

Many Users vs. CS6400

—CS6400 Operating Experience in the Large Environment at Chiba University—

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Introduction

Chiba University starts new computer education curriculum from October 1994 using an Integrated network of CRAY systems (8 X-client EL92s and a file server CS6400). Our curriculum is one semester course of general education. In this course, we teach what computer is and how to use terminal, UNIX, and its shell scripts and teach programming languages (C, Pascal, and Fortran), and applications (graphics, statistics, mathematics, and TeX) to freshmen who are totally beginners.

We have 13,000 account users, 100-300 simultaneous logins, and 106 simultaneous application runs. On the other hand, only 2 root staffs, several collaborative staffs, and vendor staffs have to face above huge number of users. Furthermore, students who have finished the course are permitted to use the machines during their college lives (next 3 - 3.5 years). Some would become wizards by self-education. Therefore, we need to control user and jobs strictly on the network.

When designing our system, we give CS6400 a special role as well as a file server and a backup machine. One of the reasons why CS6400 plays as "back end" is that it is difficult to port some software programs on EL92 such as up-to-date free/non-free software, PostScript viewer, and Japanese environment of Mosaic/Gopher.

We have just finished our test curriculum. We report here its performance results and some problems we faced on CS6400 with Solaris 2.3J (Japanese version).

Performance Results

We made performance tests on CS6400 with heavy duty automatic demo programs on X-window environment for IDL, SPSS, Maple, and made tests with connecting to 2 server sites for Mosaic. The followings are the results. Note that "LC" means license check.

- IDL : image processor,
83 runs well (no LC).
- SPSS : statistical package,
only 50 start (with LC)
more than 200 start (no LC),
60 runs well (no LC).
- Maple : mathematical analysis package,

more than 200 start (no LC),
60 runs well (no LC).

- Mosaic: 100 user class uses Mosaic simultaneously as a client program and a server "httpd". (Many students opened a few Mosaic windows then.)

Problems

Hereafter, we will describe problems we experienced. The main reason of these problems is based on its high performance ability as a Solaris machine. It is so powerful that some Solaris defaults are mismatched.

Weak Resource control

CPU and the number of jobs are not limited strictly especially for interactive use. So we are afraid that advanced student users will know "back end" CS6400 to be used as "front end" That is to say, we do not want users to login CS6400 explicitly ("rlogin") and run commands instead of implicitly running commands on CS6400 ("rsh" with commands). This is because they may (happen to) occupy large memory or long CPU time and then they may disturb our class. This weakness is one of the reasons why we take CS6400 to be "back" and take EL92 having a strict resource control system under UNICOS to be "front"

Small number of
File descriptors

The system default number of file descriptors is 64. It limits the number of runs of programs with a license checker or with a "daemon" program. We have met the limited number of runs for certain software with "unlimited" license. It is unreasonable that the number of runs are determined by shell's magic number such as that of file descriptors. As shown in the results of performance, only 50 SPSS starts with LC but more than 200 starts without LC. So we are using any licensed software programs without LC under software vendor's permission.

Small number of
Terminal devices of pts

How many terminals can be opened ? The system default number of pts devices is 48 for Solaris 2.3J. Since student users open at least a few windows, this small number causes some users not to login. So we changed it into 1024. Then our class have performed better.

Hot-Swap functions

In educational use, we must keep classes non-stop even if some hardware crashes occur. One may think that the hot-swap functions on Solaris 2.3 help the situation. However, the command “detach” is not available on Solaris 2.3. So we have to reboot every time when we change troubled parts to fix

because the command “attach” does not work without “detach”. How does it work on Solaris 2.4, which has not been installed in our system ?

Summary

From our experience of network environment for the educational use, we need an OS which should have strict resource control, admit several hundreds of runs and terminal connections, i.e., handling many file descriptors and pts devices, and make swapping modules possible during machine runs, but should be popular one like Solaris to run public software programs.