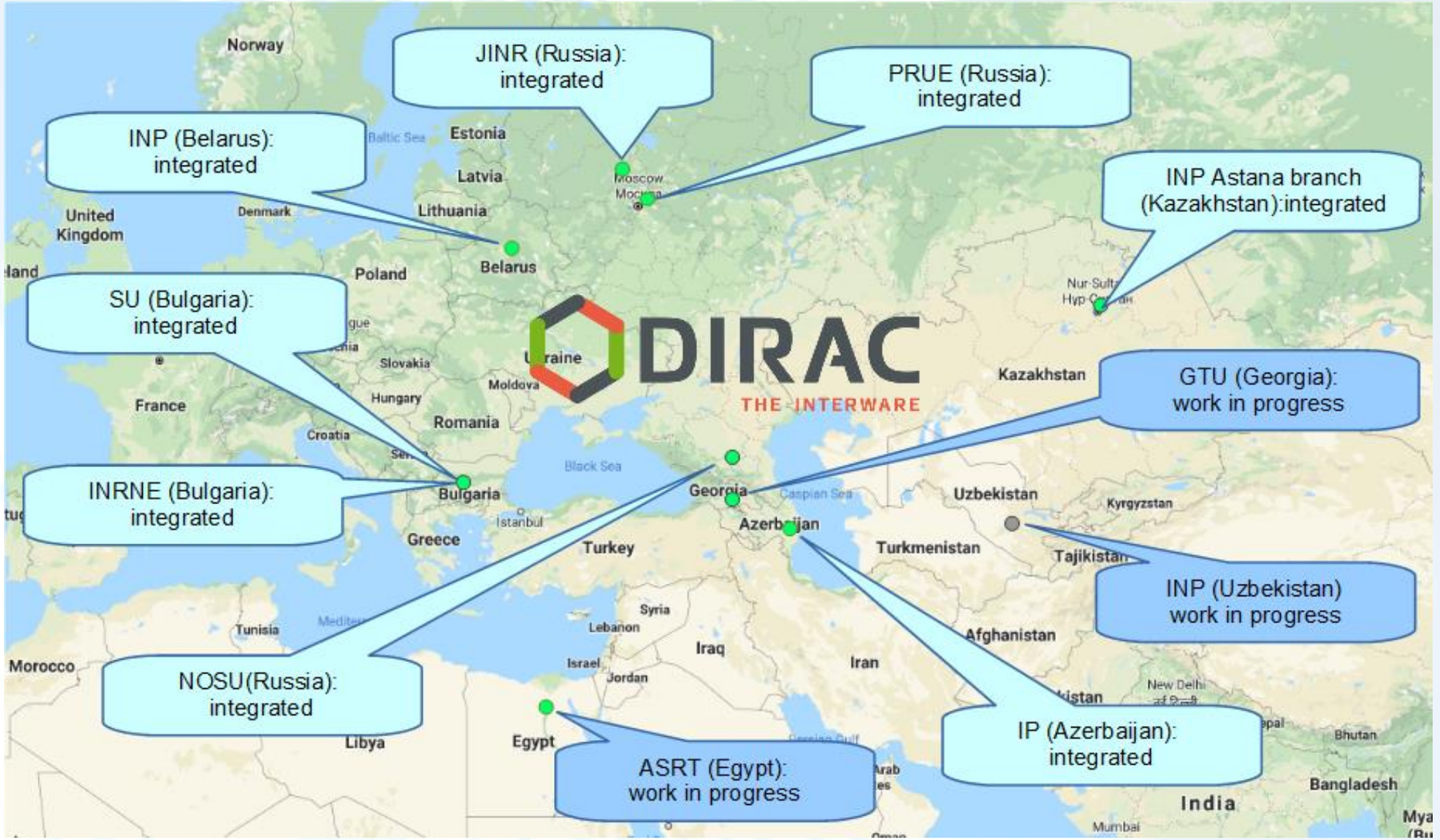


/cvmfs/nica.jinr.ru/
- centos7
  - bmnroot
  - fairroot
  - fairsoft
  - mpdroot
- sl6
  - bmnroot
  - fairroot
  - fairsoft
  - mpdroot

Participants of the distributed cloud infrastructure

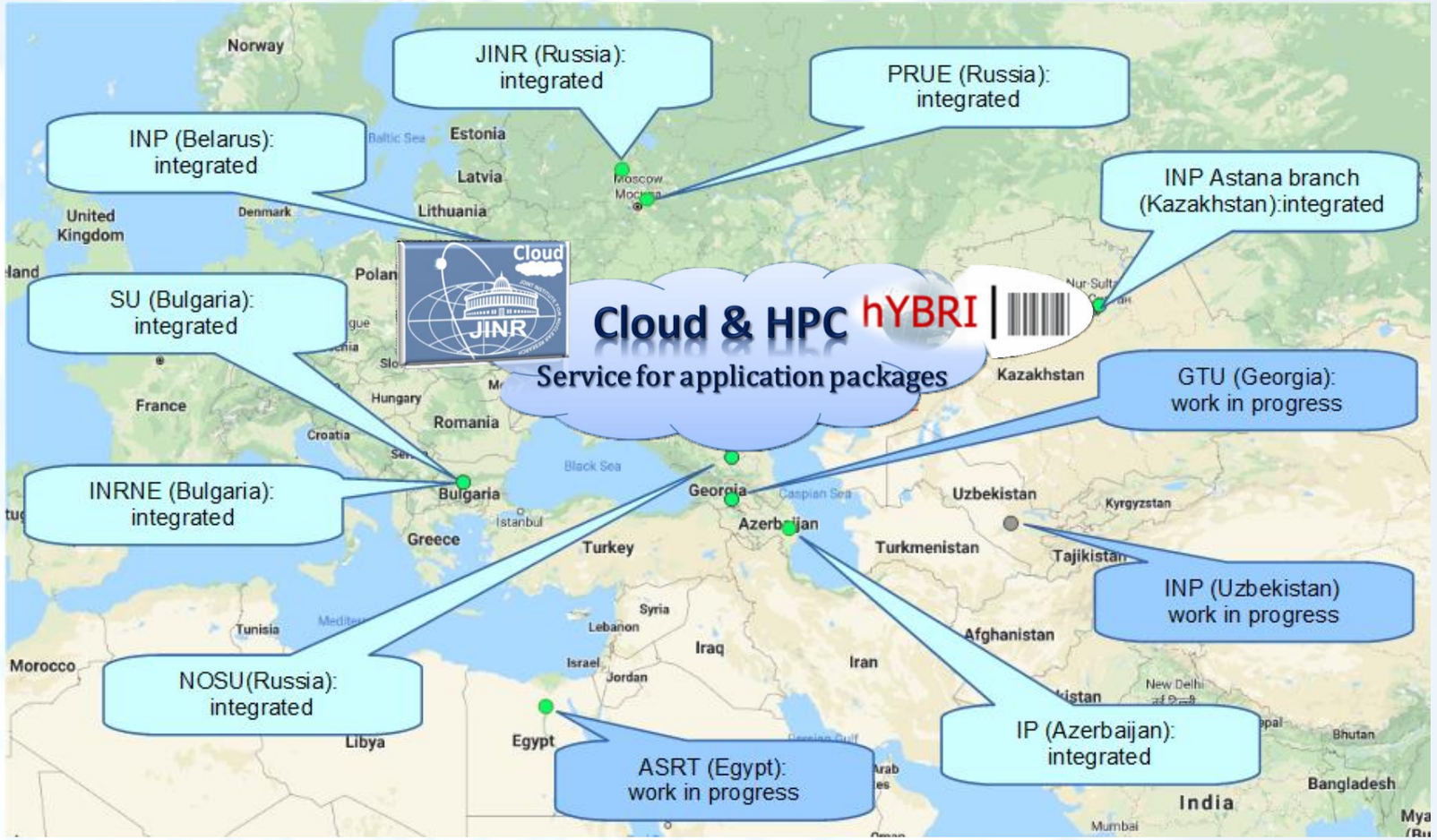
The JINR cloud is the core of a distributed cloud infrastructure. At the moment, the integration of clouds of organizations from the JINR Member States is at different stages.

All integrated clouds are based on OpenNebula platform.



Participants of the distributed cloud infrastructure

One of the most important tasks for the nearest future is to provide scientists from the JINR Member States with access to the computational capacities of the JINR supercomputer named after N.N. Govorun.
The integration of its hardware and the cloud recourses of the participating countries would significantly increase a total computing capacity of the entire DICE.



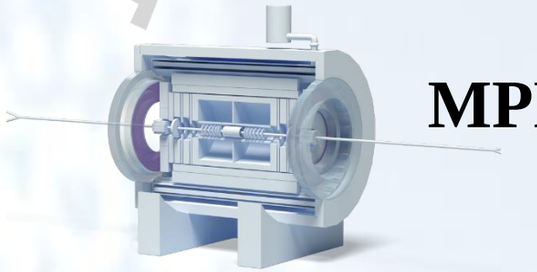
BM@N, MPD, Baikal-GVD

The JINR DICE resources are configured to support the following virtual organizations (VO): BM@N, MPD, Baikal-GVD.

More than 15 000 Monte-Carlo simulation jobs for BM@N VO were completed successfully.

Testing jobs for MPD and jobs for Baikal-GVD were run on the distributed cloud infrastructure.

BM@N
Baryonic Matter at Nuclotron



MPD

BAIKAL-GVD

Research on the SARS-CoV-2

Team: Joint Institute for Nuclear Research

Date of last work unit	2020-10-21 06:04:11
Active CPUs within 50 days	155
Team Id	265602
Grand Score	27,693,728
Work Unit Count	12,018
Team Ranking	6756 of 255314
Homepage	http://www.jinr.ru/main-en/

Team members

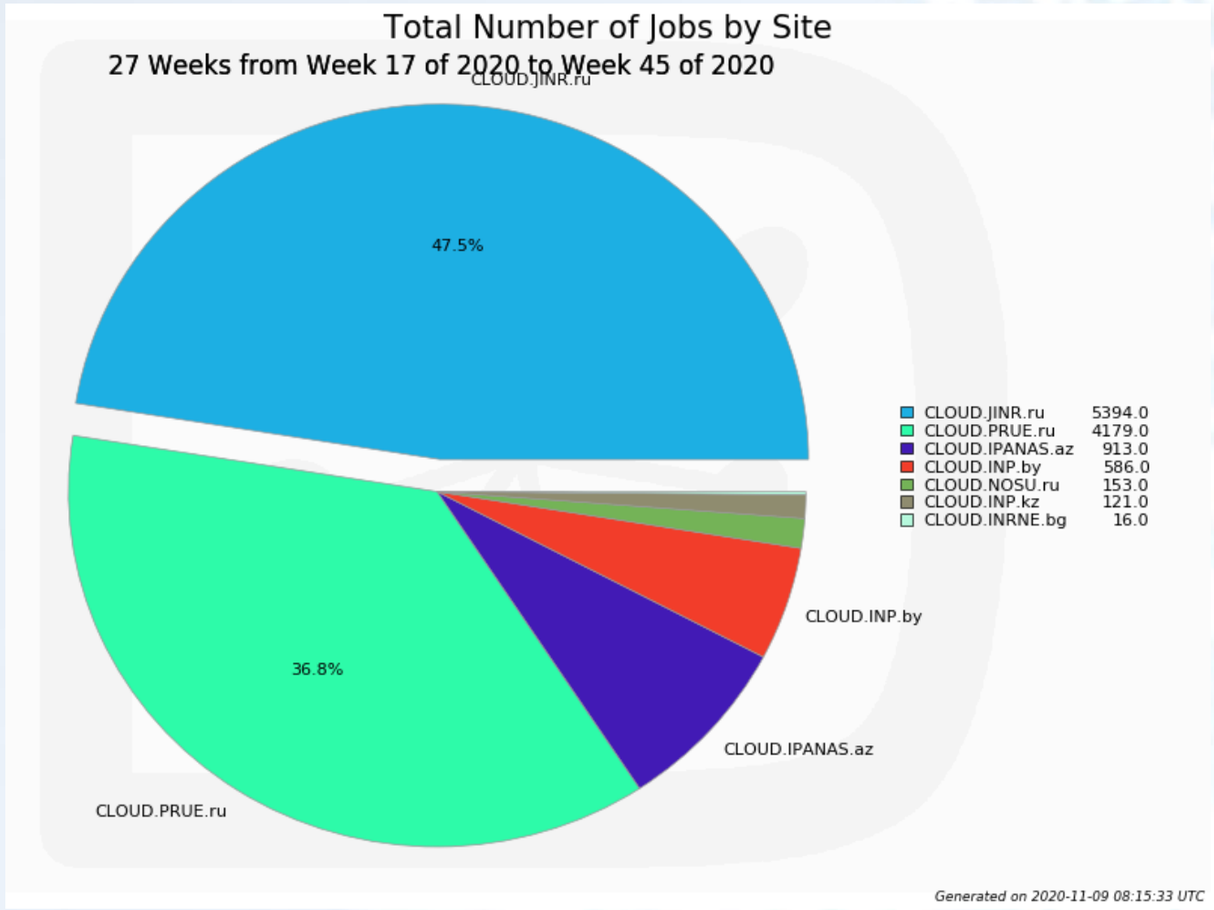
Rank	Name	Credit	WUs
68 416	CLOUD.JINR.ru	12,645,224	5,355
81 988	CLOUD.PRUE.ru	9,453,851	4,175
200 259	CLOUD.IPANAS.az	1,542,618	910
204 504	CLOUD.INP.by	1,465,167	599
230 877	CLOUD.NOSU.ru	1,083,663	395
237 027	CLOUD.INP.kz	1,012,919	413
311 109	DIRAC.REA-Parallel.ru	471,543	155
N/A	CLOUD.INRNE.bg	18,743	16

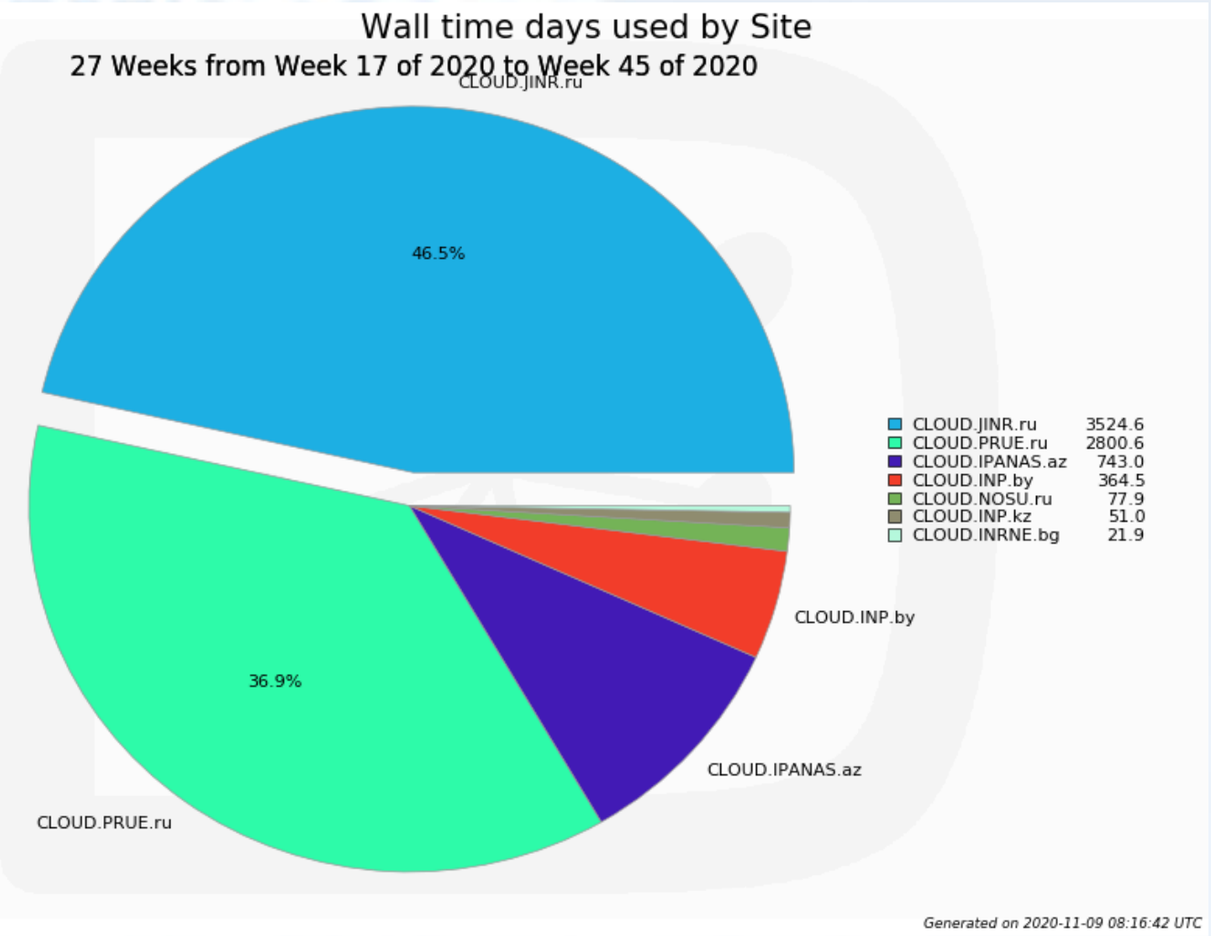
In March 2020, Folding@home launched a program to assist researchers around the world who are working on finding a cure and learning more about the coronavirus pandemic. The initial wave of projects simulate potentially druggable protein targets from SARS-CoV-2 virus, and the related SARS-CoV virus, about which there is significantly more data available.

It was decided to use idle cloud resources to participate in F@H. Our priorities:

1. Do not interfere with other VMs
2. Control of the usage
3. Accounting
4. Only COVID-19 jobs accepted

Statistics on the use of resources

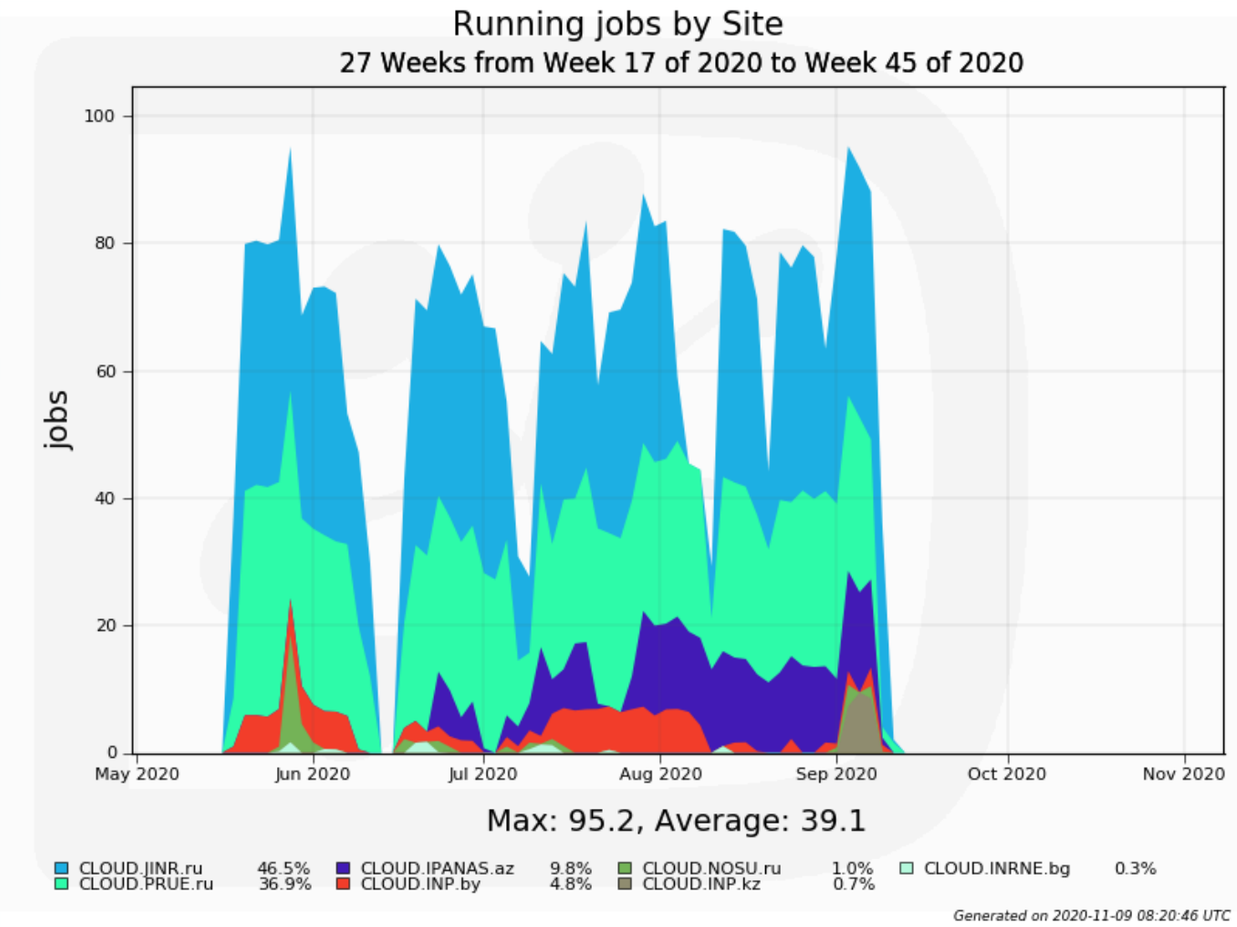




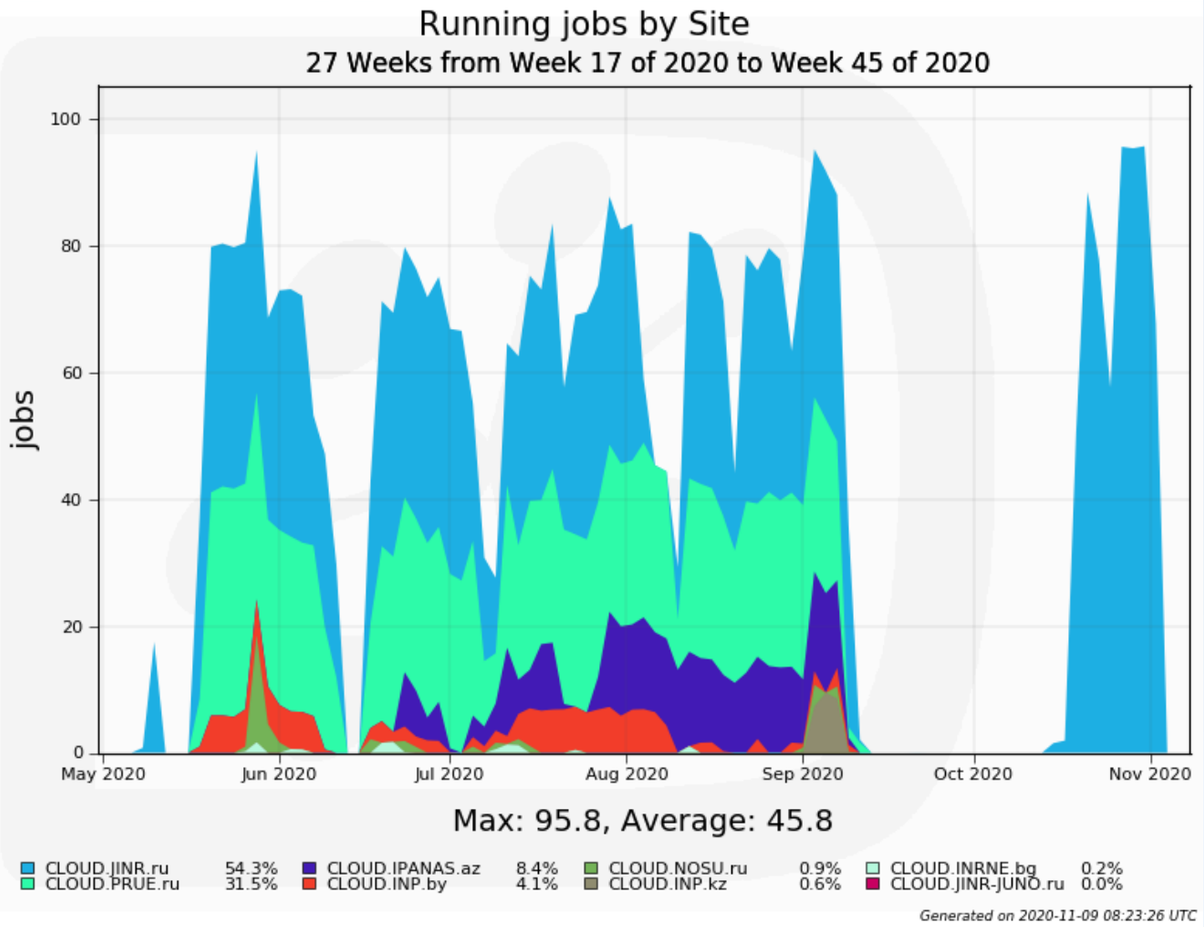
Number of completed tasks on different clouds

Walltime days

Statistics on the use of resources



Running Jobs (simultaneously)



DIRAC FAH+Baikal Running Jobs

Conclusion

For a significant reduction of time spent on research to obtaining meaningful results in scientific domains, the computer resources of the Joint Institute for Nuclear Research and some organizations of its Member States were integrated into a distributed information and computing environment.

A technical possibility for running tasks in that environment was implemented for the BM@N, MPD and Baikal-GVD collaborations users.

Resources that are not occupied by computational tasks within the main JINR scientific domains are used to conduct research on the SARS-CoV-2 virus that causes the COVID-19 disease.

References

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- OpenNebula web-portal. URL: http://opennebula.org.
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- Nikita Balashov, et al. Present Status and Main Directions of the JINR Cloud Development, CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2507, 2019, pp. 185-189.
- Nikita Balashov, et al. Cloud Integration Within the DIRAC Interware, CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2507, 2019, pp. 256-260.

Thank you for attention!