# Performance Analysis Flowchart

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*"If you can't Measure it,*

*I am Just Not Interested ™"*

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**"z" is:**

- Very large,
- Very complex and
- Very well-instrumented

**The challenge?**

**What challenge, it is all there!**

- 200+ zMON panels (with menus)
- 160+ zMAP reports (with table of contents)
- 3400+ unique variables

**Very few companies support full-time performance analysts.**

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**The challenge:**

- Performance problems are visible,
- "z" applications are often impacted by other applications

**My challenge**

- Provide a flowchart to resolve problems quickly
- Describe the few panels/reports needed to solve any specific problem

**This flowchart is based on decades of analysis**

**Velocity Tuning Guide – Each web page has more details**

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# The Challenge:  z/VM Serves Many Functions (160+ Reports)

```
ESAHDR ESATUNE

*Performance Summary
ESASSUM ESASUM

*Transaction Activity    (5)
ESAUSLA ESAXACT ESARATE
ESACLAS ESAEXCP

*User Activity (21)
ESATUNA
ESASRVC ESASRV1 ESAUSRC ESAUSR1
ESAUSR2 ESAUSR3 ESAUSR4 ESAUSR5
ESAUSP2 ESAUSP3 ESAUSP4 ESAUSCP
ESAUSTR ESAUSPG ESAUSEK
ESAWKLD ESAUSRQ ESASCED
ESAACCT
ESAPOOL

*Multi-Tasking Users
ESAMTSK

*Web Serving Reports   (8)
ESAWEB1 ESAWEB2 ESAWEB3 ESAWEB4
ESAVWS1 ESAVWS2 ESAVWS3 ESAVWS4

*Virtual NETWORK Reporting   (7)
ESAQDIO ESAQDI2 ESANIC
ESAVSWC ESAVSW  ESAVSW2
ESAOSA

*TCPIP Reporting    (15)
ESATCPC ESATCPI ESATCP1 ESATCP2 ESATCP3 ESATCP4
ESATCP5 ESATCP6 ESATCP7 ESATCP8
ESATCPP ESATCPS ESATCPA ESATCPU ESATFTP

*LINUX Reporting    (20)
ESAUCD1 ESAUCD2 ESAUCD3 ESAUCD4 ESAUCDD ESALNXD
ESAHST1 ESAHST2 ESAHST3 ESAHST4 ESAHSTA
ESALNXS ESALNXR ESALNXP ESALNXA ESALNXC
ESALNXU ESALNXV ESALNXM ESALNXUP
```

```
*Linux Application Reporting   (4)
ESAJVM  ESAORAC ESAORAG ESAORAS ESAORAW

*VSE    Reporting    (4)
ESAVSEC ESAVSES ESAVSEP ESAVSEJ

*Shared File System   (7)
ESASFS1 ESASFS2 ESASFS3 ESASFS4
ESASFS5 ESASFS6 ESASFS7

*Byte File System
ESABFS1 ESABFS2 ESABFS3

*Processor Subsystem (24)
ESACPUU ESACPUA ESACPUS ESASMT
ESADIAG ESAINS ESALCK1 ESALCK2
ESAMFC ESAMFCA ESAMFCC ESACPUV
ESACPU1 ESACPU2
ESAIUCV ESAIUC2 ESAIUER
ESALPARC ESALPAR ESALPARS
ESAPLDV ESAIOP ESACRYPT ESACRY2

*Storage Subsystem   (10)
ESASTRC ESASTOR ESASTR1 ESASTR2 ESASTR3 ESAME
ESAFREE ESADCSS ESAASPC ESASXS

*Paging Subsystem    (5)
ESAPSPC ESAPAGE ESABLKP ESAXSTO
ESAPSDV

*Input/Output Subsystem (23)
ESADEV1 ESADEV2 ESADSD1 ESADSD2
ESADSD6 ESAIOAS ESACHNC ESACHAN ESACHNH
ESADSDC ESADSD4 ESADSD5 ESAMDC
ESAVDSK ESATAPE ESA3495
ESASCSI ESASCS2
ESASEEK

*
ESAOPER
```

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## Analysis starts with "is there a problem?"

- Describe the problem (what user(s), what time)

## System Configuration

- Processor model, CPU type, SMT support
- Number of processors, storage size

## Loads on the system and subsystems
## Wait states for those impacted
## Subsystem Analysis

- DASD, Storage, Paging, Processor, Network

## Tuning Guide – Performance Methodology Tips

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A1: Know the configuration

↓

A2: Understand the load
CPU, I/O, Paging, Network

↓

A3: Single server or system problem?

Single server (B)

System problem (S)

A1: Common configuration problems?
Servers stop & go? SRM
AGELIST size too small?
Real disks for swap devices?
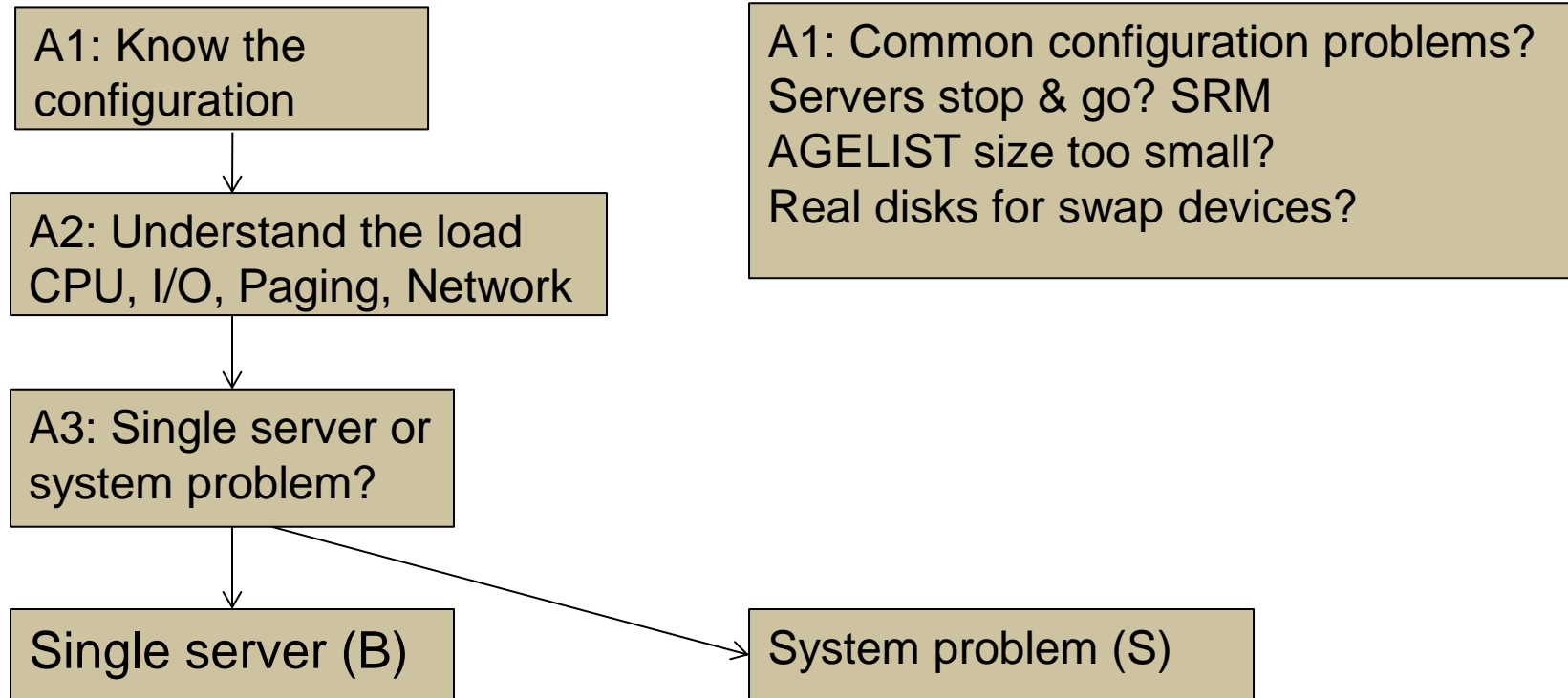
## Tuning Guide – Flow Chart Analysis

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Single server (B)

B1: Check wait states for constraints

B2: Understand configuration (VM) Share, VMSIZE

B3: Understand Linux configuration

Choose constraint
CPU (C), Paging (D),
DASD(E), Network(F)

C1: Check process table, requirements
C2: Check system load (processes)
C3: Validate virtual CPUs
C4: Check "resident/reset"

D1: Check Linux storage/swap sizes
D2: Check paging configuration
D3: Check server page rates
D4: Virtual disk used for swap?

E1: Check data configuration
E2: Check DASD data rates

F1: Check network configuration
F2: Check network data rates

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# The Analysis Flow Chart

System problem (S)

S1: Check wait states for constraints

S2: Choose constraint:
CPU(T),
Paging(U),
DASD(V),
NETWORK(W)

T1:  LPAR Utilization
T2:  LPAR overhead
T2:  Abusive servers
T3:  Cron across multiple servers

U1:  Storage requirements
U2:  User storage?
U3:  Correct virtual disk settings
U4:  Page space, block paging
U5:  AGELIST settings

V1: Top DASD, Control units?
V2: DASD cache, fast/write
V3: Device configuration

A1: Configuration:             ESAHDR
A2: System Load:               ESASSUM  / ESAMAIN

B1: Check wait states:         ESAXACT
B2: Virtual machine config:  ESAUSRC / ESAUSR1
B3: Linux configuration:        ESALNXS

C1: Process table:              ESALNXC
C2: Process Load:               ESALNXP
C3: Validate Virtual CPUs:   ESAUSP2

D1: Linux Storage:             ESAUCD2
D2: Paging configuration:    ESAPSDV
D3: Server Paging Rate:       ESAUSPG
D4: VDISK for swap:            ESAASPC

E1: Data configuration:       ESAUSEK / ESAQDIO
E2: DASD Rates:                ESADSD2

F1: Network configuration:  ESATCPI
F2: Network data rates:       ESATCP1/2/4
F3: VSWITCH users:            ESANIC
F4: VSWITCH traffic:          ESAVSW
F5: OSA traffic:                 ESAOSA

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S1:  Wait states:                    ESAXACT
T1:  LPAR utilization:              ESALPARS
T2:  LPAR overhead:                ESALPAR
T3:  Abusive Server:                ESAUSP2 / ESAUSR2
T4:  Cron across servers:        ESALNXP


U1:  Storage requirements:    ESASTR1
U2:  User storage:                  ESAUSPG
U3:  VDISK storage:                ESAVDSK / ESAASPC
U4:  Page configuration:          ESAPSDV
U5:  Page space:                    ESAPSDV / ESABLKP
U6:  Expanded storage:          ESAXSTO


V1: Top DASD control units:   ESADSD2
V2: DASD cache, fast/write:   ESADSD5
V3: Device configuration:        ESADSD1

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```
Report: ESAHDR          z/VM Monitor Analysis
Monitor period:         3600 seconds (   1:00:00)
----------------------------------------------------------
z/VM Version:  5                    Release 4.0 SLU 1002
TOD clock at termination                    09:49:16
Abend code of last termination
TOD clock at last IPL:            12/26/10  09:49:40
System Operator:                            OPERATOR
Time zone adjustment from GMT:              -7 hours


System Identifier                           ZVM2
Checkpoint/Warmstart Volumes                V2RES1/V2RES1
Machine Model/Type                          z10E:2097/710
System Sequence Code               00000000000D2655
Processor  0 model/serial          2097-710  /072655 Mast
Processor  1 model/serial          2097-710  /072655
Processor  2 model/serial          2097-710  /072655
Processor  3 model/serial          2097-710  /072655
Processor  4 model/serial          2097-710  /072655


 ESAME (Memory Extension) Nucleus in use
 Power of processor in terms of service Units: 32989
 ESA/370 hardware installed
 Operating on IFL Processor(s)
 Channel Path Measurement Faclity(CPMF) Extended is inst

Main Storage installed (MB):                70656
Main Storage Generated (MB):                70656
Number of users in monitor file:              90
Number of DASD in monitor file:              530
Number of non-DASD in monitor file:            2
```

Common configuration problems:
- IFLs?
- Real Storage
- Release significant
- Master processor significant

**Tuning Guide – Configuration**

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# Know the Overall Loads:  ESASSUM / ESAMAIN

```
Report: ESASSUM       Subsystem Activity                          Veloci
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655       First
----------------------------------------------------------------------
          <---Users----> Transactions <Processor> Storage (MB) <-Paging-->
          <-avg number->     Per  Avg. Utilization Fixed Active <pages/sec>
Time       On Actv In Q Minute  Resp Total Virt.   User Resid. XStore DASD
--------  ---- ---- ---- ------ ----- ----- ----- ----- ------ ------ ----
10:15:00    89   63 61.3  145.1 0.613   262   254  14.4  68662    862  289
10:30:00    89   63 61.3  140.3 0.545   270   261  14.4  68726    886  133
10:45:00    89   63 63.3  134.1 0.563   262   253  14.0  68806   1123  281
11:00:00    89   64 67.4  137.8 0.477   275   259  13.5  68156   2218  665
*****************************************************Summary****************
Average:    89   63 63.3  139.3 0.550   267   257  14.1  68587   1272  342
```

Look for Spikes, dramatic changes, what time?
- Processor
- Storage for users
- Page rates
- DASD I/O rates
- (Transactions are for traditional workloads)

**Tuning Guide – System Load**

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S O F T W A R E

P R O V E N   P E R F O R M A N C E

## Wait states provide options for improvement

- State Sampling – once per minute per user
- Hi-Frequency State Sampling – once per second per vCPU
- (900 samples per vCPU per 15 minute period)

## Waits reported by server, class, top user

- Look for what is impacting the users
- Recognize "running" to wait comparison

## Tuning Guide – Wait State Analysis

## Wait state (queue) analysis -> where to focus

- Running / CPU Wait   -> CPU Subsystem
- Simulation wait (master processor) -> CPU Subsystem
- Page wait  -> Paging/Storage subsystems
- Asynchronous I/O, SIO -> DASD subsystem
- Loading – special state, loading in working set (LDUBUF)
  - NOT a wait state, indicates thrashing
- Eligible – SRM Settings – has no value with 6.3

## Normal idle wait states

- TCPIP, Linux:  Test idle
- Traditional servers:  SVM (service machine wait)
- Traditional users:  Idle (not in queue)

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# Wait States:  ESAXACT

```
Report: ESAXACT        Transaction Delay Analysis                    Veloc
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655      First
---------------------------------------------------------------------------
                     <-----Percent non-dormant (Wait states)------------
UserID    <-Samples->                      E-   D-   T-       Tst <Asynch>    Pct
/Class    Total  In Q Run Sim CPU SIO Pag SVM  SVM  SVM   CF Idl I/O Pag Ldg Elig
--------  ----- ----- --- --- --- --- --- ---  ---  ---  --- --- --- --- --- ----
11:00:00   1335  1011 4.0 0.2 0.6   0 0.5   0    0 0.1    0  91 0.1   .   .   0
Hi-Freq:   116K 59208 4.2 0.0 1.9 0.0 0.3   0  7.9 0.1  0.0  89 0.4 0.1 0.2   0
 ***Key User Analysis ***
RSCS        893     1   0   0   0   0   0   0    0   0    0   0   0   0   0   0
RSCSDNS     893     8   0   0   0   0   0   0   99 100    0   0   0   0   0   0
TCPIP       893   285 0.4   0 2.5   0   0   0    0   0    0  97   0   0   0   0
 ***User Class Analysis***
*Servers  12502   822 0.7 0.1 1.0 0.2   0   0   17 4.5    0  93   0   0   0   0
*System    1786  1437 0.1 0.1 1.1   0 0.2   0    0   0    0  92 0.1   0 0.7   0
*ITM       1786   911 1.5 0.1 2.2   0 0.5   0    0   0    0  78 0.4 0.1 0.2   0
*SOA      35720 31695 7.0 0.0 2.2   0 0.3   0    0   0  0.1  88 0.6 0.0 0.1   0
*ITM      36613 23570 1.1 0.0 1.7   0 0.3   0    0   0    0  91 0.1 0.2 0.4   0
*TheUsrs  24111   480 0.2 0.8 1.3   0 0.6   0   26 5.2    0  91 0.2   0 0.2   0
 ***Top User Analysis***
LNXUWA01    893   893  71   0 2.8   0 0.1   0    0   0    0  24 1.7 0.4   0   0
LNXUWA03   1786  1786  28 0.2 5.5   0 1.2   0    0   0  0.6  57 7.2 0.1 0.1   0
LNXUWA02   1786  1786  27 0.1 3.6   0 0.1   0    0   0  0.4  69 0.1   0 0.1   0
LNXQWA01   1786  1786 4.0   0 2.2   0   0   0    0   0    0  94 0.1   0   0   0
LNXDWA02   1786  1786 6.0   0 2.2   0 0.2   0    0   0    0  91 0.1   0   0   0
LNXDWA04   1786  1786 4.1   0 2.9   0   0   0    0   0    0  93   0   0 0.1   0
V2TPSP02    179   179  35   0 6.1   0   0   0    0   0    0  59   0   0   0   0
```

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```
Report: ESAUSRC       User Configuration              Velocity Software Corporate  ESAMAP 4
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655   First record analyzed: 04/15/11 10:00:
Monitor period:        3600 seconds (   1:00:00)                 Last record:               04/15/11 11:00
------------------------------------------------------------------------------------------------
                                <---------SHARE--------->          <Status> <-MDC> <-Storage->
               Account  ACI Grp  CPU <Normal> <--MAX-> Lim CPU <Modes>      NO  NO  <-VM Size->
UserID   ClassID Code    Name    Type Rel Abs Typ Shre -it Cnt VM  STG SVM QDSP FS INS Dflt    Max
-------- ------- ------- -------- ---- ---- --- --- ---- --- --- --- --- --- ---- -- --- ----- -----
LNXDMS2A *ITM    27482         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  2.0G   2.0G
LNXDPB02 *System 75113         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  512M   512M
LNXDWA01 *SOA    03817         .  IFL  400   .   .   .    .   2 ESA V=V   N    N  N   N  6.0G   6.0G
LNXDWA02 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  4.0G   4.0G
LNXDWA03 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  2.0G   2.0G
LNXDWA04 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  7.0G   7.0G
LNXDWA11 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  8.0G   8.0G
LNXQWA01 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  7.0G   7.0G
LNXQWA02 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  2.0G   2.0G
LNXQWA03 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  2.0G   2.0G
LNXQWA04 *SOA    03817         .  IFL  200   .   .   .    .   2 ESA V=V   N    N  N   N  2.0G   2.0G
LNXTWA04 *SOA    03817         .  IFL  400   .   .   .    .   4 ESA V=V   N    N  N   N  5.0G   5.0G
LNXUWA01 *SOA    03817         .  IFL  100   .   .   .    .   1 ESA V=V   N    N  N   N   12G    12G
```

Look for "Interesting configurations"
- Large relative shares / absolute shares
- CPU Counts, matching shares (100 Rel / vcpu)
- CPU Type (IFL, CP)
- Virtual machine storage sizes (too large?, largest?)

**Tuning Guide - Configuration**

## Top down:

- CEC / LPAR
- LPAR / z/VM
- Virtual machine
- Linux process

## CPU Capture ratio 100% down to process

## Tuning Guide – LPAR Level

# LPAR Configuration: ESALPARS

```
Report: ESALPARS      Logical Partition Summary                    Velocity Software Corporate
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655     First record analyzed: 04/1
-------------------------------------------------------------------------------------------------
              <--Complex--> <-------Logical Partition---> <-Assigned Shares----->              Proce
              Phys Dispatch              Virt <%Assigned> <---LPAR--> <VCPU Pct> Cap-  Wait Type
Time          CPUs    Slice Name     Nbr CPUs Total  Ovhd Weight  Pct /SYS /CPU  ped   Comp
--------      ----  -------- -------- --- ---- ----- ---- ------ ---- ---- ---- ----  ---- -----
04/15/11

10:15:00       18   Dynamic Totals:    0   34 968.7  4.9   1080 88.9
                            SYS4N3     7    5 263.5  1.2     80  6.6 1.32 23.7   No    No IFL
                            SYS4P1     3    3  22.9  0.4     60  4.9 1.65 29.6   No    No CP
                            SYS4N1     1    8 323.3  1.6    590 48.6 6.07  109   No    No CP
                            SYS4N2     2    2  17.1  0.4     60  4.9 2.47 44.4   No    No CP
                            SYS4D1     4    7  98.3  0.8    160 13.2 1.88 33.9   No    No CP
                            SYS4D2     5    5  35.9  0.4    100  8.2 1.65 29.6   No    No CP
                            SYS4D3     6    2   9.0  0.2     30  2.5 1.23 22.2   No    No CP
                            SYS4D4     8    1 100.0  0.0    Ded  5.6 5.56  100   No   Yes ICF
                            SYS4D5     9    1  98.6  0.0    Ded  5.6 5.56  100   No   Yes ICF
```

Look for "Shared processors"
- IFLs shared between LPARs  (none)
- Check weights
- Assigned Pct/CPU > 100 ???  -> excess share?
- First LPAR is "us", z/VM where data collected

**Tuning Guide – LPAR Level**

# Already Know the Overall Loads: ESASSUM / ESAMAIN

```
Report: ESASSUM        Subsystem Activity                        Veloci
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655       First
------------------------------------------------------------------------
           <---Users---> Transactions <Processor> Storage (MB) <-Paging-->
           <-avg number->      Per  Avg. Utilization Fixed Active <pages/sec>
Time       On Actv In Q Minute  Resp Total Virt.  User Resid. XStore DASD
--------   ---- ---- ---- ------ ----- ----- ----- ----- ------ ------ ----
10:15:00    89   63 61.3  145.1 0.613   262   254  14.4  68662    862  289
10:30:00    89   63 61.3  140.3 0.545   270   261  14.4  68726    886  133
10:45:00    89   63 63.3  134.1 0.563   262   253  14.0  68806   1123  281
11:00:00    89   64 67.4  137.8 0.477   275   259  13.5  68156   2218  665
**************************************************Summary****************
Average:    89   63 63.3  139.3 0.550   267   257  14.1  68587   1272  342
```

Look for Spikes, dramatic changes, what time? (11:00)
- What else changed at that time?
- Processor (Also, ESACPUU, ESACPUA)

**Tuning Guide – System Load**

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```
Report: ESALPARS        Logical Partition Summary

Totals by Processor type:
<---------CPU------> <-Shared Processor busy->
Type Count Ded shared  Total  Logical Ovhd Mgmt
---- ----- --- ------ ------ -------- ---- ----
CP       1   0      1   21.8     21.7  0.1  0.1
IFL     11   0     11  180.1    167.6  5.4  7.1
ICF      3   2      1  100.0     99.6  0.0  0.3
ZIIP     2   0      2    0.0      0.0  0.0  0.0
```

**Tuning Guide – LPAR Level**

Look for processor type busy
- IFLs shared between LPARs (4 LPARs)
- TOTAL IFL Busy:  167% out of 1100
- Check overheads – high overhead result of too many vCPU
  - Logical overhead part of LPAR assigned
  - Physical overhead is CEC Management

```
Report: ESALPARS      Logical Partition Summary                    Velocity Softw
---------------------------------------------------------------------------------
         <--Complex--> <--------Logical Partition------->  <-Assigned Shares----
         Phys Dispatch              Virt CPU  <%Assigned>  <---LPAR--> <VCPU Pct
Time     CPUs    Slice Name      Nbr CPUs Type Total  Ovhd Weight  Pct /SYS /CPU
-------- ---  -------- -------- --- ---- ---- ----- ----- ------ ---- ---- ----
11:20:00  17  Dynamic Totals:     0    2  CP   21.7   0.1    167  100
                      Totals:     0   18 IFL  173.0   5.4    100  100
                      VT4        44    7 IFL  112.4   3.2     60 60.0 8.57 94.3
                      CFED2      15    1 ICF  100.0   0.0    Ded  5.9    0    0
                      CFEH2      13    1 ICF   12.5   0.0     90  9.0 9.00 9.00
                      CFEN2      14    1 ICF  100.0   0.0    Ded  5.9    0    0
                      CFEA2      31    1 ICF   74.7   0.0    820 82.0 82.0 82.0
                      CFEI2      30    1 ICF   12.5   0.0     90  9.0 9.00 9.00
                      ITKP       21    1  CP    0.8   0.0     50 29.9 29.9 29.9
                      VTT        47    2 IFL    3.0   0.4      2  2.0 1.00 11.0
                      VT3        43    2 IFL    2.9   0.3      8  8.0 4.00 44.0
                      VT8        45    7 IFL   54.7   1.6     30 30.0 4.29 47.1
                      DRITE4     29    1  CP      0     0     50 29.9 29.9 29.9
                      DRITE1     28    2  CP   20.9   0.0     50 29.9 15.0 15.0
```

Look for "Shared processors"
- IFLs shared between LPARs (4 LPARs)
- Check weights
- Assigned pct/CPU > 100 ???  -> excess share?

**Tuning Guide –
LPAR Weights/Overhead
Analysis**

```
Report: ESALPAR        Logical Partiti
Monitor initialized: 04/15/11 at 10:
-------------------------------------
Physical CPU Management time
      CPU     Percent Type
      ---     ------- ----
       0       3.838   CP
       1       4.412   CP
       2       3.134   CP
       3       2.222   CP
       4       4.429   CP
       5       3.924   CP
      11       0.132  ZAP
      13       0.068  ZAP
      14       0.311  ZAP
      15       1.070 ZIIP
      17       1.391 ZIIP
      18       0.945 ZIIP
      19       1.298  IFL
      24       0.121  ZAP
      30       3.111   CP
      33       0.408  ZAP
      37       0.293  ZAP
      40       1.903  IFL
      41       1.786  IFL
      42       1.687  IFL
      43       1.161  IFL
      44       1.176  IFL
      45       1.158  IFL
      46       1.178  IFL
```

Look for processor type overhead
- CPs shared between LPARs (13 LPARs)
- Check overheads:
  - High overhead result of too many vCPUs
- Total CP Utilization 835 / 900 = 93%

**ESALPARS**

Totals by Processor type:

| | <--------CPU------> | | | <-Shared Processor busy-> | | | |
|------|-------|-----|--------|--------|---------|------|------|
| Type | Count | Ded | shared | Total  | Logical | Ovhd | Mgmt |
| ---- | ----- | --- | ------ | ------ | -------- | ---- | ---- |
| CP   | 9     | 0   | 9      | 835.8  | 779.4   | 12.5 | 31.4 |
| ZAP  | 9     | 2   | 7      | 214.8  | 208.9   | 1.5  | 2.9  |
| IFL  | 31    | 0   | 31     | 1778.5 | 1669.4  | 28.4 | 52.2 |
| ICF  | 3     | 0   | 3      | 300.2  | 292.4   | 0.2  | 7.3  |
| ZIIP | 6     | 0   | 6      | 328.8  | 311.5   | 4.2  | 9.0  |

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# Consumers Within LPAR:  ESAUSP2

```
Report: ESAUSP2        User Resource Rate Report                    Velocity Software C
-----------------------------------------------------------------------------------------
          <---CPU time--> <----Main Storage (pages)-----> <------Paging (pages)----->
UserID    <(Percent)> T:V <Resident> Lock <-----WSS----> <---Allocated---> <Pgs/Secnd>
/Class    Total  Virt Rat Totl Activ  -ed Totl Activ  Avg Total ExStg  Disk  Read Write
--------  ----- ----- --- ---- ----- ---- ---- ----- ---- ----- ----- ----- ----- -----
11:00:00 262.6 259.3 1.0  17M   17M  234  19M   19M 213K   13M 4346K 8891K 166.3 391.8
 ***Key User Analysis ***
TCPIP     0.12  0.05 2.4 1286  1286   79  316   316  316  5005   736  4269   0.0   0.0
 ***User Class Analysis***
*Servers  0.40  0.36 1.1  957   951    3 1704  1067   76 16285  2162 14123   0.1   0.5
*SOA     239.2 236.7 1.0  15M   15M   39  17M   17M 843K 5138K 2431K 2707K  79.1 184.0
*ITM     22.47 21.83 1.0   2M 1971K    7   2M 2117K  96K 7686K 1761K 5925K  74.7 126.4
*TheUsrs  0.21  0.18 1.2 2869  2862   17 4372  3688  135  185K 82382  102K   2.5   2.1
 ***Top User Analysis***
LNXUWA01 67.65 67.32 1.0   3M 2889K    1   3M 3146K   3M  324K 65398  259K  15.3   0.1
LNXUWA03 54.43 53.29 1.0   4M 3848K    1   4M 3855K   4M 72353 63975  8378   7.5   0.3
LNXUWA02 50.18 49.92 1.0 685K  685K    0 855K  855K 855K  381K  296K 84613   2.2   2.7
LNXQWA01 12.23 12.11 1.0   1M 1246K    7   1M 1334K   1M  592K  541K 51075   3.1   3.0
LNXDWA02 11.73 11.64 1.0 713K  713K    6 844K  844K 844K  205K 56215  148K   2.0   0.7
LNXDWA04 10.18 10.10 1.0   1M 1152K    1   1M 1248K   1M  689K  593K 96720   1.0  70.8
```

Look for consumers in percent of CPU
- By class  (SOA)
- Abusive servers (LNXUWA*)?
- Correct per expected?  Not a performance question

**Tuning Guide – User Level**

23

```
Report: ESALNXP        LINUX HOST Process Statistics Report         Velocity Software Corporate   ESAMAP 4.1.1 0
---------------------------------------------------------------------------------------------------------------
node/        <-Process Ident-> Nice <------CPU Percents----> <------CPU Seconds------> <Stg (k)> <-Faults/Second->
Name         ID    PPID   GRP  Valu  Tot   sys  user syst usrt Total  sys   user syst usrt  Size RSS  min maj mint majt
---------   ----- ----- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- --- --- ---- ----
LNXQWA01       0     0     0    0 11.9 1.72 7.91 1.42 0.88 107.4 15.5 71.2 12.8 7.88  11M   6M  21   0 7530    0
 java       1235     1  1235    0 1.11 0.19 0.92    0    0  10.0 1.68 8.32    0    0 894K 470K   0   0    0    0
 java       7124     1  7124    0 0.86 0.15 0.71    0    0   7.7 1.37 6.36    0    0 720K 415K   0   0    0    0
 kcawd      8853     1  4390    0 2.24 0.01 0.02 1.38 0.83  20.1 0.10 0.14 12.4 7.49  38K 5428   2   0 7392    0
 java      10522     1 10522    0 1.08 0.17 0.91    0    0   9.8 1.57 8.19    0    0 758K 437K   0   0    0    0
 java      15498     1 15498    0 1.09 0.19 0.90    0    0   9.8 1.72 8.07    0    0 763K 523K   0   0    0    0
LNXUWA01       0     0     0    0 67.0 5.98 59.0 1.20 0.81 601.9 53.8  531 10.8 7.29  13M   9M  88   0 7566    0
 java       4444     1  4444    0 1.10 0.07 1.03    0    0   9.9 0.65 9.25    0    0   1M 801K   0   0    0    0
 kd4agent   5576     1  4362    0 4.71 1.68 3.03    0    0  42.4 15.1 27.3    0    0  99K  64K   0   0    0    0
 kynagent   9569     1  4362    0 2.48 0.07 2.41    0    0  22.3 0.63 21.7    0    0 314K 212K   5   0    0    0
 kcawd      9634     1  4362    0 1.92 0.01 0.01 1.14 0.75  16.4 0.06 0.13 10.3 6.78  37K 6936   1   0 7200    0
 java      10547     1 10547    0 0.82 0.07 0.75    0    0   7.4 0.64 6.74    0    0 870K 743K   1   0    0    0
 java      11751  4877  4877    0 0.57 0.07 0.50    0    0   5.2 0.67 4.49    0    0 617K  98K   6   0    0    0
 java      11837     1 11837    0 3.28 0.12 3.16    0    0  29.5 1.10 28.4    0    0   3M   1M   1   0    0    0
 java      21374 15199 21374    0 46.3 3.07 43.2    0    0 416.9 27.6  389    0    0   3M   3M  34   0    0    0
 java      24567     1 24567    0 2.27 0.18 2.09    0    0  20.4 1.59 18.8    0    0   1M 831K   0   0    0    0
 java      28060     1 28060    0 1.23 0.09 1.14    0    0  11.1 0.82 10.3    0    0   1M 821K   0   0    0    0
 java      32428     1 32428    0 1.17 0.10 1.07    0    0  10.5 0.87  9.7    0    0 810K 538K   5   0    0    0
```

Look for processes within Linux, in percent of cpu
- By relevant server (LNXUWA01)
- Correct?  Relevant?  Cron?

**Tuning Guide –
Linux Process Usage**

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**Top down:**

- z/VM
- Virtual machines
- VDISK / MDC / Address Space
- Linux server
- Linux process

**CPU Capture ratio 100% down to server**

**Tuning Guide – Storage/Paging Level**

```
Report: ESASTR1      Main Storage Analysis                        Velocity Software Corporate   ESAMAP 4.1.1 01/21/
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655      First record analyzed: 04/15/11 10:00:00
-------------------------------------------------------------------------------------------------------------------
           Users <---------------------------Pages----------------------------------------------------------------->
           Loggd System  Fixed Non-   Free Frame <Available> Systm  User   NSS/DCSS  <-AddSpace> VDISK <MDC> Diag
Time          On Storage Store Pgble  Stor Table <2gb  >2gb  ExSpc Resdnt  Resident  Systm User  Rsdnt Rsdnt  98
-------- ----- ------- ----- -----  ---- ----- ----- ----- ----- ------ -------- ----- ----- ----- ----- ----
10:15:00     89  18088K  2252  3691   700  141K    79  1032  4710 17577K     4771   226K     0 26852 81157 1126
10:30:00     89  18088K  2252  3683   700  141K    89  1193  4686 17594K     4769   226K     0 30182 61307 1126
10:45:00     89  18088K  2252  3583   700  141K    78  1050  4681 17614K     4769   225K     0 46189 25812 1126
11:00:00     89  18088K  2252  3455   700  141K    82  1062  4688 17448K     4775   223K     0  237K  1418 1126
```

Total storage analysis (in pages)
- MDC?  300mb?  SET MDC MAX/MIN
- VDISK Spike (1gb) ?  Which server?
- User resident should be a large percent

**Tuning Guide – System Storage Analysis**

```
Report: ESAUSPG       User Storage Analysis                       Velocity Software Corporate
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655    First record analyzed: 04/1
---------------------------------------------------------------------------------------------
           <---Storage occupancy in pages---> <--Main Storage page Read/Write--> Pages  <Address
UserID     <---Main Storage---> <--Paging---> <-Page Writes to:--> <Page Reads:> Moved  <pages R
/Class     Total   >2gb   <2GB  Xstor   DASD  Xsto   Disk   Migr   Xstor  Disk   <2GB   VirtDisk
--------  ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ --------
11:00:00 17448K 16943K 504640  4346K  8891K  1120K 352582 320630 822546 149628     0    237286
***Top User Analysis***
LNXUWA01  2889K  2798K  90725  65398 258675  10999    112      0   5390  13806     0        0
LNXUWA03  3848K  3762K  85186  63975   8378  21875    277      0 221201   6714     0   223173
LNXUWA02 685385 648345  37040 296256  84613  36427   2443      0  22943   1983     0        0
LNXQWA01  1246K  1218K  28190 541178  51075  35529   2727      0  14094   2787     0     1428
LNXDWA02 713091 672702  40388  56215 148406  16314    649      0    451   1828     0        0
LNXDWA04  1152K  1120K  31859 592756  96720  13708  63725  63261   1189    942     0        0
LNXDWA03 330601 324021   6581   4194  39207   3926   5601   5345    120    734     0        8
LNXTWA04 883228 860363  22865  90734 129722   7768     31      0    182     66     0     1889
LNXUWA15 693689 664995  28694  53516 137150  10556   1382      0    553    457     0        0
```

Total storage analysis (in pages, new "megabyte" option)
- Largest consumer(s) resident storage
- Largest consumer - which virtual disk?
- VDISK Spike (1gb) ?  Which server?

**Tuning Guide –
User Storage Analysis**

```
Report: ESAVDSK      VDISK Analysis Report                    Velocity Software Corporate
------------------------------------------------------------------------------------------

                           -----<--Size---> <AddSpce> Priv  VIO       <--pages---------
                           AddSpc VDSK Cre- Del-  or   rate User Resi- Lock-  Sto- DASD
Owner    Space Name        Pages  Blks ates etes  Shrd /sec Links dent   ed   len  Read
-------- ----------------- -----  ----- ---- ---- ---- ---- ----- ----- ----- ----- ----
10:45:00
LNXQWA01 VDISK$LNXQWA01$0206$0530 64256  512K    0    0 Shrd 0.00    1  122     0   0.7  0.0
LNXQWA01 VDISK$LNXQWA01$0207$0531 64256  512K    0    0 Shrd 0.04    1 2565     0   3.5  0.2
LNXTWA04 VDISK$LNXTWA04$0206$051C  131K 1049K    0    0 Shrd 1.28    1  11K     0     0  0.0
LNXUWA03 VDISK$LNXUWA03$0206$051E  250K 2002K    0    0 Shrd 0.65    1  14K     0   1.6  6.7
LNXUWA03 VDISK$LNXUWA03$0207$051F  375K 3002K    0    0 Shrd 0.29    1 4980     0   0.4  0.7
LNXUWA03 VDISK$LNXUWA03$0208$0520  513K 4102K    0    0 Shrd 0.28    1 4751     0   0.4  0.4
          ----- ----- ---- ---- ---- ---- ----- ----- ----- ----- ----
System Totals:             7805K  125M    0    0  .   5.09  204  46K     0   7.3  8.1
------------------------------------------------------------------------------------------
11:00:00
LNXQWA01 VDISK$LNXQWA01$0206$0530 64256  512K    0    0 Shrd    0    1 46.9     0   0.1    0
LNXQWA01 VDISK$LNXQWA01$0207$0531 64256  512K    0    0 Shrd    0    1 1381     0   0.3    0
LNXTWA04 VDISK$LNXTWA04$0206$051C  131K 1049K    0    0 Shrd    0    1 3984     0  11.7    0
LNXUWA03 VDISK$LNXUWA03$0206$051E  250K 2002K    0    0 Shrd 10.1    1  46K     0  12.9 58.4
LNXUWA03 VDISK$LNXUWA03$0207$051F  375K 3002K    0    0 Shrd 16.2    1  88K     0   6.1 19.7
LNXUWA03 VDISK$LNXUWA03$0208$0520  513K 4102K    0    0 Shrd 16.1    1  88K     0   5.8 20.2
          ----- ----- ---- ---- ---- ---- ----- ----- ----- ----- ----
Totals:                    7805K  125M    0    0  .  84.6  204 237K     0  37.2 98.3
```

Virtual Disk Analysis:
- Which virtual disk spiked?
- Are there multiple VDISKs - PRIORITIZED!!!

**Tuning Guide – VDISK Analysis**

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# Storage Utilization (By Megabyte): ESASTR1

```
Report: ESASTR1        Main Storage Analysis                    Velocity Software Corporate    ZMAP 4.2.3
Monitor initialized: 01/24/14 at 00:00:00 on 2827 serial 55AB7    First record analyzed: 01/24/14 00:00:00
----------------------------------------------------------------------------------------------------------
          Users <-------------------------MegaBytes------------------------------------------------------->
          Loggd System  Fixed Non-  Free Frame <Available> Systm  User   NSS/DCSS  <-AddSpace> VDISK <MDC>
Time         On Storage  Store Pgble Stor Table <2gb  >2gb ExSpc Resdnt  Resident  Systm User  Rsdnt Rsdnt
-------- ----- ------- ----- ----- ---- ----- ----- ----- ----- ------ -------- ----- ----- ----- -----
00:05:00   114   10240    11    55    1    80  1993  2656    22   4474       97    93     0   362   241
00:10:00   115   10240    11    55    1    80  1993  2649    22   4484       97    96     0   362   242
00:15:00   114   10240    11    56    1    80  1992  2644    22   4480      103    97     0   362   243
00:20:00   113   10240    11    56    1    80  1992  2658    22   4474       98    97     0   362   242
```

Total storage analysis ("megabyte" option)
- uspg_byMB = '1'b (Impacts ESASTR1, ESAUSPG) – now default
- MDC? 240mb? SET MDC MAX/MIN
- VDISK normal?
- User resident should be a large percent
- System "oversized"

# Invalid but Resident Storage Analysis

```
Report: ESAUSTR        User Storage Analysis
Monitor initialized: 07/07/15 at 13:03:48 on 2964 serial 5C2A7
----------------------------------------------------------------
          <-------Virtual Server Storage (Pages)---------> <Resident>
UserID    Size  Alloc Resi- UFO    <-----IBR---> <AgeList> <Unreferd>
/Class                    dent Activ TOT  <2gb >2gb <2gb >2gb <2gb >2gb
--------  ----- ----- ----- ----- ---- ---- ---- ---- ---- ---- ----
13:08:00  109M  93.1M   93M 93.0M 4405 1368 3037  316 123K    0    0
 ***User Class Analysis***
Servers   186K 33583 33583  8730  568  107  461 54.0  24K    0    0
ZVPS      420K 27906 27906 27906    0    0    0    0    0    0    0
TheUsers  108M 93.0M   93M 92.9M 3530 1135 2395  241  95K    0    0
 ***Top User Analysis***
LINXA195 1311K 1310K 1310K 1309K  3.0  3.0    0  3.0 1066    0    0
LINXA203 1311K 1310K 1310K 1309K  2.0  2.0    0  3.0 1072    0    0
LINXA204 1311K 1310K 1310K 1309K  3.0  1.0  2.0  3.0 1072    0    0
LINXA198 1311K 1310K 1310K 1309K  4.0  4.0    0  3.0 1072    0    0
LINXA199 1311K 1310K 1310K 1309K  4.0  4.0    0  3.0 1072    0    0
LINXA197 1311K 1310K 1310K 1309K 49.0 49.0    0  3.0 1069    0    0
LINXA155 1573K 1572K 1572K 1571K 23.0 12.0 11.0  3.0 1076    0    0
LINXA146 1573K 1572K 1572K 1571K  6.0  5.0  1.0  3.0 1073    0    0
LINXA148 1573K 1572K 1572K 1571K 17.0  3.0 14.0  3.0 1094    0    0
LINXA150 1573K 1572K 1572K 1571K  158  128 30.0  3.0 1075    0    0
```

Invalid but Resident (IBR)
- Are correct servers losing pages?  (Yes)

**Tuning Guide – IBR Analysis**

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```
Report: ESAUCD2        LINUX UCD Memory Analysis Report              Velocity Softwar
-------------------------------------------------------------------------------------
Node/      <-------------------------Storage Sizes (in MegaBytes)-------------------->
Time/      <--Real Storage--> <-----SWAP Storage----> Total <----Storage in Use----->
Date       Total  Avail Used  Total Avail Used  MIN    Avail CMM    Buffer Cache Ovrhd
--------  ------ ----- ----- ----- ----- ----- ----- ----- ------ ------ ----- -----
*** Nodes *******
LINUXVM2  495.2   7.2 488.1  63.5  63.5   0.0  15.6  70.7         0   63.9 283.2 141.0
LNXDPB02  493.0  52.5 440.5     0     0     0  15.6  52.5         0   89.6 278.8  72.1
V2TPSP01 1992.8  28.7  1964 269.5  84.9 184.6  16.4 113.6         0  218.3 669.7  1076
V2TPSP06 1895.4 757.1  1138 256.3 256.3     0  15.6  1013         0  126.9 901.2 110.2
V2TPSP04 1895.5 756.9  1139 256.3 256.3     0  15.6  1013         0  127.0 901.1 110.4
V2TPSP05 1895.5 756.8  1139 256.3 256.3     0  15.6  1013         0  126.6 901.3 110.8
V2TPSP03 1895.4 723.4  1172 256.3 201.8  54.5  15.6 925.2         0  109.0 655.7 407.2
V2TMSP04 1501.1   8.3  1493 256.3 256.3   0.0  15.6 264.7         0   82.0 599.3 811.5
V2TMSP05 1501.1 121.7  1379 256.3 256.3   0.0  15.6 378.0         0   84.0 269.2  1026
V2TMSP02 1501.1  65.3  1436 256.3 256.3   0.0  15.6 321.6         0  105.9 599.5 730.3
V2TMSP03 1501.1  64.2  1437 256.3 256.3   0.0  15.6 320.5         0   80.4 270.3  1086
```

Linux Storage Map
- Opportunities?
  - High available (greater than 5%)
  - High buffer (greater than 20mb)
- Issues?  Swap
- If swap used, but also a large buffer, CMM?

**Tuning Guide –
Linux Storage Analysis**

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## Top down:

- z/VM
- Configuration
- Rates
- Space full
- Device busy

## Paging rules change in 6.3

## Tuning Guide – Storage/Paging Level

```
Report: ESAPSDV        Page And Spool Device Activity                  Velo
-----------------------------------------------------------------------------
              <--------------Paging-------------> <--------------Spooli
 Dev          <--------Slots--------> <-per sec-> <--------Slots------
 No. Serial   Avail    Used %Use      Max  Read Write  Avail   Used %Use
 ---- ------  ------  ------ ----  ------ ----- ----- ------  ------ ---- --
11:00:00
E92F V2PAG1   1803K   1121K   62   1129K  25.2  35.1      .       .    .
E93F V2PAG2   1803K   1114K   62   1122K  24.1  35.2      .       .    .
E930 V2PAG3   1803K   1117K   62   1123K  22.5  31.2      .       .    .
E940 V2PAG4   1803K   1081K   60   1089K  21.0  35.8      .       .    .
E933 V2PAG5   1803K  904950   50  913775  23.2  37.2      .       .    .
E934 V2PAG6   1803K  894360   50  903958  23.7  39.4      .       .    .
E935 V2PAG7   1803K  840048   47  848995  23.8  37.2      .       .    .
E937 V2PAG8   1803K  709086   39  718015  24.4  37.1      .       .    .
E93C V2PAG9   1803K  726428   40  734888  24.8  36.1      .       .    .
E938 V2PA10   1803K  596028   33  604582  25.0  37.4      .       .    .
E93B V2PA11   1803K  594606   33  603738  26.7  38.9      .       .    .
EA4A V2SPL1      .       .    .       .       0     0  5897K 546231    9 54
             ------  ------ ----  ------ ----- ----- ------  ------ ---- --
Total:       19832K   9697K   49   9791K 264.6 400.5  5897K 546231    9 54
```

Paging Configuration:
- How many devices (11)
- Equal sizes?
- How full?  (50%)
- Rates reasonable?   Device type dependent

**Tuning Guide –
System Page Analysis**

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```
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
 ---- ------ ------ ------ --- ---- ---- ----- ----- ----- ---- ---- ---- ----
11:00:00
***Top DASD by Device busy***
E95C V2U019 3390-9 23344    0 10.6 44.6  26.4 116.6   4.8   4.0  0.3  1.4  2.2
E930 V2PAG3 3390-9  9170    0  6.2 19.5  10.4  29.3   5.9   5.9  0.3  0.0  5.6
E93F V2PAG2 3390-9  9759    0  5.9 15.8  11.0  31.7   5.3   5.3  0.3  0.0  5.0
E93C V2PAG9 3390-9  8101    0  5.8 17.1   9.2  29.3   6.3   6.3  0.3  0.0  6.0
E92F V2PAG1 3390-9 10137    0  5.7 15.6  11.5  31.4   5.0   5.0  0.3  0.0  4.6
E940 V2PAG4 3390-9  8869    0  5.2 14.8  10.0  29.9   5.2   5.2  0.3  0.0  4.8
E933 V2PAG5 3390-9  8418    0  5.1 12.8   9.5  28.9   5.3   5.3  0.3  0.0  5.0
E934 V2PAG6 3390-9  7858    0  5.0 13.4   8.9  26.9   5.6   5.6  0.3  0.0  5.3
E937 V2PAG8 3390-9  7568    0  5.0 13.3   8.6  28.9   5.8   5.8  0.3  0.0  5.5
E935 V2PAG7 3390-9  8284    0  4.9 13.1   9.4  30.8   5.2   5.2  0.3  0.0  4.9
***End Top DASD by Device busy***
```

## Page Device Analysis – DASD Subsystem

- Page Devices are usually in "Top Ten DASD"
- Device busy > 20% cause for concern
- Device busy > 50% serious
- Minute by minute analysis would show a 30% "Peak"

Velocity SOFTWARE

PROVEN PERFORMANCE

```
Report: ESABLKP        Block Paging Analysis                    Velocity Software Corporate
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655     First record analyzed: 04/15/1
-----------------------------------------------------------------------------------------------
            <----Load---->  Serv  <-Block->  <-Blocks Formed By->  Block  <--Block Exceptions/sec->
            <-Users-> Tran  Time  <-Reads->  <-Steal->  <Migrate>  Fault  <Single Read>  <No Refers>
Time        Actv In Q /sec  (ms)  /sec Size  /sec Size  /sec Size   /sec  User System    Migr Steal
--------    ---- ---- ----  ----  ---- ----  ---- ----  ---- ----  -----  ------ ------   ----- -----
10:15:00     63 61.3  2.4  45.9  19.9  7.0   0.0 31.0  10.2 13.2    9.0     8.8    0.0     0.8  50.0
10:30:00     63 61.3  2.3  47.1  10.3  7.0   0.0 25.1   3.7 13.7    4.7     5.6    0.0       0  45.1
10:45:00     63 63.3  2.2  33.0  18.8  7.0   0.0 29.4   6.0 20.9    8.4    11.1    0.0       0  57.2
11:00:00     64 67.4  2.3  57.8  27.1  7.7   1.0 33.3  26.0 13.6   11.0    34.6    0.1    12.9 176.8
```

Block Paging Analysis
- Block page read – optimal 10 pages
- Steal should be zero prior to 6.3
- Migrate should be zero with 6.3 and beyond
- Pages stolen, unreferenced – Storage stress
- Single page read – goes up with 6.3

PROVEN PERFORMANCE

```
Report: ESABLKP        Block Paging Analysis                      TEST MAP
-------------------------------------------------------------------------------
          <----Load----> Serv <-Block-> <-Blocks Formed By-> Block <--Block Exceptions/sec-->
          <-Users-> Tran Time <-Reads-> <-Steal->  <Migrate> Fault <Single Read>  <No Refers>
Time      Actv In Q /sec (ms)  /sec Size /sec Size /sec Size  /sec    User System  Migr Steal
--------  ---- ---- ---- ----  ---- ---- ---- ---- ---- ---- -----  ------ ------  ----- -----
07:49:00   83  262  0.7    .   65.6  5.6 31.4 18.8    0    0  25.4   291.2    1.7      0     0
```

Block Paging Analysis for 6.3+
- Block page read – optimal 5 pages??
- Migrate should be zero (No expanded storage)
- Pages stolen, unreferenced – zero with 6.3
- Single page read – goes up with 6.3
- Faster paging devices?  (new market for SSD)

## Top down:

- Configuration
- DASD I/O for system
- Rates by control unit
- Rates by device
- Rates by minidisk (by user)
- Cache

## Tuning Guide – DASD Level

# DASD Configuration: ESADSD1

```
Report: ESADSD1        DASD Configuration     Velocity Software Corporate
-------------------------------------------------------------------------
 Dev Sys               Device   <CHPIDS OnLn> MDisk <----Extent----> <--MDC St
 No. ID   Serial       Type     SHR 01 02 03 04 Links Type  Start Size Elig Def
 ---- ---- ------       ------   --- -- -- -- -- ----- ----- ----- ---- ---- ---
 E92F 1B89 V2PAG1       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E930 1B8A V2PAG3       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E931 1B8B 540RES       3390-9 NO  7A 7B 78 79     0    .       .    .  No   On
 E933 1B8D V2PAG5       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E934 1B8E V2PAG6       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E935 1B8F V2PAG7       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E936 1B90 V4SPL2       3390-9 NO  7A 7B 78 79     0    .       .    .  No   On
 E937 1B91 V2PAG8       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E938 1B92 V2PA10       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E939 1B93 VME939       3390-9 NO  7A 7B 78 79     0    .       .    .  No   On
 E93B 1B95 V2PA11       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E93C 1B96 V2PAG9       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E93E 1B98 VME93E       3390-9 NO  7A 7B 78 79     0    .       .    .  No   On
 E93F 1B99 V2PAG2       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E940 1B9A V2PAG4       3390-9 NO  7A 7B 78 79     0 Page      1  10K  Yes  On
 E958 1BB2 V2U011       3390-9 NO  7A 7B 78 79   113    .       .    .  Yes  On
 E959 1BB3 V2U013       3390-9 NO  7A 7B 78 79    15    .       .    .  Yes  On
 E95A 1BB4 V2U015       3390-9 NO  7A 7B 78 79    39    .       .    .  Yes  On
 E95B 1BB5 V2U017       3390-9 NO  7A 7B 78 79    29    .       .    .  Yes  On
```

DASD Configuration
- Multi channels to devices
- No minidisks on page devices
- MDC enabled appropriately

**Tuning Guide – DASD Configuration Analysis**

```
Report: ESADSD2        DASD Performance Analysis                    Velocity Sof
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655      First record
--------------------------------------------------------------------------------
                                               <--------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
 ---- ------  ------  ------ ---  ---- ----  ----- ----- -----  ---- ---- ---- ----
11:00:00

1800 Control Unit    3000    0   0.0  0.0    3.4   3.4   0.3   0.3  0.3    0  0.0

1880 Control Unit    3000    0   0.0  0.0    3.4   3.4   0.3   0.3  0.2    0  0.0

E900 Control Unit   186192   0   0.7  1.8  210.4 530.4   3.9   3.8  0.3  0.4  3.1

E980 Control Unit    1500    0   0.0  0.0    1.7   1.7   0.4   0.4  0.4    0  0.1

EA00 Control Unit   42722    0   0.1  0.5   48.3  93.2   2.1   2.1  0.3  0.2  1.5

EA80 Control Unit    1500    0   0.0  0.0    1.7   1.7   0.4   0.4  0.3    0  0.1
                    ------  ---  ---- ----  ----- ----- -----  ---- ---- ---- ----
System:             237914   0   0.2  0.5  268.8 633.7   3.4   3.4  0.3  0.3  2.7
```

DASD Control Units Rates, Performance:
- Shows activity by control unit
- Pend - indication of cache problems
- Compare control units to determine normality

**Tuning Guide –
DASD Utilization Analysis**

# Data Rates, Device Performance: ESADSD2

```
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
---- ------ ------ ------ --- ---- ---- ----- ----- -----  ---- ---- ---- ----
11:00:00
***Top DASD by Device busy***
E95C V2U019 3390-9 23344   0 10.6 44.6  26.4 116.6   4.8   4.0  0.3  1.4  2.2
E930 V2PAG3 3390-9  9170   0  6.2 19.5  10.4  29.3   5.9   5.9  0.3  0.0  5.6
E93F V2PAG2 3390-9  9759   0  5.9 15.8  11.0  31.7   5.3   5.3  0.3  0.0  5.0
E93C V2PAG9 3390-9  8101   0  5.8 17.1   9.2  29.3   6.3   6.3  0.3  0.0  6.0

***End Top DASD by Device busy***
1880 Control Unit   3000   0  0.0  0.0   3.4   3.4   0.3   0.3  0.2    0  0.0
E900 Control Unit 186192   0  0.7  1.8 210.4 530.4   3.9   3.8  0.3  0.4  3.1
E980 Control Unit   1500   0  0.0  0.0   1.7   1.7   0.4   0.4  0.4    0  0.1
EA00 Control Unit  42722   0  0.1  0.5  48.3  93.2   2.1   2.1  0.3  0.2  1.5
                   ------ --- ---- ---- ----- ----- -----  ---- ---- ---- ----
System:            237914   0  0.2  0.5 268.8 633.7   3.4   3.4  0.3  0.3  2.7
```

DASD Rates, Performance:
- System: rate, average service/response time
- Pend, disconnect low -> else DASD cache
- Connect low -> else faster channels
- Response = service, else queueing
- Peak busy for device (1 minute peak)

```
Report: ESADSD5        3990-3 Cache Analysis                    Velocity Software Corporate   ES
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655      First record analyzed: 04/15/11
--------------------------------------------------------------------------------------------------
              Pct. <-------------------per second------------------> <--------Write activity per se
 Dev         Actv <------Total-------> <----Read---> <--Seq Read--> Total  DFW  DFW SEQ        NVS
 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
 ----  ------ ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ----
11:00:00
***Top DASD by Device busy***
E95C  V2U019  100 25.9 21.3 82.0  62.5 16.2 11.5 71.3    0    0    0   9.7  9.7  9.7    0  100    0
E930  V2PAG3  100 10.1  7.6 75.9  58.6  5.9  3.5 58.9    0    0    0   4.2  4.2  4.2    0  100    0
E93F  V2PAG2  100 10.9  8.5 77.3  58.2  6.4  3.9 61.1    0    0    0   4.6  4.6  4.6    0  100    0
E93C  V2PAG9  100  8.9  6.3 70.0  65.8  5.9  3.2 54.5    0    0    0   3.1  3.1  3.1    0  100    0
E92F  V2PAG1  100 11.2  8.5 76.3  59.2  6.6  4.0 60.1    0    0    0   4.6  4.6  4.6    0  100    0
***End Top DASD by Device busy***

1800 CtlUnit  100  220  219  100   4.6 10.1  9.7 96.7    0    0    0 209.6  210  210    0  100    0
1880 CtlUnit  100  1.8  1.8  100 100.0  1.8  1.8  100    0    0    0     0    0    0    0    0    0
E900 CtlUnit  100  368  331 89.8  27.3  101 63.3 62.9    0    0    0 267.8  268  268    0  100    0
EA00 CtlUnit  100 73.0 72.3 99.1   6.9  5.0  4.4 86.8    0    0    0  68.0 68.0 68.0    0  100    0
 ----  ------ ---- ---- ---- ---- ----- ---- ---- ---- ---- ---- ---- ----- ---- ---- ---- ---- ----
 System:      100  663  624 94.2  17.7  118 79.2 67.4    0    0    0 545.3  545  545    0  100    0
```

**DASD Cache:**
- Hit percent (read, write)
- Low hit% -> need more cache or batch (backups)
- NVS full ->  fast write stops
- Data shows activity from all LPARS to device/ctl unit

**Tuning Guide – DASD Cache Analysis**

# Data activity by user:  ESASEEK, ESAUSEK

```
Report: ESAUSEK       User DASD Seeks Report                    Velocity
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655     First re
Monitor period:        3600 seconds (   1:00:00)                   Last rec
-----------------------------------------------------------------------------
 Userid    Dev Volume <--Minidisk-> <Cylinder-> Total <---Non-zero---> Read
 /Time     No. Serial Ownerid  Addr Start Stop  Seeks Seeks Pct. Dist. Pct.
--------   ---- ------ -------- ---- ----- ----- ----- ----- ---- ----- ----
*********************************************Summary*****************
Average:
LNXUWA01  E95C V2U019 LNXUWA01 0233 40591 40722  2389  1699 71.1  9685    0
          EA59 V2U016 LNXUWA01 0210     1 16698 14762  9854 66.8  2220    0
          E903 V2U034 LNXUWA01 021F 15207 32689  7542  4394 58.3  1578 16.6
          E903 V2U034 LNXUWA01 0220 32986 33350    63    63  100 10459    0
          E95A V2U015 LNXUWA01 0209     1 12084 10345  4849 46.9  4981 28.4
          E95A V2U015 LNXUWA01 020A 12085 19617  2608  2024 77.6  8521    0
          E95A V2U015 LNXUWA01 020F 52329 53478    24    16 66.7 33363    0
          E926 V2U041 LNXUWA01 0232  6062  7598  2239  1544 69.0  4294    0
          E95B V2U017 LNXUWA01 021E 26231 28597    42    36 85.7 10207    0
          E95E V2U023 LNXUWA01 0204 63268 63850   675   327 48.4 21376    0
          EA58 V2U014 LNXUWA01 0205  3029  3033     3     2 66.7 31999    0
```

DASD activity by virtual machine: ESAUSEK

DASD activity by minidisk/volume:  ESASEEK
  - Correlate activity to poor performing disks
  - Note read percent for Linux minidisks

## Network Activity

- Configuration
- Rates
- Errors
- vSwitch/Guest LAN

## Tuning Guide – Network Level

```
Report: ESATCPI          TCPIP Interface Configuration Report          Velocity Sof
-----------------------------------------------------------------------------------
NODE      Idx        Speed <-Status-> Up    <-------------------Interface---------
          Nbr MTU    (Est) Oper Admin Time MACAddress          Description Type
--------  --- -----  ----- ---- ----- ---- ----------------- ----------- --------

          ***********************************************Summary*********************
Average:
TCPIP      1  1500 1000M    .     .      .                 . ETHERNET viETHERNET-
VMLOCAL    1  1500 1000M   UP    UP     0 00:20:20:20:20:20 ETHERNET viETHERNET-
LINUXVM2   2  1500  100M   UP    UP     0 02:00:00:00:00:30 eth0        ETHERNET-
LNXDPB02   3  1492  100M   UP    UP     0 02:00:00:00:00:04 eth0        ETHERNET-
V2TPSP01   1 16436   10M   UP    UP     0 00:20:20:20:20:20 lo          Software
           2  1500  100M   UP    UP     0 02:00:00:00:00:15 eth0        ETHERNET-
V2TMSP05   1 16436   10M   UP    UP     0 00:20:20:20:20:20 lo          Software
           2  1500  100M   UP    UP     0 02:00:00:00:00:09 eth0        ETHERNET-
V2TMSP02   1 16436   10M   UP    UP     0 00:20:20:20:20:20 lo          Software
           2  1500  100M   UP    UP     0 02:00:00:00:00:06 eth0        ETHERNET-
V2TMSP03   1 16436   10M   UP    UP     0 00:20:20:20:20:20 lo          Software
           2  1500  100M   UP    UP     0 02:00:00:00:00:07 eth0        ETHERNET-
LNXUWA01   1 16436   10M   UP    UP     0 00:20:20:20:20:20 lo
           4  1492  100M   UP    UP     0 02:00:00:00:00:22 eth0
```

Interface configuration
- Ethernet adapter
- Loop back
- MTU check

**Tuning Guide –
Network Configuration Analysis**

**VELOCITY**
S O F T W A R E

P R O V E N   P E R F O R M A N C E

# Network Data Rates: ESATCP4

```
Report: ESATCP4         TCPIP Hardware Layer/Interfaces Report          Ve
-----------------------------------------------------------------------------
Date/           <Total Octets> Avg  <-Subnet packets / Sec->  <-----Pack
Time            <-Per second->  Q   <-Unicast-> <NonUnicast> <In Error>
Node      IFT Input   Output   Len  Input Outpt Input Output Inpt Outpt
-------- ---- -----   ------   ----  ----- ----- ----- ------- ---- -----
11:00:00
*** Nodes *******
TCPIP    -  1 16897   6231.9     0  25.74  21.3     0      0     0     0
VMLOCAL  -  1 16859   6223.3     0  25.70  21.3     0      0     0     0
LINUXVM2 -  2 93.06   208.92     0   0.38   0.4     0      0     0     0
LNXDPB02 -  3 293.8   590.32     0   2.25   2.4     0      0     0     0
V2TPSP01 -  1 418.3   418.26     0   1.54   1.5     0      0     0     0
         -  2 188.6   666.61     0   0.95   1.2     0      0     0     0
V2TMSP05 -  1 323.6   323.61     0   6.16   6.2     0      0     0     0
         -  2  1517   2481.8     0   4.70   4.5     0      0     0     0
LNXDMS2A -  3 103.4   299.74     0   0.47   0.6     0      0     0     0
LNXUWA01 -  1 21167   21167      0  57.81  57.8     0      0     0     0
         -  4  109K   122K       0 236.9  268.5     0      0     0     0
LNXDWA02 -  1 920.2   920.23     0   5.03   5.0     0      0     0     0
         -  4  9112   10306      0  25.84  24.3     0      0     0     0
```

Network activity, server, by interface
Understand rates
Check for errors

**Tuning Guide – Network Data Rate**

VELOCITY SOFTWARE

PROVEN PERFORMANCE

```
Report: ESAQDIO        Queued I/O Report                      Velocity Software Corpor
Monitor initialized: 04/15/11 at 10:00:00 on 2097 serial 72655     First record analyzed: 0
--------------------------------------------------------------------------------------------
                             Number <QDIO SIGA Instructions/Sec-> <-Throughtput / sec->
Date/      Dev.         Virt QDIO Queues <---Guest----> <----CP------> <Buffers> <--Bytes→
Time       Nmbr owner   DevN Fmt  In Out Read Writ "s"  Read Writ "s"  Sent From  Sent From
--------   ---- ------- ---- ---- -- --- ---- ---- ---- ---- ---- ---- ---- ---- ----- -----
--------------------------------------------------------------------------------------------
11:00:00 0000 Totals    0000 QDIO 0  0   0    0    0    0    693  0   1066 676  644K  422K
         F3D8 VSWCTRL2  F3D8 QDIO 1  1   0    0    0    0    573  0   895  535  527K  306K
         F3E0 VSWCTRL2  F3E0 QDIO 1  1   0    0    0    0    119  0   171  141  118K  117K
         F53E LNXUWA02  7002 HPER 1  4   0    0    0    0    0.6  0   1    0    89    0
*****************************************Summary********************************************
Average: 0000 Totals    0000 QDIO 0  0   0    0    0    0    639  0   1040 621  615K  441K
         F3C8 VSWCTRL1  F3C8 QDIO 1  1   0    0    0    0    0    0   0    0    0     0
         F3D8 VSWCTRL2  F3D8 QDIO 1  1   0    0    0    0    530  0   891  491  529K  322K
         F3E0 VSWCTRL2  F3E0 QDIO 1  1   0    0    0    0    108  0   149  130  85716 119K
         F3F0 VSWCTRL1  F3F0 QDIO 1  1   0    0    0    0    0    0   0    0    0     0
         F515 LNXDPB02  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
         F518 LNXDWA01  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
         F53B LNXUWA01  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
         F53E LNXUWA02  7002 HPER 1  4   0    0    0    0    0.6  0   1    0    92    0
         F542 LNXUWA03  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
         F545 LNXUWA04  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
         F548 LNXDMS2A  7002 HPER 1  4   0    0    0    0    0    0   0    0    0     0
```

QDIO activity
- Hipersockets
- Virtual switch

**Tuning Guide – QDIO Utilization Analysis**

# Guest LAN / Virtual Switch Data Rates:  ESANIC / ESATCP4

```
Screen: ESANIC   Velocity Software - VSIVM4
1 of 3  Virtual NIC Activity

                                   <-- Data Th
            VSWITCH/ <Virtual NIC> <Bytes/Sec>
Time        GuestLAN Userid   Addr   Sent  Rcvd
--------    -------- -------- ---- ----- -----
15:24:00 VSIINT    TIML2     0600   4048 11059
                   SLES11X3 0600   1160   628
                   RKS2LV    0600    481   839
                   REDHAT71 0600    573   376
                   REDHAT64 0600   1818   846
                   REDHAT56 0600   2415   964

F1=Help                     PF3=Quit      PF4=S
              PF8=Forward  PF9=Sort      PF10=
_____

Screen: ESATCP4   Velocity Software - VSIVM4
1 of 2  TCPIP Hardware Layer / Interfaces

                            <Total Octets>
            Node/           <-Per second->
Time        Group    Interface  Input  Output
--------    -------- --------- ------ ------
15:24:00 redhat71 enccw0.0.  390.87 584.07
                   redhat71 lo            0      0
                   redhat64 eth0      918.03   1908
                   redhat64 lo            0      0
                   redhat6x eth0      818.33   1900
                   redhat6x eth1       0.47      0
                   redhat6x lo         3059   3059
                   redhat6  eth0       1862   4660
                   redhat6  lo            0      0
```

Guest LAN / Virtual Switch activity
- ESANIC:  CP Monitor data
- ESATCP4:  SNMP data
- Compare "received to input"

- Redhat7 renamed eth0

**Tuning Guide –
Network User Data Rate Analysis**

PROVEN PERFORMANCE

# OSA Adapter:  ESAOSA

```
Report: ESAOSA           OSA System Configuration Report
-------------------------------------------------------
Collector <---------OSA Configuration--> MacAddress
Node      Idx  Name  Nbr  Type Level Shrd Active
--------  ---  ------ ---  ---- ----- ---- ------------
00:15:00
OSA178     2   OSA1    0 1G Eth 6.00  Yes 6CAE8B483FD4

redhat6x   3   OSA1    0 1G Eth 6.00  Yes 6CAE8B483FD4
```

```
Report: ESAOSA                    Velocity Software Corporate
--------------------------------------------------------------
Collector <-------- LPAR Bus  CPHID  KBytes/Sec Packets/sec
Node      Idx  Name  NBR Util Util    IN   OUT    In   OUT
--------  ---  ------ --- ---- ----  ----- ----- ----- -----

OSA178     2   OSA1   Tot   0   15    4.0   8.1  25.5  16.7
                       2    0    .    53    15
                       4    0    .   288   291
                       5    0    .    59    55

redhat6x   3   OSA1   Tot   0   15   12.7   5.3  26.8  16.8
                       1    0    .     2    56
                       2    0    .    61    15
                       4    0    .   312   400
                       5    0    .    59    55
```

OSA data collected via SNMP
- Configuration data
- Total data
- Data by LPAR if shared
- (New with 4.3)

**Tuning Guide – OSA Utilization Analysis**

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