Development of distributed computing technologies and BigData in LIT-JINR

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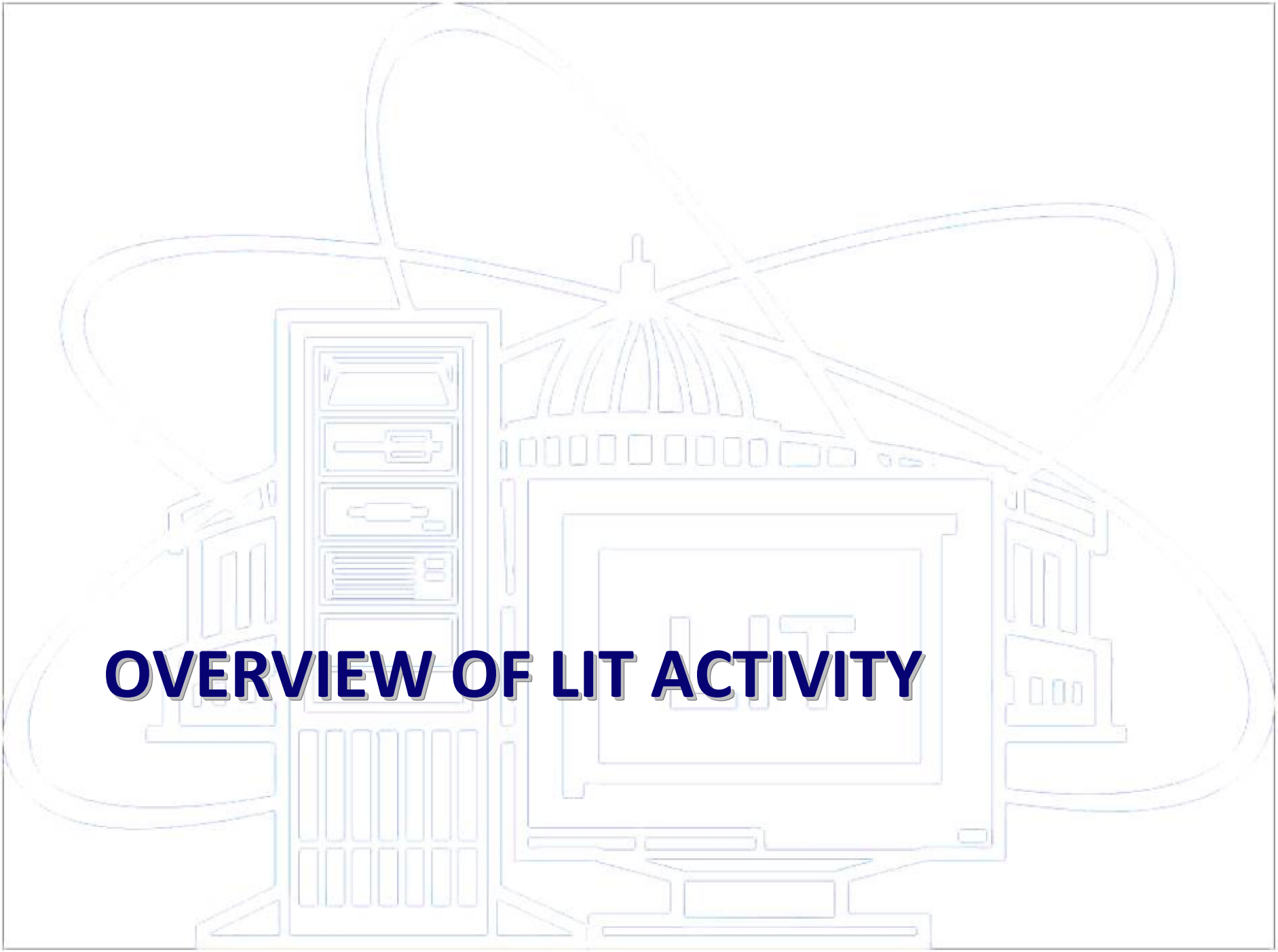
Invited Lecture at the RO-LCG 2014 conference, November 3-5, 2014



OVERVIEW OF LIT ACTIVITY

Five Pillars of LIT-JINR Development

The information technology and computing roadmap for the JINR are built on five pillars allowing the JINR to be well positioned to face the foreseeable challenges:

- **IT-infrastructure development**
- **Mathematical and software support of JINR research**
- **Corporative information system**
- **Training, education and user support**
- **User policies**

While it is difficult to predict where technology will be in next few years, a strategy that puts key foundational policies, resources, and infrastructure in place, will allow the JINR to be well positioned to lead and adapt to changes in information technology and computing for the JINR benefit.

IT-infrastructure is the one of JINR basic facilities with 24/7 service, such availability is called nonstop service

Guidelines of LIT-JINR Activities

1. **The Seven-Year Plan for JINR Development, 2010-2016**
2. **The annual Topical Plans for JINR Research**.

   Priorities are defined by:
   - Meetings with directorate of other JINR Laboratories
   - Specific research interests of JINR Member States financed by grants and projects of the Plenipotentiary Representatives (Bulgaria, Czech Rep., Romania, Slovakia, Georgia)
   - Joint projects (BMBF, CERN/WLCG, Hulubei-Meshcheryakov, AR Egypt, South Africa)
   - Protocols of cooperation with external scientific organizations (45 concluded protocols)
   - Joint programs with JINR Member States (JINR – Czech R, JINR – Poland, JINR – Romania, JINR – Bulgaria)
3. **Initiative projects** focused on research in the field of computational physics aimed at software development for modern computing architectures (Geant4, BigData, Quantum Information, Research on home-made own facilities)
4. **Contracts** with external organizations on commercial basis (LIT Extra-budgetary Self-supporting Unit)

JINR Field of Research:

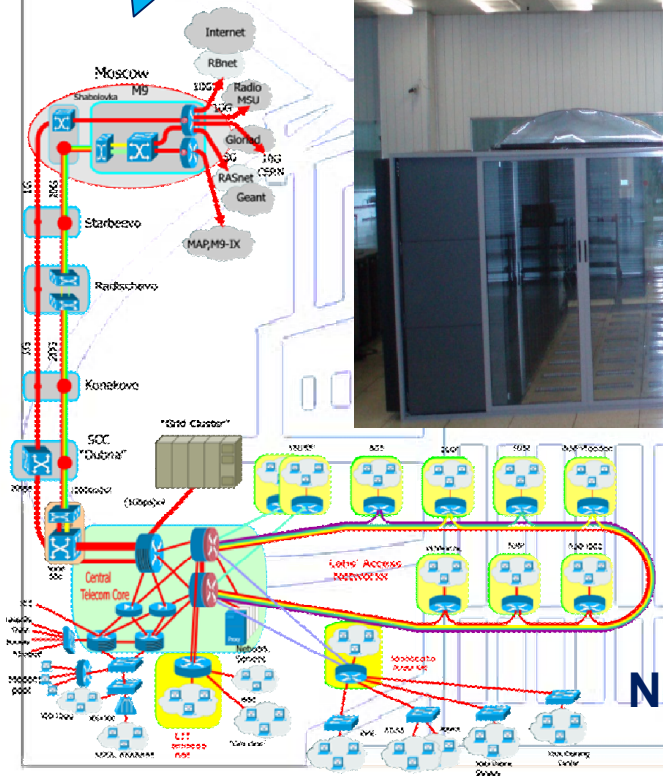
Networking, Computing, Computational Physics

LIT Topics in JINR Topical Plan:

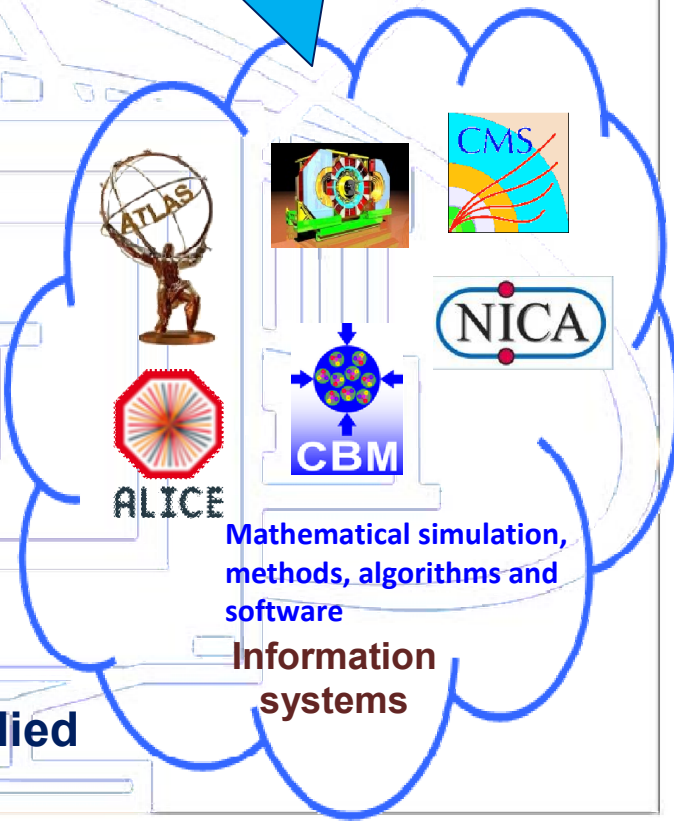
05-6-1118-2014/2016 Information and Computing Infrastructure of JINR

05-6-1119-2014/2016 Methods, algorithms and software for modeling physical systems, mathematical processing and analysis of experimental data

Resource



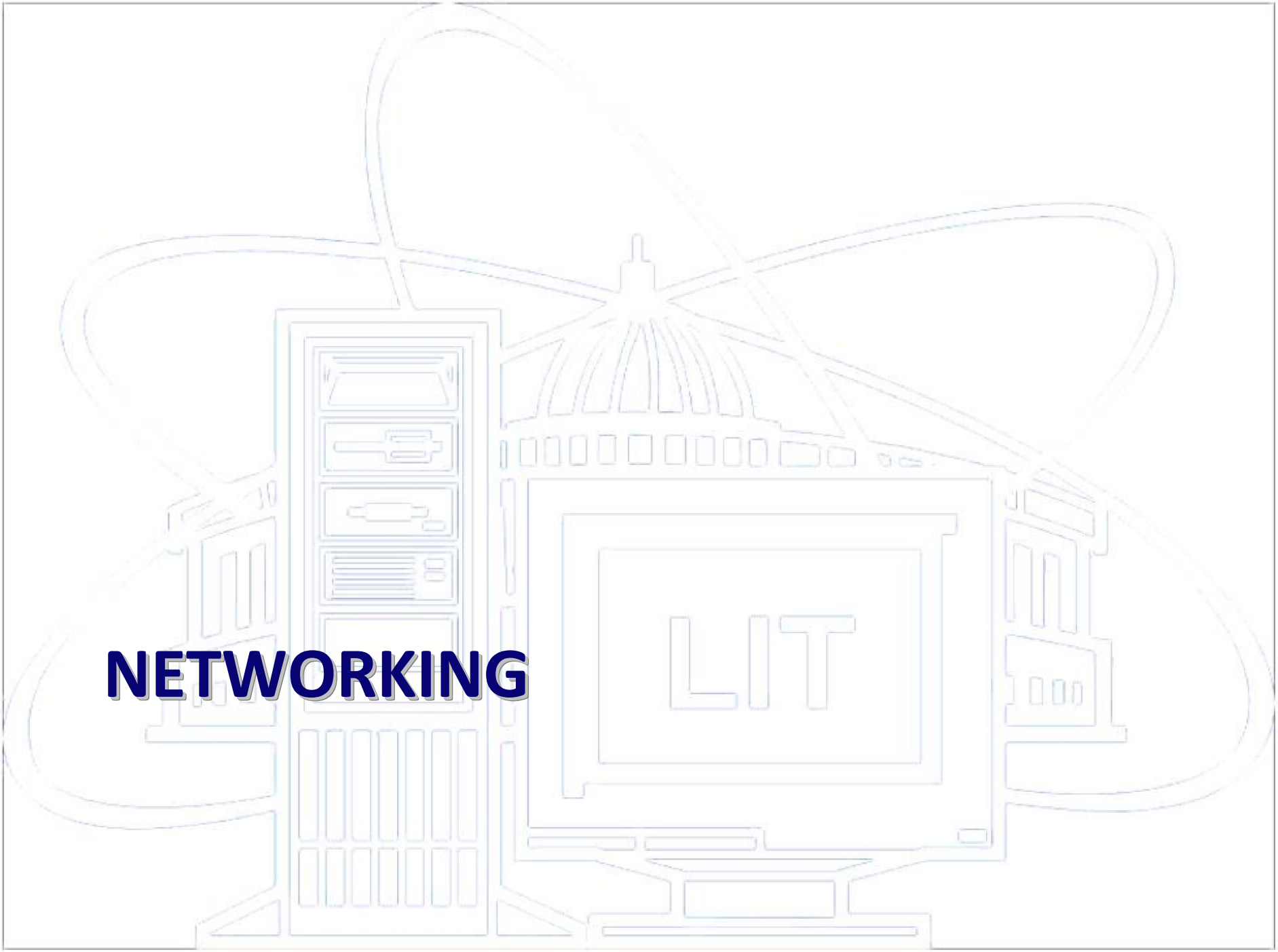
Network



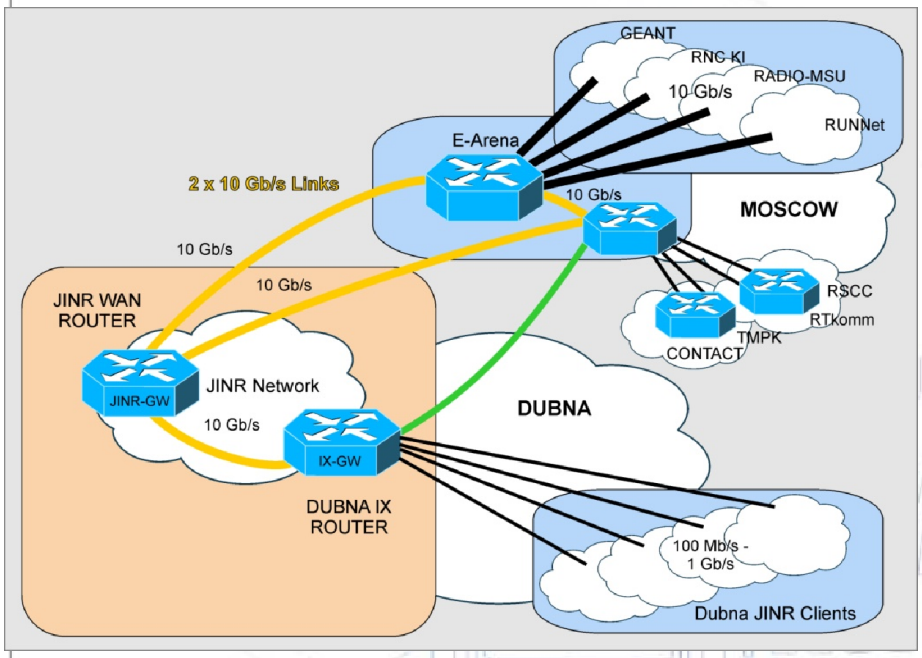
Applied

Mathematical simulation, methods, algorithms and software

Information systems



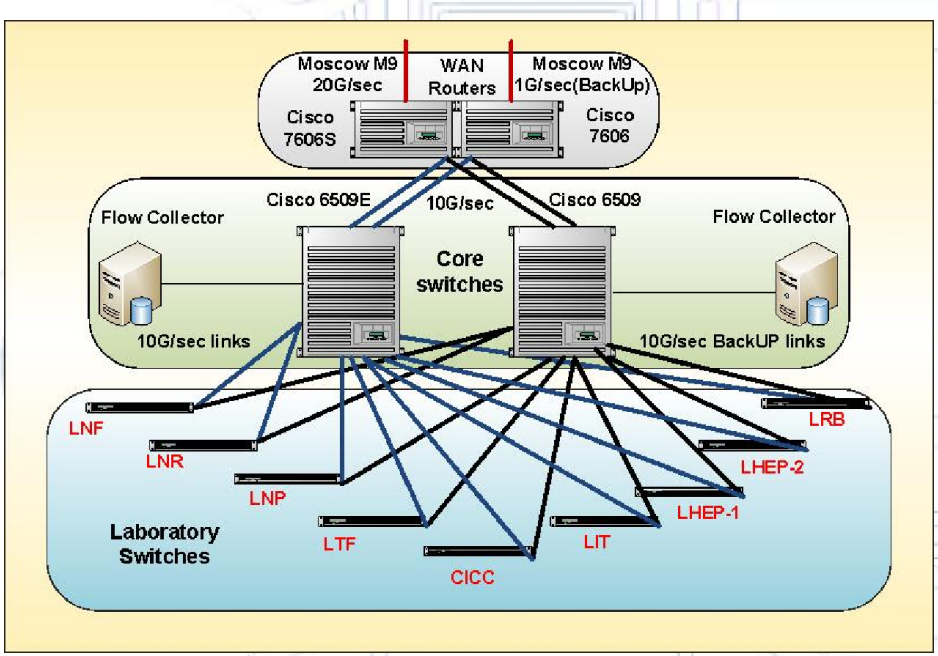
NETWORKING



The JINR network infrastructure has worldwide connectivity through telecommunication channels:

Moscow-20Gbps

CERN – 10Gbps; RBnet - 10Gbps; RASnet - 10Gbps; RadioMSU - 10Gbps; GEANT – 2x10Gbps; GLORIAD - 1Gbps, etc.



JINR Local Area Network

Comprises **7726** computers & nodes

Users – **4020**, IP – **12259**

Remote VPN users – **854**

E-library**- 1398,** VOIP **-120,** AFS **- 367**

High-speed transport (10 Gb/s)

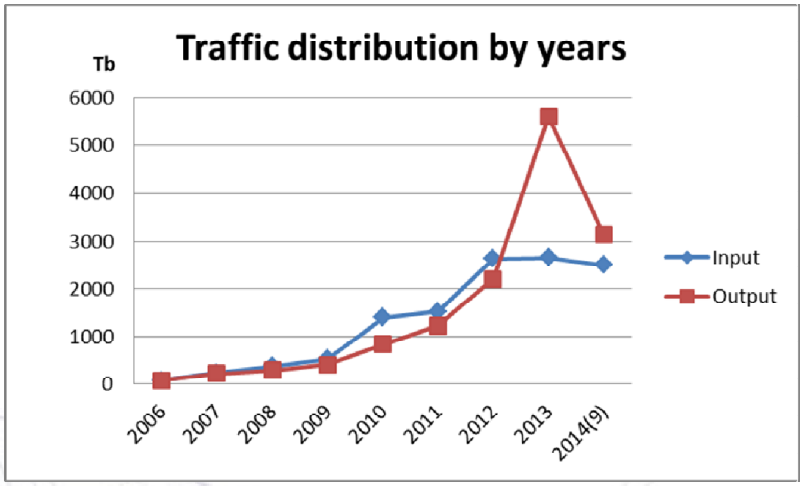
Controlled-access at network entrance.

General network authorization system involves basic services (AFS, batch systems, Grid, JINR LAN remote access, etc.)

IPDB database - registration and the authorization of the network elements and users, the visualization of statistics of the network traffic flow, etc.

Traffic distribution by categories

N	Категория	Сокращение	Входящий (IN) ->ОИЯИ	Исходящий (OUT) ОИЯИ->	% от IN	% от OUT
1	Научные и образовательные организации	SCIENCE	1891.58 Tb	2478.58 Tb	93.43 %	95.29 %
2	Файлообмен (p2p)	P2P	83.86 Tb	117.26 Tb	4.14 %	4.51 %
3	Веб ресурсы	WEB	31.39 Tb	4.48 Tb	1.55 %	0.17 %
4	Социальные сети	SOCIAL_NET	13.09 Tb	272.25 Gb	0.65 %	0.01 %
5	Программное обеспечение	SOFTWARE	4.25 Tb	376.94 Gb	0.21 %	0.01 %
6	Мультримедийные трансляции	MM_STREAM	343.13 Gb	24.79 Gb	0.02 %	0 %
7	Дубненские сети	DUBNA	24.15 Gb	41.67 Gb	0 %	0 %
Всего:			2024.53 Tb	2601.01 Tb	100 %	100 %



Paid by JINR Laboratories and subdivisions

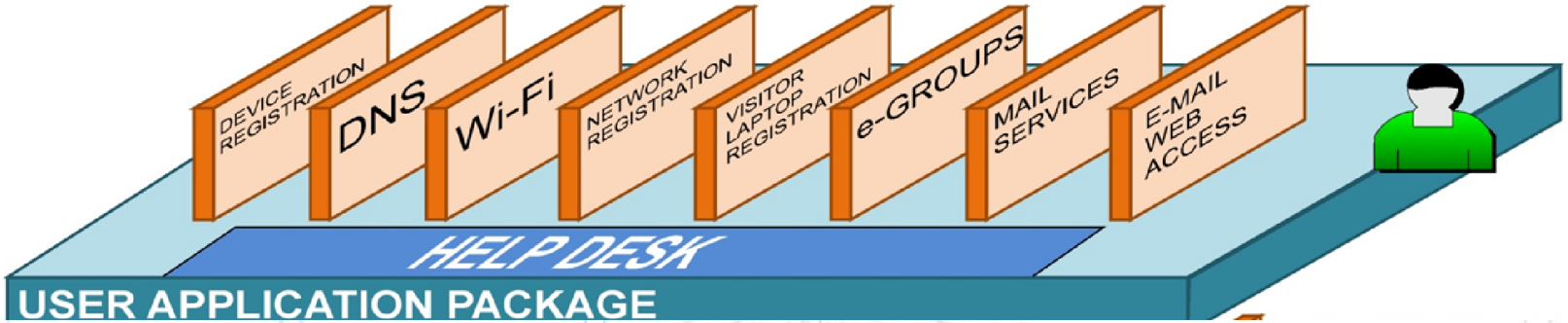
N	Подразделение	Входящий (IN)	Исходящий (OUT)	% от IN	% от OUT
1	Центральный информационно-вычислительный комплекс	1773.66 Tb	1495.6 Tb	71.47 %	47.37 %
2	TIER_1	428.05 Tb	1477.74 Tb	17.25 %	46.81 %
3	Лаборатория Физики Высоких Энергий	52.91 Tb	26.72 Tb	2.13 %	0.85 %
4	Лаборатория Ядерных Проблем	42.82 Tb	39.51 Tb	1.73 %	1.25 %
5	Лаборатория Нейтронной Физики	33.71 Tb	36.7 Tb	1.36 %	1.16 %
6	Лаборатория Информационных Технологий	33.58 Tb	16.35 Tb	1.35 %	0.52 %
7	Сервера общего доступа	28.49 Tb	6.11 Tb	1.15 %	0.19 %
8	Лаборатория Радиационной биологии	19.55 Tb	968.35 Gb	0.79 %	0.03 %
9	Лаборатория Теоретической Физики	14.36 Tb	6.13 Tb	0.58 %	0.19 %
10	Управление	13.89 Tb	33.67 Tb	0.56 %	1.07 %
11	Лаборатория Ядерных Реакций	12.01 Tb	2.62 Tb	0.48 %	0.08 %
12	Узел удаленного доступа	11.56 Tb	3.32 Tb	0.47 %	0.11 %
13	МСЧ-9	3.76 Tb	800.89 Gb	0.15 %	0.02 %
14	Университет Дубна	3.36 Tb	3.89 Tb	0.14 %	0.12 %
15	Библиотека ОМК	2.04 Tb	415.73 Gb	0.08 %	0.01 %
16	Научный центр прикладных исследований	1.66 Tb	209.04 Gb	0.07 %	0.01 %
17	Деп ХО	1.46 Tb	126.67 Gb	0.06 %	0 %
18	Учебно-научный центр	1.12 Tb	925.47 Gb	0.05 %	0.03 %
19	Отдел радиационной безопасности	646.85 Gb	82.72 Gb	0.03 %	0 %
20	Отдел импортно-экспортных операций	578.05 Gb	67.5 Gb	0.02 %	0 %
21	Дом Международных Совещаний	556.29 Gb	118.74 Gb	0.02 %	0 %
22	УТС - Участок Телефонной Связи	455.53 Gb	168.1 Gb	0.02 %	0.01 %
23	Издательский Отдел	291.48 Gb	40.17 Gb	0.01 %	0 %
24	Участок пожарной автоматики	233.55 Gb	17.51 Gb	0.01 %	0 %
25	Ремонтно-строительный участок	210.74 Gb	14.57 Gb	0.01 %	0 %
26	Научно-техническая библиотека	173.2 Gb	60.1 Gb	0.01 %	0 %
27	Алушта	160.79 Gb	32.7 Gb	0.01 %	0 %
28	Объединенный местный комитет 2 (ф)	123.95 Gb	24.55 Gb	0 %	0 %
29	GRID	99.96 Gb	4.76 Tb	0 %	0.15 %
30	ПромСанЛаборатория	84.29 Gb	8.53 Gb	0 %	0 %
31	Пожарная часть 26	74.56 Gb	6.96 Gb	0 %	0 %
32	Автохозяйство	51.49 Gb	6.45 Gb	0 %	0 %
33	Отдел капитального строительства	43.67 Gb	2.48 Gb	0 %	0 %
34	Охрана	34.08 Gb	7.05 Gb	0 %	0 %
35	Объединенный местный комитет	10 Gb	581.22 Mb	0 %	0 %
36	Отдел Хозяйственного обслуживания	2.58 Gb	266.46 Mb	0 %	0 %
Всего:		2481.72 Tb	3157.14 Tb	100 %	100 %

WLCG traffic - paid by LIT, LHEP and DLNP as Laboratories involved in data processing of ATLAS, ALICE and CMS experiments

Paid by external organizations

N	Подразделение	Входящий (IN)	Исходящий (OUT)	% от IN	% от OUT
1	Гостинично-ресторанный комплек	8.81 Tb	1.8 Tb	41.95 %	42.67 %
2	ОАО 'НПК Дедал'	5.48 Tb	836.86 Gb	26.1 %	19.42 %
3	Санаторий-профилакторий 'Ратмино'	2.98 Tb	878.45 Gb	14.22 %	20.38 %
4	ООО "НПО Атом"	1.73 Tb	321.67 Gb	8.24 %	7.46 %
5	Отдел Главного Энергетика	1.29 Tb	108.32 Gb	6.14 %	2.51 %
6	Управление социальной инфраструктурой	422.77 Gb	49.09 Gb	1.97 %	1.14 %
7	ООО "Металлтехника"	219.07 Gb	83.55 Gb	1.02 %	1.94 %
8	Филиал МГУ	57.76 Gb	49.32 Gb	0.27 %	1.14 %
9	ЗАО "МПОТК "Технокомплект"	8.81 Gb	105.06 Gb	0.04 %	2.44 %
10	ООО 'Нейтронные технологии'	5.07 Gb	35.4 Gb	0.02 %	0.82 %
11	Международный инновационный центр	3.7 Gb	2.52 Gb	0.02 %	0.06 %
12	ООО "Таларии"	619.44 Mb	94.51 Mb	0 %	0 %
13	Банкоматы Сбербанка	295.62 Mb	255.06 Mb	0 %	0.01 %
14	МДМ Банк	47.13 Mb	47.02 Mb	0 %	0 %
15	НПО 'Аспект'	35.5 Mb	56.87 Mb	0 %	0 %
16	Оптическая связь	10.79 Mb	11.14 Mb	0 %	0 %
Всего:		21 Tb	4.21 Tb	100 %	100 %

Mail service *mail.jinr.ru*



- Number of registered users – 1800.
- Disk quota per user – 750 Mbyte.
- Antivirus and antispam security:

  Blocks ~ 50 000 spam messages daily.
- Daily incoming messages ~ 7 500.
- Daily outcoming messages ~ 3 000:

  Three main destinations:

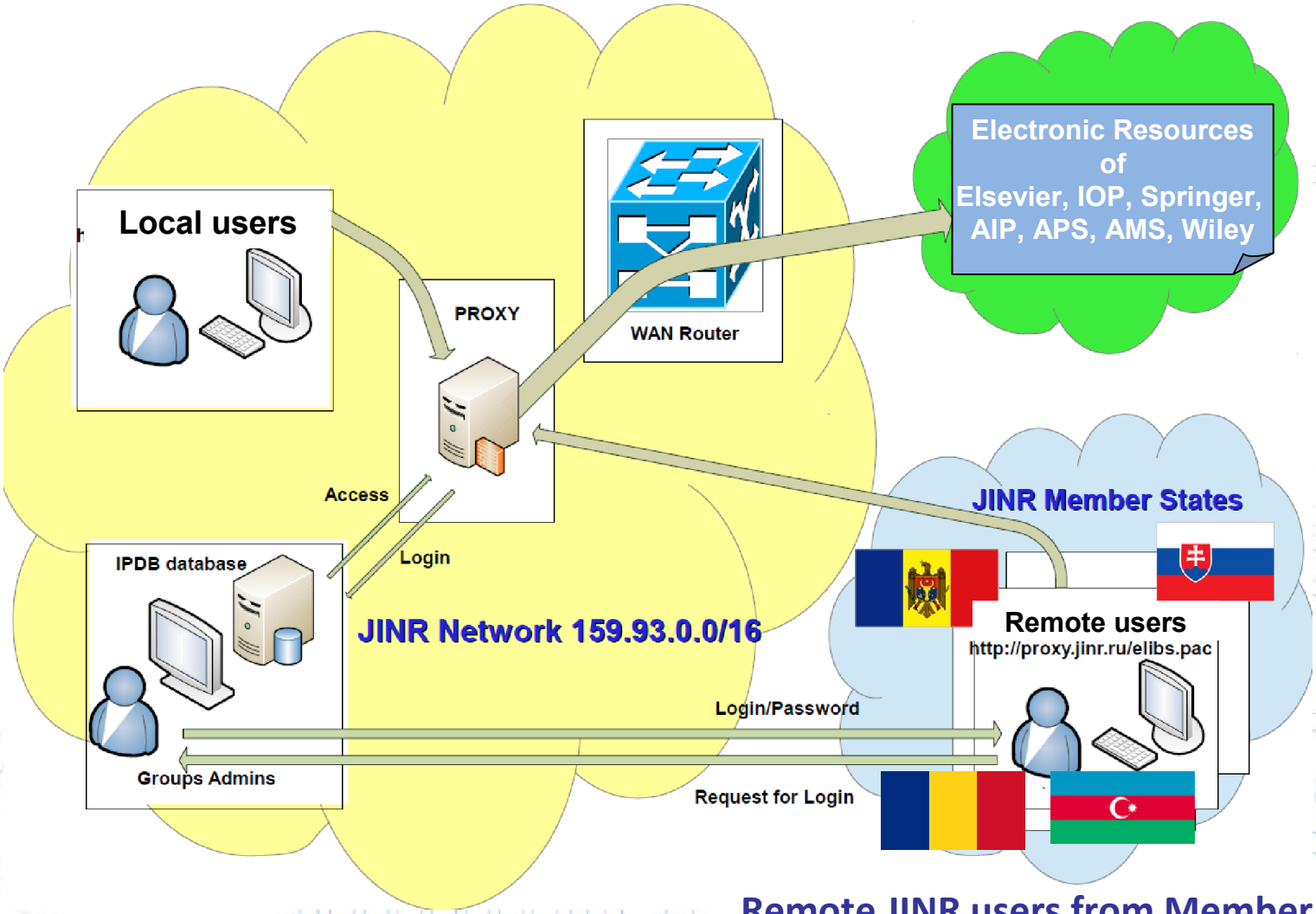
  cca. 500 – transit messages to other JINR servers;

  cca. 1000 – messages to servers of outer networks;

  cca. 1500 – change of messages within the server itself

mail.jinr.ru ←→ *mail.jinr.ru*

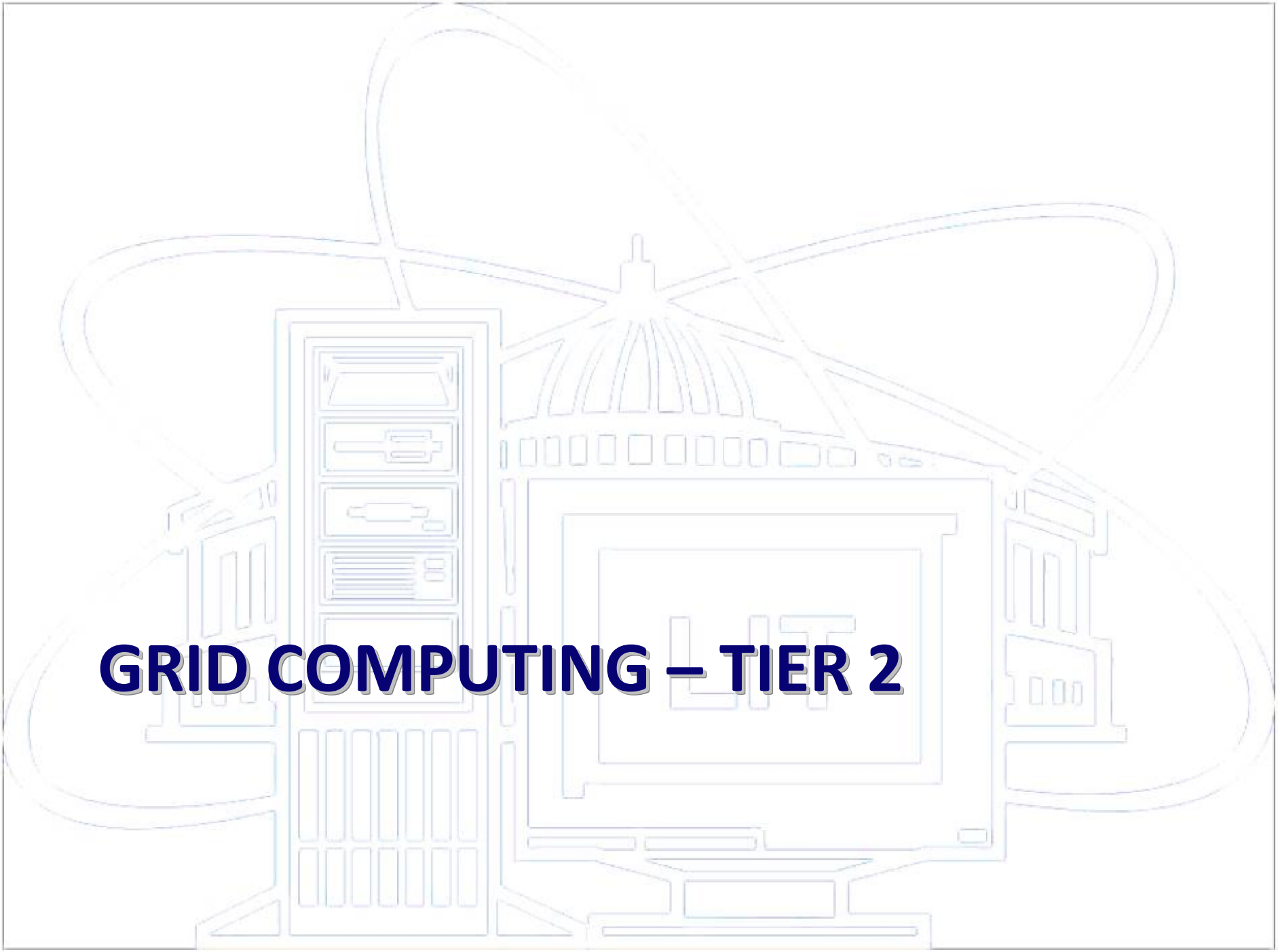
Access Service to Electronic Resources of World Publishers



Total e-library users: 1398

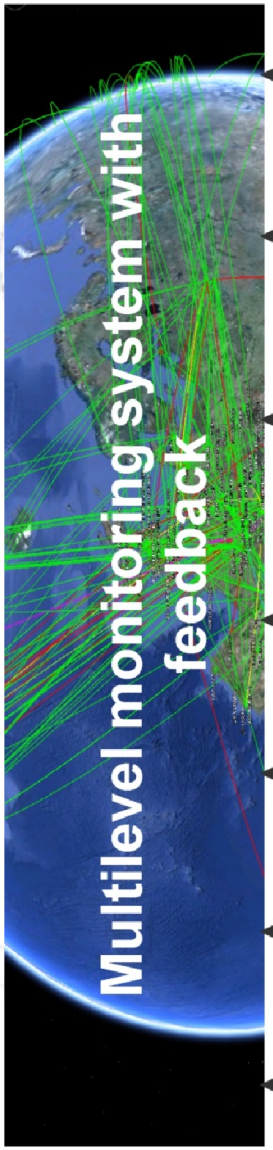
Remote JINR users from Member States :

Republic of Azerbaijan - 24
Slovak Republic - 39
Republic of Moldova – 6 (+3)
Romania – 35, Bulgaria -1 (+8), Georgia-1(+7)



GRID COMPUTING – TIER 2

The multilevel computing system components



Users	Grid Virtual Organizations	Outside users	Local users	Users of parallel computing
Services and applications	Software for simulation and program libraries	Virtual organization specific software	Data and jobs flow analysis	
Grid Middleware	Security	Job management	Data management	Information services
Basic software	OS	Network services	Cloud	Software and tools
Equipment	Server pool	Computing environment: basic / parallel / hybrid	Disk pool	Tape library
Network infrastructure	Local network	Trunks	Communication environment	External communications
Engineering infrastructure	Uninterrupted power supply	Climate control system	Fire extinguishing system	

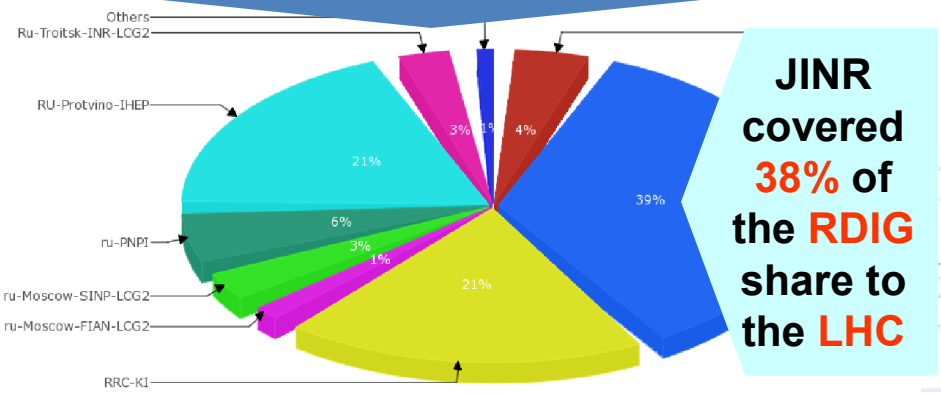
JINR Central Information and Computing Complex (CICC)
JINR-LCG2 Tier2 Site

~ 4 million Jobs (using ~166 million normalized CPU time) were executed during the first eight months of 2014

CICC comprises 2448 Cores
Disk storage capacity 1800 TB

Availability and Reliability = 99%

RDIG Normalized CPU time (HEPSPEC06) per site (2010-2013)



JINR covered 38% of the RDIG share to the LHC

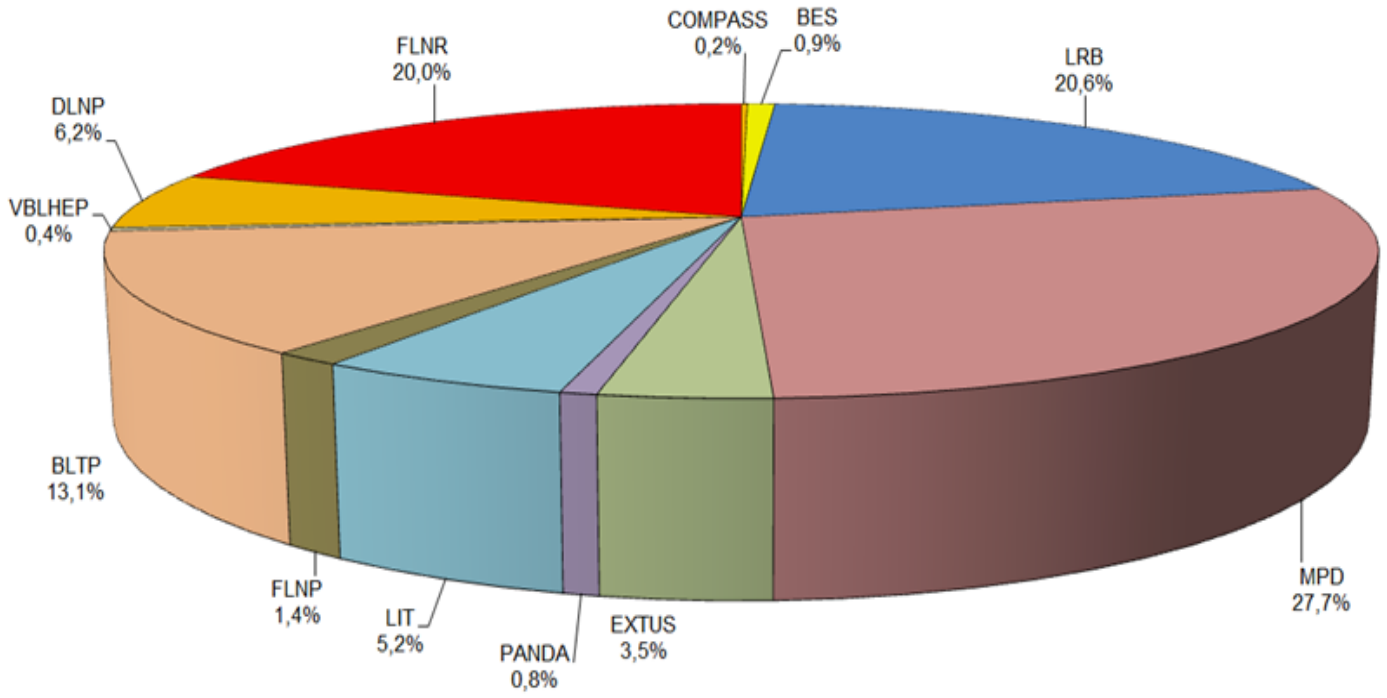
Foreseen computing resources to be allocated for JINR CICC

	2014 – 2015	2016
CPU (HEPSPEC06)	28 000	40 000
Disk storage (TB)	4 000	8 000
Mass storage (TB)	5 000	10 000

LOCAL USERS

Normalized CPU time share:
JINR Laboratories and experiments in 2014

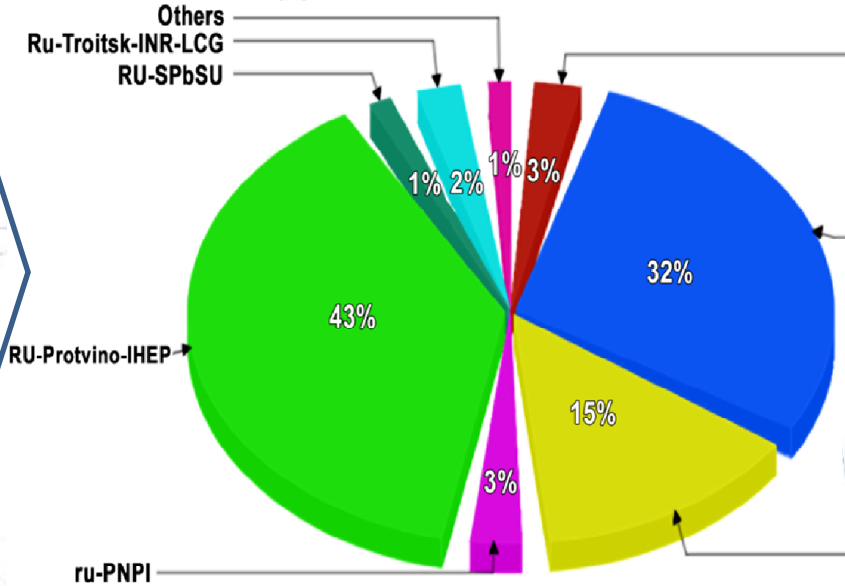
Total number of registered users 968

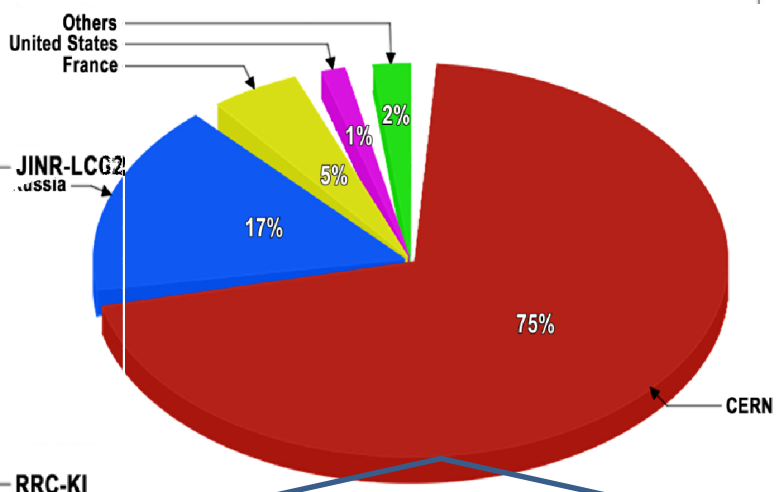


Total Normalized CPU time: 2 007 158 **Jobs executed: 447 993**

GRID USERS

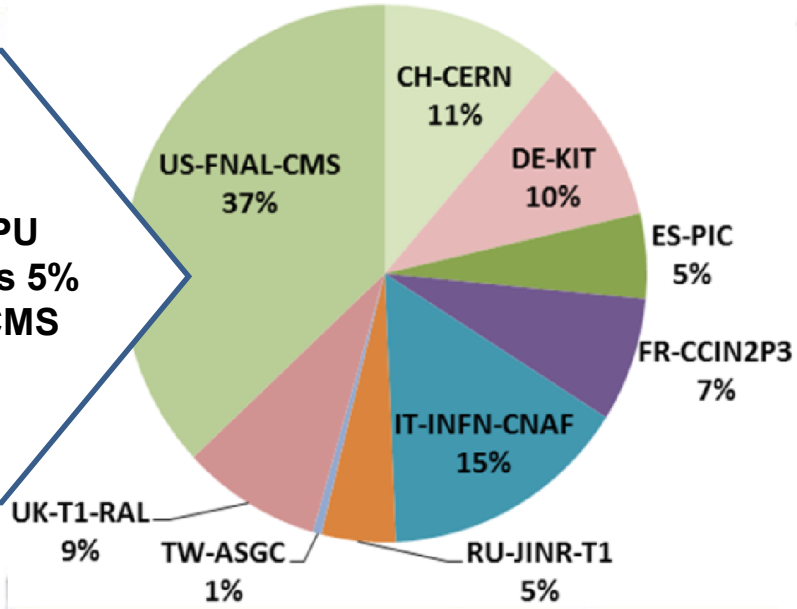
JINR-Tier2 Normalized CPU time share was 32% of RDIG in 2014



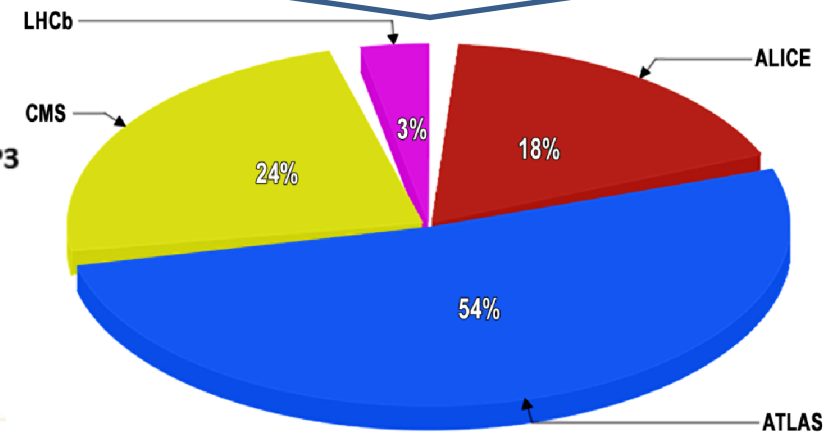


Percentage of Users by country

JINR-Tier1 Normalized CPU time share was 5% in WLCG for CMS in 2014

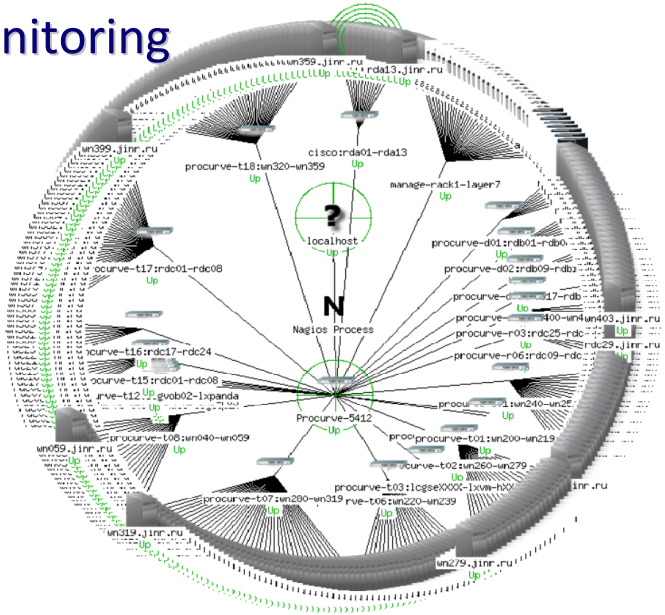


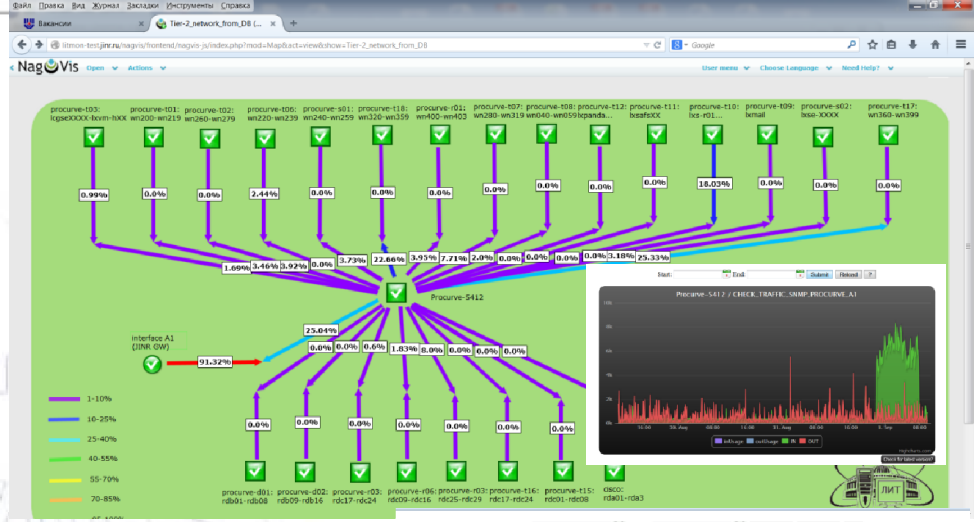
Total number of jobs of ATLAS, ALICE, LHCb, CMS

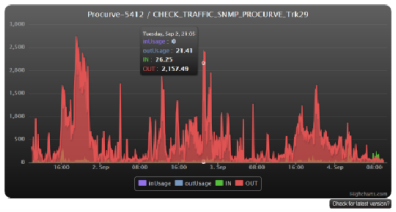


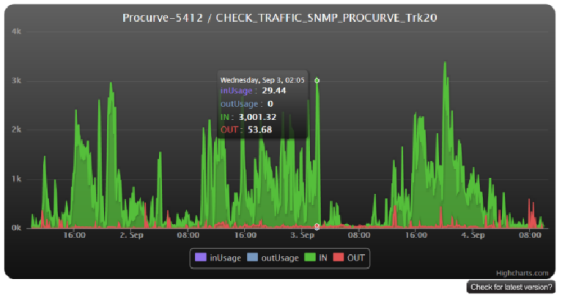
JINR monitoring

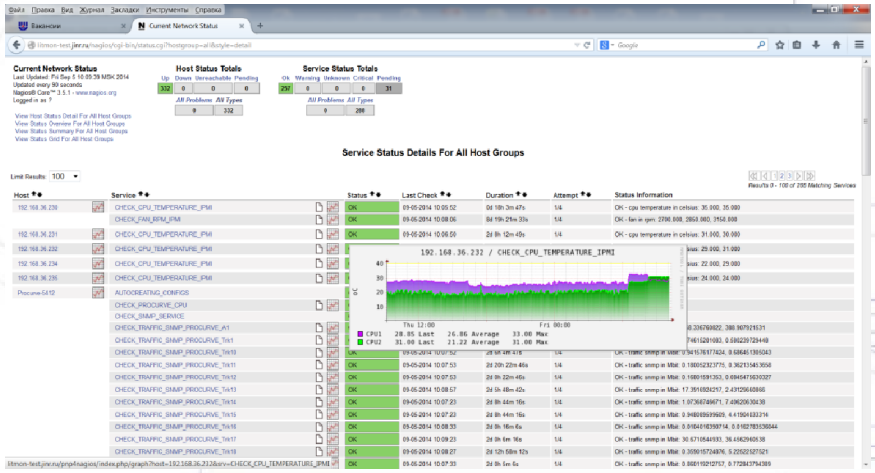
Network monitoring information system - more than 623 network nodes are in round-the-clock monitoring

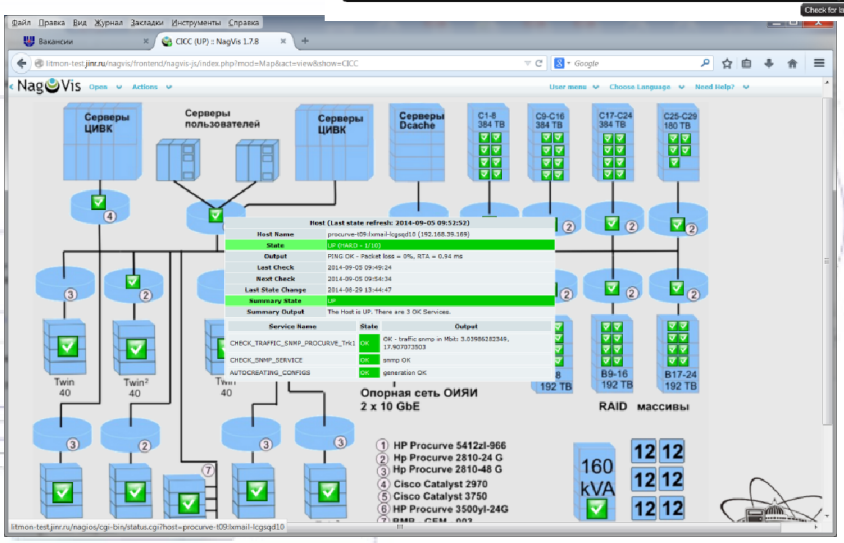






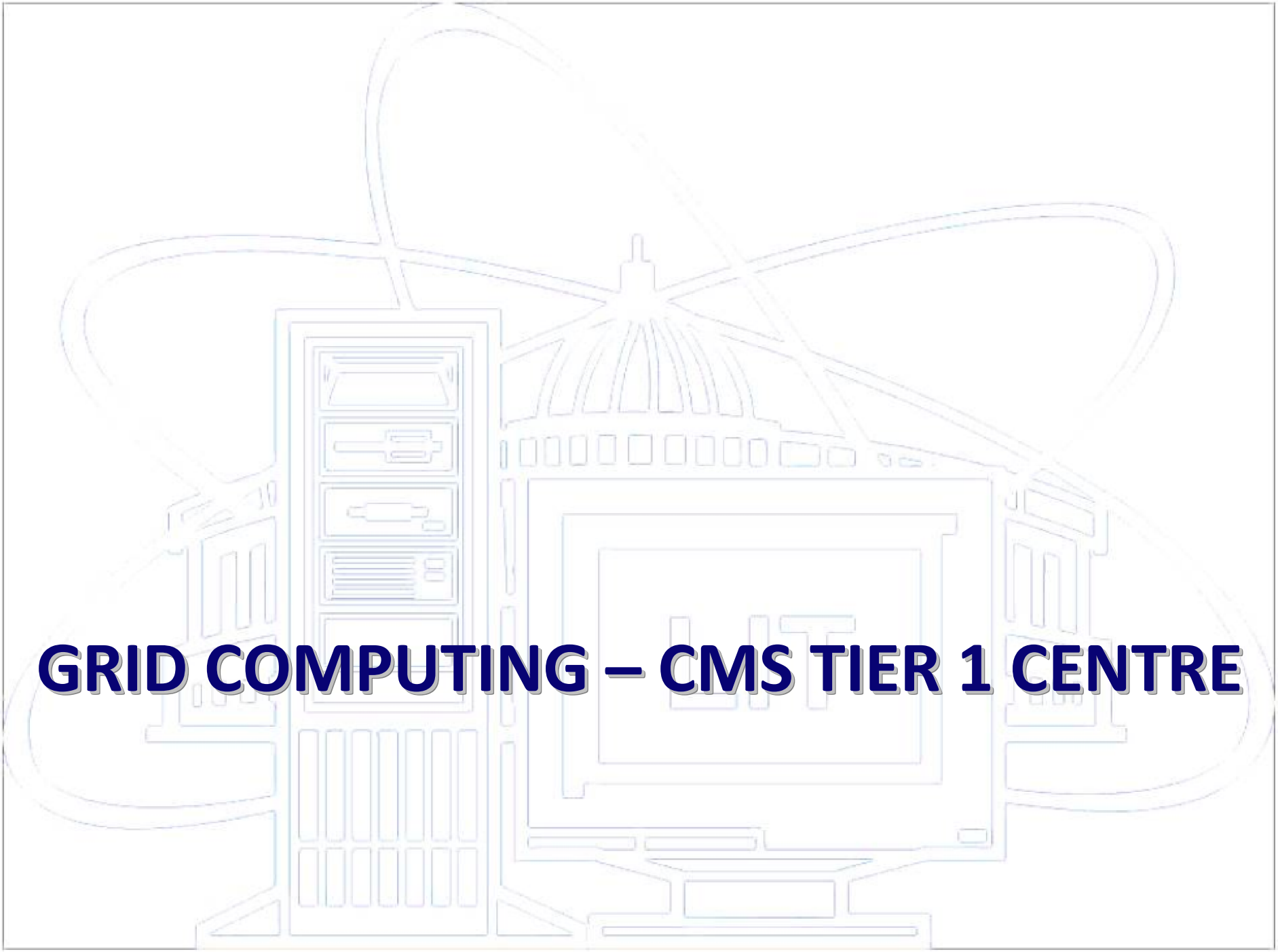






Grid cooperation of LIT-JINR

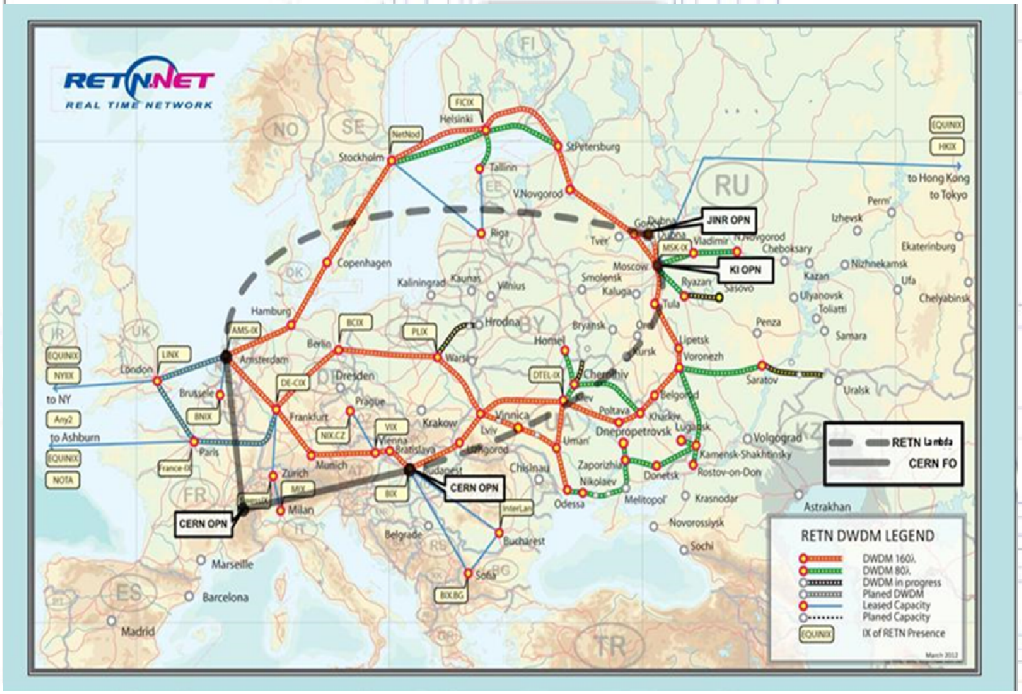
- Worldwide LHC Computing Grid (WLCG)
- EGI-InSPIRE
- RDIG Development
- Project BNL, ANL, UTA "Next Generation Workload Management and Analysis System for BigData"
- Tier1 Center in Russia (NRC KI, LIT JINR)
- 6 Projects at CERN
- CERN-RFBR project "Global data transfer monitoring system for WLCG infrastructure"
- BMBF grant "Development of the grid-infrastructure and tools to provide joint investigations performed with participation of JINR and German research centers"
- "Development of grid segment for the LHC experiments" was supported in frames of JINR-South Africa cooperation agreement;
- Development of grid segment at Cairo University and its integration to the JINR GridEdu infrastructure
- JINR - FZU AS Czech Republic Project "The grid for the physics experiments"
- NASU-RFBR project "Development and implementation of cloud computing technologies on grid-sites of Tier-2 level at LIT JINR and Bogolyubov Institute for Theoretical Physics for data processing from ALICE experimen"
- JINR-Romania cooperation Hulubei-Meshcheryakov programme
- JINR-Moldova cooperation (MD-GRID, RENAM)
- JINR-Mongolia cooperation (Mongol-Grid)



GRID COMPUTING – CMS TIER 1 CENTRE

Joint Project: Tier1 Centre NRC "Kurchatov Institute"– JINR

Project: **«Creation of an automated system of data processing for experiments at the Large Hadron Collider (LHC) of Tier-1 level and maintenance of Grid-services for a distributed analysis of these data»**



Terms: 2011-2013

Type of project: R&D

Cost: RF federal budget - 280 million roubles, extrabudgetary sources - 50% of the total cost

Leading executor: NRC KI «Kurchatov institute»

Co-executor: **LIT JINR (for the CMS experiment)**

Core of the proposal:

- Working prototype of a first-level center for data processing within LHC experiments
- Technical polygon for designing systems of distributed processing and analysis of data obtained at future scientific megainstallations:
  FAIR (Darmstadt, Germany),
  NICA (JINR, Dubna),
  XFEL (Hamburg, Germany)

2012:

Direct 10Gbps telecommunication channel to CERN

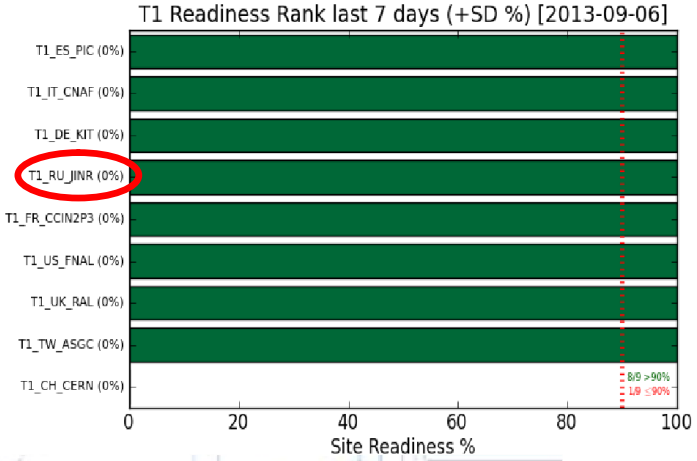
Tier-1-CMS Prototype

CPU (kSI2k) – 1000

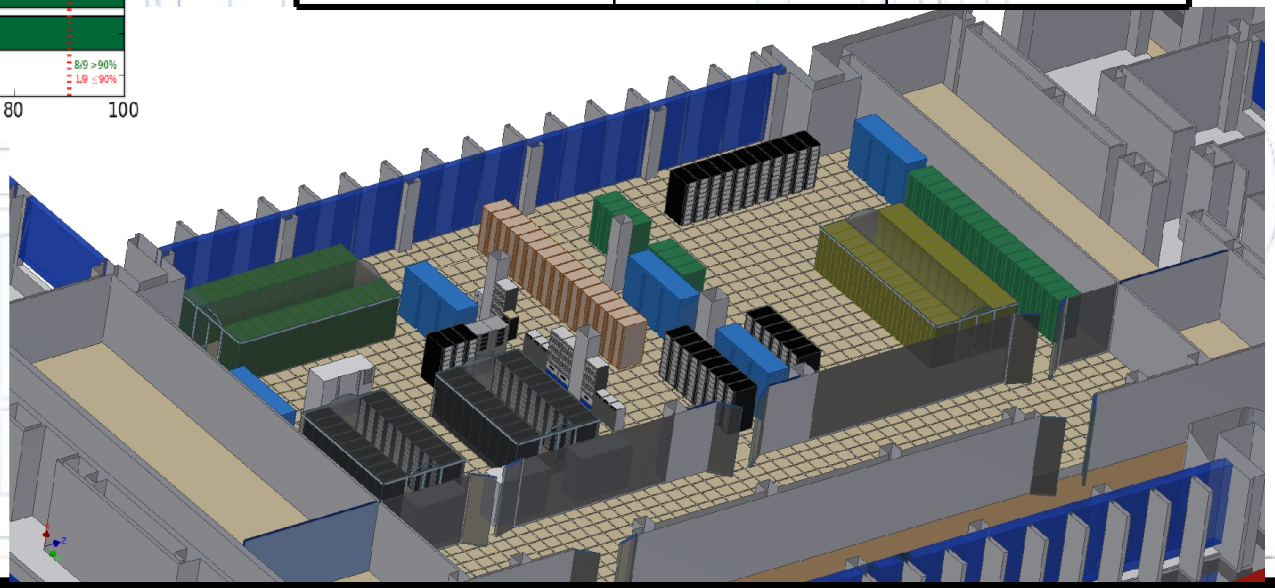
Disk(Tbytes) – 500

Main Features

- **Engineering infrastructure** (uninterrupted power supply, climate-control);
- **High-speed reliable network** infrastructure with **dedicated reserved data link** to CERN (LHCOPN);
- **Computing system** and **storage** using both disk arrays and tape libraries of high capacity;
- **Reliability and accessibility 100%**

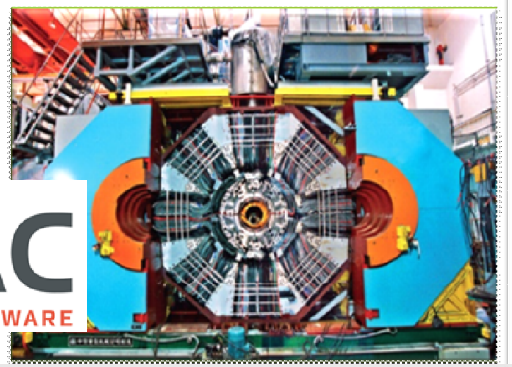


	2014 Present status	2015 Febr. (planned)
CPU (HEPSpec06)	17000	28800
Number of cores	1200	2400
Disk (Terabytes)	450	2400
Tape (Terabytes)	202	5000
Link CERN-JINR	10	40



GRID COMPUTING – WORLDWIDE DEVELOPMENTS

LIT JINR - BES-III collaboration



LIT team is a key developer of BES-III distributed computing system

A prototype of BES-III Grid has been built (9 sites including IHEP CAS and JINR).

Main developments were done at IHEP and JINR.

The Grid is based on DIRAC interware.

DIRAC
THE INTERWARE

Monitoring

- A BES-III grid monitoring system is operational since February 2014.
- Implementation of the new monitoring system based on DIRAC RSS service is in progress

Job management

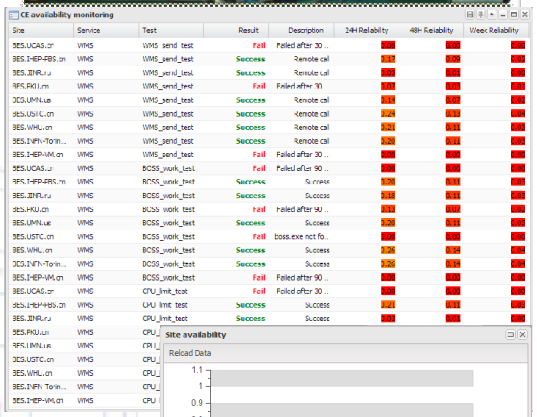
- Advising on the CE's installation and management
- BES-III jobs can nowadays be submitted on JINR cloud service

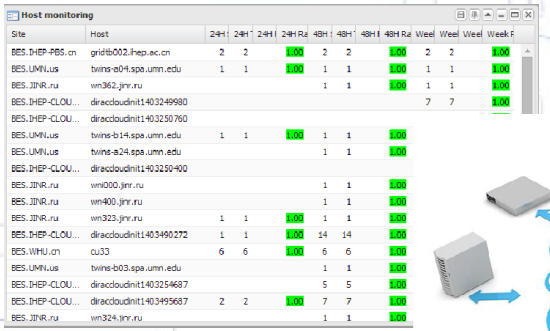
Data management

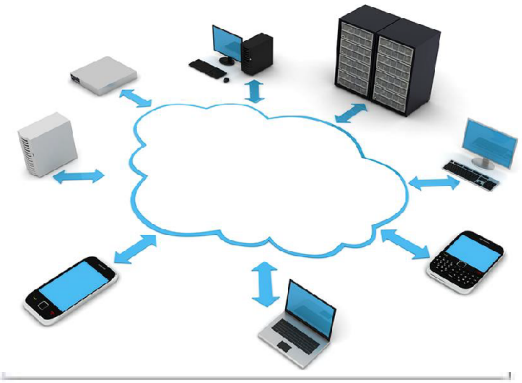
- Installation package for Storage Element was adopted for BES-III Grid
- Solution on dCache-Lustre integration was provided for main data storage in IHEP
- Research on the alternative DB and data management service optimization is in progress

SE latency monitoring

Source	Destination	Latency(sec)
IHEPD-USER	IHEPD-USER	2.678
IHEPD-USER	JINR-USER	16.316
IHEPD-USER	USTC-USER	15.932
IHEPD-USER	WHU-USER	6.728
JINR-USER	IHEPD-USER	14.322
JINR-USER	JINR-USER	14.24
JINR-USER	USTC-USER	14.827
JINR-USER	WHU-USER	8.516
USTC-USER	IHEPD-USER	3.677
USTC-USER	JINR-USER	17.855
USTC-USER	USTC-USER	2.746
USTC-USER	WHU-USER	624.375
WHU-USER	IHEPD-USER	5.727
WHU-USER	JINR-USER	20.227
WHU-USER	USTC-USER	9.199
WHU-USER	WHU-USER	3.092

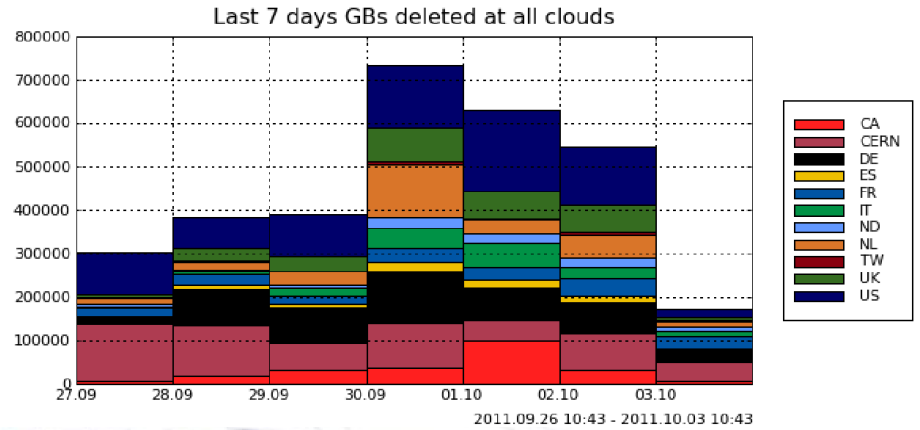


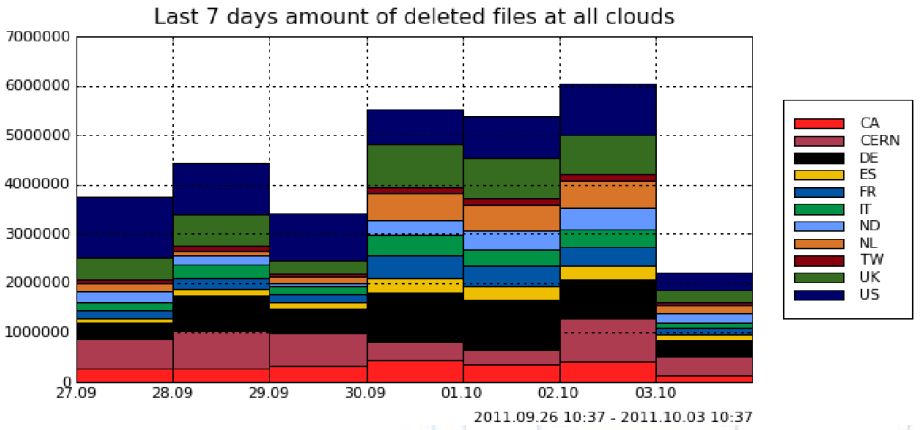




DDM DQ2 Deletion service

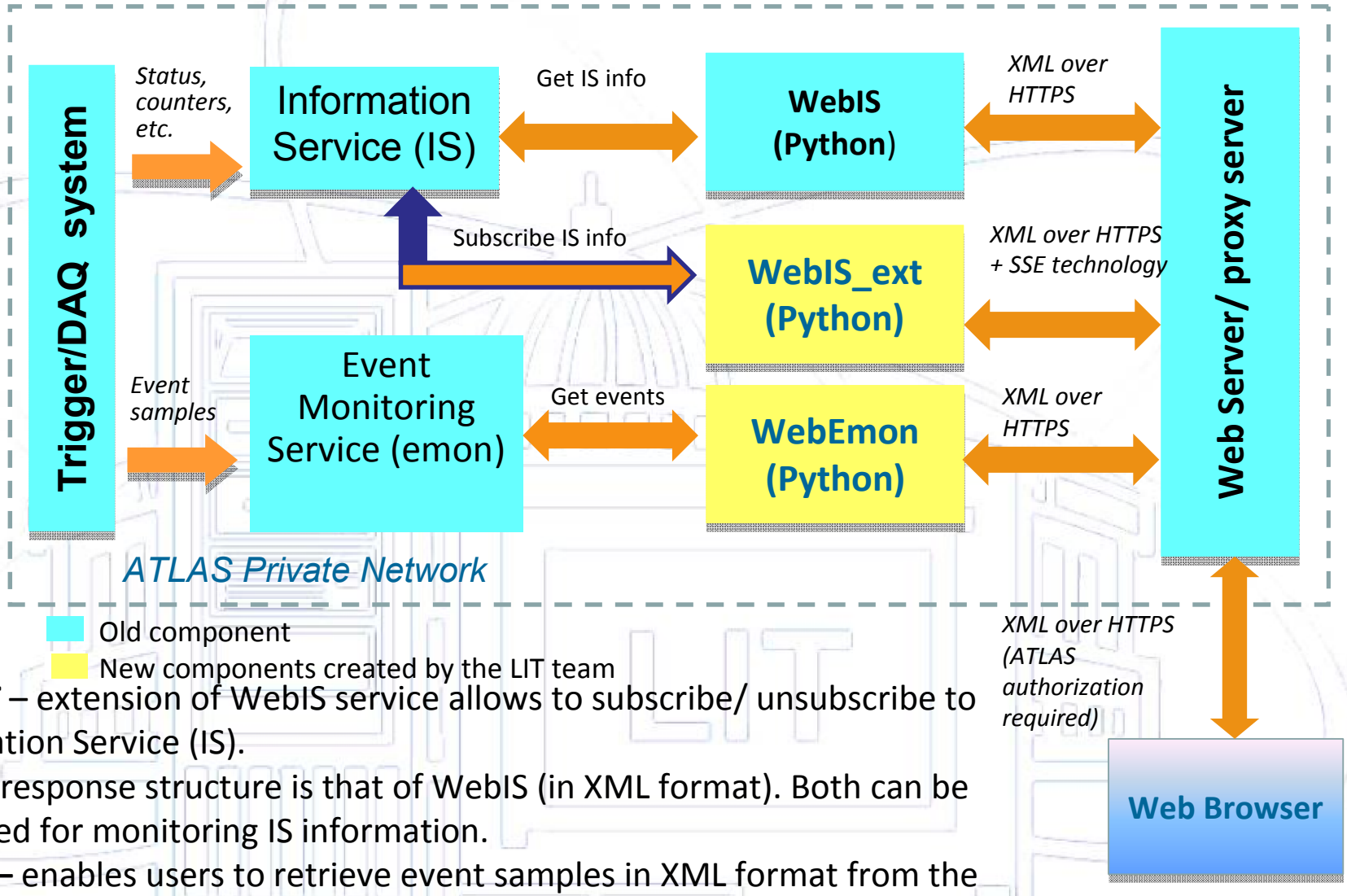
- The ATLAS Distributed Data Management (DDM) project DQ2 is responsible for the replication, access and bookkeeping of ATLAS data across more than 120 distributed grid sites. It also enforces data management policies decided by the collaboration and defined in the ATLAS computing model.
- The DQ2 Deletion Service is one of the most important DDM services. This distributed service interacts with 3rd party grid middleware and the DQ2 catalogues to serve data deletion requests on the grid. Furthermore, it also takes care of retry strategies, check-pointing transactions, load management and fault tolerance.
- The current version of Deletion Service was developed (and is maintained) by LIT JINR specialists and is used by the ATLAS Distributed Computing





Deletion Service serves more than 120 sites. In usual operation it deletes 2-2,5M of files per day, which correspond to 400 - 500 TB per day. During the deletion campaigns when deletion was carried out on most sites, deletion rate achieved is more than 6M of files per day, reaching up to 300k files per hour.

Upgrades to ATLAS remote monitoring system



WEBIS_EXT – extension of WebIS service allows to subscribe/ unsubscribe to the Information Service (IS).

WebIS_Ext response structure is that of WebIS (in XML format). Both can be similarly used for monitoring IS information.

WebEmon – enables users to retrieve event samples in XML format from the outside CERN using HTTP requests.

3 members of LIT staff *are among the* authors *of the* seminal ATLAS paper ***«Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC», Phys.Letters Volume716 Issue:1 Pages: 1-29 2012 .***

PanDA WMS (Workload Management System)

Production and Distributed Analysis system developed for the ATLAS

- In use for all ATLAS computing applications
- Deployed on WLCG resources worldwide
- Now also used by AMS and CMS experiments
- Being evaluated for ALICE, LSST and others
- Many international partners: CERN IT, OSG, NorduGrid, European grid projects, Russian grid projects
- PanDA can manage:
  - Large data volume – hundreds of petabytes
  - Distributed resources – hundreds of computing centers worldwide
  - Collaborative – thousands of scientific users
  - Complex work flows, multiple applications, automated processing chunks, fast turn-around
  - **Possible as WMS for NICA**

BigPanDA: evolution of PanDA

Success in ATLAS has sparked interest among other communities

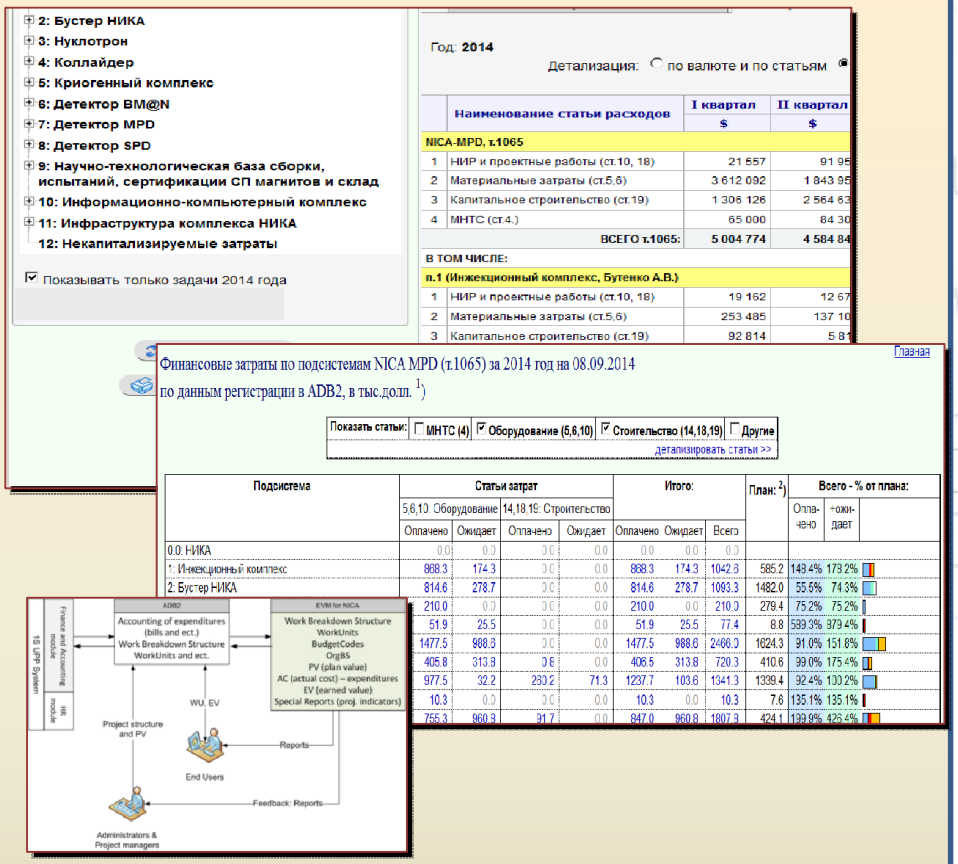
To cope this requirements was started:

- ✓ **Factorizing the core components of PanDA to enable adoption by a wide range of exascale scientific communities**
- ✓ **Evolving PanDA to support extreme scale computing clouds and Leadership Computing Facilities**
- ✓ **Integrating network services and real-time data access to the PanDA workflow**
- ✓ **Real time monitoring and visualization package for PanDA**

2 LIT specialists are currently working at BNL in "Next Generation Workload Management and Analysis System for Big Data" project (DoE ASCR funding)

COMPUTING FOR NICA

Development of management system for NICA project



Current status:

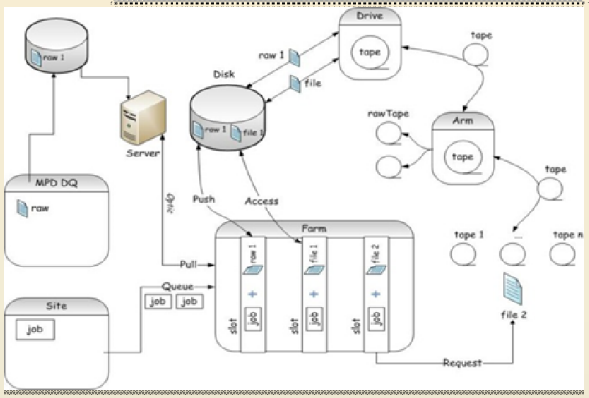
- ❑Financial planning and cost control – in production;
- ❑Distributed collection of earned value data – test operation;
- ❑Installation of CERN's EVM system at JINR and system integration – in progress

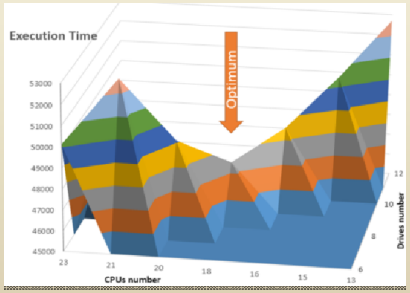
Processing, storage, and security of petabyte volume of data expected at NICA complex

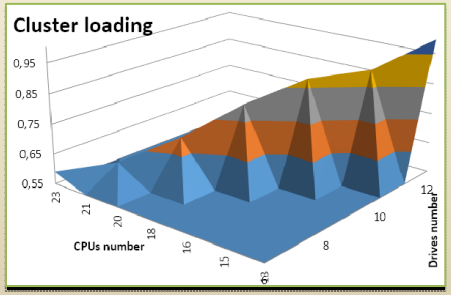
Design a geographic-distributed protected information-computer environment

Structure composition (under study):

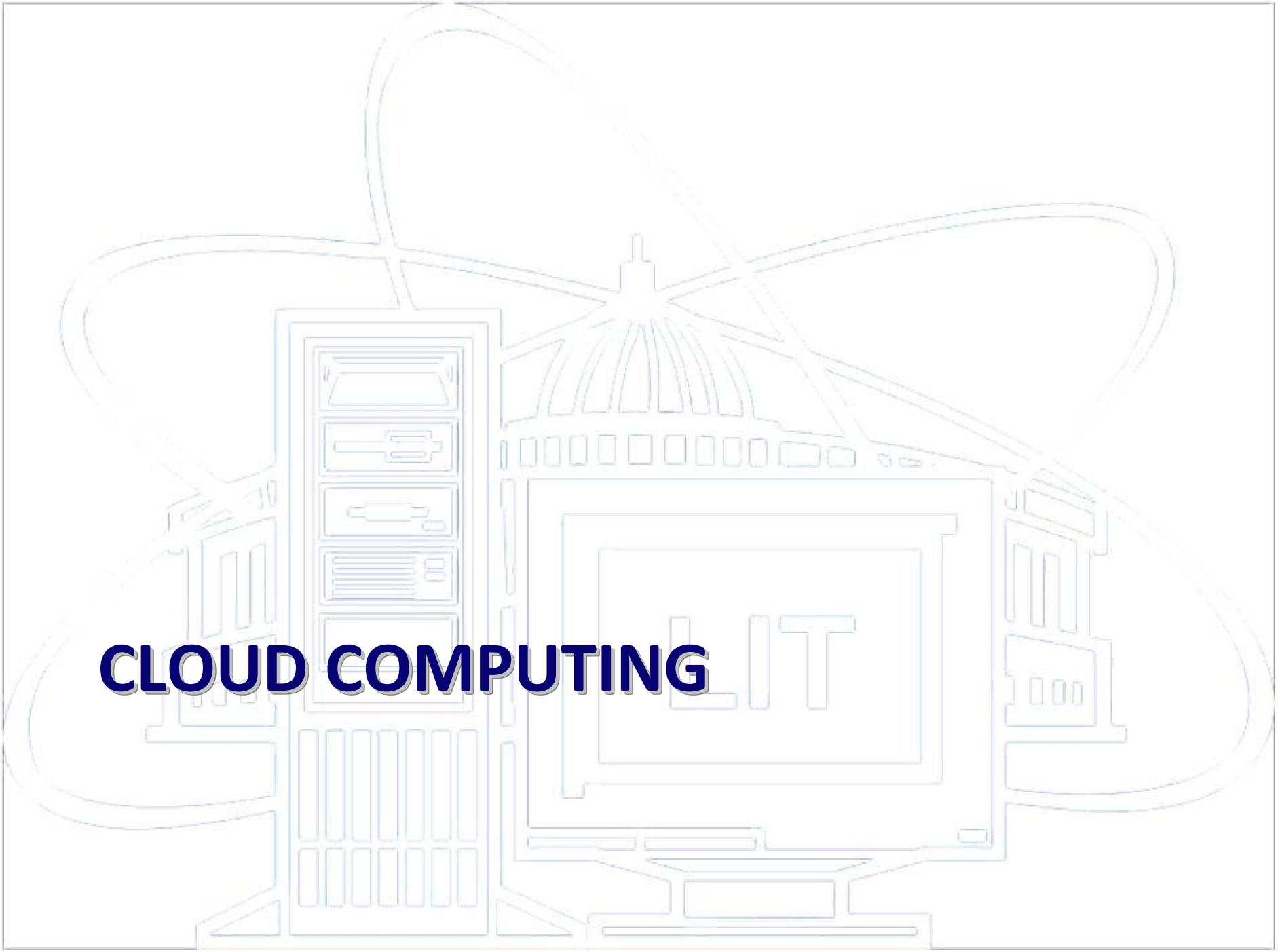
- ✓Tape robot,
- ✓Disk array,
- ✓CPU Cluster







Aim: get optimal configuration of processors, tape drives, and changers for data processing



CLOUD COMPUTING

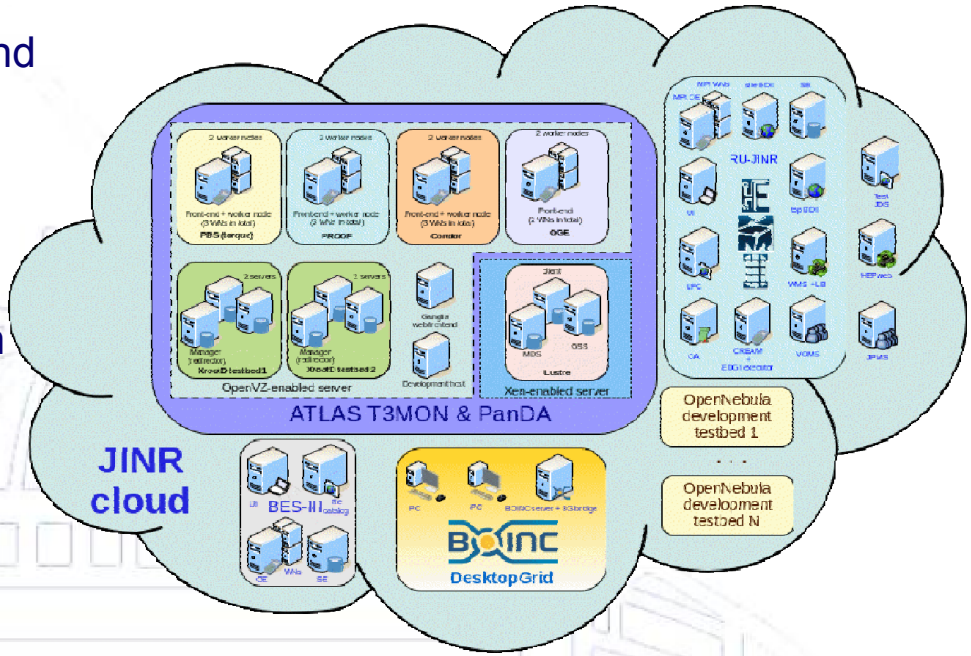
JINR cloud infrastructure

Purpose:

- increase the efficiency of hardware and proprietary software utilization,
- improve IT-services management.

Implementation:

- Cloud platform: OpenNebula
- Two types of VM managers: OpenVZ (linux only) and KVM (any OS)
- Two types of VMs: highly reliable (run on RAID1 disks) and normal
- user access: web GUI and command line interface
- VM access: rsa/dsa-key or password
- Authentication: JINR central user database (LDAP+Kerberos)
- HTTPS protocol (more secure information exchange between clients and service)



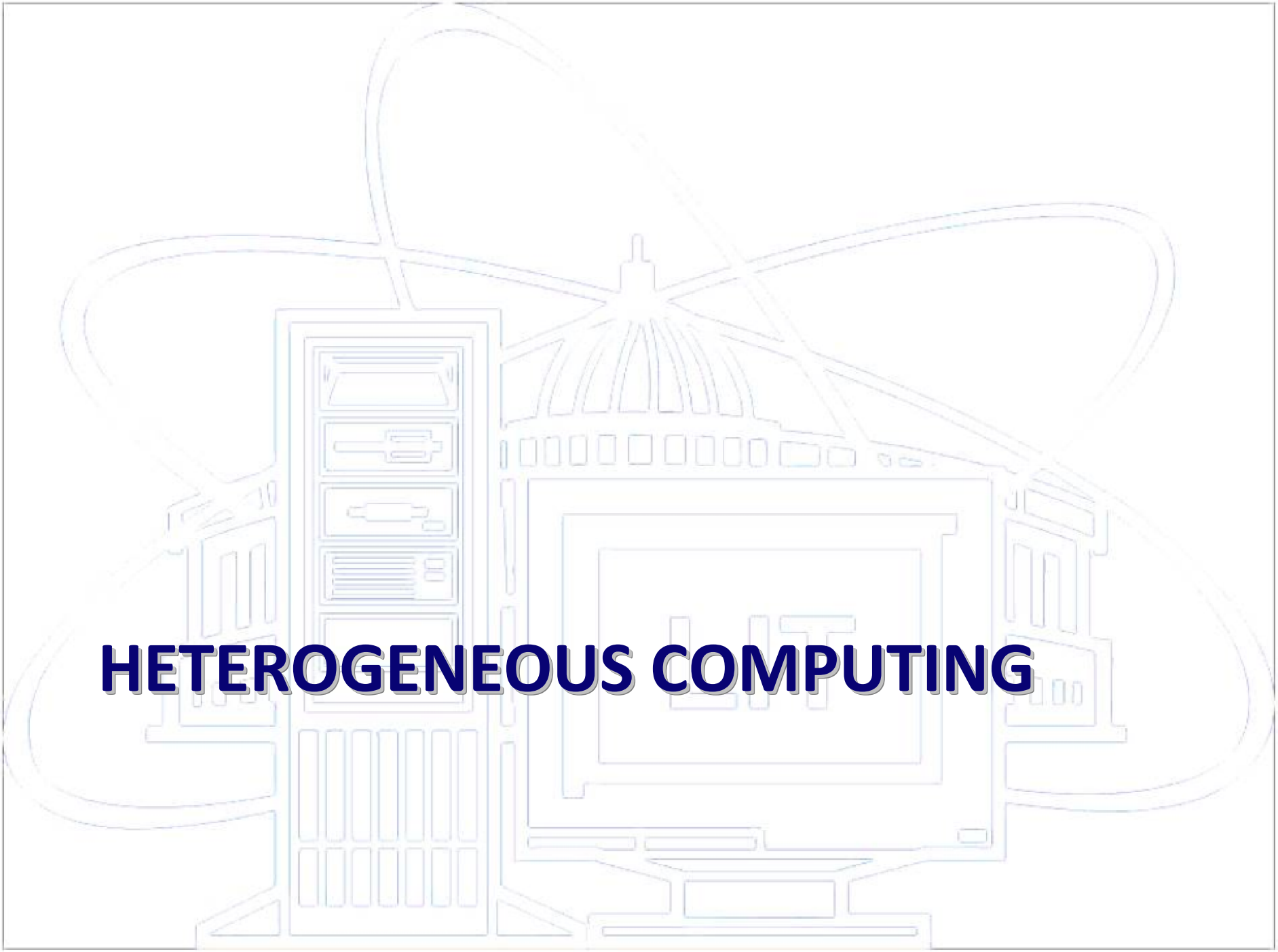
Utilization

- EMI testbed
- ATLAS T3MON + PanDA
- BES-III (DIRAC)
- DesktopGrid testbed
- HEPWEB
- Test JINR document server (JDS)
- JINR project management service (JPMS)
- OpenNebula testbeds for development and tests

Number of users: 42
Number of running VMs: 70

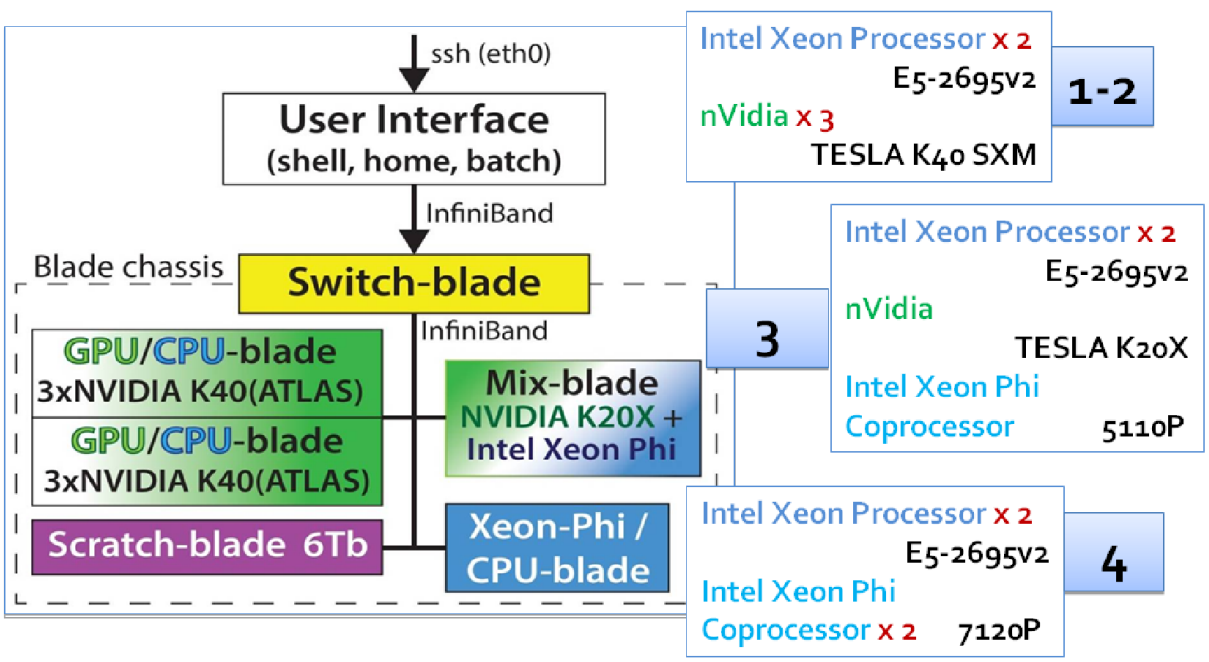
Number of cores in cloud: 138;
Occupied by the operating VM: 89;
Available for creation of new VM: 49;
Overall storage of RAM: 259 Gb;
Occupied by operating VM: 112 Gb;
Available for new VM: 147 Gb;

Service URL: http://cloud.jinr.ru



HETEROGENEOUS COMPUTING

The heterogeneous computing cluster HybriLIT



Resources

CPU 96 cores
GPU 19968 cuda cores
PHI 182 cores

RAM 512 Gb
EOS storage 14 Tb
Ethernet
InfiniBand 40 Gb/s

Performance

Max. single-precision 46,914 Tflops
Max. double-precision 17,979 Tflops

Power consumption: 10 KW

Software installed

Scientific Linux 6.5.
CUDA Toolkit 5.5, CUDA Toolkit 6.0
OpenMPI 1.6.5, 1.8.1
OpenMP GCC, ICC
Intel Cluster Studio 2013
JDK-1.7.0, JDK-1.8.0

Available compilers

nvcc
mpic++, mpicc, mpicxx, mpif77, mpif90,
mpifort, icc, ifort
mpiicc, mpiifort

ADMINISTRATIVE AND INFORMATION SYSTEMS

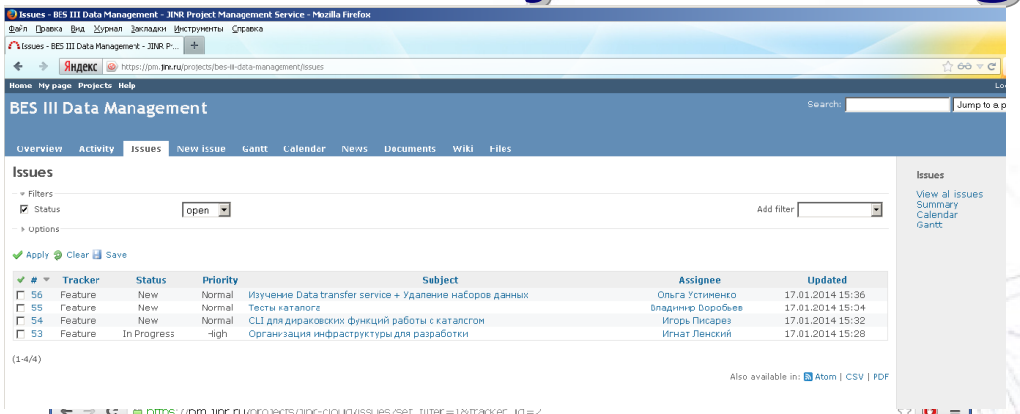
Corporative information system

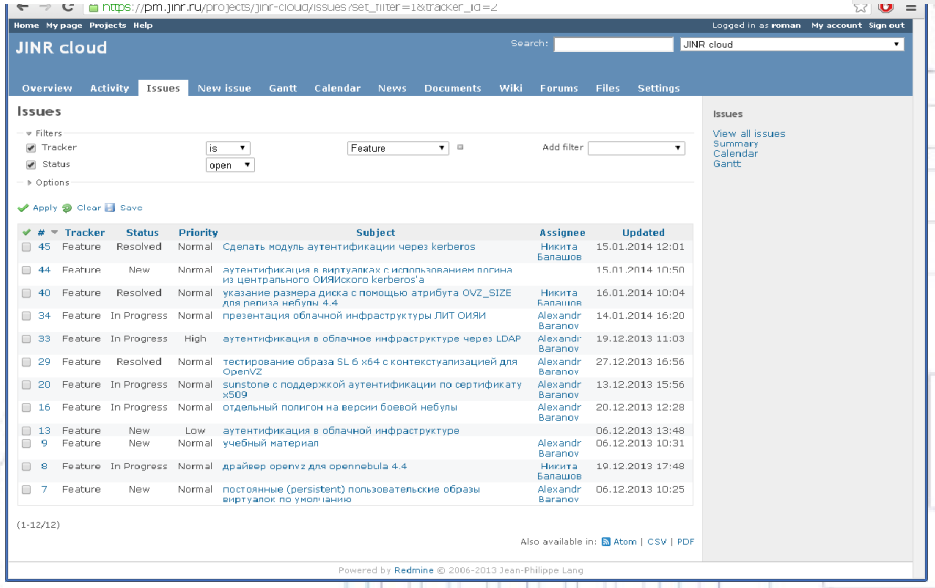
JINR corporative information system – integration of:

- General Information platform 1C 8.2.
- APT EVM system (Activity Planning Tool Earned Value Management) for the NICA and future projects management
- JINR Document Server – electronic archive-repository
- JINR and JINR Member-states access to e-library
- PIN – JINR staff personal information
- JINR Events at Indico
- JINR video portal

Enabling corporative information system for all JINR users will result in significant improvement of the standard JINR document workflow, electronic archive-repository, PIN, etc.

JINR Project Management Service





Purpose:

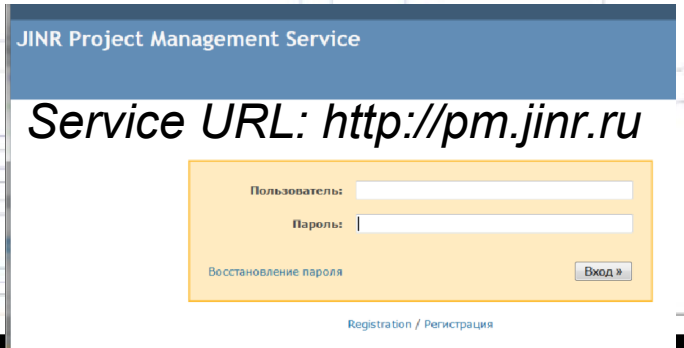
- To help plan, organize and manage resource pools and develop resource estimates
- To increase the efficiency of resource management
- To reduce time spent for project realization

Implementation:

- OpenSource platform (freeware): Redmine
- Authentication: JINR central user database (LDAP+Kerberos) + ability to add external (non-JINR) users
- HTTPS protocol (more secure information exchange between clients and service)

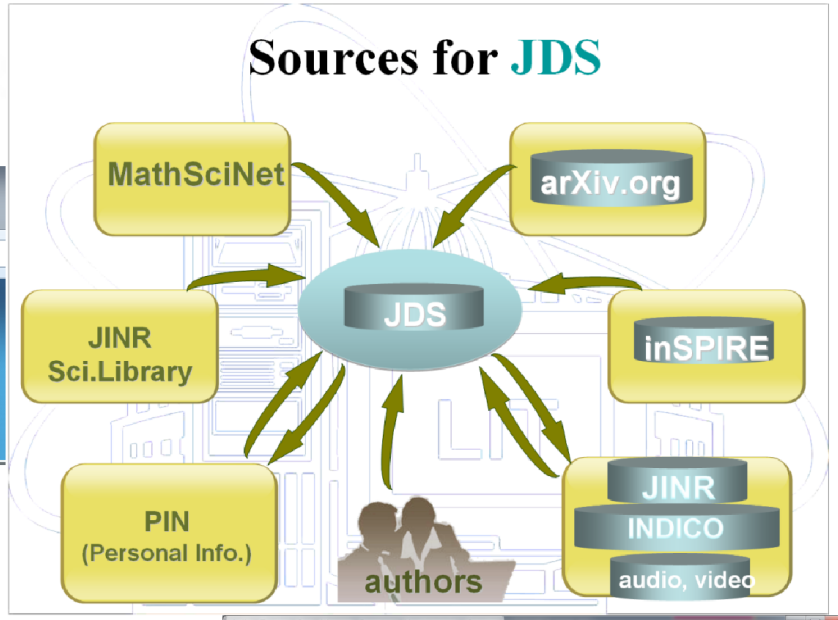
Utilization:

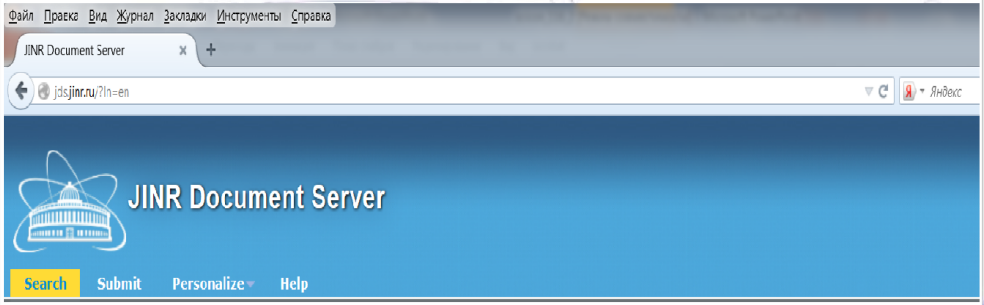
JINR cloud infrastructure
BES-III (DIRAC)
JINR project management service (JPMS)
Hybrilit, etc/



JINR Document Server (JDS)

http://jdsweb.jinr.ru/





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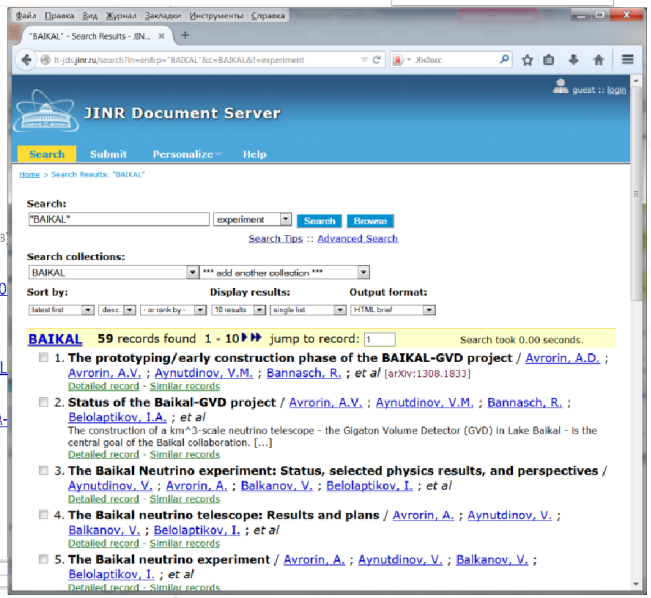
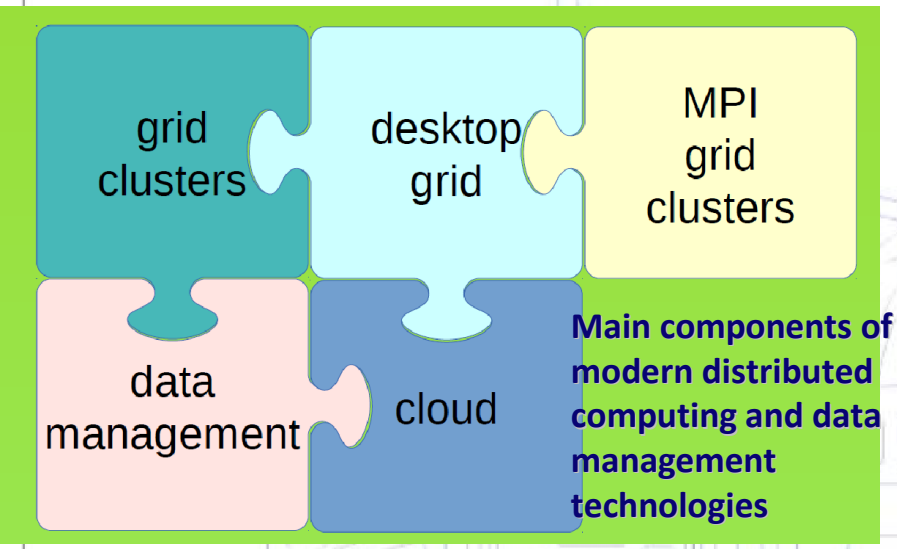


IT TRAINING

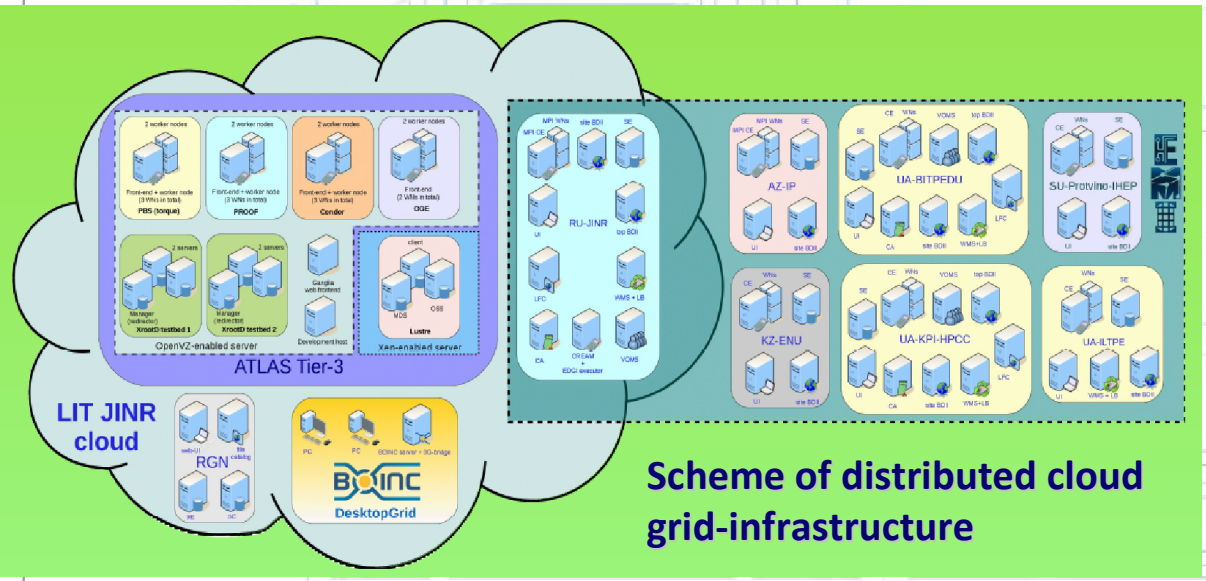
JINR distributed cloud grid-infrastructure for training and research



Main components of modern distributed computing and data management technologies

A special infrastructure is needed for training, research, development, testing, and evaluation of modern technologies in distributed computing and data management.
Such infrastructure was set up at LIT integrating the JINR cloud and educational grid infrastructure of the sites located at the following organizations:

- Institute of High-Energy Physics (Protvino, Moscow region),
- Bogolyubov Institute for Theoretical Physics (Kiev, Ukraine),
- National Technical University of Ukraine "Kyiv Polytechnic Institute" (Kiev, Ukraine),
- L.N. Gumilyov Eurasian National University (Astana, Kazakhstan),
- B.Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine (Kharkov,Ukraine),
- Institute of Physics of Azerbaijan National Academy of Sciences (Baku, Azerbaijan)

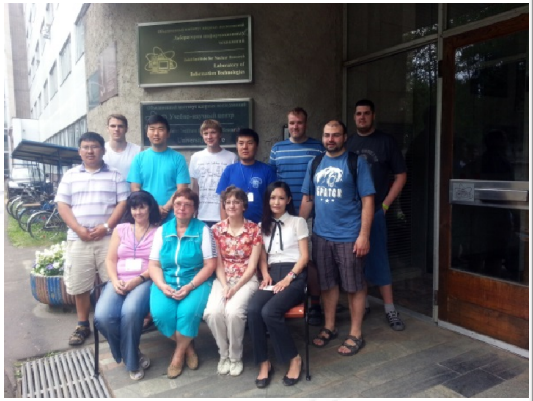


Scheme of distributed cloud grid-infrastructure

Tutorials on HybriLIT

Parallel programming technologies on hybrid architectures

7 – 17 July, 2014
Participants
From Mongolia, Romania, Russia



27 August, 2014
Participants from CIS and Russian institutes and companies

1 and 5 September, 2014
Participants from India, Germany, Japan, Ireland, Austria, Ukraine, Russia

The total number of participants in the above-mentioned tutorials comprises 60 students and young scientists from Germany, India, Mongolia, Russia, Romania, Ukraine, Czech Republic, etc.

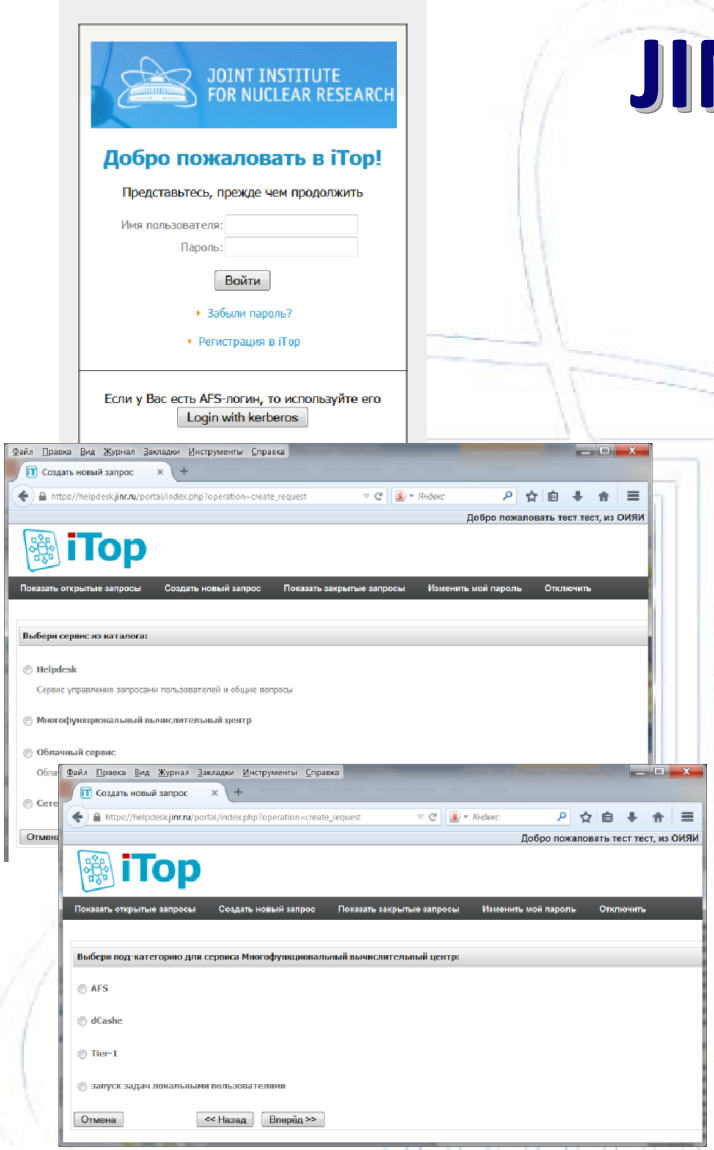
USER POLICY

Targets of LIT User Policies

- All users need secure networking: Internet (wired and wireless infrastructure), e-mail, tutorials for using modern IT
- Researchers: modern computing (local, grid, parallel, hybrid, cloud, etc.), access to scientific data, publications, video-conferencing
- Administration: corporative information system
- Students: e-learning, modern computing, video-conferencing

The main aim of user policy at LIT is the increase of efficiency of using modern computing means and information technologies in realization of research conducted at JINR

JINR Helpdesk



- Purpose - to get a unique entrance to information and help services for the IT infrastructure users
- Basic idea (Helpdesk) - creation of an information system securing technical support for all categories of users aimed at solving problems encountered while using computers, equipment, and software
- The Helpdesk coverage:
  - a unique reference to the user support service;
  - standard way of registration and task description to IT-specialists;
  - control over execution;
  - assignment of inquiries for priorities;
  - notifications of enabled persons;
  - knowledge base storage on the previous inquiries allowing quick solutions to problems similar to the already arisen ones;
  - reports on time and means expenses for inquiry processing.

Together with the full-function resource monitoring system, the Helpdesk allows the identification of the bottlenecks in the infrastructure, efficiency estimate of its work, systematization and adequate consideration of the interests of different categories of users.

It ultimately provides an overall increase of the work done by the Laboratory.

Thank you for your attention !