



BRUDEN **OSSG**
On-Shore Systems Group

Guy Peleg
Senior Member of the Technical Staff
Director of EMEA Operations
guy.peleg@bruden.com



BRUDEN **OSSG**
On-Shore Systems Group

New Features added in V8.2

- SHOW SYSTEM/IMAGE
- EDCL
- Wildcard matching in SEARCH
- SHOW FASTPATH
- SSL
- WRITE/NOWAIT
- SET/SHOW IMAGE
- PATCH/ABSOLUTE
- B2B
 - SET PROCESS/UNITS=BYTES

2

BRUDEN **OSSG**
On-Shore Systems Group

System Service Logging

```
IPL31> ana/ssl/stat  
START version: 1.1 process: 3720041f GUY ! 7-JUL-2006 15:47:56.31  
username: GUY node: IPL31 platform: IA64  
buffer count: 2 size: 65024 start_flags: 00000003
```

Service	Count	User	Super	Exec	Kernel	Rate/sec
SYSSQIO	52	0	0	43	9	2.9
SYSTRNLNM	47	0	10	37	0	2.6
SYSSCLRST_INTERNAL	43	0	0	43	0	2.4
SYSSPAL_SWASTEN	42	0	0	42	0	2.3
SYSSDCLAST	22	0	0	22	0	1.2
SYSSRMS_GET	22	0	22	0	0	1.2
SYSSSYNCH_INT	22	0	22	0	0	1.2
SYSSGETDVI	21	0	11	10	0	1.2


3

BRUDEN **OSSG**
On-Shore Systems Group



© Disney Pixar
PIXAR
FINDING NEMO
CATCH IT NOW
ON DVD AND VIDEO
findingnemo.com


4



Customizing CTRL-T output

- The output of the CTRL-T message may be customized
- The contents of the symbol DCL\$CTRLT will be appended to the traditional CTRL-T output
 - Useable from applications / DCL
 - May be used for debugging applications
 - Display the name of current procedure being executed by DCL
 -and much more...
- Like every symbol, DCL\$CTRLT may have different values in different procedure levels

5



```

IPL31> ty ctrlt_loop.com
$ inner=0
$ outer=0
$ loop:
$ loop1:
$ if inner .gt. 20000 then goto end_loop1
$ inner=inner+1
$ dcl$ctrlt=F$FAO("Inner loop count is !SL !/ Outer loop count is !SL",inner,outer)
$ goto loop1
$ end_loop1:
$ inner=0
$ outer=outer+1
$ goto loop

IPL31> @ctrlt_loop
IPL31::GUY 10:46:37 (DCL) CPU=00:03:42.68 PF=13453 IO=6743 MEM=187
Inner loop count is 12306
Outer loop count is 0
IPL31::GUY 10:46:43 (DCL) CPU=00:03:49.19 PF=13455 IO=6744 MEM=187
Inner loop count is 19200
Outer loop count is 2

```

Simple DCL procedure demonstrating Customizing CTRL-T output

BRUDEN On-Shore Systems Group **OSSG**

```

IPL31> ty ctrlt_looper.c

#include <descrip>
void main()
{
int counter=0;
$DESCRIPTOR(sym_name,"dcl$ctrlt");
static struct dsc$descriptor_s value_desc;
char buffer[256]={0};

value_desc.dsc$b_dtype = DSC$K_DTYPE_T;
value_desc.dsc$b_class = DSC$K_CLASS_S;
while (1){
counter++;
sprintf(buffer,"Counter is %d",counter);
value_desc.dsc$a_pointer = buffer;
value_desc.dsc$w_length = strlen(buffer);
lib$set_symbol (&sym_name,&value_desc);
}
}
IPL31> r ctrlt_looper
IPL31::GUY 10:47:27 CTRLT_LOO CPU=00:03:53.26 PF=13631 IO=6784 MEM=335
Counter is 216766
IPL31::GUY 10:47:28 CTRLT_LOO CPU=00:03:54.45 PF=13631 IO=6785 MEM=335
Counter is 338429

```

Simple C program demonstrating Customizing CTRL-T output

BRUDEN On-Shore Systems Group **OSSG**

Customizing CTRL-T output

- Displaying the name of the current procedure


```

$!
$ if f$trnlnm("DCL$CTRLT_DEBUG") .NES. ""
$ then
$   dcl$ctrlt = f$parse(f$environment("procedure"),,, "NAME") -
               + f$parse(f$environment("procedure"),,, "TYPE")
$ endif
$

```

- With V8.3, when SYS\$OUTPUT is redirected, CTRL-T output will still be displayed on the terminal.


8



Remote CTRL-T

- Introducing the concept of remote CTRL-T
 - CTRL-T can now display standard CTRL-T information about remote processes.
 - Remote may be on a different system in the cluster
 - The symbol DCL\$CTRLT_PID should contain the PID of the remote process

9



Remote CTRL-T

```

Running on node BLUSKY...hitting CTRL-T
$
BLUSKY::SYSTEM 17:40:55 (DCL) CPU=00:00:00.16 PF=212 IO=98 MEM=146
$
$! Now define the new symbol
$!
$ dcl$ctrlt_pid="23800436"
$
$! Hit CTRL-T again
$!
IPL31::GUY 17:41:12 LOOPER CPU=01:28:05.17 PF=2700 IO=594 MEM=322
$
IPL31::GUY 17:41:14 LOOPER CPU=01:28:07.02 PF=2700 IO=594 MEM=322
$

```

10

BRUDEN On-Shore Systems Group **OSSG**

New Permanent DCL symbols

- On image rundown DCL populates \$SEVERITY and \$STATUS
- Added \$FACILITY and \$IDENT

```
$ exit %x10911a02

$ show symbol $status
$STATUS == "%X10911A02"

$ show symbol $facility
$FACILITY == "%X00000091"

$ show symbol $ident
$IDENT == "%X00000340"

$ show symbol $severity
$SEVERITY == "2"
```

11

BRUDEN On-Shore Systems Group **OSSG**

SHOW DEVICE/FULL

- Enhanced information for LAN devices
- LAN-specific \$GETDVI item codes added

```
Device EWA0:, device type DEGXA, is online, network device, error logging is
enabled, device is a template only.

Error count          1      Operations completed          0
Owner process        ""      Owner UIC                     [SYSTEM]
Owner process ID     00000000  Dev Prot                      S:RWPL,O:RWPL,G,W
Reference count      0      Default buffer size           512
Current preferred CPU Id  0      Fastpath                      1
Current Interrupt CPU Id  0

Operating characteristics: Link up, Full duplex, Autonegotiation, Jumbo frames.

Speed (Mbits/sec)    1000
Def. MAC addr 00-D0-59-61-6A-E2  Current MAC addr 00-D0-59-61-6A-E2
```

12

BRUDEN On-Shore Systems Group **OSSG**

SHOW DEVICE/FULL

```
$ sho dev/ful ewa5

Device EWA5:, device type DEGXA, is online, network device, error logging is
enabled.

Error count          0      Operations completed          2
Owner process        "NETACP"      Owner UIC                      [SYSTEM]
Owner process ID     39800425      Dev Prot                      S:RWPL,O:RWPL,G,W
Reference count      1      Default buffer size           1498

Operating characteristics: Full duplex, Autonegotiation, Jumbo frames.

Speed (Mbits/sec)    1000
Def. MAC addr 00-D0-59-61-6A-B2      Current MAC addr              00-D0-59-61-6A-B2
Protocol name        DECNET      Protocol type                  60-03
```

13

BRUDEN On-Shore Systems Group **OSSG**

SHOW PROCESS

- SHOW PROCESS/CONTINUOUS now supports the 'Q' option....

- 'Q' = Quota
 - While the continuous display is running, it is now possible to hit 'Q' and dynamically monitor the process quotas

14

```

PowerTerm 420/32 - TELNET (vms2.americas.hpqcorp.net)
File Edit Terminal Communication Options Macro Script Help
VT420-7 24.1 Eng Caps Hold On Line
Process CTMSERVER 09:23:05

State LEF Working set 6223
PID 00000453 Page faults 5681
UIC [SYSTEM] Event flags C0000001
80000000

# open files remaining 119/128 ( 92%)
Direct I/O count/limit 100/100 (100%)
Buffered I/O count/limit 99/100 ( 99%)
BUFTD byte count/limit 250816/250816 (100%)
ASTs remaining 98/100 ( 98%)
Timer entries remaining 15/16 ( 93%)
PGFL quota count/limit 39671/43750 ( 90%)
ENQ quota count/limit 2098/2098 (100%)

vms2$DK0600:[SYS0.SYSCOMM.[HBEH_SERVICES]]CTMSERVER.EXE:2

```

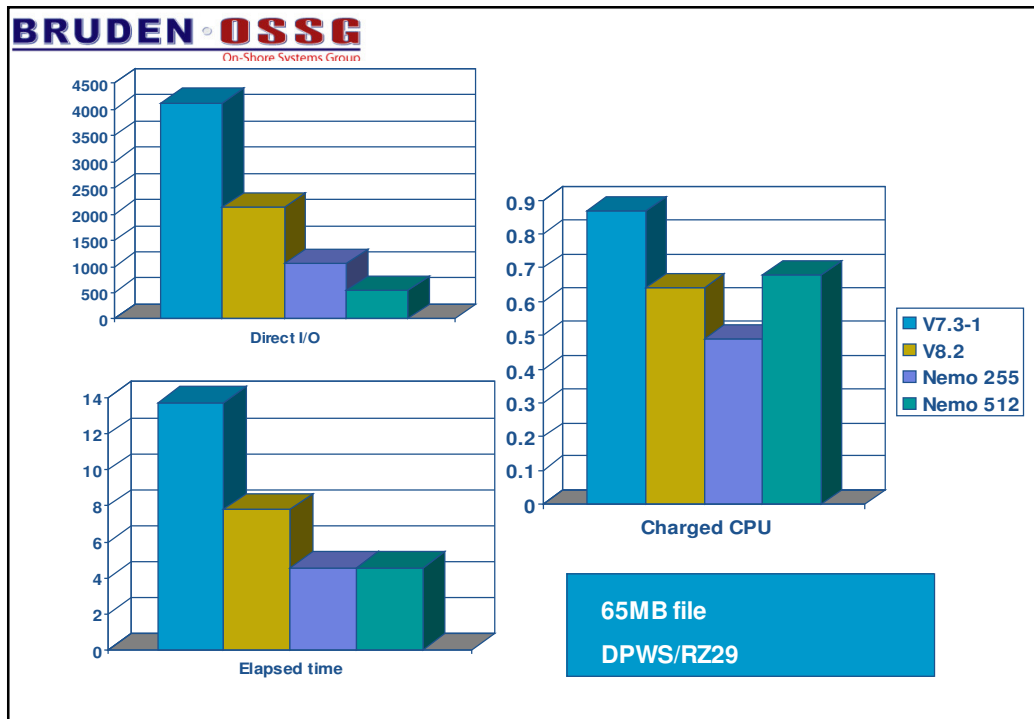
BRUDEN **OSSG**
On-Shore Systems Group

COPY

- V8.2 added the /BLOCK_SIZE qualifier
 - Default I/O size is 124 blocks
 - Maximum I/O size is 127 blocks

- V8.3 removes the I/O size limit
 - Copy has been modified to use RAB64
 - Can't exceed maximum I/O size supported by the port driver
 - VCC_MAX_IO_SIZE

16



BRUDEN **OSSG**
On-Shore Systems Group


Lexical Functions

- F\$LICENSE now supports 3rd party producers
 - Optional producer argument, DEC/HP assumed if omitted.

```
$ write sys$output f$license("PLI", "KEDNOS")
TRUE
```
- F\$CUNITS – New lexical function
 - F\$CUNITS (number to convert, from_units, to_units)
 - The first argument is limited to 32bits
 - Currently only knows how to convert blocks to bytes
 - What else do you need?

```
$ write sys$output f$cunits(4432216, "blocks", "bytes")
2.11GB
```

18




Lexical Functions

- F\$MATCH_WILD
 - Performs wildcard matching between candidate and pattern string
 - Returns TRUE if the strings match
 - Syntax
 - F\$MATCH_WILD (CANDIDATE, PATTERN)

```
$ write sys$output f$match_wild ("This is a candidate", "*c%d*")
TRUE
$
```

19



SEARCH / STATISTICS

- SEARCH/STATISTICS now defines several DCL symbols with statistics information

Files searched:	125	Buffered I/O count:	602
Records searched:	15575	Direct I/O count:	135
Characters searched:	842598	Page faults:	36
Records matched:	45	Elapsed CPU time:	0 00:00:00.26
Lines printed:	97	Elapsed time:	0 00:00:02.87

```
$ sh sym search*
SEARCH$CHARACTERS_SEARCHED = "842598"
SEARCH$FILES_SEARCHED = "125"
SEARCH$LINES_PRINTED = "97"
SEARCH$RECORDS_MATCHED = "45"
SEARCH$RECORDS_SEARCHED = "15575"
```

20

BRUDEN On-Shore Systems Group **OSSG**

MONITOR

- New "TOP" display
 - Top processes that use Kernel, Executive, Supervisor and User mode on the system
 - MONITOR PROCESS /TOPKERNEL /TOPEXEC.....
- Align class added to monitor alignment faults rate

```

OpenVMS Monitor Utility
ALIGNMENT FAULT STATISTICS
on node IPL31
3-JAN-2006 15:32:59.66

```

	CUR	AVE	MIN	MAX
Kernel Alignment Faults	1655.00	1613.00	1356.00	2068.00
Exec Alignment Faults	8525.00	8657.79	7499.00	10527.00
Super Alignment Faults	0.00	0.00	0.00	0.00
User Alignment Faults	1294.00	1267.20	1084.00	1628.00
Total Alignment Faults	11474.00	11538.00	10011.00	14223.00


21

BRUDEN On-Shore Systems Group **OSSG**

Queue Manager

- Increase batch queue job limit to 65535 (was 255)
 - V7.3-2 TIMA kit
- Performance enhancement to SYS\$SNDJBC
 - Avoid heavy alignment faults (2000 faults per submit)
 - Pad the message being exchanged between the job controller and the queue manager
 - The old algorithm used when Queue Manager is running on non V8.3 version
 - In mixed version cluster run the Queue Manager on V8.3 node for optimal performance


22



65535 SPAWNed processes

- Maximum number of spawned subprocesses increased to 65535
- Previous limit was 255
 - When this limit is reached - excessive CPU time (with spinlocks held) trying (and failing) to create more processes
- Numeric portion of the spawned process name increased from byte to word
 - ***Username portion may be truncated from 11 to 9 characters***
 - Set Bit 2 in DCL_CTLFLAGS to restore previous behavior (255 spawned process)
 - ***%DCL-S-SPAWNED,process GUY_47132 spawned***

23



More New Features

- Support for Montecito based servers
- COPY/RECORDABLE_MEDIA
- VLAN support
- PEDRIVER Data Compression
- Lock Remaster Weight
- TCP/IP V5.6
- SHADOWING
 - Prioritizing merge and copy operations
 - Automatic Bitmap Creation
- CPU Bitmaps parameters
- LINK/SEGMENT=CODE=P2
- Symbolic Links

24

BRUDEN **OSSG**
On-Shore Systems Group



Latest happenings with OpenVMS BACKUP

25

BRUDEN **OSSG**
On-Shore Systems Group

Encryption support

- Starting with OpenVMS V8.2 the Encrypt product is covered by the base O/S license
 - No separate license required
- Starting with V8.3 the Encrypt product is integrated into the base O/S
 - No separate installation required
- BACKUP supports creating encrypted save-sets using the /ENCRYPT qualifier


26



Encryption support

- How does it work?
 - At run-time, BACKUP generates a random encryption key used for encrypting the save-set records
 - Random (time based) string is XOR'd with the user's command and encrypted against itself
 - The encryption key is being encrypted using a user provided key and stored in the save-set header
 - Decryption – the encryption key is retrieved by decrypting the key stored in the header using the user provided key
 - BACKUP/ENCRYPT=(...)
 - NAME
 - ALGORITHM
 - VALUE

27



Encryption support

- Existing limitations
 - Uses DESCBC algorithm (old, slow & expensive)
 - User provided algorithm is only used for encrypting the key
 - DESCBC is still used for encrypting the data

- V8.3 adds AES encryption support to BACKUP
 - Modern & stronger encryption
 - User provided algorithm is used for encrypting the data
 - DESCBC is still used by default (to maintain backward compatibility)
 - The following algorithms supported by BACKUP:
 - **AES128**, AES192, AES256, AESECB, AESCFB and AESOFB

28

BRUDEN On-Shore Systems Group **OSSG**

Encryption support - examples

- Create an encrypted save-set, specify the encryption key at run-time

```
$ backup *.com coms.bck/sav/encrypt=alg=aes
Enter key value:
Verification:
```

- Create an encrypted save-set, create the encryption key from DCL

```
$ encryp/create_key guy "This is a nice key called guy"/aes
$ backup *.com coms.bck/sav/encrypt=(alg=aes,name=guy)

$ backup coms.bck/sav [...] /encrypt=(alg=aes,name=guy)
```

29

BRUDEN On-Shore Systems Group **OSSG**

Conflict in verbs

- Starting with V8.3 the DECRAM verb has been removed
 - Avoid conflict between DECRAM & DECRYPT
- Any procedure using the DECRAM verb should be modified to use a foreign command
 - \$DECRAM == "\$MDMANAGER"

30

BRUDEN On-Shore Systems Group **OSSG**

Disk Queue Load

- BACKUP uses a large buffer pool to read file data in an optimized manner
- Algorithm was designed 20 years ago
- All reads for the entire buffer pool are issued concurrently
- Over time buffer pools have gotten larger & the I/O subsystem's tolerance of being flooded with large number of I/Os has decreased
 - Especially true with EVA & XP storage controllers
- A picture is worth a thousand words....

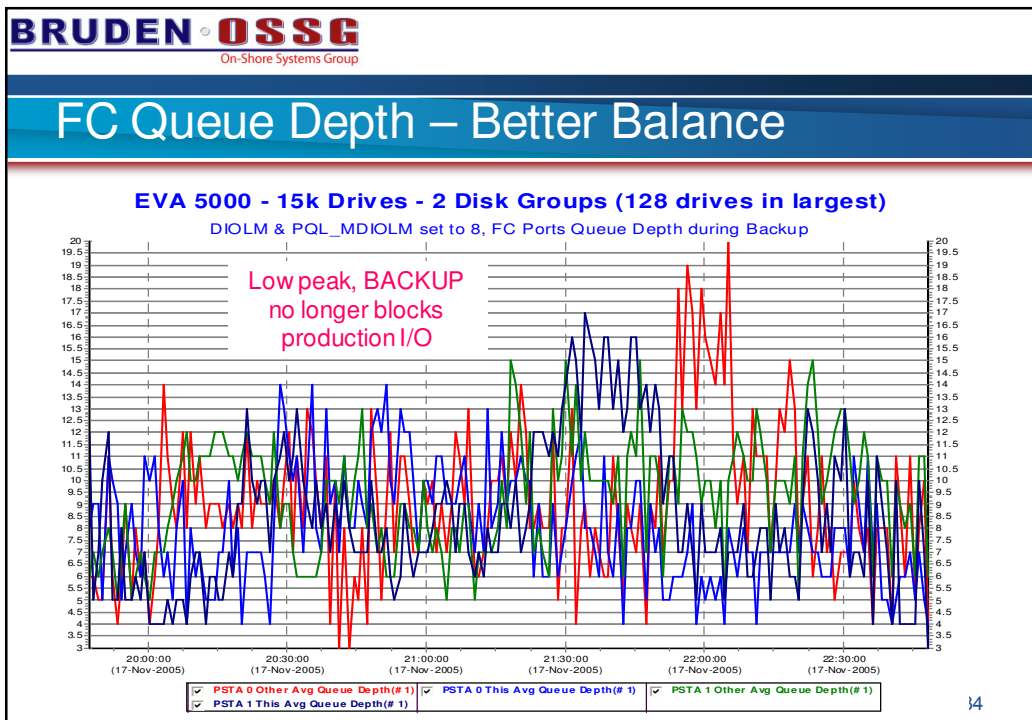
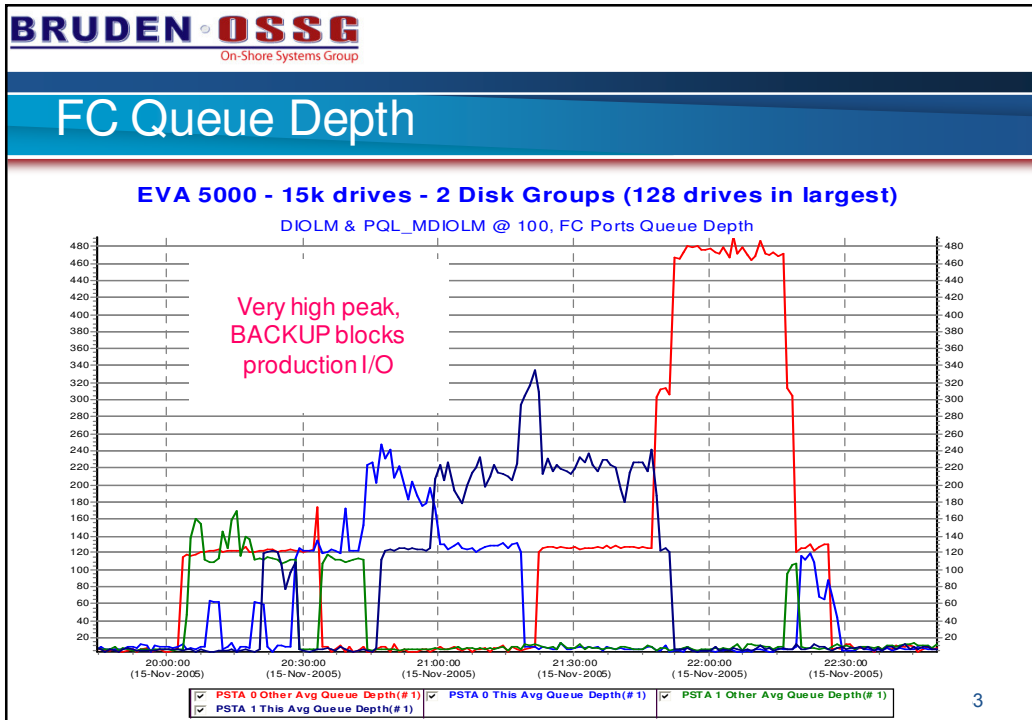
31

BRUDEN On-Shore Systems Group **OSSG**

Impact of DIOLM on Storage Arrays

- Customer's production environment experienced
 - Poor performance during BACKUP jobs
 - Using latest EVA VCS, Drive and HBA firmware
 - Using recommended DIOLM values of 100
- Recommended dropping DIOLM to only 8
 - After system startup
 - Set DIOLM on the BACKUP account to 8
 - Before BACKUP jobs set PQL_MDIOLM to 8
 - After BACKUP jobs return PQL_MDIOLM to 100
- Performance better by an order of magnitude !!

32

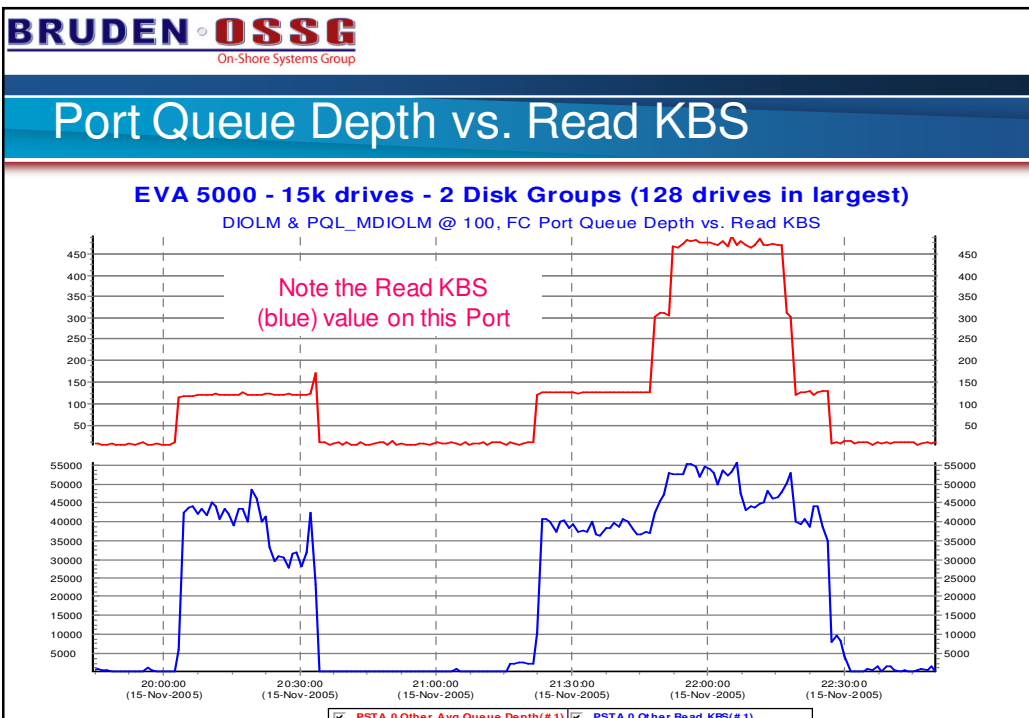


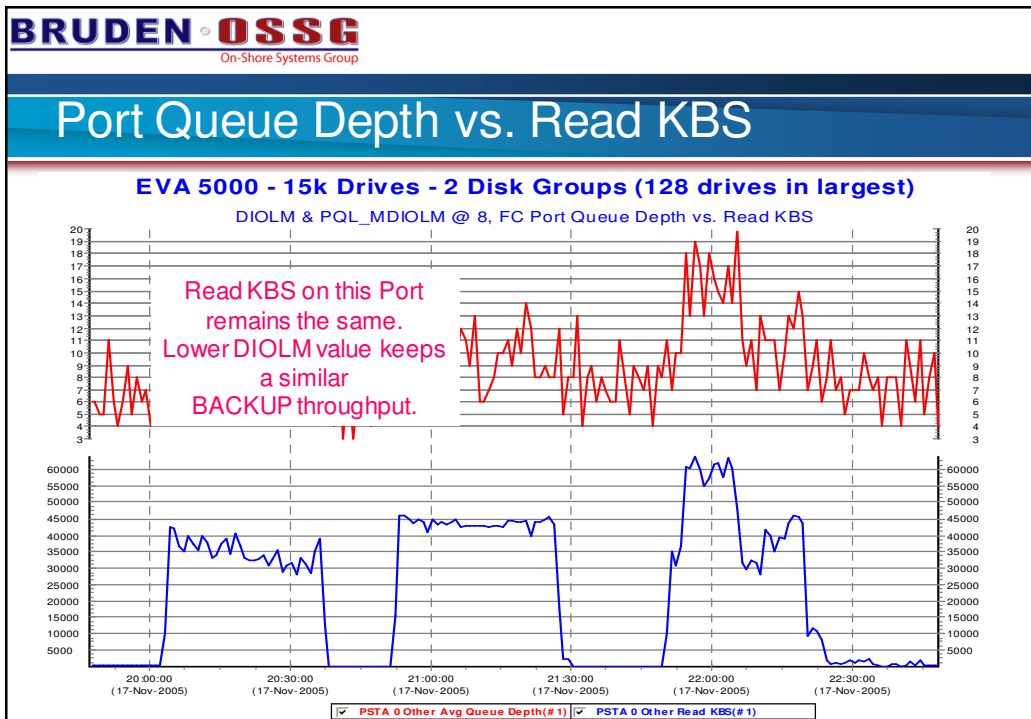
BRUDEN **OSSG**
On-Shore Systems Group

FC Queue Depth – Conclusions

- A SAN Storage Controller is a shared resource:
 - Production and backup often use the same
 - FC Ports
 - Cache
 - Back end
 - Heavy activity by one host can impact all hosts
 - Heavy queue on FC port delays I/O for other hosts
 - Heavy use of queue decreases cache effectiveness for all
 - Heavy back end usage decreases availability for all
- When possible, keep the FC Port Queue Depth as low as possible. DIOLM of 8 decreases demand, but keep tapes streaming.

35



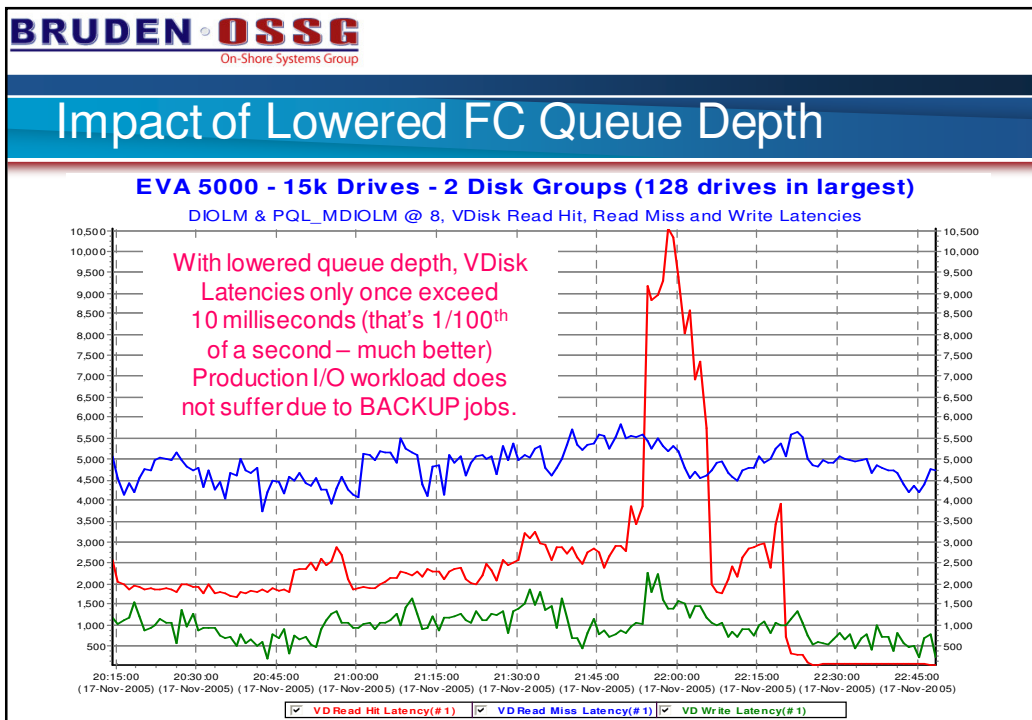
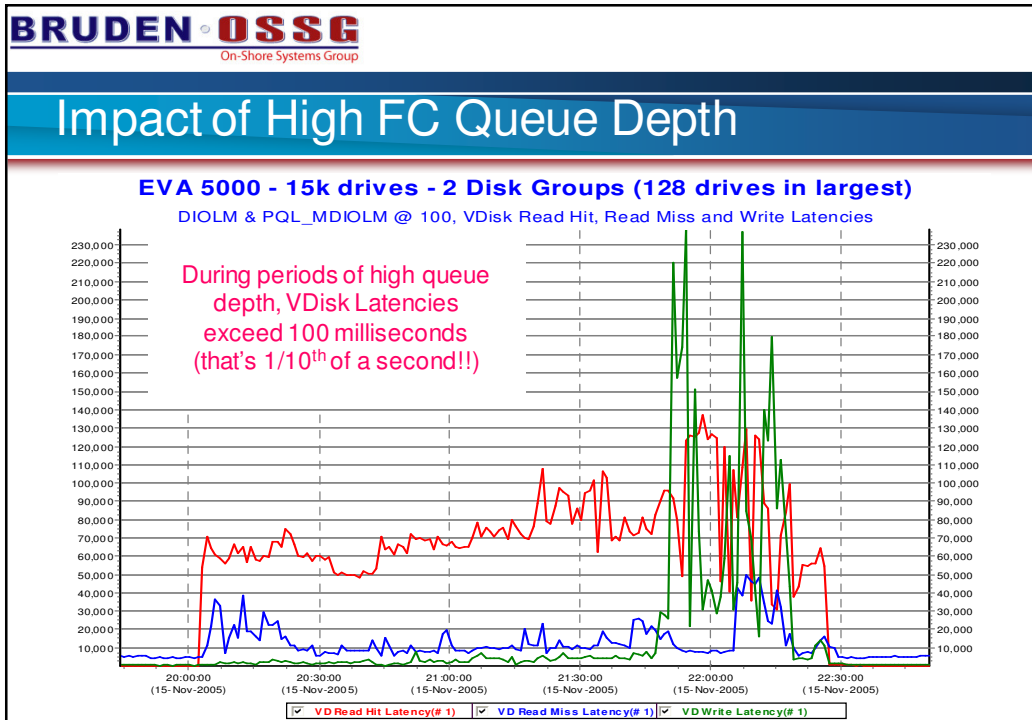


BRUDEN OSSG
On-Shore Systems Group

QDepth vs. Read KBS – Conclusions

- QDepth at DIOLM 8 is only 1/20th of the queue depth when DIOLM is set to 100.
 - DIOLM at 100 = QDepth of 400
 - DIOLM at 008 = QDepth of 020
- Yet, the Read KBS remains the same. OpenVMS does not issue all the I/Os at once. However, it can issue enough to keep the data moving at the same rate.
 - DIOLM at 100 = Read KBS at 40-50MB/sec
 - DIOLM at 008 = Read KBS at 40-50MB/sec

38



BRUDEN On-Shore Systems Group **OSSG**

VDisk Latencies – Conclusions

- Latencies with DIOLM at 8 stay below 10ms.
 - DIOLM at 100 = Latencies significantly exceed 100ms
 - DIOLM at 008 = Latencies stay below 10ms
- Read Miss Latency achieves an excellent 5ms
- Read Hit Latency achieves an outstanding 2.5ms
 - Some spikes as extra BACKUP jobs start
 - Even under added load, the latencies remain acceptable
- Write Latency stays at 1 ms.
 - Compare that to more than 200ms during peak when DIOLM was at 100.


41

BRUDEN On-Shore Systems Group **OSSG**

Disk Queue Load

- Something had to be done....
- *Old behavior*
 - *issue as much I/Os possible allowed by DIOLM*
 - *Continue issuing I/Os until we hit SS\$_EXQUOTA*
 - *Wait for I/Os to complete and flood the I/O subsystem again*
- *The New algorithm*
 - *Issue the disk reads in n parallel AST threads*
 - *The completion AST of each thread issues the next I/O*
 - *By default use 8 parallel I/O threads*
 - *Number of threads controlled by new /IO_LOAD qualifier*

42




Disk Queue Load

- Better performance
 - Idle EVA controller showed 15% reduction in elapsed time
 - Results are not linear – busy controllers will witness more significant (dramatic !) improvement
 - Direct attached SCSI disk showed ~5% improvement
 - YMMV

- RMS optimization when writing a save-set to disk
 - set the WBH & RAH bits

30% reduction in elapsed time

43



BACKUP & DVE

- OpenVMS V7.3-2 added Dynamic Volume Expansion (DVE) support
- Two new terms introduced: Logical Volume size and Expansion Volume size
- Controlled by the /SIZE & /LIMIT qualifiers to the INITIALIZE & SET VOLUME commands

```

Error count                0      Operations completed          8936
Owner process              "_VTAT7:"  Owner UIC                    [NPAR_BUILD]
Owner process ID          2817CDDC  Dev Prot                     S:RWPL,O:RWPL,G:R,W
Reference count           2
Current preferred CPU Id  0
Total size                33.91GB  Sectors per track            96
Total cylinders           7719      Tracks per cylinder           96
Logical Volume Size       2.38GB   Expansion Size Limit       190.96GB
Allocation class          5
  
```

44

BRUDEN On-Shore Systems Group **OSSG**

BACKUP & DVE

- BACKUP had no knowledge about DVE
 - DVE characteristics of a device were lost when image backup performed
- Customers had to manually set DVE characteristics (assuming they noticed it was lost ;-)
- BACKUP now fully supports DVE
 - VMS732_BACKUP-V0600

45

BRUDEN On-Shore Systems Group **OSSG**

BACKUP & DVE – Expansion size

- The volume expansion size is being recorded in the save-set header
- BACKUP/LIST displays the expansion size if it exists in the save-set
- When restoring a save-set (using /image) or performing disk-to-disk image backup, the target device inherits the expansion size limit of the input device
- New qualifiers
 - /IGNORE=LIMIT prevents the target device from inheriting the expansion size
 - /LIMIT=n added to allow overriding the expansion size stored in the save-set header
 - Corresponding to \$INIT/LIMIT

46

BRUDEN On-Shore Systems Group **OSSG**

BACKUP & DVE – Logical size

- By default logical size is not preserved
 - Restoring image backup of 4GB disk to a 36GB disk will only result in 4GB of usable disk space
- BACKUP/SIZE
 - Instructs BACKUP to preserve the logical volume size during a restore operation
- BACKUP/SIZE=n
 - Instructs BACKUP to initialize the target device to have a logical volume size of n

47

BRUDEN On-Shore Systems Group **OSSG**

BACKUP & DVE – the fine prints

- Did you know....
 - BACKUP/NOINIT initializes the target device...
 - Yes this is not a mistake !
- DVE characteristics will not be preserved if /NOINIT is specified
 - The target device is mounted foreign and we can't retrieve the logical volume size and the expansion size
 - Use /LIMIT & /SIZE if you must

```
IPL31> back IA64: [KITS] I64XB3X.BCK/sav dka100:/ima/noini
%BACKUP-I-LOGNOTPRES, logical volume size of volume DKA100: not preserved
%BACKUP-I-LIMITNOTPRES, expansion size limit of volume DKA100: not preserved
```

48

BRUDEN On-Shore Systems Group **OSSG**

Improved CTRL-T information

- Traditional CTRL-T information showed the name of the current file being saved/restored and the total number of save-set blocks processed

```
$ backup IA64:[KITS]I64XB37.BCK/sav $5$dka100:/ima
MIKAXP::_VTA61: 14:36:38 BACKUP    CPU=00:00:00.86 PF=908 IO=2192 MEM=256
Restoring file: $5$DKA100:[DWMOTIF_SUPPORT_I64XB37.KIT]HP.SI$COMPRESSED;1
Saveset volume:1, saveset block:266 (32256 byte blocks)
```

- Can you tell how much data restored so far?
- Can you tell when the restore will be done?
- Something had to be done...
- Introducing the new & improved CTRL-T**

49

BRUDEN On-Shore Systems Group **OSSG**

Improved CTRL-T information

```
IPL31::_VTAT7: 14:46:27 BACKUP    CPU=00:00:03.40 PF=6298 IO=18408 MEM=465
Restoring file: DKA100:[DWMOTIF_SUPPORT_I64XB37.KIT]HP.PCSI$COMPRESSED;1
Saveset volume:1, saveset block:720 (32256 byte blocks)
22.14MB restored out of 1.18GB, 1% completed
Restore rate: 965KB/sec, estimated completion time: 15:07:31.85
```

50

BRUDEN On-Shore Systems Group **OSSG**

Improved CTRL-T information

- Note the message says ESTIMATED !!!
- Fancy CTRL-T message displayed when
 - Restoring a saveset
 - Creating an image backup
 - Counters are updated when a file marked nobackup is encountered
- When the amount of data to be saved is unknown, only the rate and total amount of data processed so far is displayed
- CTRL-T can not be used in batch....and BACKUP is usually running in batch...

51

BRUDEN On-Shore Systems Group **OSSG**

BACKUP/PROGRESS_REPORT=n

- /PROGRESS_REPORTS writes CTRL-T style message to the output device every given interval
- n is the number of seconds between intervals

```
$ back IA64: [KITS]I64XB37.BCK/sav dka100:/ima/progress=10
%BACKUP-I-PROGRESS, progress report generated at  4-JAN-2006 15:00:54.47
Restoring file: DKA100:[DWMOTIF_SUPPORT_I64XB37.KIT]HP1.PCSI$COMPRESSED;1
Saveset volume:1, saveset block:170 (32256 byte blocks)
5.22MB restored out of 1.18GB, 0% completed
Restore rate: 535KB/sec, estimated completion time: 15:39:28.28
```

52

BRUDEN **OSSG**
On-Shore Systems Group

CRC

- Tape drives are getting faster...
 - Ultrium-960 can write @160 MB/sec
- BACKUP completes faster but during this time the CPU gets overloaded (calculating CRC)
 - 90% CPU utilization on DS25 writing to Ultrium-460 drive (@ 40MB/sec)
 - May impact the availability of other applications on the system

53

BRUDEN **OSSG**
On-Shore Systems Group

CRC

- Performance enhancement made to LIB\$CRC
 - 30% - 50% reduction in CPU consumption
 - ~50% increase in throughput

```

$ r crc2
500 buffers of size = 32768 bytes
lib$crc latency 228.6628 msec
Total bytes processed = 16384000
Rate = 68.3321 Mbytes/sec

$ r crc2
500 buffers of size = 32768 bytes
lib$crc latency 152.2836 msec
Total bytes processed = 16384000
Rate = 102.6046 Mbytes/sec

```

- This is a short term solution.....

54

BRUDEN On-Shore Systems Group **OSSG**

“lost” saveset attributes

- A saveset transferred using FTP or compressed and decompressed using ZIP will lose it's RMS attributes
- An attempt to process the saveset will fail
 - %BACKUP-F-NOTSAVESET
- Fortunately the correct RMS settings are stored in the saveset header
- Many procedures for fixing this are floating around.....and now....**drum roll please**..... BACKUP can do it out of the box

55

BRUDEN On-Shore Systems Group **OSSG**

BACKUP / REPAIR

- /REPAIR instructs BACKUP to attempt and restore the correct RMS attributes

```
$ backup images.bck/sav [.exes]/repair
%BACKUP-I-REPAIRED, saveset attributes changed to RFM=FIX, MRS=32256
IPL31::GUY 14:58:58 BACKUP    CPU=00:00:10.89 PF=7765 IO=71628 MEM=409
Restoring file: UPS$: [000000.EXES]BACKUPSHR.EXE;16
```

56

BRUDEN **OSSG**
On-Shore Systems Group


Misc. updates

- BACKUP\$_STARTVERIFY, STARTRECORD and STARTDELETE modified to include the current time
`%BACKUP-I-STARTVERIFY, starting verification pass at 4-JAN-2006 15:13:19.88`
- When performing image backup of 18GB disk, VAX will fail to generate a valid boot block on the target device
 - Occurs when VMB.EXE lives on LBN 16777216 (or higher)
 - Fix is available

57

BRUDEN **OSSG**
On-Shore Systems Group

Project X



58

BRUDEN On-Shore Systems Group **OSSG**

ZLIB

- Free
- Legally unencumbered
- May be included in commercial applications
- Lossless data compression library
- Never expands the data
- Unlike DCX may be used to compress stream of bytes
 - Does not need to analyze the file in advance
- Maximum compression factor 1:1000
 - 50MB file filled with zeros compressed to 49KB
 - Realistic numbers are in the range of 2:1 to 5:1
- <http://www.zlib.net>

59

BRUDEN On-Shore Systems Group **OSSG**

Compression support in BACKUP

- ZLIB routines are shipping in a new shareable image
 - SYS\$LIBRARY:COMPRESS\$SHR.EXE
 - SYS\$LIBRARY:COMPRESS\$SHR_EV6.EXE (alpha only)
- New qualifier - /DATA_FORMAT=COMPRESSED
 - Instructs BACKUP to create a compressed save-set
 - Does not need to be specified on the restore command
- Initially viewed as a feature to save space....but turned out to be a significant performance improvement

60

BRUDEN On-Shore Systems Group **OSSG**

Compression support in BACKUP

- The slower the I/O subsystem the bigger the performance win
 - Big win for network operations
 - Big win for MSCP served devices
 - doubles the CPU consumption
- On average BACKUP completes 2-5 times faster
- 800MB dump file was compressed to 75MB
- No support for writing compressed savesets to tapes
- Do not encrypt & compress.....at least for now

61

BRUDEN On-Shore Systems Group **OSSG**

Compression support in BACKUP

- Compressed save-sets have variable length records
 - Instead of fix
- First record is not compressed
 - Detect compressed savesets
 - Force largest record = value of /BLOCK_SIZE
- To fix attributes after file transfer
 - SET FILE X.CBCK/ATTRIB=(RFM=VAR,LRL=32256,MRS=32256)

62

```

BRUDEN On-Shore Systems Group OSSG

IPL31> dir cxx*.exe/siz=all

Directory SYS$COMMON: [SYSEXE]

CXX$COMPILER.EXE;1   39.68MB/39.68MB
CXX$DEMANGLE.EXE;1   41KB/42KB
CXX$LINK.EXE;1       166KB/166KB

Total of 3 files, 39.89MB/39.89MB

IPL31> backup cxx*.exe cxx.bck/sav/log
%BACKUP-W-NOFILES, no files selected from DSA5:[SYS0.] [SYSEXE]CXX*.EXE;*
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$COMPILER.EXE;1
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$DEMANGLE.EXE;1
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$LINK.EXE;1

IPL31> dir cxx.bck/siz

Directory SYS$SYSROOT: [SYSEXE]

CXX.BCK;1           44.60MB

Total of 1 file, 44.60MB

```

```

BRUDEN On-Shore Systems Group OSSG

IPL31> dir cxx*.exe/siz

Directory SYS$COMMON: [SYSEXE]

CXX$COMPILER.EXE;1   39.68MB
CXX$DEMANGLE.EXE;1   41KB
CXX$LINK.EXE;1       166KB

Total of 3 files, 39.89MB

IPL31> backup cxx*.exe cxx.cbck/sav/data=comp/log
%BACKUP-W-NOFILES, no files selected from DSA5:[SYS0.] [SYSEXE]CXX*.EXE;*
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$COMPILER.EXE;1
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$DEMANGLE.EXE;1
%BACKUP-S-COPIED, copied DSA5:[SYS0.SYSCOMMON.] [SYSEXE]CXX$LINK.EXE;1
%BACKUP-I-COMPRESS, data compressed by 66%

IPL31> dir cxx.cbck/siz

Directory SYS$SYSROOT: [SYSEXE]

CXX.CBCK;1           14.82MB

```

Compression support in action

BRUDEN **OSSG**
On-Shore Systems Group

Questions?

BRUDEN-OSSG thanks you for attending this session.

See us at www.BRUDENOSSG.com for:

- *Performance analysis*
 - *(Performance Results Or No Expense)*
- *Porting assistance*
- *Special OPS (OpenVMS Programming Services)*

65