

“GOVORUN” SUPERCOMPUTER FOR JINR TASKS

MAXIM I. ZUEV^{1,2}

¹*Meshcheryakov Laboratory of Information Technologies,
JINR, Dubna, Russia*

²*on behalf on HybriLIT heterogeneous group*

The “Govorun” supercomputer was created in 2018 on top of the experience gained during the operation of the HybriLIT heterogeneous cluster, which is part of the JINR MLIT Multifunctional Information and Computing Complex. HybriLIT has shown its relevance in solving tasks of QCD on lattices, radiation biology, applied research, etc. The continuous growth in the number of users and the expansion of the range of tasks to be solved entailed not only a significant increase in the computing capabilities of the cluster, but also the development and implementation of novel technologies, which resulted in the creation of a new computing system, the “Govorun” supercomputer. The “Govorun” supercomputer was built as a high-performance, scalable liquid-cooled system with a hyperconverged and software-defined architecture. The current configuration of the “Govorun” supercomputer involves computing modules containing GPU and CPU components, as well as a hierarchical data processing and storage system. The total peak performance of the “Govorun” supercomputer is 1.7 PFlops for double-precision calculations (3.4 PFlops for single-precision calculations) with a read/write speed of 300 GB/sec for the hierarchical data processing and storage system.

The created flexible architecture of the “Govorun” supercomputer and the hierarchical data processing and storage system included in it allow one not only to carry out calculations, but also to use the supercomputer as a research polygon for developing software-hardware and IT solutions for tasks underway at JINR. This feature made it possible to deploy polygons for quantum computing and LRB experimental data processing, to integrate the resources of the “Govorun” supercomputer into a unified heterogeneous environment based on the DIRAC platform for the NICA project and utilize its resources to implement the program of runs of data mass modeling within the MPD experiment.

The resources of the “Govorun” supercomputer have shown their relevance and effectiveness in solving such tasks as calculating the electronic structure of superheavy elements taking into account high-order relativistic corrections, investigating changes in the Periodic Law in the field of extremely heavy elements, studying the electronic structure of

elements of the end of the 7th and beginning of the 8th periods, modeling the kinetics of the excitation and relaxation of dielectrics irradiated by fast heavy ions, examining the structure of light exotic, heavy and superheavy nuclei and reactions with them, as well as analyzing the radiation safety of heavy ion accelerators at FLNR JINR using Monte Carlo modeling, etc.

The results obtained using the resources of the “Govorun” supercomputer from the moment it was put into operation in July 2018 until now are reflected in over 336 user publications, two of them in the Nature Physics journal.

At present, the resources of the “Govorun” supercomputer are used by scientific groups from all the Laboratories of the Institute. The number of users of the “Govorun” supercomputer is 350 people, of which 293 are JINR staff members, and 57 are from the Member States. Access to the supercomputer resources is provided only to those users who are directly involved in the implementation of the JINR Topical Plan.