MWAIT User’s Guide

MWAIT displays information about hanging OpenVMS processes.

This manual contains a description of the MWAIT program, including usage details and an explanation of the output produced.

Software Version: 2.8

Operating System: OpenVMS Alpha Version 7.0 or higher.

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I would like to thank Jim Good for his feedback concerning this documentation.

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1. PURPOSE OF MWAIT

The MWAIT program provides detailed information about a hanging process or thread and attempts to determine the reason for the process going into its wait state.
Starting from version 7.0 OpenVMS Alpha supports multiple execution contexts within a process, each execution context has it own hardware context and stacks and can execute independently.
The term "Kernel Thread" refers to one of these execution contexts.
The term "Multithreaded" refers to a process with multiple kernel threads.

MWAIT provides a means of quickly obtaining and presenting process details.

Note: The System Dump Analyzer (SDA) may be used to obtain further information about a hanging processes.

The information retrieved by MWAIT includes:

- General Process information.
- Threads information.
- Event flags, EFN clusters and names of common EFN clusters.
- Process quota usage.
- AST modes enabled, active and queued.
- Time since last event.
- Process active channels and open files.
- I/O-packets for busy devices and I/O-packets from other processes.
- CXB's (Complex chained buffer) for busy INETn:/BGn: devices (TCP/IP)
- Session Control and OSI/NSP Transport Ports for Busy NETn: devices.
- Current process registers.
- Current PC, return address and call chain with corresponding image names.

The screen output is stored in the file 'xxx.OUT' in your current default directory, where 'xxx' is the target process PID.

2. RUNNING THE MWAIT PROGRAM

MWAIT is started by running the MWAIT.EXE executable image.

The MWAIT image does not require any logical names or symbols to be defined before execution.

The only parameter required is the PID value for the process to be investigated.

Note : PID values can be obtained from the output of the $SHOW PROCESS or $SHOW SYSTEM commands. (They are hexadecimal numbers, e.g. '5060013B')

The various alternatives available for running the MWAIT executable are as follows:

2.1 The DCL RUN Command

MWAIT.EXE can be started as follows with the RUN command:

```
$ RUN device:[directory]MWAIT
```

where 'device:[directory]' is the disk device and directory in which MWAIT.EXE is located.

Note : As usual, if MWAIT.EXE is in the current default directory, then the device and directory specification can be omitted. In this case, the command simply becomes $ RUN MWAIT. This remark applies also to the other command lines shown below.

Once started by a RUN command, MWAIT will then prompt for the identification of the process to be inspected:

```
Please give target process PID :
```

2.2 DCL Foreign Command

A DCL ’foreign command’ can be defined as follows:

$ MWAIT :== $device:[directory]MWAIT

With such a foreign command definition, a MWAIT session can be started just by entering ’MWAIT’, and the PID of the process to be investigated can be entered directly on the command line. Thus, MWAIT can be started as follows:

$ MWAIT pid

(If a process identification is not included on the command line, then MWAIT will prompt for a PID value just as it does when it is started with an explicit RUN command.)

Note: If such a foreign command is defined then the device and directory specification MUST be included, even if the MWAIT.EXE file is in the current default directory.

Note : The reader may find it useful to include such a foreign command in their LOGIN.COM.

2.3 MWAIT Executable in SYS$COMMON:[SYSEXE]

A third alternative is to copy the MWAIT.EXE into the SYS$COMMON:[SYSEXE] directory, or have it copied there by a system manager. Placing the MWAIT.EXE file in SYS$COMMON:[SYSEXE] makes it available to all users on the system that have CMKRNL privilege.

In this case, MWAIT can be started with the MC command as follows:

$ MC MWAIT pid

or

$ MC MWAIT

(with MWAIT prompting for the PID, as above).

When the MWAIT executable copied to the SYS$COMMON:[SYSEXE] directory, it is also possible to define a foreign command as shown above.

The difference in this case is that the device and directory specification can be omitted. In other words, when the MWAIT.EXE program is in SYS$COMMON:[SYSEXE], the foreign command specification is simply:

```
$ MWAIT :== $MWAIT
```

3. USAGE NOTES

3.1 PRIVILEGES REQUIRED

The Change Mode to Kernel (CMKRNL) privilege is needed to run MWAIT.

Note: Use $SET PROC/PRIV=CMKRNL to get this privilege. If it happens that you're not authorized to set the CMKRNL privilege, you'll have to plead with your friendly system manager.

3.2 ERROR MESSAGES

Possible error messages from MWAIT include:

SS$_ACCVIO	- No read access to target process data structures.
SS$_NONEXPR	- No process found that matches the specified PID.
SS$_REMOTE_PROC	- Process is running on another node in the VMScluster. MWAIT can monitor only local node processes.
%MWAIT-F-INVFRAME	- Invalid Call Frame. The target process has a non-standard call frame. The call does apply to the "OpenVMS Calling Standard".
%MWAIT-F-NORESPONSE	- No response from target process. The kernel mode AST timed out on reading the specified target process data.
%MWAIT-F-NOTINPHYS	- Virtual data not in physical memory. The data referenced by a call frame pointer is not in physical memory.

3.3 RESTRICTIONS

MWAIT can only analyze processes running on the same node.

The SWAPPER is not allowed as target process.

N.B.: MWAIT runs partly in Kernel Mode, i.e. a program error or access violation usually leads to a system crash. Thus, MWAIT SHOULD NOT BE EXECUTED IN A PRODUCTION ENVIRONMENT.

3.4 MWAIT KIT FILES

The MWAIT distribution kit consists of:

MWAIT.EXE	Executable file for OpenVMS Alpha.
MWAIT.COM	Command file to build MWAIT on OpenVMS Alpha.
MWAIT.C	Source file for OpenVMS Alpha.
MWAIT.TXT	MWAIT User’s guide text file .
MWAIT.DOC	MWAIT User’s guide DECwrite source file.
MWAIT.PS	MWAIT User’s guide Postscript file.

3.5 BUILD OF MWAIT EXECUTABLE

To build the MWAIT executable image, set the current default directory to the one containing the MWAIT kit files and execute the command file MWAIT.COM as follows:

```
$ @MWAIT
```

4. DISPLAY FIELDS

Field	Use
-----	---
Process name	VMS process name.
User name	VMS username.
Extended PID	Extended Process ID of the process.
Internal PID	Internal Process ID of the process.
Terminal name	Control device for process (FTAn:/Det/Sub/Net/Bat)
Cur/Base prior	Current/Base priority of the process.
PCB address	Address of Process Control Block.
PHD address	Address of Process Header.
JIB address	Address of Job Information Block.
KTB vector	Kernel Thread Block.
Threads	Number of process kernel threads.
Running on CPU	CPU id.
Thread state	Thread state, see table below.
Thread status	Thread status, see table below.
EFN wait cluster	The event flag cluster number that the "EFN wait mask" refers to. The value shows the event flag range: 0 = 0 - 31 1 = 32 - 63 2 = 64 - 95 3 = 96 - 127 4 = 128 (Special EFN for thread upcall support) EFNs in the range 64..127 are found in named "Common Event Flag Clusters". If the process is not in a wait state, the contents of this field is unpredictable.
EFN wait mask	If the process is in LEF, LEFO or CEF state the wait mask has one bit set for each event flag being waited for. For the special thread upcall support EFN the mask contents is unpredictable. In other wait states a small positive number (1-20) identifies the wait resource number. A negative number indicates the address of the mutex lock routine or JIB.

If the process is not in a wait state, the contents of this field is unpredictable.

Process quotas	Displays the quota usage of the process, under currently available, maximum and currently used quota. If a quota has been exhausted, then the text "*** Process has run out of XXX quota ***" will be displayed.

```
Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :        0 /      64  In use : 64
Working set quota/limit [Pagelets] :    78224 /   80000  In use : 1776
Page file quota/limit      [Pages] :     3887 /    4096  In use : 209
AST count/limit            [AST's] :      248 /     250  In use : 2
```

AST's enabled	Each letter corresponds to a mode for which AST's are enabled (Kernel, Executive, Supervisor and User, "-" means disabled).
AST's active	Each letter corresponds to a mode for which AST's are currently active ("-" means not active)
AST's queued	Each letter corresponds to a process AST queue which is not empty ("-" means nothing queued).
Delete pending count	Number of active XQP (eXtended QIO Processor) threads for the process.
Process active channels	Displays process active I/O channels. 'Chnl' is the I/O channel index. 'Window' is the window control block address. 'IOC' is the I/O count. 'Sts' is the I/O channel status (busy or idle) 'Device/file accessed' is the device and file name.

Session Control Port	Session control port name (busy NETn: devices only)
OSI Transport Port or	OSI Transport Port name (busy NETn: devices only)
NSP Transport Port	NSP Transport Port name (busy NETn: devices only)

CXB	Complex chained buffer (busy INETn: devices only) One logical buffer is split into several segments for the transmission over a data link and they are combined when transferred to the user buffer.

APPENDIX A STANDARD PROCESS WAIT STATES

State	Description
COLPG	Collided page wait. Two or more processes (or kernel threads within mulitithreaded processes) have referenced the same page, and this page is not in physical memory. The first of such processes/threads goes into PFW and the subsequent processes/threads into COLPG.
MWAIT	Mutex and miscellaneous resource wait. The process/thread is waiting for a exhausted or locked resource or a job quota (MUTEX).
CEF	Common event flag wait. The process/thread is waiting on event flags in clusters 2 (64-95) or 3 (96-127). MWAIT displays the name of any associated common event flag clusters, and the EFN numbers. The process can be resident or outswapped.
PFW	Page fault wait. The process/thread has referenced a page that is not in physical memory, and must wait until the page has been read in. (Process deletion, AST delivery and a successful read of the page will place the process into COM or COMO.)
LEF	Local event flag wait. The process/thread is waiting for one or more local event flags to be set. The program displays the event flag cluster number 0 (0-31) or 1 (32-63) or 4 (128) and the EFN numbers. If more than one EFN is being waited for, the process is waiting for any of the EFNs shown to be set. Typically the process has called a system service like $QIOW, $SYNCH or $WAITFR.
LEFO	Local event flag wait, Outswapped.
HIB	Hibernate wait. The process/thread has called $HIBER. (A $WAKE or $SCHDWK will restart the process.)
HIBO	Hibernate wait, Outswapped.
SUSP	Suspended. The process has used, or been subject to, a $SUSPND call. (A $RESUME will restart the process.)
SUSPO	Suspended, Outswapped.
FPG	Free page wait. The Process has requested a physical page to be added to its working set, and there are no pages are on the free page list. (When a page is made available, the process becomes COM or COMO.)
COM	Compute wait. The process is capable of using a CPU, but none is currently available.
COMO	Computable, Outswapped.
CUR	Current process. Currently executing on a CPU.

APPENDIX B PROCESS STATUS VALUES

Status	Description
--------	---------------
RES	Resident, in balance set
DELPEN	Delete pending
FORCPEN	Force exit pending
INQUAN	Initial quantum in progress
PSWAPM	Process cannot be swapped
RESPEN	Resume pending, skip suspend
SSFEXC	System service exception enable (K)
SSFEXCE	System service exception enable (E)
SSFEXCS	System service exception enable (S)
SSFEXCU	System service exception enable (U)
SSRWAIT	System service resource wait disable
SUSPEN	Suspend pending
WAKEPEN	Wake pending, skip hibernate
WALL	Wait for all events in mask
BATCH	Process is a batch job
NOACNT	No accounting for process
NOSUSPEND	Process cannot be suspended
ASTPEN	AST pending
PHDRES	Process header resident
HIBER	Hibernate after initial image activate
LOGIN	Login without reading UAF
NETWRK	Network connect job
PWRAST	Power fail AST
NODELET	Cannot delete process
DISAWS	Disable automatic WS adjustment
INTER	Process is an interactive job
RECOVER	Process can recover locks
SECAUDIT	Mandatory security auditing enabled
HARDAFF	Process is bound to particular CPU
ERDACT	Exec mode rundown active
SOFTSUSP	Process is in soft suspend
PREEMPTED	Hard suspend has preempted soft

APPENDIX C SYSTEM RESOURCE WAIT STATES

State	Description
RWAST	General-purpose resorce wait for a system or special kernel mode AST. A process/kernel thread is placed into the wait queue specified by the resource number. Note: Some RWAST states can only be cleared by a system reboot.
RWMBX	Mailbox full. The process has tried to write to a mailbox that is full or has insufficient buffer space.
RWNPG	Wait for nonpaged dynamic memory. Process failed to allocate the specified amount of nonpaged dynamic memory.
RWPFF	Page file is full. The system paging file (PAGEFILE.SYS) is too small or has not been initialized. Note: When convenient increase the paging file size and reboot the system. Note: See DCL command SHOW MEMORY, Paging File Usage.
RWPAG	Wait for paged dynamic memory. Process failed to allocate the specified amount of paged pool.
RWBRK	Wait for breakthrough (Currently not used).
RWIMG	Wait for image activation lock (Currently not used).
RWQUO	Wait for job pooled quota (Currently not used).
RWLCK	Wait for lock identification database (Currently not used).
RWSWP	Wait for swap file space (Currently not used).
RWMPE	Modified page list empty. Process is waiting for the modified page writer to signal that it has flushed the modified page list. Only OPCRASH does this to wait prior to stopping the system.
RWMPB	Modified page writer busy. The process has faulted a modified page out of its working set, and either the modified page list already contains more pages than MPW_WAITLIMIT, or the modified page list contains more pages than MPW_LOWLIMIT and the modified page writer is active, writing modified pages. Note: Processes should not remain in RWMPB for long periods. If they do, it may be that a page file has become full, or that the paging disk is extremely busy or has gone into mount verification.

RWSCS Distributed lock manager wait. The process is waiting for a response from a remote cluster node that has information about a particular lock resource.

RWCLU Wait for cluster state transition. The process has requested a lock on a node that is in transition (being added or removed from the cluster). The process will remain in this state until the cluster membership stabilizes.

RWCAP Wait for CPU capability. The process is computable, and has requested specific CPU capabilities or affinity that a single active CPU on a SMP system can't offer. The process is rescheduled to run on a CPU that has the right SMP characteristics.

RWCSV Wait for cluster server process. The limit of outstanding requests from one cluster member to another's server process has been reached, and this process has also requested a service of that node. Also requesting certain clusterwide process system services can place a process into this state until the request completes.

RWSNP Wait for a system snapshot (Currently not used).

PSXFR Posix fork creation wait. A kthread/process is in POSIX specific wait state (parent and child process). A kthread will remain in this wait state until the thread is explicitly resumed by calling the EXE$PSX_RESUME[_xxx] routine.

INNER_MODE
Indicates a thread in an inner mode semaphore wait. The semaphore needed for a piggy-back special kernel AST delivery to a thread of a multithreaded process is owned by another thread.

EXH Kernel thread in exit handler wait (Currently not used).

Appendix D. SAMPLE RUNS

D.1 MULTITHREADED PROCESS

```
$ RUN MWAIT

          *** MWAIT /Alpha V2.2 - Process Hang Analyzer ***

Please give target process PID : 21200249

Process name     : _FTA2:               User name      : SALMINEN
Extended PID     : 21200249             Internal PID   : 00010049
PCB address      : 813DACC0             Terminal name  : FTA2:
JIB address      : 813DAB40             Cur/Base prior : 0/0
PHD address      : 9FE98000
KTB vector       : 81114640             Threads        : 2
Thread 00
---------
KTB address      : 813DACC0             Running on CPU : 1
Thread state     : COM                  Compute
Thread status    : 02040001  ssrwait    System service resource wait enabled
                             RES        Resident, in balance set
                             PHDRES     Process header resident
                             INTER      Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 0000000D
Thread 01
---------
KTB address      : 81020400             Running on CPU : 0
Thread state     : COM                  Compute
Thread status    : 02040001  ssrwait    System service resource wait enabled
                             RES        Resident, in balance set
                             PHDRES     Process header resident
                             INTER      Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 00000000

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99552 /   99552  In use : 0
Byte count/orig. limit     [Bytes] :    99552 /  100000  In use : 448
File count/limit           [Files] :      198 /     200  In use : 2
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    76000 /   80000  In use : 4000
Page file quota/limit      [Pages] :     3722 /    4096  In use : 374
AST count/limit            [AST's] :      248 /     250  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
```

```
AST’s queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 007DA110 / 007D9DEF / 00000321 [hex] ticks
Time since last event : 8 seconds 10 milliseconds

Process active channels:

Chnl  Window  IOC Sts  Device/file accessed
----  ------  --- ---  --------------------
0010 00000000   0      GDCW3B$DRA0:
0020 8110CC00   0      GDCW3B$DRA2:[USER5.SALMINEN.THREAD]PRIME.EXE;2
0030 810F9C40   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]PTHREAD$RTL.EXE;1
0040 811C59C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
0050 811AE780   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811BC300   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0070 811C5480   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
0080 00000000   0      FTA2:
0090 00000000   0      FTA2:
00A0 811C6240   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00B0 811C72C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;2
00C0 811C69C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
00D0 811B5000   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SYS$SSISHR.EXE;1
00E0 00000000   0      FTA2:

Current process registers:

R0   = 00000000 00000FFD  R1   = 00000000 00000FFD  R2   = 00000000 000101C0
R3   = 00000000 00000001  R4   = 00000000 00000000  R5   = 00000000 00000004
R6   = 00000000 00001003  R7   = 00000000 000F44F0  R8   = 00000000 00003D09
R9   = 00000000 000011AE  R10  = 00000000 00007A11  R11  = 00000000 00020004
R12  = 00000000 00020004  R13  = 00000000 00000001  R14  = 00000000 00000000
R15  = 00000000 00000000  R16  = 00000000 00007A11  R17  = 00000000 00000000
R18  = FFFFFE4F 00000007  R19  = 00000000 00000000  R20  = 00000000 00000008
R21  = 00000000 00000000  R22  = 00000000 00000001  R23  = 00000000 0044D0F8
R24  = 00000000 01000000  R25  = 00000000 00000001  R26  = 00000000 00030450
R27  = 00000000 00104010  R28  = FFFFFFFF 8089E4BC  FP   = 00000000 004A7B90
PC   = 00000000 00030450  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        00030450 is in the image:
PRIME
Base      End       Image Offset  Psect type
00010000  000603FF  00030450      MAIN

R26 (Return address):  00030450 is in the image:
PRIME
Base      End       Image Offset  Psect type
00010000  000603FF  00030450      MAIN

****************** Call Frame 1 ***************************************

FP      = 004A7B90
PDSC    = 000101C0  Stack Frame Procedure Descriptor
```

```
Next FP = 004A7DD0

Procedure Entry: 00030158 is in the image:
PRIME
Base      End       Image Offset  Psect type
00010000  000603FF  00030158      MAIN

Return address:  000AE148 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00062000  001035FF  0004C148      GLOBAL

******************* Call Frame 2 ***************************************

FP       = 004A7DD0
PDSC     = 00065990  Stack Frame Procedure Descriptor
Next FP = 004A7FE0

Procedure Entry: 000AD818 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00062000  001035FF  0004B818      GLOBAL

Return address:  0009F294 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00062000  001035FF  0003D294      GLOBAL

******************* Call Frame 3 ***************************************

FP       = 004A7FE0
PDSC     = 00064178  Stack Frame Procedure Descriptor
Next FP = 7ED2DA70

Procedure Entry: 0009F27C is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00062000  001035FF  0003D27C      GLOBAL

Return address:  00000000 is not within a system or user image

******************* Call Frame 4 ***************************************

FP       = 7ED2DA70
PDSC     = 00062048  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00092148 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00062000  001035FF  00030148      GLOBAL

Return address:  A503F0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  000130D8      Paged read only
```

```
****************** Call Frame 5 *************************************

FP      = 7ED31B30
PDSC    = A5041A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: A503EF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 6 *************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.2 PROCESS WAITING FOR AN EVENT FLAG

Start the example program WAIT on an other terminal and run MWAIT.

```
$ sho sys
OpenVMS V7.1  on node GDCW3A  15-MAY-1997 11:28:00.56  Uptime  1 20:23:25
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A00275 _FTA16:         LEF      4    12102   0 00:00:29.78      7922     96


$ RUN MWAIT


          *** MWAIT /Alpha V2.2 - Process Hang Analyzer ***

Please give target process PID : 21200249

Process name     : _FTA2:            User name      : SALMINEN
Extended PID     : 21200249          Internal PID   : 00010049
PCB address      : 813DACC0          Terminal name  : FTA2:
JIB address      : 813DAB40          Cur/Base prior : 4/4
PHD address      : 9FE98000
KTB vector       : 813DAFAC          Threads        : 1
Thread 00
---------
KTB address      : 813DACC0          Running on CPU : 1
Thread state     : LEF               Local event flag wait
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : FFFFFFF7  EFN's = 3

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       63 /      64  In use : 1
Working set quota/limit [Pagelets] :    78432 /   80000  In use : 1568
Page file quota/limit      [Pages] :     3889 /    4096  In use : 207
AST count/limit            [AST's] :      248 /     250  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0
```

```
Absolute/Last event/Delta time     : 007DBF16 / 007DBB75 / 000003A1 [hex] ticks
Time since last event : 9 seconds 290 milliseconds
Time since last event : 9 seconds 290 milliseconds

Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA2:
0020 8110CC00   0       GDCW3B$DRA2:[USER5.SALMINEN.MWAIT]WAIT.EXE;1
0050 811AE780   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811BC300   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0080 00000000   0       FTA2:
0090 00000000   0       FTA2:

Current process registers:

R0   = 00000000 00000001  R1   = 00000000 7FFA1F50  R2   = 00000000 7FF48000
R3   = 00000000 00000008  R4   = 00000000 7FFCF818  R5   = 00000000 7FFCF938
R6   = 00000000 7FFAC9F0  R7   = 00000000 7FFAC9F0  R8   = 00000000 7FFAC208
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9984EA80  R14  = FFFFFFFF 81813C00
R15  = 00000000 009B440D  R16  = FFFFFFFF 99806318  R17  = FFFFFFFF 81813C00
R18  = 00000000 00000000  R19  = FFFFFFFF 99805000  R20  = 00000000 00000000
R21  = FFFFFFFF 99805000  R22  = 00000000 000000C2  R23  = 00000000 7FFAC208
R24  = 00000000 7FFAC410  R25  = 00000000 00000005  R26  = 00000000 00000FD2
R27  = FFFFFFFF 9984B260  R28  = FFFFFFFF 81813C00  FP   = 00000000 7ED31A90
PC   = FFFFFFFF 800DB8A4  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        800DB8A4 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001D8A4      Nonpaged read only

R26 (Return address):  00000FD2 is not within a system or user image
and is not a return address

****************** Call Frame 1 ***************************************

FP      = 7ED31A90
PDSC    = 9984EA80  Stack Frame Procedure Descriptor
Next FP = 7ED31AD0

Procedure Entry: 800DB7D0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001D7D0      Nonpaged read only

Return address:  00030074 is in the image:
WAIT
Base      End       Image Offset  Psect type
00010000  000401FF  00030074      MAIN
```

```
****************** Call Frame 2 *************************************

FP      = 7ED31AD0
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00030000 is in the image:
WAIT
Base      End       Image Offset  Psect type
00010000  000401FF  00030000      MAIN

Return address:  9F2BF0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  000130D8      Paged read only

****************** Call Frame 3 *************************************

FP      = 7ED31B30
PDSC    = 9F2C1A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 9F2BEF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 4 *************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.2.2 FIND THE CURRENT SOURCE CODE LINE

The Call Frame 1 has the first address within the target program WAIT.

```
Return address:  00030074 is in the image:
WAIT
Base      End       Image Offset  Psect type
00010000  000401FF  00030074      MAIN
```

Find in WAIT.MAP the psect '$CODE$'

```
Psect Name  Module Name   Base     End     Length           Align               Attributes
----------  -----------   ----     ---     ------           -----               ----------
$LINKAGE                00010000 0001005F 00000060 (     96.) OCTA  4 NOPIC,CON,REL,LCL,NOSHR,NOEXE,NOWRT,NOVEC,MOD
             WAIT       00010000 0001005F 00000060 (     96.) OCTA  4
$DATA$                  00020000 00020018 00000019 (     25.) LONG  2 NOPIC,CON,REL,LCL,NOSHR,NOEXE,  WRT,NOVEC,MOD
             WAIT       00020000 00020018 00000019 (     25.) LONG  2
$CODE$                  00030000 0003008B 0000008C (    140.) LONG  2   PIC,CON,REL,LCL,  SHR,  EXE,NOWRT,NOVEC,MOD
             WAIT       00030000 0003008B 0000008C (    140.) LONG  2
```

Find in the Psect $CODE$ the module in which the 'Image Offset' 00030074 locates.
In this case, it is in the module WAIT.

Subtract the module base address 00030000 from the Image Offset 00030074,
30074 - 30000 = 0074. This is the code offset within the module WAIT.

Find from the WAIT.LIS file (compiled with /LIST/MACHINE_CODE) the offset 0074 (always 4 digits) in the generated Alpha code part. From that code line go backwards and find at the the end of a line the first semicolon followed by a line number. This number is the line number in the original source code.

WAIT.LIS
========

```
A74D0040     0060          LDQ     R26, 64(R13)                     ; R26, 64(R13)              ; 000100
47E07410     0064          BIS     R31, 3, R16                      ; R31, 3, R16
A76D0048     0068          LDQ     R27, 72(R13)                     ; R27, 72(R13)
47E03419     006C          BIS     R31, 1, R25                      ; R31, 1, R25
6B5A4000     0070          JSR     R26, R26                         ; R26, R26
             0074    $L2:                                                                       ; 000107
47FD041E     0074          MOV     FP, SP                           ; FP, SP
```

The source code line number is '; 000107'.

```
00000028       100          $WAITFR_S        EFN=#3
00000031       106
00000031       107          RET
```

For low level languages (MACRO) this code line indicates the instruction immediately succeeding the one currently executing.

Thus, in this example the current execution is at line 100, i.e. the call to wait for an event flag ($WAITFR_S).

D.3 USING SDA TO FIND MODULE NAMES FOR SYSTEM ADDRESSES

The current PC of the target program is 800DB8A4 in the image PROCESS_MANAGEMENT.EXE

```
$ ANALYZE/SYSTEM
OpenVMS (TM) Alpha system analyzer

SDA>read/executive
SDA>read sys$loadable_images:sysdef.stb

- Instruction were the program shall continue execution,

SDA> examine/instruction 800DB8A4
SYS$WAITFR_C+000D4:     BIS             R31,SP,SP

- Previous instructions,

SDA> examine/instruction 800DB8A4-20;24
SYS$WAITFR_C+000B4:     LDL             R0,(R23)
SYS$WAITFR_C+000B8:     BIS             R31,R0,R0
SYS$WAITFR_C+000BC:     BNE             R0,#X000008
SYS$WAITFR_C+000C0:     LDQ             R26,#X0030(R13)
SYS$WAITFR_C+000C4:     LDA             R25,#X0001(R31)
SYS$WAITFR_C+000C8:     LDQ             R27,#X0038(R13)
SYS$WAITFR_C+000CC:     STQ             R16,#X0010(FP)
SYS$WAITFR_C+000D0:     JSR             R26,(R26)
SYS$WAITFR_C+000D4:     BIS             R31,SP,SP

In the previous line the code has made a subroutine call,

SYS$WAITFR_C+000D0:     JSR             R26,(R26)
```

Note: Detailed analysis of calls inside the system code requires the "OpenVMS Alpha Listings CD-ROM Kit and License" for VMS V7.1 (order number QB-MT1AB-E8)

Call Frames

```
****************** Call Frame 2 ***************************************

Procedure Entry: 80299AF8 is in the image:
[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
80284000  802F2C00  00015AF8      Nonpaged read only

Return address:  7EE546C0 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE2E000  7EE907FF  000266C0      Merged
```

DCL.MAP
=======

Image offset 000266C0 is within module READREC

```
 Psect Name  Module Name   Base     End      Length            Align         Attributes
 ----------  -----------   ----     ---      ------            -----         ----------
 $CODE$                  00010000 00010000 00000000 (     0.) OCTA  4   PIC,CON,REL,LCL,NOSHR,EXE,NOWRT,NOVEC,MOD
             ...
             ...
 DCL$ZCODE               00010090 0003ED4B 0002ECBC (191676.) OCTA  4   PIC,CON,REL,LCL,NOSHR,EXE,NOWRT,NOVEC,MOD
             ...
             ...

             CANCEL      00025C88 00025D8F 00000108 (   264.) BYTE  0
             CONVERT     00025D90 00026573 000007E4 (  2020.) BYTE  0
             READREC     00026574 000289C3 00002450 (  9296.) BYTE  0
```

Offset: 000266C0-00026574 = 0000014C

READREC.LIS
===========

```
00000084      3025 GET_INPUT:

00000099      3032 ; READ THE NEXT INPUT RECORD AND CHECK FOR ERRORS.

000000E5      3189 13$:    $GET    RAB=(R4)            ;GET NEXT RECORD FROM INPUT FILE



              0134  7_13$:                                                   ; 003189
A74DFFB0      0134         LDQ     R26, -80(R13)       ; R26, -80(R13)
47E40410      0138         MOV     R4, R16             ; R4, R16
A76DFFB8      013C         LDQ     R27, -72(R13)       ; R27, -72(R13)
43C0953E      0140         SUBQ    SP, 4, SP           ; SP, 4, SP
47E03419      0144         BIS     R31, 1, R25         ; R31, 1, R25
6B5A4000      0148         JSR     R26, R26            ; R26, R26
273F4000      014C         LDAH    R25, 16384(R31)     ; R25, 16384(R31)          ; 003190
```

D.4 DECTERM PROCESS AWAITING KEYBOARD INPUT

Note: This process is not currently hanging.

```
$ sho sys
OpenVMS V7.1  on node GDCW3A  15-MAY-1997 11:28:00.56  Uptime  1 20:23:25
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A00275 _FTA16:         LEF      5    12106   0 00:00:29.79      7922     91

$ MC MWAIT 21A00275


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : _FTA16:             User name      : SALMINEN
Terminal name    : FTA16:              Running on CPU : 1
Extended PID     : 21A00275            Internal PID   : 00010075
PCB address      : 81813C00            Cur/Base prior : 4/4
PHD address      : 9A438000
JIB address      : 81787E80
Process state    : LEF                 Local event flag wait
Process status   : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : DFFFFFFF   EFN's = 29

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      149 /     150  In use : 1
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99424 /   99808  In use : 384
Byte count/orig. limit     [Bytes] :    99424 /  100000  In use : 576
File count/limit           [Files] :      200 /     200  In use : 0
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    78576 /   80000  In use : 1424
Page file quota/limit      [Pages] :     3896 /    4096  In use : 200
AST count/limit            [AST's] :      247 /     250  In use : 3
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00F3A97B / 00F3A82C / 0000014F [hex] ticks
Time since last event : 3 seconds 350 milliseconds

Process active channels:

Chnl  Window  IOC Sts  Device/file accessed
----  ------  --- ---  --------------------
```

```
0010 00000000   0      GDCW3B$DRA0:
0050 8159C780   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 815AA780   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;240
0080 00000000   1 Busy FTA16:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 8102B100
       EFN           : 0000001D  00000029
       FUNC          : 0000C000  00049152 IO$_NOP
       IOST1         : 00000000
       IOSB address  : 7EF548E0
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000100  00000256 Bytes
       AST address   : 9F514E00           is in the image:

[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
9F513C00  9F525000  00075200      Nonpaged read/write

       AST parameter : 7EF548D0  2130004176
       P1            : 7EF51A00  2129992192
       P2            : 00000100  00000256
       P3            : 00000002  00000002
       P4            : 00000000  00000000
       P5            : 7FFCF79C  2147284892
       P6            : 00000018  00000024

090 00000000   0      FTA16:

Current process registers:

R0   = 00000000 00000001  R1   = 00000000 00000002  R2   = FFFFFFFF 99893CB0
R3   = 00000000 7FFCF668  R4   = 00000000 0000001D  R5   = 00000000 7FFCF668
R6   = 00000000 7FFCE4C0  R7   = 00000000 7EE01398  R8   = 00000000 7ED33FB0
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 000516F8  R13  = FFFFFFFF 9984ECB0  R14  = FFFFFFFF 81813C00
R15  = 00000000 009B440D  R16  = FFFFFFFF 99806318  R17  = FFFFFFFF 81813C00
R18  = 00000000 00000002  R19  = FFFFFFFF 99805000  R20  = 00000000 7FFF0010
R21  = FFFFFFFD FF7FE000  R22  = FFFFFFFF 800DBA18  R23  = 00000000 7FFA1FC0
R24  = 00000000 7ED33FB0  R25  = 00000000 00000005  R26  = 00000000 00000FD2
R27  = FFFFFFFF 9984B260  R28  = 00000000 009B440D  FP   = 00000000 7FFAC280
PC   = FFFFFFFF 800DBA18  PS   = 00000000 00000012

Current mode     : Supervisor
Previous mode    : Supervisor
Current IPL      : 0

The current PC:        800DBA18 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001DA18      Nonpaged read only

R26 (Return address):  00000FD2 is not within a system or user image
and is not a return address

****************** Call Frame 1 ***************************************
```

```
FP      = 7FFAC280
PDSC    = 9984ECB0  Stack Frame Procedure Descriptor
Next FP = 7FFAC2D0

Procedure Entry: 800DB920 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001D920      Nonpaged read only

Return address:  802FB9FC is in the image:
[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
802E4000  80357E00  000179FC      Nonpaged read only

******************* Call Frame 2 ***************************************

FP      = 7FFAC2D0
PDSC    = 99893CB0  Stack Frame Procedure Descriptor
Next FP = 7FFAC320

Procedure Entry: 802FB960 is in the image:
[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
802E4000  80357E00  00017960      Nonpaged read only

Return address:  802FC474 is in the image:
[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
802E4000  80357E00  00018474      Nonpaged read only

******************* Call Frame 3 ***************************************

FP      = 7FFAC320
PDSC    = 99894030  Stack Frame Procedure Descriptor
Next FP = 7FFAC410

Procedure Entry: 802FC3D0 is in the image:
[SYS$LDR]RMS.EXE
Base      End       Image Offset  Psect type
802E4000  80357E00  000183D0      Nonpaged read only

Return address:  7EE3AB18 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  00028B18      Merged

******************* Call Frame 4 ***************************************

%MWAIT-F-INVFRAME, Invalid Call Frame:
Unknown procedure descriptor kind, FP = 7FFAC410, Kind = 04
```

D.5 PROCESS IS HIBERNATED

Note: This process is not hanging.

```
$ sho sys

OpenVMS V7.1  on node GDCW3A  15-MAY-1997 11:28:00.56  Uptime  1 20:23:25
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A00206 CONFIGURE       HIB     10       18   0 00:00:23.99        48     43


$ mc mwait 21A00206


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : CONFIGURE           User name      : SYSTEM
Extended PID     : 20400206            Internal PID   : 00010006
PCB address      : 81115500            Terminal name  : -Detached-
JIB address      : 811D8880            Cur/Base prior : 9/8
PHD address      : 9F5D4000
KTB vector       : 811157EC            Threads        : 1
Thread 00
---------
KTB address      : 81115500            Running on CPU : 2
Thread state     : HIB                 Hibernate wait
Thread status    : 00140001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             LOGIN     Login without reading UAF
EFN wait cluster : 0
EFN wait mask    : 998058B0

Direct   I/O count/limit    [IO's] :      200 /     200  In use : 0
Buffered I/O count/limit    [IO's] :      200 /     200  In use : 0
Sub-process count/limit    [Procs] :        0 /     200  In use : 0
Byte count/limit           [Bytes] :    99552 /   99552  In use : 0
Byte count/orig. limit     [Bytes] :    99552 /  100000  In use : 448
File count/limit           [Files] :      198 /     200  In use : 2
Timer queue count/limit   [Timers] :      199 /     200  In use : 1
Working set quota/limit [Pagelets] :    79312 /   80000  In use : 688
Page file quota/limit      [Pages] :     3940 /    4096  In use : 156
AST count/limit            [AST's] :      198 /     200  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00F3E917 / 00F3E857 / 000000C0 [hex] ticks
Time since last event : 1 seconds 920 milliseconds
```

```
Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA0:
0020 815E7EC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]CONFIGURE.EXE;1
0030 815E7C00   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]IOGEN$SHARE.EXE;1
0040 00000000   0       MBA5: (Buffered I/O Quota available: 1056 bytes)

Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 99840C80  R2   = 00000000 7FFCF880
R3   = 00000000 7FFCF95C  R4   = FFFFFFFF 81519580  R5   = 00000000 7FF48000
R6   = FFFFFFFF 9E906E20  R7   = 00000000 00001000  R8   = 00000000 00000000
R9   = FFFFFFFF 9F1B9358  R10  = 00000000 7FFCF800  R11  = 00000000 7FF1A1A2
R12  = 00000000 00000000  R13  = FFFFFFFF 9984D480  R14  = 00000000 00000000
R15  = 00000000 009B4337  R16  = 00000000 00000000  R17  = 00000000 00000000
R18  = FFFFFFFF 99805000  R19  = 00000000 7FF48000  R20  = 00000000 7FFF0000
R21  = 00000000 000A0000  R22  = 00000000 00000000  R23  = 00000000 00000000
R24  = 00000000 00000000  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 9984B260  R28  = 00000000 000A0000  FP   = 00000000 7EE85B00
PC   = FFFFFFFF 80001924  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

******************* Call Frame 1 ***************************************

FP      = 7EE85B00
PDSC    = 9984D480  Stack Frame Procedure Descriptor
Next FP = 7EE85B20

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  00030380 is in the image:
CONFIGURE
Base      End       Image Offset  Psect type
00010000  000503FF  00030380      MAIN
```

```
****************** Call Frame 2 ************************************

FP      = 7EE85B20
PDSC    = 00010168  Stack Frame Procedure Descriptor
Next FP = 7EE85B60

Procedure Entry: 000301C0 is in the image:
CONFIGURE
Base      End       Image Offset  Psect type
00010000  000503FF  000301C0      MAIN

Return address:  000300C4 is in the image:
CONFIGURE
Base      End       Image Offset  Psect type
00010000  000503FF  000300C4      MAIN

****************** Call Frame 3 ************************************

FP      = 7EE85B60
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7EE85BA0

Procedure Entry: 00030000 is in the image:
CONFIGURE
Base      End       Image Offset  Psect type
00010000  000503FF  00030000      MAIN

Return address:  9F1A5DCC is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F1A4000  9F1B6C00  00031DCC      Paged read only

****************** Call Frame 4 ************************************

FP      = 7EE85BA0
PDSC    = 9F1B9250  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 9F1A5C90 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F1A4000  9F1B6C00  00031C90      Paged read only

Return address:  9F1A5C7C is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F1A4000  9F1B6C00  00031C7C      Paged read only
```

D.6 RWMBX: WAITING FOR MAILBOX SPACE

```
$ SHO SYS
OpenVMS V7.1  on node GDCW3A  14-MAY-1997 14:32:14.61  Uptime  9 23:27:44
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A00257 _FTA7:          RWMBX    4      161   0 00:00:46.34       170    159

$ mc mwait 21A00257


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : _FTA7:              User name      : SALMINEN
Extended PID     : 2080024A            Internal PID   : 0001004A
PCB address      : 810A7C00            Terminal name  : FTA7:
JIB address      : 81359880            Cur/Base prior : 5/4
PHD address      : 9FE98000
KTB vector       : 810A7EEC            Threads        : 1
Thread 00
---------
KTB address      : 810A7C00            Running on CPU : 2
Thread state     : RWMBX               Mailbox full
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 00000002  Process is waiting for Mailbox space

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    77456 /   80000  In use : 2544
Page file quota/limit      [Pages] :     3853 /    4096  In use : 243
AST count/limit            [AST's] :      168 /     250  In use : 82
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ---U
AST's queued                [KESU] :     ---U
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00F42830 / 00F42815 / 0000001B [hex] ticks
Time since last event : 270 milliseconds

Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA2:
0020 8156CE80   0       GDCW3B$DRA2:[USER5.SALMINEN.MWAIT]TEST4.EXE;9
```

```
0030 815B3BC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;1
0040 815B5B80   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;1
0050 8159C780   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 815AA780   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;240
0070 815B5280   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
0080 00000000   0       FTA7:
0090 00000000   0       FTA7:
00A0 815B4B00   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00B0 815B4280   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
00C0 00000000   0       MBA132: (Buffered I/O Quota available: 2 bytes)
00D0 00000000   0       FTA7:

Current process registers:

R0   = 00000000 00000001  R1   = 00000000 7FFAC208  R2   = 00000000 000100A0
R3   = 00000000 000000C0  R4   = 00000000 7FFCF818  R5   = 00000000 00000000
R6   = 00000000 7FFAC9F0  R7   = 00000000 7FFAC9F0  R8   = 00000000 7FFAC208
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9984E570  R14  = FFFFFFFF 81866640
R15  = 00000000 009B4351  R16  = 00000000 00000000  R17  = 00000000 000000C0
R18  = 00000000 00000070  R19  = 00000000 7ED31848  R20  = 00000000 000100A0
R21  = 00000000 000000C0  R22  = 00000000 009B4351  R23  = 00000000 7ED31840
R24  = 00000000 7ED31810  R25  = 00000000 0000000C  R26  = 00000000 000301D0
R27  = 00000000 00000FB2  R28  = FFFFFFFF 81866640  FP   = 00000000 7ED31840
PC   = FFFFFFFF 800003B4  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        800003B4 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  000003B4      Nonpaged read only

R26 (Return address):  000301D0 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000301D0      MAIN

****************** Call Frame 1 ***************************************

FP      = 7ED31840
PDSC    = 000100A0  Stack Frame Procedure Descriptor
Next FP = 7ED31880

Procedure Entry: 00030158 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  00030158      MAIN

Return address:  800D93A8 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001B3A8      Nonpaged read only

****************** Call Frame 2 ***************************************
```

```
FP      = 7ED31880
PDSC    = 9984E570  Stack Frame Procedure Descriptor
Next FP = 7ED31A90

Procedure Entry: 800D6C20 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00018C20      Nonpaged read only

Return address:  0004202B is not within a system or user image

****************** Call Frame 3 *************************************

FP      = 7ED31A90
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00030000 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  00030000      MAIN

Return address:  9F2BF0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  000130D8      Paged read only

****************** Call Frame 4 *************************************

FP      = 7ED31B30
PDSC    = 9F2C1A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 9F2BEF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 5 *************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.6.1 FIND THE CORRESPONDING SOURCE CODE LINE

The R26 (Return address): 000301D0 is the first address within the target program TEST4.

```
R26 (Return address):  000301D0 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000301D0      MAIN
```

Find in TEST4.MAP the psect '$CODE$'

```
Psect Name  Module Name  Base     End      Length          Align         Attributes
----------  -----------  ----     ---      ------          -----         ----------
$LINK$                   00010000 000100BF 000000C0 (  192.) OCTA  4 NOPIC,CON,REL,LCL,NOSHR,NOEXE,NOWRT,NOVEC,MOD
            TEST4        00010000 000100BF 000000C0 (  192.) OCTA  4
$DATA$                   00020000 0002002F 00000030 (   48.) OCTA  4 NOPIC,CON,REL,LCL,NOSHR,NOEXE,  WRT,NOVEC,MOD
            TEST4        00020000 0002002F 00000030 (   48.) OCTA  4
$CODE$                   00030000 000301EB 000001EC (  492.) OCTA  4   PIC,CON,REL,LCL,  SHR,  EXE,NOWRT,NOVEC,MOD
            TEST4        00030000 000301EB 000001EC (  492.) OCTA  4
```

Find in the Psect $CODE$ the module corresponding to the 'Image Offset' 000301D0. In this case it is in the module TEST4.

Subtract the module base address 00030000 from the Image Offset 000301D0, 301D0 - 30000 = 01D0. This is the code offset within the module TEST4.

Find from the TEST4.LIS file (obtained from compilation with /LIS/MACHINE_CODE) the offset 01D0 in the generated Alpha code part. From that code line go backwards and find at the the end of a line the first semicolon followed by a line number. This is the line number of the original source code.

```
            0188      L$8:                                                         ; 003782
A742FFF0    0188              LDQ     R26, -16(R2)
43A21012    018C              ADDL    FP, 16, R18
B65E0000    0190              STQ     R18, (SP)
47E11412    0194              MOV     8, R18
B65E0008    0198              STQ     R18, 8(SP)
43E30011    019C              SEXTL   mbx$w_chan, R17         ; R3, R17
A682FFD0    01A0              LDQ     R20, -48(R2)
43A11013    01A4              ADDL    FP, 8, R19
A762FFF8    01A8              LDQ     R27, -8(R2)
43E30015    01AC              SEXTL   mbx$w_chan, R21         ; R3, R21
B7FE0010    01B0              STQ     R31, 16(SP)
47FF0410    01B4              CLR     R16
B7FE0018    01B8              STQ     R31, 24(SP)
47EE1412    01BC              MOV     112, R18
B7FE0020    01C0              STQ     R31, 32(SP)
47E19419    01C4              MOV     12, R25
B7FE0028    01C8              STQ     R31, 40(SP)
6B5A4000    01CC              JSR     R26, SYS$QIO            ; R26, R26
F01FFFED    01D0              BLBS    R0, L$8
```

The source code line number is '; 003782' For high level language this represents the code line where the program is executing, eg. SYS$QIO.

```
3782      ss_check( SYS$QIO(
3783              mbx$l_efn       ,                /* Use our own event flag   */
3784              mbx$w_chan      ,                /* Channel to use           */
3785              IO$_WRITEVBLK | IO$M_NOW ,       /* Write console channel    */
3786              mbx$q_iosb      ,                /* I/O status block         */
3787              ast_routine     ,                /* QIO AST address          */
3788              mbx$w_chan      ,                /* QIO AST parameter        */
3789              mbx$t_buffer    ,                /* P1 = Message buffer      */
3790              MBX_WRITE_SIZE  ,                /* P2 = Size of buffer      */
3791              0               ,                /* P3                       */
3792              0               ,                /* P4                       */
3793              0               ,                /* P5                       */
3794              0               ) )              /* P6                       */
```

D.7 RWAST: RESOURCE WAIT STATE

The Process has run out of Buffered I/O quota.

```
The queued Supervisor mode AST is the result of trying to stop the
process with CTRL/Y.

$ sho sys

OpenVMS V7.1  on node GDCW3A  14-MAY-1997 16:16:50.21  Uptime  1 01:12:19
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A00258 _FTA8:          RWAST    6      223   0 00:00:14.17       168    158


$ mc mwait 21A00258


          *** MWAIT /Alpha V2.8 - Process Hang Analyzer ***

 *** The output will be written into file 21A00258.OUT ***

Process name     : _FTA8:              User name      : SALMINEN
Terminal name    : FTA8:               Running on CPU : 1
Extended PID     : 21A00258            Internal PID   : 00010058
PCB address      : 81866E00            Cur/Base prior : 5/4
PHD address      : 9A25C000
JIB address      : 8185BF00
Process state    : RWAST               Wait for AST completion
Process status   : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 00000001  Process is waiting for AST event/channel interlock


Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :        0 /     150  In use : 150
   *** Process has run out of Buffered I/O quota ***
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    77472 /   80000  In use : 2528
Page file quota/limit      [Pages] :     3854 /    4096  In use : 242
AST count/limit            [AST's] :      248 /     250  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     --S-
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00F5597B / 00F5597A / 00000001 [hex] ticks
Time since last event : 10 milliseconds
```

```
Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA2:
0020 8156CF00   0       GDCW3B$DRA2:[USER5.SALMINEN.MWAIT]TEST3.EXE;1
0030 815B3BC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;1
0040 815B5B80   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;1
0050 8159C780   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 815AA780   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;240
0070 815B5280   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
0080 00000000   0       FTA8:
0090 00000000   0       FTA8:
00A0 815B4B00   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00B0 815B4280   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
00C0 00000000 150 Busy MBA132: (Buffered I/O Quota available: 2 bytes)
This unit has 150 I/O-packets, enter amount to display ? [Def: 5] : 1
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81053240
       EFN           : 00000000  00000000
       FUNC          : 00000020  00000032 IO$_WRITELBLK (or IO$_WRITEVBLK)
       IOST1         : 02000001
       IOSB address  : 7ED31A98
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000001  00000001 Bytes
       AST address   : 00000000
       AST parameter : 00000000  00000000
       P1            : 7ED31AA0  2127764128
       P2            : 00000001  00000001
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

00D0 00000000   0       FTA8:

Current process registers:

R0   = 00000000 7FFA1E20  R1   = FFFFFFFF 99835400  R2   = FFFFFFFF 81866EA0
R3   = 00000000 7FF48000  R4   = FFFFFFFF 81866E00  R5   = FFFFFFFF 81717940
R6   = 00000000 7FF28160  R7   = 00000000 00000030  R8   = FFFFFFFF 998485B8
R9   = 00000000 000000C0  R10  = 00000000 00000030  R11  = 00000000 00000003
R12  = 00000000 00008001  R13  = FFFFFFFF 9982EA38  R14  = 00000000 00000000
R15  = FFFFFFFF 998460C8  R16  = 00000000 00000001  R17  = FFFFFFFF 9982EFA0
R18  = 00000000 00000000  R19  = FFFFFFFF 998460C8  R20  = 00000000 00000008
R21  = 00000000 7FFA1E20  R22  = 00000000 7FFA1E20  R23  = FFFFFFFF 99805000
R24  = 00000000 7FFA1E20  R25  = 00000000 7FFA1E20  R26  = 00000000 7FFA1E20
R27  = 00000000 7FFA1E20  R28  = 00000000 7FFA1E20  FP   = 00000000 7FFA1E20
PC   = FFFFFFFF 8003741C  PS   = 20000000 00000003

Current mode     : Kernel
Previous mode    : User
Current IPL      : 0
```

```
The current PC:        8003741C is in the image:
SYSTEM_PRIMITIVES_MIN.EXE
Base      End       Image Offset  Psect type
80028000  8005D600  0000F41C      Nonpaged read only

R26 (Return address):  7FFA1E20 is not within a system or user image
and is not a return address

****************** Call Frame 1 ***************************************

FP      = 7FFA1E20
PDSC    = 9982EA90  Stack Frame Procedure Descriptor
Next FP = 7FFA1EC0

Procedure Entry: 800372B0 is in the image:
SYSTEM_PRIMITIVES_MIN.EXE
Base      End       Image Offset  Psect type
80028000  8005D600  0000F2B0      Nonpaged read only

Return address:  8003C24C is in the image:
SYSTEM_PRIMITIVES_MIN.EXE
Base      End       Image Offset  Psect type
80028000  8005D600  0001424C      Nonpaged read only

****************** Call Frame 2 ***************************************

FP      = 7FFA1EC0
PDSC    = 998460C8  Stack Frame Procedure Descriptor
Next FP = 7ED31AA0

Procedure Entry: 800AC6C0 is in the image:
IO_ROUTINES.EXE
Base      End       Image Offset  Psect type
80096000  800B9600  000166C0      Nonpaged read only

Return address:  80082D64 is in the image:
EXCEPTION.EXE
Base      End       Image Offset  Psect type
80082000  80095600  00014D64      Nonpaged read only

****************** Call Frame 3 ***************************************

FP      = 7ED31AA0
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00020000 is in the image:
TEST3
Base      End       Image Offset  Psect type
00010000  000301FF  00020000      MAIN

Return address:  9F2BF0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  000130D8      Paged read only

****************** Call Frame 4 ***************************************
```

```
FP      = 7ED31B30
PDSC    = 9F2C1A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 9F2BEF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

******************* Call Frame 5 ***************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged

 *** The output was written into file 21A00258.OUT ***
```

D.8 MUTEX: RESOURCE WAIT STATE

The Process has run out of timer count quota.

```
$ sho sys
OpenVMS V7.1  on node GDCW3A  14-MAY-1997 16:16:50.21  Uptime  1 01:12:19
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
21A0025A _FTA10:         MUTEX    6       73   0 00:00:06.03       123    111


$ mc mwait 21A0025A


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : _FTA6:             User name      : SALMINEN
Extended PID     : 20800252           Internal PID   : 00010052
PCB address      : 8109BD40           Terminal name  : FTA6:
JIB address      : 8130A8C0           Cur/Base prior : 4/4
PHD address      : 9FE54000
KTB vector       : 8109C02C           Threads        : 1
Thread 00
---------
KTB address      : 8109BD40           Running on CPU : 1
Thread state     : MUTEX              Mutex/resource wait
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 815CD3C0  JIB address, waiting on TQCNT

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :        0 /      64  In use : 64
   *** Process has run out of Timer count quota ***
Working set quota/limit [Pagelets] :    78224 /   80000  In use : 1776
Page file quota/limit      [Pages] :     3887 /    4096  In use : 209
AST count/limit            [AST's] :      248 /     250  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00FE2651 / 00FE23CE / 00000283 [hex] ticks
Time since last event : 6 seconds 430 milliseconds
```

```
Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA2:
0020 8156CF80   0       GDCW3B$DRA2:[USER5.SALMINEN.MWAIT]TEST1.EXE;2
0030 815B3BC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;1
0050 8159C780   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 815AA780   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;240
0080 00000000   0       FTA10:
0090 00000000   0       FTA10:

Current process registers:

R0   = 00000000 00000001  R1   = 00000000 7FFAC410  R2   = 00000000 00010000
R3   = 00000000 00018481  R4   = 00000000 7FFCF818  R5   = 00000000 7FFCF938
R6   = 00000000 7FFAC9F0  R7   = 00000000 7FFAC9F0  R8   = 00000000 7FFAC208
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9F2C1A90  R14  = 00000000 00000000
R15  = 00000000 009B4351  R16  = 00000000 00000000  R17  = 00000000 7ED31AC8
R18  = 00000000 00000000  R19  = 00000000 00018480  R20  = 00000000 00000000
R21  = FFFFFFFF 99805000  R22  = 00000000 00000005  R23  = 00000000 00000000
R24  = 00000000 7ED31AC8  R25  = 00000000 00000005  R26  = 00000000 00020078
R27  = FFFFFFFF 9984B260  R28  = FFFFFFFF 99805000  FP   = 00000000 7ED31AC0
PC   = FFFFFFFF 80000454  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80000454 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00000454      Nonpaged read only

R26 (Return address):  00020078 is in the image:
TEST1
Base      End       Image Offset  Psect type
00010000  000301FF  00020078      MAIN

****************** Call Frame 1 ***************************************

FP      = 7ED31AC0
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00020000 is in the image:
TEST1
Base      End       Image Offset  Psect type
00010000  000301FF  00020000      MAIN

Return address:  9F2BF0D8 is in the image:
IMAGE_MANAGEMENT.EXE
```

```
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  000130D8      Paged read only

****************** Call Frame 2 *************************************

FP      = 7ED31B30
PDSC    = 9F2C1A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 9F2BEF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
9F2B4000  9F2BF800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 3 *************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.10 LEF on thread upcall

This ADA program has made a call to the LIB$FIND_IMAGE_SYMBOL (in LIBRTL) and the thread upcall does not complete. The program hangs on a $SYNCH call (in LIBRTL) waiting for the EFN 128.

The program has User mode AST's queued and the User mode AST's are disabled.

```
$ MC MWAIT 21200284


          *** MWAIT /Alpha V2.2 - Process Hang Analyzer ***


Process name     : _FTA5:             User name      : SALMINEN
Extended PID     : 21200284           Internal PID   : 00010084
PCB address      : 814045C0           Terminal name  : FTA5:
JIB address      : 813C8680           Cur/Base prior : 8/4
PHD address      : 9FD44000
KTB vector       : 814048AC           Threads        : 1
Thread 00
---------
KTB address      : 814045C0           Running on CPU : 1
Thread state     : LEF                Local event flag wait
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 4
EFN wait mask    : DFFFFFFF  EFN = 128, EFN$C_ENF for thread upcall support

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      148 /     150  In use : 2
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    96864 /   96864  In use : 0
Byte count/orig. limit     [Bytes] :    96864 /  100000  In use : 3136
File count/limit           [Files] :      191 /     200  In use : 9
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    67152 /   80000  In use : 12848
Page file quota/limit      [Pages] :     2718 /    4096  In use : 1378
AST count/limit            [AST's] :      244 /     250  In use : 6
AST's enabled               [KESU] :     KES-
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ---U
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 0104570D / 010456F9 / 00000014 [hex] ticks
Time since last event : 200 milliseconds

Process active channels:

Chnl  Window  IOC Sts  Device/file accessed
```

```
----  ------  --- ---  --------------------
0010 00000000   0      GDCW2Z$DRA2:
0020 81110240   0      GDCW3B$DRA2:[USER5.SALMINEN]RUN_SHAREABLE_D.EXE;182
0030 811B9C00   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]MOUNTSHR.EXE;1
0040 811B7EC0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]INIT$SHR.EXE;1
0050 811AE780   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811BC300   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0070 811B66C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DISMNTSHR.EXE;1
0080 00000000   0      FTA5:
0090 00000000   0      FTA5:
00A0 81342380   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SECURESHR.EXE;1
00B0 811C59C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
00C0 811C5480   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
00D0 81346000   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SECURESHRP.EXE;1
00E0 811BBB80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]PTD$SERVICES_SHR.EXE;1
00F0 811CA080   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CRFSHR.EXE;1
0100 811C37C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]ADARTL.EXE;1
0110 8138C300   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$RTL.EXE;1
0120 811C6240   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
0130 8110C1C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]PTHREAD$RTL.EXE;1
0140 811CA800   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]TRACE.EXE;1
0150 811B5000   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SYS$SSISHR.EXE;1
0160 8117CD40   0      GDCW3B$DRA2:[TEST.TMC_BE.RUNTIME_AXP]AUTBE_AUX_RO_SHR.EXE;14
0170 813AA200   0      GDCW3B$DRA2:[TEST.EXCEPTIONS.RUNTIME]EXCEPTIONS_CTRL_SHR.EXE;1
0180 813AD340   0      GDCW3B$DRA2:[TEST.LIBRARY.RUNTIME_AXP]SHRLIB_SHR.EXE;18
0190 811C8140   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]PAS$RTL.EXE;1
01A0 811C69C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
01B0 811C72C0   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;2
01C0 81394800   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]IMG$SHRLIB.EXE;1
01D0 8137D200   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]XIE$SHRLIB.EXE;1
01E0 81376A40   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$XLIBSHR.EXE;2
01F0 81375E00   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CDE$UNIX_ROUTINES.EXE;2
0200 81342180   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$TRANSPORT_COMMON.EXE;1
0210 8137BC40   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CDA$ACCESS.EXE;1
0220 81379100   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$XTSHR.EXE;1
0230 8137A880   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$XMLIBSHR.EXE;1
0240 8137B780   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$DXMLIBSHR.EXE;1
0250 81342300   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LBRSHR.EXE;1
0260 81378F80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECW$DWTLIBSHR.EXE;1
0270 813AFB80   0      GDCW3B$DRA2:[TEST.PRIMITIVES.RUNTIME_AXP]PRIMITIVES_SHR.EXE;19
0280 8117A980   0      GDCW3B$DRA2:[TEST.PDC.RUNTIME_AXP]PDCAPPLIB_SHR.EXE;31
0290 811BF580   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SORTSHR.EXE;1
02A0 813AE880   0      GDCW3B$DRA2:[TEST.PDR_COMMON.RUNTIME_AXP]PDRCOMMON_SHR.EXE;17
02B0 813B0440   0      GDCW3B$DRA2:[TEST.RPC.RUNTIME_AXP]RPCLIB_SHR.EXE;14
02C0 8119DB00   0      GDCW3B$DRA2:[TEST.PDC_COMMON.RUNTIME_AXP]PDCCLIB_SHR.EXE;23
02D0 8119DD00   0      GDCW3B$DRA2:[TEST.APPL_LIBRARY.RUNTIME_AXP]APPLIB_SHR.EXE;23
02E0 811D2D00   0      GDCW3B$DRA2:[TEST.PDC.RUNTIME_AXP]PDCLIB_SHR.EXE;31
02F0 811D4D00   0      GDCW3B$DRA2:[TEST.PDC_COMMON.RUNTIME_AXP]SQLMOD_COMM_SHR.EXE;9
0300 81389480   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SQL$INT.EXE;11
0310 81387B80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]RDBSHR.EXE;8
0320 811E1F80   0      GDCW3B$DRA2:[TEST.PDC.RUNTIME_AXP]SQLMOD_SHR.EXE;29
0330 00000000   1 Busy MBA747: (Buffered I/O Quota available: 570 bytes)
0340 00000000   1 Busy MBA748: (Buffered I/O Quota available: 570 bytes)
0350 00000000   0      FTA5:

Current process registers:
```

```
R0   = 00000000 00000001  R1   = FFFFFFFF 9F4B9080  R2   = 00000000 00706120
R3   = 00000000 0257EFC0  R4   = 00000000 00709AA0  R5   = FFFFFFFF 80857D7C
R6   = 00000000 00000000  R7   = 00000000 0031A440  R8   = 00000000 00000000
R9   = 00000000 0257F0E0  R10  = 00000000 9F4CECB0  R11  = 00000000 0031A448
R12  = 00000000 01AB8250  R13  = FFFFFFFF 9F4CECB0  R14  = FFFFFFFF 9F4CECB0
R15  = 00000000 00000001  R16  = FFFFFFFF 9F486318  R17  = FFFFFFFF 814045C0
R18  = FFFFFFFF 9F4B9080  R19  = FFFFFFFF 9F485000  R20  = 00000000 7FFF0010
R21  = FFFFFFFD FF7FE000  R22  = FFFFFFFF 800DBA18  R23  = 00000000 7FFA1FC0
R24  = 00000000 00000000  R25  = 00000000 00000005  R26  = 00000000 00000FD2
R27  = FFFFFFFF 9F4CB260  R28  = 00000000 00000001  FP   = 00000000 0257EEE0
PC   = FFFFFFFF 800DBA18  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        800DBA18 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001DA18      Nonpaged read only

R26 (Return address):  00000FD2 is not within a system or user image
and is not a return address

****************** Call Frame 1 ***************************************

FP      = 0257EEE0
PDSC    = 9F4CECB0  Stack Frame Procedure Descriptor
Next FP = 0257EF30

Procedure Entry: 800DB920 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001D920      Nonpaged read only

Return address:  006F70A0 is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  000110A0      GLOBAL

****************** Call Frame 2 ***************************************

FP      = 0257EF30
PDSC    = 007061B0  Stack Frame Procedure Descriptor
Next FP = 0257EF50

Procedure Entry: 006F6FE0 is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  00010FE0      GLOBAL

Return address:  006F668C is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  0001068C      GLOBAL

****************** Call Frame 3 ***************************************
```

```
FP      = 0257EF50
PDSC    = 00706120  Stack Frame Procedure Descriptor
Next FP = 0257EFE0

Procedure Entry: 006F6278 is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  00010278      GLOBAL

Return address:  006F7194 is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  00011194      GLOBAL

******************* Call Frame 4 ***************************************

FP      = 0257EFE0
PDSC    = 0070CAA0  Stack Frame Procedure Descriptor
Next FP = 0257F030

Procedure Entry: 006F70D0 is in the image:
SYS$SSISHR
Base      End       Image Offset  Psect type
006E6000  007163FF  000110D0      GLOBAL

Return address:  80857D7C is in the image:
LIBRTL
Base      End       Image Offset  Psect type
80800000  8089E000  00057D7C      System Resident Code

******************* Call Frame 5 ***************************************

FP      = 0257F030
PDSC    = 0030C9B8  Stack Frame Procedure Descriptor
Next FP = 0257F7A0

Procedure Entry: 80857A78 is in the image:
LIBRTL
Base      End       Image Offset  Psect type
80800000  8089E000  00057A78      System Resident Code

Return address:  01D3E6A0 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  000366A0      GLOBAL

******************* Call Frame 6 ***************************************

FP      = 0257F7A0
PDSC    = 01D080C8  Stack Frame Procedure Descriptor
Next FP = 0257F7D0

Procedure Entry: 01D3E668 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  00036668      GLOBAL
```

```
Return address:  01D3B898 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  00033898      GLOBAL

****************** Call Frame 7 ***************************************

FP      = 0257F7D0
PDSC    = 01D08260  Stack Frame Procedure Descriptor
Next FP = 0257F820

Procedure Entry: 01D3B848 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  00033848      GLOBAL

Return address:  01D3B4F4 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  000334F4      GLOBAL

****************** Call Frame 8 ***************************************

FP      = 0257F820
PDSC    = 01D083E0  Stack Frame Procedure Descriptor
Next FP = 0257FA50

Procedure Entry: 01D3AFE0 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  00032FE0      GLOBAL

Return address:  01D38548 is in the image:
SQL$INT
Base      End       Image Offset  Psect type
01D08000  01D785FF  00030548      GLOBAL

****************** Call Frame 9 ***************************************

FP      = 0257FA50
PDSC    = 01C58C68  Stack Frame Procedure Descriptor
Next FP = 0257FA90

Procedure Entry: 01C99358 is in the image:
SQLMOD_COMM_SHR
Base      End       Image Offset  Psect type
01C56000  01D067FF  00043358      GLOBAL

Return address:  01C98FC4 is in the image:
SQLMOD_COMM_SHR
Base      End       Image Offset  Psect type
01C56000  01D067FF  00042FC4      GLOBAL

****************** Call Frame 10 **************************************

FP      = 0257FA90
```

```
PDSC    = 01C58BB8  Stack Frame Procedure Descriptor
Next FP = 0257FAB0

Procedure Entry: 01C98F74 is in the image:
SQLMOD_COMM_SHR
Base      End       Image Offset  Psect type
01C56000  01D067FF  00042F74      GLOBAL

Return address:  01C99894 is in the image:
SQLMOD_COMM_SHR
Base      End       Image Offset  Psect type
01C56000  01D067FF  00043894      GLOBAL

****************** Call Frame 11 ***************************************

FP      = 0257FAB0
PDSC    = 01C58D18  Stack Frame Procedure Descriptor
Next FP = 0257FB10

Procedure Entry: 01C99574 is in the image:
SQLMOD_COMM_SHR
Base      End       Image Offset  Psect type
01C56000  01D067FF  00043574      GLOBAL

Return address:  01B608D4 is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D08D4      GLOBAL

****************** Call Frame 12 ***************************************

FP      = 0257FB10
PDSC    = 01AB8070  Stack Frame Procedure Descriptor
Next FP = 0257FB70

Procedure Entry: 01B60868 is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D0868      GLOBAL

Return address:  01B60CBC is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D0CBC      GLOBAL

****************** Call Frame 13 ***************************************

FP      = 0257FB70
PDSC    = 01AB8250  Stack Frame Procedure Descriptor
Next FP = 0257FB90

Procedure Entry: 01B60C98 is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D0C98      GLOBAL

Return address:  004560BC is in the image:
```

```
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  000200BC      GLOBAL

****************** Call Frame 14 ***************************************

FP      = 0257FB90
PDSC    = 0043C440  Stack Frame Procedure Descriptor
Next FP = 0257FBC0

Procedure Entry: 00456040 is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  00020040      GLOBAL

Return address:  0045D4DC is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  000274DC      GLOBAL

****************** Call Frame 15 ***************************************

FP      = 0257FBC0
PDSC    = 004371C0  Stack Frame Procedure Descriptor
Next FP = 0257FD20

Procedure Entry: 0045C5C0 is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  000265C0      GLOBAL

Return address:  01B610B0 is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D10B0      GLOBAL

****************** Call Frame 16 ***************************************

FP      = 0257FD20
PDSC    = 01AB8310  Stack Frame Procedure Descriptor
Next FP = 0257FD80

Procedure Entry: 01B60F48 is in the image:
PDCLIB_SHR
Base      End       Image Offset  Psect type
01A90000  01C553FF  000D0F48      GLOBAL

Return address:  004613E4 is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  0002B3E4      GLOBAL

****************** Call Frame 17 ***************************************

FP      = 0257FD80
PDSC    = 00437630  Stack Frame Procedure Descriptor
Next FP = 7ED2D770
```

```
Procedure Entry: 00461258 is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  0002B258      GLOBAL

Return address:  0059E148 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00552000  005F35FF  0004C148      GLOBAL

****************** Call Frame 18 ***************************************

FP      = 7ED2D770
PDSC    = 0043A490  Stack Frame Procedure Descriptor
Next FP = 7ED2D7B0

Procedure Entry: 004753B0 is in the image:
ADARTL
Base      End       Image Offset  Psect type
00436000  004D6FFF  0003F3B0      GLOBAL

Return address:  0003005C is in the image:
RUN_SHAREABLE_D
Base      End       Image Offset  Psect type
00010000  000605FF  0003005C      MAIN

****************** Call Frame 19 ***************************************

FP      = 7ED2D7B0
PDSC    = 00010050  Stack Frame Procedure Descriptor
Next FP = 7ED2D810

Procedure Entry: 00030000 is in the image:
RUN_SHAREABLE_D
Base      End       Image Offset  Psect type
00010000  000605FF  00030000      MAIN

Return address:  000353A4 is in the image:
RUN_SHAREABLE_D
Base      End       Image Offset  Psect type
00010000  000605FF  000353A4      MAIN

****************** Call Frame 20 ***************************************

FP      = 7ED2D810
PDSC    = 00010BA0  Stack Frame Procedure Descriptor
Next FP = 7ED2D860

Procedure Entry: 00035500 is in the image:
RUN_SHAREABLE_D
Base      End       Image Offset  Psect type
00010000  000605FF  00035500      MAIN

Return address:  0059E148 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
```

```
00552000  005F35FF  0004C148      GLOBAL

****************** Call Frame 21 **************************************

FP      = 7ED2D860
PDSC    = 00555990  Stack Frame Procedure Descriptor
Next FP = 7ED2DA70

Procedure Entry: 0059D818 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00552000  005F35FF  0004B818      GLOBAL

Return address:  00582664 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00552000  005F35FF  00030664      GLOBAL

****************** Call Frame 22 **************************************

FP      = 7ED2DA70
PDSC    = 00552048  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00582148 is in the image:
PTHREAD$RTL
Base      End       Image Offset  Psect type
00552000  005F35FF  00030148      GLOBAL

Return address:  A503F0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  000130D8      Paged read only

****************** Call Frame 23 **************************************

FP      = 7ED31B30
PDSC    = A5041A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: A503EF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 24 **************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
```

```
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.11 Set Host

```
$ @show_links

              ****************************
              *   SHOW_LINKS.COM  V1.3    *
              *   Show DECnet/OSI Links   *
              ****************************


   This procedure simulates the PHASE IV NCP command
   SHOW KNOWN LINKS for DECnet/OSI

   Collecting data...


    LINK
 REM     LOC    DIRECTION   LOCAL USER          PID       PROCESS NAME
--------------  ---------   ---------------     --------  ---------------
 169     75     OUTGOING    [0,0]SALMINEN       20800251  _FTA5:


REMOTE USER                  NODE    PORT
---------------------------  ------  ---------------
42                           GDC127  OSI$PORT_0_004B


GDCW3A>mc mwait 20800251


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : _FTA5:             User name      : SALMINEN
Extended PID     : 20800251           Internal PID   : 00010051
PCB address      : 810A5B80           Terminal name  : FTA5:
JIB address      : 811042C0           Cur/Base prior : 9/4
PHD address      : 9FE10000
KTB vector       : 810A5E6C           Threads        : 1
Thread 00
---------
KTB address      : 810A5B80           Running on CPU : 1
Thread state     : HIB                Hibernate wait
Thread status    : 02040401  RES      Resident, in balance set
                             SSRWAIT  System service resource wait disable
                             PHDRES   Process header resident
                             INTER    Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : FFFFFFFE

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      146 /     150  In use : 4
```

```
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    95968 /   96352  In use : 384
Byte count/orig. limit     [Bytes] :    95968 /  100000  In use : 4032
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    77776 /   80000  In use : 2224
Page file quota/limit      [Pages] :     3864 /    4096  In use : 232
AST count/limit            [AST's] :      242 /     250  In use : 8
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00065808 / 00064E54 / 000009B4 [hex] ticks
Time since last event : 24 seconds 840 milliseconds

Process active channels:

Chnl  Window  IOC Sts  Device/file accessed
----  ------  --- ---  --------------------
0010 00000000   0      GDCW3B$DRA2:
0020 811B5640   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]RTPAD.EXE;1
0030 811CFA00   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
0040 811CF580   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
0050 811B8E40   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811C6D80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0070 00000000   1 Busy MBA175: (Buffered I/O Quota available: 1050 bytes)
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 8132C000
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 40000001
       IOSB address  : 00000000
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 000003EB  00001003 Bytes
       AST address   : 00004B98           is in the image:

RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  00004B98      MAIN

       AST parameter : 0000A070  00041072
       P1            : 0000A09F  00041119
       P2            : 000003EB  00001003
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0080 00000000   0      FTA5:
0090 00000000   0      FTA5:
00A0 00000000   1 Busy FTA5:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 813EBFC0
       EFN           : 00000000  00000000
```

```
       FUNC          : 0000C000  00049152 IO$_NOP
       IOST1         : 00000000
       IOSB address  : 000404E4
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000100  00000256 Bytes
       AST address   : 00004B98           is in the image:

RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  00004B98      MAIN

       AST parameter : 000404E0  00263392
       P1            : 0004095C  00264540
       P2            : 00000100  00000256
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 000411B8  00266680
       P6            : 00000030  00000048

00B0 00000000   0      FTA5:
00C0 00000000   0      FTA5:
00D0 00000000   0      NET85:
00E0 00000000   1 Busy MBA176: (Buffered I/O Quota available: 1056 bytes)
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81034740
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 00090001
       IOSB address  : 00009F74
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000028  00000040 Bytes
       AST address   : 00004B98           is in the image:

RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  00004B98      MAIN

       AST parameter : 00009F70  00040816
       P1            : 00009F98  00040856
       P2            : 00000028  00000040
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

00F0 81100214   1 Busy NET86:
Session Control Port : SCL$PORT$1201004A
OSI Transport Port   : OSI$PORT_0_004B

       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 812C9EC0
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 00140001
       IOSB address  : 00040D74
```

```
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 0000041A  00001050 Bytes
       AST address   : 00004B98           is in the image:

RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  00004B98      MAIN

       AST parameter : 00040D70  00265584
       P1            : 00040D98  00265624
       P2            : 0000041A  00001050
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0100 00000000   0      FTA5:
0110 00000000   0      FTA5:
0120 00000000   0      FTA5:
0130 00000000   0      FTA5:

Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 9F4C0C80  R2   = 00000000 00000000
R3   = 00000000 7EE6B869  R4   = 00000000 7FFCF818  R5   = 00000000 7FFCF944
R6   = 00000000 00000000  R7   = 00000000 00000001  R8   = 00000000 7FFAC208
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9F4CD480  R14  = 00000000 00000000
R15  = 00000000 009BA7DD  R16  = 00000000 00000003  R17  = 0000FFFE 00007204
R18  = 00000000 00000000  R19  = FFFFFFFF 9F485000  R20  = 00000000 0000000E
R21  = 00000000 00000043  R22  = 00000000 00000000  R23  = 00000000 00000003
R24  = 0000FFFE 00007204  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 9F4CB260  R28  = 00000000 00000043  FP   = 00000000 7ED31B50
PC   = FFFFFFFF 80001924  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

******************* Call Frame 1 ***************************************

FP      = 7ED31B50
PDSC    = 9F4CD480  Stack Frame Procedure Descriptor
Next FP = 7ED31B70

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
```

```
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  00013428 is in the image:
RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  00013428      MAIN

******************* Call Frame 2 ***************************************

FP      = 7ED31B70
PDSC    = 00004650  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 000133C0 is in the image:
RTPAD
Base      End       Image Offset  Psect type
00004000  0002C9FF  000133C0      MAIN

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

******************* Call Frame 3 ***************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.12 RLOGIN

```
$ UCX SHO DEV
                            Port                         Remote
Device_socket  Type    Local  Remote  Service             Host

  bg3         STREAM     512       0  REXEC             0.0.0.0
  bg4         STREAM     513       0  RLOGIN            0.0.0.0
  bg5         STREAM     514       0  RSH               0.0.0.0
  bg6         STREAM      23       0  TELNET            0.0.0.0
  bg12        STREAM       1       0  RDBSERVER         0.0.0.0
  bg13        STREAM    1023     513                    GDCW3A
  bg14        STREAM     513    1023  RLOGIN            GDCW3A


$ MC MWAIT 20800251


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***


Process name     : _FTA5:             User name      : SALMINEN
Extended PID     : 20800251           Internal PID   : 00010051
PCB address      : 810A5B80           Terminal name  : FTA5:
JIB address      : 811042C0           Cur/Base prior : 5/4
PHD address      : 9FE10000
KTB vector       : 810A5E6C           Threads        : 1
Thread 00
---------
KTB address      : 810A5B80           Running on CPU : 0
Thread state     : HIB                Hibernate wait
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : FFFFFFFD

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      148 /     150  In use : 2
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    98400 /   98528  In use : 128
Byte count/orig. limit     [Bytes] :    98400 /  100000  In use : 1600
File count/limit           [Files] :      200 /     200  In use : 0
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    76928 /   80000  In use : 3072
Page file quota/limit      [Pages] :     3825 /    4096  In use : 271
AST count/limit            [AST's] :      246 /     250  In use : 4
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0
```

```
Absolute/Last event/Delta time     : 0006C072 / 0006B908 / 0000076A [hex] ticks
Time since last event : 18 seconds 980 milliseconds

Process active channels:

Chnl  Window  IOC Sts  Device/file accessed
----  ------  --- ---  --------------------
0010 00000000   0      GDCW3B$DRA0:
0020 81332740   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]UCX$RLOGIN.EXE;1
0030 811CFA00   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
0040 811CF580   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
0050 811B8E40   0      GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811C6D80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0070 811D1480   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;2
0080 00000000   0      FTA5:
0090 00000000   0      FTA5:
00A0 811D0B80   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
00B0 811D0400   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00C0 81311440   0      GDCW3B$DRA0:[VMS$COMMON.SYSLIB]UCX$ACCESS_SHR.EXE;1
00D0 00000000   0      FTA5:
00E0 00000000   1 Busy FTA5:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 813AE480
       EFN           : 00000001  00000001
       FUNC          : 00000200  00000512 IO$_NOP
       IOST1         : 00000000
       IOSB address  : 0015C810
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000001  00000001 Bytes
       AST address   : 00010F80           is in the image:

UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  00010F80      MAIN

       AST parameter : 00000001  00000001
       P1            : 0015C862  01427554
       P2            : 00000001  00000001
       P3            : 00000000  00000000
       P4            : 0015C85A  01427546
       P5            : 00000000  00000000
       P6            : 00000000  00000000

00F0 00000000   1 Busy BG13:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 813DA0C0
       EFN           : 00000002  00000002
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 00000001
       IOSB address  : 0015C808
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 00010BD0           is in the image:

UCX$RLOGIN
```

```
Base      End       Image Offset  Psect type
00010000  000905FF  00010BD0      MAIN

       AST parameter : 00000001  00000001
       P1            : 0015CD7A  01428858
       P2            : 00001BD9  00007129
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000


Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 9F4C0C80  R2   = 00000000 000107B8
R3   = 00000000 0015C808  R4   = 00000000 0015C808  R5   = 00000000 00021030
R6   = 00000000 000823C0  R7   = 00000000 000824B0  R8   = 00000000 0015C808
R9   = 00000000 08018079  R10  = 00000000 00000001  R11  = 00000000 00000000
R12  = 00000000 00082470  R13  = FFFFFFFF 9F4CD480  R14  = 00000000 00000000
R15  = 00000000 009BA7DD  R16  = 00000000 0016299F  R17  = 00000000 00000000
R18  = 00000000 0015F97C  R19  = 00000000 00000000  R20  = 00000000 001629B3
R21  = 00000000 00000000  R22  = 00000000 00000000  R23  = 00000000 0016299F
R24  = 00000000 00000000  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 9F4CB260  R28  = 00000000 00000000  FP   = 00000000 7ED318B0
PC   = FFFFFFFF 80001924  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

****************** Call Frame 1 ***************************************

FP      = 7ED318B0
PDSC    = 9F4CD480  Stack Frame Procedure Descriptor
Next FP = 7ED318E0

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  000320A8 is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  000320A8      MAIN

****************** Call Frame 2 ***************************************
```

```
FP      = 7ED318E0
PDSC    = 000107B8  Stack Frame Procedure Descriptor
Next FP = 7ED319F0

Procedure Entry: 000310A0 is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  000310A0      MAIN

Return address:  000306DC is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  000306DC      MAIN

******************* Call Frame 3 ***************************************

FP      = 7ED319F0
PDSC    = 00010250  Stack Frame Procedure Descriptor
Next FP = 7ED31B60

Procedure Entry: 00030080 is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  00030080      MAIN

Return address:  00030050 is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  00030050      MAIN

******************* Call Frame 4 ***************************************

FP      = 7ED31B60
PDSC    = 000102F0  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: 00030000 is in the image:
UCX$RLOGIN
Base      End       Image Offset  Psect type
00010000  000905FF  00030000      MAIN

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

******************* Call Frame 5 ***************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged
```

```
Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.13 Mailbox read from another process

The process AUDIT_SERVER has a outstanding read to MBA3:.

```
GDCW3A>mc mwait 2080020D

          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***

Process name     : OPCOM              User name      : SYSTEM
Extended PID     : 2080020D           Internal PID   : 0001000D
PCB address      : 8121B500           Terminal name  : -Detached-
JIB address      : 8121B840           Cur/Base prior : 8/6
PHD address      : 9F7F4000
KTB vector       : 8121B7EC           Threads        : 1
Thread 00
---------
KTB address      : 8121B500           Running on CPU : 2
Thread state     : HIB                Hibernate wait
Thread status    : 00140001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             LOGIN     Login without reading UAF
EFN wait cluster : 0
EFN wait mask    : 9F4858B0

Direct   I/O count/limit    [IO's] :      100 /     100  In use : 0
Buffered I/O count/limit    [IO's] :       99 /     100  In use : 1
Sub-process count/limit    [Procs] :        0 /      64  In use : 0
Byte count/limit           [Bytes] :    99680 /   99680  In use : 0
Byte count/orig. limit     [Bytes] :    99680 /  100000  In use : 320
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       63 /      64  In use : 1
Working set quota/limit [Pagelets] :    79216 /   80000  In use : 784
Page file quota/limit      [Pages] :     3921 /    4096  In use : 175
AST count/limit            [AST's] :      198 /     200  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 000D2914 / 000CF643 / 000032D1 [hex] ticks
Time since last event : 2 minutes 10 seconds 90 milliseconds

Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA0:
0020 8121BBC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]OPCOM.EXE;1
0030 00000000   1 Busy MBA2: (Buffered I/O Quota available: 65535 bytes)
       I/O-Packet   1       Hex / Decimal
```

```
              --------------  ------------------
              IRP address   : 8132C000
              EFN           : 00000003  00000003
              FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
              IOST1         : 00720001
              IOSB address  : 00040A00
              IOSB = [hex]  : 00000000.00000000
              BCNT          : 00000A00  00002560 Bytes
              AST address   : 00032E60           is in the image:

OPCOM
Base      End       Image Offset  Psect type
00010000  000903FF  00032E60      MAIN

              AST parameter : 00000000  00000000
              P1            : 000A4AE0  00674528
              P2            : 00000A00  00002560
              P3            : 00000000  00000000
              P4            : 00000000  00000000
              P5            : 00000000  00000000
              P6            : 00000000  00000000

0040 00000000   0      MBA3: (Buffered I/O Quota available: 65535 bytes)
              I/O-Packet   1       Hex / Decimal
              --------------  ------------------
              Internal PID  : 0001000E           Process name:
              PID           : 2080020E           AUDIT_SERVER
              IRP address   : 81102B40
              EFN           : 00000000  00000000
              FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
              IOST1         : 00000001
              IOSB address  : 000208D4
              IOSB = [hex]  : 00000000.00000000
              BCNT          : 0000FFFF  00065535 Bytes
              AST address   : 00011A50           is in the image:

AUDIT_SERVER
Base      End       Image Offset  Psect type
00010000  000707FF  00011A50      MAIN

              AST parameter : 000208D4  00133332
              P1            : 0016A070  01482864
              P2            : 0000FFFF  00065535
              P3            : 00000000  00000000
              P4            : 00000000  00000000
              P5            : 00000000  00000000
              P6            : 00000000  00000000


Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 9F4C0C80  R2   = 00000000 00032FD0
R3   = 00000000 00037D78  R4   = 00000000 0004006C  R5   = 00000000 000405D8
R6   = 00000000 00040050  R7   = 00000000 00001000  R8   = 00000000 00000000
R9   = FFFFFFFF A4F39358  R10  = 00000000 7FFCF800  R11  = 00000000 7FF1A1A2
R12  = 00000000 00000000  R13  = FFFFFFFF 9F4CD480  R14  = 00000000 00000000
R15  = 00000000 009BA7D4  R16  = 00000000 00040050  R17  = 0000FFFE 00007204
```

```
R18  = FFFFFFFF 8102BA40  R19  = 00000000 00000001  R20  = 00000000 00000000
R21  = 00000000 00000011  R22  = 00000000 00000000  R23  = 00000000 00040050
R24  = 0000FFFE 00007204  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 9F4CB260  R28  = 00000000 00000011  FP   = 00000000 7EE85AF0
PC   = FFFFFFFF 80001924  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

******************* Call Frame 1 ***************************************

FP      = 7EE85AF0
PDSC    = 9F4CD480  Stack Frame Procedure Descriptor
Next FP = 7EE85B10

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  000501E4 is in the image:
OPCOM
Base      End       Image Offset  Psect type
00010000  000903FF  000501E4      MAIN

******************* Call Frame 2 ***************************************

FP      = 7EE85B10
PDSC    = 00032FD0  Stack Frame Procedure Descriptor
Next FP = 7EE85BA0

Procedure Entry: 00050000 is in the image:
OPCOM
Base      End       Image Offset  Psect type
00010000  000903FF  00050000      MAIN

Return address:  A4F25DCC is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A4F24000  A4F36C00  00031DCC      Paged read only

******************* Call Frame 3 ***************************************

FP      = 7EE85BA0
PDSC    = A4F39250  Stack Frame Procedure Descriptor
Next FP = 00000000
```

```
Procedure Entry: A4F25C90 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A4F24000  A4F36C00  00031C90      Paged read only

Return address:  A4F25C7C is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A4F24000  A4F36C00  00031C7C      Paged read only
```

D.14 RWMBX, Process waiting for Mailbox space

```
Note: this is a special Mailbox I/O case, because the QIO’s are performed
with the I/O modifier IO$M_NOW, the process I/O count will not be charged.


$ SHO SYS
OpenVMS V7.1  on node GDCW2Z  19-SEP-1997 15:25:14.77  Uptime  1 01:38:19
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
20600248 _FTA1:          RWMBX    6      205   0 00:00:09.76       197    154


$ MC MWAIT 20600248


          *** MWAIT /Alpha V2.4 - Process Hang Analyzer ***

Process name     : _FTA1:              User name      : SALMINEN
Extended PID     : 20600248            Internal PID   : 00010048
PCB address      : 811D5EC0            Terminal name  : FTA1:
JIB address      : 8116C3C0            Cur/Base prior : 6/4
PHD address      : 9FE10000
KTB vector       : 811D61AC            Threads        : 1
Thread 00
---------
KTB address      : 811D5EC0            Running on CPU : 2
Thread state     : RWMBX               Mailbox full
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 00000002  Process is waiting for Mailbox space


Direct   I/O count/limit    [IO’s] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO’s] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :    99296 /   99296  In use : 0
Byte count/orig. limit     [Bytes] :    99296 /  100000  In use : 704
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    77536 /   80000  In use : 2464
Page file quota/limit      [Pages] :     3853 /    4096  In use : 243
AST count/limit            [AST’s] :      243 /     250  In use : 7
AST’s enabled               [KESU] :     KESU
AST’s active                [KESU] :     ---U
AST’s queued                [KESU] :     ---U
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 00757213 / 007571BD / 00000056 [hex] ticks
Time since last event : 860 milliseconds

Process active channels:
```

```
Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA2:
0020 81021A00   0       GDCW3B$DRA2:[USER5.SALMINEN.MWAIT]TEST4.EXE;9
0030 811B4180   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
0040 811B5FC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;2
0050 8119D140   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 811AAB40   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;242
0070 811B56C0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
0080 00000000   0       FTA1:
0090 00000000   0       FTA1:
00A0 811B4F40   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00B0 811B4AC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
00C0 00000000   0       MBA345: (Buffered I/O Quota available: 2 bytes)
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 811BA080
       EFN           : 00000000  00000000
       FUNC          : 00000060  00000096 IO$_WRITELBLK (or IO$_WRITEVBLK)
       IOST1         : 00080001
       IOSB address  : 7ED31848
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000008  00000008 Bytes
       AST address   : 000100A0           is in the image:

TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000100A0      MAIN

       AST parameter : 000000C0  00000192
       P1            : 7ED31850  2127763536
       P2            : 00000008  00000008
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

       I/O-Packet   2       Hex / Decimal
       --------------  ------------------
       IRP address   : 8101DE80
       EFN           : 00000000  00000000
       FUNC          : 00000060  00000096 IO$_WRITELBLK (or IO$_WRITEVBLK)
       IOST1         : 00080001
       IOSB address  : 7ED31848
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000008  00000008 Bytes
       AST address   : 000100A0           is in the image:

TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000100A0      MAIN

       AST parameter : 000000C0  00000192
       P1            : 7ED31850  2127763536
       P2            : 00000008  00000008
       P3            : 00000000  00000000
```

```
        P4             : 00000000  00000000
        P5             : 00000000  00000000
        P6             : 00000000  00000000

        I/O-Packet   3       Hex / Decimal
        --------------  ------------------
        IRP address    : 810217C0
        EFN            : 00000000  00000000
        FUNC           : 00000060  00000096 IO$_WRITELBLK (or IO$_WRITEVBLK)
        IOST1          : 00080001
        IOSB address   : 7ED31848
        IOSB = [hex]   : 00000000.00000000
        BCNT           : 00000008  00000008 Bytes
        AST address    : 000100A0           is in the image:

TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000100A0      MAIN

        AST parameter : 000000C0  00000192
        P1             : 7ED31850  2127763536
        P2             : 00000008  00000008
        P3             : 00000000  00000000
        P4             : 00000000  00000000
        P5             : 00000000  00000000
        P6             : 00000000  00000000

        I/O-Packet   4       Hex / Decimal
        --------------  ------------------
        IRP address    : 8114E180
        EFN            : 00000000  00000000
        FUNC           : 00000060  00000096 IO$_WRITELBLK (or IO$_WRITEVBLK)
        IOST1          : 00080001
        IOSB address   : 7ED31848
        IOSB = [hex]   : 00000000.00000000
        BCNT           : 00000008  00000008 Bytes
        AST address    : 000100A0           is in the image:

TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000100A0      MAIN

        AST parameter : 000000C0  00000192
        P1             : 7ED31850  2127763536
        P2             : 00000008  00000008
        P3             : 00000000  00000000
        P4             : 00000000  00000000
        P5             : 00000000  00000000
        P6             : 00000000  00000000

        I/O-Packet   5       Hex / Decimal
        --------------  ------------------
        IRP address    : 811D5940
        EFN            : 00000000  00000000
        FUNC           : 00000060  00000096 IO$_WRITELBLK (or IO$_WRITEVBLK)
        IOST1          : 00080001
        IOSB address   : 7ED31848
```

```
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000008  00000008 Bytes
       AST address   : 000100A0           is in the image:

TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000100A0      MAIN

       AST parameter : 000000C0  00000192
       P1            : 7ED31850  2127763536
       P2            : 00000008  00000008
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

00D0 00000000   0      FTA1:

Current process registers:

R0   = 00000000 00000001  R1   = 00000000 7FFAC208  R2   = 00000000 000100A0
R3   = 00000000 000000C0  R4   = 00000000 7FFCF818  R5   = 00000000 00000000
R6   = 00000000 7FFAC9F0  R7   = 00000000 7FFAC9F0  R8   = 00000000 7FFAC208
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9F4CE570  R14  = FFFFFFFF 811D5EC0
R15  = 00000000 009BA7EE  R16  = 00000000 00000000  R17  = 00000000 000000C0
R18  = 00000000 00000070  R19  = 00000000 7ED31848  R20  = 00000000 000100A0
R21  = 00000000 000000C0  R22  = 00000000 009BA7EE  R23  = 00000000 7ED31840
R24  = 00000000 7ED31810  R25  = 00000000 0000000C  R26  = 00000000 000301D0
R27  = 00000000 00000FB2  R28  = FFFFFFFF 811D5EC0  FP   = 00000000 7ED31840
PC   = FFFFFFFF 800003B4  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        800003B4 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  000003B4      Nonpaged read only

R26 (Return address):  000301D0 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  000301D0      MAIN

******************* Call Frame 1 ***************************************

FP      = 7ED31840
PDSC    = 000100A0  Stack Frame Procedure Descriptor
Next FP = 7ED31880

Procedure Entry: 00030158 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  00030158      MAIN
```

```
Return address:  800D93A8 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  0001B3A8      Nonpaged read only

****************** Call Frame 2 ***************************************

FP      = 7ED31880
PDSC    = 9F4CE570  Stack Frame Procedure Descriptor
Next FP = 7ED31A90

Procedure Entry: 800D6C20 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00018C20      Nonpaged read only

Return address:  7F3310F0 is in the image:
DECC$SHR
Base      End       Image Offset  Psect type
7F32A000  7F3ADFFF  000070F0      GLOBAL

****************** Call Frame 3 ***************************************

FP      = 7ED31A90
PDSC    = 00010000  Stack Frame Procedure Descriptor
Next FP = 7ED31B30

Procedure Entry: 00030000 is in the image:
TEST4
Base      End       Image Offset  Psect type
00010000  000401FF  00030000      MAIN

Return address:  A503F0D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  000130D8      Paged read only

****************** Call Frame 4 ***************************************

FP      = 7ED31B30
PDSC    = A5041A90  Stack Frame Procedure Descriptor
Next FP = 7ED31BB0

Procedure Entry: A503EF60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
A5034000  A503F800  00012F60      Paged read only

Return address:  7EE40DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EDCC      Merged

****************** Call Frame 5 ***************************************

FP      = 7ED31BB0
PDSC    = 7EE161E0  Stack Frame Procedure Descriptor
```

```
Next FP = 00000000

Procedure Entry: 7EE40BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBDC      Merged

Return address:  7EE40BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0002EBC8      Merged
```

D.15 Process with sub-processes

The sub-process SALMINEN_1 has sub-processes, the processes are not hanging.

```
$ MC MWAIT 206018BD

          *** MWAIT /Alpha V2.5 - Process Hang Analyzer ***

Process name     : SALMINEN_1          User name      : SALMINEN
Extended PID     : 206018C1            Internal PID   : 000C00C1
PCB address      : 811E6440            Terminal name  : -Subprocess-
Master PID       : 206018BD            Master Process : _FTA21:
Owner PID        : 206018BD            Owner Process  : _FTA21:

Processes in this job:
Process  1  PID  : 206018BD            Process name   : _FTA21:
Process  2  PID  : 206018C1    (*)     Process name   : SALMINEN_1
Process  3  PID  : 206018C2            Process name   : SALMINEN_2
Process  4  PID  : 20601A89            Process name   : SALMINEN_3

JIB address      : 812FA780            Cur/Base prior : 9/4
PHD address      : 9FA58000
KTB vector       : 811E672C            Threads        : 1
Thread 00
---------
KTB address      : 811E6440            Running on CPU : 0
Thread state     : HIB                 Hibernate wait
Thread status    : 02040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
                             INTER     Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 7FFFFFFF

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      150 /     150  In use : 0
Sub-process count/limit    [Procs] :        1 /      16  In use : 1
Byte count/limit           [Bytes] :    95840 /   96032  In use : 192
Byte count/orig. limit     [Bytes] :    95840 /  100000  In use : 4160
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       64 /      64  In use : 0
Working set quota/limit [Pagelets] :    78624 /   80000  In use : 1376
Page file quota/limit      [Pages] :     3171 /    4096  In use : 925
AST count/limit            [AST's] :      247 /     250  In use : 3
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 09498CDD / 08F48807 / 005504D6 [hex] ticks
Time since last event : 15 hours 28 minutes 37 seconds 980 milliseconds
```

```
Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW3B$DRA0:
0020 00000000   0       MBA4596: (Buffered I/O Quota available: 336 bytes)
0030 8119F900   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0040 00000000   0       FTA21:
0050 00000000   0       FTA21:
0060 811AD140   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;243
0080 00000000   0       MBA4598: (Buffered I/O Quota available: 16 bytes)

Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 9F4C0C80  R2   = 00000000 00000000
R3   = 00000000 7ED3760D  R4   = 00000000 00000000  R5   = 00000000 00000000
R6   = 00000000 7ED37570  R7   = 00000000 7ED37650  R8   = 00000000 7FFABE58
R9   = 00000000 7FFAC410  R10  = 00000000 7FFAD238  R11  = 00000000 7FFCE3E0
R12  = 00000000 00000000  R13  = FFFFFFFF 9F4CD480  R14  = 00000000 7FFCE140
R15  = 00000000 7FFCE020  R16  = 00000000 0000001F  R17  = 00000000 7FFABE50
R18  = 00000000 7FFA1D8C  R19  = FFFFFFFF 9F485000  R20  = FFFFFFFF 813BDA0C
R21  = FFFFFFFF 9F485B90  R22  = 00000000 00000000  R23  = 00000000 0000001F
R24  = 00000000 7FFABE50  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 9F4CB260  R28  = FFFFFFFF 9F485B90  FP   = 00000000 7FFABE30
PC   = FFFFFFFF 80001924  PS   = 00000000 00000012

Current mode     : Supervisor
Previous mode    : Supervisor
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

******************* Call Frame 1 ***************************************

FP      = 7FFABE30
PDSC    = 9F4CD480  Stack Frame Procedure Descriptor
Next FP = 7FFAC410

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  7EE31ED4 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  0001FED4      Merged
```

```
****************** Call Frame 2 *************************************

FP      = 7FFAC410
PDSC    = 7EE12EA0  Stack Frame Procedure Descriptor
Next FP = 7FFADFC0

Procedure Entry: 7EE22100 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  00010100      Merged

Return address:  800E2584 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00024584      Nonpaged read only

****************** Call Frame 3 *************************************

FP      = 7FFADFC0
PDSC    = 7EE12D30  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE22060 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE12000  7EE83DFF  00010060      Merged

Return address:  800E2584 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00024584      Nonpaged read only
```

D.16 Process with INETn: and BGn: devices

The processes is not hanging.

```
$ MC MWAIT 22412AC5

          *** MWAIT /Alpha V2.8 - Process Hang Analyzer ***

 *** The output will be written into file 22412AC5.OUT ***

Process name     : VZ_1_SRV            User name      : KOBE_STARTUP
Extended PID     : 22412AC5            Internal PID   : 009500C5
PCB address      : 810C8680            Terminal name  : -Subprocess-
Master PID       : 22412AC4            Master Process : SRV_CTRL_VZ_1
Owner PID        : 22412AC4            Owner Process  : SRV_CTRL_VZ_1

Processes in this job:
Process  1  PID  : 22412AC4            Process name   : SRV_CTRL_VZ_1
Process  2  PID  : 22412AC5    (*)     Process name   : VZ_1_SRV
Process  3  PID  : 22412AC6            Process name   : VZ_1_B_BCK

JIB address      : 81040840            Cur/Base prior : 6/4
PHD address      : 84464000
KTB vector       : 810C896C            Threads        : 1
Thread 00
---------
KTB address      : 810C8680            Running on CPU : 2
Thread state     : HIB                 Hibernate wait
Thread status    : 00040001  ssrwait   System service resource wait enabled
                             RES       Resident, in balance set
                             PHDRES    Process header resident
EFN wait cluster : 0
EFN wait mask    : 83D058B0

Direct   I/O count/limit    [IO's] :     1246 /    1250  In use : 4
Buffered I/O count/limit    [IO's] :     3143 /    3150  In use : 7
Sub-process count/limit    [Procs] :        0 /      10  In use : 0
Byte count/limit           [Bytes] :   943104 /  975872  In use : 32768
Byte count/orig. limit     [Bytes] :   943104 /  999616  In use : 56512
File count/limit           [Files] :      976 /    1000  In use : 24
Timer queue count/limit   [Timers] :     1186 /    1200  In use : 14
Working set quota/limit [Pagelets] :   463952 /  524288  In use : 60336
Page file quota/limit      [Pages] :    47931 /   50000  In use : 2069
AST count/limit            [AST's] :     4076 /    4096  In use : 20
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0
```

```
Absolute/Last event/Delta time     : 09C38B9D / 09C38B91 / 0000000C [hex] ticks
Time since last event : 120 milliseconds

Process active channels:

Chnl  Window   IOC Sts  Device/file accessed
----  ------   --- ---  --------------------
0010 00000000   0       GDCW2Z$DRA3:
0020 80DB7840   0       GDCW3B$DRA0:[SYBASE_1003.SYBASE.BIN]DATASERVER.EXE;5
0030 81025EC0   0       GDCW2Z$DRA3:[KOBE_RT.LOG]START_VZ_1.OUT;55
0040 8102DEC0   0       GDCW3B$DRA0:[SYBASE_1003.SYBASE.INSTALL]RUN_VZ_1.COM;12
0050 80D71B80   0       GDCW3B$DRA0:[VMS$COMMON.SYSEXE]DCL.EXE;1
0060 80D15B40   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DCLTABLES.EXE;252
0070 80FCC400   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]SECURESHRP.EXE;1
0080 80D88400   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBOTS.EXE;1
0090 80D89340   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DPML$SHR.EXE;1
00A0 80D88BC0   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]CMA$TIS_SHR.EXE;1
00B0 80D87E00   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]LIBRTL.EXE;2
00C0 80D89C40   0       GDCW3B$DRA0:[VMS$COMMON.SYSLIB]DECC$SHR.EXE;2
00D0 00000000   0       NLA0:
00E0 80F3C5C0   0       GDCW2Z$DRA1:[VZ_MASTER]MASTER_DB.DAT;1
00F0 00000000   1 Busy MBA8225: (Buffered I/O Quota available: 3000 bytes)
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 8105E940
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 135B001F
       IOSB address  : 0088C4A0
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000080  00000128 Bytes
       AST address   : 00012230           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00012230      MAIN

       AST parameter : 0046FD10  04652304
       P1            : 0088C4A8  08963240
       P2            : 00000080  00000128
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0100 00000000   0       NET3196:
0110 00000000   1 Busy INET441:
       The CXB is on   BG457:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 8114BF40
       EFN           : 00000000  00000000
       FUNC          : 000002B2  00000690 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 08000001
       IOSB address  : 0088C5FC
       IOSB = [hex]  : 00000000.00000000
```

```
       BCNT          : 00000000  00000000 Bytes
       AST address   : 000523D8           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  000523D8      MAIN

       AST parameter : 00478D00  04689152
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0120 00000000   1 Busy BG457:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81149C80
       EFN           : 00000000  00000000
       FUNC          : 000000B2  00000178 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 08000001
       IOSB address  : 8105B97C
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 8C7F4040           is in the image:

UCX$INETDRIVER
Base      End       Image Offset  Psect type
8C7F4000  8C7F4200  00000040      Paged read/write

       AST parameter : 81059B40  -2130339008
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 8105B954  -2130331308
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0130 00000000   1 Busy INET442:
       The CXB is on   BG458:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81089200
       EFN           : 00000000  00000000
       FUNC          : 000002B2  00000690 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 00000001
       IOSB address  : 0088C758
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 000523D8           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  000523D8      MAIN

       AST parameter : 0048AD00  04762880
```

```
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0140 00000000   1 Busy BG458:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 8114B500
       EFN           : 00000000  00000000
       FUNC          : 000000B2  00000178 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 00000001
       IOSB address  : 810F133C
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 8C7F4040           is in the image:

UCX$INETDRIVER
Base      End       Image Offset  Psect type
8C7F4000  8C7F4200  00000040      Paged read/write

       AST parameter : 810EF500  -2129726208
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 810F1314  -2129718508
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0150 80DDC680   0      GDCW3B$DRA0:[VMS$COMMON.SYSMSG]SHRIMGMSG.EXE;1
0160 80D92B00   0      GDCW3B$DRA0:[VMS$COMMON.SYSMSG]DECC$MSG.EXE;1
0170 00000000   1 Busy INET443:
       The CXB is on   BG459:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 811481C0
       EFN           : 00000000  00000000
       FUNC          : 000002B2  00000690 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 00000000
       IOSB address  : 0088C8B4
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 000523D8           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  000523D8      MAIN

       AST parameter : 0049CD00  04836608
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000
```

```
0180 00000000   1 Busy BG459:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81147BC0
       EFN           : 00000000  00000000
       FUNC          : 000000B2  00000178 IO$_ACCESS, IO$_PSXWRITEVBLK
       IOST1         : 00000000
       IOSB address  : 8109163C
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 8C7F4040           is in the image:

UCX$INETDRIVER
Base      End       Image Offset  Psect type
8C7F4000  8C7F4200  00000040      Paged read/write

       AST parameter : 8108F800  -2130118656
       P1            : 00000000  00000000
       P2            : 00000000  00000000
       P3            : 00000000  00000000
       P4            : 81091614  -2130110956
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0190 8100F240   0      DRA1:[VZ_1_DB]DATA.DAT;1
01A0 8100B2C0   0      GDCW2Z$DRA1:[VZ_1_LOG]DATA_LOG.DAT;1
01B0 8100D000   0      GDCW2Z$DRA1:[LOG_DB]VZ_1_LOG_DB.DAT;1
01C0 80CF8D40   0      DRA1:[VZ_1_DB]STAMM.DAT;1
01D0 81008100   0      DRA1:[VZ_1_DB]STAMM_2.DAT;1
01E0 81006D80   0      DRA1:[VZ_1_DB]STAMM_3.DAT;1
01F0 80D6D240   0      GDCW2Z$DRA1:[VZ_1_LOG]STAMM_LOG.DAT;1
0200 810043C0   0      GDCW2Z$DRA1:[VZ_1_LOG]STAMM_LOG_2.DAT;1
0210 80CFAF00   0      GDCW2Z$DRA1:[LOG_DB]TEMPDB.DAT;1
0220 81002A40   0      GDCW2Z$DRA1:[VZ_MASTER]PROC_DB.DAT;1
0230 00000000   0      BG460:
0240 00000000   1 Busy INET576:
       The CXB is on   BG593:
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 811EA000
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 01580001
       IOSB address  : 0088CA00
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000200  00000512 Bytes
       AST address   : 00052158           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00052158      MAIN

       AST parameter : 0088CAEC  08964844
       P1            : 03A65150  61231440
       P2            : 00000200  00000512
       P3            : 00000000  00000000
```

```
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

0250 00000000   0      BG462:
```
0260 00000000   1 Busy BG593:
```
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 811ACB40
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 00000001
       IOSB address  : 810F3364
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000000  00000000 Bytes
       AST address   : 8C7F4040           is in the image:

UCX$INETDRIVER
Base      End       Image Offset  Psect type
8C7F4000  8C7F4200  00000040      Paged read/write

       AST parameter : 810F1500  -2129718016
       P1            : 03A65150  61231440
       P2            : 00000200  00000512
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000
```
0270 00000000   1 Busy MBA4676: (Buffered I/O Quota available: 256 bytes)
```
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 81136F80
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 00000001
       IOSB address  : 0088CB6C
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000080  00000128 Bytes
       AST address   : 00011F70           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00011F70      MAIN

       AST parameter : 0088CB24  08964900
       P1            : 0088CB74  08964980
       P2            : 00000080  00000128
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000
```
0280 80D14894   1 Busy NET1392:
```
Session Control Port : SCL$PORT$1214008B
OSI Transport Port   : OSI$PORT_0_034A
```

```
       I/O-Packet   1       Hex / Decimal
       --------------  ------------------
       IRP address   : 811149C0
       EFN           : 00000000  00000000
       FUNC          : 00000021  00000033 IO$_READLBLK (or IO$_READVBLK)
       IOST1         : 003C0001
       IOSB address  : 0088CB5C
       IOSB = [hex]  : 00000000.00000000
       BCNT          : 00000200  00000512 Bytes
       AST address   : 00011D68           is in the image:

DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00011D68      MAIN

       AST parameter : 0088CC48  08965192
       P1            : 03A65360  61231968
       P2            : 00000200  00000512
       P3            : 00000000  00000000
       P4            : 00000000  00000000
       P5            : 00000000  00000000
       P6            : 00000000  00000000

02B0 00000000   0      BG611:

Current process registers:

R0   = 00000000 00000001  R1   = FFFFFFFF 83D40C80  R2   = 00000000 0002D208
R3   = 00000000 00000000  R4   = 00000000 003E7700  R5   = 00000000 0042F9B0
R6   = 00000000 00000001  R7   = 00000000 0042F9B0  R8   = 00000000 00000000
R9   = 00000000 00000000  R10  = 00000000 003EBF80  R11  = 00000000 00000000
R12  = 00000000 00000000  R13  = FFFFFFFF 83D4D480  R14  = 00000000 003E9B60
R15  = 00000000 000DCD70  R16  = 00000000 008A7320  R17  = 00000000 008A7320
R18  = 00000000 00000000  R19  = 00000000 00000000  R20  = 00000000 00050005
R21  = 00000000 0004D648  R22  = 00000000 00000000  R23  = 00000000 008A7320
R24  = 00000000 008A7320  R25  = 00000000 00000000  R26  = FFFFFFFF 800CEAB0
R27  = FFFFFFFF 83D4B260  R28  = 00000000 0004D648  FP   = 00000000 00466DE8
PC   = FFFFFFFF 80001924  PS   = 00000000 0000001B

Current mode     : User
Previous mode    : User
Current IPL      : 0

The current PC:        80001924 is in the image:
SYS$PUBLIC_VECTORS.EXE
Base      End       Image Offset  Psect type
80000000  80001A00  00001924      Nonpaged read only

R26 (Return address):  800CEAB0 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010AB0      Nonpaged read only

****************** Call Frame 1 ***************************************

FP      = 00466DE8
PDSC    = 83D4D480  Stack Frame Procedure Descriptor
```

```
Next FP = 00466E08

Procedure Entry: 800CEA00 is in the image:
PROCESS_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
800BE000  800E2800  00010A00      Nonpaged read only

Return address:  0022E6D4 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  0022E6D4      MAIN

******************* Call Frame 2 ***************************************

FP      = 00466E08
PDSC    = 00038898  Stack Frame Procedure Descriptor
Next FP = 00466E28

Procedure Entry: 0022E6B0 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  0022E6B0      MAIN

Return address:  001E003C is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001E003C      MAIN

******************* Call Frame 3 ***************************************

FP      = 00466E28
PDSC    = 0002D208  Stack Frame Procedure Descriptor
Next FP = 00466E78

Procedure Entry: 001DFF98 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001DFF98      MAIN

Return address:  001DFB84 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001DFB84      MAIN

******************* Call Frame 4 ***************************************

FP      = 00466E78
PDSC    = 0002D2C0  Stack Frame Procedure Descriptor
Next FP = 7ED385B0

Procedure Entry: 001DF550 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001DF550      MAIN

Return address:  001E012C is in the image:
DATASERVER
```

```
Base      End       Image Offset  Psect type
00010000  003F53FF  001E012C      MAIN

****************** Call Frame 5 ***************************************

FP      = 7ED385B0
PDSC    = 0002C3F0  Stack Frame Procedure Descriptor
Next FP = 7ED392A0

Procedure Entry: 001D89B0 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001D89B0      MAIN

Return address:  001163D8 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  001163D8      MAIN

****************** Call Frame 6 ***************************************

FP      = 7ED392A0
PDSC    = 000134F0  Stack Frame Procedure Descriptor
Next FP = 7ED397C0

Procedure Entry: 00115C30 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00115C30      MAIN

Return address:  7EE60294 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  00046294      Merged

****************** Call Frame 7 ***************************************

FP      = 7ED397C0
PDSC    = 7EE1A4A0  Stack Frame Procedure Descriptor
Next FP = 7ED39800

Procedure Entry: 7EE601EC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  000461EC      Merged

Return address:  8005ACC0 is in the image:
SYSTEM_PRIMITIVES_MIN.EXE
Base      End       Image Offset  Psect type
80028000  8005D600  00032CC0      Nonpaged read only

****************** Call Frame 8 ***************************************

FP      = 7ED39800
PDSC    = 7EE20CF8  Stack Frame Procedure Descriptor
Next FP = 7ED398C0
```

```
Procedure Entry: 7EE5B384 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  00041384      Merged

Return address:  8005ACC0 is in the image:
SYSTEM_PRIMITIVES_MIN.EXE
Base      End       Image Offset  Psect type
80028000  8005D600  00032CC0      Nonpaged read only

****************** Call Frame 9 ***************************************

FP      = 7ED398C0
PDSC    = 8934C4B0  Stack Frame Procedure Descriptor
Next FP = 7ED39950

Procedure Entry: 894E2380 is in the image:
EXCEPTION.EXE
Base      End       Image Offset  Psect type
894E2000  894EF400  00000380      Paged read only

Return address:  003C5DC4 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  003C5DC4      MAIN

****************** Call Frame 10 ***************************************

FP      = 7ED39950
PDSC    = 0007ADF8  Stack Frame Procedure Descriptor
Next FP = 7ED39A50

Procedure Entry: 003C5D30 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  003C5D30      MAIN

Return address:  00115BF8 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00115BF8      MAIN

****************** Call Frame 11 ***************************************

FP      = 7ED39A50
PDSC    = 00013290  Stack Frame Procedure Descriptor
Next FP = 7ED39AC0

Procedure Entry: 00115AD8 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00115AD8      MAIN

Return address:  00115AA8 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00115AA8      MAIN
```

```
****************** Call Frame 12 *************************************

FP      = 7ED39AC0
PDSC    = 00013320  Stack Frame Procedure Descriptor
Next FP = 7ED39B30

Procedure Entry: 00115A50 is in the image:
DATASERVER
Base      End       Image Offset  Psect type
00010000  003F53FF  00115A50      MAIN

Return address:  896490D8 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
8963E000  89649800  000130D8      Paged read only

****************** Call Frame 13 *************************************

FP      = 7ED39B30
PDSC    = 8964BA90  Stack Frame Procedure Descriptor
Next FP = 7ED39BB0

Procedure Entry: 89648F60 is in the image:
IMAGE_MANAGEMENT.EXE
Base      End       Image Offset  Psect type
8963E000  89649800  00012F60      Paged read only

Return address:  7EE48DCC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  0002EDCC      Merged

****************** Call Frame 14 *************************************

FP      = 7ED39BB0
PDSC    = 7EE1E1E0  Stack Frame Procedure Descriptor
Next FP = 00000000

Procedure Entry: 7EE48BDC is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  0002EBDC      Merged

Return address:  7EE48BC8 is in the image:
DCL.EXE (CLI Image, in P1 Space)
Base      End       Image Offset  Psect type
7EE1A000  7EE8BDFF  0002EBC8      Merged

 *** The output was written into file 22412AC5.OUT ***
```

D.17 MUTEX: waiting on BYTCNT

```
This is an example of a hanging process, where you can't read
the process channels.



OpenVMS V7.1  on node GDCW3A  19-AUG-1998 18:09:30.38  Uptime  19 06:16:00
  Pid    Process Name    State  Pri      I/O       CPU       Page flts  Pages
2241AE41 _FTA14:         MUTEX    5      175   0 00:00:00.50       270    135


$ MC MWAIT 2241AE41


          *** MWAIT /Alpha V2.8 - Process Hang Analyzer ***


 *** The output will be written into file 2241AE41.OUT ***

Process name     : _FTA14:            User name      : SALMINEN
Extended PID     : 2241AE41           Internal PID   : 00D70041
PCB address      : 812168C0           Terminal name  : FTA14:
JIB address      : 80D9D200           Cur/Base prior : 5/0
PHD address      : 848A4000
KTB vector       : 81216BAC           Threads        : 1
Thread 00
---------
KTB address      : 812168C0           Running on CPU : 0
Thread state     : MUTEX              Mutex/resource wait
Thread status    : 02040001  ssrwait  System service resource wait enabled
                             RES      Resident, in balance set
                             PHDRES   Process header resident
                             INTER    Process is an interactive job
EFN wait cluster : 0
EFN wait mask    : 80D9D200  JIB address, waiting on BYTCNT

Direct   I/O count/limit    [IO's] :      150 /     150  In use : 0
Buffered I/O count/limit    [IO's] :      102 /     150  In use : 48
Sub-process count/limit    [Procs] :        0 /      16  In use : 0
Byte count/limit           [Bytes] :      416 /   99680  In use : 99264
Byte count/orig. limit     [Bytes] :      416 /  100000  In use : 99584
File count/limit           [Files] :      199 /     200  In use : 1
Timer queue count/limit   [Timers] :       10 /      10  In use : 0
Working set quota/limit [Pagelets] :   522128 /  524288  In use : 2160
Page file quota/limit      [Pages] :     3857 /    4096  In use : 239
AST count/limit            [AST's] :      248 /     250  In use : 2
AST's enabled               [KESU] :     KESU
AST's active                [KESU] :     ----
AST's queued                [KESU] :     ----
Delete pending count (XQP event)   :        0

Absolute/Last event/Delta time     : 09EB5A99 / 09EB2DDE / 00002CBB [hex] ticks
Time since last event : 1 minutes 54 seconds 510 milliseconds
%MWAIT-F-NORESPONSE, can not read target process channels
```

```
%SYSTEM-F-TIMEOUT, device timeout
```