

OpenVMS Hints & Kinks



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The Hints

Things you might not know about
OpenVMS, and were seriously afraid to
ask about.

Where to go for help?



<http://www.hp.com/go/openvms/>

<http://www.hp.com/go/openvms/faq/>

<http://www.hp.com/go/openvms/wizard/>

<http://www.hp.com/go/openvms/freeware/>

<http://www.hp.com/go/dspp/>

<http://www.hp.com/go/productbulletin/>

Secret Terminology Decoder



Confusion? What confusion?

Itanium® : the Intel® processor family

IA-64® : the Intel® architecture

Integrity : the HP implementation

I64 : the HP OpenVMS name for the platform

DIGITAL did not traditionally differentiate among the architecture, the implementation and the platform. Accordingly, you would often see VAX and Alpha largely used near-interchangeably.

Controlling Interactive Logins



Shutting out all users?

```
$ SET LOGIN /INTERACTIVE=0
$ @SYS$MANAGER:TCPIP$REXEC_SHUTDOWN
$ @SYS$MANAGER:TCPIP$RSH_SHUTDOWN
$ @SYS$MANAGER:TCPIP$FTP_SHUTDOWN
$ MCR NCL RESTRICT SESSION CONTROL
```

V7.3-2 Unit Limits Increased...

- Increase limit from 9999 to 32767 units
 - Used for MB (mailbox) and BG (IP) devices
 - See the scalable kernel support for TCP/IP Services

Media Overwrites, Recovery

DLT and DDS media cannot generally be recovered (using standard drives and firmware) once overwritten...

- Drive firmware does not allow access past EOT, and drives can silently erase data on media beyond EOT.
- Service vendors specializing in data recovery can potentially recover data from overwritten media.
- To avoid media overwrites should a tape be immediately (and erroneously) reloaded into the drive, consider:
 - `/TAPE_EXPIRATION="TODAY+7-"`

Debugging

- XQP Activity
 - SET WATCH/CLASS=cls FILE
 - ALL,NONE,etc
- System Service Logging (V8.2 and later)
 - SET PROCESS/SSL=command
- Security Auditing
 - Use the privilege audits, alarms
- License PAK failures
 - LMF\$DISPLAY_OPCOM_MESSAGE

VAX vs. Alpha vs. I64

- Memory Page Size
 - VAX: Fixed Page Size
 - 0.5KB (512 bytes)
 - Alpha: Implementation-specific
 - 8KB to 64KB (8192 to 65536 bytes)
 - Itanium®: Implementation-specific
 - 8KB+ (8192+)

- Compiler Code Generation Options
 - Architecture EV56
 - Tune GENERIC (or EV56)
 - FAQ has details
 - Similar GENERIC mechanism available on I64
- Alpha AMASK/IMPLVER
 - Example code at Ask The Wizard

OpenVMS I64 Image Upward Compatibility

- Starts at OpenVMS I64 V8.2
- Incompatible changes made V8.0 through V8.2
- Rebuilding can be (may be? is?) required...

Alpha, VAX, I64

- Synchronization, common programming bugs, etc
 - ATW topics (1661), ...

Alpha

- Memory Caching
 - Memory Barriers
 - ATW Topics (1661), (2681), ...

Seeing %CLI-E-INVTAB Invalid Table Errors?

- Correct external references for CLI tables?
 - Bliss:
EXTERNAL cmdtbl;
 - C
extern void *cmdtbl;
 - Fortran
integer cmdtbl
cDEC\$ attributes extern :: cmdtbl

how to do a globalref in ANSI C?

```
#define BUGCHK_QUOTE(s) #s  
#define BUGCHK_STR(s) BUGCHK_QUOTE(s)  
#define BUGCHK_FATAL 1  
#define BUGCHK_NONFATAL 0  
#define BUGCHK_POWEROFF 2  
#define BUGCHK_COLD 1  
#define BUGCHK_WARM 0
```

...cont'd

how to do a globalref in ANSI C?

```
#ifndef _ALPHA  
#define bug_check(code, severity, reboot) \  
    { \  
        extern const int BUG$_##code; \  
        int bug_code = (int) &BUG$_##code; \  
        bug_code |= (BUGCHK_##severity) ? ((BUGCHK_##reboot) ? 5 :  
4) : 0; \  
        asm ( "call_pal " BUGCHK_STR(EVX$PAL_BUGCHK) ";" , bug_code );  
    }  
#endif
```

...cont'd

how to do a globalref in ANSI C?

```
#ifdef __ia64  
#define bug_check(code, severity, reboot) \  
    { \  
        extern const int BUG$_##code; \  
        int bug_code = (int) &BUG$_##code; \  
        bug_code |= (BUGCHK_##severity) ? ((BUGCHK_##reboot) ? 5 :  
4) : 0; \  
        __PAL_BUGCHK(bug_code); \  
    }  
#endif
```


File and Data Integrity

CHECKSUM finally makes the manuals!

- CHECKSUM is documented in V8.2, and offers XOR and MD5 capabilities.
- While the command has been latent for eons, earlier versions offered only the XOR scheme that provided for integrity, but not for security. (XOR could be easily circumvented by the nefarious-minded, in other words.)

System Performance

- EXE\$GETSPI API beneath MONITOR utility
 - See Freeware I_SPI.C code example
 - Use SYS\$GETRMI on OpenVMS V7.3 and later

System Performance

XFC performance is better in base allocation...

- To dedicate 200MB memory for XFC caching
- Note that the MPW_HILIMIT setting takes precedence over the allocation of memory for XFC cache.
- To reserve the memory, use the following:
 - SYSMAN> RESERVED_MEMORY ADD –
VCC\$MIN_CACHE_SIZE - /ALLOCATE/NOPAGE_TABLE-
/NOZERO/NOGLOBAL/SIZE=200
 - Now set VCC_CACHE_SIZE to at least 200 MB in size.

XFC...

- Increments performance counters differently than VIOC
 - PMS\$GL_DIRIO incremented for XFC cache hits
 - SDA extensions
 - XFC SHOW FILE/BRIEF
 - XFC SHOW VOLUME/BRIEF

End Of File, End Block

RMS Indexed Files and EOF...

- The End Of File (EOF) handling is subtle on indexed files...
 - The EBK value indicates the last block written, and not the actual EOF
 - EBK is updated for record-oriented extends, but not for block-mode extends
 - There are tools that depend on this EBK behaviour

Console Confusion

Alpha SRM Console...

- SRM Console V6.3 and later have SET PROMPT
- P00>>> set prompt "_foo>"
- P00_foo>

System Service Logging?

SSL found a serious performance win within DCL...

```
$ cc hello
```

```
$ link hello
```

```
$ set process/sslog=state=on
```

```
$ run hello
```

```
Hello
```

```
$ set process/sslog=state=unload
```

```
$ analyze/ssl
```

```
....
```

DCL for System Managers

V7.3-2 Error Count Reset Support

- SET DEVICE/RESET=ERROR
- See the FAQ for procedure for other releases
- Does not operate with NET: devices (DECnet can crash) and with template UCB devices

USB History



- Early Adopters Kit Fall 1998
 - V7.2 DS10 only (1 keyboard, mouse, and Printer)
- V7.3-1 Support for ES47 and GS1280
 - Supported 1 keyboard, mouse, printer, and modem
 - More than 1 of any device possible with Device name persistence across boots.
- V7.3-2
 - Support for Philips ISP1561 controller
 - Several midnight drivers started to appear
 - Joystick/Gamepad, Button, Scanner, Mass Storage, Ethernet
- V8.2
 - Support for IA64 systems
 - Add support for NEC USB controller.
 - Add Mass Storage for IA64 (SYS\$DNDRIVER)
 - This is latent support for new platforms with USB DVD's
 - Add USB to RS232 for Prolific PL2303 chip (SYS\$DZDRIVER)

USB – V8.3



- Completed Work
 - USB Mass storage enhancements
 - Support for Mount Verify, IO\$_DIAGNOSE
 - Add new device type DT\$_USB_CB_DISK stopped using DT\$_GENERIC_DK
 - Lots of bug fixes pool leaks, error handling, more device types supported
 - Joystick/Gamepad driver SYS\$AGDRIVER
 - Support for another USB to RS232 controller
 - SYS\$DZADRIVER supports the FTDI 232AM chips
 - Generic USB driver
 - SYS\$UGDRIVER
 - Allows users to add device support for new devices as long as they are not part of the HID (mice, keyboards, etc.) collection of devices.

Serial Line Support for IA64



- USB options chosen for the following reasons
 - Drivers fairly simple to develop
 - No certification issues
 - No concern about PCI-e BUS
 - Example drivers available from Linux
- Readily available devices use one of the following chip sets
 - Prolific PL2303 chip based device
 - FTDI Chip FTDI-232AM based devices
 - Digi IO Networks Edgeport devices
- "OpenVMS will produce and support drivers for the above Chipsets so customers can purchase 3rd party commodity devices to meet their serial connectivity requirements"

CDRECORD, MKISOFS...

- CDRECORD in OpenVMS V7.3-1 and later
- Most current OpenVMS Master Pack (VDE) versions are available on OpenVMS Freeware V7.0

Expected in V8.3, a new DCL Command Verb for CD-R/RW and DVD+R/+RW

- COPY/RECORDABLE_MEDIA source target
 - /SPEED=...
 - /[NO]FORMAT
 - /DIAGNOSTICS=...
 - /[NO]LOG
 - /BELL

CD and DVD Bootable Media

How to build Bootable Optical Media

- Ask The Wizard topic (9820)
- SYS\$SETBOOT, SET BOOTBLOCK
 - VAX and Alpha boot blocks latent, too, but...
- Sector Sizing and the OpenVMS I64 Boot Block
 - 512 bytes
 - 2048 bytes

How to select traditional boot flags, options

- Boot alias options
 - SRM-style syntax
 - "-flags 0,1"
- `SYS$MANAGER:BOOT_OPTIONS.COM`
 - Can add flags to the boot menu entries.
- FAQ has details

Host-Based Mini-Merge

Shadowing and Volume Merges

- Any Fibre Channel or SCSI disks
- Get the VMS732_HBMM ECO kit
- Documentation is in the kit

Unaligned references trap to PALcode on OpenVMS Alpha, and trap to hardware or OpenVMS on OpenVMS I64...

- `sys$perm_report_align_fault()`
- `sys$examples:set_align_report.c`
- SDA extensions

Kernel Memory Management Changes

New 50-Bit PFN support means kernel changes...

- SCH\$GI_FREECNT and (old) SCH\$GL_FREECNT
- Allows addressing of additional physical memory on OpenVMS I64

The Kinks

"And now for something completely different"

EFI Hints & Kinks

EFI Boot Aliases...

- Contains GUID from target disk boot block; unique signature from target disk MBR/GPT
- Preserve your GUID, or see your EFI boot aliases become stale
- When in doubt about the operation of a boot alias, remove the alias and re-add it
- `SYS$MANAGER:BOOT_OPTIONS.COM` can re-validate the entries in the boot menu.

EFI Hints & Kinks

EFI Console Devices...

- different boot paths for removable and fixed disks
- file system (fs) versus block (blk) devices
 - one or two FAT devices, and three or five block devices
- device and boot order can and does vary
 - fs:\efi\vms\vms_loader.efi
 - fs:\efi\boot\bootia64.efi

EFI Hints & Kinks

EFI Console Devices...

- boot specification can and does vary
 - OpenVMS system disk
 - fs:\efi\vms\vms_loader.efi
 - Bootable removable media
 - fs:\efi\boot\bootia64.efi

EFI and Volume Shadowing...

- Shadowing doesn't (currently) know about changes to the disk made at the EFI console within the boot partition, or (when present) within the hardware partition.

EFI Hints & Kinks

Network Booting...

- VMS supports more NIC cards than EFI.
- Core I/O NIC is always supported.
- If EFI can't see it, you can't boot over it.
- V8.2-1 supports network upgrade. Future versions will support network installation and satellite boot.

Interlocks are not to be ignored lightly

BACKUP/IGNORE=INTERLOCK...

- This command does ***NOT*** provide what most folks expect...
 - Silent corruptions are possible
 - Modification dates can (will) be wrong
- *The now-ignored interlocks were implemented for a reason...*
- *Please see the FAQ for related information*

Installation Menu and DVE (Dynamic Volume Expansion)



Can't SET VOLUME/LIMIT from the bootable menu?

Why? The mounted device is owned by the parent and (prior to V8.2) SET VOLUME checks for a local mount.

\$\$\$ SET VOLUME ddcu: /LIMIT

%SET-E-NOTSET, error modifying ddcu:

-SYSTEM-W-DEVNOTALLOC, device not allocated

- Fix is in the V732_F11X-V0100 kit and later and in V8.2, but the V7.3-2 CD distribution won't be re-issued.*
- Related updates expected circa V8.3*

Case Sensitivity

CC/CASE_LOOKUP=SENSITIVE.

- The `#include` suffix must be `.H` (not `.h`)
- This is expected to be a permanent restriction of case-sensitive compilation
- either use no file type, or use an uppercase type
- effects nested includes, too

LAN Controller Negotiation...

- "Beware hubs set to auto-negotiate or for full-duplex 10Mbit Ethernet, as these are causing errors with the newer PEDRIVER support with the updated multi-path LAN support. 10Mbit must be half-dup, and auto-negotiation is not supported prior to later DE500 controllers."

- cont'd...

NIC Duplex, Negotiation

If your LAN mis-negotiates...

- DE500 details in FAQ
- 10 Mb Ethernet is assumed half-duplex
- Negotiation
 - switch: Hello, I will be serving as your switch, and here is what I can offer. What are you?
 - NIC: [silence]
 - switch: OK, I know your speed, but will have to guess your current duplex setting... And since most any NIC can support half-duplex...
- Negotiation detection improvements in V8.2:
"possible duplex mismatch condition detected"

lib\$table_parse source code changes

lib\$table_parse and ARCH_DEFS

- The \$TRAN macro now expects ARCH_DEFS
 - \$ MACRO /OBJECT=SYS\$LOGIN:LTPTBL.MAR -
SYS\$SHARE:ARCH_DEFS.MAR+SYS\$LOGIN:LTPTBL
- OpenVMS V7.3-2 and later
- See GNM on Freeware V7.0

DCL Buglets

V7.3-2 RECALL/ALL...

- sensitive to leading spaces (pre-ECO)

V7.3-2 SYSMAN procedure verification

- UPDATE introduced the bug
- MANAGE removes the bug

XFC...

- Extended File Caching
 - Available in V7.3 and later
 - XFC V2.0 ECO for OpenVMS Alpha V7.3
 - Please install the ECO, ...or...
 - Please set VCC_FLAGS parameter to one (1)
 - Select VIOC if mixing older (and un-eco'd) releases

XFC Revision and Modification Dates

- Cached in-memory with XFC, updated values written on file close
 - REVDATE will return later of FCB\$Q_MODDDATE
 - or the file header's FCB\$Q_REVDATE
 - Behaviour changes with ECO kits
 - Related Commands:
 - Use DUMP/HEADER to show the on-disk value
 - SDA shows the FCB\$Q_MODDDATE value
 - BACKUP/IGNORE=INTERLOCK
- XFC does not cache FCBs, VIOC does...

LD Virtual Disk Driver Bypasses XFC...

- Disable XQP Caching on LD Container Files
 - Use of ALTSTART bypasses XFC caching
 - SET FILE/CACHING_ATTRIBUTES=NO_CACHING
 - Reduces exposure to corruption
- Get LD080 kit, ECO (as available), or OpenVMS V8.2

WWID Support

WWIDtoname and nametoWWID logicals...

- The logicals are just part of the "fun"
- WWID values are stored in several locations, including logical names and kernel-mode data structures, and in SYS\$CONFIG.DAT
- OpenVMS is sensitive to mappings, consistency
 - Don't even try remapping, lest chaos and corruption visit

Cluster Satellite Bootstraps?

Clustering now checks for EXPECTED_VOTES...

- If unable to get your satellites into the cluster, check EXPECTED_VOTES as OpenVMS has gotten rather crankier about bogus values of this parameter.
- Insufficient non-paged pool can also cause problems bringing a satellite into the cluster.
- Details on VOTES and EXPECTED_VOTES are in the FAQ and the manuals.
- “Creative” or invalid settings of these parameters can corrupt your disk data.

MSCP Load Balancing...

- MSCP load balancing on OpenVMS VAX has not been ported forward to OpenVMS Alpha nor I64.
- Once a drive is served by a particular server, it stays there until something happens. "Something" is a path or server failure.
- You can always failover the device to a host of your choice by issuing:

```
$ SET PREFERRED_PATH ddcu: /HOST=server/FORCE
```

Volume Shadowing Performance

Shadowing Kinks...

- Very conservative I/O (greatly) slows merge
 - SHAD\$MERGE_DELAY_FACTOR 1000
 - Also: ...DELAY_FACTOR_DSAnnn
 - Dynamic

Shadowing and System Dumps

Shadowing Kinks...

- System Dump files are written to one shadowset member
 - See FW4 CLUSTER tool COPY_SHADOW_DUMP
 - SDA on V7.3-1 and later can find the proper volume

System Dumps

System Dump Kinks...

- Dump file formats changed with V7.3-2
 - %SDA-F-INCDUMPFORM
- Debugger ADB073 can redefine SDA\$SHARE, you'll need the shipped V7.3-2 image with SDA itself.
- The error can also appear if the dump file hasn't been rewritten after the OpenVMS upgrade; if there have been no crashes.

Can't see the TQEs for the Trees

- ***Kernel Change in V7.3-1...***
- SPAWN process name algorithm changed!
 - Old scheme selectable with system parameter
- Kernel TQE linked list becomes a tree

Creating a Compressed PCSI Kit...

- PCSI (PRODUCT SHOW UTILITY) versions V7.3-300 and later have compressed kit (PCSI\$COMPRESSED) support. Create the kit using PCSI. Then compress it.



VMS732_UPDATE V4.0 and COPY.CLD

Changes in COPY.CLD cause problems...

- COPY/CONTIGUOUS APB.EXE, then WRITEBOOT

The following product will be installed to destination:

```
DEC AXPVMS VMS732_UPDATE V4.0  
DISK$AXPVMSSYS:[VMS$COMMON.]
```

```
%PCSI-I-OBJSKP, file [SYS$LDR]NETDRIVER.EXE pertains to an option that was not  
selected
```

```
Portion done: 0%...10%...20%...30%...40%...50%...60%...70%...80%...90%
```

```
%CLI-F-SYNTAX, error parsing 'BLOCK_SIZE'
```

```
-CLI-E-ENTNF, specified entity not found in command tables
```

```
...100%SKPDAT, image data (records not beginning with "$") ignored
```

Freeware Errors

Kinks in OpenVMS Freeware...

- Use the most current Zip
 - do not use Zip from prior to Freeware V6.0
- Freeware V6.0 disk won't mount prior to V7.2
- Freeware menu errors
 - menu system error on second volume of Freeware V6
 - menu will not work on OpenVMS I64
 - current menu system (over-)due for replacement

so I was telnetting myself....

changes in IPv6

- use "telnet localhost" or "telnet 0.0.0.0"
- do not use "telnet 0"

Where to go for help?

<http://www.hp.com/go/openvms/>

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<http://www.hp.com/go/openvms/wizard/>

<http://www.hp.com/go/openvms/freeware/>

<http://www.hp.com/go/dspp/>

<http://www.hp.com/go/productbulletin/>

Thank You!
European Technical Bootcamp



QA



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