I.2: Development of Information Systems at RRCAT

A) Enhancements to OASIS - Project Monitoring Software:

Web based software OASIS (On-line AccesS to project Information System) for comprehensive project monitoring is being used by project coordinators to monitor their XI plan projects. The software has reduced the manual work done by project coordinators for preparing various reports. This software has been enhanced further for maintaining the details of sub-projects within a project. To facilitate access to sub-coordinators, authentication mechanism of the software has been re-designed and implemented. Re-engineering of the data related to indents of sub-projects of various XI plan projects was done in the databases of Integrated Accounting Software and Integrated Purchase-Stores-Audit Software. All the programs related to Budget Monitoring reports were modified to facilitate access at sub-coordinator level. Report for 'Procurement Calendar' was modified for viewing financial year wise data. A new feature for uploading and viewing documents was also added to the software, so that all the information related to XI plan projects can be accessed from a single point.

B) Modifications in Payroll Software as per Sixth Pay Commission:

Programs were developed for Establishment Section to help in carrying out Pay Fixation of employees and due care was taken for promotion cases. Various programs were developed for generating 'Drawn and due statement' (as per sixth pay commission orders) and 'Arrears calculation sheet'. Based on due statement, income tax was calculated. Leave recoveries were taken care of in arrear calculation. This exercise helped Administration and Accounts for speedy disbursement of sixth Pay Commission arrears. Payroll software is also modified for processing of monthly salary as per sixth Pay Commission recommendations.

C) Migration of client/ server based Training School Software to web based architecture:

Software for BARC Training School at RRCAT is developed and maintained by Computer Centre. Earlier this software was working on client/ server (two-tier) architecture, but now it is migrated to web based platform using n-tier architecture. The data was migrated from Oracle 9i to Oracle 10g database and Oracle Internet Directory was configured for authentication. Migration of forms and reports, application deployment and unified login was completed with single sign-on functionality. Comprehensive training was provided to the users and now the software is successfully running on Oracle 10g platform.

D) Deployment of InPAC-09 Website:

A website for Indian Particle Accelerator Conference - InPAC-2009 has been developed and deployed on http://www.inpac2009.rrcat.gov.in. This site contains information related to the conference.

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I.3: Development in Networking and Communication at RRCAT

A) RRCATNet Planning, Expansion and Upgradation:

Phase IV of RRCATNet high speed OFC backbone network expansion, was completed. This phase of the network expansion facilitates physical media redundancy and high speed network (1 Gbps backbone) connectivity to Fire Station, Guest House, Training School, H-Block and Guard House buildings. It also includes extension of the high speed OFC backbone to Residential Area Exchange, Medical Centre, AECS (both new and old computer labs) buildings and 100 Mbps Copper backbone connectivity to New Chemical and CAP buildings. In all, 200 nodes were added to RRCATNet.

B) Enhancements to RRCAT Data Centre:

Necessary configuration changes were done to extend "Z Drive" access to various committees and groups namely AGB, LGB, SCR, ARPF and PSS, for better and easy collaboration among members. "Z Drive" is a shared storage with authenticated access over RRCATNet. Approximately 100 users have benefited with these configurations.

C) Email and Internet Access Setup Enhancements:

The domain name of RRCAT was changed from "cat.ernet.in" to "rrcat.gov.in". Necessary configuration changes were carried out in the Domain Name Service, mail and web servers to accept requests for both the domains. It

is planned that use of cat.ernet.in domain will be closed by the end of calendar year 2009.

To tackle spam mails, name servers were upgraded to support SPF (Sender Policy Framework) queries. The SPF framework forces the mail servers across the world to only accept emails for a particular domain from the well known and organization owned servers. To further bring down the number of spam mails and viruses entering RRCATNet, the spam mails and virus filtering software configured on the email gateways were upgraded to the latest versions with new rule sets. The web email client software was also upgraded to the latest stable version.

To enforce strong password policy for email and internet access, configuration changes were carried out on the LDAP password database server. The account password can now be changed only from the web interface with URL http://mail.cat.ernet.in/ change_passwd. The change password option on the web mail interface has been removed.

D) Commissioning of network traffic sensor, recorder and data profiler:

To easily identify malicious (virus/ spyware/ malware) traffic flowing on RRCATNet, network traffic sensors and recorders with graphical visualization tools have been installed and commissioned. At present traffic sensors have been placed to record all network packet headers for traffic flowing from/to proxy servers, email servers and internet routers. Data profiler tools with various filtering options have also been configured to ease out the process of data analysis. Following are the typical screenshots of the data profiler:

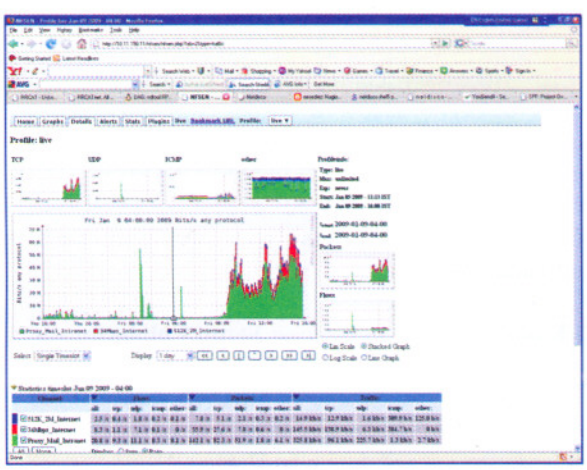

Fig. I.3.1: Screenshot of the data profiler output.

E) Commissioning of switch port level network monitoring tool:

To monitor RRCATNet access level policy compliance, an intelligent, switch port level monitoring tool has been installed. This tool helps in providing detailed view of the various IP resources, like the attached hubs and wireless equipments on the network, inventory of the used IPs, port level mapping of a particular IP/PC, NETBIOS information of a node and duplex mismatch information on uplink ports. Following is a typical screenshot of the IP address utilization of the sub-network with ID 10.31.0.0/16 on RRCATNet.

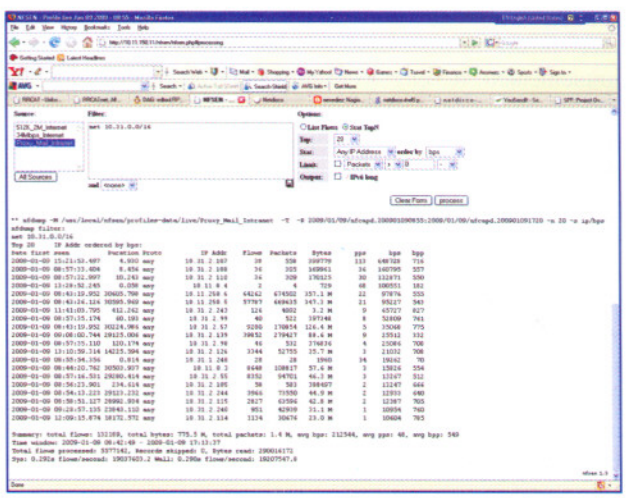

Fig. I.3.2: Screenshot of the top 20 IP traffic generators.

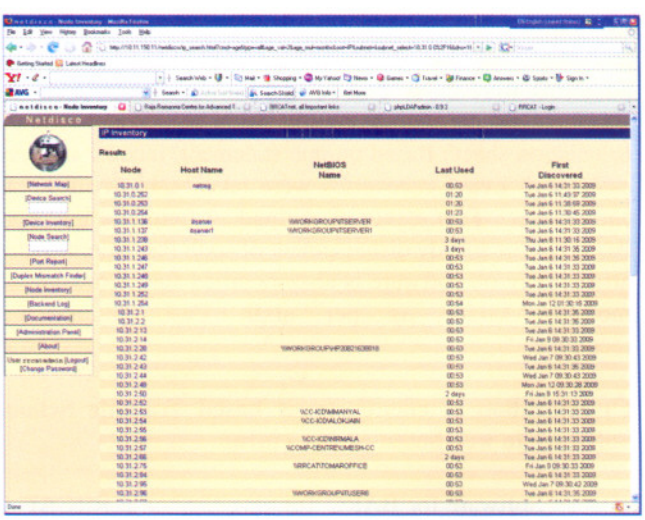

Fig. I.3.3: Screenshot of details of IP address utilization (subnet 10.31.0.0/16) on RRCATNet.

F) Video Conferencing Setup Utilization:

Six promotion interviews were successfully conducted in RRCAT, using the Inter DAE video conferencing setup. Large number of video conferences have been successfully conducted with various national and international research centres like CERN, FNAL, BARC and TIFR.

G) Expansion of Communication Network:

Telecommunication facilities were extended to Chemical Treatment Facility (CTF) Lab and Laser Photo Cathode buildings. Mobile access facilities were enabled on 19 extensions, 30 telephone connections were shifted and 17 new telephone connections were installed in RRCAT campus. MDF of the lab area exchange was further upgraded to support 100 more telephone connections. The RRCAT internal telephone directory containing the up to date information was published, data for which was drawn directly from the centralized HR database of RRCAT.

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I.4: Modification in power distribution helps in Indus-2 performance improvement

Commissioning activities for the synchrotron radiation source Indus-2 have been in progress. During these operations, the beam used to get killed very frequently. On many occasions, the reason was voltage variation on the input side. Such variations are unpredictable and their range also keeps varying according to the seasons of the year.

The electric power to the Indus complex, including all the subsystems of Indus-1 and Indus-2, is distributed through a dedicated 11 kV/ 433 V substation. There are eight transformers in the substation including a three winding transformer TR-7 for the Indus-2 Dipole power supply. Transformer no. 1 (TR-1) feeds the Magnet Power Supply system and TR-4 feeds Radio Frequency Power Supply system of Indus-2. Power Control Centres (PCCs) have been provided separately for these sub-systems. All other loads such as LCW system, Ultra High vacuum system, HVAC system etc. are on different PCC, fed by a pair of transformers viz., TR-5 and TR-6. TR-2 feeds Indus-1 loads through power conditioners. TR-8 feeds the Booster Power Supply. TR-3 is a Stand-by transformer for all the two-winding transformers

Two major power supply systems of Indus-2 viz., Magnet Power Supply (MPS) and RF Power Supply (RFS) need more stable input mains for achieving the energy level of 2.5 GeV. For estimating power requirements of the MPS and RFS, simulation trials were carried out at 2 GeV and 2.5 GeV respectively. Results of one of the trials are given below:

Sr. #	Beam Energy	RF Station #1	RF Station # 2	MPS
1	2.0 GeV	425 A	350 A	744 A
2	2.25 GeV	425 A	350 A	831 A
3	2.3 GeV	425 A	350 A	849 A
4	2.4 GeV	425 A	350 A	891 A
5	2.5 GeV	425 A	350 A	930 A

It is to be noted that each RF Station feeds two RF cavities. RFS-1 was fed unconditioned power, whereas RFS-2 was fed conditioned power. Auxiliaries for RF were connected to RFS-3. As the load was not comparable to the cavities, it was not recorded.

From the trials, it was concluded that conditioned power to the tune of around 1500 kVA might be required at this stage, if all the loads of both the MPS system and RF System are to be fed conditioned power. Looking at the urgency of commissioning activities of Indus-2, an immediate solution was required in this regard, as the procurement of power conditioning system for Indus-2 may take some more time.

The Indus-1 Power Conditioning System (PCS) having a rated capacity of 2 x 1100 kVA has been performing well. After the isolation of Booster Power Supply from this PCS, some capacity margin had become available.

Accordingly it was decided to connect all the loads of Indus-2 MPS, two Indus-2 RF cavities and their auxiliaries to Indus-1 PCS. The available capacity margin imposed a restriction, thus only two RF cavities and their auxiliaries could be connected. Remaining two RF cavities were not connected. A load ceiling has been imposed through the respective air circuit breakers on both the MPS as well as RFS to the tune of 800 A each, to restrict overall loading on the Indus-1 PCS. Additional cabling and relevant modifications in the connections at the PCCs in the Indus substation have been carried out.

After these modifications, a notable improvement in the Indus-2 performance vis-à-vis the input power quality has been observed.

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