

Fig. I.1.5: Class C 3D FFT Partial Differential Equation (FT) benchmark of NPB for 8 process application.

We used homogenous distributed memory based 16 nodes cluster, Mellanox PCI express MT25418 HCA and HP BLc 4X DDR IB switch for interconnecting nodes, Linux 2.6.18-128 as operating system, MVAPICH2 with Intel FORTRAN and C/C++ compilers as Inter Process Communication (IPC) library, HP ProLiant BL460c blade server with eight cores (two quad core) as node of cluster for this analysis.

The results of all these tests (indicated graphically in above figures) show that communication between cores of two nodes are faster than communication between two cores of the same node, in case of Infiniband interconnect. The best performance of HPC cluster with Infiniband interconnect can be achieved by selecting lower number of processors per node.

C) Augmentation of centralized computing server setup:

Two Intel Xeon based computing servers named as "amogh-2.rrcat.gov.in" and "amogh-4.rrcat.gov.in" have been commissioned with two Intel Xeon 2.93/ 2.00 GHz quad core processors, 16/ 10 GB memory for scientific computing and engineering applications. Red Hat Enterprise Linux Server release 5.4 is used as operating system for these two servers.

Intel FORTRAN and C compiler version 11, Absoft FORTRAN Compiler version 10.2.0, Lahey/Fujitsu v8.1a Linux64 Fortran compiler, MATH Kernel Libraries version 11, Intel Threading Building Blocks (tbb) for Intel C compilers, MATHEMATICA 7, IMSL version 9 are available in these server for advanced computing applications. User applications namely CST STUDIO SUIT 2009, CNTech, Flair and Fluka are also made available for computing and engineering applications.

D) Porting of user programs:

As per requirement of users, various software packages are successfully ported on computing servers and clusters.

Parallel software package LS-DYNA version 971 R4.2.1 with Inter Process Communication library OpenMPI-1.2.5 is ported successfully on 'Kshitij-1' HPC cluster. The software was successfully tested for user application.

Parallel version of CRYSTAL09 is ported successfully on 'Aryabhata' cluster using OPENMPI version 1.4.3 and Intel FORTRAN compiler version 11.1. This package performs ab initio calculation of the ground state energy, energy gradient, electronic wave function and properties periodic systems.

Sequential application Tracy2 is also successfully ported on Intel Xeon Linux server. This program does the computation of off-momentum particle (i.e. electrons) loss in presence of multi-polar magnetic field error.

E) Training and hand-on sessions conducted at User Hall:

Five days training with hands-on session was organized on Virtual Reality & Visualization Software - EON Professional from 6th Sept. to 10th Sep. 2010.

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I.2: Development of Information Systems at RRCAT

A) Design, development and implementation of EAGLE (Electronic Assessment - Grade Logger and Editor) software:

EAGLE - Electronic Assessment Grade Logger and Editor software was designed, developed and released on RRCATInfonet for on-line assessment of APARs. This is an authenticated web based software for calculation of grade and writing of remarks electronically for Annual Performance Appraisal Report (APAR) of employees. The appraisal form as well as the remark entry interface has been made available digitally, to ease out the task of evaluation of grade and remark writing procedure. The evaluation process became more convenient by simple mouse clicks in comparison to the paper

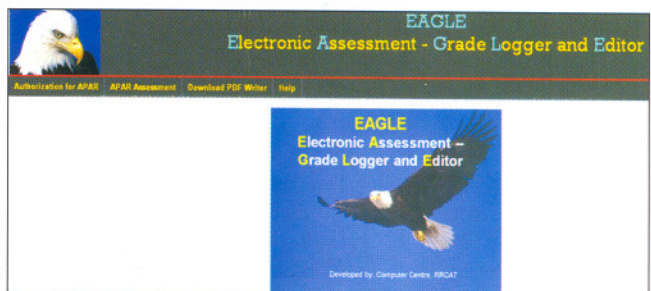
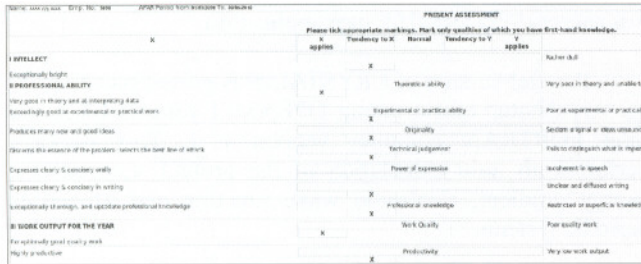


Figure I.2.1: EAGLE Software on RRCATInfonet.

based procedure. Provision has been made to store the information in PDF format also.

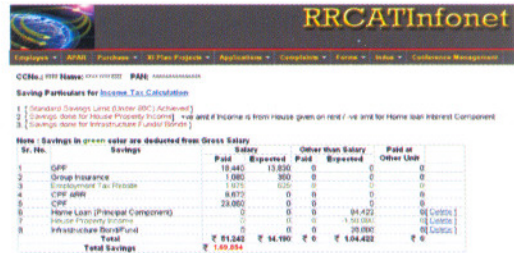


The image shows a 'PRESENT ASSESSMENT' form with a grid for marking scores. The grid has columns for 'X' (Tendency to X) and 'Y' (Tendency to Y) under the heading 'Please tick appropriate markings, mark only qualities of which you have first-hand knowledge.' The rows list various attributes like 'Intellect', 'Professional Ability', 'Public relations', etc., with checkboxes for 'X' and 'Y'.

Figure I.2.2: Snapshot of Present Assessment Form

C) Web based module for submission of Income Tax related savings particulars:

A web based software module was developed and released on RRCATInfonet for entering Income Tax related savings particulars by individual employees. This authenticated module can be used by employees to enter expected savings related to 80CC, infrastructure bonds, income from house property etc. The expected savings will be verified by the salary section and transferred to paid savings by just a mouse click.



The screenshot shows the 'RRCATInfonet' web interface. It includes a navigation menu (Employees, APAR, Purchase, etc.) and a 'Saving Particulars for Income Tax Calculation' form. The form has a table for 'Savings' with columns for 'Sr. No.', 'Savings', 'Paid', 'Other than Salary', and 'Paid as'. The table lists items like GPF, Group Insurance, EPF, etc., with their respective values.

Sr. No.	Savings	Paid	Other than Salary	Paid as
1	GPF	18,480	13,870	0
2	Group Insurance	1,000	800	0
3	Investment in PPF	1,000	0	0
4	EPF	8,870	0	0
5	CPF	23,000	0	0
6	Home Loan (Principal Component)	0	0	84,473
7	Income from House Property	0	0	1,10,000
8	Infrastructure Bond/Fund	0	0	29,800
	Total	₹ 51,350	₹ 14,700	₹ 1,14,273

Figure I.2.3: Income Tax Savings particulars form.

This software is released on RRCATInfonet and it has reduced data entry work of salary section substantially.

D) Enhancements to Allowance Processing System:

Allowance processing system was enhanced for arrear calculation and disbursement of Organizational Incentive and Group Incentive under PRIS with provision for maintaining history of PRIS related payments and leave recovery during this period.

A web based Data uploading module for Allowance Processing System was also developed and released for Salary Section. This module enables the staff of Salary Section to upload recurring entitlements/ deductions like CAT Co-operative Society recovery, BARC Co-operative Society recovery, Telephone recovery etc. (in .xls format) to Entitlement/ Deductions side of Oracle tables for payroll processing. Various other types of entitlements like Honaraium, Group Achievement Award etc., deductions like CATSOA, CATSA, CATGanaga recovery and one time recoveries like Relief to family etc. can also be uploaded using this module. Authenticated access of this module has been provided to the staff of Salary Section.

A module for DDR Heads was developed for maintaining the record of all transactions related to loans given to employees from Government Head of Account. DDR register can also be printed for various types of loans. This module is integrated with Allowance processing system so that employee loan details need not be entered again to save data entry work.

Members of Scientific Committee of RRCAT can authorize assessing officers and countersigning officers for assessing APARs in their respective Division/ Independent Section. Assessing officers can use the software for preparing and printing 'Staff Assessment Form' and 'Present Assessment'. Countersigning officers can use the software for calculating grade based on scores for various parameters.

This system is linked with HR database, which is maintained by administration department. Presently, there is no storage of assessment data at the server as the data is not encrypted. The 'Staff Assessment Form' and 'Present Assessment' can be printed directly or saved in PDF format for printing later.

Using this software, APARs were submitted in uniform format within the specified deadlines for the current assessment year 2009-10.

B) Software module for nurses at Medical Centre:

Software module for nurses was developed for Medical Centre with provision for Stock maintenance of medicines/ items at Stores and Observation room. The module facilitates the staff to manage the inventory of medicines received from the supplier at nurses' store. The module at observation room facilitates the staff to maintain the inventory of the medicines issued to patients and also to maintain the record of health check-up of patients like blood pressure, sugar, ECG etc. Information related to the indents raised by the nurses can be accessed by the store in-charge. Thus, it helps in reducing the data entry work.

The software provides various query options like issue of medicines to observation room, receipt of medicine from supplier, issue of medicine to patients etc. Various reports like daily transaction, monthly transaction, transaction up to particular date, medicine balance at store and observation room etc. can be generated using this software.



E) Enhancement and revamping of RRCAT website for complying to GoI(Government of India) guidelines:

RRCAT website was enhanced and modified as per compliance matrix specified in GoI guidelines. The website was re-designed and revamped with new look and feel and also fine tuned by making changes under the headings (of GoI guidelines compliance matrix) like Government of India Identifiers (link to Home page of National Portal etc.), Building confidence (disclaimer, copy right, hyper linking policy etc.), Scope of contents (News, Contact Us, Secondary Content as per archiving policy etc.), Quality of contents (Documents with Timestamps etc.), Design (Alternate text provision etc.), Development (Meta Data for keywords etc.) and website hosting (security of website, regular backup of the website for disaster recovery purpose etc.).

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I.3: Development in Networking and Communication at RRCAT

A) Commissioning of VPN connectivity setup for XRD beam line (BL12) at Indus-2

VPN connectivity setup was designed, developed and implemented for remote access of RRCATNet resources over internet. Software tools used for VPN setup implementation are OpenVPN v2.1 (GUI application for OpenVPN on Windows), fwbuilder V4.0 (Firewall Management Software), CreateInstall free Software V4.14.5 (VPN Client Installation file builder), Fedora Directory Server V1.2 (for VPN User database) and phpLDAPadmin V0.9.3 (for Access to VPN user database). Strong password and digital certificate based authentication technique has been used to allow only pre-registered users the access to the pre-identified resource, for a pre defined duration.

As a proof of concept, the VPN setup is being used to provide access to an instrumentation setup named "SPEC", procured from M/S. Certified Scientific Software, Cambridge. This setup is being used on XRD beam line (BL12) at Indus-2. To enable the vendor, to securely install some new features of the software and test its working with new x-ray detector, over Internet, the VPN connectivity is being provided using the recently commissioned setup.

B) Commissioning of Open Source Security Information Management (OSSIM) based Security Analysis and Management setup

OSSIM based security analysis and management setup is commissioned to monitor and log complete network traffic, related to Internet, Intranet, Anunet, DAEGrid and National

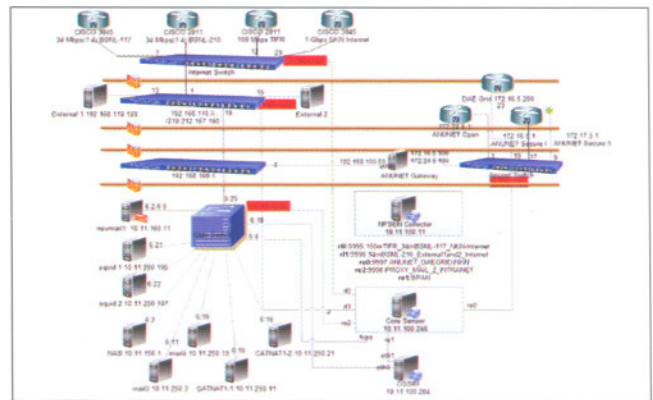


Figure I.3.1: Schematic diagram of OSSIM based Security Analysis and Management setup

#	Alarm	Risk	Sensor	Since
351	P2P BitTorrent: torrent download by 210.212.157.170 (140 events)	1	ossim.rrcat.gov.in	2011-01-21 16:35:02
352	AVT-FEED Spyware Fun Web Products Agent detected on 10.29.2.159 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 16:44:28
353	AVT-FEED BitTorrent usage on 210.212.157.170 (140 events)	6	ossim.rrcat.gov.in	2011-01-21 16:36:49
354	AVT-FEED Spyware Fun Web Products Agent detected on 10.125.2.248 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 16:35:50
355	AVT-FEED Spyware Fun Web Products Agent detected on 10.29.2.149 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 16:19:58
356	AVT-FEED Spyware Fun Web Products Agent detected on 10.28.2.79 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 16:08:31
357	AVT-FEED Spyware Fun Web Products Agent detected on 10.28.2.176 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 15:32:38
358	AVT-FEED Spyware Fun Web Products Agent detected on 10.26.2.242 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 15:24:24
359	AVT-FEED Spyware Fun Web Products Agent detected on 10.125.2.26 (140 events)	2	ossim.rrcat.gov.in	2011-01-21 15:22:42

Figure I.3.2: Snapshot of Report regarding network traffic related to threat Incidents and events

Figure I.3.3: Snapshot of Network fabric status view, both host and service wise