

I.3: Development in Networking and Communication at RRCAT

Commissioning of centralized high capacity backup setup

A centralized high capacity and high performance backup setup has been commissioned to provide automated backup facility for backup of data related to various servers connected to the RRCATNet. The backup setup consists of a backup server installed with sophisticated backup software, a Virtual Tape Library (VTL) of 4TB capacity and high end automated physical tape library consisting of 60 slots of 800GB/1.6TB(compressed) tapes with 2 number of tape drives. Backup procedures for file system data, online database data like Oracle, MySQL etc, ISO images of critical servers have been streamlined. This has facilitated the backup and restoration of user and system data, which is required for faster recovery of servers in case of catastrophes resulting in data losses. The newly installed backup setup has helped us to reduce the backup window time by about 10 folds, as compared to that in the older conventional setup. Fig.I.3.1 shows the rack view of the various components of the centralized backup setup.

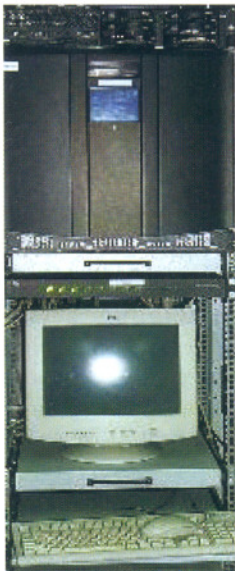


Fig.I.3.1: Rack view of the centralized backup setup

Commissioning of a Cluster based Email server setup

To enhance the performance of email access service, the standalone email server setup was replaced with a cluster based email server setup. The new cluster consists of three servers and a SAN (Storage Area Network) based storage of 1TB capacity expandable to 2TB capacity. The cluster of servers, have been configured with server load balancing feature, to maximize server utilization among multiple, simultaneous users. The SAS (Serial Attached SCSI) drives based SAN storage has been configured with dual access channels and devices for providing fault tolerant and fail over

operations. In addition to this, RAID (Redundant Array of Inexpensive Disks) and logical drive configurations have been carried out for faster access time and enhanced reliability. The email service is accessible using all types of mail user agents namely the pine, webmail and Outlook Express. Provisions to record all email transactions, along with the contents have been made and activated for security auditing purposes. The disk quota of various user accounts, have been increased significantly. The various email service related pages have been revamped to give a new and consistent, look and feel to the users. The snapshot of the first page of the email service page is as given in Fig.I.3.2.

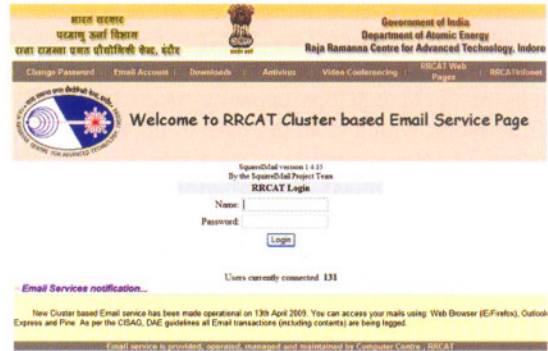


Fig.I.3.2: Screenshot of the email service home page.

Commissioning of 34 Mbps (1:2) bandwidth Internet link

A new 34 Mbps (1:2) shared bandwidth, Internet link from ERNET India, was commissioned in addition to the already existing 34 Mbps (1:4) shared bandwidth Internet link from M/s BSNL for Internet browsing and file downloading facilities on RRCATNet. Both links are configured in load balancing and failover mode. Using links from different Internet Service Providers (ISPs) have allowed us to provide uninterrupted Internet access service to the users. The load balancing configurations have allowed us to use both the links seamlessly for outgoing traffic, thus aggregating available outgoing bandwidths of both the links. The failover configuration allows automated shifting of outgoing traffic to the active link in case of single link failures. Network address translation configurations have been carried out on link concentrators, to seamlessly allow incoming traffic to access the domain, web and email services in load balanced and failover mode. Figures I.3.3 and I.3.4 depict typical utilization of the two links on a working day.

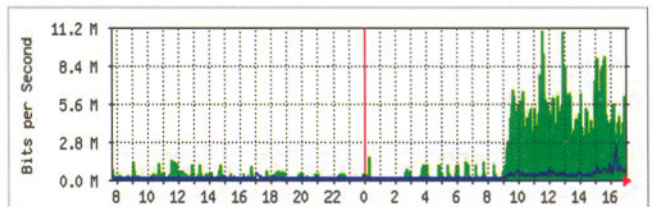


Fig. I.3.3: Graphical view of the 34 Mbps (1:4) Internet link utilization on a working day.

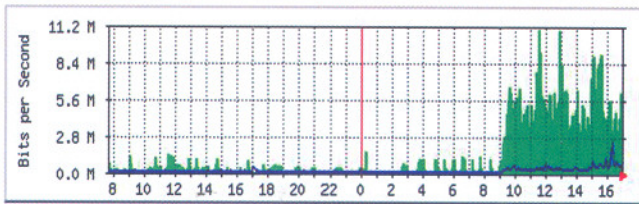


Fig.I.3.4: Graphical view of the 34 Mbps (1:2) Internet link utilization on a working day.

Enhancements to RRCAT Data Center

A new rack mount multiplexer of STM16 capacity was installed in the Data Center to terminate all current and future external data links from M/s BSNL to RRCAT. This facilitated RRCAT with enhanced provisions for terminating data links of up to 2.5Gbps capacity, from M/s BSNL to RRCAT network, which is an increase of up to 70 fold from the existing 34 Mbps network connectivity. Fig-I.3.5 shows the front view of the OptiMUX installed at our Data Center.

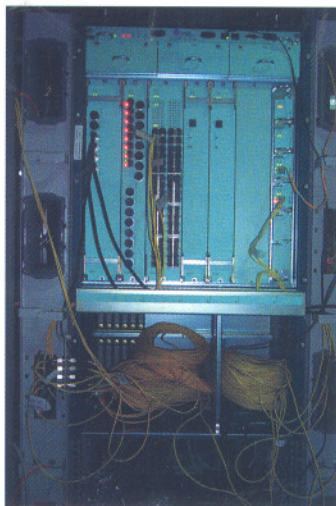


Fig.I.3.5: Rack view of the OptiMUX with STM16 bandwidth capacity

Expansion of communication Network

Telecommunication facilities were extended to Laser photo Cathode buildings, where 21 new telephone connections were provided. Mobile facilities were enabled on 13 extensions, 21 telephone connections were shifted, 28 new telephone connections were installed and 9 numbers of digital reflex phones were installed with voice mail facility in RRCAT campus. Seventeen numbers of TDPs, located in the colony area were revamped.

RRCATNet Planning, Expansion and Upgradation

Planning for Phase-V of the RRCATNet high speed OFC backbone network expansion, was carried out and work for “enhanced Phase-IV” was started.

The Phase-V of the networking will cover laying of ten OFC segments, which will benefit users of New Chemical, Old Chemical, Medical Centre, ID Card room, New CAP, H-Block and I & M building.

The “enhanced Phase-IV” of the network expansion includes replacement of the aging, unmanaged/managed network switches in various buildings with the new managed switches. About 12 numbers of switches will be replaced in this phase. The 120 port network of RF and the 40 port network of Photocathode buildings were included in one of the OFC rings of the RRCAT Net for providing physical level redundancy. Internal wiring of the 40 node network at Laser Photo Cathode building was also completed. A 20 node network was commissioned at new library building and was connected to RRCATNet. Internal network of ADL was upgraded by replacing the old 24 port unmanaged hub with the new 24 port managed switch. Both, AECS building (new and old) networks were connected to RRCATNet using OFC links. The internal networking of the two building was revamped by replacing old unmanaged switches with new managed switches. In all, two numbers of 24 port switches and one number of 48 port switch were installed. In all, 130 nodes were added to RRCATNet.

*Reported by:
S. S. Tomar (tomar@rrcat.gov.in) and Anil Rawat*

I.4: VRF based air Conditioning for temperature stability of $\pm 0.5^{\circ}\text{C}$ at Calibration Facility

Survey and alignment of beam plays an important role in building and maintaining accelerator machines. Electromagnetic distance meters (EDM) and Distinvar™ are commonly used to meet the required accuracy over large distances. All such instruments need to be calibrated periodically and till recently, were calibrated at CERN. Recently, a new laser interferometer based calibration facility has been setup at RRCAT, near Indus building. This needs very precise temperature control throughout the year.

To maintain precise temperature control, within a range of $\pm 0.5^{\circ}\text{C}$, along a 30 meters long calibration table, selection of a proper air conditioning system with high accuracy and precision was essential. Conventionally such systems are based on PID controllers and are costly.

In order to meet such stable environment conditions, within limited budgets and using standard, available air conditioning systems, the calibration facility was planned as 33 meters long and housed in a partially underground tunnel to minimize solar gains and to get good amount of north lighting.

The stringent temperature control requirement needed, design of a detailed flow dynamics system to ensure proper