THE MULTI-TASKER

The Newsletter of the RSX-11/IAS Special Interest Group

Letters and articles for publication are requested from members of the SIG. They may include helpful hints, inquiries to other users, reports on SIG business, summaries of SPR's submitted to Digital or other information for the members of RSX-11/IAS SIG.

All contributions should be "camera-ready copy" e.g. sharp black type in a 160x240 mm area (8 1/2" x 11" paper with 1" margins) and should not include xerox copies. If you use RUNOFF to prepare your contribution the following parameters have been found to be satisfactory:

.PAPER SIZE 60,80 .LEFT MARGIN 8 .RIGHT MARGIN 72 .SPACING 1

These parameters assume output on a lineprinter with a pitch of 10 char/inch. Adjust the parameters to maintain the same margins if another pitch is used.

TABLE OF CONTENTS

Columns

Articles

FROM THE EDITOR

The highlight of this issue is the long awaited return of BOMBs. Also, there is an interesting article on waking up the 22-bit addressing capabilities of the 11/23.

The Multi-Tasker needs submissions. I can publish up to 80 pages each issue. As you can see, we are not even close to the limit. Any and all submissions would be welcomed. If your LUG has a meeting and something interesting happens, send a copy of the minutes to the Multi-Tasker. If you have written an interesting program, send an abstract to the Multi-Tasker. If you are mad about some new Digital policy, send an article to the Multi-Tasker. Please, send something.

Ralph Stamerjohn
Multi-Tasker Editor

BOMBS

Welcome to the puzzling world of BOMBS - Baffling, Obscure, and Mysterious Bugs! Readers are challenged to determine an explanation for the described behaviour. If you think you have a solution, send it to (NOTE change of address): Mark Johnson, Atmospheric Sciences Department, Alberta Research Council, 11315 - 87 Avenue, Edmonton, Alberta, T6G 2C2.

To be fair to my fellow frostbacks here in Canada, winners will be chosen from the correct entries two weeks after I receive my copy of the Multi-Tasker, and will be rewarded with:

>>>>>>>>THEIR NAMES IN PRINT<<<<<<<<

in the next column, not to mention the adulation of all and sundry. Computer entomologists (bug collectors) are encouraged to send their favourite BOMBs to the above address to be included in later issues (please include a suggested answer).

Readings From the Book of BOMBs

Chapter 5 - Playing With a Stacked DEC

This is a good example of program 'improvement'.

The original code:

```
;
; A ROUTINE TO SAVE R2, R3, R4, AND R5 ON THE STACK
; CALLED BY:    JSR R5,SAVE
;
SAVE::   MOV     R5,R0           ;R0 IS VOLATILE
         MOV     SP,R5
         MOV     R4,-(SP)
         MOV     R3,-(SP)
         MOV     R2,-(SP)
         JMP     (R0)

;
; RESTORE AND RETURN
; RESTORES R2, R3, R4, AND R5 AND RETURNS TO ORIGINAL CALLER
; CALLED BY:    JMP RESRET
;
RESRET::MOV      R5,R1
         MOV     -(R1),R4
         MOV     -(R1),R3
         MOV     -(R1),R2
         MOV     R5,SP
         MOV     (SP)+,R5
         RTS     PC
```

With the advent of modular programming, an enormous emphasis has been placed on efficient module linkage, to the point that even one extra instruction is intolerable. Hence, the improved RESRET:

```
RESRET::MOV      R5,SP
         MOV     -(R5),R4
         MOV     -(R5),R3
         MOV     -(R5),R2
         MOV     (SP)+,R5
         RTS     PC
```

One whole instruction shorter!

The problem:

The code doesn't always work. VERY occasionally, programs using the new routine will terminate as if there were a hardware problem (and the diagnostics show all is well - as usual).

Why is the Better Optimized Macro Bad?

By the way, the RSX-11M executive uses a co-routine to do this sort of stuff. For a good time, see the routine $SAVNR in the module SYSXT.

Defusing the BOMB from Chapter 4

OK, so it was easy! INC doesn't affect the carry bit, so the ADC instruction was really adding the carry from the code before the loop. However, I had no INCling that INC was different than ADD #1,...

George Birmingham of DEC sent the first of 28 replies to point out my naivety. And to all of you who telephoned, or cornered me at the Toronto symposium to tell me how easy this was: WATCH OUT, I've got some tougher ones coming!

HINTS AND THINGS

"Hints and Things" is a monthly potpouri of helpful tidbits and rumors. Readers are encouraged to submit items to this column. Any input about any way to make life easier on RSX/IAS is needed. Please beware that items in this column have not been checked for accuracy.

The following article is from Chuck McCann, General Electric Corporation, Burlongton, Vermont, 05401.

I have modified the CTS-11 Card Reader/Punch driver to run under RSX-11M+ version 1.0.   DEC informed me that DECUS was responsible for support of this item, so I thought I would make my changes available to DECUS.   The code and database have been modified and will now run only on M+. If any of you have a CTS-11 and would like a copy of the M+ driver, drop me a line and I will gladly send you one.

The following article is from Micheal Neale, U.S. Department of Transportation, P.O. Box 37, East Liberty, Ohio, 43319.

The following patch to the full-duplex terminal driver will disable checkpointing on output, but still allow tasks to checkpoint on an IO.RPR (read with prompt) request. The only SYSGEN options required for this are read with prompt support (obviously) and CTRL/R support although to conditionals could be modified if CTRL/R was not desired. (I don't know if it would still work, though). This patch has the following advantages:

   o No checkpointing on output can greatly reduce thrashing on systems with
      a lot of terminal I/O.

   o IO.RPR only requires 1 QIO.

   o IO.RPR requests can still checkpoint in case the user is distracted,
      sleeping, etc.

For further reference, see the Software Dispatch Review article 3.1.3.9. Also note that this change can easily be tested by patching the branch offset on a running system using OPEN command. (carefully, of course).


```
TTRW.MAC;2=[11,10]TTRW.MAC;1/AU/-BF
\
-2,2
        .IDENT   /V1.38V/
-41
;       MRN01   17-JAN-81
;       DISABLE CHECKPOINTING ON OUTPUT BUT STILL ALLOW
;       IT FOR IO.RPR IF OTHER CONDITIONS SATISFIED
%
-/WRITE 1:/
-/BEQ   70$/,.,/;MRN01
        BEQ     CLR 16          ;N - JUMP TO BYPASS CHECKPOINTING
```

The following is a true story from the editor's own system. The names have been changed to protect the innocent.

A programmer on one of our production systems suffered brain fade one afternoon when removing a task named INA. Unfortunately, the command he typed was:

>REM INS

This was a no-no. One of the keys to the system design was the use of the spawn directive to install and run analysis programs. However, we could not reboot the system because this would kill data collection for over 30 laboratory instruments. This is also considered a no-no.

However, we were not daunted. We got the phyiscal disk address and size for [1,54]INS.TSK. Then picking a TCB for a task installed (BYE), we used OPEN to change the load image block number (T.LBN) and maximum size of the task (T.MXSZ) to point to [1,54]INS.TSK. The we typed the following:

                >BYE $INS
                >REM BYE
                >INS BYE

and, bingo, the system was running again.

P.S. You might be interested in how we got the logical block number for INS.TSK. We run the system very lean and did not have DMP or ZAP installed. However, the system is connected to another using DECNET and PIP was installed. So we copied the index file ([0,0]INDEXF.SYS) to an account and then used DECNET to transfer it to another system. By using DMP on that system, we could dump out the file header for [1,54]INS.TSK and get the logical block number from the retrieval pointers.

Now, we have a hard-copy of the TAS output plastered on the side of the CPU so the next time it happens, we will have the starting block numbers for all tasks.

SOFTWARE PERFORMANCE REPORTS

This section contains SPR's submitted to the Multi-Tasker by users. SPR's should always be sent to DIGITAL. However, if you feel that a report should be published in the Multi-Tasker, you may send a duplicate copy to the editor at the addresses listed on the cover. Publication of an SPR in the Multi-Tasker does not imply endorsement by the SIG. Implementation of suggested fixes must be at the reader's own risk. The SPR's published in this column may be abstracts of the original submission and have not been checked for accuracy.

The following SPR on RSX-11M V3.2 system generation was submitted by Kreigh Tomaszewski (Amway Corporation, EDP Technical Support, 21-2B, 7575 East Fulton Road, Ada, Michigan, 49355). Kreigh also submitted the response he got from Digital.

After a recent sysgen we "filled up a disk" but a PIP showed about 9000 free blocks on the RK07. We got around the problem by copying the pack with PIP and using VMR to transfer a bootable image.

DIGITAL RESPONSE:

The RK07 kit is simply a copy of the RK06, as the RL02 is of the RL01. Therefore the RK07 kit will have the same file limits as those of the RK06. The RK06 kit was made with the default values for maximum number of files (1668), and for initial index file size (834).

We realize these are unreasonable for the RK07, and RL02, and will consider making those disks with higher values for the next release.

In the mean time, a good solution is to BRU a copy of the kit to another RK07 with larger values for /MAXIMUM (/MXF) and HEADERS (/INF). See BRU utilities manual for a description fo these switches. Possible values are /MAXIMUM:10000, /HEADERS:2000.

The following SPR of RSX-11M V3.2 VFY was submitted by Felix Lee (A & S Building Systems, P.O. Box 40099, Houston, Texas, 77040). Felix also submitted the response he got from the Telephone Support Center.

We have a 300MB, 500,384 block, non-DEC, Files-11 disk, with a user written driver. VFY complains that the SCB (VBN 1 of BITMAP.SYS) is corrupted. The RSX-11M version 3.1 VFY does not complain. BITMAP.SYS is not documented anywhere.

DIGITAL RESPONSE:

A bug was accidentally introduced into VFY for RSX-11M version 3.2. This VFY will incorrectly state that the SCB is corrupted for any valid Files-11 disk with 352,257 to 516,096 blocks. It correctly determines the condition of the SCB for disks up to 352,256 blocks, and for disks with 516,097 to 1,044,480 blocks.

VFY for RSX-11M version 3.1 will correctly verify any Files-11 disk up to 516,096 blocks.

What follows is a patch source and command sequence for RSX-11M version 3.2, and for RSX-11M-PLUS version 1, (VFY on IAS does not have this problem.)

```
        .TITLE  VFYOPN
        .IDENT  /M0113A/

        SR057 - SPR #27090 - SCB IS NOT REALLY CORRUPT FOR DEVICES
                WITH 352,257 TO 516,096 BLOCKS.

        .PSECT  PURE$I

 . =.+316

        CMPB    #126.,R3        ;BIG DISK?

        .END
```

To apply the patch to VFY, enter the above patch as VFYOPN.PAT and perform the following procedure.

```
        SET /UIC=[1,20]
        PIP /NV=VFY.OLB
        SET /UIC=[200,200]

        MAC VFYOPN.POB=VFYOPN.PAT
        LBR VFYOPN.OBJ;1=[1,20]VFY/EX:VFYOPN
        PAT VFYOPN.OBJ;2=VFYOPN.OBJ;1/CS:34372,VFYOPN.POB/CS:7156

        SET /UIC=[1,20]
        LBR VFY/RP=[200,200]VFYOPN.OBJ;2
        TKB @VFYBLD
```

There are two formats used for the Storage Control Block, VBN 1 of BITMAP.SYS. The first is that of your disk.

```
        FORMAT 1:       3   BYTES - ZERO
                        1   BYTE  - NUMBER OF BLOCKS IN THE STORAGE BITMAP (N)
                      4*N   BYTES - NOT USED
                        4   BYTES - VOLUME SIZE IN LOGICAL BLOCKS

                        REST OF BLOCK - ZEROES


        FORMAT 2:       3   BYTES - ZERO
                        1   BYTE  - NUMBER OF BLOCKS IN THE STORAGE BITMAP (N)
                        4   BYTES - VOLUME SIZE IN LOGICAL BLOCKS

                        REST OF BLOCK - ZEROES
```

INI for RSX-11M V3.2 will write Format 2 for disks with 516,097 to 1,044,480 blocks (that is "N" value will be greater than 126 and less than 256). INI will use Format 1 for smaller disks.

At present, only RSX-11M version 3.2 uses format 2. If future releases of IAS and VAX/VMS (Files-11 Structure Level 1) support disks of 516,097 to 1,044,480 blocks, they will use format 2.

Note that the size of BITMAP.SYS = N + 1, because the SCB is not included in "N".

The following SPR on Fortran IV V2.2 was submitted by Tony Gandy, (TRW-FUJITSU Company, 3634 Silver Star Road, Orlando, Florada, 32800).

The FORTRAN compiler (V2.2-5) seems to have a problem when generating "EIS" code. Following is a sample program and runs made with and without the "/CD:EIS" switch. Note that with "EIS" the first "IT=1" statement seems to be

ignored. Various alternate coding sequences will cause the problem to disappear from the test program, but instances where "real" programs encounter this bug are much harder to find.

```
        COMMON ID(1),IT
        DIMENSION IO(2)
        EQUIVALENCE (IO(1),ID(1))
   1    FORMAT (I3)
        IT = 1
        WRITE (5,1) IO(2)
        IT = 2
        WRITE (5,1) IO(2)
        END


   >FOR TEST=TEST
   .MAIN.
   >TKB TEST=TEST
   >RUN TEST
     1
     2
    TT11   --  STOP

   >FOR TEST=TEST/CD:EIS
   .MAIN.
   >TKB TEST=TEST
   >RUN TEST
     0
     2
    TT11   --  STOP
```

HELP YOURSELF

"Help Yourself" is a place for you to get your tough questions answered. Each month, questions from readers will be published. If you have a question, send a letter to the Multi-Tasker at one of the addresses listed on the cover.

We would also like to publish the answers to questions. If you can help someone, send a letter to the Multi-Tasker or call Ralph Stamerjohn at (314) 694-4252. Your answer will be sent directly to the person in need and published in the next edition of the Multi-Tasker.

ANSWERS TO PREVIOUS QUESTIONS

IAS TERMINAL LOCKOUT

Bruce Wright from the Duke University Medical Center had an answer for the IAS terminal lockout question in the January, 1981 edition.

The IAS terminal lockout problem is a very well-known problem. The basic cause is that the IAS terminal handler will buffer up parity errors without regard for the typeahead buffer size. This is not done for framing errors (a bit is set indicating that a framing error has occurred, but it doesn't buffer up framing error messages). If a line is generating enough parity errors without any task doing a read on the line to get the parity error report, the ENTIRE terminal buffer area can be filled up with parity error reports for ONE terminal! The result of this is (as was observed) a <bel> response from any terminal whenever anything is typed on a terminal. It has nothing to do with system load static, etc., although parity errors on terminal lines can be generated by line cross-talk.

We have been trying (> 1 year) to get DEC to respond to this problem, but the only response we ever get is that this is considered a feature (!!) because it is possible for a task to get a report on EVERY parity error which occurs on a line. This may be desirable for communications applications, but for other uses of terminals it is UNACCEPTABLE! This is especially true as the fix is quite easy. The following code was developed for IAS V3.0, and works for the field test release of IAS V3.1 as well since the appropriate module has not been changed. The effect of the patch is that only the first parity error in typeahead is reported (if the terminal is not in typeahead all parity errors will be reported). This is the way breaks or framing errors are currently handled. In the module ISRRTN, the subroutine UARTER (Uart error), the following patch:

```
-40
;
; PATCH AUTHOR          DATE            REASON
; ----- ------          ----            ------
;
; L01   BRUCE C. WRIGHT 10-SEP-80       TREAT PARITY ERRORS LIKE
;                                       FRAMING ERRORS (COPIED
;                                       FROM IAS V3.0 LOCAL MODS)
-416,422
        BMI     20$             ;++L01 SKIP ON DATA OVERRUN.
10$:    ASL     R5              ;++071 TRY FOR BREAK (FRAMING ERROR)
        BPL     12$             ;++L01 J IF NOT
        MOV     #TE.BCC,R5      ;++071 ELSE GET CODE
        BR      14$             ;++L01 AND JOIN COMMON CODE
12$:    MOV     #TE.VER,R5      ;++L01 GET PARITY ERROR CODE
14$:    BIT     #SC.BRK,(R4)    ;++L01 ALREADY SEEN A BREAK?
-428,428
20$:    MOV     #TE.DAO,R5      ;++L01 GET DATA OVERRUN CODE
/
```

THIS MONTH'S QUESTIONS

6502 CROSS ASSEMBLER

I have been attempting to locate a 6502 cross assembler for the PDP-11 for either RT-11 or RSX-11M for quite some time now. Rumor has it that there is "more than one version out there" which is probably a safe assumption. If

anyone knows of such an animal, would you please write or phone me.

Paul Shahood, Digital Equipment Corporation, NR2-2/E34, Maynard, Massachusetts, 01754. (617) 897-5111.

ICS/ICR DRIVER FOR RSX-11M-PLUS

We are now preparing to convert from RSX-11M V3.2 to RSX-11M Plus. However, the ICR driver is no longer supported. To save us the effort of re-inventing the wheel, we would like to locate a copy of an ICR driver for RSX-11M Plus. If you can help, please write or phone me.

Kriegh Tomaszewski, Amway Corporation, EDP Technical Support, 21-2B, 7575 East Fulton Road, Ada, Michigan, 49355. (616) 676-7402.

BOOTING RT-11 FROM RSX-11M

We have an 11/23 system with two RL01 drives. One drive has RSX-11M and the other has RT-11. Is there a way from a terminal to boot the RT-11 drive when running RSX-11M. Also, we would like to do the reverse, boot the RSX-11M system from RT-11.

Barry C. Gray, KYA AM/FM, 300 Broadway, San Francisco, CA 94133. (415) 391-1260.

RSX-11S IBV11 SUPPORT

I am looking for any assistance in developing RSX-11S support for DEC's IBV11 - IEEE-488 bus interface card.

George Prescott, Caterpillar Tractor Co., 100 N.E. Adams Street, Technical Center, Building E, Peoria, Illinois, 61629.

PDP-11/23 22-BIT SUPPORT

Stuart Dole
Dole and Farmer

As most people know by now, the 11/23 is capable of 22-bit addressing but memory and DMA controllers to support this feature are scarce - DEC has just announced a backplane with the 4 extra lines wired up. However, an intrepid client of mine wanted to make a 750k byte 11/23 based RSX system for use in somewhat hostile environments. I'd like to report to the members of SIG that we have succeeded. Here's what we did:

We used DEC's 12x2 backplanes and wired the high order 4 lines ourselves. There's even spare termination available on the backplane should you care to use it. (Actually, the client uses two such backplanes in tandem, using wirewrap to connect them). Memory we got from one of the many "brand-X" vendors who advertise 256k byte dual cards, based on 64k chips. For disks, we used Priam's (with the Smart interface) connected to a Peritek DMA card (which does 22-bits). These winchesters are about 30 megabytes (currently), and seem fairly rugged.

The hardware my client is putting in the field is dual 11/23 system with a custom array processor and the Priam disks. It has dual sided double density floppies (non-DEC-emulating), magtape, memory-mapped video, lots of memory, special sensor devices, line printers (with graphics capabilities), and a few terminals. It all goes in a truck and runs off a generator. Which is why we used 23's instead of 70's.

I did the driver for the disks. I set the bit DV.MBC in the UCB so it looks like a Mass-Bus device, and then the exec passes the high 6 bits of the address in the high byte of U.BUF. The driver lets the intelligent controller do all the seeks and retries and etc. I also did a SAV driver so we could boot it.

SYSGEN was fairly easy. I did a "dry run" and then edited the answer file, telling it how big the memory really was. SYSGEN then did everything correctly! We ran as an 18 bit system for a while so we could use other DMA peripherals, like mag tape. The 22-bit system can really only use 22-bit DMA peripherals. The non-DMA stuff (terminals, line printers, etc) works OK. It came up very nicely, we kept plugging in memory cards and the system just got bigger and bigger. Lots of copies of DUNGEON without swapping.

If 22-bit addressing is enabled (M$$EXT defined), there are lots of references to the UNIBUS mapping registers, throughout the exec and in SAV and BOO. The following ruse works: (1) Extract the module HWDDF from the executive macro library and edit UBMPR to be 400 instead of 170200. This causes the exec to use a block of low core instead of the (nonexistant) hardware. During SYSGEN, tell it that your highest vector is 600. ZAP the executive object library reference the same way (do a rad50 dump to see where UBMPR is defined, then ZAP the nearby occurrence of 170200 to be 400). Since none of the hardware actually needs the mapping registers (in this system anyway) this scheme works. Otherwise, edit out all references to the UNIBUS mapping registers from the exec sources and privileged task sources.

Since we really wanted mag-tape, I went into the driver (TM-11 type) to see what I could do. I modified it so that it also looks like a Mass-bus device to the exec, then simply does the transfer if it's in the lower 18-bit range, else returns an error. In the process I found there's still a UMR allocation bug in the TM-11 driver: if you really are on a 70 or 44, it tries to allocate UMR's on rewinds and write-EOF functions, based on garbage parameters in the I/O packet. So beware! Since we got our software through the Components Group (class C) we can't send an SPR. Anyway, the modified magtape driver works well enough for BRU, PIP, FLX.

The obvious question in all this is: Why not an I/O mapping card that looks like the UNIBUS map? Then we could use all our old DMA interfaces. Fear not, it's on it's way too.

A word about the Priam's performance. Since we're going through the Smart interface, which is fully buffered, we have to use a 5:1 interlace factor. That ends up putting the throughput down to about 350 "blocks/sec", better than an

RK-05, but below an RL-01. With all that memory, we don't have to worry about swapping, which helps a lot, and single block (FCS type) I/O is as fast as anyone else's since seeks are fast. But there's still room for improvement.

The 11/23 seems like it has the processing power to handle about a megabyte of main memory in typical development environments (several KED users), and in special cases, like my client's, with his need for vast array space and memory-mapped video devices, the ability to address a larger address space is critical. That way we can stay with DEC instead of having to plunge off in 68000 land or whatever.

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