IMPROVEMENT OF HIGH LEVEL COMPUTER SYSTEM FOR PLS STORAGE RING

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Abstract

We are improving the performance of the computer system for the storage ring operations in three way. First, we have enhanced the file system related to the storage ring operations. Each process in the operation of the storage ring has a registration file which verifies whether there are any process that has the same function and/or that access the same address in the dynamic database. We have improved the file system in order to maintain registration files consistently. Second, we provide one more operating computer system as a backup system. It gives more reliable operations in the storage ring even in case of the primary system down. Finally, the operating system is upgraded from old SunOS 4.1.3 to new Solaris 2.5. With these improvements, the accelerator operations and physics studies for the storage ring can be performed more efficiently and safely.

1 INTRODUCTION

The high-level computer system for the storage ring operation consists of one console computer system as a network gateway, four console computer systems, four X-terminals. Four console computer systems are for the operators to monitor and control the storage ring device, while X-terminals display the status of the device continuously. X-terminals depend the computing power on the host computer [1].

The console software consists of database management programs, communication programs, application programs, man-machine interfacing programs, and miscellaneous utility programs. Each program in the console software was developed under SunOS 4.1.3. Communication programs communicate constantly with the database server in the SCC(Sub Control Computer), and update the dynamic database of the console computer system. Other programs except the communication programs monitor the storage ring device using the information updated by the dynamic database server[2].

In this paper, we present the internal architecture of the high level computer system for the storage ring operation. The registration file essential for the process execution is discussed in detail. For the safe and fault tolerant system, we introduce a dual-system architecture that consists of a main and a backup systems. Section 2 describes the function and use of the registration file. In Section 3, we discuss why dual system should be introduced. Section 4 describes the upgrade of the high level computer system toward 32-bit bus architecture. Finally, Section 5 gives the work to do in the near future.

2 REGISTRATION FILE

Programs, such as database utility programs, application programs, and man-machine interfacing programs, are communicating with the dynamic database server reference to the registration file in the console computer system. The programs are executed only when satisfying the corresponding condition. The running program is called the process. Figure 1 shows the registration procedure for a process.

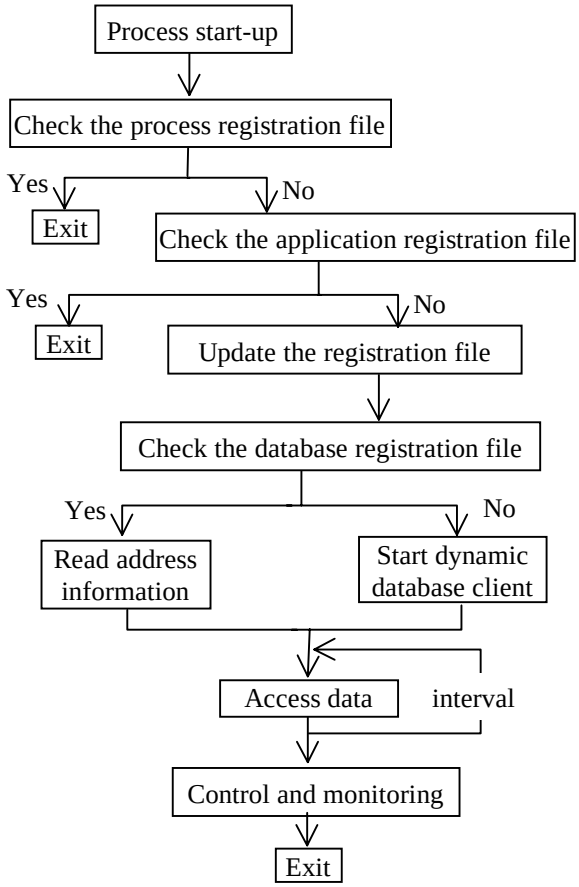

Figure 1: Process registration procedure.

The registration file has informations such as the description and the function of the process, and addresses being accessed by the process. By using the

registration file, we can guarantee that there are no more than one process that either provides the equivalent function or accesses the same address. In addition, the process will surely manage the consistent data on static databases because any other process is not allowed to access the same address.

Several registration files are stored in a specific directory in order to manage the registration files consistently and conveniently. If registration files spread over several directories, a process may be registered many times. It results in the inconsistent static database.

We have improved the file system in order to maintain registration files consistently. Figure 2 shows the registration file system.

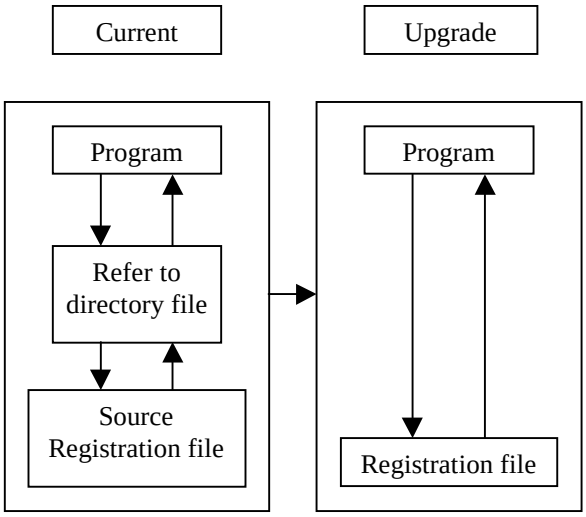

Figure 2: Registration file system.

3 DUAL SYSTEM

As mentioned earlier, the high level computer system for the storage ring operation consists of five console computer systems, four X-terminals and one color monitor. One console computer system plays the role of gateway. Also, the color monitor helps the operator control and monitor the high level computer system by displaying the status of the storage ring device. Control programs executed in the console computer system control the related device. Monitoring programs display the status of the storage ring device in real-time and make the operators to control the storage ring device.

Each computer system monitors and controls the corresponding device. Hence, a failure of the application program may lead to interruption of the related application programs and device. In this case, the operator should immediately check up the high level computer system and resolve the problem. Moreover, the high level computer system should be tested in the offline state in order to upgrade the system or to modify the application programs. It means that the running system might be interrupted. We resolved this problem by introducing a dual system[3]. By doing so, the high level computer system consists of a main and a backup systems.

A dual system can provide the safe operating environment for the high level computer system in case of the main or backup system failure. In particular, if one system malfunctions, an operator finds out and isolates the failed system without interrupting the high level computer system. It can continue to run as a dual system after repairing the failed system. If both of main and backup systems fail, the high level computer system cannot operate. However, we ignore the possibility that both of them fail at a time.

4 SYSTEM UPGRADE

Application programs in the high level computer system are developed and performed under SunOS 4.1.3 at Sun Workstation 4. The 16-bit bus architecture of SunOS 4.1.3 has poor performance in comparison with SunOS 5.X with 32-bit bus system. Recently, most Sun workstation has been upgrading to SunOS 5.X called Solaris 2.X. The high level computer system should be upgraded in order to support the 32-bit bus system because the 32-bit bus architecture outperforms the 16-bit bus architecture. Moreover, The operating system should be upgraded to support 32-bit bus system[4].

At present, we have a plan to upgrade the operating system to enhance the structure of the registration file, and to support the dual system architecture. Sun Ultra workstations with 32-bit bus system will be introduced as forthcoming computer system, i.e., leading to performance enhancement of the high level computer system[5]. However, application programs should be re-compiled and tested under new operating system because former application programs have been developed under SunOS 4.1.3. This forces X-windows Motif programming environment to upgrade.

5 FURTHER WORKS AND SUMMARY

5.1 Introducing Simple Color Monitor

X-terminals in the high level computer system play the role of displaying real-time data from the dynamic database. In particular, the real-time data is shown by X-terminal in the form of graphic or text, and provides useful information to the operators. In general, primary function of X-terminal transfers data by users' keyboard or mouse input to the server system, and graphically displays the result from the server to users. However, we use of X-terminal in order to just display real-time data. In forthcoming system, we will replace X-terminal with a supplementary color monitor by exploiting multi screen of the console computer system. In result, the operator enables to use the console table efficiently by removing the space for the keyboard and mouse. In the

aspect of the system administration, the maintenance cost for X-terminals can be minimized.

5.2 Consistency Maintenance of the Dual System

In the dual system, although one of main and backup systems fails, the high level computer system can continue to control and monitor the storage ring device because the other system can still work. The dual system provides a fault tolerance with respect to the system failure. However, there is a problem on the database maintenance in the main and the backup systems. The main and backup systems independently communicate with SCC, update the signal database and control the device. In particular, the signal database in the main system may not agree with that in the backup system because of time delay between SCC and each system. This leads to fatal errors in the high level computer system if one of the main and the backup systems does not work and then the other system performs the whole function of the high level computer system. Hence, the dual system should maintain the consistency between signal databases of the main and the backup systems.

As a summary, the high level computer system can guarantee that there are no processes that perform the same function and access the same address by using the registration file. Also, we make the use of dual system in order to overcome a certain system failure. The high level computer system will be upgraded to support 32-bit bus system. As further work, we should devise a strategy to resolve the inconsistency problem between the main and the backup systems.

6 ACKNOWLEDGEMENTS

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7 REFERENCES

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