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```
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAA         AAA
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  QQQQQQ      AAAAAA      SSSSSSSS  TTTTTTTTTT
  QQQQQQ      AAAAAA      SSSSSSSS  TTTTTTTTTT
QQ      QQ  AA      AA  SS              TT
QQ      QQ  AA      AA  SS              TT
QQ      QQ  AA      AA  SS              TT
QQ      QQ  AA      AA  SS              TT
QQ      QQ  AA      AA    SSSSSS        TT
QQ      QQ  AA      AA    SSSSSS        TT
QQ  QQ  QQ  AAAAAAAAAA          SS      TT
QQ  QQ  QQ  AAAAAAAAAA          SS      TT
QQ    QQ    AA      AA          SS      TT           ....
QQ    QQ    AA      AA          SS      TT           ....
  QQQQ  QQ  AA      AA  SSSSSSSS        TT           ....
  QQQQ  QQ  AA      AA  SSSSSSSS        TT           ....

LL            IIIIII      SSSSSSSS
LL            IIIIII      SSSSSSSS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II        SSSSSS
LL              II        SSSSSS
LL              II              SS
LL              II              SS
LL              II              SS
LL              II              SS
LLLLLLLLLL    IIIIII    SSSSSSSS
LLLLLLLLLL    IIIIII    SSSSSSSS
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```
0000              .TITLE  QAST - GET DATA FROM ANOTHER PROCESS
0000              .SBTTL  COPYRIGHT NOTICE
0000              .IDENT  'V04-000'
0000      ;
0000      ;****************************************************************************
0000      ;*                                                                          *
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0000      ;*                                                                          *
0000      ;*                                                                          *
0000      ;****************************************************************************
0000      ;
```

```
0000            .SBTTL  PROGRAM DESCRIPTION
0000    ;++
0000    ; FACILITY
0000    ;
0000    ;       SYSTEM DUMP ANALYZER
0000    ;
0000    ; ABSTRACT
0000    ;
0000    ;       ROUTINES TO OBTAIN MEMORY FROM ANOTHER PROCESS ON
0000    ;       THE RUNNING SYSTEM.
0000    ;
0000    ; ENVIRONMENT
0000    ;
0000    ;       NATIVE MODE, USER MODE
0000    ;
0000    ; AUTHOR
0000    ;
0000    ;       TIM HALVORSEN, JULY 1978
0000    ;
0000    ; MODIFIED BY
0000    ;
0000    ;       V03-003 MSH0011         Michael S. Harvey       23-Feb-1983
0000    ;               Simplify the handling of a target process in SUSP or SUSPO
0000    ;               state. Instead of having to queue yet another special kernel
0000    ;               AST just to resuspend the process, simply clear the RESPEN
0000    ;               bit (set by SDA's $RESUME call). This all works because now
0000    ;               the SUSPEND AST in the Exec is a normal kernel AST instead
0000    ;               of a special kernel AST and so SDA doesn't have to work as
0000    ;               hard as it used to in the case of a suspended process.
0000    ;
0000    ;               Use IPL$_SYNCH to close window between state test and special
0000    ;               kernel AST queueing.
0000    ;
0000    ;       V03-002 TMH0002         Tim Halvorsen           02-Aug-1983
0000    ;               Fix code which allows analysis of suspended processes
0000    ;               which was broken when EPIDs were added.
0000    ;
0000    ;       V03-001 KDM0002         Kathleen D. Morse       28-Jun-1982
0000    ;               Added $PRDEF.
0000    ;
0000    ;--
```

```
                    0000            .SBTTL  DECLARATIONS
                    0000      ;
                    0000      ;     SYMBOL DEFINTIONS
                    0000      ;
                    0000
                    0000            $ACBDEF                                 ; AST CONTROL BLOCK DEFINITIONS
                    0000            $PRIDEF                                 ; PRIORITY DEFINITIONS
                    0000            $IPLDEF                                 ; IPL DEFINITIONS
                    0000            $PCBDEF                                 ; PROCESS CONTROL BLOCK
                    0000            $PHDDEF                                 ; PROCESS HEADER
                    0000            $PRDEF                                  ; PROCESSOR REGISTERS
                    0000            $PSLDEF                                 ; PSL DEFINITIONS
                    0000            $SSDEF                                  ; STATUS DEFINITIONS
                    0000            $STATEDEF                               ; PROCESS STATE VALUES
                    0000            $MCHKDEF                                ; MACHINE CHECK PROTECTION MASK
                    0000            $VADEF                                  ; VIRTUAL ADDRESS DEFINITIONS
                    0000            $PTEDEF                                 ; PAGE TABLE ENTRY DEFINITIONS
                    0000            $RPBDEF                                 ; RESTART PARAMETER BLOCK
                    0000
                    0000      ;
                    0000      ;     DEFINE EXTENSIONS TO THE AST CONTROL BLOCK
                    0000      ;
                    0000            $DEFINI PKT
                    0000
          00000010  0000      PKT_ORIGPID     =       ACB$L_AST         ; PID OF REQUESTOR
          00000014  0000      PKT_ADDR        =       ACB$L_ASTPRM      ; ADDRESS OF REQUESTED DATA
                    0000
          0000001C  0000      .               =       ACB$L_KAST+4
                    001C
                    001C      $DEF    PKT_QAST        .BLKL             ; ADDRESS OF SCH$QAST
                    0020      $DEF    PKT_DEANON      .BLKL             ; ADDRESS OF EXE$DEANONPAGED
                    0024      $DEF    PKT_RETLOC      .BLKL             ; ADDRESS TO RETURN DATA
                    0028      $DEF    PKT_LEN         .BLKL             ; LENGTH OF DATA
                    002C      $DEF    PKT_STATUS      .BLKL             ; STATUS OF TRANSFER
                    0030      $DEF    PKT_STATLOC     .BLKL             ; ADDRESS TO RETURN STATUS
                    0034      $DEF    PKT_WAKE        .BLKL             ; ADDRESS OF SCH$WAKE
                    0038      ;$DEF   PKT_PRTCT       .BLKL             ; ADDRESS OF EXE$MCHK_PRTCT
                    0038      $DEF    PKT_IMGCNT      .BLKL             ; PHD$L_IMGCNT OF REQUESTOR
                    003C      $DEF    PKT_FLAGS       .BLKB             ; FLAGS BYTE
                    003D            _VIELD  PKT,0,<-
                    003D                    <SUSPEND,,M>,-            ; RE-SUSPEND PROCESS AFTER MEMORY FETCH
                    003D                    >
                    003D      $DEF    PKT_SIZE                          ; TOTAL SIZE OF FIXED PORTION
                    003D      $DEF    PKT_DATABUF                       ; START OF DATA TO BE MOVED
                    003D                                                ; AST CODE FOLLOWS DATA
                    003D            $DEFEND PKT
                    0000
                    0000            .DEFAULT DISPLACEMENT,LONG
                    0000
          00000000                  .PSECT  DATA,NOEXE,WRT
                    0000
                    0000      QAST_COUNT:
          00000000  0000            .LONG   0                       ; QAST REQUEST COUNTER
                    0004
          00000000                  .PSECT  QAST,EXE,NOWRT
                    0000
          00989680  0000      SECONDS =       10*1000*1000              ; 1 SECOND IN DELTA TIME
```

```
                            0000
                            0000  TIMEOUT:
        FFFFFFFF FE363C80  0000                 .LONG   -3*SECONDS,-1           ; 3 SECOND TIMEOUT COUNT
```

```
                           0008          .SBTTL  GETPROCMEM - GET MEMORY FROM ANOTHER PROCESS
                           0008  ;---
                           0008  ;
                           0008  ;       READ MEMORY FROM ANOTHER PROCESS ON THE RUNNING SYSTEM.
                           0008  ;
                           0008  ; INPUTS:
                           0008  ;
                           0008  ;       04(AP) = LOCATION TO READ IN OTHER PROCESS CONTEXT
                           0008  ;       08(AP) = ADDRESS OF BUFFER IN LOCAL MEMORY TO RECIEVE TRANSFER
                           0008  ;       12(AP) = LENGTH OF TRANSFER
                           0008  ;       16(AP) = PID OF OTHER PROCESS
                           0008  ;
                           0008  ; OUTPUTS:
                           0008  ;
                           0008  ;       SS$_NORMAL      - MEMORY TRANSFERRED OK
                           0008  ;       SS$_ACCVIO      - UNABLE TO ACCESS MEMORY
                           0008  ;       SS$_NOPRIV      - NOT ENOUGH PRIVILEGE (CMKRNL)
                           0008  ;       SS$_NONEXPR     - NON-EXISTANT PROCESS OR INVALID PID
                           0008  ;---
                      0000 0008          .ENTRY  GETPROCMEM,0
                           000A
          0000022C 8F   DD 000A          PUSHL   #SS$_TIMEOUT                 ; PRESET TO TIMED OUT STATUS
                   5E   DD 0010          PUSHL   SP                           ; ADDRESS OF LONGWORD TO GET STATUS
             7E   0C AC   7D 0012        MOVQ    12(AP),-(SP)                 ; MOVE LENGTH AND PID
             7E   04 AC   7D 0016        MOVQ    4(AP),-(SP)                  ; MOVE SOURCE AND DESTINATION ADDRESSES
                   05   DD 001A          PUSHL   #5                           ; NUMBER OF ARGUMENTS
                   5E   DD 001C          PUSHL   SP                           ; ADDRESS OF ARGUMENT LIST
          000000B0'EF   9F 001E          PUSHAB  QAST                         ; ADDRESS OF KERNEL MODE ROUTINE
     00000000'GF   02   FB 0024          CALLS   #2,G^SYS$CMKRNL              ; CALL ROUTINE IN KERNEL MODE
              4B   50   E9 002B          BLBC    R0,90$                       ; IF ERROR, EXIT WITH STATUS
              5E   18   C0 002E          ADDL    #6*4,SP                      ; REMOVE ARGUMENT LIST
              03   50   D1 0031          CMPL    R0,#3                        ; AST OUTSTANDING?
                   43   13 0034          BEQL    90$                          ; IF NOT, EXIT WITH SUCCESS
          00000000'EF   D6 0036          INCL    QAST_COUNT                   ; INCREMENT THE COUNTER
                           003C          $SETIMR_S ASTADR=B^QAST_TIMEOUT,-    ; SCHEDULE TIMEOUT REQUEST
                           003C                  REQIDT=QAST_COUNT,-          ; ASTPRM OF QAST COUNTER
                           003C                  DAYTIM=TIMEOUT               ; ADDRESS OF TIMEOUT DELTA TIME
                           0051          $HIBER_S                             ; WAIT FOR AST TO COMPLETE
                           0058          $CANTIM_S                            ; CANCEL OUTSTANDING TIMER REQUESTS
                           0061  ;
                           0061  ; HIBERNATE COULD HAVE COMPLETED DUE TO THE FOLLOWING REASONS:
                           0061  ;       1) WAKE FROM AST RESPONSE, REQUEST SUCCESSFUL
                           0061  ;       2) WAKE FROM TIMEOUT, REQUEST UNSUCCESSFUL, AST CANCELED BY TIMEOUT
                           0061  ;       3) WAKE FROM 'WAKE PENDING' FLAG, WHICH COMPLETES $HIBER IMMEDIATELY.
                           0061  ;               (NOT SURE WHAT SCENIOS CAUSE THIS, BUT BETTER SAFE...)
                           0061  ;
                           0061  ;       FOR CASE #3, WE CAN LIMIT THE DAMAGE BY CANCELING THE OUTSTANDING
                           0061  ;       AST SO THAT IT DOESN'T COME BACK AND WIPE OUT OUR STACK WITH THE
                           0061  ;       COMPLETION STATUS OR WIPE OUT OUR BUFFER WITH THE MEMORY.
                           0061  ;
     0000022C 8F   6E   D1 0061          CMPL    (SP),#SS$_TIMEOUT            ; HAS REQUEST HAS COME BACK YET?
                   0C   12 0068          BNEQ    50$                          ; BRANCH IF IT HAS
                           006A          $CMKRNL_S B^REJECT_RESPONSE          ; DONT LET AST EVER COME BACK
              50   8E   D0 0076  50$:    MOVL    (SP)+,R0                     ; GET RETURN STATUS
                        04 0079  90$:    RET                                  ; EXIT WITH SUCCESS
```

```
                                 007A         .SBTTL  QAST_TIMEOUT - AST ROUTINE CALLED WHEN QAST TIMES OUT
                                 007A   ;---
                                 007A   ;
                                 007A   ;       THIS AST ROUTINE IS CALLED WHEN A SPECIAL KERNEL MODE
                                 007A   ;       AST REQUEST TO ANOTHER PROCESS TIMES OUT.  THE IMAGE
                                 007A   ;       COUNTER IS INCREMENTED CAUSING THE KAST ROUTINE (WHEN
                                 007A   ;       IT EVER GETS GOING AGAIN) TO DROP IT ON THE FLOOR.  THE
                                 007A   ;       CURRENT PROCESS IS WOKEN UP.  THE STATUS LONGWORD HAS
                                 007A   ;       BEEN PRESET TO SS$_TIMEOUT SO THAT IT KNOWS THE REQUEST
                                 007A   ;       FAILED.
                                 007A   ;
                                 007A   ; INPUTS:
                                 007A   ;
                                 007A   ;       4(AP) = QAST REQUEST NUMBER
                                 007A   ;
                                 007A   ; OUTPUTS:
                                 007A   ;
                                 007A   ;       NONE
                                 007A   ;---
                                 007A
                                 007A   QAST_TIMEOUT:
                          0000   007A           .WORD   0
                                 007C
      00000000'EF    04 AC   D1  007C           CMPL    4(AP),QAST_COUNT        ; IS THIS FOR THE CURRENT QAST?
                        17   12  0084           BNEQ    90$                     ; IF NOT, IGNORE THE TIMEOUT
                                 0086           $CMKRNL_S B^REJECT_RESPONSE     ; INCREMENT THE IMAGE COUNTER
                                 0092           $WAKE_S                         ; WAKEUP THE CURRENT PROCESS
                             04  009D   90$:    RET
                                 009E
                                 009E   REJECT_RESPONSE:
                          0000   009E           .WORD   0
   50      00000000'FF       D0  00A0           MOVL    @SCH$GL_CURPCB,R0       ; ADDRESS OF CURRENT PCB
           51     6C A0      D0  00A7           MOVL    PCB$L_PHD(R0),R1        ; ADDRESS OF PHD
               00F4 C1       D6  00AB           INCL    PHD$L_IMGCNT(R1)        ; INCREMENT IMAGE COUNTER
                             04  00AF           RET
                        00B0          .SBTTL  QAST - QUEUE MEMORY REQUEST TO ANOTHER PROCESS
                        00B0  ;---
                        00B0  ;
                        00B0  ;       QAST - QUEUE AST TO READ MEMORY FROM ANOTHER PROCESS
                        00B0  ;
                        00B0  ; INPUTS:
                        00B0  ;       04(AP) - LOCATION OF DATA
                        00B0  ;       08(AP) - RETURN LOCATION
                        00B0  ;       12(AP) - LENGTH OF TRANSFER
                        00B0  ;       16(AP) - PID OF TARGET PROCESS
                        00B0  ;       20(AP) - ADDRESS TO RETURN STATUS
                        00B0  ;
                        00B0  ; IMPLICIT INPUTS:
                        00B0  ;
                        00B0  ;       THE FOLLOWING SYMBOLS REFER TO LONGWORDS WHICH CONTAIN THE
                        00B0  ;       VALUE OF THE SYMBOL FOR THE CURRENT RUNNING EXECUTIVE:
                        00B0  ;
                        00B0  ;       SCH$GL_CURPCB
                        00B0  ;       SCH$GL_MAXPIX
                        00B0  ;       SCH$GL_PCBVEC
                        00B0  ;       PHV$GL_PIXBAS
                        00B0  ;       SGN$GL_BALSETCT
                        00B0  ;       SWP$GL_BALBASE
                        00B0  ;       SWP$GL_BSLOTSZ
                        00B0  ;       MMG$GL_SPTBASE
                        00B0  ;       EXE$GL_RPB
                        00B0  ;       EXE$ALLOCBUF
                        00B0  ;       EXE$DEANONPAGED
                        00B0  ;       EXE$MCHK_PRTCT
                        00B0  ;       SCH$QAST
                        00B0  ;       SCH$WAKE
                        00B0  ;
                        00B0  ; OUTPUTS:
                        00B0  ;
                        00B0  ;       R0 = 1 IF THE SPECIAL KERNEL MODE AST IS STILL OUTSTANDING
                        00B0  ;               (IMPLIES HIBERNATE NEEDED IN CALLING ROUTINE)
                        00B0  ;       R0 = 3 IF NO SPECIAL KERNEL AST WAS ISSUED (AVOID HIBERNATE)
                        00B0  ;
                        00B0  ;       SS$_ACCVIO = NO READ ACCESS TO MEMORY
                        00B0  ;       SS$_NONEXPR = NON-EXISTANT PROCESS OR INVALID PID
                        00B0  ;
                        00B0  ;---
                        00B0
                  007C  00B0  QAST:   .WORD   ^M<R2,R3,R4,R5,R6>
                        00B2
                        00B2  ;
                        00B2  ; CHECK ACCESSIBILITY OF SYSTEM VA BECAUSE ALTHOUGH A PROBE INSTRUCTION
                        00B2  ; WILL RETURN SUCCESS (PTE VALID), PAGEFAULT DOES NOT ALLOW ONE TO
                        00B2  ; FAULT IN SOME ONE ELSES PROCESS PAGE TABLE PAGE (WHOSE WORKING SET
                        00B2  ; DO YOU PUT IT IN?, ETC.) AND FAKES AN ACCESS VIOLATION ON THE MOVC.
                        00B2  ; THUS, WE MUST MUCK IN SYSTEM SPACE IN THE CONTEXT OF THE PROCESS WHICH
                        00B2  ; OWNS THE BALANCE SET SLOT TO AVOID PROBLEMS DISPLAYING HIS PROCESS
                        00B2  ; PAGE TABLE.  ALSO, CHECK IF BEYOND END OF SYSTEM VIRTUAL MEMORY, AS
                        00B2  ; PROBE DOES NOT DETECT THIS CONDITION, AND PAGEFAULT ABORTS ON IT.
                        00B2  ;
        56   10 AC   D0 00B2          MOVL    16(AP),R6               ; ASSUME SWITCHING TO "CURRENT" PROCESS
     55 04 AC   1F   E1 00B6          BBC     #VA$V_SYSTEM,4(AP),5$   ; CONTEXT SWITCH IF NOT SYSTEM SPACE
```

```
 52  04 AC    000001FF 8F   CB  00BB            BICL3   #^X1FF,4(AP),R2           ; CLEAR PAGE OFFSET
    50  52    00000000'FF   C3  00C4            SUBL3   @SWP$GL_BALBASE,R2,R0     ; BELOW BALANCE SET SLOTS?
                       45   19  00CC            BLSS    20$                       ; IF NOT, CHECK IF I/O SPACE
      50   50      F7 8F    78  00CE            ASHL    #-9,R0,R0                 ; COMPUTE BALANCE SET PAGE NUMBER
     50    00000000'FF      C6  00D3            DIVL    @SWP$GL_BSLOTSZ,R0        ; PROCESS HEADER INDEX
     00000000'FF       50   B1  00DA            CMPW    R0,@SGN$GL_BALSETCT       ; BEYOND END OF BALANCE SET SLOTS?
                       6C   18  00E1            BGEQ    8$                        ; IF SO, CHECK IF LEGAL AT ALL
        54    00000000'FF   D0  00E3            MOVL    @SCH$GL_CURPCB,R4         ; GET ADDRESS OF CURRENT PCB
                 55   6C A4 D0  00EA            MOVL    PCB$L_PHD(R4),R5          ; GET ADDRESS OF CURRENT PHD
              42 A5     50  B1  00EE            CMPW    R0,PHD$W_PHVINDEX(R5)     ; THIS PROCESS'S HEADER?
                       1C   13  00F2            BEQL    5$                        ; IF SO, OK TO USE THIS PROCESS CONTEXT
        51    00000000'FF   D0  00F4            MOVL    @PHV$GL_PIXBAS,R1         ; GET ADDRESS OF HEADER/PIX ARRAY
                 50   6140  32  00FB            CVTWL   (R1)[R0],R0               ; GET PROCESS INDEX OWNING BALANCE SLOT
                       57   19  00FF            BLSS    80$                       ; ACCVIO IF NOBODY OWNS THE SLOT
        51    00000000'FF   D0  0101            MOVL    @SCH$GL_PCBVEC,R1         ; GET ADDRESS OF PCB ADDRESS ARRAY
                 54   6140  D0  0108            MOVL    (R1)[R0],R4               ; GET PCB OWNING BALANCE SET SLOT
                 56   60 A4 D0  010C            MOVL    PCB$L_PID(R4),R6          ; GET PID OF PROCESS WHICH OWNS SLOT
                     0073   31  0110        5$: BRW     50$                       ; USE THAT PROCESS CONTEXT
                                0113        ;
                                0113        ;       SYSTEM ADDRESS IS BELOW THE BALANCE SET SLOTS.  CHECK IF MAPPED
                                0113        ;       BY ANY ACTIVE MEMORY CONTROLLER.  IF NOT, THEN ASSUME ITS I/O
                                0113        ;       SPACE AND DISALLOW TRANSFER.
                                0113        ;
     53   52    15    09    EF  0113       20$: EXTZV   #VA$V_VPN,#VA$S_VPN,R2,R3 ; EXTRACT SYSTEM PAGE NUMBER
     51    00000000'FF      D0  0118            MOVL    @MMG$GL_SPTBASE,R1        ; GET VIRTUAL BASE OF SPT
                 53   6143  D0  011F            MOVL    (R1)[R3],R3               ; GET PAGE TABLE ENTRY
                       37   18  0123            BGEQ    40$                       ; IF NOT VALID, CAN'T BE I/O SPACE
                                0125                                              ; (ALLOW TRANSFER TO CAUSE PAGEFAULT)
     53   53    15    00    EF  0125            EXTZV   #PTE$V_PFN,#PTE$S_PFN,R3,R3 ; GET PFN
     51    00000000'FF      D0  012A            MOVL    @EXE$GL_RPB,R1            ; GET RPB ADDRESS
          51    00BC C1     9E  0131            MOVAB   RPB$L_MEMDSC(R1),R1       ; START OF MEMORY CONTROLLER DESC'S
                 52   08    D0  0136            MOVL    #RPB$C_NMEMDSC,R2         ; SIZE OF ARRAY
                                0139            ASSUME  RPB$V_BASEPFN EQ 32
                                0139            ASSUME  RPB$S_BASEPFN EQ 32
      50    53      04 A1   C3  0139       25$: SUBL3   4(R1),R3,R0               ; PFN LESS THAN BASE ADDRESS?
                       07   1F  013E            BLSSU   28$                       ; IF SO, SKIP TO NEXT ONE
    50    61    18    00    ED  0140            CMPZV   #RPB$V_PAGCNT,#RPB$S_PAGCNT,(R1),R0 ; WITHIN RANGE OF MEMORY?
                       15   1A  0145            BGTRU   40$                       ; IF SO, ALLOW ACCESS TO LOCATION
                 51    08   C0  0147       28$: ADDL    #RPB$C_MEMDSCSIZ,R1       ; SKIP TO NEXT DESCRIPTOR
                    EC 52   F5  014A            SOBGTR  R2,25$                    ; AND LOOP UNTIL END OF ARRAY
                       09   11  014D            BRB     80$                       ; NOT MAPPED BY ANY CONTROLLER, ACCVIO
                                014F        ;
                                014F        ;       SYSTEM ADDRESS IS ABOVE THE BALANCE SET SLOTS.  CHECK IF BEYOND
                                014F        ;       END OF SYSTEM VIRTUAL ADDRESS SPACE.
                                014F        ;
      00000000'FF      52   D1  014F        8$: CMPL    R2,@MMG$GL_MAXGPTE        ; LEGAL SYSTEM VA?
                       04   1F  0156            BLSSU   40$                       ; IF GPTE, DON'T NEED TO SWITCH CONTEXT
                 50    0C   3C  0158       80$: MOVZWL  #SS$_ACCVIO,R0            ; IF NOT, ACCESS VIOLATION
                       04       015B            RET
                                015C        ;
                                015C        ;       READ MEMORY FROM CURRENT PROCESS CONTEXT
                                015C        ;
                       7E   DC  015C       40$: MOVPSL  -(SP)                     ; GET CURRENT PSL
    6E    02    16    00    F0  015E            INSV    #PSL$C_KERNEL,#PSL$V_PRVMOD,#PSL$S_PRVMOD,(SP)
          0000016A'EF       9F  0163            PUSHAB  42$                       ; ADDRESS FOLLOWING REI
                       02       0169            REI                               ; SET PREVIOUS MODE TO KERNEL
           52      04 AC    D0  016A       42$: MOVL    4(AP),R2                  ; GET SOURCE BUFFER ADDRESS
```

```
              53   08 AC    7D  016E   338          MOVQ     8(AP),R3                     ; GET DESTINATION ADDRESS AND LENGTH
                                0172   339          IFNORD   R4,(R2),80$                  ; CHECK FOR READ ACCESS
                                0178   340          IFNOWRT  R4,(R3),80$                  ; CHECK FOR WRITE ACCESS
                                017E   341 ;        PUSHAB   B^45$                        ; END OF RECOVERY BLOCK ADDESS
                                017E   342 ;        MOVL     #<MCHK$M_LOG!MCHK$M_MCK!MCHK$M_NEXM!MCHK$M_UBA>,R0 ; PROTECT MASK
                                017E   343 ;        JSB      @EXE$MCHK_PRTCT              ; INHIBIT MACHINE CHECKS
           63   62   54    28  017E   344          MOVC     R4,(R2),(R3)                 ; MOVE DATA TO BUFFER
                                0182   345 ;        RSB                                   ; END OF PROTECTED CODE
                                0182   346 ;45$:    BLBC     R0,80$                       ; BRANCH IF MACHINE CHECK OCCURRED
                50   03    D0  0182   347          MOVL     #3,R0                        ; SET NO AST OUTSTANDING
                           04  0185   348 90$:     RET
                                0186   349 ;
                                0186   350 ;        READ MEMORY FROM SOME OTHER PROCESS CONTEXT
                                0186   351 ;
                     56    D5  0186   352 50$:     TSTL     R6                           ; ANY PID TO SWITCH TO?
                     D2    13  0188   353          BEQL     40$                          ; BRANCH IF NOT
           50     08E8 8F    3C  018A   354          MOVZWL   #SS$_NONEXPR,R0              ; ASSUME BAD PID
     51   00000000'FF   56    A3  018F   355          SUBW3    R6,@SCH$GL_MAXPIX,R1         ; CHECK FOR LEGAL INDEX
                     51    B6  0197   356          INCW     R1                           ; MAXPIX+1 = ''SYSTEM PROCESS''
                     C1    13  0199   357          BEQL     40$                          ; SKIP AST IF ''SYSTEM PROCESS''
                     E8    19  019B   358          BLSS     90$                          ; BR IF ILLEGAL INDEX
   51   0C AC   000000B1'8F    C1  019D   359          ADDL3    #PKT_SIZE+CODELEN,12(AP),R1      ; TOTAL SIZE OF BUFFER
              00000000'FF    16  01A6   360          JSB      @EXE$ALLOCBUF                ; ALLOCATE BUFFER FOR CODE
                  D6 50    E9  01AC   361          BLBC     R0,90$                       ; BRANCH IF ERROR DETECTED
               55    52    D0  01AF   362          MOVL     R2,R5                        ; SAVE ADDRESS OF PACKET
            0C A5    56    D0  01B2   363          MOVL     R6,ACB$L_PID(R5)             ; SET TARGET PID
        0B A5    80 8F    90  01B6   364          MOVB     #1@ACB$V_KAST,ACB$B_RMOD(R5)     ; SET SPECIAL KERNEL AST
            50    0C AC    D0  01BB   365          MOVL     12(AP),R0                    ; GET LENGTH OF TRANSFER
      18 A5    3D A540    9E  01BF   366          MOVAB    PKT_SIZE(R5)[R0],ACB$L_KAST(R5) ; SET ADDRESS FOR AST
            28 A5    50    D0  01C5   367          MOVL     R0,PKT_LEN(R5)               ; SET LENGTH OF TRANSFER
        14 A5    04 AC    D0  01C9   368          MOVL     4(AP),PKT_ADDR(R5)           ; SET ADDRESS FOR FETCH
        24 A5    08 AC    D0  01CE   369          MOVL     8(AP),PKT_RETLOC(R5)         ; AND ADDRESS OF RETURN LOCATION
            2C A5    0C    D0  01D3   370          MOVL     #SS$_ACCVIO,PKT_STATUS(R5) ; ASSUME NO READ ACCESS
        30 A5    14 AC    D0  01D7   371          MOVL     20(AP),PKT_STATLOC(R5)       ; ADDRESS TO RETURN STATUS
      54   00000000'FF    D0  01DC   372          MOVL     @SCH$GL_CURPCB,R4            ; GET ADDRESS OF CURRENT PCB
            50    6C A4    D0  01E3   373          MOVL     PCB$L_PHD(R4),R0             ; GET PHD ADDRESS
        10 A5    60 A4    D0  01E7   374          MOVL     PCB$L_PID(R4),PKT_ORIGPID(R5)    ; SET PID FOR RETURN
      38 A5    00F4 C0    D0  01EC   375          MOVL     PHD$L_IMGCNT(R0),PKT_IMGCNT(R5) ; SET IMGCNT OF REQUESTOR
                  3C A5    94  01F2   376          CLRB     PKT_FLAGS(R5)                ; AND CLEAR FLAGS BYTE
                     55    DD  01F5   377          PUSHL    R5                           ; SAVE REGS FOR MOVC
 18 B5   0268'CF   0074'8F    28  01F7   378          MOVC3    #CODELEN,W^CODE,@ACB$L_KAST(R5) ; COPY CODE SEGMENT
                  55 8ED0  0200   379          POPL     R5                           ; RESTORE REGISTERS
     1C A5   00000000'EF    D0  0203   380          MOVL     SCH$QAST,PKT_QAST(R5)        ; COPY ABSOLUTE ADDRESSES IN EXECUTIVE
     34 A5   00000000'EF    D0  020B   381          MOVL     SCH$WAKE,PKT_WAKE(R5)
     20 A5   00000000'EF    D0  0213   382          MOVL     EXE$DEANONPAGED,PKT_DEANON(R5)
                                021B   383 ;        MOVL     EXE$MCHK_PRTCT,PKT_PRTCT(R5)
               52    04    9A  021B   384          MOVZBL   #PRI$_TICOM,R2               ; SET PRIORITY INCREMENT CLASS
            50    0C A5    3C  021E   385          MOVZWL   ACB$L_PID(R5),R0             ; GET DESTINATION PID
      51   00000000'FF    D0  0222   386          MOVL     @SCH$GL_PCBVEC,R1            ; GET ADDRESS OF PCB VECTOR
               54    6140    D0  0229   387          MOVL     (R1)[R0],R4                  ; GET DESTINATION PCB ADDRESS
                                022D   388          SETIPL   #IPL$_SYNCH                  ; DON'T LET TARGET'S STATE CHANGE
            09    2C A4    B1  0230   389          CMFW     PCB$W_STATE(R4),#SCH$C_SUSP      ; IF TARGET PROCESS SUSPENDED
                     0D    13  0234   390          BEQL     100$                             ; THEN PESUME IT
            0A    2C A4    B1  0236   391          CMPW     PCB$W_STATE(R4),#SCH$C_SUSPO     ; OR SUSPENDED AND OUTSWAPPED
                     07    13  023A   392          BEQL     100$                             ; THEN RESUME IT
                  1C B5    16  023C   393          JSB      @PKT_QAST(R5)                ; QUEUE AST FOR TARGET (NO RESUSPEND)
                                023F   394          SETIPL   #0                           ; DROP IPL, BLOCK IS GONE
```

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```
                 04  0242             RET                               ; RETURN TO ORIGINAL MODE
                     0243  ;
                     0243  ;        RESUME DESTINATION PROCESS AFTER QUEUEING THE SPECIAL KERNEL AST.
                     0243  ;        NOTE THAT BECAUSE THIS AST WILL PREEMPT THE SUSPND AST CODE IN
                     0243  ;        THE EXEC, THE RESPEN BIT WILL NOT GET CLEARED PRIOR TO THIS AST'S
                     0243  ;        EXECUTION. THUS, THIS AST MERELY HAS TO CLEAR THE RESPEN BIT TO
                     0243  ;        ENSURE THAT THE TARGET PROCESS REENTERS THE SUSPENDED STATE. THE EXEC
                     0243  ;        WILL GET A CHANCE TO RUN WHEN THIS AST COMPLETES, IT WILL SEE THAT
                     0243  ;        RESPEN BIT CLEAR, AND IMMEDIATELY REENTER THE SUSPEND STATE.
                     0243  ;
  3C A5     01   90  0243  100$:      MOVB    #PKT_M_SUSPEND,PKT_FLAGS(R5)    ; MARK PROCESS IN SUSPEND STATE
        1C B5    16  0247             JSB     @PKT_QAST(R5)             ; QUEUE AST FOR TARGET (RESUSPEND)
                     024A             SETIPL  #0                        ; LOWER IPL, BLOCK IS NOW GONE
  50    60 A4    D0  024D             MOVL    PCB$L_PID(R4),R0          ; GET PROCESS IPID
00000000'FF      16  0251             JSB     @EXE$IPID_TO_EPID         ; CONVERT TO EPID (IN R0)
           50    DD  0257             PUSHL   R0                        ; PUSH EPID ON STACK
     50    5E    D0  0259             MOVL    SP,R0                     ; POINT TO IT
                     025C             $RESUME_S PIDADR=(R0)             ; RESUME PROCESS SO AST WILL EXECUTE
                 04  0267             RET                               ; RETURN
```

```
                           0268  ;
                           0268  ;          CODE PLACED IN NON-PAGED BUFFER EXECUTED IN
                           0268  ;          DESTINATION PROCESS CONTEXT AS A SPECIAL KERNEL AST.
                           0268  ;
                           0268  CODE:      IFNORD   PKT_LEN(R5),@PKT_ADDR(R5),10$    ; BRANCH IF NOT READABLE
                 30    BB  0270             PUSHR    #^M<R4,R5>                       ; SAVE REGISTERS
                           0272  ;          PUSHAB   B^5$                             ; END OF RECOVERY BLOCK ADDESS
                           0272  ;          MOVL     #<MCHK$M_LOG!MCHK$M_MCK!MCHK$M_NEXM!MCHK$M_UBA>,R0 ; PROTECT MASK
                           0272  ;          JSB      @PKT_PRTCT(R5)                   ; INHIBIT MACHINE CHECKS
3D A5    14 B5    28 A5    28  0272         MOVC     PKT_LEN(R5),@PKT_ADDR(R5),PKT_DATABUF(R5) ; GET DATA
                           0279  ;          RSB                                       ; END OF PROTECTED CODE
                 30    BA  0279  5$:        POPR     #^M<R4,R5>                       ; RESTORE REGISTERS
                           027B  ;          BLBC     R0,10$                           ; BRANCH IF MACHINE CHECK OCCURRED
         2C A5    01    D0  027B            MOVL     #SS$_NORMAL,PKT_STATUS(R5) ; SET SUCCESS ON TRANSFER
                           027F  10$:       ASSUME   PKT_V_SUSPEND EQ 0
        05 3C A5    E9  027F                BLBC     PKT_FLAGS(R5),40$                ; BRANCH IF NOT RE-SUSPENDING
     00 24 A4    05    E5  0283             BBCC     #PCB$V_RESPEN,PCB$L_STS(R4),40$ ; ALLOW TARGET TO REMAIN IN SUSP
     0C A5    10 A5    D0  0288  40$:       MOVL     PKT_ORIGPID(R5),ACB$L_PID(R5)    ; SET PID FOR RETURN AST
     0B A5    80 8F    90  028D             MOVB     #1@ACB$V_KAST,ACB$B_RMOD(R5)     ; SET FOR KAST AGAIN
     18 A5    9D'AF    9E  0292             MOVAB    B^REPLY,ACB$L_KAST(R5)   ; SET NEW AST ADDRESS
           52    04    9A  0297             MOVZBL   #PRI$_TICOM,R2                   ; SET PRIORITY INCREMENT CLASS
              1C B5    17  029A             JMP      @PKT_QAST(R5)                    ; QUEUE RETURN AST AND EXIT
                           029D  ;
                           029D  ;          CODE PLACED IN NON-PAGED BUFFER EXECUTED IN
                           029D  ;          ORIGINATOR PROCESS CONTEXT TO RETURN MEMORY
                           029D  ;          TO REQUESTED BUFFER AND RETURN COMPLETION STATUS.
                           029D  ;
           50    6C A4    D0  029D  REPLY:  MOVL     PCB$L_PHD(R4),R0                 ; GET ADDRESS OF PROCESS HEADER
   00F4 C0    38 A5    D1  02A1             CMPL     PKT_IMGCNT(R5),PHD$L_IMGCNT(R0) ; CHECK IF STILL SAME IMAGE
                 2A    12  02A7             BNEQ     DEALOC                           ; IF NOT, DROP TRANSFER ON FLOOR
                           02A9             IFNOWRT  PKT_LEN(R5),@PKT_RETLOC(R5),130$ ; BRANCH IF NOT WRITABLE
                 55    DD  02B1             PUSHL    R5                               ; SAVE REGISTER
24 B5    3D A5    28 A5    28  02B3         MOVC     PKT_LEN(R5),PKT_DATABUF(R5),@PKT_RETLOC(R5) ; MOVE DATA
               55 8ED0  02BA                POPL     R5                               ; RESTORE REGISTER
                           02BD  130$:      IFNOWRT  #4,@PKT_STATLOC(R5),140$ ; BRANCH IF STATUS NOT WRITABLE
     30 B5    2C A5    D0  02C4             MOVL     PKT_STATUS(R5),@PKT_STATLOC(R5) ; RETURN STATUS
        51    0C A5    D0  02C9  140$:      MOVL     ACB$L_PID(R5),R1                 ; GET PID FOR WAKE
                           02CD             SETIPL   #IPL$_SYNCH                      ; RAISE TO SYNCH
              34 B5    16  02D0             JSB      @PKT_WAKE(R5)                    ; WAKE REQUESTOR PROCESS
                           02D3
                           02D3
                           02D3  DEALOC:    SETIPL   #IPL$_ASTDEL                     ; RESTORE IPL
           50    55    D0  02D6             MOVL     R5,R0                            ; SET ADDRESS FOR RELEASE
              20 B5    17  02D9             JMP      @PKT_DEANON(R5)                  ; FREE BLOCK
                           02DC
              00000074     02DC  CODELEN = .-CODE                                     ; SIZE OF ENTIRE CODE SEGMENT
                           02DC
                           02DC             .END
```

```
$$T1                          = 00000001                RPB$S_BASEPFN                 = 00000020
ACB$B_RMOD                    = 0000000B                RPB$S_PAGCNT                  = 00000018
ACB$L_AST                     = 00000010                RPB$V_BASEPFN                 = 00000020
ACB$L_ASTPRM                  = 00000014                RPB$V_PAGCNT                  = 00000000
ACB$L_KAST                    = 00000018                SCH$C_SUSP                    = 00000009
ACB$L_PID                     = 0000000C                SCH$C_SUSPO                   = 0000000A
ACB$V_KAST                    = 00000007                SCH$GL_CURPCB                   ********   X   03
CODE                            00000268 R     03       SCH$GL_MAXPIX                   ********   X   03
CODELEN                       = 00000074                SCH$GL_PCBVEC                   ********   X   03
DEALOC                          000002D3 R     03       SCH$QAST                        ********   X   03
EXE$ALLOCBUF                    ********   X   03       SCH$WAKE                        ********   X   03
EXE$DEANONPAGED                 ********   X   03       SECONDS                       = 00989680
EXE$GL_RPB                      ********   X   03       SGN$GL_BALSETCT                 ********   X   03
EXE$IPID_TO_EPID                ********   X   03       SIZ...                        = 00000001
GETPROCMEM                      00000008 RG    03       SS$_ACCVIO                    = 0000000C
IPL$_ASTDEL                   = 00000002                SS$_NONEXPR                   = 000008E8
IPL$_SYNCH                    = 00000008                SS$_NORMAL                    = 00000001
MMG$GL_MAXGPTE                  ********   X   03       SS$_TIMEOUT                   = 0000022C
MMG$GL_SPTBASE                  ********   X   03       SWP$GL_BALBASE                  ********   X   03
PCB$L_PHD                     = 0000006C                SWP$GL_BSLOTSZ                  ********   X   03
PCB$L_PID                     = 00000060                SYS$CANTIM                      ********  GX   03
PCB$L_STS                     = 00000024                SYS$CMKRNL                      ********  GX   03
PCB$V_RESPEN                  = 00000005                SYS$HIBER                       ********  GX   03
PCB$W_STATE                   = 0000002C                SYS$RESUME                      ********  GX   03
PHD$L_IMGCNT                  = 000000F4                SYS$SETIMR                      ********  GX   03
PHD$W_PHVINDEX                = 00000042                SYS$WAKE                        ********  GX   03
PHV$GL_PIXBAS                   ********   X   03       TIMEOUT                         00000000 R     03
PKT_ADDR                      = 00000014                VA$S_VPN                      = 00000015
PKT_DATABUF                     0000003D                VA$V_SYSTEM                   = 0000001F
PKT_DEANON                      00000020                VA$V_VPN                      = 00000009
PKT_FLAGS                       0000003C
PKT_IMGCNT                      00000038
PKT_LEN                         00000028
PKT_M_SUSPEND                 = 00000001
PKT_ORIGPID                   = 00000010
PKT_QAST                        0000001C
PKT_RETLOC                      00000024
PKT_SIZE                        0000003D
PKT_STATLOC                     00000030
PKT_STATUS                      0000002C
PKT_V_SUSPEND                 = 00000000
PKT_WAKE                        00000034
PR$_IPL                       = 00000012
PRI$_TICOM                    = 00000004
PSL$C_KERNEL                  = 00000000
PSL$S_PRVMOD                  = 00000002
PSL$V_PRVMOD                  = 00000016
PTE$S_PFN                     = 00000015
PTE$V_PFN                     = 00000000
QAST                            000000B0 R     03
QAST_COUNT                      00000000 R     02
QAST_TIMEOUT                    0000007A R     03
REJECT_RESPONSE                 0000009E R     03
REPLY                           0000029D R     03
RPB$C_MEMDSCSIZ               = 00000008
RPB$C_NMEMDSC                 = 00000008
RPB$L_MEMDSC                  = 000000BC
```

```
                                                   +----------------+
                                                   ! Psect synopsis !
                                                   +----------------+

PSECT name                       Allocation           PSECT No.  Attributes
----------                       ----------           ---------  ----------
.  ABS  .                        00000000  (      0.)  00 (   0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
$ABS$                            0000003D  (     61.)  01 (   1.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
DATA                             00000004  (      4.)  02 (   2.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD     WRT NOVEC BYTE
QAST                             000002DC  (    732.)  03 (   3.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC BYTE

                                                +-------------------------+
                                                ! Performance indicators !
                                                +-------------------------+

Phase                     Page faults    CPU Time       Elapsed Time
-----                     -----------    --------       ------------
Initialization                     35    00:00:00.04    00:00:01.10
Command processing                134    00:00:00.43    00:00:03.77
Pass 1                            322    00:00:07.38    00:00:26.97
Symbol table sort                   0    00:00:01.14    00:00:05.55
Pass 2                            103    00:00:01.48    00:00:06.06
Symbol table output                11    00:00:00.05    00:00:00.48
Psect synopsis output               2    00:00:00.02    00:00:00.36
Cross-reference output              0    00:00:00.00    00:00:00.00
Assembler run totals              609    00:00:10.54    00:00:44.29

The working set limit was 1650 pages.
60357 bytes (118 pages) of virtual memory were used to buffer the intermediate code.
There were 60 pages of symbol table space allocated to hold 1053 non-local and 19 local symbols.
462 source lines were read in Pass 1, producing 20 object records in Pass 2.
36 pages of virtual memory were used to define 35 macros.

                                               +----------------------------+
                                               ! Macro library statistics !
                                               +----------------------------+

Macro library name                               Macros defined
------------------                               --------------
_$255$DUA28:[SDA.OBJ]SDALIB.MLB;1                           0
_$255$DUA28:[SYS.OBJ]LIB.MLB;1                             13
_$255$DUA28:[SYSLIB]STARLET.MLB;2                          18
TOTALS (all libraries)                                     31

1222 GETS were required to define 31 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS$:QAST/OBJ=OBJ$:QAST MSRC$:QAST/UPDATE=(ENH$:QAST)+EXECML$/LIB+LIB$:SDALIB/LIB
```

0353 AH-BT13A-SE
VAX/VMS V4.0

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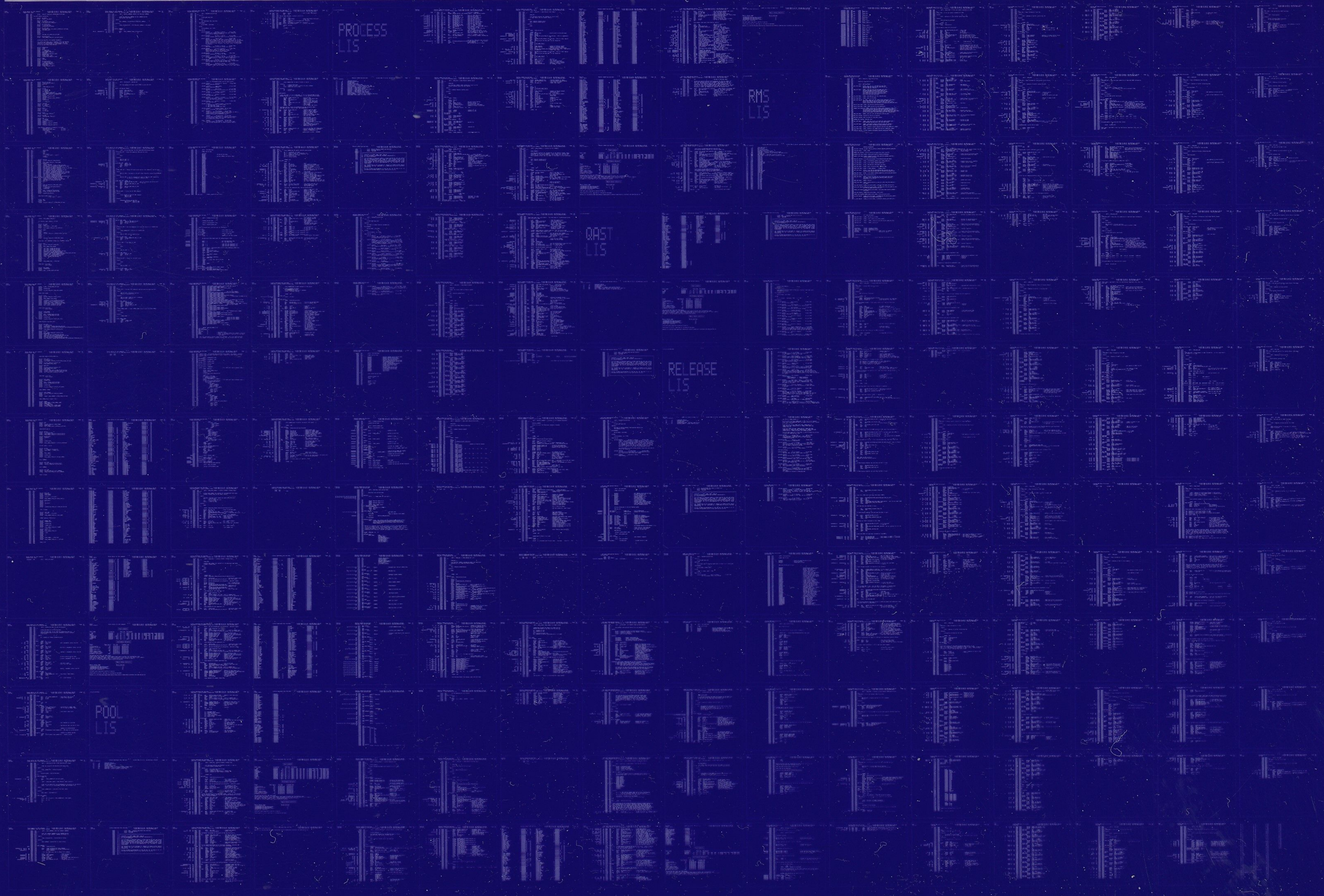

PROCESS
LIS

RMS
LIS

QAST
LIS

RELEASE
LIS

POOL
LIS