Linux and z/VM Performance Management (Version 5.1), zOSMON ™ too….

Velocity Software Inc.
196-D Castro Street
Mountain View CA 94041
650-964-8867

Velocity Software GmbH
Max-Joseph-Str. 5
D-68167 Mannheim
Germany
+49 (0)621 373844

Barton Robinson,
barton@velocitysoftware.com

If you can't measure it, I'm just not interested….

Topics

Performance Management Overview

Systems Management Features

zVPS Objectives (and buzwords)

End to End Performance Management

zVPS

- Data Collection
- PDB
- Technology
- Applications
- zVPS Version 5

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"z" Performance Management Level Set

SHARED resource environment,

- z/VM Performance critical (Many user facing applications run on Linux on Z)
- Any server or application can impact other servers or applications

Linux is not z/OS

- No workload manager, workload prioritization is manual

This is not distributed Environment

- We do not have cycles to waste (java 1,000 times more expensive than alc)
- We DO have capacity planning, chargeback requirements
- We DO expect to run at very high utilization!

Tools are needed specific to the environment

- "end to end"

Performance Management User Requirement

What are the user requirements, really? Ask the users….

- **Performance Analysis**
- **Operational Alerts**
- **Capacity Planning**
- **Accounting/Charge back**

How many data sources and tools required?

Information Services job is to support the users!

Manage the System resources well (pick 3)

- **Low resource consumption/cost**
- **Fast**
- **High function**

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Performance Management "vendor" Requirements

Performance Management Business Requirements

- Performance Analysis
- Operational Alerts
- Capacity Planning
- Accounting/Charge back

Correct data

- (Virtual Linux CPU data wrong)
- SMT CPU data difficult to understand

Capture ratios (is the data valid?)

Instrumentation can NOT be the performance problem

Non-Intrusive!

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Infrastructure Requirements: Performance Analysis

Why Performance Analysis: Service Level Mgmt

- Diagnose problems real time
- Manage Shared resource environment
- Any application may impact other applications

Infrastructure Requirements

- Analyze all z/VM Subsystems in detail, real time
  - (DASD, Cache, Storage, Paging, Processor, TCPIP)
- Analyze Linux
  - (applications, processes, processor, storage, swap)
- Historical view of same data important
  - Why are things worse today than yesterday?
  - Did adding new workload affect overall throughput?
  - Know who/what is using resource and how to re-allocate

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Infrastructure Requirements: Capacity Planning

Why Capacity Planning: Future Service Levels

- How many more servers can you support with existing z14?
- What is capacity requirements for an application?
- Avoid crises ***in advance***
- Consolidation Planning – Projecting requirements of the next 100 or 1000 servers

Infrastructure Requirements

- Performance database (long term)
- z/VM **AND** Linux data
- Resource requirements by Server, Application, User
- z/VM and z/Linux data must be usable by existing planners
- **Interface to MICS, MXG, TDS, IUE (BMC)**

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Infrastructure Requirements: Chargeback

Why Chargeback?

- How much does an application cost IT to operate?
- Distributed chargeback model is by server
- Shared chargeback model is by resource utilized
- Convincing customers to move applications to "z"
- Encourages efficient/effective resource use
- Align IT to your business model

Infrastructure Requirements

- Identify Resource by server
- Identify Resource by Linux Application
- **High capture ratio**
- Every site does it differently, so flexible data is key

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Infrastructure Requirements: Operations

Operational Requirements

- Operations will manage 100's (1000's) of servers
  - Requires active performance management
- Alerts for processes in loops, disks 90% full, missing processes
  - One test server in a loop impacts all other servers
- Fast problem detection
- Requires active performance management
- Requires AUTOMATION! (zALERT!) (Non-Intrusive)

Infrastructure Requirements

- Interface to SNMP management console (NETCOOL, HPOpenView)
- User tailored alerts
- Web based alerts
- OPERATIONS CONSOLE (zOPERATOR)

zVPS does "End to End" Performance Management

Management wants "single pane of glass" - One tool that does all

Complete performance management includes:

- z/VM System Level: CEC, LPAR data, ALL SubSystems
- Network analysis
- VSE – partitions, CPU, I/O
- Linux – Storage, CPU, file system, network
- Process – applications, performance data
- z/OS….

Application subsystem analysis

- Java, WAS, Oracle, (MQ, DB2), MongoDB, Docker

Outside "z" server analysis

- Linux on "x", VMWare, KVM
- Microsoft servers
- VPN, gateways, utilities

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Performance Management Data Sources

Performance instrumentation is NOT the problem!!!

Instrumentation source guidelines

- NO Control Blocks (HIGH OVERHEAD)
- "Agentless"
- Standard, Defined APIs!!!
- No release to release issues
- Extensible
- (NO JAVA)….

Data sources:

- z/VM: CP Monitor
- Network: SNMP
- Linux/Microsoft: SNMP HOST Mib
- z/VSE: SNMP, DMF/SMF (CICS)
- z/OS: SMF (logstream)
- Secure Container: collectd

Performance Management Data Sources

SNMP

- Standard network data source
- Standard across all platforms except VMWare and AIX
  - Microsoft host mib

- Easily enhanced for platform specific:
  - Linux (UCD, Host, network)
  - Linux (Velocity mib)
  - Oracle (Velocity mib)
  - Java / Websphere
  - VSE (IBM)
  - VSE (Velocity)
  - GPFS
  - MongoDB
  - Docker

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Standard Interfaces mean less work

- Agentless

CP Monitor – z/VM

- LPAR data, CPU data
- Disk, storage, paging data
- Virtual machine data
- Seeks data

SNMP – Standard (requires zTCP collector)

- Network data, microsoft servers, many appliances
- VSE data
- Linux "UCD" mib – high level ram, CPU

SNMP – Velocity Software mib

- Process details, applications, Java, WAS, Oracle

z/VM Performance monitor architecture

Traditional model (1989)

ESAMON/zMON: Real time analysis

- Uses Standard CP Monitor

  Real Time Analysis

ESAMAP/zMAP: Performance Reporting

Post (midnight) Processing

Creates Long Term PDB

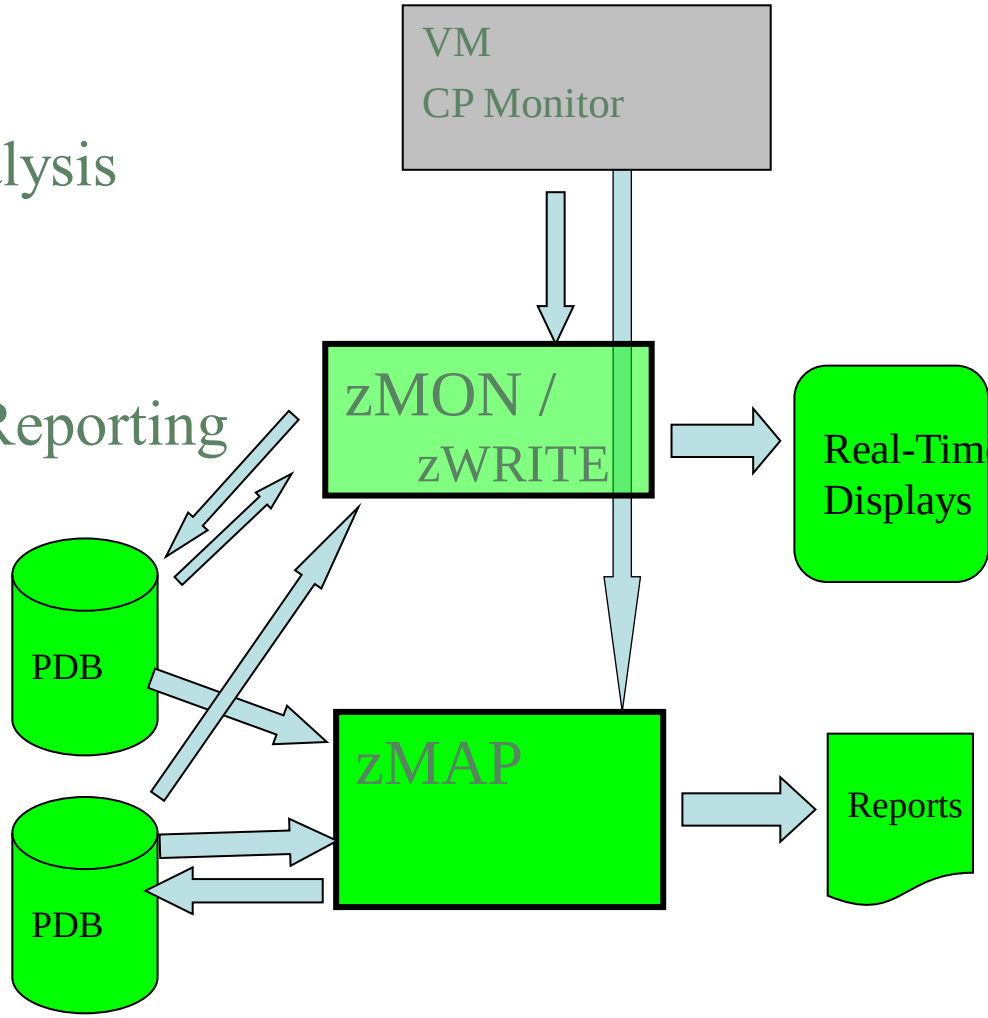
PDB or monwrite data input

PDB (Performance DataBase)

Complete data

By Minute, hour, day

Monthly/Yearly Archive



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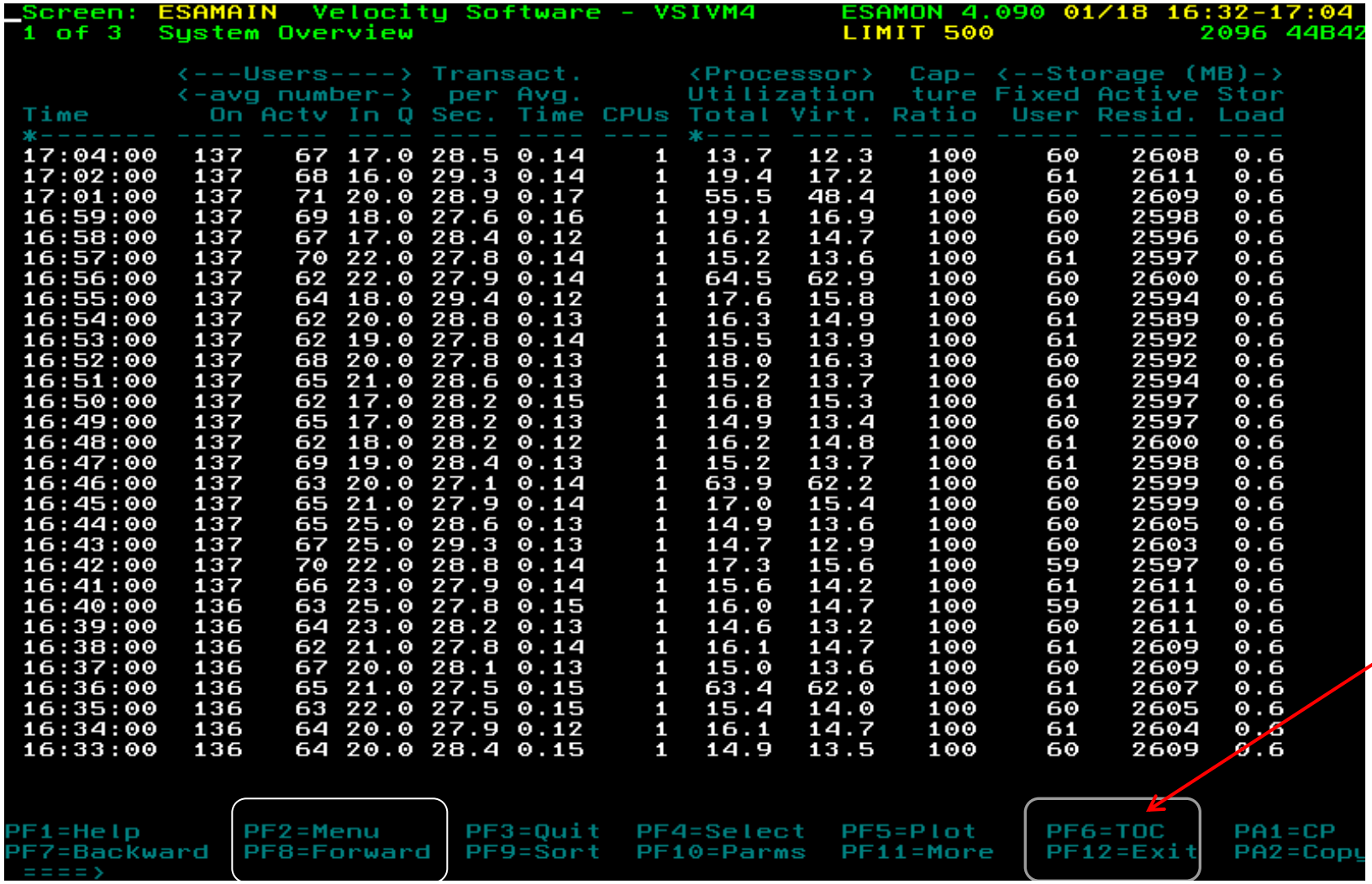
zMON 3270 Overview

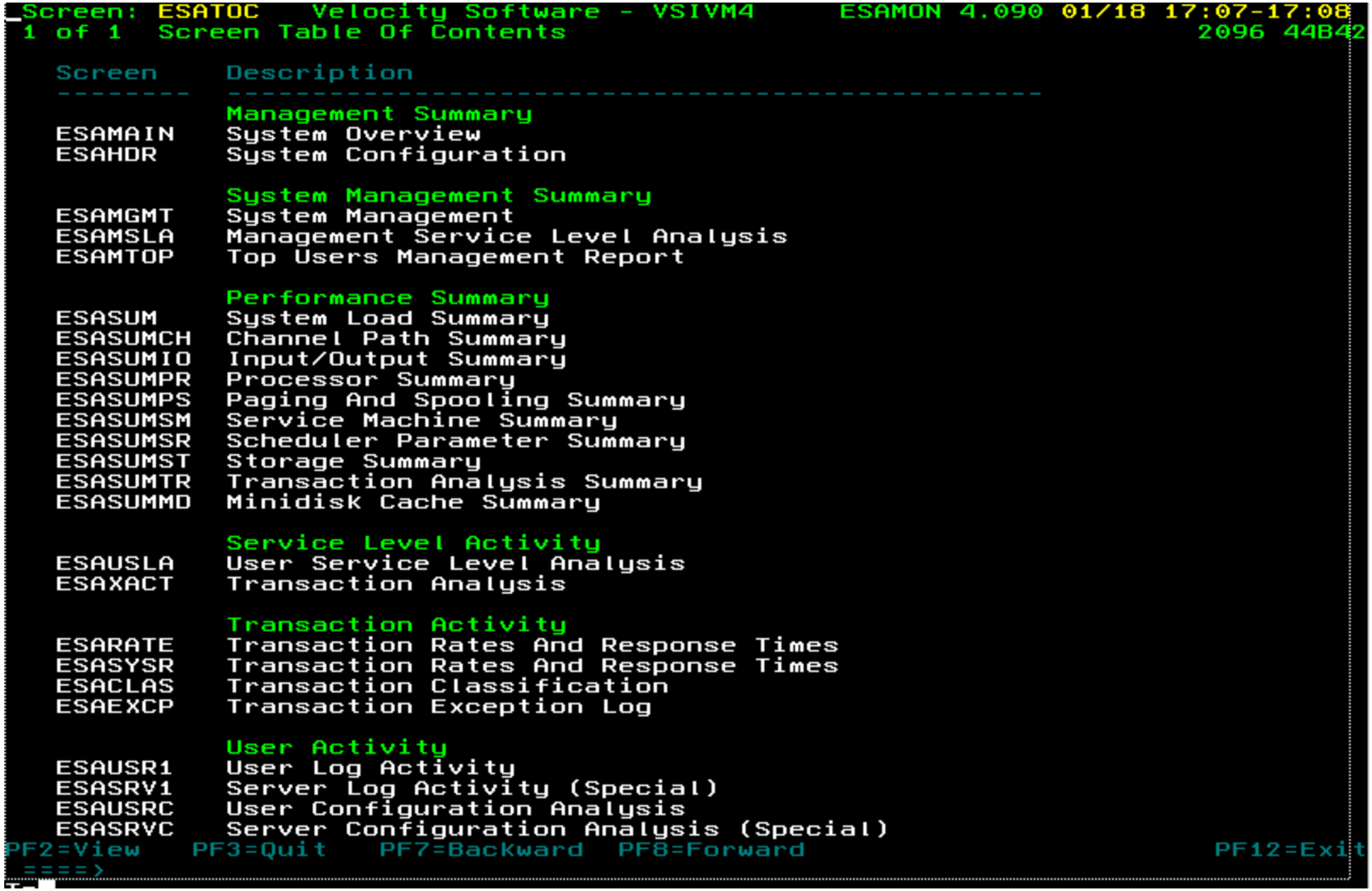


```
Screen: ESAMAIN  Velocity Software - VSIVM4      ESAMON 4.090 01/18 16:32-17:04
1 of 3  System Overview                          LIMIT 500              2096 44B42

          <---Users----> Transact.        <Processor> Cap- <--Storage (MB)->
          <-avg number-> per Avg.         Utilization ture Fixed Active Stor
Time        On Actv In Q Sec. Time CPUs   Total Virt. Ratio User Resid. Load
*-------- ---- ---- ---- ---- ---- ----  *---- ----- ----- ----- ------ ----
17:04:00  137   67 17.0 28.5 0.14    1    13.7  12.3   100    60   2608  0.6
17:02:00  137   68 16.0 29.3 0.14    1    19.4  17.2   100    61   2611  0.6
17:01:00  137   71 20.0 28.9 0.17    1    55.5  48.4   100    60   2609  0.6
16:59:00  137   69 18.0 27.6 0.16    1    19.1  16.9   100    60   2598  0.6
16:58:00  137   67 17.0 28.4 0.12    1    16.2  14.7   100    60   2596  0.6
16:57:00  137   70 22.0 27.8 0.14    1    15.2  13.6   100    61   2597  0.6
16:56:00  137   62 22.0 27.9 0.14    1    64.5  62.9   100    60   2600  0.6
16:55:00  137   64 18.0 29.4 0.12    1    17.6  15.8   100    60   2594  0.6
16:54:00  137   62 20.0 28.8 0.13    1    16.3  14.9   100    61   2589  0.6
16:53:00  137   62 19.0 27.8 0.14    1    15.5  13.9   100    61   2592  0.6
16:52:00  137   68 20.0 27.8 0.13    1    18.0  16.3   100    60   2592  0.6
16:51:00  137   65 21.0 28.6 0.13    1    15.2  13.7   100    60   2594  0.6
16:50:00  137   62 17.0 28.2 0.15    1    16.8  15.3   100    61   2597  0.6
16:49:00  137   65 17.0 28.2 0.13    1    14.9  13.4   100    60   2597  0.6
16:48:00  137   62 18.0 28.2 0.12    1    16.2  14.8   100    61   2600  0.6
16:47:00  137   69 19.0 28.4 0.13    1    15.2  13.7   100    61   2598  0.6
16:46:00  137   63 20.0 27.1 0.14    1    63.9  62.2   100    60   2599  0.6
16:45:00  137   65 21.0 27.9 0.14    1    17.0  15.4   100    60   2599  0.6
16:44:00  137   65 25.0 28.6 0.13    1    14.9  13.6   100    60   2605  0.6
16:43:00  137   67 25.0 29.3 0.13    1    14.7  12.9   100    60   2603  0.6
16:42:00  137   70 22.0 28.8 0.14    1    17.3  15.6   100    59   2597  0.6
16:41:00  137   66 23.0 27.9 0.14    1    15.6  14.2   100    61   2611  0.6
16:40:00  136   63 25.0 27.8 0.15    1    16.0  14.7   100    59   2611  0.6
16:39:00  136   64 23.0 28.2 0.13    1    14.6  13.2   100    60   2611  0.6
16:38:00  136   62 21.0 27.8 0.14    1    16.1  14.7   100    61   2609  0.6
16:37:00  136   67 20.0 28.1 0.13    1    15.0  13.6   100    60   2609  0.6
16:36:00  136   65 21.0 27.5 0.15    1    63.4  62.0   100    61   2607  0.6
16:35:00  136   63 22.0 27.5 0.15    1    15.4  14.0   100    60   2605  0.6
16:34:00  136   64 20.0 27.9 0.12    1    16.1  14.7   100    61   2604  0.6
16:33:00  136   64 20.0 28.4 0.15    1    14.9  13.5   100    60   2609  0.6

PF1=Help     PF2=Menu     PF3=Quit   PF4=Select  PF5=Plot    PF6=TOC     PA1=CP
PF7=Backward PF8=Forward  PF9=Sort   PF10=Parms  PF11=More   PF12=Exit   PA2=Copy
 ====>
```

zMON 3270 TOC



zMON 3270 zoom – User classification

```
Screen: ESAUSP2  Velocity Software - VSIVM4      ESAMON 4.090 01/18 17:09-17:10
1 of 3  User Percent Utilization                 CLASS *              2096 44B42

                                 <-------Main Storage-------->
          UserID    <Processor>  <Resident->  Lock  <-WSSize-->
Time      /Class    Total  Virt  Total  Actv   -ed  Total  Actv
--------  --------  -----  ----- -----  -----  ----- -----  -----
17:10:00  System:   15.32  14.23  667K   665K  5448   675K   665K
          REDHAT     4.58   4.53  281K   281K  1997   284K   284K
          TEST       3.56   2.98  161K   161K   844   161K   160K
          *TheUsrs   3.12   3.02 57661  57645   290 59127  57322
          SUSE       1.63   1.57  109K   109K   839   109K   108K
          ORACLE     0.96   0.96 50503  50503    66 50437  50437
          Velocity   0.93   0.90  4552   3444    28  7385   3401
          KeyUser    0.36   0.15  2973   2973  1379  1898   1573
          Servers    0.17   0.13   943    520     5  1874    495
```

Hit PF2 to zoom on SUSE class, get:

```
Screen: ESAUSP2  Velocity Software - VSIVM4      ESAMON 4.090 01/18 17:11-17:12
1 of 3  User Percent Utilization                 CLASS SUSE USER *    2096 44B42

                                 <-------Main Storage-------->
          UserID    <Processor>  <Resident->  Lock  <-WSSize-->
Time      /Class    Total  Virt  Total  Actv   -ed  Total  Actv
--------  --------  -----  ----- -----  -----  ----- -----  -----
_17:12:00 SLES11X    0.39   0.39 24223  24223   247 23976  23976
          SLES11     0.32   0.32 12404  12404   181 12199  12199
          SUSELNX2   0.25   0.23  3648   3648     0  3628   3628
          SLES9X     0.21   0.21 14632  14632    35 14597  14597
          SLES10     0.20   0.20 28935  28935   299 28636  28636
          SLES9      0.20   0.20 12722  12722   177 12545  12545
          SLES8      0.06   0.03 11251  11251     0 11201  11201
          SLES8X        0      0     0      0     0   890      0
          SUSELNX1      0      0     0      0     0   219      0
```

zMAP listings and zMON displays SAME names

```
Report: ESATOC        Table Of Contents
Monitor initialized: 12/23/14 at 13:55:
Monitor period:           660 seconds (
---------------------------------------
```

zMAP Performance Data Base

History data format – long term

- All history in “daily” files, yyyymmdd

zMAP, EXTRACT Formats

- ESAMAP yyyymmdd
- ESAMAP (WEEK 51
- ESAMAP (MONTH 12
- Same for ESAEXTR
- Wild card support “yyymm*”

Performance Database "EXTRACT"

Performance database language:

- ESAEXTR – ZMAP feature
- HISTORY KEYWORDS – describes variable names (~4000 metrics)

ESAEXTR Functions

- ESAEXTR filetype* (PARM ucdsys CSV
- Filetype is history type, as in 201906* for "june, 2019"
- CSV produces CSV format vs column aligned

ESAEXTR Statements

- EXTRACT:
- x = 'NODE'
- y = 'UCDSYS.REALSIZE'
- y = 'UCDSYS.BUFFER'
- y = 'UCDSYS.CACHE'
- y = 'UCDSYS.REALSIZE-UCDSYS.REALAVAIL-UCDSYS.BUFFER-UCDSYS.CACHE‘ ; anonymous
- y = 'UCDSYS.SWAPSIZE-UCDSYS.SWAPAVAIL'
- y = 'UCDSYS.CMM'
- **criteria = NODE = LNXD01*'** ; wild card
- TITLE = 'Linux Storage Analysis'
- TITLE = '*Label Available Buffer Cache Anonymous'

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Capacity Planning "planning"

Monitor data very large

- Process it real time, extract information, discard the data
- All classification and collection done before discard

Classification functions

- User classes – defined by installation, some predefined
- "Key users", class 0 is special
- DASD and non-DASD Control Units

USERCLASS statements

- nuserclass = 20
- class_size = 140
- nclasses = 1

- **Userclass(03,000) = 'ZVPS '**
- Userclass(03,007) = 'ZMAP'
- Userclass(03,008) = 'ZMON'
- Userclass(03,009) = 'ZWRITE'
- Userclass(03,010) = 'ZSERVE'
- Userclass(03,011) = 'ZTCP'
- Userclass(03,016) = 'ZTCP'
- Userclass(03,017) = 'ZWEB*'

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Benefits of Architecture – day one

- **z/VM new releases supported day 1 (Note stg size)**

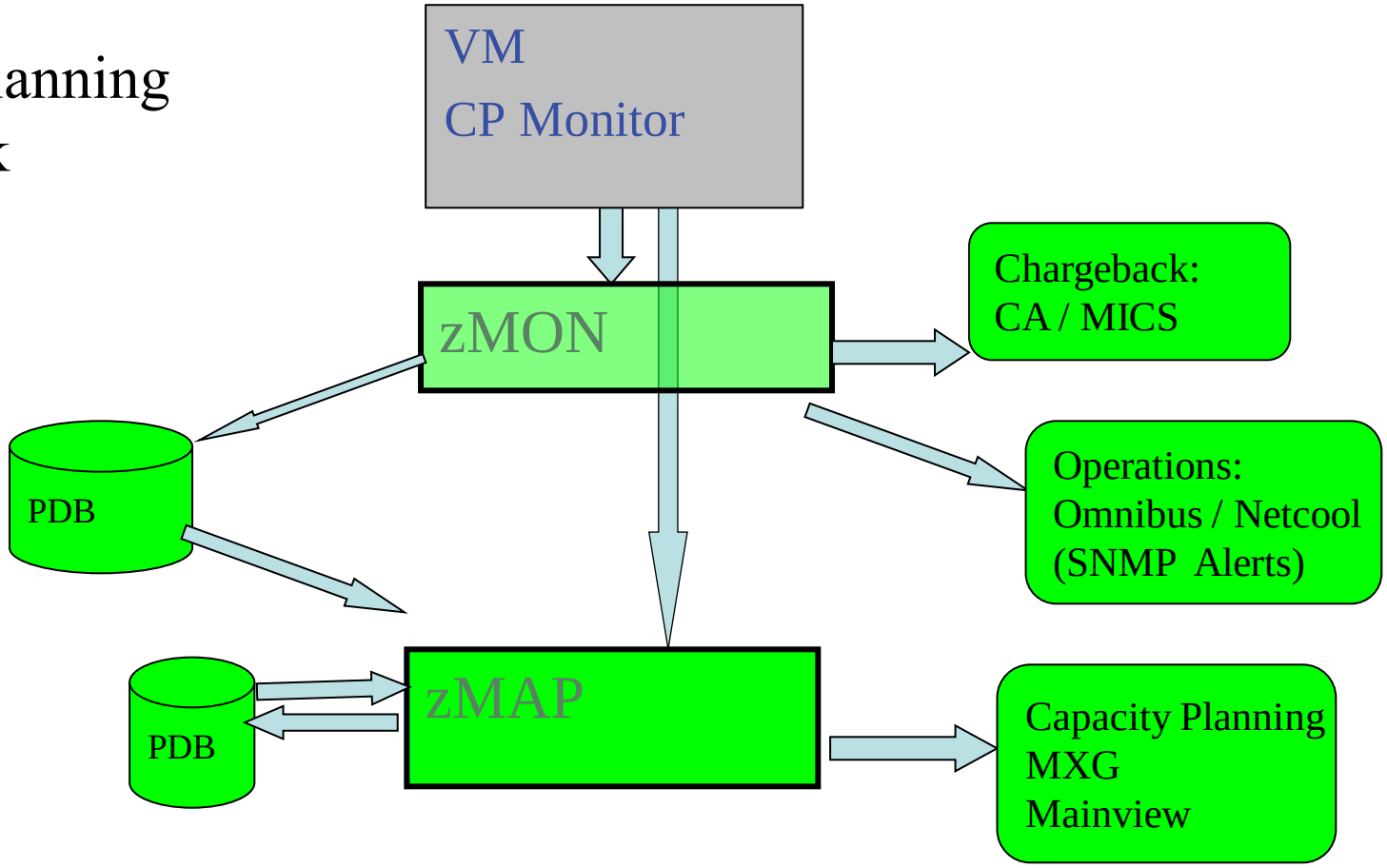
Report: ESASTR1 Velocity Software Corporate

	Users	<------Pages----------					<-AddSpace>		Over	
	Loggd	System	<Available>		Systm	User			Commit	Capt-
Time	On	Storage	<2gb	>2gb	ExSpc	Resdnt	Systm	User	Ratio	Ratio
15:29:00	69	138412K	84	1258K	10296	134M	1641K	0	1.915	1.000
15:30:02	69	138412K	109	1649K	10194	134M	1699K	0	1.915	1.000
15:31:00	69	138412K	178	1540K	10059	134M	1732K	0	1.915	1.000
15:32:00	67	138412K	838	2974K	9869	89040K	1764K	0	1.915	0.686
15:33:03	66	138412K	200K	46M	9717	58977K	1064K	0	1.915	0.776
15:34:08	66	138412K	390K	77M	9277	23615K	707K	0	1.915	0.743
15:36:01	65	138412K	486K	136M	8669	204895	81839	0	1.915	0.995
15:37:00	65	138412K	486K	136M	8426	205722	78891	0	1.915	0.996
15:38:00	62	138412K	486K	137M	8333	206309	14582	0	1.915	1.000
**********Summary**********										
Average:	66	138412K	250K	65M	9392	57454K	912K	0	1.915	0.903

Add "Enterprise" Support

Architecture needs to consider enterprise requirements

Capacity Planning
Chargeback
Operations



Linux Management Requirements

Linux (and networks) adds requirement

- **Correct data (bad assumption)**
- **Complete data (very difficult)**
- **Low cost data (extremely difficult)**

Support requirements:

- SLES 7,8,9,10, 11, 12, 15
- RHEL 3,4,5, 6,7
- UBUNTU, KVM
- Other platforms (VSE, VMWare, SUN, P, MicroSoft)

Must support:

- Performance tuning (one minute granularity)
- Capacity planning (15 minute granularity)
- Operational alerts (one minute granularity)
- Chargeback/Accounting (15 minute granularity)

Instrumentation Considerations

Operational cost of agents

- Does your agent use 2%? 5%? 95%? of a processor per Linux server?
- Does this matter on distributed servers where agents were created?
- Will local data collection fill up your file system? (intrusive)
- Does turning off performance monitoring solve the performance problem?
- Do you only turn on your agent when you have a problem???
  - Diagnostics vs Performance Management?
- **Customer quote: an agent that costs 1% of a processor will cost me 10 IFLs**
- **(standard snmp host mib, about 1%, VSI mib .1%)**

•Agents must provide correct data

- Is your data correct? Or wrong by order of magnitude?
- Prior to SLES10/RHEL5, all "Virtual" agents provide wrong data
- **Why collect bad data?**

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Network, Linux Instrumentation

Performance Data infrastructure existed (zMON/zMAP)

- PDB already existed for performance analysis and Capacity Planning
- Data presentation tools existed

Data source needed for Linux and Network:

- Standard interface, "Agentless", Non-Intrusive
- **Low overhead (want to monitor 100 / 1000 servers under z/VM)**
  - **Agents developed for Intel and Distributed servers did not care about overhead**
- Open Source (fast development time), instrumentation MUST be part of the platform

SNMP: Standard interface for network and host data

- Provided by TCPIP Vendor
- **Not proprietary agent! – Can't charge for it….**
- Used to collect network, host data from NT, SUN, HP
- NETSNMP available for Linux - Meets all requirements
  - (Distributed with RHEL 3,4,5 SLES 7,8,9,10,11)
- Platform independent (Intel, P-series, Microsoft, Linux)

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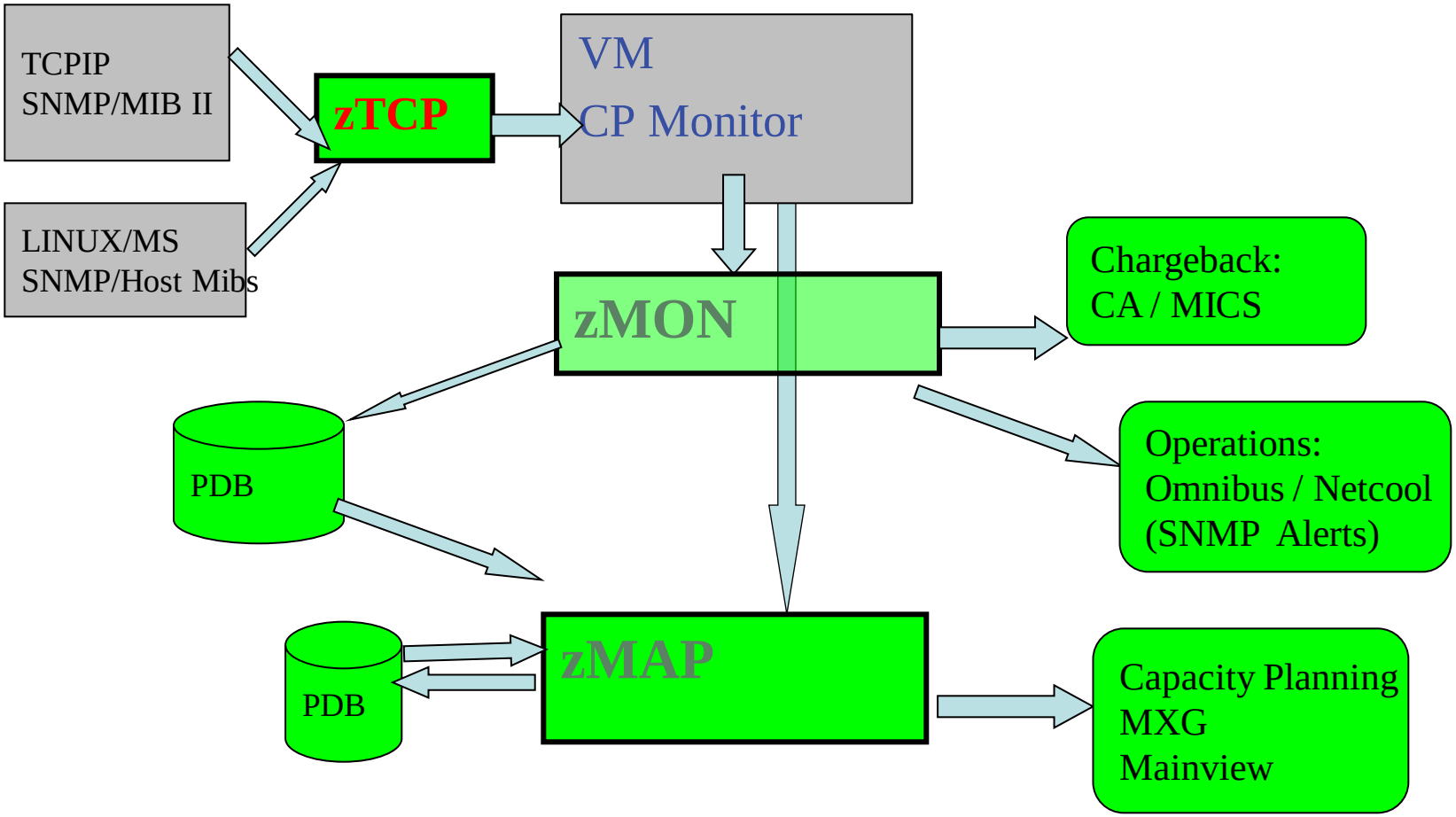
Add "Network" and "host" Support – Pre Linux



MibII: Transport layer (ESATCP1), IP layer(ESATCP2), hardware layer (ESATCP4), icmp (ESATCP3)

- Transport layer data shows connections, TCP rates, UDP rates

Report: ESA**TCP**1 TCPIP Transport Layer Data Report

Date/	<--------TCP Connections---------->					<-TCP Communications / sec			
Time/	Current	<Opens/Second>		<Closes/Sec>		<----Segments Transmitted-			
Node	Connects	Active	Passive	Fails	Resets	Input	Outpt	ReTran	InError
00:15:00									
Node Groups									
KeyUser	1.1	0.0	0.0	0.0	0	0.04	0.06	0.07	0.00
*TheUsrs	21.9	1.3	1.6	0.2	0	48.74	48.75	0.00	0
VsLPARs	5.3	0.1	0.5	0.1	0.3	8.02	11.95	0.29	0.08
*** Nodes *******									
oracle	16.9	0.5	1.0	0	0	24.51	24.52	0.00	0
RH5X161	0	0	0	0	0	0	0	0	0
S11R20RA	5.0	0.8	0.6	0.2	0	24.25	24.26	0	0
TCPIP	0	0.0	0.0	0.0	0	0.02	0.03	0.03	0.00
TCPIP2	0	0	0	0	0	0.01	0.01	0	0.00
TCPIP2	1.1	0.0	0.0	0.0	0	0.02	0.03	0.03	0.00
VSIVM1	2.0	0.0	0.0	0.0	0	0.49	0.59	0.10	0.01
VSIVM2	1.1	0.0	0.0	0.0	0	0.02	0.03	0.03	0.00
VSIVM4	2.2	0.0	0.4	0.0	0.3	7.51	11.33	0.15	0.07

Snmp, Velocity Software mib

Standard mib

- MIB II: 1.3.6.1.2.1 (Network)
- HOST 1.3.6.1.2.1.25 (process, file system device, memory)

Private mibs:

- Private: 1.3.6.1.4
- **ucd-snmp 1.3.6.1.4.1.2021.**
- **Velocity 1.3.6.1.4.1.F971**
- **VeloJava 1.3.6.1.4.1.F971.100.**
- **VeloOracle 1.3.6.1.4.1.F971.11**
- **VeloVSE 1.3.6.1.4.1.F971.10.1**

- **IBM 1.3.6.1.4.1.2**
- **IBMVSE 1.3.6.1.4.1.2.6.81FD**

Why Velocity mib?

Performance management

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Analyzing "distributed" Disks

HOST MIB data:
Provides disk data
Percent full
Supports WinNT,Unix
Alerts by disk full

Standard data!!!

```
Report: ESAHST2      LINUX HOST Storage Analysis Report
Monitor initialized: 02/05/07 at 10:41:41 on 2084 serial 55BAF
-------------------------------------------------------------------
NODE/              <-Utilization->          <------Storage------>
Time/              <MegaByte>  Pct          Alloc
Date       Index   Size  Used  Full  Errors  Units  Description
-------- -------  ----  ----  ----  ------  -----  ----------------
10:43:00
acme
                1   495  14.2   2.9       0   1024  Memory Buffers
                2   495   487  98.4       0   1024  Real Memory
                3  2031  12.8   0.6       0   1024  Swap Space
                4  2310   775  33.6       0   4096  /
                6  2310  1293  56.0       0   4096  /usr
dominoz1
                1  2002  38.5   1.9       0   1024  Memory Buffers
                2  2002  1994   100       0   1024  Real Memory
                3  2031  97.4   4.8       0   1024  Swap Space
                4  2310  1556  67.4       0   4096  /
                6  2310  1398  60.5       0   4096  /usr
                7  984K  238K  24.2       0   4096  /notesdata
ebiz1
                1   997   9.0   0.9       0   1024  Memory Buffers
                2   997   992  99.5       0   1024  Real Memory
                3  2031   514  25.3       0   1024  Swap Space
                4  2310  1607  69.6       0   4096  /
                6  2310  1451  62.8       0   4096  /usr
                7  101K   10K  10.3       0   4096  /notesdata
```

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Distributed Systems Process data

Windows NT

Screen: ESAHST1 NT Data ESAMON V3.2 07/30 14:56-14:57
1 of 1 LINUX HOST Software Analysis Report NODE * LIMIT 500

		<--Software Program--------->				<CPU Seconds>		CPU	Storage(K)
Time	Node	Name	ID	Type	Status	Total	Intrval	Pct	Current
14:57:00	ENTWDB	NetTime.	2648	4	1	4259	0.68	1.12	1320
		NetTime.	2452	4	1	982	0.57	0.94	1040
		sqlagent	2408	4	1	100	0.03	0.05	3724
		snmp.exe	2268	4	1	73	0.07	0.12	3888
		taskmgr.	2224	4	1	21076	0.28	0.46	2524
		sqlservr	2136	4	1	50038	9.53	15.72	511624
		NetTime.	1808	4	1	10481	1.47	2.42	1092
		sqlmangr	1660	4	1	189	0.01	0.02	3664
		DLLHOST.	1648	4	1	102	0.02	0.03	4684
		liccheck	1352	4	1	1272	0.04	0.07	1584
		DLLHOST.	1284	4	1	2158	0.09	0.15	6660
		inetinfo	1208	4	1	3063	0.10	0.16	9708
		WinVNC.e	1160	4	1	20742	0.56	0.92	3536
		explorer	788	4	1	2252	0.14	0.23	5336
		SERVICES	272	4	1	6892	1.50	2.47	7480
		msdtc.ex	164	4	1	71	0.02	0.03	5108

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Linux user cpu by process name

```
Report: ESAHSTA       LINUX HOST Application Report
Monitor initialized: 21/01/11 at 07:03:00 on
-------------------------------------------------------------------------
Node/     Process/    <Application Status Counts> <-----Processor---->
Date      Application             Run-  Res  Load  <---Utilization---->
Time      name        Total Actv ning  Wait  -ed  Percent seconds Avg
--------  ----------- ----- ---- ----  ---- ----  ------- ------- ----
07:04:00
***Node Groups***
TheUsers  *Totals*    840.0  138 11.0   829    0     88.0    52.7  0.1
          automoun      1.0  1.0    0   1.0    0      0.0     0.0  0.0
          events/0      1.0  1.0    0   1.0    0      0.0     0.0  0.0
          httpd       277.0  106  1.0   276    0     86.0    51.5  0.3
          java          2.0  2.0    0   2.0    0      0.0     0.0  0.0
          ksoftirq      3.0  1.0    0   3.0    0      0.0     0.0  0.0
          rotatelo     72.0 14.0    0  72.0    0      1.0     0.6  0.0
          sendmail      6.0  3.0    0   6.0    0      0.0     0.0  0.0
          sidd          1.0  1.0    0   1.0    0      0.2     0.1  0.2
          snmpd         9.0  9.0  9.0     0    0      0.7     0.4  0.1
```

Standard Linux ucd mib: Managing Storage (RAM)

Linux data shows
- Real storage
- Swap storage
- "cache"

Swapping is "good"

If not swapping,
- reduce vm size
- Use CMM to reduce

```
Report: ESAUCD2      LINUX UCD Memory Analysis Report                Linux Test
Monitor initialized: 02/05/07 at 10:41:41 on 2084 serial 55BAF     First recor
-------------------------------------------------------------------------------
Node/    <-------------------------Storage Sizes (in MegaBytes)---------------
Time/    <--Real Storage--> <-----SWAP Storage----> Total <----Storage in Use-
Date     Total  Avail Used  Total Avail Used  MIN   Avail Shared Buffer Cache
-------- ------ ----- ----- ----- ----- ----- ----- ----- ------ ------ -----
10:43:00
acme      494.7   7.7 487.0  2031  2018  12.8  15.6  2026      0   14.2  39.1
dominoz1 2002.1   8.0  1994  2031  1934  97.4  15.6  1942      0   38.6  1417
ebiz1     997.1   5.7 991.4  2031  1517 513.7  15.6  1523      0    8.9 635.8
ebiz2     997.1  13.0 984.2  2031  1878 152.8  15.6  1891      0   26.9 607.8
ibmds1   2002.1  11.6  1990  2031  2029   2.0  15.6  2041      0   84.0  1484
ebizdev2  997.1   6.8 990.4  2031  1980  51.3  15.6  1986      0   63.3 530.9
ebizdev1  997.1   8.0 989.2  2031  1754 277.3  15.6  1762      0   43.8 521.2
ibmedge1 1007.3 497.1 510.2  2031  2031     0  15.6  2528      0  174.9 165.4
ibmds3   8031.8  81.5  7950  2031  2031     0  15.6  2112      0  320.3  6494
ibmedge2 1007.3 492.7 514.6  2031  2031     0  15.6  2524      0  175.3 167.4
ibmred2   997.1   4.5 992.6  2031  2026   4.6  15.6  2031      0   98.4 586.4
ibmred1   997.1   9.7 987.4  2031  2026   4.6  15.6  2036      0   98.7 578.5
tdirdb2  4012.0  31.9  3980  2031  1613 418.1  15.6  1645      0  250.1  3017
tdirtam  4012.0  1294  2718  2031  2031     0  15.6  3325      0  235.1  2106
tdirtds  4012.0  1061  2951  2031  2031     0  15.6  3092      0  324.8  2259
tdirtim  4012.0  1007  3005  2031  2031     0  15.6  3038      0  239.7  1981
tdsds-a1  997.1 124.0 873.1  2031  2031     0  15.6  2155      0   87.1 569.0
ibmds2   8031.8  78.0  7954  2031  2031   0.4  15.6  2109      0  251.7  6546
```

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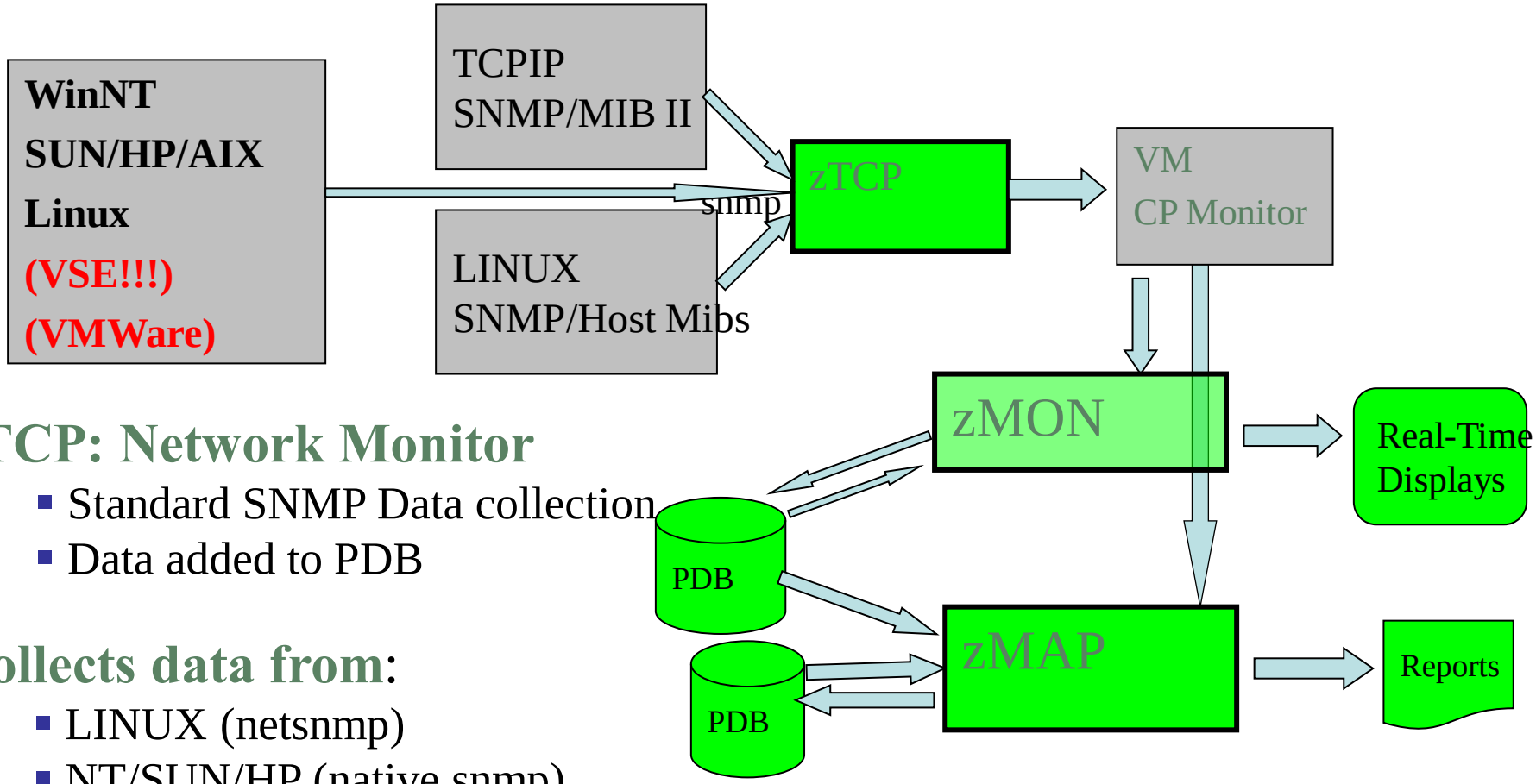
Snmp today….



zTCP: Network Monitor

- Standard SNMP Data collection
- Data added to PDB

Collects data from:

- LINUX (netsnmp)
- NT/SUN/HP (native snmp)
- Printers/Routers….
- **THOUSANDS OF SERVERS?**

VELOCITY SOFTWARE

Operational Support - SNMP Alerts

Issue with SNMP alerts (intrusive…)

- How many control points? (one per server?)
- How many configuration files? (one plus per server?)

ZVPS SNMP Alert Architecture

- Centralized alert
- One point of control (ZALERT)

SNMP alerts sent to any SNMP operations console

- Create "SNMP TRAPDEST" file

```
* this file is the list of snmp trap destinations
* format is ip address, and community name
67.100.74.25 velocity
```

Sending SNMP alerts by other functions:

```
/* authorized user can send alerts */
parse arg msg
'CP SMSG ZTCP ALERT' msg
```

Benefit of using standard interface?

- z/VM new releases supported day 1 (Note stg size)

Report: ESAUCD2 LINUX UCD Memory Analysis Report Veloc

Node/	<-------------------------Storage Sizes (in MegaBytes)---------									
Time/	<--Real Storage-->			<-----SWAP Storage---->			Total	<----Storage i		
Date	Total	Avail	Used	Total	Avail	Used	MIN	Avail	CMM	Buffer
15:29:00										
ZLNXT030	994.8	407.7	587.1	256.1	256.1	0	15.6	663.8	0	21.8
ZLNXT006	494.7	388.8	105.9	511.5	511.5	0	15.6	900.3	0	19.3
ZLNXT017	3008.7	2612	396.9	1279	1279	0	15.6	3891	0	29.5
ZLNXT002	2001.3	902.4	1099	512.0	512.0	0	15.6	1414	0	53.9
ZLNXT007	201192	96151	103K	1023	1023	0	15.6	97174	0	18.1
ZLNXT009	201192	165K	32356	640.1	640.1	0	15.6	166K	0	19.9
ZLNXT013	201192	171K	26563	7.9	7.9	0	15.6	171K	0	22.2
ZLNXT010	201192	181K	15917	1535	1535	0	15.6	182K	0	24.3
ZLNXT011	201192	194K	2280	128.9	128.9	0	15.6	194K	0	28.4

VELOCITY SOFTWARE

Process Capture Ratio with Velocity mib

High cpu capture ratio

Report: ESALNXV LINUX Virtual Processor Analysis Report

```
Node/      VM        <Linux Pct CPU> <Process  Data> Capture Prorate
 Name      ServerID Total Syst User Total Syst User   Ratio Factor
--------- -------- ----- ---- ---- ----- ---- ---- ------- ------
10:03:00
NEALE1     LNEALE1  100.0 11.4 88.6 100.2 11.5 88.7   1.002  1.000
```

Report: ESALNXP LINUX HOST Process Statistics Report

```
node/      <-Process Ident-> Nice <------CPU Percents---->
 Name      ID    PPID   GRP  Valu  Tot  sys user syst usrt
--------- ----- ----- ----- ---- ---- ---- ---- ---- ----
10:03:00
NEALE1        0     0     0    0  100 0.43 3.35 11.0 85.4
 kswapd0    100     1     1    0 0.12 0.12    0    0    0
 snmpd     1013     1  1012  -10 0.13 0.03 0.10    0    0
 sh        3653  3652 30124    0 52.7    0    0 9.37 43.3
 gmake     9751  9750 30124    0 43.4 0.02 0.02 1.37 42.0
 sh       10129  9751 30124    0 0.02 0.02    0    0    0
 sh       10130 10129 30124    0 0.63 0.03 0.23 0.28 0.08
 cc1      10307 10306 30124    0 3.12 0.18 2.93    0    0
 rpmbuild 30124 16382 30124    0 0.07 0.03 0.03    0    0
 sh       30125 30124 30124    0 0.02    0 0.02    0    0
 gmake    30126 30125 30124    0 0.02    0 0.02    0    0
```

```
Report: ESALNXC      LINUX Process Conf
-----------------------------------------
Node/        <-Process Ident-> <-----Pr
 Name        ID    PPID   GRP  Path
------------ ----- ----- ----- --------
NEALE1
 init            1     0     0 init [3]
 migratio        2     1     0 migratio
 ksoftirq        3     1     0 ksoftirq
 events/0        4     1     0 events/0
  khelper        5     4     0 khelper
  kblockd/       6     4     0 kblockd/
  cio           41     4     0 cio
  cio_noti      42     4     0 cio_noti
  kslowcrw      43     4     0 kslowcrw
  appldata      96     4     0 appldata
  aio/0        101     4     0 aio/0
  pdflush     5266     4     0 pdflush
  pdflush    26647     4     0 pdflush
 kswapd0       100     1     1 kswapd0
 kmcheck       158     1     1 kmcheck
 syslogd       976     1   976 /sbin/sy
 klogd         979     1   979 /sbin/kl
 snmpd        1013     1  1012 snmpd
 portmap      1030     1  1030 /sbin/po
 rpciod       1034     1     1 rpciod
 lockd        1035     1     1 lockd
 sshd         1072     1  1072 /usr/sbi
  sshd       16272  1072 16272 sshd: bu
  sshd       16288  1072 16288 sshd: bu
   sshd      16290 16288 16288 sshd: bu
    bash     16291 16290 16291 bash
     python  16312 16291 16291 python
      do-bui 16313 16312 16291 /bin/sh
       bb_do 16382 16313 16291 /usr/bin
        rpmb 16415 16382 16415 rpmbuild
        rpmb 30124 16382 30124 rpmbuild
```

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Correct Linux Performance Data?

Valid and Correct?

- **Process data from Linux under z/VM is wrong**
  - All process accounting based on timer ticks
  - Corrected in SLES10, RHEL5 (now underreports)
- TOP, ALL other agents "lie" when under z/VM
- Sample wrong by factor of 10-100 prior to SLES10
  - Well known issue since 2001
  - HTTP://velocitysoftware.com/present/CaseAFS
  - Mostly corrected by "steal timer"

Leads to solving performance problems?

- If "STEAL" is the only metric, can you solve problems?
- z/VM owns the shared resources
- **"Native" tools will not detect many problems**
- "performance was unexplainably bad so we abandoned the project"
- Skills, experience and Education help…

Analyzing Linux CPU by process

Velocity MIB data:
Provides process data
Parent/Child relationship

Note ALL application processes are owned by "24445".

```
Report: ESALNXP      LINUX HOST Process Statistics Report
Monitor initialized: 02/05/07 at 10:41:41 on 2084 serial 5
-------------------------------------------------------------
node/     <-Process Ident-> Nice <------CPU Percents---->
 Name      ID    PPID   GRP  Valu  Tot  sys user syst usrt
--------- ----- ----- ----- ---- ---- ---- ---- ---- ----
10:43:00
dominoz1      0     0     0    0  9.9 3.20 6.69    0    0
 ksoftirq     5     1     0   19 0.03 0.03    0    0    0
 ksoftirq     7     1     0   19 0.05 0.05    0    0    0
 kswapd0    134     1     1    0 0.05 0.05    0    0    0
 kjournal  1140     1     1    0 0.08 0.08    0    0    0
 snmpd     1775     1  1774  -10 0.27 0.16 0.11    0    0
 scontrol 24521 24445 24414    0 0.03    0 0.03    0    0
 server   24539 24521 24414    0 1.46 0.41 1.06    0    0
 logasio  24553 24539 24414    0 0.14 0.11 0.03    0    0
 event    28636 24539 24414    0 0.16 0.03 0.14    0    0
 replica  28663 24539 24414    0 1.76 0.27 1.49    0    0
 update   28665 24539 24414    0 5.36 1.92 3.44    0    0
 amgr     28667 24539 24414    0 0.03    0 0.03    0    0
 adminp   28670 24539 24414    0 0.19 0.08 0.11    0    0
 sched    28676 24539 24414    0 0.03    0 0.03    0    0
 rnrmgr   28686 24539 24414    0 0.03    0 0.03    0    0
 clrepl   28920 24539 24414    0 0.22    0 0.22    0    0
```

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Analyzing Linux CPU by Application

Velocity MIB data:

- Provides process data
- Parent/Child relationship
- Allows combining into "applications"
- Note the "bash/24445" "application"

Define alerts based on application

```
Report: ESALNXA      LINUX HOST Application Report
Monitor initialized: 02/05/07 at 10:41:41 on 2084 ser
-------------------------------------------------------
Node/    Process/    ID    <---Processor Percent--->
Date     Application             <Process><Children>
Time     name              Total sys  user syst usrt
-------- ----------- ----- ----- ---- ---- ---- ----
10:43:00
dominoz1 *Totals*        0   9.9  3.2  6.7    0    0
         bash        24445   9.4  2.8  6.6    0    0
         kernel          1   0.2  0.2    0    0    0
         snmpd        1775   0.3  0.2  0.1    0    0
```

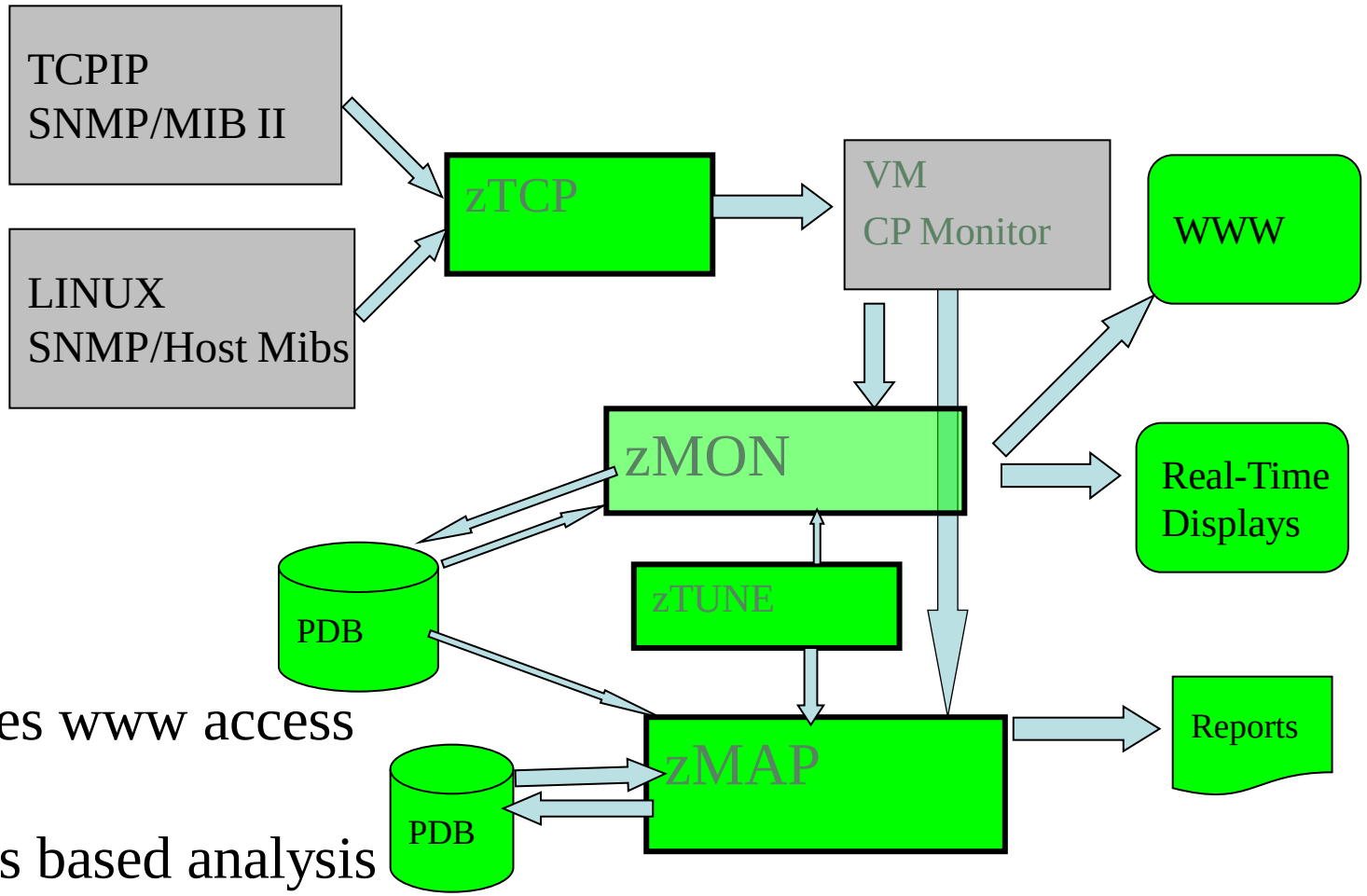
Analyzing Linux CPU by Userid

Velocity MIB data:

- Provides process data
- Parent/Child relationship allows accumulation by applications
- And reporting by Linux userid
- Allows alerts by userid

```
Report: ESALNXU       LINUX USER Analysis Report
Monitor initialized: 02/05/07 at 10:41:41
-------------------------------------------------------------------------
Node/                                                <---Processor Percent--->
Date      <---------User and Group Identity------>      <Process><Children>
Time      Userid        GroupID       usrpid grppid Total sys  user syst usrt
--------  ------------  ------------  ------ ------ ----- ---- ---- ---- ----
10:43:00
dominoz1  bin           root               1      0     0    0    0    0    0
          daemon        daemon             2      2     0    0    0    0    0
          lp            lp                 4      7     0    0    0    0    0
          notes         notes           1001   1001   9.4  2.8  6.6    0    0
          root          root               0      0   0.5  0.4  0.1    0    0
```

Modernize: Webserving, performance skills



ZVWS Provides www access

zTUNE: Rules based analysis

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zTUNE

- Many installations lack z/VM and Linux on z/VM tuning skills
- Velocity Software's objective is to ensure our customer performance problems are resolved – quickly.
- zTUNE includes configuration guidance, health checks when ever installation requests, and assistance in all areas of Linux on z/VM and z/VM performance
- no more "performance was unexplainably bad so we abandoned the project"

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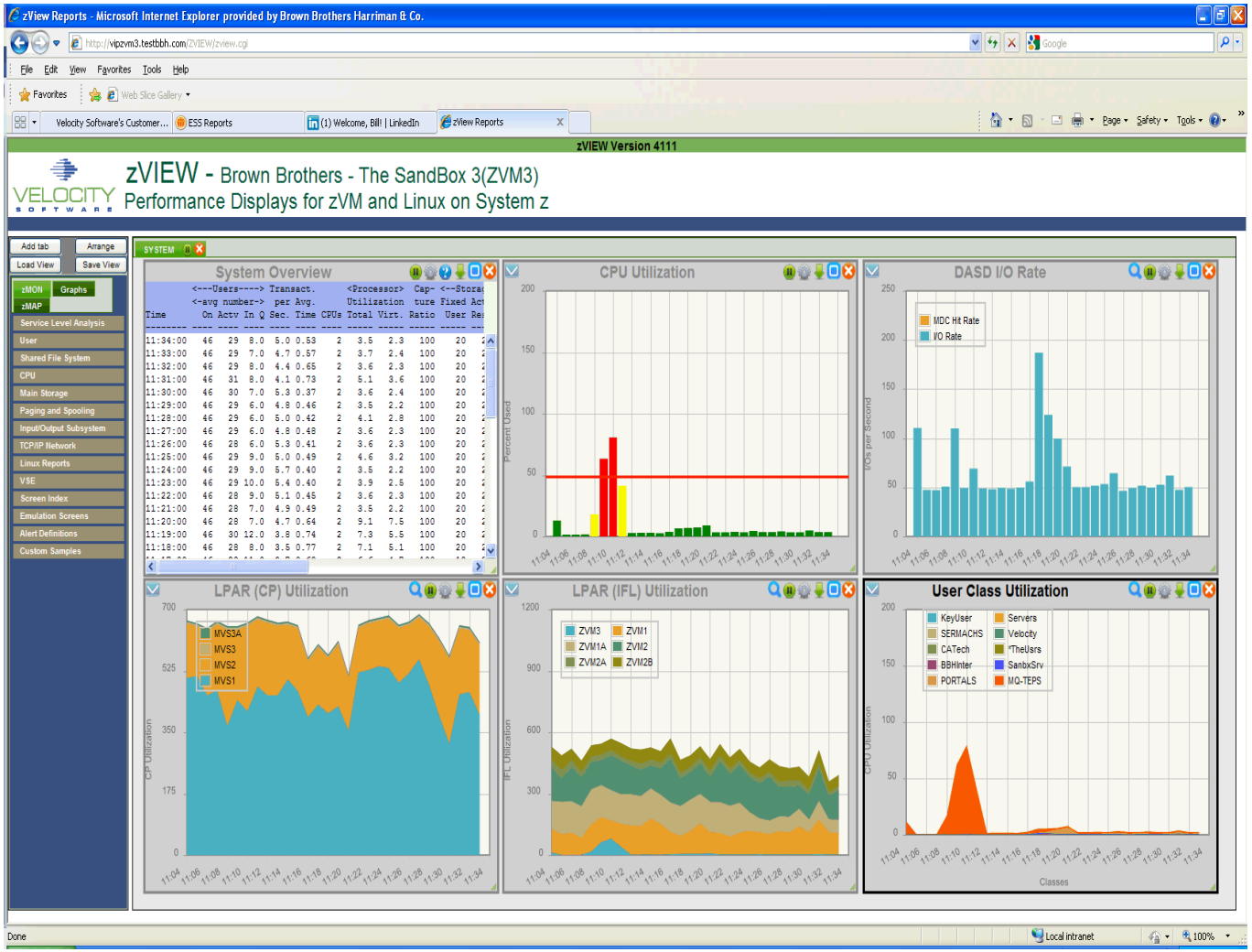
Health Checker for z/VM, Linux: zTUNE

Focus more now on simplifying problem resolution

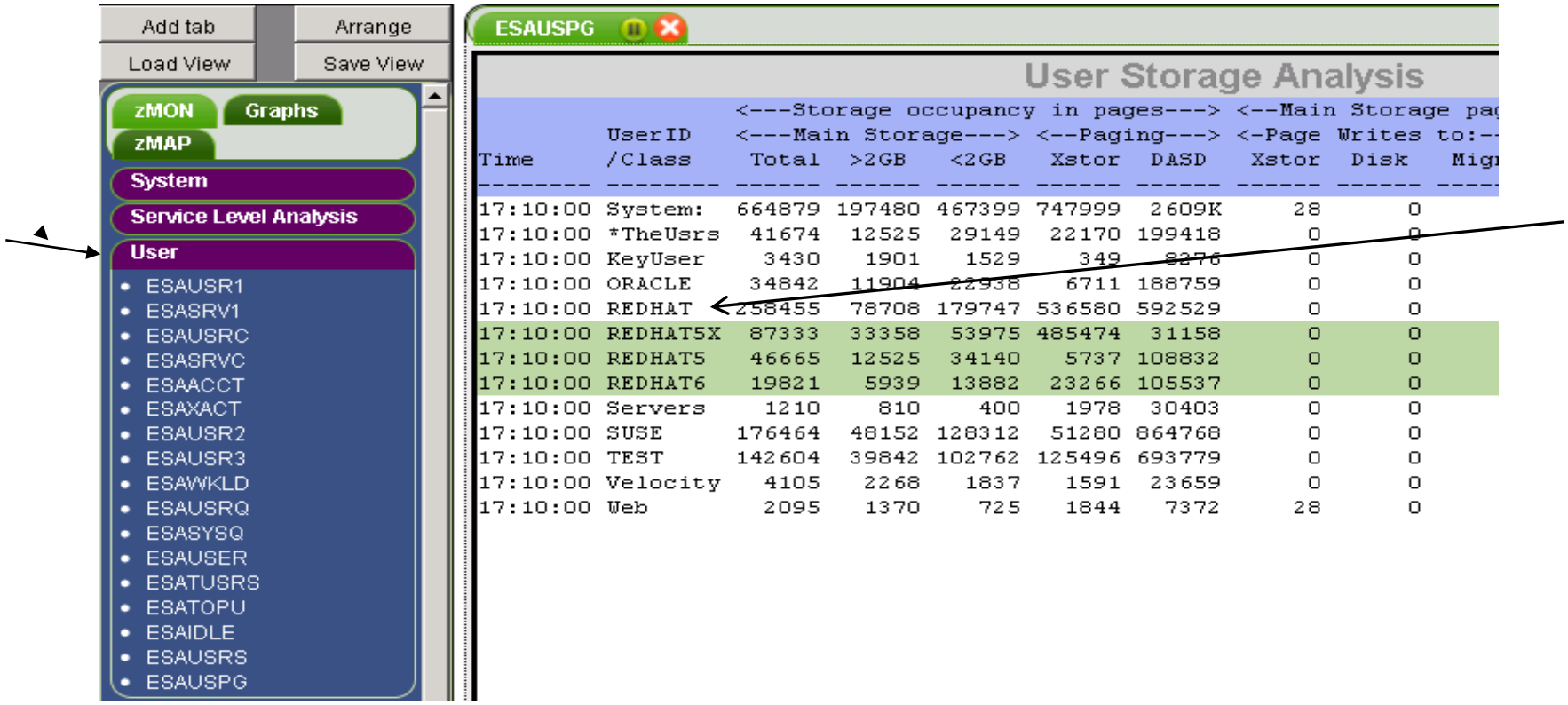
User reports that applications complained about zLinux / WAS performance:

```
Report: ESATUNE      Tuning Recommendation Report
Monitor initialized:                      on 2084 serial 9ABED
-------------------------------------------------------------
The following changes are suggestions by Velocity Software
 to enhance performance of this system.
However, Velocity Software takes no responsibility -
 all tuning is the responsibility of the installations.
Please call 650-964-8867 if you have any questions about
 these values, or suggestions on report enhancements.

USR2 User LINUX160 is paging excessively (75.0 per second)
     This user can be protected using SET RESERVED

SPL5 Spool utilization is 100% full.
     Perform Spool file analysis and purge large
     spool files, or force users currently writing
     excessively to spool.

*****zTUNE Evaluation   *************
XAC1 User total PROCESSOR WAIT excessive at 33 percent.
     Current reporting threshold set to 20.
     This is percent of inqueue time waiting for
     specific (PROCESSOR)resources to become available.
LPR3 LPAR share is too low, causing USER CPU Wait
     VM LPAR allocated share: 0.94 percent of total
     VM LPAR used 389 percent of allocated share
```

"z" VIEW Example



ZMON Drill down Options



Click on "user" to see user screens

Click on "redhat" class to see "redhat users"

Oracle data available too

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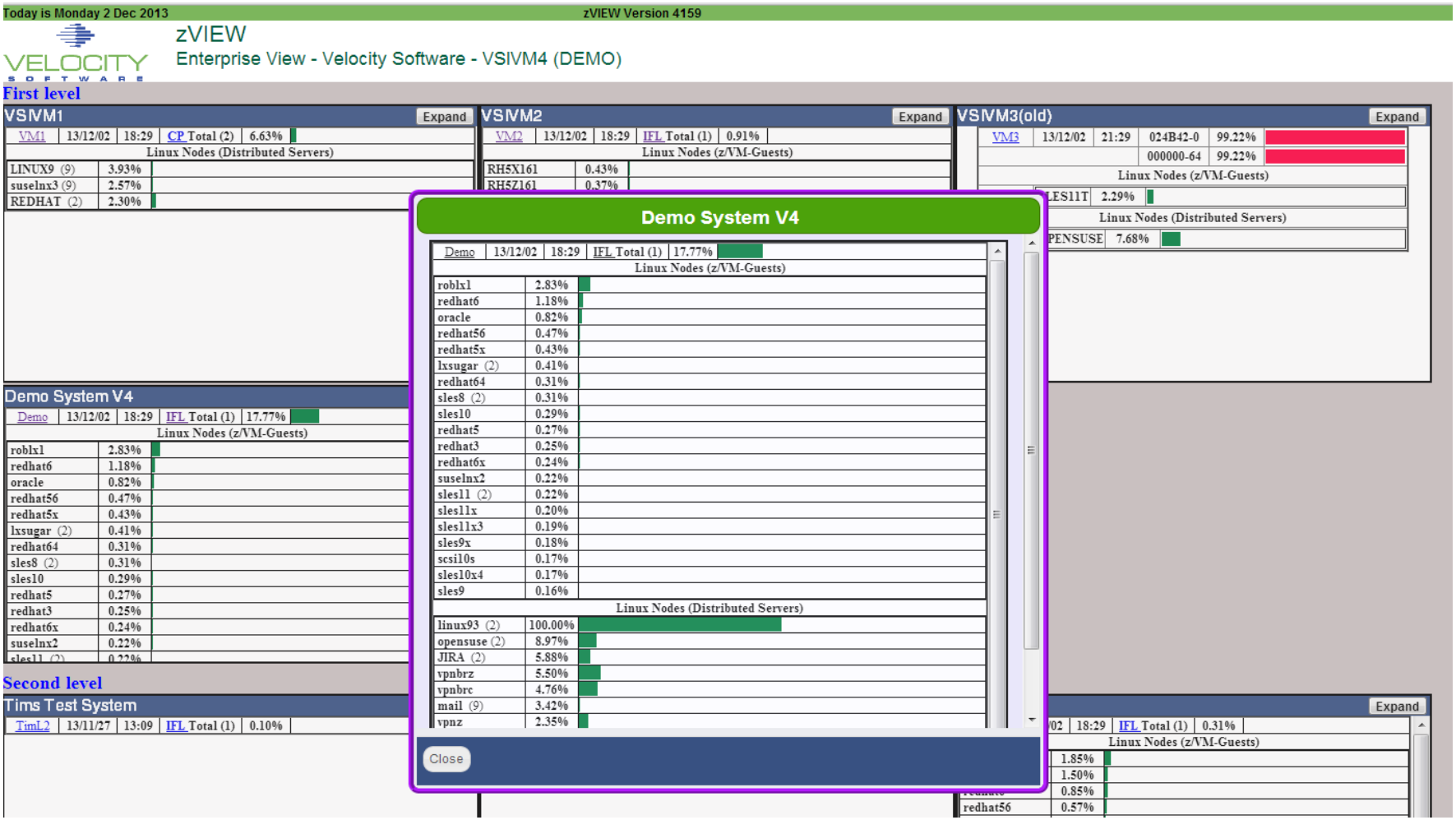
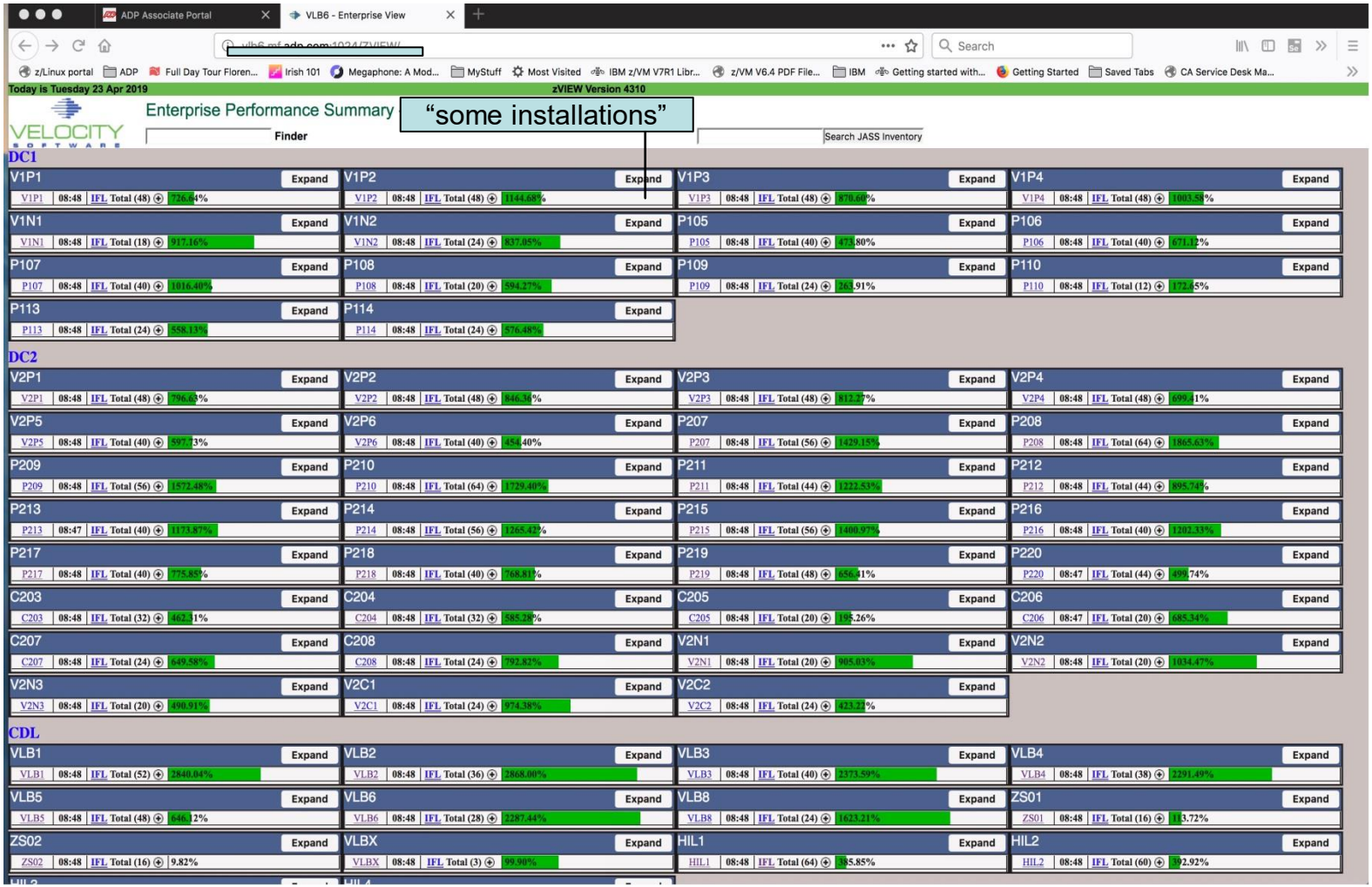
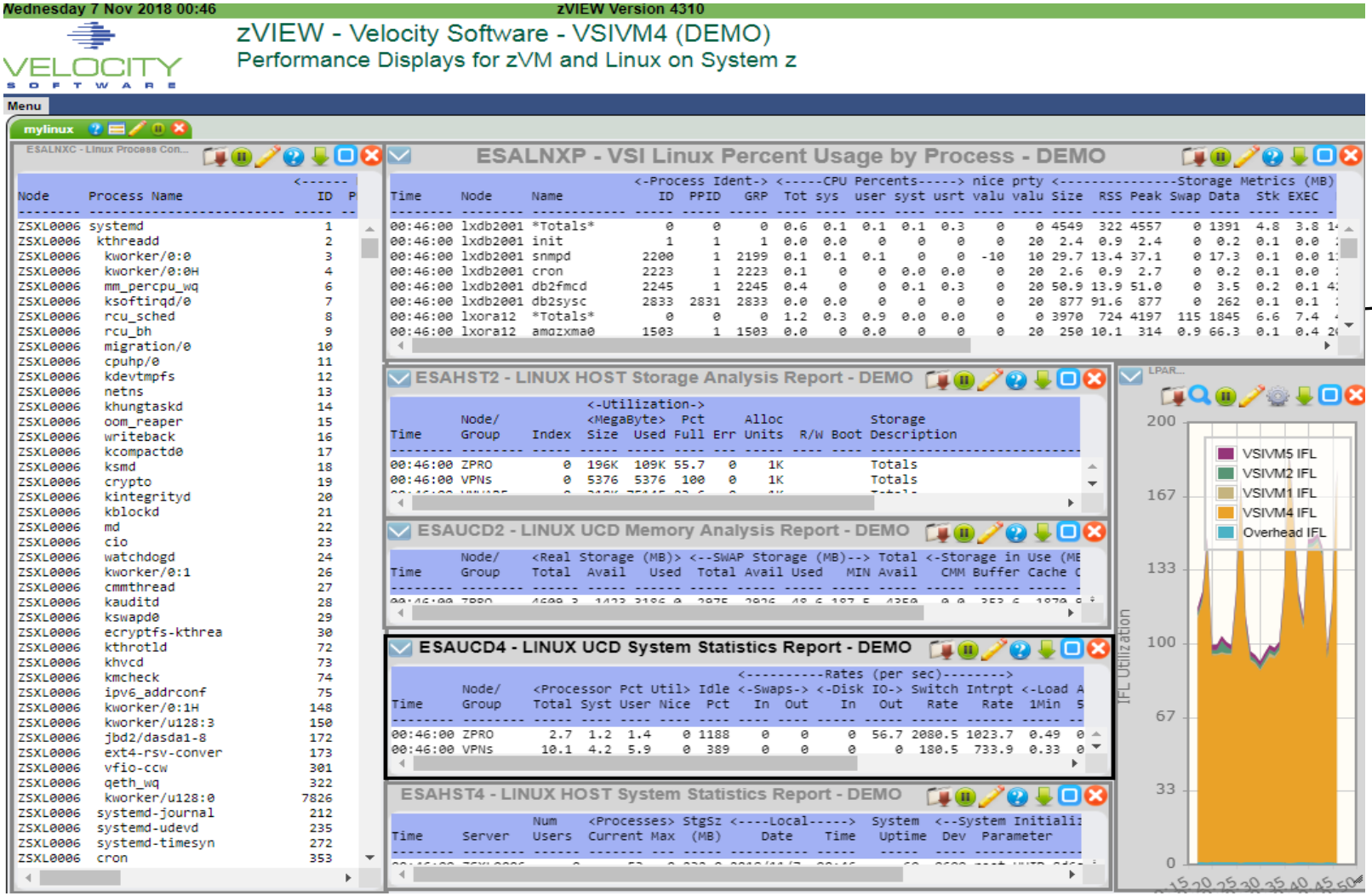
Tailorable, expandable, zoomable



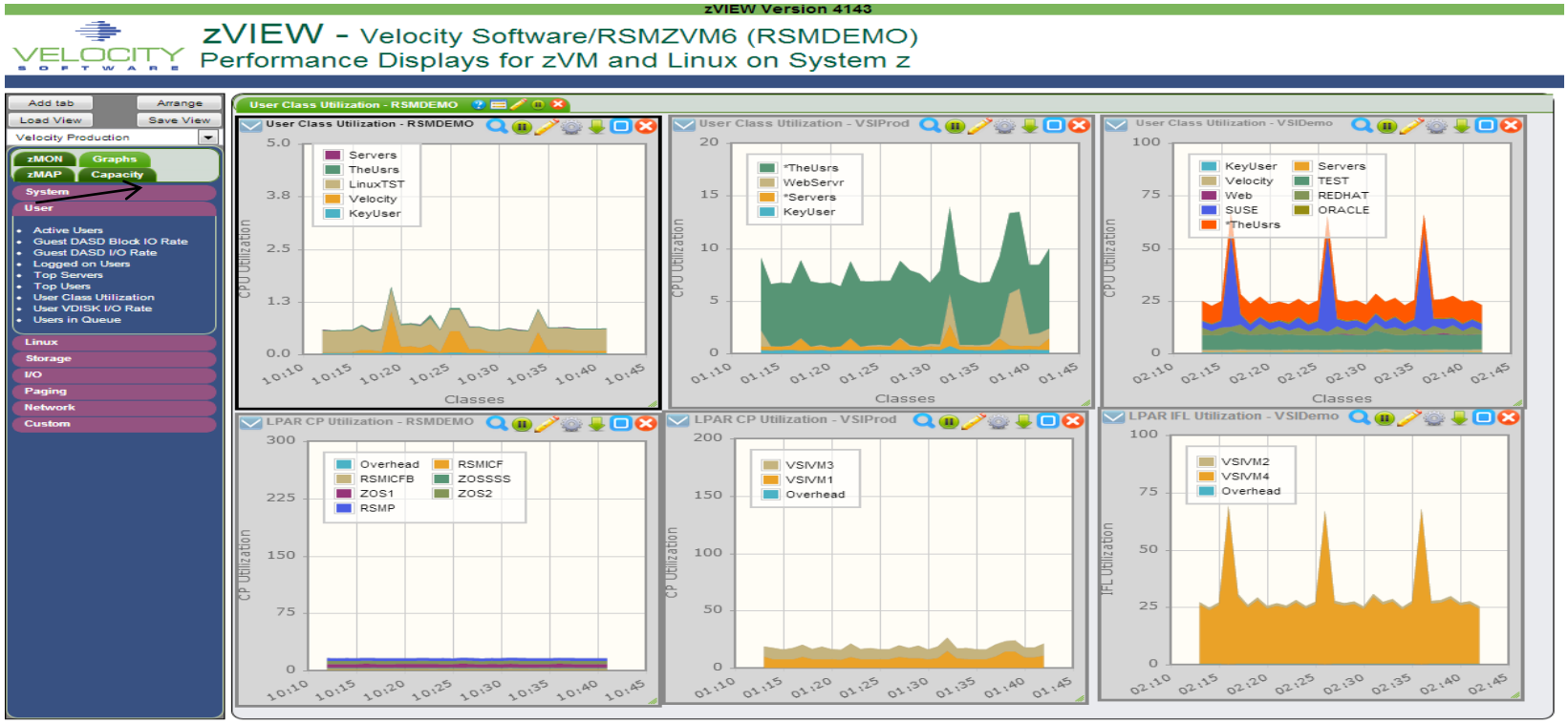
Did I say scalable? A lot of LPARS….



Drill down Options – Everything instantly

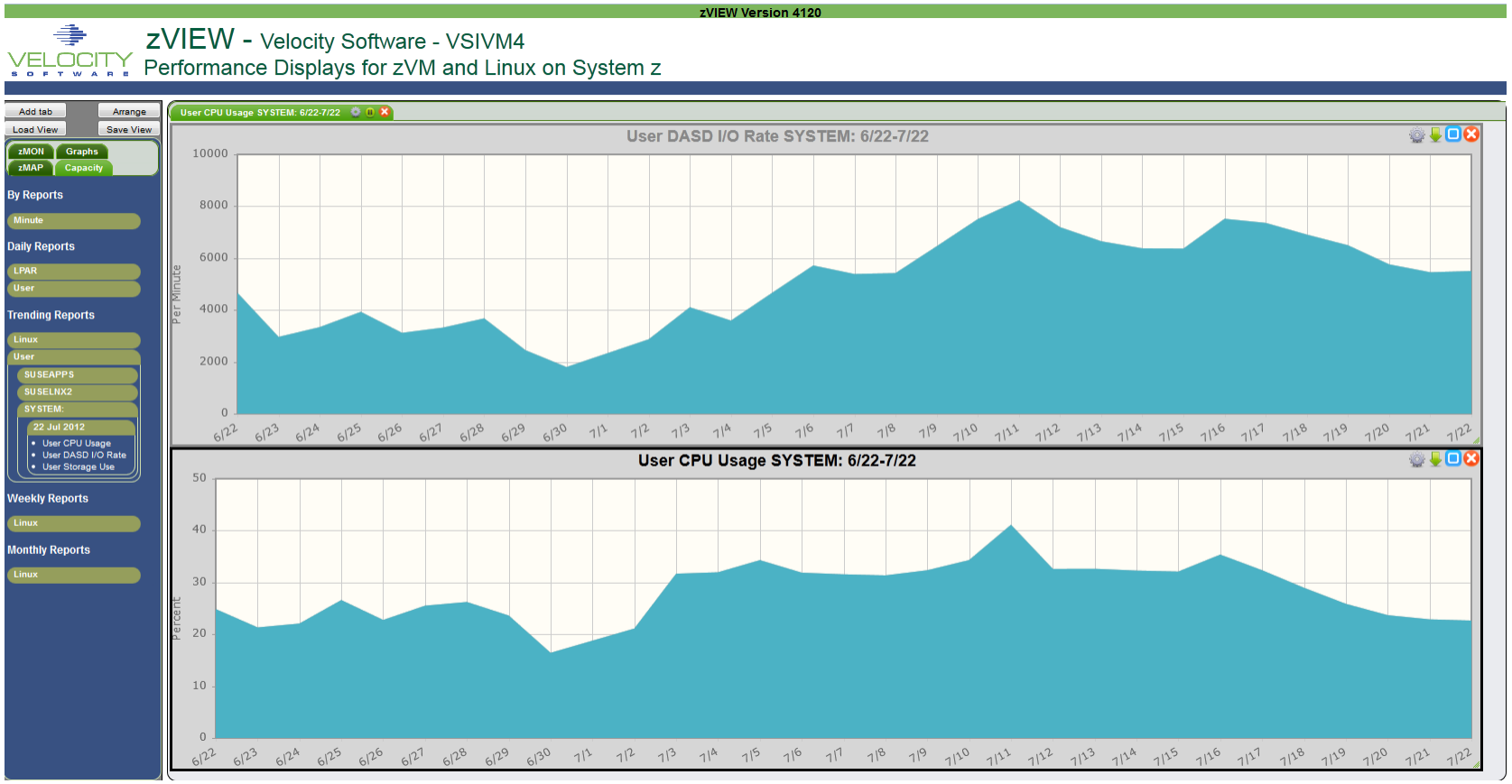


Multiple System View (3 LPARs)



Oracle data from multiple lpars visible on one tab

zMAP Capacity/Trend Graphs



zVPS Version 4, Release 1 (2012)

Performance Management

- VMWare (node grouping)
- Mixed mode capacity planning (IFL vs CP)
- Linux DISK reporting (ESAUCDD)
- Granularity in virtual cpu reporting (ESAUSCP, ESALNXS)
- VSE Initial support (ESAVSES, ESAVSEC)
- LGR support
- zVIEW V2
- zALERT

Operational support

- Global Installer
- Portal

Other

- z/VM 5.4 support, up to 96 CPUs per LPAR, 200 physical CPUs / CEC
- Framework for future products and enhancements
- Customer enhancement requests - MANY

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zVPS Version 4, Release 2 (January 2015)

Performance Management

- **Application support** (JAVA, Oracle)
- VSE partition support, job support (ESAVSEP)
- Linux process metrics for RAM, I/O, Swap (ESALNXP, ESALNXI)
- Linux system metrics for ram (ESALNXR)
- **MFC Support** for z114, z196, EC12/BC12, Z13/Z13S (SMF 113)
- CP Pooling support
- LINMON support
- APPLE sever support (decimal process ID up to 99,999)

Operational support

- Recognize lpar, vmid for linux servers, LGR support
- Peer to peer support
- SNMP V3

Other

- z/VM 6.2, z/VM 6.3 Support

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zVPS Version 4, Release 3 (January 2017)

Performance Management

- Java Thread support (ESAJVMT)
- HiperPav Support (ESAHPP)
- SMT Support (ESASMT, ESAUSR5)
- Diagnose support (ESADIAG)
- OSA Support (ESAOSA)

Operational support

- Move linux nodes to correct LPAR (requires VSI mib) (ESALNXV)
- DNS Support for zTCP

Other

- z/VM 6.4 support
- Many “small” Customer enhancement requests

Performance Management

- User Diagnose support (ESAUSRD)

Operational support

- Enterprise server inventory
- UBUNTU Support with snmpv3
- Class C subnet node discovery

Other

- Z14 Support (model numbers, MFC)
- Specter apar / status recognition

ZTCP Parameters for enterprise support

Added DNS Names capability

```
community = 'velocity'  TCPIP='TCPIP'   nodegrp = 'VSILPARs'

dnsport = 53
dnsIPADDR = '64.105.172.26'

node = 'VSIVM1' domain='vsivm1.VelocitySoftware.com'
node = 'VSIVM2' domain='vsivm2.VelocitySoftware.com'
node = 'VSIVM3' domain='vsivm3.VelocitySoftware.com'
node = 'VSIVM4' domain='demo.VelocitySoftware.com'
```

Added SSI (enterprise) Support – monitor where operating

```
TCPIP='TCPIP'   peerport = 1998

peeraddr ='67.218.99.132' peerport = 1998   ;vsivm2
peeraddr ='67.218.99.134' peerport = 1998   ;vsivm4
peeraddr ='67.218.99.135' peerport = 1998   ;vsivm5

Ssiflag = '1'b
Node = 'lnxssi1' domain='prod.mylinux.mycompany.com"
```

zALERT - Operational Support

Alerts

- User tailorable
- 3270 based, web based, and / or SNMP
- Alerts can be set on any variable or calculated variable

Linux alert examples:

- Disk full
- Missing processes (requires complete data)
- **Looping processes (requires correct data)**

z/VM alert examples

- Page/spool space full (avoid abends)
- Looping servers
- DASD service times

Network alert examples

- Transport errors
- ICMP rates
- Bandwidth thresholds

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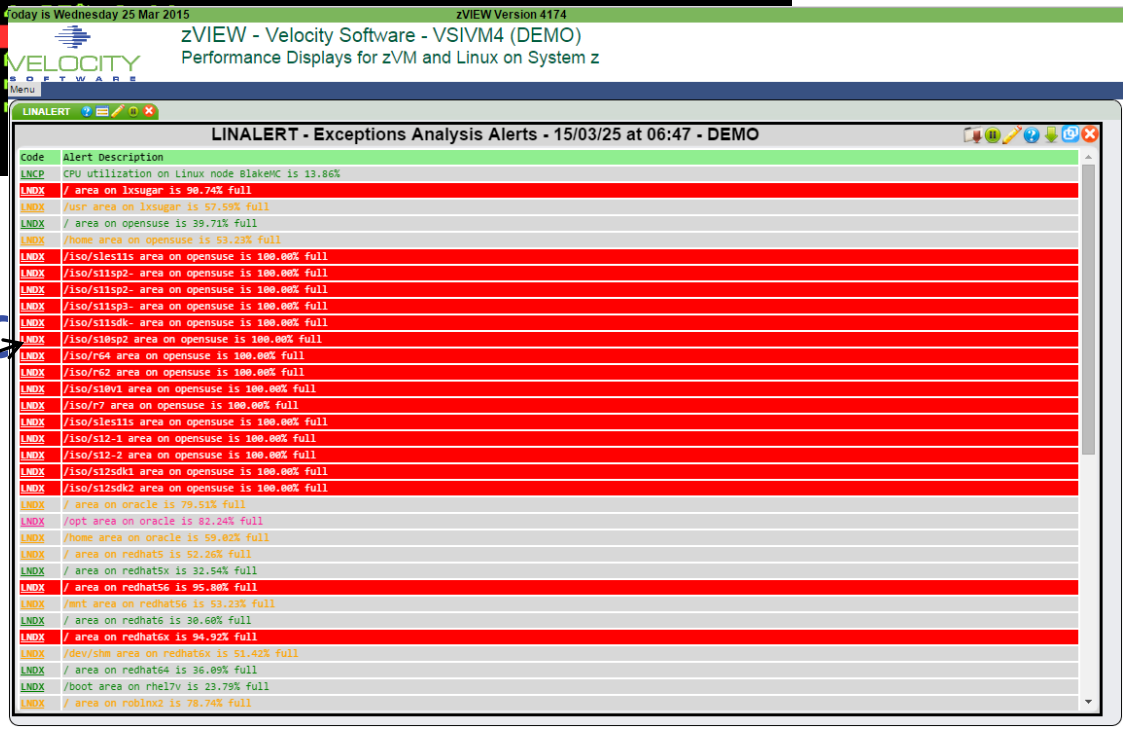
zALERT – Automate problem detection

3270 Style Alerts (50+ sample alerts provided)

```
 Screen: LINALERT              Velocity Software              25 Mar 2015 06:42:29
------------------------- Exceptions Analysis Alerts -------------------------

    Type Description
    LNDX / area on oracle is 79.51% full
    LNDX /opt area on oracle is 82.24% full
    LNDX /home area on oracle is 59.02% full
    LNDX / area on RH5X161 is 32.54% full
    LNDX / area on S11R20RA is 81.56% full
    LNDX /boot area on S11R20RA is 2
    LNDX /opt area on S11R20RA is 95
    LNDX /mnt/oracle area on S11R20R
    LNSU Swap utilization for Linux
    LNSU Swap utilization for Linux
```



Or Browser based Click Thru or SMS, email…

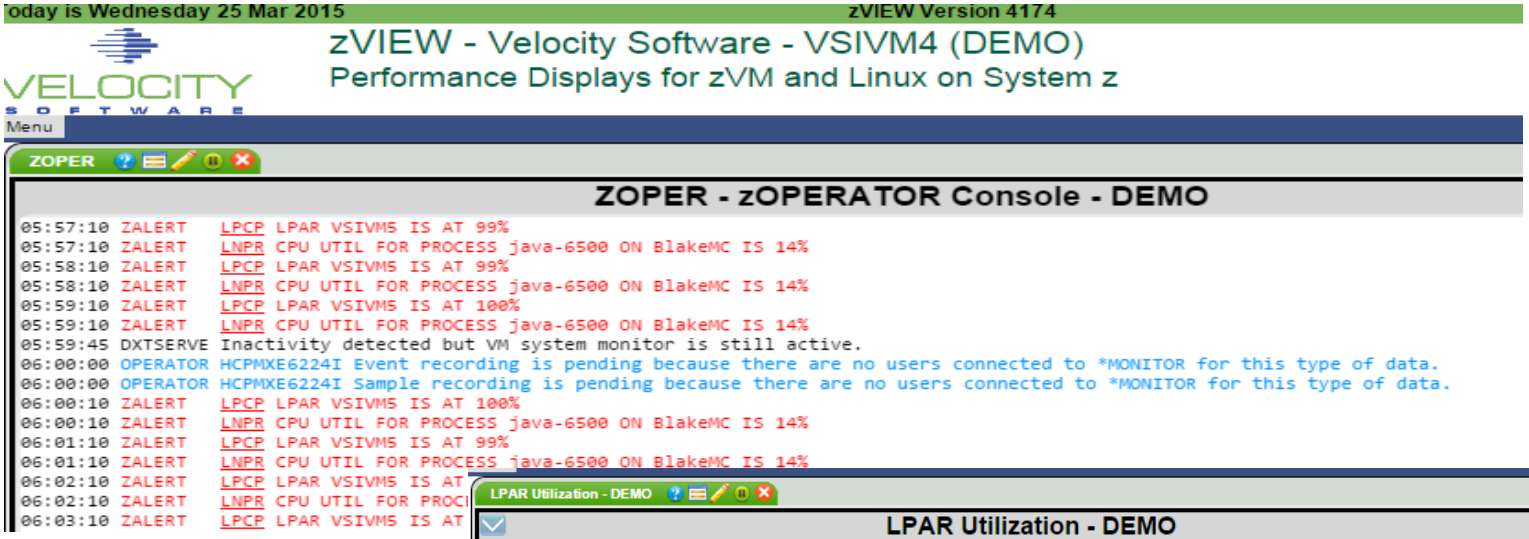
Several requests to extend ESAOPER screen

zOPERATOR:

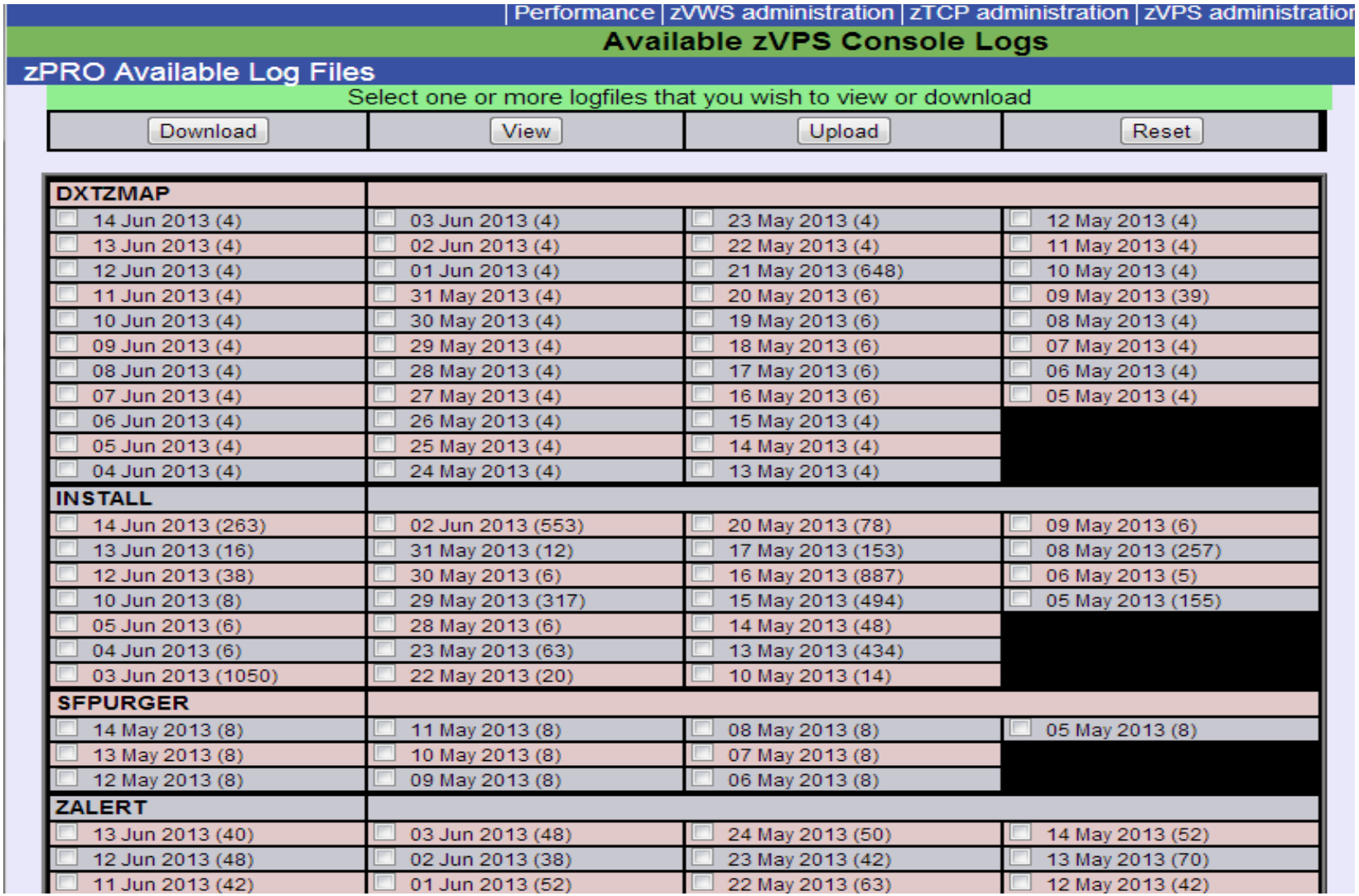
- Optional no-charge application component of zMON
- Uses standard zMON 3270 screen driver, existing function
- Scrollable 3270 console
- Messages can be searched by text, date or time
- All messages logged in daily files
- Actions can be set based on messages received
- Can be viewed from DIALed terminal or zVIEW (WEB!)
- Now can be enterprise console for z/OS as well….

Operator Function browser based

- Click Thru for problem analysis – LPCP example



Console Management View



VSE 4.3 adds SNMP Interface plus some mibs:

•IBMVSE “vse mib” – system data

```
Report: ESAVSES       VSE System Configuration Report
-------------------------------------------------------------
NODE      <---z/VM---> <LogicalPart> <--------CPU model-------
/Time     VirtID   Lvl  Name      Nbr <IBM/<model>/CPs/ serial
-------- -------- --- --------  --- -------------------------
06:26:00
vse2      ZVSE      1  VSIVM3     0  IBM 2096-A02 02 (14B4202)
-------------------------------------------------------------
06:27:00
vse2      ZVSE      1  VSIVM3     0  IBM 2096-A02 02 (14B4202)
```

```
-------------------------------------------------------------
NODE      <---z/VM---> <--Partitions--> <----CPU Counts---->
/Time     VirtID   Lvl Max Cur Stat Dyn Tot Actv Quies Inact
-------- -------- --- --- --- ---- --- --- ---- ----- -----
06:26:00
vse2      ZVSE      1  120  20   12   8   2    2     0     0
-------------------------------------------------------------
06:27:00
vse2      ZVSE      1  120  20   12   8   2    2     0     0
```

VELOCITY SOFTWARE

VSE 4.3 adds SNMP Interface plus some mibs:

•IBMVSE “vse mib” adds CPU data for system, and by virtual cpu

```
Report: ESAVSEC      VSE System Performance Report                  VSIVM3
-------------------------------------------------------------------------
NODE       Pages/Sec <Rate/Sec> <CPU Utilization>   All       Pct  Seconds
/Time      In    Out   SVC  DSP  Total  Mstr  Spin   Bound      NP  OfData
--------   ---- ---- ---- ----  -----  -----  -----   -----    ----  ------
06:26:00
vse2          0    0  196  428   83.6   4.0   0.0        0     4.8    64.6
 CPU- 0                    270   40.5   2.7     0        0     6.6    64.6
 CPU- 1                    160   43.7   1.4   0.0        0     3.2    64.6
-------------------------------------------------------------------------
06:27:00
vse2          0    0  295  597   82.5   4.2   0.0        0     5.1    56.0
 CPU- 0                    359   36.6   3.2   0.0        0     8.8    56.0
 CPU- 1                    238   45.3   1.0     0        0     2.2    56.0
```

Velocity Software proof of concept for "Plug in"

- SNMP Support is "extensible"

What do customers want?

- TCPIP?
- VSAM?
- CICS?
- DB2
- High Capture ratio?

```
Report: ESAVSEP      VSE Partition Performance
-------------------------------------------------
NODE       Part   Job       Phase      <-CPU Time->
/Time      ID     Name      Name       CPU   Overhd
--------   ----   -------- --------   ----- ------
06:26:00
vse2            Totals                52.0   1.5
            FB  SECSERV   BSTPSTS       0     0
            F7  TCPIP00   IPNET       0.3   0.0
            F6  TCPIP01   IPNET       0.0   0.0
            F3  VTAMSTRT  ISTINCVT    0.0   0.0
            F2  CICSICCF  DFHSIP      0.6   0.0
            F1  POWSTART  IPWPOWER    0.0   0.0
            R2  STARTMAS  IESMASNM    0.6   0.0
            R3  STRTMAS1  IESMASNM      0     0
            S1  STGPLAY5  STGPLAY     6.6   0.4
            S2  STGPLAY2  STGPLAY     0.6   0.1
            S3  STGPLAY4  STGPLAY    11.6   0.3
            S4  STGPLAY1  STGPLAY    17.3   0.3
            R1  STARTVCS  IESVCSRV    0.0   0.0
            S5  STGPLAY3  STGPLAY    14.3   0.3
```

ESAUSCP – VCPU Analysis, linux needs new mib

- DB2 workload has very strange overhead….

Report: ESAUSCP **Virtual Machine** VCPU Analysis

UserID CPUvadd	<---CPU time--> Cnt	<-Percent-> TOT	Virt	<-SHARE--> Type	Value	CPU TYPE	<-Samples-> Total	In Q	<---Percent Run	Sim	CPU
07:17:00	0	57.73	35.96	.	.	.	4307	1045	3.2	1.1	1.4
TSTDB2	2	22.88	2.85	ABS	4.0	IFL	118	117	6.0	7.7	1.7
CPU-00		2.21	2.16	ABS	0	IFL	59	59	5.1	0	1.7
CPU-01		20.68	0.69	ABS	0	IFL	59	58	6.9	16	1.7

Report: ESALNXS **LINUX VSI** System Analysis Report

Node/ Time	<---Load Numbers--> Users	Procs	MaxProc	CPU NBR	<Processor Pct Util> Total	Syst	User	Idle	NICE Time	<CPU Overhead%> Krnl	IRQ	Steal	IO Wait
01/16/17													
TSTDB2	0	346	0	Tot	0	0	0	0	0	0	0	0	0
				1	0	0	0	0	0	0	0	0	0
				2	0	0	0	0	0	0	0	0	0

VELOCITY SOFTWARE

ESAUCD2 – The most useful storage report available

- Note, page tables are “anonymous / overhead”

```
Report: ESAUCD2      LINUX UCD Memory Analysis Report          Velocity Softwar
Monitor initialized: 05/13/14 at 00:00:00 on 2828 serial 414C7     First recordana
-------------------------------------------------------------------------------
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
-------- ------ ----- ----- ----- ----- ----- ----- ----- ------ ------ ----- -----
00:15:00
oracle    994.8  18.1 976.7 123.9  74.0  49.9  15.6  92.1      0  240.6 581.4 154.7
redhat5   499.2  17.9 481.3  4095  4095   0.0  15.6  4113      0  140.5 206.6 134.2
redhat5x  497.1  19.8 477.3  4095  4095   0.0  15.6  4114      0  150.0 170.6 156.7
redhat56  497.0  24.3 472.7  1051  1051   0.0  15.6  1075      0  170.1 174.6 128.0
redhat6   492.7   7.8 484.9  4095  4090   5.2  15.6  4098      0  167.9 182.6 134.4
redhat6x  994.8  10.7 984.1 495.8 404.0  91.9  15.6 414.7      0   29.7 785.4 169.0
rhel64v   996.4  70.0 926.4  2047  2047     0  15.6  2117      0  152.0 601.8 172.6
roblx2    241.7  11.1 230.6     0     0     0  15.6  11.1      0   44.2 107.6  78.8
sles10    493.0  19.8 473.2  4219  4219     0  15.6  4238      0  140.9 281.1  51.2
sles11    494.7 172.8 322.0  4087  4087     0  15.6  4260      0  139.3 122.7  59.9
sles11v2 2006.7  85.9  1921  1542 699.6 842.4  15.6 785.5      0    3.0 894.9  1023
sles11v3  868.8  91.2 777.6  2046  1759 287.2  15.6  1850      0    4.2  65.8 707.6
suselnx2  247.3 158.6  88.6 255.8 255.8     0  15.6 414.5      0   29.0  37.3  22.4
s11s2ora  996.5  23.7 972.8 743.8 598.2 145.5  15.6 621.9      0   41.2 777.9 153.7
```

Process Storage metrics (zVPS version 4.2)

New metrics

- RSS, Size - Same
- Locked: Locked memory size (mlock)
- Peak: peak RSS (high water mark)
- Data: size of data, stack
- **PTBL: page table entries (linux 2.6.10) - Use to evaluate LARGE PAGES**
- EXEC: size of executable (text)
- Lib: shared library code size
- Swap: Swapped out
- Stack: size of stack

```
Report: ESALNXP      LINUX HOST Process Statistics Report       Velocity Software Corporate   ZMAP 4.2.0
-------------------------------------------------------------------------------------------------------
node/     <-Process Ident-> PRTY <------CPU Percents----> <---------------Storage Metrics (MB)---------->
 Name      ID    PPID   GRP  Valu  Tot  sys user syst usrt  Size RSS Peak Swap Data Stk  EXEC Lib Lck PTbl
--------- ----- ----- ----- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- --- --- ----
00:15:00
 oracle       0     0     0    0 1.87 0.11 1.05 0.16 0.55 7345  845 108K    0 1997 62.8  28K  6K   0  130
 init         1     1     0   16 0.60    0    0 0.12 0.48    1    0 12.5    0 2.17  1.2  8.9   0   0 0.12
 oracle   21131     1 21131   16 0.88 0.00 0.87    0    0  403   52 3585    0 18.4  1.4  965 139   0 5.98
redhat6x      0     0     0    0 1.66 0.38 0.67 0.22 0.38  19K 1216 275K  462  15K  103  74K 18K   0  219
 init         1     1     1   20 0.59 0.00    0 0.21 0.38    3    1 46.6 0.53 3.11  1.3  2.2  38   0 0.21
sles11v2      0     0     0    0 5.96 3.54 1.83 0.19 0.40 105K 4321 1.5M 6958  21K  517 347K 34K   0 1498
 init         1     1     1   20 0.58 0.00 0.00 0.19 0.38   11    0  135 1.27 2.34  1.7  0.5  25   0 0.51
 ora_vktm  5963     1  5963   -2 1.65 1.65    0    0    0 1137    2  17K 28.2 46.3  2.1 3546 285   0 7.03
 ora_vktm 10254     1 10254   -2 1.62 1.33 0.29    0    0  926    2  14K 27.8 46.3  2.1 3546 285   0 7.27
s11s2ora      0     0     0    0 1.86 0.42 0.68 0.26 0.50  16K 1063 238K  830 2353  141  70K  9K   0  207
 init         1     1     1   20 0.75    0    0 0.26 0.50    2    0 34.0 1.31 2.57  1.9  0.5  28   0 0.14
```

Process Storage metrics (zVPS version 4.2)

Benchmark process analysis (2G SGA, oversized)

```
Report: ESALNXP      Velocity Software Corporate   ZMAP 4.2.0
-------------------------------------------------------------
node/     <-Proc <----------------Storage Metrics (MB)---------->
 Name      ID      Size RSS Peak Swap Data Stk  EXEC Lib Lck PTbl

--------- -----  ---- ---- ---- ---- ---- ---- ---- --- --- ----
NO HUGE PAGES
 oracle   43146  2303  265 2249    0 3.07  0.1  181  13   0 0.96
 oracle   43148  2310   81 2256    0 8.95  0.1  181  13   0 1.06
 oracle   43152  2303   57 2249    0 3.07  0.1  181  13   0 0.69
 oracle   43158  2308  141 2254    0 3.20  0.3  181  14   0 1.21
 oracle   43160  2303  101 2249    0 3.07  0.1  181  13   0 0.84

HUGE PAGES
 oracle   51439  2304   18 2250    0 4.26  0.1  181  14   0 0.31
 oracle   51451  2303   22 2250    0 3.07  0.1  181  14   0 0.32
 oracle   51453  2314   23 2259    0 3.07  0.1  181  13   0 0.32
 oracle   51455  2303   16 2249    0 3.07  0.1  181  13   0 0.31
 oracle   51457  2310   23 2256    0 8.95  0.1  181  13   0 0.31
 oracle   51459  2318   17 2263    0 3.07  0.1  181  13   0 0.32
```

zVPS Application Management

Requirement to go beyond z/VM and Linux metrics

z/VPS provides over 4,000 unique metrics (z/VM ONLY)

- z/VM System, storage, paging, dasd metrics (3,000)
- z/VM Virtual machine metrics (~400)
- Network metrics (~100)
- Linux System metrics (~250 VSI, 80 HST, 80 UCD)
- Linux Process metrics (~40)
- VSE ++, z/OS ++, CICS ++

Application subsystem users:

- **Oracle (70 metrics), supports (10G, 11G, 12C)**
- **Websphere (30 metrics)**

Most application "monitors" are diagnostic tools, not management tools

VELOCITY SOFTWARE

Java/Websphere Metrics

```
Report: ESAJVM       Java Subsystem Analysis Report                  Velocity Sof
-------------------------------------------------------------------------------
Node/                                 <JavaClass> Memory  <------Heap data------->
Date     <------Application------> <--Loaded-> pending <------sizes----------->
Time     Name                  Type Curr  /Sec  Final   Init  Used  Commit Max
-------- -------------------- ---- ----- ----- ------- ----- ----- ------ -----
13:06:00
S11R20RA WAS Server1          JVM   15287     0       0 52.4M  100M 107.5M  268M
         WAS Server2longerna JVM   15312     0       0 52.4M 85.4M 103.3M  268M


Report: ESAJVM       Java Velocity Software Corporate   ESAMAP 4.2.0 06/19/13
-------------------------------------------------------------------------------
Node/                          <---Non Heap Data----> <--Thread Count data->
Date     <------Application- <-----sizes----------> Curr Daemon Peak start
Time     Name                Init Used  Commit Max  Live Count  thrds /sec
-------- ------------------ ---- ----- ------ ---- ---- ------ ----- ----
13:06:00
S11R20RA WAS Server1           0  101M 184.7M    0 58.0   55.0  55.0    0
         WAS Server2longerna    0  101M 171.9M    0 58.0   55.0  55.0    0
```

ESAORAC: Oracle Configuration, SGA, PGA High Level information

Report: ESAORAC Oracle Database Configuration Report

Node/ Date Time	<---------Database Description--------> DatabaseName	Instance	Version	<------Database-------> <----Start-----> Date	Time	Status
PAZXXT10	soedb	soedb	12.1.0.1.0	2014/01/27	10:15	OPEN
redhat6x	db01	db01	11.2.0.2.0	2013/12/19	14:42	OPEN
sles11v2	db01	db01	12.1.0.1.0	2013/11/08	13:20	OPEN

Node/ Date Time	<--------- Database	<-------Storage Overview (MB)------> <-----SGA-------> Max	Fixed	Free Size	<-------PGA-----> Max	MaxMan
PAZXXT10	soedb	1598	2.3	557K	557.1	293.7	1040.0
redhat6x	db01	399.6	2.2	139K	139.3	164.8	529.0
sles11v2	db01	334.4	2.2	32768	106.5	355.2	12950

Measuring Oracle – Linux Process Perspective

Report: ESALNXA LINUX HOST Application Report Velocity Software ZMAP 4.2.0

Node/ Date Time	Process/ Application name	<---Processor Percent---> Total	sys	user	<Process><Children> syst	usrt	<Process-> <-Counts-> Total	Actv	<---Percent Process Status--> Run- ing	Sleep -ing	Zom bie	Disk Wait	Page Wait	Stop
08:30:00														
PAZXXT10	*Totals*	6.6	2.0	2.6	0.7	1.3	149.0	24.5	0.7	99.3	0	0	0	0
	init	1.9	0.0	0.0	0.6	1.3	1.0	0.3	0	100	0	0	0	0
	ora_vktm	1.9	1.0	0.8	0	0	1.0	1.0	0	100	0	0	0	0
08:45:00														
PAZXXT10	*Totals*	55.9	7.5	46.1	0.8	1.6	164.9	42.5	1.9	94.7	0	3.4	0	0
	init	2.3	0.0	0	0.7	1.6	1.0	0.2	0	100	0	0	0	0
	ora_vktm	1.3	0.7	0.6	0	0	1.0	1.0	0	100	0	0	0	0
	oracle_1	19.8	2.9	16.8	0	0	12.0	12.0	15.0	48.3	0	36.7	0	0
	xterm	27.8	1.7	26.1	0	0	3.3	1.0	0	100	0	0	0	0
09:00:00														
PAZXXT10	*Totals*	69.4	11.1	56.9	0.5	0.9	181.6	57.7	1.8	95.1	0	3.1	0	0
	init	1.3	0.0	0.0	0.5	0.8	1.0	0.3	0	100	0	0	0	0
	ora_dbw0	2.2	1.5	0.7	0	0	1.0	1.0	6.7	0	0	93.3	0	0
	ora_lg00	0.7	0.4	0.2	0	0	1.0	1.0	0	46.7	0	53.3	0	0
	ora_vktm	1.2	0.7	0.5	0	0	1.0	1.0	0	100	0	0	0	0
	oracle_1	43.5	5.0	38.5	0	0	20.0	20.0	8.0	73.7	0	18.3	0	0
	xterm	15.7	1.6	14.2	0	0	5.0	1.3	0	100	0	0	0	0
	Xvnc	1.3	0.5	0.8	0	0	1.0	1.0	6.7	93.3	0	0	0	0

VELOCITY SOFTWARE

ESAORAG: General Storage Areas – SGA, no changes

```
Report: ESAORAG    SGA/PGA Analysis Report                    Velocity Software
Monitor initializ/14 at 08:00:00 on 2094 serial 53E5D     First record anal
-------------------------------------------------------------------------------
Node/                <------------Shared Global Area (SGA) in Megabytes----->
Date      <--Data    Max    Fixed Redo Buffer      <------Pool sizes---------->
Time      Name       Size   Size Buffr Cache Free Shrd Large Java Stream ShrIO
-------- --------  ----- ---- ----- ----- ---- ---- ----- ---- ------ -----
08:30:00
PAZXXT10 soedb      1598  2.3   6.9 655.4 557K  295  32.8 16.4   32.8   49.2
-------------------------------------------------------------------------------
08:45:00
PAZXXT10 soedb      1598  2.3   6.9 658.6 557K  295  32.8 16.4   29.5   49.2
-------------------------------------------------------------------------------
09:00:00
PAZXXT10 soedb      1598  2.3   6.9 671.7 557K  295  32.8 16.4   16.4   49.2
```

ESAORAG: General Storage Areas – PGA Grows with workload

```
Report: ESAORAG
-------------------------------------------------------
Node/                <--PGA Data (in Megabytes)-->
Date      <--Data    <-Target-> InUse Alloc Free
Time      Name       Parm Auto                -able
--------  --------   ---- ---- ----- -----   -----
01/28/14
08:30:00
PAZXXT10 soedb        557  451  56.8  84.1    17.5
-------------------------------------------------------
08:45:00
PAZXXT10 soedb        557  426  84.2 128.9    30.4
-------------------------------------------------------
09:00:00
PAZXXT10 soedb        557  404 109.4 170.3    43.6
```

ESAORAS: User Committs/Rollbacks, Session CPU, Recursive CPU

```
Report: ESAORAS Oracle Subsystem Analysis Report
-------------------------------------------------------------
Node/     <---Database----> <-User Activity-> <--CPU--->
Date                        <Rate per second>  Sess  Re-
Time      Name      Instance Calls Comm Rollbk  -ion  Cur
-------- -------- -------- ----- ----- ----- ----- -----
08:30:00
PAZXXT10 soedb     soedb      0.2   2.3   3.8   0.0     0
-------------------------------------------------------------
08:45:00
PAZXXT10 soedb     soedb      0.2 241.2  73.1  22.0   0.0
-------------------------------------------------------------
09:00:00
PAZXXT10 soedb     soedb      0.2 569.5 168.2  52.4  0.11
```

ESAORAS: Oracle Subsystem

```
Report: ESAORAS          Velocity Software Corporate ZMAP 4.2.0 12/21/13
-------------------------------------------------------------------------
Node/           <----Physical Reads Activty---> <-Physical Write Activity-->
Date            <------Rate per second--------> <----Rate per second------->
Time       Name   Rds Hits Direct   I/O  Bytes  Writs  CHits  Dirct  I/O  Bytes
-------- ----- ----- ----- ----- -----  -----  -----  ----- ------ ----- ----
08:30:00
PAZXXT10 soedb   0.8   0.2   0.2   0.2      0    0.1   1415    0.3   0.2  0.1
-------------------------------------------------------------------------
08:45:00
PAZXXT10 soedb  18.1   8.3 172.8 172.8      0  172.2   715K   42.8  42.3  0.5
-------------------------------------------------------------- ----------
09:00:00
PAZXXT10 soedb  36.5  13.8 279.9 279.9      0  276.6  9733K  178.6 178.6  0.1
```

Average over 15 minute hides performance changes

- How to alert on the spikes?
- AT LOW COST!!! (.1% of an IFL per server)
- The performance monitor can NOT be the problem

```
Report: ESAORAS      Oracle Subsystem Analysis Report              Velocity Software Corporate   ZMAP 4.2.0 0
Monitor initialized: 08/04/14 at 00:00:00 on 2828 serial 414C7     First record analyzed: 08/04/14 00:00:00
-------------------------------------------------------------------------------------------------------------
Node/    <---Database----> <-User Activity-> <--CPU---> <----Physical Reads Activty---> <-Physical Write
Activit
Date                       <Rate per second> Sess Re-   <------Rate per second--------> <----Rate per second--
Time     Name    Instance  Calls Comm Rollbk -ion  Cur    Rds  Hits  Direct    I/O Bytes Writs CHits Dirct  I/O
-------- -------- -------- ----- ----- ----- ----- ----- ----- ----- ------ ----- ----- ----- ----- ------ ----

00:15:00
oracle   orcl     orcl       0.4   3.9   6.3   0.1     0   1.6   1.5    0.8   0.8     0   0.7  6176   0.5   0.5
roblx1   orcl     orcl       0.2  42.1  11.8   0.8   0.0  16.8  10.1   3353  1728  1625 171.2 9355K   5.5   5.4
s11s2ora db01     db01       0.4   7.2   5.7   0.1     0   0.7   0.2    4.3   4.3     0   2.7 35455   0.9   0.9
-------------------------------------------------------------------------------
```

Performance analysis vs "averages"

```
Report: ESAORAS      Oracle Subsystem Analysis Report              Velocity Software Corporate   ZMAP 4.2.0
Monitor initialized: 08/04/14 at 00:00:00 on 2828 serial 414C7     First record analyzed: 08/04/14 00:00:00
Node/    <---Database----> <-User Activity-> <--CPU---> <----Physical Reads Activty---> <-Physical Write Actv
Date                       <Rate per second> Sess Re-   <------Rate per second--------> <----Rate per second--
Time     Name    Instance  Calls Comm Rollbk -ion  Cur   Rds  Hits  Direct   I/O Bytes Writs CHits Dirct  I/O
-------- ------- --------  ----- ---- ------ ---- ------ ---- ------ ------ ----- ----- ----- ----- ----- -----
00:01:00
roblx1   orcl     orcl       0.3 302.3   10.9  2.0      0 10.0   4.9    6.9    6.9     0   6.7 56361   1.0   1.0
00:02:00
roblx1   orcl     orcl       0.2  26.7   10.4  0.2      0  6.9   2.0      0      0     0     0     0   1.7   1.7
00:03:00
roblx1   orcl     orcl       0.2  40.3    9.5  0.3      0  5.7   0.8      0      0     0     0     0   1.5   1.5
00:04:00
roblx1   orcl     orcl       0.2   7.6    9.6  0.2      0  5.2   0.2      0      0     0     0     0   1.9   1.9
00:05:00
roblx1   orcl     orcl       0.2  23.3    9.3  0.4      0  4.9   0.3      0      0     0     0     0   0.8   0.8
00:06:00
roblx1   orcl     orcl       0.2  16.6   10.2  0.2      0  5.8   0.6      0      0     0     0     0  43.6  43.6
00:07:00
roblx1   orcl     orcl       0.2  37.3   10.3  0.2      0  5.1   0.0      0      0     0     0     0   1.3   1.3
00:08:00
roblx1   orcl     orcl       0.5  26.7   15.0  0.9      0  6.9   0.7   4221 122.2  4099 267.7 2499K   1.6   1.6
00:09:00
roblx1   orcl     orcl       0.3  25.5   16.1  1.3      0 36.9  41.5   6781   4202  2579 333.9 60.6M   9.7   9.7
00:10:00
roblx1   orcl     orcl       0.2  26.4   14.3  1.7    0.0 45.0  18.6   6489   645    38.6 248.9 3648K   1.9   1.9
```

VELOCITY SOFTWARE

Setting Oracle Alerts?

Possible metrics for alerting:

- For server, by database:
- SGA size > x
- PGA allocated > x
- Users?
- I/O
- Cache hits?

Daily/Weekly/Monthly CSV files created, zview exposed….

```
; Chart Syntax: type days strt stop extr parm
;  Where type is DAILY/WEEK/MONTH
;   "days" is the previous "n" days
;   TimesT is called with these parms

;       type    days  strttime stop   extractname  parm
CHART  DAILY     1     00:00    24:00   CPULPAR
CHART  DAILY     1     00:00    24:00   USERCPU

CHART  MONTHLY   31    00:00    24:00   CPULPAR
CHART  MONTHLY   31    07:00    17:00   USERCPU
CHART  MONTHLY   31    *        *       USERWAIT    SUSELNX1

CHART  WEEKLY    7     07:00    17:00   USERCPU
CHART  WEEKLY    7     00:00    24:00   CPULPAR

; Charts will be kept up to 12 months,52 weeks, 31  days
; format of chartcnt is "chartcnt mm ww dd"
CHARTCNT 2 2 2
```

```
;LPAR Utilization over time
"STARTTIME","STOPTIME","LPARNAME","CPUUTIL"
"2010/12/13","02:00:00","Totals:","79.64"
"2010/12/13","02:00:00","VSIVM4","34.72"
"2010/12/13","02:00:00","VSIVM1","3.87"
"2010/12/13","02:00:00","VSIVM2","0.41"
```

```
ESAMAP   FILELIST A0  V 1
  Filename Filetype Fm
  TOTAL    CSVDC348 A1
  TOTAL    CSVDU348 A1
  TOTAL    CSVWC049 A1
  TOTAL    CSVWU049 A1
  TOTAL    CSVDC347 A1
  TOTAL    CSVDU347 A1
  TOTAL    CSVDC346 A1
  TOTAL    CSVDU346 A1
```

VELOCITY SOFTWARE

Linux applications by Group

```
Report: ESALNXA      LINUX HOST Application Report
Monitor initialized: 21/01/11 at 07:03:00 on
-----------------------------------------------------
Node/     Process/     ID    <---Processor Percent--->
Date      Application              <Process><Children>
Time      name               Total sys  user syst usrt
-------- ----------- ----- ----- ---- ---- ---- ----
07:04:00
***Node Groups***
WASApps   *Totals*        0  90.8  9.4 78.6  0.5  2.2
          automoun        0   0.0    0  0.0    0    0
          httpd           0   5.4  1.8  3.6    0    0
          httpd1          0  44.4  4.0 40.5    0    0
          httpd18         0   8.8  0.2  8.6    0    0
          httpd19         0   2.8  0.2  2.6    0    0
          httpd2          0   2.5  0.2  2.3    0    0
          httpd3          0   4.1  0.7  1.3  0.3  1.8
          httpd4          0   6.0  0.9  5.1    0    0
          httpd5          0   1.1  0.1  1.1    0    0
          httpd6          0   2.7  0.2  2.5    0    0
          httpd7          0   6.4  0.3  6.1    0    0
          httpd9          0   4.3  0.0  4.2    0    0
          kernel          0   0.6  0.0    0  0.2  0.4
          snmpd           0   0.7  0.4  0.2    0    0
```

VELOCITY SOFTWARE

Defining applications

```
appname = 'PIDFILE  '   appstring = 'PidFile'
appname = 'MineCrft '   appstring = 'minecraft'
appname = 'HVC      '   appstring = 'hvc'
appname = 'DESKTOP  '   appstring = 'desktop'
appname = 'oracle   '   appstring = 'oracle'
```

```
Screen: ESALNXA  Velocity Software - VSIVM4      ESAMON 4.201 02/25
1 of 3  LINUX VSI Host Application Report        CLASS * NODE BLAKEMC

                    Process/     ID    <---Processor Percent--->
                                                <Process><Children>
Time      Node/     Application                  Total  sys  user syst usrt
          Group     name
-------- -------- ------------ ----- ----- ---- ---- ---- ----
21:20:00 BLAKEMC  *Totals*         0  15.6  0.1 15.5    0    0
                  kernel       2097K   0.0  0.0    0    0    0
                  snmpd        98934   0.1  0.1  0.0    0    0
                  MineCrft     81176  15.5  0.0 15.5    0    0
21:19:00 BLAKEMC  *Totals*         0  14.5  0.1 14.4    0    0
                  snmpd        98934   0.1  0.0  0.0    0    0
                  MineCrft     81176  14.4  0.0 14.4    0    0
21:18:00 BLAKEMC  *Totals*         0  14.4  0.1 14.3    0    0
                  snmpd        98934   0.1  0.0  0.0    0    0
                  MineCrft     81176  14.3  0.0 14.3    0    0
```

Websphere argument string used for accounting

wasadmin 27144 6846 0 Feb06 ? 00:43:13 /u01/was61/java/bin/java -Declipse.security -Dwas.status.socket=34229 -Dosgi.install.area=/u01/was61 -Dosgi.configuration.area=/u01/was61/profiles/appsrv/configuration -Dosgi.framework.extensions=com.ibm.cds -Xshareclasses:name=webspherev61_%g,groupAccess,nonFatal -Xscmx50M -Xbootclasspath/p:/u01/was61/java/jre/lib/ext/ibmorb.jar:/u01/was61/java/jre/lib/ext/ibmext.jar:/u01/J2EEProbe/DiagnosticsAgent/classes/IBM/1.5.0/instr.jre:/u01/J2EEProbe/DiagnosticsAgent/classes/boot -classpath /u01/was61/profiles/appsrv/properties:/u01/was61/properties:/u01/was61/lib/startup.jar:/u01/was61/lib/bootstrap.jar:/u01/was61/lib/j2ee.jar:/u01/was61/lib/lmproxy.jar:/u01/was61/lib/urlprotocols.jar:/u01/was61/deploytool/itp/batchboot.jar:/u01/was61/deploytool/itp/batch2.jar:/u01/was61/java/lib/tools.jar -Dibm.websphere.internalClassAccessMode=allow -verbose:gc -Xms1024m -Xmx1200m -Dws.ext.dirs=/u01/was61/java/lib:/u01/was61/profiles/appsrv/classes:/u01/was61/classes:/u01/was61/lib:/u01/was61/installedChannels:/u01/was61/lib/ext:/u01/was61/web/help:/u01/was61/deploytool/itp/plugins/com.ibm.etools.ejbdeploy/runtime -Dderby.system.home=/u01/was61/derby -Dcom.ibm.itp.location=/u01/was61/bin -Djava.util.logging.configureByServer=true -Duser.install.root=/u01/was61/profiles/appsrv -

Linux Capacity Planning "planning"

Node Classes (installation defined)

- By application (capacity planning)
- By VMWare/ESX box
- By department (chargeback)

Other grouping (automatic)

- Process by user (ESALNXU)
- Process by process name (ESAHSTA)
- Process by application (ESALNXA)
  - Requires Parent/Child relationship
- Disk storage by NODE class

Define alerts (Operational support)

- based on application
- Based on node group
- Based on linux user

MFC – ie SMF 113

Why do all z/OS performance "experts" talk about 113?

- Because they can….
- It explains lpar configuration performance
- z/OS has RNI – Relative Nest Intensity

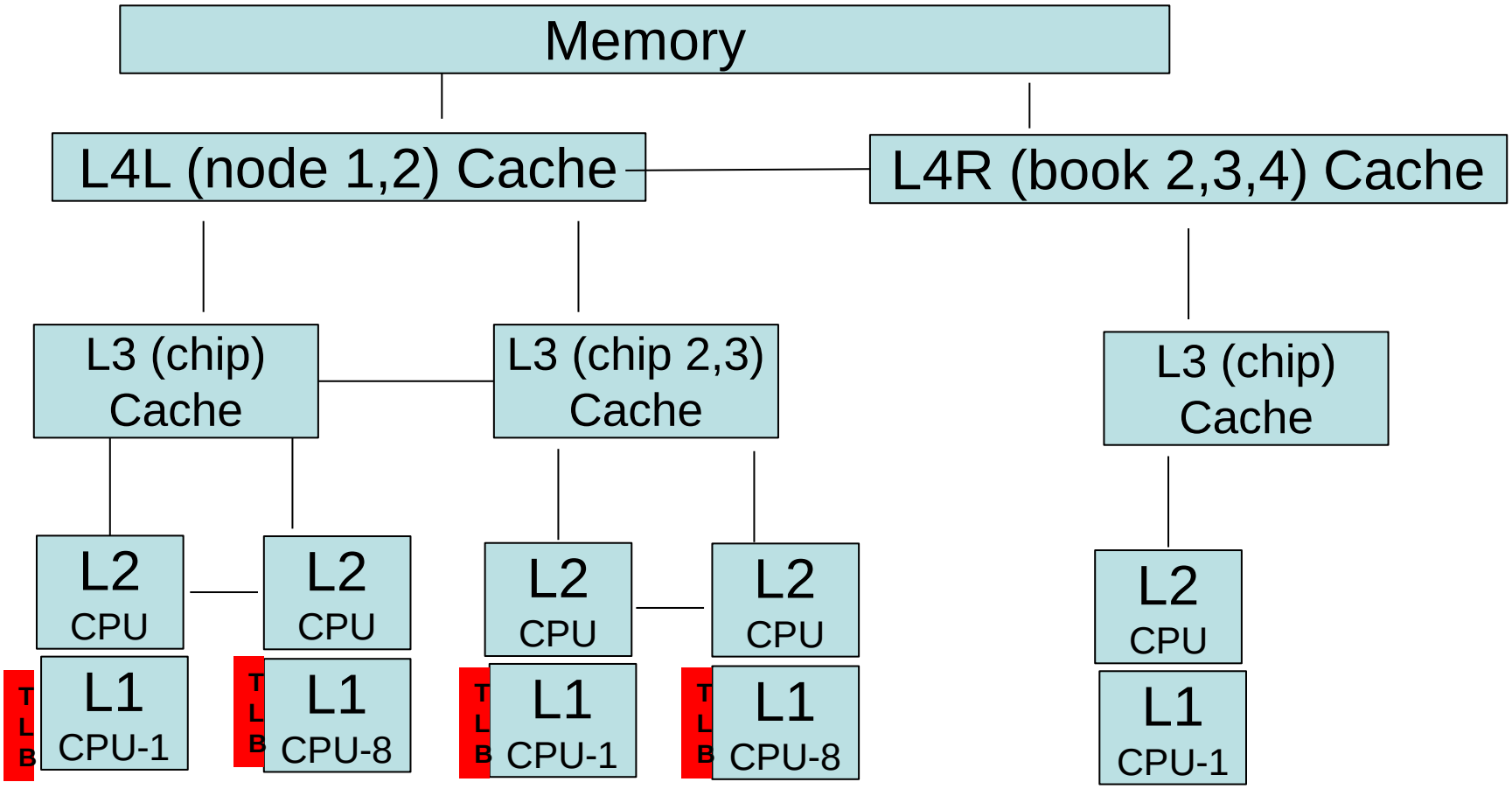
Why do z/VM IBM people not talk about it?

- Because they can't…. (special tool now available)

The value of the PRCMFC information is huge

- RNI does not track on z/VM, excludes one important factor
- CPI (Cycles per instruction) Answers the SMT questions
- CPI Shows the value of high/medium/low parking

See ESAMFC, ESAMFCA, ESAMFCC



Question, If 10,000 dispatch / second / cpu, impact?

What is the CPU Measurement Facility (Basic)

CPI: Cycles per Instruction

```
Report: ESAMFCA       MainFrame Cache Hit Analysi
Monitor initialized: 12/10/14 at 07:44:37 on 282
-----------------------------------------------
                 <CPU Busy> <-------Processor------>
                 <percent>  Speed/<-Rate/Sec-> CPI
Time      CPU  Totl  User   Hertz Cycles  Instr Ratio
--------  ---  ----  ----   ----- ------  ----- -----
07:48:35    0 20.8  18.4   5504M  1121M   193M 5.807
            1 21.6  19.6   5504M  1161M   221M 5.264
            2 24.4  22.5   5504M  1300M   319M 4.078
            3 22.4  19.7   5504M  1248M   265M 4.711
            4 19.6  17.6   5504M  1102M   194M 5.683
            5 20.4  18.6   5504M  1144M   225M 5.087
            6 23.9  22.0   5504M  1341M   341M 3.935
            7 17.6  15.4   5504M   949M   160M 5.927
            8 18.5  16.5   5504M  1005M   194M 5.195
            9 22.5  20.6   5504M  1259M   347M 3.629
              ----  ----   -----  ------  ----- -----
System:        212   191   5504M  10.8G  2457M 4.733
```

Why you should be interested – what is a MIP?

Report: ESAMFC MainFrame Cache Analysis Rep

		<CPU Busy>		<-------Processor------>			
		<percent>		Speed/<-Rate/Sec->			
Time	CPU	Totl	User	Hertz	Cycles	Instr	Ratio
14:05:32	0	92.9	64.6	5000M	4642M	1818M	2.554
	1	92.7	64.5	5000M	4630M	1817M	2.548
	2	93.0	64.7	5000M	4646M	1827M	2.544
	3	93.1	64.9	5000M	4654M	1831M	2.541
	4	92.9	64.8	5000M	4641M	1836M	2.528
	5	92.6	64.6	5000M	4630M	1826M	2.536
System:		557	388	5000M	25.9G	**10.2G**	**2.542**
14:06:02	0	67.7	50.9	5000M	3389M	2052M	1.652
	1	67.8	51.4	5000M	3389M	2111M	1.605
	2	69.0	52.4	5000M	3450M	2150M	1.605
	3	67.2	50.6	5000M	3359M	2018M	1.664
	4	60.8	44.5	5000M	3042M	1625M	1.872
	5	70.1	53.8	5000M	3506M	2325M	1.508
System:		403	304	5000M	18.8G	**11.4G**	**1.640**

1830 mips
(at 100%)

2828 Mips
(at 100%)
Doing 10%
more work

VELOCITY SOFTWARE

TLB Analysis P – z13 data SMT Enabled

Why working sets are important,

Why we need large pages?

DAT Translation consumes 30% of the cycles for both threads

Report: ESAMFC MainFrame Cache Magnitudes Report ZMAP 4.2.4

		<CPU Busy>		<---------->		<-Translation Lookaside buffer(TLB)-					
		<percent>		Speed/		<cycles/Miss>		<Writs/Sec>		CPU	Cycles
Time	CPU	Totl	User	Hertz	Ratio	Instr	Data	Instr	Data	Cost	Lost
07:45:01	0	25.9	24.4	5000M	1.704	159	742	473K	244K	19.77	257M
	1	35.9	34.7	5000M	1.491	138	731	530K	249K	14.17	255M
	2	15.8	13.9	5000M	2.868	206	826	419K	245K	36.30	289M
	3	16.6	15.4	5000M	2.508	212	825	411K	247K	34.90	291M
	23	18.1	17.0	5000M	2.144	197	815	412K	229K	29.44	268M
	24	21.4	19.9	5000M	1.865	114	533	598K	302K	21.35	229M
	25	26.2	24.9	5000M	1.742	98	503	736K	346K	18.71	246M
	26	12.9	11.6	5000M	2.050	154	631	378K	214K	29.92	194M
	27	13.1	11.9	5000M	1.987	156	630	378K	217K	29.64	195M
System:		514	476	5000M	2.257	176	724	14M	7641K	30.69	7917M

z/VM 6.4 Support

- HyperPav

Linux

- FCP Disk performance data (ESALNXF)

Applications

- Java threads (ESAJVMT)

Major clean up

- Office vision removal
- 3880-23 removal
- Better internal support of vcpu

Hyperpav has additional metrics in 6.4

```
Report: ESAHPP        HyperPav Device Pool Analysis
Monitor initialized: 09/27/16 at 14:12:32 on 2964 serial 0FE8C7
-------------------------------------------------------------------------
           <Storage>                                <Alias Rate>  <----Data T
 Time/     <Director><HPP Device Counts>            <-Acquires->
 Date      ID   Pool Base Alias min max  Tries Fails  Type   Shr
-------- ---- ----- ---- ----- --- ---  ----- ------  ------ ---
14:14:00 C901    0     3     2   0   2   17.6    8.0  MDISK    0
                                                     PAGING   0
         C701    1     4     2   0   2   12.7    6.9  MDISK    0
                                                     PAGING   0
```

Hyperpav has additional metrics in 6.4

```
Report: ESALNXF      LINUX VSI Filesystem Performance                  Velocity
Monitor initialized: 01/21/17 at 05:00:00 on 2828 serial 0314C7        First rec
-------------------------------------------------------------------------------
                   <-----Read I/O-----> <----Write I/O-----> IO In <Time(ms)>
NODE/     Disk     /Second  Sectrs (ms) /Second  Sectrs (ms) Prog- <Per I/O)>
Time/     Name     I/O Mrgd  /RdIO /IO  I/O Mrgd /WrtIO /IO   ress IOQ  I/O
-------- -------- --- ---- ------ ---- --- ---- ------ ---- ----- ---- ----
01/21/17
05:15:00
OSA178
          dasda      0    0      0    0   0    0      0    0     0    0    0
          dasda1     0    0      0    0   0    0      0    0     0    0    0
          sda        0    0      0    0 1.8  0.5   52.5  0.3     0  0.2  0.3
          sda1       0    0      0    0   0    0      0    0     0    0    0
          sda2       0    0      0    0 0.3  0.5  264.8  1.0     0  0.6  1.0
sles12
          dasda      0    0      0    0   0    0      0    0     0    0    0
          dasda1     0    0      0    0   0    0      0    0     0    0    0
          sda        0    0      0    0 1.8  0.5   52.5  0.3     0  0.2  0.3
          sda1       0    0      0    0   0    0      0    0     0    0    0
          sda2       0    0      0    0 0.3  0.5  264.8  1.0     0  0.6  1.0

NODE/     Disk     >
Time/     Name      <--Device Path-->
-------- --------  -----------------
01/21/17
05:15:00
OSA178
          dasda     ccw-0.0.0203
          dasda1    ccw-0.0.0203-part1
          sda       ccw-0.0.0201-zfcp-0x500507630718d02a:0x4012405c00000
          sda1      ccw-0.0.0201-zfcp-0x500507630718d02a:0x4012405c00000
          sda2      ccw-0.0.0201-zfcp-0x500507630718d02a:0x4012405c00000
-------------------------------------------------------------------------------
```

The Velocity Software mib extracts threads

```
Report: ESAJVMT      Java Subsystem Analysis Report                  Velocity Sof
Monitor initialized: 12/05/16 at 14:35:40 on 2828 serial 0314C7      First record
-------------------------------------------------------------------------------

Node/
Date     <-----------Thread ID----------->  <--Blocks--> <Thread Waits>  CPU
Time     Name                              nbr  /Second Time   /Sec  Time    (ms)
-------- --------------------------------  ---- ------- ---- -----  -----  -----
14:37:00
lxora12  Totals: AppSrv01-server1            0     0.2    0   73.1      0  170.8
         CommunicatorServer                  7       0    0      0      0    7.8
         Thread-11                          17       0    0    0.0      0    1.1
         Deferred Alarm Manager             30       0    0    2.2      0    4.0
         Non-Deferred Alarm Manager         31       0    0    2.0      0    2.9
         Deferrable Alarm : 0               43       0    0    1.0      0    3.1
         LT=0:P=315710:O=0:port=9100        49       0    0      0      0    1.4
         LT=1:P=315710:O=0:port=9403        50       0    0      0      0    1.8
         ThreadService-0                    90     0.0    0    1.6      0   19.2
         Deferrable Alarm : 1               99       0    0    1.0      0    3.9
         Deferrable Alarm : 2              135       0    0    1.0      0    3.8
         Thread-79                         140       0    0    0.3      0    1.1
         ThreadService-1                   148     0.0    0    1.8      0   16.7
         Deferrable Alarm : 3              149       0    0    1.0      0    3.4
         ThreadService-2                   150     0.0    0    1.7      0   11.7
         ThreadService-3                   151     0.0    0    1.6      0   14.5
         ThreadService-4                   153     0.1    0    1.5      0   16.1
         ThreadService-5                   154     0.0    0    1.5      0   25.8
         AIO Timer Thread 1                183       0    0    1.0      0    1.7
         WebContainer : 2                  186       0    0    1.0      0    1.5
         WebContainer : 15                 226       0    0    1.0      0    1.0
         WebContainer : 17                 228       0    0    1.0      0    1.6
```

For z/VM, OSA MIB installs on a Linux Server
Two sources, Shows configuration, totals, by LPAR
Not sure which source is accurate or why discrepancy

```
Report: ESAOSA       OSA System Configuration Report
Monitor initialized: 05/14/16 at 06:02:00 on
-------------------------------------------------------
Collector <----------OSA Configuration--> MacAddress
Node      Idx  Name  Nbr  Type Level Shrd Active
--------- --- ------ ---  ---- ----- ---- ------------
06:03:00
OSA178     2  OSA1    0 1G Eth 6.00  Yes 6CAE8B483FD4
```

```
Report: ESAOSA       OSA                  Velocity Software Corporate
Monitor initialized: 05/                First record analyzed: 05/14
-------------------------------------------------------------------
Collector <----------OSA   LPAR Bus  CPHID  KBytes/Sec Packets/sec
Node      Idx  Name  Nbr    NBR Util Util    IN   OUT    In   OUT
--------- --- ------ ---    --- ---- ----  ----- ----- ----- -----
06:03:00
OSA178     2  OSA1    0    Tot    0    0    7.0   8.2  30.1  23.2
                             2    0    .      3     1
                             4    0    .     17    17
                             5    0    .      4     4
```

zVPS Version 5 Major new features:

- ILMT/SCRT (4 hour rolling averages for license mgmt.)
- GPFS
- z/OS, CICS, more VSE
- Mongodb
- Docker
- collectd (Secure container)

Requirements:

- Licensing for many things based on "peak 4 hour average"
- Installations interested in "local reporting"
- Installations interested in avoiding costs:
  - Alert when peak average target reached

Customer Requests

- Alert when VSE guest exceeds threshold in timeshare
- Tell me what my suse server application peaks at
- Provide "local report" to validate IBM license charges

ESAILMT

Features:

- Peak average
  - for day, week, month
- By server,
- by class,
- by CPU Type,
- by LPAR
- Identifies time, top hours

```
Report: ESAILMT      ILMT Analysis
-------------------------------------------------------------
<-ILMT Object-> <Peak 4 Hr Activity>  <--Interval/Hour 1->
Name       Type  CPU    Date     Time    CPU   Date     Time
--------   ----  -----  -------- -----   ----- -------- -----
DBPDEV     USER    0.04 04/15/19 13:00    0.02 04/15/19 09:00
NETWATCH   USER    0.16 04/15/19 23:00    0.16 04/15/19 20:00
OPERATOR   USER    0.03 04/15/19 16:00    0.02 04/15/19 13:45
RACFVM     USER    0.00 04/15/19 13:00    0.00 04/15/19 10:00
ZWRITE     USER    0.13 04/15/19 23:00    0.11 04/15/19 20:00
ZWSSL11    USER    0.00 04/15/19 11:00    0.00 04/15/19 08:00

suse       CLAS    0.24 04/15/19 14:00    0.23 04/15/19 11:00
KeyUser    CLAS    0.27 04/15/19 23:00    0.17 04/15/19 20:00
Servers    CLAS    0.06 04/15/19 23:00    0.03 04/15/19 20:00
TheUsrs    CLAS    1.34 04/15/19 23:00    1.00 04/15/19 20:00
Velocity   CLAS    0.42 04/15/19 14:00    0.42 04/15/19 11:00

TotalCP    CPUT   98.88 04/15/19 08:00  104.2 04/15/19 05:00
TotalIFL   CPUT  101.3 04/15/19 23:00  100.1 04/15/19 20:00

VSIVM1     LPAR    1.86 04/15/19 24:00    1.25 04/15/19 21:00
VSIVM2     LPAR    2.46 04/15/19 23:00    1.92 04/15/19 20:00
VSIVM3     LPAR    5.67 04/15/19 13:00    5.22 04/15/19 10:00
VSIVM4     LPAR   95.35 04/15/19 15:00   95.20 04/15/19 12:00
VSIVM5     LPAR   82.73 04/15/19 08:00   87.82 04/15/19 05:00
VSIVM5     LPAR    2.04 04/15/19 07:00    2.03 04/15/19 04:00
VSIVM6     LPAR   11.10 04/15/19 24:00   10.78 04/15/19 21:00
```

VELOCITY SOFTWARE

snmp is extensible

- GPFS / Spectrum Scale has an snmp mib
- MongoDB provided a mib
- Docker mib provided by Velocity Software

Other Data Sources

- Collectd (Secure Container)
- SMF (z/OS, z/VSE)

GPFS: Data from snmp – problem? How full….

```
Report: ESAGPFS      GPFS Cluster File System Config                Velocity
-------------------------------------------------------------------------------
Collector                                                  Node FS
Node     Cluster Name              GPFS ID           Rlse Cnt  Cnt   Domain
-------- ------------------  -------------------- ---- ---- ----  --------
11:56:00
ssnode1  cluster1.ssnode1     5049816574407790568  1700    3    1  cluster1


Report: ESAGPFSN     GPFS File system Configuration                 Velocity
-------------------------------------------------------------------------------
Collector                                Plat-                        Thread
Node     Idx  Name    IP Address        Form Status Fails  Wait  Good Versn
-------- --- -------- --------------- ---- ------ -----  ----  ----  ----
11:56:00
ssnode1   49 ssnode1  192.168.5.92     S390 up      0      yes  none 4.2.3.6
          50 ssnode2  192.168.5.93     S390 up      0      yes  none 4.2.3.6
          51 ssnode3  192.168.5.94     S390 up      0      yes  none 4.2.3.6
```

VELOCITY SOFTWARE

GPFS: Data from snmp

```
Report: ESAGPFSS     GPFS Storage Pool Configuration
-------------------------------------------------------
Collector Subpool  Files
Node      Name     System   Storage   Free Disks
--------  -------- -------- ------- ------ -----
11:56:00
ssnode1   system@@ gpfs1@@@    192K   185K     0


Report: ESAGPFSD     GPFS DISK Configuration/Analysis
Monitor initialized: 06/22/18 at 11:54:12 on 2828 serial 0314C7
-------------------------------------------------------------------
Collector                  StgPool Disk  <Dsk Blks> Sub  <I/O Time>
Node      DiskName FSName  Name    Status Total Free free Read Write
--------- -------- -------- ------ ------ ----- ---- ---- ---- -----
11:56:00
ssnode1   disk1    gpfs1    stem   InUse 192352 185K 13.7 1.1M     0
```

VELOCITY SOFTWARE

MongoDB Configuration, Transactions

```
Report: ESAMNG1      MONGODB Configuration Report                    Velocity Sof
Monitor initialized: 03/07/19 at 20:15:01 on 2828 serial 0314C7    First record
--------------------------------------------------------------------------------
Node
 Database                                  <-----Memory (Megabytes)----->
  Primary Node                             Residnt Virtual Mapped Journal
-----------------------------------------  ------- ------- ------ -------
20:17:00
mongo
 mongo01.velocitysoftware.com:27017
 mongo01.velocitysoftware.com:27017           1305    2660      0       0
--------------------------------------------------------------------------------
20:18:00
mongo
 mongo01.velocitysoftware.com:27017
 mongo01.velocitysoftware.com:27017           1305    2660      0       0


Report: ESAMNG2      MONGODB Transaction Report            Velocity Software Corporate   ZMAP
Monitor initialized: 03/07/19 at 20:15:01 on 2828 serial 0314C7    First record analyzed: 03/07/19
------------------------------------------------------------------------------------------------------
Node     Database  <--Connections-->   <----------Aserts---------------->  <Cursors Rate>
Node                 Open  Avail Total  Regulr Warning  Msg User Rollover   Open   Timeout
-------- --------  -----  ----- ------  ------ -------  ---- ---- --------  ------ -------
20:17:00
mongo    mongo01       5  51195    988       0       0    0    0        0         0     0
------------------------------------------------------------------------------------------------
20:18:00
mongo    mongo01       5  51195    988       0       0    0    0        0         0     0
------------------------------------------------------------------------------------------------
```

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MongoDB Resources, database

```
Report: ESAMNG3      MONGODB Resource Report                          Velocity Software Corporate   ZMAP
Monitor initialized: 03/07/19 at 20:15:01 on 2828 serial 0314C7    First record analyzed: 03/07/19
-------------------------------------------------------------------------------------------------------
Node     Database  <---Commit Rate---> <Journal MB Sec> Comp  <-Network Traffic-> Requtest
Node     Name       Count Locked Early     To     From  Ratio  KBytesIn KBytesOut   Rate
-------- -------    ----- ------ -----  ------ -------  -----  -------- -------- -  ------
20:17:00
mongo    mongo01        0      0     0       0       0      0       132       78        0
-------------------------------------------------------------------------------------------
20:18:00
mongo    mongo01        0      0     0       0       0      0       272     1619        0
-------------------------------------------------------------------------------------------


Report: ESAMNG4      MONGODB Database Report                          Velocity Software Corporate   ZMAP
Monitor initialized: 03/07/19 at 20:15:01 on 2828 serial 0314C7    First record analyzed: 03/07/19
-------------------------------------------------------------------------------------------------------
Node     Database   <---------Global Rate / Second---------->                  <---------Reply  Rate / Second--------
Name     Name       Inserts Query Update Delete GETMORE  Cmds Inserts Query Update Delete GETMORE
-------- --------   ------- ----- ------ ------ ------- ----- ------- ----- ------ ------ -------
20:17:00
mongo    mongo01        4.2 435.5    0.7      0       0   2.3       0     0      0      0       0
-------------------------------------------------------------------------------------------------------
20:18:00
mongo    mongo01        8.6 898.2    1.7      0       0   2.5       0     0      0      0       0
0  g
```

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Docker

```
Report: ESADOCK1     DOCKER Configuration Report                    Velocity Sof
Monitor initialized: 03/23/19 at 01:23:22 on 2828 serial 0314C7     First record
-------------------------------------------------------------------------------
Time /   <----------Container Configuration----------> Status  <------Create--
Node     Index         ImageName    ContName                    Date       Time
-------- ------------ ------------ -------------------- ------  ---------- ----
01:25:00
DOCKER   9555b066af0d httpd2       angry_easley         runn    2019-01-29 23:4
DOCKER   87715241e80b httpd2       stupefied_torval     runn    2019-01-29 21:5
DOCKER   92a88955945c http2        youthful_hugle       runn    2019-01-23 18:3
-------------------------------------------------------------------------------
01:26:00
DOCKER   9555b066af0d httpd2       angry_easley         runn    2019-01-29 23:4
DOCKER   87715241e80b httpd2       stupefied_torval     runn    2019-01-29 21:5
DOCKER   92a88955945c http2        youthful_hugle       exit    2019-01-23 18:3

Report: ESADOCK2     DOCKER Transaction Report                      Velocity Sof
Monitor initialized: 03/23/19 at 01:23:22 on 2828 serial 0314C7     First record
-------------------------------------------------------------------------------
                                  <----------Storage in "K"------------------
Node     Container    <CPU Percent> Current                 <Anonymous>  <---Fi
         Index        User  System   use   max   cache  rss inact activ  Inact
-------- ------------ ----- ------  ---- -----  ------ ---- ----- -----  -----
01:25:00
DOCKER   9555b066af0d     0      0  0.70  8348  1052.0 2188  1324  1204  344.0
DOCKER   87715241e80b     0      0  0.70  8364  992.00 2344  1344  1308  348.0
DOCKER   92a88955945c     0      0  0.70  2776  344.00 2368 340.0  2368   4.00
-------------------------------------------------------------------------------
01:26:00
DOCKER   9555b066af0d     0      0  0.70  8348  1052.0 2188  1324  1204  344.0
DOCKER   87715241e80b     0    1.0  0.70  8364  992.00 2344  1344  1308  348.0
DOCKER   92a88955945c     0      0     0     0       0    0     0     0      0
-------------------------------------------------------------------------------
```

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Secure container technology is a black box….

- If there is a performance problem, what are your options?
- Snmp not an option

IBM has included collectd to export json like data

- zTCP enhanced to listen to new port for collectd data
- 4 reports:
  - ESASSCC – configuration
  - ESASSCD – disks
  - ESASSCF – Files
  - ESASSCP - processes

Why ZOSMON ™?

Customer requests for z/OS Real Time Monitoring….

- zVIEW web application well received
- Default graphs, charts sufficient for “out of box” operation
- Single pane of glass only missing z/OS

If you run Linux workload, zVPS runs on IFLS….

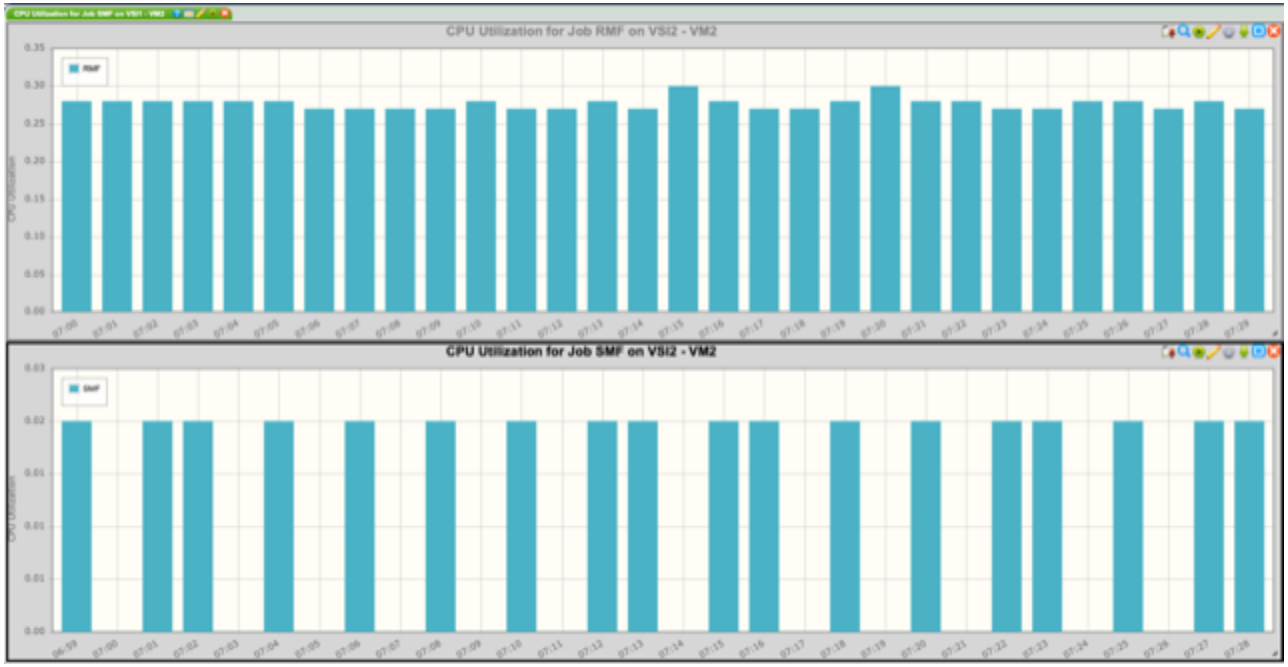
- (And very efficient code, NO JAVA!)
- zOSMON processed 24 hours of SMF 30/70 in 24 CPU seconds (bc12)

Currently supports records 70, 30, extensions easy.

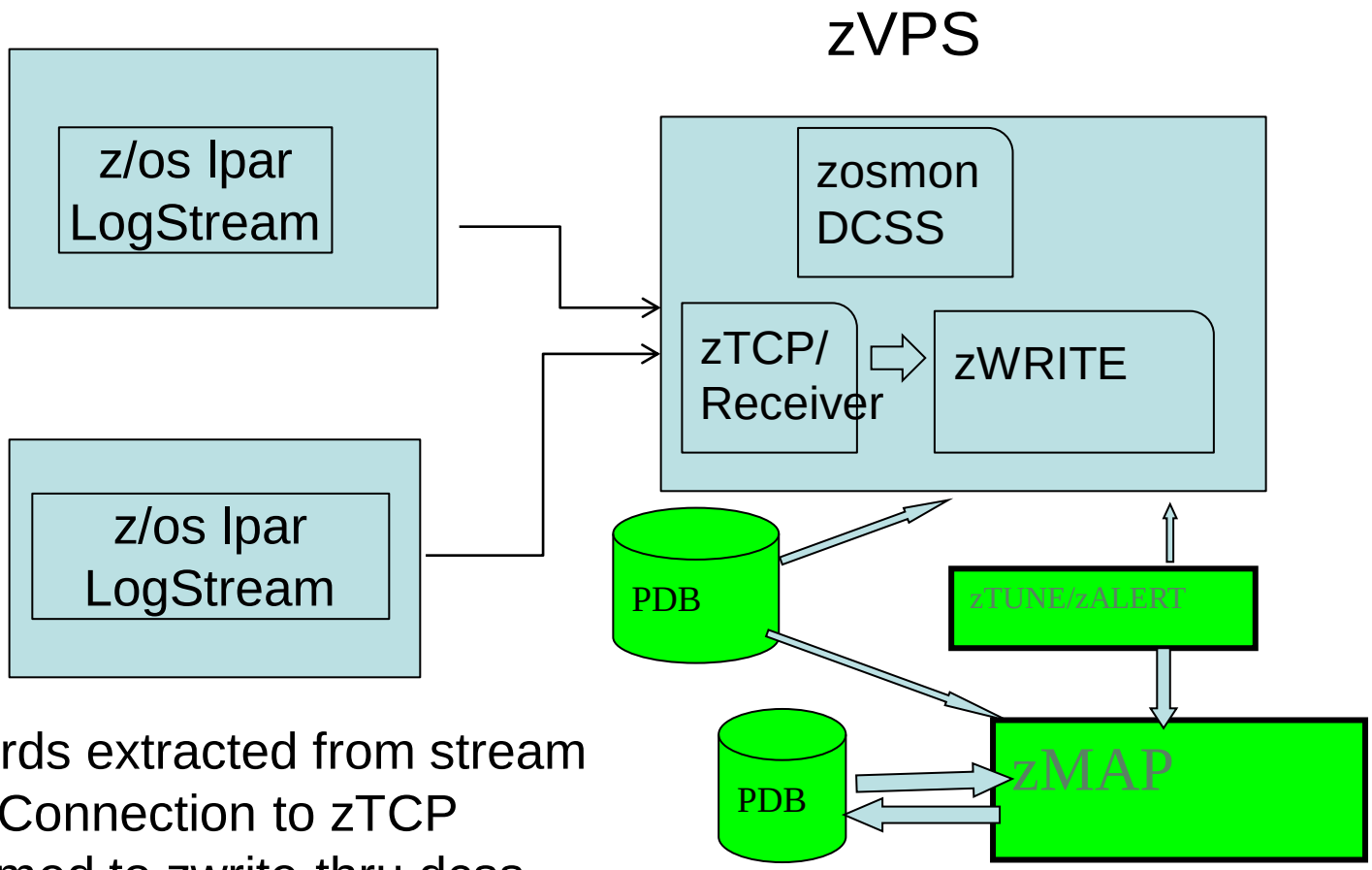
- Customer driven…. Expect at least monthly updates

zVIEW supports z/OS
On z/OS, Jobs are measurable!

- SMF comes in at about .02%
- RMF at about .26%.



ZOSMON ™ Architecture



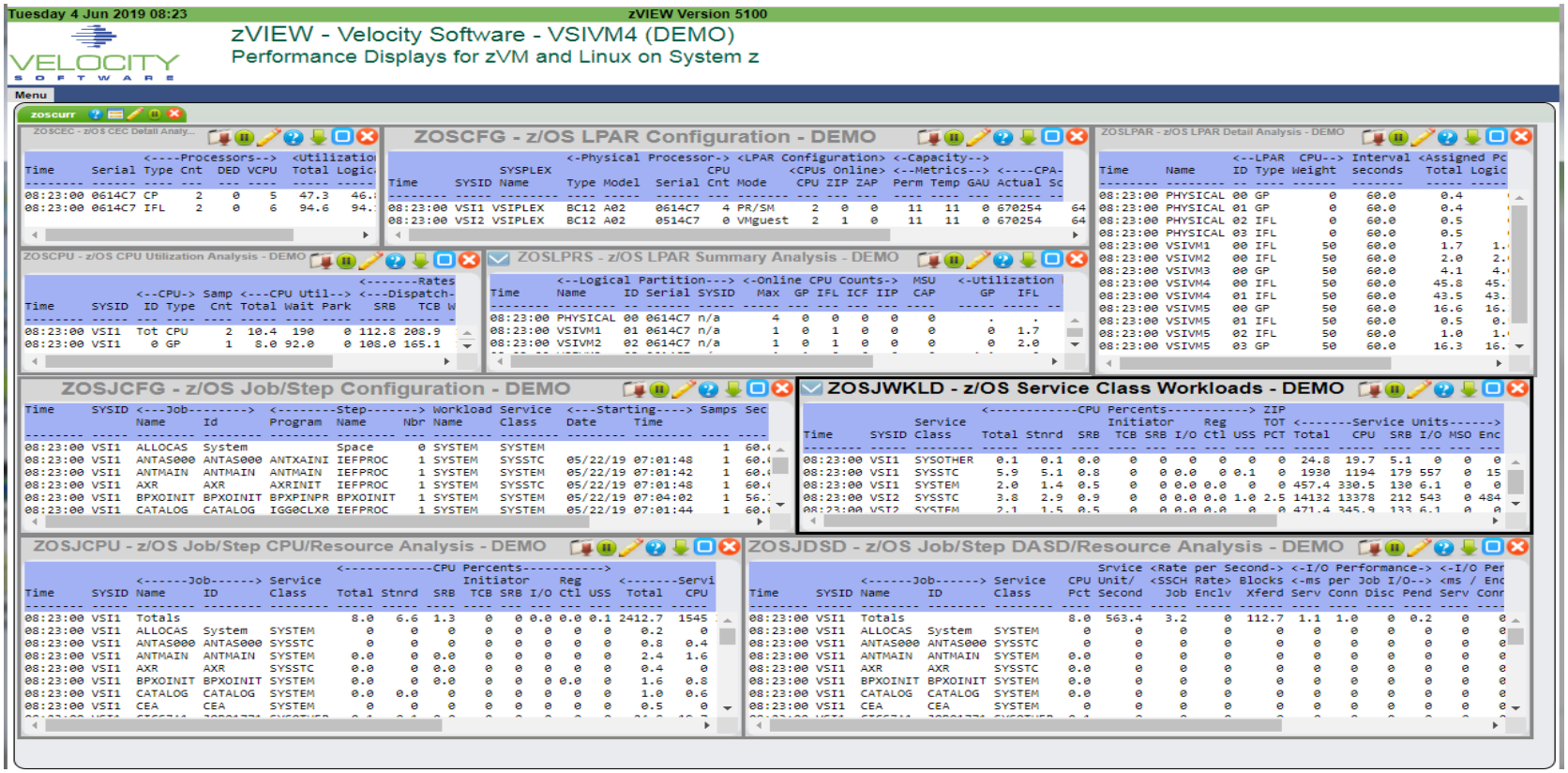
SMF Records extracted from stream
TCP/UDP Connection to zTCP
Data streamed to zwrite thru dcss
One minute granularity – real time data…

zVPS 5.1 – zOSMON ™

z/OS – SMF records: 70s, 30s, 110 , 113 , db2/mq soon

Live on Demo: http://VelocitySoftware.com/zosmon.html

Click on link for live data – it's real….



Thank You

SPECIAL WEBSITES….

- VelocitySoftware.com/HANDOUTS
- VMWORKSHOP.ORG (140 Real Attendees… June 27-29)
- Performance Workshop (no charge) June 25-26
- velocitysoftware.com/seminar/workshop.html
- Velocitysoftware.com/zosmon.html

Send data….

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