

## FOREWORD

The present issue of the Scientific Report of the Laboratory of Information Technologies (LIT) contains the most important results obtained during the 2006–2007 years within the direction of research *Networking, Computing, Computational Physics*.

The main tasks of the Laboratory of Information Technologies consist in the provision with modern telecommunication, network, and information resources, as well as mathematical support of theoretical and experimental studies conducted by the JINR, Member State institutes at JINR, and other scientific centers.

In order to fulfill the networking and computing tasks, it is necessary to provide: JINR and its Member States with high-speed telecommunication data links; fault-tolerant operation and further development of the high-speed and protected local area network of JINR; development and maintenance of the distributed high-performance computing infrastructure and mass storage resources; information, algorithmic and software support of the research-and-production activity of the Institute; a reliable operation and development of the JINR Grid-segment as a component of the global Grid-structure.

In the field of computational physics, it is needed to perform top research in computational mathematics and physics, aimed at solving specific problems arising in experimental and theoretical research carried out with the participation of JINR. The successful realization of such research efforts assumes: development of mathematical methods and tools for modeling physical processes and experimental data analysis; creation of methods and numerical algorithms for modeling magnetic systems; development of software and computer complexes for experimental data processing; elaboration of numerical algorithms and software for the simulation of complex physical systems; development of methods, algorithms and software of computer algebra; development of computing tools of a new generation. Application of the developed methods and algorithms to other topics in science and technology: nanotechnologies, biology, medicine, economy, industry, etc.

The creation of the distributed high-performance computing infrastructure and mass storage resources is centered around the JINR Central Information and Computing Complex (CICC) as a core of the distributed infrastructure. About 600 staff members of JINR and other research centres are using the JINR Central Information and Computing Complex. JINR CICC facilities were used by more than 15 experiments for mass event production, data simulation and analysis.

In 2006, the JINR CICC comprised 160 CPUs, and 57 TB disk memory. Total performance of computer centre was 100 kSI2K. In 2007, the JINR CICC has been substantially modernized and developed. A new supercomputing cluster was put into operation in June, 2007. At present, the CICC performance equals 670 kSI2K and the disk storage capacity 57 TB (47 TB for user catalogs, software and large data volumes storage). Thus, in the last 2 years the CPU and disk storage resources have been increased 6.7 and 3 times, accordingly.

The performance assessment for parallel computing of the new supercomputer cluster of the JINR CICC was estimated by the High-Performance Linpack Benchmark. The Linpack performance output of 1.124 TFlops (peak performance 2 400 TFlops) ranks the JINR CICC cluster on the 12-th place in the Top50 list of the most powerful computing systems of the CIS states.

The traditional provision of information, algorithmic and software support of the JINR research-and-production activity included a large spectrum of activities both at the LIT and JINR levels.

The elaboration of the JINR Grid segment and its inclusion in the European and global Grid structures have been done through the participation in the Worldwide LHC Computing Grid project (WLCG), the development of LCG/EGEE infrastructure, the participation in the

development of the Russian Tier2 Cluster, Grid middleware evaluations, participation in the LHC projects ALICE, CMS, and ATLAS.

The Laboratory staff participated in research work done within 13 topics at the project level and within 23 topics at the cooperation level inside JINR.

The main results have been published in leading scientific journals, proceedings of scientific conferences, JINR preprints and JINR communications.

The JINR Member States show a high interest in the LIT activities. The LIT cooperation with Romanian institutes is successfully done within the Hulubei-Meshcheryakov programme/Protokols of cooperation have been conducted with INRNE (Bulgaria), ArmeSFo (Armenia), FZK Karlsruhe GmbH (Germany), IHEPI TSU (Georgia), NC PHEP BSU (Belarus), KFTI NASU (Ukraine), Tashkent (Uzbekistan), Wroclaw(Poland), University of Bucharest, IFIN-HH (Romania), etc. In frames of this theme we have BMBF grant, CERN-JINR Cooperation Agreement on several topics, JINR-South Africa cooperation agreement. The project “Dubna-Grid” started in 2004 on the base of the Agreement between Administration of Dubna, JINR, and University “Dubna” for creation of a city-wide multi-purpose new generation informational infrastructure based on the Grid technologies.

Some work was performed also in frames of participation in common projects: NATO project “DREAMS-ASIA”, Worldwide LHC Computing Grid, and Enabling Grids for E-science project. In 2005-2006 LIT JINR was a leading executor of work on the State Contract I-22.3/001 “Creation of a prototype of a new generation base Grid-services centre for intensive operations with distributed data of a federal scale”. From the year 2007 LIT team participates in SKIF-GRID project.

LIT was the main organizer of the Second International Conference “Distributed Computing and Grid Technologies in Science and Education”, Dubna, June 26 - 30, 2006, XIII International Conference “Mathematics. Computer. Education” January 23 - 28, 2006, 10-th Workshop on Computer Algebra, May 23 -24, 2006 , 11-th International Workshop on Computer Algebra, May 24 - 25, 2007, the 4th International Workshop “Quantum Physics and Communication” “QPC 2007”, October 15 - 19, 2007, and one of the organizers of the International Conference “Mathematical Modeling and Computational Physics 2006”, High Tatra Moutains, Slovakia, August 28 - September 1, 2006, and the XXI International Symposium on Nuclear Electronics & Computing “NEC’2007”, Varna, Bulgaria, 10-17 September, 2007.

It is our hope that the results of the research work collected in this report will be useful to the scientific community of JINR and JINR Member States to throw new bridges for joint scientific collaborations in the years to come.

**Editors**