I.3: Development in Networking and Communication at RRCAT

A) Commissioning of a new Network Core Switch in IT Extension building:

A new network core switch (Extreme Networks Black Diamond BD8810) is commissioned in the data center hall of IT extension building. The new core switch is working in tandem with the old core switch (Extreme networks Black Diamond BD 6808) installed at IT building, to provide load balanced and fail-over switching and routing on RRCATNet. The two core switches have been interconnected to each other using 4 number of 1 Gbps OFC links. The newly commissioned switch is a 10 slot core switch, with 2 number of controllers, 3 number of power supplies and has a total aggregate backplane switching capacity of 1320 Gbps. Presently, the core switch is populated with 6 number of 10 Gbps optical ports, 24 number of 1 Gbps optical ports and 48 number of 1 Gbps copper ports. Figure I.3.1 provides a rack mounted view of the newly installed core switch.
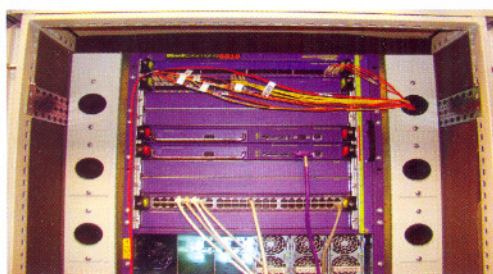

Fig. I.3.1: Rack mounted view of core switch

One end of the seven OFC rings, covering 50 buildings on RRCATNet, is terminated in the new core switch. The other end of the OFC rings is terminated in the old core switch. Layer-2 level redundancy has been configured using Ethernet Automatic Protection Switching (EAPS) protocol which provides failover times of 50 milisecond. Layer-3 level redundancy has been provided using the Virtual Router Redundancy Protocol (VRRP). This has helped in achieving the core switch level redundancy on RRCATNet.

B) Commissioning of network management software for managing RRCATNet:

A Simple Network Management Protocol (SNMP) based network management software has been commissioned to graphically visualize the state of the various network switches and network segments on the network. It also generates alarms to inform the network administrator about the malfunctioning component. The software also allows global configuration commands to be dispatched to a group of network switches for faster administration.
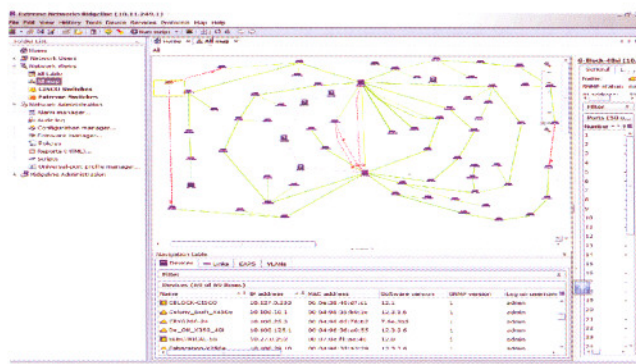

Fig. I.3.2: Graphical view of RRCATNet as seen in Network Management software

Figure I.3.2 depicts a graphical view of the state of various switches and segments on RRCATNet. The green coloured lines and blocks indicate properly working components and segments while the red ones indicate malfunctioning components and segments.

C) Commissioning of a redundant and failover Service Load Balancer (SLB) setup:

To provide reliable, 24X7, network services to the users of RRCATNet, all network services like the Internet Proxy, Webmail, Simple Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP), Post Office Protocol (POP3) and Lightweight Directory Access Protocol (LDAP) have been configured on multiple servers. To distribute the requests of users to these multiple servers in load balanced and failover fashion a SLB setup is required.

Fig. I.3.3: Snapshot of Load balancer setup connections at some instant

Prior to the commissioning of the new core switch the SLB feature of the old core switch was used for this purpose. To provide core switch level redundancy on RRCATNet, a new SLB setup was created on two servers using the open source Ultramonkey (ver. 3) package configured on Red Hat Linux 3 (RHEL3) servers. The pilot IP address for all services has been kept as 10.31.31.10 and each service is using the standard port numbers. The Linux Virtual Server with NATting (LVS-NAT) technique has been used for load balancing. Figure I.3.3 depicts the state of the various SLB services and connections.

D) Commissioning of a Multi Level Anti-spam, Antivirus and Mail Gateway setup:

Scanning of emails for virus and spam is a very compute intensive task. Till sometime back, all emails received on RRCATNet were scanned for virus and spam on the actual email server, where user inboxes and mail folders were also stored. With the growing number of emails (approx. 20,000 daily) being received on RRCAT email server this sometimes caused slowness of the email server.

In order to improve the email server response time, a Multi Level Anti-spam, Antivirus Mail Gateway setup is designed, developed and deployed. In this setup two number of spam and virus filtering mail gateways namely spamfilter1 and spamfilter2, have been configured in load balanced and failover mode. These email gateways are installed at a level above the actual email server whereby they receive and process all mails received on RRCATNet from outside, and allow only filtered non virus and non spam mails to pass through to the actual mail server. Figs. I.3.4 and I.3.5 depict the typical week-wise email processing performed on these servers. Figs. I.3.6 and I.3.7 depict the typical week-wise email processing performed on actual mail server before and after the new setup deployment.
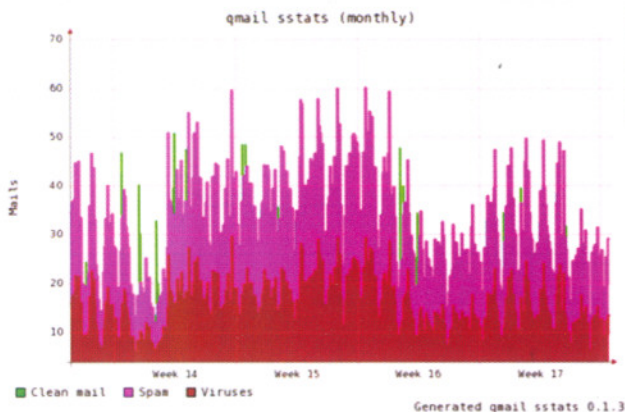

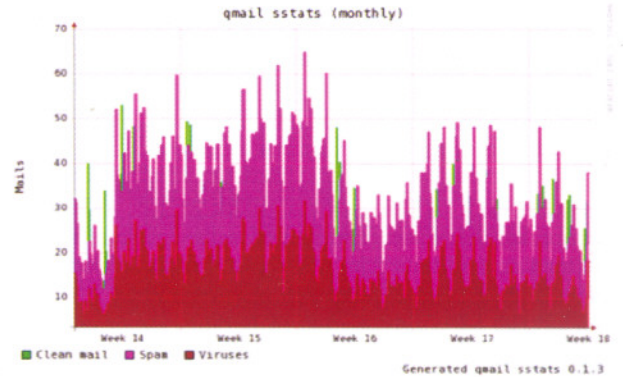Fig. I.3.4: Graph showing weekly email processing on spamfilter1 server

Fig. I.3.5: Graph showing weekly email processing on spamfilter2 server
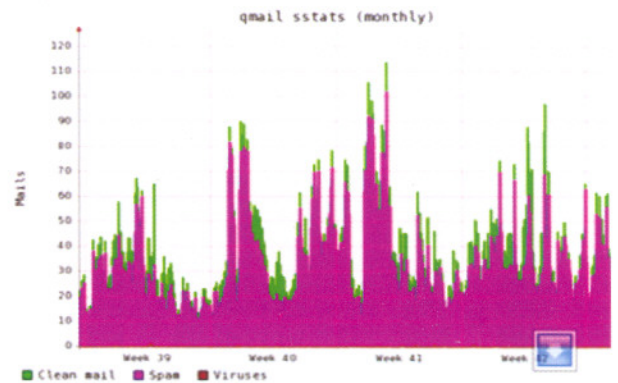
Fig. I.3.6: Graph showing weekly email processing on actual mail server prior to new setup deployment
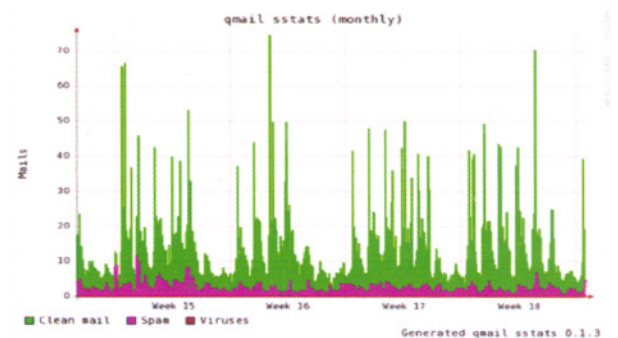
Fig. I.3.7: Graph showing weekly email processing on actual mail server after new setup deployment

The two new mail gateways have been configured with Qmail (ver 1.0.3) as Mail Transfer Agent (MTA) with Clam AntiVirus (ClamAV) as email virus scanner and Spamassassin (V3.3.1) with Pyzor (V0.5.0), Razor (V2.84) and Bayesian filtering modules for filtering of spam mails. All internal emails generated by RRCAT users are still scanned

for virus and spam on the actual email server. With this implementation the actual email server processing load has reduced from 20,000 emails per day to 2,000 mails per day, thus giving a performance increase of 10 folds.

E) Commissioning of a secure web server for access of Ph.D. application over Internet:

For hosting of Ph.D. application over Internet, a hardened secure web server with necessary open source based host level firewall and Host Intrusion Detection System (HIDS) software has been commissioned. This allows prospective Ph.D. candidates to securely fill up and submit the application forms over Internet to the RRCAT servers. The web server based on Apache (ver. 2.2.3) has been chrooted for providing additional security to the other resources on the network. ConfigServer Firewall (CSF), which is automatically updated over Internet has been configured along with Login failure daemon (LFD) as the host level firewall. Open Source Security (OSSEC) based HIDS has also been configured on the server. The Ph.D application web server has been hosted on a new domain accessible using the Universal Resource Locator (URL) https://www.info-rrcat.ernet.in/phdappl/index.php on any web browser.

F) Commissioning of a hot standby ANUNET email server:

A new email server has been commissioned on ANUNET. This server will act as an email gateway to various ANUNET sites. The new server has been configured, using Red Hat Enterprise Linux (RHEL3) as operating system, Qmail (ver. 1.03) as Mail Transfer Agent (MTA) and djbDNS as name server package. The server has been configured to work in failover mode with the already existing email server. This allows server level redundancy of the ANUNET email gateway at RRCAT.

G) Expansion of communication network:

Forty one number of new telephone connections were provided at various locations in RRCAT campus including Ferrite Lab, New Fire Station Building, IT building extension and C & S Division building extension. Approximately twenty eight telephone connections were shifted to other location as per user requirement. Mobile facility was enabled for fourteen users and five number of Digital Reflex Phones were installed.

H) RRCATNet Planning, Expansion and Upgradation:

Two number of new points were added to LSL network. One number of new point was added in H Block network. Eight number of new points were provided in the console room of IT Extension building. Connectivity of 10 Mbps bandwidth was provided at Electrical control room in Colony area. Inter rack and CAT-6 copper links were provided at 24 points in IT extension building. LAN installation work in PG Hostel and RTS Hostel buildings is in progress. Phase V of the OFC termination work is also in progress. Installation of a 24 port switch (LMD building), a 48 port switch (Purchase building), a 48 port switch (4th switch in ADL building), and restoration of a 48 port switch (Photocathode building) to expand/improve network connectivity was completed. In all 144 ports were added to RRCATNet.

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I.4: Construction & Services

A) Integration and Commissioning of Power Conditioning System for Indus-2

Introduction:

Synchrotron Radiation facility (SRF) Indus-2 is a power intensive set up. The stringent power quality requirements due to major involvement of power electronics and various sensitive subsystems call for large, reliable and regulated power input. In view of above, Power Conditioning System (PCS) comprising rotary UPS of rating 415V; 6110kVA has been provided for Indus-2.

Building details:

The building has been constructed adjacent to Indus substation for optimized operation and control of the services. The special foundations for PCS have been designed and constructed for static and dynamic loads of the machines including vibration isolation. The building has a mezzanine floor. Design considerations of the foundation are as given below:

1. The foundation gradient (max): 5 mm / metre.

2. Static design load: 90000 N.

3. Dynamic design load: 2000 N (vibration 30 –55 Hz.).

4. The natural resonance of the elastic mounted machine is between 250 - 900 rpm.

5. Concrete foundation grade: M 25.

In order to meet the ventilation requirements, an evaporative cooling system with filtration units was designed. The air washer rooms have been constructed to house the units with all necessary services including ducts, fresh air louvers, water supply network etc