

Grid-infrastructure and Computing Aids for Research Work Performed within Joint JINR-Germany Projects

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1. Current status of Grid-infrastructure at JINR

The JINR Central Information and Computing Centre (CICC) is the element of the Russian Grid Segment used for LHC computing and other applications. The CICC provides resources needed for different tasks, implied by many projects the JINR researchers take part in, namely: E391A (KEK), KLOD, COMPASS, D0, DIRAC, HARP, CMS, ALICE, ATLAS, H1, NEMO, OPERA, CBM, PANDA, etc. During the years 2008-2009 the CICC hardware has been expanded to 960 job slots of the total performance of 2400 KSI2K and the disk subsystem – 500 TB structured as a dCache storage system. In October 2009 the transition to Scientific Linux 5 was accomplished at the computing farm. The CICC software includes a number of program packages which form the Grid-environment. The current version of the WLCG software is gLite 3.2. A monitoring and accounting system has been developed at JINR and is in use by the entire Russian LCG/EGEE segment. A project on upgrading the JINR external optical communication data link up to 10 Gbps and more has been developed and realized providing the 20 Gbps data link.

The CICC provides the following services in the WLCG environment: Storage Element (SE) service; Computing Element (CE) service as grid queue enabling access for 10 Virtual Organizations (VO) including ALICE, ATLAS, CMS, LHCb, HONE; Information Service (BDII - Berkley DB Information Index); Proxy service (PX); the advanced service for access to the LCG/EGEE resources (MyProxy); Workload Management System + Logging&Bookkeeping Service (WMS+LB); RGMA-based monitoring system collector service (MON-box); LCG File Catalog (LFC) service and VOboxes special services for ALICE, CMS, CBM and PANDA. It is to be mentioned that batch queues were enabled for PANDA and CBM. Also there are three NFS-servers dedicated to VOs.

2. Participation in Grid Activities with German centers

1) FTS test file transfers between T1-FZK and T2-JINR

In accordance to the CMS computing requirements,

the network links between CMS Tier1 and Tier2 centers should be tested and then be certified at the CMS collaboration if during fixed time intervals transfer rates are not less than 20 MBs. In October 2008 the link between T1-FZK and T2-JINR was successfully tested in frames of the CMS Phedex data transfer system (which provides FTS transfers between CMS sites) and certified in CMS. It can be seen at the picture given below that the maximal transfer rates were more than 37 MBs.

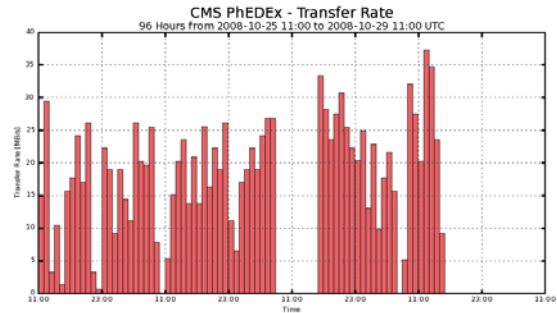


Figure 1: Transfer Rates during the certification of network link between FZK and JINR. Maximum: 37.29 MB/s, average: 16.62 MB/s

2) H1 MC production grid monitoring

These common activities with DESY (Hamburg) were started in 2007 and continued in the 2008-2009. The main goal of the work is to provide a reliable way to track down job states in cooperation with the DESY H1 Monte Carlo production group. A statistical monitoring component has been introduced for H1 Monte Carlo production group as an extension to the current job processing framework. It is made as an extension to the current job batch system and can be stopped or removed completely without interrupting the job batch system process. This application is in practical use by H1 Monte Carlo production group. A sample picture of graphical representation of statistical data by MonALISA can be seen in Fig.2.

The results of the work have been presented at the GRID'2008 international conference in Dubna (June 2008) and published in the conference proceedings [1].

3) PANDA experiment support at JINR

VO Box machine for PANDA has been installed and supported. From the beginning of 2009, a number

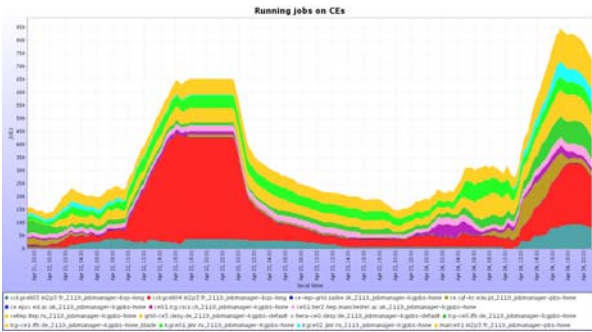


Figure 2: H1 MC Production monitoring plot. HONE VO Normalised CPU time by HONE Production Sites (Dec.2008-Nov.2009)

of 20559 PANDA jobs have been run with a total CPU time 53850.99 hours and astronomic time 71459.87 hours normalized to 1000 Specint2000 (<http://lit.jinr.ru/view.php?var1=comp&var2=ccic&lang=lat&menu=ccic/menu&file=ccic/statistic/stat-09>). In October 2009, PANDA VO Box has been successfully moved to a new version of Scientific Linux SL release 5.3. The dedicated PANDA Storage Element with a capacity of 7 TB is in the process of installation and is expected to be put into operation by the end of 2009.

4) CBM Experiment Support at JINR

VO Box machine for CBM has been installed and supported. CBM software installation has been successfully tested at JINR. In October 2009, CBM VO Box has been successfully moved to a new version of Scientific Linux SL release 5.3. The dedicated CBM Storage Element with a capacity of 7 TB is in the process of installation and is expected to be put into operation by the end of 2009.

5) HONE queue at the JINR LCG site

The HONE VO queue configured and enabled at JINR WLCG-site in 2007 is in active use for H1 Monte-Carlo production. From December 2007 to November 2008 more than 23 000 HONE VO jobs were completed at the JINR WLCG site (this amounts to 4% of the total number of HONE VO jobs during this period) and CPU time usage for their execution represents 7.5 % of the total HONE VO job CPU time (normalized to a reference value of 1000 SpecInt2000). Table 1 shows the distribution of normalized CPU time consumed at the JINR-LCG2 site from December 2007 to November 2008. Table 2 shows a fragment of the whole CPU time distribution (normalized to a reference value of 1000 SpecInt2000) consumed at VO HONE sites for H1 Monte-Carlo production from December 2008 to November 2009. The JINR-LCG2 site investment is 2.55% (see <http://www3.egee.cesga.es/gridsite/accounting/CESGA/vodis-view.html>)

Table 1: Distribution of normalized CPU time consumed at the JINR-LCG2 site from December 2007 to November 2008

Site	Normalized CPU time [units KSI2K.Hours] by Site and VO	Percentage
Alice	1,774,097	34.29%
atlas	777,546	15.03%
biomed	717,568	13.87%
cms	891,723	17.23%
fusion	440,538	8.51%
Hone	434,087	8.39%
Lhcb	138,553	2.68%
Total	5,174,112	100.00%

Table 2: HONE VO Normalised CPU time by HONE Production Sites

Site	HONE VO	%
BEgrid-ULB-VUB	11,184	0.29%
CSCS-LCG2	67,300	1.74%
CYFRONET-LCG2	48,423	1.25%
DESY-HH	2,213,591	57.37%
DESY-ZN	209,066	5.42%
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JINR-LCG2	98,362	2.55%
.....
UNI-DORTMUND	22,157	0.57%
Total	3,858,597	
Percentage	100.00%	

3. Future Plans

1. The JINR computing and networking infrastructure upgrade to satisfy the requirements for computing support of the experiments.
2. Cooperation with German scientific centers in the Grid infrastructure support and development.
3. Common participation in the LHC computing support and development, especially in ALICE computing taking into account that FZK is ALICE Tier1 center for JINR.
4. Computing support for CBM, PANDA, H1 and other experiments.
5. Common activities on monitoring tools development.

References

- [1] S. Mitsyn, B. Lobodzinski, H1 Monte Carlo production on the LCG Grid - job monitoring, in GRID'2008 Conference Proceedings, Dubna, 2008, pp.360-362.