

# **What's new in zVPS 4.3 z/VM and Linux Performance Management**

**(What can you do “new” after 29 years???)**

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Performance Management Overview  
Systems Management Features  
zVPS Objectives (and buzzwords)  
End to End Performance Management  
zVPS

- Data Collection
- PDB
- Technology

zVPS Release 4.3 Updates

# *The Velocity Software mission and principals*

## Performance Management (vs DIAGNOSTICS)

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

Correct data (Virtual Linux CPU data wrong)

Capture ratios (is the data valid?)

Velocity Software can NOT be the performance problem

KISS Principal ALWAYS (NO SMAPI!!!)

FULL Integration of all components

Performance Research critical to our customers

# *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

# Infrastructure Requirements: Capacity Planning

## Why Capacity Planning: Future Service Levels

- How many more servers can you support with existing z10?
- 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, TUAM, TDS, IUE (BMC)**

## Why Chargeback?

- 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

## 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
- Requires active performance management

## Infrastructure Requirements

- Fast problem detection
- Interface to SNMP management console (NETCOOL, HPOpenView)
- User tailored alerts
- Web based alerts

## “z” – original focus

- z/VM
- Linux
- VSE

## Distributed

- Linux (blades, vmware, etc)
- Microsoft
- Solaris, aix

## Distributions

- Suse
- Redhat
- UBUNTU (2Q 2017)

## Network

- Any snmp enabled devices

## “Applications

- Oracle
- Java/Websphere
- (MQ)
- (DB2)
- (DOCKER)

**Focus is shifting to more of an Enterprise Model**



## Standard Interfaces mean less work

- Agentless, very little “proprietary” data

## CP Monitor – z/VM

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

## SNMP – Standard

- 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



## Data Engine

- zWRITE
- zMAP
- zTCP
- SNMP

## Data / User Interface

- zMON
- zVWS
- zVIEW

## Database

- Extract (zmap)
- Extract (zmon)
- MICS / MXG / IUE

## Operations

- zALERT
- zOPERATOR
- Portal / zPRO

# *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**

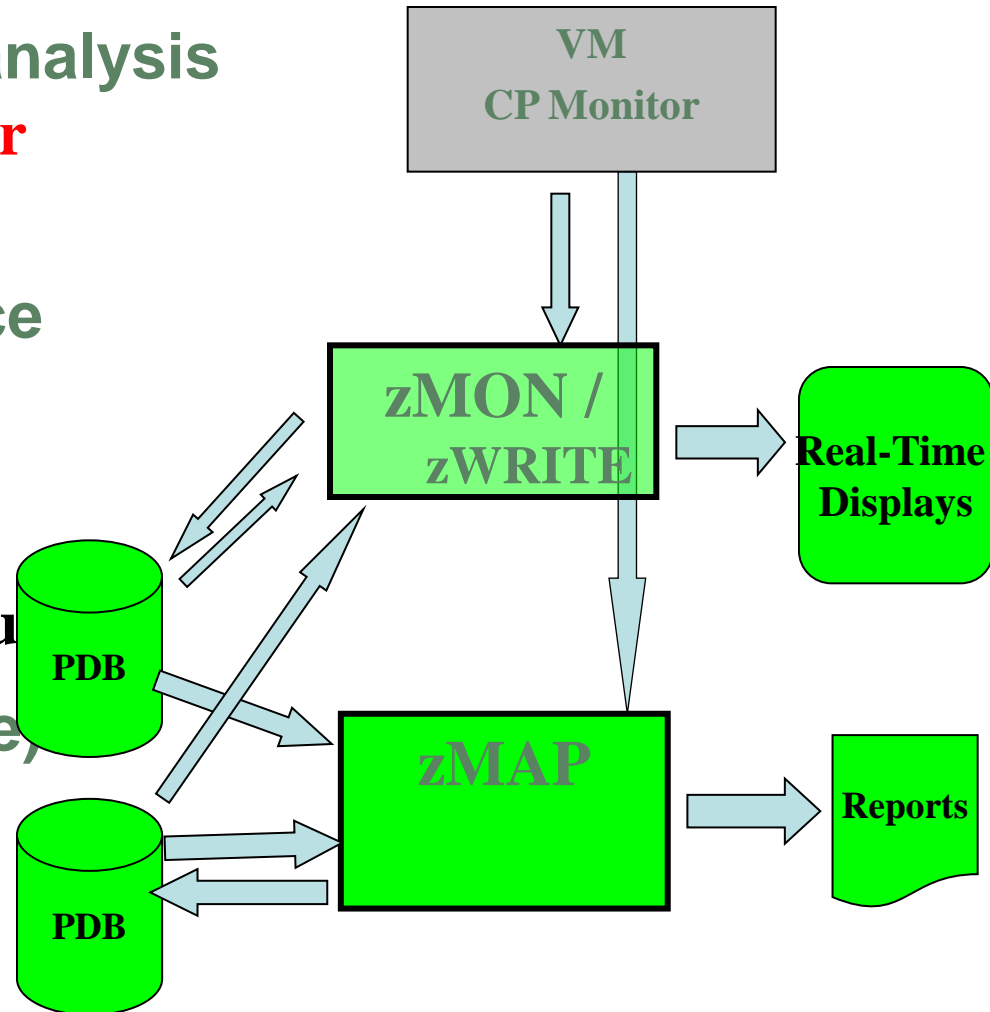
**PDB or monwrite data input**

**PDB (Performance DataBase)**

**Complete data**

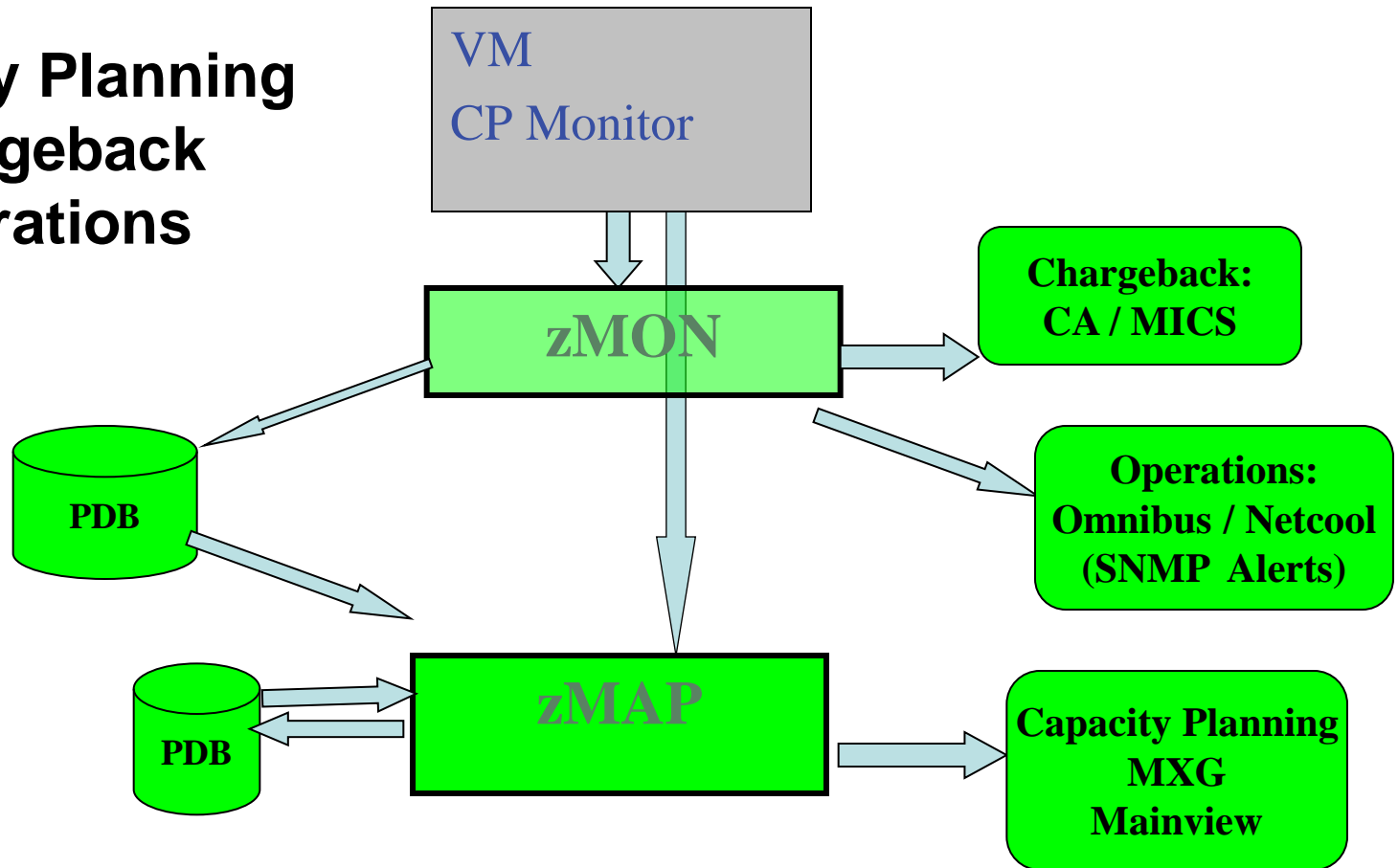
**By Minute, hour, day**

**Monthly/Yearly Archive**



# Add “Enterprise” Support

## Capacity Planning Chargeback Operations



## Operational cost of agents

- Does the 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?
- 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%)**

## • 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?**

# Network, Linux Instrumentation

## Performance Data infrastructure existed (ZMON/zMAP)

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

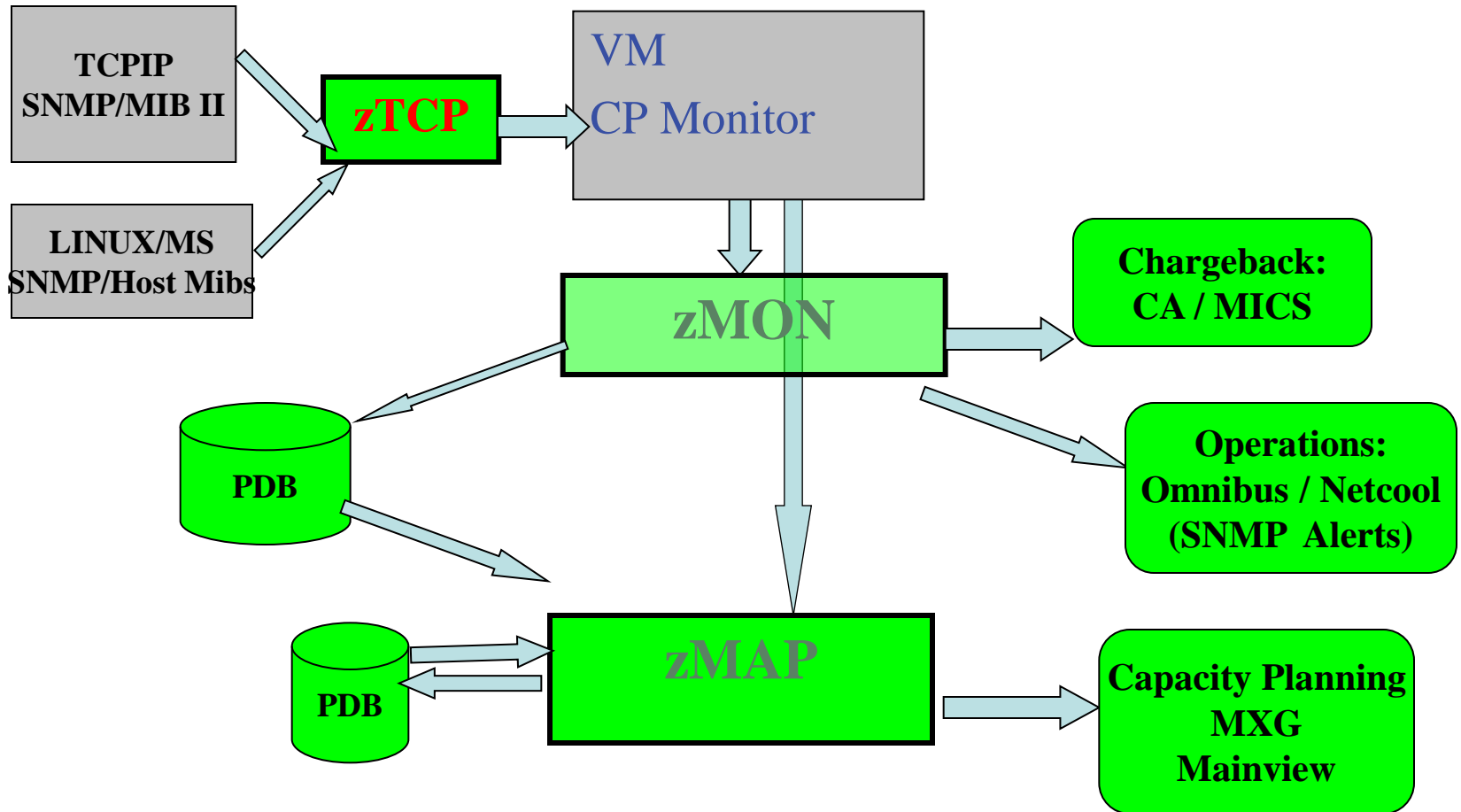
## Data source needed for Linux and Network:

- Passive agent (do not measure idle servers)
- **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
- Standard interface

## 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 SLES – UBUNTU is “different”)
- **Platform independent (Intel, P-series, Microsoft, Linux)**
- **.03% of ONE IFL (z10,sles9) per server, ONE MINUTE COLLECTION**

# Add “Network” and “host” Support – Pre Linux



## 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**
- **IBMOSA**

## Why Velocity mib?

- More data
- Better data
- Better performance



## MibII: Transport layer, IP layer, hardware layer, icmp

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

Report: ESATCP1		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

# Host Analysis “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
```

# 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

Time	Node	Name	ID	Type	Status	Total	Intrval	Pct	Storage(K)
		-----Software Program-----							
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
		<b>sqlservr</b>	<b>2136</b>	<b>4</b>	<b>1</b>	<b>50038</b>	<b>9.53</b>	<b>15.72</b>	<b>511624</b>
		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

# 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)

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/ Time/ Date	-----Storage Sizes (in MegaBytes)-----											
	<---Real Storage-->			<-----SWAP Storage----->			Total	<----Storage in Use-				
	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	
tdirtlds	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	

Linux data shows  
Real storage  
Swap storage  
“cache”

Swapping is “good”

If not swapping,  
reduce vm size  
Use CMM to reduce

## More data at very low cost Expose linux internal metrics

- Process data (50 metrics instead of 6)
- Storage / RAM metrics (40 vs 10)
- CPU Metrics
- File system metrics (disk response times)
  
- Oracle data (AWR is expensive diagnostic tool)
- Java (ditto for diagnostic tools)

# Process Capture Ratio with Velocity mib

## High cpu capture ratio

Report: ESALNXV		LINUX Virtual Processor Analysis Report							
Node/ Name	VM ServerID	<Linux Pct CPU>			<Process Data>			Capture Ratio	Prorate Factor
		Total	Syst	User	Total	Syst	User		
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/ Name	<-Process Ident->			Nice	<-----CPU Percents----->					
	ID	PPID	GRP	Valu	Tot	sys	user	syst	usr	t
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/ Name	<-Process ID	PPID	GRP	<-----Pr 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
apldata	96	4	0	apldata
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

# 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
```



# Analyzing Linux CPU by Application

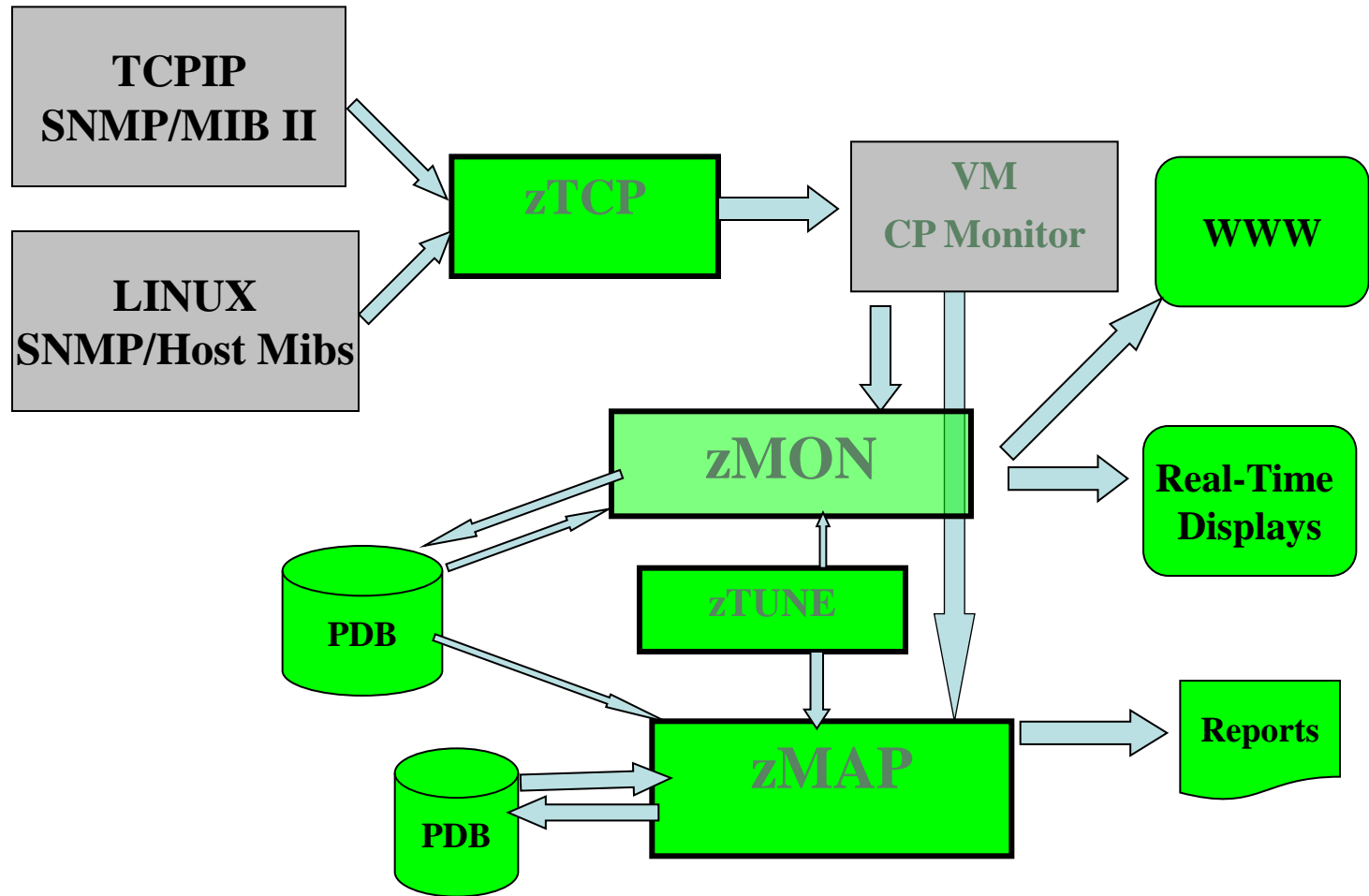
## Velocity MIB data:

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
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
```

# Modernize: Webserving, performance skills



**ZVWS** Provides www access

## 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 Support – monitor where operating

```
TCPIP='TCPIP'  peerport = 1998
```

```
peeraddr = '67.218.99.132' peerport = 1998 ;vsivm2
```

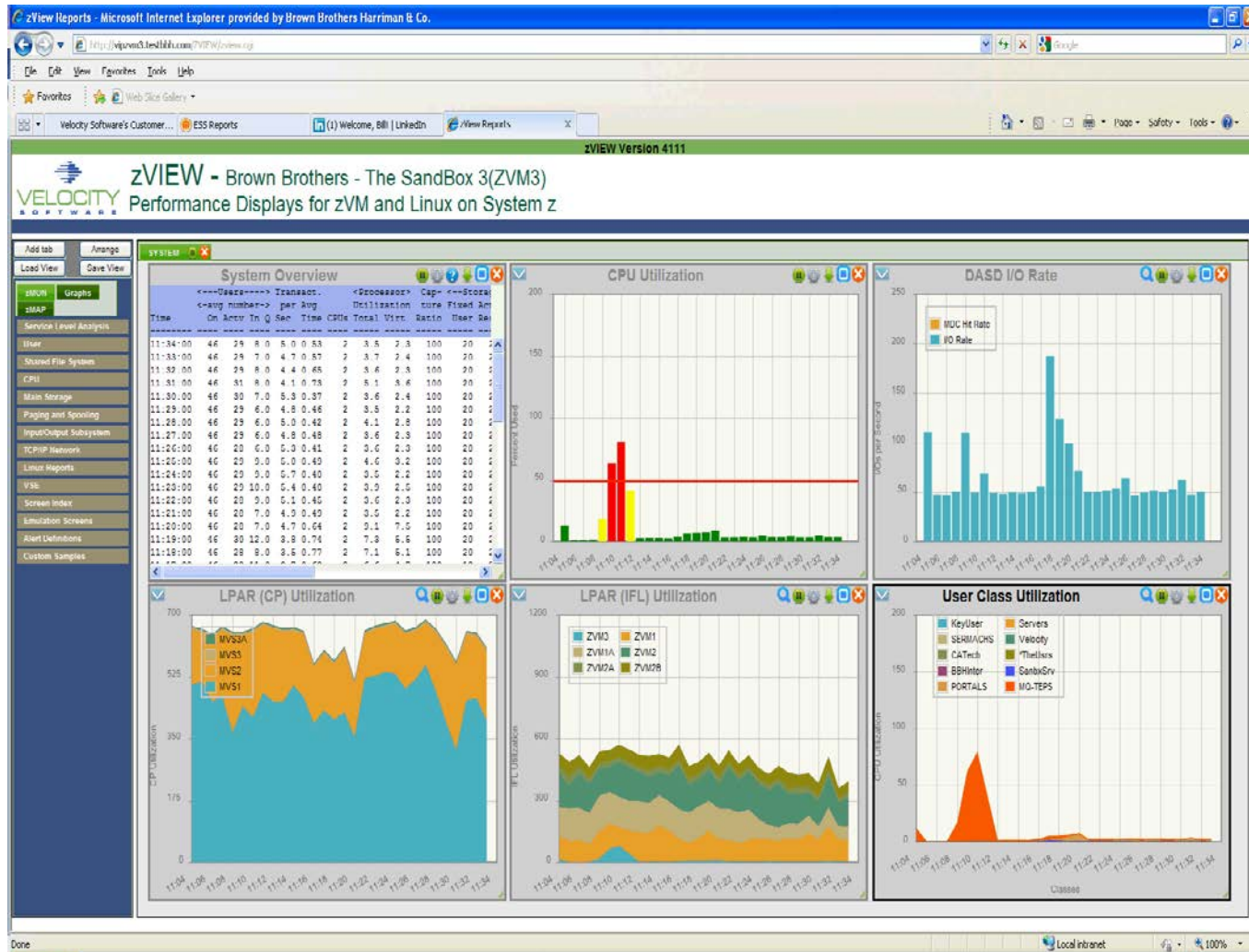
```
peeraddr = '67.218.99.134' peerport = 1998 ;vsivm4
```

```
peeraddr = '67.218.99.135' peerport = 1998 ;vsivm5
```

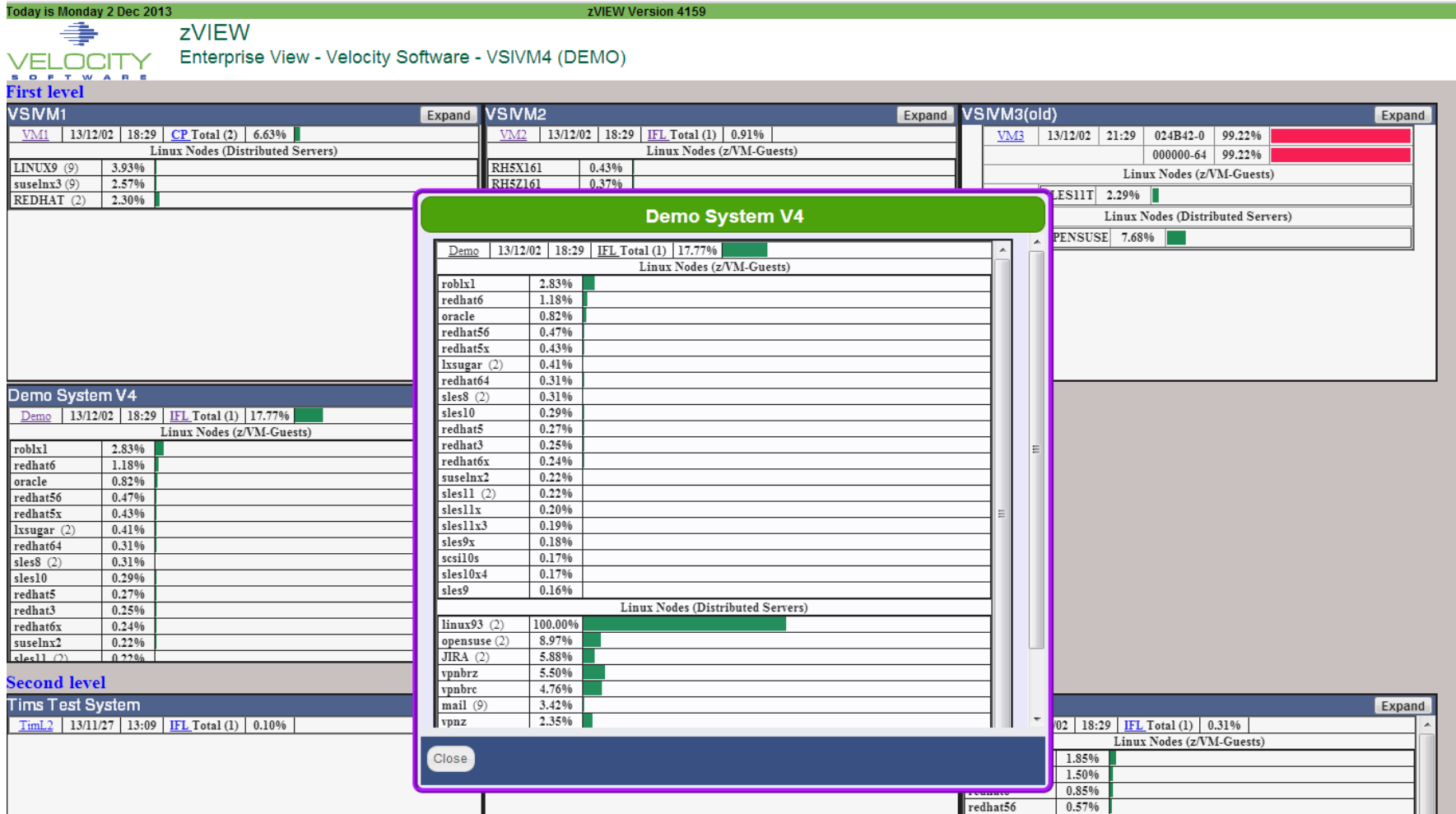
```
Ssiflag = '1'b
```

```
Node = 'lnxssil' domain='prod.mylinux.mycompany.com'
```

# zVIEW Version 2 Example



## Tailorable, expandable, zoomable



## 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

# 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 24.42% full
LNDX /opt area on S11R20RA is 95.80% full
LNDX /mnt/oracle area on S11R20RA is 53.23% full
LNSU Swap utilization for Linux node BlakeMC is 13.86%
LNSU Swap utilization for Linux node S11R20RA is 39.71% full
```

zVIEW - Velocity Software - VSIVM4 (DEMO)  
Performance Displays for zVM and Linux on System z

Or Browser based:  
Click Thru  
or SMS, email...

LINALERT - Exceptions Analysis Alerts - 15/03/25 at 06:47 - DEMO	
Code	Alert Description
LNSU	CPU utilization on Linux node BlakeMC is 13.86%
LNDX	/ area on lxsugar is 90.74% full
LNDX	/usr area on lxsugar is 57.59% full
LNDX	/ area on opensuse is 39.71% full
LNDX	/home area on opensuse is 53.23% full
LNDX	/iso/sles11s area on opensuse is 100.00% full
LNDX	/iso/s11sp2- area on opensuse is 100.00% full
LNDX	/iso/s11sp2- area on opensuse is 100.00% full
LNDX	/iso/s11sp3- area on opensuse is 100.00% full
LNDX	/iso/s11sdk- area on opensuse is 100.00% full
LNDX	/iso/s10sp2 area on opensuse is 100.00% full
LNDX	/iso/r64 area on opensuse is 100.00% full
LNDX	/iso/r62 area on opensuse is 100.00% full
LNDX	/iso/s10v1 area on opensuse is 100.00% full
LNDX	/iso/r7 area on opensuse is 100.00% full
LNDX	/iso/sles11s area on opensuse is 100.00% full
LNDX	/iso/s12-1 area on opensuse is 100.00% full
LNDX	/iso/s12-2 area on opensuse is 100.00% full
LNDX	/iso/s12sd1 area on opensuse is 100.00% full
LNDX	/iso/s12sd2 area on opensuse is 100.00% full
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 redhat5 is 52.26% full
LNDX	/ area on redhat5x is 32.54% full
LNDX	/ area on redhat6 is 95.80% full
LNDX	/mnt area on redhat6 is 53.23% full
LNDX	/ area on redhat6 is 30.08% full
LNDX	/ area on redhat6x is 94.92% full
LNDX	/dev/shm area on redhat6x is 51.42% full
LNDX	/ area on redhat64 is 36.09% full
LNDX	/boot area on rhel7v is 23.79% full
LNDX	/ area on roblnx2 is 78.74% full

# Operational Support - SNMP Alert integration

## ZVPS SNMP Alert Architecture

- Centralized alert (no trap settings on each server!)
- 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
```



## Several requests to extend ESAOPER screen

Optional **no-charge** application component

Replaces VM Operations Manager

Display:

- Uses standard zMON 3270 screen driver, existing function
- Dialed terminal for multiviewing
- zVIEW integration (browser)

Scrollable console

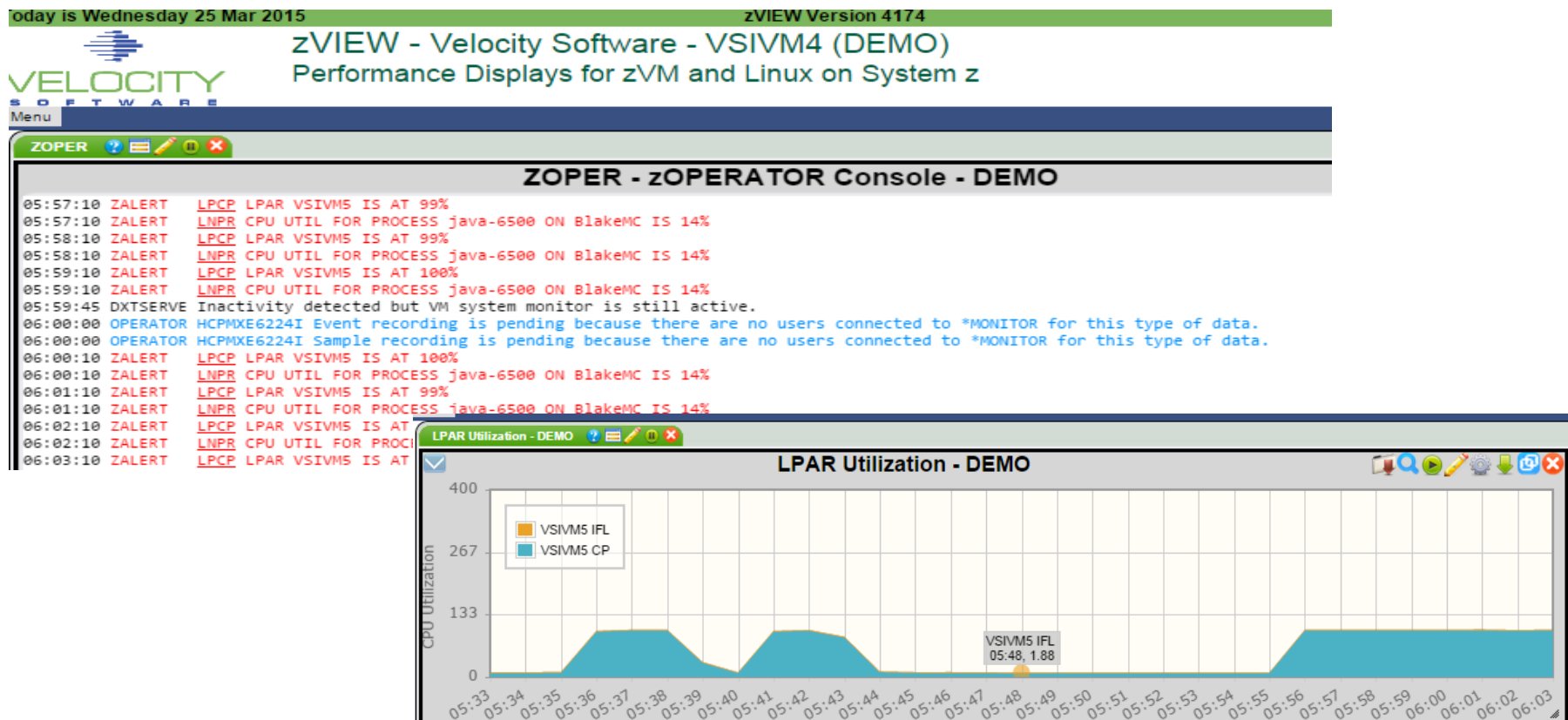
Messages can be searched by text, date or time

All messages logged in daily files

Actions can be set based on messages received

## Operator Function browser based

- Click Thru for problem analysis – LPCP example



# Portal Console Management View

Can also Give console access to end users via browser  
Record zvps service machines

Performance | zVWS administration | zTCP administration | zVPS administration

## Available zVPS Console Logs

### zPRO Available Log Files

Select one or more logfiles that you wish to view or download

<b>DXTZMAP</b>			
<input type="checkbox"/> 14 Jun 2013 (4)	<input type="checkbox"/> 03 Jun 2013 (4)	<input type="checkbox"/> 23 May 2013 (4)	<input type="checkbox"/> 12 May 2013 (4)
<input type="checkbox"/> 13 Jun 2013 (4)	<input type="checkbox"/> 02 Jun 2013 (4)	<input type="checkbox"/> 22 May 2013 (4)	<input type="checkbox"/> 11 May 2013 (4)
<input type="checkbox"/> 12 Jun 2013 (4)	<input type="checkbox"/> 01 Jun 2013 (4)	<input type="checkbox"/> 21 May 2013 (648)	<input type="checkbox"/> 10 May 2013 (4)
<input type="checkbox"/> 11 Jun 2013 (4)	<input type="checkbox"/> 31 May 2013 (4)	<input type="checkbox"/> 20 May 2013 (6)	<input type="checkbox"/> 09 May 2013 (39)
<input type="checkbox"/> 10 Jun 2013 (4)	<input type="checkbox"/> 30 May 2013 (4)	<input type="checkbox"/> 19 May 2013 (6)	<input type="checkbox"/> 08 May 2013 (4)
<input type="checkbox"/> 09 Jun 2013 (4)	<input type="checkbox"/> 29 May 2013 (4)	<input type="checkbox"/> 18 May 2013 (6)	<input type="checkbox"/> 07 May 2013 (4)
<input type="checkbox"/> 08 Jun 2013 (4)	<input type="checkbox"/> 28 May 2013 (4)	<input type="checkbox"/> 17 May 2013 (6)	<input type="checkbox"/> 06 May 2013 (4)
<input type="checkbox"/> 07 Jun 2013 (4)	<input type="checkbox"/> 27 May 2013 (4)	<input type="checkbox"/> 16 May 2013 (6)	<input type="checkbox"/> 05 May 2013 (4)
<input type="checkbox"/> 06 Jun 2013 (4)	<input type="checkbox"/> 26 May 2013 (4)	<input type="checkbox"/> 15 May 2013 (4)	
<input type="checkbox"/> 05 Jun 2013 (4)	<input type="checkbox"/> 25 May 2013 (4)	<input type="checkbox"/> 14 May 2013 (4)	
<input type="checkbox"/> 04 Jun 2013 (4)	<input type="checkbox"/> 24 May 2013 (4)	<input type="checkbox"/> 13 May 2013 (4)	
<b>INSTALL</b>			
<input type="checkbox"/> 14 Jun 2013 (263)	<input type="checkbox"/> 02 Jun 2013 (553)	<input type="checkbox"/> 20 May 2013 (78)	<input type="checkbox"/> 09 May 2013 (6)
<input type="checkbox"/> 13 Jun 2013 (16)	<input type="checkbox"/> 31 May 2013 (12)	<input type="checkbox"/> 17 May 2013 (153)	<input type="checkbox"/> 08 May 2013 (257)
<input type="checkbox"/> 12 Jun 2013 (38)	<input type="checkbox"/> 30 May 2013 (6)	<input type="checkbox"/> 16 May 2013 (887)	<input type="checkbox"/> 06 May 2013 (5)
<input type="checkbox"/> 10 Jun 2013 (8)	<input type="checkbox"/> 29 May 2013 (317)	<input type="checkbox"/> 15 May 2013 (494)	<input type="checkbox"/> 05 May 2013 (155)
<input type="checkbox"/> 05 Jun 2013 (6)	<input type="checkbox"/> 28 May 2013 (6)	<input type="checkbox"/> 14 May 2013 (48)	
<input type="checkbox"/> 04 Jun 2013 (6)	<input type="checkbox"/> 23 May 2013 (63)	<input type="checkbox"/> 13 May 2013 (434)	
<input type="checkbox"/> 03 Jun 2013 (1050)	<input type="checkbox"/> 22 May 2013 (20)	<input type="checkbox"/> 10 May 2013 (14)	
<b>SFPURGER</b>			
<input type="checkbox"/> 14 May 2013 (8)	<input type="checkbox"/> 11 May 2013 (8)	<input type="checkbox"/> 08 May 2013 (8)	<input type="checkbox"/> 05 May 2013 (8)
<input type="checkbox"/> 13 May 2013 (8)	<input type="checkbox"/> 10 May 2013 (8)	<input type="checkbox"/> 07 May 2013 (8)	
<input type="checkbox"/> 12 May 2013 (8)	<input type="checkbox"/> 09 May 2013 (8)	<input type="checkbox"/> 06 May 2013 (8)	
<b>ZALERT</b>			
<input type="checkbox"/> 13 Jun 2013 (40)	<input type="checkbox"/> 03 Jun 2013 (48)	<input type="checkbox"/> 24 May 2013 (50)	<input type="checkbox"/> 14 May 2013 (52)
<input type="checkbox"/> 12 Jun 2013 (48)	<input type="checkbox"/> 02 Jun 2013 (38)	<input type="checkbox"/> 23 May 2013 (42)	<input type="checkbox"/> 13 May 2013 (70)
<input type="checkbox"/> 11 Jun 2013 (42)	<input type="checkbox"/> 01 Jun 2013 (52)	<input type="checkbox"/> 22 May 2013 (63)	<input type="checkbox"/> 12 May 2013 (42)

## Linux Performance Management

- Oracle
- Java
- Longer process names/paths
- System real storage metrics
- Process – more metrics
- 32 bit process IDs (Apple server processes go to 99,999)

## z/VM Performance Management

- 6.3 Exploitation (ESAMFC, Diagnose rates)
- Storage report,
- zOPERATOR
- PORTAL V2

## Performance Research

- Large page support, MFC, CMM

## Processor announcements always include hardware stuff

- pipelining
- More cache
- Better cache
- Different cycle time

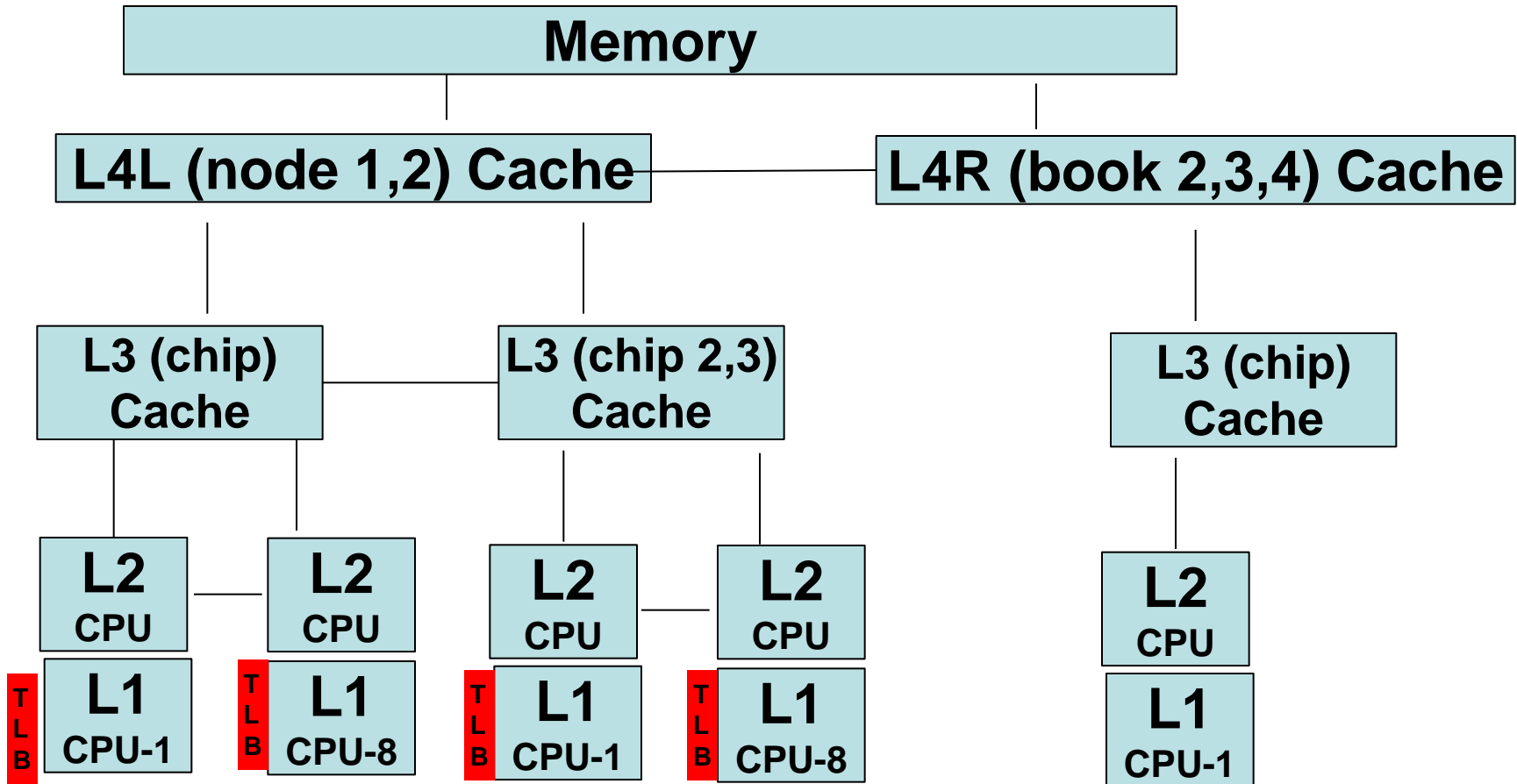
## New stuff

- Hiperdispatch
- Vertical vs Horizontal dispatching
- SMT

## How do you speed up existing processors?

- Measure Cycles per instruction
- Measure Cycles used for work
- Fix polling applications.....

## Understanding architecture becoming necessary



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

What is the CPU Measurement Facility (Basic)

CPI: Cycles per Instruction (EC12 is 5.5Ghz)

Report: ESAMFCA MainFrame Cache Hit Analysis  
Monitor initialized: 12/10/14 at 07:44:37 on 282

Time	CPU	<CPU Busy> <percent>		<-----Processor-----> Speed/<Rate/Sec>			CPI Ratio
		Totl	User	Hertz	Cycles	Instr	
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 MIPS?

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

**1830 mips  
(at 100%)**

-----							
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

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



# 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> <percent>		<-----> Speed/ Hertz		<-----> Ratio		<-Translation Lookaside buffer(TLB)-> <cycles/Miss><Writs/Sec>		CPU Cycles	
Time	CPU	Totl	User			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

# zTCP Version 4.2 (“spe” Enterprise support)

## Snmp v3 support

## SSI Flag

- zTCP knows on which LPAR server is running
- Move data collection to correct LPAR

## Test communication status

```
smsg ztcp query nodes
Ready; T=0.01/0.01 19:52:15
  PRODVM1 ,TCPIP2 67.218.99.131 1998, 0:00:00
  VSIDEV ,TCPIP 67.218.99.132 1998, 0:00:00
  VSIVM4 ,TCPIP 67.218.99.134 1998, 9:37:34
    ,TCPIP 67.218.99.135 1998, 0:00:00
    ,TCPIP 67.218.99.136 1998, 0:00:00
  PRODVM1 ,TCPIP2 192.168.5.41 1998, 0:00:00
  VSIDEV ,TCPIP 192.168.5.42 1998, 0:00:00
  VSIVM4 ,TCPIP2 192.168.5.44 1998, 9:37:34
  VSIVM5 ,TCPIP2 192.168.5.45 1998, 0:00:00
  VSIVM6 ,TCPIP2 192.168.5.46 1998, 0:00:00
  VSIVM6 ,TCPIP 67.218.99.142 1998, 0:00:00
  PRODVM1 ,TCPIP 50.193.31.129 1998, 0:00:00
End Display
```

## Z13 monitor support

- CPU Pooling (ESAPOOL)
- SMT Support (ESASMT, ESAUSR5/ESAUSP5)
- MFC support for z13 (ESAMFCx)
- Topography suport

## Performance Engine

- Filesystem response times (ESALNXF)
  - Measure FCP vs ECKD always a problem
  - No host support, only from Linux metrics
- JVM Threads – extension to java support (ESAJVMT)
- Oracle enhancements
  - Asynchronous agent
- Z/VM 6.4 new records
  - HiperPav (ESAHPP)
  - More SMT (ESASMT)
- VSE enhancements
- OSA adapter (ESAOSA)
  - No host support, must use Linux agent

## Operational

- zOPER
  - Many minor enhancements
- zALERT
  - Many minor enhancements
- zVIEW
  - Many minor enhancements

## Performance Research

- SMT, MFC

## Challenges:

- Chrome vs IE vs what next
- SSL to TLS
- TLS 1.0 vs 1.2

## zVPS 4.3 provided

- Updated browser support
- Updates SSL (TLS 1.0) support

## Preview for 2017

- TLS 1.1 and 1.2 support
- Stronger ciphers as needed
- Support IBM ssl?

## Hyperpav Works, can demonstrate it's use

```

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

```

## FCP vs ECKD performance

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/ Time/	Disk Name	/Second I/O Mrgd	Sectrs /RdIO	(ms) /IO	/Second I/O Mrgd	Sectrs /WrtIO	(ms) /IO	Prog- ress	<Per I/O>		
OSA178											
	dasda	0	0	0	0	0	0	0	0	0	
	dasda1	0	0	0	0	0	0	0	0	0	
	sda	0	0	0	0	1.8	0.5	52.5	0.3	0.2	
	sda1	0	0	0	0	0	0	0	0	0	
	sda2	0	0	0	0	0.3	0.5	264.8	1.0	0.6	
sles12										1.0	
	dasda	0	0	0	0	0	0	0	0	0	
	dasda1	0	0	0	0	0	0	0	0	0	
	sda	0	0	0	0	1.8	0.5	52.5	0.3	0.2	
	sda1	0	0	0	0	0	0	0	0	0	
	sda2	0	0	0	0	0.3	0.5	264.8	1.0	0.6	
NODE/ Time/	Disk Name	> <--Device Path-->									
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 Time	<-----Thread ID-----> Name	nbr	<--Blocks--> /Second	Time	<Thread /Sec	Waits> Time	CPU (ms)
14:37:00	Totals: AppSrv01-server1	0	0.2	0	73.1	0	170.8
lxoral2	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	Node	Idx	Name	Nbr	Type	Level	Shrd	MacAddress
06:03:00	OSA178	2	OSA1	0	1G Eth	6.00	Yes	6CAE8B483FD4

Report: ESAOSA OSA Velocity Software Corporate  
Monitor initialized: 05/14 First record analyzed: 05/14

Collector	Node	Idx	Name	Nbr	LPAR NBR	Bus Util	CPHID Util	KBytes/Sec IN	KBytes/Sec OUT	Packets/sec In	Packets/sec 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		

# Longer process names

## Requirement for longer names to distinguish....

```
Report: ESALNXL          LINUX Process Configuration Report
Veloc
Monitor initialized: 02/26/17 at 02:00:00 on 2828 serial 0314C7
First
Monitor period:         79200 seconds ( 22:00:00)
Last
```

```
-----
Node/Process          <-Process ID> <---Process Path---> <-
  Name                ID      PPID
-----
lxora12
  init                 1        1  init '3"
  *                    2        1
  kswapd0              20       2  kswapd0
  *                    3219      1
  sshd                 394      3219  sshd: root@pts/0
  sshd                 2074     3219  sshd: root@pts/1
  cron                 3227      1  /usr/sbin/cron
  ora_j000_db02ct      22761     1  ora_j000_db02ctn
  ora_j000_db02ct      22803     1  ora_j000_db02ctn
  ora_j000_db02ct      23211     1  ora_j000_db02ctn
  ora_j000_db02ct      23253     1  ora_j000_db02ctn
  ora_j000_db02ct      23637     1  ora_j000_db02ctn
  , "
```

## Docker not that complicated

Experiment, 3 containers, each has snmp included

```
Report: ESALNXC          LINUX Process Configuration Report          Ve
Monitor initialized: 03/17/17 at 15:59:34 on 2828 serial 0414C7      Fi
Monitor period:          540 seconds (          9:00)              La
```

Node/ Name	<----Process ID	PPID	Ident----> GRP	Appl Appl	Appl Name	<User Identity> Userid	<Group Id PID GroupID
rksctnr1							
bash	1	1	1	1	bash	root	0 root
snmpd	26	1	25	26	snmpd	root	0 root
stresser	28	1	28	28	stresser	root	0 root
sleep	32716	28	28	32716	sleep	root	0 root
rksctnr2							
bash	1	1	1	1	bash	root	0 root
snmpd	26	1	25	26	snmpd	root	0 root
stresser	28	1	28	28	stresser	root	0 root
sleep	30010	28	28	30010	sleep	.	. .
rksctnr3							
bash	1	1	1	1	bash	root	0 root
snmpd	26	1	25	26	snmpd	root	0 root
stresser	28	1	28	28	stresser	root	0 root
sleep	29794	28	28	29794	sleep	root	0 root

## Docker from host perspective

Report: ESALNXC      LINUX Process Configuration Report      Velo  
Monitor initialized: 03/17/17 at 15:59:34 on 2828 serial 0414C7      Firs  
Monitor period:      540 seconds (      9:00)      Last

Node/ Name	<----Process ID	PPID	Ident----> GRP	Appl	Appl Name	<User Identity> Userid	<Group PID	Iden GroupID
sles12								
systemd	1	1	1	60839	systemd	root	0	root
kthreadd	2	1	0	1	Kernel	root	0	root
containe	1289	1	1289	3488	containe	root	0	root
master	1489	1	1489	1489	master	root	0	root
qmgr	1524	1489	1489	1524	qmgr	postfix	51	postfix
exe	2696	7195	7195	3399	exe	root	0	root
containe	2701	1289	2701	3488	containe	root	0	root
bash	2714	2701	2714	3417	bash	root	0	root
snmpd	2774	1289	2773	24763	snmpd	root	0	root
docker	2776	1	2776	7195	docker	root	0	root
containe	2781	1289	2781	3488	containe	root	0	root
stresser	2795	2781	2795	3502	stresser	root	0	root
exe	3037	7195	7195	3399	exe	root	0	root
containe	3042	1289	3042	3488	containe	root	0	root
bash	3055	3042	3055	3417	bash	root	0	root
snmpd	3109	1289	3108	24763	snmpd	root	0	root
docker	3149	1	3149	7195	docker	root	0	root
containe	3154	1289	3154	3488	containe	root	0	root
stresser	3168	3154	3168	3502	stresser	root	0	root
exe	3399	7195	7195	3399	exe	root	0	root
containe	3404	1289	3404	3488	containe	root	0	root
bash	3417	3404	3417	3417	bash	root	0	root
snmpd	3475	1289	3474	24763	snmpd	root	0	root
docker	3483	1	3483	7195	docker	root	0	root
containe	3488	1289	3488	3488	containe	root	0	root
stresser	3502	3488	3502	3502	stresser	root	0	root
docker	7195	1	7195	7195	docker	root	0	root
pickup	10088	1489	1489	10088	pickup	postfix	51	postfix
sleep	13190	2795	13192	13192	sleep	root	0	root
sleep	13191	3168	3168	13192	sleep	root	0	root
sleep	13192	3502	3502	13192	sleep	root	0	root
snmpd	24763	1	24761	24763	snmpd	root	0	root

### Many Enhancements, more to come

- Db2, mq, docker
- ubuntu
- Enterprise model for applications
- Access control for zview, zoperator
- Spool access
- Splunk
- Ipv6 (bad....)

### Performance Research needed:

- SMT, MFC

### Opportunities:

- Smapi replacements
- Xcat/cma total failures
- Wave not so good

## Performance workshop in June in Columbus

- Free for zvps installations

Keep the requirements coming