DASD Performance

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DASD Reports and Analysis

Is disk performance a problem?

DASD I/O Overview, I/O Components

Cache Controllers

Tuning MDC

Tuning DASD Cache

Seek Analysis

Other Functions

Storage Processors

z/VM Virtual machine SIO Wait, Asynch IO Wait

- Rule of thumb? Greater than CPU Weight?

```
Report: ESAXACT      Transaction Delay Analysis
Monitor initialized: 05/31/16 at 00:00:00ial 2F5A7
-------------------------------------------------------------
                     <-----Percent non-dormant (Wait states)
UserID   <-Samples->                          .    Tst <Asynch>
/Class   Total  In Q Run Sim CPU SIO Pag . CF Idl I/O Pag Ldg
-------- ----- ----- --- --- --- --- --- .--- --- --- --- ---
00:15:00  1101  1987  11   0  35   0 1.2 .  0  52   0   .   .
Hi-Freq:  143K  120K  11 0.1  29 0.1 1.2 .  0  57 0.0 0.6 1.2
 ***Key User Analysis ***                 .
TCPIP      900   198 1.0 2.5 5.6   0   0 .  0  91   0   0   0
 ***User Class Analysis***                .
Servers   8100     1   0   0   0   0   0 .  0 100   0   0   0
Velocity  9358  1479 3.0 0.5 3.2 5.2 0.6 .  0  87   0   0   0
LDXmno    9000  9000  13 0.2  40   0 1.3 .  0  45 0.0 0.2 0.1
LDXecs   14400 14400  24 0.2  51   0 0.2 .  0  24   0 0.1 0.1
LDXcii    1800  1800 7.7   0  23   0  33 .  0  27 0.1 0.1 8.6
LDXfrm    7200  7200 3.4 0.0  33   0 0.6 .  0  62   0 0.3 0.6
LDXlfe    8100  8100  13 0.1  31   0 1.2 .  0  53   0 1.2 1.2
TheUsrs  20700 13994 4.4 0.1  21   0 0.7 .  0  71 0.0 0.5 2.1
```

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Linux I/O Wait – ESALNXS

- Rule of thumb? Comparable to steal? Total CPU?

```
Report: ESALNXS      LINUX VSI System Analysis Report                Velocity Sof
Monitor initialized: 05/30/17 at 02:00:00 on 2827 serial 0168A7    First record
-------------------------------------------------------------------------------
Node/    <---Load Numbers--> CPU <Processor Pct Util> NICE <CPU Overhead%> IO
Time     Users Procs MaxProc NBR Total Syst User Idle Time Krnl IRQ  Steal Wait
-------- ----- ----- ------- --- ----- ---- ---- ---- ---- ---- ---- ----- ----
02:01:00
L21EP        0   448       0 Tot  27.2 13.2  9.0 38.1    0  0.7  4.3 127.3  7.4
                             1  16.5  7.8  5.1  4.2    0  0.4  3.2  76.7  2.6
                             2  10.7  5.4  3.9 33.9    0  0.3  1.1  50.6  4.7
L212P        0   252       0 Tot  10.9  3.6  3.6 75.0    0  0.5  3.3   9.1  5.0
L218P        0   552       0 Tot  18.3  4.1 13.3 20.8    0  0.4  0.4  58.1  2.8
L22AP        0   440       0 Tot  18.3  4.6 12.6  114    0  0.6  0.5  63.1  5.0
                             1  11.4  2.6  8.0 45.0    0  0.3  0.4  40.4  3.2
                             2   7.0  2.0  4.6 68.7    0  0.3  0.1  22.6  1.7
L220P        0   248       0 Tot  31.5 10.8 14.2 23.5    0  0.4  6.2 140.9  4.1
                             1  16.4  6.1  5.2  6.4    0  0.3  4.8  76.4  0.8
                             2  15.1  4.7  9.0 17.1    0  0.1  1.4  64.5  3.3
L21EP        0   446       0 Tot  24.6 14.1  3.4 55.0    0  0.8  6.2 114.7  5.7
                             1  13.0  6.3  1.7 24.3    0  0.4  4.5  60.5  2.3
                             2  11.6  7.9  1.7 30.7    0  0.3  1.7  54.3  3.4
L258P        0   244       0 Tot  21.0  5.0 13.4  0.2    0  0.4  2.1  77.9  0.9
```

DASD

- ESADSD1 – Configuration
- ESADSD2 – Disk Performance
- ESADSD6 – Disk Performance extended

DASD Cache

- ESADSDC – DASD Cache configuration
- ESADSD5 – DASD Cache performance

Channels

- ESACHNC – Channel configuration
- ESACHAN – Channel Performance
- ESACHNH – Hypersockets
- ESAQDIO,ESAQDIO2 – Queued I/O analysis
- ESAIOP – I/O Processor (SAP)

Seek Analysis

- ESASEEK – Seeks by minidisk
- ESAUSEK – Seeks by user

ESADSD1 show configuration, known information

```
Report: ESADSD1      DASD Configuration                              Linux Test
Monitor initialized: 05/06/08 at 12:00:00 on 2094 serial AEA7D       First record analyze
Monitor period:         3600 seconds (   1:00:00)                    Last record:
-------------------------------------------------------------------------------------
 Dev Sys          Device    <CHPIDS OnLn><-Cntrl Unit-> UserID   MDisk <----Extent---->
 No. ID   Serial Type   SHR 01 02 03 04 OBR/CU Model   (if ded) Links Type  Start Size
---- ---- ------ ------ --- -- -- -- -- ------ ------- -------- ----- ----- ----- ----
C557 6177 LNXP5F 3390-9 YES 48 49 76 87  35/00 2105                 0 Page      0  10K
                            95 96 D6 5A
C558 6178 LNXP55 3390-9 YES 48 49 76 87  35/00 2105                 0 Page      0  10K
                            95 96 D6 5A

 Report: ESADSD1      DASD Configuration            ESAMAP 3.7.4 06/06/08  Pg  2815
 Monitor initialized: 05/06/08 at 12:00:0ed: 05/06/08 12:00:00
 Monitor period:         3600 seconds (      05/06/08 13:00:00
 ------------------------------------------------------------------------------
  Dev Sys          Device    <CHPIDS OnLn> . <--MDC Status--> <3990 Cache Status> PAV
  No. ID   Serial Type   SHR 01 02 03 04  . Elig Def Now Shr Actv DFW NVS STGID  Base
 ---- ---- ------ ------ --- -- -- -- --  . ---- --- --- --- ---- --- --- -----  ----
 C557 6177 LNXP5F 3390-9 YES 48 49 76 87  .  Yes Off   . Yes  Yes  On  On  9C50
                            95 96 D6 5A  .
 C558 6178 LNXP55 3390-9 YES 48 49 76 87  .  Yes Off   . Yes  Yes  On  On  9C50 .
                            95 96 D6 5A  .
```

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ESADSD2 provides

- **Interval top dasd**
- **Interval control unit**
- **Summary - everything**

```
Report: ESADSD2      DASD Performance Analysis                    Velocity Software            ESAMAP
Monitor initialized: 05/22/08 at 14:00:00 on 2084 serial 15BAF    First record analyzed: 05/22/08 14:0
-------------------------------------------------------------------------------------------------------
                                                          <--------DASD Response times (ms)------>
 Dev        Device <--SSCH--> <%DevBusy> <SSCH/sec->       <--Service times--> <--Queueing-> QLengths
 No. Serial Type   Total  ERP  Avg  Peak   avg  peak  Resp  Serv Pend Disc Conn DASD Cntl THR  avg max
---- ------ ------ ------ ---  ---- ---- ----- ----- -----  ---- ---- ---- ---- ---- ---- --- ---- ---

14:01:00
***Top DASD by Device busy***
0C51 VME090 3390-3   8795   0   8.5  8.5 146.6 146.6   0.6   0.6  0.2  0.0  0.3    0  0.0   0    0   0
0B6E VME106 3390-3   7858   0   8.4  8.4 131.0 131.0   0.6   0.6  0.2  0.0  0.4    0    0   0    0   0
0E78 VME089 3390-3   4186   0   8.1  8.1  69.8  69.8   1.2   1.2  0.3  0.4  0.5    0    0   0    0   0
0E71 VME067 3390-3    989   0   7.5  7.5  16.5  16.5   4.6   4.6  0.4  3.3  0.9    0    0   0    0
0***End Top DASD by Device busy***

0509 Control Unit    4166   0   0.1  0.1  69.4  69.4   1.2   1.2  0.3  0.2  0.6    0    0   0    0   0

0B00 Control Unit    8716   0   0.1  0.1 145.3 145.3   0.7   0.7  0.3  0.1  0.4    0    0   0    0   0
                    ------ ---  ---- ---- ----- ----- -----  ---- ---- ---- ---- ---- ---- --- ---- ---
System:             32137   0   0.1  0.1 535.6 535.6   1.0   1.0  0.3  0.3  0.5    0  0.0   0    0   0
```

ESADSD5 provides cache statistics

- **Read/Hit depends on cache size and locality of reference**
- **Write/Hit depends on NVS (Persistent Memory)**
- **NVS Full, Cache Inhibit, Cache Bypass are not good.**

```
Report: ESADSD5      3990-3 Cache Analysis                          Velocity Software            ESAMAP 3.7.4 05
Monitor initialized: 05/22/08 at 14:00:00 on 2084 serial 15BAF     First record analyzed: 05/22/08 14:00:00
-------------------------------------------------------------------------------------------------------------------
            Pct. <------------------per second------------------> <--------Write activity per second-------->
 Dev        Actv <------Total-------> <----Read----> <--Seq Read--> Total  DFW  DFW SEQ        NVS <--Cache--->
 No.  Serial Samp  I/O Hits Hit% Read%  I/O Hits Hit%  I/O Hits Hit%   I/O  I/O Hits  I/O Hit% Full Inhib Bypass
---- ------ ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ----- ------
14:01:00
***Top DASD by Device busy***
0C51  VME090  100  172  172  100 100.0 64.6 64.6  100  108  108  100     0    0    0    0    0    0     0      0
0B6E  VME106  100  131  131  100 100.0  100  100  100 31.3 31.3  100     0    0    0    0    0    0     0      0
0E78  VME089  100 74.0 72.2 97.6  97.9 58.4 56.7 97.1 14.0 13.9 99.3   1.5  1.5  1.5  1.5  100    0     0      0

***End Top DASD by Device busy***

0509 CtlUnit  100 1106 1052 95.1  92.9  283  231 81.5  744  743  100  78.5 77.8 77.8 23.0 99.1    0     0      0
0B00 CtlUnit  100  518  489 94.5  94.9  341  313 91.7  150  150  100  26.6 26.2 26.2  1.8 98.5    0     0      0
0C00 CtlUnit  100  233  230 98.7  91.7 88.5 88.5  100  125  124 99.1  19.4 17.4 17.4  4.8 89.9    0     0      0
0D00 CtlUnit  100  127  110 86.6  64.8 80.9 65.0 80.3  1.5  1.4 96.6  44.7 43.7 43.7  3.2 97.7    0     0      0
0E00 CtlUnit  100  316  294 93.1  48.8  139  125 90.3 15.6 15.5 99.2 161.7  153  153  103 94.8    0     0      0
---- ------ ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ----- ------
System:       100 2332 2206 94.6  84.8  941  831 88.3 1036 1034  100 355.1  341  341  152 96.0    0     0      0
-------------------------------------------------------------------------------------------------------------------
```

Disk Performance history

Assumptions and rules of thumb based on technology:

DASD Assumptions on what is “good”:

- 3350 (1978): 30ms
- 3380 (1983): 20 ms
- 3380J/K (1986): 18ms
- 3390 (1990): 15ms
- Ibmdrive(2012): (73gb, 5ms)
- 600gb 15,000 rpm, 3.5ms seek, 2ms rotation)

DASD Cached Assumptions

- 3880-23 (1982), 3380: 15ms
- 3390-1 (1988), 3390, gray cable: 10ms
- 3390-3 (1995), ESCON: 5ms
- 3390-9 (2001), FICON: 2ms
- “3390” (2009) sub 1ms

Assumptions keep changing – FCP “not measureable”

Note change in response time, explain?

```
Report: ESADSD2      DASD Performance Analysis                    Linux Test
------------------------------------------------------------------------------
                                                        <--------DASD Response time
 Dev        Device <--SSCH--> <%DevBusy> <SSCH/sec->        <--Service times-->
 No. Serial Type   Total  ERP  Avg  Peak   avg  peak  Resp  Serv Pend Disc Conn
---- ------ ------ ------ ---  ---- ---- ----- ----- -----  ---- ---- ---- ----
14:24:00
***Top DASD by Device busy***
F68E VS2P12 3390-3    594   0  11.3 11.3  10.1  10.1  11.3  11.3  0.3  0.0 11.0
F490 VS2P11 3390-3    617   0  11.1 11.1  10.5  10.5  10.6  10.6  0.5  0.0 10.1
F49A VS2P71 3390-3    572   0  10.3 10.3   9.7   9.7  10.6  10.6  0.2  0.0 10.3
F38F VS2P39 3390-3    558   0  10.1 10.1   9.5   9.5  10.6  10.6  0.2  0.2 10.2
F1A0 VS2P97 3390-3    542   0   9.9  9.9   9.2   9.2  10.8  10.8  0.2  0.2 10.3
F78E VS2P40 3390-3    530   0   9.8  9.8   9.0   9.0  10.9  10.9  0.3  0.0 10.7
F3A7 VS2PAC 3390-3    600   0   9.7  9.7  10.2  10.2   9.5   9.5  0.3  0.0  9.2
F79A VS2P74 3390-3    531   0   9.7  9.7   9.0   9.0  10.7  10.7  0.2  0.3 10.2
F6A6 VS2PA7 3390-3    504   0   9.5  9.5   8.5   8.5  11.2  11.2  0.3  0.0 10.9
***End Top DASD by Device busy***
------------------------------------------------------------------------------
14:25:00
***Top DASD by Device busy***
F68E VS2P12 3390-3    316   0  74.2 74.2   5.4   5.4 138.5   139  0.3  127 10.7
F78E VS2P40 3390-3    353   0  74.2 74.2   6.0   6.0 123.9   124  0.3  112 11.3
F3A7 VS2PAC 3390-3    368   0  59.7 59.7   6.2   6.2  95.7  95.7  0.3 83.2 12.1
F491 VS2P15 3390-3    325   0  51.5 51.5   5.5   5.5  93.6  93.6  0.3 81.1 12.2
F6A6 VS2PA7 3390-3    316   0  39.7 39.7   5.4   5.4  74.1  74.1  0.3 60.3 13.5
F5A8 VS2PB6 3390-3    322   0  38.5 38.5   5.5   5.5  70.5  70.5  0.3 57.9 12.4
F795 VS2P56 3390-3    325   0  37.5 37.5   5.5   5.5  68.0  68.1  0.3 52.7 15.0
F39A VS2P70 3390-3    337   0  36.9 36.9   5.7   5.7  64.6  64.7  0.3 52.0 12.4
F38F VS2P39 3390-3    356   0  36.9 36.9   6.0   6.0  61.2  61.2  0.3 49.2 11.6
***End Top DASD by Device busy***                                             -
```

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The “dasd cache”

```
Report:     3990-3 Cache Analysis            inux Test                      ES
Monitor ed: 06/02/07 at 13:00:00 on 2094 seriirst record analyzed: 06/02/07
-------------------------------------------------------------------------------
         <------------------per second------ <--------Write activity per se
 Dev     <------Total-------> <----Read----->  Total  DFW  DFW SEQ        NVS
 No.  Se  I/O Hits Hit% Read%  I/O Hits Hit%    I/O  I/O Hits  I/O Hit% Full
----  -- ---- ---- ---- ----- ---- ---- ----  ----- ---- ---- ---- ---- ----
System:  2325 1527 65.7  65.3 1519  721 47.5  806.0 1724  806    0  100    0
System:  2719 1723 63.4  67.0 1822  827 45.4  896.7 1910  896    0  100    0
System:  2498 1626 65.1  65.6 1639  767 46.8  859.2 1842  859    0  100    0
System:  2238 1504 67.2  65.1 1458  724 49.7  780.6 1667  781    0  100    0
System:  3057 2126 69.6  57.9 1771  840 47.5   1286 2704 1286    0  100    0
System:  2934 2013 68.6  63.3 1857  937 50.4   1076 2264 1076    0  100    0
System:  2383 1677 70.4  65.4 1558  852 54.7  824.8 3964  825    0  100    0
System:  1846 1268 68.7  62.1 1147  569 49.6  699.4 5423  699    0  100  274 <==== 14:26
System:  1358  934 68.8  58.2  791  368 46.5  567.4 5047  567    0  100 1035
System:  1165  763 65.5  59.1  688  289 42.0  476.3 4753  474    0 99.4 1091
System:  1269  764 60.2  63.1  800  298 37.2  468.7 4255  467    0  100 1520
System:  1230  702 57.1  66.8  822  296 36.0  408.2 3684  406    0 99.4 1807
System:  1160  661 56.9  66.1  766  270 35.2  393.9 3198  391    0 99.2 2391
System:  1218  678 55.7  66.8  813  278 34.2  404.4 3228  400    0 99.0 2397
System:  1107  615 55.6  65.8  729  242 33.2  378.1 3153  373    0 98.6 2377
System:  1134  650 57.3  64.1  726  248 34.2  407.5 3214  402    0 98.6 2384
System:  3192 1751 54.9  73.5 2346  905 38.6  846.0 1864  846    0  100  106
System:  5660 2720 48.1  86.5 4899 1959 40.0  762.1 1605  761    0  100  5.2
System:  4454 2246 50.4  82.0 3651 1444 39.5  802.9 1732  802    0  100 54.8
```

Flags?

14:26, dasd cache?

What really happened?

- NVS filled up, writes go to disk (Takes a LONG time)
- Disks become highly utilized, everything slows down

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ECKD DASD I/O Components

PEND Time

- CPU Channel Connection
- Protocol (IO Processor)

Disconnect Time (dependent on cache, channels)

- Rotational Delay (not in cache)
- Seek time (not in cache)
- (Internal controller contention)

Connect Time

- Transmission time

Queue Time (dependent on pav)

- Control Unit
- Device
- Throttle

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Model: Response Time

DASD Response Time

= Service time + Queue Time

DASD Service Time

= (Pend + DISC + CONN)

Device Busy = rate * service time

DASD Response Time (MM1)

= (Service time) / (1 – Device Busy)

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Model: Service Time

Service Time

= (Pend + DISC + CONN)

DISCONNECT Time (Cache, XA Channels)

= (Rotational Delay + Seek + RPS Miss + Internal contention)

Connect Time (Faster channels)

= DataSize / DataRate

Pend (IO Processor, control unit contention)

= Protocol / (1 - Channel Utilization)

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DASD I/O Enhancements

Cache

- Read only (3880-23, 1980)
- Write with non-volatile cache (8mb, 1985)
- Large Write cache (GB, 1990)
- On board cache (device level)
- MDC
- RAID

Channels

- VM/XA Multiple Channels
- Grey Cables, 3390 (4.5mb/sec)
- XA Channels
- Escon (17mb/sec, 1995)
- Ficon (110mb/sec, 2003)
- Ficon Express (200/400 mb/sec) 2005/2007
- PAV (z/VM 5.2)
- HyperPav, FCX….

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Model: RPS Miss, XA

VM/XA allowed multiple channels to access same device

If 1st channel busy, try 2nd, and so on

Architecture supports up to 16 channels

Four channels should be considered minimum

Some controllers (IBM 6800) do not support dynamic reconnect

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Model: RPS Miss, XA

RPS Miss (3380, XA)

- 17ms * (1 / (1 – ChanUtil*ChanUtil))

RPS Miss Times – 20% Channel Util

- Two channels: 17ms * (1 /(1 - .04)) – 17 = .4ms

Channel Utilization can be higher when more channels (This used to matter)

Channel	RPS MISS TIME (3380)		
BUSy	1 Chan	2 Chan	4 Chan
20%	4ms	.7ms	0ms
40%	11ms	3ms	.4ms
60%	25ms	9ms	2ms
80%	68ms	30ms	12ms

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Model: RPS Miss, Cache

Cache reduces “Hardware” DISConnect Time

DISConnect (non-cache)

= (Rotational Delay + Seek + RPS Miss)

DISConnect (cache)

= (Rotational Delay + Seek + RPS Miss)
* (CacheMiss / CacheTotal)

Rotational Delay + Seek with cache

= (17ms / 2 + 7ms) * (CacheMiss / CacheTotal)

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Block sizes vary and impact assumptions

- 4K I/O
- MDC does full track I/O
- Linux does 4k I/O
- Linux can chain 1024 I/O

Storage “Control Units”

- Raid
- Storage Processors
- Multiple Internal Paths
- Logical Volumes vs Physical Volumes

PAV (2000)

- Z/OS Guest
- Linux Guest, dedicated devices

Linux

- LVM

Subchannel Measurement Block

- Pend
- Connect
- Disc

Seek Analysis

- Seek by cylinder
- Seek by minidisk
- Seek by user

Channels

- VM Sample
- FICON

Channel Measurements

Old Style

- Sampled by CP
- Measured by Channel

Utilization Sampled at Hifrequency rate, example is 6 second sample

LPAR is total for all LPARs, measured.

```
Report: ESACHAN      Chann
Monitor initialized: 01/11
--------------------------
           <Pct Channel>
   Time/    Utilization
CHPID    LPAR Total  Shrd
-------- ---- -----  ----
         16:26:00
26        28.3  10.0    No
27        27.7  20.0    No
2E        27.8  50.0    No
42         6.4  20.0    No
60        12.3  10.0    No
64        11.9  10.0    No
65        10.1  10.0    No
C2        11.7  20.0    No
D3         2.1  20.0    No
D6        28.2  40.0    No
D7        28.3  30.0    No
DD        28.1  20.0    No
DE        28.1  40.0    No
E8        10.1  10.0    No
E9        11.2  10.0    No
EC        10.2     0    No
ED        10.8  20.0    No
   -------- ---- -----
   System:   337 370.0
```

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Channel Measurements

New Style (z/VM 3.1)

- Sampled by CP (TOTAL)
- Measured by Channel (LPAR)
- What is Channel Utilization?
- (EMIF)

```
Report: ESACHAN      Channel Performance Analysis                  Velocit
Monitor initialized: 06/30/03 at 13:21:34 on 2064 serial 5146B     First r
--------------------------------------------------------------------------
         <Pct Channel>             <--------------Data Units ----------->
 Time/    Utilization       Chanl  <---Reads/Second--> <--Writes/Second-->
 CHPID    LPAR Total   Shrd Type   LPAR TOTAL Pct  Max LPAR TOTAL pct  MAX
 -------- ---- -----   ---- -----  ---- ----- --- ---- ---- ----- --- ----
                                  13:31:53
                       16        5.1  14.4   Yes ESCON
                       18        9.9  18.3   Yes ESCON
                       20        3.9  19.4   Yes ESCON
                       25        5.3  12.2   Yes ESCON
                       27       10.3  10.6   Yes ESCON
                       30        3.7  16.1   Yes ESCON
                       34        5.3  12.8   Yes ESCON
                       36       10.0  14.4   Yes ESCON
                       43        5.1  15.6   Yes ESCON
                       45       10.4  15.6   Yes ESCON
                       52        5.6  20.0   Yes ESCON
                       53        1.9  31.1   Yes ESCON
                       54       10.0  14.4   Yes ESCON
                       63       10.4  14.4   Yes ESCON
                       70        5.3  10.6   Yes ESCON
                       71          .  11.7   Yes ESCON
                       72        9.8  15.0   Yes ESCON
                       77       18.1  21.7   Yes ESCON
                       7F        5.3  18.9   Yes ESCON
                       90       10.2  15.0   Yes ESCON
                       98        4.1  15.0   Yes ESCON
                       9D       53.6  56.7   Yes ESCON
                       A8        4.5  17.8   Yes ESCON
                       B4       16.4  19.4   Yes ESCON
                             -------- ---- -----
```

Channel Utilization not obvious

- One fibre for read
- One fibre for write
- Data unit processing
- Channel Bus

- Channel balancing takes planning

New Style (z/VM 3.1)

- Sampled by CP
- Measured by Channel, data / second
- What is Channel Utilization?

```
Report: ESACHAN      Channel Performance Analysis                Linux T
Monitor initialized: 05/09/03 at 10:53:54 on 2064 serial 31539     First r
---------------------------------------------------------------------------
         <Pct Channel>              <---------------Data Units ------------>
 Time/    Utilization         Chanl <---Reads/Second--> <--Writes/Second-->
 CHPID    LPAR Total   Shrd Type    LPAR TOTAL Pct  Max LPAR TOTAL pct  MAX
 -------- ---- -----   ---- -----   ---- ----- --- ---- ---- ----- --- ----
                                    10:54:33
 02        0.2   3.0    Yes FICON      0     0   0  82K    0     0   0  82K
 03        0.2   3.0    Yes FICON      0     0   0  82K    0     0   0  82K
 04          .   3.0    Yes FICON      0     0   0  82K    0     0   0  82K
 C0          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 C1          .  12.3    Yes FICON      0     0   0  82K    0     0   0  82K
 C2          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 C3          .  12.3    Yes FICON      0     0   0  82K    0     0   0  82K
 C9       12.9  12.9    Yes FICON    28K 27550  24 117K   55    55 0.0 117K
 CC          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 CD          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 CE          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 CF          .  12.2    Yes FICON      0     0   0  82K    0     0   0  82K
 F4        1.3   3.9    Yes FICON      0     0   0  82K    0     0   0  82K
 F5        3.7   3.9    Yes FICON      1     1 0.0  82K    1     1 0.0  82K
 F6          .   3.9    Yes FICON      0     0   0  82K    0     0   0  82K
 F7          .   3.9    Yes FICON      0     0 0.0  82K    0     0   0  82K
                      -------- ---- ----- ----
                        System:   20.8  142.5
```

New Style

- Sampled by CP
- Measured by Channel, work per second
- What is Channel Utilization?

```
Report: ESACHAN      Channel Perest                    ESAMAP 3.3.0 Monitor
    initialized: 05/09/03 atecord analyzed: 05/09/03 10:54:03
-------------------------------------------------------------------------------
        <Pct Channel>              <----Work Unit---->  <-Bus Cycles>  Bytes
Time/    Utilization       Chanl   <-Rates / Second-->  <-per Second>  /Data
CHPID    LPAR Total  Shrd Type    LPAR TOTAL Pct  MAX   Used pct  Max   Unit
-------- ---- -----  ---- -----   ---- ----- --- ----   ---- --- ----  -----
10:54:33
02        0.2   3.0   Yes FICON     33   495 3.0  16K   1376 8.5  16K   1024
03        0.2   3.0   Yes FICON     31   495 3.0  16K   1290 7.9  16K   1024
04          .   3.0   Yes FICON      0   495 3.0  16K   1376 8.5  16K   1024
C0          .  12.2   Yes FICON      0  1993  12  16K   1440 8.8  16K   1024
C1          .  12.3   Yes FICON      0  1994  12  16K   1440 8.8  16K   1024
C2          .  12.2   Yes FICON      0  1992  12  16K   1441 8.9  16K   1024
C3          .  12.3   Yes FICON      0  1994  12  16K   1439 8.8  16K   1024
C9       12.9  12.9   Yes FICON    17K 16811  13 130K    10K  16  65K   1024
CC          .  12.2   Yes FICON      0  1993  12  16K   1345 8.3  16K   1024
CD          .  12.2   Yes FICON      0  1993  12  16K   1440 8.9  16K   1024
CE          .  12.2   Yes FICON      0  1993  12  16K   1344 8.3  16K   1024
CF          .  12.2   Yes FICON      0  1993  12  16K   1440 8.9  16K   1024
F4        1.3   3.9   Yes FICON    212   636 3.9  16K   2464  15  16K   1024
F5        3.7   3.9   Yes FICON    596   638 3.9  16K   2304  14  16K   1024
F6          .   3.9   Yes FICON      0   636 3.9  16K   2463  15  16K   1024
F7          .   3.9   Yes FICON      0   635 3.9  16K   2465  15  16K   1024
--------  ----  -----  ----
System:   20.8  142.5
```

VELOCITY SOFTWARE

Ficon Channel Measurements

New Style

- Channels are defined

```
Report: ESACHAN      Channel Performance Analysis                Linux
------------------------------------------------------------------------
        <Pct Channel>                   <----------------Data Units -------
Time/    Utilization      Channel       <---Reads/Second---> <--Writes/Sec
CHPID    LPAR Total  Shrd Class/Type    LPAR  TOTAL Pct  Max  LPAR  TOTAL p
-------- ---- -----  ---- ----------    ----- ----- --- ----  ----- ----- -
12:01:00
48        0.3   8.5   Yes FICON/FCS      36  7872 6.7 117K    294  2228 1
49        0.3   8.4   Yes FICON/FCS      35  7827 6.7 117K    315  2127 1
5A        0.4  11.6   Yes FICON/FCS      53 10570 5.4 195K    441  3312 1
76        0.3   8.5   Yes FICON/FCS      30  7984 6.8 117K    267  2284 1
87        0.3   8.4   Yes FICON/FCS      32  7568 6.5 117K    285  2078 1
95        0.5  12.6   Yes FICON/FCS      57 11393 5.8 195K    455  3583 1
96        0.5  12.4   Yes FICON/FCS      58 11495 5.9 195K    471  3466 1
D6        0.4  11.9   Yes FICON/FCS      52 11192 5.7 195K    471  3303 1
```

```
Report: ESADSD1      DASD Configuration                               Linux test
-------------------------------------------------------------------------------------
 Dev Sys         Device     <CHPIDS OnLn><-Cntrl Unit-> UserID    MDisk <----Extent---->
 No. ID   Serial Type   SHR 01 02 03 04 OBR/CU Model    (if ded) Links Type   Start Size
---- ---- ------ ------ --- -- -- -- -- ------ -------  -------- ----- -----  ----- ----
C557 6177 LNXP5F 3390-9 YES 48 49 76 87  35/00 2105                     0 Page      0  10K
                            95 96 D6 5A
C558 6178 LNXP55 3390-9 YES 48 49 76 87  35/00 2105                     0 Page      0  10K
                            95 96 D6 5A
C559 6179 LNXP56 3390-9 YES 48 49 76 87  35/00 2105                     0 Page      0  10K
                            95 96 D6 5A
C55A 617A LXPC22 3390-9 YES 48 49 76 87  35/00 2105                     0     .     .    .
                            95 96 D6 5A
C55B 617B LNXP57 3390-9 YES 48 49 76 87  35/00 2105                     0 Page      0  10K
                            95 96 D6 5A
C55C 617C LNXP58 3390-9 YES 48 49 76 87  35/00 2105                     0 Page      0  10K
                            95 96 D6 5A
```

New Channel reporting

- Specific channel type now reported:

```
class type description
CTC   CTC Channel-to-channel
CTC   CTP Channel-to-channel point-to-point
CTC   CTS Channel-to-channel swt-point-to-point
ESCON CBY Fiber extended (byte pacer)
ESCON CNC Serial-channel-path
ESCON CNP Serial-point-to-point channel
ESCON CNS Serial-switched-point-to-point channel
ESCON CVC Fiber extended (block pacer)
ESCON DSD Direct-system-device channel
ESCON EIO Emulated I/O channel
ESCON FCV Fibre-channel converted channel FCV
ESCON ISD Internal-system-device-channel
FCP   FCP Fibre-channel-protocol channel FCP
FICON FC  Fibre-channel point-to-point channel FC
FICON FC? Fibre channel
FICON FCS Fibre-channel switched channel
HIPER IQD Internal-queued-direct-communication channel IQD
OSA   OSA Open-Systems-adapter channel
OSA   OSC OSA 3270-console (OSC) channel
OSA   OSD Open-Systems-Adapter Direct-Express (OSD) channel
OSA   OSE Open-Systems-Adapter Express (OSE) channel
OSA   OSN OSA NCP (OSN) channel
PAR   BL  Reserved, no longer valid, previously Parallel-block
PAR   BY  Reserved, no longer valid, previously Parallel-byte
```

VELOCITY SOFTWARE

Determine potential problems: Top dasd

What is caching characteristic? (no disc time?)

What could be done to enhance?

```
Report: ESADSD2    DASD Performance Analysis                Velocity Software,
Monitor initialized at 16:24:57 on 9021 serial 42105        First record analy
-------------------------------------------------------------------------------
                                                <--------DASD Response times (ms
 Dev         Device   <%DevBusy> <SSCH/sec->          <--Service times--> <--Qu
 No. Serial Type       Avg  Peak   avg  peak  Resp   Serv Pend Disc Conn DASD
---- ------ ------     ---- ---- ----- ----- -----   ---- ---- ---- ---- ----
16:26:00
***Top DASD by Device busy
DE0E VM984F 3390-3    97.9 96.3 403.6 396.9   5.4    2.4  0.4  0.0  2.0  3.0
D2F1 VM9C1B 3390-3    38.2 37.6  47.6  46.8   8.0    8.0  0.3  5.3  2.5    0
DE51 VMD11E 3390-3    32.8 32.3  66.6  65.4   4.9    4.9  0.3  0.2  4.4    0
D2EC VM9C16 3390-3    27.9 27.4  59.7  58.8   4.7    4.7  0.3  0.4  4.0    0
D786 VMSPL1 3390-3    25.0 24.6  91.2  89.7   2.7    2.7  1.8  0.1  0.9    0
DE1F VM9860 3390-3    21.4 21.1  30.2  29.7   7.1    7.1  0.3  0.1  6.7    0
D787 VMSPL2 3390-3    18.2 17.9  66.6  65.5   2.7    2.7  1.7  0.1  0.9    0
D2C7 VM9C02 3390-3    17.3 17.0  23.3  22.9   7.4    7.4  0.3  4.6  2.5    0
D2CB VM9C00 3390-3    10.7 10.5  18.6  18.3   5.7    5.7  0.3  0.5  5.0    0
DE4E VMD11B 3390-3    10.6 10.4  18.7  18.4   5.7    5.7  0.3  0.5  4.9    0
***End Top DASD by device busy***
```

Evaluate cache controller configuration

Each controller has Device Address and Identifier

Size of cache, non-volatile cache shown

```
Report: ESADSDC      Cache Control Unit Configuration     Velocity Software, Inc.  ESAMAP 3.4.0
-------------------------------------------------------------------------------------------
<--Control-->  <-Storage--> <-Cache Storage in MB> <Non-volatile> Cache
<---Unit---->  <-Director->             Off  Not    Storage (MB)  Fast   <Channel Paths Online>
Dev#  Model    <ID/Status-> Size  Avail line Avail  Avail Pinned  Write  01 02 03 04 05 06 07 08
----  -------  ------------ ---- ------ ---- -----  ----- ------  -----  -- -- -- -- -- -- -- --

02CB  3990-3E  0053/OnLine  3742 3742.0    0     0   4.00      0  Active 33 3B B3  .  .  .  .  .
D2C0  3990-6E  7733/OnLine  3072 3072.0    0     0   1024      0  Active 60 61 64 65 E8 E9 EC ED
D780  3990-3E  0051/OnLine  3750 3750.0    0     0   4.00      0  Active 42 4A C2  .  .  .  .  .
DAA1  3990-3E  0058/OnLine  1702 1701.7    0     0   4.00      0  Active 23 2A 2C D3 D5 DA DC  .
DB40  3990-3E  005B/OnLine  2638 2637.6    0     0   4.00      0  Active 23 2A 2C D3 D5 DA DC  .
DD40  3990-3E  0075/OnLine  1702 1701.7    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
DDA0  3990-3E  0076/OnLine  1702 1701.7    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
DE00  3990-3E  0078/OnLine  2638 2637.6    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
DE40  3990-3E  0079/OnLine  2638 2637.6    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
DE80  3990-3E  007A/OnLine  2638 2637.6    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
DEC0  3990-3E  007B/OnLine  2638 2637.6    0     0   4.00      0  Active 26 27 2E D6 D7 DD DE  .
```

VELOCITY SOFTWARE

Cache Configuration

- NVS (Non-volatile store often limiter with Linux)

```
Report: ESADSDC      Cache Control Unit Configuration
-------------------------------------------------------------------------------------------------
<--Control-->  <-Storage--> <-Cache Storage in MB> <Non-volatile> Cache
<---Unit---->  <-Director->             Off  Not    Storage (MB)  Fast   <Channell Paths Online>
Dev#  Model    <ID/Status-> Size  Avail line Avail  Avail Pinned  Write  01 02 03 04 05 06 07 08
----  -------  ------------ ---- ------ ---- -----  ----- ------  -----  -- -- -- -- -- -- -- --
F000  2105     F000/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F100  2105     F100/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F200  2105     F200/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F300  2105     F300/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F400  2105     F400/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F500  2105     F500/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F600  2105     F600/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
F700  2105     F700/OnLine   51K  50627    0     0  192.0      0  Active A4 A5 B4 B5  .  .  .  .
```

VELOCITY SOFTWARE

Cache Performance

- Evaluate value of cache and why
- Read percent/Read cache
- Write percent/Write cache

```
Report: ESADSD5      3990-3 Cache Analysis                          Velocity Software, Inc.       ESAMAP 3.7.2 09/07/07  Pg  2241
Monitor initialized: 02/06/07 at 13:00:00 on 2094 serial 2BFBD     First record analyzed: 02/06/07 13:00:00
-------------------------------------------------------------------------------------------------------------------------------
            Pct. <------------------per second------------------> <--------Write activity per second--------> <tracks/second>
 Dev        Actv <------Total-------> <----Read----> <--Seq Read--> Total  DFW  DFW SEQ        NVS <--Cache---> <Staged-> De-
 No.  Serial Samp  I/O Hits Hit% Read%  I/O Hits Hit%  I/O Hits Hit%   I/O  I/O Hits  I/O Hit% Full Inhib Bypass  Seq Nseq stged
---- ------ ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ----- ------ ---- ---- -----
13:15:00
***Top DASD by Device busy***
F794  VS2P52  100  9.7  5.4 55.4  83.8  8.1  3.8 46.8    0    0    0   1.6  3.2  1.6    0  100    0     0      0    0    0     1
F181  VS2P13  100 10.7  6.2 57.5  82.3  8.8  4.3 48.3    0    0    0   1.9  3.8  1.9    0  100    0     0      0    0    0     2
F4A8  VS2PB5  100 11.0  6.3 57.3  83.3  9.2  4.5 48.7    0    0    0   1.8  3.7  1.8    0  100    0     0      0    0    0     2
F2A6  VS2PA3  100 11.7  6.7 57.5  82.8  9.7  4.7 48.7    0    0    0   2.0  4.0  2.0    0  100    0     0      0    0    0     2
F598  VS2P66  100 11.0  6.3 56.9  82.0  9.0  4.3 47.4    0    0    0   2.0  4.0  2.0    0  100    0     0      0    0    0     2
F39C  VS2P78  100 10.9  6.1 56.6  83.3  9.0  4.3 47.9    0    0    0   1.8  3.6  1.8    0  100    0     0      0    0    0     2
F79F  VS2P95  100 10.1  5.6 55.3  83.4  8.5  3.9 46.3    0    0    0   1.7  3.4  1.7    0  100    0     0      0    0    0     1
F096  VS2P57  100 11.0  6.3 57.3  81.8  9.0  4.3 47.8    0    0    0   2.0  4.0  2.0    0  100    0     0      0    0    0     2
F3A6  VS2PA4  100 11.3  6.4 56.5  83.2  9.4  4.5 47.8    0    0    0   1.9  3.8  1.9    0  100    0     0      0    0    0     2
F0A9  VS2PB9  100 11.0  6.4 58.1  82.7  9.1  4.5 49.4    0    0    0   1.9  3.8  1.9    0  100    0     0      0    0    0     2
***End Top DASD by Device busy***
```

DASD Configuration Guidelines

Dedicate volumes for:

- Spool
- Paging
- Tdisk
- SFS File Pools
- Linux shared disk
- Linux LVM

VELOCITY SOFTWARE

Parallel Access Volumes: PAV

Allows multiple real addresses to point to one volume

- Allows multiple concurrent I/O
- One device defined as Base address
- Other addresses assigned as Alternate

Supports:

- Linux dedicated
- Minidisk or tdisk. One concurrent I/O to one minidisk….

No support for paging devices

ESADSD1 reports PAV Addressing

ESADSDx reports combine data and report as base

- Option to report all address separately

VELOCITY SOFTWARE

```
Report: ESADSD1      DASD Configuration
-------------------------------------------------------------
 Dev Sys          Device    <CHPIDS OnLn><-Cntrl Unit->  PAV
 No. ID   Serial  Type   SHR 01 02 03 04 OBR/CU Model    Base
---- ---- ------ ------ --- -- -- -- -- ------ -------  ----
6700 053D TEST1  3390-3 NO  2C 2E  .  .  35/1B 3990-6E  Base
6701 053E CMSPAV 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  Base
6702 053F CMSPV2 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  Base
6703 0540        3390-3 NO  2C 2E  .  .  35/1B 3990-6E  Base
67F0 062D        3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6703
67F1 062E        3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6703
67F2 062F        3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6703
67F3 0630        3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6703
67F4 0631 CMSPV2 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6702
67F5 0632 CMSPV2 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6702
67F6 0633 CMSPV2 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6702
67F7 0634 CMSPV2 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6702
67F8 0635 CMSPAV 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6701
67F9 0636 CMSPAV 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6701
67FA 0637 CMSPAV 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6701
67FB 0638 CMSPAV 3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6701
67FC 0639 TEST1  3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6700
67FD 063A TEST1  3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6700
67FE 063B TEST1  3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6700
67FF 063C TEST1  3390-3 NO  2C 2E  .  .  35/1B 3990-6E  6700
```

Base address and parallel volume configuration shown on ESADSD1

Allows multiple real addresses to point to one volume

- Allows multiple concurrent I/O
- One device defined as Base address
- Pool of alternate addresses
- Alternate assigned for duration of I/O
- Less alternates needed

ESADSD1 reports PAV Addressing

ESADSDx reports combine data and report as base

- Option to report all address separately

HyperPAV seems to be rarely used, low value

VELOCITY SOFTWARE

HyperPAV Configuration

```
Report: ESADSD1      DASD Configuration                .3.1 05/18/17   Pg   142
Monitor initialized: 10/01/14 at 13:08:46 on 2817 seri9:00
Monitor period:           720 seconds (     12:00)     1:00
-------------------------------------------------------------------------------
 Dev Sys         Device    <CHPIDS OnLn><-Cntrl Unit-> Cache  PAV <-HiperPav>
 No. ID   Serial Type   SHR 01 02 03 04 OBR/CU Model   STGID BASE Type   Pool
---- ---- ------ ------ --- -- -- -- -- ------ ------- ----- ---- -----  ----

C801 2A39 VS4W03 3390-3 NO  4B B0 4D 6F  3C/00 2107     C801    .  Base  0005

C901 2B09 VS4W02 3390-3 NO  4B B0 4D 6F  3C/00 2107     C901    .  Base  0007



Report: ESADSDC      Cache Control Unit  ZMAP 4.3.1 05/18/17   Pg   151
Monitor initialized: 10/01/14 at 13:08:414 13:09:00
Monitor period:           720 seconds (  14 13:21:00
-------------------------------------------------------------------------------
<--Control-->  <-Storage--> <-Cache Stor <-----HiperPav Devices----->
<---Unit---->  <-Director->              Pool <Number Devs> <Alias>
Dev#  Model    <ID/Status-> Size  Avail  Nmbr  Base  Alias  min max
----  -------  ------------ ---- ------  ----- ----  -----  --- ---

C800  2107     C801/OnLine  406K 405528     5   148    32   31  32
C900  2107     C901/OnLine  406K 405528     7   148    32   31  32
CA00  2107     CA01/OnLine  406K 405528    10   148    32   31  32
CB00  2107     CB01/OnLine  406K 405528     9   148    32   31  32
```

VELOCITY SOFTWARE

HyperPAV Performance

```
Report: ESADSD2    ormance Analysis                        TEST MAP      Pg   1504
Monitor initializedat 13:08:46 on 2817 serial 0CE0A6    First record
-------------------------------------------------------------------------------
                                                <--------DASD Response time/HiperPAV>
 Dev         Device <%DevBusy> <SSCH/sec->          <--Service times--> e/Second->
 No. Serial Type    Avg  Peak   avg  peak  Resp  Serv Pend Disc Conn SSCH Alias
---- ------ ------  ---- ---- ----- ----- -----  ---- ---- ---- ---- ---- -----
13:21:00
***Top DASD by Devi
C801 VS4W03 3390-3   6.0 11.8 182.6 361.2   0.3   0.3  0.2    0  0.2 0.26     0
C901 VS4W02 3390-3   5.9 11.7 182.6 360.8   0.3   0.3  0.2  0.0  0.2 0.27     0
C507 VS4S06 3390-3   4.8  9.6  27.5  54.5   1.8   1.8  0.2  0.0  1.6    0     0
C701 VS4W06 3390-3   4.0  7.7  66.5 131.0   0.6   0.6  0.2  0.1  0.3 6.38     0
C601 VS4W07 3390-3   3.9  7.7  67.3 133.0   0.6   0.6  0.2  0.1  0.3 6.81     0
C201 VS4S01 3390-3   3.9  7.7  22.7  45.0   1.7   1.7  0.2  0.0  1.5    0     0
C60A VS4W05 3390-9   3.1  6.1  64.7 127.7   0.5   0.5  0.2  0.0  0.3 1.30     0
C101 VS4S02 3390-3   2.8  5.5  16.8  33.2   1.7   1.7  0.2  0.0  1.5    0     0
```

Rate going to alternate addresses VERY low.

Ensure device utilization justifies expense

If Serv = Resp, no queueing, so no value

VELOCITY SOFTWARE

HyperSockets Performance

```
Report: ESACHNH      HiperSocket Channel Report
Monitor initialized: 03/02/17 at 15:02:00 on 2964 serial 496067
-------------------------------------------------------------------------------
        <>                    <Messages-> <DataUnits>  Failed  <Failed Receives
Time/                Channel  <Sent/Sec-> <Sent/Sec->  Sends   <Unavail Buffers
CHPID     Shrd FCX Type        LPAR TOTAL  LPAR Total  /Sec     LPAR   Total
--------  ---- --- --------- ----- ----- ----- -----  ------    -----  -----
15:03:00
E4         Yes  No HIPER/IQD    0.4   3.1 103.2     0       0       0    0.7
E5         Yes  No HIPER/IQD      0     0     0     0       0       0      0
E7         Yes  No HIPER/IQD      0     0     0     0       0       0      0
E8         Yes  No HIPER/IQD      0   0.6     0     0       0       0      0
EA         Yes  No HIPER/IQD      0     0     0     0       0       0      0
-------------------------------------------------------------------------------
15:04:00
E4         Yes  No HIPER/IQD    0.3   2.9  48.7     0       0     0.3    1.1
E5         Yes  No HIPER/IQD      0     0     0     0       0       0      0
E7         Yes  No HIPER/IQD      0     0     0     0       0       0      0
E8         Yes  No HIPER/IQD      0   0.6     0     0       0       0      0
EA         Yes  No HIPER/IQD      0     0     0     0       0       0      0
-------------------------------------------------------------------------------
```

Can see rates, errors.

VELOCITY SOFTWARE

Function has moved to Storage Processor

Internal architecture is important

Must often understand Limiting resource:

- Channel paths (chpid)
- Host Adapters (should be one chpid/HA)
- Ranks (One rank is one raid-5 array of disks)
- Disks

Sequential devices are in one rank

- Concurrent I/O to devices in rank are delayed

How to improve performance of top DASD?

Connect time high

- Channels

Pend time

- IOP

DISC

- Cache

```
Report: ESADSD2     DASD Performance Analysis                      Velocity Sof
--------------------------------------------------------------------------------
                                                        <--------DASD Response tim
 Dev        Device <--SSCH--> <%DevBusy> <SSCH/sec->          <--Service times-->
 No. Serial Type   Total  ERP  Avg  Peak   avg  peak  Resp   Serv Pend Disc Conn
---- ------ ------ ------ ---  ---- ---- ----- ----- -----  ---- ---- ---- ----
21:19:00
***Top DASD by Device busy***
2218 VLS053 3990      747   0  12.1 12.1  12.4  12.4   9.8    9.8  0.5  5.1  4.1
E690 VLPPG7 3990      387   0   6.2  6.2   6.4   6.4   9.5    9.5  0.5  9.1  0.0
CE00 VLPPG1 3990      271   0   5.9  5.9   4.5   4.5  13.0   13.0  0.6 12.4  0.0
E691 VLPPG8 3990      306   0   5.1  5.1   5.1   5.1  10.0   10.0  0.5  9.5  0.0
1201 VLPPG5 3990      330   0   3.7  3.7   5.5   5.5   6.7    6.7  0.5  6.2  0.0
1202 VLPPG6 3990      314   0   3.6  3.6   5.2   5.2   6.9    6.9  0.5  6.4  0.0
1203 VLPPG3 3990      311   0   3.5  3.5   5.2   5.2   6.7    6.7  0.5  6.2    0
1334 VLPPG2 3990      332   0   3.3  3.3   5.5   5.5   6.0    6.0  0.5  5.5    0
1E07 VLS005 3990      426   0   2.5  2.5   7.1   7.1   3.5    3.5  0.5  1.4  1.7
1E08 VLS006 3990      116   0   1.6  1.6   1.9   1.9   8.3    8.3  0.6  4.5  3.2
***End Top DASD by Device busy***

1CCC Control Unit    1121   0   0.1  0.1  18.7  18.7   5.9    5.9  0.5  5.4  0.0
1DCC Control Unit    2183   0   0.2  0.2  36.4  36.4   4.8    4.8  0.5  2.6  1.7
1FCB Control Unit     923   0   0.1  0.1  15.4  15.4   3.3    3.3  0.5  1.4  1.4
20CB Control Unit     311   0   0.0  0.0   5.2   5.2   1.6    1.6  0.5  0.1  1.0
21CB Control Unit    3003   0   0.3  0.3  50.0  50.0   4.7    4.7  0.5  2.0  2.2
CE00 Control Unit    1506   0   0.1  0.1  25.1  25.1   4.9    4.9  0.6  3.1  1.2
E690 Control Unit     954   0   0.4  0.4  15.9  15.9   7.5    7.5  0.5  6.8  0.2
                   ------ ---  ---- ---- ----- ----- -----  ---- ---- ---- ----
     System:          12003   0    0.1   0.1 200.0 200.0   4.3   4.3  0.5  2.5  1.3
```

Check configuration

- Channel paths
- Caching status

```
Report: ESADSD1      DASD Configuration Inc.       ESAMAP 3.4.0 01/25/04  Page 331
                                          03/25/03 21:17:00
Monitor period:         1260 seconds (    03/25/03 21:38:00
-------------------------------------------------------------------------------
 Dev Sys          Device    <CHPIDS OnLn> <--MDC Status--> <3990 Cache Status> PAV
 No. ID   Serial Type   SHR 01 02 03 04  Elig Def Now Shr Actv DFW NVS STGID  Base
---- ---- ------ ------ --- -- -- -- --  ---- --- --- --- ---- --- --- -----  ----
2214 2214 VLS049 3990   NO  B5 B6 B7 C5   Yes  On  On  No  Yes  On  On  2F00     .
                           C6 C7
2215 2215 VLS050 3990   NO  B5 B6 B7 C5   Yes  On  On  No    .   .   .     .
                           C6 C7
2216 2216 VLS051 3990   NO  B5 B6 B7 C5   Yes  On  On  No    .   .   .     .
                           C6 C7
2217 2217 VLS052 3990   NO  B5 B6 B7 C5   Yes  On  On  No    .   .   .     .
                           C6 C7
2218 2218 VLS053 3990   NO  B5 B6 B7 C5   Yes  On  On  No  Yes  On  On  2F00     .
                           C6 C7
2219 2219 VLS054 3990   NO  B5 B6 B7 C5   Yes  On  On  No    .   .   .     .
                           C6 C7
```

Check Channel path busy

- FICON Channel paths
- Percent busy ok
- The busy channels don't belong to us
- Are they impacting the IOP?

```
Report: ESACHAN      Channel Performance Analysis                    Veloci
                                                                     First
-------------------------------------------------------------------------------
        <Pct Channel>            <---------------Data Units ------------>
Time/    Utilization      Chanl  <---Reads/Second-->  <--Writes/Second-->
CHPID    LPAR Total  Shrd Type   LPAR TOTAL Pct  Max  LPAR TOTAL pct  MAX
-------- ---- -----  ---- -----  ---- ----- --- ----  ---- ----- --- ----
21:19:00
15        0.1  13.8   Yes FICON    24  4610 3.9 117K    39  5172 4.4 117K
16        0.1  13.9   Yes FICON    32  4759 4.1 117K    38  4889 4.2 117K
17        0.1  13.8   Yes FICON    29  4476 3.8 117K    36  4961 4.2 117K
1F          .  96.7   Yes ESCON
35        0.1  14.1   Yes FICON    29  4842 4.1 117K    39  4845 4.1 117K
36        0.1  13.9   Yes FICON    23  4839 4.1 117K    26  5147 4.4 117K
37        0.1  13.9   Yes FICON    23  4861 4.1 117K    47  5234 4.5 117K
3F          .  85.0   Yes ESCON
9F          .  90.0   Yes ESCON
B5        1.0   1.1   Yes FICON   273   274 0.2 117K    73    74 0.1 117K
B6        1.0   1.1   Yes FICON   266   266 0.2 117K    72    72 0.1 117K
B7        1.0   1.1   Yes FICON   260   260 0.2 117K    82    82 0.1 117K
C5        1.1   1.1   Yes FICON   292   292 0.2 117K    81    81 0.1 117K
C6        1.1   1.1   Yes FICON   278   278 0.2 117K    85    85 0.1 117K
C7        1.0   1.0   Yes FICON   269   269 0.2 117K    81    81 0.1 117K
D5          .  19.3   Yes FICON     0  5143 4.4 117K     0 10296 8.8 117K
DF          .  81.7   Yes ESCON
E5          .  16.7   Yes ESCON
E7          .  15.0   Yes ESCON
E8          .  26.7   Yes ESCON
System:  14.6 603.2
```

VELOCITY SOFTWARE

Check Channel Processor (SAP)

- Processors very busy
- Lots of I/O Starts because of channel busy
- Probably not impacting our data
- Other LPARs need more IOP power

```
Report: ESAIOP I/O Processor Analysis                    Velocity Softwa
                                                         First record an
-------------------------------------------------------------------------
          I/O  <-----------------I/O Processor-------------------->
          Proc <Pct Util> <Rate/Second>  <-Percent of Strts busy->
Time      Nmbr Busy  Idle  SSCH Intrpts  chan switch CtlUnit Device
--------  ---- ---- ----- ----- -------  ---- ------ ------- ------
21:18:00    0  81.1  18.9  2387    2038  2152   17.1     0.4    0.9
            1  76.9  23.1  2670    3417  1379    6.7     0.3    0.1
            2  76.7  23.3  1664    3121  2520    0.7     0.4    0.4
21:19:00    0  60.8  39.2  1990    1763  1888   12.3     0.3    1.7
            1  50.5  49.5  2241    2914   846    7.5     0.2    0.2
            2  50.8  49.2  1547    2754  1962    0.8     0.2    0.3
21:20:00    0  55.6  44.4  2885    2564  1081   12.3     0.1    1.7
            1  42.6  57.4  3106    3851   527    3.9     0.1    0.1
            2  39.1  60.9  1787    2957  1089    0.6     0.2    0.3
```

Check Caching status

- High read percent and low read hit: probably backup?
- Page device: Read percent about 65%, low hit percent
- Evaluate cache controller technology, “Writes” do not enter cache
- Should reduce load on paging devices too….

```
Report: ESADSD5      3990-3 Cache Analysis
-----------------------------------------------------
             Pct. <-------------------per second------
 Dev         Actv <------Total-------> <----Read---->
 No.  Serial Samp  I/O Hits Hit% Read%  I/O Hits Hit%
----  ------ ---- ---- ---- ---- ----- ---- ---- ----
21:19:00
***Top DASD by Device busy***
2218  VLS053  100 12.2  2.0 16.6  86.1 10.5  0.3  3.2
E690  VLPPG7  100  6.1  2.9 47.5  75.7  4.6  1.4 30.7
CE00  VLPPG1  100  5.7  4.6 80.9  65.3  3.7  2.6 70.7
E691  VLPPG8  100  8.0  4.1 51.6  67.2  5.4  1.5 28.2
1201  VLPPG5  100  5.9  3.3 56.0  63.6  3.7  1.1 30.8
1202  VLPPG6  100  5.6  3.4 59.6  59.0  3.3  1.1 32.5
1203  VLPPG3  100  3.9  2.0 51.9  72.1  2.8  0.9 33.3
1334  VLPPG2  100  5.6  3.4 60.8  61.4  3.5  1.2 36.1
1E07  VLS005  100 10.5  8.3 79.0  24.5  2.6  0.4 14.3
1E08  VLS006  100  2.1  0.6 29.0  90.3  1.9  0.4 21.4
***End Top DASD by Device busy***
```

VELOCITY SOFTWARE

Two reasons for using LVM

- I/O Performance
- Large files

Performance:

- Stripe volumes
- May not add volume / space to LVM

Large files

- May add volume / space if not striped
- All new writes to new volume
- Bad performance

VELOCITY SOFTWARE

FCP / SCSI

FCP eliminates 390 I/O CKD translation

Less processing to be done

- (but done in CPU, not the IOP/SAP)

Reportedly faster than FICON

Reportedly lower bandwidth than FICON

No way to effectively measure response times

VELOCITY SOFTWARE

Seeks are not optimized in Linux

Most I/O is write I/O

```
Report: ESASEEK      DASD Seeks Analysis                                Veloc
Monitor period:         1320 seconds (     22:00)                       Last
-------------------------------------------------------------------------------
 Dev        Device Ownerid  Mdsk <Cylinder> Total <---Non-zero---> Read
 No. Serial Type    /userid Addr Start Stop Seeks Seeks Pct. Dist. Pct.
---- ------ ------ -------- ---- ----- ---- ----- ----- ---- ----- ----
0491 VMR408 3990   Volume:     .     0    .  2644  1587 60.0   342 41.8
                   LNX0036  0292    51 2963   708   549 77.5   640    0
                    LNX0036                   708   549 77.5   640    0
                   LNX0036  0293  3140 3173  1936  1038 53.6   184 57.0
                    LNX0036                  1936  1038 53.6   184 57.0
                   cylinders   .     0   99    30    24 80.0  2379    0
                   cylinders   .   200  299    24    24  100  1882    0
                   cylinders   .   400  499    26    14 53.8   812    0
                   cylinders   .   700  799    46    36 78.3   866    0
                   cylinders   .   900  999    30    29 96.7   402    0
                   cylinders   .  1100 1199   107    58 54.2   504    0
                   cylinders   .  1300 1399    28    27 96.4   311    0
                   cylinders   .  1500 1599    61    50 82.0   782    0
                   cylinders   .  1600 1699   102    92 90.2   340    0
                   cylinders   .  1700 1799    22    22  100   447    0
                   cylinders   .  1800 1899    47    45 95.7   749    0
                   cylinders   .  2000 2099    61    32 52.5   515    0
                   cylinders   .  2200 2299    57    29 50.9   294    0
                   cylinders   .  2400 2499    23    23  100   207    0
                   cylinders   .  2700 2799    24    24  100   365    0
                   cylinders   .  2900 2999    20    20  100   247    0
                   cylinders   .  3100 3199  1936  1038 53.6   184 57.0
System:                                    6719  4277 63.7   606 17.9
```

```
Report: ESAUSEK      User DASD Seeks Report

-------------------------------------------------------
 Userid    Dev Volume <--Minidisk-> <Cylinder> Total
 /Time     No. Serial Ownerid  Addr Start Stop Seeks
--------  ---- ------ -------- ---- ----- ---- -----
21:02:00
LINUX2    01E7 LX0200 LINUX2   0200     1 3326   107
LINUX4    01BB LX0407 LINUX4   0206     6 2982    82
          01A9 LX0401 LINUX4   0200     1 2265    61
          01B7 LX0403 LINUX4   0202  3180 3180     1
LINUX5    01C0 LX0501 LINUX5   0200  1365 1365     2
ESAWRITE  022D ESALPS ESAWRITE 0191    51  186    21
```

Analyzing Linux Disks

Dev No.	Device Serial	Type	Ownerid /userid	Mdsk Addr	<Cylinder> Start	Stop	Total Seeks	<---Non-zero---> Seeks	Pct.	Dist.	Read Pct.
21:02:00											
01E7	LX0200	3990	Volume:	.	0	.	107	84	78.5	1514	0
			LINUX2	0200	1	3326	107	84	78.5	1514	0
			LINUX2				107	84	78.5	1514	0
			cylinders	.	0	9	12	12	100	2831	0
			cylinders	.	10	19	24	12	50.0	2369	0
			cylinders	.	40	49	12	12	100	31	0
			cylinders	.	540	549	1	1	100	542	0
			cylinders	.	550	559	1	1	100	555	0
			cylinders	.	1720	1729	2	2	100	1719	0
			cylinders	.	1890	1899	2	2	100	948	0
			cylinders	.	2360	2369	12	12	100	1873	0
			cylinders	.	2490	2499	12	12	100	1870	0
			cylinders	.	2800	2809	1	1	100	2762	0
			cylinders	.	2910	2919	4	4	100	339	0
			cylinders	.	3060	3069	2	2	100	1791	0
			cylinders	.	3070	3079	18	7	38.9	610	0
			cylinders	.	3220	3229	1	1	100	309	0
			cylinders	.	3240	3249	2	2	100	333	0
			cylinders	.	3320	3329	1	1	100	104	0

VELOCITY SOFTWARE

0 Percent reads at DASD cache level

```
Report: ESADSD5      3990-3 Cache Analysis
-------------------------------------------------------
             Pct. <-------------------per second------
 Dev         Actv <------Total-------> <----Read---->
 No.  Serial Samp  I/O Hits Hit% Read%  I/O Hits Hit%
---- ------ ---- ---- ---- ---- ----- ---- ---- ----
21:02:00
***Top DASD by Device busy***
01E7  LX0200  100  1.8  1.8  100     0    0    0    0
01BB  LX0407  100  1.4  1.4  100     0    0    0    0
022D  ESALPS  100  0.7  0.7  100   5.0  0.0  0.0  100
01A9  LX0401  100  1.0  1.0  100     0    0    0    0
***End Top DASD by Device busy***

2000 CtlUnit  100  2.4  2.4  100     0    0    0    0
01E6 CtlUnit  100  1.8  1.8  100     0    0    0    0
2200 CtlUnit  100  0.7  0.7  100   5.0  0.0  0.0  100
---- ------ ---- ---- ---- ---- ----- ---- ---- ----
System:       100  4.9  4.9  100   0.7  0.0  0.0  100
```

VELOCITY SOFTWARE

0 Percent MDC reads at cache level

```
Report: ESAUSR3      User Resource Uti
---------------------------------------
                 DASD MDisk Virt Cache
UserID    DASD Block Cache Disk   Hit
/Class     I/O   I/O  Hits  I/O   Pct
-------- ----- ----- ----- ---- -----
21:02:00   289     0    13    0   4.5
***User Class Analysis***
*Servers    35     0    12    0  34.3
*LINUX     254     0     1    0   0.4
***Top User Analysis***
LINUX2     107     0     0    0     0
LINUX4     145     0     1    0   0.7
LINUX5       2     0     0    0     0
ESATCP       0     0     0    0     0
ESAWRITE    35     0    12    0  34.3
```

LINUX I/O Problem? Turn Off MDC???

```
Screen: ESADSD2  xxxxxxxxxxxxxxxxx              ESAMON V2.2  05/04 11:14-1
          Dev         Device %Dev <SSCH/sec-> <-----Response times (ms)--->
Time      No. Serial Type   Busy   avg  peak  Resp  Serv  Pend  Disc  Conn
-------- *--- ------ ------ ---- *---- ----- ----- ----- ----- ----- -----
11:16:23 1007 LIN501 3390-3 80.8  31.0  31.0  26.1  26.1   0.2  15.1  10.8
         1008 LIN502 3390-3 98.7  36.1  36.1  27.3  27.3   0.2  16.1  11.0
         1009 LIN503 3390-3 45.5  18.9  18.9  24.1  24.1   0.2  13.4  10.5
11:17:23 1008 LIN502 3390-3 96.8  36.3  36.3  26.7  26.7   0.2  15.6  10.9
11:18:23 1008 LIN502 3390-3 99.2  37.1  37.1  26.8  26.8   0.2  15.7  10.8
11:19:23 1008 LIN502 3390-3 98.5  37.5  37.5  26.2  26.2   0.2  15.3  10.7
11:20:23 1007 LIN501 3390-3 28.8  13.4  13.4  22.7  21.5   0.2  12.1   9.1
         1008 LIN502 3390-3 41.7  17.0  17.0  24.5  24.5   0.2  14.0  10.3
11:30:23 1007 LIN501 3390-3 26.7  10.7  10.7  24.9  24.9   0.3  14.3  10.3  =====> MDC OFF
11:31:23 1007 LIN501 3390-3  8.0   5.2   5.2  15.3  15.3   0.2   3.5  11.5
         1008 LIN502 3390-3 10.7  20.6  20.6   5.2   5.2   0.2   1.3   3.6
12:00:23 1007 LIN501 3390-3 35.1 114.8 114.8   3.1   3.1   0.2   0.1   2.7
         1008 LIN502 3390-3 21.6  64.8  64.8   3.3   3.3   0.2   0.3   2.8
         1009 LIN503 3390-3 22.4  37.7  37.7   5.9   5.9   0.2   0.1   5.6
12:01:23 1007 LIN501 3390-3  4.5  13.0  13.0   3.5   3.5   0.2   0.7   2.6
         1008 LIN502 3390-3 35.6 160.0 160.0   2.2   2.2   0.2   0.1   1.9
12:06:23 1007 LIN501 3390-3  9.4  10.9  10.9   8.6   8.6   0.2   0.3   8.2
12:41:23 1007 LIN501 3390-3 24.3  20.3  20.3  12.0  12.0   0.2   1.4  10.4  ======> MDC ON
12:42:23 1007 LIN501 3390-3 61.0  47.1  47.1  13.0  13.0   0.2   1.8  10.9
         1008 LIN502 3390-3 81.8  65.2  65.2  12.5  12.5   0.2   1.3  11.0
         1009 LIN503 3390-3 30.0  27.0  27.0  11.1  11.1   0.2   0.3  10.7
12:43:23 1008 LIN502 3390-3 95.9  74.1  74.1  12.9  12.9   0.2   1.9  10.9
12:44:23 1008 LIN502 3390-3 34.8  27.3  27.3  13.4  12.7   0.2   2.0  10.6
```

If backup, then MDC “reads ahead”,
if database, random 4k I/O, MDC wastes bandwidth
Basis for recommending “MDC OFF” by IBM

VELOCITY SOFTWARE

LINUX I/O Problem? Turn Off MDC???

Linux chains up to 128 / 1024 I/O

- Overflows the DASD Non-volatile cache

MDC: Minidisk cache Track Level Caching (Default)

- Read in one track for every read
- Linux writes 4K blocks, not synchronous
- Long connect times

Minidisk caching Block level CAN BE USED!!!

- Requires diagnose I/O driver
- Reads one block per I/O

Watch MDC hits per device, per server

VELOCITY SOFTWARE

DASD CACHE: choose dasd cache algorithm

- tunedasd --get_cache to get caching behaviour
- tunedasd --cache
  - sequential | normal | prestage | record | bypass
- Io scheduler, noop or none for oracle….

DASD Drivers

- Diagnose – designed to assist virtualized environment
  - Proven more efficient
  - Allows MDC Record level caching
- Non-Diagnose
  - Default

SCSI I/O is not instrumented as is ECKD

- Monitor data for FBA emulated devices
- Performance measured by each Linux

QDIO

- Eliminates hardware interupt
- Used for FCP, HiperSockets, FICON

ESAQDIO

- Provides traffic by user
- QDIO – Network traffic (if CP maintains Shadow Queues)
  - Tcpip uses diag98, no shadow queues, no qdio monitor record
- FCP – Fiber channel network
- HPER – HiperSockets

ESAQDIO provides traffic by user

```
Report: ESAQDIO      Queued I/O Report                              Linux Test    ESAMAP 3.6.2 10/19/06  Page 233
Monitor initialized: 10/09/06 at 08:00:00 on 2096 serial 29EBD     First record analyzed: 10/09/06 08:00:00
-------------------------------------------------------------------------------------------------------------------
                                  Number <QDIO SIGA Instructions/Sec-> <-Throughtput / sec-> <--PCI Interupts--->
Date/    Dev.          Virt QDIO Queues <---Guest----> <----CP------> <Buffers> <--Bytes-->       Cause
Time     Nmbr owner    DevN Fmt  In Out Read Writ "s"  Read Writ "s"  Sent From  Sent  From Count Input Complete
-------- ---- -------- ---- ---- -- --- ---- ---- ---- ---- ---- ---- ---- ---- ----- ----- ----- ----- --------
08:15:00 0000 Totals   0000 QDIO  0   0    0  237  928    0  393    0  678  404   20M  297K     7     7        0
         0800 TSMSERV  0800  FCP  1   1    0    0   46    0   15    0   73   15 3843K     0     0     0        0
         0801 TSMSERV  0801  FCP  1   1    0    0    0    0    0    0    0    0   94      0     0     0        0
         0802 TSMSERV  0802  FCP  1   1    0    0   44    0   14    0   71   14 3733K     0     0     0        0
         0C11 SAP000   0C05 HPER  1   4    0   55  109    0   55    0   55   55 17907 35100     0     0        0
         0C14 SAP010   0C05 HPER  1   4    0   95  184    0   95    0   95   97 34264  107K     0     0        0
         3D02 TCPVSWC1 3D02 QDIO  1   1    0    0    0    0    6    0    7    7  9533  1430     7     7        0
         3D02 TCPVSWC1 3D02 QDIO  1   1    0    0    0    0    6    0    7    7  9533  1430     7     7        0
```

- Device Number - is used to get to get to channel
- QDIO Format – FCP, HiperSockets, QDIO
- QDIO Instruction rate
- QDIO traffic

VELOCITY SOFTWARE

ESADEV provides configuration

- Device Number – gives Channel Path ID
- Device owner (dedicated to userid) same as ESAQDIO
- Hipersocket devices are on Channel path ID FC-FF

```
Report: ESADEV1      Device Configuration (non-DASD)
------------------------------------------------------------------
 Dev       Device <CHPIDs OnLn> OBR <-Cntrl Unit-> UserID
 No. SysID Type   01 02 03 04   Code Code Model    (if ded)
---- ----- ------ -- -- -- --   ---- ---- -------  --------
0800 0002  1732-3 33 .  .  .     00   00  1731-3   TSMSERV
0801 0003  1732-3 33 .  .  .     00   00  1731-3   TSMSERV
0802 0004  1732-3 33 .  .  .     00   00  1731-3   TSMSERV

0C11 0021  1732-5 FF .  .  .     00   00  1731-5   SAP000
0C12 0022  1732-5 FF .  .  .     00   00  1731-5   SAP010
0C13 0023  1732-5 FF .  .  .     00   00  1731-5   SAP010
0C14 0024  1732-5 FF .  .  .     00   00  1731-5   SAP010
0C15 0025  1732-5 FF .  .  .     00   00  1731-5   SAP015
```

VELOCITY SOFTWARE

ESACHAN

- What is “channel busy”?
- Maximum value of (Read, Write, BUS)

```
Report: ESACHAN      Channel Performance Analysis     Linux Test                    ESAMAP 3.6.2 10/19/06  Page 210
Monitor initialized: 10/09/06 at 08:00:00 on 2096 serial 29EBD     First record analyzed: 10/09/06 08:00:00
-------------------------------------------------------------------------------------------------------------------
        <Pct Channel>            <---------------Data Units ------------>  <----Work Unit---->  <-Bus Cycles>  Bytes
Time/     Utilization      Chanl  <---Reads/Second-->  <--Writes/Second-->  <-Rates / Second-->  <-per Second>  /Data
CHPID     LPAR Total  Shrd Type   LPAR TOTAL Pct  Max  LPAR TOTAL pct  MAX  LPAR TOTAL Pct  MAX  Used pct  Max   Unit
-------- ---- -----  ---- -----  ---- ----- --- ----  ---- ----- --- ----  ---- ----- --- ----  ---- --- ----  -----
08:15:00
14         0.2   7.6   Yes FICON    37  3617 1.9 195K   198  1800 0.9 195K   285  9444 7.6 125K  1226 1.1 109K   1024
16         0.2   7.5   Yes FICON    35  3622 1.9 195K   188  1780 0.9 195K   284  9420 7.5 125K  1223 1.1 109K   1024
31           .   0.3   Yes FICON     0     0   0 123K     0     0   0 123K     0    19 0.3 7291     0   0 7291   2048
33         0.3   0.4   Yes FICON    10    10 0.0 123K  3948  3948 3.2 123K    21    30 0.4 7291    72 1.0 7291   2048
35         0.3   0.4   Yes FICON  2671  2671 2.2 123K    28    28 0.0 123K    21    29 0.4 7291    38 0.5 7291   2048
37           .   0.3   Yes FICON     0     0   0 123K     0     0   0 123K     0    19 0.3 7291     0   0 7291   2048
39         0.3   0.4   Yes FICON  2670  2670 2.2 123K    30    30 0.0 123K    23    30 0.4 7291    39 0.5 7291   2048
3B         0.1   0.3   Yes FICON     2     2 0.0 123K   785   785 0.6 123K     6    25 0.3 7291    14 0.2 7291   2048
-------- ---- -----
System:    1.9  36.4
```

SCSI Device Data

ESAQDIO – show rates, device number:

```
                                  Number <QDIO SIGA Instructions/Sec-> <-Throughtput / sec-> <--PCI Interupts--->
Date/    Dev.          Virt QDIO Queues <---Guest----> <----CP------> <Buffers> <--Bytes-->       Cause
Time     Nmbr owner    DevN Fmt  In Out Read Writ "s"  Read Writ "s"  Sent From  Sent  From Count Input Complete
-------- ---- -------- ---- ---- -- --- ---- ---- ---- ---- ---- ---- ---- ---- ----- ----- ----- ----- --------
08:15:00 0000 Totals   0000 QDIO  0   0    0  237  928    0  393    0  678  404   20M  297K     7     7        0
         0800 TSMSERV  0800  FCP  1   1    0    0   46    0   15    0   73   15 3843K     0     0     0        0
         0802 TSMSERV  0802  FCP  1   1    0    0   44    0   14    0   71   14 3733K     0     0     0        0
         0C14 SAP010   0C05 HPER  1   4    0   95  184    0   95    0   95   97 34264  107K     0     0        0
```

ESADEV1 – Shows channel path ID

```
 Dev       Device <CHPIDs OnLn> OBR <-Cntrl Unit-> UserID
 No. SysID Type   01 02 03 04   Code Code Model    (if ded)
---- ----- ------ -- -- -- --   ---- ---- -------  --------
0800 0002  1732-3 33 .  .  .     00   00  1731-3   TSMSERV
0801 0003  1732-3 33 .  .  .     00   00  1731-3   TSMSERV
0802 0004  1732-3 33 .  .  .     00   00  1731-3   TSMSERV
```

ESACHAN – Shows channel path utilizations

```
       <Pct Channel>           <--------------Data Units ----------->  <----Work Unit---->  <-Bus Cycles>  Bytes
Time/    Utilization      Chanl <---Reads/Second-->  <--Writes/Second-->  <-Rates / Second-->  <-per Second>  /Data
CHPID    LPAR Total  Shrd Type  LPAR TOTAL Pct  Max  LPAR TOTAL pct  MAX  LPAR TOTAL Pct  MAX  Used pct  Max   Unit
-------- ---- -----  ---- -----  ---- ----- --- ----  ---- ----- --- ----  ---- ----- --- ----  ---- --- ----  -----
08:15:00
33        0.3   0.4   Yes FICON    10    10 0.0 123K  3948  3948 3.2 123K    21    30 0.4 7291    72 1.0 7291   2048
35        0.3   0.4   Yes FICON  2671  2671 2.2 123K    28    28 0.0 123K    21    29 0.4 7291    38 0.5 7291   2048
-------- ---- -----
System:   1.9  36.4
```

VELOCITY SOFTWARE

DASD Guidelines

Spread load

- across multiple channels, RANKS
- across devices
- across internal SAP paths

Define many devices 3390-3, not few 3390-9

FICON can help

Reduce seek time

Utilize DASD cache

Utilize MDC

Block up

SET IOPRIORITY if queueing

SET SRM DSPSLICE 1 to favor I/O workloads

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