Intel FORTRAN compiler version 13 & OPENMPI version 1.6.3 were used for porting of this software.

VisIt version 2.6.3 (distributed, parallel, visualization tool for visualizing data defined on two- and three-dimensional structured and unstructured meshes) is successfully ported on Kshitij-3 cluster using Visualization Toolkit (VTK) version 6.0.0. This visualization tool is used to visualize large simulation data at its place of generation, thus eliminating the need to move the voluminous data to other visualization server.
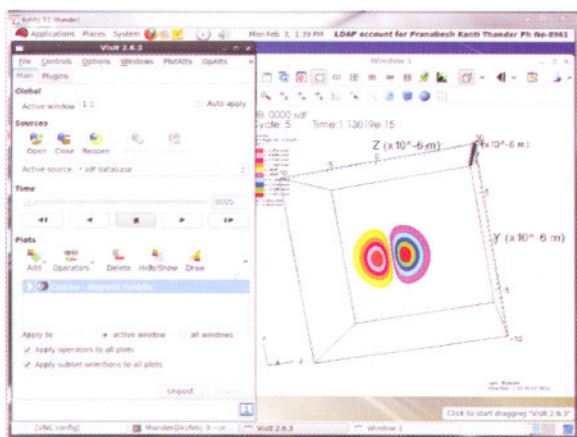

Figure I.1.2: 3D Visualization of output data of EPOCH using VisIt

VisIt tool is used by users of Laser Plasma Division of RRCAT, to visualize output of **VORPAL** and **EPOCH** parallel applications.

GDL version 0.9.3 (GNU Data Language) is successfully installed and configured on Kshitij-3 cluster for users of Laser Plasma Division at RRCAT, for visualization based analysis of output.

XCRYSDEN version 1.5.53 (crystalline and molecular structure visualization program) is successfully installed and configured on Kshitij-2 cluster to visualize and analyze output generated by parallel applications **CRYSTAL 09** and *Quantum ESPRESSO.* **This tool is used by users of** Laser Materials Development and Devices Division, Indus Synchrotrons Utilization Division and BARC Training School at RRCAT.

In addition to porting of application programs, license of ANSYS multi-physics version installed in Computer Centre, has been upgraded to version 14.5 and license of Material Studio version 6.1 is also installed on HPC cluster Kshitij-3.

Reported by:
Alpana Rajan (alpana@rrcat.gov.in) and Anil Rawat

I.2: Development of Information Management Systems at RRCAT

A) Commissioning of Oracle 11g platform for next generation of Information Management Systems:

Various information management systems being used in RRCAT Administration, Accounts, IRPSU and Medical centre, are deployed on Oracle 10g platform and are operational since year 2007. These applications and associated databases are required to be migrated to Oracle 11g platform, since support for Oracle 10g Database and Application server Release 2, expired in July 2010 and Oracle 10g setup is not compatible with latest server hardware. Also, the old version of Application Server supports only JDK (Java Development Kit) 1.3, which is also an un-supported version.

Intel Xeon based **HP enterprise** servers with 32 GB memory, 3.6 TB storage and open source Enterprise Linux release 5.7 as Operating System have been commissioned for next generation information management applications. The server deployment is based on three tiered Oracle 11g infrastructure which comprises of web servers, application servers and database tiers. The production ready setup of Oracle 11g platform, which includes, application deployment, central administration and unified login across information management systems is completed.

Installation and commissioning of NAS (Network Attached Storage) based backup solution for performing backup of data on database servers, application software and system software repository was completed. Two numbers of NAS devices, having two Intel Xeon Processors of 2.26 GHz, 24 GB memory and 28 TB storage capacity with Windows 2012 storage server as underlying Operating System, have been installed. These two NAS devices are used for offline backup of Oracle 10g/ Oracle 11g database and software code on Oracle 10g /Oracle Web logic application server.

B) Migration and re-engineering of Integrated Purchase-Stores-Audit Software and OASIS Software to Oracle 11g platform:

Migration of data from Oracle 10g database to Oracle 11g database was completed for Integrated Purchase-Stores-Audit Software and Project Monitoring Software - OASIS. Application porting and re-engineering of forms and reports on Oracle 11g Web logic mid-tier, was completed. Now, Integrated Purchase-Stores-Audit Software and OASIS Software both are successfully running on Oracle 11g platform with Oracle Single Sign-on functionality. The whole exercise has resulted in a sustainable information system which is compliant with international standards.

C) Design, development and implementation of software for Immovable Property Returns:

A web based module has been designed and developed for on-line filing of calendar year-wise Immovable Property Returns (IPR), by individual employees on RRCATInfonet after successful authentication. PDF file of calendar year-wise 'Statement of Immovable Property' is generated in the prescribed format with date and time stamp for signature. IPR details can be accessed by the vigilance section of RRCAT, using the software module developed in Oracle 10g database for verification against the approval of acquisition/ disposal/ construction of Immovable Property. The software module has been released on RRCATInfonet, for on-line filing of Immovable Property Return for the calendar year 2013 for Group 'A' and 'B' employees. The figure below shows snapshot of the interface used by employees to fill on-line IPR.

Figure I.2.1: On-line filing of Immovable Property Return on RRCATInfonet

A module has been designed, developed and implemented for Vigilance Section using Oracle 10g forms and reports, to maintain the records pertaining to the immovable properties of the employees of RRCAT. Data related to the transactions of acquisition, construction and disposal of the immovable properties like location of property, type of property, name of party, relationship with party, acquired in the name of, acquisition value, disposal value, source of fund etc. are stored systematically using this module. Provision has been made in the software to generate permission letter, final intimation letter and noting letter for acquisition/ disposal/ construction of Immovable Property in the prescribed formats.

D) Design, development and deployment of Guest House Information Management Software:

Web based software has been designed, developed and implemented on RRCATInfonet for management of information related to RRCAT Guest House. The software can be accessed by the authorized persons with required access levels.

The software has options for advance booking of rooms, allotment of rooms, registration of rooms, cancellation of booking and billing Information. Provision is made in the software for viewing guest house wise allotment and occupancy status of rooms as shown in the figure I.2.2. Various reports can be generated related to booking/ allotment register, guest registration book, date/ guest house/ institute wise allotment & registration status and cancellation list.

Figure I.2.2: Guest House wise Allotment/ Occupancy Status of rooms

Using this software billing of rooms can also be done based on number of days of stay and room charges for the corresponding room as shown in the figure I.2.3. PDF file of bill receipt is generated in the prescribed format.

Figure I.2.3: Guest House Check Out and Billing

The software has helped concerned officers to streamline the process of booking, allotment and registration of rooms by managing the information of rooms and guest house status.

E) Design, development and implementation of Material Gate Pass Reconciliation Software:

One web based software package has been designed, developed and deployed on RRCATInfonet to provide workflow based solution for Material Gate Pass (MGP) Preparation, Approval and Reconciliation along with related data management. Individual employees and office staff of Divisions/ Independent Sections can prepare the Material Gate Pass for Returnable and Non-returnable items electronically.

Authorized Signatory from respective Divisions/ Independent Sections can electronically Approve or Cancel the pending gate passes prepared by officers from their Division/ Independent Section. List of all MGPs pending for approval, pending for return of material & canceled MGP will be available in the software to respective Authorized Signatories. Access Rights have been implemented based on type of Material that can be approved by Authorized Signatory i.e. Normal Material/ Data Storage Devices/ Design Drawings. Authorized Signatory can issue 'Certificate for Closing of Gate Pass' in the case of 'Returnable Gate Pass with Free Issue Material', where returned items are in different form than the sent out items.

Figure I.2.4: Material Gate Pass Entry Interface on RRCATInfonet

PDF file of Material Gate Pass is generated in the prescribed format with date and time stamp for signature. The Material Gate Pass has to be printed, and signed by the employee/ by the person carrying out the material and also by the Authorized Signatory.

The Security Staff will use an option in the software to transfer the MGP data to a database, which will be later used for reconciliation in case of returnable material gate passes. Returnable Gate Pass will be 'Closed' only when all the items are received back in RRCAT. The software has item wise control for this purpose.

Figure I.2.5: Material Gate Pass Software Interface for Security Staff

All the information related to gate pass details, approval, and cancellation is also maintained in log files to generate audit trail at a later stage. The complete software for gate pass preparation, requests for approval, gate pass information management and reconciliation by security has been deployed. This software can provide various reports related to items pending against returnable material gate passes, generation of reminders, when item against returnable material gate passes is not received within stipulated time frame, generation of registers for returnable and non-returnable items based on date range, division-wise report of pending returnable items etc. In case of returnable items, authorized signatory will be able to view the status of items, pending for return.

F) Customization and Deployment of Payroll Software for DAE-HO, Mumbai over Anunet:

DAE-HO, Mumbai has been using FoxPro based payroll system, designed and developed by Computer Centre, RRCAT since 2001. The existing system had problems due to character mode interface and legacy OS which are now obsolete. Computer Centre had designed and developed web based Pay & Allowance processing system which is operational since March 2009 in RRCAT. Some of the main features of the developed system are – code standardization, flexibility, provision to generate reports dynamically with various filter options and adaptability to changing requirements & rules. The software is fully parameterized and customizable to suite the present as well as anticipated future requirements.

This software has been customized and configured as per the requirement of DAE-HO, Mumbai. Data files, table spaces, schema, tables and views for payroll database have been created on database server, deployed on Anunet. Modifications in forms and reports were carried out as per the requirement at DAE-HO. Codification for master tables for maintaining details of employees, entitlements, deductions, head of accounts and various recovery rates have been done. Data migration with proper data type casting from existing FoxPro system to new Oracle system was done with export and import utilities and PL/ SQL scripts.

This system has been integrated with the Personnel System of DAE-HO for using information of the employees, to eliminate redundancy of data. Additional reports were developed as per their requirement for generating section wise summary, multiple bank wise schedule, division wise bank schedule, modified consolidated statement of pay bill (for IAS officers) etc. The software is in regular use, since last three months.

G) Enhancements and deployment of software for on-line submission of applications for Recruitment at RRCAT and RRCAT Ph.D. Programme 2014:

Web based software for on-line submission of applications on Internet was fine tuned as per the revised application formats of advertisements for recruitment at RRCAT. The software was deployed for two more advertisements for regular recruitment - Advertisement No. 'RRCAT-5/2013' and 'RRCAT-6/2013'. Provision has been made in the software to generate different application form for different post codes, within the single advertisement. Provision has also been made for source code versioning for various advertisements for future reference and rapid deployment of similar type of advertisement.

Web based software for on-line submission of applications on Internet was fine tuned as per the application format for RRCAT Ph.D. programme – 2014 and deployed on Internet.

Figure I.2.6: Management information of on-line Recruitment Advertisements

The administrative interface on RRCATInfonet has been enhanced to provide statistical information and with graphical representation in the form of bar chart, for applications received on-line and entered manually as shown in figure I.2.6. Deployment of these software applications has reduced data entry workload of staff at recruitment section.

Reported by:
Alpana Rajan (alpana@rrcat.gov.in) and Anil Rawat

I.3: Developments in Networking and Communication at RRCAT

A) Design, Development and Commissioning of high performance and high availability cluster based email server setup:

With rapid growth of email communication as the most convenient, fast, reliable and legally accepted mode of communication, organizational level email services are required to be responsive and reliable. In RRCAT also, requirement of email service as an essential mode of communication, has increased rapidly over the last few years. The bar graph in figure I.3.1, depicts the rate of growth of mails sent by RRCAT users in last five years. The graph shows that there is great amount of dependency on email services for communication, and it is increasing day by day. Thus, there is a need to provide reliable, fast and high capacity email storage to users.
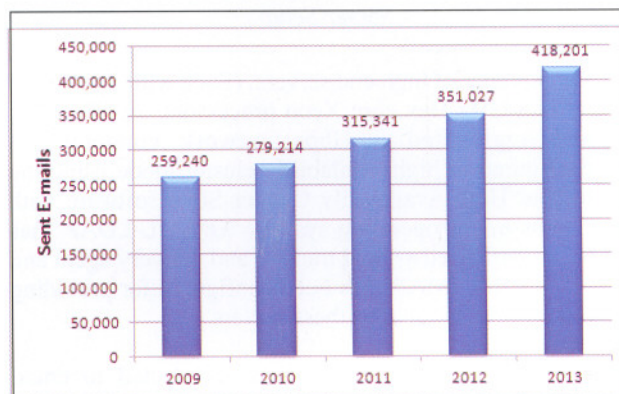

Figure I.3.1: Graph depicting yearly volume of emails sent by RRCAT users for last five years

In view of the requirements, a state of the start, high performance and high availability cluster based email server setup is commissioned. The complete email setup has been designed and developed in house using Freeware Open Source Software (FOSS) components. Email server setup is released to users with enhanced features. The newly added features are **(a)** *Increased disk quota for each user,* **(b)** *Auto insertion of TO/ CC/ BCC fields based on search on Email-ID*