Cyclotron Computing

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We have in this past year enhanced our Linux computing capabilities in both data acquisition and data analysis. Much of the software which was formerly tied to Open VMS has now been either replaced or ported to Linux. In addition, we have made improvements to our networking.

Analysis Computing

We have implemented LDAP as our account agent for the central lab computers. We are still in the process of converting some of the older computers from the NIS accounting to LDAP. Our Kerberos implementation has matured and is now in production use with a server and a backup server. This authentication system is used for all of the labwide computers we manage and is available to any individual who wishes to use those authentication capabilities.

We now have deployed in the lab a server, komp running Linux, which has been set up to replace the primary VMS mail server (comp). This will happen when we make the final decision to officially migrate away from VMS. It is also ready for immediate service should the VAX for any reason become unusable. Komp (to renamed comp once the VAX is decommissioned) is positioned to take over the mail services for the lab, to act as the primary gateway into the lab for off-campus connections, and to serve as an analysis machine with dual 933 MHz CPUs, 512 MBytes of memory and a disk array capable of housing twelve 73 GByte SCSI drives. Ten of these disk slots are available to Research Groups as per request.

Data Acquisition

We have continued the development implemented of the data acquisition backend which was described in last year's report [1]. The system has been made more robust and user friendly. In addition, several new features have been added to the GUI to add new capabilities.

For the data acquisition frontend we continue to use hardware and software acquired in 1994 [2]. This hardware (as well as the software) is old, obsolete, slow and tedious to use given the changes in technology since then. In addition, we do not have the means to load the software into the frontend through any means other than a VAX. Rectification of this problem is obviously in order.

We have begun this step using an idea promoted by the computer group at the MSU NSCL. This idea replaces the expensive VME processors running expensive software with a PC running Linux. The PC is connected to the VME via a fiber optic connection using a SBS Model 620 VME-PCI Bridge which has the PCI card in the PC with the corresponding VME card connected by the fiber optic cable. This enables us to map the VME address space using a driver originally written by Nata Kruszynska [3].

To use the card, we received assistance from the MSU NSCL computer group who installed the card as well as their software on a PC that we shipped to them. After receiving the computer from MSU, we brought up the software in a test mode and verified that we

could acquire data. This will undoubtedly be a mode of running when the system is fully activated.

In addition, we are in the process of integrating the calls to the driver [3] into our root-[4] based system [1]. This is a relatively simple enhancement which will enable users to seamlessly use the new system without having to learn a new set of software. In addition, it was written in such a way that we can use existing frontend code for the present system [2] with only minimal modifications. Also, the event-by-event files generated will be written in the same format as the files we already have for which a significant amount of analysis software already exists. This has been tested to work in a prototype setup reading a small number of ADCs (i.e., the same setup as used to test the MSU software). We are currently in the process of working out the details of reading FASTBUS ADCs using the Struck 340 SFI modules.

Networking

We have made several enhancements to the network in the past year. The most important improvement is the evolution of the primary network bandwidth delivered to desktop computers from 10Mbit/s to 100Mbit/s. This has two additional benefits. The first is that the higher density switches that allow the faster connection also allow us to have more connections in the limited space we currently have. The second benefit is that these higher density faster switches also have a gigabit connection. We have therefore upgraded the main backbone of the lab to be a gigabit connection. A gigabit switch will be purchased when the network traffic warrants.

In addition to the in-house network enhancement, we also upgraded the network connection to the University from 10Mbit/s to 100 Mbit/s. This will allow us to take advantage of any enhancements of the Internet as they become available.

We also added a firewall to help protect us from malicious attacks outside the lab. The simple addition of this firewall has significantly reduced the many port scans we were constantly subjected to. The firewall has also eliminated the use of our DHCP address space for computers outside the lab.

References

[1] R. Burch *et al., Progress in Research*, Cyclotron Institute, Texas A&M University, (2000-2001) p. V-11.

[2] H. Dejbakhsh *et al., Progress in Research*, Cyclotron Institute, Texas A&M University, (1993-1994) p. V-111.

[3] N. Kruszynska, http://www.nikhef.nl/ ~natalia /projects/vmehb.html.

[4] Rene Brun and Fons Rademakers, ROOT- An Object Oriented Data Analysis Framework, Proceedings AIHENP '96 Workshop, Lausanne, September 1996; Nucl. Instr. & Meth. A **389,** 81-86 (1997); See also http:// root.cern.ch/.