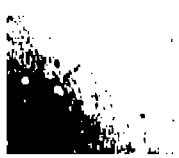
A major purpose of the Technical Information Center is to provide the broadest dissemination possible of information contained in DOE's Research and Development Reports to business, industry, the academic community, and federal, state and local governments.

Although a small portion of this report is not reproducible, it is being made available to expedite the availability of information on the research discussed herein.



LA-UR -85-181

CONF-841249--3

Los Alamos National Laboratory is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36.

LA-UR--85-181

DE85 005968

TITLE: CONVERSION FROM RSX-11D TO RSX-11M OR: DID I REALLY WANT TO DO IT?

AUTHOR(S): Gregg C. Giesler

MASTER

SUBMITTED TO: DECUS Proceedings, Fall 1984, Anaheim, CA

DISCLAIMER

Los Alamos Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CONVERSION FROM RSX-11D TO RSX-11M OR DID I REALLY WANT TO DO IT?

Gregg C. Giesler*
Los Alamos National Laboratory
Los Alamos, NM 87545

ABSTRACT

The LAMPF Nuclear Chemistry Data Acquisition System (DAS) is used to acquire and to process data from a variety of nuclear chemistry experiments. In June 1977, the DAS was upgraded to a PDP-11/34 and RSX-11D V6.2 and FORTRAN 4-PLUS V2.5. That software remained in use until January, 1984 even though the PDP-11/34 was replaced by a PDP-11/44, and a number of peripherals were added or replaced. The arrival and installation of an RA-60 disk system forced us to upgrade to RSX-11M V4.1 and FORTRAN-77 V5.0. This was not without much pain and many problems. There was a change in functionality, and some things did not work as they previously had worked. A description of some of the changes in the DAS and of the problems in going from the ancient to the current software will be given as well as an evaluation of the results obtained so far in the conversion.

The LAMPF Nuclear Chemistry Data Acquisition System (DAS) is used to acquire and to process data from nuclear chemistry experiments at the Clinton P. Anderson Meson Physics Facility (LAMPF) and has been described elsewhere[1]. The heart of the DAS is a PDP-11 CPM with a variety of peripherals, and it uses the RSX-11 operating system and the FORTRAN language. Over the last decade, all of these major components have been replaced several times. These replacements or upgrades have generally been made with few, if any, problems. This latest upgrade in system software, along with the installation of a new disk system, has had far more than the usual number of problems. I shall describe the major problems I had and then evaluate the situation as it currently exists.

The story of this conversion begins with the last major upgrade of the DAS. In June, 1977, a PDP-11/34 was installed to replace a PDP-11/40, and the software was upgraded to the then current version of RSX-11D, V6.2, and to FORTRAN 4-PLUS V2.5 to take advantage of the floating point processor available on the PDP-11/34. This conversion of both hardware and software took only two working days and was problem free. The only work which needed to be done with the software performing was a few sysgens with command files from the previous version of RSX-11D. This took only half a day to complete. Then all I had to do was to recompile and to task build the applications software, which was not a problem.

*This work was supported by the U. S. Department of Energy

In the years following, the magnetic tape drives were replaced, a DZ-11 multiplexer was added to replace several DL-11 interfaces, and a RP-03 equivalent disk system was added to become the system disk. The only problem encountered in adding these peripherals was that the terminal handler had an error in setting parity on the DZ-11. It started with 8-bit no parity ASCII, then checked to see if parity was enabled. If so, it added the parity bit, but forgot to change to 7-bit ASCII to account for the extra parity bit. As a result, it transmitted 9-bit characters which the terminals could not handle. This was corrected by adding one line of code to the terminal handler.

In December, 1980, the PDP-11/34 was replaced by a PDP-11/44. By this time, RSX-11D V6.2 was out of support, and did not know about PDP-11/44s. When the system was booted, it would go and look for UMRs. If they were found, the system would assume it was running on a PDP-11/70 and get the memory size from the memory size register. Since a PDP-11/44 has UMRs but not a size register, RSX-11D would crash in the middle of the routine that determined whether the system used a line-time clock or a programmable clock. After spending time over several weeks to find the cause of the crashes, I located the problem and fixed it with a patch which gets the memory size from the memory location rather than an I/O page register. No other software changes were necessary. I did not have to recompile or task build a program. All the other systems software and all the application's software worked as they had.

RSX-11D V6.2 had another problem with PDP-11/44s that did not affect me. It could not use MASSBUS devices on a 22-bit-addressing UNIBUS. The handler knew about those devices on a 22-bit-addressing MASSBUS, on a PDP-11/70, or on an 18-bit-addressing

UNIBUS, but not on a 22-bit-addressing UNIBUS with with UMRs for the DMA. Because I did not have any of those devices, it had no effect on the DAS.

While this system ran fine, there was no incentive to convert to RSX-11M until two separate events occurred in 1983. The first was the conversion of our real-time data acquisition software package from RSX-11D to RSX-11M. It had not been converted earlier because of heavy use of system executive calls, and RSX-11D and RSX-11M were largely not compatible with respect to these calls. Because RSX-11D was now long out of support and RSX-11M was now much more compatible with RSX-11D, the conversion to RSX-11M V4.0 had been accomplished. Now local support for systems running RSX-11D was being phased out as the other users of it were converting from it to RSX-11M.

The other reason to convert to RSX-11M was the shortage of disk space. In the last few years, the experiments we performed produced many times the data of previous experiments. As a result, the 40-Mbyte disk on the DAS was frequently full, and processing the data required a lot of handling of magnetic tapes and deleting of files from the disk. In December, 1982, we ordered an RA-60 to replace our current system disk. As a result, we also had to change operating systems to get a handler for the RA series disks.

Although we had plenty of warning that we needed to convert to RSX-11M, the actual conversion process did not begin until December, 1983, only a week before the RA-60 arrived. That is when the problems began. Because the conversion of the data acquisition actually began with RSX-11M V3.2, I had activated self-maintenance support for the RSX-11M license on the DAS. We received the RP02/03 magnetic tape distribution for V3.2 at that time, but it was never used.

When V4.0 was released, we received the distribution kit for RP4/5/6 because the RP2/3 version was no longer made. Because of the need for the data acquisition software whose conversion had not been completed, this distribution kit was stored without being used. When V4.1 was released in the summer of 1983, we again received the RP4/5/6 distribution kit which was in BRU format this time instead of the DSC format of V4.0. This also was stored until we had time to do the conversion.

Finally, in December, 1983, with the imminent arrival of the RA-60, the conversion was started. The BRU64K tape was placed on the tape drive and booted. Only a few blocks were read in before it crashed. It would not read in no matter what I did. I was stuck since the V4.0 distribution was in DSC format, and I did not want to spend several days generating a V4.0 system just to read in the V4.1 distribution kit.

To get help, I called a local user whom I knew had a V4.1 distribution kit. It turned out to be a magnetic tape kit for RL disks of which I had none. However, he had generated an RP03-equivalent disk like the one on the DAS and had a BRU tape of this system that included RA-series as one of its disk types. I borrowed this backup tape and the BRU64K tape from his distribution kit. Both worked! I now had a working system with which I could start generating a system specifically for the DAS.

I also used that BRU64K tape to boot the rest of my distribution kit. It read in fine except for a read error in file [1,54]RSX11M.SYS. So, this part of the kit was also useless. I now called the Albuquerque software sales office to complain about my bad tapes. They ordered replacement tapes for the two bad tapes, a distribution kit for RA60/80/81 disks, and suggested I borrow the RP4/5/6 kit from the local software support group.

I borrowed the set from the local DEC office and went to use it. The BRU64K tape would read in the crash while trying to print to the console. Using the good BRU64K tape I borrowed, I read in the rest of that distribution kit. It read in without errors and printed on the console THIS IS NOT A HARDWARE BOOTABLE SYSTEM. At least, I had the RL-based system to work with.

By now the RA-60 had arrived and had been installed. That was also not without problems. The installation went well until the diagnostic was run. It worked in the user area of the disk, but failed in the maintenance area of the disk. Changing boards in the UDA and the disk did not solve the problem. This board swapping took some time since this RA-60 was one of the first shipped, and the maintenance kits hadn't been sent to the field service offices yet. It took an air express shipment to get the first one sent out. Those installed in New Mexico VAXs had no problems, even with the diagnostics. The problem appeared to be with the diagnostics for PDP-11s. It took the field service office several weeks of calling all over the country to find out that they had a bad version of the diagnostic, and this version had the problem. A copy of the correct version was sent. So a month after the disk was installed, it finally passed the diagnostic. There had been nothing wrong with it in the first place.

The replacement tapes for the RP4/6/6 kit arrived. The BRU64K tape would read in most of the way and then hang. This was now the third bad copy of that tape I had used. I still had to use the borrowed tape to read in my distribution tapes. I read in the RP4/5/6 kit onto the RA-60, and then, using the system on the RP03-equivalent, boot the RA-60. I then would do a sysgen to properly configure it for the DAS. However, it would terminate before completing Phase II. Since I was new to RSX-11M and its long sysgen and VMR, it took me quite a while to discover that I was using a saved answer file which was missing its last four lines.

The conversion process proceeded slowly during the early part of 1984. With all the problems with bad tapes and the RA-60 diagnostic, much of the time was spent using RSX-11D for data acquisition and analysis. Also, time was needed to learn about the differences between RSX-11D and RSX-11M. Finally, the RA60/80/81 kit arrived, and all the tapes read in and worked without errors. I finally had a good kit I could use!

Now with a good and proper distribution kit and the time available to work at developing the new system, I again started working on the conversion. I noticed that each sysgen had more assembly errors than the previous one, even if I started from the distribution kit each time. The RA-60 disk pack was degrading as I used it. Switching to my spare pack, I encountered the same problem. Upon calling field service, I found out both of my RA-60 packs had been recalled due to manufacturing problems. These symptoms matched those of the cause for the recall. However, they could only replace one pack now. I would have to wait for another new pack to be sent to them. This took about one month.

Finally, I created a system I was satisfied with. I started on the FORTRAN-77 compiler. It was installed without any problems. When I started converting my applications software, the problems with it began. As with any new compiler version, the task images were now larger. As a result, some programs were now too large to fix the 16-bit-addressing memory limitation. I now had to chop or further overlay these programs so they would fit. Most of my programs did not have this problem, and all the programs worked fine without other changes.

The Versaplot[2] plotting package for the printer/plotter on the DAS was installed with only a few problems. One problem was changing all references to F4P into F77. The other problem was that the software no longer did a top-of-form after each plot. This turned out to be a missing page in the Versaplot installation manual; on this page a patch was given to fix this problem.

I now had a system I could use to replace the RSX-11D system used for seven years. Several problems or nuisances still remain. One is the difference between the RSX-11D print spooler and the RSX-11M queue manager. With RSX-11D, all output to the printer was spooled no matter what the source. With RSX-11M, only output to the PRINT symbiont is spooled. Anything sent to LP: either hangs forever if the printer is not shared or can be interrupted at the end of any line by the PRINT controller. As a result, directory listings and other unspooled output can become a mess if users are not careful.

Another problem is that setting parity on the DZ-11 doesn't work. This time, the terminal driver doesn't contain the code to set the parity. It is supposed to be fixed in Update D, but the Update D release notes don't mention the problem as being fixed. I haven't had the time to go through the sysgen to find out if it does work. I was told in an SPR response in June, 1984 that this problem was known and fixed in Update D. Somewhere, my normal distribution of the update got lost, so I didn't get it until the middle of December.

Another nuisance is the six hours it takes to do the first two sysgen phases versus the twenty minutes it takes to do a RSX-11D sysgen. Additionally, it is much more difficult to change device drivers or add devices. In order to load the Versaplot handler for the printer/plotter, I have to load LP in order to start the Queue Manager, then I unload it, load LV and redirect LP to LV. An additional problem is having to go through all the waits in the sysgen command file in order to edit the executive build file to allocate UMRs for a foreign device.

On the positive side, I can use the RA-60 or any other large capacity disk system because RSX-11M doesn't have the UMR problem mentioned earlier about RSX-11D V6.2. Also, BRU is available, and DSC has the /VER option. There are also more wildcard possibilities with PIP, but some of them take very long to execute. Two other positive features are ANSI magnetic tape support and a greatly improved error logging. EDT is much nicer than EDI.

Comparing the positive and negative points of this conversion, I find it hard to say that this conversion is a great benefit. The use of the RA-60 is a great improvement, but the spooling limitations are nuisances. Having a supported operating system doesn't help if it doesn't function as desired. I still can't use parity on the DZ-11, although there is a small program I could write and run at boot time to set parity. This problem should not have even existed. The other pluses and minuses are a toss up. The system generally works well, and I haven't had any crashes so far.

As should be obvious by now, I don't consider the conversion as completed. I haven't brought up the data acquisition software because it was only recently converted from FORTRAN 4-PLUS to FORTRAN-77. I also have some other applications software to convert. I would like to get my problems with RSX-11M and FORTRAN-77 fixed. May be in another six months I'll consider it complete.

ACKNOWLEDGEMENTS

I would like to thank Judy Casey in the DEC software sales office in Albuquerque for all the help she provided in getting the necessary replacements for my distribution kit.

REFERENCES

1. Gregg C. Giesler, "LAMPF Nuclear Chemistry Data Acquisition System", Proc. Digital Equipment Computer Users Society, 251-259 (U.S.A Fall,1983)

2. Trademark, Versatec.