

PB15

Team development system for accelerator control software on the WAN

Y.SHIBASAKI, M.MUTOH, I.ABE* and K.NAKAHARA*

Laboratory of Nuclear Science, Tohoku University(LNS)

1-2-1 Mikamine, Taihaku-ku, Sendai-shi 982, Japan

*Photon Factory, National Laboratory for High Energy Physics(KEK)

1-1 Oho, Tsukuba-shi, Ibaraki-ken 305, Japan

1. Introduction

Highly efficient microprocessors have recently become available at low cost, thus improving the available semiconductor technology. As a result, for example, microprocessors such as the 80X86 and Pentium are improved versions of equipment used for personal computers before. The CPUs (Alpha-AXP, PowerPC, R4000 and etc.) are being manufactured with new architecture, such as RISC.

New operating systems(OS), such as WindowsNT and OS/2, are running on highly efficient CPUs. They have powerful graphical user Interfaces(GUI) with almost the same ability as that of the UNIX workstations.

It has thus become possible to build medium-size accelerator control systems based on personal computers. This was difficult in the past because the OS had no communication functions among standard applications. In accelerator control, it is often possible to use commercial products, except in special cases. When it is urgent to build a control system with few bugs, it is necessary to choose the reasonable software from among commercial packaged software. However, some programs must be made in-house for accelerator control. We therefore analyze the domain structure of the accelerator from the control side, thus necessitating an understanding of the structure of the objects and their relations.

LNS and KEK PF-Linac have started a new project for accelerator control. We have thus analyzed the domain of the accelerators from a mutual viewpoint, and have established a project to find some common object between them. One useful possibility could be a productive development of programming.

We therefore arranged a development environment using a wide area network (WAN) for the following purposes:

- 1) An analysis of the accelerator domain from the control side (using the OMT technique^[1]).

- 2) A cooperative verification of the developed program.
- 3) An efficient information exchange.

2. Features of WindowsNT

There are several kinds of OS that are used on personal computers. Generally, OSs during the early stage were made depending on the CPU architecture, and worked only for a specific CPU. Now, since there are several kinds of CPUs available for PCs, it is necessary to choose a reasonable OS for accelerator control that doesn't depend on the CPU architecture. We have therefore adopted WindowsNT for building this team-development environment.

WindowsNT has various good points that do not exist in personal computer OSs. We discuss those features which we should adopt for accelerator control.

- 1) Support for existing MS-DOS and Windows-based applications.
- 2) Processor-independence (It works on various CPU).
- 3) The network function is equipped as a standard.
- 4) The security function is enriched.
- 5) Preemptive multitasking.

With such specific features, switching over to the new system while inheriting conventional property is comparatively easy.

3. Team development environment

We have decided to use personal computers with WindowsNT, and to build a team development environment (see Fig.1). Also, the specifications of the personal computer used for its purpose are given in table1. WindowsNT, itself, provides a multi protocol network

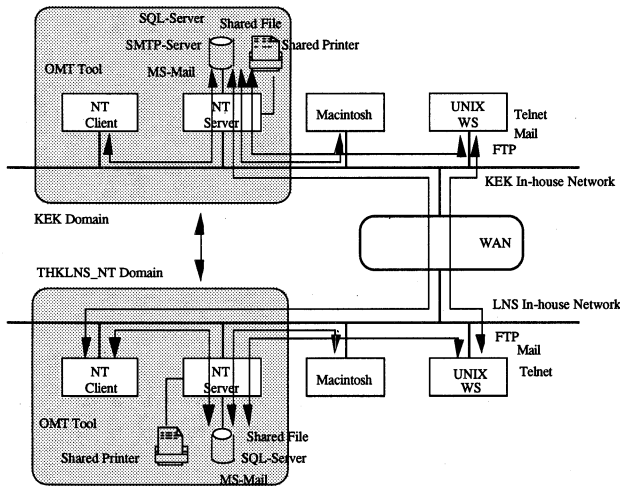


Fig.1 Outline of the team development system

Table1 Specification of the PCs

LNS side

WindowsNT Server

Maker: Packard Bell
 CPU: 80486DX2(50MHz)
 Memory size: 32Mbyte

WindowsNT Client

Maker: DEC
 CPU: 80486DX4(100MHz)
 Memory size: 24Mbyte

KEK side

WindowsNT Server

Maker: DEC
 CPU: Alpha-AXP(150MHz)
 Memory size: 64Mbyte

function as the standard, and we faced few problems concerning the local-network environment. The network environment could be built only by installing an OS in each personal computer only. Also, as for the WANconnection, it became possible by setting some parameters.

Generally, WindowsNT is connected on NetBeui protocol. Routers on the WAN is protected from protocols, except for TCP/IP. Therefore, to connect between WindowsNTs on WAN it is necessary to use TCP/IP. Several of its files are explained below. Descriptions of the HOSTS file and the LMHOSTS file are necessary for the setting. The HOSTS is the file used to determine a computer name and an IP address in Internet. LMHOSTS is the file which refers to the computer name and IP address at the LAN manager.

Below is an example of these files.

Contents of HOSTS file.

IP Address	Name	comment
130.87.xxx.xxx	PF-Linac	#
130.34.xxx.xxx	LNS-Linac	#

Contents of LMHOSTS file

IP Address	Name	extension	comment
130.87.xxx.xxx	PF-Linac	#DOM:KEK	#
130.34.xxx.xxx	LNS-Linac	#DOM:THKLNS_NT #	

We have carried out a test concerning connections between LNS and KEK PF-Linac.

A single-domain connection was made during an early stage. Then, a connection test among different domains was successfully. The models used to build each domain server are the following three kinds:

- 1) Master domain model.
- 2) Multi master domain model.
- 3) Complete trust domain model.

The single-domain model and 1) or 2) listed above don't match our system, because all organization are located in the distance and are independent. Therefore, this time a complete trust domain model has been used. This model can be realized by setting the trust relations among each other. As a result, the resource that each has become is capable of being shared.

4. The performance

The performance is measured based on the above-mentioned environment. Incidentally, the OS of the new version became smaller in memory size, and the speed was improved. We used WindowsNT Client3.5 and WindowsNT Server3.5 as an OS. The performance was measured in terms of the speed of writing and reading of data to the local disk and the remote disk over the WAN and the LAN. Since a measurement with the WAN and the LAN environment is influenced by the network traffic, it extracted the average value measured every hour. This result is shown in Fig.2.

It became clear from the results of the measurements that WindowsNT is equal to or more than twice as fast as Windows3.1. Also, it depends on the condition, we have recognized the result that LAN is faster at writing than the local disk of Windows3.1. The speed which is running on the WAN was about 5-20Kbyte/s, because it has bottlenecks on the routes of the Network as well as various

routers. The routing of the Network is shown in Fig.3.

Many people are presently using the Internet and Network, the traffic is thus quite crowded. To improve this situation, the backbone on the mutual network connection must be made thick by one who manage network systems. For us, this result is satisfactory, except when using multimedia, where we believe that it isn't sufficient.

scheduling functions, which in the commercial software have been used for efficiency of information exchange.

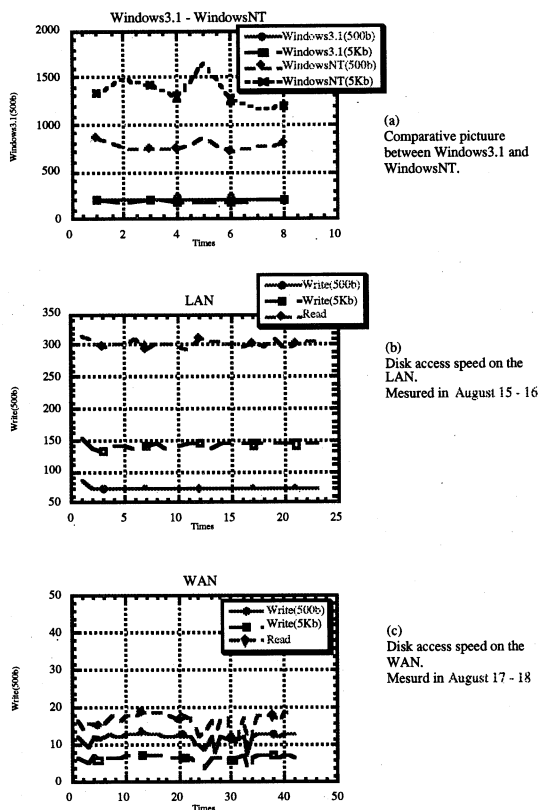


Fig.2 Chart comparing each access speed.

5. Operations

The possible operations on the WindowsNT WAN are listed below. OMT is the main application program, which runs on the WAN between LNS and KEK PF-Linac. OMT is being used for our team to develop in accelerator control programming^[2].

- 1) File sharing by the mount with an identical volume.
- 2) Sharing of the Database servers.
- 3) Mail.
- 4) Schedule management.

A way of information exchange is necessary for us who are working at distant locations from each other. Mail and

- 1 AR-0900.net.tohoku.ac.jp (130.34.8.40)
 - 2 sasaya.gw.tohoku.ac.jp (130.34.11.13)
 - 3 kahoku.topic.ad.jp (130.34.10.2)
 - 4 new-tohoku.bb.sinet.ad.jp (150.99.2.1)
 - 5 new-nacsis.bb.sinet.ad.jp (150.99.118.1)
 - 6 nishi-chiba.bb.sinet.ad.jp (150.99.90.1)
 - 7 otsuka.sinet.ad.jp (150.100.127.1)
 - 8 kek-jix.sinet.ad.jp (150.100.1.101)
 - 9 jp-hepnet-kek-jix.kek.jp (130.87.220.1)
 - 10 kekcis2.kek.jp (130.87.43.4)
 - 11 KEKNIE.kek.jp (130.87.1.14)
 - 12 abe719as.kek.jp (130.87.160.26)
- Computer Center of Tohoku University
National Center for Science Information System
Computing Center of National Laboratory for High Energy Physics

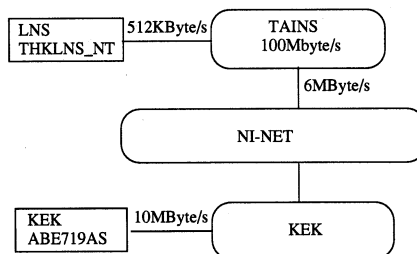


Fig.3 Routes between LNS and KEK

6. Conclusions

A team-development environment using WindowsNT was completed on the WindowsNT Network. With this, a reinforcement of cooperative development in programming is possible, and a cooperative-development analysis for the accelerator domains will be promoted. The network environment of WindowsNT is excellent, and the performance is sufficiently practical, except for the communications required in real time, and a great deal of information communication.

7. References

- [1] James Rumbaugh et al. "Object-oriented modeling and design.", Englewood Cliffs, N.J. :Prentice Hall, 1991.
- [2] I. ABE et al. "Analysis of the PLC object model in the PF-Linac.", In this conference.