

I.1 Scientific computing and software development at RRCAT

A) Scalable Distributed Monitoring System for High Performance Computing Clusters:

Web based scalable distributed monitoring system 'Ganglia' version 3.0.4 for High Performance Computing (HPC) systems has been configured and deployed on RRCATNet. Presently HPC cluster 'Aryabhata' is configured under this monitoring system, and in future, other clusters of RRCAT will also be configured under it.

Consolidated cluster usage in terms of CPU load, Memory and Network is readily available in Ganglia. Also detailed usage of each node of cluster is available in terms of CPU load, Memory, Network, Disk and Packets flow. All these details are available from last one hour to one year in graphical form.



Fig. I.1.1: Typical output of 'Ganglia' showing Load, CPU, Memory and Network usage of Aryabhata cluster.

B) Commissioning of Power 5+ Server:

IBM Power 5+ RISC processor based computing server, named as 'Avantika', has been commissioned and released to the scientific computing users. This is IBM P series server (p5 550/550Q) comprising of dual core 2.1 GHz Power 5+, 64-bit RISC processor with 36 MB L3, 1.9 MB L2 cache and 8 GB RAM. This server is configured with 64-bit Red Hat Enterprise Linux version 5 operating system. Fortran compilers - g77, gfortran, IBM XL fortran (xlf, xlf90, xlf95, xlf2003) and C compilers - gcc, g++, IBM XL C/C++ (xlc, xlc++) are installed on this server. BLAS and LAPACK libraries are also compiled and configured on this server for advance computing usage. This server is configured in NIS enabled centralized set-up and all users having NIS enabled login-id and password can access the server with same login-id and password.

C) Porting of user programs:

As per requirement of the users, various software packages are successfully ported on Intel based computing servers and clusters. The programs successfully ported on Intel based servers are: SDDS simulation software (Self-Describing Data Sets - a modular system for Accelerator Design, Simulation, Control, and Analysis) and Flair (Fluka Advanced Interface).

Math Kernel Library 9.0 is configured on 64-bit computing environment of Aryabhata cluster, and WIEN2k_08 (latest version) has been successfully ported on it.

D) Publication Archive Software:

A Web based Publication Archive Software is designed and developed, which facilitates storage and retrieval of publication details of employees for journals, conference papers, invited talks, internal reports, books, patents etc. All these details are stored in Oracle 10g database, to facilitate easy retrieval of the information in variety of formats.

Authenticated access on RRCATInfonet has been provided to Content Managers of various Divisions / Sections / Labs, to maintain the publication details. Enhanced editing facility has been provided in the software for storing special symbols like Greek characters, super scripts, sub scripts, html tags etc. This provision of storing special symbols is required as the data is to be stored in Oracle tables, and after retrieval, it is to be displayed in HTML format by the software. Various reports generated from the software include : RRCAT publication list (year-wise), Division / Section / Lab wise publication list, and publication list for individual employees. The publication list of individual employee is generated in specific format by this software and linked to staff profile of all employees on RRCATInfonet.

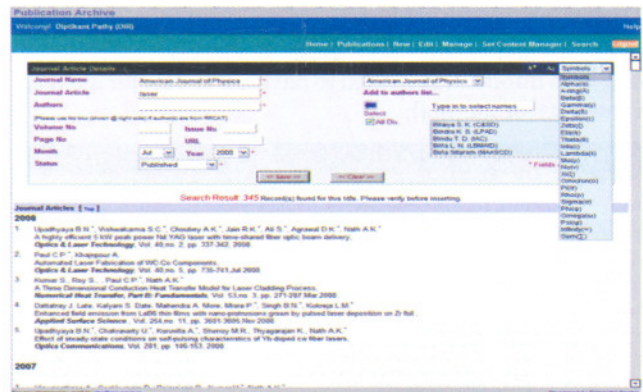


Fig. I.1.2: Entry screen for journal publications, listing all the records of Publication Archive containing the word 'Laser' in title of the paper (pattern matching is done using Ajax).

The software is developed using Java Server Pages (JSP), Java Scripts and HTML. At the back-end, the tables



used for storing the publication details are linked to the Personnel database of RRCAT to maintain consistency of employee details. Asynchronous JavaScript and XML (Ajax) technique is used for automatic pattern searching to avoid duplicate entry of publications.

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I.2: Development of information management systems at RRCAT

A) OASIS – Project Monitoring Software:

Web based software OASIS (On-line AccesS to project Information System) for comprehensive project monitoring has been developed and implemented, which can be used by all project coordinators on RRCATInfonet, to monitor XI plan projects efficiently. Access to the software is authenticated and only the project coordinators and authorized persons are able to access information related to respective projects. Various reports can be generated from the software, which are otherwise prepared manually by the project coordinators. This software, if used methodically, can substantially reduce the work done by project coordinators for preparing various reports. Project related data and reports can be exported to Microsoft Word. OASIS is single point access to the data retrieved from on-line Integrated Purchase-Stores-Audit Software, on-line Integrated Accounting Software and also from XI plan project report (entered by the project coordinators in this system). The software maintains information related to project sanction details, major activities, schedules of M&E / M&S / MW along with financial year wise project milestones and item wise breakup. It enables project coordinator to track the history of activities even if the project is closed or carried to next financial year. Item wise breakup related to project milestones can be maintained and Quarterly Progress Report can be generated along with information related to physical targets for the plan and reasons for shortfall.

Reports like 'Procurement Calendar' and 'Phasing of Plan Expenditure' can be generated, which are useful to monitor payments to be made during financial year with reference to delivery schedules. They also provide information for items to be indented from the schedules of M&E / M&S / MW contained in the project report. Reports for Budget Estimates (BE), Revised Estimates (RE), Variation between BE & RE can also be generated through this software. Report for 'Status of Project / Plan Schemes – Physical Progress' containing targets set up for each financial year and targets achieved can also be generated. Financial year wise statement of 'Outlays & Outcomes / Targets & Achievements' can be generated by this software. Some of the reports generated by the software can be used in totality, whereas some of the reports are suggestive in nature.

Budget Monitoring is another module of this software, which provides various reports for monitoring the procurement status of projects. Expenditure statement for project coordinators is generated containing details of budget provision, expenditure incurred and balance available with reference to annual plan as well as financial sanction. It also provides graphical representation of funds allocated to projects, expenditure incurred and balance left for each financial year. This web based software is developed using Java Servlets, Javascript and HTML. Oracle 10g database is used as back-end for storing the data. SQL queries have been optimized for improving the response time to the users.

B) Indus Usage Software:

Indus Usage Software is developed and implemented for keeping track of usage of various beam lines of Indus-1 and Indus-2. This software is released to the users on RRCATInfonet. Access to the software is fully authenticated and five-level authentication mechanism is implemented for different levels. Depending on the user level, restricted access to the beam line usage data is provided. The five different access levels are – Beam line user, Approving authority, Beam line in-charge, Shift in-charge and Administrator.

Different Beam line users can request for booking the beam lines of Indus-1 and Indus-2, one week prior to the actual requirement. Approving authority can approve or cancel the request of Beam line user. Approving authority can view reservation status of all beam lines, approved and cancelled beam requests, and feedback provided by the Beam line in-charge. Approved requests can be viewed by the Shift in-charge, so that beam can be provided for experiment. Shift in-charge can view reservation status of all beam lines along with approved requests and their feedback details. Beam line in-charge of each beam line can provide feedback for all the approved requests once experiment is over. Administrator can view date wise approved beam requests and feedback for all the beam lines.

RRCATInfonet OASIS - On line Access to project information System

Procurement Calendar - 2008-2

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- Indents for which payment has been made are displayed in green color.
- All items which are authorized by the software are displayed in yellow color.
- Indents for which Material has been received, but Payment is not made, are displayed in brown color.
- Indents with Purchase Orders Received but awaiting supply of material, are displayed in dark red color.
- Indents for which Purchase Orders are printed but not released, are displayed in blue color.
- Indents for which Expenses are sent but PO is not printed, are displayed in orange color.
- Items pending the issue of Orders, are displayed in grey color.
- Items 'To be indented' are listed from Run-into Drawings of MS&AS&MW. They are displayed in purple color.

Sr. No.	Indent No./PORs	Indent Date	Item Description	Payment Amount	Payment Date	Budget Code
1	38514 / 23990	Jul-2007	Integrated Service Network Router	15,58,800	Jun-2008	11C1000EL
2	38719 / 34295	Aug-2007	One U Rack Mount Server, Make: HP, Model : DL 140G3	5,08,830	Jun-2008	11C1000EL
3	38719 / 34163	Aug-2007	Linux Based NAS, Model:Datakit RAID-LE2 NAS	9,10,800	Mar-2008	11C1000EL
4	38995 / 33830	Sep-2007	Multimedia Projector Toshiba TDP-T 350	1,02,468	Feb-2008	11C1000EL
Total Amount (in lakhs of INR)				30.81		

Sr. No.	Indent No./PORs	Indent Date	Item Description	PO Value/Estimated Cost	PO Release Date/Estimated date of Order	Expected date of Expenditure	Budget Code
1	38717 / 34242	Aug-2007	PC-G401 With External 16 Bay 4 GFC-SAS RAID Sub. Systems	21,29,565	Mar-2008	Jul-2008	11C1000EL
2	39141 / 34860	Oct-2007	Supply & Installation Of xen Based Servers	8,98,560	Apr-2008	Aug-2008	11C1000EL
3	37865 / 33662	Jan-2007	SPECTRUM ANALYSER	5,67,440	Apr-2008	Jul-2008	11C1000EF
4	39131 / 34889	Oct-2007	MODULAR OTDR TEST PLATFORM WITH FIBER SPLICER	21,55,500	Mar-2008	Jun-2008	11C1000EL
5	39620 / 34310	Jul-2007	NETWORK CONTROLLER SERVER	18,45,223	Feb-2008	May-2008	11C1000EF

Fig. I.2.1: OASIS – Project Monitoring Software.