

Information and Computing Infrastructure of JINR

Leader: V.V. Korenkov
Deputy: T.A. Strizh

Participating countries and international organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, CERN, China, Czech Republic, Egypt, France, Georgia, Germany, Italy, Kazakhstan, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, South Africa, Sweden, Taiwan, Ukraine, USA.

Issues addressed and main goals of research:

The purpose of the theme is to develop the network, information and computing infrastructure of JINR for the research and production activities of the Institute and its Member States on the basis of state-of-the-art information technologies in accordance with the Seven-Year Plan for the development of JINR. A particular direction within the theme is the development of the JINR LIT Multifunctional Information and Computing Complex (MICC) presented as a Project.

Expected results in the current year:

- Provision of the reliable operation of the JINR local network, namely the NICA megaproject transport network (400 Gbps); the LIT mesh network (100 Gbps); the backbone network (2x100 Gbps); the Wi-Fi network of the JINR campus using deep signal penetration technologies. Modernization of the internet-exchange node Dubna-IX. Development of the SSO authorization service. Work on updating the level of information security, namely the organization of the DPI gateway, i.e. a system service of deep analysis of data packages; the adaption of the 6-layered structure of information security management of the JINR network.

Completion of works on the system of redundant and uninterrupted power supplies of the MICC infrastructure. Putting into service new infrastructure modules in the MICC hall to create optimal climate conditions for the equipment. Elaboration of the project on fire safety for the MICC engineering infrastructure.

Building up the MICC basic grid component, i.e. the Tier1 center of the CMS experiment at JINR: processor capacities up to 200 kHS06, dCache storage systems on disks up to 8.8 PB and tape storage up to 25 PB.

Expansion of the computing resources and data storage systems as part of the Tier2/CICC integral component, namely processor capacities up to 110 kHS06 and disk storages up to 5.5 PB.

Expansion of the capacity of the general distributed data storage system on the basis of the EOS file system at the JINR MICC up to 10 PB.

Enlargement of the computing part of the MICC cloud component to expand the range of services and the number of resources provided to users up to 2000 CPU cores and 10 TB of RAM. Increasing the total volume of cloud storage based on ceph up to 1.5 PB. Expansion of the capacity of the JINR cloud due to resources acquired by the experiments Baikal-GVD, JUNO, NOvA and their support. Development of the distributed information and computing platform based on DIRAC integrating cloud resources of the organizations of the JINR Member States.

Development of the computing resources of the "Govorun" supercomputer to meet the needs of users from JINR and its Member States.

Development of the data processing flow management system: the analysis of deployed services and solutions, the choice of load and data management systems, the refinement of components, the integration with the authentication system, the elaboration of an authorization system, the development of an information system, the stage-by-stage integration with the MICC resources.

Introduction of control parameters of the external engineering infrastructure into the MICC monitoring system: diesel generators, cooling towers, external elements of the cooling system. Work on expanding the monitoring system by including new nodes of the computing infrastructure of Tier1, Tier2, CICC and the “Govorun” supercomputer.

- Development and maintenance of the electronic document system EDS “Dubna”, the project management system APT EVM for NICA, the systems ADB2, ISS, “Document Base”, HR LHEP at the request of end users and the recommendations of the coordination group on the development of databases, electronic document management and information security, with the concept of the cloud SaaS platform of a unified administrative and business information system. Development and commissioning of the JINR Scientific Attestation Information System (SAIS).

Work on the transfer from 1C MEM to a new software product 1C ERP 2.4. Creation of a mechanism for the transparent integration of the systems 1C MEM and ERP 2.4. Completion of the project of transferring the personnel management system to the configuration 1C “Corporate salary and personnel management”. Work on the current maintenance, system refinement and user support. Creation of mobile systems for themes management. Continuation of works on the automation of self-supporting subdivisions. Increasing the performance and reliability of the system by optimizing the code, analyzing long requests, arising locks in the database and by increasing the performance of servers and reallocating the functionality performed on them.

Continuation of works on upgrading the information system based on the Invenio JOIN2 platform: the unification of metadata formats; regular updating of the software platform; the development of the functionality of the JOIN2 software platform; support of collections “Authorities”.

Transition to modern software development tools including free software (Intel Parallel Studio, GNU Compiler Collection) for creating libraries of JINRLIB programs and CERNLIB mathematical programs (MATHLIB).

Development and maintenance of central information servers and portals for information support and software for LIT and JINR activities. Maintenance of VisitCentre websites, PEPAN and PEPAN Letters journals.

Providing users with modern IT solutions and services in the field of high performance computing, including the development of an ecosystem for machine and deep learning, Big data analysis for solving problems of fast recognition of multiple tracks in particle physics experiments. Development of the HLIT-VDI service for calculations as part of application packages with an advanced graphics interface such as Mathematica, Matlab, COMSOL Multiphysics, FLUKA, etc. Introduction and development of the “My Account” service providing platform users with information on work in the system, platform resource usage statistics, etc.

- Organizing and conducting regular courses on modern IT technologies including special courses from leading software developers for both the Institute staff and students and young scientists from the JINR Member States within practices organized by the UC and conferences and schools organized by JINR. Organizing specialized courses on training IT specialists for solving problems related to the processing and analysis of data for megascience experiments, including the NICA project.

List of projects:

Project	Leader	Priority (period of realization)
1. MICC	V.V. Korenkov	1 (2017 – 2023)

List of activities:

Activity or experiment	Leaders
Laboratory or other	Main researchers
Division of JINR	
1. MICC Project	V.V. Korenkov A.G. Dolbilov V.V. Mitsyn T.A. Strizh
LIT	Gh. Adam, G. Adamov, Eu.I. Aleksandrov, I.N. Aleksandrov, K.N. Angelov, A.S. Baginyan, A.I. Balandin, N.A. Balashov, A.V. Baranov, S.D. Belov, D.V. Belyakov, A.S. Bondyakov, Yu.A. Butenko, A.I. Churin, S.V. Chashchin, S.V. Gavrilov, A.P. Gavrish, V.V. Galaktionov, T.M. Goloskokova, A.O. Golunov, E.N. Grafova, Eu.A. Grafov, N.I. Gromova, A.E. Gushchin, I.S. Kadochnikov, A.S. Kamensky, V.A. Kapitonov, I.A. Kashunin, A.O. Kondratiev, G.A. Korobova, E.Yu. Kulpin, N.A. Kutovskiy, A.A. Lavrentiev, S.B. Marchenko, M.A. Matveev, S.V. Mitsyn, A.V. Nechaevsky, D.A. Oleynik, G.A. Ososkov, I.S. Pelevanyuk, A.Sh. Petrosyan, M.S. Plyashkevich, D.V. Podgainy, L.A. Popov, D.I. Pryakhina, Ya.I. Rozenberg, T.F. Sapozhnikova, R.N. Semenov, M.L. Shishmakov, O.I. Streltsova, V.V. Trofimov, N.N. Voitishin, A.S. Vorontsov, A.V. Uzhinskiy, A.Yu. Zakomoldin, V.E. Zhiltsov, P.V. Zrelov, M.I. Zuev
VBLHEP	Yu.K. Potrebenikov, Yu.P. Minaev, O.V. Rogachevsky, B.G. Shchinov, S.V. Shmatov, A.N. Moshkin
FLNP	G.A. Sukhomlinov
LRB	V.N. Chausov
FLNR	V.V. Sorokoumov, A.G. Polyakov
DLNP	Yu.P. Ivanov
BLTP	A.A. Sazonov
UC	I.N. Semeniushkin
2. Information and software support of the research-and-production activity at JINR	P.V. Zrelov V.V. Korenkov I.A. Filozova
LIT	N.A. Balashov, A.V. Baranov, D.V. Belyakov, N.A. Davyudova, S.V. Duchits, V.P. Gerdt, T.M. Goloskokova, D.S. Golub, N.V. Jerusalemova, L.A. Kalmykova, A.A. Karlov, D.V. Kekelidze, S.A. Kretova, S.V. Kunyaev, G.A. Kurmaeva, N.A. Kutovskiy, A.A. Kutovskaya, O.G. Melnikova, G.G. Musulmanbekov, S.A. Nechitailo, E.A. Paschenko, M.S. Plyashkevich, L.V. Popkova, A.V. Prikhodko, V.M. Pushkina, E.Yu. Razinkova, A.M. Raportirenko, A.P. Sapozhnikov, T.F. Sapozhnikova, S.V. Semashko, R.N. Semenov, A.V. Sheyko, G.V. Shestakova, D.B. Stankus, T.S. Syresina, N.N. Vorobieva, V.M. Yagafarova, A.G. Zaikina, T.N. Zaikina

SOICO

A.S. Sorin, V.F. Borisovskiy

VBLHEP

Yu.K. Potrebenikov, A.V. Philippov, K.V. Turusina

3. Development of the system for training and retraining of IT specialists based on the JINR MICC and its educational components

**V.V. Korenkov
T.A. Strizh
O.I. Streltsova**

LIT

N.A. Balashov, A.V. Baranov, S.D. Belov, V.V. Galaktionov, T.M. Goloskokova, N.I. Gromova, I.S. Kadochnikov, D.V. Kekelidze, N.A. Kutovskiy, V.V. Mitsyn, S.V. Mitsyn, I.K. Nekrasova, A.V. Nechaevsky, D.A. Oleynik, A.Sh. Petrosyan, D.V. Podgainy, T.F. Sapozhnikova, R.N. Semenov, V.V. Trofimov, A.V. Uzhinskiy, V.E. Zhiltsov, M.I. Zuev

UC

S.Z. Pakuliak

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia

Yerevan

IIAP NAS RA

Azerbaijan

Baku

IP ANAS

Belarus

Minsk

BSTU

INP BSU

JIPNR-Sosny

NASB

GSTU

Bulgaria

Gomel

INRNE BAS

Sofia

SU

CERN

Geneva

CERN

China

Beijing

IHEP CAS

Czech Republic

Prague

IP CAS

Egypt

Giza

CU

France

Marseille

CPPM

Georgia

Tbilisi

GRENA

GTU

TSU

Germany

Darmstadt

GSI

Frankfurt/Main

Univ.

Hamburg

DESY

Karlsruhe

KIT

Zeuthen

DESY

Italy

Bologna

INFN

Kazakhstan

Nur-Sultan

BA INP

NU

Almaty

INP

Moldova

Chişinău

IMCS

		IAP
		RENAM
Mongolia	Ulaanbaatar	NUM
Poland	Krakow	CYFRONET
Romania	Bucharest	IFIN-HH
	Cluj-Napoca	INCDTIM
	Magurele	IFA
Russia	Moscow	FRC IM RAS
		IITP RAS
		ISP RAS
		ITEP
		KIAM RAS
		MPEI
		MSU
		MSK-IX
		NRC KI
		RCC MSU
		RSCC
		SINP MSU
		INR RAS
	Moscow, Troitsk	SCC IPCP RAS
	Chernogolovka	LITP RAS
		Dubna State Univ.
	Dubna	SCC "Dubna"
		SEZ "Dubna"
		NRC KI PNPI
	Gatchina	UNN
	Nizhny Novgorod	BINP SB RAS
	Novosibirsk	PSI RAS
	Pereslavl-Zaleskiy	IHEP
	Protvino	IMPB RAS
	Puschino	SU
	Samara	ITMO Univ.
	St. Petersburg	CC SPbSU
		ITMO Univ.
		FIP
		SPbSU
		SPbSPU
Slovakia	Košice	IEP SAS
	Prešov	PU
South Africa	Cape Town	UCT
Sweden	Lund	LU
Taiwan	Taipei	ASGCCA
Ukraine	Kiev	BITP NASU
	Kharkov	NSC KIPT

USA

Arlington, TX
Batavia, IL
Upton, NY

UTA
Fermilab
BNL